Preface

Thank you for your continuing loyalty to Fujitsu's semiconductor products.

Electronic equipment is continually becoming smaller, lighter, and less expensive while also growing more advanced in terms of function and performance. As a result, applications for semiconductor devices such as IC and LSI are rapidly increasing.

Given this environment, package technology is rapidly increasing in importance. Fujitsu is working hard to develop packages that permit improved mounting efficiency.

This data book demonstrates Fujitsu's technologies that are capable of responding to the growing diversification of packages, and includes all of Fujitsu's IC packages, from general-purpose packages to those that are still under development.

This data book is intended for engineers who are using Fujitsu packages in the design of their products, and therefore focuses on the package outline drawings.

Fujitsu Limited
Electronic Devices

Safety Precautions

To prevent possible danger, damage, and bodily harm, understand and follow the precautions below to use each product safely.

⚠ **WARNING**	Inappropriate handling of a product contrary to a WARNING note could result in death or serious injury.

- Avoid contact with chemicals.
  Letting the product come into contact with an acid or alkaline chemical may generate harmful gas from dissolved product material.

⚠ **CAUTION**	Inappropriate handling of a product contrary to a CAUTION note may result in personal injury or damage to the product.

- Use the product only within each maximum rating. Exceeding any of the maximum ratings may adversely affect the features of the product, or cause the product to overheat, smoke or burn, producing harmful gas.
- Read the manuals for modules, cards, and hybrid products.
  When connecting any component to the main unit of the equipment, incorrect handling may result in malfunction or damage to the product and danger of injury from electric shock.
- When handling the product, use meticulous care to protect it from static electricity. Take measures against static electricity when handling the product. Static electricity can damage the product, adversely affect its features, or cause a malfunction.
- When designing products to be mounted, take account of the effects of heating. Since some products heat up considerably, handling with bare hands may result in burn injuly, or they may transfer heat to components mounted around them.

⚠ **CAUTION**	Inappropriate handling of a product contrary to a CAUTION note may result in personal injury or damage to the product.

- When mounting the product, satisfy the mounting conditions recommended by Fujitsu.
  Disregarding any of the mounting conditions may adversely affect the features of the product or dissolve its material, producing harmful gas.
- When mounting a heat sink plate or fin on the product, be careful not to deform the product.
  If the part is mounted inappropriately, it may adversely affect the features of the product.
- Be careful to avoid injury from pins.
  Some products have sharp-ended pins for functional purpose.
- Be careful during ultrasonic cleaning.
  Ultrasonic cleaning of ceramic packages or ceramic modules may adversely affect them, for example, by vibrating internal wires, resulting in breaks. For plastic packages, observe the cleaning conditions recommended by Fujitsu.
- When mounting modules, cards, or hybrid products, use a non-deforming method at an appropriate temperature.
  Incorrect mounting may result in defective products.
- Do not use the product where corrosive gas is generated.
  Corrosive gas may adversely affect the features of the product, for example, by degrading its characteristics by corrosion.
- When discarding the product, refer to an authorized disposal or recycling company.
  Burning the product for disposal may generate harmful gas.

Precautionary Information for Handling of Semiconductor Devices

Any semiconductor devices have inherently a certain rate of failure. The possibility of failure is greatly affected by the conditions in which they are used (circuit conditions, environmental conditions, etc.). This page describes precautions that must be observed to minimize the chance of failure and to obtain higher reliability from your FUJITSU semiconductor devices.

1. Precautions for Product Design

This section describes precautions when designing electronic equipment using semiconductor devices.

1.1 Absolute Maximum Ratings

Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of certain established limits, called absolute maximum ratings. Do not exceed these ratings.

1.2 Recommended Operating Conditions

Recommended operating conditions are normal operating ranges for the semiconductor device. All the device's electrical characteristics are warranted when operated within these ranges.

Always use semiconductor devices within the recommended operating conditions. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses , operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their FUJITSU sales representative beforehand.

1.3 Processing and Protection of Pins

These precautions must be followed when handling the pins which connect semiconductor devices to power supply and input/output functions.

(a) Preventing Over-Voltage and Over-Current Conditions

Exposure to voltage or current levels in excess of maximum ratings at any pin is likely to cause deterioration within the device, and in extreme cases leads to permanent damage of the device. Try to prevent such over-voltage or over-current conditions at the design stage.

(b) Protection of Output Pins

Shorting of output pins to supply pins or other output pins, or connection to large capacitance can cause large current flows. Such conditions if present for extended periods of time can damage the device.

Therefore, avoid this type of connection.

(c) Handling of Unused Input Pins

Unconnected input pins with very high impedance levels can adversely affect stability of operation. Such pins should be connected through an appropriate resistance to a power supply pin or ground pin.

1.4 Latch-up

Semiconductor devices are constructed by the formation of P-type and N-type areas on a substrate. When subjected to abnormally high voltages, internal parasitic PNPN junctions (called thyristor structures) may be formed, causing large current levels in excess of several hundred mA to flow continuously at the power supply pin. This condition is called latch-up.

CAUTION: *The occurrence of latch-up not only causes loss of reliability in the semiconductor device, but can cause injury or damage from high heat, smoke or flame. To prevent this from happening, do the following:*

(a) Be sure that voltages applied to pins do not exceed the absolute maximum ratings. This should include attention to abnormal noise, surge levels, etc.

(b) Be sure that abnormal current flows do not occur during the power-on sequence.

1.5 Observance of Safety Regulations and Standards

Most countries in the world have established standards and regulations regarding safety, protection from electromagnetic interference, etc. Customers are requested to observe applicable regulations and standards in the design of products.

1.6 Fail-Safe Design

Any semiconductor devices have inherently a certain rate of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

1.7 Precautions Related to Usage of Devices

FUJITSU semiconductor devices are intended for use in standard applications (computers, office automation and other office equipment, industrial, communications, and measurement equipment, personal or household devices, etc.).

CAUTION: *Customers considering the use of our products in special applications where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded (such as aerospace systems, atomic energy controls, sea floor repeaters, vehicle operating controls, medical devices for life support, etc.) are requested to consult with FUJITSU sales representatives before such use. The company will not be responsible for damages arising from such use without prior approval.*

2. Precautions for Package Mounting

Package mounting may be either lead insertion type or surface mount type. In either case, for heat resistance during soldering, you should only mount under FUJITSU's recommended conditions. For detailed information about mount conditions, contact your FUJITSU sales representative.

2.1 Lead Insertion Type

Mounting of lead insertion type packages onto printed circuit boards may be done by two methods: direct soldering on the board, or mounting by using a socket.

Direct mounting onto boards normally involves processes for inserting leads into through-holes on the board and using the flow soldering (wave soldering) method of applying liquid solder. In this case, the soldering process usually causes leads to be subjected to thermal stress in excess of the absolute ratings for storage temperature. Mounting processes should conform to FUJITSU recommended mounting conditions.

If socket mounting is used, differences in surface treatment of the socket contacts and IC lead surfaces can lead to contact deterioration after long periods. For this reason it is recommended that the surface treatment of socket contacts and IC leads be verified before mounting.

2.2 Surface Mount Type

Surface mount packaging has longer and thinner leads than lead-insertion packaging, and therefore leads are more easily deformed or bent. The use of packages with higher pin counts and narrower pin pitch results in increased susceptibility to open connections caused by deformed pins, or shorting due to solder bridges.

You must use appropriate mounting techniques. FUJITSU recommends the solder reflow method, and has established a ranking of mounting conditions for each product. Users are advised to mount packages in accordance with FUJITSU ranking of recommended conditions.

2.3 Storage of Semiconductor Devices

Because plastic chip packages are formed from plastic resins, exposure to natural environmental conditions will cause absorption of moisture. During mounting, the application of heat to a package that has absorbed moisture can cause surfaces to peel, reducing moisture resistance and causing packages to crack. To prevent, do the following:

(a) Avoid exposure to rapid temperature changes, which cause moisture to condense inside the product. Store products in locations where temperature changes are slight.

(b) Use dry boxes for product storage. Products should be stored below 70% relative humidity, and at temperatures between 5 °C (41 °F) and 30 °C (86 °F).

(c) When necessary, FUJITSU packages semiconductor devices in highly moisture-resistant aluminum laminate bags, with a silica gel desiccant. Devices should be sealed in their aluminum laminate bags for storage.

(d) Avoid storing packages where they are exposed to corrosive gases or high levels of dust.

2.4 Baking

Packages that have absorbed moisture may be de-moisturized by baking (heat drying). Follow the FUJITSU recommended conditions for baking.

2.5 Static Electricity

Because semiconductor devices are particularly susceptible to damage by static electricity, you must take the following precautions:

(a) Maintain relative humidity in the working environment between 40% and 70%. Use of an apparatus for ion generation may be needed to remove electricity.

(b) Electrically ground all conveyors, solder vessels, soldering irons and peripheral equipment.

(c) Eliminate static body electricity by the use of rings or bracelets connected to ground through high resistance (on the level of 1MW).

Wearing of conductive clothing and shoes, use of conductive floor mats and other measures to minimize shock loads is recommended.

(d) Ground all fixtures and instruments, or protect with anti-static measures.

(e) Avoid the use of styrofoam or other highly static-prone materials for storage of completed board assemblies.

3. Precautions for Use Environment

Reliability of semiconductor devices depends on ambient temperature and other conditions as described above. For reliable performance, do the following:

(a) Humidity

Prolonged use in high humidity can lead to leakage in devices as well as printed circuit boards. If high humidity levels are anticipated, consider anti-humidity processing.

(b) Discharge of Static Electricity

When high-voltage charges exist close to semiconductor devices, discharges can cause abnormal operation. In such cases, use anti-static measures or processing to prevent discharges.

(c) Corrosive Gases, Dust, or Oil

Exposure to corrosive gases or contact with dust or oil may lead to chemical reactions that will adversely affect the device. If you use devices in such conditions, consider ways to prevent such exposure or to protect the devices.

(d) Radiation, Including Cosmic Radiation

Most devices are not designed for environments involving exposure to radiation or cosmic radiation. Users should provide shielding as appropriate.

(e) Smoke, Flame

CAUTION: *Plastic molded devices are flammable, and therefore should not be used near combustible substances. If devices begin to smoke or burn, there is danger of the release of toxic gases.*

Customers considering the use of FUJITSU products in other special environmental conditions should consult with FUJITSU sales representatives.

Organization of This Data Book

This data book consists of six chapters.

Chapter 1: Introduction to Packages

This chapter provides an overview of packages, and describes their organization, forms, and structure, and also discusses future trends in packages.

Chapter 2: Package Mounting Methods

This chapter explains mounting methods, humidity resistance characteristics, and handling, focusing especially on surface mounting packages since they require particular care in terms of mounting techniques.

Chapter 3: Package Lineup

This chapter shows the correspondence between package form and the number of pins, and lists the package lineup.

Chapter 4: Package Outline Diagrams

This chapter first describes how the package dimensions are displayed and also explains the package codes. The remainder of the chapter is devoted to the package outline diagrams, showing one package per page.

Chapter 5: Sockets

This chapter explains sockets.

Chapter 6: Packaging for Shipment

This chapter explains packaging for shipment.

How to Use This Document

When you want to find a particular piece of information within a given section, there are the following additional means for locating that information, aside from the normal table of contents and index:

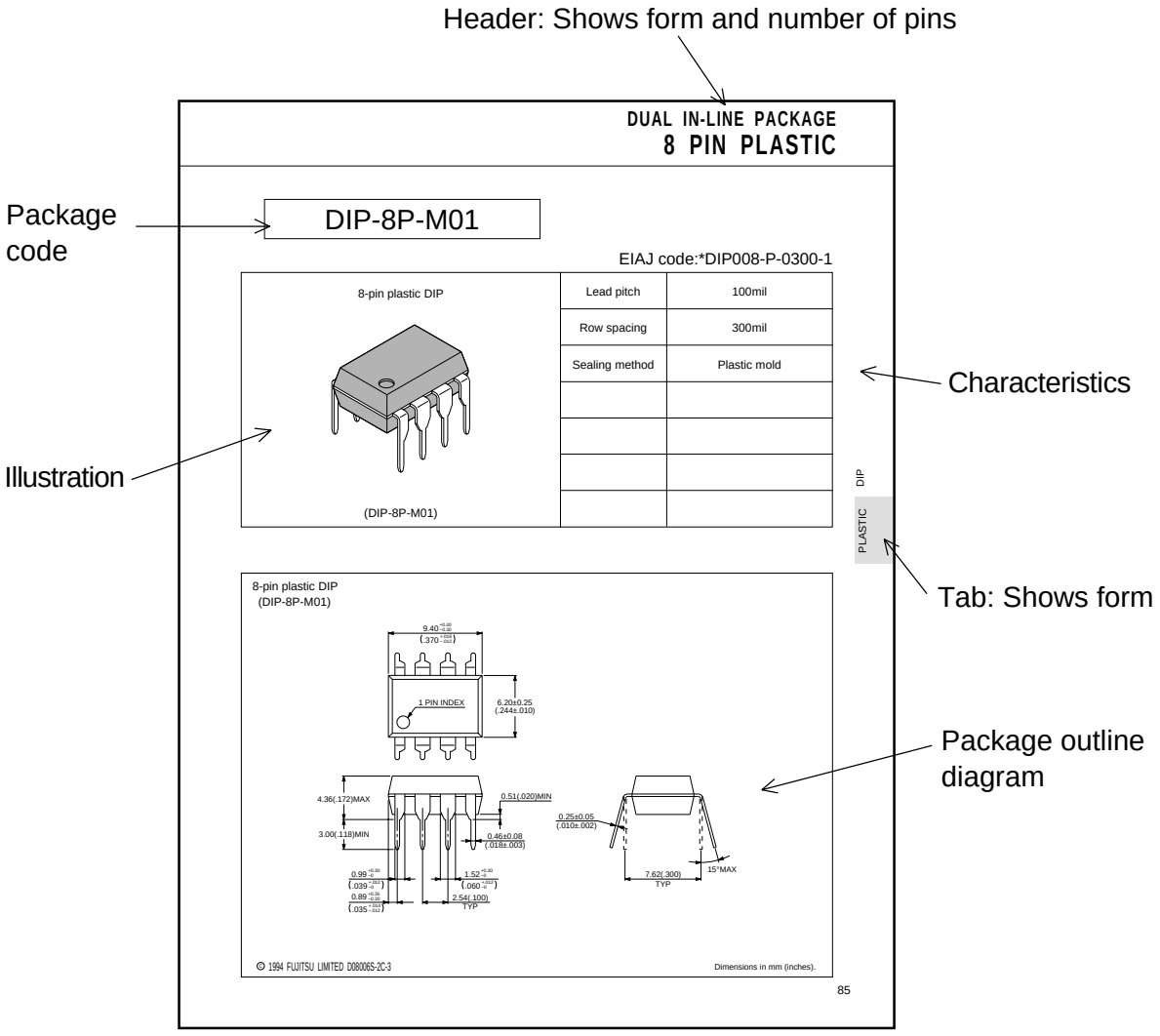
- Searching for information in the package lineup

The package lineup is displayed in charts grouped according to the package form and material. The package codes are listed in the chart in sequence, starting from the least number of pins. (Refer to section 2 of chapter 3.)

- Searching for information from the package form and number of pins

The thumb indices and headers are convenient. Each page in the package outline diagram section has a thumb index and a header. The thumb index indicates the package form, while the header indicates the form and the number of pins.

Package Outline Diagram Page Layout Used in This Data Book



1.1 Overview

Fujitsu provides semiconductor packages as a kind of "interposers" for protecting semiconductor devices and getting the full benefit of them. Fujitsu has developed and released a diversified series of "general-purpose package families" supporting a wide range of applications to suit customers' needs. The packages include through-hole type packages such as DIPs and PGAs; QFPs and SOPs that contributed to setting the trend of surface mounting; and multi-pin QFPs, TCPs, and SVPs supporting high-tensity mounting.

In addition, Fujitsu has developed and provided custom packages, cards, and modules for specific customers.

This chapter begins with Fujitsu's package lineup, followed by descriptions of package shapes and structures.

This chapter also describes the package dimension display conventions and package code based on the EIAJ and JEDEC[*1] standards to help you use this data book more efficiently as a source of information for you.

Also, this chapter introduces Fujitsu's basic concept of package development for future packages.

The electronic device marketplace has been demanding more advanced and diversified high-density mounting technologies.

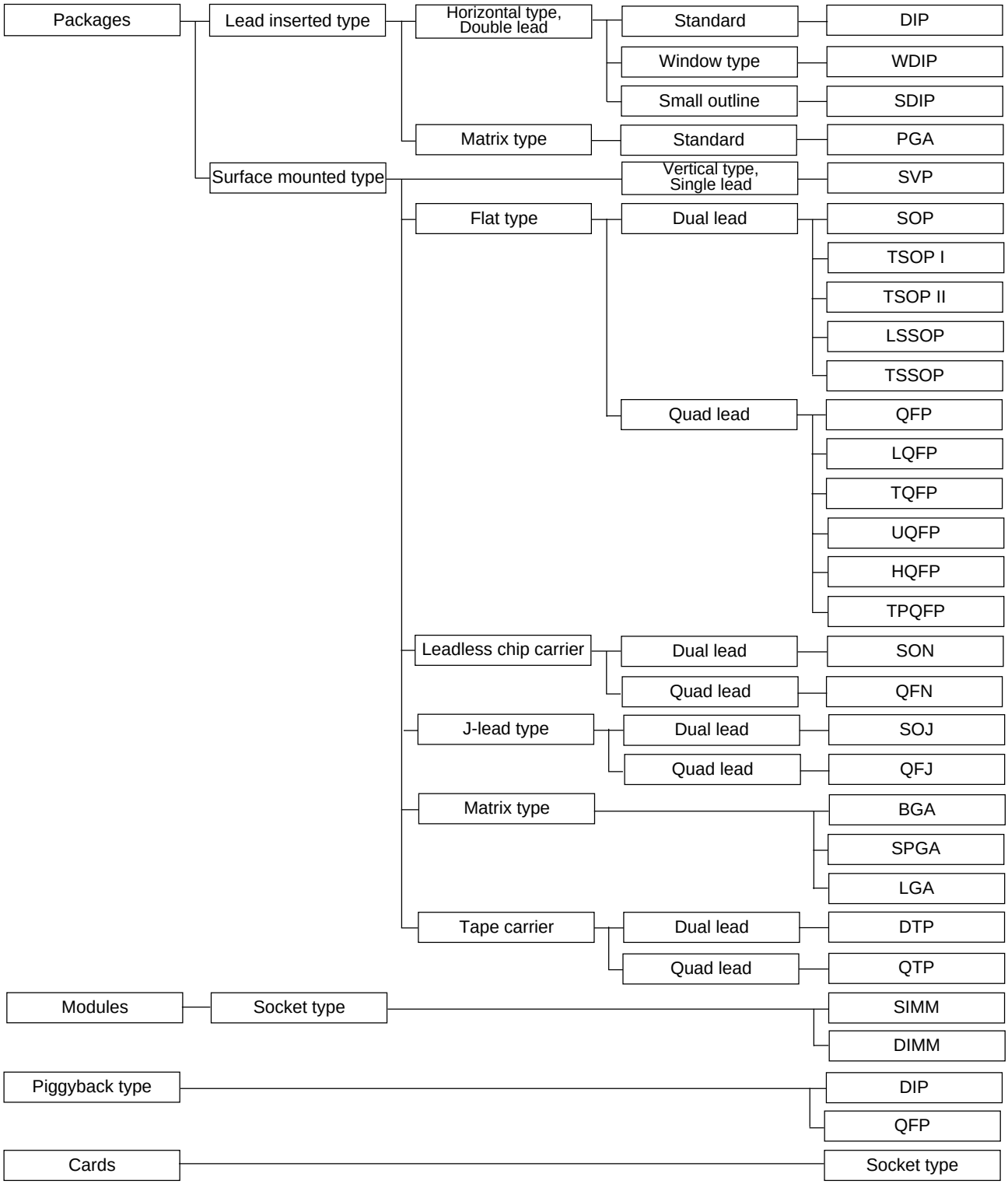
Fujitsu has developed new packages such as SONs and FBGAs to meet the needs of the industry. To support customers for easier use of these new packages, at the same time, Fujitsu has made a strong commitment to standardization of the packages by EIAJ[*2].

*1: Joint Electron Device Engineering Council

*2: Electronic Industries Association of Japan

1.2 Package Lineup

The packages are classified as follows, according to form, material, and the mounting methods for which they are suited.

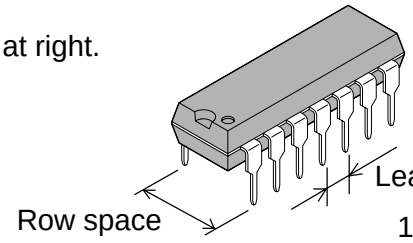


Name of package	Description	Lead pitch *1 (mm)	Row space *1 (mm)
DIP	Dual In-line Package	2.54	7.62/10.16/15.24/22.86
SH-DIP*3	Shrink Dual In-line Package	1.778	–
SK-DIP*3	Skinny Dual In-line Package	2.54	7.62
SL-DIP*3	Slim Dual In-line Package	2.54	10.16
SZIP	Shrink Zig-Zag In-line Package	0.89	1.778
PGA	Pin Grid Array Package	1.27/2.54	–
SVP	Surface Vertical Package	0.5/0.65	–
SOP	Small Outline Package (straight lead) Small Outline L-Leaded Package	1.27	–
SOL*3	Small Outline L-Leaded Package(JEDEC*2)	1.27	–
SSOP	Shrink Small Outline L-Leaded Package	0.65/0.80/1.00	–
TSOP (I)	Thin Small Outline L-Leaded Package (I)	0.50/0.55/0.60	–
TSOP (II)	Thin Small Outline L-Leaded Package (II)	0.50/0.80/ 1.00/1.27	–
SON	Small Outline Non-Leaded Package	0.50/1.00	–
QFP	Quad Flat Package(straight lead) Quad Flat L-Leaded Package	0.40/0.50/ 0.65/0.80/ 1.00	–
LQFP*3	Lowprofile Quad Flat L-Leaded Package	0.40/0.50/ 0.65/0.80	–
TQFP	Thin Quad Flat L-Leaded Package	0.40/0.50	–
HQFP	QFP with Heat Sink	0.40/0.50/ 0.65	–
TPQFP	QFP with Test Pad	0.30	–
LCC*3	Leadless Chip Carrier	1.016/1.27	–
QFN	Quad Flat Non-Leaded Package (EIAJ)		
PCLP*3	Printed Circuit-board Leadless Package	0.50/0.65	–
QFJ	Quad Flat J-Leaded Package (EIAJ)	1.27	–
SOJ	Small Outline J-Leaded Package	1.27	–
BGA	Ball Grid Array	1.5/1.27/1.0	–
DTP	Dual Tape Carrier Package	–	–
QTP	Quad Tape Carrier Package	–	–
SIMM	Single Inline Memory Module	1.27/2.54	–
DIMM	Dual Inline Memory Module	1.27	–

*1: These columns indicate the dimensions shown at right.

*2: Joint Electron Device Engineering Council

*3: Package name used by Fujitsu



100 mil = 2.54 mm

1.3 Package Forms

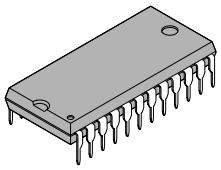
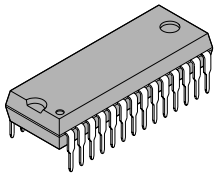
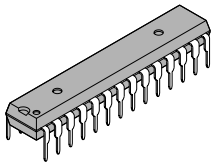
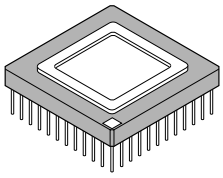
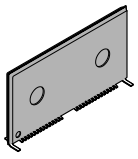
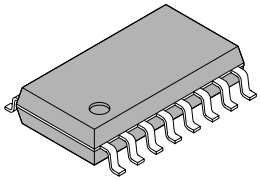
Packages can be broadly classified into two types according to the mounting method used:

Lead inserted type: The leads on the package are inserted into through holes in a printed circuit board, etc., and then soldered in place.

Surface mounted type: The device lays flat on surface of the circuit board and the leads are soldered directly to the wires.

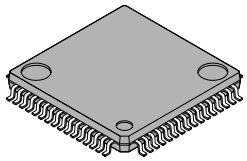
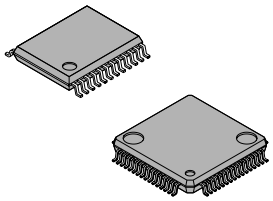
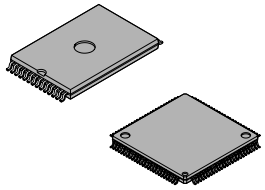
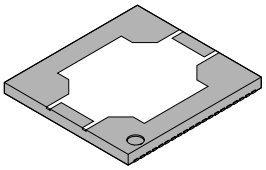
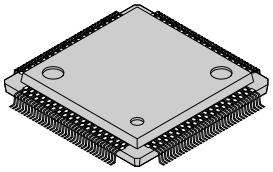
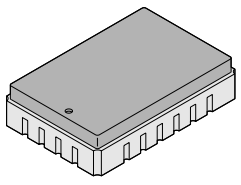
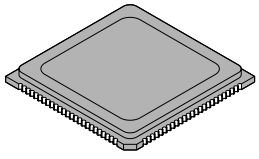
In addition, each of the various package forms has its own unique features.

1.3.1 Lead insertion types

Illustration	Name of package	Features	Lead pitch
	DIP	The leads on this package extend down from the sides of the package in two rows. This is currently the most typical standard package. The row spacing varies according to the number of pins, as follows: 8 to 20 pins: 300 mil 24 to 52 pins: 600 mil 22 to 28 pins: 400 mil 64 pins or more: 900 mil	Standard : 100 mil
	SH-DIP*	This is a standard DIP with the lead pitch reduced from 100 mil to 70 mil (1.778 mm). In some versions, both the lead pitch and the row spacing are reduced. The benefit of the reduced pitch is greatest when there are a large number of leads.	Standard: 70 mil
	SK-DIP* SL-DIP*	This is a standard DIP with the row spacing reduced to 300 mil in the case of the "SK-DIP" and 400 mil in the case of the "SL-DIP." SK-DIP: 300 mil, 22/22/28/32 pins SK-DIP: 400 mil, 24/28 pins	Standard : 100 mil
	PGA	The leads on this package extend straight down from the bottom of the package in a grid arrangement. This package is suited for high-density mounting of packages with 64 or more pins. A special version with a lead pitch of 50 mil is available.	Standard : 100 mil
	SVP	This type of package is placed perpendicular to the printed circuit board and can then be surface mounted.	0.50mm 0.65mm
	SOP SOL*	The leads on these packages extend out from two edges of the package; the leads are either gullwing (L-shaped) or straight. Packages that conform with JEDEC specifications are called "SOL".	Standard: 50 mil

*: Package name used by Fujitsu.

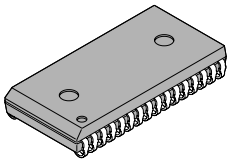
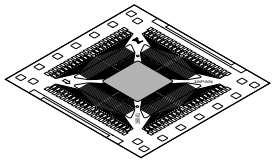
1.3.2 Surface mounted types

Illustration	Name of package	Features	Lead pitch
	QFP	The leads on this package extend out from four sides of the package; the leads are either gullwing (L-shaped) or straight.	1.00mm 0.80mm 0.65mm
	SSOP LQFP*	These packages are compact versions of the SOP and QFP. (The lead pitch and body size are smaller.)	SSOP:0.65mm/0.80mm/ 1.00mm LQFP:0.40mm/0.50mm
	TSOP TQFP	These packages are thinner versions of the SOP and QFP. (Mounted height: 1.27 mm max.)	TSOP: 0.50mm/ 0.55mm/0.60mm TQFP: 0.40mm/0.50mm
	SON	This type of package has external electrodes provided in two directions on the surface of the package. The package is a smaller version of the TSOP. It can be handled easily because of no bent leads.	0.5mm/1.0mm
	TPQFP	This is a fine-pitch QFP package with fixed test pads located around the periphery of the package and body. Excellent lead precision is possible by mounting a holder.	0.30mm
	LCC QFN	This package has no leads; instead, it has only electrode pads for soldering. A ceramic leadless chip carrier is a compact, high-reliability representative of this type of package.	Standard: 50 mil Among LCCs with many pads, 40-mil, 25-mil and other fine-pitch packages are currently under development.
	PCLP	This package has no leads; instead, it has only electrode pads for soldering. A plastic leadless chip carrier is a compact representative of this type of package.	0.50mm 0.65mm

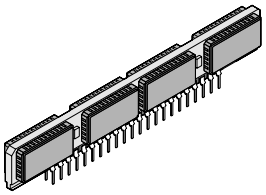
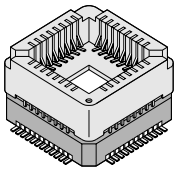
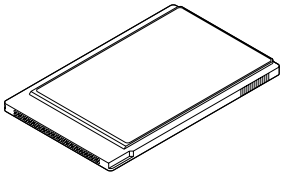
*: Package name used by Fujitsu.

(continued)

(continued)

Illustration	Name of package	Features	Lead pitch
	QFJ SOJ	The leads on this type of package are bent down from the sides of the package in a J shape. Of these packages, those with leads on Quad are called QFJ packages, while those with leads on dual are called SOJ packages.	Standard: 50 mil
	DTP QTP	This type of package, generally called a "TAB package," consists of an IC chip mounted by means of TAB technology on a tape on which the wiring pattern is formed; the chip is then coated with resin. This package is suited for the increasing number of pins required in chips and for high-density mounting. There are three tape widths: 35 mm, 48 mm, and 70 mm.	0.50 to 0.15mm

1.3.3 SMD module, piggyback, card

Illustration	Name of package	Features
	SMD module	This module consists of multiple small surface mounted packages (SMDs) on a ceramic or resin motherboard. These modules are primarily used for memory and permit higher densities and more advanced systems. The pins are arranged in either a SIP, DIP or ZIP pattern. The module is also available in a socket form that permits easy insertion and removal for future memory expansion.
	Piggyback	This package consists of a ceramic package with a socket mounted on it, and can be used to plug in LCC, DIP and other types of packages. The pins are arranged in either DIP form or QFP form. This type of package is used for program evaluation and system operation testing in the development of microcomputer-based systems.
	Card	This type of package consists of multiple elements or chip-type passive elements mounted on a resin wiring substrate. Cards are used for PC cards, DRAM cards, miniature cards, etc.

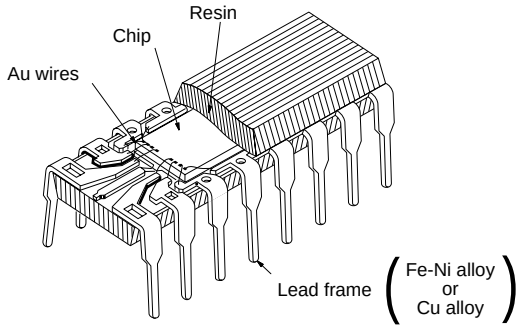
1.4 Package Structures

1.4.1 Structure diagrams

Structure diagrams for typical packages are shown below.

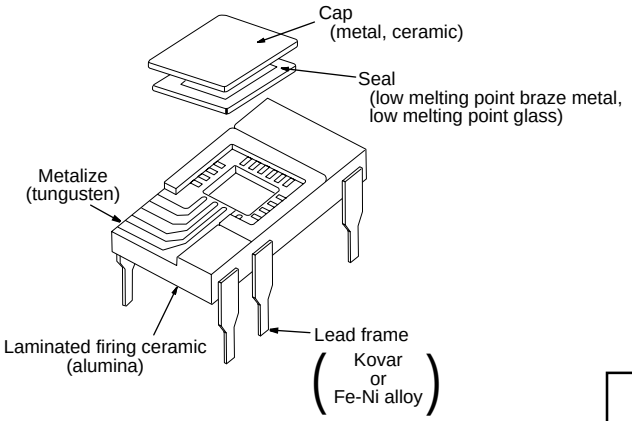
Lamination: Metal seal, frit seal

Plastic DIP



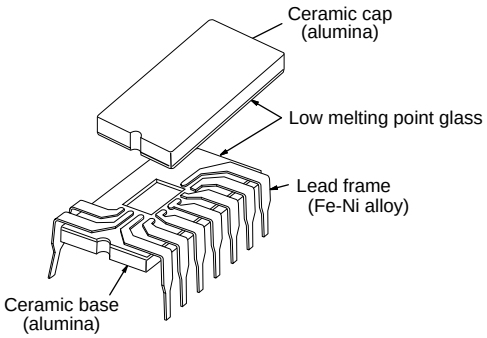
Lead finish	Solder plating

Ceramic DIP (laminated)



Lead finish	Au plating or Sn plating

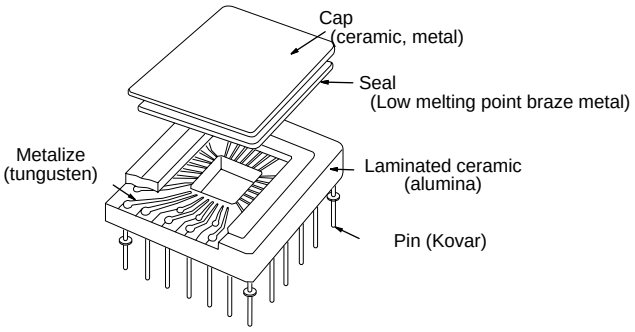
Ceramic DIP (cerdip)



Lead finish	Sn plating

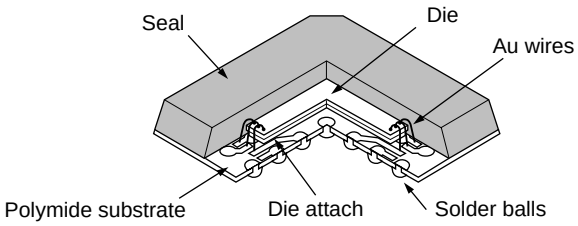
Lamination: Metal seal, frit seal

Ceramic PGA (laminated)



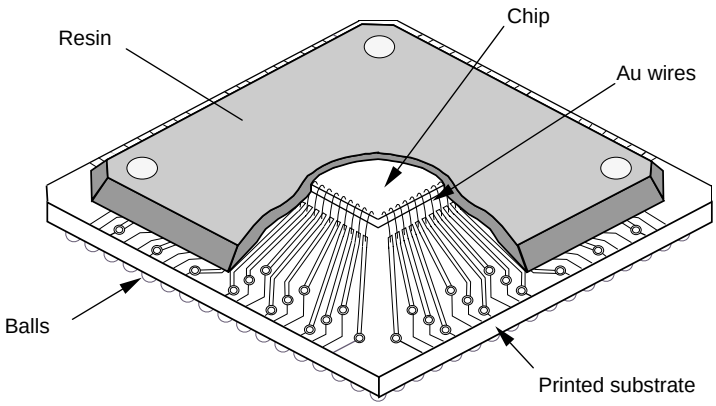
Lead finish	Au plating or solder dip

Plastic FBGA



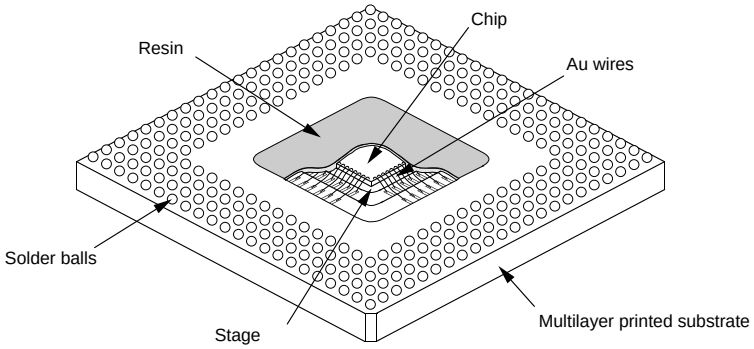
Lead finish	Au plating or solder dip

Plastic BGA (mold type)

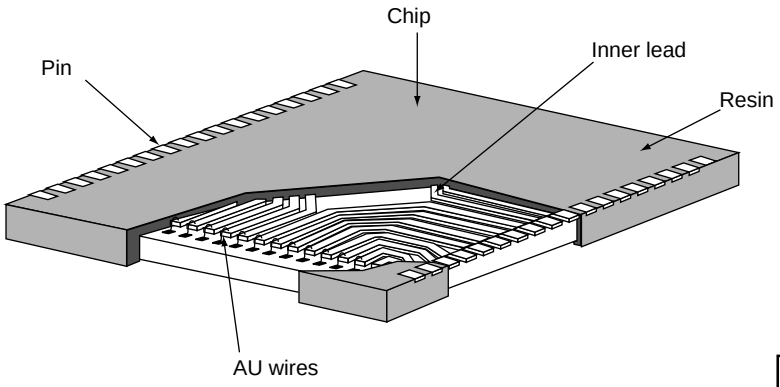


Lamination: Metal seal, frit seal

Plastic BGA (cavity down type)

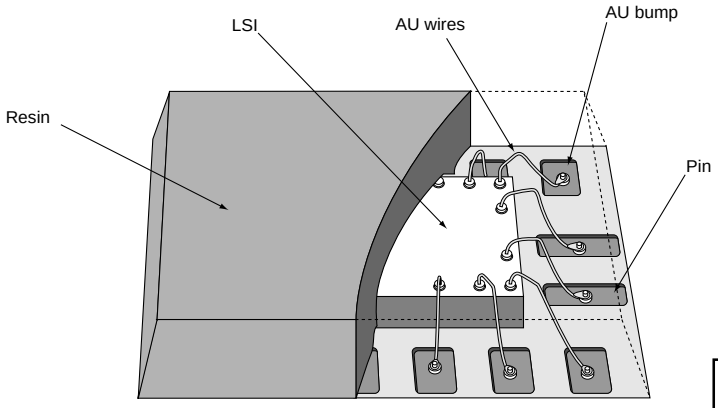


Plastic SON



Lead finish	Solder plating

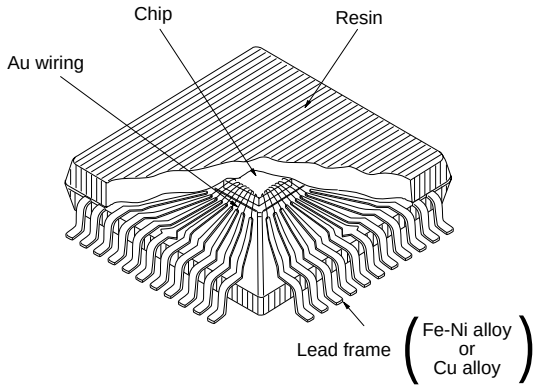
Plastic BCC



Lead finish	Pd/Ni/Pd plating

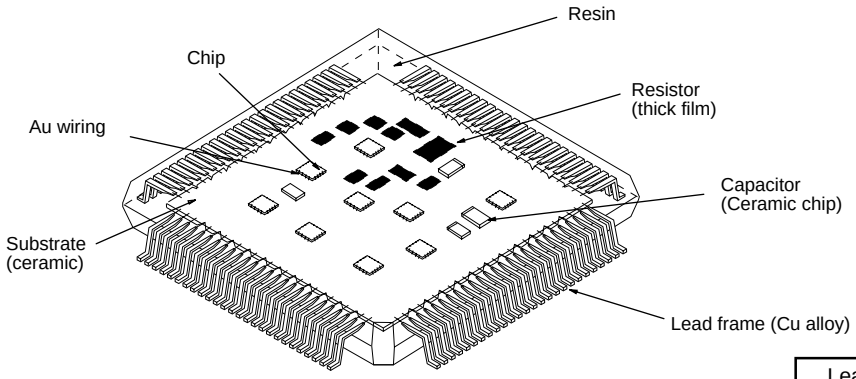
Lamination: Metal seal, frit seal

Plastic QFP



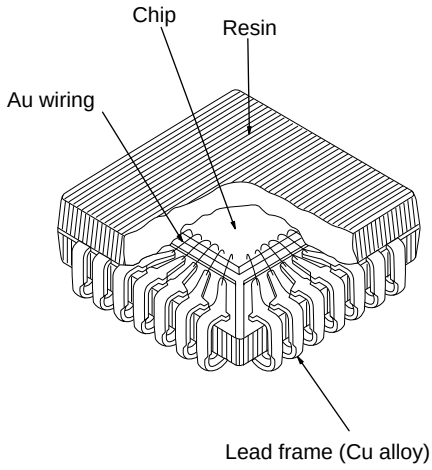
Lead finish	Solder plating

SMD hybrid IC



Lead finish	Solder plating

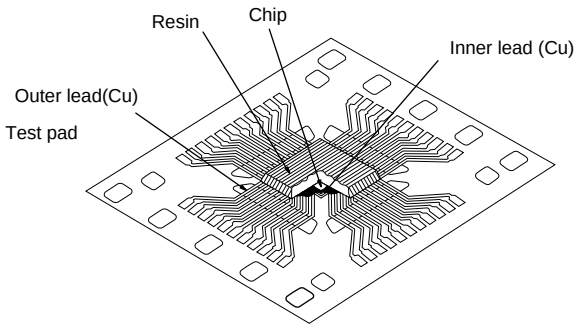
Plastic QFJ



Lead finish	Solder plating

Lamination: Metal seal, frit seal

Tape carrier package



Lead finish	Sn plating

1.4.2 Structural materials

Some of the materials of which packages are composed are described below. In addition, their general characteristics are shown in Table 1.

Alumina	Al_2O_3 90 to 95%. Used as a substrate material in typical ceramic packages. Substrates are divided into several different types according to the percentage content of Al_2O_3, with each demonstrating slightly different physical properties.
Low melting point glass	Primary components include PbO, B_2O_3, SiO_2, and Al_2O_3. Primarily used for seal between the ceramic substrate and the lead frame in cerdip packages, or for sealing the ceramic cap on a laminated ceramic package.
Epoxy resin	Raw material for plastic packages; phenol-hardened epoxy resin is primarily used.
Kovar	An iron-nickel-copper alloy. Because it has a coefficient of thermal expansion near that of ceramics, it is used primarily for metal caps and external leads in laminated ceramic packages.
42 alloy	Iron-nickel alloy (42% nickel). Generally used as the lead frame material in cerdip packages and plastic packages. Also used as external lead material in laminated ceramic packages.
Copper (Cu)	A copper alloy (a copper-nickel-tin alloy) is used as the lead frame material in plastic packages. Also used as a structural material in ceramic packages. When lowering thermal resistance is an objective, a copper film, a copper-molybdenum compound or a copper alloy may be used as the intermediate metallic material between the bottom of the chip and the heat dissipation fins. Copper has also recently gained attention for use in bonding wires.
Tungsten (W)	Raw material for metallized paste used in the wiring patterns (internal wiring) of laminated ceramic packages. The paste is screen printed on the unsintered ceramic substrate and is then sintered simultaneously with the ceramic.
Molybdenum (Mo)	A molybdenum film is sometimes used for the bottom substrate in a chip in order to increase the heat dissipation effect of a ceramic package. A molybdenum-manganese paste is also sometimes used for the metallized paste.

Silver (Ag)	There are partially silver-plated inner pattern tips and portions of the stage with chip in the lead frame of a plastic package. Silver is also used in the metallized paste used in the chip mount in a cerdip package. A silver paste is also used as an adhesive between the chip and substrate.
Aluminum (Al)	Used as a wire material for wire bonding (ultrasonic type). In addition, aluminum is sometimes vapor deposited or pressed onto the tips of the inner pattern of the lead frame in a cerdip package for its bonding characteristics. Aluminum is also often used for heat dissipation fins.
Gold (Au)	Used as a wire material for wire bonding (nailhead type). Gold plating is also often used for the metallized pattern and external leads in a laminated ceramic package.
Tin (Sn)	The external leads of most cerdip packages are often tin-plated. A gold-tin alloy (20% tin) is also used as a sealing solder for the metal cap on a ceramic package.
Solder (Pb/Sn)	Solder with slightly different characteristics can be obtained by altering the lead/tin ratio. At present, the external leads of most plastic packages are plated with a mixture of lead and tin (commonly referred to as "solder plating"). A lead-tin mixture is also used as a sealing braze for the metal cap on a ceramic package. This mixture is also used for the solder dip for external leads.
Polyimide tape	This is the primary material in the tape used for TCP. This tape is generally made from pyromellitic dianhydride and aromatic diamine. In addition to the ability to withstand high temperatures, this tape also possesses excellent mechanical, electrical, and chemical characteristics.

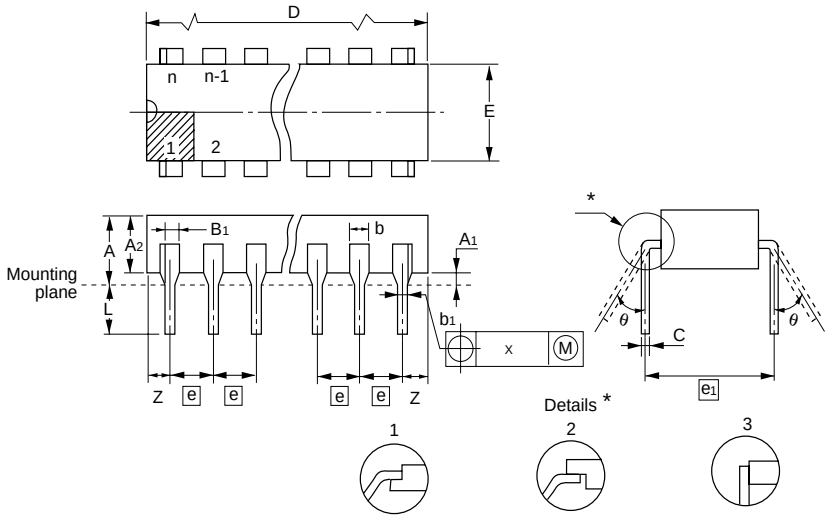
Table 1. General Characteristics of Package Materials

Material / Characteristic	Alumina (Al_2O_3 90% to 95%)	Low melting point glass (LS-0110)	Kovar	42alloy	Tungsten (W)	Molybde-num (Mo)	Al	Au	Ag	Cu	Epoxy resin	Pb/Sn (eutectic)	Sn
Specific gravity	3.6 to 3.9	4.8	8.4	8.2	19.1	10.2	2.69	19.3	10.5	8.93	to 1.8	8.45	7.3
Coefficient of the rmal expansion ($x10^{-6}$/C) (40~400)	to 6.5 to 7.0	to 5.3	(5.1 to 5.5)	(6.7 to 7.4)	to 4.5	(3.7 to 5.3)	(23 to 29)	to 14	to 19	to 16.7	to 18	24.5	to 22
Thermal propagation (cal • cm/cm^2 • sec • C°)	0.04	0.0032	0.04	0.03	0.423	0.342	0.569	0.762	1.022	0.963	to 1.4x 10^{-3}>	0.122	0.16
Specific heat (cal/g • C°)	to 0.20	—	0.11	—	0.033	0.072	0.21	0.030	0.056	to 0.091	—	to 0.042	0.05
Volume resistivity (Ω • cm) (20C°)	10^{12} to 10^{14}	to 10^{9}	$49x10^{-6}$	$58x10^{-6}$	$5.5x10^{-6}$	$5.6x10^{-6}$	$2.75x10^{-6}$	$2.4x10^{-6}$	$1.62x10^{-6}$	$1.72x10^{-6}$	10^{15}≥	$17x10^{-6}$	$11.5x10^{-6}$
Permittivity (1 MHz)	8.7 to 9.6	to 12	—	—	—	—	—	—	—	—	to 4.3	—	—
Dielectric loss ($x10^{-4}$)	6.5 to 8.9	to 19	—	—	—	—	—	—	—	—	—	—	—
Vickers hardness	to 1100 to 1300	—	to160	170 to 240>	250 to 490	—	—	—	—	to 80	—	—	—
Young's modulus ($x10^5$kg/cm^2)	26 to 30	6.87	to14	(15 to 16)	to 37	to 35	7.17	to 7.95	to 8.1	to 12.5	1.4<	to 3.2	4.99
Tensile strength (kg/cm^2)	—	—	(5000 to 9000)	—	(1300 to 47000)	—	to1020	(2040 to 2550)	—	to 2500	—	to 560	—
Bending strength (kg/cm^2)	to 2100 to 2800	to 450	—	—	to 5200	—	—	—	—	—	to 1000>	—	—

1.5 How Package Dimensions Are Indicated

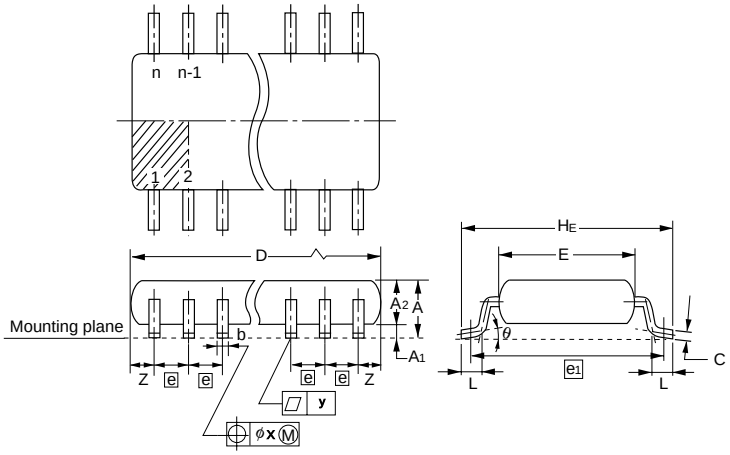
This section will use representative DIP and FLAT (SOP) packages to explain the manner in which dimensions are indicated in the package outline dimension diagrams in this data book.

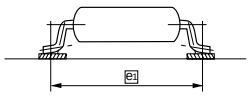
1.5.1 DIP dimensions (in accordance with EIAJ IC-74-3)



Dimension name	Symbol	Explanation
Mounting height	A	Height from the mounting surface to the top of the package
Standoff height	A_1	Distance between the mounting surface and the bottom of the package
Height of body	A_2	Height (thickness) of the package body
Pin width	b_1	Width of the portion of the pin inserted into the mounting hole in the printed circuit board, etc.
Maximum pin width	b, B_1	Maximum width of the pin
Pin thickness	C	Thickness of the pin
Package length	D	The longest dimension of the body of the package parallel to the mounting surface and excluding the pins; also include resin burrs
Package width	E	The width of the body of the package, excluding the pins
Pin linear spacing	e	Linear spacing between the centers of the pins; also called the "lead pitch"
Pin linear spacing	e_1	Width between the rows of the pins; also called the "row spacing"
Pin length	L	Length from the mounting surface to the tip of the pin
Pin angle	θ	Angle of spread between the pin and a line perpendicular to the mounting surface
Overhang	Z	Distance from the center position of an end pin to the end of the body of the package

1.5.2 FLAT (SOP) dimensions (in conformity with EIAJ IC-74-2)



Dimension name	Symbol	Explanation
Mounting height	A	Height from the mounting surface to the top of the package
Standoff height	A_1	Distance between the mounting surface and the bottom of the package
Height of body	A_2	Thickness of the package (height of the body)
Pin width	b	Width of the pin
Pin thickness	c	Thickness of the pin
Package length	D	The longest dimension of the body of the package parallel to the mounting surface and excluding the pins; also include resin burrs
Package width	E	The width of the body of the package, excluding the pins
Pin linear spacing	e	Linear spacing between the centers of the pins; also called the "lead pitch"
Call dimension 	e_1	Distance between the centers of the pads where the package is mounted; in the case of flat packages, there are generally four standard values: TYPEI :225mil (5.72mm) TYPEII :300mil (7.62mm) TYPEIII :375mil (9.53mm) TYPEIV :450mil (11.43mm) TYPEV :525mil (13.34mm)
Overall width	H_E	TYPE VI :600mil (15.24mm)
Length of flat portion of pin	L	Distance from the tip of one pin to the tip of the pin on the opposite side of the package
Angle of flat portion of pin	θ	Length of the flat portion of the pin that comes into contact with the mounting pad
Overhang	Z	Angle formed by the mounting surface and the flat portion of the pin Distance from the center position of an end pin to the end of the body of the package
Pin center tolerance	φx M	Shows the tolerance for the center position of the pin in the package outline diagram
Uniformity of pin bottoms	y	Shows the uniformity of the pin bottoms in the package outline diagram

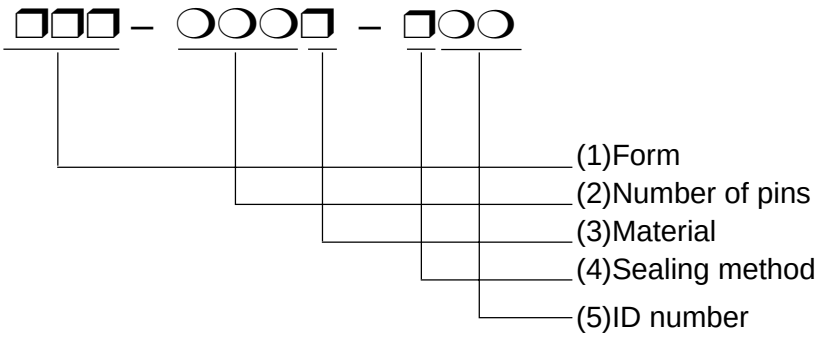
The information provided above is a simplified explanation. If you have inquiries concerning dimensions, confirm the "dimension name" shown in the preceding tables.

1.6 Package Codes

1.6.1 Fujitsu Code Labeling

Distinctions among package forms, number of pins, material, sealing method, etc., as well as classification between packages and modules are shown in the package code as follows.

Packages (excluding TCPs)



(1) Form: Indicates the form of the package. (three letters)

DIP: Indicates a DIP-type package (including SH, SK, and SL).

PGA: Indicates a PGA-type package

FPT: Indicates a flat-type package

LCC: Indicates an LCC-, QFJ-, or SOJ-type package

CRD: Indicates a card.

(2) Number of pins: Indicates the number of pins.

(3) Material: Indicates the package material. (one letter)

P: Plastic

C : Ceramic

(4) Sealing method: Indicates the package sealing method. (one letter)

M: Plastic mold

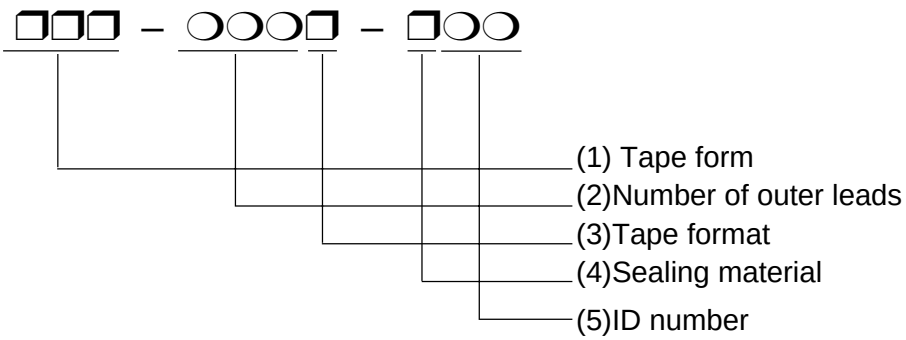
A : Metal seal

F: Frit seal

C : Cerdip

(5) ID number: An ID number within the form. (two digits)

Packages (TCP)



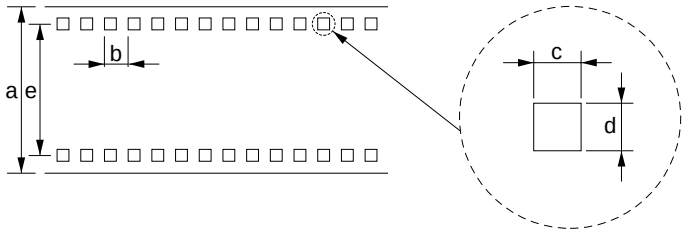
(1) Tape form: Indicates the tape form of the package. (three letters)

DTP: TCP with leads on two sides

QTP: TCP with leads on four sides

(2) Number of outer leads: Indicates the number of outer leads that are actually used.

(3) Tape format: Indicates the tape format. (a letter from A to F)



(Dimensions in mm)

Letter in code / Symbol / Name	a	b	c	d	e
A 35 mm superwide	34.975	4.750	1.420	1.420	31.820
B 48 mm superwide	48.175	4.750	1.420	1.420	44.860
C 70 mm superwide	66.800	4.750	1.420	1.420	66.800
D 35 mm wide	34.975	4.750	1.981	1.981	28.977
E 48 mm wide	48.175	4.750	1.981	1.981	42.177
F 70 mm wide	69.950	4.750	1.981	1.981	63.949

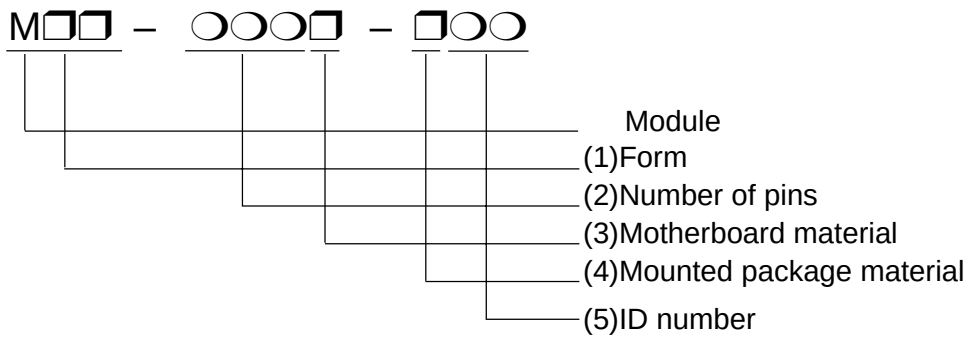
(4) Sealing method: Indicates the package sealing method. (one letter)

M: Resin sealed

B: Not sealed

(5) ID number: An ID number within the form. (two digits)

Modules



(1) Form: Indicates the form of the module. (three letters)

DP: DIP type

QP: QFP type

TP: DIP type with 100-mil (2.54 mm) row spacing

SS: Socket mounted type

(2) Number of pins: Indicates the number of pins. (two or three digits)

(3) Motherboard material: Indicates the motherboard material. (one letter)

P: Plastic

C: Ceramic

(4) Mounted package material: Indicates the material of the package that is mounted. (one letter)

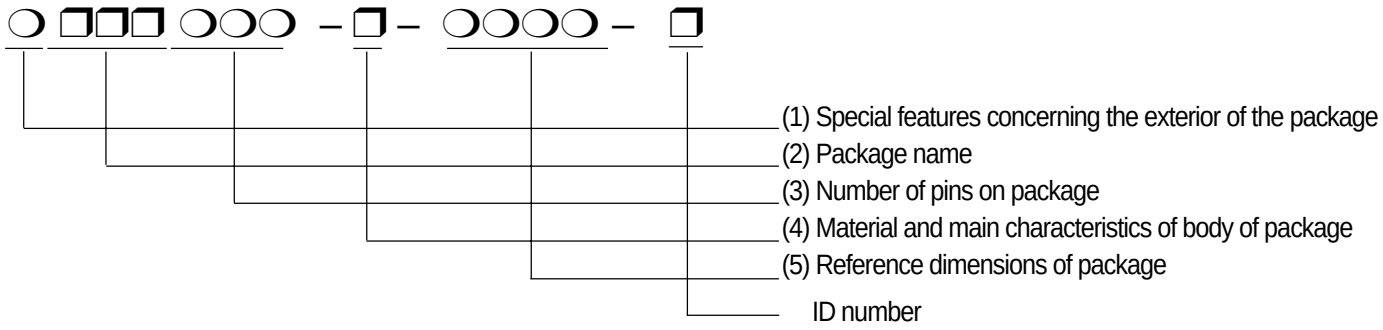
P: Plastic

C: Ceramic

(5) ID number: An ID number within the form. (two digits)

1.6.2 EIAJ code labeling

Section 1.6.1 explained the codes used by Fujitsu. This section explains the EIAJ codes.



(1) Special features concerning the exterior of the package

*: Standard package

S: Standard package with compressed lead pitch

H: Package with heat sink

W: Package with transparent window

A: Piggyback package

T: Package with a mounting height of 1.27mm (0.050 inches) or less

(2) Package name

Indicates either SIP, ZIP, DIP, PGA, SOP, SOL, SOJ, QFP, QFJ, or QFN.

(3) Number of pins on package

Basically indicates the total number of pins present. If the number of pins is 1000 or more, four digits are used.

(4) Material and main characteristics of body of package

C: Airtight ceramic package sealed with metal

G: Airtight ceramic package sealed with glass

P: Package formed of resin

R: Package formed from plastic and glass compound substrate

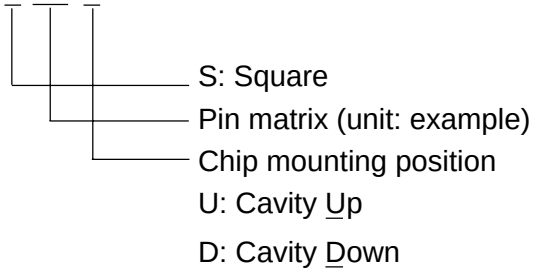
X: Package not covered by any of the other designations

(5) Package reference dimensions

DIP: Package pin row spacing (unit: mil)

PAG: Refer to the following example:

Example: S IO U



Cavity up: The chip mounting position is on the top of the package
Cavity down: The chip mounting position is on the bottom of the package

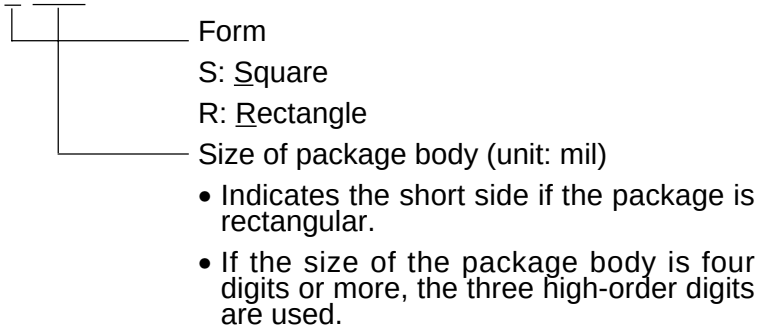
SOP: Spacing between centers of mounting pads (unit: mil)

SOP/SOJ: Width of package body (unit: mil)

QFP: Size of package body (unit: mm)

QFJ, QFN: Refer to the following example:

Example S 350



- Indicates the short side if the package is rectangular.
- If the size of the package body is four digits or more, the three high-order digits are used.

1.7 Marking

Marking includes Fujitsu's standard marking and customer-specified marking. Section 1.7.1 shows the format for standard marking; if customer-specified marking is desired, the customer should establish the marking specifications while observing the restrictions shown in section 1.7.2 Note that in the case of customer-specified marking, the Engineering Samples (ES) will bear the standard marking, and the Commercial Samples (CS) will bear the customer-specified marking.

If a format other than those shown in this data book is desired, consult with the Fujitsu sales office beforehand.

1.7.1 Standard marking

Information marked

F̄ ..... Fujitsu's mark

JAPAN ..... Country of manufacture

MBxxxx ..... Fujitsu product name

98 50 (Example) Lot No.

- 50: Code for week of IC manufacture: "01" indicates the first week, "02" the second week, and so on, up to "50", which indicates the 50th week.
- 98: Code for year of IC manufacture: The last two digits of the year are shown. For 1990: "90"; for 1998: "98".

<<Type 1>>

F̄	MBxxxx
JAPAN	9850 E00

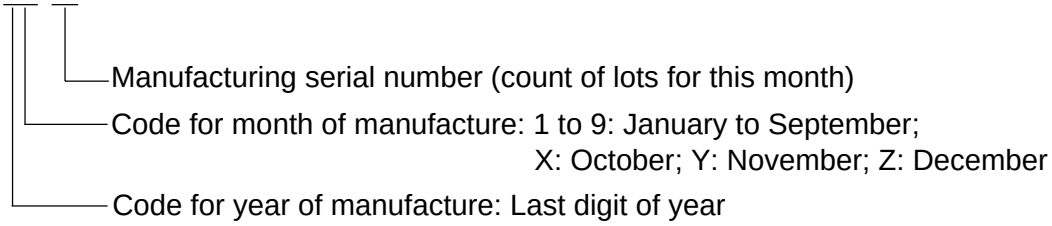
<<Type 2>>

F̄	JAPAN
MBxxxx	
9850	E00

Note: The <<Type 1>> and <<Type 2>> formats are the basic formats; there are other simpler formats based on the lot number and control number for cases where space is limited, etc.

However, the lot number indication in the case of hybrid ICs is as follows.

IX 03 (Example)



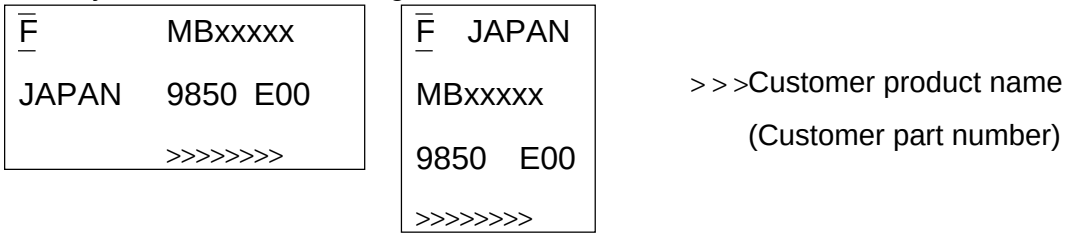
E01 (Example) .. Fujitsu’s control number

1.7.2 Customer-specified marking

If needed for custom ICs, etc., marking can be specified as indicated below.

Marking format

(1) One line for the customer product name (the customer part number) can be added to Fujitsu's standard marking format.



(2) Fujitsu's mark can be replaced with the customer's company mark.

If the customer's company mark is to be required, a camara-ready copy must be submitted.

If marking other than that described above is desired, or if the above format is not feasible due to space limitations, etc., special consultation will be necessary.

Note that the lot number and control number are administrative numbers required by Fujitsu's specifications, and cannot be omitted.

1.8 Future Trends in Packages

1.8.1 Diversification

Semiconductor packages can be broadly classified into two types: pin inserted types and surface mounted types. The main package format has changed from DIP to types such as SOP, QFP, and PGA. In addition, a package is now expected to provide the following features:

- High-density mounting in order to permit lighter and smaller designs as more equipment becomes portable
- Multiple I/O pins, required as devices are integrated on larger scales and more functions are offered
- Faster speed
- Lower cost

Given the balance between mounting technology and the design standards for the reference printed circuit board that serves as the mounting platform, progress in the area of surface mounting and leadless packages (except for vertical packages) should be attainable.

Development is already progressing on representative types such as BGAs and CSPs. The features of each of these types and their future direction of development are described below:

- SOPs are mainly suited for packages with up to 100 pins. There are versions in which the pitch is even smaller or the package profile is even lower, such as TSOPs and UTSOPs, and the trend is towards CSPs. One variation is the SVP, as progress in utilizing all three dimensions is made in order to permit high-density mounting of memory.
- QFP normally have from 50 to 300 pins.Packages for an even smaller pitch are in progress and being deployed into QTPs and TPQFPs using tape carriers.
- PGAs are a package type suited for ICs with a large number of pins (200 to 500 pins). SPGAs offer an even narrow pitch, and BGAs are being developed for the future.

1.8.2 Future formats

In the future, due to the demand for high-density mounting, surface mounted packages will grow in number, while the demand for higher speeds will drive the growth of leadless packages.

Cost requirements will cause growth in plastic packages, while the characteristics of ceramic packages will make them required for applications that demand high reliability, for devices that operate at high speeds and consume a lot of power, and for large chips.

With these trends in mind, Fujitsu's own package development efforts will continue to emphasize mounting efficiency while paying attention to the need for compatibility with the JEDEC*1 standards, the EIAJ*2 standards, and packages from other manufacturers.

*1:Joint Electron Device Engineering Council

*2:Electronic Industries Association of JAPAN

1.8.3 Custom packages

In addition to the increasingly important diversity of product types, there is also a growing trend towards diversity among semiconductor types and mounting methods. As a manufacturer of ASICs, it is important for Fujitsu to be able to quickly grasp market trends and make strategic contributions to customer product differentiation efforts.

At Fujitsu, in addition to promoting new standard packages in order to meet market demand for smaller and thinner packages, through joint development of CSPs and BGAs, we are also striving to supply "user-friendly" custom packages that satisfy the needs of a single customer. We make every effort to meet with customers and discuss in detail their desires concerning the form of the package, the dimensions, the number of leads, the exterior processing, etc., and then we strive to meet those needs quickly and flexibly.

1.8.4 Modules

Recently, modules intended for higher densities and more advanced functions are becoming increasingly important for the following types of applications:

- Although there is a trend towards combining multiple ICs and peripheral components into a single LSI in order to raise mounting density and permit more sophisticated functions, when the characteristics of the devices make it difficult to do so, a module is used to create a circuit block.
- High-density modules, such as PC cards, are used to increase mounting densities.

In light of these needs, and given our background in a variety of device families and small package series, Fujitsu is devoting tremendous effort to the design and supply of modules that are suited for COB mounted (including multi-layered wiring boards) and surface mounted packages.

1.8.5 Multi-chip Modules

Fujitsu's hybrid ICs, with analog and digital components mounted together and featuring the formation of high-precision resistors, have contributed to the reduced size of systems, and now we have developed a surface mounted package for these hybrid ICs. Fig. 1 shows the internal structure of the MBH10000 Multi-chip Modules, which not only retains the strengths of earlier hybrid ICs and offers increased integration, but also permits surface mounting.

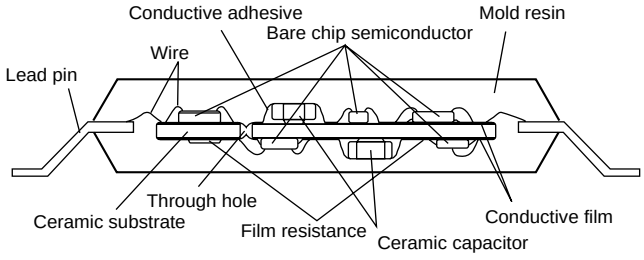


Fig. 1 Structural Diagram of Multi-chip Modules

2.1 Overview

There are two basic methods for mounting packages. One is the flow soldering method, and the other is the reflow soldering method.

The flow soldering method, which is widely used for lead inserted type packages, uses a jet-type solder bath to mount packages on printed circuit boards.

As electronic devices become smaller and lighter, IC packages are also expected to become smaller and thinner. As a result, in recent years there has been rapid growth in surface mounted packages, and surface mounting technology based on the reflow soldering method has garnered much attention.

One point that is important is that the flow soldering method used with lead insertion packages does not subject the package to much thermal stress, while in the reflow soldering method used with surface mounted packages, the package as a whole is heated, so that there is a great deal of thermal stress placed on the package, which must be noted during mounting.

This chapter will provide an overview of the mounting methods, the level of package moisture absorption, and the proper handling of packages, all in order to permit surface mounted packages to be mounted in a proper manner that preserves their reliability.

2.2 Mounting Methods

2.2.1 Lead inserted type

There are two methods for mounting lead inserted type packages on a printed circuit board: one method where the solder is applied directly to the printed circuit board, and another method where the package is mounted in a socket on the board.

When applying solder directly to the board, the leads are inserted into the mounting holes in the printed circuit board first, and the flow soldering method (wave soldering method) is used with jet solder. This is the most popular and widely used method for mounting packages on a printed circuit board.

However, during the soldering process, heat in excess of the normal maximum rating for the storage temperature is applied to the leads. As a result, quality assurance concerning heat resistance during soldering limits the soldering process to the levels shown below; do not exceed these levels during soldering work.

1) Solder temperature and immersion time
   260 °C (500 °F), 10 seconds or less
2) Lead immersion position
   Up to a distance of at least 1 to 1.5 mm from the main body of the package
3) When mounting an element using the solder flow method, ensure that the element itself is not immersed in the solder.
4) When using flux, avoid chlorine based fluxes; instead, use a resin-based flux.

Note, however, that if the module leads are exposed to the solder for a long period of time, solder on the module board may melt and previously mounted ICs may become detached. Also be careful to prevent any solder from coming into direct contact with the packages mounted on the module.

When using socket mounting, in some cases when the surface treatment of the socket pins is different from the surface metal of the IC leads, problems due to poor contact may arise. Therefore, a check of the surface treatment of the socket contacts and of the surface treatment of the IC leads is recommended.

2.2.2 Surface mounted type

Compared to the lead inserted type, surface mounted packages have finer, thinner leads, which means that the leads are more easily bent. In addition, as packages come to have more and more pins, the lead pitch is becoming narrower, making handling more difficult. When the pitch of an IC is narrow, problems such as open pins caused by bent leads or short circuits caused by solder bridges occur easily; therefore, suitable mounting technology becomes a necessity.

Surface mounted packages include ceramic LCCs with no leads, flat packages with gull-wing leads or straight leads, packages with J-leaded, and ball-grid array packages(BGA); aside from the LCCs, the packages can be either plastic or ceramic. In the case of surface mounted packages, the solder reflow method is recommended as the mounting method for either type of package.

Fig. 1 illustrates the basic process for mounting.

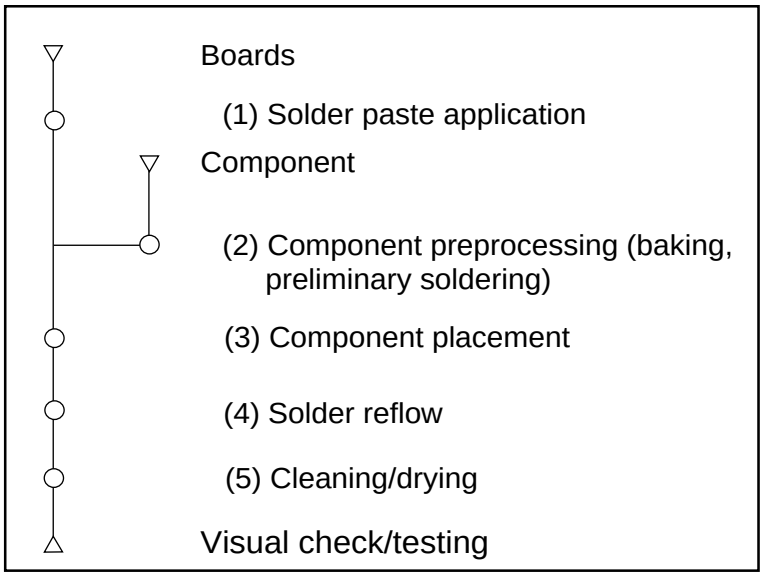
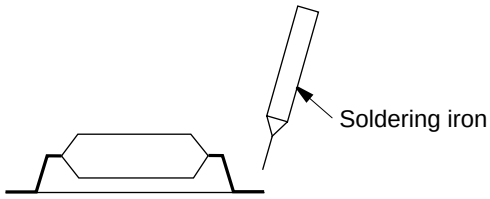
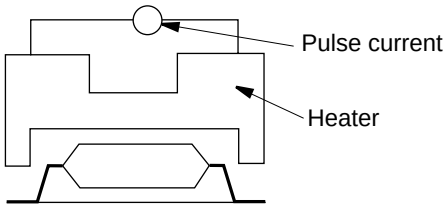
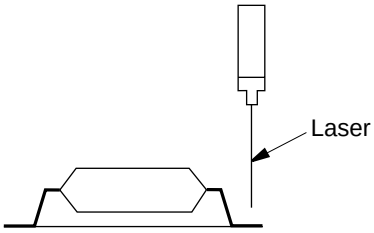
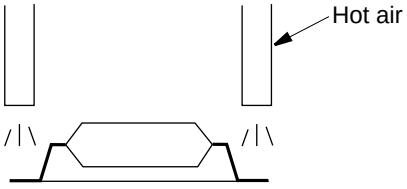


Fig. 1 Flow Chart of Basic Mounting Process

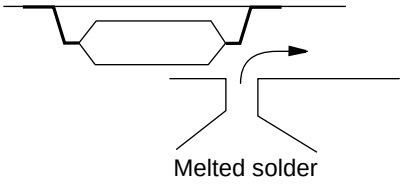
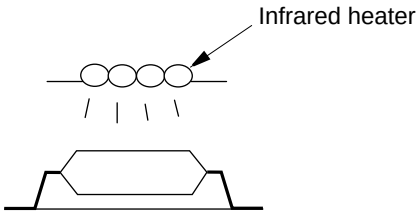
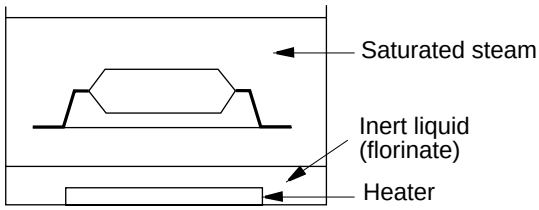
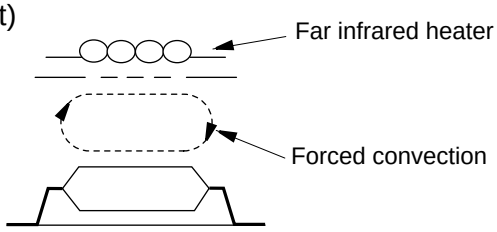
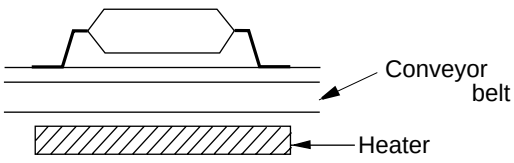
There are a variety of methods for soldering surface mounted packages onto a printed circuit board. Some of these methods are described below.

The mounting methods can be broadly classified into two types: partial heating methods and the total heating methods. The partial heating methods are desirable from a reliability standpoint since the thermal stress is small, but from the standpoint of mass production such methods are somewhat more difficult to implement.

(1) Partial heating methods

Soldering method	Advantages	Disadvantages
Manual method 	• Less stress placed on IC package • Bent leads can be repaired • Low equipment/ facility cost	• Limited suitability for mass production • Danger of electrostatic damage
Block heater method 	• Less stress placed on IC package • Bent leads can be repaired • No problem if the leads are raised a little • Faster than the manual method	• Limited suitability for mass production • Danger of electrostatic damage
Laser method 	• Less stress placed on IC package	• Limited suitability for mass production • Problems arise if leads are raised slightly
Hot air method 	• Less stress placed on IC package • Low operating costs	• Very low suitability for mass production

(2) Total heating methods

Soldering method	Advantages	Disadvantages
Full dip method  	• Highly suited for mass production • Existing techniques and facilities can be used • Low operating costs	• Places the most stress on package
Infrared reflow method  	• Highly suited for mass production • Low operating costs	• Places comparatively large amount of stress on package
Vapor phase reflow method  	• Highly suited for mass production • Places comparatively little stress on package • Uniformity of temperature distribution is excellent	• Operating costs are high
Hot air heating method (used with far infrared heat)  	• Places comparatively little stress on package • Highly suited for mass production	• Oxidation due to surrounding air may occur
Underside heating method  	• High temperatures are not applied directly to the package	• Cannot be used with double-sided boards

2.2.3 Precautions on mounting

Points of consideration concerning mounting work are explained below.

(1) Boards

Packages can be mounted on a variety of boards, including resin boards made of materials such as paper phenol or glass epoxy, ceramic boards, and flexible printed circuit boards, and when selecting the board material it is essential to give due consideration to factors such as matching the thermal expansion coefficients of the components to be mounted, electrical and mechanical characteristics, heat dissipation characteristics, the total reliability level, and cost. In addition, the reliability and production yield in terms of the wiring pattern on the component mounting surface also become important factors.

Figs. 2, 3, and 4 show examples of design criteria for surface patterns. In the design stage, consideration should be given to ease of mounting, reliability of the connections, pattern spacing, and the possibility of solder bridge formation.

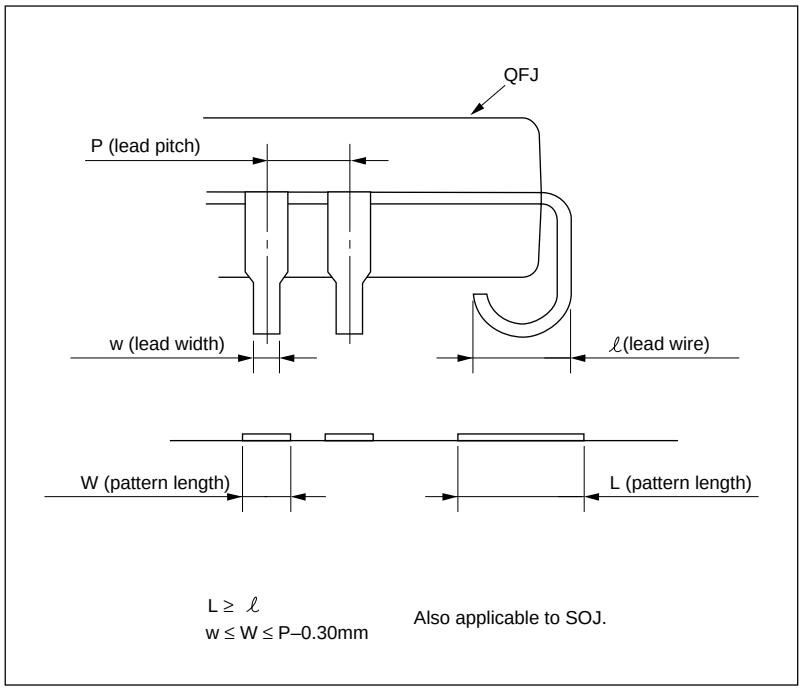


Fig. 2 Example of Surface Pattern Design Criteria for QFJs (SOJs)

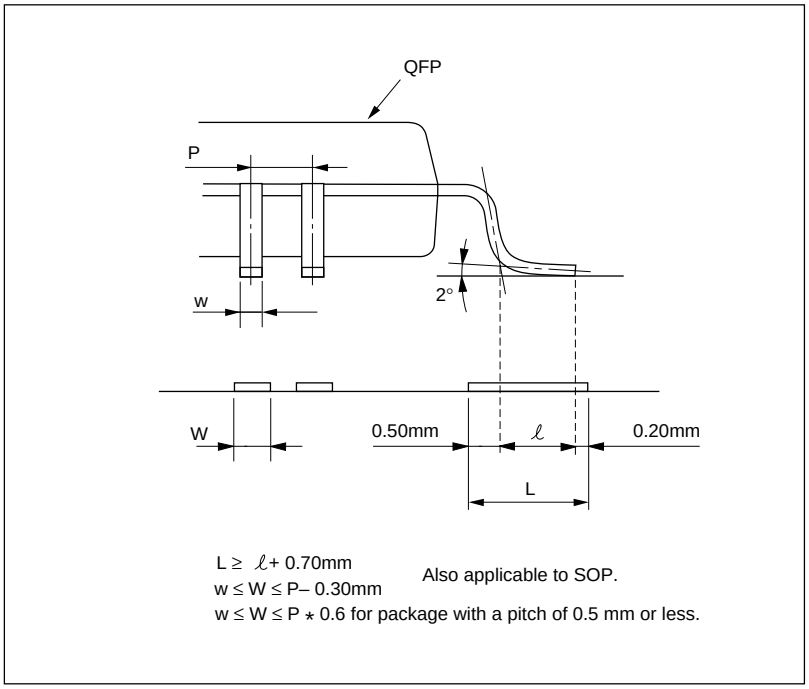


Fig. 3 Example of Surface Pattern Design Criteria for SOPs and QFPs

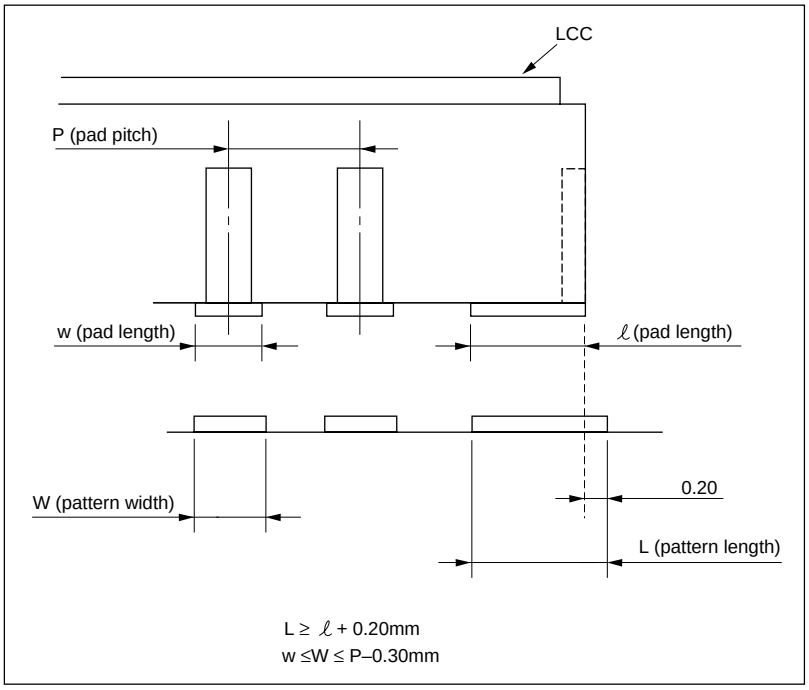


Fig. 4 Example of Surface Pattern Design Criteria for LCCs

(2) Applying solder paste

There are two methods for supplying the solder paste: by printing and by dispenser.

When done by printing, a stainless steel screen mask is used to apply the solder paste. When mounting packages with a narrow pitch, how the solder paste printing process is performed has a major effect on the production yield after the reflow process, so careful attention must be paid to the selection of the equipment and to the printing conditions.

Careful attention must also be paid to the selection of the solder paste and the printing mask.

If the board surface is not flat and some of the solder is to be applied after a portion of the components have already been mounted, the remaining solder paste can be applied by using a dispenser.

(3) Solder paste

The solder paste is a mixture of solder powder (normally #250 to 325) mixed with flux.

The merits of using solder paste include:

- It is easy to control the amount of solder used.
- It is possible to use the viscosity of the paste to temporarily hold components in place.
- There are no impurities from a solder bath, etc.
- It is well suited for automation and mass production.

The most common type of solder is lead-tin eutectic type, but when soldering boards or components that use silver-lead for conductors, a eutectic type solder with a silver content of about 2% or 3% is used.

Until now, most solder pastes have used a resin-type flux, but recently measures to eliminate fluorocarbons and regulations on organic solvents have spurred the development of pastes that require no cleaning process or that use water-soluble flux.

Key points to consider in the selection of flux include:

a) Selection based on catalog values
   - Size and shape of the solder powder
   - Solder composition
   - Amount of flux and chlorine included

b) Evaluation criteria for actual trials

- Good patterning characteristics (deposits well)
- No change in the viscosity and uniformity of the mixture of solder powder and flux over time
- Continuous printing possible
- Very little dripping or formation of solder balls when melted
- Easy to clean, with little flux residue, no-discoloration or staining

Although the cost of the solder paste is also important, the total manufacturing cost in terms of production yield, etc., must be taken into consideration when selecting a paste, not just the cost of the paste itself.

Before beginning mass production, a thorough study should be conducted and then those materials that best fit the conditions under which they will be used should be selected.

Solder paste is normally applied through a printing process, using a screen mask about 150 μm thick.

(4) Component preprocessing

a) Preliminary soldering of ceramic packages

Either an alloy with a low melting point or glass with a low melting point is used to seal LCC packages. The melting point of the alloy is about 280°C (536°F), so work must be performed at temperatures below that level. While the glass sealant will maintain its air-tight integrity at higher temperatures, in the interest of maintaining device reliability the same precautions as for alloys should be observed.

When using the solder dip method, regardless of the type of sealing material, the package must not be immersed in the solder bath to the point where the sealant is also immersed. For the conditions for solder dipping, refer to Table 1.

Table 1 Recommended Conditions for Preliminary Soldering

Process	Conditions
Preliminary heating	100 °C (212 °F) to 150°C (302 °F)
Solder dip temperature	260°C max. (500°F max.), 10 seconds max.
Cooling	Natural cooling until temperature drops below 100°C (212 °F)

b) Baking plastic SMD packages

Unlike ceramic packages, plastic packages absorb moisture when exposed to atmosphere. Although this does not present a reliability problem during storage, if a plastic package that has absorbed moisture is soldered by the reflow method, the package may crack. Although it depends on the package type and the reflow method, it is important to note that some packages must undergo a baking process before the reflow process. (For details, refer to section 2.3, "Surface Mounted Plastic Package Reliability.")

(5) Component placement

Equipment that positions surface mounted package components is available from a variety of manufacturers in worldwide. When selecting such equipment, it is necessary to consider the number of components it will handle and the manner in which the components are packaged (in containers, trays, or on tape).

Because the leads on flat packages extend outwards, they are easily bent. Because repair is difficult once the leads are bent, great care must be taken when handling the packages.

(6) Full solder dip (wave soldering method)

When using the full solder dip method for mounting, observe the following conditions.

(Contact a Fujitsu sales representative for details on those packages and products for which full solder dipping is available.)

Solder bath temperature: 260°C max. (500°F max.)

Time: Less than 5 seconds

(7) Solder reflow

The typical reflow methods are: a) infrared reflow; b) vapor phase reflow; and c) hot air reflow. General descriptions of

each of these methods are provided below. Note that the use of full solder dipping should be avoided.

a) Infrared reflow

This reflow method uses radiant heat from an infrared heater.

Advantages
- Processing capability is high.
- Temperature profile can be controlled comparatively well.
- Operating cost is low.
- Equipment is inexpensive.

Disadvantages
- Temperature differences can arise due to differences in radiation absorption rates on the board.
- Caution is required, since the flux is easily blackened.
- Reflow in a normal oxidizing atmosphere.

b) Vapor phase reflow

This reflow method uses the latent heat of vaporization of an inert liquid.

Advantages
- Uniform temperature distribution.
- Reflow in an inert atmosphere.
- No fear of overheating. (Heat is not applied above the boiling point of the inert liquid.)

Disadvantages
- Temperature profile is limited.
- Operating cost is high.
- Processing capability decreases somewhat.
- Attention must be paid to ventilation.
- Equipment is expensive.

c) Hot air reflow

This reflow method uses convective thermal propagation with heat-saturated air. There are two different types of methods: the far infrared combination type and the hot air circulation type.

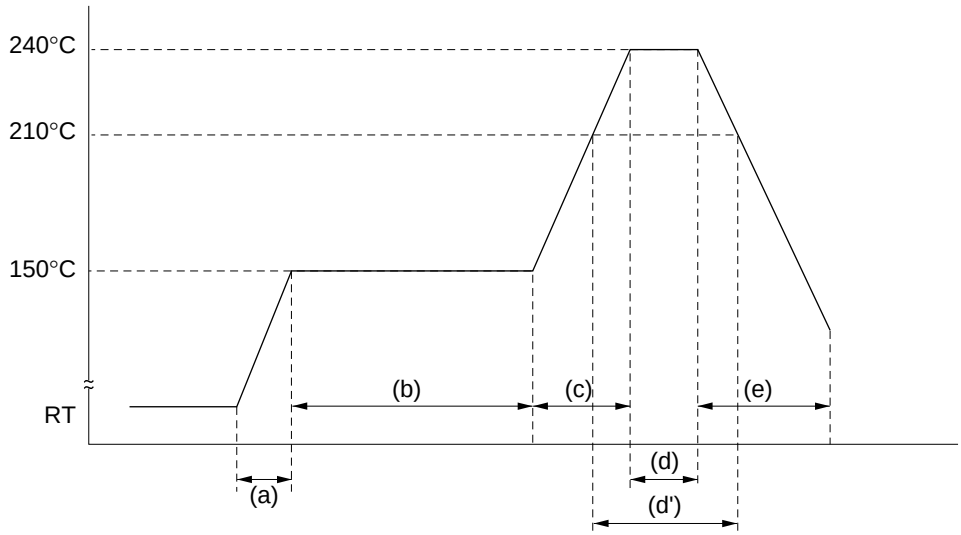
Advantages
- Temperature profile can be controlled comparatively well.
- Temperature distribution can be made relatively uniform.
- Operating cost is low.

Disadvantages
- Reflow in a normal oxidizing atmosphere.
- Processing capability decreases somewhat.

- Note on temperature profiles

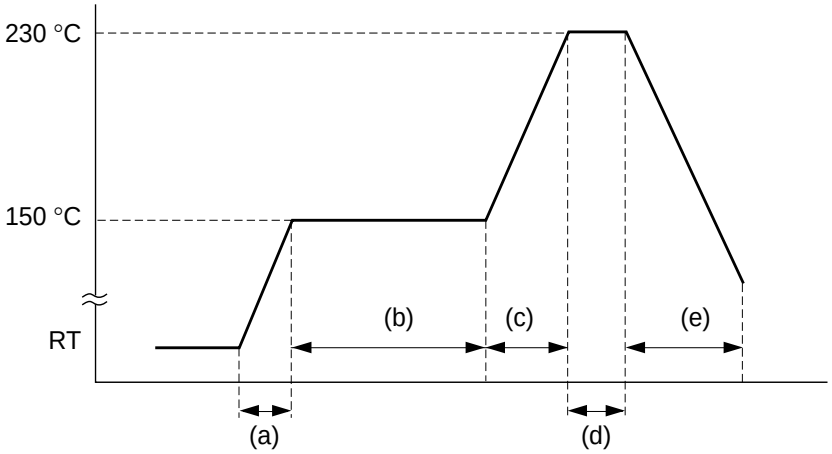
  No problems should arise if the temperature profile is equivalent to that of infrared reflow.

- Temperature profile for infrared reflow scheme



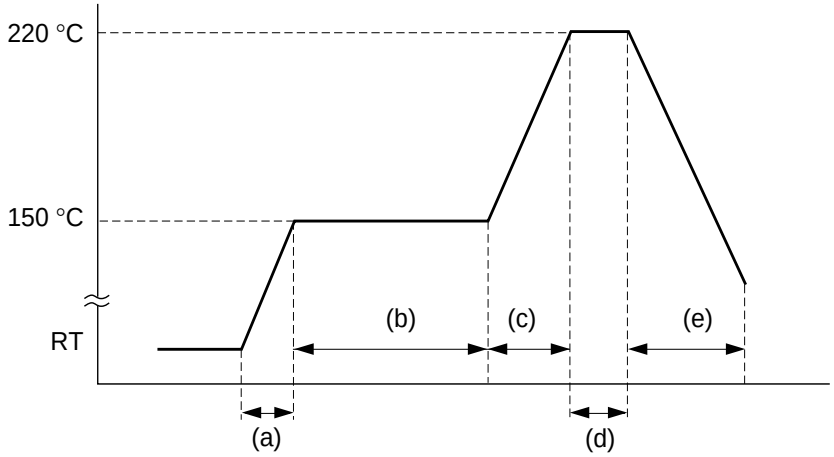
(a) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(b) Preliminary heating Temperature:150 ± 10°C (302 ± 50°F):60 sec or more
(c) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(d) Actual heating Temperature: 230°C (446°F) max.
Time: 10 sec or less
(Temperature of the top of the package body)
(d') Temperature: 210°C (410°F) Time: 40 sec or less
(e) Natural cooling or forced cooling

• Temperature profile for infrared reflow scheme



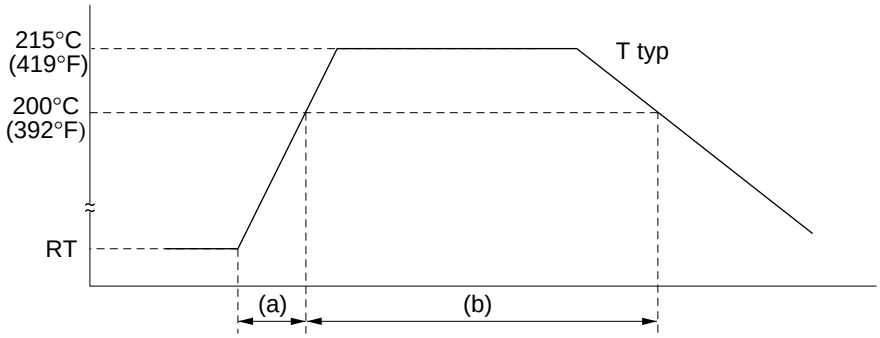
(a) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(b) Preliminary heating Temperature:150 ± 10°C (302 ± 50°F):60 sec or more
(c) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(d) Actual heating Temperature: 230°C (446°F) max.
Time: 10 sec or less
(Temperature of the top of the package body)
(e) Natural cooling or forced cooling

• Temperature profile for infrared reflow scheme



(a) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(b) Preliminary heating Temperature:150 ± 10°C (302 ± 50°F):60 sec or more
(c) Temperature increase gradient 1°C to 4°C /sec (33.8°F to 39.2°F /sec)
(d) Actual heating Temperature: 225°C (437°F) max.
220°C (428°F) up
Time: 10 sec or less
(Temperature of the top of the package body)
(e) Natural cooling or forced cooling

• Temperature profile for vapor phase reflow scheme (using florinate or an equivalent)



(a) Temperature increase gradient 1°C to 8°C /sec. (33.8°F to 46.4°F /sec)

(b) Temperature: 200°C to (Typ: 215°C) (392°F to (Typ: 419°F))
Time: 30 to 60 sec.

(8) Manual soldering (partial heating method)

This method uses a soldering iron; soldering is done with the IC fixed in place by flux or adhesive.

Conditions Temperature: 350°C max. (662°F max.)
Time: 3 seconds max./pin

(9) Cleaning

After soldering, clean away any flux residue.

If any flux left on the printed circuit board begins to absorb moisture, it can have a negative impact on reliability due to degradation of the insulation resistance or corrosion of the leads due to the chlorine component of the flux; therefore, cleaning is recommended. Refer to Table 2 for details on the cleaning requirements.

The following cautions should be observed during cleaning:

a) Do not touch printed surfaces until the cleaning fluid dries.

b) When solder paste was used for mounting, solder balls may have formed, depending on the paste type, paste quality, mounting conditions, etc.; therefore, pay attention to the need to clean away any solder ball residue as well.

Table 2 Plastic Package Cleaning Requirements

Frequency	27 to 29kHz
Ultrasonic wave output	15w/s or less
Solvent	Water-based cleaning solvent, alcohol-based cleaning solvent, etc.
Cleaning time	Up to 30 seconds (one time)
Cautions	• The packages must not resonate. • The packages and printed circuit board must not come into direct contact with the vibration source. • Do not touch or brush printed surfaces while cleaning is in progress or while there is cleaning solvent on a package. • When using solvents, observe public environmental standards and safety standards.

Note: Cleaning ceramic packages

Do not use ultrasonic cleaning to clean ceramic packages after mounting. Instead, use hot water, boiling water, steam, etc., for cleaning. Also, caution should be exercised in regards to the volatility of the cleaning fluids, and performing the work in sealed equipment is recommended.

(8) Miscellaneous (reworking a package)

If, after mounting, a package must be reworked, use a hot jet or other method to apply localized heat in order to remove the package in question, and then mount a proper package in its place in the same manner. In this instance, the preliminary soldering method and the solder paste (applied with a dispenser) method can be used individually or together. In either case, keep the points described in item 4, "Component preprocessing," in mind. From the standpoint of device reliability, such replacements should be kept to a minimum.

2.3 Surface Mounted Plastic Package Reliability

The heat stress that surface mounted plastic packages are subjected to when they are mounted adversely affects their humidity resistance characteristics. This section describes the humidity resistance characteristics of surface mounted plastic packages.

2.3.1 Features of surface mounted packages

Compared with conventional lead inserted types, surface mounted packages offer the following advantages and disadvantages.

(1) Advantages

- Higher mounting densities are possible, making thinner and lighter devices possible.
- Packages can have more pins.
- Surface mounted packages offer benefits from the standpoint of electrical characteristics.
- Because through holes are not needed, costs are lower.
- Surface mounted packages are suited for automated assembly lines.

(2) Disadvantages

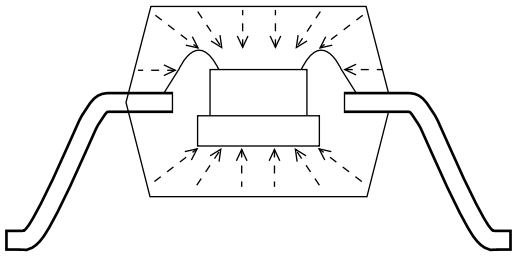
- Surface mounted packages are vulnerable to thermal stress during mounting, which can result in cracked packages or poor humidity resistance characteristics.
- Because the external leads are thin, they are easily bent.
- Because the pitch is very small, solder bridges form easily.

2.3.2 Mechanism behind degradation of humidity resistance characteristics due to thermal stress during mounting

For plastic packages, high thermal stress may cause deterioration of the IC Packages.
The moisture resistance of packages is deteriorated by thermal stress in the following phases:

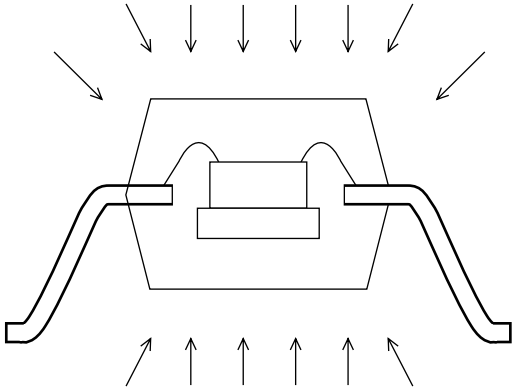
(1) Moisture absorption

Plastic packages absorb moisture in the air. The thinner the package, the sooner the moisture absorbed to the center.



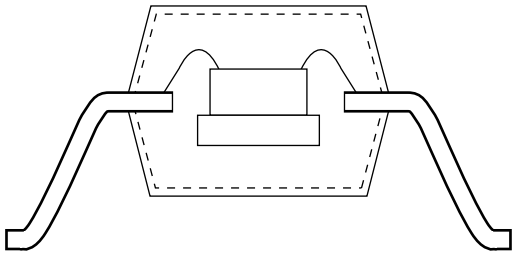
(2) Thermal stress during mounting

The mounting temperature and time depend on the mounting method. In particular, the overall heating method causes higher thermal stress on the package than the partial heating method.



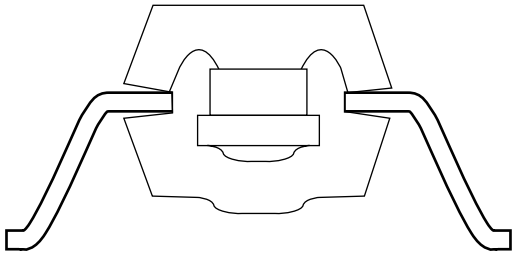
(3) Temperature increase in package

The increasing temperature causes evaporation of moisture absorbed in phase (1), and deterioration of resin strength and mismatch between the lead frame and resin of the package due to the different thermal expansion coefficients.



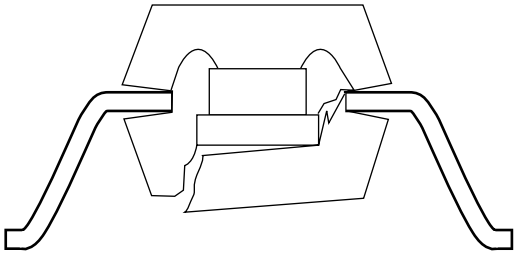
(4) Resin interface exfoliation

The stress generated in phase (3), causes exfoliation of the package resin interface. (The water pressure increases to 46 atm at 260˚C (500 ˚F).)



(5) Package cracking

If the above-mentioned stress is high, package cracking and bonding wire breaking may occur.



2.3.3 Measures to improve humidity resistance characteristics

In response to the mechanisms described above that contribute to the degradation of a package's humidity resistance characteristics, Fujitsu is taking the following measures in order to improve reliability.

(1) Improvement of mold resins

Fujitsu is striving to improve the sealing power of resins, reduce the stress that they are subjected to, and to increase their purity.

(2) Improvement of the lead frame

It is essential to eliminate the boundary surface separations that form due to thermal expansion of the lead frame and the resin when thermal stress is applied during the mounting process.

(3) Improvement of packaging materials for shipment

Since one of the mechanisms described was the absorption of moisture by plastic ICs which in turn lead to a degradation of humidity resistance characteristics, Fujitsu packages ICs in an aluminum-laminate pouch that is highly impermeable to moisture, and with silica gel placed inside the pouch.

2.3.4 Mount ranking

Surface mounted plastic packages come in a variety of sizes and thicknesses, and also vary in their ability to withstand the thermal stress of the mounting process. Therefore, Fujitsu specifies (for each individual product) the number of days that can elapse between the time a shipment of ICs is unpacked until the time when they are mounted. This specification is called the "mount ranking." The number of days allowed differs according to the product name, the package, and the mounting conditions. Table 3 shows classified mount ranking. Even for the same packages, the mounting rank may vary depending on the device type.For detailed information about each mounting rank, contact Fujitsu.

Table 3 Classification of Mounting Ranks (Mounting by Overall Heating)

		Overall dipping	IR*1	IR x 2 times	VPS*2
Mountig rank	A	Free (within 2 years after production)			
	B	Within 7 days after PB*3	Within 25 days	Within 14 days *4	Within 25 days
	Cn	Impossible	Within n days	n ≥ 10 Within 7 days	Within n days
			Within n days	10 > n ≥ 7 Within 3 days	
			Within n days	7 > n >0 Impossible	
	Dn	Impossible	Impossible	Impossible	Within n days
	Fn	Impossible	Within n days	n ≥ 10 Within 7 days	Within n days
				10 > n ≥ 7 Within 3 days	
				7 > n >0 Impossible	
	Jn	Impossible	Within n days	Impossible	Within n days

n: Number of days (for control of moisture absorption)

*1: Infrared reflow

Peak temperature A, B, Cn : 240˚C (464˚F) Max. within 10 min.

Fn : 230˚C (446˚F) Max. within 10 min.

Jn : 225˚C (437˚F) Max. (conforms with JEDEC)

*2: Vapor phase soldering

*3: Overall dip is possible depending on products or packages.

Mounting by overall dipping requires baking at 125˚C (257˚F) for 24 H.

*4: Double reflow is not supported for some products or packages. (QFJ22, etc.)

- Mounting by partial heating

  Mounting by partial heating is possible at any rank (A to D).

Table 4 List of mounting ranks

Mountig rank	Mounting method	Allowable period from unpacking to mountig*1	Action after elapse of allowable period and 2 years after production
A	Overall dipping Infrared reflow Vapor phase reflow	Within 2 years after production	Baking (at 125° C (257° F) for 24 H) after storage of 2 years from production
B	(Overall dipping)*2 Infrared reflow Vapor phase reflow	– 25 days (14 days)	Mount within 30 days after baking (at 125° C (257° F) for 24 H)
C25	Infrared reflow Vapor phase reflow	25 days (7 days)	Mount within 30 days after baking (at 125° C (257° F) for 24 H)
C10	Infrared reflow Vapor phase reflow	10 days (7 days)	Mount within 10 days after baking (at 125° C (257° F) for 24 H)
C7	Infrared reflow Vapor phase reflow	7 days (3 days)	Mount within 7 days after baking (at 125° C (257° F) for 24 H)
C4	Infrared reflow Vapor phase reflow	4 days (Impossible)	Mount within 4 days after baking (at 125° C (257° F) for 24 H)
C3	Infrared reflow Vapor phase reflow	3 days (Impossible)	Mount within 3 days after baking (at 125° C (257° F) for 24 H)
C2	Infrared reflow Vapor phase reflow	2 days (Impossible)	Mount within 2 days after baking (at 125° C (257° F) for 24 H)
C1	Infrared reflow Vapor phase reflow	1 days (Impossible)	Mount within 1 days after baking (at 125° C (257° F) for 24 H)
D3	Vapor phase reflow	3 days	Mount within 3 days after baking (at 125° C (257° F) for 24 H)
D2	Vapor phase reflow	2 days	Mount within 2 days after baking (at 125° C (257° F) for 24 H)
D1	Vapor phase reflow	1 days	Mount within 1 days after baking (at 125° C (257° F) for 24 H)
F3	Infrared reflow Vapor phase reflow	1 days	Mount within 1 days after baking (at 125° C (257° F) for 24 H)
J3	Infrared reflow Vapor phase reflow	1 days	Mount within 1 days after baking (at 125° C (257° F) for 24 H)

*1: Parenthesized numbers indicate allowable periods for mounting by two-pass reflow.

[Example] Mounting rank B:

Period from unpacking to mounting at the first reflow = α days

Period from the first reflow to mounting to the second reflow = β days

$\alpha + \beta = 14$ days

For mounting by two-pass reflow, pre-baking should be performed after 14 days from unpacking.

*2: Mounting by overall dipping requires pre-baking (PB) at 125˚C (257˚F) for 24 H.

For the products and packages not supported, contact your local dealer or representative (such as some product of QFP44 or 48 pins or QFJ or low-profile packages).

2.3.5 Storage and drying processing

Surface mounted plastic packages should be stored while still packed in the materials that they were shipped in from Fujitsu. If you have any questions, contact Fujitsu.

2.3.6 Reliability data

Because surface mounted plastic packages are mounted by total heating methods, they are easily affected by thermal stress during the mounting process, with the result that packages sometimes crack or their humidity resistance characteristics are adversely affected.

In addition to normal reliability evaluations, Fujitsu subjects SMDs to temperature cycle tests and PTHS tests after preprocessing the packages for solder heat resistance, all in order to evaluate reliability versus the stresses encountered during the mounting process.

Tables 5 to 9 show examples of the results of these evaluations.

Table 5 Reliability Testing Results (SOJ-42P MB81V16160A)

Test item	Test conditions	Test results
High temperature storage test	150°C (302°F) 1000H	0/55
High temperature continuous operation test* (AC operation)	125°C (257°F) 1000H	0/105
High temperature continuous operation test* (DC operation)	150°C (302°F) 1000H	0/55
High humidity continuous operation test* (AC operation)	85°C (185°F)/85% 1000H	0/55
Low temperature continuous operation test (AC operation)	– 55°C (– 67°F) 1000H	0/55
Temperature cycle*	– 65°C to 150°C (– 85°F to 302°F) 100C	0/55
Thermal shock	0°C to 100°C (32°F to 212°F) 100C	0/55
PTHS*	121°C (250°F)/100% 168H	0/55
PTHB	121°C (250°F)/100% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/ 85%, 48 H + Infrared reflow 245˚C (473˚F) Max.

Table 6 Reliability Testing Results (SON-40P MBM29LV004)

Test item	Test conditions	Test results
High temperature storage test	150°C (302°F) 1000H	0/25
High temperature continuous operation test* (AC operation)	125°C (257°F) 1000H	0/55
High humidity continuous operation test* (AC operation)	85°C (185°F)/85% 1000H	0/25
Temperature cycle*	– 65°C to 150°C (– 85°F to 302°F) 100C	0/105
Thermal shock	0°C to 100°C (32°F to 212°F) 100C	0/55
PTHS*	121°C (250°F)/100% 168H	0/55
PTHB	121°C (250°F)/100% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 6 H +Infrared reflow 245˚C (473˚F) Max.

Table 7 Reliability Testing Results (SSOP-20P MB15A60)

Test item	Test conditions	Test results
High temperature storage test	150°C (302°F) 1000H	0/25
High temperature continuous operation test* (AC operation)	150°C (302°F) 1000H	0/55
High humidity continuous operation test* (AC operation)	85°C (185°F)/85% 1000H	0/25
Low temperature continuous operation test (AC operation)	– 55°C (– 67°F) 1000H	0/25
Temperature cycle*	– 65°C to 150°C (– 85°F to 302°F) 100C	0/55
Thermal shock	0°C to 100°C (32°F to 212°F) 100C	0/25
PTHS*	121°C (250°F)/100% 168H	0/55
PTHB	121°C (250°F)/100% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 24 H + Infrared reflow 245˚C (473˚F) Max.

Table 8 Reliability Testing Results (QFP-120P MB90000A Serise)

Test item	Test conditions	Test results
High temperature storage test	150°C (302°F) 1000H	0/55
High temperature continuous operation test* (AC operation)	150°C (302°F) 1000H	0/105
High humidity continuous operation test* (AC operation)	85°C (185°F)/85% 1000H	0/55
Low temperature continuous operation test (AC operation)	– 55°C (– 67°F) 1000H	0/25
Temperature cycle*	– 65°C to 150°C (– 85°F to 302°F) 100C	0/105
Thermal shock	0°C to 100°C (32°F to 212°F) 100C	0/55
PTHS*	121°C (250°F)/100% 168H	0/55
PTHB	121°C (250°F)/100% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 30˚C (86˚F)/85%, 96 H + Infrared reflow 245˚C (473˚F) Max.

Table 9 Reliability Testing Results (QFP-256P MBCE46194)

Test item	Test conditions	Test results
High temperature storage test	150°C (302°F) 1000H	0/25
High temperature continuous operation test* (AC operation)	100°C (212°F) 1000H	0/55
High humidity continuous operation test* (AC operation)	85°C (185°F)/85% 1000H	0/25
Low temperature continuous operation test (AC operation)	– 55°C (– 67°F) 1000H	0/25
Temperature cycle*	– 65°C to 150°C (– 85°F to 302°F) 100C	0/55
Thermal shock	0°C to 100°C (32°F to 212°F) 100C	0/25
PTHS*	121°C (250°F)/100% 168H	0/55
PTHB	121°C (250°F)/100% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 30˚C (86˚F)/85%, 96 H + Infrared reflow 245˚C (473˚F) Max.

Table 10 Reliability Testing Results (BCC-16P MB15E07SL)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High temperature continuous operation test* (AC operation)	150° C (302° F) /1005D 1000H	0/55
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Low temperature continuous operation test (AC operation)	– 55° C (– 67° F) 1000H	0/25
Temperature cycle*	1010C 200c	0/55
Thermal shock	1011A 200c	0/25
PTHS*	121° C (250° F)/2.03 $\times 10^5$Pa 168H	0/55
PTHB	121° C (250° F)/2.03 $\times 10^5$Pa 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 48 H + Infrared reflow 245˚C (473˚F) Max.

Table 11 Reliability Testing Results (FBGA-48P MBM29LV800A)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High humidity continuous operation test* (DC operation)	85° C (185° F)/85% 1000H	0/55
Temperature cycle*	1010C 200c	0/105
Thermal shock	1011A 200c	0/55
PTHS*	121° C (250° F)/85% 168H	0/55
PTHB	121° C (250° F)/85% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 24 H + Infrared reflow 245˚C (473˚F) Max.

Table 12 Reliability Testing Results (FBGA-168P MBCU62000)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Temperature cycle*	1010C 200c	0/55
Thermal shock	1011A 200c	0/25
PTHS*	121° C (250° F)/85% 168H	0/55
PTHB	121° C (250° F)/85% 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 24 H + Infrared reflow 235˚C (455˚F) Max.

Table 13 Reliability Testing Results (BGA-416P CG51 Series)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High temperature continuous operation test* (AC operation)	125° C (257° F) /1005D 1000H	0/55
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Temperature cycle*	1010B 500c	0/55
Thermal shock	1011A 200c	0/25
PTHS*	121° C (250° F)/85% 168H	0/55
PTHB	121° C (250° F)/85% 96H V_{CC}=3.8V	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 30˚C (86˚F)/80%, 96 H + Infrared reflow 225˚C (437˚F) Max. (3times)

Table 14 Reliability Testing Results (BGA-416P CS60ALE TEST CHIP)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High temperature continuous operation test* (AC operation)	125° C (257° F) /1005D 1000H	0/55
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Low temperature continuous operation test (AC operation)	– 55° C (– 67° F) 1000H	0/25
Temperature cycle*	1010B 500c	0/55
Thermal shock	1011A 200c	0/25
PTHS*	121° C (250° F)/85% 168H	0/55
PTHB	121° C (250° F)/85% 96H V_{CC}=3.8V	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 30˚C (86˚F)/80%, 96 H + Infrared reflow 225˚C (437˚F) Max.

Table 15 Reliability Testing Results (BGA-416P CS60ALE Custum CHIP)

Test item	Test conditions	Test results
High temperature storage test	150° C (302° F) 1000H	0/25
High temperature continuous operation test* (AC operation)	125° C (257° F) /1005D 1000H	0/55
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Low temperature continuous operation test (AC operation)	– 55° C (– 67° F) 1000H	0/25
Temperature cycle*	1010B 500c	0/55
Thermal shock	1011A 200c	0/25
PTHS*	121° C (250° F)/85% 168H	0/55
PTHB	121° C (250° F)/85% 96H $V_{DD1,2}$=3.8V	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 30˚C (86˚F)/80%, 96 H + Infrared reflow 225˚C (437˚F) Max.

Table 16 Reliability Testing Results (TSOP-86P MB811643242A)

Test item	Test conditions	Test results
High temperature continuous operation test* (AC operation)	125° C (257° F) /1005D 1000H	0/55
High humidity continuous operation test* (AC operation)	85° C (185° F)/85% 1000H	0/25
Temperature cycle*	1010C 200c	0/105
Thermal shock	1011A 200c	0/55
PTHS*	121° C (250° F)/2 atm 168H	0/55
PTHB	121° C (250° F)/2 atm 96H	0/25

* Preprocessing requirements: Drying 125˚C (257˚F), 24 H + humidity absorption precess 85˚C (185˚F)/85%, 24 H + Infrared reflow 235˚C (455˚F) Max.

2.4 Storage

Products should be stored while still packed in the materials that they were shipped in from Fujitsu.

- The recommended condition for the storage area is as belows;

  Room Temperature; 5 to 30°C (41 to 86°F)

  Room Humidity; 40 to 70%

- Do not store the products where they will be exposed to corrosive gases or in dusty locations.
- Because sudden temperature changes can cause moisture to condense on the products, store the products in an area where the temperature remains fairly constant.
- Note that if products are stored for an extended period of time, the solderability of the lead pins may decline, rust may form, or the electrical characteristics may deteriorate.

Package Forms and Number of Pins

3.1 Package Forms and Number of Pins

The following tables show the correspondence between the forms and number of pins for each package.

Lead inserted types

Form	Package	Number of pins																																
		8	9	14	16	17	18	19	20	22	24	28	32	36	40	42	48	52	64	68	80	88	107	121	135	149	179	208	211	256	299	321	361	401	441
Standard	DIP	●		● ❍	● ❍		● ❍		● ❍	● ❍	● ❍	● ❍	●	●	● ❍	● ❍	● ❍																				
Small	SH-DIP										●	●			●	●	●	●	● ❍																
	SK-DIP									● ❍	● ❍	●	●																						
	SL-DIP										● ❍	● ❍	❍																						
Matrix	PGA																		❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

● : Plastic ❍ : Ceramic

Package Forms and Number of Pins

Surface mounted types

Form	Package	Number of pins																																						
		8	14	16	18	20	24	28	30	32	34	38	40	44	48	50	54	56	64	68	80	86	100	104	120	124	144	160	164	168	176	196	208	216	232	240	256	260	296	304	320	368
Flat	SOP	● ❍	● ❍	● ❍	❍	●	● ❍	● ❍		●	●	●	●	●																												
	SOL	●																																								
	SSOP	●		●		●	●		●		●							●																								
	TSOP						●			●			●	●	●	●	●	●				●																				
	CSOP														●																											
	QFP							❍		❍				●	● ❍				● ❍	❍	● ❍		● ❍	●	● ❍	❍	● ❍	● ❍	❍	●	● ❍	❍	● ❍		● ❍	● ❍	● ❍	❍	●	● ❍	❍	❍
	LQFP									●					●				●		●		● ❍		●		●				●		●	●			●					
	TQFP																		●		●		●		●		●				●											
	FPT (round)			❍			❍																																			

Form	Package	Number of pins																																					
		16	26	28	32	36	40	42	44	46	48	57	61	64	68	69	77	84	100	112	120	144	168	176	192	224	240	256	272	288	320	352	416	420	560	576	672	720	1196	1344	1600
Lead-less chip carrier	SON						●			●																															
	BCC	●			●						●																														
	QFN	❍			❍	❍			❍		❍			❍																											
	PCLP										●								●			●																			
	LCC				❍																																				
Leaded chip carrier	QFJ			●	● ❍				● ❍						●			●																							
	SOJ		❍	❍				●																																	
Matrix	BGA										●																	●				●	●	●	●	●	●	●			
	FBGA										●	●	●			●	●			●	●	●	●	●	●	●	●		●	●	●								●	●	●
	T-BGA																											●	●												

● : Plastic ❍ : Ceramic

Package Forms and Number of Pins

Modules, Cards Package Lineup

Mount type	Form	Package	Number of pins									
			72	48	60	64	68	80	100	144	168	200
Modules	SMD	SIMM	●									
		MZIP	●									
		DIMM								●	●	●
	Piggy back	Flat		❍		❍		❍	❍			
Cardss	—	Socket			●		●					

● : Plastic ❍ : Ceramic

3.2 Package Lineup

3.2.1 Lead inserted types

Plastic and Ceramic DIPs

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Row spacing mm/mil	Weight g/package	Features
8		M	DIP-8P-M01	2.54/100	7.62/300	0.45	
14	Standard	M	DIP-14P-M02	2.54/100	7.62/300	0.94	(= M01) Index is different
		C	DIP-14C-C01	2.54/100	7.62/300	—	Pin length: 134mil, package width: 248mil
			DIP-14C-C04	2.54/100	7.62/300	—	Pin length: 134mil, package width: 268mil
16	Standard	M	DIP-16P-M03	2.54/100	7.62/300	1.07	Package width: 260mil
			DIP-16P-M04	2.54/100	7.62/300	1.06	Package width: 244mil
			DIP-16P-M05	2.54/100	7.62/300	1.06	Package width: 283mil
		C	DIP-16C-C01	2.54/100	7.62/300	—	Package width: 248mil
			DIP-16C-C02	2.54/100	7.62/300	—	Package width: 268mil
			DIP-16C-C04	2.54/100	7.62/300	—	Package width: 288mil
18	Standard	M	DIP-18P-M02	2.54/100	7.62/300	1.16	Package width: 244mil
			DIP-18P-M03	2.54/100	7.62/300	1.15	Package width: 260mil
			DIP-18P-M04	2.54/100	7.62/300	1.31	Package width: 283mil
		C	DIP-18C-C01	2.54/100	7.62/300	—	
20	Standard	M	DIP-20P-M01	2.54/100	7.62/300	1.22	Package width: 260mil
			DIP-20P-M02	2.54/100	7.62/300	—	Package width: 244mil
			DIP-20P-M03	2.54/100	7.62/300	1.53	Package width: 283mil
		A	DIP-20C-A01	2.54/100	7.62/300	—	Package width: 288mil, mounted height: 177mil
		C	DIP-20C-C01	2.54/100	7.62/300	—	Package width: 275mil
			DIP-20C-C02	2.54/100	10.16/400	—	Package width: 380mil
22	Standard	M	DIP-22P-M03	2.54/100	10.16/400	1.94	
		C	DIP-22C-C02	2.54/100	10.16/400	—	
	SK	M	DIP-22P-M04	2.54/100	7.62/300	1.41	
		C	DIP-22C-C03	2.54/100	7.62/300	—	
24	Standard	M	DIP-24P-M02	2.54/100	15.24/600	3.40	
		A	DIP-24C-A04	2.54/100	15.24/600	—	Package width: 588mil, mounted height: 177mil, maximum pin width: 50mil
			DIP-24C-A06	2.54/100	15.24/600	—	Package width: 590mil, mounted height: 200mil, maximum pin width: 40mil

(continued)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Row spacing mm/mil	Weight g/package	Features
24	Standard	A	DIP-24C-A07	2.54/100	15.24/600	—	Package width: 595mil, mounted height: 177mil, maximum pin width: 40mil
		C	DIP-24C-C01	2.54/100	15.24/600	—	Package width: 520mil
			DIP-24C-C03	2.54/100	15.24/600	—	Package width: 577mil
	SH	M	DIP-24P-M05	1.778/70	7.62/300	1.15	
	SK	M	DIP-24P-M03	2.54/100	7.62/300	1.55	
		C	DIP-24C-C04	2.54/100	7.62/300	—	
	SL	M	DIP-24P-M04	2.54/100	10.16/400	2.35	
		A	DIP-24C-A05	2.54/100	10.16/400	—	
		C	DIP-24C-C05	2.54/100	10.16/400	—	
28	Standard	M	DIP-28P-M05	2.54/100	15.24/600	—	(= M02) Index is different
		A	DIP-28C-A01	2.54/100	15.24/600	—	Mounted height: 177mil
			DIP-28C-A07	2.54/100	15.24/600	—	Mounted height: 200mil
		C	DIP-28C-C02	2.54/100	15.24/600	—	
	SH	M	DIP-28P-M03	1.778/70	10.16/400	1.87	
	SK	M	DIP-28P-M04	2.54/100	7.62/300	2.10	
	SL	M	DIP-28P-M06	2.54/100	10.16/400	—	
		A	DIP-28C-A10	2.54/100	10.16/400	—	
32	Standard	M	DIP-32P-M01	2.54/100	15.24/600	4.60	
	SK	M	DIP-32P-M02	2.54/100	7.62/300	2.45	Package length: 1600mil
	SL	A	DIP-32C-A02	2.54/100	10.16/400	—	
36	Standard	M	DIP-36P-M01	2.54/100	15.24/600	5.36	Package length: 2063mil
40	Standard	M	DIP-40P-M02	2.54/100	15.24/600	—	Package length: 1510mil
		A	DIP-40C-A04	2.54/100	15.24/600	—	With window(DIA : 355mil)
			DIP-40C-A05	2.54/100	15.24/600	—	Purple body
	SH	M	DIP-40P-M03	1.778/70	15.24/600	4.44	
42	Standard	M	DIP-42P-M03	2.54/100	15.24/600	—	(= M01) Index is different
		A	DIP-42C-A01	2.54/100	15.24/600	—	
			DIP-42C-A03	2.54/100	15.24/600	—	(= A01) With window (DIA : 335mil)
	SH	M	DIP-42P-M02	1.778/70	15.24/600	4.47	
48	Standard	M	DIP-48P-M02	2.54/100	15.24/600	7.52	
		A	DIP-48C-A01	2.54/100	15.24/600	—	
	SH	M	DIP-48P-M01	1.778/70	15.24/600	5.00	

(continued)

M : Plastic mold
A : Metal seal (ceramic)
F : Frit seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Row spacing mm/mil	Weight g/package	Features
52	SH	M	DIP-52P-M01	1.778/70	15.24/600	5.55	
64	SH	M	DIP-64P-M01	1.778/70	19.05/750	9.03	
		A	DIP-64C-A02	1.778/70	19.05/750	—	
			DIP-64C-A06	1.778/70	19.05/750	—	(= A02) With window (DIA : 350mil)

M : Plastic mold
F : Frit seal (ceramic)
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Ceramic PGAs

Number of pins	Construction	Package code	Lead pitch mm/mil	Pin matrix	Features
64	A	PGA-64C-A02	2.54/100	10	
68	A	PGA-68C-A01	2.54/100	11	
80	A	PGA-80C-A01	2.54/100	12	3 fins
88	A	PGA-88C-A01	2.54/100	12	
		PGA-88C-A02	2.54/100	12	(= A01) Cap is different
		PGA-88C-A05	2.54/100	12	2 fins
		PGA-88C-A06	2.54/100	12	3 fins
107	A	PGA-107C-A01	2.54/100	12	
		PGA-107C-A02	2.54/100	12	(= A01) Cap is different
121	A	PGA-121C-A01	2.54/100	13	2 fins
		PGA-121C-A02	2.54/100	13	3 fins
135	A	PGA-135C-A01	2.54/100	14	Pin length: 134mil
		PGA-135C-A02	2.54/100	14	Pin length: 130mil
		PGA-135C-A05	2.54/100	14	2 fins
		PGA-135C-A06	2.54/100	14	(= A01) Cap is different
	C	PGA-135C-C02	2.54/100	14	
149	A	PGA-149C-A02	2.54/100	15	6 fins
		PGA-149C-A03	2.54/100	15	3 fins
		PGA-149C-A06	2.54/100	15	2 fins
		PGA-149C-A09	2.54/100	15	
179	A	PGA-179C-A02	2.54/100	15	Pin length: 189mil
		PGA-179C-A03	2.54/100	15	Pin length: 134mil
		PGA-179C-A04	2.54/100	18	Pin fins
		PGA-179C-A06	2.54/100	16	2 fins

(continued)

M : Plastic mold
F : Frit seal (ceramic)
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

(continued)

Number of pins	Construction	Package code	Lead pitch mm/mil	Pin matrix	Features
208	A	PGA-208C-A02	2.54/100	17	
		PGA-208C-A03	2.54/100	17	Pin fins
		PGA-208C-A04	2.54/100	17	6 fins
		PGA-208C-A05	2.54/100	17	Screw stud
		PGA-208C-A06	2.54/100	17	3 fins
		PGA-208C-A07	2.54/100	17	2 fins
211	A	PGA-211C-A01	2.54/100	17	
256	A	PGA-256C-A01	1.27/50	19	
		PGA-256C-A02	2.54/100	19	Pin length: 134mil
		PGA-256C-A03	2.54/100	19	Pin length: 130mil
		PGA-256C-A04	2.54/100	19	3 fins, pin length: 134mil
		PGA-256C-A05	2.54/100	19	2 fins
		PGA-256C-A07	2.54/100	19	3 fins, pin length: 187mil
299	A	PGA-299C-A01	2.54/100	20	
		PGA-299C-A02	2.54/100	20	3 fins
321	A	PGA-321C-A02	2.54/100	33	Interstitial
361	A	PGA-361C-A01	1.27/50	35	Interstitial
401	A	PGA-401C-A02	1.27/50	37	Interstitial
		PGA-401C-A04	1.27/50	30	
441	A	PGA-441C-A01	1.27/50	27	6 fins
		PGA-441C-A03	1.27/50	27	17 fins
		PGA-441C-A06	1.27/50	27	

M : Plastic mold
C : Cerdip(ceramic)
A : Metal seal (ceramic)

3.2.2 Surface mounted types

Plastic and Ceramic SOPs

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Package width x package length mm/mil	Lead shape	Weight g/package	Features
8	SOP	M	FPT-8P-M01	1.27/50	7.62/300 (II)	Gullwing	0.10	
		C	FPT-8C-A01	1.27/50	—	Gullwing	—	
	SSOP	M	FPT-8P-M03	0.80mm	—	Gullwing	0.04	
	SOL	M	FPT-8P-M02	1.27/50	—	Gullwing	0.06	
14	SOP	M	FPT-14P-M03	1.27/50	5.72/225 (I)	Gullwing	—	
			FPT-14P-M04	1.27/50	7.62/300 (II)	Gullwing	0.20	
		C	FPT-14C-A01	1.27/50	—	Straight	—	
			FPT-14C-A02	1.27/50	—	Straight	—	
16	SOP	M	FPT-16P-M03	1.27/50	9.53/375 (III)	Gullwing	0.50	
			FPT-16P-M04	1.27/50	5.72/225 (I)	Gullwing	—	
			FPT-16P-M06	1.27/50	7.62/300 (II)	Gullwing	0.20	
		C	FPT-16C-C01	1.27/50	—	Straight	—	
			FPT-16C-C02	1.27/50	—	Gullwing	—	
	SSOP	M	FPT-16P-M05	0.65mm	—	Gullwing	0.07	
18	SOP	C	FPT-18C-C01	50/1.27	—	Straight	—	
20	SOP	M	FPT-20P-M01	50/1.27	7.62/300 (II)	Gullwing	—	
			FPT-20P-M02	50/1.27	9.53/375 (III)	Gullwing	0.50	Mounted height: 3.10mm max.
			FPT-20P-M05	50/1.27	9.53/375 (III)	Gullwing	0.50	Mounted height: 2.80mm max.
	SSOP	M	FPT-20P-M03	0.65mm	—	Gullwing	0.09	Mounted height: 1.45mm max.
			FPT-20P-M04	0.65mm	—	Gullwing	0.08	Mounted height: 1.20mm max.
24	SOP	M	FPT-24P-M01	1.27/50	7.62/300 (II)	Gullwing	0.39	
			FPT-24P-M02	1.27/50	9.53/375 (III)	Gullwing	0.58	
		A	FPT-24C-A01	1.27/50	—	Straight	—	
			FPT-24C-A02	1.27/50	—	Straight	—	
		F	FPT-24C-F01	1.27/50	—	Straight	—	
		C	FPT-24C-C04	0.76/30	—	Straight	—	
	SSOP	M	FPT-24P-M03	0.65mm	—	Gullwing	0.12	

(continued)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Package width x package length mm/mil	Lead shape	Weight g/package	Features
28	SOP	M	FPT-28P-M01	1.27/50	9.53/375 (III)	Gullwing	0.67	
			FPT-28P-M17	1.27/50	—	Gullwing	0.82	
		F	FPT-28C-F01	1.27/50	—	Straight	—	
		C	FPT-28C-C02	1.27/50	—	Gullwing	—	
			FPT-28C-C03	1.27/50	—	Straight	—	
			FPT-28C-C07	30mil	—	Straight	—	
30	SSOP	M	FPT-30P-M02	0.65mm	—	Gullwing	0.16	
32	SOP	M	FPT-32P-M02	1.27/50	11.43/450(IV)	Gullwing	0.80	
			FPT-32P-M03	1.27/50	13.34/525 (V)	Gullwing	1.08	Width: 14.40mm
	TSOP	M	FPT-32P-M24	0.50mm	—	Gullwing	0.38	Normal bend type
			FPT-32P-M25	0.50mm	—	Gullwing	0.38	Reverse bend type
34	SOP	A	FPT-34C-A01	1.00m	—	Straight	—	
	SSOP	M	FPT-34P-M01	1.00mm	—	Gullwing	0.70	Normal bend type
			FPT-34P-M02	1.00mm	—	Gullwing	—	Reverse bend type
			FPT-34P-M03	0.65mm	—	Gullwing	0.19	
38	SOP	M	FPT-38P-M02	1.00mm	—	Gullwing	1.63	
40	SSOP	M	FPT-40P-M01	0.80mm	—	Gullwing	0.76	
			FPT-40P-M04	0.80mm	—	Gullwing	0.71	Normal bend type
			FPT-40P-M05	0.80mm	—	Gullwing	—	Reverse bend type
	TSOP	M	FPT-40P-M06	0.50mm	—	Gullwing	—	Normal bend type
			FPT-40P-M07	0.50mm	—	Gullwing	—	Reverse bend type
44	SOP	M	FPT-44P-M16	0.80mm	—	Gullwing	—	
	TSOP	M	FPT-44P-M07	0.80mm	—	Gullwing	0.49	Normal bend type
			FPT-44P-M08	0.80mm	—	Gullwing	—	Reverse bend type
			FPT-44P-M18	0.80mm	—	Gullwing	—	
48	TSOP	M	FPT-48P-M19	0.50mm	—	Gullwing	0.50	Normal bend type
			FPT-48P-M20	0.50mm	—	Gullwing	0.50	Reverse bend type
	CSOP	M	LCC-48P-M03	0.40mm	10.0 × 9.50	—	—	
50	TSOP	M	FPT-50P-M05	0.80mm	—	Gullwing	—	
			FPT-50P-M06	0.80mm	—	Gullwing	0.60	
54	TSOP	M	FPT-54P-M01	0.80mm	—	Gullwing	0.77	
			FPT-54P-M02	0.80mm	10.16/400	Gullwing	0.63	
56	SSOP	M	FPT-56P-M03	0.80mm	—	Gullwing	—	

(continued)

M : Plastic mold
F : Frit seal (ceramic)
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm/mil	Package width x package length mm/mil	Lead shape	Weight g/package	Features
56	TSOP	M	FPT-56P-M01	0.50mm	—	Gullwing	—	
			FPT-56P-M02	0.50mm	—	Gullwing	—	
			FPT-56P-M04	0.40mm	—	Gullwing	—	
86	TSOP	M	FPT-86P-M01	0.50mm	10.16/400	Gullwing	0.63	

M : Plastic mold
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C : Cerdip(ceramic)

Plastic SONs

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
40	SON	M	LCC-40P-M02	0.50	—	—	0.20	Mounted height: 0.75mm max.
46	SON	M	LCC-46P-M02	0.50	—	—	0.20	Mounted height: 0.75mm max.

M : Plastic mold
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C : Cerdip(ceramic)

Plastic BCCs

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
16	BCC	M	LCC-16P-M02	0.65 0.80	3.40 × 4.55	—	0.02	Bump contact
			LCC-16P-M03	0.65 0.80	4.20 × 4.55	—	0.02	Bump contact
32	BCC	M	LCC-32P-M08	—	—	—	—	
			LCC-32P-M09	—	—	—	—	
48	BCC	M	LCC-48P-M02	—	—	—	—	

M : Plastic mold
F : Frit seal (ceramic)
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

Plastic and Ceramic QFPs

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
16	FPT	A	FPT-16C-A01	—	—	Straight	—	Round package
24	FPT	A	FPT-24C-A03	—	—	Straight	—	Round package
28	QFP	A	FPT-28C-A06	—	—	Straight	—	Round package
		A	FPT-28C-A07	1.27	11.40 × 11.40	Gullwing	—	Length of flat portion of pin: 0.80mm
			FPT-28C-A08	1.27	11.40 × 11.40	Gullwing	—	Length of flat portion of pin: 0.48mm
32	LQFP	M	FPT-32P-M21	1.27	—	Gullwing	0.17	
	QFP	C	FPT-32C-C02	1.27	—	Gullwing	—	
44	QFP	M	FPT-44P-M11	0.80	10 × 10	Gullwing	0.42	Length of flat portion of pin: 1.40mm
48	QFP	M	FPT-48P-M13	0.80	10 × 10	Gullwing	0.42	Length of flat portion of pin: 1.80mm
			FPT-48P-M15	0.80	12 × 12	Gullwing	0.75	Length of flat portion of pin: 0.85mm
			FPT-48P-M16	0.80	12 × 12	Gullwing	0.75	Length of flat portion of pin: 1.80mm
		A	FPT-48C-A01	0.80	12 × 12	Gullwing	—	
	LQFP	M	FPT-48P-M05	0.50	7 × 7	Gullwing	0.17	Length of flat portion of pin: 0.50mm
64	QFP	M	FPT-64P-M06	1.00	14 × 20	Gullwing	1.68	Length of flat portion of pin: 1.20mm
			FPT-64P-M07	1.00	14 × 20	Gullwing	1.67	Length of flat portion of pin: 1.70mm
			FPT-64P-M10	1.00	14 × 20	Gullwing	1.68	Length of flat portion of pin: 0.80mm
		A	FPT-64C-A01	1.00	14 × 20	Gullwing	—	
			FPT-64C-A02	1.00	14 × 20	Gullwing	—	With window(DIA : 370mil)
	LQFP	M	FPT-64P-M03	0.50	10 × 10	Gullwing	0.32	Length of flat portion of pin: 0.50mm
			FPT-64P-M09	0.65	12 × 12	Gullwing	0.64	
	TQFP	M	FPT-64P-M04	0.50	10 × 10	Gullwing	0.25	Mounted height: 1.27mm max.
68	QFP	A	FPT-68C-A01	1.00	19.61 × 19.61	Gullwing	—	5 fins
			FPT-68C-A02	1.00	19.61 × 19.61	Gullwing	—	
80	QFP	M	FPT-80P-M06	0.80	14 × 20	Gullwing	1.70	Length of flat portion of pin: 0.80mm
			FPT-80P-M07	0.80	14 × 20	Gullwing	1.70	Length of flat portion of pin: 1.20mm
			FPT-80P-M09	0.80	24 × 24	Gullwing	—	For multichip module
		A	FPT-80C-A01	0.80	14 × 20	Gullwing	—	
			FPT-80C-A02	0.80	14 × 20	Gullwing	—	With window(DIA : 335mil)
	LQFP	M	FPT-80P-M05	0.50	12 × 12	Gullwing	—	Length of flat portion of pin: 0.50mm

(continued)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
80	LQFP	M	FPT-80P-M11	0.65	14 × 14	Gullwing	0.62	
	TQFP	M	FPT-80P-M15	0.50	12 × 12	Gullwing	0.4	
100	QFP	M	FPT-100P-M06	0.65	14 × 20	Gullwing	1.68	(= M01) Different tie bar position
			FPT-100P-M07	0.65	14 × 20	Gullwing	1.68	(= M01) Different tie bar position
		A	FPT-100C-A01	0.65	14 × 20	Gullwing	—	
			FPT-100C-A02	0.65	14 × 20	Gullwing	—	(DIA: 350mil) With window
	LQFP	M	FPT-100P-M05	0.50	14 × 14	Gullwing	0.65	Length of flat portion of pin: 0.50mm
		C	FPT-100C-C01	0.50	14 × 14	Gullwing	—	
	TQFP	M	FPT-100P-M09	0.50	14 × 14	Gullwing	0.46	
			FPT-100P-M18	0.40	12 × 12	Gullwing	0.4	
			FPT-100P-M19	0.65	14 × 20	Gullwing	0.7	
104	QFP	M	FPT-104P-M01	0.80	28 × 28	Gullwing	—	For multichip module
120	QFP	M	FPT-120P-M03	0.80	28 × 28	Gullwing	5.37	Length of flat portion of pin: 0.80mm
			FPT-120P-M04	0.80	28 × 28	Gullwing	5.37	Length of flat portion of pin: 1.20mm
			FPT-120P-M13	0.50	20 × 20	Gullwing	—	
		A	FPT-120C-A01	0.80	27.81 × 27.81	Gullwing	—	
		C	FPT-120C-C01	0.80	28 × 28	Gullwing	—	
	LQFP	M	FPT-120P-M05	0.40	14 × 14	Gullwing	0.62	
			FPT-120P-M21	0.50	16 × 16	Gullwing	0.88	
	TQFP	M	FPT-120P-M17	0.40	14 × 14	Gullwing	—	Mounted height: 1.27mm max.
124	QFP	A	FPT-124C-A03	0.51/0.76	20.32 × 20.32	Gullwing	—	
144	QFP	M	FPT-144P-M01	0.65	28 × 28	Gullwing	—	Length of flat portion of pin: 0.80mm
			FPT-144P-M02	0.65	28 × 28	Gullwing	5.34	Length of flat portion of pin: 1.20mm
			FPT-144P-M03	0.50	20 × 20	Gullwing	—	Mounted height: 3.85mm max.
		C	FPT-144C-C01	0.65	28 × 28	Gullwing	—	
			FPT-144C-C02	0.50	20.20 × 20.20	Gullwing	—	
	LQFP	M	FPT-144P-M08	0.50	20 × 20	Gullwing	—	Length of flat portion of pin: 0.50mm
			FPT-144P-M12	0.40	16 × 16	Gullwing	0.88	
	TQFP	M	FPT-144P-M10	0.50	20 × 20	Gullwing	—	

(continued)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
160	QFP	M	FPT-160P-M03	0.65	28 × 28	Gullwing	5.34	Length of flat portion of pin: 0.80mm
			FPT-160P-M04	0.65	28 × 28	Gullwing	5.34	Length of flat portion of pin: 1.20mm
			FPT-160P-M11	0.65	28 × 28	Gullwing	—	Heat spreader built in
		A	FPT-160C-A01	0.65	27.81 × 27.81	Gullwing	—	
		C	FPT-160C-C01	0.65	28 × 28	Gullwing	—	
			FPT-160C-C02	0.65	28 × 28	Gullwing	—	
			FPT-160C-C04	0.65	28 × 28	Gullwing	—	
164	QFP	A	FPT-164C-A03	0.51/0.76/1.02	27.94 × 27.94	Gullwing	—	Length of flat portion of pin: 1.02mm
			FPT-164C-A05	0.51/0.76	27.94 × 27.94	Gullwing	—	Length of flat portion of pin: 1.02mm
		C	FPT-164C-C01	0.65	25.60 × 23.37	Gullwing	—	
168	QFP	M	FPT-168P-M01	0.80	40 × 40	Gullwing	—	For multichip module
176	QFP	M	FPT-176P-M01	0.50	24 × 24	Gullwing	3.80	Length of flat portion of pin: 0.50mm
		C	FPT-176C-C01	0.50	23.20 × 23.20	Gullwing	—	
	LQFP	M	FPT-176P-M02	0.50	24 × 24	Gullwing	—	Length of flat portion of pin: 0.50mm
			FPT-176P-M03	0.40	20 × 20	Gullwing	—	Length of flat portion of pin: 0.50mm
	TQFP	M	FPT-176P-M06	0.40	20 × 20	Gullwing	—	
196	QFP	C	FPT-196C-C01	0.65	28 × 40	Gullwing	—	
208	QFP	M	FPT-208P-M01	0.50	28 × 28	Gullwing	5.25	Length of flat portion of pin: 0.50mm
			FPT-208P-M04	0.50	28 × 28	Gullwing	—	Heat spreader built in
		A	FPT-208C-A01	0.50	28 × 28	Gullwing	—	
		C	FPT-208C-C02	0.50	27.20 × 27.20	Gullwing	—	
			FPT-208C-C03	0.50	27.20 × 27.20	Gullwing	—	Base ceramic: Aluminium nitride
			FPT-208C-C04	0.50	27.20 × 27.20	Gullwing	—	(= C03) With pin fins
	LQFP	M	FPT-208P-M06	0.50	28 × 28	Gullwing	3.0	
216	LQFP	M	FPT-216P-M01	0.40	24 × 24	Gullwing	—	
232	QFP	M	FPT-232P-M01	0.65	40 × 40	Gullwing	12.47	Length of flat portion of pin: 0.80mm
		C	FPT-232C-C01	0.65	40 × 40	Gullwing	—	
240	QFP	M	FPT-240P-M02	0.50	32 × 32	Gullwing	7.80	Length of flat portion of pin: 0.50mm

(continued)

M : Plastic mold
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

(continued)

Number of pins	Form	Construction	Package code	Lead pitch mm	Package width x package length mm	Lead shape	Weight g/package	Features
240	QFP	M	FPT-240P-M03	0.50	32 × 32	Gullwing	—	Heat spreader built in
		A	FPT-240C-A03	0.51/0.63/0.76	37.34 × 37.34	Gullwing	—	7 fins
			FPT-240C-A05	0.51/0.63/0.76	37.34 × 37.34	Gullwing	—	
		C	FPT-240C-C01	0.50	31.20 × 31.20	Gullwing	—	
256	QFP	M	FPT-256P-M04	0.50	40 × 40	Gullwing	—	For multichip module
			FPT-256P-M06	0.40	28 × 28	Gullwing	—	
256	QFP	M	FPT-256P-M09	0.40	28 × 28	Gullwing	—	Heat spreader built in
		A	FPT-256C-A07	0.50	36 × 36	Gullwing	—	3 fins
		C	FPT-256C-C01	0.50	27.20×39.20	Gullwing	—	
			FPT-256C-C02	0.50	27.20×27.20	Gullwing	—	Base ceramic: Aluminium nitride
			FPT-256C-C03	0.50	27.20×27.20	Gullwing	—	Pin fins
	LQFP	M	FPT-256P-M11	0.40	28 × 28	Gullwing	—	
260	QFP	A	FPT-260C-A02	0.51/0.76	41.15 × 41.15	Gullwing	—	No fins
			FPT-260C-A03	0.51/0.76	41.15 × 41.15	Gullwing	—	12 fins
			FPT-260C-A04	0.51/0.76	41.15 × 41.15	Gullwing	—	5 fins
296	QFP	M	FPT-296P-M01	0.40	32 × 32	Gullwing	—	
304	QFP	M	FPT-304P-M02	0.50	40 × 40	Gullwing	—	Heat spreader built in
		C	FPT-304C-C01	0.50	39.20 × 39.20	Gullwing	—	
			FPT-304C-C02	0.50	39.20 × 39.20	Gullwing	—	Base ceramic: Aluminium nitride
320	QFP	A	FPT-320C-A01	0.40	36 × 36	Gullwing	—	8 fins
368	QFP	A	FPT-368C-A01	0.40	40 × 40	Gullwing	—	8 fins
		C	FPT-368C-C01	0.40	39.20 × 39.20	Gullwing	—	Base ceramic: Aluminium nitride

M : Plastic mold
A : Metal seal (ceramic)
F : Frit seal (ceramic)
C : Cerdip(ceramic)

Package Lineup

Ceramic QFNs (LCCs)

Number of pins	Construction	Package code	Lead pitch mm/mil	Package width × package length mm/mil	Features
16	F	LCC-16C-F01	1.27/50	6.35 × 6.35/250 × 250	Body thickness: 100mil
32	A	LCC-32C-A01	1.27/50	11.45 × 13.97/450 × 550	Body thickness: 130mil
		LCC-32C-A06	1.016/40	10.67 × 10.67/420 × 420	Body thickness: 130mil
	F	LCC-32C-F01	1.27/50	11.45 × 13.97/450 × 450	Body thickness: 130mil
36	F	LCC-36C-F01	1.27/50	13.97 × 13.97/550 × 550	Body thickness: 130mil
44	F	LCC-44C-F01	1.27/50	16.51 × 16.51/650 × 650	Body thickness: 130mil
48	A	LCC-48C-A01	1.016/40	14.22 × 14.22/560 × 560	Body thickness: 100mil
64	A	LCC-64C-A01	1.016/40	18.29 × 18.29/720 × 720	Body thickness: 100mil

Plastic and Ceramic QFJs

Number of pins	Construction	Package code	Lead pitch mm/mil	Package width × package length mm/mil	Weight g/package	Features
28	M	LCC-28P-M03	1.27/50	453 × 453	1.00	
32	M	LCC-32P-M02	1.27/50	450 × 550	0.96	
	C	QFJ-32C-C01	1.27/50	450 × 550	—	
44	M	LCC-44P-M02	1.27/50	653 × 653	2.05	
	C	QFJ-44C-C01	1.27/50	650 × 650	—	
68	M	LCC-68P-M02	1.27/50	953 × 953	4.25	
84	M	LCC-84P-M02	1.27/50	1153 × 1153	6.20	

M : Plastic mold
F : Frit seal (ceramic)
P : Resin seal
A : Metal seal (ceramic)
C : Cerdip(ceramic)

Plastic and Ceramic SOJs

Number of pins	Construction	Package code	Lead pitch mm/mil	Package width mm/mil	Weight g/package	Features
26	A	LCC-26C-A01	1.27/50	8.03/316	—	
28	A	LCC-28C-A04	1.27/50	10.98/432	—	
42	M	LCC-42P-M01	1.27/50	10.16/400	—	

Package Lineup

Plastic BGAs

Number of pins	Construction	Package code	Lead pitch mm/mil	Pin matrix	Features
48	M	BGA-48P-M06	1.0	8 × 6	
		BGA-48P-M10	1.0	6 × 8	
256	M	BGA-256P-M01	1.27/50	20	
		BGA-256P-M02	1.27/50	20	
352	M	BGA-352P-M01	1.27/50	26	
		BGA-352P-M02	1.27/50	26	
		BGA-352P-M03	1.27/50	26	
		BGA-352P-M04	1.27	26	
		BGA-352P-M05	1.27	26	
		BGA-352P-M08	—	—	
416	M	BGA-416P-M02	1.27/50	30	
420	M	BGA-420P-M01	1.27/50	26	
		BGA-420P-M02	1.27/50	26	
		BGA-420P-M03	1.27	26	
560	M	BGA-560P-M01	—	—	
576	M	BGA-576P-M01	1.27	30	
672	M	BGA-672P-M01	1.27	34	
720	M	BGA-720P-M01	—	—	
1196	M	BGA-1196C-M01	—	—	
1344	M	BGA-1344C-M01	—	—	
1600	M	BGA-1600C-M01	—	—	

Package Lineup

Plastic and Ceramic F-BGAs

Number of pins	Construction	Package code	Lead pitch mm	Pin matrix	Features
48	M	BGA-48P-M11	0.80	6 × 8	
		BGA-48P-M12	0.80	6 × 9	
		BGA-48P-M13	0.80	8 × 9	
57	M	BGA-57P-M01			
61	M	BGA-61P-M02			
69	M	BGA-69P-M02			
77	M	BGA-77P-M01			
112	M	BGA-112P-M01	0.80	11 × 11 (4 row)	
120	M	BGA-120P-M01	0.80	13 × 13 (3 row)	
144	M	BGA-144P-M01	0.80	14 × 14 (a part is 4 row)	
		BGA-144P-M02	0.80	13 × 13 (4 row)	
168	M	BGA-168P-M01	0.80	14 × 14 (a part is 5 row)	
176	M	BGA-176P-M02	0.80	14 × 14 (5 row)	
192	M	BGA-192P-M01	0.80	16 × 16 (4 row)	
		BGA-192P-M02	0.50	19 × 19 (3 row)	
224	M	BGA-224P-M03	0.80	18 × 18 (4 row)	
240	M	BGA-240P-M01	0.50	19 × 19 (4 row)	
272	M	BGA-272P-M02	0.80	21 × 21 (4 row)	
288	M	BGA-288P-M02	0.75	22 × 22 (4 row)	
320	M	BGA-320P-M01	0.80	21 × 21 (5 row)	

Package Lineup

T-BGA Plastic

Number of pins	Construction	Package code	Lead pitch mm/mil	Pin matrix	Features
256	M	BGA-256P-M04	1.27/50	20	Body thickness: 50mil
272	M	BGA-272P-M01	1.27/50	21	Body thickness: 50mil

LGA Plastic

Number of pins	Construction	Package code	Land pitch mm	Land matrix	Features
48	M	LGA-48P-M01	1.00	6 × 8	
		LGA-48P-M02	1.00	6 × 8	

TCP Plastic

Number of pins	Form	Construction	Package code	Lead pitch mm	Lead pitch mm/mil	Package width x package length mm/mil	Features
44	DTP	M	DTP-44A-M01	0.80	1.27/50	10.16 × 18.41	
160	QTP	M	QTP-160A-M01	0.30	1.27/50	14.00 × 14.00	
208	QTP	M	QTP-208E-M01	0.30	1.27/50	20.00 × 20.00	
256	QTP	M	QTP-256E-M01	0.30	1.27/50	24.00 × 24.00	
400	QTP	M	QTP-400F-M01	0.30	1.27/50	28.00 × 28.00	

3.2.3 SMD Module

SIMM (SIPs, socket-mounted type)

Number of pins	Construction	Package code	Lead pitch mm/mil	Features
72	M	MSS-72P-P11	1.27/50	With 8 SOJs and 4 PLCCs mounted; module thickness: 200mil max.
		MSS-72P-P12	1.27/50	
		MSS-72P-P23	1.27/50	With 8 SOJs and 4 PLCCs mounted; module thickness: 200mil max.
		MSS-72P-P24	1.27/50	With 16 SOJs and 8 PLCCs mounted; module thickness: 350mil max.
		MSS-72P-P27	1.27/50	With 16 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P29	1.27/50	With 8 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P39	1.27/50	With 16 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P43	1.27/50	With 8 TSOPs mounted; module thickness: 160mil max.
		MSS-72P-P48	1.27/50	With 8 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P49	1.27/50	With 16 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P62	1.27/50	With 3 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P74	1.27/50	With 8 TSOPs mounted; module thickness: 160mil max.
		MSS-72P-P75	1.27/50	With 9 SOJs mounted; module thickness: 160mil max.
		MSS-72P-P76	1.27/50	With 18 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P77	1.27/50	With 8 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P78	1.27/50	With 16 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P79	1.27/50	With 8 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P80	1.27/50	With 16 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P81	1.27/50	With 12 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P82	1.27/50	With 12 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P84	1.27/50	With 18 TSOPs + 2 logic mounted; module thickness: 160mil max.
		MSS-72P-P85	1.27/50	With 4 SOJs mounted; module thickness: 350mil max.
		MSS-72P-P86	1.27/50	With 2 SOJs mounted; module thickness: 200mil max.
		MSS-72P-P87	1.27/50	

MZIP

Number of pins	Construction	Package code	Lead pitch mm/mil	Features
72	M	MZP-72P-P01	1.27/50	With 20 SOJs mounted; module thickness: 350mil max.

Package Lineup

DIMM

Number of pins	Construction	Package code	Lead pitch mm/mil	Features
144	M	MDS-144P-P01	1.00/39	4 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P02	1.00/39	8 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P03	1.00/39	4 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P04	1.00/39	8 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P05	1.00/39	16 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P06	1.00/39	4 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P07	1.00/39	8 TSOPs + 1 logic mounted; module thickness: 150mil max.
		MDS-144P-P08	0.80	
		MDS-144P-P09	0.80	
		MDS-144P-P12	0.80	
168	M	MDS-168P-P04	1.27/50	18 TSOPs + 3 logic mounted; module thickness:157mil max.
		MDS-168P-P05	1.27/50	16 TSOPs + 3 logic mounted; module thickness:157mil max.
		MDS-168P-P06	1.27/50	8 SOPs + 3 logic mounted; module thickness:350mil max.
		MDS-168P-P07	1.27/50	8 TSOPs + 1 logic mounted; module thickness:157mil max.
		MDS-168P-P08	1.27/50	4 TSOPs + 1 logic mounted; module thickness:110mil max.
		MDS-168P-P09	1.27/50	16 TSOPs + 1 logic mounted; module thickness:157mil max.
		MDS-168P-P10	1.27/50	8 SOJs + 1 logic mounted; module thickness:200mil max.
		MDS-168P-P11	1.27/50	16 SOJs + 1 logic mounted; module thickness:350mil max.
		MDS-168P-P12	1.27/50	4 SOJs + 1 logic mounted; module thickness:200mil max.
		MDS-168P-P13	1.27/50	8 TSOPs + 1 logic mounted; module thickness:157mil max.
		MDS-168P-P14	1.27/50	16 TSOPs + 1 logic mounted; module thickness:157mil max.
		MDS-168P-P16	1.27	
		MDS-168P-P17	1.27	
		MDS-168P-P18	1.27	
		MDS-168P-P19	1.27	
		MDS-168P-P20	1.27	
		MDS-168P-P21	1.27	
		MDS-168P-P22	1.27	
		MDS-168P-P23	1.27	
		MDS-168P-P24	1.27	
		MDS-168P-P25	1.27	

M : Plastic mold

(continued)

(continued)

Number of pins	Construction	Package code	Lead pitch mm/mil	Features
168	M	MDS-168P-P26	1.27	
		MDS-168P-P27	1.27	
		MDS-168P-P28	1.27	
		MDS-168P-P29	1.27	
		MDS-168P-P36	1.27	
		MDS-168P-P37	1.27	
168	M	MDS-168P-P38	1.27	
		MDS-168P-P39	1.27	
		MDS-168P-P40	1.27	
		MDS-168P-P41	1.27	
200	M	MDS-200P-P05	1.27/50	
		MDS-200P-P06	1.27/50	
		MDS-200P-P07	1.27/50	18 TSOPs + 3 logic mounted; module thickness: 160mil max.
		MDS-200P-P08	1.27/50	9 TSOPs + 3 logic mounted; module thickness: 110mil max.

M : Plastic mold

3.2.4 Piggy Back

MQFP

Number of pins	Construction	Package Code	Lead pitch mm/mil	Features
48	C	MQP-48C-P01	0.80/31.5	
64	C	MQP-64C-P01	1.00/39	
80	C	MQP-80C-P01	0.80/31.5	
		MQP-80C-P02	0.80/31.5	
		MQP-80C-C01	0.80/31.5	
100	C	MQP-100C-P01	0.65/25.6	
		MQP-100C-P02	0.50/19.7	

C : Cerdip(ceramic)

3.2.5 Cards

Cards

Number of pins	Package code	Lead pitch mm/mil	Features
60	CRD-60P-M01	1.0/39.37	Miniature card
	CRD-60P-M02	1.0/39.37	Miniature card
68	CRD-68P-M02	1.27/50	PC Card (TYPE I)
	CRD-68P-M04	1.27/50	PC Card (TYPE I)
	CRD-68P-M05	1.27/50	PC Card (TYPE I)
	CRD-68P-M14	1.27/50	PC Card (TYPE II)
	CRD-68P-M16	1.27/50	PC Card (TYPE II)
	CRD-68P-M17	1.27/50	PC Card (TYPE I)
	CRD-68P-M19	1.27/50	PC Card (TYPE II)
	CRD-68P-M24	1.27/50	PC Card (TYPE II)
	CRD-68P-M28	1.27/50	PC Card (TYPE II)
	CRD-68P-M29	1.27/50	PC Card (TYPE II)

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PGA-441C-A06
PGA-64C-A02
PGA-68C-A01
PGA-80C-A01
PGA-88C-A01
PGA-88C-A02
PGA-88C-A05
PGA-88C-A06
QFJ-32C-C01
QFJ-44C-C01
QTP-160A-M01
QTP-208E-M01
QTP-256E-M01
QTP-400F-M01

4 Package Outline Diagrams

DIP (Standard DIP, SH-DIP, SK-DIP, SL-DIP)

- Plastic
- Ceramic

SIP

- Plastic

ZIP (Standard ZIP, SZIP)

- Plastic

PGA

- Plastic
- Ceramic

SOP (SOP, SOL, SSOP, TSOP)

- Plastic
- Ceramic

SON

- Plastic

BCC

- Plastic

QFP (QFP, LQFP, TQFP, TPQ)

- Plastic
- Ceramic

QFN (LCC)

- Ceramic

PCLP

- Plastic

QFJ

- Plastic
- Ceramic

SOJ

- Plastic
- Ceramic

BGA

- Plastic

T-BGA

- Plastic

TCP

- Plastic

SMD MODULE

- SIMM
- MZIP
- DIMM

PIGGY BACK

- MQFP

CARD

- MINIATURE CARD
- PC CARD
- DRAM CARD

5.1 Sockets

The sockets listed in section 5.2, “List of test sockets,” are available as test sockets. For details, on functions, performance, price and delivery, contact the respective socket manufacturers directly. Fujitsu also has its own sockets under development. If a socket not listed in the charts is required, contact the sales department indicated on the endpaper of this data book.

Contact information

Company	Address of headquarters	Telephone	Name
Yamaichi Electric Mfg. Co., Ltd.	3-28-7, Nakamagome, Ota-ku, Tokyo, 143	+81-3-3778-6102	Mr. Oguchi
Enplas Corp.	Kojima Bldg 9th Floor, 2-15-1, Dote-machi, Ohmiya-shi, Saitama, 330	+81-48-643-7676	Mr. Watanabe
Fuso Trading *1	TBR Bldg, 2-10-2, Nagatacho, Chiyoda-ku, Tokyo, 100	+81-3-3581-9056	Mr. Itoo
Showa Densen Trading *2	Tomozuna Bldg, 2-17-22, Mita, Minato-ku, Tokyo, 108	+81-3-5440-4710	Mr. Kuroda
Unitechno	Maekawa Shibaura Bldg2, 2-13-9, Shiba-ura, Minato-ku, Tokyo, 108	+81-3-5476-5661	Mr. Yamazaki
Macnica *3	Shirayama Hi-tech Park1-22-2, Shirayama, Midori-ku, Yokohama, 226	-81-45-939-6116	Mr. Suzuki

*1: Fuso Trading is the Japanese agent for Wells Co. of the U.S.
*2: Showa Densen Trading is a representative for Texas Instruments, Japan.
*3: Macnica is an agent for Sumitomo 3M.

5.2 List of Test Sockets

Plastic SOPs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
8	FPT-8P-M01	IC51-902-2.KS-8571	Yamaichi Electric Mfg.
		FP-16 (20M) -1.27-06A	Enplas
	FPT-8P-M02	FP-8 (16H) -1.27-06	Enplas
14	FPT-14P-M03	IC51-0162-658	Yamaichi Electric Mfg.
		FP-14 (16H) -1.27-05	Enplas
	FPT-14P-M04	IC51-902-2.KS-8571	Yamaichi Electric Mfg.
		FP-14 (20) -1.27-06	Enplas
16	FPT-16P-M03	IC51-347.KS-5755	Yamaichi Electric Mfg.
		FP-16 (28Z) -1.27-10	Enplas
	FPT-16P-M04	IC51-0162-658	Yamaichi Electric Mfg.
		FP-16-1.27-05	Enplas
	FPT-16P-M05	IC51-0162-911	Yamaichi Electric Mfg.
		FP-16-0.65-01A	Enplas
	FPT-16P-M06	IC51-902-2.KS-8571	Yamaichi Electric Mfg.
		FP-16 (20) -1.27-06	Enplas
20	FPT-20P-M01	IC51-793.KS-7536	Yamaichi Electric Mfg.
		FP-20-1.27-06	Enplas
	FPT-20P-M02	IC51-0202-347-2	Yamaichi Electric Mfg.
		FP-20-1.27-03	Enplas
	FPT-20P-M03	IC51-0202-912	Yamaichi Electric Mfg.
		FP-20-0.65-01A	Enplas
	FPT-20P-M04	IC51-0202-912	Yamaichi Electric Mfg.
		FP-20-0.65-01A	Enplas
	FPT-20P-M05	IC51-0202-347-2	Yamaichi Electric Mfg.
		FP-20-1.27-03	Enplas
24	FPT-24P-M01	IC51-0242-793	Yamaichi Electric Mfg.
	FPT-24P-M02	IC51-371.KS-7842	Yamaichi Electric Mfg.
		FP-24 (28S) -1.27-08	Enplas
	FPT-24P-M03	IC51-0242-913	Yamaichi Electric Mfg.
		FP-24-0.65-01A	Enplas
28	FPT-28P-M01	IC51-0302-904	Yamaichi Electric Mfg.
		FP-28-1.27-10	Enplas
	FPT-28P-M17	IC51-474.KS-94455	Yamaichi Electric Mfg.
		FP-28-1.27-22	Enplas

(continued)

(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
30	FPT-30P-M02	IC51-0302-914	Yamaichi Electric Mfg.
		FP-30-0.65-01A	Enplas
32	FPT-32P-M02	IC51-0322-937	Yamaichi Electric Mfg.
		OTS-32-1.27-06	Enplas
	FPT-32P-M03	IC51-0322-667-2	Yamaichi Electric Mfg.
		OTS-32-1.27-12	Enplas
32	FPT-32P-M24	IC51-0322-1207	Yamaichi Electric Mfg.
		OTS-32-0.5-02	Enplas
		648-0322211-A41	Wells (Fuso Trading)
	FPT-32P-M25	IC51-0322-1207	Yamaichi Electric Mfg.
		OTS-32-0.5-02	Enplas
		648-0322211-A41	Wells (Fuso Trading)
34	FPT-34P-M01	IC51-0342-741	Yamaichi Electric Mfg.
	FPT-34P-M02	IC51-0342-741	Yamaichi Electric Mfg.
40	FPT-40P-M01	IC51-0402-708	Yamaichi Electric Mfg.
	FPT-40P-M04	IC51-0402-708	Yamaichi Electric Mfg.
	FPT-40P-M05	IC51-0402-708	Yamaichi Electric Mfg.
	FPT-40P-M06	IC51-0402-1174	Yamaichi Electric Mfg.
		648-0402211-A41	Wells (Fuso Trading)
	FPT-40P-M07	IC51-0402-1174	Yamaichi Electric Mfg.
		648-0402211-A41	Wells (Fuso Trading)
44	FPT-44P-M07	IC235-0402-005	Yamaichi Electric Mfg.
		FP-40 (44) -0.8-03	Enplas
		674C1444011FA11	Wells (Fuso Trading)
	FPT-44P-M08	IC235-0402-005	Yamaichi Electric Mfg.
		FP-40 (44) -0.8-03	Enplas
		674C1444011FA11	Wells (Fuso Trading)
	FPT-44P-M16	IC51-0442-1315	Yamaichi Electric Mfg.
	FPT-44P-M18	IC297-0442-003P	Yamaichi Electric Mfg.
		674C1442211FA13	Wells (Fuso Trading)
48	FPT-48P-M19	IC189-0482-077P	Yamaichi Electric Mfg.
		648-0482211-A41	Wells (Fuso Trading)
	FPT-48P-M20	IC189-0482-077P	Yamaichi Electric Mfg.
		648-0482211-A41	Wells (Fuso Trading)
50	FPT-50P-M05	674C1502211FA11	Wells (Fuso Trading)
	FPT-50P-M06	674C1504411FA11	Wells (Fuso Trading)

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(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
54	FPT-54P-M01	IC235-0542-218P-2	Yamaichi Electric Mfg.
	FPT-54P-M02	IC297-0542-004P	Yamaichi Electric Mfg.
		674C1542211FA13	Wells (Fuso Trading)
56	FPT-56P-M01	IC354-0562-010P	Yamaichi Electric Mfg.
	FPT-56P-M02	IC354-0562-010P	Yamaichi Electric Mfg.
	FPT-56P-M03	CSP056-070	Japan TI (Showa Densen Trading)
	FPT-56P-M04	TS4-056040-019	Unitechno
86	FPT-86P-M01	IC297-0862-005P	Yamaichi Electric Mfg.
		674C2862211-A11	Wells (Fuso Trading)

Ceramic SOPs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
8	FPT-8C-A01	IC51-793.KS-8194	Yamaichi Electric Mfg.
16	FPT-16C-C02	IC51-902.KS-8571	Yamaichi Electric Mfg.

Plastic QFPs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
32	FPT-32P-M21	FPQ-32-0.8-01	Enplas
44	FPT-44P-M11	IC51-0444-228	Yamaichi Electric Mfg.
		FPQ-44-0.8-14A	Enplas
48	FPT-48P-M05	IC51-0484-806	Yamaichi Electric Mfg.
		FPQ-48-0.5-06	Enplas
	FPT-48P-M13	FPQ-48-0.8-01	Enplas
	FPT-14P-M15	FPQ-48-0.8-05	Enplas
	FPT-48P-M16	IC51-0484-630	Yamaichi Electric Mfg.
		FPQ-48-0.8-05	Enplas
64	FPT-64P-M03	QP1-064050-108	Unitechno
		IC51-0644-807	Yamaichi Electric Mfg.
		FPQ-64-0.5-01	Enplas
	FPT-64P-M04	QP1-064050-108	Unitechno
		IC51-0644-807	Yamaichi Electric Mfg.
		FPQ-64-0.5-01	Enplas

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(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
64	FPT-64P-M06	680H642111	Wells (Fuso Trading)
		IC53-108.KS-7507	Yamaichi Electric Mfg.
		FPQ-64-1.0-08A	Enplas
	FPT-64P-M07	IC53-108.KS-7507	Yamaichi Electric Mfg.
		FPQ-64-1.0-08A	Enplas
	FPT-64P-M09	IC51-0644-1602	Yamaichi Electric Mfg.
		FPQ-64-0.65-02	Enplas
	FPT-64P-M10	680H642111	Wells (Fuso Trading)
		IC53-108.KS-7507	Yamaichi Electric Mfg.
		FPQ-64-1.0-08A	Enplas
80	FPT-80P-M05	IC234-0804-026P	Yamaichi Electric Mfg.
		IC51-0804-808	Yamaichi Electric Mfg.
		OTQ-80-0.5-02	Enplas
		QP1-080050-147	Unitechno
		FPQ-80-0.5-04	Enplas
	FPT-80P-M06	IC201-0804-005	Yamaichi Electric Mfg.
		IC51-0804-819-4	Yamaichi Electric Mfg.
		FPQ-80-0.8-13A	Enplas
		QP1-080080-007	Unitechno
80	FPT-80P-M07	IC51-0804-819-4	Yamaichi Electric Mfg.
		FPQ-80-0.8-13A	Enplas
		QP1-080080-007	Unitechno
	FPT-80P-M11	IC218-0804-007P	Yamaichi Electric Mfg.
		IC51-1311.KS-12951	Enplas
		FPQ-80-0.65-09A	Unitechno
	FPT-80P-M15	QP1-080050-147	Unitechno
		IC234-0804-026P	Yamaichi Electric Mfg.
100	FPT-100P-M05	IC234-1004-023P	Yamaichi Electric Mfg.
		IC51-1004-809	Yamaichi Electric Mfg.
		FPQ-100-0.5-10A	Enplas
		QP1-100050-146	Unitechno
	FPT-100P-M06	IC234-1004-009P	Yamaichi Electric Mfg.
		IC51-1004-814-4	Yamaichi Electric Mfg.
		FPQ-100-0.65-11A	Enplas
		QP1-100065-004	Unitechno

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Package		Socket	
Number of pins	Package code	Model number	Manufacturer
100	FPT-100P-M07	IC51-1004-814-4	Yamaichi Electric Mfg.
		FPQ-100-0.65-11A	Enplas
		QP1-100065-004	Unitechno
	FPT-100P-M09	IC51-1004-809	Yamaichi Electric Mfg.
		FPQ-100-0.5-10A	Enplas
		QP1-100050-146	Unitechno
	FPT-100P-M18	IC234-045P.AC-10654	Yamaichi Electric Mfg.
	FPT-100P-M19	680-1001111-002	Wells (Fuso Trading)
		CQF100-151	Japan TI (Showa Densen Trading)
		QP1-100065-003	Unitechno
		IC51-1004-814-7	Yamaichi Electric Mfg.
120	FPT-120P-M03	IC234-1204-065P	Yamaichi Electric Mfg.
		IC51-844.KS-7692	Yamaichi Electric Mfg.
		FPQ-120-0.8-03A	Enplas
		QP1-120080-177	Unitechno
	FPT-120P-M04	IC234-1204-065P	Yamaichi Electric Mfg.
		IC51-844.KS-7692	Yamaichi Electric Mfg.
		FPQ-120-0.8-03A	Enplas
		QP1-120080-177	Unitechno
	FPT-120P-M13	QP1-144050-044-1	Unitechno
	FPT-120P-M21	IC234-1204-058P	Yamaichi Electric Mfg.
		QP1-120050-272	Unitechno
144	FPT-144P-M01	IC51-1444-1014	Yamaichi Electric Mfg.
		FPQ-144-0.65-02A	Enplas
		QP1-144065-178	Unitechno
	FPT-144P-M02	IC51-1444-1014	Yamaichi Electric Mfg.
		FPQ-144-0.65-02A	Enplas
		QP1-144065-178	Unitechno
	FPT-144P-M03	QP1-1440050-044	Unitechno
	FPT-144P-M08	IC51-1444-1354-7	Yamaichi Electric Mfg.
		FPQ-144-0.5-03	Enplas
	FPT-144P-M12	IC234-1444-053P	Yamaichi Electric Mfg.

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Package		Socket	
Number of pins	Package code	Model number	Manufacturer
160	FPT-160P-M03	IC234-1604-064P	Yamaichi Electric Mfg.
		IC51-845.KS-7764	Yamaichi Electric Mfg.
		FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno
	FPT-160P-M04	IC234-1604-064P	Yamaichi Electric Mfg.
		IC51-845.KS-7764	Yamaichi Electric Mfg.
		FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno
	FPT-160P-M11	QP1-160065-010	Unitechno
176	FPT-176P-M02	IC234-1764-002P	Yamaichi Electric Mfg.
208	FPT-208P-M01	QP4-208050-024	Unitechno
		IC51-2084-1052-9	Yamaichi Electric Mfg.
		FPQ-208-0.5-06	Enplas
		QP1-208050-014	Unitechno
	FPT-208P-M04	QP4-208050-024	Unitechno
		QP1-208050-182	Unitechno
	FPT-208P-M06	IC201-001.AC-08598	Yamaichi Electric Mfg.
216	FPT-216P-M01	IC234-2164-050P	Yamaichi Electric Mfg.
240	FPT-240P-M03	EXC97072CQF240	Japan TI (Showa Densen Trading)
304	FPT-304P-M02	IC201-004.AC-07901	Yamaichi Electric Mfg.

Sockets

Ceramic QFPs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
16	FPT-16C-A01	FP-16-0.0-02	Enplas
48	FPT-48C-A01	FPQ-48-0.8-03	Enplas
64	FPT-64C-A01	IC51-820-2.KS-9376	Yamaichi Electric Mfg.
		OTQ-64-1.0-03	Enplas
	FPT-64C-A02	IC51-820-2.KS-9177	Yamaichi Electric Mfg.
		OTQ-64-1.0-03	Enplas
80	FPT-80C-A01	IC51-0804-819-4	Yamaichi Electric Mfg.
		FPQ-80-0.8-13A	Enplas
		QP1-080080-007	Unitechno
	FPT-80C-A02	FPQ-80-0.8-13A	Enplas
		QP1-080080-007	Unitechno
100	FPT-100C-A01	IC51-1004-814-4	Yamaichi Electric Mfg.
		FPQ-100-0.65-10D	Enplas
		QP1-100065-004	Unitechno
	FPT-100C-A02	FPQ-100-0.65-10D	Enplas
	FPT-100C-C01	FPQ-100-0.5-10A	Enplas
		QP1-100050-146	Unitechno
120	FPT-120C-A01	IC51-844.KS-7692	Yamaichi Electric Mfg.
		FPQ-120-0.8-03A	Enplas
		QP1-120080-177	Unitechno
	FPT-120C-C01	IC51-844.KS-7692	Yamaichi Electric Mfg.
		FPQ-120-0.8-03A	Enplas
		QP1-120080-177	Unitechno
144	FPT-144C-C01	FPQ-144-0.65-02A	Enplas
		QP1-144065-178	Unitechno
160	FPT-160C-A01	FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno
	FPT-160C-C01	FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno
	FPT-160C-C02	FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno
	FPT-160C-C04	FPQ-160-0.65-06A	Enplas
		QP1-160065-165	Unitechno

Sockets

Ceramic LCCs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
16	LCC-16C-F01	IC53-0164-083	Yamaichi Electric Mfg.
32	LCC-32C-A01	IC51-0324-1259	Yamaichi Electric Mfg.
		LCC-32-1.27- (03)	Enplas
	LCC-32C-A06	IC53-0324-098	Yamaichi Electric Mfg.
	LCC-32C-F01	IC53-0324-065	Yamaichi Electric Mfg.
		LCC-32-1.27- (03)	Enplas
36	LCC-36C-F01	IC53-0364-296	Yamaichi Electric Mfg.
44	LCC-44C-F01	IC53-0444-306	Yamaichi Electric Mfg.
		LCC-44-1.27- (01)	Enplas
48	LCC-48C-A01	IC53-0484-100	Yamaichi Electric Mfg.

Plastic QFJs (PLCCs) , SOJs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
28	LCC-28P-M03	IC51-0284-399	Yamaichi Electric Mfg.
		PLCC-28-1.27-30	Enplas
		647X1281912	Wells (Fuso Trading)
32	LCC-32P-M02	IC51-0324-453	Yamaichi Electric Mfg.
		PLCC-32-1.27-30	Enplas
		647X0321912	Wells (Fuso Trading)
42	LCC-42P-M01	IC100-4204-G	Yamaichi Electric Mfg.
		IC255-4204	Yamaichi Electric Mfg.
44	LCC-44P-M02	IC51-0444-400	Yamaichi Electric Mfg.
		PLCC-44-1.27-30	Enplas
		647X1441912	Wells (Fuso Trading)
68	LCC-68P-M02	IC51-0684-390-2	Yamaichi Electric Mfg.
		PLCC-68-1.27-30	Enplas
		647X1681912	Wells (Fuso Trading)
84	LCC-84P-M02	IC51-0844-401-2	Yamaichi Electric Mfg.
		PLCC-84-1.27-30	Enplas
		647X1841912	Wells (Fuso Trading)

Sockets

Ceramic QFJs, SOJs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
26	LCC-26C-A01	IC100-2603-20-G	Yamaichi Electric Mfg.
		IC107-2603-20-G	Yamaichi Electric Mfg.
32	QFJ-32C-C01	IC51-0324-453	Yamaichi Electric Mfg.
		PLCC-32-1.27-30	Enplas
		647X0321912	Wells (Fuso Trading)
44	QFJ-44C-C01	IC51-0444-400	Yamaichi Electric Mfg.
		PLCC-44-1.27-30	Enplas
		647X1441912	Wells (Fuso Trading)

Sockets

Modules

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
MSS	MSS-30P-P03	IC-176-4	Yamaichi Electric Mfg.
	MSS-30P-P04	IC-176-4	Yamaichi Electric Mfg.
	MSS-30P-P11	IC-176-4	Yamaichi Electric Mfg.
	MSS-30P-P12	IC-176-4	Yamaichi Electric Mfg.
	MSS-72P-P11	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P12	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P16	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P17	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P18	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P19	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P23	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P24	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P27	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P29	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P39	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P43	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P44	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P48	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P49	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P62	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P70	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P74	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P75	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P76	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P77	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P78	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P79	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P80	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P81	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P82	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P84	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P85	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P86	IC-176-2	Yamaichi Electric Mfg.
	MSS-72P-P87	IC-176-2	Yamaichi Electric Mfg.
MDS	MDS-144P-P01	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P02	IC-497-1-2	Yamaichi Electric Mfg.

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(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
MDS	MDS-144P-P03	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P04	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P05	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P06	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P07	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P08	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P09	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P11	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-144P-P12	IC-497-1-2	Yamaichi Electric Mfg.
	MDS-168P-P04	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P05	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P06	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P07	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P08	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P09	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P10	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P11	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P12	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P13	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P14	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P16	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P17	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P18	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P19	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P20	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P21	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P22	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P23	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P24	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P25	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P26	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P27	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P28	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P29	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P36	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P37	IC-438-3-2	Yamaichi Electric Mfg.

(continued)

Sockets

(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
MDS	MDS-168P-P38	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P39	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P40	IC-438-3-2	Yamaichi Electric Mfg.
	MDS-168P-P41	IC-438-3-2	Yamaichi Electric Mfg.

Piggyback devices

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
MQP	MQP-48C-P01	IC53-0484-107	Yamaichi Electric Mfg.
	MQP-64C-P01	IC53-0644-237	Yamaichi Electric Mfg.
	MQP-80C-P01	IC53-0804-160	Yamaichi Electric Mfg.
	MQP-80C-P02	IC53-0804-160	Yamaichi Electric Mfg.
	MQP-80C-C01	IC53-0804-160	Yamaichi Electric Mfg.
	MQP-100C-P01	IC53-1004-374	Yamaichi Electric Mfg.

Sockets

BGAs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
48	BGA-48P-M06	654048228010812	Wells (Fuso Trading)
	BGA-48P-M10	654048231010812	Wells (Fuso Trading)
256	BGA-256P-M01	CBG256-011	Japan TI (Showa Densen Trading)
		NP276-37206.AC-02310	Yamaichi Electric Mfg.
		BGA-256 (441) -1.27-08	Enplas
	BGA-256P-M02	CBG256-011	Japan TI (Showa Densen Trading)
		NP276-40009.AC-06524	Yamaichi Electric Mfg.
		BGA-292 (441) -1.27-08	Enplas
352	BGA-352P-M01	CBG352-014	Japan TI (Showa Densen Trading)
		NP276-59608.AC-13306-2	Yamaichi Electric Mfg.
		2352K-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-352 (841) -1.27-19	Enplas
	BGA-352P-M02	CBG352-014A	Japan TI (Showa Densen Trading)
		NP276-59608.AC-04944	Yamaichi Electric Mfg.
		2352-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-352 (841) -1.27-14	Enplas
	BGA-352P-M03	CBG352-014A	Japan TI (Showa Densen Trading)
		NP276-59608.AC-11092	Yamaichi Electric Mfg.
		2352-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-352 (841) -1.27-14	Enplas
	BGA-352P-M04	EXC96124-352	Japan TI (Showa Densen Trading)
		NP276-59608.AC-13306-1	Yamaichi Electric Mfg.
		2352K-9228-01-1401	Sumitomo 3M (Macnica)
	BGA-352P-M05	CBG352-014	Japan TI (Showa Densen Trading)
		NP276-59608.AC-13306-1	Yamaichi Electric Mfg.
		2352K-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-352 (841) -1.27-19	Enplas
416	BGA-416P-M02	NP276-76820.AC-06127	Yamaichi Electric Mfg.
		BGA-416 (1089) -1.27-04	Enplas
420	BGA-420P-M01	NP276-59608.AC-03119	Yamaichi Electric Mfg.
		2420-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-420 (841) -1.27-14	Enplas
	BGA-420P-M02	NP276-59608.AC-03035	Yamaichi Electric Mfg.
		2420-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-484 (841) -1.27-14	Enplas

(continued)

(continued)

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
420	BGA-420P-M03	EXC96144-420	Japan TI (Showa Densen Trading)
		NP276-59608.AC-09801	Yamaichi Electric Mfg.
		2420K-9228-01-1401	Sumitomo 3M (Macnica)
480	BGA-480P-M01	CBG480-014	Japan TI (Showa Densen Trading)
		NP276-59608.AC-03036	Yamaichi Electric Mfg.
		2480-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-480 (841) -1.27-14	Enplas
	BGA-480P-M02	CBG480-014	Japan TI (Showa Densen Trading)
		NP276-59608.AC-11093	Yamaichi Electric Mfg.
		2480-9228-01-1401	Sumitomo 3M (Macnica)
		BGA-544 (841) -1.27-14	Enplas
560	BGA-560P-M01	NP352-56009	Yamaichi Electric Mfg.
576	BGA-576P-M01	NP276-76820.AC-06128	Yamaichi Electric Mfg.
		BGA-576 (1089) -1.27-17	Enplas
672	BGA-672P-M01	NP276-97623.AC-06017	Yamaichi Electric Mfg.
		2-0672-08407-000	Sumitomo 3M (Macnica)
720	BGA-720P-M01	NP352-72017	Yamaichi Electric Mfg.
		IC280-720-106	Yamaichi Electric Mfg.

Sockets

FBGAs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
48	BGA-48P-M11	654048628010806	Wells (Fuso Trading)
		703-1048-01	Wells (Fuso Trading)
	BGA-48P-M12	654048631010806	Wells (Fuso Trading)
		703-1048-02	Wells (Fuso Trading)
	BGA-48P-M13	654048632010806	Wells (Fuso Trading)
		703-1048-03	Wells (Fuso Trading)
61	BGA-61P-M02	NP351-05673-1	Yamaichi Electric Mfg.
69	BGA-69P-M02	NP351-05672-1	Yamaichi Electric Mfg.
77	BGA-77P-M01	NP351-05671-1	Yamaichi Electric Mfg.
120	BGA-120P-M01	NP351-12114-1.AC-13081	Yamaichi Electric Mfg.
144	BGA-144P-M01	NP291-16803-1.AC-06328	Yamaichi Electric Mfg.
168	BGA-168P-M01	NP291-16803-1	Yamaichi Electric Mfg.
176	BGA-176P-M01	NP291-16803-1.AC-08229	Yamaichi Electric Mfg.
192	BGA-192P-M01	NP351-19219-1	Yamaichi Electric Mfg.
	BGA-192P-M02	IC274-192267	Yamaichi Electric Mfg.
224	BGA-224P-M02	NP351-22405-1	Yamaichi Electric Mfg.
240	BGA-240P-M01	IC274-240269	Yamaichi Electric Mfg.
256	BGA-256P-M04	BGA-256 (441) -1.27-29	Enplas
272	BGA-272P-M01	BGA-272 (441) -1.27-25	Enplas
288	BGA-288P-M02	NP291-28807-1	Yamaichi Electric Mfg.
320	BGA-320P-M01	NP351-21653-1.AC-14425	Yamaichi Electric Mfg.

T-BGAs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
256	BGA-256P-M04	BGA-256 (441) -1.27-29	Enplas
272	BGA-256P-M01	BGA-272 (441) -1.27-25	Enplas

FC-BGAs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
1600	BGA-1600C-M01	NP352-160018	Yamaichi Electric Mfg.
		21600-9130-90-1101	Sumitomo 3M (Macnica)

Sockets

SONs

Package		Socket	
Number of pins	Package code	Model number	Manufacturer
40	LCC-40P-M02	685-0402211	Wells (Fuso Trading)
46	LCC-46P-M02	IC162-0462-055P	Yamaichi Electric Mfg.

6.1 Packing for Shipment

6.1.1 Packing form

The packaging used to deliver products consits of tubes, trays, tapes, inner boxes, and an outer box. (See Figures 1 to 7.)
The tubes, trays, and tapes are designed to protect the products from damage. After unpacking the products, however, handle them with care not to let ICs become loose or protrude to prevent them from being damaged.

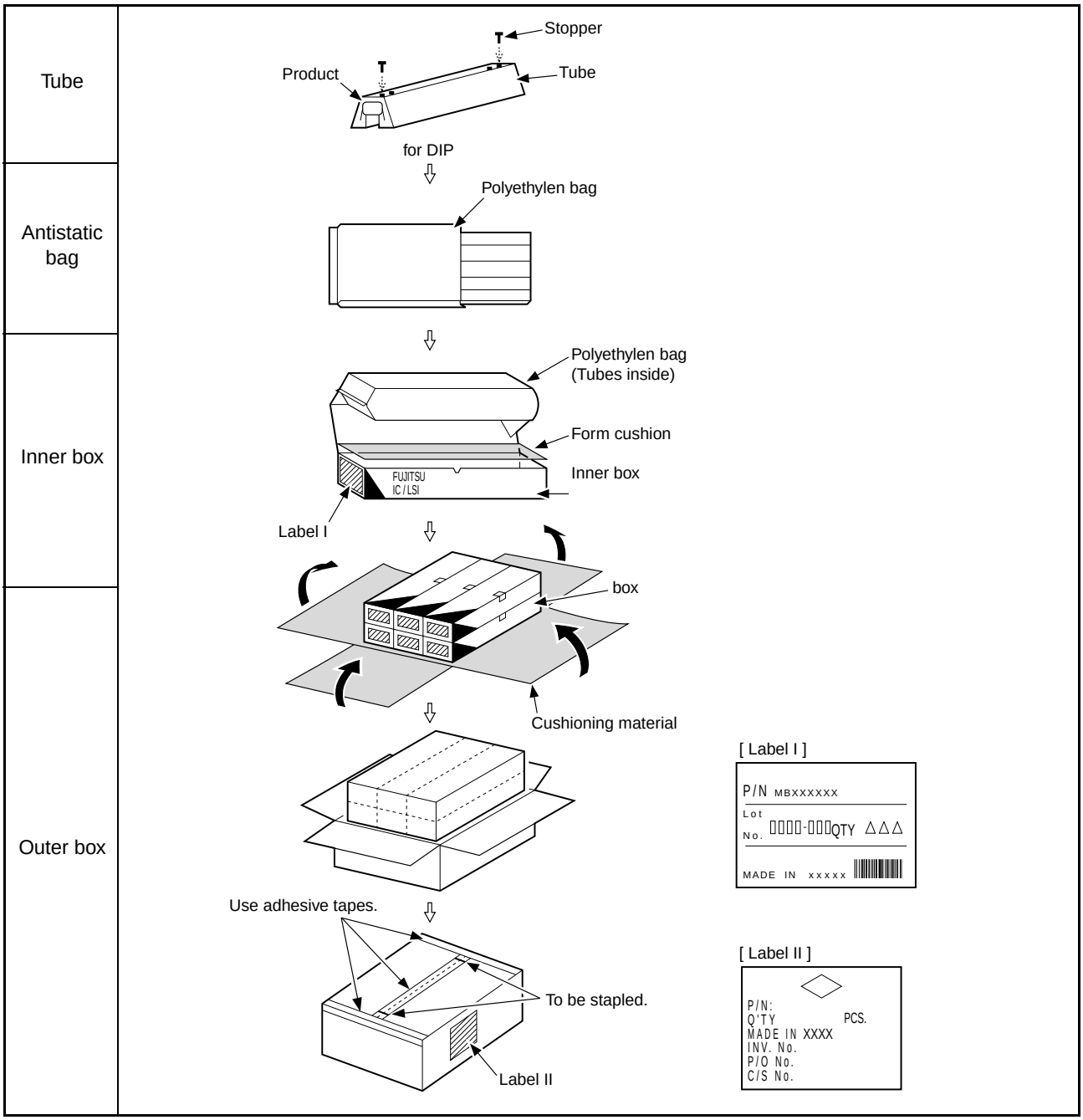


Fig.1 Packing Form for DIP, SIP, ZIP, LCC Tubes

Packing for Shipment

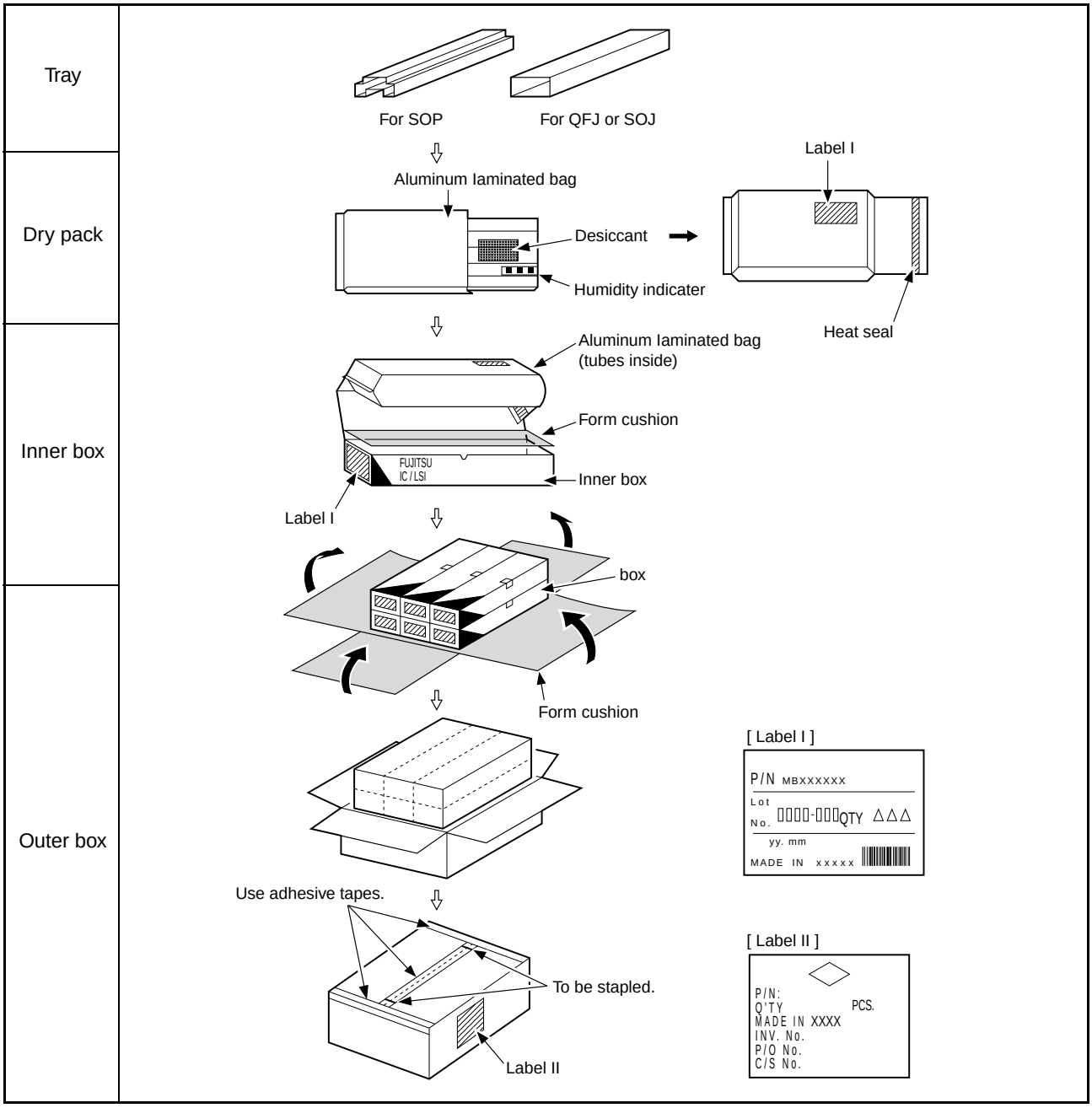


Fig.2 Packing Form for Plastic SIP, SOP, SSOP, QFJ, SOJ Tubes

Packing for Shipment

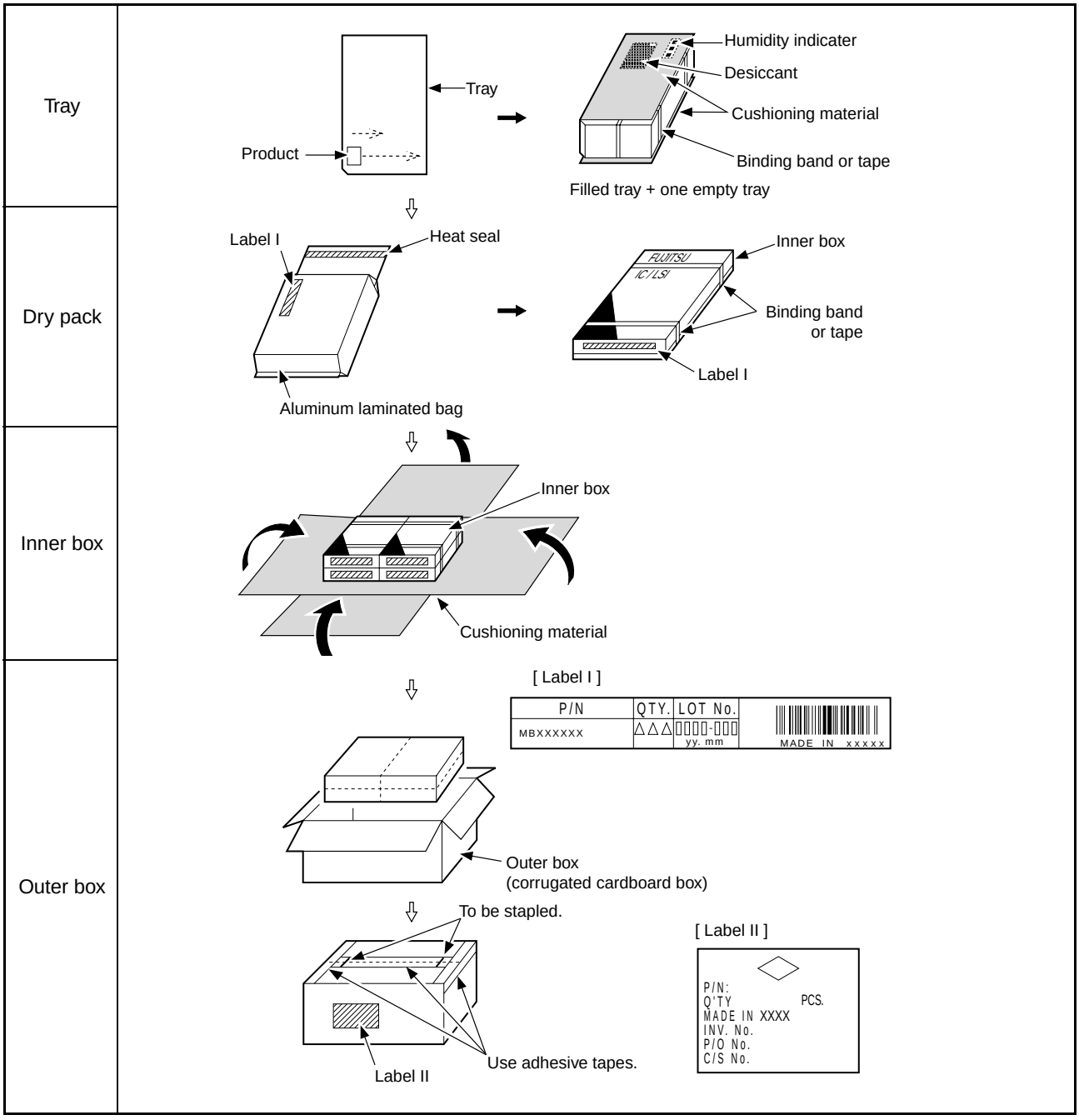


Fig.3 Packing Form for Plastic SOP, SSOP, TSOP, QFP, LQFP, TQFP Trays

Packing for Shipment

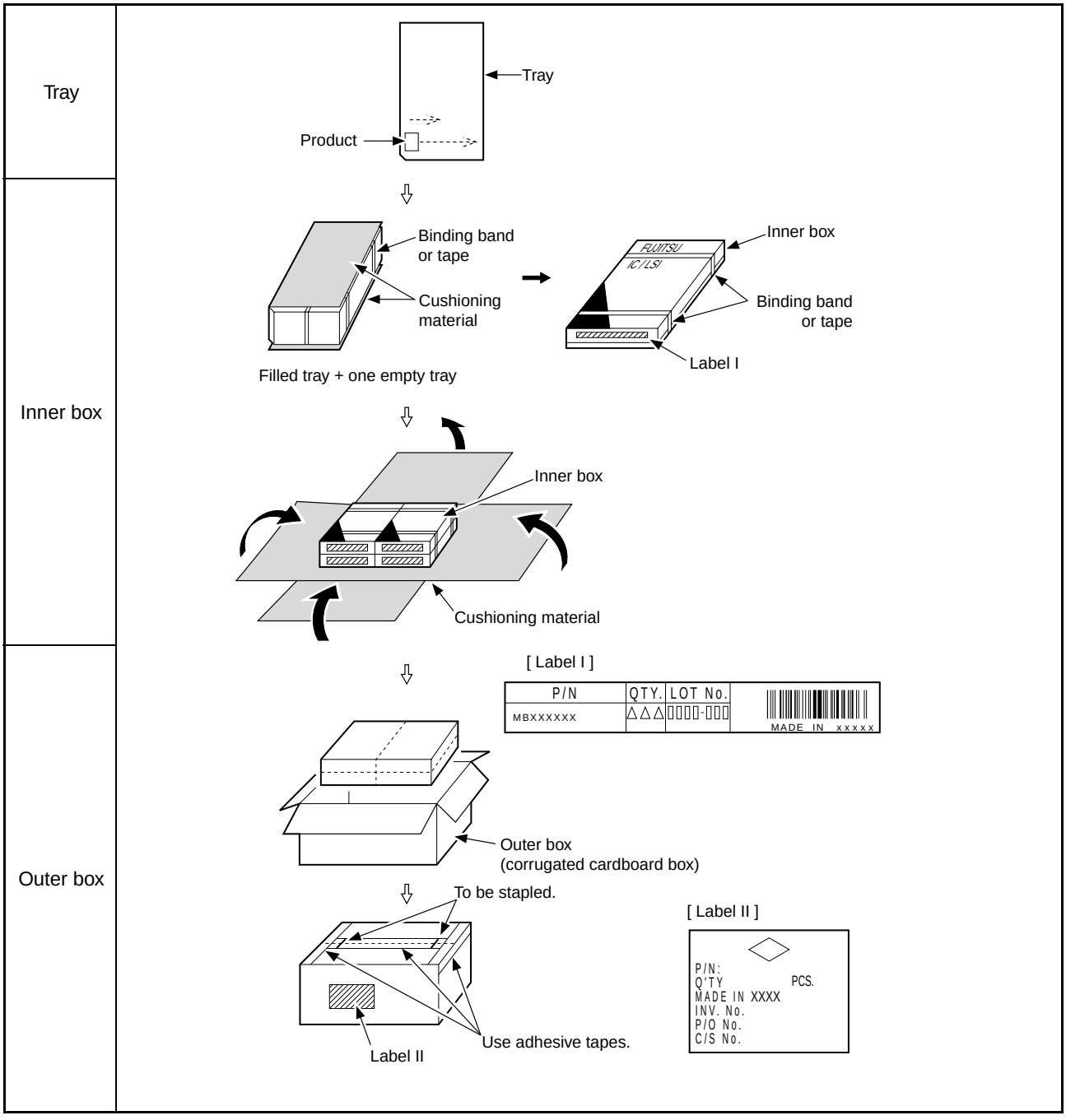


Fig.4 Packing Form for CeramicSOP, QFP, LQFP Trays

Packing for Shipment

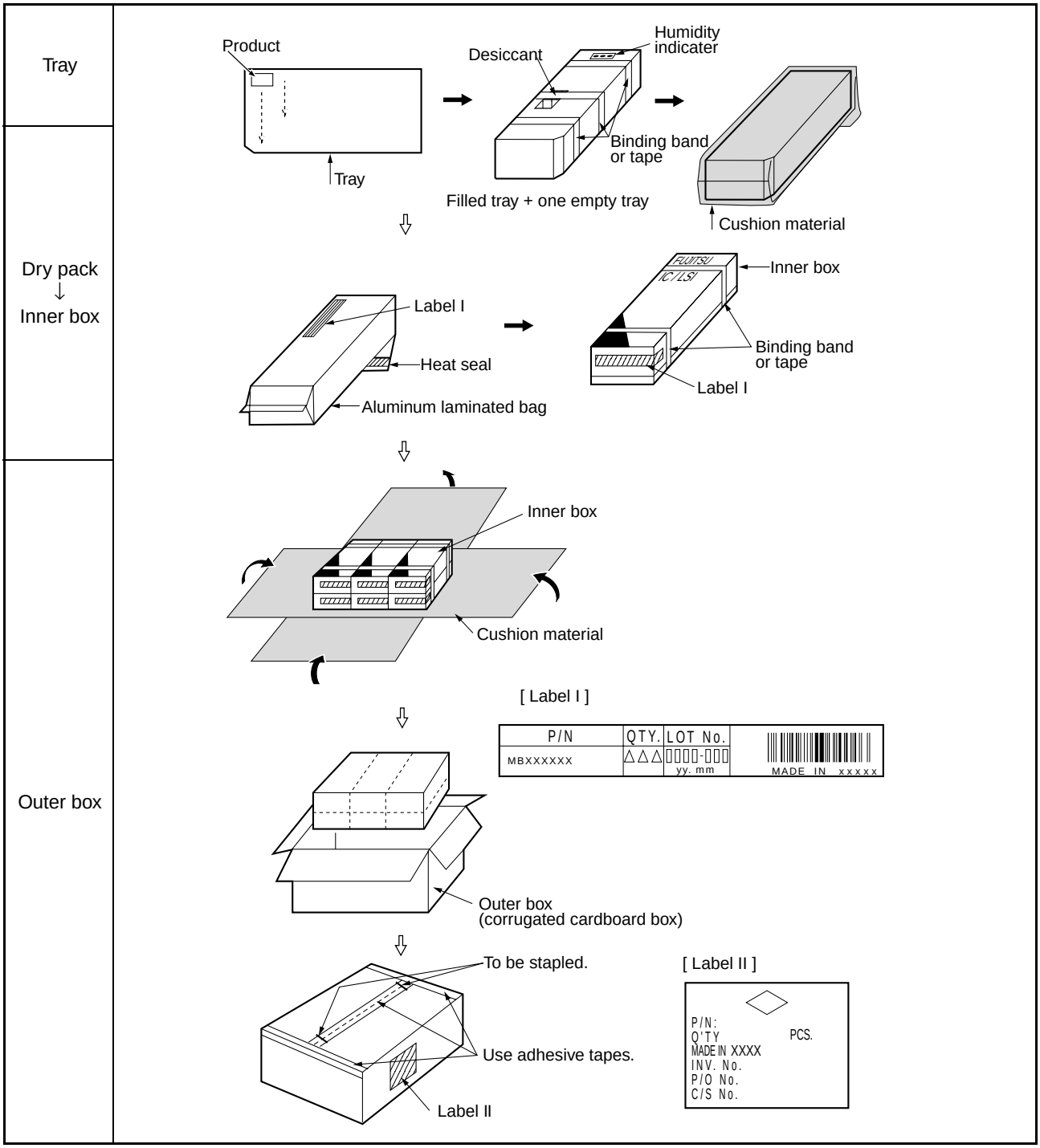


Fig.5 Packing Form for Plastic SOP, TSOP, SON, BCC, QFP, LQFP, TQFP, BGA, T-BGA, FBGA
JEDEC Size Trays

Packing for Shipment

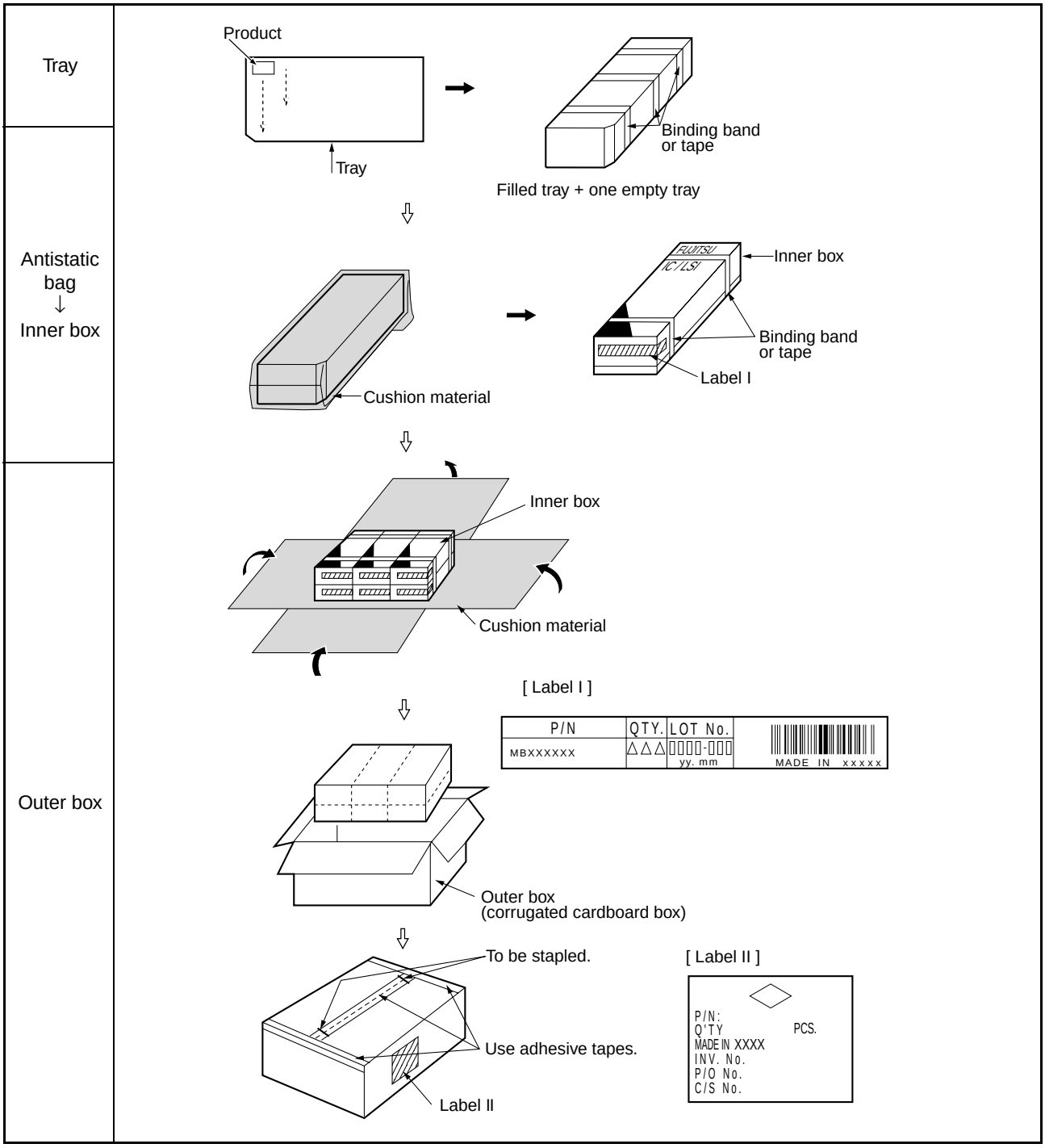


Fig.6 Packing Form for Ceramic QFP, LQFP JEDEC Size Tray

Packing for Shipment

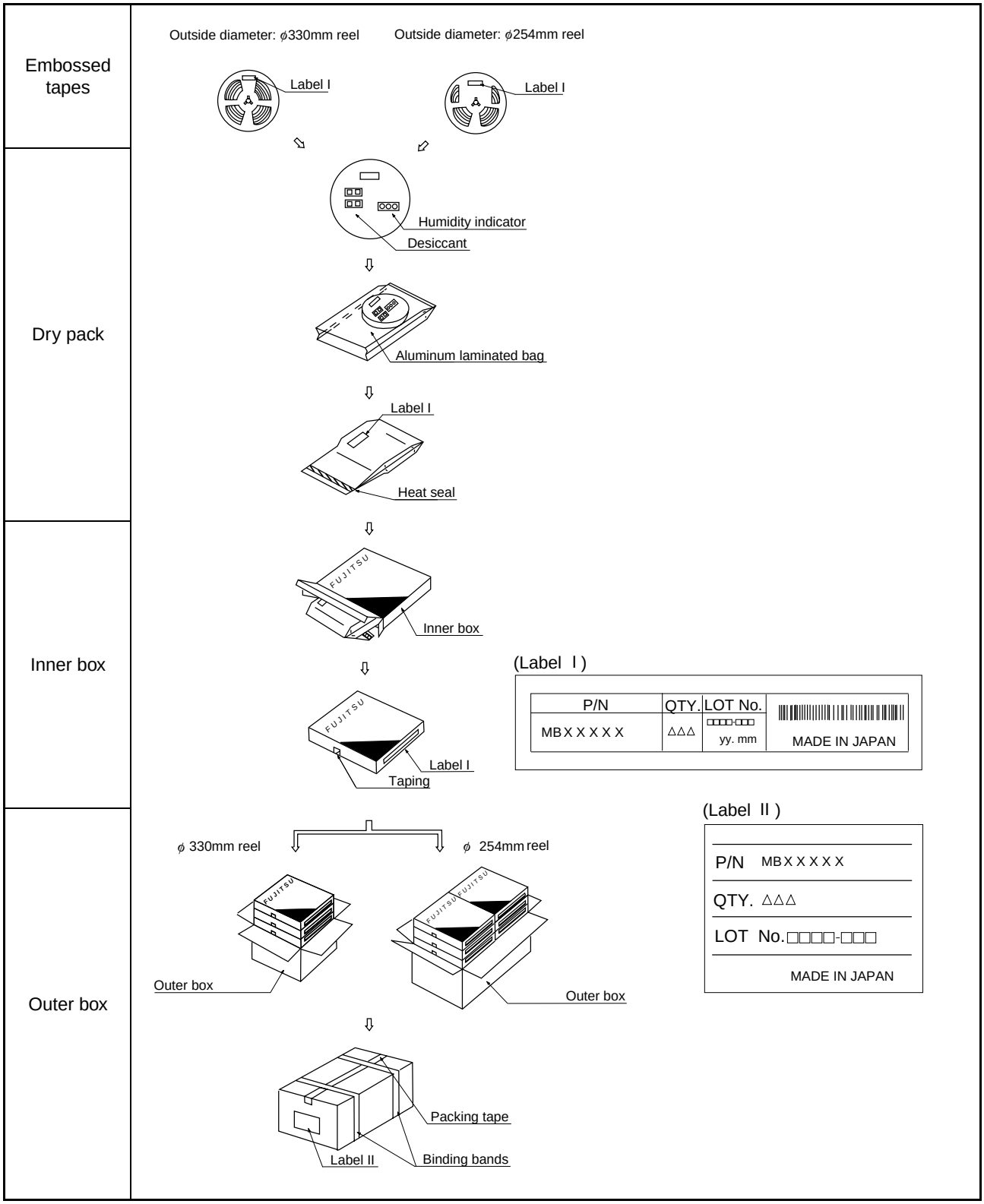


Fig.7 Packing form (Embossed tapes)

Packing for Shipment

• Embossed tapes

Package code		Quantity			Remarks (outer diameter of reel used)
		ICs/reel	Inner box/outer box	ICs/outer box	
SOP	FPT-8P-M01	1500	7	10500	ϕ 330 mm
	FPT-8P-M02	1500	7	10500	ϕ 330 mm
	FPT-14P-M04	1500	7	10500	ϕ 330 mm
	FPT-16P-M03	1500	5	7500	ϕ 330 mm
	FPT-16P-M04	1500	7	10500	ϕ 330 mm
	FPT-16P-M06	1500	7	10500	ϕ 330 mm
	FPT-20P-M01	1500	5	7500	ϕ 330 mm
	FPT-20P-M02	1500	5	7500	ϕ 330 mm
	FPT-20P-M05	1500	5	7500	ϕ 330 mm
	FPT-24P-M01	1500	5	7500	ϕ 330 mm
	FPT-24P-M02	1500	5	7500	ϕ 330 mm
	FPT-28P-M01	1000	5	5000	ϕ 330 mm
	FPT-32P-M03	1000	5	5000	ϕ 330 mm
SSOP	FPT-8P-M03	2000	6	12000	ϕ 254 mm
	FPT-16P-M05	1500	7	10500	ϕ 330 mm
	FPT-20P-M03	1500	7	10500	ϕ 330 mm
	FPT-20P-M04	1500	7	10500	ϕ 330 mm
	FPT-24P-M03	1500	7	10500	ϕ 330 mm
	FPT-30P-M02	1500	7	10500	ϕ 330 mm
	FPT-34P-M01	1000	5	5000	ϕ 330 mm
	FPT-34P-M02	1000	5	5000	ϕ 330 mm
	FPT-34P-M03	1000	6	6000	ϕ 254 mm
	FPT-40P-M01	1000	5	5000	ϕ 330 mm
TSOP	FPT-32P-M24	1000	5	5000	ϕ 330 mm
	FPT-32P-M25	1000	5	5000	ϕ 330 mm
	FPT-40P-M06	1000	5	5000	ϕ 330 mm
	FPT-40P-M07	1000	5	5000	ϕ 330 mm
	FPT-44P-M07	1000	6	6000	ϕ 254 mm
	FPT-44P-M08	1000	6	6000	ϕ 254 mm
	FPT-44P-M16	750	4	3000	ϕ 330 mm
	FPT-44P-M18	1000	6	6000	ϕ 254 mm
	FPT-48P-M19	1000	5	5000	ϕ 330 mm
	FPT-48P-M20	1000	5	5000	ϕ 330 mm
	FPT-50P-M05	1000	6	6000	ϕ 254 mm
	FPT-50P-M06	1000	6	6000	ϕ 254 mm
SON	LCC-40P-M02	1000	6	6000	ϕ 254mm
	LCC-46P-M02	1000	6	6000	ϕ 254mm
BCC	LCC-16P-M02	2000	6	12000	ϕ 254mm
	LCC-16P-M03	2000	6	12000	ϕ 254mm
	LCC-48P-M02	2000	6	12000	ϕ 254mm

(continued)

Packing for Shipment

(continued)

Package code		Quantity			Remarks (outer diameter of reel used)
		ICs/reel	Inner box/outer box	ICs/outer box	
QFP	FPT-32P-M21	1500	7	10500	ϕ 330 mm
LQFP	FPT-48P-M05	1500	7	10500	ϕ 330 mm
	FPT-64P-M03	1500	5	7500	ϕ 330 mm
QFJ	LCC-28P-M03	800	5	4000	ϕ 330 mm
	LCC-32P-M02	1000	5	5000	ϕ 330 mm
	LCC-44P-M02	500	5	2500	ϕ 330 mm
	LCC-68P-M02	300	4	1200	ϕ 330 mm
	LCC-84P-M02	200	4	800	ϕ 330 mm
SOJ	LCC-28C-A04	1000	5	5000	ϕ 330 mm
	LCC-42P-M01	500	4	2000	ϕ 330 mm
FBGA	BGA-48P-M01	2000	6	12000	ϕ 254 mm
	BGA-48P-M11				
	BGA-48P-M02	2000	6	12000	ϕ 254 mm
	BGA-48P-M12				
	BGA-48P-M03	1500	6	9000	ϕ 254 mm
	BGA-48P-M13				

6.1.2 Packing handling precautions

(1)Because corrugated cardboard boxes gradually weaken during storage as a result of moisture, stacking, etc., inventory should be handled on a first-in, first-out basis.

(2)Although the IC packing materials (such as tubes) are designed to protect against electrostatic damage, full precautions against electrostatic damage must be taken when removing the products from their packing.

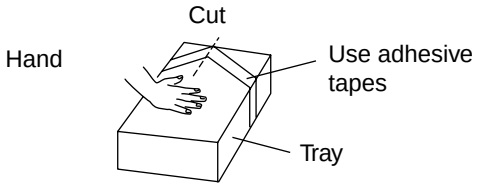
(3)Handle the inner and outer boxes gently. Rough handling can dislodge the tubes stoppers, allowing the products to fall out of the tubes and possibly bend their leads.
Rough handling of boxes containing ceramic packages in particular can cause chips, cracks, or leak defects.

(4)Because the inner and outer boxes are made of corrugated cardboard, do not allow them to become wet. Do not store the boxes outside or in a hot and humid location under any circumstances.

(5)Do not throw, drop or otherwise roughly handle the outer boxes (corrugated cardboard boxes) containing products under any circumstances.

(6)QFPs are packed in trays, but it is very easy to accidentally bend their leads when removing them from their original packing and placing them in other packing. Therefore, strictly obsever the following items.

a) When cutting the binding tape, hold the trays securely in place with one hand.



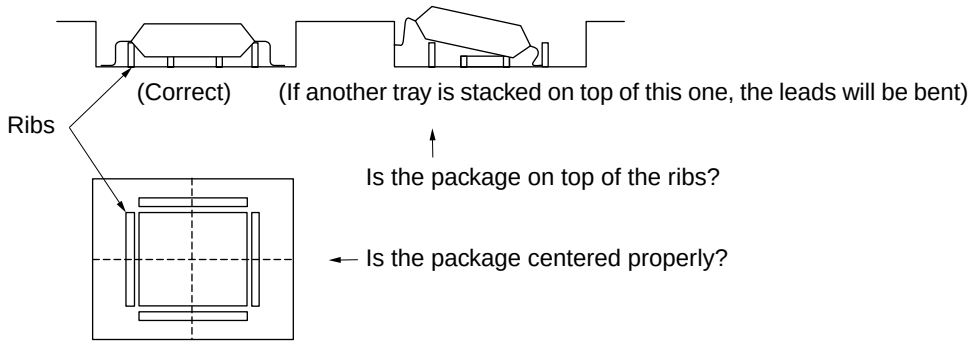
b) Hold the trays firmly in place while removing the tape so that the trays do not shift position. (If the trays shift, the packed ICs may be dislodged and the leads may bend.)

c) Check after packing the packages
Before stacking the trays containing the IC packages, check the following points.

•Make sure that the packages are properly positioned on the ribs.

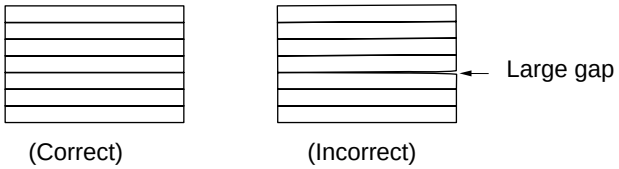
•If any packages are not positioned on the ribs, , check for bent leads and then reposition the packages.

Note: When handling the packages, make sure to take electrostatic countermeasures, such as wearing finger sleeves or a grounded wrist strap. Use air tweezers, and avoid touching the leads if possible.



d) Check after stacking the trays

- Make sure that there are no abnormal gaps between the stacked trays.
- Handle the stacked trays carefully when using packing tape or packing bands to secure the trays. (Secure the trays only after making sure that there are no gaps.)

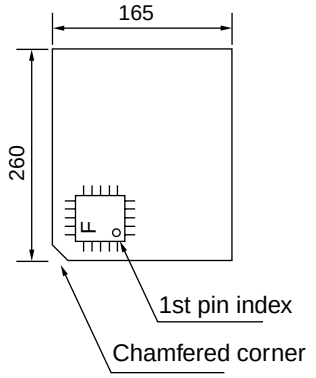
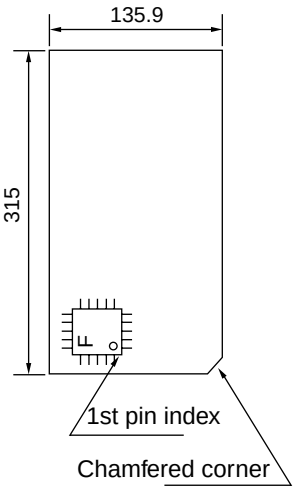


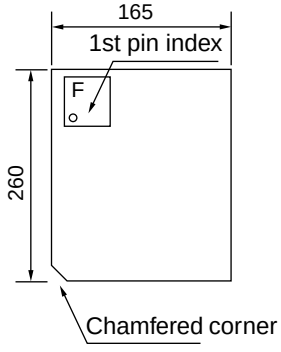
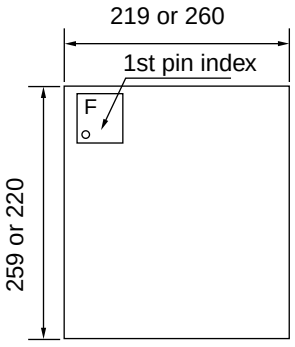
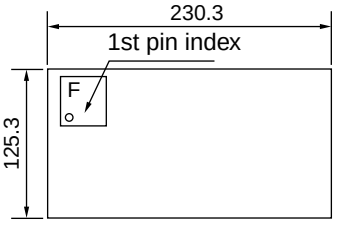
(7) When removing stoppers from containers, be careful not to let the stopper jump out of the container.

(8) A container, coated with antistatic, may be sticky.

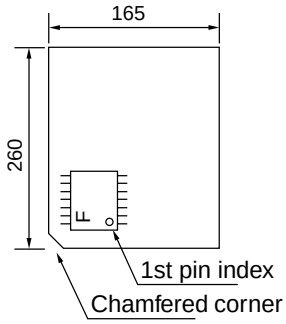
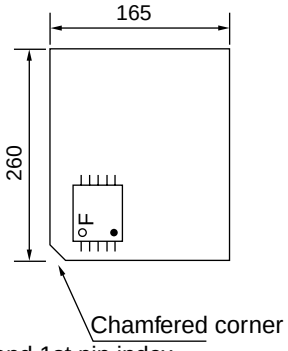
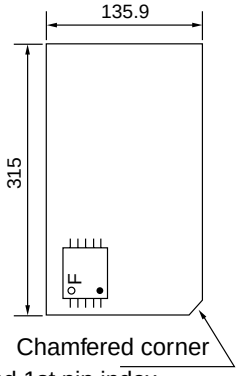
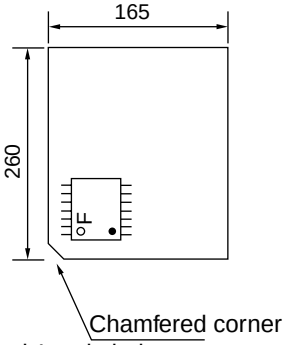
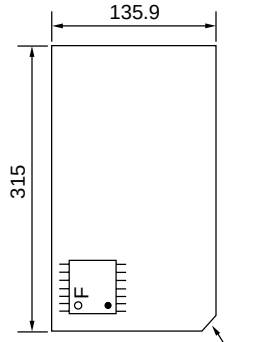
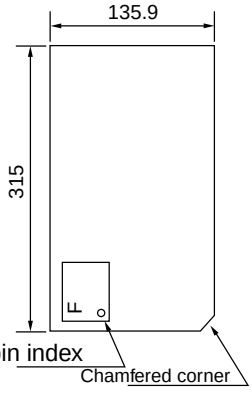
(9) Heat resistant tray has a label entitled "HT" or " heat proof temperature" (e.g. 125 °C MAX). The heat resistant tray allows 125 °C heat being applied for 24 hours. It may cause warp on heating or cooling. To minimize the warp, it is be heated or cooled on a flat surface. Avoid the abrupt cooling.

6.1.3 1st pin orientation of a package on the tray

	Tray size and 1st pin orientation	
QFP in general		

	Tray size and 1st pin orientation		
PGA in general			

Packing for Shipment

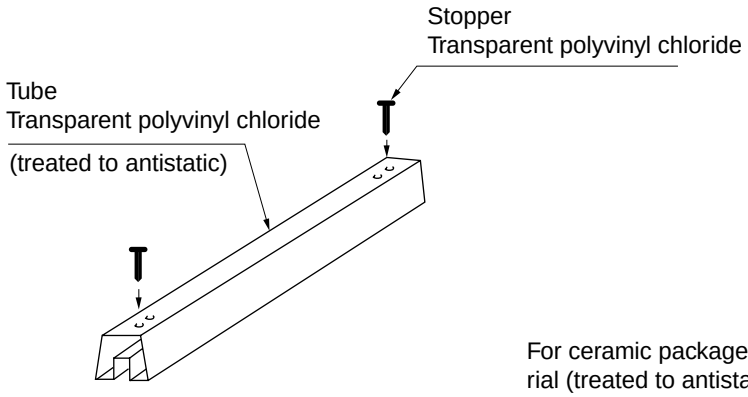
	Tray size and 1st pin orientation	
SOP in general		———
TSOPI	 ❍ = Positive bend 1st pin index ● = Reverse bend 1st pin index	 ❍ = Positive bend 1st pin index ● = Reverse bend 1st pin index
TSOPII	 ❍ = Positive bend 1st pin index ● = Reverse bend 1st pin index	 ❍ = Positive bend 1st pin index ● = Reverse bend 1st pin index
BGA T-BGA FBGA SON BCC	———	

Packing for Shipment

6.2 Tube Dimensions

6.2.1 DIP

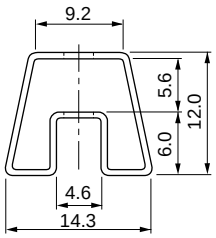
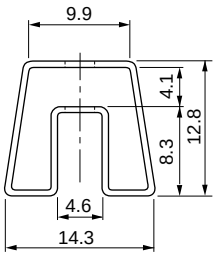
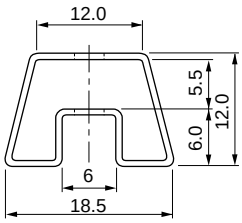
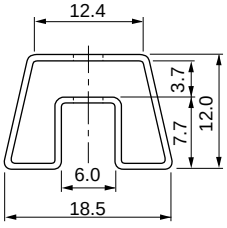
Tube/stopper shape



Tube length: 510 mm

For ceramic packages, cushioning material (treated to antistatic) is included in each end to hold the packages in place.

Tube cross-sections

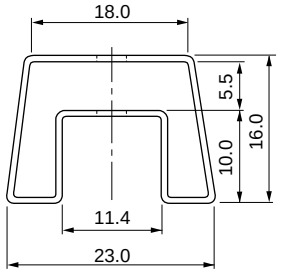
300mil, plastic/ceramic (cerdip)  t = 0.4	300mil, ceramic (metal seal, frit seal)  t = 0.4
400mil, plastic/ceramic (cerdip)  t = 0.5	400mil, ceramic (metal seal, frit seal)  t = 0.6

(Dimensions in mm.)

Packing for Shipment

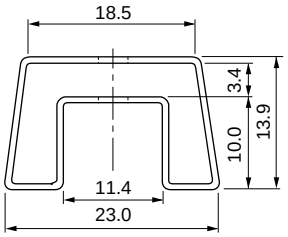
Tube cross-sections

600mil, plastic/ceramic
(cerdip)



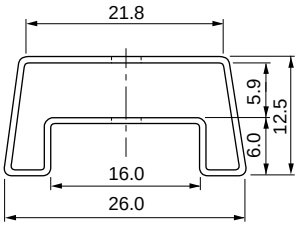
t = 0.5

600mil, ceramic
(metal seal, frit seal)



t = 0.5

750mil, plastic



t = 0.6

(Dimensions in mm.)

Packing for Shipment

Maximum quantity per tube (DIP)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
DIP, 300mil, plastic/ceramic (cerdip)	DIP-8P-M01	50	2000	8000
	DIP-14P-M02	25	1000	4000
	DIP-14C-C01	25	1000	4000
	DIP-14C-C04	25	1000	4000
	DIP-16P-M03	25	1000	4000
	DIP-16P-M04	25	1000	4000
	DIP-16P-M05	25	1000	4000
	DIP-16C-C01	25	1000	4000
	DIP-16C-C02	25	1000	4000
	DIP-16C-C04	25	1000	4000
	DIP-18P-M02	22	880	3520
	DIP-18P-M03	22	880	3520
	DIP-18P-M04	22	880	3520
	DIP-18C-C01	21	840	3360
	DIP-20P-M01	20	800	3200
	DIP-20P-M02	20	800	3200
	DIP-20P-M03	20	800	3200
	DIP-20C-C01	20	800	3200
	DIP-22P-M04	18	720	2880
	DIP-22C-C03	17	680	2720
	DIP-24P-M03	16	640	2560
	DIP-24P-M05	22	880	3520
	DIP-24C-C04	15	600	2400
	DIP-28P-M04	13	520	2080
	DIP-32P-M02	12	480	1920
DIP, 300mil, ceramic (metal seal, frit seal)	DIP-20C-A01	20	800	3200
DIP, 400mil, plastic/ceramic (cerdip)	DIP-20C-C02	20	600	2400
	DIP-22P-M03	18	540	2160
	DIP-22C-C02	17	510	2040
	DIP-24P-M04	16	480	1920
	DIP-28P-M03	18	540	2160
	DIP-28P-M06	13	390	1560
DIP, 400mil, ceramic (metal seal, frit seal)	DIP-24C-A05	16	480	1920
	DIP-28C-A10	13	390	1560
	DIP-32C-A02	12	360	1440
DIP, 600mil, plastic/ceramic (cerdip)	DIP-24P-M02	16	320	1280
	DIP-24C-C01	15	300	1200

Packing for Shipment

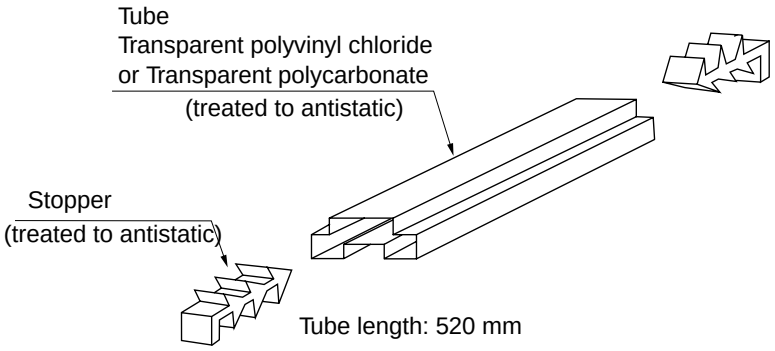
Maximum quantity per tube (DIP)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
DIP, 600mil, plastic/ceramic (cerdip)	DIP-24C-C03	15	300	1200
	DIP-28C-C02	13	260	1040
	DIP-32P-M01	12	240	960
	DIP-36P-M01	10	200	800
	DIP-40P-M02	9	180	720
	DIP-40P-M03	12	240	960
	DIP-42P-M02	12	240	960
	DIP-42P-M03	9	180	720
	DIP-48P-M01	11	220	880
	DIP-48P-M02	8	160	640
	DIP-52P-M01	10	200	800
DIP, 600mil, ceramic (metal seal, frit seal)	DIP-24C-A04	16	320	1280
	DIP-24C-A06	16	320	1280
	DIP-24C-A07	16	320	1280
	DIP-28C-A01	13	260	1040
	DIP-28C-A07	13	260	1040
	DIP-40C-A04	9	180	720
	DIP-40C-A05	9	180	720
	DIP-42C-A01	9	180	720
	DIP-42C-A03	9	180	720
	DIP-48C-A01	8	160	640
DIP, 750mil, plastic	DIP-64P-M01	8	160	640

Packing for Shipment

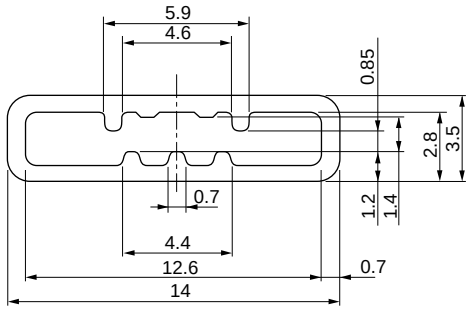
6.2.2 SOP and SSOP

Tube/stopper shape (1)



Tube cross-sections

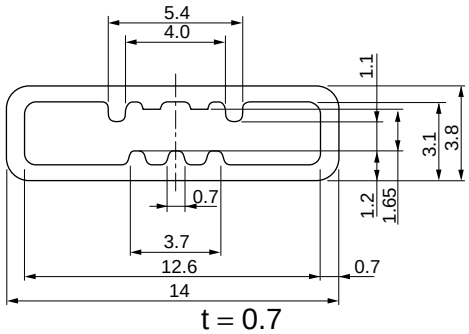
225mil, plastic (1)



t = 0.7

Transparent polycarbonate

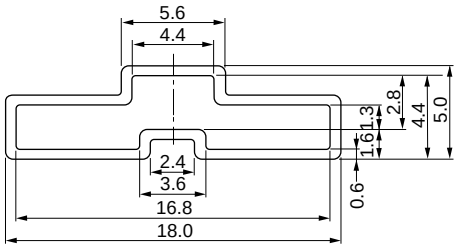
225mil, plastic (2)



t = 0.7

Transparent polycarbonate

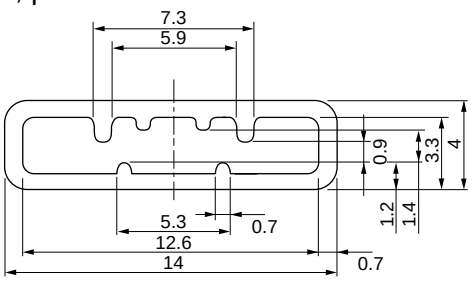
225mil, plastic (3)



t = 0.6

Transparent polyvinyl chloride

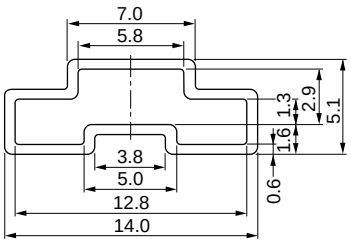
260mil, plastic



t = 0.7

Transparent polycarbonate

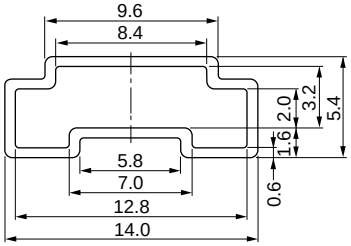
300mil, plastic



t = 0.6

Transparent polyvinyl chloride

375mil, plastic

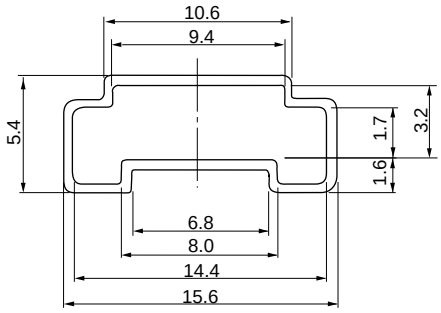
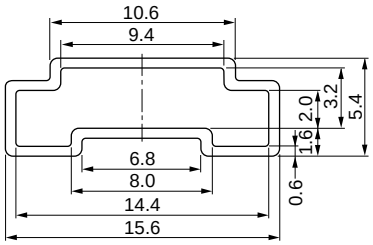


t = 0.6

Transparent polyvinyl chloride

(Dimensions in mm.)

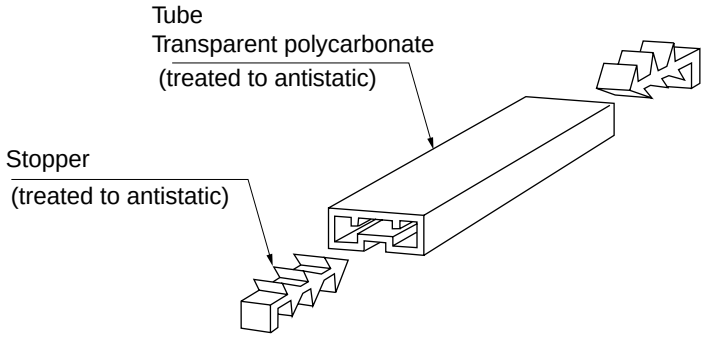
Packing for Shipment

450mil, plastic (1)	450mil, plastic (2)
 t = 0.6 Transparent polycarbonate	 t = 0.6 Transparent polyvinyl chloride

(Dimensions in mm.)

Packing for Shipment

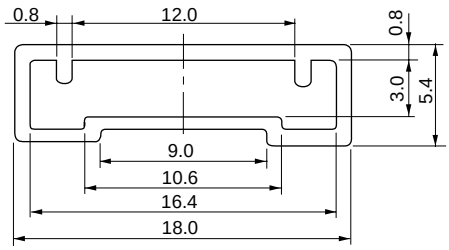
Tube/stopper shape (2)



Tube length: 510 mm

Tube cross-sections

525mil, plastic



t = 0.8

(Dimensions in mm.)

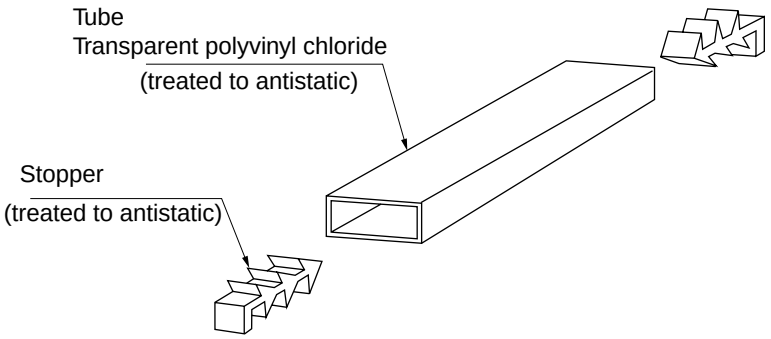
Packing for Shipment

Maximum quantity per tube (SOP and SSOP)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
SOP/SSOP, 225mil, plastic (1)	FPT-8P-M03	130	10400	41600
	FPT-16P-M05	95	7600	30400
	FPT-20P-M03	75	6000	24000
SOP/SSOP, 225mil, plastic (2)	FPT-8P-M02	95	7600	30400
SOP/SSOP, 225mil, plastic (3)	FPT-14P-M03	50	4000	16000
	FPT-16P-M04	48	3840	15360
SOP/SSOP, 260mil, plastic	FPT-24P-M03	62	4960	19840
	FPT-30P-M02	50	4000	16000
SOP/SSOP, 300mil, plastic	FPT-8P-M01	80	6400	25600
	FPT-14P-M04	50	4000	16000
	FPT-16P-M06	50	4000	16000
	FPT-16C-C02	50	4000	16000
	FPT-20P-M01	40	3200	12800
	FPT-24P-M01	33	2640	10560
SOP/SSOP, 375mil, plastic	FPT-16P-M03	39	3120	12480
	FPT-20P-M02	39	3120	12480
	FPT-20P-M05	39	3120	12480
	FPT-24P-M02	33	2640	10560
	FPT-28P-M01	28	2240	8960
	FPT-34P-M01	28	2240	8960
	FPT-34P-M02	28	2240	8960
SOP/SSOP, 450mil, plastic (1)	FPT-32P-M02	24	1920	7680
	FPT-40P-M04	28	2240	8960
	FPT-40P-M05	28	2240	8960
SOP/SSOP, 450mil, plastic (2)	FPT-40P-M01	28	2240	8960
SOP/SSOP, 525mil, plastic	FPT-32P-M03	23	1150	4600

6.2.3 LCC

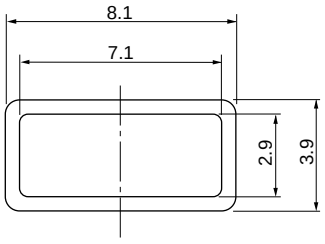
Tube/stopper shape



Tube length: 510 mm

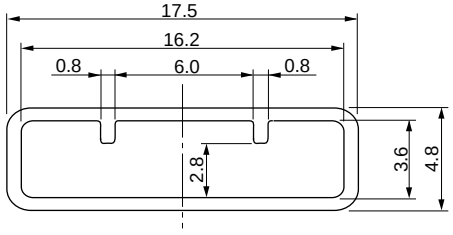
Tube cross-sections

LCC 16, frit seal



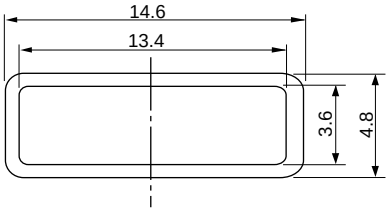
t = 0.5

LCC 48, metal seal



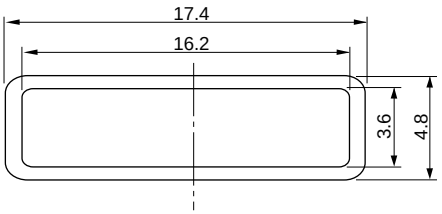
t = 0.6

LCC 32, metal seal/frit seal



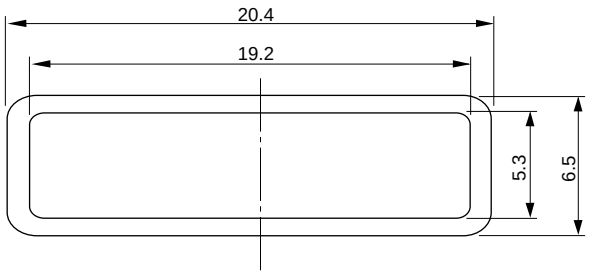
t = 0.6

LCC 36, frit seal



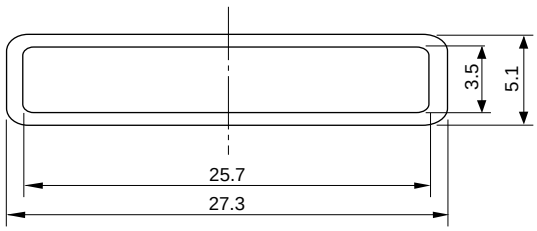
t = 0.6

LCC 44, frit seal



t = 0.6

LCC 64, metal seal



t = 0.8

(Dimensions in mm.)

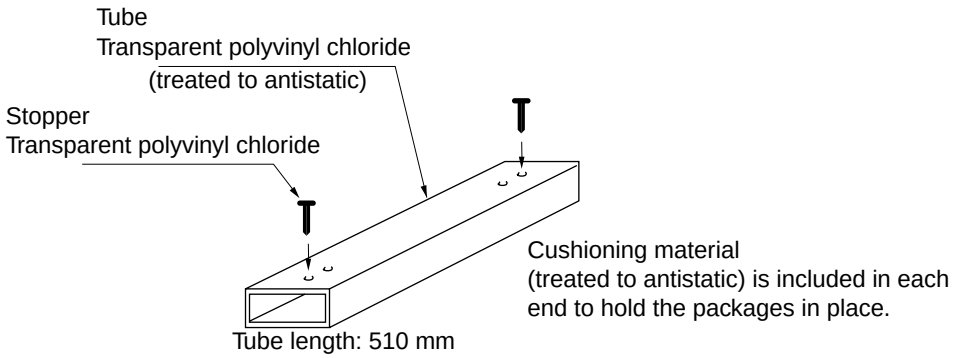
Packing for Shipment

Maximum quantity per tube (LCC)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
LCC16, frit seal	LCC-16C-F01	77	7700	30800
LCC 48, metal seal	LCC-48C-A01	34	2040	8160
LCC 32, metal seal/frit seal	LCC-32C-F01	35	2450	9800
LCC 36, frit seal	LCC-36C-F01	35	2450	9800
LCC 44, frit seal	LCC-44C-F01	28	1260	5040
LCC 64, metal seal	LCC-64C-A01	26	832	3328

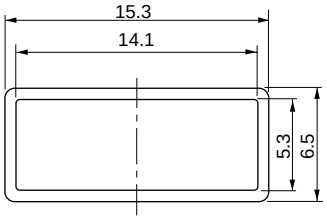
6.2.4 QFJ

Tube/stopper shape



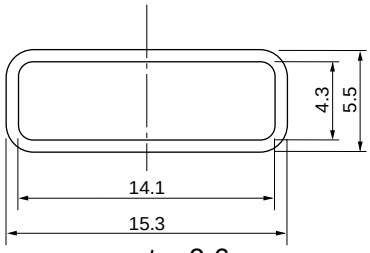
Tube cross-sections

QFJ 28, plastic



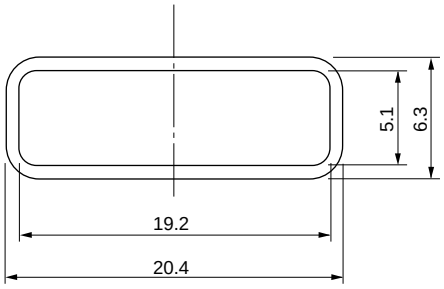
t = 0.6

QFJ 32, plastic/ceramic



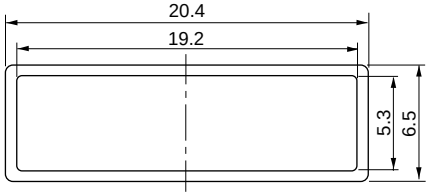
t = 0.6

QFJ 44, ceramic



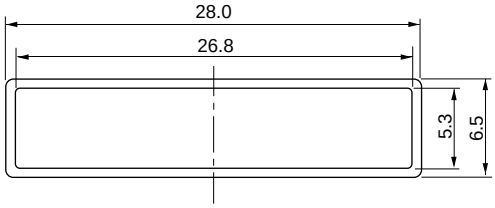
t = 0.6

QFJ 44, plastic



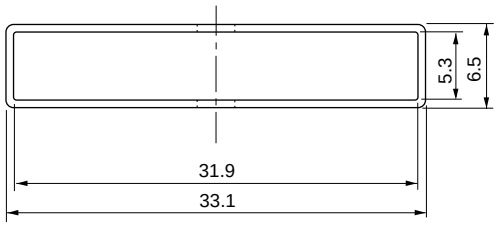
t = 0.6

QFJ 68, plastic



t = 0.6

QFJ 84, plastic



t = 0.6

(Dimensions in mm.)

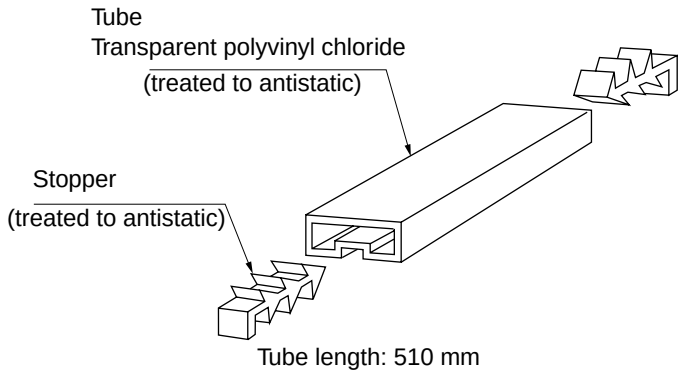
Packing for Shipment

Maximum quantity per tube (QFJ)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
QFJ 28, plastic	LCC-28P-M03	36	2016	8064
QFJ 32, plastic/ceramic	LCC-32P-M02	30	1680	6720
	QFJ-32C-C01	30	1680	6720
QFJ 44, ceramic	QFJ-44C-C01	25	1000	4000
QFJ 44, plastic	LCC-44P-M02	25	1000	4000
QFJ 68, plastic	LCC-68P-M02	17	544	2176
QFJ 84, plastic	LCC-84P-M02	14	336	1344

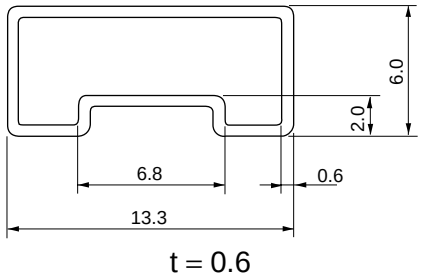
6.2.5 SOJ

Tube/stopper shape



Tube cross-sections

400mil, plastic/metal seal



(Dimensions in mm.)

Maximum quantity per tube (SOJ)

Package form	Package code	Maximum quantity		
		pcs/tube	pcs/inner box	pcs/outer box
SOJ 28 (400mil) , plastic/metal seal	LCC-28C-A04	26	1560	6240
	LCC-42P-M01	17	1020	4080

6.3 Tray Dimensions

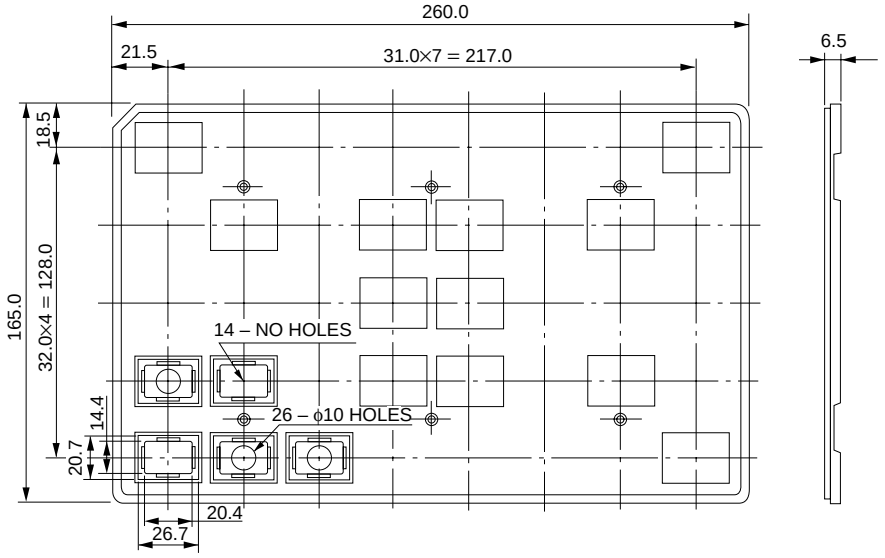
6.3.1 Plastic SOP • SOP • TSOP (heat proof type) , ceramic SOP (non-heat proof type)

(1) Plastic SOP

SOP38

(The identical Figure is also in Plastic QFP 64, 80, 100.)

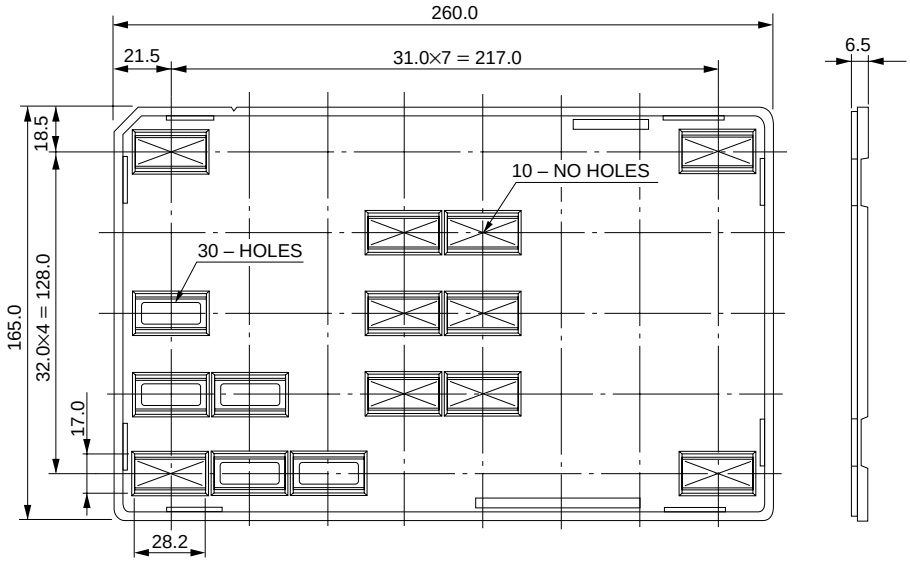
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-38P-M02	40	400	1600



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

SOP 44

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-44P-M16	40	400	1600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

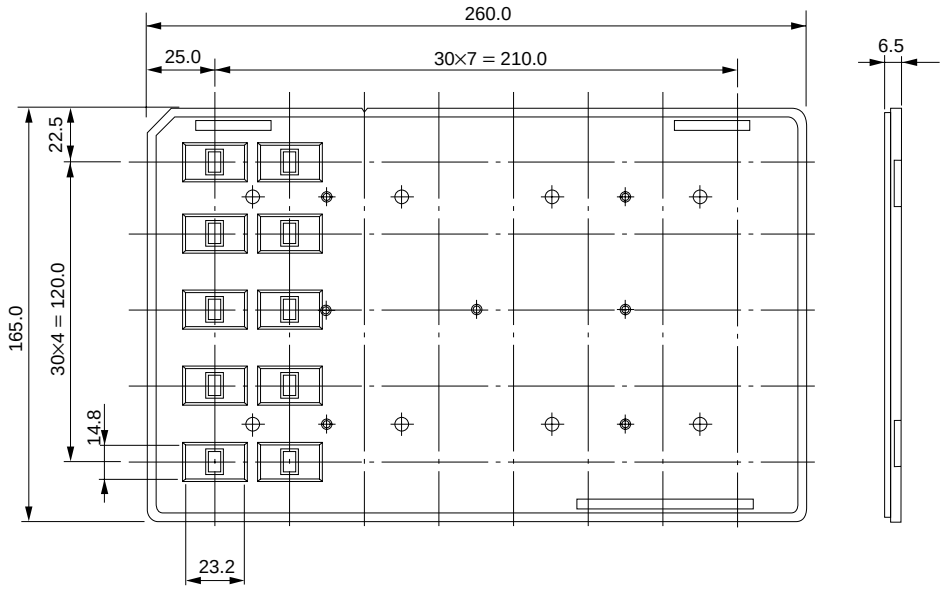
(Dimensions in mm)

Tray Dimensions

(2) Ceramic SOP (non-heat proof type)

SOP 24

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-24C-F01	40	400	1600



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

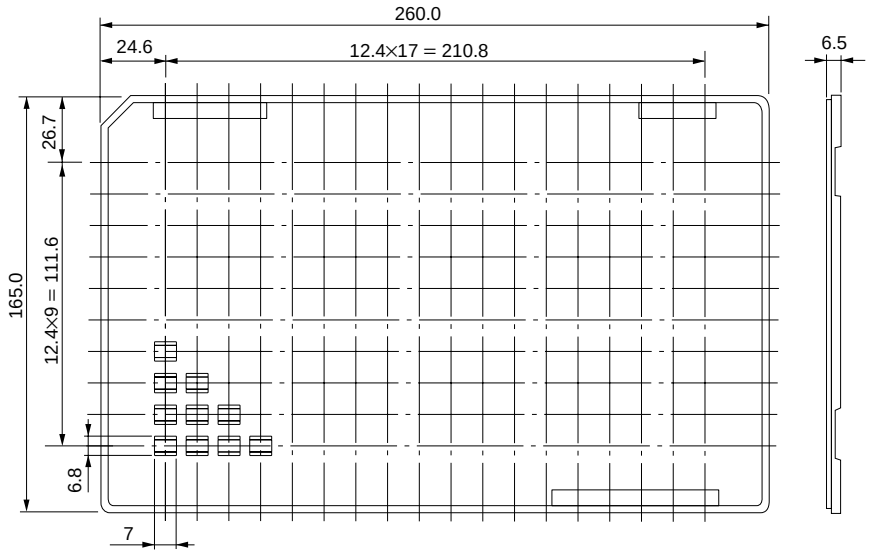
(Dimensions in mm)

Tray Dimensions

(3) Plastic SSOP

SSOP 20

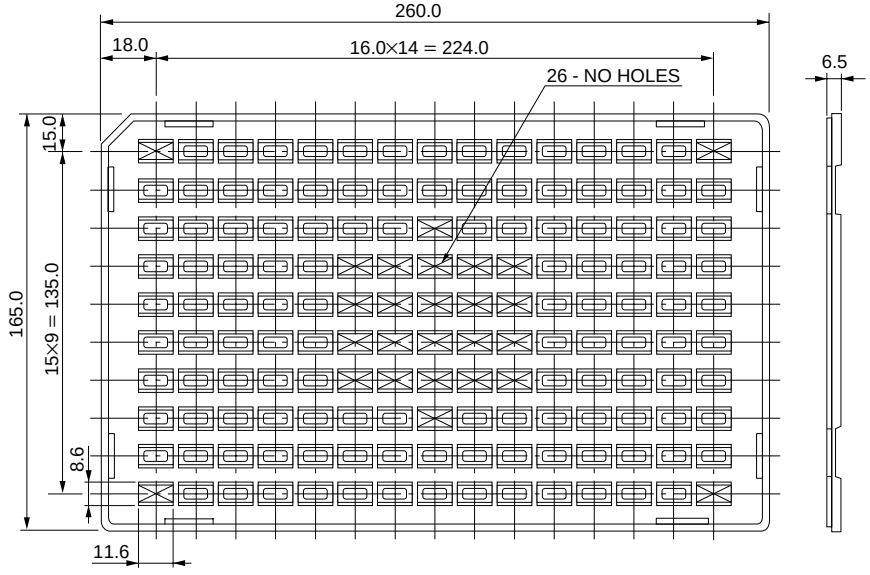
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-20P-M04	180	1800	7200



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

SSOP 34

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-34P-M03	150	1500	6000



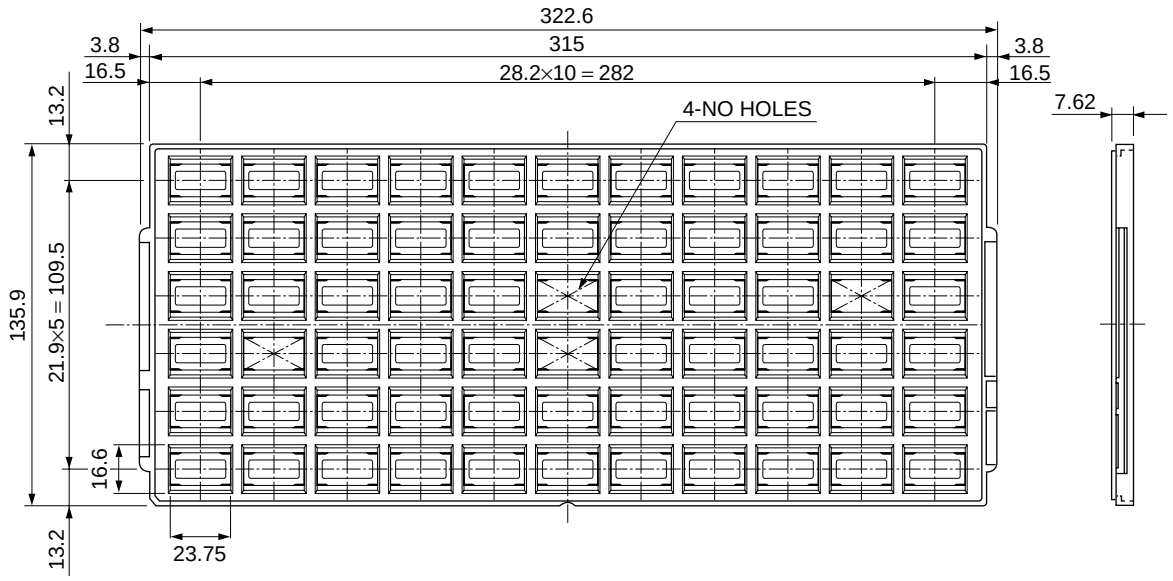
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

SSOP 56

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-56P-M03	66	660	3960



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

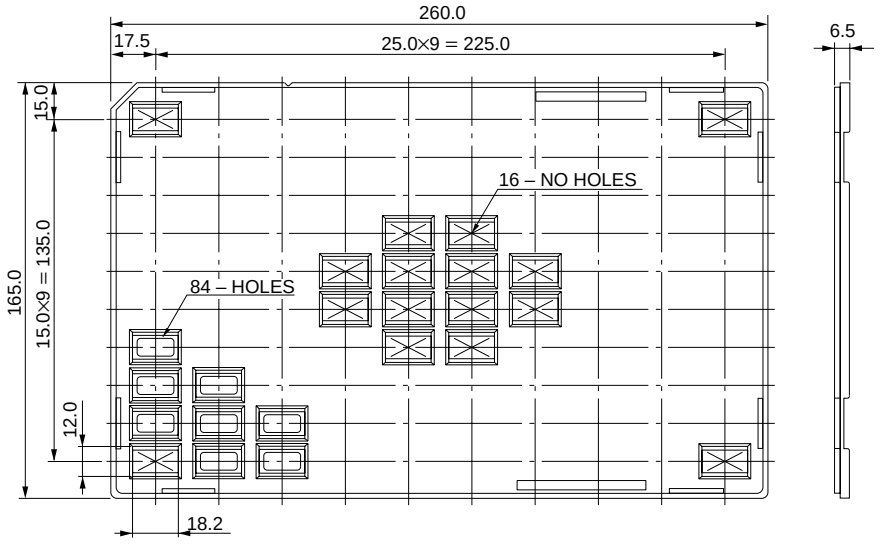
(Dimensions in mm)

Tray Dimensions

(4) Plastic TSOP

TSOP 44 (II)

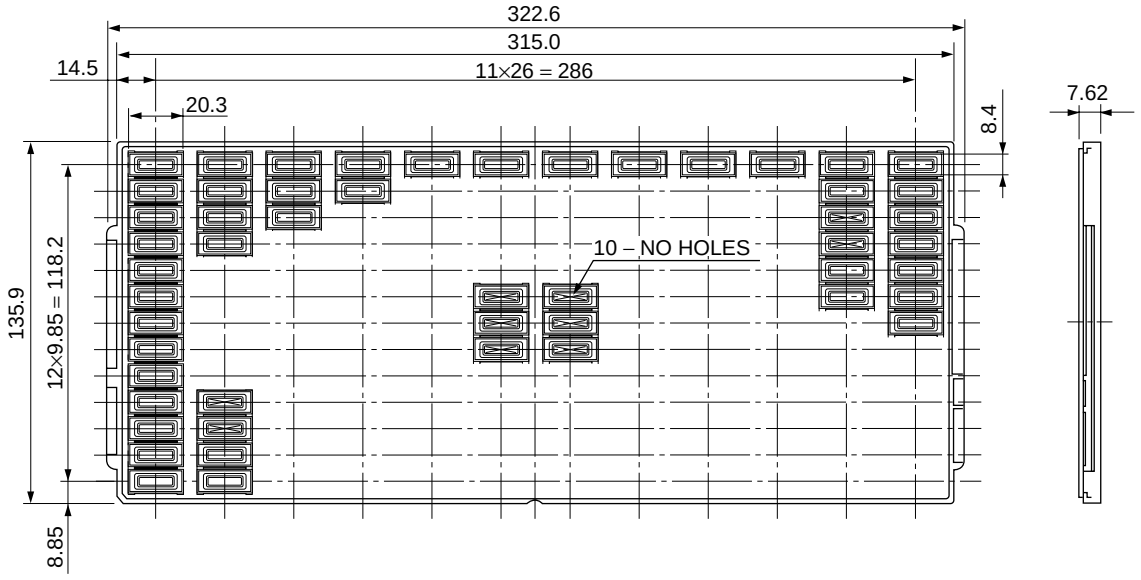
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-44P-M07	100	1000	4000
FPT-44P-M08	100	1000	4000



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TSOP 32 (I)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-32P-M24	156	1560	9360
FPT-32P-M25	156	1560	9360



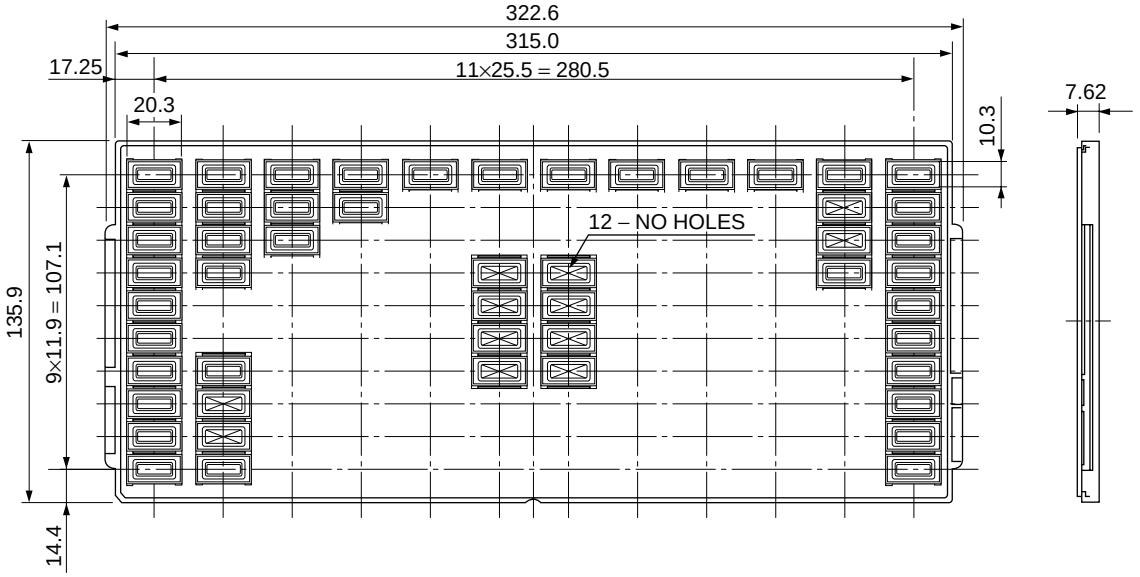
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

TSOP 40 (I)

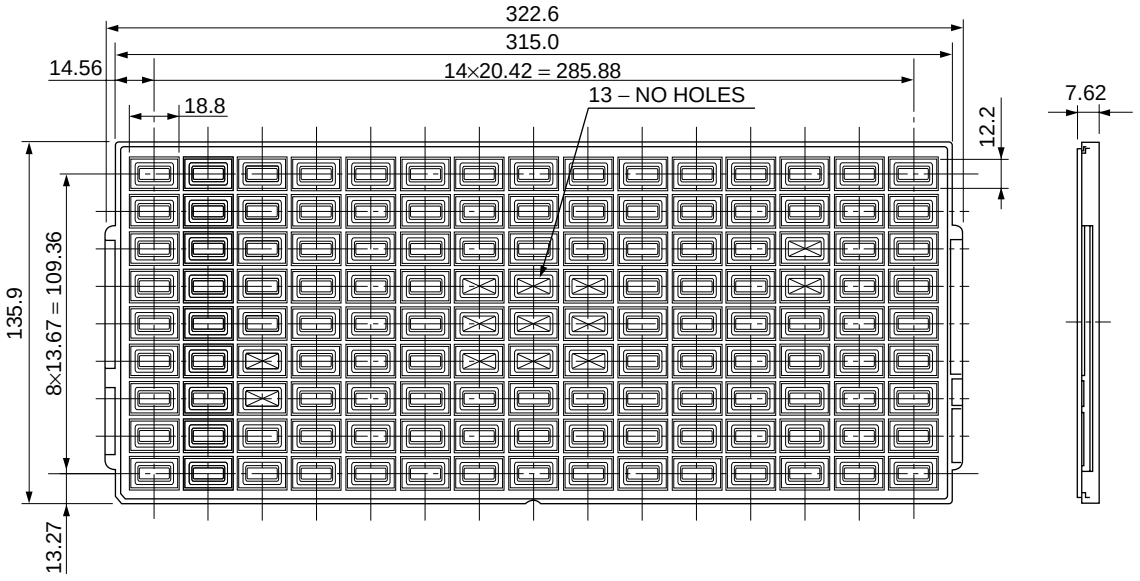
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-40P-M06	120	1200	4800
FPT-40P-M07	120	1200	4800



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TSOP 44 (II)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-44P-M18	135	1350	8100



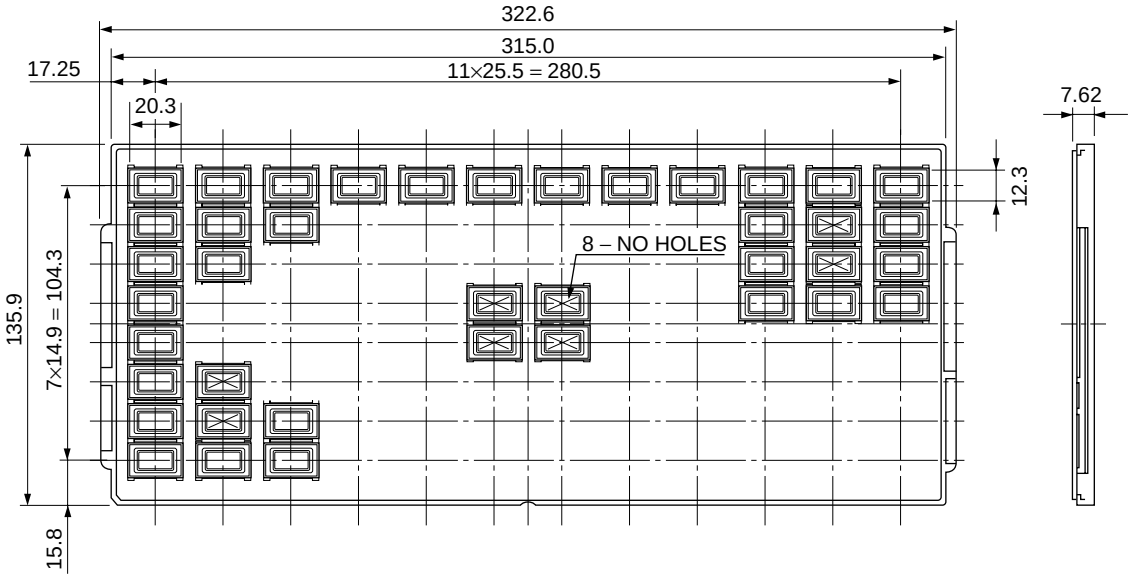
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

TSOP 48 (I)

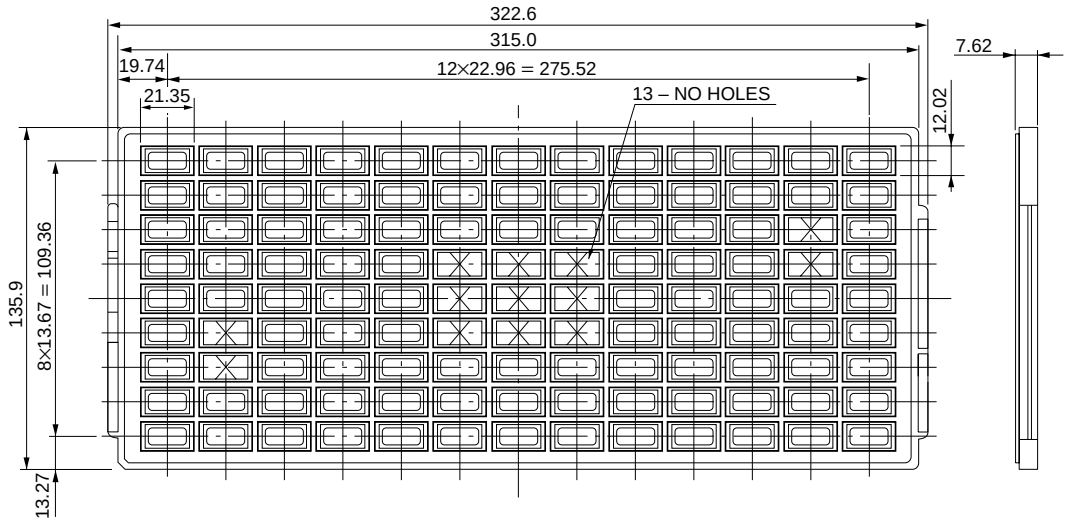
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-48P-M19	96	960	5760
FPT-48P-M20	96	960	5760



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TSOP 50 (II)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-50P-M05	117	1170	7020
FPT-50P-M06	117	1170	7020



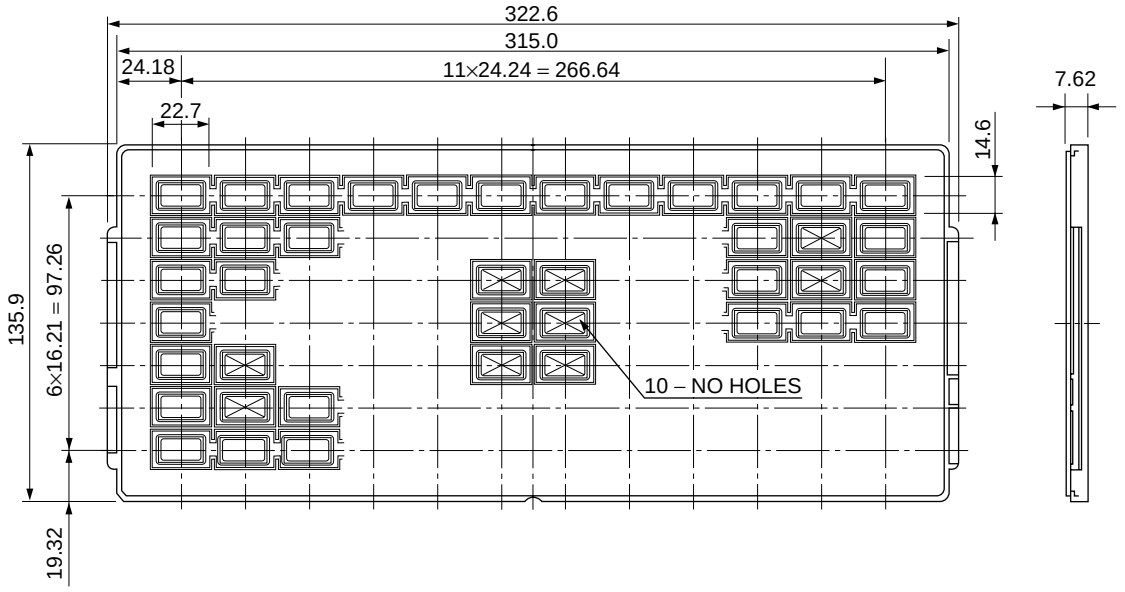
Material: Conductive polyphenylenether
Heat proof temperature: 135 °C MAX

(Dimensions in mm)

Tray Dimensions

TSOP 54 (II)

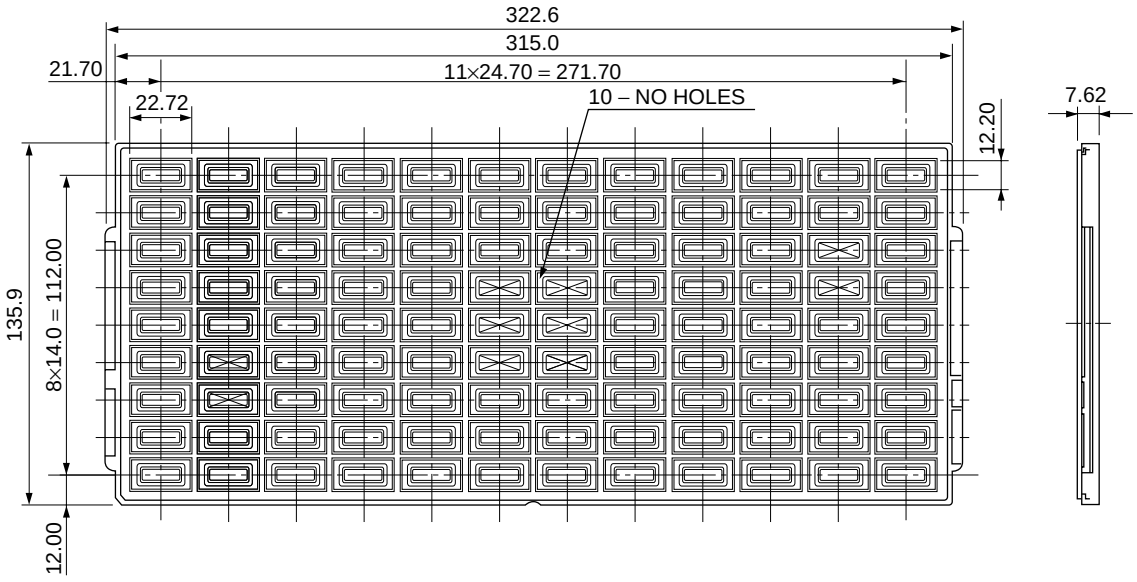
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-54P-M01	84	840	5040



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TSOP 54, 86 (II)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-54P-M02	108	1080	6480
FPT-86P-M01	108	1080	6480



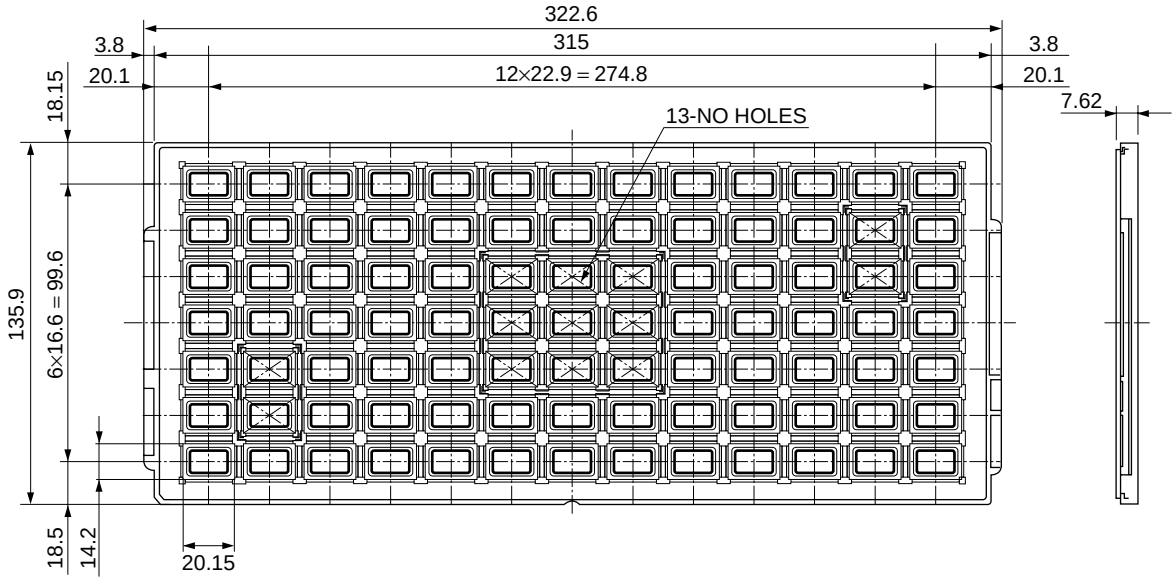
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

TSOP 56 (I)

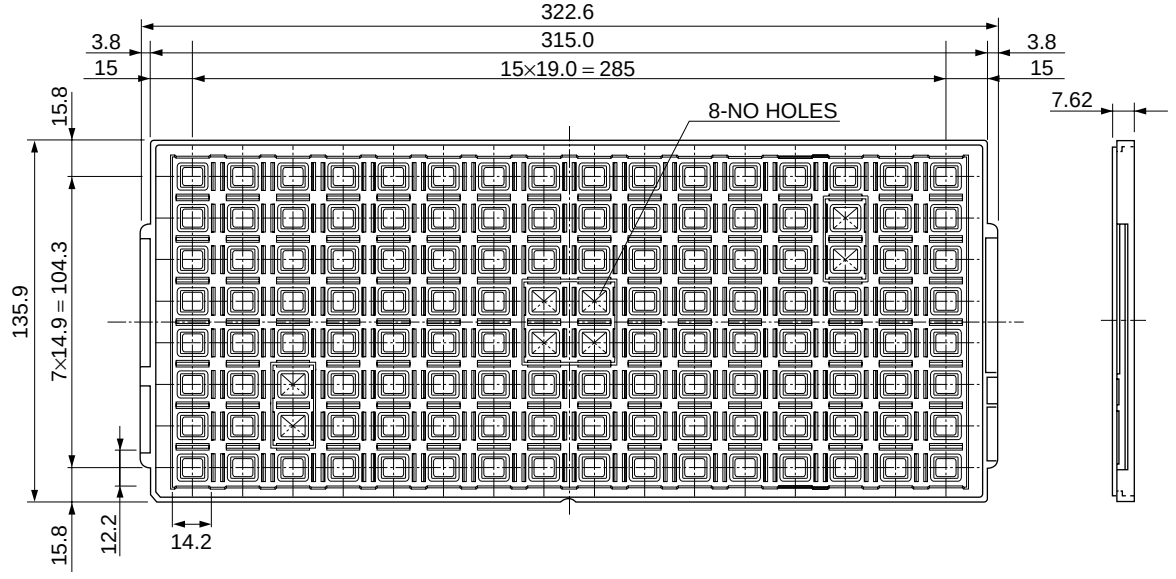
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-56P-M01	91	910	5460
FPT-56P-M02	91	910	5460



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TSOP 56 (I)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-56P-M04	128	1280	7680



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

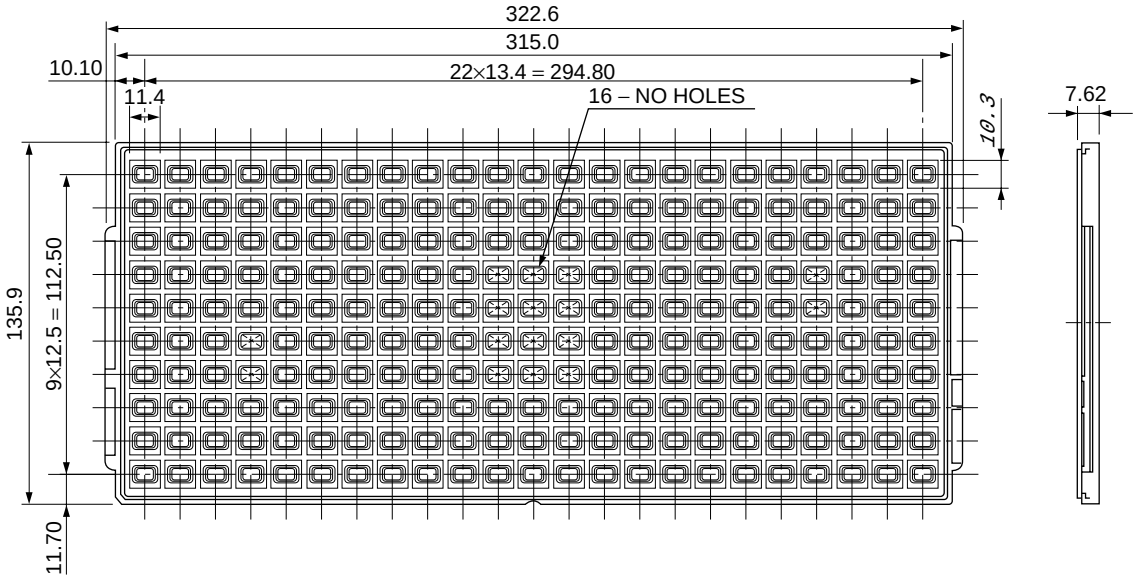
(Dimensions in mm)

Tray Dimensions

6.3.2 Plastic SON (heat proof type)

SON 40

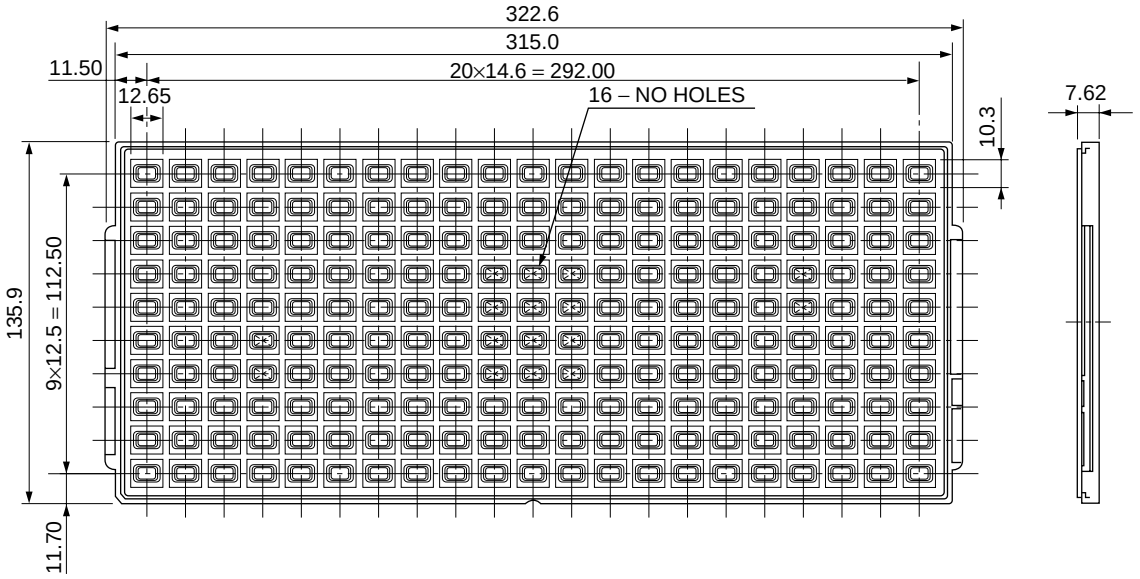
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-40P-M02	230	2300	13800



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

SON 46

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-46P-M02	210	2100	12600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

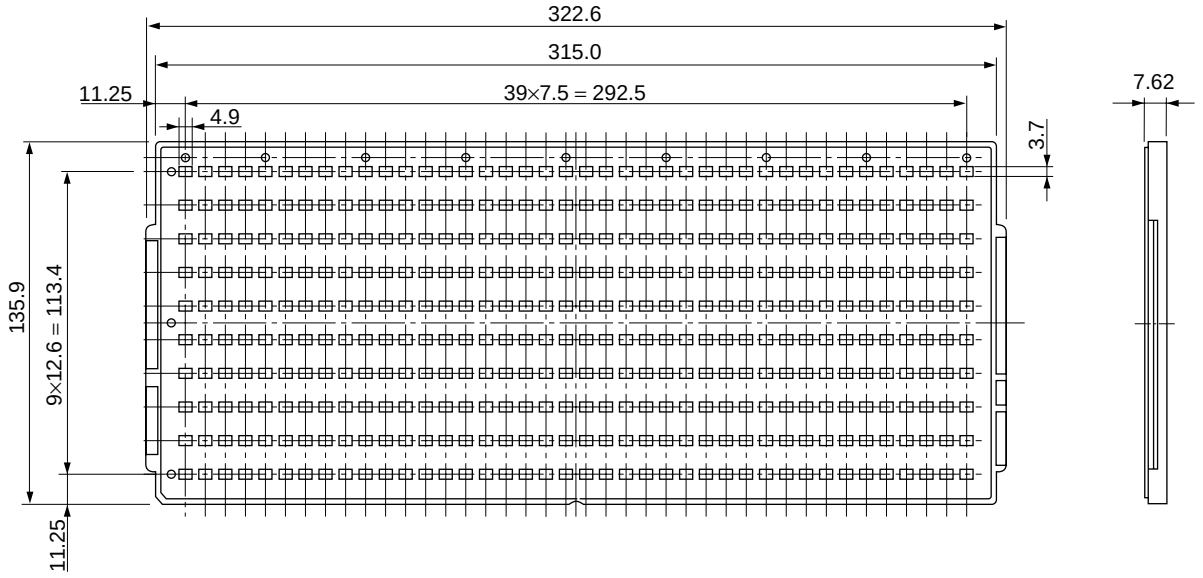
(Dimensions in mm)

Tray Dimensions

6.3.3 Plastic BCC (non-heat proof type)

BCC 16 (S)

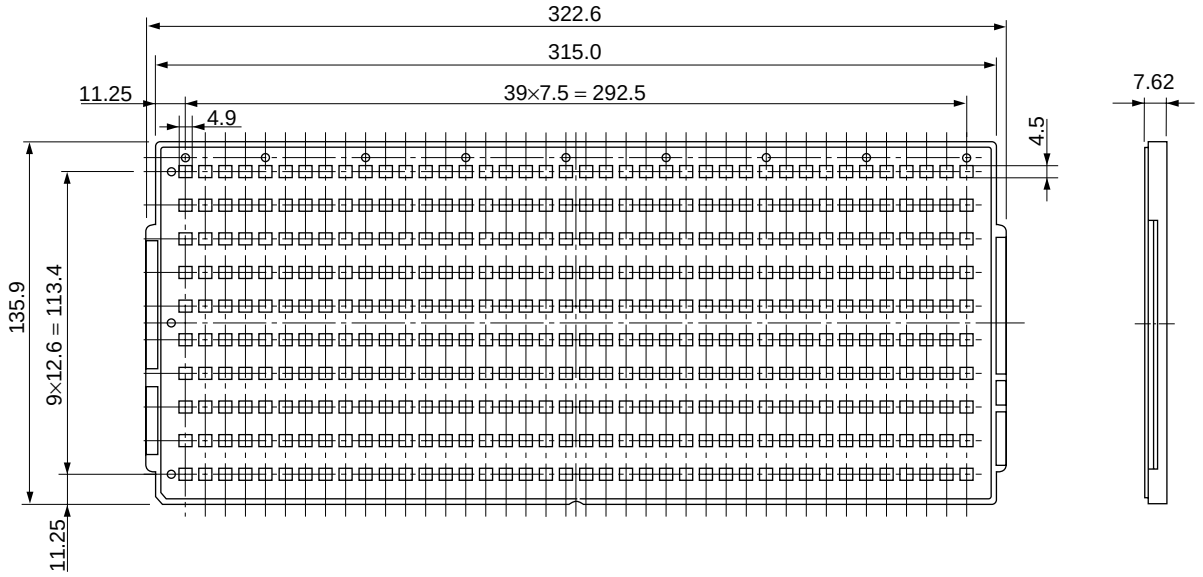
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-16P-M02	400	4000	24000



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

BCC 16 (D)

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-16P-M03	400	4000	24000



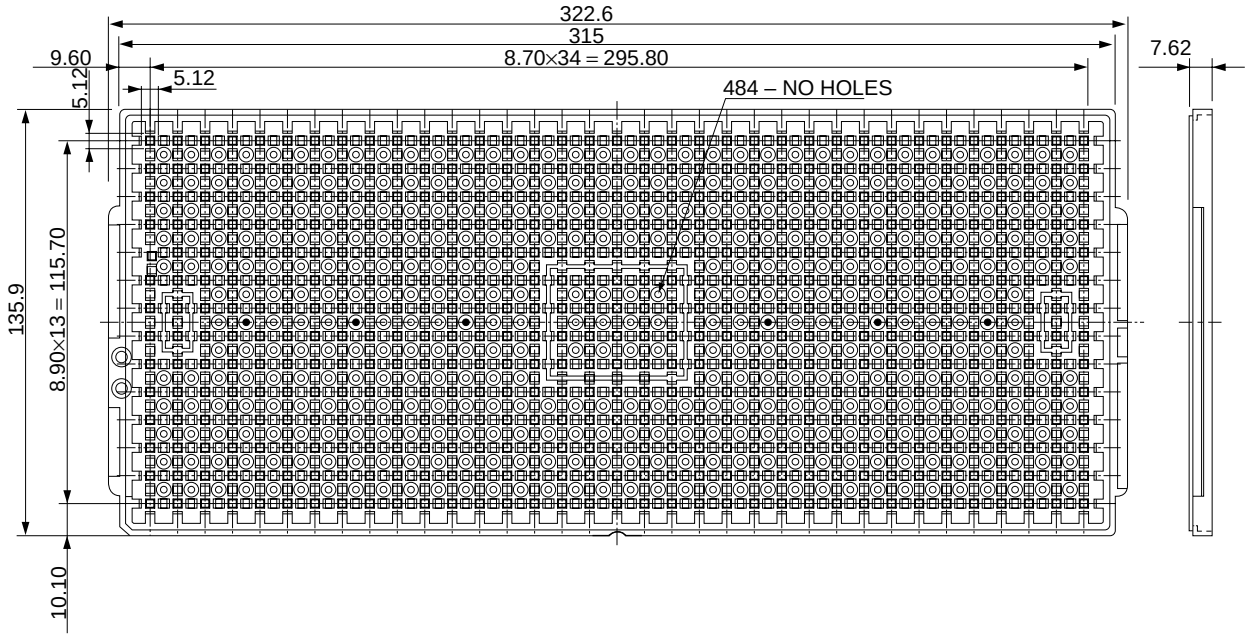
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

BCC 32

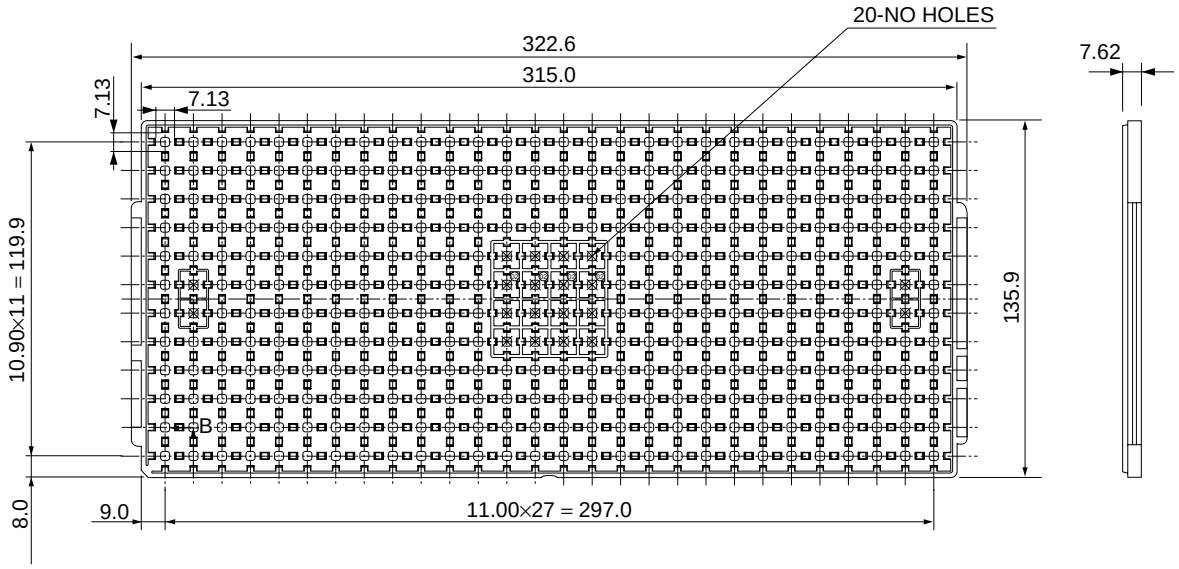
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-32P-M08	490	4900	29400



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

BCC 48

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
LCC-48P-M02	336	3360	21600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

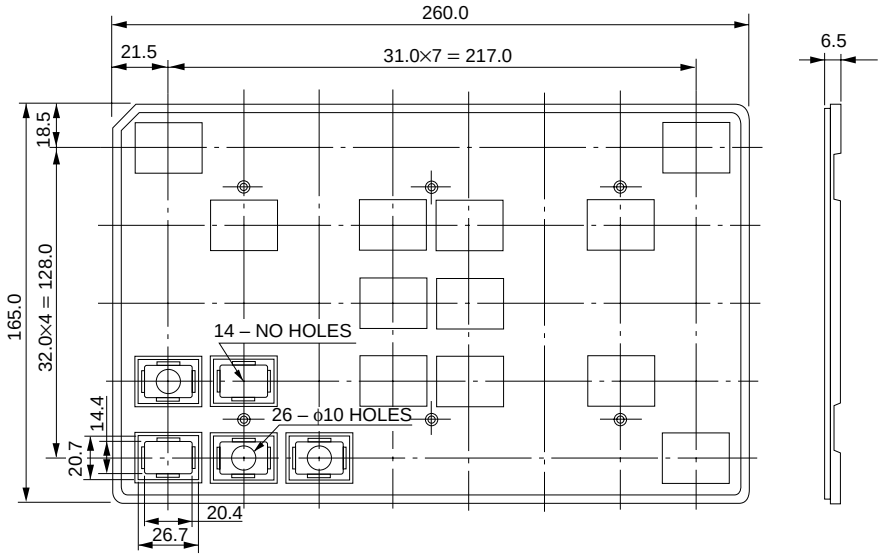
6.3.4 Plastic QFP • LQFP • TQFP (heat proof type)

(1) Plastic QFP

QFP 64, 80, 100

(The identical Figure is also in Plastic SOP38.)

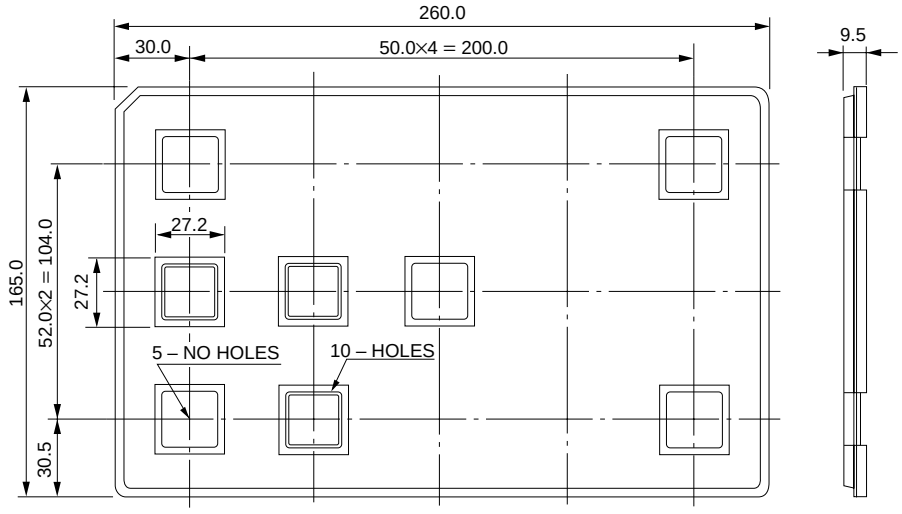
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-64P-M06	40	400	1600
FPT-64P-M10	40	400	1600
FPT-80P-M06	40	400	1600
FPT-80P-M07	40	400	1600
FPT-100P-M06	40	400	1600
FPT-100P-M07	40	400	1600



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

QFP 80, 176

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-80P-M09	15	120	480
FPT-176P-M01	15	120	480



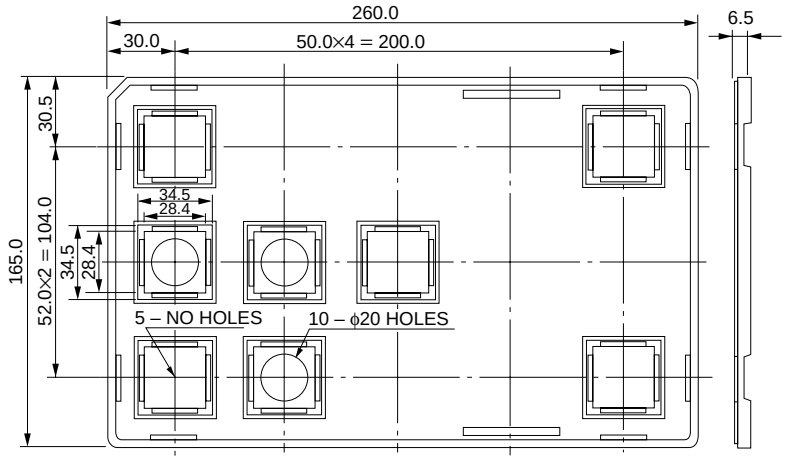
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 120, 144, 160

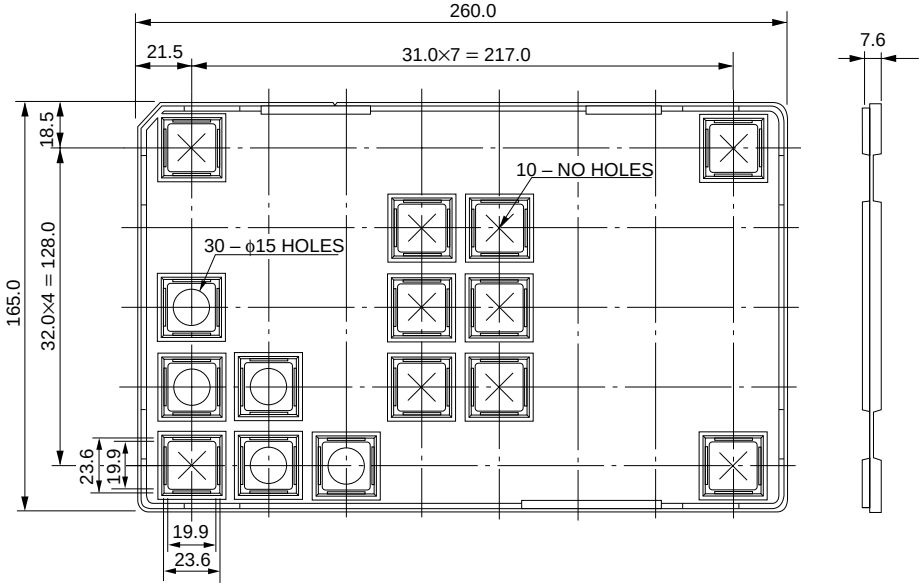
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-120P-M03	15	150	600
FPT-120P-M04	15	150	600
FPT-144P-M01	15	150	600
FPT-144P-M02	15	150	600
FPT-160P-M03	15	150	600
FPT-160P-M04	15	150	600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

QFP 120, 144

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-120P-M13	40	320	1280
FPT-144P-M03	40	320	1280



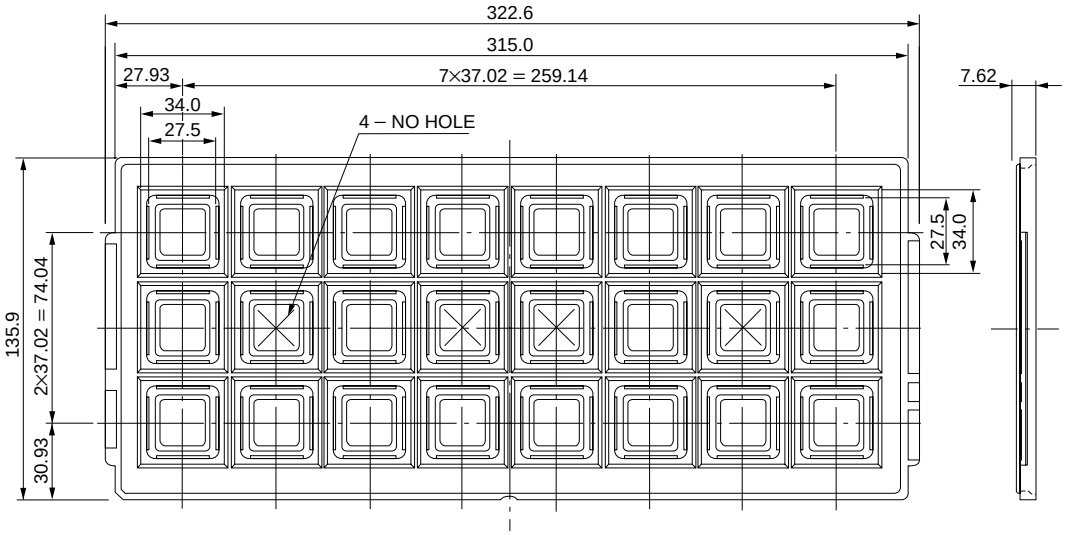
Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 160, 208, 256

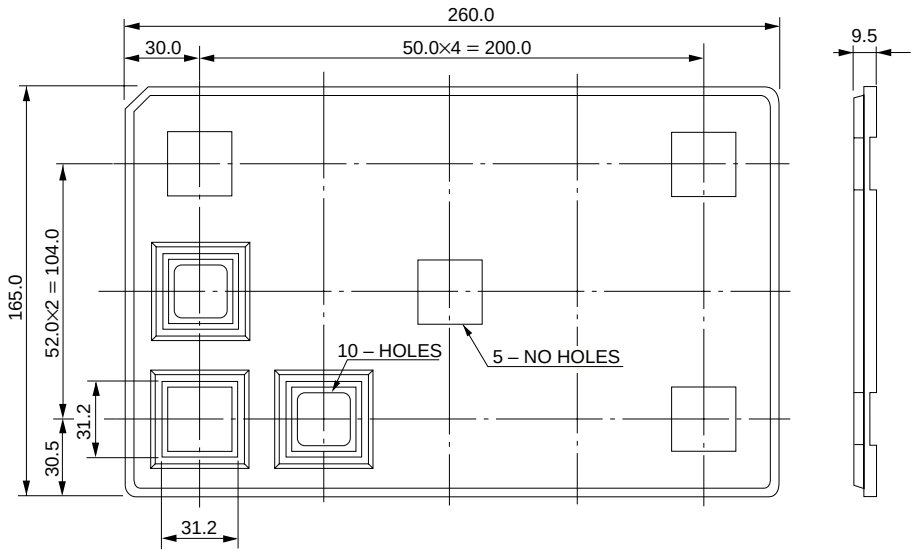
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-160P-M11	24	240	1440
FPT-208P-M04	24	240	1440
FPT-256P-M09	24	240	1440



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

QFP 208, 256

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-208P-M01	15	120	480
FPT-256P-M06	15	120	480



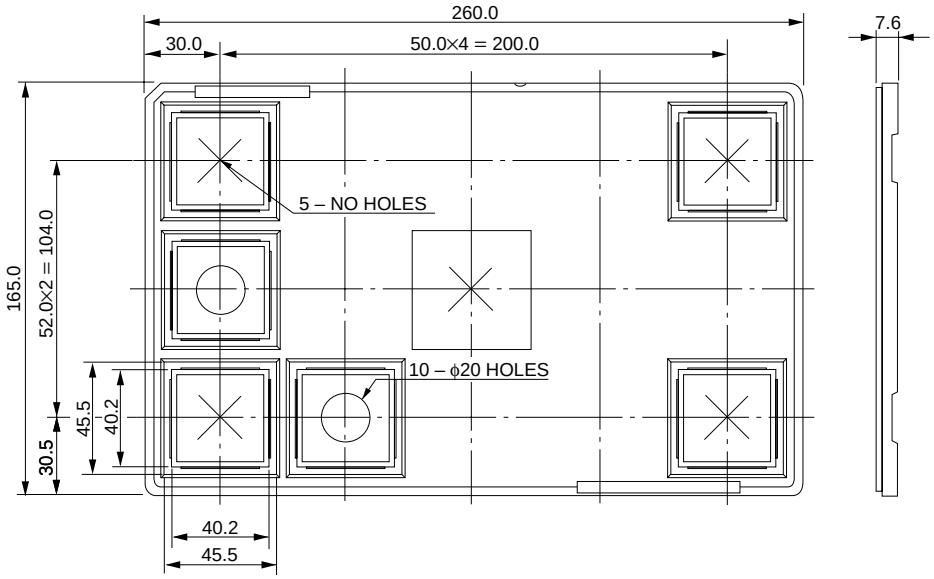
Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 232

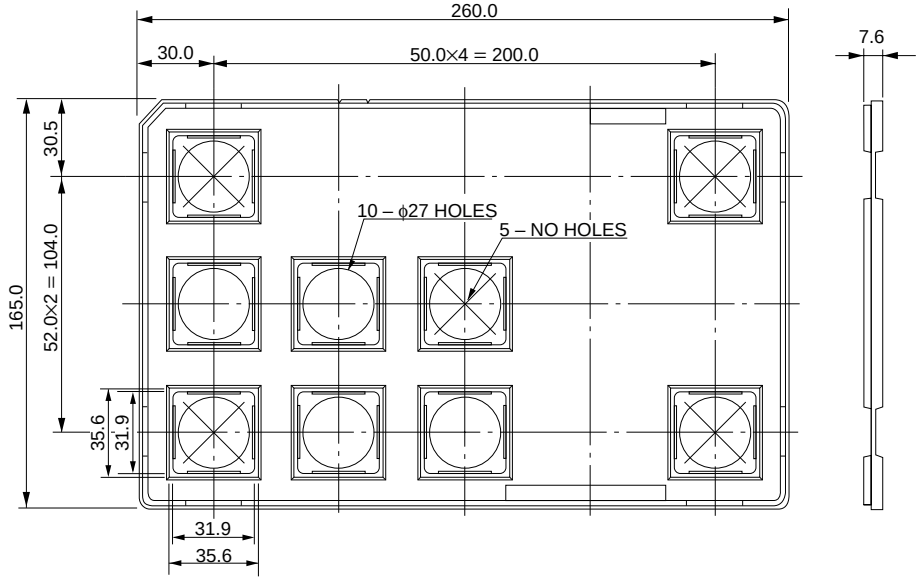
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-232P-M01	15	120	480



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

QFP 240, 296

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-240P-M02	15	120	480
FPT-296P-M01	15	120	480



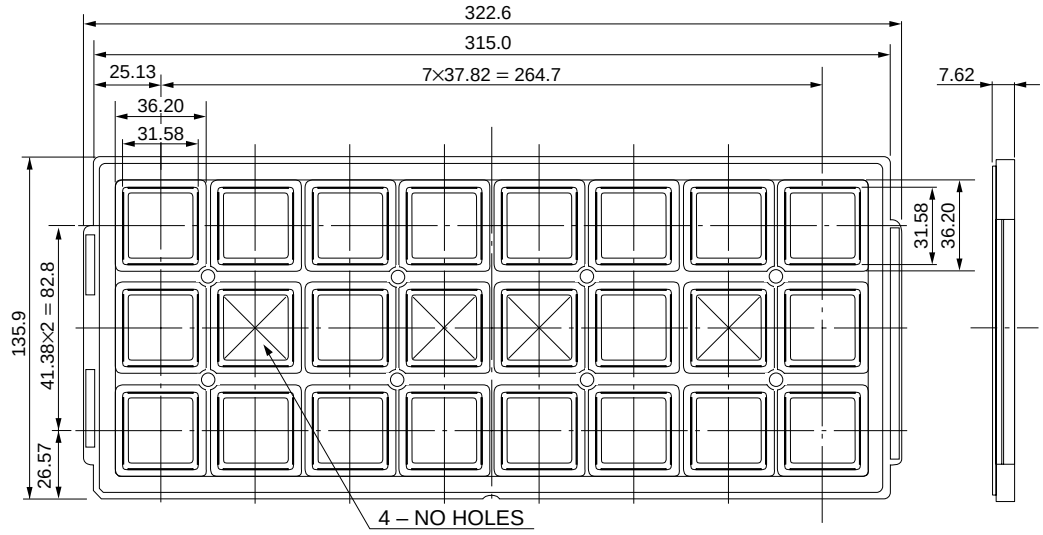
Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 240

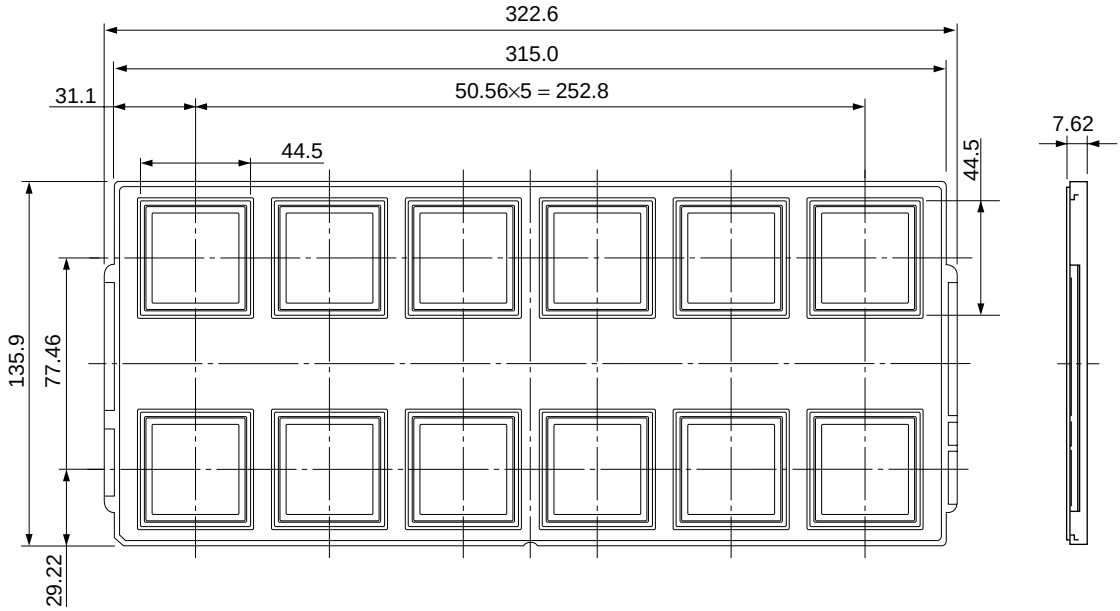
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-240P-M03	24	240	1440



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

QFP 304

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-304P-M02	12	120	720



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

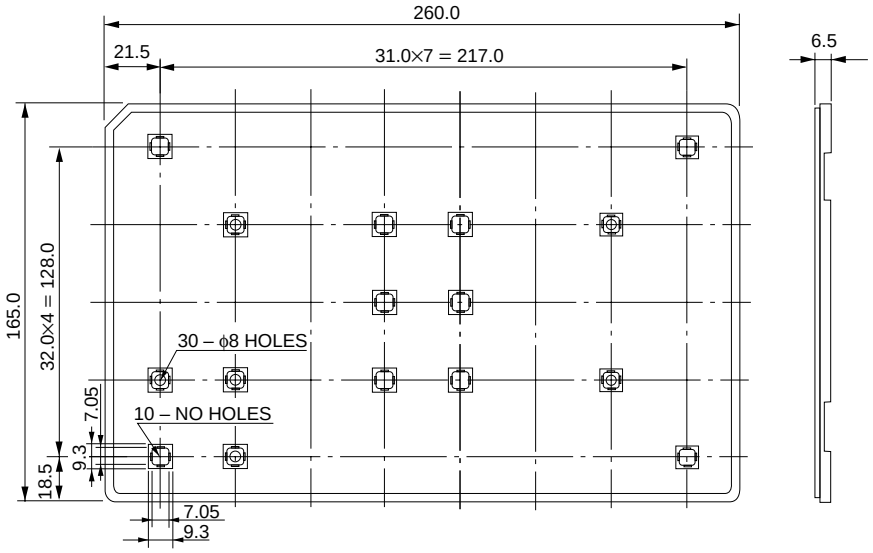
(Dimensions in mm)

Tray Dimensions

(2) Plastic LQFP (LQFP is a Fujitsu package name.)

LQFP 32, 48

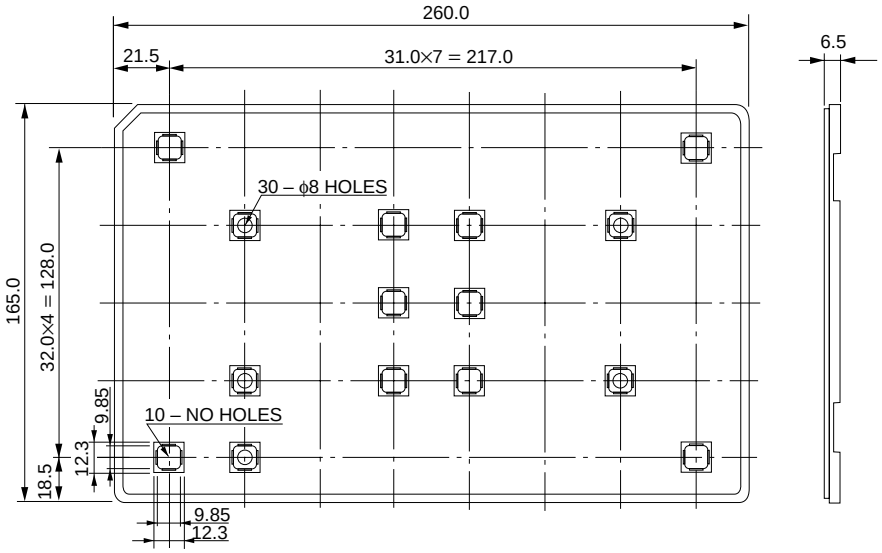
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-32P-M21	40	400	1600
FPT-48P-M05	40	400	1600



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

LQFP 64, TQFP 64

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-64P-M03	40	400	1600
FPT-64P-M04	40	400	1600



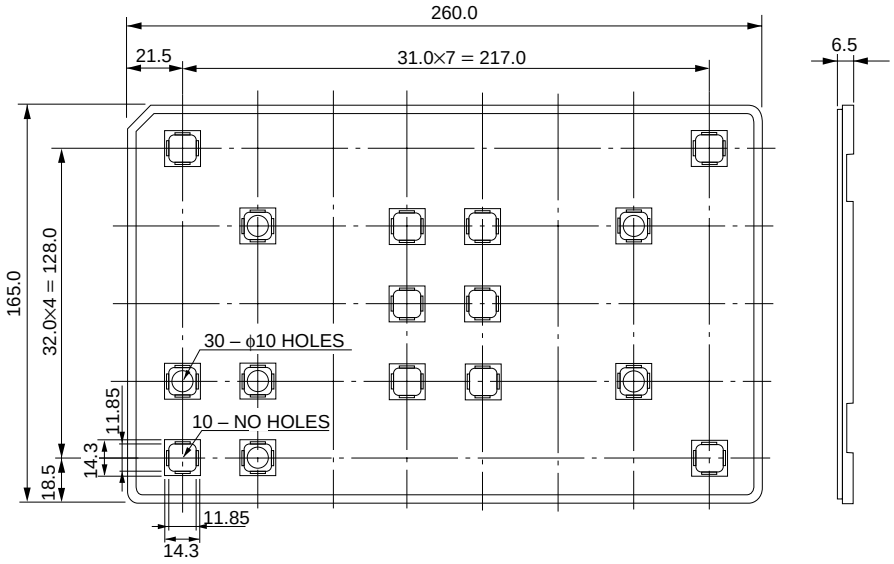
Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

LQFP 64, 80

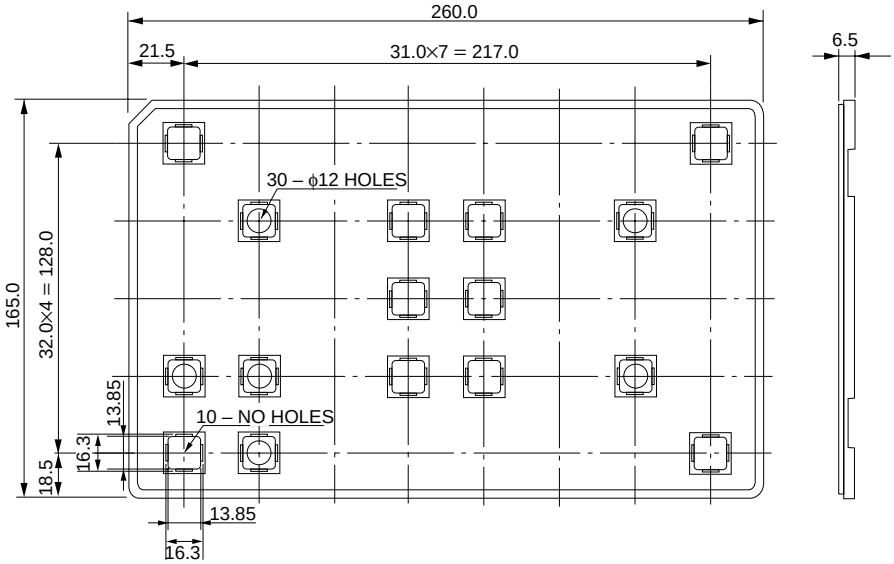
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-64P-M09	40	400	1600
FPT-80P-M05	40	400	1600



Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

LQFP 80, 100, 120, TQFP 100, 120

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-80P-M11	40	400	1600
FPT-100P-M05	40	400	1600
FPT-100P-M09	40	400	1600
FPT-120P-M05	40	400	1600
FPT-120P-M17	40	400	1600



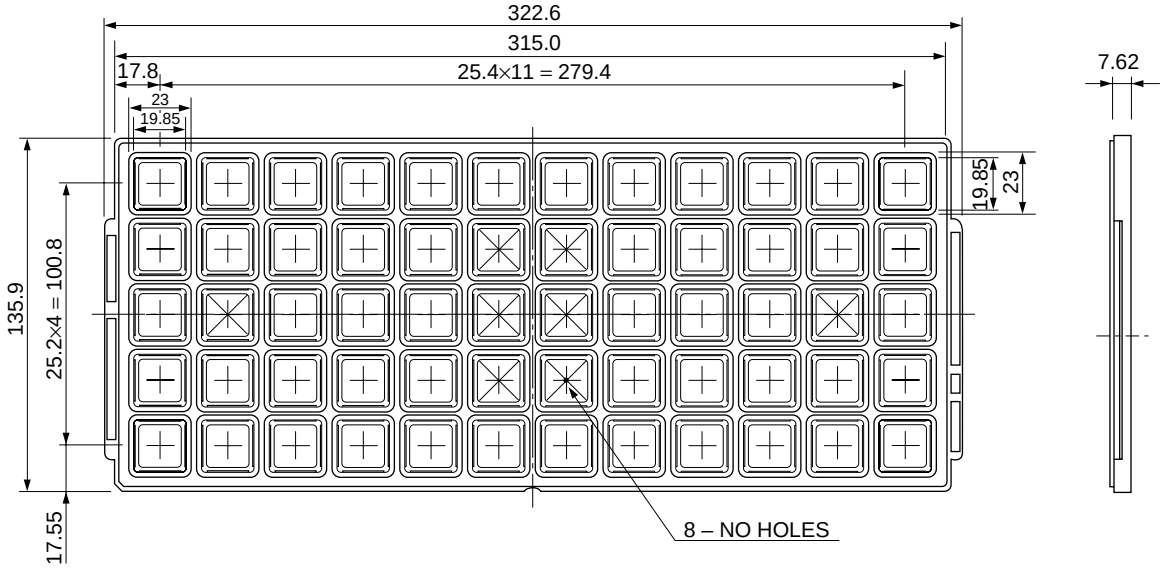
Material: Conductive polypropylene
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

LQFP 144, 176

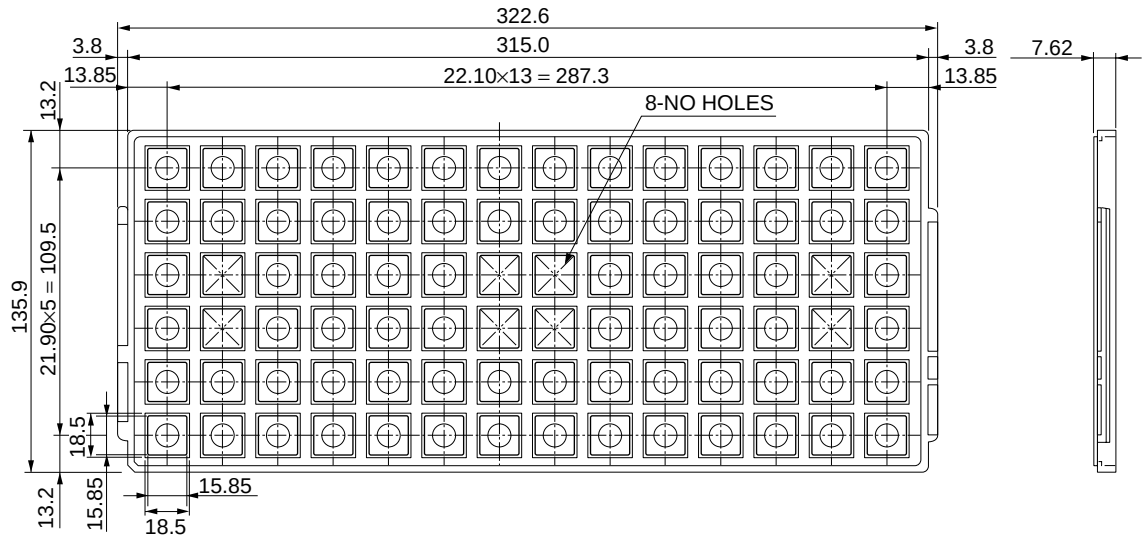
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-144P-M08	60	600	3600
FPT-176P-M03	60	600	3600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

LQFP 144

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-144P-M12	84	840	5040



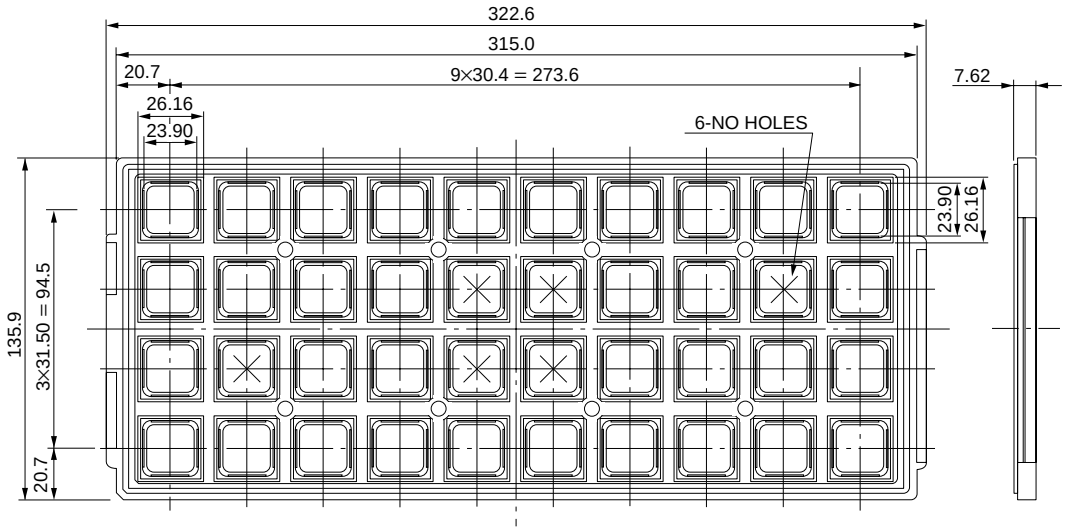
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

LQFP 176

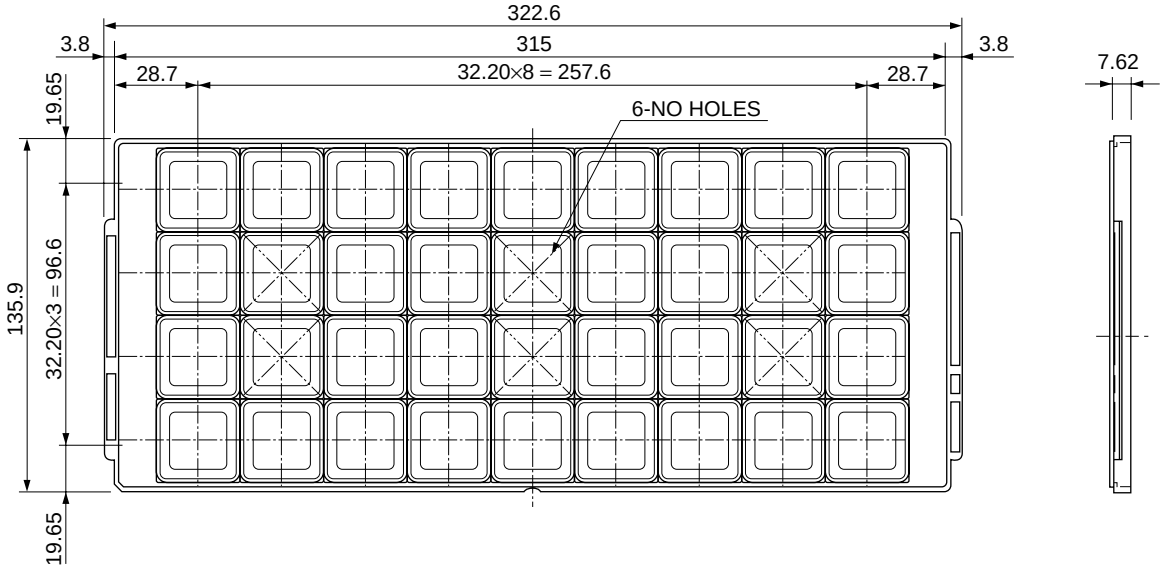
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-176P-M02	40	400	2400



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

LQFP 208

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-208P-M06	36	360	2160



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

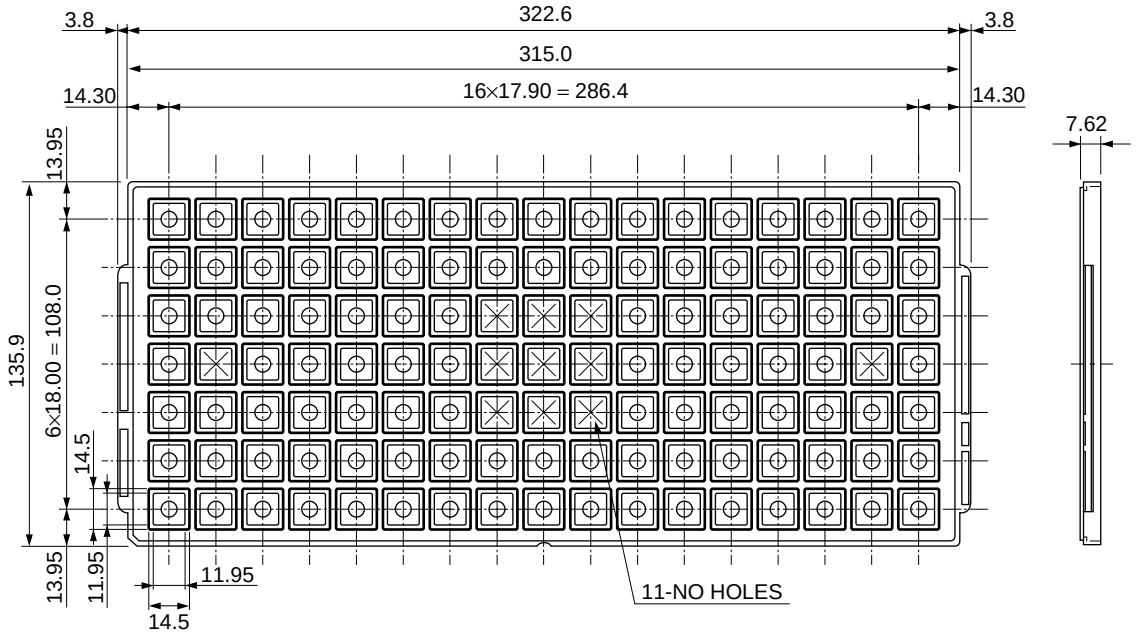
(Dimensions in mm)

Tray Dimensions

(3) Plastic TQFP

TQFP 80, 100

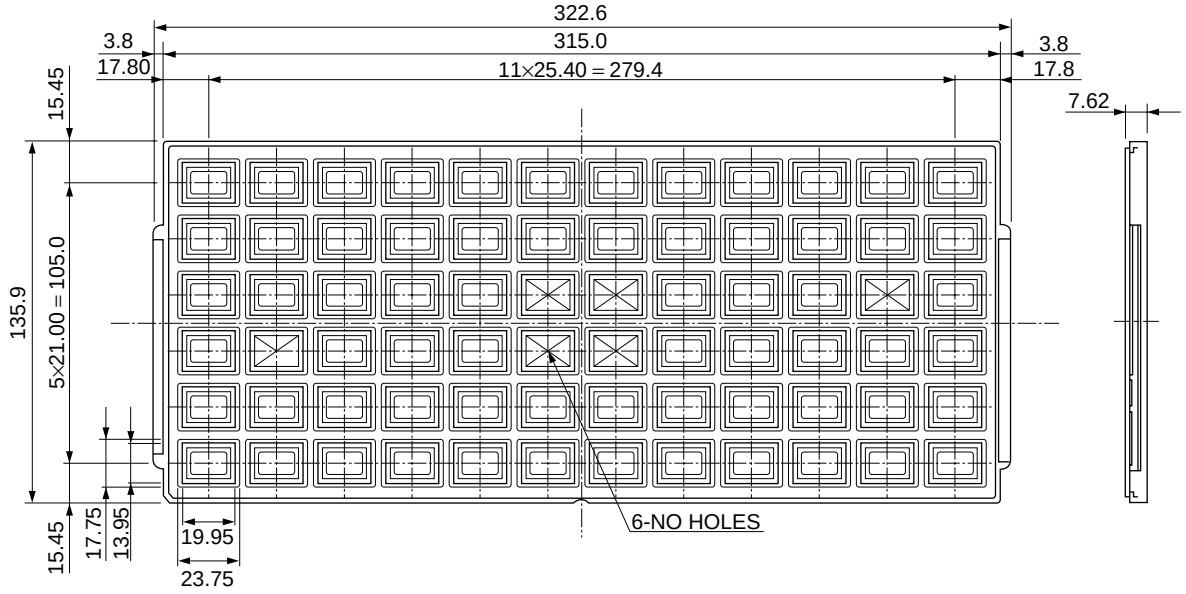
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-80P-M15	119	1190	7140
FPT-100P-M18	119	1190	7140



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

TQFP 100

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-100P-M19	72	720	4320



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

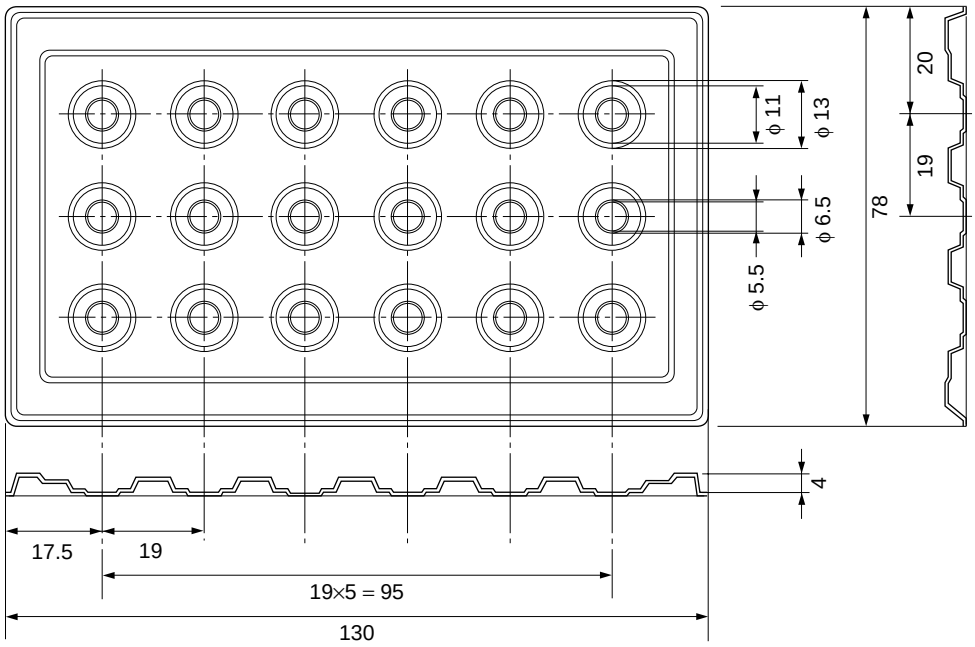
(Dimensions in mm)

Tray Dimensions

6.3.5 Ceramic QFP (non-heat proof type)

QFP 16C

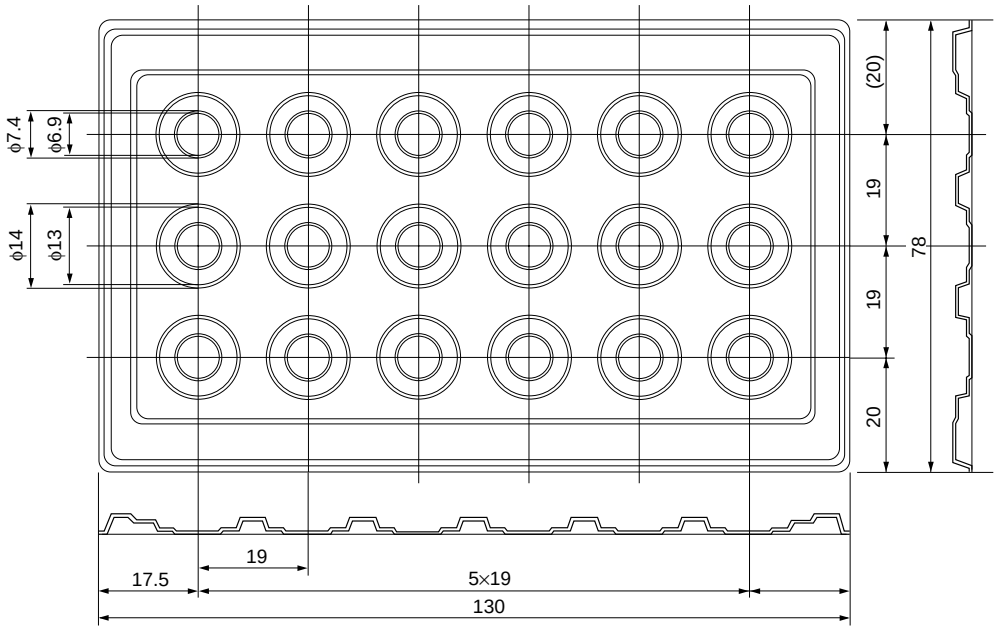
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-16C-A01	18	144	6912



Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

QFP 24C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-24C-A03	18	144	6912



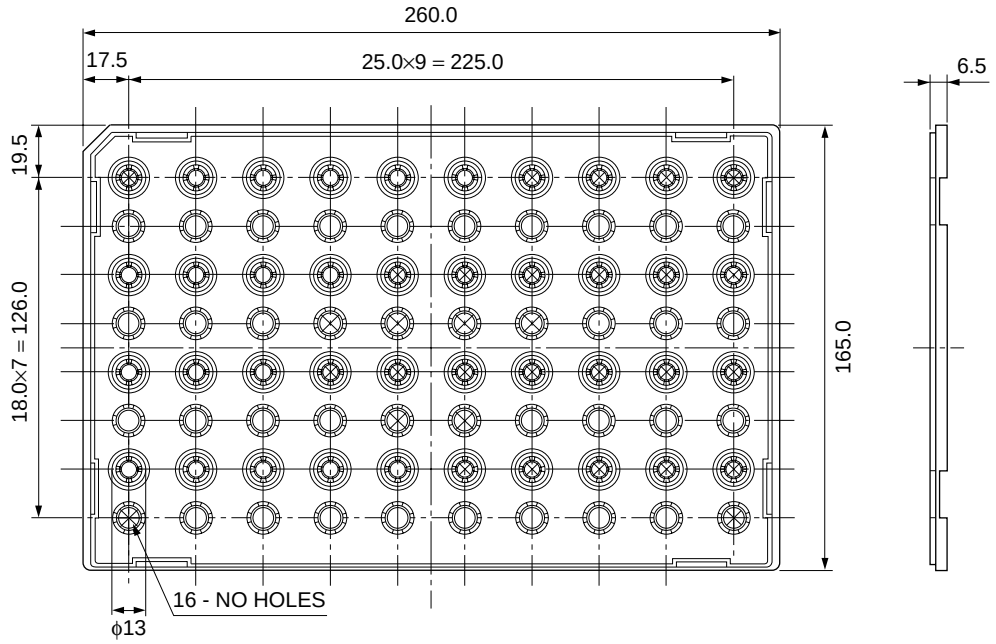
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 28C

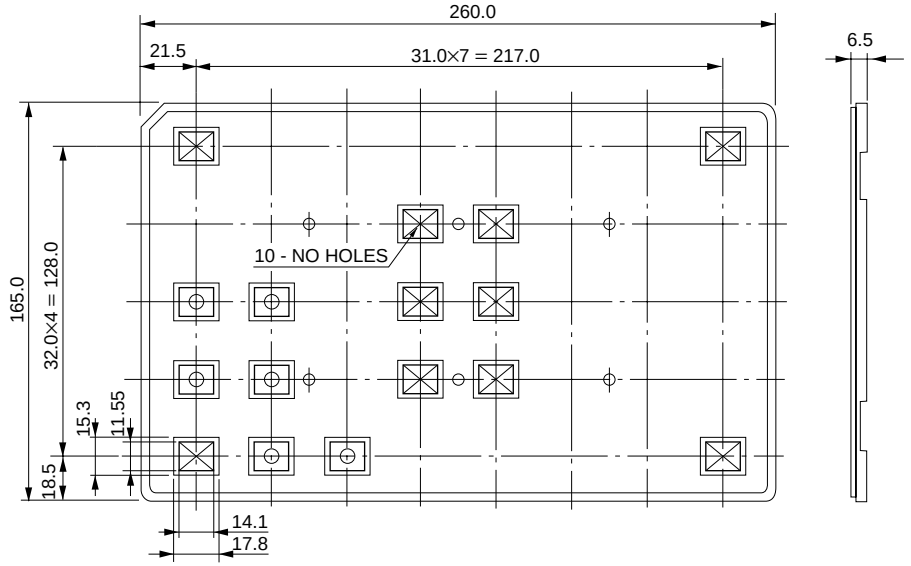
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-28C-A08	40	400	1600



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

QFP 32C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-32C-C02	40	400	1600



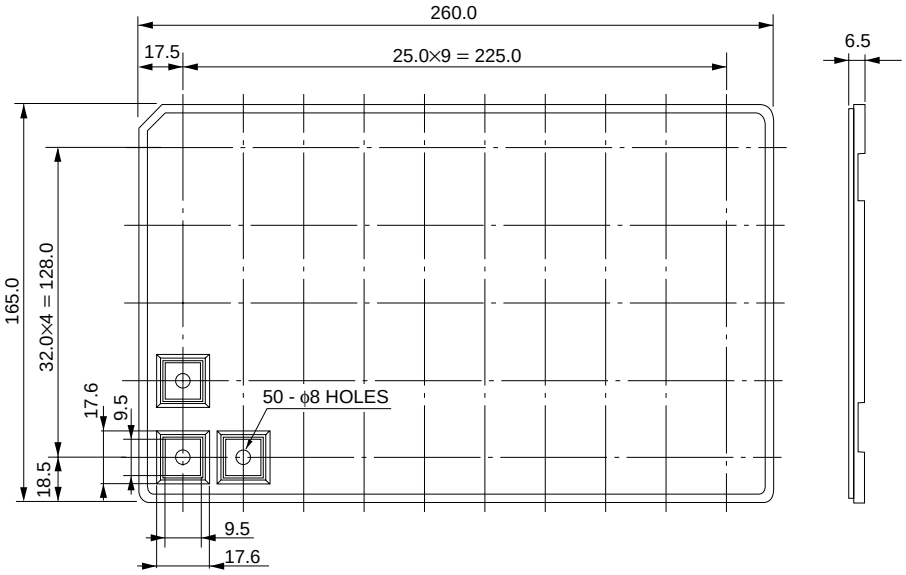
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 48C

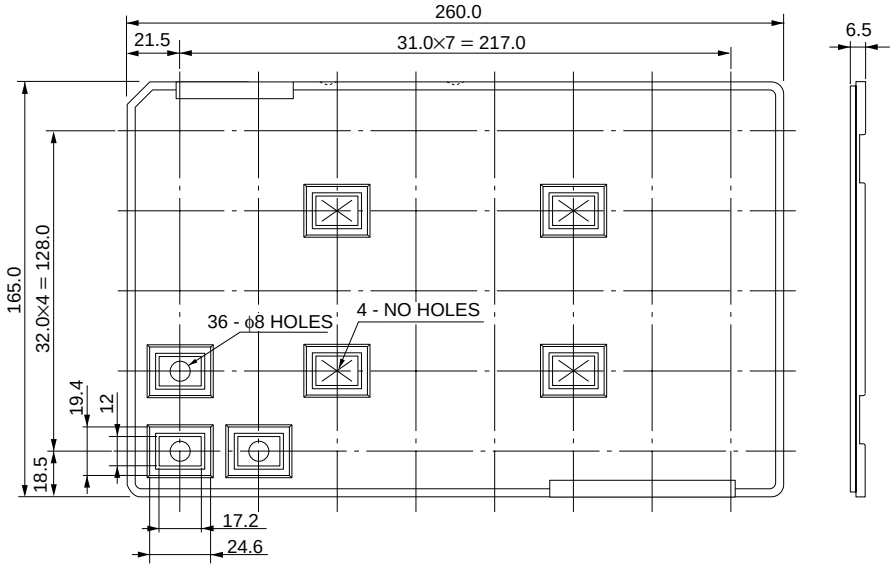
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-48C-A01	50	500	2000



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

QFP 64C, 80C, 100C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-64C-A01	40	400	1600
FPT-64C-A02	40	200	800
FPT-80C-A01	40	400	1600
FPT-80C-A02	40	200	800
FPT-100C-A01	40	400	1600
FPT-100C-A02	40	200	800



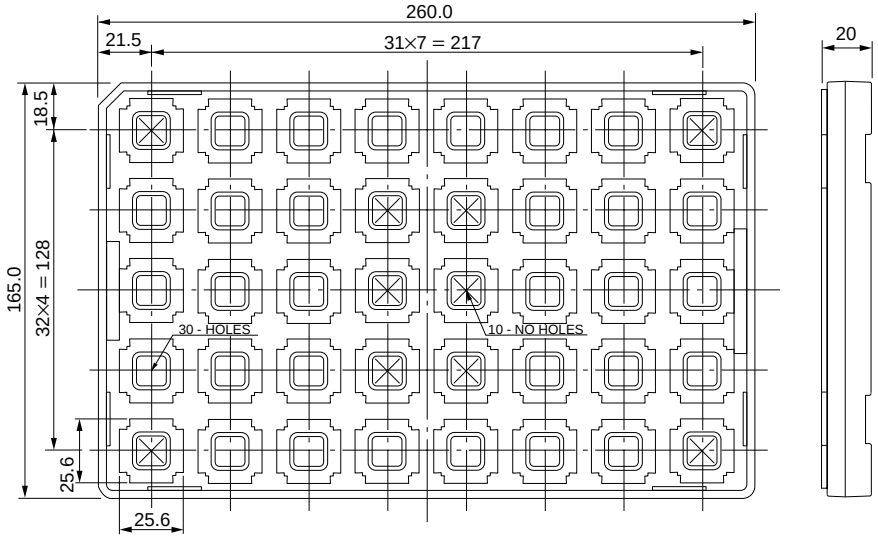
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 68C

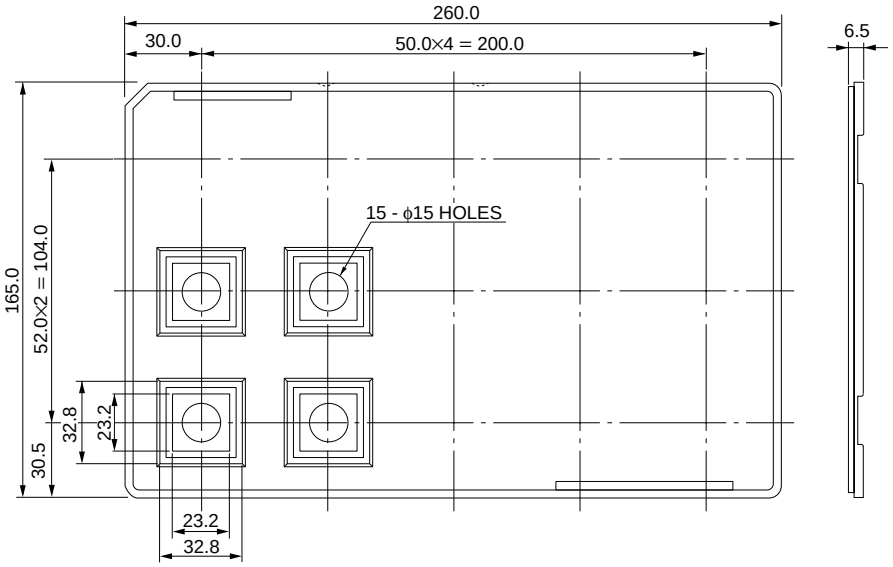
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-68C-A01	40	80	160
FPT-68C-A02	40	80	160



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

QFP 120C, 160C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-120C-A01	15	150	600
FPT-160C-A01	15	150	600



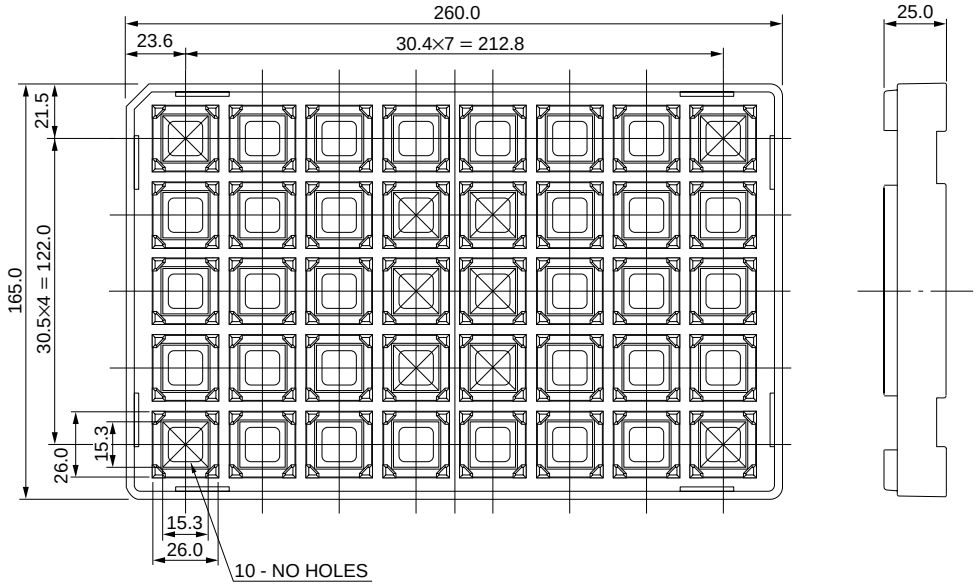
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 124C

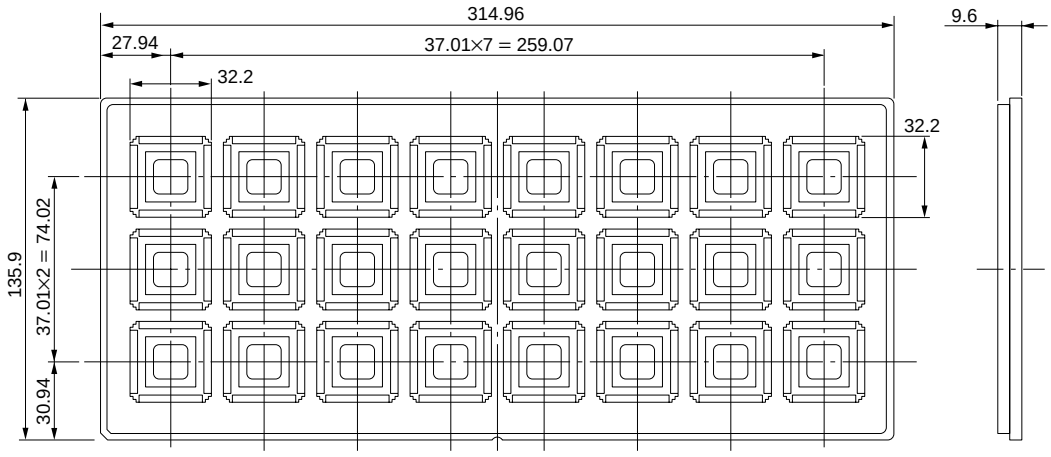
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-124C-A03	40	40	160



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

QFP 164C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-164C-A03	24	72	432
FPT-164C-A05	24	72	432



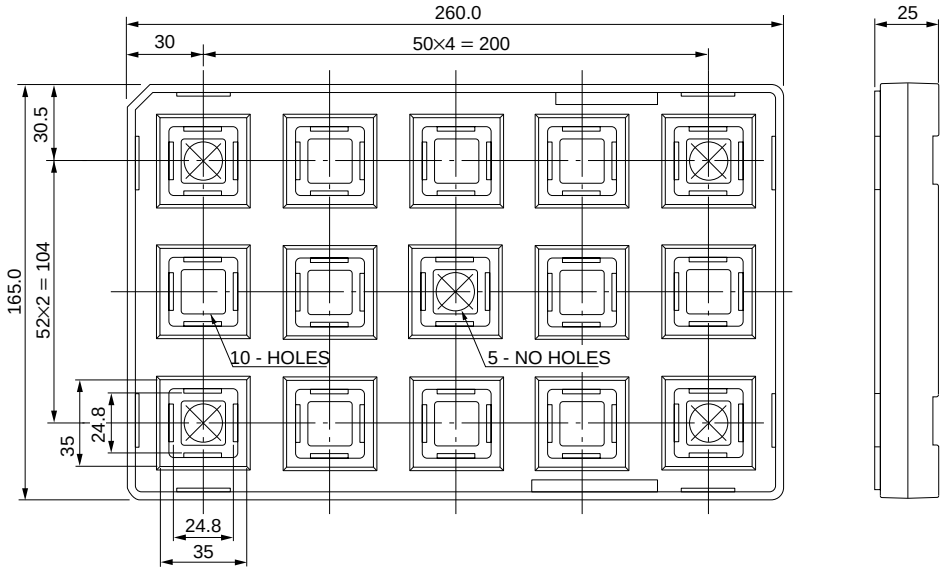
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 208C

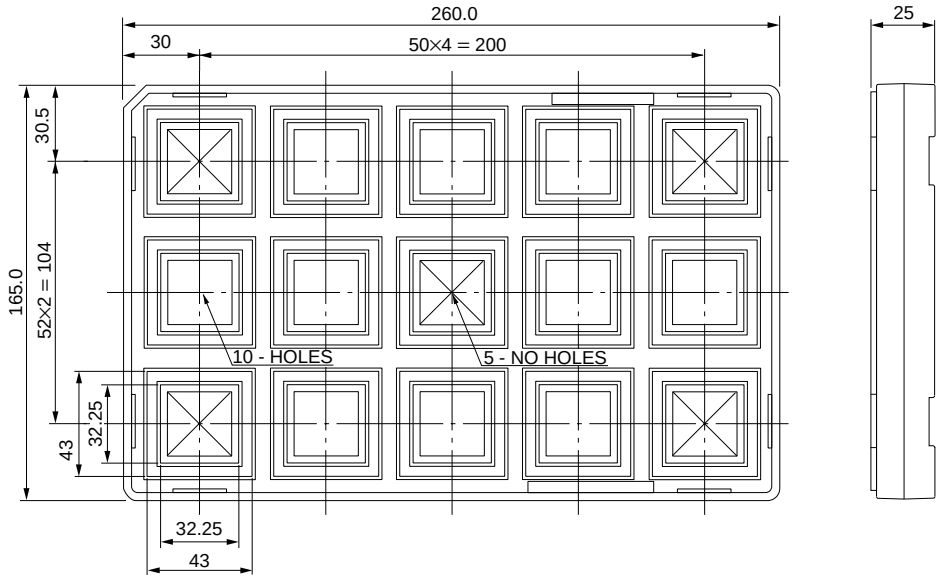
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-208C-A01	15	15	60



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

QFP 256C, 320C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-256C-A07	15	15	30
FPT-320C-A01	15	15	30



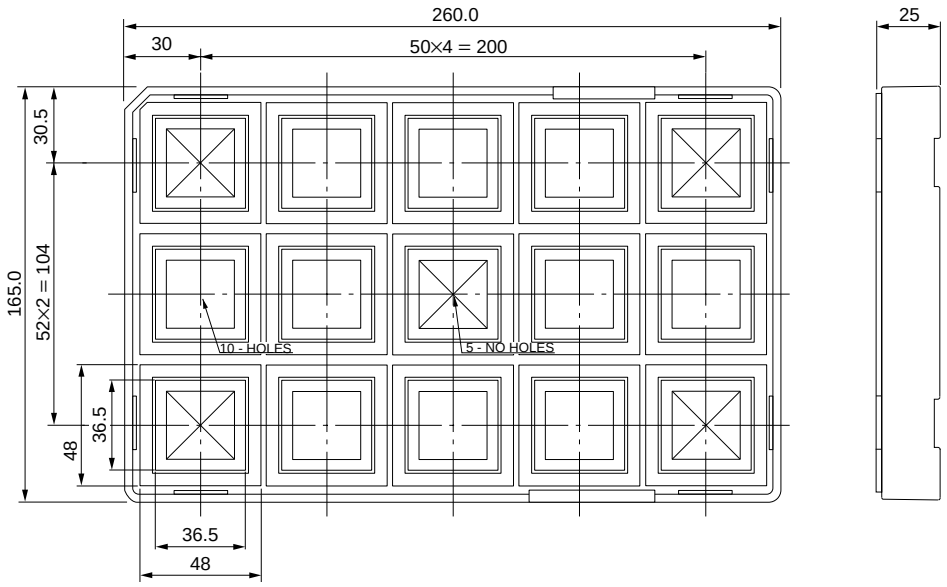
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 368C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-368C-A01	15	15	30



Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

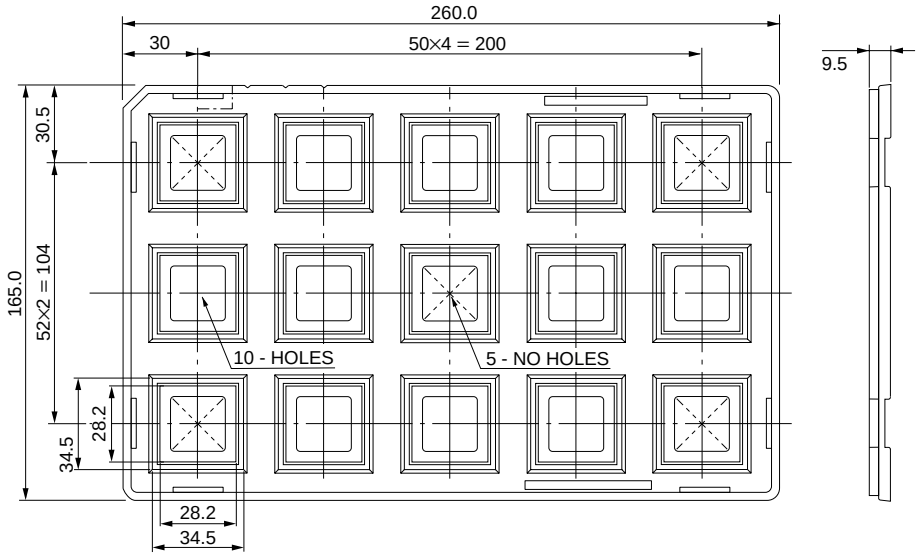
(Dimensions in mm)

Tray Dimensions

6.3.6 Ceramic QFP/Cerquad (non-heat proof type)

QFP 120C, 144C, 160C

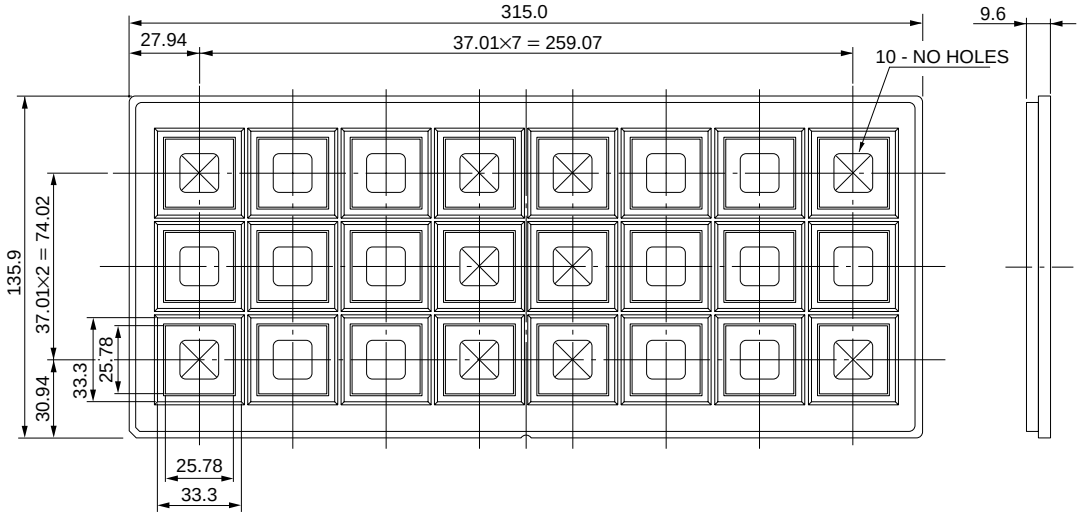
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-120C-C01	15	120	240
FPT-144C-C01	15	120	240
FPT-160C-C01	15	120	240
FPT-160C-C04	15	120	240
FPT-160C-C02	15	30	60



Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

QFP 164C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-164C-C01	24	72	288



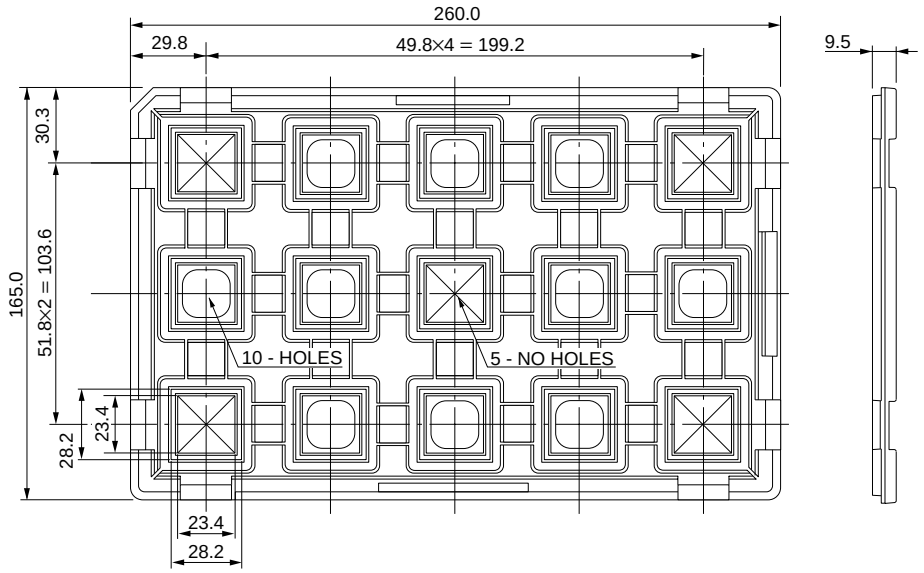
Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 176C

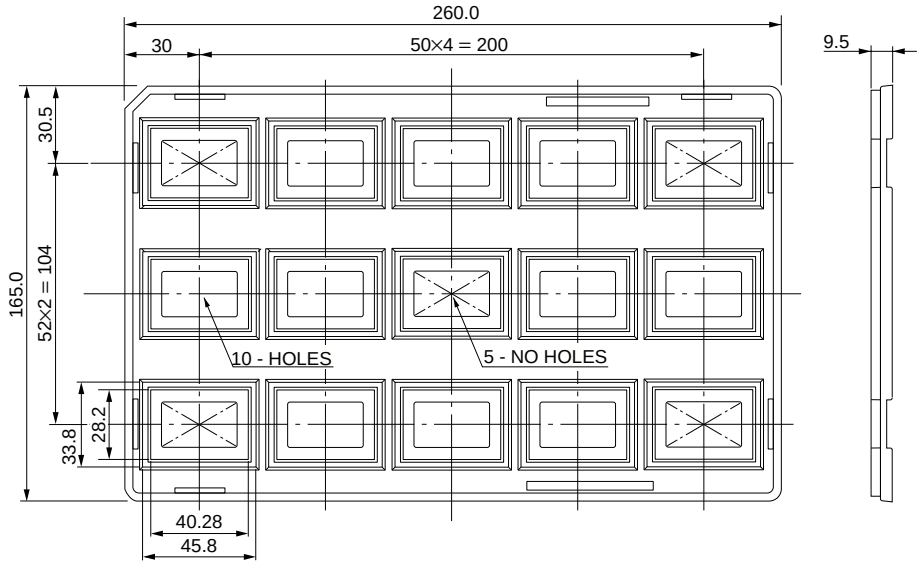
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-176C-C01	15	120	240



Material: Conductive polypropylene
Heat proof temperature: 50 °C MAX

QFP 196C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-196C-C01	15	120	240



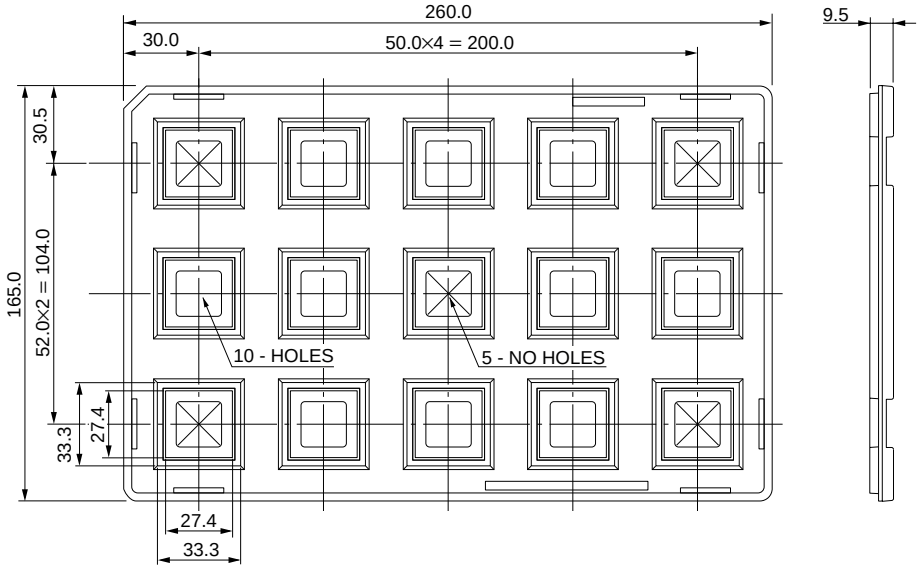
Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 208C

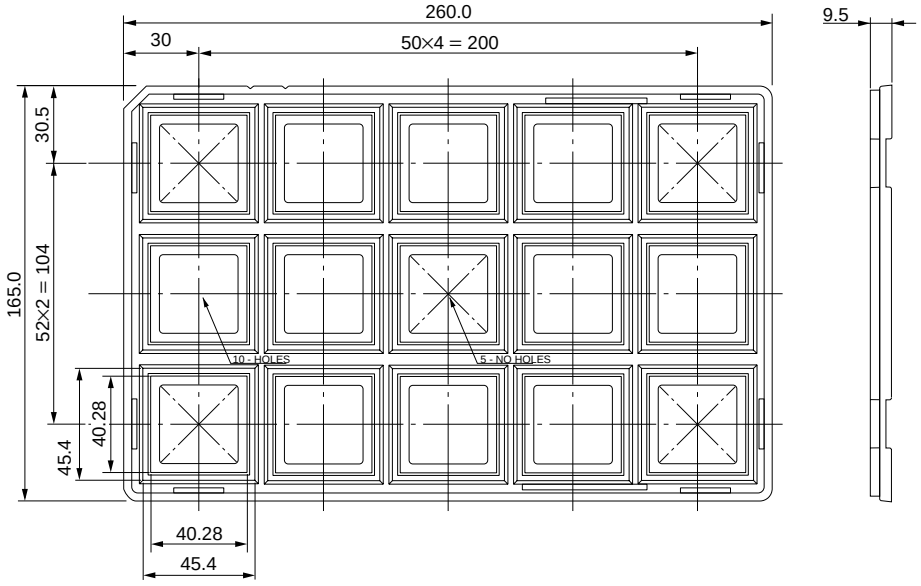
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-208C-C02	15	120	240
FPT-208C-C03	15	120	240
FPT-208C-C04	15	120	240



Material: Conductive polypropylene
Heat proof temperature: 50 °C MAX

QFP 232C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-232C-C01	15	120	240



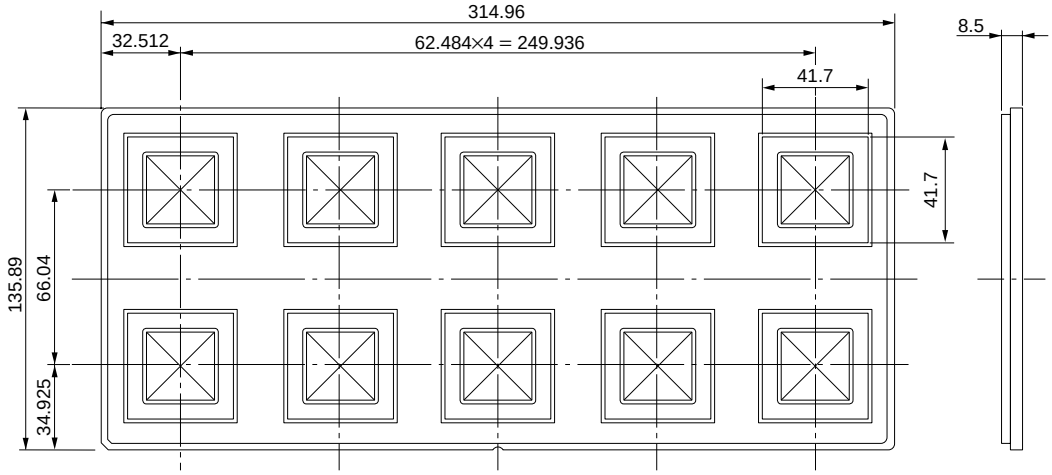
Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 240C

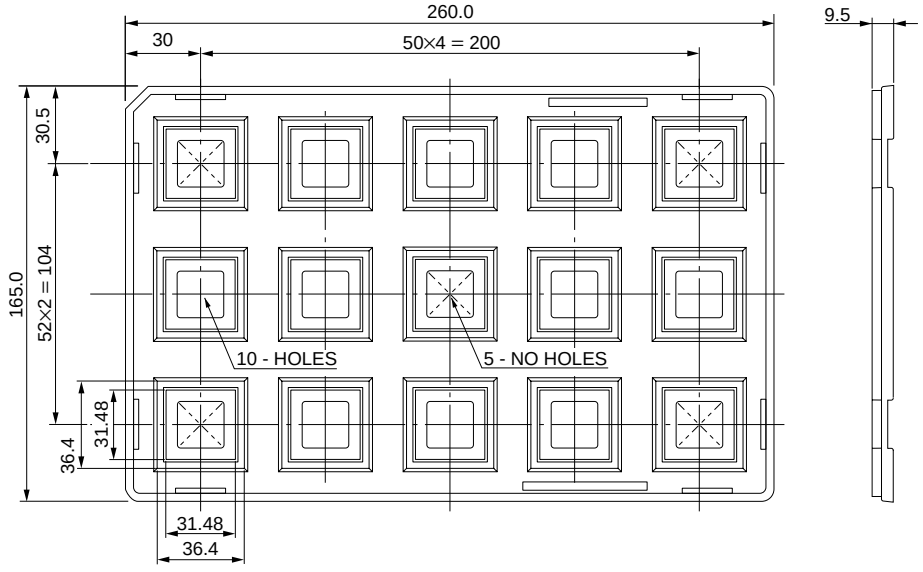
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-240C-A03	10	30	180
FPT-240C-A05	10	30	180



Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

QFP 240C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-240C-C01	15	120	240



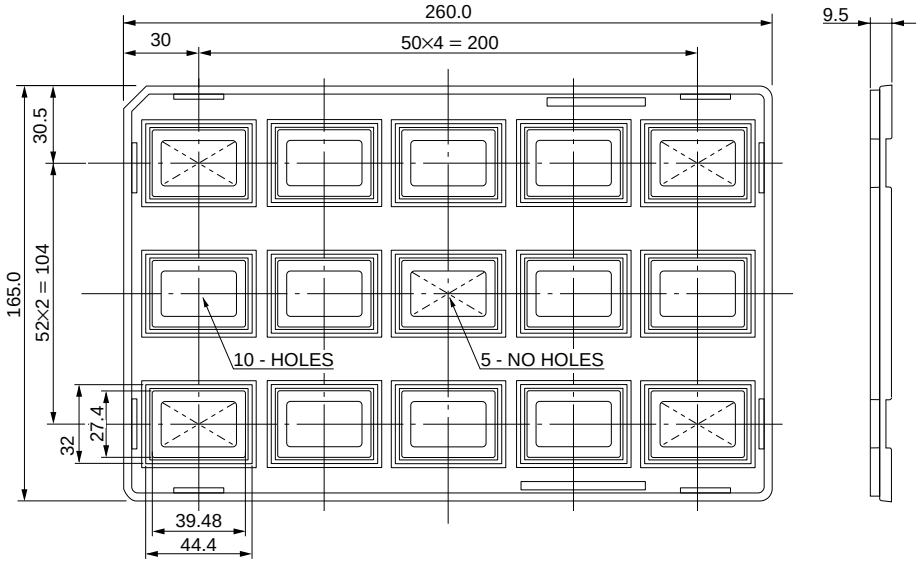
Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

QFP 256C

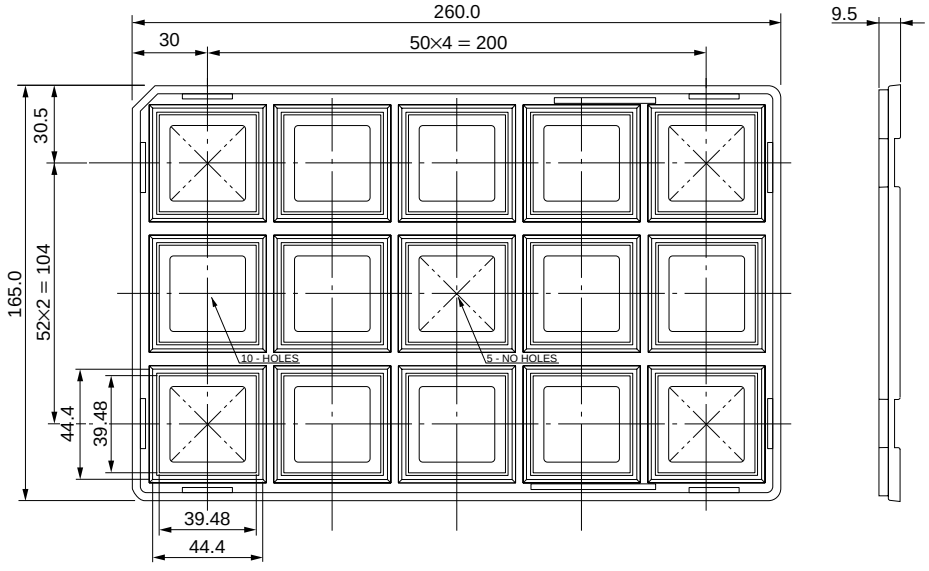
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-256C-C01	15	120	240
FPT-256C-C02	15	120	240
FPT-256C-C03	15	30	60



Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

QFP 304C, 368C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-304C-C01	15	120	240
FPT-304C-C02	15	120	240
FPT-368C-C01	15	120	240



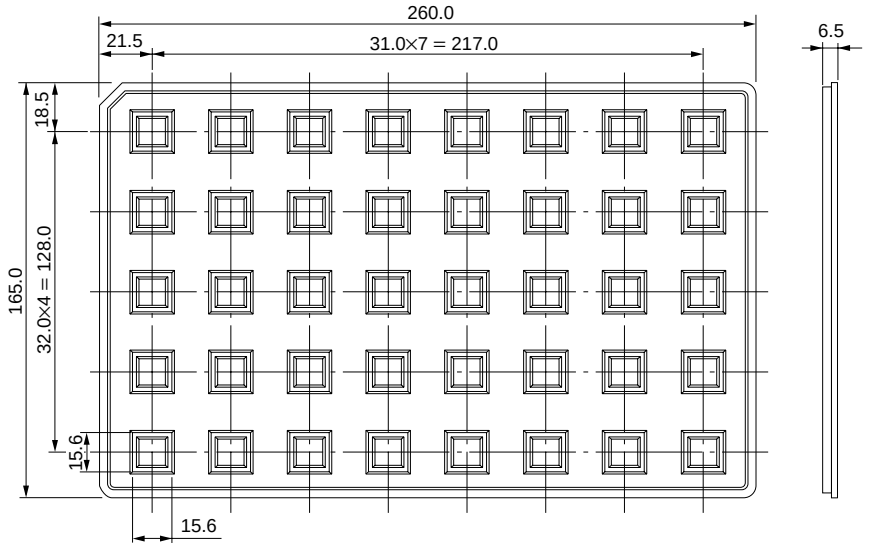
Material: Conductive polyphenylenether
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

LQFP 100C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
FPT-100C-C01	40	400	1600



Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

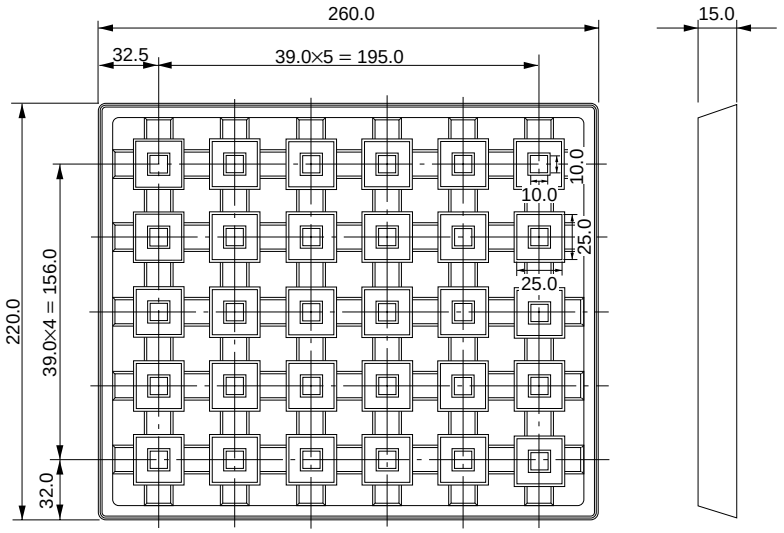
(Dimensions in mm)

Tray Dimensions

6.3.7 Ceramic PGA (non-heat proof type)

PGA 64C

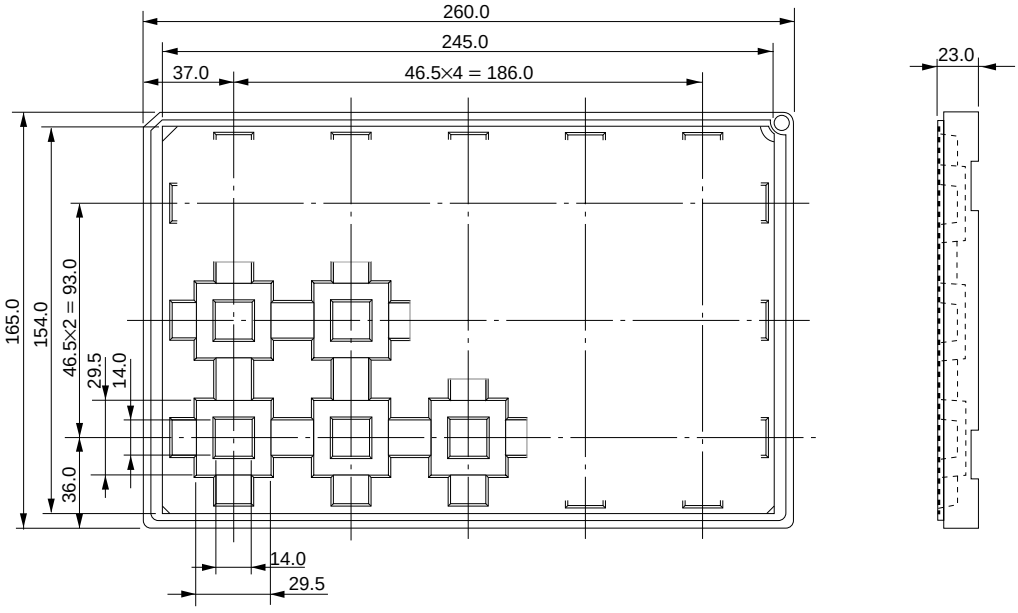
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-64C-A02	30	30	480



t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

PGA 68C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-68C-A01	15	30	120



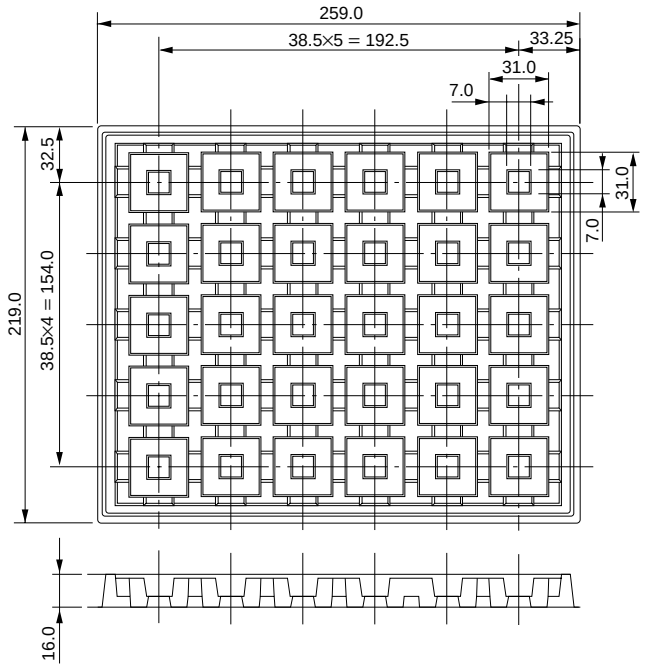
t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 80C, 88C

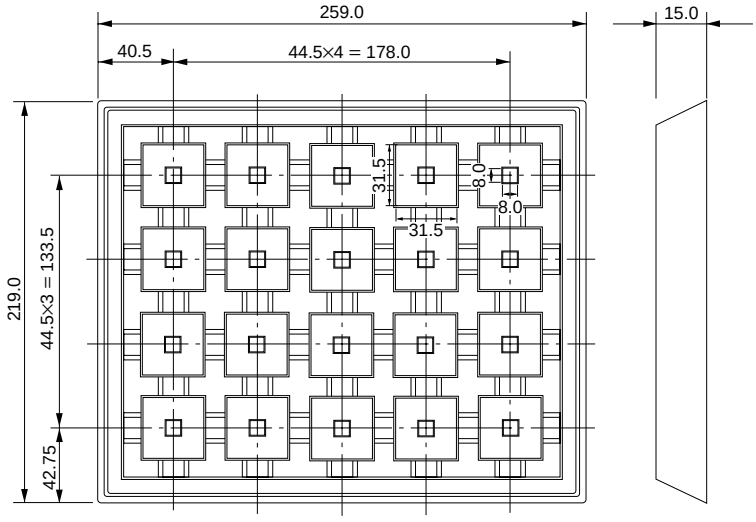
PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-80C-A01	20	20	320	PGA-88C-A06	20	20	320
PGA-88C-A05	20	20	320				



t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

PGA 88C, 107C

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-88C-A01	20	20	320	PGA-107C-A01	20	20	320
PGA-88C-A02	20	20	320	PGA-107C-A02	20	20	320



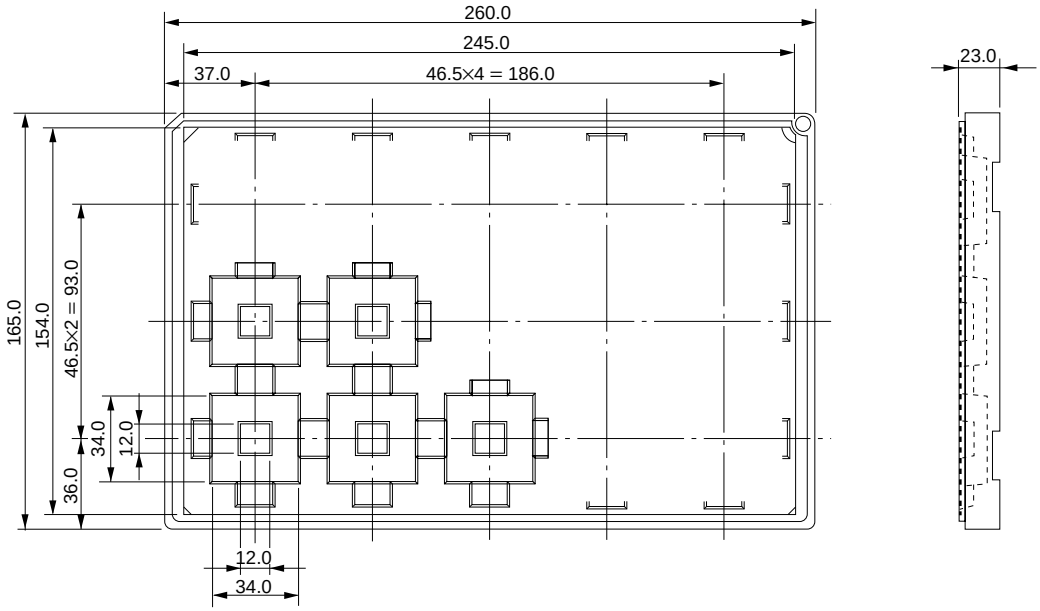
t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 121C (with fins)

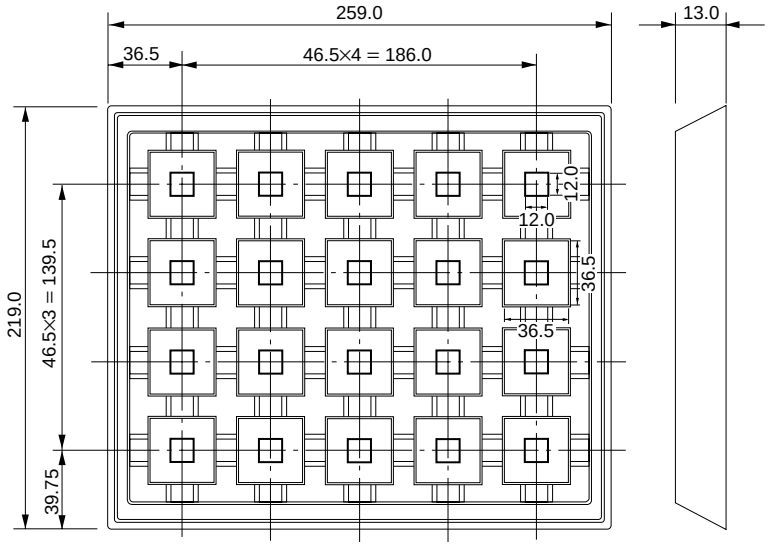
PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-121C-A01	15	30	120	PGA-121C-A02	15	30	120



t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

PGA 135C

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-135C-C02	20	20	320	PGA-135C-A02	20	20	320
PGA-135C-A01	20	20	320	PGA-135C-A06	20	20	320



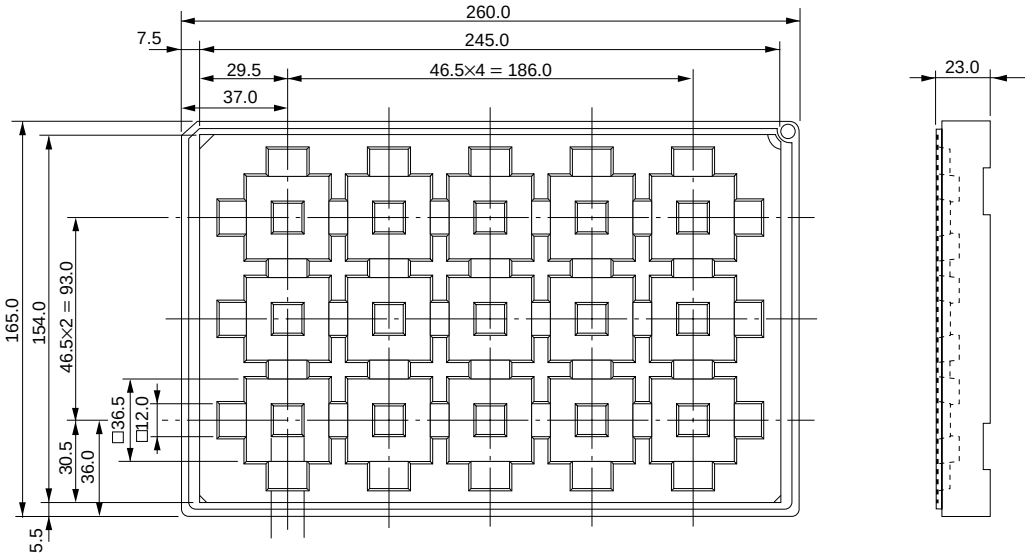
t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 135C

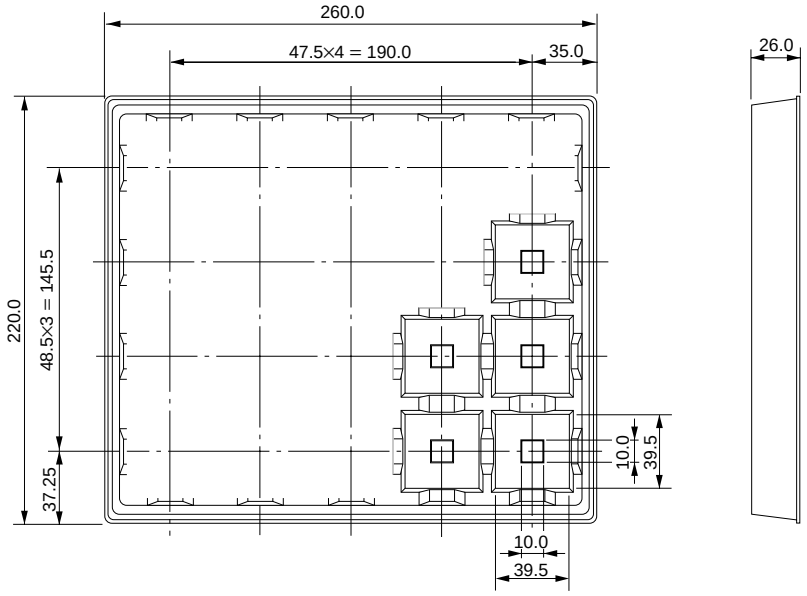
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-135C-A05	15	30	120



t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

PGA 149C (with fins)

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-149C-A02	20	40	160	PGA-149C-A09	20	40	160
PGA-149C-A03	20	40	160	PGA-149C-A06	20	40	160



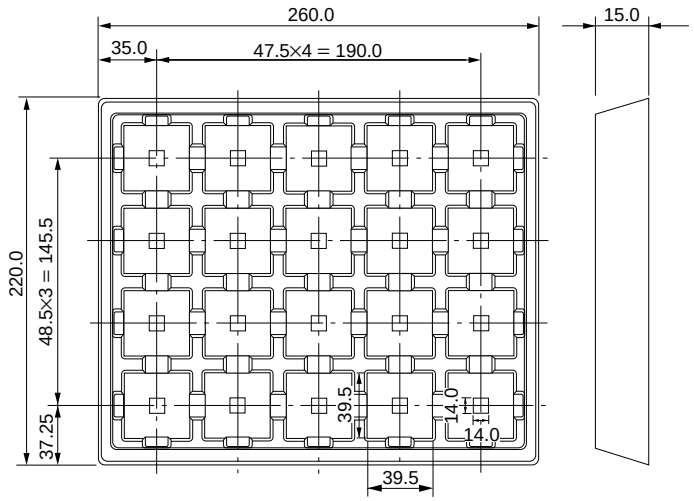
t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 179C

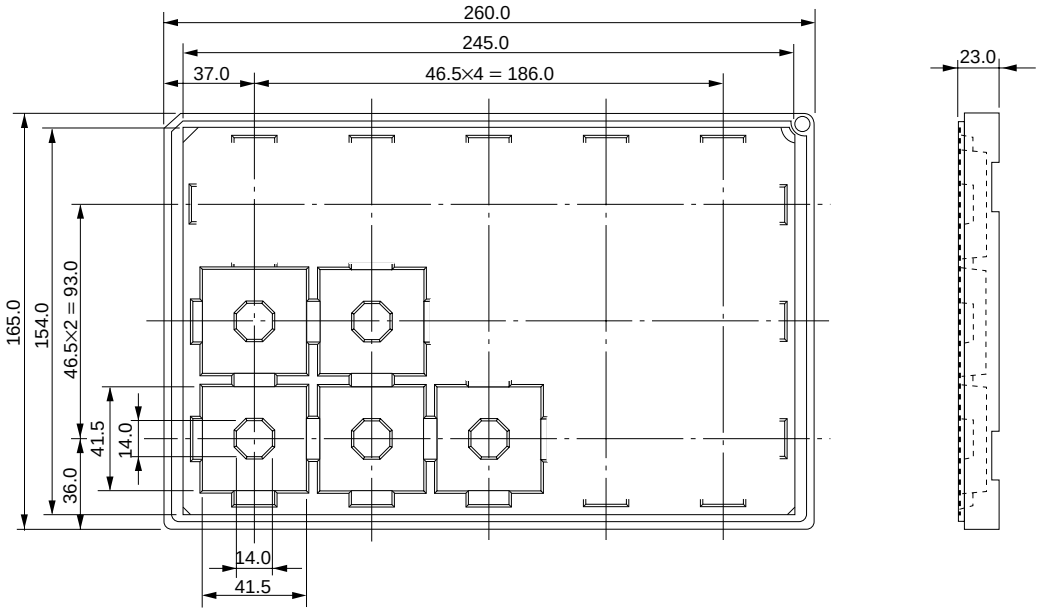
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-179C-A02	20	20	320
PGA-179C-A03	20	20	320



t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

PGA 179C (with fins) , 401C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-179C-A06	15	30	120
PGA-401C-A04	15	30	120



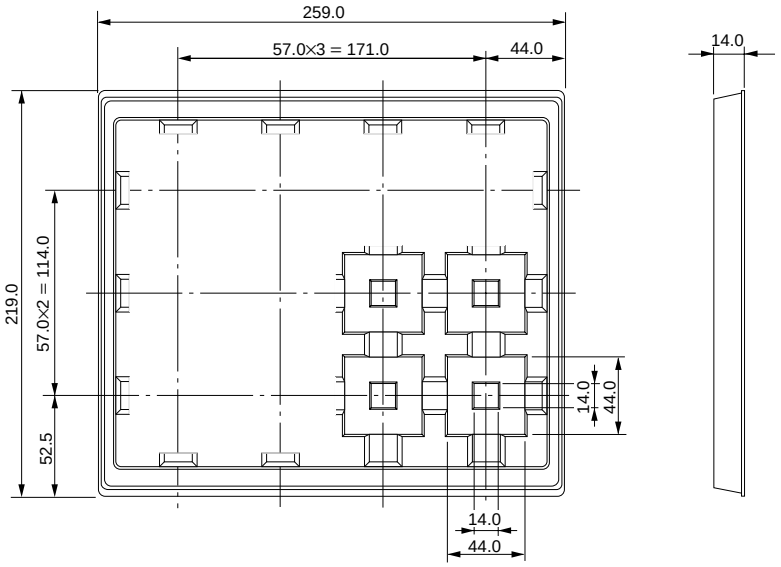
t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 208C

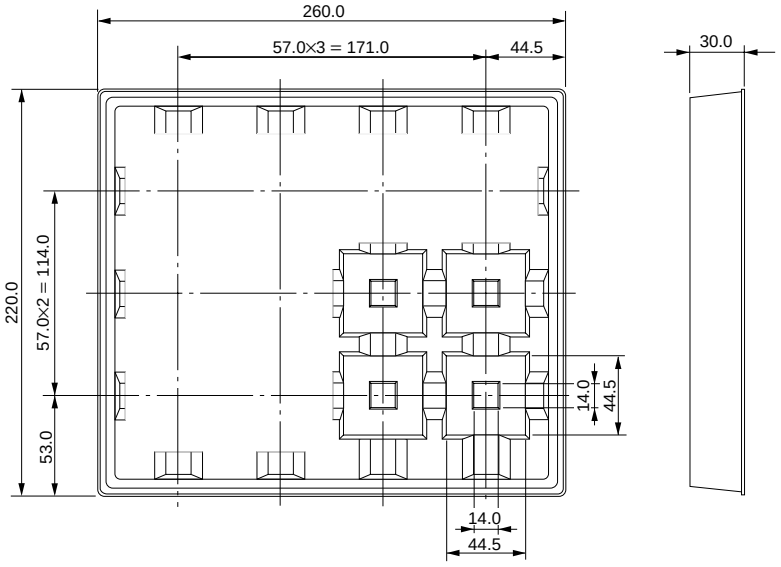
PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-208C-A02	12	12	192	PGA-211C-A01	12	12	192



t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

PGA 179C, 208C (with fins)

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
PGA-179C-A04	12	24	96	PGA-208C-A05	12	24	96
PGA-208C-A03	12	24	96	PGA-208C-A06	12	24	96
PGA-208C-A04	12	24	96	PGA-208C-A07	12	24	96



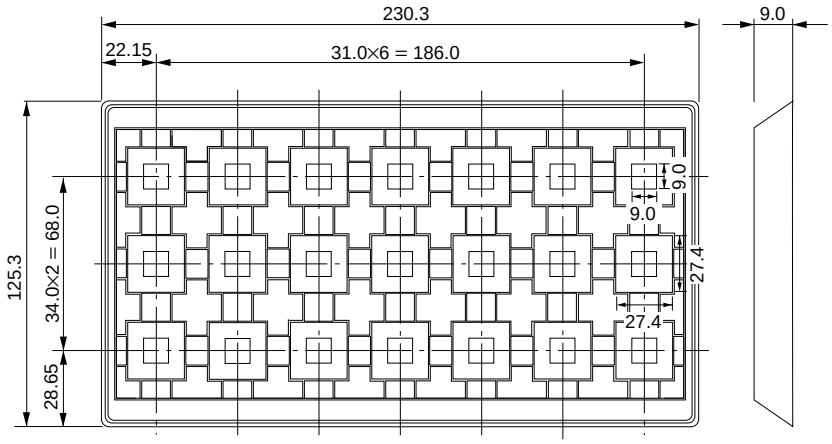
t = 1.0
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

50mil PGA 256C

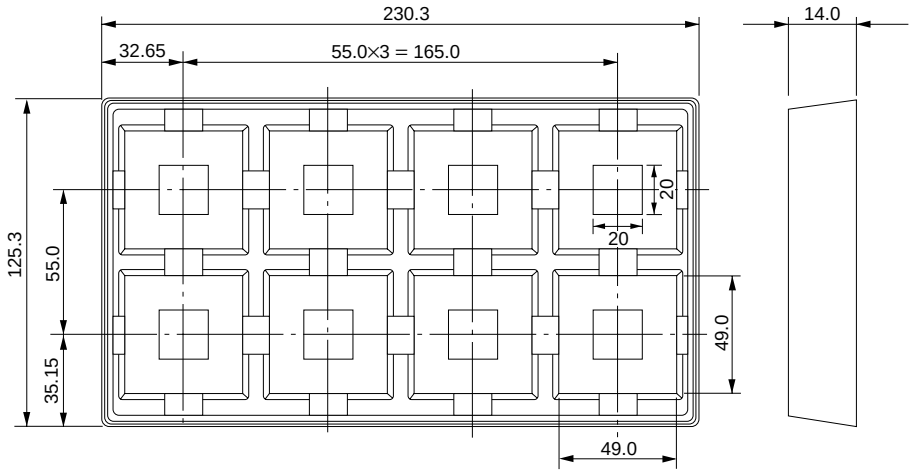
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-256C-A01	21	21	336



t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

100mil PGA 256C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-256C-A02	8	8	64
PGA-256C-A03	8	8	64
PGA-256C-A04	8	8	64
PGA-256C-A05	8	8	64
PGA-256C-A07	8	8	64



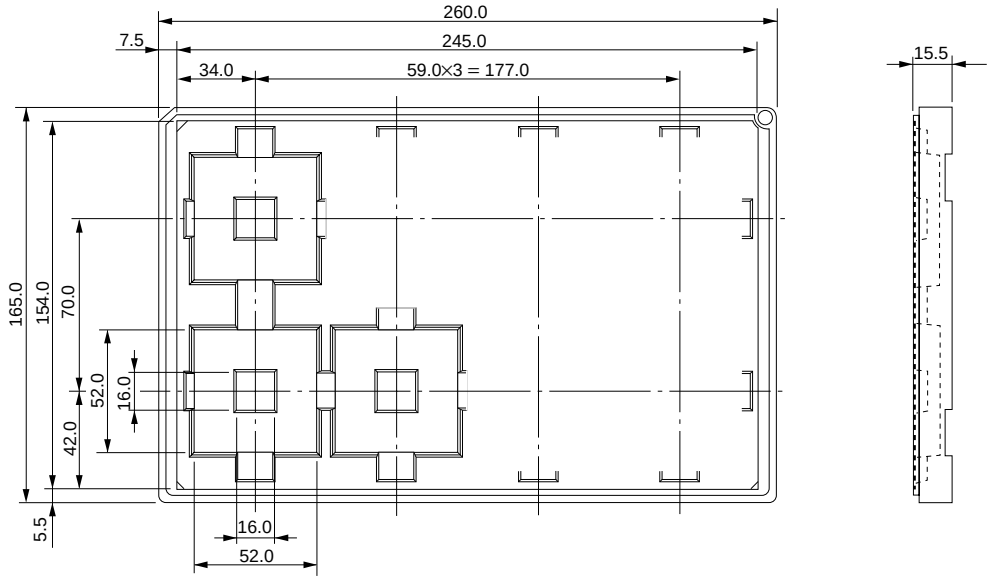
t = 0.5
Material: Conductive polyvinyl chloride
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 299C

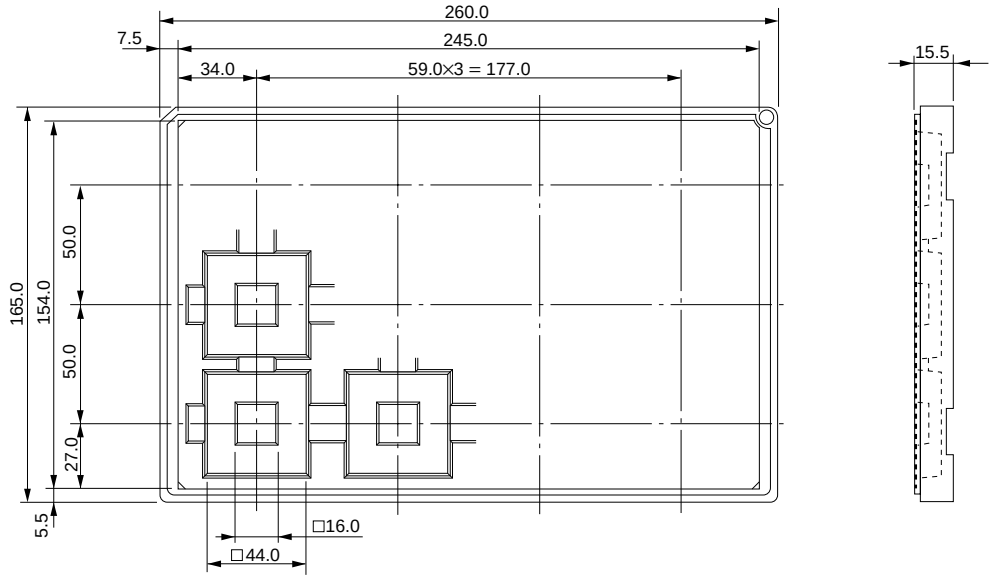
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-299C-A01	8	24	96
PGA-299C-A02	8	24	96



t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

PGA 321C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-321C-A02	12	36	144



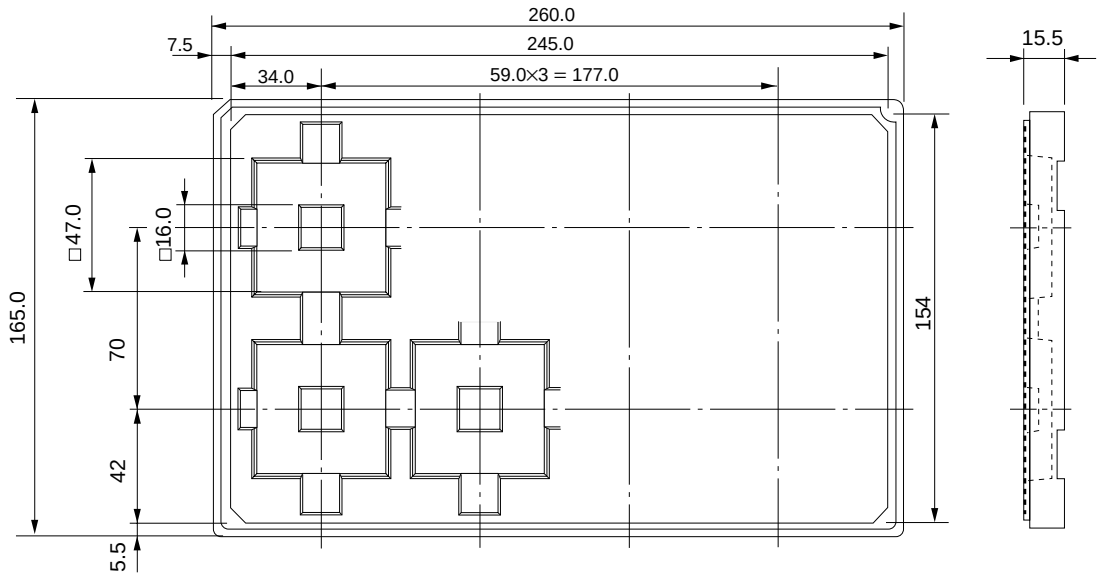
t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 361C

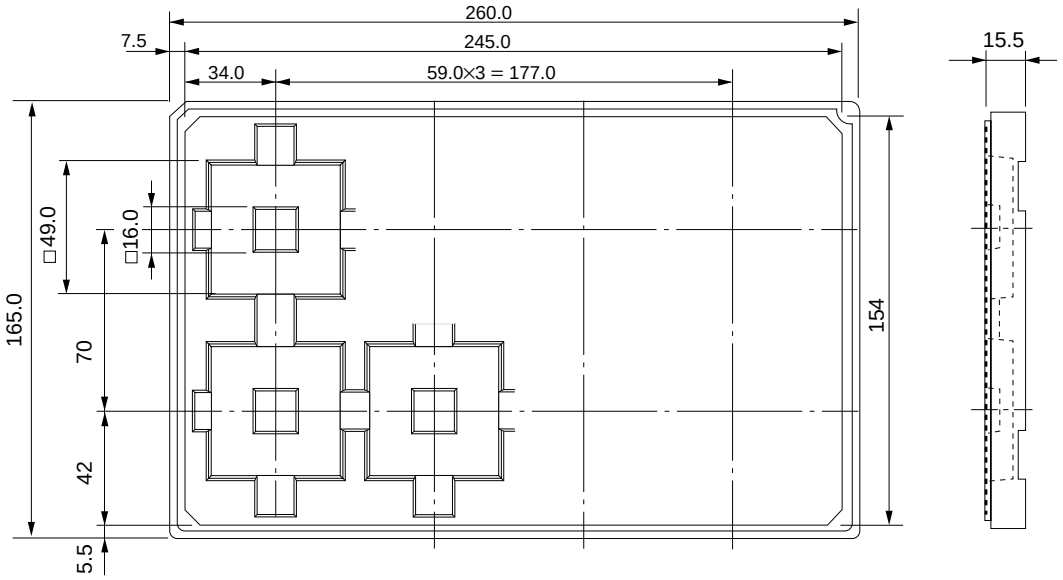
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-361C-A01	8	24	96



t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

PGA 401C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-401C-A02	8	24	96



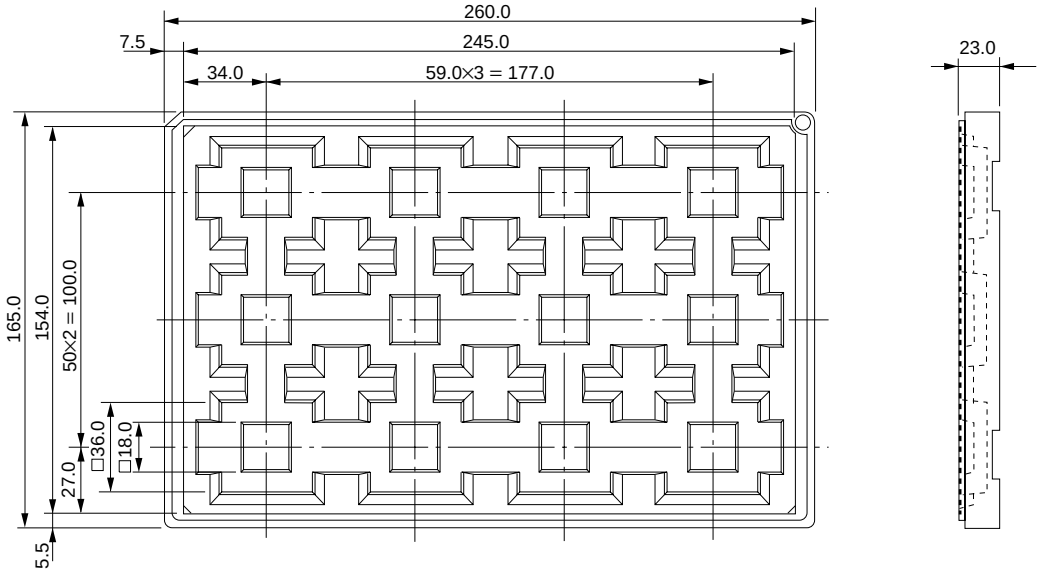
t = 0.5
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

PGA 441C (with fins)

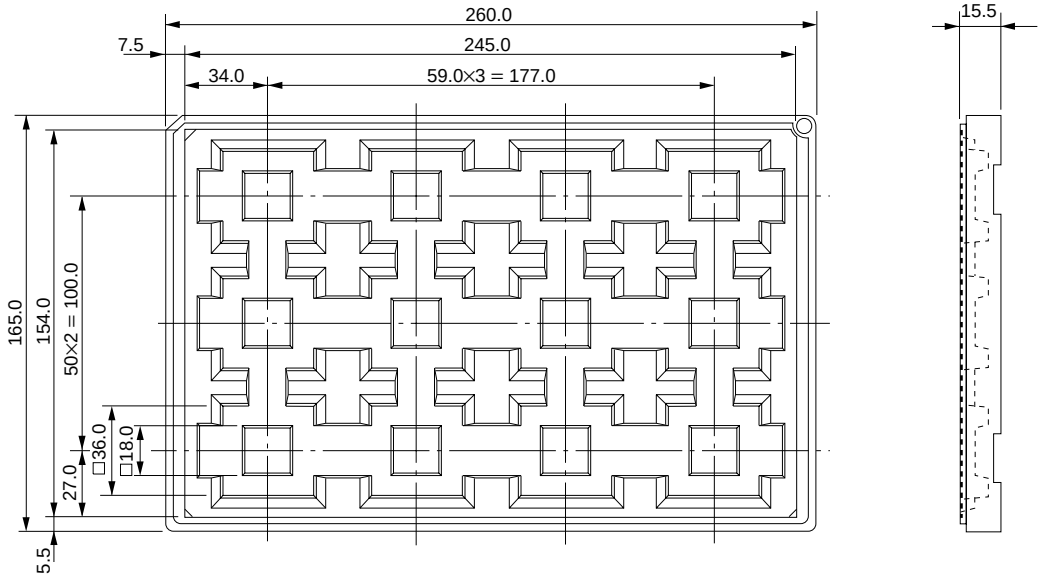
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-441C-A01	12	24	96
PGA-441C-A03	12	24	96



t = 1.0
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

PGA 441C

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
PGA-441C-A06	12	36	144



t = 1.0
Material: Conductive polyvinyl chloride
Conductive polystyrene (outer tray)
Heat proof temperature: 50 °C MAX

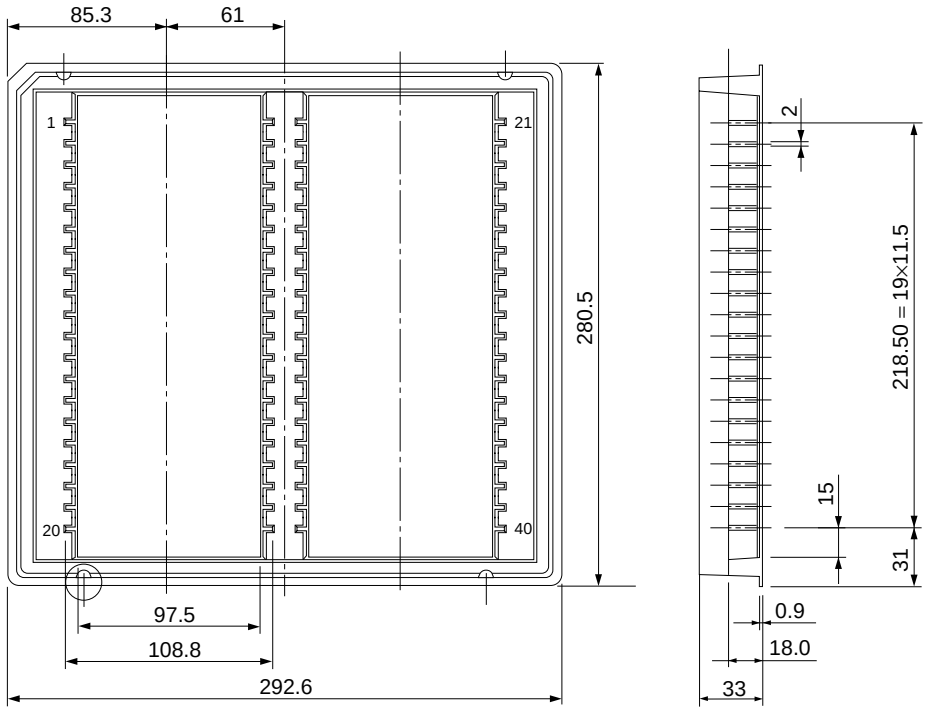
(Dimensions in mm)

Tray Dimensions

6.3.8 Module (non-heat proof type)

MODULE

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
MSS-72P-P11	40	80	320
MSS-72P-P23	40	80	320
MSS-72P-P24	40	80	320
MSS-72P-P27	40	80	320
MSS-72P-P29	40	80	320
MSS-72P-P39	40	80	320
MSS-72P-P48	40	80	320
MSS-72P-P49	40	80	320



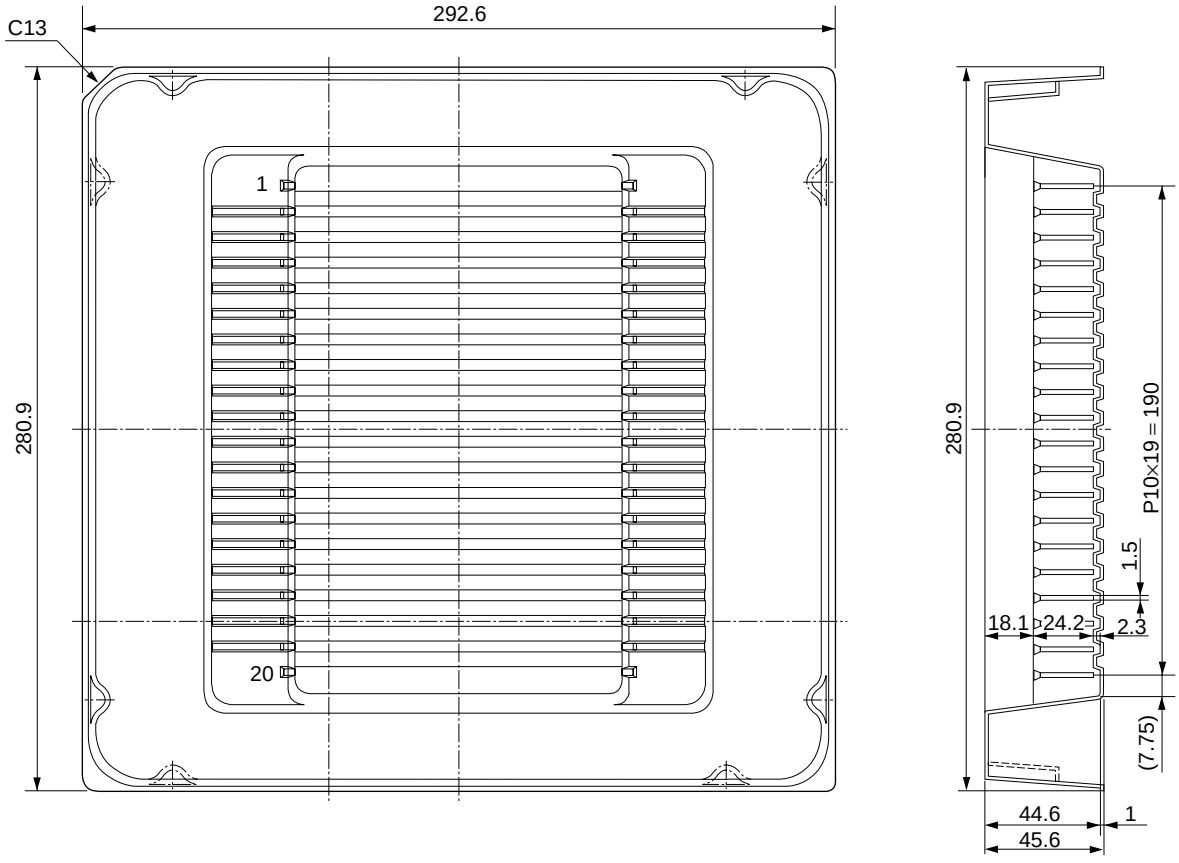
t = 0.9
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

(Dimensions in mm)

Tray Dimensions

MODULE

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
MDS-168P-P04	20	20	80	MDS-168P-P20	20	20	80
MDS-168P-P05	20	20	80	MDS-168P-P21	20	20	80
MDS-168P-P06	20	20	80	MDS-168P-P22	20	20	80
MDS-168P-P07	20	20	80	MDS-168P-P23	20	20	80
MDS-168P-P08	20	20	80	MDS-168P-P24	20	20	80
MDS-168P-P09	20	20	80	MDS-168P-P25	20	20	80
MDS-168P-P10	20	20	80	MDS-168P-P26	20	20	80
MDS-168P-P11	20	20	80	MDS-168P-P27	20	20	80
MDS-168P-P12	20	20	80	MDS-168P-P36	20	20	80
MDS-168P-P13	20	20	80	MDS-168P-P37	20	20	80
MDS-168P-P14	20	20	80	MDS-168P-P38	20	20	80
MDS-168P-P16	20	20	80	MDS-168P-P39	20	20	80
MDS-168P-P17	20	20	80	MDS-168P-P40	20	20	80
MDS-168P-P18	20	20	80	MDS-168P-P41	20	20	80
MDS-168P-P19	20	20	80				



t = 1.0
Material: Conductive polystyrene
Heat proof temperature: 50 °C MAX

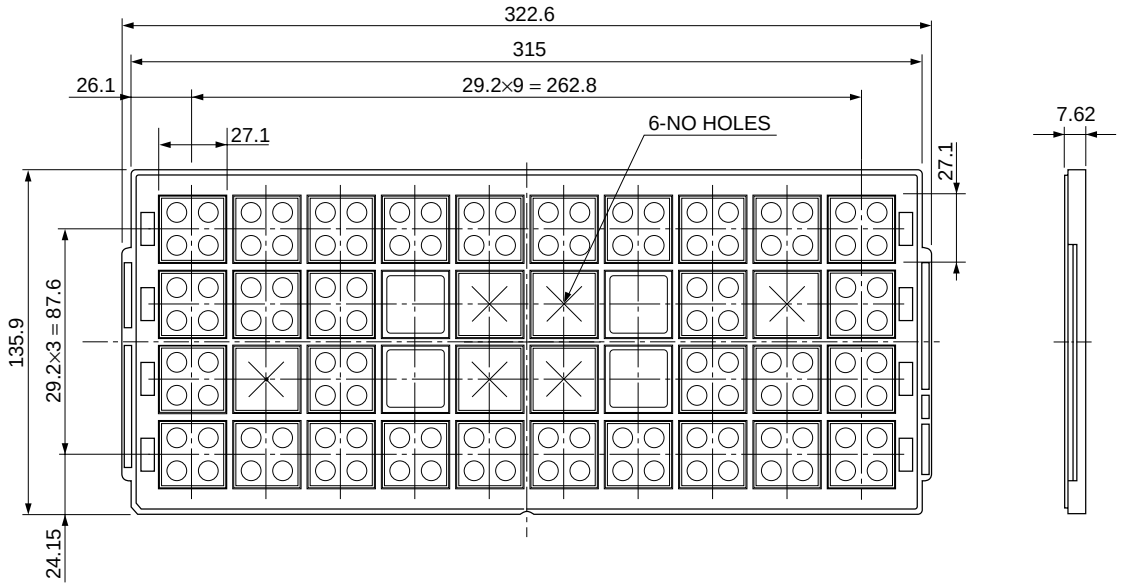
(Dimensions in mm)

Tray Dimensions

6.3.9 BGA, T-BGA, FBGA (heat proof type)

BGA 256,
T-BGA 256

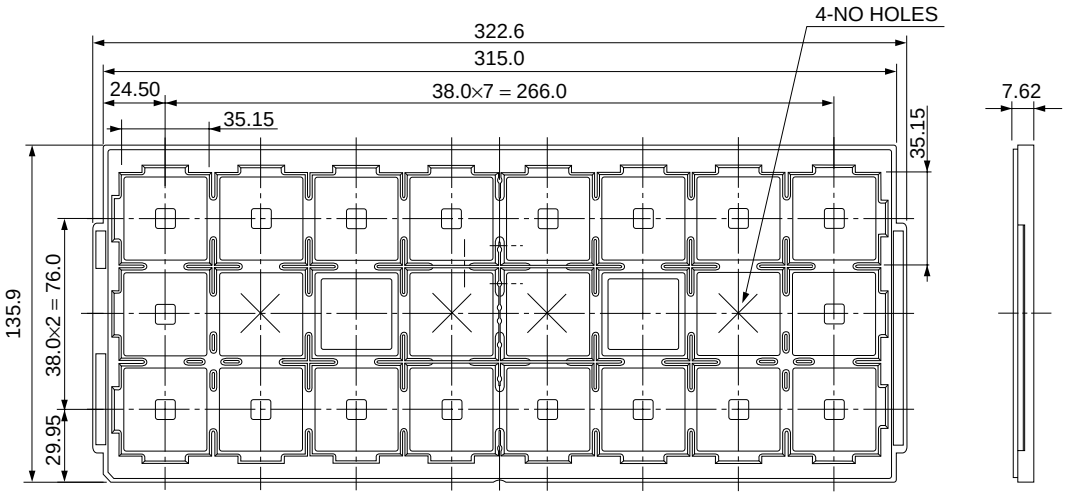
PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
BGA-256P-M01	40	400	2400	BGA-256P-M04	40	400	2400
BGA-256P-M02	40	400	2400				



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

BGA 352, 420, 560

PKG code	Maximum strage capacity			PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box		pcs/tray	pcs/inner box	pcs/outer box
BGA-352P-M01	24	120	720	BGA-420P-M01	24	240	1440
BGA-352P-M02	24	240	1440	BGA-420P-M02	24	240	1440
BGA-352P-M03	24	240	1440	BGA-420P-M03	24	120	720
BGA-352P-M04	24	120	720	BGA-560P-M01	24	240	1440
BGA-352P-M05	24	120	720				



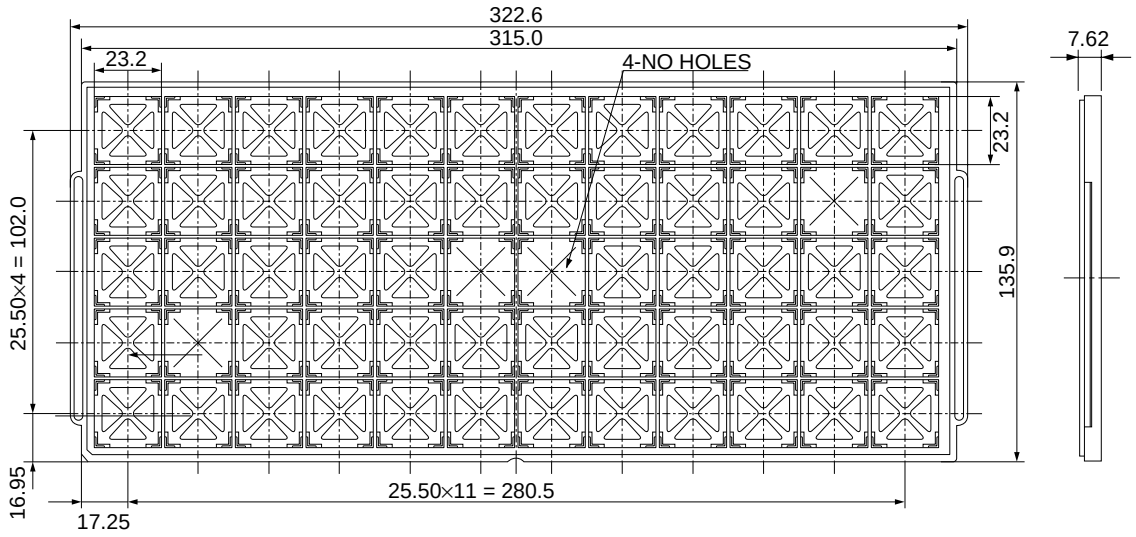
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

BGA 352

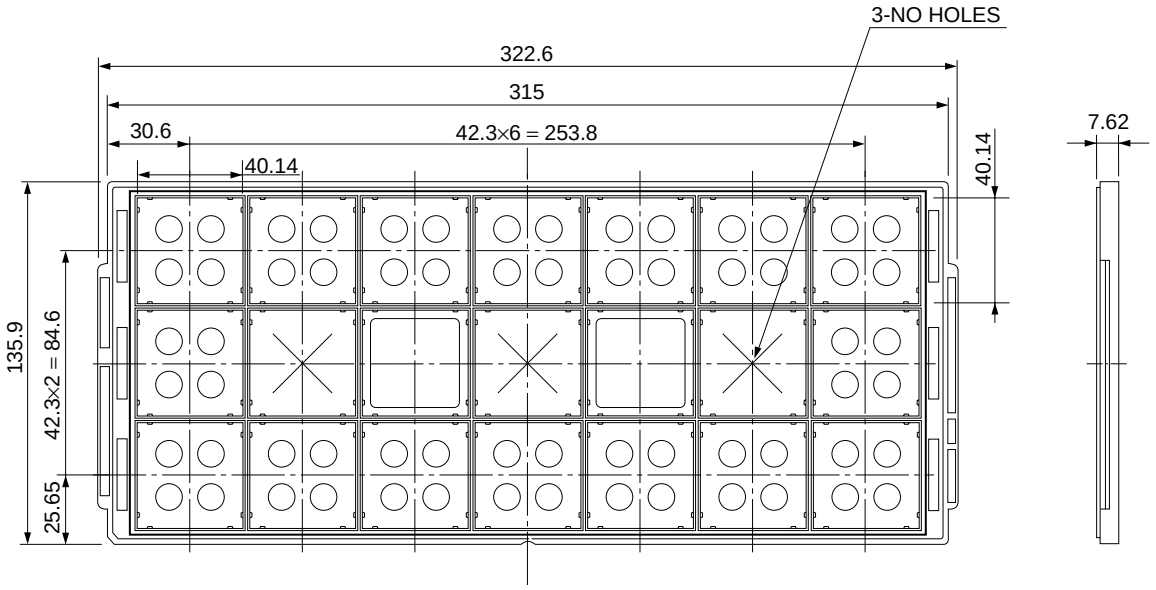
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-352P-M08	60	600	3600



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

BGA 416, 576

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-416P-M02	21	105	630
BGA-576P-M01	21	105	630



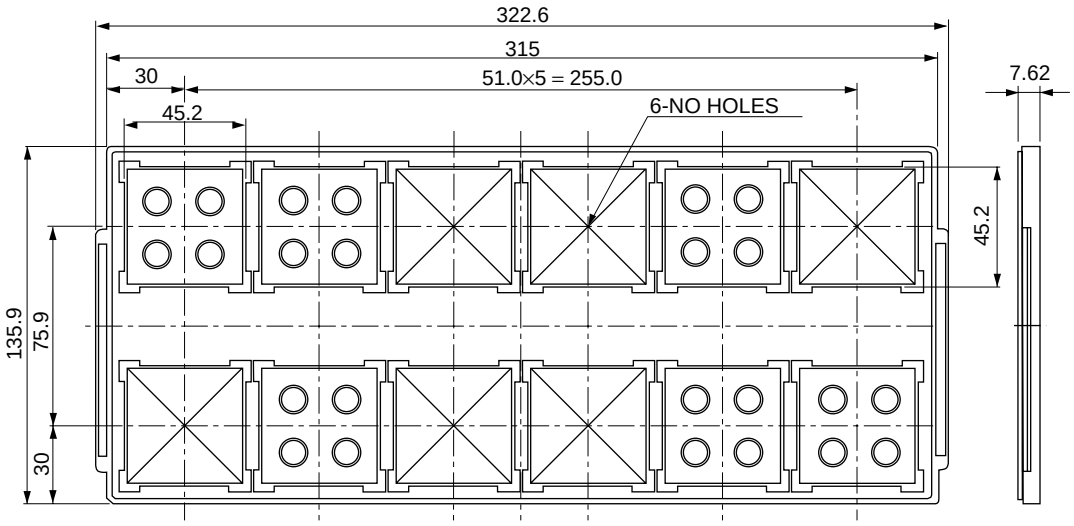
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

BGA 672

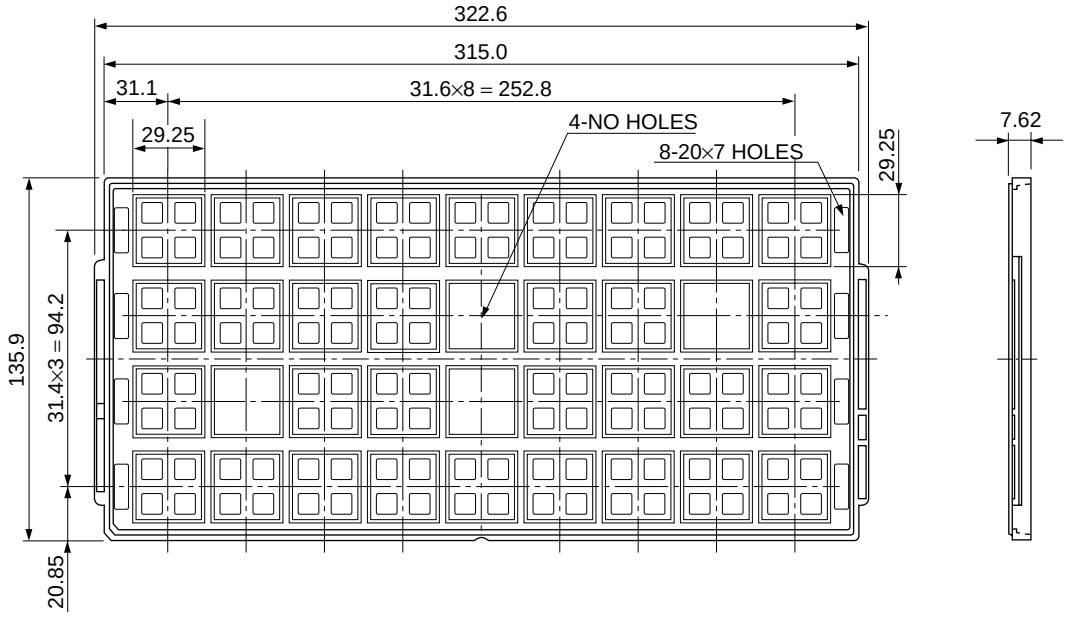
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-672P-M01	12	60	360



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

T-BGA 272

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-272P-M01	36	360	2160



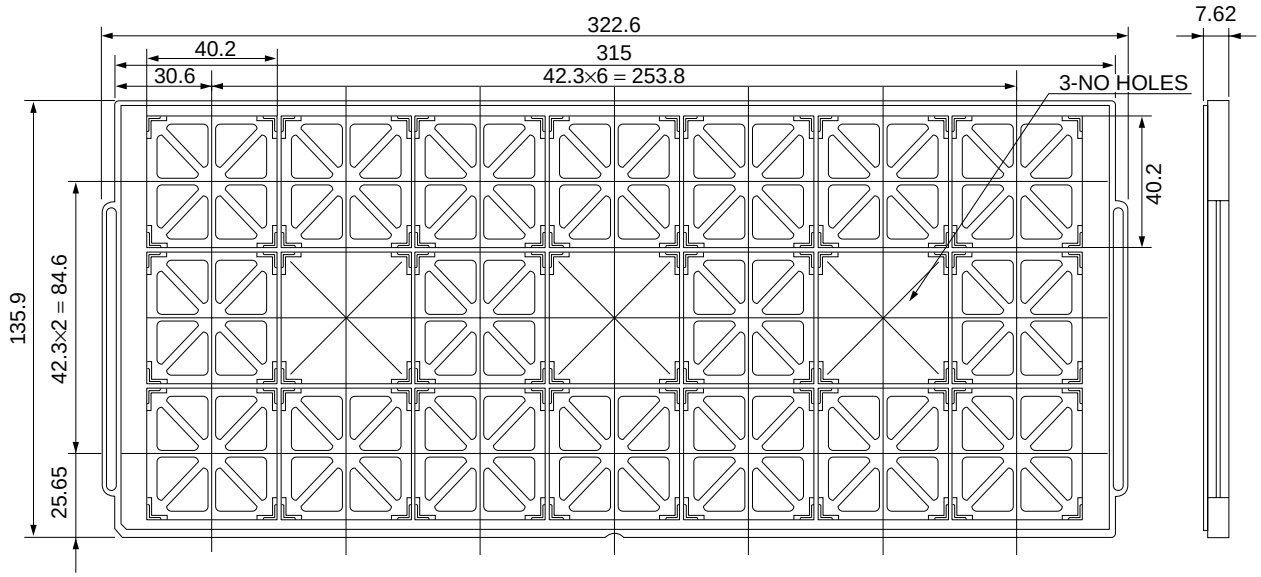
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

T-BGA 720

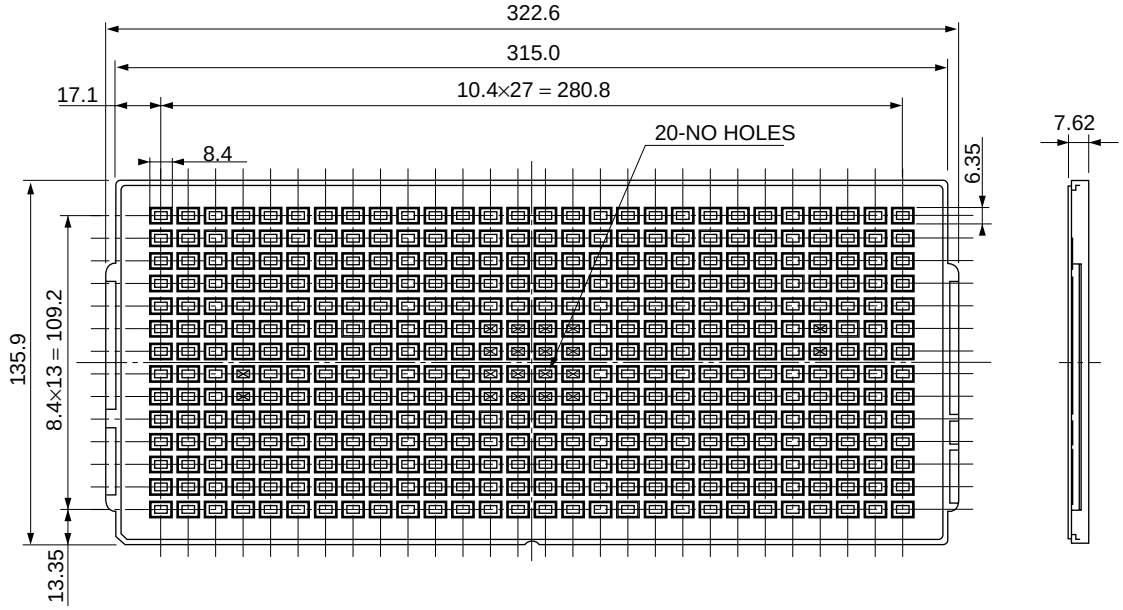
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-720P-M01	21	210	1260



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 48

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-48P-M01	392	3920	23520
BGA-48P-M11	392	3920	23520



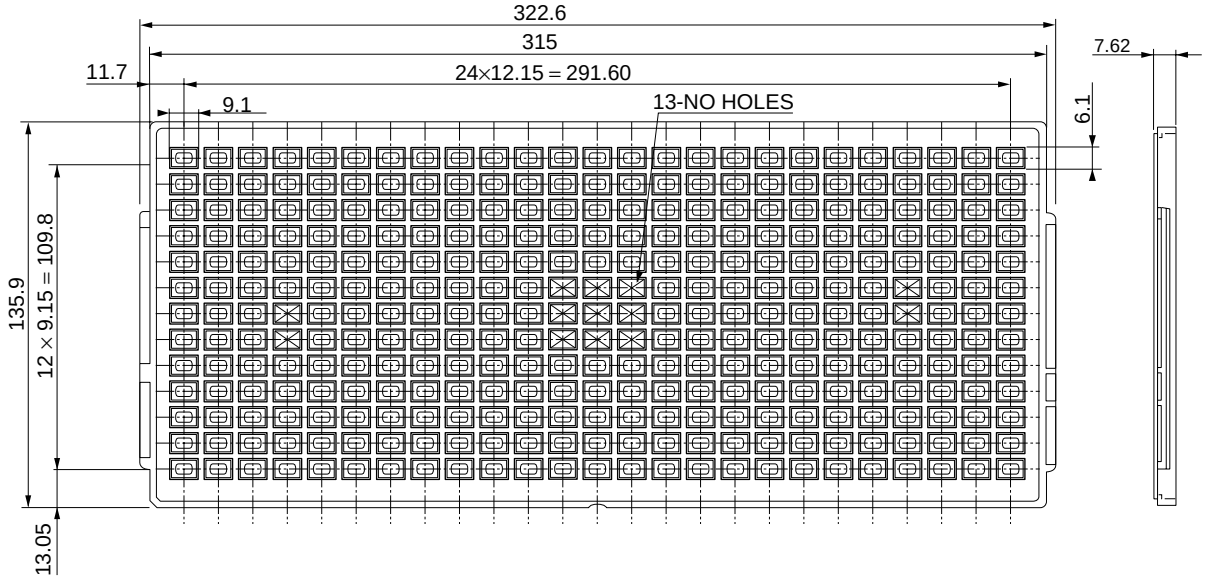
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 48

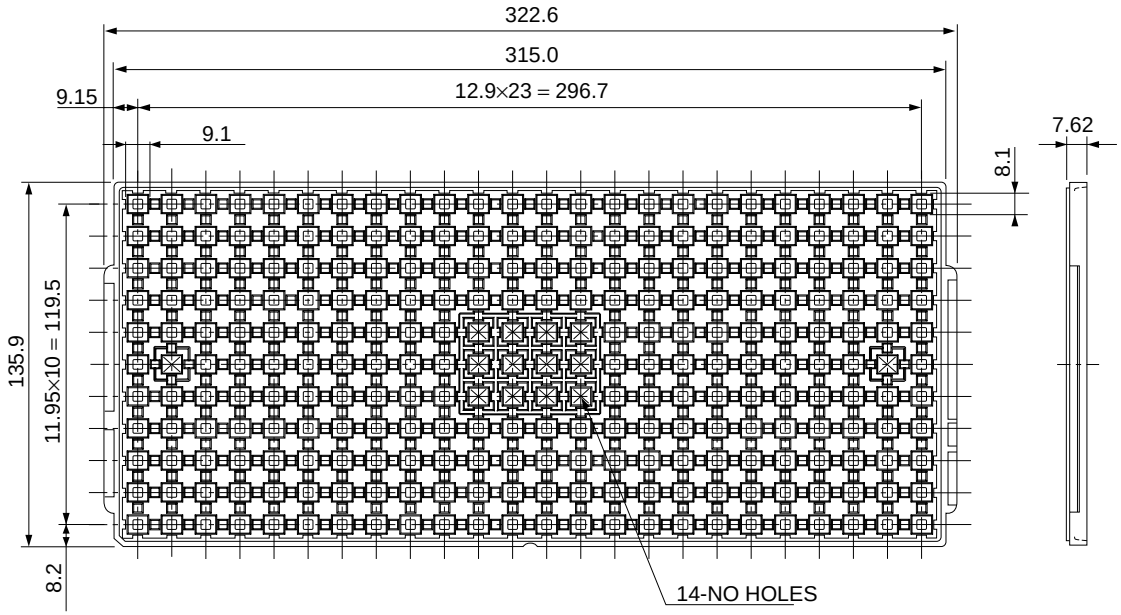
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-48-M02	325	3250	19500
BGA-48-M12	325	3250	19500



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 48

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-48P-M03	264	2640	15840
BGA-48P-M13	264	2640	15840



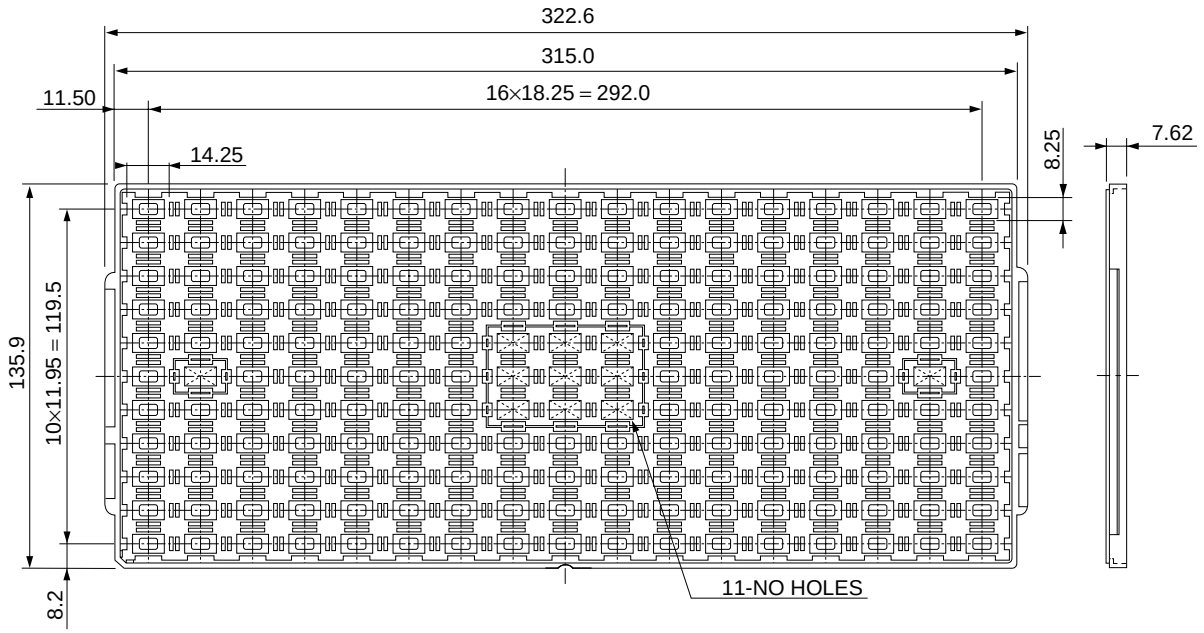
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 57

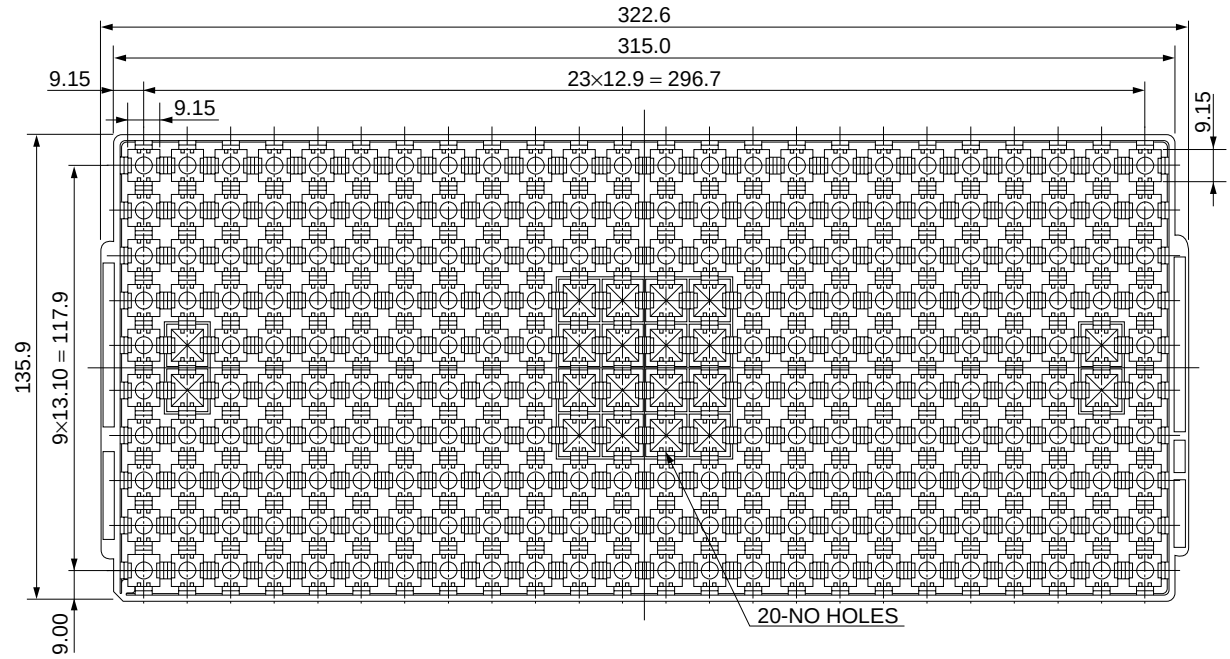
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-57P-M01	187	1870	11220



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 61

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-61P-M02	240	2400	14400



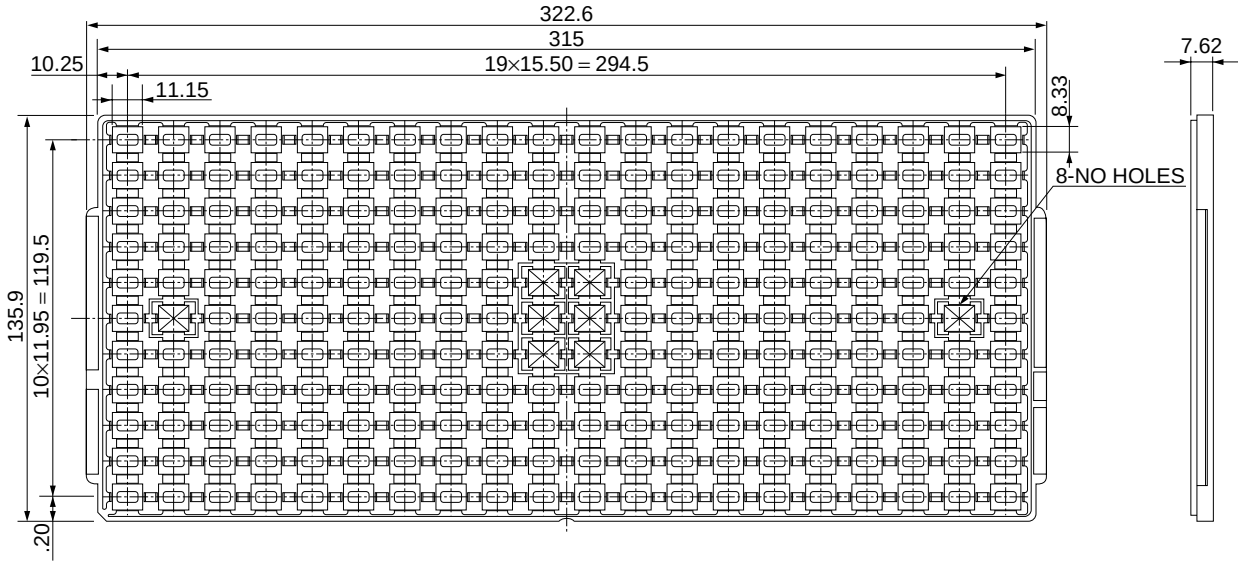
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 69

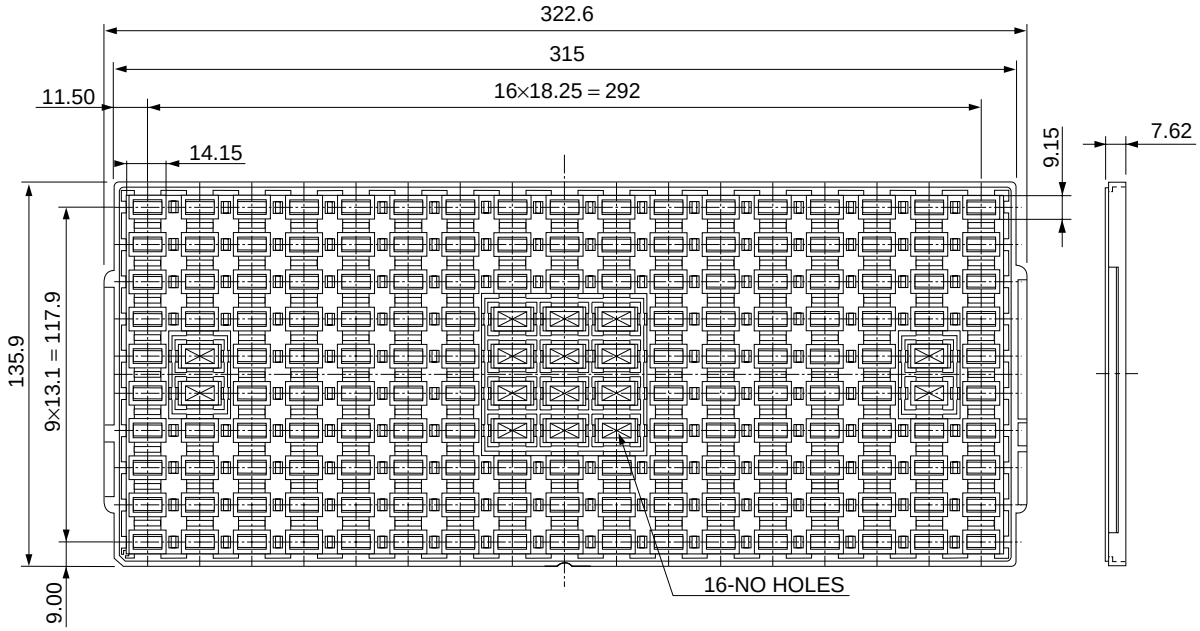
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-69P-M02	220	2200	13200



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 77

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-77P-M01	170	1700	10200



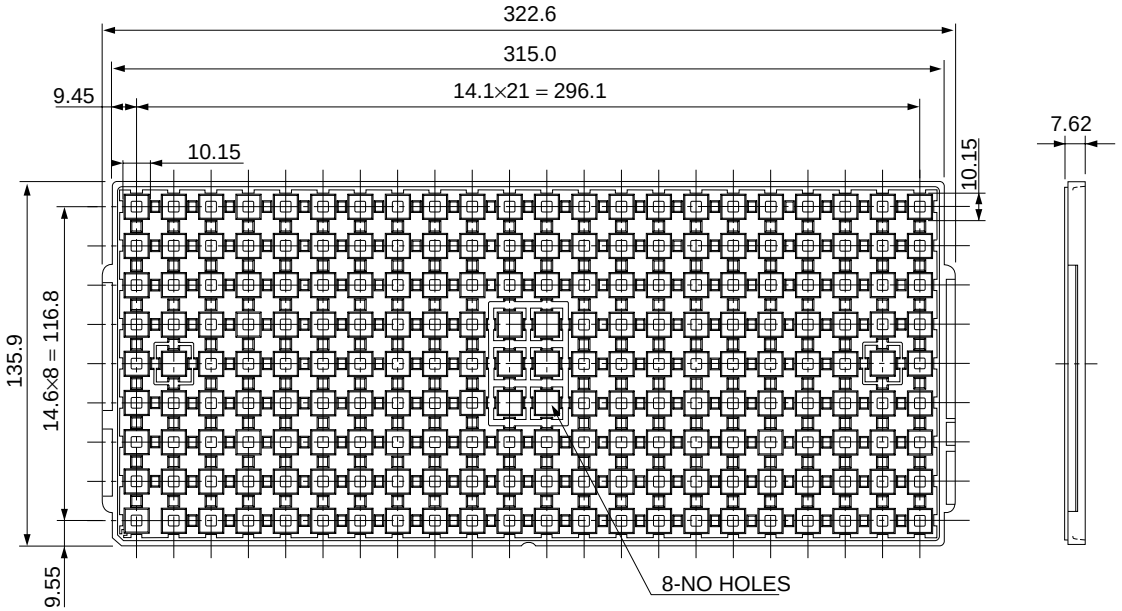
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 112

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-112P-M01	198	1980	11880

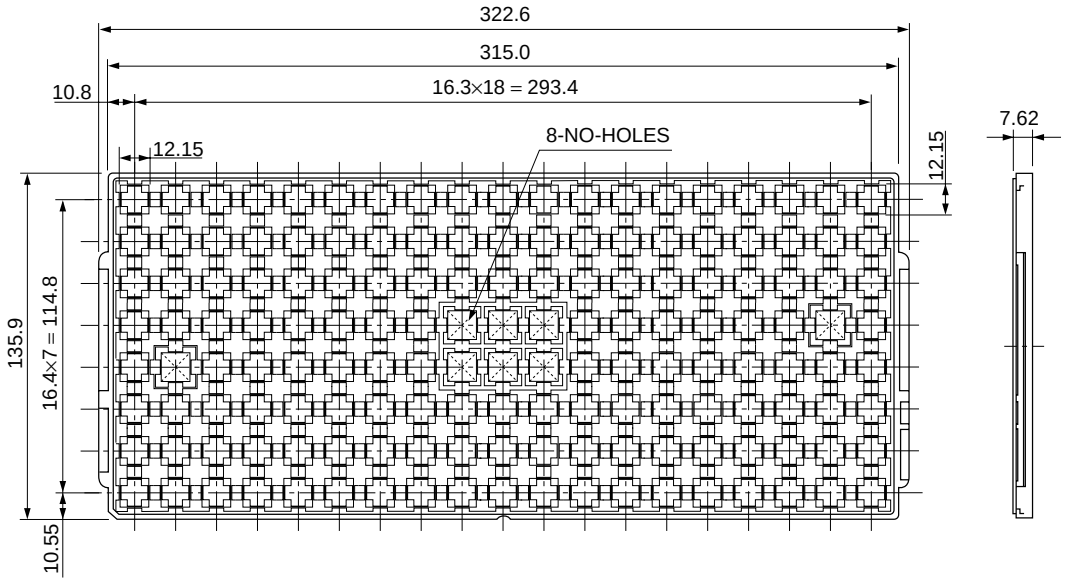


Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 120, 144, 168, 176

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-120P-M01	152	1520	9120
BGA-144P-M01	152	1520	9120
BGA-144P-M02	152	1520	9120

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-168P-M01	152	1520	9120
BGA-176P-M02	152	1520	9120



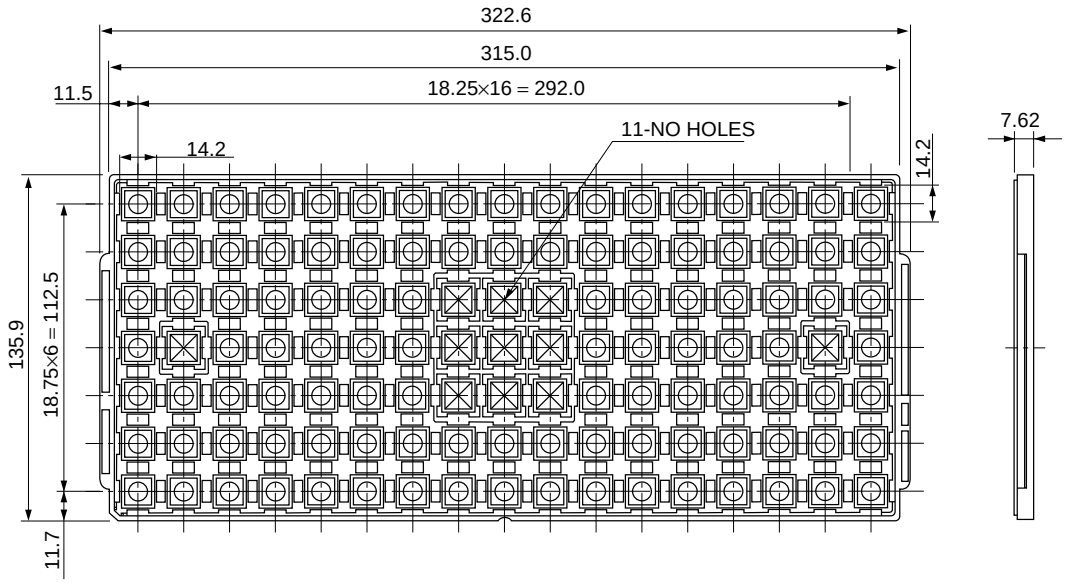
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 192

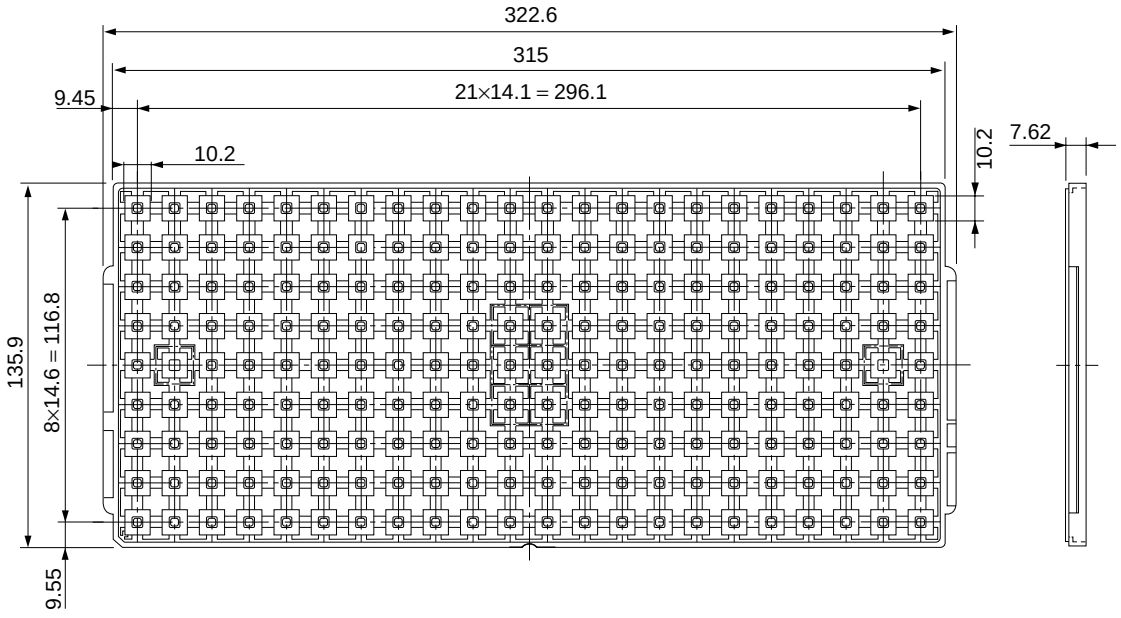
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-192P-M01	119	1190	7140



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 192

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-192P-M02	198	1980	11880



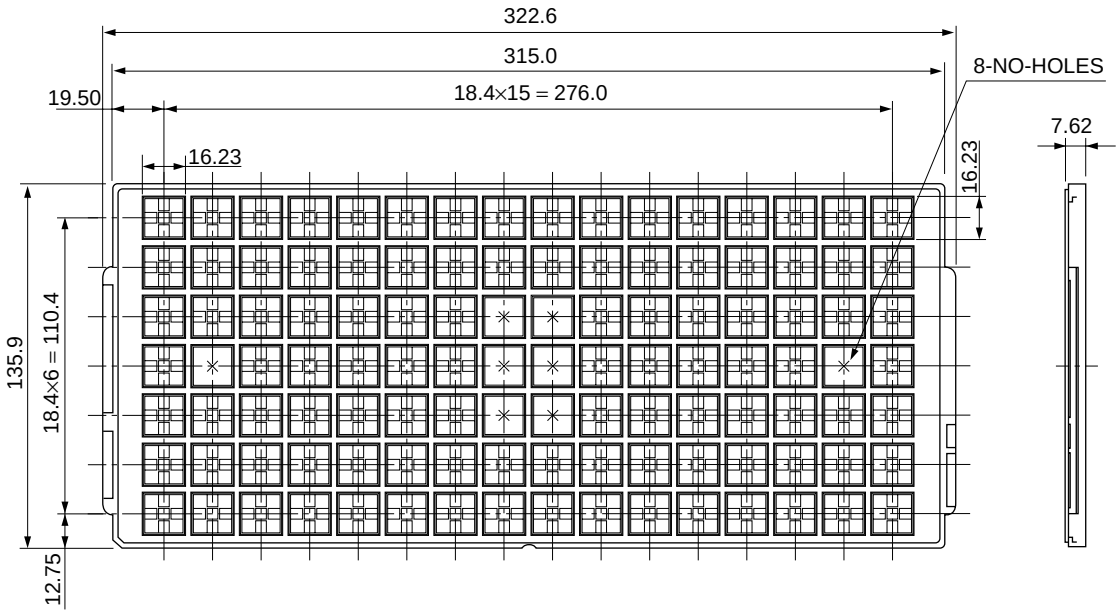
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 224

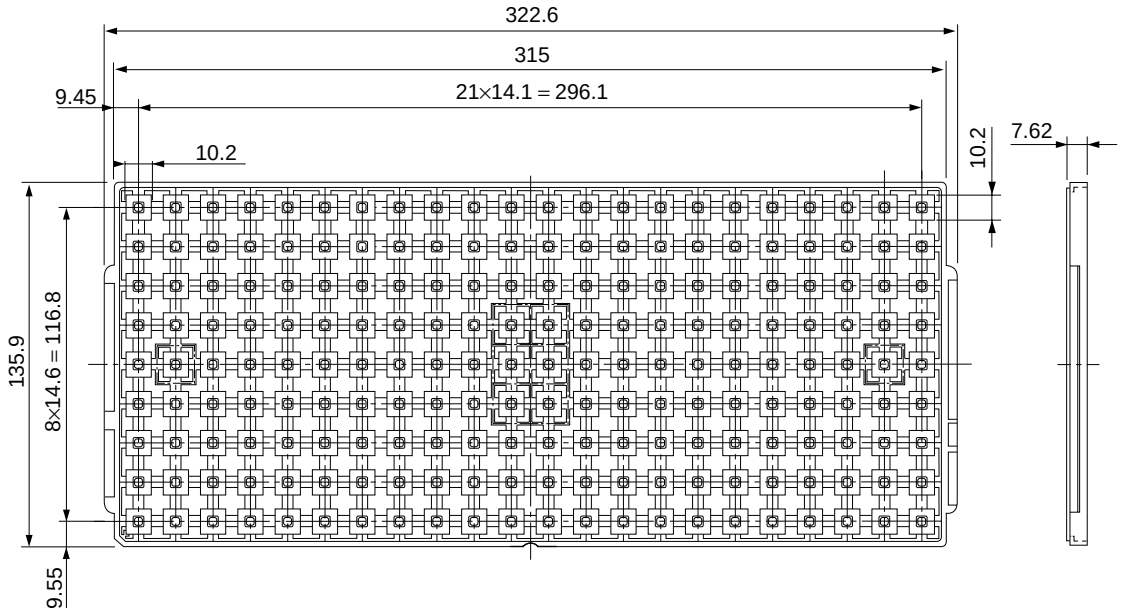
PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-224P-M03	112	1120	6720



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

FBGA 240

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-240P-M01	198	1980	11880



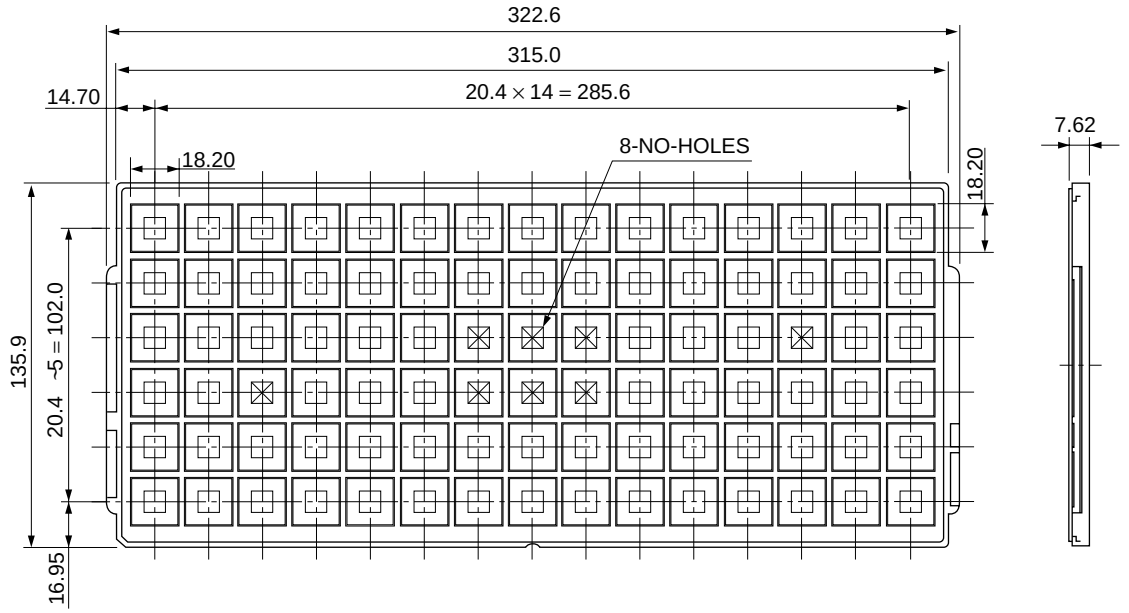
Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

(Dimensions in mm)

Tray Dimensions

FBGA 288, 320

PKG code	Maximum strage capacity		
	pcs/tray	pcs/inner box	pcs/outer box
BGA-288P-M02	90	900	5400
BGA-320P-M01	90	900	5400



Material: Conductive polyphenylenether
Heat proof temperature: 125 °C MAX

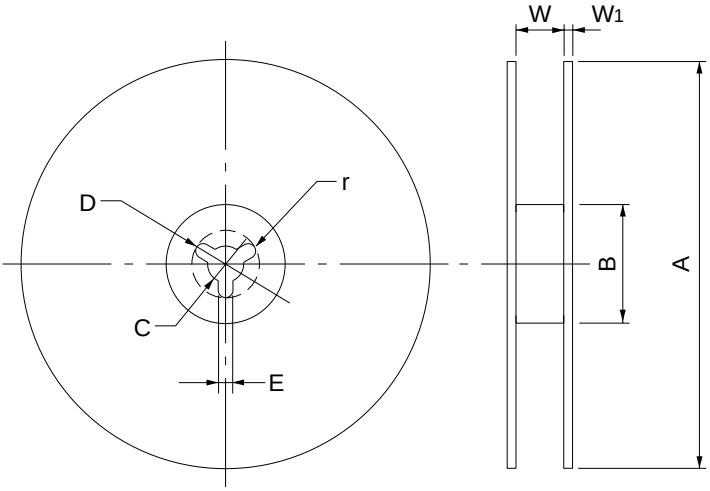
(Dimensions in mm)

Tray Dimensions

6.4 Taping Dimensions

6.4.1 Embossed tapes(standard: conforms with JIS)

(1) Reel dimensions

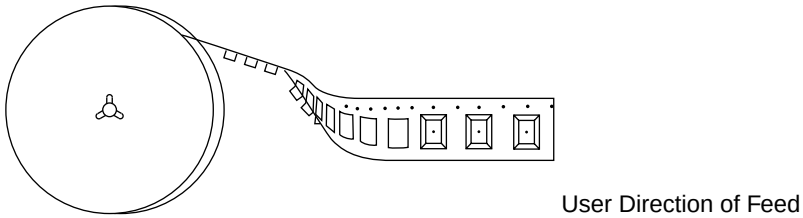


(Dimensions in mm)

Symbol \ Tape width	12mm	16mm	24mm	32mm	44mm
A	330 ± 2.0				
	254 ± 2.0				
B	$100^{+2.0}_{-0}$			$100^{+2.0}_{-0}/150^{+2.0}_{-0}$	
C	13 ± 0.2				
D	21 ± 0.8				
E	2 ± 0.5				
W	12.4 to 14.4	16.4 to 18.4	24.4 to 26.4	32.4 to 34.4	44.4 to 46.4
W1	2.9 max.				
r	1 ± 0.2				

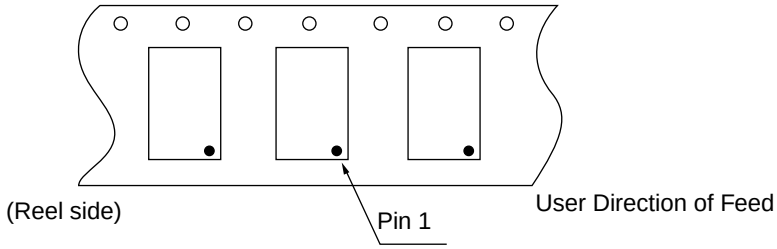
Tray Dimensions

(2) IC orientation

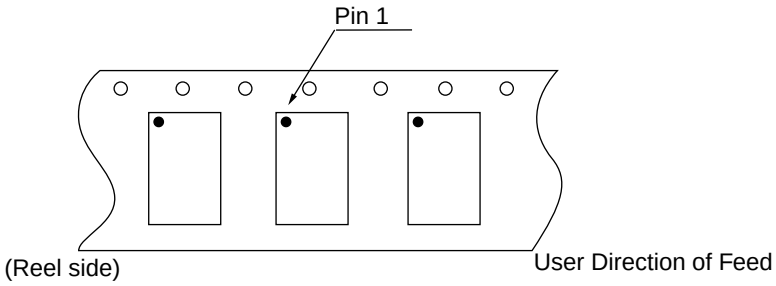


a) SOP, QFP, SOJ, SON, BCC, FBGA

- EF type

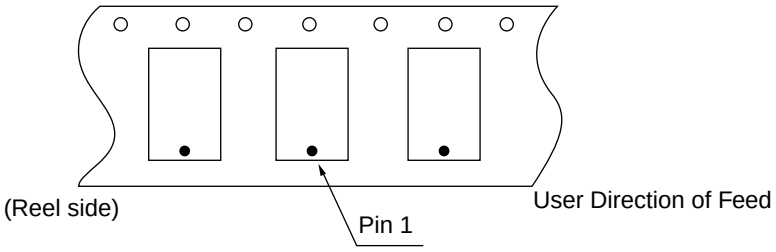


- ER type

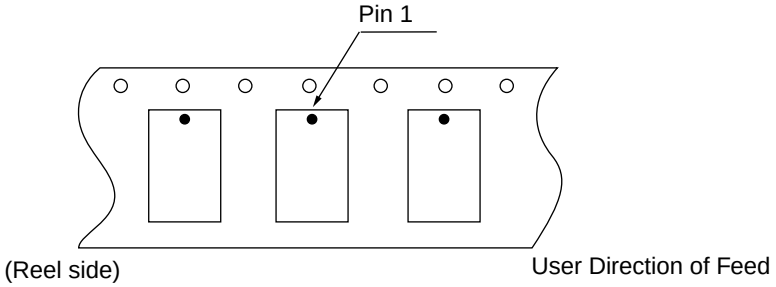


b) LCC, QFJ, TSOP

- EF type



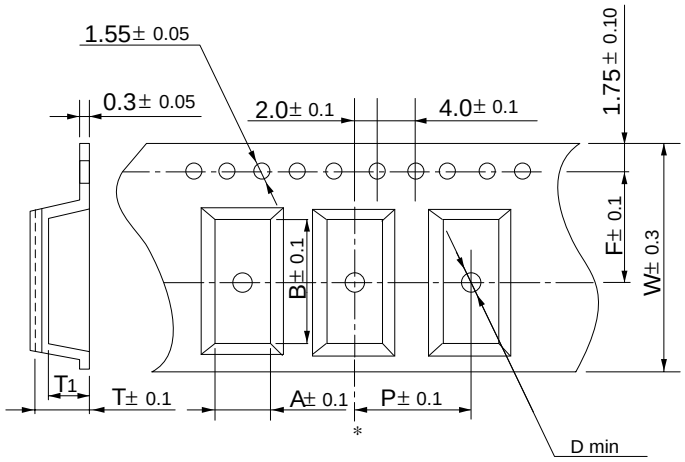
- ER type



Tray Dimensions

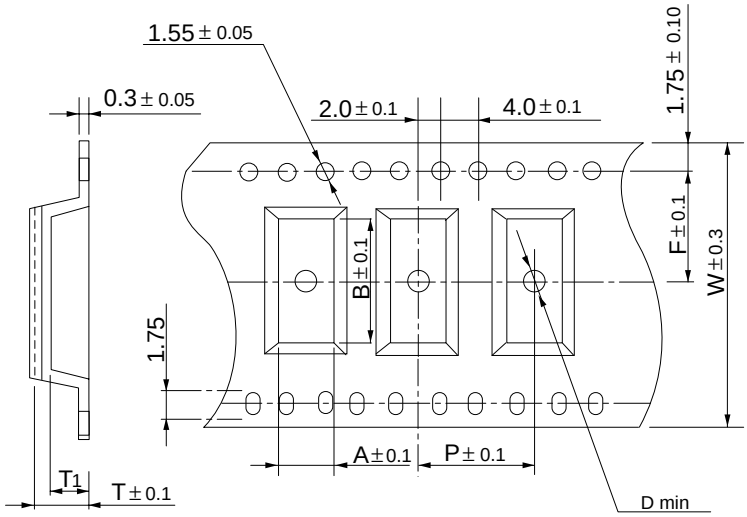
(3) Tape dimensions

12mm, 16mm, 24mm tape width



*: The pocket shapes have raised bottoms, except for BCCs.

32mm, 44mm tape width



Tray Dimensions

- Tape dimansions

(Dimensions in mm)

PKG code		Symbol							
		A	B	F	P	T	T1	D	W
SOP	FPT-8P-M01	8.3	6.65	7.5	12.0	2.85	2.35	2.0	16.0
	FPT-8P-M02	6.5	5.4	5.5	8.0	2.1	1.7	2.0	12.0
	FPT-14P-M04	8.5	10.6	7.5	12.0	2.5	2.2	2.0	16.0
	FPT-16P-M03	10.85	13.0	11.5	12.0	3.55	3.05	2.0	24.0
	FPT-16P-M04	6.9	10.5	7.5	12.0	2.45	1.95	1.5	16.0
	FPT-16P-M06	8.5	10.6	7.5	12.0	2.5	2.2	2.0	16.0
	FPT-20P-M01	8.2	13.1	11.5	12.0	2.7	2.3	2.0	24.0
	FPT-20P-M02	10.85	13.0	11.5	12.0	3.55	3.05	2.0	24.0
	FPT-20P-M05	10.85	13.0	11.5	12.0	3.55	3.05	2.0	24.0
	FPT-24P-M01	8.5	15.6	11.5	12.0	2.8	2.2	2.0	24.0
	FPT-24P-M02	10.65	15.6	11.5	12.0	3.3	2.8	2.0	24.0
	FPT-28P-M01	10.8	18.2	11.5	16.0	3.3	2.8	2.0	24.0
	FPT-32P-M03	14.8	21.1	14.2	16.0	3.1	2.6	2.0	32.0
SSOP	FPT-8P-M03	6.7	3.9	5.5	8.0	1.85	1.35	1.5	12.0
	FPT-16P-M05	6.9	5.5	7.5	12.0	2.0	1.5	1.6	16.0
	FPT-20P-M03	6.9	7.0	7.5	12.0	2.0	1.5	1.5	16.0
	FPT-20P-M04	6.9	7.0	7.5	12.0	2.0	1.5	1.5	16.0
	FPT-24P-M03	8.1	8.3	7.5	12.0	2.0	1.5	1.6	16.0
	FPT-30P-M02	8.1	10.2	7.5	12.0	2.0	1.5	1.6	16.0
	FPT-34P-M01	10.8	18.2	11.5	16.0	3.3	2.8	2.0	24.0
	FPT-34P-M02	10.8	18.2	11.5	16.0	3.3	2.8	2.0	24.0
	FPT-34P-M03	8.55	11.5	11.5	12.0	1.8	1.35	2.0	24.0
	FPT-40P-M01	12.4	18.2	11.5	16.0	3.3	2.8	2.0	24.0
TSOP	FPT-32P-M24	8.5	20.4	14.2	12.0	1.65	1.25	2.0	32.0
	FPT-32P-M25	8.5	20.4	14.2	12.0	1.65	1.25	2.0	32.0
	FPT-40P-M06	10.35	20.4	14.2	16.0	1.7	1.4	2.1	32.0
	FPT-40P-M07	10.35	20.4	14.2	16.0	1.7	1.4	2.1	32.0
	FPT-44P-M07	12.15	18.95	11.5	16.0	1.65	1.25	2.0	24.0
	FPT-44P-M08	12.15	18.95	11.5	16.0	1.65	1.25	2.0	24.0
	FPT-44P-M16	16.6	28.8	20.2	24.0	3.5	3.0	2.0	44.0
	FPT-44P-M18	12.15	18.95	11.5	16.0	1.65	1.25	2.0	24.0
	FPT-48P-M19	12.6	20.4	14.2	16.0	1.6	1.2	2.0	32.0
	FPT-48P-M20	12.6	20.4	14.2	16.0	1.6	1.2	2.0	32.0
	FPT-50P-M05	12.25	21.35	14.2	16.0	1.7	1.2	2.0	32.0
	FPT-50P-M06	12.25	21.35	14.2	16.0	1.7	1.2	2.0	32.0

Tray Dimensions

(Dimensions in mm)

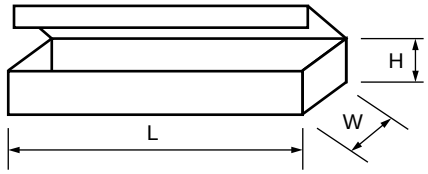
PKG code		Symbol							
		A	B	F	P	T	T1	D	W
SON	LCC-40P-M02	10.35	11.2	11.5	12.0	1.25	0.95	2.0	24.0
	LCC-46P-M02	10.45	12.55	11.5	12.0	1.35	0.95	2.0	24.0
BCC	LCC-16P-M02	3.65	4.8	5.5	8.0	1.0	—	1.5	12.0
	LCC-16P-M03	4.45	4.8	5.5	8.0	1.0	—	1.5	12.0
	LCC-48P-M02	7.25	7.25	5.50	12.0	1.0	—	1.5	12.0
QFP	FPT-32P-M21	9.5	9.5	7.5	12.0	2.2	1.7	1.6	16.0
LQFP	FPT-48P-M05	9.5	9.5	7.5	12.0	2.2	1.7	1.6	16.0
	FPT-64P-M03	12.5	12.5	11.5	16.0	2.2	1.7	2.0	24.0
QFJ	LCC-28P-M03	12.85	12.85	11.5	16.0	4.8	3.7	2.0	24.0
	LCC-32P-M02	12.8	15.3	11.5	16.0	4.0	2.8	1.9	24.0
	LCC-44P-M02	17.9	17.9	14.2	20.0	4.8	3.7	2.0	32.0
	LCC-68P-M02	25.6	25.6	20.2	32.0	4.8	3.7	2.0	44.0
	LCC-84P-M02	30.7	30.7	20.2	36.0	4.8	3.7	2.0	44.0
SOJ	LCC-28C-A04	11.95	18.95	11.5	16.0	4.45	2.8	2.0	24.0
	LCC-42P-M01	11.6	27.75	20.2	16.0	4.1	2.9	1.5	44.0
FBGA	BGA-48P-M01	6.3	8.3	7.5	8.0	1.85	0.85	1.5	16.0
	BGA-48P-M02	6.1	9.1	7.5	8.0	1.85	0.85	1.5	16.0
	BGA-48P-M03	8.1	9.25	11.5	12.0	1.26	0.72	1.5	24.0

Tray Dimensions

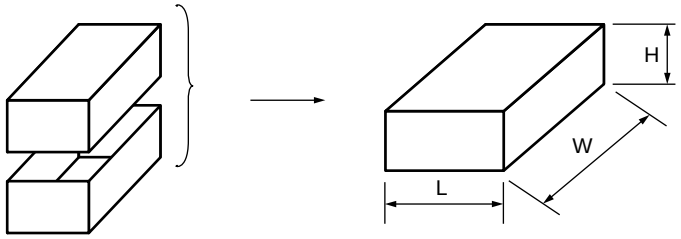
6.5 Dimensions for Containers

(1) Dimensions for inner box

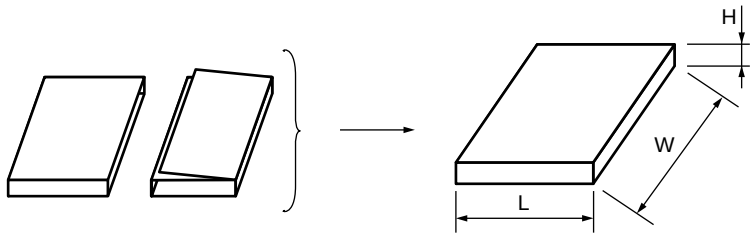
- TypeA



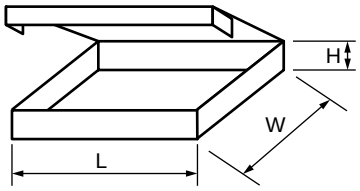
- TypeB



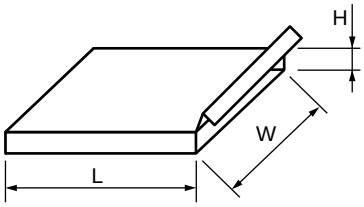
- TypeC



- TypeD



- TypeE

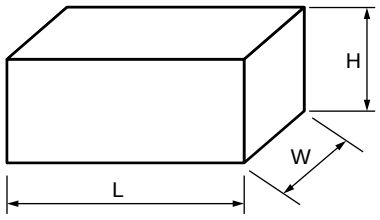


Tray Dimensions

					Inner type	Dimensions for inner box		
						L	W	H
Tube					A	550	125	75
Tray	Dimensions		165.00 × 260.00		B	180	275	45
			135.90 × 322.60		B	165	360	75
			135.90 × 314.96					
			135.90 × 315.00					
			135.89 × 314.96					
			220.00 × 260.00		C	225	265	15
			219.00 × 259.00					
			292.00 × 280.50		D	320	290	65
Emboss	Reel	ϕ330	Tape width	12.16	D	365	345	40
				24.32		365	345	50
				44		365	345	65
		ϕ254			E	265	265	50

(Dimensions in mm)

(2) Dimensions for outer box



					Dimensions for outer box		
					L	W	H
Tube					580	305	210
Tray	Dimensions		165.00 × 260.00		395	315	215
			135.90 × 322.60		580	395	210
			135.90 × 314.96				
			135.90 × 315.00				
			135.89 × 314.96				
			220.00 × 260.00		580	305	210
			219.00 × 259.00				
			292.00 × 280.50		340	320	295
Emboss	Reel	ϕ330	Tape width	12.16	425	410	325
				24.32			
				44			
		ϕ254			580	305	210

(Dimensions in mm)