

32M-bit / 64M-bit Mobile FCRAM™

MB82D02172A / MB82D04172

FUJITSU has developed 32M-bit and 64M-bit Mobile FCRAM™s, these memories provide large-density, high-speed, low-power-consumption required for mobile applications.

These Mobile FCRAM™s are used as work memory device to store a variety of contents in the next generation of mobile phones.

Product Overview

In near future, the next-generation of mobile phones is expected rapid growth into mobile phone market, and it's high performance will lead to provide various new contents such as moving images and music distribution and games. The memories to be mounted in these new mobile phones are also required to be larger density, higher-speed, and more energy efficient. While carrying on with our mass production of 16M-bit and 32M-bit Mobile FCRAMs*¹, we developed a second generation of 32M-bit Mobile FCRAMs with access times as fast as 65ns and power consumption as low as 25mA. We went even further by developing a large-density 64M-bit Mobile FCRAM with the same high access speed of 65ns and low power consumption of 25 mA. And by adopting an asynchronous SRAM type interface, FUJITSU can mount these products without modifying the conventional system configuration.

Product Features

Two Mobile FCRAMs have been developed:

Second-generation 32M-bit product: MB82D02172A

First-generation 64M-bit product: MB82D04172

These products have the following features.

- Adoption of an asynchronous SRAM type interface
- ×16 I/O configuration
- Access time (tCE) : 65ns/75ns

- Low power consumption : 25mA

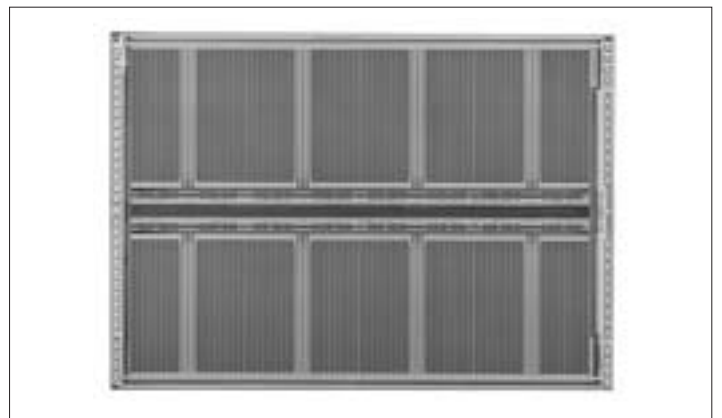
Separate models are configured to perform at access speeds of 65ns and 75ns. There is also a standard-power-consumption type and low-power-consumption type (L version).

In addition to the bare chips (KTD), stacked multi-chip packages (MCP) configured by combining these devices with our high-performance flash memory are also available.

Power Down Mode

The Mobile FCRAM has a power-down function not provided in low-power SRAMs. Today's Mobile FCRAMs are mostly used as work memories for CPUs. After the CPU

Photo 1 Chip View



completes a processing task, there is no longer any need to maintain the data stored in work memory. Therefore, by not maintaining the data while the data is waiting to be used, FUJITSU found a way to reduce power consumption. This function improves battery life, a critical feature for mobile phones. Entry into and exit from the power-down mode are controlled by the CE2 pin.

Fig. 1 shows details on the timing in the power-down mode.

The power-down mode includes SLEEP, NAP, and PARTIAL modes.

- **SLEEP mode** : Conventional power-down mode
- **NAP mode** : Capable of high-speed recovery from power-down mode ($350\mu s \Rightarrow 1\mu s$)
- **PARTIAL mode** : 8M-bit (32M-bit product) / 16M-bit (64M-bit product) data can be retained.

In the conventional power down-mode (SLEEP mode)

supported by a 16M-bit product, the exit time (t_{CHH}) from the power down mode is $350\mu s$. In the NAP mode, the exit time (t_{CHHN}) is as short as $1\mu s$. In the conventional SLEEP mode, no data is retained in any area of the memory. In the PARTIAL mode, data retention is allowed in some areas, and prohibited in others. Data can be retained in an 8M-bit area in a 32M-bit product, and in a 16M-bit area in a 64M-bit product.

Fig. 2 shows an example of the PARTIAL mode.

In conventional mobile phones, low-power SRAMs have been used for the data backup memory and mobile FCRAMs have been used for temporary retention memory (work memory) for data rewrites. The PARTIAL power-down function in the new models makes it possible to use the mobile FCRAM like an SRAM and double up as a backup memory.

Table 1 shows the exit time from power down. **Table 2**

Fig.1 Power-down Entry and Exit Timing

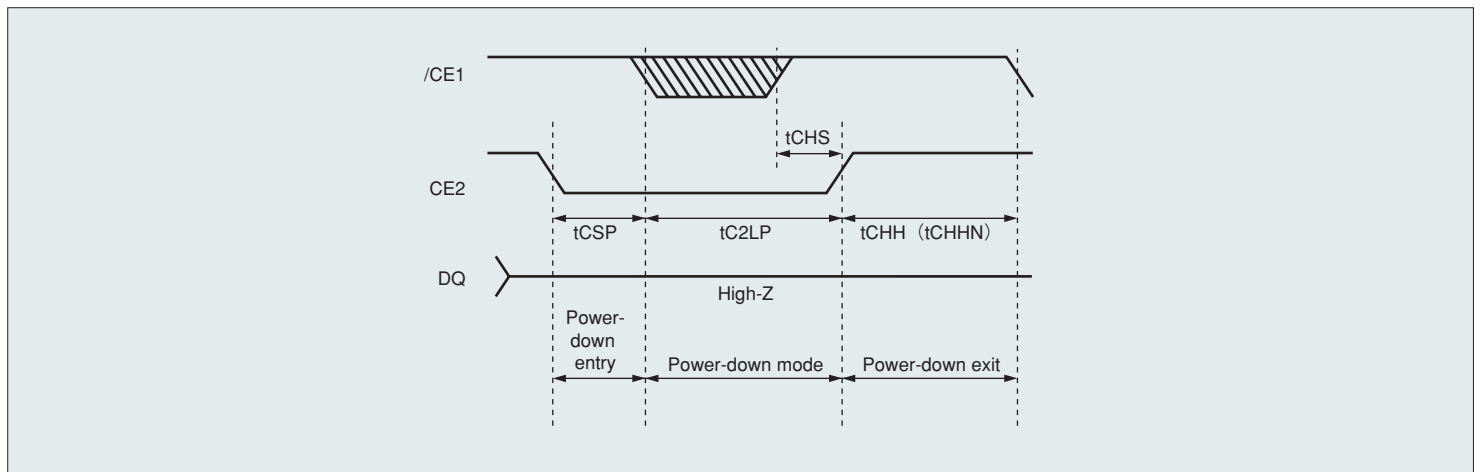
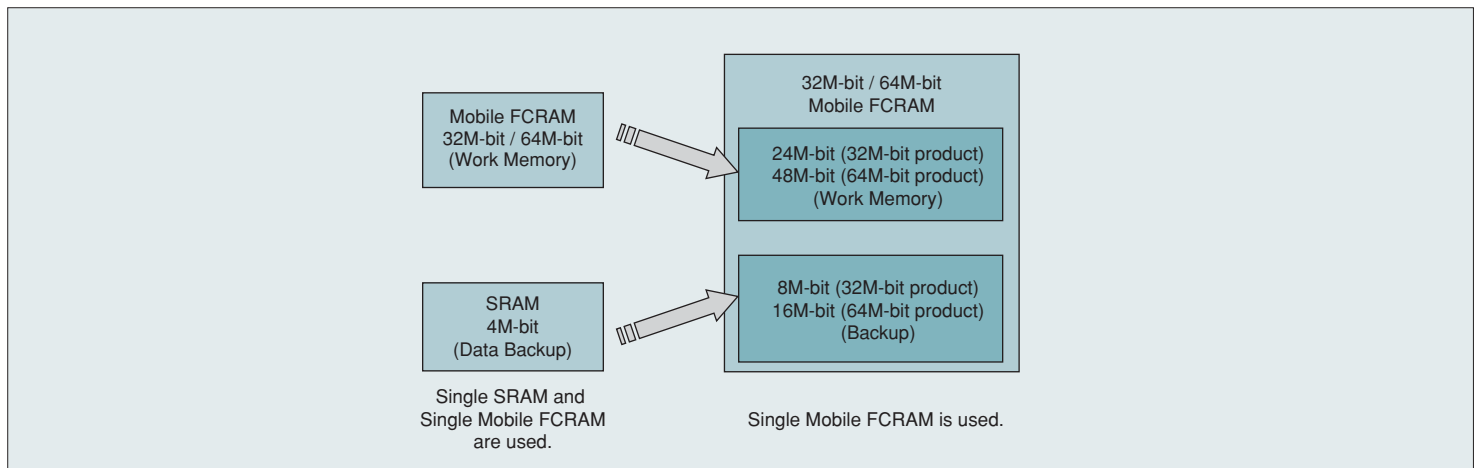


Fig.2 Example of Power-down Mode (PARTIAL mode)



shows the current standard value of the product during power down.

These new functions are users options that can be set just after power is turned on.

Characteristics

Table 3 shows the main parameters of the products.

Future Development

This article has introduced the Mobile FCRAMs which achieve large-density, high-speed, low power consumption as a memory solution for the next-generation mobile phone. FUJITSU will continue to offer memory solutions to meet the needs of the diversifying market. *

NOTES

*1: Mobile FCRAM : A large-density and low-power pseudo SRAM in which asynchronous SRAM-type interface is mounted on an FCRAM core.

*: FCRAM (Fast Cycle RAM) is a trademark of FUJITSU LIMITED.

Table 1 Exit Time from Power-down Mode

Power-down mode		Time	Unit
SLEEP mode	tCHH	350	μ s
NAP mode	tCHHN	1	
PARTIAL mode			

Table 2 Power-down Current of Mobile FCRAM

Item			32M-bit product	64M-bit product	Unit
VDD power-down current	Normal Version	IDDP (SLEEP)	30	30	μ A
	L Version		10	10	
	Normal Version	IDDPN (NAP)	100	100	
	L Version		60	65	
	Normal Version	IDDP (PARTIAL)	150	150	
	L Version		70 (8M-bit PARTIAL)	85 (16M-bit PARTIAL)	

Table 3 Main Parameters

Parameter		MB82D02172A		MB82D04172	
		-65	-75	-65	-75
Read Cycle Time	tRC (Min.)	70ns	80ns	70ns	80ns
Write Cycle Time	tWC (Max.)	70ns	80ns	70ns	80ns
/CE Access Time	tCE (Max.)	65ns	75ns	65ns	75ns
Operating Current	IDDA (Max.)	25mA		25mA	
Standby Current	IDDS1 (Max.)	Normal Version		200 μ A	
		L Version		100 μ A	