

PRODUCT SUMMARY (TYPICAL)

V_{DS} (V)	600
$R_{DS(on)}$ (Ω)	0.29
Q_{rr} (nC)	29

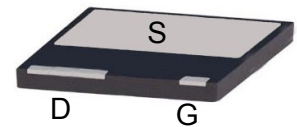
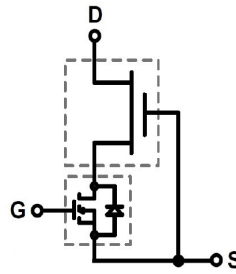
Features

- Low Q_{rr}
- Free-wheeling diode not required
- Low-side Quiet Tab™ for reduced EMI
- RoHS compliant
- High frequency operation

Applications

- Compact DC-DC converters
- AC motor drives
- Battery chargers
- Switch mode power supplies

GaN Power Low-loss Switch



8x8 PQFN Package
(bottom view)

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise stated)

Symbol	Parameter	Limit Value	Unit
I _{D25°C}	Continuous Drain Current @T _C =25 °C	9	A
I _{D100°C}	Continuous Drain Current @T _C =100 °C	6.9	A
I _{DM}	Pulsed Drain Current (pulse width: 100 μs)	35	A
V _{DSS}	Drain to Source Voltage	600	V
V _{TDS}	Transient Drain to Source Voltage ^a	750	V
V _{GSS}	Gate to Source Voltage	±18	V
P _{D25°C}	Maximum Power Dissipation	65	W
T _C	Operating Temperature	Case	-55 to 150 °C
T _J		Junction	-55 to 175 °C
T _S	Storage Temperature	-55 to 150	°C
T _{Csold}	Soldering peak Temperature ^b	260	°C

Thermal Resistance

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Junction-to-Case	2.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient ^c	45	$^\circ\text{C}/\text{W}$

Notes

a: For 1 μs , duty cycle $D=0.1$;

b: Reflow MSL3

c: Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling; with 6cm^2 copper area and $70\text{ }\mu\text{m}$ thickness).

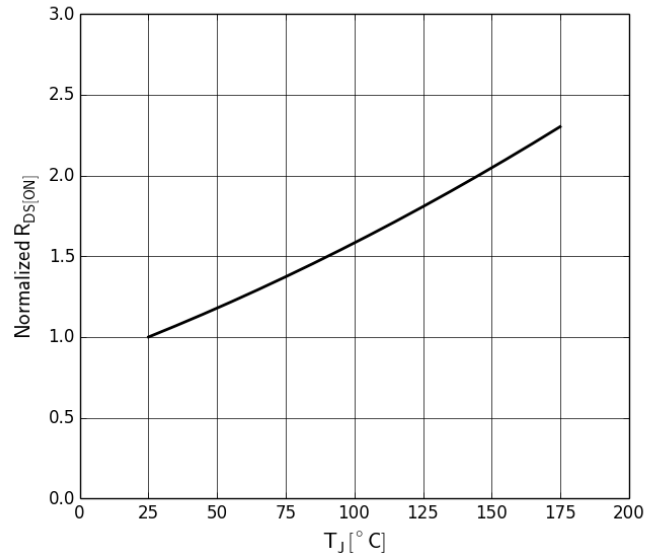
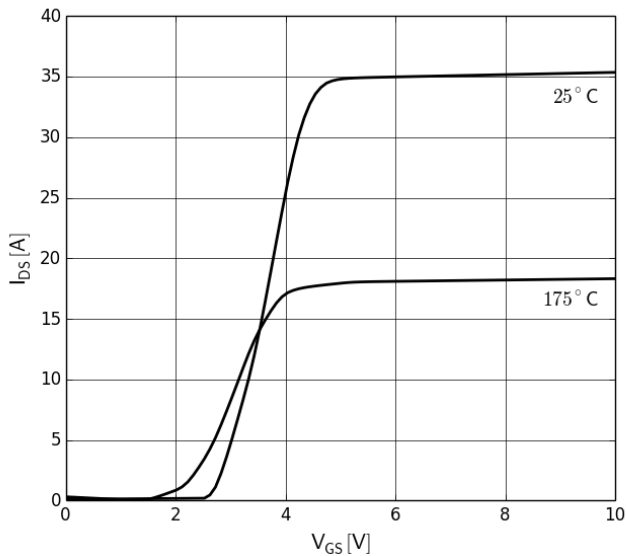
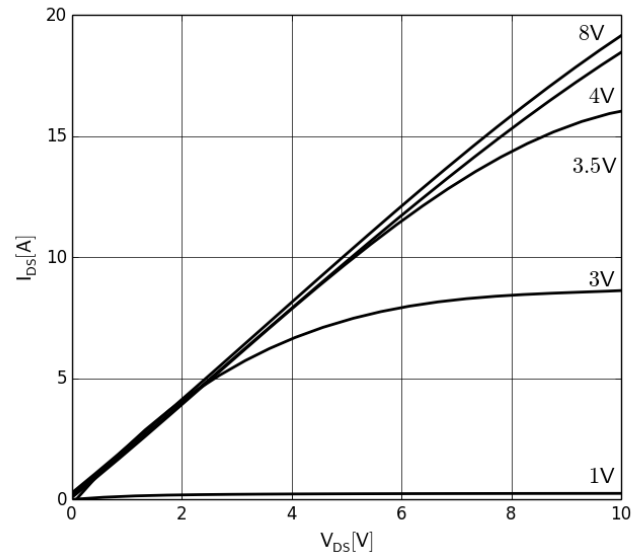
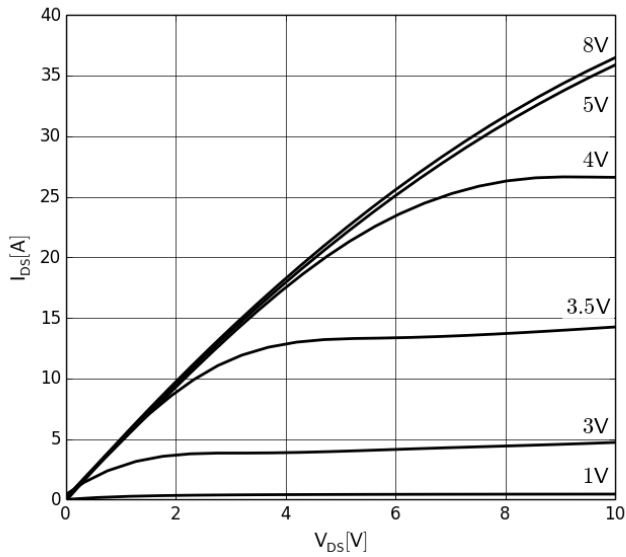
Electrical Characteristics (T _C =25 °C unless otherwise stated)						
Symbol	Parameter	Min	Typical	Max	Unit	Test Conditions
Static						
V _{DSS-MAX}	Maximum Drain-Source Voltage	600	-	-	V	V _{GS} =0 V
V _{GS(th)}	Gate Threshold Voltage	1.6	2	2.5	V	V _{DS} =V _{GS} , I _D =250 μA
R _{DS(on)}	Drain-Source On-Resistance (T _J = 25 °C)	-	0.29	0.35	Ω	V _{GS} =8V, I _D =5.5A, T _J = 25 °C
R _{DS(on)}	Drain-Source On-Resistance (T _J = 175 °C)	-	0.67	-	Ω	V _{GS} =8V, I _D =5.5A, T _J = 175 °C
I _{DSS}	Drain-to-Source Leakage Current, T _J = 25 °C	-	2.5	90	μA	V _{DS} =600V, V _{GS} =0V, T _J = 25 °C
I _{DSS}	Drain-to-Source Leakage Current, T _J = 150 °C	-	8	-	μA	V _{DS} =600V, V _{GS} =0V, T _J = 150 °C
I _{GSS}	Gate-to-Source Forward Leakage Current	-	-	100	nA	V _{GS} = 18 V
	Gate-to-Source Reverse Leakage Current	-	-	-100		V _{GS} = -18 V
Dynamic						
C _{ISS}	Input Capacitance	-	760	-	pF	V _{GS} =0 V, V _{DS} =480 V, f =1 MHz
C _{OSS}	Output Capacitance	-	26	-		
C _{RSS}	Reverse Transfer Capacitance	-	3.5	-		
C _{O(er)}	Output Capacitance, energy related ^a	-	36	-		V _{GS} =0 V, V _{DS} =0 V to 480 V
C _{O(tr)}	Output Capacitance, time related ^a	-	57	-		
Q _g	Total Gate Charge ^b	-	6.2	9.3	nC	V _{DS} =100 V ^a , V _{GS} = 0-4.5 V, I _D = 5.5 A
Q _{gs}	Gate-Source Charge	-	2.1	-		
Q _{gd}	Gate-Drain Charge	-	2.2	-		
t _{d(on)}	Turn-On Delay	-	6.2	-	ns	V _{DS} =480 V , V _{GS} = 0-10 V, I _D = 5.5 A, R _G = 2 Ω
t _r	Rise Time	-	4.5	-		
T _{d(off)}	Turn-Off Delay	-	9.7	-		
t _f	Fall Time	-	5.0	-		
Reverse operation						
I _S	Reverse Current	-	-	8.9	A	V _{GS} =0 V, T _C =100 °C
V _{SD}	Reverse Voltage	-	2.11 3.10		V	V _{GS} =0 V, I _S =5.5A, T _J =25 °C V _{GS} =0 V, I _S =5.5A, T _J =175 °C
V _{SD}	Reverse Voltage	-	1.48		V	V _{GS} =0 V, I _S =3 A, T _J =25 °C
t _{rr}	Reverse Recovery Time	-	11.5	-	ns	I _S =5.5 A, V _{DD} =480 V, di/dt =1500A/μs, T _J =25 °C
Q _{rr}	Reverse Recovery Charge	-	29	-	nC	

Notes

a: Fixed while V_{DS} is rising from 0 to 80% V_{DSS} ;

b: Q_g does not change for V_{DS}>100 V.

Typical Characteristic Curves 25 °C unless otherwise noted



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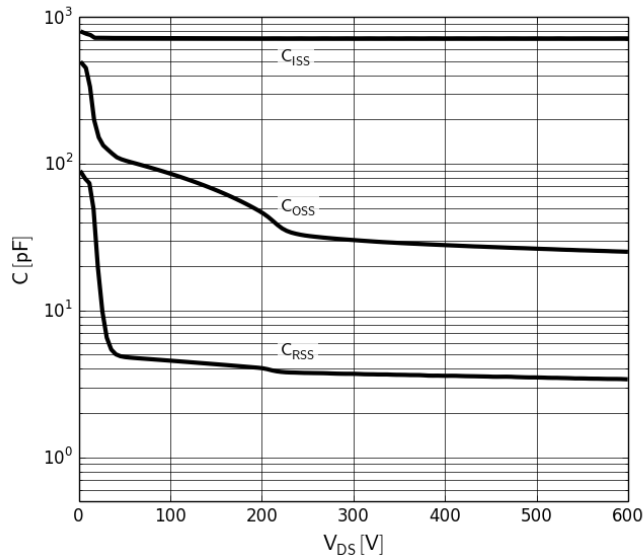


Fig. 5. Typical Capacitance
 $V_{GS}=0$ V, $f=1$ MHz

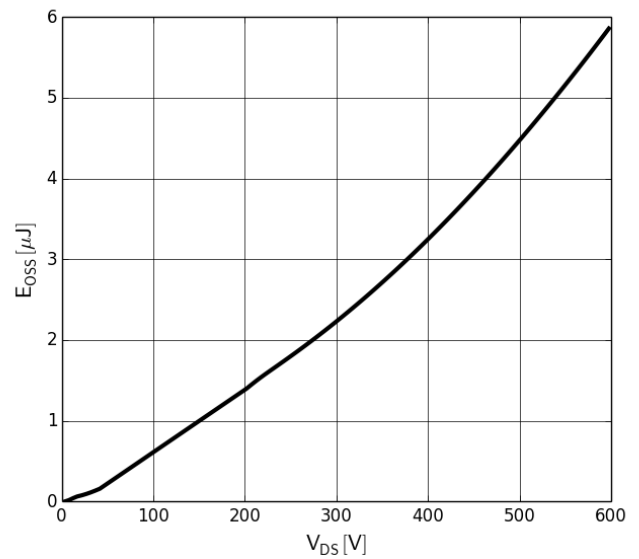


Fig. 6. Typical C_{OSS} Stored Energy

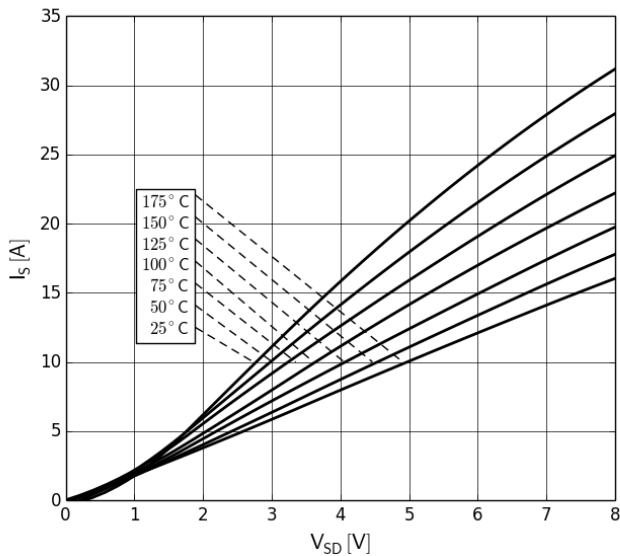


Fig. 7. Forward Characteristics of Rev. Diode
 $I_S=f(V_{SD})$; parameter T_j

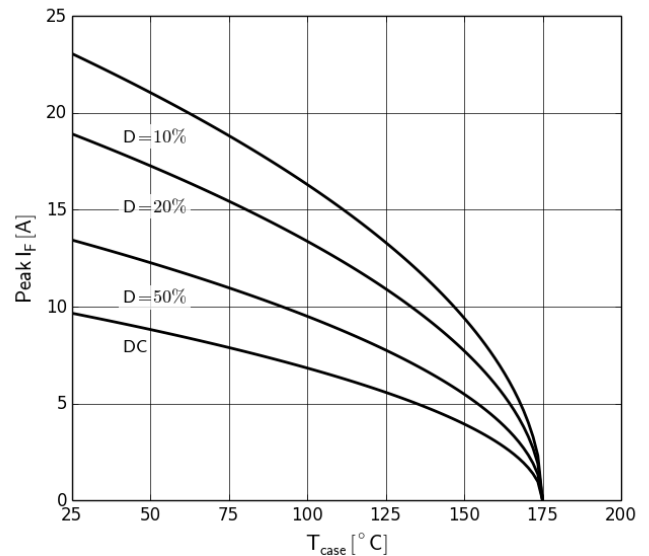


Fig. 8. Current Derating

Typical Characteristic Curves 25 °C unless otherwise noted

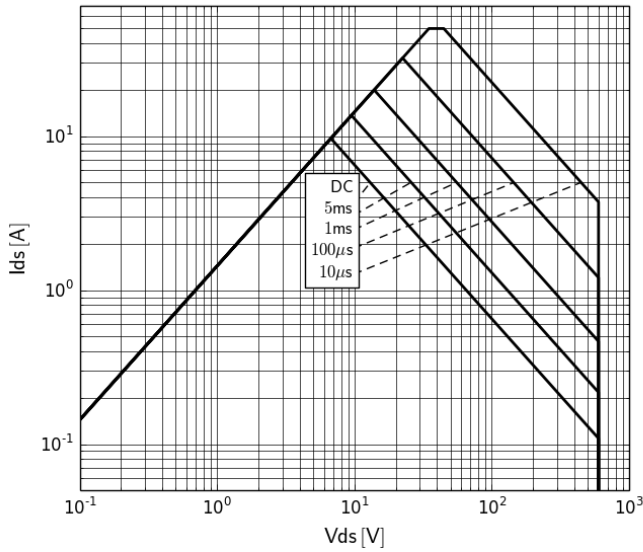


Fig. 9. Safe Operating Area $T_c = 25\text{ °C}$

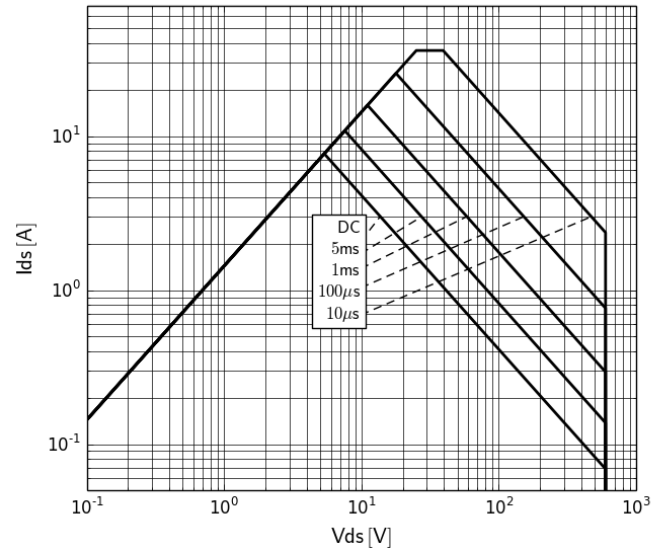


Fig. 10. Safe Operating Area $T_c = 80\text{ °C}$

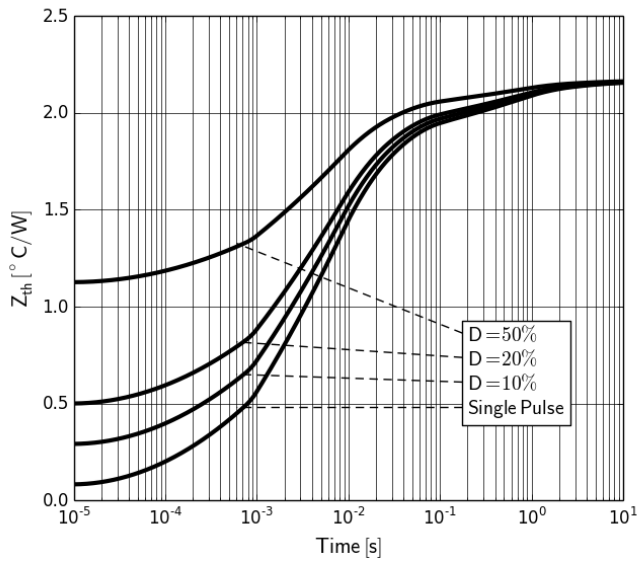


Fig. 11. Transient Thermal Resistance

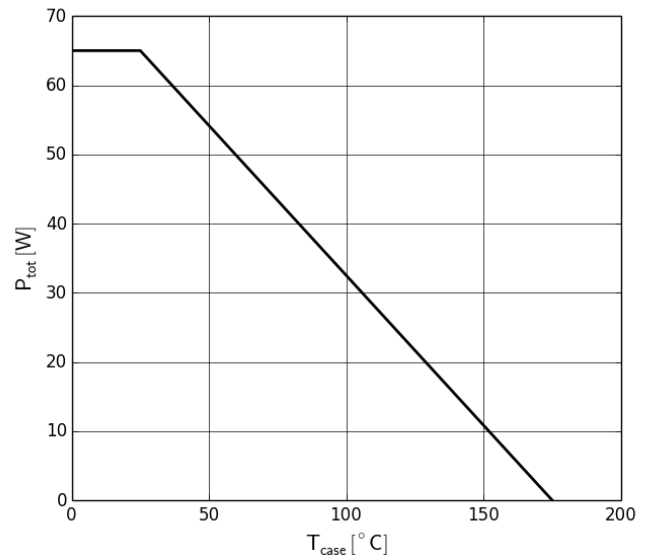


Fig. 12. Power Dissipation

Test Circuits and Waveforms

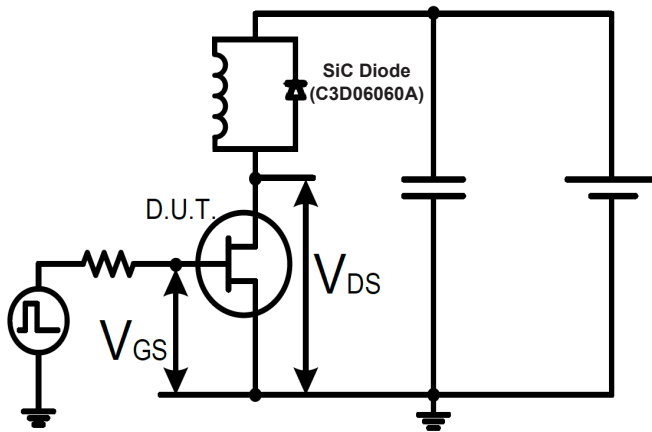


Fig. 13. Switching Time Test Circuit

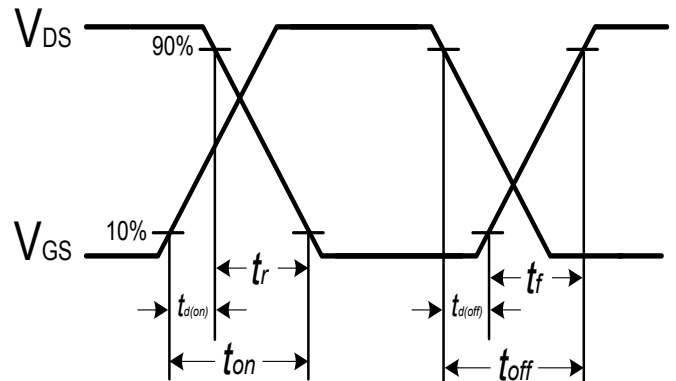


Fig. 14. Switching Time Waveform

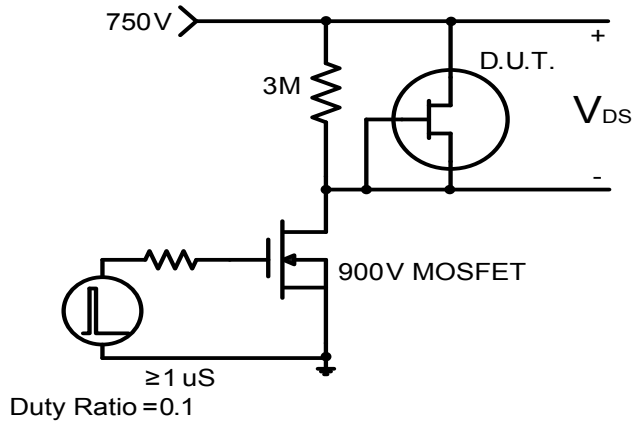


Fig. 15. Spike Voltage Test Circuit

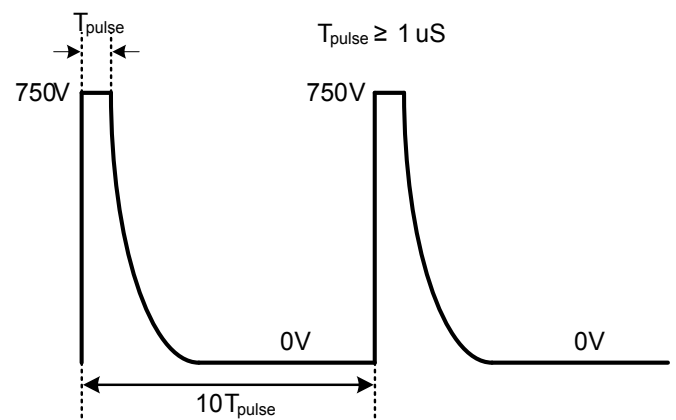


Fig. 16. Spike Voltage Waveform

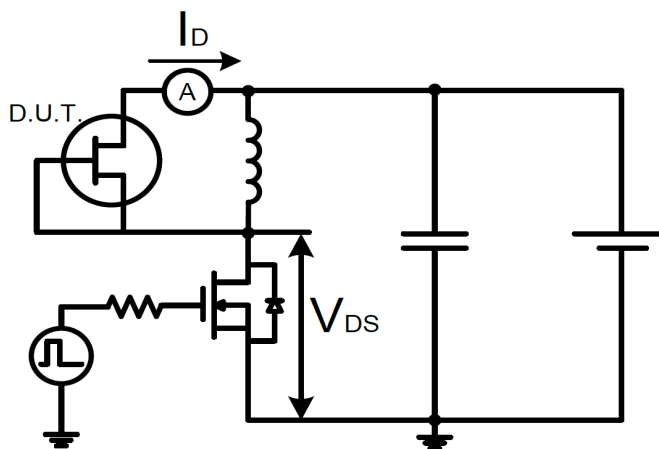


Fig. 17. Test Circuit for Reverse Diode Characteristics

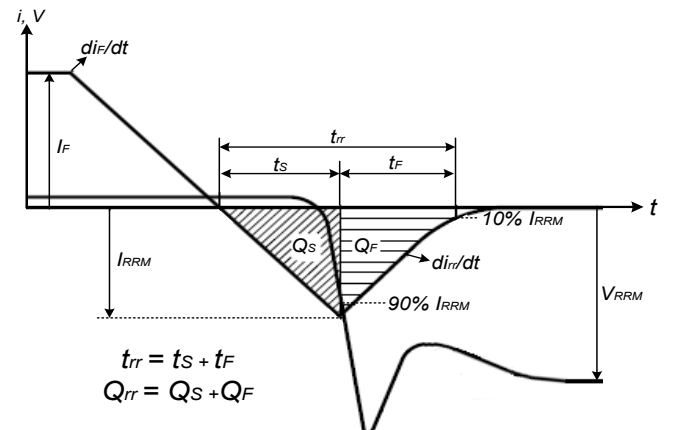
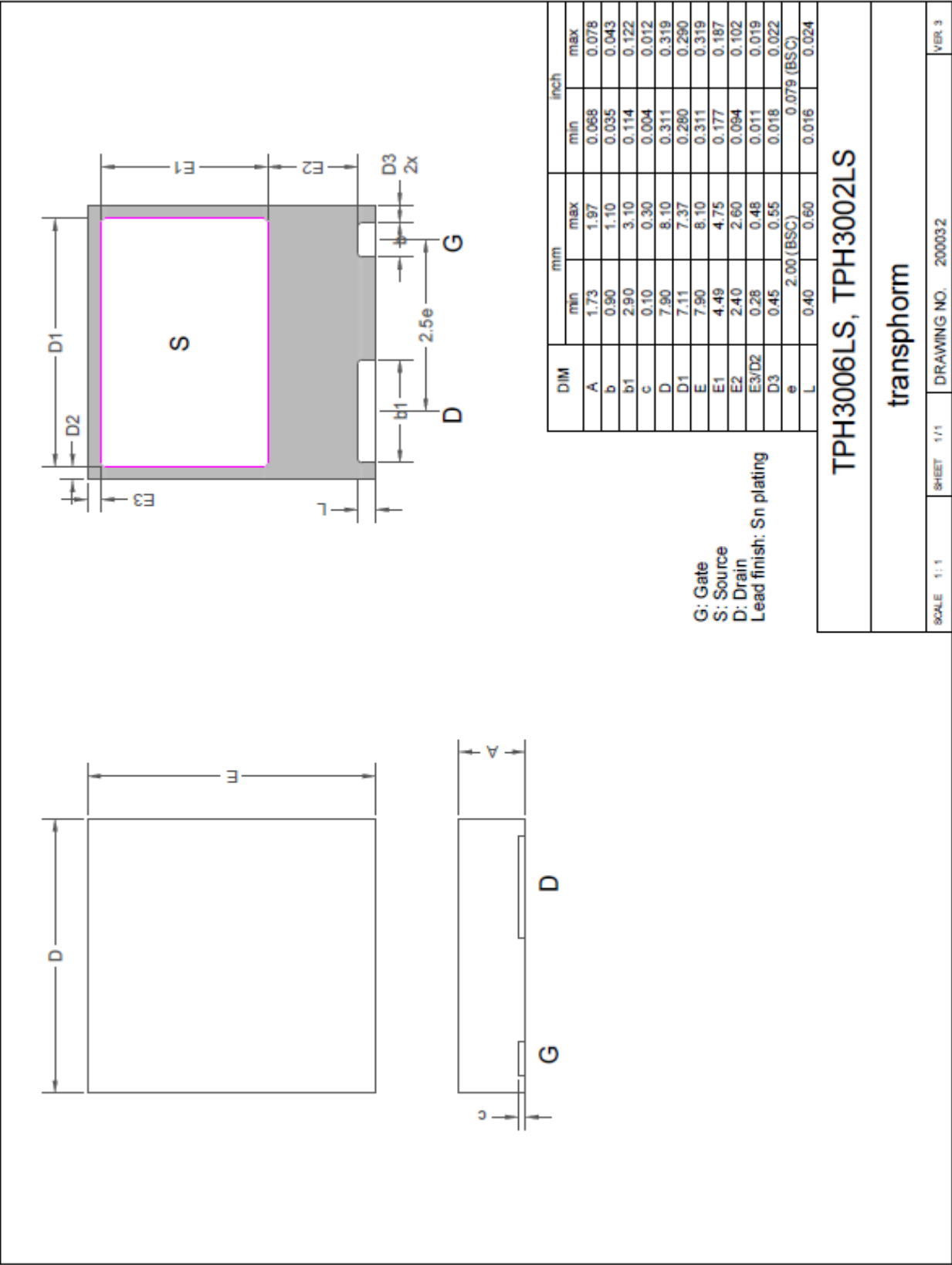


Fig. 18. Diode Recovery Waveform



Important Notice

Transphorm Gallium Nitride (GaN) Switches provide significant advantages over silicon (Si) Superjunction MOSFETs with lower gate charge, faster switching speeds and smaller reverse recovery charge. GaN Switches exhibit in-circuit switching speeds in excess of 150 V/ns and can be even pushed up to 500V/ns, compared to current silicon technology usually switching at rates less than 50V/ns.

The fast switching of GaN devices reduces current-voltage cross-over losses and enables high frequency operation while simultaneously achieving high efficiency. However, taking full advantage of the fast switching characteristics of GaN Switches requires adherence to specific PCB layout guidelines and probing techniques .

Transphorm suggests visiting application note “Printed Circuit Board Layout and Probing for GaN Power Switches” before evaluating Transphorm GaN switches. Below are some practical rules that should be followed during the evaluation.

When Evaluating Transphorm GaN Switches	
DO	DO NOT
Minimize circuit inductance by keeping traces short, both in the drive and power loop.	Use long traces in drive circuit, long lead length of the devices.
Use shortest sense loop for probing. Attach the probe and its ground connection directly to the test points.	Use differential mode probe, or probe ground clip with long wire.