

Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

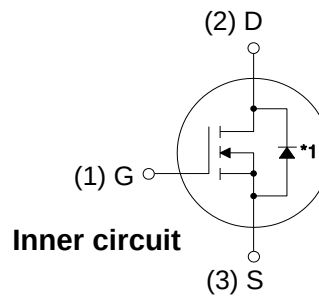
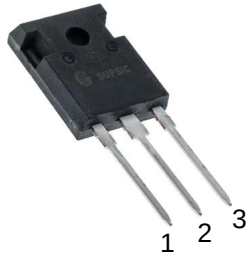
Parameter	Rating	Units
V_{DS}	1200	V
I_D @ 25°C	33	A
$R_{DS(on)}$	75	m Ω



Applications

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating

TO-247-3
Package



- (1) Gate
(2) Drain
(3) Source

*1 Body Diode

Maximum Ratings (T_C = 25 °C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+19	V	AC (f > 1 Hz)	
V_{GSop}	Gate - Source Voltage (static)	-4/+15	V	Static	
I_D	Continuous Drain Current	33	A	$V_{GS} = 15\text{ V}, T_C = 25^\circ\text{C}$	
		23		$V_{GS} = 15\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	136	W	$T_C = 25^\circ\text{C}, T_J = 175^\circ\text{C}$	
T_J, T_{stg}	Operating Junction and Storage Temperature	-40 to +175	°C		
T_L	Solder Temperature	260	°C	1.6mm (0.063") from case for 10s	
M_d	Mounting Torque	1 8.8	Nm lbf-in	M3 or 6-32 screw	

Note (1): When using MOSFET Body Diode $V_{GSmax} = -4\text{V}/+19\text{V}$

Note (2): MOSFET can also safely operate at 0/+15 V



Electrical Characteristics (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V _{(BR)DSS}	Drain-Source Breakdown Voltage	1200			V	V _{GS} = 0 V, I _D = 100 μA	
V _{GS(th)}	Gate Threshold Voltage	1.8	2.5	3.6	V	V _{DS} = V _{GS} , I _D = 5 mA	
			2.2		V	V _{DS} = V _{GS} , I _D = 5 mA, T _J = 175°C	
I _{DSS}	Zero Gate Voltage Drain Current		1	100	μA	V _{DS} = 1200 V, V _{GS} = 0 V	
I _{GSS}	Gate-Source Leakage Current		10	250	nA	V _{GS} = 15 V, V _{DS} = 0 V	
R _{DS(on)}	Drain-Source On-State Resistance		75	90	mΩ	V _{GS} = 15 V, I _D = 20 A	
			120			V _{GS} = 15 V, I _D = 20A, T _J = 175°C	
g _{fs}	Transconductance		12		S	V _{DS} = 20 V, I _{DS} = 20 A	
			13			V _{DS} = 20 V, I _{DS} = 20 A, T _J = 175°C	
C _{iss}	Input Capacitance		1335		pF	V _{GS} = 0 V, V _{DS} = 1000 V f = 1 MHz V _{AC} = 25 mV	
C _{oss}	Output Capacitance		58				
C _{rss}	Reverse Transfer Capacitance		2				
E _{oss}	C _{oss} Stored Energy		33				
E _{ON}	Turn-On Switching Energy (SiC Diode FWD)		564		μJ	V _{DS} = 800 V, V _{GS} = -4 V/15 V, I _D = 20A, R _{G(ext)} = 0Ω, L = 157 μH, T _J = 150°C	
E _{OFF}	Turn Off Switching Energy (SiC Diode FWD)		186				
E _{ON}	Turn-On Switching Energy (Body Diode FWD)		924		μJ	V _{DS} = 800 V, V _{GS} = -4 V/15 V, I _D = 20A, R _{G(ext)} = 0Ω, L = 157 μH, T _J = 150°C	
E _{OFF}	Turn Off Switching Energy (Body Diode FWD)		162				
t _{d(on)}	Turn-On Delay Time		56		ns	V _{DD} = 800 V, V _{GS} = -4 V/15 V I _D = 20 A, R _{G(ext)} = 0 Ω, Timing relative to V _{DS} Inductive load	
t _r	Rise Time		17				
t _{d(off)}	Turn-Off Delay Time		32				
t _f	Fall Time		13				
R _{G(int)}	Internal Gate Resistance		9.0		Ω	f = 1 MHz, V _{AC} = 25 mV	
Q _{gs}	Gate to Source Charge		17		nC	V _{DS} = 800 V, V _{GS} = -4 V/15 V I _D = 20 A Per IEC60747-8-4 pg 21	
Q _{gd}	Gate to Drain Charge		20				
Q _g	Total Gate Charge		52				

Reverse Diode Characteristics (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V _{SD}	Diode Forward Voltage	4.5		V	V _{GS} = -4 V, I _{SD} = 10 A	
		4.0		V	V _{GS} = -4 V, I _{SD} = 10 A, T _J = 175 °C	
I _S	Continuous Diode Forward Current		26	A	V _{GS} = -4 V, T _J = 25 °C	
I _{S, pulse}	Diode pulse Current	80		A	V _{GS} = -4 V, pulse width t _p limited by T _{jmax}	
t _{rr}	Reverse Recover time	48		ns	V _{GS} = -4 V, I _{SD} = 20 A, V _R = 800 V dif/dt = 2800 A/μs, T _J = 150 °C	
Q _{rr}	Reverse Recovery Charge	279		nC		
I _{rrm}	Peak Reverse Recovery Current	9		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
R _{θJC}	Thermal Resistance from Junction to Case	0.97	1.1	°C/W		Fig. 21
R _{θJA}	Thermal Resistance From Junction to Ambient		40			



Typical Performance

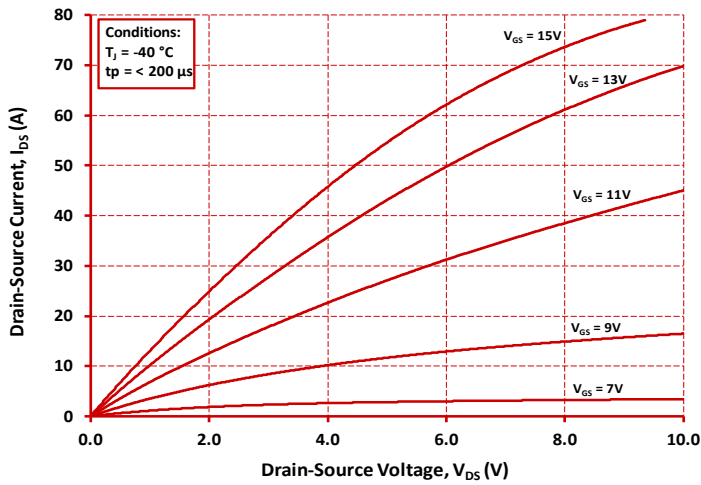


Figure 1. Output Characteristics $T_j = -40\text{ }^{\circ}\text{C}$

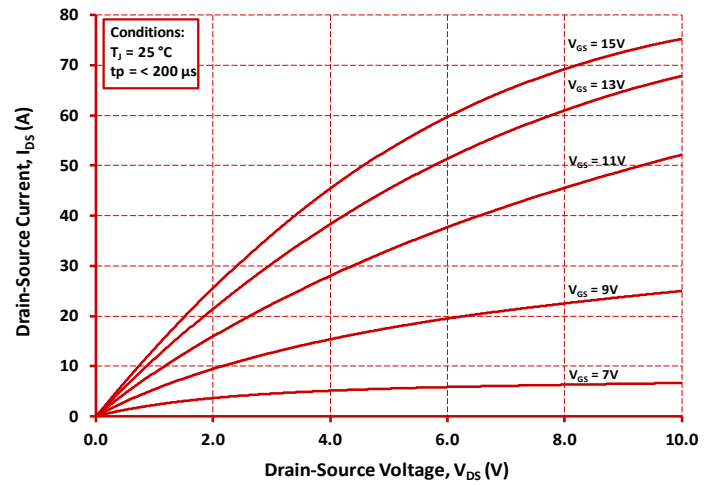


Figure 2. Output Characteristics $T_j = 25\text{ }^{\circ}\text{C}$

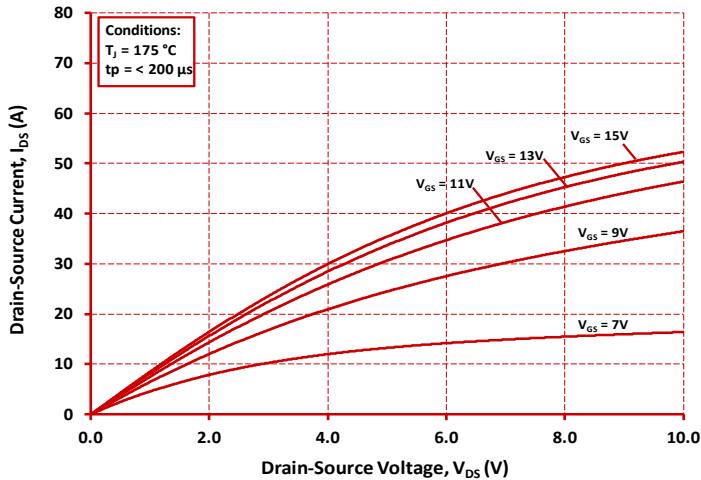


Figure 3. Output Characteristics $T_j = 175\text{ }^{\circ}\text{C}$

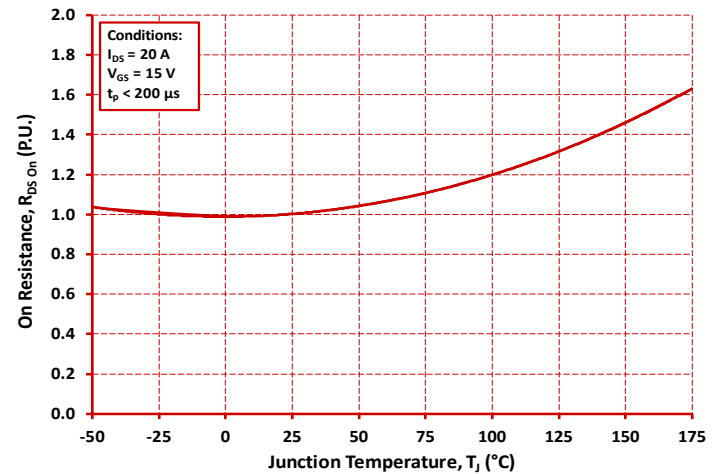


Figure 4. Normalized On-Resistance vs. Temperature

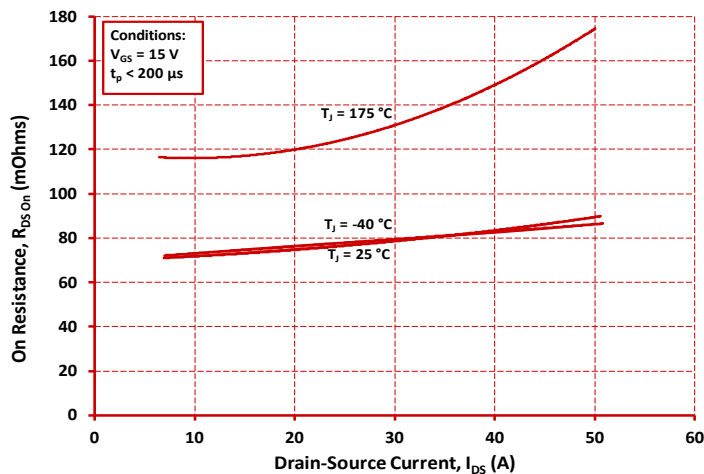


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

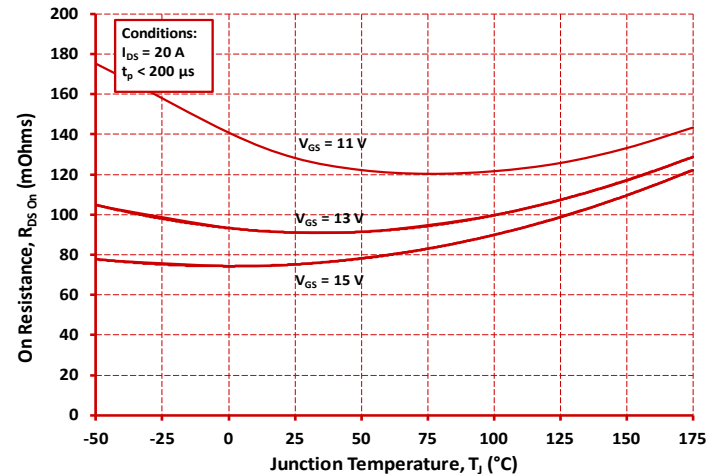


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage



Typical Performance

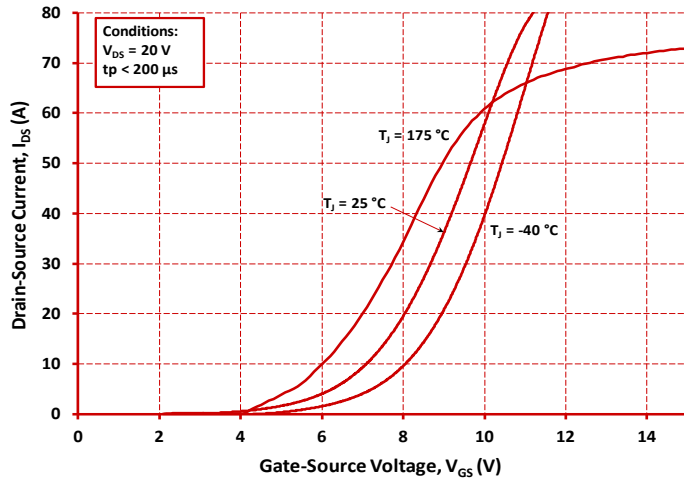


Figure 7. Transfer Characteristic for Various Junction Temperatures

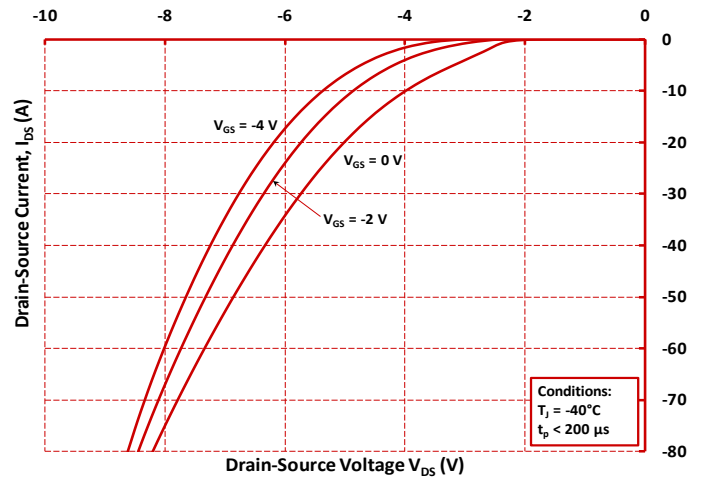


Figure 8. Body Diode Characteristic at -40 °C

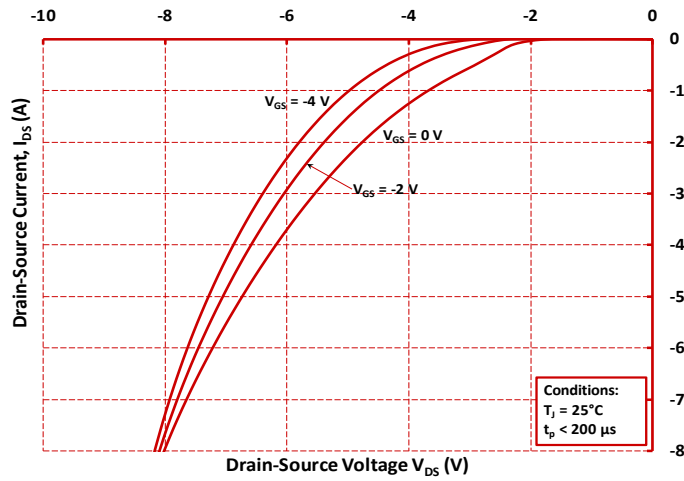


Figure 9. Body Diode Characteristic at 25 °C

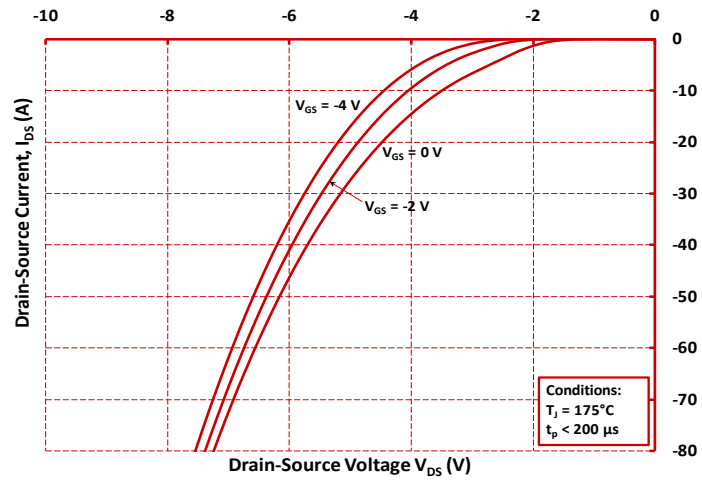


Figure 10. Body Diode Characteristic at 175 °C

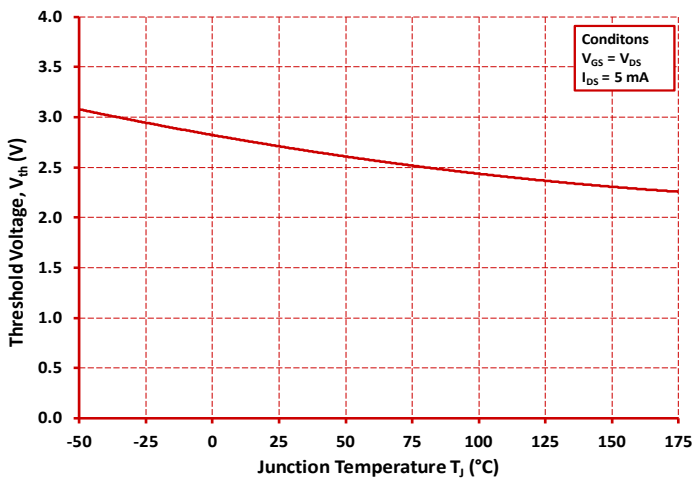


Figure 11. Threshold Voltage vs. Temperature

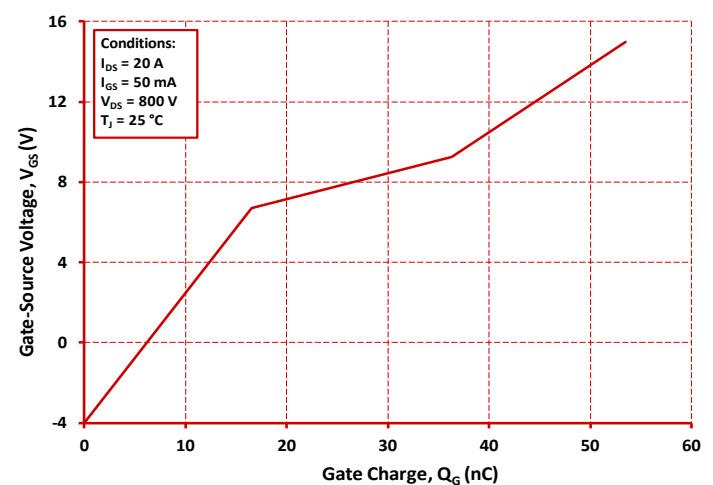


Figure 12. Gate Charge Characteristics



Typical Performance

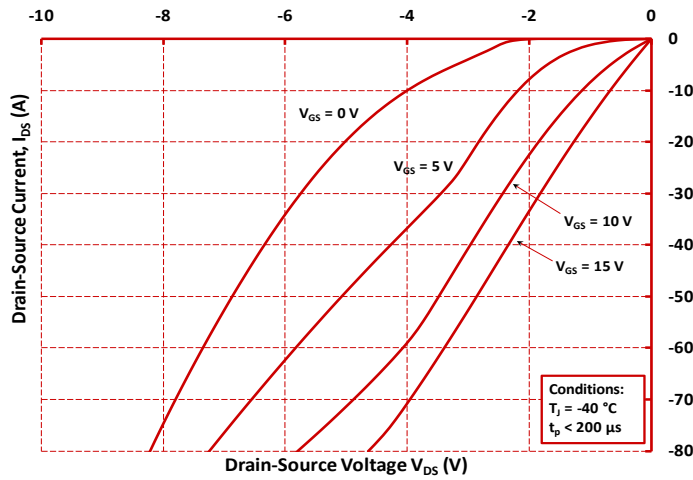


Figure 13. 3rd Quadrant Characteristic at $-40\text{ }^{\circ}\text{C}$

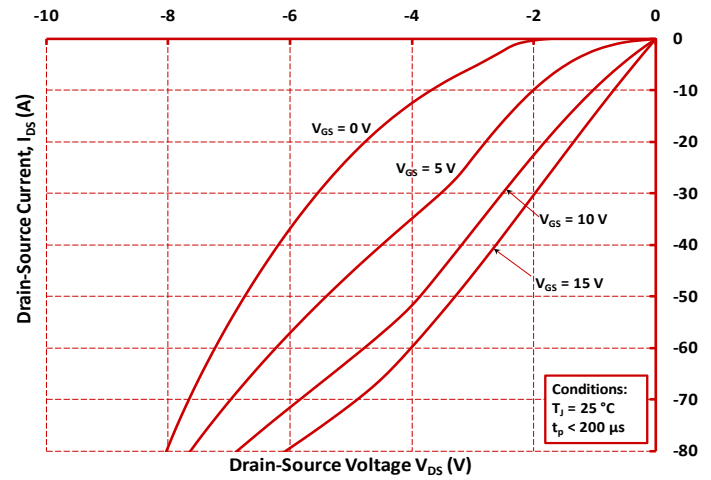


Figure 14. 3rd Quadrant Characteristic at $25\text{ }^{\circ}\text{C}$

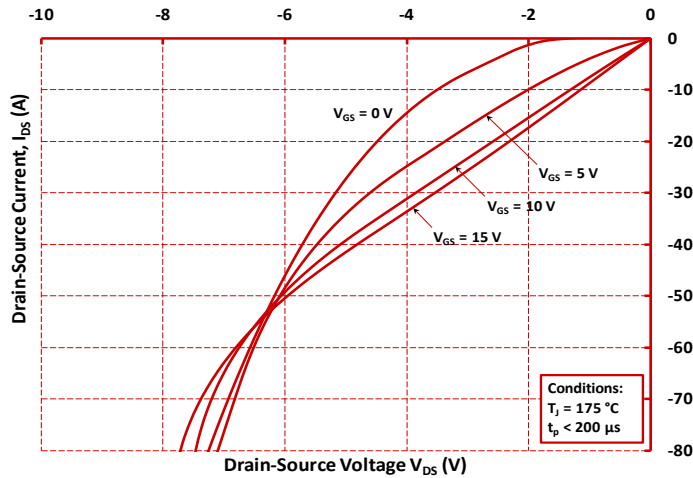


Figure 15. 3rd Quadrant Characteristic at $175\text{ }^{\circ}\text{C}$

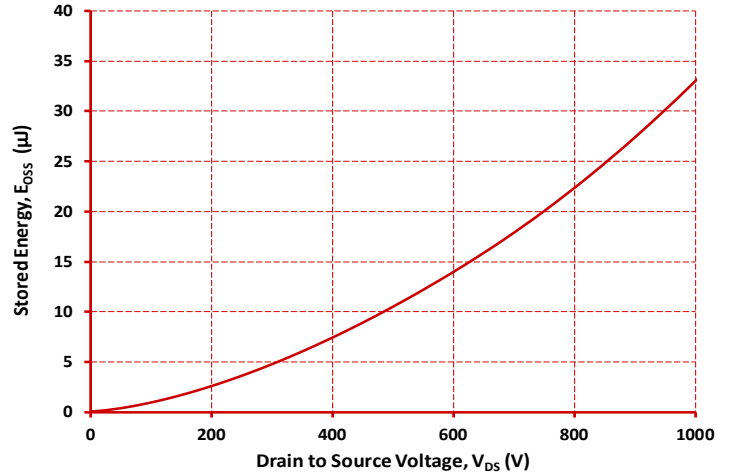


Figure 16. Output Capacitor Stored Energy

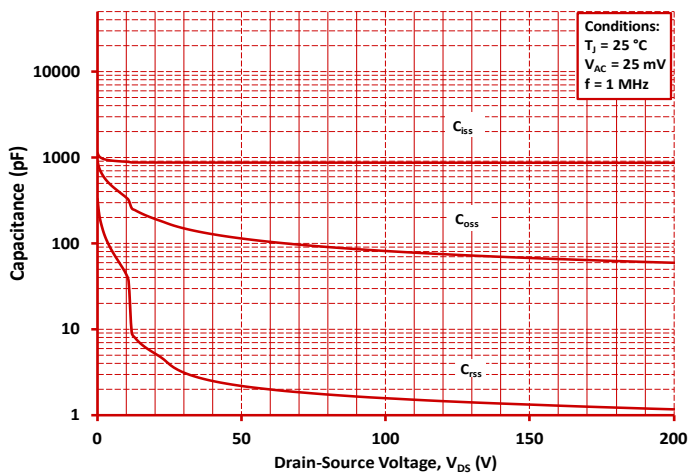


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

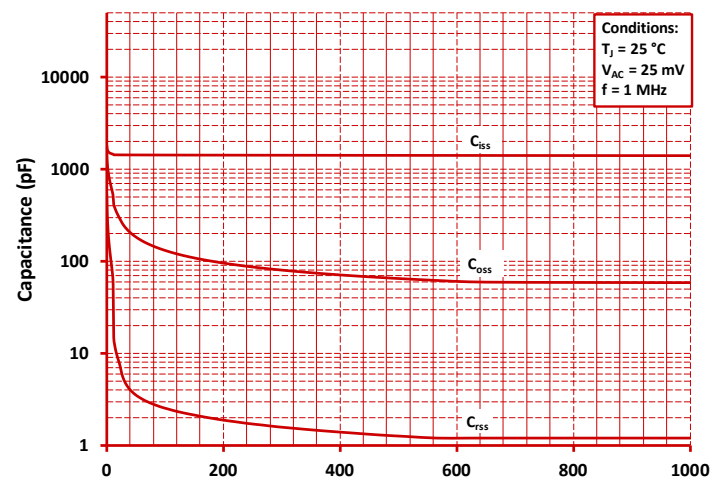


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

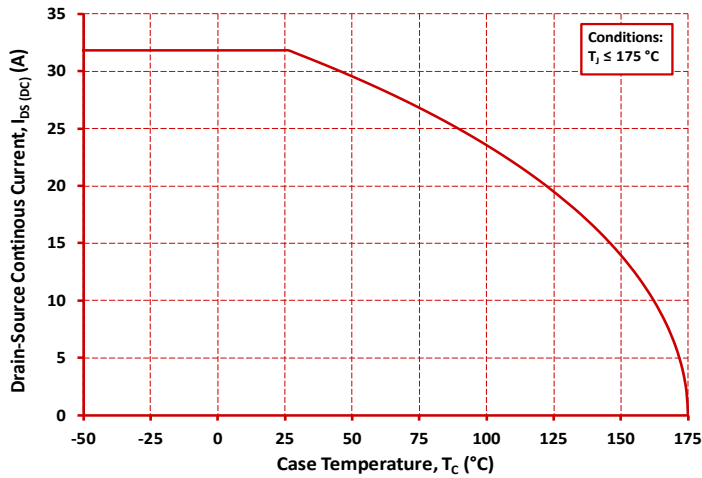


Figure 19. Continuous Drain Current Derating vs. Case Temperature

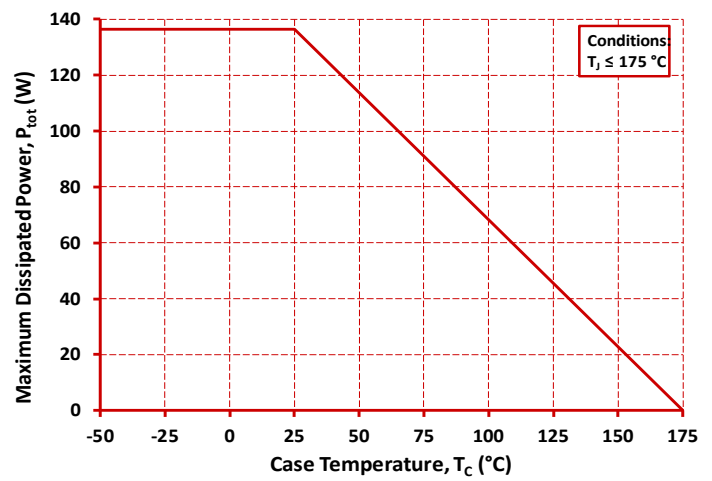


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

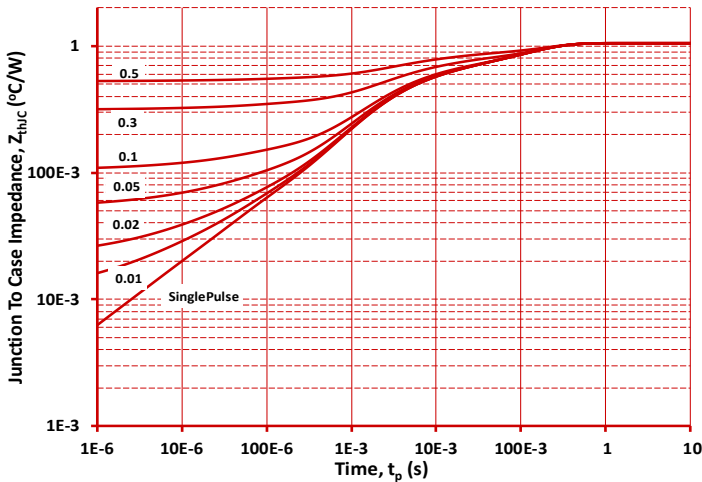


Figure 21. Transient Thermal Impedance (Junction - Case)

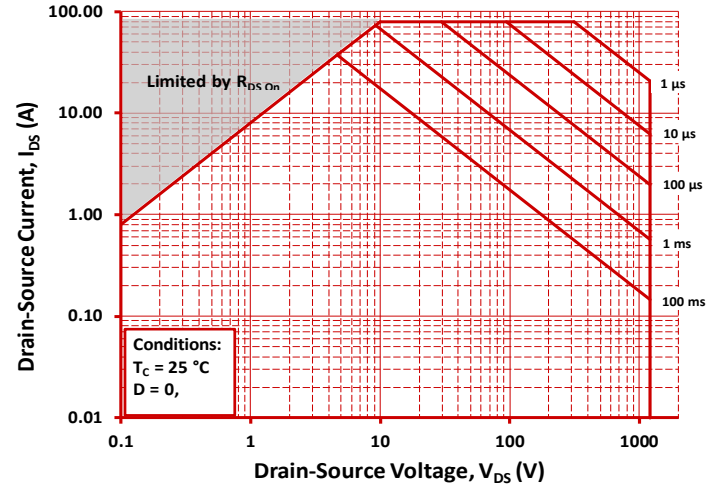


Figure 22. Safe Operating Area

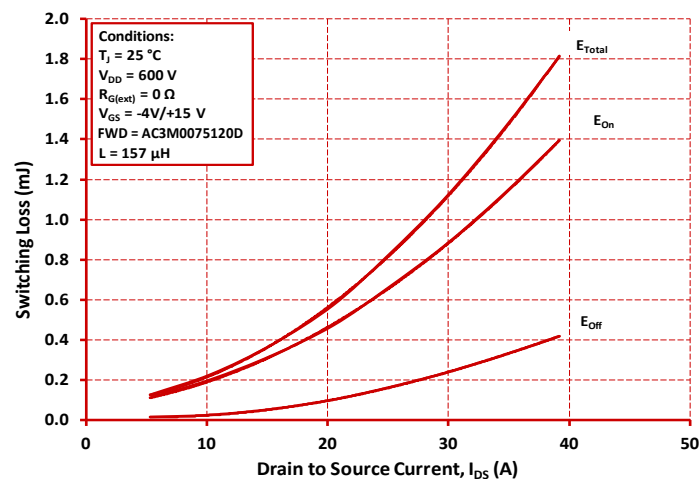


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

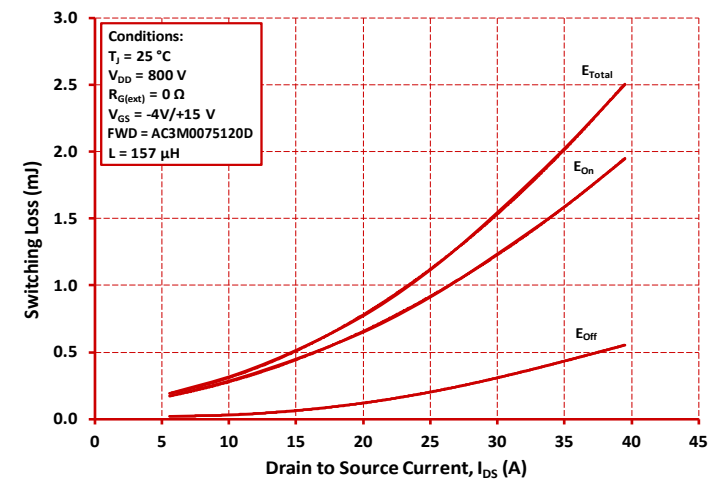


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

Typical Performance

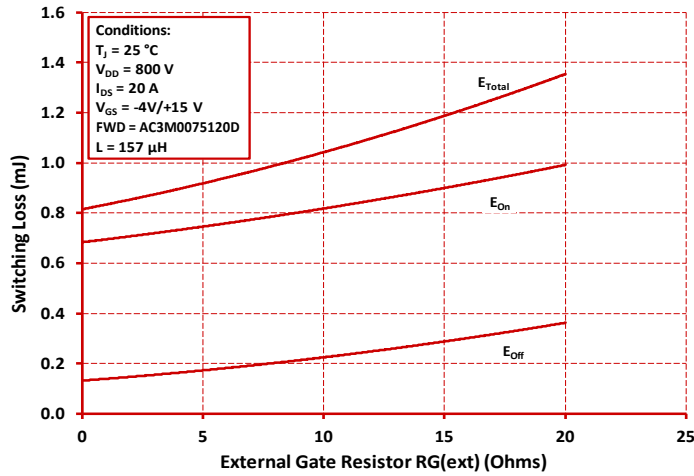


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

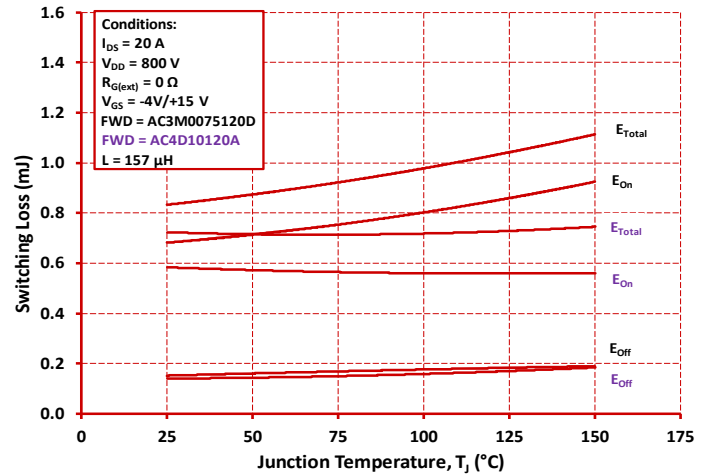


Figure 26. Clamped Inductive Switching Energy vs. Temperature

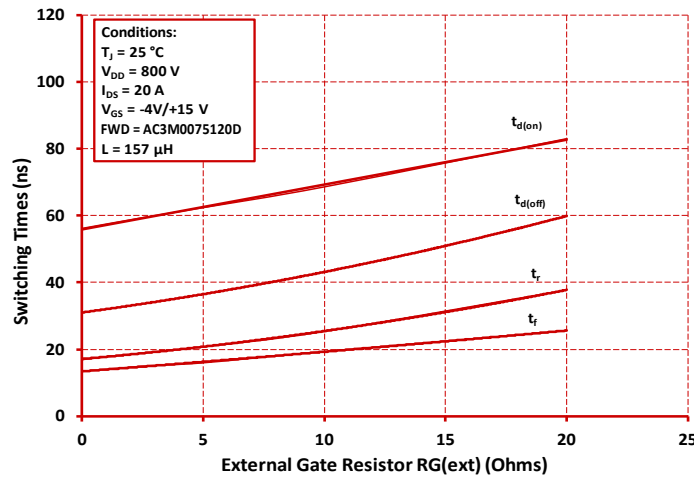


Figure 27. Switching Times vs. $R_{G(\text{ext})}$

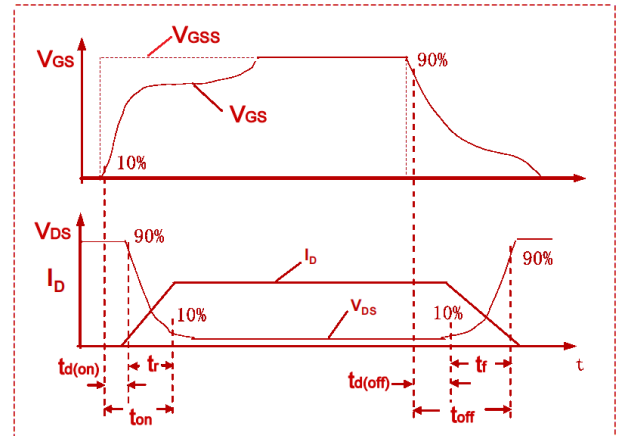


Figure 28. Switching Times Definition

Test Circuit Schematic

Fig.29 Switching Time Measurement Circuit

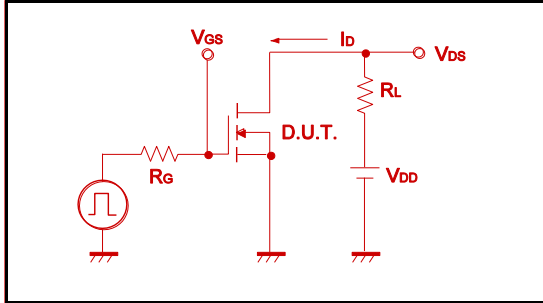


Fig.30 Switching Waveforms

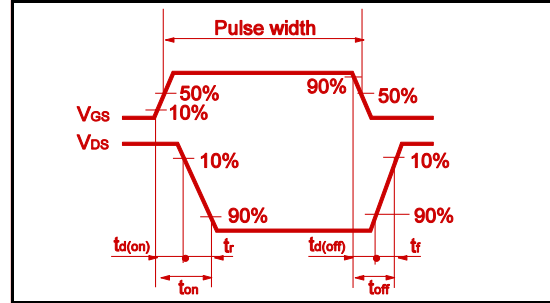


Fig.30-1 Gate Charge Measurement Circuit

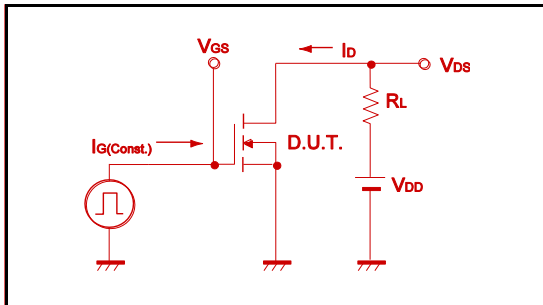


Fig.30-2 Gate Charge Waveform

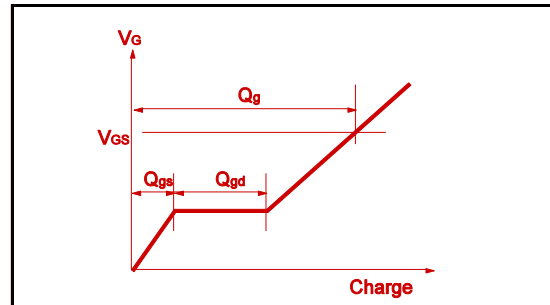


Fig.31-1 Switching Energy Measurement Circuit

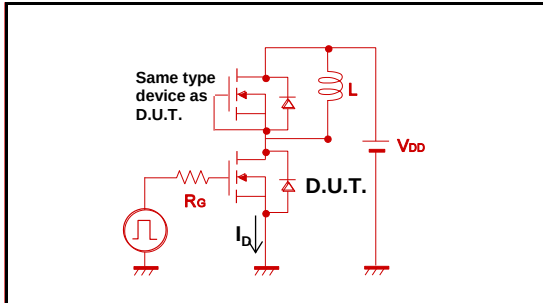


Fig.31-2 Switching Waveforms

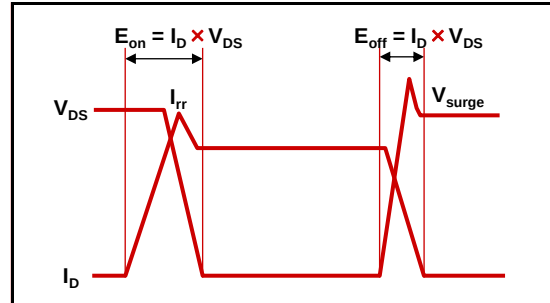
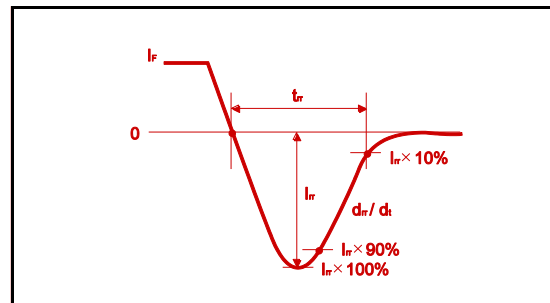
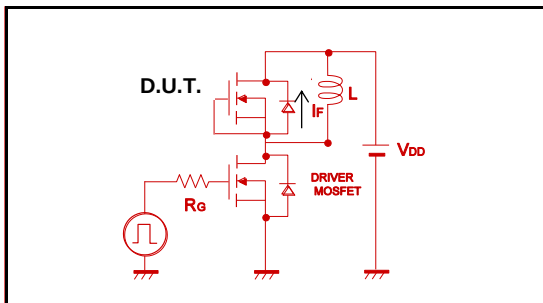
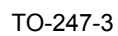


Fig.32-1 Reverse Recovery Time Measurement Circuit Fig.32-2 Reverse Recovery Waveform



Unit: mm



TO-247-3