

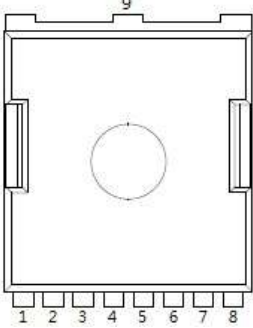
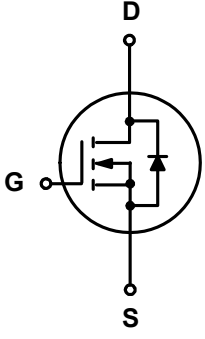
Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Resistant to Latch-Up
- Halogen Free, RoHS Compliant

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC converters
- Battery Chargers
- Motor Drives
- Pulsed Power Applications

Package

Pin	Description	Simplified Outline	Symbol
1	Gate(G)	 Top View TOLL	
2,3,4,5,6,7,8	Source(S)		
9	Drain(D)		

Maximum Ratings ($T_c = 25^\circ\text{C}$ 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	-10/+25	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-5/+20	V	Recommended operational values	
I_D	Continuous Drain Current	60	A	$V_{GS} = 20\text{ V}, T_c = 25^\circ\text{C}$	Fig. 19
		40		$V_{GS} = 20\text{ V}, T_c = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	160	A	Pulse width t_p limited by T_{jmax}	Fig. 22
P_D	Power Dissipation	330	W	$T_c = 25^\circ\text{C}, T_j = 150^\circ\text{C}$	Fig. 20
T_j, T_{stg}	Operating Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$	1.6mm (0.063") from case for 10s	
M_d	Mounting Torque	1 8.8	Nm lbf-in	M3 or 6-32 screw	

Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.4	4	V	$V_{DS} = V_{GS}, I_D = 10\text{ mA}$	Fig. 11
			2.1		V	$V_{DS} = V_{GS}, I_D = 10\text{ mA}, T_J = 150^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	
I_{GSS}	Gate-Source Leakage Current			250	nA	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	
$R_{DS(on)}$	Drain-Source On-State Resistance		40	52	m Ω	$V_{GS} = 20\text{ V}, I_D = 40\text{ A}$	Fig. 4,5,6
			84			$V_{GS} = 20\text{ V}, I_D = 40\text{ A}, T_J = 150^\circ\text{C}$	
g_{fs}	Transconductance		11.4		S	$V_{DS} = 20\text{ V}, I_{DS} = 40\text{ A}$	Fig. 7
			10.1			$V_{DS} = 20\text{ V}, I_{DS} = 40\text{ A}, T_J = 150^\circ\text{C}$	
C_{iss}	Input Capacitance		3500		pF	$V_{GS} = 0\text{ V}$	Fig. 17,18
C_{oss}	Output Capacitance		180			$V_{DS} = 1000\text{ V}$	
C_{rss}	Reverse Transfer Capacitance		37			$f = 1\text{ MHz}$	
E_{oss}	C_{oss} Stored Energy		105		μJ	$V_{AC} = 25\text{ mV}$	Fig 16
E_{AS}	Avalanche Energy, Single Pluse		1.7		J	$I_D = 40\text{ A}, V_{DD} = 50\text{ V}$	Fig. 29
E_{ON}	Turn-On Switching Energy		1.5		mJ	$V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}$	Fig. 25
E_{OFF}	Turn Off Switching Energy		0.7			$I_D = 40\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega, L = 80\text{ }\mu\text{H}$	
$t_{d(on)}$	Turn-On Delay Time		60		ns	$V_{DD} = 800\text{ V}, V_{GS} = -5/20\text{ V}$ $I_D = 40\text{ A}$ $R_{G(ext)} = 2.5\text{ }\Omega, R_L = 20\text{ }\Omega$ Timing relative to V_{DS} Per IEC60747-8-4 pg 83	Fig. 27
t_r	Rise Time		140				
$t_{d(off)}$	Turn-Off Delay Time		50				
t_f	Fall Time		42				
$R_{G(int)}$	Internal Gate Resistance		0.8		Ω	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	
Q_{gs}	Gate to Source Charge		40		nC	$V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}$ $I_D = 40\text{ A}$ Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		55				
Q_g	Total Gate Charge		205				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.6		V	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, T_J = 25^\circ\text{C}$	Fig. 8, 9, 10
		3.3		V	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, T_J = 150^\circ\text{C}$	
I_S	Continuous Diode Forward Current		60	A	$T_c = 25^\circ\text{C}$	Note 1
t_{rr}	Reverse Recovery Time	54		ns	$V_{GS} = -5\text{ V}, I_{SD} = 40\text{ A}, T_J = 25^\circ\text{C}$ $VR = 800\text{ V}$ $dif/dt = 1000\text{ A}/\mu\text{s}$	Note 1
Q_{rr}	Reverse Recovery Charge	283		nC		
I_{rrm}	Peak Reverse Recovery Current	15		A		

Note (1): When using SiC Body Diode the maximum recommended $V_{GS} = -5\text{ V}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.34	0.38	$^\circ\text{C}/\text{W}$		Fig. 21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient		40			

Typical Performance

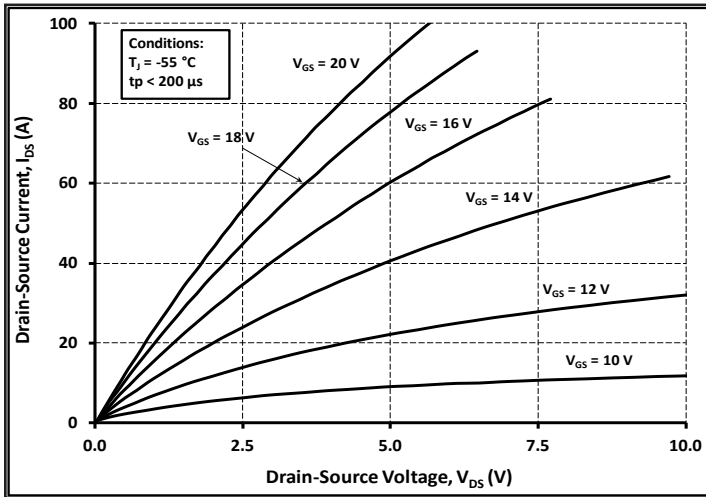


Figure 1. Output Characteristics $T_J = -55\text{ }^{\circ}\text{C}$

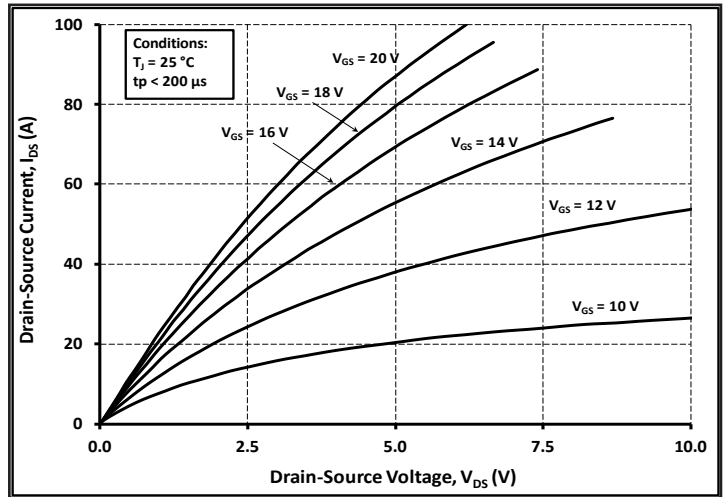


Figure 2. Output Characteristics $T_J = 25\text{ }^{\circ}\text{C}$

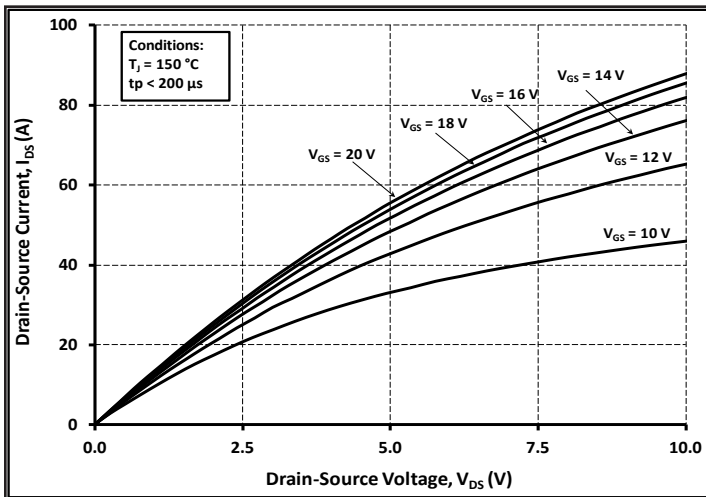


Figure 3. Output Characteristics $T_J = 150\text{ }^{\circ}\text{C}$

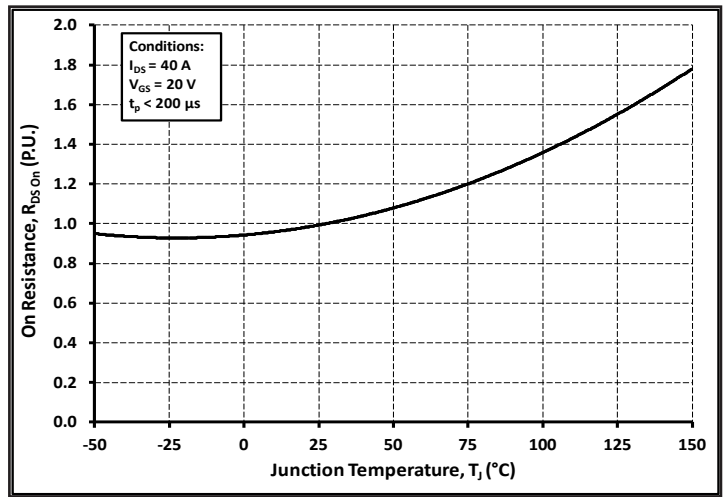


Figure 4. Normalized On-Resistance vs. Temperature

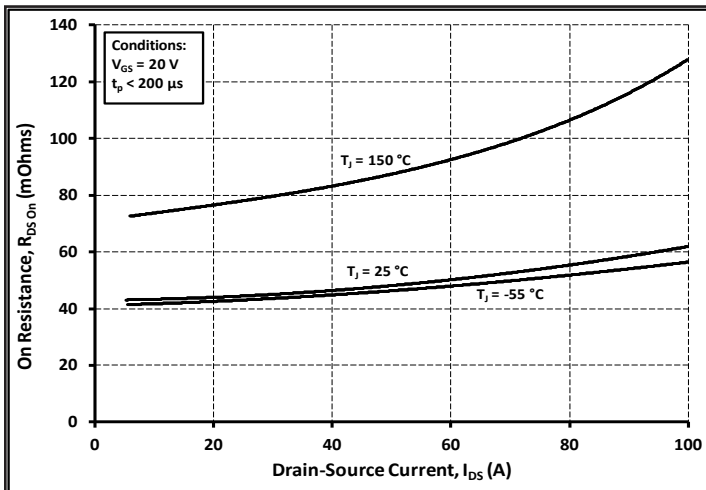


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

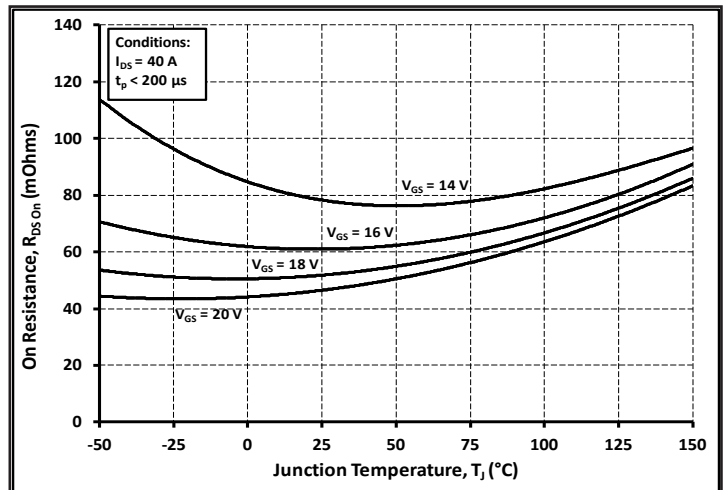


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

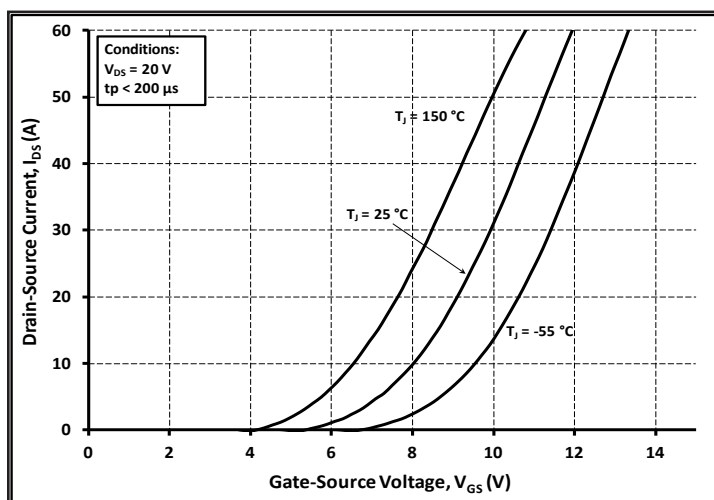


Figure 7. Transfer Characteristic for Various Junction Temperatures

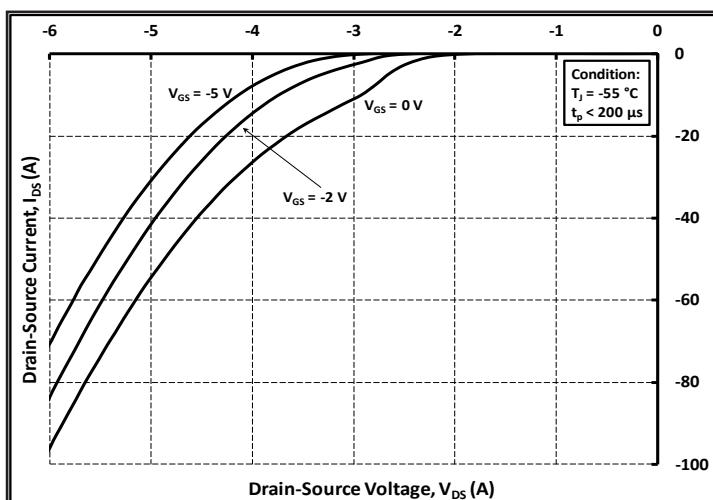


Figure 8. Body Diode Characteristic at -55 °C

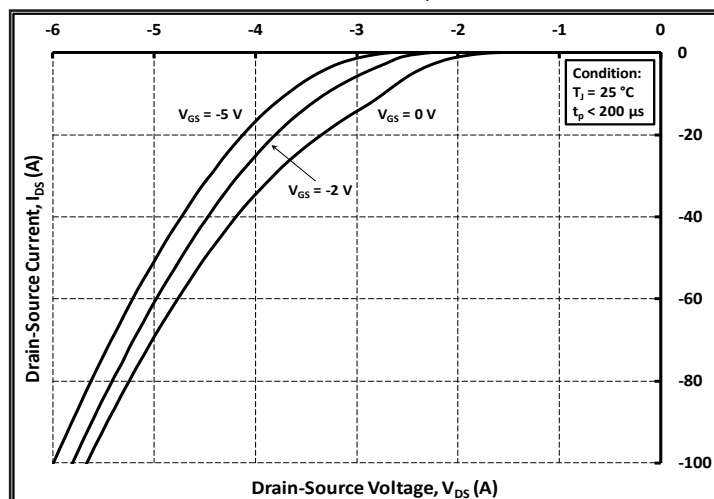


Figure 9. Body Diode Characteristic at 25 °C

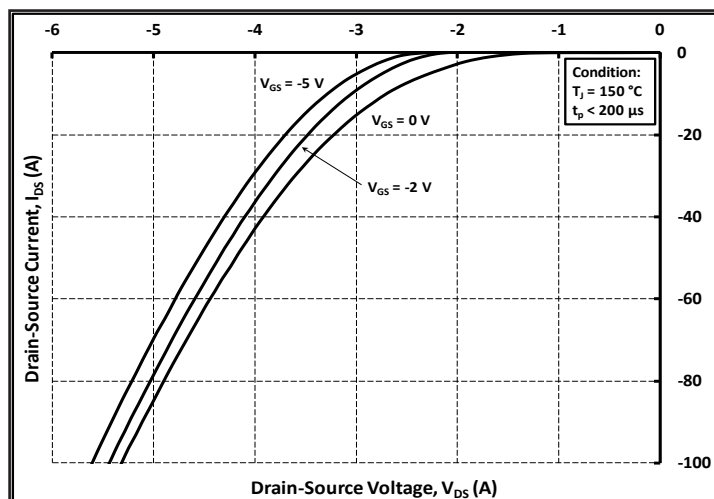


Figure 10. Body Diode Characteristic at 150 °C

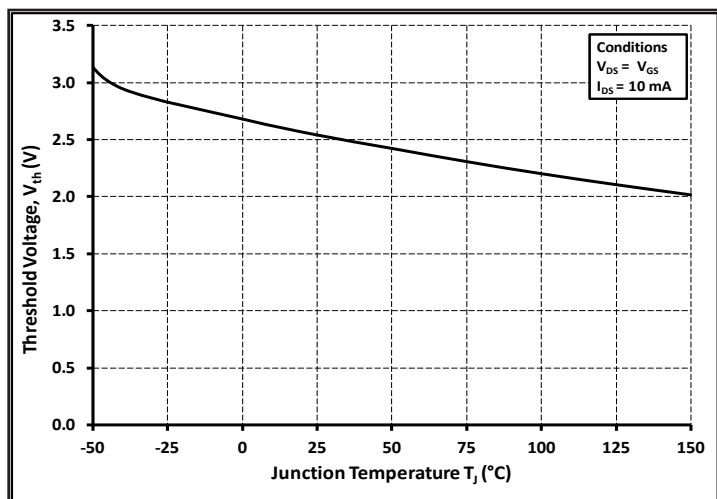


Figure 11. Threshold Voltage vs. Temperature

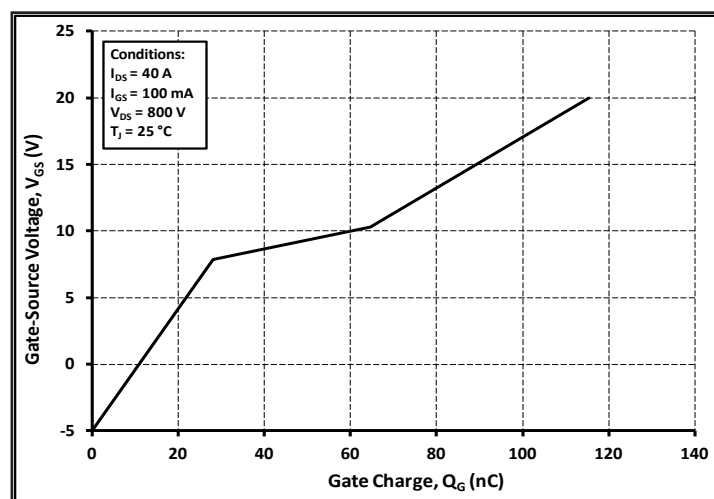


Figure 12. Gate Charge Characteristics

Typical Performance

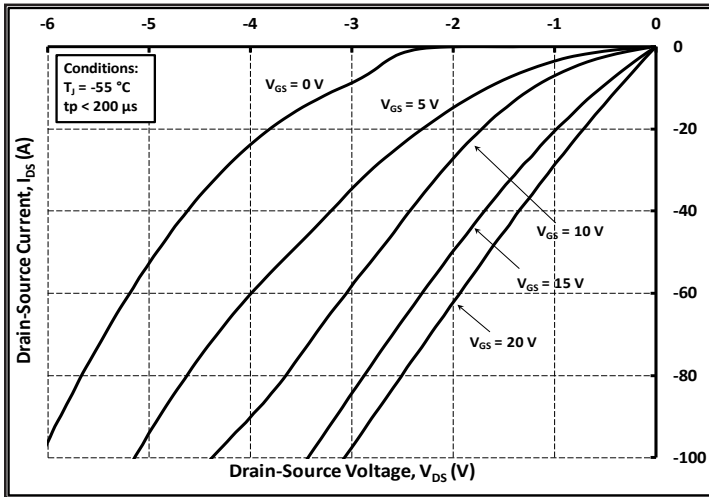


Figure 13. 3rd Quadrant Characteristic at -55 °C

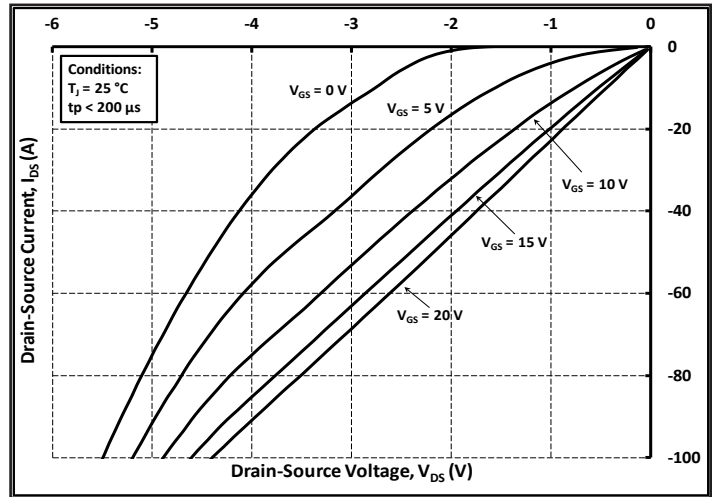


Figure 14. 3rd Quadrant Characteristic at 25 °C

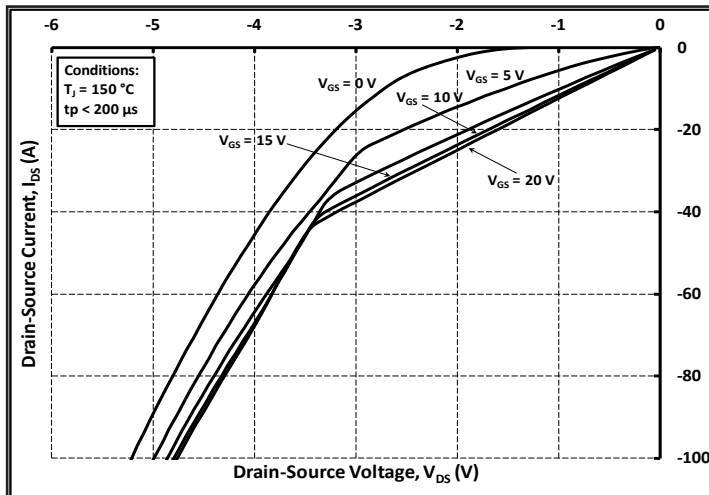


Figure 15. 3rd Quadrant Characteristic at 150 °C

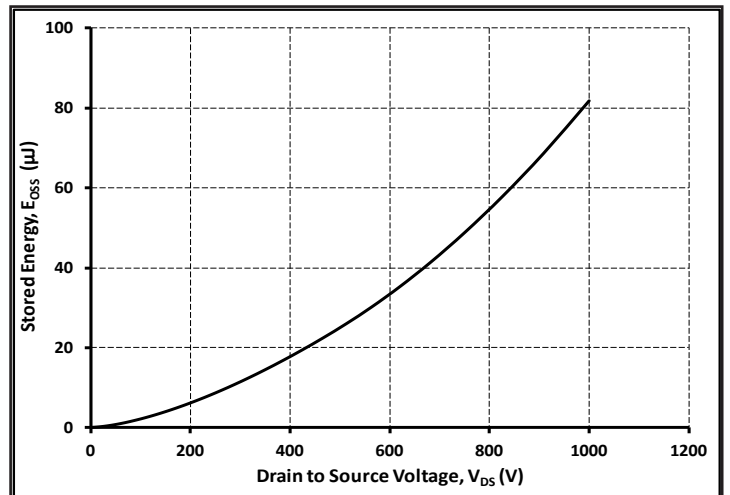


Figure 16. Output Capacitor Stored Energy

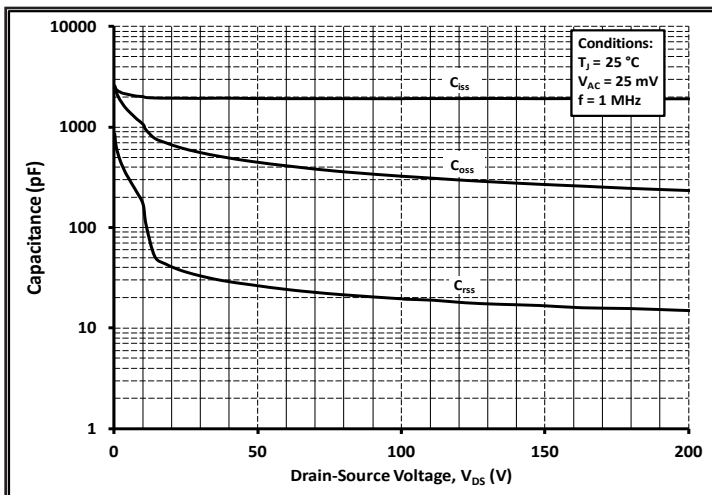


Figure 17. Capacitances vs. Drain-Source Voltage (0-200 V)

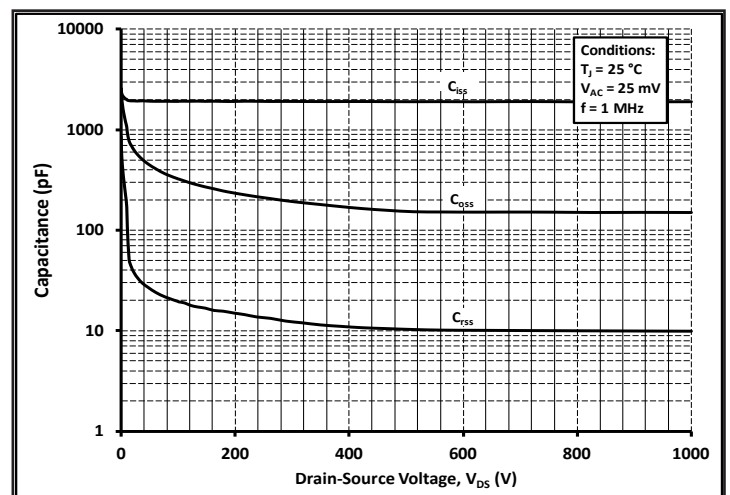


Figure 18. Capacitances vs. Drain-Source Voltage (0-1000 V)

Typical Performance

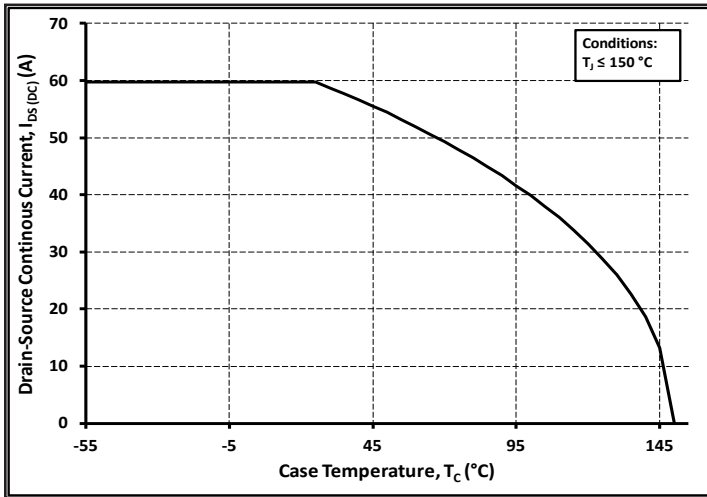


Figure 19. Continuous Drain Current Derating vs. Case Temperature

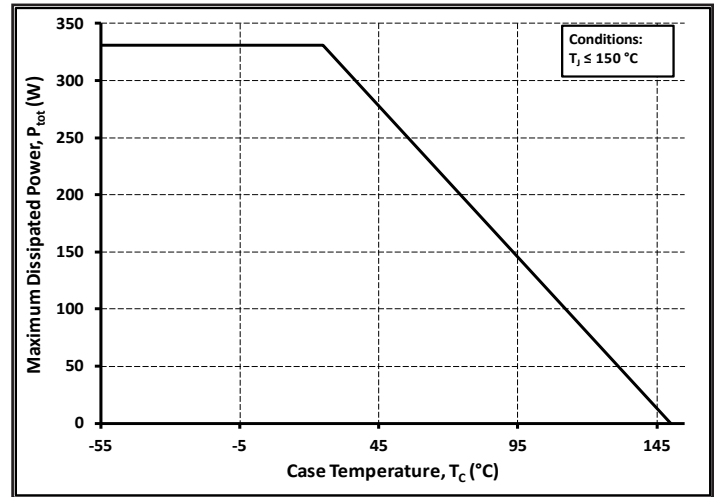


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

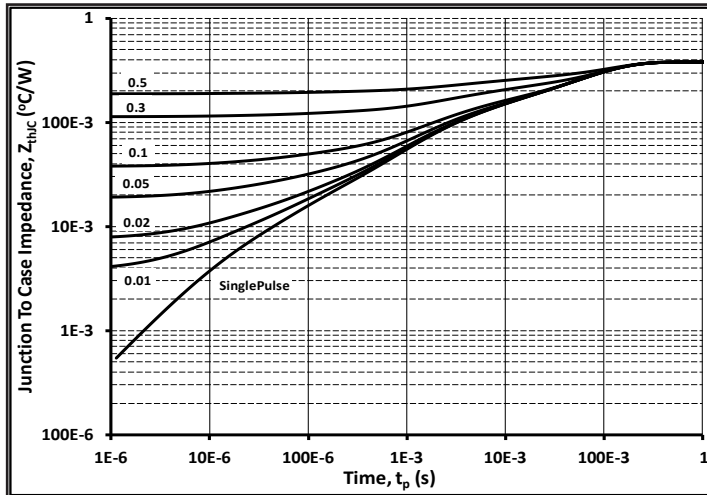


Figure 21. Transient Thermal Impedance (Junction - Case)

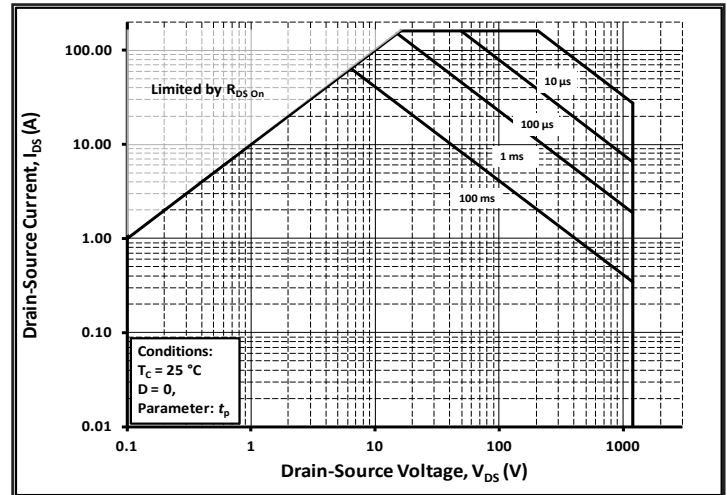


Figure 22. Safe Operating Area

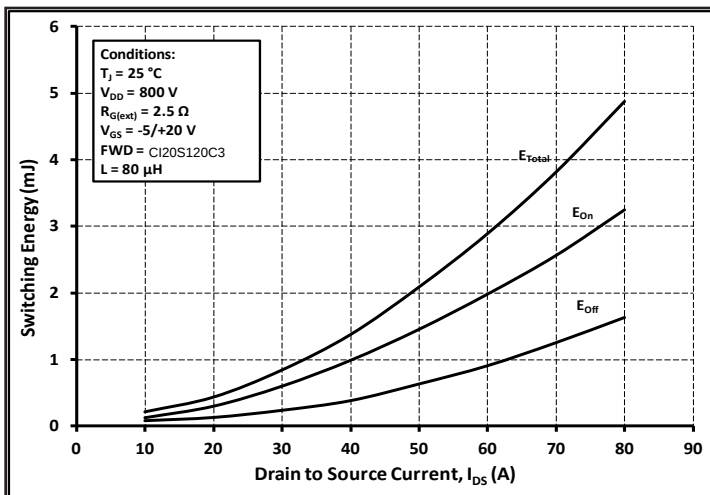


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

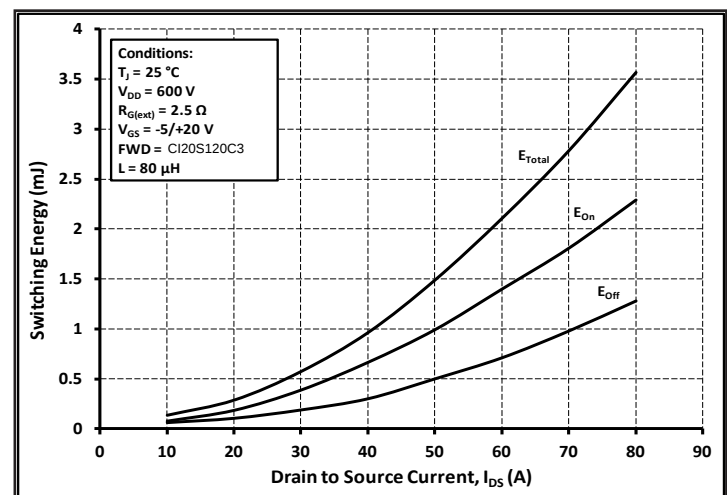


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

Typical Performance

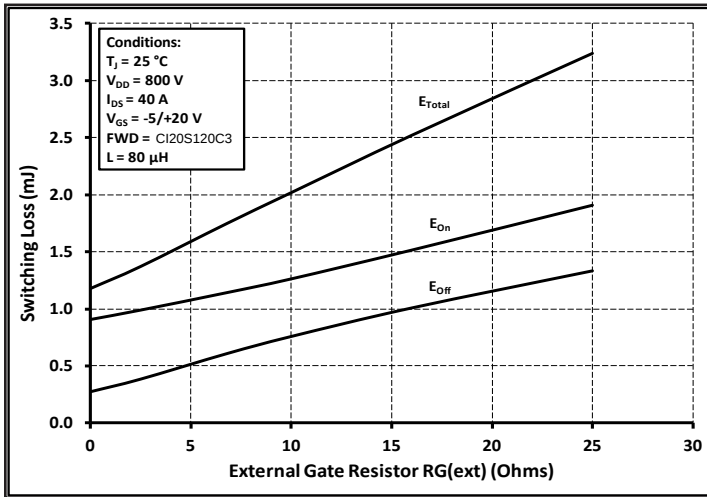


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

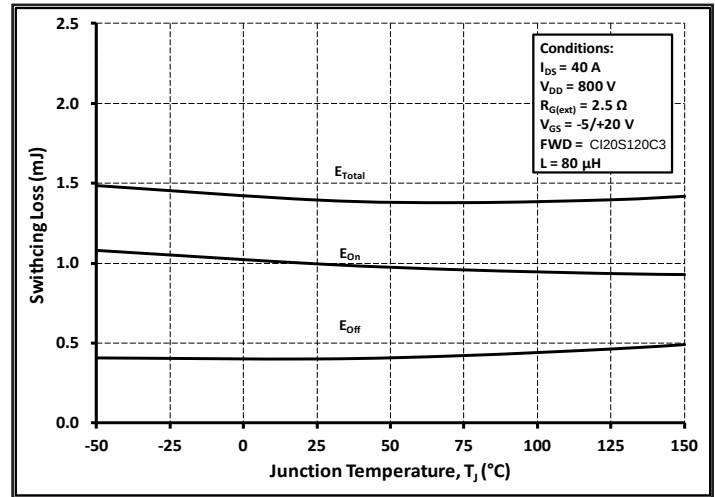


Figure 26. Clamped Inductive Switching Energy vs. Temperature

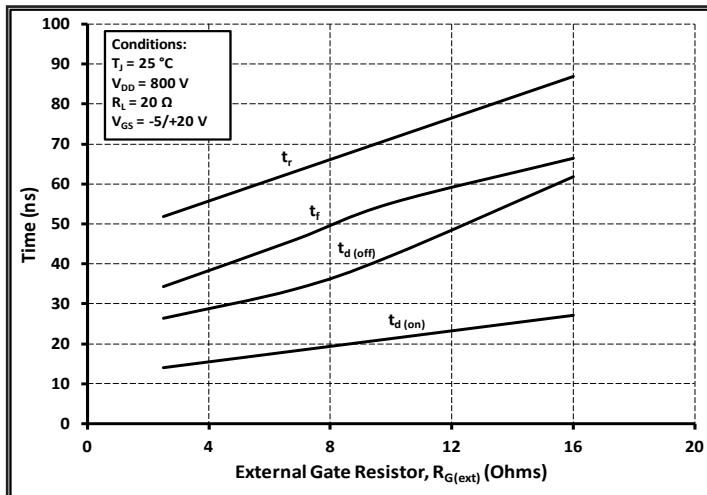


Figure 27. Switching Times vs. $R_{G(\text{ext})}$

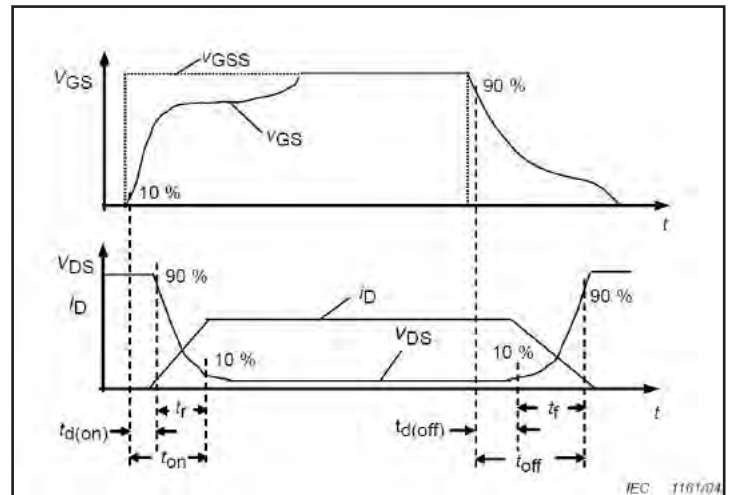


Figure 28. Switching Times Definition

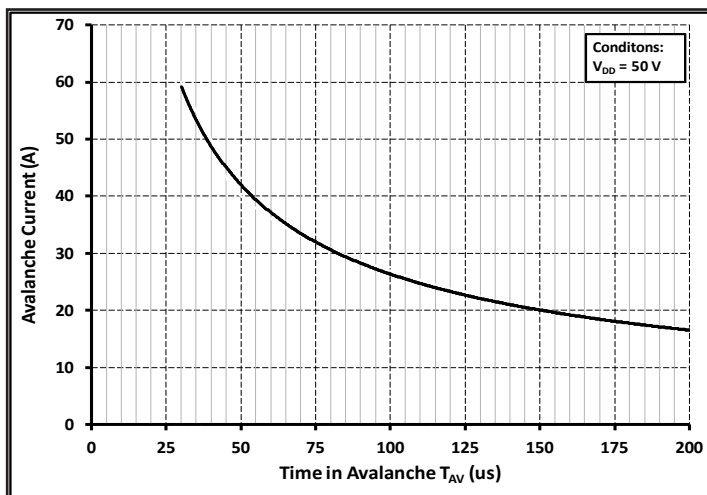


Figure 29. Single Avalanche SOA curve

Test Circuit Schematic

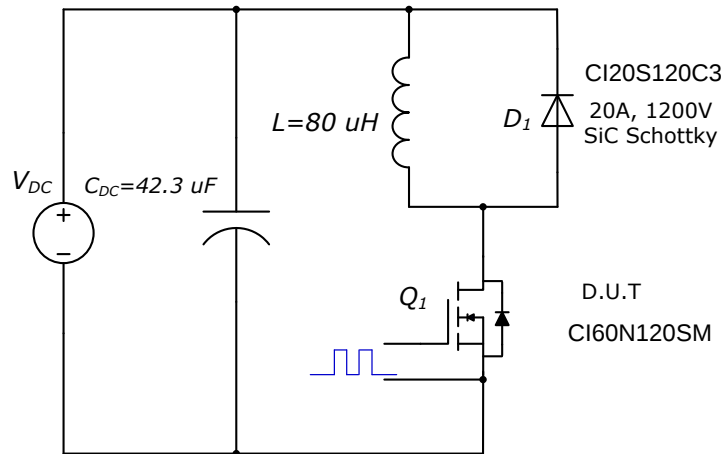


Figure 30. Clamped Inductive Switching Waveform Test Circuit

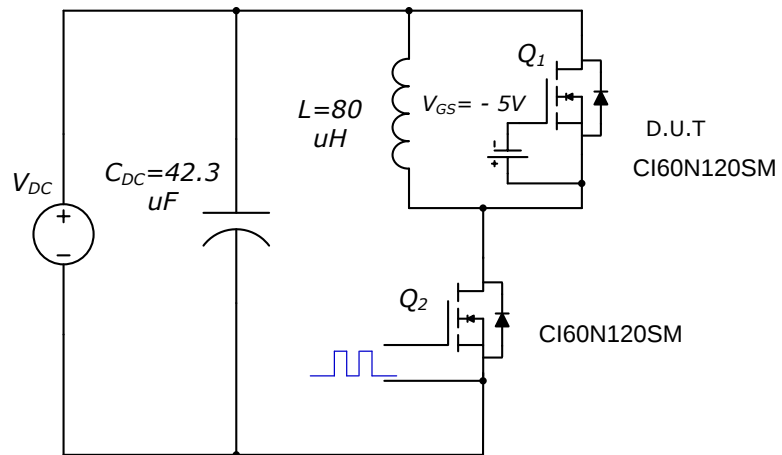
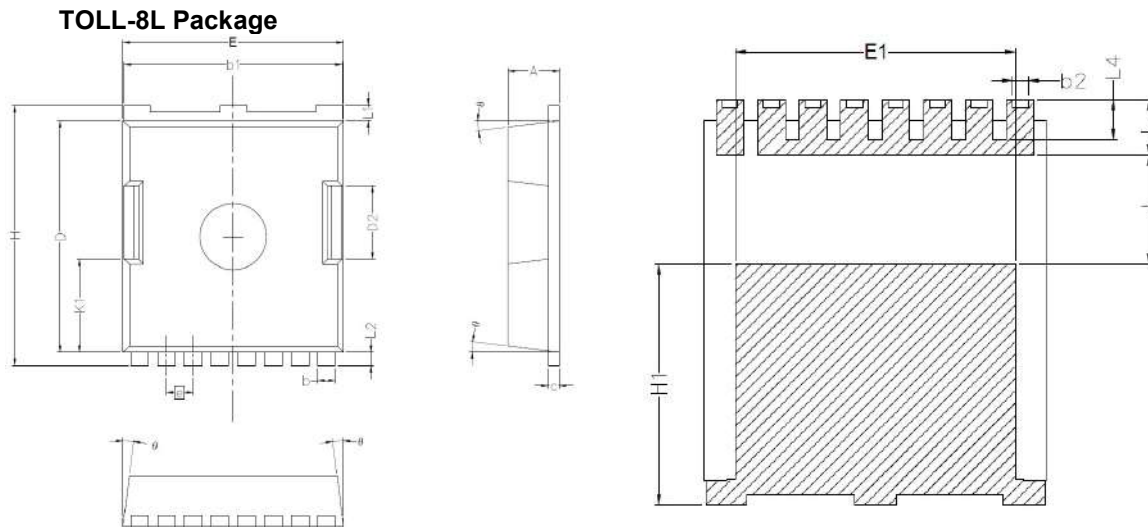


Figure 31. Body Diode Recovery Test Circuit

Package Dimensions



Symbol	Dimensions In Millimeters	
	MIN.	MAX.
A	2.20	2.40
b	0.70	0.90
b1	9.70	9.90
b2	0.42	0.50
c	0.40	0.60
D	10.28	10.58
D2	3.10	3.50
E	9.70	10.10
E1	7.90	8.30
e	1.20BSC	
H	11.48	11.88
H1	6.75	7.15
N	8	
J	3.00	3.30
K1	3.98	4.38
L	1.40	1.80
L1	0.60	0.80
L2	0.50	0.70
L4	1.00	1.30
θ	4°	10°