

### 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

### Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

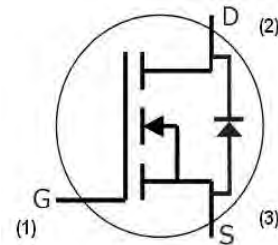
### Applications

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

### Package



TO-247-3



### Maximum Ratings ( $T_c = 25\text{ }^\circ\text{C}$ 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	$V_{GS} = 20\text{ V}, T_C = 25\text{ }^\circ\text{C}$	Fig. 19
		40		$V_{GS} = 20\text{ V}, T_C = 100\text{ }^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	160	A	Pulse width $t_p$ limited by $T_{jmax}$	Fig. 22
$P_D$	Power Dissipation	330	W	$T_c=25\text{ }^\circ\text{C}, T_j = 150\text{ }^\circ\text{C}$	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<sub>c</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	1200			V	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA	
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	2.4	4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 10mA	Fig. 11
			2.1		V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 10mA, T <sub>J</sub> = 150 °C	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		1	100	μA	V <sub>DS</sub> = 1200 V, V <sub>GS</sub> = 0 V	
I <sub>GSS</sub>	Gate-Source Leakage Current			250	nA	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V	
R <sub>DS(on)</sub>	Drain-Source On-State Resistance		40	52	mΩ	V <sub>GS</sub> = 20 V, I <sub>D</sub> = 40 A	Fig. 4,5,6
			84			V <sub>GS</sub> = 20 V, I <sub>D</sub> = 40 A, T <sub>J</sub> = 150 °C	
g <sub>fs</sub>	Transconductance		11.4		S	V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 40 A	Fig. 7
			10.1			V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 40 A, T <sub>J</sub> = 150 °C	
C <sub>iss</sub>	Input Capacitance		3500		pF	V <sub>GS</sub> = 0 V	Fig. 17,18
C <sub>oss</sub>	Output Capacitance		180			V <sub>DS</sub> = 1000 V	
C <sub>rss</sub>	Reverse Transfer Capacitance		37			f = 1 MHz	
E <sub>oss</sub>	C <sub>oss</sub> Stored Energy		105		μJ	V <sub>AC</sub> = 25 mV	Fig. 16
E <sub>AS</sub>	Avalanche Energy, Single Pluse		1.7		J	I <sub>D</sub> = 40A, V <sub>DD</sub> = 50V	Fig. 29
E <sub>ON</sub>	Turn-On Switching Energy		1.5		mJ	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = -5/20 V	Fig. 25
E <sub>OFF</sub>	Turn Off Switching Energy		0.7			I <sub>D</sub> = 40A, R <sub>G(ext)</sub> = 2.5Ω, L = 80 μH	
t <sub>d(on)</sub>	Turn-On Delay Time		60		ns	V <sub>DD</sub> = 800 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 40 A R <sub>G(ext)</sub> = 2.5 Ω, R <sub>L</sub> = 20 Ω Timing relative to V <sub>DS</sub> Per IEC60747-8-4 pg 83	Fig. 27
t <sub>r</sub>	Rise Time		140				
t <sub>d(off)</sub>	Turn-Off Delay Time		50				
t <sub>f</sub>	Fall Time		42				
R <sub>G(int)</sub>	Internal Gate Resistance		0.8		Ω	f = 1 MHz, V <sub>AC</sub> = 25 mV	
Q <sub>gs</sub>	Gate to Source Charge		40		nC	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 40 A Per IEC60747-8-4 pg 21	Fig. 12
Q <sub>gd</sub>	Gate to Drain Charge		55				
Q <sub>g</sub>	Total Gate Charge		205				

## Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V <sub>SD</sub>	Diode Forward Voltage	3.6		V	V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 20 A, T <sub>J</sub> = 25 °C	Fig. 8, 9, 10
		3.3		V	V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 20 A, T <sub>J</sub> = 150 °C	
I <sub>S</sub>	Continuous Diode Forward Current		60	A	T <sub>c</sub> = 25 °C	Note 1
t <sub>rr</sub>	Reverse Recovery Time	54		ns	V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 40 A T <sub>J</sub> = 25 °C VR = 800 V dif/dt = 1000 A/μs	Note 1
Q <sub>rr</sub>	Reverse Recovery Charge	283		nC		
I <sub>rrm</sub>	Peak Reverse Recovery Current	15		A		

Note (1): When using SiC Body Diode the maximum recommended V<sub>GS</sub> = -5V

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
R <sub>θJC</sub>	Thermal Resistance from Junction to Case	0.34	0.38	°C/W		Fig. 21
R <sub>θJA</sub>	Thermal Resistance from Junction to Ambient		40			

Typical Performance

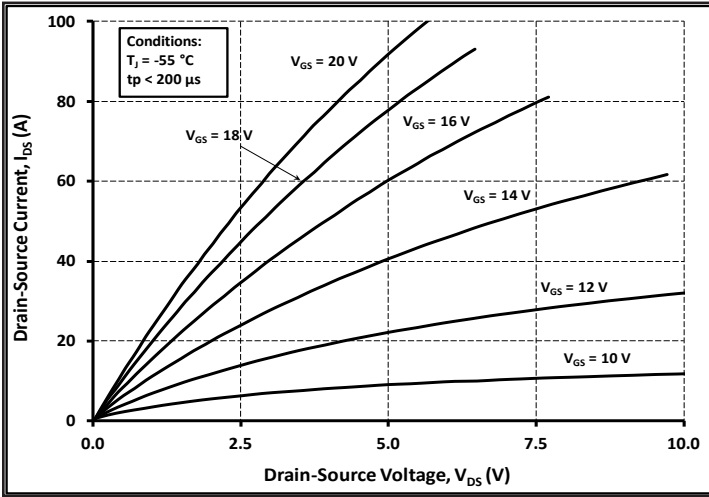


Figure 1. Output Characteristics  $T_J = -55\text{ }^\circ\text{C}$

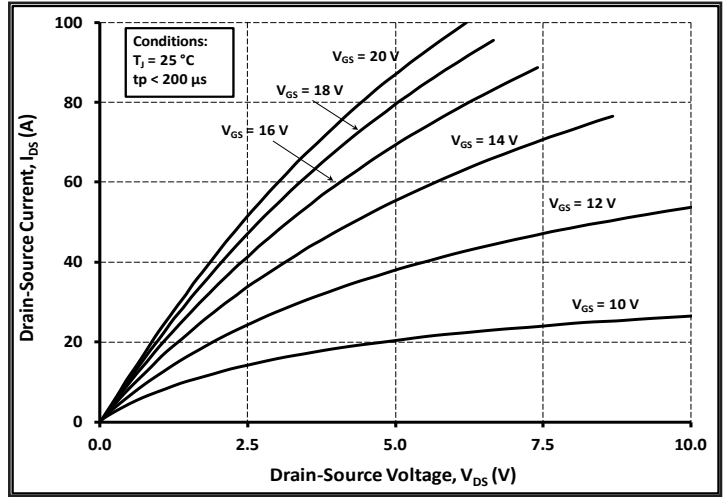


Figure 2. Output Characteristics  $T_J = 25\text{ }^\circ\text{C}$

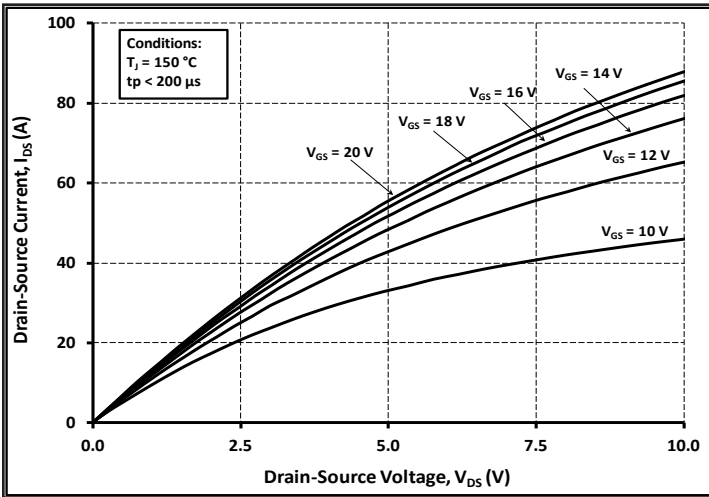


Figure 3. Output Characteristics  $T_J = 150\text{ }^\circ\text{C}$

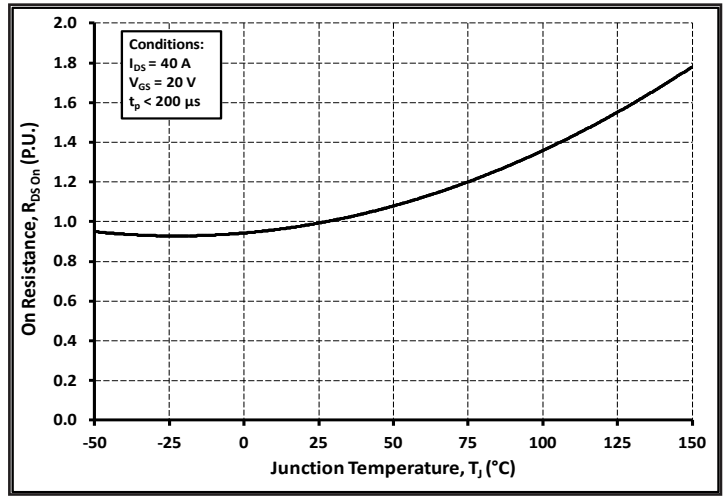


Figure 4. Normalized On-Resistance vs. Temperature

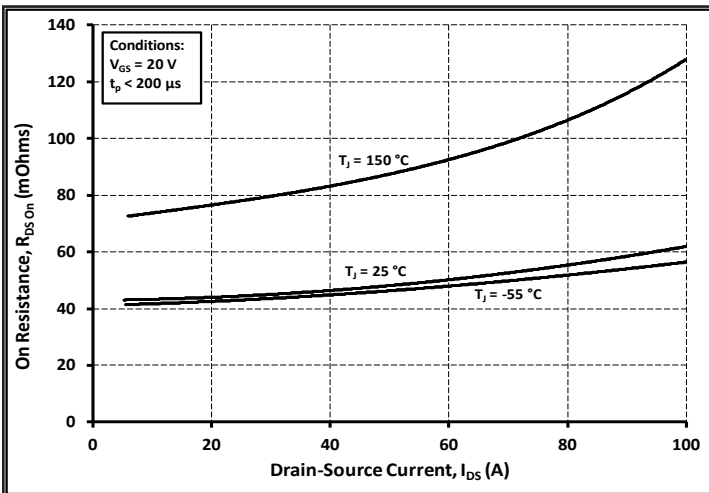


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

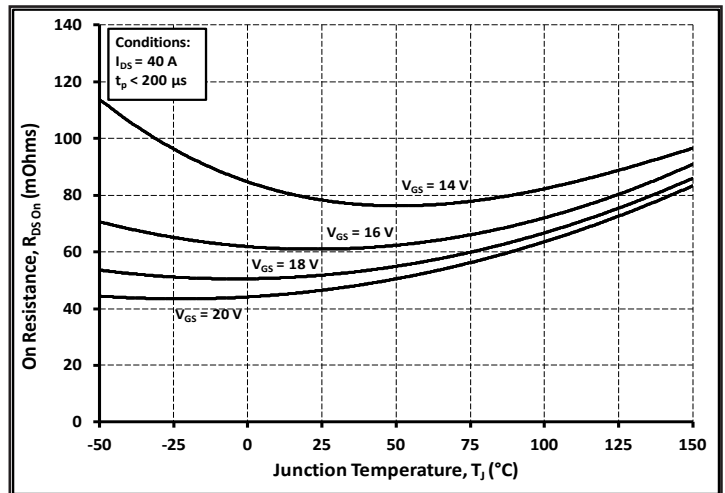


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance

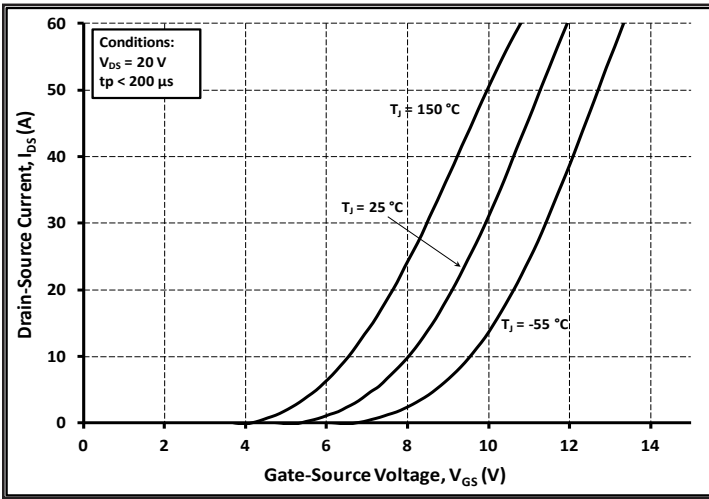


Figure 7. Transfer Characteristic for Various Junction Temperatures

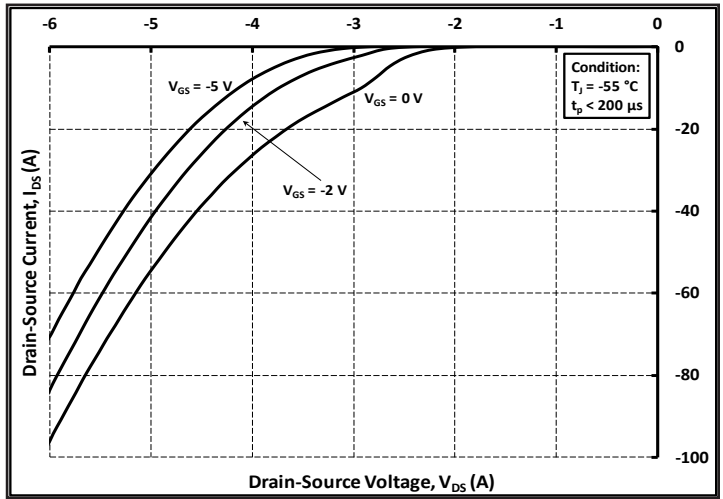


Figure 8. Body Diode Characteristic at -55 °C

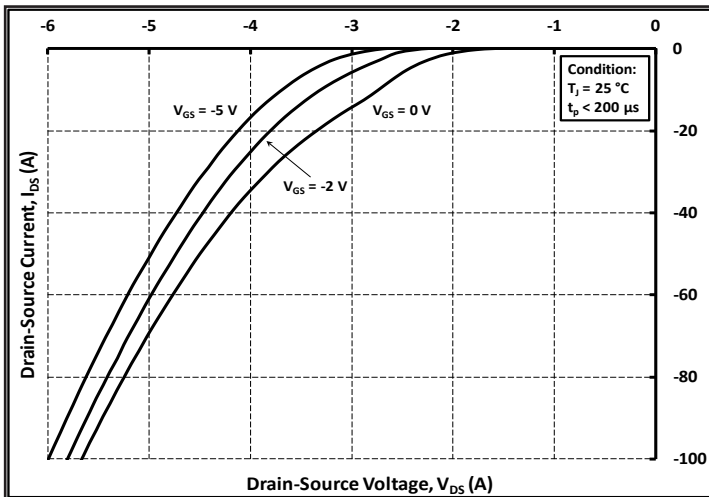


Figure 9. Body Diode Characteristic at 25 °C

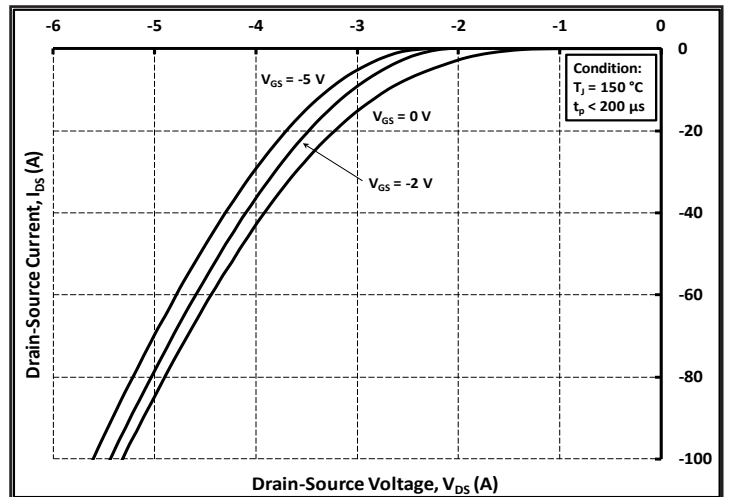


Figure 10. Body Diode Characteristic at 150 °C

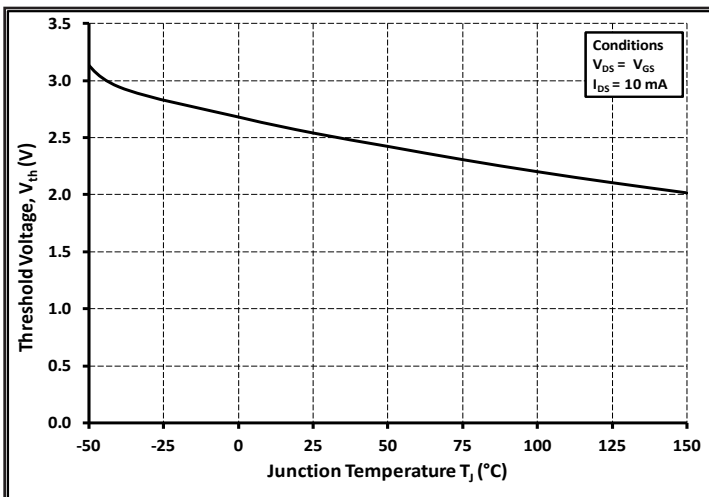


Figure 11. Threshold Voltage vs. Temperature

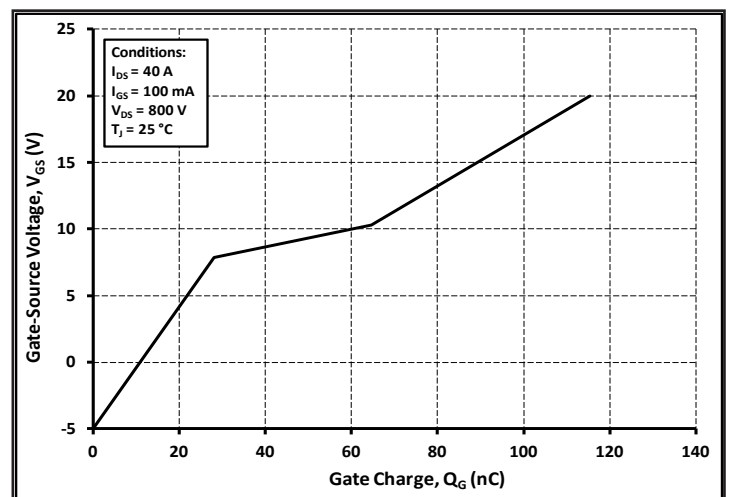


Figure 12. Gate Charge Characteristics

Typical Performance

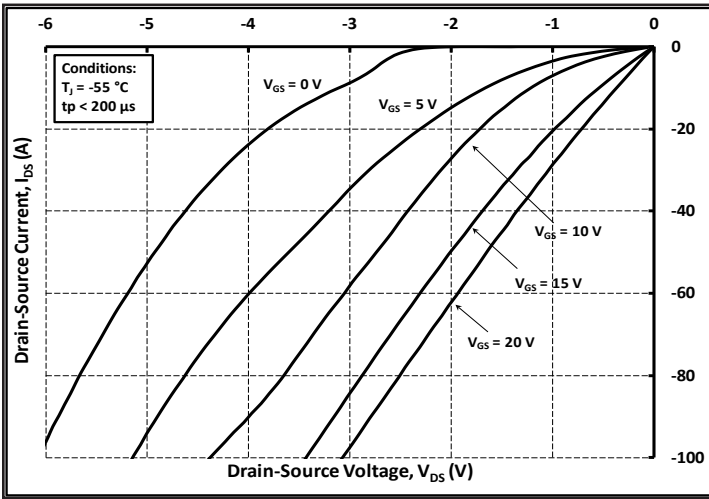


Figure 13. 3rd Quadrant Characteristic at -55 °C

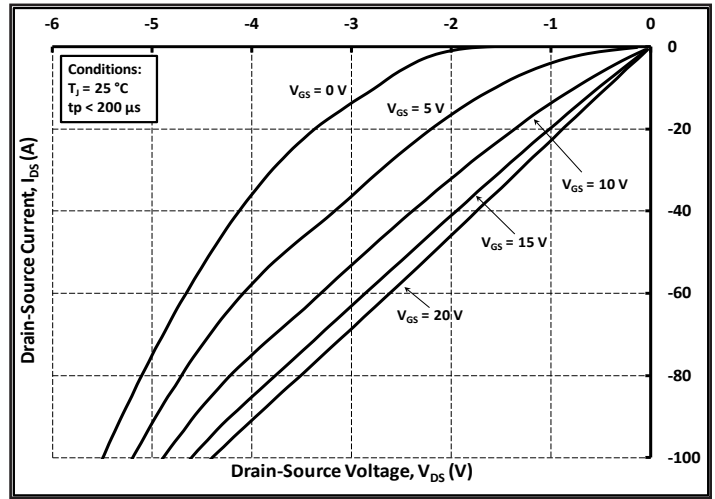


Figure 14. 3rd Quadrant Characteristic at 25 °C

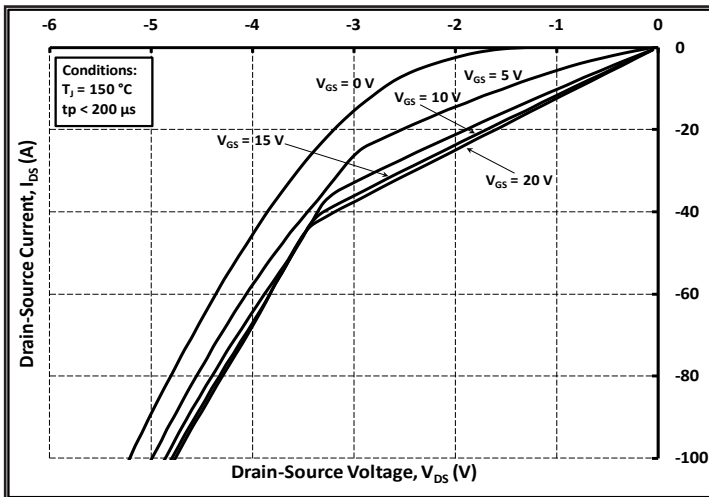


Figure 15. 3rd Quadrant Characteristic at 150 °C

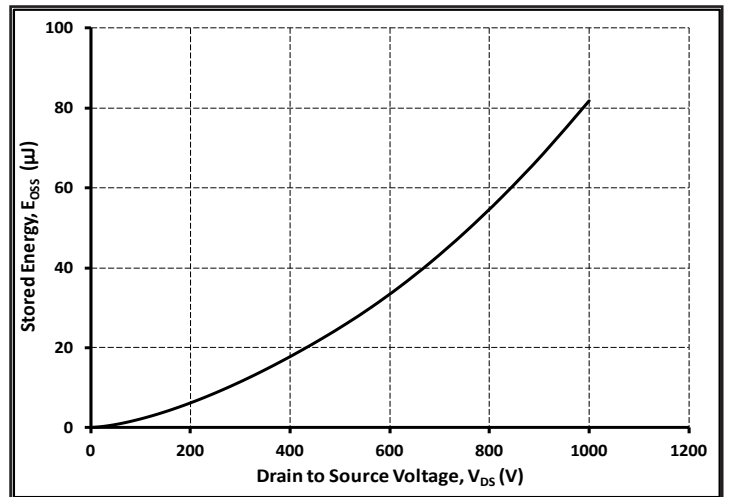


Figure 16. Output Capacitor Stored Energy

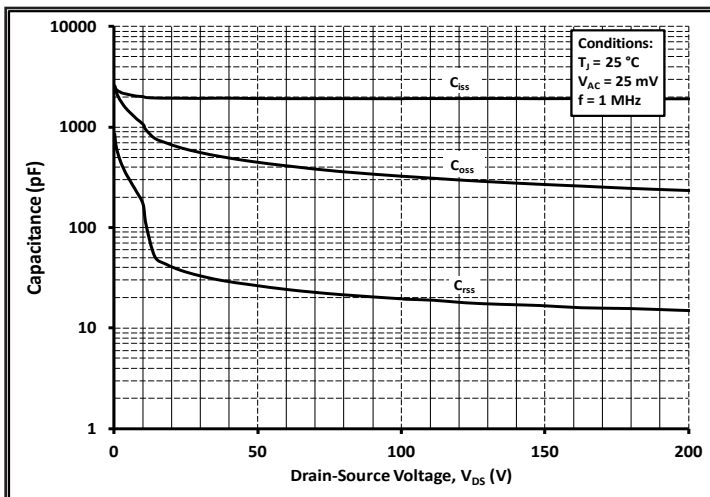


Figure 17. Capacitances vs. Drain-Source Voltage (0-200 V)

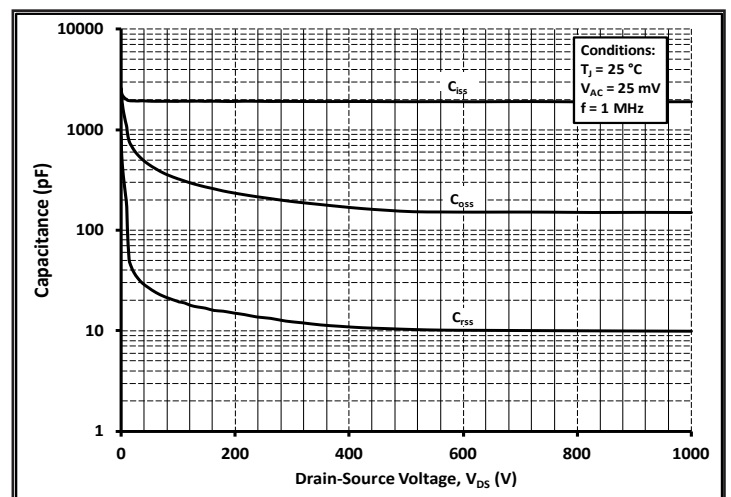


Figure 18. Capacitances vs. Drain-Source Voltage (0-1000 V)

Typical Performance

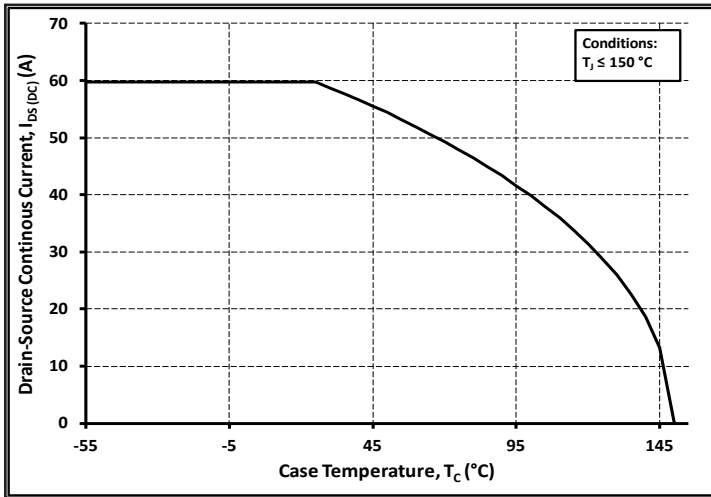


Figure 19. Continuous Drain Current Derating vs. Case Temperature

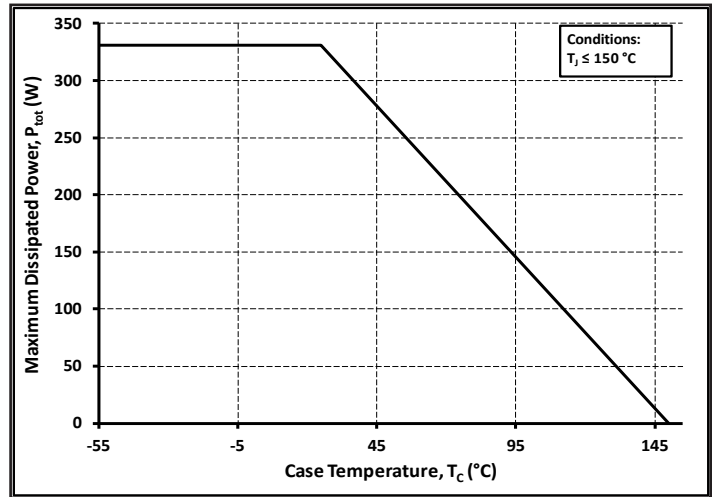


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

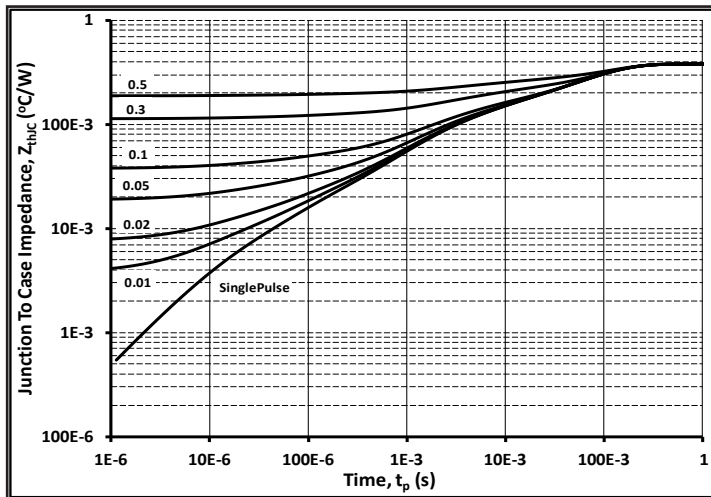


Figure 21. Transient Thermal Impedance (Junction - Case)

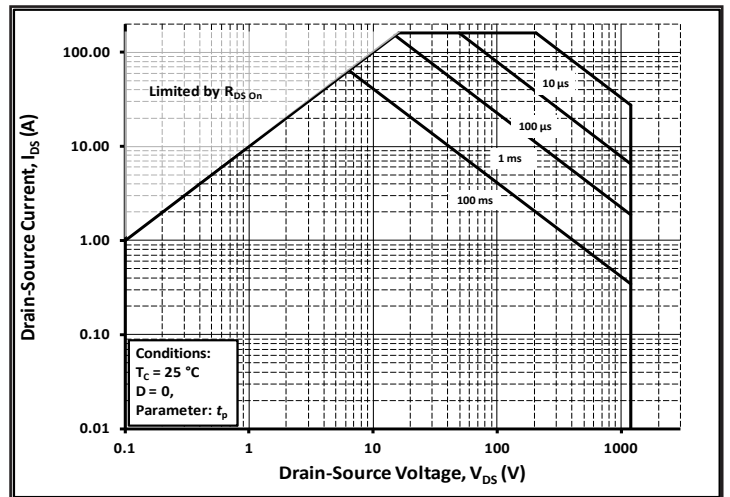


Figure 22. Safe Operating Area

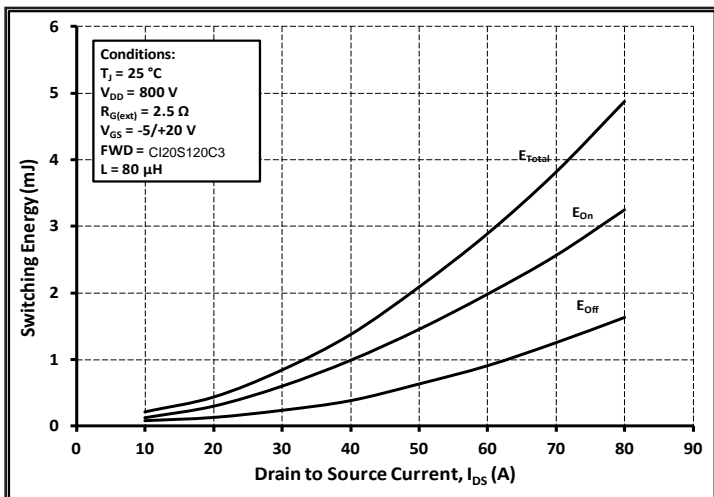


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DD} = 800V$ )

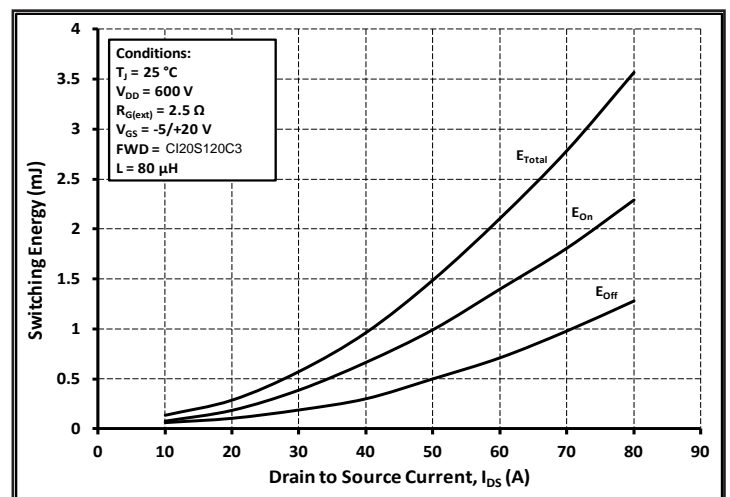


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DD} = 600V$ )

Typical Performance

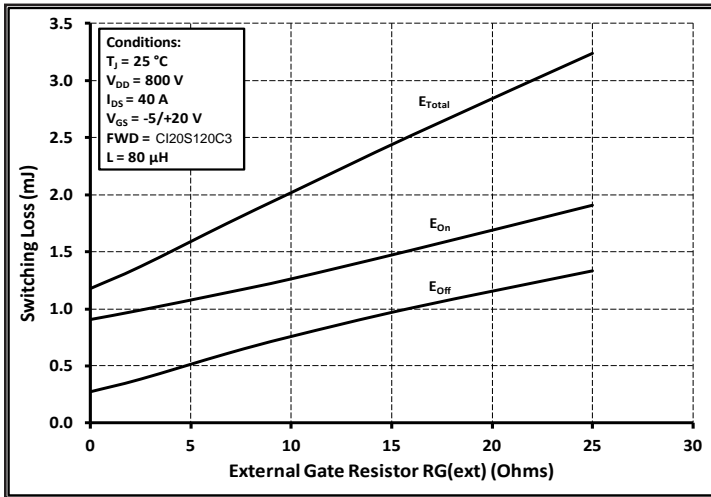


Figure 25. Clamped Inductive Switching Energy vs.  $R_{G(ext)}$

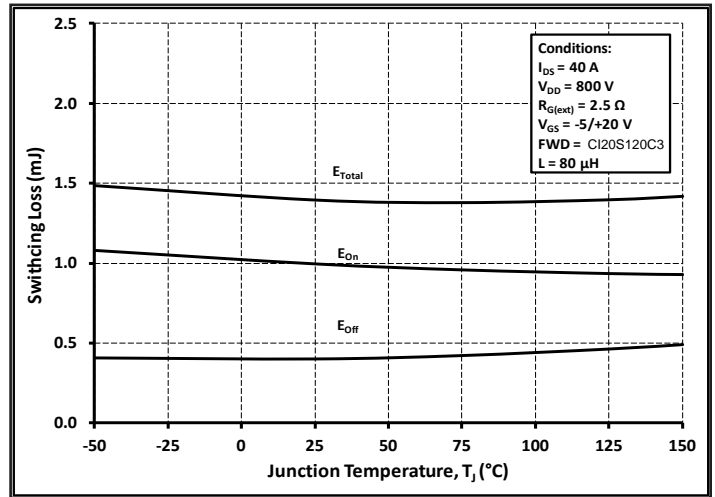


Figure 26. Clamped Inductive Switching Energy vs. Temperature

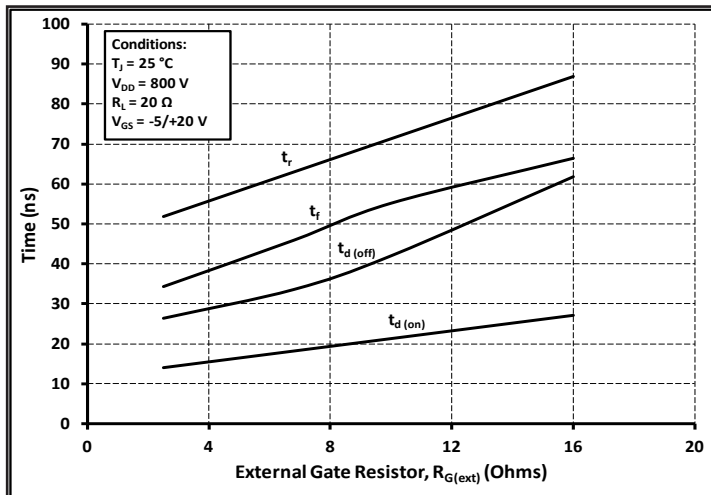


Figure 27. Switching Times vs.  $R_{G(ext)}$

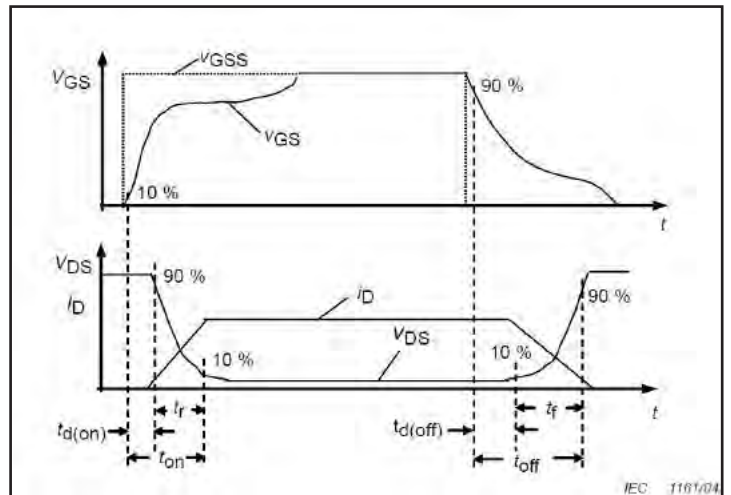


Figure 28. Switching Times Definition

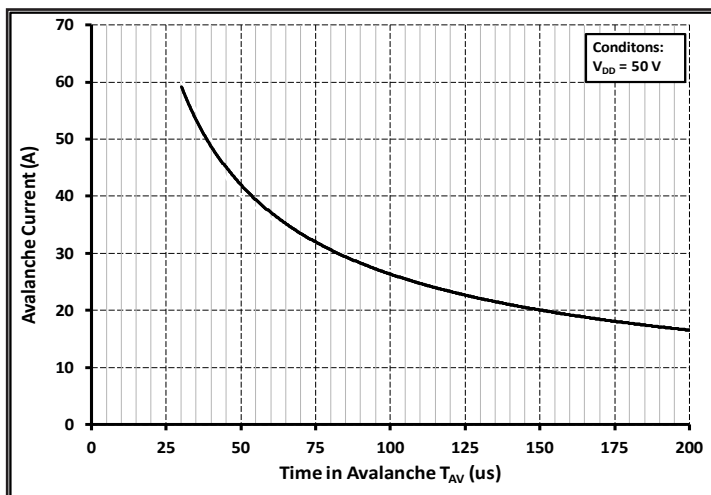


Figure 29. Single Avalanche SOA curve

Test Circuit Schematic

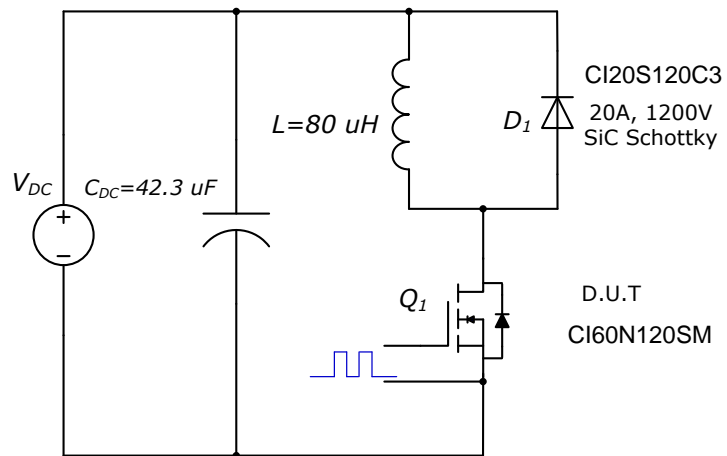


Figure 30. Clamped Inductive Switching Waveform Test Circuit

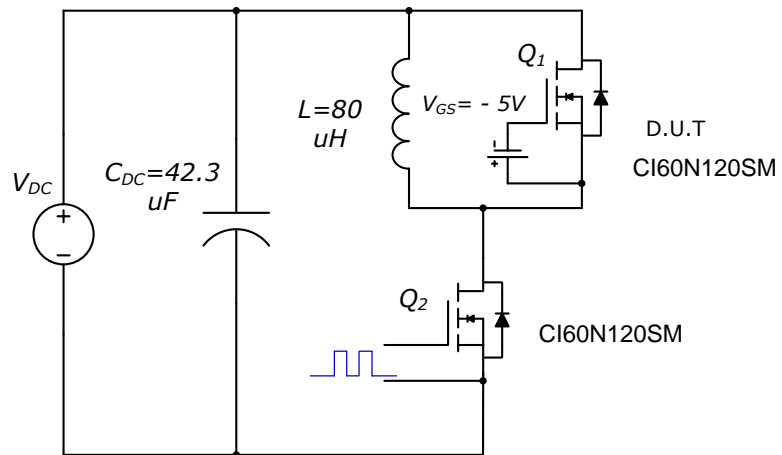
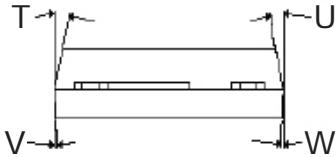
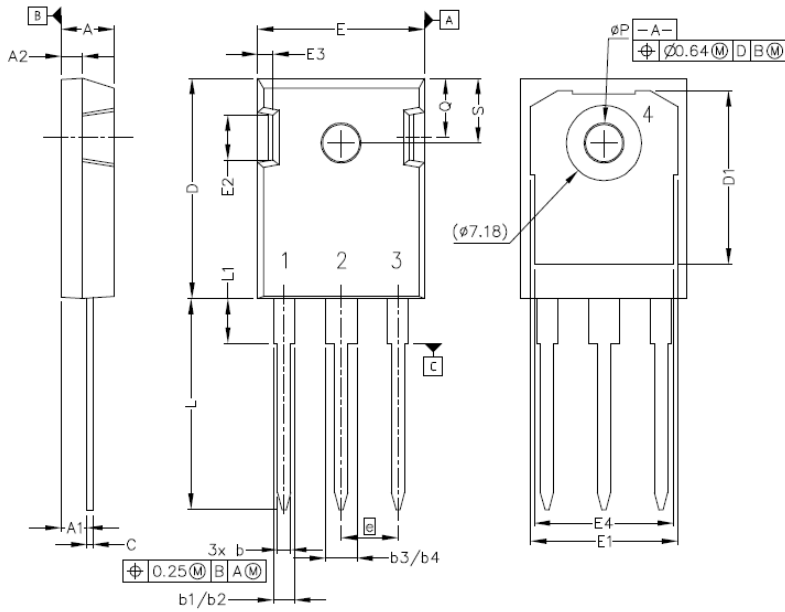


Figure 31. Body Diode Recovery Test Circuit



**Package Dimensions**

Package TO-247-3



**Pinout Information:**

- Pin 1 = Gate
- Pin 2, 4 = Drain
- Pin 3 = Source

POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b2	.075	.085	1.91	2.16
b3	.113	.133	2.87	3.38
b4	.113	.123	2.87	3.13
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
N	3		3	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30
T	9°	11°	9°	11°
U	9°	11°	9°	11°
V	2°	8°	2°	8°
W	2°	8°	2°	8°