



Features

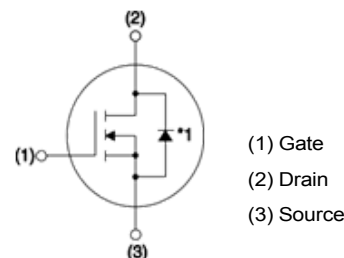
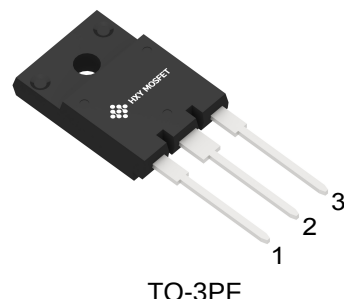
- Effectively lower down T_j and R_{th} , high anti-EMI ability
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel and Simple to Drive
- Ultra-low Drain-Gate capacitance
- Halogen Free, RoHS Compliant

Benefits

- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Auxiliary Power Supplies Switch
- Mode Power Supplies
- High-Voltage Capacitive Loads



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

Ordering Part Number	Package	Brand
MSC750SMA170B	TO-3PF	HXY MOSFET

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1700	V	$V_{GS}=0V, I_D=100\mu A$	
V_{GSmax}	Gate-Source Voltage	-8/+22	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-4/+18	V	Recommended operational values	
I_D	Continuous Drain Current	5.0	A	$V_{GS}=20V, T_c=25^\circ\text{C}$	Fig. 19
		3.5		$V_{GS}=20V, T_c=100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	15	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	69	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, 1.6mm from case for 10s	260	$^\circ\text{C}$		
M_d	Mounting Torque, (M3 or 6-32 screw)	1	Nm		
		8.8	lbf-in		



Electrical Characteristics (T_c = 25 °C unless other

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V _{(BR)DSS}	Drain-Source Breakdown Voltage	1700			V	V _{GS} = 0 V, I _D = 100 μA	
V _{GS(th)}	Gate Threshold Voltage	2.0	2.8	4.3	V	V _{DS} = V _{GS} , I _D = 0.5 mA	Fig. 11
			2.4		V	V _{DS} = V _{GS} , I _D = 0.5 mA, T _J = 150 °C	
I _{DSS}	Zero Gate Voltage Drain Current		0.01	10	μA	V _{DS} = 1.7 kV, V _{GS} = 0 V	
I _{GSS}	Gate-Source Leakage Current			100	nA	V _{GS} = 18 V, V _{DS} = 0 V	
R _{DS(on)}	Drain-Source On-State Resistance		0.80	1.4	Ω	V _{GS} = 18 V, I _D = 2 A	Fig. 4,5,6
			1.4			V _{GS} = 18 V, I _D = 2 A, T _J = 150 °C	
g _{fs}	Transconductance		1.04		S	V _{DS} = 18 V, I _{DS} = 2 A	Fig. 7
			1.09			V _{DS} = 18 V, I _{DS} = 2 A, T _J = 150 °C	
C _{iss}	Input Capacitance		215		pF	V _{GS} = 0 V V _{DS} = 1000 V f = 1 MHz	Fig. 17,18
C _{oss}	Output Capacitance		19				
C _{rss}	Reverse Transfer Capacitance		2.2				
E _{oss}	C _{oss} Stored Energy		10.2		μJ	V _{AC} = 25 mV	Fig 16
E _{ON}	Turn-On Switching Energy		89		μJ	V _{DS} = 1.2 kV, V _{GS} = -5/20 V I _D = 2 A, R _{G(ext)} = 2.5 Ω, L = 1478 μH, T _J = 150 °C	Fig. 26
E _{OFF}	Turn Off Switching Energy		14				
t _{d(on)}	Turn-On Delay Time		5		ns	V _{DD} = 1.2 kV, V _{GS} = -5/20 V I _D = 2 A, R _{G(ext)} = 2.5 Ω, R _L = 600 Ω Timing relative to V _{DS} Per IEC60747-8-4 pg 83	Fig. 27
t _r	Rise Time		19				
t _{d(off)}	Turn-Off Delay Time		14				
t _f	Fall Time		63				
R _{G(int)}	Internal Gate Resistance		24.8		Ω	f = 1 MHz, V _{AC} = 25 mV	
Q _{gs}	Gate to Source Charge		4		nC	V _{DS} = 1.2 kV, V _{GS} = -5/20 V I _D = 2 A Per IEC60747-8-4 pg 21	Fig. 12
Q _{gd}	Gate to Drain Charge		12				
Q _g	Total Gate Charge		22				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V _{SD}	Diode Forward Voltage	3.8		V	V _{GS} = -5 V, I _{SD} = 1 A, T _J = 25 °C	Fig. 8, 9, 10
		3.3		V	V _{GS} = -5 V, I _{SD} = 1 A, T _J = 150 °C	
I _S	Continuous Diode Forward Current		4	A	T _c = 25 °C	Note 1
t _{rr}	Reverse Recovery Time	30		ns	V _{GS} = -5 V, I _{SD} = 2 A T _J = 150 ° C V _R = 1.2 kV dif/dt = 1135 A/μs	Note 1
Q _{rr}	Reverse Recovery Charge	31		nC		
I _{rrm}	Peak Reverse Recovery Current	3		A		

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
R _{θJC}	Thermal Resistance from Junction to Case	2.0	2.3	°C/W		Fig. 21
R _{θJA}	Thermal Resistance from Junction to Ambient		50			



Typical Performance

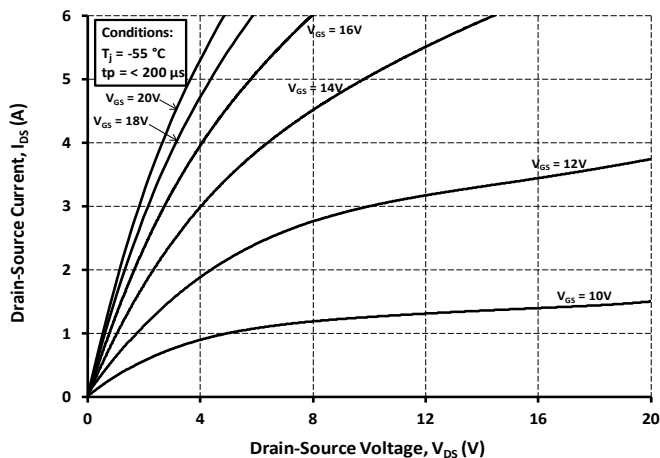


Figure 1. Output Characteristics $T_J = -55\text{ }^{\circ}\text{C}$

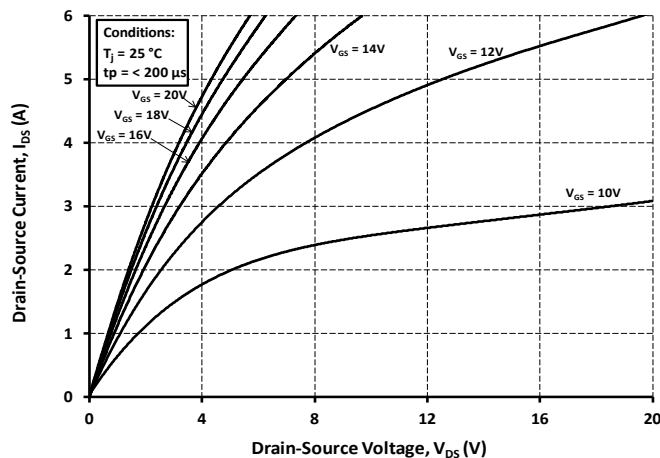


Figure 2. Output Characteristics $T_J = 25\text{ }^{\circ}\text{C}$

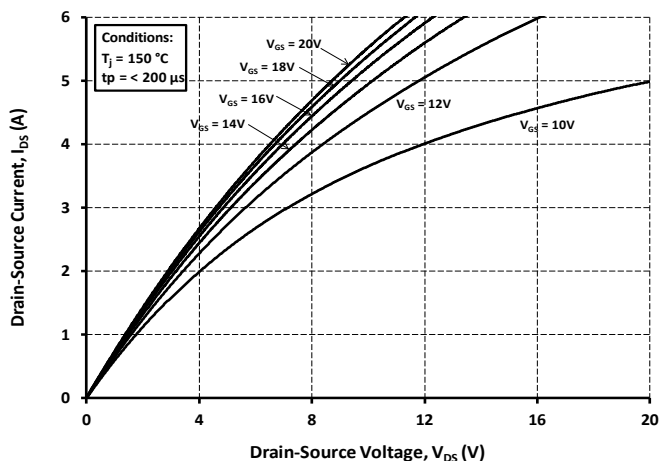


Figure 3. Output Characteristics $T_J = 150\text{ }^{\circ}\text{C}$

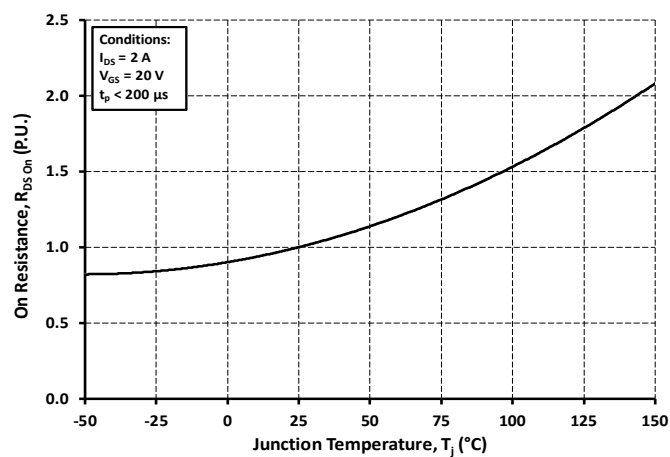


Figure 4. Normalized On-Resistance vs. Temperature

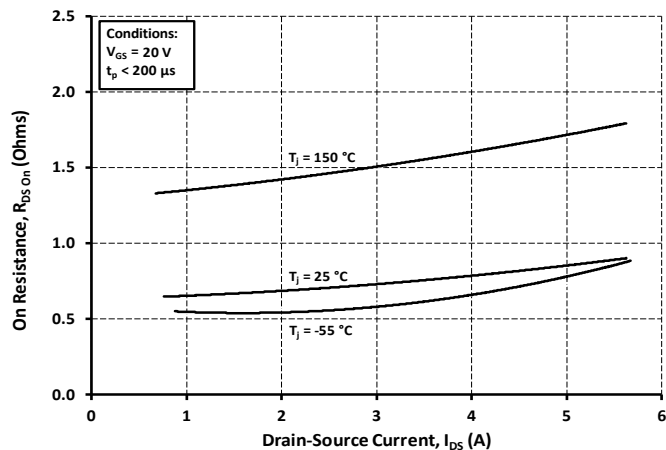


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

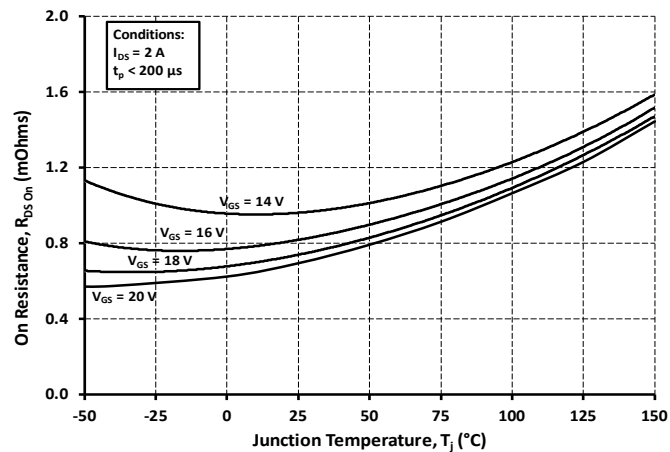


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

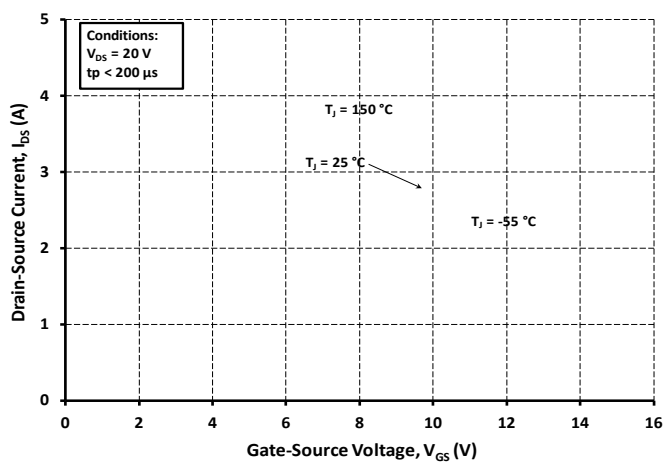


Figure 7. Transfer Characteristic for Various Junction Temperatures

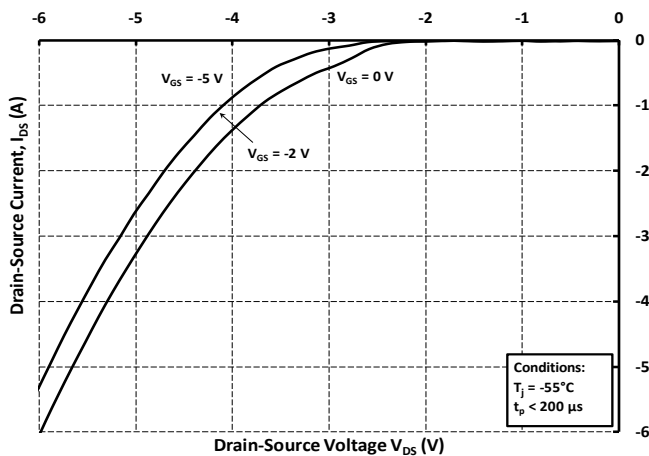


Figure 8. Body Diode Characteristic at -55 °C

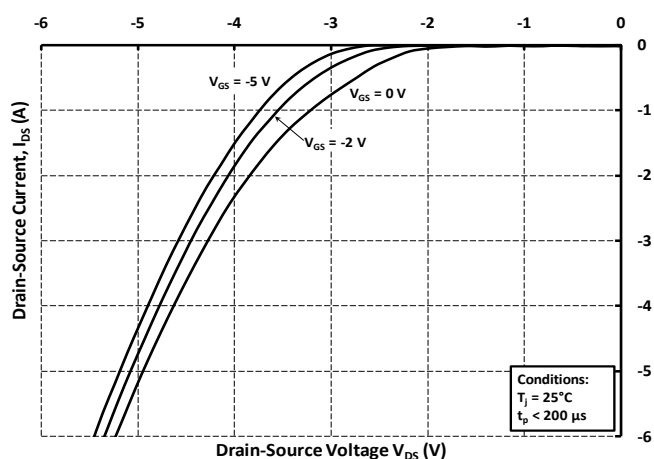


Figure 9. Body Diode Characteristic at 25 °C

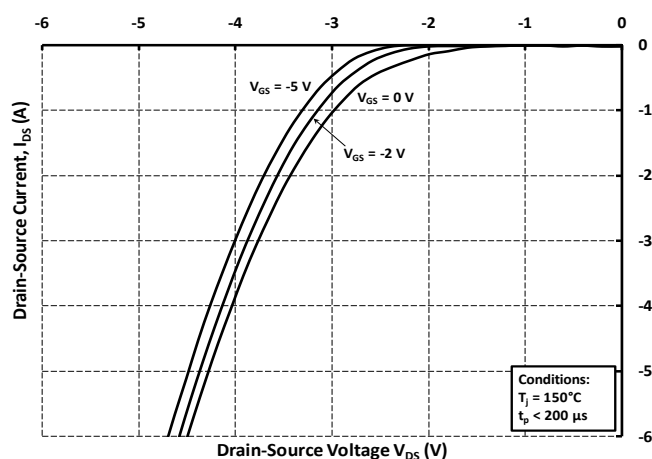


Figure 10. Body Diode Characteristic at 150 °C

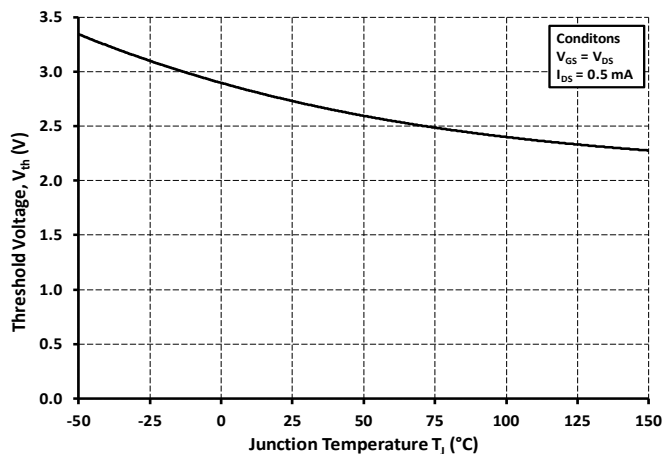


Figure 11. Threshold Voltage vs. Temperature

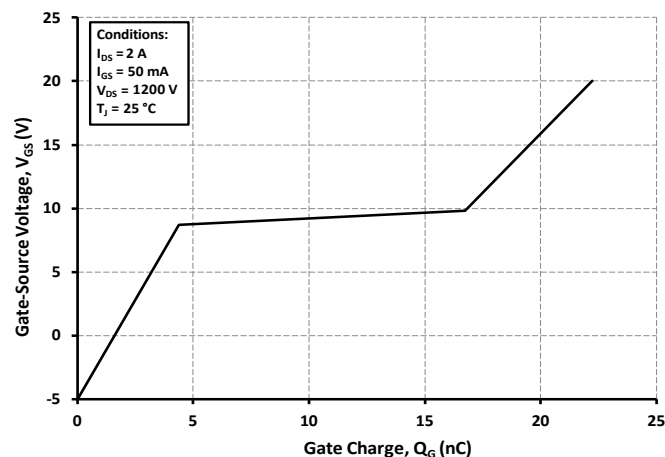


Figure 12. Gate Charge Characteristics

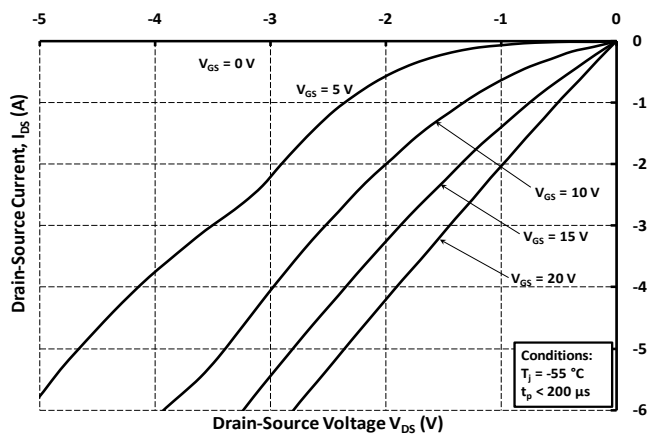


Figure 13. 3rd Quadrant Characteristic at -55 °C

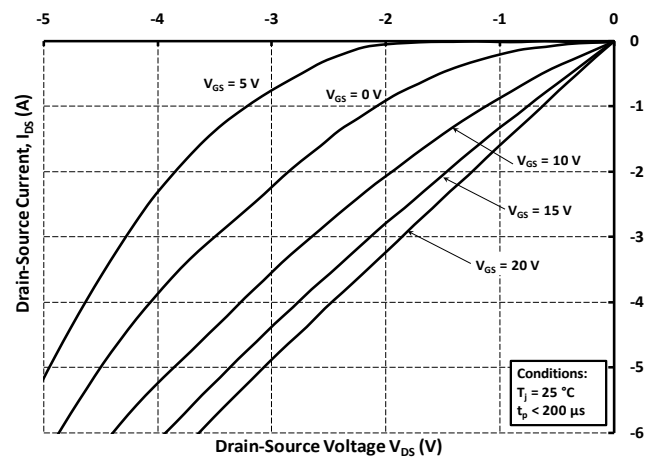


Figure 14. 3rd Quadrant Characteristic at 25 °C

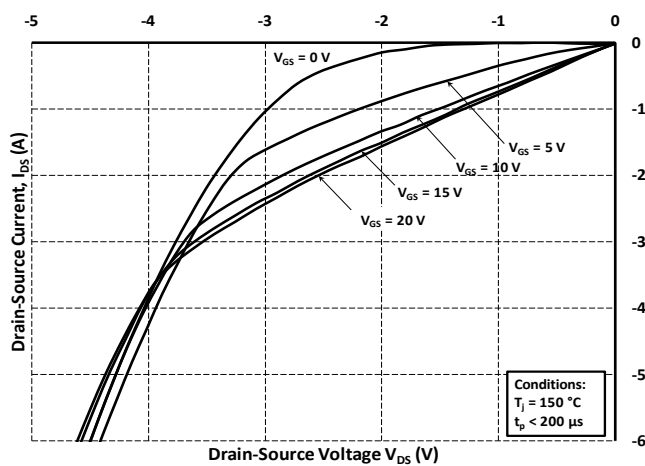


Figure 15. 3rd Quadrant Characteristic at 150 °C

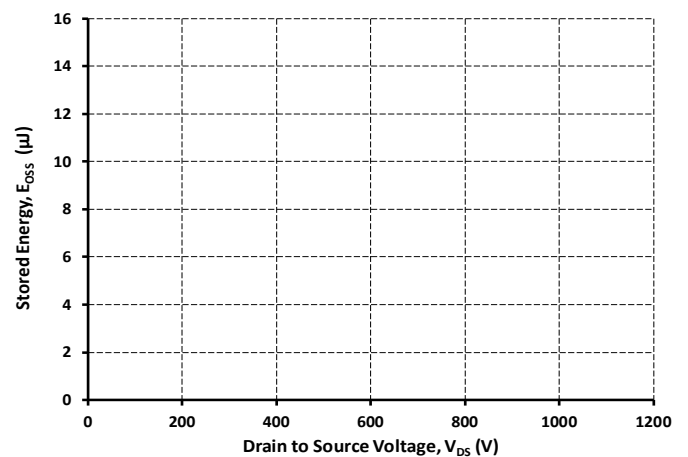


Figure 16 Output Capacitor Stored Energy

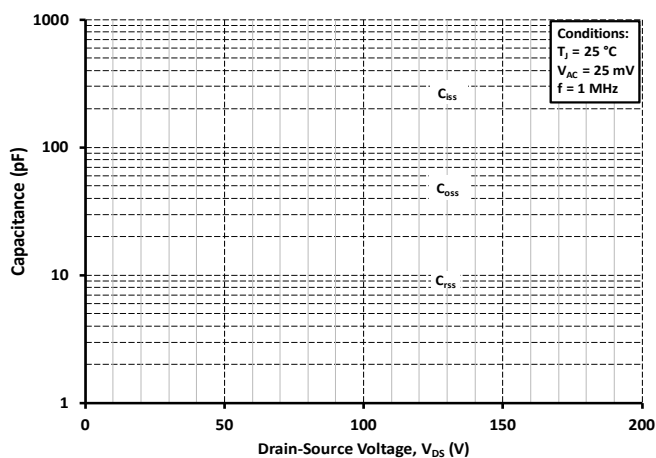


Figure 17. Capacitances vs. Drain-Source Voltage (0-200 V)

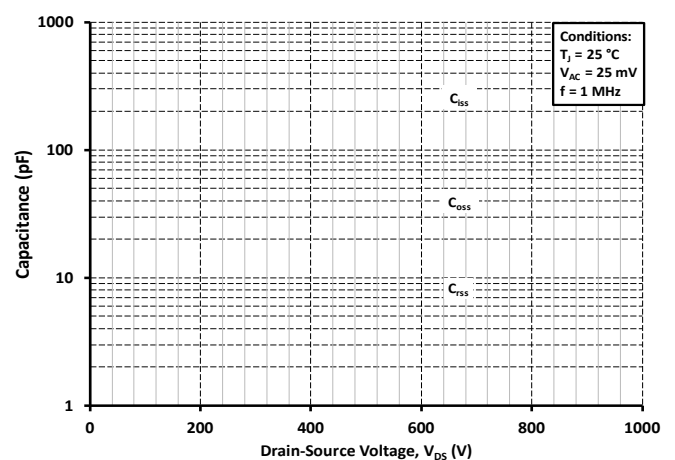


Figure 18. Capacitances vs. Drain-Source Voltage (0-1000 V)

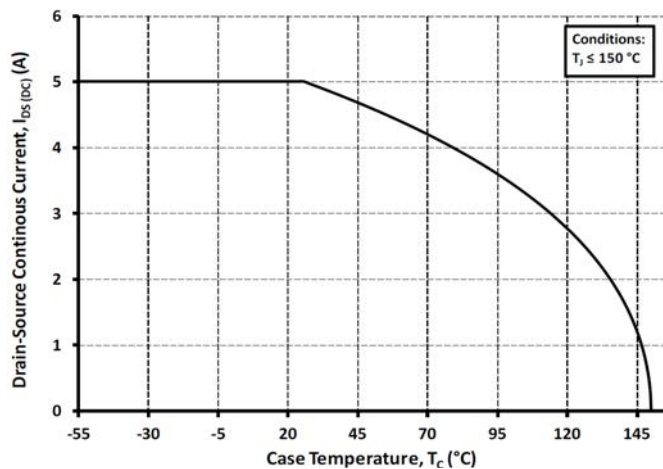


Figure 19. Continuous Drain Current Derating vs. Case Temperature

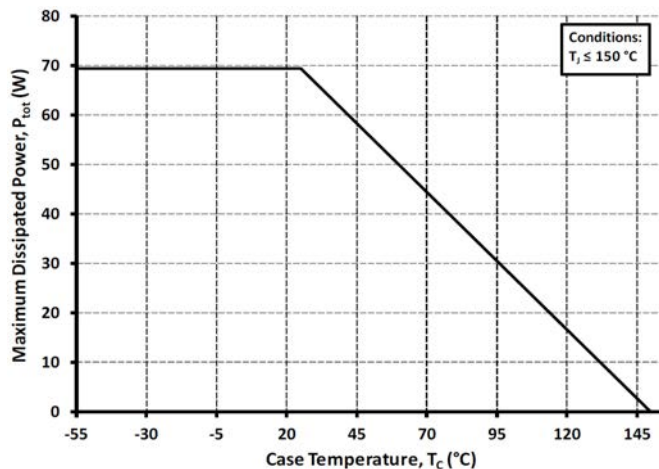


Figure 20. Maximum Power Dissipation Derating Vs Case Temperature

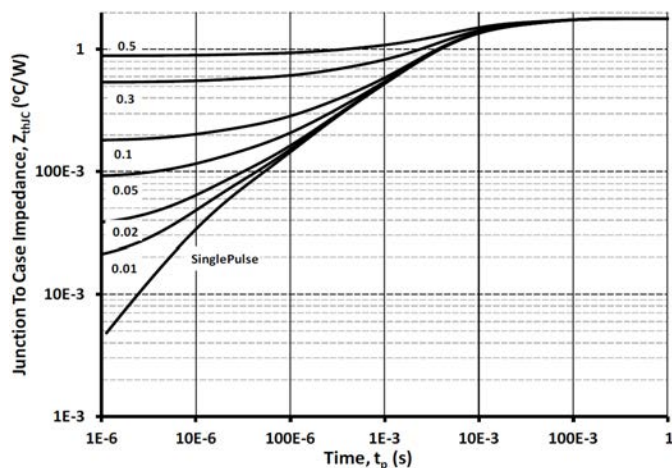


Figure 21. Transient Thermal Impedance (Junction - Case)

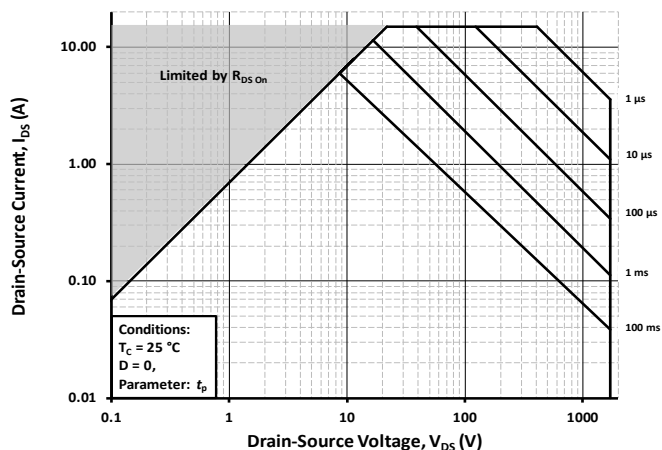


Figure 22. Safe Operating Area

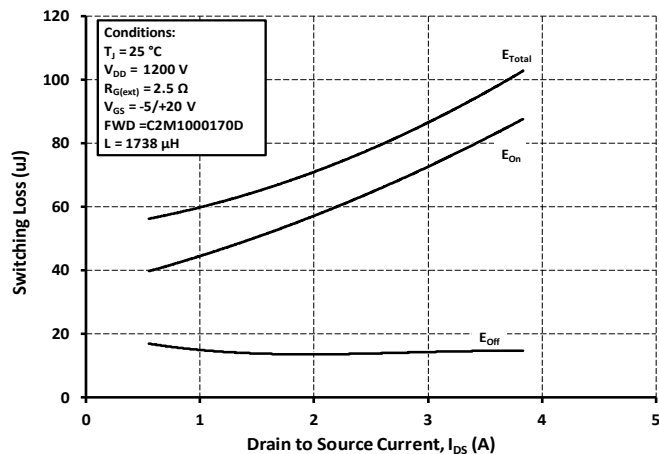


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 1200V$)

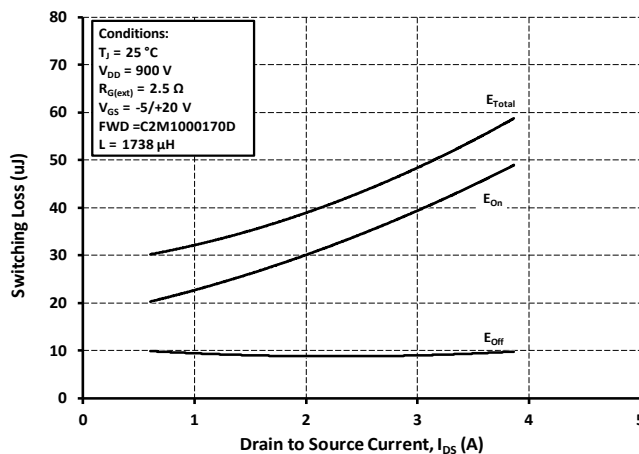


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 900V$)

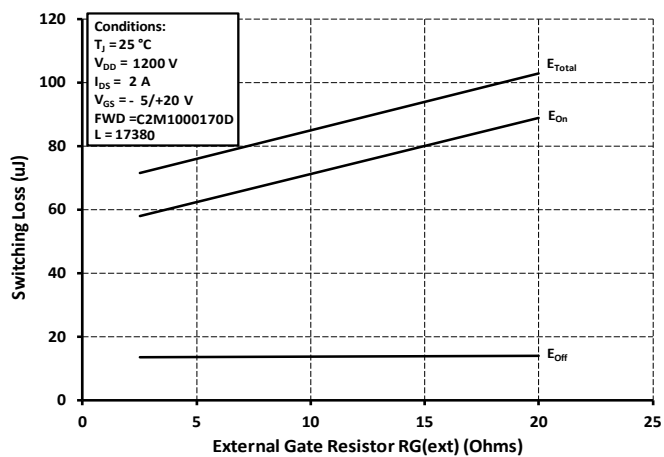


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

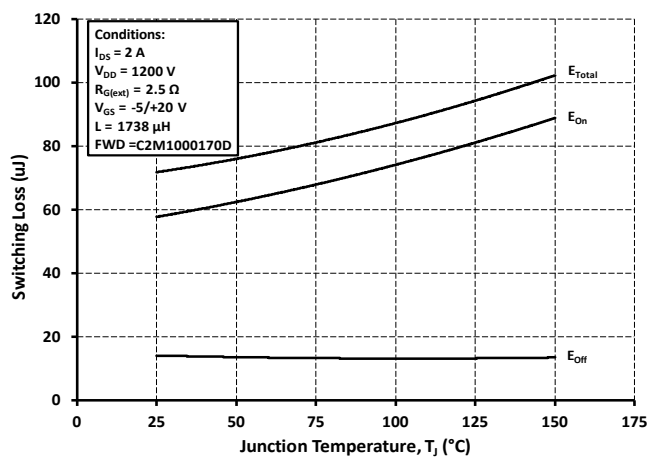


Figure 26. Clamped Inductive Switching Energy vs. Temperature

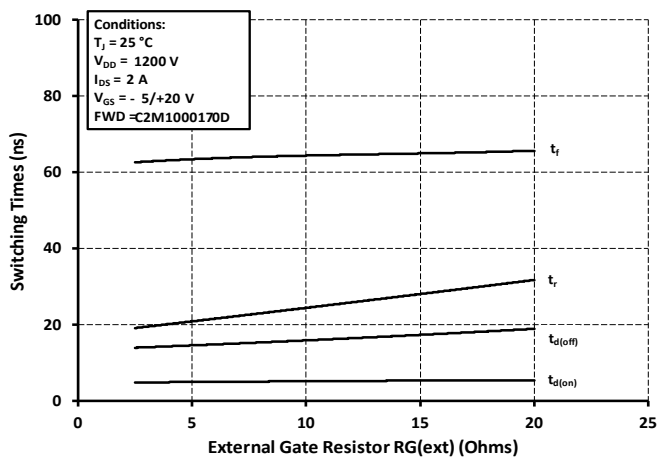


Figure 27. Switching Times vs. $R_{G(\text{ext})}$

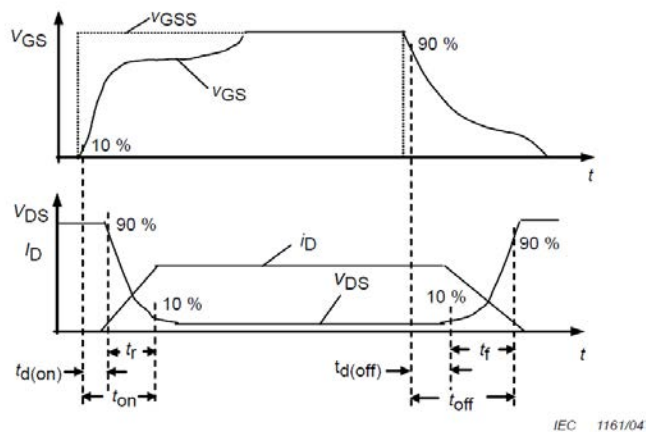


Figure 28. Switching Times Definition



Test Circuit Schematic

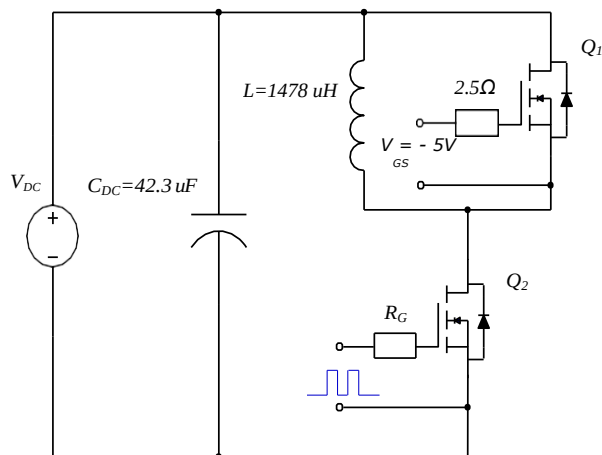


Figure 29. Clamped Inductive Switching
Waveform Test Circuit

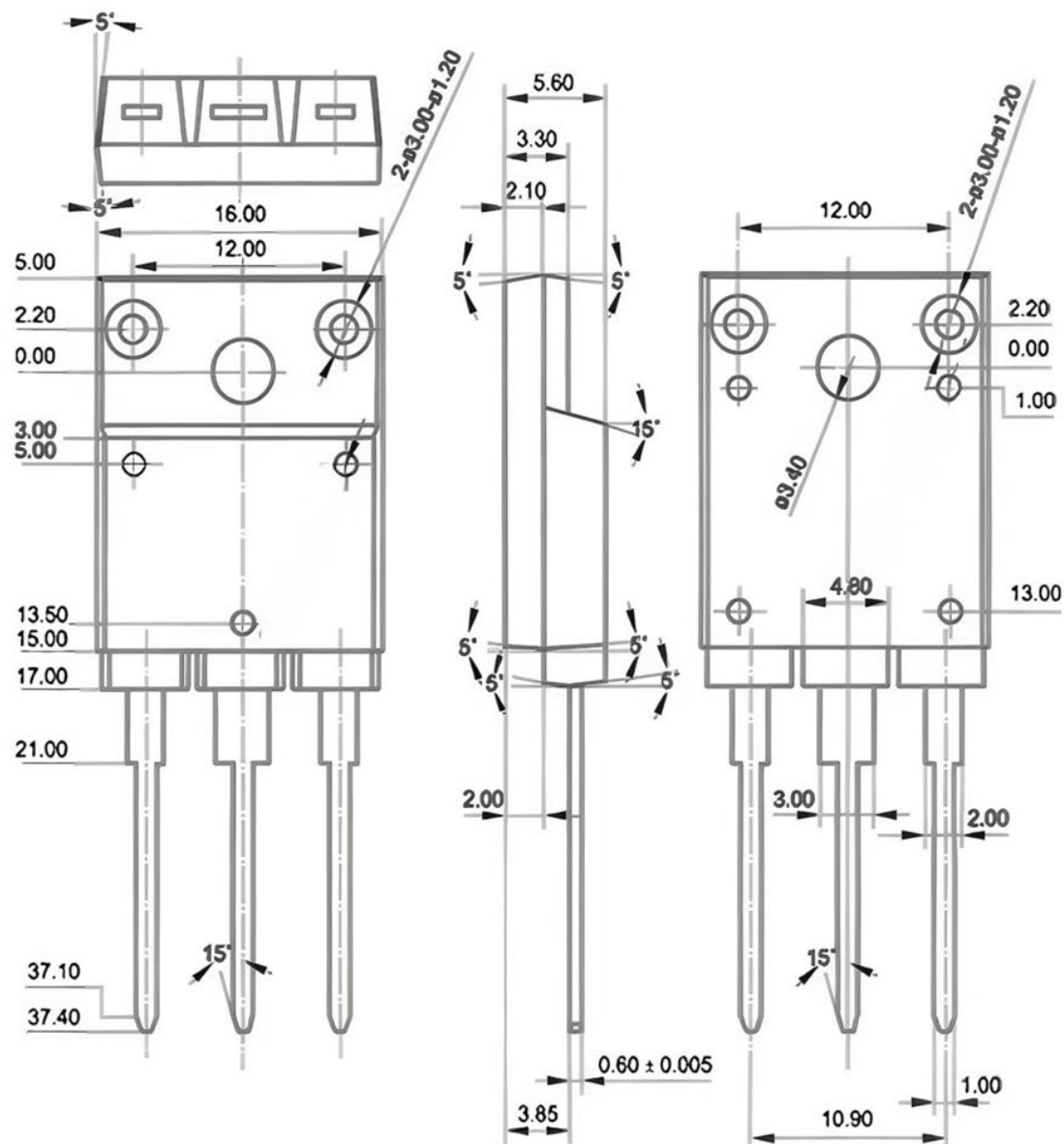
ESD Ratings

ESD Test	Total Devices Sampled	Resulting Classification
ESD-HBM	All Devices Passed 4000V	3A (>4000V)
ESD-CDM	All Devices Passed 1000V	IV (>1000V)



SiC Power MOSFET N-Channel Enhancement Mode

Package TO-3PF





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