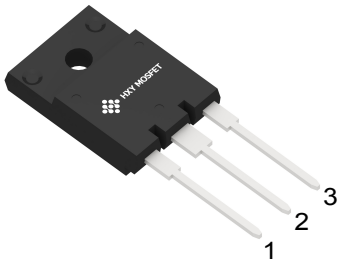
HT5N1700ADZ

SiC Power MOSFET N-Channel Enhancement Mode

Features

- Effectively lower down Tj and Rth,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



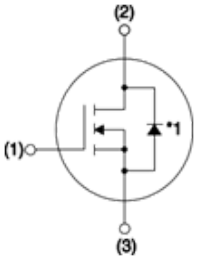
TO-3PF

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
HT5N1700ADZ	TO-3PF	HXY MOSFET

Maximum Ratings (T_c = 25 ˚C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1700	V	V_{GS}=0V, I_D=100μA	
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˚C	Fig. 19
		3.5		V_{GS}=20V, T_c=100˚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˚C, T_J=150˚C	Fig. 20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +150	˚C		
T_L	Solder Temperature, 1.6mm from case for 10s	260	˚C		
M_d	Mounting Torque, (M3 or 6-32 screw)	1 8.8	Nm 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 V_{AC} = 25 mV	Fig. 17,18
C_{oss}	Output Capacitance		19				
C_{rss}	Reverse Transfer Capacitance		2.2				
E_{oss}	C_{oss} Stored Energy		10.2		µJ		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
$R_{\theta JC}$	Thermal Resistance from Junction to Case	2.0	2.3	°C/W		Fig. 21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient		50			

Typical Performance

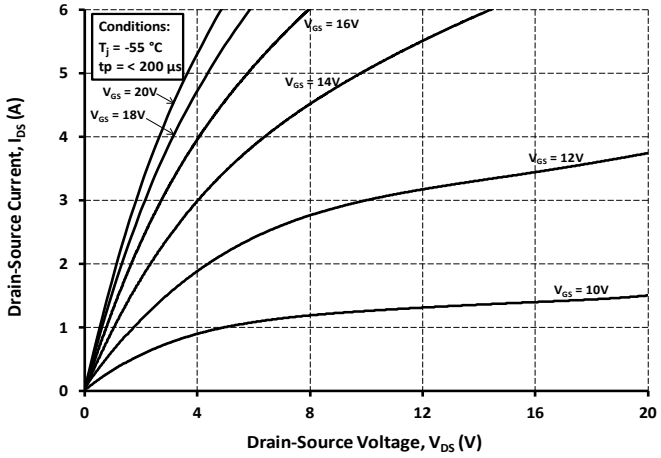


Figure 1. Output Characteristics T_J = -55 °C

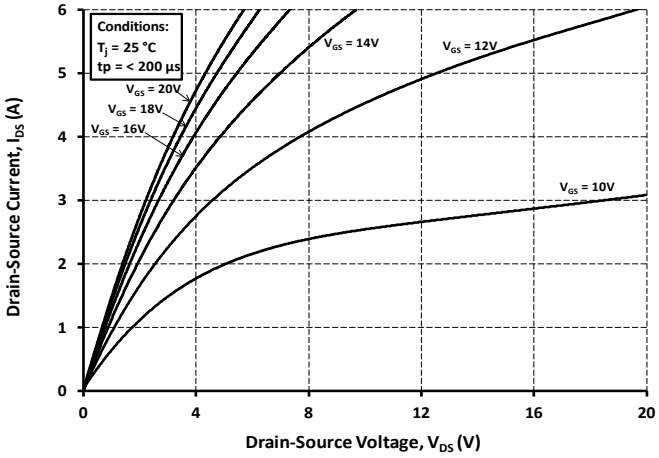


Figure 2. Output Characteristics T_J = 25 °C

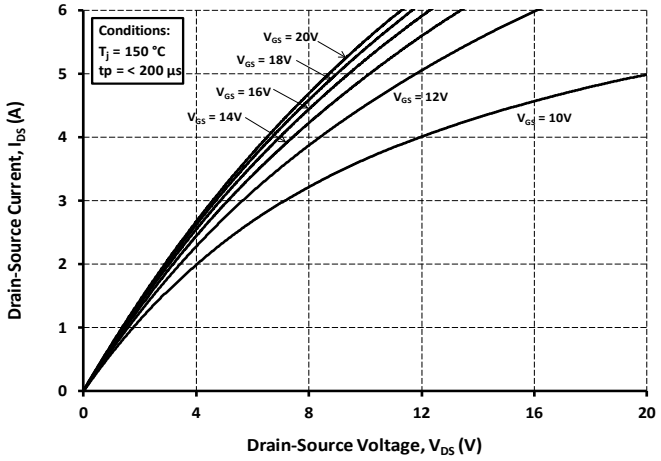


Figure 3. Output Characteristics T_J = 150 °C

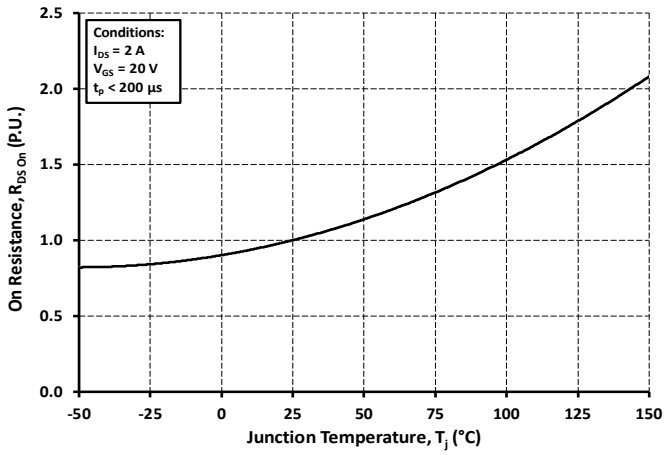


Figure 4. Normalized On-Resistance vs. Temperature

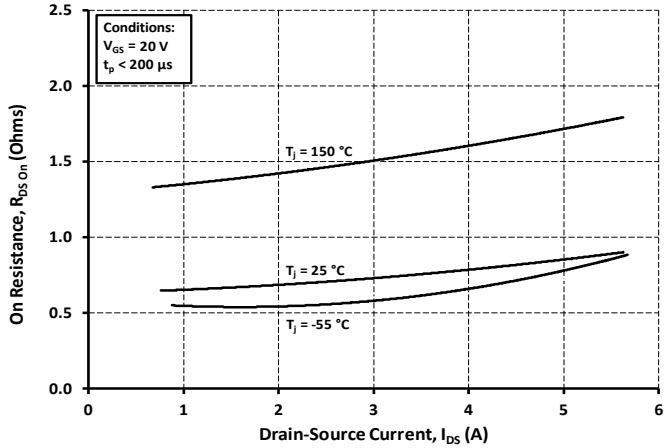


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

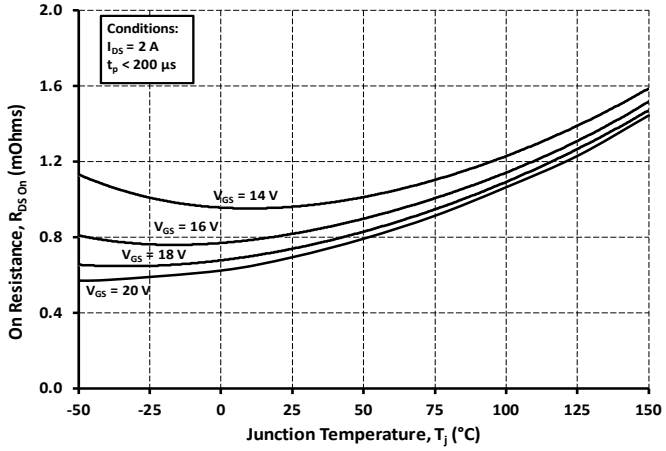


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

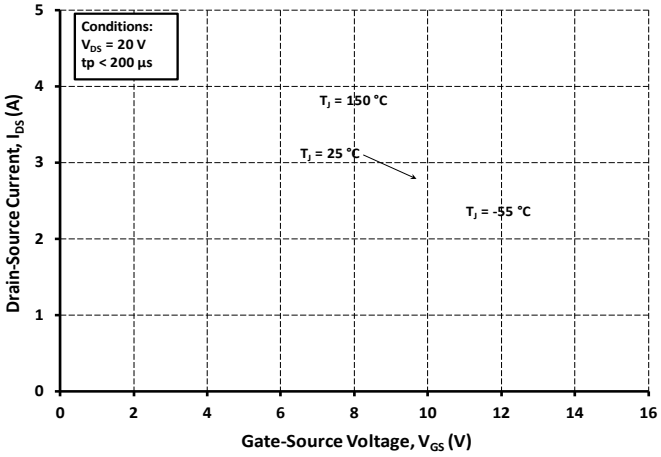


Figure 7. Transfer Characteristic for Various Junction Temperatures

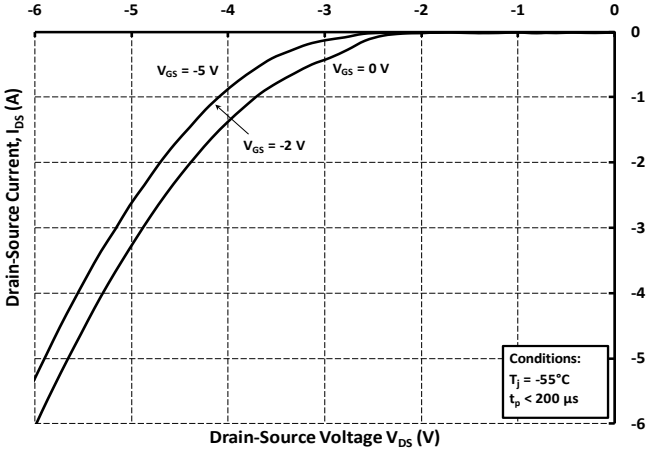


Figure 8. Body Diode Characteristic at -55 ºC

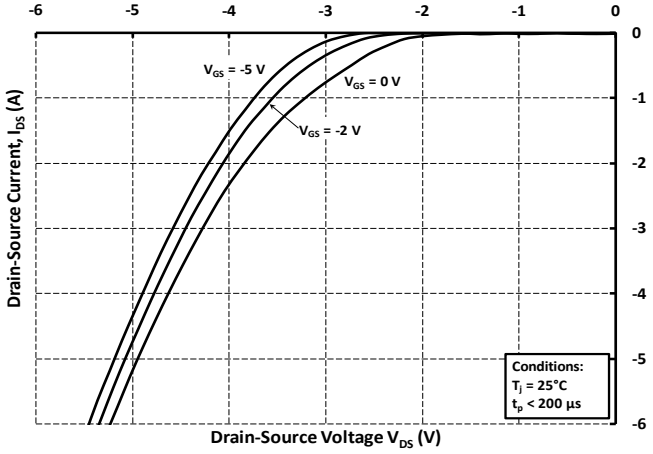


Figure 9. Body Diode Characteristic at 25 ºC

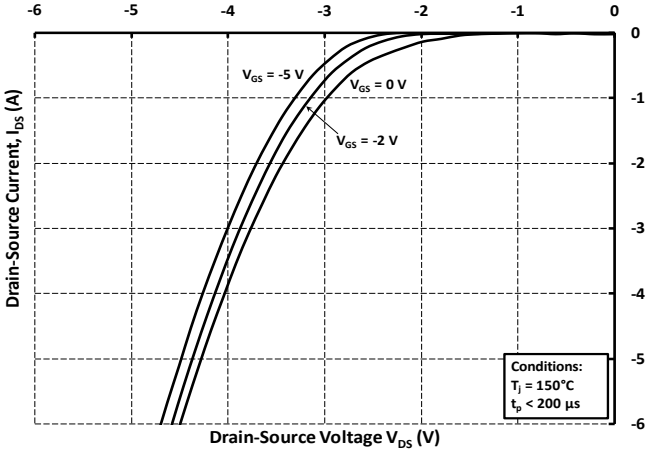


Figure 10. Body Diode Characteristic at 150 ºC

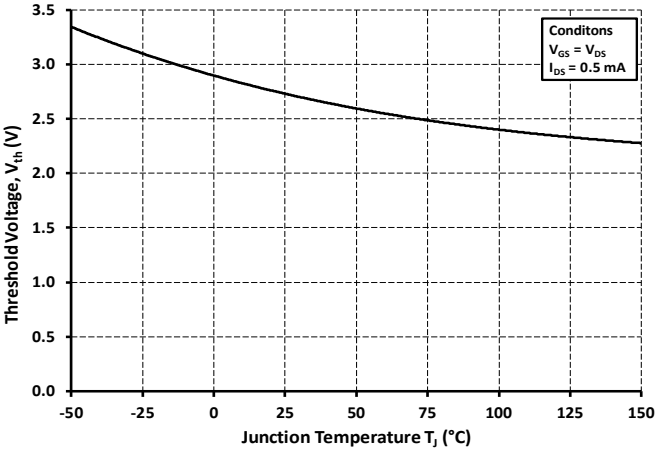


Figure 11. Threshold Voltage vs. Temperature

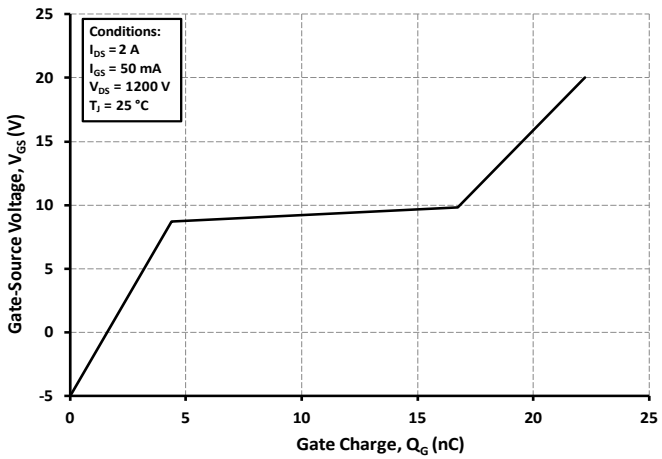


Figure 12. Gate Charge Characteristics

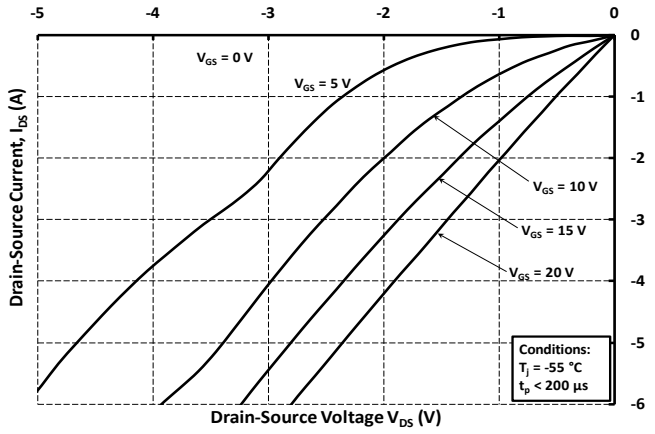


Figure 13. 3rd Quadrant Characteristic at -55 °C

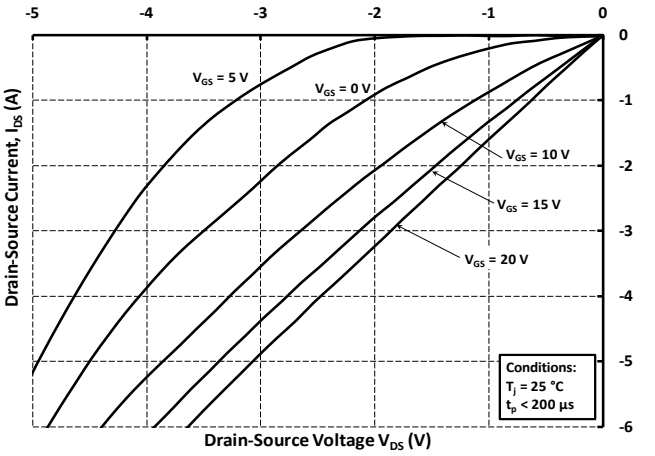


Figure 14. 3rd Quadrant Characteristic at 25 °C

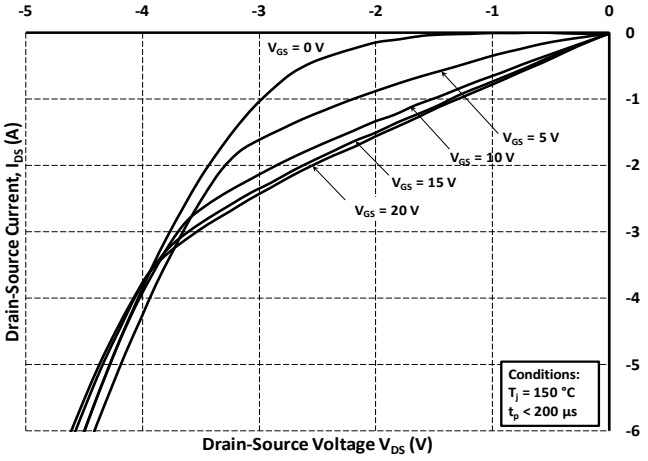


Figure 15. 3rd Quadrant Characteristic at 150 °C

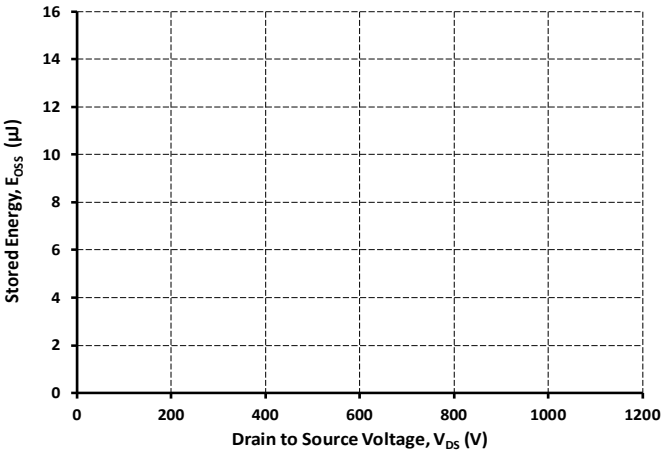


Figure 16 Output Capacitor Stored Energy

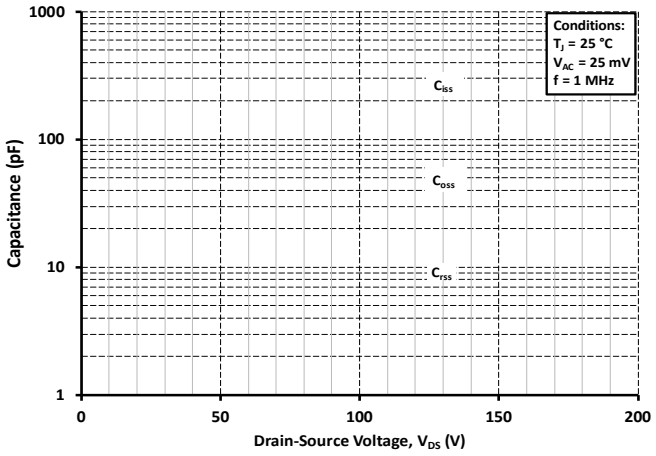


Figure 17. Capacitances vs. Drain-Source Voltage (0-200 V)

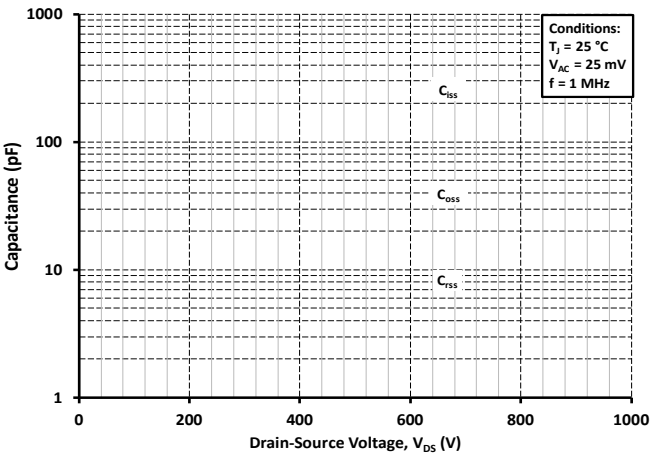


Figure 18. Capacitances vs. Drain-Source Voltage (0-1000 V)

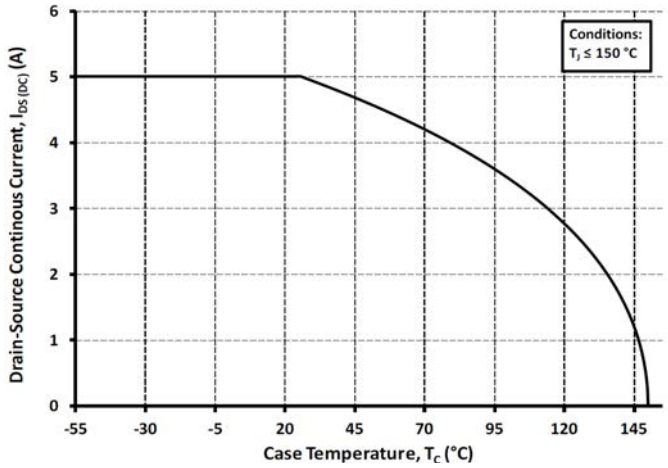


Figure 19. Continuous Drain Current Derating vs. Case Temperature

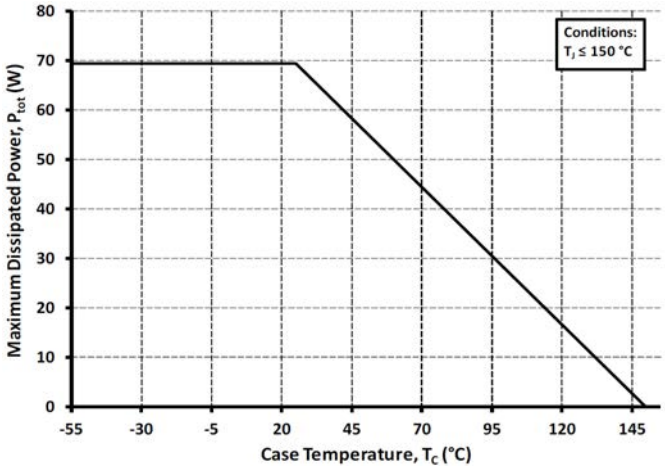


Figure 20. Maximum Power Dissipation Derating Vs Case Temperature

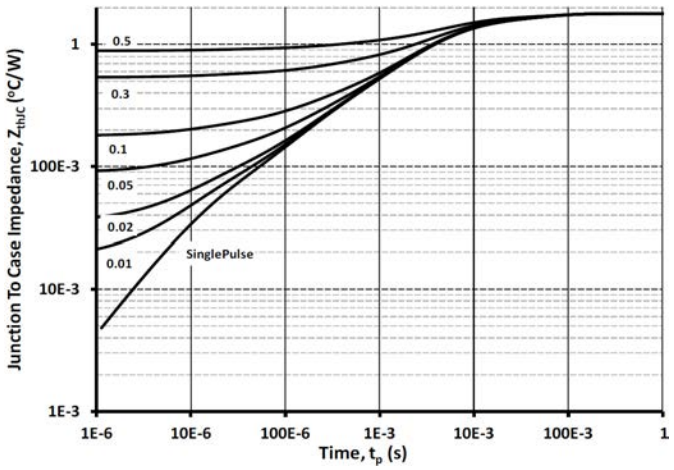


Figure 21. Transient Thermal Impedance (Junction - Case)

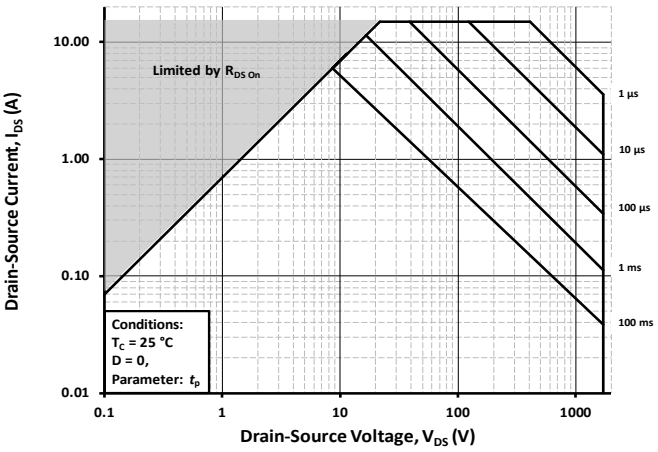


Figure 22. Safe Operating Area

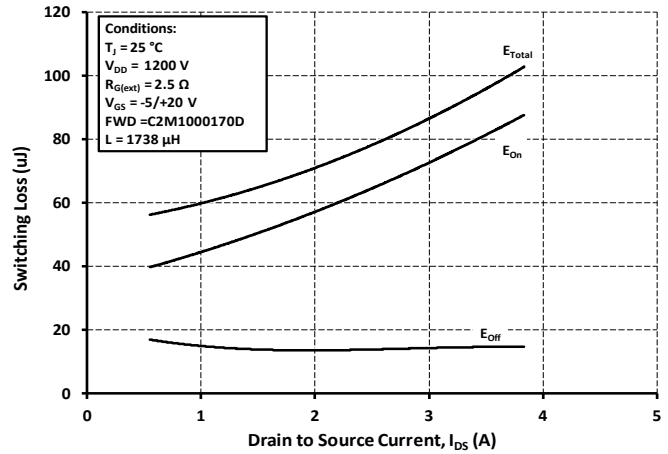


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)

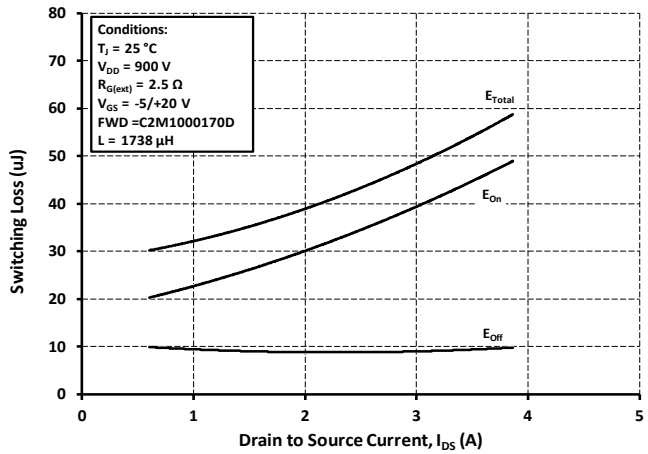


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 900 V)

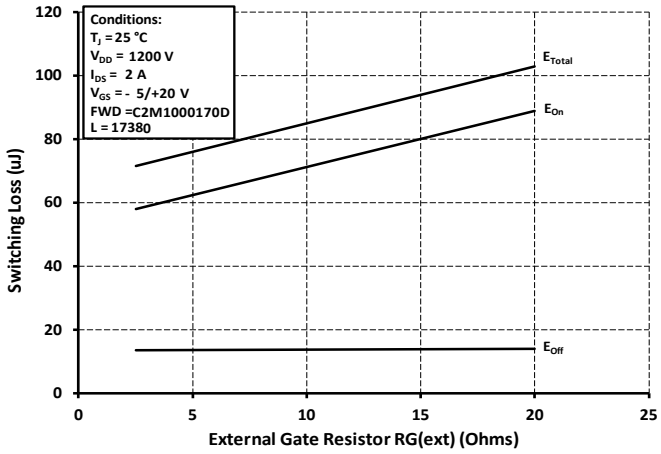


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

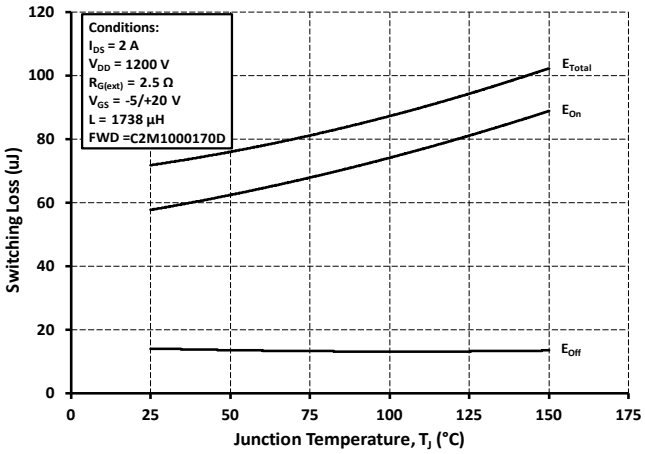


Figure 26. Clamped Inductive Switching Energy vs. Temperature

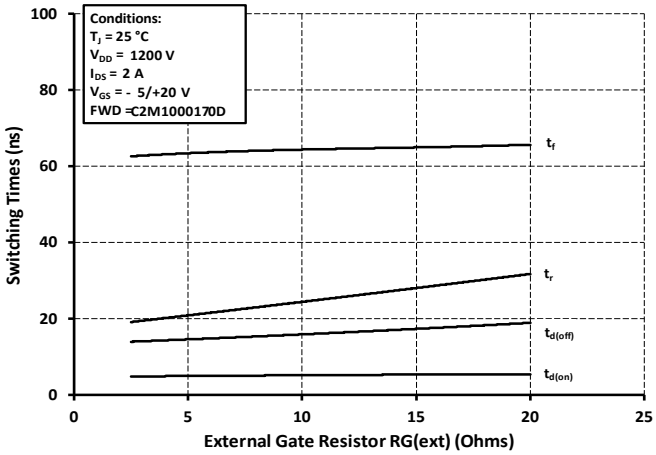


Figure 27. Switching Times vs. $R_{G(ext)}$

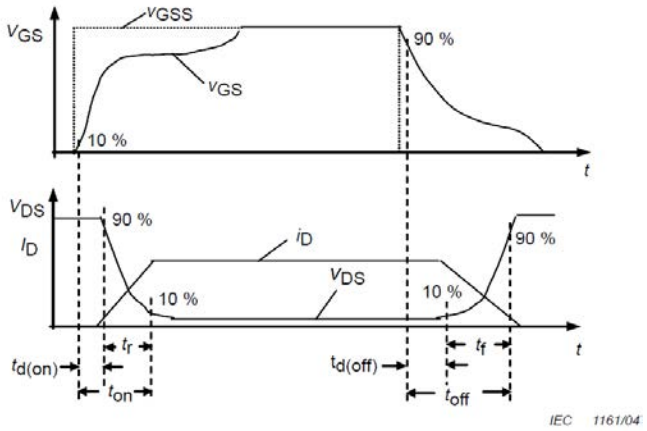


Figure 28. Switching Times Definition

Test Circuit Schematic

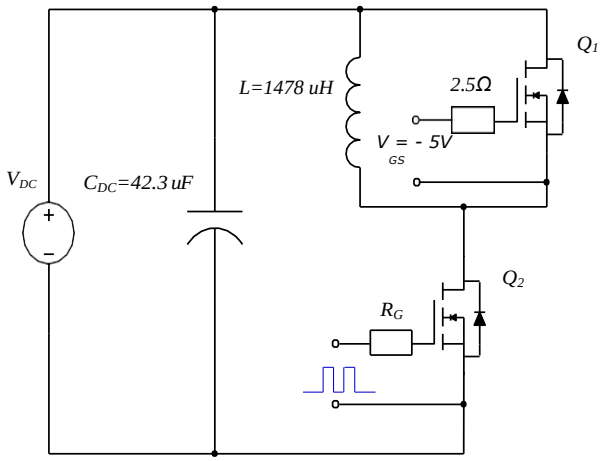


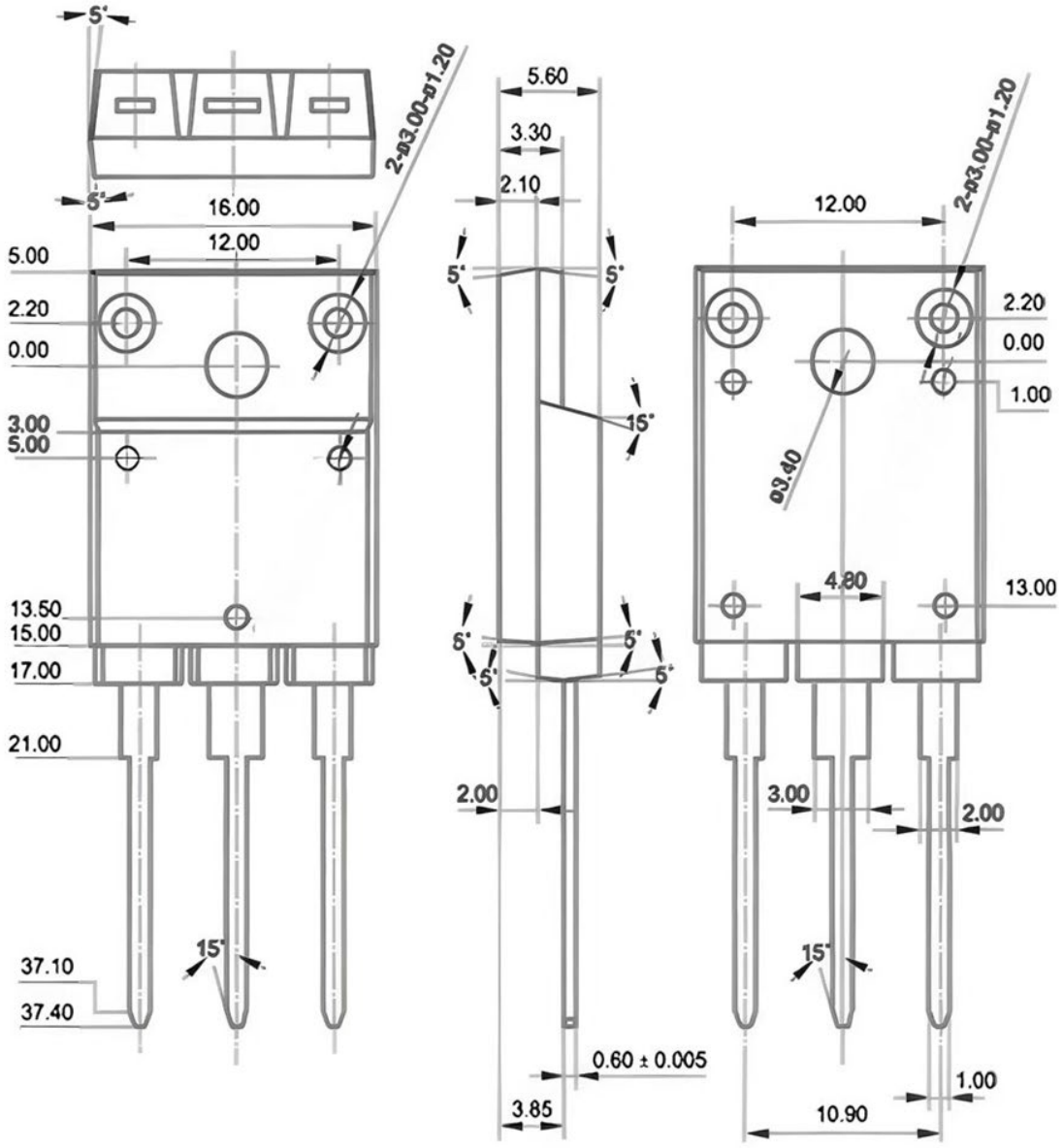
Figure 29. Clamped Inductive Switching
Waveform Test Circuit

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)

Package Dimensions

Package TO-3PF



Attention

■ Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.

■ HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.

■ Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

■ HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could
give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

■ In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

■ Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

■ Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.