

Features

- High Speed Switching with Low Capacitances
- 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
- Increased System Switching Frequency
- Reduced Cooling Requirements
- Increased System Reliability

Applications

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

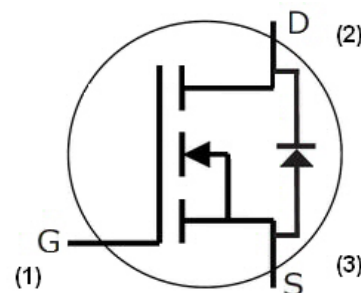
Part Number	Package	Marking
GC2M1000170D	TO-247-3	GC2M1000170

V_{DS}	1700 V
$I_D @ 25^\circ\text{C}$	5.0 A
$R_{DS(on)}$	1.0 Ω



TO-247-3

Package



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	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
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	5.0	A	$V_{GS} = 20\text{ V}, T_C = 25^\circ\text{C}$	Fig. 19
		3.5		$V_{GS} = 20\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	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	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°C unless otherwise specified)

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	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		1	100	μA	V _{DS} = 1.7 kV, V _{GS} = 0 V	
I _{GSS}	Gate-Source Leakage Current			250	nA	V _{GS} = 20 V, V _{DS} = 0 V	
R _{DS(on)}	Drain-Source On-State Resistance		0.80	1.4	Ω	V _{GS} = 20 V, I _D = 2 A	Fig. 4,5,6
			1.4			V _{GS} = 20 V, I _D = 2 A, T _J = 150 °C	
g _{fs}	Transconductance		1.04		S	V _{DS} = 20 V, I _{DS} = 2 A	Fig. 7
			1.09			V _{DS} = 20 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	1.7	1.8	°C/W		Fig. 21
R _{θJA}	Thermal Resistance from Junction to Ambient		40			

Typical Performance

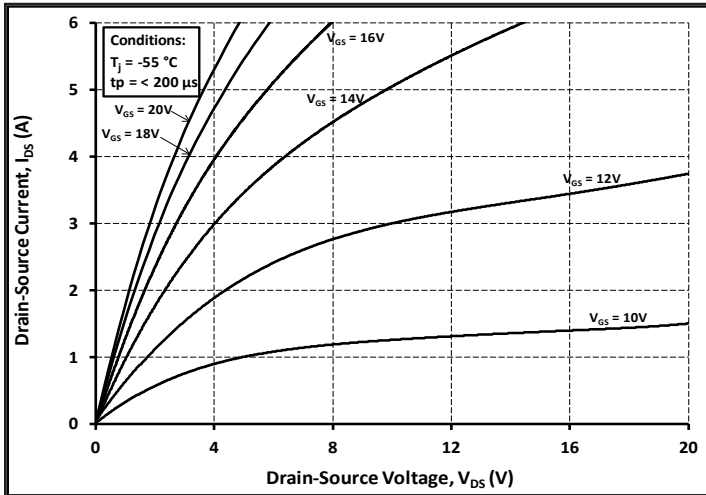


Figure 1. Output Characteristics $T_j = -55\text{ }^{\circ}\text{C}$

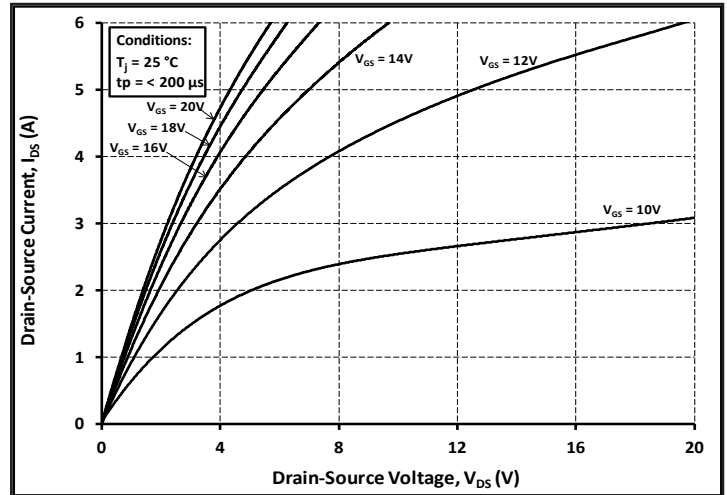


Figure 2. Output Characteristics $T_j = 25\text{ }^{\circ}\text{C}$

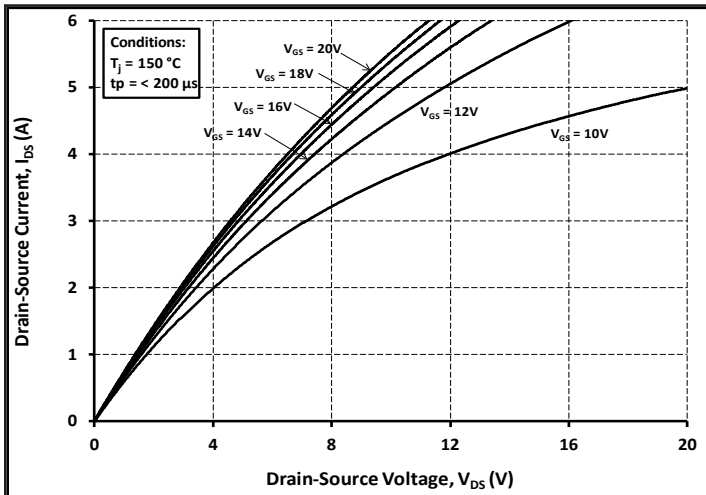


Figure 3. Output Characteristics $T_j = 150\text{ }^{\circ}\text{C}$

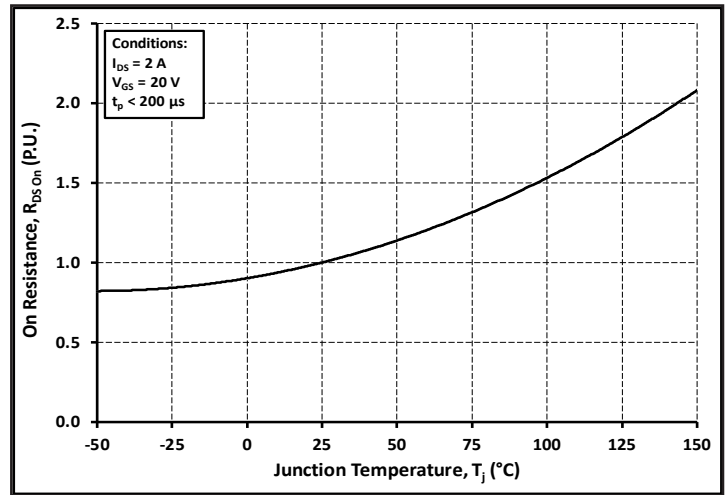


Figure 4. Normalized On-Resistance vs. Temperature

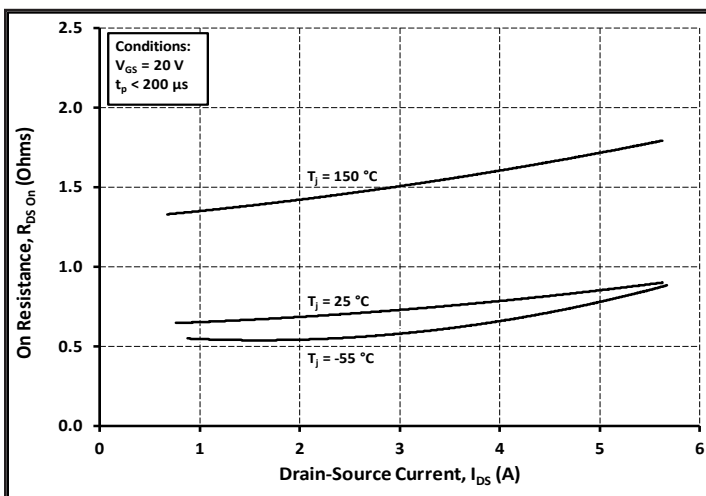


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

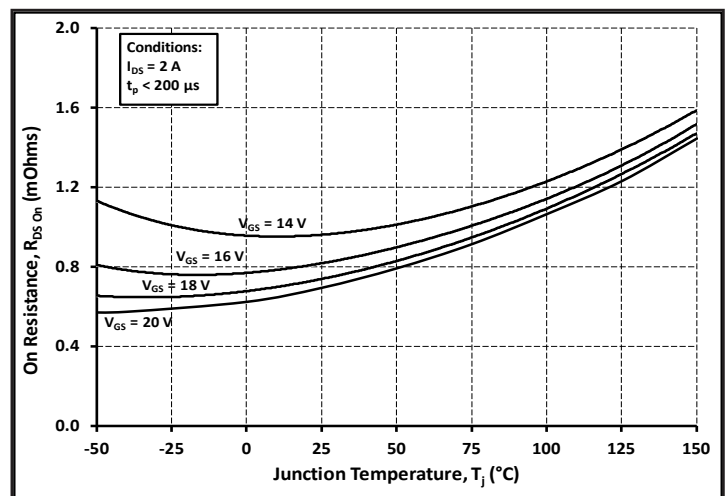


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

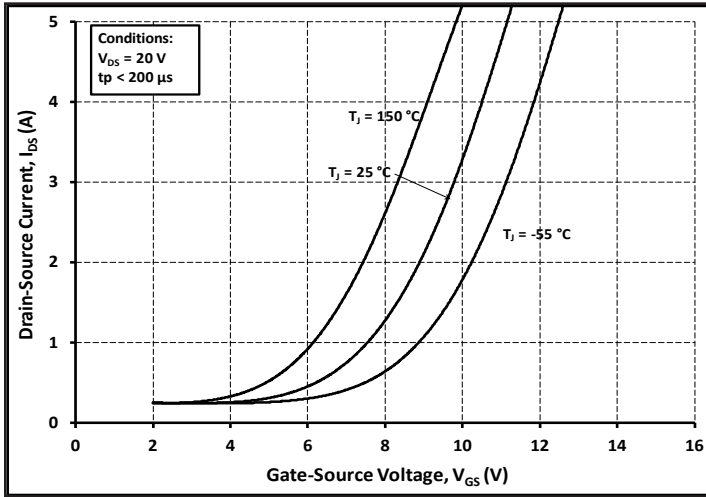


Figure 7. Transfer Characteristic for Various Junction Temperatures

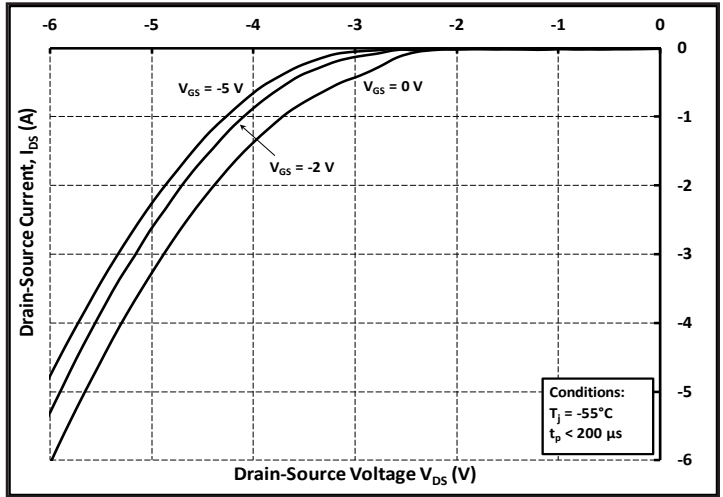


Figure 8. Body Diode Characteristic at -55 °C

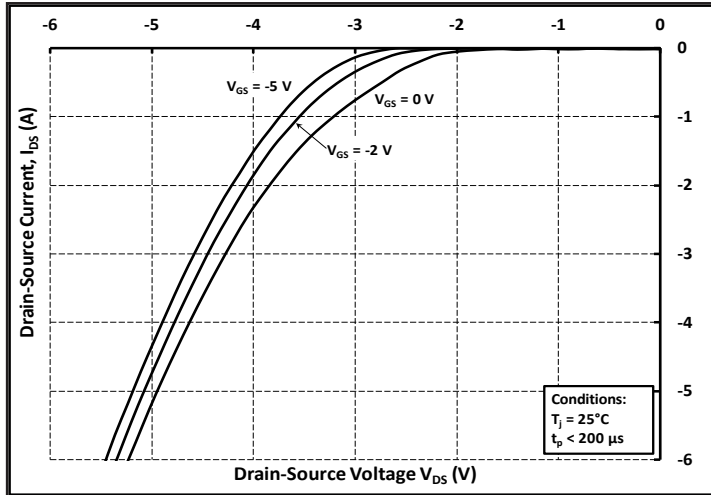


Figure 9. Body Diode Characteristic at 25 °C

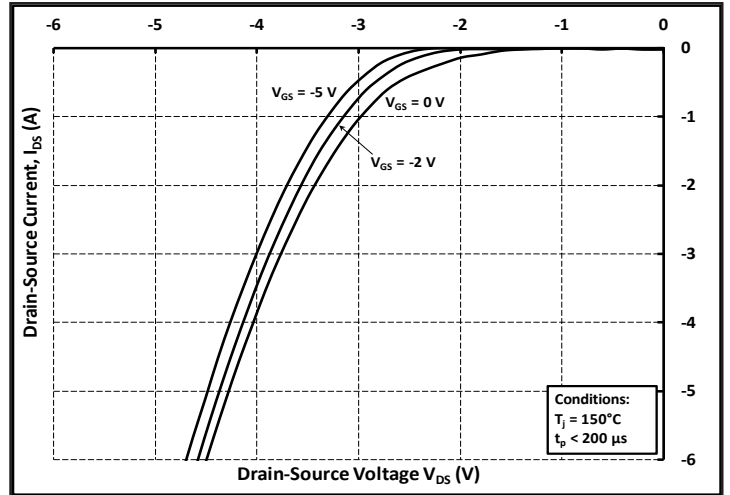


Figure 10. Body Diode Characteristic at 150 °C

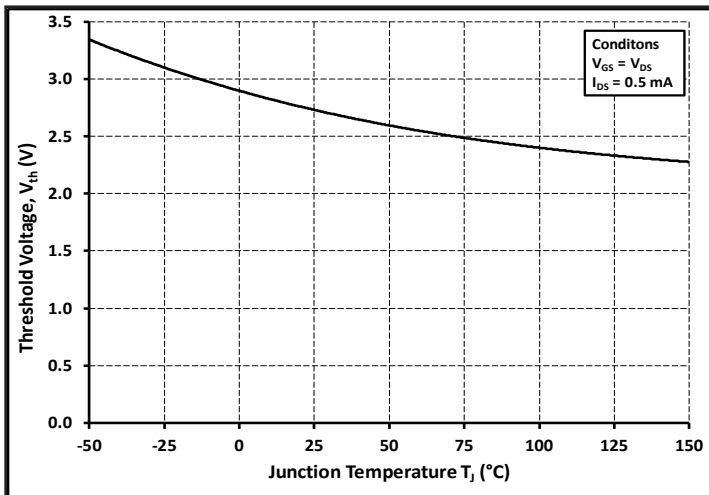


Figure 11. Threshold Voltage vs. Temperature

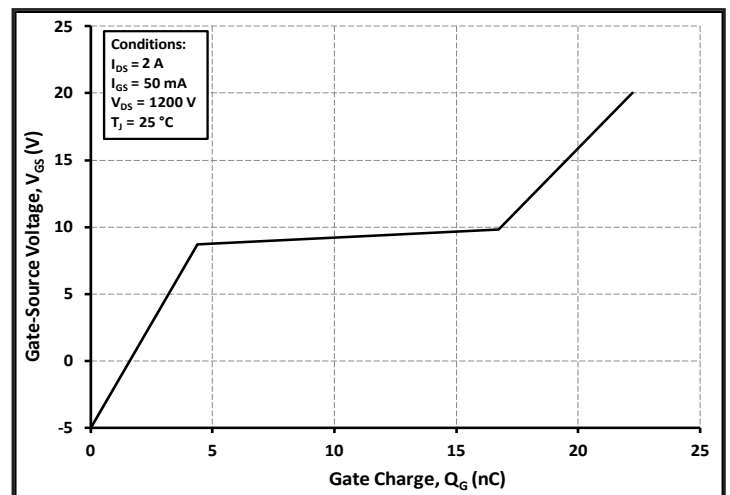


Figure 12. Gate Charge Characteristics

Typical Performance

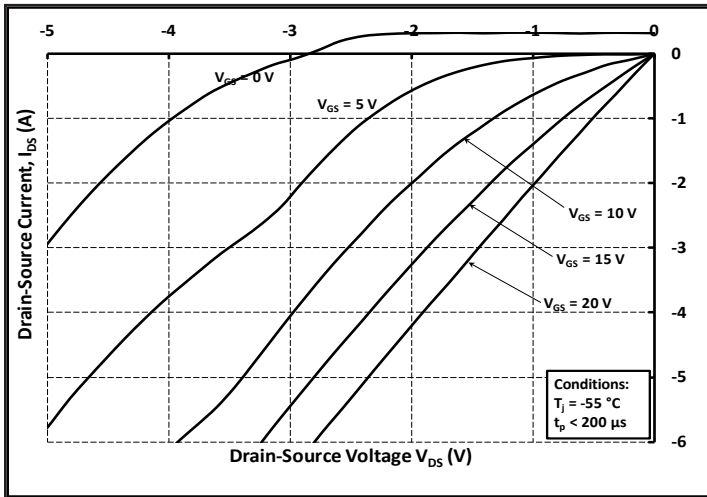


Figure 13. 3rd Quadrant Characteristic at -55 °C

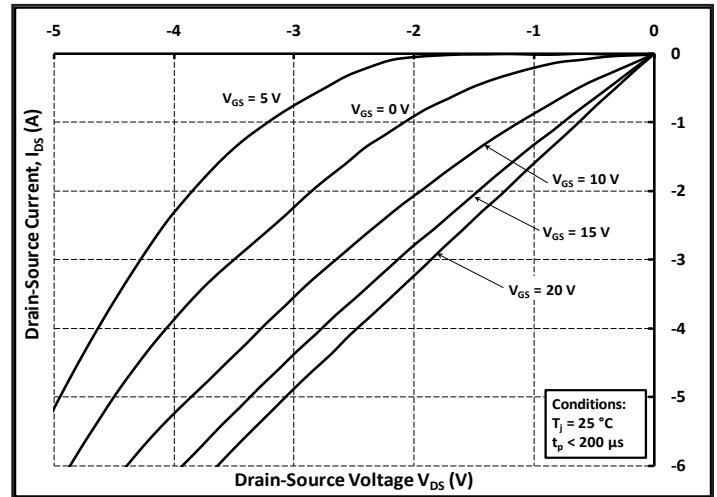


Figure 14. 3rd Quadrant Characteristic at 25 °C

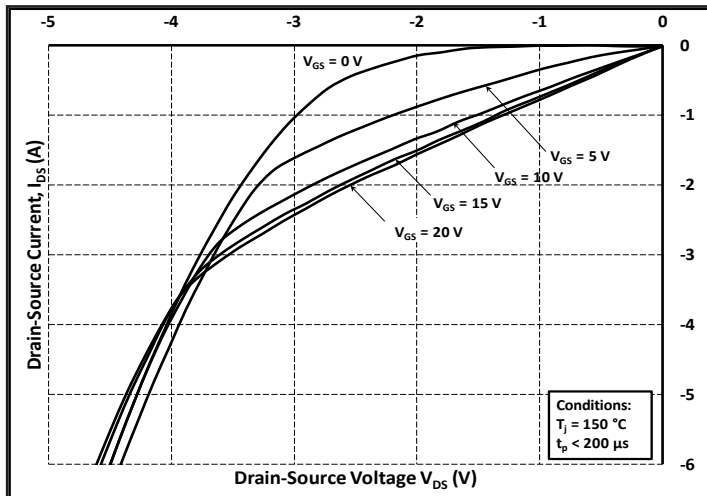


Figure 15. 3rd Quadrant Characteristic at 150 °C

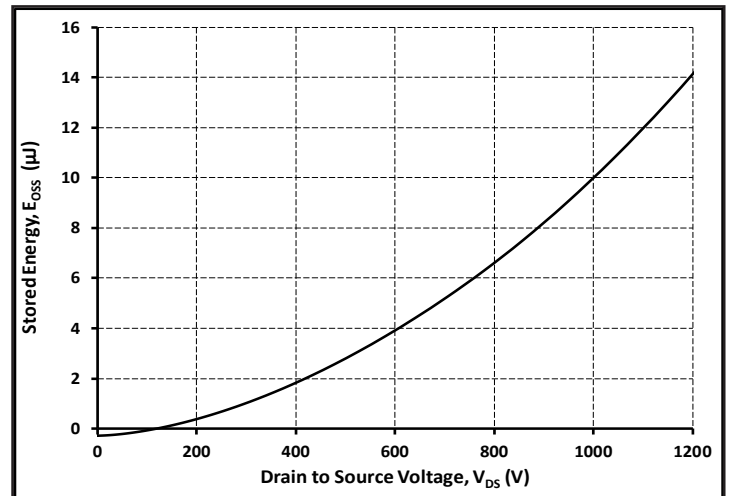


Figure 16. Output Capacitor Stored Energy

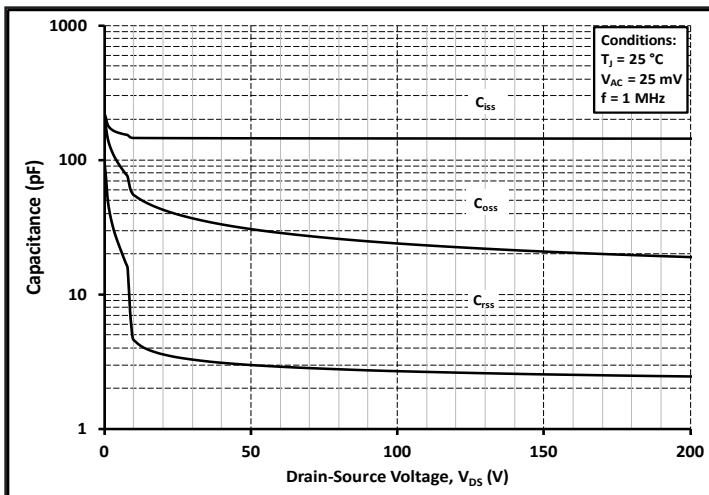


Figure 17. Capacitances vs. Drain-Source Voltage (0-200 V)

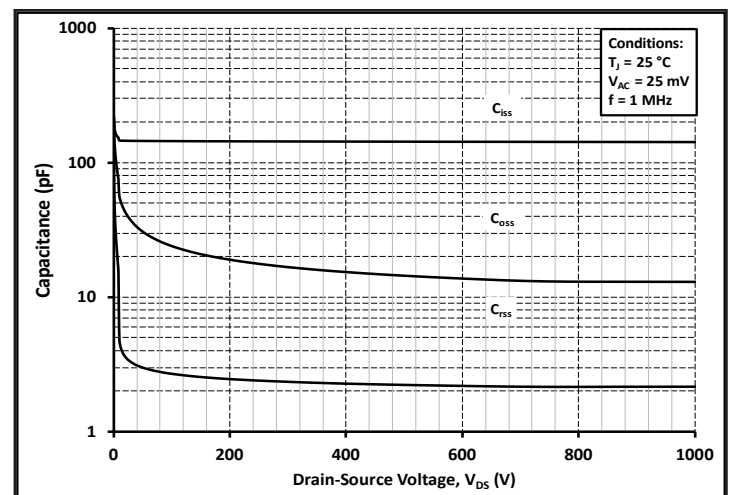


Figure 18. Capacitances vs. Drain-Source Voltage (0-1000 V)

Typical Performance

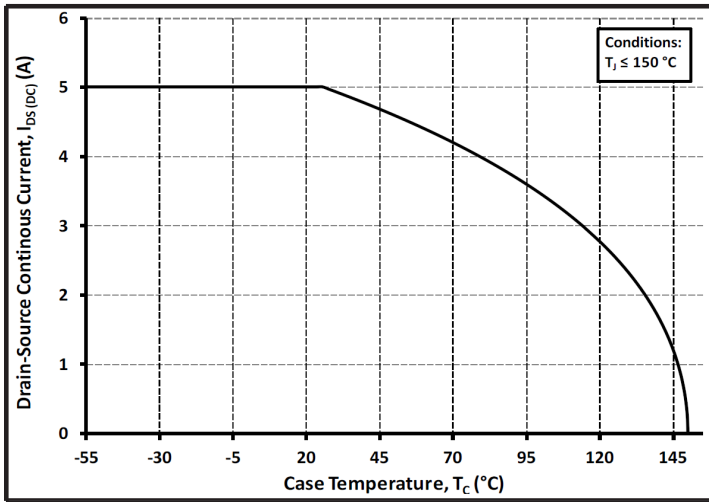


Figure 19. Continuous Drain Current Derating vs. Case Temperature

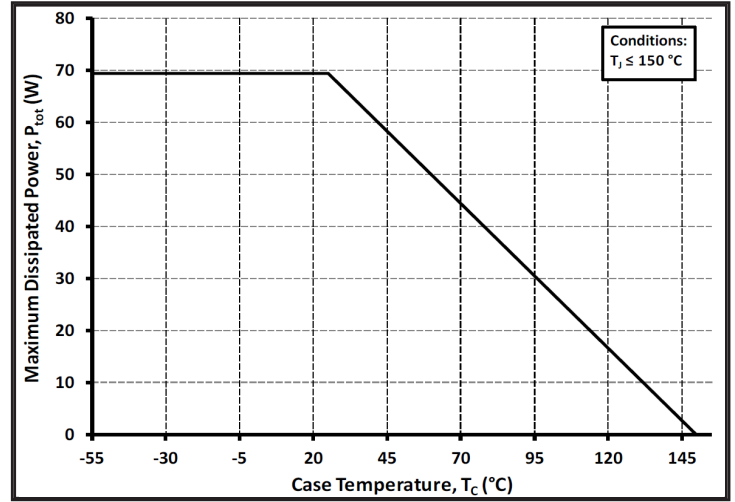


Figure 20. Maximum Power Dissipation Derating Vs Case Temperature

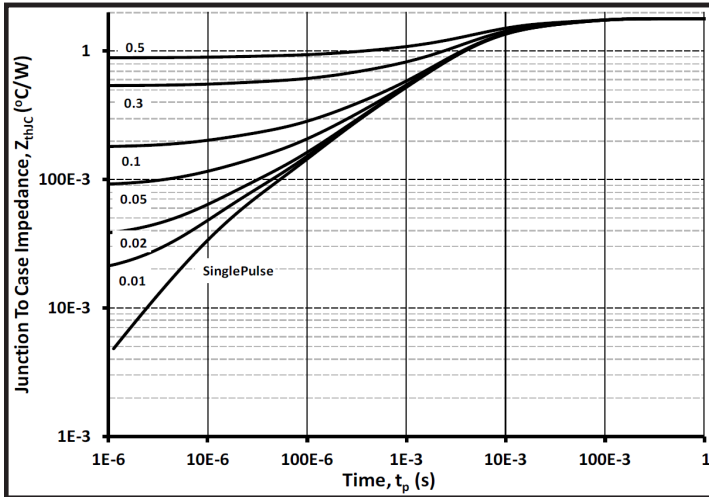


Figure 21. Transient Thermal Impedance (Junction - Case)

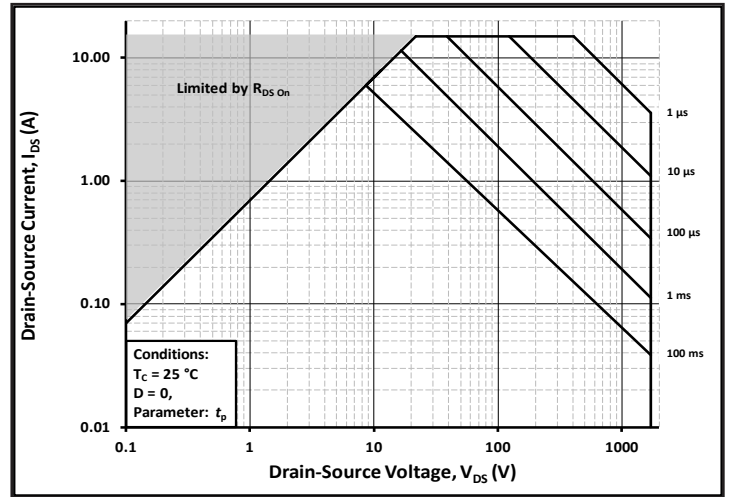


Figure 22. Safe Operating Area

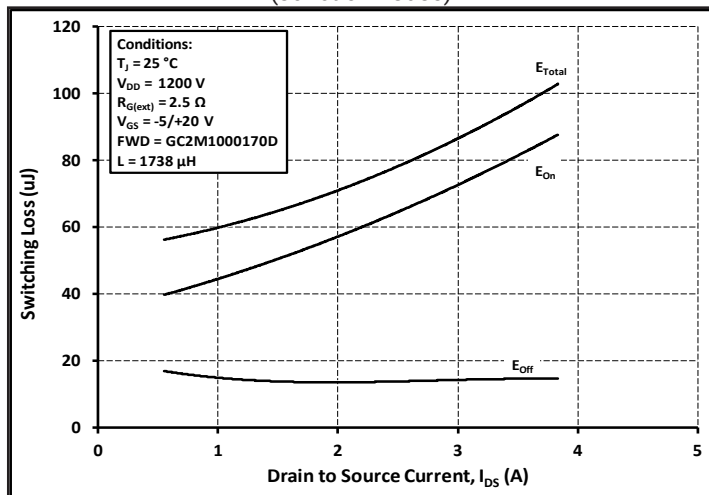


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 1200V$)

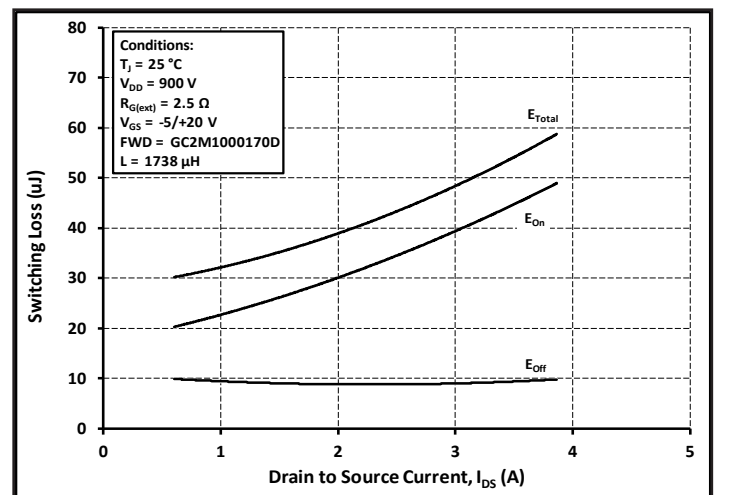


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 900V$)

Typical Performance

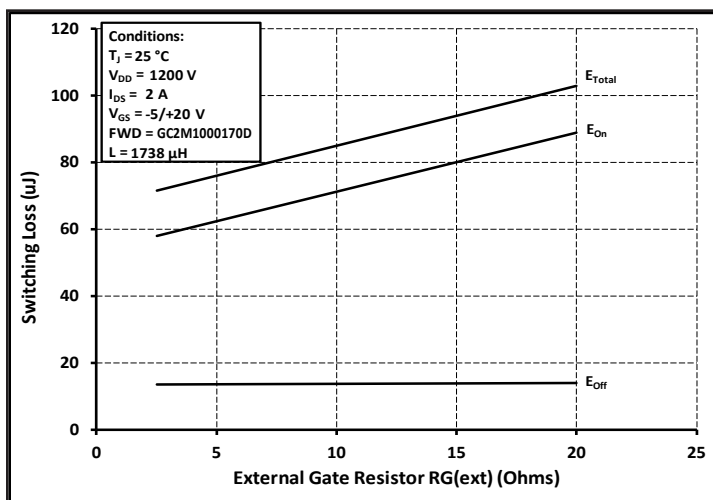


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

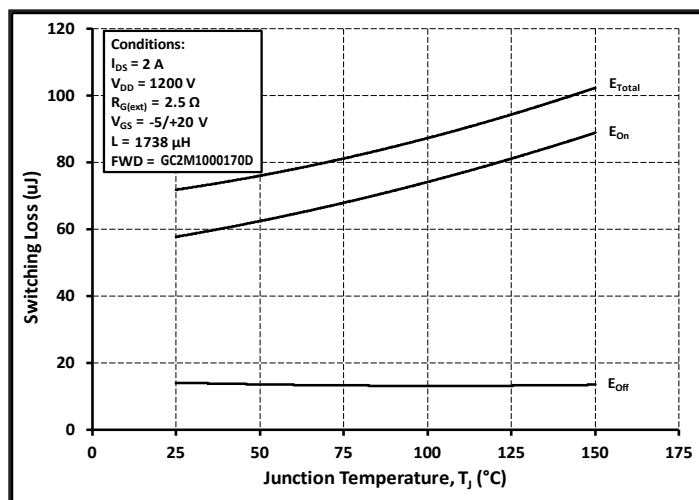


Figure 26. Clamped Inductive Switching Energy vs. Temperature

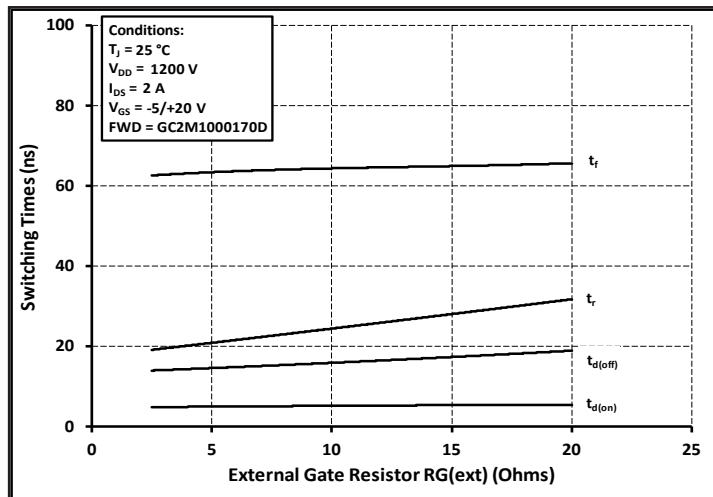


Figure 27. Switching Times vs. $R_{G(ext)}$

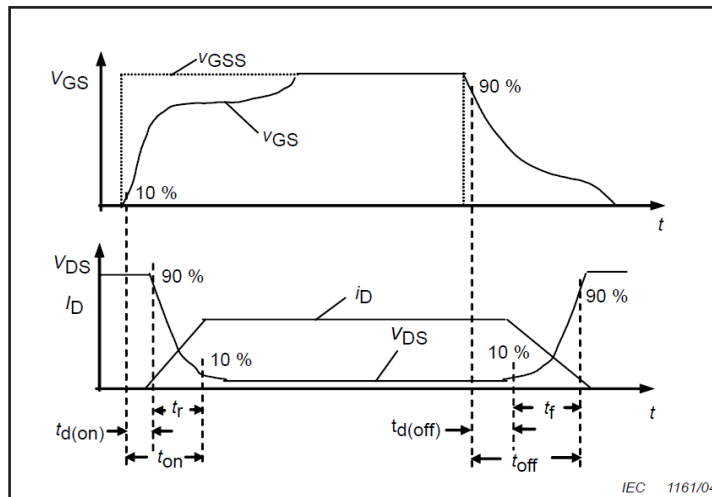


Figure 28. Switching Times Definition

Test Circuit Schematic

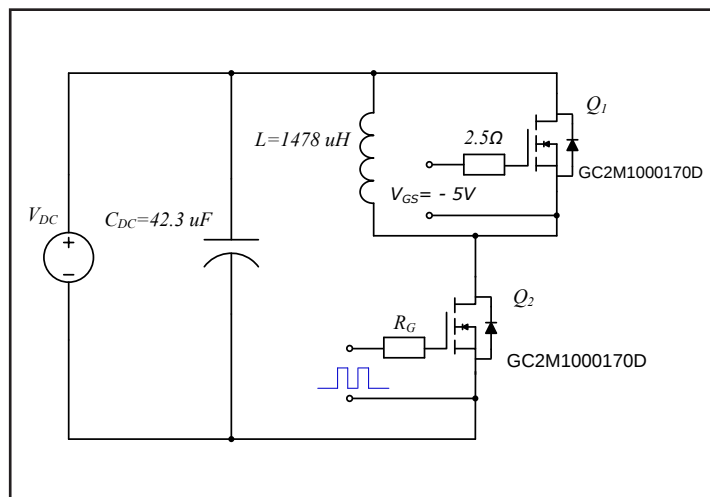


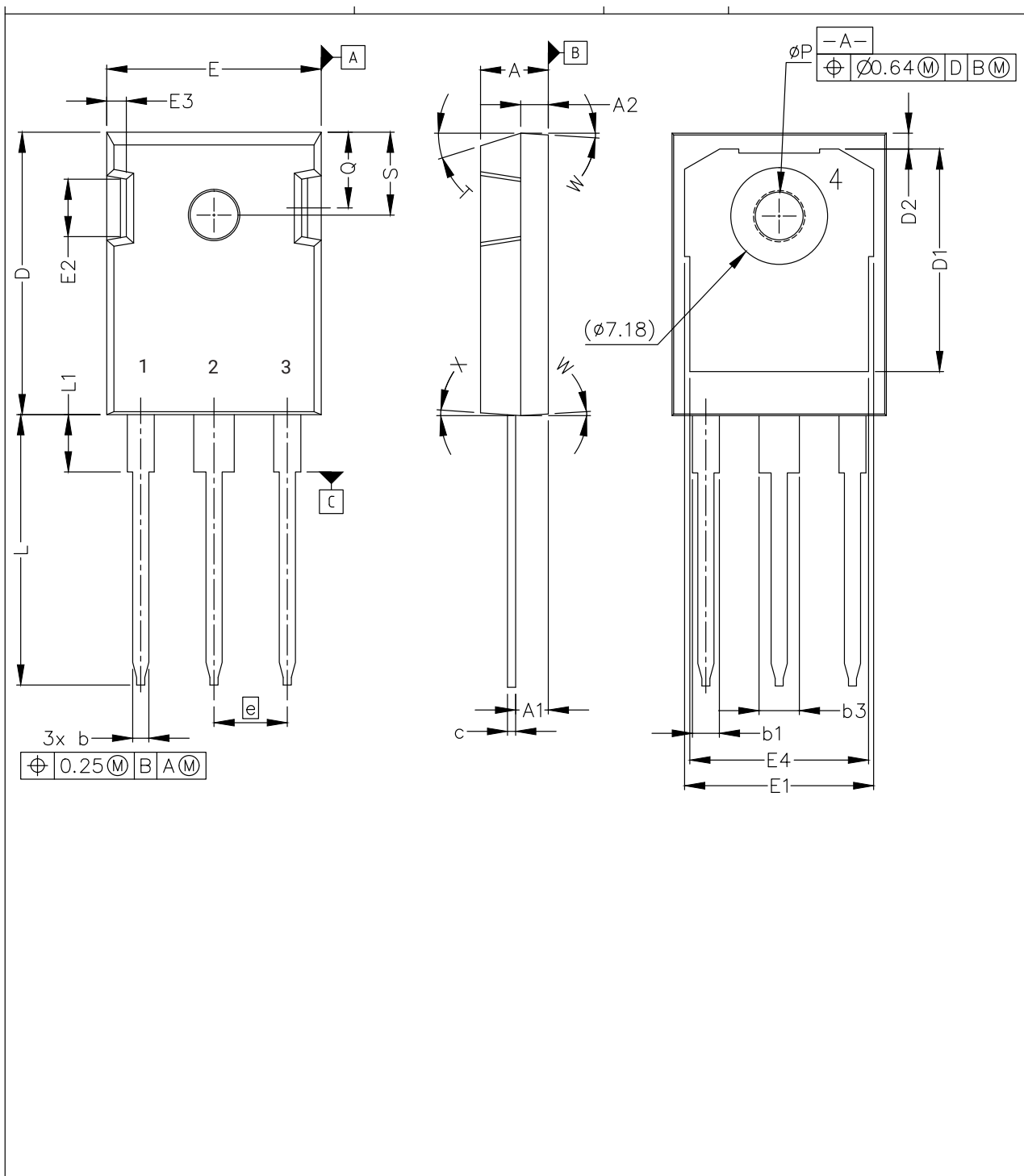
Figure 29. Clamped Inductive Switching
Waveform Test Circuit

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-247-3

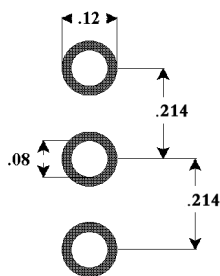


Package Dimensions

Package TO-247-3

SYM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	.190	.205
A1	2.29	2.54	.090	.100
A2	1.91	2.16	.075	.085
b	1.07	1.33	.042	.052
b1	1.91	2.41	.075	.095
b3	2.87	3.38	.113	.133
c	0.55	0.68	.022	.027
D	20.80	21.10	.819	.831
D1	16.25	17.65	.640	.695
D2	0.95	1.25	.037	.049
E	15.75	16.13	.620	.635
E1	13.10	14.15	.516	.557
E2	3.68	5.10	.145	.201
E3	1.00	1.90	.039	.075
E4	12.38	13.43	.487	.529
e	5.44 BSC		.214 BSC	
N	3		3	
L	19.81	20.32	.780	.800
L1	4.10	4.40	.161	.173
ØP	3.51	3.65	.138	.144
Q	5.49	6.00	.216	.236
S	6.04	6.30	.238	.248
T	17.5° REF.			
W	3.5° REF.			
X	4° REF.			

Recommended Solder Pad Layout



TO-247-3