GC3M0160120D
Silicon Carbide Power MOSFET
N-Channel Enhancement Mode

Features

- High blocking voltage with low On-resistance
- High speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)
- Halogen free, RoHS compliant

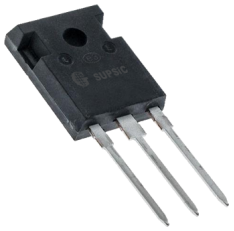
Benefits

- Higher system efficiency
- Reduced cooling requirements
- Increased power density
- Increased system switching frequency

Applications

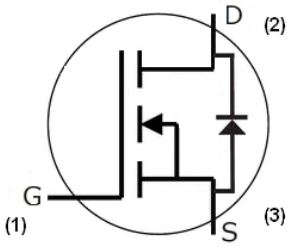
- Renewable energy
- High voltage DC/DC converters
- Switch Mode Power Supplies
- UPS

V_{DS}	1200 V
$I_{D\ @\ 25^{\circ}C}$	17 A
$R_{DS(on)}$	160 mΩ



TO-247-3

Package



Part Number	Package
GC3M0160120D	TO-247-3

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	V_{GS} = 0 V, I_D = 100 µA	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+19	V	AC (f >1 Hz)	Note: 1
V_{GSop}	Gate - Source Voltage (static)	-4/+15	V	Static	Note: 2
I_D	Continuous Drain Current	17	A	V_{GS} = 15 V, T_C = 25˚C	Fig. 19
		12		V_{GS} = 15 V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed Drain Current	34	A	Pulse width t_P limited by T_{jmax}	Fig. 22
P_D	Power Dissipation	97	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	260	˚C	1.6mm (0.063") from case for 10s	
M_d	Mounting Torque	1 8.8	Nm lbf-in	M3 or 6-32 screw	

Note (1): When using MOSFET Body Diode V_{GSmax} = -4V/+19V
Note (2): MOSFET can also safely operate at 0/+15 V

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	1200			V	V_{GS} = 0 V, I_D = 100 µA	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.8	3.6	V	V_{DS} = V_{GS}, I_D = 2.33 mA	Fig. 11
			2.2		V	V_{DS} = V_{GS}, I_D = 2.33 mA, T_J = 150°C	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	µA	V_{DS} = 1200 V, V_{GS} = 0 V	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	V_{GS} = 15 V, V_{DS} = 0 V	
$R_{DS(on)}$	Drain-Source On-State Resistance		160	208	mΩ	V_{GS} = 15 V, I_D = 8.5 A	Fig. 4, 5, 6
			256			V_{GS} = 15 V, I_D = 8.5 A, T_J = 150°C	
g_{fs}	Transconductance		5.2		S	V_{DS}= 20 V, I_{DS}= 8.5 A	Fig. 7
			4.9			V_{DS}= 20 V, I_{DS}= 8.5 A, T_J = 150°C	
C_{iss}	Input Capacitance		632		pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 1 MHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		39				
C_{rss}	Reverse Transfer Capacitance		3				
E_{oss}	C_{oss} Stored Energy		22.5		µJ		Fig. 16
E_{ON}	Turn-On Switching Energy (SiC Diode FWD)		183		µJ	V_{DS} = 800 V, V_{GS} = -4 V/15 V, I_D = 8.5 A, $R_{G(ext)}$ = 2.5 Ω, L= 336 µH, T_J = 150°C	Fig. 26, 29
E_{OFF}	Turn Off Switching Energy (SiC Diode FWD)		16				
E_{ON}	Turn-On Switching Energy (Body Diode FWD)		294		µJ	V_{DS} = 800 V, V_{GS} = -4 V/15 V, I_D = 8.5 A, $R_{G(ext)}$ = 2.5 Ω, L= 336 µH, T_J = 150°C	Fig. 26, 29
E_{OFF}	Turn Off Switching Energy (Body Diode FWD)		14				
$t_{d(on)}$	Turn-On Delay Time		30		ns	V_{DD} = 800 V, V_{GS} = -4 V/15 V I_D = 8.5 A, $R_{G(ext)}$ = 2.5 Ω, Timing relative to V_{DS} Inductive load	Fig. 27, 28
t_r	Rise Time		16				
$t_{d(off)}$	Turn-Off Delay Time		20				
t_f	Fall Time		13				
$R_{G(int)}$	Internal Gate Resistance		8		Ω	f = 1 MHz, V_{AC} = 25 mV	
Q_{gs}	Gate to Source Charge		9		nC	V_{DS} = 800 V, V_{GS} = -4 V/15 V I_D = 8.5 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		12				
Q_g	Total Gate Charge		38				

Reverse Diode Characteristics (T_C = 25˚C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.5		V	V_{GS} = -4 V, I_{SD} = 3 A	Fig. 8, 9, 10
		4.0		V	V_{GS} = -4 V, I_{SD} = 3 A, T_J = 150 °C	
I_S	Continuous Diode Forward Current		17	A	V_{GS} = -4 V, T_J = 25 ˚C	Note 1
$I_{S, pulse}$	Diode pulse Current		34	A	V_{GS} = -4 V, pulse width t_P limited by T_{jmax}	Note 1
t_{rr}	Reverse Recover time	34		ns	V_{GS} = -4 V, I_{SD} = 8.5 A, V_R = 800 V dif/dt = 844 A/µs, T_J = 150 °C	Note 1
Q_{rr}	Reverse Recovery Charge	194		nC		
I_{rrm}	Peak Reverse Recovery Current	8		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.29	°C/W		Fig. 21

Typical Performance

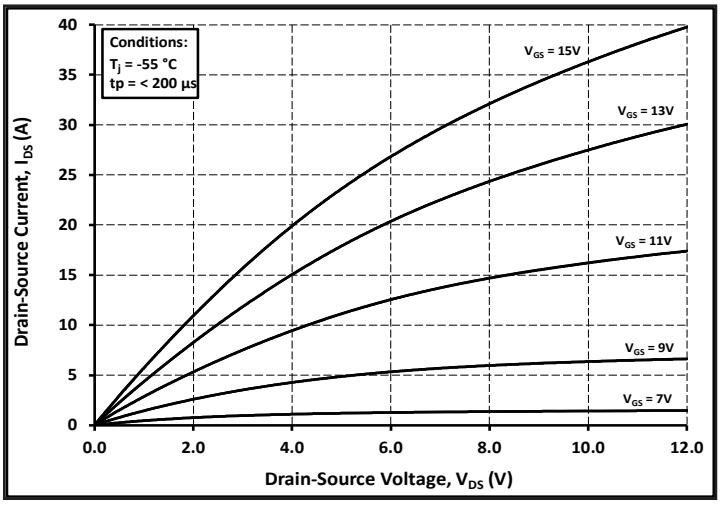


Figure 1. Output Characteristics T_J = -55 ºC

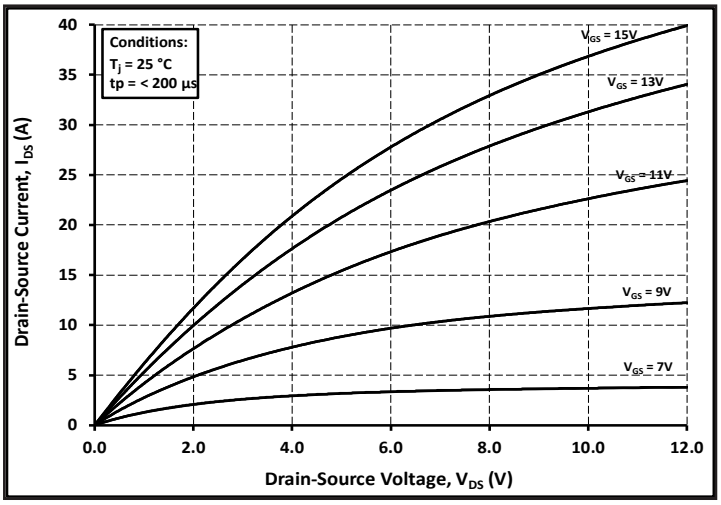


Figure 2. Output Characteristics T_J = 25 ºC

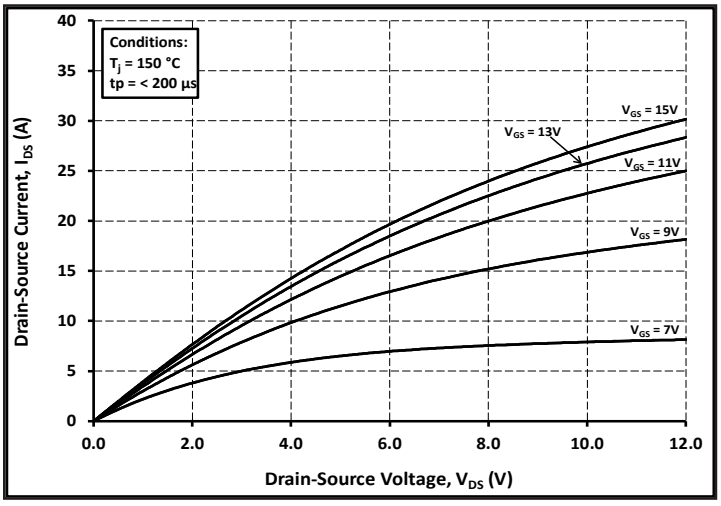


Figure 3. Output Characteristics T_J = 150 ºC

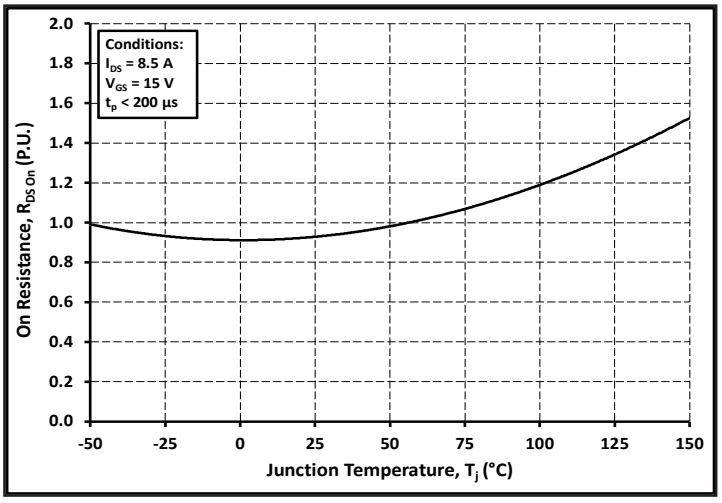


Figure 4. Normalized On-Resistance vs. Temperature

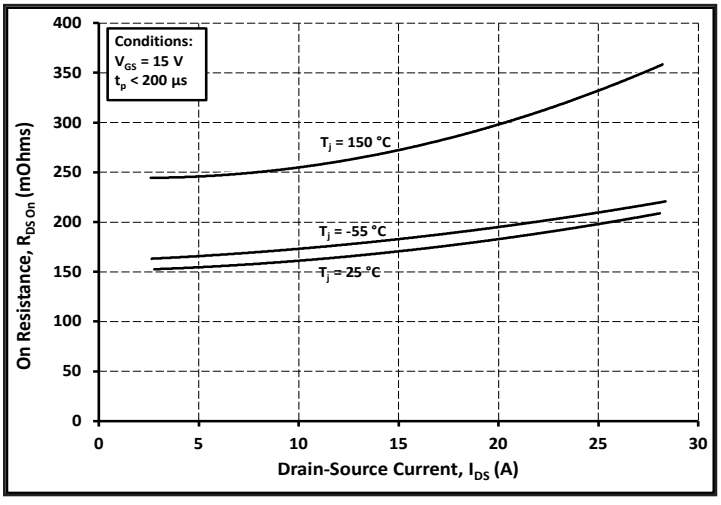


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

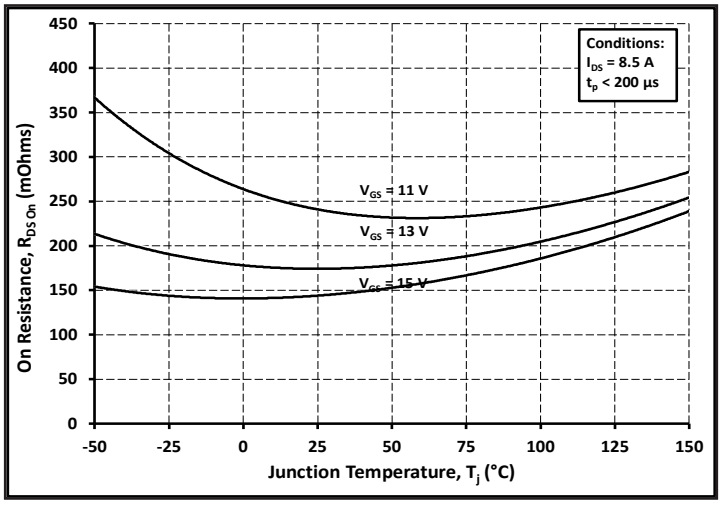


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

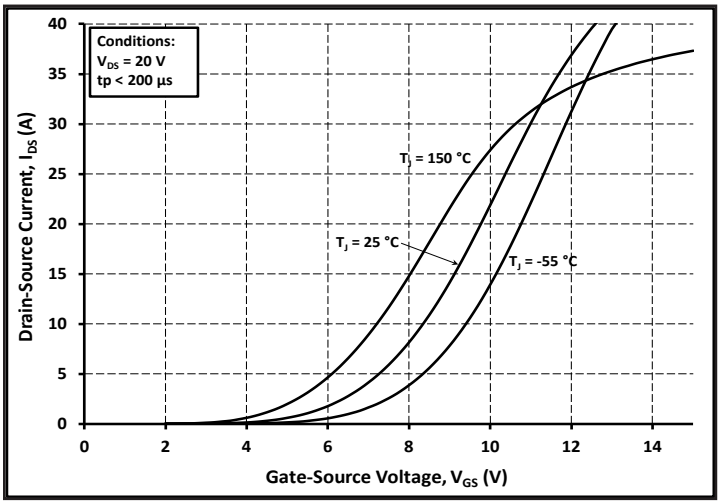


Figure 7. Transfer Characteristic for Various Junction Temperatures

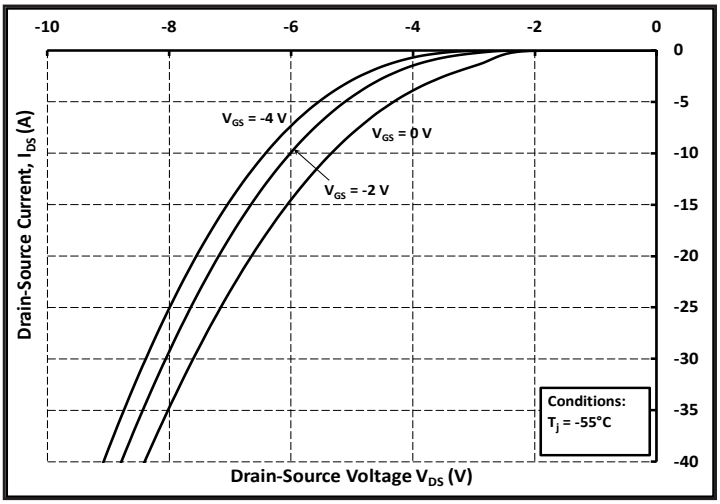


Figure 8. Body Diode Characteristic at -55 ºC

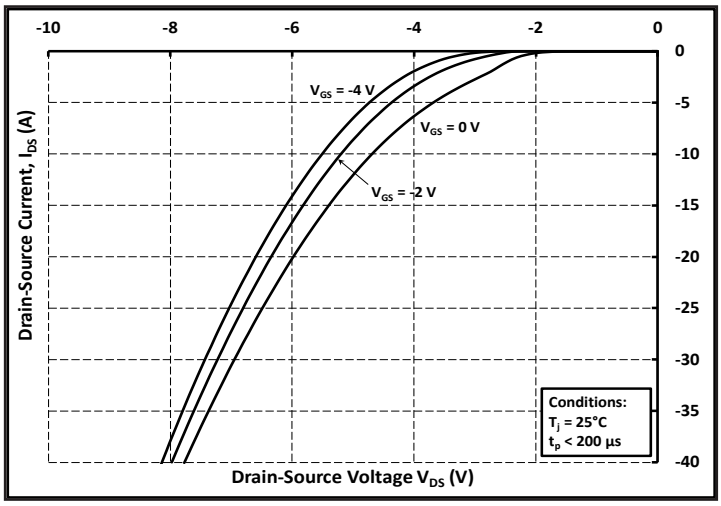


Figure 9. Body Diode Characteristic at 25 ºC

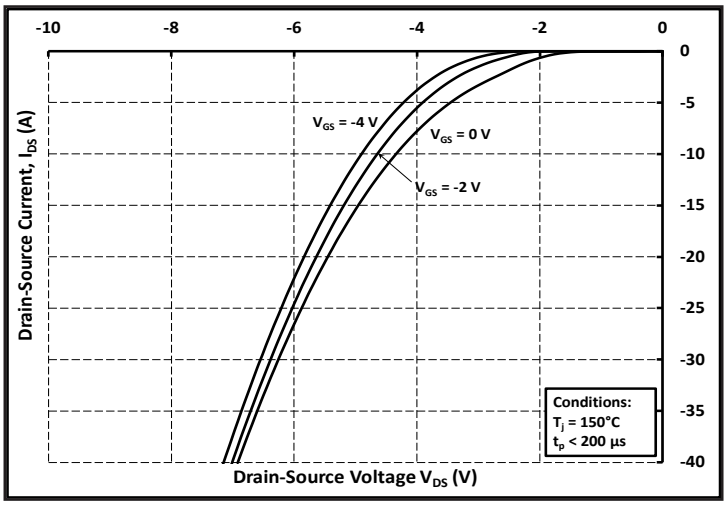


Figure 10. Body Diode Characteristic at 150 ºC

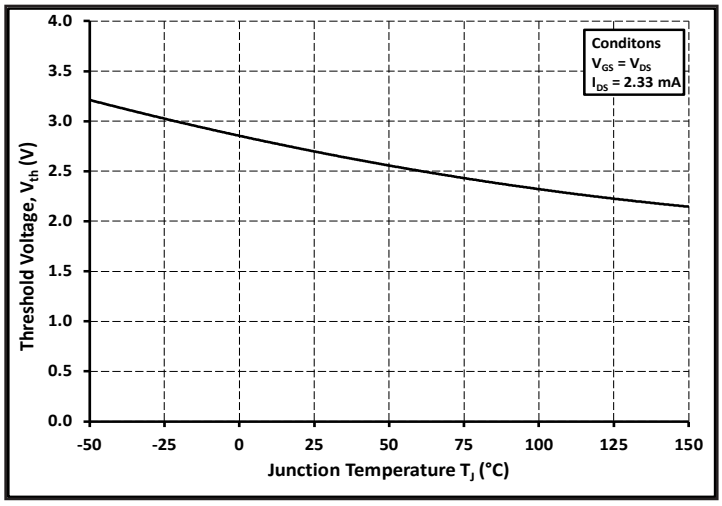


Figure 11. Threshold Voltage vs. Temperature

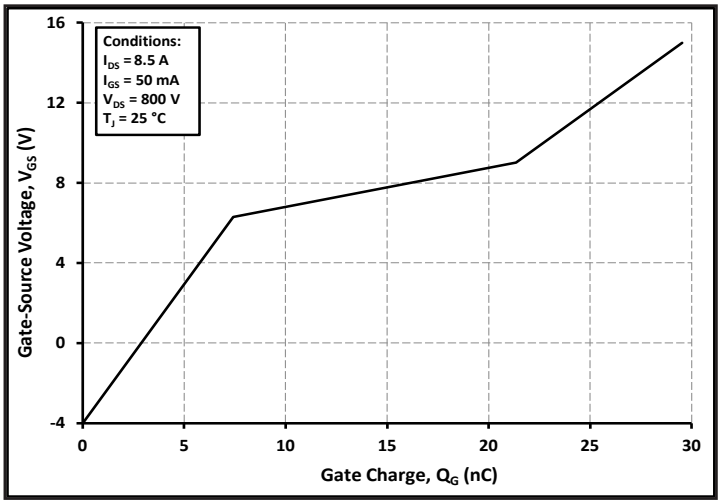


Figure 12. Gate Charge Characteristics

Typical Performance

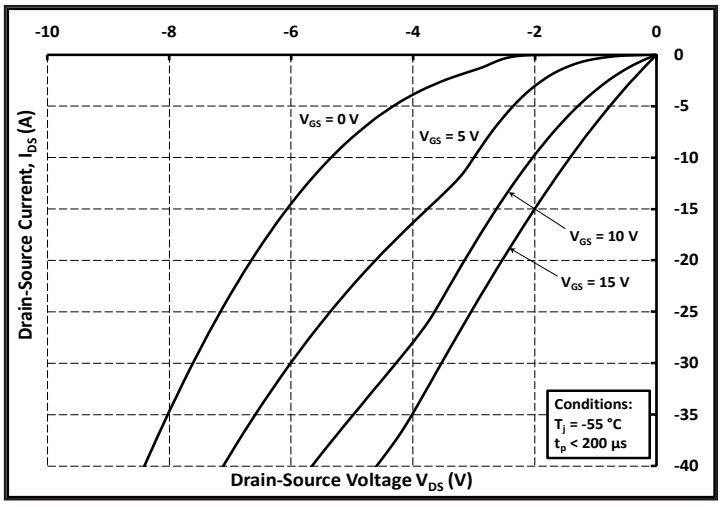


Figure 13. 3rd Quadrant Characteristic at -55 ºC

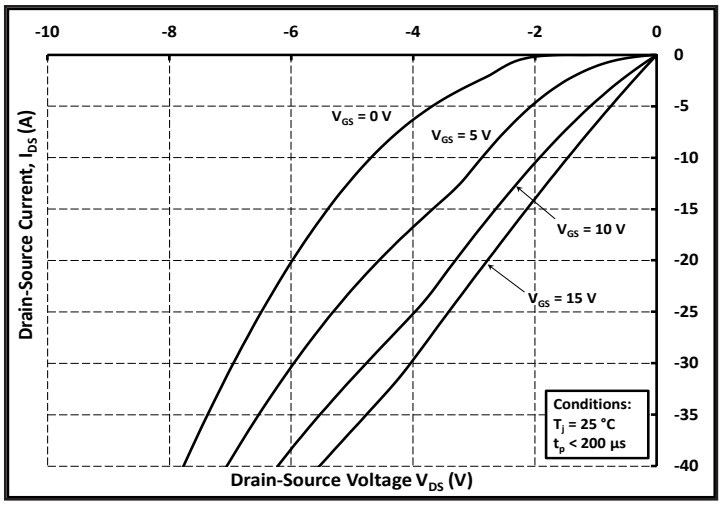


Figure 14. 3rd Quadrant Characteristic at 25 ºC

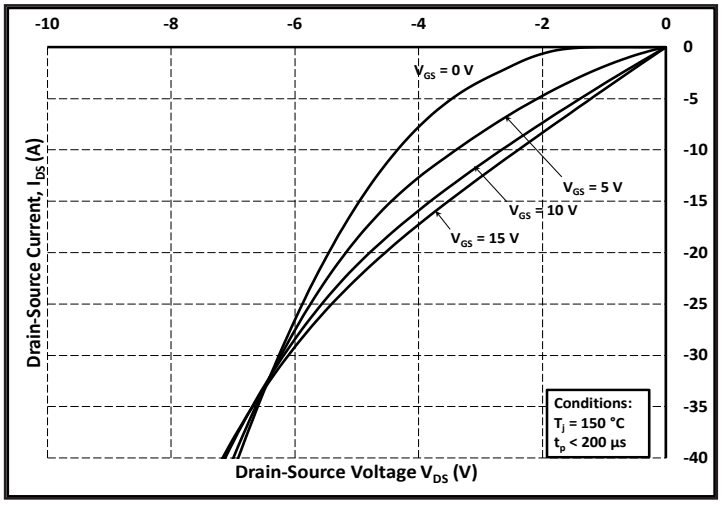


Figure 15. 3rd Quadrant Characteristic at 150 ºC

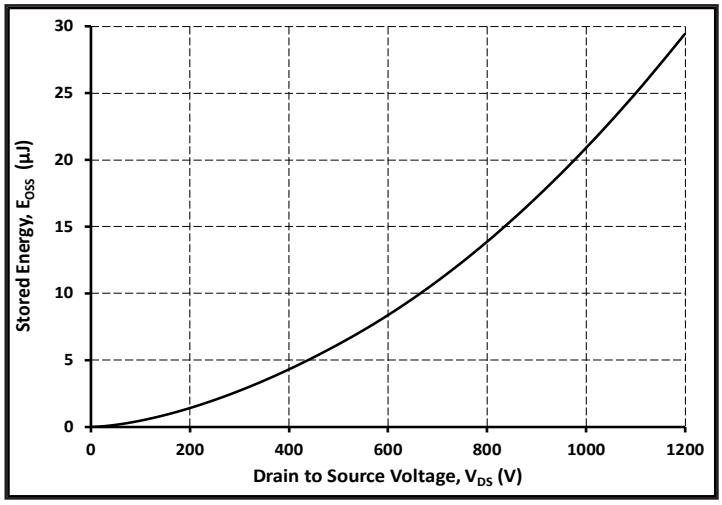


Figure 16. Output Capacitor Stored Energy

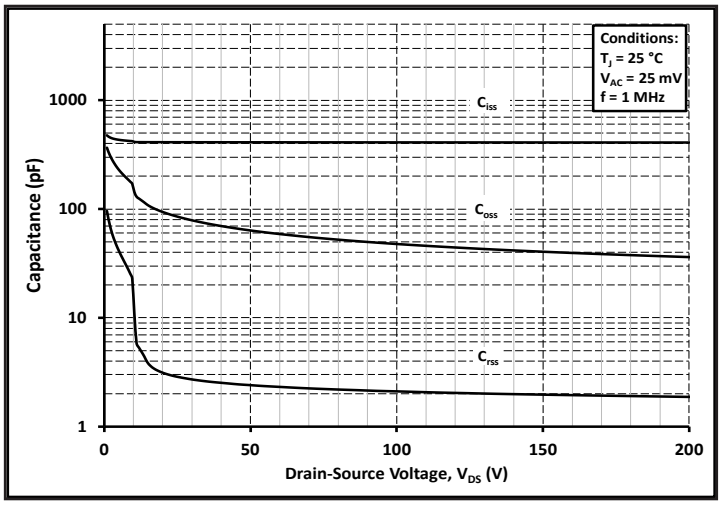


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

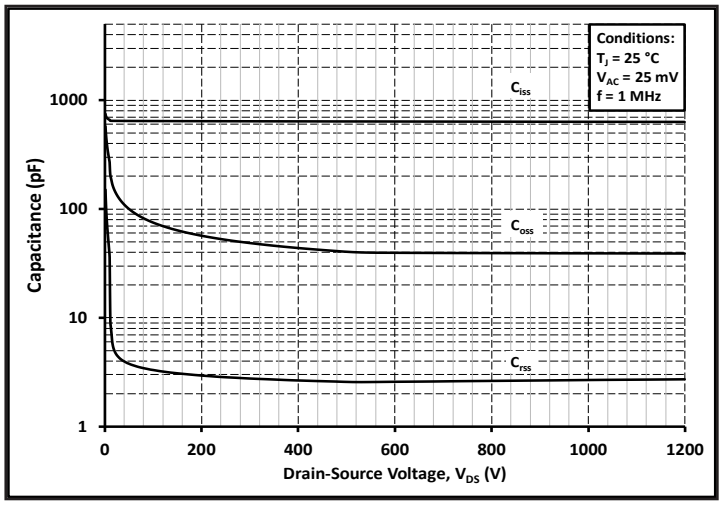


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1200V)

Typical Performance

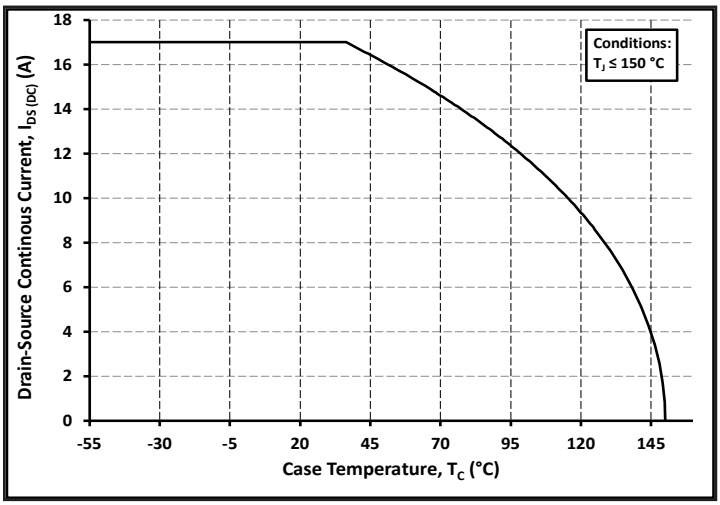


Figure 19. Continuous Drain Current Derating vs. Case Temperature

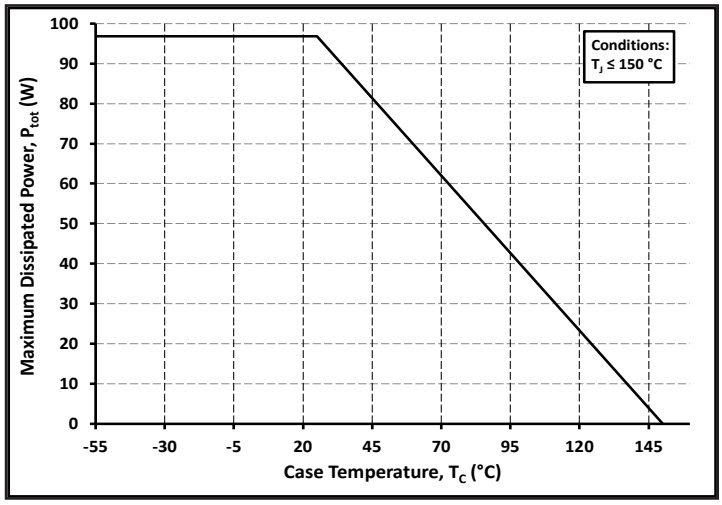


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

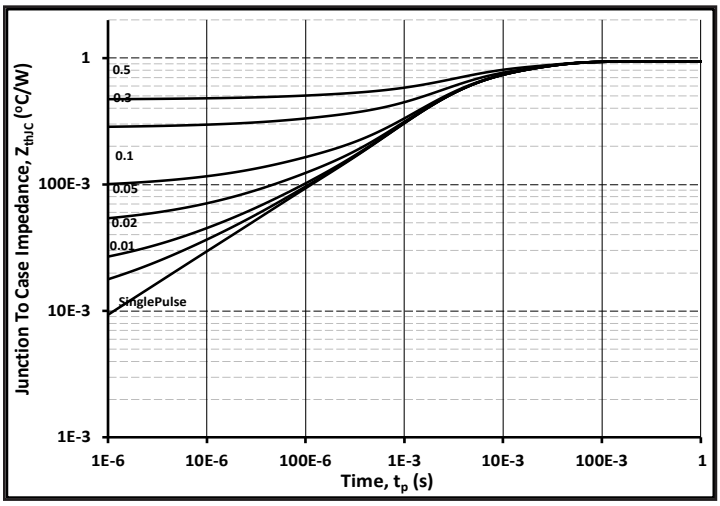


Figure 21. Transient Thermal Impedance (Junction - Case)

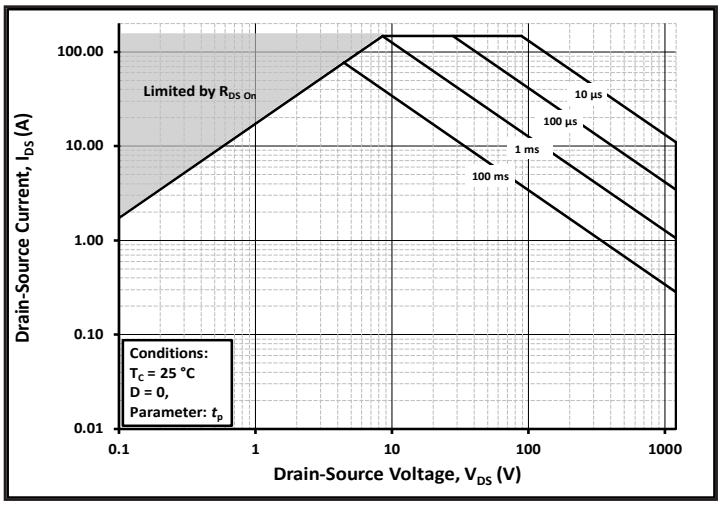


Figure 22. Safe Operating Area

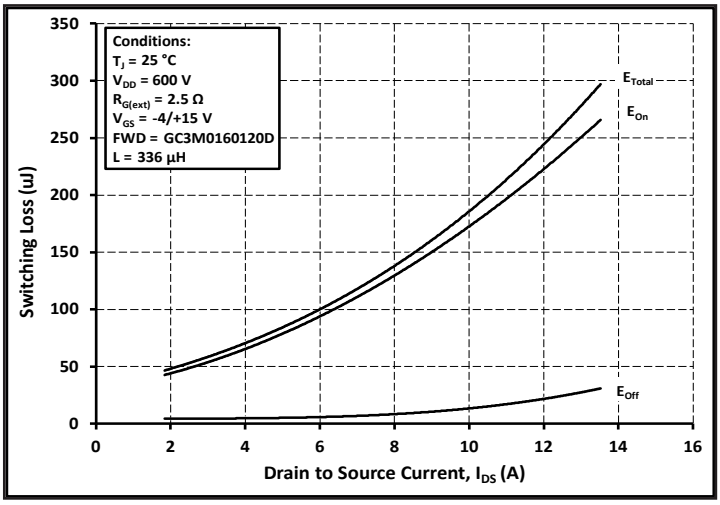


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

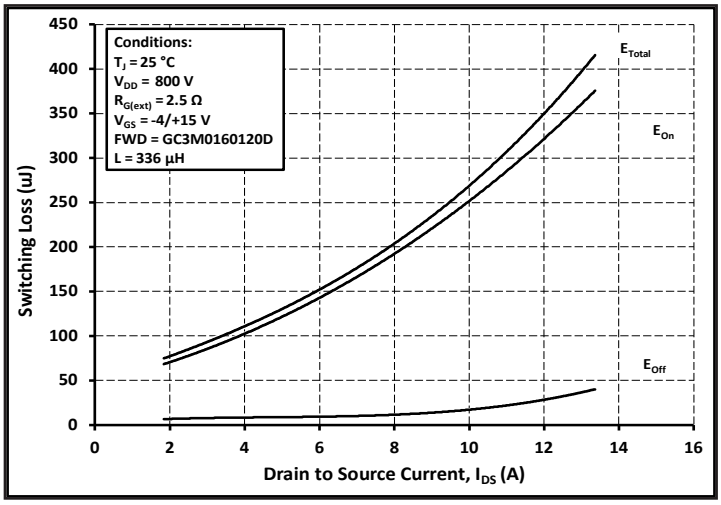


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

Typical Performance

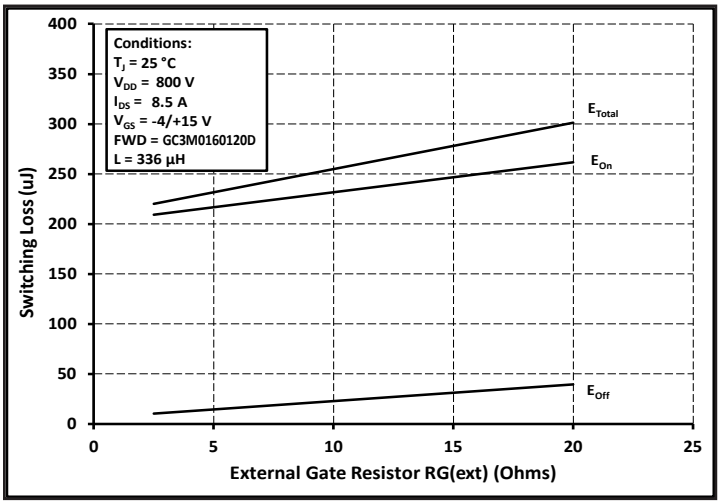


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

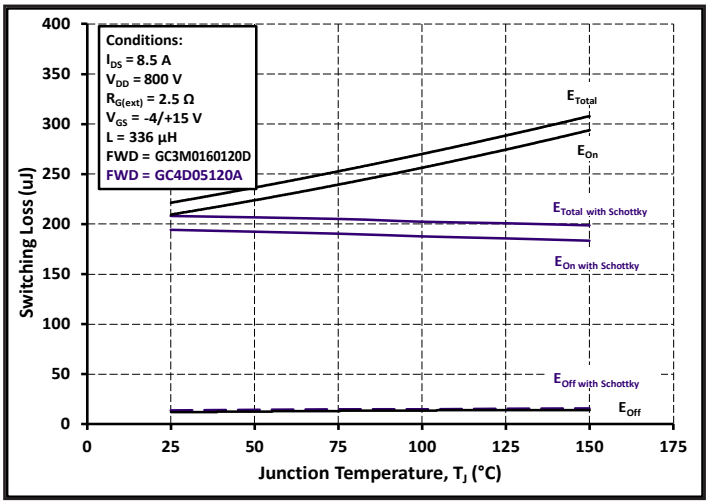


Figure 26. Clamped Inductive Switching Energy vs. Temperature

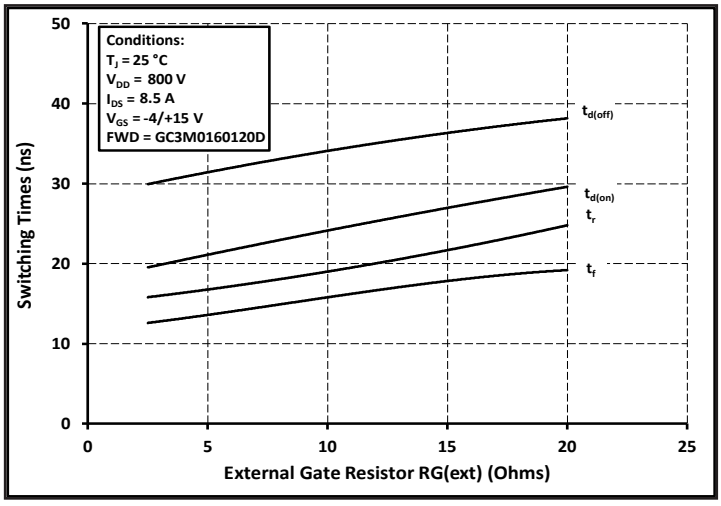


Figure 27. Switching Times vs. $R_{G(ext)}$

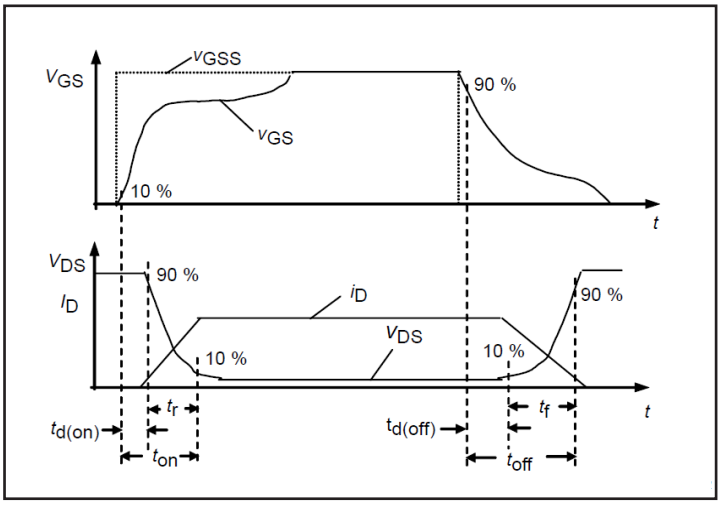


Figure 28. Switching Times Definition

Test Circuit Schematic

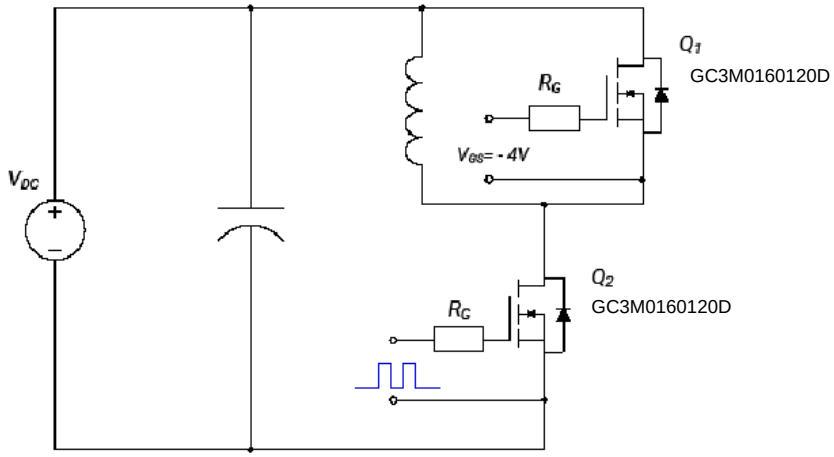
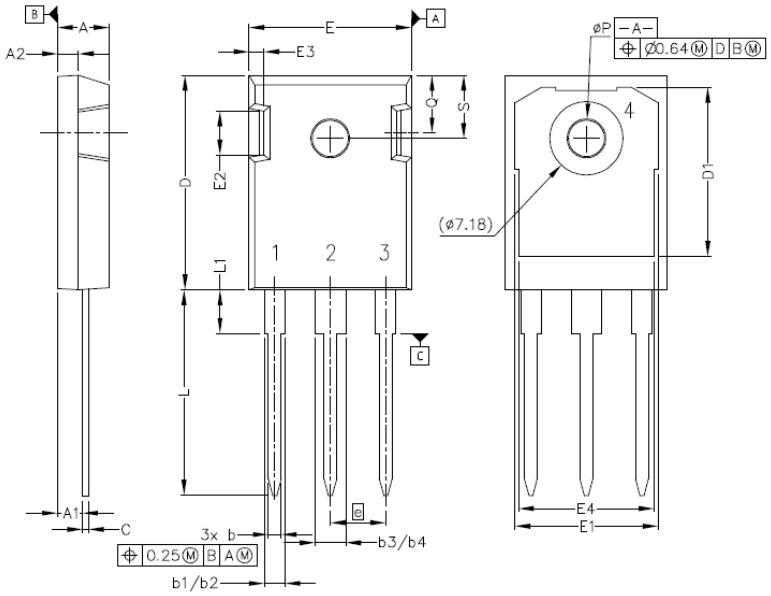


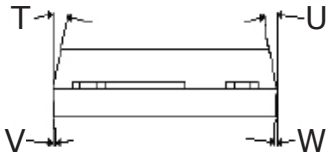
Figure 29. Clamped Inductive Switching
Waveform Test Circuit

Note (3): Turn-off and Turn-on switching energy and timing values measured using SiC MOSFET Body Diode as shown above.

Package Dimensions

Package TO-247-3



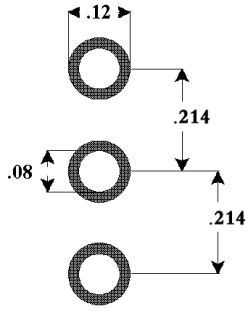


Pinout Information:

- 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°

Recommended Solder Pad Layout



TO-247-3

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for SiC MOSFETs ***category:***

Click to view products by SUPSiC ***manufacturer:***

Other Similar products are found below :

NTC040N120SC1 HC3M001K170J IMBG65R048M1HXTMA1 IMW120R045M1 SCTWA70N120G2V-4 SCT040HU65G3AG SCTWA90N65G2V GC3M0060065K GC3M0120090D GC3M0032120D GC3M0160120D GC3M0040120K GC3M0021120D GC3M0065090D GC3M0032120K GC3M0065100K GC3M0075120K GC2M0040120D GC3M0280090D GC2M0025120D GC3M0075120D GC3M0040120D GC2M0280120D GC2M0080120K GC3M0016120D GC2M0045170D GC2M0160120K GC3M0021120K SP25N120CTK SP90N120CTK GC3M0080120K SP50N120CTK GC2M0160120D GC2M1000170D GC3M0120100K GC2M0080120D SP50N120CTF SP35N120CTF SP25N120CTF IV2Q171R0D7 IV1Q06040L1 IV1Q06060T3G IV1Q12160T4 IV1B12013HA1L IV1Q12160T3 IV1Q07015T4G IV1Q12750O3 IV1Q06040T3 IV1Q12050T4Z IV1Q12030T4G