

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

Benefits

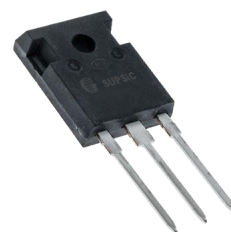
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

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

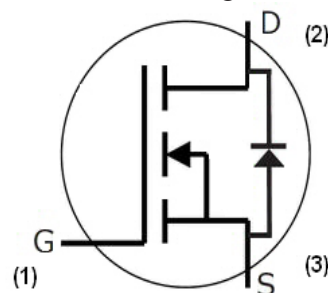
Part Number	Package	Marking
GC2M0080120D1	TO-247-3	GC2M0080120D1

V_{DS}	1200 V
$I_D @ 25^\circ\text{C}$	34 A
$R_{DS(on)}$	80 mΩ



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	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	34	A	$V_{GS} = 20\text{ V}, T_C = 25^\circ\text{C}$	Fig. 19
		24		$V_{GS} = 20\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	190	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 ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.9	4	V	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$	Fig. 11
			2.4		V	$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 150^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	
I_{GSS}	Gate-Source Leakage Current			250	nA	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	
$R_{DS(on)}$	Drain-Source On-State Resistance		80	98	m Ω	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}$	Fig. 4, 5, 6
			144			$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 150^\circ\text{C}$	
g_{fs}	Transconductance		10		S	$V_{DS} = 20\text{ V}, I_{DS} = 20\text{ A}$	Fig. 7
			9			$V_{DS} = 20\text{ V}, I_{DS} = 20\text{ A}, T_J = 150^\circ\text{C}$	
C_{iss}	Input Capacitance		1130		pF	$V_{GS} = 0\text{ V}$	Fig. 17, 18
C_{oss}	Output Capacitance		92			$V_{DS} = 1000\text{ V}$	
C_{rss}	Reverse Transfer Capacitance		7.5			$f = 1\text{ MHz}$	
E_{oss}	C_{oss} Stored Energy		50		μJ	$V_{AC} = 25\text{ mV}$	Fig. 16
E_{AS}	Avalanche Energy, Single Pluse		1		J	$I_D = 20\text{ A}, V_{DD} = 50\text{ V}$	Fig. 29
E_{ON}	Turn-On Switching Energy		523		μJ	$V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}, I_D = 20\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega, L = 156\text{ }\mu\text{H}$	Fig. 25
E_{OFF}	Turn Off Switching Energy		72				
$t_{d(on)}$	Turn-On Delay Time		15		ns	$V_{DD} = 800\text{ V}, V_{GS} = -5/20\text{ V}$ $I_D = 20\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega,$ $R_L = 40\text{ }\Omega$, Timing relative to V_{DS} Per IEC60747-8-4 pg 83	Fig. 27
t_r	Rise Time		22				
$t_{d(off)}$	Turn-Off Delay Time		24				
t_f	Fall Time		14				
$R_{G(int)}$	Internal Gate Resistance		3.9		Ω	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	
Q_{gs}	Gate to Source Charge		17		nC	$V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}$ $I_D = 20\text{ A}$ Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		29				
Q_g	Total Gate Charge		71				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.3		V	$V_{GS} = -5\text{ V}, I_{SD} = 10\text{ A}$	Fig. 8, 9, 10
		3.8		V	$V_{GS} = -5\text{ V}, I_{SD} = 10\text{ A}, T_J = 150^\circ\text{C}$	
I_S	Continuous Diode Forward Current		34	A	$T_c = 25^\circ\text{C}$	Note 1
t_{rr}	Reverse Recover time	24		ns	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, V_R = 800\text{ V}$ $\text{dif}/\text{dt} = 1950\text{ A}/\mu\text{s}$	Note 1
Q_{rr}	Reverse Recovery Charge	152		nC		
I_{rrm}	Peak Reverse Recovery Current	10		A		

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

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.60	0.65	$^\circ\text{C}/\text{W}$		Fig. 21
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient		40			

Typical Performance

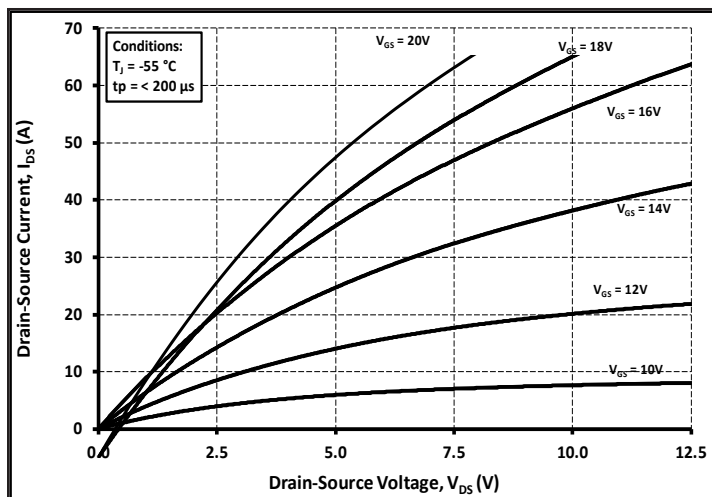


Figure 1. Output Characteristics $T_J = -55\text{ }^{\circ}\text{C}$

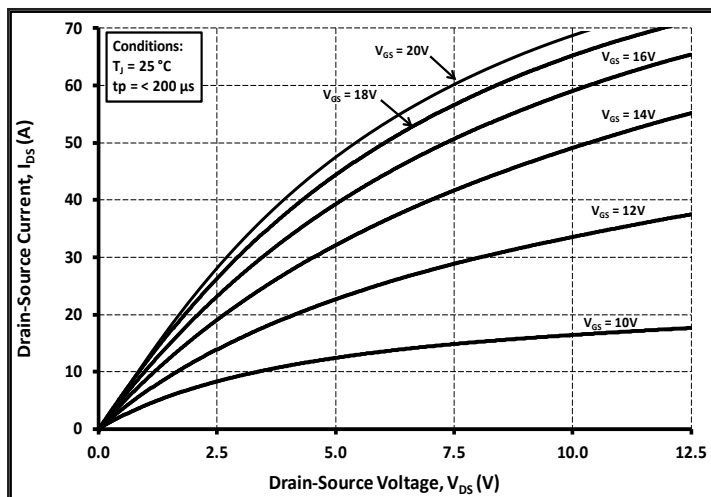


Figure 2. Output Characteristics $T_J = 25\text{ }^{\circ}\text{C}$

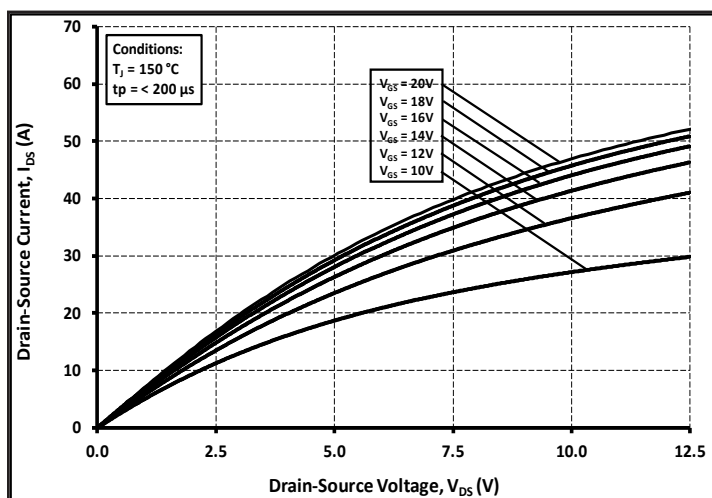


Figure 3. Output Characteristics $T_J = 150\text{ }^{\circ}\text{C}$

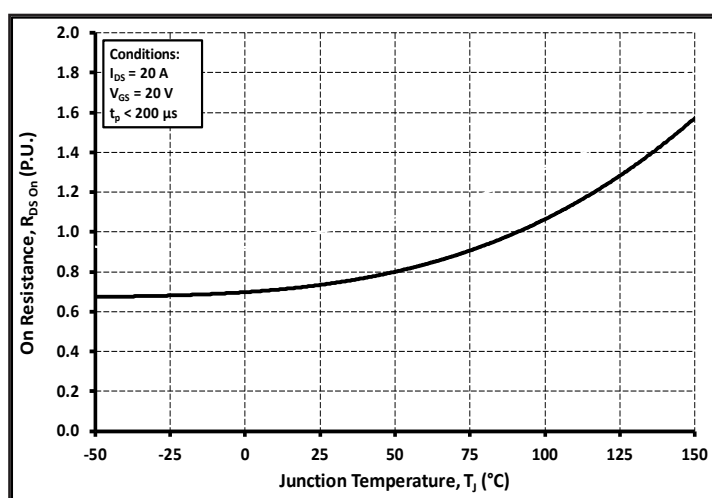


Figure 4. Normalized On-Resistance vs. Temperature

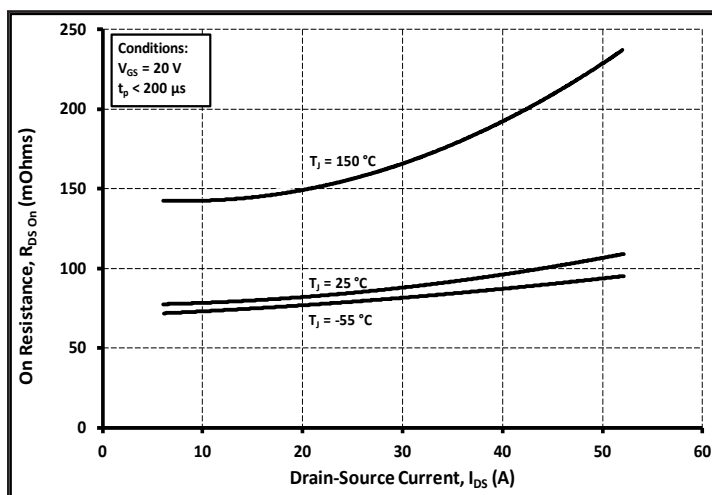


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

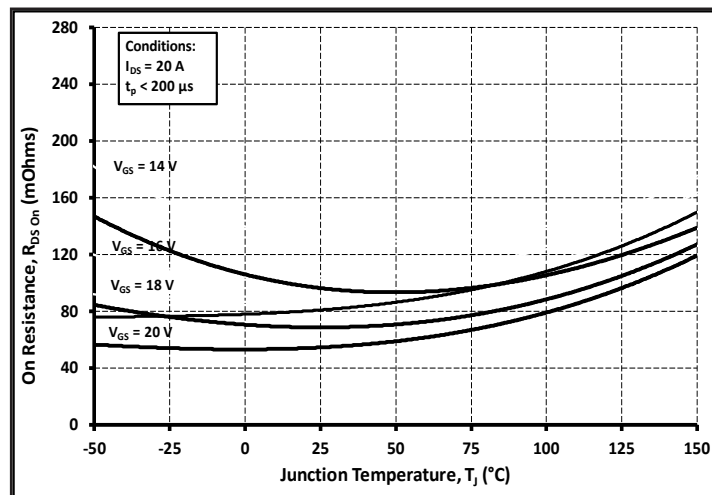


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

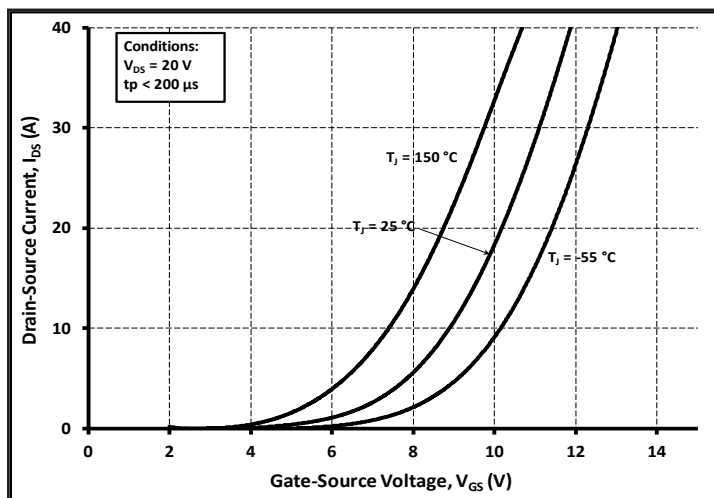


Figure 7. Transfer Characteristic for Various Junction Temperatures

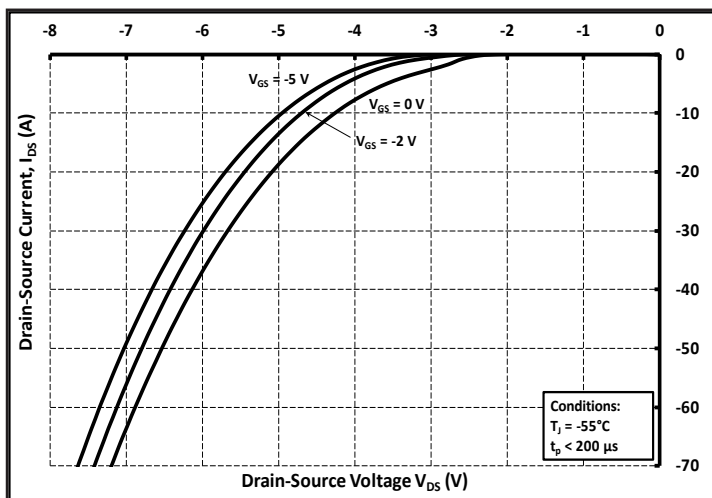


Figure 8. Body Diode Characteristic at -55 °C

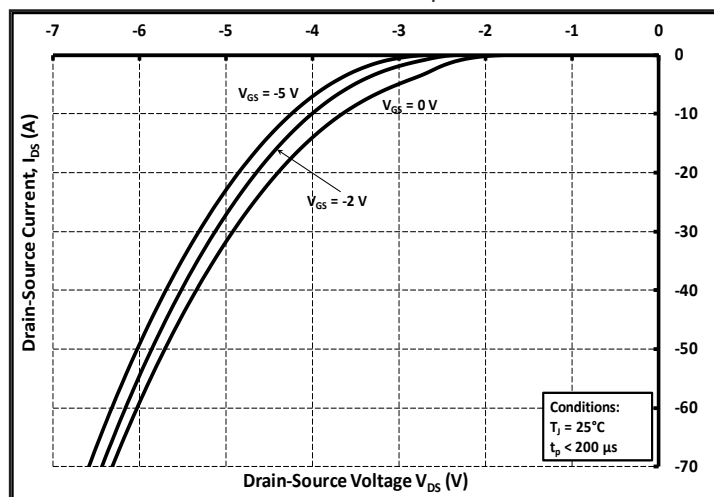


Figure 9. Body Diode Characteristic at 25 °C

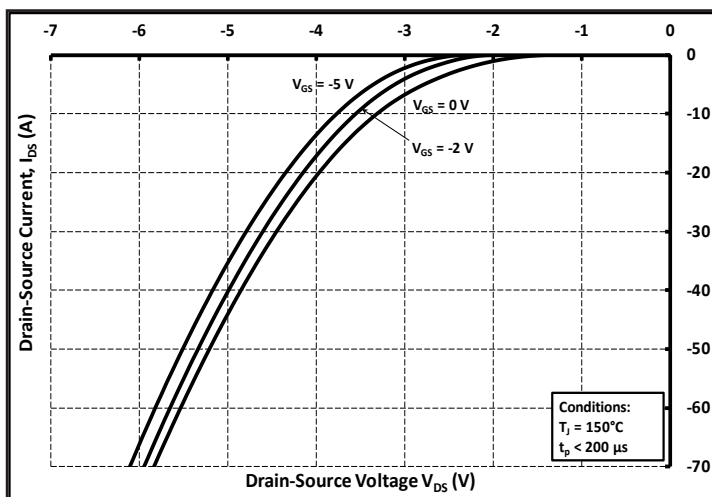


Figure 10. Body Diode Characteristic at 150 °C

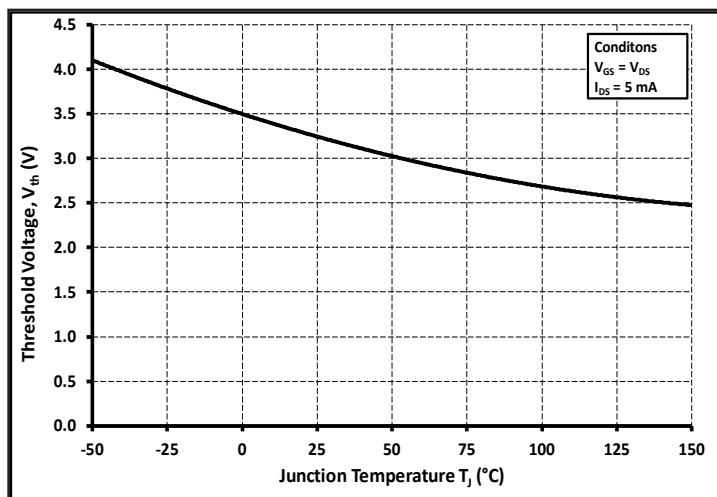


Figure 11. Threshold Voltage vs. Temperature

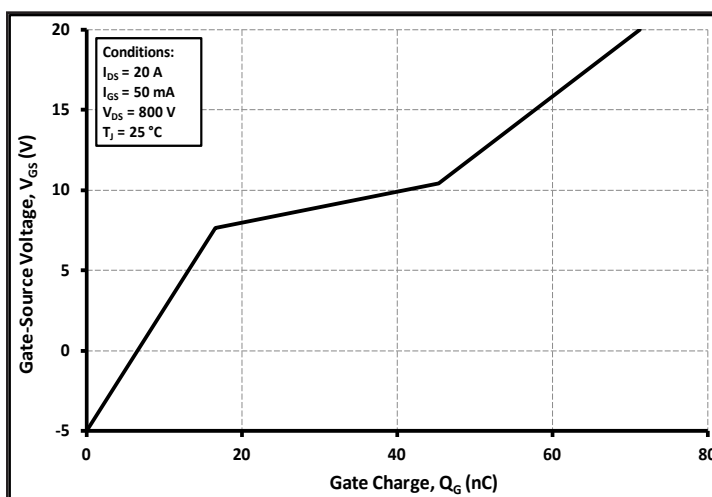


Figure 12. Gate Charge Characteristics

Typical Performance

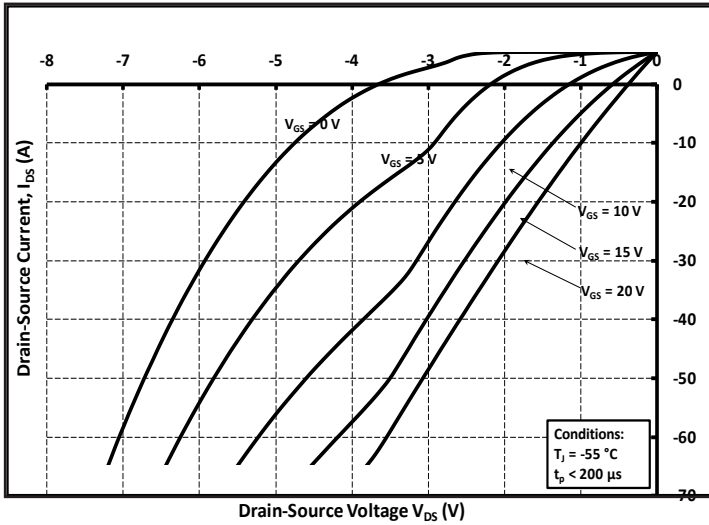


Figure 13. 3rd Quadrant Characteristic at -55 °C

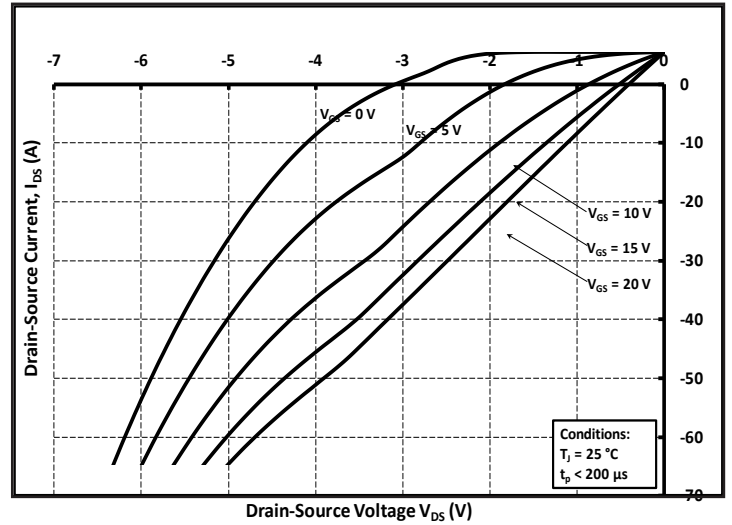


Figure 14. 3rd Quadrant Characteristic at 25 °C

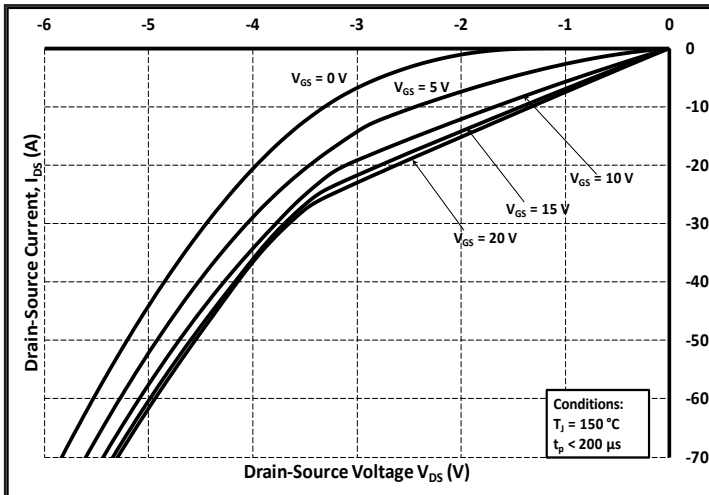


Figure 15. 3rd Quadrant Characteristic at 150 °C

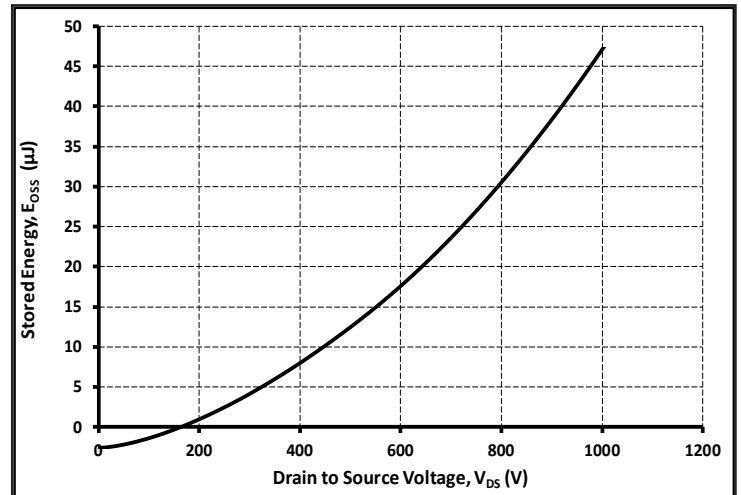


Figure 16. Output Capacitor Stored Energy

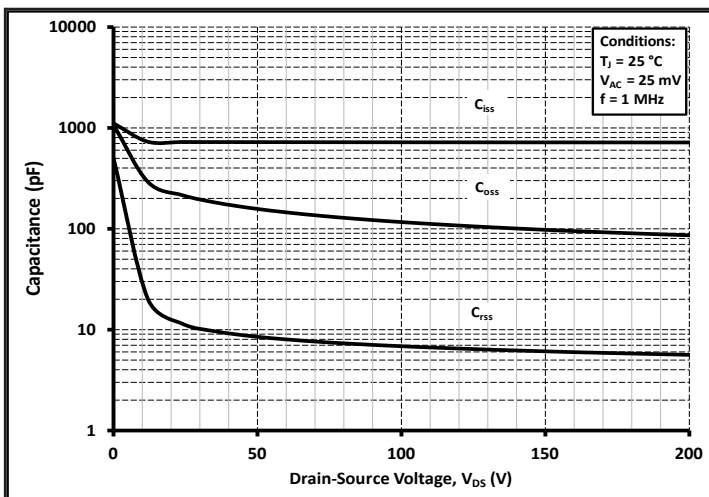


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

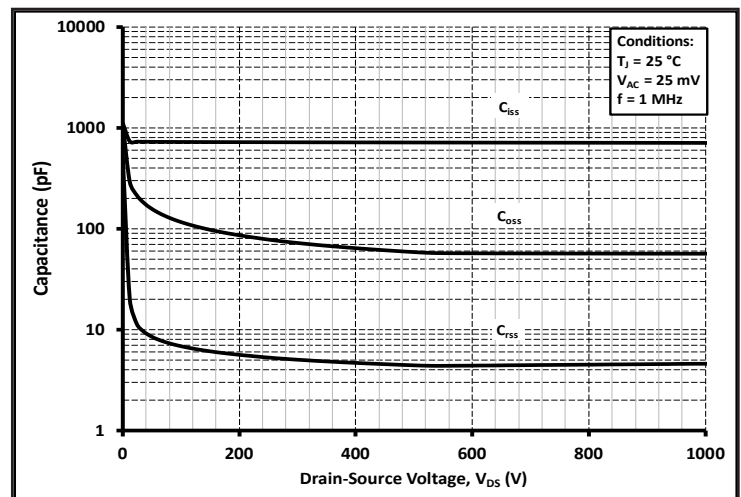


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

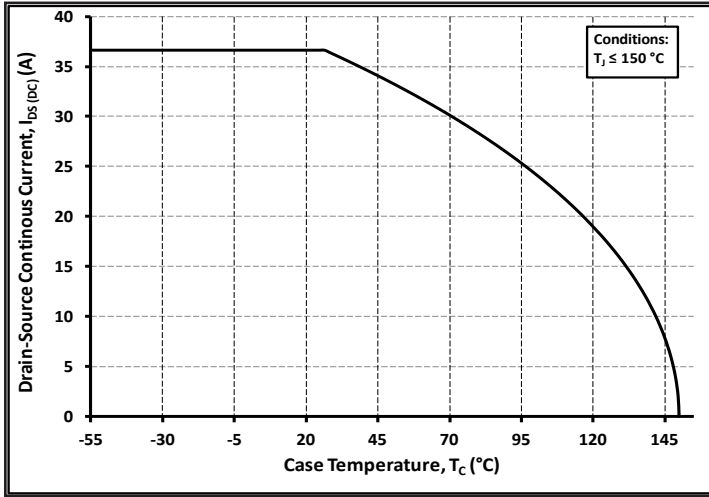


Figure 19. Continuous Drain Current Derating vs. Case Temperature

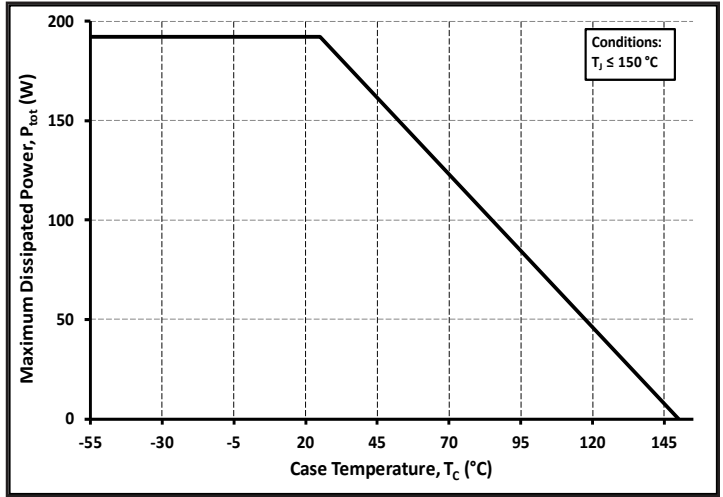


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

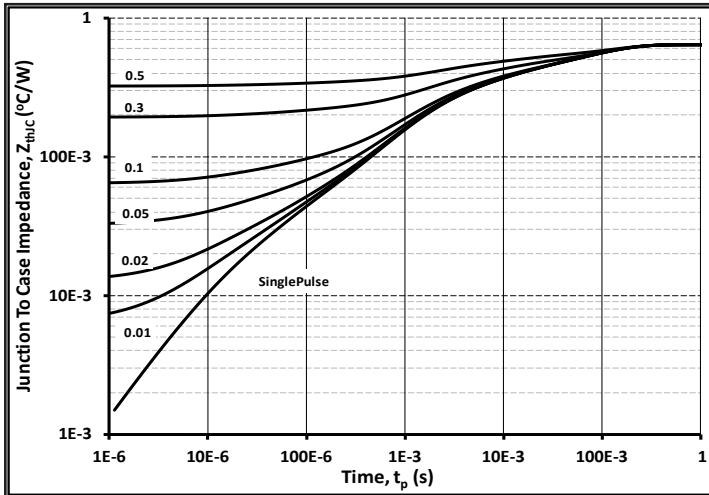


Figure 21. Transient Thermal Impedance (Junction - Case)

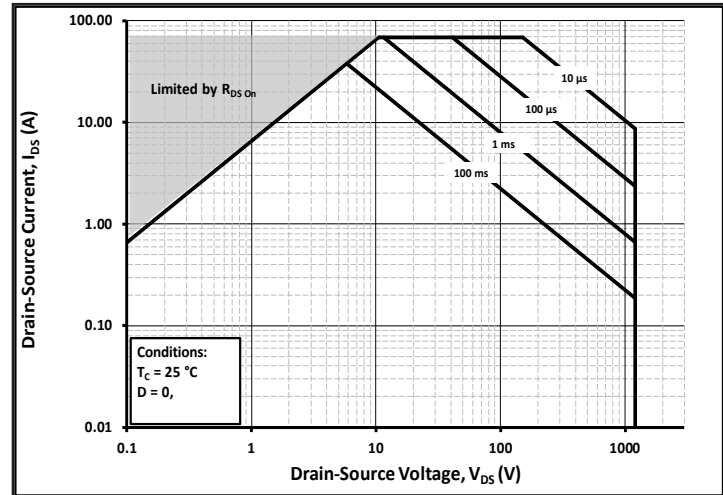


Figure 22. Safe Operating Area

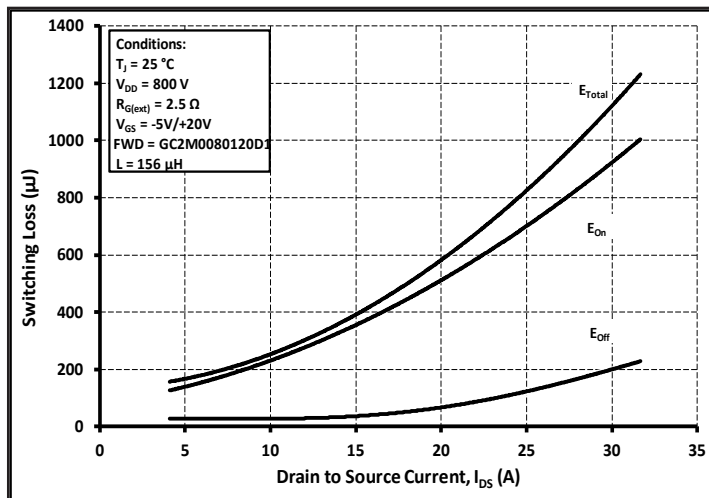


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

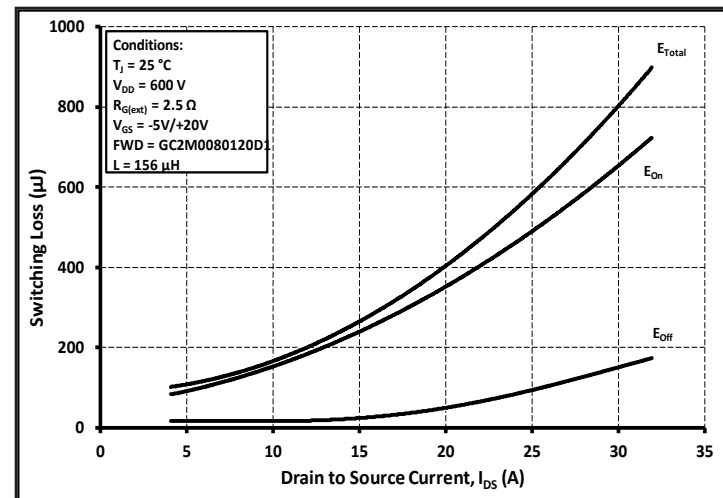


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

Typical Performance

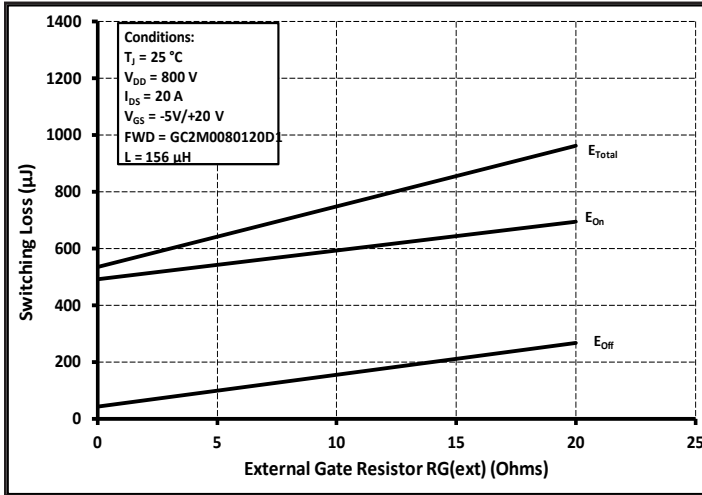


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

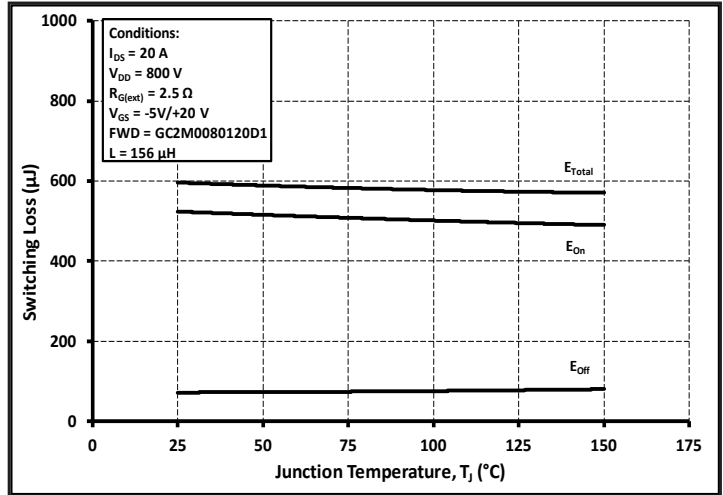


Figure 26. Clamped Inductive Switching Energy vs. Temperature

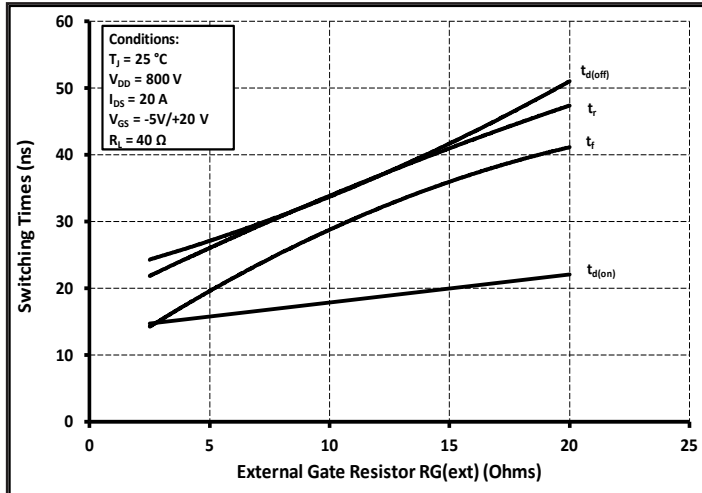


Figure 27. Switching Times vs. $R_{G(\text{ext})}$

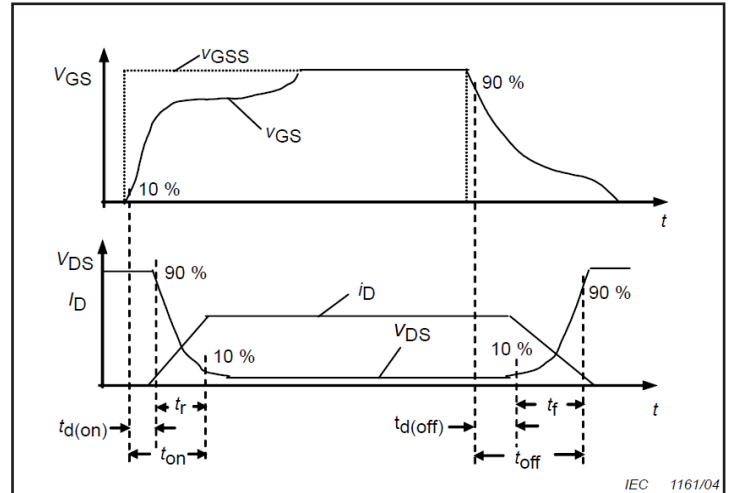


Figure 28. Switching Times Definition

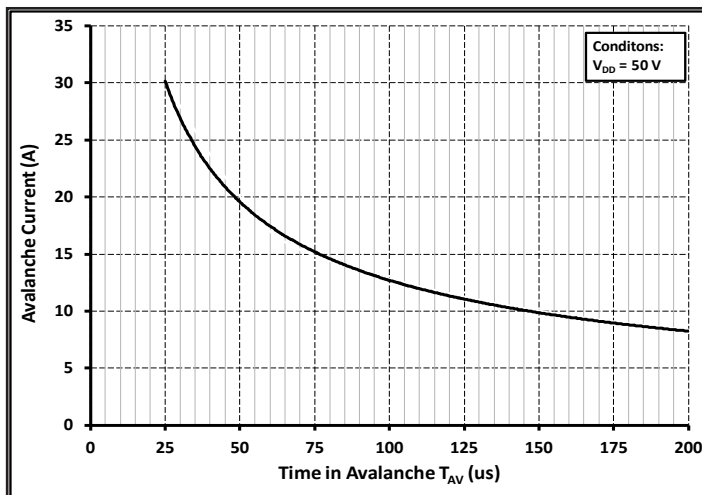
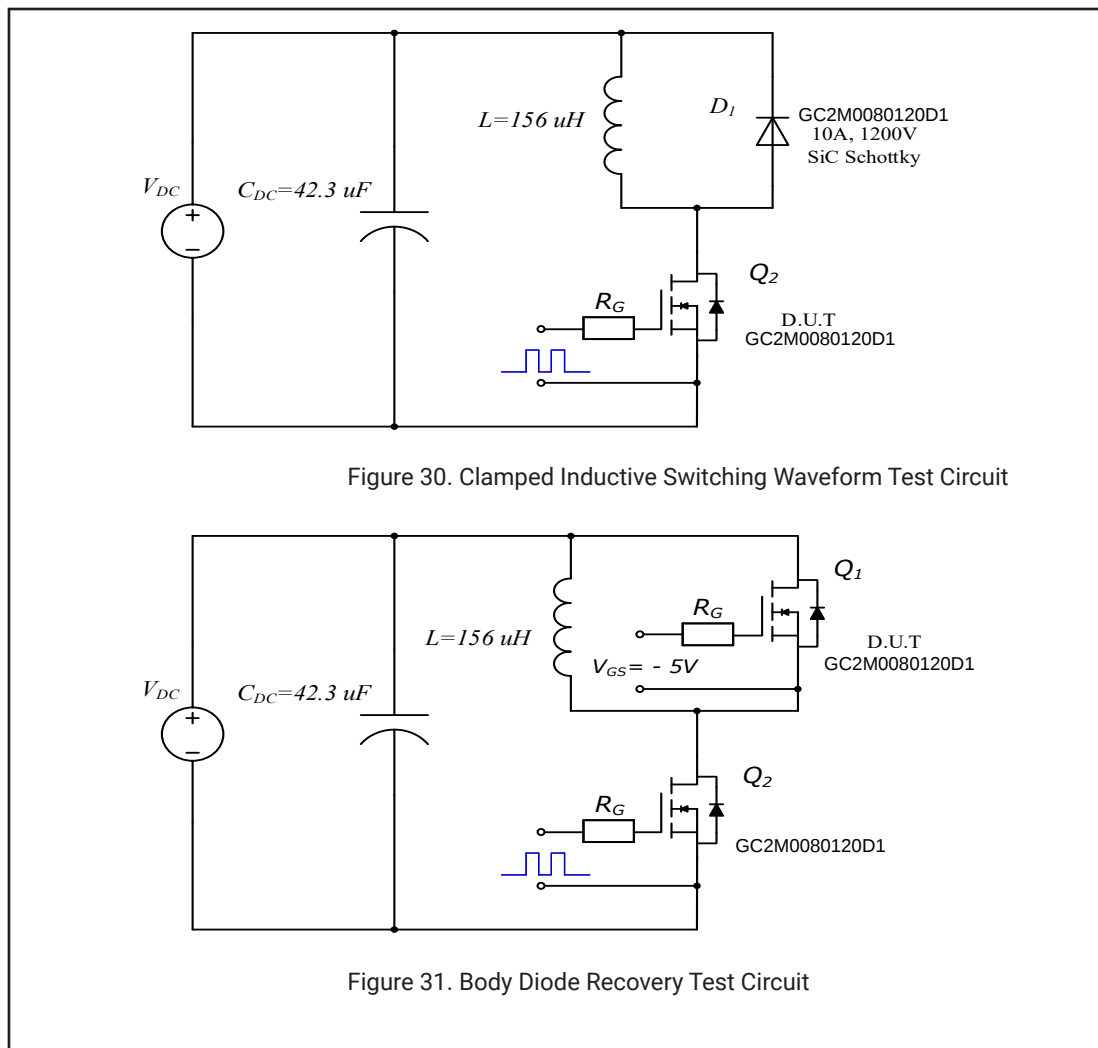


Figure 29. Single Avalanche SOA curve

Test Circuit Schematic

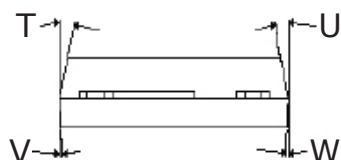
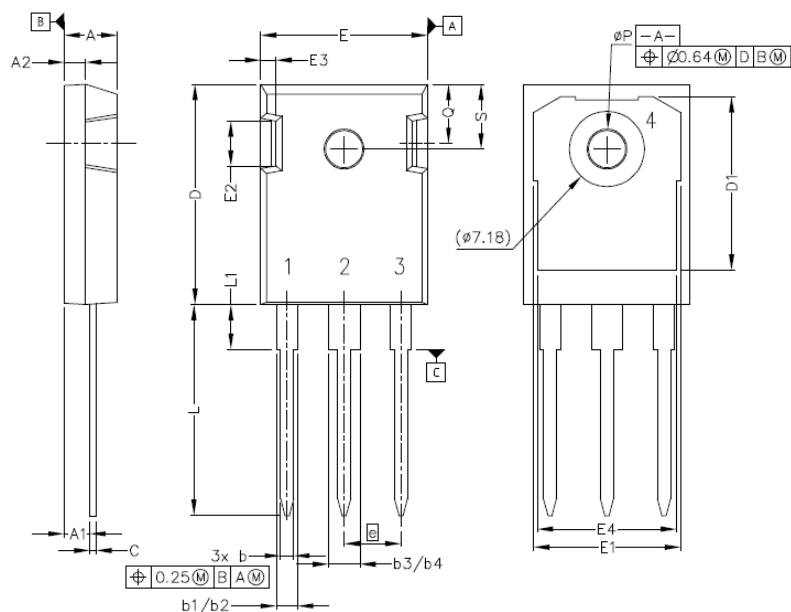


ESD Ratings

ESD Test	Total Devices Sampled	Resulting Classification
ESD-HBM	All Devices Passed 1000V	2 (>2000V)
ESD-MM	All Devices Passed 400V	C (>400V)
ESD-CDM	All Devices Passed 1000V	IV (>1000V)

Package Dimensions

Package TO-247-3

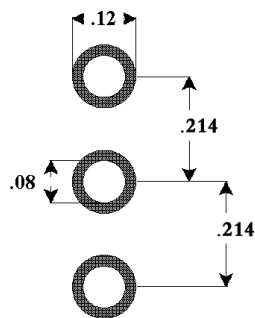


Pinout Information:

- 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

Part Number	Package
GC2M0080120D1	TO-247-3