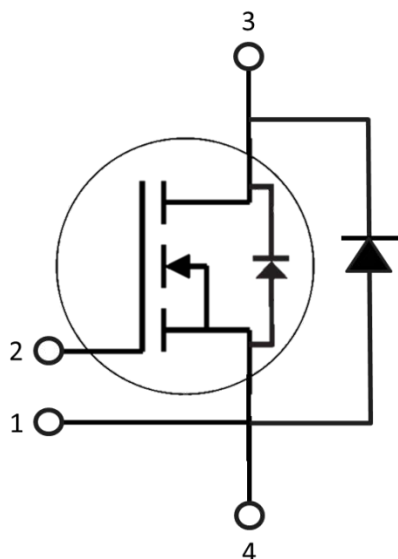


1200V/80 mΩ SiC MOSFET in SOT-227 Package

$V_{RRM} = 1200V$
 $I_D = 20A @ T_C = 80^{\circ}C$
 $R_{DS_ON} = 80 \text{ mohm} @ T_J = 25^{\circ}C$



Features

- High speed switching SiC MOSFET
- Freewheeling diode with zero reverse recovery SiC SBDs
- Low R_{DS_ON}
- Simple to drive
- Low stray inductance
- High junction temperature operation
- Easy to parallel and mounting

Applications

- Photo Voltaic Inverter
- Motor Driver
- Multi-level Converter
- High voltage AC/DC Converter

Benefits

- Outstanding power conversion efficiency at high switching frequency operation
- Low switching losses and Low EMI noises
- Very rugged and easy mount
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive T_C of V_f
- Reduced cooling requirement
- RoHS Compliant

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

Parameters	Symbol	Conditions	Specifications	Units
SiC MOSFET				
Maximum Drain-Source Voltage	V_{DSS}	$T_j = 25^{\circ}\text{C} \sim 150^{\circ}\text{C}$	1200	V
Continuous Drain Current	I_{D}	$T_j = 25^{\circ}\text{C}, V_{\text{GS}}=20\text{V}$	40	A
		$T_j = 150^{\circ}\text{C}, V_{\text{GS}}=20\text{V}$	20	A
Pulsed Drain Current	I_{DS}	Limited by T_{j_max}	60	A
Gate-Source Voltage	V_{GS}		-10/+25	V
Maximum Power Dissipation	P_{D}	$T_c = 25^{\circ}\text{C}$	TBD	W
		$T_c = 100^{\circ}\text{C}$	TBD	W
Operating Junction Temperature	T_j		-40 ~ 150	$^{\circ}\text{C}$
Storage Temperature	T_{STG}		-40 ~ 125	$^{\circ}\text{C}$
SiC SBDs				
Maximum Reverse Voltage	V_{RRM}		1200	V
Average Forward Current	I_{DAV}	$T_j = 25^{\circ}\text{C}$	20	A
		$T_j = 150^{\circ}\text{C}$	7	A
Non-repetitive Forward Surge Current	I_{FSM}	$T_c=25^{\circ}\text{C}, t_p=8.3\text{ ms}$	120	A
Non-repetitive Forward Surge Current	$I_{\text{F,MAX}}$	$T_c=25^{\circ}\text{C}, t_p=10\text{ }\mu\text{s}$	700	A

Electrical Characteristics ($T_j=25^{\circ}\text{C}$ unless otherwise specified)

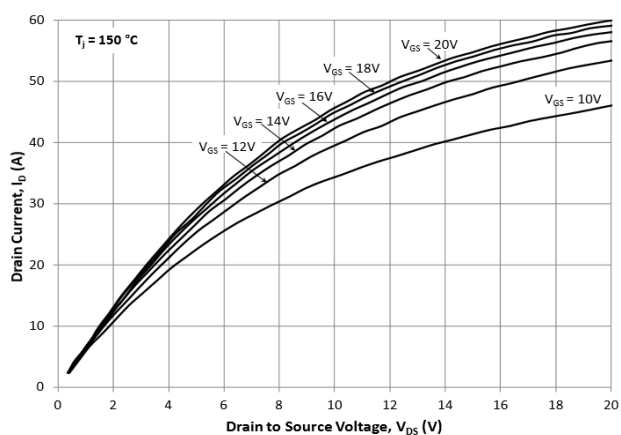
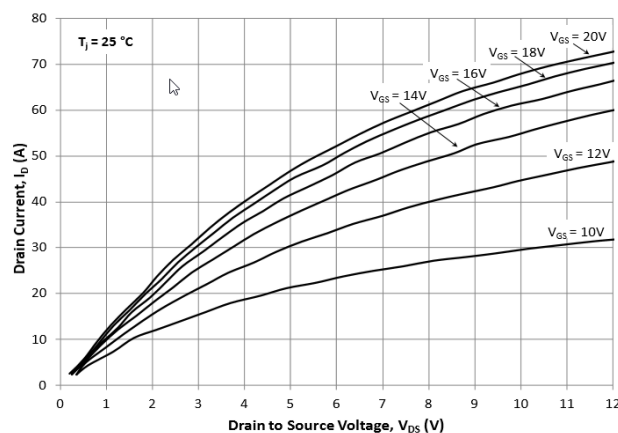
Parameters	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=100\mu\text{A}$	1200	--	--	V
Gate Threshold Voltage	$V_{\text{GS(TH)}}$	$V_{\text{GS}}=V_{\text{DS}}, I_{\text{D}}=2.5\text{mA}, T_j = 25^{\circ}\text{C}$	1.7	2.2	--	V
		$V_{\text{GS}}=V_{\text{DS}}, I_{\text{D}}=2.5\text{mA}, T_j = 150^{\circ}\text{C}$	--	1.6	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{DS}}=1200\text{V}, V_{\text{GS}}=0\text{V}, T_j = 25^{\circ}\text{C}$	--	1	100	μA
		$V_{\text{DS}}=1200\text{V}, V_{\text{GS}}=0\text{V}, T_j = 150^{\circ}\text{C}$	--	TBD	--	μA
Gate Source Leakage Current	I_{GSS}	$V_{\text{GS}}=20\text{V}, V_{\text{DS}}=0\text{V}$	--	--	250	nA
Internal Gate Resistance	R_{G}	$f = 1\text{MHz}, V_{\text{AC}} = 25\text{mV},$ ESR of C_{iss}		1.5		Ω
Drain-Source On-state Resistance	$R_{\text{DS(ON)}}$	$V_{\text{GS}}=20\text{V}, I_{\text{D}}=20\text{A}, T_j = 25^{\circ}\text{C}$	--	80	--	m Ω
		$V_{\text{GS}}=20\text{V}, I_{\text{D}}=20\text{A}, T_j = 150^{\circ}\text{C}$	--	150	--	m Ω
Input Capacitance	C_{iss}	$V_{\text{GS}} = 0\text{V}, V_{\text{DS}} = 800\text{V}, \text{freq} = 1\text{MHz}, V_{\text{AC}} = 25\text{mV},$ measured at one MOSFET.	--	950	--	pF
Output Capacitance	C_{OSS}		--	80	--	pF
Reverse transfer Capacitance	C_{rSS}		--	6.5	--	pF
Turn-on Delay Time	$t_{\text{d(on)i}}$	$V_{\text{DS}} = 800\text{V}, V_{\text{GS}} = -5/20\text{V}$ $I_{\text{D}} = 20\text{A}, R_{\text{G(ext)}} = 2.5\Omega,$ $L = 856\mu\text{H}$	--	15	--	ns
Rise Time	t_{ri}		--	35	--	ns
Turn-off Delay Time	$t_{\text{d(off)i}}$		--	32	--	ns

Fall Time	t _{fi}		--	26	--	ns
Turn-on Switching Loss	E _{ON}			0.4		mJ
Turn-off Switching Loss	E _{OFF}			0.25		mJ
Body Diode Forward Voltage	V _{SD}	I _F = 10A, T _j = 25 °C	--	3.3	--	V
		I _F = 10A, T _j = 150 °C	--	TBD	--	V
Total Gate Charge	Q _g	V _{DS} =800 V, V _{GS} = -5/20V I _D = 20A	--	49.2	--	nC
Gate-Source Charge	Q _{GS}		--	10.8	--	nC
Gate-Drain Charge	Q _{GD}		--	18	--	nC
SiC SBDs						
Maximum peak repetitive reverse voltage	V _{RRM}		1200	--	--	V
Maximum Reverse Leakage Current	I _{RM}	V _R = 1200V, T _j = 25 °C	--	2	20	μA
		V _R = 1200V, T _j = 150 °C	--	23	200	μA
Diode Forward Voltage	V _F	I _F = 10A, T _j = 25 °C	--	1.5	1.7	V
		I _F = 10A, T _j = 150 °C	--	2	2.6	V
Total Capacitive Charge	Q _C	V _R = 800 V	--	56	--	nC
Total Capacitance	C	V _R = 1V, f = 1 MHz	--	608	--	pF
		V _R = 400V, f = 1 MHz	--	53	--	pF
		V _R = 800V, f = 1 MHz	--	39	--	pF

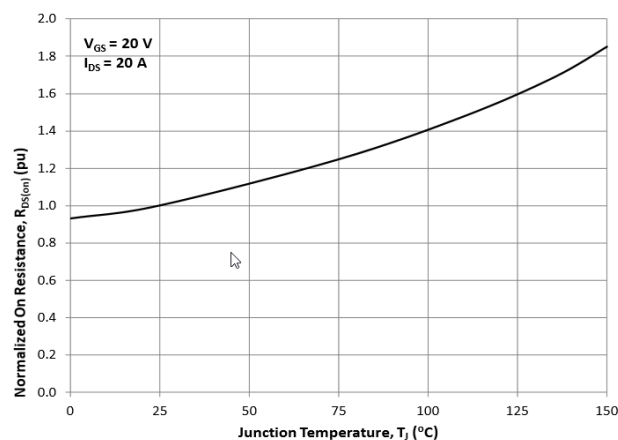
Thermal and Package Characteristics ($T_j=25^{\circ}C$ unless otherwise specified)

Parameters	Symbol	Conditions	Min	Typ	Max	Units
Junction to Case Thermal Resistance	R_{THJC}	Per MOSFET	--	--	0.6	$^{\circ}C/W$
		Per SBD			2.2	$^{\circ}C/W$
Mounting Torque	M_d				1.5	N-m
Terminal Connection Torque	M_{dt}		1.3	--	1.5	N-m
Package Weight	W_t			32		g
Isolation Voltage	V_{ISOL}	$I_{ISOL} < 1mA, 50/60Hz, t=1min$	2500			V

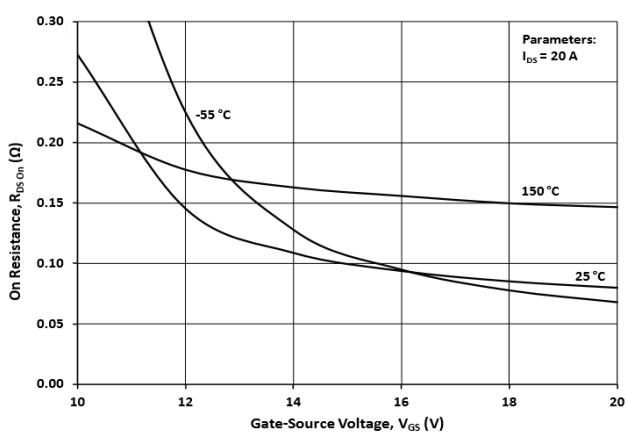
MOSFET Typical Characteristics



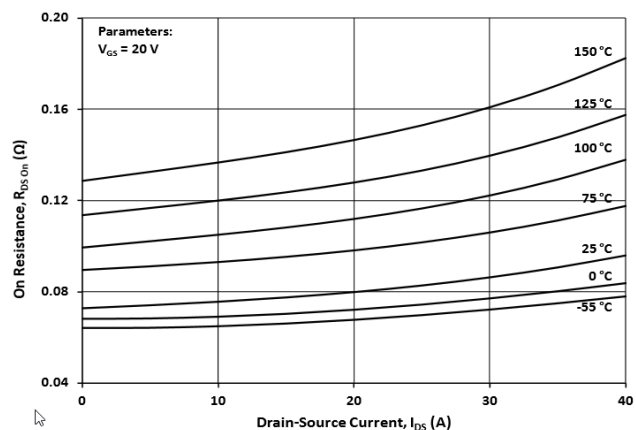
Typical Forward Characteristics $T_J = 25\text{ }^{\circ}\text{C}$



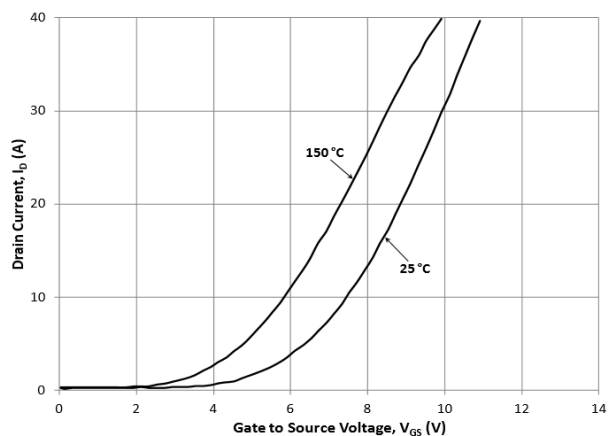
Typical Forward Characteristics $T_J = 150\text{ }^{\circ}\text{C}$



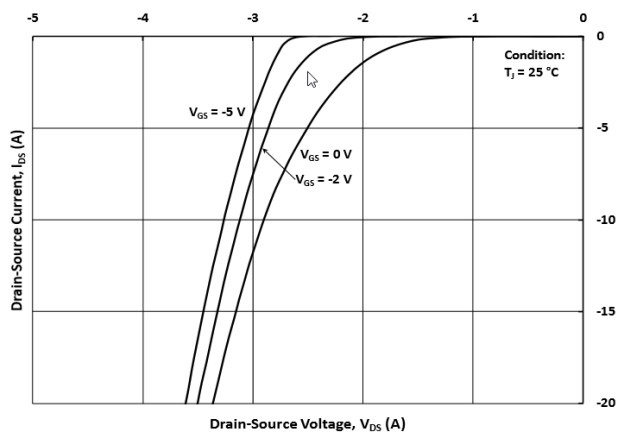
Normalized R_{DS_ON} vs. Temperature



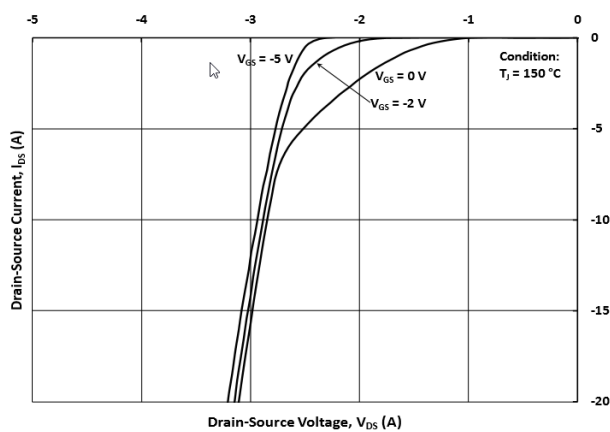
R_{DS_ON} vs. Drain Current



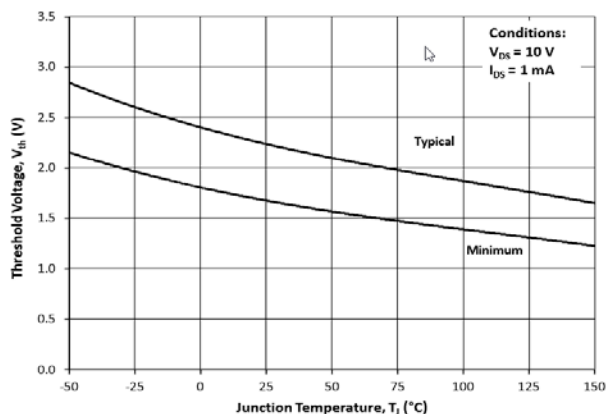
Transfer Characteristics



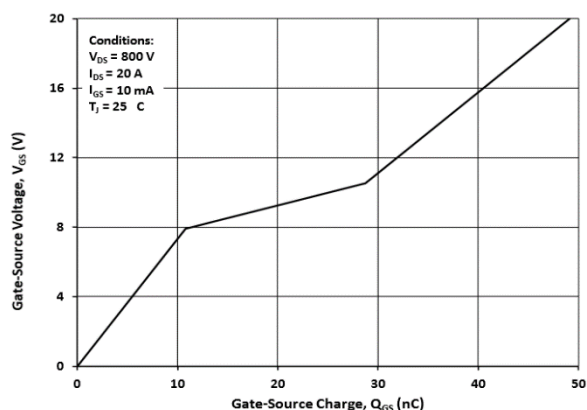
Body Diode Characteristics $T_J=25\text{ }^{\circ}\text{C}$



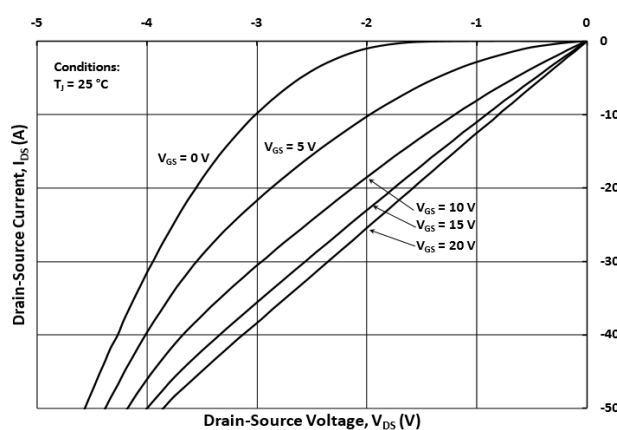
Body Diode Characteristics $T_J=150\text{ }^{\circ}\text{C}$



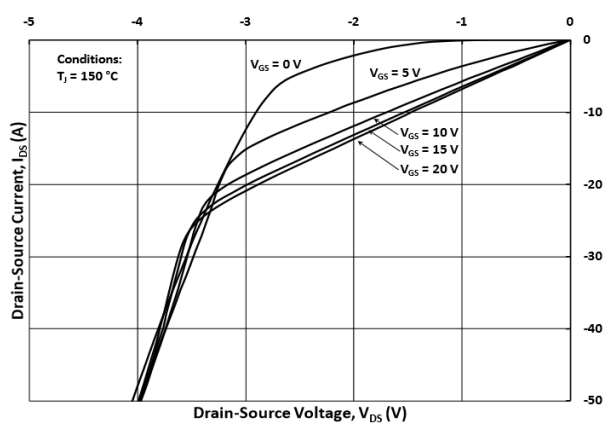
Threshold Voltage vs. Temperature



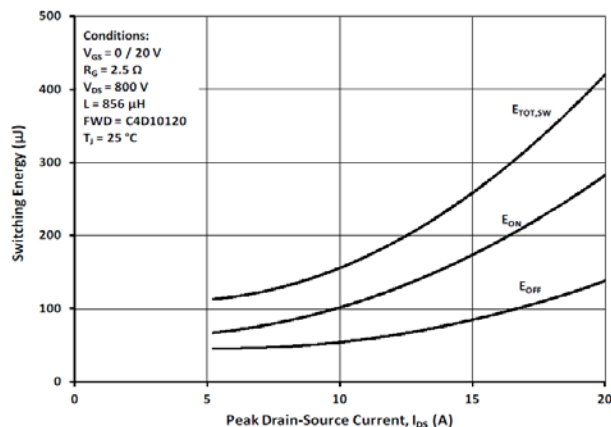
Gate Charge Characteristics



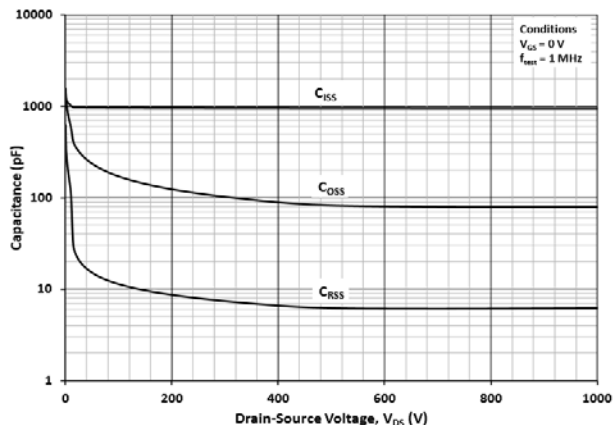
3rd Quadrant Characteristics $T_J=25\text{ }^{\circ}\text{C}$



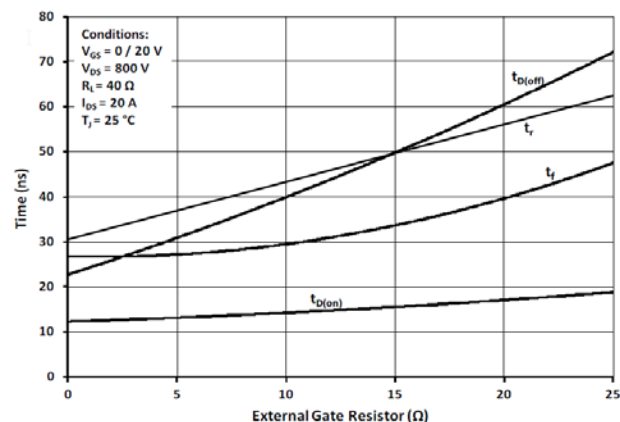
3rd Quadrant Characteristics $T_J=150\text{ }^{\circ}\text{C}$



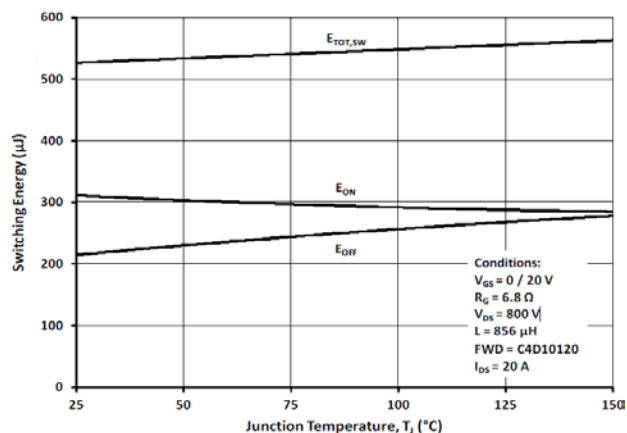
Switching Loss vs. Drain Current ($V_{DD}=800\text{V}$)



Capacitances vs. Drain-Source Voltage (0~1k V)

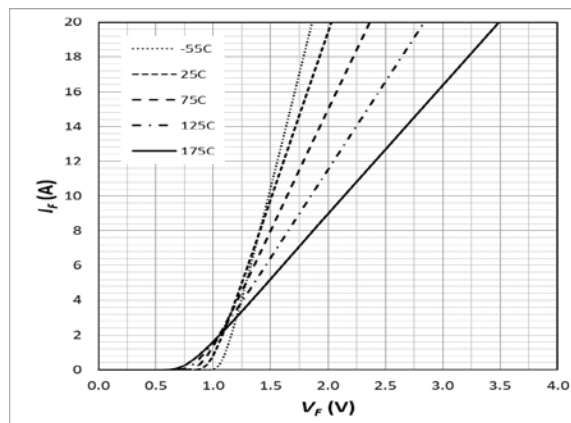


Resistive Switching Time vs. $R_{G(ext)}$

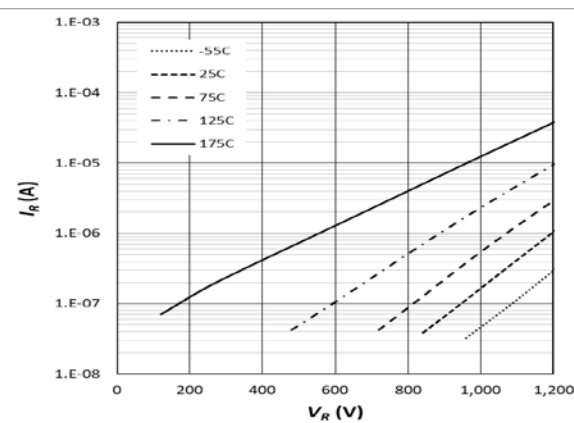


Clamped Inductive Switching Energy vs. Temperature

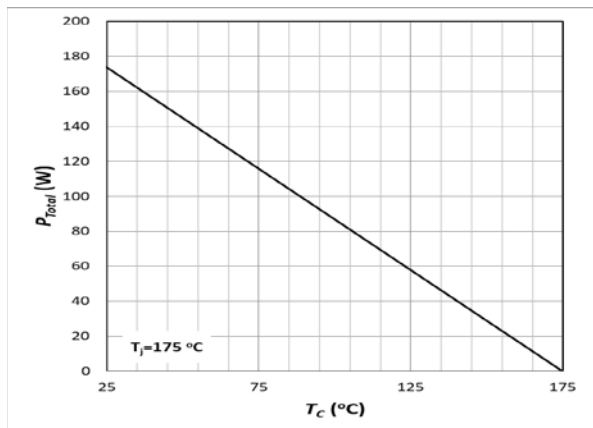
SiC SBD Typical Characteristics



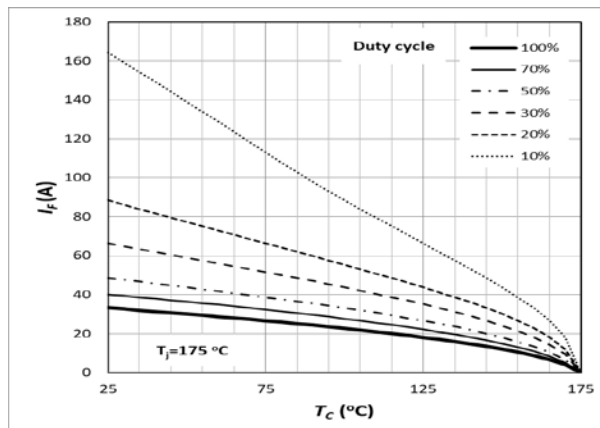
Forward Characteristics (parameterized on T_J)



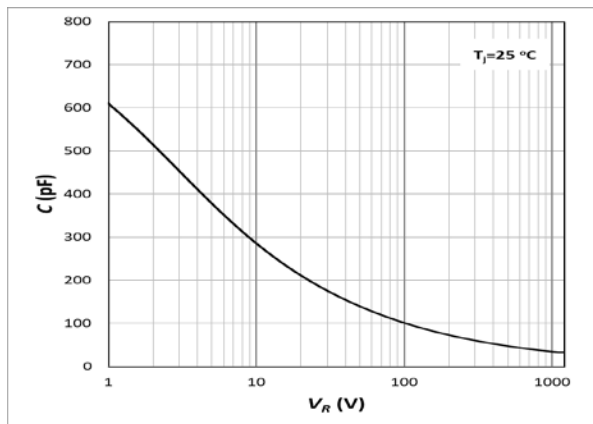
Reverse Characteristics (parameterized on T_J)



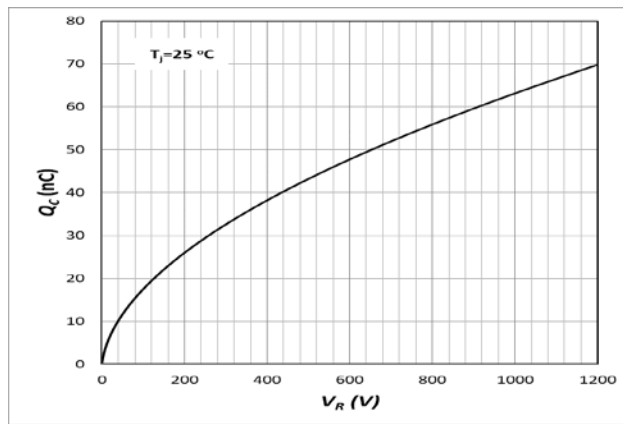
Power Derating



Current Derating

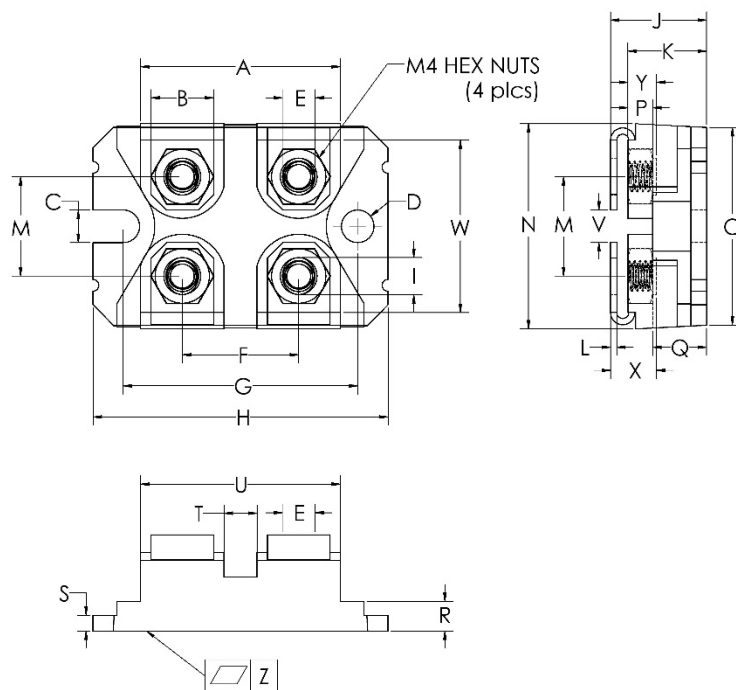


Capacitance



Recovery Charge

SOT-227 Package Outline and Dimension



Sym	Millimeters		Inches	
	Min	Max	Min	Max
A	31.67	31.90	1.247	1.256
B	7.95	8.18	0.313	0.322
C	4.14	4.24	0.163	0.167
D	4.14	4.24	0.163	0.167
E	4.14	4.24	0.163	0.167
F	14.94	15.09	0.588	0.594
G	30.15	30.25	1.187	1.191
H	38.00	38.10	1.496	1.500
I	4.75	4.83	0.187	0.190
J	11.68	12.19	0.460	0.480
K	9.45	9.60	0.372	0.378
L	0.76	0.84	0.030	0.033
M	12.62	12.88	0.497	0.507
N	25.15	25.30	0.990	0.996
O	24.79	25.04	0.976	0.986
P	3.02	3.15	0.119	0.124
Q	6.71	6.96	0.264	0.274
R	4.17	4.42	0.164	0.174
S	2.08	2.13	0.082	0.084
T	3.28	3.63	0.129	0.143
U	26.75	26.90	1.053	1.059
V	3.86	4.24	0.152	0.167
W	20.55	26.90	0.809	0.814
X	5.45	5.85	0.215	0.230
Y	3.15	3.66	0.124	0.144
Z	0.00	0.13	0.000	0.005

Revision History

Date	Revision	Notes
10/3/2016	0.1	Initial release
01/03/2020	0.2	Applied company name change
05/27/2020	0.3	Updated mechanical drawing
07/24/2020	0.4	Updated SBD specification

Notes

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.SemiQ.com.

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