C2M0080170P

Silicon Carbide Power MOSFET
C2M™ MOSFET Technology

N-Channel Enhancement Mode

V_{DS}	1700 V
I_D @ 25˚C	40 A
$R_{DS(on)}$	80 mΩ

Features

- Optimized package with separate driver source pin
- 8mm of creepage distance between drain and source
- High blocking voltage with low On-resistance
- High speed switching with low capacitances
- Easy to parallel and simple to drive
- Halogen Free, RoHS compliant

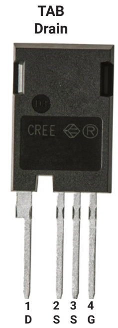
Benefits

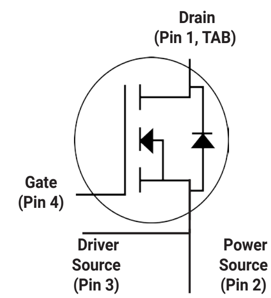
- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduced cooling requirements
- Increased power density
- Increased system switching frequency

Applications

- 1500V Solar Inverters
- Switch Mode Power Supplies
- High voltage DC/DC Converters
- Capacitor discharge

Package





Part Number	Package	Marking
C2M0080170P	TO-247-4 Plus	C2M0080170P

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} = 0 V, I_D = 100 μA	
V_{GSmax}	Gate - Source Voltage	-10/+25	V	AC (f >1 Hz)	Note: 1
V_{GSop}	Gate - Source Voltage	-5/+20	V	Static	Note: 2
I_D	Continuous Drain Current	40	A	V_{GS} = 20 V, T_C = 25˚C	Fig. 19
		27		V_{GS} = 20 V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_P limited by T_{jmax}	Fig. 22
P_D	Power Dissipation	277	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	

Note (1): When using MOSFET Body Diode V_{GSmax} = -5V/+25V
Note (2): MOSFET can also safely operate at 0/+20V

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	2.6	4	V	V_{DS} = V_{GS}, I_D = 10 mA	Fig. 11
			2.0		V	V_{DS} = V_{GS}, I_D = 10 mA, T_J = 150ºC	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	V_{DS} = 1700 V, 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		80	125	mΩ	V_{GS} = 20 V, I_D = 28 A	Fig. 4, 5, 6
			150			V_{GS} = 20 V, I_D = 28 A, T_J = 150ºC	
g_{fs}	Transconductance		9.73		S	V_{DS}= 20 V, I_{DS}= 20 A	Fig. 7
			10.07			V_{DS}= 20 V, I_{DS}= 20 A, T_J = 150ºC	
C_{iss}	Input Capacitance		2250		pF	V_{GS} = 0 V V_{DS} = 1000 V f = 1 MHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		105				
C_{rss}	Reverse Transfer Capacitance		4				
E_{oss}	C_{oss} Stored Energy		65		μJ		Fig. 16
E_{ON}	Turn-On Switching Energy (SiC Diode FWD)		0.3		mJ	V_{DS} = 1200 V, V_{GS} = -5/20 V, I_D = 20A, $R_{G(ext)}$ = 2.5Ω, L= 200 μH, T_J = 150ºC, Using SiC Diode as FWD	Fig. 26, 29b
E_{OFF}	Turn Off Switching Energy (SiC Diode FWD)		0.1				
E_{ON}	Turn-On Switching Energy (Body Diode FWD)		1.1		mJ	V_{DS} = 1200 V, V_{GS} = -5/20 V, I_D = 20A, $R_{G(ext)}$ = 2.5Ω, L= 200 μH, T_J = 150ºC, Using MOSFET as FWD	Fig. 26, 29a
E_{OFF}	Turn Off Switching Energy (Body Diode FWD)		0.1				
$t_{d(on)}$	Turn-On Delay Time		25		ns	V_{DD} = 1200 V, V_{GS} = -5/20 V I_D = 20 A, $R_{G(ext)}$ = 2.5 Ω, Timing relative to V_{DS} Inductive load	Fig. 27
t_r	Rise Time		9				
$t_{d(off)}$	Turn-Off Delay Time		34				
t_f	Fall Time		18				
$R_{G(int)}$	Internal Gate Resistance		2		Ω	f = 1 MHz, V_{AC} = 25 mV	
Q_{gs}	Gate to Source Charge		28		nC	V_{DS} = 1200 V, V_{GS} = -5/20 V I_D = 20 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		33				
Q_g	Total Gate Charge		120				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.1		V	V_{GS} = - 5 V, I_{SD} = 10 A	Fig. 8, 9, 10
		3.6		V	V_{GS} = - 5 V, I_{SD} = 10 A, T_J = 150 °C	
I_S	Continuous Diode Forward Current		28	A	T_C = 25˚C, V_{GS} = - 5 V	Note 1
t_{rr}	Reverse Recover time	36		ns	V_{GS} = - 5 V, I_{SD} = 20 A, V_R = 1200 V dif/dt = 2600 A/μs, T_J = 150 °C	Note 1
Q_{rr}	Reverse Recovery Charge	1		μC		
I_{rrm}	Peak Reverse Recovery Current	38		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	0.37	0.45	˚C/W		Fig. 21
$R_{θJA}$	Thermal Resistance From Junction to Ambient		40			

Typical Performance

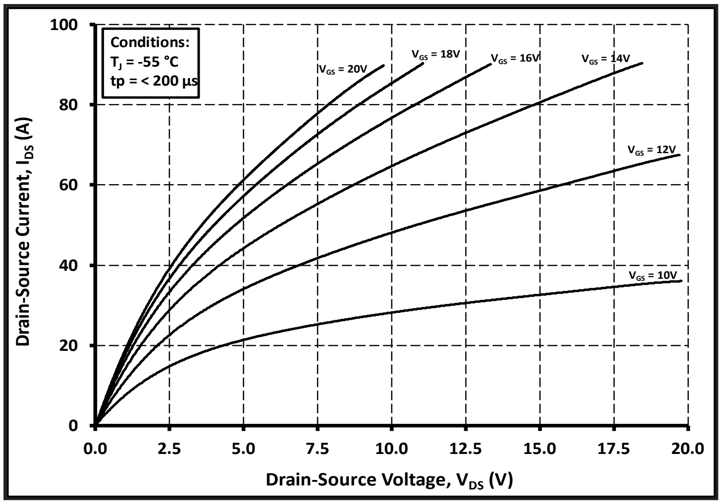


Figure 1. Output Characteristics T_J = -55 °C

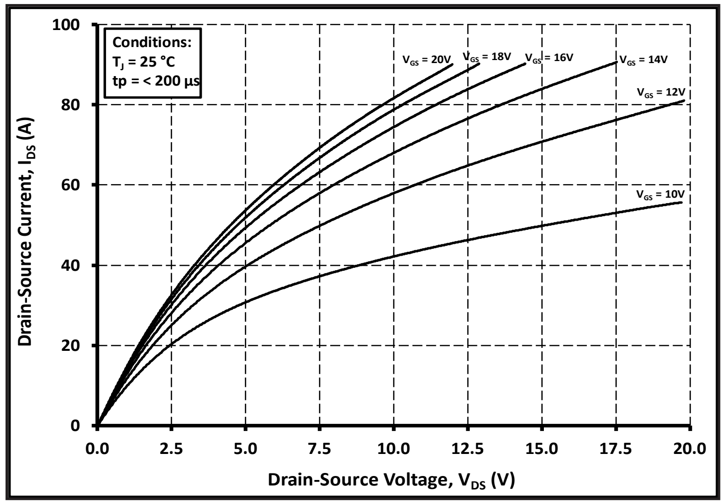


Figure 2. Output Characteristics T_J = 25 °C

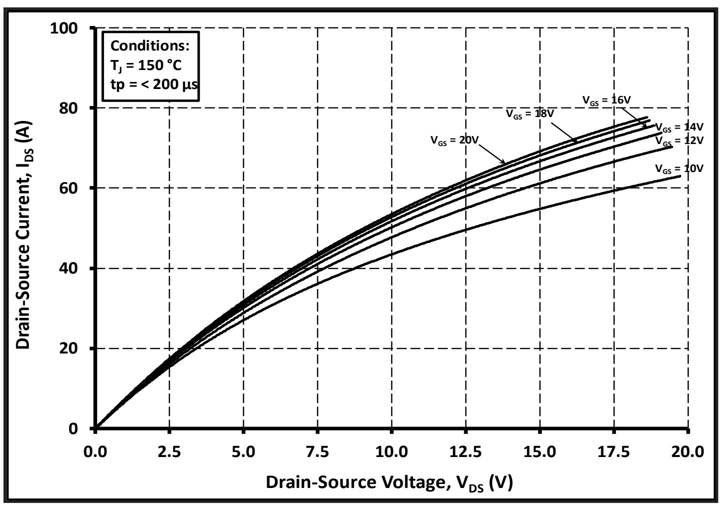


Figure 3. Output Characteristics T_J = 150 °C

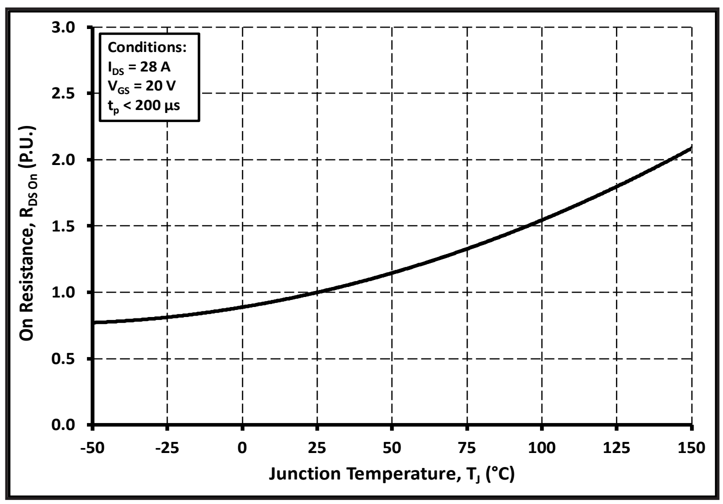


Figure 4. Normalized On-Resistance vs. Temperature

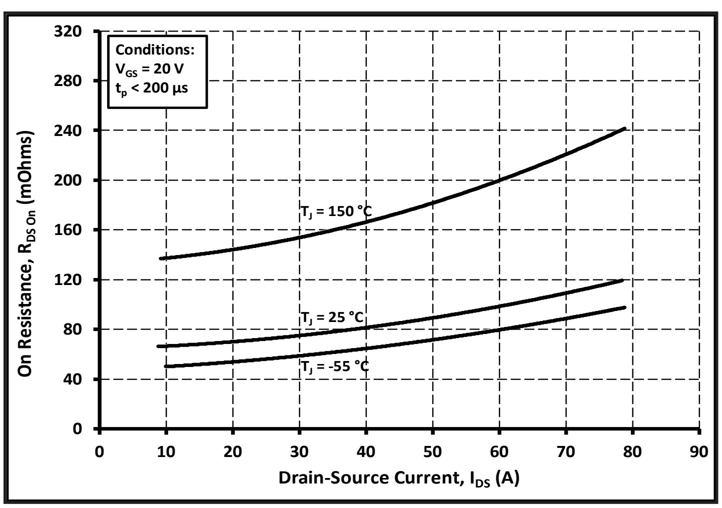


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

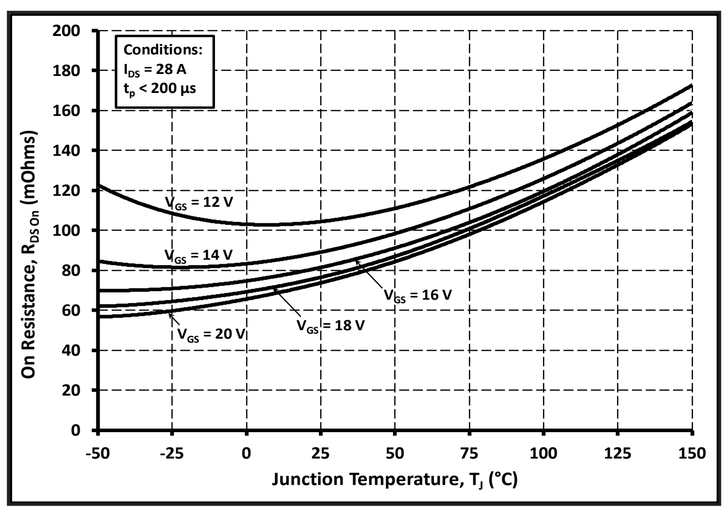


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

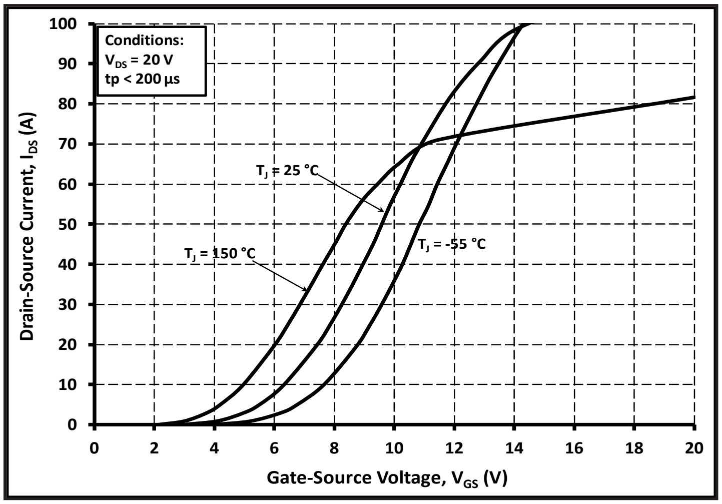


Figure 7. Transfer Characteristic for Various Junction Temperatures

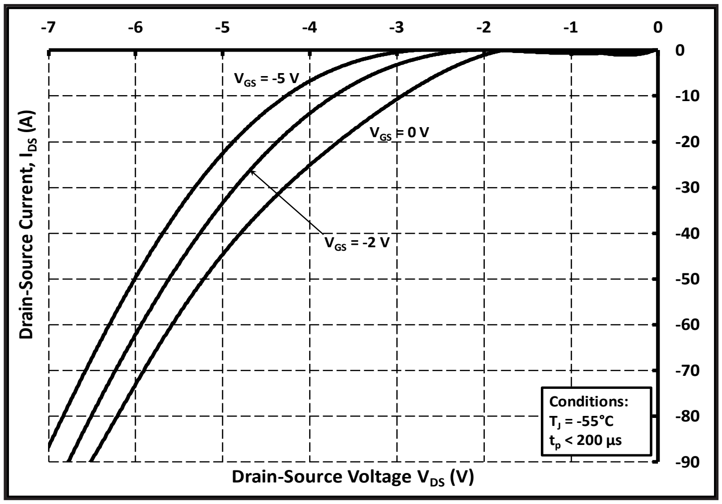


Figure 8. Body Diode Characteristic at -55 ºC

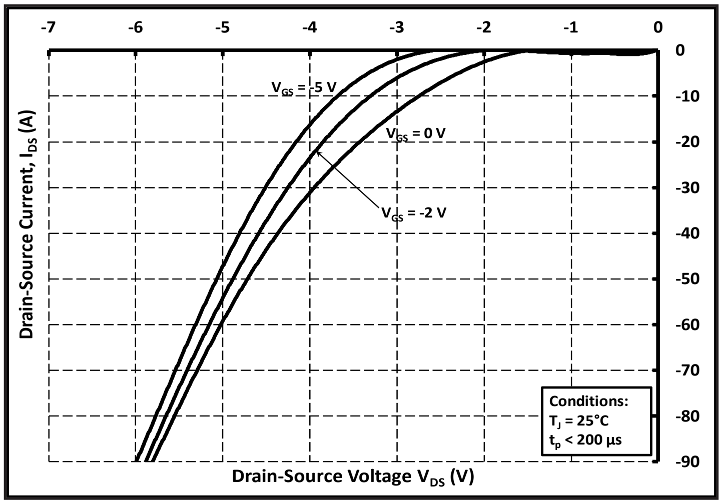


Figure 9. Body Diode Characteristic at 25 ºC

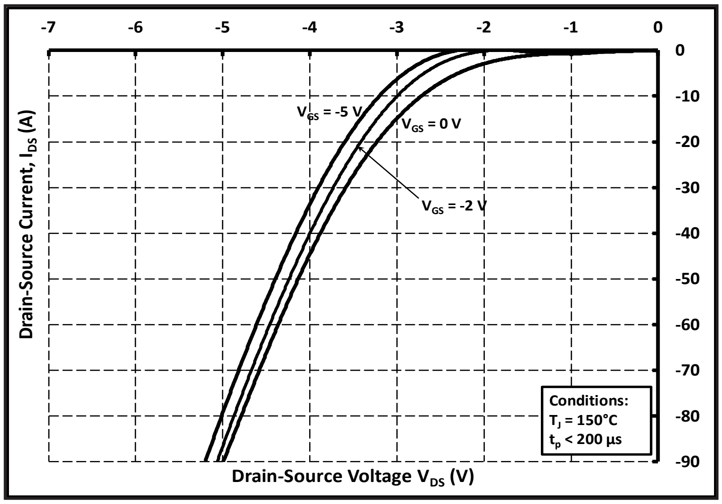


Figure 10. Body Diode Characteristic at 150 ºC

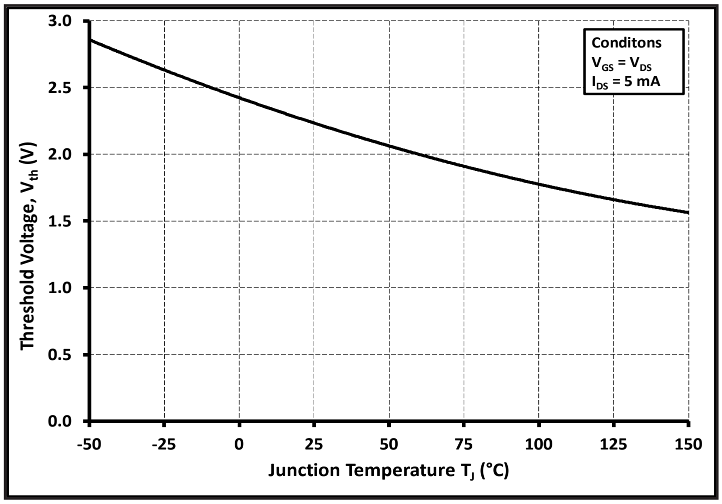


Figure 11. Threshold Voltage vs. Temperature

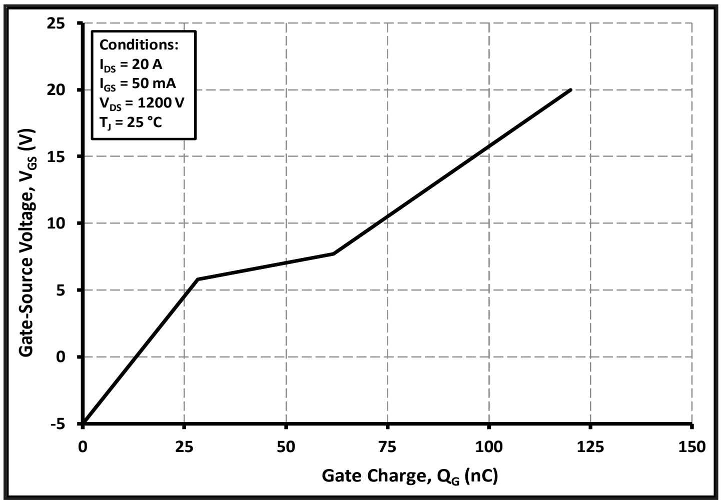


Figure 12. Gate Charge Characteristics

Typical Performance

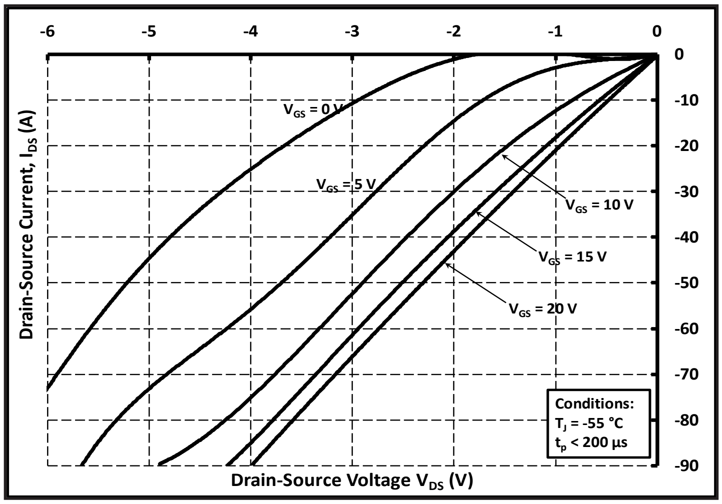


Figure 13. 3rd Quadrant Characteristic at -55 °C

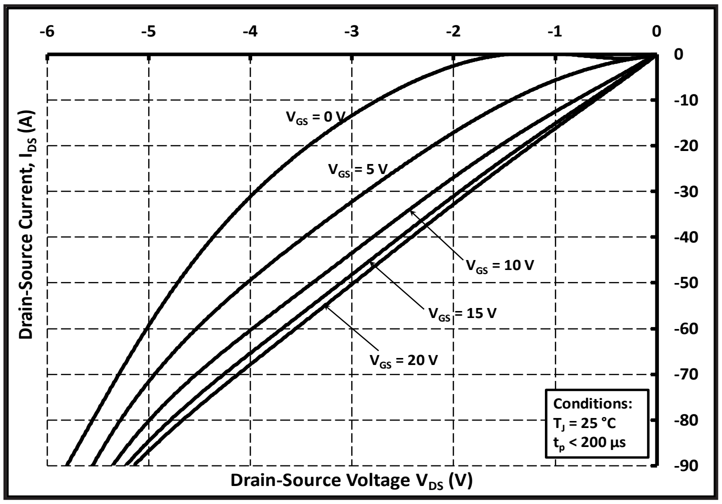


Figure 14. 3rd Quadrant Characteristic at 25 °C

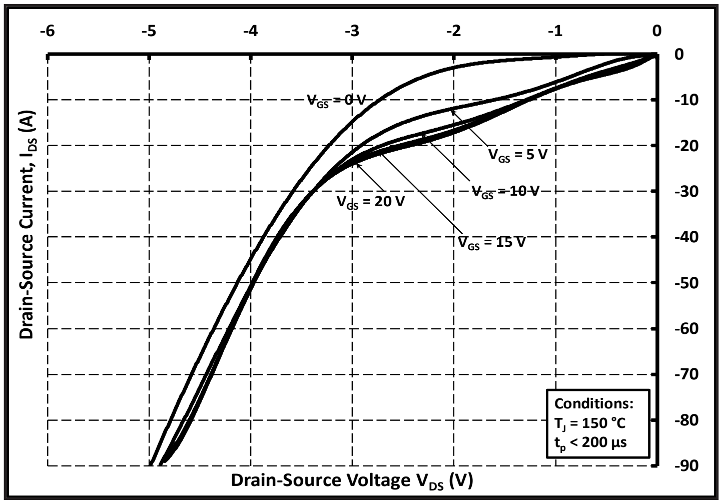


Figure 15. 3rd Quadrant Characteristic at 150 °C

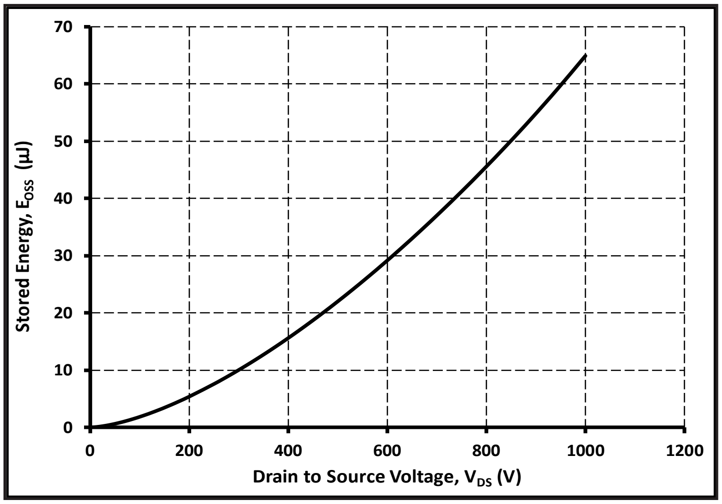


Figure 16. Output Capacitor Stored Energy

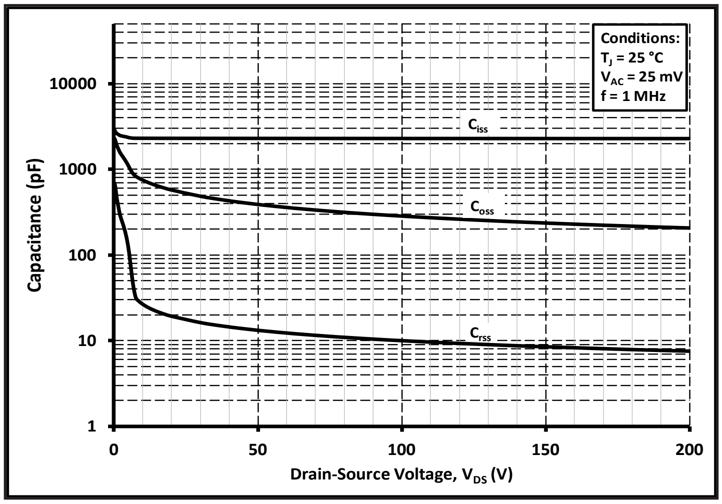


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

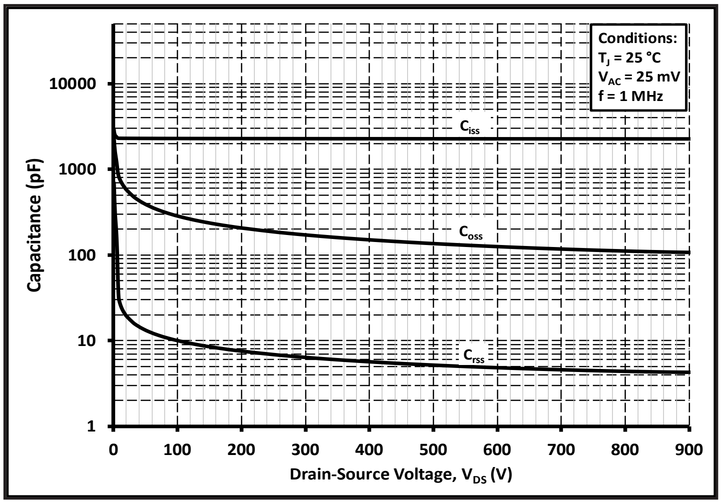


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

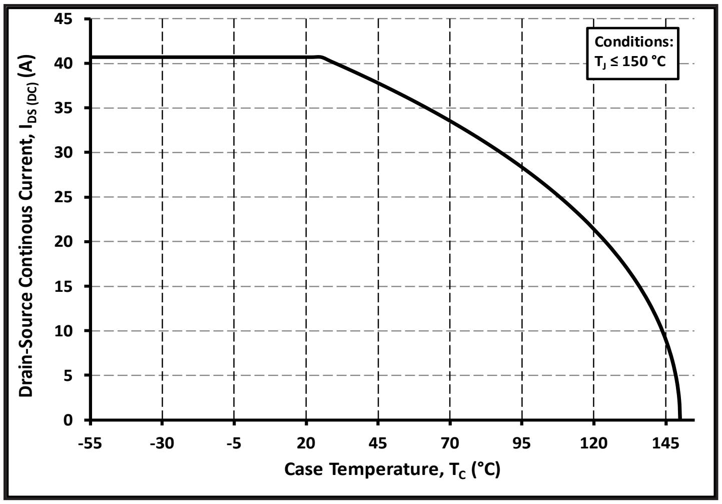


Figure 19. Continuous Drain Current Derating vs. Case Temperature

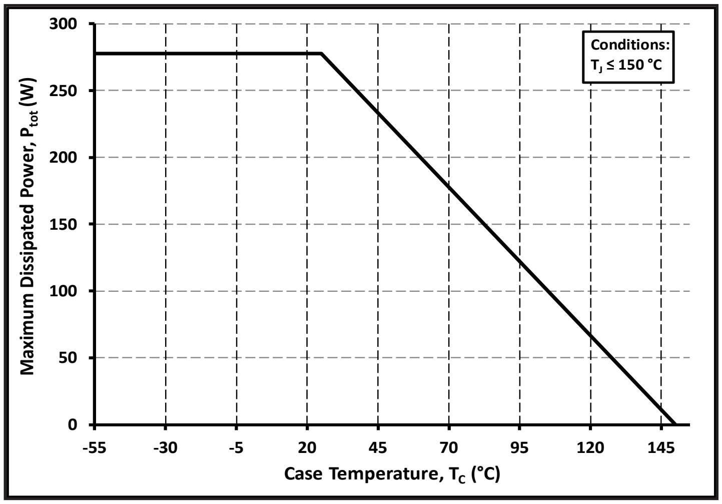


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

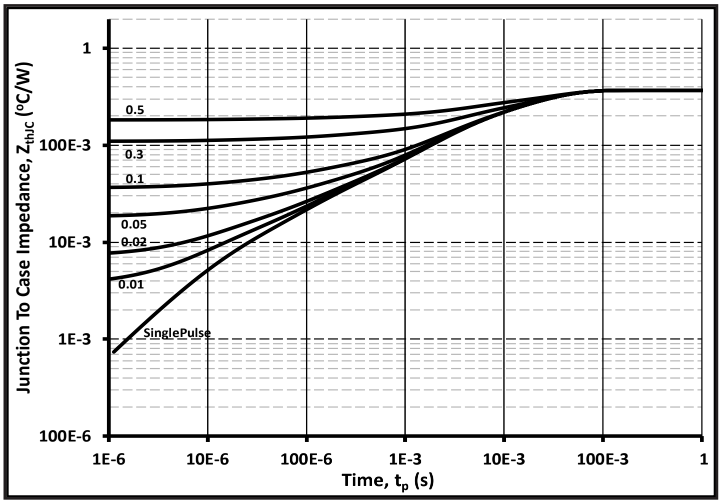


Figure 21. Transient Thermal Impedance (Junction - Case)

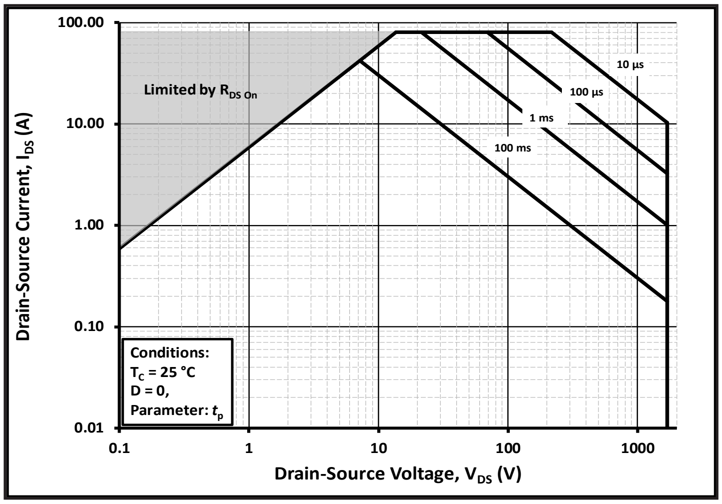


Figure 22. Safe Operating Area

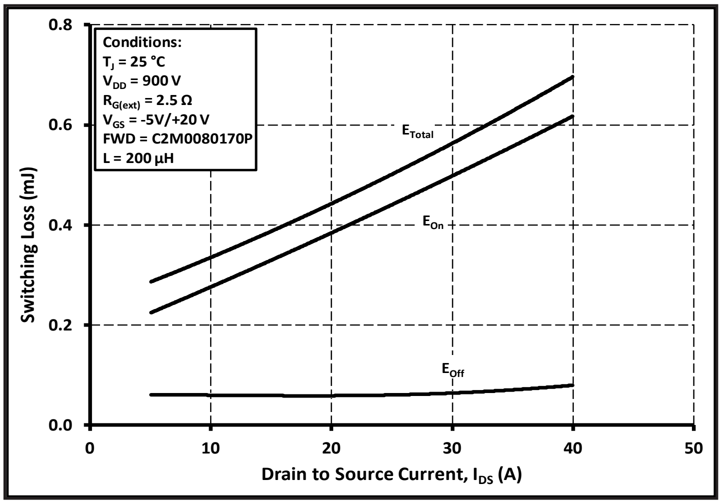


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 900V)

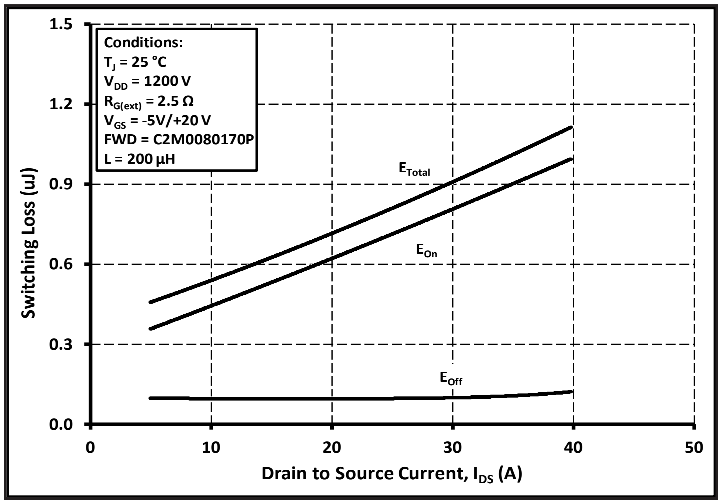


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)

Typical Performance

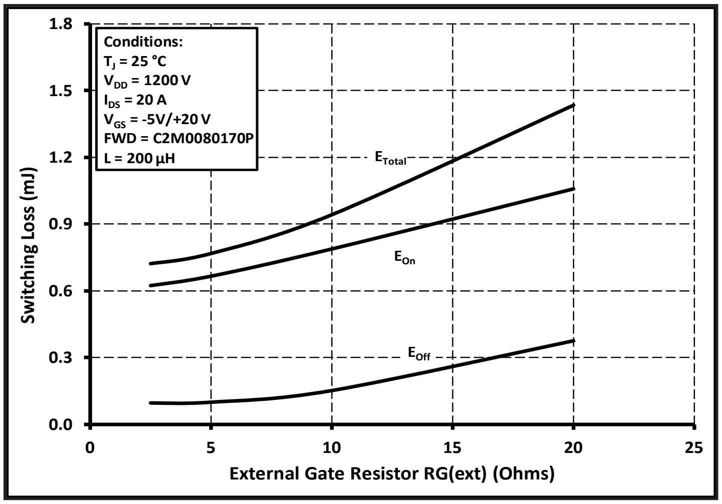


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

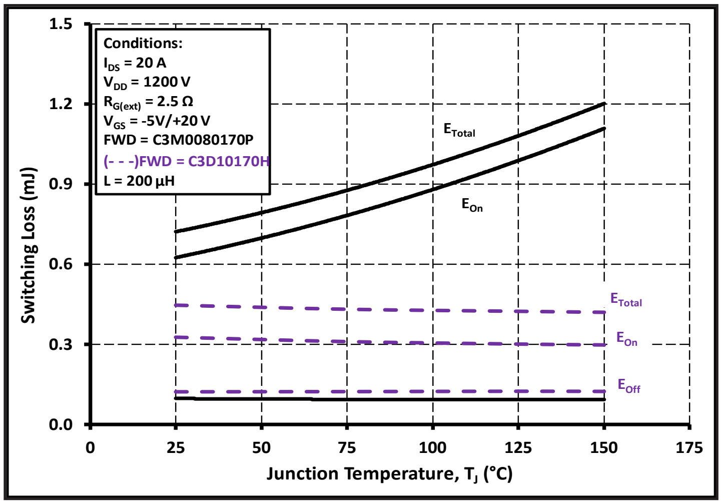


Figure 26. Clamped Inductive Switching Energy vs. Temperature

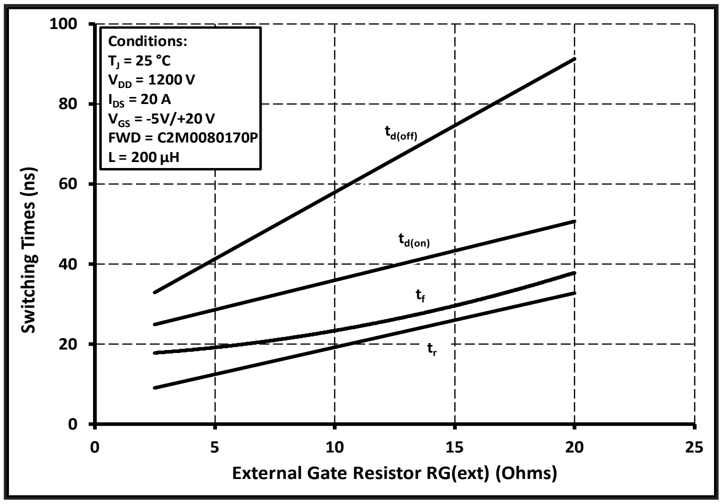


Figure 27. Switching Times vs. $R_{G(ext)}$

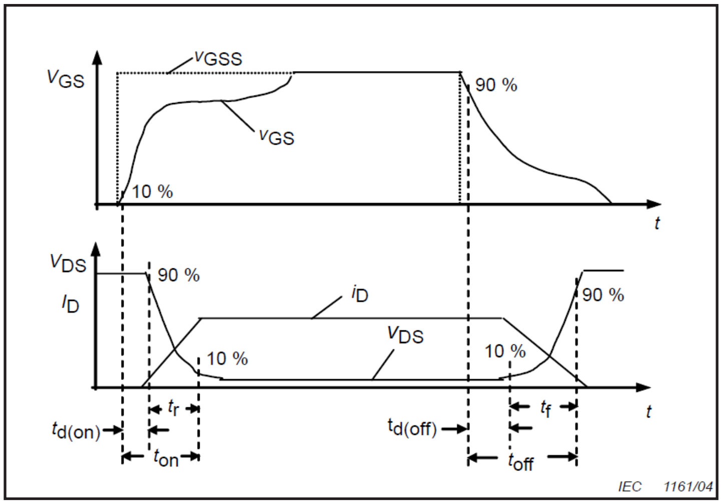


Figure 28. Switching Times Definition

Test Circuit Schematic

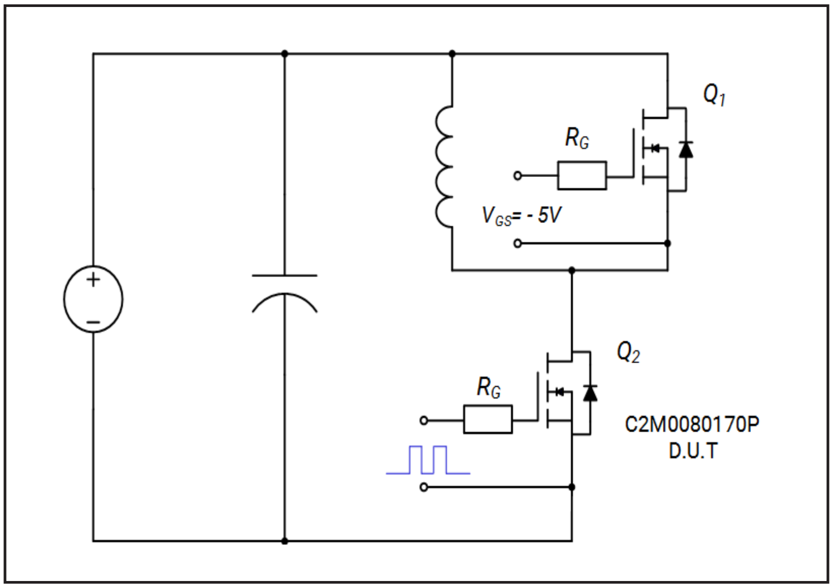


Figure 29a. Clamped Inductive Switching Test Circuit using MOSFET intristic body diode

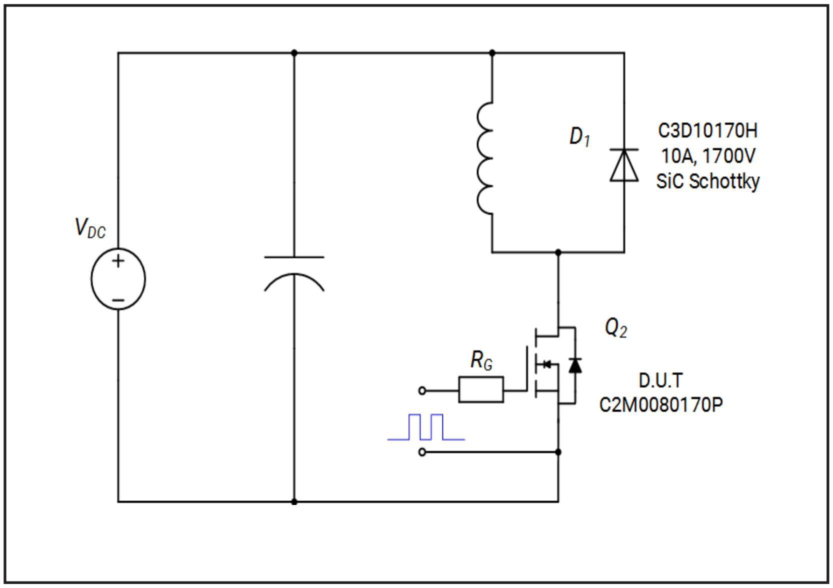
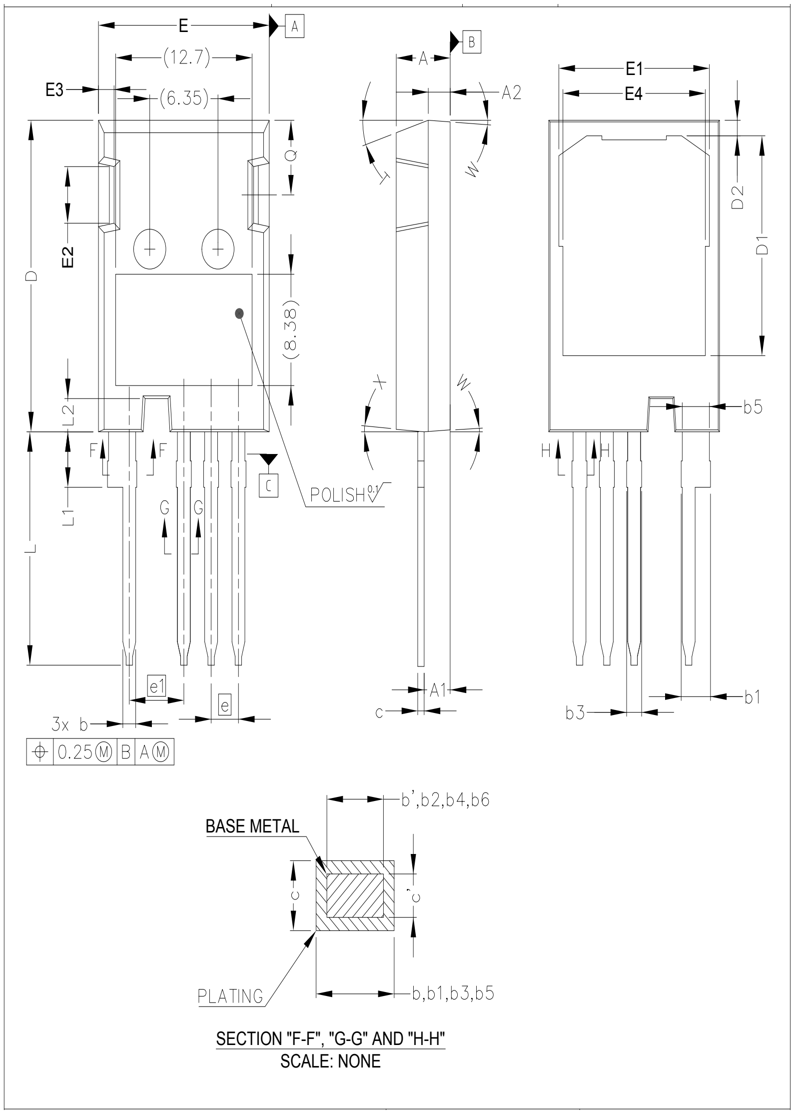


Figure 29b. Clamped Inductive Switching Test Circuit using SiC Schottky diode

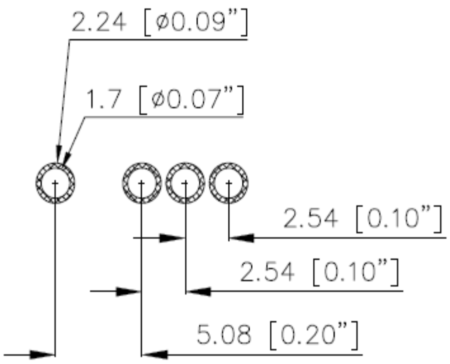
Package Dimensions

Package TO-247-4L Plus



SYM	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
Q	5.49	6.00
T	17.5° REF.	
W	3.5 ° REF.	
X	4 ° REF.	

Recommended Solder Pad Layout



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 January 2, 2013. RoHS Declarations for this product can be obtained from your Cree representative or from the Product Documentation sections of www.cree.com.

- **REACh Compliance**
  REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future,please contact a Cree representative to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request.

- This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, air traffic control systems.

Related Links

- **C2M PSPICE Models: http://wolfspeed.com/power/tools-and-support**
- **SiC MOSFET Isolated Gate Driver reference design: http://wolfspeed.com/power/tools-and-support**
- **SiC MOSFET Evaluation Board: http://wolfspeed.com/power/tools-and-support**

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- Поставка более 17-ти миллионов наименований электронных компонентов;
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- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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