C2M0025120D

Silicon Carbide Power MOSFET
Z-FET™ MOSFET

N-Channel Enhancement Mode

V_{DS}	1200 V
I_D @ 25˚C	90 A
$R_{DS(on)}$	25 mΩ

Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel and Simple to Drive
- Resistant to Latch-Up
- Halogen Free, RoHS Compliant

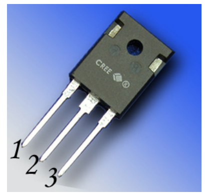
Benefits

- Higher System Efficiency
- Increased System Switching Frequency
- Reduced Cooling Requirements
- Increased System Reliability

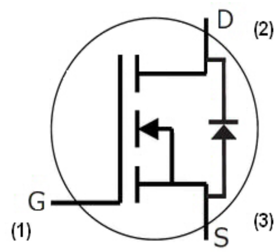
Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC converters
- Motor Drive

Package



TO-247-3



Part Number	Package
C2M0025120D	TO-247-3

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
$I_{DS\ (DC)}$	Continuous Drain Current	90	A	V_{GS} = 20 V, T_C = 25 °C	Fig. 19
		60		V_{GS} = 20 V, T_C = 100 °C	
$I_{DS\ (pulse)}$	Pulsed Drain Current	250	A	Pulse width t_P limited by T_{jmax} T_C = 25 °C	Fig. 22
V_{GS}	Gate Source Voltage	-10/+25	V		
P_{tot}	Power Dissipation	463	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	1.6 mm (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	1200			V	V_{GS} = 0 V, I_D = 50 μA	
$V_{GS(th)}$	Gate Threshold Voltage	2.1	2.4		V	V_{DS} = 10 V, I_D = 10mA	Fig. 11
		1.6	1.8		V	V_{DS} = 10 V, I_D = 10mA, T_J = 150 °C	
I_{DSS}	Zero Gate Voltage Drain Current		2	100	μA	V_{DS} = 1200 V, V_{GS} = 0 V	
I_{GSS}	Gate-Source Leakage Current			600	nA	V_{GS} = 20 V, V_{DS} = 0 V	
$R_{DS(on)}$	Drain-Source On-State Resistance		25	34	mΩ	V_{GS} = 20 V, I_D = 50 A	Fig. 4,5,6
			43	63		V_{GS} = 20 V, I_D = 50 A, T_J = 150 °C	
g_{fs}	Transconductance		23.6		S	V_{DS}= 20 V, I_{DS}= 50 A	Fig. 7
			21.7			V_{DS}= 20 V, I_{DS}= 50 A, T_J = 150 °C	
C_{iss}	Input Capacitance		2788		pF	V_{GS} = 0 V V_{DS} = 1000 V f = 1 MHz V_{AC} = 25 mV	Fig. 17,18
C_{oss}	Output Capacitance		220				
C_{rss}	Reverse Transfer Capacitance		15				
E_{oss}	C_{oss} Stored Energy		121		μJ		Fig 16
$t_{d(on)}$	Turn-On Delay Time		14.4		ns	V_{DD} = 800 V, V_{GS} = -5/20 V I_D = 50 A, $R_{G(ext)}$ = 2.5 Ω, R_L = 16 Ω Timing relative to V_{DS} Per IEC60747-8-4 pg 83	Fig. 27
t_r	Rise Time		31.6				
$t_{d(off)}$	Turn-Off Delay Time		28.8				
t_f	Fall Time		28.4				
E_{ON}	Turn-On Switching Loss		1.4		mJ	V_{DS} = 800 V, V_{GS} = -5/20 V, I_D = 50A, $R_{G(ext)}$ = 2.5Ω,L= 412 μH	Fig. 25
E_{OFF}	Turn Off Switching Loss		0.3				
R_G	Internal Gate Resistance		1.1		Ω	f = 1 MHz, V_{AC} = 25 mV, ESR of C_{ISS}	

Built-in SiC Body Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.3		V	V_{GS} = - 5 V, I_{SD} = 25 A, T_J = 25 °C	Note 1
		3.0		V	V_{GS} = - 5 V, I_{SD} = 25 A, T_J = 150 °C	
t_{rr}	Reverse Recover time	45		ns	V_{GS} = - 5 V, I_{SD} = 50 A T_J = 25 °C VR = 800 V dif/dt = 1000 A/μs	Note 1
Q_{rr}	Reverse Recovery Charge	406		nC		
I_{rrm}	Peak Reverse Recovery Current	13.5		A		

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.24	0.27	°C/W		Fig. 21
$R_{\theta JC}$	Thermal Resistance from Junction to Ambient		40			

Gate Charge Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
Q_{gs}	Gate to Source Charge	46		nC	V_{DS} = 800 V, V_{GS} = -5/20 V I_D = 50 A Per IEC60747-8-4 pg 83	Fig. 12
Q_{gd}	Gate to Drain Charge	50				
Q_g	Gate Charge Total	161				

Typical Performance

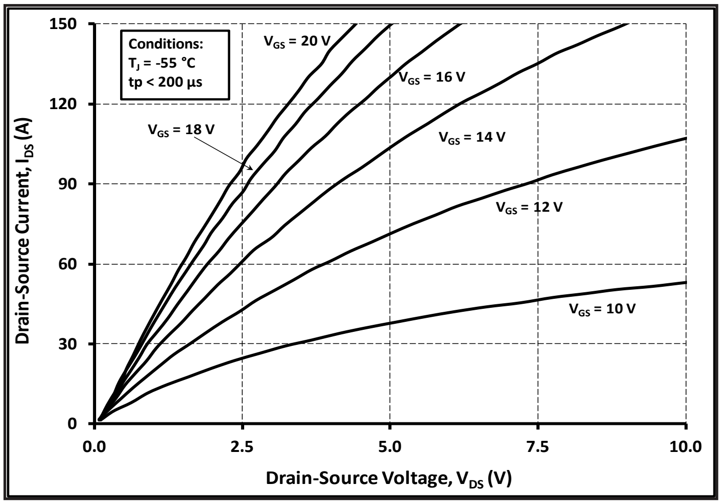


Figure 1. Typical Output Characteristics T_J = -55 °C

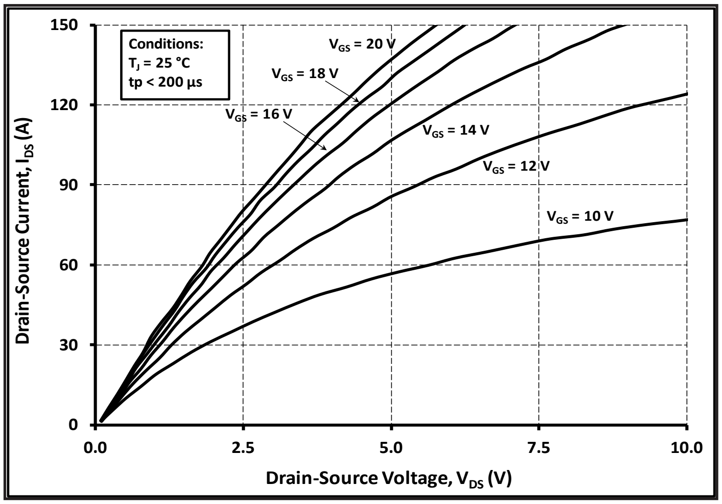


Figure 2. Typical Output Characteristics T_J = 25 °C

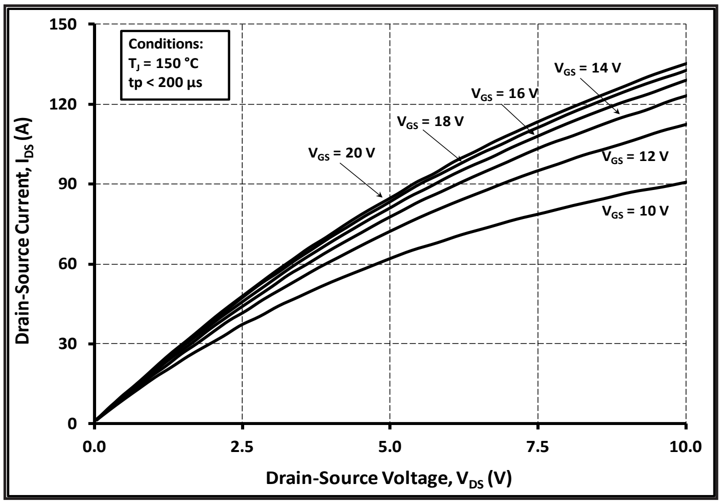


Figure 3. Typical Output Characteristics T_J = 150 °C

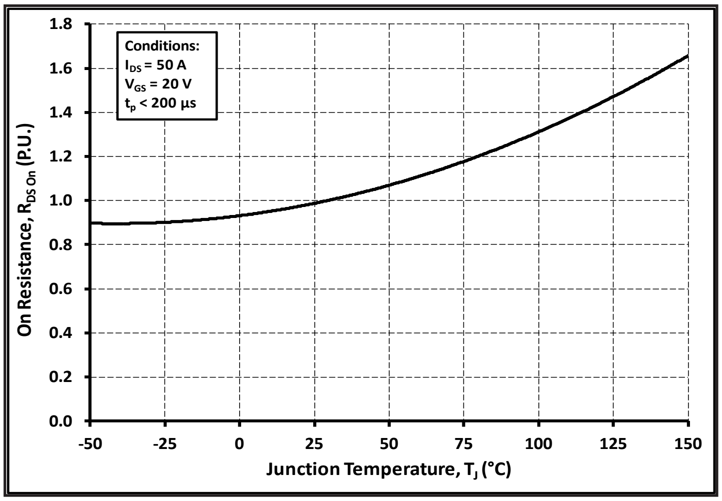


Figure 4. Normalized On-Resistance vs. Temperature

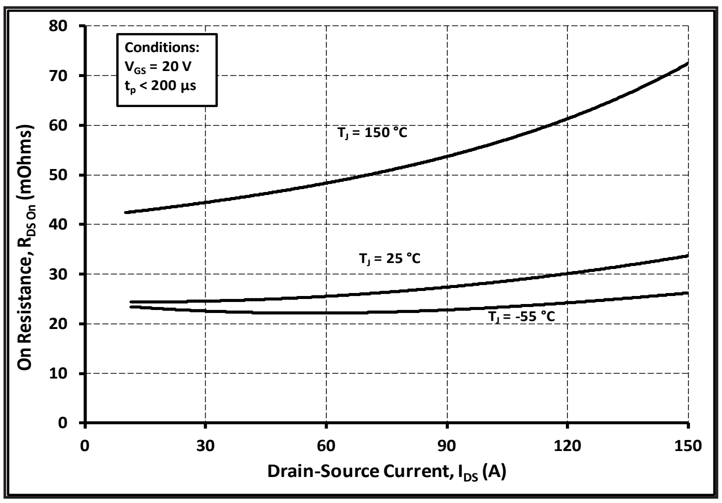


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

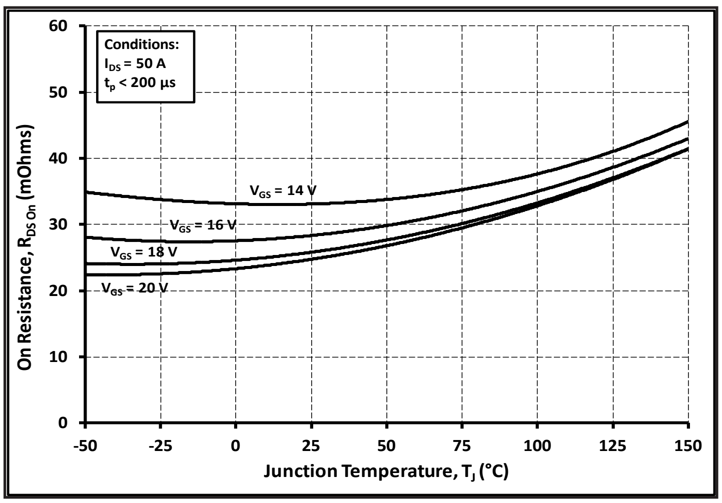


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

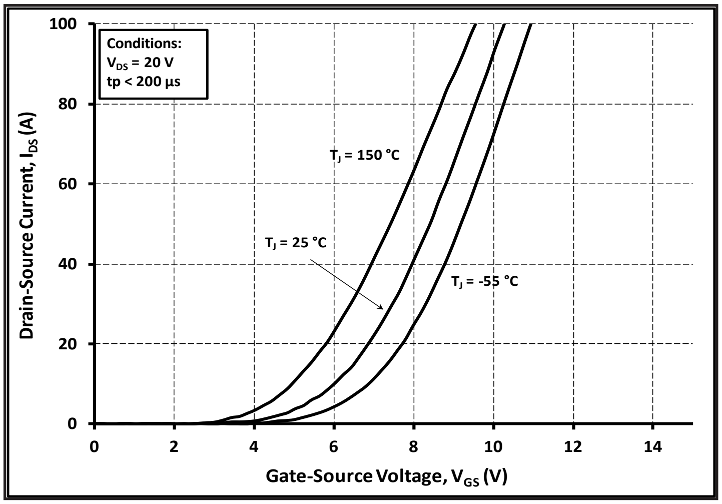


Figure 7. Typical Transfer Characteristic For Various Temperatures

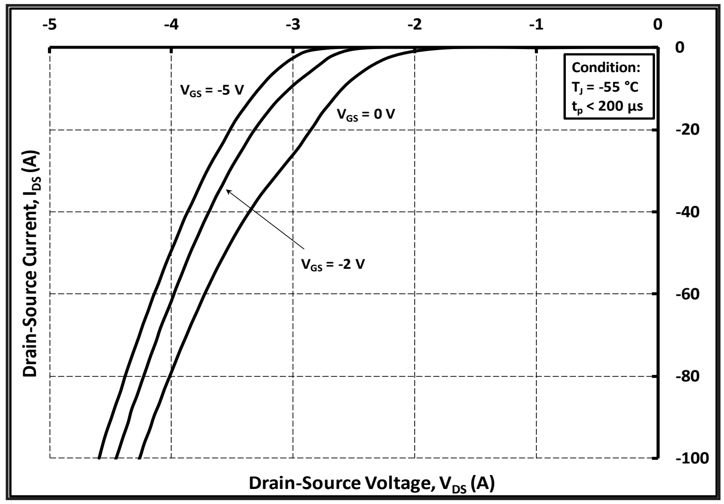


Figure 8. Typical Body Diode Characteristic T_J = -55 ºC

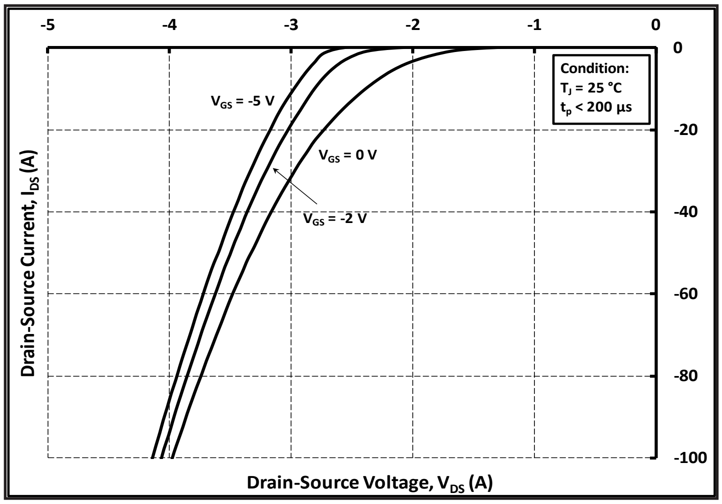


Figure 9. Typical Body Diode Characteristic T_J = 25 ºC

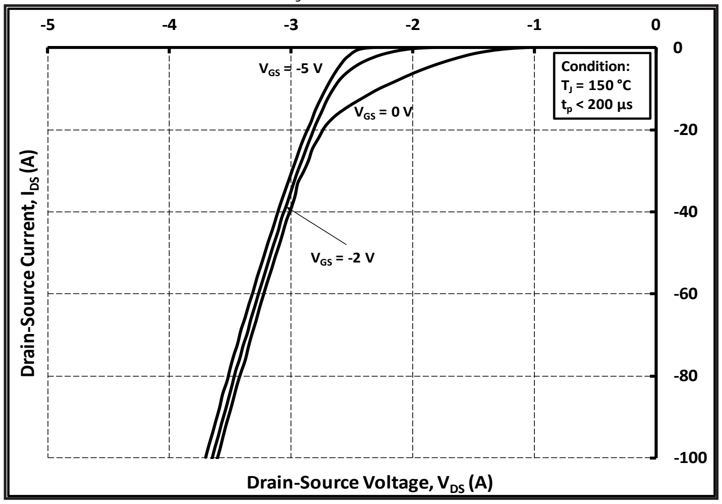


Figure 10. Typical Body Diode Characteristic T_J = 150 ºC

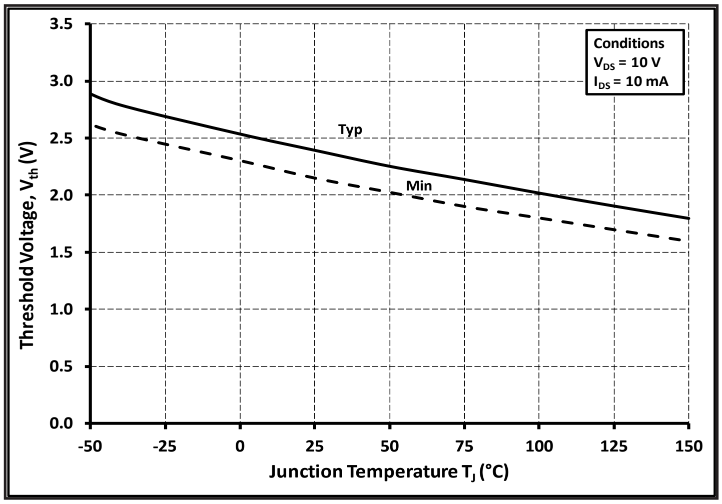


Figure 11. Typical and Minimum Threshold Voltage vs. Temperature

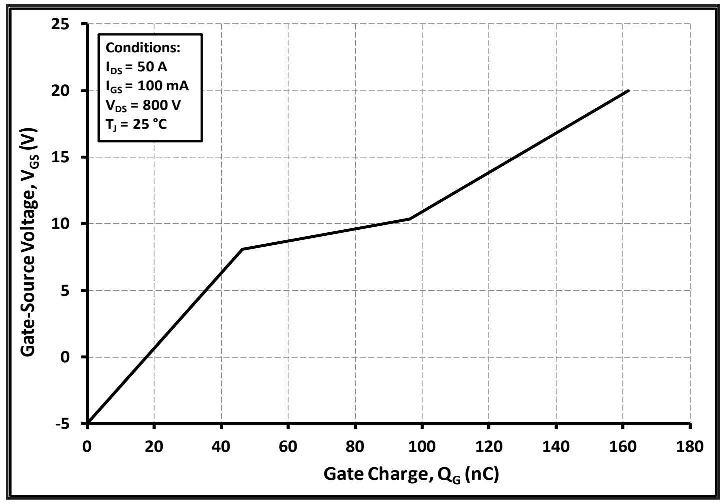


Figure 12. Typical Gate Charge Characteristic 25 ºC

Typical Performance

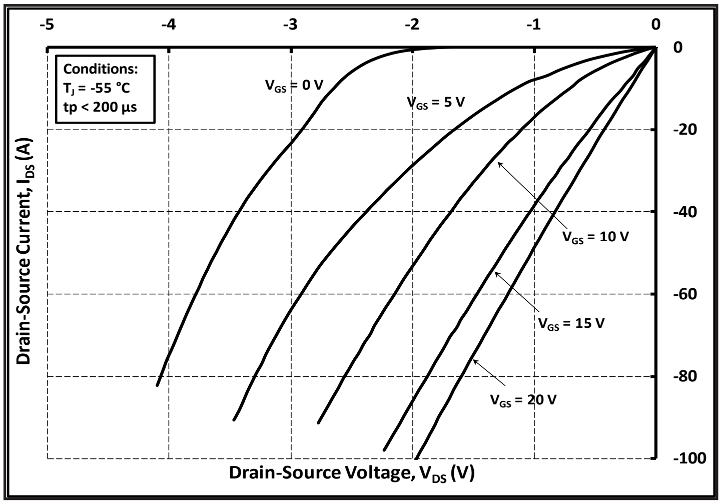


Figure 13. Typical 3rd Quadrant Characteristic T_J = -55 ºC

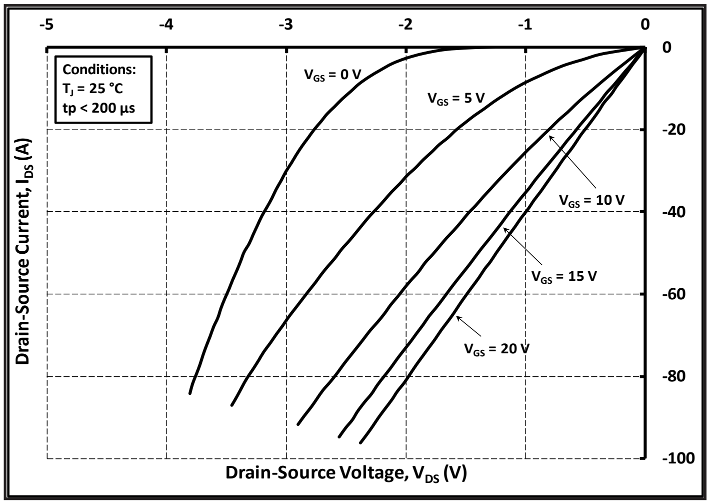


Figure 14. Typical 3rd Quadrant Characteristic T_J = 25 ºC

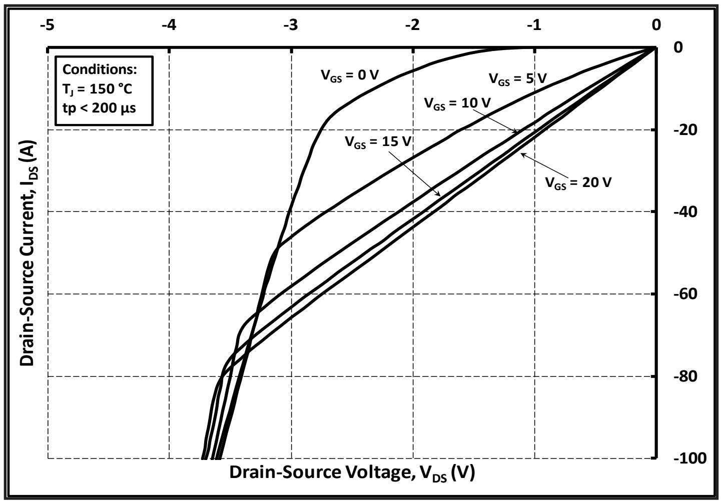


Figure 15. Typical 3rd Quadrant Characteristic T_J = 150 ºC

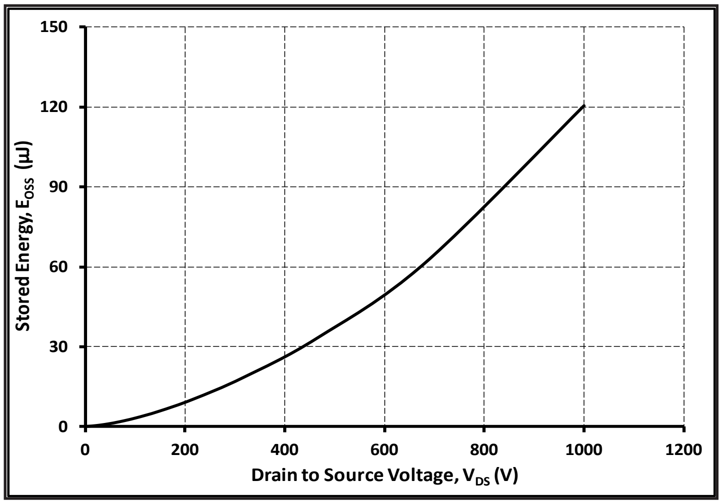


Figure 16. Typical Output Capacitor Stored Energy

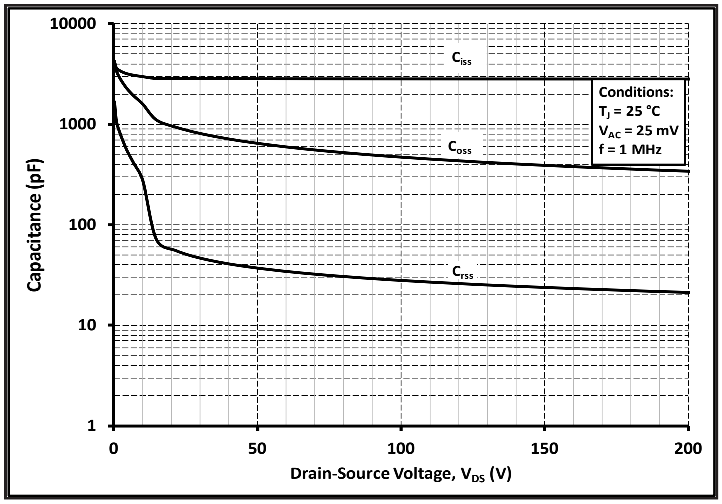


Figure 17. Typical Capacitances vs Drain Voltage (0-200 V)

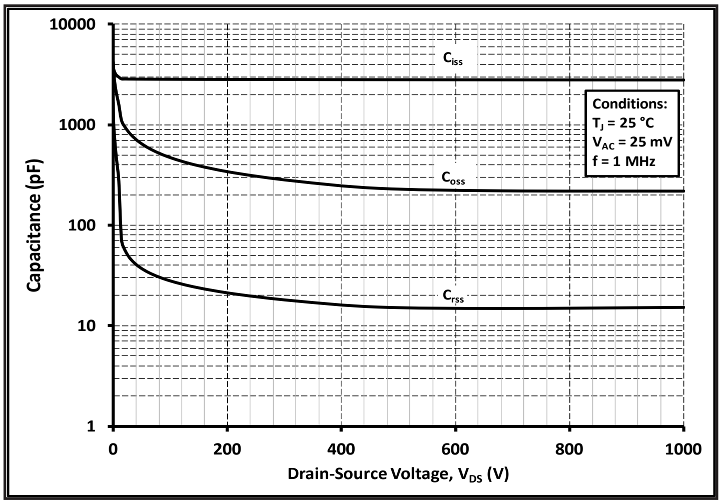


Figure 18. Typical Capacitances vs Drain Voltage (0-1000 V)

Typical Performance

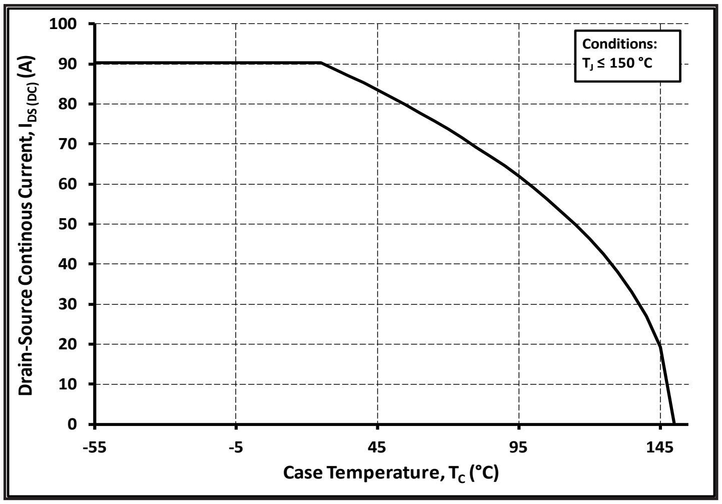


Figure 19. Continuous I_{DS} Current derating curve

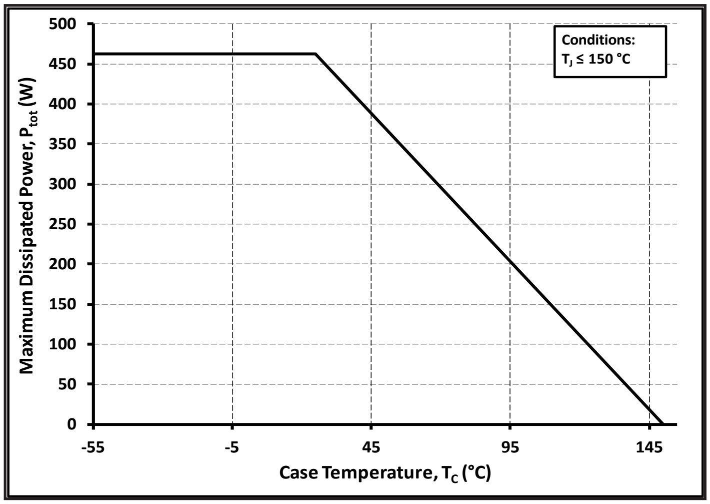


Figure 20. Power Dissipation Derating Curve

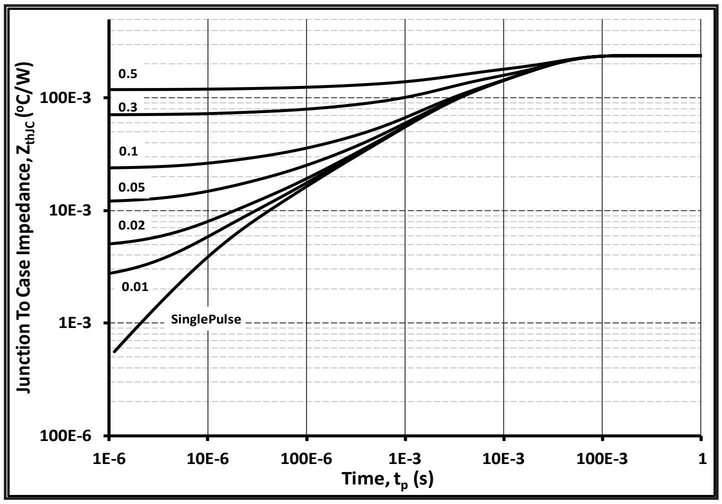


Figure 21. Typical Transient Thermal Impedance (Junction - Case) with Duty Cycle

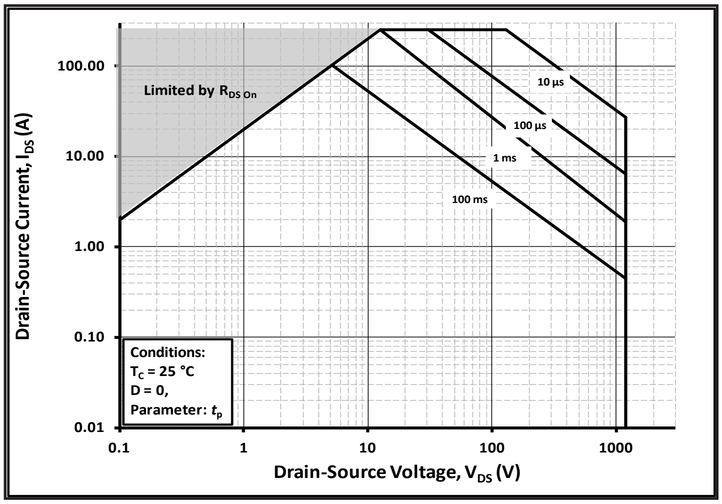


Figure 22. Safe Operating Area

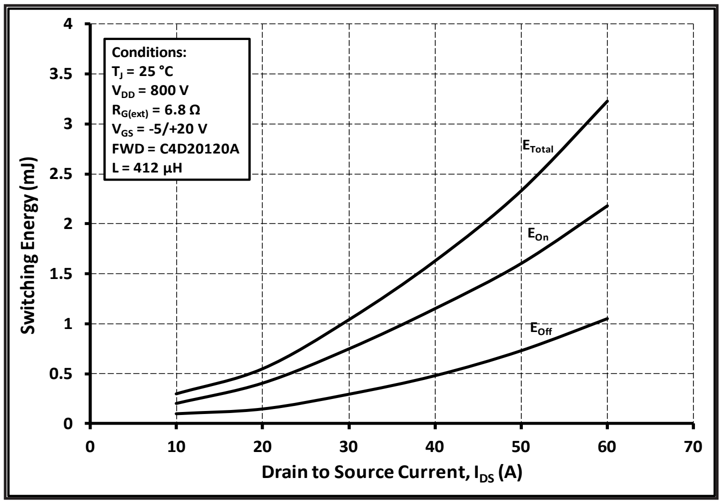


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

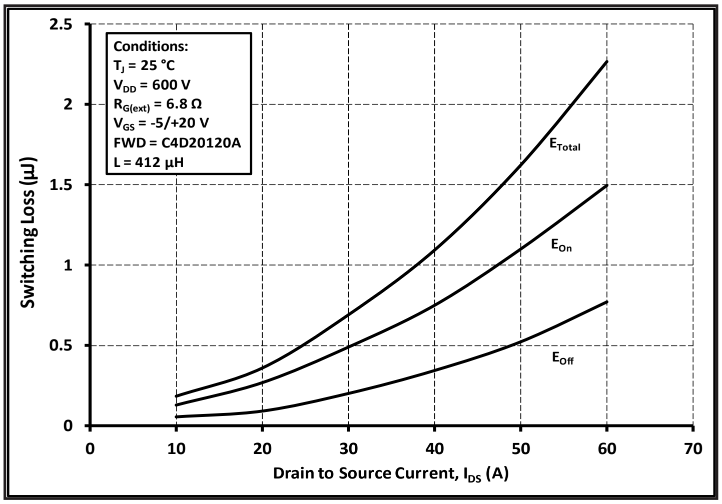


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

Typical Performance

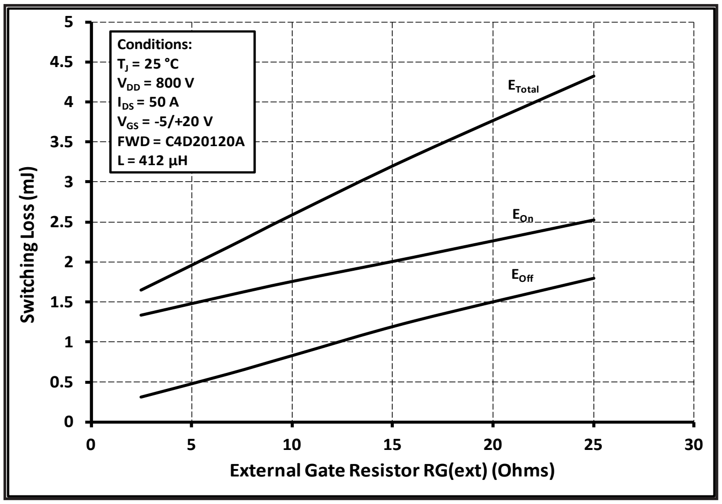


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

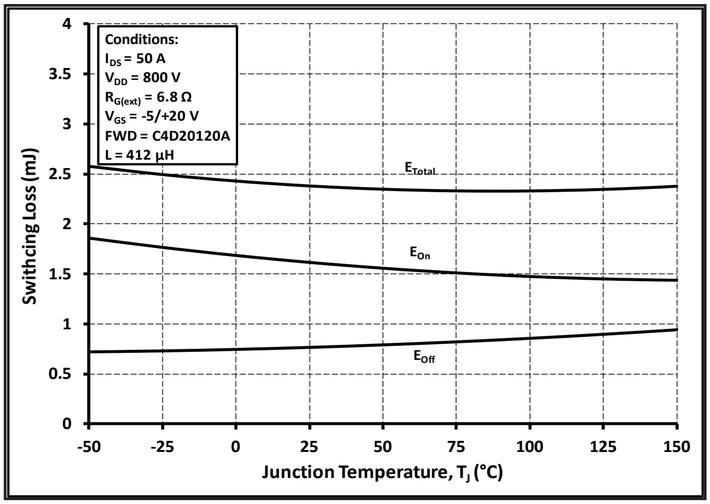


Figure 26. Clamped Inductive Switching Energy vs. Junction Temperature

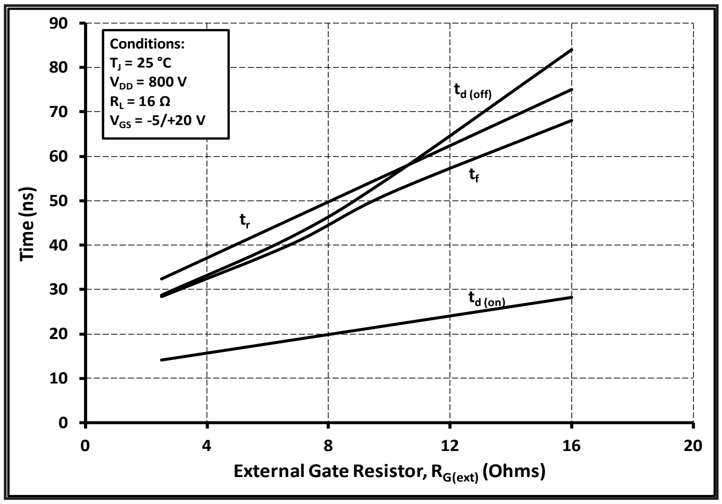


Figure 27. Resistive Switching Times vs. External Gate Resistor (V_{DD} = 800V, I_D = 50A)

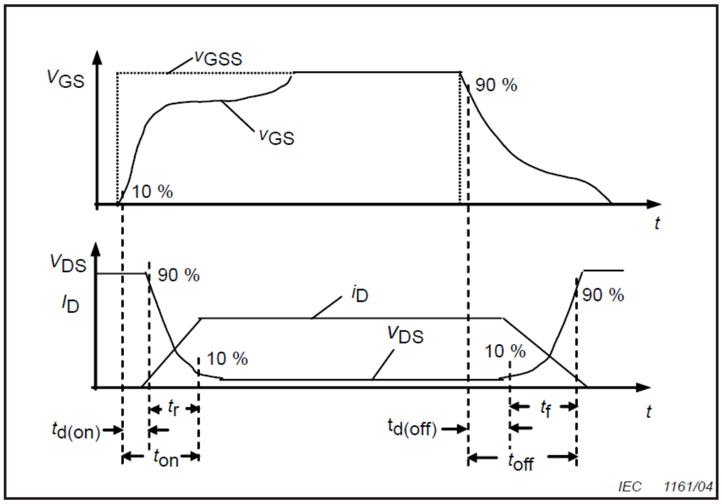


Figure 28. Resistive Switching Time Description

Test Circuit Schematic

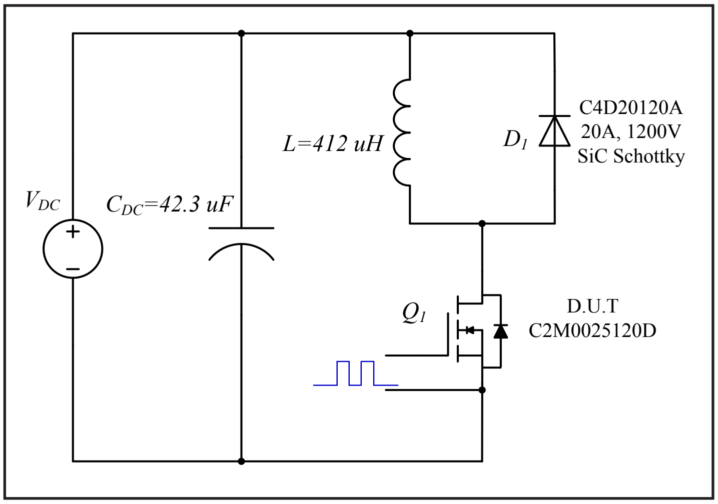


Figure 30. Clamped Inductive Switching Waveform Test Circuit

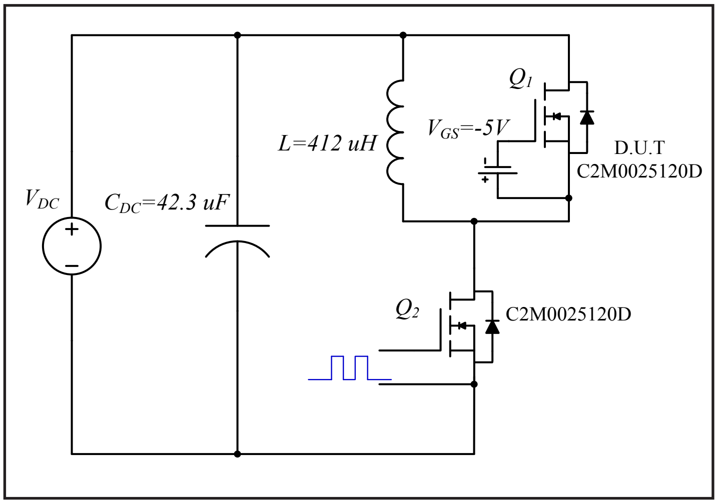


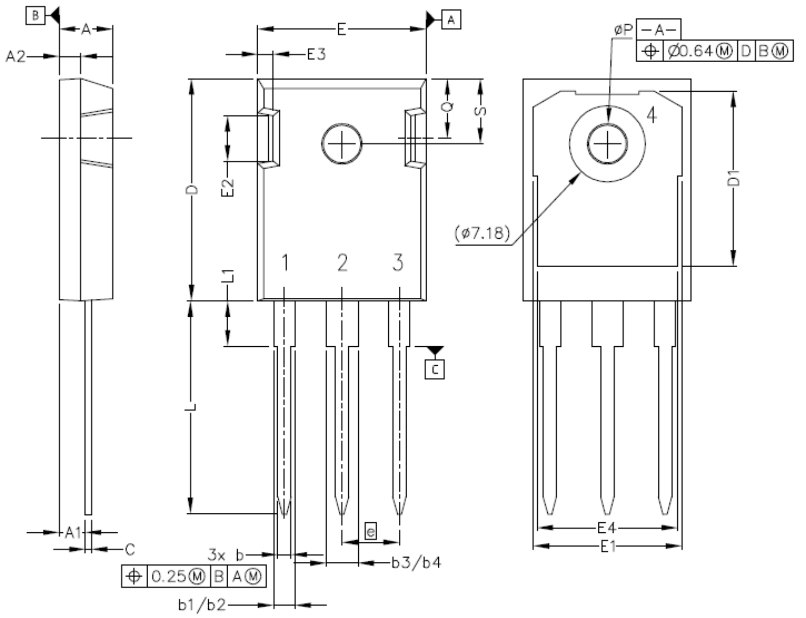
Figure 31. Body Diode Recovery Test Circuit

ESD Ratings

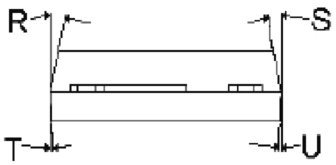
ESD Test	Total Devices Sampled	Resulting Classification
ESD-HBM	All Devices Passed 1000V	2 (>2000V)
ESD-MM	All Devices Passed 400V	C (>400V)
ESD-CDM	All Devices Passed 1000V	IV (>1000V)

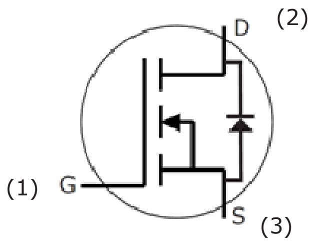
Package Dimensions

Package TO-247-3

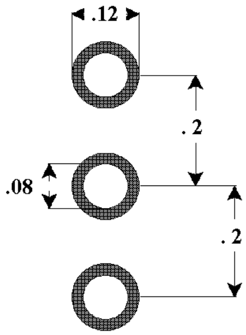


POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b2	.075	.085	1.91	2.16
b3	.113	.133	2.87	3.38
b4	.113	.123	2.87	3.13
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.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





Recommended Solder Pad Layout



TO-247-3

Part Number	Package	Marking
C2M0025120D	TO-247-3	C2M0025120

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.

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- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- 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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- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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