CREE

CPM3-1200-0016A

Silicon Carbide Power MOSFET
C3M™ MOSFET Technology

N-Channel Enhancement Mode

V_{DS}	1200 V
$I_{D\ @\ 25^\circ C}$	112 A
$R_{DS(on)}$	16 mΩ

Features

- C3M SiC MOSFET technology
- High blocking voltage with low on-resistance
- Resistant to Latch-up
- Fast intrinsic diode with low reverse recovery (Qrr)
- Easy to parallel and simple to drive
- Optimized gate resistance for modules

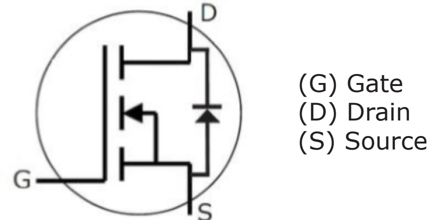
Benefits

- Higher system efficiency
- Reduced cooling requirements
- Low conduction losses over temperature
- Increased system switching frequency

Applications

- Solar and UPS inverters
- EV motor drive
- High voltage DC/DC converters
- Switched mode power supplies
- Load switch

Inner Circuit



Part Number	Die Size (mm)
CPM3-1200-0016A	Please contact your sales representative to get the detailed information about die layout and dimensions.

Maximum Ratings

Symbol	Parameter		Value	Unit
V_{DSmax}	Drain - Source Voltage, $T_{vj} \geq -55\ ^\circ C$		1200	V
V_{GSmax} [1]	Gate - Source Voltage (dynamic, <1% duty cycle)		-8/+19	V
V_{GSop} [2]	Gate - Source Voltage (static), recommended		-4/+15	V
I_D [3]	Continuous Drain Current, t_p limited by T_{vjmax}, V_{GS} = 15V, assumes $R_{th(j-c)}$ < 0.4 K/W	T_C = 25 ˚C	112	A
		T_C = 100 ˚C	75	
$I_{D(pulse)}$ [3]	Pulsed Drain Current, t_p limited by T_{vjmax}		250	A
T_{VJ} , T_{stg}	Virtual Junction and Storage Temperature		-55 to +175	˚C
T_{Proc}	Maximum Processing Temperature		325	˚C

[1] When using MOSFET Body Diode V_{GSmax} = -4/+19V
[2] MOSFET can safely operate at 0/+15 V
[3] Verified by design

Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	V_{GS} = 0 V, T_{VJ} = 25°C	
		1200			V	V_{GS} = 0 V, T_{VJ} = -55°C	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.5	3.6	V	V_{DS} = V_{GS}, I_{DS} = 21.23 mA, T_{VJ} = 25°C	Fig. 11
			2.0		V	V_{DS} = V_{GS}, I_{DS} = 21.23 mA, T_{VJ} = 175°C	
I_{DSS}	Zero Gate Voltage Drain Current		1	32	μA	V_{DS} = 1200 V, V_{GS} = 0 V	
I_{GSS}	Gate-Source Leakage Current		10	100	nA	V_{GS} = 15 V, V_{DS} = 0 V	
$R_{DS(on)}$	Drain-Source On-State Resistance	11.2	16	20.8	mΩ	V_{GS} = 15 V, I_{DS} = 77.2 A, T_{VJ} = 25°C	Fig. 4, 5, 6
			25.6			V_{GS} = 15 V, I_{DS} = 77.2 A, T_{VJ} = 175°C	
g_{fs}	Transconductance		58		S	V_{DS}= 20 V, I_{DS}= 77.2 A, T_{VJ} = 25°C	Fig. 7
			51			V_{DS}= 20 V, I_{DS}= 77.2 A, T_{VJ} = 175°C	
C_{iss}	Input Capacitance		5777		pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 1 MHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		230				
C_{rss}	Reverse Transfer Capacitance		12.5				
E_{oss}	C_{oss} Stored Energy		127		μJ		Fig. 16
$R_{G(int)}$	Internal Gate Resistance		2.6		Ω	f = 1 MHz, V_{AC} = 25 mV	
Q_{gs}	Gate to Source Charge		64		nC	V_{DS} = 800 V, V_{GS} = -4 V/15 V I_{DS} = 77.2 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		77				
Q_g	Total Gate Charge		227				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.6		V	V_{GS} = -4 V, I_{SD} = 38.6 A T_{VJ} = 25 °C	Fig. 8, 9, 10
		4.2		V	V_{GS} = -4 V, I_{SD} = 38.6 A, T_{VJ} = 175 °C	
t_{rr}	Reverse Recovery Time	48		ns	V_{GS} = -4 V, I_{SD} = 77.2 A, V_R = 800 V dif/dt = 4720 A/μs, T_{VJ} = 150 °C	Note 1
Q_{rr}	Reverse Recovery Charge	1200		nC		
I_{rrm}	Peak Reverse Recovery Current	59		A		

Note: For switching waveforms please refer to datasheet for packaged device C3M0016120K.

Typical Performance

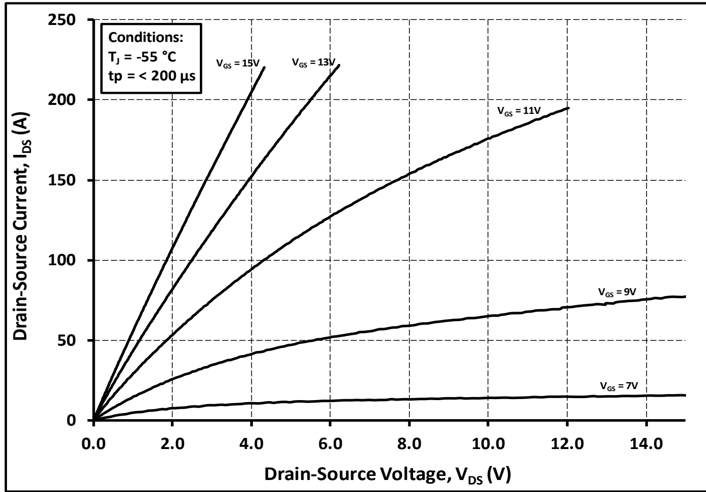


Figure 1. Output Characteristics T_J = -55 °C

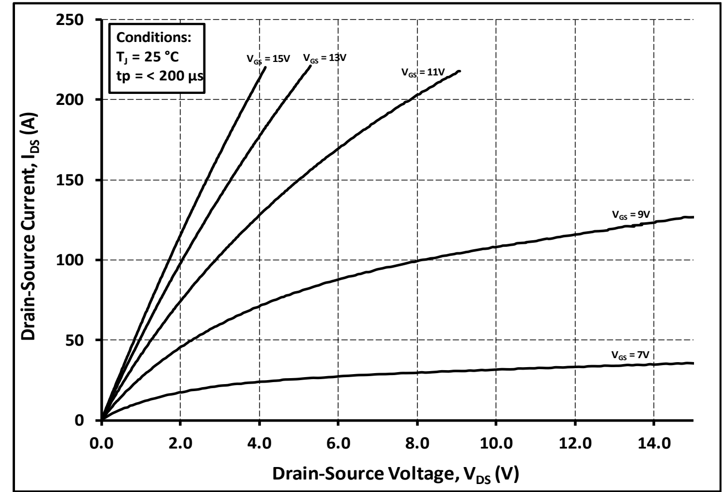


Figure 2. Output Characteristics T_J = 25 °C

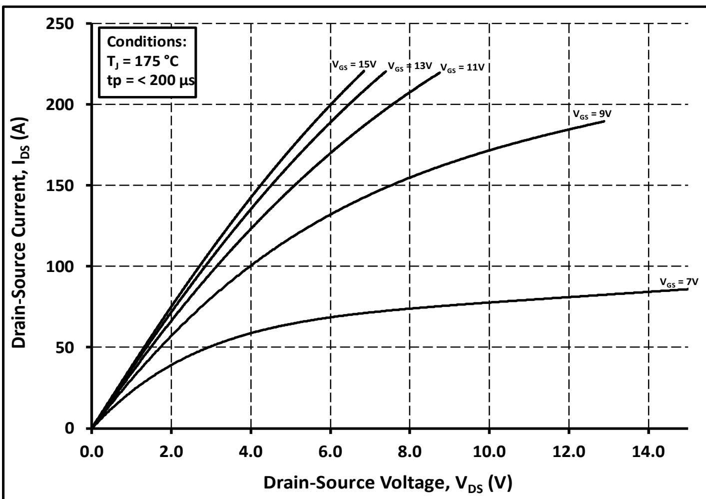


Figure 3. Output Characteristics T_J = 175 °C

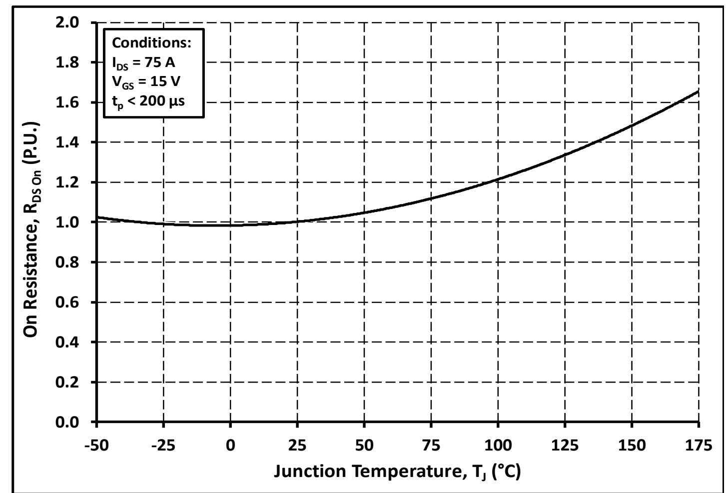


Figure 4. Normalized On-Resistance vs. Temperature

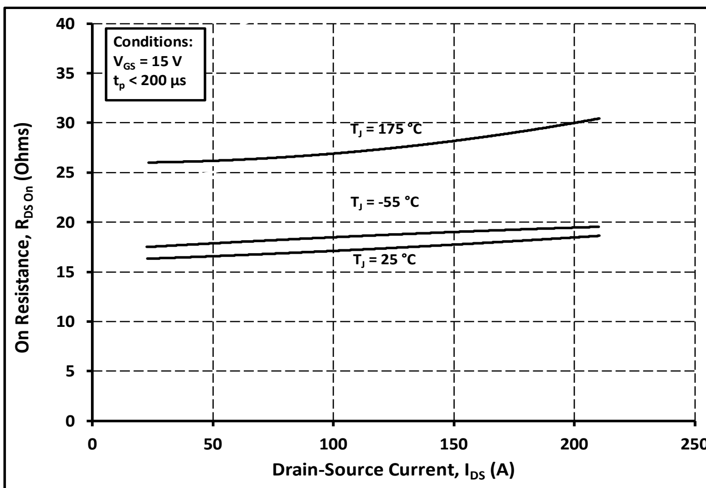


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

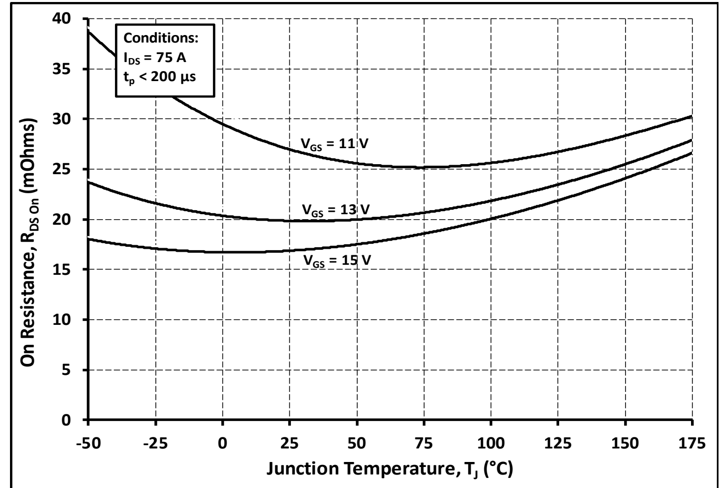


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

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Typical Performance

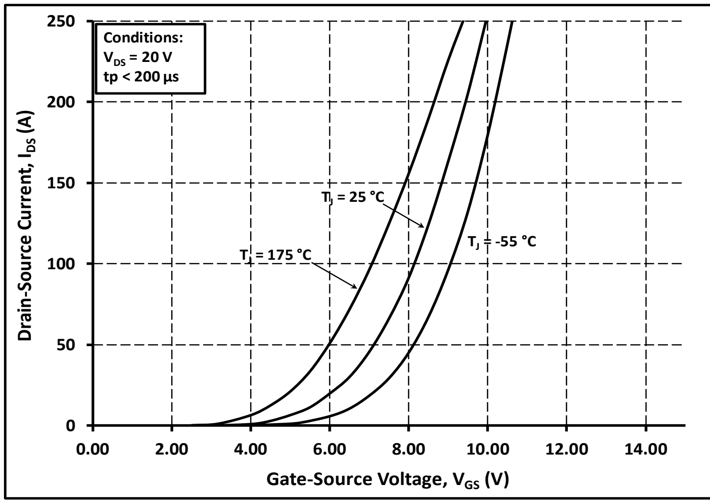

Figure 7. Transfer Characteristic for Various Junction Temperatures

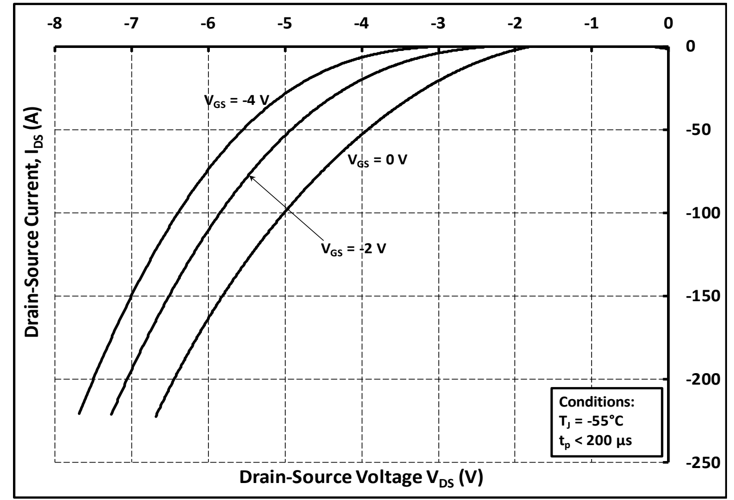

Figure 8. Body Diode Characteristic at -55 °C

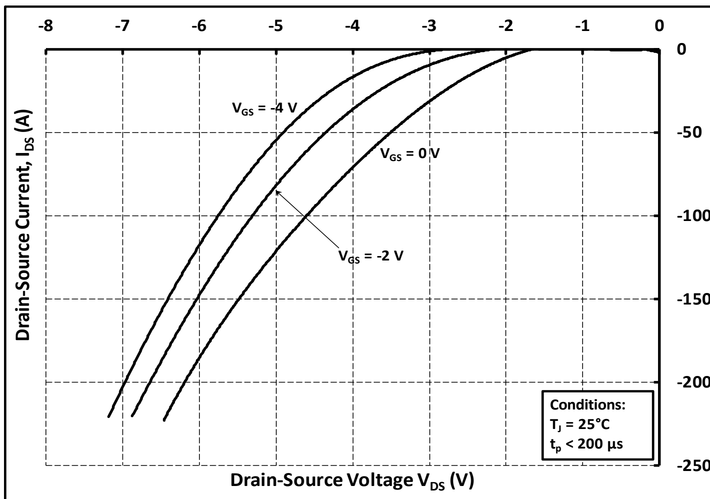

Figure 9. Body Diode Characteristic at 25 °C

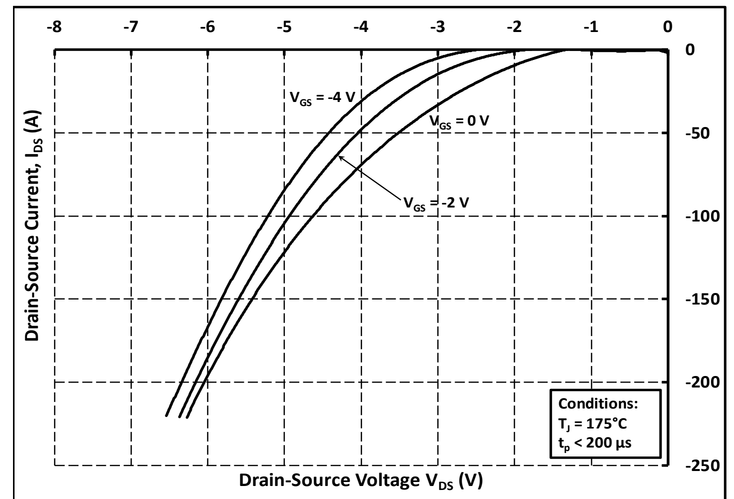

Figure 10. Body Diode Characteristic at 175 °C

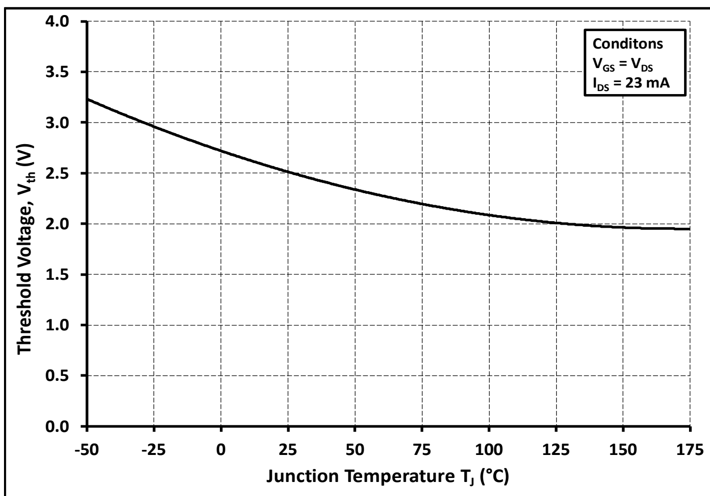

Figure 11. Threshold Voltage vs. Temperature

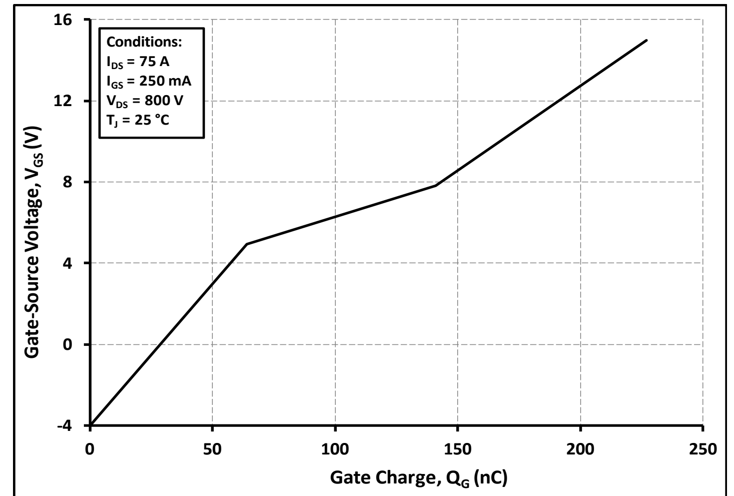

Figure 12. Gate Charge Characteristics

Typical Performance

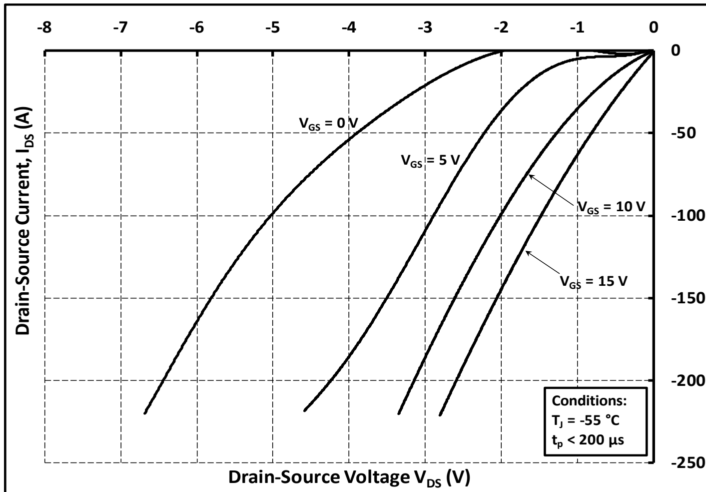

Figure 13. 3rd Quadrant Characteristic at -55 °C

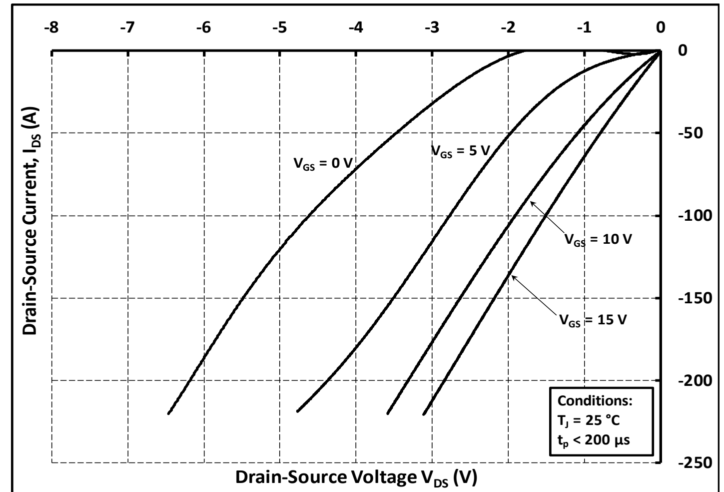

Figure 14. 3rd Quadrant Characteristic at 25 °C

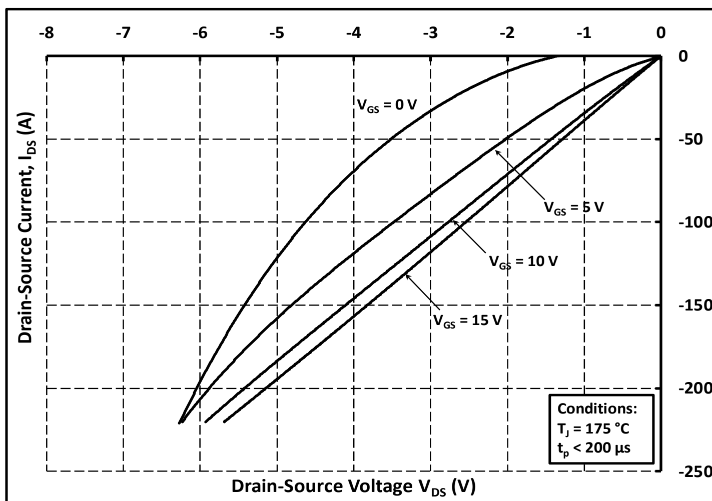

Figure 15. 3rd Quadrant Characteristic at 175 °C

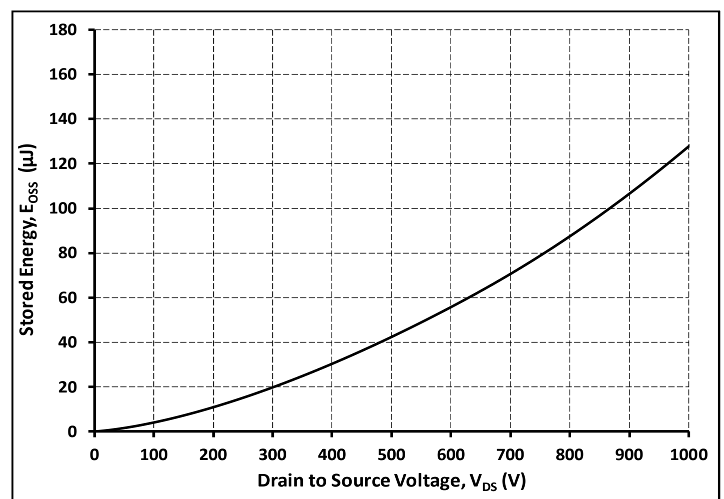

Figure 16. Output Capacitor Stored Energy

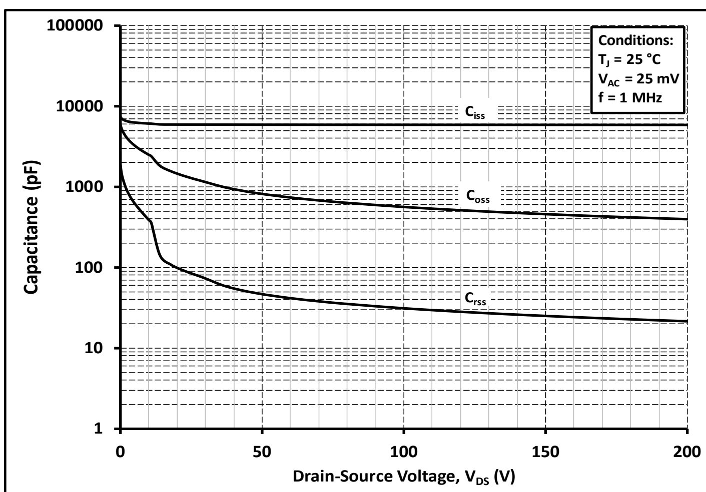

Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

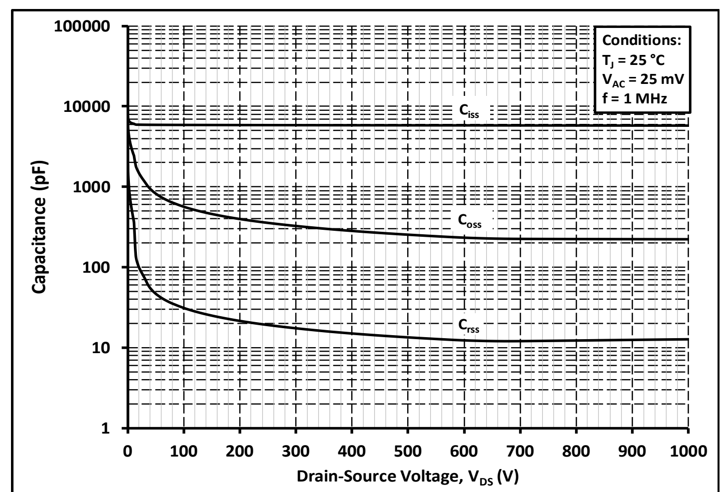

Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

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Revision History

Revision Number	Date of Change	Brief Summary
-	04/04/2019	Initial Release
1	12/4/2019	• Removed test conditions and note section from the Maximum Ratings Table • Updated description for all the parameters in the Maximum Ratings Table • Updated footnotes • Temperature note was removed and embedded into every test condition • Drain-source current in the test condition for gate threshold voltage changed to 21.33mA • Drain-source current in the test condition for drain-source on-state resistance and transconductance changed to 77.2A • Drain-source current in the test condition for gate to source charge, gate to drain charge and total gate charge was changed to 77.2A • Source-drain current in the test condition for diode forward voltage was changed to 37.5A • Source-drain current in the test condition for reverse recovery time, reverse recovery charge and peak reverse recovery current was changed to 77.2A • All junction temperatures were changed to virtual junction temperatures

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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

- **SiC MOSFET Isolated Gate Driver reference design: www.wolfspeed.com/power/Tools-and-Support**
- **Application Considerations for Silicon-Carbide MOSFETs: www.wolfspeed.com/power/Tools-and-Support**

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