CPM3-0900-0065B

Silicon Carbide Power MOSFET
C3M^{TM} MOSFET Technology

N-Channel Enhancement Mode

V_{DS}	900 V
I_{D} @ 25˚C	36 A
$R_{DS(on)}$	65 mΩ

Features

- New C3M SiC MOSFET technlogy
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness

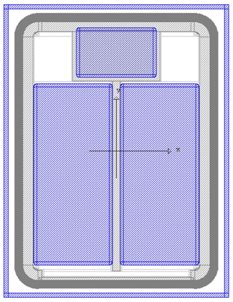
Benefits

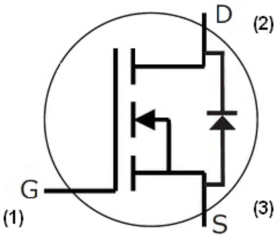
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies

Chip Outline





Part Number	Die Size (mm)
CPM3-0900-0065B	2.25 x 2.95

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	900	V	V_{GS} = 0 V, I_D = 100 μA	
V_{GSmax}	Gate - Source Voltage	-8/+18	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-4/+15	V	Recommended operational values	
I_D	Continuous Drain Current	36	A	V_{GS} =15 V, T_C = 25˚C	Note 1
		23		V_{GS} =15 V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed Drain Current	90	A	Pulse width t_P limited by T_{jmax}	
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	
T_{Proc}	Maximum Processing Temperature	325	˚C	10 min. maximum	

Note (1): Assumes a $R_{\theta JC}$ < 1.0 K/W

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	900			V	V_{GS} = 0 V, I_D = 100 μA	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.1		V	V_{DS} = 10V, I_D = 5 mA	Fig. 11
			1.6		V	V_{DS} = 10V, I_D = 5 mA, T_J = 150ºC	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	V_{DS} = 900 V, V_{GS} = 0 V	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	V_{GS} = 15 V, V_{DS} = 0 V	
$R_{DS(on)}$	Drain-Source On-State Resistance		65	78	mΩ	V_{GS} = 15 V, I_D = 20 A	Fig. 4, 5, 6
			90			V_{GS} = 15 V, I_D = 20A, T_J = 150ºC	
g_{fs}	Transconductance		13.6		S	V_{DS}= 15 V, I_{DS}= 20 A	Fig. 7
			11.6			V_{DS}= 15 V, I_{DS}= 20 A, T_J = 150ºC	
C_{iss}	Input Capacitance		660		pF	V_{GS} = 0 V, V_{DS} = 600 V f = 1 MHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		60				
C_{rss}	Reverse Transfer Capacitance		4.0				
E_{oss}	C_{oss} Stored Energy		16		μJ		Fig. 16
E_{ON}	Turn-On Switching Energy		225		μJ	V_{DS} = 400 V, V_{GS} = -4 V/15 V, I_D = 20A, $R_{G(ext)}$ = 2.5Ω, L= 77 μH, T_J = 150ºC	Note: 3
E_{OFF}	Turn Off Switching Energy		91				
$t_{d(on)}$	Turn-On Delay Time		21		ns	V_{DD} = 400 V, V_{GS} = -4 V/15 V I_D = 20 A, $R_{G(ext)}$ = 2.5 Ω, Timing relative to V_{DS} Per IEC60747-8-4 pg 83 Resistive load	Note: 3
t_r	Rise Time		36				
$t_{d(off)}$	Turn-Off Delay Time		28				
t_f	Fall Time		25				
$R_{G(int)}$	Internal Gate Resistance		4.7		Ω	f = 1 MHz, V_{AC} = 25 mV	
Q_{gs}	Gate to Source Charge		7.5		nC	V_{DS} = 400 V, V_{GS} = -4 V/15 V I_D = 20 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		12				
Q_g	Total Gate Charge		30.4				

Reverse Diode Characteristics (T_C = 25˚C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.8		V	V_{GS} = -4 V, I_{SD} = 10 A	Fig. 8, 9, 10
		4.4		V	V_{GS} = -4 V, I_{SD} = 10 A, T_J = 150 °C	
I_S	Continuous Diode Forward Current		21	A	V_{GS} = -4 V	Note 2
$I_{S, pulse}$	Diode pulse Current		90	A	V_{GS} = -4 V, pulse width t_P limited by T_{jmax}	Note 2
t_{rr}	Reverse Recover time	30		ns	V_{GS} = -4 V, I_{SD} = 20 A, V_R = 400 V dif/dt = 600 A/μs	Note 2
Q_{rr}	Reverse Recovery Charge	134		nC		
I_{rrm}	Peak Reverse Recovery Current	7.5		A		

Note (2): When using SiC Body Diode the maximum recommended V_{GS} = -4V

Note (3): All Switching measurements taken on a TO-247-3 package. Final values may vary depending on final package.

Typical Performance

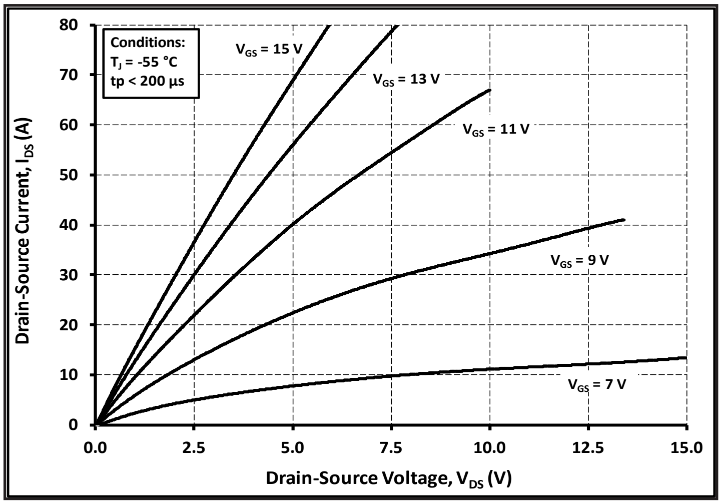


Figure 1. Output Characteristics T_J = -55 °C

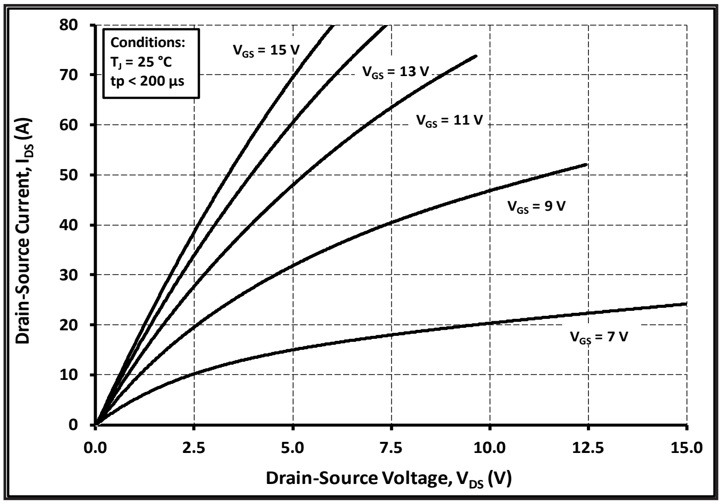


Figure 2. Output Characteristics T_J = 25 °C

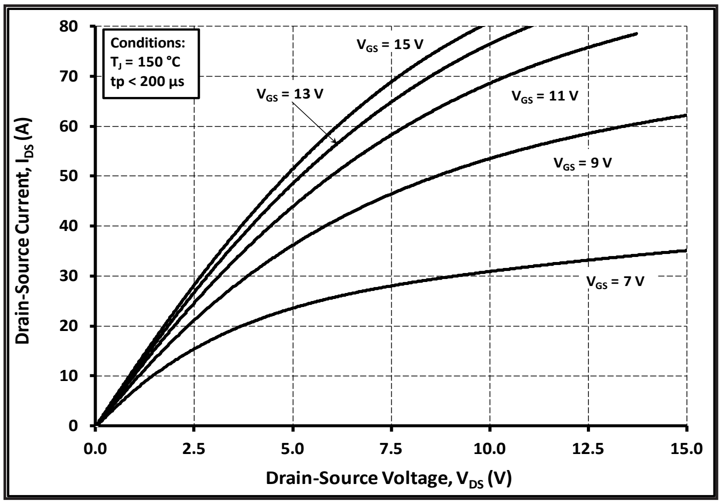


Figure 3. Output Characteristics T_J = 150 °C

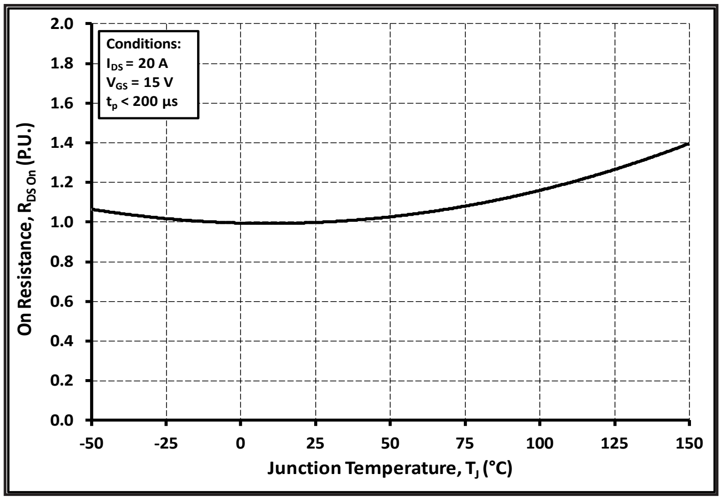


Figure 4. Normalized On-Resistance vs. Temperature

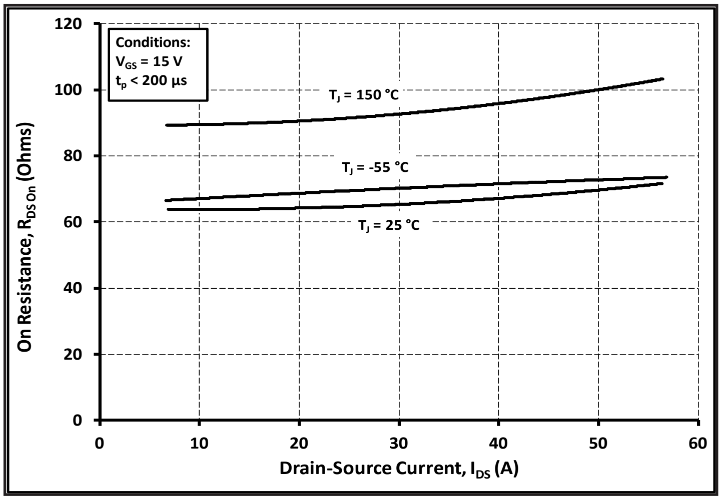


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

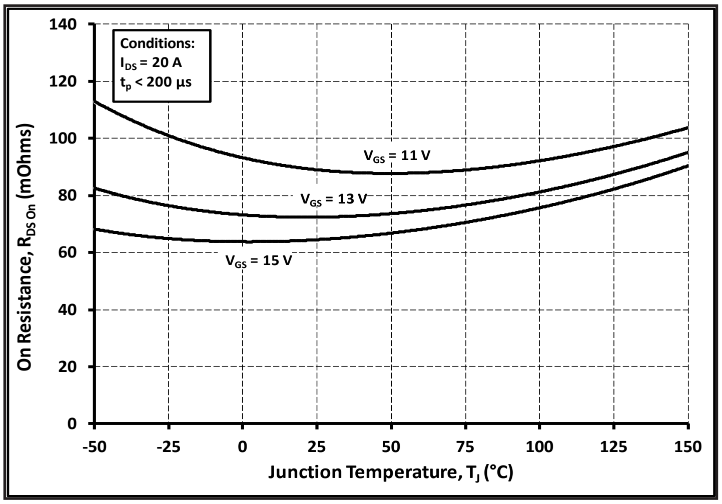


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

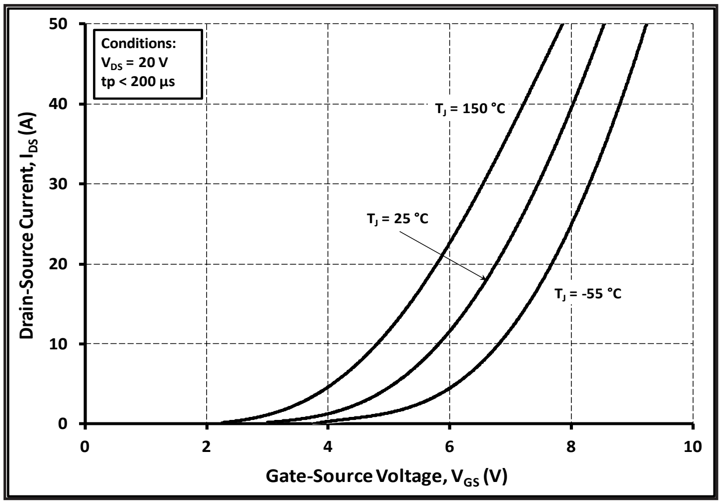


Figure 7. Transfer Characteristic for Various Junction Temperatures

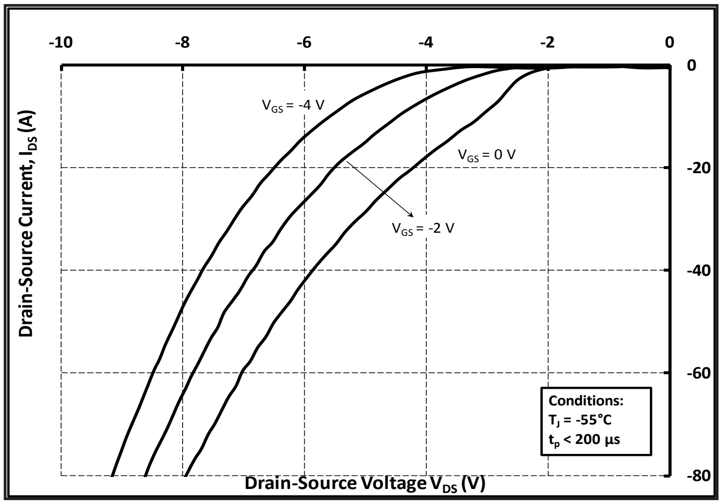


Figure 8. Body Diode Characteristic at -55 °C

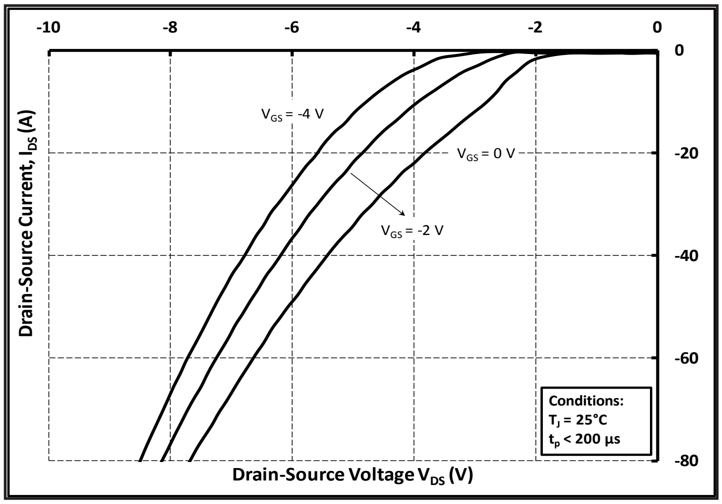


Figure 9. Body Diode Characteristic at 25 °C

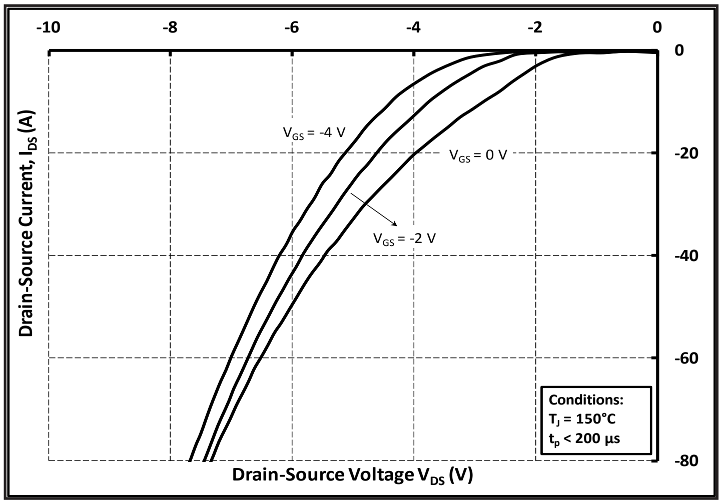


Figure 10. Body Diode Characteristic at 150 °C

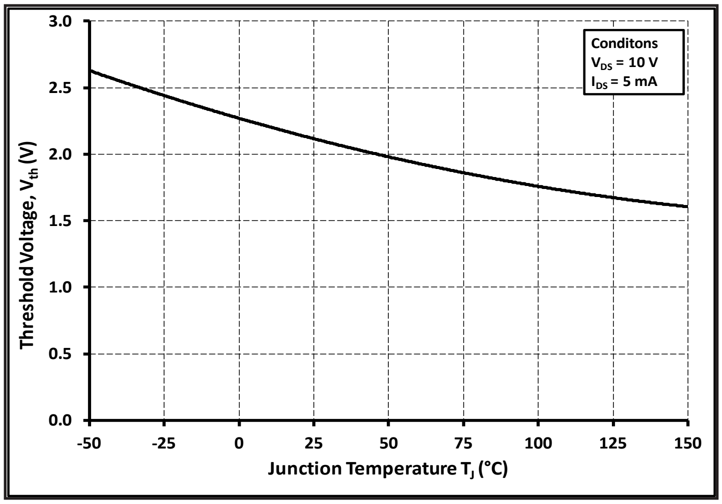


Figure 11. Threshold Voltage vs. Temperature

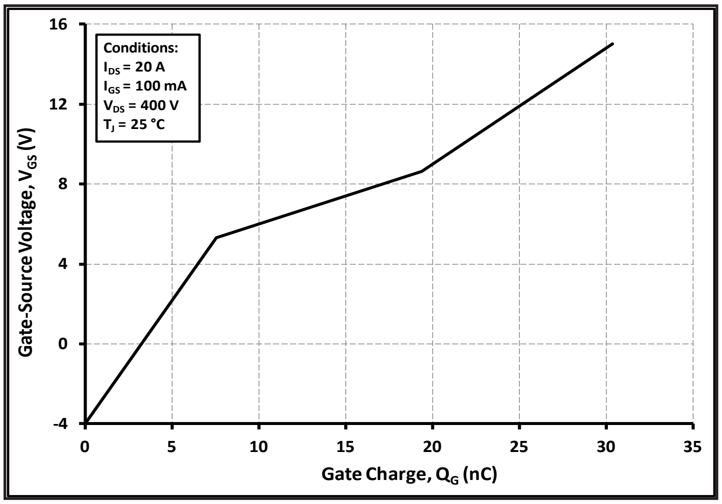


Figure 12. Gate Charge Characteristics

Typical Performance

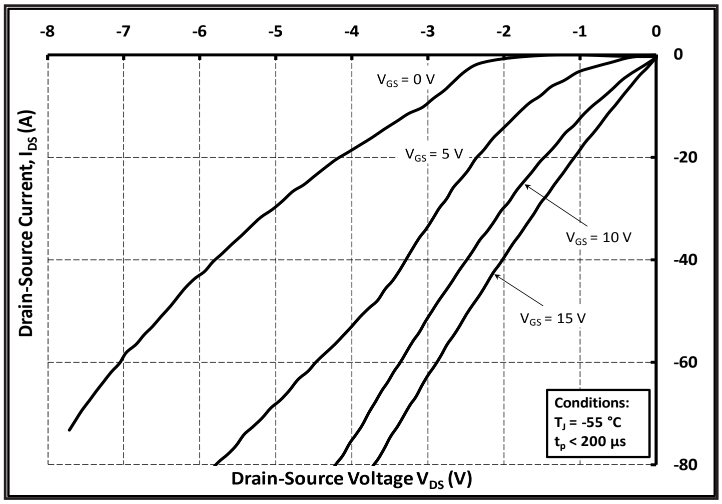


Figure 13. 3rd Quadrant Characteristic at -55 °C

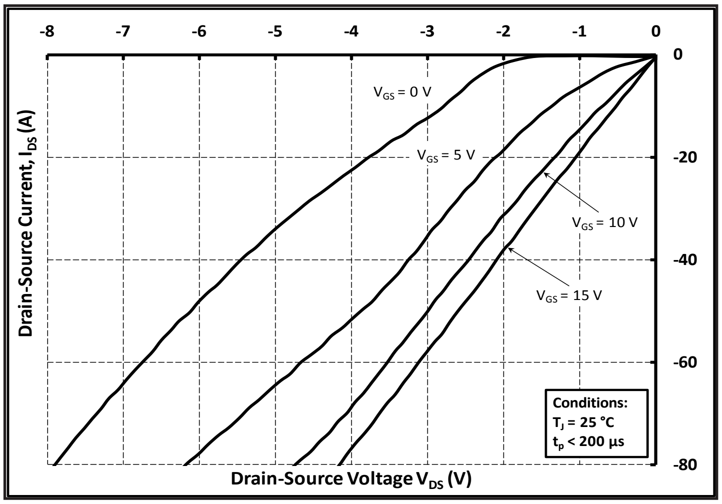


Figure 14. 3rd Quadrant Characteristic at 25 °C

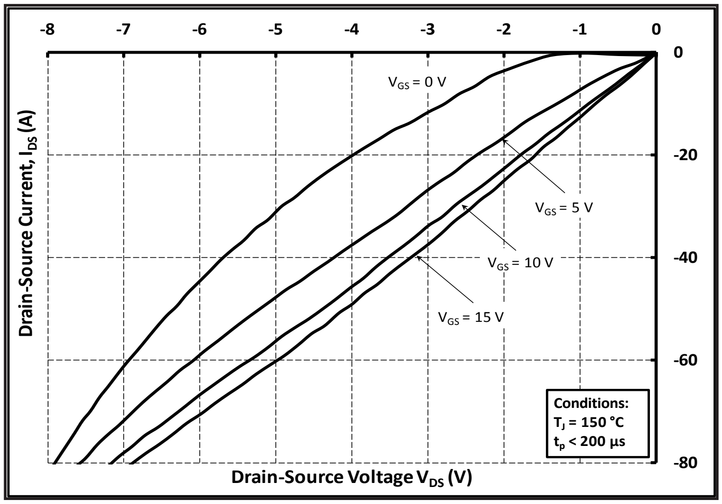


Figure 15. 3rd Quadrant Characteristic at 150 °C

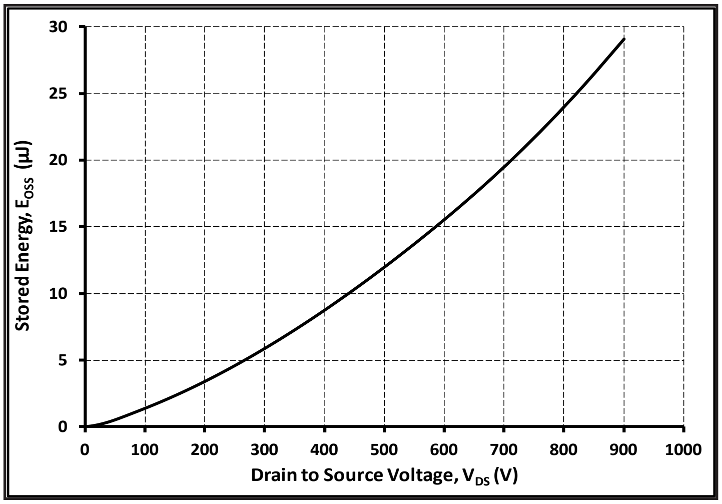


Figure 16. Output Capacitor Stored Energy

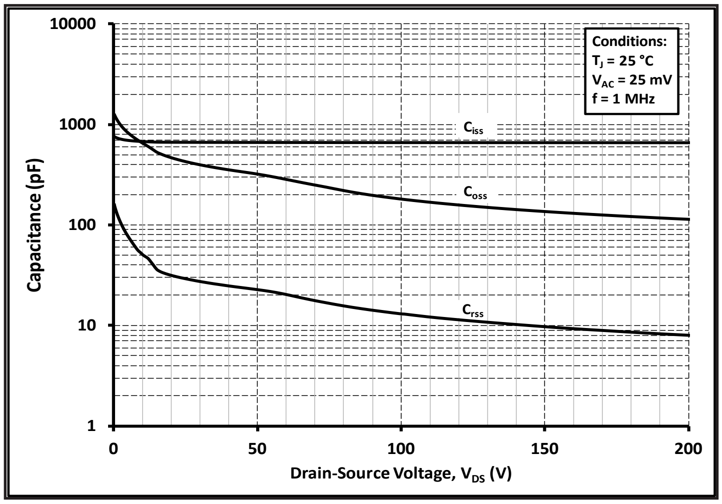


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

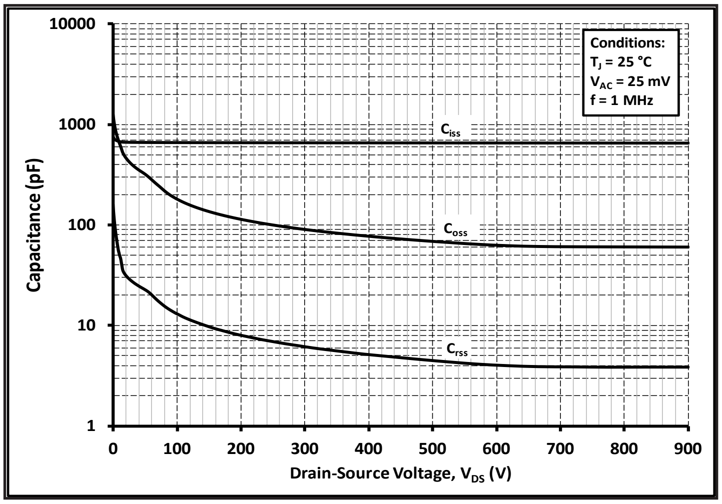
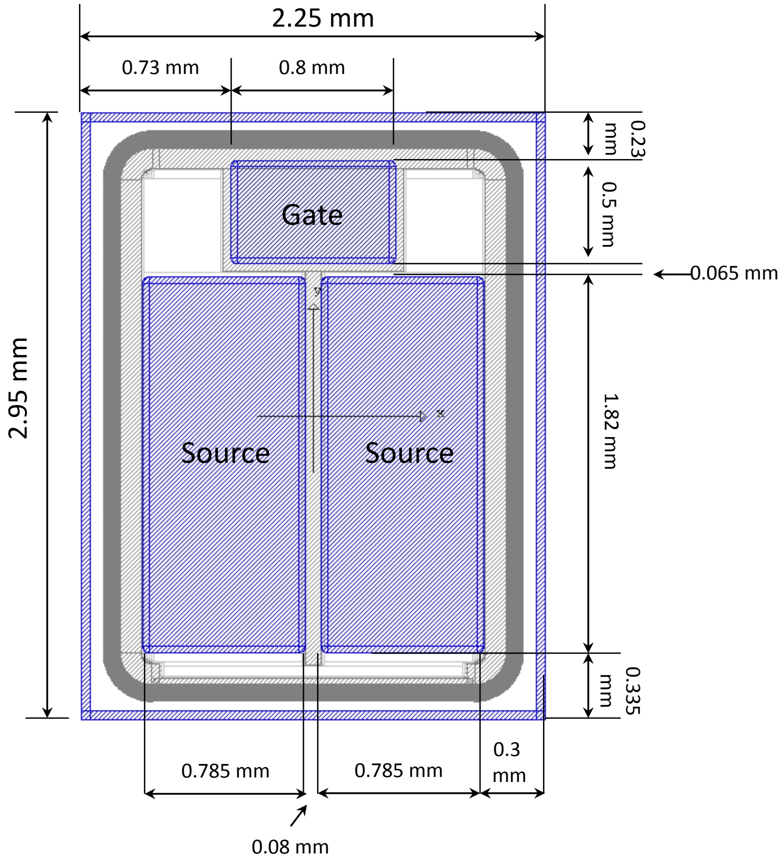


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 900V)

Mechanical Parameters

Parameter	Typ	Unit
Die Dimensions (L x W)	2.25 x 2.95	mm
Exposed Source Pad Metal Dimensions (Each)	1.82 x 0.785 (x 2)	mm
Gate Pad Dimensions	0.8 x 0.5	mm
Chip Thickness	180 ± 10%	µm
Frontside (Source) metallization (Al)	4	µm
Frontside (Gate) metallization (Al)	4	µm
Backside (Drain) metallization (Ni/Ag)	1.8	µm

Chip Dimensions



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.cree.com/power/Tools-and-Support**
- **Application Considerations for Silicon-Carbide MOSFETs: www.cree.com/power/Tools-and-Support**

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