

# CPM2-1200-0160B

## Silicon Carbide Power MOSFET C2M™ MOSFET Technology

N-Channel Enhancement Mode

### Features

- New C2M SiC MOSFET technology
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Resistant to Latch-Up
- Halogen Free, RoHS Compliant

### Benefits

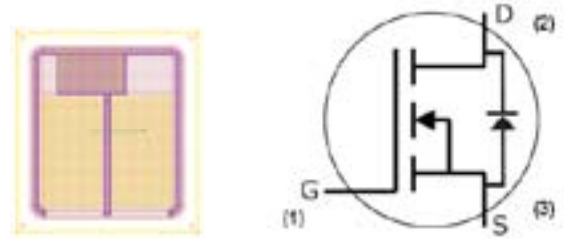
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

### Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- LED Lighting Power Supplies

$V_{DS}$	1200 V
$I_D @ 25^\circ C$	19 A
$R_{DS(on)}$	160 mΩ

### Chip Outline



Part Number	Die Size (mm)
CPM2-1200-0160B	2.39 × 2.63

### Maximum Ratings ( $T_c = 25^\circ C$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DSmax}$	Drain - Source Voltage	1200	V	$V_{GS} = 0 V, I_D = 100 \mu A$	
$V_{GSmax}$	Gate - Source Voltage	-10/+25	V	Absolute maximum values	
$V_{GSop}$	Gate - Source Voltage	-5/+20	V	Recommended operational values	
$I_D$	Continuous Drain Current	19	A	$V_{GS} = 20 V, T_C = 25^\circ C$	
		12.5		$V_{GS} = 20 V, T_C = 100^\circ C$	
$I_{D(pulse)}$	Pulsed Drain Current	40	A	Pulse width $t_p$ limited by $T_{jmax}$	
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-55 to +150	$^\circ C$		
$T_L$	Solder Temperature	260	$^\circ C$	1.6mm (0.063") from case for 10s	
$T_{Proc}$	Maximum Processing Temperature	325	$^\circ C$	10 min. maximum	

Note (1): Assumes a  $R_{\theta JC} < 0.90 K/W$



## Electrical Characteristics (T<sub>c</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	1200			V	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA	
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.4	2.5		V	V <sub>DS</sub> = 10V, I <sub>DS</sub> = 2.5 mA	Fig. 11
		1.8	1.9		V	V <sub>DS</sub> = 10V, I <sub>DS</sub> = 2.5 mA, T <sub>J</sub> = 150°C	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		1	100	μA	V <sub>DS</sub> = 1200 V, V <sub>GS</sub> = 0 V	
I <sub>GSS</sub>	Gate-Source Leakage Current			250	nA	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V	
R <sub>DS(on)</sub>	Drain-Source On-State Resistance		160	196	mΩ	V <sub>GS</sub> = 20 V, I <sub>D</sub> = 10 A	Fig. 4, 5, 6
			290			V <sub>GS</sub> = 20 V, I <sub>D</sub> = 10A, T <sub>J</sub> = 150°C	
g <sub>fs</sub>	Transconductance		4.8		S	V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 10 A	Fig. 7
			4.3			V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 10 A, T <sub>J</sub> = 150°C	
C <sub>iss</sub>	Input Capacitance		525		pF	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 1000 V f = 1 MHz	Fig. 17, 18
C <sub>oss</sub>	Output Capacitance		47				
C <sub>rss</sub>	Reverse Transfer Capacitance		4				
E <sub>oss</sub>	C <sub>oss</sub> Stored Energy		25		μJ	V <sub>AC</sub> = 25 mV	Fig. 16
E <sub>AS</sub>	Avalanche Energy, Single Pluse		600		mJ	I <sub>D</sub> = 10A, V <sub>DD</sub> = 50V	
E <sub>ON</sub>	Turn-On Switching Energy		79		μJ	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = -5/20 V, I <sub>D</sub> = 10A, R <sub>G(ext)</sub> = 2.5Ω, L = 256 μH	
E <sub>OFF</sub>	Turn Off Switching Energy		57				
t <sub>d(on)</sub>	Turn-On Delay Time		9		ns	V <sub>DD</sub> = 800 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 10 A R <sub>G(ext)</sub> = 2.5 Ω, R <sub>L</sub> = 80 Ω Timing relative to V <sub>DS</sub> Per IEC60747-8-4 pg 83	
t <sub>r</sub>	Rise Time		11				
t <sub>d(off)</sub>	Turn-Off Delay Time		16				
t <sub>f</sub>	Fall Time		10				
R <sub>G(int)</sub>	Internal Gate Resistance		6.5		Ω	f = 1 MHz, V <sub>AC</sub> = 25 mV	
Q <sub>gs</sub>	Gate to Source Charge		7		nC	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 10 A Per IEC60747-8-4 pg 21	Fig. 12
Q <sub>gd</sub>	Gate to Drain Charge		14				
Q <sub>g</sub>	Total Gate Charge		34				

## Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V <sub>SD</sub>	Diode Forward Voltage	3.3		V	V <sub>GS</sub> = -5 V, I <sub>F</sub> = 5 A	Fig. 8,9, 10
		3.1			V <sub>GS</sub> = -5V, I <sub>F</sub> = 5 A, T <sub>J</sub> = 150 °C	
I <sub>S</sub>	Continuous Diode Forward Current		19	A	T <sub>c</sub> = 25°C	Note 2
t <sub>rr</sub>	Reverse Recovery Time	23		ns	V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 10 A, V <sub>R</sub> = 800 V dif/dt = 3200 A/μs	Note 2
Q <sub>rr</sub>	Reverse Recovery Charge	105		nC		
I <sub>rrm</sub>	Peak Reverse Recovery Current	9		A		

Note (2): When using SiC Body Diode the maximum recommended V<sub>GS</sub> = -5V

Note (3): For inductive and resistive switching data and waveforms please refer to datasheet for packaged device. Part number C2M0160120D.

# Typical Performance

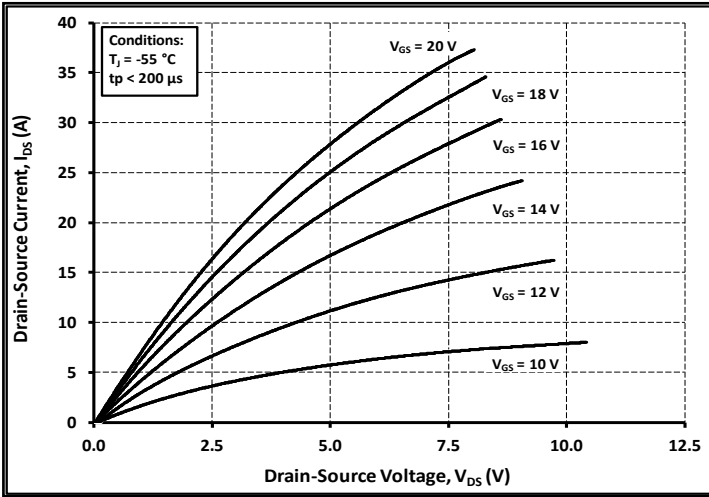


Figure 1. Output Characteristics  $T_j = -55\text{ }^\circ\text{C}$

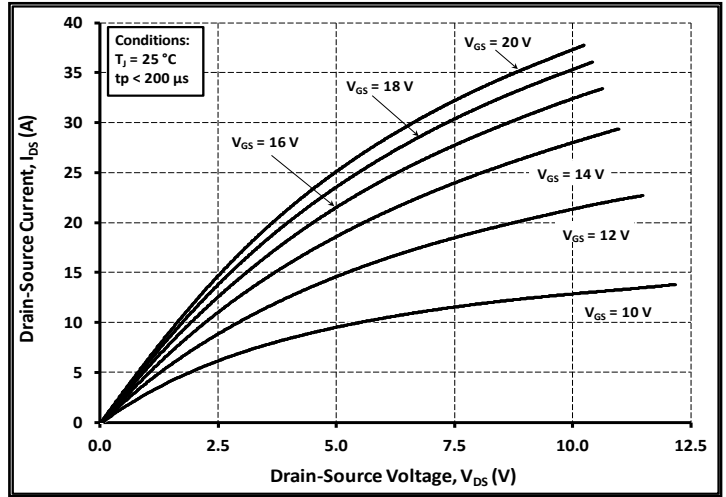


Figure 2. Output Characteristics  $T_j = 25\text{ }^\circ\text{C}$

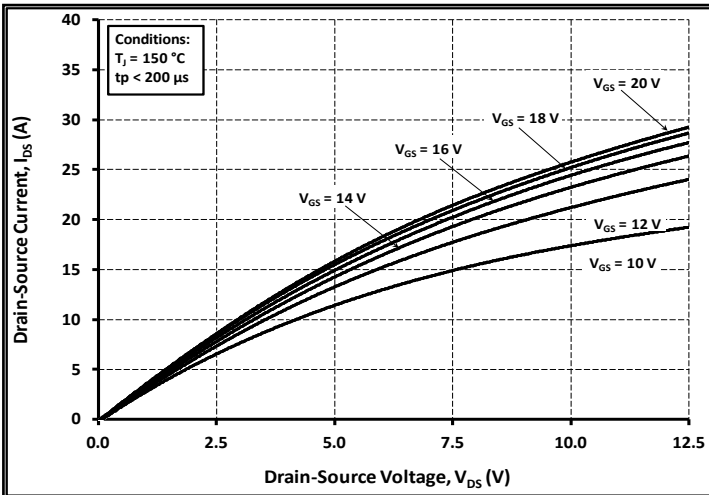


Figure 3. Output Characteristics  $T_j = 150\text{ }^\circ\text{C}$

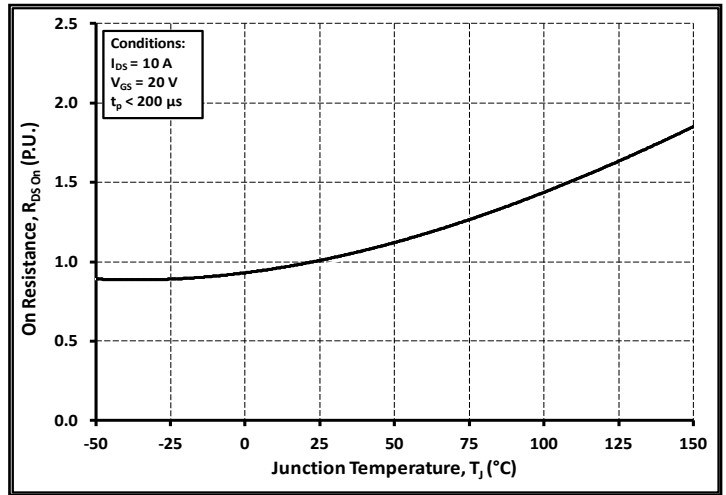


Figure 4. Normalized On-Resistance vs. Temperature

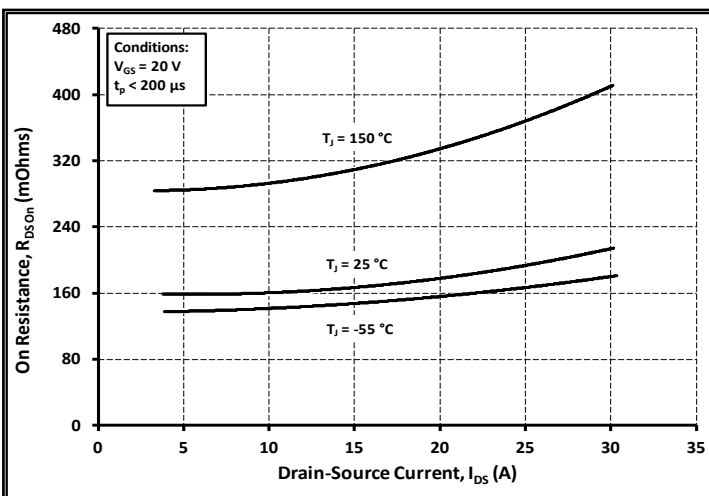


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

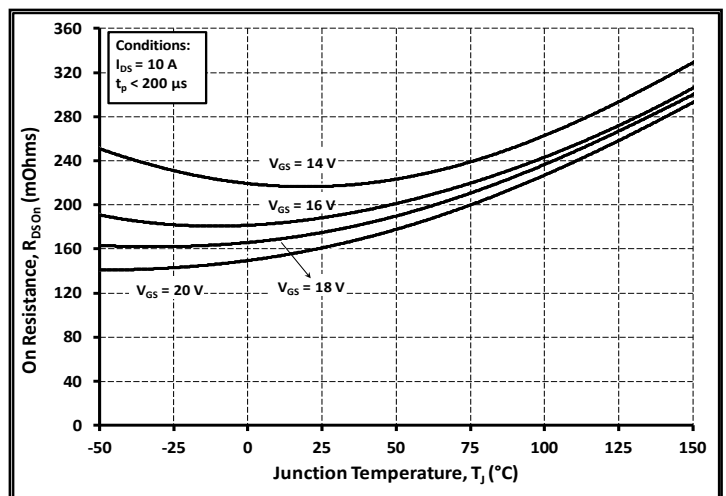


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

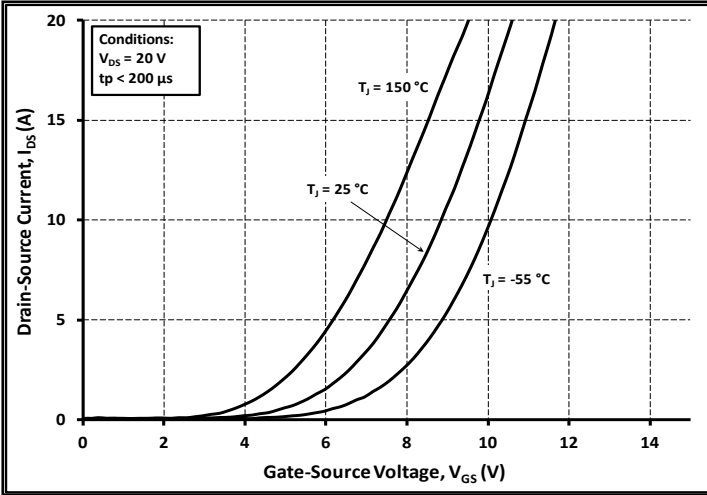


Figure 7. Transfer Characteristic for Various Junction Temperatures

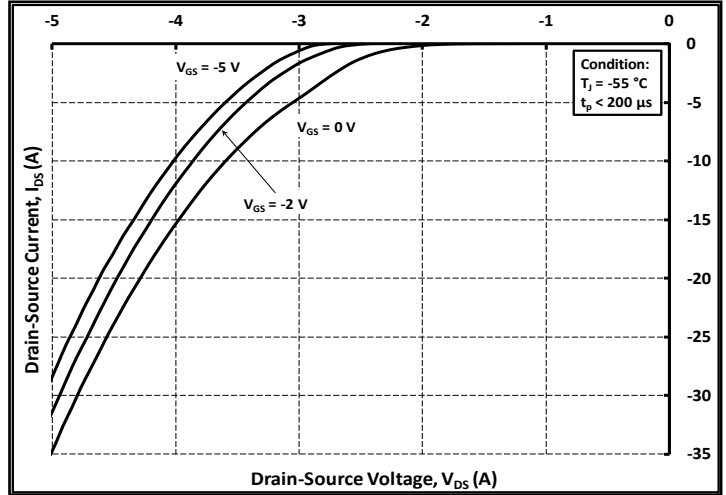


Figure 8. Body Diode Characteristic at -55 °C

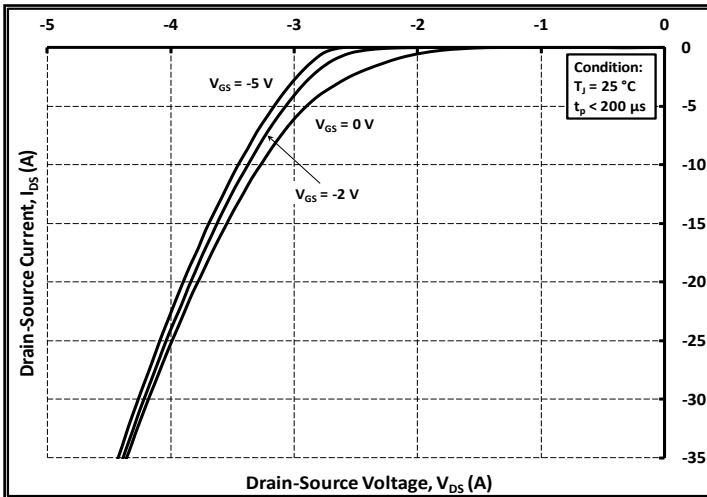


Figure 9. Body Diode Characteristic at 25 °C

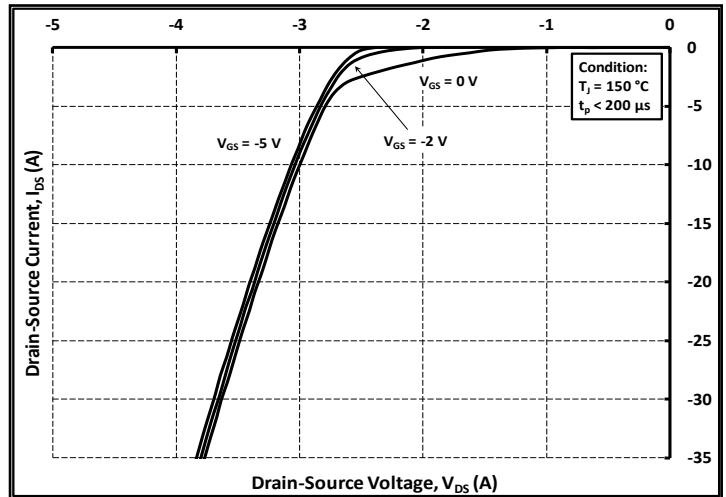


Figure 10. Body Diode Characteristic at 150 °C

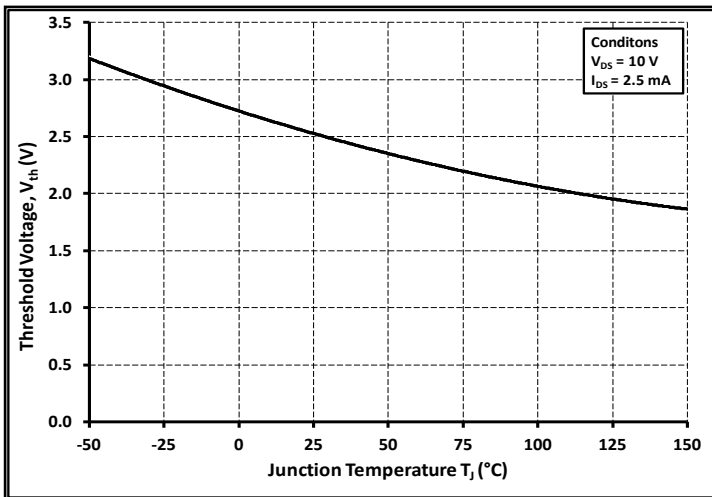


Figure 11. Threshold Voltage vs. Temperature

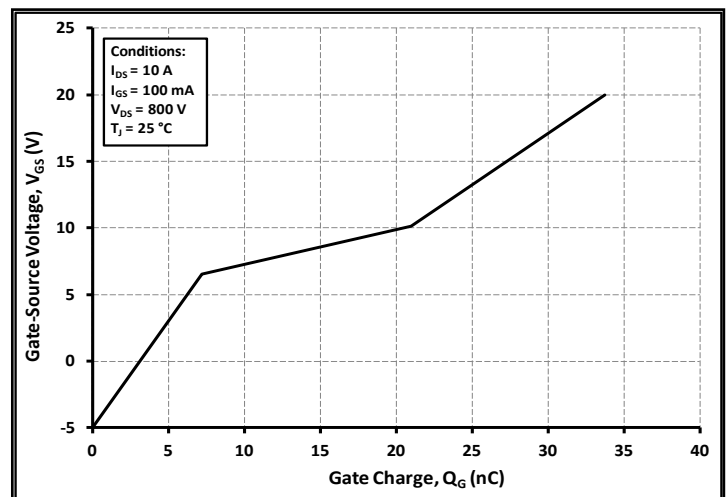


Figure 12. Gate Charge Characteristics

# Typical Performance

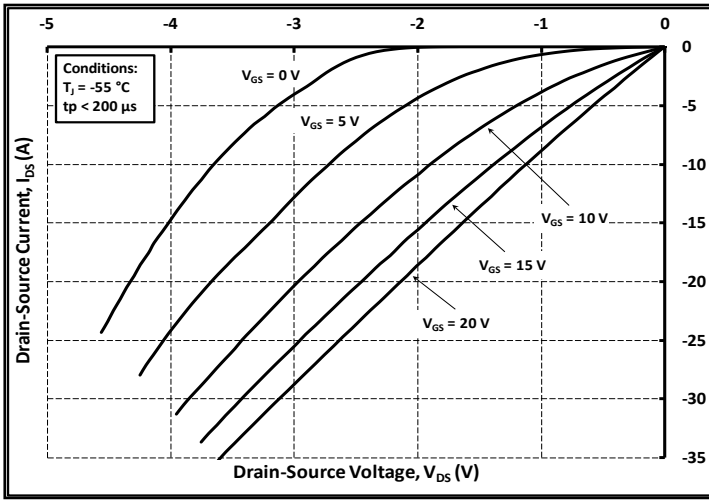


Figure 13. 3rd Quadrant Characteristic at -55 °C

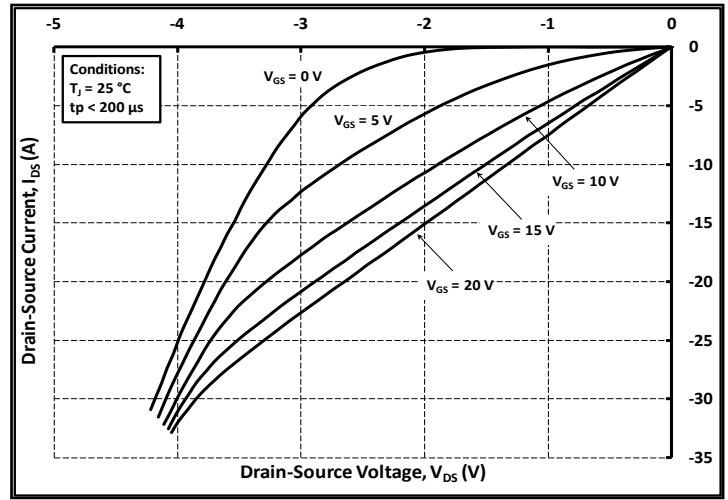


Figure 14. 3rd Quadrant Characteristic at 25 °C

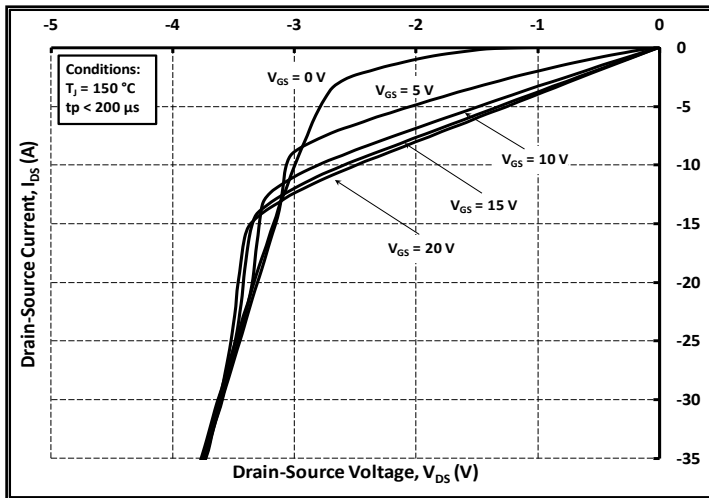


Figure 15. 3rd Quadrant Characteristic at 150 °C

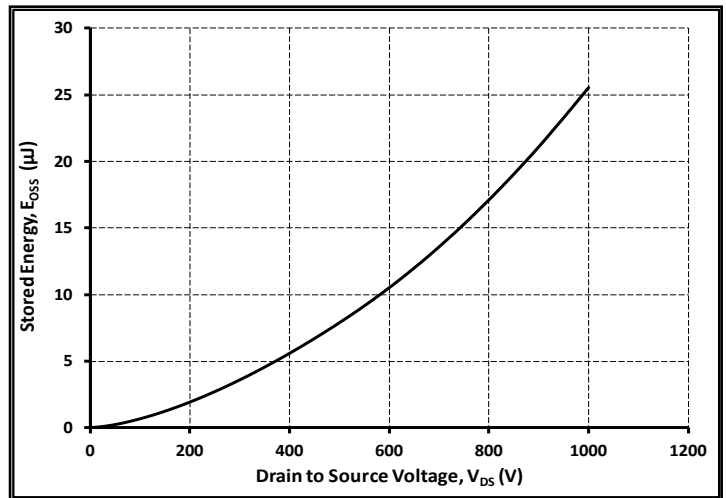


Figure 16. Output Capacitor Stored Energy

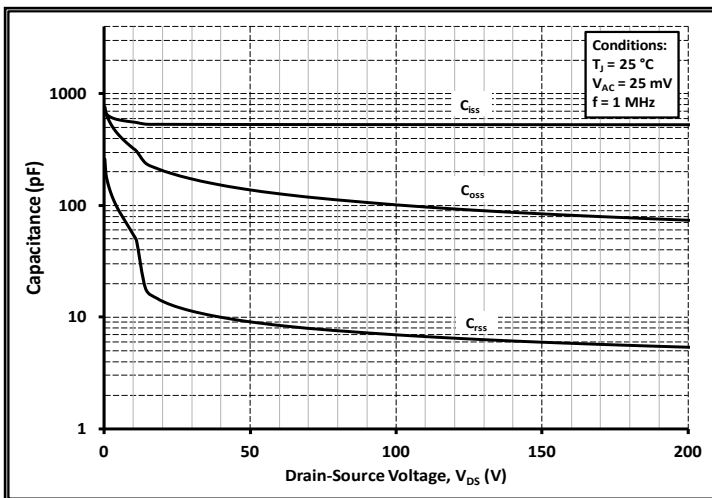


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

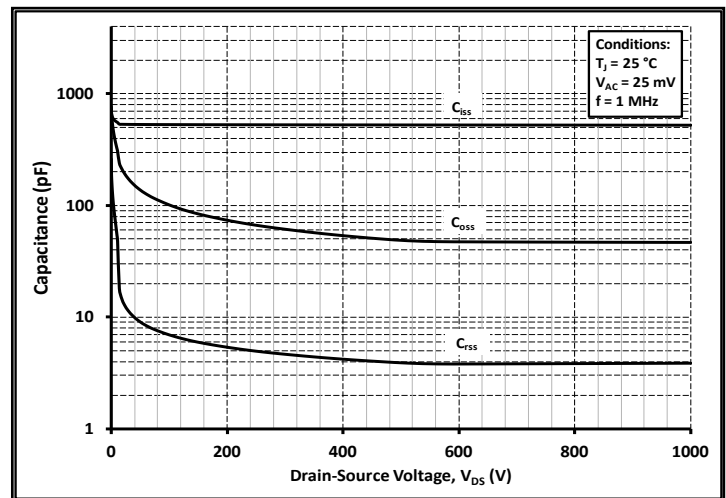
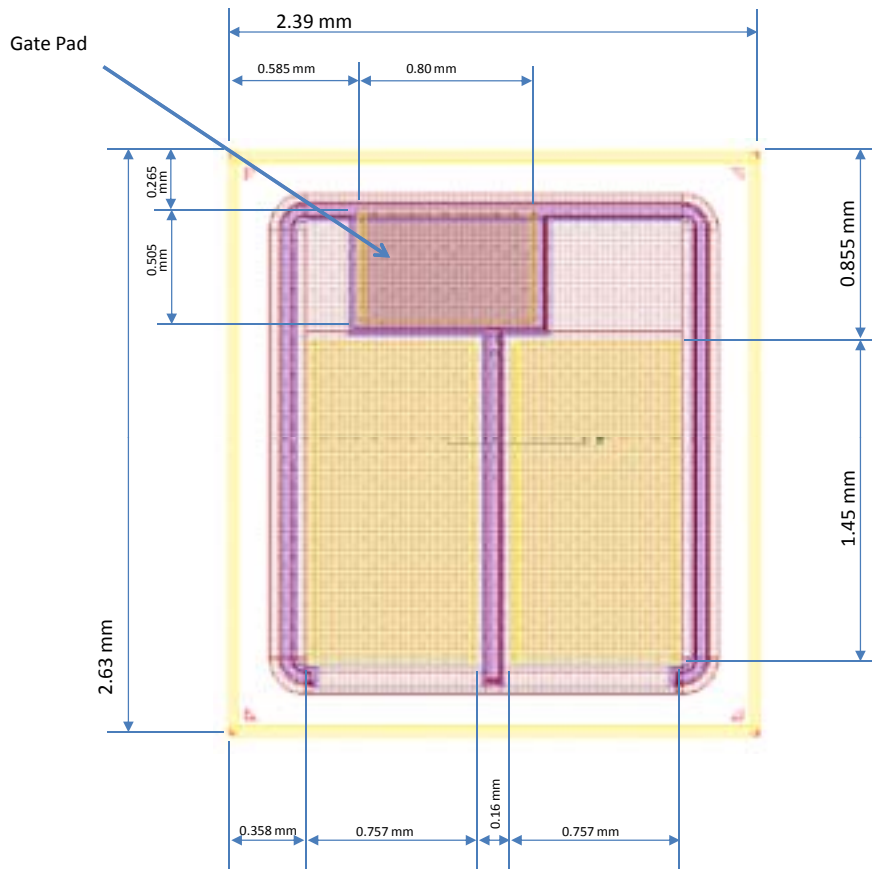


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

## Mechanical Parameters

Parameter	Typical Value	Unit
Die Dimensions (L x W)	2.39 × 2.63	mm
Exposed Source Pad Metal Dimensions (LxW) Each	0.757 × 1.45	mm
Gate Pad Dimensions (L x W)	0.80 × 0.505	mm
Die Thickness	180 ± 40	µm
Top Side Source metallization (Al)	4	µm
Top Side Gate metallization (Al)	4	µm
Bottom Drain metallization (Ni/Ag)	0.8 / 0.6	µm

## Chip Dimensions





## Notes

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- **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](http://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

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- **C2M PSPICE Models:** [www.cree.com/power](http://www.cree.com/power)
- **SiC MOSFET Isolated Gate Driver reference design:** [www.cree.com/power](http://www.cree.com/power)
- **Application Considerations for Silicon-Carbide MOSFETs:** [www.cree.com/power](http://www.cree.com/power)