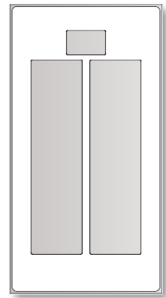
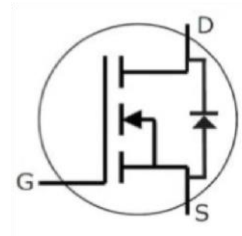
CPM2-1200-0040A

Wolfspeed SiC Gen 2 MOSFET

Description

This is the Wolfspeed's 2nd generation of high performance silicon carbide MOSFET in a packageless bare die format to be implemented into any custom module design. The high blocking voltage with low on-resistance, high speed switching with low capacitance make this MOSFET ideal for high frequency switching application including solar inverters and motor drives.





Package Types: Bare Die
PN's: CPM2-1200-0040A

Features

- Enhanced 2nd Generation SiC MOSFET
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- Fast intrinsic diode with low reverse recovery

Applications

- UPS
- Solar Inverters
- SMPS
- DC/DC Converters
- Motor Drives

Absolute Maximum Ratings

Stress beyond those listed under absolute maximum ratings may damage the device.

Parameter	Symbol		Rating	Unit
Drain-Source Voltage, across T_{vj}	$V_{DS(max)}$		1200	V
Maximum Gate-Source Voltage, Peak Transient Capability	$V_{GS(max)}$		-10/+25	V
Continuous Drain Current, V_{GS} = 15V, assumes die packaged in TO-247 package with $R_{th(j-c)}$ < 0.38 K/W	I_D	T_c = 25°C	60	A
		T_c = 100°C	44	
Pulsed Drain Current, t_p limited by $T_{vj(max)}$	$I_{D(pulse)}$		170	A
Virtual Junction and Storage Temperature	T_{VJ}, T_{stg}		-55 to 175	°C
Maximum Processing Temperature, in non-reactive ambient	T_{proc}		325	°C

Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Recommended Operating Gate - Source Voltage	$V_{GS(op)}$	-5/+20	V

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Electrical Characteristics (T_{VJ} = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200			V	V_{GS} = 0 V, I_D =100 µA
Gate Threshold Voltage	$V_{GS(th)}$	2.0	3.1	4.0	V	V_{DS} = V_{GS}, I_{DS} = 10 mA
			2.3		V	V_{DS} = V_{GS}, I_{DS} = 10 mA, T_{VJ} = 175°C
Zero Gate Voltage Drain Current	I_{DSS}		1	100	µA	V_{DS} = 1200 V, V_{GS} = 0 V
Gate-Source Leakage Current	I_{GSS}		10	250	nA	V_{GS} = 20 V, V_{DS} = 0 V
Drain-Source On-State Resistance	$R_{DS(on)}$		40	52	mΩ	V_{GS} = 20 V, I_D = 40 A
			90			V_{GS} = 20 V, I_D = 40 A, T_{VJ} = 175°C
Transconductance	g_{fs}		18		S	V_{DS} = 20 V, I_{DS} = 40 A
			17			V_{DS} = 20 V, I_{DS} = 40 A, T_{VJ} = 175°C
Input Capacitance	C_{iss}		2287		pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 1 Mhz V_{AC} = 25 mV
Output Capacitance	C_{oss}		157			
Reverse Transfer Capacitance	C_{rss}		8			
C_{oss} Stored Energy	E_{oss}		85		µJ	V_{DS} = 1000 V, f = 1 Mhz
Internal Gate Resistance	$R_{G(int)}$		2.7		Ω	f = 1 Mhz, V_{AC} = 25 mV
Gate to Source Charge	Q_{gs}		29		nC	V_{DS} = 800 V, V_{GS} = -5 V/20 V I_{DS} = 40 A Per IEC60747-8-4 pg 21
Gate to Drain Charge	Q_{gd}		45			
Total Gate Charge	Q_g		131			

Reverse Diode Characteristics (T_{VJ} = 25˚C)

Characteristics	Symbol	Typ.	Max.	Unit	Test Conditions
Diode Forward Voltage	V_{SD}	4.2		V	V_{GS} = -5 V, I_{SD} = 20 A
		3.7		V	V_{GS} = -5 V, I_{SD} = 20 A, T_{VJ} = 175 °C
Reverse Recovery Time	t_{rr}	63		ns	V_{GS} = -5 V, I_{SD} = 40 A, V_R = 800 V dif/dt = 1406 A/µs
Reverse Recovery Charge	Q_{rr}	964		nC	
Peak Reverse Recovery Current	I_{rrm}	18		A	

Typical Performance

All the graphs are based on a die placed in a TO-247-4L package.

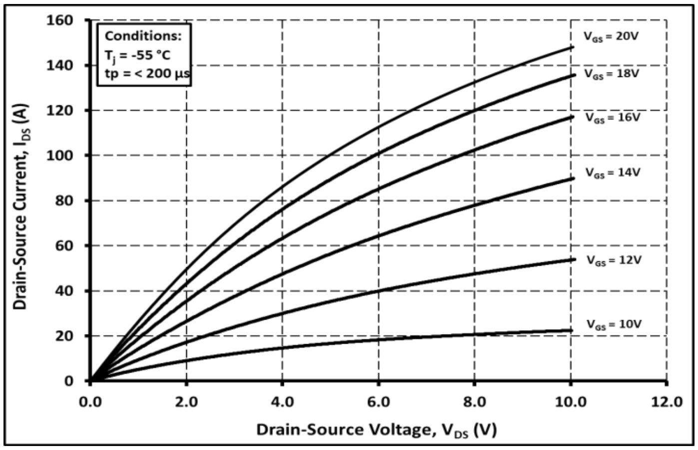


Figure 1.

Output Characteristics T_{vj} = -55 °C

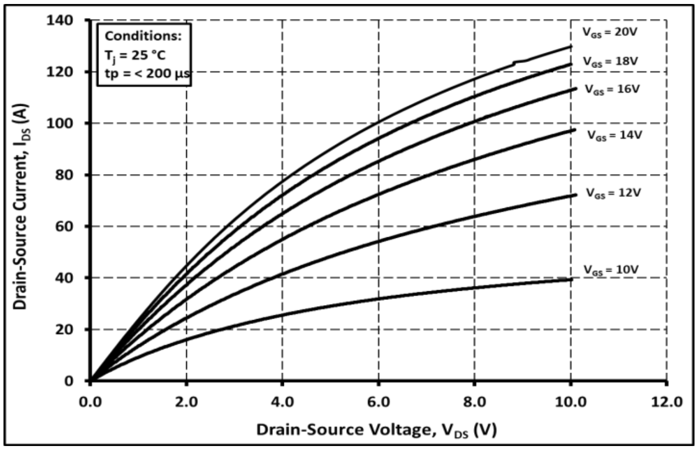


Figure 2.

Output Characteristics T_{vj} = 25 °C

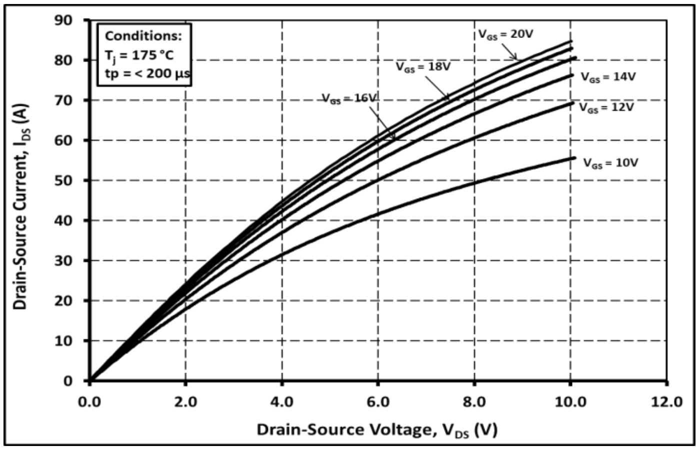


Figure 3.

Output Characteristics T_{vj} = 175 °C

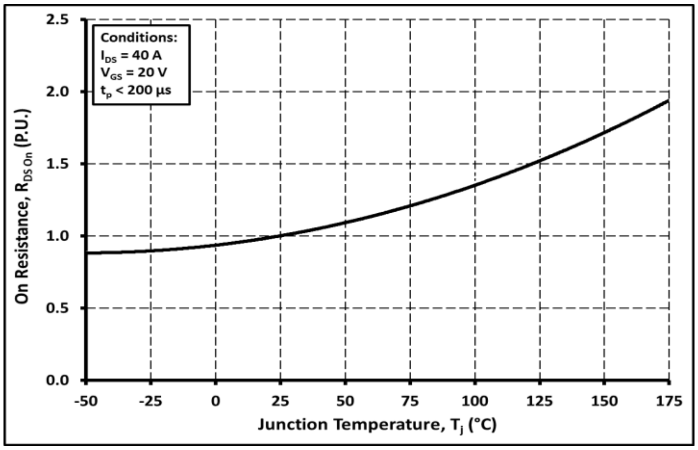


Figure 4.

Normalized On-Resistance vs. Temperature

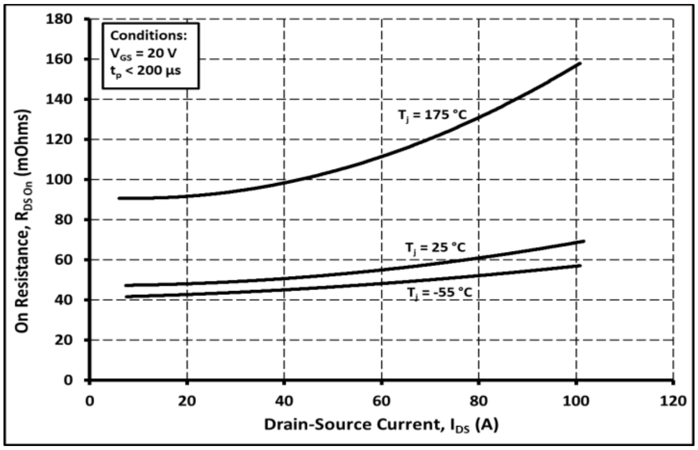


Figure 5.

On-Resistance vs. Drain Current For Various Temperatures

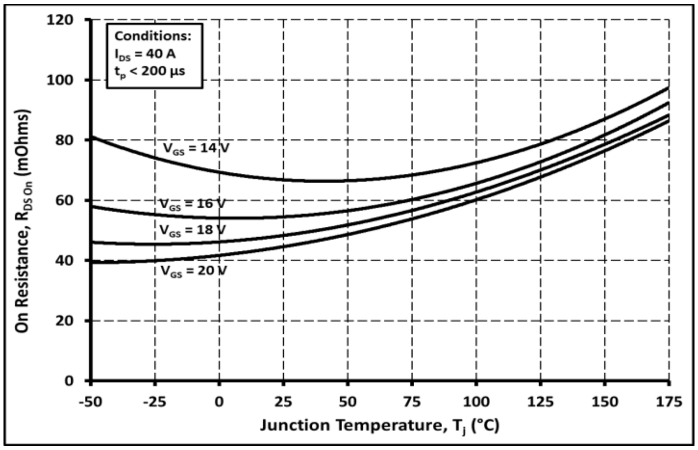


Figure 6.

On-Resistance vs. Temperature For Various Gate Voltages

Typical Performance

All the graphs are based on a die placed in a TO-247-4L package.

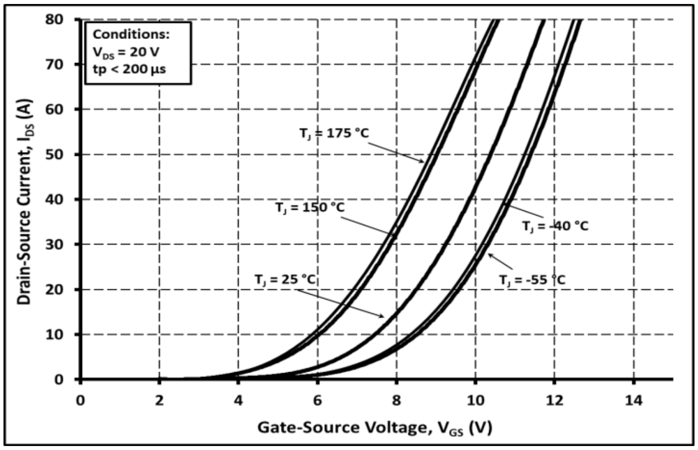


Figure 7.

Transfer Characteristic For Various Junction Temperatures

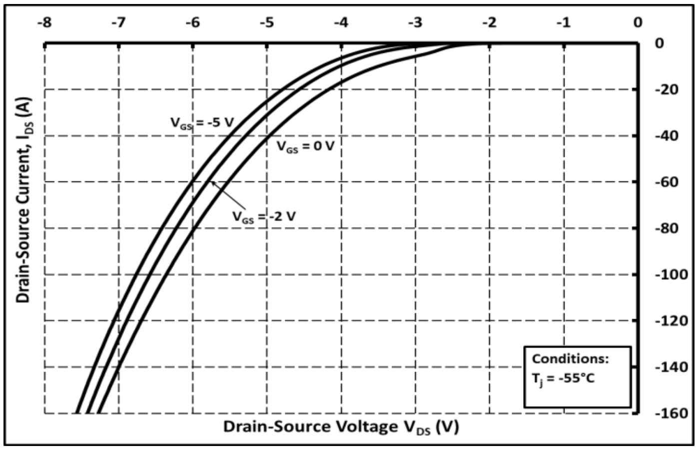


Figure 8.

Body Diode Characteristic at T_{vj} = -55 °C

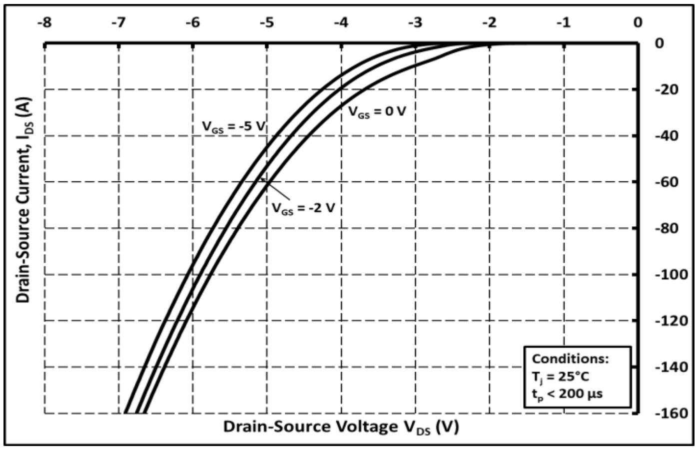


Figure 9.

Body Diode Characteristic at T_{vj} = 25 °C

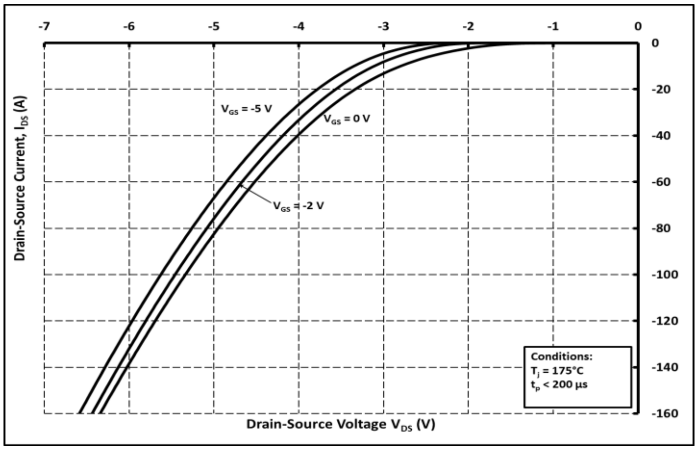


Figure 10.

Body Diode Characteristic at T_{vj} = 175 °C

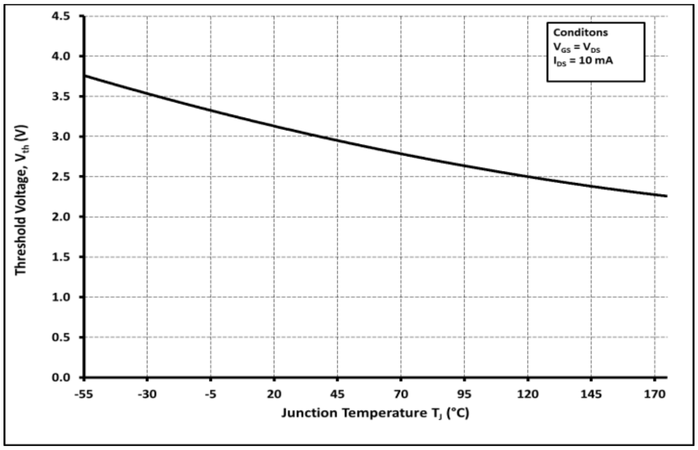


Figure 11.

Threshold Voltage vs. Temperature

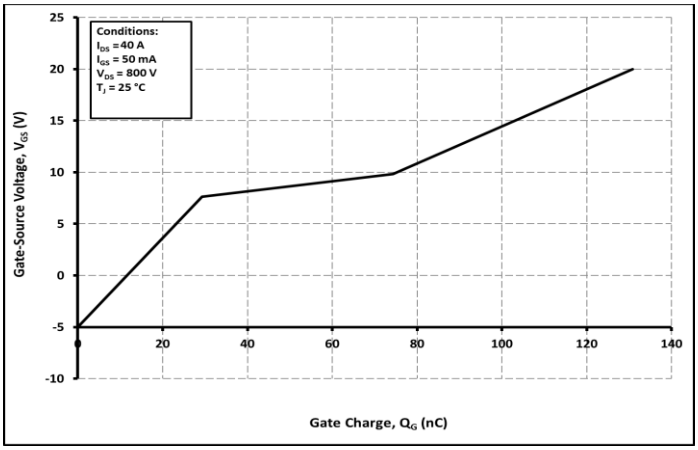


Figure 12.

Gate Charge Characteristics

Typical Performance

All the graphs are based on a die placed in a TO-247-4L package.

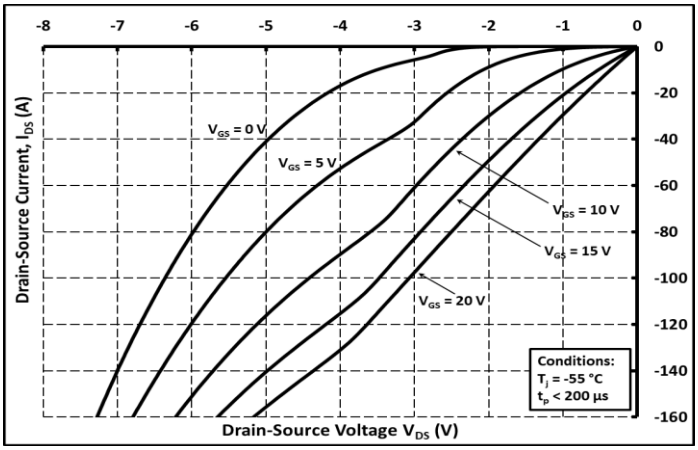


Figure 13.

3rd Quadrant Characteristic at T_{vj} = -55 °C

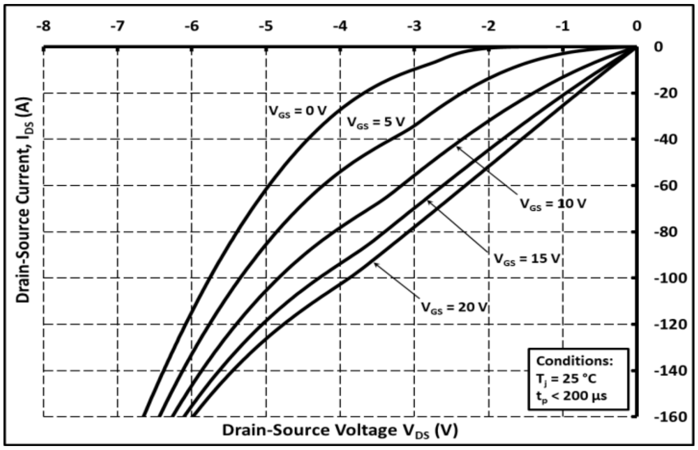


Figure 14.

3rd Quadrant Characteristic at T_{vj} = 25 °C

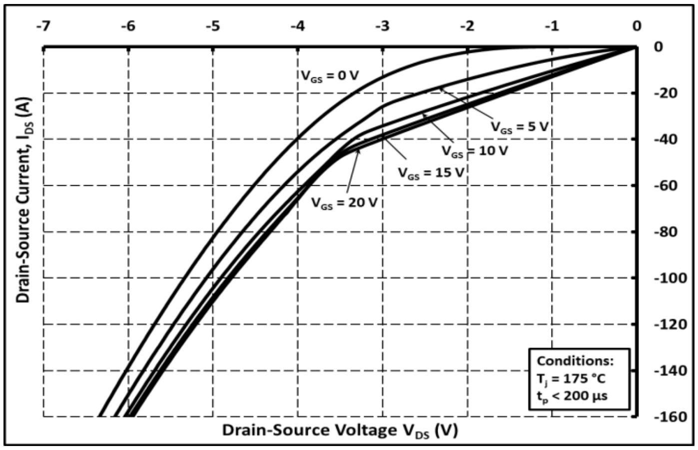


Figure 15.

3rd Quadrant Characteristic at T_{vj} = 175 °C

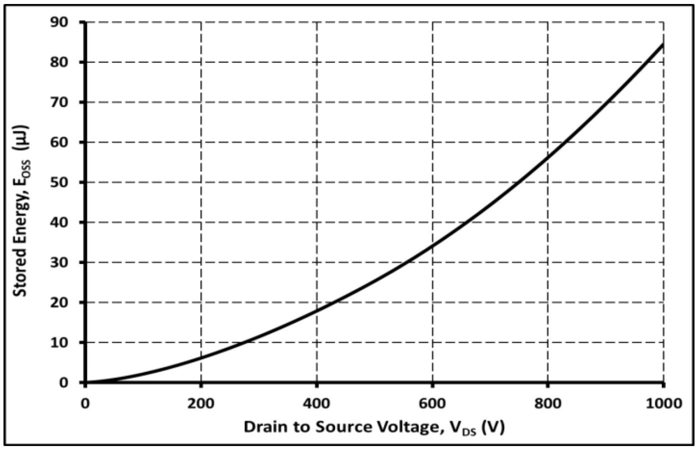


Figure 16.

Output Capacitor Stored Energy

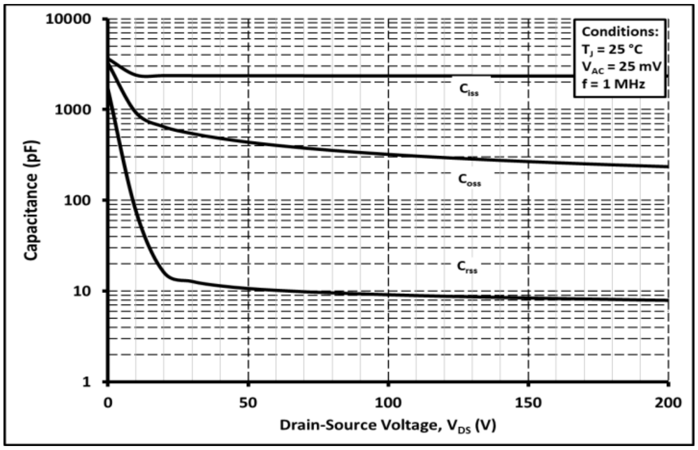


Figure 17.

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

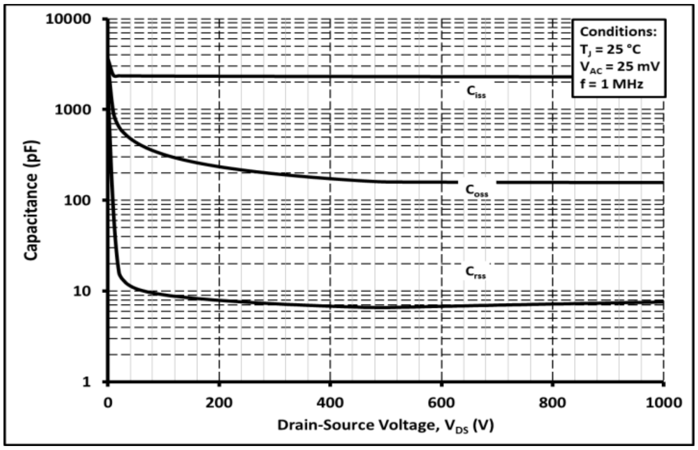
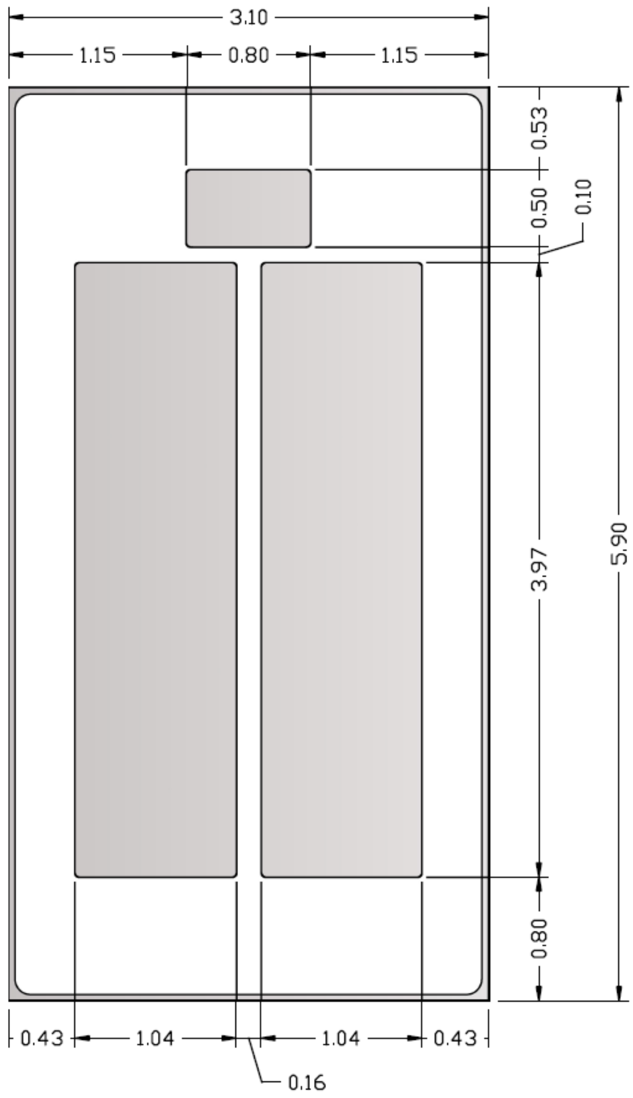


Figure 18.

Capacitances vs. Drain-Source Voltage (0-1200V)

Product Dimensions CPM2-1200-0040A



Product Dimensions CPM2-1200-0040A

Parameter	Typical	Units
Die Size (L x W)	3.10 x 5.90	mm
Exposed Source Pad Metal Dimensions	1.04 x 3.97 (x2)	mm
Gate Pad Dimensions	0.80 x 0.50	mm
Chip Thickness[1]	180 ± 40	µm
Frontside (Source) metalization (Al)	4	µm
Frontside (Gate) metalization (Al)	4	µm
Backside (Drain) metalization (Ni:Au)	0.8 / 0.1	µm

[1] SiC wafer thickness

Product Ordering Information

Order Number	Description	Package
CPM2-1200-0040A-FY6	SiC MOSFET G3 IND 1200V/40mO UV MLT	Bare Die Product

Revision History

Revision History	Date of Change	Brief Summary
1	11/2020	Initial Release
2	12/22/2023	Template updated

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Contact info:

4600 Silicon Drive
Durham, NC 27703 USA
Tel: +1.919.313.5300
www.wolfspeed.com/power

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