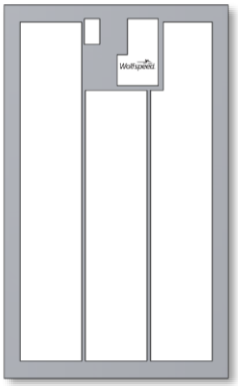
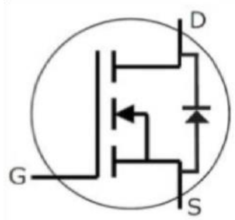
CPM3-1700-R020E

Wolfspeed SiC Gen 3 MOSFET

Description

This is the Wolfspeed's 3rd 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 industrial inverters and UPS





Package Types: Bare Die
PN's: CPM3-1700-R020E

Features

- Enhanced 3rd Generation SiC MOSFET
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- Fast intrinsic diode with low reverse recovery

Applications

- EV Chargers
- UPS
- Inverters
- DC/DC Converters

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}	$V_{DS(max)}$		1700	V
Maximum Gate-Source Voltage, Peak Transient Capability	$V_{GS(max)}$		-8/+19	V
Continuous Drain Current, V_{GS} = 15V, assumes die packaged in TO-247 package with $R_{th(j-c)}$ < 0.275 K/W	I_D	T_c = 25°C	120	A
		T_c = 100°C	86	
Pulsed Drain Current, t_p limited by $T_{vj(max)}$	$I_{D(pulse)}$		249	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	$V_{GS(op)}$	-4/+15	V

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

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

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1700			V	V_{GS} = 0 V, I_D = 40 µA
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.5	3.6	V	V_{DS} = V_{GS}, I_{DS} = 25.4 mA
			2.0		V	V_{DS} = V_{GS}, I_{DS} = 25.4 mA, T_{VJ} = 175°C
Zero Gate Voltage Drain Current	I_{DSS}		1	40	µA	V_{DS} = 1700 V, V_{GS} = 0 V
Gate-Source Leakage Current	I_{GSS}		1	250	nA	V_{GS} = 15 V, V_{DS} = 0 V
Drain-Source On-State Resistance	$R_{DS(on)}$	12.3	17.5	22.8	mΩ	V_{GS} = 15 V, I_D = 92.2 A
			40.3			V_{GS} = 15 V, I_D = 92.2 A, T_{VJ} = 175°C
Transconductance	g_{fs}		63		S	V_{DS} = 20 V, I_{DS} = 92.2 A
			61			V_{DS} = 20 V, I_{DS} = 92.2 A, T_{VJ} = 175°C
Input Capacitance	C_{iss}		7667		pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 100 kHz V_{AC} = 25 mV
Output Capacitance	C_{oss}		188			
Reverse Transfer Capacitance	C_{rss}		10			
C_{oss} Stored Energy	E_{oss}		292		µJ	V_{DS} = 1000 V, f = 100 kHz
Total Internal Gate Resistance	$R_{G(total)}$	5.2	7.4	9.6	Ω	f = 1 Mhz, V_{AC} = 25 mV
Gate to Source Charge	Q_{gs}		80		nC	V_{DS} = 1200 V, V_{GS} = -4 V/15 V I_{DS} = 92.2 A
Gate to Drain Charge	Q_{gd}		70			
Total Gate Charge	Q_g		249			

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

Characteristics	Symbol	Typ.	Max.	Unit	Test Conditions
Diode Forward Voltage	V_{SD}	4.9		V	V_{GS} = -4 V, I_{SD} = 41.6 A
		4.3		V	V_{GS} = -4 V, I_{SD} = 41.6 A, T_{VJ} = 175 °C
Reverse Recovery Time	t_{rr}	43		ns	V_{GS} = -4 V, I_{SD} = 92.2 A, V_R = 1200 V dif/dt = 4000 A/µs, T_{VJ} = 175 °C
Reverse Recovery Charge	Q_{rr}	2557		nC	
Peak Reverse Recovery Current	I_{rrm}	87		A	

Typical Performance

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

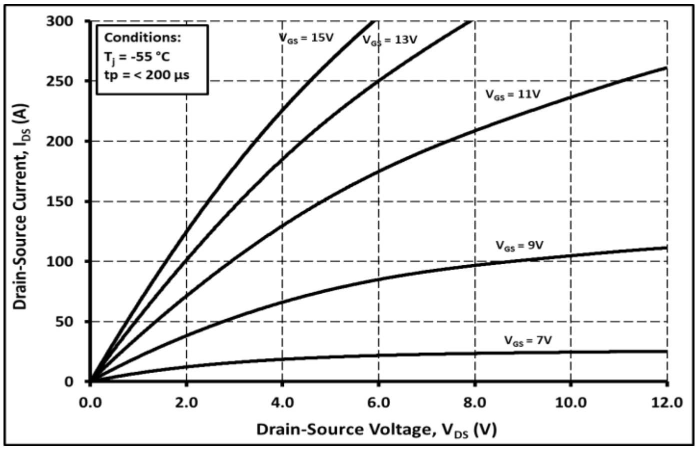


Figure 1.

Output Characteristics T_{vj} = -55 °C

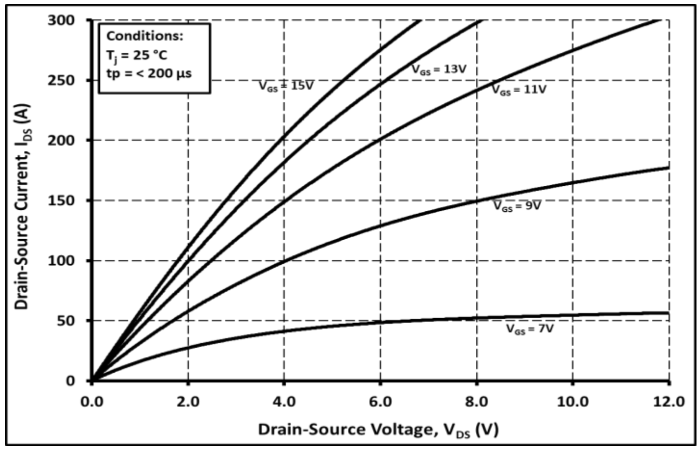


Figure 2.

Output Characteristics T_{vj} = 25 °C

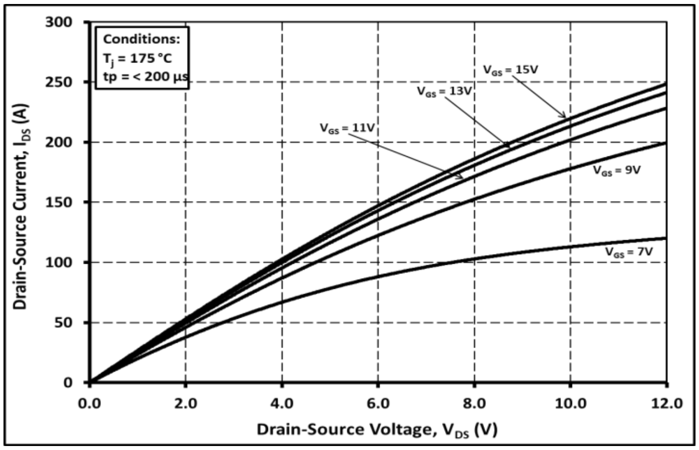


Figure 3.

Output Characteristics T_{vj} = 175 °C

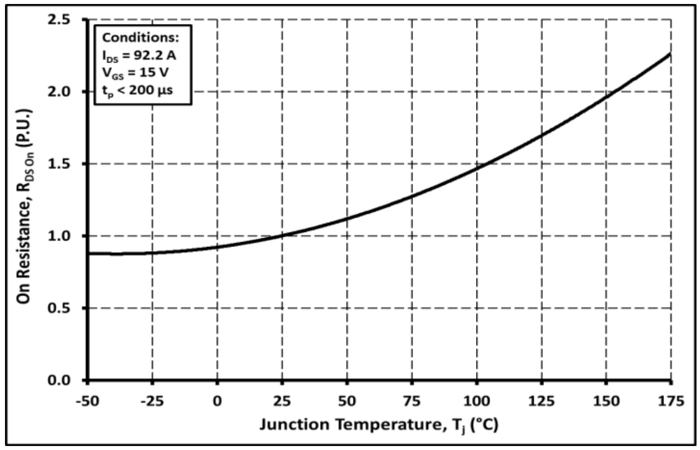


Figure 4.

Normalized On-Resistance vs. Temperature

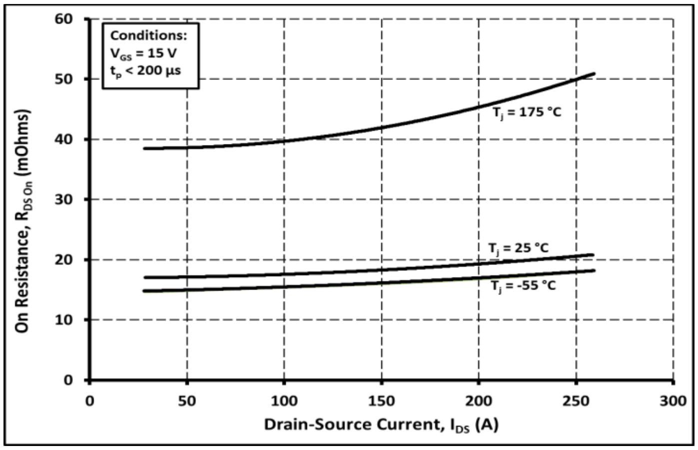


Figure 5.

On-Resistance vs. Drain Current For Various Temperatures

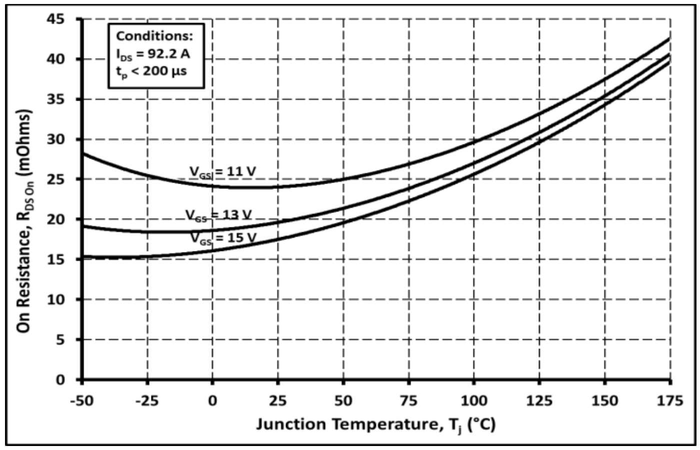


Figure 6.

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.

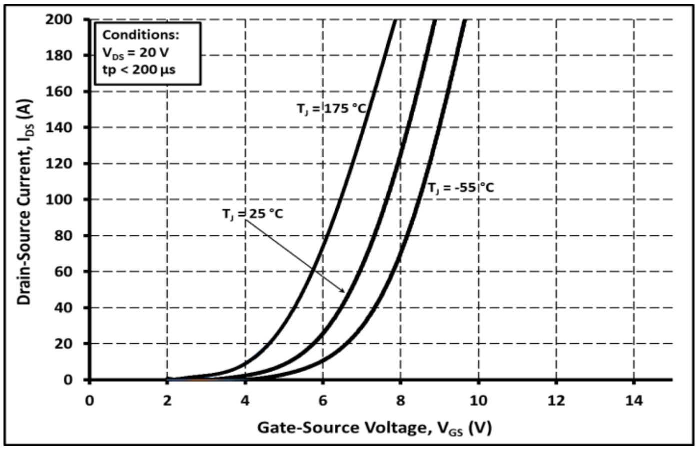


Figure 7.

Transfer Characteristic For Various Junction Temperatures

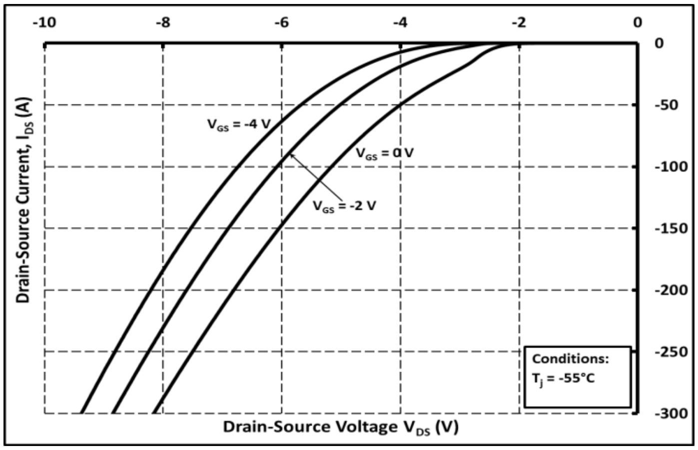


Figure 8.

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

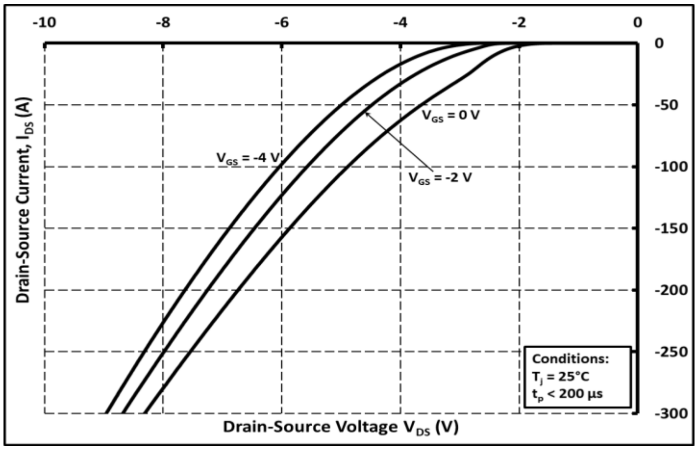


Figure 9.

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

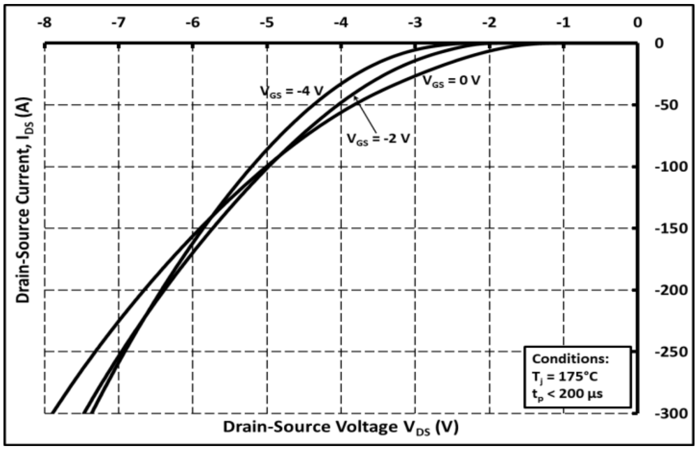


Figure 10.

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

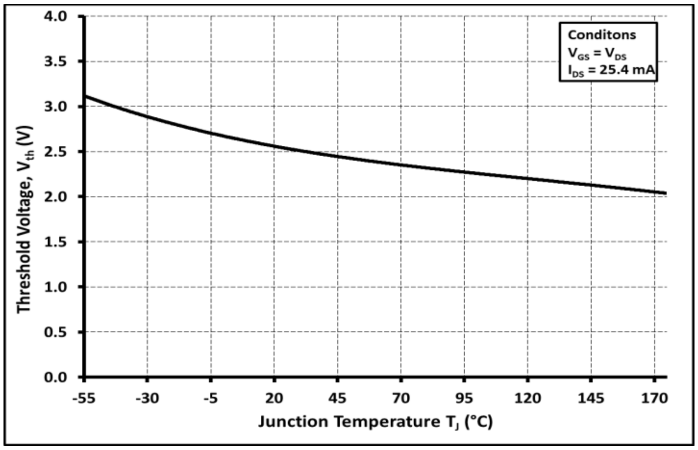


Figure 11.

Threshold Voltage vs. Temperature

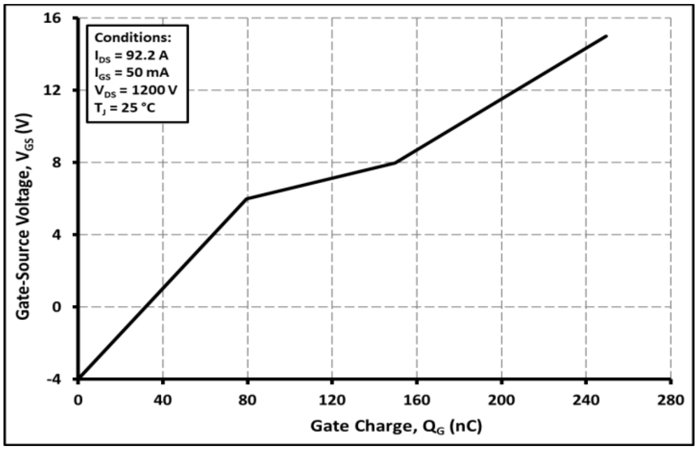


Figure 12.

Gate Charge Characteristics

Typical Performance

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

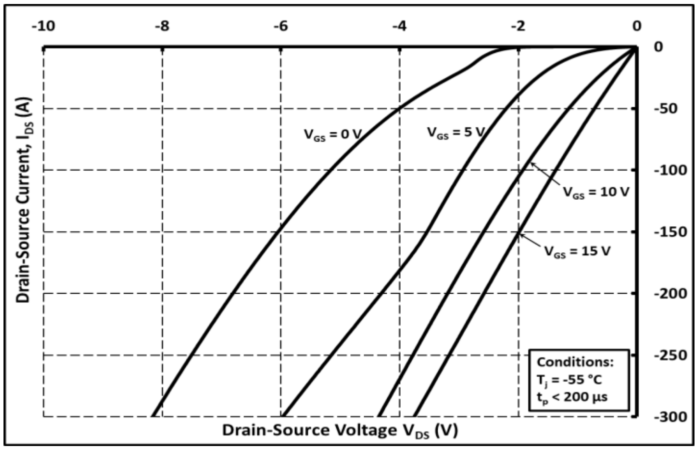


Figure 13.

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

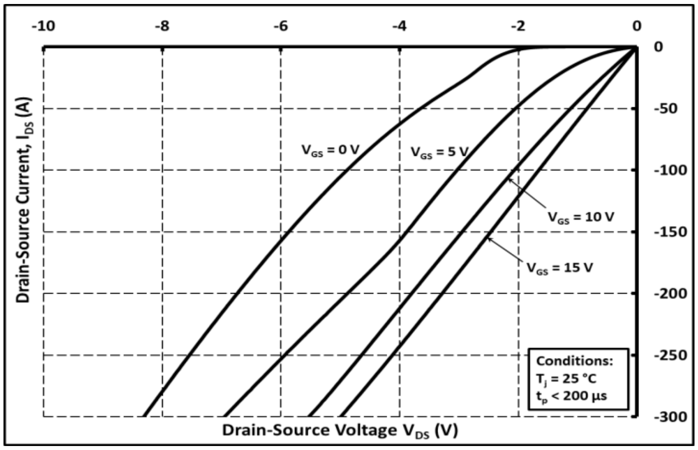


Figure 14.

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

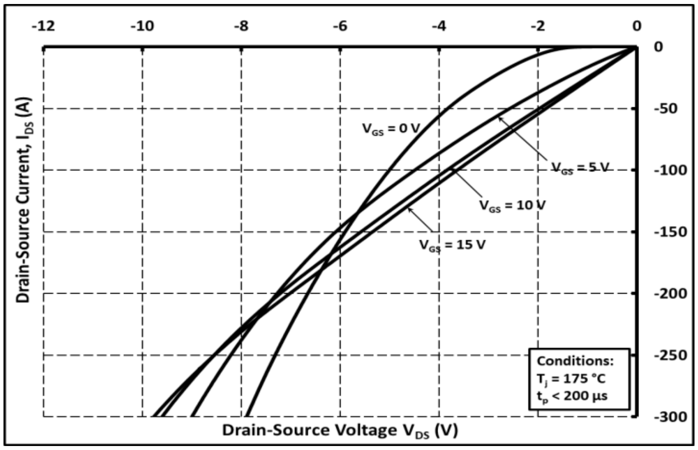


Figure 15.

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

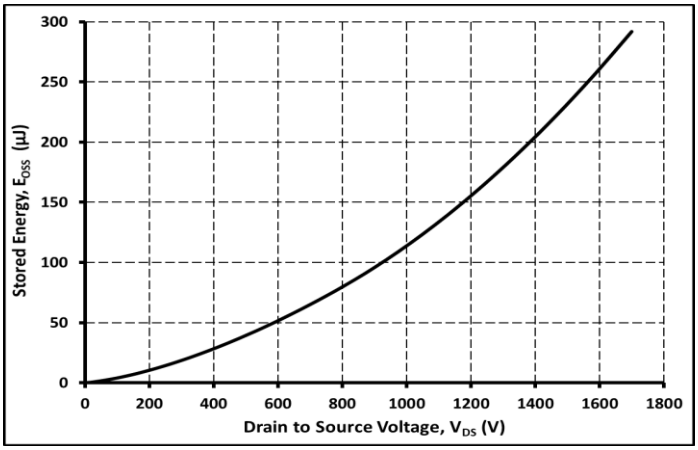


Figure 16.

Output Capacitor Stored Energy

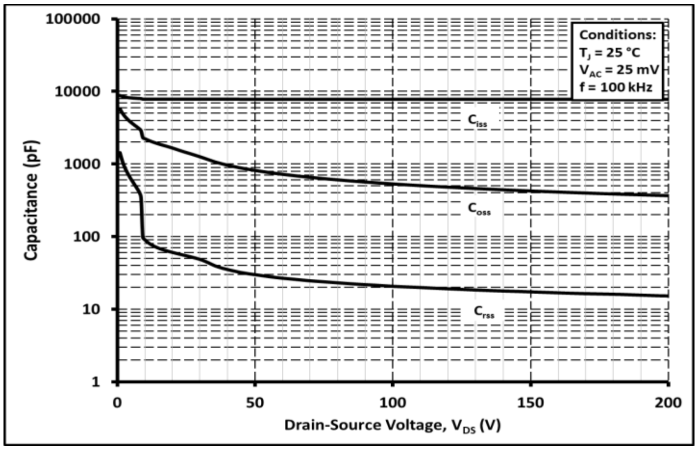


Figure 17.

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

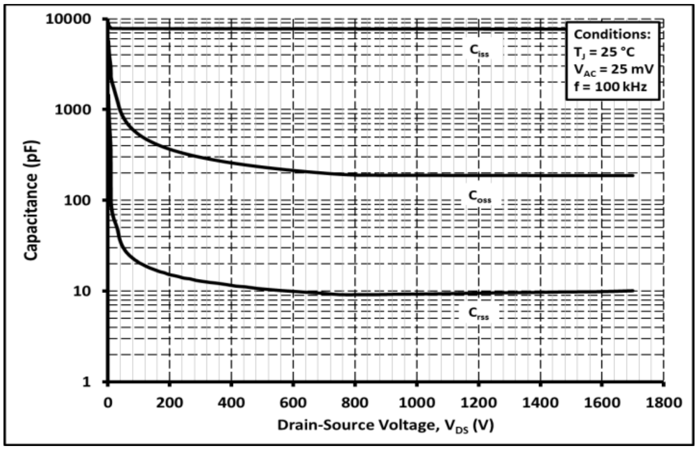
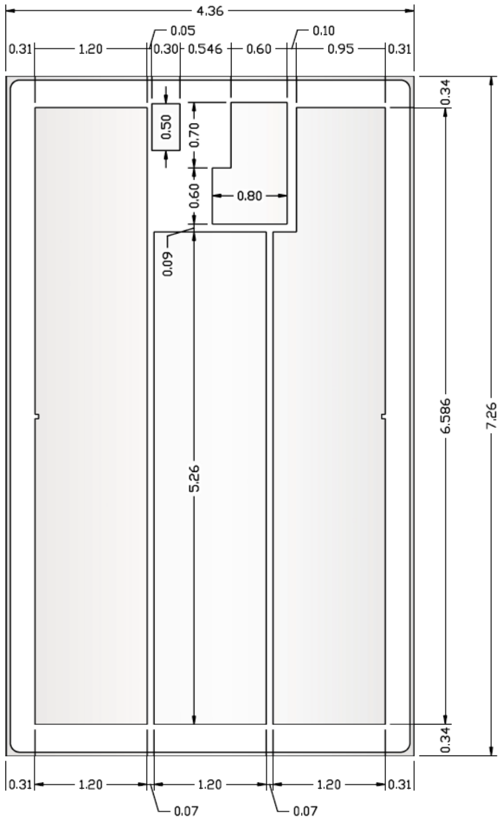


Figure 18.

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

Product Dimensions CPM3-1700-R020E



Product Dimensions CPM3-1700-R020E

Parameter	Typical	Units
Die Size (L x W)	4.36 x 7.26	mm
Exposed Source Pad Metal Dimensions	1.20 x 6.59	mm
Exposed Source Pad Metal Dimensions	1.20 x 5.26 (X2)	mm
Exposed Source Pad Metal Dimensions	0.95 x 1.39	mm
Gate Pad Dimensions	0.8 x 0.6	mm
Gate Pad Dimensions	0.6 x 0.7	mm
Rg Pad Dimensions*	0.5 x 0.3	mm
Chip Thickness[1]	180 ± 20	µm
Frontside (Source) metalization (Al)	4	µm
Frontside (Gate) metalization (Al)	4	µm
Backside (Drain) metalization (Ni:Pd:Au)	0.8 / 0.2 / 0.1	µm

[1] SiC wafer thickness
*For internal use only

Product Ordering Information

Order Number	Description	Package
CPM3-1700-R020E-FY6	SiC MOSFET G3 IND 1700V/20mO UV MLT	Bare Die Product

Revision History

Revision History	Date of Change	Brief Summary
1	09/09/2021	Initial Release
2	12/21/2023	• Document format updated

Notes & Disclaimer

This document and the information contained herein are subject to change without notice. Any such change shall be evidenced by the publication of an updated version of this document by Wolfspeed. No communication from any employee or agent of Wolfspeed or any third party shall effect an amendment or modification of this document. No responsibility is assumed by Wolfspeed for any infringement of patents or other rights of third parties which may result from use of the information contained herein. No license is granted by implication or otherwise under any patent or patent rights of Wolfspeed.

Notwithstanding any application-specific information, guidance, assistance, or support that Wolfspeed may provide, the buyer of this product is solely responsible for determining the suitability of this product for the buyer's purposes, including without limitation for use in the applications identified in the next bullet point, and for the compliance of the buyers' products, including those that incorporate this product, with all applicable legal, regulatory, and safety-related requirements.

This product has not been designed or tested for use in, and is not intended for use in, applications in which failure of the product would reasonably be expected to cause death, personal injury, or property damage, including but not limited to equipment implanted into the human body, life-support machines, cardiac defibrillators, and similar emergency medical equipment, aircraft navigation, communication, and control systems, aircraft power and propulsion systems, air traffic control systems, and equipment used in the planning, construction, maintenance, or operation of nuclear facilities.

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 Wolfspeed representative or from the Product Documentation sections of www.Wolfspeed.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 your Wolfspeed representative to ensure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information is also available upon request.

Contact info:

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

© 2023 Wolfspeed, Inc. All rights reserved. Wolfspeed® and the Wolfstreak logo are registered trademarks and the Wolfspeed logo is a trademark of Wolfspeed, Inc.
The information in this document is subject to change without notice.