E3M0900170D

1700V 900mΩ Silicon Carbide Power MOSFET
N-Channel Enhancement Mode

Features

- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- 12V...15V/ 0V V_{GS} compatible with most flyback controllers
- Ultra-low drain-gate capacitance
- Qualified to operate under high humidity and high temperature environmental conditions
- Halogen free, RoHS compliant
- Automotive qualified (AEC-Q101) and PPAP capable

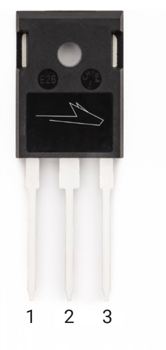
Benefits

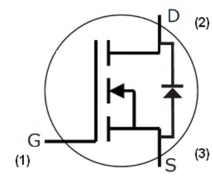
- Smooth switching waveforms
- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Increases system switching frequency
- Increases system reliability

Typical Applications

- Auxillary power supplies
- Switch Mode Power Supplies
- High-Voltage capacitive loads

Package





Orderable Part Number	Package	Marking
E3M0900170D	TO-247-3L	E3M0900170D

Key Parameters

Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions	Note
Drain - Source Voltage	V_{DS}			1700	V	$T_C = 25°C$	
Maximum Gate - Source Voltage (Transient)	$V_{GS(max)}$	-8		+19	V	Transient	
Operational Turn-On Gate-Source Voltage	$V_{GS\ op}$		+12...+15		V	Static	
Operational Turn-Off Gate-Source Voltage	$V_{GS\ op}$		-4...0		V	Static	
DC Continuous Drain Current	I_D			4.4	A	V_{GS} =15 V, T_C = 25 °C, $T_J \leq$175 °C	Note 2
				3.3	A	V_{GS} =15 V, T_C = 100 °C, $T_J \leq$175°C	Note 2
Pulsed Drain Current	I_{DM}			15	A	t_{Pmax} limited by T_{jmax} V_{GS} = 15V, T_C = 25 °C	Fig. 22
Power Dissipation	P_D			41	W	T_C = 25 °C, T_J = 175 °C	Fig. 20
Operating Junction and Storage Temperature	T_J, T_{stg}			-55 to +175	°C		
Mounting Torque	M_D			1 8.8	Nm lbf-in	M3 or 6-32 screw	

Note (1): Review application Note PRD-04814 for additional details
Note (2): Verified by design

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	1700			V	V_{GS} = 0 V, I_D = 100 μA	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	3.1	4.2	V	V_{DS} = V_{GS}, I_D = 0.55 mA	Fig. 11
			2.6		V	V_{DS} = V_{GS}, I_D = 0.55 mA, T_J = 175ºC	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	V_{DS} = 1700 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		900	1250	mΩ	V_{GS} = 15 V, I_D = 1.99 A	Fig. 4, 5, 6
			1938			V_{GS} = 15 V, I_D = 1.99 A, T_J = 175ºC	
g_{fs}	Transconductance		1		S	V_{DS}= 20 V, I_{DS}= 1.99 A	Fig. 7
			1			V_{DS}= 20 V, I_{DS}= 1.99 A, T_J = 175ºC	
C_{iss}	Input Capacitance		202		pF	V_{GS} = 0 V, V_{DS} = 0V to 1200 V F = 100 kHz V_{AC} = 25 mV	Fig. 17, 18
C_{oss}	Output Capacitance		8				
C_{rss}	Reverse Transfer Capacitance		1.4				
E_{oss}	C_{oss} Stored Energy		8		μJ		Fig. 16
$C_{o(er)}$	Effective Output Capacitance (Energy Related)		10		pF	V_{GS} = 0 V, V_{DS} = 0V to 1200V	Note: 3
$C_{o(tr)}$	Effective Output Capacitance (Time Related)		14		pF		
E_{ON}	Turn-On Switching Energy (External Diode)		154		μJ	V_{DS}= 1200 V, V_{GS}= -4 V/15 V, I_D= 1.99 A, $R_{G(ext)}$ = 2.5 Ω, L= 1707 μH, T_J = 175ºC FWD = External SiC DIODE	Fig. 26, 28
E_{OFF}	Turn Off Switching Energy (External Diode)		15				
$t_{d(on)}$	Turn-On Delay Time		23		ns	V_{DD} = 1200 V, V_{GS} = -4 V/15 V I_D = 1.99 A, $R_{G(ext)}$ = 2.5 Ω, Tj=175⁰C, L=1707 μH Timing relative to V_{DS} Inductive load	Fig. 27, 28
t_r	Rise Time		18				
$t_{d(off)}$	Turn-Off Delay Time		19				
t_f	Fall Time		43				
$R_{G(int)}$	Internal Gate Resistance		31		Ω	f = 1 MHz	
Q_{gs}	Gate to Source Charge		4		nC	V_{DS} = 1200 V, V_{GS} = -4 V/15 V I_D = 1.99 A Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		4				
Q_g	Total Gate Charge		10				

Note (3): $C_{o(er)}$, a lumped capacitance that gives same stored energy as Coss while Vds is rising from 0 to 1200V
$C_{o(tr)}$, a lumped capacitance that gives same charging time as Coss while Vds is rising from 0 to 1200V

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

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.7		V	V_{GS} = -4 V, I_{SD} = 1 A, T_J = 25 °C	Fig. 8, 9, 10
		4.2		V	V_{GS} = -4 V, I_{SD} = 1 A, T_J = 175 °C	
I_S	Continuous Diode Forward Current	5.8		A	V_{GS} = -4 V, T_C = 25˚C	
I_{SM}	Diode pulse Current		15	A	V_{GS} = -4 V, pulse width t_P limited by T_{jmax}	
t_{rr}	Reverse Recover time	40		ns	V_{GS} = -4 V, I_{SD} = 1.99 A, V_R = 1200 V dif/dt = 3710 A/μs, T_J = 25 °C	
Q_{rr}	Reverse Recovery Charge	72		nC		
I_{rrm}	Peak Reverse Recovery Current	3		A		
t_{rr}	Reverse Recover time	40		ns	V_{GS} = -4 V, I_{SD} = 1.99 A, V_R = 1200 V dif/dt = 1030 A/μs, T_J = 25 °C	
Q_{rr}	Reverse Recovery Charge	57		nC		
I_{rrm}	Peak Reverse Recovery Current	2		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	2.8	3.7	°C/W		Fig. 21

Typical Performance

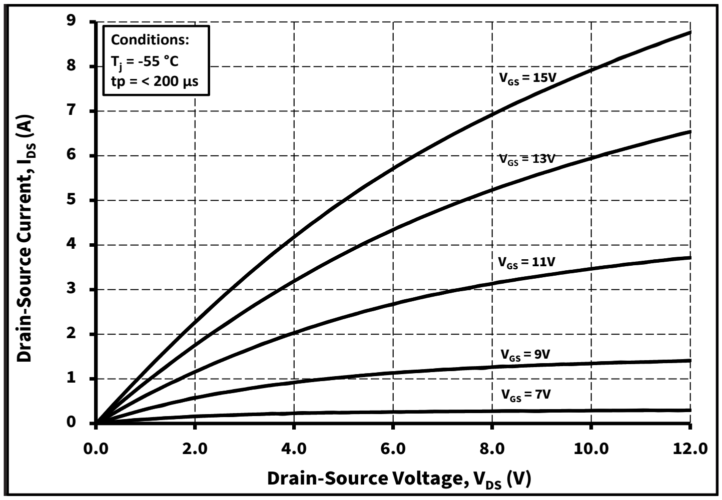


Figure 1. Output Characteristics T_J = -55 ºC

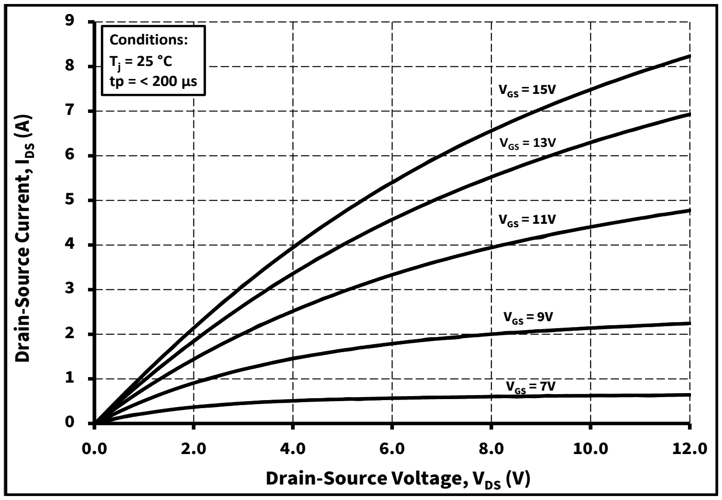


Figure 2. Output Characteristics T_J = 25 ºC

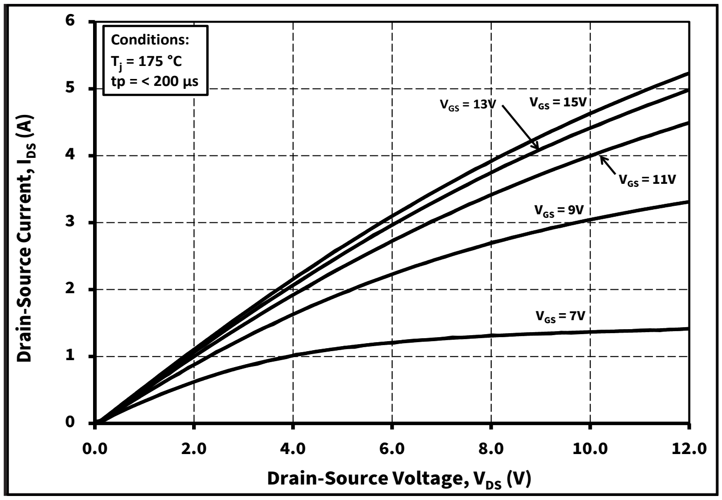


Figure 3. Output Characteristics T_J = 175 ºC

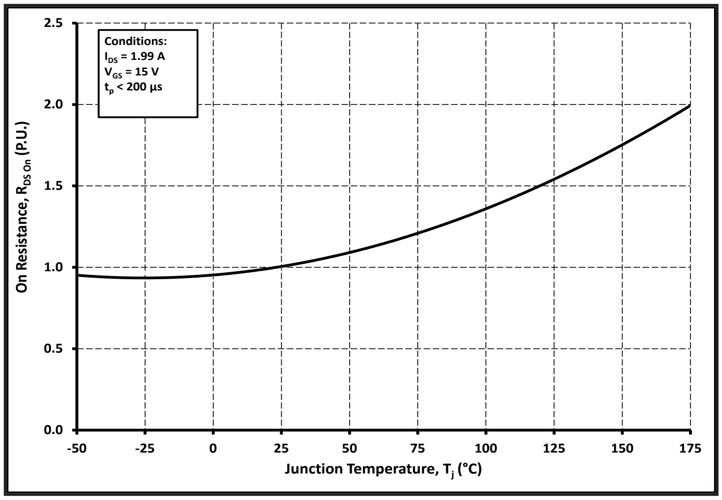


Figure 4. Normalized On-Resistance vs. Temperature

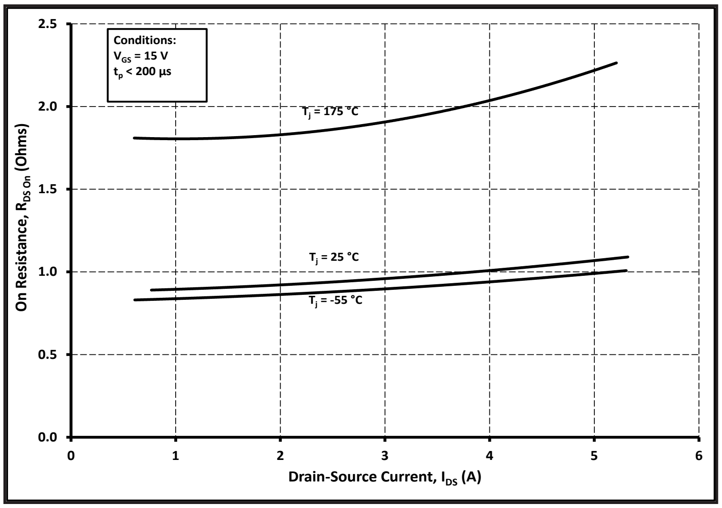


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

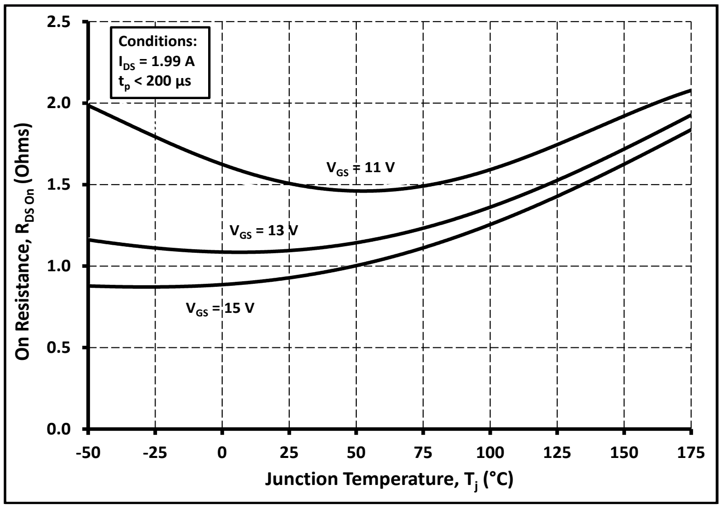


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

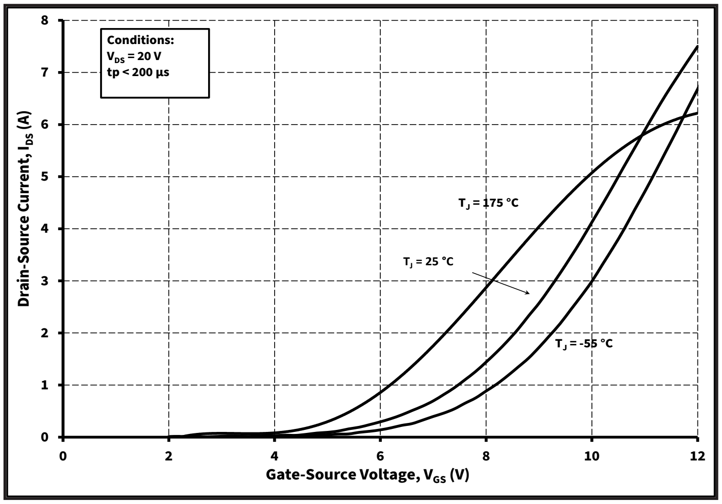


Figure 7. Transfer Characteristic for Various Junction Temperatures

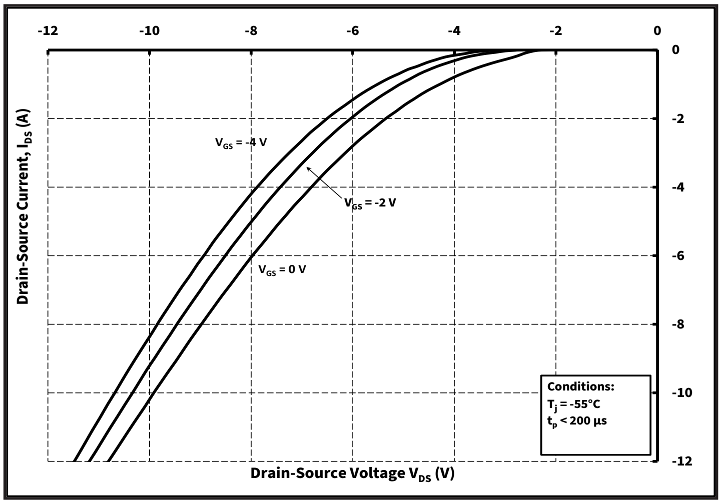


Figure 8. Body Diode Characteristic at -55 °C

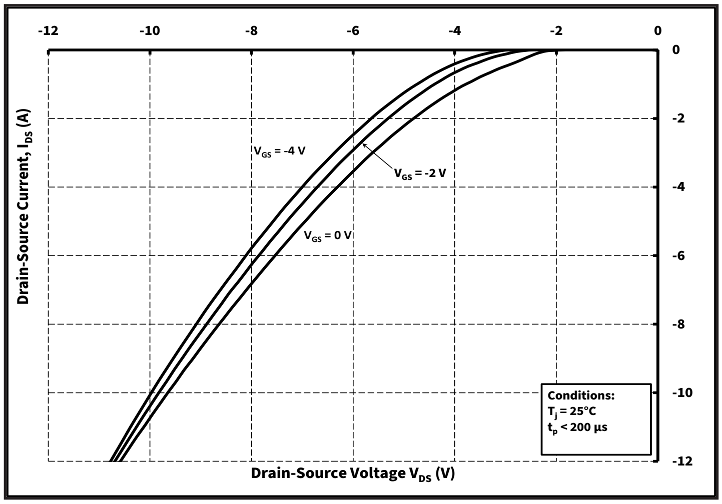


Figure 9. Body Diode Characteristic at 25 °C

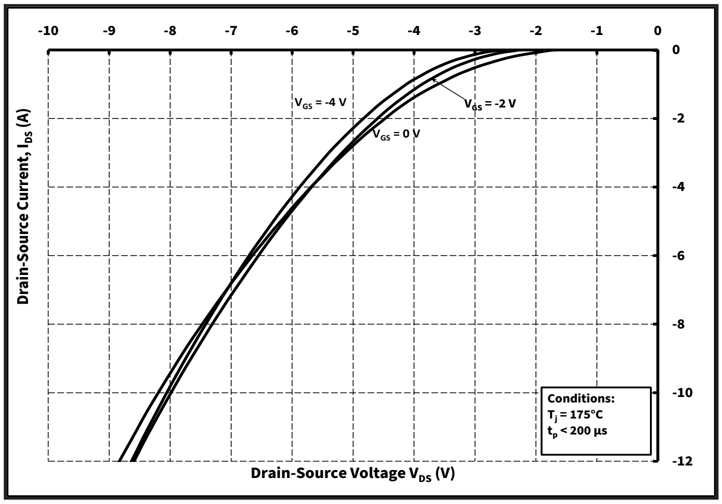


Figure 10. Body Diode Characteristic at 175 °C

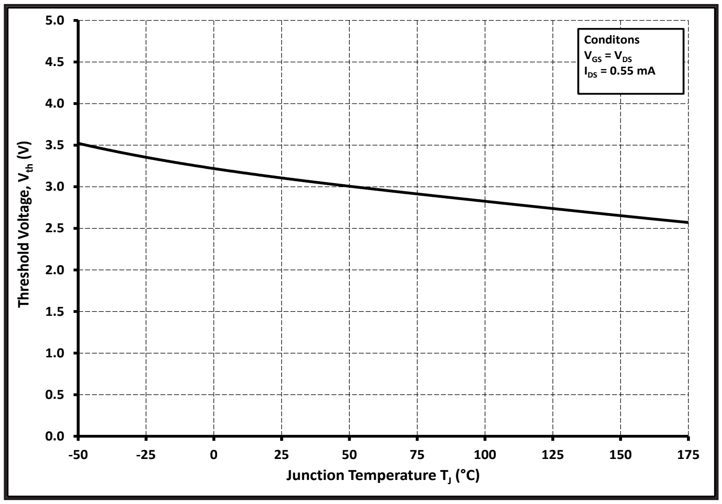


Figure 11. Threshold Voltage vs. Temperature

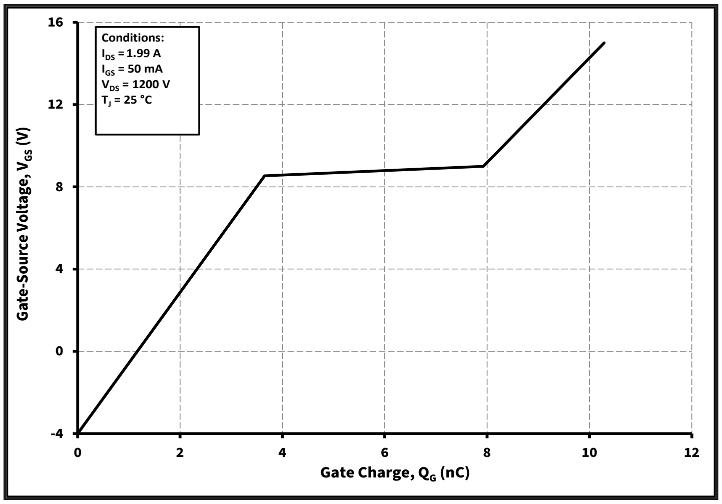


Figure 12. Gate Charge Characteristics

Typical Performance

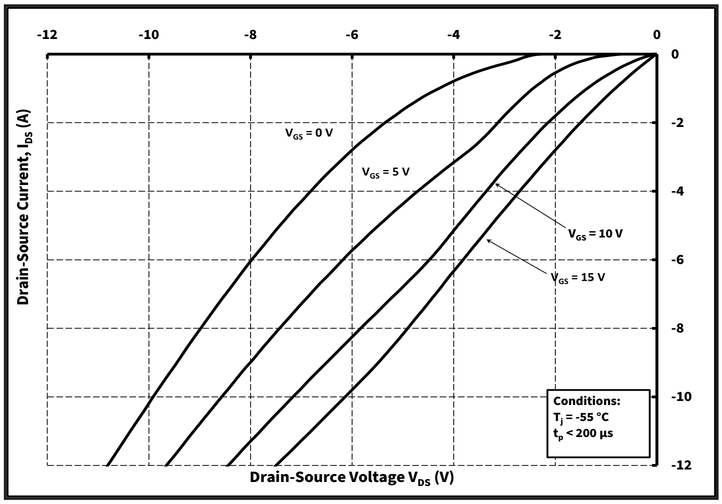


Figure 13. 3rd Quadrant Characteristic at -55 °C

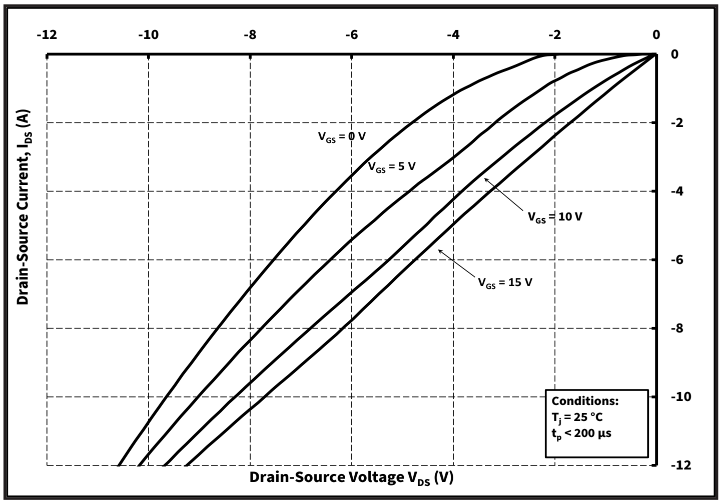


Figure 14. 3rd Quadrant Characteristic at 25 °C

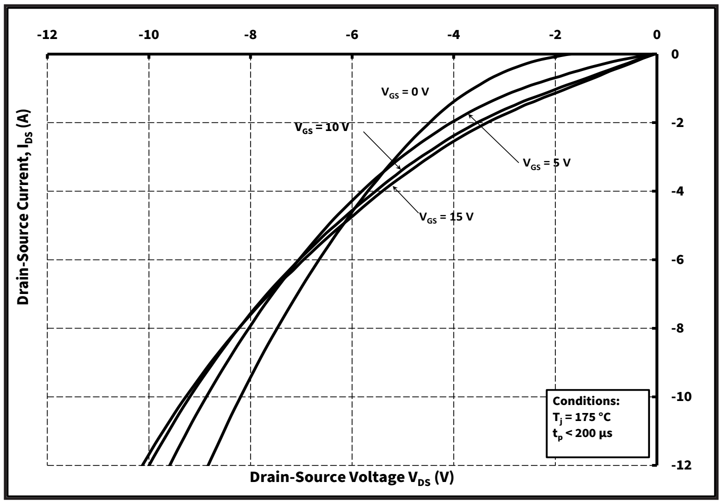


Figure 15. 3rd Quadrant Characteristic at 175 °C

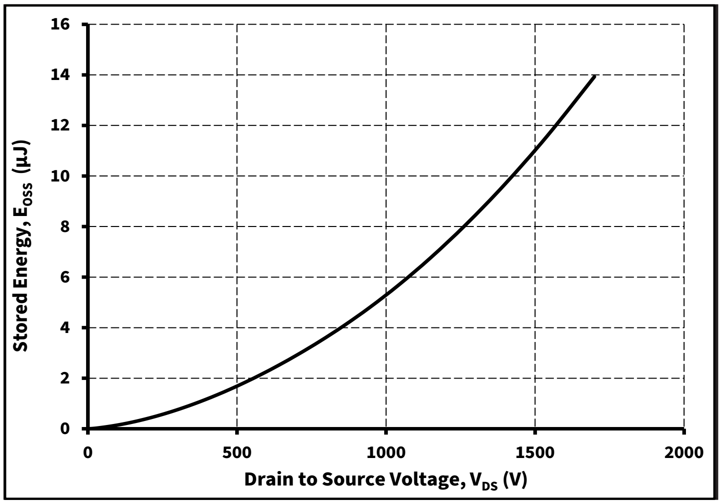


Figure 16. Output Capacitor Stored Energy

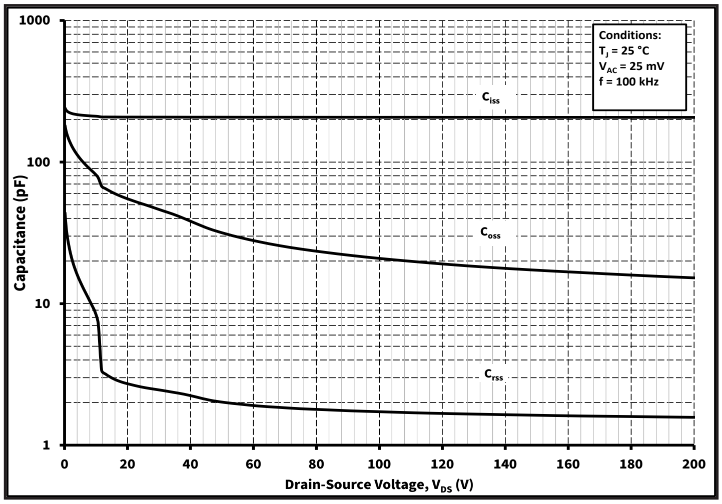


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

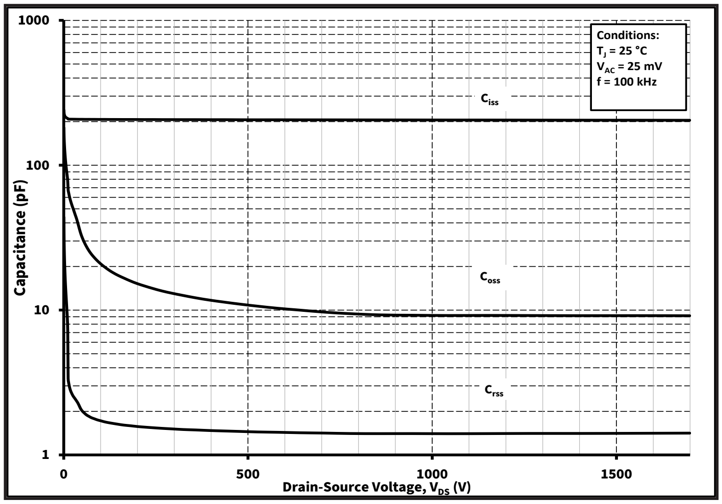


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1700V)

Typical Performance

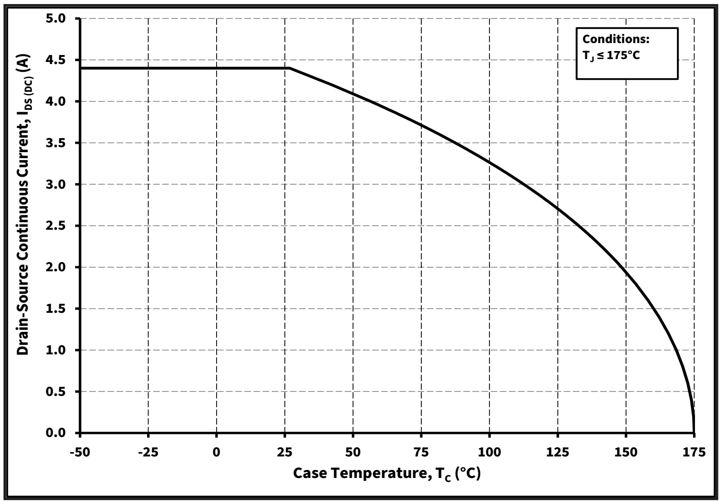


Figure 19. Continuous Drain Current Derating vs. Case Temperature

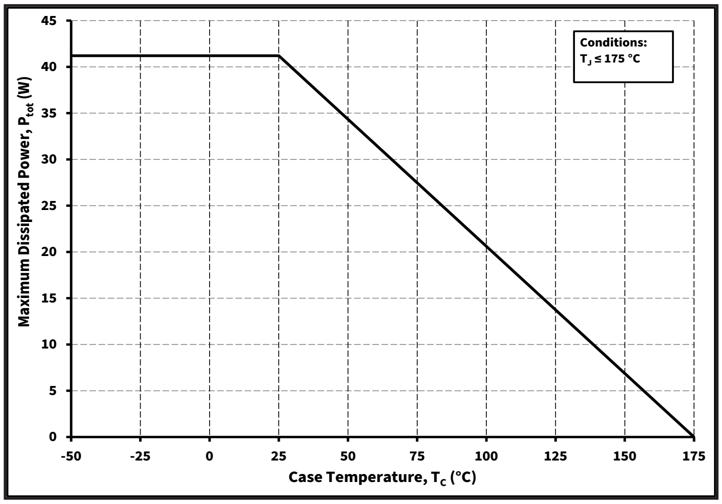


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

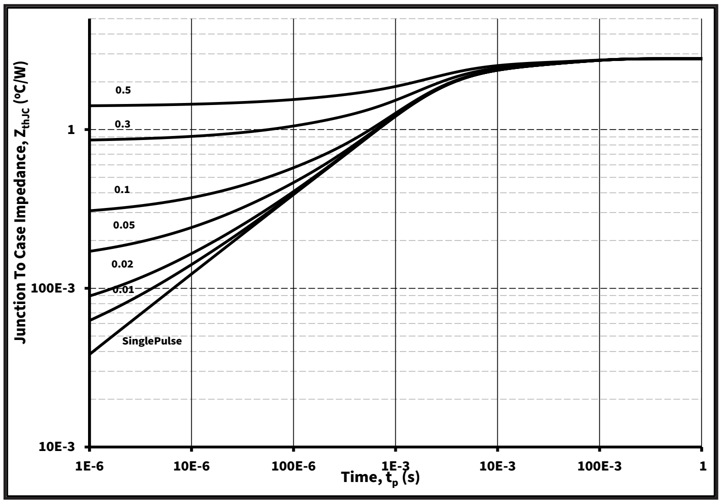


Figure 21. Transient Thermal Impedance (Junction - Case)

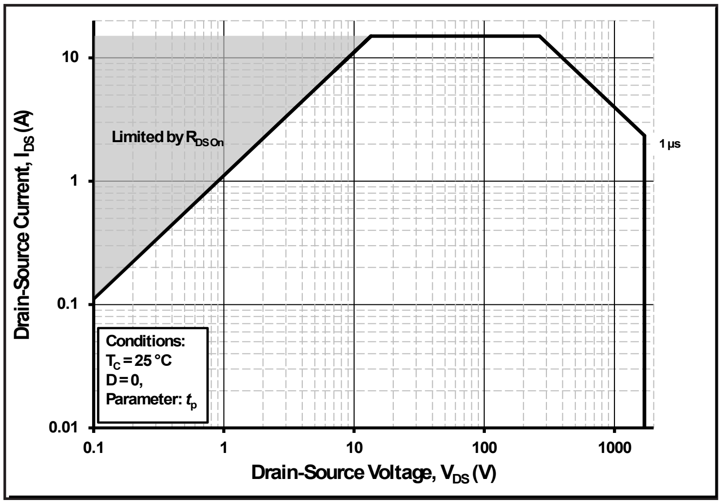


Figure 22. Safe Operating Area

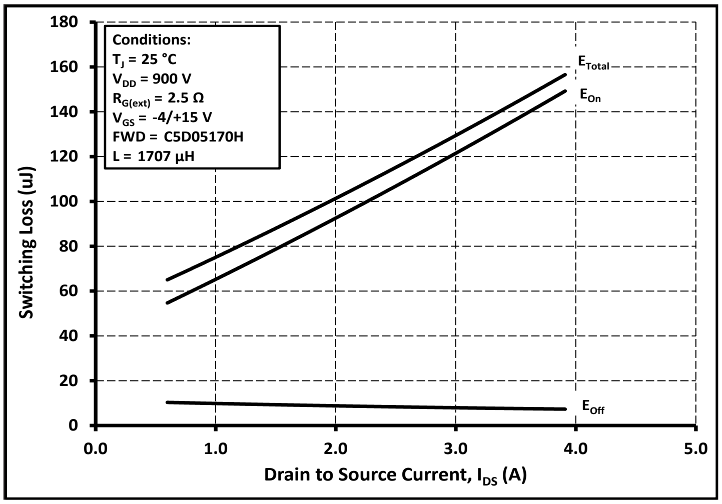


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 900V)

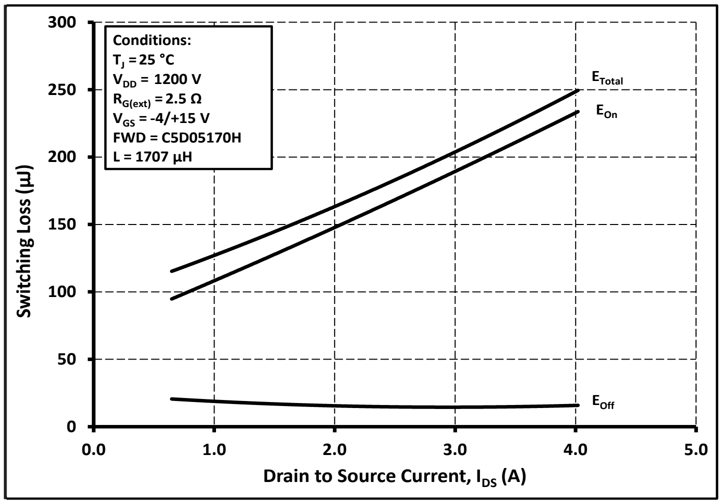


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)

Typical Performance

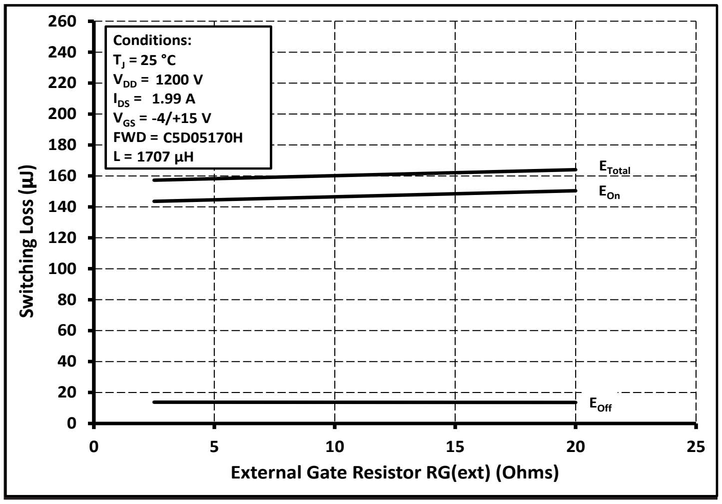


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

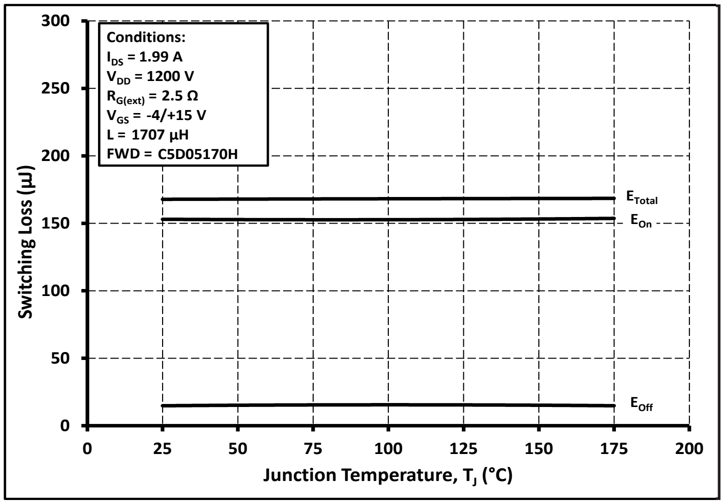


Figure 26. Clamped Inductive Switching Energy vs. Temperature

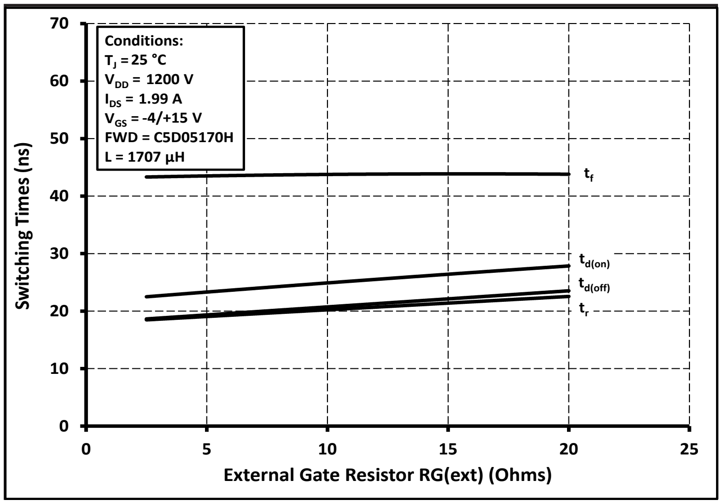


Figure 27. Switching Times vs. $R_{G(ext)}$

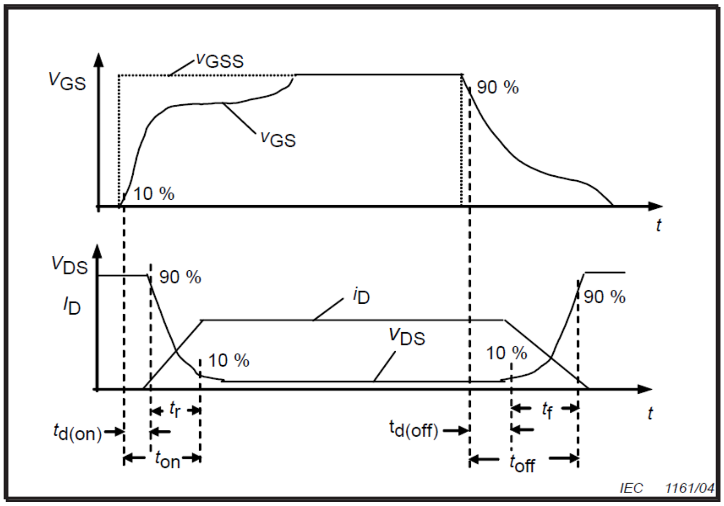


Figure 28. Switching Times Definition

Test Circuit Schematic

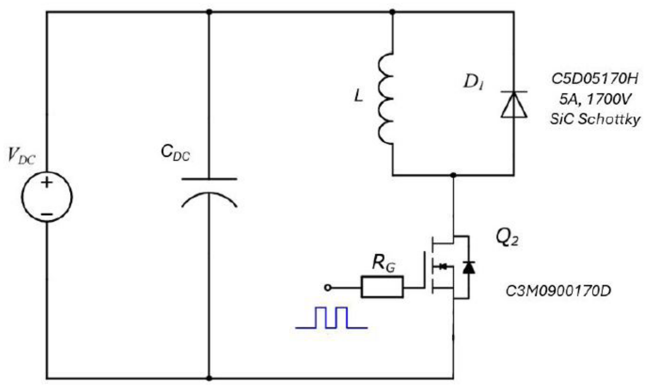
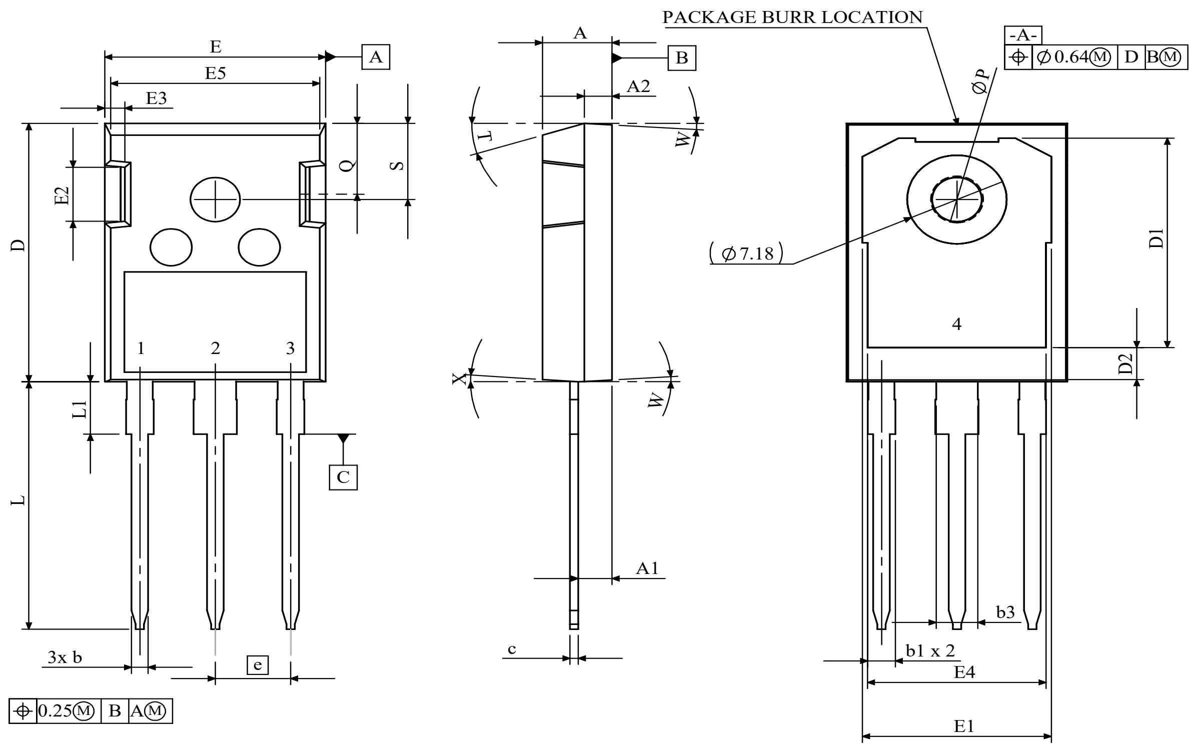


Figure 29. Clamped Inductive Switching Waveform Test Circuit

Package Dimensions



SYMBOL	MIN (mm)	MAX (mm)
A	4.83	5.21
A1	2.27	2.52
A2	1.91	2.16
b	1.07	1.33
b1	1.91	2.41
b3	2.87	3.38
c	0.55	0.74
D	20.75	21.05
D1	16	17.4
D2	2.86	3.26
E	15.75	16.13
E1	13.5	14.55
E2	3.68	5.1
E3	1	1.9
E4	12.38	13.43
E5	14.65	15.05
e	5.44 BSC	
L	19.73	20.48
L1	3.97	4.69
∅P	3.18	4.06
Q	5.42	5.96
S	5.85	6.49
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	

1	GATE
2	DRAIN
3	SOURCE
4	DRAIN

NOTES:

1. ALL METAL SURFACES ARE TIN PLATED (MATTE), EXCEPT AREA OF CUT.
2. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE LISTED IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. BURR OR MOLD FLASH SIZE (0.5 mm) IS NOT INCLUDED IN THE DIMENSIONS

Wolfspeed

TITLE: PACKAGE OUTLINE DRAWING: TO-247-3L(MOSFET)

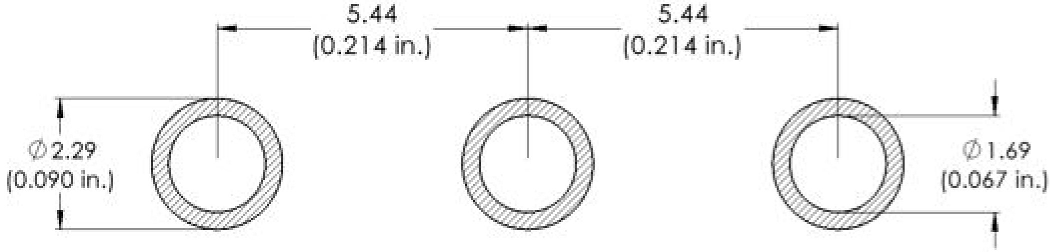
Date: 3/4/24

REVISION NO. 02 A4

PRD 05964 SCALE:1:1 SHEET 1 OF 1

Recommended Solder Pad Layout

All dimensions in mm



Revision history

Document Version	Date of release	Descriptiion of changes
1	February - 2025	Initial Release
2	March - 2025	$V_{GS\ OP}$ corrected

Notes & Disclaimer

WOLFSPEED PROVIDES TECHNICAL AND RELIABILITY DATA, DESIGN RESOURCES, APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, WITH RESPECT THERETO, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, SUITABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRDPARTY INTELLECTUAL PROPERTY RIGHTS.

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.

The information contained in this document (excluding examples, as well as figures or values that are labeled as "typical") constitutes Wolfspeed's sole published specifications for the subject product. "Typical" parameters are the average values expected by Wolfspeed in large quantities and are provided for informational purposes only. Any examples provided herein have not been produced under conditions intended to replicate any specific end use. Product performance can and does vary due to a number of factors.

This product has not been designed or tested for use in, and is not intended for use in, any application in which failure of the product would reasonably be expected to cause death, personal injury, or property damage. For purposes of (but without limiting) the foregoing, this product is not designed, intended, or authorized for use as a critical component in equipment implanted into the human body, life-support machines, cardiac defibrillators, and similar emergency medical equipment; air traffic control systems; or equipment used in the planning, construction, maintenance, or operation of nuclear facilities. 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 (1) selecting the appropriate Wolfspeed products for the buyer's application, (2) designing, validating, and testing the buyer's application, and (3) ensuring the buyer's application meets applicable standards and any other legal, regulatory, and safety-related requirements.

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 February 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 (REACh Article 67) is also available upon request.

Contact info:

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

© 2025 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.