

E4M0025075K1

Silicon Carbide Power MOSFET
E-Series Automotive
N-Channel Enhancement Mode



Features

- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Halogen free, RoHS compliant
- Automotive Qualified (AEC-Q101) and PPAP Capable

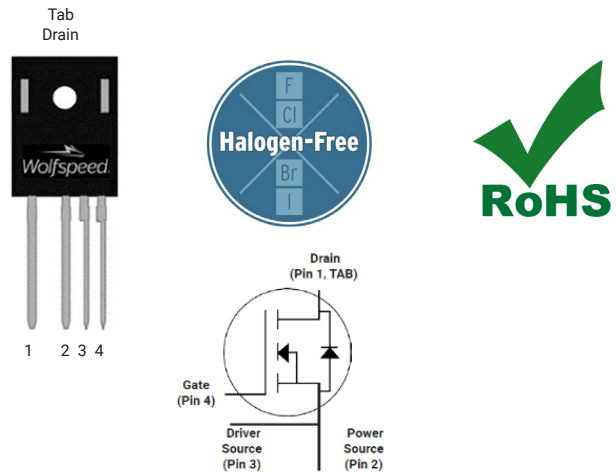
Benefits

- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Motor Control
- EV Battery Chargers
- High Voltage DC/DC Converters

Package



Part Number	Package	Marking
E4M0025075K1	TO-247-4L	E4M0025075K1

Maximum Ratings ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Note
V_{DSmax}	Drain - Source Voltage	750	V	
V_{GSmax}	Gate - Source Voltage	-8/+19	V	Note: 1
I_D	Continuous Drain Current, $V_{GS} = 15\text{ V}$	$T_c = 25^\circ\text{C}$	74	A Fig. 19 Note: 2
		$T_c = 100^\circ\text{C}$	56	
$I_{D(pulse)}$	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	251	A	Fig. 22
P_D	Power Dissipation, $T_c=25^\circ\text{C}$, $T_j = 175^\circ\text{C}$	262	W	Fig. 20 Note: 2
T_j, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$	
T_L	Solder Temperature, 1.6mm (0.063") from case for 10s	260	$^\circ\text{C}$	
M_d	Mounting Torque, M3 or 6-32 screw	1	Nm	
		8.8	lbf-in	

Note (1): Recommended turn off / turn on gate voltage $V_{GS} = -4V...0V / +15V$

Note (2): Verified by design


Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	750			V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.6	3.8	V	$V_{DS} = V_{GS}, I_D = 9.22\text{ mA}$	Fig. 11
			2.1		V	$V_{DS} = V_{GS}, I_D = 9.22\text{ mA}, T_J = 175^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	$V_{DS} = 750\text{ V}, V_{GS} = 0\text{ V}$	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	$V_{GS} = 15\text{ V}, V_{DS} = 0\text{ V}$	
$R_{DS(on)}$	Drain-Source On-State Resistance		25	34	m Ω	$V_{GS} = 15\text{ V}, I_D = 33.5\text{ A}$	Fig. 4, 5, 6
			41			$V_{GS} = 15\text{ V}, I_D = 33.5\text{ A}, T_J = 175^\circ\text{C}$	
g_{fs}	Transconductance		24		S	$V_{DS} = 20\text{ V}, I_{DS} = 33.5\text{ A}$	Fig. 7
			24			$V_{DS} = 20\text{ V}, I_{DS} = 33.5\text{ A}, T_J = 175^\circ\text{C}$	
C_{iss}	Input Capacitance		3055		pF	$V_{GS} = 0\text{ V}, V_{DS} = 0\text{ V to } 500\text{ V}$ $F = 100\text{ kHz}$ $V_{AC} = 25\text{ mV}$	Fig. 17, 18
C_{oss}	Output Capacitance		158				
C_{rss}	Reverse Transfer Capacitance		16				
E_{oss}	C_{oss} Stored Energy		23		μJ		Fig. 16
$C_{o(er)}$	Effective Output Capacitance (Energy Related)		201		pF	$V_{GS} = 0\text{ V}, V_{DS} = 0 \dots 500\text{ V}$	Note: 3
$C_{o(tr)}$	Effective Output Capacitance (Time Related)		291		pF		
E_{ON}	Turn-On Switching Energy (External Diode)		116		μJ	$V_{DS} = 500\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}, I_D = 33.5\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 59\text{ }\mu\text{H}, T_J = 175^\circ\text{C}$ FWD = External SiC DIODE	Fig. 25, 27
E_{OFF}	Turn Off Switching Energy (External Diode)		91				
E_{ON}	Turn-On Switching Energy (Body Diode FWD)		174		μJ	$V_{DS} = 500\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}, I_D = 33.5\text{ A},$ $R_{G(ext)} = 2.5\text{ }\Omega, L = 59\text{ }\mu\text{H}, T_J = 175^\circ\text{C}$ FWD = Internal Body Diode	Fig. 25, 27
E_{OFF}	Turn-Off Switching Energy (Body Diode FWD)		85				
$t_{d(on)}$	Turn-On Delay Time		12		ns	$V_{DD} = 500\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$ $I_D = 33.5\text{ A}, R_{G(ext)} = 2.5\text{ }\Omega,$ Timing relative to V_{DS} Inductive load	Fig. 26, 27
t_r	Rise Time		18				
$t_{d(off)}$	Turn-Off Delay Time		31				
t_f	Fall Time		10				
$R_{G(int)}$	Internal Gate Resistance		2.0		Ω	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	
Q_{gs}	Gate to Source Charge		33		nC	$V_{DS} = 500\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$ $I_D = 33.5\text{ A}$ Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		40				
Q_g	Total Gate Charge		119				

Note (3): $C_{o(er)}$, a lumped capacitance that gives same stored energy as C_{oss} while V_{ds} is rising from 0 to 500V
 $C_{o(tr)}$, a lumped capacitance that gives same charging time as C_{oss} while V_{ds} is rising from 0 to 500V


Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.8		V	$V_{GS} = -4\text{ V}, I_{SD} = 16.8\text{ A}, T_J = 25^\circ\text{C}$	Fig. 8, 9, 10
		4.2		V	$V_{GS} = -4\text{ V}, I_{SD} = 16.8\text{ A}, T_J = 175^\circ\text{C}$	
I_S	Continuous Diode Forward Current		45	A	$V_{GS} = -4\text{ V}, T_c = 25^\circ\text{C}$	
$I_{S, \text{pulse}}$	Diode pulse Current		251	A	$V_{GS} = -4\text{ V}$, pulse width t_p limited by T_{Jmax}	
t_{rr}	Reverse Recover time	29		ns	$V_{GS} = -4\text{ V}, I_{SD} = 33.5\text{ A}, V_R = 500\text{ V}$ $dif/dt = 2185\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	372		nC		
I_{rrm}	Peak Reverse Recovery Current	23		A		
t_{rr}	Reverse Recover time	20		ns	$V_{GS} = -4\text{ V}, I_{SD} = 33.5\text{ A}, V_R = 500\text{ V}$ $dif/dt = 6235\text{ A}/\mu\text{s}, T_J = 175^\circ\text{C}$	
Q_{rr}	Reverse Recovery Charge	601		nC		
I_{rrm}	Peak Reverse Recovery Current	52		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.45	0.57	$^\circ\text{C}/\text{W}$		Fig. 21



Typical Performance

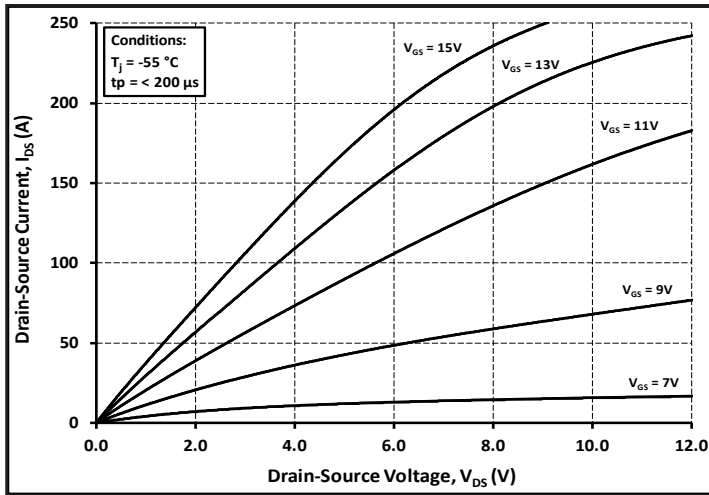


Figure 1. Output Characteristics $T_J = -55\text{ }^{\circ}\text{C}$

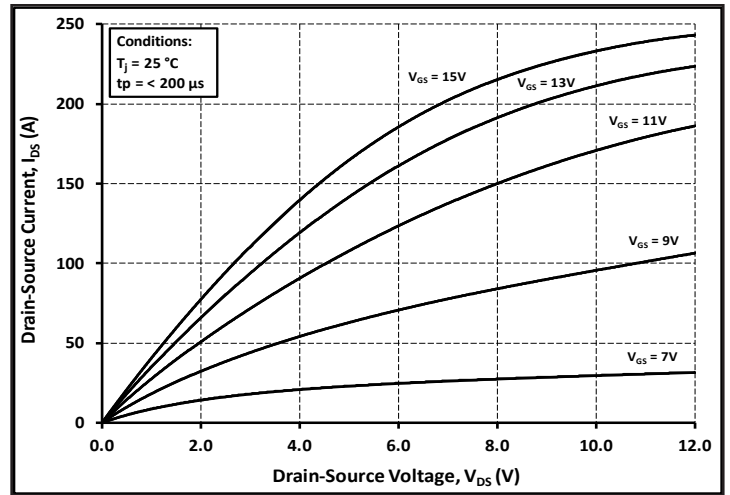


Figure 2. Output Characteristics $T_J = 25\text{ }^{\circ}\text{C}$

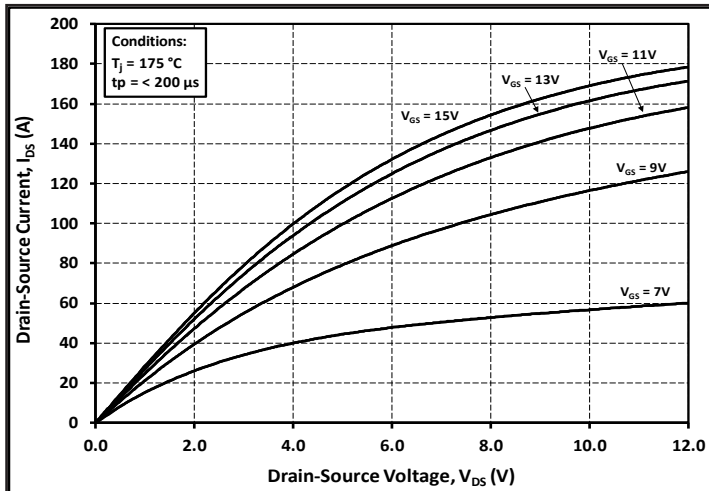


Figure 3. Output Characteristics $T_J = 175\text{ }^{\circ}\text{C}$

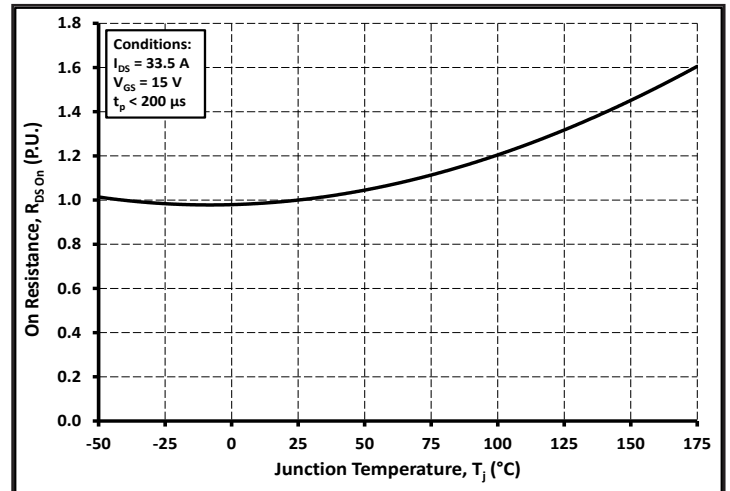


Figure 4. Normalized On-Resistance vs. Temperature

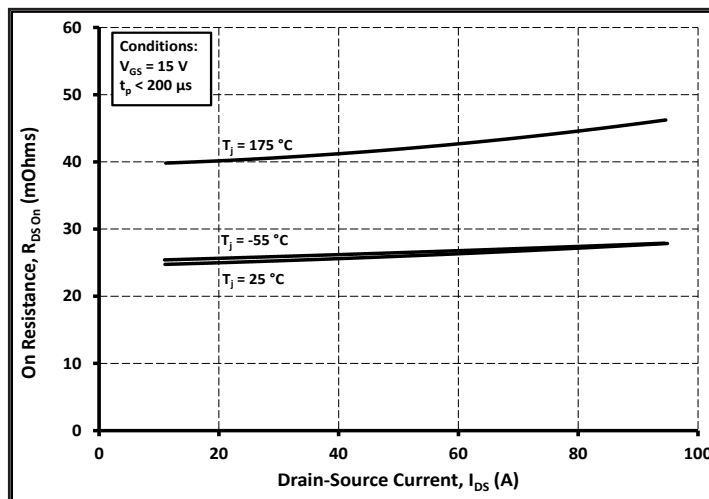


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

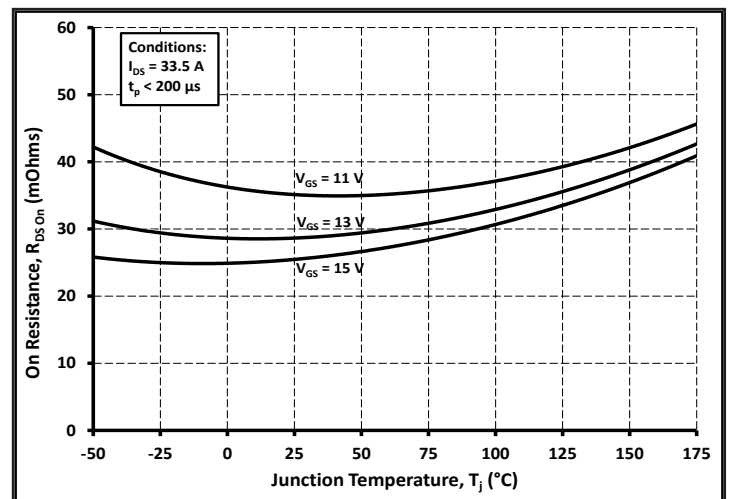


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

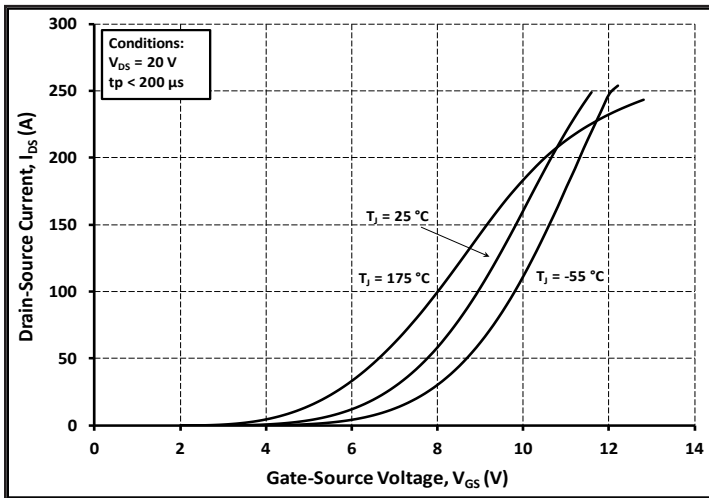


Figure 7. Transfer Characteristic for Various Junction Temperatures

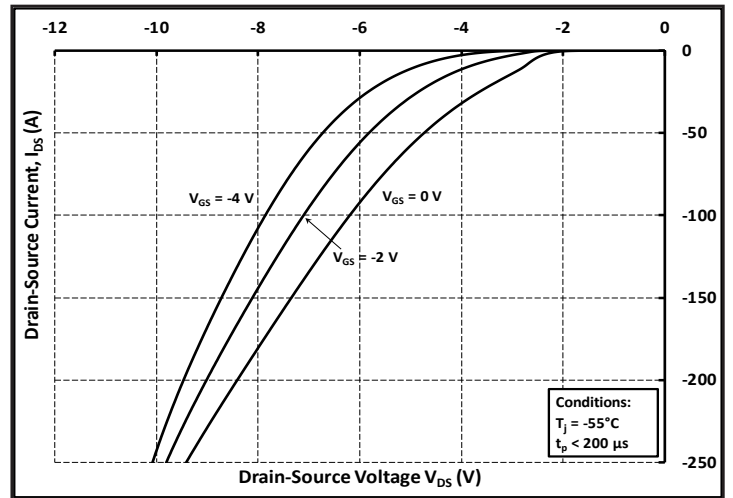


Figure 8. Body Diode Characteristic at -55°C

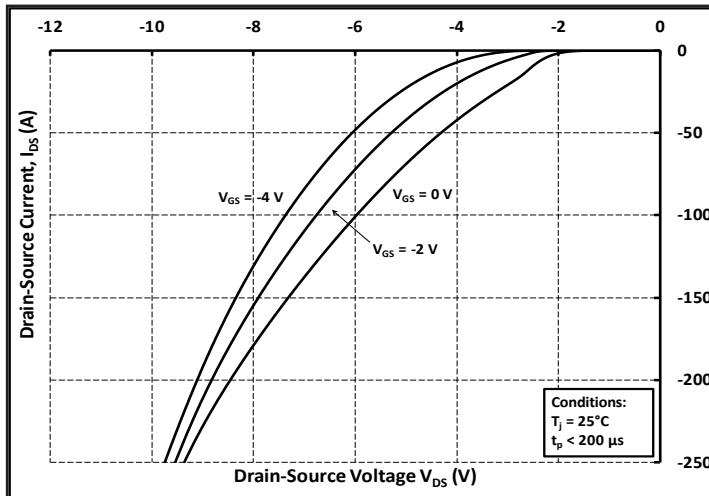


Figure 9. Body Diode Characteristic at 25°C

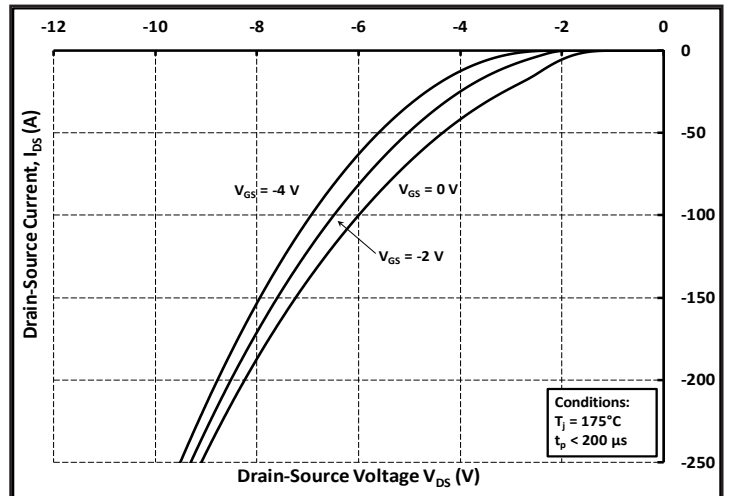


Figure 10. Body Diode Characteristic at 175°C

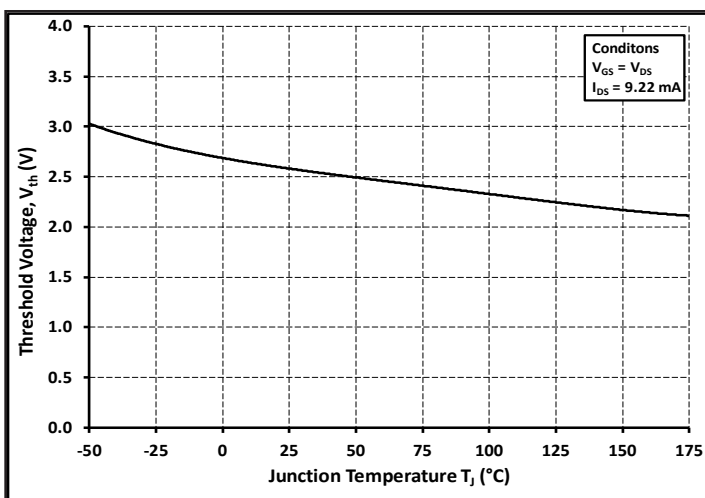


Figure 11. Threshold Voltage vs. Temperature

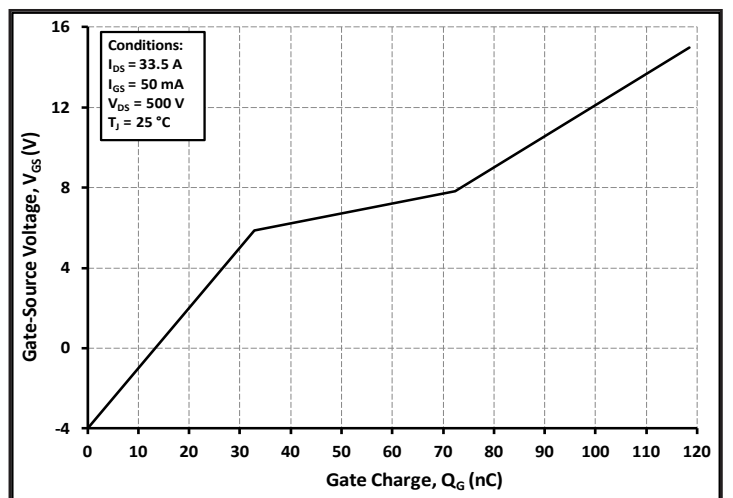


Figure 12. Gate Charge Characteristics

Typical Performance

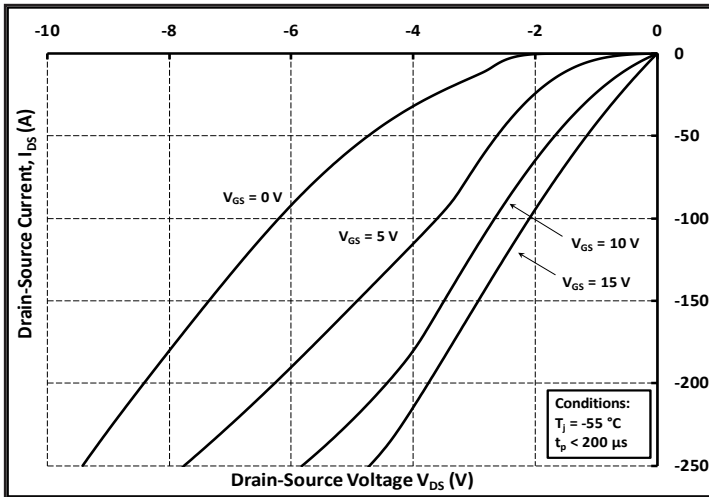
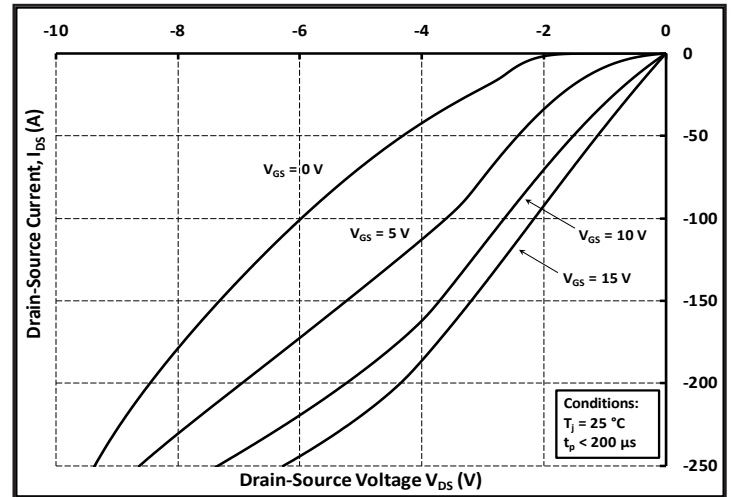
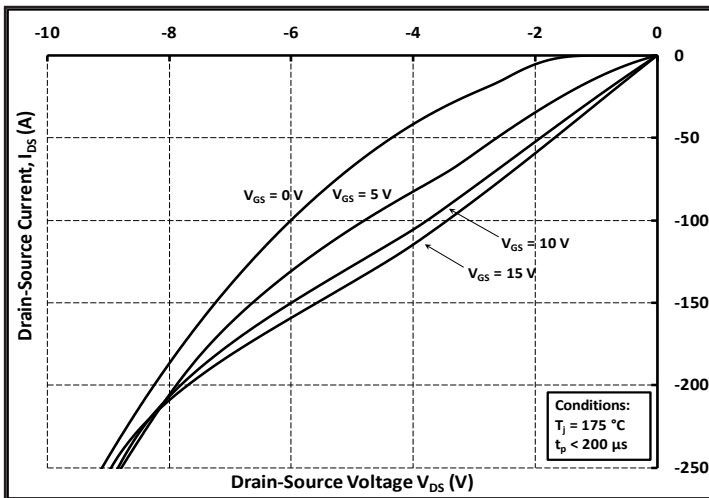
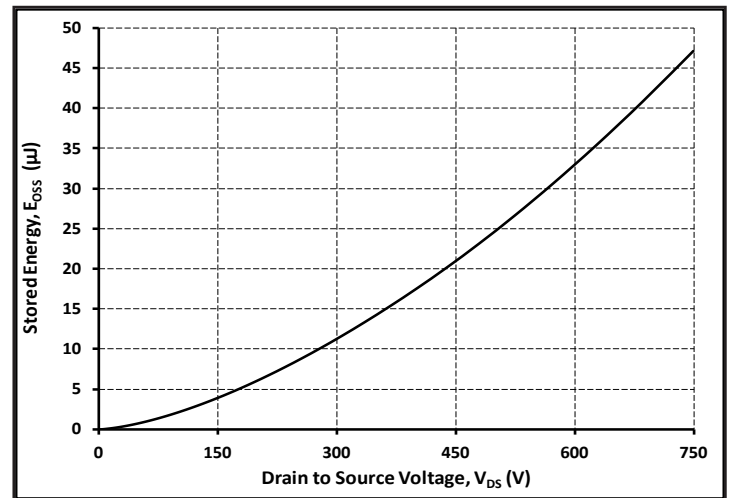
Figure 13. 3rd Quadrant Characteristic at $-55\text{ }^{\circ}\text{C}$ Figure 14. 3rd Quadrant Characteristic at $25\text{ }^{\circ}\text{C}$ Figure 15. 3rd Quadrant Characteristic at $175\text{ }^{\circ}\text{C}$ 

Figure 16. Output Capacitor Stored Energy

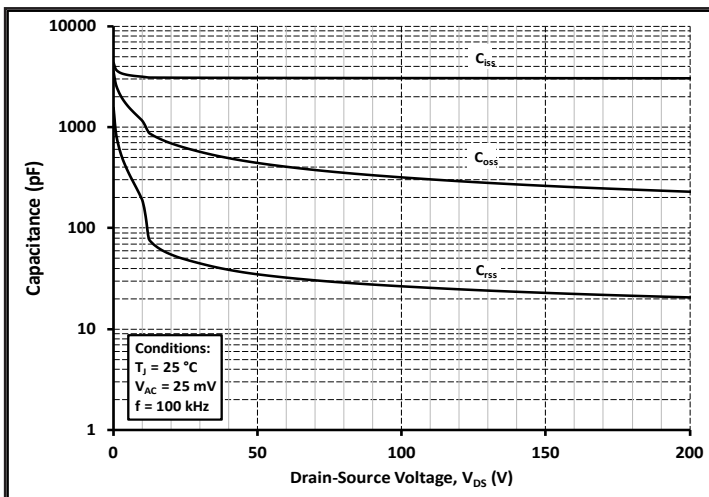


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

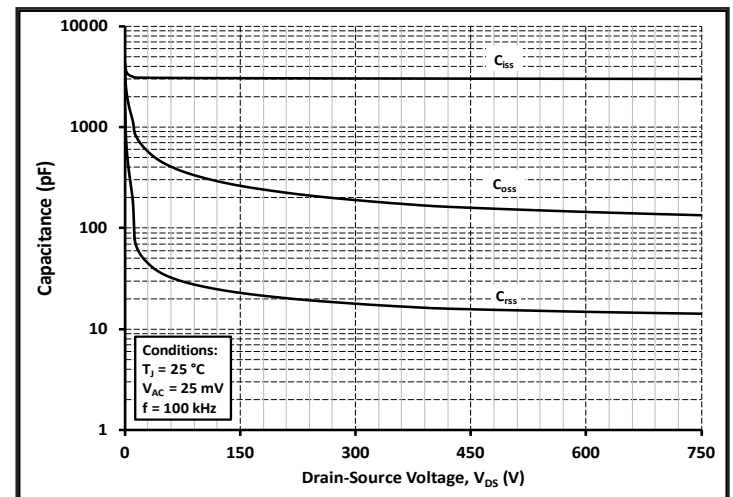


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 750V)

Typical Performance

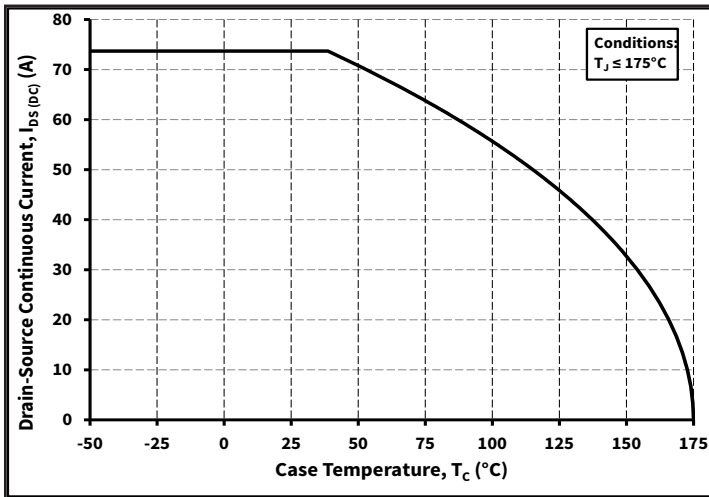


Figure 19. Continuous Drain Current Derating vs. Case Temperature

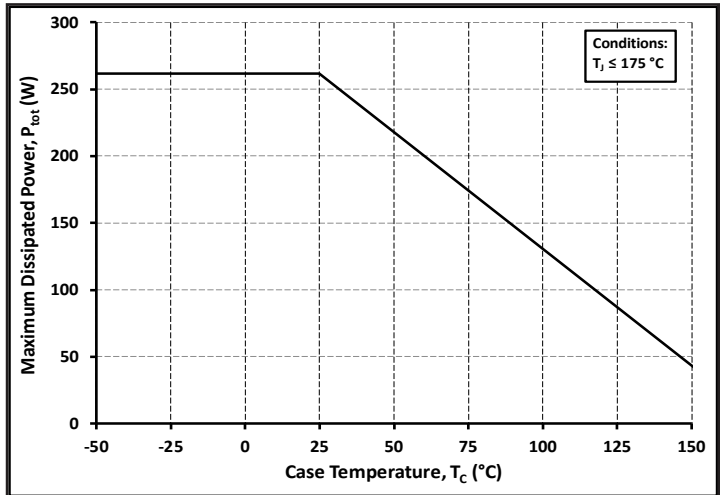


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

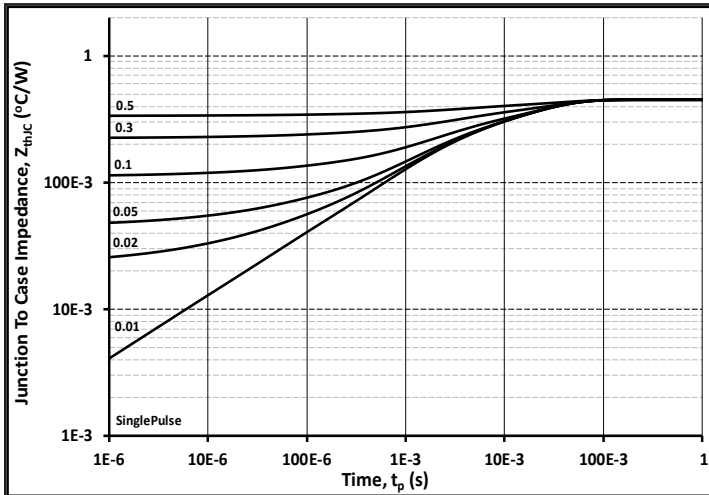


Figure 21. Transient Thermal Impedance (Junction - Case)

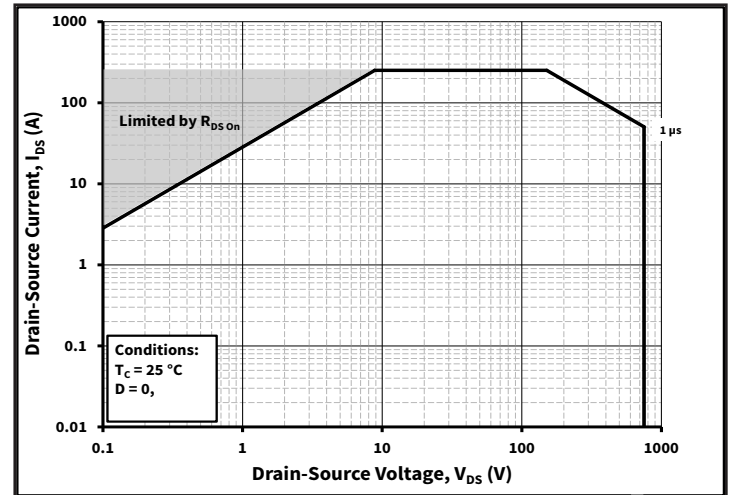
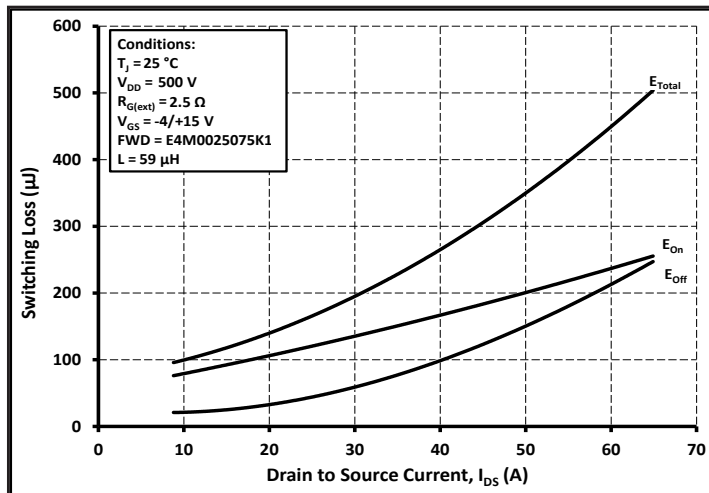
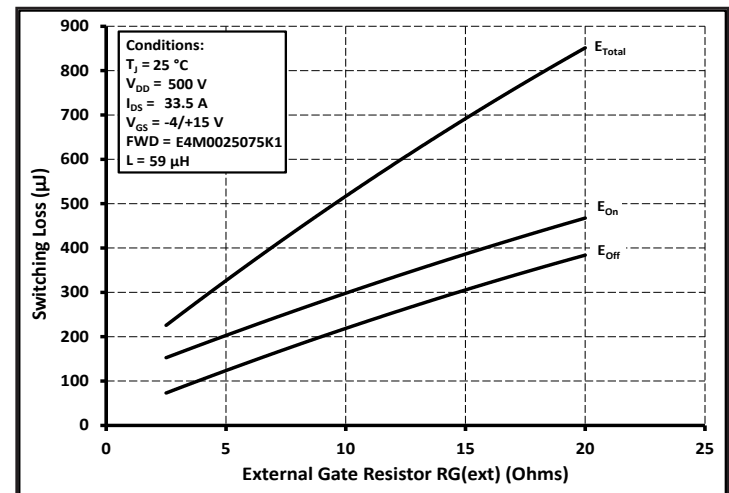


Figure 22. Safe Operating Area

Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 500V$)Figure 24. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

Typical Performance

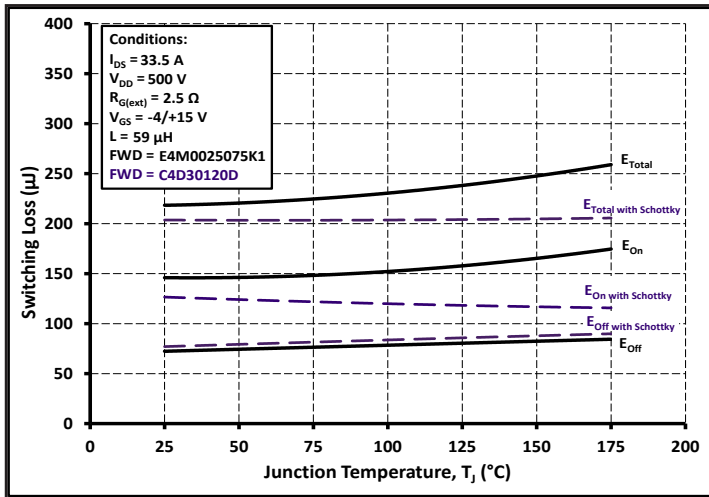


Figure 25. Clamped Inductive Switching Energy vs. Temperature

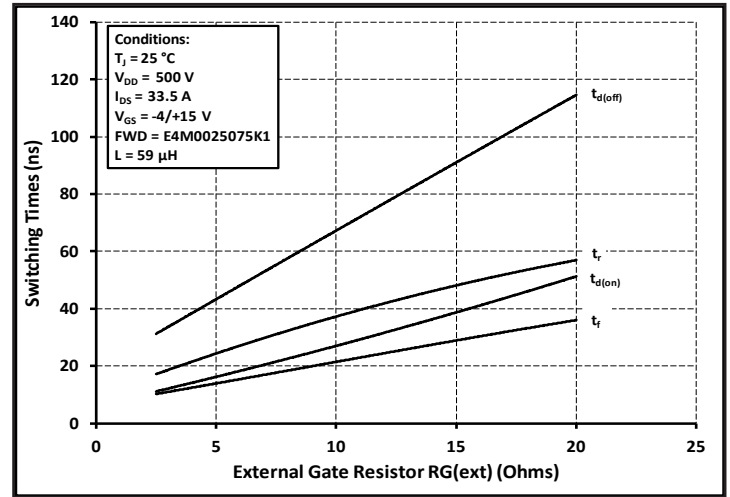
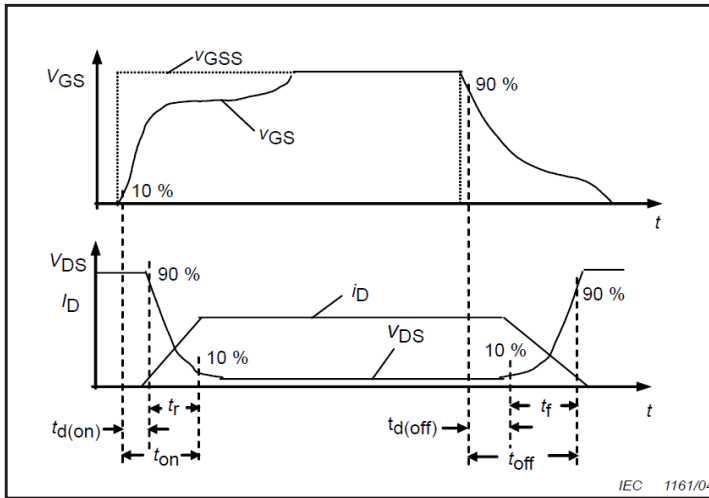
Figure 26. Switching Times vs. $R_{G(ext)}$ 

Figure 27. Switching Times Definition

Test Circuit Schematic

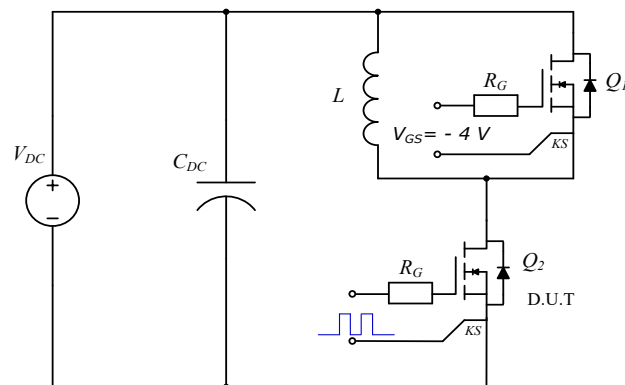
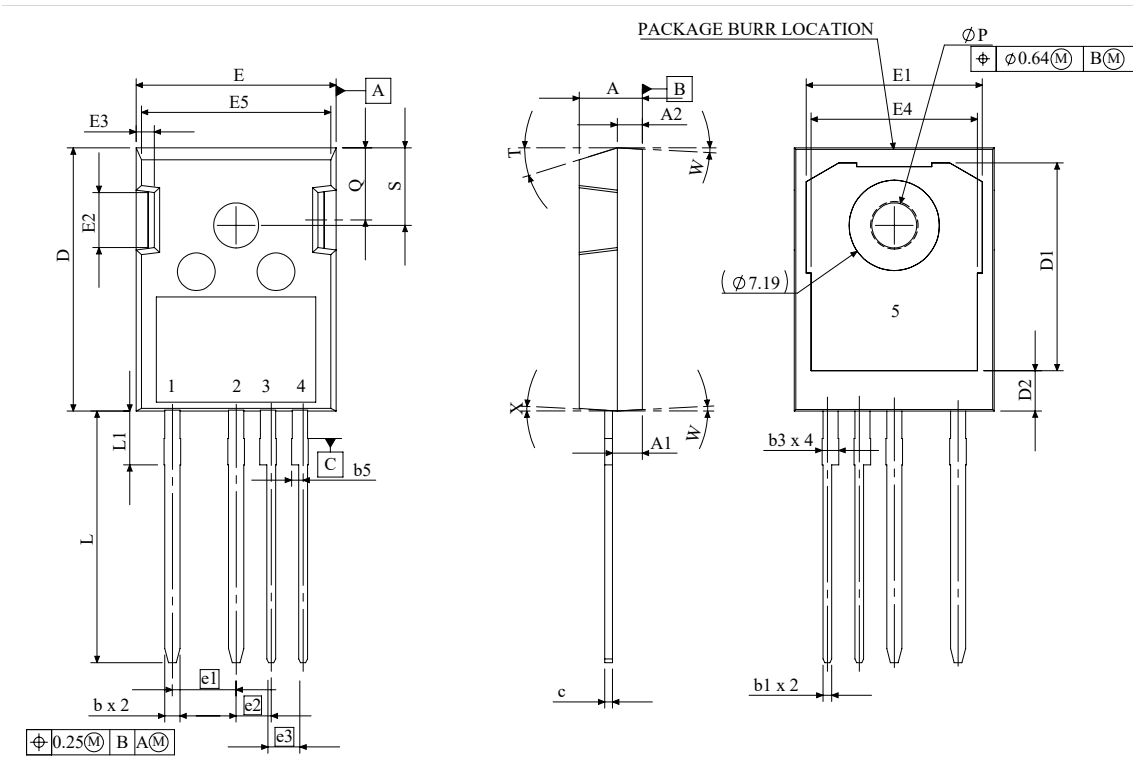


Figure 28. Clamped Inductive Switching Waveform Test Circuit

Package Dimensions



SYMBOL	MIN (mm)	MAX (mm)
A	4.83	5.21
A1	2.22	2.6
A2	1.91	2.16
b	1.10	1.30
b1	0.65	0.79
b3	1.34	1.44
b5	0.74	1.14
c	0.55	0.68
D	20.76	21.14
D1	16.25	17.65
D2	2.95	3.35
E	15.75	16.13
E1	13.1	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	14.65	15.05
e1	5.08 BSC	
e2	2.79 BSC	
e3	2.54 BSC	
L	19.72	20.32
L1	3.87	4.47
ΦP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	

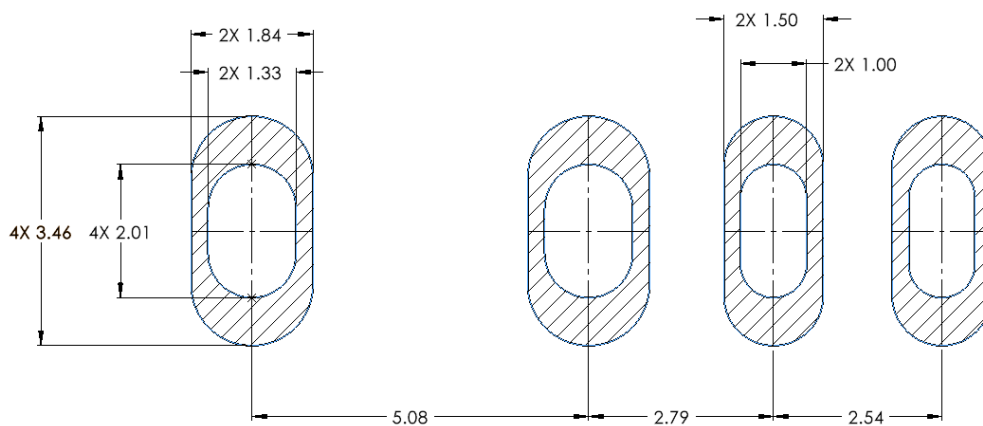
1	DRAIN
2	SOURCE
3	DRIVER SOURCE
4	GATE
5	DRAIN

- NOTE:
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



Recommended Solder Pad Layout

All dimensions in mm



Revision history

Document Version	Date of release	Description of changes
1.0	January-2024	Initial datasheet
2	January - 2025	Legal Disclaimer Updated
3	October - 2025	Updated datasheet values for: • Continuous Drain Current • Drain-Source On-State Resistance • Transconductance • Turn-On and Turn-Off Switching Energies • Continuous Diode Forward Current • Figures 4-6, 19, 22-25 • Removed Figure: Clamped Inductive Switching Energy vs. Low Drain Current



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 THIRD-PARTY 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 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 (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.
PATENT: <https://www.wolfspeed.com/legal/patents>

The information in this document is subject to change without notice.