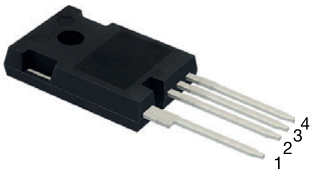
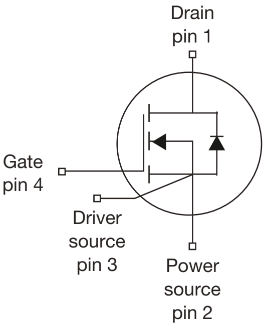
MaxSiC® 1200 V N-Channel SiC MOSFET

TO-247AD 4L





Marking Code: 120A045SL

FEATURES

- Fast switching speed
- Short circuit withstand time 3 μs
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Solar Inverters
- Energy Storage Systems
- UPS (uninterruptible power supplies)

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	1200	
$R_{DS(on)}$ typ. (mΩ) at 25 °C	V_{GS} = 18 V	45
Q_g typ. (nC)	83	
I_D (A)	51	
C_{oss} typ. (pF)	96	
P_D (W)	254	
Configuration	Single	

ORDERING INFORMATION

Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	MXP120A045SL-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	1200	V
Gate-source voltage		V_{GS}	-10 / +22	
Recommended operation voltage of gate-source		V_{GSOP}	-5 to -3 / +18	
Continuous drain current	T_C = 25 °C	I_D	51	A
Pulsed drain current [a]		I_{DM}	102	
Short-circuit withstand time [b]		T_{SC}	3	μs
Maximum power dissipation	T_C = 25 °C	P_D	254	W
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C
Single pulse avalanche energy [c]		E_{AS}	200	mJ

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature

b. V_{GS} = 18 V, V_{DS} = 800 V, $R_{g(ext)}$ = 20 Ω, verified by the design / characterization

c. T_J = 25 °C, V_{DD} = 120 V, L = 1 mH, V_{GS} = 18 V, I_{AS} = 20 A

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.59	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 1 mA		1200	-	-	V
Gate-source threshold voltage (N)	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 5 mA		-	2.8	-	V
		V_{DS} = V_{GS}, I_D = 5 mA, T_J = 175 °C		-	1.9	-	V
Gate-source leakage	I_{GSS}	V_{GS} = 22 V, V_{DS} = 0 V		-	-	100	nA
		V_{GS} = -10 V, V_{DS} = 0 V		-	-	-100	
Zero gate voltage drain current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V		-	-	10	μA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 15 V, I_D = 26 A		-	60	75	mΩ
		V_{GS} = 18 V, I_D = 26 A		-	45	56	
		V_{GS} = 18 V, I_D = 26 A, T_J = 175 °C		-	82	-	
Transconductance	gfs	V_{DS} = 10 V, I_D = 26 A		-	11	-	S
Dynamic							
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 100 KHz		-	2523	-	pF
Output capacitance	C_{oss}			-	96	-	
Reverse transfer capacitance	C_{rss}			-	3	-	
Total gate charge	Q_g	V_{GS} = -5 V ~ 18 V, I_D = 26 A, V_{DS} = 800 V		-	83	-	nC
Gate-source charge	Q_{gs}			-	24	-	
Gate-drain charge	Q_{gd}			-	23	-	
Gate Resistance	R_g	V_{DS} = 0 V, f = 1 MHz		-	3	-	Ω
Switching Characteristics							
Turn-on delay time	$t_{d(on)}$	V_{GS} = -5 V ~ 18 V, I_D = 26 A, V_{DS} = 800 V, $R_{g(ext)}$ = 4.4 Ω	T_J = 25 °C	-	20	-	ns
			T_J = 175 °C	-	18	-	
Rise time	t_r		T_J = 25 °C	-	17	-	
			T_J = 175 °C	-	16	-	
Turn-off delay time	$t_{d(off)}$		T_J = 25 °C	-	26	-	
			T_J = 175 °C	-	29	-	
Fall time	t_f		T_J = 25 °C	-	10	-	
			T_J = 175 °C	-	10	-	
Turn-on switching energy	E_{on}		T_J = 25 °C	-	285	-	μJ
			T_J = 175 °C	-	252	-	
Turn-off switching energy	E_{off}		T_J = 25 °C	-	86	-	
			T_J = 175 °C	-	85	-	
Body Diode Ratings and Characteristic							
Forward diode voltage	V_{SD}	V_{GS} = -5 V, I_{SD} = 13 A, T_J = 25 °C		-	4.9	-	V
Continuous diode forward current	I_{SD}	V_{GS} = -5 V, T_J = 25 °C		-	-	37	A
Pulsed diode forward current	I_{SDM}			-	-	102	
Reverse recovery time	t_{rr}	V_{GS} = -5 V, I_{SD} = 26 A, V_R = 800 V, di/dt = 1000 A/μs		-	19	-	ns
Reverse recovery charge	Q_{rr}			-	83	-	nC
Reverse recovery current	I_{RRM}			-	7	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

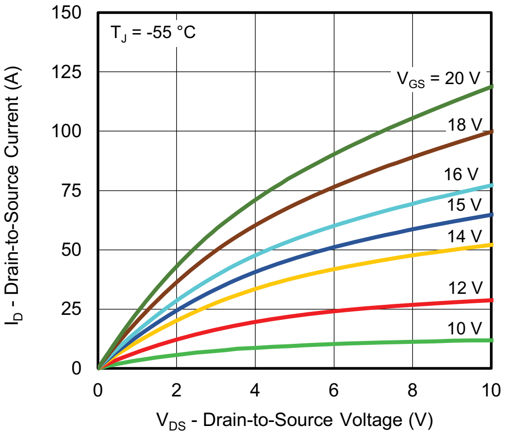


Fig. 1 - Typical Output Characteristics

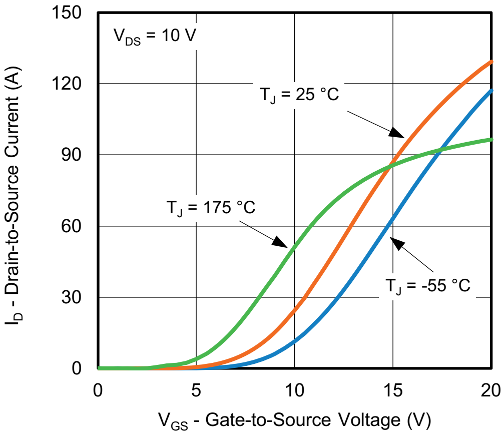


Fig. 4 - Typical Transfer Characteristics

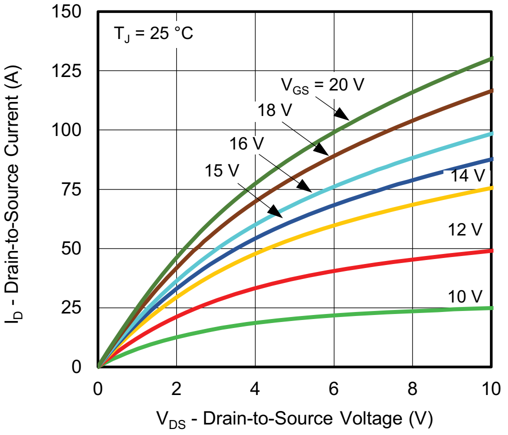


Fig. 2 - Typical Output Characteristics

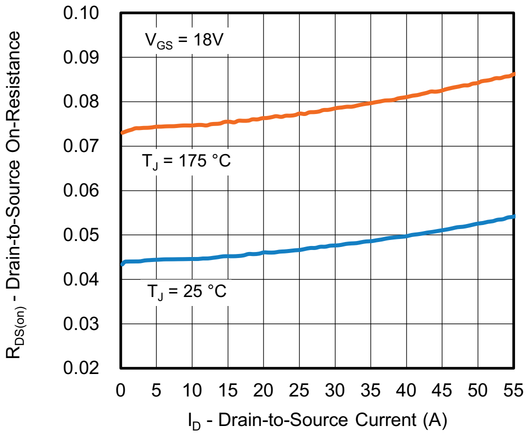


Fig. 5 - Normalized On-Resistance vs. Drain Current

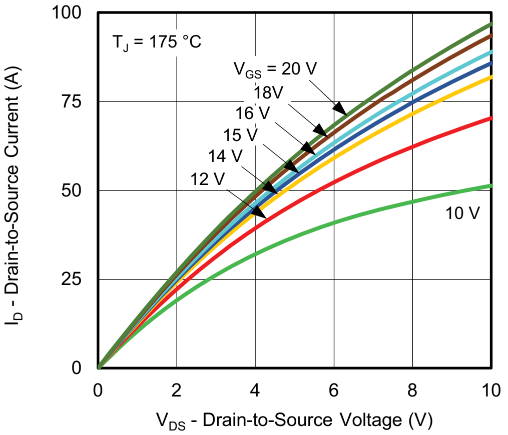


Fig. 3 - Typical Output Characteristics

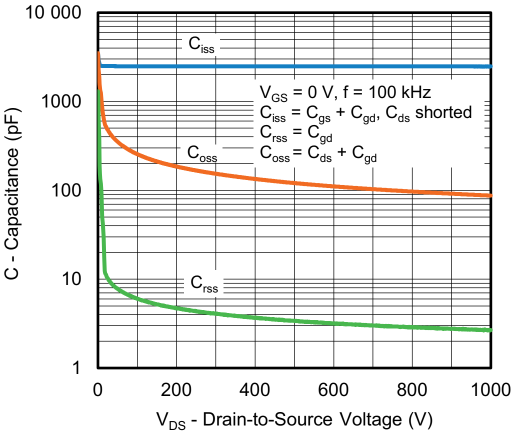


Fig. 6 - Typical Capacitance vs. Drain-to-Source Voltage

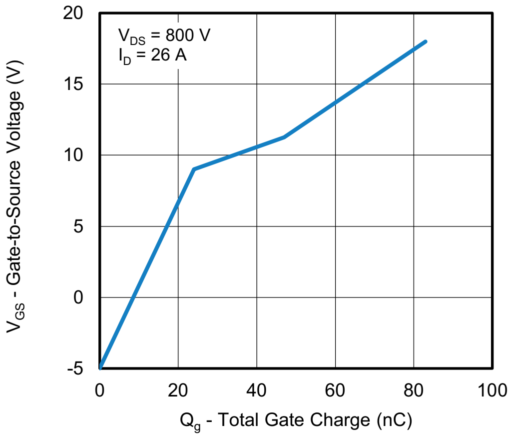


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

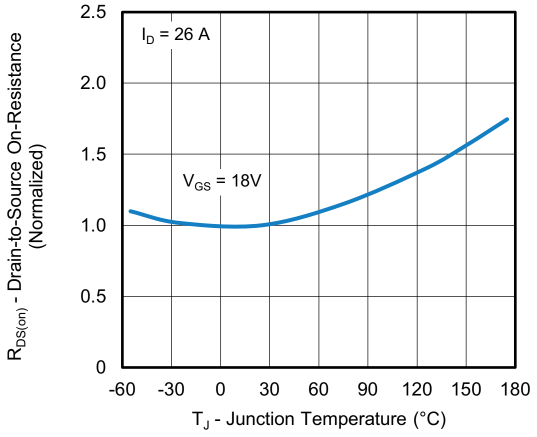


Fig. 8 - Normalized On-Resistance vs. Temperature

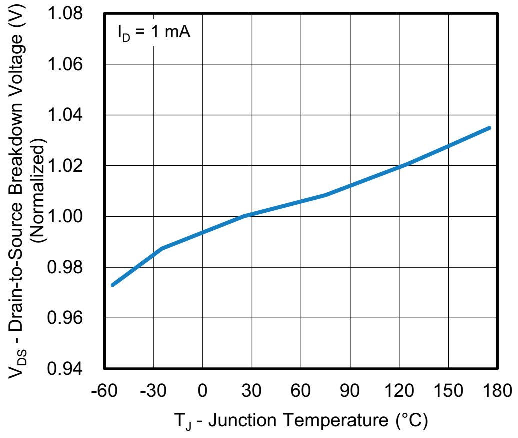


Fig. 9 - Drain-to-Source Voltage vs. Temperature

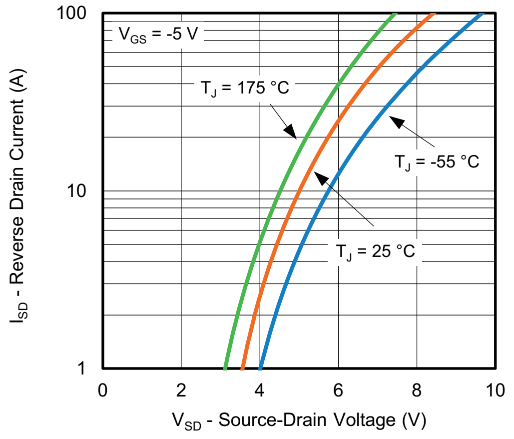


Fig. 10 - Typical Source-Drain Diode Forward Voltage

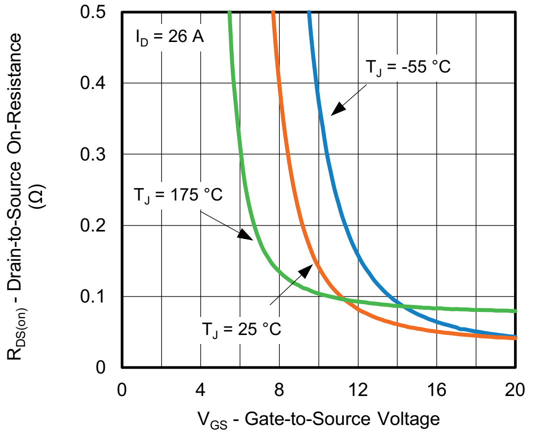


Fig. 11 - On-Resistance vs. Gate-to-Source Voltage

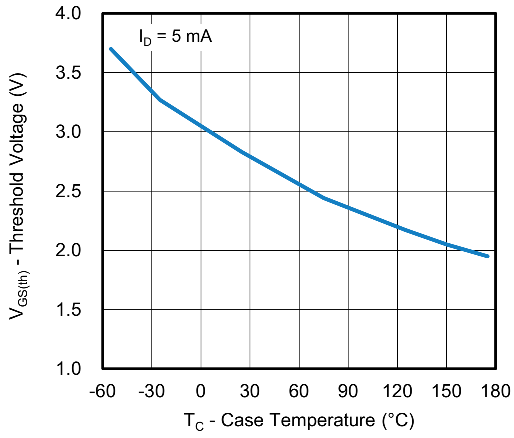


Fig. 12 - Threshold Voltage vs. Case Temperature

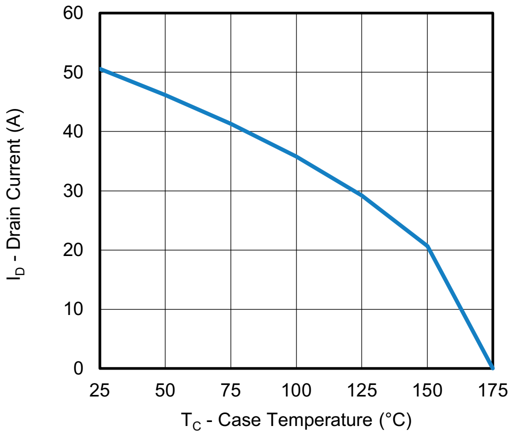


Fig. 13 - Drain Current vs. Case Temperature

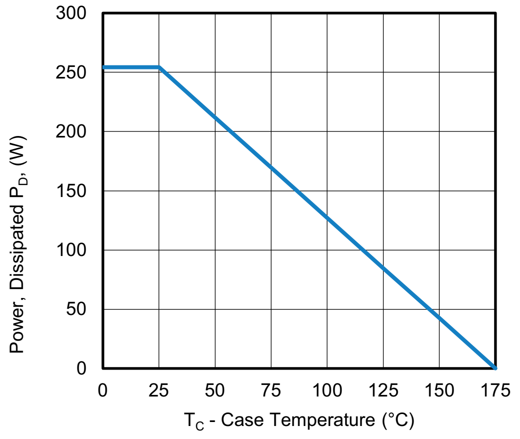


Fig. 15 - Power, Dissipated P_D vs. Case Temperature

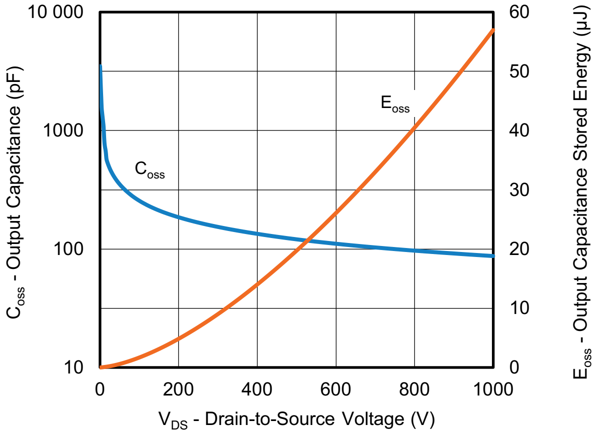


Fig. 14 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage

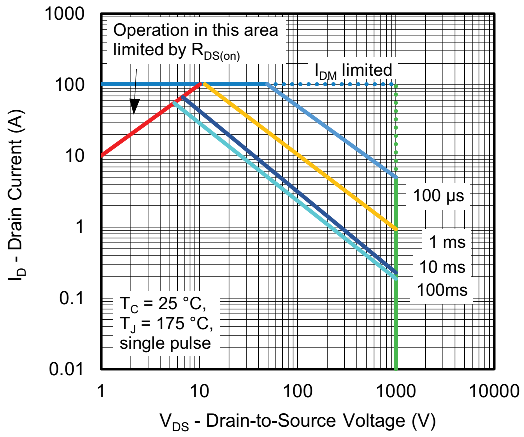
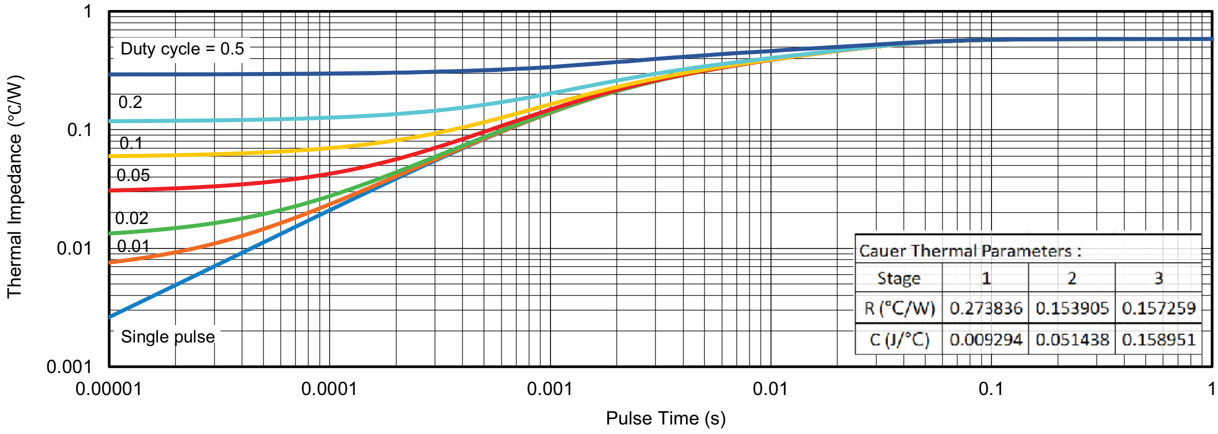


Fig. 16 - Safe Operating Area



Cauer Thermal Parameters :

Stage	1	2	3
R (°C/W)	0.273836	0.153905	0.157259
C (J/°C)	0.009294	0.051438	0.158951

Fig. 17 - Transient Thermal Impedance

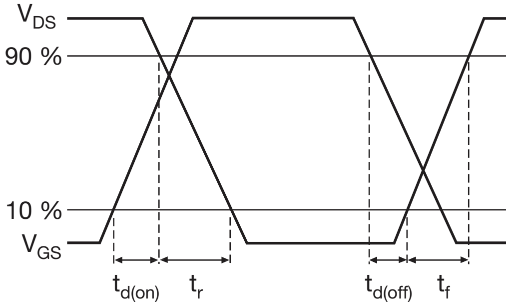


Fig. 18 - Waveforms of Switching Time

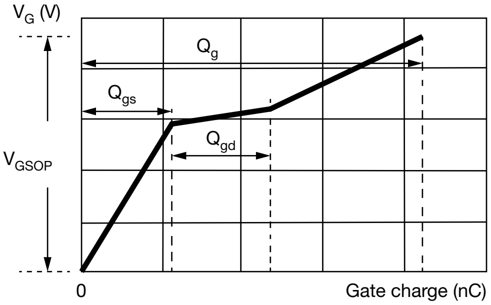


Fig. 21 - Waveforms for Gate Charge

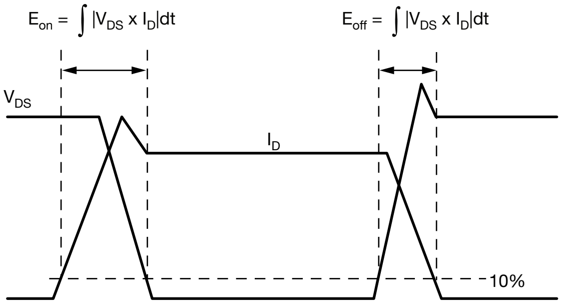


Fig. 19 - Waveforms for Switching Energy

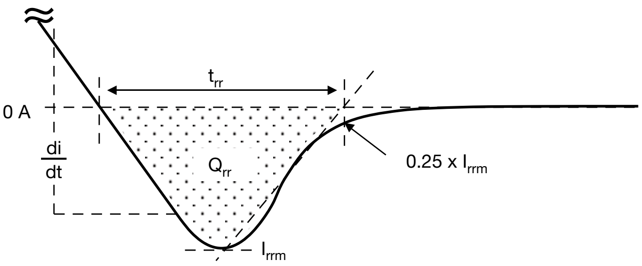


Fig. 22 - Waveforms for Reverse Recovery

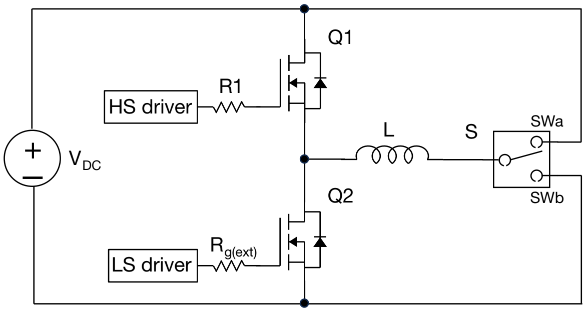


Fig. 20 - Switching and Reverse Diode Characteristics Measurement Circuit

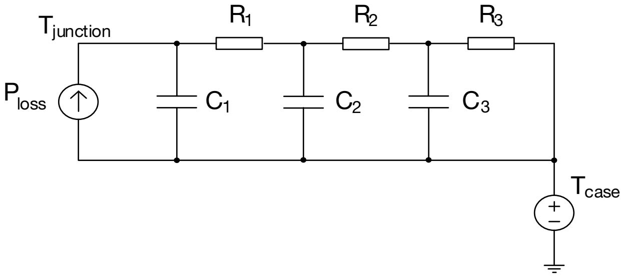
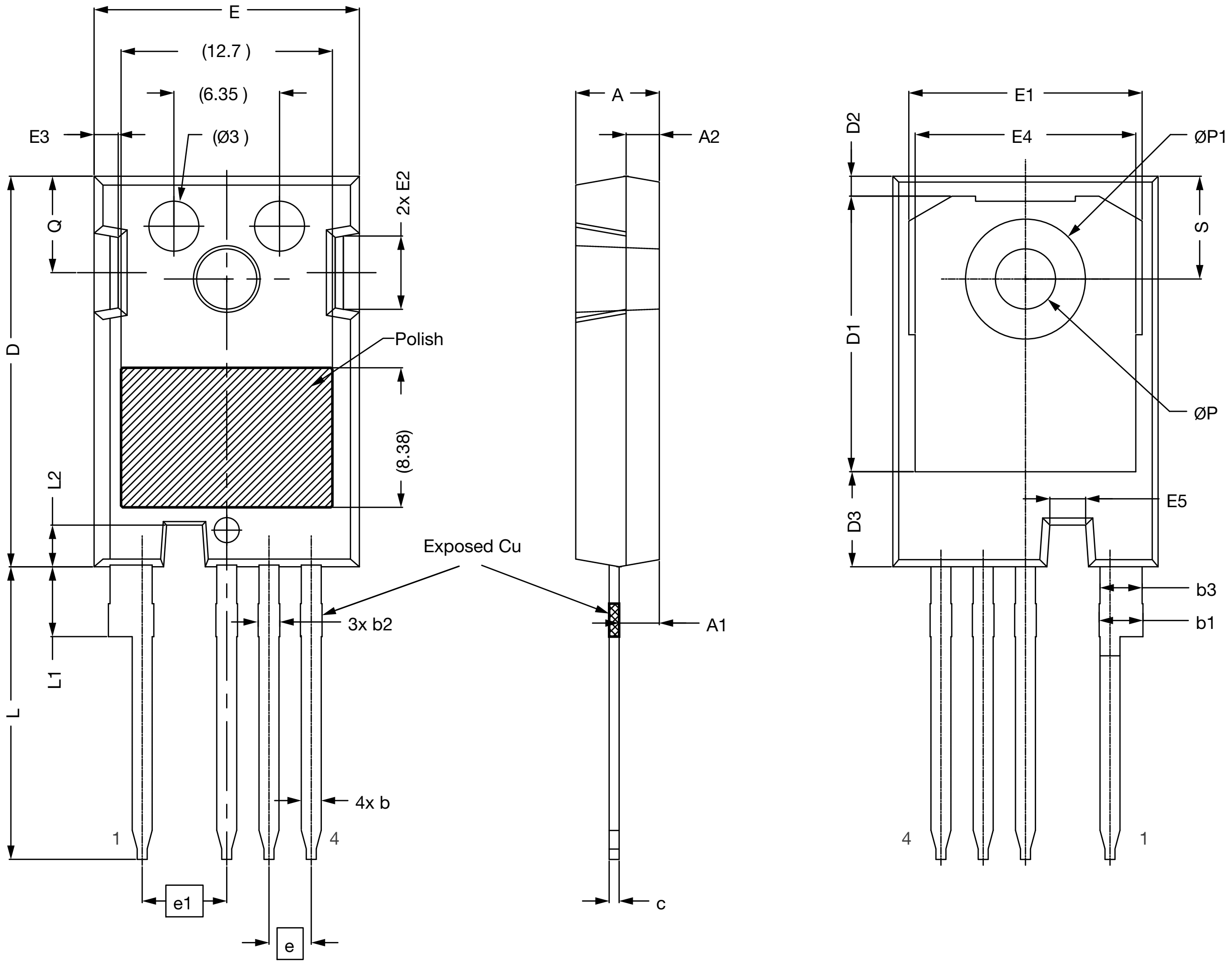


Fig. 23 - Thermal Equivalent Circuit

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?92852.

Case Outline for TO-247AD 4L Package

FACILITY CODE: 9

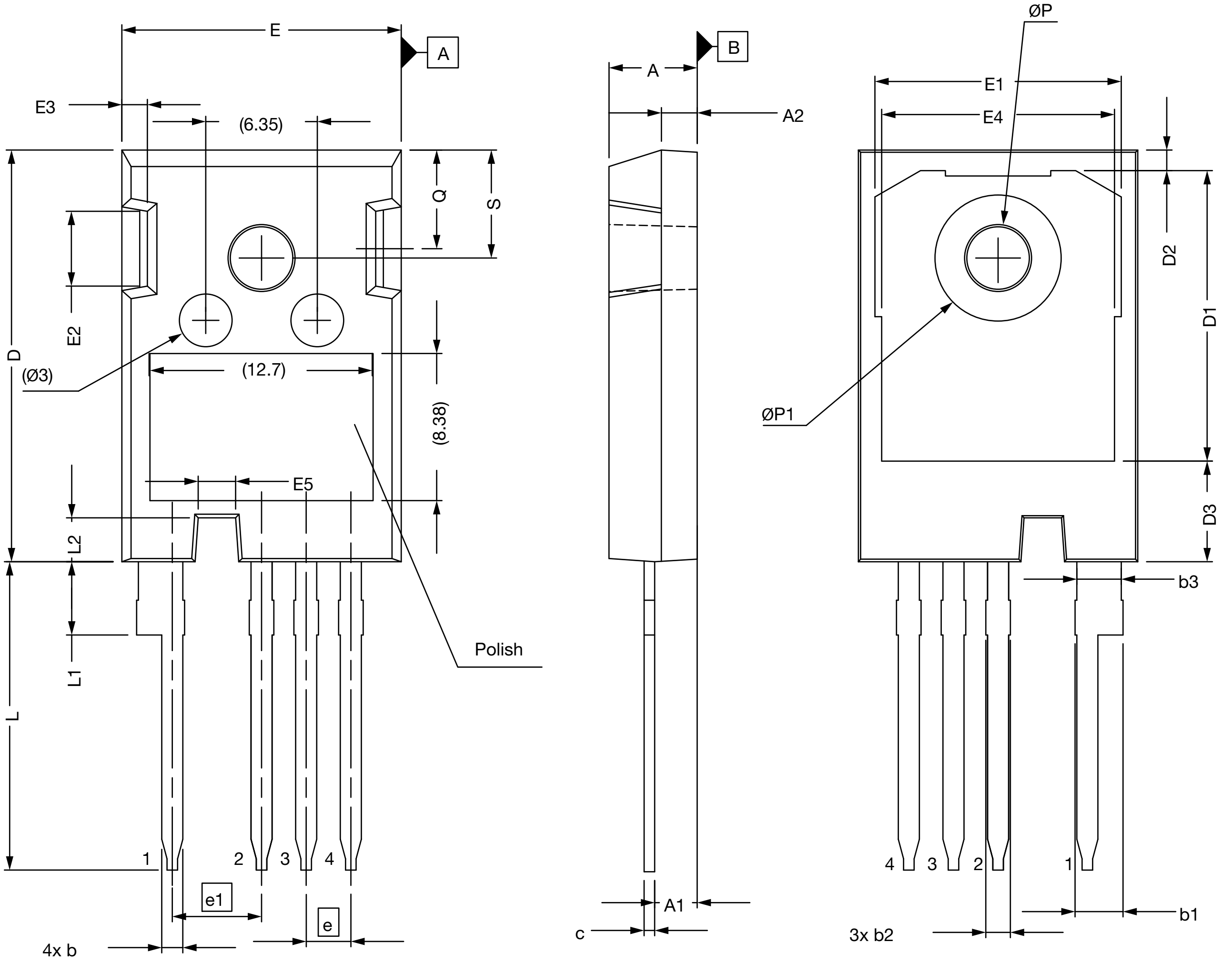


DIM.	MILLIMETERS	
	MIN.	**MAX.**
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC.	
e1	5.08 BSC.	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
ØP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30

Notes

- All dimensions are in mm. Angles are in degrees
- Dimension D and E do not include mold flash
- All metal surfaces: tin plated, except area of cut
- Dimensioning and toleranceing confirm to ASME Y14.5M-1994
- Creepage 1 is 8.58 mm (ref.) which is the distance alongside the surface between drain (pin 1) and trough the notch towards source (pin 2). Creepage 2 is 7.95 mm (ref.) which is the distance from end of the copper slug on the backside of the package to either pin 2, pin 3 or pin 4

FACILITY CODE: N



For technical questions, contact: sicmostechsupport@vishay.com

DIM.	MILLIMETERS		
	MIN.	**NOM.**	**MAX.**
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	1.07	1.30	1.60
b3	2.39	2.53	2.69
c	0.55	0.60	0.68
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
D3	5.55	5.71	6.01
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
E5	1.95	2.15	2.35
e	2.54 BSC.		
e1	5.08 BSC.		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1	7.19 ref.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30
ECN: S25-0851-Rev. C, 18-Jul-2025 DWG: 6121			

Notes

- All dimensions are in mm
- Dimension D and E do not include mold flash.
- Creepage 1 is 8.40 mm (ref.) which is the distance alongside the surface between drain (pin 1) and trough the notch towards source (pin 2). Creepage 2 is 7.70 mm (ref.) which is the distance from end of the copper slug on the backside of the package to either pin 2, pin 3 or pin 4

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.