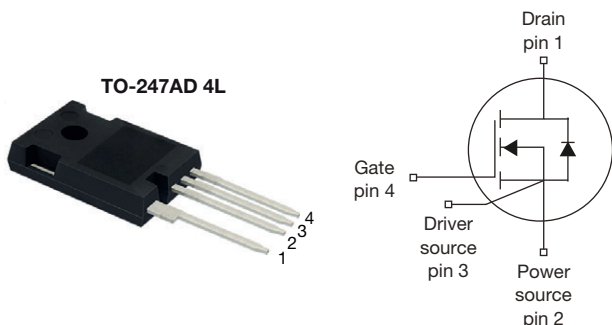


MaxSiC® 1200 V N-Channel SiC MOSFET


Marking Code: Q120A045SL

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	1200	
$R_{DS(on)}$ typ. (m Ω) 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	

FEATURES

- AEC-Q101 qualified
- Fast switching speed
- Short circuit withstand time 3 μ s
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Automotive on board charger
- Automotive DC/DC converter for EV/HEV
- Auxiliary drives
- EV Charging

ORDERING INFORMATION	
Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	MXPQ120A045SL-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	μ s
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

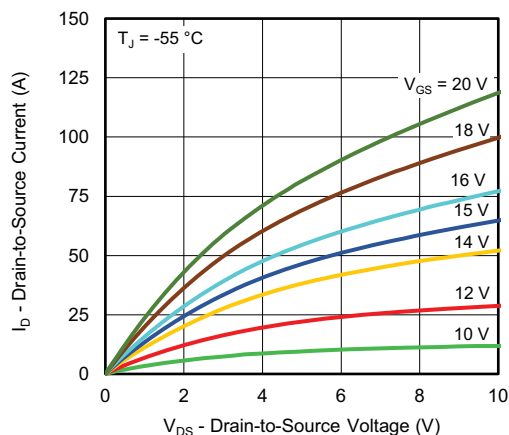
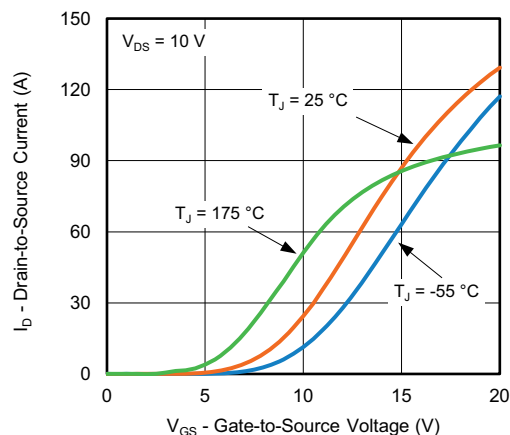
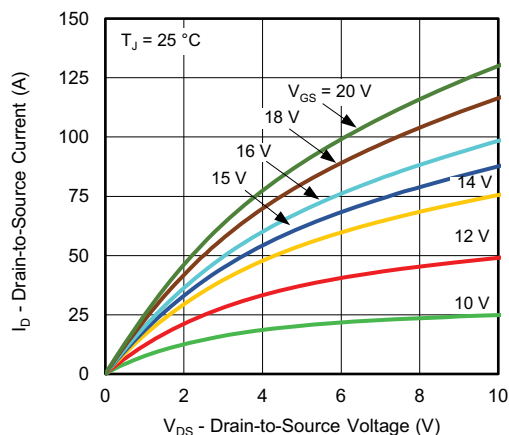
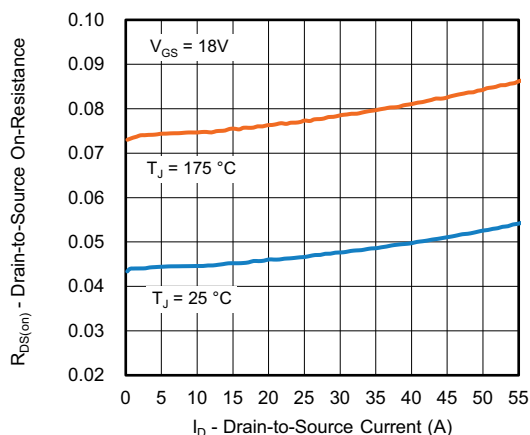
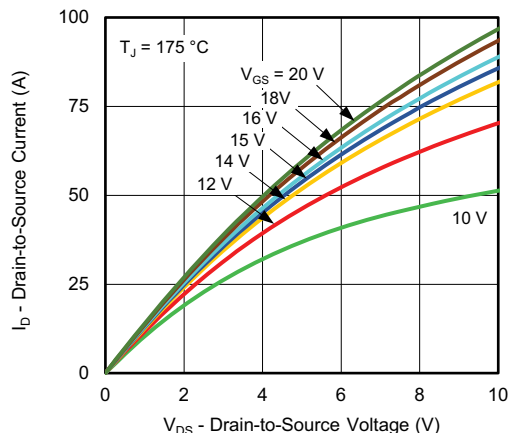
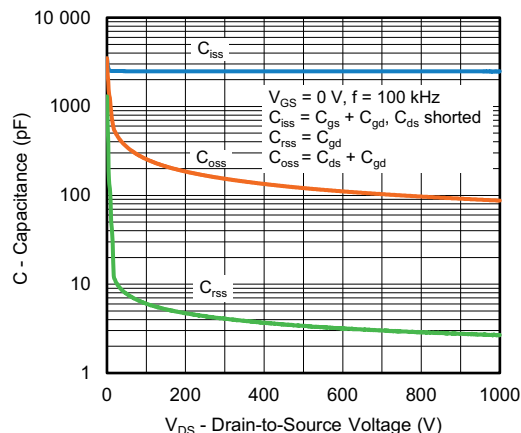
- a. Repetitive rating; pulse width limited by maximum junction temperature
b. $V_{GS} = 18$ V, $V_{DS} = 800$ V, $R_{g(ext)} = 20$ Ω , verified by the design / characterization
c. $T_J = 25$ °C, $V_{DD} = 120$ V, $L = 1$ mH, $V_{GS} = 18$ V, $I_{AS} = 20$ A

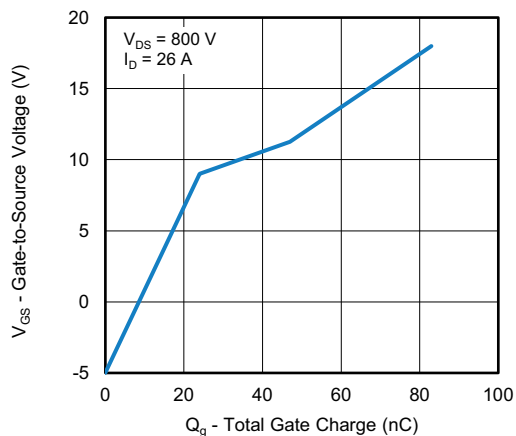
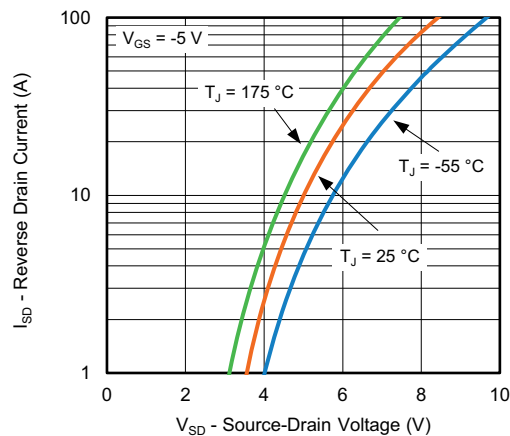
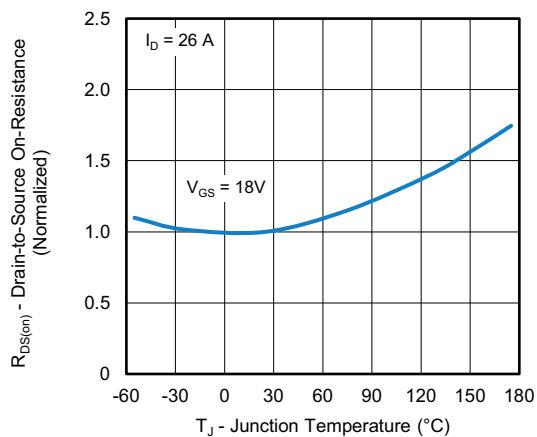
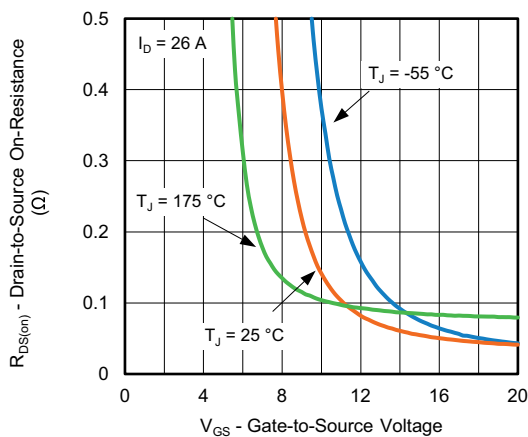
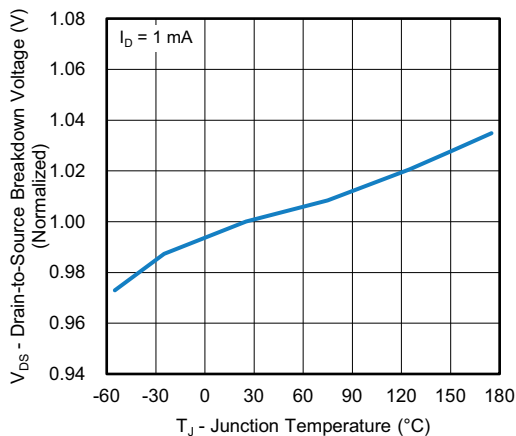
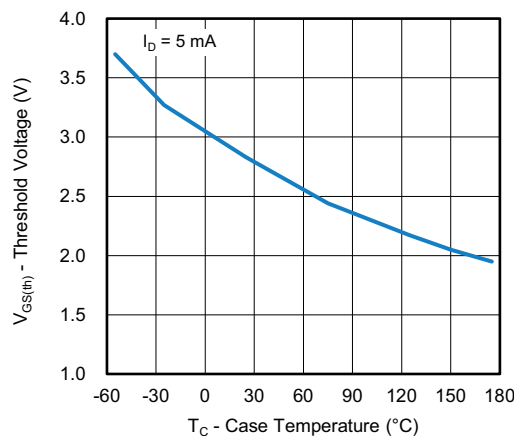
**THERMAL RESISTANCE RATINGS**

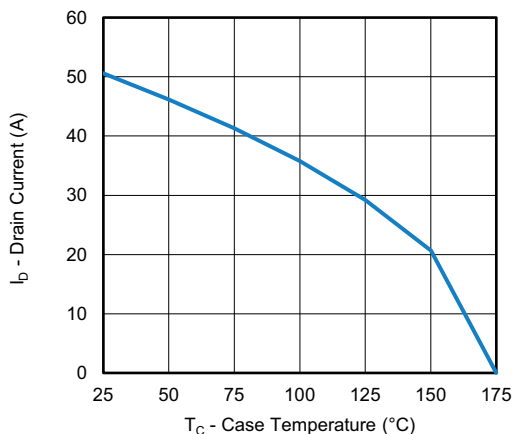
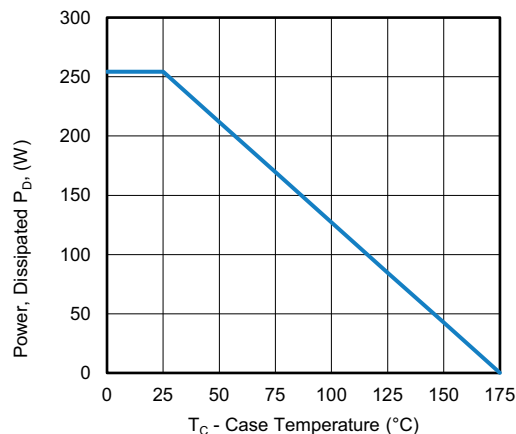
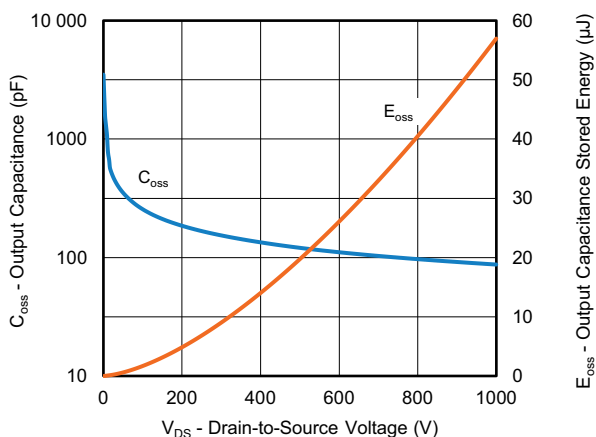
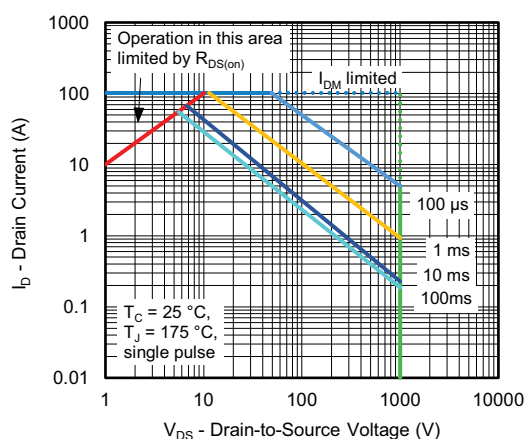
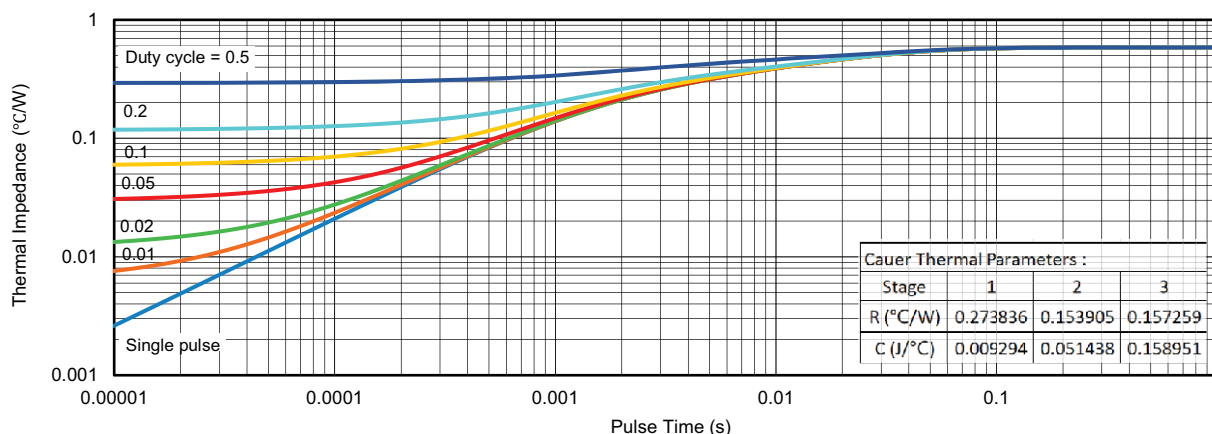
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.59	

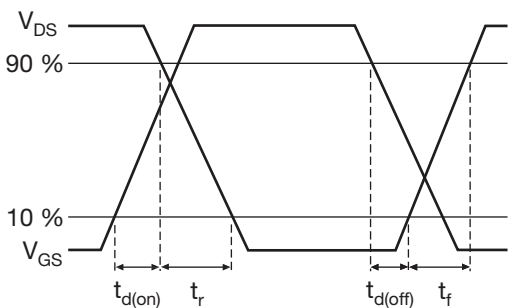
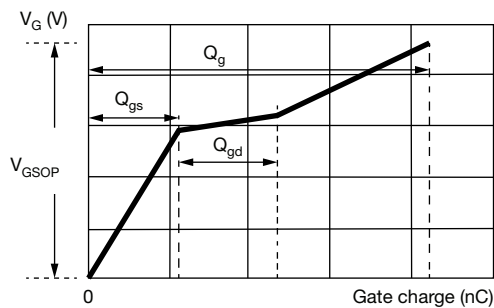
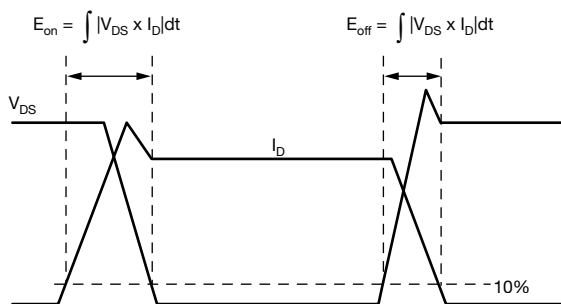
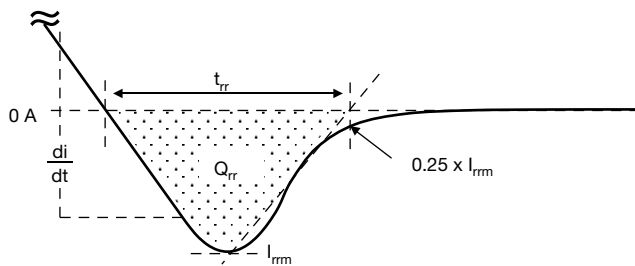
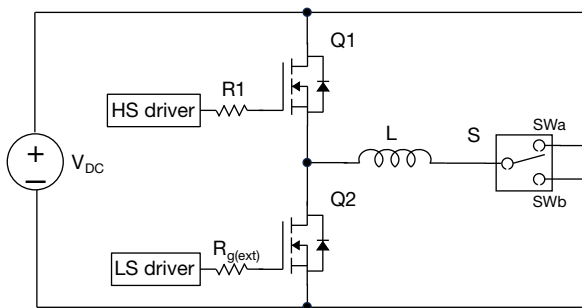
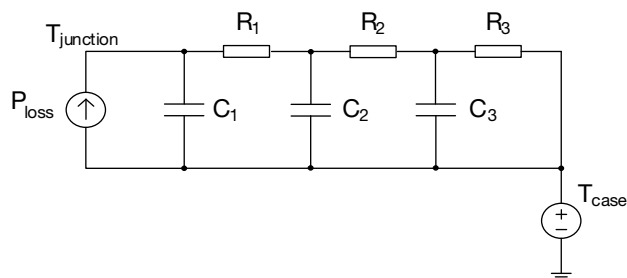
SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

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	g _{fs}	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
Rise time	t _r		T _J = 175 °C	-	18	-	
			T _J = 25 °C	-	17	-	
			T _J = 175 °C	-	16	-	
			T _J = 25 °C	-	26	-	
Turn-off delay time	t _{d(off)}		T _J = 175 °C	-	29	-	
			T _J = 25 °C	-	10	-	
Fall time	t _f		T _J = 175 °C	-	10	-	μJ
			T _J = 25 °C	-	285	-	
Turn-on switching energy	E _{on}		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. 10 - Typical Source-Drain Diode Forward Voltage

Fig. 8 - Normalized On-Resistance vs. Temperature

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

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

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

Fig. 17 - Transient Thermal Impedance

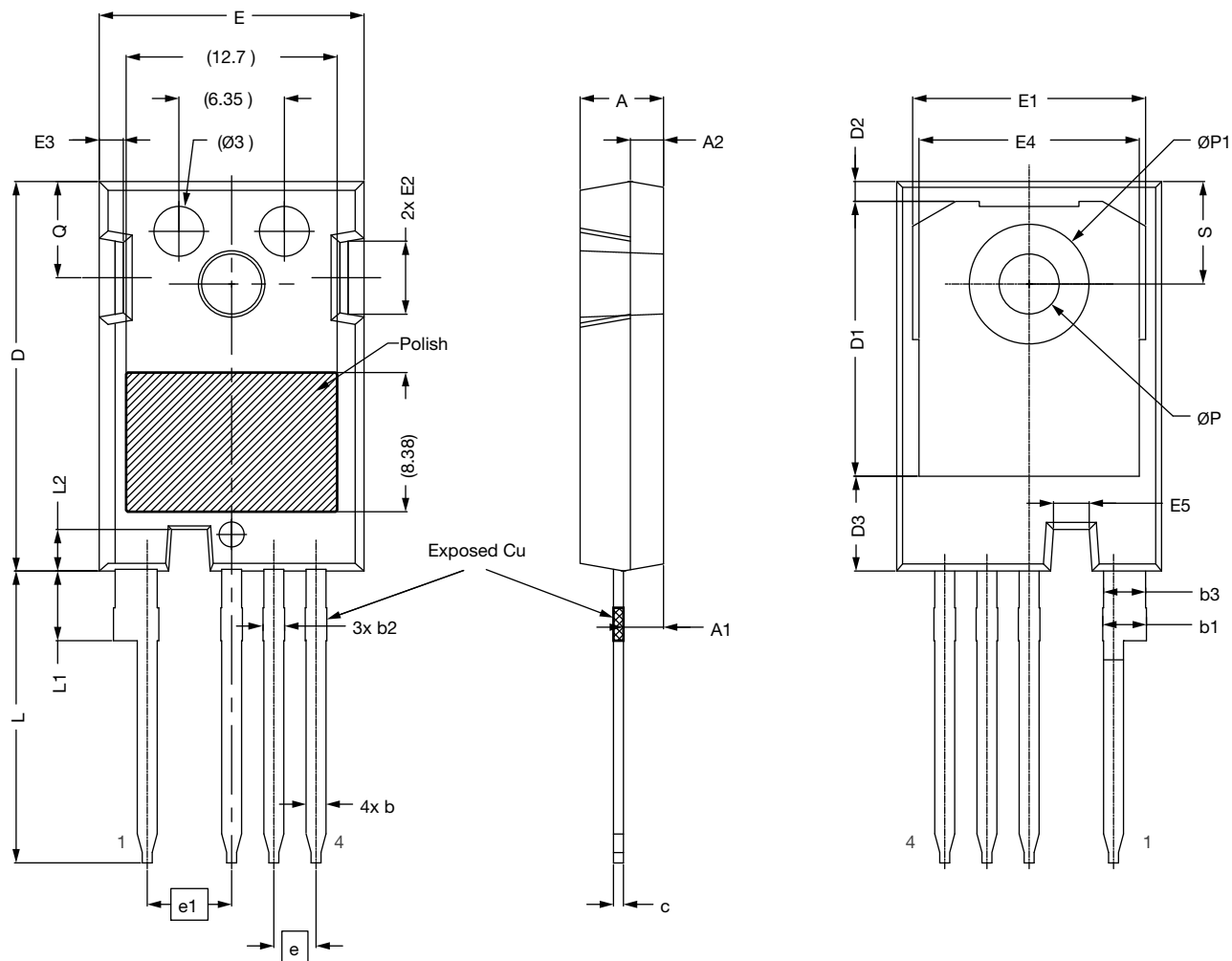

Fig. 18 - Waveforms of Switching Time

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

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Case Outline for TO-247AD 4L Package

FACILITY CODE: 9





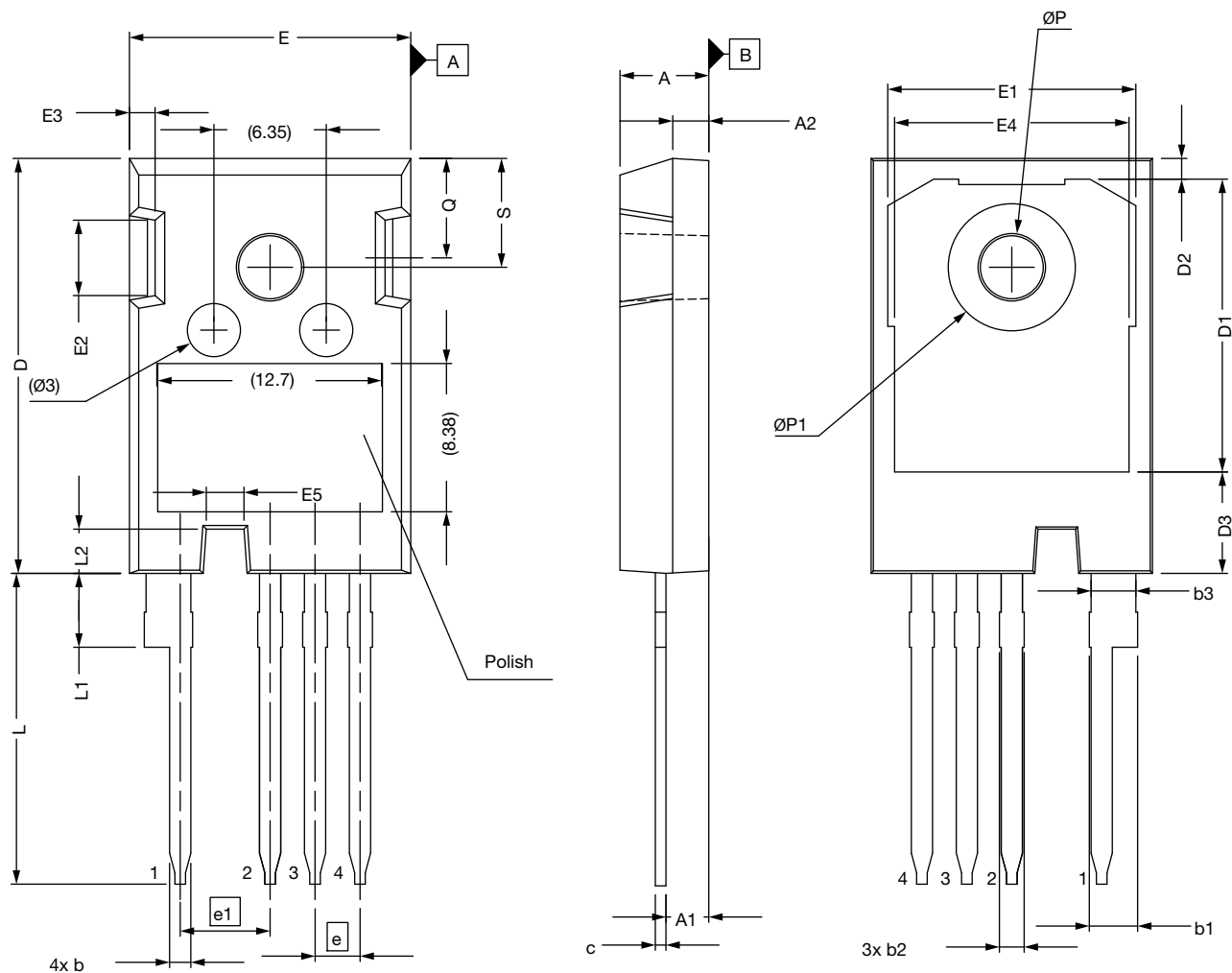
DIM.	MILLIMETERS	
	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC.	
e1	5.08 BSC.	
L	17.31	17.82
L1	3.97	4.37
L2	2.35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





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



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