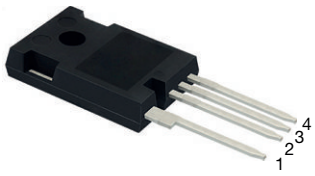
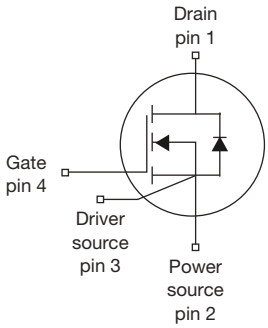
MaxSiC™ 1200 V N-Channel SiC MOSFET

TO-247AD 4L





Marking Code: 120A080FL

FEATURES

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

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Charger
- Auxiliary motor drive
- DC/DC converter

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	1200	
$R_{DS(on)}$ typ. (mΩ) at 25 °C	V_{GS} = 20 V	80
Q_g typ. (nC)	47.3	
I_D (A)	29	
C_{oss} typ. (pF)	50	
P_D (W)	139	
Configuration	Single	

ORDERING INFORMATION	
Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	MXP120A080FL-GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage [a]		V_{DS}	1200	V
Gate-source voltage		V_{GS}	-10 / +22	
Recommended operation voltage of gate-source		V_{GSOP}	-5 / +20	
Continuous drain current	T_C = 25 °C	I_D	29	A
	T_C = 100 °C	I_D	18	
Pulsed drain current [b]		I_{DM}	58	
Short-circuit withstand time [c]		T_{SC}	3	µs
Maximum power dissipation	T_C = 25 °C	P_D	139	W
	T_C = 100 °C	P_D	56	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

Notes

a. T_J = 25 °C to 150 °C
b. Repetitive rating; pulse width limited by maximum junction temperature
c. Verified by the design / characterization

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THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.9	

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	-	2.69	-	V
		V_{DS} = V_{GS}, I_D = 5 mA, T_J = 150 °C	-	1.86	-	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} = 960 V, V_{GS} = 0 V	-	-	10	µA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 20 A	-	80	100	mΩ
		V_{GS} = 20 V, I_D = 20 A, T_J = 150 °C	-	128	160	
		V_{GS} = 18 V, I_D = 20 A	-	95	119	
		V_{GS} = 18 V, I_D = 20 A, T_J = 150 °C	-	140	175	
Dynamic						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 1 MHz	-	1156	-	pF
Output capacitance	C_{oss}		-	50	-	
Reverse transfer capacitance	C_{rss}		-	5	-	
Coss Stored Energy	E_{oss}		-	20	-	µJ
Total gate charge	Q_g	V_{GS} = 18 V, I_D = 20 A, V_{DS} = 800 V	-	47.3	-	nC
Gate-source charge	Q_{gs}		-	14.2	-	
Gate-drain charge	Q_{gd}		-	17.8	-	
Gate Resistance	R_g	V_{DS} = 0 V, f = 1 MHz	-	9.8	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{GS} = -5 V ~ 18 V, I_D = 20 A, V_{DS} = 800 V, $R_{g(ext)}$ = 4.4 Ω	-	13	-	ns
Rise time	t_r		-	19	-	
Turn-off delay time	$t_{d(off)}$		-	15	-	
Fall time	t_f		-	8	-	
Turn-on switching energy	E_{on}		-	258	-	µJ
Turn-off switching energy	E_{off}		-	24	-	
Body Diode Ratings and Characteristic						
Forward diode voltage	V_{SD}	V_{GS} = -5 V, I_{SD} = 10 A, T_J = 25 °C	-	5.1	-	V
Continuous diode forward current	I_{SD}	V_{GS} = -5 V, T_J = 25 °C	-	-	21	A
Pulsed diode forward current	I_{SDM}		-	-	58	
Reverse recovery time	t_{rr}	V_{GS} = -5 V, I_{SD} = 20 A, V_R = 800 V, di/dt = 1000 A/µs	-	14	-	ns
Reverse recovery charge	Q_{rr}		-	35	-	nC
Reverse recovery current	I_{rrm}		-	4.5	-	A

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

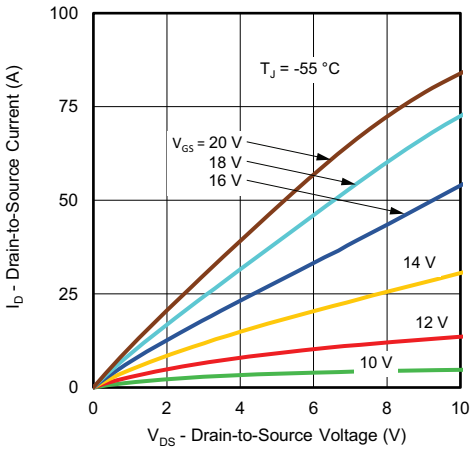

Fig. 1 - Typical Output Characteristics

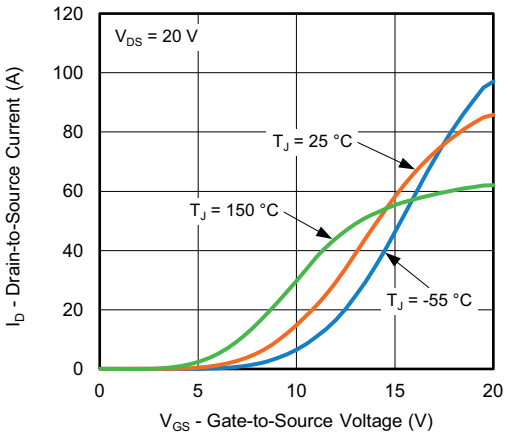

Fig. 4 - Typical Transfer Characteristics

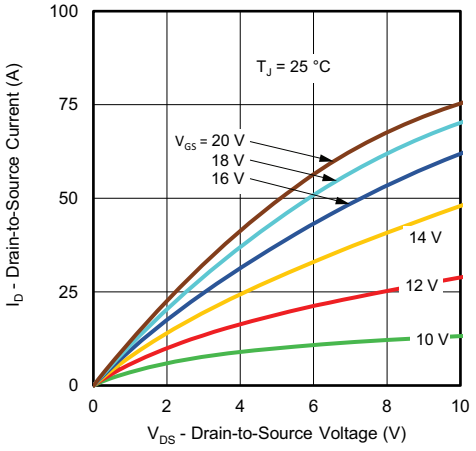

Fig. 2 - Typical Output Characteristics

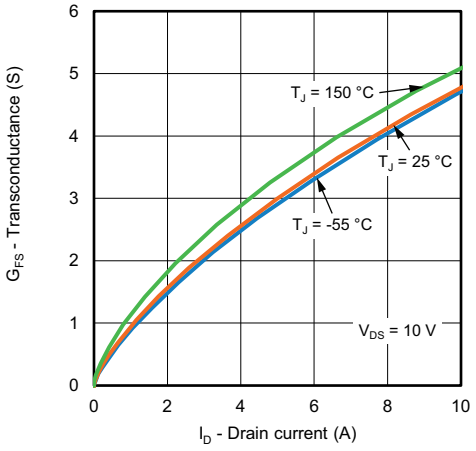

Fig. 5 - Forward Transconductance vs. Drain Current

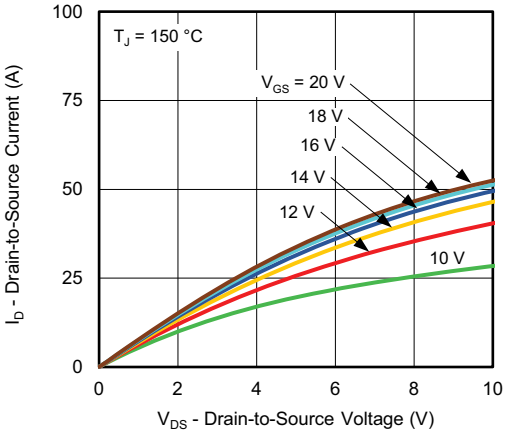

Fig. 3 - Typical Output Characteristics

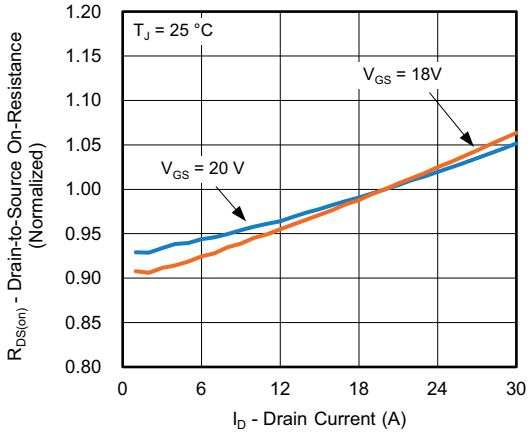

Fig. 6 - Normalized On-Resistance vs. Drain Current

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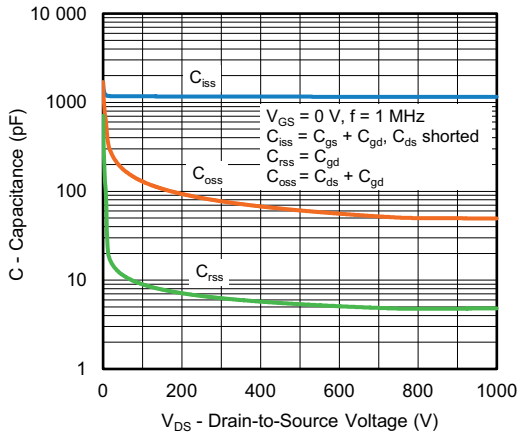

Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage

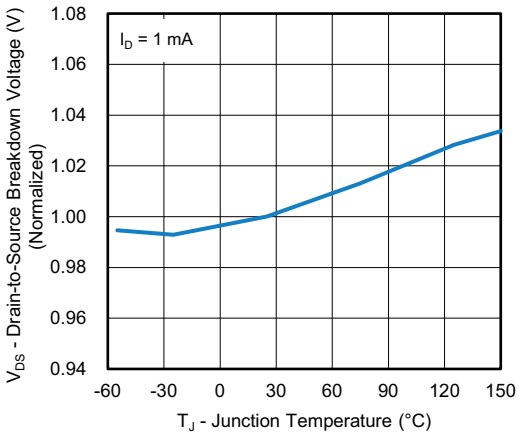

Fig. 10 - Drain-to-Source Voltage vs. Temperature

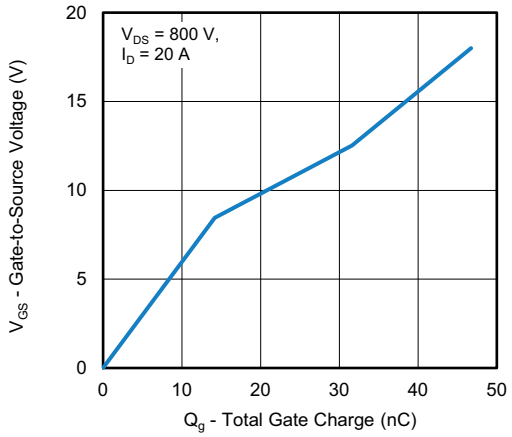

Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage

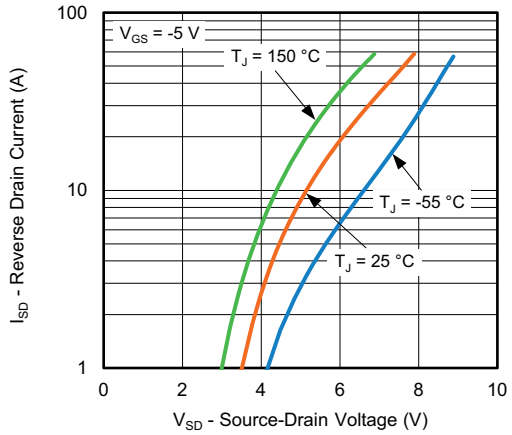

Fig. 11 - Typical Source-Drain Diode Forward Voltage

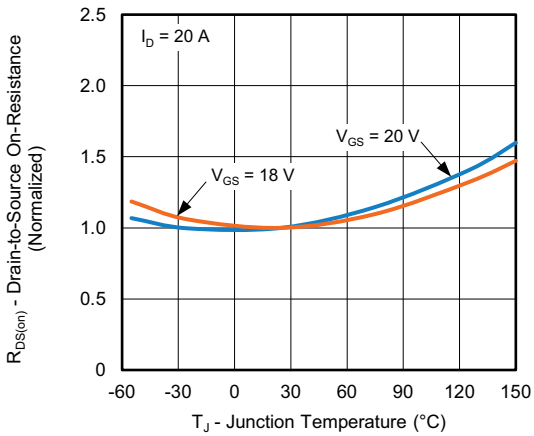

Fig. 9 - Normalized On-Resistance vs. Temperature

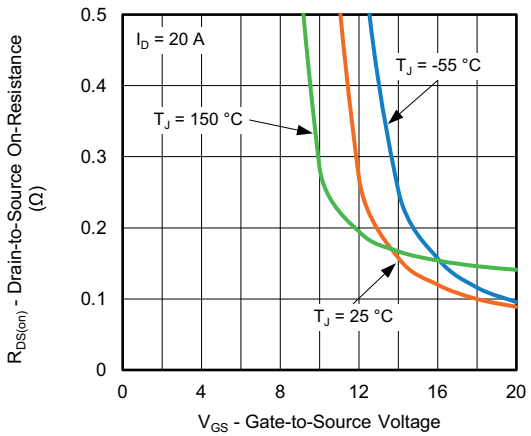

Fig. 12 - On-Resistance vs. Gate-to-Source Voltage

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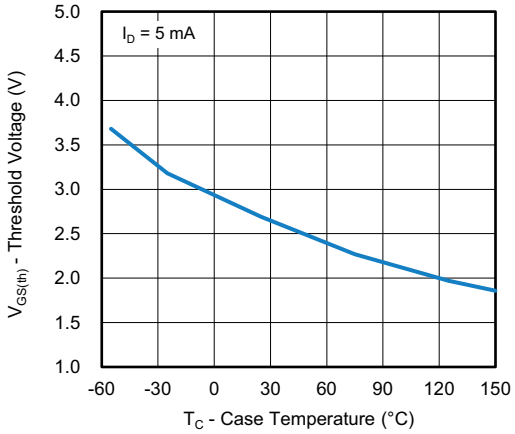

Fig. 13 - Threshold Voltage vs. Case Temperature

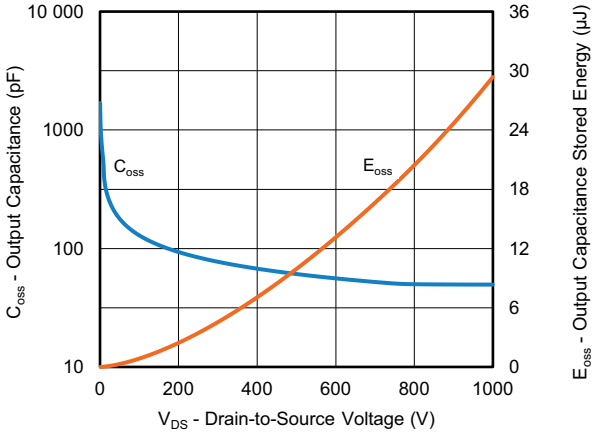

Fig. 15 - Output Capacitances and its Stored Energy vs. Drain-to-Source Voltage

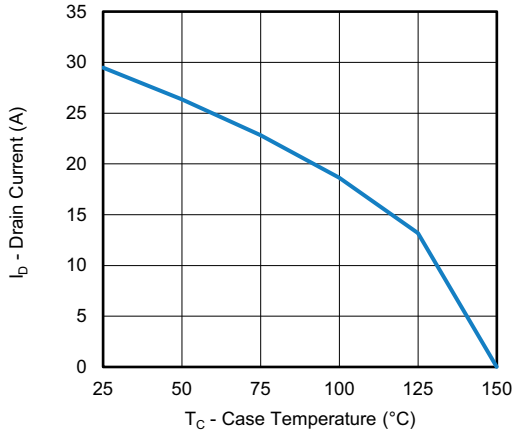

Fig. 14 - Drain Current vs. Case Temperature

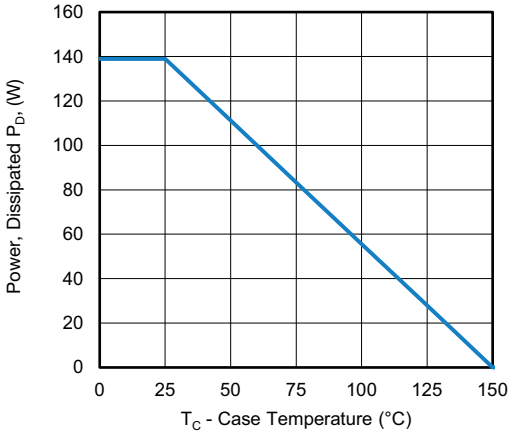

Fig. 16 - Power, Dissipated P_D vs. Case Temperature

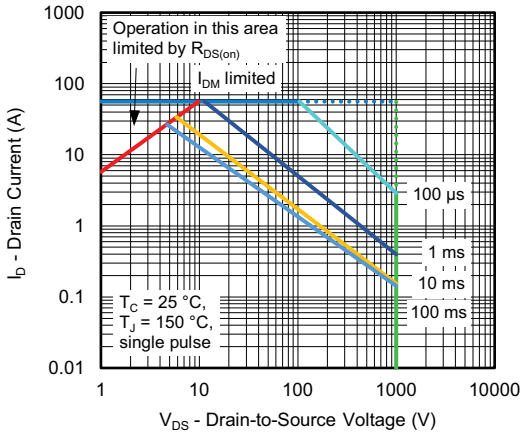

Fig. 17 - Safe Operating Area

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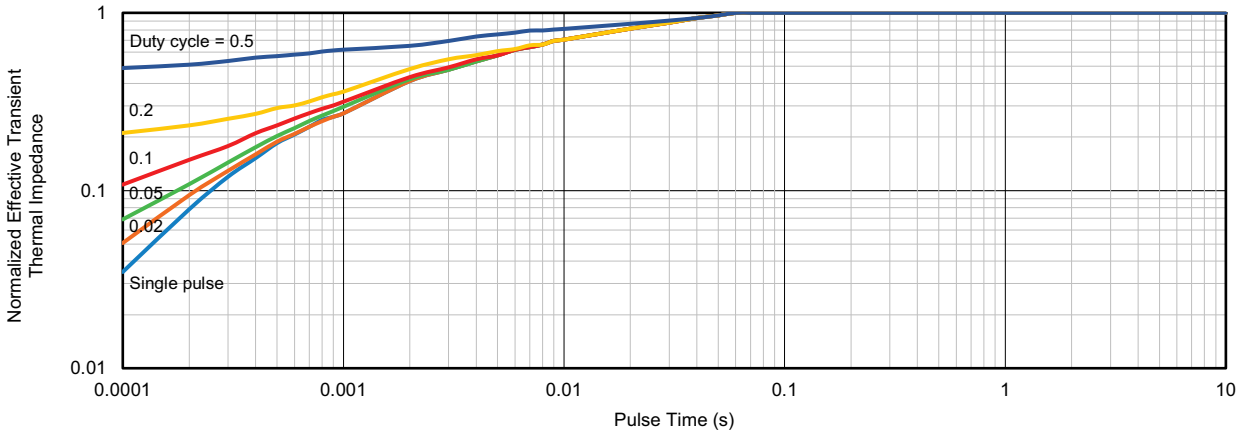

Fig. 18 - Normalized Effective Transient Thermal Impedance

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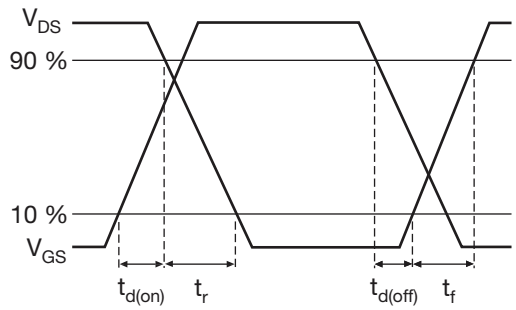

Fig. 19 - Waveforms of Switching Time

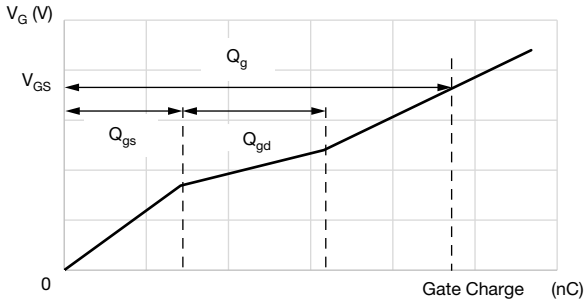

Fig. 22 - Waveforms for Gate Charge

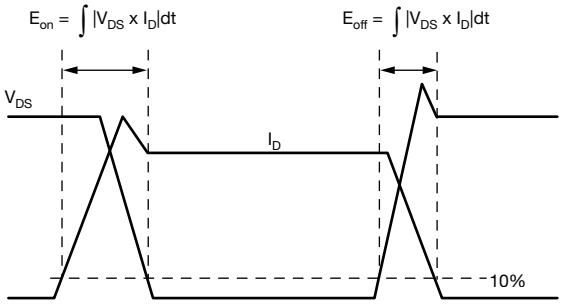

Fig. 20 - Waveforms for Switching Energy

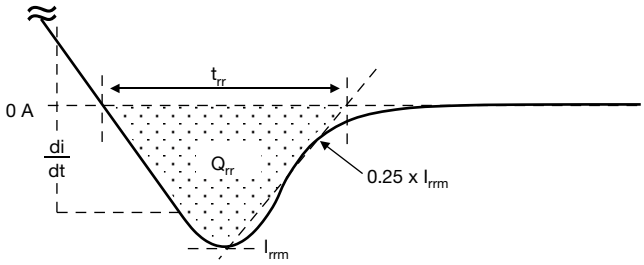

Fig. 23 - Waveforms for Reverse Recovery

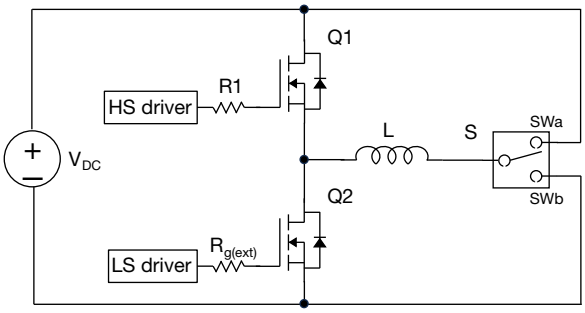

Fig. 21 - Switching and Reverse Diode Characteristics Measurement Circuit

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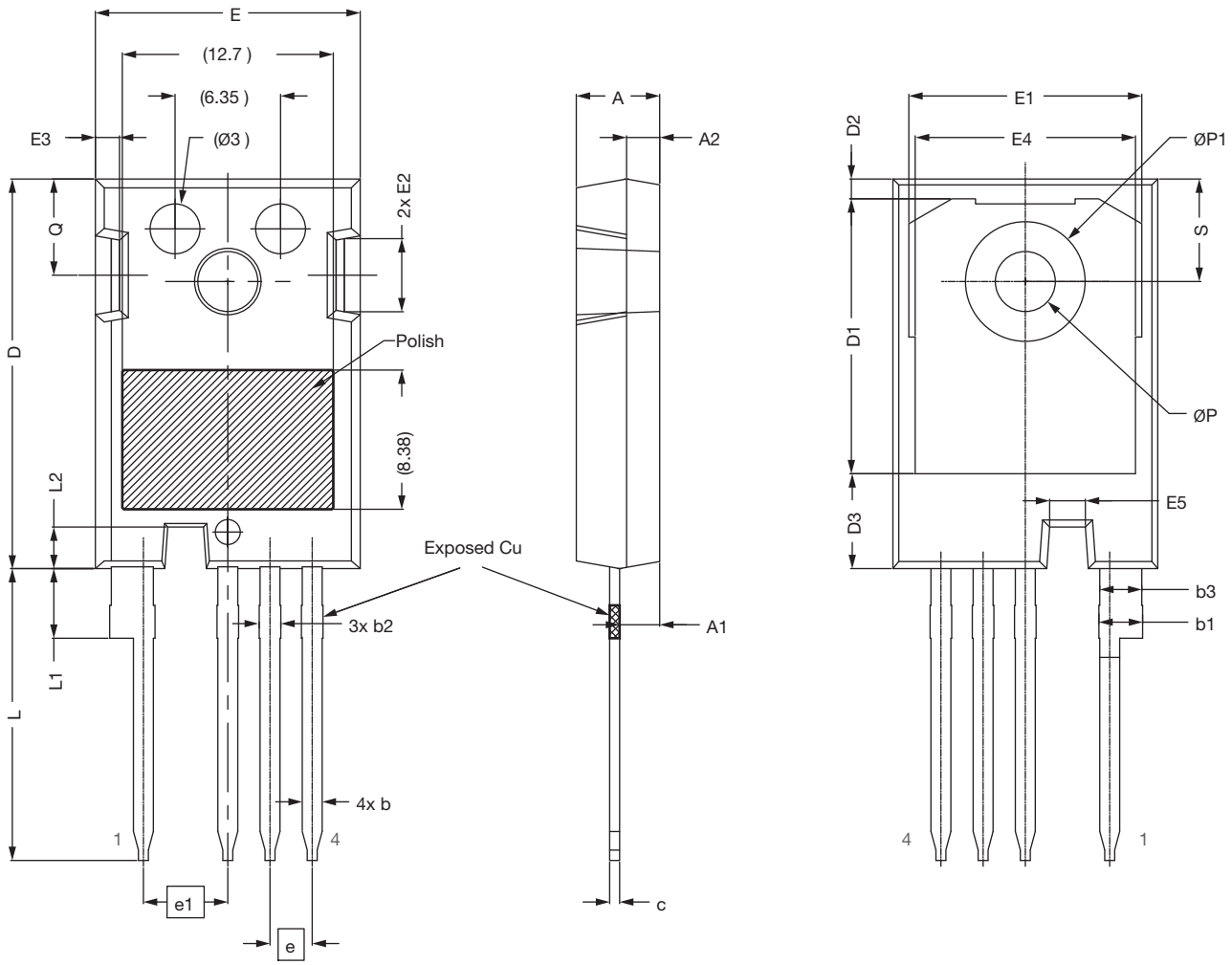
Case Outline for TO-247AD 4L Package

FACILITY CODE: 9



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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

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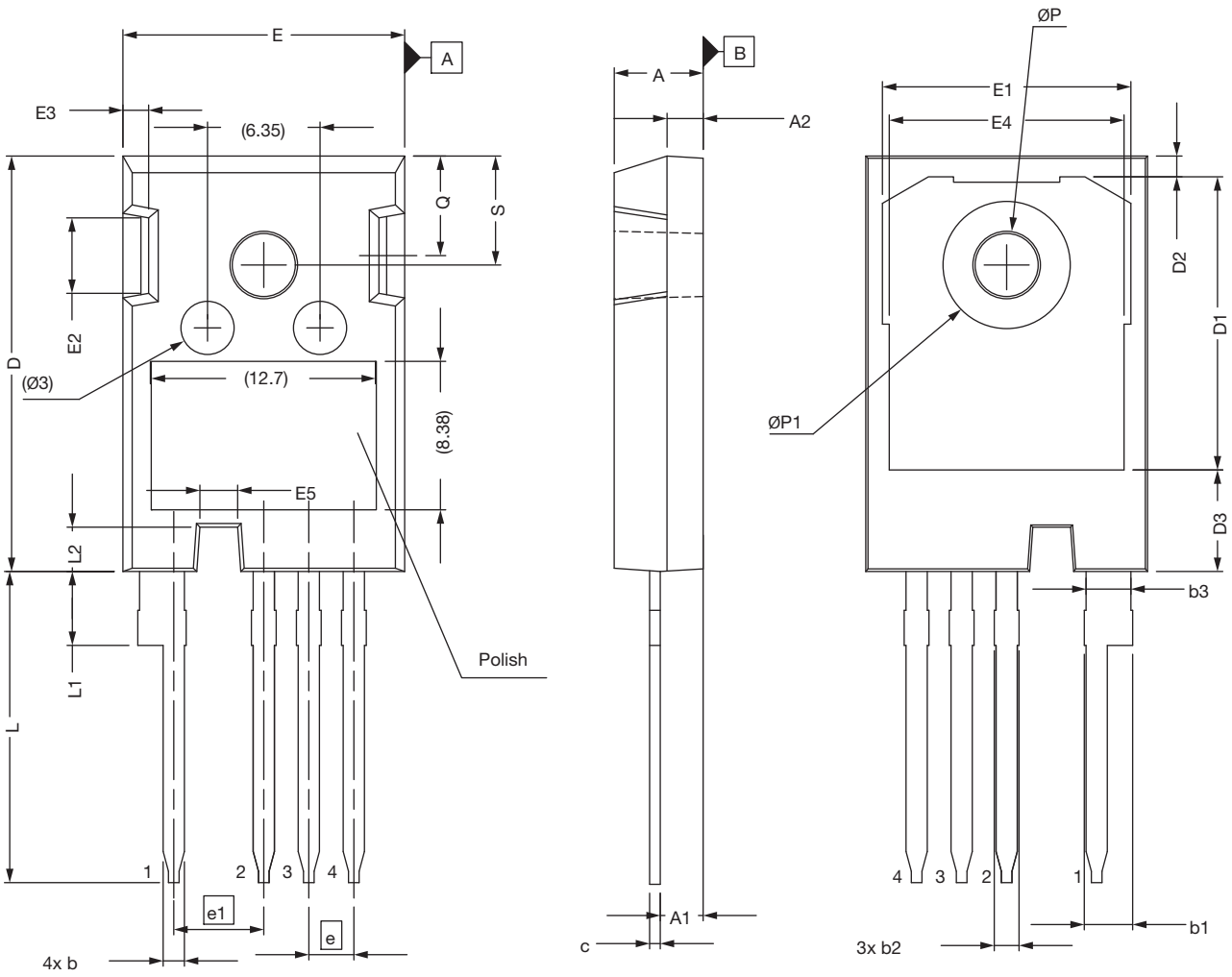
FACILITY CODE: N



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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: E24-0559-Rev. B, 11-Nov-2024 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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