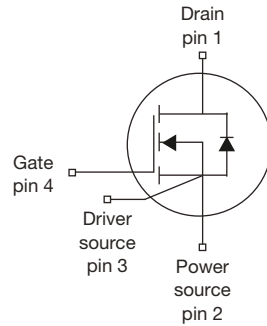
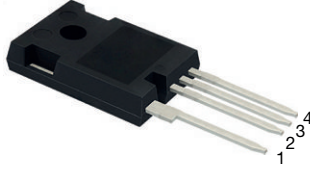


MaxSiC™ 1200 V N-Channel SiC MOSFET

TO-247AD 4L


Marking Code: 120A250FL

FEATURES

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


RoHS
COMPLIANT
HALOGEN
FREE
APPLICATIONS

- Charger
- Industrial UPS
- Boost inverter
- DC/DC converter

PRODUCT SUMMARY	
V_{DS} (V) at T_J max.	1200
$R_{DS(on)}$ typ. ($m\Omega$) at 25 °C	$V_{GS} = 20$ V 250
Q_g typ. (nC)	20
I_D (A)	10.5
C_{oss} (pF)	21.2
P_D (W)	56
Configuration	Single

ORDERING INFORMATION	
Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	MXP120A250FL-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	10.5	A
	$T_C = 100$ °C	I_D	6.7	
Pulsed drain current ^b		I_{DM}	21	
Short-circuit withstand time ^c		T_{SC}	3	μ s
Maximum power dissipation	$T_C = 25$ °C	P_D	56	W
	$T_C = 100$ °C	P_D	22	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

Notes

- $T_J = 25$ °C to 150 °C
- Repetitive rating; pulse width limited by maximum junction temperature
- Verified by the design / characterization

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	2.24	

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200	-	-	V
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 10\text{ mA}$	-	3.1	-	V
		$V_{DS} = V_{GS}, I_D = 10\text{ mA}, T_J = 150\text{ °C}$	-	2.3	-	V
Gate-source leakage	I_{GSS}	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$	-	-	-100	
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 960\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	μA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 20\text{ V}, I_D = 4\text{ A}$	-	250	313	mΩ
		$V_{GS} = 20\text{ V}, I_D = 4\text{ A}, T_J = 150\text{ °C}$	-	383	479	
		$V_{GS} = 18\text{ V}, I_D = 4\text{ A}$	-	280	350	
		$V_{GS} = 18\text{ V}, I_D = 4\text{ A}, T_J = 150\text{ °C}$	-	400	500	
Dynamic						
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$	-	447	-	pF
Output capacitance	C_{oss}		-	21.2	-	
Reverse transfer capacitance	C_{rss}		-	3.2	-	
Cross stored energy	E_{oss}		-	8.7	-	
Total gate charge	Q_g	$V_{GS} = 18\text{ V}, I_D = 4\text{ A}, V_{DS} = 800\text{ V}$	-	20.3	-	nC
Gate-source charge	Q_{gs}		-	5.5	-	
Gate-drain charge	Q_{gd}		-	7.9	-	
Gate Resistance	R_g	$V_{DS} = 0\text{ V}, f = 1\text{ MHz}$	-	34	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 4\text{ A}, V_{DS} = 800\text{ V}, R_{g(ext)} = 4.4\text{ Ω}$	-	8.5	-	ns
Rise time	t_r		-	11.5	-	
Turn-off delay time	$t_{d(off)}$		-	8.5	-	
Fall time	t_f		-	14.5	-	
Turn-on switching energy	E_{on}		-	67	-	μJ
Turn-off switching energy	E_{off}		-	5	-	
Body Diode Ratings and Characteristic						
Forward diode voltage	V_{SD}	$V_{GS} = -5\text{ V}, I_{SD} = 2\text{ A}, T_J = 25\text{ °C}$	-	4.6	-	V
Continuous diode forward current	I_{SD}	$V_{GS} = -5\text{ V}, T_J = 25\text{ °C}$	-	-	7	A
Pulsed diode forward current	I_{SDM}		-	-	21	
Reverse recovery time	t_{rr}	$V_{GS} = -5\text{ V}, I_{SD} = 4\text{ A}, V_R = 800\text{ V}, di/dt = 1000\text{ A/μs}$	-	7.5	-	ns
Reverse recovery charge	Q_{rr}		-	12	-	nC
Reverse recovery current	I_{rrm}		-	2.8	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

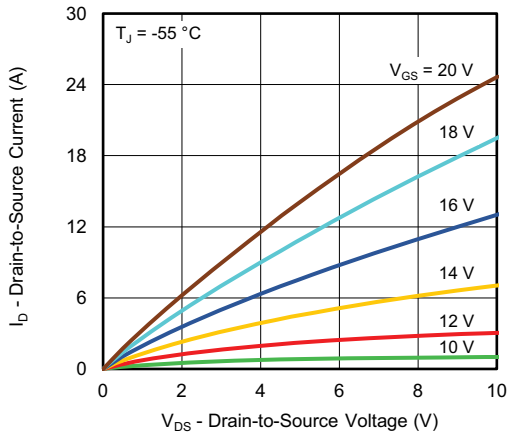


Fig. 1 - Typical Output Characteristics

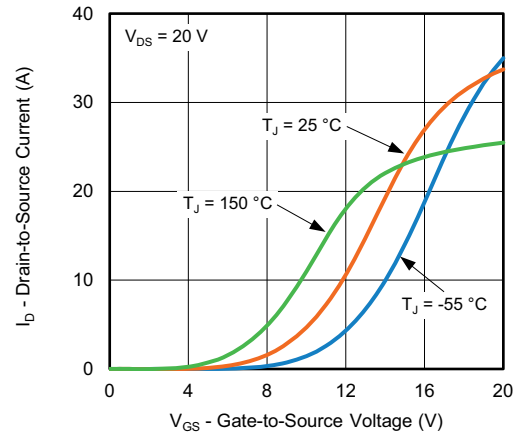


Fig. 4 - Typical Transfer Characteristics

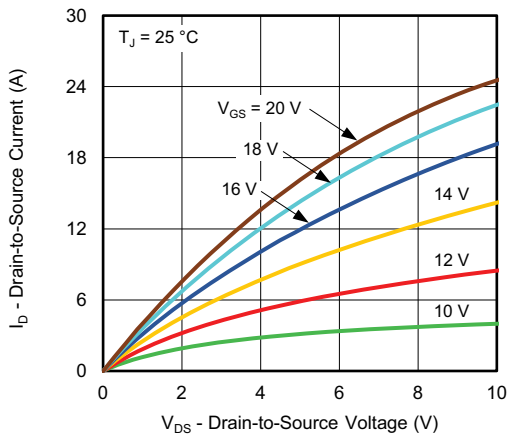


Fig. 2 - Typical Output Characteristics

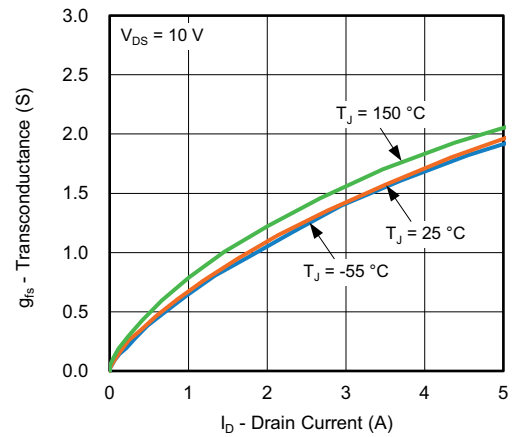


Fig. 5 - Forward Transconductance vs. Drain Current

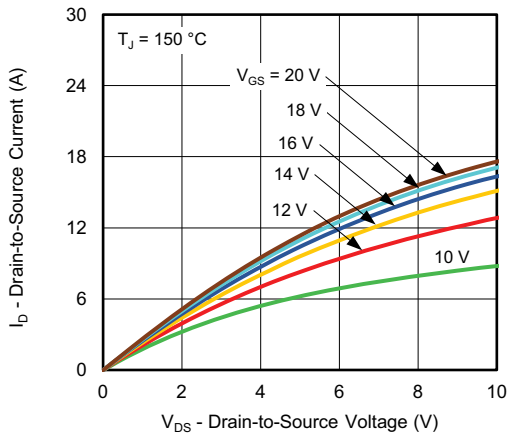


Fig. 3 - Typical Output Characteristics

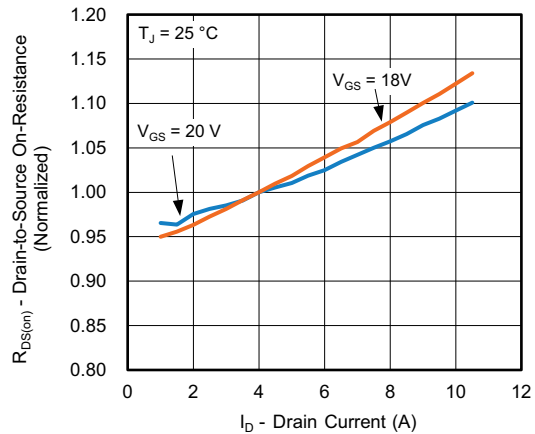


Fig. 6 - Normalized On-Resistance vs. Drain Current

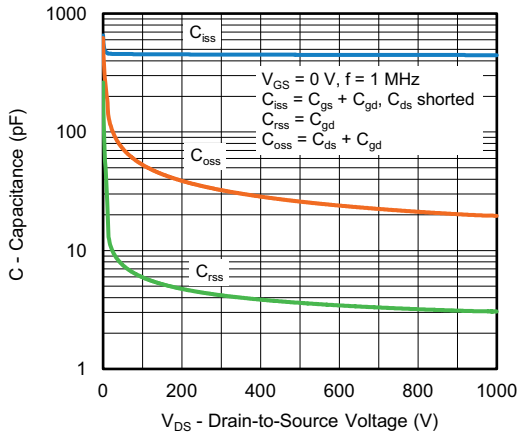


Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage

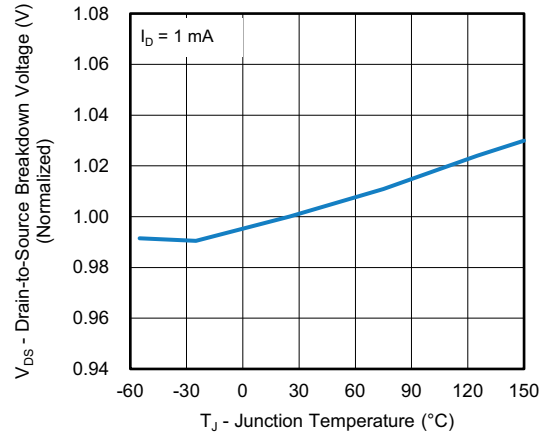


Fig. 10 - Drain-to-Source Voltage vs. Temperature

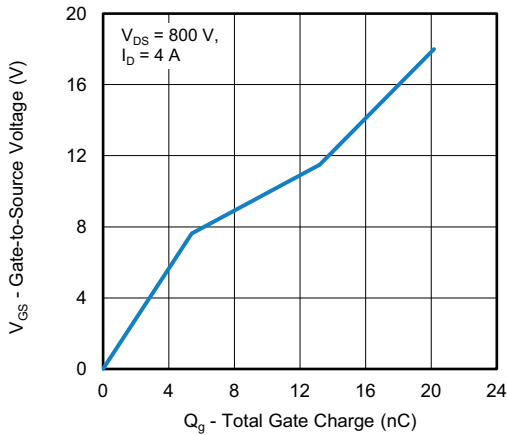


Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage

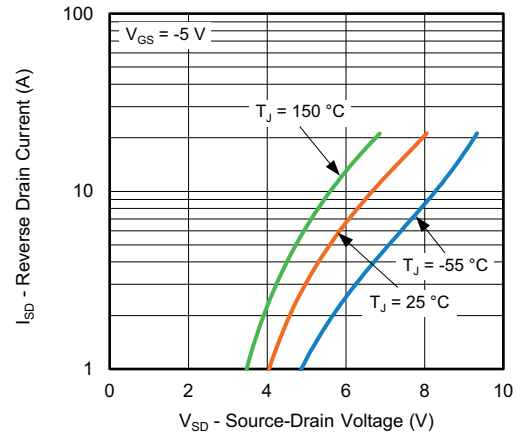


Fig. 11 - Typical Source-Drain Diode Forward Voltage

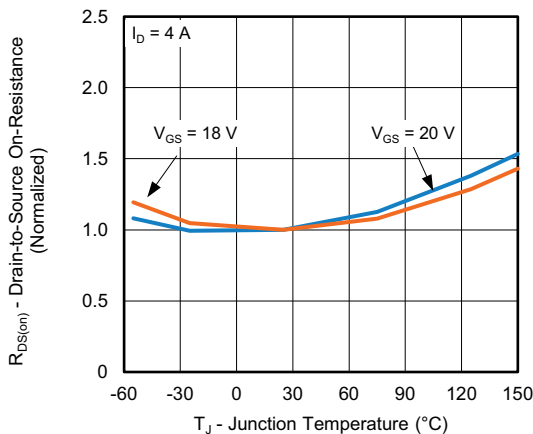


Fig. 9 - Normalized On-Resistance vs. Temperature

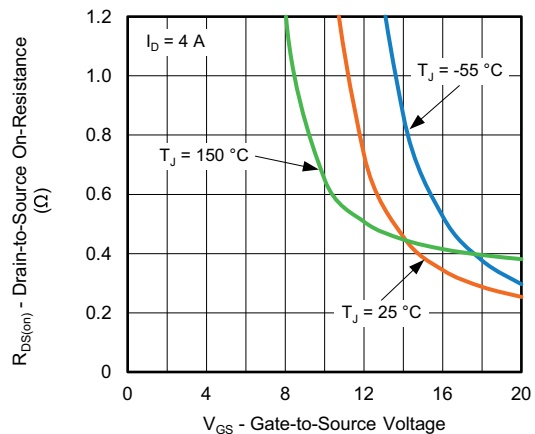


Fig. 12 - On-Resistance vs. Gate-to-Source Voltage

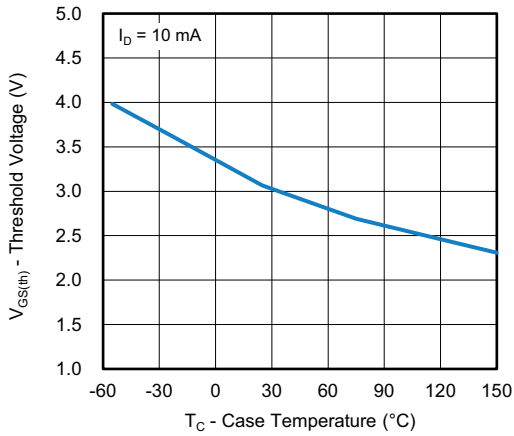


Fig. 13 - Threshold Voltage vs. Case Temperature

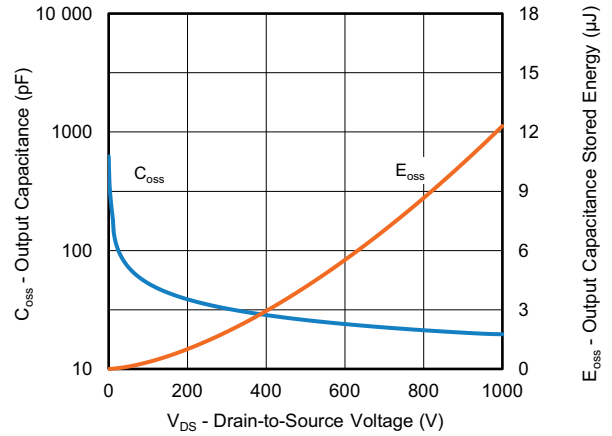


Fig. 15 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage

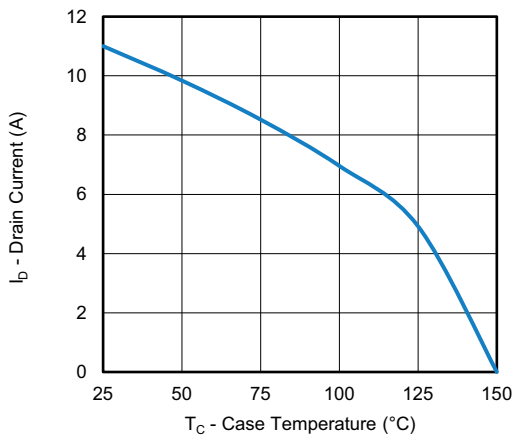


Fig. 14 - Drain Current vs. Case Temperature

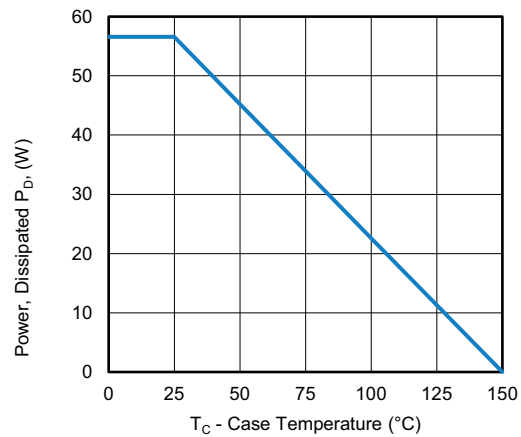


Fig. 16 - Power, Dissipated P_D vs. Case Temperature

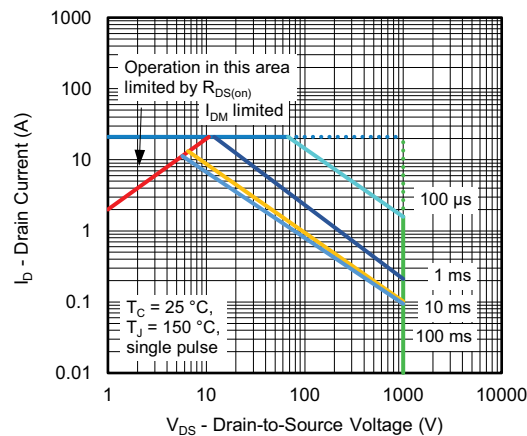


Fig. 17 - Safe Operating Area

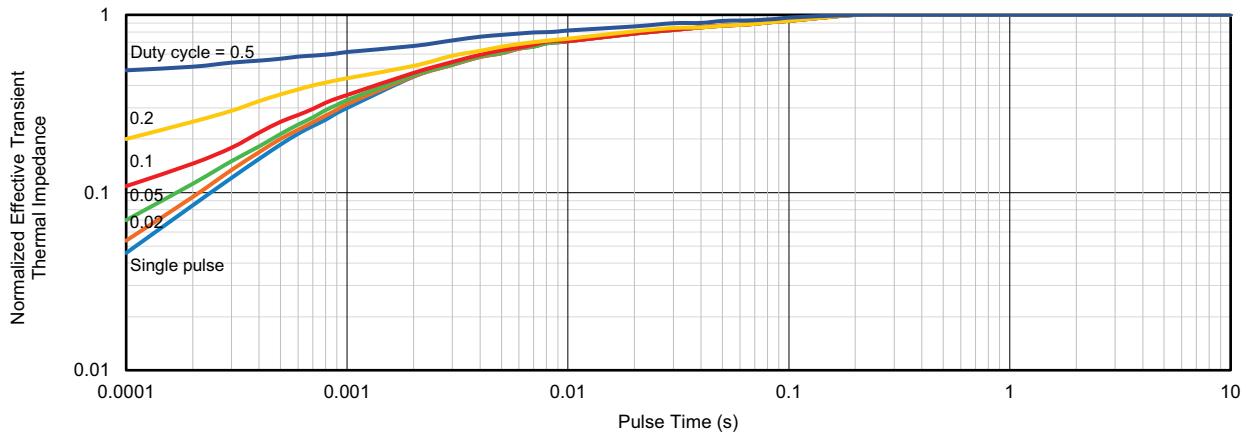


Fig. 18 - Normalized Effective Transient Thermal Impedance

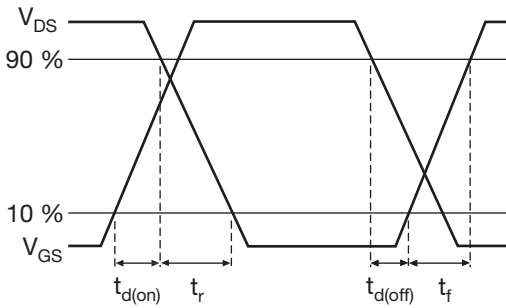


Fig. 19 - Waveforms of Switching Time

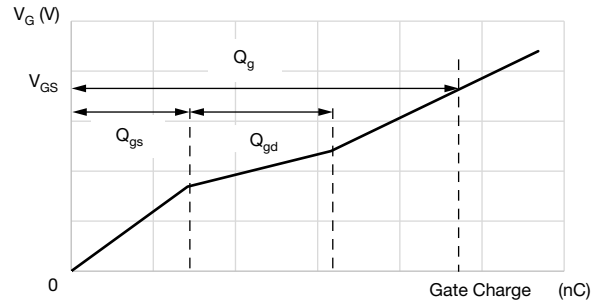


Fig. 22 - Waveforms for Gate Charge

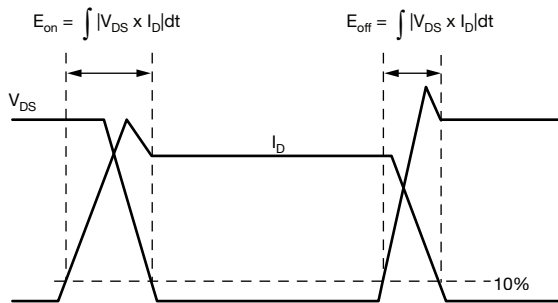


Fig. 20 - Waveforms for Switching Energy

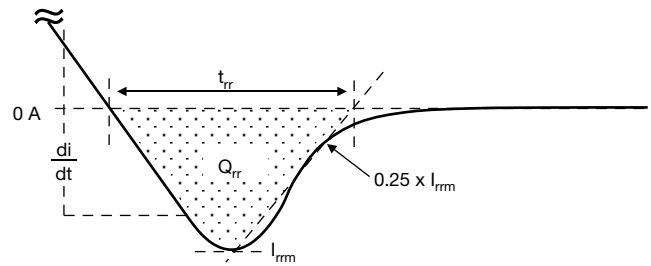


Fig. 23 - Waveforms for Reverse Recovery

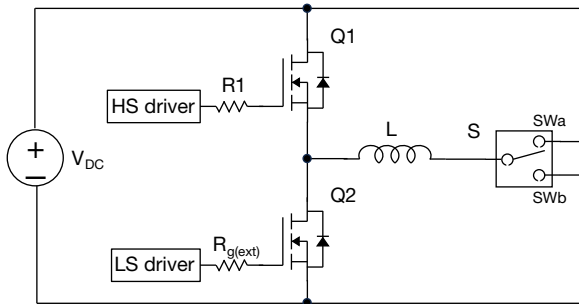


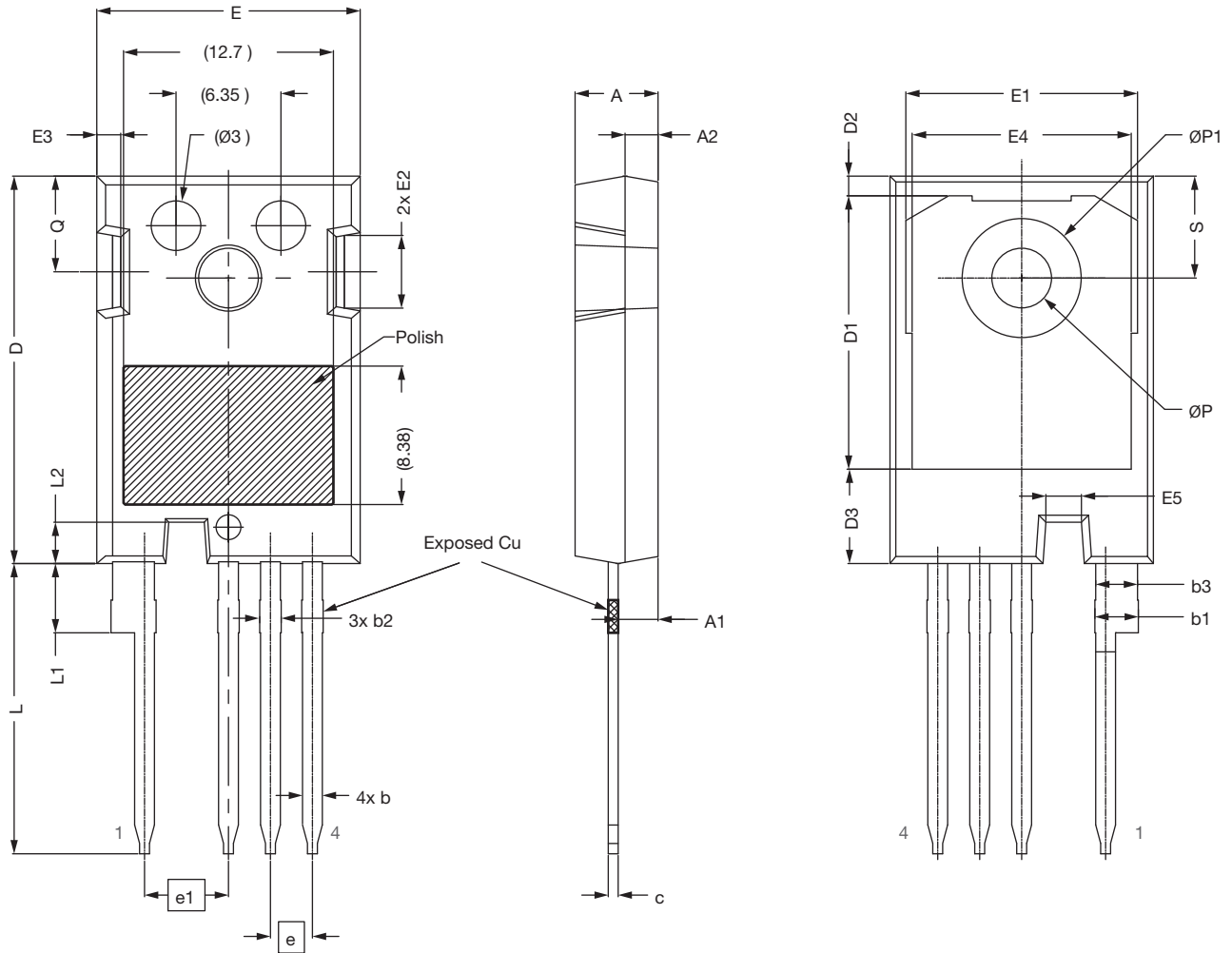
Fig. 21 - Switching and Reverse Diode Characteristics Measurement Circuit

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Case Outline for TO-247AD 4L Package

FACILITY CODE: 9





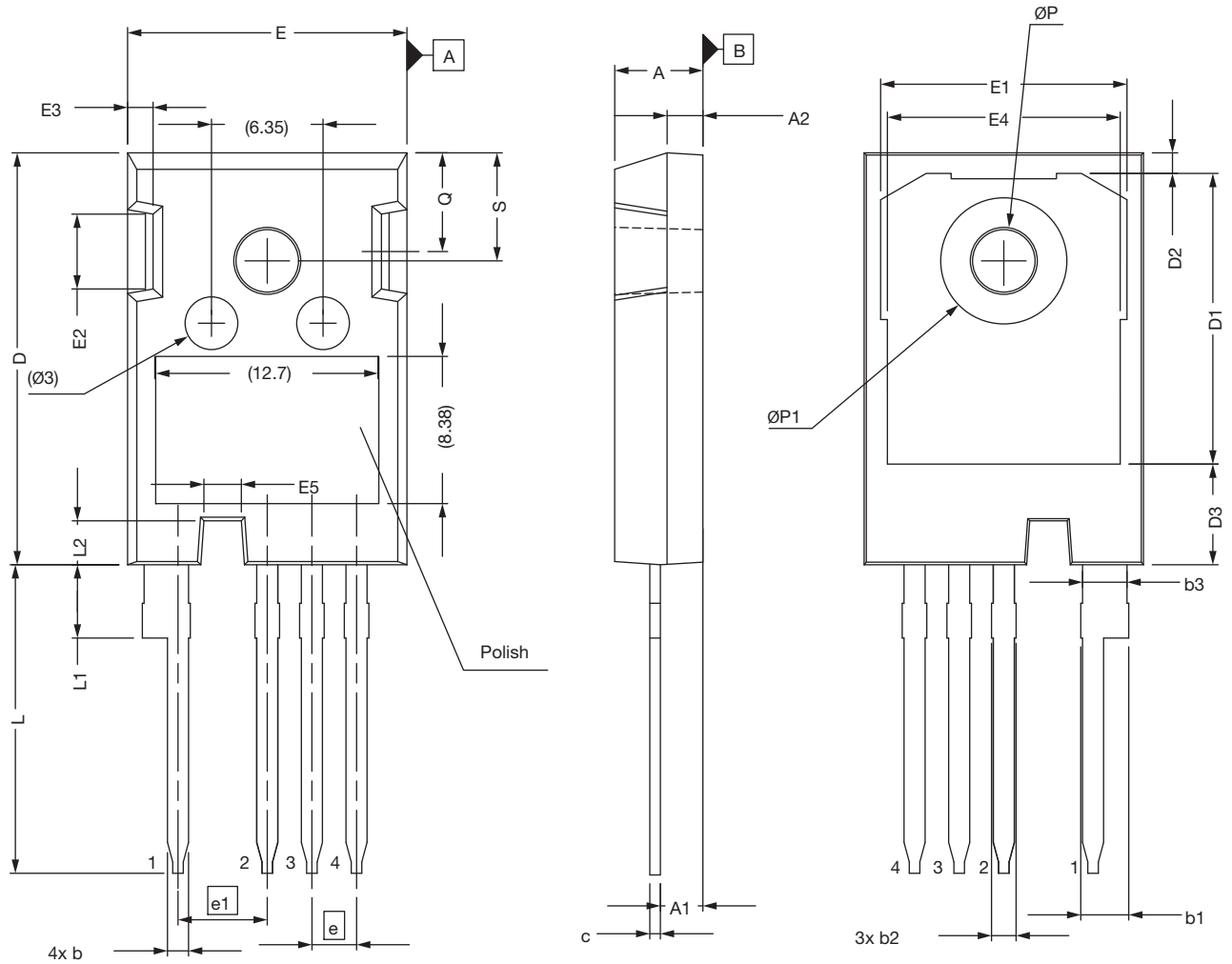
DIM.	MILLIMETERS	
	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC.	
e1	5.08 BSC.	
L	17.31	17.82
L1	3.97	4.37
L2	2.35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