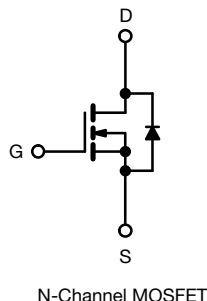


MaxSiC® 1200 V N-Channel SiC MOSFET



N-Channel MOSFET

Marking Code: 120A080FW

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
- Auxiliary motor drive
- 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	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 3L
Lead (Pb)-free and halogen-free	MXP120A080FW-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

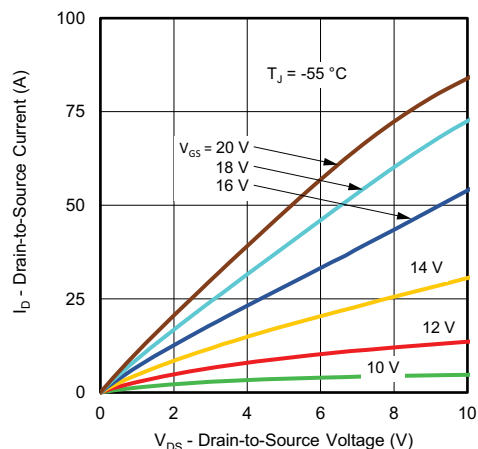
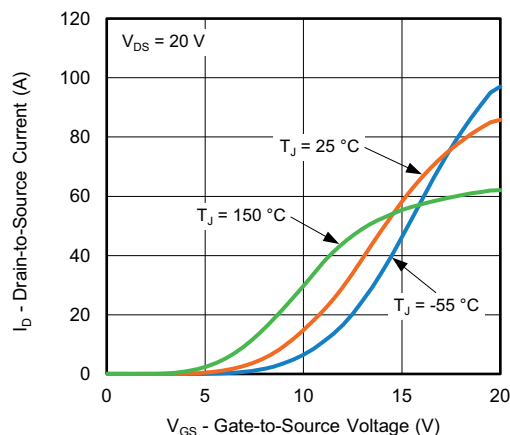
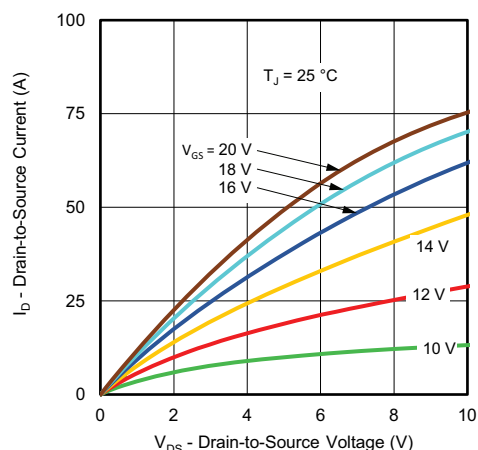
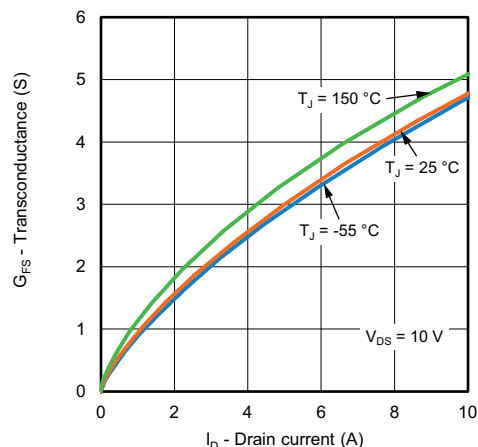
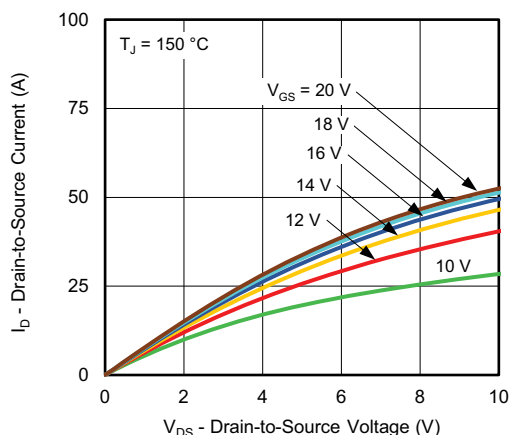
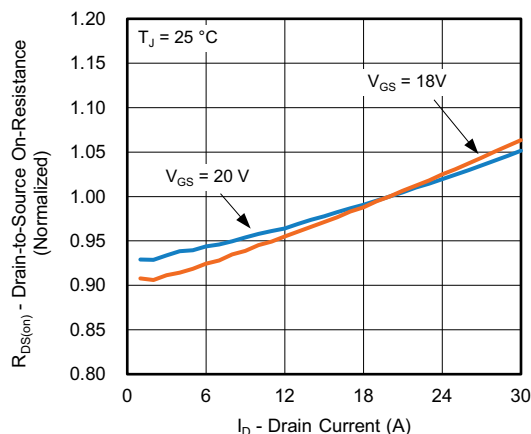
- a. $T_J = 25$ °C to 150 °C
b. Repetitive rating; pulse width limited by maximum junction temperature
c. Verified by the design / characterization

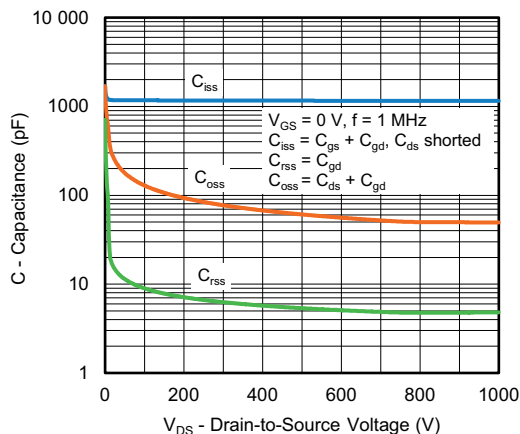
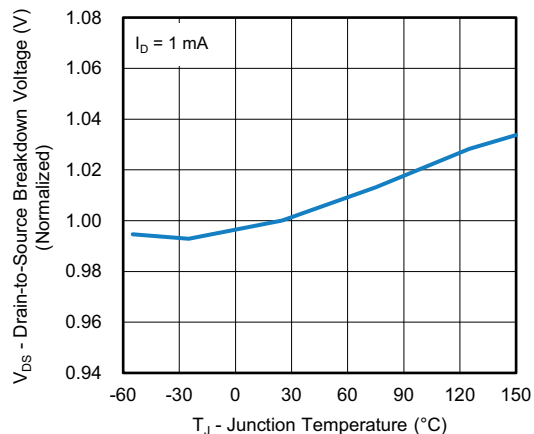
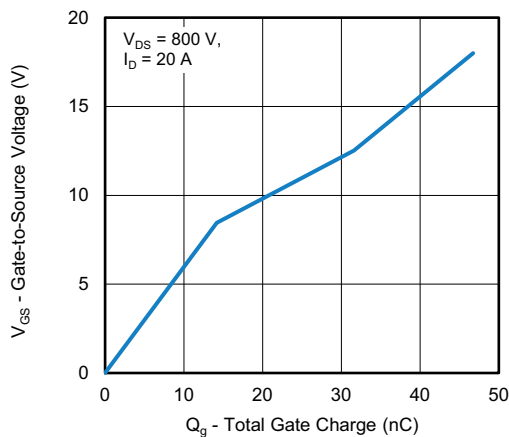
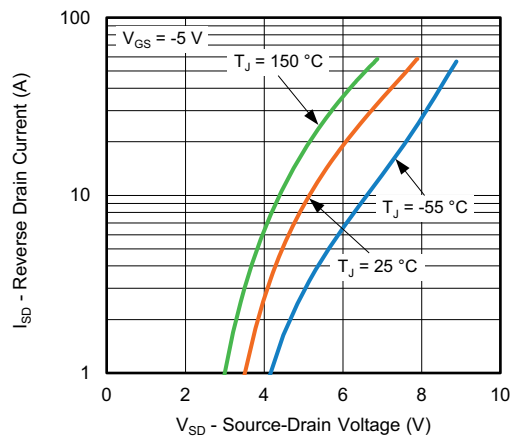
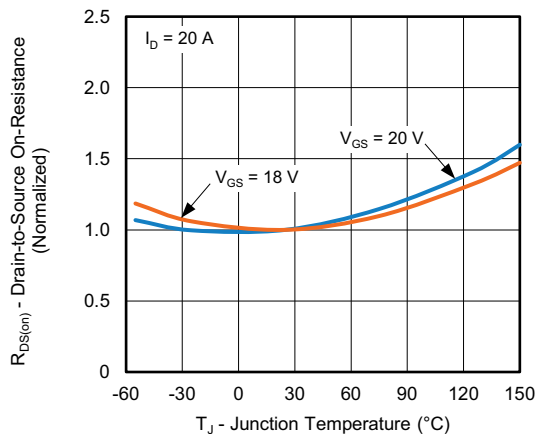
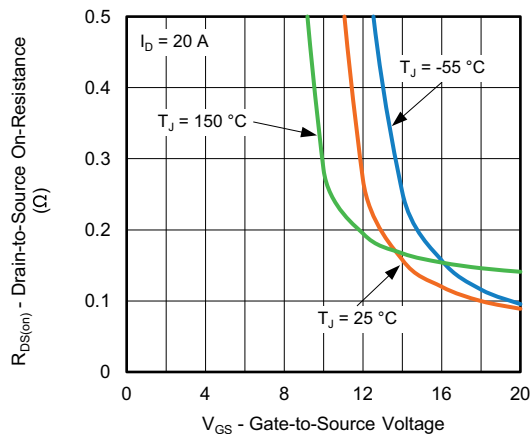
**THERMAL RESISTANCE RATINGS**

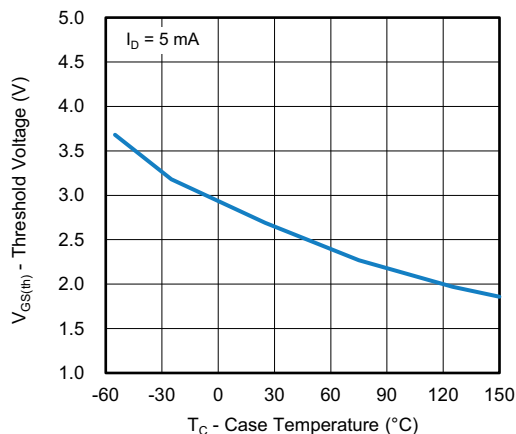
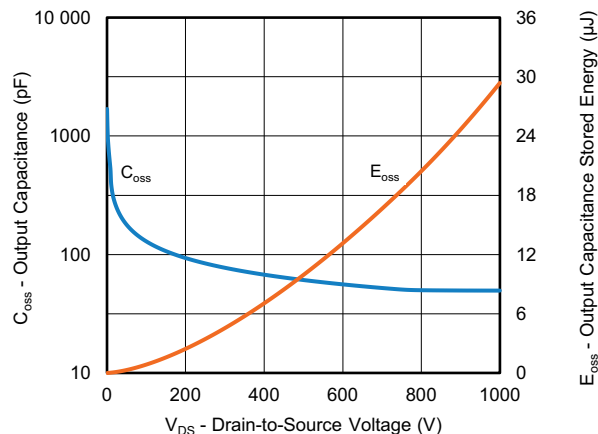
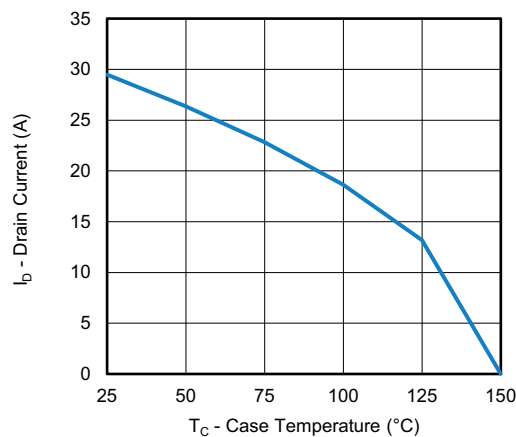
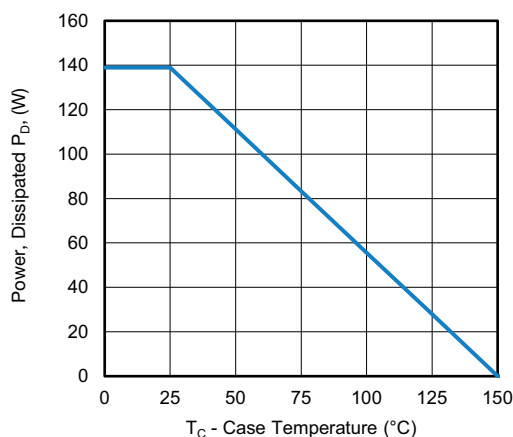
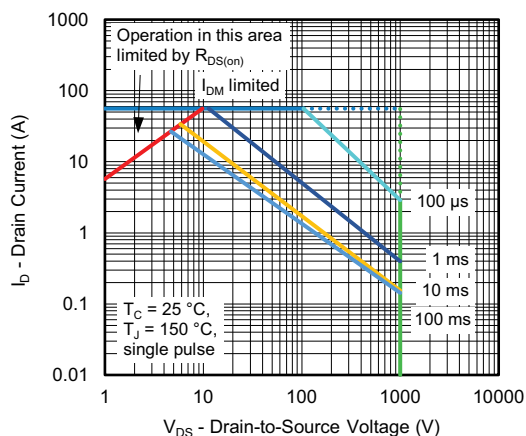
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.9	

SPECIFICATIONS ($T_J = 25\text{ °C}$, 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	-	2.69	-	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	-	25.6	-	ns
Rise time	t _r		-	15.6	-	
Turn-off delay time	t _{d(off)}		-	16	-	
Fall time	t _f		-	9	-	
Turn-on switching energy	E _{on}		-	386	-	μJ
Turn-off switching energy	E _{off}		-	37	-	
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

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 Breakdown 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 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

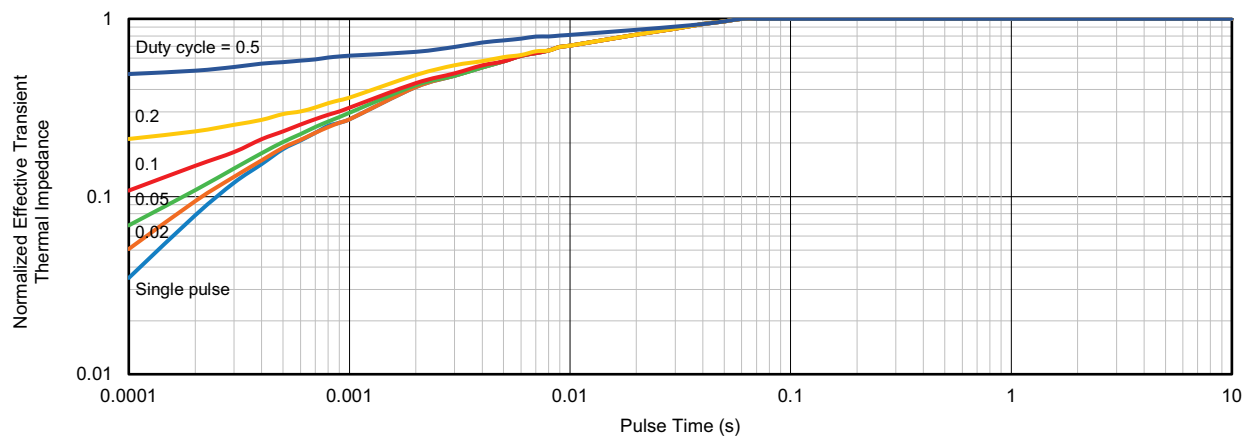
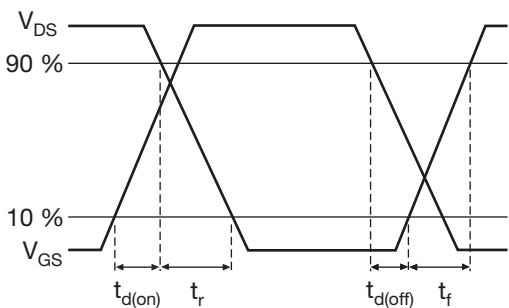
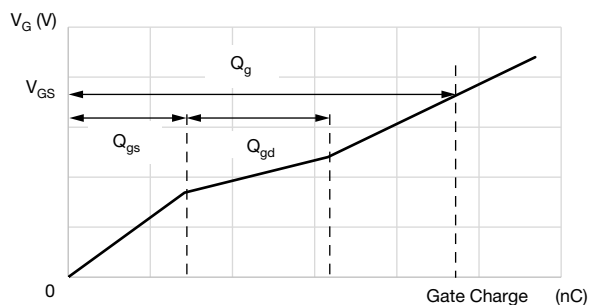
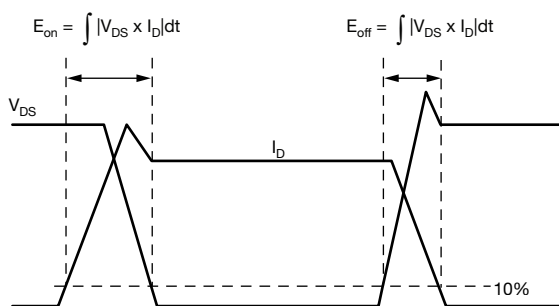
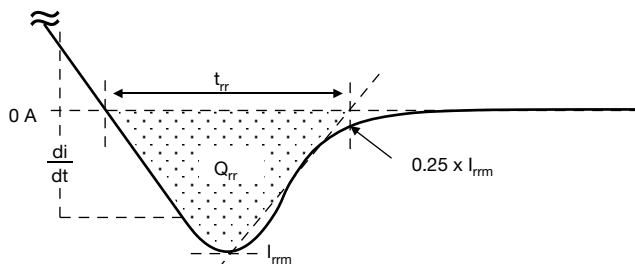
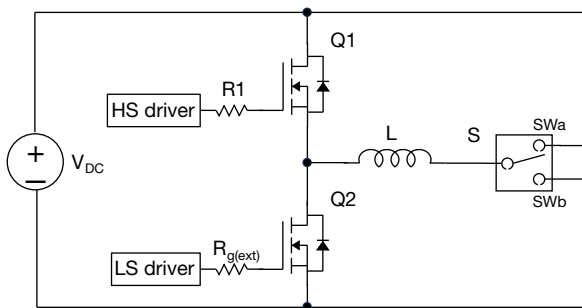


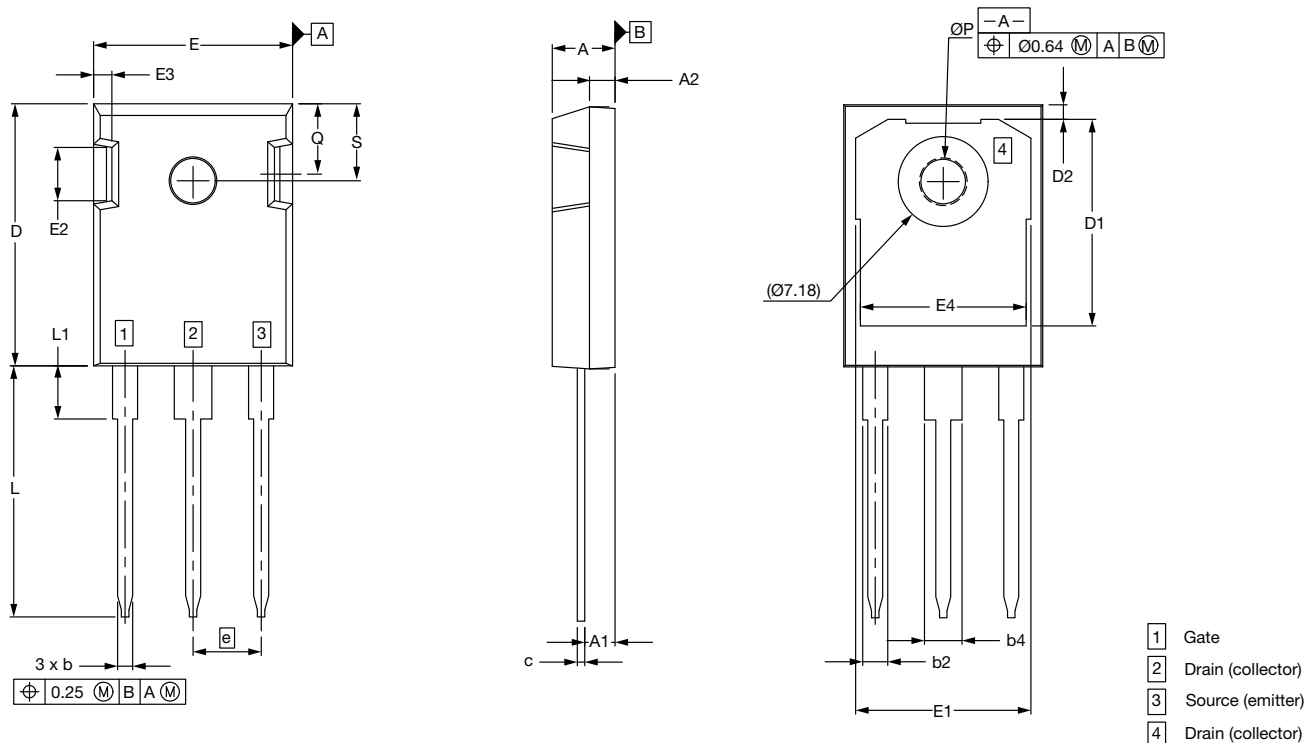
Fig. 18 - Normalized Effective Transient Thermal Impedance


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 3L

FACILITY CODE: N


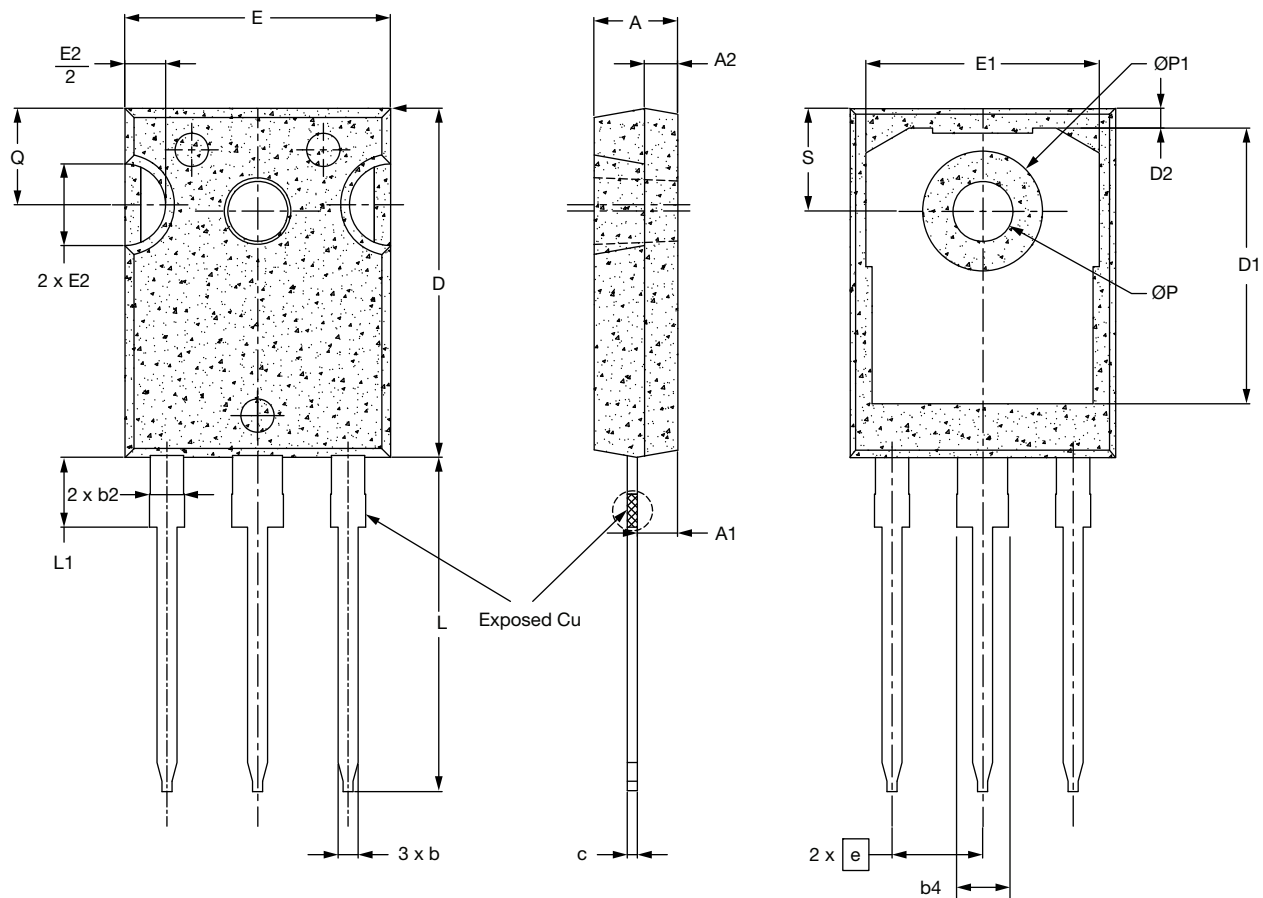
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	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b2	1.91	2.41
b4	2.87	3.38
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC.	
N	3	
L	19.81	20.32
L1	4.10	4.40
ØP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30

Notes

- All metal surfaces: tin plated (MATTE), except area of cut
- Dimensioning and tolerancing confirm to ASME Y14.5M-1994
- All dimensions are in millimeters
- This drawing will meet all dimensions requirement of JEDEC outlines TO-247 AD
- Dimension b2 and b4 does not include dambar protrusion



FACILITY CODE: 9





DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.55
A2	1.50	2.00	2.49
b	1.12	1.20	1.33
b2 ⁽¹⁾	1.91	2.00	2.39
b4 ⁽¹⁾	2.87	3.00	3.22
c	0.55	0.60	0.69
D ⁽²⁾	20.80	20.95	21.10
D1 ⁽³⁾	16.25	16.55	17.65
D2	0.51	1.19	1.35
E ⁽²⁾	15.75	15.94	16.13
E1 ⁽³⁾	13.46	14.02	14.16
E2	4.32	4.91	5.49
e	5.44 BSC.		
L	19.81	20.07	20.32
L1 ⁽⁴⁾	4.10	4.19	4.40
ØP ⁽⁵⁾	3.56	3.61	3.65
ØP1	7.19 ref.		
Q	5.39	5.79	6.20
S	6.04	6.17	6.30
ECN: E24-0303-Rev. B, 19-Aug-2024 DWG: 6118			

Notes

- Package reference: JEDEC TO-247, variation AD
- All dimensions are in mm
- Slot required, notch may be rounded
- ⁽¹⁾ Dimension b2 and b4 does not include dambar protrusion
- ⁽²⁾ Dimension D and E do not include mold flash
- ⁽³⁾ Thermal pad contour optional within dimension D1 and E1
- ⁽⁴⁾ Lead Finish Uncontrolled In L1
- ⁽⁵⁾ ØP to have a draft angle of 1.5 ° ref. to the top of the part with hole diameter of 3.91mm



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