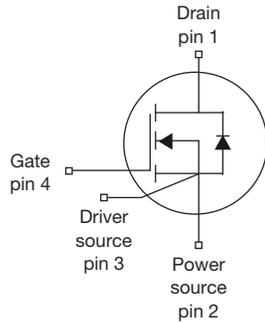




# MaxSiC<sup>®</sup> 1200 V N-Channel SiC MOSFET



### FEATURES

- Fast switching speed
- Short circuit withstand time 3  $\mu$ s
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Charger
- Boost inverter
- DC/DC converter

Marking Code: 120A045FL

PRODUCT SUMMARY	
V <sub>DS</sub> (V) at T <sub>J</sub> max.	1200
R <sub>DS(on)</sub> typ. (m $\Omega$ ) at 25 °C	V <sub>GS</sub> = 20 V   45
Q <sub>g</sub> typ. (nC)	75.6
I <sub>D</sub> (A)	49
C <sub>oss</sub> typ. (pF)	90
P <sub>D</sub> (W)	227
Configuration	Single

ORDERING INFORMATION	
Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	MXP120A045FL-GE3

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage <sup>a</sup>		V <sub>DS</sub>	1200	V
Gate-source voltage		V <sub>GS</sub>	-10 / +22	
Recommended operation voltage of gate-source		V <sub>GSOP</sub>	-5 / +20	
Continuous drain current	T <sub>C</sub> = 25 °C	I <sub>D</sub>	49	A
Continuous drain current	T <sub>C</sub> = 100 °C	I <sub>D</sub>	31	
Pulsed drain current <sup>b</sup>		I <sub>DM</sub>	98	
Short-circuit withstand time <sup>c</sup>		T <sub>SC</sub>	3	$\mu$ s
Maximum power dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	227	W
	T <sub>C</sub> = 100 °C	P <sub>D</sub>	91	W
Operating junction and storage temperature range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

### Notes

- T<sub>J</sub> = 25 °C to 150 °C
- Repetitive rating; pulse width limited by maximum junction temperature
- 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)	$R_{thJC}$	-	0.55	

SPECIFICATIONS ( $T_J = 25\text{ °C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200	-	-	V
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$	-	2.38	-	V
		$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 150\text{ °C}$	-	1.65	-	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	$R_{DS(on)}$	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}$	-	45	56	mΩ
		$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ °C}$	-	69	86	
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}$	-	55	69	mΩ
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ °C}$	-	80	99	
<b>Dynamic</b>						
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$	-	1958	-	pF
Output capacitance	$C_{oss}$		-	90	-	
Reverse transfer capacitance	$C_{rss}$		-	4	-	
Cross stored energy	$E_{oss}$		-	35	-	
Total gate charge	$Q_g$	$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, V_{DS} = 800\text{ V}$	-	75.6	-	nC
Gate-source charge	$Q_{gs}$		-	19.5	-	
Gate-drain charge	$Q_{gd}$		-	26.2	-	
Gate Resistance	$R_g$	$V_{DS} = 0\text{ V}, f = 1\text{ MHz}$	-	4.9	-	Ω
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 20\text{ A}, V_{DS} = 800\text{ V}, R_{g(ext)} = 4.4\text{ Ω}$	-	15	-	ns
Rise time	$t_r$		-	21	-	
Turn-off delay time	$t_{d(off)}$		-	23	-	
Fall time	$t_f$		-	11	-	
Turn-on switching energy	$E_{on}$		-	295	-	μJ
Turn-off switching energy	$E_{off}$		-	34	-	
<b>Body Diode Ratings and Characteristic</b>						
Forward diode voltage	$V_{SD}$	$V_{GS} = -5\text{ V}, I_{SD} = 10\text{ A}, T_J = 25\text{ °C}$	-	4.7	-	V
Continuous diode forward current	$I_{SD}$	$V_{GS} = -5\text{ V}, T_J = 25\text{ °C}$	-	-	35	A
Pulsed diode forward current	$I_{SDM}$		-	-	98	
Reverse recovery time	$t_{rr}$	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, V_R = 800\text{ V}, di/dt = 1000\text{ A/μs}$	-	17	-	ns
Reverse recovery charge	$Q_{rr}$		-	65	-	nC
Reverse recovery current	$I_{rrm}$		-	6.6	-	A



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

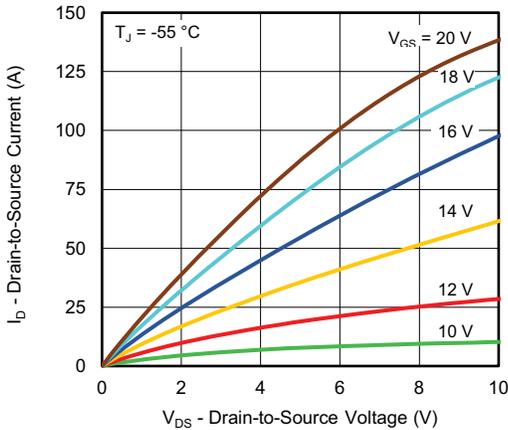


Fig. 1 - Typical Output Characteristics

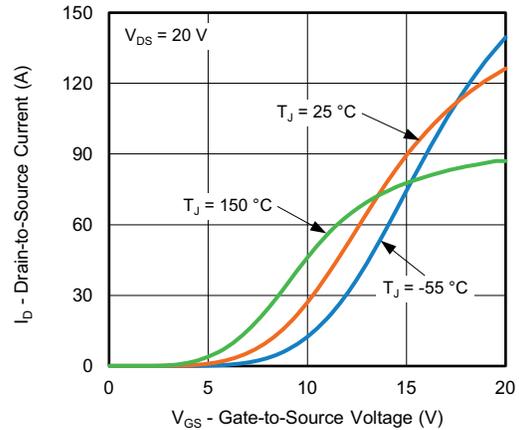


Fig. 4 - Typical Transfer Characteristics

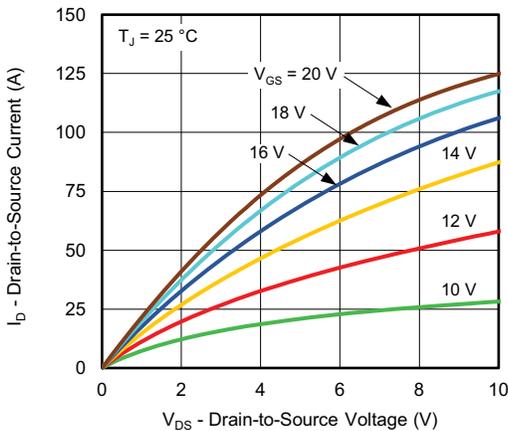


Fig. 2 - Typical Output Characteristics

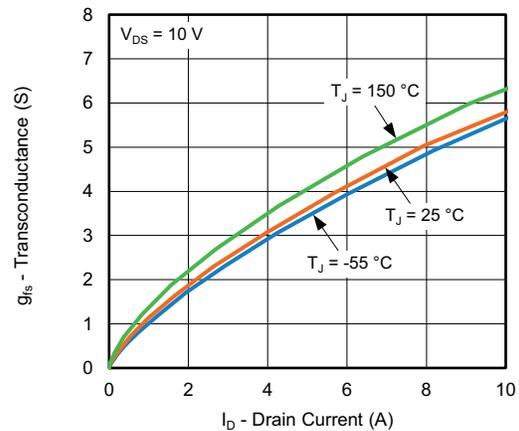


Fig. 5 - Forward Transconductance vs. Drain Current

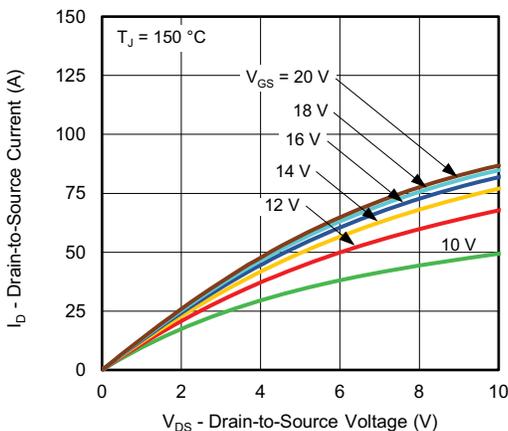


Fig. 3 - Typical Output Characteristics

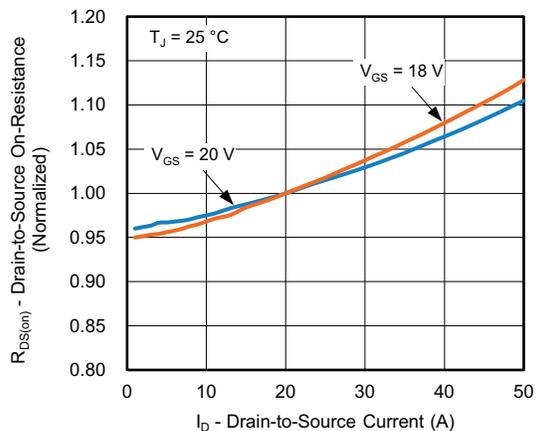
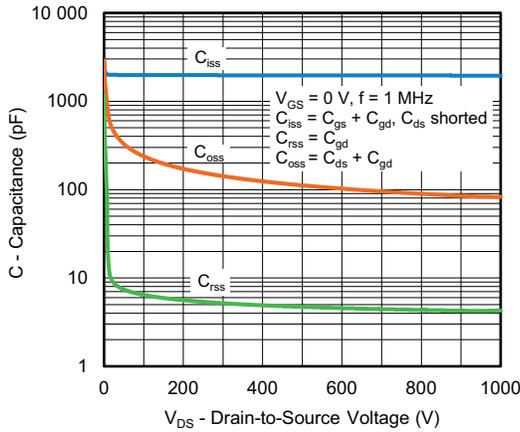
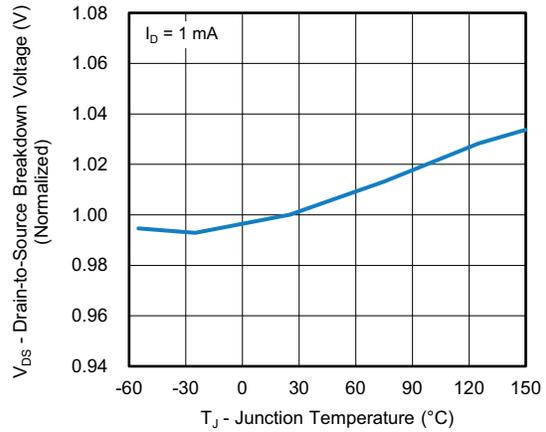


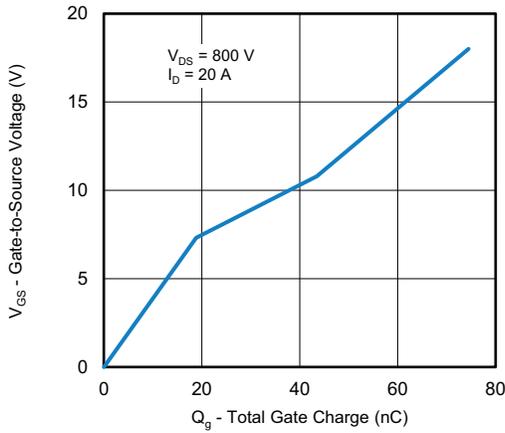
Fig. 6 - Normalized On-Resistance vs. Drain Current



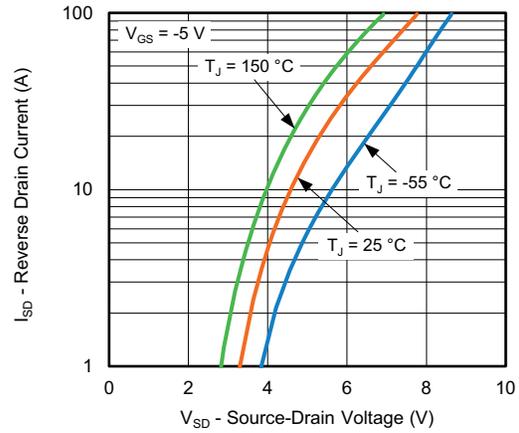
**Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage**



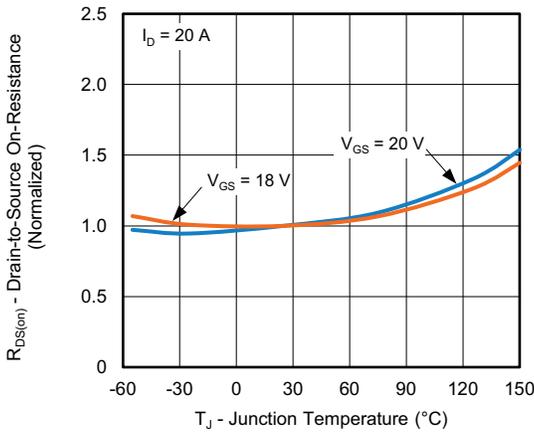
**Fig. 10 - Drain-to-Source Voltage vs. Temperature**



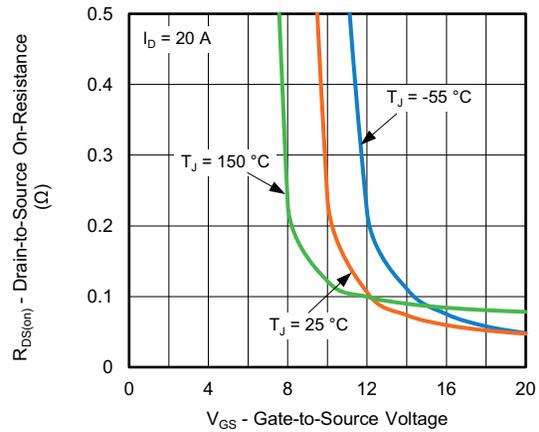
**Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage**



**Fig. 11 - Typical Source-Drain Diode Forward Voltage**



**Fig. 9 - Normalized On-Resistance vs. Temperature**



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

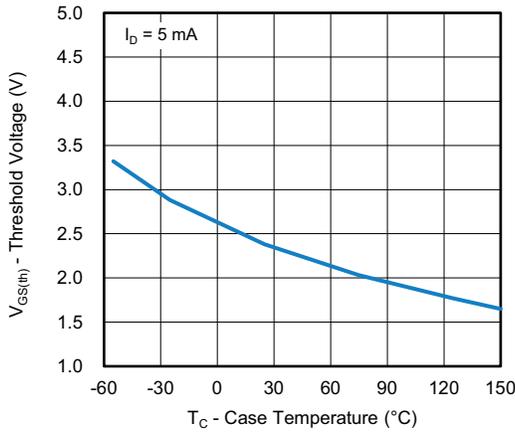


Fig. 13 - Threshold Voltage vs. Case Temperature

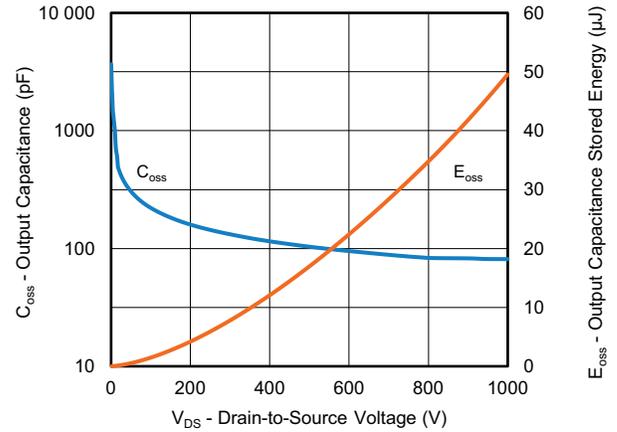


Fig. 15 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage

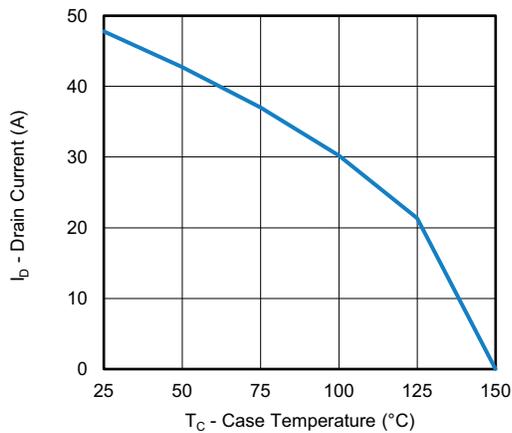


Fig. 14 - Drain Current vs. Case Temperature

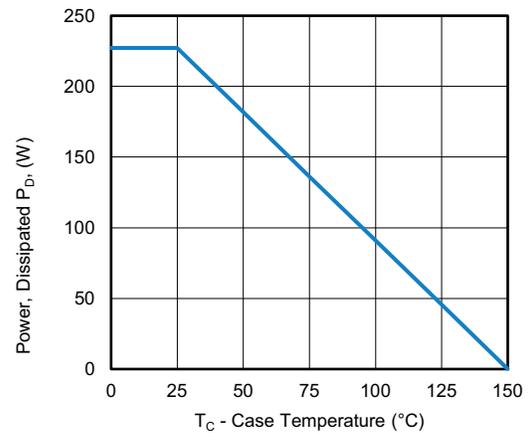


Fig. 16 - Power, Dissipated  $P_D$  vs. Case Temperature

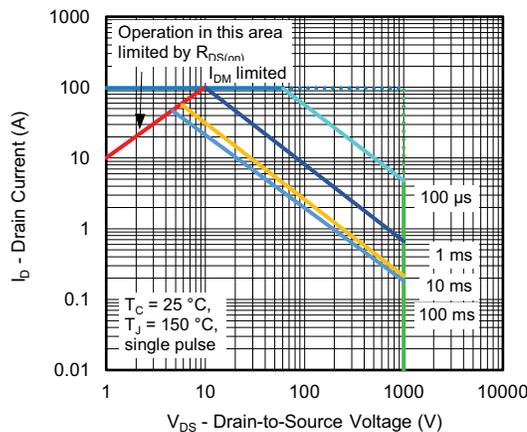


Fig. 17 - Safe Operating Area

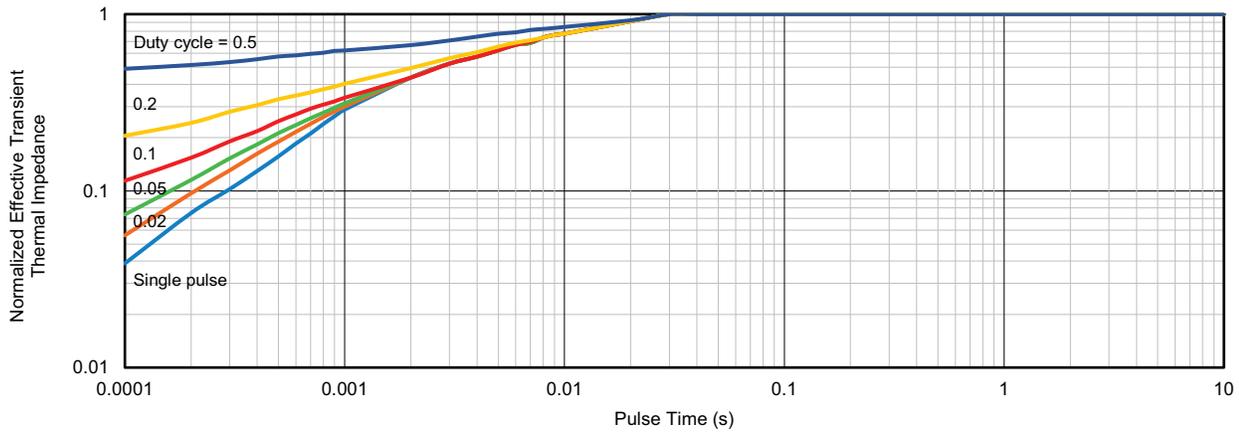
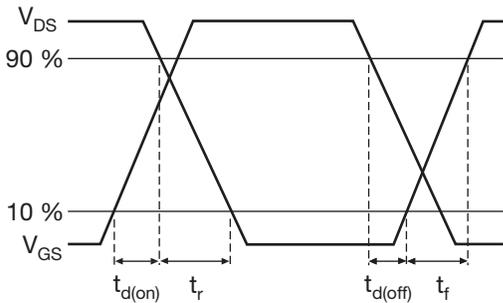
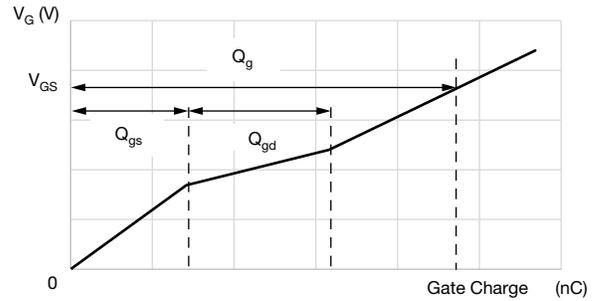


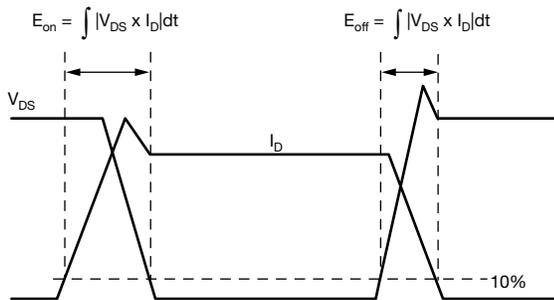
Fig. 18 - Normalized Effective Transient Thermal Impedance



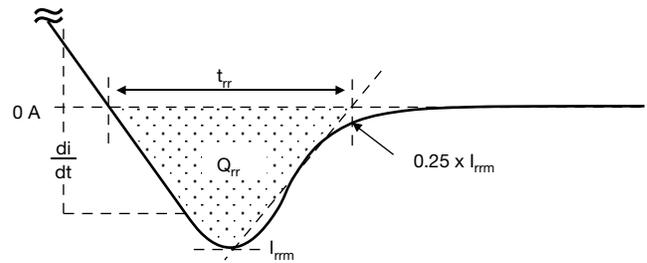
**Fig. 19 - Waveforms of Switching Time**



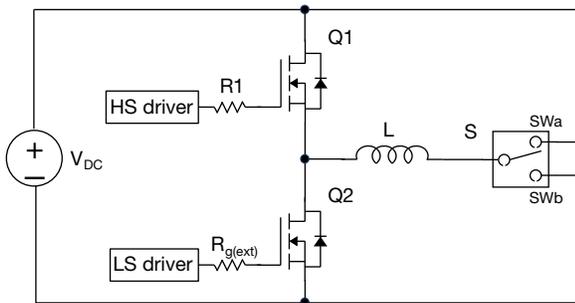
**Fig. 22 - Waveforms for Gate Charge**



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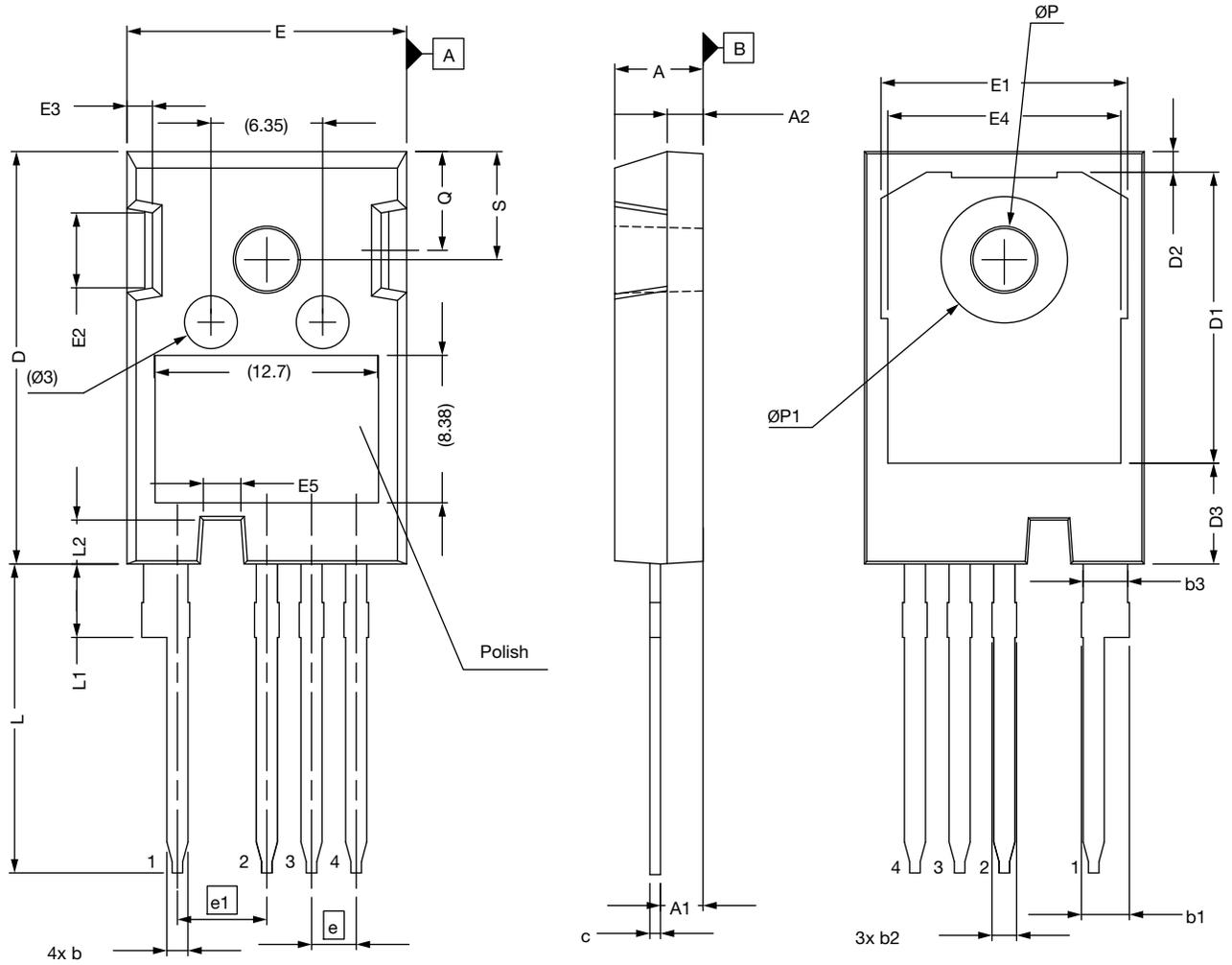
DIM.	MILLIMETERS	
	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC.	
e1	5.08 BSC.	
L	17.31	17.82
L1	3.97	4.37
L2	2.35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





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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