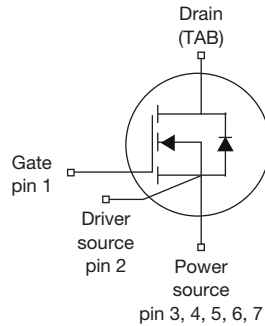
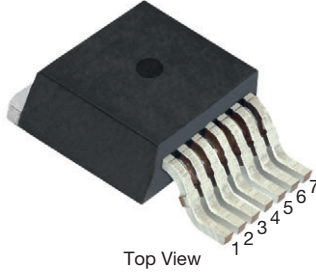


# MaxSiC<sup>®</sup> 1200 V N-Channel SiC MOSFET

**D<sup>2</sup>PAK 7L (TO-263 7L)**

**Marking Code:** 120A045SE

**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**

- Solar inverters
- Energy storage systems
- UPS (uninterruptible power supplies)

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> = 18 V   45
Q <sub>g</sub> typ. (nC)	82
I <sub>D</sub> (A)	52
C <sub>oss</sub> typ. (pF)	91
P <sub>D</sub> (W)	268
Configuration	Single

ORDERING INFORMATION	
Package	D <sup>2</sup> PAK 7L (TO-263 7L)
Lead (Pb)-free and halogen-free	MXP120A045SE-T1GE3

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		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 to -3 / +18	
Continuous drain current	T <sub>C</sub> = 25 °C	I <sub>D</sub>	52	A
Pulsed drain current <sup>a</sup>		I <sub>DM</sub>	104	
Short-circuit withstand time <sup>b</sup>		T <sub>SC</sub>	3	$\mu$ s
Maximum power dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	268	W
Operating junction and storage temperature range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C
Single pulse avalanche energy <sup>c</sup>		E <sub>AS</sub>	200	mJ

**Notes**

- Repetitive rating; pulse width limited by maximum junction temperature
- V<sub>GS</sub> = 18 V, V<sub>DS</sub> = 800 V, R<sub>g(ext)</sub> = 20  $\Omega$ , verified by the design / characterization
- T<sub>J</sub> = 25 °C, V<sub>DD</sub> = 120 V, L = 1 mH, V<sub>GS</sub> = 18 V, I<sub>AS</sub> = 20 A



<b>THERMAL RESISTANCE RATINGS</b>				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	42	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.56	

<b>SPECIFICATIONS</b> ( $T_J = 25\text{ °C}$ , 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)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$	-	2.8	-	V	
		$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 175\text{ °C}$	-	1.9	-	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	$I_{DSS}$	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	μA	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 15\text{ V}, I_D = 26\text{ A}$	-	60	75	mΩ	
		$V_{GS} = 18\text{ V}, I_D = 26\text{ A}$	-	45	56		
		$V_{GS} = 18\text{ V}, I_D = 26\text{ A}, T_J = 175\text{ °C}$	-	82	-		
Transconductance	gfs	$V_{DS} = 10\text{ V}, I_D = 26\text{ A}$	-	10	-	S	
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 100\text{ KHz}$	-	2483	-	pF	
Output capacitance	$C_{oss}$		-	91	-		
Reverse transfer capacitance	$C_{rss}$		-	3	-		
Total gate charge	$Q_g$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 26\text{ A}, V_{DS} = 800\text{ V}$	-	82	-	nC	
Gate-source charge	$Q_{gs}$		-	25	-		
Gate-drain charge	$Q_{gd}$		-	22	-		
Gate Resistance	$R_g$		$V_{DS} = 0\text{ V}, f = 1\text{ MHz}$	-	3		-
<b>Switching Characteristics</b>							
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 26\text{ A}, V_{DS} = 800\text{ V}, R_{g(ext)} = 4.4\text{ Ω}$	$T_J = 25\text{ °C}$	-	23	-	ns
			$T_J = 175\text{ °C}$	-	22	-	
Rise time	$t_r$		$T_J = 25\text{ °C}$	-	12	-	
			$T_J = 175\text{ °C}$	-	11	-	
Turn-off delay time	$t_{d(off)}$		$T_J = 25\text{ °C}$	-	25	-	
			$T_J = 175\text{ °C}$	-	27	-	
Fall time	$t_f$		$T_J = 25\text{ °C}$	-	10	-	
			$T_J = 175\text{ °C}$	-	10	-	
Turn-on switching energy	$E_{on}$		$T_J = 25\text{ °C}$	-	273	-	μJ
			$T_J = 175\text{ °C}$	-	261	-	
Turn-off switching energy	$E_{off}$		$T_J = 25\text{ °C}$	-	74	-	
			$T_J = 175\text{ °C}$	-	73	-	
<b>Body Diode Ratings and Characteristic</b>							
Forward diode voltage	$V_{SD}$	$V_{GS} = -5\text{ V}, I_{SD} = 13\text{ A}, T_J = 25\text{ °C}$	-	4.9	-	V	
Continuous diode forward current	$I_{SD}$	$V_{GS} = -5\text{ V}, T_J = 25\text{ °C}$	-	-	38	A	
Pulsed diode forward current	$I_{SDM}$		-	-	104		
Reverse recovery time	$t_{rr}$	$V_{GS} = -5\text{ V}, I_{SD} = 26\text{ A}, V_R = 800\text{ V}, di/dt = 1000\text{ A/μs}$	-	19	-	ns	
Reverse recovery charge	$Q_{rr}$		-	83	-	nC	
Reverse recovery current	$I_{RRM}$		-	7	-	A	



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

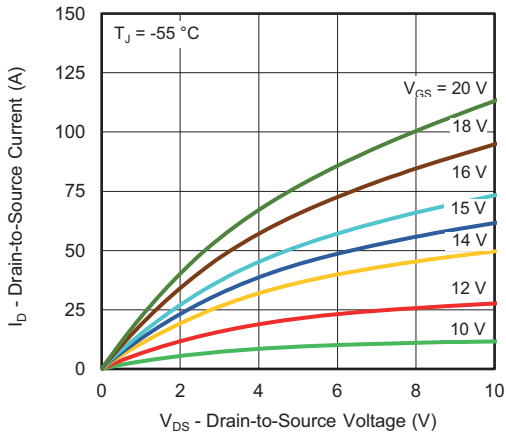


Fig. 1 - Typical Output Characteristics

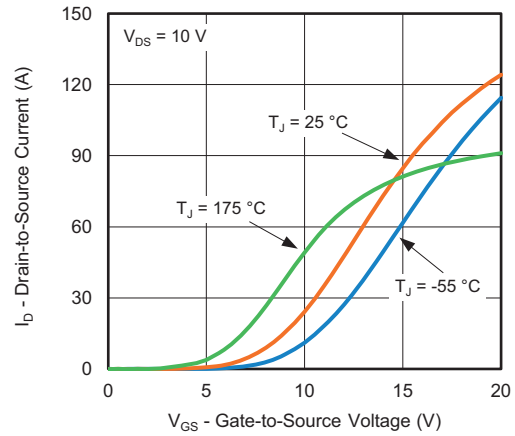


Fig. 4 - Typical Transfer Characteristics

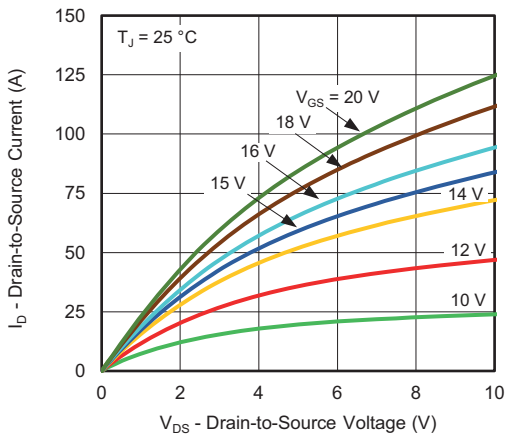


Fig. 2 - Typical Output Characteristics

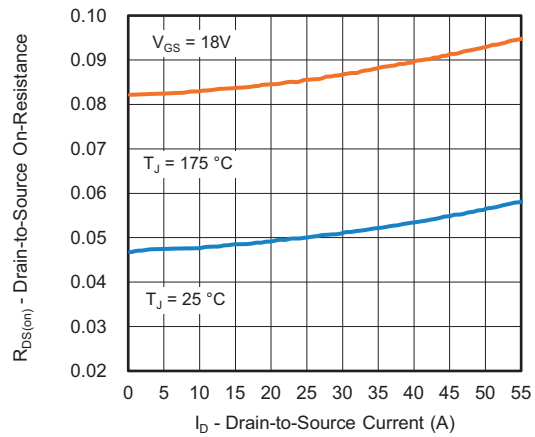


Fig. 5 - Normalized On-Resistance vs. Drain Current

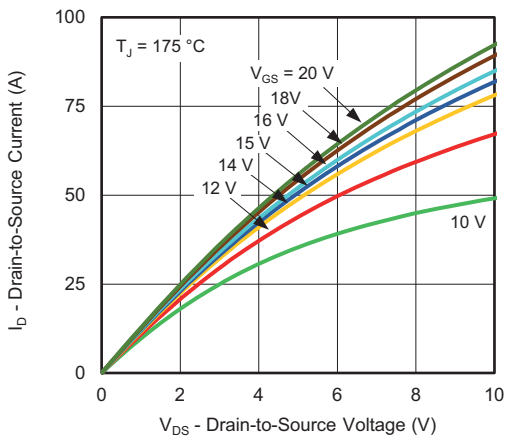


Fig. 3 - Typical Output Characteristics

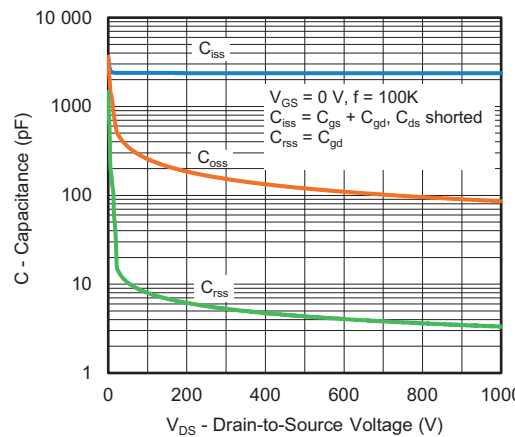
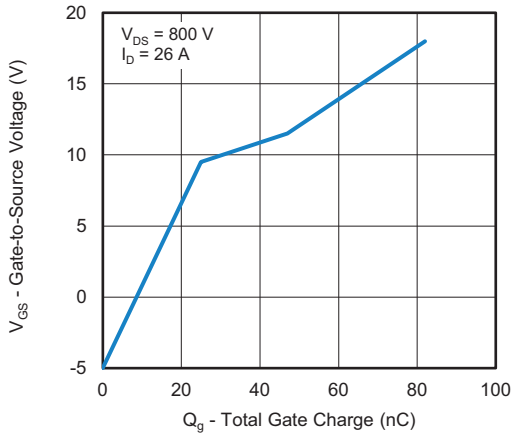
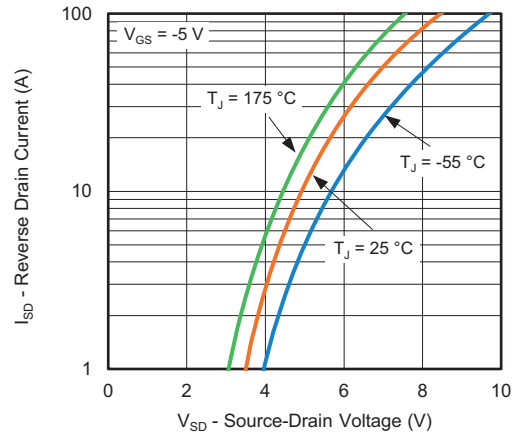


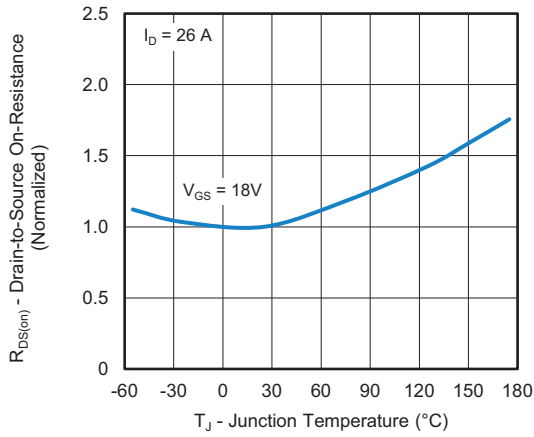
Fig. 6 - Typical Capacitance vs. Drain-to-Source Voltage



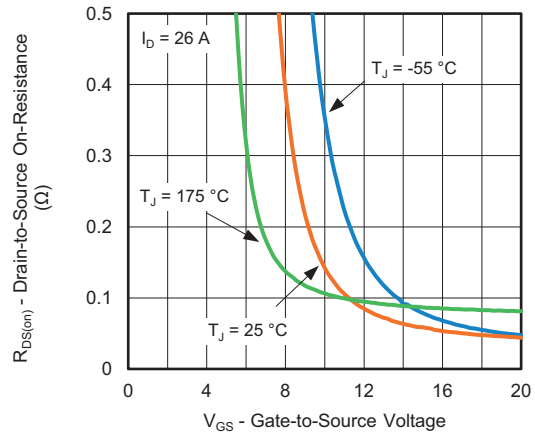
**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**



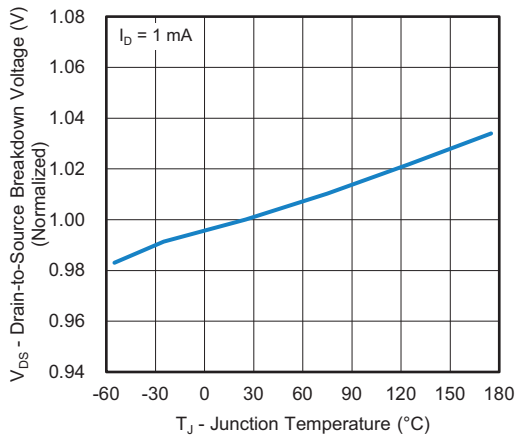
**Fig. 10 - Typical Source-Drain Diode Forward Voltage**



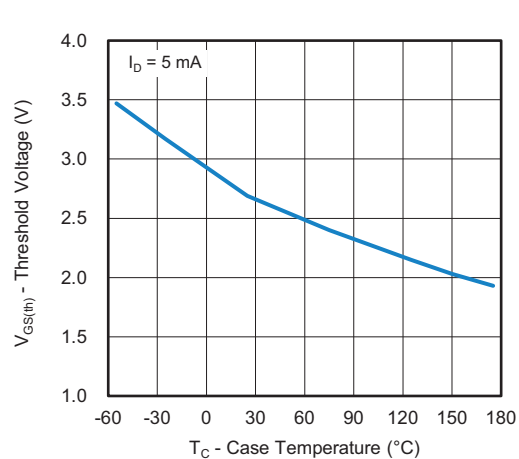
**Fig. 8 - Normalized On-Resistance vs. Temperature**



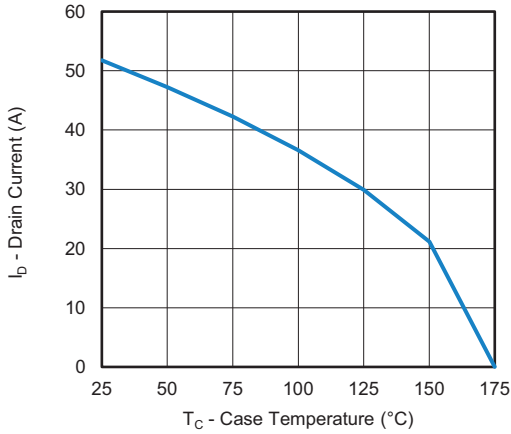
**Fig. 11 - On-Resistance vs. Gate-to-Source Voltage**



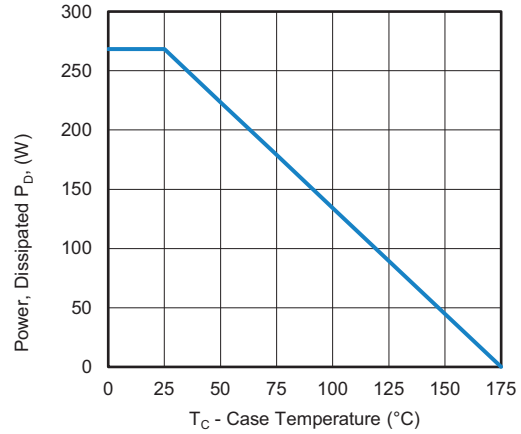
**Fig. 9 - Drain-to-Source Voltage vs. Temperature**



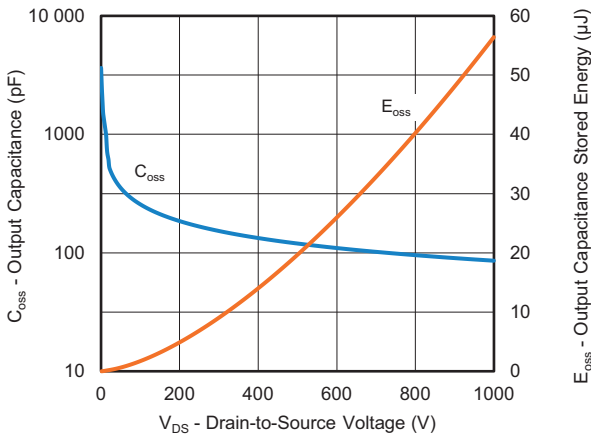
**Fig. 12 - Threshold Voltage vs. Case Temperature**



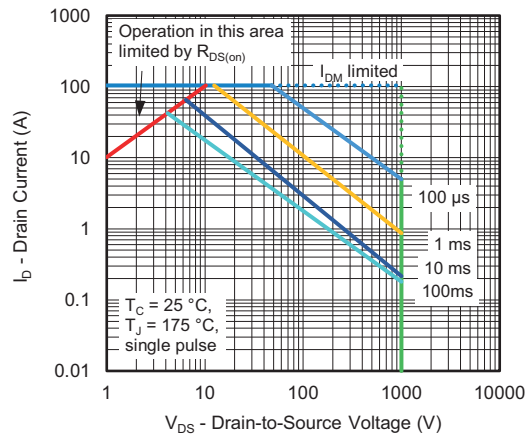
**Fig. 13 - Drain Current vs. Case Temperature**



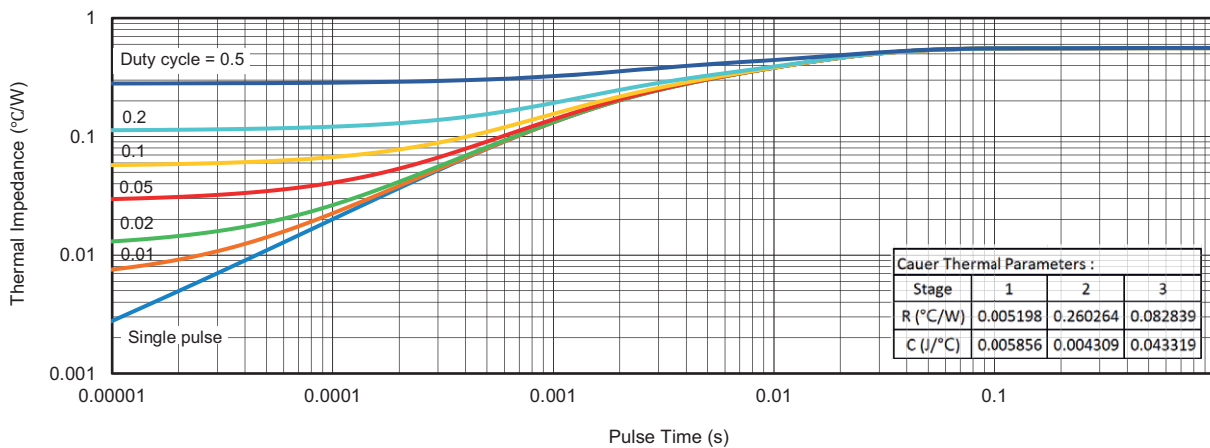
**Fig. 15 - Power, Dissipated  $P_D$  vs. Case Temperature**



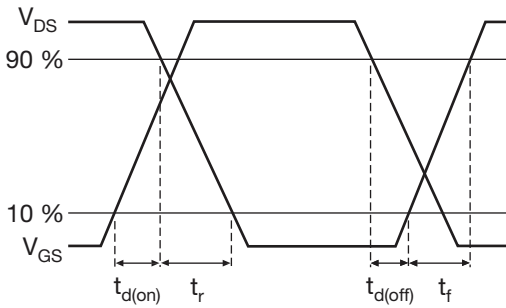
**Fig. 14 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage**



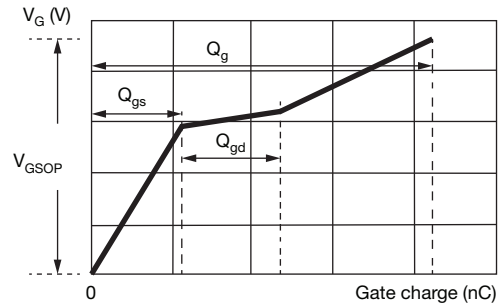
**Fig. 16 - Safe Operating Area**



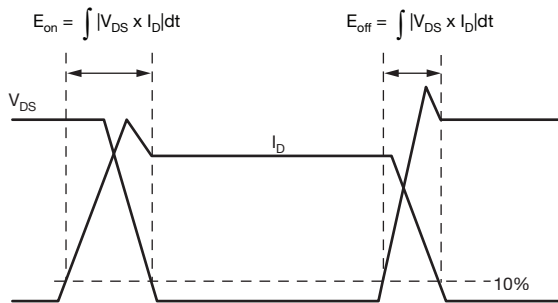
**Fig. 17 - Transient Thermal Impedance**



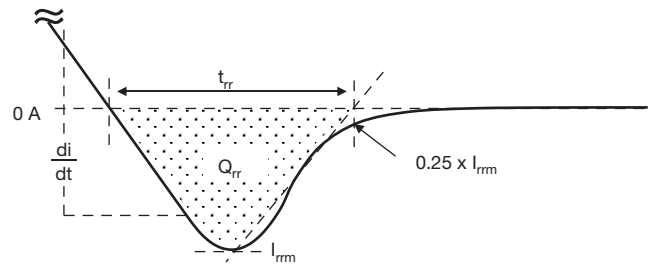
**Fig. 18 - Waveforms of Switching Time**



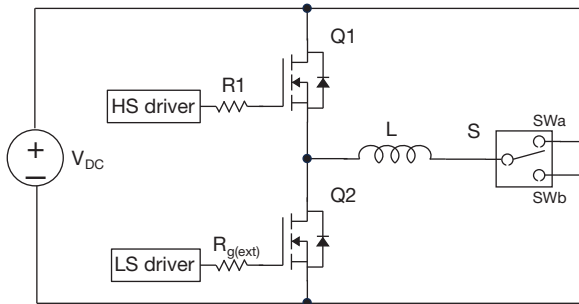
**Fig. 21 - Waveforms for Gate Charge**



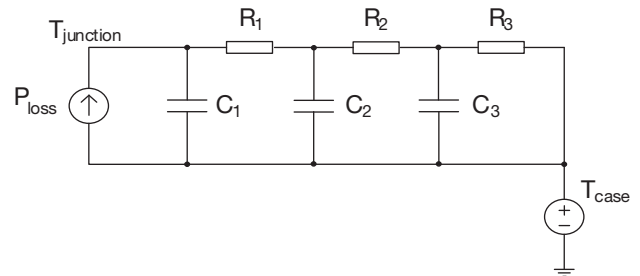
**Fig. 19 - Waveforms for Switching Energy**



**Fig. 22 - Waveforms for Reverse Recovery**



**Fig. 20 - Switching and Reverse Diode Characteristics Measurement Circuit**

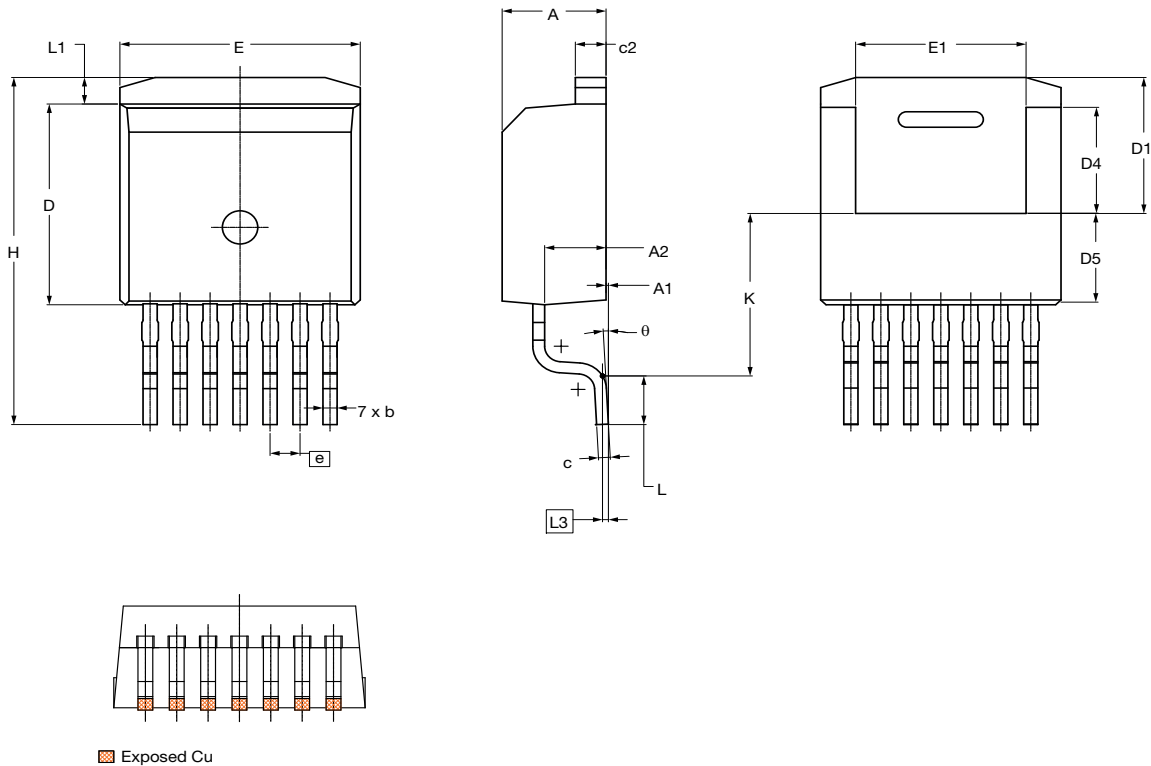


**Fig. 23 - Thermal Equivalent Circuit**

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### Case Outline for TO-263 7L Package

**FACILITY CODE: 9**



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.30	4.40	4.50
A1	0.00	0.10	0.25
A2	2.45	2.60	2.75
b	0.50	0.60	0.70
c	0.45	0.50	0.60
c2	1.20	1.30	1.40
D	8.93	9.08	9.23
D1	6.15 ref.		
D4	4.65	4.80	4.95
D5	3.83	4.13	4.43
E	10.08	10.18	10.28
E1	6.82	7.22	7.62
e	1.27 BSC.		
H	15.00	15.70	16.00
K	7.30		
L	1.90	2.20	2.50
L1	1.00	1.20	1.40
L3	0.25 BSC.		
$\theta$	0 °	3 °	7 °

ECN: S25-0851-Rev. C, 18-Jul-2025  
DWG: 6119

**Notes**

- All dimensions are in mm and angles are in degrees
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extreme of the plastic body
- Thermal pad contour optional within Dimensions E, L1, D4 and E1
- Dimension D4 and E1 establish a minimum mounting surface for the thermal pad
- There is exposed Cu and molding flash bleeding at the pin which is close to package



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