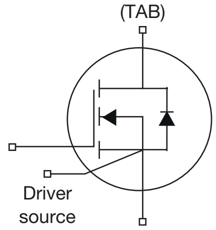
MaxSiC® 1200 V N-Channel SiC MOSFET

D²PAK 7L (TO-263 7L)

Top View



Marking Code: 120A045SE

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

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

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	1200	
$R_{DS(on)}$ typ. (mΩ) at 25 °C	V_{GS} = 18 V	45
Q_g typ. (nC)	82	
I_D (A)	52	
C_{oss} typ. (pF)	91	
P_D (W)	268	
Configuration	Single	

ORDERING INFORMATION	
Package	D²PAK 7L (TO-263 7L)
Lead (Pb)-free and halogen-free	MXP120A045SE-T1GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	1200	V
Gate-source voltage		V_{GS}	-10 / +22	
Recommended operation voltage of gate-source		V_{GSOP}	-5 to -3 / +18	
Continuous drain current	T_C = 25 °C	I_D	52	A
Pulsed drain current [a]		I_{DM}	104	
Short-circuit withstand time [b]		T_{SC}	3	μs
Maximum power dissipation	T_C = 25 °C	P_D	268	W
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C
Single pulse avalanche energy [c]		E_{AS}	200	mJ

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature
b. V_{GS} = 18 V, V_{DS} = 800 V, $R_{g(ext)}$ = 20 Ω, verified by the design / characterization
c. T_J = 25 °C, V_{DD} = 120 V, L = 1 mH, V_{GS} = 18 V, I_{AS} = 20 A

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

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

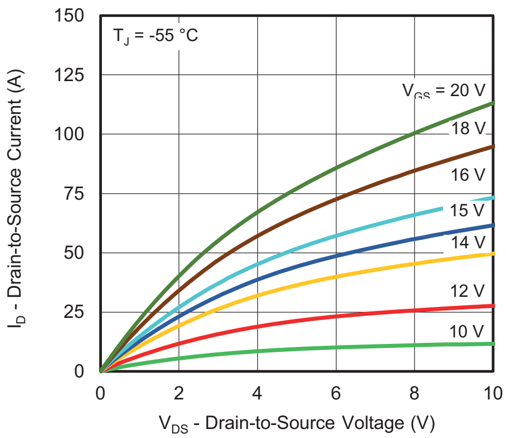


Fig. 1 - Typical Output Characteristics

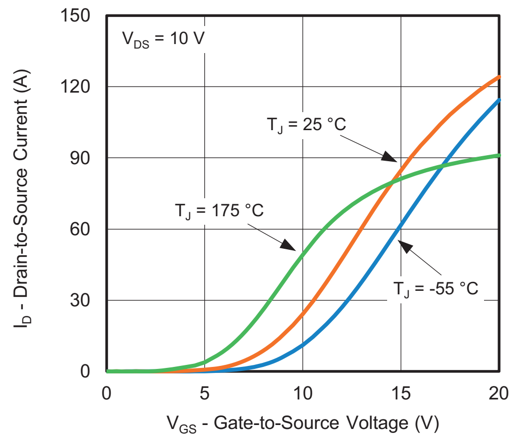


Fig. 4 - Typical Transfer Characteristics

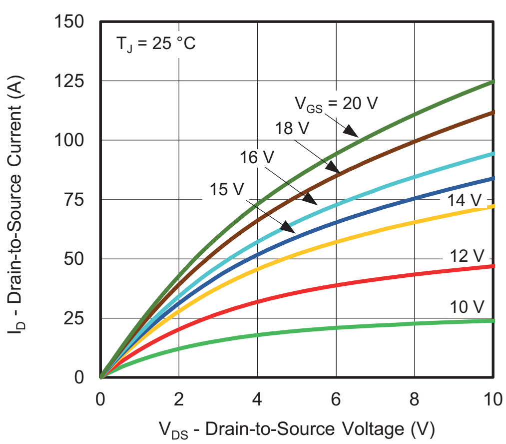


Fig. 2 - Typical Output Characteristics

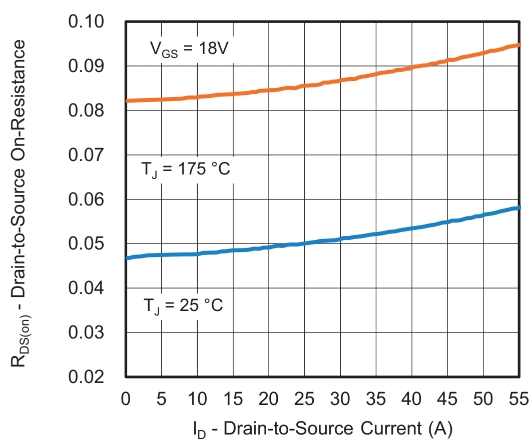


Fig. 5 - Normalized On-Resistance vs. Drain Current

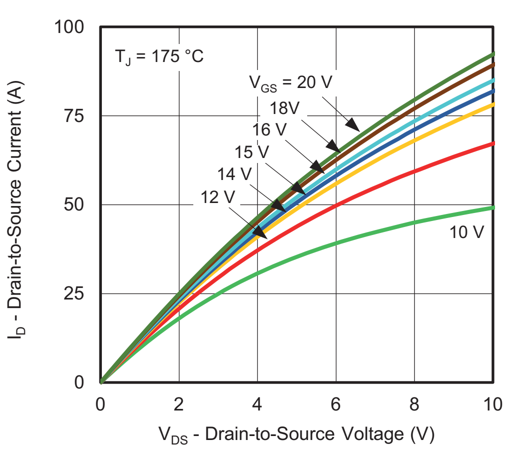


Fig. 3 - Typical Output Characteristics

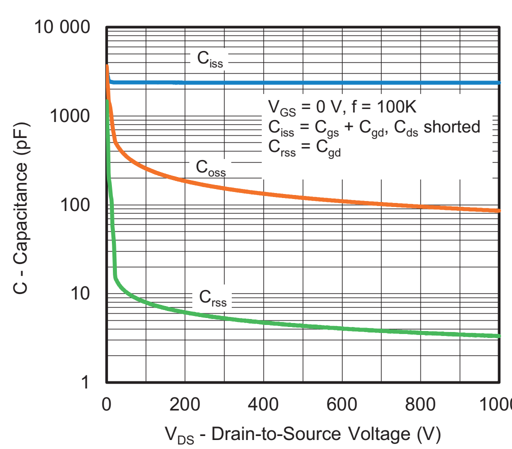


Fig. 6 - Typical Capacitance vs. Drain-to-Source Voltage

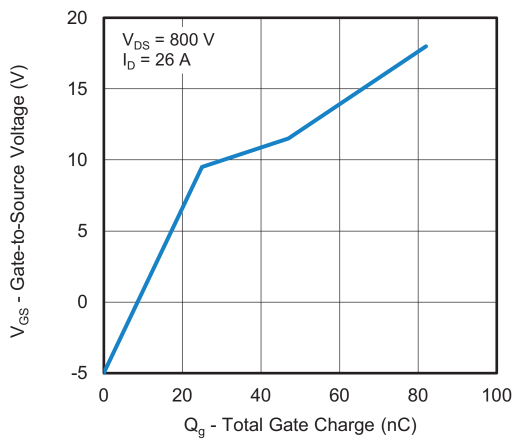


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

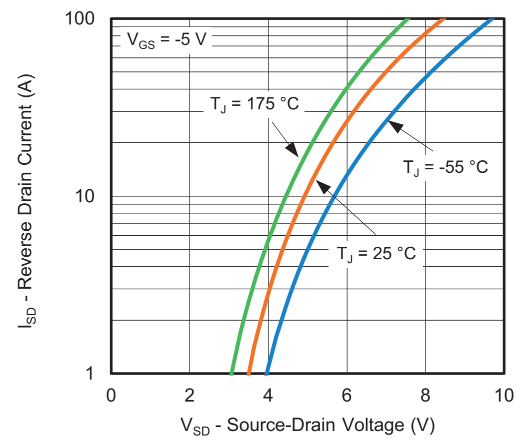


Fig. 10 - Typical Source-Drain Diode Forward Voltage

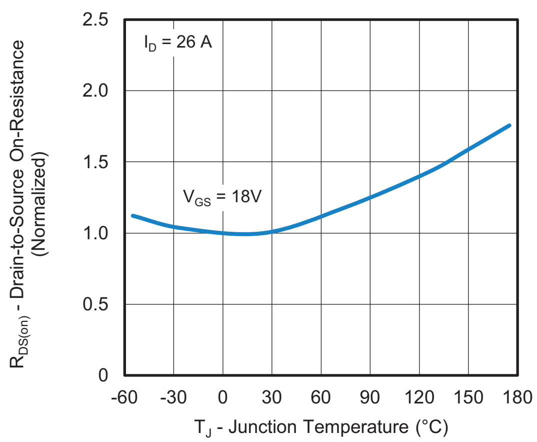


Fig. 8 - Normalized On-Resistance vs. Temperature

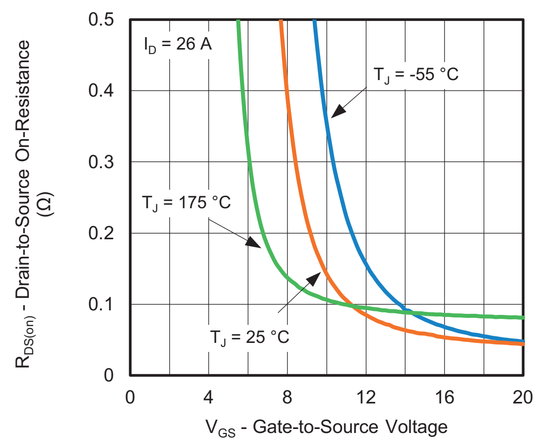


Fig. 11 - On-Resistance vs. Gate-to-Source Voltage

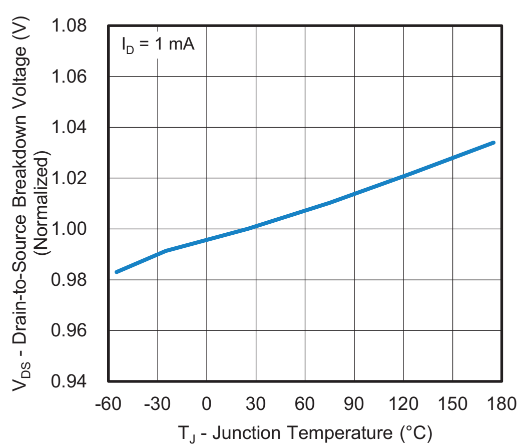


Fig. 9 - Drain-to-Source Voltage vs. Temperature

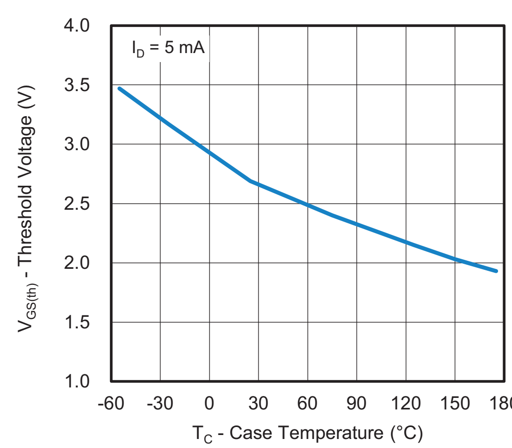


Fig. 12 - Threshold Voltage vs. Case Temperature

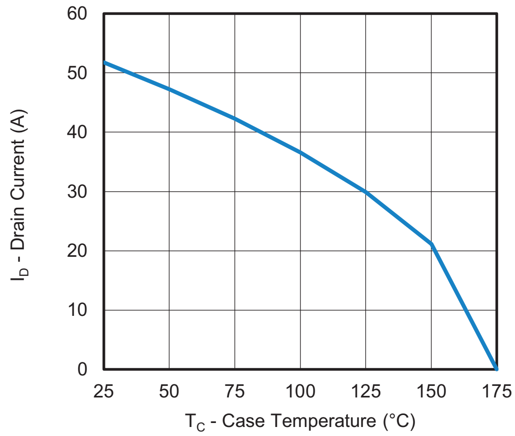


Fig. 13 - Drain Current vs. Case Temperature

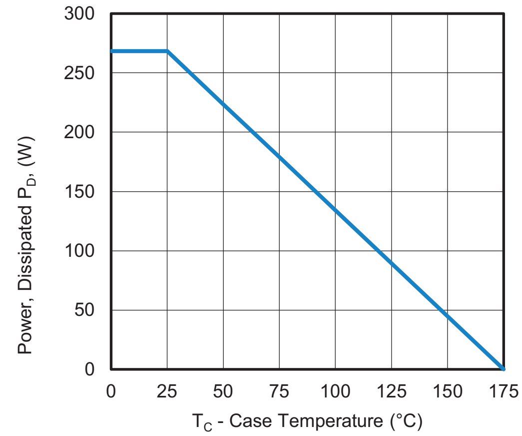


Fig. 15 - Power, Dissipated P_D vs. Case Temperature

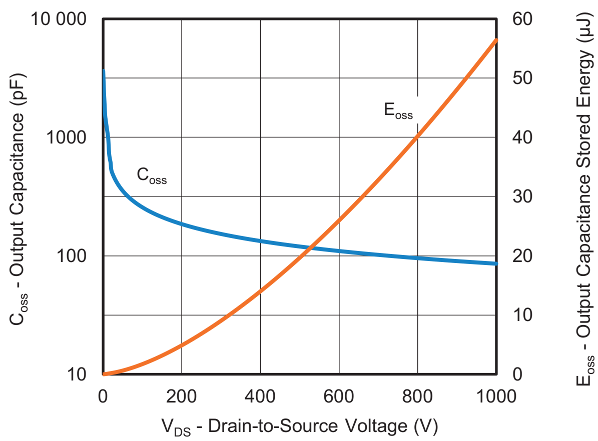


Fig. 14 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage

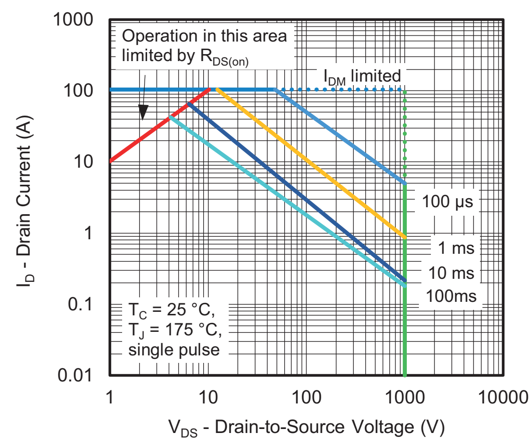
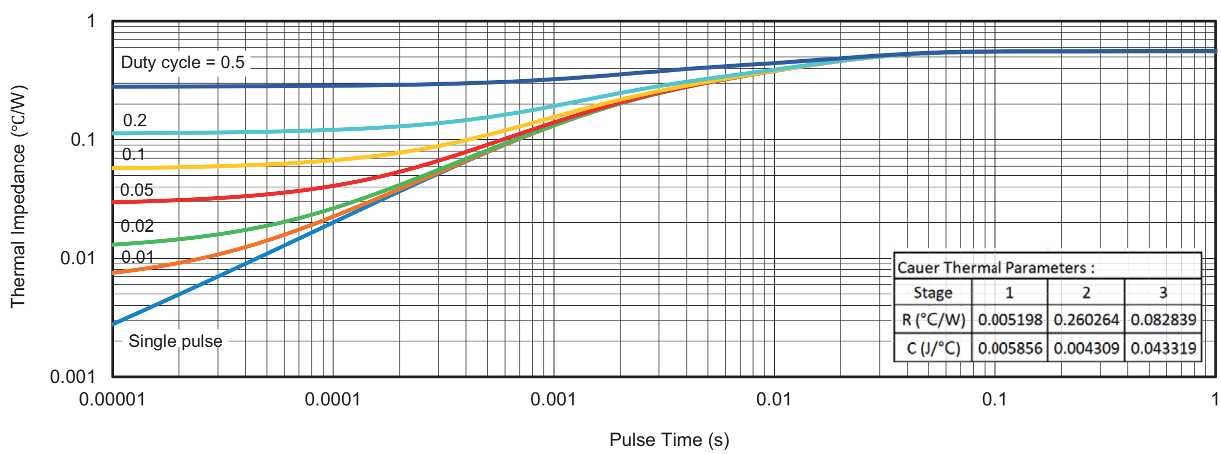


Fig. 16 - Safe Operating Area



Stage	1	2	3
R (°C/W)	0.005198	0.260264	0.082839
C (J/°C)	0.005856	0.004309	0.043319

Fig. 17 - Transient Thermal Impedance

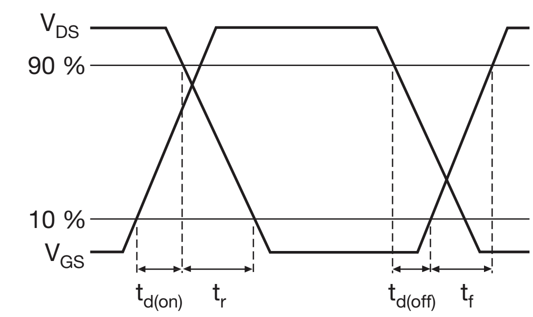


Fig. 18 - Waveforms of Switching Time

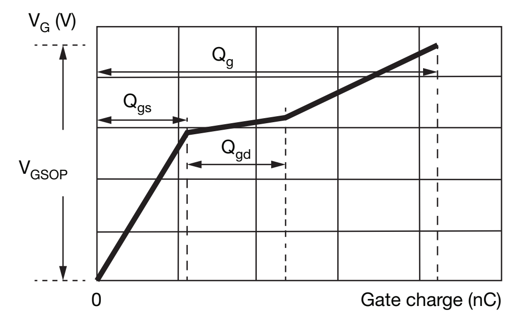


Fig. 21 - Waveforms for Gate Charge

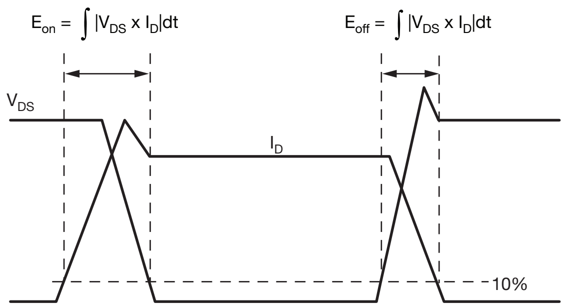


Fig. 19 - Waveforms for Switching Energy

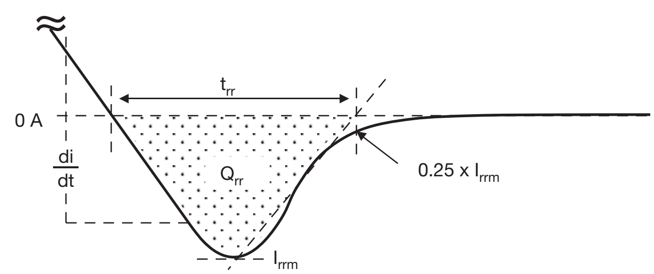


Fig. 22 - Waveforms for Reverse Recovery

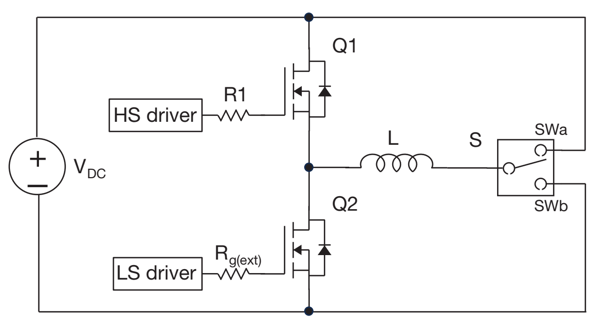


Fig. 20 - Switching and Reverse Diode Characteristics Measurement Circuit

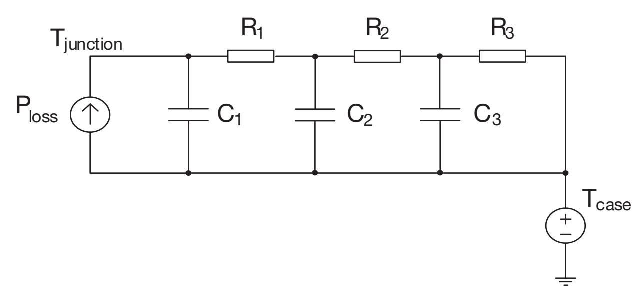


Fig. 23 - Thermal Equivalent Circuit

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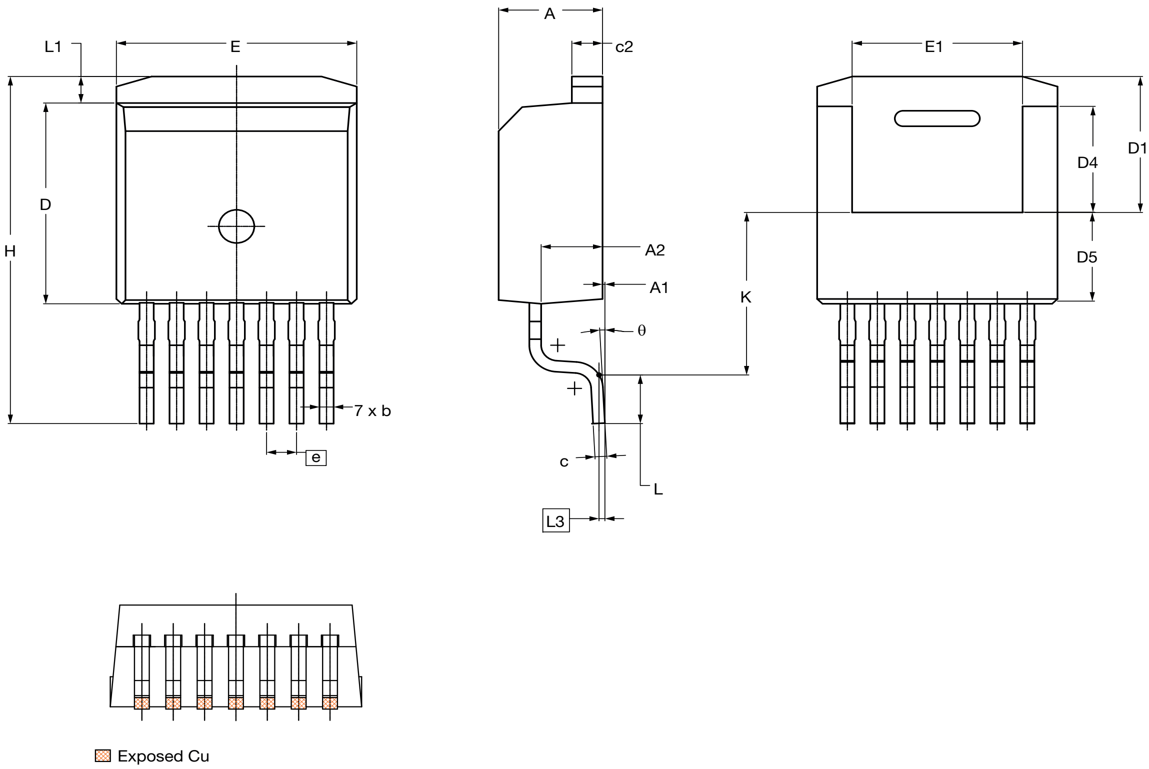
Case Outline for TO-263 7L Package

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.	
θ	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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