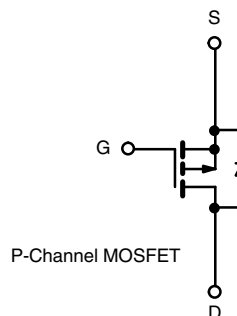


# P-Channel 60 V (D-S) 175 °C MOSFET



## FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT


## PRODUCT SUMMARY

$V_{DS}$ (V)	-60
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -10$ V	0.0069
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0088
$Q_g$ typ. (nC)	230
$I_D$ (A) <sup>d</sup>	-110
Configuration	Single

## ORDERING INFORMATION

Package	TO-263
Lead (Pb)-free	SUM110P06-07L-E3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>d</sup> ( $T_J = 175$ °C)	$I_D$	-110	A
		-95	A
Pulsed drain current	$I_{DM}$	-240	A
Avalanche current	$I_{AS}$	-75	A
Single pulse avalanche energy <sup>a</sup>	$E_{AS}$	281	mJ
Power dissipation	$P_D$	375	W
		3.75	W
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	UNIT
Junction-to-ambient	$R_{thJA}$	40	°C/W
Junction-to-case	$R_{thJC}$	0.4	°C/W

### Notes

- Duty cycle  $\leq 1$  %
- When mounted on 1" square PCB (FR4 material)
- See SOA curve for voltage derating
- Limited by package



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-60	-	-	V
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1	-	-3	
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	-50	
		V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C	-	-	-250	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V	-120	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A	-	0.0055	0.0069	Ω
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A, T <sub>J</sub> = 125 °C	-	-	0.0115	
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A, T <sub>J</sub> = 175 °C	-	-	0.0138	
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -20 A	-	0.0070	0.0088	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -50 A	20	-	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -25 V, f = 1 MHz	-	11 400	-	pF
Output capacitance	C <sub>oss</sub>		-	1200	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	900	-	
Total gate charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -110 A	-	230	345	nC
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>		-	50	-	
Gate-drain charge <sup>c</sup>	Q <sub>gd</sub>		-	60	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	-	3	-	Ω
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -30 V, R <sub>L</sub> = 0.27 Ω I <sub>D</sub> ≐ -110 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	20	30	ns
Rise time <sup>c</sup>	t <sub>r</sub>		-	53	85	
Turn-off delay time <sup>c</sup>	t <sub>d(off)</sub>		-	110	200	
Fall time <sup>c</sup>	t <sub>f</sub>		-	220	430	
Drain-Source Body Diode Characteristics (T <sub>C</sub> = 25 °C <sup>b</sup> )						
Continuous current	I <sub>S</sub>		-	-	-110	A
Pulsed current	I <sub>SM</sub>		-	-	-240	
Forward voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = -85 A, V <sub>GS</sub> = 0 V	-	-1	-1.5	V
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -85 A, dI/dt = 100 A/μs	-	91	137	ns
Peak reverse recovery charge	I <sub>RM(REC)</sub>		-	-6	-9	A
Reverse recovery charge	Q <sub>rr</sub>		-	0.21	0.44	μC

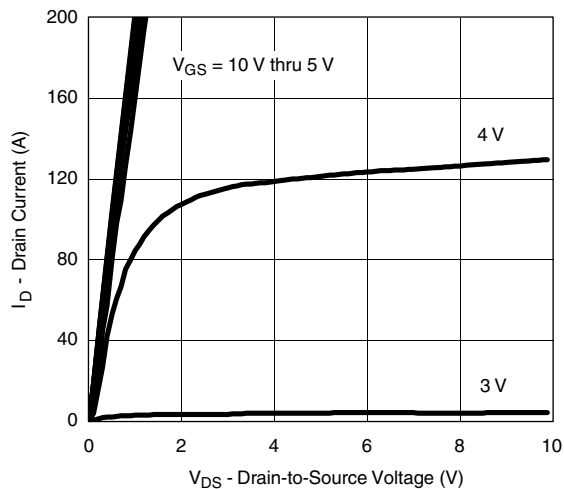
**Notes**

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
b. Guaranteed by design, not subject to production testing  
c. Independent of operating temperature

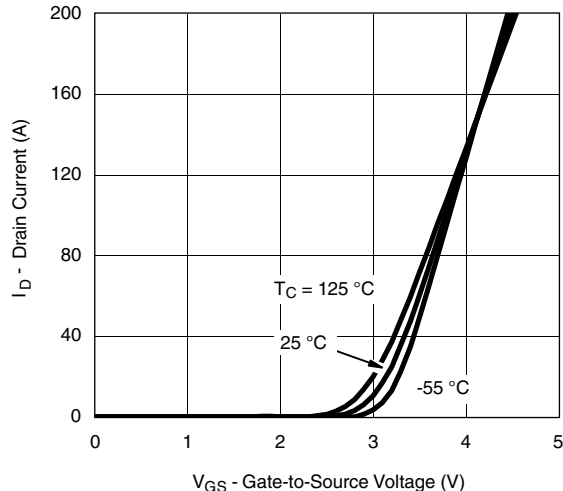
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



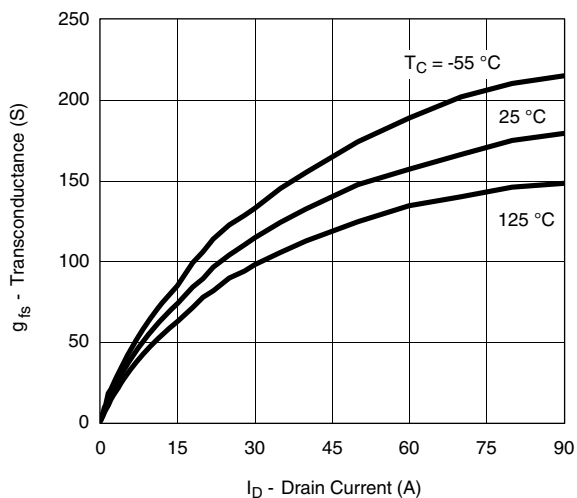
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



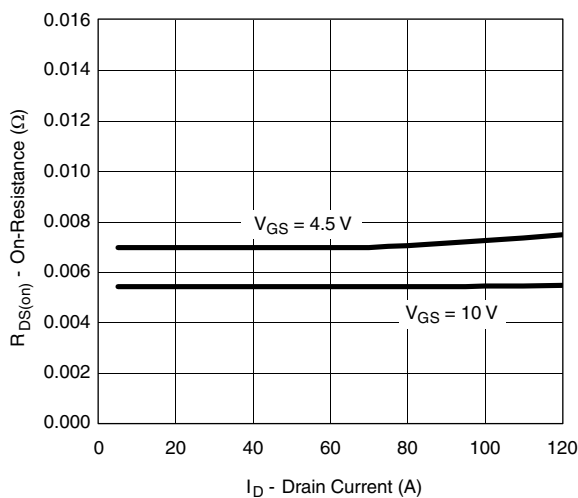
**Output Characteristics**



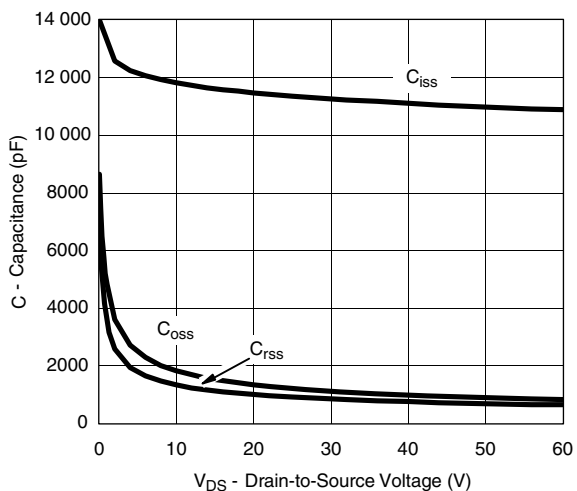
**Transfer Characteristics**



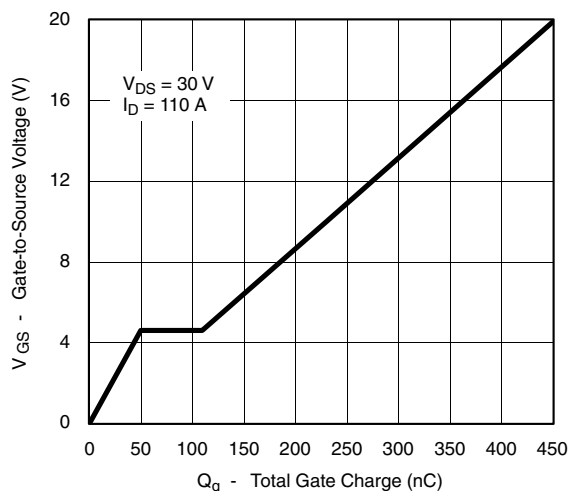
**Transconductance**



**On-Resistance vs. Drain Current**



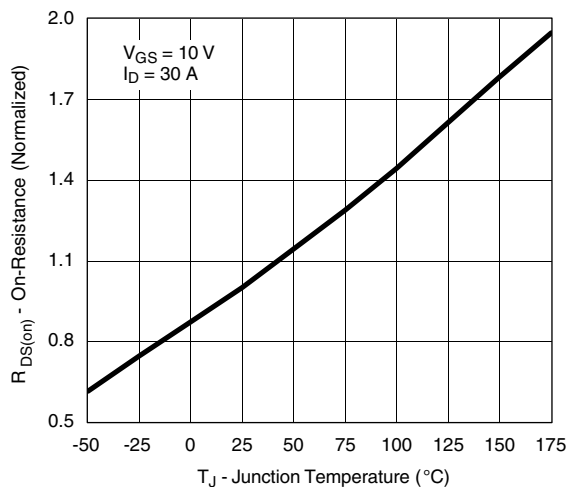
**Capacitance**



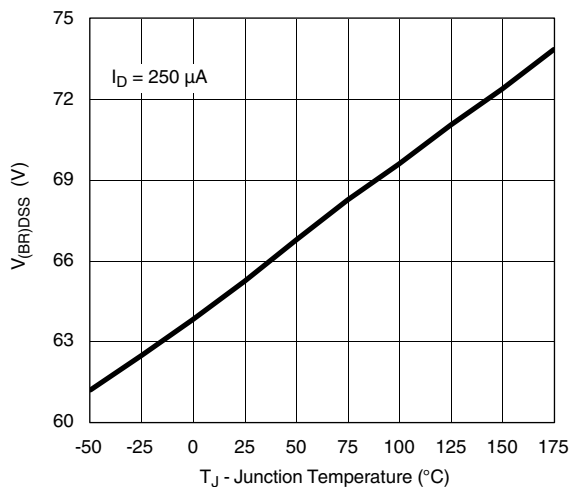
**Gate Charge**



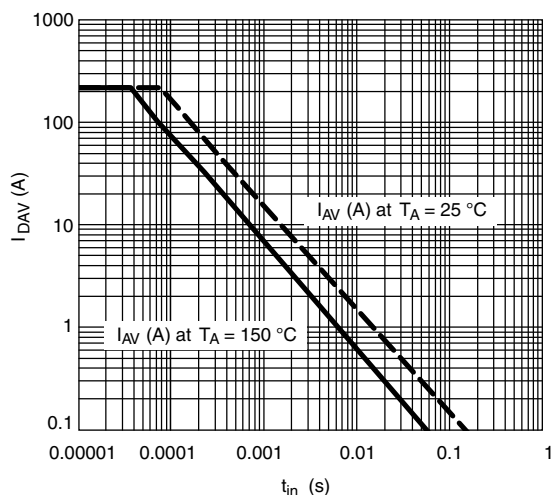
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



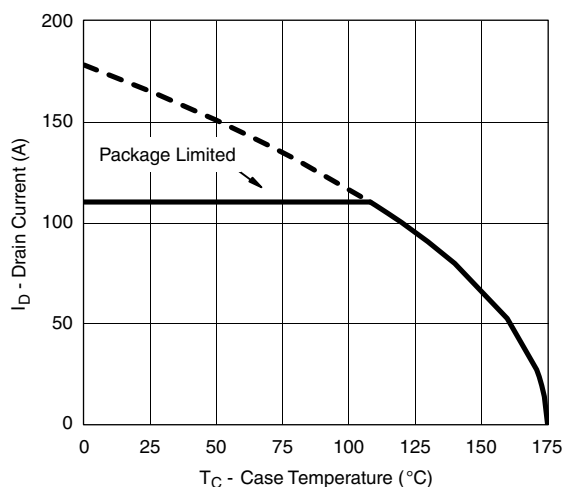
**On-Resistance vs. Junction Temperature**



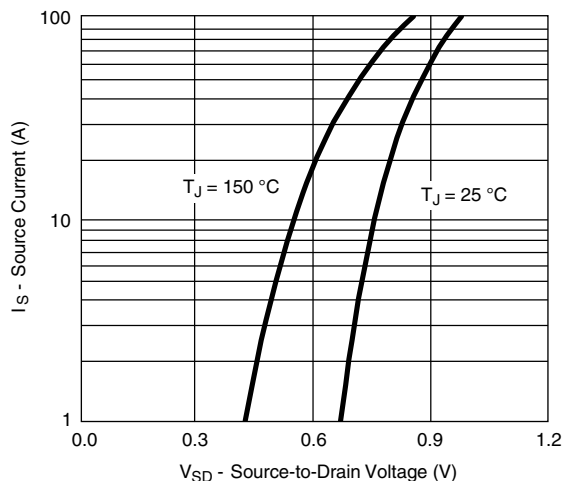
**Drain Source Breakdown vs. Junction Temperature**



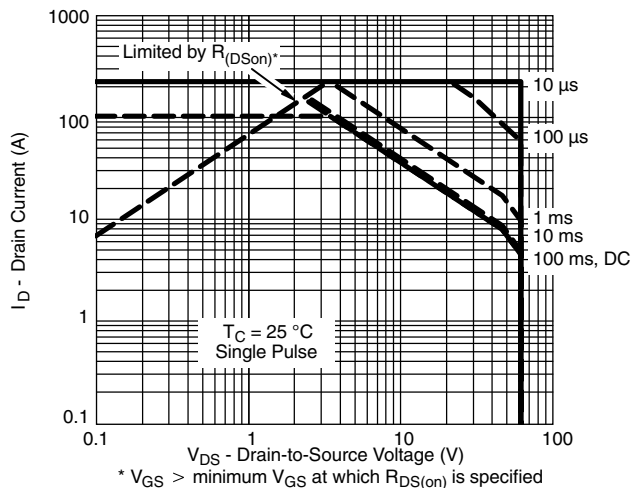
**Avalanche Current vs. Time**



**Maximum Avalanche and Drain Current vs. Case Temperature**



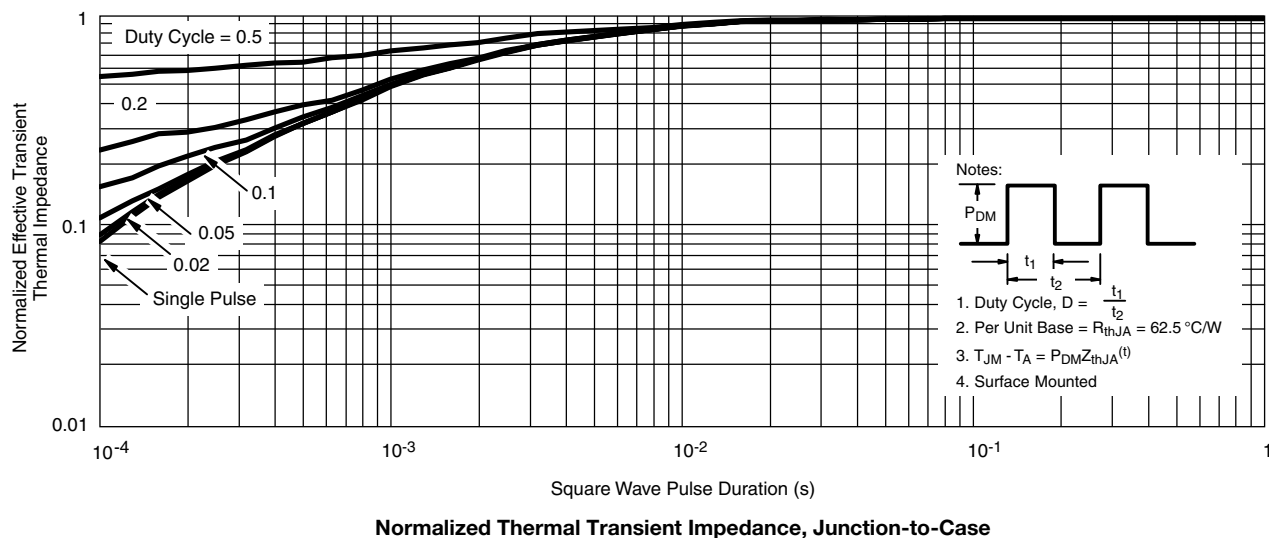
**Source-Drain Diode Forward Voltage**



**Safe Operating Area**



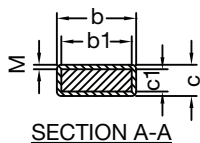
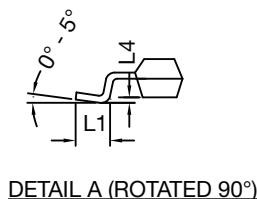
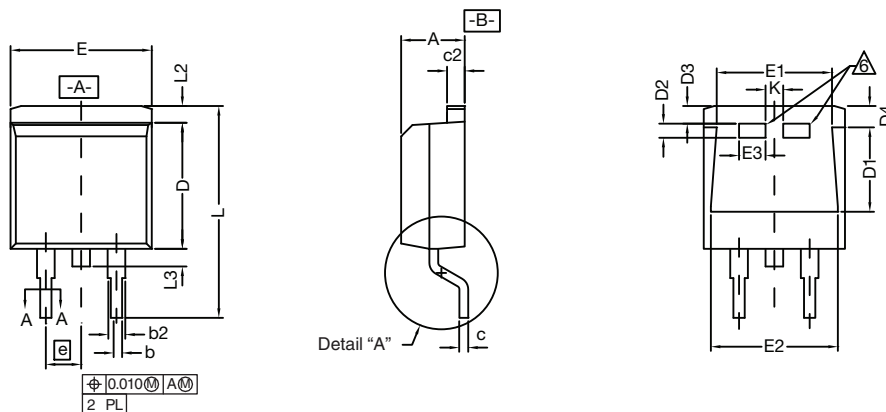
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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
## TO-263 (D<sup>2</sup>PAK): 3-LEAD

### VERSION 1: FACILITY CODE = T



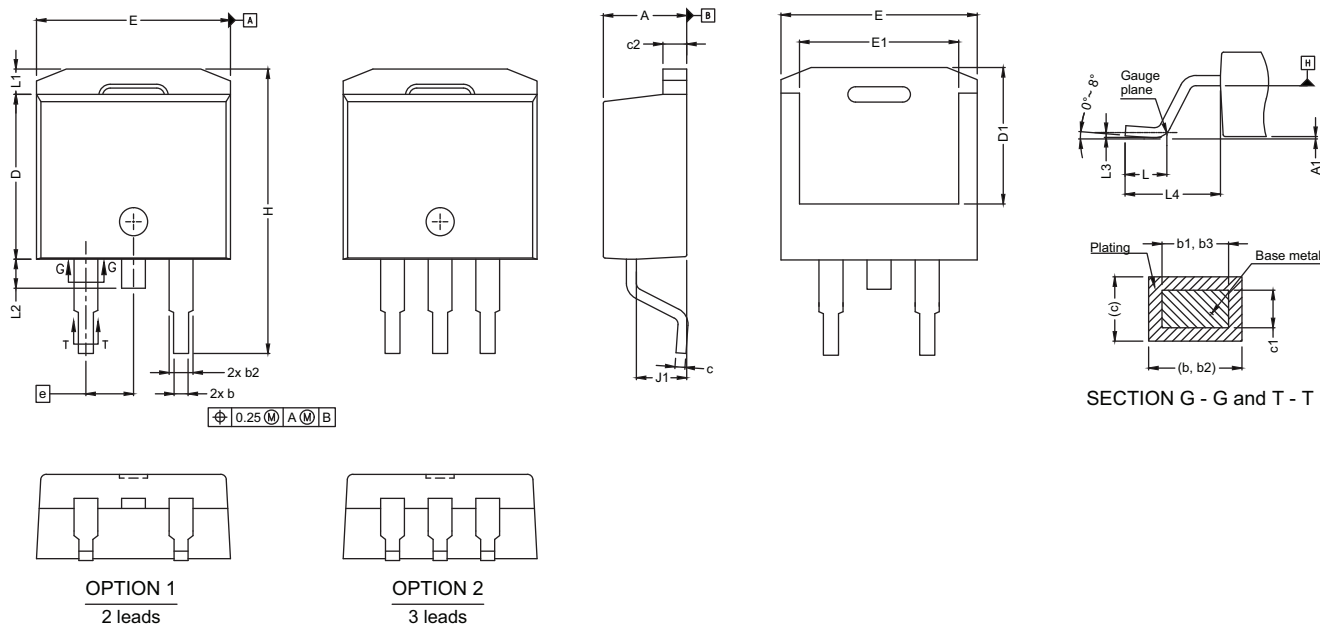
DIM.		INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
c2		0.045	0.055	1.143	1.397
D		0.340	0.380	8.636	9.652
D1		0.220	0.240	5.588	6.096
D2		0.038	0.042	0.965	1.067
D3		0.045	0.055	1.143	1.397
D4		0.044	0.052	1.118	1.321
E		0.380	0.410	9.652	10.414
E1		0.245	-	6.223	-
E2		0.355	0.375	9.017	9.525
E3		0.072	0.078	1.829	1.981
e		0.100 BSC		2.54 BSC	
K		0.045	0.055	1.143	1.397
L		0.575	0.625	14.605	15.875
L1		0.090	0.110	2.286	2.794
L2		0.040	0.055	1.016	1.397
L3		0.050	0.070	1.270	1.778
L4		0.010 BSC		0.254 BSC	
M		-	0.002	-	0.050

#### Notes

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- \*: Thin lead is for SUB, SYB.  
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
-  This feature is for thick lead.



### VERSION 2: FACILITY CODE = N



DIM.	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.70	0.90
b1	0.51	0.89
b2	1.20	1.46
b3	1.17	1.37
c	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.60	9.00
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
e	2.54 BSC	
H	15.0	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25 typ.	
L4	4.78	5.28
J1	2.56	2.96
ECN: S24-1080-Rev. L, 28-Oct-2024		
DWG: 5843		

**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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