Automotive N-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.006
I_D (A)	120
Configuration	Single
Package	TO-263

FEATURES

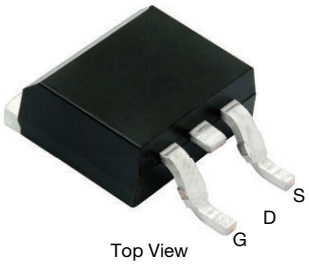
- TrenchFET® power MOSFET
- Package with low thermal resistance
- AEC-Q101 qualified [d]
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

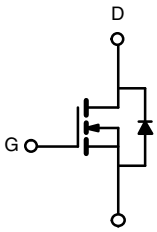
RoHS COMPLIANT

HALOGEN FREE

TO-263



Top View



N-Channel MOSFET

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}	± 20	
Continuous Drain Current	T_C = 25 °C [a]	I_D	120	A
	T_C = 125 °C		80	
Continuous Source Current (Diode Conduction) [a]		I_S	120	
Pulsed Drain Current [b]		I_{DM}	480	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	65	
Single Pulse Avalanche Energy		E_{AS}	211	mJ
Maximum Power Dissipation [b]	T_C = 25 °C	P_D	230	W
	T_C = 125 °C		76	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Junction-to-Ambient	PCB Mount [c]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)		R_{thJC}	0.65	

Notes

a. Package limited.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
c. When mounted on 1" square PCB (FR4 material).
d. Parametric verification ongoing.

For technical questions, contact: automostechsupport@vishay.com

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SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.5	3.0	3.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 60 V	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 175 °C	-	-	250	
On-State Drain Current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	120	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A	-	0.0045	0.0060	Ω
		V_{GS} = 10 V	I_D = 30 A, T_J = 125 °C	-	-	0.0104	
		V_{GS} = 10 V	I_D = 30 A, T_J = 175 °C	-	-	0.0129	
Forward Transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 30 A		-	94	-	S
Dynamic [b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	5196	6495	pF
Output Capacitance	C_{oss}			-	708	885	
Reverse Transfer Capacitance	C_{rss}			-	336	420	
Total Gate Charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 30 V, I_D = 75 A	-	96.5	145	nC
Gate-Source Charge	Q_{gs}			-	24.6	-	
Gate-Drain Charge [c]	Q_{gd}			-	27.2	-	
Gate Resistance	R_g	f = 1 MHz		0.3	1	1.7	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 0.4 Ω I_D ≅ 75 A, V_{GEN} = 10 V, R_g = 1 Ω		-	16	24	ns
Rise Time [c]	t_r			-	14	21	
Turn-Off Delay Time [c]	$t_{d(off)}$			-	34	51	
Fall Time [c]	t_f			-	9	14	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed Current [a]	I_{SM}			-	-	480	A
Forward Voltage	V_{SD}	I_F = 75 A, V_{GS} = 0		-	0.9	1.5	V

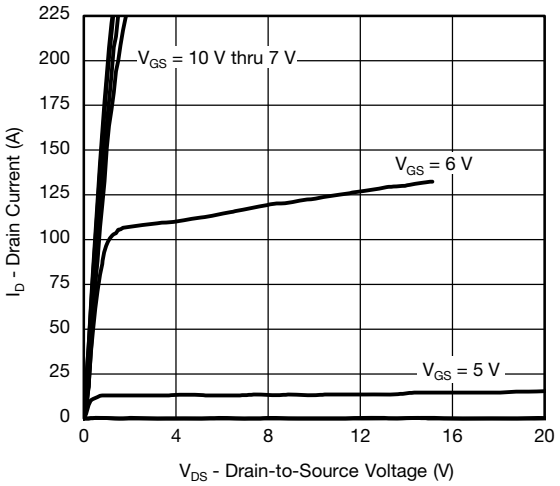
Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

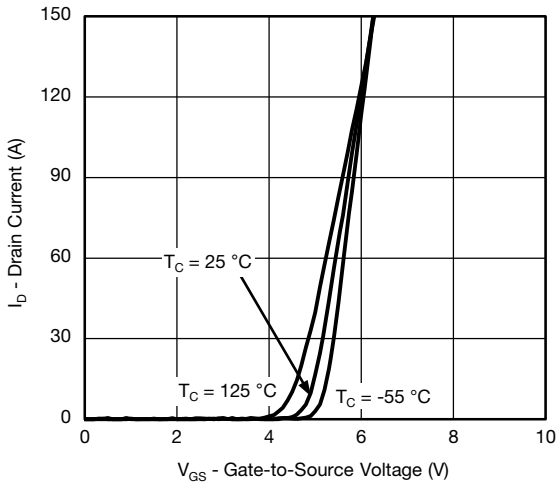
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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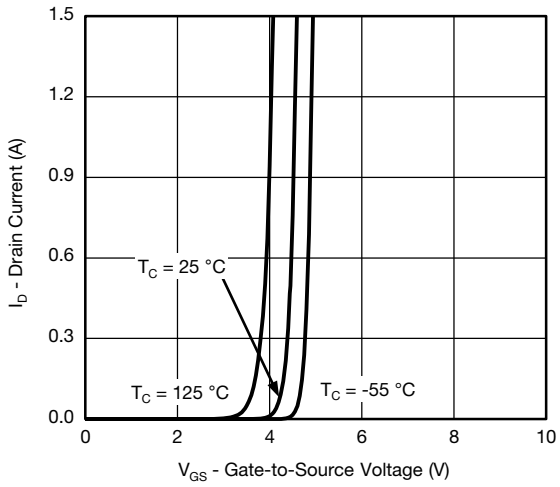
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



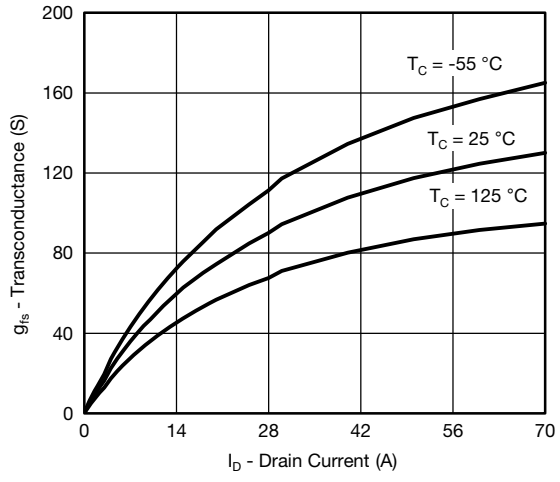
Output Characteristics



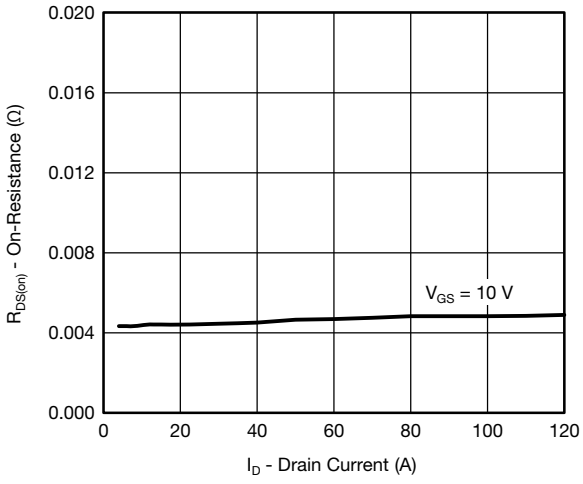
Transfer Characteristics



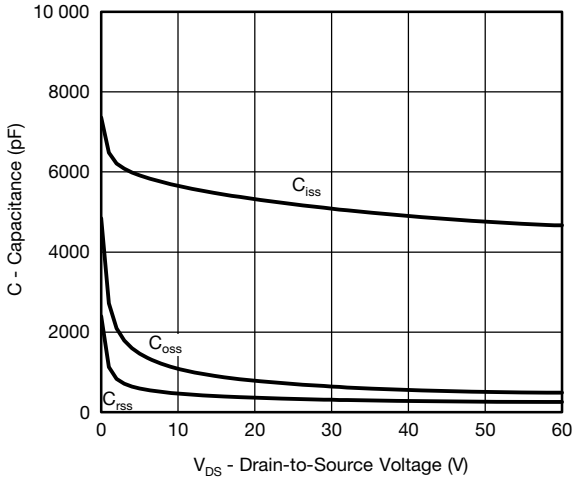
Transfer Characteristics



Transconductance



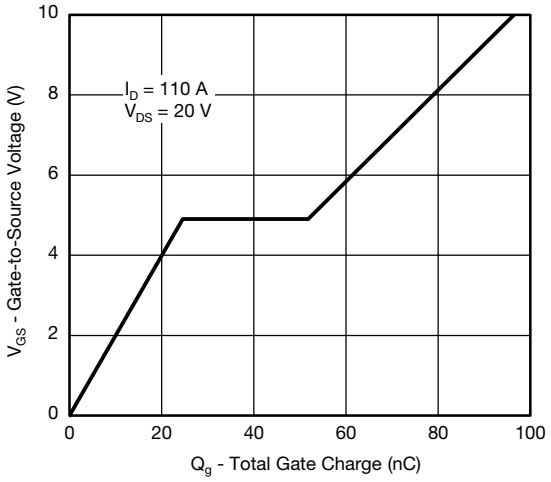
On-Resistance vs. Drain Current



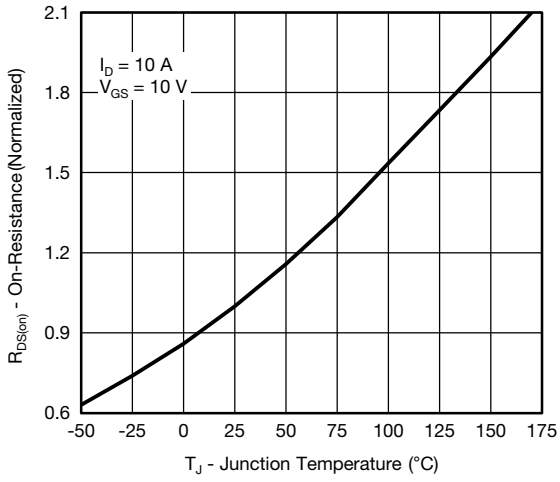
Capacitance

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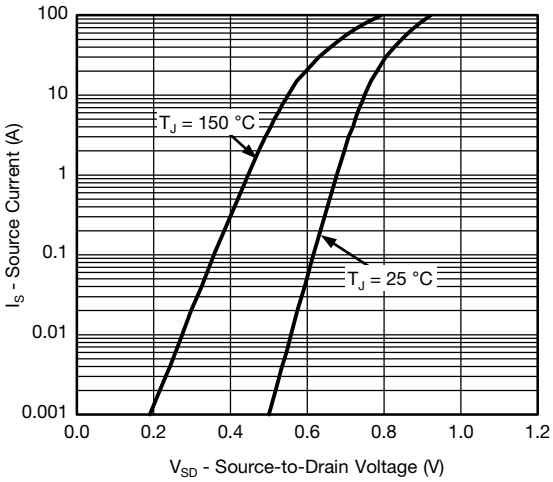
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



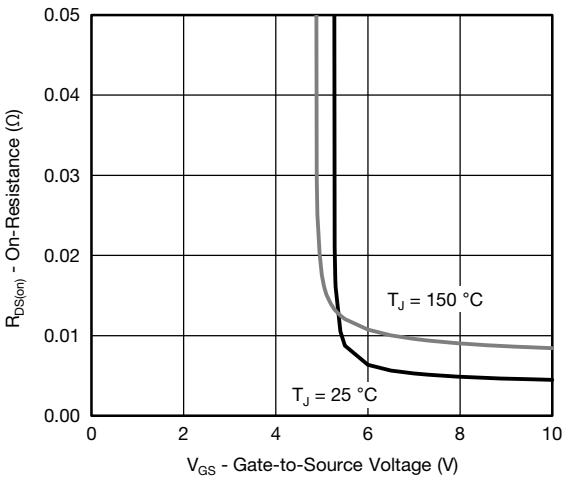
Gate Charge



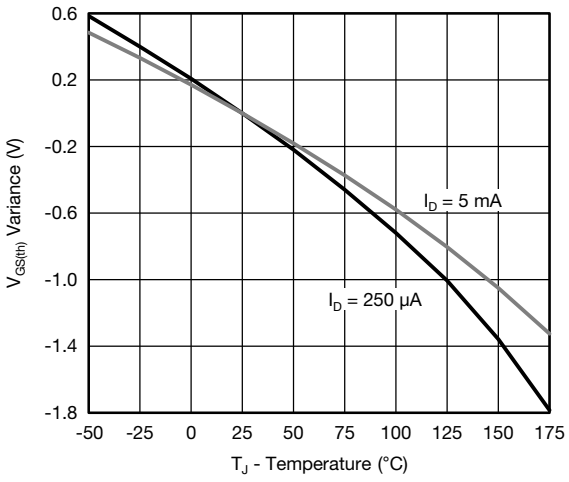
On-Resistance vs. Junction Temperature



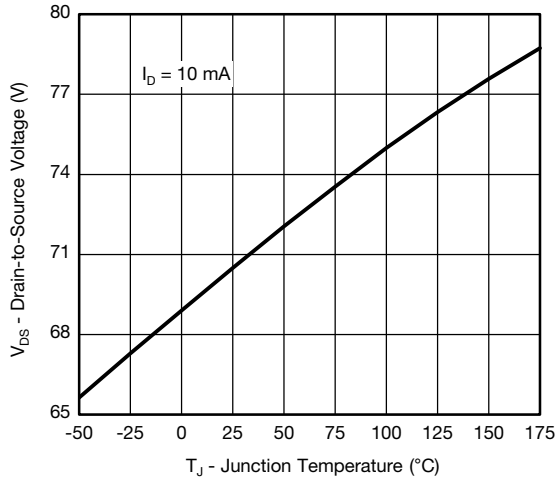
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

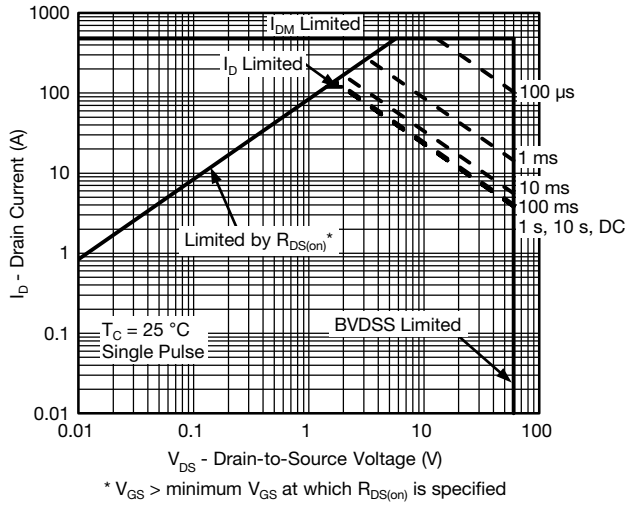


Drain Source Breakdown vs. Junction Temperature

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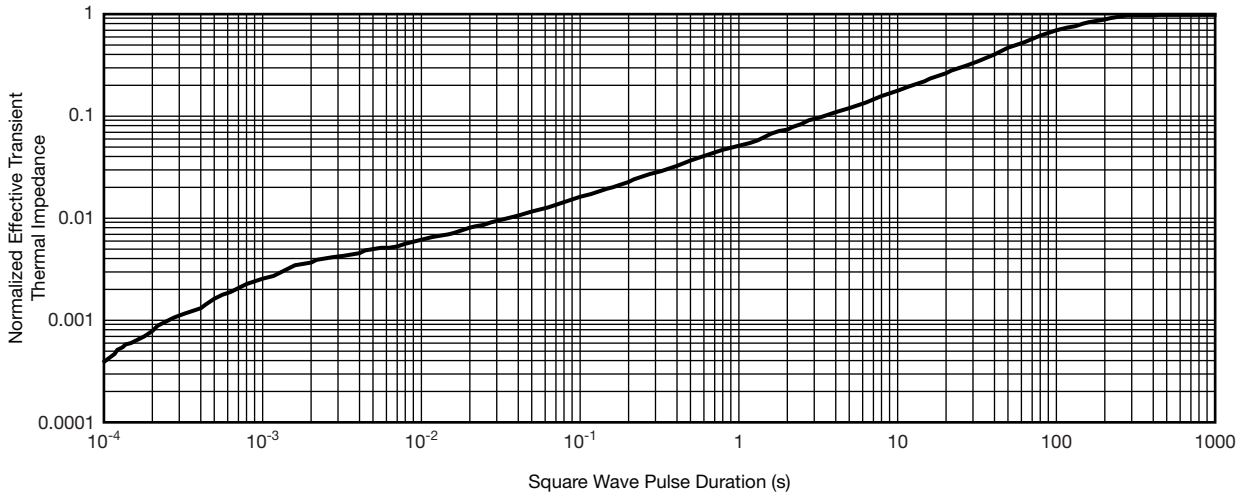
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THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

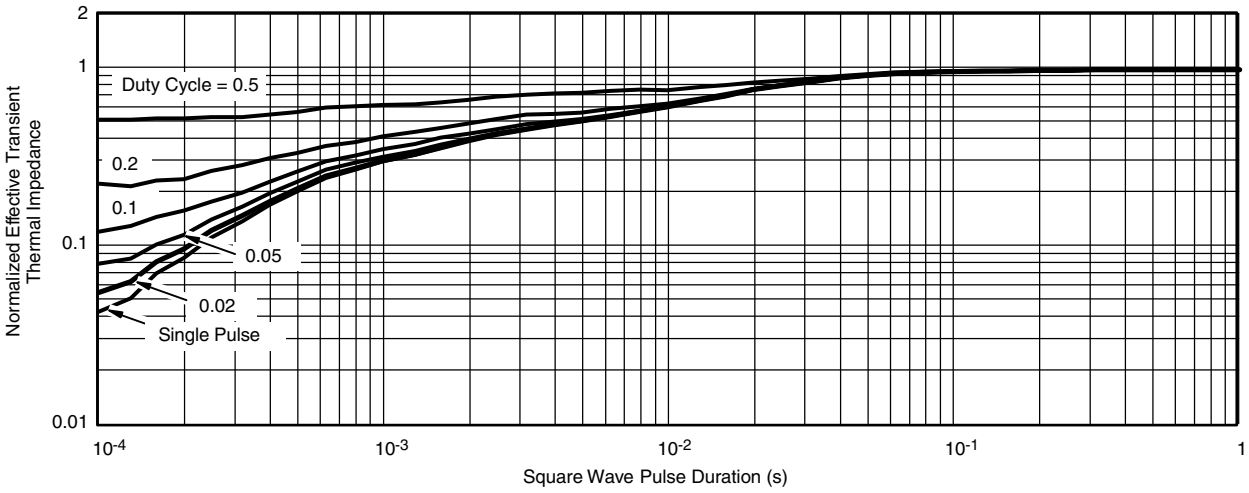
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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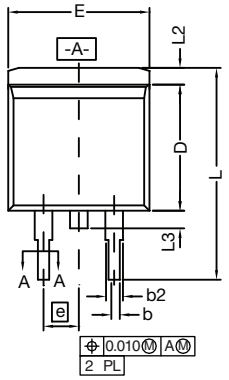
REVISION HISTORY [a]		
REVISION	DATE	DESCRIPTION OF CHANGE
C	04-Aug-15	• Revised R_g minimum limit

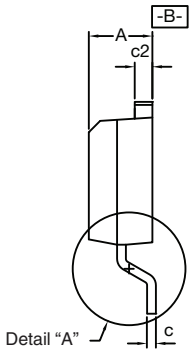
Note

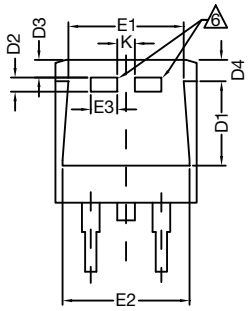
a. As of April 2014

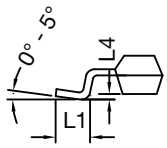
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TO-263 (D²PAK): 3-LEAD

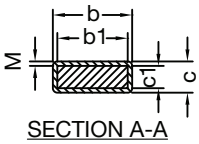








DETAIL A (ROTATED 90°)



SECTION A-A

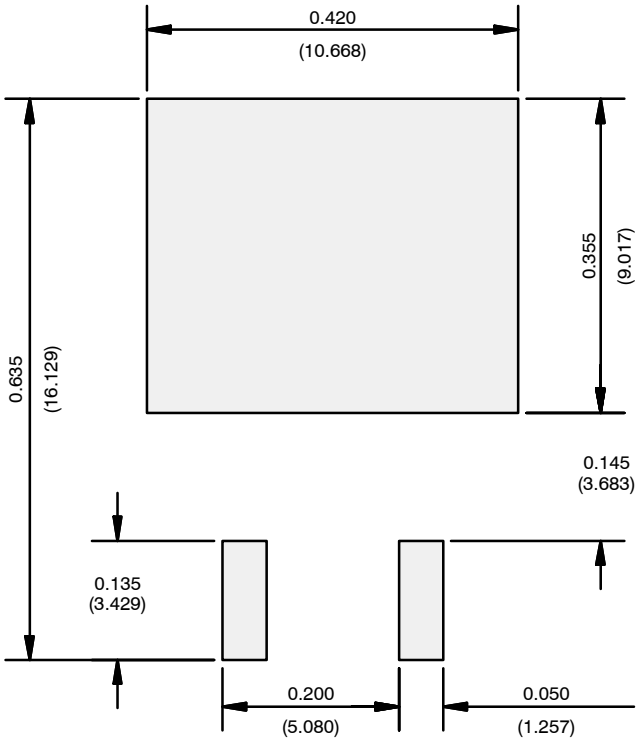
DIM.		INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
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
ECN: T13-0707-Rev. K, 30-Sep-13 DWG: 5843					

Notes

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

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RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

Return to Index

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