N-Channel 20-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]
20	0.0039 at V_{GS} = 10 V	60
	0.0052 at V_{GS} = 4.5 V	60

FEATURES

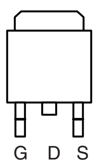
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- 100 % R_g Tested
- 100 % UIS Tested

RoHS COMPLIANT

APPLICATIONS

- OR-ing

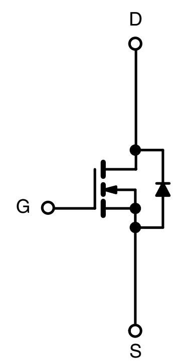
TO-263



DRAIN connected to TAB

Top View

Ordering Information: SUM60N02-3m9P-E3 (Lead (Pb)-free)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	60[a]	A
	T_C = 100 °C		60[a]	
Pulsed Drain Current		I_{DM}	120	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	50	
Single Pulse Avalanche Energy		E_{AS}	125	mJ
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	120[c]	W
	T_A = 25 °C[d]		3.75	
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)[d]	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.25	

Notes:
a. Package limited.
b. Duty cycle ≤ 1 %.
c. See SOA curve for voltage derating.
d. When mounted on 1" square PCB (FR-4 material).

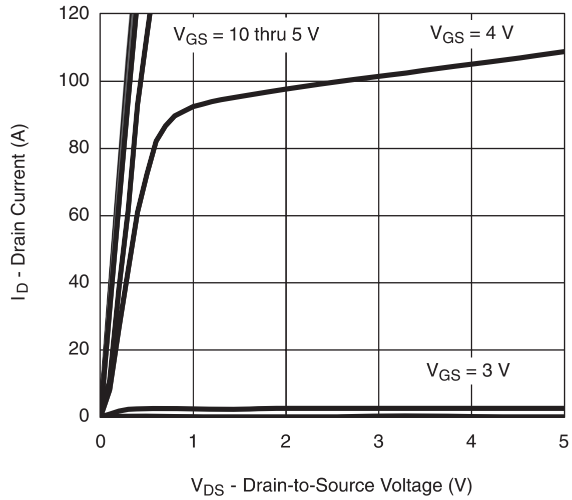
SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 µA	20			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	1.0		3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 175 °C			250	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	100			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0031	0.0039	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125 °C			0.0059	
		V_{GS} = 10 V, I_D = 20 A, T_J = 175 °C			0.007	
		V_{GS} = 4.5 V, I_D = 20 A		0.0042	0.0052	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 20 A		95		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz		5950		pF
Output Capacitance	C_{oss}			985		
Reverse Transfer Capacitance	C_{rss}			365		
Total Gate Charge[b]	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 50 A		33	50	nC
Gate-Source Charge[b]	Q_{gs}			18		
Gate-Drain Charge[b]	Q_{gd}			7		
Gate Resistance	R_g		0.75	1.5	2.3	Ω
Turn-On Delay Time[b]	$t_{d(on)}$	V_{DD} = 10 V, R_L = 0.2 Ω $I_D \cong$ 50 A, V_{GEN} = 10 V, R_g = 1.0 Ω		15	25	ns
Rise Time[b]	t_r			7	11	
Turn-Off Delay Time[b]	$t_{d(off)}$			35	55	
Fall Time[b]	t_f			8	12	
Source-Drain Diode Ratings and Characteristics T_C = 25 °C[c]						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				100	
Forward Voltage[a]	V_{SD}	I_F = 20 A, V_{GS} = 0 V		0.85	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 20 A, di/dt = 100 A/µs		45	90	ns
Peak Reverse Recovery Current	I_{RM}			1.7	3.4	A
Reverse Recovery Charge	Q_{rr}			0.039	0.155	µC

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

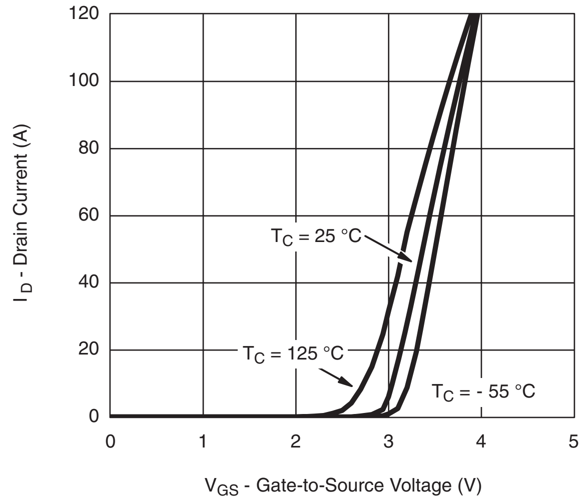
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

Document Number: 69820
S-80183-Rev. A, 04-Feb-08

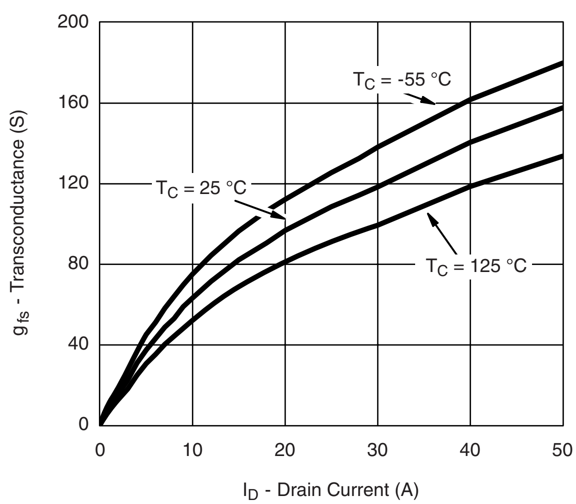
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



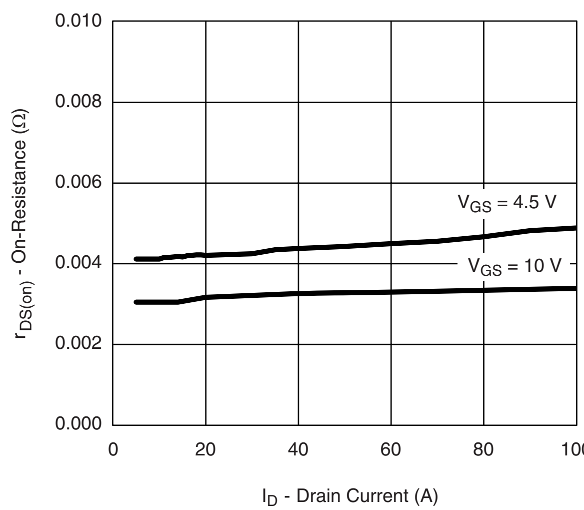
Output Characteristics



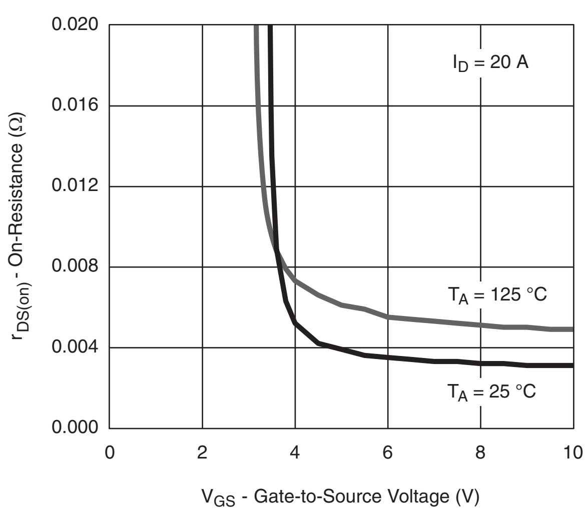
Transfer Characteristics



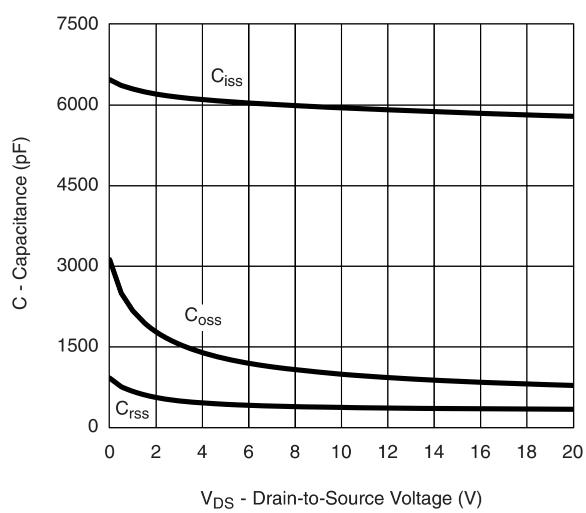
Transconductance



On-Resistance vs. Drain Current

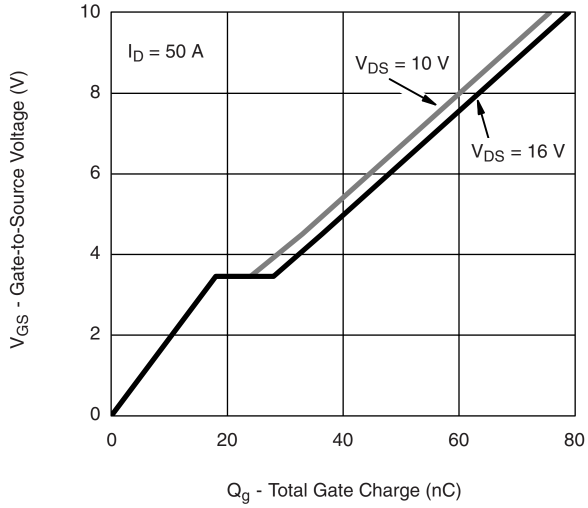


On-Resistance vs. Gate-to-Source Voltage

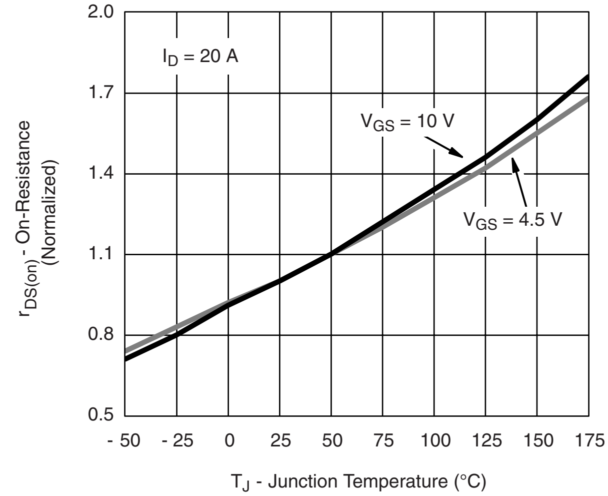


Capacitance

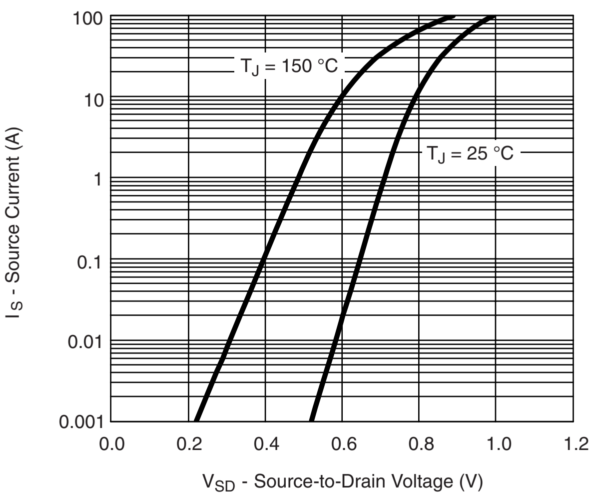
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



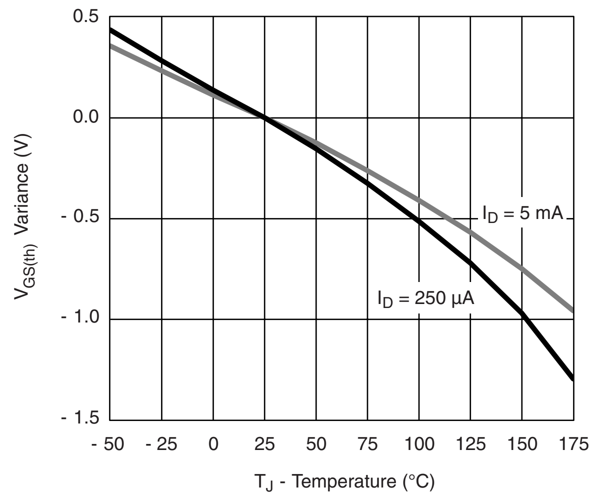
Gate Charge



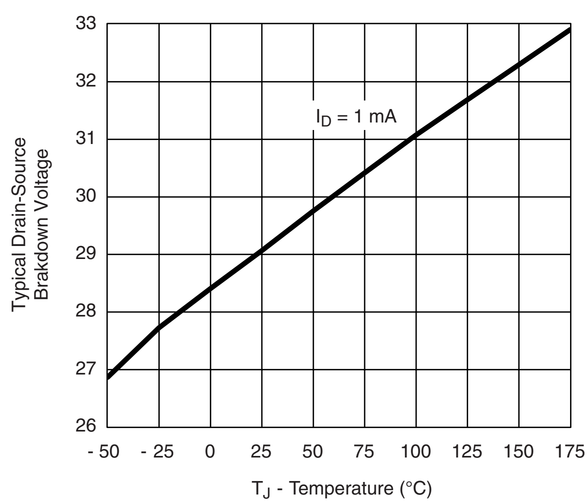
On-Resistance vs. Junction Temperature



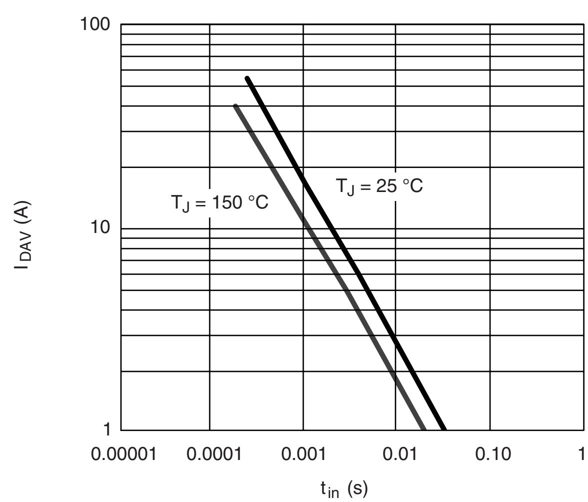
Source-Drain Diode Forward Voltage



Threshold Voltage

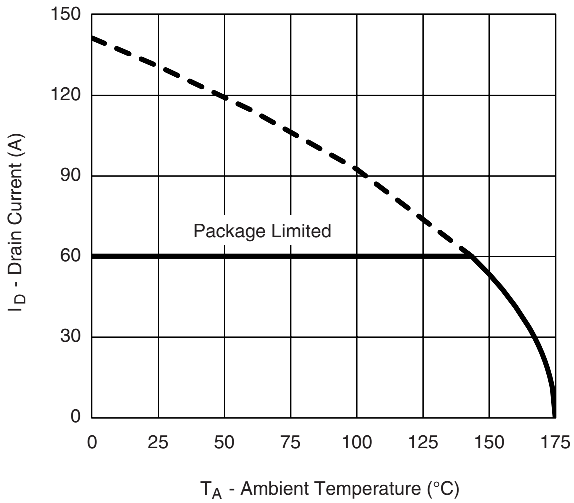


Typical Drain-Source Brakdown Voltage vs. Junction Temperature

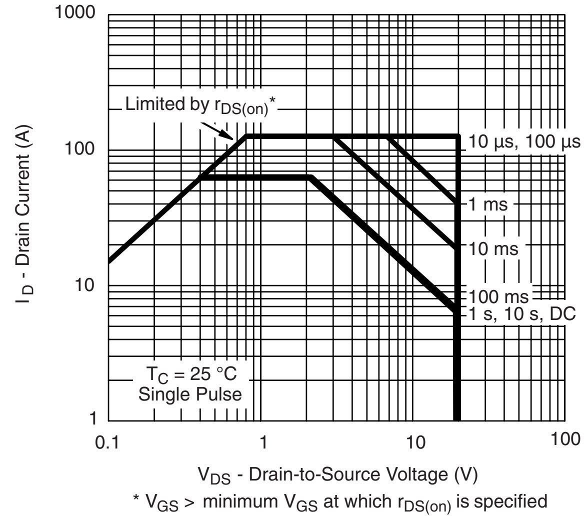


Single Pulse Avalanche Current vs. Time

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

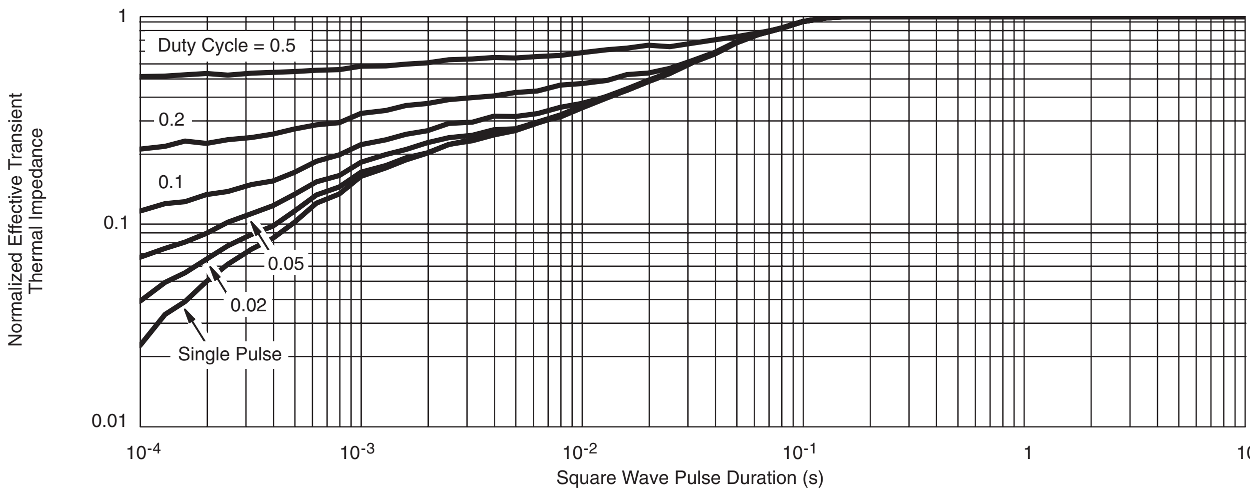


Drain Current vs. Ambient Temperature



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

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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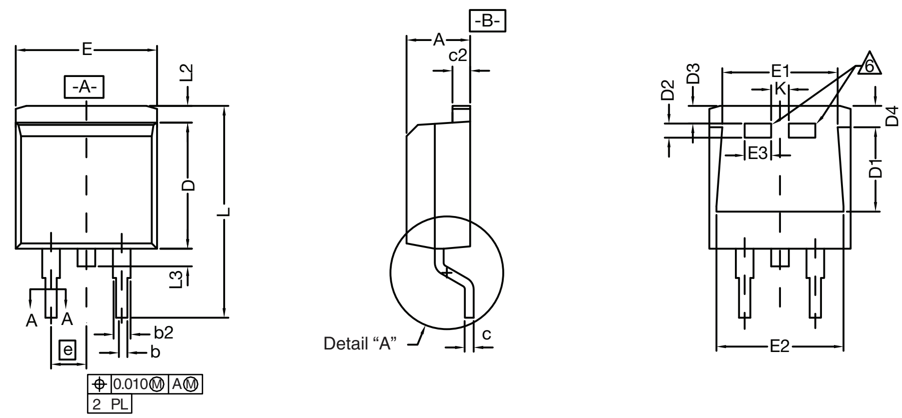
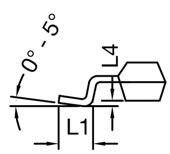
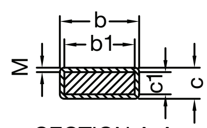
TO-263 (D2PAK): 3-LEAD





DETAIL A (ROTATED 90°)



SECTION A-A

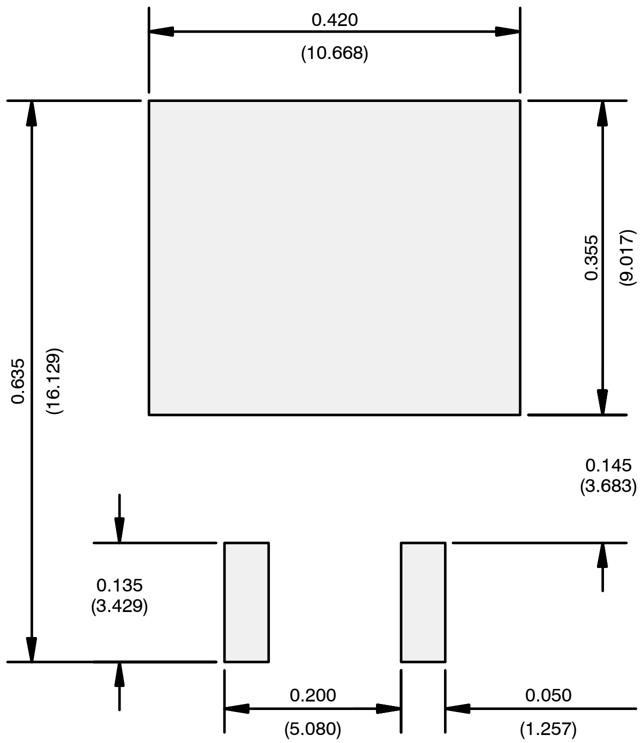
DIM.		INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	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.

RECOMMENDED MINIMUM PADS FOR D^2PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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