

N-Channel 40-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.0074 at $V_{GS} = 10$ V	70 ^a
	0.011 at $V_{GS} = 4.5$ V	67

FEATURES

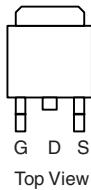
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- Low Threshold


RoHS*
COMPLIANT

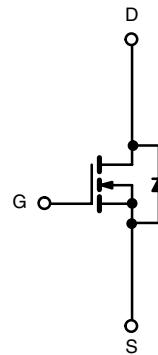
APPLICATIONS

- Motor Control

TO-263



Top View



Ordering Information: SUM70N04-07L-E3 (Lead (Pb)-free)

N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175$ °C)	I_D	70 ^a	A
		47	
Pulsed Drain Current	I_{DM}	120	
Avalanche Current	I_{AR}	40	
Repetitive Avalanche Energy ^b	E_{AR}	80	mJ
Maximum Power Dissipation ^b	P_D	100 ^c	W
		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	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.4	

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).

* Pb containing terminations are not RoHS compliant, exemptions may apply.

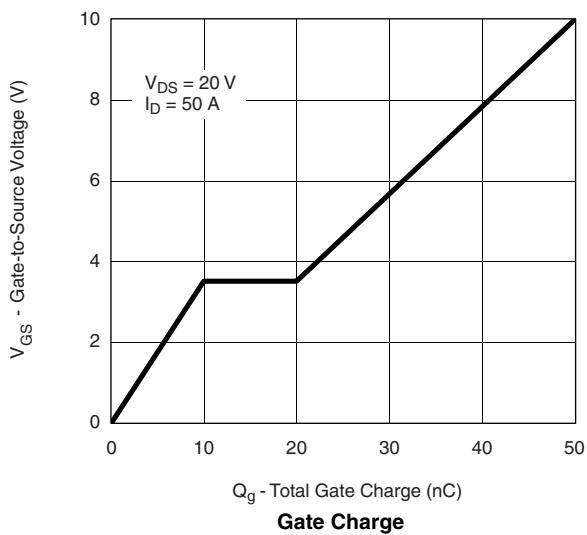
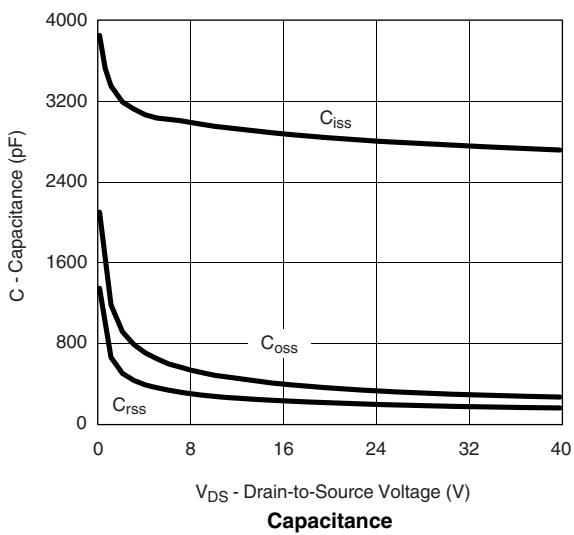
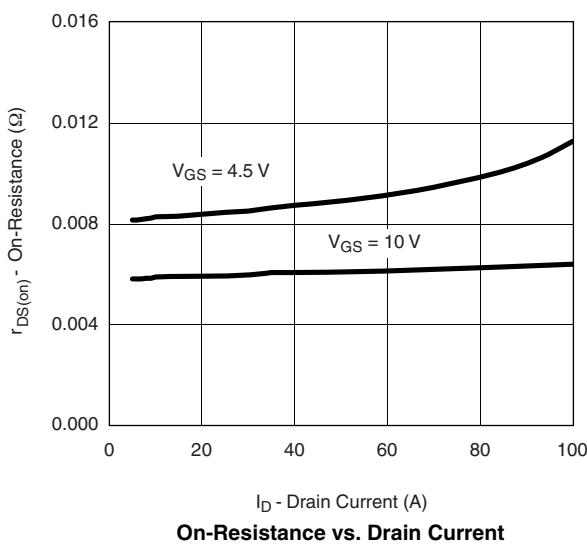
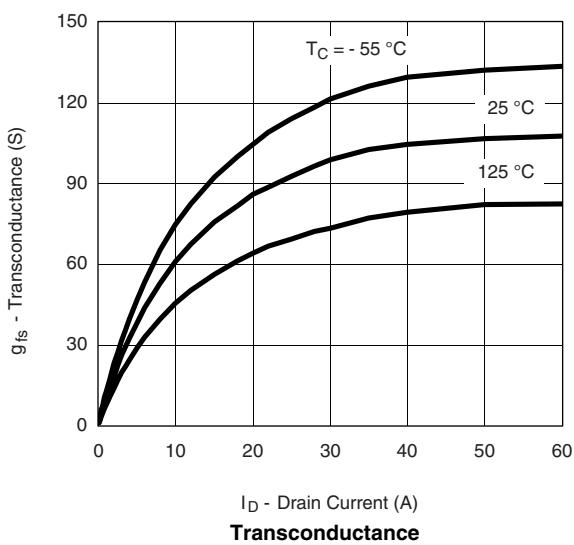
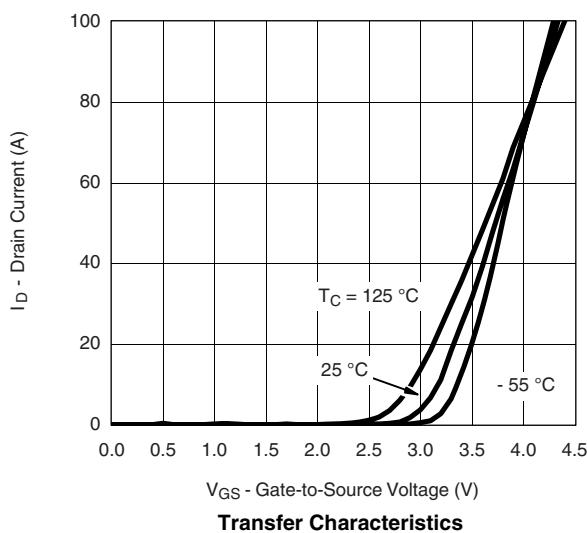
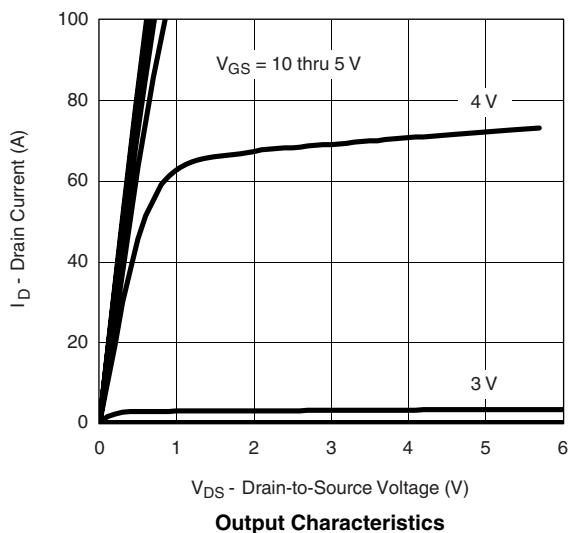
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

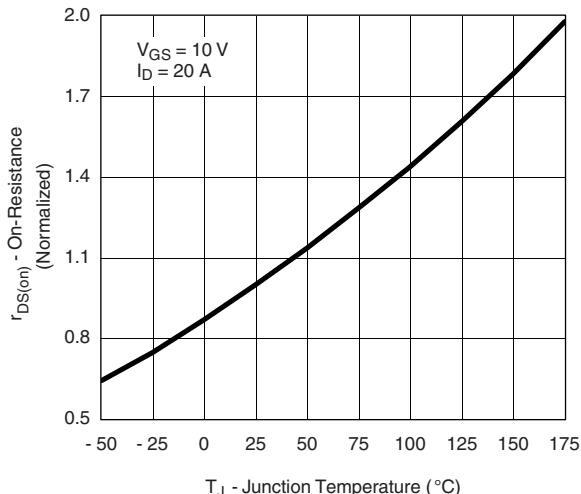
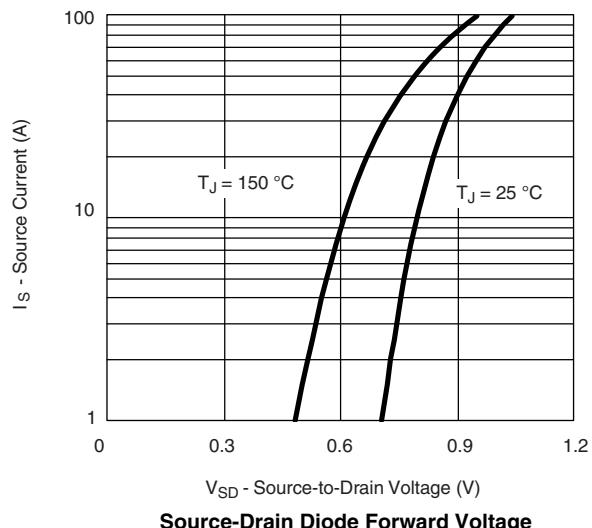
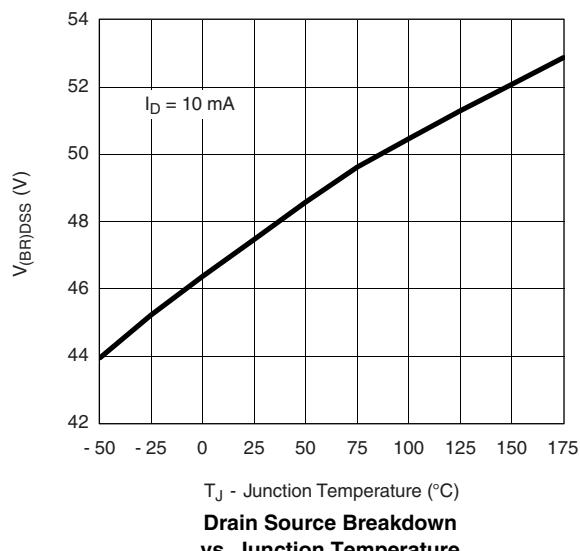
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{DS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	40			V
Gate-Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{DS}} = V_{\text{GS}}, I_D = 250 \mu\text{A}$	1		3	
Gate-Body Leakage	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{DS}} = 32 \text{ V}, V_{\text{GS}} = 0 \text{ V}$			1	μA
		$V_{\text{DS}} = 32 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 125^\circ\text{C}$			50	
		$V_{\text{DS}} = 32 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 175^\circ\text{C}$			250	
On-State Drain Current ^a	$I_{\text{D}(\text{on})}$	$V_{\text{DS}} \geq 5 \text{ V}, V_{\text{GS}} = 10 \text{ V}$	100			A
Drain-Source On-State Resistance ^a	$r_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 30 \text{ A}$		0.006	0.0074	Ω
		$V_{\text{GS}} = 4.5 \text{ V}, I_D = 10 \text{ A}$		0.0085	0.011	
		$V_{\text{GS}} = 10 \text{ V}, I_D = 30 \text{ A}, T_J = 125^\circ\text{C}$			0.012	
		$V_{\text{GS}} = 10 \text{ V}, I_D = 30 \text{ A}, T_J = 175^\circ\text{C}$			0.015	
Forward Transconductance ^a	g_{fs}	$V_{\text{DS}} = 15 \text{ V}, I_D = 30 \text{ A}$	20			S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 25 \text{ V}, f = 1 \text{ MHz}$		2800		pF
Output Capacitance	C_{oss}			320		
Reverse Transfer Capacitance	C_{rss}			190		
Total Gate Charge ^c	Q_g	$V_{\text{DS}} = 20 \text{ V}, V_{\text{GS}} = 10 \text{ V}, I_D = 50 \text{ A}$		50	75	nC
Gate-Source Charge ^c	Q_{gs}			10		
Gate-Drain Charge ^c	Q_{gd}			10		
Gate Resistance	R_g			2.0		Ω
Turn-On Delay Time ^c	$t_{\text{d}(\text{on})}$	$V_{\text{DD}} = 20 \text{ V}, R_L = 0.4 \Omega$ $I_D \geq 50 \text{ A}, V_{\text{GEN}} = 10 \text{ V}, R_g = 2.5 \Omega$		11	20	ns
Rise Time ^c	t_r			20	30	
Turn-Off Delay Time ^c	$t_{\text{d}(\text{off})}$			40	60	
Fall Time ^c	t_f			15	25	
Source-Drain Diode Ratings and Characteristics $T_C = 25^\circ\text{C}^b$						
Continuous Current	I_S				66	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	V_{SD}	$I_F = 50 \text{ A}, V_{\text{GS}} = 0 \text{ V}$		1.0	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50 \text{ A}, \text{di/dt} = 100 \text{ A}/\mu\text{s}$		30	50	ns
Peak Reverse Recovery Current	$I_{\text{RM}(\text{REC})}$			1.6	2.4	A
Reverse Recovery Charge	Q_{rr}			0.024	0.06	μC

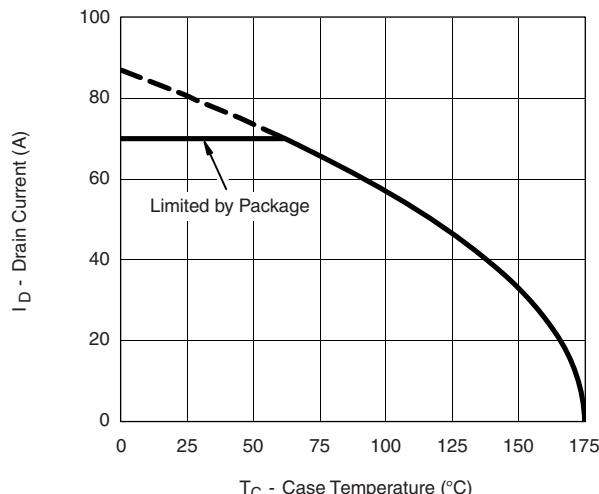
Notes:

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

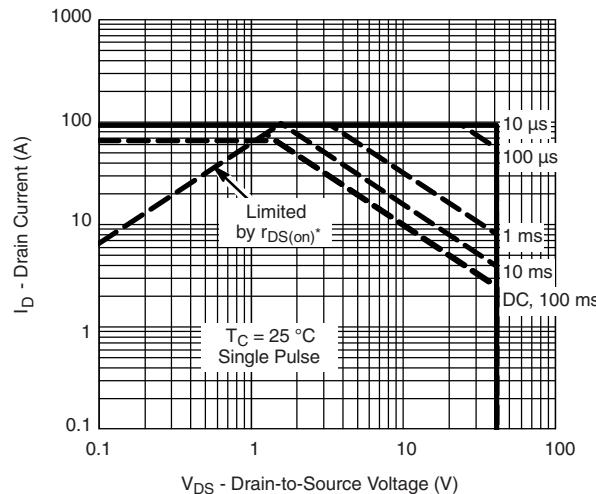
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage****Drain Source Breakdown
vs. Junction Temperature**

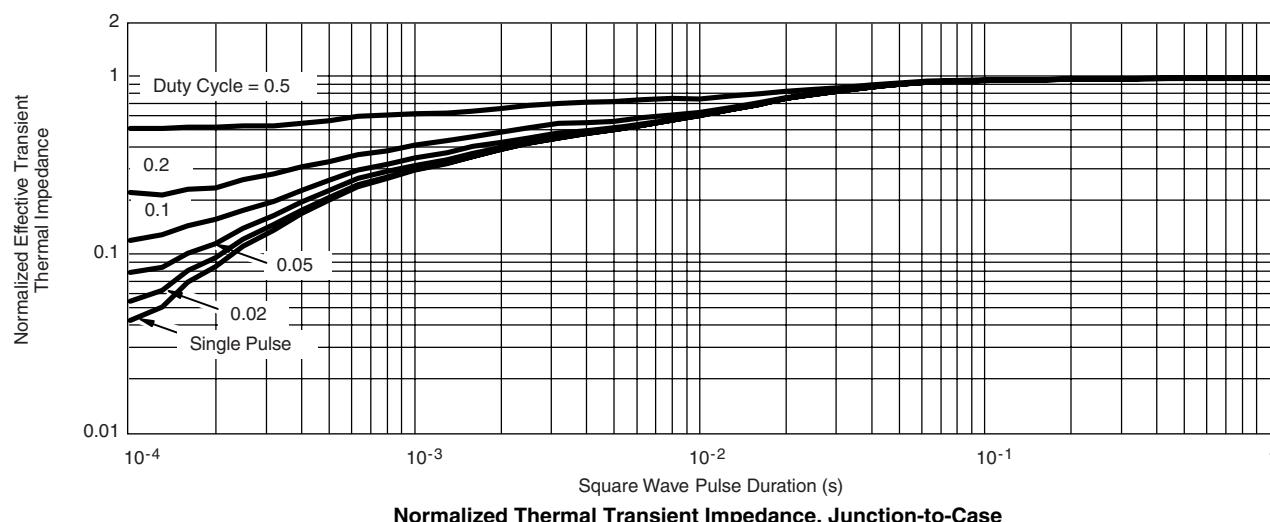
THERMAL RATINGS


Maximum Avalanche and Drain Current vs. Case Temperature



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

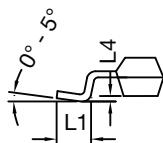
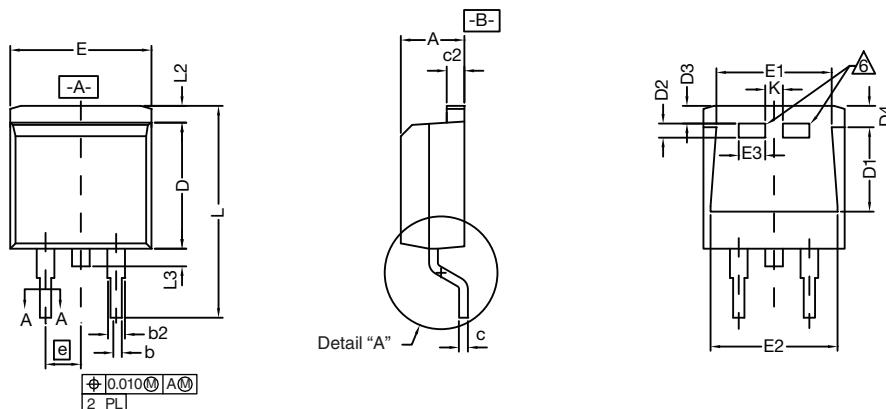
Safe Operating Area, Junction-to-Case



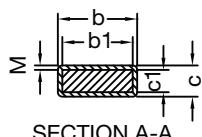
Normalized Thermal Transient Impedance, Junction-to-Case

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TO-263 (D²PAK): 3-LEAD



DETAIL A (ROTATED 90°)



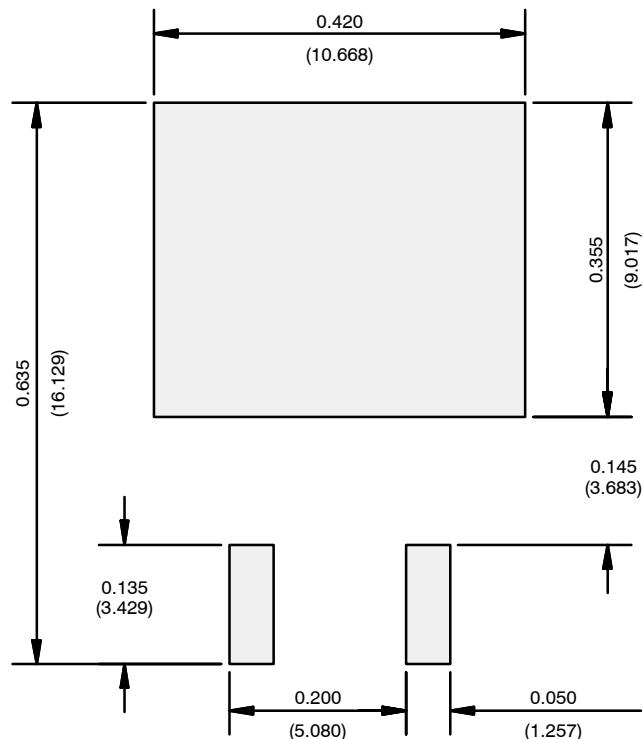
SECTION A-A

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.

 This feature is for thick lead.

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					

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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