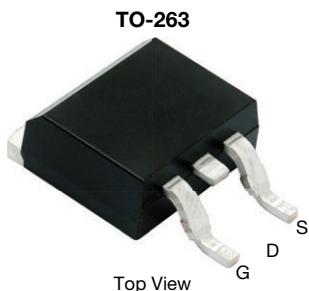


## N-Channel 40 V (D-S) MOSFET

<b>PRODUCT SUMMARY</b>			
<b><math>V_{DS}</math> (V)</b>	<b><math>R_{DS(on)}</math> (<math>\Omega</math>) MAX.</b>	<b><math>I_D</math> (A) <sup>d</sup></b>	<b><math>Q_g</math> (TYP.)</b>
40	0.0017 at $V_{GS} = 10$ V	120	190
	0.0020 at $V_{GS} = 4.5$ V	120	



### FEATURES

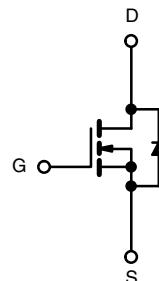
- TrenchFET® power MOSFET
- 100 %  $R_g$  and UIS tested
- Material categorization:  
For definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**

### APPLICATIONS

- Power supply
  - Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch



N-Channel MOSFET

### Ordering Information:

SUM120N04-1m7L-GE3 (Lead (Pb)-free and Halogen-free)

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{GS}$	$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_C = 25$ °C	$I_D$	120 <sup>d</sup>	A
	$T_C = 70$ °C		120 <sup>d</sup>	
Pulsed Drain Current ( $t = 100$ $\mu$ s)		$I_{DM}$	480	A
Avalanche Current		$I_{AS}$	92	
Single Avalanche Energy <sup>a</sup>	$L = 0.1$ mH	$E_{AS}$	423	mJ
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	375 <sup>b</sup>	W
	$T_C = 25$ °C <sup>c</sup>		125 <sup>b</sup>	
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) <sup>c</sup>		$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)		$R_{thJC}$	0.4	

### Notes

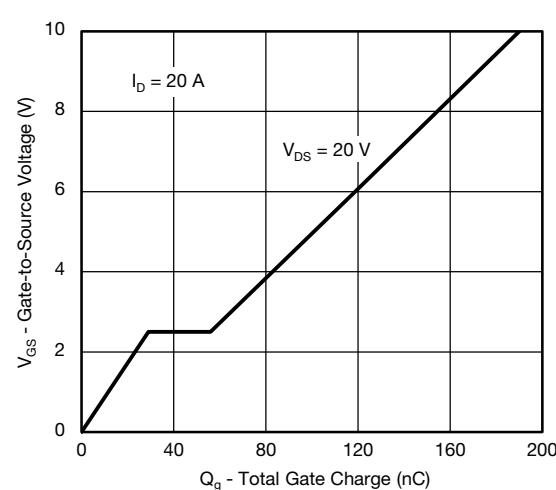
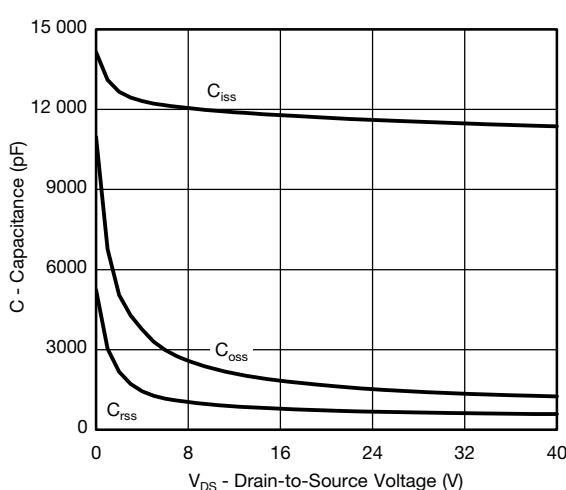
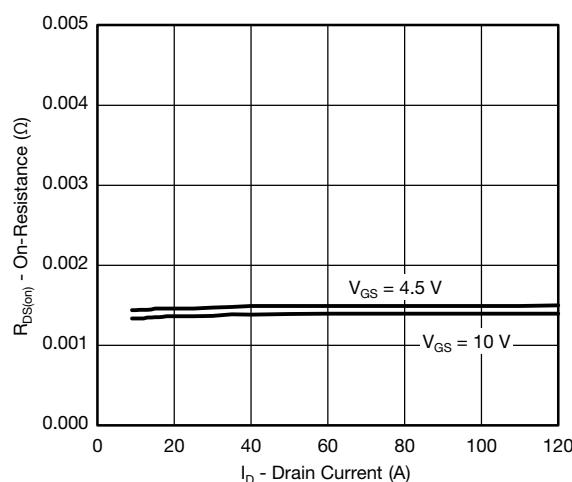
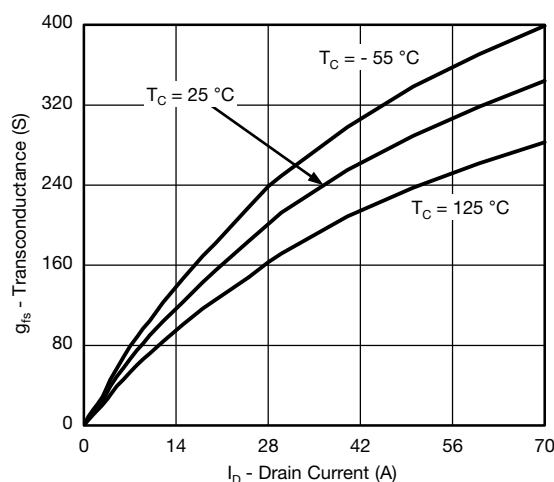
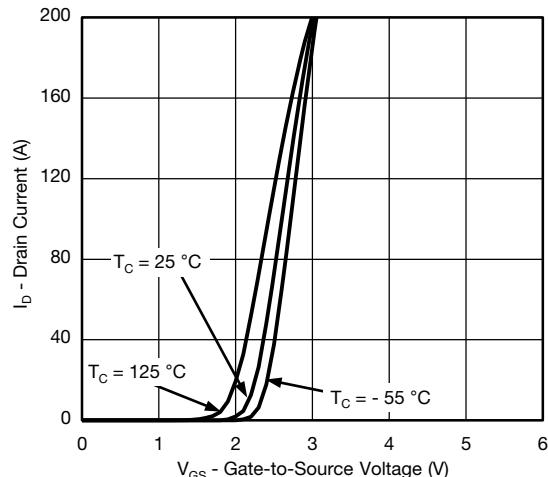
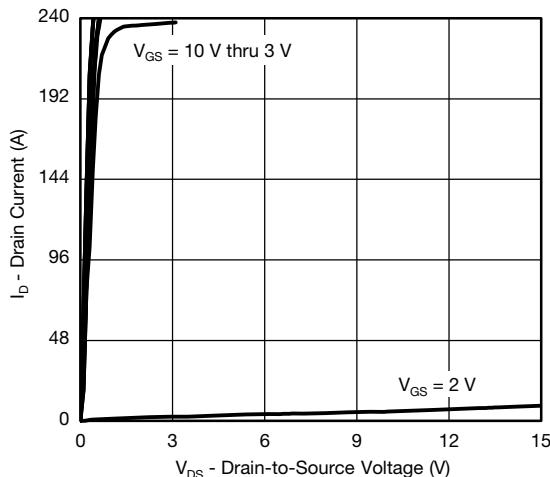
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).
- Package limited.

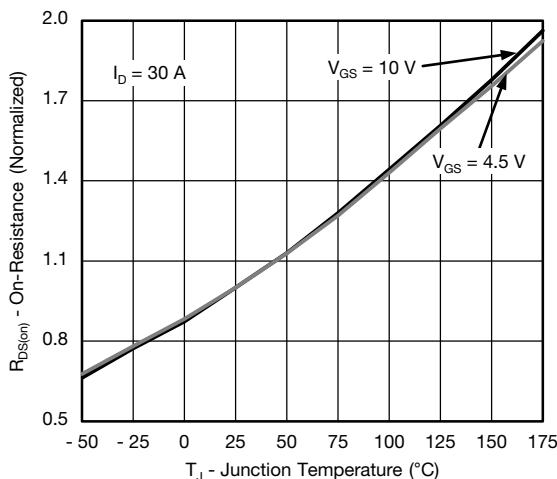
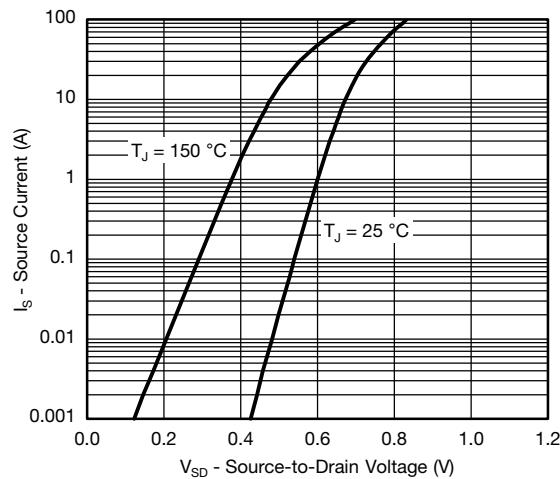
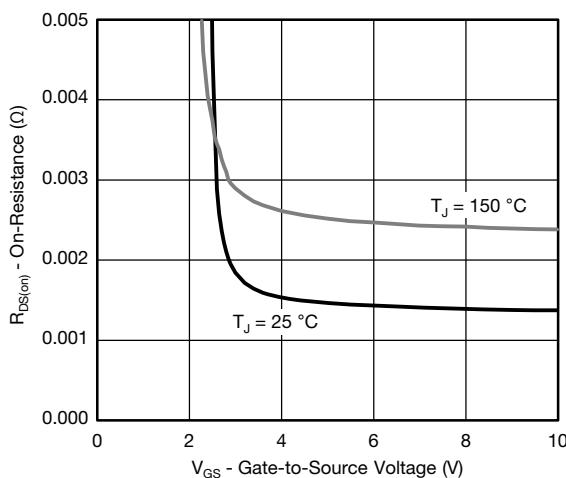
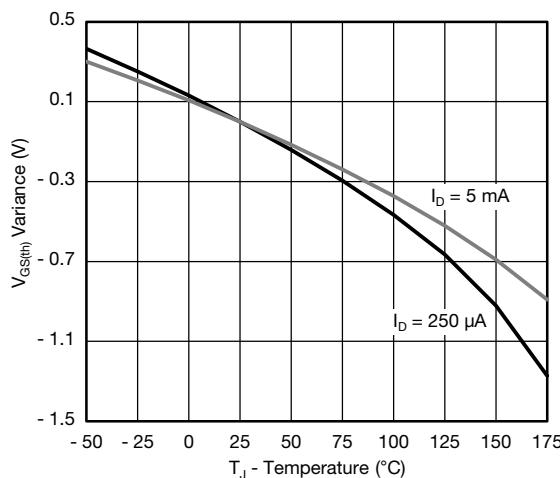
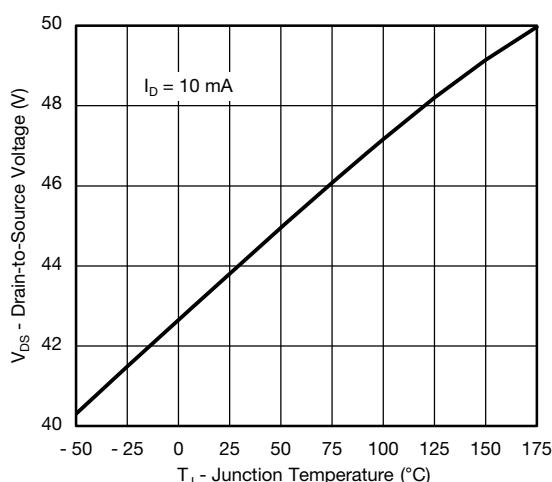
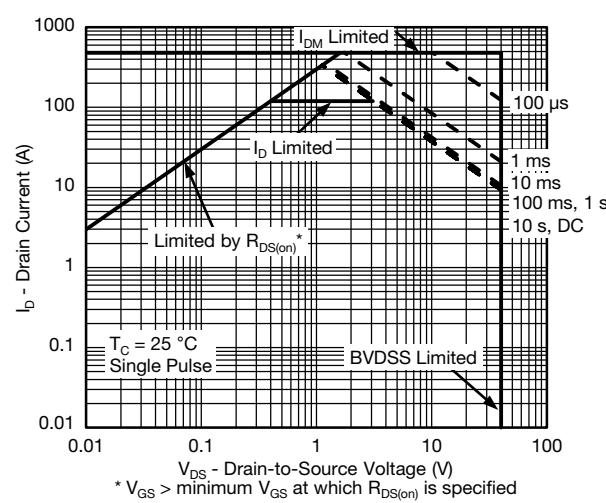
<b>SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	40	-	-	V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	1.5	-	2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$	-	-	$\pm 250$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	150	
		$V_{DS} = 40 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ\text{C}$	-	-	5	
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$ , $V_{GS} = 10 \text{ V}$	120	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 30 \text{ A}$	-	0.0014	0.0017	$\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.0015	0.0020	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$	-	212	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 20 \text{ V}$ , $f = 1 \text{ MHz}$	-	11 685	-	pF
Output Capacitance	$C_{oss}$		-	1652	-	
Reverse Transfer Capacitance	$C_{rss}$		-	733	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	190	285	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$		-	29	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		-	27	-	
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	0.2	1.07	2.14	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = 20 \text{ V}$ , $R_L = 2 \Omega$ $I_D \geq 10 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	-	15	23	ns
Rise Time <sup>c</sup>	$t_r$		-	10	20	
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$		-	74	111	
Fall Time <sup>c</sup>	$t_f$		-	12	20	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (<math>T_C = 25^\circ\text{C}</math>)</b>						
Pulsed Current	$I_{SM}$		-	-	480	A
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 10 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-	0.8	1.5	V

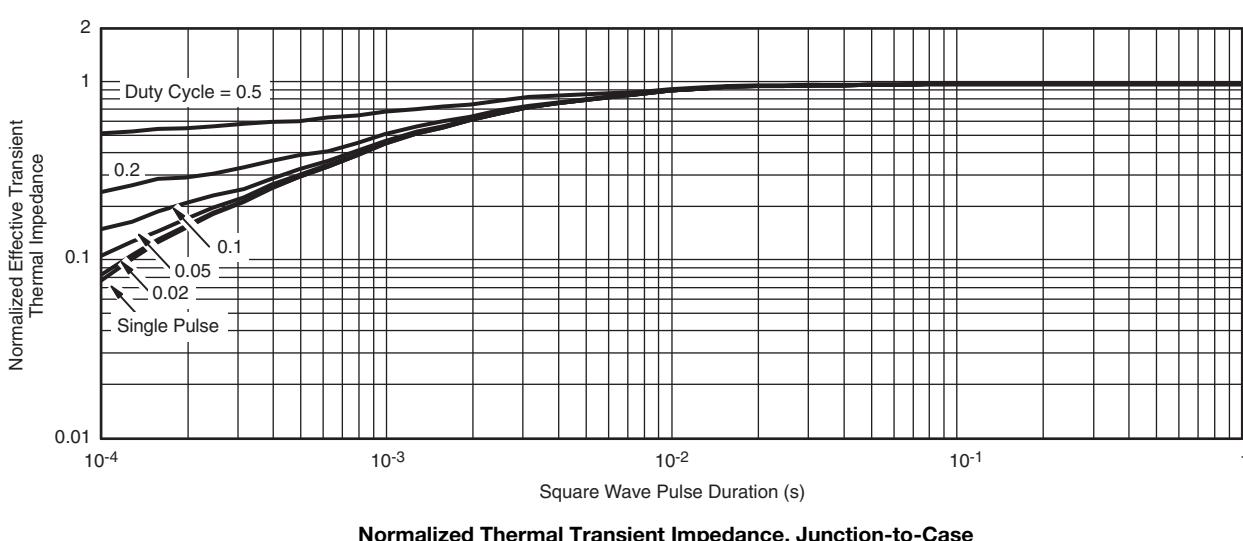
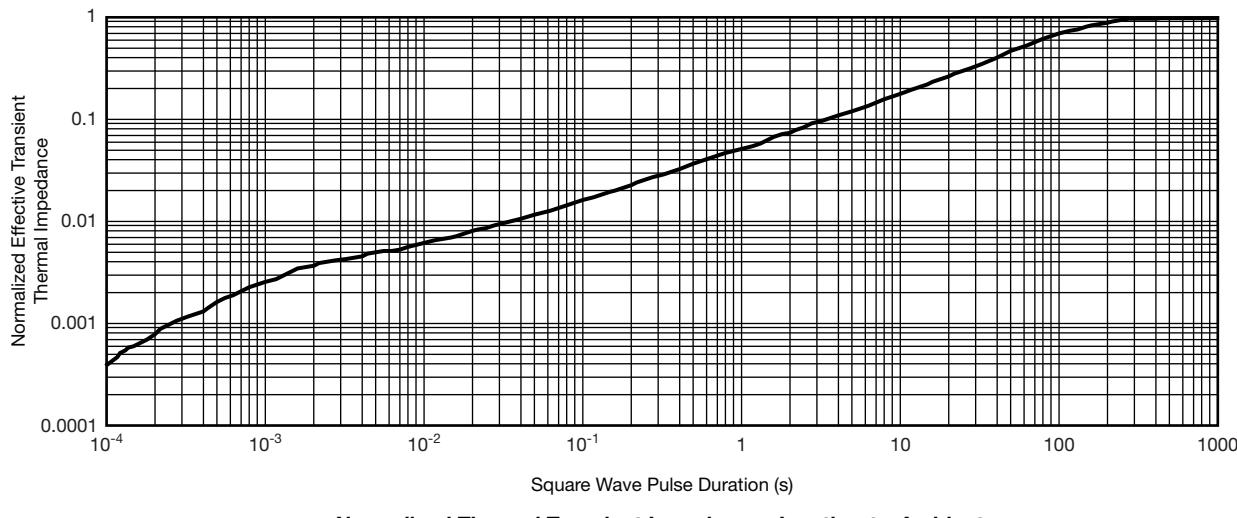
**Notes**

- 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**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Drain Source Breakdown vs. Junction Temperature**

**Safe Operating Area**

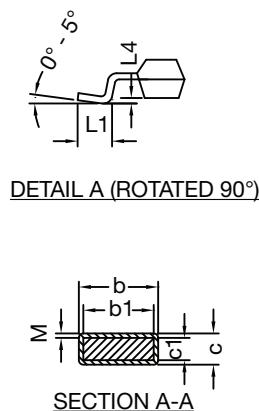
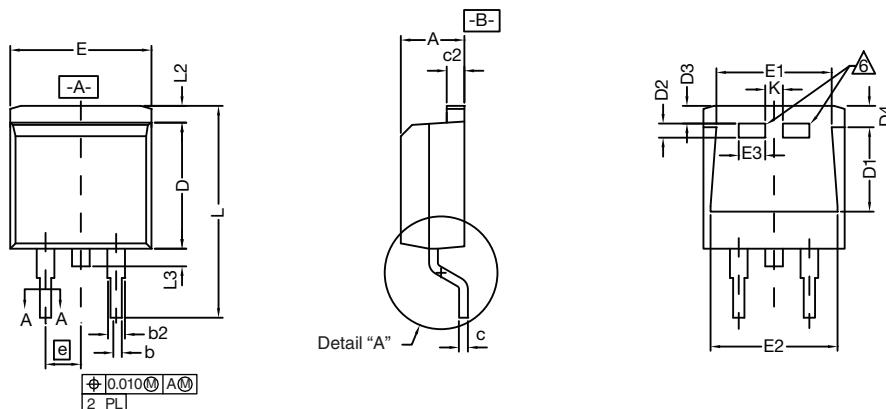
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

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

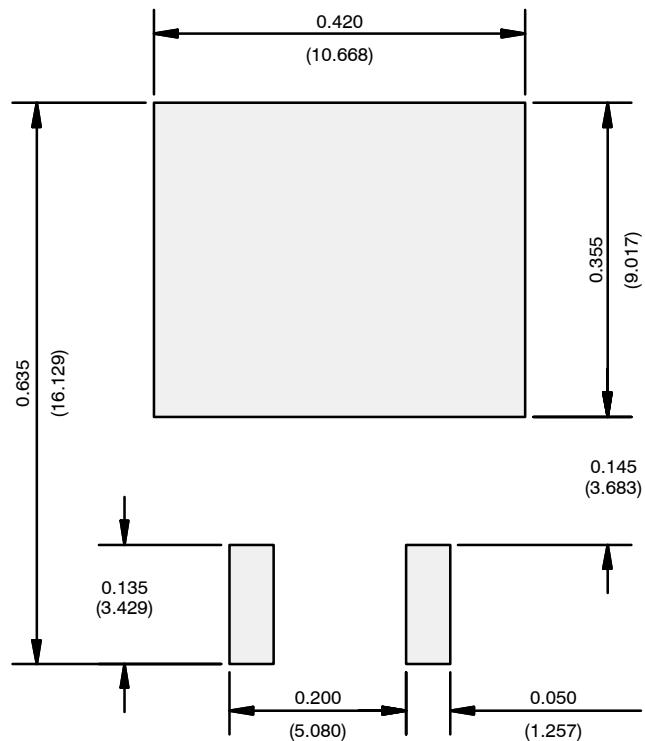


#### Notes

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 D<sup>2</sup>PAK: 3-Lead**

Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)

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