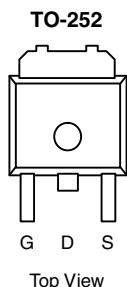


## P-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max.	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)
- 40	0.0162 at V <sub>GS</sub> = - 10 V	- 36	67
	0.0230 at V <sub>GS</sub> = - 4.5 V	- 24	



**Ordering Information:**  
SUD45P04-16P-GE3 (Lead (Pb)-free and Halogen-free)

### FEATURES

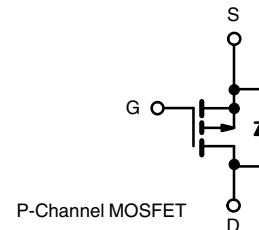
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

- Power Switch
- Load Switch in High Current Applications
- DC/DC Converters



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	- 40	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	A
	T <sub>C</sub> = 70 °C	- 36	
Pulsed Drain Current (t = 300 μs)	I <sub>DM</sub>	- 29	A
	I <sub>AS</sub>	- 100	
Single Avalanche Energy <sup>a</sup>	L = 0.1 mH	51	mJ
	T <sub>C</sub> = 25 °C	P <sub>D</sub>	W
Maximum Power Dissipation <sup>a</sup>	T <sub>A</sub> = 25 °C <sup>c</sup>	41.7 <sup>b</sup>	W
	T <sub>A</sub> = 25 °C <sup>c</sup>	2.1	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) <sup>c</sup>	R <sub>thJA</sub>	60	°C/W
Junction-to-Case (Drain)	R <sub>thJC</sub>	3	

Notes:

a. Duty cycle ≤ 1 %.

b. See SOA curve for voltage derating.

c. When mounted on 1" square PCB (FR-4 material).

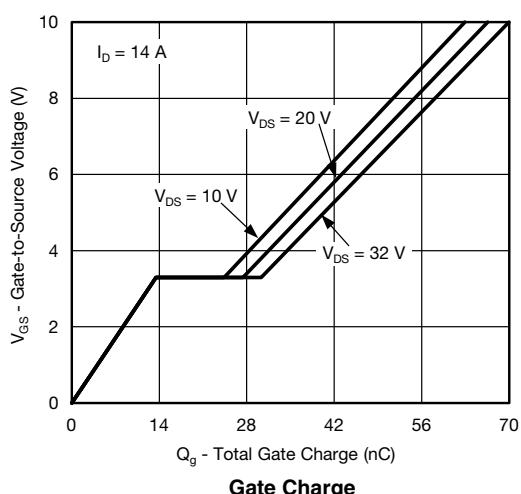
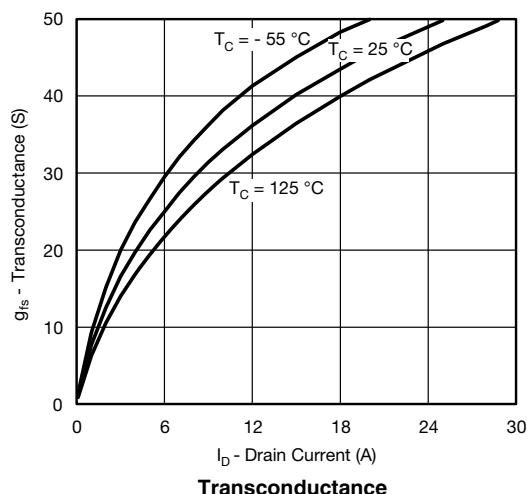
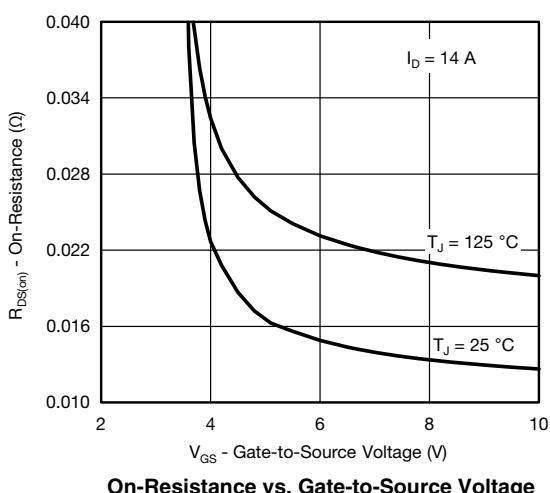
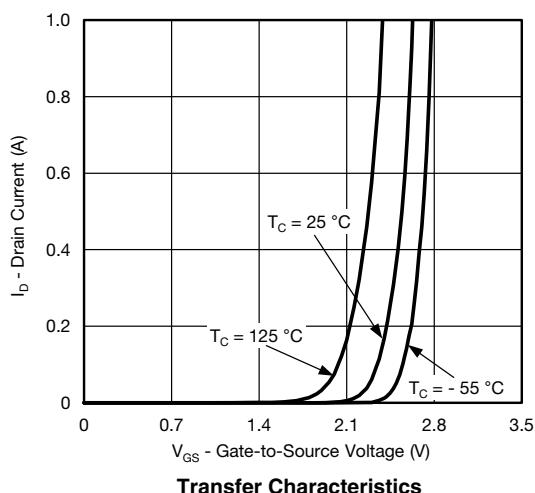
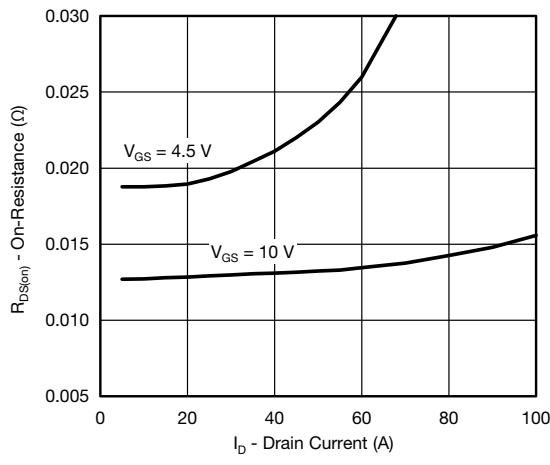
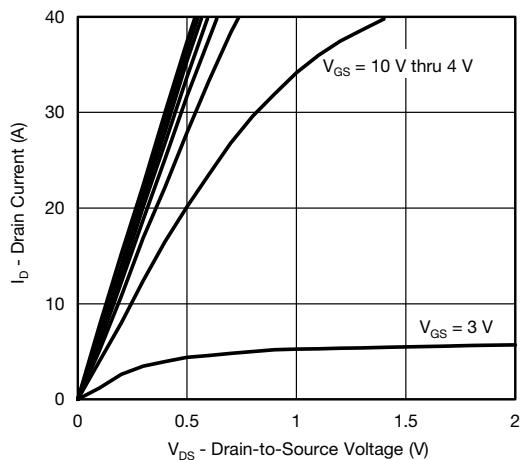
**SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{DS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	- 40			V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	- 1		- 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	$\mu\text{A}$
		$V_{DS} = -40 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125^\circ\text{C}$			- 50	
		$V_{DS} = -40 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 150^\circ\text{C}$			- 250	
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \leq -10 \text{ V}, V_{GS} = -10 \text{ V}$	- 50			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = -10 \text{ V}, I_D = -14 \text{ A}$		0.0135	0.0162	$\Omega$
		$V_{GS} = -4.5 \text{ V}, I_D = -12 \text{ A}$		0.0190	0.0230	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -20 \text{ V}, I_D = -14 \text{ A}$		40		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}, V_{DS} = -20 \text{ V}, f = 1 \text{ MHz}$		2765		pF
Output Capacitance	$C_{oss}$			330		
Reverse Transfer Capacitance	$C_{rss}$			280		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = -20 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -14 \text{ A}$		67	100	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			13.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			14		
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	0.5	2.5	5	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = -20 \text{ V}, R_L = 2 \Omega$ $I_D \equiv -10 \text{ A}, V_{GEN} = -10 \text{ V}, R_g = 1 \Omega$		10	20	ns
Rise Time <sup>c</sup>	$t_r$			11	20	
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$			42	63	
Fall Time <sup>c</sup>	$t_f$			12	20	
<b>Drain-Source Body Diode Ratings and Characteristics</b> $T_C = 25^\circ\text{C}^b$						
Continuous Current	$I_S$				- 36	A
Pulsed Current	$I_{SM}$				- 100	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = -10 \text{ A}, V_{GS} = 0 \text{ V}$		- 0.8	- 1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = -10 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}$		38	57	ns
Peak Reverse Recovery Current	$I_{RM(\text{REC})}$			2.3	3.5	A
Reverse Recovery Charge	$Q_{rr}$			40	60	nC

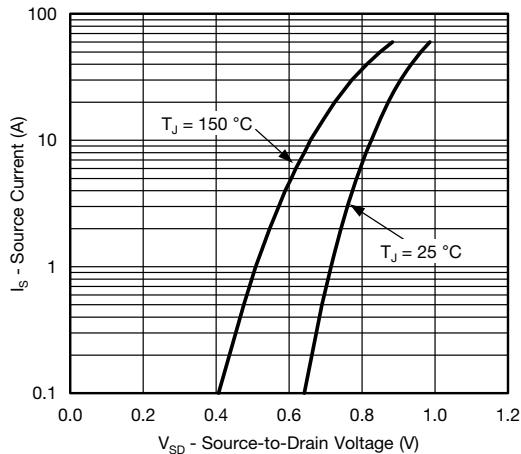
## Notes:

- 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.

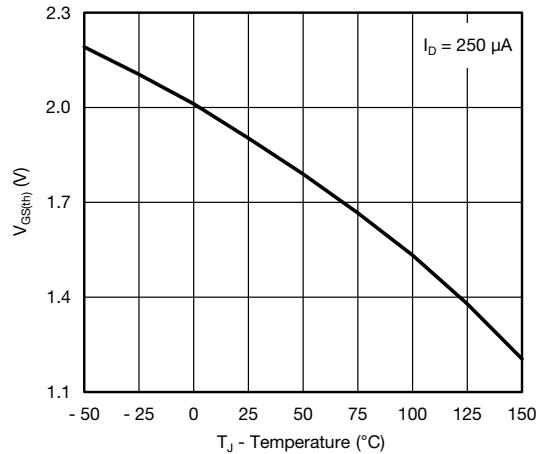
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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


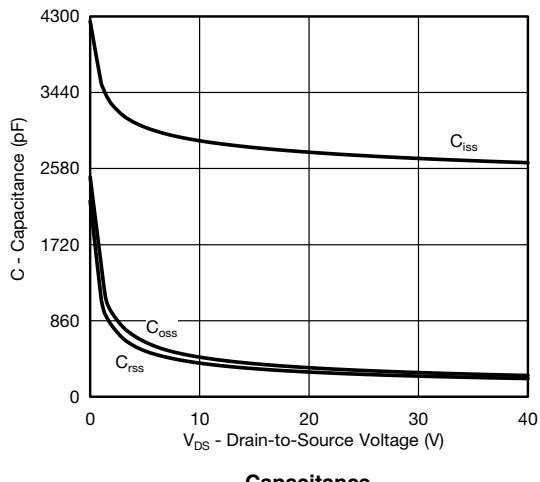
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



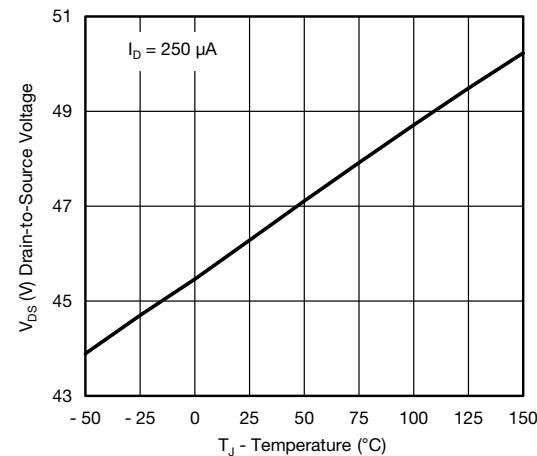
Source-Drain Diode Forward Voltage



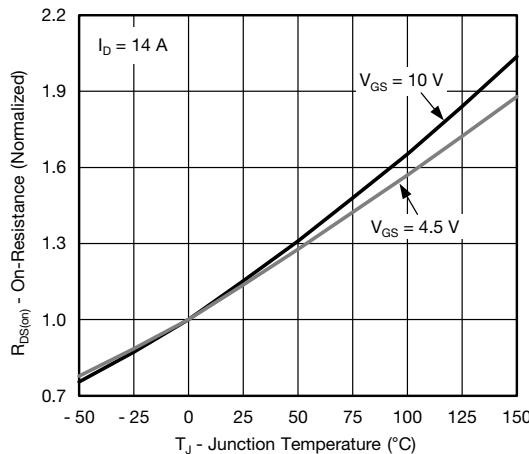
Threshold Voltage



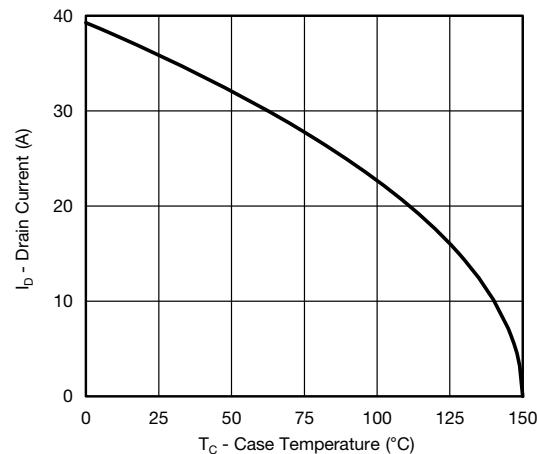
Capacitance



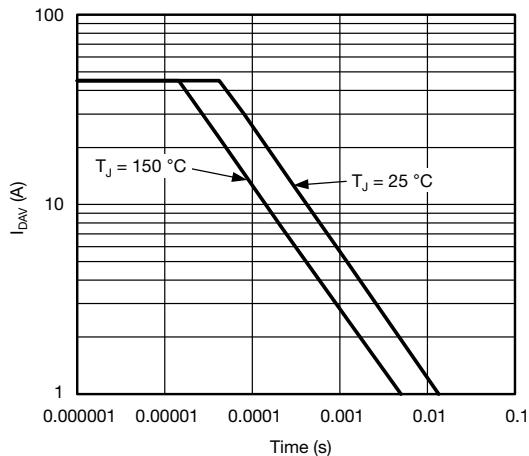
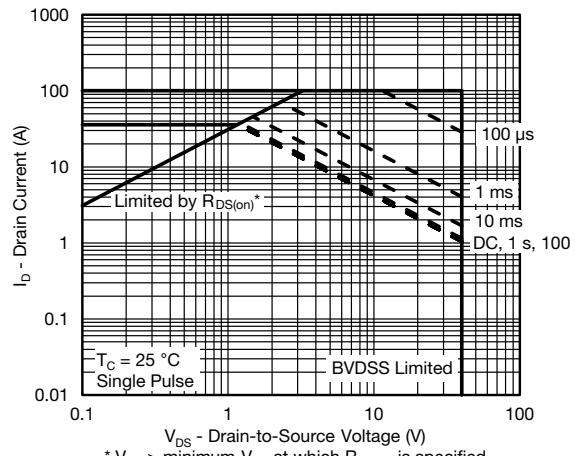
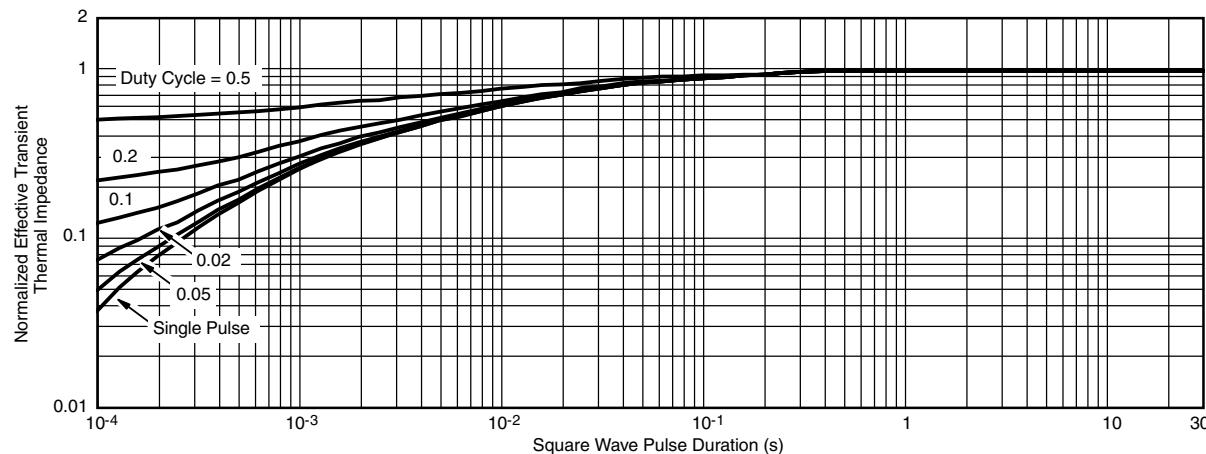
Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Junction Temperature

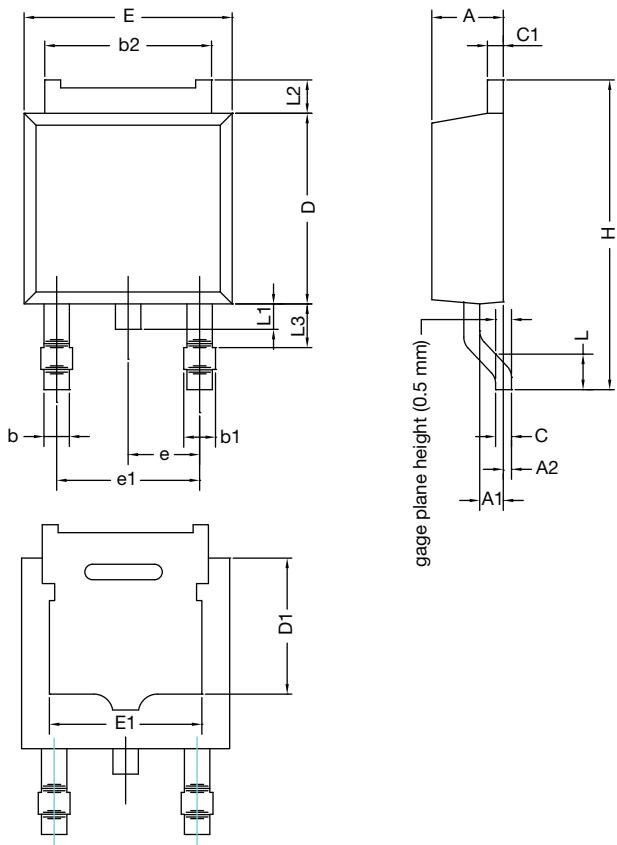


Current Derating

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

**Single Pulse Avalanche Current Capability vs. Time**

**Safe Operating Area**

**Normalized Thermal Transient Impedance, Junction-to-Case**

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### TO-252AA CASE OUTLINE



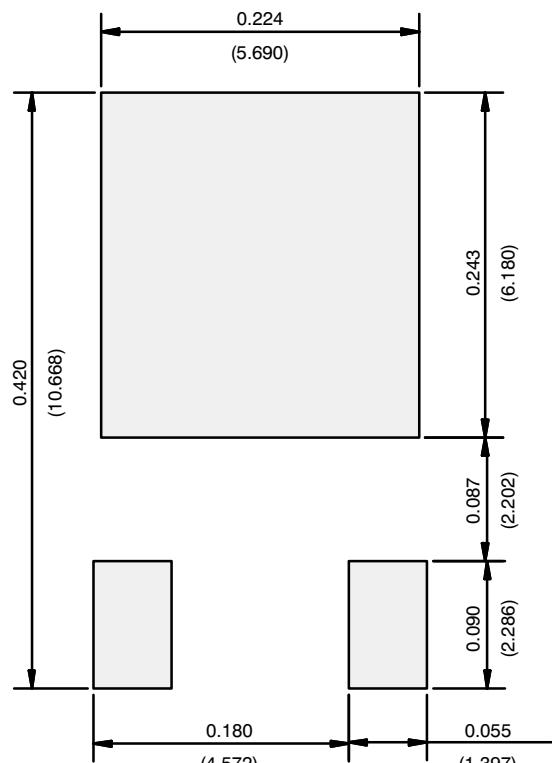
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
A2	0.030	0.127	0.001	0.005
b	0.71	0.88	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.44	0.206	0.214
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
D1	4.10	4.45	0.161	0.175
E	6.48	6.73	0.255	0.265
E1	4.49	5.50	0.177	0.217
e	2.28 BSC		0.090 BSC	
e1	4.57 BSC		0.180 BSC	
H	9.65	10.41	0.380	0.410
L	1.40	1.78	0.055	0.070
L1	0.64	1.02	0.025	0.040
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.040	0.060

ECN: T11-0110-Rev. L, 18-Apr-11  
DWG: 5347

#### Note

- Dimension L3 is for reference only.

## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



**Recommended Minimum Pads  
Dimensions in Inches/(mm)**

[Return to Index](#)

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