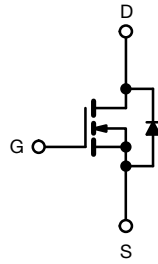
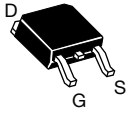


## E Series Power MOSFET

**DDPAK  
(TO-252)**


N-Channel MOSFET


**RoHS  
COMPLIANT  
HALOGEN  
FREE**

### FEATURES

- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low input capacitance ( $C_{iss}$ )
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Industrial
  - Welding
  - Induction heating
  - Motor drives
  - Battery chargers
  - Renewable energy
  - Solar (PV inverters)

### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	850	
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V	0.82
$Q_g$ max. (nC)	44	
$Q_{gs}$ (nC)	5	
$Q_{gd}$ (nC)	8	
Configuration	Single	

### ORDERING INFORMATION

Package	DDPAK (TO-252)
Lead (Pb)-free and halogen-free	SiHD6N80E-GE3

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


PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	800	V
Gate-source voltage	$V_{GS}$	$\pm 30$	
Continuous drain current ( $T_J = 150$ °C)	$V_{GS}$ at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed drain current <sup>a</sup>	$I_{DM}$	15	
Linear derating factor		0.63	W/°C
Single pulse avalanche energy <sup>b</sup>	$E_{AS}$	95	mJ
Maximum power dissipation	$P_D$	78	W
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C
Drain-source voltage slope	dv/dt	$T_J = 125$ °C	V/ns
Reverse diode dv/dt <sup>d</sup>			
Soldering recommendations (peak temperature) <sup>c</sup>	For 10 s	300	°C

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 2.6$  A
- 1.6 mm from case
- $I_{SD} \leq I_D$ ,  $di/dt = 100$  A/ $\mu$ s, starting  $T_J = 25$  °C



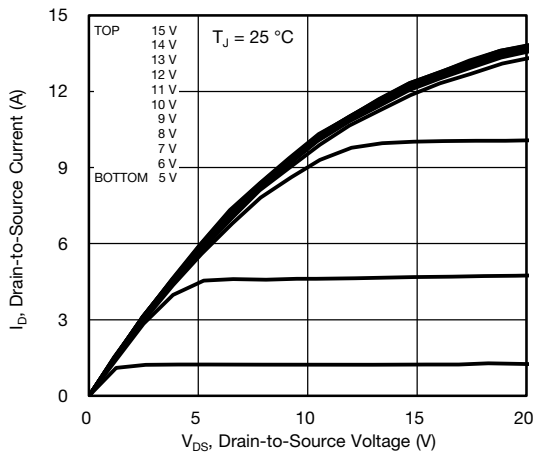
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R <sub>thJA</sub>	-	62	°C/W
Maximum junction-to-case (drain)	R <sub>thJC</sub>	-	1.6	

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		800	-	-	V
V <sub>DS</sub> temperature coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	Reference to 25 °C, I <sub>D</sub> = 1 mA		-	1.1	-	V/°C
Gate-source threshold Voltage (N)	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		2.0	-	4.0	V
Gate-source leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
		V <sub>GS</sub> = ± 30 V		-	-	± 1	μA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = 0 V		-	-	1	μA
		V <sub>DS</sub> = 640 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C		-	-	10	
Drain-source on-state resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 3 A	-	0.82	0.94	Ω
Forward transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 30 V, I <sub>D</sub> = 3 A		-	2.5	-	S
<b>Dynamic</b>							
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 100 V, f = 1 MHz		-	827	-	pF
Output capacitance	C <sub>oss</sub>			-	37	-	
Reverse transfer capacitance	C <sub>rss</sub>			-	5	-	
Effective output capacitance, energy related <sup>a</sup>	C <sub>o(er)</sub>			-	24	-	
Effective output capacitance, time related <sup>b</sup>	C <sub>o(tr)</sub>	V <sub>DS</sub> = 0 V to 480 V, V <sub>GS</sub> = 0 V		-	109	-	
Total gate charge	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 3 A, V <sub>DS</sub> = 480 V	-	22	44	nC
Gate-source charge	Q <sub>gs</sub>			-	5	-	
Gate-drain charge	Q <sub>gd</sub>			-	8	-	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 480 V, I <sub>D</sub> = 3 A, V <sub>GS</sub> = 10 V, R <sub>g</sub> = 9.1 Ω		-	13	26	ns
Rise time	t <sub>r</sub>			-	9	18	
Turn-off delay time	t <sub>d(off)</sub>			-	27	54	
Fall time	t <sub>f</sub>			-	18	36	
Gate input resistance	R <sub>g</sub>	f = 1 MHz, open drain		0.5	1.0	2.0	Ω
<b>Drain-Source Body Diode Characteristics</b>							
Continuous source-drain diode current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	5.4	A
Pulsed diode forward current	I <sub>SM</sub>			-	-	15	
Diode forward voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = 3 A, V <sub>GS</sub> = 0 V		-	-	1.2	V
Reverse recovery time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = I <sub>S</sub> = 3 A, di/dt = 100 A/μs, V <sub>R</sub> = 25 V		-	282	564	ns
Reverse recovery charge	Q <sub>rr</sub>			-	2.0	4.0	μC
Reverse recovery current	I <sub>RRM</sub>			-	11	-	A

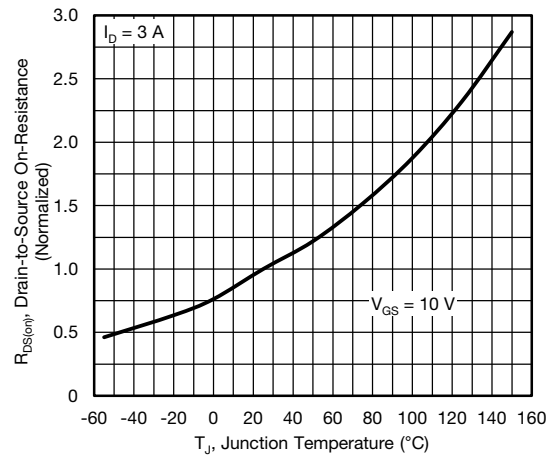
**Notes**

- a. C<sub>oss(er)</sub> is a fixed capacitance that gives the same energy as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 V to 480 V V<sub>DSS</sub>
- b. C<sub>oss(tr)</sub> is a fixed capacitance that gives the same charging time as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 V to 480 V V<sub>DSS</sub>

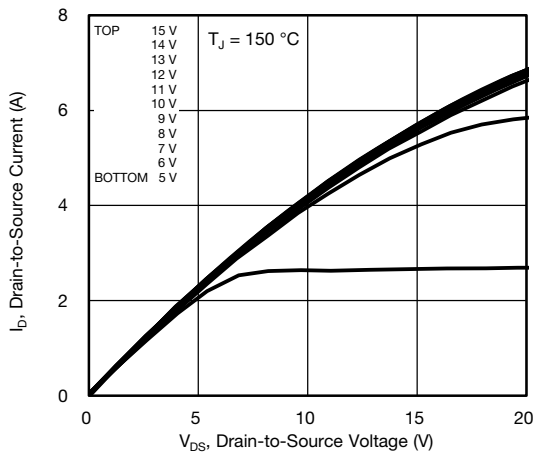
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



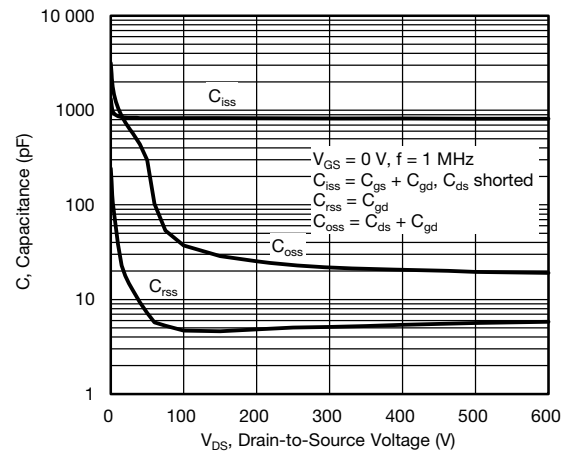
**Fig. 1 - Typical Output Characteristics**



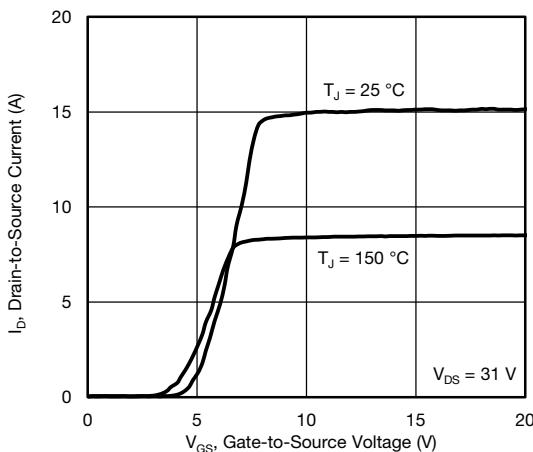
**Fig. 4 - Normalized On-Resistance vs. Temperature**



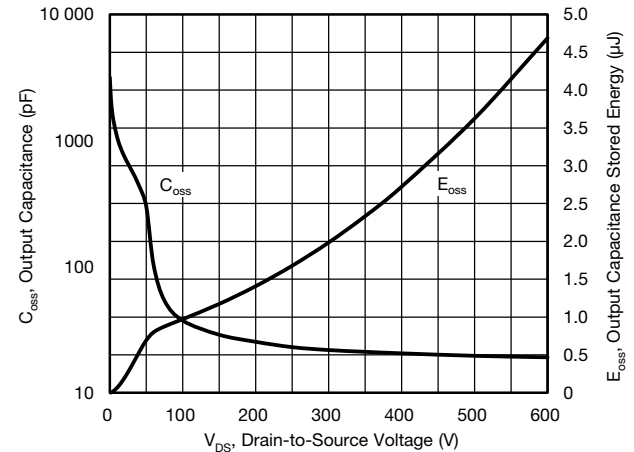
**Fig. 2 - Typical Output Characteristics**



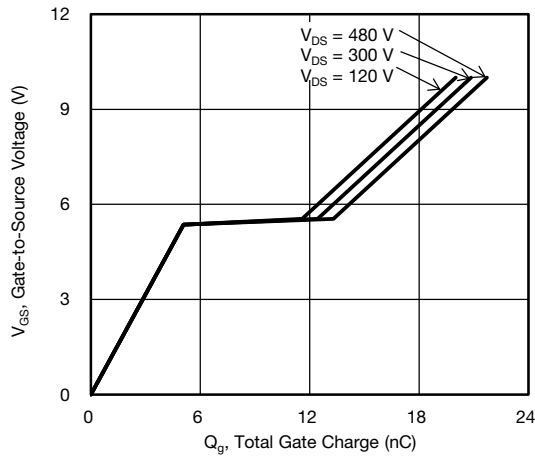
**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**



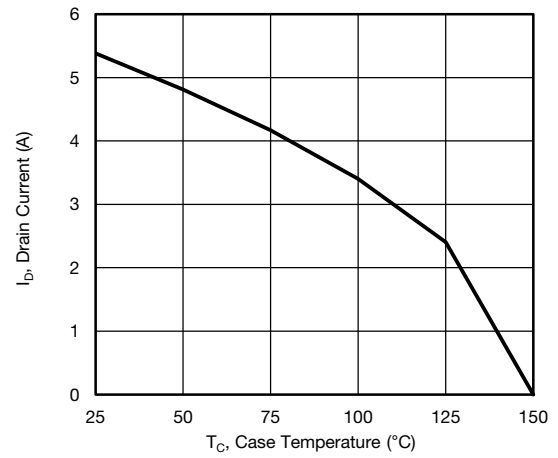
**Fig. 3 - Typical Transfer Characteristics**



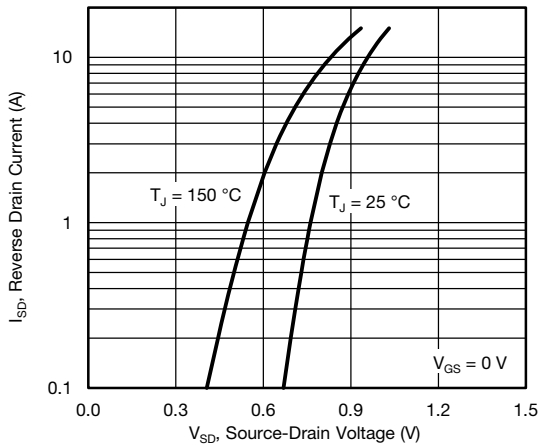
**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{DS}$**



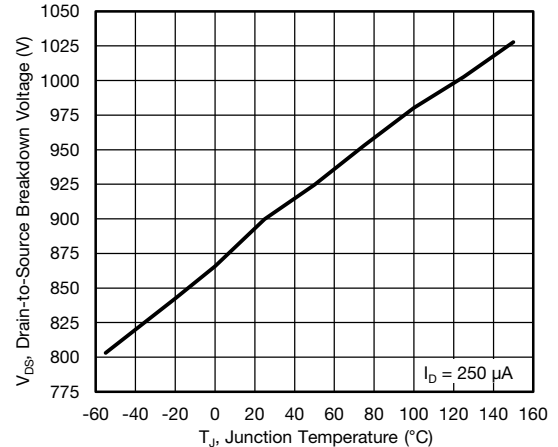
**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**



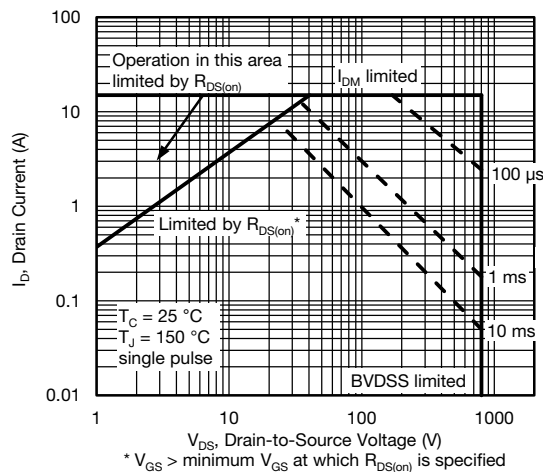
**Fig. 10 - Maximum Drain Current vs. Case Temperature**



**Fig. 8 - Typical Source-Drain Diode Forward Voltage**



**Fig. 11 - Temperature vs. Drain-to-Source Voltage**



**Fig. 9 - Maximum Safe Operating Area**

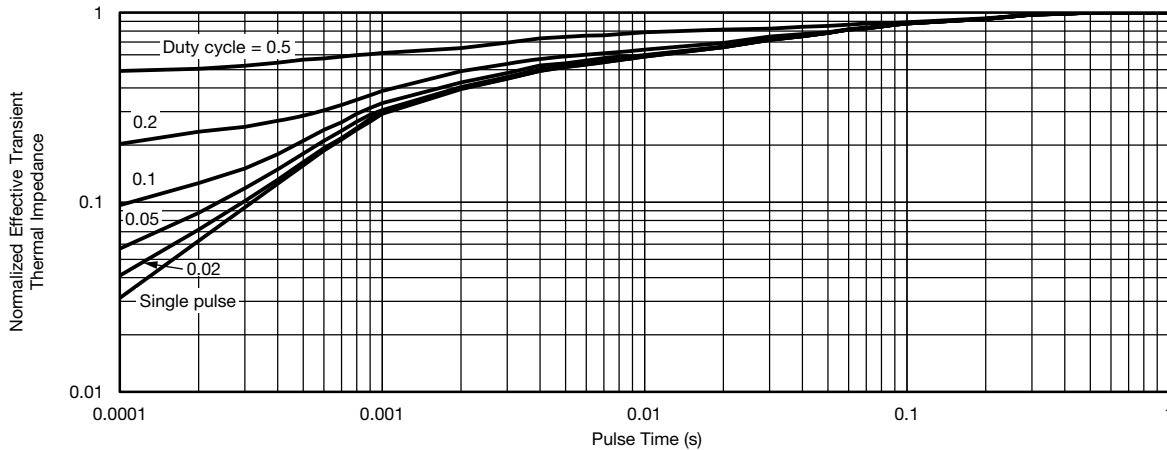


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

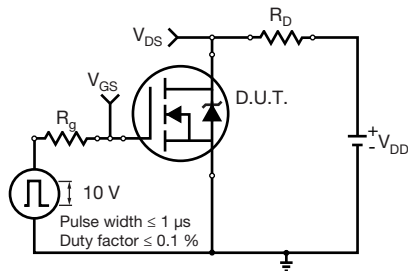


Fig. 13 - Switching Time Test Circuit

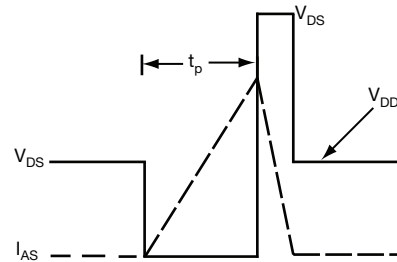


Fig. 16 - Unclamped Inductive Waveforms

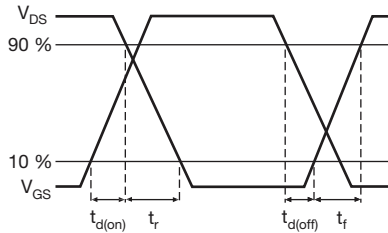


Fig. 14 - Switching Time Waveforms

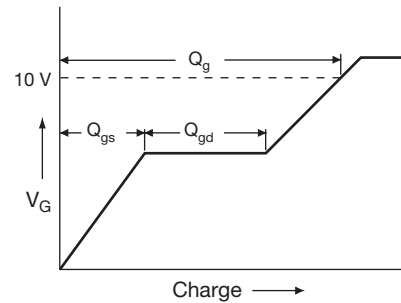


Fig. 17 - Basic Gate Charge Waveform

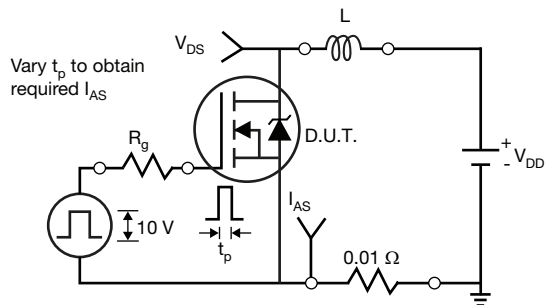
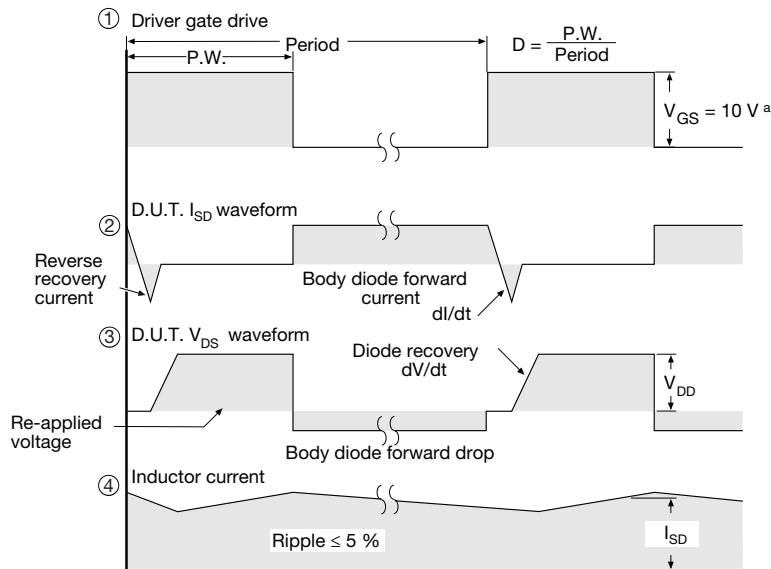


Fig. 15 - Unclamped Inductive Test Circuit



Fig. 18 - Gate Charge Test Circuit



**Note**

a.  $V_{GS} = 5 V$  for logic level devices

**Fig. 19 - For N-Channel**

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## TO-252AA (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
E	6.40	6.73	0.252	0.265
L	1.40	1.77	0.055	0.070
L1	2.743 REF		0.108 REF	
L2	0.508 BSC		0.020 BSC	
L3	0.89	1.27	0.035	0.050
L4	0.64	1.01	0.025	0.040
D	6.00	6.22	0.236	0.245
H	9.40	10.40	0.370	0.409
b	0.64	0.88	0.025	0.035
b2	0.77	1.14	0.030	0.045
b3	5.21	5.46	0.205	0.215
e	2.286 BSC		0.090 BSC	
A	2.20	2.38	0.087	0.094
A1	0.00	0.13	0.000	0.005
c	0.45	0.60	0.018	0.024
c2	0.45	0.58	0.018	0.023
D1	5.30	-	0.209	-
E1	4.40	-	0.173	-
θ	0'	10'	0'	10'

ECN: S-81965-Rev. A, 15-Sep-08  
 DWG: 5973

### Notes

1. Package body sizes exclude mold flash, protrusion or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.10 mm per side.
2. Package body sizes determined at the outermost extremes of the plastic body exclusive of mold flash, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3. The package top may be smaller than the package bottom.
4. Dimension "b" does not include dambar protrusion. Allowable dambar protrusion shall be 0.10 mm total in excess of "b" dimension at maximum material condition. The dambar cannot be located on the lower radius of the foot.

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



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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