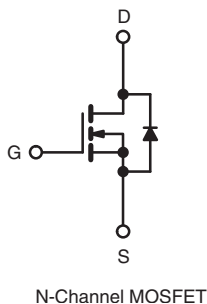
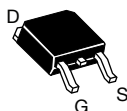


## D Series Power MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	550	
$R_{DS(on)}$ max. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V	3.2
$Q_g$ (max.) (nC)	20	
$Q_{gs}$ (nC)	3	
$Q_{gd}$ (nC)	5	
Configuration	Single	

**DPAK  
(TO-252)**



### FEATURES

- Optimal Design
  - Low Area Specific On-Resistance
  - Low Input Capacitance ( $C_{iss}$ )
  - Reduced Capacitive Switching Losses
  - High Body Diode Ruggedness
  - Avalanche Energy Rated (UIS)
- Optimal Efficiency and Operation
  - Low Cost
  - Simple Gate Drive Circuitry
  - Low Figure-of-Merit (FOM):  $R_{on} \times Q_g$
  - Fast Switching
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Consumer Electronics
  - Displays (LCD or Plasma TV)
- Server and Telecom Power Supplies
  - SMPS
- Industrial
  - Welding
  - Induction Heating
  - Motor Drives
- Battery Chargers



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

### ORDERING INFORMATION

Package	DPAK (TO-252)
Lead (Pb)-free	SiHD3N50D-E3
Lead (Pb)-free and Halogen-free	SiHD3N50D-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	500	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	
Gate-Source Voltage AC ( $f > 1$ Hz)		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>	$I_{DM}$	5.5	
Linear Derating Factor		0.56	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	9	mJ
Maximum Power Dissipation	$P_D$	104	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150	°C
Drain-Source Voltage Slope	$dV/dt$	24	V/ns
Reverse Diode $dV/dt$ <sup>(d)</sup>		0.22	
Soldering Recommendations (Peak Temperature) <sup>c</sup>		for 10 s	°C


#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.3$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 2.8$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ , starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

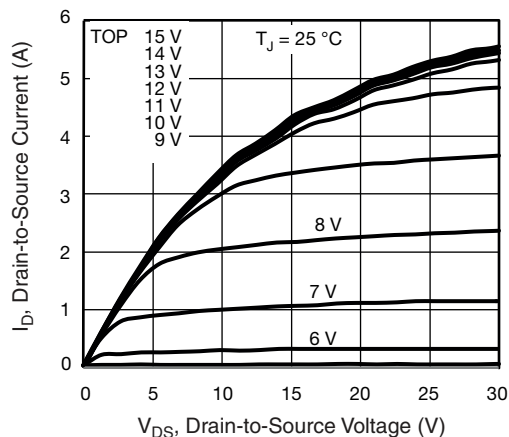
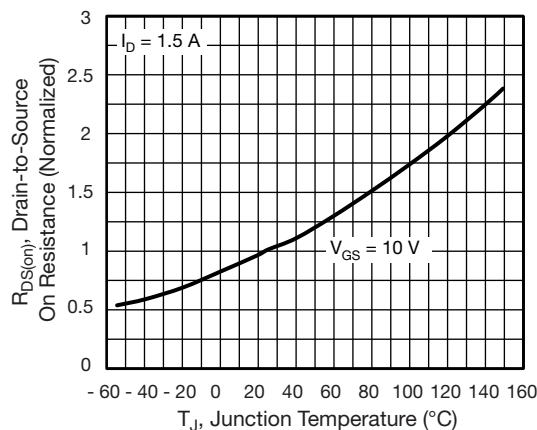
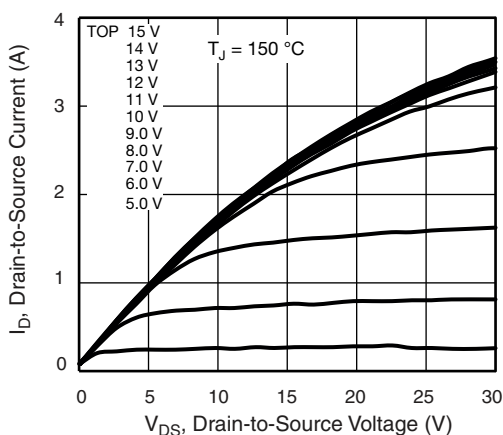
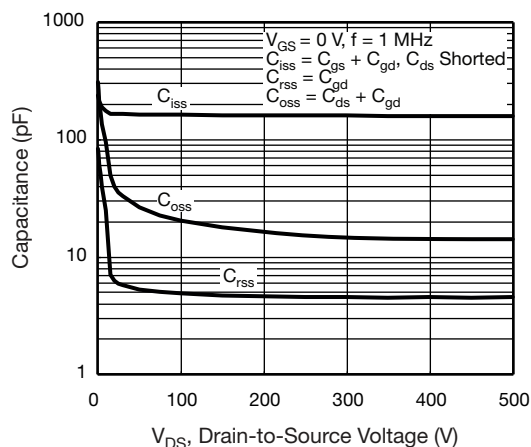
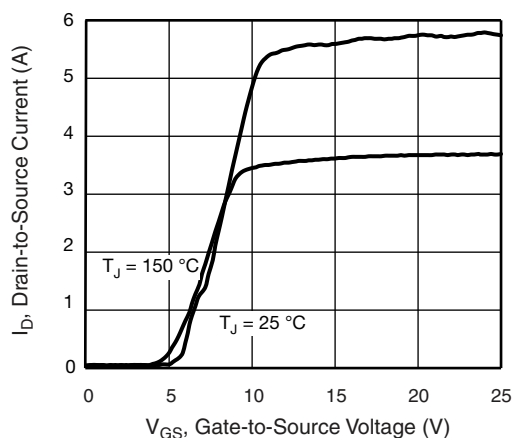
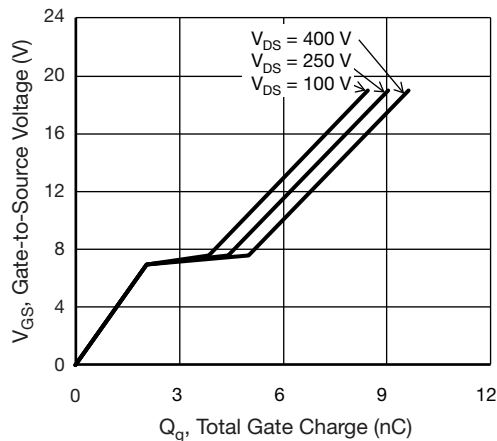
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	1.8	

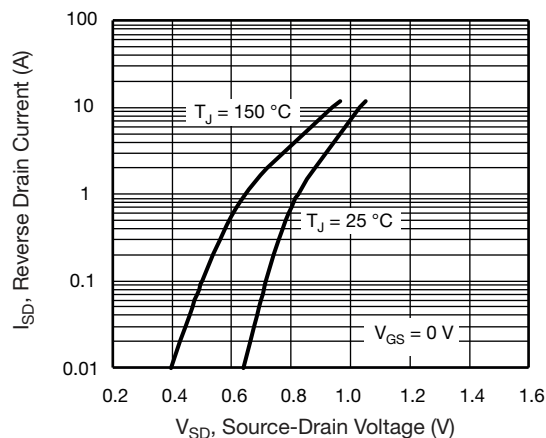
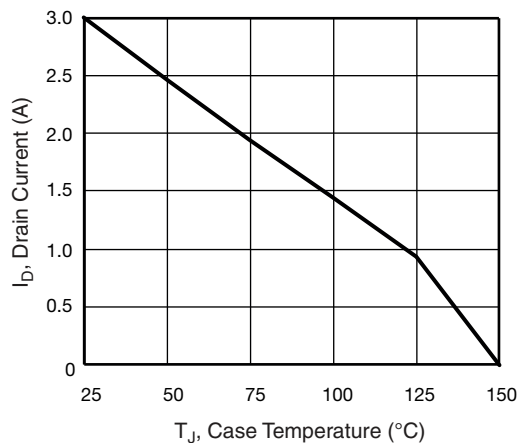
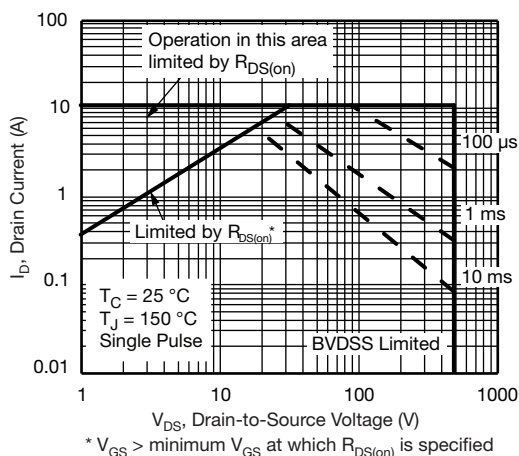
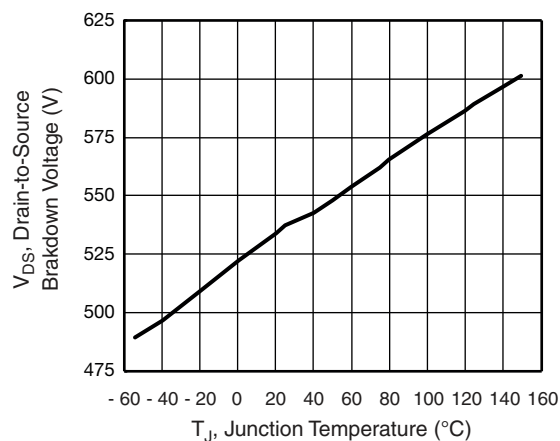
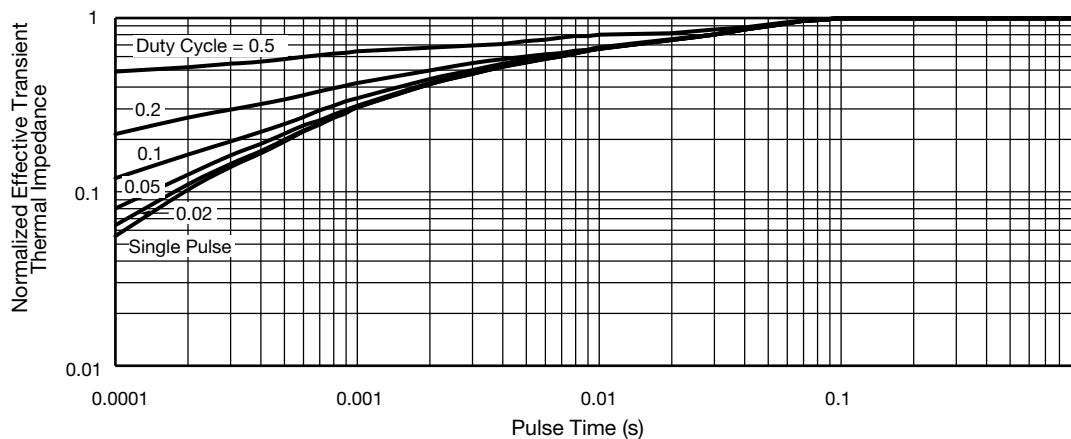
**SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

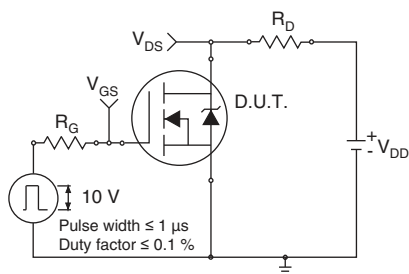
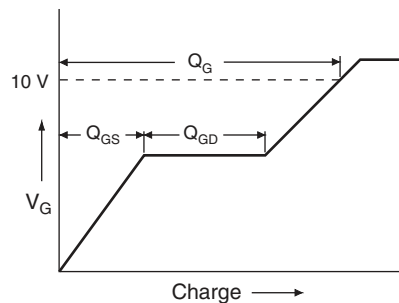
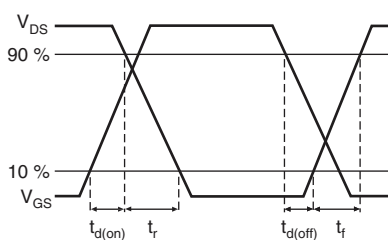
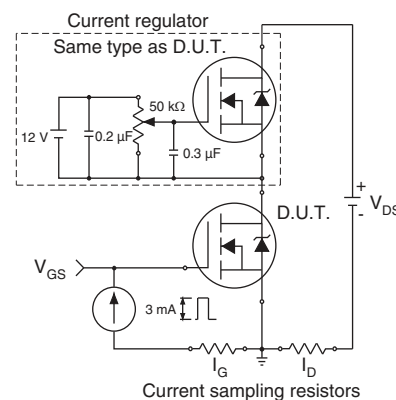
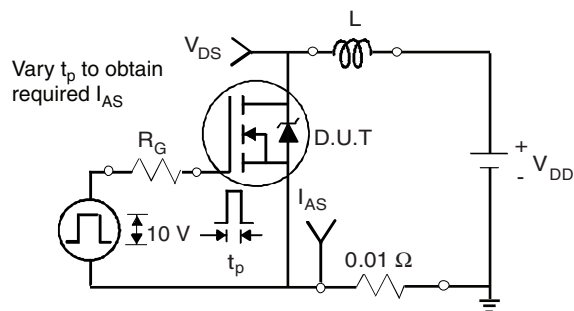
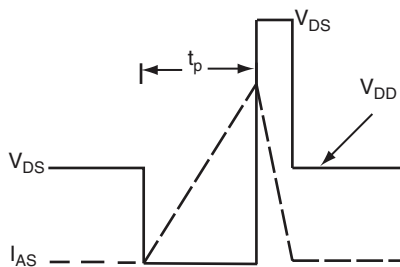
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25^\circ\text{C}$ , $I_D = 250\text{ }\mu\text{A}$	-	0.56	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3	-	5	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$	-	2.6	3.2	$\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 8\text{ V}, I_D = 1.5\text{ A}$	-	1	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$	-	175	-	pF
Output Capacitance	$C_{oss}$		-	21	-	
Reverse Transfer Capacitance	$C_{rss}$		-	5	-	
Effective Output Capacitance, Energy Related <sup>b</sup>	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	21	-	
Effective Output Capacitance, Time Related <sup>c</sup>	$C_{o(tr)}$		-	26	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}, I_D = 1.5\text{ A}, V_{DS} = 400\text{ V}$	-	6	12	nC
Gate-Source Charge	$Q_{gs}$		-	2	-	
Gate-Drain Charge	$Q_{gd}$		-	3	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}, I_D = 1.5\text{ A}, R_g = 9.1\text{ }\Omega, V_{GS} = 10\text{ V}$	-	12	24	ns
Rise Time	$t_r$		-	9	18	
Turn-Off Delay Time	$t_{d(off)}$		-	11	22	
Fall Time	$t_f$		-	13	26	
Gate Input Resistance	$R_g$	$f = 1\text{ MHz}, \text{open drain}$	-	3.3	-	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse P - N junction diode 	-	-	3	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	12	
Diode Forward Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_S = 1.5\text{ A}, V_{GS} = 0\text{ V}$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = I_S = 1.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 20\text{ V}$	-	293	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	0.74	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	5	-	A

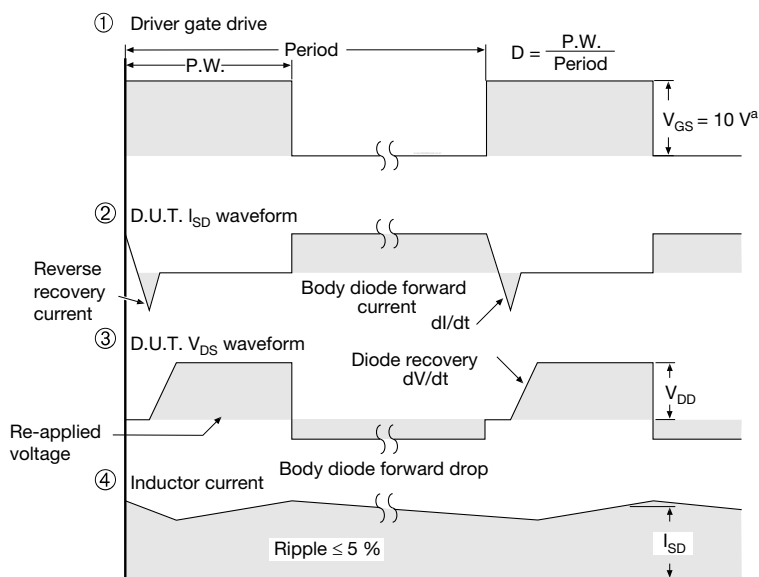
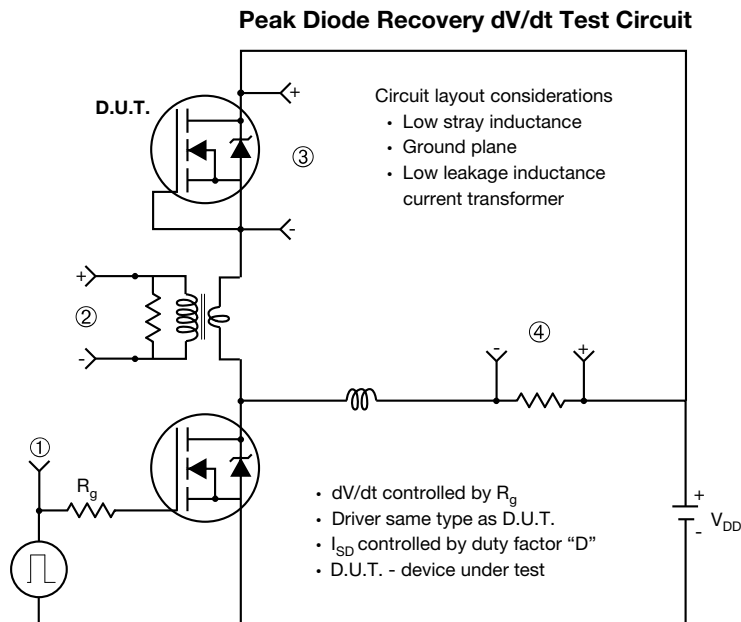
**Notes**

- Repetitive rating; pulse width limited by maximum junction temperature.
- $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .
- $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

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


**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

**Fig. 9 - Maximum Drain Current vs. Case Temperature**

**Fig. 8 - Maximum Safe Operating Area**

**Fig. 10 - Typical Drain-to-Source Voltage vs. Temperature**

**Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case**


**Fig. 12 - Switching Time Test Circuit**

**Fig. 16 - Basic Gate Charge Waveform**

**Fig. 13 - Switching Time Waveforms**

**Fig. 17 - Gate Charge Test Circuit**

**Fig. 14 - Unclamped Inductive Test Circuit**

**Fig. 15 - Unclamped Inductive Waveforms**



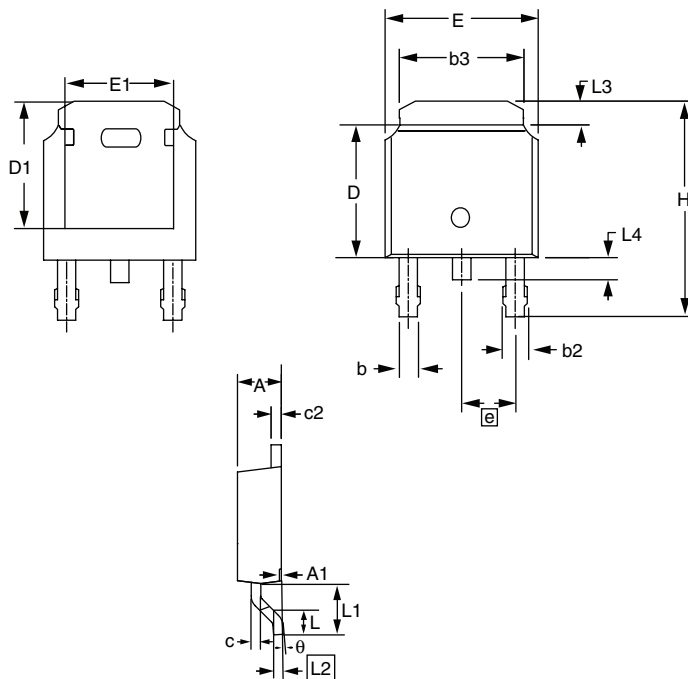
**Note**

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

**Fig. 18 - For N-Channel**

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?91495](http://www.vishay.com/ppg?91495).

## TO-252AA (HIGH VOLTAGE)



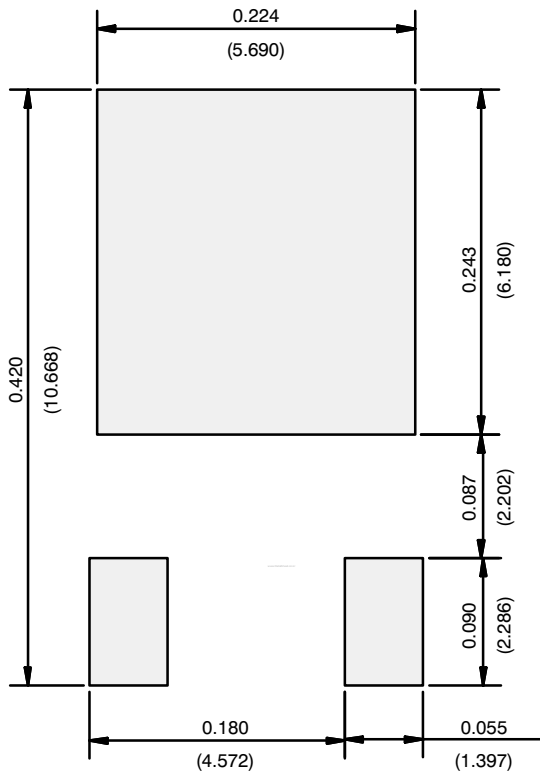
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
E	6.40	6.73	0.252	0.265
L	1.40	1.77	0.055	0.070
L1	2.743 REF		0.108 REF	
L2	0.508 BSC		0.020 BSC	
L3	0.89	1.27	0.035	0.050
L4	0.64	1.01	0.025	0.040
D	6.00	6.22	0.236	0.245
H	9.40	10.40	0.370	0.409
b	0.64	0.88	0.025	0.035
b2	0.77	1.14	0.030	0.045
b3	5.21	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)

[Return to Index](#)





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