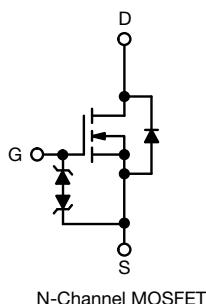


## E Series Power MOSFET



### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	850	
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V	0.826
$Q_g$ max. (nC)	22.5	
$Q_{gs}$ (nC)	4	
$Q_{gd}$ (nC)	7	
Configuration	Single	

### FEATURES

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



RoHS  
COMPLIANT  
HALOGEN  
FREE

### 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

### ORDERING INFORMATION

Package	DPAK (TO-252)	
Lead (Pb)-free and halogen-free	SiHD6N80AE-GE3 SiHD6N80AET4-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	$V_{GS}$	$\pm 30$	V
Continuous drain current ( $T_J = 150$ °C)	$V_{GS}$ at 10 V	5	A
		3.2	
Pulsed drain current <sup>a</sup>	$I_{DM}$	10	
Linear derating factor		0.5	W/°C
Single pulse avalanche energy <sup>b</sup>	$E_{AS}$	20.3	mJ
Maximum power dissipation	$P_D$	62.5	W
Operating junction and storage temperature range	$T_J$ , $T_{stg}$	-55 to +150	°C
Drain-source voltage slope	$T_J = 125$ °C	100	V/ns
Reverse diode dv/dt <sup>d</sup>		0.4	
Soldering recommendations (peak temperature) <sup>c</sup>	For 10 s	260	°C

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$  V, starting  $T_J = 25$  °C,  $L = 28.2$  mH,  $R_g = 25$  Ω,  $I_{AS} = 1.2$  A
- 1.6 mm from case
- $I_{SD} \leq I_D$ ,  $di/dt = 100$  A/μs, starting  $T_J = 25$  °C

**THERMAL RESISTANCE RATINGS**

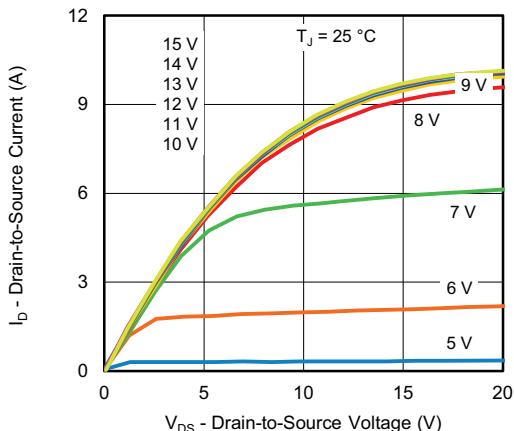
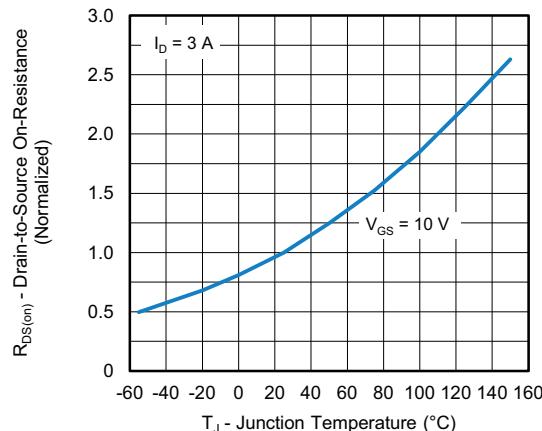
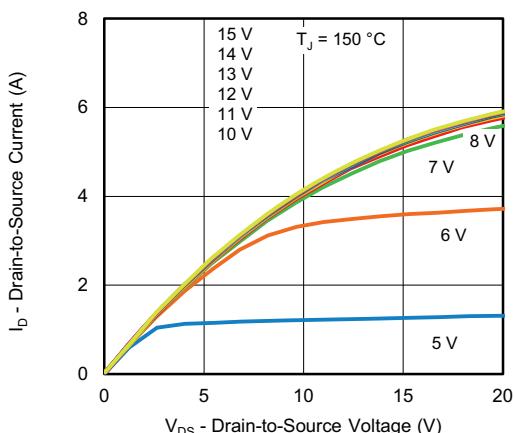
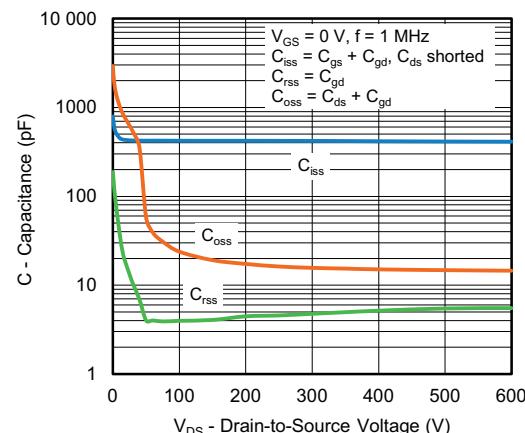
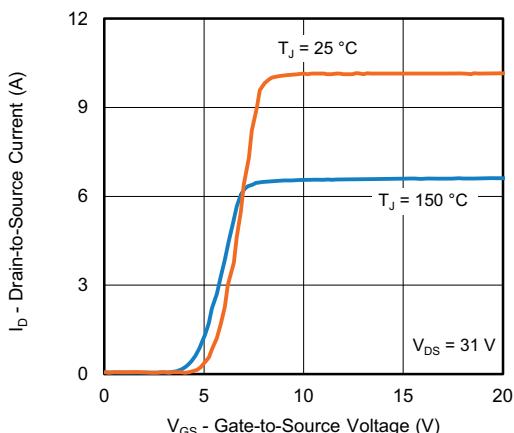
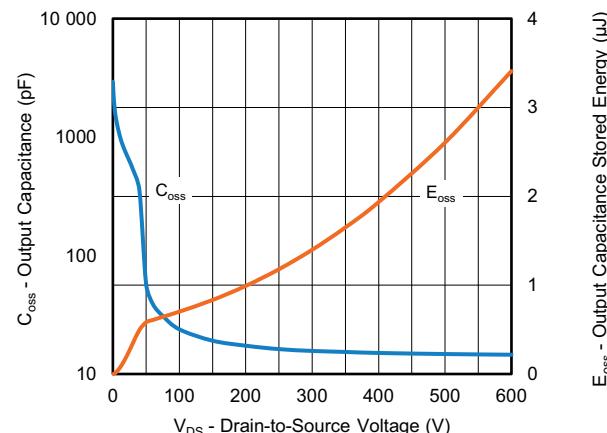
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	62	
Maximum junction-to-case (drain)	$R_{thJC}$	-	2	°C/W

**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	$V_{DS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A		800	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1$ mA		-	0.8	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250$ $\mu$ A		2	-	4	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 20$ V		-	-	$\pm 10$	$\mu$ A
		$V_{GS} = \pm 30$ V		-	-	$\pm 50$	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 800$ V, $V_{GS} = 0$ V		-	-	1	$\mu$ A
		$V_{DS} = 640$ V, $V_{GS} = 0$ V, $T_J = 125$ °C		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10$ V	$I_D = 2$ A	-	0.826	0.950	$\Omega$
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 30$ V, $I_D = 3$ A		-	1.9	-	S
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0$ V, $V_{DS} = 100$ V, $f = 1$ MHz		-	422	-	pF
Output capacitance	$C_{oss}$			-	24	-	
Reverse transfer capacitance	$C_{rss}$			-	4	-	
Effective output capacitance, energy related <sup>a</sup>	$C_{o(er)}$	$V_{DS} = 0$ V to 480 V, $V_{GS} = 0$ V		-	17	-	
Effective output capacitance, time related <sup>b</sup>	$C_{o(tr)}$			-	92	-	
Total gate charge	$Q_g$	$V_{GS} = 10$ V	$I_D = 3$ A, $V_{DS} = 640$ V	-	15	22.5	nC
Gate-source charge	$Q_{gs}$			-	4	-	
Gate-drain charge	$Q_{gd}$			-	7	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 640$ V, $I_D = 3$ A, $V_{GS} = 10$ V, $R_g = 9.1$ $\Omega$		-	12	24	ns
Rise time	$t_r$			-	10	20	
Turn-off delay time	$t_{d(off)}$			-	16	32	
Fall time	$t_f$			-	20	40	
Gate input resistance	$R_g$	$f = 1$ MHz, open drain		1	2	4	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	5	A
Pulsed diode forward current	$I_{SM}$			-	-	10	
Diode forward voltage	$V_{SD}$	$T_J = 25$ °C, $I_S = 3$ A, $V_{GS} = 0$ V		-	-	1.2	V
Reverse recovery time	$t_{rr}$	$T_J = 25$ °C, $I_F = I_S = 3$ A, $di/dt = 100$ A/ $\mu$ s, $V_R = 25$ V		-	285	570	ns
Reverse recovery charge	$Q_{rr}$			-	1.7	3.4	$\mu$ C
Reverse recovery current	$I_{RRM}$			-	9.9	-	A

**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 V to 480 V  $V_{DSS}$   
b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 V to 480 V  $V_{DSS}$

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

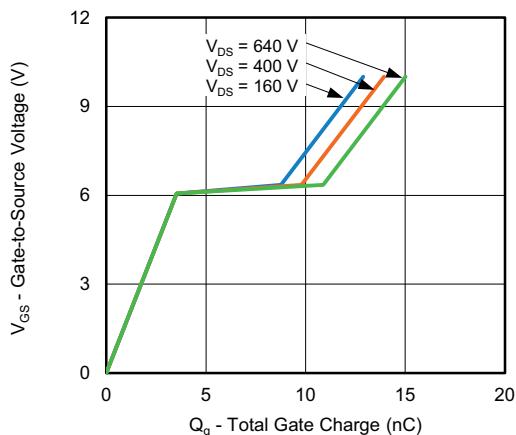


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

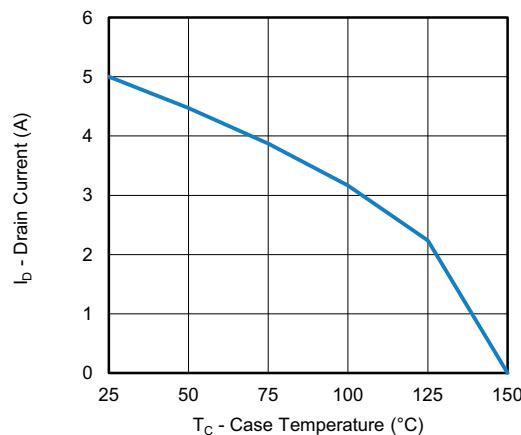


Fig. 10 - Maximum Drain Current vs. Case Temperature

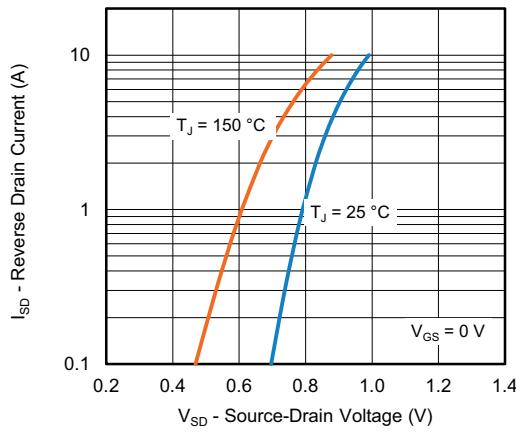


Fig. 8 - Typical Source-Drain Diode Forward Voltage

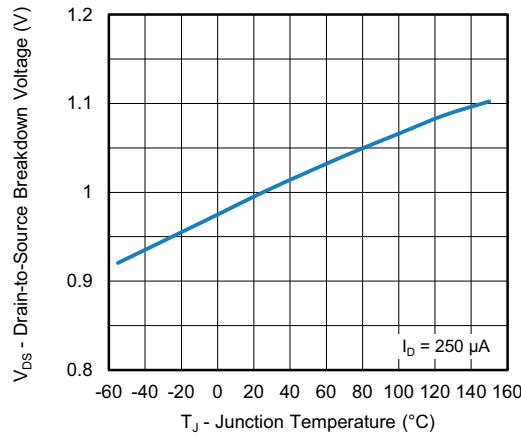


Fig. 11 - Temperature vs. Drain-to-Source Voltage

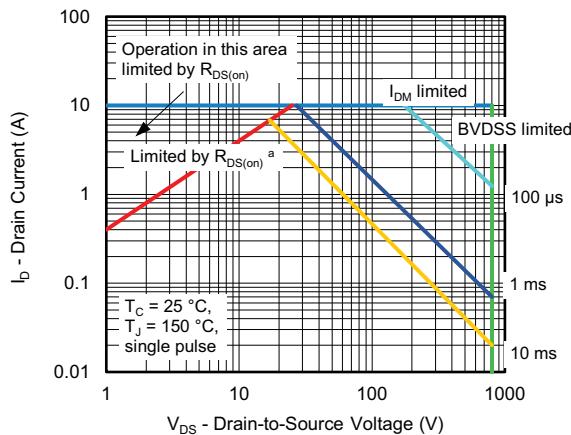
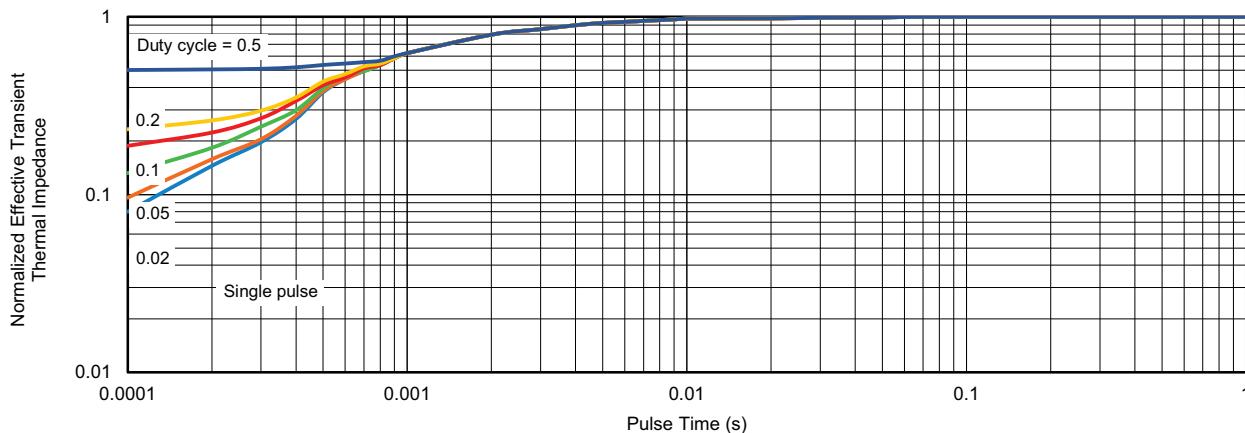


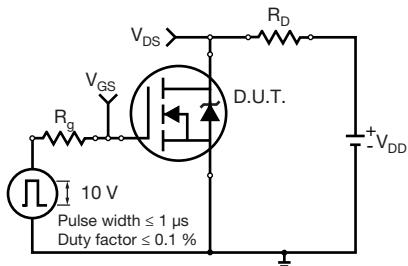
Fig. 9 - Maximum Safe Operating Area

#### Note

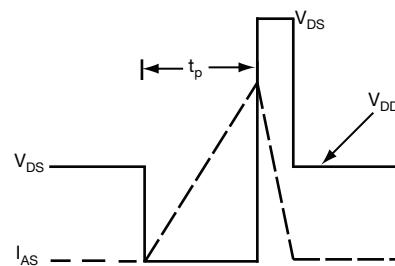
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



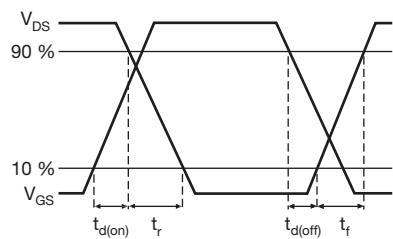
**Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case**



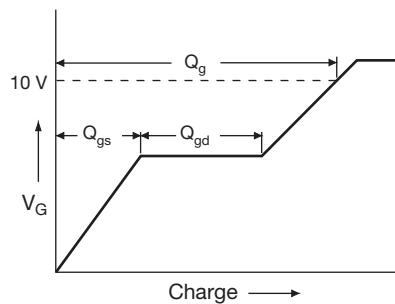
**Fig. 13 - Switching Time Test Circuit**



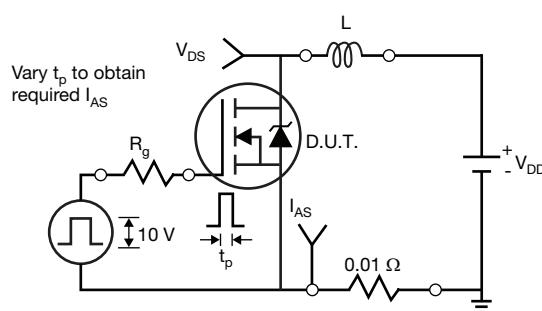
**Fig. 16 - Unclamped Inductive Waveforms**



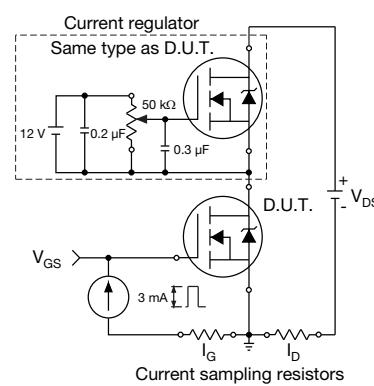
**Fig. 14 - Switching Time Waveforms**



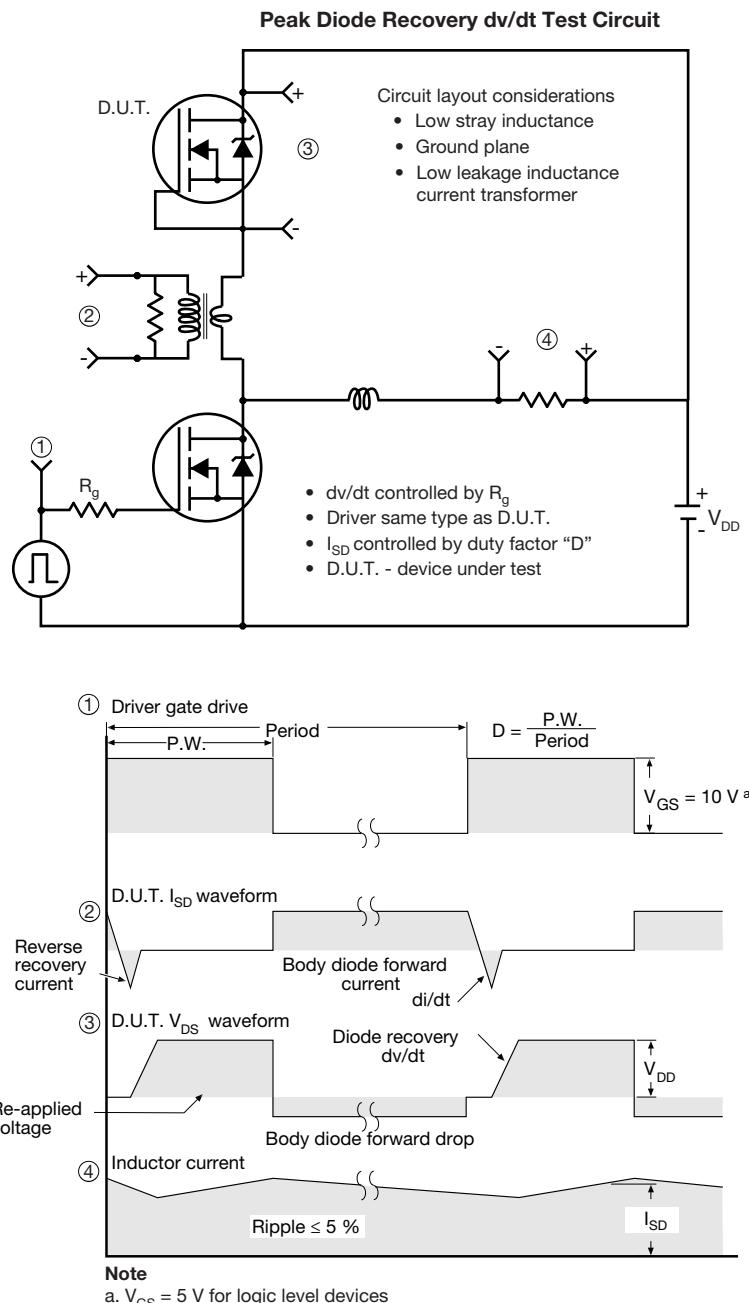
**Fig. 17 - Basic Gate Charge Waveform**



**Fig. 15 - Unclamped Inductive Test Circuit**



**Fig. 18 - Gate Charge Test Circuit**

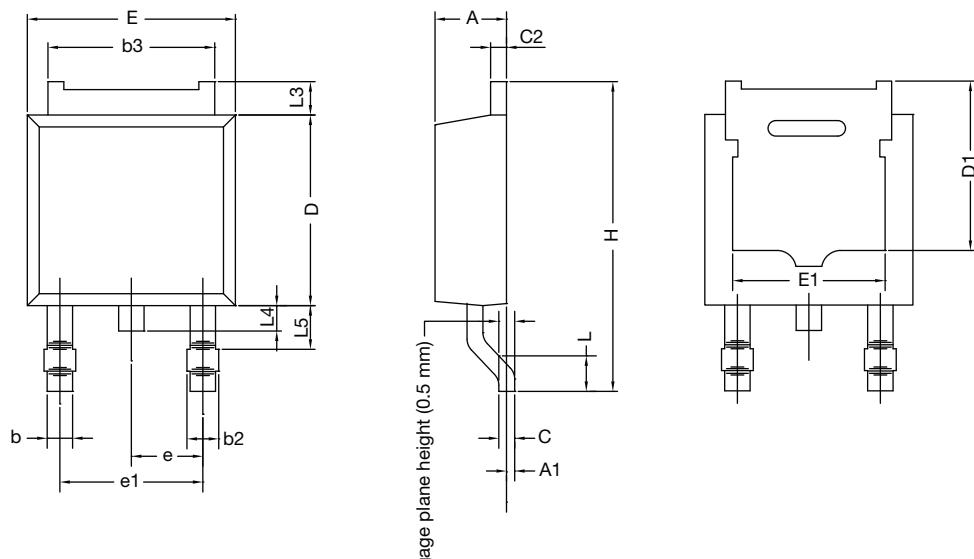


**Fig. 19 - For N-Channel**

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## TO-252AA Case Outline

### VERSION 1: FACILITY CODE = Y

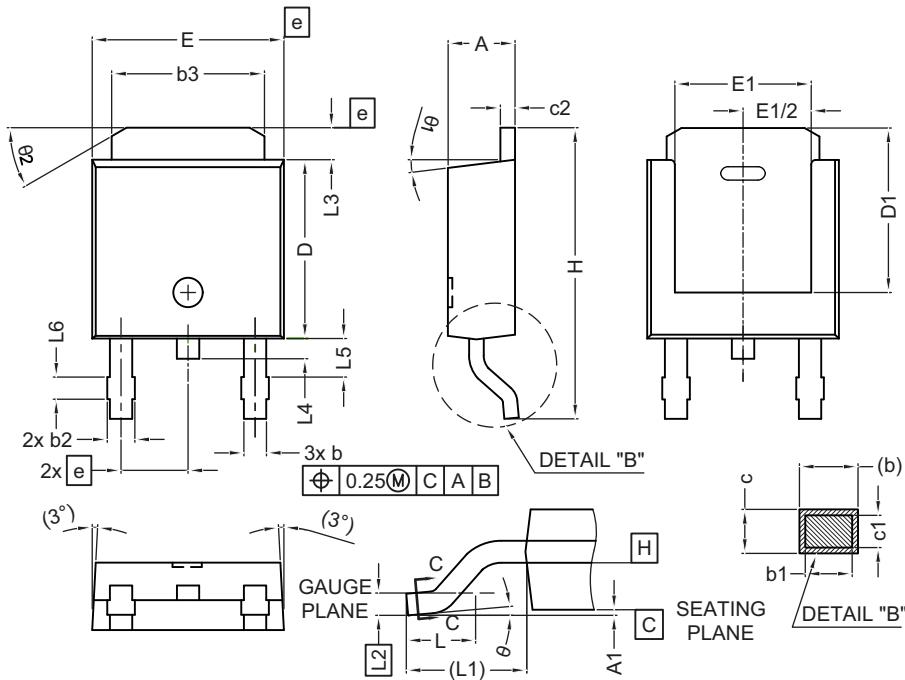


<b>MILLIMETERS</b>		
<b>DIM.</b>	<b>MIN.</b>	<b>MAX.</b>
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

**Note**

- Dimension L3 is for reference only

### VERSION 2: FACILITY CODE = N



MILLIMETERS		
DIM.	MIN.	MAX.
A	2.18	2.39
A1	-	0.13
b	0.65	0.89
b1	0.64	0.79
b2	0.76	1.13
b3	4.95	5.46
c	0.46	0.61
c1	0.41	0.56
c2	0.46	0.60
D	5.97	6.22
D1	5.21	-
E	6.35	6.73
E1	4.32	-
e	2.29 BSC	
H	9.94	10.34

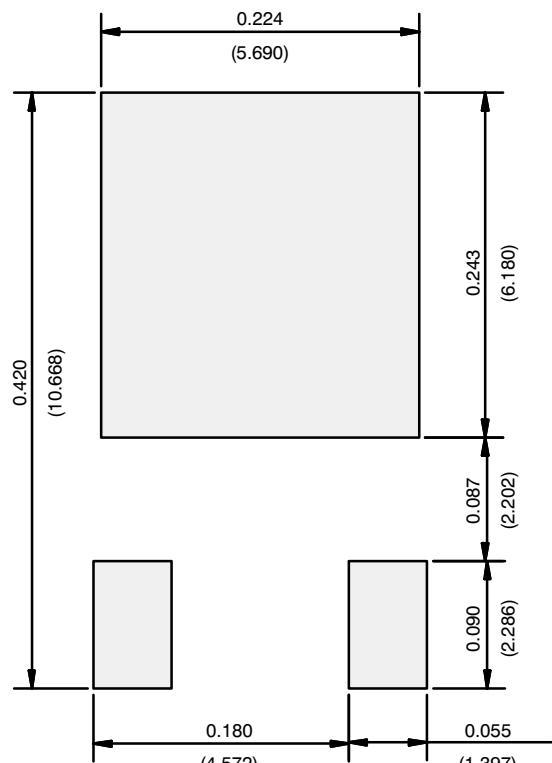
MILLIMETERS		
DIM.	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

#### Notes

- Dimensioning and tolerance confirm to ASME Y14.5M-1994
- All dimensions are in millimeters. Angles are in degrees
- Heat sink side flash is max. 0.8 mm
- Radius on terminal is optional

ECN: E22-0399-Rev. R, 03-Oct-2022  
 DWG: 5347

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



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

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