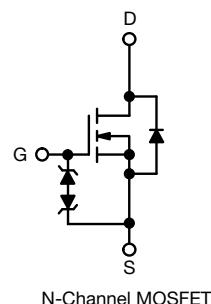
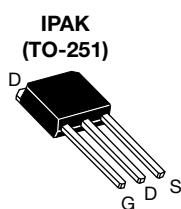


E Series Power MOSFET



RoHS
COMPLIANT
HALOGEN
FREE

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

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

PRODUCT SUMMARY	
V_{DS} (V) at T_J max.	850
$R_{DS(on)}$ typ. (Ω) 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

ORDERING INFORMATION	
Package	IPAK (TO-251)
Lead (Pb)-free and halogen-free	SiHU6N80AE-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}	± 30	
Continuous drain current ($T_J = 150$ °C)	V_{GS} at 10 V	$T_C = 25$ °C	5	A
		$T_C = 100$ °C	3.2	
Pulsed drain current ^a		I_{DM}	10	
Linear derating factor			0.5	W/°C
Single pulse avalanche energy ^b		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	dv/dt	100	V/ns
Reverse diode dv/dt ^d			0.4	
Soldering recommendations (peak temperature) ^c	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

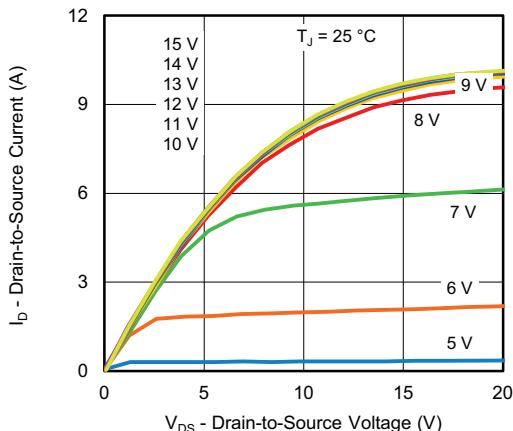
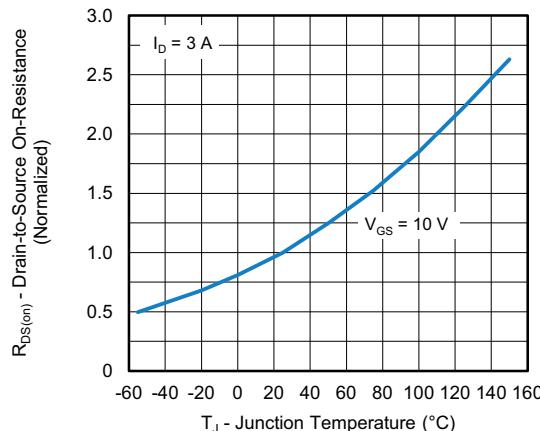
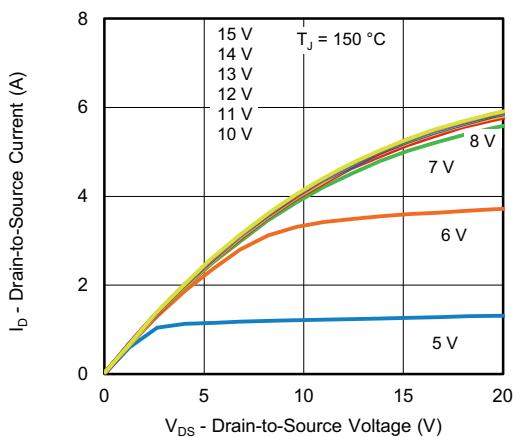
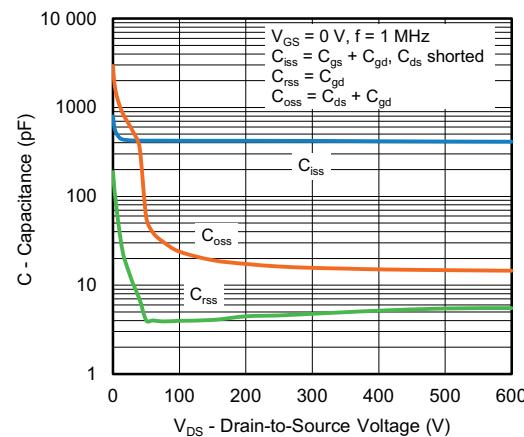
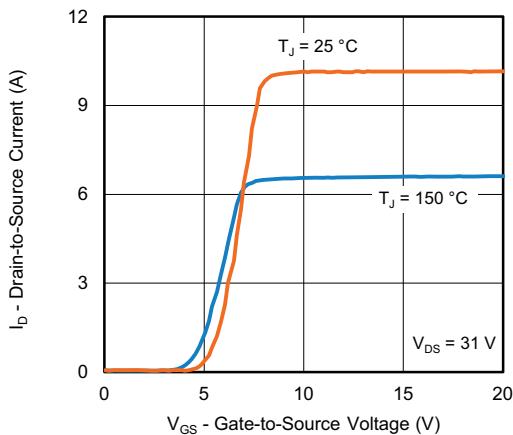
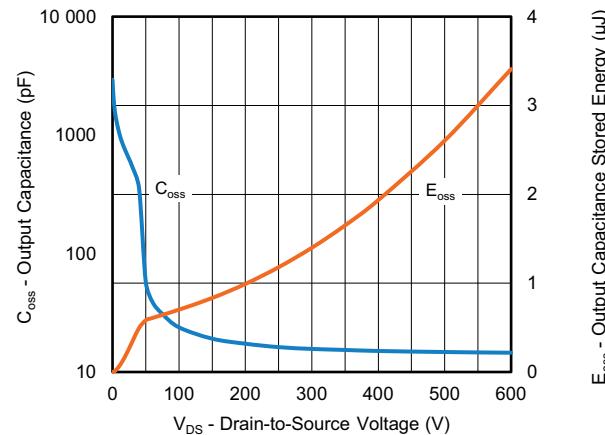
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	
Maximum junction-to-case (drain)	R_{thJC}	-	2	°C/W

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = 250$ μ 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)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ μ A		2	-	4	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20$ V		-	-	± 10	μ A
		$V_{GS} = \pm 30$ V		-	-	± 50	
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 800$ V, $V_{GS} = 0$ V		-	-	1	μ 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	Ω
Forward transconductance ^a	g_{fs}	$V_{DS} = 30$ V, $I_D = 3$ A		-	1.9	-	S
Dynamic							
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 ^a	$C_{o(er)}$	$V_{DS} = 0$ V to 480 V, $V_{GS} = 0$ V		-	17	-	
Effective output capacitance, time related ^b	$C_{o(tr)}$			-	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, $R_g = 9.1$ Ω		-	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	Ω
Drain-Source Body Diode Characteristics							
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/ μ s, $V_R = 25$ V		-	285	570	ns
Reverse recovery charge	Q_{rr}			-	1.7	3.4	μ 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}

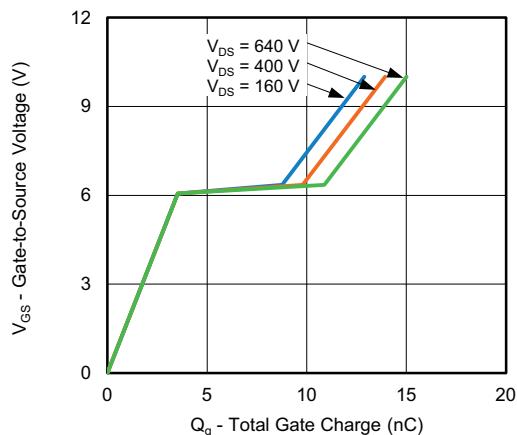


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

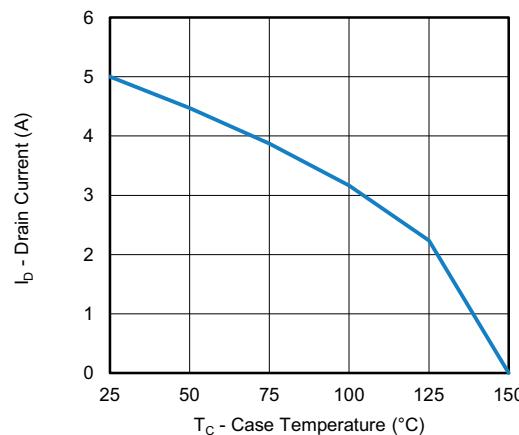


Fig. 10 - Maximum Drain Current vs. Case Temperature

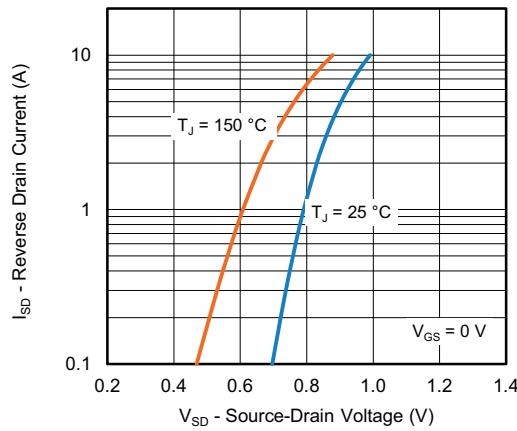


Fig. 8 - Typical Source-Drain Diode Forward Voltage

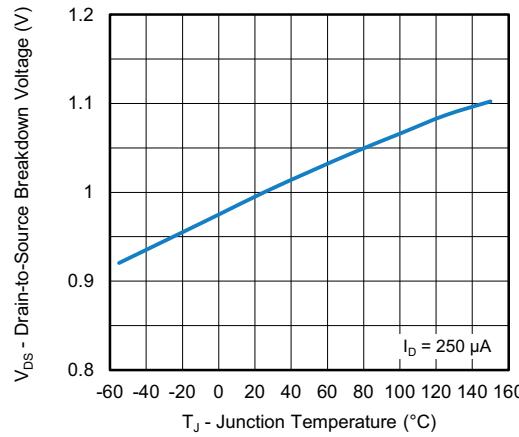


Fig. 11 - Temperature vs. Drain-to-Source Voltage

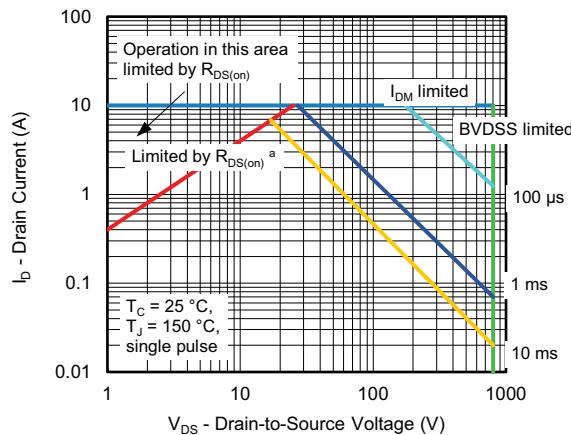


Fig. 9 - Maximum Safe Operating Area

Note

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

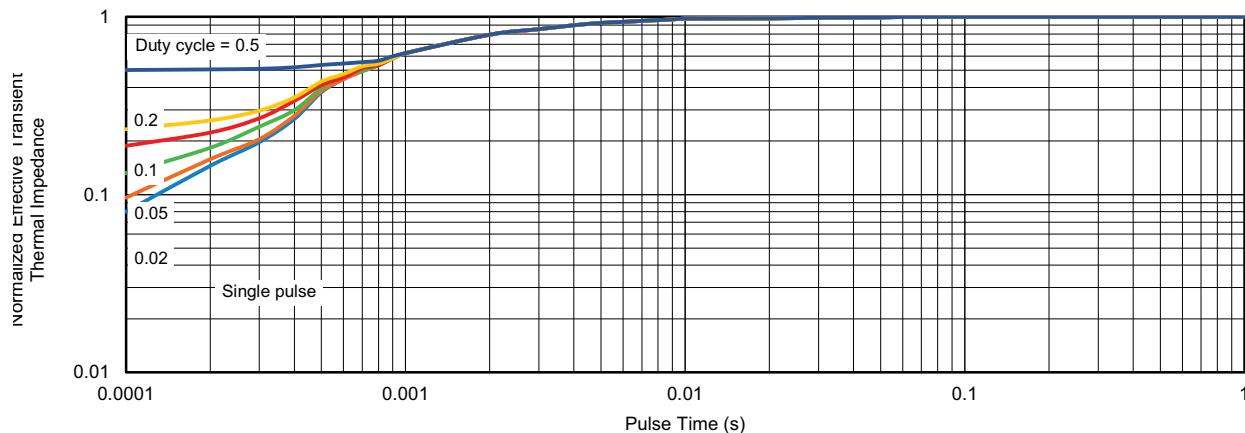


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

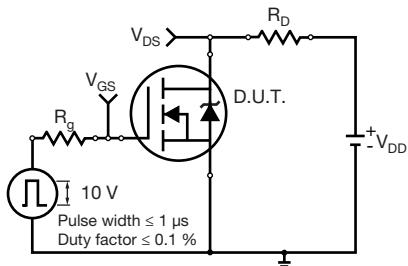


Fig. 13 - Switching Time Test Circuit

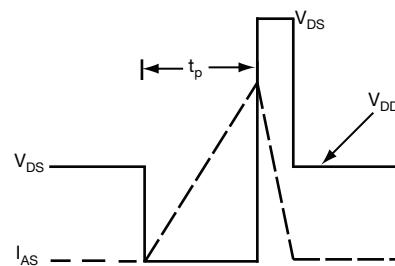


Fig. 16 - Unclamped Inductive Waveforms

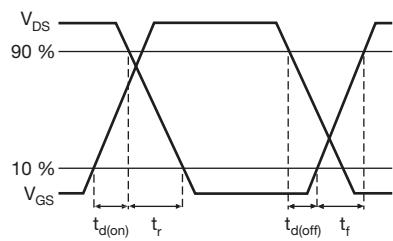


Fig. 14 - Switching Time Waveforms

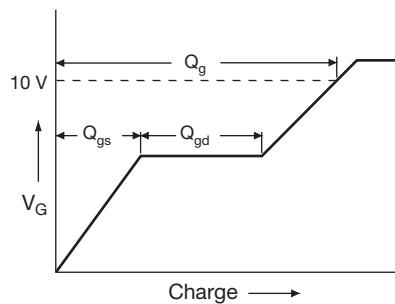


Fig. 17 - Basic Gate Charge Waveform

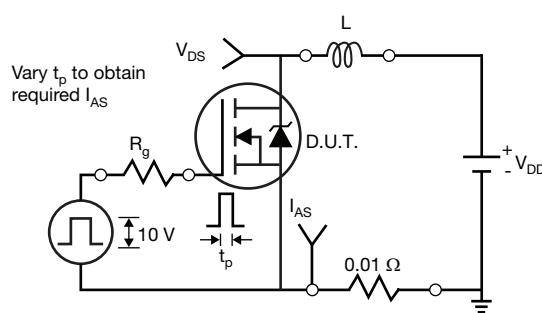


Fig. 15 - Unclamped Inductive Test Circuit

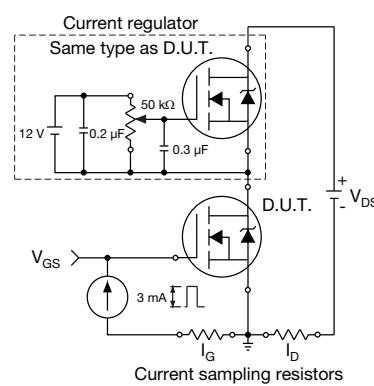


Fig. 18 - Gate Charge Test Circuit

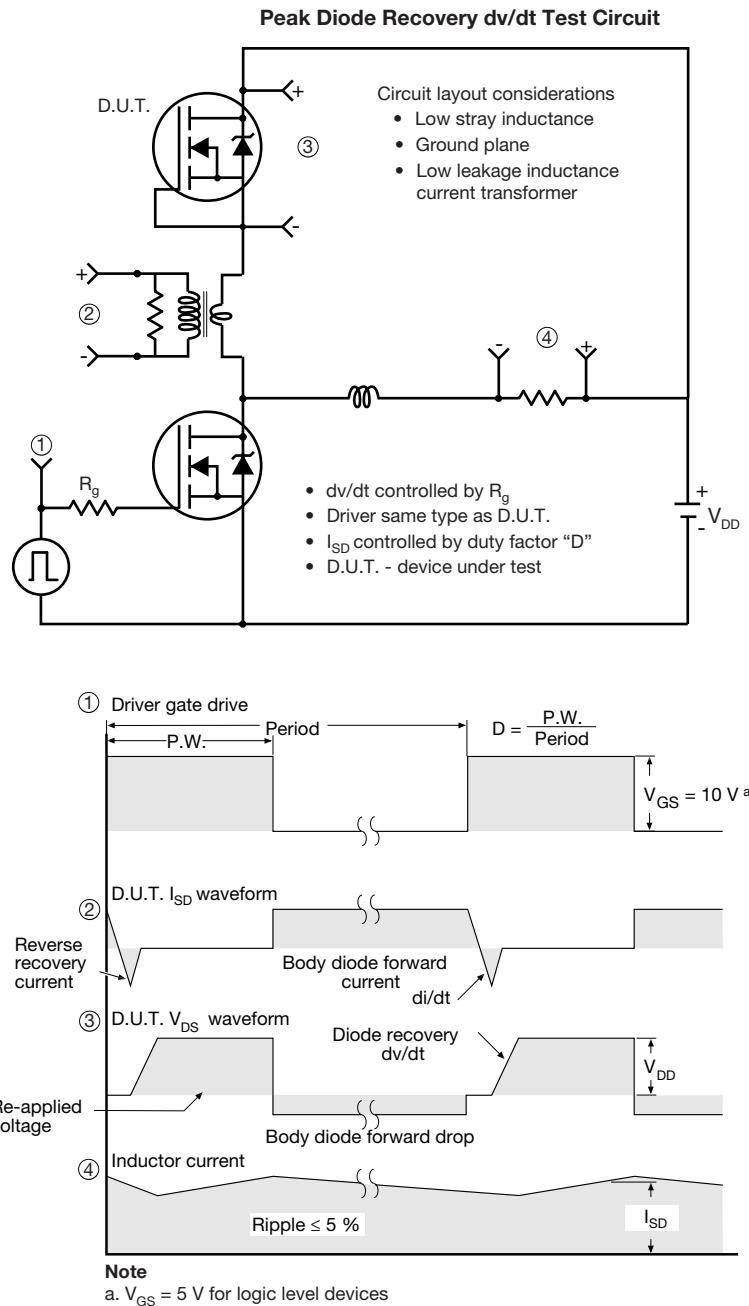
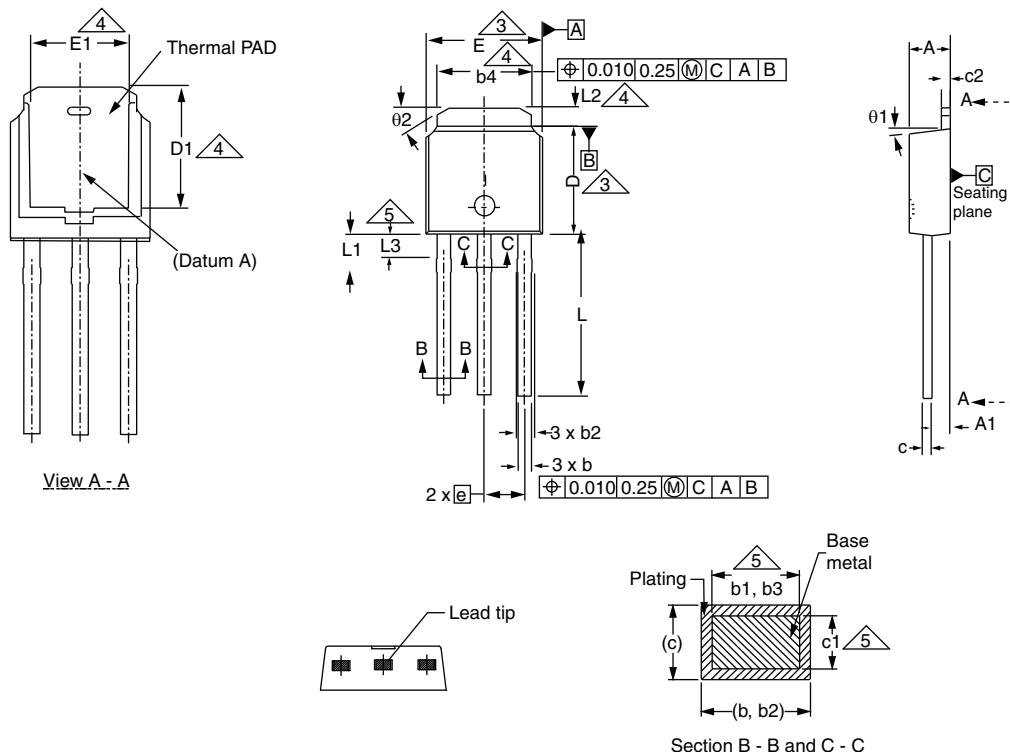


Fig. 19 - For N-Channel

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Case Outline for TO-251AA (High Voltage)

OPTION 1:



	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	0.89	1.14	0.035	0.045
b	0.64	0.89	0.025	0.035
b1	0.65	0.79	0.026	0.031
b2	0.76	1.14	0.030	0.045
b3	0.76	1.04	0.030	0.041
b4	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c1	0.41	0.56	0.016	0.022
c2	0.46	0.86	0.018	0.034
D	5.97	6.22	0.235	0.245

ECN: E21-0682-Rev. C, 27-Dec-2021

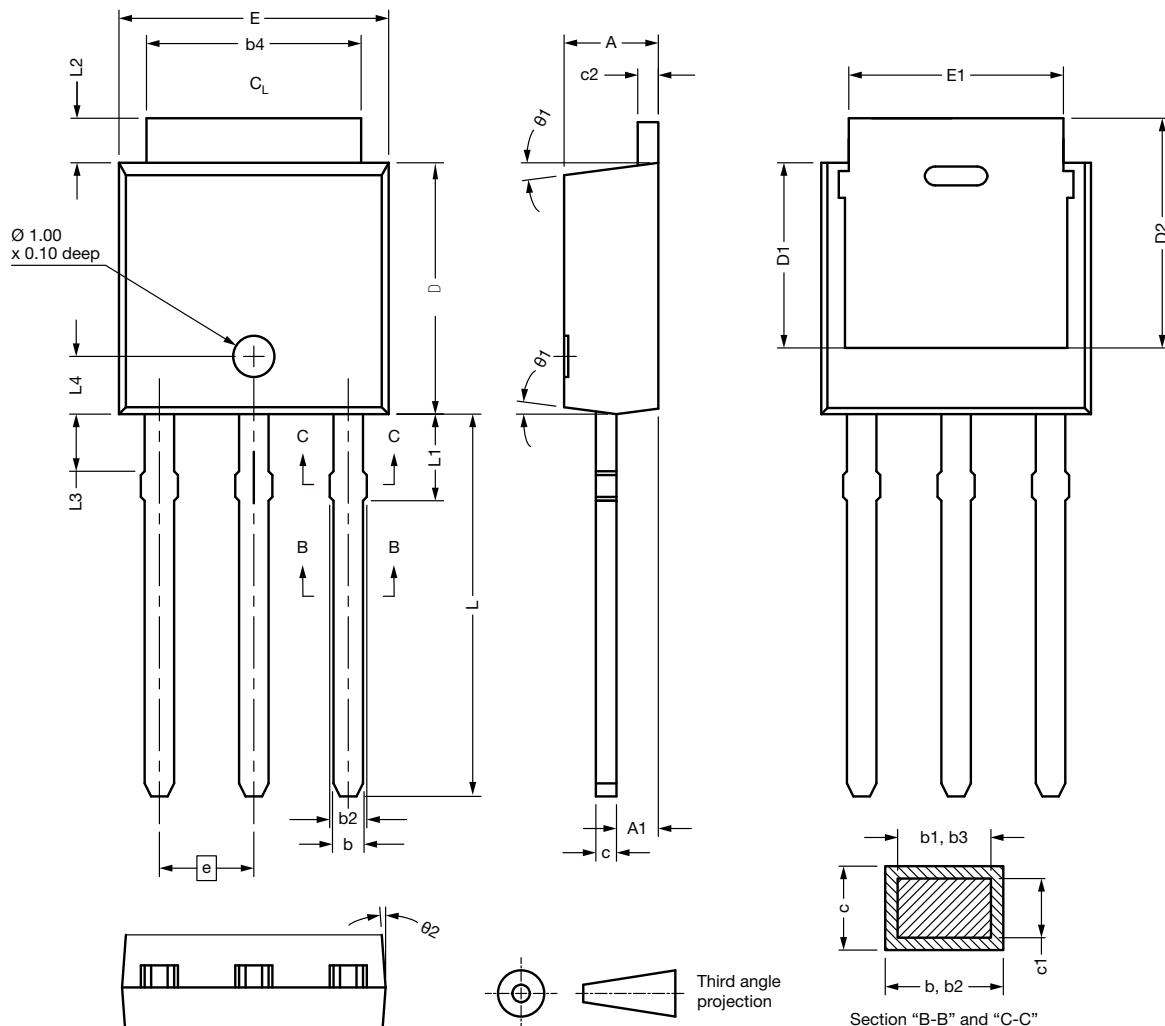
DWG: 5968

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
e	2.29 BSC		2.29 BSC	
L	8.89	9.65	0.350	0.380
L1	1.91	2.29	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.14	1.52	0.045	0.060
01	0'	15'	0'	15'
02	25'	35'	25'	35'

Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Dimension are shown in inches and millimeters
- Dimension D and E do not include mold flash. Mold flash shall not exceed 0.13 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions b4, L2, E1 and D1
- Lead dimension uncontrolled in L3
- Dimension b1, b3 and c1 apply to base metal only
- Outline conforms to JEDEC® outline TO-251AA

OPTION 2: FACILITY CODE = N



DIM.	MIN.	NOM.	MAX.
A	2.180	2.285	2.390
A1	0.890	1.015	1.140
b	0.640	0.765	0.890
b1	0.640	0.715	0.790
b2	0.760	0.950	1.140
b3	0.760	0.900	1.040
b4	4.950	5.205	5.460
c	0.460	-	0.610
c1	0.410	-	0.560
c2	0.460	-	0.610
D	5.970	6.095	6.220
D1	4.300	-	-

DIM.	MIN.	NOM.	MAX.
D2	5.380	-	-
E	6.350	6.540	6.730
E1	4.32	-	-
e	2.29 BSC		
L	8.890	9.270	9.650
L1	1.910	2.100	2.290
L2	0.890	1.080	1.270
L3	1.140	1.330	1.520
L4	1.300	1.400	1.500
Ø1	0°	7.5°	15°
Ø2	4°	-	-

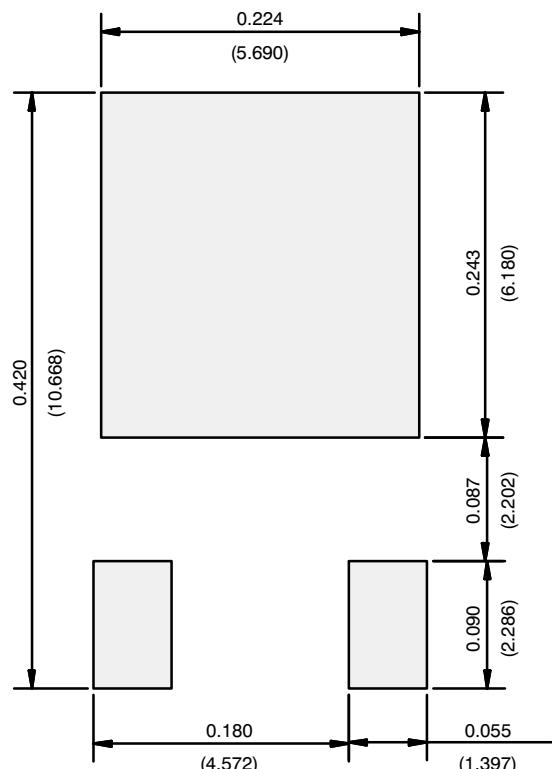
ECN: E21-0682-Rev. C 27-Dec-2021

DWG: 5968

Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- All dimension are in millimeters, angles are in degrees
- Heat sink side flash is max. 0.8 mm

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



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APPLICATION NOTE

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