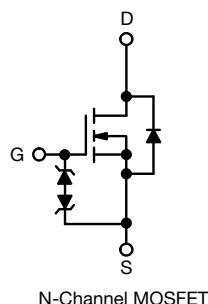
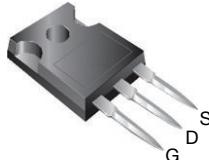


## E Series Power MOSFET

TO-247AC



### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	850	
$R_{DS(on)}$ typ. ( $\Omega$ ) at 25 °C	$V_{GS} = 10$ V	0.391
$Q_g$ max. (nC)	42	
$Q_{gs}$ (nC)	6	
$Q_{gd}$ (nC)	12	
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	TO-247AC
Lead (Pb)-free and halogen-free	SiHG11N80AE-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	8	A
		5	
Pulsed drain current <sup>a</sup>	$I_{DM}$	22	
Linear derating factor		0.6	W/°C
Single pulse avalanche energy <sup>b</sup>	$E_{AS}$	88	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	$T_J = 125$ °C	70	V/ns
Reverse diode dV/dt <sup>d</sup>		2	
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,  $I_{AS} = 2.5$  A
- 1.6 mm from case
- $I_{SD} \leq I_D$ ,  $dI/dt = 100$  A/μs, starting  $T_J = 25$  °C

**THERMAL RESISTANCE RATINGS**

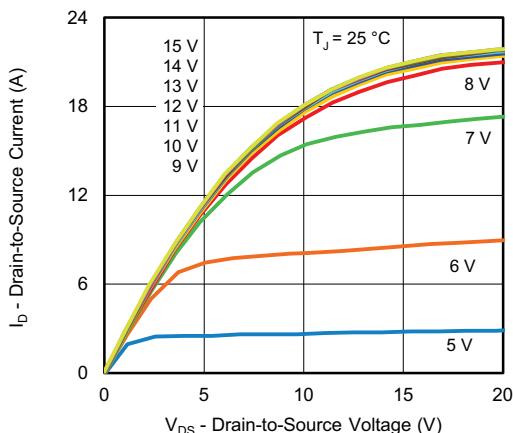
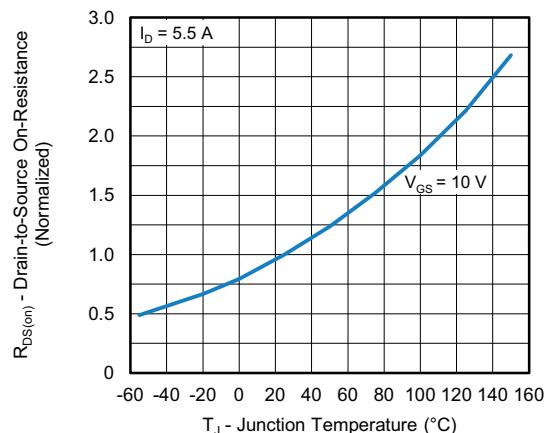
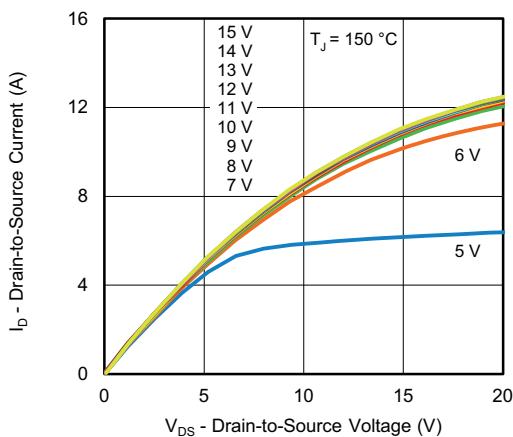
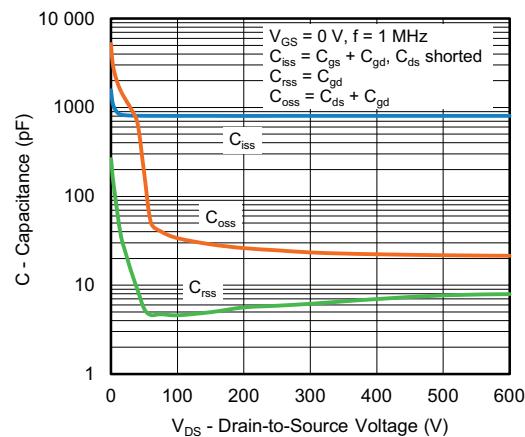
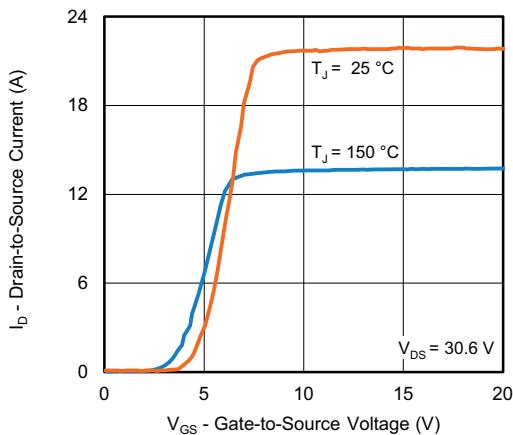
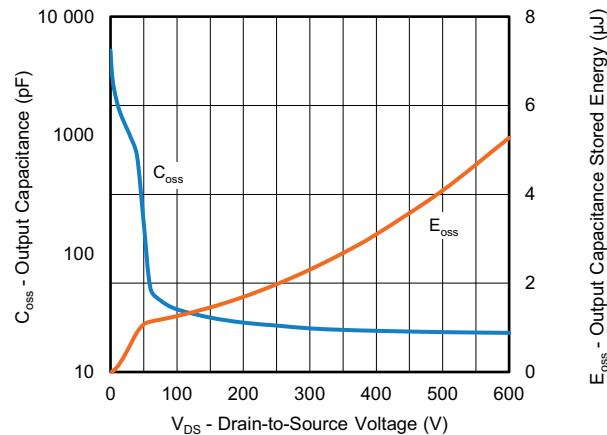
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	62	
Maximum junction-to-case (drain)	$R_{thJC}$	-	1.6	°C/W

**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	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		800	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1 \text{ mA}$		-	0.8	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		2	-	4	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	± 10	μA
		$V_{GS} = \pm 30 \text{ V}$		-	-	± 50	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 800 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	1	μA
		$V_{DS} = 640 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125 \text{ °C}$		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 5.5 \text{ A}$	-	0.391	0.450	Ω
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 30 \text{ V}$ , $I_D = 5.5 \text{ A}$		-	2.9	-	S
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$		-	804	-	pF
Output capacitance	$C_{oss}$			-	34	-	
Reverse transfer capacitance	$C_{rss}$			-	5	-	
Effective output capacitance, energy related <sup>a</sup>	$C_{o(er)}$	$V_{DS} = 0 \text{ V}$ to 480 V, $V_{GS} = 0 \text{ V}$		-	27	-	pF
Effective output capacitance, time related <sup>b</sup>	$C_{o(tr)}$			-	162	-	
Total gate charge	$Q_g$			-	28	42	nC
Gate-source charge	$Q_{gs}$	$V_{GS} = 10 \text{ V}$	$I_D = 5.5 \text{ A}$ , $V_{DS} = 640 \text{ V}$	-	6	-	
Gate-drain charge	$Q_{gd}$			-	12	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 640 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 9.1 \Omega$		-	13	26	ns
Rise time	$t_r$			-	15	30	
Turn-off delay time	$t_{d(off)}$			-	25	50	
Fall time	$t_f$			-	27	54	
Gate input resistance	$R_g$	$f = 1 \text{ MHz}$ , open drain		0.7	1.5	3	Ω
<b>Drain-Source Body Diode Characteristics</b>							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	8	A
Pulsed diode forward current	$I_{SM}$			-	-	22	
Diode forward voltage	$V_{SD}$	$T_J = 25 \text{ °C}$ , $I_S = 5.5 \text{ A}$ , $V_{GS} = 0 \text{ V}$		-	-	1.2	V
Reverse recovery time	$t_{rr}$	$T_J = 25 \text{ °C}$ , $I_F = I_S = 5.5 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 25 \text{ V}$		-	278	556	ns
Reverse recovery charge	$Q_{rr}$			-	2.9	5.8	μC
Reverse recovery current	$I_{RRM}$			-	17	-	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.  $V_{DS}$**

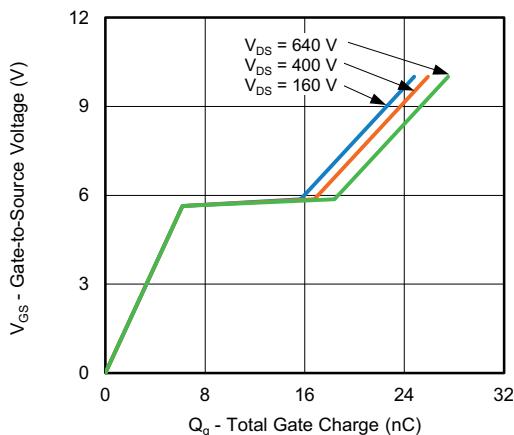


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

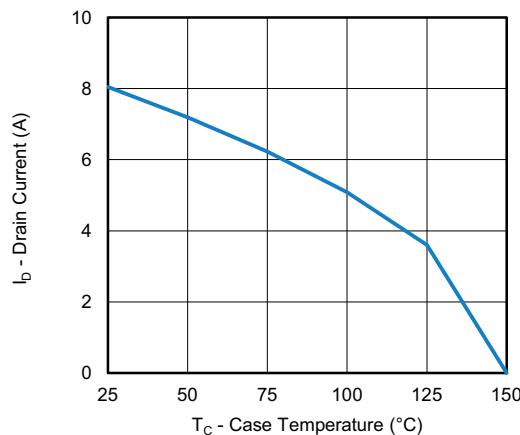


Fig. 10 - Maximum Drain Current vs. Case Temperature

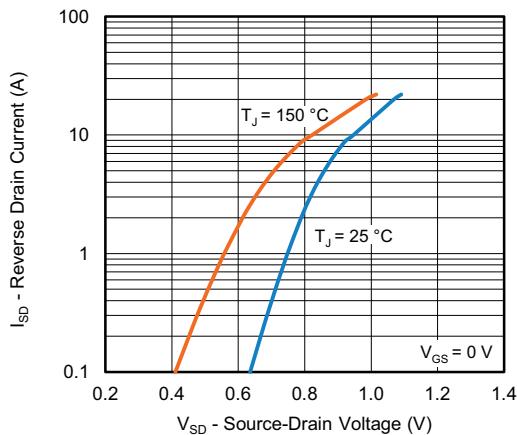


Fig. 8 - Typical Source-Drain Diode Forward Voltage

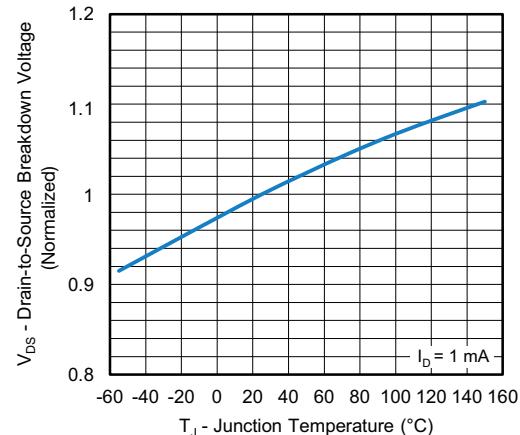


Fig. 11 - Temperature vs. Drain-to-Source Voltage

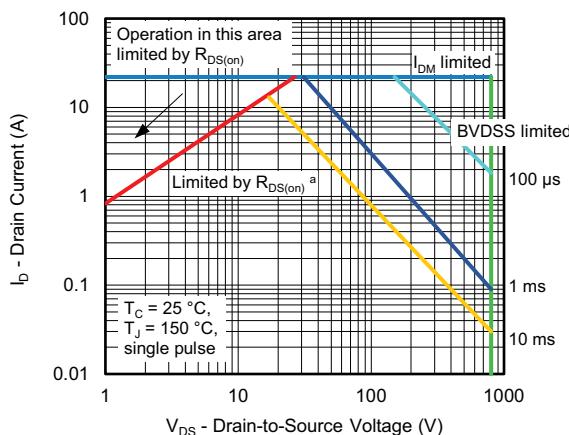


Fig. 9 - Maximum Safe Operating Area

#### Note

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

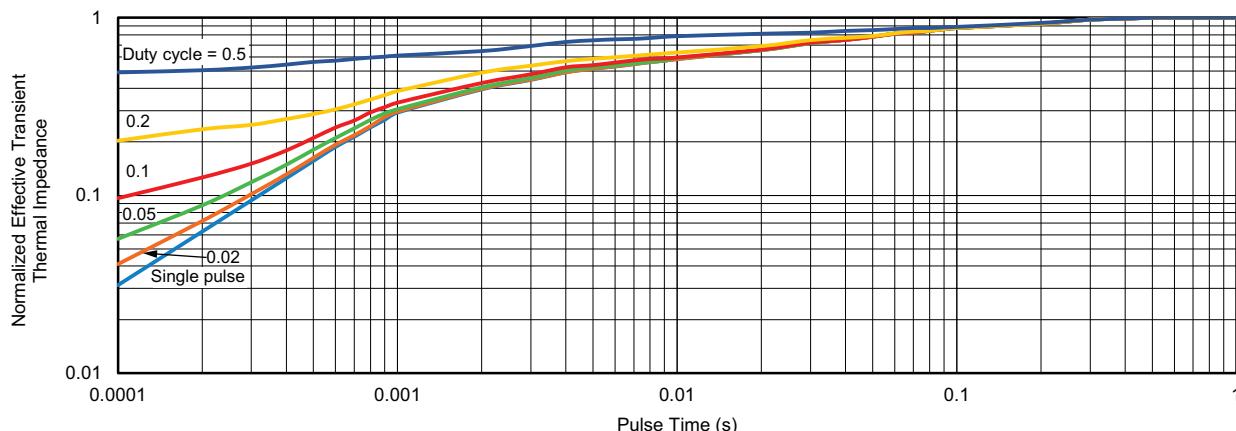


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

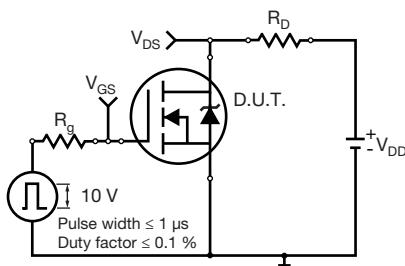


Fig. 13 - Switching Time Test Circuit

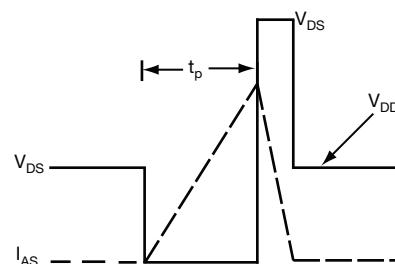


Fig. 16 - Unclamped Inductive Waveforms

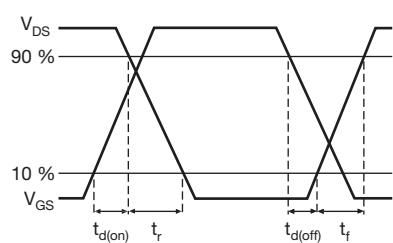


Fig. 14 - Switching Time Waveforms

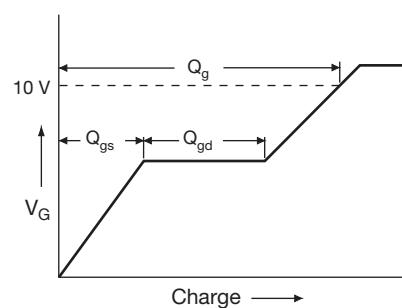


Fig. 17 - Basic Gate Charge Waveform

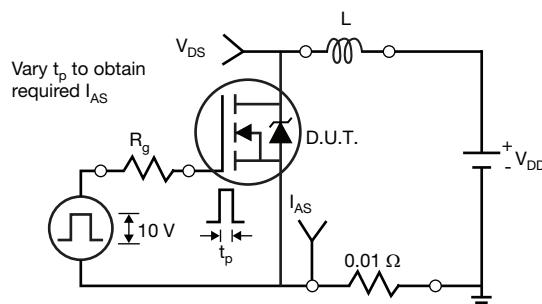


Fig. 15 - Unclamped Inductive Test Circuit

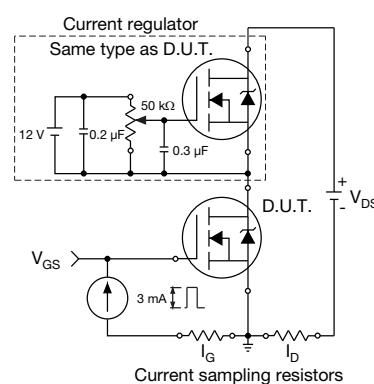
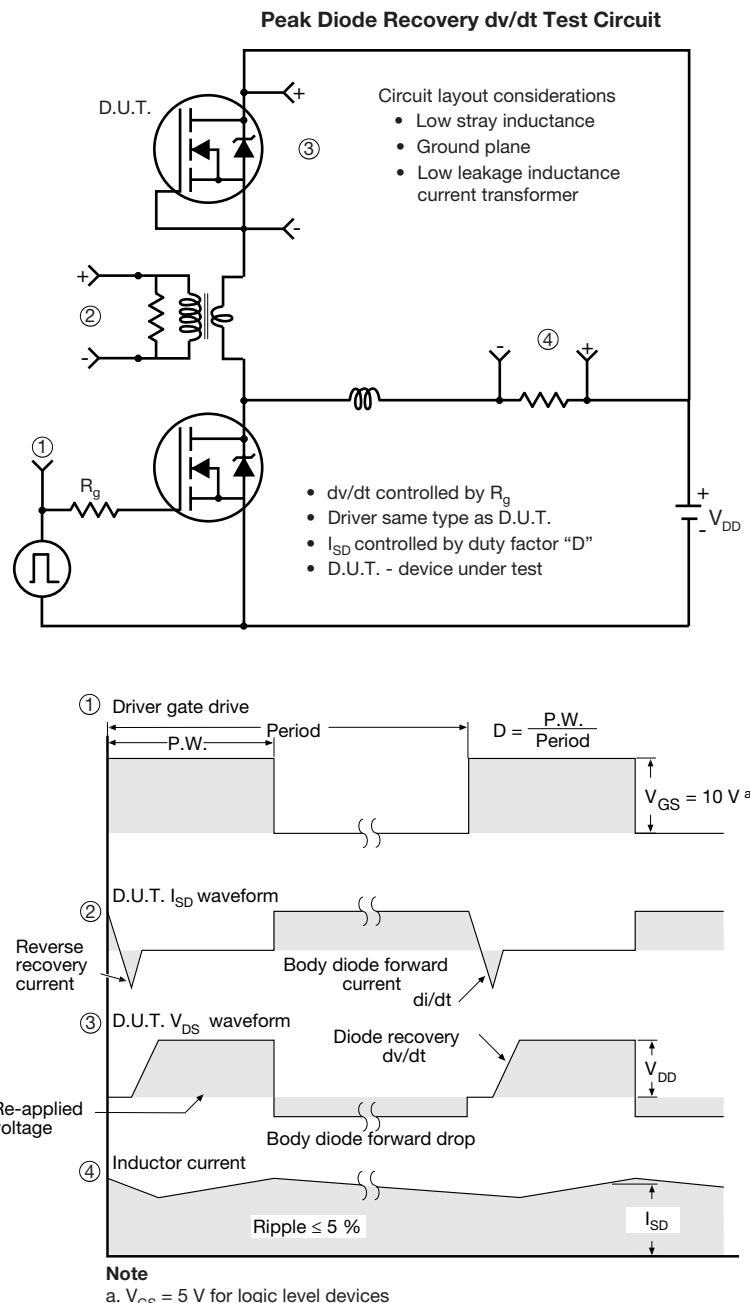


Fig. 18 - Gate Charge Test Circuit

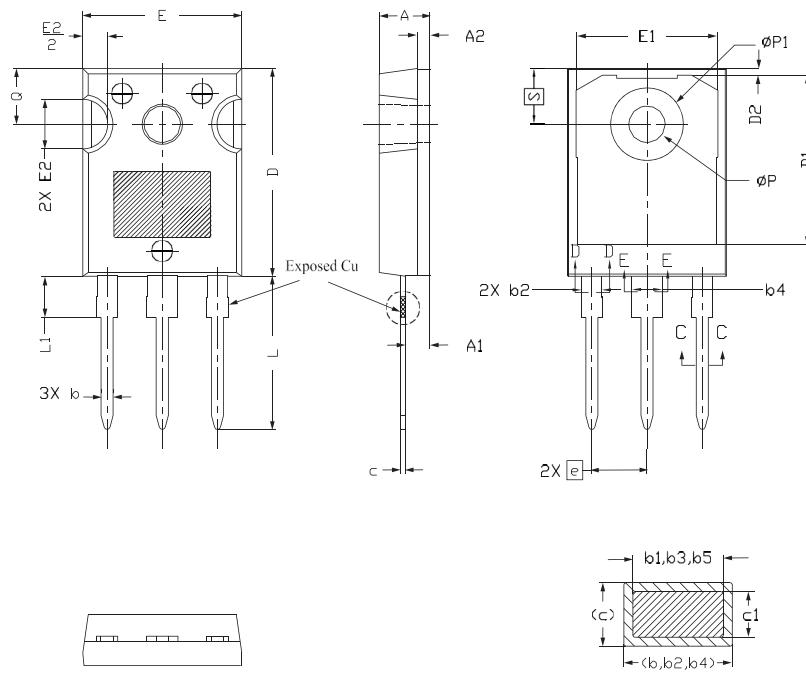


**Fig. 19 - For N-Channel**

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### TO-247AC (High Voltage)

#### VERSION 1: FACILITY CODE = 9



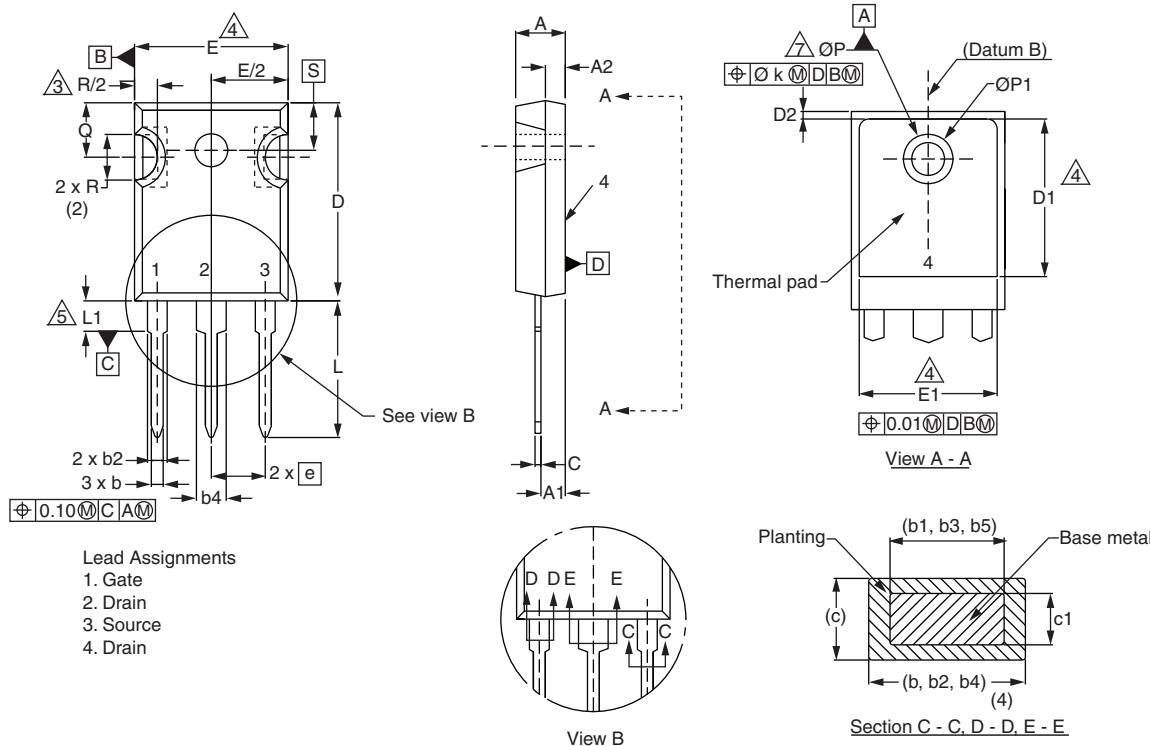
MILLIMETERS				
DIM.	MIN.	NOM.	MAX.	NOTES
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.17	1.27	1.37	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.40	0.50	0.60	6
c1	0.40	0.50	0.56	
D	20.40	20.55	20.70	4

#### Notes

- (1) Package reference: JEDEC® TO247, variation AC
- (2) All dimensions are in mm
- (3) Slot required, notch may be rounded
- (4) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outermost extremes of the plastic body
- (5) Thermal pad contour optional with dimensions D1 and E1
- (6) Lead finish uncontrolled in L1
- (7) Ø P to have a maximum draft angle of 1.5° to the top of the part with a maximum hole diameter of 3.91 mm
- (8) Dimension b2 and b4 does not include dambar protrusion. Allowable dambar protrusion shall be 0.1 mm total in excess of b2 and b4 dimension at maximum material condition

MILLIMETERS				
DIM.	MIN.	NOM.	MAX.	NOTES
D1	16.46	16.76	17.06	5
D2	0.56	0.66	0.76	
E	15.50	15.70	15.87	4
E1	13.46	14.02	14.16	5
E2	4.52	4.91	5.49	3
e	5.46 BSC			
L	14.90	15.15	15.40	
L1	3.96	4.06	4.16	6
Ø P	3.56	3.61	3.65	7
Ø P1	7.19 ref.			
Q	5.31	5.50	5.69	
S	5.51 BSC			

### VERSION 2: FACILITY CODE = Y



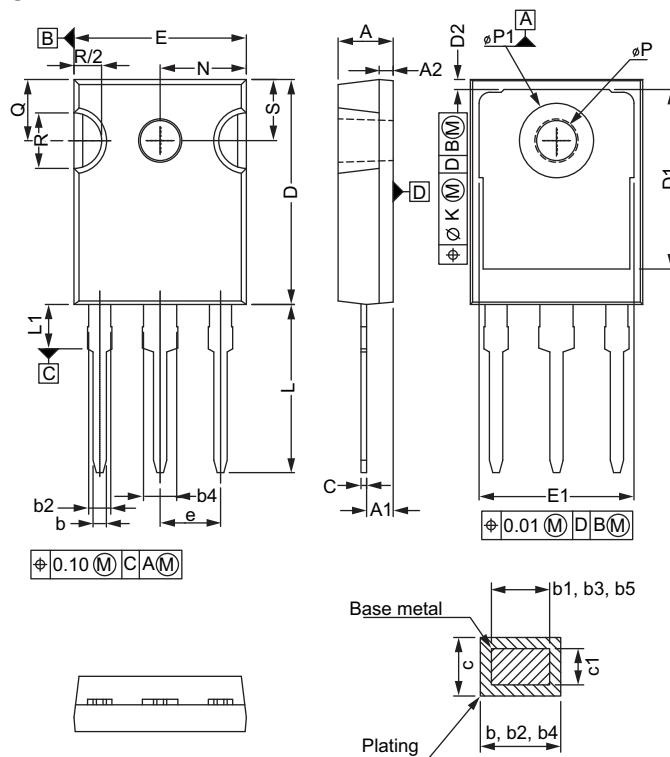
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
D2	0.51	1.30	
E	15.29	15.87	
E1	13.72	-	
e	5.46 BSC		
Ø k	0.254		
L	14.20	16.25	
L1	3.71	4.29	
Ø P	3.51	3.66	
Ø P1	-	7.39	
Q	5.31	5.69	
R	4.52	5.49	
S	5.51 BSC		

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC outline TO-247 with exception of dimension c

### VERSION 3: FACILITY CODE = N



MILLIMETERS		
DIM.	MIN.	MAX.
A	4.65	5.31
A1	2.21	2.59
A2	1.17	1.37
b	0.99	1.40
b1	0.99	1.35
b2	1.65	2.39
b3	1.65	2.34
b4	2.59	3.43
b5	2.59	3.38
c	0.38	0.89
c1	0.38	0.84
D	19.71	20.70
D1	13.08	-

ECN: E22-0452-Rev. G, 31-Oct-2022

DWG: 5971

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")

MILLIMETERS		
DIM.	MIN.	MAX.
D2	0.51	1.35
E	15.29	15.87
E1	13.46	-
e	5.46 BSC	
k	0.254	
L	14.20	16.10
L1	3.71	4.29
N	7.62 BSC	
P	3.56	3.66
P1	-	7.39
Q	5.31	5.69
R	4.52	5.49
S	5.51 BSC	

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