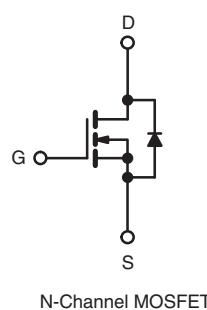
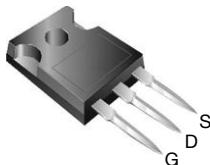


## D Series Power MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	550
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V 0.230
$Q_g$ max. (nC)	98
$Q_{gs}$ (nC)	13
$Q_{gd}$ (nC)	22
Configuration	Single

**TO-247AC**


N-Channel MOSFET

### FEATURES

- Optimal Design
  - Low Area Specific On-Resistance
  - Low Input Capacitance ( $C_{iss}$ )
  - Reduced Capacitive Switching Losses
  - High Body Diode Ruggedness
  - Avalanche Energy Rated ( $U_{AS}$ )
- 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 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

ORDERING INFORMATION	
Package	TO-247AC
Lead (Pb)-free	SiHG22N50D-E3
Lead (Pb)-free and Halogen-free	SiHG22N50D-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	$I_D$	22	A
			14	
Pulsed Drain Current <sup>a</sup>		$I_{DM}$	67	W/°C
Linear Derating Factor			2.5	
Single Pulse Avalanche Energy <sup>b</sup>		$E_{AS}$	139	mJ
Maximum Power Dissipation		$P_D$	312	W
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to + 150	°C
Drain-Source Voltage Slope	$T_J = 125$ °C		24	V/ns
Reverse Diode dV/dt <sup>c</sup>			0.38	
Soldering Recommendations (Peak Temperature)	for 10 s		300 <sup>c</sup>	°C

**Notes**

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.3$  mH,  $R_g = 25$  Ω,  $I_{AS} = 11$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ ,  $dI/dt = 100$  A/μs, starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

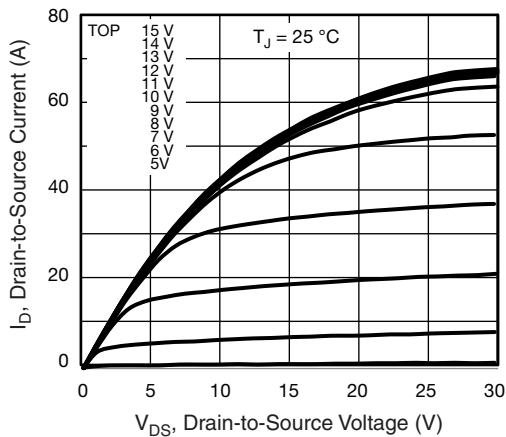
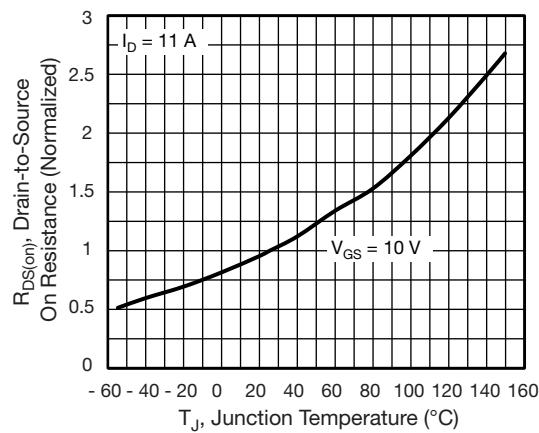
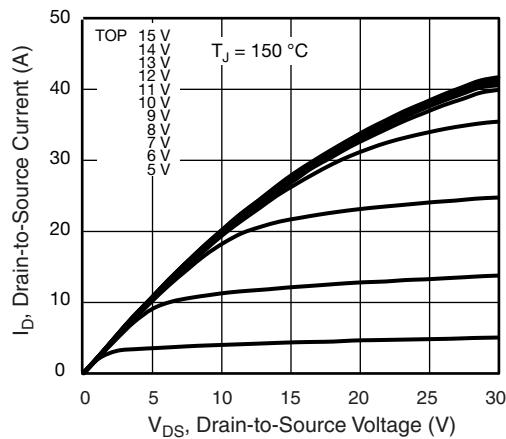
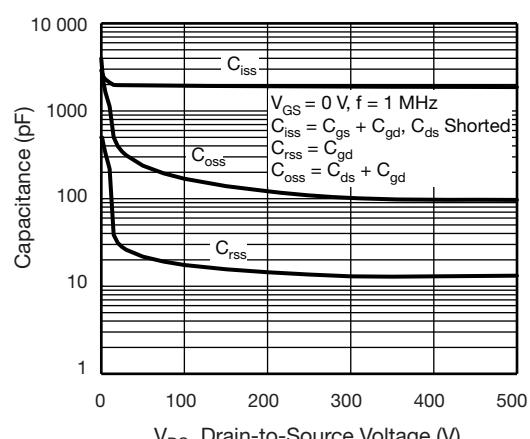
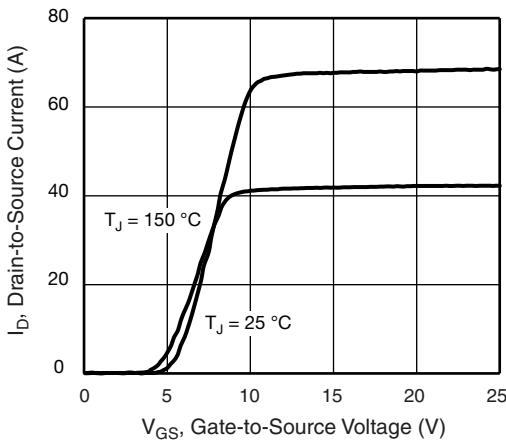
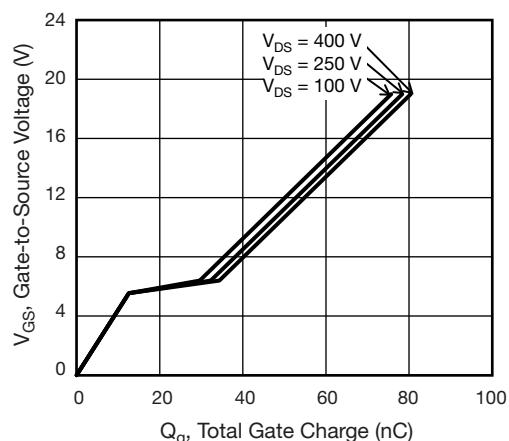
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.4	

**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	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 250 \mu\text{A}$		-	0.6	-	$^{\circ}\text{C}/\text{V}$
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		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	$\mu\text{A}$
		$V_{DS} = 400 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125 \text{ }^{\circ}\text{C}$		-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 11 \text{ A}$	-	0.185	0.230	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50 \text{ V}$ , $I_D = 11 \text{ A}$		-	8	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$		-	1938	-	pF
Output Capacitance	$C_{oss}$			-	169	-	
Reverse Transfer Capacitance	$C_{rss}$			-	18	-	
Effective Output Capacitance, Energy Related <sup>a</sup>	$C_{o(er)}$	$V_{DS} = 0 \text{ V}$ to 400 V, $V_{GS} = 0 \text{ V}$		-	144	-	pF
Effective Output Capacitance, Time Related <sup>b</sup>	$C_{o(tr)}$			-	210	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10 \text{ V}$	$I_D = 11 \text{ A}$ , $V_{DS} = 400 \text{ V}$	-	49	98	nC
Gate-Source Charge	$Q_{gs}$			-	13	-	
Gate-Drain Charge	$Q_{gd}$			-	22	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 380 \text{ V}$ , $I_D = 11 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 4.7 \Omega$		-	21	42	ns
Rise Time	$t_r$		-	42	84		
Turn-Off Delay Time	$t_{d(off)}$		-	47	94		
Fall Time	$t_f$		-	40	80		
Gate Input Resistance	$R_g$	$f = 1 \text{ MHz}$ , open drain		-	1.4	-	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	22	A
Pulsed Diode Forward Current	$I_{SM}$			-	-	88	
Diode Forward Voltage	$V_{SD}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_S = 11 \text{ A}$ , $V_{GS} = 0 \text{ V}$		-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_F = I_S = 11 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 20 \text{ V}$		-	384	-	ns
Reverse Recovery Charge	$Q_{rr}$			-	4.7	-	
Reverse Recovery Current	$I_{RRM}$			-	23	-	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 % to 80 %  $V_{DSS}$ .  
b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % 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**

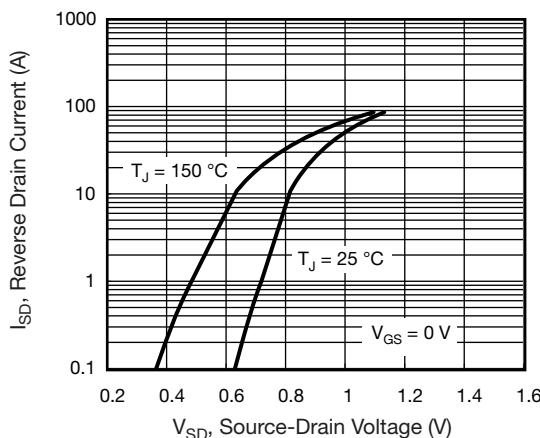


Fig. 7 - Typical Source-Drain Diode Forward Voltage

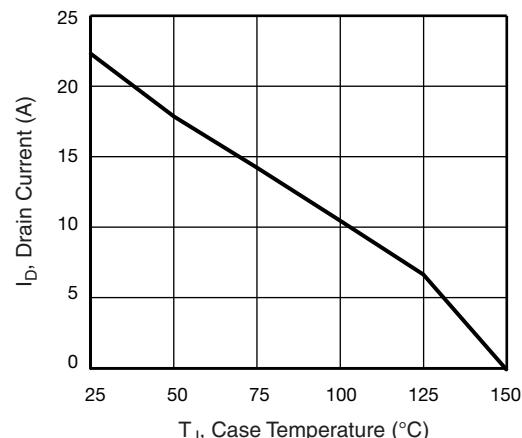


Fig. 9 - Maximum Drain Current vs. Case Temperature

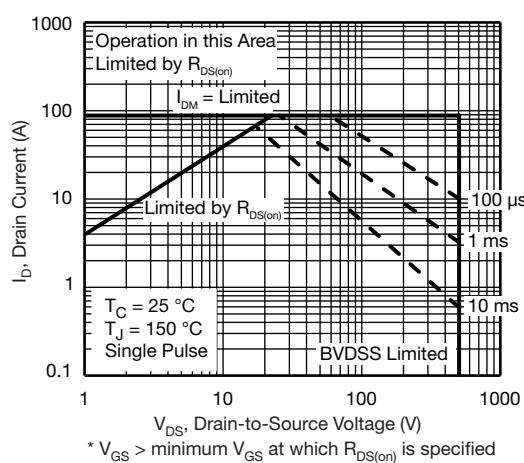


Fig. 8 - Maximum Safe Operating Area

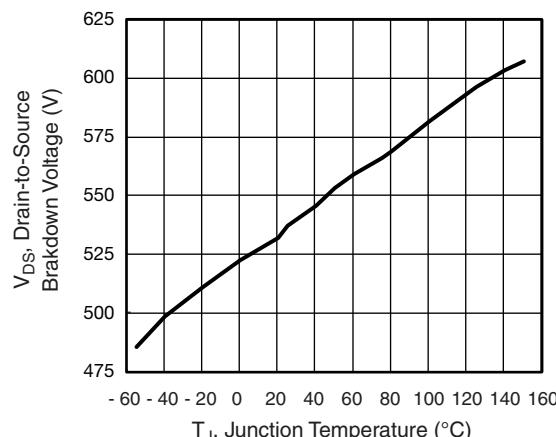


Fig. 10 - Temperature vs. Drain-to-Source Voltage

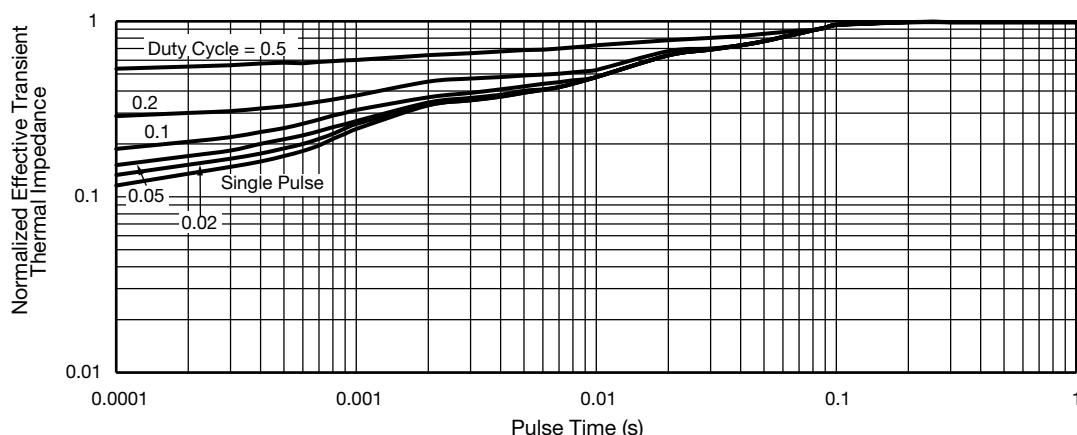
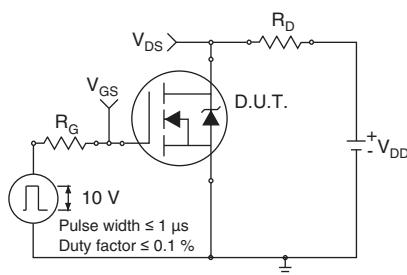
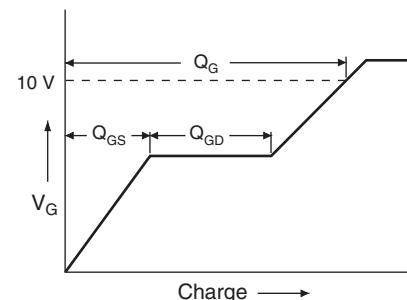


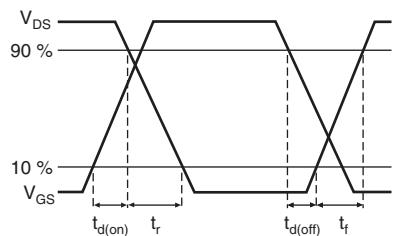
Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case



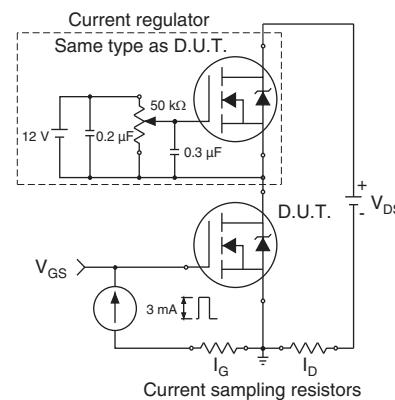
**Fig. 12 - Switching Time Test Circuit**



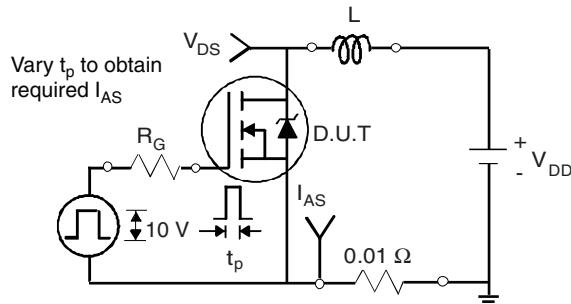
**Fig. 16 - Basic Gate Charge Waveform**



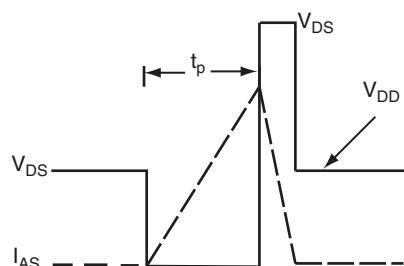
**Fig. 13 - Switching Time Waveforms**



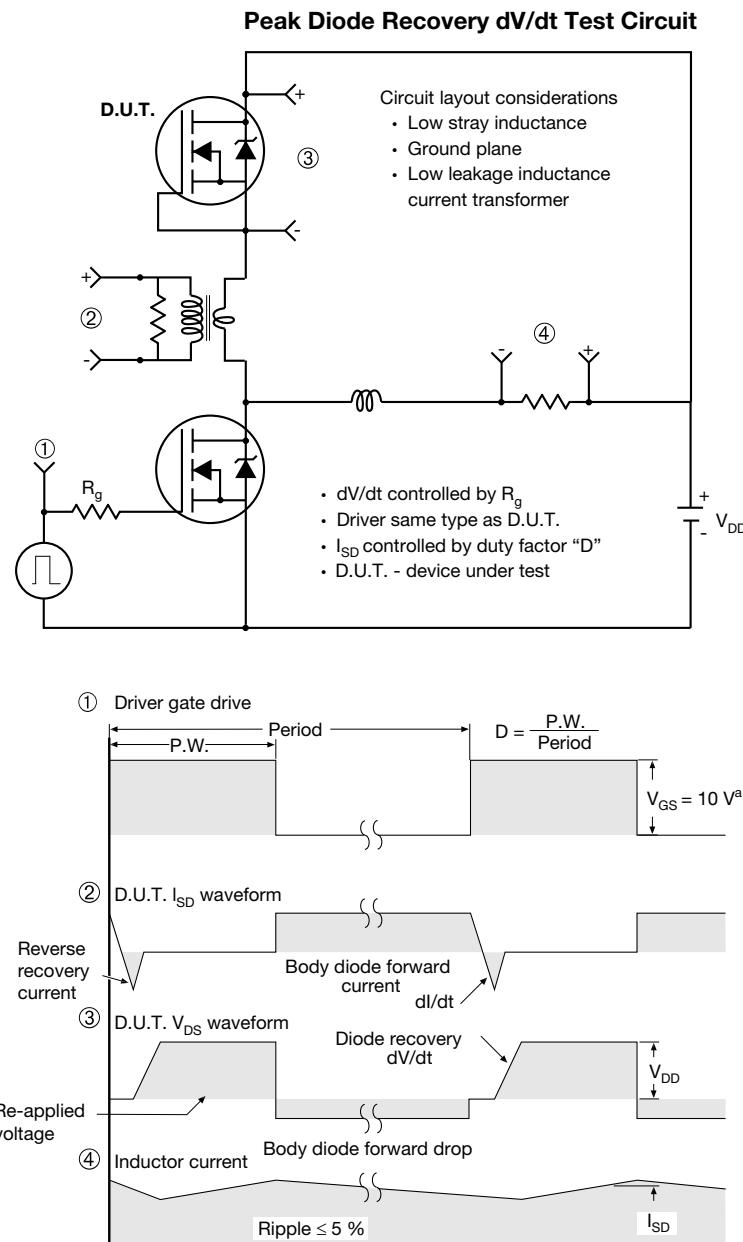
**Fig. 17 - Gate Charge Test Circuit**



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



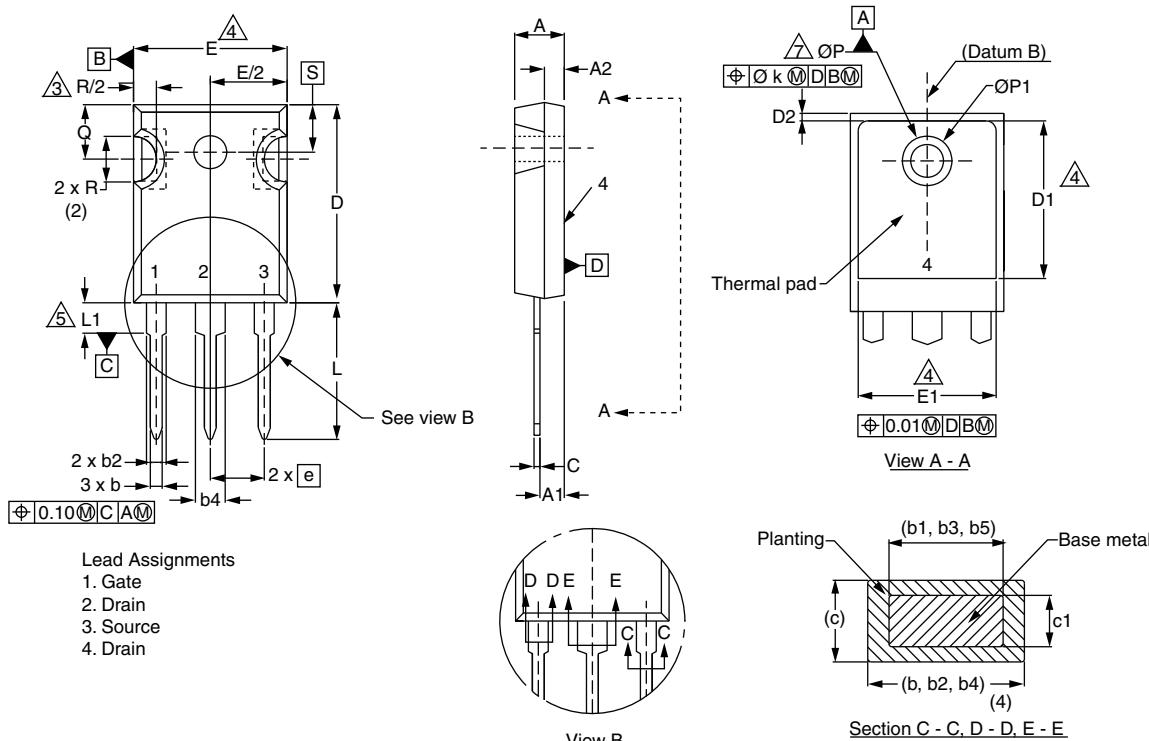
**Fig. 15 - Unclamped Inductive Waveforms**



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

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### TO-247AC (High Voltage)



Lead Assignments  
 1. Gate  
 2. Drain  
 3. Source  
 4. Drain

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.58	5.31	0.180	0.209
A1	2.21	2.59	0.087	0.102
A2	1.17	2.49	0.046	0.098
b	0.99	1.40	0.039	0.055
b1	0.99	1.35	0.039	0.053
b2	1.53	2.39	0.060	0.094
b3	1.65	2.37	0.065	0.093
b4	2.42	3.43	0.095	0.135
b5	2.59	3.38	0.102	0.133
c	0.38	0.86	0.015	0.034
c1	0.38	0.76	0.015	0.030
D	19.71	20.82	0.776	0.820
D1	13.08	-	0.515	-

ECN: X13-0103-Rev. D, 01-Jul-13  
 DWG: 5971

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D2	0.51	1.30	0.020	0.051
E	15.29	15.87	0.602	0.625
E1	13.72	-	0.540	-
e	5.46 BSC		0.215 BSC	
Ø k	0.254		0.010	
L	14.20	16.25	0.559	0.640
L1	3.71	4.29	0.146	0.169
N	7.62 BSC		0.300 BSC	
Ø P	3.51	3.66	0.138	0.144
Ø P1	-	7.39	-	0.291
Q	5.31	5.69	0.209	0.224
R	4.52	5.49	0.178	0.216
S	5.51 BSC		0.217 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.
8. Xian and Mingxin actually photo.



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