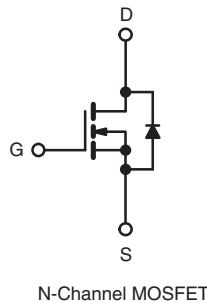
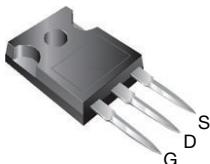


## E Series Power MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	700
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V 0.047
$Q_g$ max. (nC)	369
$Q_{gs}$ (nC)	66
$Q_{gd}$ (nC)	93
Configuration	Single

TO-247AC



N-Channel MOSFET

### FEATURES

- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low input capacitance ( $C_{iss}$ )
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)
- 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
  - Solar (PV inverters)

### ORDERING INFORMATION

Package	TO-247AC
Lead (Pb)-free and Halogen-free	SiHG64N65E-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	64	A
		40	
	$I_{DM}$	202	
Pulsed Drain Current <sup>a</sup>		4.2	W/°C
Linear Derating Factor		1800	mJ
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	520	W
Maximum Power Dissipation	$P_D$	-55 to +150	°C
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$		
Drain-Source Voltage Slope	$dV/dt$	37	V/ns
Reverse Diode $dV/dt$ <sup>d</sup>		16	
Soldering Recommendations (Peak Temperature) <sup>c</sup>		300	
for 10 s			

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 100$  V, starting  $T_J = 25$  °C,  $L = 73.5$  mH,  $R_g = 25$  Ω,  $I_{AS} = 7$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ ,  $dI/dt = 100$  A/μs, starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

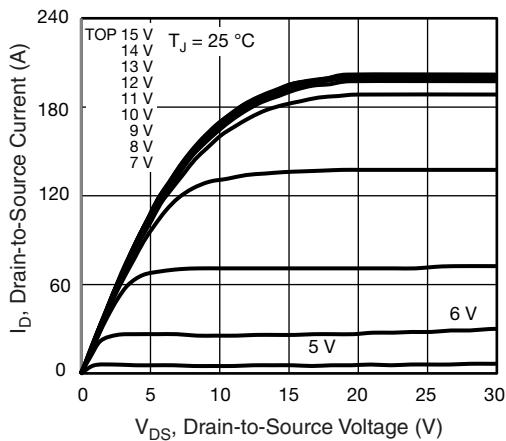
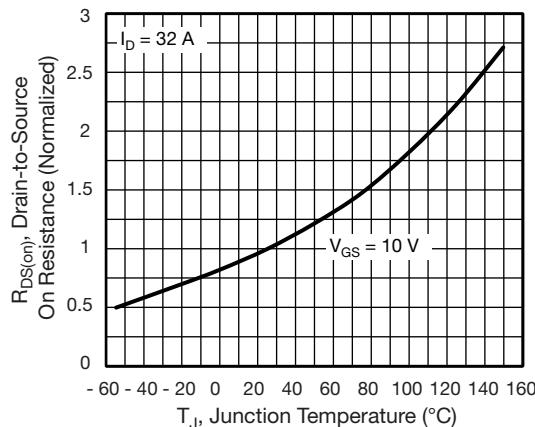
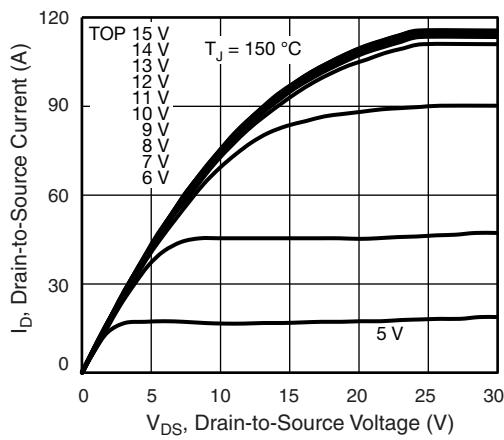
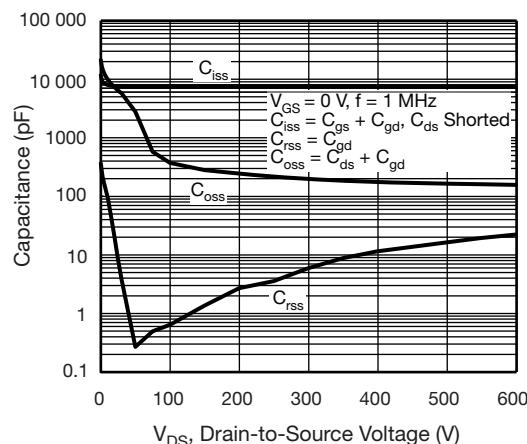
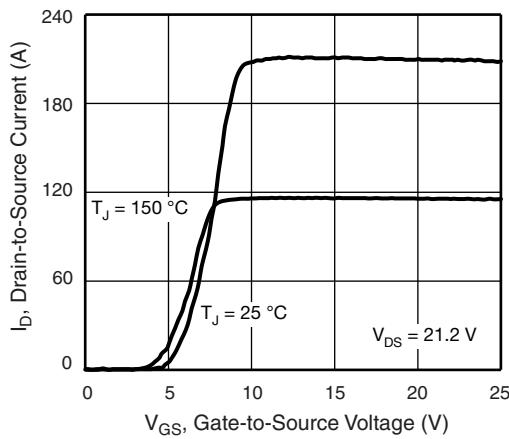
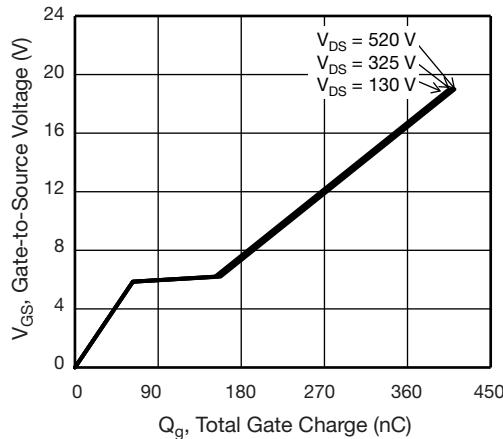
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.24	

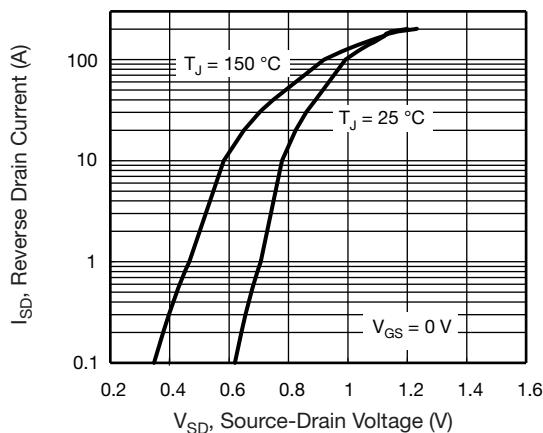
**SPECIFICATIONS** ( $T_J = 25^{\circ}\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		650	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25^{\circ}\text{C}$ , $I_D = 1 \text{ mA}$		-	0.70	-	$\text{V}/^{\circ}\text{C}$
Gate-Source Threshold Voltage (N)	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		2	-	4	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA
		$V_{GS} = \pm 30 \text{ V}$		-	-	$\pm 1$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 650 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	1	$\mu\text{A}$
		$V_{DS} = 520 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^{\circ}\text{C}$		-	-	25	
Drain-Source On-State Resistance	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$	$I_D = 32 \text{ A}$	-	0.039	0.047	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 30 \text{ V}$ , $I_D = 32 \text{ A}$		-	24	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$		-	7497	-	pF
Output Capacitance	$C_{oss}$			-	366	-	
Reverse Transfer Capacitance	$C_{rss}$			-	1	-	
Effective Output Capacitance, Energy Related <sup>a</sup>	$C_{o(er)}$			-	276	-	
Effective Output Capacitance, Time Related <sup>b</sup>	$C_{o(tr)}$	$V_{DS} = 0 \text{ V to } 520 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	986	-	
Total Gate Charge	$Q_g$			-	239	369	
Gate-Source Charge	$Q_{gs}$			$V_{GS} = 10 \text{ V}$	$I_D = 32 \text{ A}$ , $V_{DS} = 520 \text{ V}$	-	nC
Gate-Drain Charge	$Q_{gd}$			-	66	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 520 \text{ V}$ , $I_D = 6 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 9.1 \Omega$		-	93	-	ns
Rise Time	$t_r$			-	66	99	
Turn-Off Delay Time	$t_{d(off)}$			-	122	183	
Fall Time	$t_f$			-	213	320	
Gate Input Resistance	$R_g$	$f = 1 \text{ MHz}$ , open drain		-	103	206	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	64	A
Pulsed Diode Forward Current	$I_{SM}$			-	-	202	
Diode Forward Voltage	$V_{SD}$	$T_J = 25^{\circ}\text{C}$ , $I_S = 24 \text{ A}$ , $V_{GS} = 0 \text{ V}$		-	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}$ , $I_F = I_S = 32 \text{ A}$ , $dl/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 25 \text{ V}$		-	697	1394	ns
Reverse Recovery Charge	$Q_{rr}$			-	18	36	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$			-	44	-	A

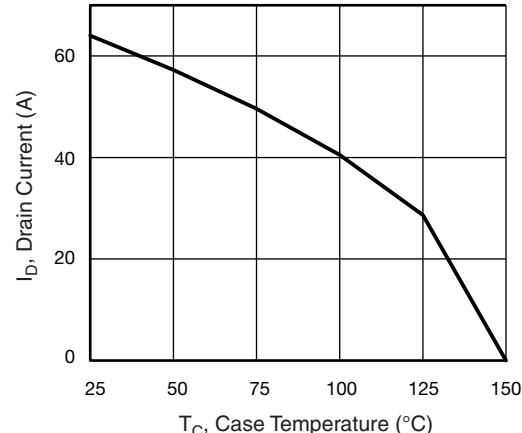
**Notes**

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 %  $V_{DSS}$ .

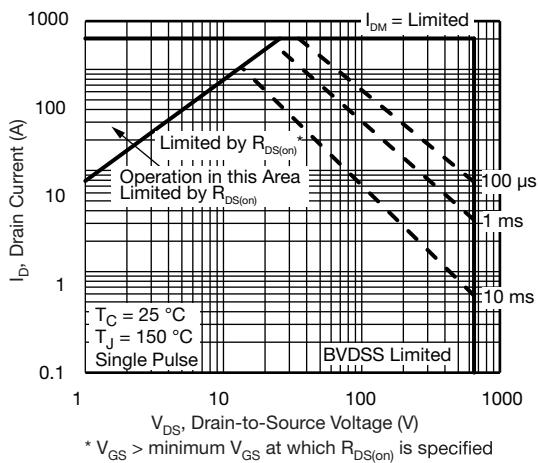
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**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**



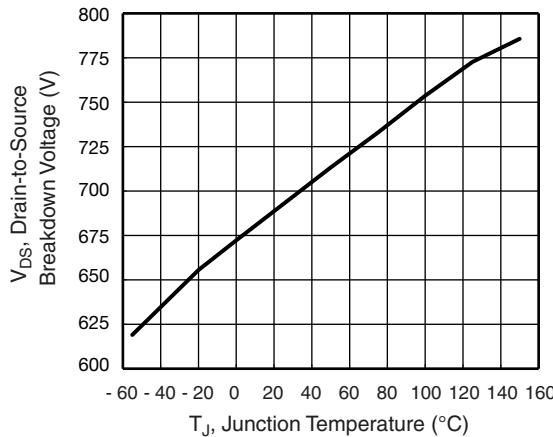
**Fig. 7 - Typical Source-Drain Diode Forward Voltage**



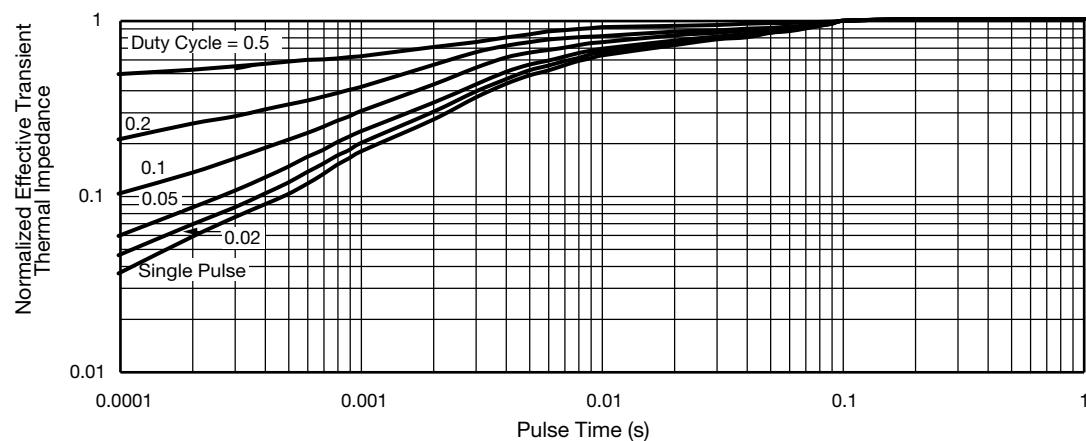
**Fig. 9 - Maximum Drain Current vs. Case Temperature**



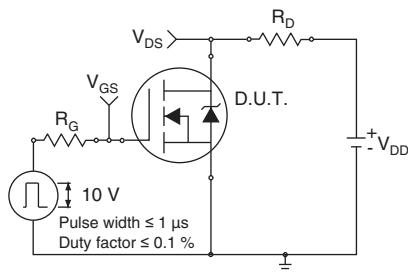
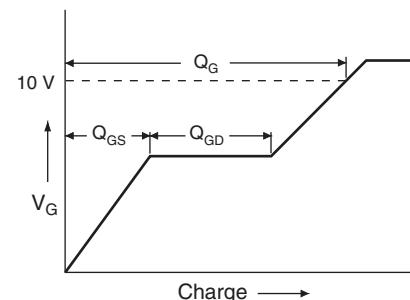
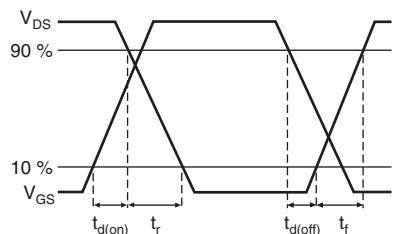
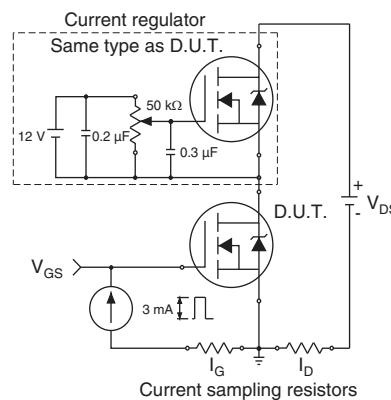
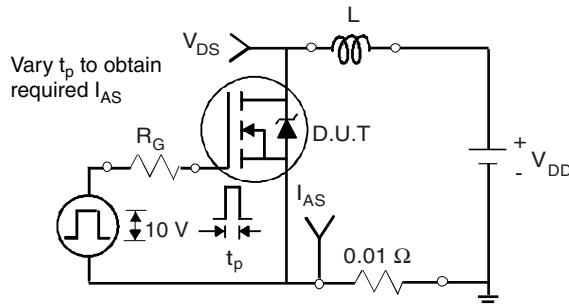
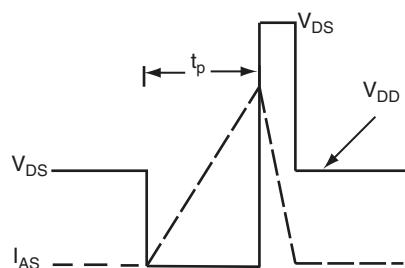
**Fig. 8 - Maximum Safe Operating Area**

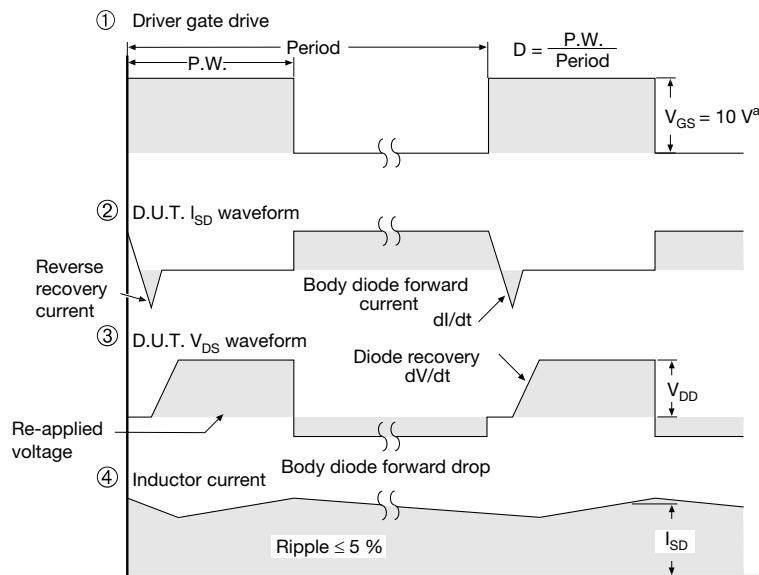
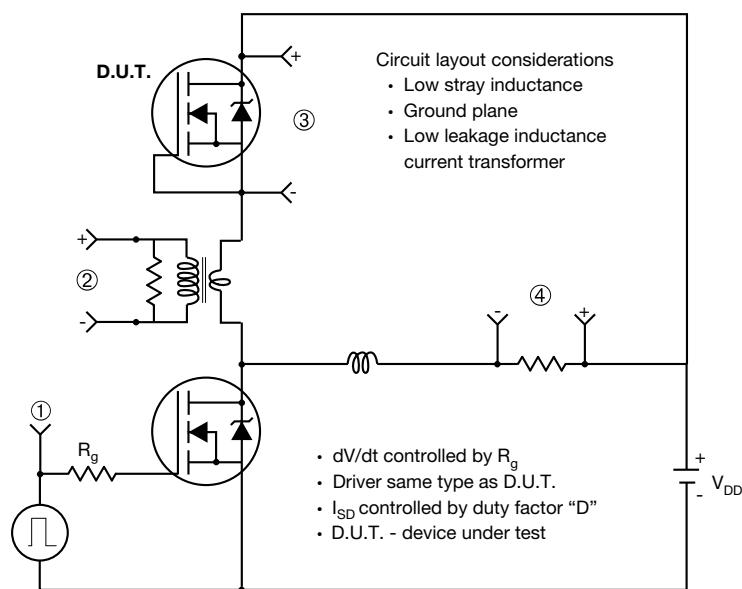


**Fig. 10 - Temperature vs. Drain-to-Source Voltage**



**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**

**Peak Diode Recovery dV/dt Test Circuit**

**Note**

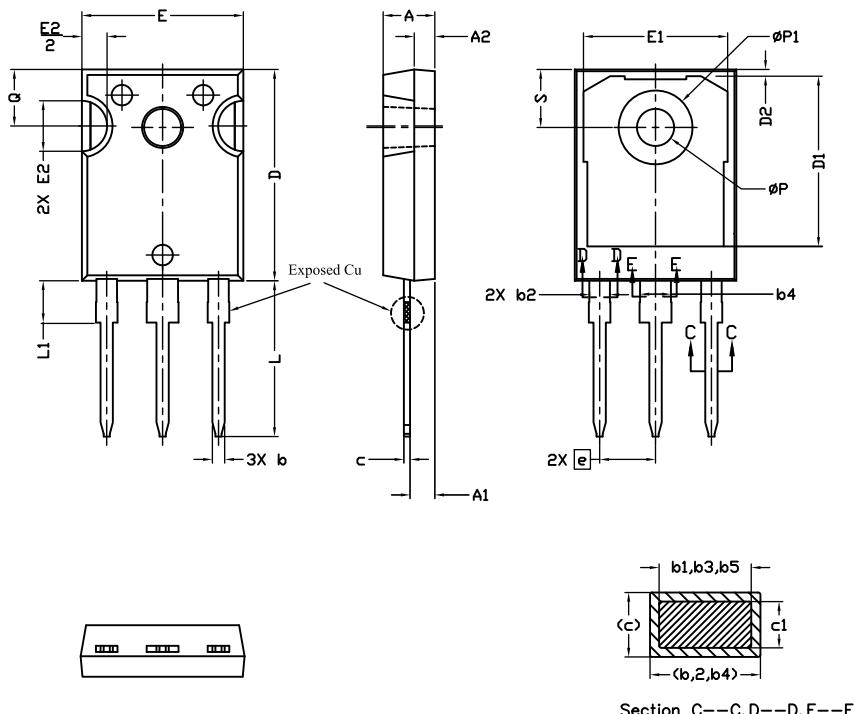
a.  $V_{GS} = 5 \text{ V}$  for logic level devices

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

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## TO-247AC (High Voltage)

### VERSION 1: FACILITY CODE = 9



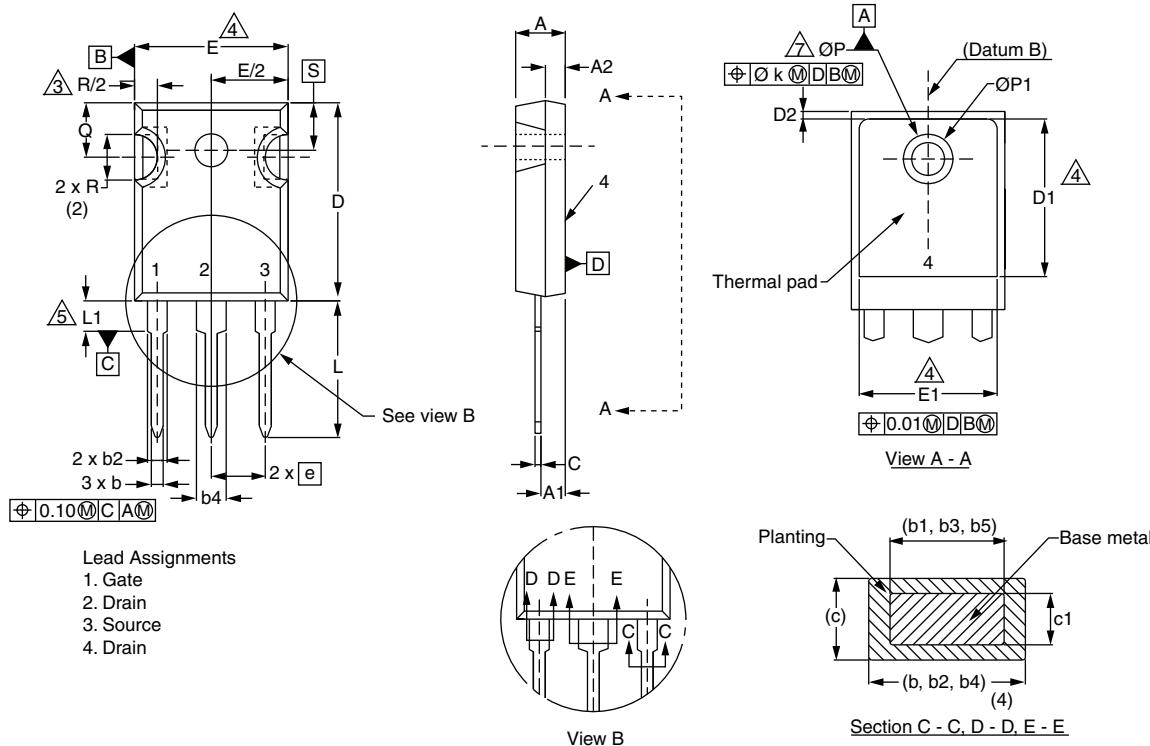
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.83	5.21	
A1	2.29	2.55	
A2	1.50	2.49	
b	1.12	1.33	
b1	1.12	1.28	
b2	1.91	2.39	6
b3	1.91	2.34	
b4	2.87	3.22	6, 8
b5	2.87	3.18	
c	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
D1	16.25	16.85	5
D2	0.56	0.76	
E	15.50	15.87	4
E1	13.46	14.16	5
E2	4.52	5.49	3
e	5.44 BSC		
L	14.90	15.40	
L1	3.96	4.16	6
Ø P	3.56	3.65	7
Ø P1	7.19 ref.		
Q	5.31	5.69	
S	5.54	5.74	

#### 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

### VERSION 2: FACILITY CODE = Y



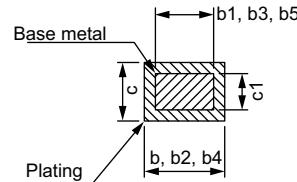
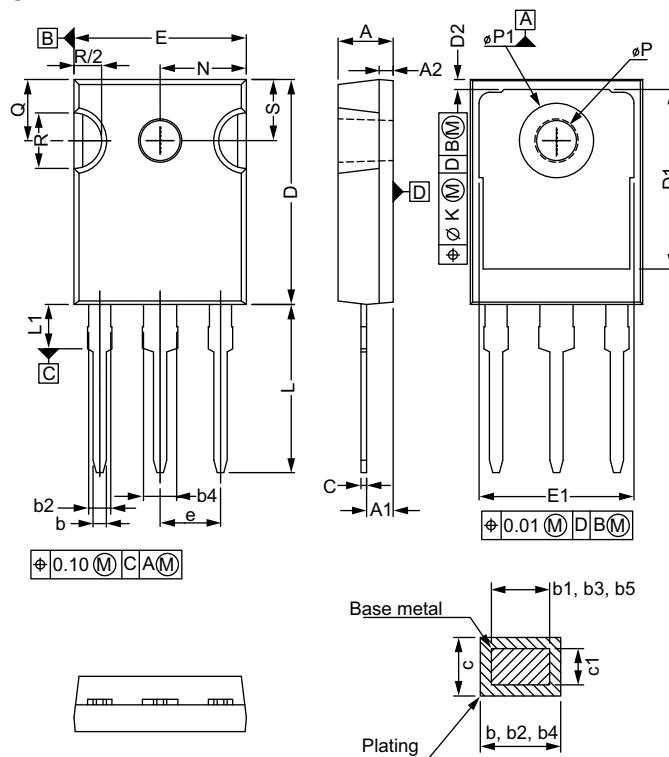
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

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: E20-0545-Rev. F, 19-Oct-2020

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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