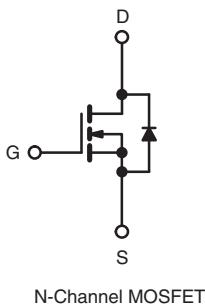
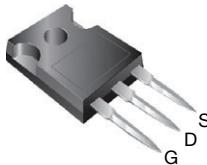


## Power MOSFET

TO-247AC



N-Channel MOSFET

### FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- Ultra low on-resistance
- Very low thermal resistance
- Isolated central mounting hole
- 175 °C operating temperature
- Fast switching
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


RoHS\*  
Available

### PRODUCT SUMMARY

V <sub>DS</sub> (V)	60	
R <sub>DS(on)</sub> (Ω)	V <sub>GS</sub> = 10 V	0.009
Q <sub>g</sub> (max.) (nC)	190	
Q <sub>gs</sub> (nC)	55	
Q <sub>gd</sub> (nC)	90	
Configuration	Single	

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-247AC package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220AB devices. The TO-247AC is similar but superior to the earlier TO-218 package because its isolated mounting hole. It also provides greater creepage distances between pins to meet the requirements of most safety specifications.

### ORDERING INFORMATION

Package	TO-247AC
Lead (Pb)-free	IRFP064PbF

### ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V <sub>DS</sub>	60	V
Gate-source voltage	V <sub>GS</sub>	± 20	
Continuous drain current <sup>e</sup>	I <sub>D</sub>	70	A
Continuous drain current		70	
Pulsed drain current <sup>a</sup>	I <sub>DM</sub>	520	
Linear derating factor		2.0	W/°C
Single pulse avalanche energy <sup>b</sup>	E <sub>AS</sub>	1000	mJ
Repetitive avalanche current <sup>a</sup>	I <sub>AR</sub>	70	A
Repetitive avalanche energy <sup>a</sup>	E <sub>AR</sub>	30	mJ
Maximum Power Dissipation	P <sub>D</sub>	300	W
Peak Diode Recovery dV/dt c	dV/dt	4.5	V/ns
Operating Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Soldering Recommendations (Peak Temperature)	for 10 s	300	
Mounting Torque	6-32 or M3 screw	10 1.1	lbf · in N · m

### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- V<sub>DD</sub> = 25 V, starting T<sub>J</sub> = 25 °C, L = 69 µH, R<sub>g</sub> = 25 Ω, I<sub>AS</sub> = 130 A (see fig. 12)
- I<sub>SD</sub> ≤ 130 A, dI/dt ≤ 300 A/µs, V<sub>DD</sub> ≤ V<sub>DS</sub>, T<sub>J</sub> ≤ 175 °C
- 1.6 mm from case
- Current limited by the package (die current = 130 A)

<b>THERMAL RESISTANCE RATINGS</b>				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	40	$^{\circ}\text{C}/\text{W}$
Case-to-sink, flat, greased surface	$R_{thCS}$	0.24	-	
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.50	

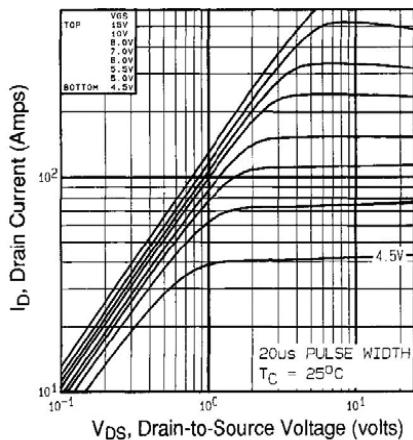
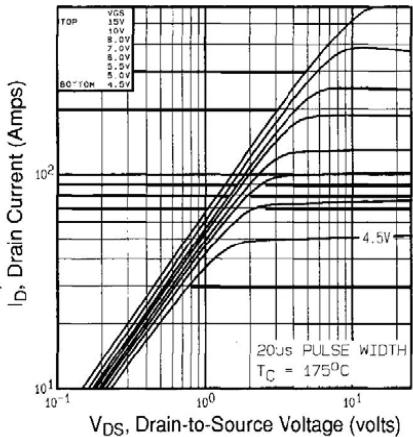
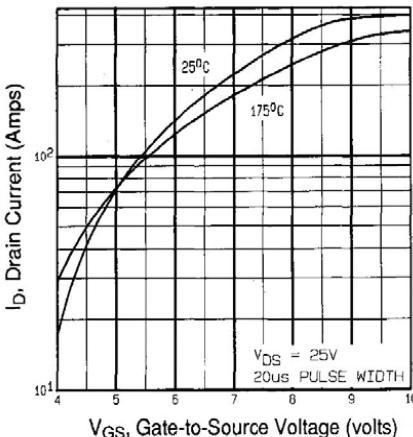
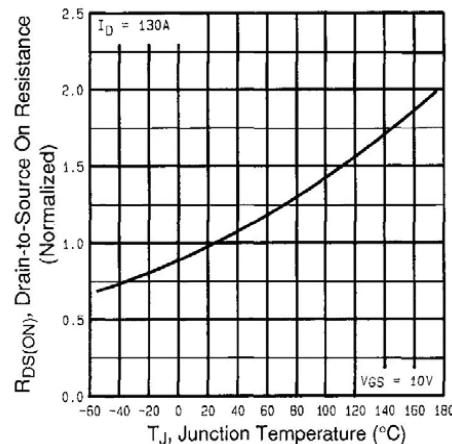
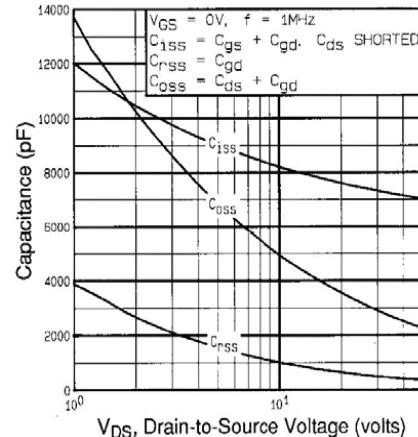
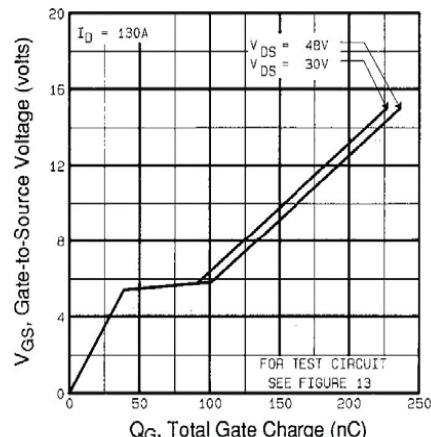
<b>SPECIFICATIONS</b> ( $T_J = 25 \text{ }^{\circ}\text{C}$ , unless otherwise noted)								
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		60	-	-	V	
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25 \text{ }^{\circ}\text{C}$ , $I_D = 1 \text{ mA}$		-	0.048	-	$\text{V}/^{\circ}\text{C}$	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		2.0	-	4.0	V	
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 60 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	25	$\mu\text{A}$	
		$V_{DS} = 48 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 150 \text{ }^{\circ}\text{C}$		-	-	250		
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 78 \text{ A}^b$	-	-	0.009	$\Omega$	
Forward transconductance	$g_{fs}$	$V_{DS} = 25 \text{ V}$ , $I_D = 78 \text{ A}^b$		38	-	-	S	
<b>Dynamic</b>								
Input capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ , $f = 1.0 \text{ MHz}$ , see fig. 5		-	7400	-	pF	
Output capacitance	$C_{oss}$			-	3200	-		
Reverse transfer capacitance	$C_{rss}$			-	540	-		
Total gate charge	$Q_g$	$V_{GS} = 10 \text{ V}$	$I_D = 130 \text{ A}$ , $V_{DS} = 48 \text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	190	nC	
Gate-source charge	$Q_{gs}$			-	-	55		
Gate-drain charge	$Q_{gd}$			-	-	90		
Turn-on delay time	$t_{d(on)}$			-	21	-		
Rise time	$t_r$	$V_{DD} = 30 \text{ V}$ , $I_D = 130 \text{ A}$ , $R_g = 4.3 \Omega$ , $R_D = 0.22 \Omega$ , see fig. 10 <sup>b</sup>		-	190	-	ns	
Turn-off delay time	$t_{d(off)}$			-	110	-		
Fall time	$t_f$			-	190	-		
Internal drain inductance	$L_D$			-	5.0	-		
Internal source inductance	$L_S$	Between lead, 6 mm (0.25") from package and center of die contact		-	13	-	nH	
<b>Drain-Source Body Diode Characteristics</b>								
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	70 <sup>c</sup>	A	
Pulsed diode forward current <sup>a</sup>	$I_{SM}$			-	-	520		
Body diode voltage	$V_{SD}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_S = 130 \text{ A}$ , $V_{GS} = 0 \text{ V}^b$		-	-	3.0	V	
Body diode reverse recovery time	$t_{rr}$	$T_J = 25 \text{ }^{\circ}\text{C}$ , $I_F = 130 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	160	250	ns	
Body diode reverse recovery charge	$Q_{rr}$			-	0.9	1.7	$\mu\text{C}$	
Forward turn-on time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )						

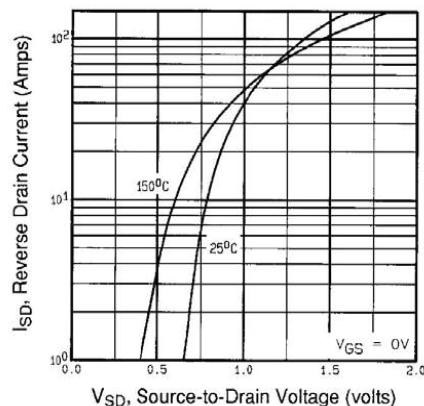
**Notes**

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

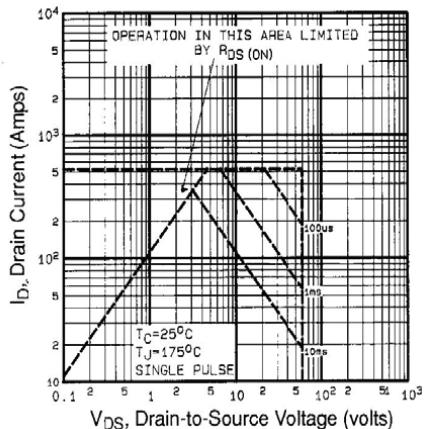
b. Pulse width  $\leq 300 \mu\text{s}$ ; duty cycle  $\leq 2 \%$

c. Current limited by the package (die current = 130 A)

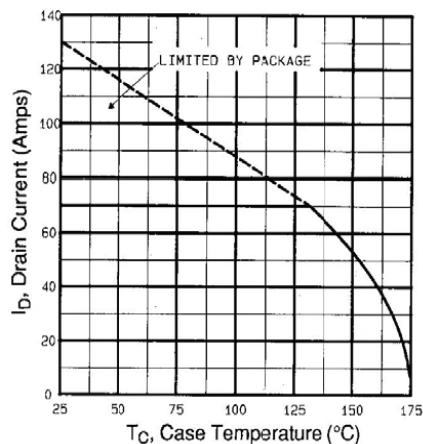
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Fig. 1 - Typical Output Characteristics,  $T_c = 25\text{ }^{\circ}\text{C}$** 

**Fig. 2 - Typical Output Characteristics,  $T_c = 175\text{ }^{\circ}\text{C}$** 

**Fig. 3 - Typical Transfer Characteristics**

**Fig. 4 - Normalized On-Resistance vs. Temperature**

**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

**Fig. 6 - Typical Source-Drain Diode Forward Voltage**



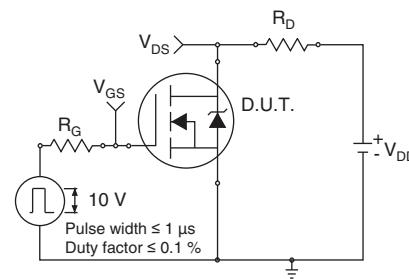
**Fig. 7 - Maximum Safe Operating Area**



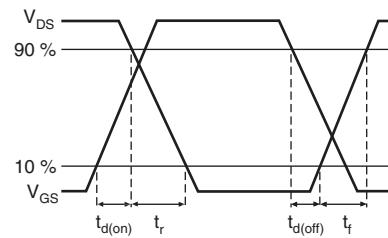
**Fig. 8 - Maximum Drain Current vs. Case Temperature**



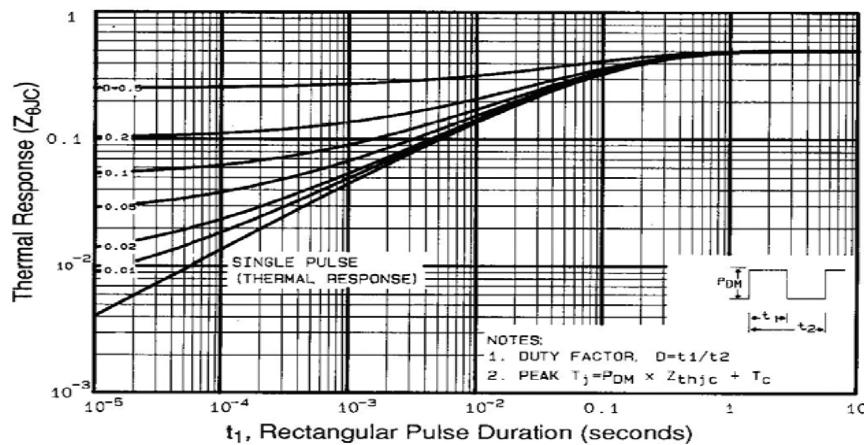
**Fig. 9 - Maximum Safe Operating Area**



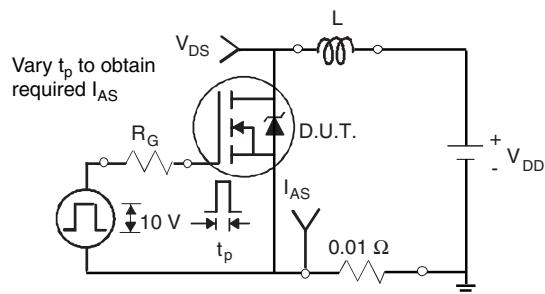
**Fig. 10a - Switching Time Test Circuit**



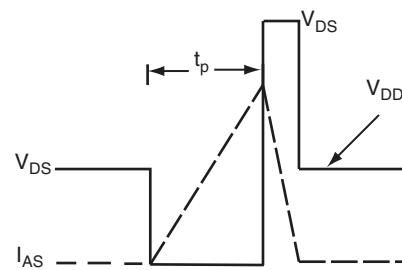
**Fig. 10b - Switching Time Waveforms**



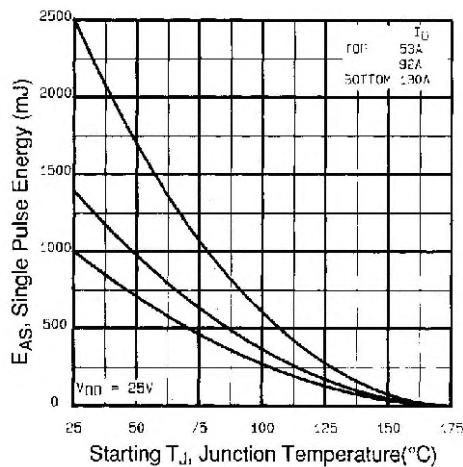
**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**



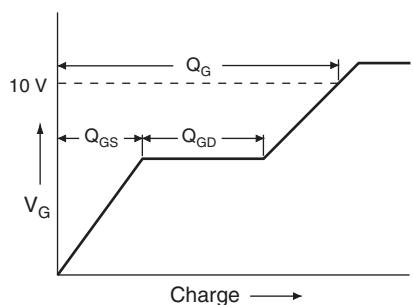
**Fig. 12a - Unclamped Inductive Test Circuit**



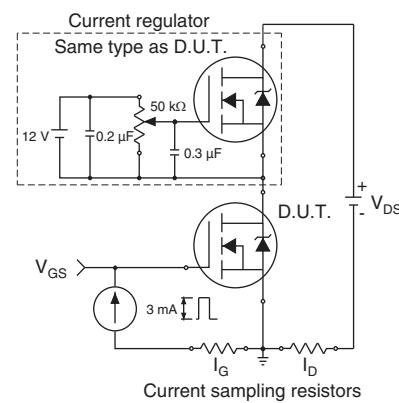
**Fig. 12b - Unclamped Inductive Waveforms**



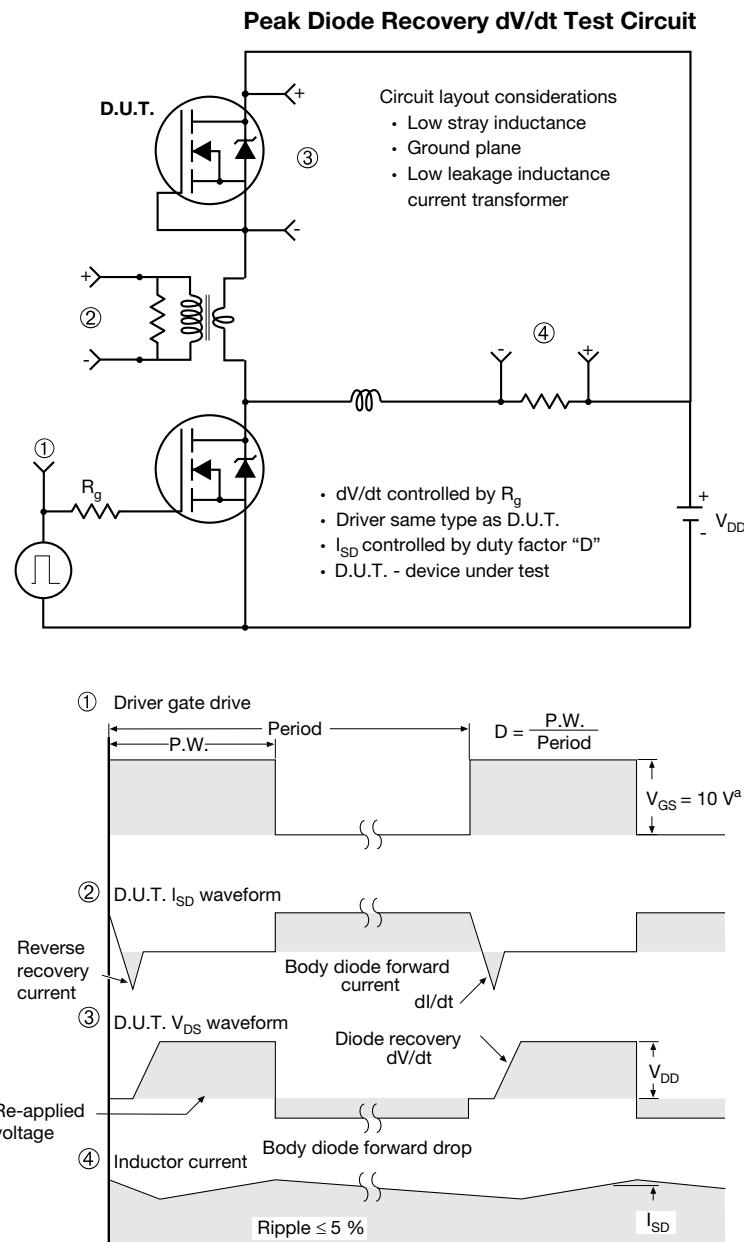
**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**



**Fig. 13a - Basic Gate Charge Waveform**



**Fig. 13b - Gate Charge Test Circuit**

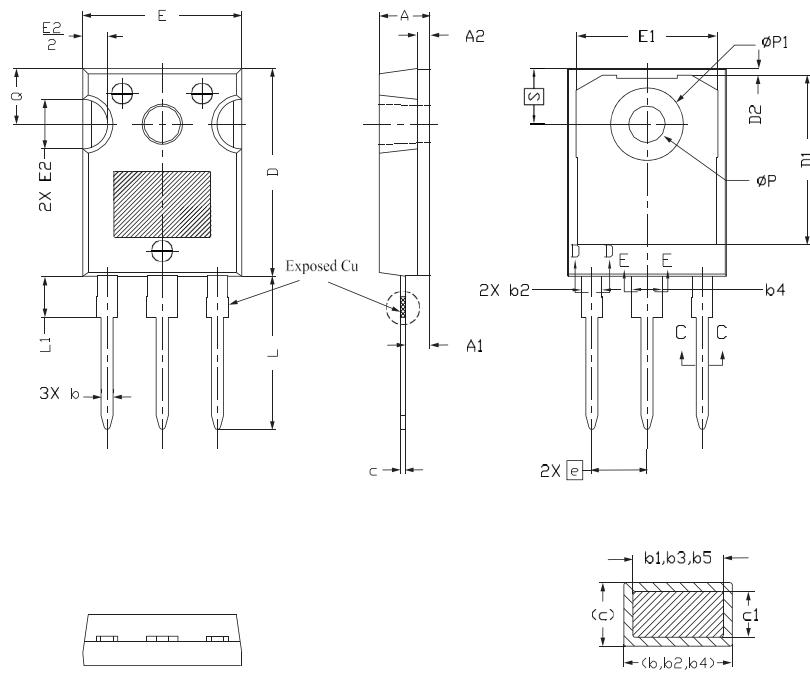


**Fig. 14 - For N-Channel**

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?91201](http://www.vishay.com/ppg?91201).

### TO-247AC (High Voltage)

**VERSION 1: FACILITY CODE = 9**



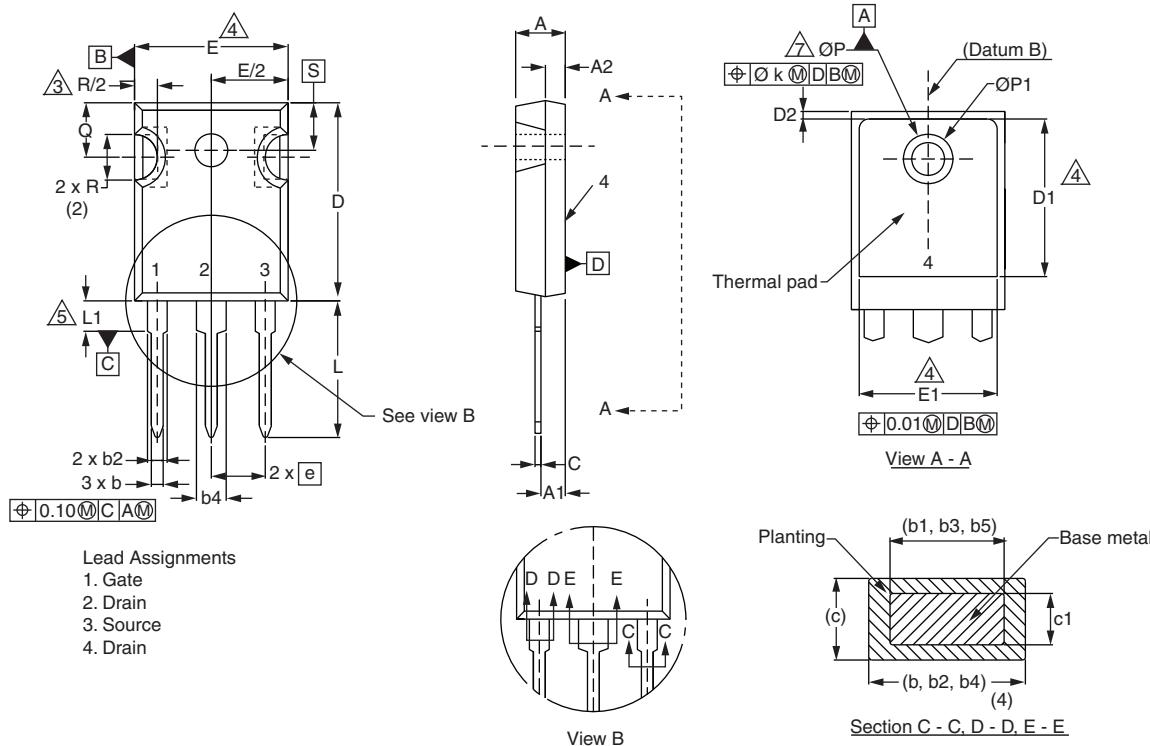
Section C-C,D-D,E-E

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			

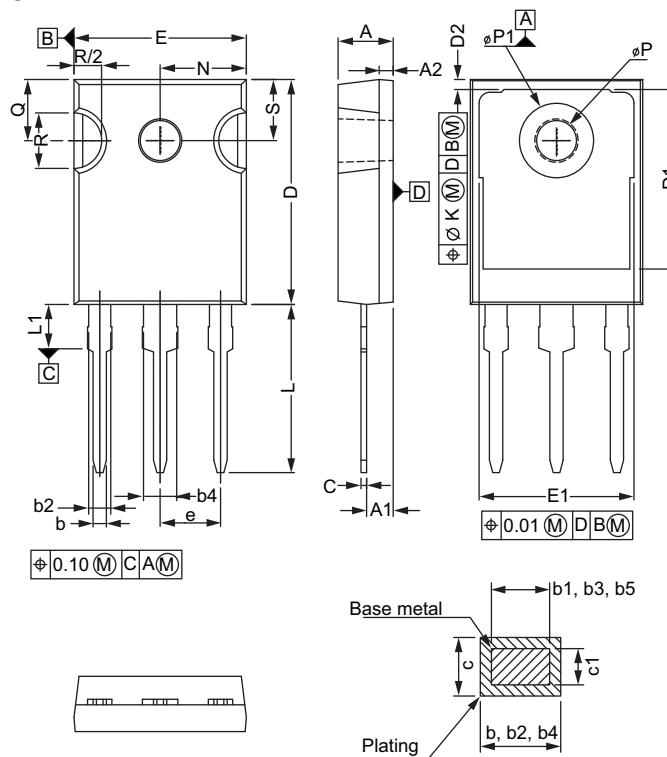
**VERSION 2: FACILITY CODE = Y**


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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