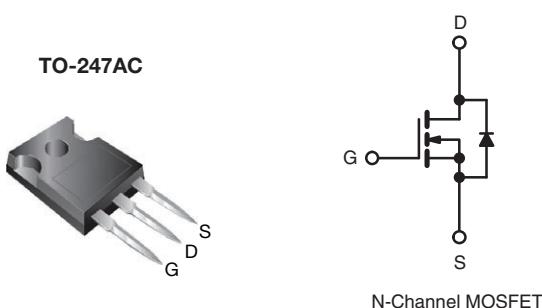


Power MOSFET



FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- Isolated central mounting hole
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



PRODUCT SUMMARY

V_{DS} (V)	400	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.55
Q_g (max.) (nC)	62	
Q_{gs} (nC)	10	
Q_{gd} (nC)	30	
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	IRFP340PbF

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	400	V
Gate-source voltage	V_{GS}	± 20	
Continuous drain current	I_D	11	A
		6.9	
Pulsed drain Current ^a	I_{DM}	44	
Linear derating factor		1.2	W/°C
Single pulse avalanche energy ^b	E_{AS}	480	mJ
Repetitive avalanche current ^a	I_{AR}	11	A
Repetitive avalanche energy ^a	E_{AR}	15	mJ
Maximum power dissipation	P_D	150	W
Peak diode recovery dV/dt ^c	dV/dt	4.0	V/ns
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^d	for 10 s	300 ^d	
Mounting torque	6-32 or M3 screw	10	lbf · in
		1.1	N · m

Notes

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

b. $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 6.9$ mH, $R_g = 25$ Ω , $I_{AS} = 11$ A (see fig. 12)

c. $I_{SD} \leq 11$ A, $dI/dt \leq 120$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C

d. 1.6 mm from case

THERMAL RESISTANCE RATINGS

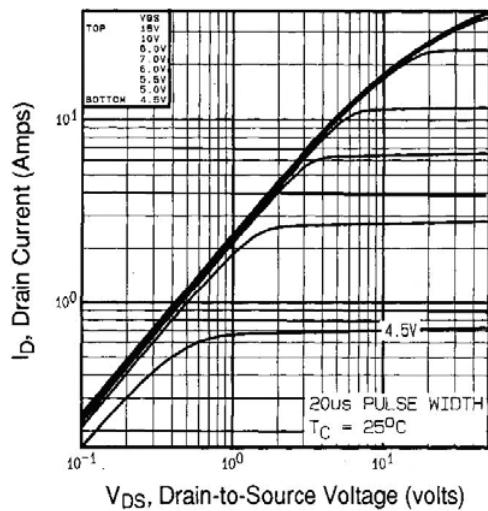
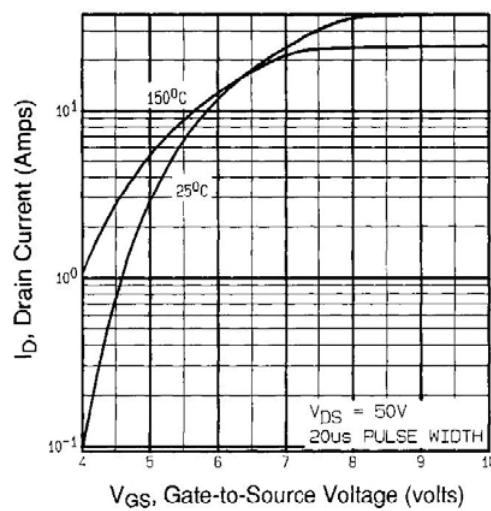
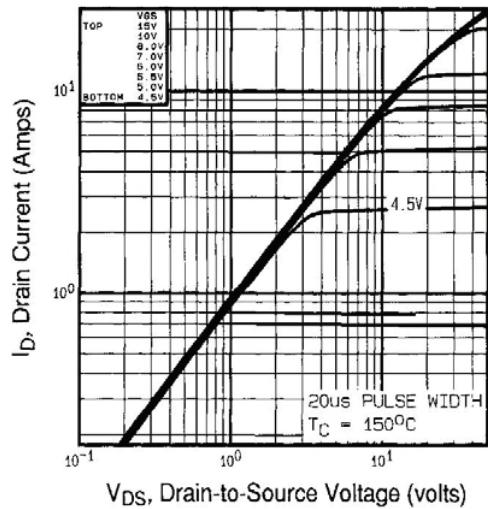
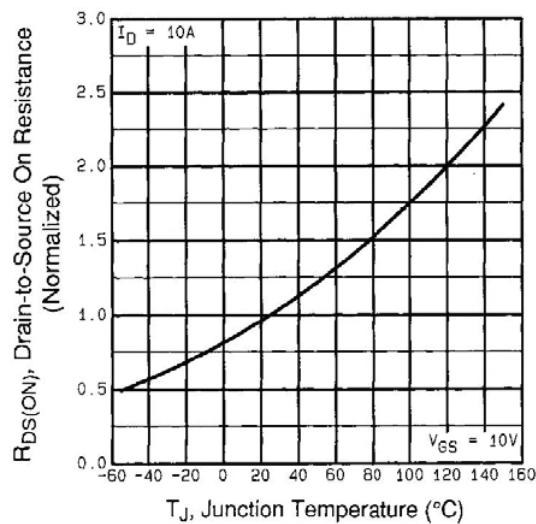
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Case-to-sink, flat, greased surface	R_{thCS}	0.24	-	
Maximum junction-to-case (drain)	R_{thJC}	-	0.83	

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$		400	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1 \text{ mA}$		-	0.49	-	$\text{V}/^\circ\text{C}$
Gate-source threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$		2.0	-	4.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 400 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	25	μA
		$V_{DS} = 320 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125^\circ\text{C}$		-	-	250	
Drain-source on-state resistance	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$	$I_D = 6.6 \text{ A}^b$	-	-	0.55	Ω
Forward transconductance	g_{fs}	$V_{DS} = 50 \text{ V}$, $I_D = 6.6 \text{ A}^b$		7.7	-	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	1400	-	pF
Output capacitance	C_{oss}			-	400	-	
Reverse transfer capacitance	C_{rss}			-	130	-	
Total Gate charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 10 \text{ A}$, $V_{DS} = 320 \text{ V}$, see fig. 6 and 13 ^b	-	-	62	nC
Gate-source charge	Q_{gs}			-	-	10	
Gate-drain charge	Q_{gd}			-	-	30	
Turn-on delay time	$t_{d(\text{on})}$	$V_{DD} = 200 \text{ V}$, $I_D = 10 \text{ A}$, $R_g = 9.1 \Omega$, $R_D = 20 \Omega$, see fig. 10 ^b		-	14	-	ns
Rise time	t_r		-	27	-		
Turn-off delay time	$t_{d(\text{off})}$		-	50	-		
Fall time	t_f		-	24	-		
Internal drain inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact		-	5.0	-	nH
Internal source inductance	L_S			-	13	-	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p-n junction diode		-	-	11	A
Pulsed diode forward current ^a	I_{SM}			-	-	44	
Body diode voltage	V_{SD}	$T_J = 25^\circ\text{C}$, $I_S = 11 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	2.0	V
Body diode reverse recovery time	t_{rr}	$T_J = 25^\circ\text{C}$, $I_F = 10 \text{ A}$, $dl/dt = 100 \text{ A}/\mu\text{s}^b$		-	330	660	ns
Body diode reverse recovery charge	Q_{rr}			-	2.5	5.9	μC
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 $\leq 2\%$

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics, $T_c = 150\text{ }^{\circ}\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

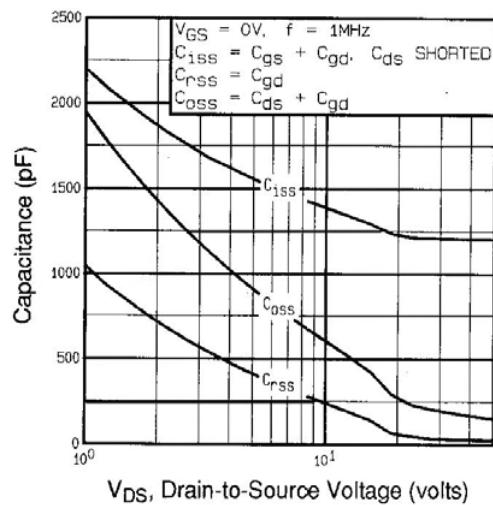


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

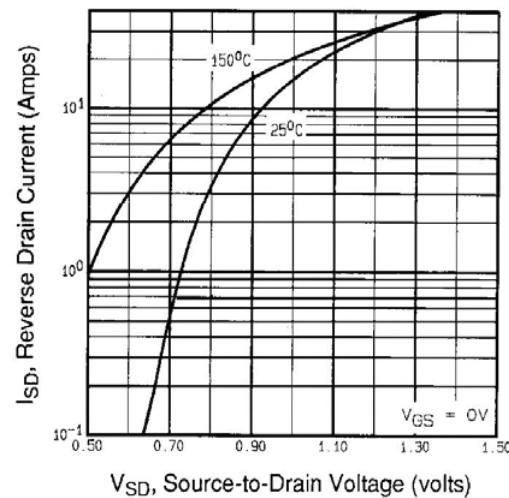


Fig. 7 - Typical Source-Drain Diode Forward Voltage

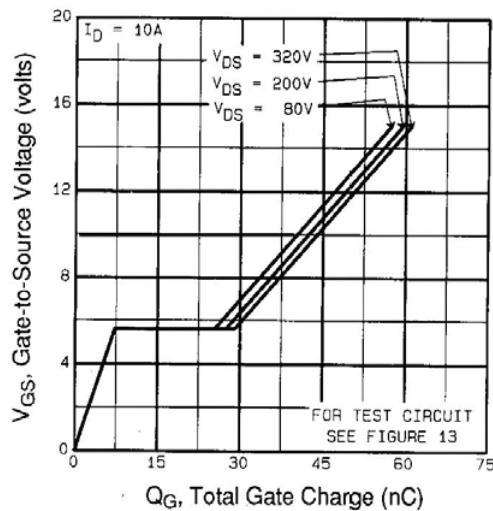


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

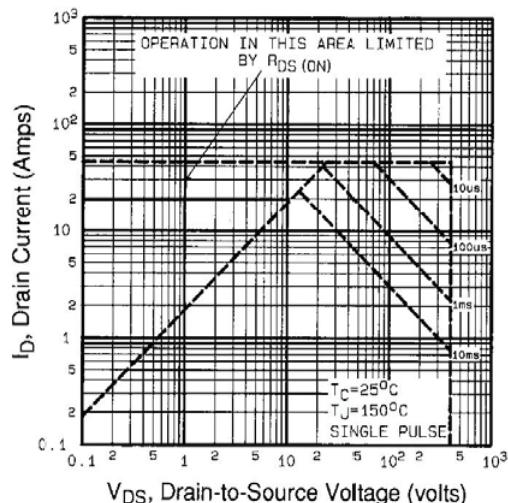


Fig. 8 - Maximum Safe Operating Area

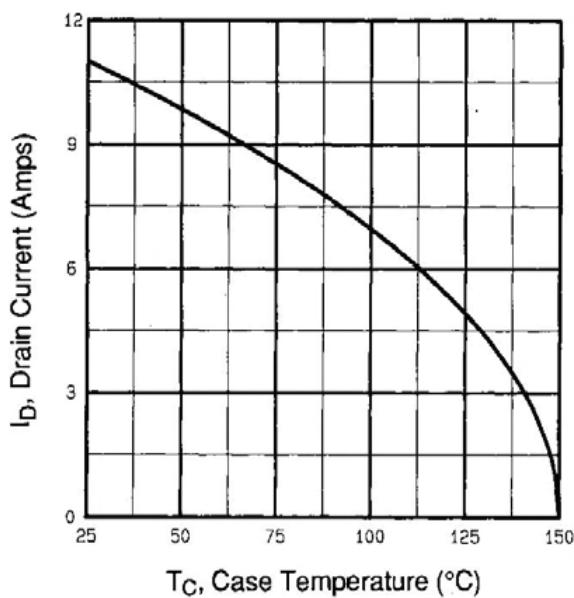


Fig. 9 - Maximum Drain Current vs. Case Temperature

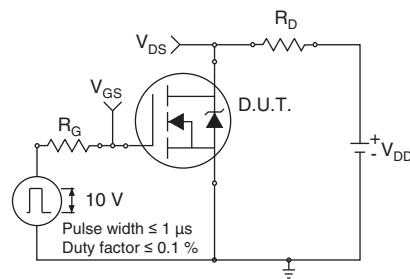


Fig. 10 - Switching Time Test Circuit

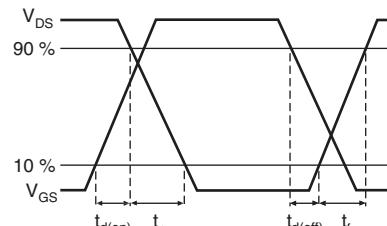


Fig. 11 - Switching Time Waveforms

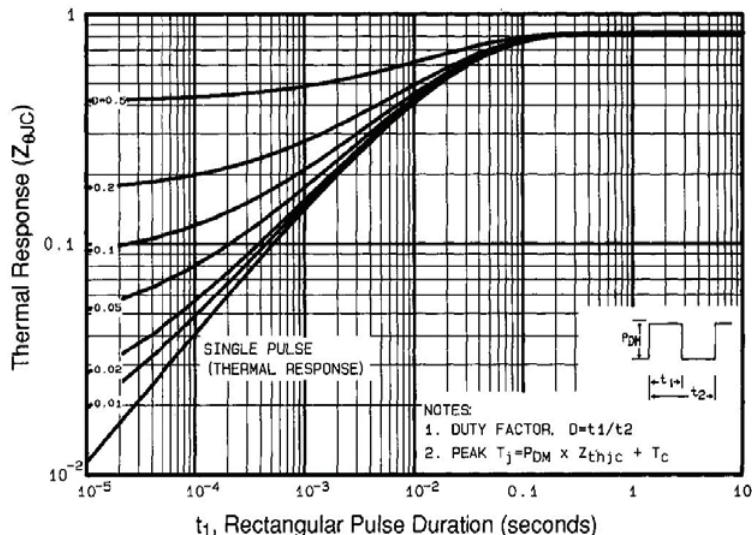


Fig. 12 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

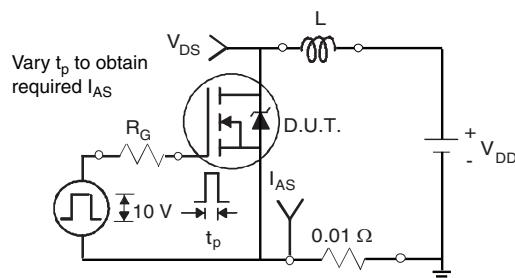


Fig. 13 - Unclamped Inductive Test Circuit

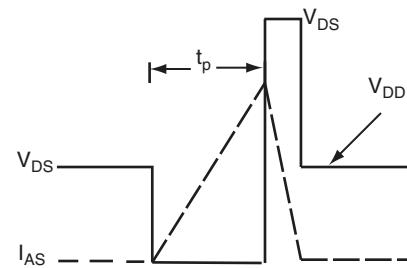


Fig. 14 - Unclamped Inductive Waveforms

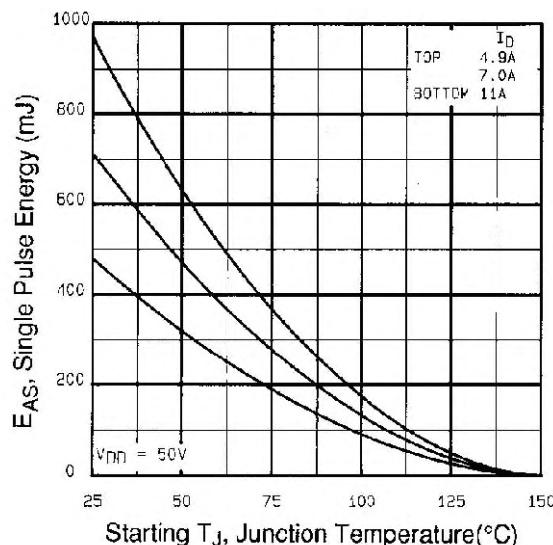


Fig. 15 - Maximum Avalanche Energy vs. Drain Current

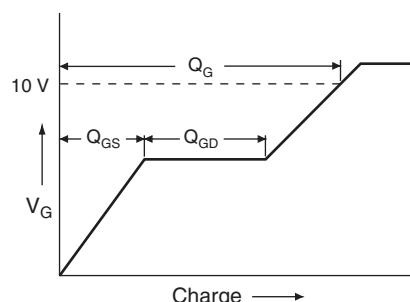


Fig. 16 - Basic Gate Charge Waveform

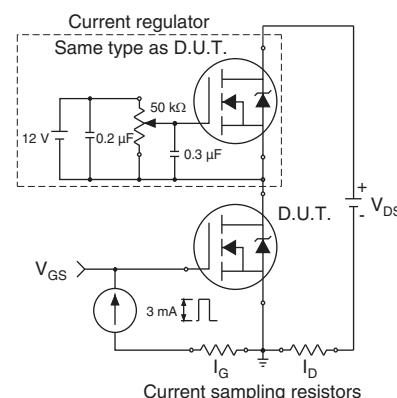
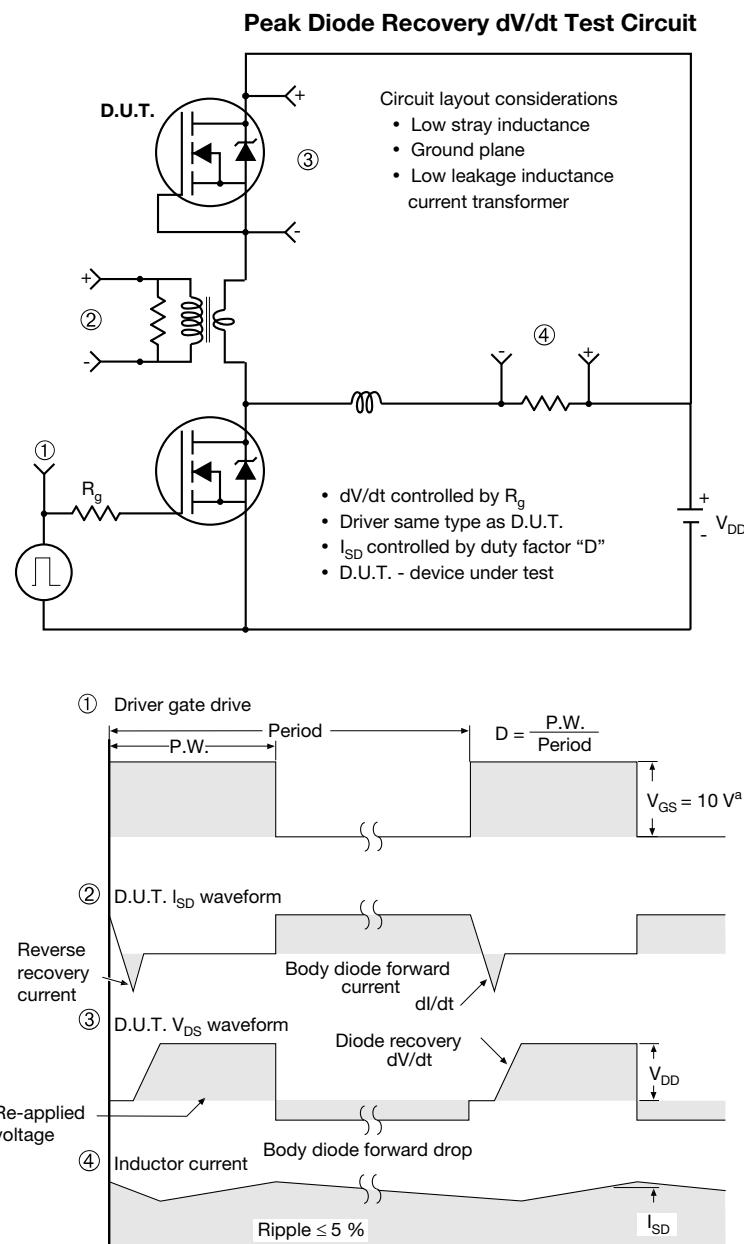


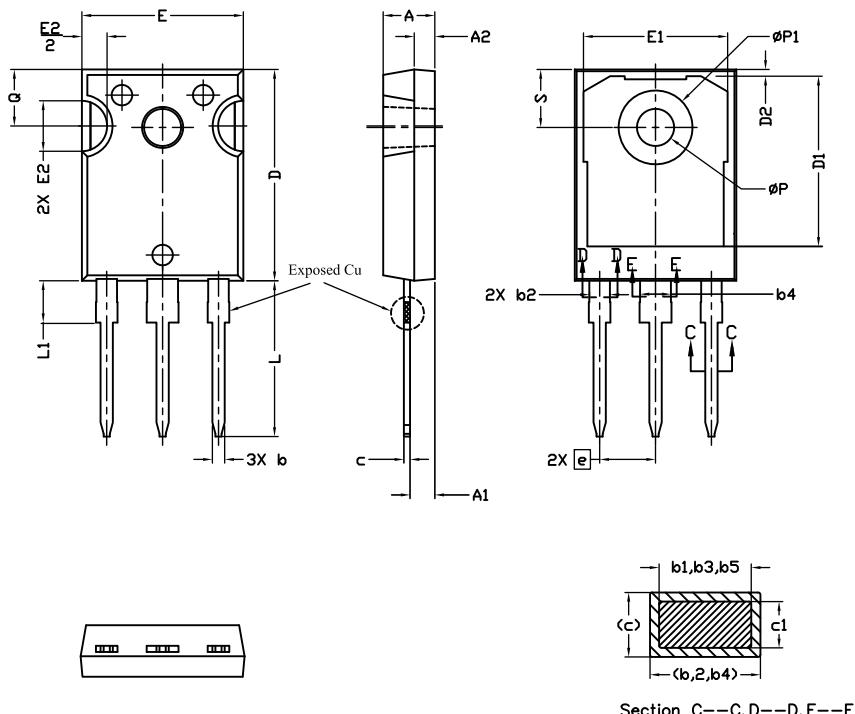
Fig. 17 - Gate Charge Test Circuit


Fig. 18 - For N-Channel

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TO-247AC (High Voltage)

VERSION 1: FACILITY CODE = 9



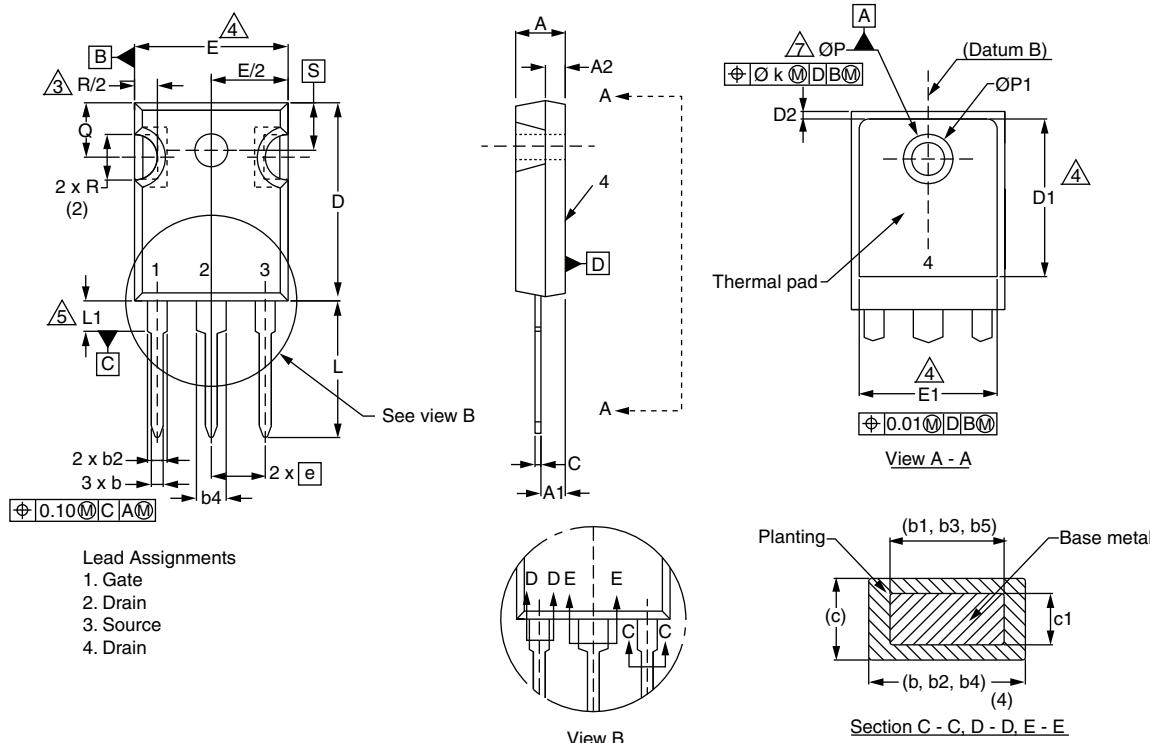
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.83	5.21	
A1	2.29	2.55	
A2	1.50	2.49	
b	1.12	1.33	
b1	1.12	1.28	
b2	1.91	2.39	6
b3	1.91	2.34	
b4	2.87	3.22	6, 8
b5	2.87	3.18	
c	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

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.	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	

VERSION 2: FACILITY CODE = Y



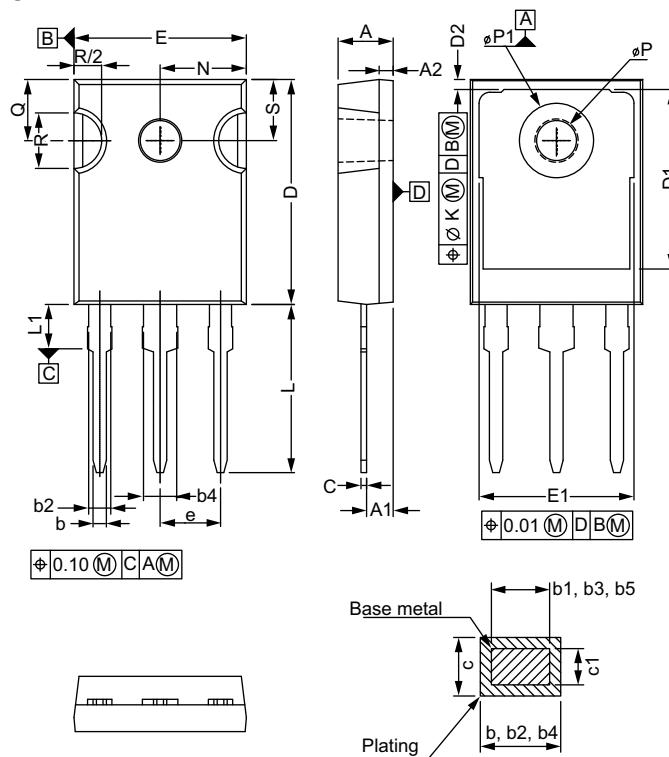
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

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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