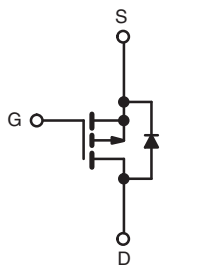
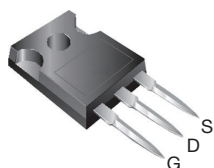


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	- 200 V	
$R_{DS(on)}$ (Max.) (Ω)	$V_{GS} = -10$ V	0.50
Q_g (Max.) (nC)	44	
Q_{gs} (nC)	7.1	
Q_{gd} (nC)	27	
Configuration	Single	

TO-247AC



P-Channel MOSFET

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- P-Channel
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



Available

RoHS*
COMPLIANT

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 of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.

ORDERING INFORMATION

Package	TO-247AC
Lead (Pb)-free	IRFP9240PbF SiHFP9240-E3
SnPb	IRFP9240 SiHFP9240

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	- 200	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	$V_{GS} \text{ at } -10 \text{ V}$	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current ^a	I_{DM}	- 48	
Linear Derating Factor		1.2	W/ $^\circ\text{C}$
Single Pulse Avalanche Energy ^b	E_{AS}	790	mJ
Repetitive Avalanche Current ^a	I_{AR}	- 12	A
Repetitive Avalanche Energy ^a	E_{AR}	15	mJ
Maximum Power Dissipation	P_D	150	W
Peak Diode Recovery dV/dt ^c	dV/dt	- 5.0	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	
Mounting Torque	6-32 or M3 screw	10	
		1.1	N · m

Notes



- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = -50$ V, starting $T_J = 25^\circ\text{C}$, $L = 8.2$ mH, $R_g = 25 \Omega$, $I_{AS} = -12$ A (see fig. 12).
- $I_{SD} \leq -12$ A, $dI/dt \leq 150$ A/ μs , $V_{DD} \leq V_{DS}$, $T_J \leq 150^\circ\text{C}$.
- 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

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 ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA		- 200	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = - 1 mA		-	- 0.20	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA		- 2.0	-	- 4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 200 V, V _{GS} = 0 V		-	-	- 100	μA
		V _{DS} = - 160 V, V _{GS} = 0 V, T _J = 125 °C		-	-	- 500	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = - 10 V	I _D = - 7.2 A ^b	-	-	0.50	Ω
Forward Transconductance	g _{fs}	V _{DS} = - 50 V, I _D = - 7.2 A		4.2	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = - 25 V, f = 1.0 MHz, see fig. 5		-	1200	-	pF
Output Capacitance	C _{oss}			-	370	-	
Reverse Transfer Capacitance	C _{rss}			-	81	-	
Total Gate Charge	Q _g	V _{GS} = - 10 V	I _D = - 11 A, V _{DS} = - 160 V see fig. 6 and 13 ^b	-	-	44	nC
Gate-Source Charge	Q _{gs}			-	-	7.1	
Gate-Drain Charge	Q _{gd}			-	-	27	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 100 V, I _D = - 11 A R _G = 9.1 Ω, R _D = 8.6 Ω, see fig. 10 ^b		-	14	-	ns
Rise Time	t _r			-	43	-	
Turn-Off Delay Time	t _{d(off)}			-	39	-	
Fall Time	t _f			-	38	-	
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 		-	-	- 12	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	- 48	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = - 12 A, V _{GS} = 0 V ^b		-	-	- 5.0	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = - 11 A, dI/dt = 100 A/μs ^b		-	250	300	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	2.9	3.6	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 $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

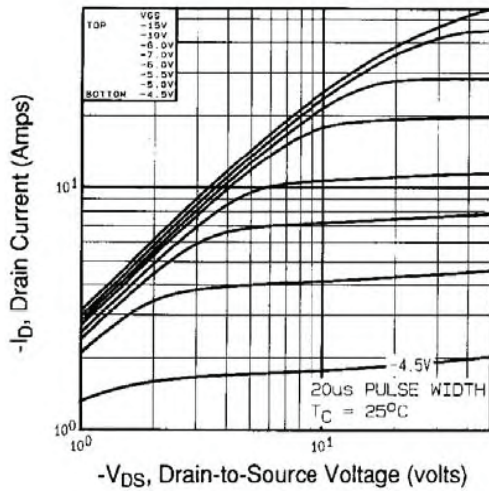


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

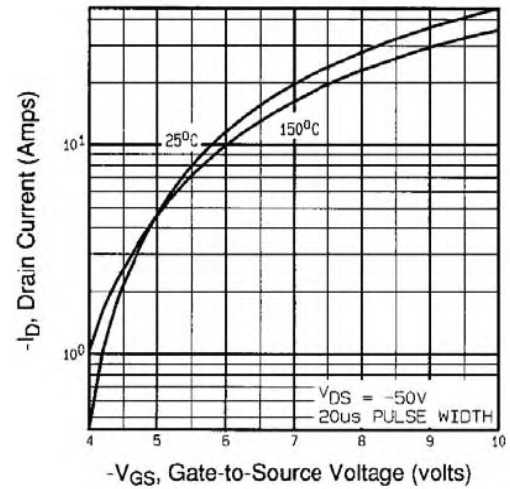


Fig. 3 - Typical Transfer Characteristics

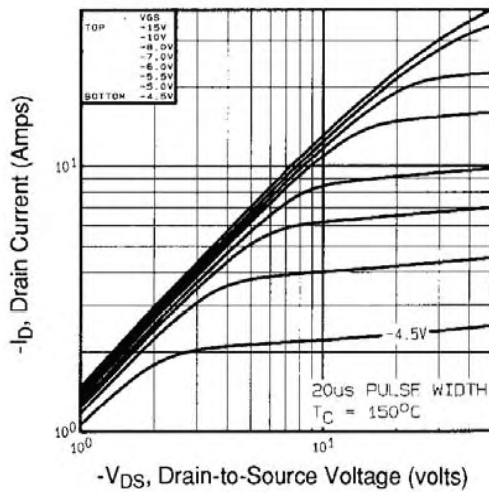


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

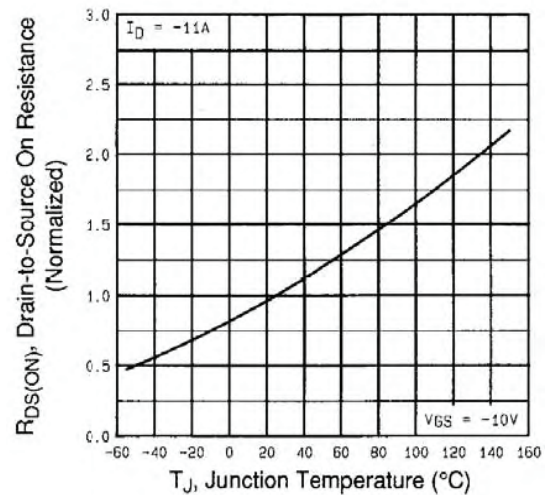


Fig. 4 - Normalized On-Resistance vs. Temperature

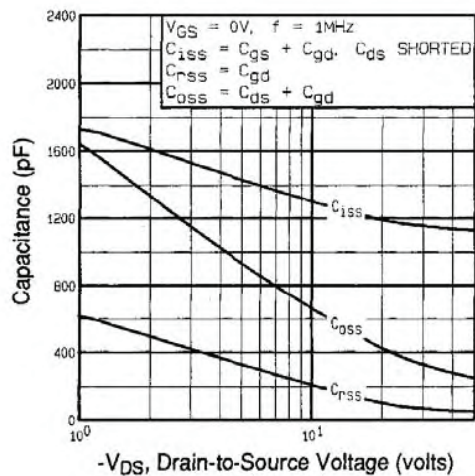


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

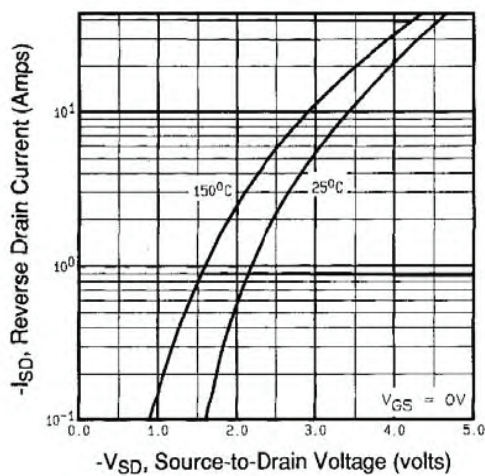


Fig. 7 - Typical Source-Drain Diode Forward Voltage

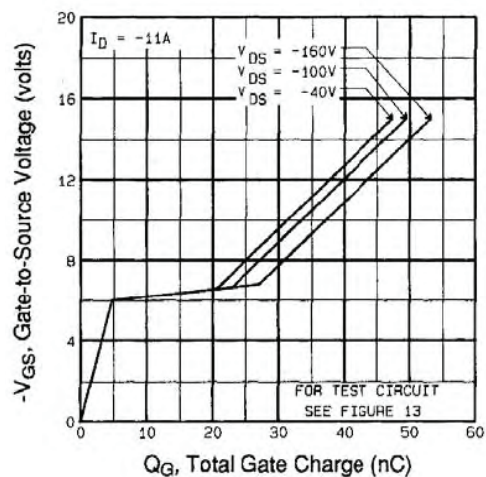


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

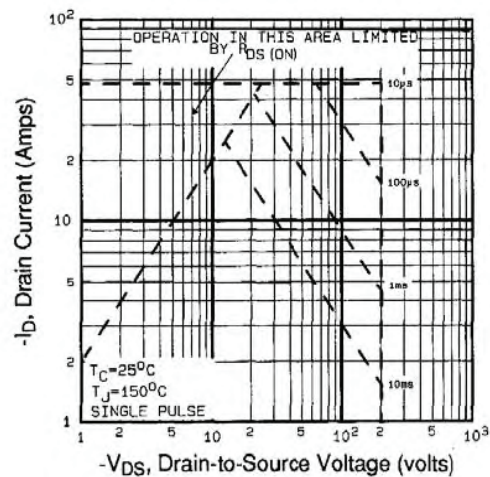


Fig. 8 - Maximum Safe Operating Area

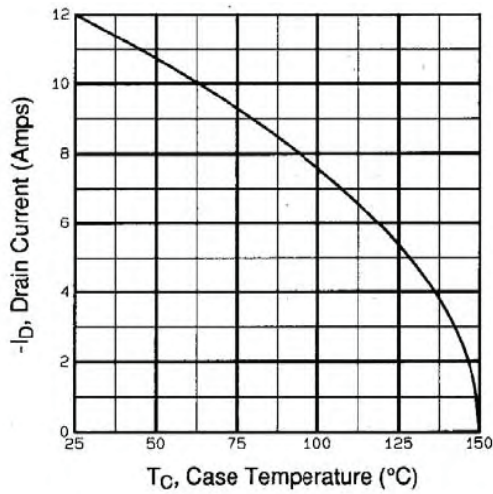


Fig. 9 - Maximum Drain Current vs. Case Temperature

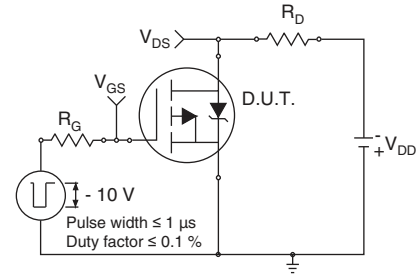


Fig. 10a - Switching Time Test Circuit

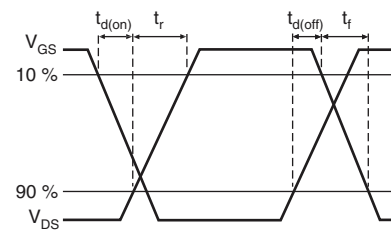


Fig. 10b - Switching Time Waveforms

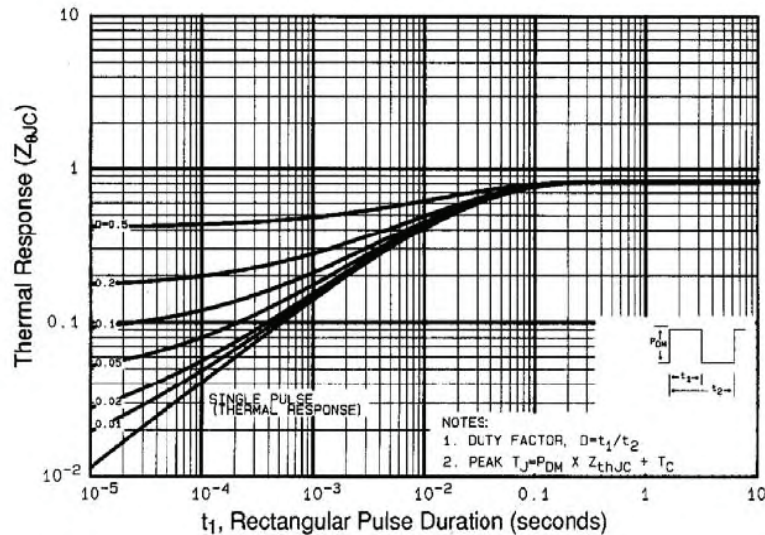


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

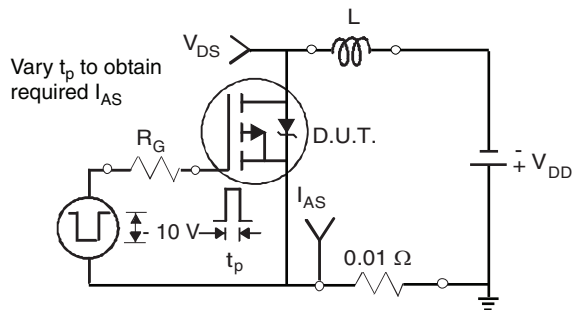


Fig. 12a - Unclamped Inductive Test Circuit

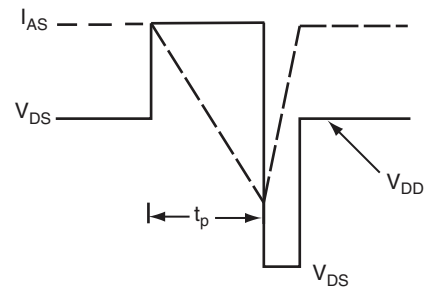


Fig. 12b - Unclamped Inductive Waveforms

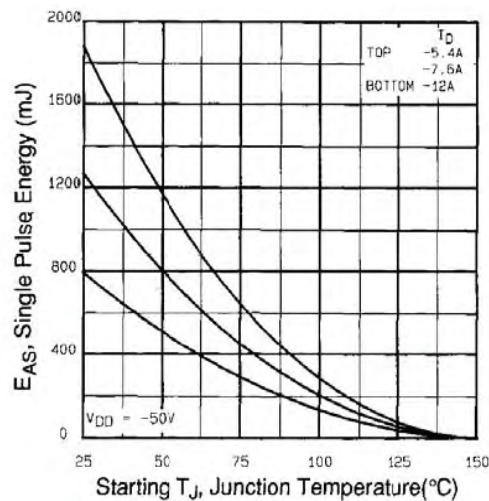


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

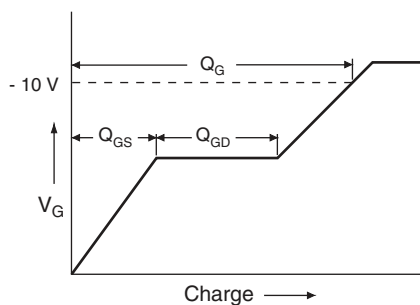


Fig. 13a - Basic Gate Charge Waveform

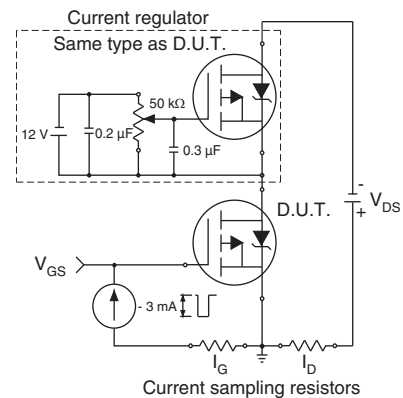


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

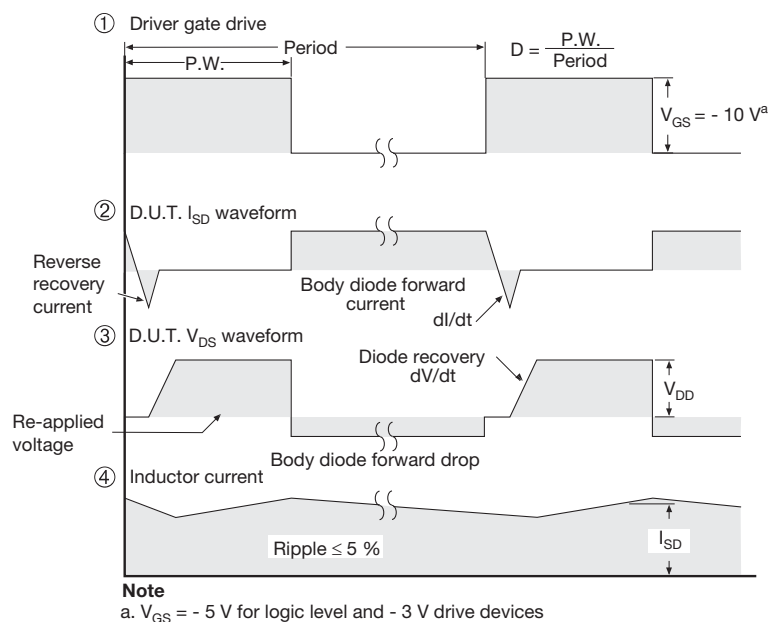
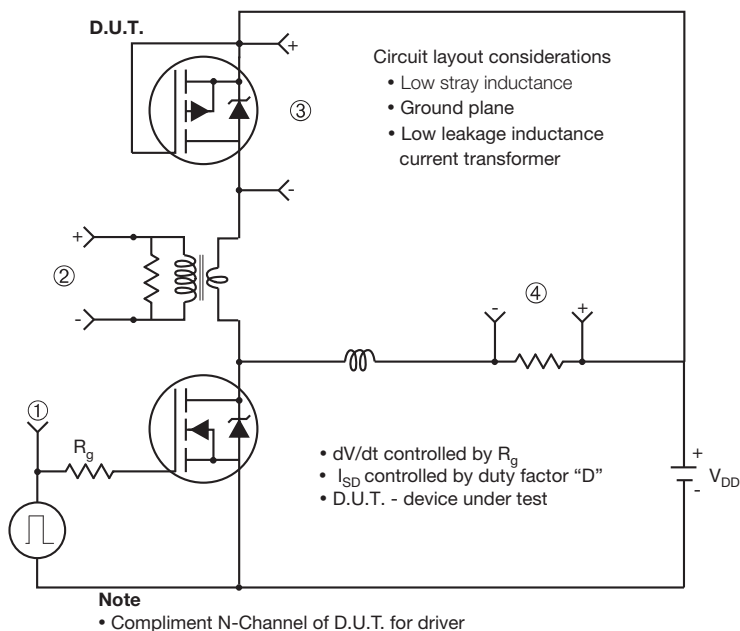
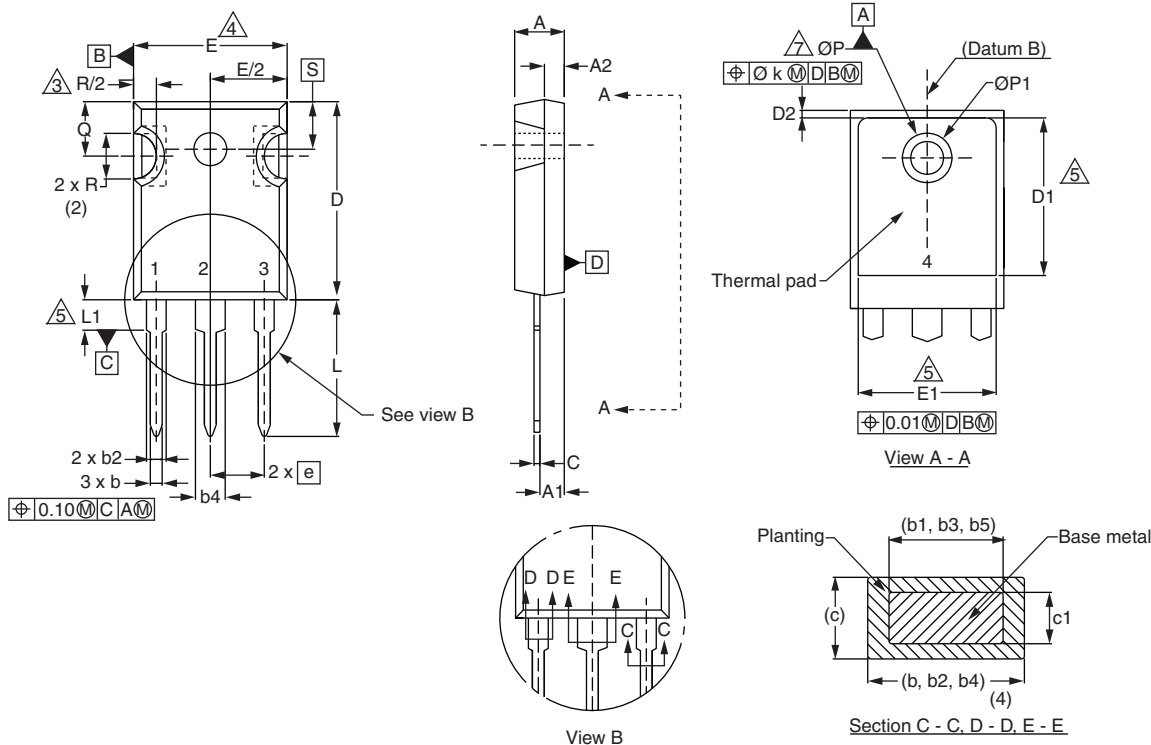


Fig. 14 - For P-Channel

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?91239.

TO-247AC (High Voltage)



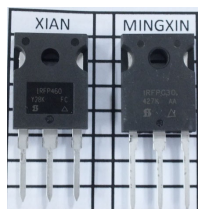
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.58	5.31	0.180	0.209
A1	2.21	2.59	0.087	0.102
A2	1.17	2.49	0.046	0.098
b	0.99	1.40	0.039	0.055
b1	0.99	1.35	0.039	0.053
b2	1.53	2.39	0.060	0.094
b3	1.65	2.37	0.065	0.093
b4	2.42	3.43	0.095	0.135
b5	2.59	3.38	0.102	0.133
c	0.38	0.86	0.015	0.034
c1	0.38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

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	

ECN: X13-0045-Rev. C, 18-Mar-13
DWG: 5971

Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994.
- Contour of slot optional.
- 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.
- Thermal pad contour optional with dimensions D1 and E1.
- Lead finish uncontrolled in L1.
- 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").
- Outline conforms to JEDEC outline TO-247 with exception of dimension c.
- Xian and Mingxin actually photo.





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