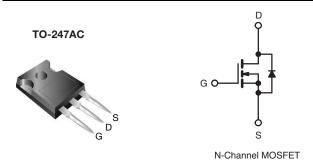


Vishay Siliconix

Power MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	400		
$R_{DS(on)}(\Omega)$	V _{GS} = 10 V	0.30	
Q _g (Max.) (nC)	76		
Q _{gs} (nC)	20		
Q _{gd} (nC)	37		
Configuration	Single		



FEATURES

- Ultra Low Gate Charge
- Reduced Gate Drive Requirement
- Enhanced 30V V_{GS} Rating
- Reduced Ciss, Coss, Crss
- Isolated Central Mounting Hole
- Dynamic dV/dt Rated
- Repetitive Avalanche Rated
- Compliant to RoHS Directive 2002/95/EC

DESCRIPTION

This new series of low charge Power MOSFETs achieve significantly lower gate charge over conventional MOSFETs. Utilizing advanced MOSFETs technology the device improvements allow for reduced gate drive requirements, faster switching speeds and increased total system savings. These device improvements combined with the proven ruggedness and reliability of MOSFETs offer the designer a new standard in power transistors for switching applications.

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.

ORDERING INFORMATION		
Package	TO-247AC	
Load (Dh) froe	IRFP350LCPbF	
Lead (Pb)-free	SiHFP350LC-E3	
SnPb	IRFP350LC	
	SiHFP350LC	

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	400	V
Gate-Source Voltage		V_{GS}	± 30	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Continuous Drain Current	V_{GS} at 10 V $T_C = 25 ^{\circ}C$	l_	16	
Continuous Drain Current $V_{GS} \text{ at 10 V} \frac{T_C = 25 ^{\circ}\text{C}}{T_C = 100 ^{\circ}\text{C}}$		ID	9.9	Α
Pulsed Drain Current ^a		I_{DM}	64	
Linear Derating Factor			1.5	W/°C
Single Pulse Avalanche Energy ^b		E _{AS}	390	mJ
Repetitive Avalanche Current ^a		I _{AR}	16	А
Repetitive Avalanche Energy ^a		E _{AR}	19	mJ
Maximum Power Dissipation	T _C = 25 °C	P_{D}	190	W
Peak Diode Recovery dV/dtc	dV/dt	4.0	V/ns	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s	, in the second	300 ^d	
Mounting Torque	6-32 or M3 screw		10	lbf ⋅ in
Mounting Torque	0-32 OF IVIS SCIEW		1.1	N·m

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. $V_{DD} = 25 \text{ V}$, starting $T_J = 25 \,^{\circ}\text{C}$, $L = 2.7 \,^{\circ}\text{mH}$, $R_g = 25 \,^{\circ}\Omega$, $I_{AS} = 16 \,^{\circ}\text{A}$ (see fig. 12).
- c. $I_{SD} \le 16$ A, $dI/dt \le 200$ A/µs, $V_{DD} \le V_{DS}$, $T_J \le 150$ °C.
- d. 1.6 mm from case.

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

IRFP350LC, SiHFP350LC

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THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R _{thJA}	-	40	
Case-to-Sink, Flat, Greased Surface	R _{thCS}	0.24	-	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	-	0.65	

PARAMETER	SYMBOL	TEST	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static					•		
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0	Ο V, I _D = 250 μA	400	-	-	V
V _{DS} Temperature Coefficient	$\Delta V_{DS}/T_{J}$	Reference	to 25 °C, I _D = 1 mA	-	0.49	-	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}	Vo	_{SS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	l	$V_{DS} = 4$	100 V, V _{GS} = 0 V	-	-	25	μA
Zero Gate voltage Drain Current	I _{DSS}	V _{DS} = 320 V, V	V _{GS} = 0 V, T _J = 125 °C	=	-	250	μΑ
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	$I_D = 9.6 A^b$	-	-	0.30	Ω
Forward Transconductance	9 _{fs}	$V_{DS} = 5$	50 V, I _D = 9.6 A ^b	8.1	-	-	S
Dynamic		·					
Input Capacitance	C _{iss}	\ \	$I_{GS} = 0 \text{ V},$	-	2200	-	
Output Capacitance	C _{oss}	V _{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	390	-	pF
Reverse Transfer Capacitance	C _{rss}			-	31	-	
Total Gate Charge	Q_g		1 10 1 1/ 000 1/	-	-	76	
Gate-Source Charge	Q_{gs}	V _{GS} = 10 V	$I_D = 16 \text{ A}, V_{DS} = 320 \text{ V}$ see fig. 6 and 13 ^b	-	-	20	nC
Gate-Drain Charge	Q_{gd}		see lig. o and 10	-	-	37	
Turn-On Delay Time	t _{d(on)}			-	14	-	
Rise Time	t _r	$V_{DD} = 2$	200 V, I _D = 16 A,	-	54	-	ns
Turn-Off Delay Time	t _{d(off)}	$R_0 = 6.2 \Omega$. R	$R_D = 12 \Omega$, see fig. 10^b	=	33	-	
Fall Time	t _f	9	, ,	-	35	-	
Drain-Source Body Diode Characteristic	s						
Continuous Source-Drain Diode Current	I _S	MOSFET symbo	MOSFET symbol showing the		-	16	^
Pulsed Diode Forward Current ^a	I _{SM}	integral reverse p - n junction diode		-	-	64	A
Body Diode Voltage	V _{SD}	T _J = 25 °C, I	I _S = 16 A, V _{GS} = 0 V ^b	-	-	1.6	٧
Body Diode Reverse Recovery Time	t _{rr}	T 05 %C !	16 A dI/d+ 100 A /:h	1	440	660	ns
Body Diode Reverse Recovery Charge	Q _{rr}	$T_J = 25 ^{\circ}\text{C}, I_F = 16 \text{A, dI/dt} = 100 \text{A/}\mu\text{s}^b$		-	4.1	6.2	μC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-		-on is do	minated h	v L c and	1-2)

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width \leq 300 µs; duty cycle \leq 2 %.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

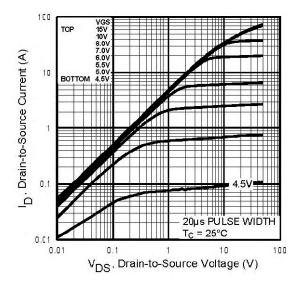


Fig. 1 - Typical Output Characteristics, $T_C = 25$ °C

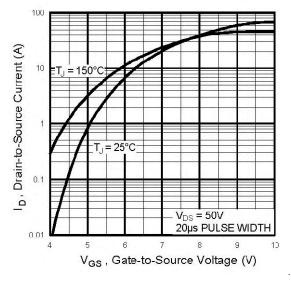


Fig. 3 - Typical Transfer Characteristics

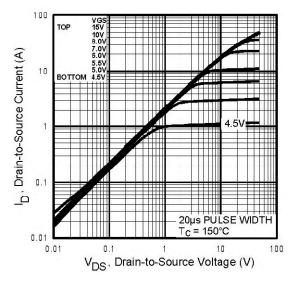


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

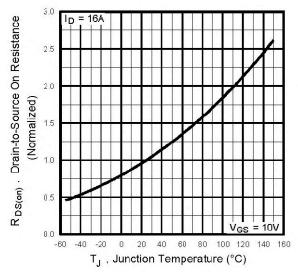


Fig. 4 - Normalized On-Resistance vs. Temperature

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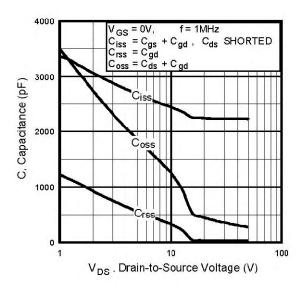


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

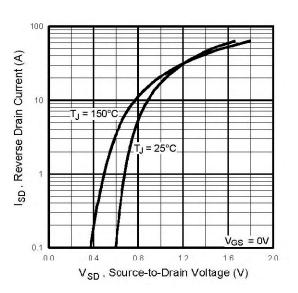


Fig. 7 - Typical Source-Drain Diode Forward Voltage

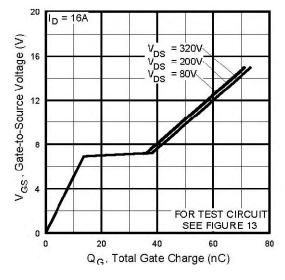


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

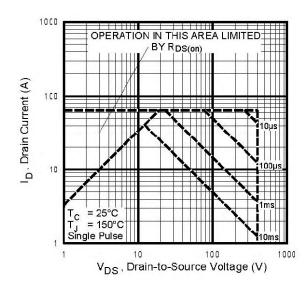


Fig. 8 - Maximum Safe Operating Area



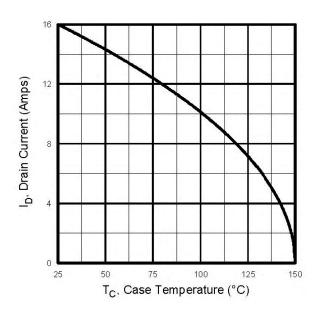


Fig. 9 - Maximum Drain Current vs. Case Temperature

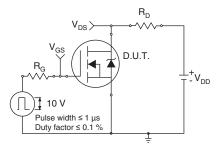


Fig. 10a - Switching Time Test Circuit

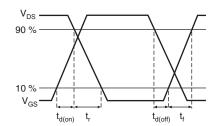


Fig. 10b - Switching Time Waveforms

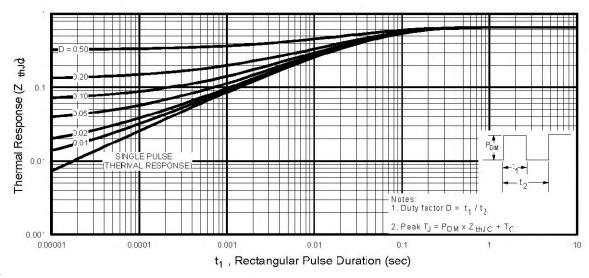


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

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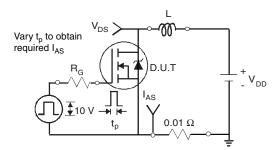


Fig. 12a - Unclamped Inductive Test Circuit

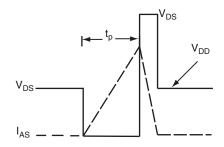


Fig. 12b - Unclamped Inductive Waveforms

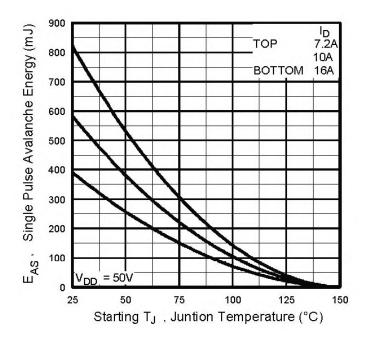


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

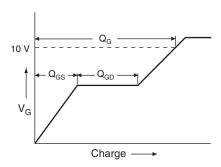


Fig. 13a - Basic Gate Charge Waveform

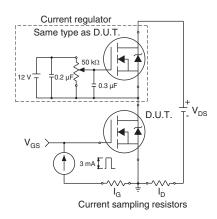
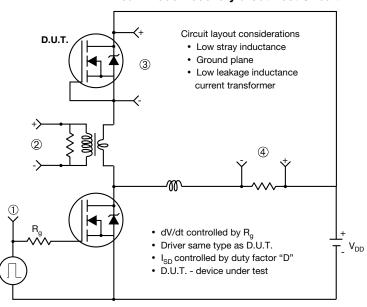


Fig. 13b - Gate Charge Test Circuit



Peak Diode Recovery dV/dt Test Circuit



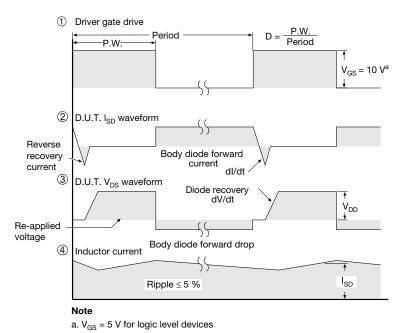


Fig. 14 - For N-Channel

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?91224.



TO-247AC (High Voltage)

VERSION 1: FACILITY CODE = 9







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

	MILLIN	IETERS	
DIM.	MIN.	MAX.	NOTES
Α	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	
С	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

	MILLIM	IETERS	
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
е	5.44	BSC	
L	14.90	15.40	
L1	3.96	4.16	6
ØΡ	3.56	3.65	7
Ø P1	7.19 ref.		
Q	5.31	5.69	
S	5.54	5.74	

- (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

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VERSION 2: FACILITY CODE = Y



	MILLIM	IETERS	
DIM.	MIN.	MAX.	NOTES
Α	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	
С	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

	MILLIN		
DIM.	MIN.	MAX.	NOTES
D2	0.51	1.30	
E	15.29	15.87	
E1	13.72	-	
е	5.46	BSC	
Øk	0.254		
L	14.20	16.25	
L1	3.71	4.29	
ØР	3.51	3.66	
Ø P1	-	7.39	
Q	5.31	5.69	
R	4.52	5.49	
S	5.51 BSC		

- (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

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VERSION 3: FACILITY CODE = N



	MILLIMETERS		
DIM.	MIN.	MAX.	
Α	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	
С	0.38	0.89	
c1	0.38	0.84	
D	19.71	20.70	
D1	13.08	-	

	MILLIMETERS		
DIM.	MIN.	MAX.	
D2	0.51	1.35	
E	15.29	15.87	
E1	13.46	=	
е	5.46	BSC	
k	0.2	54	
L	14.20	16.10	
L1	3.71	4.29	
N	7.62 BSC		
Р	3.56	3.66	
P1	=	7.39	
Q	5.31	5.69	
R	4.52	5.49	
S	5.51	BSC	

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

DWG: 5971

- ⁽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")



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