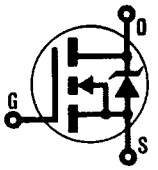
Yixin

INTERNATIONAL RECTIFIER

AVALANCHE AND dv/dt RATED

HEXFET® TRANSISTORS



N-CHANNEL

IRFR010
IRFR012
IRFU010
IRFU012

50 Volt, 0.20 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. Efficient geometry and unique processing of the HEXFET® design achieve a very low on-state resistance combined with high transconductance and great device ruggedness. HEXFETs® feature all of the established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

Surface mount packages enhance circuit performance by reducing stray inductances and capacitance. The D-Pak (TO-252AA) surface mount package brings the advantages of HEXFETs to high volume applications where PC Board surface mounting is desirable. The surface mount option IRFR010 is provided on 16mm tape. The straight lead option IRFU010 of the device is called the I-Pak (TO-251AA).

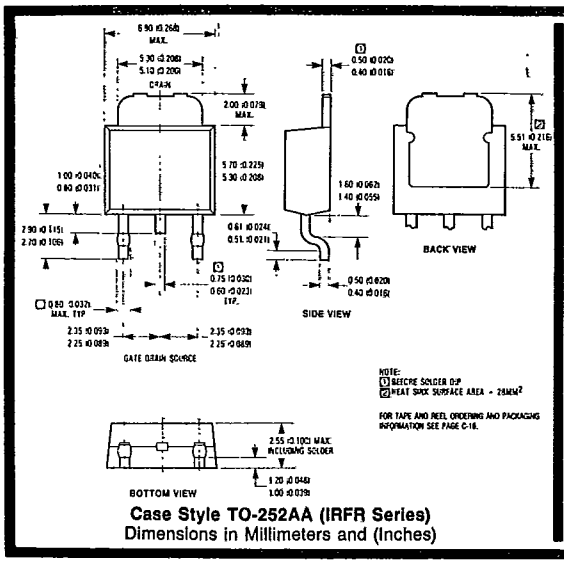
They are well suited for applications where limited heat dissipation is required such as, computers and peripherals, telecommunications equipment, DC/DC converters, and a wide range of consumer products.

Product Summary

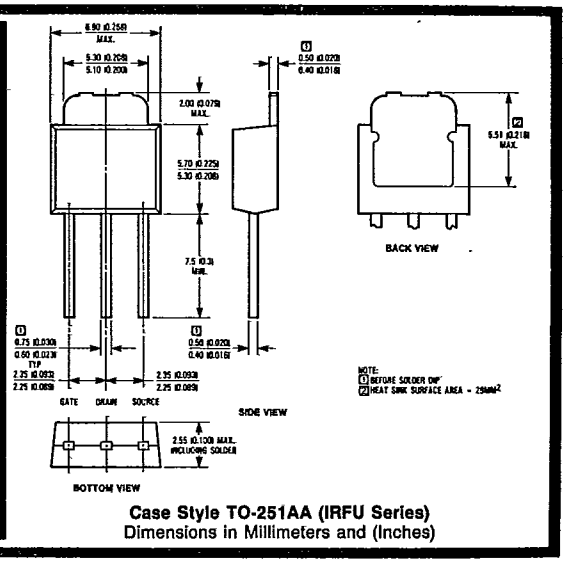
Part Number	BV_{DSS}	$R_{DS(on)}$	I_D
IRFR010	50V	0.20Ω	8.2A
IRFR012	50V	0.30Ω	6.7A
IRFU010	50V	0.20Ω	8.2A
IRFU012	50V	0.30Ω	6.7A

FEATURES:

- Surface Mountable (Order As IRFR010)
- Straight Lead Option (Order As IRFU010)
- Fast Switching
- Low Drive Current
- Easily Paralleled
- Excellent Temperature Stability



Case Style TO-252AA (IRFR Series)
Dimensions in Millimeters and (Inches)



Case Style TO-251AA (IRFU Series)
Dimensions in Millimeters and (Inches)

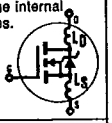
Absolute Maximum Ratings

Parameter		IRFR010, IRFU010	IRFR012, IRFU012	Units
I_D @ T_C = 25°C	Continuous Drain Current	8.2	6.7	A
I_D @ T_C = 100°C	Continuous Drain Current	5.2	4.2	A
I_{DM}	Pulsed Drain Current ①	33	27	A
P_D @ T_C = 25°C	Max. Power Dissipation	25		W
	Linear Derating Factor	0.20		W/K ⑤
V_{GS}	Gate-to-Source Voltage	±20		V
I_L	Avalanche Current ①	1.5 (See Fig. 14)		A
dv/dt	Peak Diode recovery dv/dt ③	2.0 (See Fig. 17)		V/ns
T_J T_{STG}	Operating Junction Storage Temperature Range	-55 to 150		°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)		°C

Electrical Characteristics @ T_J = 25°C (Unless Otherwise Specified)

	Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	All	50	—	—	V	V_{GS} = 0V, I_D = 250µA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance ④	IRFR010 IRFU010	—	0.16	0.20	Ω	V_{GS} = 10V, I_D = 4.2A
		IRFR012 IRFU012	—	0.20	0.30		
$I_{D(on)}$	On-State Drain Current ④	IRFR010 IRFU010	8.2	—	—	A	V_{DS} > $I_{D(on)}$ × $R_{DS(on)}$ Max. V_{GS} = −10V
		IRFR012 IRFU012	6.7				
$V_{GS(th)}$	Gate Threshold Voltage	ALL	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance ④	ALL	2.1	3.1	—	S(℧)	V_{DS} ≥ 50V, I_{DS} = 3.6A
I_{DSS}	Zero Gate Voltage Drain Current	ALL	—	—	250	µA	V_{DS} = Max. Rating, V_{GS} = 0V
			—	—	1000		V_{DS} = 0.8 × Max. Rating V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Leakage Forward	ALL	—	—	500	nA	V_{GS} = 20V
I_{GSS}	Gate-to-Source Leakage Reverse	ALL	—	—	-500	nA	V_{GS} = -20V
Q_g	Total Gate Charge	ALL	—	6.7	10	nC	V_{GS} = 10V, I_D = 7.3A V_{DS} = 0.8 × Max. Rating See Fig. 16 (Independent of operating temperature)
Q_{gs}	Gate-to-Source Charge	ALL	—	1.8	2.6	nC	
Q_{gd}	Gate-to-Drain ("Miller") Charge		—	3.2	4.8	nC	
$t_{d(on)}$	Turn-On Delay Time	ALL	—	11	17	ns	V_{DD} = 25V, I_D = 7.3A, R_G = 24Ω R_D = 3.3Ω See Fig. 15 (Independent of operating temperature)
t_r	Rise Time	ALL	—	33	50	ns	
$t_{d(off)}$	Turn-Off Delay Time	ALL	—	12	18	ns	
t_f	Fall Time	ALL	—	23	35	ns	
L_D	Internal Drain Inductance	ALL	—	4.5	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.
L_S	Internal Source Inductance	ALL	—	7.5	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.
C_{iss}	Input Capacitance	ALL	—	250	—	pF	V_{GS} = 0V, V_{DS} = 25V f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	ALL	—	150	—	pF	
C_{rss}	Reverse Transfer Capacitance	ALL	—	29	—	pF	

Modifed MOSFET symbol showing the internal inductances.



Source-Drain Diode Ratings and Characteristics

	Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	ALL	—	—	8.2	A	Modified MOSFET symbol showing the integral Reverse p-n junction rectifier. 
I_{SM}	Pulsed Source Current (Body Diode) ①	ALL	—	—	33	A	
V_{SD}	Diode Forward Voltage ④	ALL	—	—	1.6	V	T_J = 25°C, I_S = 8.2A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	ALL	41	86	190	ns	T_J = 25°C, I_F = 7.3A, di/dt = 100 A/μs
Q_{RR}	Reverse Recovery Charge	ALL	0.15	0.33	0.78	μC	
t_{on}	Forward Turn-On Time	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

Thermal Resistance

R_{thJC}	Junction-to-Case	ALL	—	—	5.0	K/W ⑤	
R_{thCS}	Case-to-Sink	ALL	—	1.7	—	K/W ⑤	Typical solder mount ⑥
R_{thJA}	Junction-to-Ambient	ALL	—	—	110	K/W ⑤	Typical socket mount

① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 5)

② @ V_{DD} = 25V, Starting T_J = 25°C, L = 100μH, R_G = 25Ω, single pulse.

③ I_{SD} ≤ 8.2A, di/dt ≤ 130A/μs, V_{DD} ≤ 40V, T_J ≤ 150°C Suggested R_G = 24Ω

④ Pulse width ≤ 300 μs; Duty Cycle ≤ 2%

⑤ K/W = °C/W W/K = W/°C

⑥ Mounting pad must cover heatsink surface area. See case style drawing on front page.

The information shown on the following graphs applies also to the IRFU devices.

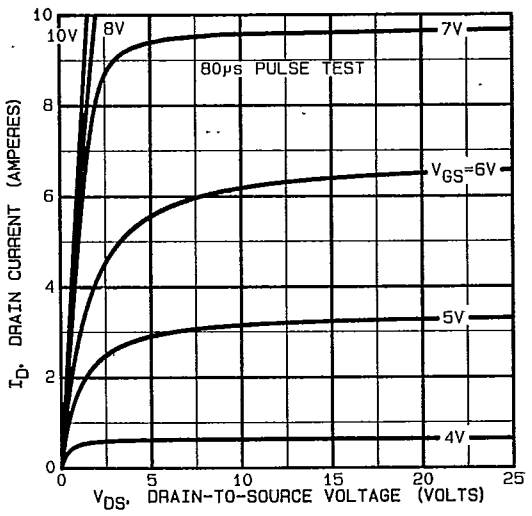


Fig. 1 — Typical Output Characteristics

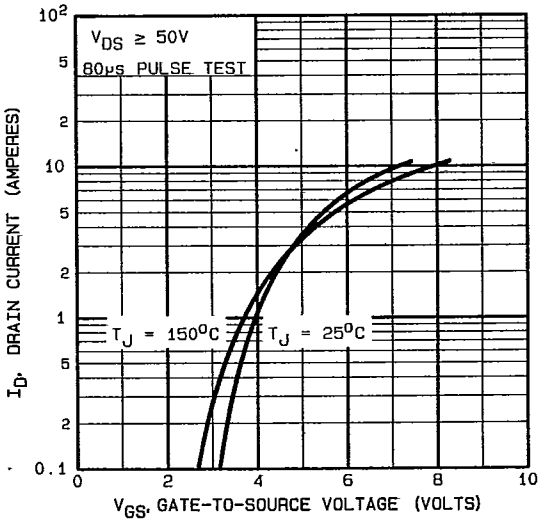


Fig. 2 — Typical Transfer Characteristics