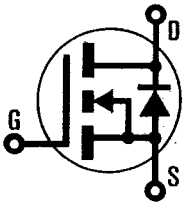
INTERNATIONAL RECTIFIER IOR

T-39-11

HEXFET® TRANSISTORS

N-CHANNEL POWER MOSFETs



IRFJ320
IRFJ321
IRFJ322
IRFJ323

400 Volt, 1.8 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and great device ruggedness.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

Features:

- Fast Switching
- Low Drive Current
- Ease of Paralleling
- Excellent Temperature Stability

Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFJ320	400V	1.8Ω	3.0A
IRFJ321	350V	1.8Ω	3.0A
IRFJ322	400V	2.5Ω	2.5A
IRFJ323	350V	2.5Ω	2.5A

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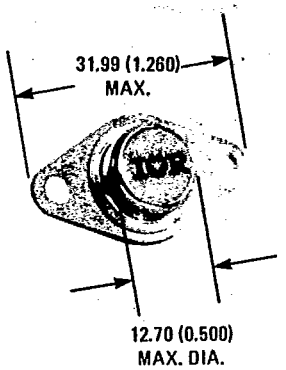
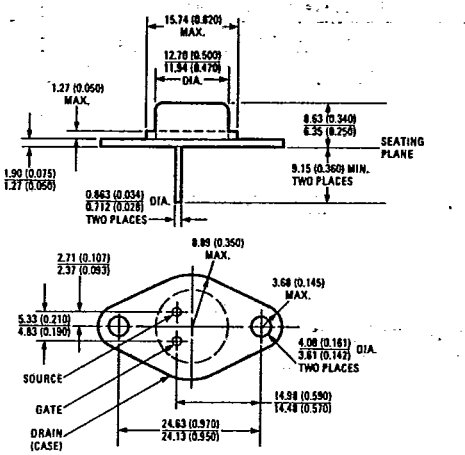
CASE STYLE AND DIMENSIONS





Conforms to JEDEC Case Style TO-213AA (TO-66)
Dimensions in Millimeters and (Inches)

IRFJ320, IRFJ321, IRFJ322, IRFJ323 Devices

Absolute Maximum Ratings

Parameter		IRFJ320	IRFJ321	IRFJ322	IRFJ323	Units
V_{DS}	Drain - Source Voltage ①	400	350	400	350	V
V_{DGR}	Drain - Gate Voltage (R_{GS} = 20 kΩ) ①	400	350	400	350	V
I_D @ T_C = 25°C	Continuous Drain Current	3.0	3.0	2.5	2.5	A
I_D @ T_C = 100°C	Continuous Drain Current	2.0	2.0	1.5	1.5	A
I_{DM}	Pulsed Drain Current ③	12	12	10	10	A
V_{GS}	Gate - Source Voltage	±20				V
P_D @ T_C = 25°C	Max. Power Dissipation	40 (See Fig. 14)				W
	Linear Derating Factor	0.32 (See Fig. 14)				W/K ④
I_{LM}	Inductive Current, Clamped	(See Fig. 15 and 16) L = 100μH				A
		12	12	10	10	
T_J T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150				°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)				°C

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

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain - Source Breakdown Voltage	IRFJ320 IRFJ322	400	–	–	V	V_{GS} = 0V
		IRFJ321 IRFJ323	350	–	–	V	I_D = 250μA
$V_{GS(th)}$	Gate Threshold Voltage	ALL	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{GSS}	Gate - Source Leakage Forward	ALL	–	–	100	nA	V_{GS} = 20V
I_{GSS}	Gate - Source Leakage Reverse	ALL	–	–	-100	nA	V_{GS} = -20V
I_{DSS}	Zero Gate Voltage Drain Current	ALL	–	–	250	μA	V_{DS} = Max. Rating, V_{GS} = 0V
			–	–	1000	μA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_C = 125°C
$I_{D(on)}$	On-State Drain Current ②	IRFJ320 IRFJ321	3.0	–	–	A	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max.}$, V_{GS} = 10V
		IRFJ322 IRFJ323	2.5	–	–	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance ②	IRFJ320 IRFJ321	–	1.5	1.8	Ω	V_{GS} = 10V, I_D = 1.6A
		IRFJ322 IRFJ323	–	1.8	2.5	Ω	
g_{fs}	Forward Transconductance ②	ALL	1.0	2.0	–	S (℧)	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max.}$, I_D = 1.6A
C_{iss}	Input Capacitance	ALL	–	450	600	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	ALL	–	100	200	pF	
C_{rss}	Reverse Transfer Capacitance	ALL	–	20	40	pF	
$t_{d(on)}$	Turn-On Delay Time	ALL	–	20	40	ns	V_{DD} ≅ 0.5 BV_{DSS}, I_D = 1.6A, Z_o = 50Ω See Fig. 17 (MOSFET switching times are essentially independent of operating temperature.)
t_r	Rise Time	ALL	–	25	50	ns	
$t_{d(off)}$	Turn-Off Delay Time	ALL	–	50	100	ns	
t_f	Fall Time	ALL	–	25	50	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	–	12	15	nC	V_{GS} = 10V, I_D = 4.0A, V_{DS} = 0.8 Max. Rating. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	ALL	–	6.0	–	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	ALL	–	6.0	–	nC	
L_D	Internal Drain Inductance	ALL	–	5.0	–	nH	Measured between the contact screw on header that is closer to source and gate pins and center of die.
L_S	Internal Source Inductance	ALL	–	12.5	–	nH	Measured from the source pin, 6 mm (0.25 in.) from header and source bonding pad.

Modified MOSFET symbol showing the internal device inductances.

Thermal Resistance

R_{thJC}	Junction-to-Case	ALL	–	–	3.1	K/W ④	
R_{thCS}	Case-to-Sink	ALL	–	0.2	–	K/W ④	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	ALL	–	–	50	K/W ④	Typical socket mount

Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFJ320 IRFJ321	–	–	3.0	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
		IRFJ322 IRFJ323	–	–	2.5	A	
I_{SM}	Pulse Source Current (Body Diode) ③	IRFJ320 IRFJ321	–	–	12	A	
		IRFJ322 IRFJ323	–	–	10	A	
V_{SD}	Diode Forward Voltage ②	IRFJ320 IRFJ321	–	–	1.6	V	T_C = 25°C, I_S = 2.8A, V_{GS} = 0V
		IRFJ322 IRFJ323	–	–	1.5	V	T_C = 25°C, I_S = 2.4A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	ALL	–	450	–	ns	T_J = 150°C, I_F = 2.8A, dI_F/dt = 100A/μs
Q_{RR}	Reverse Recovered Charge	ALL	–	3.1	–	μC	T_J = 150°C, I_F = 2.8A, dI_F/dt = 100A/μs
t_{on}	Forward Turn-on Time	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

①T_J = 25°C to 150°C. ②Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%. ③Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

④ K/W = °C/W
W/K = W/°C

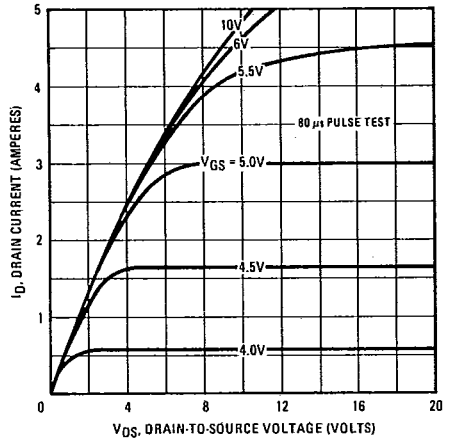


Fig. 1 – Typical Output Characteristics

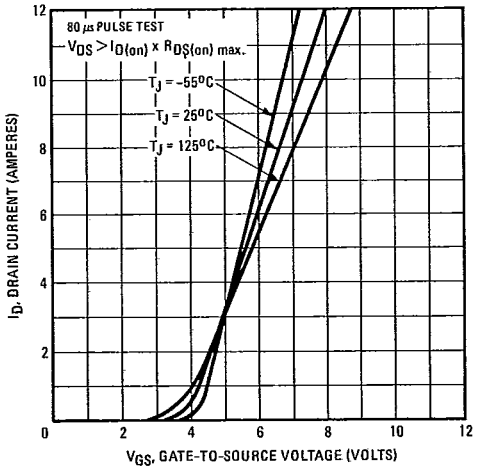


Fig. 2 – Typical Transfer Characteristics

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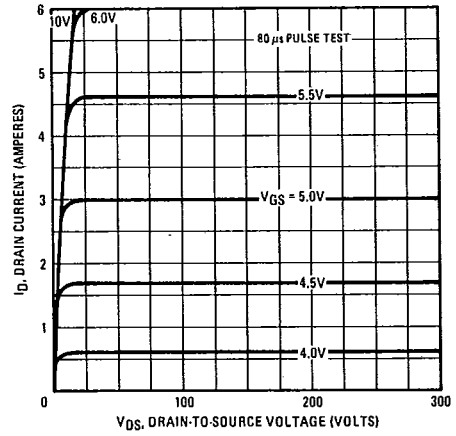

Fig. 3 – Typical Saturation Characteristics

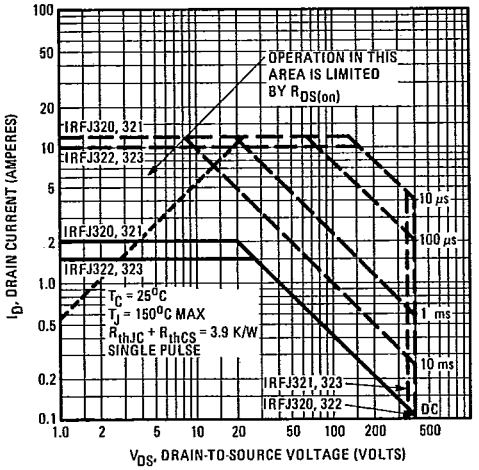

Fig. 4 – Maximum Safe Operating Area

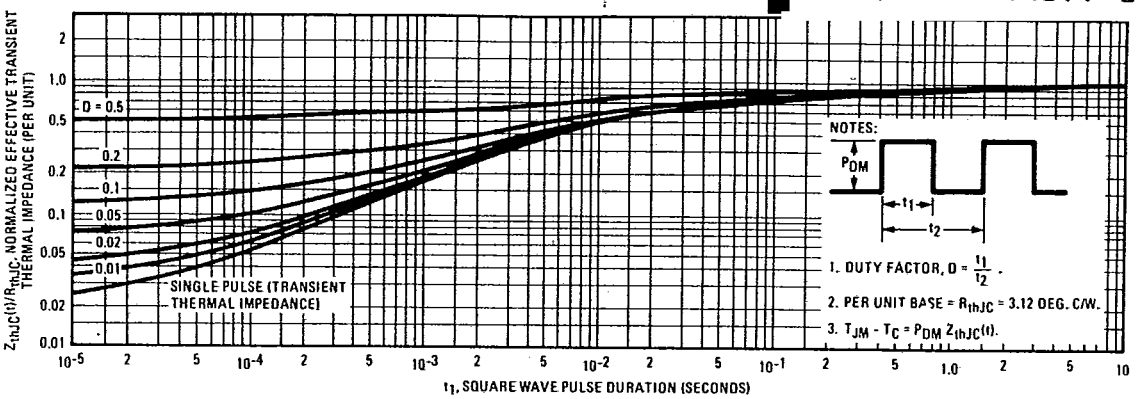

Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

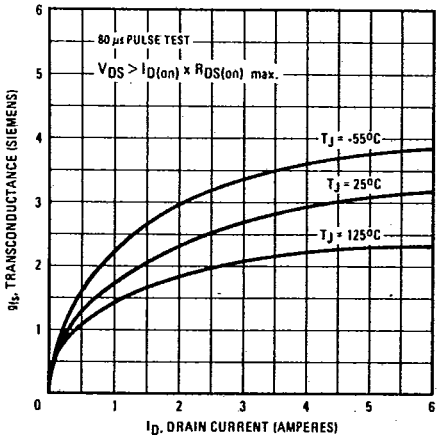

Fig. 6 — Typical Transconductance Vs. Drain Current

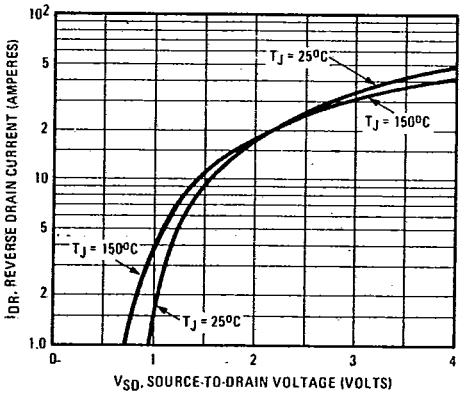

Fig. 7 — Typical Source-Drain Diode Forward Voltage

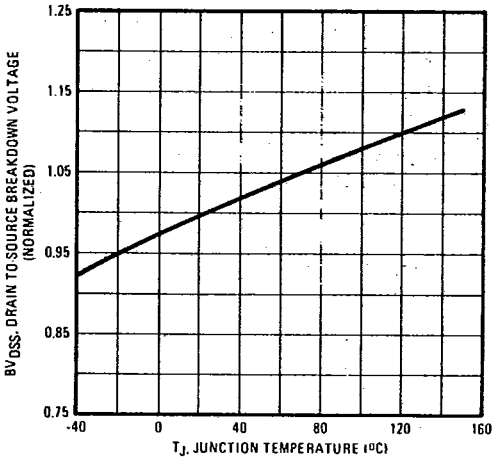

Fig. 8 — Breakdown Voltage Vs. Temperature

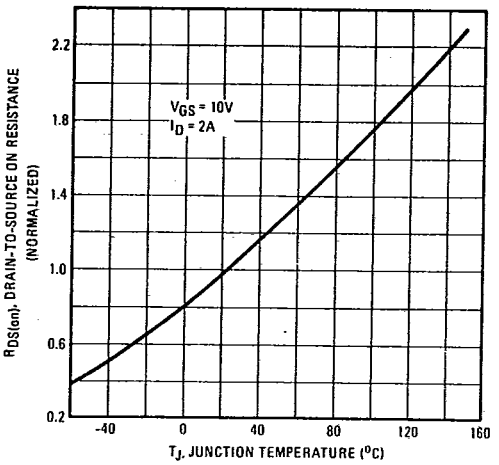

Fig. 9 — Normalized On-Resistance Vs. Temperature

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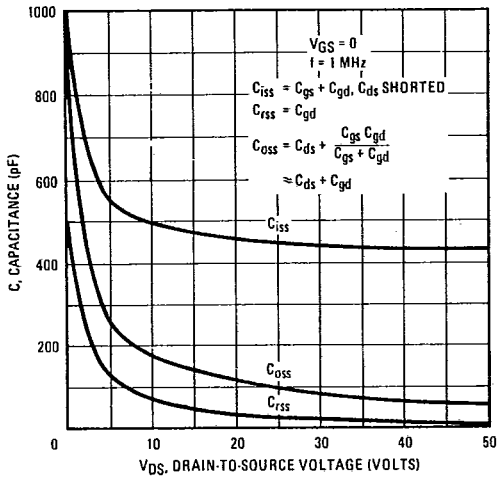

Fig. 10 – Typical Capacitance Vs. Drain-to-Source Voltage

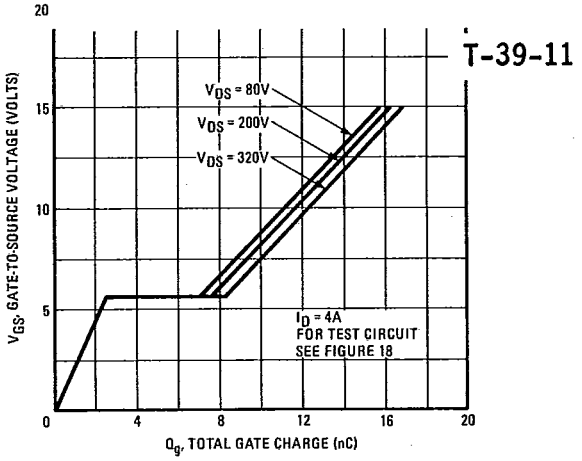

Fig. 11 – Typical Gate Charge Vs. Gate-to-Source Voltage

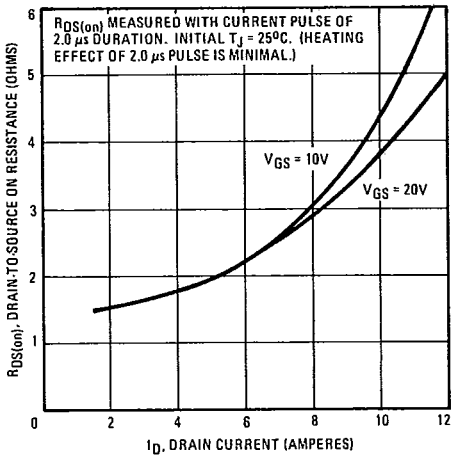

Fig. 12 – Typical On-Resistance Vs. Drain Current

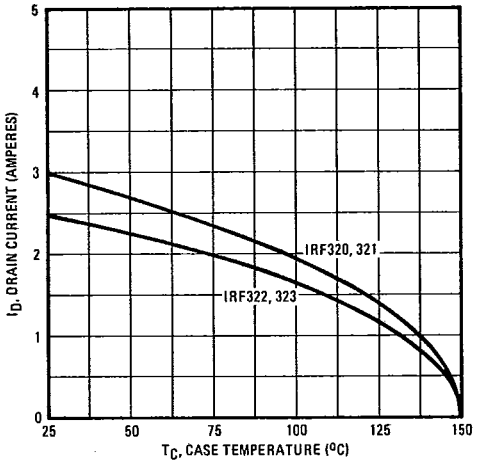

Fig. 13 – Maximum Drain Current Vs. Case Temperature

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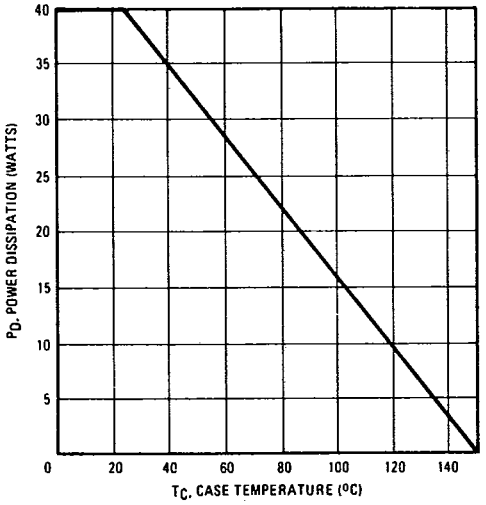

Fig. 14 – Power Vs. Temperature Derating Curve

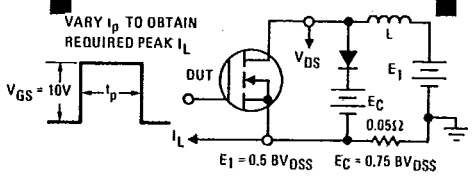

Fig. 15 — Clamped Inductive Test Circuit

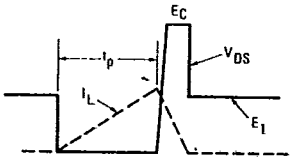

Fig. 16 — Clamped Inductive Waveforms

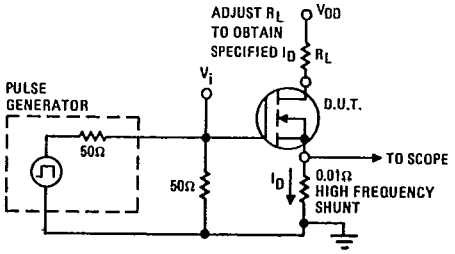

Fig. 17 — Switching Time Test Circuit

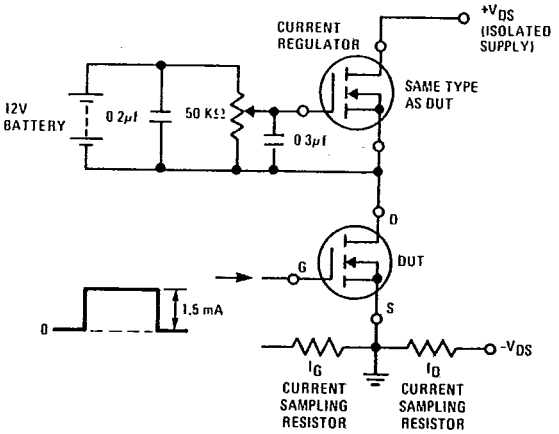

Fig. 18 — Gate Charge Test Circuit