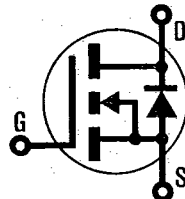


HEXFET® TRANSISTORS

IRFJ330

N-CHANNEL
POWER MOSFETs


IRFJ331

IRFJ332

IRFJ333

400 Volt, 1.0 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.

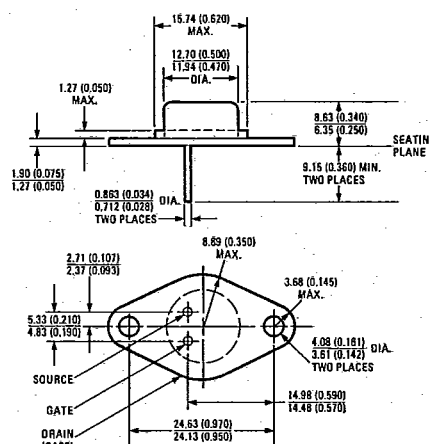
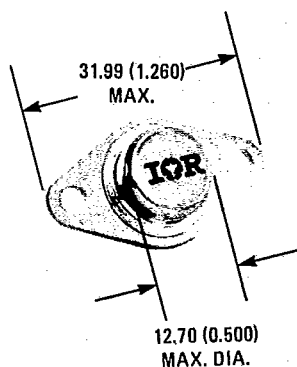
Features:

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

Product Summary

Part Number	V _{DS}	R _{DS(on)}	I _D
IRFJ330	400V	1.0Ω	4.5A
IRFJ331	350V	1.0Ω	4.5A
IRFJ332	400V	1.5Ω	4.0A
IRFJ333	350V	1.5Ω	4.0A

CASE STYLE AND DIMENSIONS



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

TO-66

Absolute Maximum Ratings

Parameter	IRFJ330	IRFJ331	IRFJ332	IRFJ333	Units
V_{DS} Drain - Source Voltage ①	400	350	400	350	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20\text{ K}\Omega$) ①	400	350	400	350	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	4.5	4.5	4.0	4.0	A
$I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current	3.0	3.0	2.5	2.5	A
I_{DM} Pulsed Drain Current ③	18	18	15	15	A
V_{GS} Gate - Source Voltage	± 20				V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	50 (See Fig. 14)				W
Linear Derating Factor	0.4 (See Fig. 14)				W/K ④
I_{LM} Inductive Current, Clamped	18	18	15	15	A
T_J Operating Junction and Storage Temperature Range	-65 to 150				$^\circ\text{C}$
Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)				$^\circ\text{C}$

Electrical Characteristics @ $T_C = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS} Drain - Source Breakdown Voltage	IRFJ330	400	—	—	V	$V_{GS} = 0\text{V}$ $I_D = 250\mu\text{A}$
	IRFJ332	—	—	—	V	
	IRFJ331	350	—	—	V	
$V_{GS(th)}$ Gate Threshold Voltage	ALL	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
I_{GSS} Gate - Source Leakage Forward	ALL	—	—	100	nA	$V_{GS} = 20\text{V}$
I_{GSS} Gate - Source Leakage Reverse	ALL	—	—	-100	nA	$V_{GS} = -20\text{V}$
I_{DSS} Zero Gate Voltage Drain Current	ALL	—	—	250	μA	$V_{DS} = \text{Max. Rating}, V_{GS} = 0\text{V}$
		—	—	1000	μA	$V_{DS} = \text{Max. Rating} \times 0.8, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$
$I_{D(on)}$ On-State Drain Current ②	IRFJ330	4.5	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on)max.}, V_{GS} = 10\text{V}$
	IRFJ331	—	—	—	A	
	IRFJ332	4.0	—	—	A	
$R_{DS(on)}$ Static Drain-Source On-State Resistance ②	IRFJ330	—	0.8	1.0	Ω	$V_{GS} = 10\text{V}, I_D = 2.5\text{A}$
	IRFJ331	—	—	—	Ω	
	IRFJ332	—	1.0	1.5	Ω	
g_{fs} Forward Transconductance ②	ALL	3.0	4.0	—	S (①)	$V_{DS} > I_{D(on)} \times R_{DS(on)max.}, I_D = 2.5\text{A}$
C_{iss} Input Capacitance	ALL	—	700	900	pF	$V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1.0\text{ MHz}$ See Fig. 10
C_{oss} Output Capacitance	ALL	—	150	300	pF	
C_{rss} Reverse Transfer Capacitance	ALL	—	40	80	pF	
$t_{d(on)}$ Turn-On Delay Time	ALL	—	—	30	ns	$V_{DD} = 175\text{V}, I_D = 2.5\text{A}, Z_\theta = 150$ See Fig. 17 (MOSFET switching times are essentially independent of operating temperature.)
t_r Rise Time	ALL	—	—	35	ns	
$t_{d(off)}$ Turn-Off Delay Time	ALL	—	—	55	ns	
t_f Fall Time	ALL	—	—	35	ns	
Q_g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	—	18	30	nC	$V_{GS} = 10\text{V}, I_D = 6\text{A}, V_{DS} = 0.8\text{ Max. Rating.}$ See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q_{gs} Gate-Source Charge	ALL	—	11	—	nC	
Q_{gd} Gate-Drain ("Miller") Charge	ALL	—	7.0	—	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	—	—	2.5	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

T-39-09

I_S	Continuous Source Current (Body Diode)	IRFJ330 IRFJ331	—	—	4.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
		IRFJ332 IRFJ333	—	—	4.0	A	
I_{SM}	Pulse Source Current (Body Diode) ③	IRFJ330 IRFJ331	—	—	18	A	
		IRFJ332 IRFJ333	—	—	15	A	
V_{SD}	Diode Forward Voltage ②	IRFJ330 IRFJ331	—	—	1.6	V	$T_C = 25^\circ\text{C}, I_S = 4.5\text{A}, V_{GS} = 0\text{V}$
		IRFJ332 IRFJ333	—	—	1.5	V	$T_C = 25^\circ\text{C}, I_S = 4.0\text{A}, V_{GS} = 0\text{V}$
t_{rr}	Reverse Recovery Time	ALL	—	600	—	ns	$T_J = 150^\circ\text{C}, I_F = 4.5\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$
Q_{RR}	Reverse Recovered Charge	ALL	—	4.0	—	μC	$T_J = 150^\circ\text{C}, I_F = 4.5\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$
t_{on}	Forward Turn-on Time	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

① $T_J = 25^\circ\text{C}$ to 150°C . ② Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

③ Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

④ $K/W = ^\circ\text{C}/\text{W}$
 $W/K = \text{W}/^\circ\text{C}$

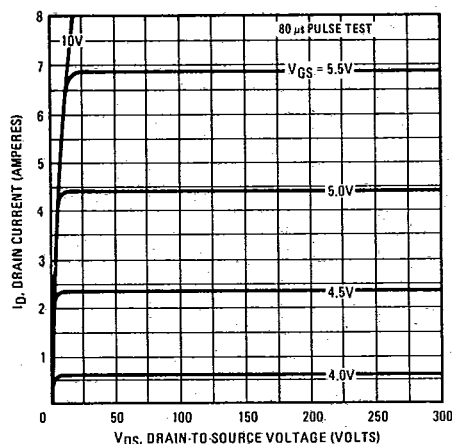


Fig. 1 - Typical Output Characteristics

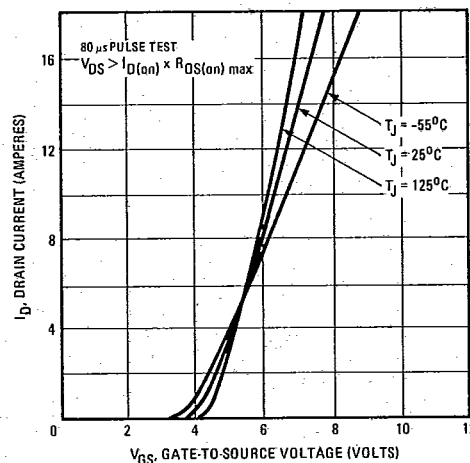


Fig. 2 - Typical Transfer Characteristics

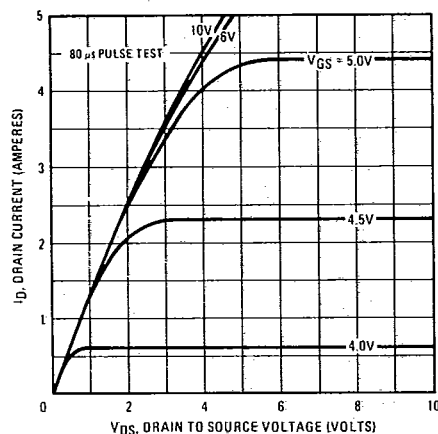


Fig. 3 - Typical Saturation Characteristics

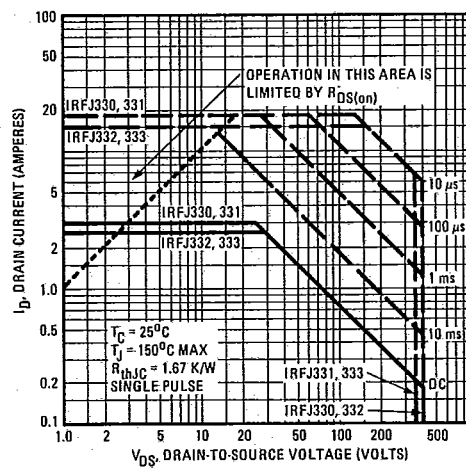


Fig. 4 - Maximum Safe Operating Area

IRFJ330, IRFJ331, IRFJ332, IRFJ333 Devices

INTERNATIONAL RECTIFIER

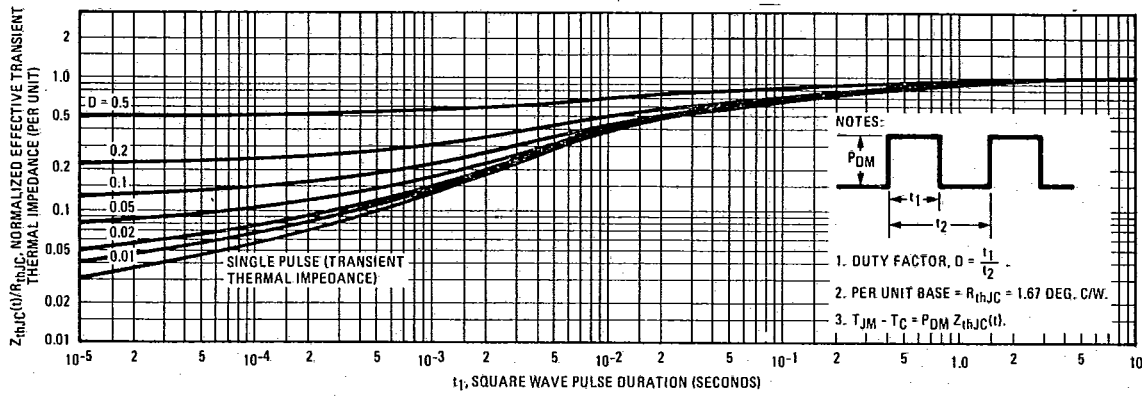


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

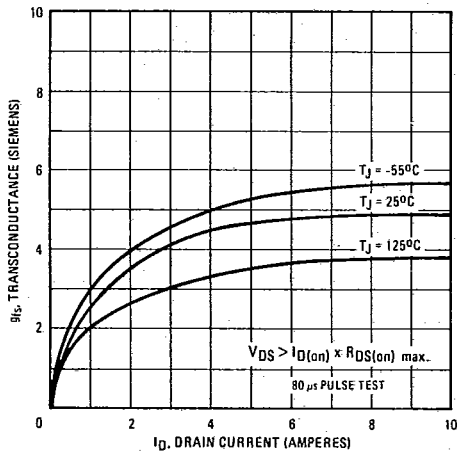


Fig. 6 — Typical Transconductance Vs. Drain Current

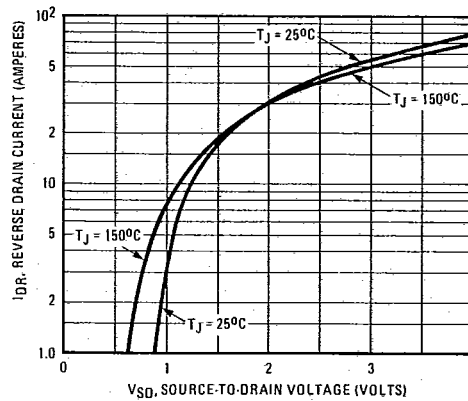


Fig. 7 — Typical Source-Drain Diode Forward Voltage

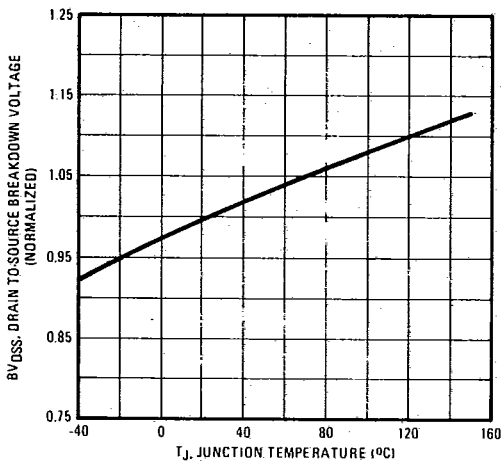


Fig. 8 — Breakdown Voltage Vs. Temperature

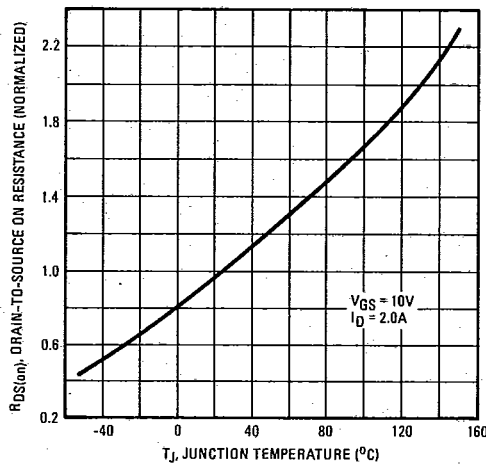
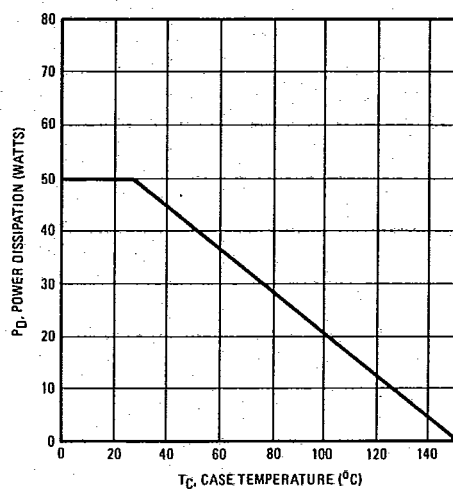
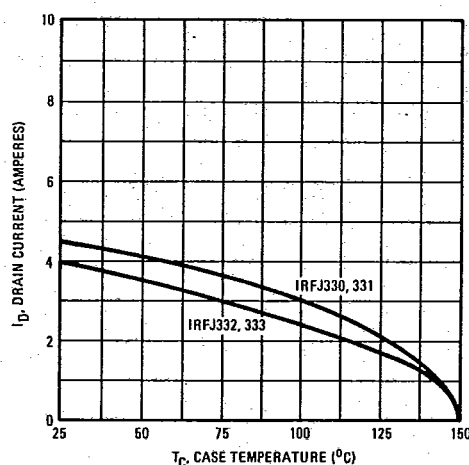
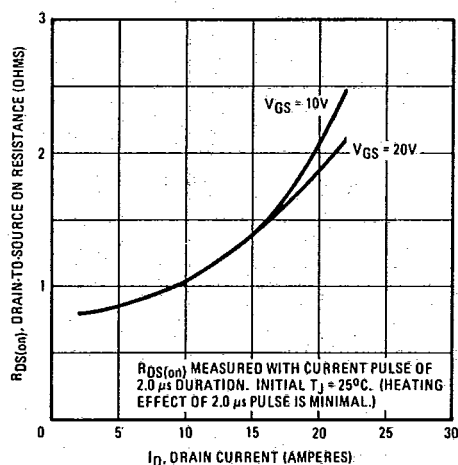
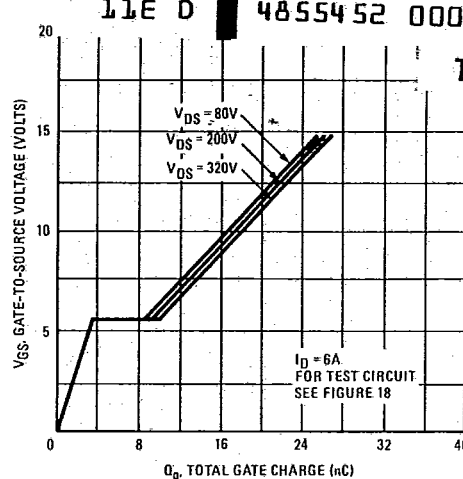
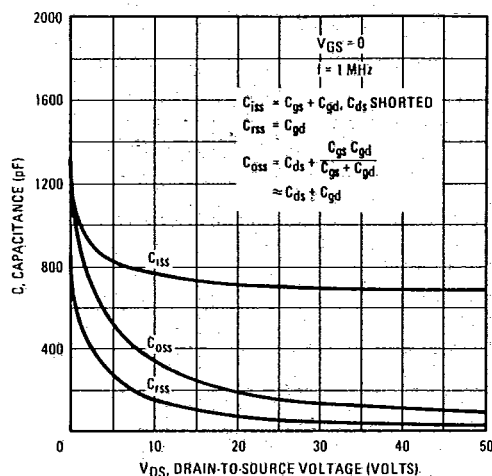


Fig. 9 — Normalized On-Resistance Vs. Temperature



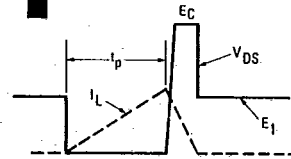


Fig. 16 — Clamped Inductive Waveforms

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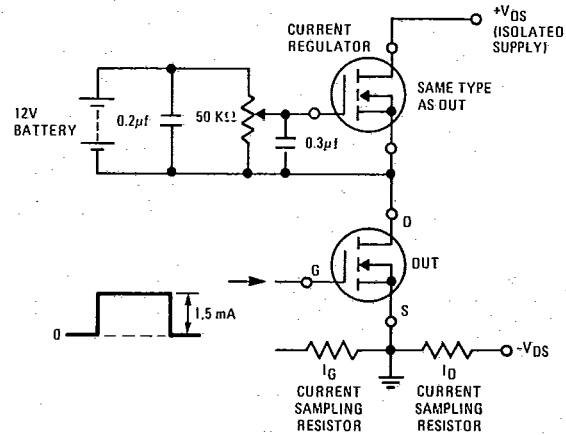


Fig. 18 — Gate Charge Test Circuit