

IRFF9130, IRFF9131
 IRFF9132, IRFF9133

Avalanche-Energy-Rated P-Channel Power MOSFETs

-5.5A and -6.5A, -60V and -100V
 $r_{DS(on)} = 0.30\Omega$ and 0.40Ω

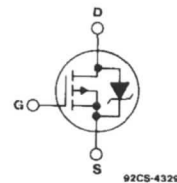
Features:

- Single pulse avalanche energy rated
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance

The IRFF9130, IRFF9131, IRFF9132 and IRFF9133 are advanced power MOSFETs designed, tested, and guaranteed to withstand a specified level of energy in the breakdown avalanche mode of operation. These are p-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

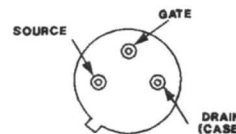
The IRFF-types are supplied in the JEDEC TO-205AF (LOW-PROFILE TO-39) metal package.

TERMINAL DIAGRAM



P-CHANNEL ENHANCEMENT MODE

TERMINAL DESIGNATION



JEDEC TO-205AF

Absolute Maximum Ratings

Parameter	IRFF9130	IRFF9131	IRFF9132	IRFF9133	Units
V_{DS} Drain - Source Voltage ①	-100	-60	-100	-60	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20\text{ k}\Omega$) ①	-100	-60	-100	-60	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	-6.5	-6.5	-5.5	-5.5	A
I_{DM} Pulsed Drain Current ③	-26	-26	-22	-22	A
V_{GS} Gate - Source Voltage	± 20				V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	25 (See Fig. 14)				W
Linear Derating Factor	0.2 (See Fig. 14)				W/°C
E_{AS} Single Pulse Avalanche Energy ④	500				mJ
T_J Operating Junction and T_{stg} Storage Temperature Range	-55 to 150				°C
Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)				°C

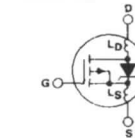
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IRFF9130, IRFF9131, IRFF9132, IRFF9133

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

Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
BV _{DSS} Drain - Source Breakdown Voltage	IRFF9130 IRFF9132	-100	-	-	V	V _{GS} = 0V
	IRFF9131 IRFF9133	-60	-	-	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
	ALL	-	-	-1000	μA	V _{DS} = Max. Rating x 0.8, V _{GS} = 0V, T _C = 125°C
I _{D(on)} On-State Drain Current ②	IRFF9130 IRFF9131	-6.5	-	-	A	V _{DS} > I _{D(on)} x R _{DS(on)} max., V _{GS} = -10V
	IRFF9132 IRFF9133	-5.5	-	-	A	
R _{DS(on)} Static Drain - Source On-State Resistance ②	IRFF9130 IRFF9131	-	0.25	0.30	Ω	V _{GS} = -10V, I _D = -3.0A
	IRFF9132 IRFF9133	-	0.30	0.40	Ω	
g _{fs} Forward Transconductance ②	ALL	2.5	3.5	-	S (Ω)	V _{DS} > I _{D(on)} x R _{DS(on)} max., I _D = -3.0A
C _{iss} Input Capacitance	ALL	-	500	-	pF	V _{GS} = 0V, V _{DS} = -25V, f = 1.0 MHz
C _{oss} Output Capacitance	ALL	-	300	-	pF	See Fig. 10
C _{rss} Reverse Transfer Capacitance	ALL	-	100	-	pF	
t _{d(on)} Turn-On Delay Time	ALL	-	30	60	ns	V _{DD} = 0.5 BV _{DSS} , I _D = -3.0A, Z ₀ = 50Ω
t _r Rise Time	ALL	-	70	140	ns	See Fig. 17
t _{d(off)} Turn-Off Delay Time	ALL	-	70	140	ns	(MOSFET switching times are essentially independent of operating temperature.)
t _f Fall Time	ALL	-	70	140	ns	
Q _g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	-	25	45	nC	V _{GS} = -15V, I _D = -15A, V _{DS} = 0.8V Max. Rating. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q _{gs} Gate-Source Charge	ALL	-	13	23	nC	
Q _{gd} Gate-Drain ("Miller") Charge	ALL	-	12	22	nC	
L _D Internal Drain Inductance	ALL	-	5.0	-	nH	Measured from the drain lead, 5mm (0.2 in.) from header to center of die.
L _S Internal Source Inductance	ALL	-	15	-	nH	Measured from the source lead, 5mm (0.2 in.) from header to source bonding pad.

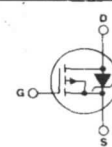


Thermal Resistance

R _{θJC} Junction-to-Case	ALL	-	-	5.0	°C/W	
R _{θJA} Junction-to-Ambient	ALL	-	-	175	°C/W	Typical socket mount

Source-Drain Diode Ratings and Characteristics

I _S Continuous Source Current (Body Diode)	IRFF9130 IRFF9131	-	-	-6.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
	IRFF9132 IRFF9133	-	-	-5.5	A	
I _{SM} Pulse Source Current (Body Diode) ③	IRFF9130 IRFF9131	-	-	-26	A	
	IRFF9132 IRFF9133	-	-	-22	A	
V _{SD} Diode Forward Voltage ②	IRFF9130 IRFF9131	-	-	-1.5	V	T _C = 25°C, I _S = -6.5A, V _{GS} = 0V
	IRFF9132 IRFF9133	-	-	-1.5	V	T _C = 25°C, I _S = -5.5A, V _{GS} = 0V
t _{rr} Reverse Recovery Time	ALL	-	300	-	ns	T _J = 150°C, I _F = -6.5A, dI _F /dt = 100A/μs
Q _{RR} Reverse Recovered Charge	ALL	-	1.8	-	μC	T _J = 150°C, I _F = -6.5A, 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 .				



① T_J = 25°C to 150°C.

② Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%.

③ Repetitive Rating: Pulse width limited by max. junction temperature.

See Transient Thermal Impedance Curve (Fig. 5).

④ V_{DD} = 25V, starting T_J = 25°C, L = 17.75 mH, R₀ = 25Ω, Peak I_L = 6.5A. (See Fig. 15 and 16)