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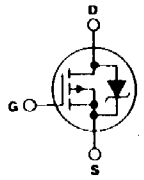
IRFP9240R, IRFP9241R, IRFP9242R, IRFP9243R

Avalanche-Energy-Rated P-Channel Power MOSFETs

-10 A and -12 A, 200 V and 150 V
$r_{DS(on)}$ = 0.50 Ω and 0.70 Ω

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

TERMINAL DIAGRAM

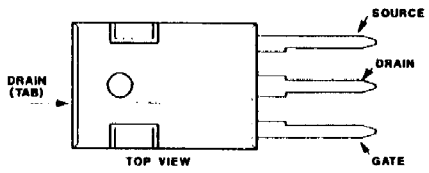


P-CHANNEL ENHANCEMENT MODE

The IRFP9240R, IRFP9241R, IRFP9242R and IRFP9243R 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 IRFP-types are supplied in the JEDEC TO-247 plastic package.

TERMINAL DESIGNATION



JEDEC TO-247

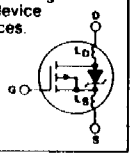
ABSOLUTE-MAXIMUM RATINGS

CHARACTERISTIC		IRFP9240R	IRFP9241R	IRFP9242R	IRFP9243R	UNITS
Drain-Source Voltage ①	V_{DS}	-200	-150	-200	-150	V
Drain-Gate Voltage (R_{GS} = 20 kΩ) ①	V_{DGR}	-200	-150	-200	-150	V
Continuous Drain Current	I_D @ T_C = 25°C	-12	-12	-10	-10	A
Continuous Drain Current	I_D @ T_C = 100°C	-7.5	-7.5	-6.3	-6.3	A
Pulsed Drain Current ③	I_{DM}	-48	-48	-40	-40	A
Gate-Source Voltage	V_{GS}	±20				V
Maximum Power Dissipation	P_D @ T_C = 25°C	150 (See Fig. 14)				W
Linear Derating Factor		1.2 (See Fig. 14)				W/°C
Single-Pulse Avalanche Energy Rating ④	E_{as}	790				mJ
Operating Junction and Storage Temperature Range	T_J T_{stg}	-55 to +150				°C
Lead Temperature		300 (0.063 in. [1.6 mm] from case for 10 s)				°C

ELECTRICAL CHARACTERISTICS *At Case Temperature (T_C) = 25°C Unless Otherwise Specified*

CHARACTERISTIC		TYPE	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Drain-Source Breakdown Voltage	BV_{DSS}	IRFP9240R IRFP9242R	-200	—	—	V	V_{GS} = 0 V
		IRFP9241R IRFP9243R	-150	—	—	V	I_D = -250 μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	-2.0	—	-4.0	V	V_{DS} = V_{GS}, I_D = 250 μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	100	nA	V_{GS} = 20 V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	-100	nA	V_{GS} = -20 V
Zero-Gate Voltage Drain Current	I_{DSS}	ALL	—	—	250	μA	V_{DS} = Max. Rating, V_{GS} = 0 V
			—	—	1000	μA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0 V, T_C = 125°C
On-State Drain Current ②	$I_{D(on)}$	IRFP9240R IRFP9241R	-12	—	—	A	V_{DS} > $I_{D(on)}$ x $r_{DS(on)\,max}$, V_{GS} = -10 V
		IRFP9242R IRFP9243R	-10	—	—	A	
Static Drain-Source On-State Resistance ②	$r_{DS(on)}$	IRFP9240R IRFP9241R	—	0.38	0.50	Ω	V_{GS} = -10 V, I_D = -6.3 A
		IRFP9242R IRFP9243R	—	0.50	0.70	Ω	
Forward Transconductance ②	g_{fs}	ALL	3.8	5.7	—	S(℧)	V_{DS} > $I_{D(on)}$ x $r_{DS(on)\,max}$, I_D = 10 A
Input Capacitance	C_{iss}	ALL	—	1400	—	pF	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz See Fig. 10
Output Capacitance	C_{oss}	ALL	—	350	—	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	140	—	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	18	22	ns	V_{DD} = -100 V, I_D = -11 A, Z_o = 9.1 Ω See Fig. 17 (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	45	68	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	75	90	ns	
Fall Time	t_f	ALL	—	29	44	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	38	57	nC	V_{GS} = -10 V, I_D = -11 A, V_{DS} = 0.8 Max. Rating. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	8	12	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	21	32	nC	
Internal Drain Inductance	L_D	ALL	—	5.0	—	nH	Measured between the contact screw on header that is closer to source and gate pins and center of die.
Internal Source Inductance	L_S	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

Junction-to-Case	$R_{\theta JC}$	ALL	—	—	0.83	°C/W	
Case-to-Sink	$R_{\theta CS}$	ALL	—	0.24	—	°C/W	Mounting surface flat, smooth, and greased.
Junction-to-Ambient	$R_{\theta JA}$	ALL	—	—	30	°C/W	Free Air Operation

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Continuous Source Current (Body Diode)	I_S	IRFP9240R IRFP9241R	—	—	-12	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
		IRFP9242R IRFP9243R	—	—	-12	A	
Pulse Source Current (Body Diode) ③	I_{SM}	IRFP9240R IRFP9241R	—	—	-48	A	
		IRFP9242R IRFP9243R	—	—	-48	A	
Diode Forward Voltage ②	V_{SD}	IRFP9240R IRFP9241R	—	—	-1.5	V	T_C = 25°C, I_S = -12 A, V_{GS} = 0 V
		IRFP9242R IRFP9243R	—	—	-1.5	V	T_C = 25°C, I_S = -12 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}	ALL	—	210	—	ns	T_J = 150°C, I_F = -12 A, dI_F/dt = 100 A/μs
Reverse Recovered Charge	Q_{RR}	ALL	—	2.0	—	μC	T_J = 150°C, I_F = -12 A, dI_F/dt = 100 A/μs
Forward Turn-on Time	t_{on}	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.