

Avalanche-Energy-Rated N-Channel Power MOSFETs

14 A and 13 A, 275 V and 250 V
 $r_{DS(on)} = 0.28 \Omega$ and 0.34Ω

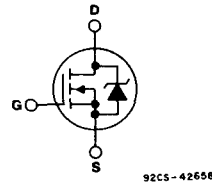
Features:

- Single pulse avalanche energy rated
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- 275, 250 V dc rated - 120V ac line system operation

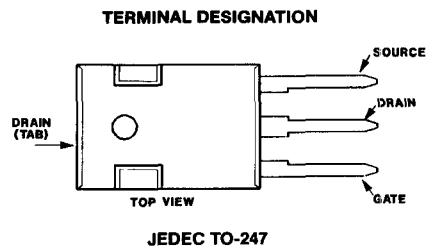
The IRFP244, IRFP245, IRFP246 and IRFP247 are advanced power MOSFETs designed, tested, and guaranteed to withstand a specified level of energy in the breakdown avalanche mode of operation. These are n-channel enhancement-mode silicon gate power field-effect transistors designed for applications such 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.

N-CHANNEL ENHANCEMENT MODE



TERMINAL DIAGRAM



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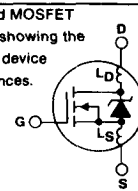
ABSOLUTE-MAXIMUM RATINGS

CHARACTERISTIC		IRFP244	IRFP245	IRFP246	IRFP247	UNITS
Drain-Source Voltage ^①	V_{DS}	250	250	275	275	V
Drain-Gate Voltage ($R_{DS} = 20 \text{ k}\Omega$) ^①	V_{DGR}	250	250	275	275	V
Continuous Drain Current	$I_D @ T_C = 25^\circ\text{C}$	14	13	14	13	A
Continuous Drain Current	$I_D @ T_C = 100^\circ\text{C}$	8.8	8.0	8.8	8.0	A
Pulsed Drain Current ^③	I_{DM}	56	52	56	52	A
Gate-Source Voltage	V_{GS}	± 20				V
Maximum Power Dissipation	$P_D @ T_C = 25^\circ\text{C}$	125				W
Linear Derating Factor		1.0				W/ $^\circ\text{C}$
Single-Pulse Avalanche Energy Rating ^④	E_{AS}	550				mJ
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150				$^\circ\text{C}$
Lead Temperature		300 (0.063 in. (1.6 mm) from case for 10s)				$^\circ\text{C}$

IRFP244, IRFP245, IRFP246, IRFP247

ELECTRICAL CHARACTERISTICS, At $T_c = 25^\circ\text{C}$ (Unless Otherwise Specified)

CHARACTERISTIC	TYPE	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Drain-Source Breakdown Voltage BV_{DS}	IRFP246	275	—	—	V	$V_{GS} = 0\text{ V}$ $I_D = 250\text{ }\mu\text{A}$
	IRFP247	—	—	—	—	
	IRFP244	250	—	—	V	
	IRFP245	—	—	—	—	
Gate Threshold Voltage $V_{GS(th)}$	ALL	2.0	—	4.0	V	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$
Gate-Source Leakage Forward I_{GSS}	ALL	—	—	500	nA	$V_{GS} = 20\text{ V}$
Gate-Source Leakage Reverse I_{GSS}	ALL	—	—	-500	nA	$V_{GS} = 20\text{ V}$
Zero-Gate Voltage Drain Current I_{DSS}	ALL	—	—	250	μA	$V_{DS} = \text{Max. Rating}$, $V_{GS} = 0\text{ V}$
		—	—	1000	μA	$V_{DS} = \text{Max. Rating} \times 0.8$, $V_{GS} = 0\text{ V}$, $T_c = 125^\circ\text{C}$
On-State Drain Current $I_{D(on)}$ ②	IRFP244	14	—	—	A	$V_{DS} > I_{D(on)} \times r_{DS(on)}$ max., $V_{GS} = 10\text{ V}$
	IRFP246	—	—	—	—	
	IRFP245	13	—	—	A	
	IRFP247	—	—	—	—	
Static Drain-Source On-State Resistance ②	IRFP244	—	0.20	0.28	Ω	$V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$
	IRFP246	—	—	—	—	
	IRFP245	—	0.24	0.34	Ω	
	IRFP247	—	—	—	—	
Forward Transconductance ③	g_{fs}	ALL	6.7	10	S (Ω)	$V_{DS} > I_{D(on)} \times r_{DS(on)}$ max., $I_D = 10\text{ A}$
Input Capacitance C_{iss}	ALL	—	1300	—	pF	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$
Output Capacitance C_{oss}	ALL	—	320	—	pF	See Fig. 10
Reverse Transfer Capacitance C_{rss}	ALL	—	69	—	pF	
Turn-On Delay Time $t_d(on)$	ALL	—	16	24	ns	$V_{DD} = 90\text{ V}$, $I_D = 10\text{ A}$, $Z_o = 4.7\text{ }\Omega$
Rise Time t_r	ALL	—	67	100	ns	See Fig. 17
Turn-Off Delay Time $t_d(off)$	ALL	—	53	80	ns	(MOSFET switching times are essentially independent of operating temperature.)
Fall Time t_f	ALL	—	49	74	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain) Q_g	ALL	—	39	59	nC	$V_{GS} = 10\text{ V}$, $I_D = 22\text{ A}$, $V_{DS} = 0.8\text{ Max. Rating}$. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
	Q_{gs}	ALL	—	6.6	9.9	nC
	Q_{gd}	ALL	—	20	30	nC
	Q_{gd}	ALL	—	20	30	nC
Internal Drain Inductance L_D	ALL	—	4.5	—	nH	Measured from the drain lead, 6 mm (0.25 in.) from package to center of die.
Internal Source Inductance L_S	ALL	—	7.5	—	nH	Measured from the source lead, 6 mm (0.25 in.) from package to source bonding pad.

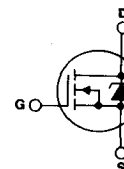


THERMAL RESISTANCE

Junction-to-Case $R_{\theta JC}$	ALL	—	—	1.0	$^\circ\text{C/W}$	
Case-to-Sink $R_{\theta CS}$	ALL	—	0.5	—	$^\circ\text{C/W}$	Mounting surface flat, smooth, and greased.
Junction-to-Ambient $R_{\theta JA}$	ALL	—	—	80	$^\circ\text{C/W}$	Free air operation.

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Continuous Source Current (Body Diode) I_S	IRFP244	—	—	14	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
	IRFP246	—	—	13	A	
Pulse Source Current (Body Diode) ③ I_{SM}	IRFP244	—	—	56	A	
	IRFP246	—	—	52	A	
Diode Forward Voltage ③ V_{SD}	ALL	—	—	1.8	V	$T_c = 25^\circ\text{C}$, $I_S = 14\text{ A}$, $V_{GS} = 0\text{ V}$
Reverse Recovery Time t_{rr}	ALL	150	300	640	ns	$T_J = 150^\circ\text{C}$, $I_F = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$
Reverse Recovered Charge Q_{RR}	ALL	1.6	3.4	7.2	μC	$T_J = 150^\circ\text{C}$, $I_F = 14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$
Forward Turn-on Time t_{on}	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 $\leq 300\text{ }\mu\text{s}$.
Duty Cycle $\leq 2\%$ ③ Repetitive Rating: Pulse width limited
by max. junction temperature
See Transient Thermal Impedance Curve (Fig. 5).④ $V_{DD} = 50\text{ V}$, Starting $T_J = 25^\circ\text{C}$, $L = 4.5\text{ mH}$,
 $R_o = 25\text{ }\Omega$, Peak $I_L = 14\text{ A}$ (See Figs. 14 & 15).

IRFP244, IRFP245, IRFP246, IRFP247

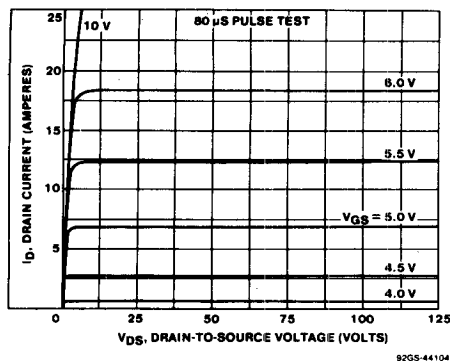


Fig. 1 - Typical output characteristics.

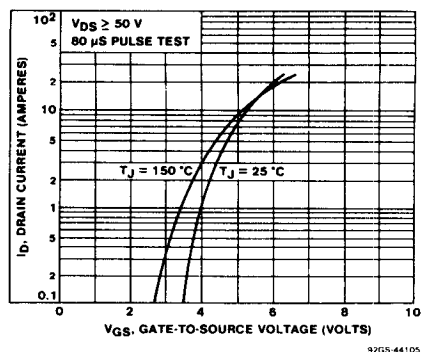


Fig. 2 - Typical transfer characteristics.

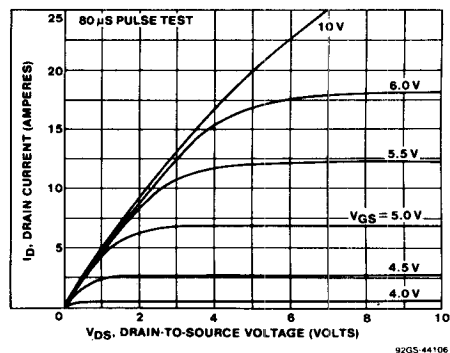


Fig. 3 - Typical saturation characteristics.

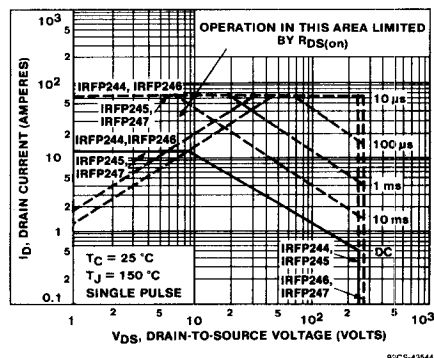


Fig. 4 - Maximum safe operating area.

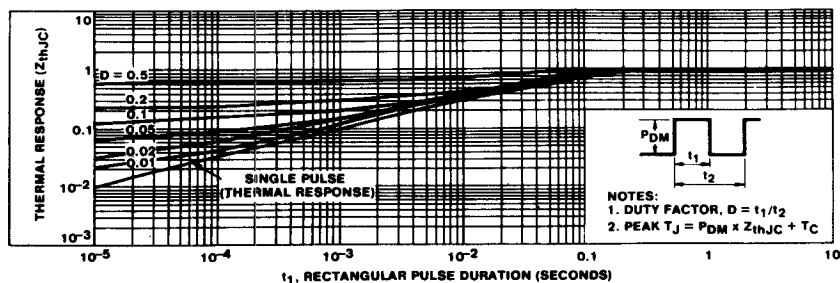
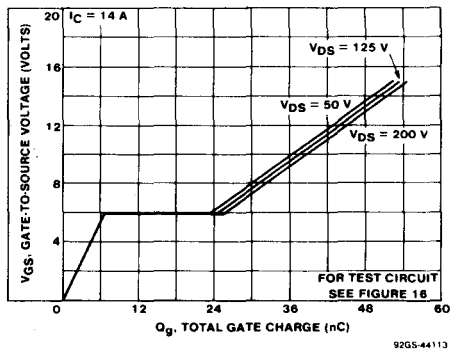
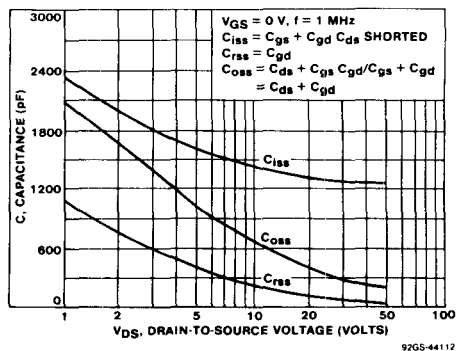
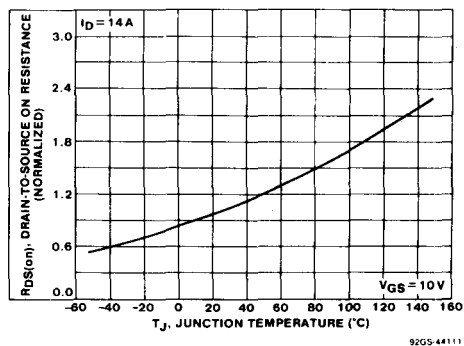
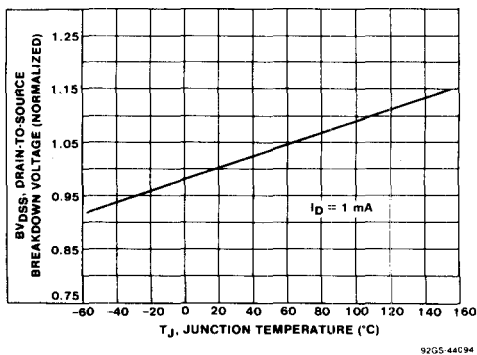
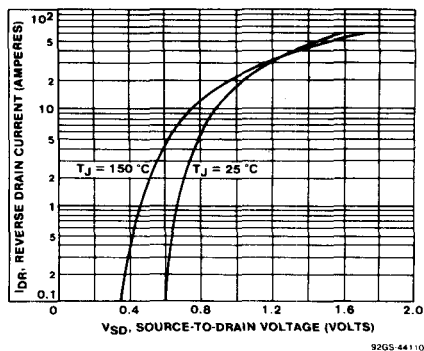
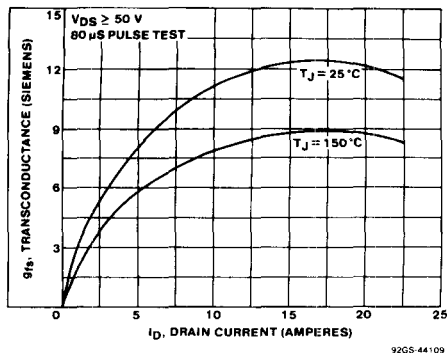


Fig. 5 - Maximum effective transient thermal impedance, junction-to-case vs. pulse duration.

IRFP244, IRFP245, IRFP246, IRFP247



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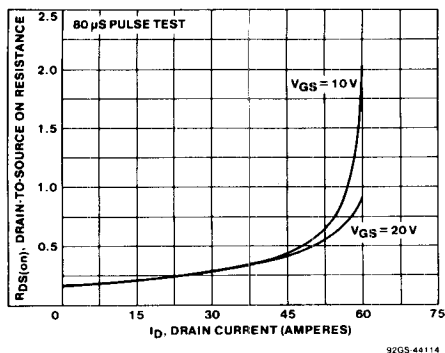


Fig. 12 - Typical on-resistance vs. drain current.

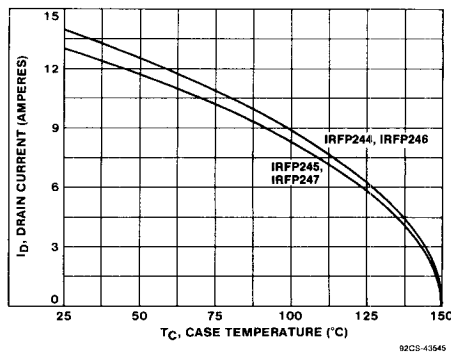


Fig. 13 - Maximum drain current vs. case temperature.

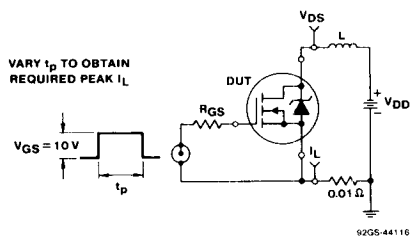


Fig. 14 - Unclamped energy test circuit.

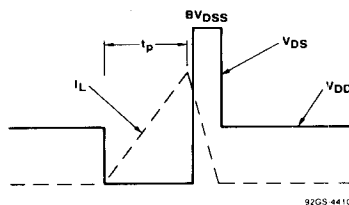


Fig. 15 - Unclamped energy waveforms.

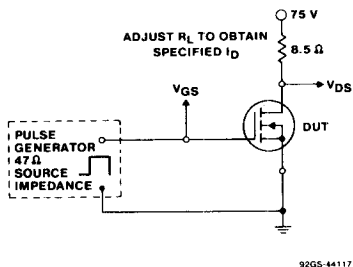


Fig. 16 - Switching time test circuit.

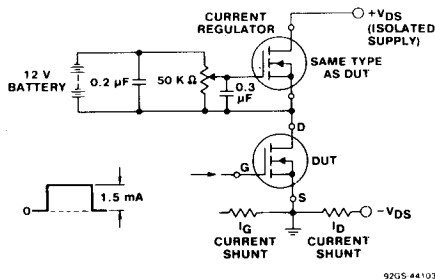


Fig. 17 - Gate charge test circuit.