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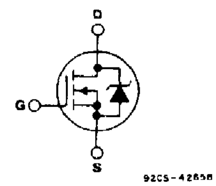
IRF254, IRF255
IRF256, IRF257

Avalanche-Energy-Rated N-Channel Power MOSFETs

22 A and 20 A, 275 V and 250 V
$r_{DS(on)}$ = 0.14 Ω and 0.17 Ω

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 - 120 V ac line system operation*

N-CHANNEL ENHANCEMENT MODE

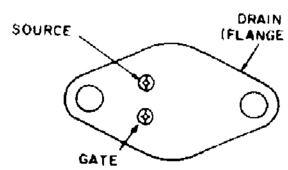


TERMINAL DIAGRAM

The IRF254, IRF255, IRF256 and IRF257 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 IRF-types are supplied in the JEDEC TO-204AE steel package.

TERMINAL DESIGNATION

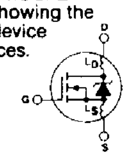


ABSOLUTE-MAXIMUM RATINGS

CHARACTERISTIC		IRF254	IRF255	IRF256	IRF257	UNITS
Drain-Source Voltage ①	V_{DS}	250	250	275	275	V
Drain-Gate Voltage (R_{GS} = 20 kΩ) ①	V_{DGR}	250	250	275	275	V
Continuous Drain Current	I_D @ T_C = 25°C	22	20	22	20	A
Continuous Drain Current	I_D @ T_C = 100°C	14	12	14	12	A
Pulsed Drain Current ③	I_{DM}	88	80	88	80	A
Gate-Source Voltage	V_{GS}	±20				V
Maximum Power Dissipation	P_D @ T_C = 25°C	150				W
Linear Derating Factor		1.2				W/°C
Single-Pulse Avalanche Energy Rating ④	E_{as}	1000				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}	IRF256 IRF257	275	—	—	V	V_{GS} = 0 V
		IRF254 IRF255	250	—	—	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	$I_{D(on)}$	IRF254 IRF256	22	—	—	A	$V_{DS} > I_{D(on)} \times r_{DS(on)\,max.}$, V_{GS} = 10 V
		IRF255 IRF257	20	—	—	A	
Static Drain-Source On-State Resistance ②	$r_{DS(on)}$	IRF254 IRF256	—	0.11	0.14	Ω	V_{GS} = 10 V, I_D = 12 A
		IRF255 IRF257	—	0.14	0.17	Ω	
Forward Transconductance ②	g_{fs}	ALL	11	17	—	S(Ω)	$V_{DS} > I_{D(on)} \times r_{DS(on)\,max.}$, I_D = 12 A
Input Capacitance	C_{iss}	ALL	—	2700	—	pF	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz See Fig. 10
Output Capacitance	C_{oss}	ALL	—	580	—	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	130	—	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	19	29	ns	V_{DD} = 125 V, I_D = 22 A, Z_O = 6.2 Ω See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	84	130	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	75	110	ns	
Fall Time	t_f	ALL	—	65	98	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	87	130	nC	V_{GS} = 10 V, I_D = 22 A, V_{DS} = 0.8 Max. Rating. See Fig. 17 for test circuit. (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	14	20	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	73	110	nC	
Internal Drain Inductance	L_D	ALL	—	5	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die. / Modified MOSFET symbol showing the internal device inductances.
Internal Source Inductance	L_S	ALL	—	13	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.

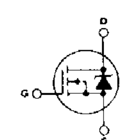


THERMAL RESISTANCE

Junction-to-Case	$R_{\theta JC}$	ALL	—	—	0.83	°C/W	
Case-to-Sink	$R_{\theta CS}$	ALL	—	0.12	—	°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	IRF254 IRF256	—	—	22	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
		IRF255 IRF257	—	—	22	A	
Pulse Source Current (Body Diode) ③	I_{SM}	IRF254 IRF256	—	—	88	A	
		IRF255 IRF257	—	—	88	A	
Diode Forward Voltage ②	V_{SD}	ALL	—	—	1.8	V	T_C = 25°C, I_S = 22 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}	ALL	150	310	650	ns	T_J = 150°C, I_F = 22 A, dI_F/dt = 100 A/μs
Reverse Recovered Charge	Q_{RR}	ALL	1.9	4	8.4	μC	T_J = 150°C, I_F = 22 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.				



① T_J = 25°C to 150°C.
② Pulse Test: Pulse width ≤ 300 μs, Duty Cycle ≤ 2%.
③ Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve.
④ V_{DD} = 50 V, Starting T_J = 25°C, L = 3.3 mH, R_G = 25 Ω, Peak I_L = 22 A (See Figs. 14 & 15).