

Avalanche Energy Rated N-Channel Power MOSFETs

8.1A, and 6.5A, 275, 250V

$r_{DS(on)} = 0.45\Omega, 0.68\Omega$

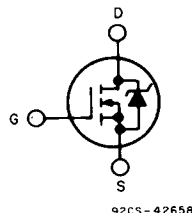
Features:

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

The IRF634, IRF635, IRF636, and IRF637 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.

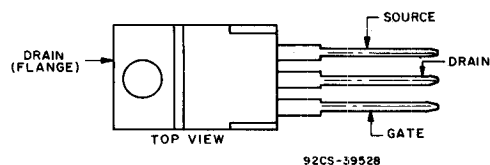
All types are supplied in the JEDEC TO-220AB plastic package.

N-CHANNEL ENHANCEMENT MODE



TERMINAL DIAGRAM

TERMINAL DESIGNATION



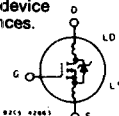
JEDEC TO-220AB

Absolute Maximum Ratings

Parameter	IRF634	IRF635	IRF636	IRF637	Units
V_{DS} Drain - Source Voltage ①	250	250	275	275	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20\text{ K}\Omega$) ①	250	250	275	275	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	8.1	6.5	8.1	6.5	A
$I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current	5.1	4.1	5.1	4.1	A
I_{DM} Pulsed Drain Current ②	32	26	32	26	A
V_{GS} Gate - Source Voltage	± 20				V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	75				W
Linear Derating Factor	0.6				W/ $^\circ\text{C}$
E_{AS} Single Pulse Avalanche Energy Rating ③	180				mJ
T_J Operating Junction and	-55 to 150				$^\circ\text{C}$
T_{stg} Storage Temperature Range					
Lead Temperature	300 [0.063 in. (1.6mm) from case for 10s]				$^\circ\text{C}$

**IRF634, IRF635
IRF636, IRF637**

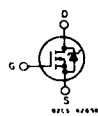
Electrical Characteristics @ $T_c = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions	
BV _{DSS} Drain - Source Breakdown Voltage	IRF636 IRF637	275	—	—	V	V _{GS} = 0V I _D = 250 μ A	
	IRF634 IRF635	250	—	—	V		
V _{GS(th)} Gate Threshold Voltage	ALL	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250 μ A	
I _{GSS} Gate-Source Leakage Forward	ALL	—	—	500	nA	V _{GS} = 20V	
I _{GSS} Gate-Source Leakage Reverse	ALL	—	—	-500	nA	V _{GS} = 20V	
I _{DSS} Zero Gate Voltage Drain Current	ALL	—	—	250	μ A	V _{DS} = Max. Rating, V _{GS} = 0V	
		—	—	1000	μ A	V _{DS} = Max. Rating x 0.8, V _{GS} = 0V, T _c = 125°C	
I _{D(on)} On-State Drain Current ②	IRF634 IRF636	8.1	—	—	A	V _{DS} > I _{D(on)} X R _{DS(on)max} , V _{GS} = 10V	
	IRF635 IRF637	6.5	—	—	A		
R _{DS(on)} Static Drain-Source On-State Resistance ②	IRF634 IRF636	—	0.32	0.45	Ω	V _{GS} = 10V, I _D = 4.1A	
	IRF635 IRF637	—	0.48	0.68	Ω		
g _{fs} Forward Transconductance ②	ALL	2.9	4.3	—	S(Ω)	V _{DS} > I _{D(on)} X R _{DS(on)max} , I _D = 4.1	
C _{iss} Input Capacitance	ALL	—	600	—	pF	V _{GS} = 0V, V _{DS} = 25V, f = 1.0 MHz See Fig. 10	
C _{oss} Output Capacitance	ALL	—	180	—	pF		
C _{rss} Reverse Transfer Capacitance	ALL	—	52	—	pF		
t _{D(on)} Turn-On Delay Time	ALL	—	9.1	14	ns	V _{DD} = 90V, I _D = 5.0A, Z _D = 15 Ω See Fig. 17 (MOSFET switching times are essentially independent of operating temperature.)	
t _r Rise Time	ALL	—	23	35	ns		
t _{D(off)} Turn-Off Delay Time	ALL	—	31	47	ns		
t _f Fall Time	ALL	—	19	29	ns		
Q _g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	—	24	35	nC	V _{GS} = 10V, I _D = 12A, V _{DS} = 0.8 Max. Rating. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)	
Q _{gs} Gate-Source Charge	ALL	—	5.1	7.7	nC		
Q _{gd} Gate-Drain ("Miller") Charge	ALL	—	12	18	nC		
L _D Internal Drain Inductance	ALL	—	4.5	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.	Modified MOSFET symbol showing the internal device inductances. 
L _S Internal Source Inductance	ALL	—	7.5	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.	

Thermal Resistance

R _{thJC} Junction-to-Case	ALL	—	—	1.67	°C/W	
R _{thCS} Case-to-Sink	ALL	—	0.5	—	°C/W	Mounting surface flat, smooth, and greased.
R _{thJA} Junction-to-Ambient	ALL	—	—	80	°C/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I _S Continuous Source Current (Body Diode)	IRF634 IRF636	—	—	8.1	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
	IRF635 IRF637	—	—	6.5	A	
I _{SM} Pulse Source Current (Body Diode) ③	IRF634 IRF636	—	—	32	A	
	IRF635 IRF637	—	—	26	A	
V _{SD} Diode Forward Voltage ②	ALL	—	—	2.0	V	T _c = 25°C, I _S = 8.1A, V _{GS} = 0V
t _{rr} Reverse Recovery Time	ALL	92	180	390	ns	T _J = 150°C, I _F = 8.1A, dI _F /dt = 100A/ μ s
Q _{RR} Reverse Recovered Charge	ALL	0.83	1.3	2.7	μ C	T _J = 150°C, I _F = 8.1A, dI _F /dt = 100A/ μ 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°C to 150°C.

② Pulse Test: Pulse width $\leq 300\mu$ 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} = 50V, starting T_J = 25°C, L = 4.5mH, R_{gs} = 25 Ω , I_{peak} = 8.1A. See figures 14, 15.

IRF634, IRF635
IRF636, IRF637

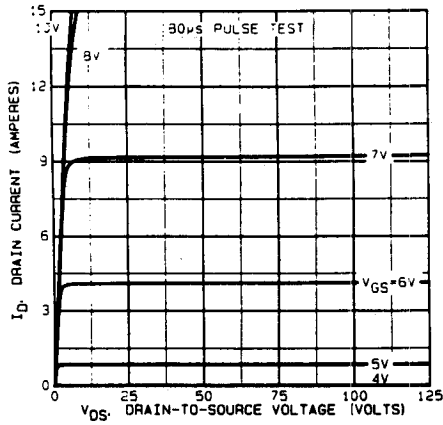


Fig. 1 — Typical Output Characteristics

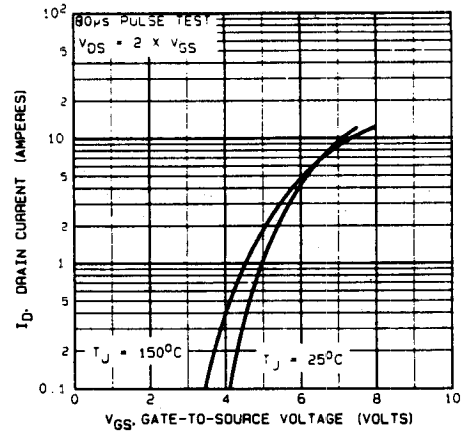


Fig. 2 — Typical Transfer Characteristics

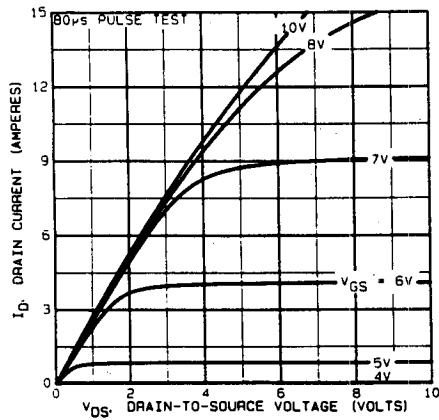


Fig. 3 — Typical Saturation Characteristics

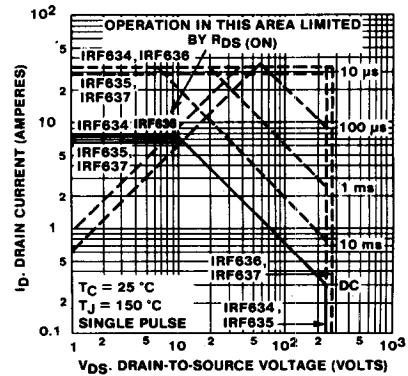
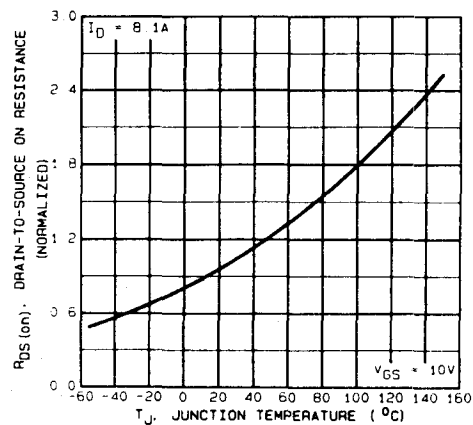
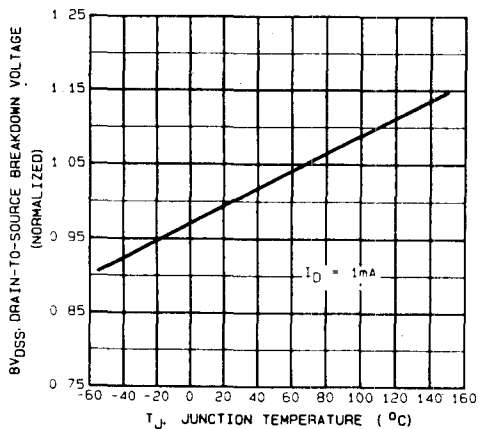
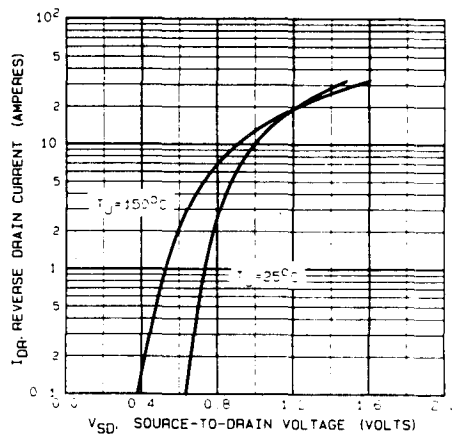
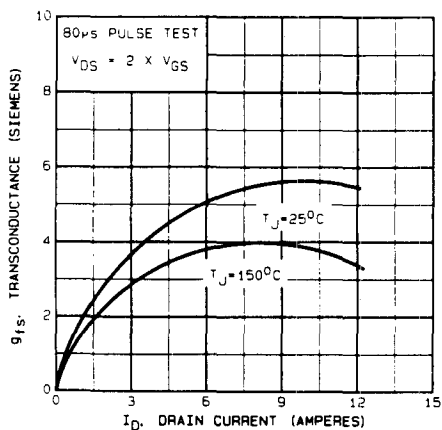
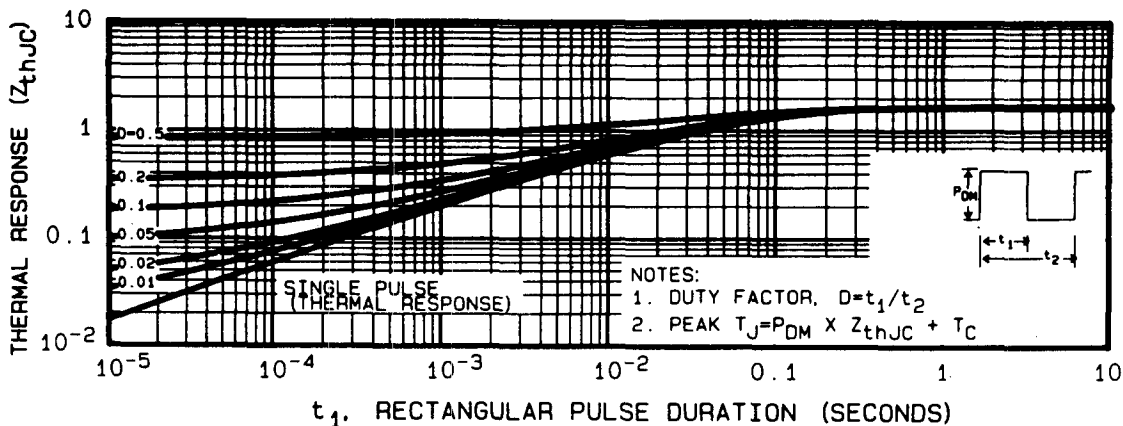


Fig. 4 — Maximum Safe Operating Area

IRF634, IRF635
IRF636, IRF637



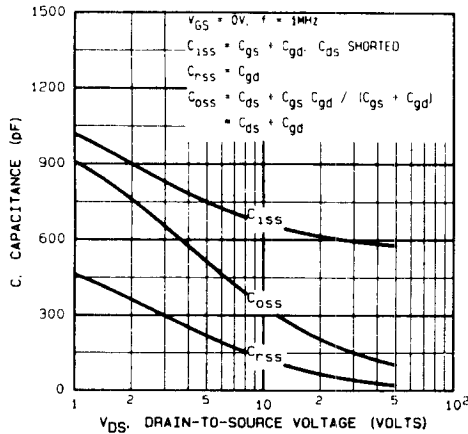


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

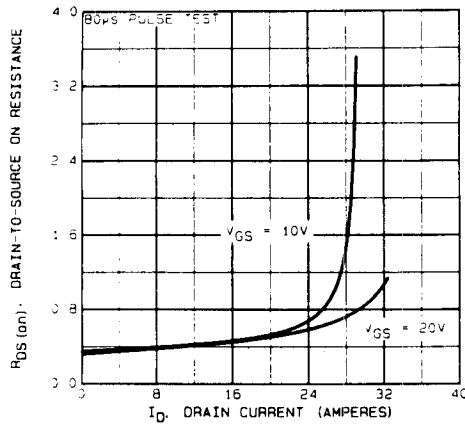


Fig. 12 — Typical On-Resistance Vs. Drain Current

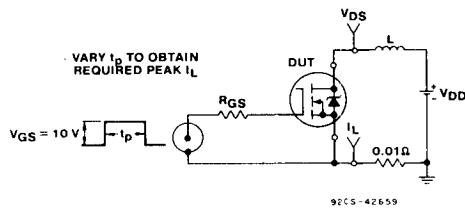


Fig. 14 — Unclamped Energy Test Circuit

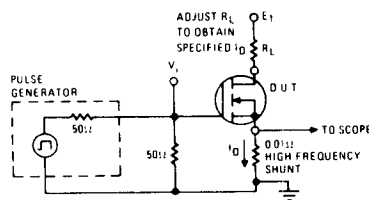


Fig. 16 — Switching Time Test Circuit

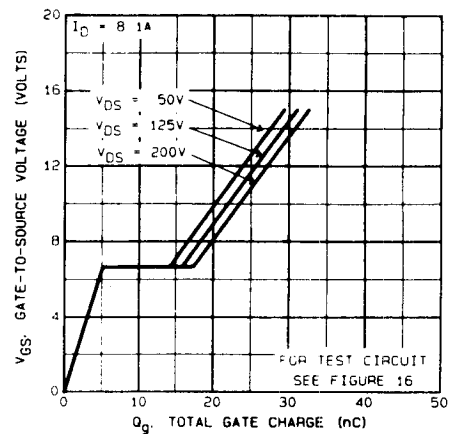


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

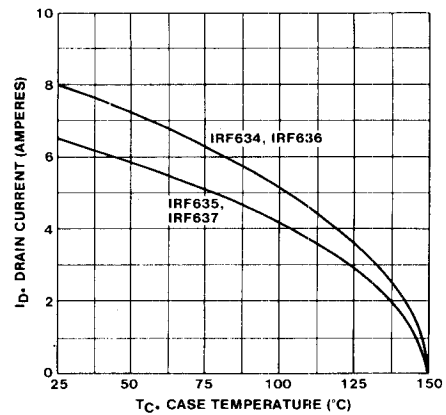


Fig. 13 — Maximum Drain Current Vs. Case Temperature

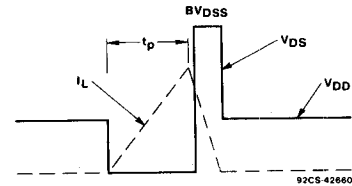


Fig. 15 — Unclamped Energy Waveforms

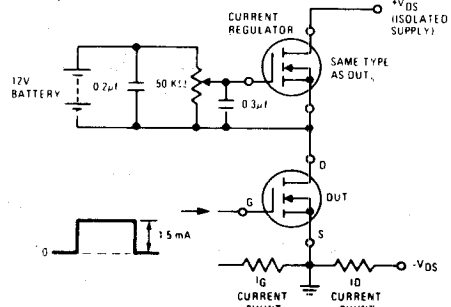


Fig. 17 — Gate Charge Test Circuit