

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode Power Field-Effect Transistors

25 A and 30 A, 150 V - 200 V
 $r_{DS(on)} = 0.085 \Omega$ and 0.120Ω

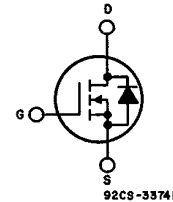
Features:

- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device

The IRF250, IRF251, IRF252 and IRF253 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 metal package.

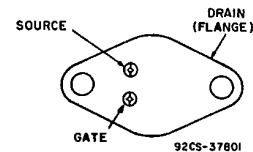
N-CHANNEL ENHANCEMENT MODE



92CS-33741

TERMINAL DIAGRAM

TERMINAL DESIGNATION



92CS-37801

JEDEC TO-204AE

Absolute Maximum Ratings

Parameter	IRF250	IRF251	IRF252	IRF253	Units
V_{DS} Drain - Source Voltage ①	200	150	200	150	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20 \text{ k}\Omega$) ①	200	150	200	150	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	30	30	25	25	A
$I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current	19	19	16	16	A
I_{DM} Pulsed Drain Current ②	120	120	100	100	A
V_{GS} Gate - Source Voltage	± 20				V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	150 (See Fig. 14)				W
Linear Derating Factor	1.2 (See Fig. 14)				W/K
I_{LM} Inductive Current, Clamped	(See Fig. 15 and 16) $L = 100 \mu\text{H}$				A
	120	120	100	100	
T_J Operating Junction and Storage Temperature Range	-55 to 150				$^\circ\text{C}$
T_{stg} Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)				$^\circ\text{C}$

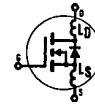
勝特力電材超市-龍山店 886-3-5773766
 勝特力電材超市-光復店 886-3-5729570
 勝特力電子(上海) 86-21-34970699
 勝特力電子(深圳) 86-755-83298787
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IRF250, IRF251, IRF252, IRF253

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	IRF250	200	—	—	V	$V_{GS} = 0\text{V}$ $I_D = 250\mu\text{A}$
	IRF252	—	—	—	—	
	IRF251	150	—	—	V	
	IRF253	—	—	—	—	
V _{GS(th)} Gate Threshold Voltage	ALL	2.0	—	4.0	V	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$
I _{GSS} Gate-Source Leakage Forward	ALL	—	—	100	nA	$V_{GS} = 20\text{V}$
I _{GSS} Gate-Source Leakage Reverse	ALL	—	—	-100	nA	$V_{GS} = -20\text{V}$
I _{DSS} Zero Gate Voltage Drain Current	ALL	—	—	250	μA	$V_{DS} = \text{Max. Rating}$, $V_{GS} = 0\text{V}$
		—	—	1000	μA	$V_{DS} = \text{Max. Rating} \times 0.8$, $V_{GS} = 0\text{V}$, $T_C = 125^\circ\text{C}$
I _{D(on)} On-State Drain Current ②	IRF250	30	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}$, $V_{GS} = 10\text{V}$
	IRF251	—	—	—	—	
	IRF252	25	—	—	A	
	IRF253	—	—	—	—	
R _{DS(on)} Static Drain-Source On-State Resistance ②	IRF250	—	0.07	0.085	Ω	$V_{GS} = 10\text{V}$, $I_D = 16\text{A}$
	IRF251	—	—	—	—	
	IRF252	—	0.09	0.120	Ω	
	IRF253	—	—	—	—	
g _{fs} Forward Transconductance ②	ALL	8.0	14	—	S (Ω)	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}$, $I_D = 16\text{A}$
C _{iss} Input Capacitance	ALL	—	2000	3000	pF	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1.0\text{MHz}$ See Fig. 10
C _{oss} Output Capacitance	ALL	—	800	1200	pF	
C _{rss} Reverse Transfer Capacitance	ALL	—	300	500	pF	
t _{d(on)} Turn-On Delay Time	ALL	—	—	35	ns	$V_{DD} = 95\text{V}$, $I_D = 16\text{A}$, $Z_o = 4.7\Omega$ See Fig. 17 (MOSFET switching times are essentially independent of operating temperature.)
t _r Rise Time	ALL	—	—	100	ns	
t _{d(off)} Turn-Off Delay Time	ALL	—	—	125	ns	
t _f Fall Time	ALL	—	—	100	ns	
Q _g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	—	79	120	nC	$V_{GS} = 10\text{V}$, $I_D = 38\text{A}$, $V_{DS} = 0.8 \text{ Max. Rating}$. See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q _{gs} Gate-Source Charge	ALL	—	37	—	nC	
Q _{gd} Gate-Drain ("Miller") Charge	ALL	—	42	—	nC	
L _D Internal Drain Inductance	ALL	—	5.0	—	nH	Measured between the contact screw on header that is closer to source and gate pins and center of die.
L _S Internal Source Inductance	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

R _{thJC} Junction-to-Case	ALL	—	—	0.83	K/W	
R _{thCS} Case-to-Sink	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased.
R _{thJA} Junction-to-Ambient	ALL	—	—	30	K/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I _S Continuous Source Current (Body Diode)	IRF250	—	—	30	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier.
	IRF251	—	—	—	—	
	IRF252	—	—	25	A	
	IRF253	—	—	—	—	
I _{SM} Pulse Source Current (Body Diode) ③	IRF250	—	—	120	A	
	IRF251	—	—	—	—	
	IRF252	—	—	100	A	
	IRF253	—	—	—	—	
V _{SD} Diode Forward Voltage ②	IRF250	—	—	2.0	V	$T_C = 25^\circ\text{C}$, $I_S = 30\text{A}$, $V_{GS} = 0\text{V}$
	IRF251	—	—	—	—	
	IRF252	—	—	1.8	V	$T_C = 25^\circ\text{C}$, $I_S = 25\text{A}$, $V_{GS} = 0\text{V}$
t _{rr} Reverse Recovery Time	ALL	—	750	—	ns	$T_J = 150^\circ\text{C}$, $I_F = 30\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$
Q _{RR} Reverse Recovered Charge	ALL	—	4.7	—	μC	$T_J = 150^\circ\text{C}$, $I_F = 30\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$
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 $T_J = 25^\circ\text{C}$ to 150°C .

② Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

③ Repetitive Rating: Pulse width limited by max. junction temperature.
See Transient Thermal Impedance Curve (Fig. 5).

IRF250, IRF251, IRF252, IRF253

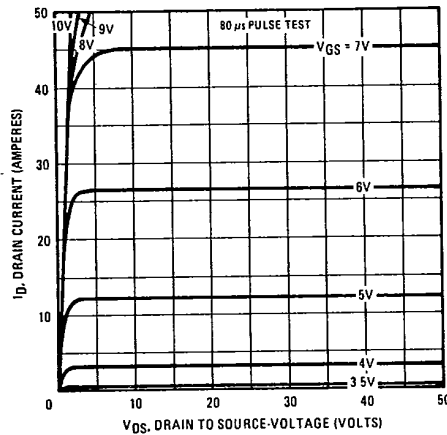


Fig. 1 - Typical Output Characteristics

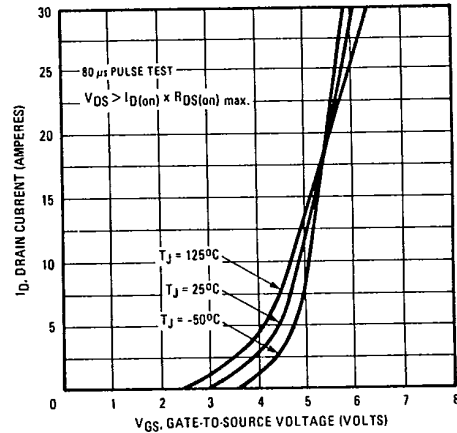


Fig. 2 - Typical Transfer Characteristics

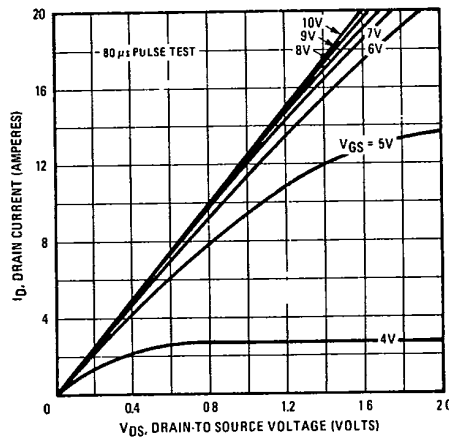


Fig. 3 - Typical Saturation Characteristics

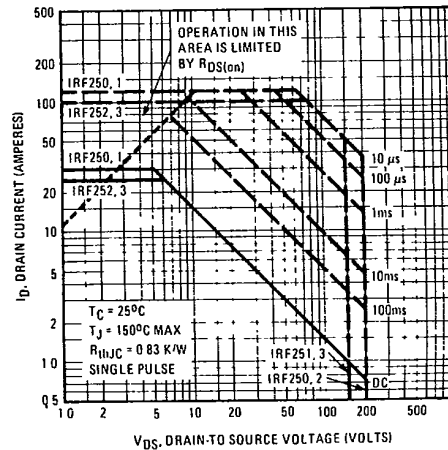


Fig. 4 - Maximum Safe Operating Area

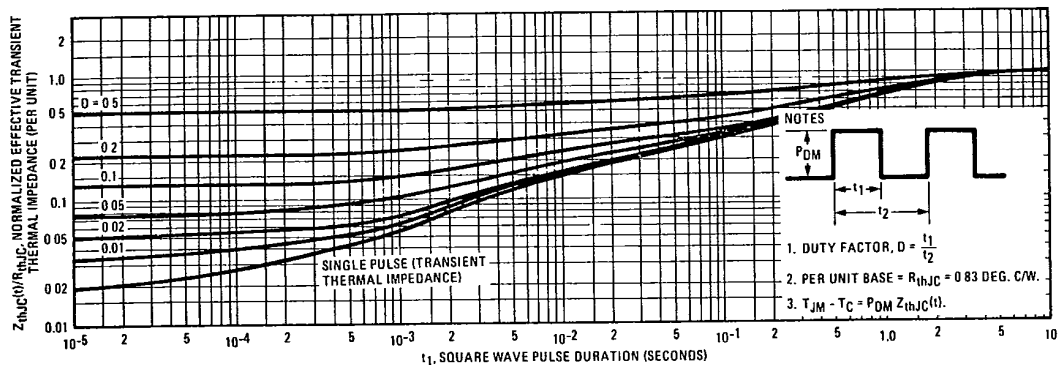


Fig. 5 - Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

IRF250, IRF251, IRF252, IRF253

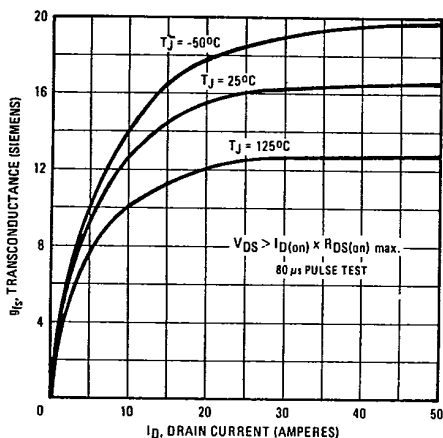


Fig. 6 - Typical Transconductance Vs. Drain Current

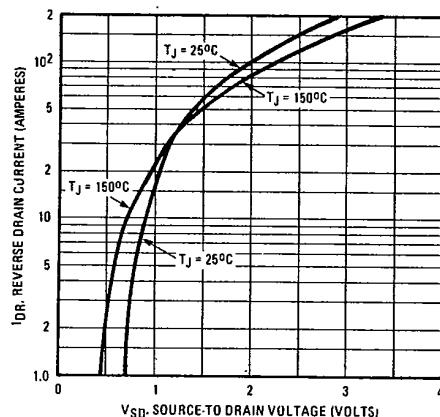


Fig. 7 - Typical Source-Drain Diode Forward Voltage

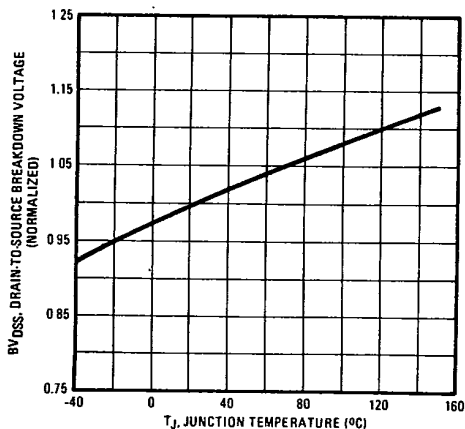


Fig. 8 - Breakdown Voltage Vs. Temperature

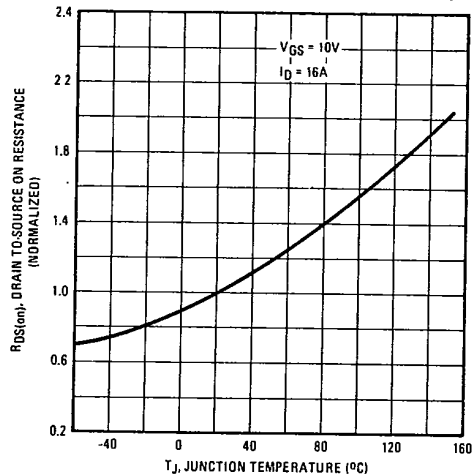


Fig. 9 - Normalized On-Resistance Vs. Temperature

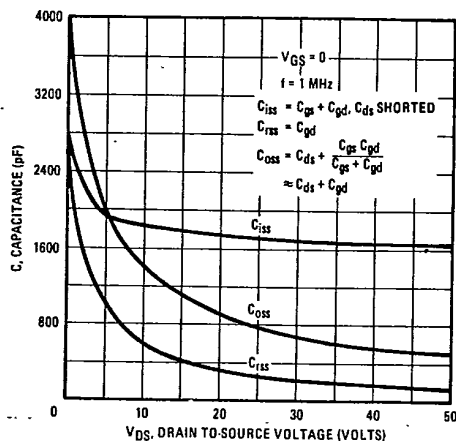


Fig. 10 - Typical Capacitance Vs. Drain-to-Source Voltage

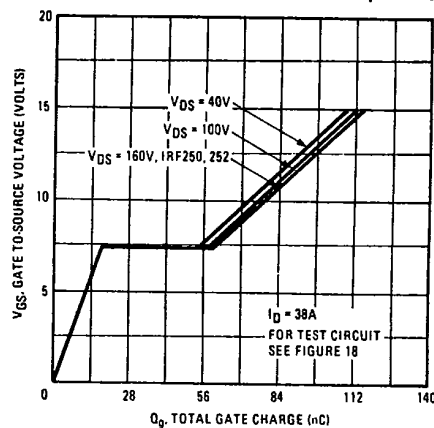


Fig. 11 - Typical Gate Charge Vs. Gate-to-Source Voltage

IRF250, IRF251, IRF252, IRF253

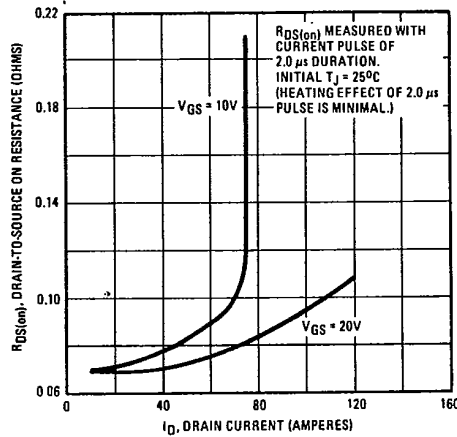


Fig. 12 - Typical On-Resistance Vs. Drain Current

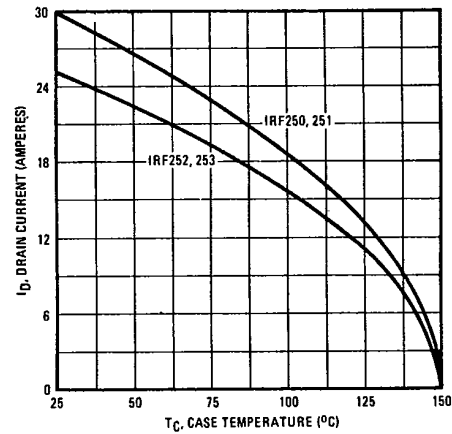


Fig. 13 - Maximum Drain Current Vs. Case Temperature

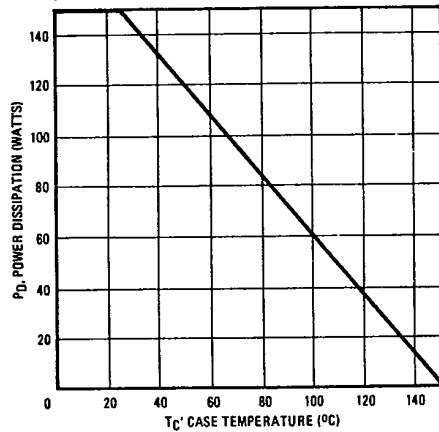


Fig. 14 - Power Vs. Temperature Derating Curve

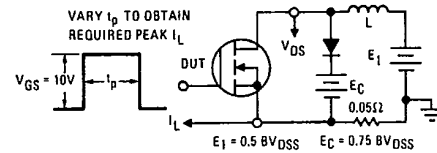


Fig. 15 - Clamped Inductive Test Circuit

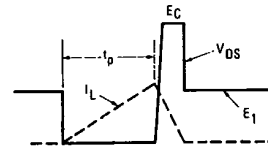


Fig. 16 - Clamped Inductive Waveforms

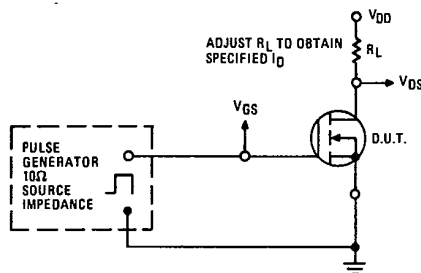


Fig. 17 - Switching Time Test Circuit

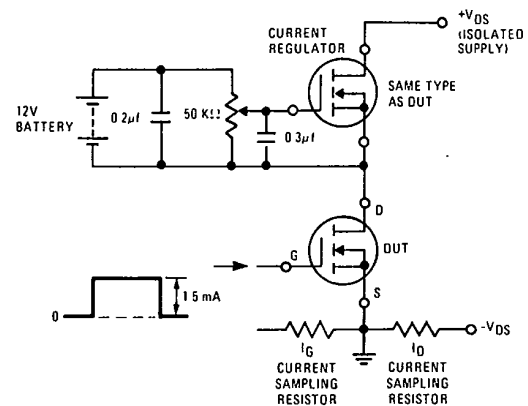


Fig. 18 - Gate Charge Test Circuit