File Number **2277**

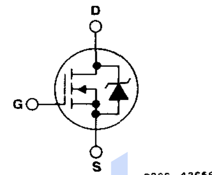
IRF460, IRF462

Avalanche-Energy-Rated N-Channel Power MOSFETs

21 A and 19 A, 500 V
$r_{DS(on)}$ = 0.27 Ω and 0.35 Ω

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

N-CHANNEL ENHANCEMENT MODE



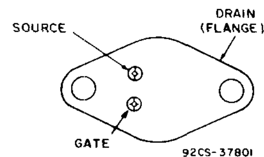
TERMINAL DIAGRAM

Datasheet.Live

The IRF460 and IRF462 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 metal package.

TERMINAL DESIGNATION



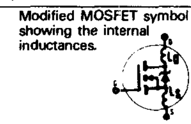
JEDEC TO-204AE

ABSOLUTE MAXIMUM RATINGS

	Parameter	IRF460	IRF462	Units
I_D @ T_C = 25°C	Continuous Drain Current	21	19	A
I_D @ T_C = 100°C	Continuous Drain Current	14	12	A
I_{DM}	Pulsed Drain Current ①	84	76	A
P_D @ T_C = 25°C	Max. Power Dissipation	300		W
	Linear Derating Factor	2.4		W/°C
V_{GS}	Gate-to-Source Voltage	±20		V
E_{AS}	Single Pulse Avalanche Energy ②	1200 (See Fig. 14)		mJ
I_{AR}	Avalanche Current ①	21		A
T_J T_{STG}	Operating Junction Storage Temperature Range	−55 to 150		°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)		°C

IRF460, IRF462

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

Symbol	Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions	
BV_{DSS}	Drain-to-Source Breakdown Voltage	ALL	500	–	–	V	V_{GS} = 0V, I_D = 250 μA	
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance ③	IRF460	–	0.24	0.27	Ω	V_{GS} = 10V, I_D = 12A	
		IRF462	–	0.27	0.35			
$I_{D(on)}$	On-State Drain Current ③	IRF460	21	–	–	A	V_{DS} > $I_{D(on)}$ X $R_{DS(on)}$ Max.	
		IRF462	19	–	–		V_{GS} = 10V	
$V_{GS(th)}$	Gate Threshold Voltage	ALL	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 250μA	
g_{fs}	Forward Transconductance ③	ALL	13	20	–	S (℧)	V_{DS} ≥ 50V, I_{DS} = 12A	
I_{DSS}	Zero Gate Voltage Drain Current	ALL	–	–	250	μA	V_{DS} = Max. Rating, V_{GS} = 0V	
			–	–	1000		V_{DS} = 0.8 x Max. Rating V_{GS} = 0V, T_J = 125°C	
I_{GSS}	Gate-to-Source Leakage Forward	ALL	–	–	100	nA	V_{GS} = 20V	
I_{GSS}	Gate-to-Source Leakage Reverse	ALL	–	–	−100	nA	V_{GS} = −20V	
Q_g	Total Gate Charge	ALL	–	120	190	nC	V_{GS} = 10V, I_D = 21A	
Q_{gs}	Gate-to-Source Charge	ALL	–	18	27	nC	V_{DS} = 0.8 x Max. Rating See Fig. 16	
Q_{gd}	Gate-to-Drain ("Miller") Charge	ALL	–	62	93	nC	(Independent of operating temperature)	
$t_{d(on)}$	Turn-On Delay Time	ALL	–	23	35	ns	V_{DD} = 250V, I_D ≈ 21A, R_G = 4.3Ω	
t_r	Rise Time	ALL	–	81	120	ns	R_D = 12Ω	
$t_{d(off)}$	Turn-Off Delay Time	ALL	–	85	130	ns	See Fig. 15	
t_f	Fall Time	ALL	–	65	98	ns	(Independent of operating temperature)	
L_D	Internal Drain Inductance	ALL	–	5.0	–	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.	Modified MOSFET symbol showing the internal inductances. 
L_S	Internal Source Inductance	ALL	–	13	–	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.	
C_{iss}	Input Capacitance	ALL	–	4100	–	pF	V_{GS} = 0V, V_{DS} = 25V	
C_{oss}	Output Capacitance	ALL	–	480	–	pF	f = 1.0 MHz	
C_{rss}	Reverse Transfer Capacitance	ALL	–	84	–	pF	See Fig. 10	
R_{thJC}	Junction-to-Case	ALL	–	–	0.42	°C/W		
R_{thJS}	Case-to-Sink	ALL	–	0.15	–	°C/W	Mounting surface flat, smooth, and greased	
R_{thJA}	Junction-to-Ambient	ALL	–	–	30	°C/W	Typical socket mount	

① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 5) Refer to current HEXFET reliability report

② @ V_{DD} = 50V, Starting T_J = 25°C, L = 4.9 μH, R_G = 25Ω, Peak I_L = 21A.

③ Pulse width ≤ 300 μs; Duty Cycle ≤ 2%

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	ALL	–	–	21	A	Modified MOSFET symbol showing the integral Reverse p-n junction rectifier.
I_{SM}	Pulsed Source Current (Body Diode) ①	ALL	–	–	84	A	
V_{SD}	Diode Forward Voltage ③	ALL	–	–	1.8	V	T_J = 25°C, I_S = 21A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	ALL	280	580	1200	ns	T_J = 25°C, I_F = 21A, di/dt = 100 A/μs
Q_{RR}	Reverse Recovery Charge	ALL	3.8	8.1	18	μC	
t_{on}	Forward Turn-On Time	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

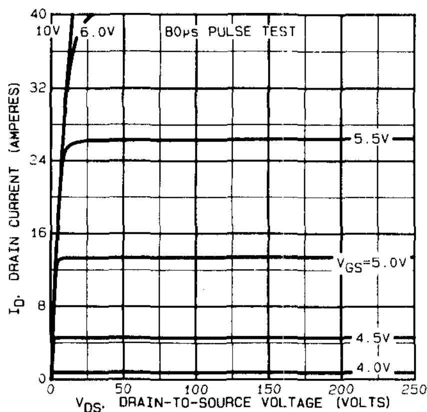


Fig. 1 - Typical output characteristics.

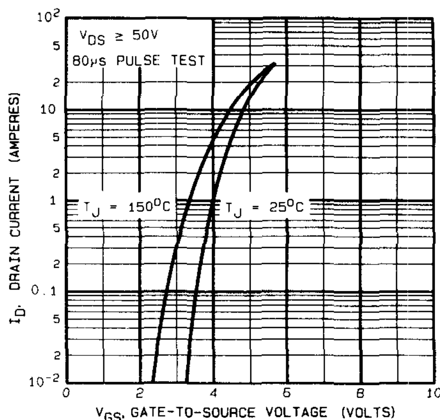


Fig. 2 - Typical transfer characteristics.

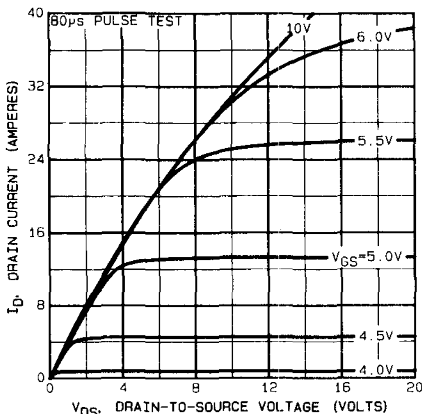


Fig. 3 - Typical saturation characteristics.

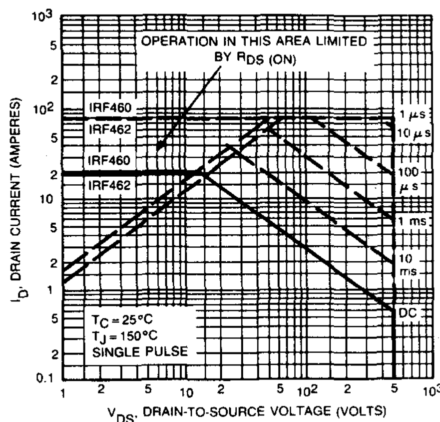


Fig. 4 - Maximum safe operating area.

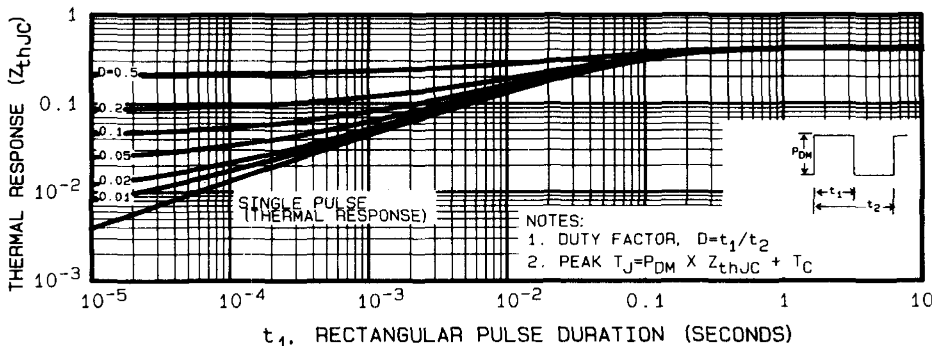


Fig. 5 - Maximum effective transient thermal impedance, junction-to-case vs. pulse duration.

IRF460, IRF462

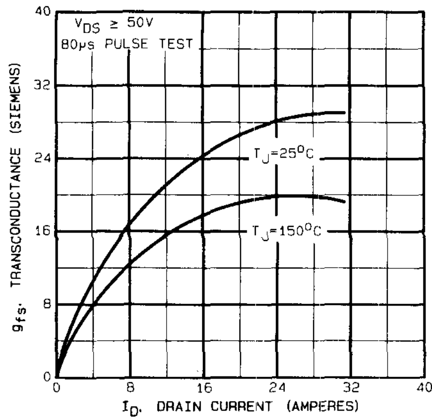


Fig. 6 - Typical transconductance vs. drain current.

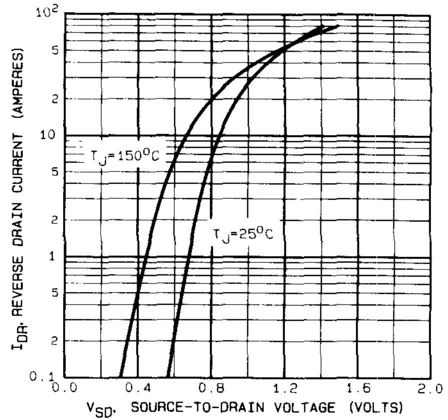


Fig. 7 - Typical source-drain diode forward voltage.

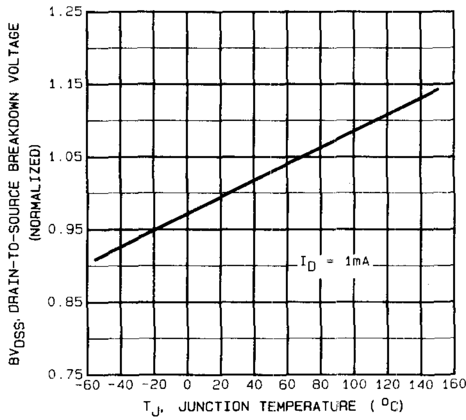


Fig. 8 - Breakdown voltage vs. temperature.

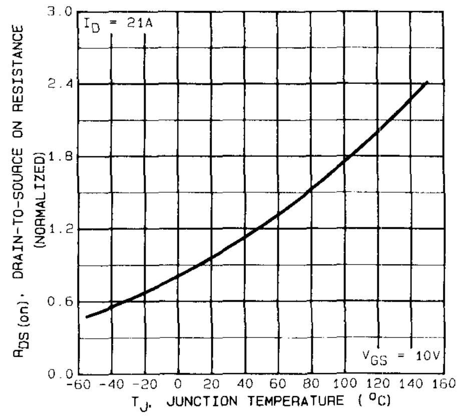


Fig. 9 - Normalized on-resistance vs. temperature.

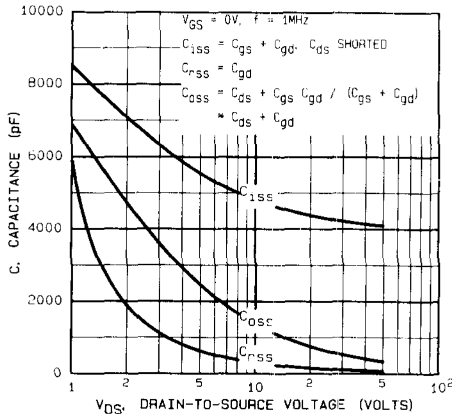


Fig. 10 - Typical capacitance vs. drain-to-source voltage.

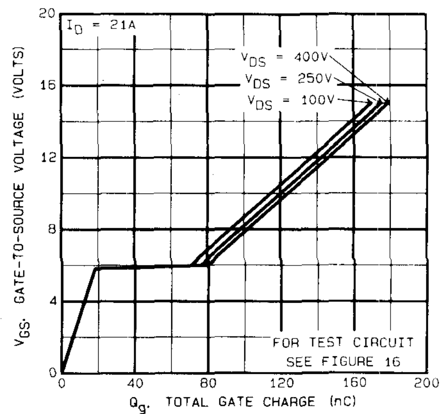


Fig. 11 - Typical gate charge vs. gate-to-source voltage.

IRF460, IRF462

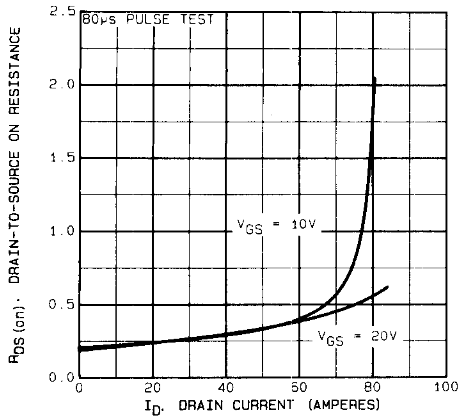


Fig. 12 - Typical on-resistance vs. drain current.

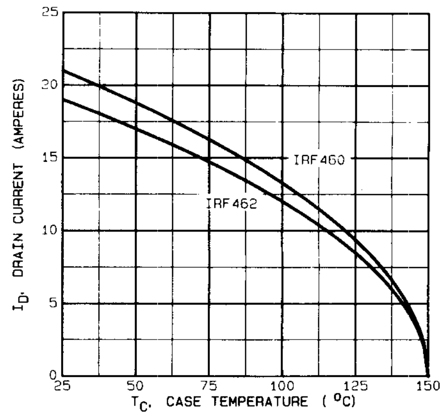


Fig. 13 - Maximum drain current vs. case temperature.

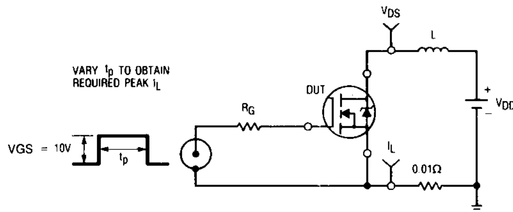


Fig. 14a - Unclamped inductive test circuit.

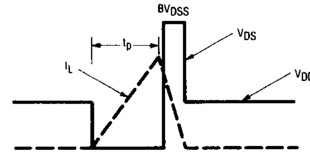


Fig. 14b - Unclamped inductive waveforms.

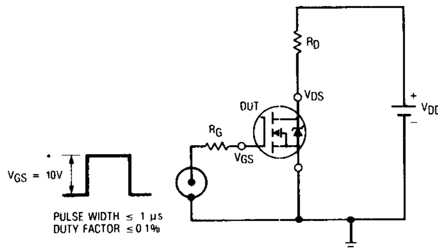


Fig. 15a - Switching time test circuit.

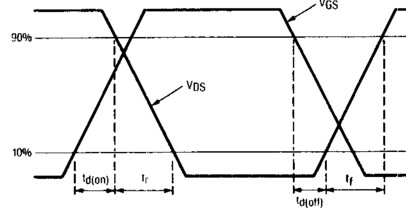


Fig. 15b - Switching time waveforms.

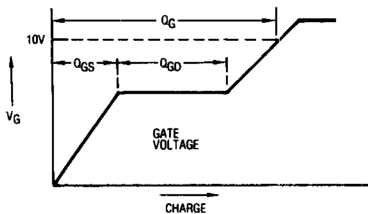


Fig. 16a - Basic gate charge waveform.

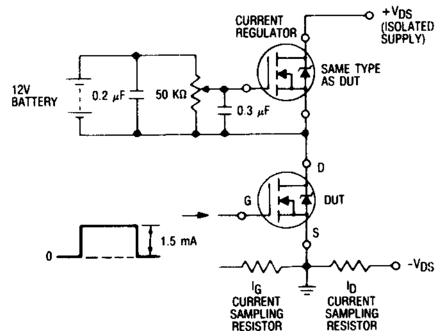


Fig. 16b - Gate charge test circuit.