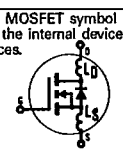


Absolute Maximum Ratings

Parameter	IRFD010	IRFD012	Units
V_{DS} Drain - Source Voltage ①	50	50	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20\text{ K}\Omega$) ①	50	50	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	1.7	1.4	A
$I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current	1.1	0.86	A
I_{DM} Pulsed Drain Current ②	14	11	A
V_{GS} Gate - Source Voltage	±20		V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	1		W
Linear Derating Factor	0.0082		W/K ③
I_{LM} Inductive Current, Clamped	14	11	A
I_L Unclamped Inductive Current (Avalanche Current) ③	1.5		A
T_J Operating Junction and Storage Temperature Range	-55 to 150		°C
T_{stg} Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)		°C

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	IRFD010	50	—	—	V	$V_{GS} = 0V$ $I_D = 250\ \mu A$
	IRFD012	50	—	—	V	
$V_{GS(th)}$ Gate Threshold Voltage	ALL	2.0	—	4.0	V	$V_{DS} = V_{GS}$, $I_D = 250\ \mu A$
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	μA	$V_{DS} = \text{Max. Rating}$, $V_{GS} = 0V$ $V_{DS} = \text{Max. Rating} \times 0.8$, $V_{GS} = 0V$, $T_C = 125^\circ\text{C}$
		—	—	1000	μA	
$I_{D(on)}$ On-State Drain Current ④	IRFD010	1.7	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $V_{GS} = 10V$
	IRFD012	1.4	—	—	A	
$R_{DS(on)}$ Static Drain-Source On-State Resistance ④	IRFD010	—	0.16	0.20	Ω	$V_{GS} = 10V$, $I_D = 0.88A$
	IRFD012	—	0.20	0.30	Ω	
g_{fs} Forward Transconductance ④	ALL	2.1	3.2	—	S(D)	$V_{DS} = 2 \times V_{GS}$, $I_{DS} = 3.6A$
C_{iss} Input Capacitance	ALL	—	250	—	pF	$V_{GS} = 0V$, $V_{DS} = 25V$, $f = 1.0\text{ MHz}$ See Fig. 10
C_{oss} Output Capacitance	ALL	—	150	—	pF	
C_{rss} Reverse Transfer Capacitance	ALL	—	29	—	pF	
$t_{d(on)}$ Turn-On Delay Time	ALL	—	11	17	ns	$V_{DD} = 25V$, $I_D = 7.2A$, $R_G = 25\Omega$, $R_D = 3.3\Omega$ See Fig. 16
t_r Rise Time	ALL	—	33	50	ns	
$t_{d(off)}$ Turn-Off Delay Time	ALL	—	12	18	ns	(MOSFET switching times are essentially independent of operating temperature.)
t_f Fall Time	ALL	—	23	35	ns	
Q_g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	—	8.8	13	nC	$V_{GS} = 10V$, $I_D = 7.2A$, $V_{DS} = 0.8\text{ Max. Rating}$. See Fig. 17 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q_{gs} Gate-Source Charge	ALL	—	2.2	3.3	nC	
Q_{gd} Gate-Drain ("Miller") Charge	ALL	—	2.6	3.9	nC	
L_D Internal Drain Inductance	ALL	—	4.0	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.
L_S Internal Source Inductance	ALL	—	6.0	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.



Thermal Resistance

R_{thJA} Junction-to-Ambient	ALL	—	—	120	K/W ⑤	Typical socket mount
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Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFD010	—	—	1.7	A	Modified MOSFET symbol showing the integral reverse PN junction rectifier.
		IRFD012	—	—	1.4	A	
I_{SM}	Pulse Source Current (Body Diode) ③	IRFD010	—	—	14	A	
		IRFD012	—	—	11	A	
V_{SD}	Diode Forward Voltage ②	ALL	—	—	1.6	V	$T_C = 25^\circ\text{C}, I_S = 1.7\text{A}, V_{GS} = 0\text{V}$
t_{rr}	Reverse Recovery Time	ALL	41	88	190	ns	$T_J = 25^\circ\text{C}, I_F = 7.2\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$
Q_{RR}	Reverse Recovered Charge	ALL	0.15	0.33	0.78	μC	$T_J = 25^\circ\text{C}, I_F = 7.2\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$
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 Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).
- ③ @ $V_{dd} = 25\text{V}, T_J = 25^\circ\text{C}$
 $L = 100 \mu\text{H}, R_G = 25\Omega$
- ④ Pulse Test: Pulse width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$

⑤ $K/W = ^\circ\text{C}/\text{W}$
 $W/K = \text{W}/^\circ\text{C}$

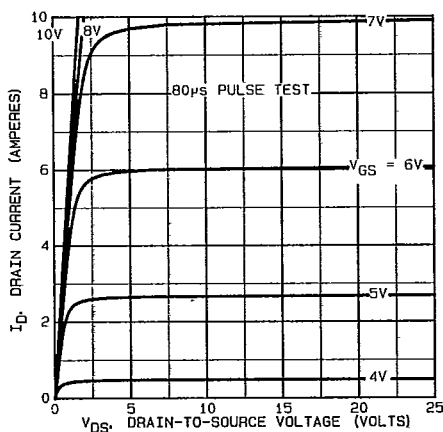


Fig. 1 — Typical Output Characteristics

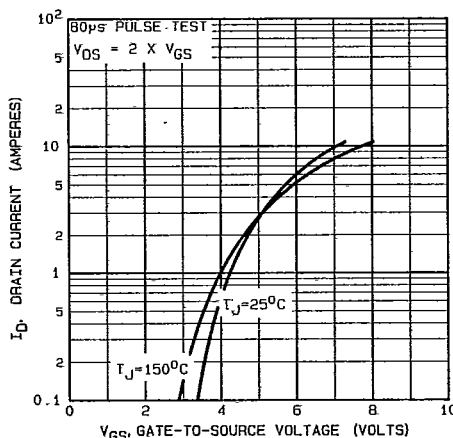


Fig. 2 — Typical Transfer Characteristics

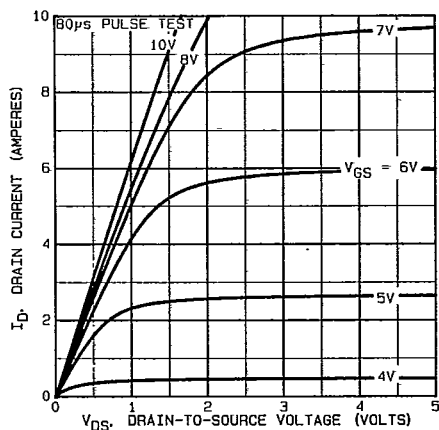


Fig. 3 — Typical Saturation Characteristics

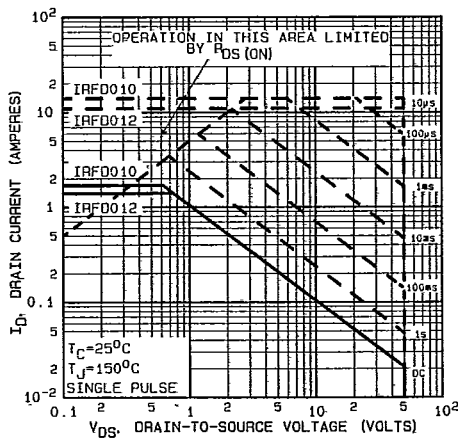


Fig. 4 — Maximum Safe Operating Area

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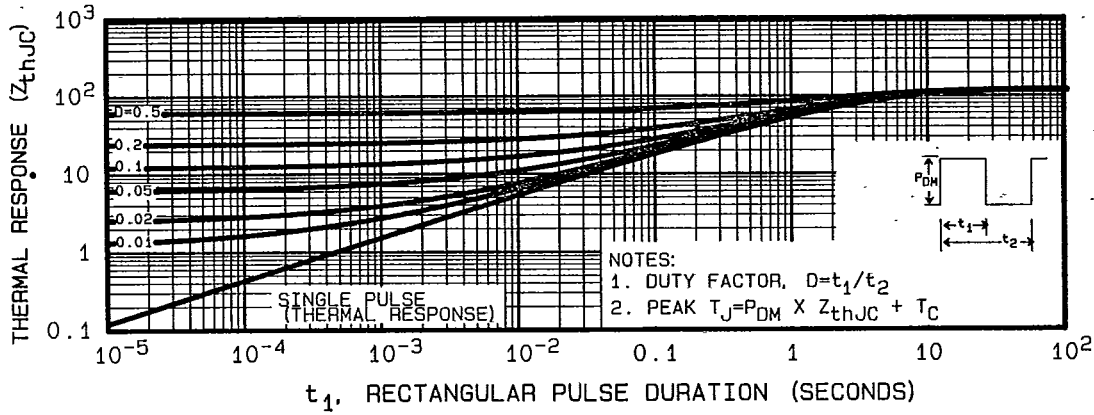


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

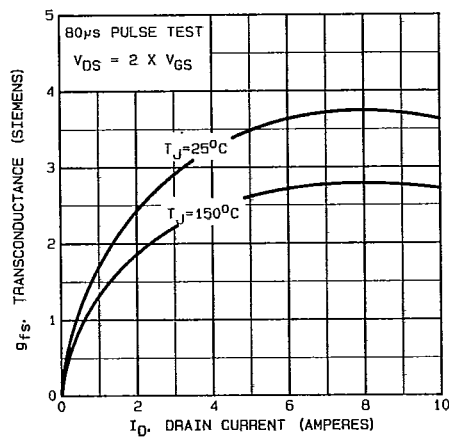


Fig. 6 — Typical Transconductance Vs. Drain Current

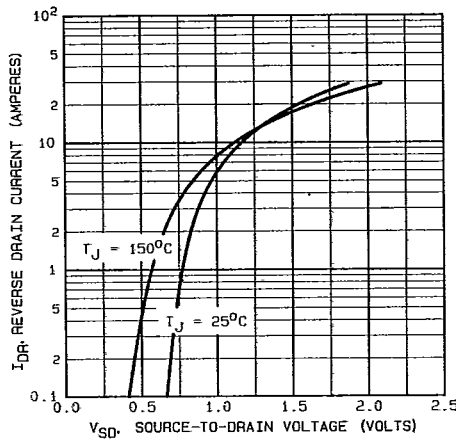


Fig. 7 — Typical Source-Drain Diode Forward Voltage

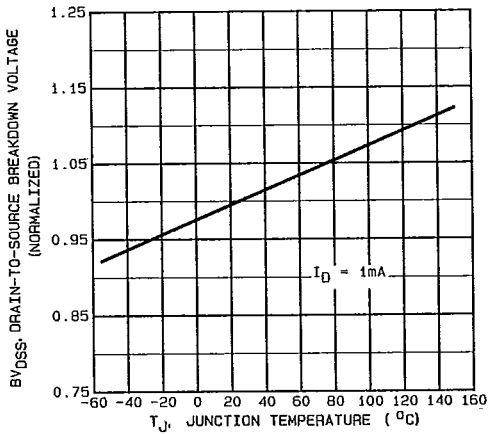


Fig. 8 — Breakdown Voltage Vs. Temperature

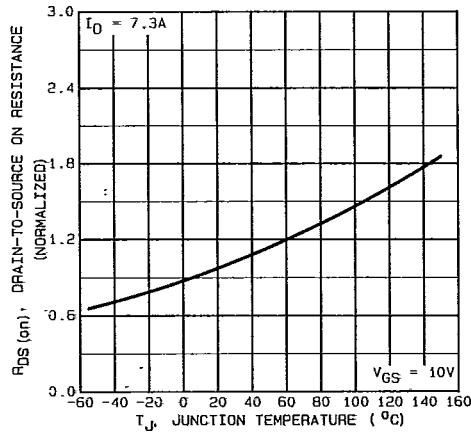


Fig. 9 — Normalized On-Resistance Vs. Temperature

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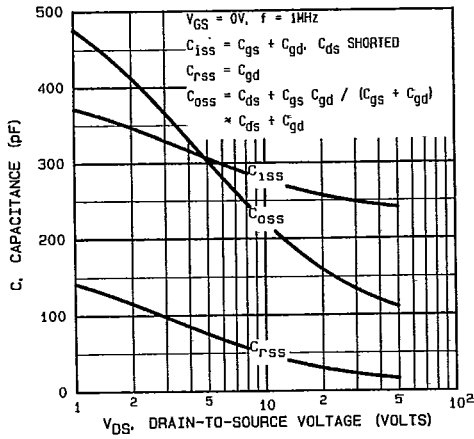


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

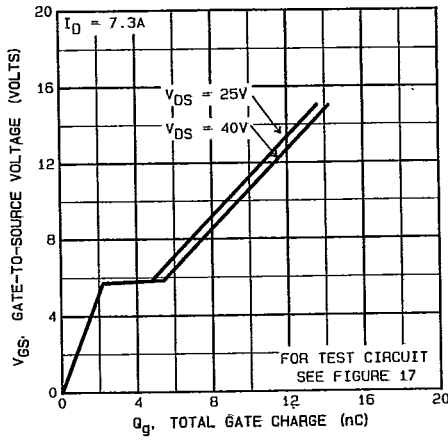


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

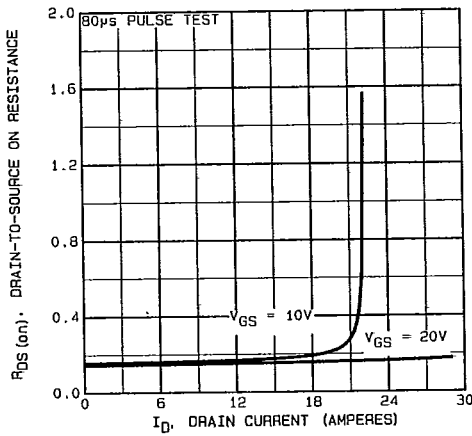


Fig. 12 — Typical On-Resistance Vs. Drain Current

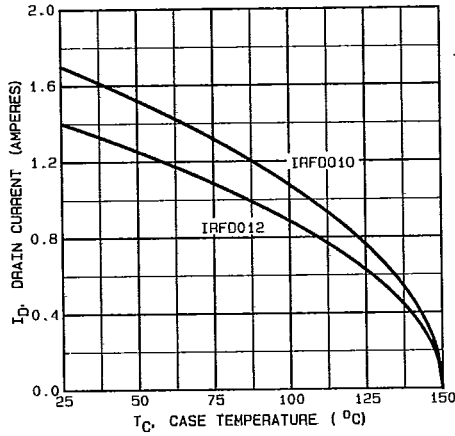


Fig. 13 — Maximum Drain Current Vs. Case Temperature

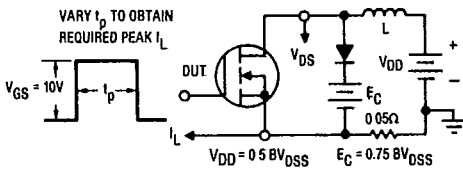


Fig. 14a — Clamped Inductive Test Circuit

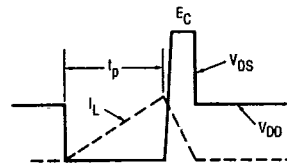


Fig. 14b — Clamped Inductive Waveforms

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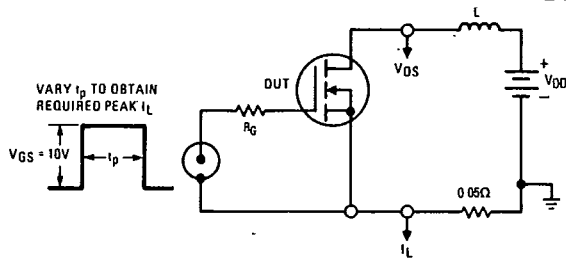


Fig. 15a — Unclamped Inductive Test Circuit

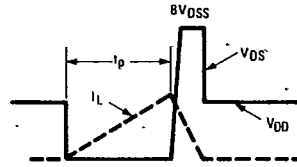


Fig. 15b. — Unclamped Inductive Load Test Waveforms

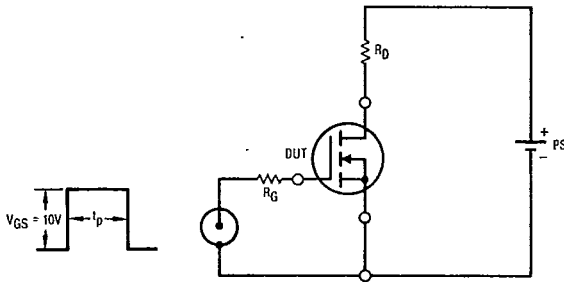


Fig. 16 — Switching Time Test Circuit

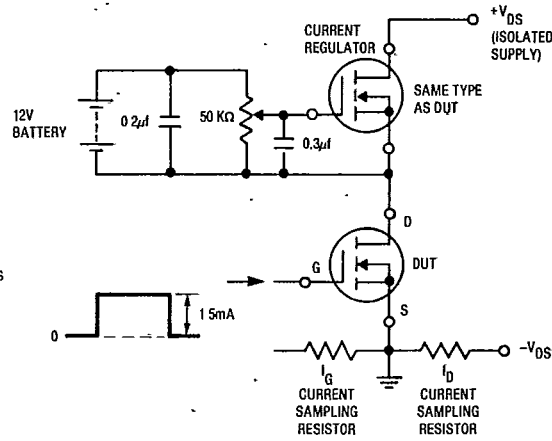
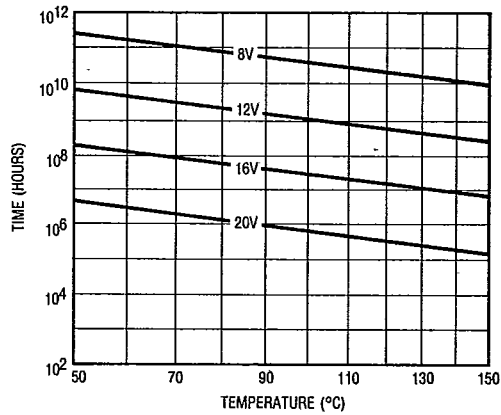
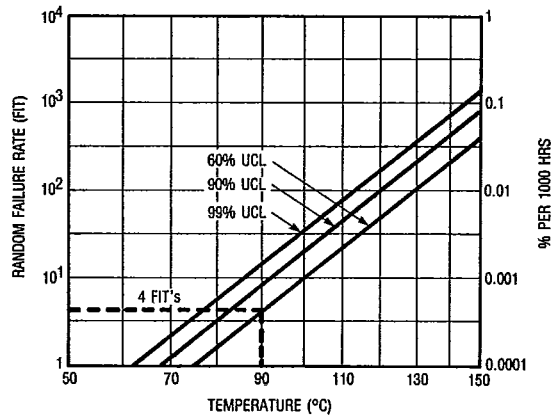


Fig. 17 — Gate Charge Test Circuit



*Fig. 18 — Typical Time to Accumulated 1% Gate Failure



*Fig. 19 — Typical High Temperature Reverse Bias (HTRB) Failure Rate

*The data shown is correct as of April 15, 1987. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.