



IRF644B/IRFS644B

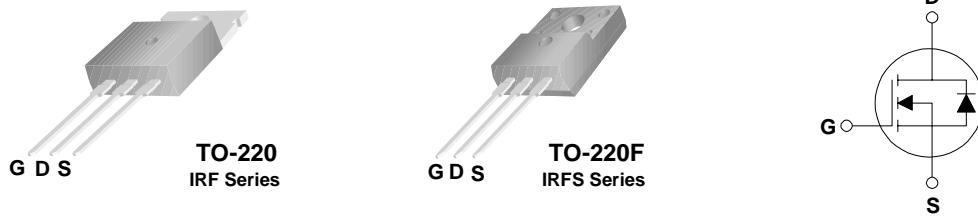
250V N-Channel MOSFET

General Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converter and switch mode power supplies.

Features

- 14A, 250V, $R_{DS(on)} = 0.28\Omega$ @ $V_{GS} = 10$ V
- Low gate charge (typical 47 nC)
- Low C_{RSS} (typical 30 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	IRF644B	IRFS644B	Units
V_{DSS}	Drain-Source Voltage	250		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	14	14 *	A
	- Continuous ($T_C = 100^\circ\text{C}$)	8.9	8.9 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	56	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	480	mJ
I_{AR}	Avalanche Current	(Note 1)	14	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	13.9	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	139	43	W
	- Derate above 25°C	1.11	0.35	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	IRF644B	IRFS644B	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case Max.	0.9	2.89	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Max.	62.5	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	250	--	--	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.24	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 250 \text{ V}, V_{\text{GS}} = 0 \text{ V}$	--	--	10	μA
		$V_{\text{DS}} = 200 \text{ V}, T_C = 125^\circ\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 30 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -30 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA

On Characteristics

$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}, I_D = 7.0 \text{ A}$	--	0.22	0.28	Ω
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}, I_D = 7.0 \text{ A}$ (Note 4)	--	11.7	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}, V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	1250	1600	pF
C_{oss}	Output Capacitance		--	150	195	pF
C_{rss}	Reverse Transfer Capacitance		--	30	40	pF

Switching Characteristics

$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 125 \text{ V}, I_D = 14 \text{ A}, R_G = 25 \Omega$ (Note 4, 5)	--	20	50	ns
t_r	Turn-On Rise Time		--	115	240	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	150	310	ns
t_f	Turn-Off Fall Time		--	95	200	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 200 \text{ V}, I_D = 14 \text{ A}, V_{\text{GS}} = 10 \text{ V}$ (Note 4, 5)	--	47	60	nC
Q_{gs}	Gate-Source Charge		--	6.2	--	nC
Q_{gd}	Gate-Drain Charge		--	23	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	14	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	56	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}, I_S = 14 \text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}, I_S = 14 \text{ A}, dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	240	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.96	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 3.9\text{mH}$, $I_{AS} = 14\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$. Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 14\text{A}$, $dI/dt \leq 300\text{A}/\mu\text{s}$, $V_{DD} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

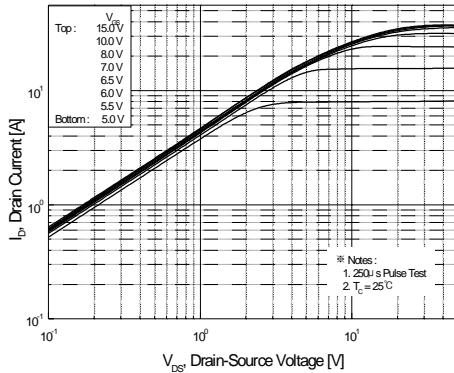


Figure 1. On-Region Characteristics

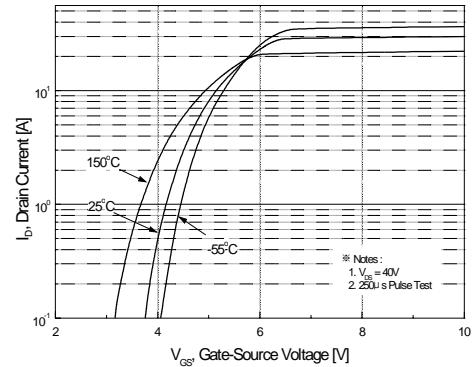


Figure 2. Transfer Characteristics

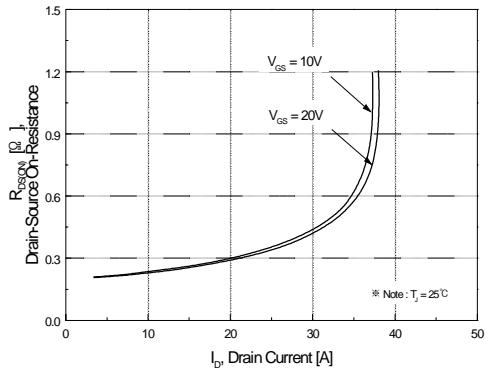


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

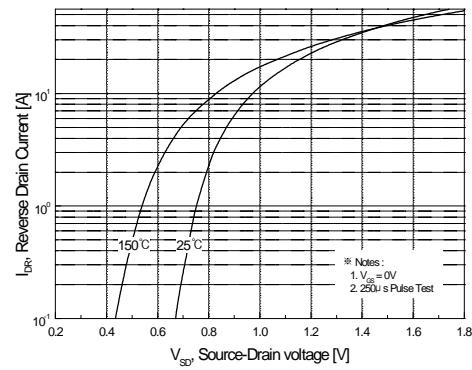


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

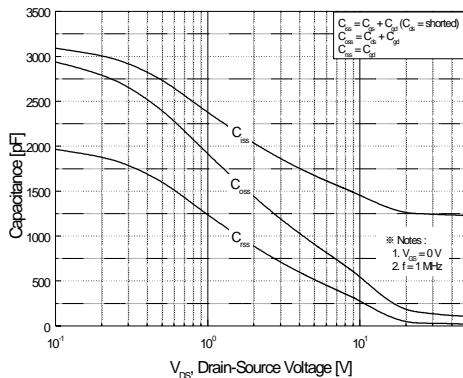


Figure 5. Capacitance Characteristics

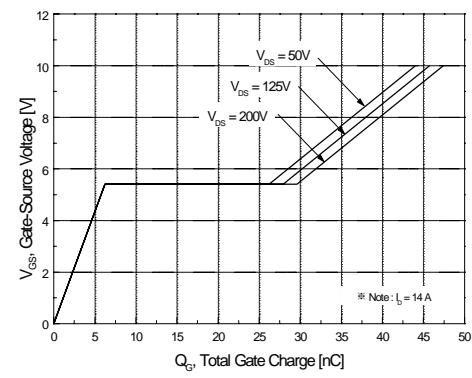


Figure 6. Gate Charge Characteristics