International
IOR Rectifier

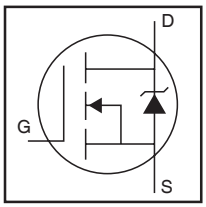
PD - 96902A

IRFB4410
IRFS4410
IRFSL4410

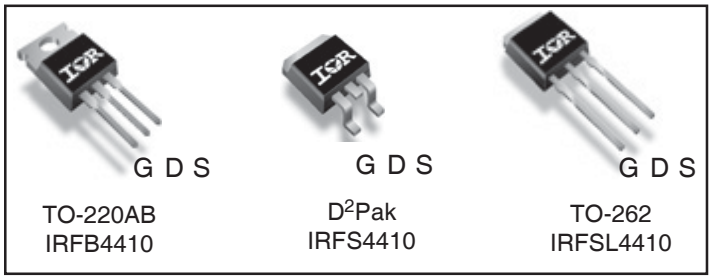
HEXFET® Power MOSFET

Applications
- High Efficiency Synchronous Rectification in SMPS
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

Benefits
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability



V_{DSS}	100V
$R_{DS(on)}$ typ.	8.0mΩ
max.	10mΩ
I_D	96A



TO-220AB IRFB4410 | D^2Pak IRFS4410 | TO-262 IRFSL4410

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	96①	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	68①	
I_{DM}	Pulsed Drain Current ②	380	
P_D @T_C = 25°C	Maximum Power Dissipation	250	W
	Linear Derating Factor	1.6	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ④	19	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10lb·in (1.1N·m)	

Avalanche Characteristics

$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ③	220	mJ
I_{AR}	Avalanche Current ①	See Fig. 14, 15, 16a, 16b	A
E_{AR}	Repetitive Avalanche Energy ⑤		mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑨	—	0.61	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface , TO-220	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient, TO-220 ⑨	—	62	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) , D^2Pak ⑧⑨	—	40	

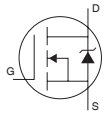
Static @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.094	—	V/°C	Reference to 25°C, I_D = 1mA②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	8.0	10	mΩ	V_{GS} = 10V, I_D = 58A ⑤
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 150µA
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	µA	V_{DS} = 100V, V_{GS} = 0V
		—	—	250		V_{DS} = 100V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V_{GS} = -20V
R_G	Gate Input Resistance	—	1.5	—	Ω	f = 1MHz, open drain

Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	120	—	—	S	V_{DS} = 50V, I_D = 58A
Q_g	Total Gate Charge	—	120	180	nC	I_D = 58A
Q_{gs}	Gate-to-Source Charge	—	31	—		V_{DS} = 80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	44	—		V_{GS} = 10V ⑤
$t_{d(on)}$	Turn-On Delay Time	—	24	—	ns	V_{DD} = 65V
t_r	Rise Time	—	80	—		I_D = 58A
$t_{d(off)}$	Turn-Off Delay Time	—	55	—		R_G = 4.1Ω
t_f	Fall Time	—	50	—		V_{GS} = 10V ⑤
C_{iss}	Input Capacitance	—	5150	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	360	—		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	—	190	—		f = 1.0MHz
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	—	420	—		V_{GS} = 0V, V_{DS} = 0V to 80V ⑦, See Fig.11
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related)⑥	—	500	—		V_{GS} = 0V, V_{DS} = 0V to 80V ⑥, See Fig. 5

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	96①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ②	—	—	380	A	
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 58A, V_{GS} = 0V ⑤
t_{rr}	Reverse Recovery Time	—	38	56	ns	T_J = 25°C V_R = 85V,
		—	51	77		T_J = 125°C I_F = 58A
Q_{rr}	Reverse Recovery Charge	—	61	92	nC	T_J = 25°C di/dt = 100A/µs ⑤
		—	110	170		T_J = 125°C
I_{RRM}	Reverse Recovery Current	—	2.8	—	A	T_J = 25°C
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.14mH R_G = 25Ω, I_{AS} = 58A, V_{GS} =10V. Part not recommended for use above this value.

④ I_{SD} ≤ 58A, di/dt ≤ 650A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

⑤ Pulse width ≤ 400µs; duty cycle ≤ 2%.

⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑧ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

⑨ R_θ is measured at T_J approximately 90°C.