

IRF630/631/632/633 IRFP230/231/232/233

N-CHANNEL POWER MOSFETS

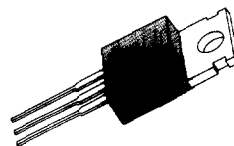
FEATURES

- Lower $R_{DS(on)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

PRODUCT SUMMARY

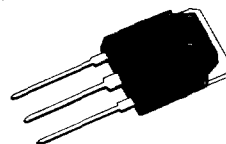
Part Number	V _{DS}	R _{DS(on)}	I _D
IRF630/IRFP230	200V	0.4 Ω	9.0A
IRF631/IRFP231	150V	0.4 Ω	9.0A
IRF632/IRFP232	200V	0.4 Ω	8.0A
IRF633/IRFP233	150V	0.6 Ω	8.0A

TO-220



IRF630/631/632/633

TO-3P



IRFP230/231/232/233

MAXIMUM RATINGS

Characteristics	Symbol	IRF630 IRFP230	IRF631 IRFP231	IRF632 IRFP232	IRF633 IRFP233	Unit
Drain-Source Voltage (1)	V _{DS}	200	150	200	150	V _{dc}
Drain-Gate Voltage (R _{GS} =1.0M Ω)(1)	V _{DGR}	200	150	200	150	V _{dc}
Gate-Source Voltage	V _{GS}	± 20				V _{dc}
Continuous Drain Current T _C =25°C	I _D	9.0	9.0	8.0	8.0	A _{dc}
Continuous Drain Current T _C =100°C	I _D	6.0	6.0	5.0	5.0	A _{dc}
Drain Current—Pulsed (3)	I _{DM}	36	36	32	32	A _{dc}
Gate Current—Pulsed	I _{GM}	± 1.5				A _{dc}
Single Pulsed Avalanche Energy (4)	E _{AS}	170				mJ
Avalanche Current	I _{AS}	9.0				A
Total Power Dissipation @ T _C =25°C Derate above 25°C	P _D	75 0.6				Watts W/°C
Operating and Storage Junction to Case	T _J , T _{stg}	-55 to 150				°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T _L	300				°C

Notes: (1) T_J=25°C to 150°C

(2) Pulse test: Pulse width $\leq$ 300 μ s, Duty Cycle $\leq$ 2%

(3) Repetitive rating: Pulse with limited by max. junction temperature

(4) L=4 mH, V_{dd}=50V, R_G=25 Ω , Starting T_J=25°C

SAMSUNG

ELECTRONICS

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRF630/IRFP230 IRF632/IRFP232	200	—	—	V	$V_{GS}=0V$ $I_D=250\mu A$
	IRF631/IRFP231 IRF633/IRFP233	150	—	—	V	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS}=V_{GS}$, $I_D=250\mu A$
I_{GSS}	Gate-Source Leakage Forward	—	—	100	nA	$V_{GS}=20V$
I_{GSS}	Gate-Source Leakage Reverse	—	—	-100	nA	$V_{GS}=-20V$
I_{DSS}	Zero Gate Voltage Drain Current	—	—	250	μA	$V_{DS}=\text{Max. Rating}$, $V_{GS}=0V$
		—	—	1000	μA	$V_{DS}=\text{Max. Rating} \times 0.8$, $V_{GS}=0V$, $T_C=125^\circ\text{C}$
$I_{D(on)}$	On-State Drain-Source Current (2) IRF630/IRFP230 IRF631/IRFP231	9.0	—	—	A	$V_{DS} \geq 5.4V$, $V_{GS}=10V$
	IRF632/IRFP232 IRF633/IRFP233	8.0	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF630/IRFP230 IRF631/IRFP231	—	0.25	0.4	Ω	$V_{GS}=10V$, $I_D=5.0A$
	IRF632/IRFP232 IRF633/IRFP233	—	0.4	0.6	Ω	
g_{fs}	Forward Transconductance (2)	3.0	4.6	—	μ	$V_{DS} \geq 50V$, $I_D=5.0A$
C_{iss}	Input Capacitance	—	750	—	pF	$V_{GS}=0V$, $V_{DS}=25V$, $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	—	120	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	45	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	—	30	ns	$V_{DD}=0.5BV_{DSS}$, $I_D=5.0A$, $Z_O=15\Omega$ (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	—	50	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	—	50	ns	
t_f	Fall Time	—	—	40	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	19	30	nC	$V_{GS}=10V$, $I_D=12A$, $V_{DS}=0.8 \text{ Max. Rating}$ (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	50	—	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	14	—	nC	

THERMAL RESISTANCE

Symbol	Characteristic		IRF630-3	IRFP230-3	Unit	
R_{thJC}	Junction-to-Case	MAX	1.67	1.67	K/W	
R_{thCS}	Case-to-Sink	TYP	1.0	0.24	K/W	Mounting surface flat, smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	80	40	K/W	Free Air Operation

Notes: (1) $T_J = 25^\circ\text{C}$ to 150°C

(2) Pulse test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

(3) Repetitive rating: Pulse width limited by max. junction temperature

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode) IRF630/IRFP230 IRF631/IRFP231	—	—	9.0	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier
	IRF632/IRFP232 IRF633/IRFP233	—	—	8.0	A	
I_{SM}	Pulse Source Current(Body Diode)(3) IRF630/IRFP230 IRF631/IRFP231	—	—	36	A	
	IRF632/IRFP232 IRF633/IRFP233	—	—	32	A	
V_{SD}	Diode Forward Voltage (2) IRF630/IRFP230 IRF631/IRFP231	—	—	2.0	V	$T_C=25^\circ\text{C}$, $I_S=9.0\text{A}$, $V_{GS}=0\text{V}$
	IRF632/IRFP232 IRF633/IRFP233	—	—	1.8	V	$T_C=25^\circ\text{C}$, $I_S=8.0\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	450	—	ns	$T_J=150^\circ\text{C}$, $I_F=9.0\text{A}$, $dI_F/dt=100\text{A}/\mu\text{S}$

Notes: (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 with limited by max. junction temperature

