

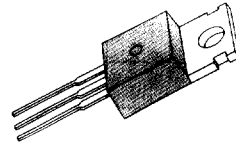
FEATURES

- 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

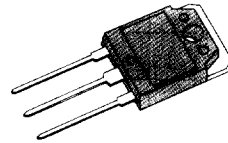
Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF840/IRFP440	500V	0.85Ω	8.0A
IRF841/IRFP441	450V	0.85Ω	8.0A
IRF842/IRFP442	500V	1.10Ω	7.0A
IRF843/IRFP443	450V	1.10Ω	7.0A

TO-220



IRF840/841/842/843

TO-3P



IRFP440/441/442/443

MAXIMUM RATINGS

Characteristics	Symbol	IRF840 IRFP440	IRF841 IRFP441	IRF842 IRFP442	IRF843 IRFP443	Unit
Drain-Source Voltage (1)	V_{DS}	500	450	500	450	Vdc
Drain-Gate Voltage ($R_{GS}=1.0M\Omega$)(1)	V_{DGR}	500	450	500	450	Vdc
Gate-Source Voltage	V_{GS}	± 20				Vdc
Continuous Drain Current $T_C=25^\circ C$	I_D	8.0	8.0	7.0	7.0	Adc
Continuous Drain Current $T_C=100^\circ C$	I_D	5.0	5.0	4.0	4.0	Adc
Drain Current—Pulsed (3)	I_{DM}	32	32	28	28	Adc
Gate Current—Pulsed	I_{GM}	± 1.5				Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	510				mJ
Avalanche Current	I_{AS}	8.0				A
Total Power Dissipation @ $T_C=25^\circ C$	P_D	125				Watts
Derate above $25^\circ C$		1.0				W/ $^\circ C$
Operating and Storage Junction to Case	T_J, T_{stg}	-55 to 150				$^\circ C$
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T_L	300				$^\circ C$

Notes: (1) $T_J=25^\circ C$ to $150^\circ C$

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

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

(4) $L=1.4 mH$, $V_{dd}=50V$, $R_G=25\Omega$, Starting $T_J=25^\circ C$

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 IRF840/IRFP440 IRF842/IRFP442	500	—	—	V	$V_{GS}=0V$ $I_D=250\mu A$
	IRF841/IRFP441 IRF843/IRFP443	450	—	—	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) IRF840/IRFP440 IRF841/IRFP441	8.0	—	—	A	$V_{DS} \geq 8.8V$, $V_{GS}=10V$
	IRF842/IRFP442 IRF843/IRFP443	7.0	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF840/IRFP440 IRF841/IRFP441	—	0.76	0.85	Ω	$V_{GS}=10V$, $I_D=4.0A$
	IRF842/IRFP442 IRF843/IRFP443	—	0.85	1.1	Ω	
g_{fs}	Forward Transconductance (2)	4.0	6.5	—	U	$V_{DS} \geq 50V$, $I_D=4.0A$
C_{iss}	Input Capacitance	—	1510	—	pF	$V_{GS}=0V$, $V_{DS}=25V$, $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	—	154	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	66	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	14	21	ns	$V_{DD}=0.5BV_{DSS}$, $I_D=8.0A$, $Z_O=19\Omega$ (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	23	35	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	49	74	ns	
t_f	Fall Time	—	20	30	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	42	63	nC	$V_{GS}=10V$, $I_D=8.0A$, $V_{DS}=0.8 \text{ Max. Rating}$ (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	6.2	9.3	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	22	32	nC	

THERMAL RESISTANCE

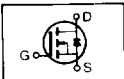
Symbol	Characteristic		IRF840-3	IRFP440-3	Unit	
R_{thJC}	Junction-to-Case	MAX	1.0	1.0	K/W	
R_{thCS}	Case-to-Sink	TYP	0.5	0.24	K/W	Mounting surface flat, smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	80	40	K/W	Free Air Operation

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) IRF840/IRFP440 IRF841/IRFP441	—	—	8.0	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
	IRF842/IRFP442 IRF843/IRFP443	—	—	7.0	A	
I_{SM}	Pulse Source Current(Body Diode)(3) IRF840/IRFP440 IRF841/IRFP441	—	—	32	A	
	IRF842/IRFP442 IRF843/IRFP443	—	—	28	A	
V_{SD}	Diode Forward Voltage (2) IRF840/IRFP440 IRF841/IRFP441	—	—	2.0	V	$T_C=25^\circ\text{C}$, $I_S=8.0\text{A}$, $V_{GS}=0\text{V}$
	IRF842/IRFP442 IRF843/IRFP443	—	—	1.9	V	$T_C=25^\circ\text{C}$, $I_S=7.0\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	460	970	ns	$T_J=25^\circ\text{C}$, $I_F=8.0\text{A}$, $dI_F/dt=100\text{A}/\mu\text{S}$

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

