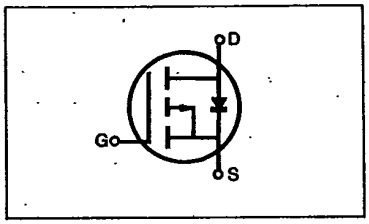
IRF9130/9131/9132/9133
IRFP9130/9131/9132/9133
IRF9530/9531/9532/9533

P-CHANNEL POWER MOSFETS

Preliminary Specifications

−100 Volt, 0.30 Ohm SFET



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF/IRFP9130, IRF9530	−100V	0.30Ω	−12A
IRF/IRFP9131, IRF9531	−60V	0.30Ω	−12A
IRF/IRFP9132, IRF9532	−100V	0.40Ω	−10A
IRF/IRFP9133, IRF9533	−60V	0.40Ω	−10A

FEATURES

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

PACKAGE STYLE

Package Type	Part Number
TO-3	IRF9130/9131/9132/9133
TO-3P	IRFP9130/9131/9132/9133
TO-220	IRF9530/9531/9532/9533

MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP 9130 9530	9131 9531	9132 9532	9133 9533	Unit
Drain-Source Voltage (1)	V_{DSS}	−100	−60	−100	−60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	−100	−60	−100	−60	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	−12	−12	−10	−10	Adc
Continuous Drain Current T_C=100°C	I_D	−7.5	−7.5	−6.5	−6.5	Adc
Drain Current—Pulsed (3)	I_{DM}	−48	−48	−40	−40	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	75 0.6				Watts W/°C
Operating and Storage Junction Temperature Rangy	T_J, Tstg	−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≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise specified)

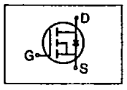
Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF9130/2 IRFP9130/2 IRF9530/2	−100	—	—	V	V_{GS}=0V
		IRF9131/3 IRFP9131/3 IRF9531/3	−60	—	—	V	I_D=−250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	−2.0	—	−4.0	V	V_{DS}=V_{GS}, I_D=−250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	−250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—	—	-1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9130/1 IRFP9130/1 IRF9530/1	−12	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=−10V
		IRF9132/3 IRFP9132/3 IRF9532/3	−10	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9130/2 IRFP9132/2 IRF9530/2	—	—	0.30	Ω	V_{GS}=−10V, I_D=−6.5A
		IRF9131/3 IRFP9131/3 IRF9531/3	—	—	0.40	Ω	
Forward Transconductance (2)	g_{fs}	ALL	2.0	—	—	Ʊ	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=−6.5A
Input Capacitance	C_{iss}	ALL	—	—	700	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	—	450	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	200	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	60	ns	V_{DD}=0.5BV_{DSS}, I_D=−6.5A, Z_O=50Ω (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	T_r	ALL	—	—	140	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	140	ns	
Fall Time	t_f	ALL	—	—	140	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	45	nC	V_{GS}=−15V, I_D=−15A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	—	20	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	—	25	nC	

THERMAL RESISTANCE

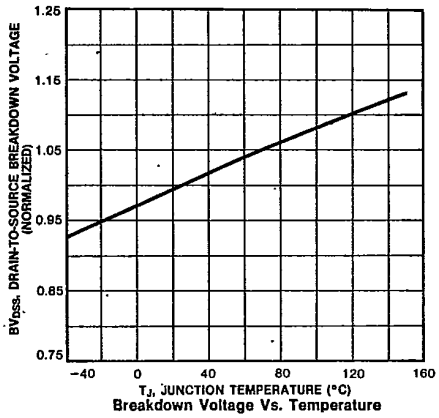
Junction-to-Case	R_{thJC}	ALL	—	—	1.67	K/W	
Case-to-Sink	R_{thCS}	ALL	—	1.0	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	IRFPXXXX IRF95XX	—	—	80	K/W	Free Air Operation
		IRF91XX	—	—	30	K/W	

Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

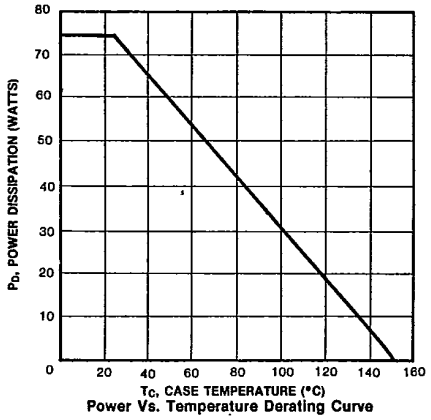
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF9130/1 IRFP9130/1 IRF9530/1	—	—	−12	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF9132/3 IRFP9132/3 IRF9532/3	—	—	−10	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF9130/1 IRFP9130/1 IRF9530/1	—	—	−48	A	
		IRF9132/3 IRFP9132/3 IRF9532/3	—	—	−40	A	
Diode Forward Voltage (2)	V_{SD}	IRF9130/1 IRFP9130/1 IRF9530/1	—	—	−6.3	V	T_C=25°C, I_S=−12A, V_{GS}=0V
		IRF9132/3 IRFP9132/3 IRF9532/3	—	—	−6.0	V	T_C=25°C, I_S=−10A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	—	—	ns	T_J=150°C, I_F=−12A, dI_F/dt=100A/μs

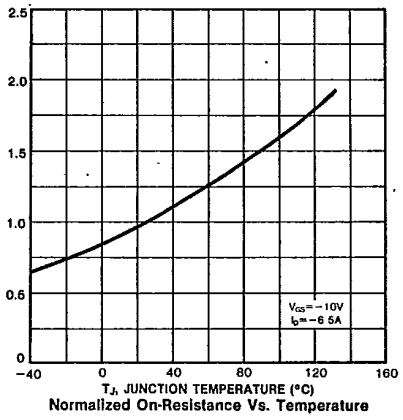
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



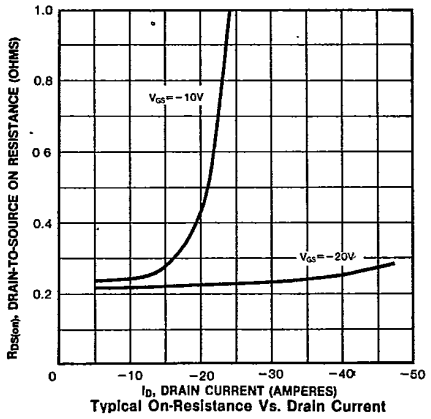
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



Normalized On-Resistance Vs. Temperature



Typical On-Resistance Vs. Drain Current

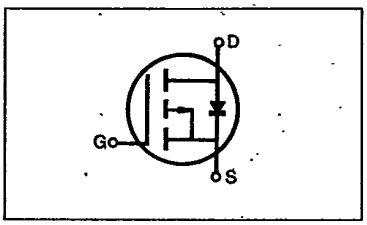
IRF9140/9141/9142/9143
IRFP9140/9141/9142/9143
IRF9540/9541/9542/9543

T-39-23

P-CHANNEL POWER MOSFETS

Preliminary Specifications

–100 Volt, 0.2 Ohm SFET



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF/IRFP9140, IRF9540	–100V	0.2Ω	–19A
IRF/IRFP9141, IRF9541	–60V	0.2Ω	–19A
IRF/IRFP9142, IRF9542	–100V	0.3Ω	–15A
IRF/IRFP9143, IRF9543	–60V	0.3Ω	–15A

FEATURES

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

PACKAGE STYLE

Package Type	Part Number
TO-3	IRF9140/9141/9142/9143
TO-3P	IRFP9140/9141/9142/9143
TO-220	IRF9540/9541/9542/9543

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MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP 9140 9540	9141 9541	9142 9542	9143 9543	Unit
Drain-Source Voltage (1)	V_{DSS}	–100	–60	–100	–60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	–100	–60	–100	–60	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	–19	–19	–15	–15	Adc
Continuous Drain Current T_C=100°C	I_D	–12	–12	–10	–10	Adc
Drain Current—Pulsed (3)	I_{DM}	–76	–76	–60	–60	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	125 1.0				Watts W/°C
Operating and Storage Junction Temperature Range	T_J, Tstg	–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≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

IRF9140/9141/9142/9143
IRFP9140/9141/9142/9143
IRF9540/9541/9542/9543

P-CHANNEL POWER MOSFETS

T-39-23

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise specified)

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF9140/2 IRFP9140/2 IRF9540/2	−100	—	—	V	V_{GS}=0V
		IRF9141/3 IRFP9141/2 IRF9541/3	−60	—	—	V	I_D=−250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	−2.0	—	−4.0	V	V_{DS}=V_{GS}, I_D=−250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	−250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—	—	−1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current(2)	$I_{D(on)}$	IRF9140/1 IRFP9140/1 IRF9540/1	−19	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=−10V
		IRF9142/3 IRFP9142/3 IRF9542/3	−15	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	0.2	Ω	V_{GS}=−10V, I_D=−10A
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	0.3	Ω	
Forward Transconductance (2)	g_{fs}	ALL	5.0	—	—		V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=−10A
Input Capacitance	C_{iss}	ALL	—	—	1300	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	—	700	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	400	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	30	ns	V_{DD}=0.5BV_{DSS}, I_D=−10A, Z_O=4.7Ω, (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	15	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	20	ns	
Fall Time	t_f	ALL	—	—	12	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	90	nC	V_{GS}=−15V, I_D=−24A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	—	30	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	—	60	nC	

THERMAL RESISTANCE

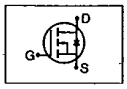
Junction-to-Case	R_{thJC}	ALL	—	—	1.0	K/W	
Case-to-Sink	R_{thCS}	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	IRFPXXX IRF95XX	—	—	80	K/W	Free Air Operation
		IRF91XX	—	—	30	K/W	

Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

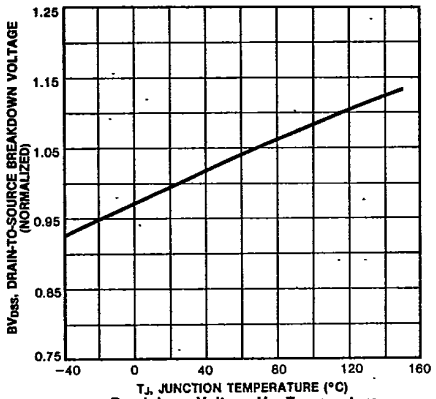
IRF9140/9141/9142/9143
IRFP9140/9141/9142/9143
IRF9540/9541/9542/9543

P-CHANNEL POWER MOSFETS

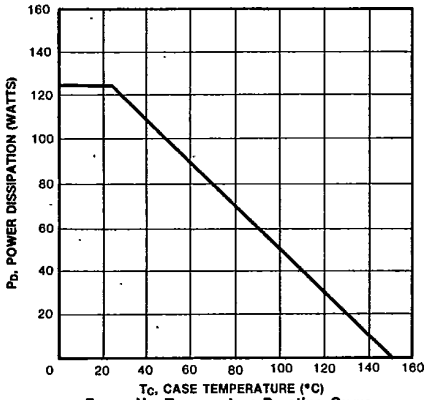
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−19	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−15	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−76	A	
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−60	A	
Diode Forward Voltage (2)	V_{SD}	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−4.2	V	T_C=25°C, I_S=−19A, V_{GS}=0V
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−4.0	V	T_C=25°C, I_S=−15A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	—	—	ns	T_J=150°C, I_F=−19A, dI_F/dt=100A/μs

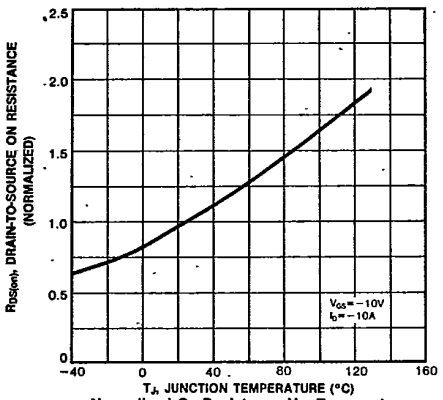
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



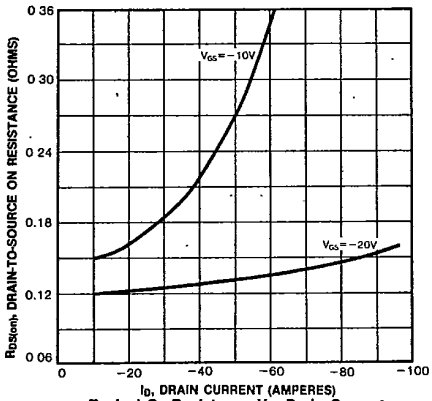
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



Normalized On-Resistance Vs. Temperature



Typical On-Resistance Vs. Drain Current

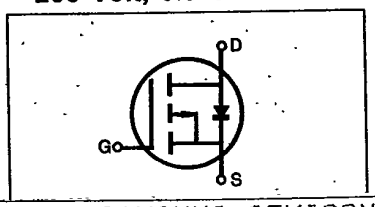
IRF9230/9231/9232/9233
IRFP9230/9231/9232/9233
IRF9630/9631/9632/9633

P-CHANNEL POWER MOSFETS

Preliminary Specifications

T-39-21

−200 Volt, 0.8 Ohm SFET



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF/IRFP9230, IRF9630	−200V	0.8Ω	−6.5A
IRF/IRFP9231, IRF9631	−150V	0.8Ω	−6.5A
IRF/IRFP9232, IRF9632	−200V	1.2Ω	−5.5A
IRF/IRFP9233, IRF9633	−150V	1.2Ω	−5.5A

FEATURES

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

PACKAGE STYLE

Package Type	Part Number
TO-3	IRF9230/9231/9232/9233
TO-3P	IRFP9230/9231/9232/9233
TO-220	IRF9630/9631/9632/9633

MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP 9230 9630	9231 9631	9232 9632	9233 9633	Unit
Drain-Source Voltage (1)	V_{DSS}	−200	−150	−200	−150	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	−200	−150	−200	−150	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	−6.5	−6.5	−5.5	−5.5	Adc
Continuous Drain Current T_C=100°C	I_D	−4.0	−4.0	−3.5	−3.5	Adc
Drain Current—Pulsed (3)	I_{DM}	−26	−26	−22	−22	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	75 0.6				Watts W/°C
Operating and Storage Junction Temperature Rangy	T_J, Tstg	−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≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

T-39-21

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise specified)

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF9230/2 IRFP9230/2 IRF9630/2	−200	—	—	V	V_{GS}=0V
		IRF9231/3 IRFP9231/3 IRF9631/3	−150	—	—	V	I_D=−250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	−2.0	—	−4.0	V	V_{DS}=V_{GS}, I_D=−250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	−250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—	—	−1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9230/1 IRFP9230/1 IRF9630/1	−6.5	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=−10V
		IRF9232/3 IRFP9232/3 IRF9632/3	−5.5	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9230/1 IRFP9230/1 IRF9630/1	—	—	0.8	Ω	V_{GS}=−10V, I_D=−3.5A
		IRF9232/3 IRFP9232/3 IRF9632/3	—	—	1.2	Ω	
Forward Transconductance (2)	g_{fs}	ALL	2.2	—	—	℧	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=−3.5A
Input Capacitance	C_{iss}	ALL	—	—	650	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	—	300	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	90	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	50	ns	V_{DD}=0.5BV_{DSS}, I_D=−3.5A, Z_O=50Ω, (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	100	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	100	ns	
Fall Time	t_f	ALL	—	—	80	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	45	nC	V_{GS}=−15V, I_D=−8.0A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	—	20	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	—	25	nC	

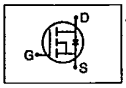
THERMAL RESISTANCE

Junction-to-Case	R_{thJC}	ALL	—	—	1.67	K/W	
Case-to-Sink	R_{thCS}	ALL	—	1.0	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	IRFPXXXX IRF96XX	—	—	80	K/W	Free Air Operation
		IRF92XX	—	—	30	K/W	

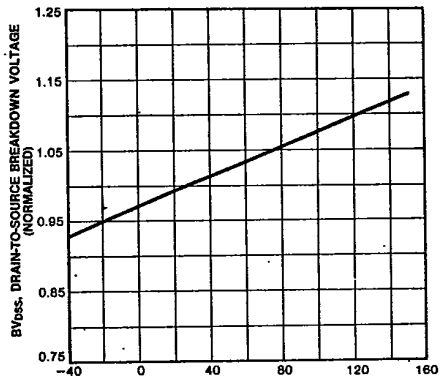
Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

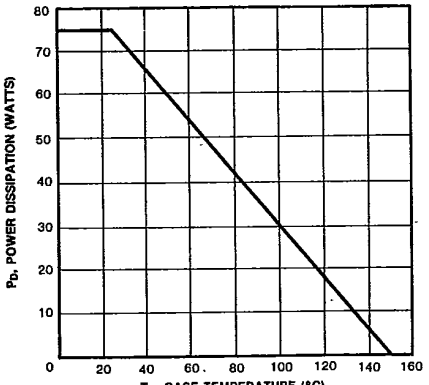
T-39-21

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF9230/1 IRFP9230/1 IRF9630/1	—	—	−6.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF9232/3 IRFP9232/3 IRF9632/3	—	—	−5.5	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF9230/1 IRFP9230/1 IRF9630/1	—	—	−26	A	
		IRF9232/3 IRFP9232/3 IRF9632/3	—	—	−22	A	
Diode Forward Voltage (2)	V_{SD}	IRF9230/1 IRFP9230/1 IRF9630/1	—	—	−6.5	V	T_C=25°C, I_S=−6.5A, V_{GS}=0V
		IRF9232/3 IRFP9232/3 IRF9632/3	—	—	−6.3	V	T_C=25°C, I_S=−5.5A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	—	—	ns	T_J=150°C, I_F=−6.5A, dI_F/dt=100A/μs

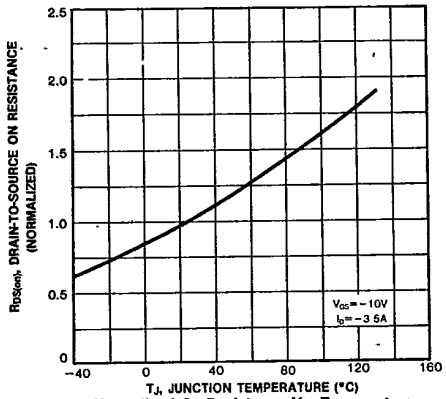
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



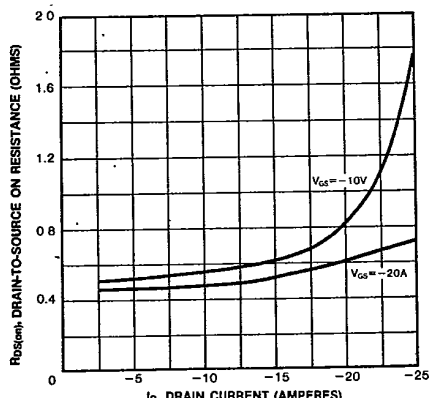
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



Normalized On-Resistance Vs. Temperature



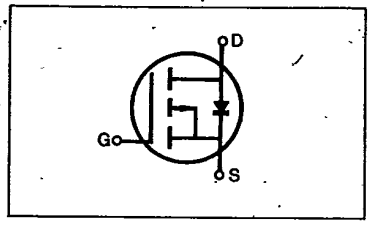
Typical On-Resistance Vs. Drain Current

IRF9240/9241/9242/9243
IRFP9240/9241/9242/9243
IRF9640/9641/9642/9643

P-CHANNEL POWER MOSFETS

Preliminary Specifications

−200 Volt, 0.5 Ohm SFET



FEATURES

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

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF/IRFP9240, IRF9640	−200V	0.5Ω	−11A
IRF/IRFP9241, IRF9641	−150V	0.5Ω	−11A
IRF/IRFP9242, IRF9642	−200V	0.7Ω	−9.0A
IRF/IRFP9243, IRF9643	−150V	0.7Ω	−9.0A

PACKAGE STYLE

Package Type	Part Number
TO-3	IRF9240/9241/9242/9243
TO-3P	IRFP9240/9241/9242/9243
TO-220	IRF9640/9641/9642/9643

MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP 9240 9640	9241 9641	9242 9642	9243 9643	Unit
Drain-Source Voltage (1)	V_{DSS}	−200	−150	−200	−150	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	−200	−150	−200	−150	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	−11	−11	−9.0	−9.0	Adc
Continuous Drain Current T_C=100°C	I_D	−7.0	−7.0	−6.0	−6.0	Adc
Drain Current—Pulsed (3)	I_{DM}	−44	−44	−36	−36	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	125 1.0				Watts W/°C
Operating and Storage Junction Temperature Rangy	T_J, Tstg	−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≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

IRF9240/9241/9242/9243
IRFP9240/9241/9242/9243
IRF9640/9641/9642/9643

P-CHANNEL POWER MOSFETS

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ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise specified)

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF9240/2 IRFP9240/2 IRF9640/2	−200	—	—	V	V_{GS}=0V
		IRF9241/3 IRFP9241/3 IRF9641/3	−150	—	—	V	I_D=−250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	−2.0	—	−4.0	V	V_{DS}=V_{GS}, I_D=−250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	−250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—.	—	−1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9240/1 IRFP9240/1 IRF9640/1	−11	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=−10V
		IRF9642 IRF9643	−9.0	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9240/1 IRFP9240/1 IRF9640/1	—	—	0.5	Ω	V_{GS}=−10V, I_D=−6.0A
		IRF9242/3 IRFP9242/3 IRF9642/3	—	—	0.7	Ω	
Forward Transconductance (2)	g_{fs}	ALL	4.0	—	—	Ʊ	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=−6.0A
Input Capacitance	C_{iss}	ALL	—	—	1300	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	—	450	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	250	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	30	ns	V_{DD}=0.5BV_{DSS}, I_D=−6.0A, Z_O=4.7Ω, (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	15	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	18	ns	
Fall Time	t_f	ALL	—	—	12	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	90	nC	V_{GS}=−15V, I_D=−22A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	—	30	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	—	60	nC	

THERMAL RESISTANCE

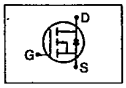
Junction-to-Case	R_{thJC}	ALL	—	—	1.0	K/W	
Case-to-Sink	R_{thCS}	ALL	—	1.0	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	IRFPXXX IRF96XX	—	—	80		Free Air Operation
		IRF92XX	—	—	30	K/W	

Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

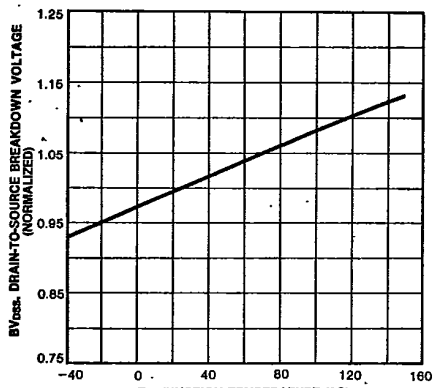
IRF9240/9241/9242/9243
IRFP9240/9241/9242/9243
IRF9640/9641/9642/9643

P-CHANNEL POWER MOSFETS

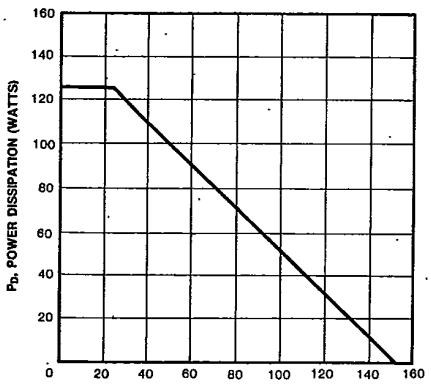
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF9240/1 IRFP9240/1 IRF9640/1	—	—	−11	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF9242/3 IRFP9242/3 IRF9642/3	—	—	−9.0	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF9240/1 IRFP9240/1 IRF9640/1	—	—	−44	A	
		IRF9242/3 IRFP9242/3 IRF9642/3	—	—	−36	A	
Diode Forward Voltage (2)	V_{SD}	IRF9240/1 IRFP9240/1 IRF9640/1	—	—	−4.6	V	T_C=25°C, I_S=−11A, V_{GS}=0V
		IRF9242/3 IRFP9242/3 IRF9642/3	—	—	−4.4	V	T_C=25°C, I_S=−9.0A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	—	—	ns	T_J=150°C, I_F=−11A, dI_F/dt=100A/μs

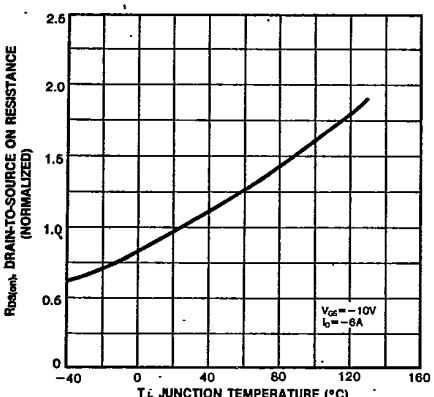
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



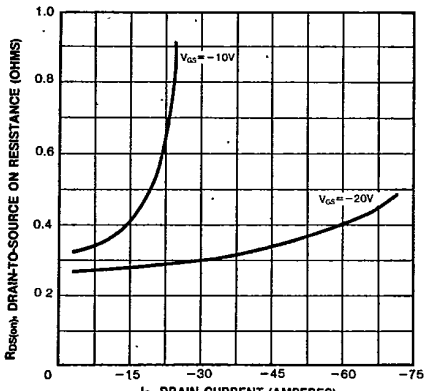
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



Normalized On-Resistance Vs. Temperature



Typical On-Resistance Vs. Drain Current