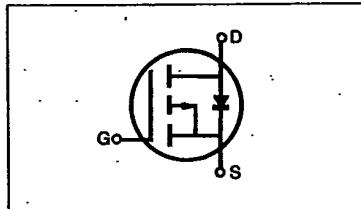


7964142 SAMSUNG SEMICONDUCTOR 7964142 0005405 7 D
IRF9130/9131/9132/9133 -37-31
IRFP9130/9131/9132/9133
IRF9530/9531/9532/9533 P-CHANNEL
POWER MOSFETS

Preliminary Specifications

- 100 Volt, 0.30 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

98 DE 7964142 0005405 ?

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

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				Unit
		9130 9530	9131 9531	9132 9532	9133 9533	
Drain-Source Voltage (1)	V _{DSS}	-100	-60	-100	-60	Vdc
Drain-Gate Voltage ($R_{GS}=1.0\text{M}\Omega$) (1)	V _{DGR}	-100	-60	-100	-60	Vdc
Gate-Source Voltage	V _{GS}	± 20				Vdc
Continuous Drain Current $T_c=25^\circ\text{C}$	I _D	-12	-12	-10	-10	Adc
Continuous Drain Current $T_c=100^\circ\text{C}$	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 @ $T_c=25^\circ\text{C}$ Derate above 25°C	P _D	75 0.6				Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	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) $T_j=25^\circ\text{C}$ to 150°C

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

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



SAMSUNG SEMICONDUCTOR

IRF9130/9131/9132/9133

IRFP9130/9131/9132/9133

IRF9530/9531/9532/9533

**P-CHANNEL
POWER MOSFETS**

98 DE 7964142 0005406 9

T-39-21

ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$ 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	$V_{GS}=0\text{V}$
		IRF9131/3 IRFP9131/3 IRF9531/3	-60	—	—	V	$I_D=-250\mu\text{A}$
Gate Threshold Voltage	$V_{GS(\text{th})}$	ALL	-2.0	—	-4.0	V	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$
Gate-Source Leakage Forward	I_{GS}	ALL	—	—	-100	nA	$V_{GS}=-20\text{V}$
Gate-Source Leakage Reverse	I_{GS}	ALL	—	—	100	nA	$V_{GS}=20\text{V}$
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	-250	μA	$V_{DS}=\text{Max. Rating}, V_{GS}=0\text{V}$
			—	—	-1000	μA	$V_{DS}=\text{Max. Rating} \times 0.8, V_{GS}=0\text{V}, T_c=125^\circ\text{C}$
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9130/1 IRFP9130/1 IRF9530/1	-12	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}, V_{GS} = -10\text{V}$
		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	$V_{GS} = -10\text{V}, I_D = -6.5\text{A}$
		IRF9131/3 IRFP9131/3 IRF9531/3	—	—	0.40	Ω	
Forward Transconductance (2)	g_{fs}	ALL	2.0	—	—	Ω	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}, I_D = -6.5\text{A}$
Input Capacitance	C_{iss}	ALL	—	—	700	pF	$V_{GS}=0\text{V}, V_{DS}=-25\text{V}, f=1.0\text{MHz}$
Output Capacitance	C_{oss}	ALL	—	—	450	pF	
Reverse Transfer Capacitance	C_{res}	ALL	—	—	200	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	60	ns	$V_{DD}=0.5V_{DSS}, I_D=-6.5\text{A}, Z_0=50\Omega$ (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	$V_{GS}=-15\text{V}, I_D=-15\text{A}, V_{DS}=0.8 \text{ Max.}$ 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	—	—	80	K/W	Free Air Operation
		IRF95XX	—	—	30	K/W	
		IRF91XX	—	—			

Notes: (1) $T_J=25^\circ\text{C}$ to 150°C (2) Pulse test: Pulse width $< 300\mu\text{s}$, Duty Cycle $< 2\%$

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

IRF9130/9131/9132/9133

IRFP9130/9131/9132/9133

IRF9530/9531/9532/9533

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P-CHANNEL

POWER MOSFETS

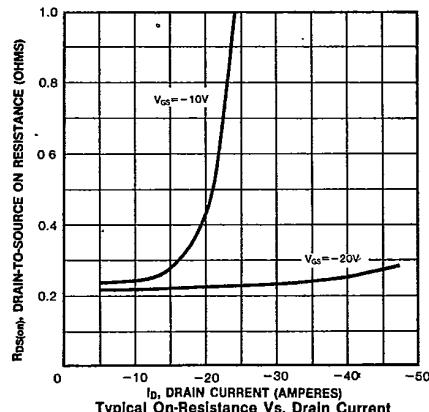
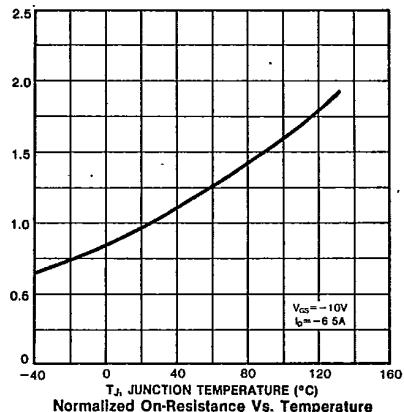
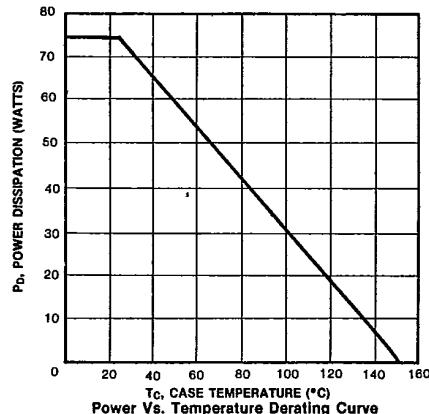
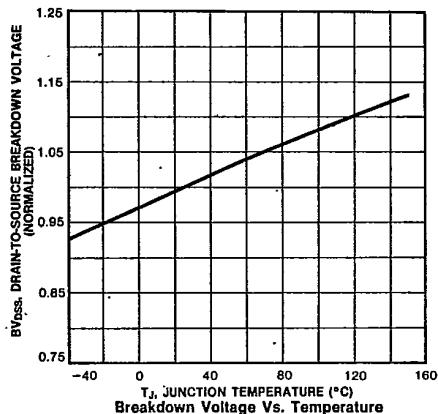
T-39-21

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	Is	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	
		IRF9130/1 IRFP9130/1 IRF9530/1	—	—	-48	A	
Pulse Source Current (Body Diode) (3)	ISM	IRF9132/3 IRFP9132/3 IRF9532/3	—	—	-40	A	T _c =25°C, Is=-12A, V _{GS} =0V
		IRF9130/1 IRFP9130/1 IRF9530/1	—	—	-6.3	V	
		IRF9132/3 IRFP9132/3 IRF9532/3	—	—	-6.0	V	T _c =25°C, Is=-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



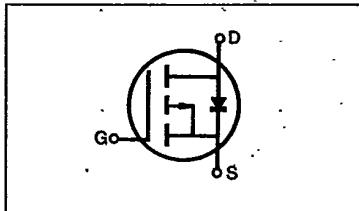
SAMSUNG SEMICONDUCTOR

**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



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/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

PACKAGE STYLE

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

MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP				Unit
		9140 9540	9141 9541	9142 9542	9143 9543	
Drain-Source Voltage (1)	V_{DSS}	-100	-60	-100	-60	Vdc
Drain-Gate Voltage ($R_{GS}=1.0M\Omega$) (1)	V_{DGR}	-100	-60	-100	-60	Vdc
Gate-Source Voltage	V_{GS}	± 20				Vdc
Continuous Drain Current $T_c=25^\circ C$	I_D	-19	-19	-15	-15	Adc
Continuous Drain Current $T_c=100^\circ C$	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 @ $T_c=25^\circ C$ Derate above $25^\circ C$	P_D	125 1.0				Watts W/ $^\circ C$
Operating and Storage Junction Temperature Range	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 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 ($T_c=25^\circ\text{C}$ unless otherwise specified)

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV _{DSS}	IRF9140/2 IRF9141/2 IRF9540/2	-100	—	—	V	$V_{GS}=0\text{V}$
		IRF9141/3 IRF9141/2 IRF9541/3	-60	—	—	V	$I_D=-250\mu\text{A}$
Gate Threshold Voltage	$V_{GS(\text{th})}$	ALL	-2.0	—	-4.0	V	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$
Gate-Source Leakage Forward	I_{GS}	ALL	—	—	-100	nA	$V_{GS}=-20\text{V}$
Gate-Source Leakage Reverse	I_{GS}	ALL	—	—	100	nA	$V_{GS}=20\text{V}$
Zero Gate Voltage Drain Current	$I_{DS(0)}$	ALL	—	—	-250	μA	$V_{DS}=\text{Max. Rating}$, $V_{GS}=0\text{V}$
			—	—	-1000	μA	$V_{DS}=\text{Max. Rating} \times 0.8$, $V_{GS}=0\text{V}$, $T_c=125^\circ\text{C}$
On-State Drain-Source Current(2)	$I_{D(on)}$	IRF9140/1 IRF9140/1 IRF9540/1	-19	—	—	A	$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}$, $V_{GS}=-10\text{V}$
		IRF9142/3 IRF9142/3 IRF9542/3	-15	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9140/1 IRF9140/1 IRF9540/1	—	—	0.2	Ω	$V_{GS}=-10\text{V}$, $I_D=-10\text{A}$
		IRF9142/3 IRF9142/3 IRF9542/3	—	—	0.3	Ω	
Forward Transconductance (2)	g_{fs}	ALL	5.0	—	—		$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}$, $I_D=-10\text{A}$
Input Capacitance	C_{iss}	ALL	—	—	1300	pF	$V_{GS}=0\text{V}$, $V_{DS}=-25\text{V}$, $f=1.0\text{MHz}$
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	$V_{DD}=0.5BV_{DSS}$, $I_D=-10\text{A}$, $Z_0=4.7\Omega$, (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	$V_{GS}=-15\text{V}$, $I_D=-24\text{A}$, $V_{DS}=0.8 \text{ Max.}$
Gate-Source Charge	Q_{gs}	ALL	—	—	30	nC	Rating (Gate charge is essentially independent of operating temperature.)
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}	IRFPXXXX IRF95XX IRF91XX	—	—	80 30	K/W K/W	Free Air Operation

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 width limited by max. junction temperature



SAMSUNG SEMICONDUCTOR

IRF9140/9141/9142/9143

T-39-23

IRFP9140/9141/9142/9143

P-CHANNEL

IRF9540/9541/9542/9543

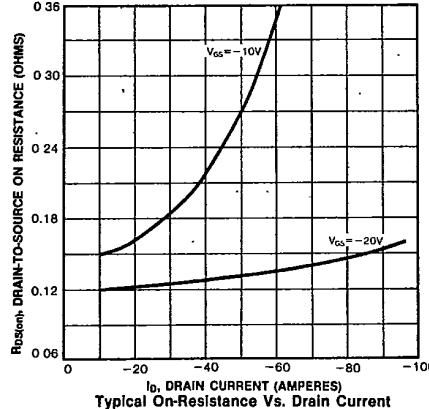
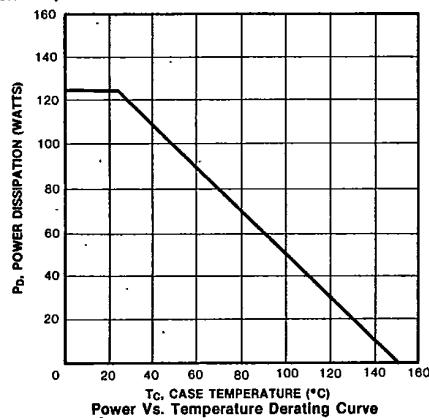
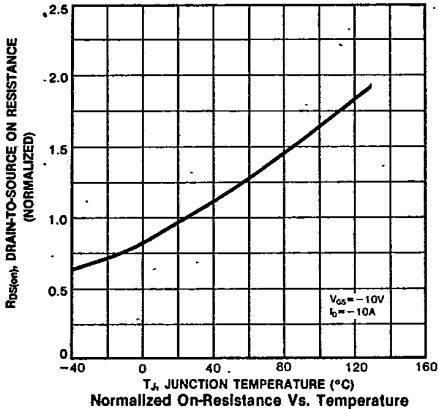
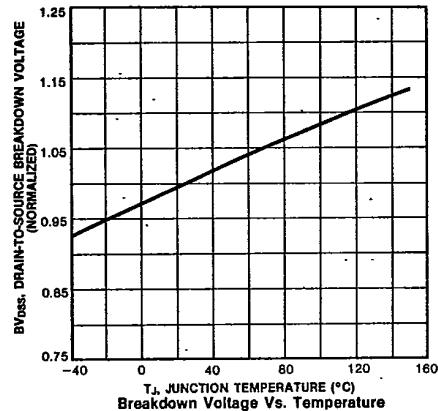
POWER MOSFETS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	Is	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)	IsM	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	-76	A	
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	-60	A	
Diode Forward Voltage (2)	VSD	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	-4.2	V	Tc=25°C, Is=-19A, Vgs=0V
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	-4.0	V	Tc=25°C, Is=-15A, Vgs=0V
Reverse Recovery Time	trr	ALL	—	—	—	ns	Tj=150°C, If=-19A, dIf/dt=100A/μs

Notes: (1) Tj=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%

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



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

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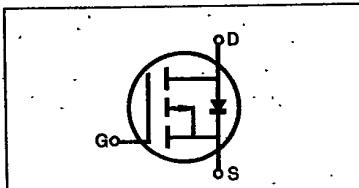
P-CHANNEL

POWER MOSFETS

Preliminary Specifications

T-39-21

-200 Volt, 0.8 Ohm SFET



7964142 SAMSUNG SEMICONDUCTOR INC

98D 05417 D

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				Unit
		9230 9630	9231 9631	9232 9632	9233 9633	
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 Range	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≤300μs, Duty Cycle≤2%

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



SAMSUNG SEMICONDUCTOR

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IRF9230/9231/9232/9233

IRFP9230/9231/9232/9233

IRF9630/9631/9632/9633

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P-CHANNEL

POWER MOSFETS

7964142 SAMSUNG SEMICONDUCTOR INC

98D 05418 D

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

T-39-21

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	$I_D=-250\mu\text{A}$
Gate Threshold Voltage	$V_{GS(\text{th})}$	ALL	-2.0	—	-4.0	V	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$
Gate-Source Leakage Forward	I_{GS}	ALL	—	—	-100	nA	$V_{GS}=-20V$
Gate-Source Leakage Reverse	I_{GS}	ALL	—	—	100	nA	$V_{GS}=20V$
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	-250	μA	$V_{DS}=\text{Max. Rating}, V_{GS}=0V$
			—	—	-1000	μA	$V_{DS}=\text{Max. Rating} \times 0.8, V_{GS}=0V, T_c=125^\circ\text{C}$
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9230/1 IRFP9230/1 IRF9630/1	-6.5	—	—	A	$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}, V_{GS}=-10V$
		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	—	—	Ω	$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}, I_D=-3.5A$
Input Capacitance	C_{iss}	ALL	—	—	650	pF	$V_{GS}=0V, V_{DS}=-25V, f=1.0\text{MHz}$
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	$V_{DD}=0.5BV_{DSS}, I_D=-3.5A, Z_0=50\Omega$, (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	$V_{GS}=-15V, I_D=-8.0A, V_{DS}=0.8 \text{ Max.}$ 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 IRF92XX	—	—	80 30	K/W	Free Air Operation

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 width limited by max. junction temperature



SAMSUNG SEMICONDUCTOR

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**IRF9230/9231/9232/9233
IRFP9230/9231/9232/9233
IRE9630/9631/9632/9633**

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**P-CHANNEL
POWER MOSFETS**

7964142 SAMSUNG SEMICONDUCTOR INC

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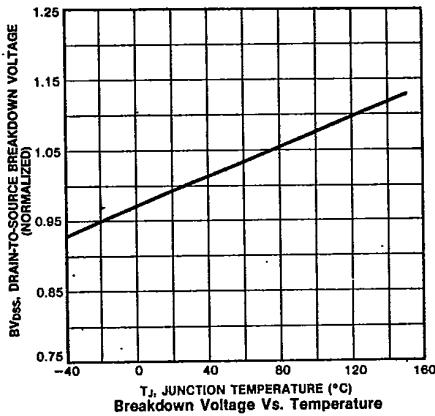
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

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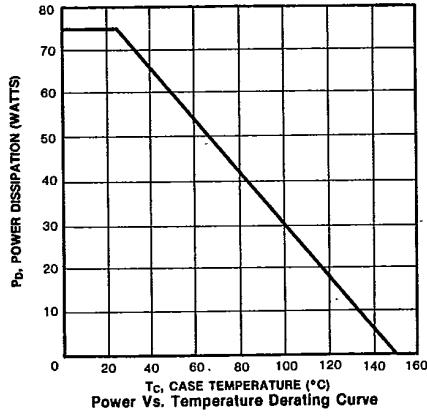
Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I _S	IRF9230/1 IRFP9230/1 IRF9630/1	—	—	-6.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier
		IRF9232/3 IRFP9232/3 IRF9632/3	—	—	-5.5	A	
Pulse Source Current (Body Diode) (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%

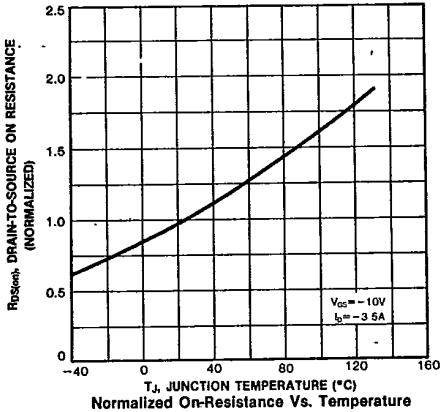
(3) Repetitive rating: Pulse width limited by max. junction temperature



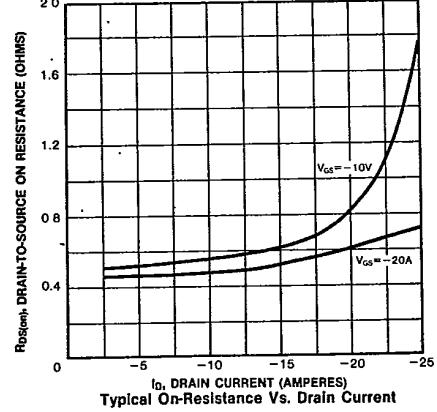
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



Normalized On-Resistance Vs. Temperature



Typical On-Resistance Vs. Drain Current



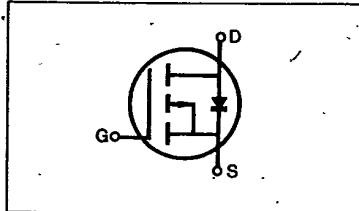
SAMSUNG SEMICONDUCTOR

IRF9240/9241/9242/9243

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IRFP9240/9241/9242/9243

IRF9640/9641/9642/9643

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

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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				Unit
		9240 9640	9241 9641	9242 9642	9243 9643	
Drain-Source Voltage (1)	V_{DSS}	-200	-150	-200	-150	Vdc
Drain-Gate Voltage ($R_{GS}=1.0\text{M}\Omega$) (1)	V_{DGR}	-200	-150	-200	-150	Vdc
Gate-Source Voltage	V_{GS}	± 20				Vdc
Continuous Drain Current $T_c=25^\circ\text{C}$	I_D	-11	-11	-9.0	-9.0	Adc
Continuous Drain Current $T_c=100^\circ\text{C}$	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 @ $T_c=25^\circ\text{C}$ Derate above 25°C	P_D	125 1.0				Watts $\text{W}/^\circ\text{C}$
Operating and Storage Junction Temperature Range	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) $T_J=25^\circ\text{C}$ to 150°C (2) Pulse test: Pulse width $\leq 300\mu\text{s}$, Duty Cycles $\leq 2\%$

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

**SAMSUNG SEMICONDUCTOR**

ELECTRICAL CHARACTERISTICS ($T_C=25^\circ C$ 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	$I_D=-250\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	ALL	-2.0	—	-4.0	V	$V_{DS}=V_{GS}$, $I_D=-250\mu A$
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	$V_{DS}=\text{Max. Rating}$, $V_{GS}=0V$
			—	—	-1000	μA	$V_{DS}=\text{Max. Rating} \times 0.8$, $V_{GS}=0V$, $T_C=125^\circ C$
On-State Drain-Source Current (2)	$I_{D(on)}$	IRF9240/1 IRFP9240/1 IRF9640/1	-11	—	—	A	
		IRF9642 IRF9643	-9.0	—	—	A	$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}$, $V_{GS}=-10V$
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_f	ALL	4.0	—	—	Ω	$V_{DS}>I_{D(on)} \times R_{DS(on) \text{ max.}}$, $I_D=-6.0A$
Input Capacitance	C_{iss}	ALL	—	—	1300	pF	
Output Capacitance	C_{oss}	ALL	—	—	450	pF	$V_{GS}=0V$, $V_{DS}=-25V$, $f=1.0MHz$
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	250	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	30	ns	
Rise Time	t_r	ALL	—	—	15	ns	$V_{DD}=0.5BV_{DSS}$, $I_D=-6.0A$, $Z_0=4.7\Omega$
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	18	ns	(MOSFET switching times are essentially independent of operating temperature.)
Fall Time	t_f	ALL	—	—	12	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	90	nC	$V_{GS}=-15V$, $I_D=-22A$, $V_{DS}=0.8 \text{ Max.}$
Gate-Source Charge	Q_{gs}	ALL	—	—	30	nC	Rating (Gate charge is essentially independent of operating temperature.)
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}	IRFPXXXX IRF96XX IRF92XX	—	—	80 .30	K/W	Free Air Operation

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 width limited by max. junction temperature



SAMSUNG SEMICONDUCTOR

**P-CHANNEL
POWER MOSFETS**

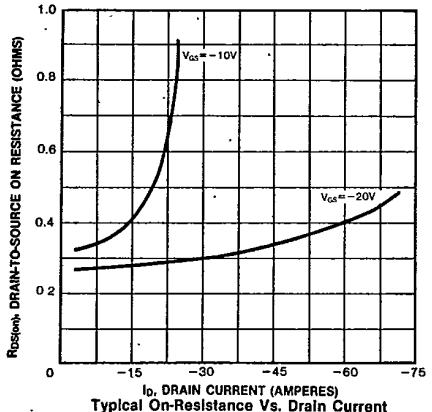
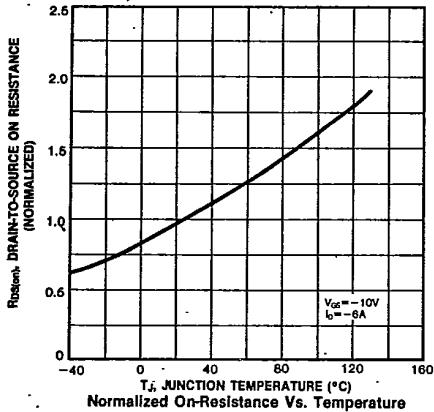
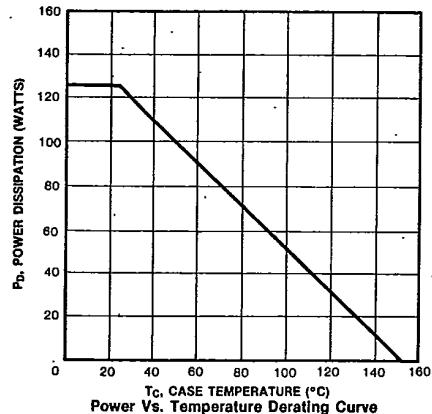
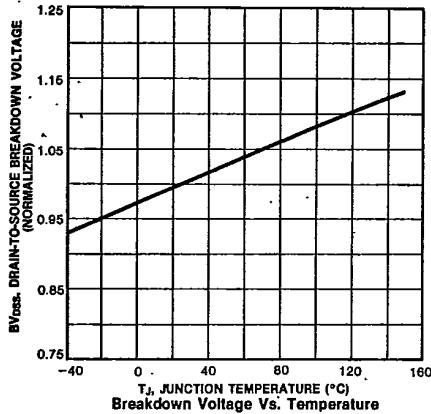
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SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	Is	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)	IsM	IRF9240/1 IRFP9240/1 IRF9640/1	—	—	-44	A	
		IRF9242/3 IRFP9242/3 IRF9642/3	—	—	-36	A	
Diode Forward Voltage (2)	VSD	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



SAMSUNG SEMICONDUCTOR