

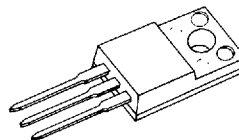
## IRFS720/721/722/723

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

TO-220F



IRFS720/721/722/723

## PRODUCT SUMMARY

Part Number	$V_{DS}$	$R_{DS(on)}$	$I_D$
IRFS720	400V	1.8 $\Omega$	2.5A
IRFS721	350V	1.8 $\Omega$	2.5A
IRFS722	400V	2.5 $\Omega$	2.0A
IRFS723	350V	2.5 $\Omega$	2.0A

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## ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRFS720	IRFS721	IRFS722	IRFS723	Unit
Drain-Source Voltage (1)	$V_{DS}$	400	350	400	350	Vdc
Drain-Gate Voltage ( $R_{GS}=1.0M\Omega$ )(1)	$V_{DGR}$	400	350	400	350	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$				Vdc
Continuous Drain Current $T_C=25^\circ C$	$I_D$	2.5	2.5	2.0	2.0	Adc
Continuous Drain Current $T_C=100^\circ C$	$I_D$	1.5	1.5	1.2	1.2	Adc
Drain Current—Pulsed (3)	$I_{DM}$	13	13	11	11	Adc
Gate Current—Pulsed	$I_{GM}$	$\pm 1.5$				Adc
Single Pulsed Avalanche Energy (4)	$E_{AS}$	109				mJ
Avalanche Current	$I_{AS}$	2.5				A
Total Power Dissipation at $T_C=25^\circ C$	$P_D$	30				Watts
Derate above $25^\circ C$		0.24				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 with limited by max. junction temperature

(4)  $L=31mH$ ,  $V_{dd}=50V$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ C$

## IRFS720/721/722/723

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POWER MOSFETSELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	400	—	—	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
	IRFS720/722 IRFS721/723	350	—	—		
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
I <sub>GSS</sub>	Gate-Source Leakage Forward	—	—	100	nA	V <sub>GS</sub> =20V
I <sub>GSS</sub>	Gate-Source Leakage Reverse	—	—	-100	nA	V <sub>GS</sub> =-20V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	250	μA	V <sub>DS</sub> =Max. Rating, V <sub>GS</sub> =0V
		—	—	1000		V <sub>DS</sub> =0.8Max. Rating, T <sub>C</sub> =125°C
I <sub>D(on)</sub>	On-State Drain-Source Current (2)	3.3	—	—	A	V <sub>DS</sub> ≥8.2A, V <sub>GS</sub> =10V
	IRFS720/721 IRFS722/723	2.8	—	—		
R <sub>DS(on)</sub>	Static Drain-Source On-State Resistance (2)	—	1.4	1.8	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =1.8A
	IRFS720/721	—	1.8	2.5		
	IRFS722/723	—	—	—		
g <sub>fs</sub>	Forward Transconductance (2)	1.0	2.2	—	∪	V <sub>DS</sub> ≥50V, I <sub>D</sub> =1.8A
C <sub>iss</sub>	Input Capacitance	—	400	—	pF	V <sub>GS</sub> =0V
C <sub>oss</sub>	Output Capacitance	—	59.3	—	pF	V <sub>DS</sub> =25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	27	—	pF	f=1.0MHz
t <sub>d(on)</sub>	Turn-On Delay Time	—	10	15	ns	V <sub>DD</sub> =0.5 BV <sub>DSS</sub> , I <sub>D</sub> =3.3A, Z <sub>O</sub> =18Ω (MOSFET switching times are essentially independent of operating temperature)
t <sub>r</sub>	Rise Time	—	14	20	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time	—	30	45	ns	
t <sub>f</sub>	Fall Time	—	13	20	ns	
Q <sub>g</sub>	Total Gate Charge (Gate-Source Pulse Gate-Drain)	—	12.5	15	nC	V <sub>GS</sub> =10V, I <sub>D</sub> =9.2A, V <sub>DS</sub> =0.8Max. Rating (Gate charge is essentially independent of operating temperature.)
Q <sub>gs</sub>	Gate-Source Charge	—	2.8	—	nC	
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	—	9.7	—	nC	

## THERMAL RESISTANCE

R <sub>thJC</sub>	Junction-to-Case	Max	4.16	K/W	
R <sub>thCS</sub>	Case-to-Sink	Typ	0.5	K/W	Mounting surface flat smooth, and greased
R <sub>thJA</sub>	Junction-to-Ambient	Max	80	K/W	Free Air Operation

Notes: (1) T<sub>J</sub>=25°C to 150°C

(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%

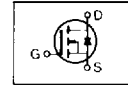
(3) Repetitive rating: Pulse width limited by max. junction temperature

IRFS720/721/722/723

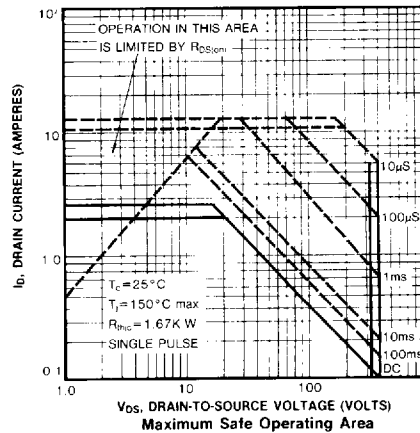
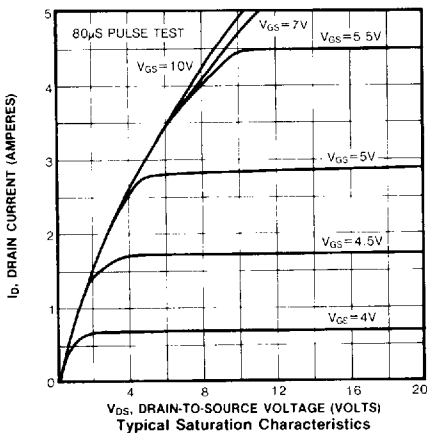
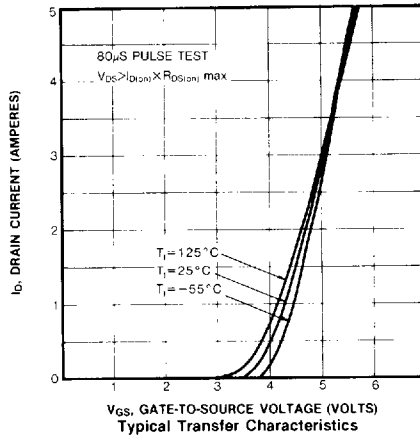
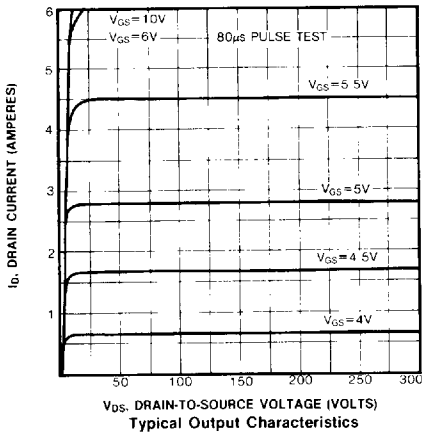
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SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
$I_s$	Continuous Source Current (Body Diode)					Modified MOSFET integral reverse P-N junction rectifier
	IRFS720/721	—	—	3.3	A	
	IRFS722/723	—	—	2.8	A	
$I_{SM}$	Pulse Source Current (3)					
	IRFS720/721	—	—	13	A	
	IRFS722/723	—	—	11	A	
$V_{SD}$	Diode Forward Voltage (2)					$T_C=25^\circ\text{C}$ , $I_S=3.3\text{A}$ , $V_{GS}=0\text{V}$ $T_C=25^\circ\text{C}$ , $I_S=2.8\text{A}$ , $V_{GS}=0\text{V}$
	IRFS720/721	—	—	1.8	V	
	IRFS722/723	—	—	1.7	V	
$t_{rr}$	Reverse Recovery Time	—	270	—	ns	$T_J=25^\circ\text{C}$ , $I_F=3.3\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{S}$



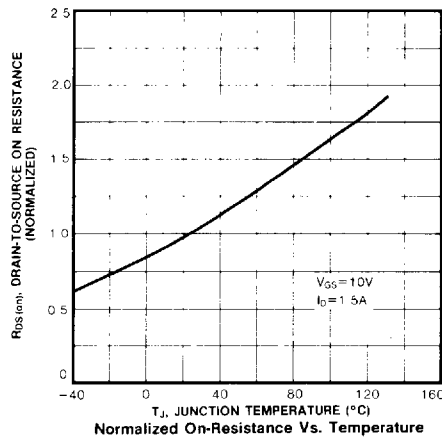
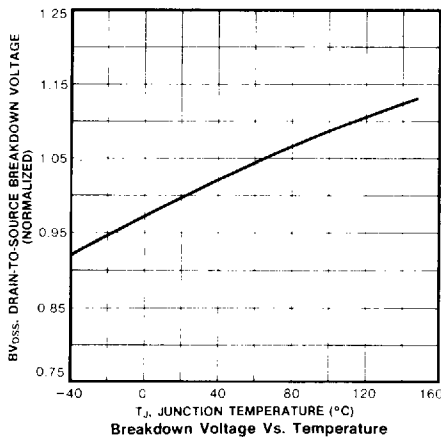
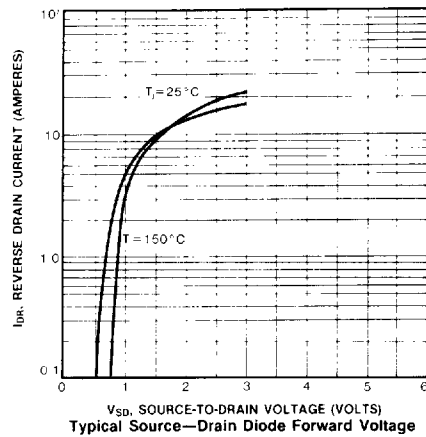
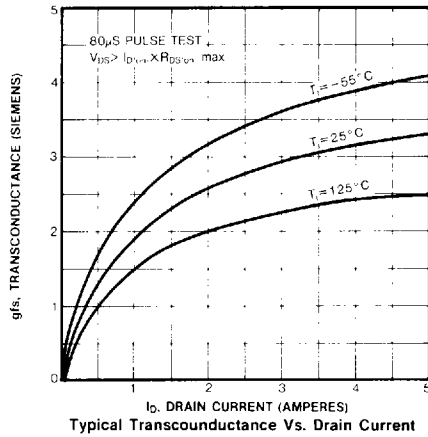
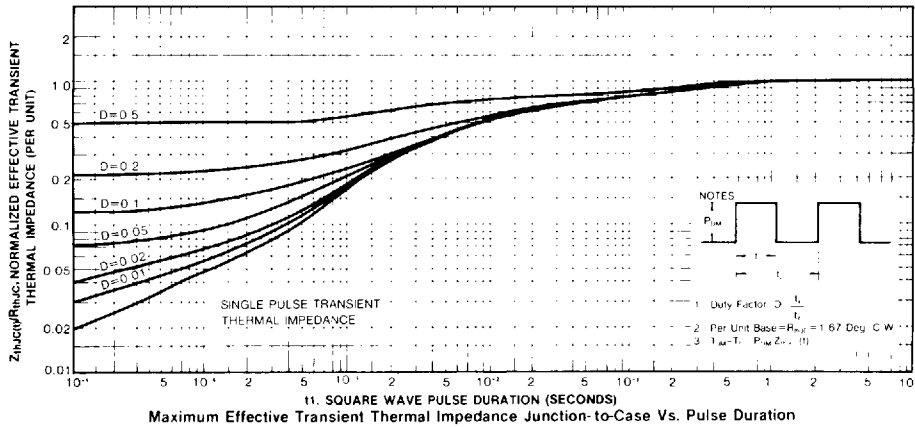
- Notes: (1)  $T_J=25^\circ\text{C}$  to  $150^\circ\text{C}$   
 (2) Pulse test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$   
 (3) Repetitive rating: Pulse with limited by max. junction temperature



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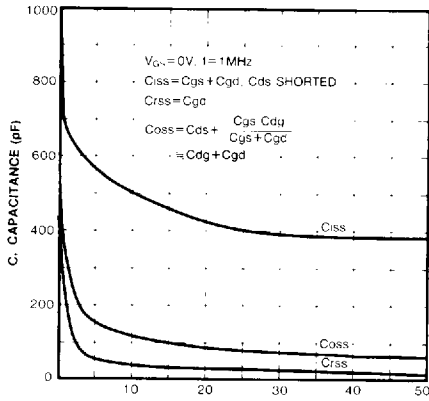
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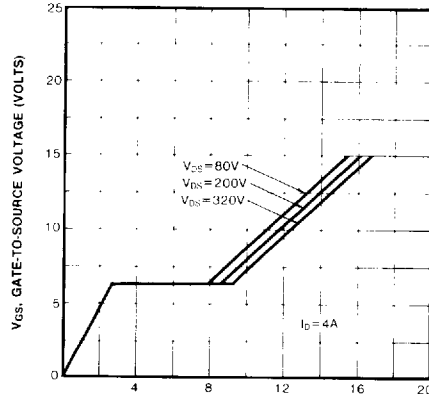


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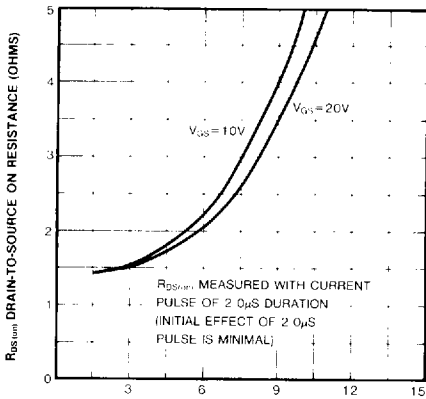
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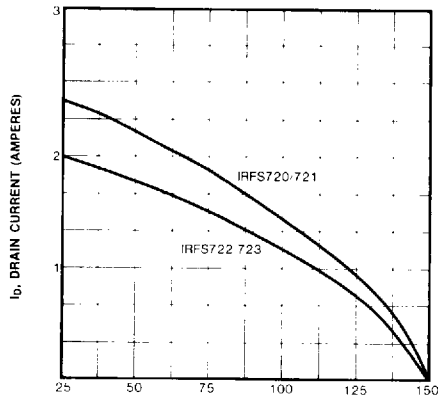
Typical Capacitance Vs. Drain to Source Voltage



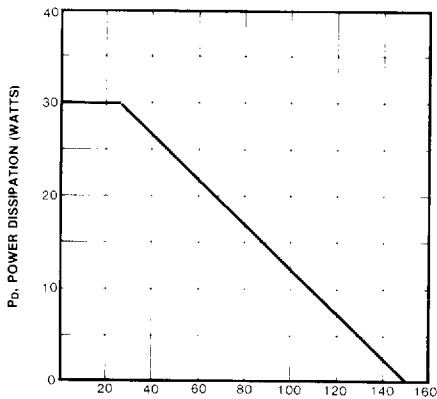
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve

