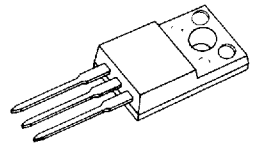
IRFS730/731/732/733

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



IRFS730/731/732/733

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFS730	400V	1.0Ω	3.5A
IRFS731	350V	1.0Ω	3.5A
IRFS732	400V	1.5Ω	3.0A
IRFS733	350V	1.5Ω	3.0A

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRFS730	IRFS731	IRFS732	IRFS733	Unit
Drain-Source Voltage (1)	V_{DSS}	400	350	400	350	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	400	350	400	350	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	3.5	3.5	3	3	Adc
Continuous Drain Current T_C=100°C	I_D	2	2	1.8	1.8	Adc
Drain Current—Pulsed (3)	I_{DM}	32	32	18	18	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	117				mJ
Avalanche Current	I_{AS}	3.5				A
Total Power Dissipation at T_C=25°C Derate above 25°C	P_D	35 0.28				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 with limited by max. junction temperature
(4) L=17mH, V_{dd}=50V, R_G=25Ω, Starting T_J=25°C

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

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRFS730/732 IRFS731/733	 400 350	 — —	 — —	V	V_{GS}=0V, I_D=250μA
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=250μA
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 1000	μA	V_{DS}=Max. Rating, V_{GS}=0V V_{DS}=0.8Max. Rating, T_C=125°C
$I_{D(on)}$	On-State Drain-Source Current (2) IRFS730/731 IRFS732/733	 5.5 4.5	 — —	 — —	A	V_{DS}≥8.2V, V_{GS}=10V
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRFS730/731 IRFS732/733	 — —	 0.8 1.0	 1.0 1.5	Ω	V_{GS}=10V, I_D=3A
g_{fs}	Forward Transconductance (2)	2.9	4.4	—	℧	V_{DS}≥50V, I_D=3.0A
C_{iss}	Input Capacitance	—	780	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	99	—	pF	V_{DS}=25V
C_{rss}	Reverse Transfer Capacitance	—	43	—	pF	f=1.0MHz
$t_{d(on)}$	Turn-On Delay Time	—	11	17	ns	V_{DD}=0.5 BV_{DSS}, I_D=5.5A, Z_O=12Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	19	29	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	37	56	ns	
t_f	Fall Time	—	16	24	ns	
Q_g	Total Gate Charge (Gate-Source Pulse Gate-Drain)	—	18	30	nC	V_{GS}=10V, I_D=5.5A, V_{DS}=0.8Max. Rating (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	40	—	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	14	—	nC	

THERMAL RESISTANCE

R_{thJC}	Junction-to-Case	Max	3.57	K/W	
R_{thCS}	Case-to-Sink	Typ	0.5	K/W	Mounting surface flat, Smooth, and greased
R_{thJA}	Junction-to-Ambient	Max	80	K/W	Free Air Operation

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

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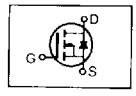
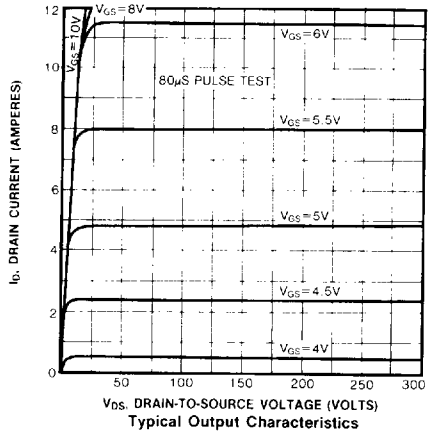
N-CHANNEL POWER MOSFETS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

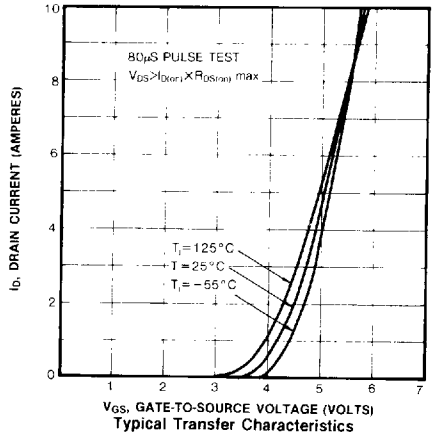
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)					
	IRFS730/731	—	—	5.5	A	Modified MOSFET integral reverse P-N junction rectifier
	IRFS732/733	—	—	4.5		
I_{SM}	Pulse Source Current (3)					
	IRFS730/731	—	—	22	A	
	IRFS732/733	—	—	18		
V_{SD}	Diode Forward Voltage (2)					
	IRFS730/731	—	—	1.8	V	T_C=25°C, I_S=5.5A, V_{GS}=0V
	IRFS732/733	—	—	1.6		T_C=25°C, I_S=4.5A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	—	310	660	ns	T_j=25°C, I_F=5.5A, dI_F/dt=100A/μS



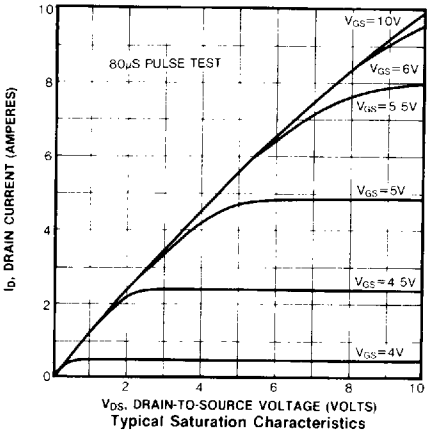
Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature



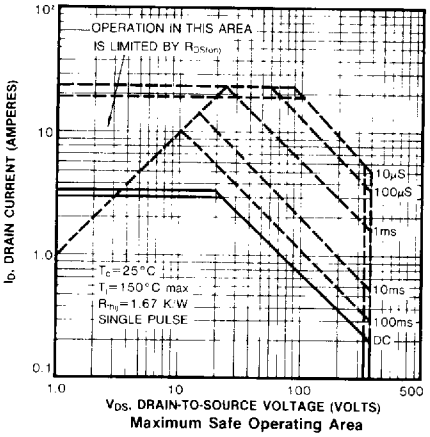
Typical Output Characteristics



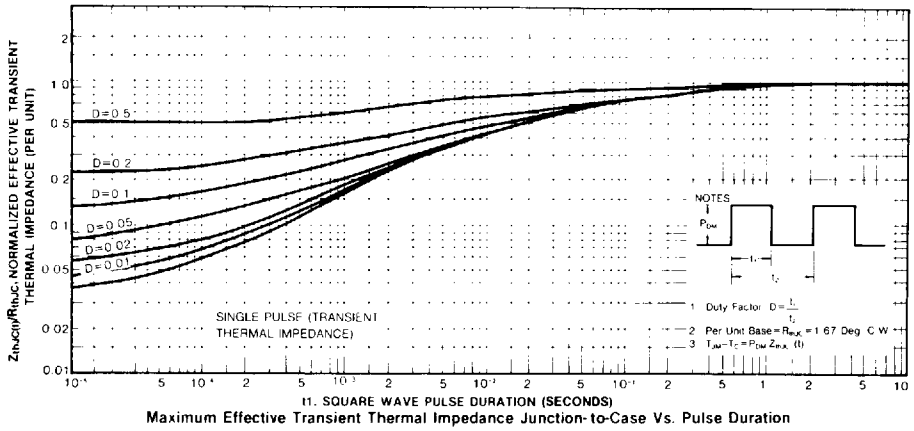
Typical Transfer Characteristics



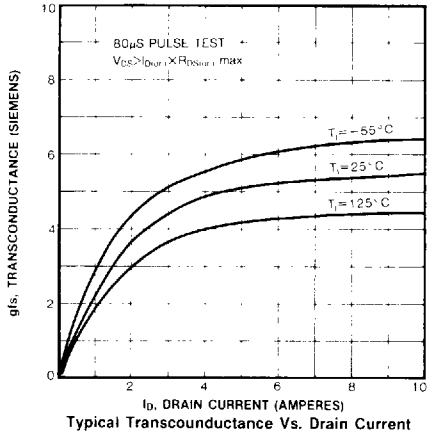
Typical Saturation Characteristics



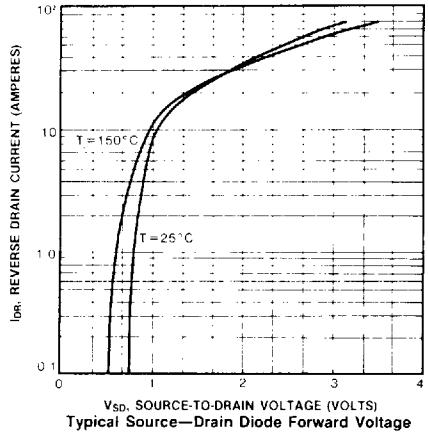
Maximum Safe Operating Area



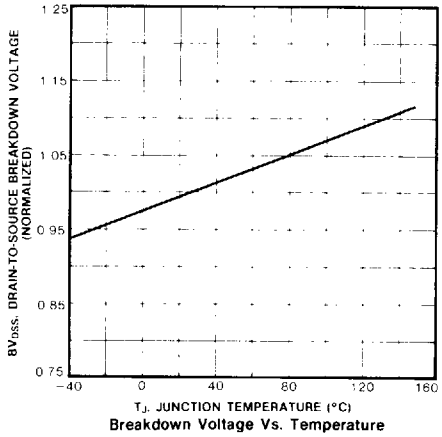
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



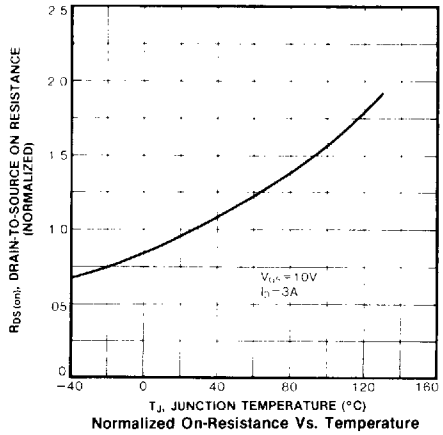
Typical Transcounductance Vs. Drain Current



Typical Source—Drain Diode Forward Voltage



Breakdown Voltage Vs. Temperature



Normalized On-Resistance Vs. Temperature

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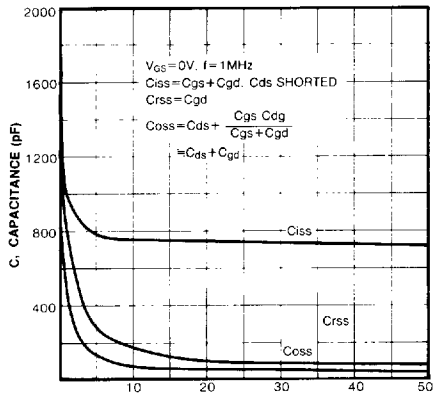
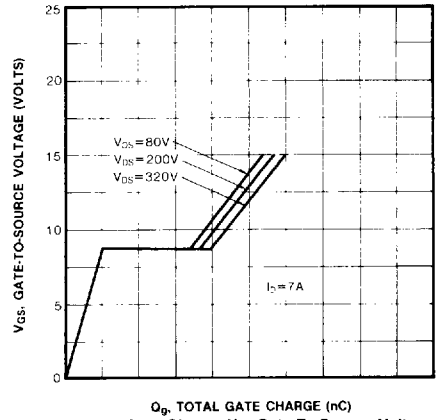
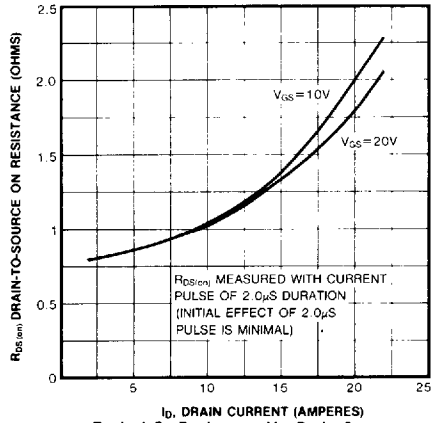


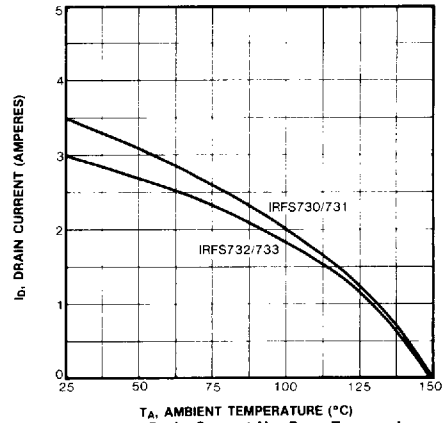
Typical Capacitance Vs. Drain to Source Voltage



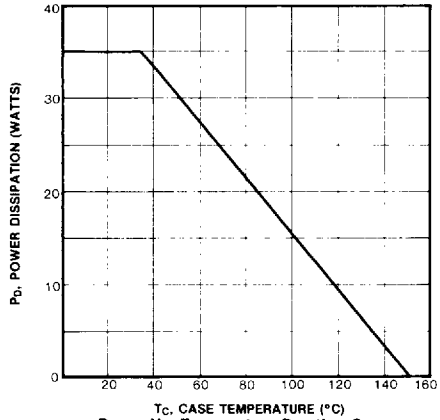
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve