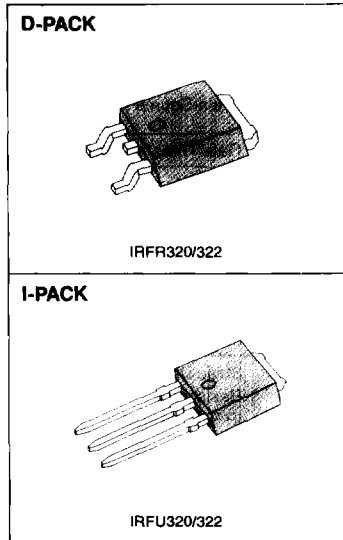


**FEATURE**

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

**PRODUCT SUMMARY**

Part Number	V <sub>DS</sub>	R <sub>DS(on)</sub>	I <sub>D(on)</sub>
IRFR320/U320	400V	1.8Ω	2.7A
IRFR322/U322	400V	2.5Ω	2.3A



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**ABSOLUTE MAXIMUM RATINGS**

Characteristic	Symbol	IRFR320/U320	IRFR322/U322	Units
Drain-Source Voltage (1)	V <sub>DSS</sub>	400		Vdc
Drain-Gate Voltage (R <sub>GS</sub> = 1.0MΩ) (1)	V <sub>DGR</sub>	400		Vdc
Gate-Source Voltage	V <sub>GS</sub>	± 20		Vdc
Continuous Drain Current T <sub>C</sub> = 25°C	I <sub>D</sub>	2.7	2.3	Adc
Continuous Drain Current T <sub>C</sub> = 100°C	I <sub>D</sub>	1.8	1.5	Adc
Drain Current — Pulsed (3)	I <sub>DM</sub>	11.0	9.0	Adc
Gate Current — Pulsed	I <sub>GM</sub>	± 1.5		Adc
Single Pulsed Avalanche Energy (4)	E <sub>AS</sub>	16		mJ
Avalanche Current	I <sub>AS</sub>	2.7		A
Total Power Dissipation at T <sub>C</sub> = 25°C	P <sub>D</sub>	42		Watts
Derate above 25°C		0.33		
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150		°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T <sub>L</sub>	300		°C

- 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  
 (4) L = 4.5mH, V<sub>dd</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C

**ELECTRICAL CHARACTERISTIC** ( $T_C = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Condition
$BV_{DSS}$	Drain-Source Breakdown Voltage	400	—	—	V	$V_{GS} = 0V$ $I_D = 250\mu A$
$V_{GS(th)}$	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	$\mu A$	$V_{DS} = \text{Max. Rating}$ , $V_{GS} = 0V$
$I_{D(on)}$	On-State Drain Source Current (2) IRFR320/U320	2.7	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on)}$ max. $V_{GS} = 10V$
	IRFU322/U322	2.3	—	—		
$R_{DS(on)}$	Static Drain-Source On-State Resistance IRFR320/U320	—	—	1.8	$\Omega$	$V_{GS} = 10V$ , $I_D = 1.4A$
	IRFR322/U322	—	—	2.5		
$g_{fs}$	Forward Transconductance (2)	1.0	2.0	—	$\text{S}$	$V_{DS} > R_{DS} \times I_{D(on)}$ , $I_D = 1.4A$
$C_{iss}$	Input Capacitance	—	400	—	pF	$V_{GS} = 0V$ , $V_{DS} = 25V$ , $f = 10\text{MHz}$
$C_{oss}$	Output Capacitance	—	59	—	pF	
$C_{rss}$	Reverse Transfer Capacitance	—	27	—	pF	
$t_d(on)$	Turn-On Delay Time	—	10	15	ns	$V_{DD} = 0.5 BV_{DSS}$ , $I_D = 2.7A$ , $Z_\theta = 18\Omega$ (MOSFET switching times are essentially independent of operating temperature)
$t_r$	Rise Time	—	14	20	ns	
$t_d(off)$	Turn-Off Delay Time	—	30	45	ns	
$t_f$	Fall Time	—	13	20	ns	
$Q_g$	Total Gate Charge (Gate-Source Pulse Gate-Drain)	—	12	15	nC	$V_{GS} = 10V$ , $I_D = 2.7A$ , $V_{DS} = 0.8 \text{ Max. Rating}$ (Gate charge is essentially independent of operating temperature)
$Q_{gs}$	Gate-Source Charge	—	2.8	—	nC	
$Q_{gd}$	Gate-Drain ("Miller") Charge	—	9.7	—	nC	

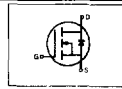
**THERMAL RESISTANCE**

$R_{thJC}$	Junction-to-Case	MAX	3.0	K/W	
$R_{thCS}$	Case-to-Sink	TYP	1.7	K/W	Mounting surface flat, smooth, and greased
$R_{thJA}$	Junction-to-Ambient	MAX	110	K/W	Free Air Operation

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

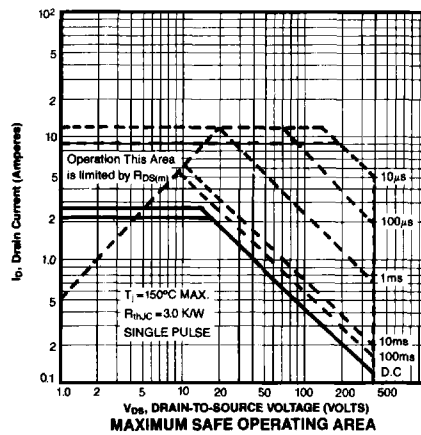
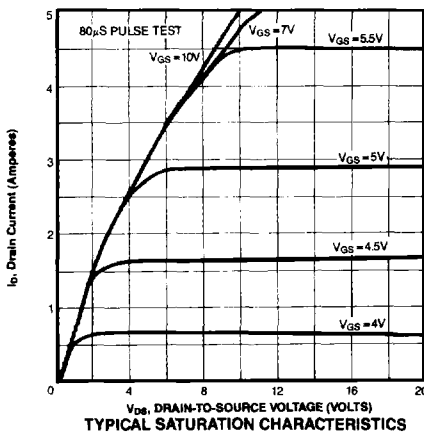
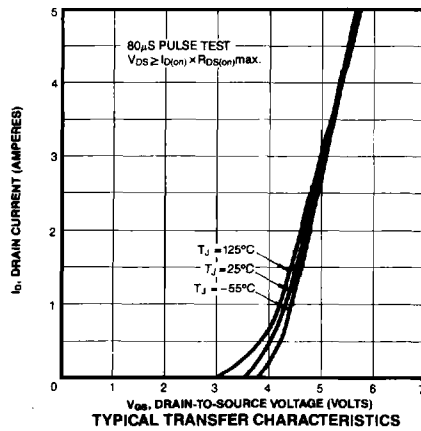
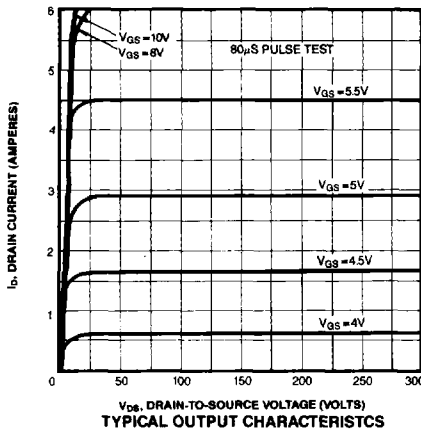
**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

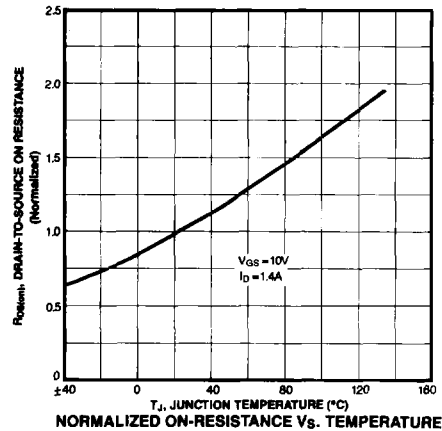
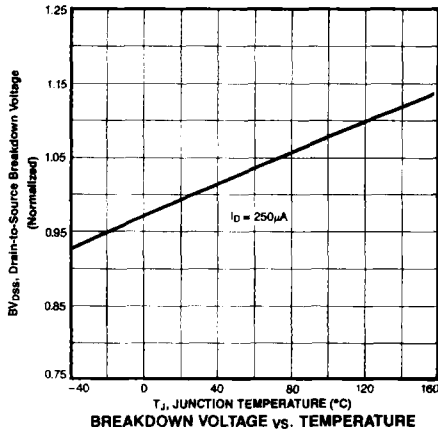
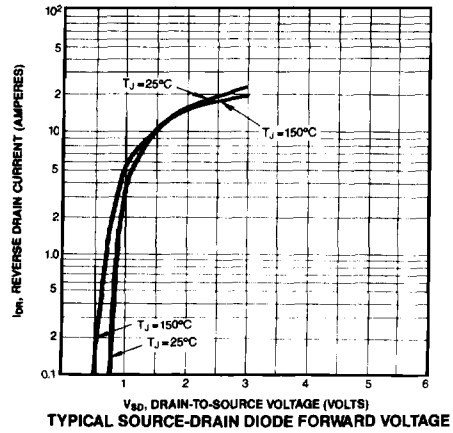
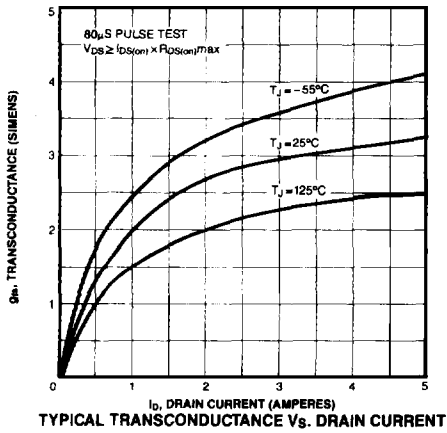
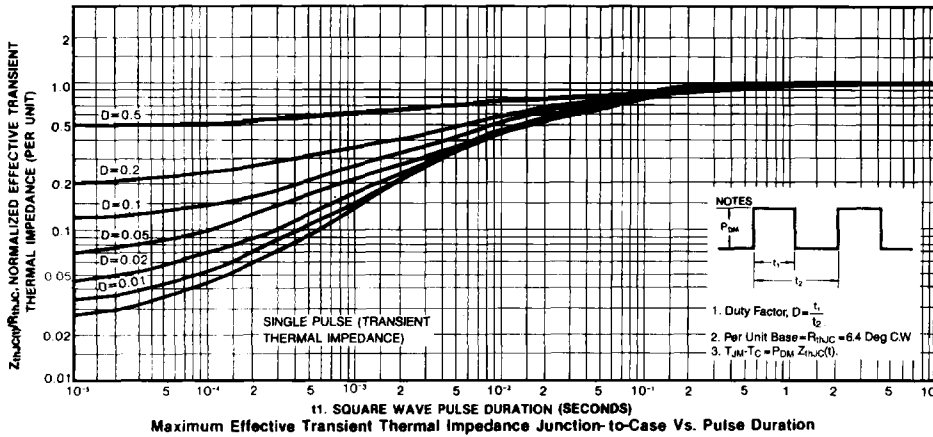
Symbol	Characteristic	Min	Typ	Max	Units	Test Condition
$I_S$	Continuous Source Current (Body Diode)	—	—	2.7	A	Modified MOSFET integral reverse
$I_{SM}$	Pulse-Source Current (3)	—	—	11	A	P-N junction rectifier
$V_{DS}$	Diode Forward Voltage (2)	—	—	1.8	V	$T_C = 25^\circ\text{C}$ , $I_S = 2.7\text{A}$ , $V_{GS} = 0\text{V}$
$t_{rr}$	Reverse Recovery time	—	270	—	ns	$T_J = 25^\circ\text{C}$ , $I_F = 2.7\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$

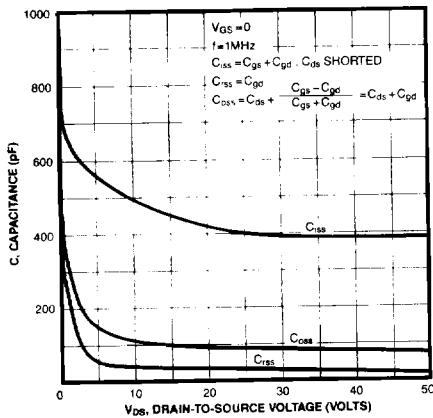


- Notes:** (1)  $T_J = 25^\circ\text{C}$  to  $150^\circ\text{C}$   
 (2) Pulse test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$   
 (3) Repetitive rating: Pulse with limited by max. junction temperature

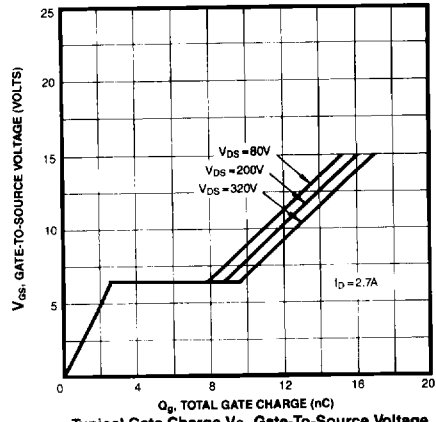
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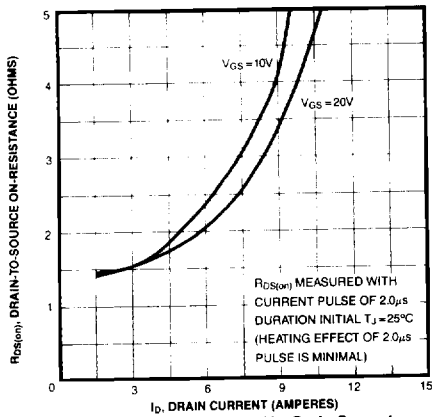




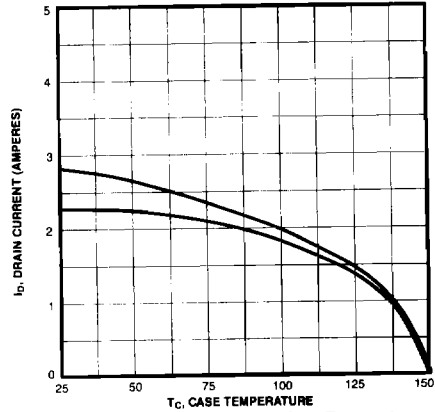
Typical Capacitance Vs. Drain to Source Voltage



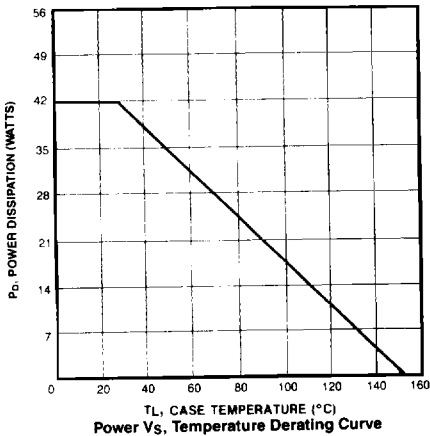
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve