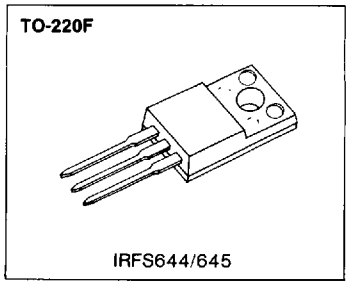
IRFS644/645

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



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFS644	250V	0.28Ωm	8.5A
IRFS645	250V	0.34Ωn	7.4A

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRFS644	IRFS645	Unit
Drain-Source Voltage (1)	V_{DSS}	250	250	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	250	250	Vdc
Gate-Source Voltage	V_{GS}	±20		Vdc
Continuous Drain Current T_C=25°C	I_D	8.5	7.4	Adc
Continuous Drain Current T_C=100°C	I_D	5	4.5	Adc
Drain Current—Pulsed (3)	I_{DM}	56	52	Adc
Gate Current—Pulsed	I_{GM}	±1.5		Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	177		mJ
Avalanche Current	I_{AS}	8.5		A
Total Power Dissipation at T_C=25°C Derate above 25°C	P_D	40 0.32		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=4mH, V_{dd}=50V, R_G=25Ω, Starting T_J=25°C

IRFS644/645

N-CHANNEL POWER MOSFETS

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

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRFS644 IRFS645	 250 250	 — —	 — —	 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 μA	V_{DS}=Max. Rating, V_{GS}=0V V_{DS}=Max. Rating, T_C=125°C
$I_{D(on)}$	On-State Drain-Source Current (2) IRFS644 IRFS645	 14 13	 — —	 — —	 A	V_{DS}≥4.7V V_{GS}=10V
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRFS644 IRFS645	 — —	 0.23 0.28	 0.28 0.34	 Ω	V_{GS}=10V, I_D=8A
g_{ts}	Forward Transconductance (2)	6.7	10.2	—	℧	V_{DS}≥50V, I_D=8A
C_{iss}	Input Capacitance	—	1472	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	190	—	pF	V_{DS}=25V
C_{rss}	Reverse Transfer Capacitance	—	69	—	pF	f=1.0MHz
$t_{d(on)}$	Turn-On Delay Time	—	16	20	ns	V_{DD}=0.5 BV_{DSS}, I_D=14A Z_O=9.1Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	67	100	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	53	80	ns	
t_f	Fall Time	—	49	74	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	39	59	nC	V_{GS}=10V, I_D=14A, V_{DS}=0.8, Max. Rating (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	6.6	9.9	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	20	30	nC	

THERMAL RESISTANCE

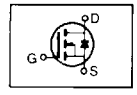
R_{thJC}	Junction-to-Case	MAX	3.12	K/W	
R_{thCS}	Case-to-Sink	TYP	0.5	K/W	Mounting surface flat, Smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	80	K/W	Free Air Operation

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

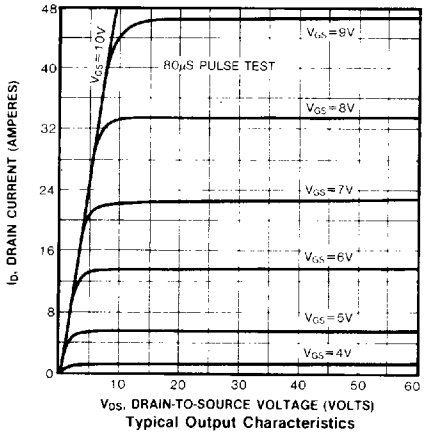
IRFS644/645

N-CHANNEL POWER MOSFETS

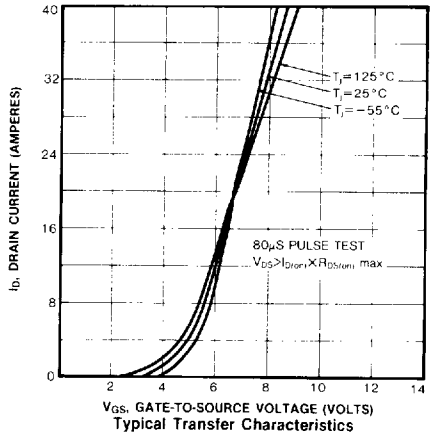
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic		Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	IRFS644	—	—	14	A	Modified MOSFET integral reverse P-N junction rectifier 
		IRFS645	—	—	13		
I_{SM}	Pulse Source Current (3)	IRFS644	—	—	56	A	
		IRFS645	—	—	52		
V_{SD}	Diode Forward Voltage (2)						
	IRFS644		—	—	1.8	V	T_C=25°C, I_S=14A, V_{GS}=0V
	IRFS645		—	—	1.8		T_C=25°C, I_S=14A, V_{GS}=0V
t_{rr}	Reverse Recovery Time		—	300	—	ns	T_J=25°C, I_F=14A, dI_F/dt=100A/μS

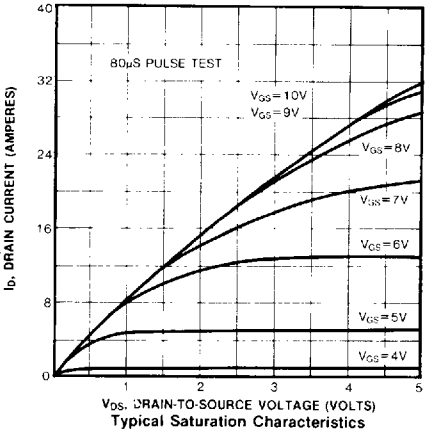
Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature



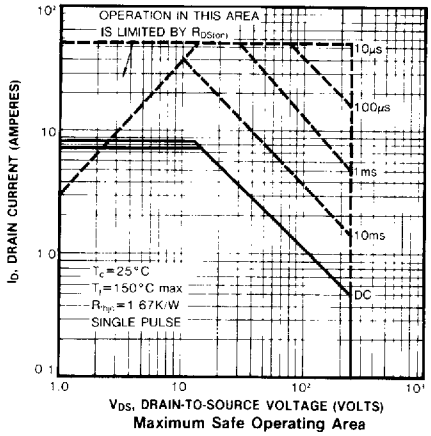
Typical Output Characteristics



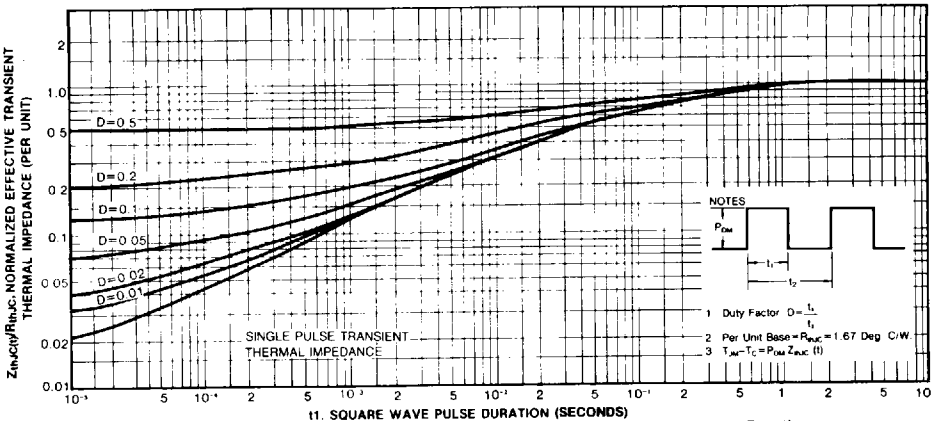
Typical Transfer Characteristics



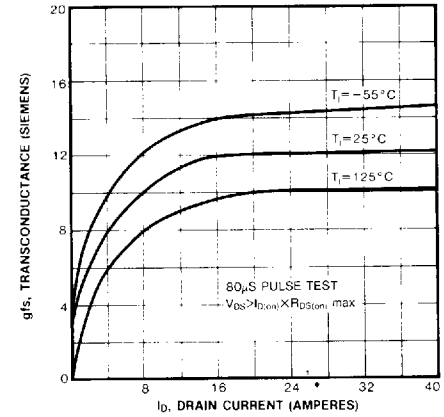
Typical Saturation Characteristics



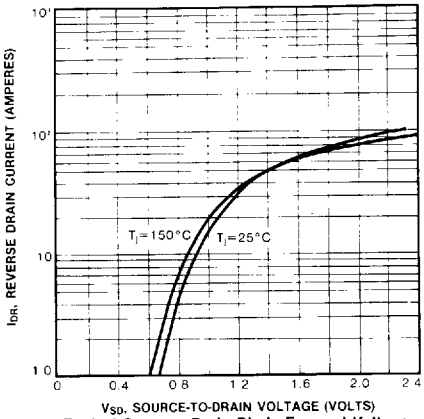
Maximum Safe Operating Area



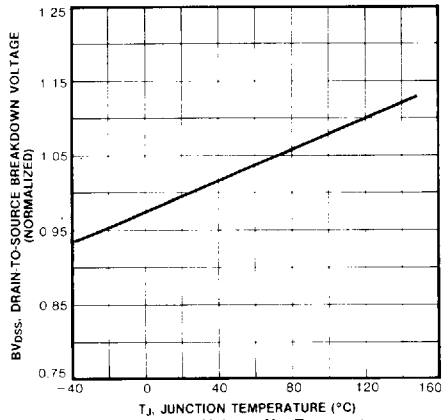
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



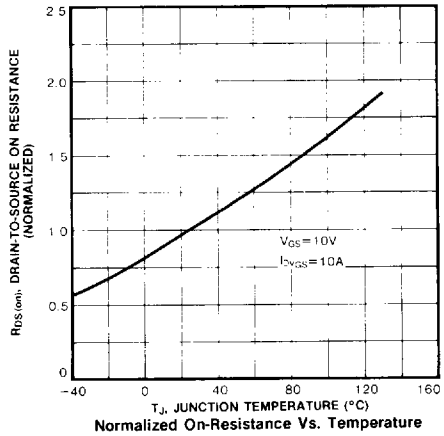
Typical Transcounductance Vs. Drain Current



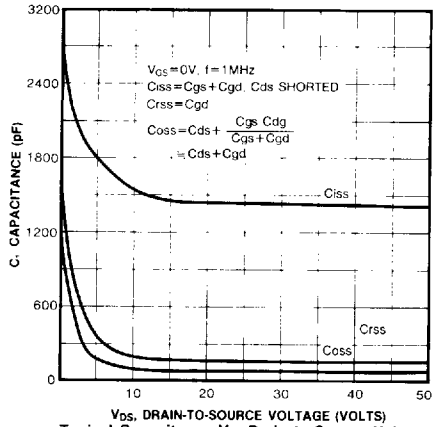
Typical Source—Drain Diode Forward Voltage



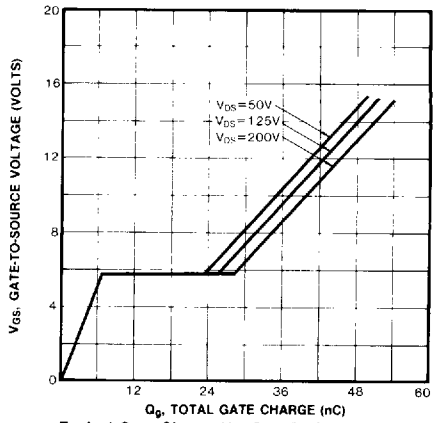
Breakdown Voltage Vs. Temperature



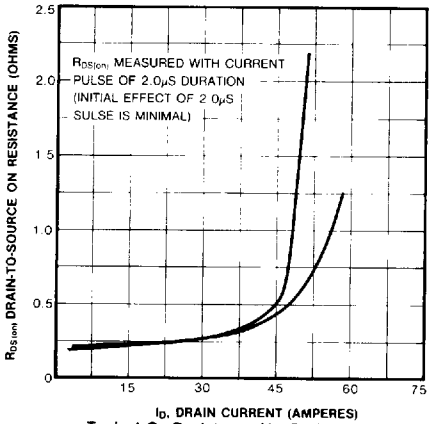
Normalized On-Resistance Vs. Temperature



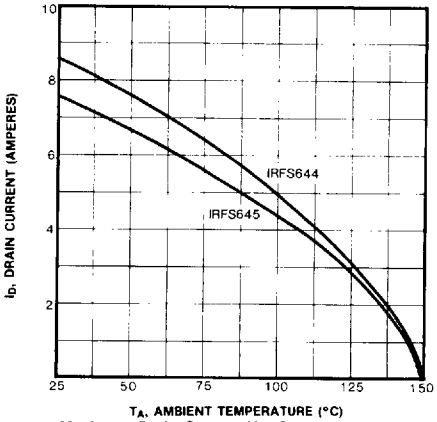
Typical Capacitance Vs. Drain to Source Voltage



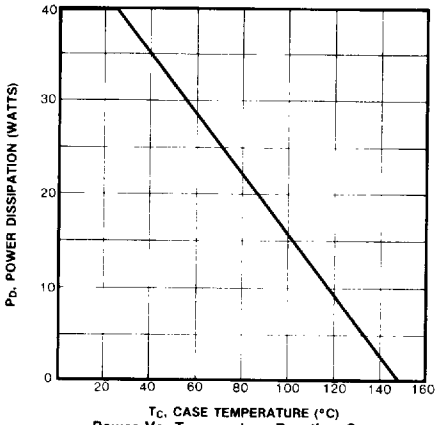
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve