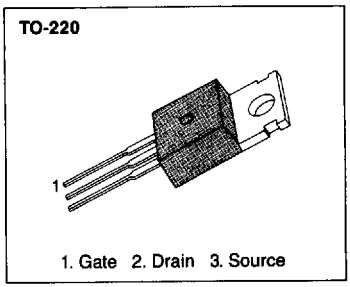
IRF9540/9541

P-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
IRF9540	-100V	0.2Ω	-17A
IRF9541	-60V	0.2Ω	-17A

4

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRF9540	IRF9541	Unit
Drain-Source Voltage (1)	V_{DSS}	-100	-60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	-100	-60	Vdc
Gate-Source Voltage	V_{GS}	±20		Vdc
Continuous Drain Current T_C=25 °C	I_D	-17		Adc
Continuous Drain Current T_C=100 °C	I_D	-12		Adc
Drain Current - Pulsed (3)	I_{DM}	-68		Adc
Gate Current - Pulsed	I_{GM}	±1.5		Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	530		mJ
Avalanche Current	I_{AS}	-17		A
Total Power Dissipation @ T_C=25 °C Derate above 25 °C	P_D	125 1.0		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
(4) L=3.5mH, V_{dd}=-25V, R_G=25Ω, Starting T_J=25°C

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

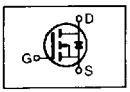
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage					
	IRF9540	-100	-	-	V	V_{GS}=0V, I_D=-250μA
	IRF9541	-60	-	-	V	
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	-	-4.0	V	V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	Gate-Source Leakage Forward	-	-	-100	nA	V_{GS}=-20V
I_{GSS}	Gate-Source Leakage Reverse	-	-	100	nA	V_{GS}=20V
I_{DSS}	Zero Gate Voltage Drain Current	-	-	-250	μA	V_{DS}=-Max. Rating, V_{GS}=0V
		-	-	-1000	μA	V_{DS}=-0.8 Max. Rating, V_{GS}=0V, T_C=125°C
$R_{DS(on)}$	Static Drain-Source On Resistance(2)	-	-	0.2	Ω	V_{GS}=-10V, I_D=-8.5A
g_{fs}	Forward Transconductance (2)	5.0	-	-	℧	V_{DS}≤-50V, I_D=-8.5A
C_{iss}	Input Capacitance	-	1560	-	pF	V_{GS}=0V, V_{DS}=-25V, f=1.0MHz
C_{oss}	Output Capacitance	-	240	-	pF	
C_{rss}	Reverse Transfer Capacitance	-	120	-	pF	
$t_{d(on)}$	Turn-On Delay Time	-	20	30	ns	V_{DD}=-0.5BV_{DSS}, I_D=-17A, Z_O=9.1Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	-	10	15	ns	
$t_{d(off)}$	Turn-Off Delay Time	-	13	20	ns	
t_f	Fall Time	-	8.0	12	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	-	-	90	nC	V_{GS}=-10V, I_D=-17A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature)
Q_{gs}	Gate-Source Charge	-	21.5	-	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	-	31.5	-	nC	

THERMAL RESISTANCE

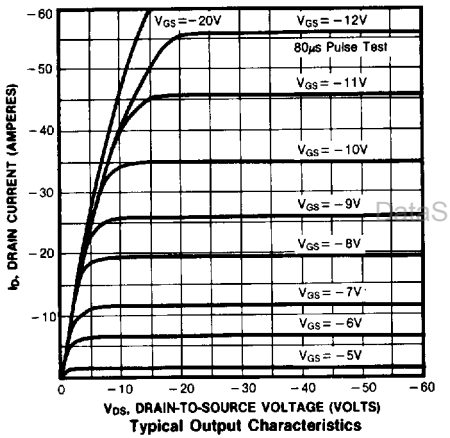
Symbol	Characteristics		All	Units	Remark
R_{thJC}	Junction-to-Case	MAX	1.0	K/W	
R_{thCS}	Case-to-Sink	TYP	0.5	K/W	Mounting surface flat smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	62.5	K/W	Free Air Operation

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

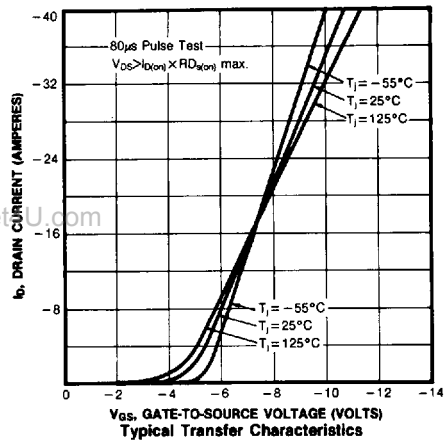
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	-17	A	Modified MOSFET Symbol showing the integral reverse P-N junction rectifier 
I_{SM}	Pulse Source Current (Body Diode) (3)	-	-	-68	A	
V_{SD}	Diode Forward Voltage (2)	-	-	-4.2	V	T_J=25°C, I_S=-17A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	-	170	-	ns	T_J=25°C, I_F=-17A, dI_F/dt=100A/μS

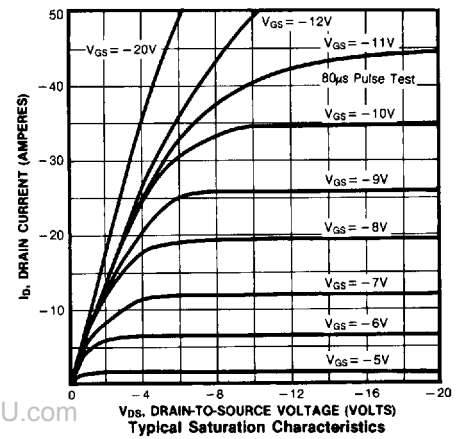
Notes : (1) T_J=25°C to 150°C
(2) Pulse test : Pulse width ≤ 300μs, Duty Cycle ≤ 2%
(3) Repetitive rating : Pulse width limited by max. junction temperature



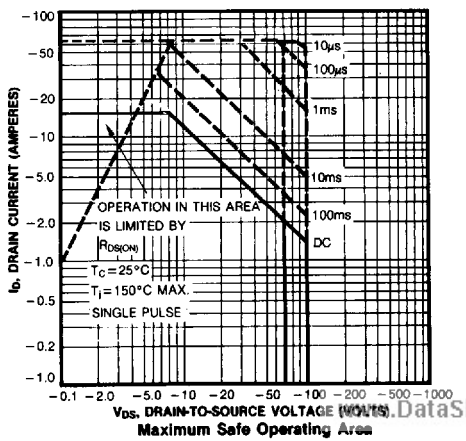
Typical Output Characteristics



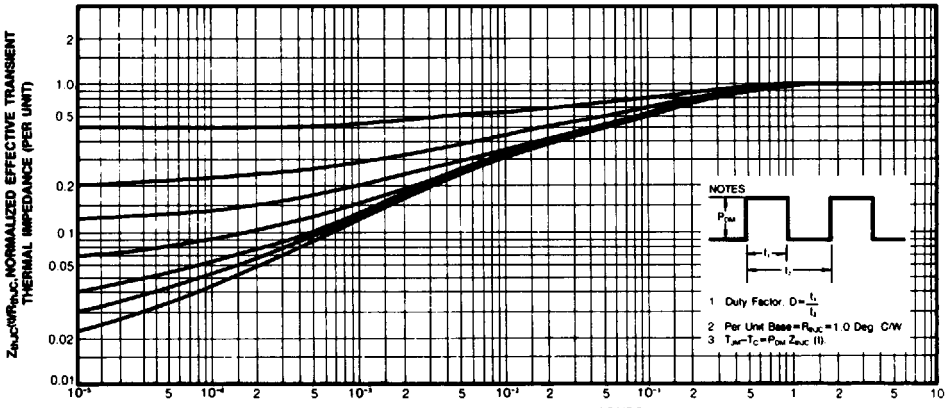
Typical Transfer Characteristics



Typical Saturation Characteristics

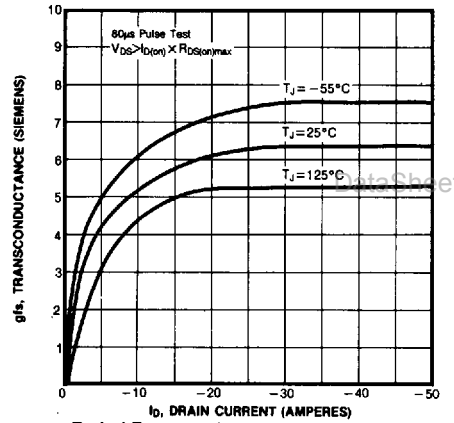


Maximum Safe Operating Area



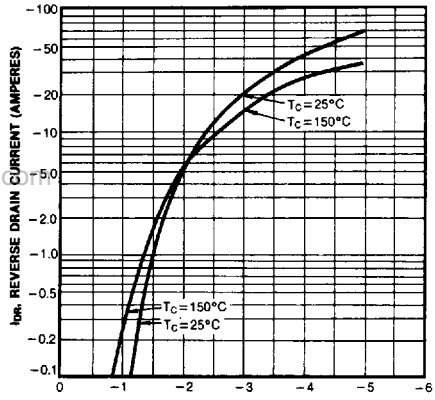
t1, SQUARE WAVE PULSE DURATION (SECONDS)

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



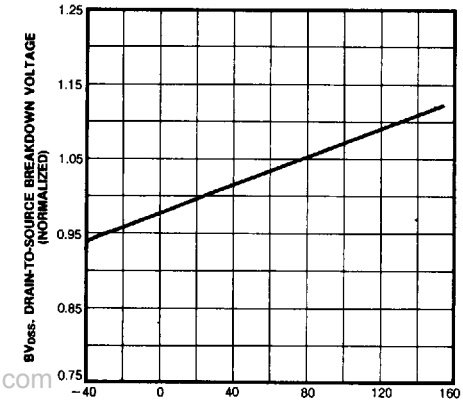
I_D, DRAIN CURRENT (AMPERES)

Typical Transcounductance Vs. Drain Current



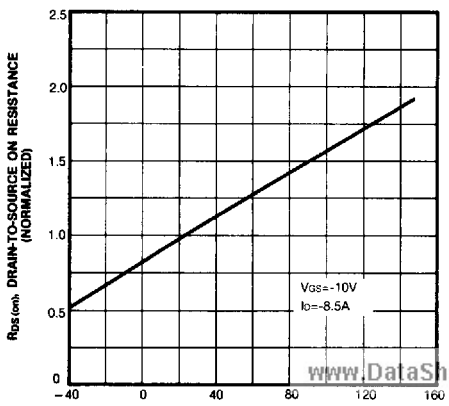
V_{SD}, SOURCE-TO-DRAIN VOLTAGE (VOLTS)

Typical Source—Drain Diode Forward Voltage



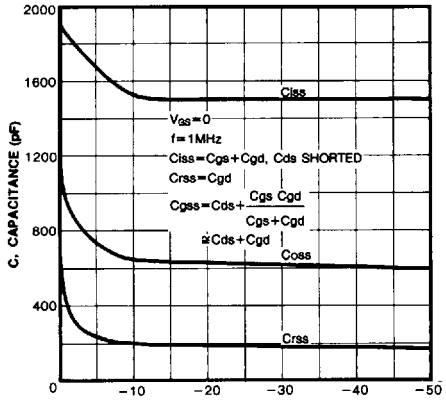
T_J, JUNCTION TEMPERATURE (°C)

Breakdown Voltage Vs. Temperature

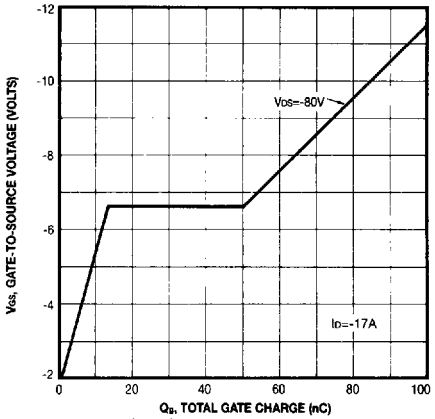


T_J, JUNCTION TEMPERATURE (°C)

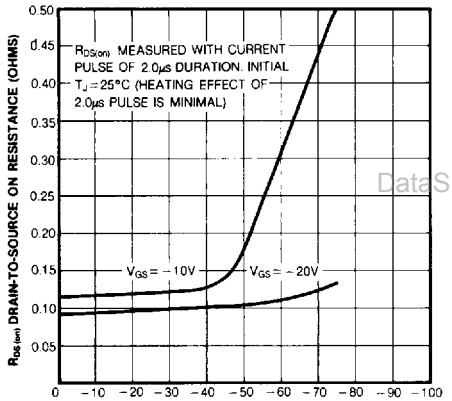
Normalized On-Resistance Vs. Temperature



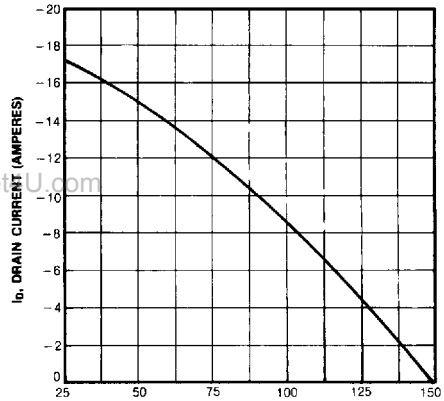
Typical Capacitance Vs. Drain to Source Voltage



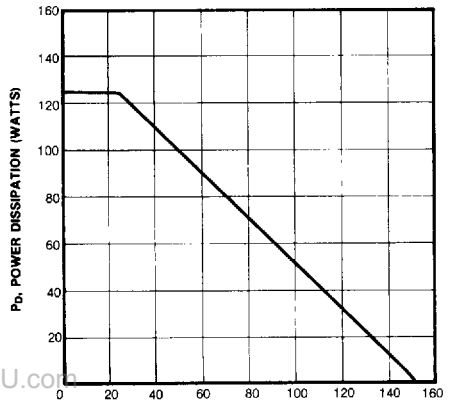
Typical Gate Charge Vs. Gate-to-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve