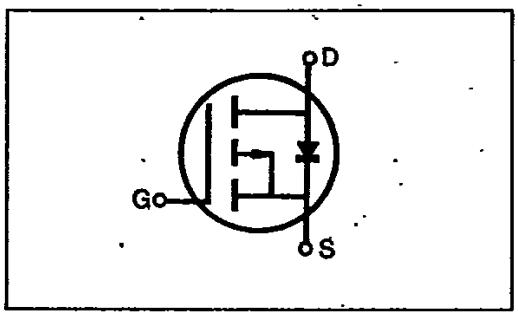
IRF9140/9141/9142/9143
IRFP9140/9141/9142/9143
IRF9540/9541/9542/9543

T-39-2

P-CHANNEL POWER MOSFETS

Preliminary Specifications

−100 Volt, 0.2 Ohm SFET



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF/IRFP9140, IRF9540	−100V	0.2Ω	−19A
IRF/IRFP9141, IRF9541	−60V	0.2Ω	−19A
IRF/IRFP9142, IRF9542	−100V	0.3Ω	−15A
IRF/IRFP9143, IRF9543	−60V	0.3Ω	−15A

FEATURES

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

PACKAGE STYLE

Package Type	Part Number
TO-3	IRF9140/9141/9142/9143
TO-3P	IRFP9140/9141/9142/9143
TO-220	IRF9540/9541/9542/9543

MAXIMUM RATINGS

Characteristic	Symbol	IRF/IRFP 9140 9540	IRF/IRFP 9141 9541	IRF/IRFP 9142 9542	IRF/IRFP 9143 9543	Unit
Drain-Source Voltage (1)	V_{DSS}	−100	−60	−100	−60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	−100	−60	−100	−60	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	−19	−19	−15	−15	Adc
Continuous Drain Current T_C=100°C	I_D	−12	−12	−10	−10	Adc
Drain Current—Pulsed (3)	I_{DM}	−76	−76	−60	−60	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
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, 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 width limited by max. junction temperature

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

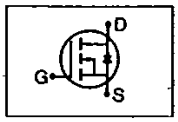
Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF9140/2 IRFP9140/2 IRF9540/2	−100	—	—	V	V_{GS}=0V
		IRF9141/3 IRFP9141/2 IRF9541/3	−60	—	—	V	I_D=−250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	−2.0	—	−4.0	V	V_{DS}=V_{GS}, I_D=−250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	−250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—	—	−1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current(2)	$I_{D(on)}$	IRF9140/1 IRFP9140/1 IRF9540/1	−19	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=−10V
		IRF9142/3 IRFP9142/3 IRF9542/3	−15	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	0.2	Ω	V_{GS}=−10V, I_D=−10A
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	0.3	Ω	
Forward Transconductance (2)	g_{fs}	ALL	5.0	—	—		V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=−10A
Input Capacitance	C_{iss}	ALL	—	—	1300	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	—	700	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	—	400	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	30	ns	V_{DD}=0.5BV_{DSS}, I_D=−10A, Z_O=4.7Ω, (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	15	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	20	ns	
Fall Time	t_f	ALL	—	—	12	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	—	90	nC	V_{GS}=−15V, I_D=−24A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	—	30	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	—	60	nC	

THERMAL RESISTANCE

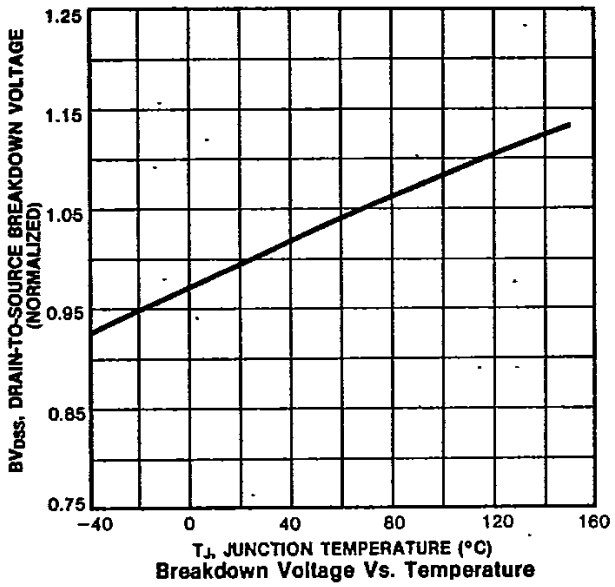
Junction-to-Case	R_{thJC}	ALL	—	—	1.0	K/W	
Case-to-Sink	R_{thCS}	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	IRFPXXXX IRF95XX	—	—	80	K/W	Free Air Operation
		IRF91XX	—	—	30	K/W	

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

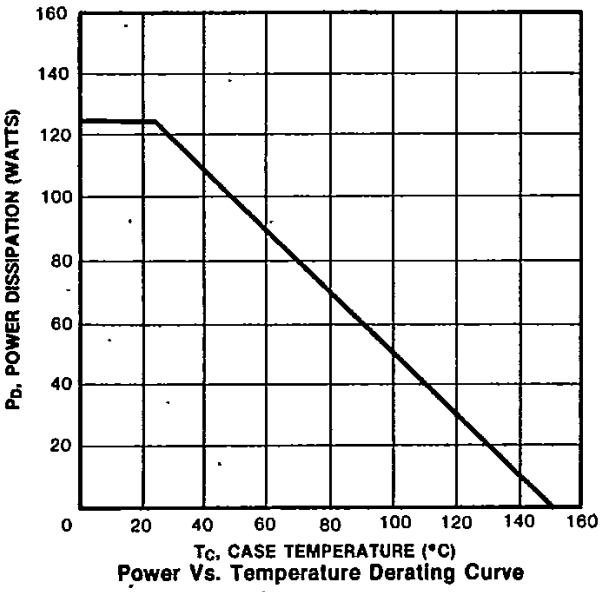
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−19	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−15	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−76	A	
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−60	A	
Diode Forward Voltage (2)	V_{SD}	IRF9140/1 IRFP9140/1 IRF9540/1	—	—	−4.2	V	T_C=25°C, I_S=−19A, V_{GS}=0V
		IRF9142/3 IRFP9142/3 IRF9542/3	—	—	−4.0	V	T_C=25°C, I_S=−15A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	—	—	ns	T_J=150°C, I_F=−19A, dI_F/dt=100A/μs

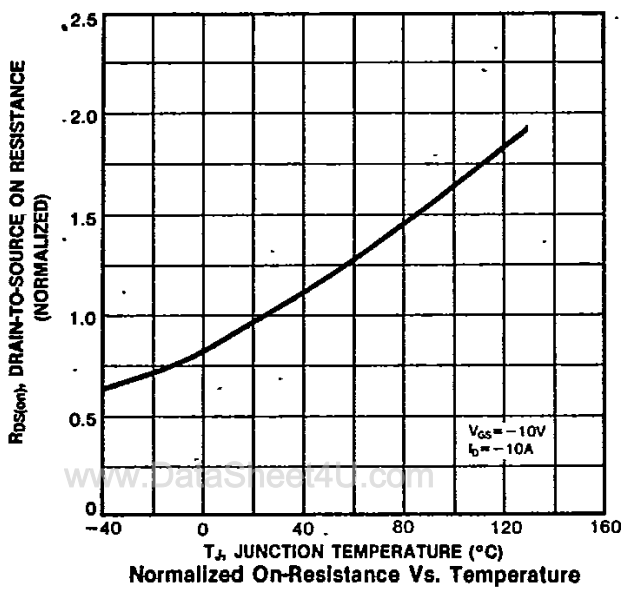
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



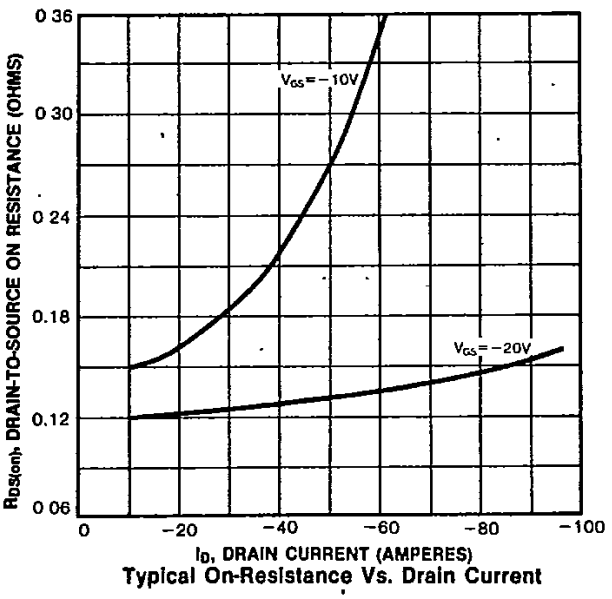
Breakdown Voltage Vs. Temperature



Power Vs. Temperature Derating Curve



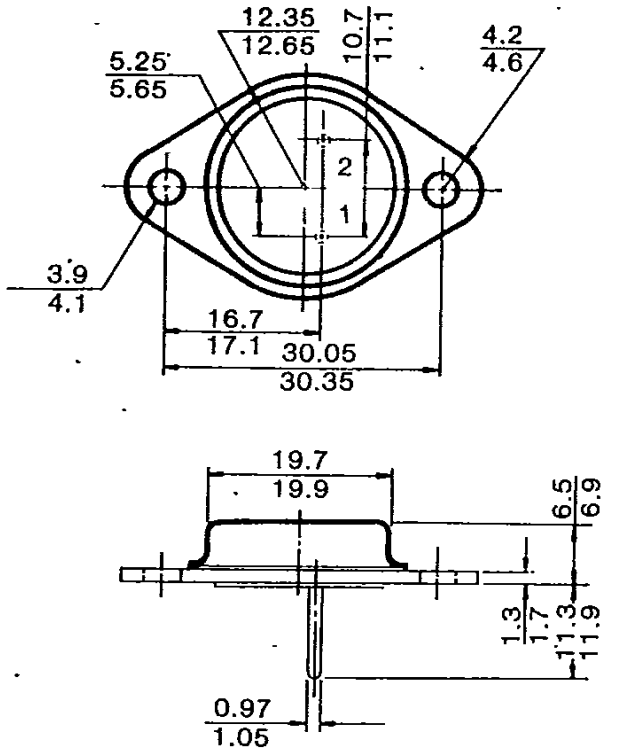
Normalized On-Resistance Vs. Temperature



Typical On-Resistance Vs. Drain Current

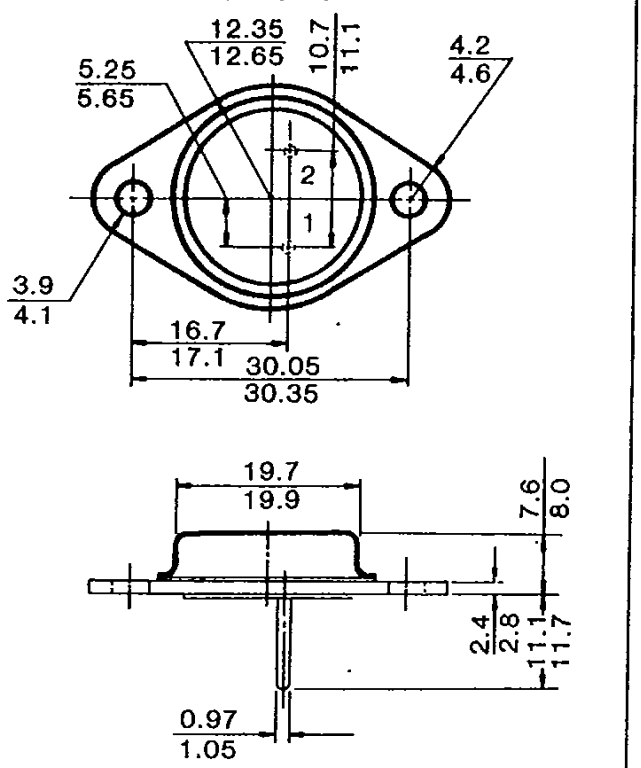
PACKAGE DIMENSIONS

TO-3 (Standard Type) Unit: mm



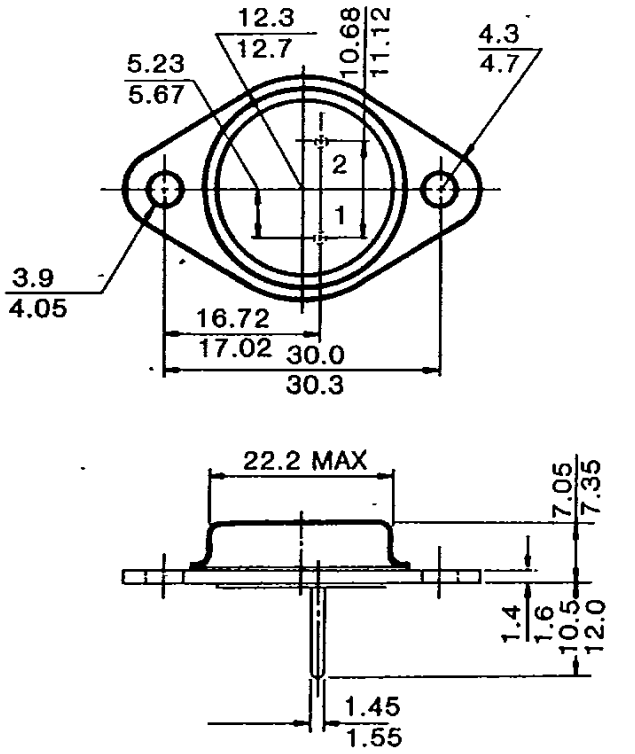
1. Gate 2. Source Case: Drain

TO-3 (High-Voltage Type) Unit: mm



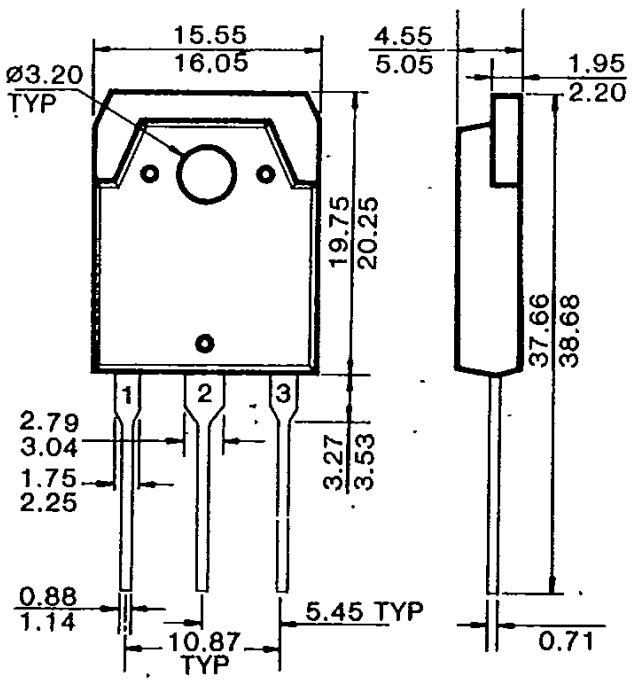
1. Gate 2. Source Case: Drain

TO-3 (High Current Type) Unit: mm



1. Gate 2. Source Case: Drain

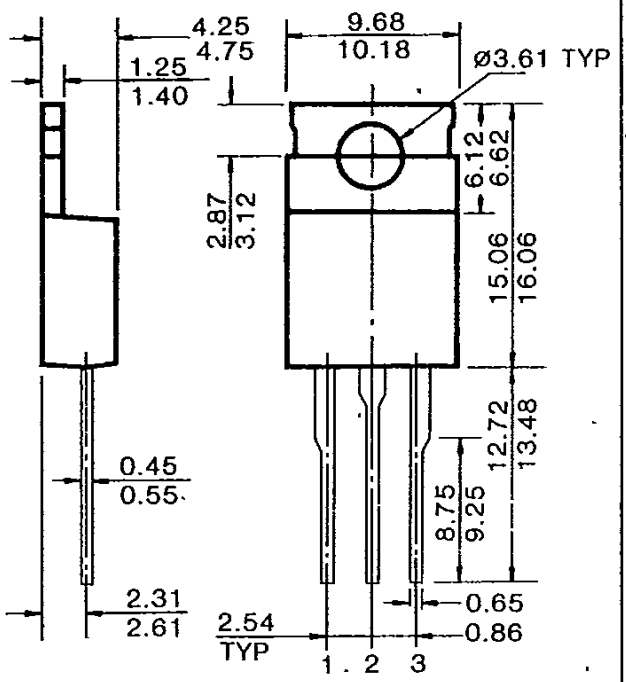
TO-3P Unit: mm



1. Gate 2. Drain 3. Source

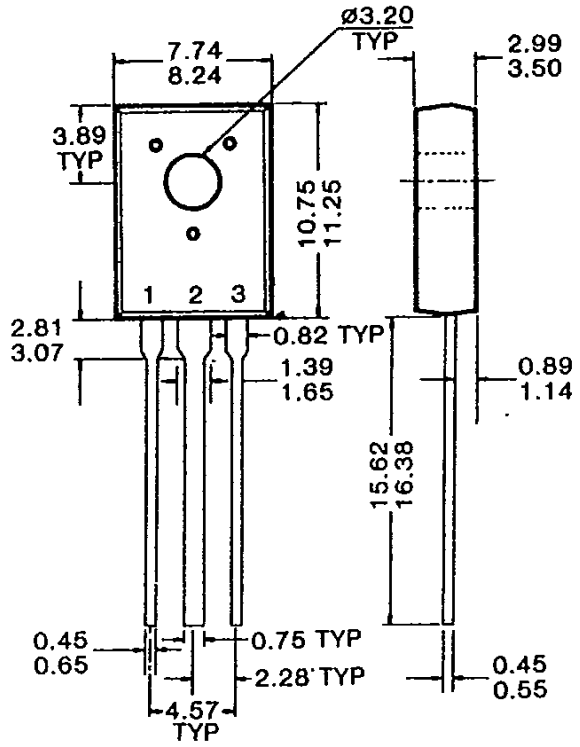
PACKAGE DIMENSIONS

TO-220 **Unit: mm**



1. Gate 2. Drain 3. Source

TO-126 **Unit: mm**



1. Gate 2. Drain 3. Source