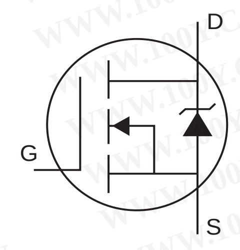
International
IOR Rectifier

PD-95660

IRL3302PbF

HEXFET® Power MOSFET

- Advanced Process Technology
- Optimized for 4.5V Gate Drive
- Ideal for CPU Core DC-DC Converters
- 150°C Operating Temperature
- Fast Switching
- Lead-Free



V_{DSS} = 20V

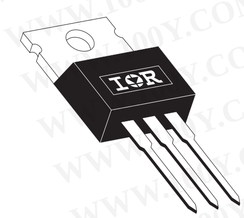
$R_{DS(on)}$ = 0.020Ω

I_D = 39A

Description

These HEXFET Power MOSFETs were designed specifically to meet the demands of CPU core DC-DC converters in the PC environment. Advanced processing techniques combined with an optimized gate oxide design results in a die sized specifically to offer maximum cost.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



TO-220AB

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 4.5V	39	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 4.5V	25	
I_{DM}	Pulsed Drain Current ①	160	
P_D @T_C = 25°C	Power Dissipation	57	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	± 10	V
V_{GSM}	Gate-to-Source Voltage (Start Up Transient, tp = 100µs)	14	V
E_{AS}	Single Pulse Avalanche Energy②	130	mJ
I_{AR}	Avalanche Current①	23	A
E_{AR}	Repetitive Avalanche Energy①	5.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 srew	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case	–––	2.2	°C/W
$R_{θCS}$	Case-to-Sink, Flat, Greased Surface	0.50	–––	
$R_{θJA}$	Junction-to-Ambient	–––	62	

7/30/04

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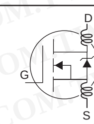
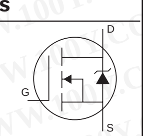
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	20	–––	–––	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.022	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	–––	0.023	Ω	V_{GS} = 4.5V, I_D = 23A ④
		–––	–––	0.020		V_{GS} = 7.0V, I_D = 23A ④
$V_{GS(th)}$	Gate Threshold Voltage	0.70	–––	–––	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	21	–––	–––	S	V_{DS} = 10V, I_D = 23A
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	25	µA	V_{DS} = 20V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 10V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	–––	–––	100	nA	V_{GS} = 10V
	Gate-to-Source Reverse Leakage	–––	–––	-100		V_{GS} = -10V
Q_g	Total Gate Charge	–––	–––	31	nC	I_D = 23A
Q_{gs}	Gate-to-Source Charge	–––	–––	5.7		V_{DS} = 16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	–––	13		V_{GS} = 4.5V, See Fig. 6 ④
$t_{d(on)}$	Turn-On Delay Time	–––	7.2	–––	ns	V_{DD} = 10V
t_r	Rise Time	–––	110	–––		I_D = 23A
$t_{d(off)}$	Turn-Off Delay Time	–––	41	–––		R_G = 9.5Ω, V_{GS} = 4.5V
t_f	Fall Time	–––	89	–––		R_D = 2.4Ω, ④
L_D	Internal Drain Inductance	–––	4.5	–––	nH	Between lead, 6mm (0.25in.) 
L_S	Internal Source Inductance	–––	7.5	–––		from package and center of die contact
C_{iss}	Input Capacitance	–––	1300	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	520	–––		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	–––	190	–––		ƒ = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	39	A	MOSFET symbol showing the 
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	160		integral reverse p-n junction diode.
V_{SD}	Diode Forward Voltage	–––	–––	1.3	V	T_J = 25°C, I_S = 23A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	62	94	ns	T_J = 25°C, I_F = 23A
Q_{rr}	Reverse Recovery Charge	–––	110	160	nC	di/dt = 100A/µs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 0.49mH R_G = 25Ω, I_{AS} = 23A.

③ $I_{SD} \le$ 23A, di/dt $\le$ 97A/µs, $V_{DD} \le V_{(BR)DSS}$, $T_J \le$ 150°C

④ Pulse width $\le$ 300µs; duty cycle $\le$ 2%.

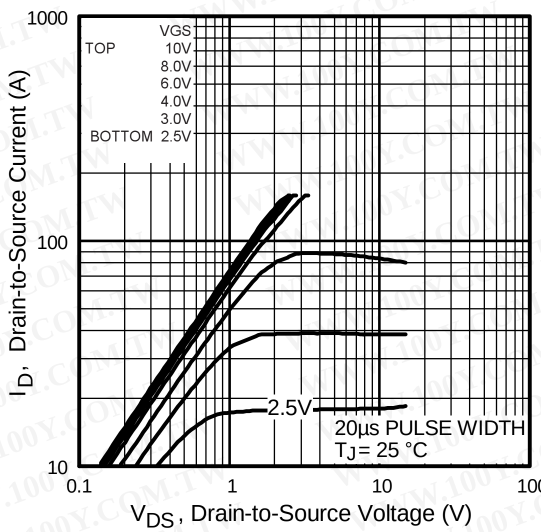


Fig 1. Typical Output Characteristics

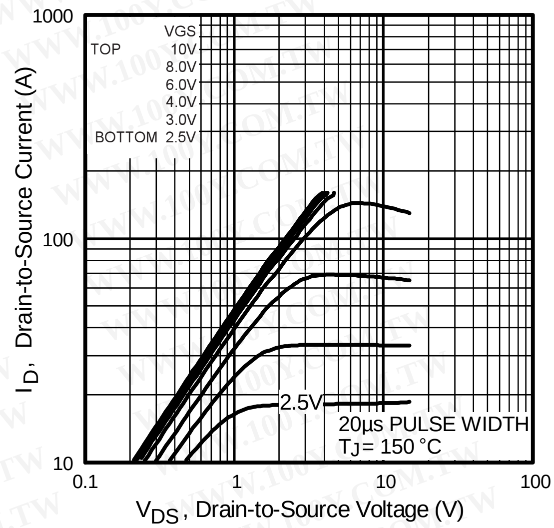


Fig 2. Typical Output Characteristics

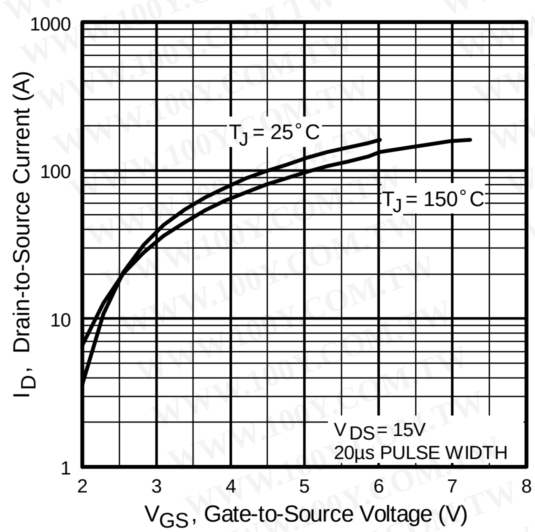


Fig 3. Typical Transfer Characteristics

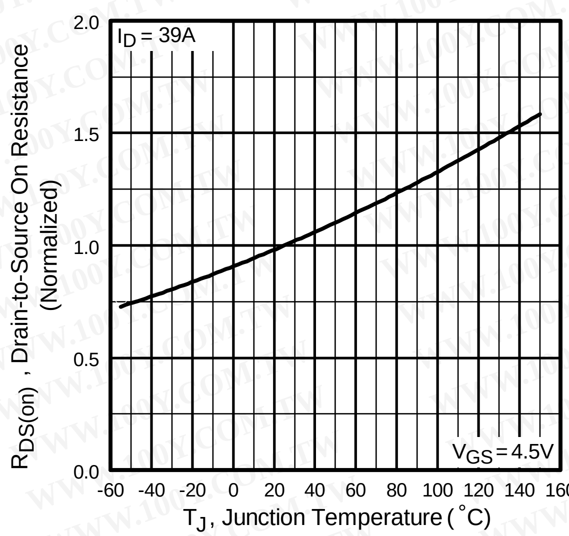


Fig 4. Normalized On-Resistance Vs. Temperature

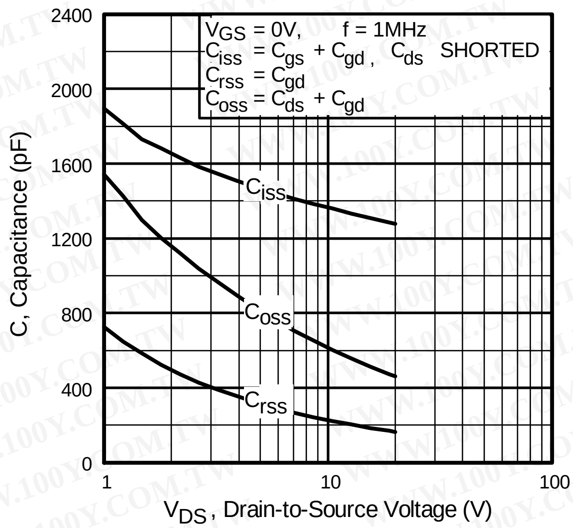


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

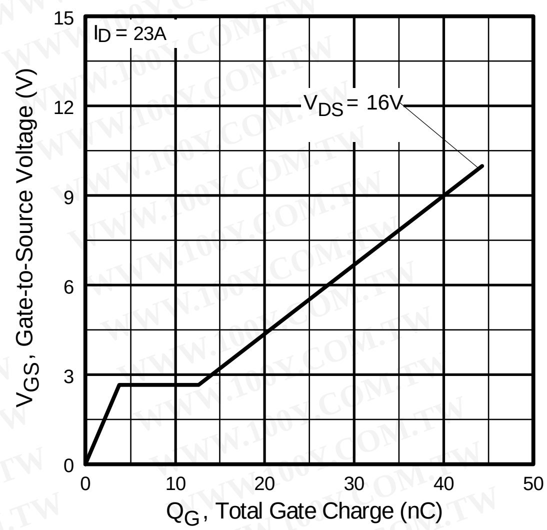


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

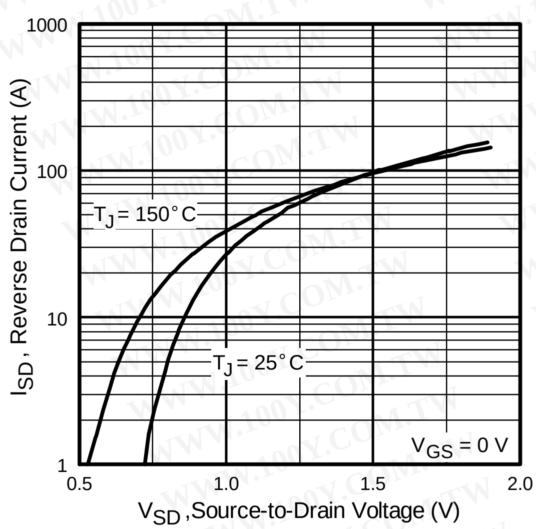


Fig 7. Typical Source-Drain Diode Forward Voltage

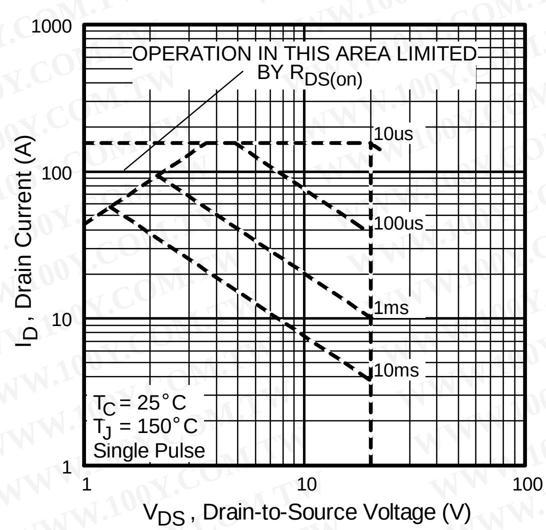


Fig 8. Maximum Safe Operating Area

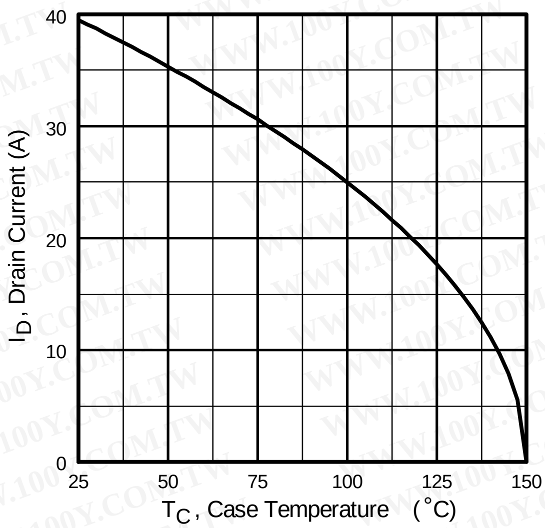


Fig 9. Maximum Drain Current Vs. Case Temperature

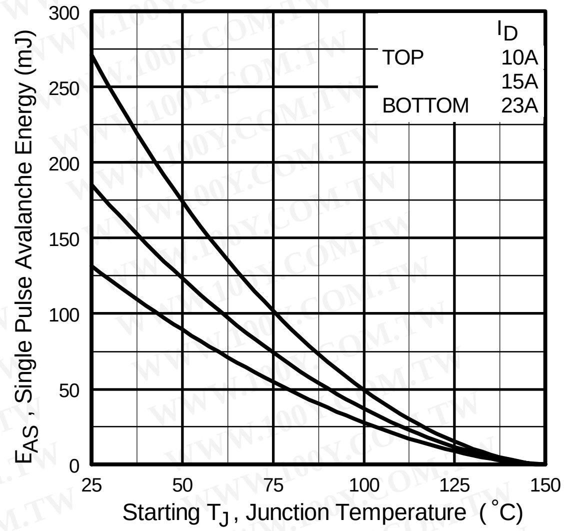


Fig 10. Maximum Avalanche Energy Vs. Drain Current

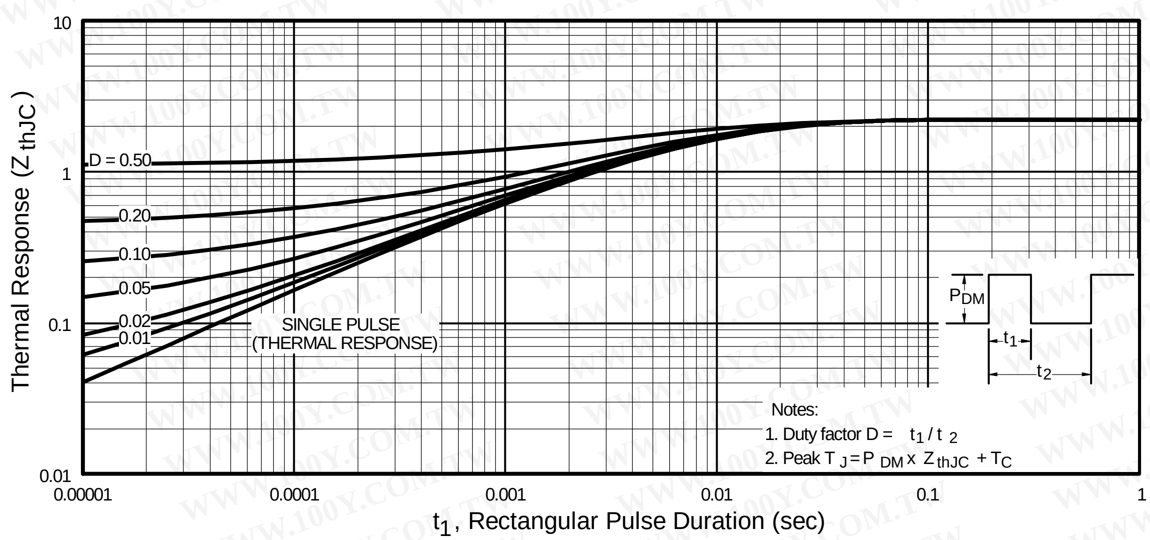


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

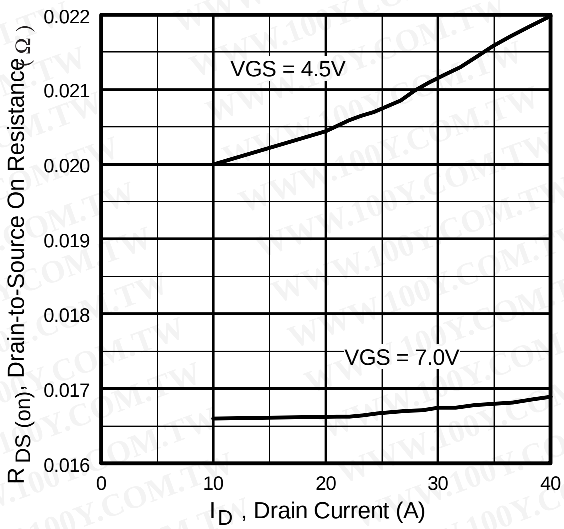


Fig 12. On-Resistance Vs. Drain Current

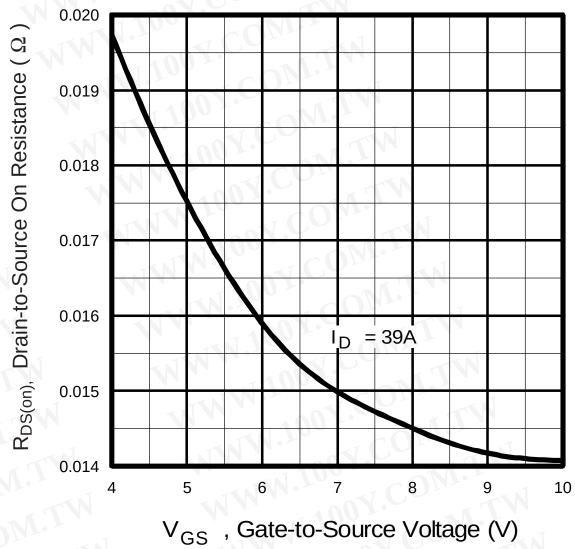
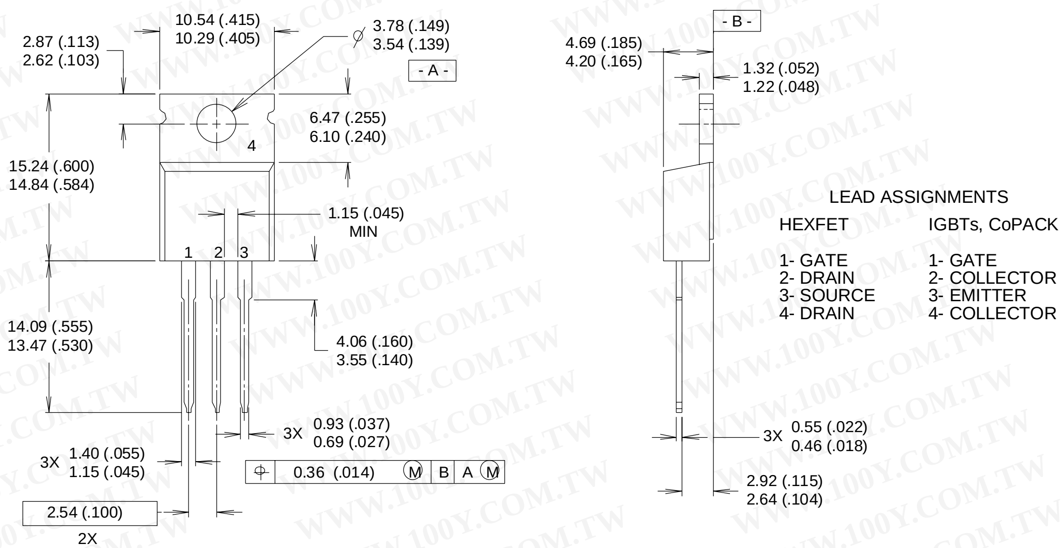


Fig 13. On-Resistance Vs. Gate Voltage

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



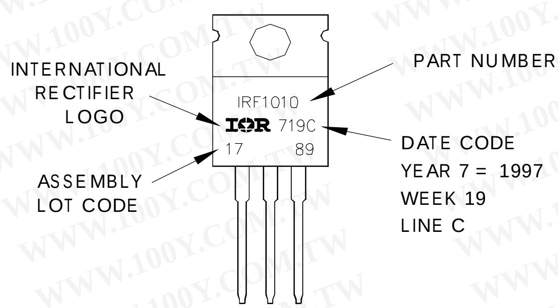
NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position indicates "Lead-Free"



Data and specifications subject to change without notice.

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