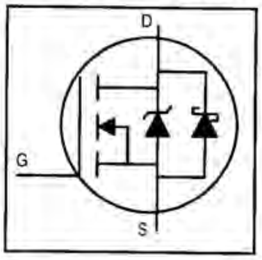
International
IOR Rectifier

PD - 94936

# IRL3103D1PbF

## FETKY™ MOSFET & SCHOTTKY RECTIFIER

- Copackaged HEXFET® Power MOSFET and Schottky Diode
- Generation 5 Technology
- Logic Level Gate Drive
- Minimize Circuit Inductance
- Ideal For Synchronous Regulator Application
- Lead-Free




$V_{DSS}$ = 30V

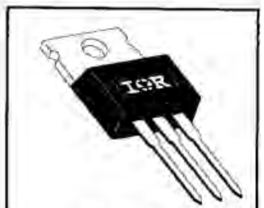
$R_{DS(on)}$ = 0.014Ω

$I_D$ = 64A

### Description

The FETKY family of copackaged HEXFET power MOSFETs and Schottky Diodes offer the designer an innovative board space saving solution for switching regulator applications. A low on resistance Gen 5 MOSFET with a low forward voltage drop Schottky diode and minimized component interconnect inductance and resistance result in maximized converter efficiencies.

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, $V_{GS}$ @ 10V③ | 64 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V③ | 45 | |
| $I_{DM}$ | Pulsed Drain Current ①③ | 220 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation | 2.0 | W |
| $P_D$ @$T_C$ = 25°C | Power Dissipation | 89 | W |
| | Linear Derating Factor | 0.56 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 16 | V |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>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) | |

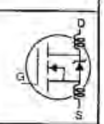
### Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{θJC}$ | Junction-to-Case | —— | 1.4 | °C/W |
| $R_{θJA}$ | Junction-to-Ambient | —— | 62 | |



1/12/04

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.037 | — | V/°C | Reference to 25°C, $I_D$ = 1mA④ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.014 | Ω | $V_{GS}$ = 10V, $I_D$ = 34A ② |
| | | — | — | 0.019 | | $V_{GS}$ = 4.5V, $I_D$ = 28A ② |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.0 | — | — | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| $g_{fs}$ | Forward Transconductance | 23 | — | — | S | $V_{DS}$ = 25V, $I_D$ = 32A③ |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 0.10 | mA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| | | — | — | 22 | | $V_{DS}$ = 24V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS}$ = 16V |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS}$ = -16V |
| $Q_g$ | Total Gate Charge | — | — | 43 | nC | $I_D$ = 32A |
| $Q_{gs}$ | Gate-to-Source Charge | — | — | 14 | | $V_{DS}$ = 24V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | — | — | 23 | | $V_{GS}$ = 4.5V, See Fig. 6 ② |
| $t_{d(on)}$ | Turn-On Delay Time | — | 9.0 | — | ns | $V_{DD}$ = 15V |
| $t_r$ | Rise Time | — | 210 | — | | $I_D$ = 32A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 20 | — | | $R_G$ = 3.4Ω, $V_{GS}$ =4.5V |
| $t_f$ | Fall Time | — | 54 | — | | $R_D$ = 0.43 Ω, ②③ |
| $L_D$ | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact  |
| $L_S$ | Internal Source Inductance | — | 7.5 | — | | |
| $C_{iss}$ | Input Capacitance | — | 1900 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 810 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 240 | — | | $f$ = 1.0MHz, See Fig. 5 |
| $C_{iss}$ | Input Capacitance | — | 3500 | — | | $V_{GS}$ = 0V, $V_{DS}$ = 0V |

## Body Diode & Schottky Diode Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_F$ (AV) | ( Schottky) | — | — | 2.0 | A | MOSFET symbol showing the integral reverse p-n junction and Schottky diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 220 | | |
| $V_{SD1}$ | Diode Forward Voltage | — | — | 1.3 | V | $T_J$ = 25°C, $I_S$ = 32A, $V_{GS}$ = 0V ② |
| $V_{SD2}$ | Diode Forward Voltage | — | — | 0.50 | V | $T_J$ = 25°C, $I_S$ = 1.0A, $V_{GS}$ = 0V ② |
| $t_{rr}$ | Reverse Recovery Time | — | 51 | 77 | ns | $T_J$ = 25°C, $I_F$ = 32A |
| $Q_{rr}$ | Reverse Recovery Charge | — | 49 | 73 | nC | di/dt = 100A/μs ② |
| $t_{on}$ | 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. ( See fig. 10 )

② Pulse width ≤ 300μs; duty cycle ≤ 2%.

③ Uses IRL3103 data and test conditions

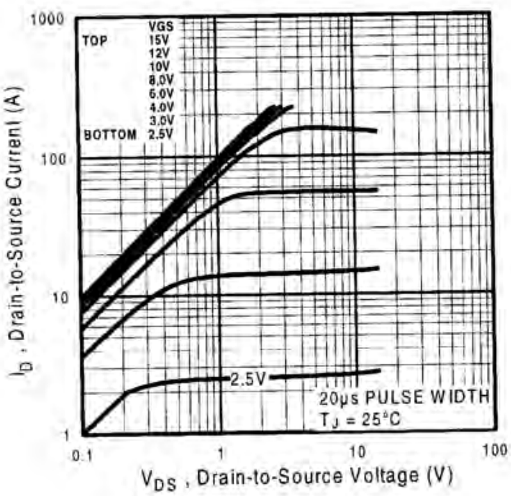



**Fig 1.** Typical Output Characteristics

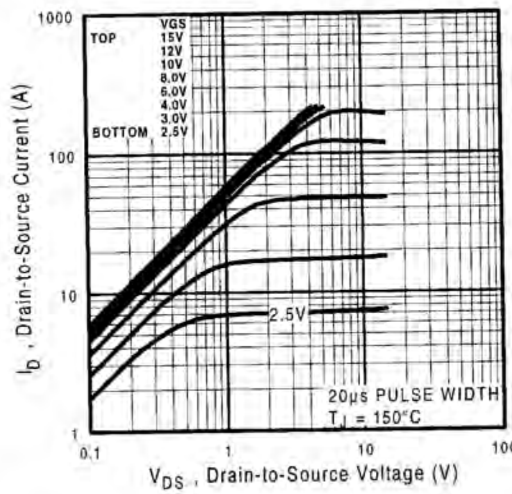



**Fig 2.** Typical Output Characteristics

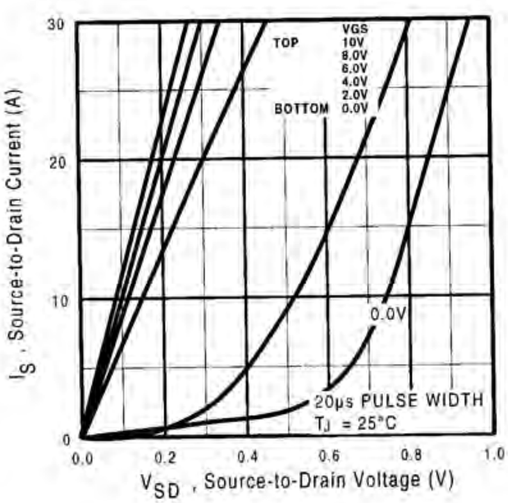



**Fig 3.** Typical Reverse Output Characteristics

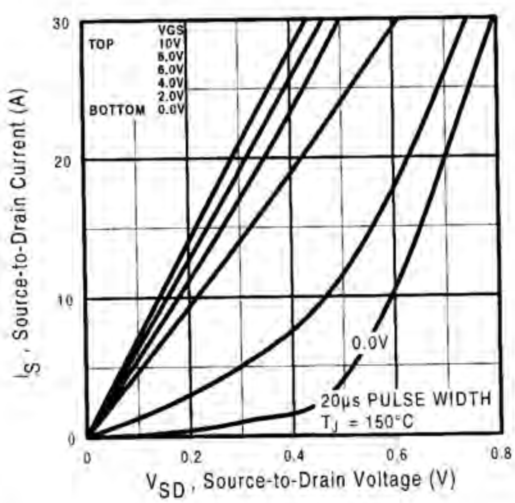



**Fig 4.** Typical Reverse Output Characteristics

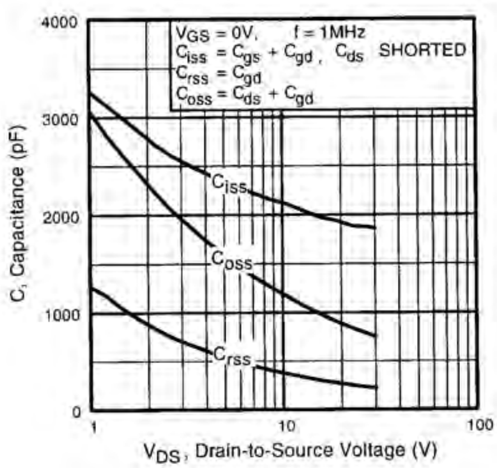



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

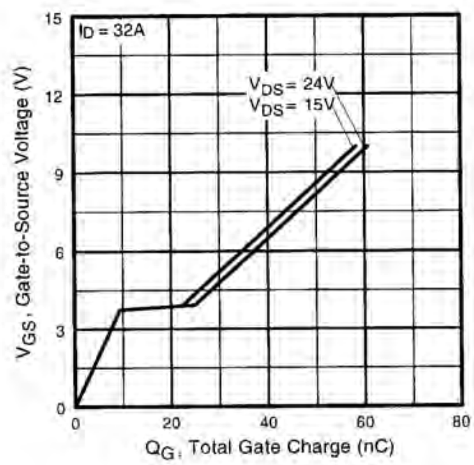



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

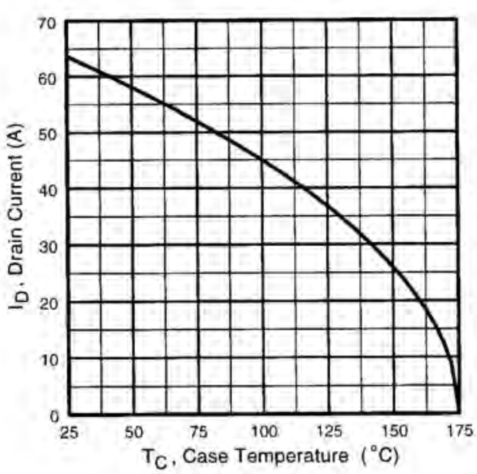



**Fig 7.** Maximum Drain Current Vs. Case Temperature

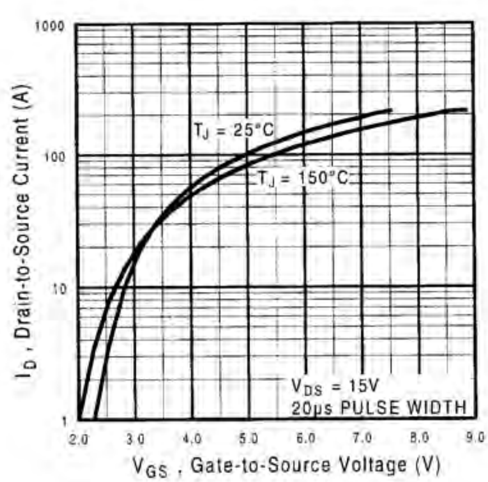



**Fig 8.** Typical Transfer Characteristics

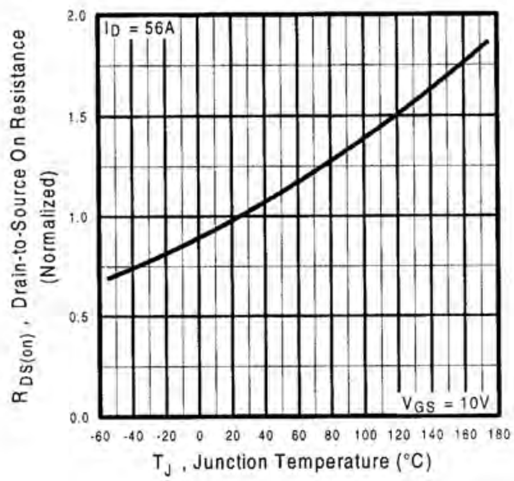



**Fig 9.** Normalized On-Resistance Vs. Temperature

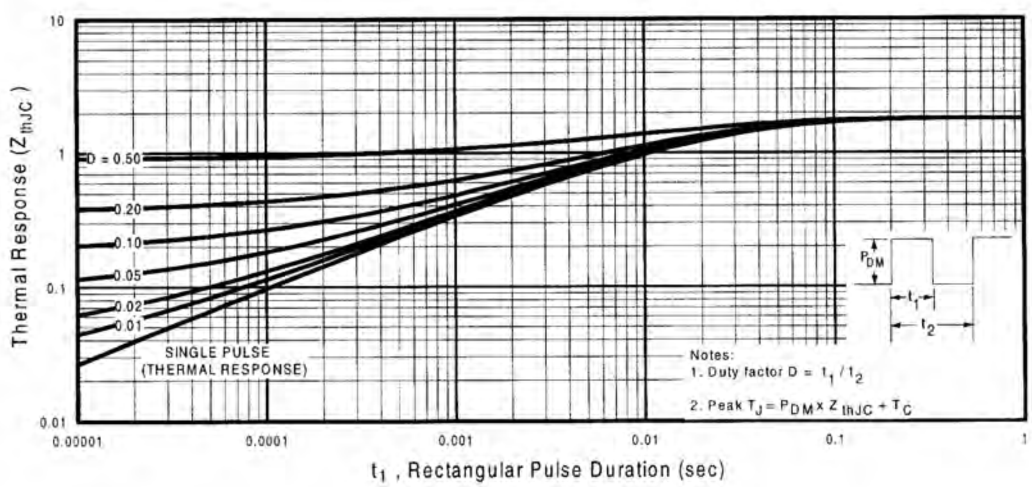
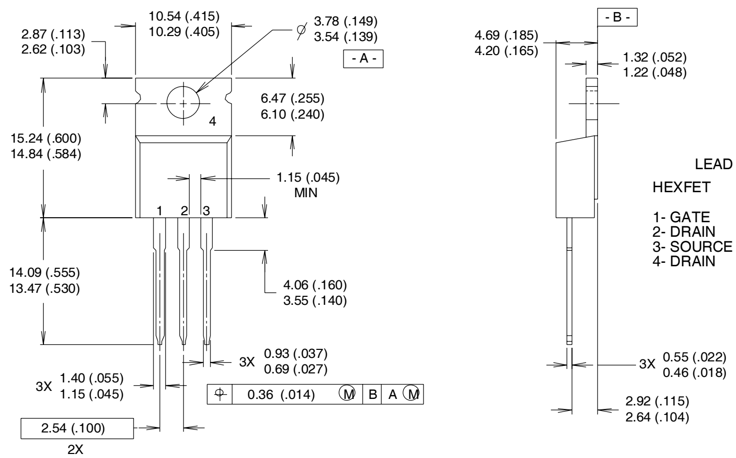



**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)




LEAD ASSIGNMENTS

| HEXFET | IGBTs, CoPACK |
|---|---|
| 1- GATE | 1- GATE |
| 2- DRAIN | 2- COLLECTOR |
| 3- SOURCE | 3- EMITTER |
| 4- DRAIN | 4- COLLECTOR |

NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.

2 CONTROLLING DIMENSION : INCH

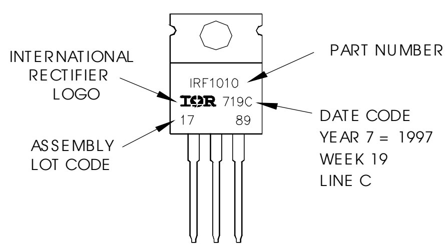
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.

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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http://www.irf.com/package/