

## HEXFET® POWER MOSFET

## IRFY9130CM

P-CHANNEL

### -100V, 0.3Ω HEXFET

International Rectifier's HEXFET technology is the key to its advanced line of power MOSFET transistors. The efficient geometry design achieves very low on-state resistance combined with high transconductance.

HEXFET power MOSFETs also feature all of the well-established advantages of MOSFETs, such as voltage control, very fast switching, ease of paralleling and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, high energy pulse circuits, and virtually any application where high reliability is required.

The HEXFET power MOSFET's totally isolated package eliminates the need for additional isolating material between the device and the heatsink. This improves thermal efficiency and reduces drain capacitance.

### Product Summary

| Part Number | BV <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------------|-------------------|---------------------|----------------|
| IRFY9130CM  | -100V             | 0.3Ω                | -11.2A         |

### Features

- Hermetically Sealed
- Electrically Isolated
- Simple Drive Requirements
- Ease of Paralleling

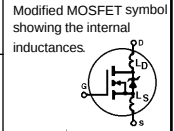
### Absolute Maximum Ratings

|                                                                 | Parameter                       | IRFY9130CM                                  | Units |
|-----------------------------------------------------------------|---------------------------------|---------------------------------------------|-------|
| I <sub>D</sub> @ V <sub>GS</sub> = -10V, T <sub>C</sub> = 25°C  | Continuous Drain Current        | -11.2                                       | A     |
| I <sub>D</sub> @ V <sub>GS</sub> = -10V, T <sub>C</sub> = 100°C | Continuous Drain Current        | -7.1                                        |       |
| I <sub>DM</sub>                                                 | Pulsed Drain Current ①          | -44                                         |       |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C                          | Max. Power Dissipation          | 75                                          | W     |
|                                                                 | Linear Derating Factor          | 0.6                                         | W/K ② |
| V <sub>GS</sub>                                                 | Gate-to-Source Voltage          | ±20                                         | V     |
| E <sub>AS</sub>                                                 | Single Pulse Avalanche Energy ② | 400                                         | mJ    |
| I <sub>AR</sub>                                                 | Avalanche Current ①             | -11.2                                       | A     |
| E <sub>AR</sub>                                                 | Repetitive Avalanche Energy ①   | 7.5                                         | mJ    |
| dv/dt                                                           | Peak Diode Recovery dv/dt ③     | -5.5                                        | V/ns  |
| T <sub>J</sub>                                                  | Operating Junction              | -55 to 150                                  | °C    |
| T <sub>stg</sub>                                                | Storage Temperature Range       |                                             |       |
|                                                                 | Lead Temperature                | 300 (0.063 in (1.6mm) from case for 10 sec) |       |
|                                                                 | Weight                          | 4.3(typical)                                | g     |

## IRFY9130CM Device

### Electrical Characteristics @ T<sub>J</sub> = 25°C (Unless Otherwise Specified)

|                                     | Parameter                                    | Min  | Typ  | Max  | Units | Test Conditions                                                                     |
|-------------------------------------|----------------------------------------------|------|------|------|-------|-------------------------------------------------------------------------------------|
| BV <sub>DSS</sub>                   | Drain-to-Source Breakdown Voltage            | -100 | —    | —    | V     | V <sub>GS</sub> = 0V, I <sub>D</sub> = -1.0mA                                       |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Temperature Coefficient of Breakdown Voltage | —    | -0.1 | —    | V/°C  | Reference to 25°C, I <sub>D</sub> = -1.0mA                                          |
| R <sub>DS(on)</sub>                 | Static Drain-to-Source On-State Resistance   | —    | —    | 0.30 | Ω     | V <sub>GS</sub> = -10V, I <sub>D</sub> = -7.1A ④                                    |
|                                     |                                              | —    | —    | 0.35 |       | V <sub>GS</sub> = -10V, I <sub>D</sub> = -11.2A ④                                   |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                       | -2.0 | —    | -4.0 | V     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                         |
| g <sub>fs</sub>                     | Forward Transconductance                     | 2.5  | —    | —    | S (r) | V <sub>DS</sub> ≥ -15V, I <sub>DS</sub> = -7.1A ④                                   |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current              | —    | —    | -25  | μA    | V <sub>DS</sub> = 0.8 x max. rating, V <sub>GS</sub> = 0V                           |
|                                     |                                              | —    | —    | -250 |       | V <sub>DS</sub> = 0.8 x max. rating<br>V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C |
| I <sub>GSS</sub>                    | Gate-to-Source Leakage Forward               | —    | —    | -100 | nA    | V <sub>GS</sub> = -20V                                                              |
| I <sub>GSS</sub>                    | Gate-to-Source Leakage Reverse               | —    | —    | 100  |       | V <sub>GS</sub> = 20V                                                               |
| Q <sub>g</sub>                      | Total Gate Charge                            | 14.7 | —    | 30   | nC    | V <sub>GS</sub> = -10V, I <sub>D</sub> = -11.2A                                     |
| Q <sub>gs</sub>                     | Gate-to-Source Charge                        | 1.0  | —    | 7.1  |       | V <sub>DS</sub> = Max. Rating x 0.5                                                 |
| Q <sub>gd</sub>                     | Gate-to-Drain ('Miller') Charge              | 2.0  | —    | 2.1  |       | see figures 6 and 13                                                                |
| t <sub>d(on)</sub>                  | Turn-On Delay Time                           | —    | —    | 60   | ns    | V <sub>DD</sub> = -50V, I <sub>D</sub> = -11.2A                                     |
| t <sub>r</sub>                      | Rise Time                                    | —    | —    | 140  |       | R <sub>G</sub> = 7.5Ω, V <sub>GS</sub> = -10V                                       |
| t <sub>d(off)</sub>                 | Turn-Off Delay Time                          | —    | —    | 140  |       | see figure 10                                                                       |
| t <sub>f</sub>                      | Fall Time                                    | —    | —    | 140  |       |                                                                                     |
| L <sub>D</sub>                      | Internal Drain Inductance                    | —    | 8.7  | —    | nH    | Measured from the drain lead, 6mm (0.25 in.) from package to center of die.         |
| L <sub>S</sub>                      | Internal Source Inductance                   | —    | 8.7  | —    |       | Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.   |
| C <sub>iss</sub>                    | Input Capacitance                            | —    | 800  | —    | pF    | V <sub>GS</sub> = 0V, V <sub>DS</sub> = -25V<br>f = 1.0MHz.<br>see figure 5         |
| C <sub>oss</sub>                    | Output Capacitance                           | —    | 350  | —    |       |                                                                                     |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                 | —    | 125  | —    |       |                                                                                     |



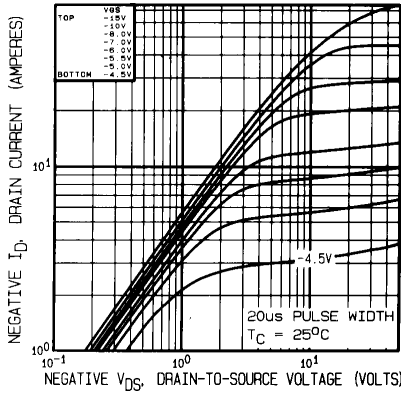
### Source-Drain Diode Ratings and Characteristics

|                 | Parameter                              | Min                                                                                                                  | Typ | Max   | Units | Test Conditions                                                             |
|-----------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----|-------|-------|-----------------------------------------------------------------------------|
| I <sub>S</sub>  | Continuous Source Current (Body Diode) | —                                                                                                                    | —   | -11.2 | A     | Modified MOSFET symbol showing the integral reverse p-n junction rectifier. |
| ISM             | Pulse Source Current (Body Diode) ①    | —                                                                                                                    | —   | -44   |       |                                                                             |
| V <sub>SD</sub> | Diode Forward Voltage                  | —                                                                                                                    | —   | -4.7  | V     | T <sub>J</sub> = 25°C, I <sub>S</sub> = -11.2A, V <sub>GS</sub> = 0V ④      |
| t <sub>rr</sub> | Reverse Recovery Time                  | —                                                                                                                    | —   | 250   | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = -11.2A, di/dt ≤ -100 A/μs           |
| Q <sub>RR</sub> | Reverse Recovery Charge                | —                                                                                                                    | —   | 3.0   | μC    | V <sub>DD</sub> ≤ -50 V ④                                                   |
| t <sub>on</sub> | Forward Turn-On Time                   | Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L <sub>S</sub> + L <sub>D</sub> . |     |       |       |                                                                             |

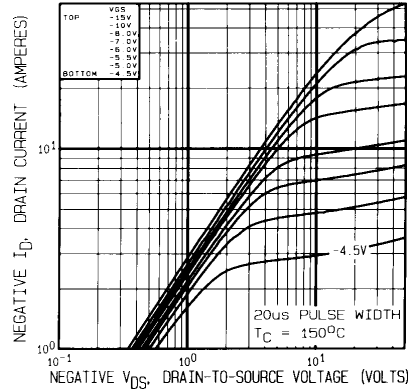


### Thermal Resistance

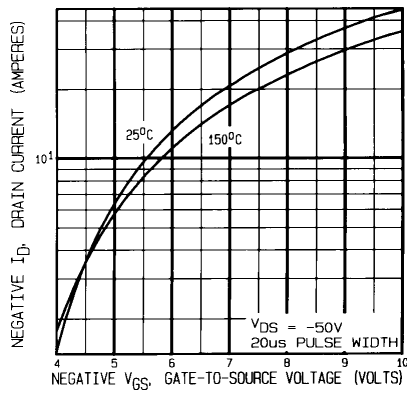
| Parameter                             | Min | Typ  | Max  | Units | Test Conditions                                       |
|---------------------------------------|-----|------|------|-------|-------------------------------------------------------|
| R <sub>thJC</sub> Junction-to-Case    | —   | —    | 1.67 | K/W⑤  | Typical socket mount<br>Mounting surface flat, smooth |
| R <sub>thJA</sub> Junction-to-Ambient | —   | —    | 80   |       |                                                       |
| R <sub>thCS</sub> Case-to-Sink        | —   | 0.21 | —    |       |                                                       |



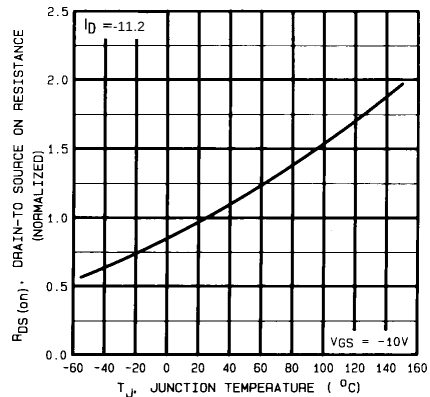
**Fig. 1 — Typical Output Characteristics**  
 $T_C = 25^\circ\text{C}$



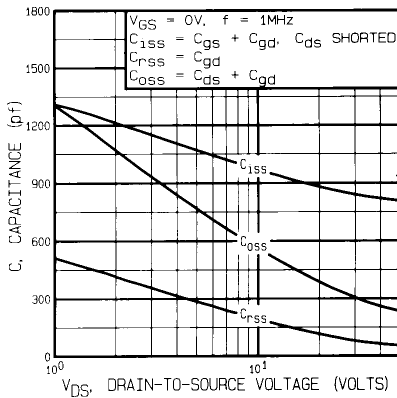
**Fig. 2 — Typical Output Characteristics**  
 $T_C = 150^\circ\text{C}$



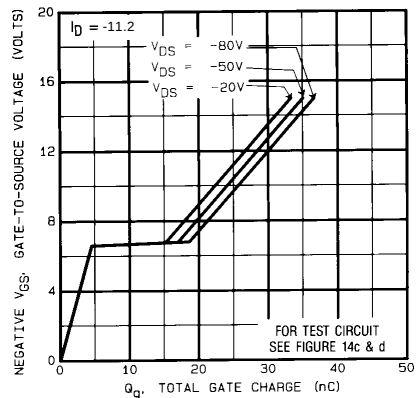
**Fig. 3 — Typical Transfer Characteristics**



**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**

IRFY9130CM Device

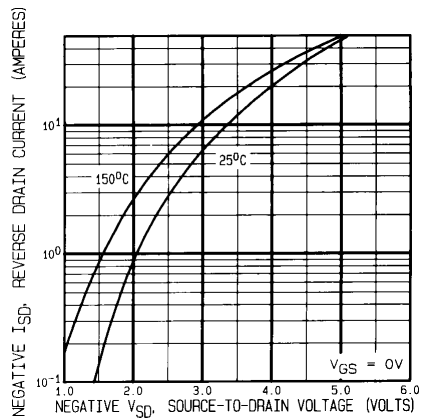


Fig. 7 — Typical Source-to-Drain Diode Forward Voltage

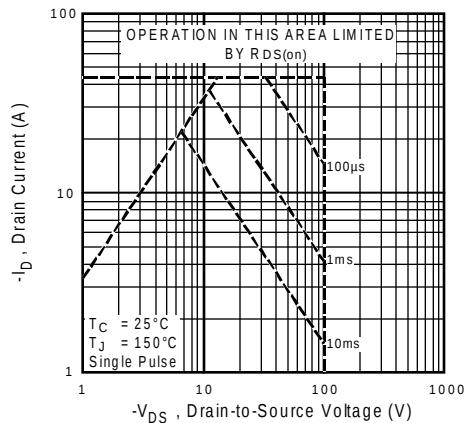


Fig. 8 — Maximum Safe Operating Area

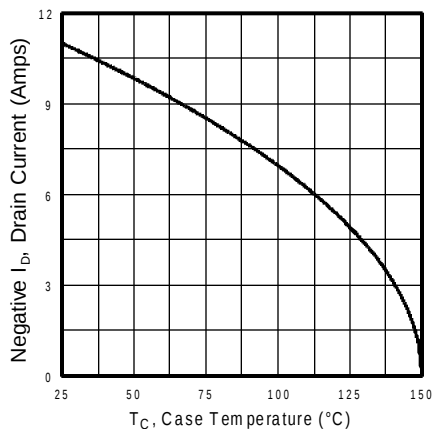


Fig. 9 — Maximum Drain Current vs. Case Temperature

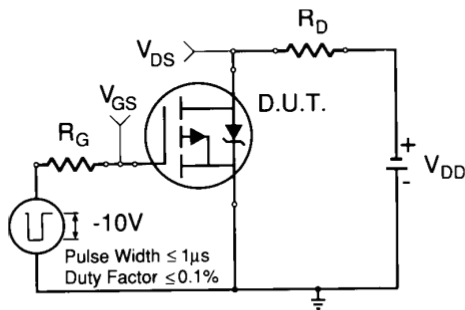


Fig. 10a — Switching Time Test Circuit

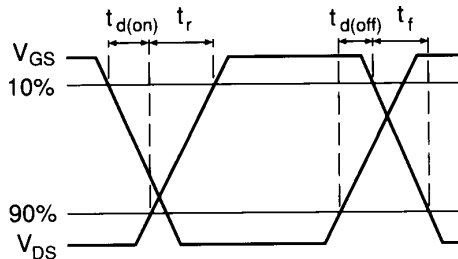


Fig. 10b — Switching Time Waveforms

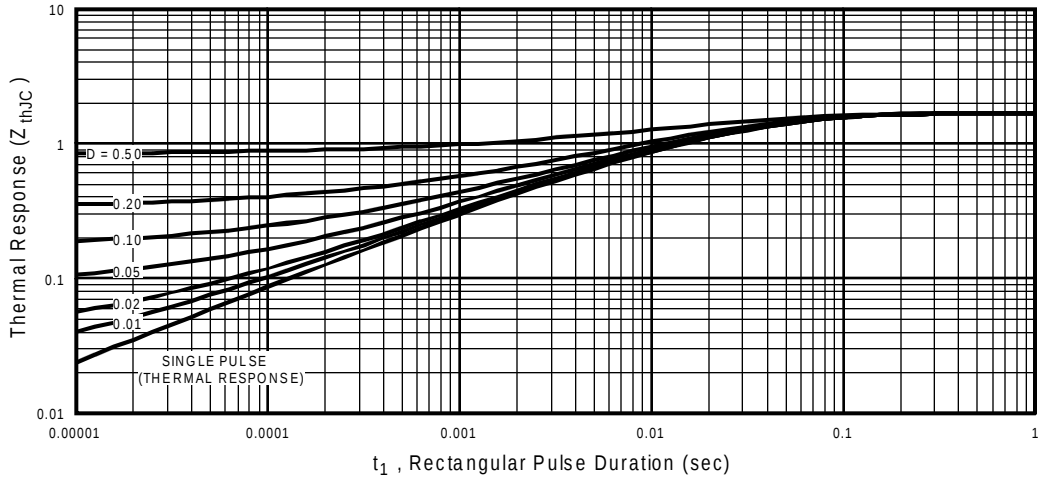


Fig. 11 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

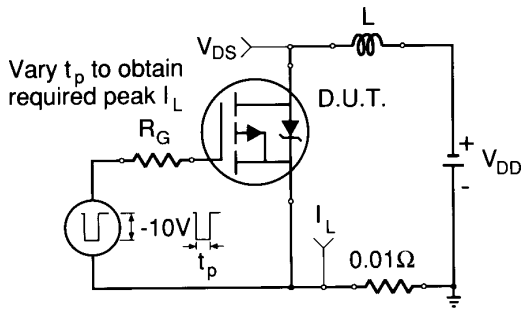


Fig. 12a — Unclamped Inductive Test Circuit

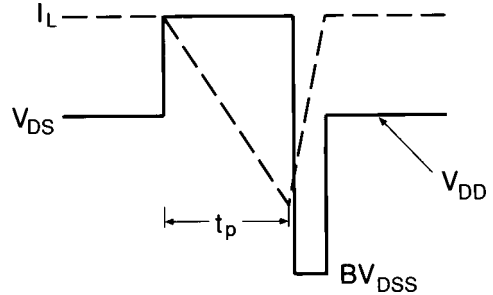


Fig. 12b — Unclamped Inductive Waveforms

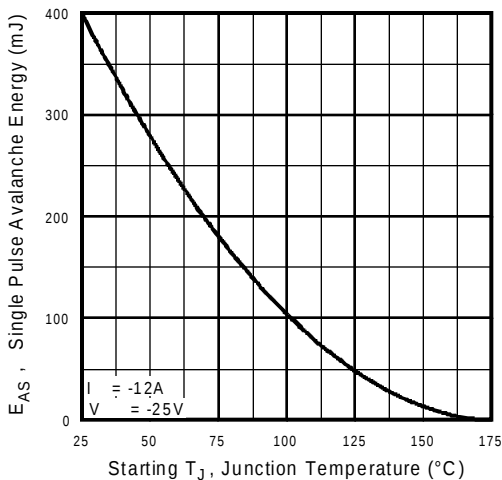


Fig. 12c — Max. Avalanche Energy vs. Current

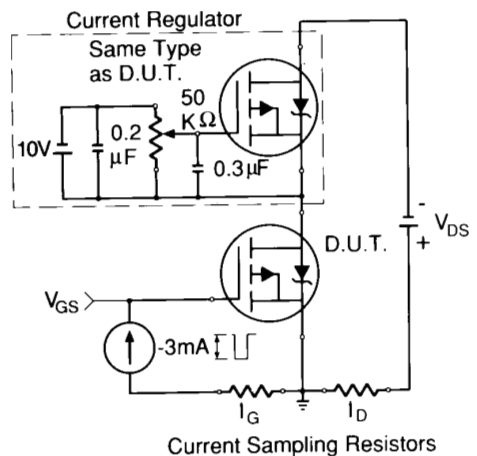


Fig. 13a — Gate Charge Test Circuit

## IRFY9130CM Device

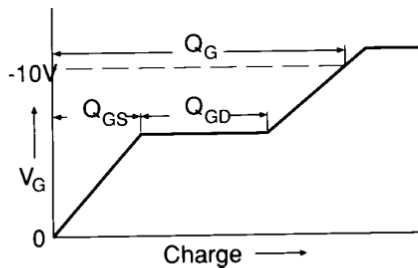
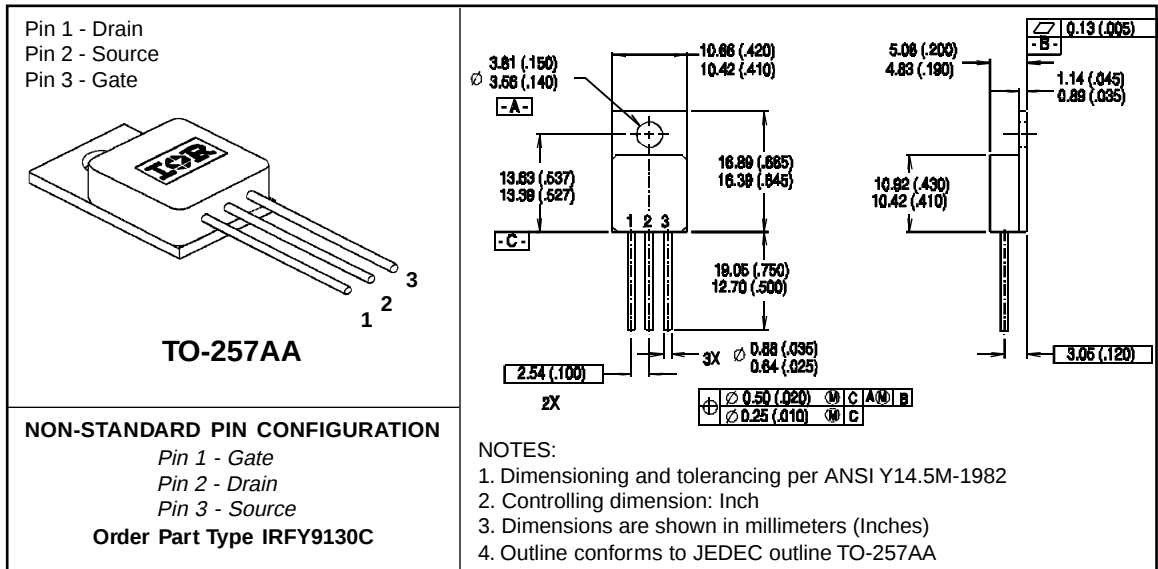


Fig. 13b — Basic Gate Charge Waveform

### Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 11).
- ② @  $V_{DD} = -25V$ , Starting  $T_J = 25^\circ C$ ,  
 $E_{AS} = [0.5 * L * (I_D^2) * [BV_{DSS}/(BV_{DSS} - V_{DD})]]$   
 Peak  $I_L = -11.2A$ ,  $V_{GS} = -10V$ ,  $25 \leq R_G \leq 200\Omega$
- ③  $I_{SD} \leq -11.2A$ ,  $di/dt \leq -140A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ ,  $T_J \leq 150^\circ C$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$
- ⑤  $K/W = ^\circ C/W$        $W/K = W/^\circ C$

## Case Outline and Dimensions



### CAUTION

#### BERYLLIUM WARNING PER MIL-PRF-19500

Packages containing beryllia shall not be ground, sandblasted, machined or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

International  
**IOR** Rectifier

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