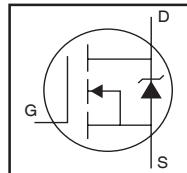


- Advanced Planar Technology
- Logic-Level Gate Drive
- Low On-Resistance
- Dynamic dV/dT Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified\*

**HEXFET® Power MOSFET**



|  |             |
|--|-------------|
| <b>V<sub>(BR)DSS</sub></b>             | <b>30V</b>  |
| <b>R<sub>DS(on)</sub> max.</b>         | <b>45mΩ</b> |
| <b>I<sub>D</sub> (Silicon Limited)</b> | <b>23A</b>  |
| <b>I<sub>D</sub> (Package Limited)</b> | <b>20A</b>  |



| <b>G</b> | <b>D</b> | <b>S</b> |
|----------|----------|----------|
| Gate     | Drain    | Source   |

**Description**

Specifically designed for Automotive applications, this cellular design of HEXFET® Power MOSFETs utilizes the latest processing techniques to achieve low on-resistance per silicon area. This benefit combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in Automotive and a wide variety of other applications.

**Absolute Maximum Ratings**

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (T<sub>A</sub>) is 25°C, unless otherwise specified.

|   | Parameter   | Max.         | Units |
|---|---|--------------|-------|
| I <sub>D</sub> @ T <sub>C</sub> = 25°C  | Continuous Drain Current, V <sub>GS</sub> @ 10V (Silicon Limited) | 23           | A     |
| I <sub>D</sub> @ T <sub>C</sub> = 100°C | Continuous Drain Current, V <sub>GS</sub> @ 10V                   | 16           |       |
| I <sub>D</sub> @ T <sub>C</sub> = 25°C  | Continuous Drain Current, V <sub>GS</sub> @ 10V (Package Limited) | 20           |       |
| I <sub>DM</sub>                         | Pulsed Drain Current ①  | 96           |       |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C  | Power Dissipation   | 45           | W     |
|   | Linear Derating Factor  | 0.30         | W/°C  |
| V <sub>GS</sub>                         | Gate-to-Source Voltage  | ± 16         | V     |
| E <sub>AS</sub>                         | Single Pulse Avalanche Energy (Thermally Limited) ②               | 77           | mJ    |
| E <sub>AS</sub> (tested )               | Single Pulse Avalanche Energy Tested Value ⑥                      | 200          |       |
| I <sub>AR</sub>                         | Avalanche Current ①   | 14           | A     |
| E <sub>AR</sub>                         | Repetitive Avalanche Energy ①                                     | 4.5          | mJ    |
| dv/dt                                   | Peak Diode Recovery ③   | 5.0          | V/ns  |
| T <sub>J</sub>                          | Operating Junction and  | -55 to + 175 | °C    |
| T <sub>STG</sub>                        | Storage Temperature Range   |              |       |
|   | Soldering Temperature, for 10 seconds (1.6mm from case )          |              |       |

**Thermal Resistance**

|                  | Parameter                         | Typ. | Max. | Units |
|------------------|-----------------------------------|------|------|-------|
| R <sub>θJC</sub> | Junction-to-Case ④                | —    | 3.3  | °C/W  |
| R <sub>θJA</sub> | Junction-to-Ambient (PCB mount) ⑦ | —    | 50   |       |
| R <sub>θJA</sub> | Junction-to-Ambient               | —    | 110  |       |

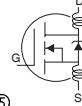
HEXFET® is a registered trademark of International Rectifier.

\*Qualification standards can be found at <http://www.irf.com/>

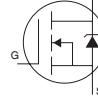
Static Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|   | Parameter                            | Min. | Typ.  | Max.  | Units               | Conditions   |
|---|--------------------------------------|------|-------|-------|---------------------|--|
| $V_{(\text{BR})\text{DSS}}$                   | Drain-to-Source Breakdown Voltage    | 30   | —     | —     | V                   | $V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$                            |
| $\Delta V_{(\text{BR})\text{DSS}/\Delta T_J}$ | Breakdown Voltage Temp. Coefficient  | —    | 0.030 | —     | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$                     |
| $R_{DS(\text{on})}$                           | Static Drain-to-Source On-Resistance | —    | —     | 0.045 | $\Omega$            | $V_{GS} = 10\text{V}$ , $I_D = 14\text{A}$ ④                             |
|   |                                      | —    | —     | 0.065 |                     | $V_{GS} = 4.5\text{V}$ , $I_D = 12\text{A}$ ④                            |
| $V_{GS(\text{th})}$                           | Gate Threshold Voltage               | 1.0  | —     | —     | V                   | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$                               |
| $g_{fs}$                                      | Forward Transconductance             | 6.4  | —     | —     | S                   | $V_{DS} = 25\text{V}$ , $I_D = 14\text{A}$ ⑦                             |
| $I_{DSS}$                                     | Drain-to-Source Leakage Current      | —    | —     | 25    | $\mu\text{A}$       | $V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$                             |
|   |                                      | —    | —     | 250   |                     | $V_{DS} = 24\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 150^\circ\text{C}$ |
| $I_{GSS}$                                     | Gate-to-Source Forward Leakage       | —    | —     | 100   | nA                  | $V_{GS} = 16\text{V}$  |
|   | Gate-to-Source Reverse Leakage       | —    | —     | -100  |                     | $V_{GS} = -16\text{V}$   |

Dynamic Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|              | Parameter                       | Min. | Typ. | Max. | Units | Conditions   |
|--------------|---------------------------------|------|------|------|-------|--|
| $Q_g$        | Total Gate Charge               | —    | —    | 15   | nC    | $I_D = 14\text{A}$   |
| $Q_{gs}$     | Gate-to-Source Charge           | —    | —    | 4.6  |       | $V_{DS} = 24\text{V}$  |
| $Q_{gd}$     | Gate-to-Drain ("Miller") Charge | —    | —    | 9.3  |       | $V_{GS} = 4.5\text{V}$ ④⑦  |
| $t_{D(on)}$  | Turn-On Delay Time              | —    | 8.5  | —    | ns    | $V_{DD} = 15\text{V}$  |
| $t_r$        | Rise Time                       | —    | 140  | —    |       | $I_D = 14\text{A}$   |
| $t_{D(off)}$ | Turn-Off Delay Time             | —    | 12   | —    |       | $R_G = 12\Omega$   |
| $t_f$        | Fall Time                       | —    | 20   | —    |       | $V_{GS} = 4.5\text{V}$ , $R_D = 1.1\Omega$ ④⑦  |
| $L_D$        | Internal Drain Inductance       | —    | 4.5  | —    | nH    | Between lead,<br>6mm (0.25in.)<br>from package<br>and center of die contact ⑤        |
| $L_S$        | Internal Source Inductance      | —    | 7.5  | —    |       |  |
| $C_{iss}$    | Input Capacitance               | —    | 450  | —    | pF    | $V_{GS} = 0\text{V}$   |
| $C_{oss}$    | Output Capacitance              | —    | 210  | —    |       | $V_{DS} = 25\text{V}$  |
| $C_{rss}$    | Reverse Transfer Capacitance    | —    | 110  | —    |       | $f = 1.0\text{MHz}$ ⑦  |

## Diode Characteristics

|          | Parameter                                 | Min.  | Typ. | Max. | Units | Conditions   |
|----------|---|---|------|------|-------|--|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —   | —    | 23⑤  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —   | —    | 96   |       |  |
| $V_{SD}$ | Diode Forward Voltage                     | —   | —    | 1.3  | V     | $T_J = 25^\circ\text{C}$ , $I_S = 14\text{A}$ , $V_{GS} = 0\text{V}$ ④   |
| $t_{rr}$ | Reverse Recovery Time                     | —   | 65   | 97   | ns    | $T_J = 25^\circ\text{C}$ , $I_F = 14\text{A}$  |
| $Q_{rr}$ | Reverse Recovery Charge                   | —   | 140  | 210  | nC    | $di/dt = 100\text{A}/\mu\text{s}$ ④⑦   |
| $t_{on}$ | 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. 11 )
- ②  $V_{DD} = 15\text{V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 570\mu\text{H}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 14\text{A}$ . (See Figure 12)
- ③  $I_{SD} \leq 14\text{A}$ ,  $di/dt \leq 140\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(\text{BR})\text{DSS}}$ ,  $T_J \leq 175^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ⑤ Calculated continuous current based on maximum allowable junction temperature. Package limitation current = 20A.
- ⑥ This is applied for I-PAK,  $L_S$  of D-PAK is measured between lead and center of die contact.
- ⑦ Uses IRL2703 data and test conditions.

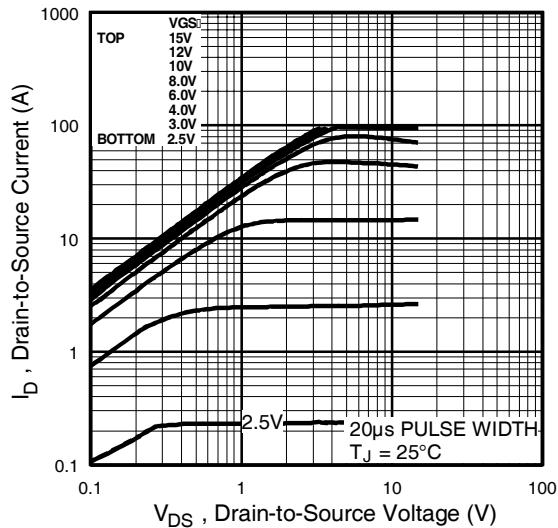
**Qualification Information<sup>†</sup>**

|                                   |                      |   |      |
|-----------------------------------|----------------------|---|------|
| <b>Qualification Level</b>        |                      | Automotive<br>(per AEC-Q101) <sup>††</sup>  |      |
|                                   |                      | Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level. |      |
| <b>Moisture Sensitivity Level</b> |                      | D-PAK   | MSL1 |
| <b>ESD</b>                        | Machine Model        | Class M2 (+/- 150V) <sup>†††</sup><br>AEC-Q101-002  |      |
|                                   | Human Body Model     | Class H1A (+/- 500V) <sup>†††</sup><br>AEC-Q101-001   |      |
|                                   | Charged Device Model | Class C5 (+/- 2000V) <sup>†††</sup><br>AEC-Q101-005   |      |
| <b>RoHS Compliant</b>             |                      | Yes   |      |

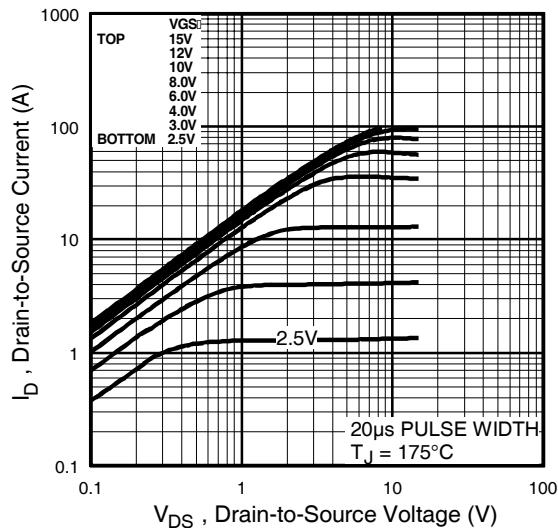
<sup>†</sup> Qualification standards can be found at International Rectifier's web site: <http://www.irf.com>

<sup>††</sup> Exceptions to AEC-Q101 requirements are noted in the qualification report.

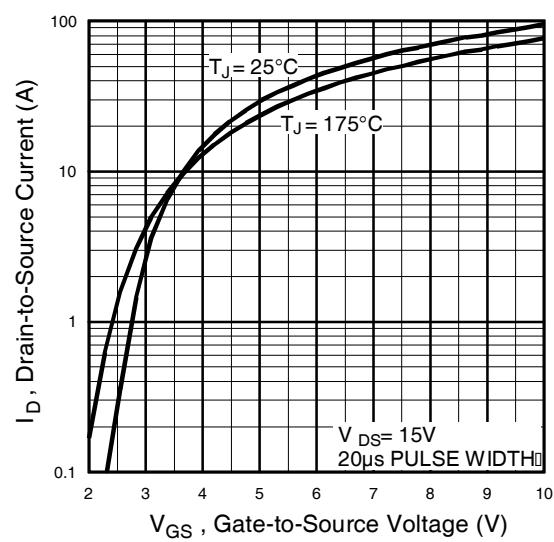
<sup>†††</sup> Highest passing voltage



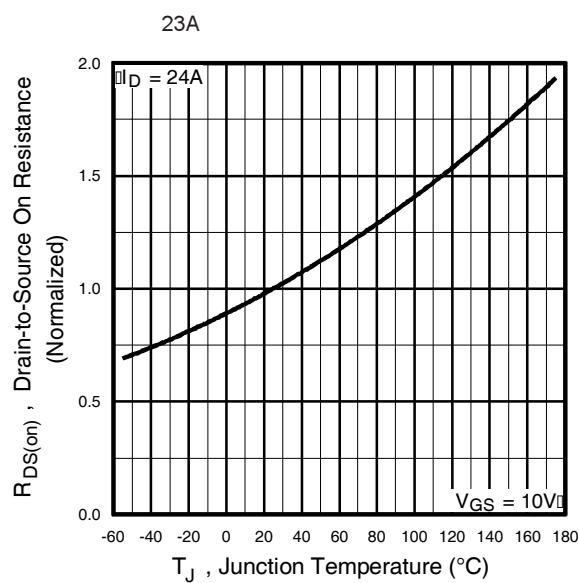
**Fig 1.** Typical Output Characteristics



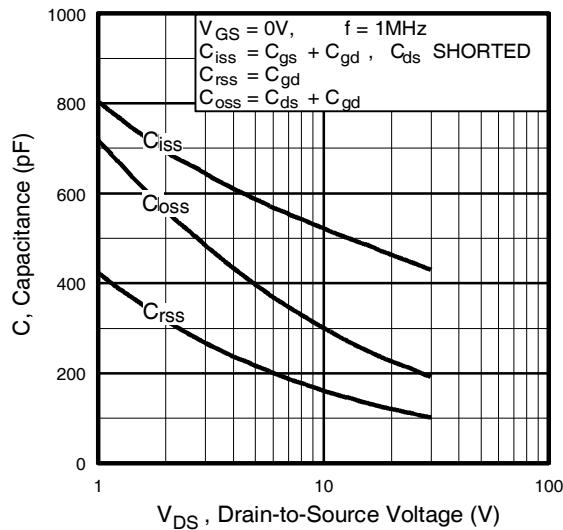
**Fig 2.** Typical Output Characteristics



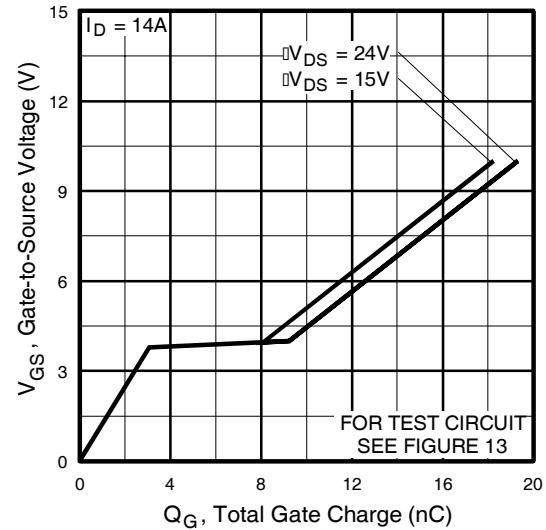
**Fig 3.** Typical Transfer Characteristics



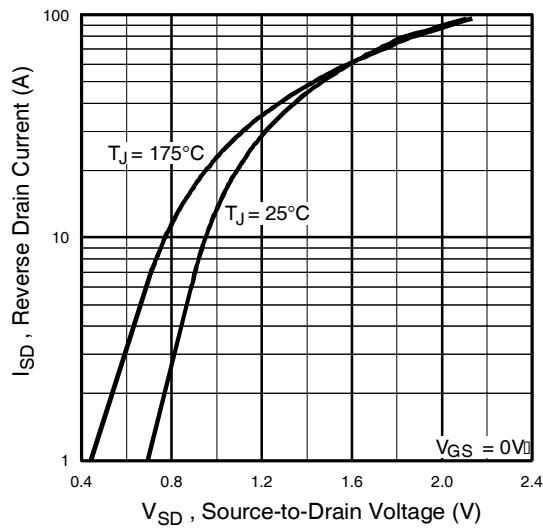
**Fig 4.** Normalized On-Resistance Vs. Temperature



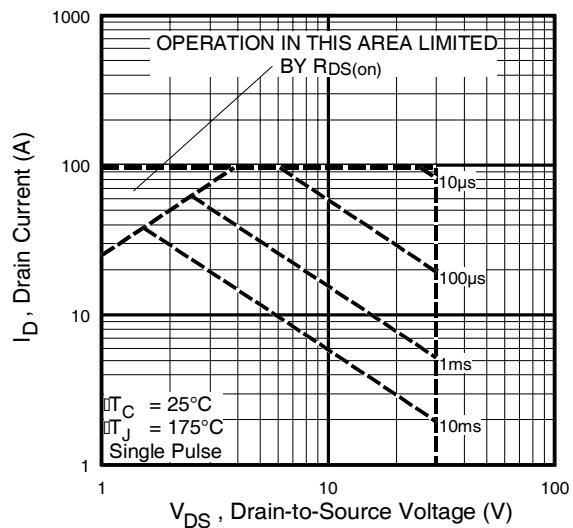
**Fig 5.** Typical Capacitance Vs.  
Drain-to-Source Voltage



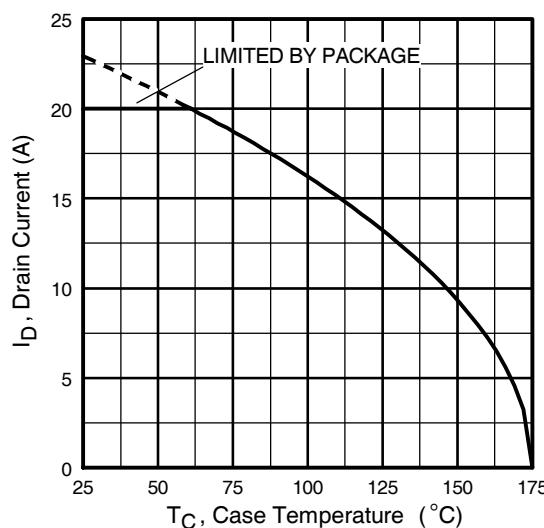
**Fig 6.** Typical Gate Charge Vs.  
Gate-to-Source Voltage



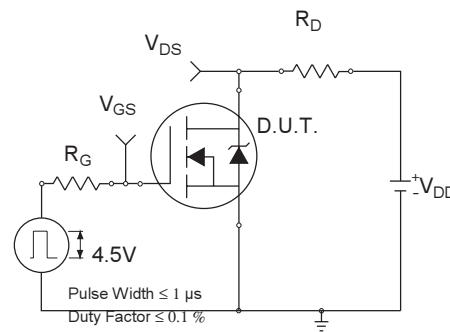
**Fig 7.** Typical Source-Drain Diode  
Forward Voltage



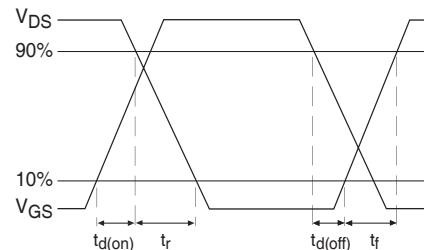
**Fig 8.** Maximum Safe Operating Area



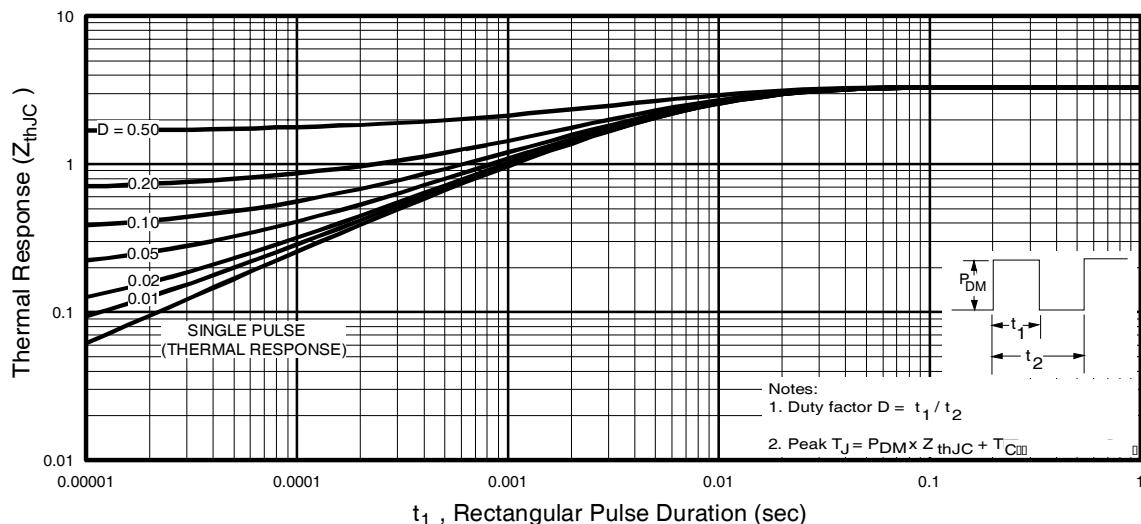
**Fig 9.** Maximum Drain Current Vs.  
Case Temperature



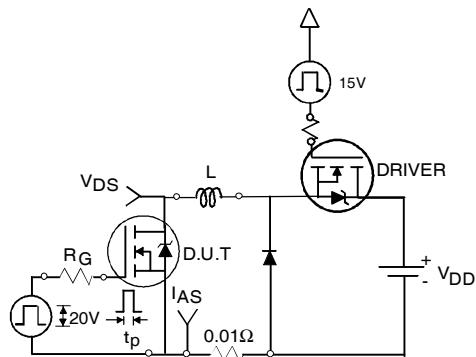
**Fig 10a.** Switching Time Test Circuit



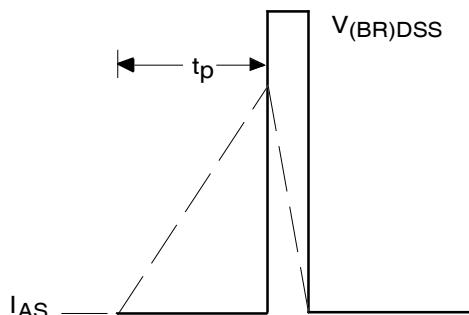
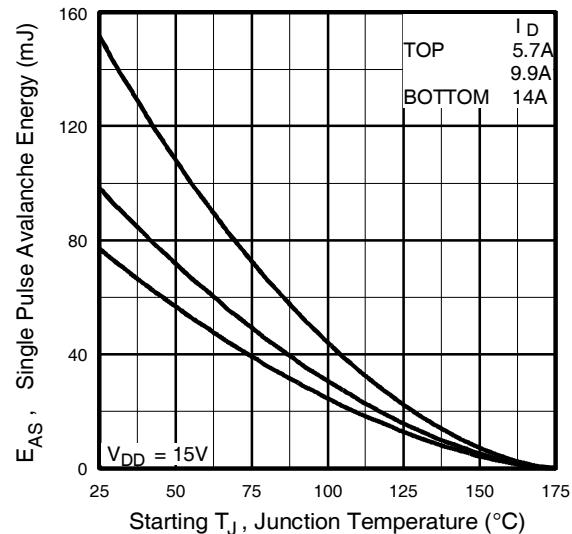
**Fig 10b.** Switching Time Waveforms



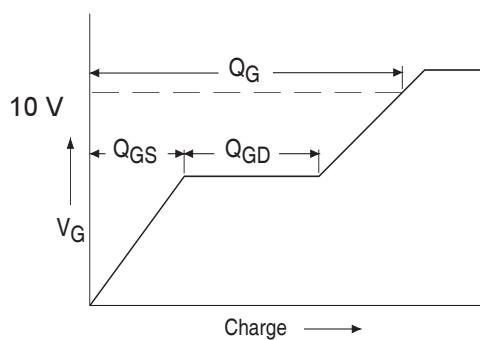
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



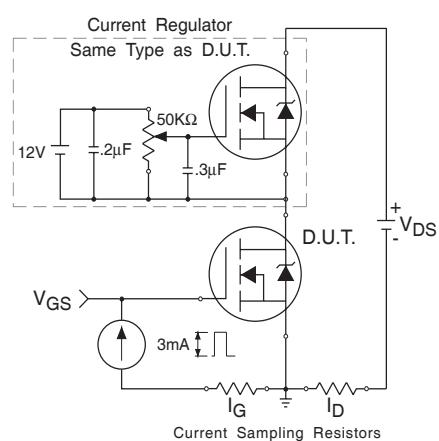
**Fig 12a.** Unclamped Inductive Test Circuit



**Fig 12b.** Unclamped Inductive Waveforms

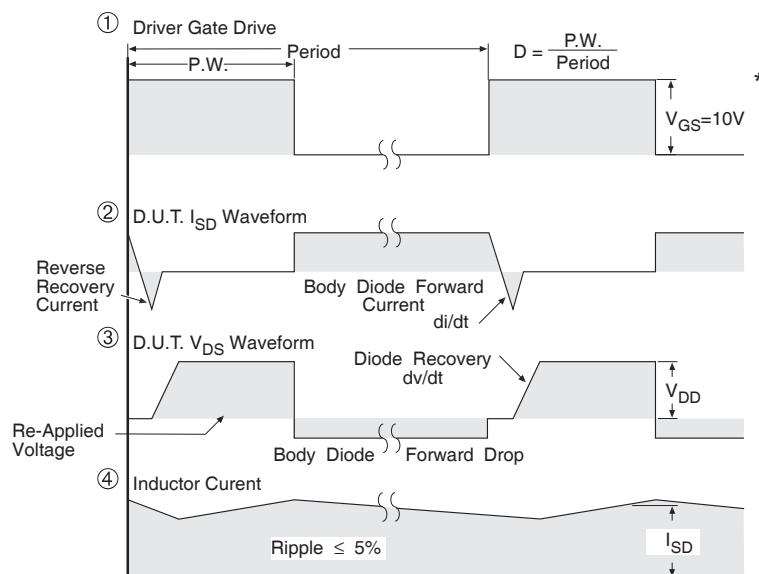
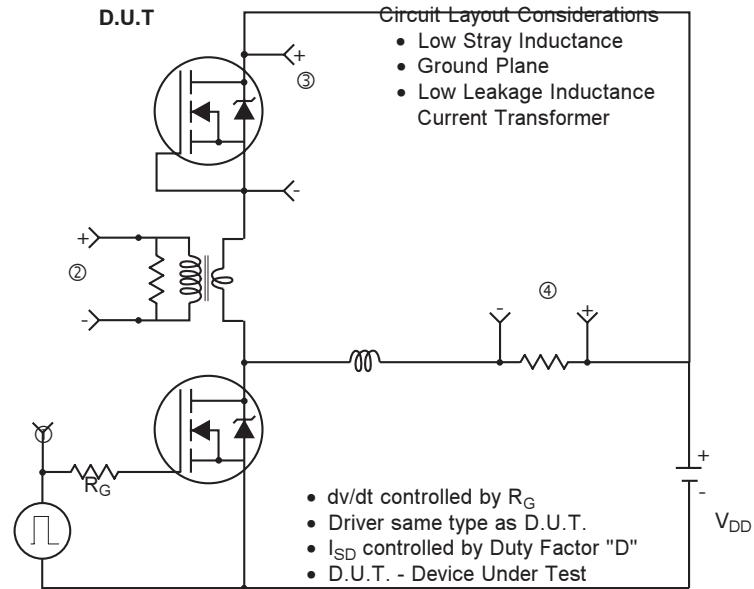


**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit

## Peak Diode Recovery dv/dt Test Circuit

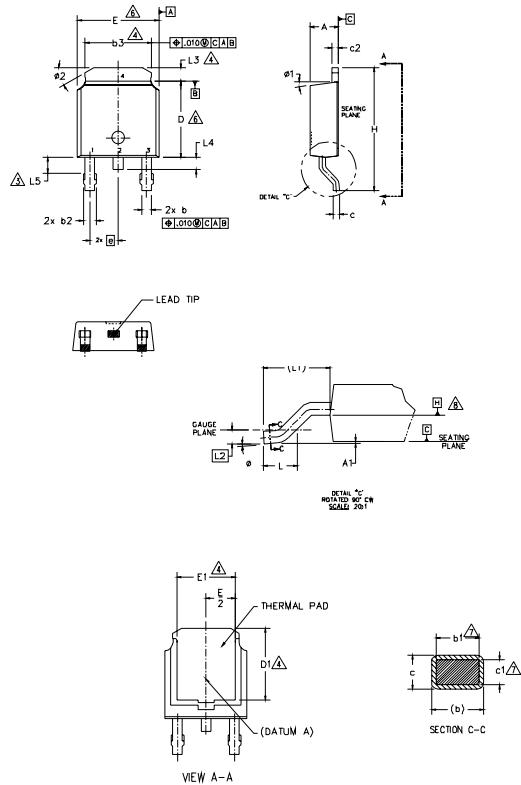


\*  $V_{GS} = 5V$  for Logic Level Devices

Fig 14. For N-Channel HEXFETS

## D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS]
- 3.- LEAD DIMENSION UNCONTROLLED IN LS.
- 4.- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
- 5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
- 6.- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- 7.- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
- 8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

| S<br>Y<br>M<br>B<br>O<br>L | DIMENSIONS  |        | N<br>O<br>T<br>E<br>S |      |
|----------------------------|-------------|--------|-----------------------|------|
|                            | MILLIMETERS | INCHES |                       |      |
|                            | MIN.        | MAX.   |                       |      |
| A                          | 2.18        | .239   | .086                  | .094 |
| A1                         | —           | .13    | —                     | .005 |
| b                          | 0.64        | .089   | .025                  | .035 |
| b1                         | 0.65        | .079   | .025                  | .031 |
| b2                         | 0.76        | .114   | .030                  | .045 |
| b3                         | 4.95        | .546   | .195                  | .215 |
| c                          | 0.46        | .061   | .018                  | .024 |
| c1                         | 0.41        | .056   | .016                  | .022 |
| c2                         | 0.46        | .089   | .018                  | .035 |
| D                          | 5.97        | 6.22   | .235                  | .245 |
| D1                         | 5.21        | —      | .205                  | —    |
| E                          | 6.35        | 6.73   | .250                  | .265 |
| E1                         | 4.32        | —      | .170                  | —    |
| e                          | 2.29        | BSC    | .090                  | BSC  |
| H                          | 9.40        | 10.41  | .370                  | .410 |
| L                          | 1.40        | 1.78   | .055                  | .070 |
| L1                         | 2.74        | BSC    | .108                  | REF. |
| L2                         | 0.51        | BSC    | .020                  | BSC  |
| L3                         | 0.89        | 1.27   | .035                  | .050 |
| L4                         | —           | 1.02   | —                     | .040 |
| L5                         | 1.14        | 1.52   | .045                  | .060 |
| Ø                          | 0°          | 10°    | 0°                    | 10°  |
| Ø1                         | 0°          | 15°    | 0°                    | 15°  |
| Ø2                         | 25°         | 35°    | 25°                   | 35°  |

LEAD ASSIGNMENTS

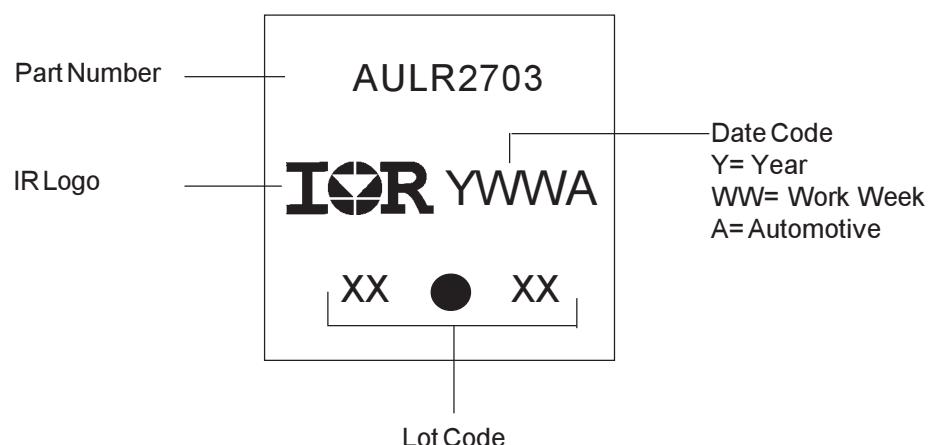
HEXFET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

IGBT & CoPAK

- 1.- GATE
- 2.- COLLECTOR
- 3.- Emitter
- 4.- COLLECTOR

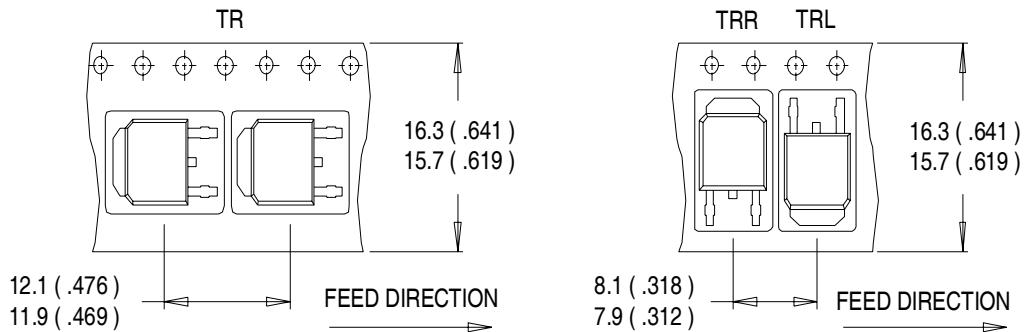
## D-Pak Part Marking Information



Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

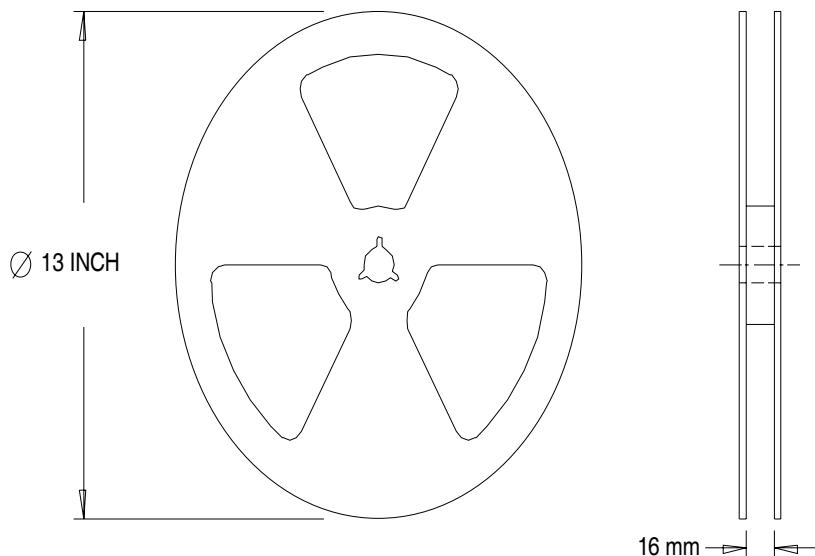
## D-Pak (TO-252AA) Tape &amp; Reel Information

Dimensions are shown in millimeters (inches)



## NOTES :

1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS ( INCHES ).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



## NOTES :

1. OUTLINE CONFORMS TO EIA-481.

Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

### Ordering Information

| Base part number | Package Type | Standard Pack       |          | Complete Part Number |
|------------------|--------------|---------------------|----------|----------------------|
|                  |              | Form                | Quantity |                      |
| AUIRLR2703       | Dpak         | Tube                | 75       | AUIRLR2703           |
|                  |              | Tape and Reel       | 2000     | AUIRLR2703TR         |
|                  |              | Tape and Reel Left  | 3000     | AUIRLR2703TRL        |
|                  |              | Tape and Reel Right | 3000     | AUIRLR2703TRR        |

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