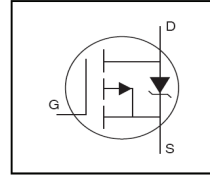
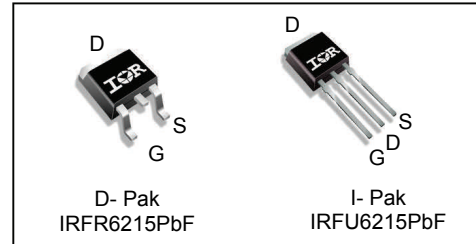


- P-Channel
- 175°C Operating Temperature
- Surface Mount (IRFR6215)
- Straight Lead (IRFU6215)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

HEXFET® Power MOSFET



|                           |               |
|---------------------------|---------------|
| <b>V<sub>DSS</sub></b>    | <b>-150V</b>  |
| <b>R<sub>DS(on)</sub></b> | <b>0.295Ω</b> |
| <b>I<sub>D</sub></b>      | <b>-13A</b>   |



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

### Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible 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 device for use in a wide variety of applications.

The D-PAK is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.

| Base part number | Package Type | Standard Pack      |          | Orderable Part Number |
|------------------|--------------|--------------------|----------|-----------------------|
|                  |              | Form               | Quantity |                       |
| IRFU6215PbF      | I-Pak        | Tube               | 75       | IRFU6215PbF           |
| IRFR6215PbF      | D-Pak        | Tube               | 75       | IRFR6215PbF           |
|                  |              | Tape and Reel Left | 3000     | IRFR6215TRLpBf        |

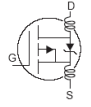
### Absolute Maximum Ratings

| Symbol                                  | Parameter   | Max.         | Units |
|---|---|--------------|-------|
| I <sub>D</sub> @ T <sub>C</sub> = 25°C  | Continuous Drain Current, V <sub>GS</sub> @ -10V        | -13          | A     |
| I <sub>D</sub> @ T <sub>C</sub> = 100°C | Continuous Drain Current, V <sub>GS</sub> @ -10V        | -9.0         |       |
| I <sub>DM</sub>                         | Pulsed Drain Current ①⑥                                 | -44          |       |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C  | Maximum Power Dissipation                               | 110          | W     |
|   | Linear Derating Factor                                  | 0.71         | W/°C  |
| V <sub>GS</sub>                         | Gate-to-Source Voltage                                  | ± 20         | V     |
| E <sub>AS</sub>                         | Single Pulse Avalanche Energy ②⑥                        | 310          | mJ    |
| I <sub>AR</sub>                         | Avalanche Current ①⑥                                    | -6.6         | A     |
| E <sub>AR</sub>                         | Repetitive Avalanche Energy ①⑥                          | 11           | mJ    |
| dv/dt                                   | Peak Diode Recovery dv/dt③                              | 5.0          | V/ns  |
| T <sub>J</sub>                          | Operating Junction and Storage Temperature Range        | -55 to + 175 | °C    |
| T <sub>STG</sub>                        |   |              |       |
|   | Soldering Temperature, for 10 seconds (1.6mm from case) | 300          |       |


### Thermal Resistance

| Symbol           | Parameter                           | Typ. | Max. | Units |
|------------------|-------------------------------------|------|------|-------|
| R <sub>θJC</sub> | Junction-to-Case                    | —    | 1.4  | °C/W  |
| R <sub>θJA</sub> | Junction-to-Ambient ( PCB Mount ) ② | —    | 50   |       |
| R <sub>θJA</sub> | Junction-to-Ambient                 | —    | 110  |       |

**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

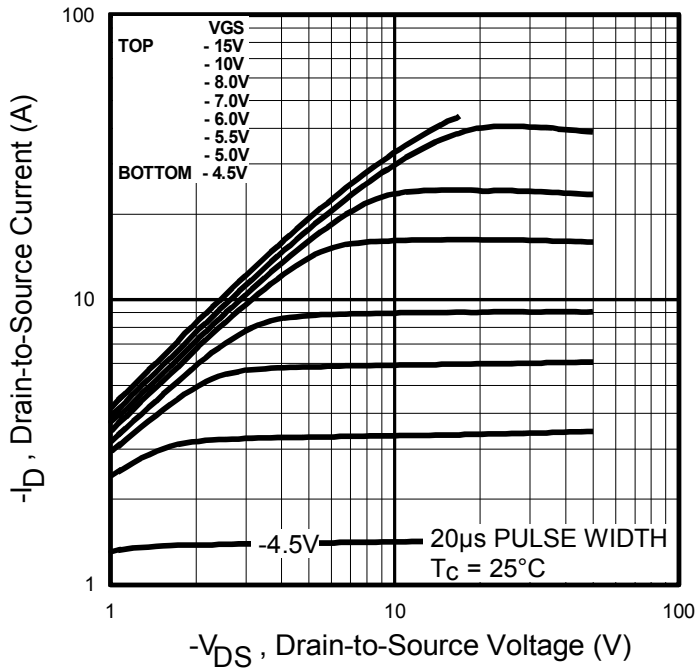
|  | Parameter                            | Min. | Typ.  | Max.  | Units | Conditions  |
|--|--------------------------------------|------|-------|-------|-------|---|
| V <sub>(BR)DSS</sub>                   | Drain-to-Source Breakdown Voltage    | -150 | —     | —     | V     | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                       |
| ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temp. Coefficient  | —    | -0.20 | —     | V/°C  | Reference to 25°C, I <sub>D</sub> = -1mA  |
| R <sub>DS(on)</sub>                    | Static Drain-to-Source On-Resistance | —    | —     | 0.295 | Ω     | V <sub>GS</sub> = -10V, I <sub>D</sub> = -6.6A ④                                    |
|  |                                      | —    | —     | 0.58  |       | V <sub>GS</sub> = -10V, I <sub>D</sub> = -6.6A ④ T <sub>J</sub> = 150°C             |
| 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                         |
| gfs                                    | Forward Trans conductance            | 3.6  | —     | —     | S     | V <sub>DS</sub> = -50V, I <sub>D</sub> = -6.6A⑥                                     |
| I <sub>DSS</sub>                       | Drain-to-Source Leakage Current      | —    | —     | -25   | μA    | V <sub>DS</sub> = -150V, V <sub>GS</sub> = 0V                                       |
|  |                                      | —    | —     | -250  |       | V <sub>DS</sub> = -120V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C               |
| I <sub>GSS</sub>                       | Gate-to-Source Forward Leakage       | —    | —     | -100  | nA    | V <sub>GS</sub> = -20V  |
|  | Gate-to-Source Reverse Leakage       | —    | —     | 100   |       | V <sub>GS</sub> = 20V   |
| Q <sub>g</sub>                         | Total Gate Charge                    | —    | —     | 66    | nC    | I <sub>D</sub> = -6.6A  |
| Q <sub>gs</sub>                        | Gate-to-Source Charge                | —    | —     | 8.1   |       | V <sub>DS</sub> = -120V   |
| Q <sub>gd</sub>                        | Gate-to-Drain Charge                 | —    | —     | 35    |       | V <sub>GS</sub> = -10V, See Fig. 6 and 13 ④⑥  |
| t <sub>d(on)</sub>                     | Turn-On Delay Time                   | —    | 14    | —     | ns    | V <sub>DD</sub> = -75V  |
| t <sub>r</sub>                         | Rise Time                            | —    | 36    | —     |       | I <sub>D</sub> = -6.6A  |
| t <sub>d(off)</sub>                    | Turn-Off Delay Time                  | —    | 53    | —     |       | R <sub>G</sub> = 6.8Ω   |
| t <sub>f</sub>                         | Fall Time                            | —    | 37    | —     |       | R <sub>D</sub> = 12Ω, See Fig. 10 ④⑥  |
| L <sub>D</sub>                         | Internal Drain Inductance            | —    | 4.5   | —     | nH    | Between lead<br>,6mm (0.25in.)<br>from package<br>and center of die contact⑤        |
| L <sub>S</sub>                         | Internal Source Inductance           | —    | 7.5   | —     |       |  |
| C <sub>iss</sub>                       | Input Capacitance                    | —    | 860   | —     | pF    | V <sub>GS</sub> = 0V  |
| C <sub>oss</sub>                       | Output Capacitance                   | —    | 220   | —     |       | V <sub>DS</sub> = -25V  |
| C <sub>rss</sub>                       | Reverse Transfer Capacitance         | —    | 130   | —     |       | f = 1.0MHz, See Fig. 5 ⑥  |

**Source-Drain Ratings and Characteristics**

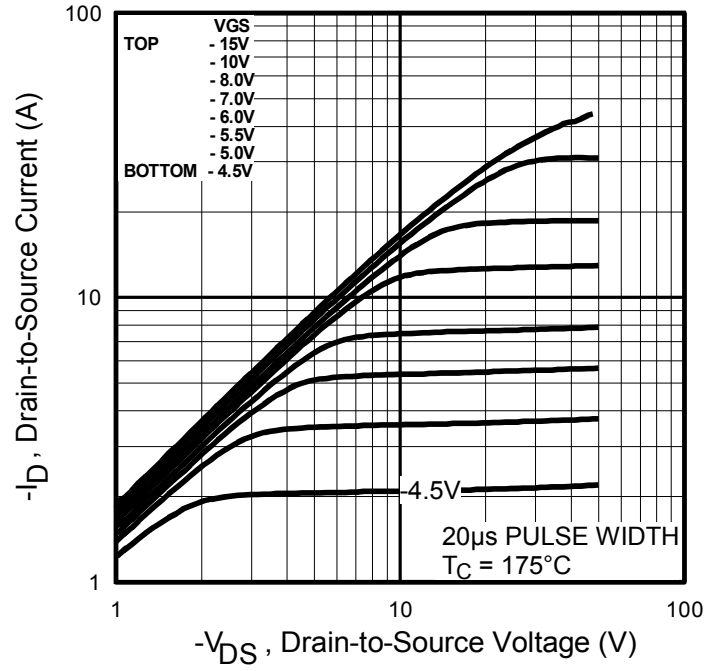
|                 | Parameter                                 | Min.   | Typ. | Max. | Units | Conditions   |
|-----------------|---|--|------|------|-------|--|
| I <sub>S</sub>  | Continuous Source Current<br>(Body Diode) | —  | —    | -13  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| I <sub>SM</sub> | Pulsed Source Current<br>(Body Diode) ①⑥  | —  | —    | -44  |       |  |
| V <sub>SD</sub> | Diode Forward Voltage                     | —  | —    | -1.6 | V     | T <sub>J</sub> = 25°C, I <sub>S</sub> = -6.6A, V <sub>GS</sub> = 0V ④  |
| t <sub>rr</sub> | Reverse Recovery Time                     | —  | 160  | 240  | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = -6.6A  |
| Q <sub>rr</sub> | Reverse Recovery Charge                   | —  | 1.2  | 1.7  | μC    | di/dt = 100A/μs ④⑥   |
| t <sub>on</sub> | Forward Turn-On Time                      | Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> ) |      |      |       |  |

**Notes:**

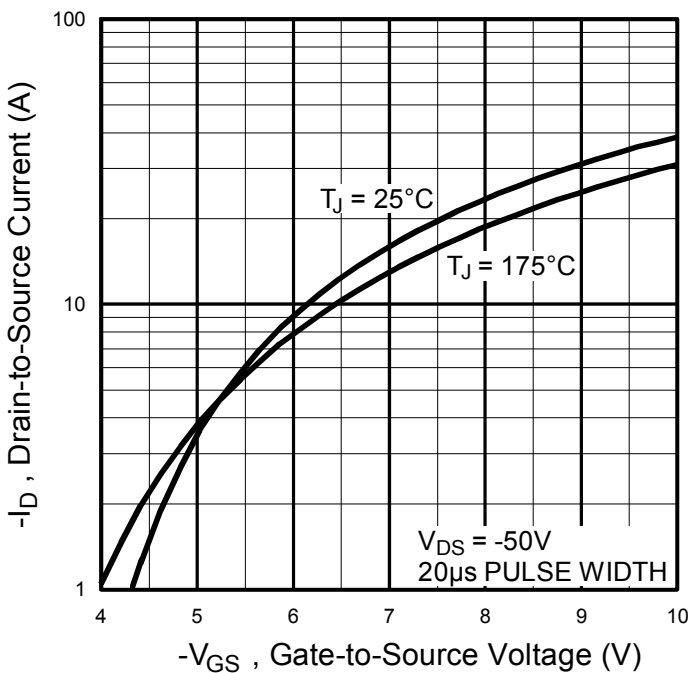
- ① Repetitive rating; pulse width limited by max. junction temperature. (See Fig.11)
- ② starting T<sub>J</sub> = 25°C, L = 14mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = -6.6A.(See Fig.12)
- ③ I<sub>SD</sub> ≤ -6.6A, di/dt ≤ -620A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ 175°C
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.
- ⑤ This is applied for I-PAK, LS of D-PAK is measured between lead and center of die contact.
- ⑥ Uses IRF6215 data and test conditions.
- ⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.



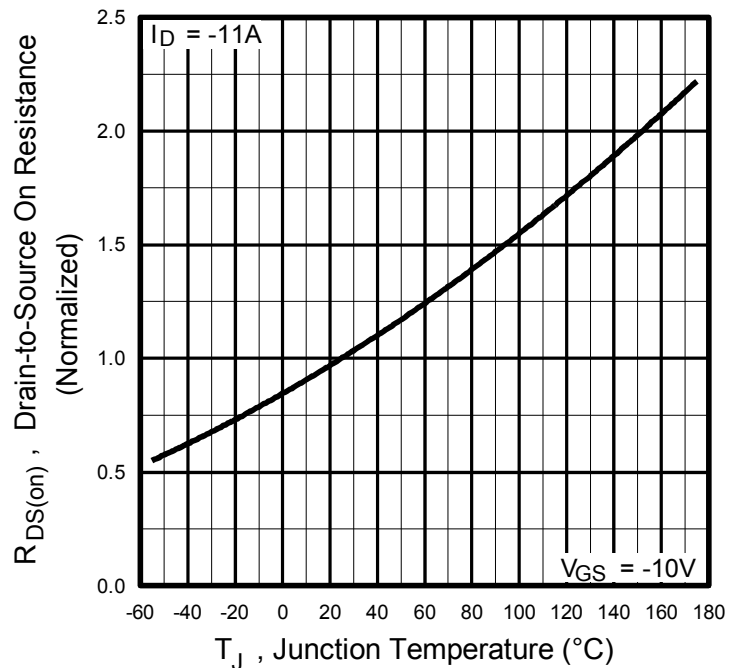
**Fig. 1** Typical Output Characteristics



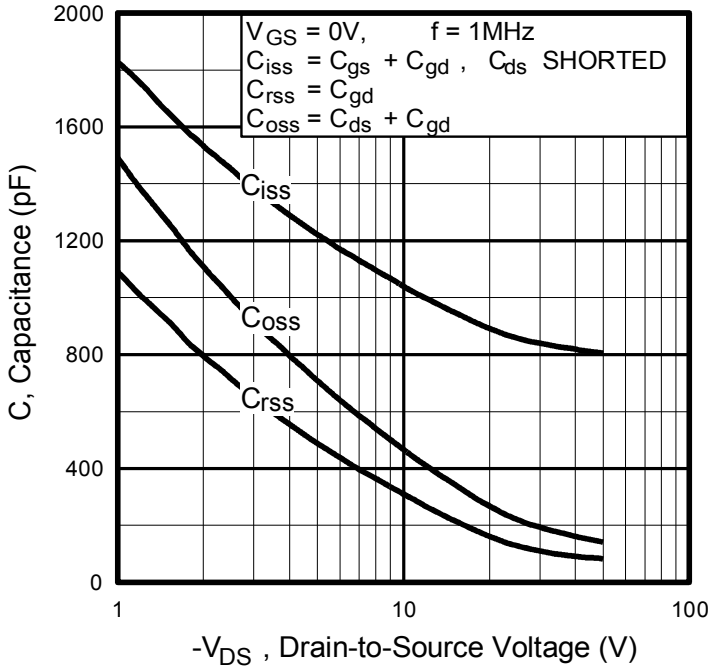
**Fig. 2** Typical Output Characteristics



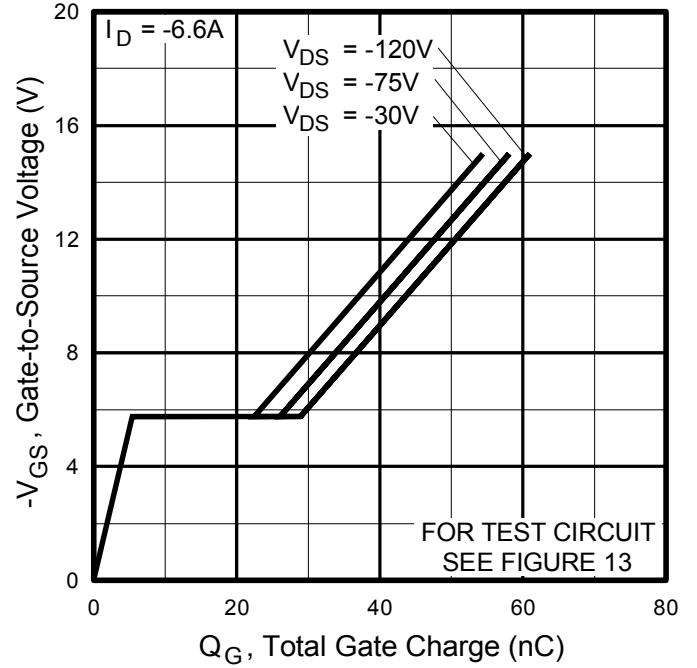
**Fig. 3** Typical Transfer Characteristics



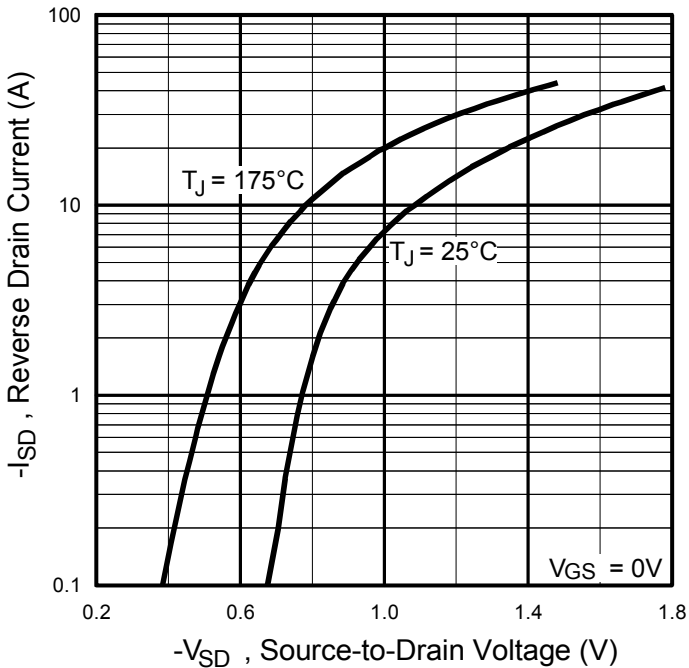
**Fig. 4** Normalized On-Resistance vs. Temperature



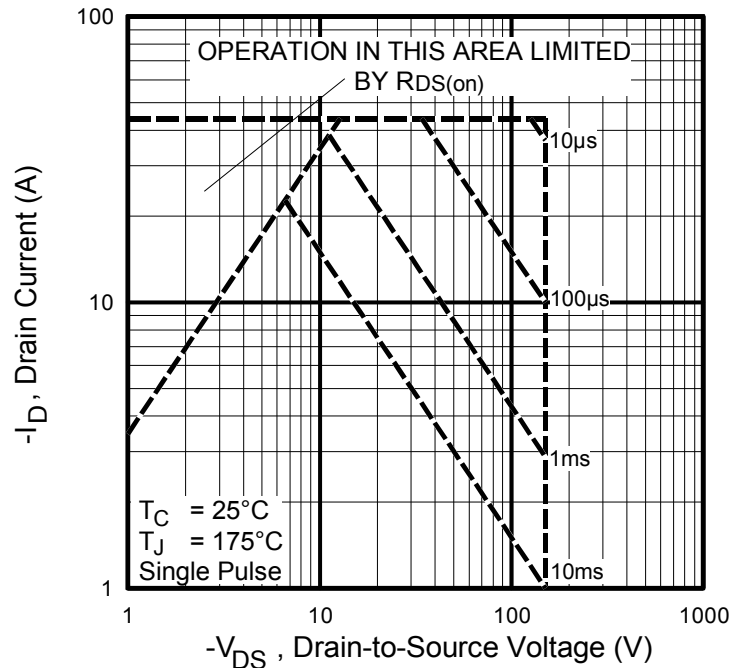
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage



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



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



**Fig 8.** Maximum Safe Operating Area

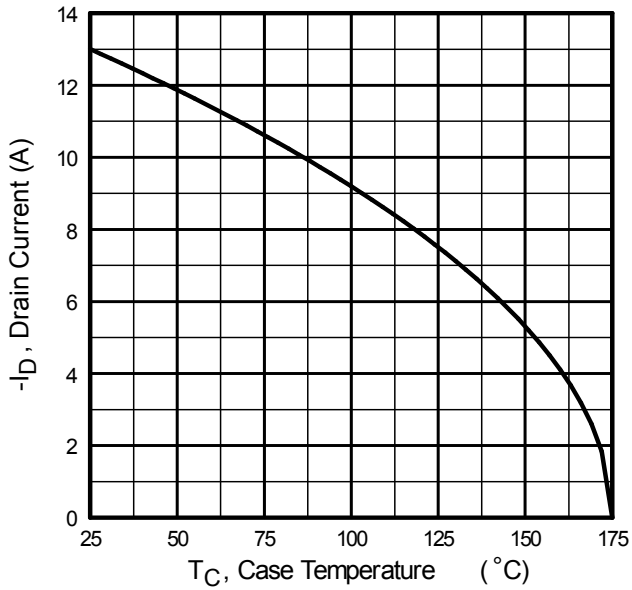


Fig 9. Maximum Drain Current vs. Case Temperature

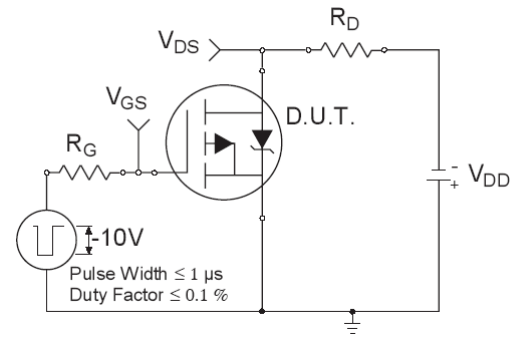


Fig 10a. Switching Time Test Circuit

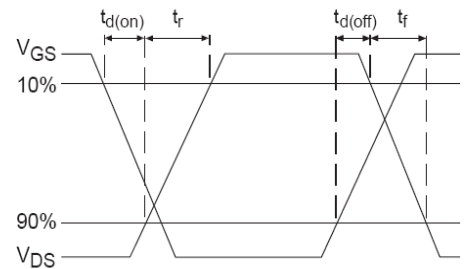


Fig 10b. Switching Time Waveforms

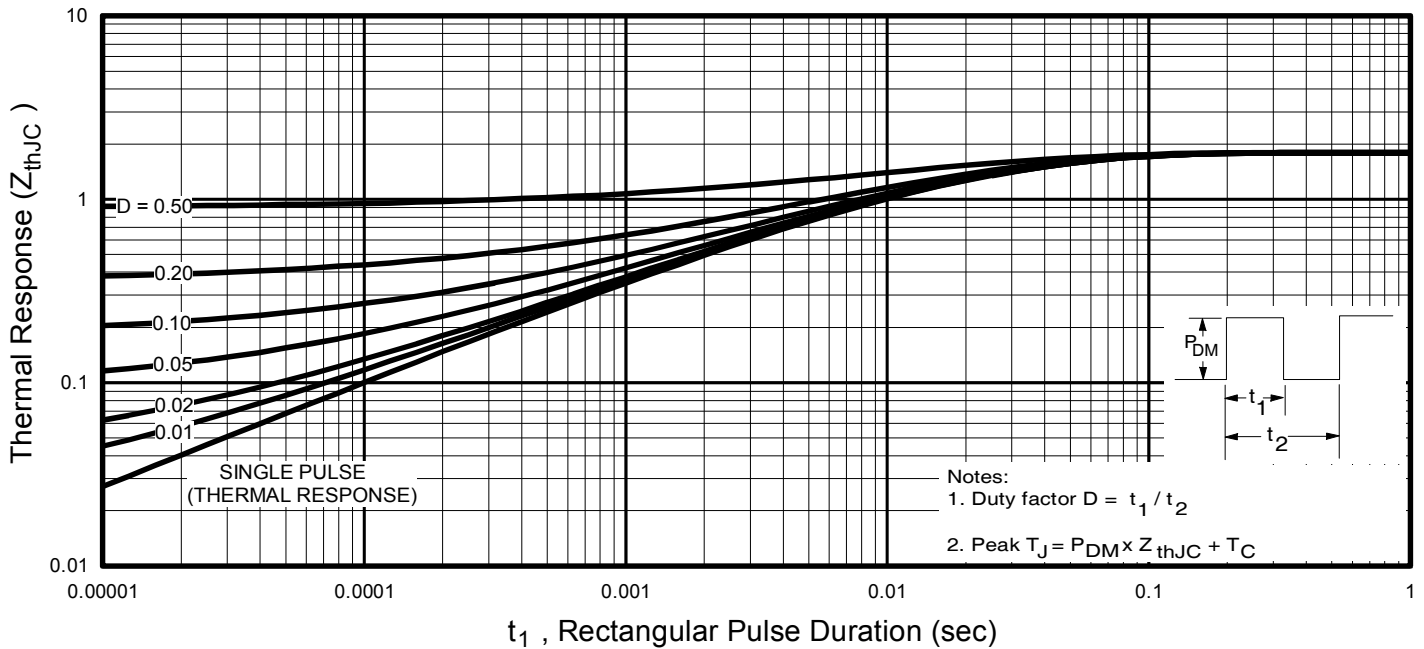


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

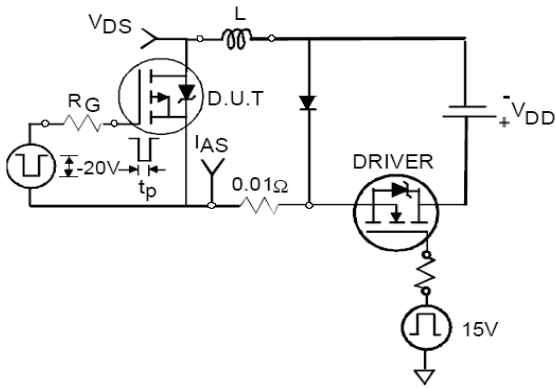


Fig 12a. Unclamped Inductive Test Circuit

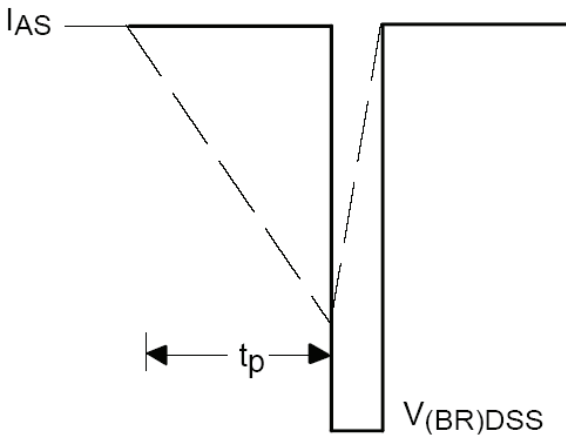


Fig 12b. Unclamped Inductive Waveforms

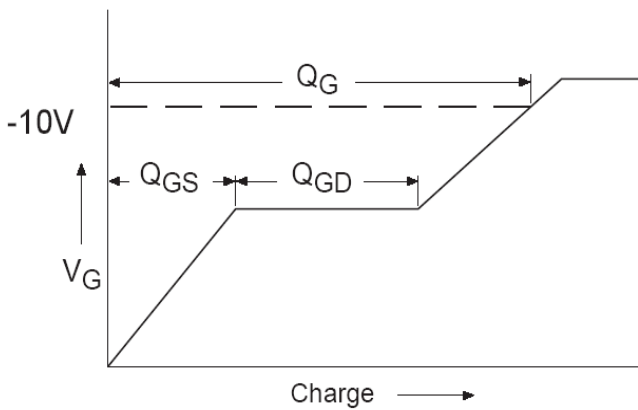


Fig 13a. Gate Charge Waveform

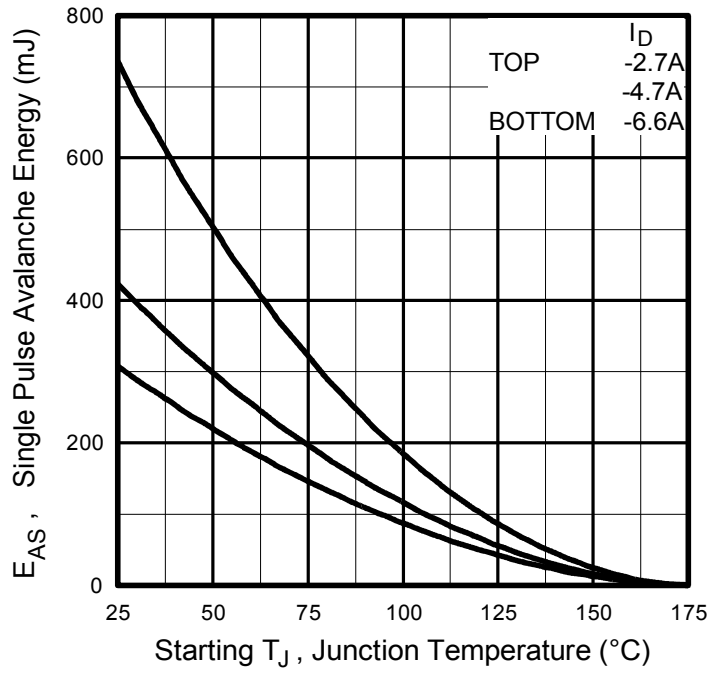


Fig 12c. Maximum Avalanche Energy vs. Drain Current

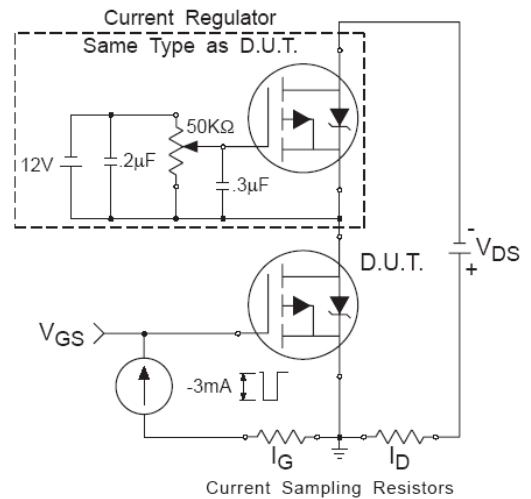
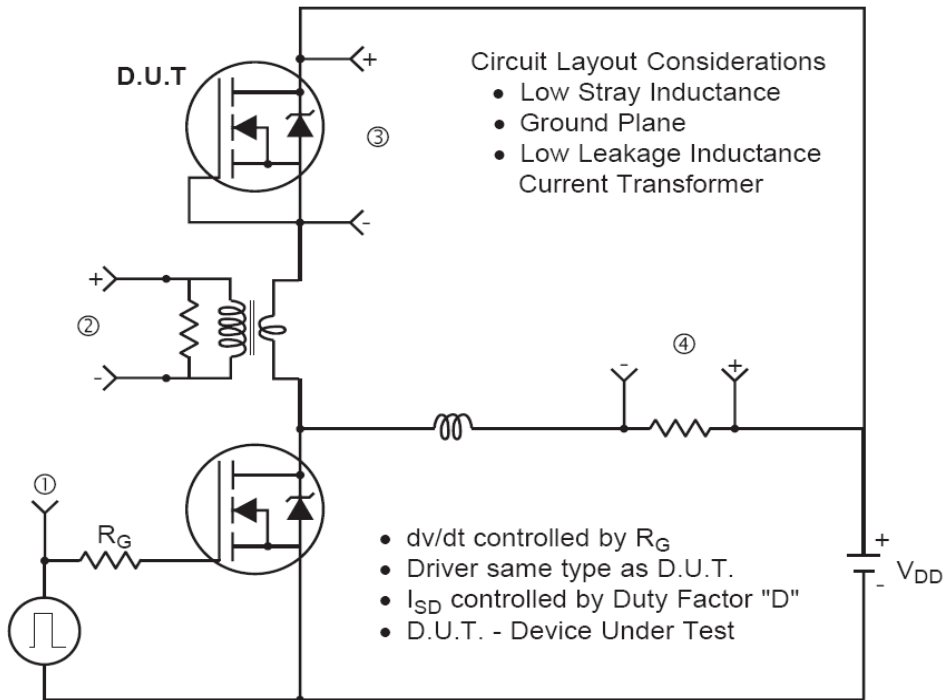
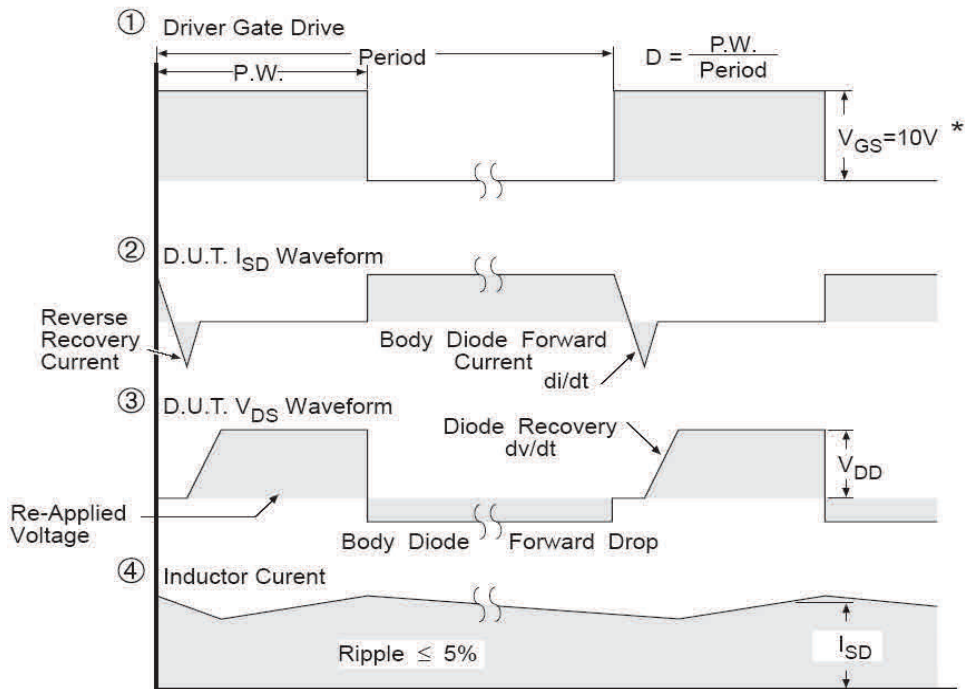


Fig 13b. Gate Charge Test Circuit

### Peak Diode Recovery dv/dt Test Circuit



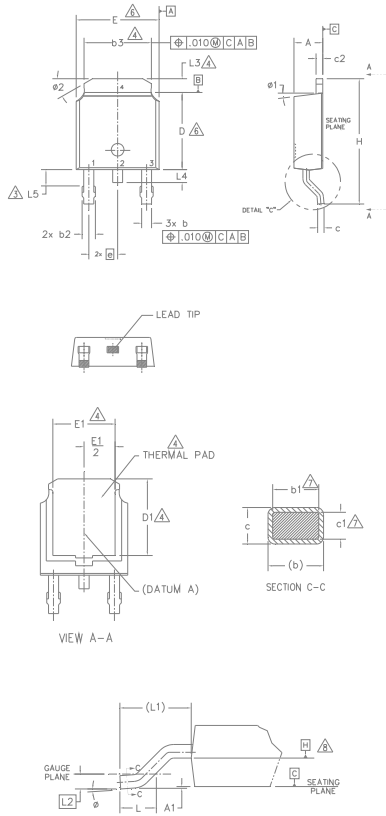
\* Reverse Polarity of D.U.T for P-Channel



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

Fig 14. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

## 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 L5.
  - 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 .006 [0.15] 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.

| SYMBOL | DIMENSIONS  |       |           |      | NOTES |
|--------|-------------|-------|-----------|------|-------|
|        | MILLIMETERS |       | INCHES    |      |       |
|        | MIN.        | MAX.  | MIN.      | MAX. |       |
| A      | 2.18        | 2.39  | .086      | .094 |       |
| A1     | -           | 0.13  | -         | .005 |       |
| b      | 0.64        | 0.89  | .025      | .035 |       |
| b1     | 0.64        | 0.79  | .025      | .031 | 7     |
| b2     | 0.76        | 1.14  | .030      | .045 |       |
| b3     | 4.95        | 5.46  | .195      | .215 | 4     |
| c      | 0.46        | 0.61  | .018      | .024 |       |
| c1     | 0.41        | 0.56  | .016      | .022 | 7     |
| c2     | 0.46        | 0.89  | .018      | .035 |       |
| D      | 5.97        | 6.22  | .235      | .245 | 6     |
| D1     | 5.21        | -     | .205      | -    | 4     |
| E      | 6.35        | 6.73  | .250      | .265 | 6     |
| E1     | 4.32        | -     | .170      | -    | 4     |
| 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 | 4     |
| L4     | -           | 1.02  | -         | .040 |       |
| L5     | 1.14        | 1.52  | .045      | .060 | 3     |
| 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 (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120 WITH ASSEMBLY LOT CODE 1234 ASSEMBLED ON VW 16, 2001 IN THE ASSEMBLY LINE "A"

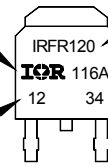
Note: "P" in assembly line position indicates "Lead-Free"

"P̄" in assembly line position indicates "Lead-Free" qualification to the consumer-level

OR

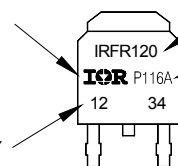
INTERNATIONAL RECTIFIER LOGO  
ASSEMBLY LOT CODE

INTERNATIONAL RECTIFIER LOGO  
ASSEMBLY LOT CODE



PART NUMBER  
DATE CODE  
YEAR 1 = 2001  
WEEK 16  
LINE A

INTERNATIONAL RECTIFIER LOGO  
ASSEMBLY LOT CODE

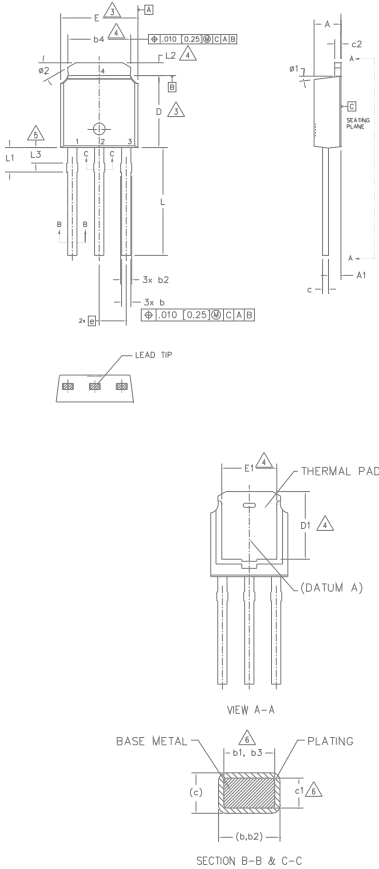


PART NUMBER  
DATE CODE  
P = DESIGNATES LEAD-FREE PRODUCT (OPTIONAL)  
P̄ = DESIGNATES LEAD-FREE PRODUCT QUALIFIED TO THE CONSUMER LEVEL (OPTIONAL)  
YEAR 1 = 2001  
WEEK 16  
A = ASSEMBLY SITE CODE

Note: For the most current drawing please refer to Infineon's web site [www.infineon.com](http://www.infineon.com)



## I-Pak (TO-251AA) Package Outline Dimensions are shown in millimeters (inches)


**NOTES:**

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- △ 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.
- △ THERMAL PAD CONTOUR OPTION WITHIN DIMENSION b4, L2, E1 & D1.
- △ LEAD DIMENSION UNCONTROLLED IN L3.
- △ DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
- 7.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA (Date 06/02).
- 8.- CONTROLLING DIMENSION : INCHES.

| SYMBOL | DIMENSIONS  |      |        |      | NOTES |
|--------|-------------|------|--------|------|-------|
|        | MILLIMETERS |      | INCHES |      |       |
|        | MIN.        | MAX. | MIN.   | MAX. |       |
| A      | 2.18        | 2.39 | .086   | .094 |       |
| A1     | 0.89        | 1.14 | .035   | .045 |       |
| b      | 0.64        | 0.89 | .025   | .035 |       |
| b1     | 0.65        | 0.79 | .025   | .031 | 6     |
| b2     | 0.76        | 1.14 | .030   | .045 |       |
| b3     | 0.76        | 1.04 | .030   | .041 | 6     |
| b4     | 4.95        | 5.46 | .195   | .215 | 4     |
| c      | 0.46        | 0.61 | .018   | .024 |       |
| c1     | 0.41        | 0.56 | .016   | .022 | 6     |
| c2     | 0.46        | 0.89 | .018   | .035 |       |
| D      | 5.97        | 6.22 | .235   | .245 | 3     |
| D1     | 5.21        | —    | .205   | —    | 4     |
| E      | 6.35        | 6.73 | .250   | .265 | 3     |
| E1     | 4.32        | —    | .170   | —    | 4     |
| e      | 2.29        | BSC  | .090   | BSC  |       |
| L      | 8.89        | 9.65 | .350   | .380 |       |
| L1     | 1.91        | 2.29 | .045   | .090 |       |
| L2     | 0.89        | 1.27 | .035   | .050 | 4     |
| L3     | 0.89        | 1.52 | .035   | .060 | 5     |
| ∅1     | 0'          | 15'  | 0'     | 15'  |       |
| ∅2     | 25'         | 35'  | 25'    | 35'  |       |

**LEAD ASSIGNMENTS**
**HEXFET**

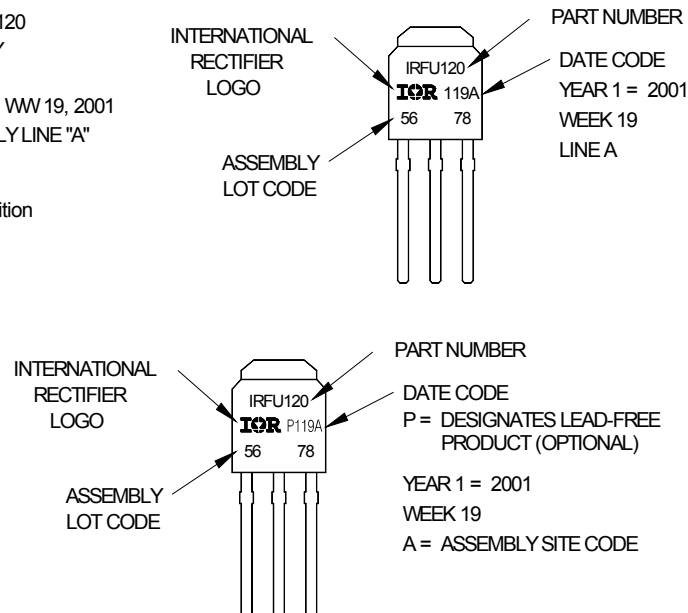
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

## I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120  
 WITH ASSEMBLY  
 LOT CODE 5678  
 ASSEMBLED ON WW 19, 2001  
 IN THE ASSEMBLY LINE "A"

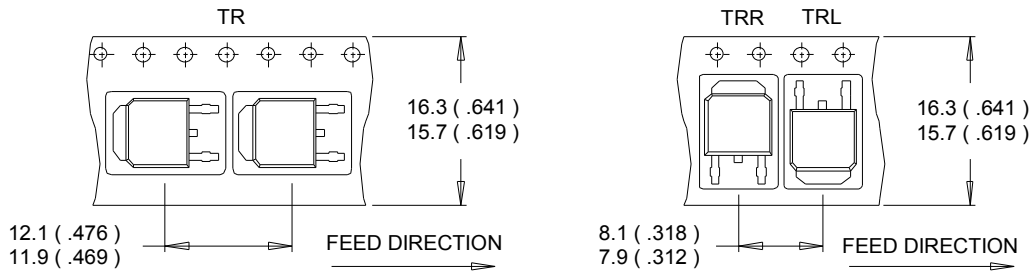
Note: "P" in assembly line position  
 indicates Lead-Free"

OR

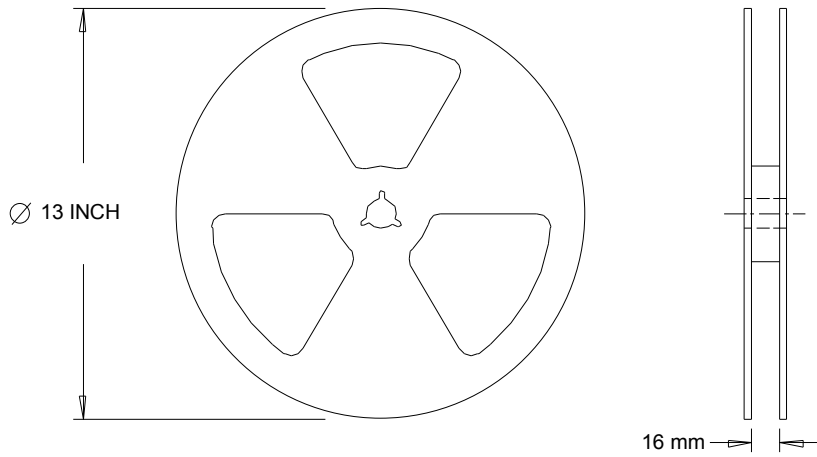


Note: For the most current drawing please refer to Infineon's web site [www.infineon.com](http://www.infineon.com)

D-Pak (TO-252AA) Tape & 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 Infineon's web site [www.infineon.com](http://www.infineon.com)

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

|                                   |   |  |
|-----------------------------------|---|--|
| <b>Qualification Level</b>        | Industrial<br>(per JEDEC JESD47F) <sup>††</sup> |  |
| <b>Moisture Sensitivity Level</b> | D-Pak   | MSL1<br><br>(per JEDEC J-STD-020D) <sup>††</sup> |
|                                   | I-Pak   |  |
| <b>RoHS Compliant</b>             | Yes   |  |

† Qualification standards can be found at Infineon's web site [www.infineon.com](http://www.infineon.com)

†† Applicable version of JEDEC standard at the time of product release.

**Revision History**

| Date      | Comments   |
|-----------|--|
| 5/31/2016 | <ul style="list-style-type: none"> <li>Updated datasheet with corporate template.</li> <li>Added disclaimer on last page.</li> </ul> |

**Trademarks of Infineon Technologies AG**

μHVIC™, μIPM™, μPFC™, AU-ConvertIR™, AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, CoolDP™, CoolGaN™, COOLiR™, CoolMOS™, CoolSET™, CoolSiC™, DAVE™, DI-POL™, DirectFET™, DrBlade™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, GaNpowIR™, HEXFET™, HITFET™, HybridPACK™, iMOTION™, IRAM™, ISOFACE™, IsoPACK™, LEDrivIR™, LITIX™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OPTIGA™, OptiMOS™, ORIGA™, PowIRaudio™, PowIRStage™, PrimePACK™, PrimeSTACK™, PROFET™, PRO-SiL™, RASIC™, REAL3™, SmartLEWIS™, SOLID FLASH™, SPOC™, StrongIRFET™, SupIRBuck™, TEMPFET™, TRENCHSTOP™, TriCore™, UHVIC™, XHP™, XMC™

Trademarks updated November 2015

**Other Trademarks**

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2016-04-19**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

**© 2016 Infineon Technologies AG.**

**All Rights Reserved.**

**Do you have a question about this document?**

**Email:** [erratum@infineon.com](mailto:erratum@infineon.com)

**Document reference**

**ifx1**

**IMPORTANT NOTICE**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("**Beschaffensgarantie**").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is **subject to customer's compliance with its obligations** stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in **customer's applications**.

The data contained in this document is exclusively intended for technically trained staff. It is the **responsibility of customer's technical departments** to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

Please note that this product is not qualified according to the AEC Q100 or AEC Q101 documents of the Automotive Electronics Council.

**WARNINGS**

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, **Infineon Technologies' products may not be used** in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.