

IRLR3802PbF
IRLU3802PbF

HEXFET® Power MOSFET

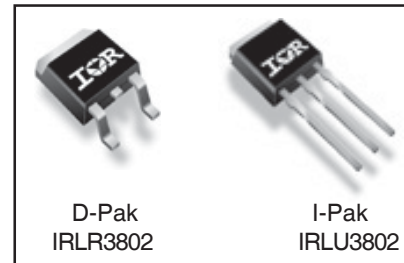
Applications

- High Frequency 3.3V and 5V input Point-of-Load Synchronous Buck Converters
- Power Management for Netcom, Computing and Portable Applications.
- Lead-Free

| V_{DSS} | $R_{DS(on)}$ max | Q_g |
|-----------|------------------|-------|
| 12V | 8.5m Ω | 27nC |

Benefits

- Ultra-Low Gate Impedance
- Very Low $R_{DS(on)}$
- Fully Characterized Avalanche Voltage and Current



Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|---------------------------------|--|--------------|----------------------|
| V_{DS} | Drain-Source Voltage | 12 | V |
| V_{GS} | Gate-to-Source Voltage | ± 12 | V |
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 4.5\text{V}$ | 84 ④ | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 4.5\text{V}$ | 60 ④ | |
| I_{DM} | Pulsed Drain Current ① | 320 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Maximum Power Dissipation | 88 | W |
| $P_D @ T_C = 100^\circ\text{C}$ | Maximum Power Dissipation | 44 | W |
| | Linear Derating Factor | 0.59 | mW/ $^\circ\text{C}$ |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to + 175 | $^\circ\text{C}$ |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|----------------------------------|------|------|---------------------------|
| $R_{\theta JC}$ | Junction-to-Case | — | 1.7 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB mount)* | — | 40 | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 110 | |

Notes ① through ④ are on page 9
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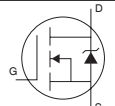
Static @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------------------------|---|------|-------|------|-------|--|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | 12 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 0.009 | — | V/°C | Reference to 25°C, I _D = 1mA ③ |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 6.5 | 8.5 | mΩ | V _{GS} = 4.5V, I _D = 15A ③ |
| | | — | — | 30 | | V _{GS} = 2.8V, I _D = 12A |
| V _{GS(th)} | Gate Threshold Voltage | 0.6 | — | 1.9 | V | V _{DS} = V _{GS} , I _D = 250μA |
| ΔV _{GS(th)} /ΔT _J | Gate Threshold Voltage Coefficient | — | -3.2 | — | mV/°C | |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | 100 | μA | V _{DS} = 9.6V, V _{GS} = 0V |
| | | — | — | 250 | | V _{DS} = 9.6V, V _{GS} = 0V, T _J = 125°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | 200 | nA | V _{GS} = 12V |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | V _{GS} = -12V |
| g _{fs} | Forward Transconductance | 31 | — | — | S | V _{DS} = 6.0V, I _D = 12A |
| Q _g | Total Gate Charge | — | 27 | 41 | | |
| Q _{gs1} | Pre-V _{th} Gate-Source Charge | — | 3.6 | — | | V _{DS} = 6.0V |
| Q _{gs2} | Post-V _{th} Gate-Source Charge | — | 2.0 | — | | V _{GS} = 5.0V |
| Q _{gd} | Gate-to-Drain Charge | — | 10 | — | nC | I _D = 6.0A |
| Q _{godr} | Gate Charge Overdrive | — | 11 | — | | See Fig.16 |
| Q _{sw} | Switch Charge (Q _{gs2} + Q _{gd}) | — | 12 | — | | |
| Q _{oss} | Output Charge | — | 28 | — | nC | V _{DS} = 10V, V _{GS} = 0V |
| t _{d(on)} | Turn-On Delay Time | — | 11 | — | ns | V _{DD} = 6.0V, V _{GS} = 4.5V ③ |
| t _r | Rise Time | — | 14 | — | | I _D = 12A |
| t _{d(off)} | Turn-Off Delay Time | — | 21 | — | | Clamped Inductive Load |
| t _f | Fall Time | — | 17 | — | | |
| C _{iss} | Input Capacitance | — | 2490 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 2150 | — | | V _{DS} = 6.0V |
| C _{rss} | Reverse Transfer Capacitance | — | 530 | — | | f = 1.0MHz |

Avalanche Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|--------------------------------|------|------|-------|
| E _{AS} | Single Pulse Avalanche Energy② | — | 300 | mJ |
| I _{AR} | Avalanche Current① | — | 20 | A |

Diode Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 84④ | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 320 | | |
| V _{SD} | Diode Forward Voltage | — | 0.81 | 1.2 | V | T _J = 25°C, I _S = 12A, V _{GS} = 0V ③ |
| | | — | 0.65 | — | | T _J = 125°C, I _S = 12A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 52 | 78 | ns | T _J = 25°C, I _F = 12A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 54 | 81 | nC | di/dt = 100A/μs ③ |
| t _{rr} | Reverse Recovery Time | — | 50 | 75 | ns | T _J = 125°C, I _F = 12A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 50 | 75 | nC | di/dt = 100A/μs ③ |

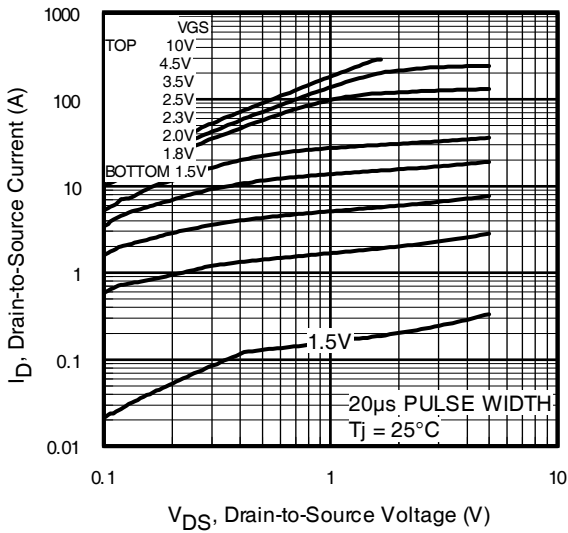


Fig 1. Typical Output Characteristics

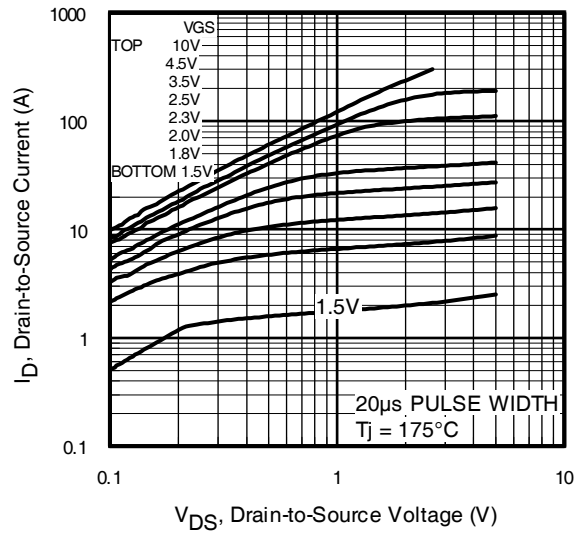


Fig 2. Typical Output Characteristics

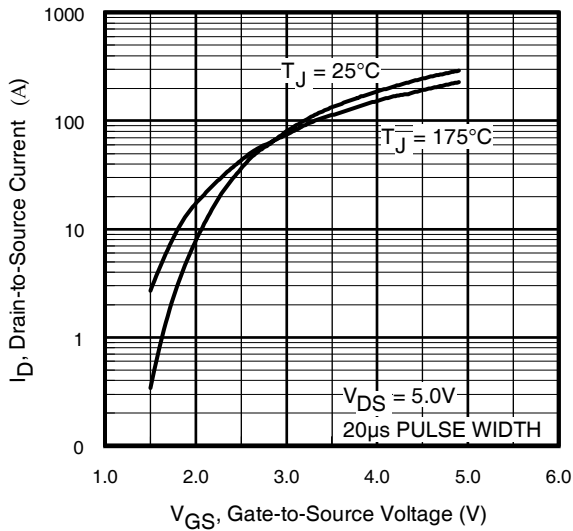


Fig 3. Typical Transfer Characteristics

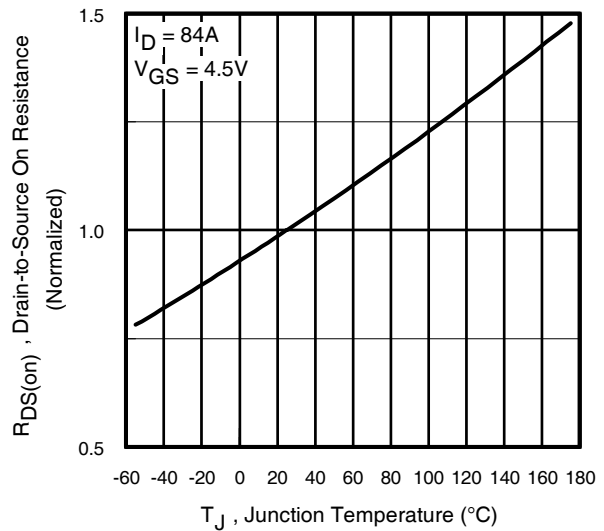


Fig 4. Normalized On-Resistance Vs. Temperature

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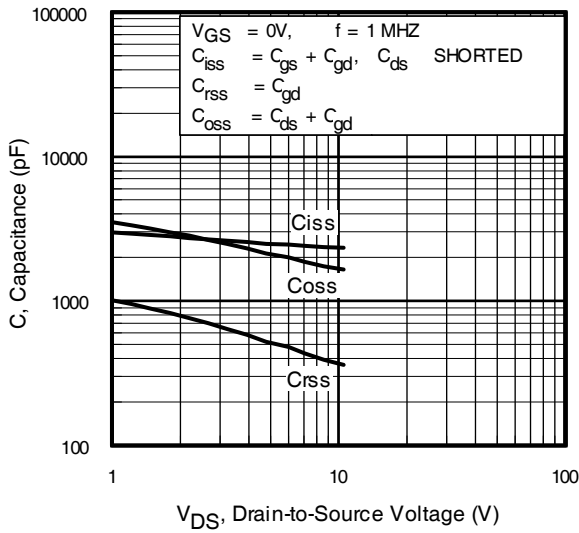


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

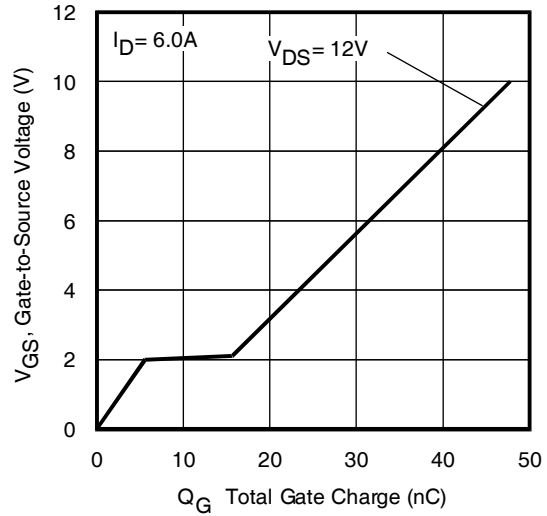


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

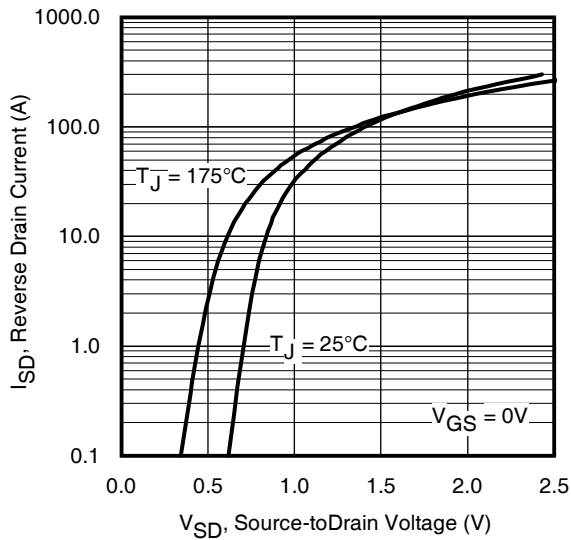


Fig 7. Typical Source-Drain Diode Forward Voltage

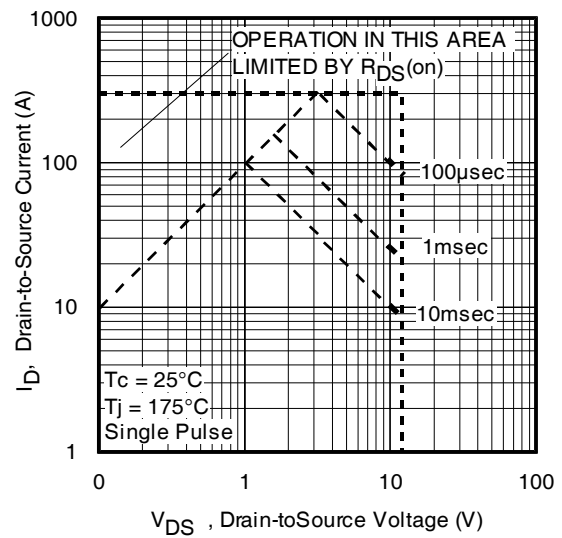


Fig 8. Maximum Safe Operating Area

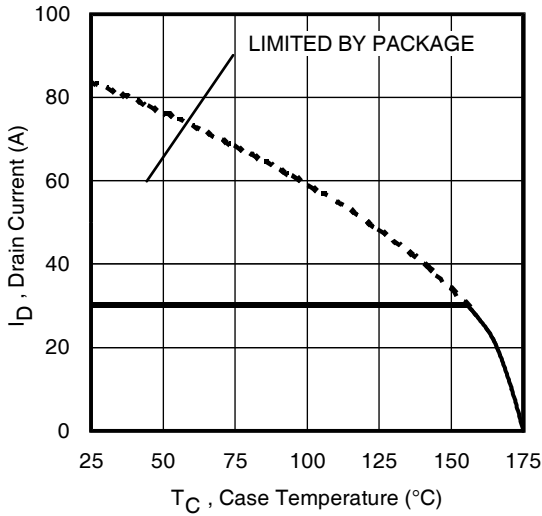


Fig 9. Maximum Drain Current Vs. Case Temperature

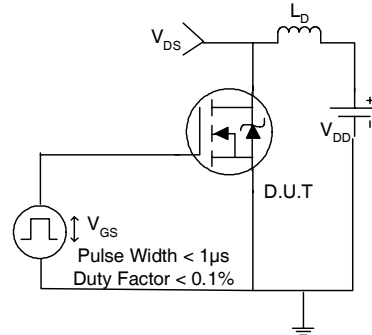


Fig 10a. Switching Time Test Circuit

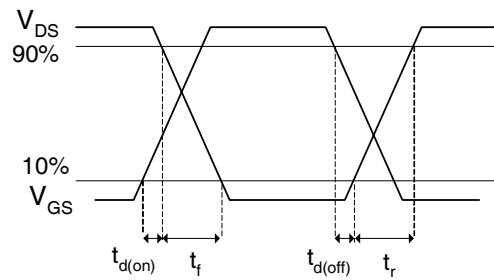


Fig 10b. Switching Time Waveforms

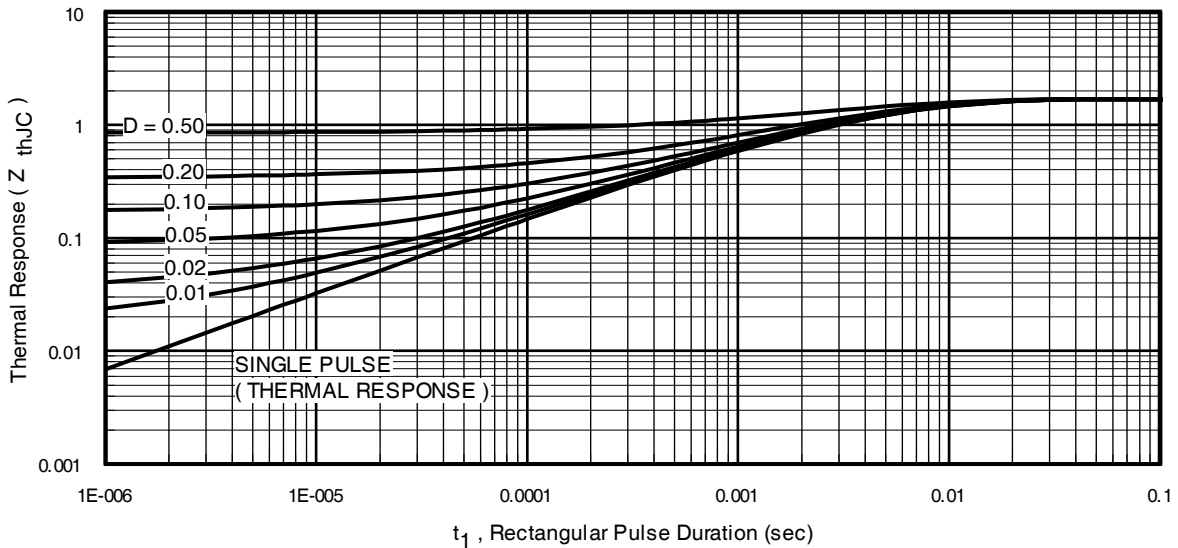


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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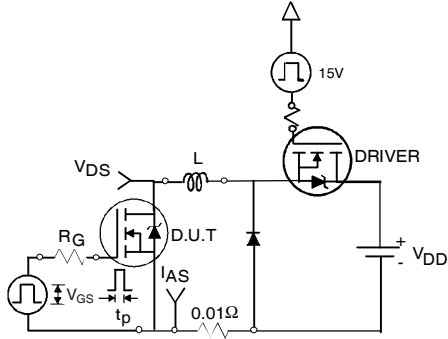


Fig 12a. Unclamped Inductive Test Circuit

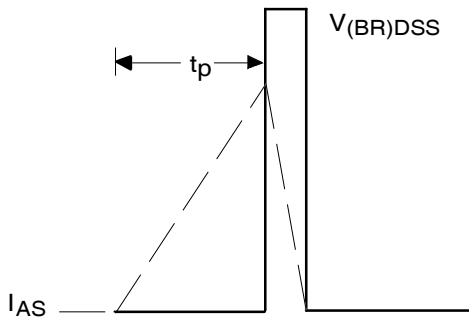


Fig 12b. Unclamped Inductive Waveforms

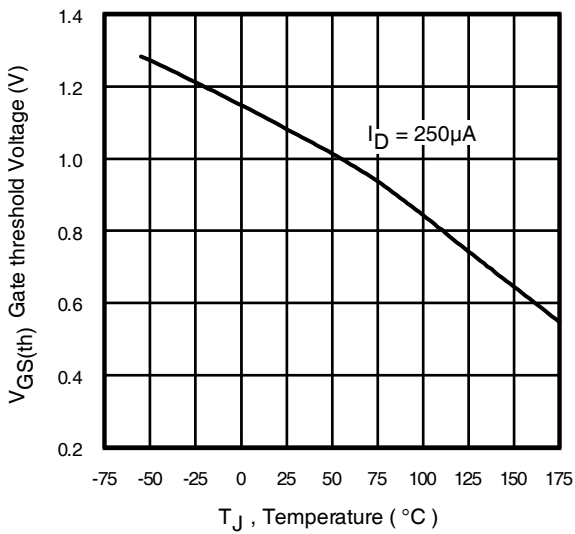


Fig 13. Threshold Voltage Vs. Temperature

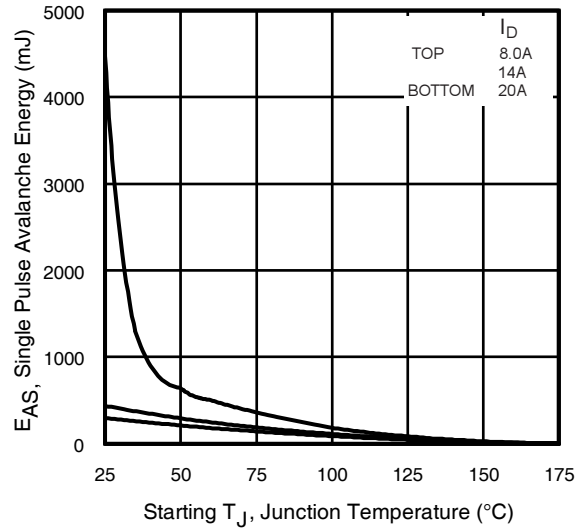


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

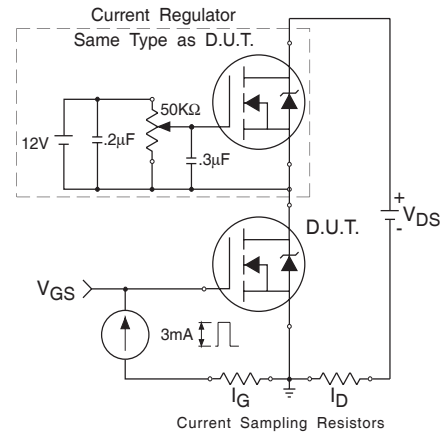


Fig 14. Gate Charge Test Circuit

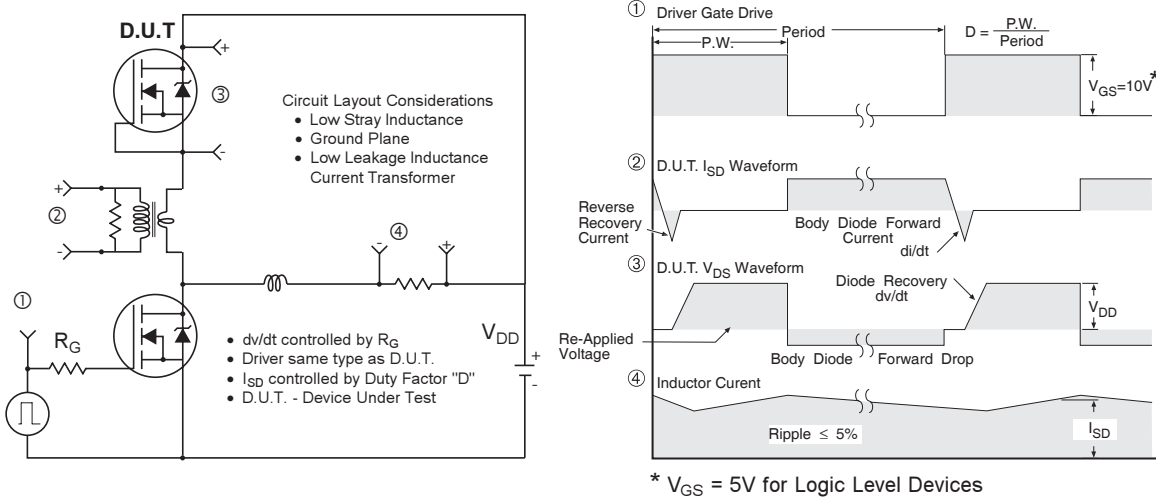


Fig 15. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET[®] Power MOSFETs

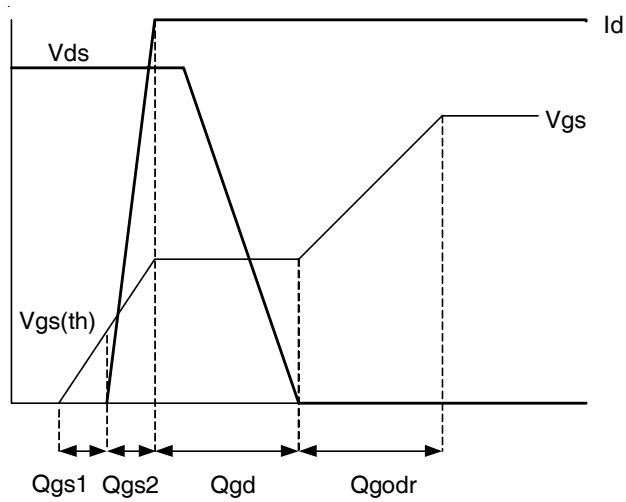


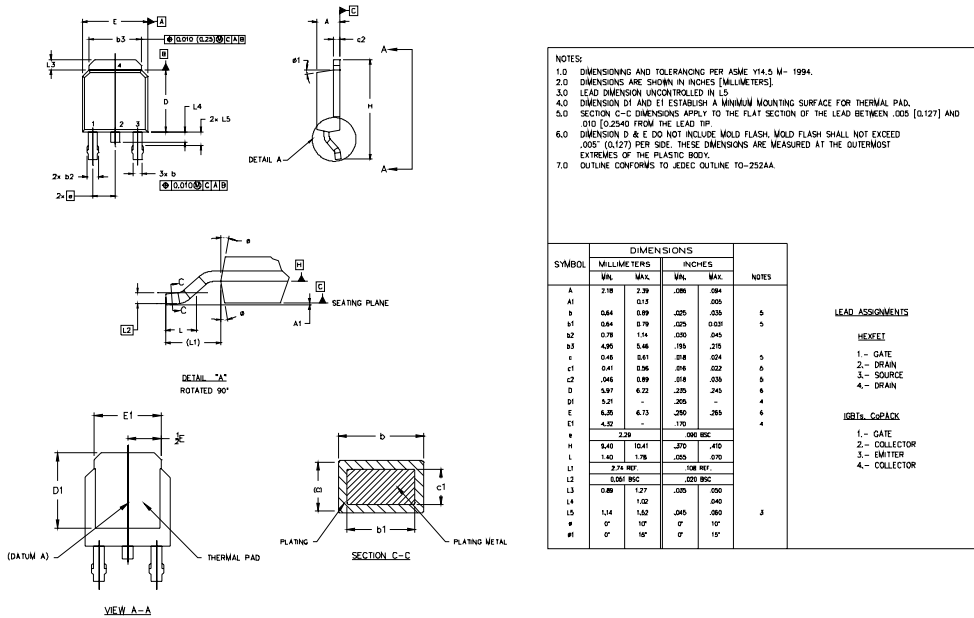
Fig 16. Gate Charge Waveform

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D-Pak (TO-252AA) Package Outline

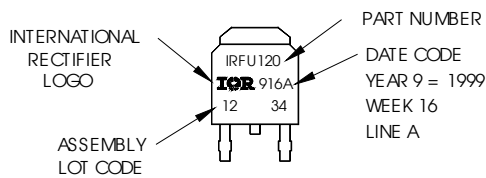
Dimensions are shown in millimeters (inches)



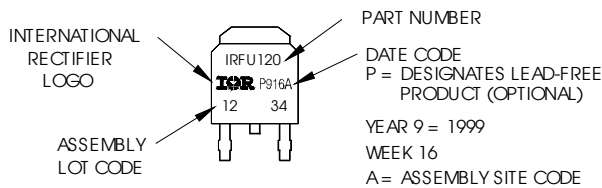
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 1999
IN THE ASSEMBLY LINE "A"

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

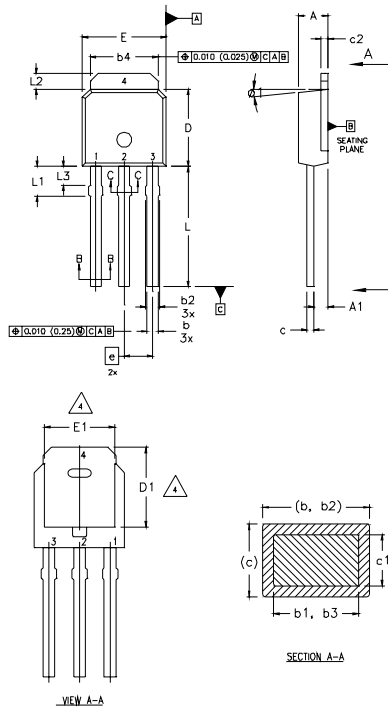


OR



I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2 DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
- 3 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 4 THERMAL PAD CONTOUR OPTION WITHIN DIMENSION b4, L2, E1 & D1.
- 5 LEAD DIMENSION UNCONTROLLED IN L3.
- 6 DIMENSION b1, b3 APPLY TO BASE METAL ONLY.
- 7 OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA.
- 8 CONTROLLING DIMENSION : INCHES.

LEAD ASSIGNMENTS

HEXFET

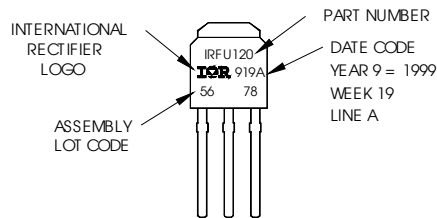
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

| SYMBOL | DIMENSIONS | | | | NOTES |
|--------|-------------|------|-----------|-------|-------|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | 2.18 | 2.39 | 0.086 | .094 | |
| A1 | 0.89 | 1.14 | 0.035 | 0.045 | |
| b | 0.64 | 0.89 | 0.025 | 0.035 | |
| b1 | 0.64 | 0.79 | 0.025 | 0.031 | 4 |
| b2 | 0.76 | 1.14 | 0.030 | 0.045 | 4 |
| b3 | 0.76 | 1.04 | 0.030 | 0.041 | |
| b4 | 5.00 | 5.46 | 0.195 | 0.215 | 4 |
| c | 0.46 | 0.61 | 0.018 | 0.024 | |
| c1 | 0.41 | 0.56 | 0.016 | 0.022 | |
| c2 | .046 | 0.86 | 0.018 | 0.035 | |
| D | 5.97 | 6.22 | 0.235 | 0.245 | 3, 4 |
| D1 | 5.21 | - | 0.205 | - | 4 |
| E | 6.35 | 6.73 | 0.250 | 0.265 | 3, 4 |
| E1 | 4.32 | - | 0.170 | - | 4 |
| e | 2.29 | | 0.090 BSC | | |
| L | 8.89 | 9.60 | 0.350 | 0.380 | |
| L1 | 1.91 | 2.29 | 0.075 | 0.090 | |
| L2 | 0.89 | 1.27 | 0.035 | 0.050 | 4 |
| L3 | 1.14 | 1.52 | 0.045 | 0.060 | 5 |
| ø1 | Ø | 15' | Ø | 15' | |

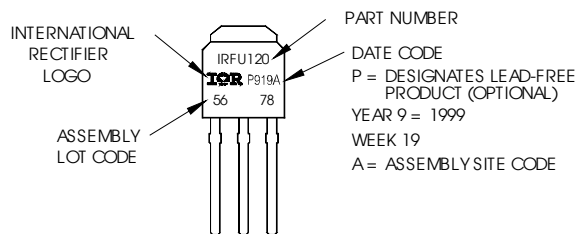
I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120
WITH ASSEMBLY
LOT CODE 5678
ASSEMBLED ON VW 19, 1999
IN THE ASSEMBLY LINE "A"

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



OR

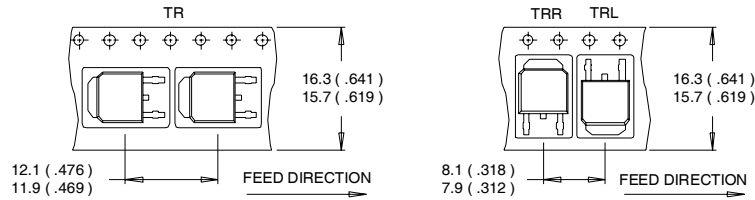


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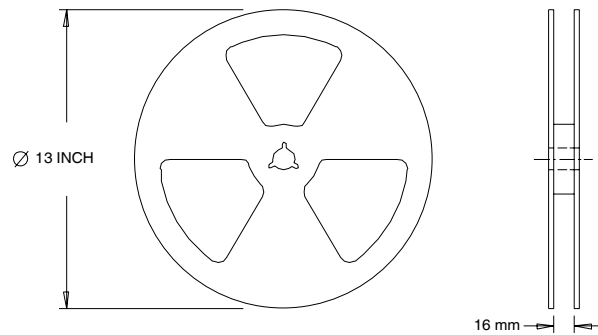
D-Pak (TO-252AA) Tape & Reel Information

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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.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
 - ② Starting $T_J = 25^\circ\text{C}$, $L = 1.4\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 20\text{A}$.
 - ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
 - ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.
- * When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrialmarket.
Qualification Standards can be found on IR's Web site.

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TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information.12/04

www.irf.com

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