

**IRLR3802**  
**IRLU3802**

HEXFET® Power MOSFET

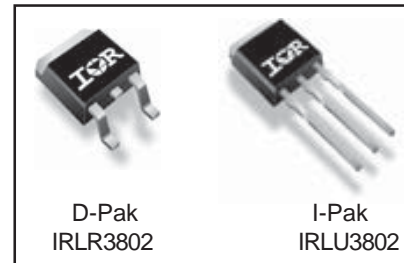
**Applications**

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

$V_{DSS}$	$R_{DS(on)}$ max	$Q_g$
12V	8.5mΩ	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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	84 ④	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	60 ④	
$I_{DM}$	Pulsed Drain Current ①	320	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	88	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	44	W
	Linear Derating Factor	0.59	mW/°C
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 175	°C

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.7	°C/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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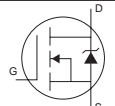
## Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.009	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA ③
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	6.5	8.5	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 15A ③
		—	—	30		V <sub>GS</sub> = 2.8V, I <sub>D</sub> = 12A
V <sub>GS(th)</sub>	Gate Threshold Voltage	0.6	—	1.9	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate Threshold Voltage Coefficient	—	-3.2	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	100	μA	V <sub>DS</sub> = 9.6V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 9.6V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	200	nA	V <sub>GS</sub> = 12V
	Gate-to-Source Reverse Leakage	—	—	-200		V <sub>GS</sub> = -12V
g <sub>fs</sub>	Forward Transconductance	31	—	—	S	V <sub>DS</sub> = 6.0V, I <sub>D</sub> = 12A
Q <sub>g</sub>	Total Gate Charge	—	27	41	nC	V <sub>DS</sub> = 6.0V V <sub>GS</sub> = 5.0V I <sub>D</sub> = 6.0A See Fig.16
Q <sub>gs1</sub>	Pre-V <sub>th</sub> Gate-Source Charge	—	3.6	—		
Q <sub>gs2</sub>	Post-V <sub>th</sub> Gate-Source Charge	—	2.0	—		
Q <sub>gd</sub>	Gate-to-Drain Charge	—	10	—		
Q <sub>godr</sub>	Gate Charge Overdrive	—	11	—		
Q <sub>sw</sub>	Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> )	—	12	—		
Q <sub>oss</sub>	Output Charge	—	28	—	nC	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V
t <sub>d(on)</sub>	Turn-On Delay Time	—	11	—	ns	V <sub>DD</sub> = 6.0V, V <sub>GS</sub> = 4.5V③ I <sub>D</sub> = 12A Clamped Inductive Load
t <sub>r</sub>	Rise Time	—	14	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	21	—		
t <sub>f</sub>	Fall Time	—	17	—		
C <sub>iss</sub>	Input Capacitance	—	2490	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 6.0V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	2150	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	530	—		

## Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	300	mJ
I <sub>AR</sub>	Avalanche Current①	—	20	A

## Diode Characteristics

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

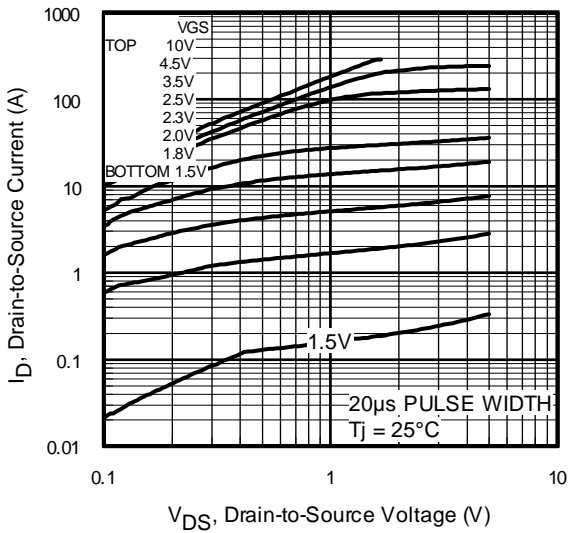


Fig 1. Typical Output Characteristics

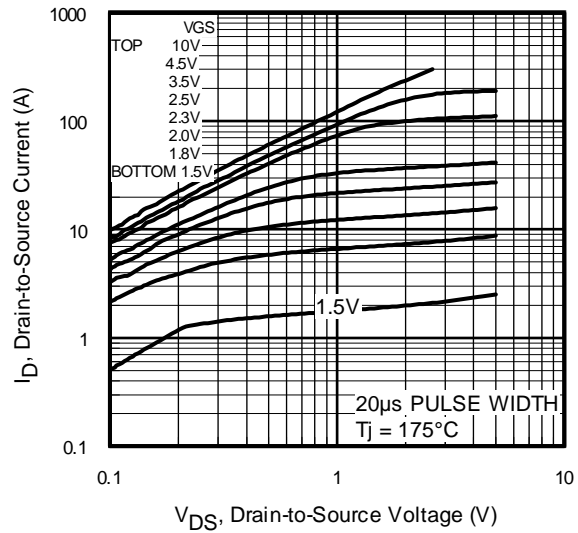


Fig 2. Typical Output Characteristics

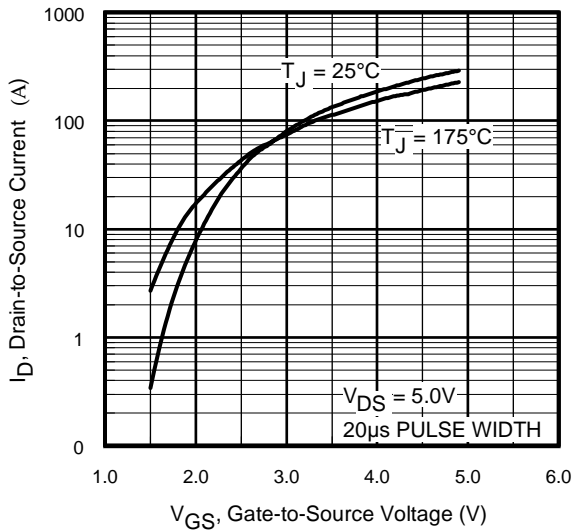


Fig 3. Typical Transfer Characteristics

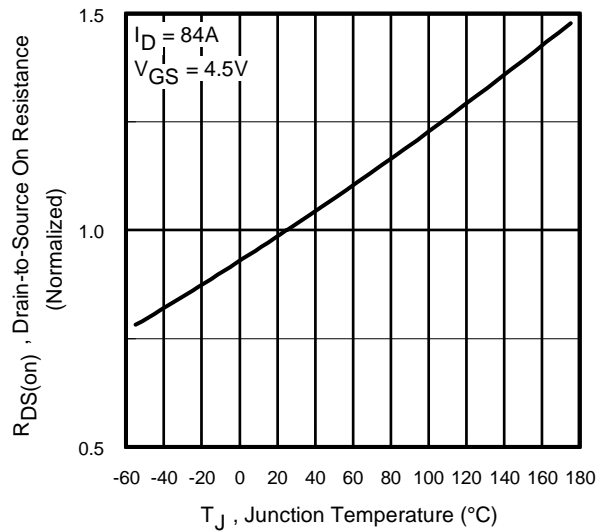
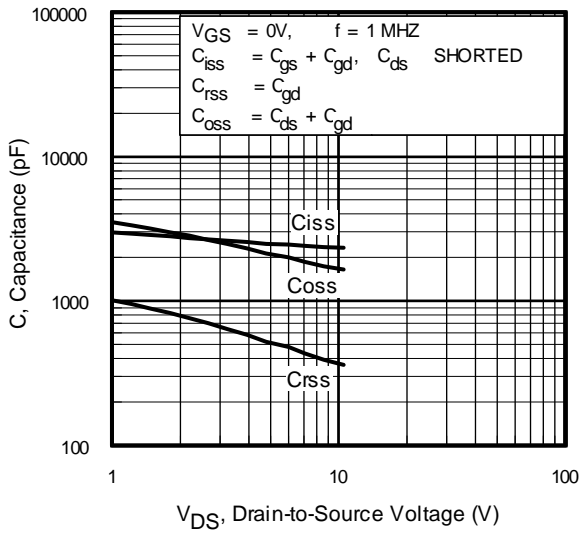
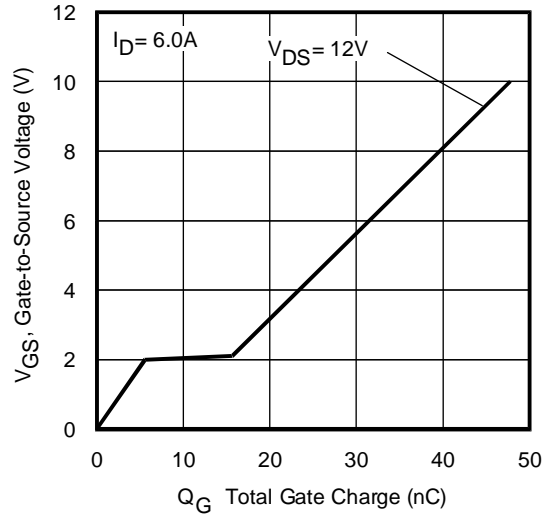


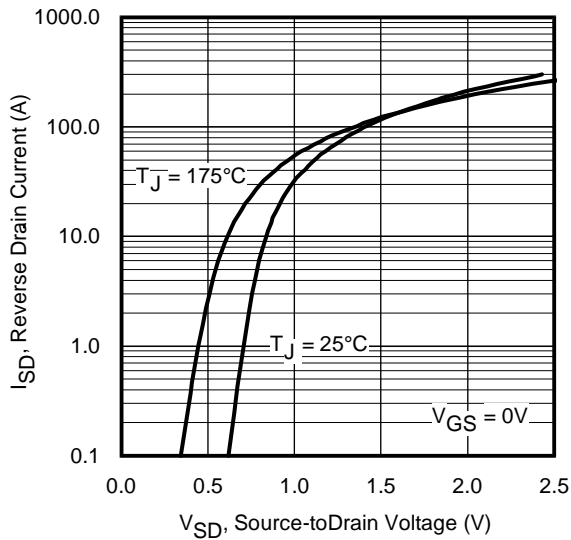
Fig 4. Normalized On-Resistance Vs. Temperature



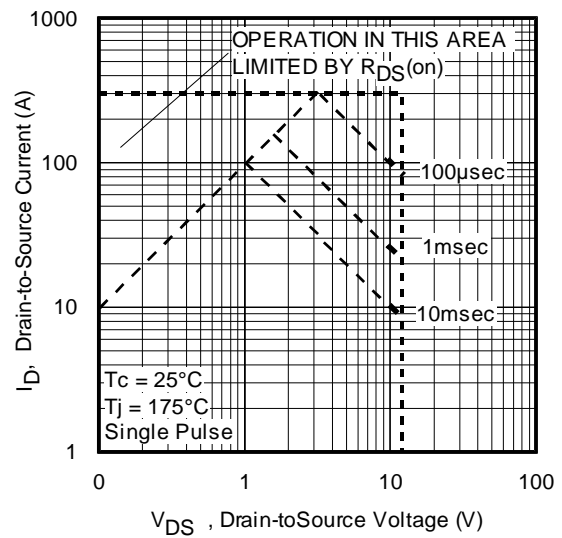
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



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



**Fig 8.** Maximum Safe Operating Area

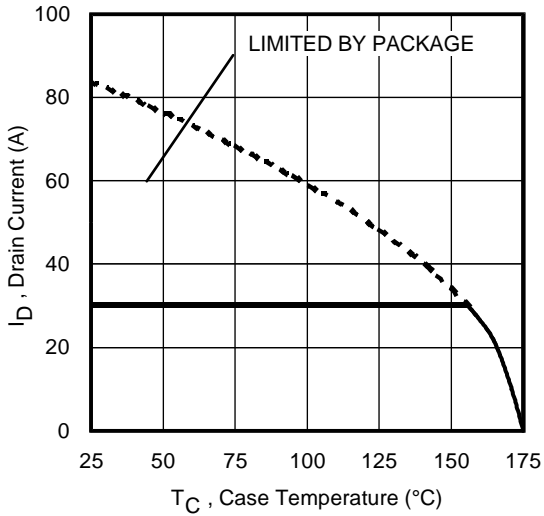


Fig 9. Maximum Drain Current Vs. Case Temperature

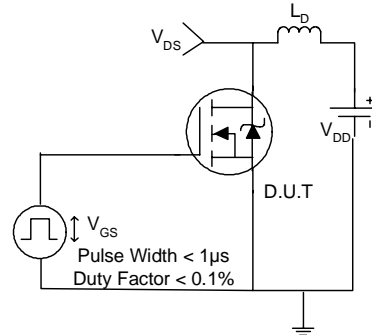


Fig 10a. Switching Time Test Circuit

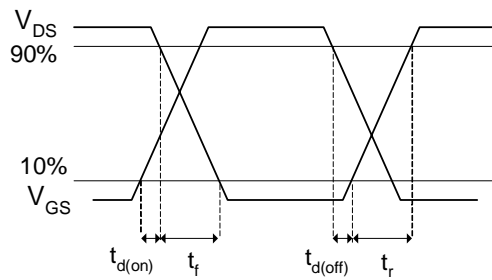


Fig 10b. Switching Time Waveforms

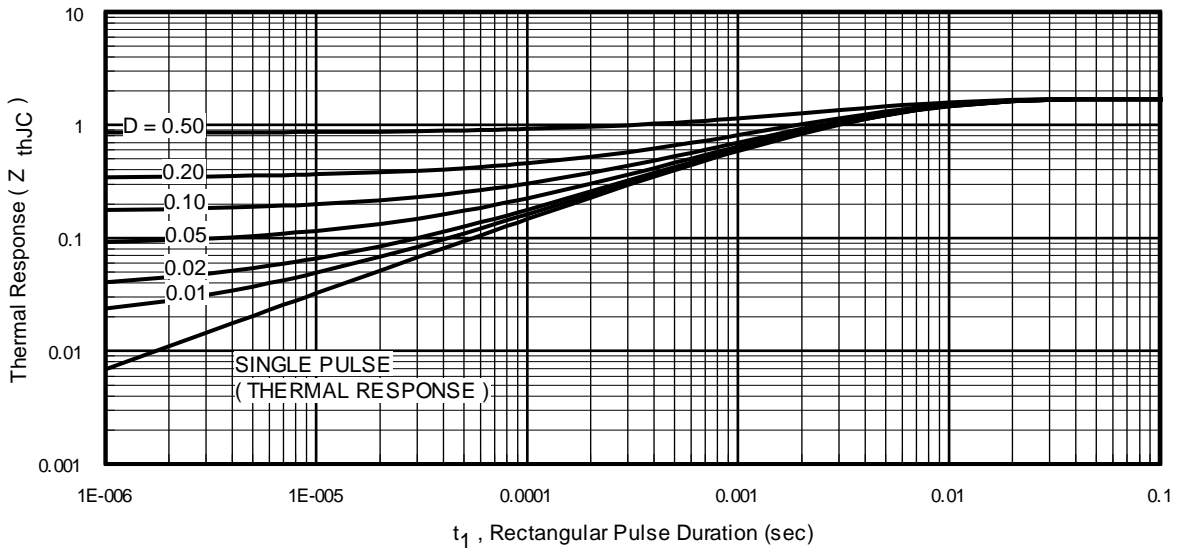
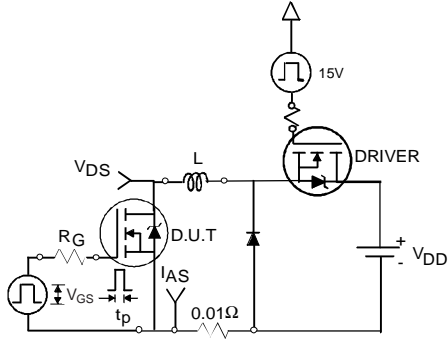
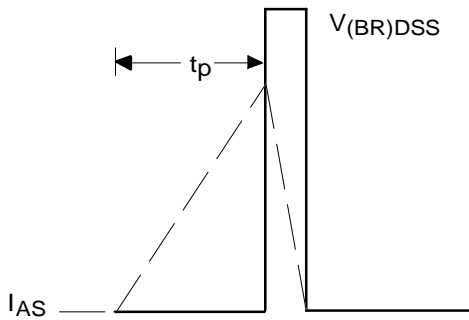


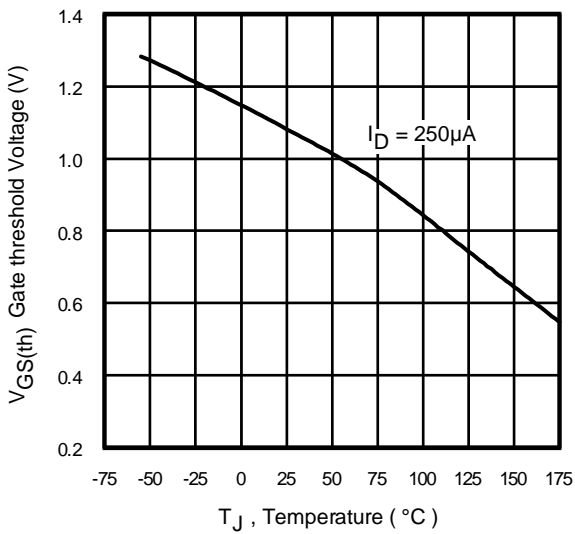
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



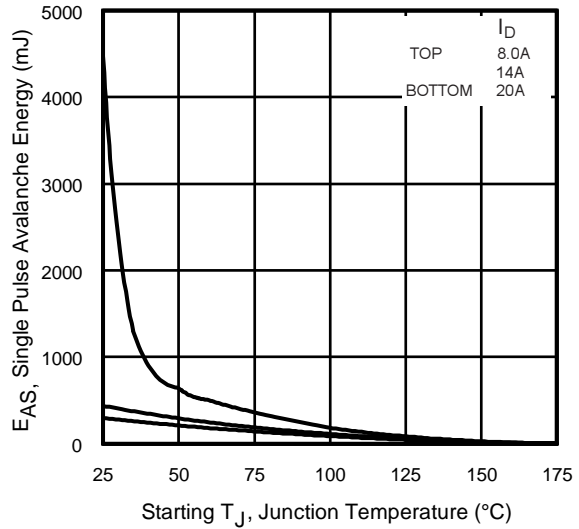
**Fig 12a.** Unclamped Inductive Test Circuit



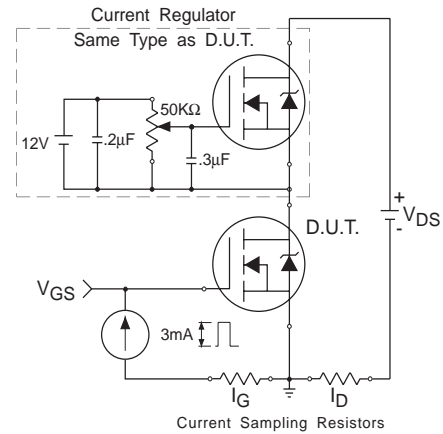
**Fig 12b.** Unclamped Inductive Waveforms



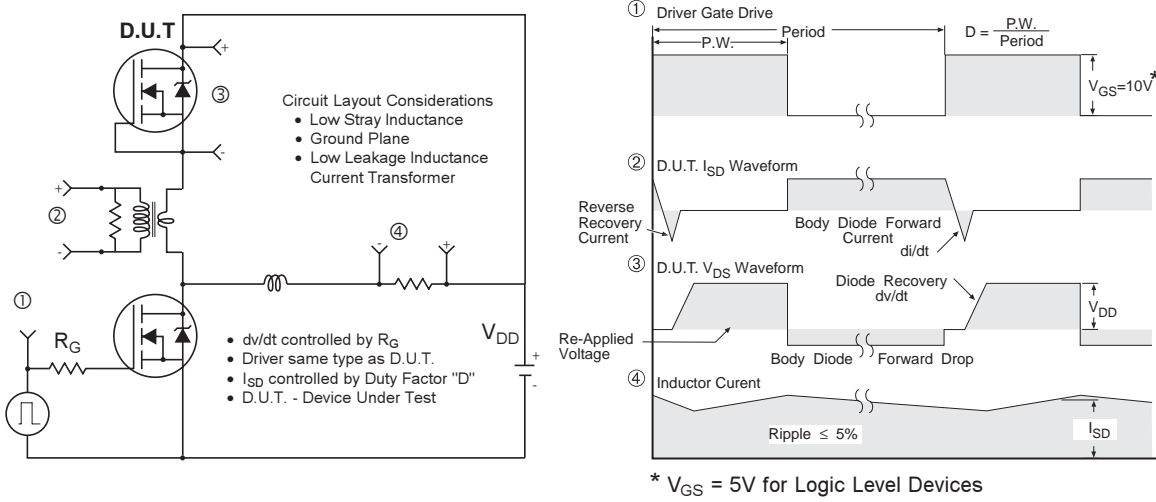
**Fig 13.** Threshold Voltage Vs. Temperature



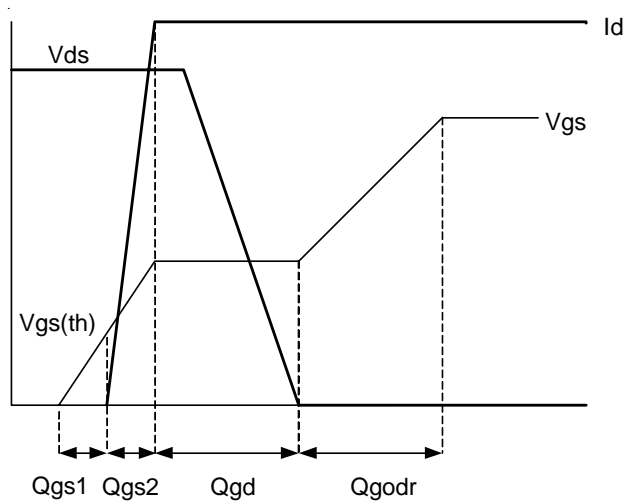
**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**Fig 14.** Gate Charge Test Circuit



**Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET<sup>®</sup> Power MOSFETs**



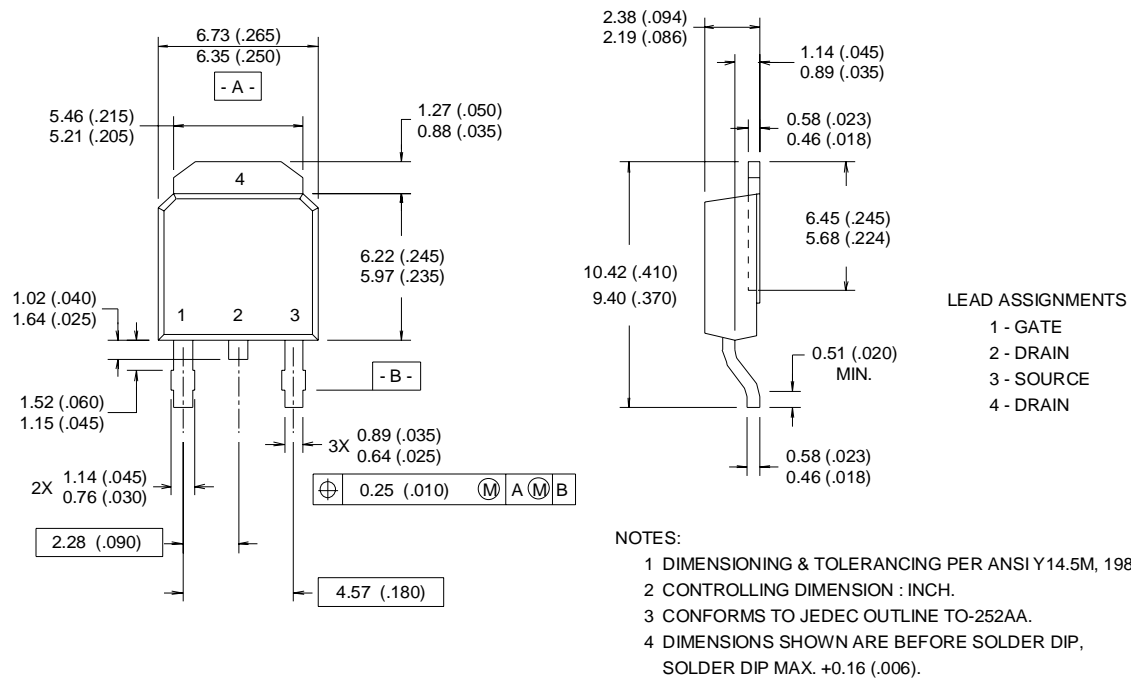
**Fig 16. Gate Charge Waveform**

# IRLR/U3802



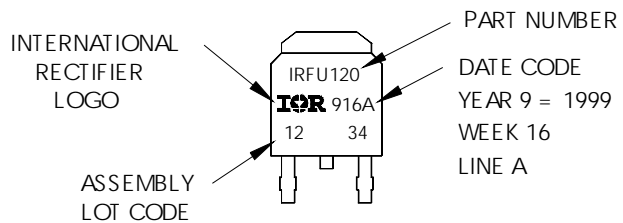
## D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



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

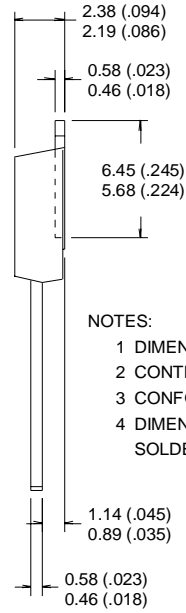
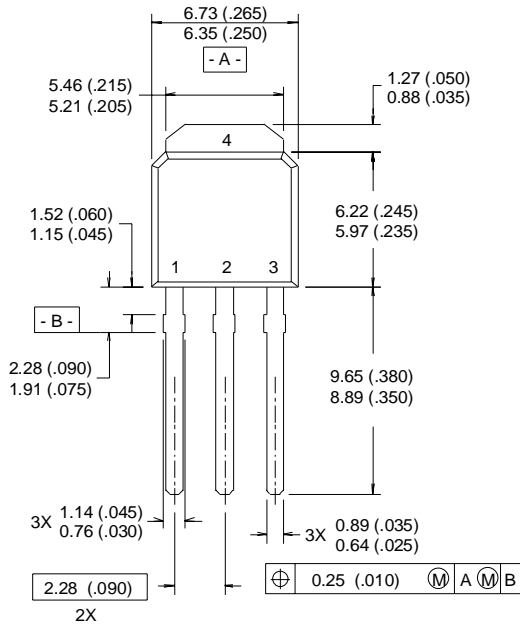
EXAMPLE: THIS IS AN IRFR120  
 WITH ASSEMBLY  
 LOT CODE 1234  
 ASSEMBLED ON WW 16, 1999  
 IN THE ASSEMBLY LINE "A"





## I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



### LEAD ASSIGNMENTS

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

### NOTES:

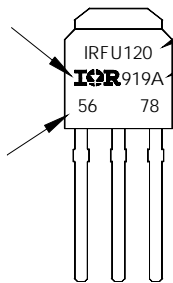
- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH.
- 3 CONFORMS TO JEDEC OUTLINE TO-252AA.
- 4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

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

EXAMPLE: THIS IS AN IRFR120  
 WITH ASSEMBLY  
 LOT CODE 5678  
 ASSEMBLED ON WW 19, 1999  
 IN THE ASSEMBLY LINE "A"

INTERNATIONAL  
 RECTIFIER  
 LOGO

ASSEMBLY  
 LOT CODE



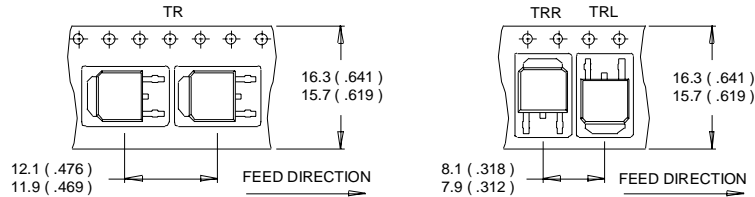
PART NUMBER  
 DATE CODE  
 YEAR 9 = 1999  
 WEEK 19  
 LINE A

# IRLR/U3802

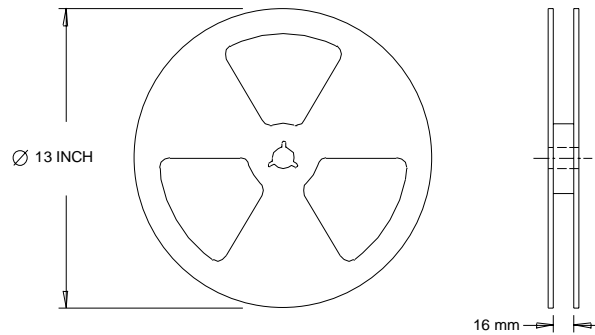
International  
**IR** Rectifier

## 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.

### 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.

International  
**IR** Rectifier

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