

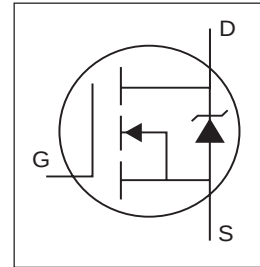
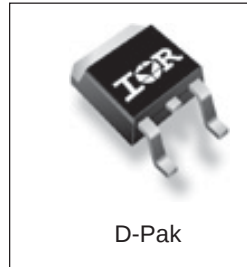
- N-Channel Application-Specific MOSFETs
- Ideal for CPU Core DC-DC Converters
- Low Conduction Losses
- Low Switching Losses
- Minimizes Parallel MOSFETs for high current applications
- 100%  $R_g$  Tested

#### Description

This new device employs advanced HEXFET Power MOSFET technology to achieve an unprecedented balance of on-resistance and gate charge. The reduced conduction and switching losses make it ideal for high efficiency DC-DC converters that power the latest generation of microprocessors.

The IRLR8103V has been optimized for all parameters that are critical in synchronous buck converters including  $R_{DS(on)}$ , gate charge and  $C_{dv}/dt$ -induced turn-on immunity. The IRLR8103V offers an extremely low combination of  $Q_{sw}$  &  $R_{DS(on)}$  for reduced losses in both control and synchronous FET applications.

The package is designed for vapor phase, infra-red, convection, or wave soldering techniques. Power dissipation of greater than 2W is possible in a typical PCB mount application.



#### DEVICE CHARACTERISTICS<sup>⑤</sup>

|              | <b>IRLR8103V</b> |
|--------------|------------------|
| $R_{DS(on)}$ | 7.9 m $\Omega$   |
| $Q_G$        | 27 nC            |
| $Q_{sw}$     | 12 nC            |
| $Q_{oss}$    | 29nC             |

#### Absolute Maximum Ratings

| Parameter                                                |           | Symbol         | IRLR8103V  | Units |
|----------------------------------------------------------|-----------|----------------|------------|-------|
| Drain-Source Voltage                                     |           | $V_{DS}$       | 30         | V     |
| Gate-Source Voltage                                      |           | $V_{GS}$       | $\pm 20$   |       |
| Continuous Drain or Source Current<br>( $V_{GS} > 10V$ ) | TC = 25°C | $I_D$          | 91         | A     |
|                                                          | TC = 90°C |                | 63         |       |
| Pulsed Drain Current <sup>①</sup>                        |           | $I_{DM}$       | 363        |       |
| Power Dissipation <sup>③</sup>                           | TC = 25°C | $P_D$          | 115        | W     |
|                                                          | TC = 90°C |                | 60         |       |
| Junction & Storage Temperature Range                     |           | $T_J, T_{STG}$ | -55 to 150 | °C    |
| Continuous Source Current (Body Diode)                   |           | $I_S$          | 91         | A     |
| Pulsed Source Current <sup>①</sup>                       |           | $I_{SM}$       | 363        |       |

#### Thermal Resistance

| Parameter                                 | Symbol          | Typ. | Max. | Units |
|-------------------------------------------|-----------------|------|------|-------|
| Maximum Junction-to-Ambient <sup>③⑥</sup> | $R_{\theta JA}$ | —    | 50   | °C/W  |
| Maximum Junction-to-Case <sup>⑥</sup>     | $R_{\theta JC}$ | —    | 1.09 |       |

## Electrical Characteristics

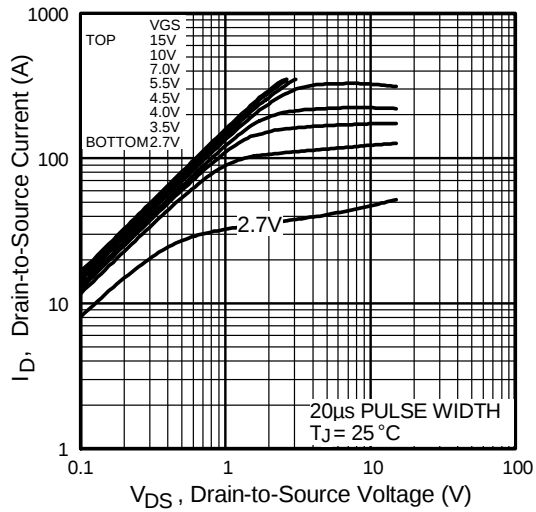
| Parameter                            | Symbol       | Min | Typ  | Max       | Units     | Conditions                                                                 |
|--------------------------------------|--------------|-----|------|-----------|-----------|----------------------------------------------------------------------------|
| Drain-to-Source Breakdown Voltage    | $BV_{DSS}$   | 30  | —    | —         | V         | $V_{GS} = 0V, I_D = 250\mu A$                                              |
| Static Drain-Source On-Resistance    | $R_{DS(on)}$ | —   | 6.9  | 9.0       | $m\Omega$ | $V_{GS} = 10V, I_D = 15A$ ②                                                |
|                                      |              | —   | 7.9  | 10.5      |           | $V_{GS} = 4.5V, I_D = 15A$ ②                                               |
| Gate Threshold Voltage               | $V_{GS(th)}$ | 1.0 | —    | 3.0       | V         | $V_{DS} = V_{GS}, I_D = 250\mu A$                                          |
| Drain-to-Source Leakage Current      | $I_{DSS}$    | —   | —    | 50        | $\mu A$   | $V_{DS} = 30V, V_{GS} = 0V$                                                |
|                                      |              | —   | —    | 20        | $\mu A$   | $V_{DS} = 24V, V_{GS} = 0$                                                 |
|                                      |              | —   | —    | 100       | $\mu A$   | $V_{DS} = 24V, V_{GS} = 0, T_J = 100^\circ C$                              |
| Gate-Source Leakage Current          | $I_{GSS}$    | —   | —    | $\pm 100$ | nA        | $V_{GS} = \pm 20V$                                                         |
| Total Gate Charge, Control FET       | $Q_G$        | —   | 27   | —         | nC        | $V_{GS} = 5V, I_D = 15A, V_{DS} = 16V$                                     |
| Total Gate Charge, Synch FET         | $Q_G$        | —   | 23   | —         |           | $V_{GS} = 5V, V_{DS} < 100mV$                                              |
| Pre-Vth Gate-Source Charge           | $Q_{GS1}$    | —   | 4.7  | —         |           | $V_{DS} = 16V, I_D = 15A$                                                  |
| Post-Vth Gate-Source Charge          | $Q_{GS2}$    | —   | 2.0  | —         |           |                                                                            |
| Gate to Drain Charge                 | $Q_{GD}$     | —   | 9.7  | —         |           |                                                                            |
| Switch Charge ( $Q_{gs2} + Q_{gd}$ ) | $Q_{SW}$     | —   | 12   | —         |           |                                                                            |
| Output Charge                        | $Q_{OSS}$    | —   | 29   | —         |           | $V_{DS} = 16V, V_{GS} = 0$                                                 |
| Gate Resistance                      | $R_G$        | 0.8 | —    | 3.1       | $\Omega$  |                                                                            |
| Turn-On Delay Time                   | $t_{d(on)}$  | —   | 10   | —         | ns        | $V_{DD} = 16V$<br>$I_D = 15A$<br>$V_{GS} = 5.0V$<br>Clamped Inductive Load |
| Rise Time                            | $t_r$        | —   | 9    | —         |           |                                                                            |
| Turn-Off Delay Time                  | $t_{d(off)}$ | —   | 24   | —         |           |                                                                            |
| Fall Time                            | $t_f$        | —   | 18   | —         |           |                                                                            |
| Input Capacitance                    | $C_{iss}$    | —   | 2672 | —         | pF        | $V_{GS} = 16V, V_{GS}=0$                                                   |
| Output Capacitance                   | $C_{oss}$    | —   | 1064 | —         |           |                                                                            |
| Reverse Transfer Capacitance         | $C_{rss}$    | —   | 109  | —         |           |                                                                            |

## Source-Drain Rating & Characteristics

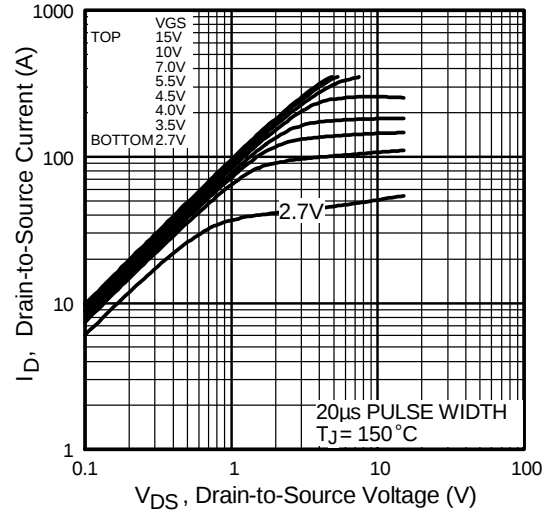
| Parameter                                          | Symbol      | Min | Typ | Max | Units | Conditions                                                                      |
|----------------------------------------------------|-------------|-----|-----|-----|-------|---------------------------------------------------------------------------------|
| Diode Forward Voltage                              | $V_{SD}$    | —   | 0.9 | 1.3 | V     | $I_S = 15A$ ②, $V_{GS} = 0V$                                                    |
| Reverse Recovery Charge ④                          | $Q_{rr}$    | —   | 103 | —   | nC    | $di/dt \sim 700A/\mu s$<br>$V_{DS} = 16V, V_{GS} = 0V, I_F = 15A$               |
| Reverse Recovery Charge (with Parallel Schottky) ④ | $Q_{rr(s)}$ | —   | 96  | —   | nC    | $di/dt = 700A/\mu s$ , (with 10BQ040)<br>$V_{DS} = 16V, V_{GS} = 0V, I_F = 15A$ |

### Notes:

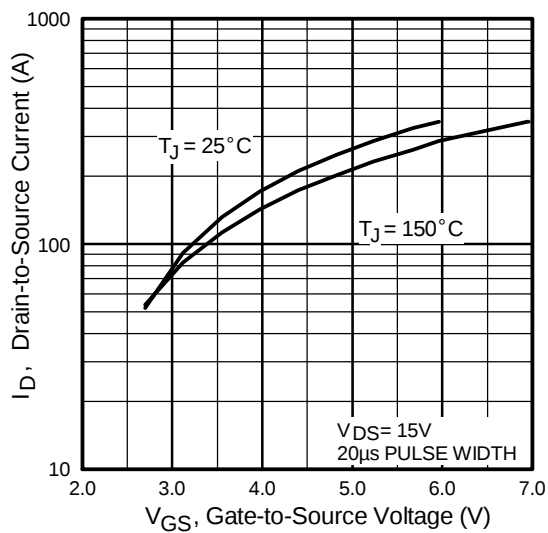
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Pulse width  $\leq 400 \mu s$ ; duty cycle  $\leq 2\%$ .
- ③ When mounted on 1 inch square copper board,  $t < 10$  sec.
- ④ Typ = measured -  $Q_{oss}$
- ⑤ Typical values of  $R_{DS(on)}$  measured at  $V_{GS} = 4.5V$ ,  $Q_G$ ,  $Q_{SW}$  and  $Q_{OSS}$  measured at  $V_{GS} = 5.0V$ ,  $I_F = 15A$ .
- ⑥  $R_\theta$  is measured at  $T_J$  approximately  $90^\circ C$



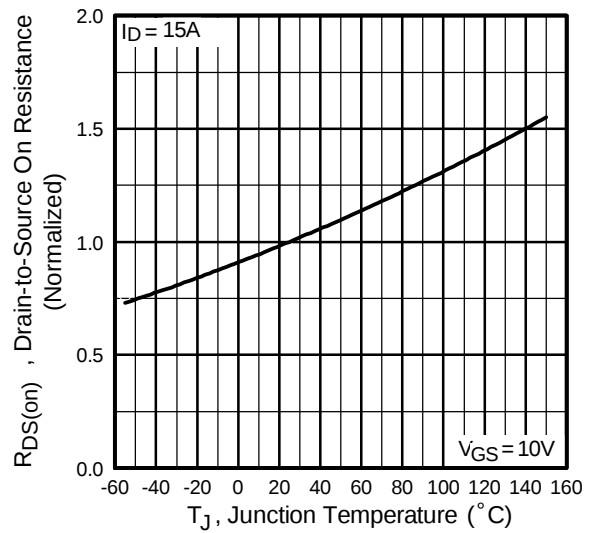
**Fig 1.** Typical Output Characteristics



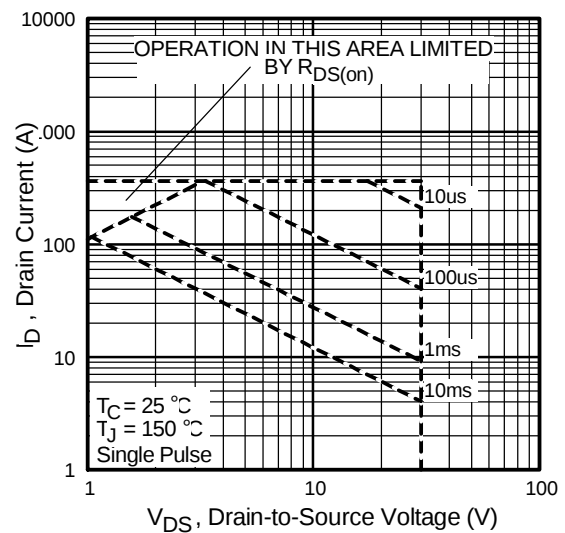
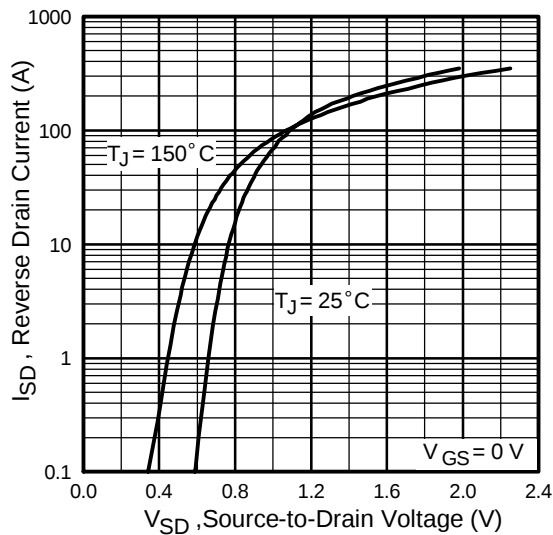
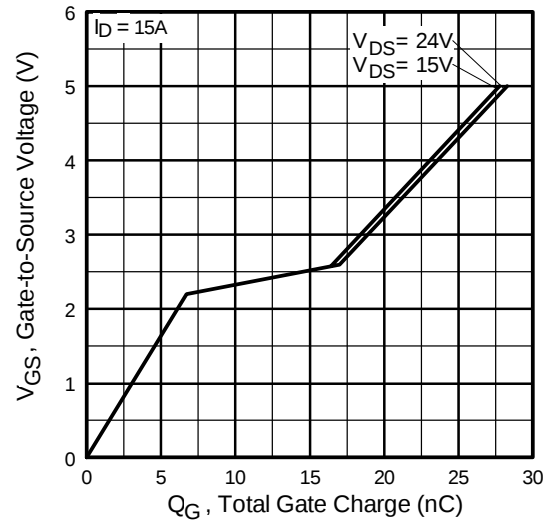
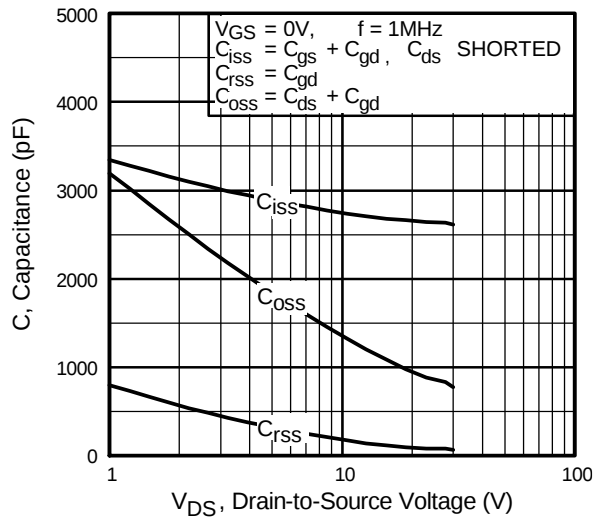
**Fig 2.** Typical Output Characteristics

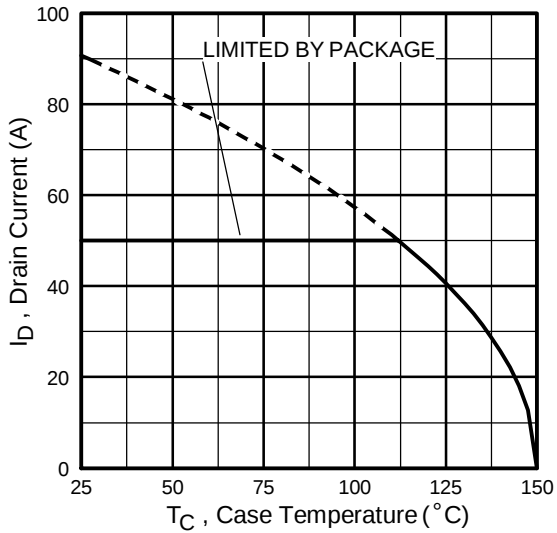


**Fig 3.** Typical Transfer Characteristics

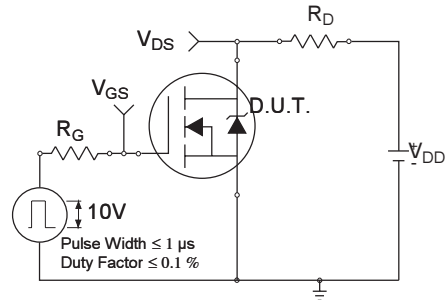


**Fig 4.** Normalized On-Resistance  
Vs. Temperature

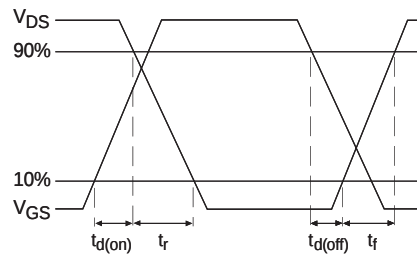




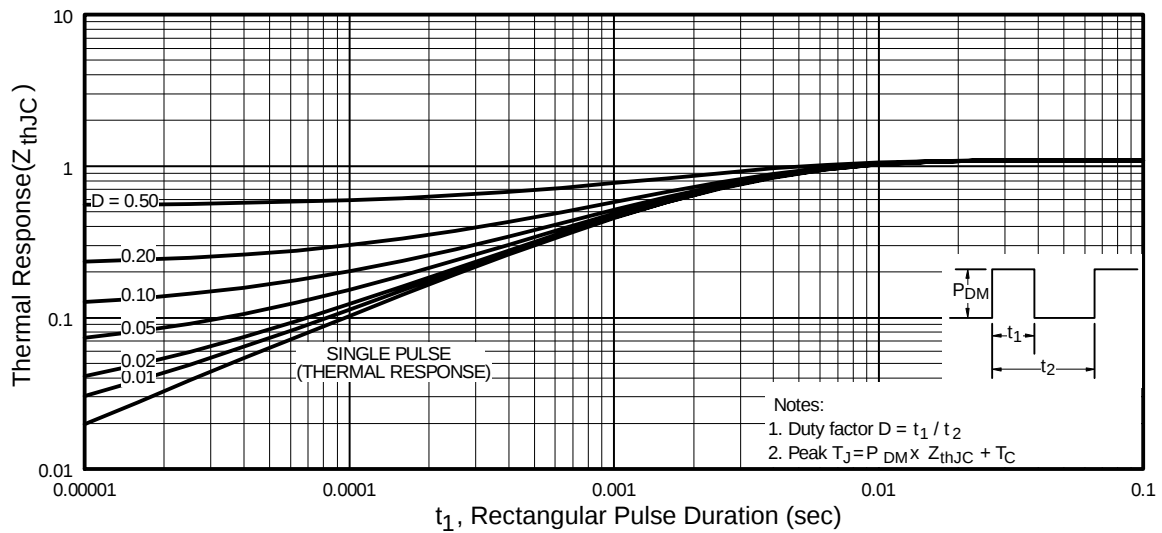
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



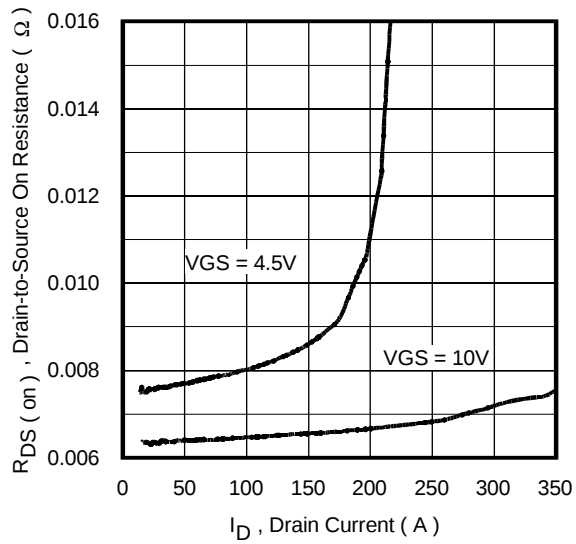
**Fig 10b.** Switching Time Waveforms



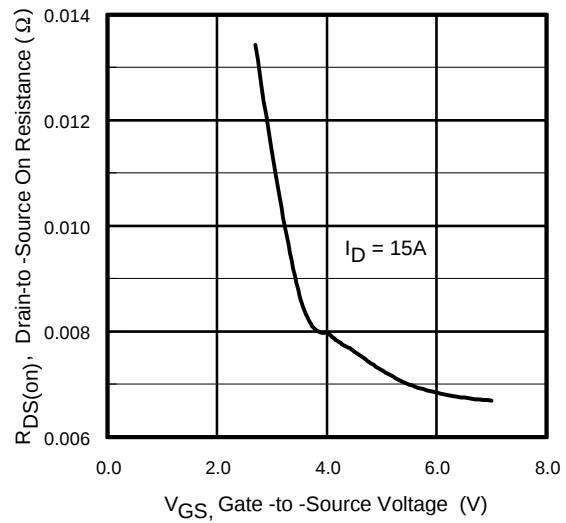
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

# IRLR8103V

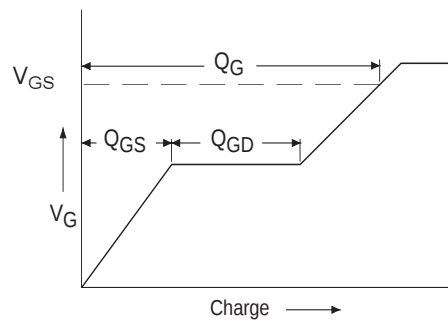
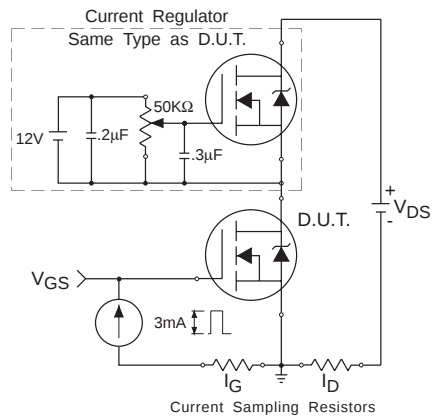
International  
**IR** Rectifier



**Fig 12.** On-Resistance Vs. Drain Current



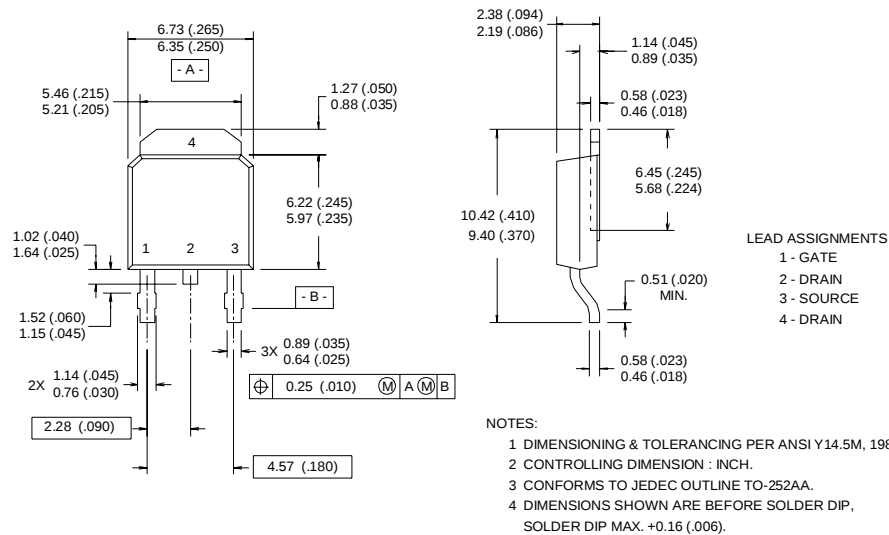
**Fig 13.** On-Resistance Vs. Gate Voltage



**Fig 14a&b.** Basic Gate Charge Test Circuit and Waveform

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

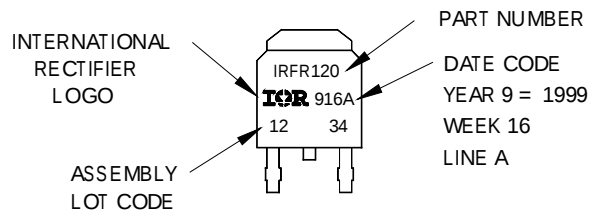
Dimensions are shown in millimeters (inches)



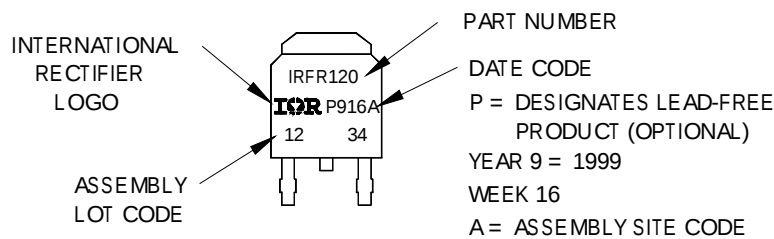
## D-Pak (TO-252AA) Part Marking Information

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**

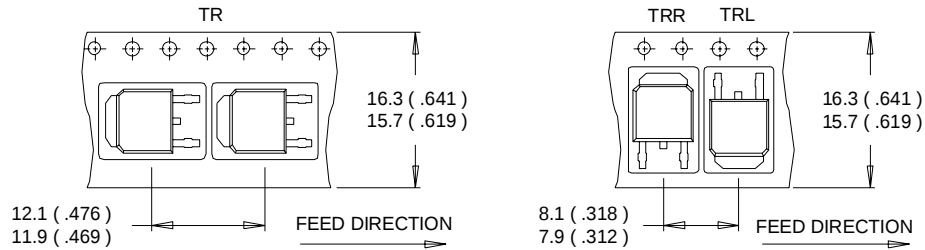


# IRLR8103V

International  
**IR** Rectifier

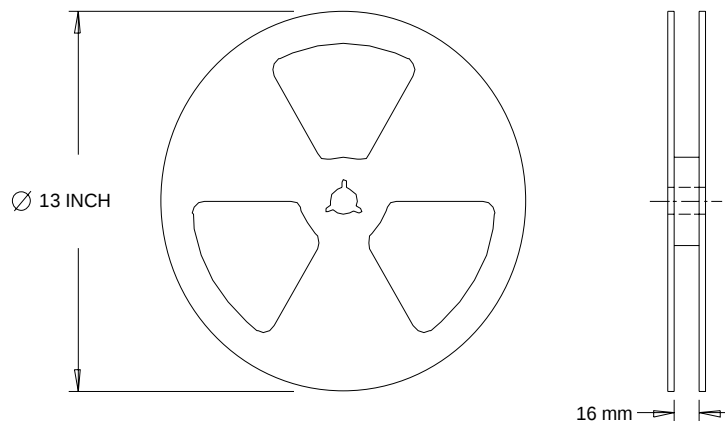
## D-Pak (TO-252AA) Tape & Reel Information

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.

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

International  
**IR** Rectifier

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