

# IRF7809AVPbF

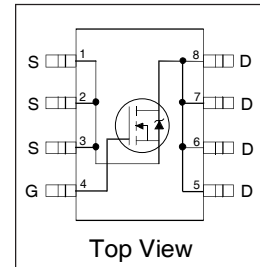
- N-Channel Application-Specific MOSFETs
- Ideal for CPU Core DC-DC Converters
- Low Conduction Losses
- Low Switching Losses
- Minimizes Parallel MOSFETs for high current applications
- 100% Tested for Rg
- Lead-Free

### 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 IRF7809AV has been optimized for all parameters that are critical in synchronous buck converters including  $R_{DS(on)}$ , gate charge and Cdv/dt-induced turn-on immunity. The IRF7809AV offers particularly low  $R_{DS(on)}$  and high Cdv/dt immunity for 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>

	IRF7809AV
$R_{DS(on)}$	7.0m $\Omega$
$Q_G$	41nC
$Q_{sw}$	14nC
$Q_{oss}$	30nC

### Absolute Maximum Ratings

Parameter	Symbol	IRF7809A V	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	
Continuous Drain or Source Current ( $V_{GS} \geq 4.5V$ )	$T_A = 25^\circ C$	$I_D$	13.3
	$T_L = 90^\circ C$		14.6
Pulsed Drain Current <sup>①</sup>	$I_{DM}$	100	A
Power Dissipation	$T_A = 25^\circ C$	$P_D$	2.5
	$T_L = 90^\circ C$		3.0
Junction & Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ C$
Continuous Source Current (Body Diode)	$I_S$	2.5	A
Pulsed Source Current <sup>①</sup>	$I_{SM}$	50	

### Thermal Resistance

Parameter		Max.	Units
Maximum Junction-to-Ambient <sup>③</sup>	$R_{\theta JA}$	50	$^\circ C/W$
Maximum Junction-to-Lead	$R_{\theta JL}$	20	$^\circ C/W$

# IRF7809AVPbF

International  
 Rectifier

## Electrical Characteristics

Parameter		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	$R_{DS(on)}$		7.0	9.0	m $\Omega$	$V_{GS} = 4.5V, I_D = 15A$ Ⓞ
Gate Threshold Voltage	$V_{GS(th)}$	1.0			V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Drain-Source Leakage Current	$I_{DSS}$			30	$\mu A$	$V_{DS} = 24V, V_{GS} = 0$
				150		$V_{DS} = 24V, V_{GS} = 0,$ $T_J = 100^\circ C$
Gate-Source Leakage Current*	$I_{GSS}$			$\pm 100$	nA	$V_{GS} = \pm 12V$
Total Gate Chg Cont FET	$Q_G$		41	62	nC	$V_{GS}=5V, I_D=15A, V_{DS}=20V$
Total Gate Chg Sync FET	$Q_G$		36	54		$V_{GS} = 5V, V_{DS} < 100mV$
Pre-Vth Gate-Source Charge	$Q_{GS1}$		7.0			$V_{DS} = 20V, I_D = 15A$
Post-Vth Gate-Source Charge	$Q_{GS2}$		2.3			
Gate to Drain Charge	$Q_{GD}$		12			$I_D=15A, V_{DS}=16V$
Switch Chg( $Q_{gs2} + Q_{gd}$ )	$Q_{sw}$		14	21		
Output Charge*	$Q_{oss}$		30	45		$V_{DS} = 16V, V_{GS} = 0$
Gate Resistance	$R_G$		1.5	3.0		$\Omega$
Turn-on Delay Time	$t_{d(on)}$		14		ns	$V_{DD} = 16V, I_D = 15A$ $V_{GS} = 5V$ Clamped Inductive Load
Rise Time	$t_r$		36			
Turn-off Delay Time	$t_{d(off)}$		96			
Fall Time	$t_f$		10			
Input Capacitance	$C_{iss}$	–	3780	–	pF	$V_{DS} = 16V, V_{GS} = 0$
Output Capacitance	$C_{oss}$	–	1060	–		
Reverse Transfer Capacitance	$C_{rss}$	–	130	–		

## Source-Drain Rating & Characteristics

Parameter		Min	Typ	Max	Units	Conditions
Diode Forward Voltage*	$V_{SD}$			1.3	V	$I_S = 15A$ Ⓞ, $V_{GS} = 0V$
Reverse Recovery ChargeⓄ	$Q_{rr}$		120		nC	$di/dt \sim 700A/\mu s$ $V_{DS} = 16V, V_{GS} = 0V, I_S = 15A$
Reverse Recovery Charge (with Parallel Schottky)Ⓞ	$Q_{rr(s)}$		150		nC	$di/dt = 700A/\mu s$ (with 10BQ040) $V_{DS} = 16V, V_{GS} = 0V, I_S = 15A$

- 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 measured at  $V_{GS} = 4.5V, I_F = 15A$ .

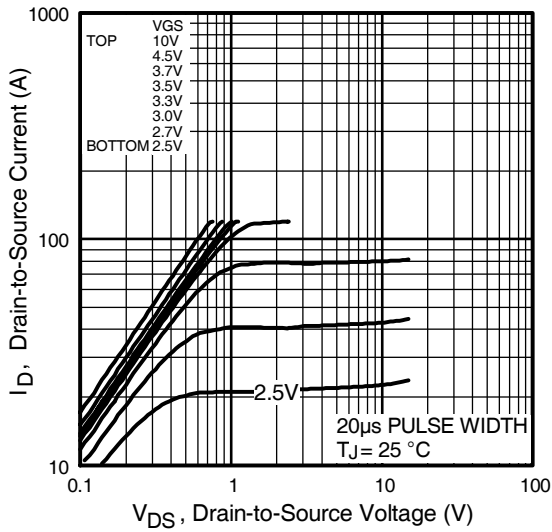


Fig 1. Typical Output Characteristics

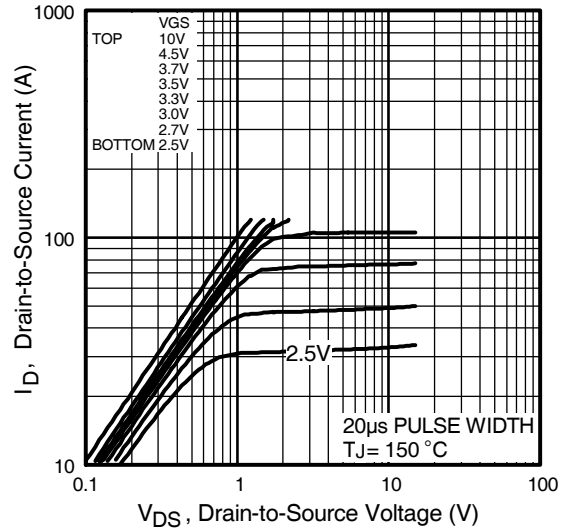


Fig 2. Typical Output Characteristics

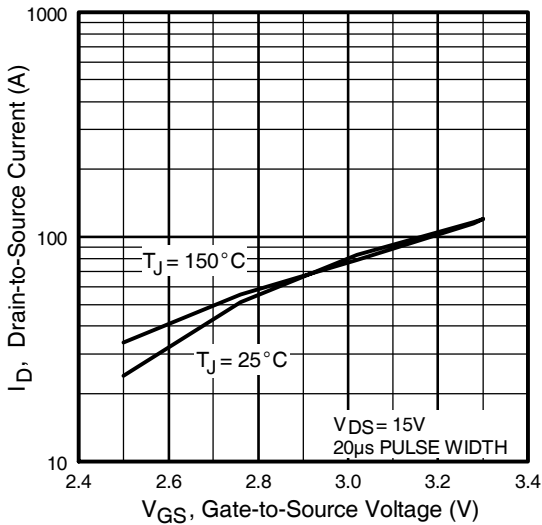


Fig 3. Typical Transfer Characteristics

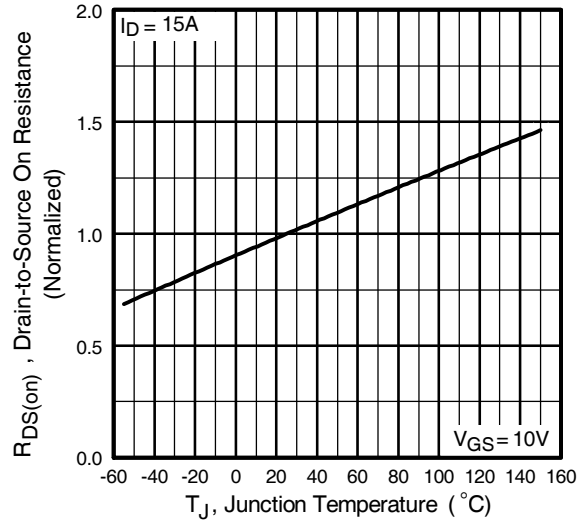
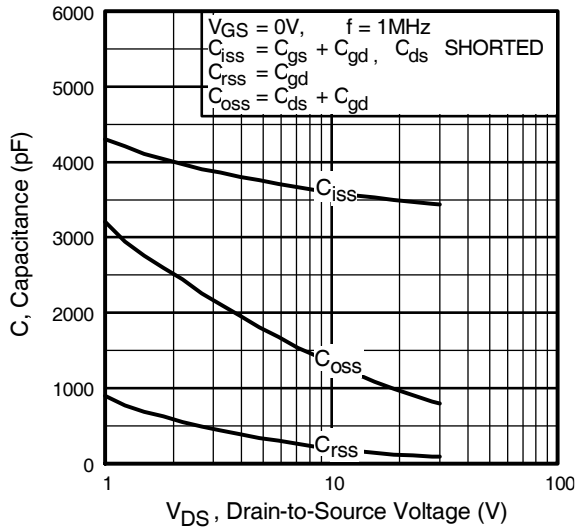


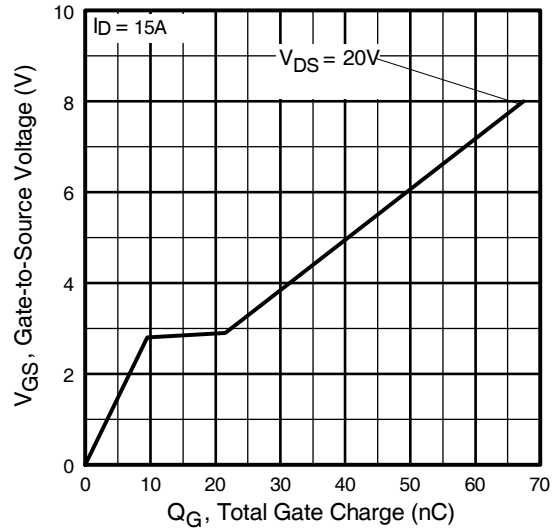
Fig 4. Normalized On-Resistance Vs. Temperature

# IRF7809AVPbF

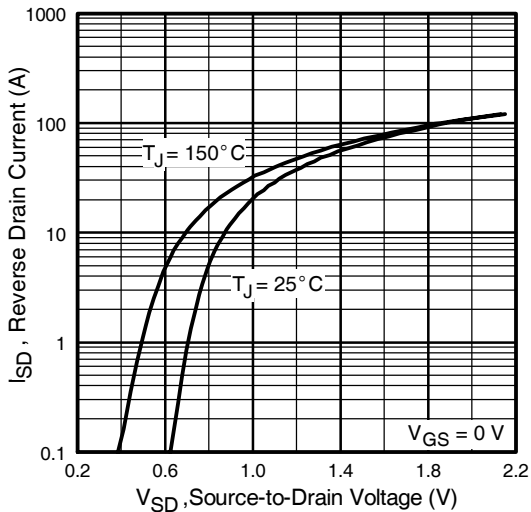
International  
**IR** Rectifier



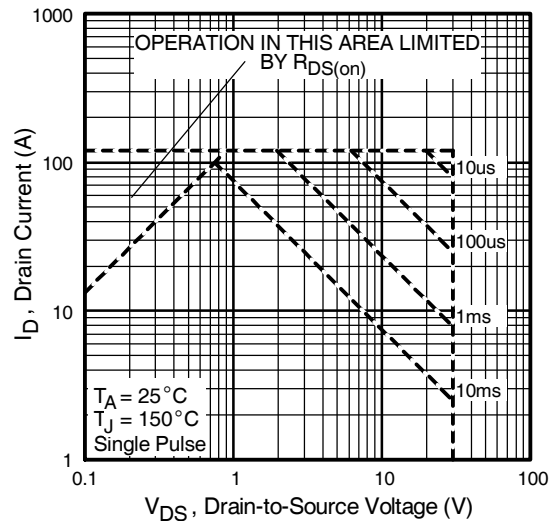
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



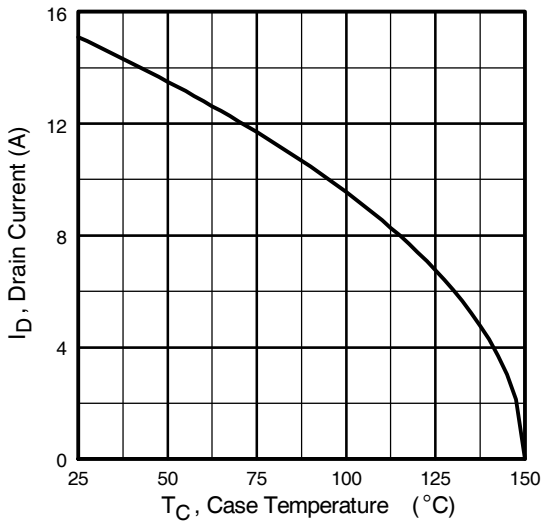
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



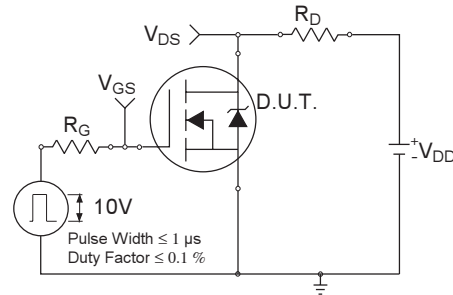
**Fig 7.** Typical Source-Drain Diode Forward Voltage



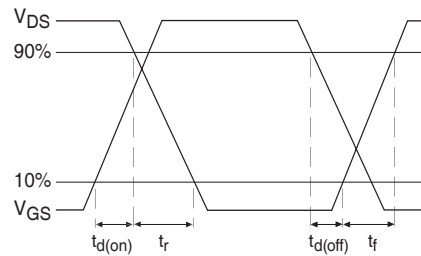
**Fig 8.** Maximum Safe Operating Area



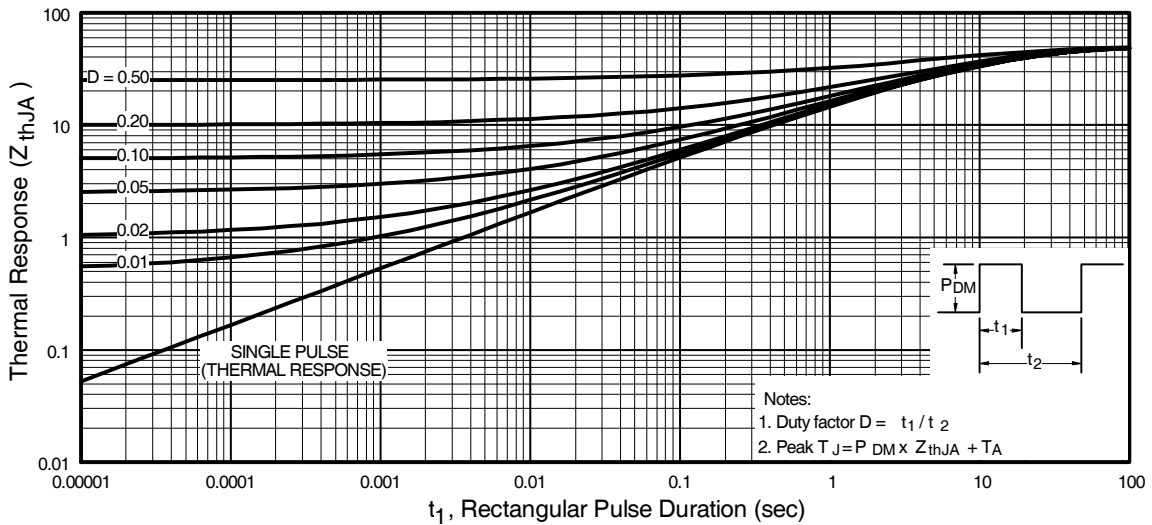
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



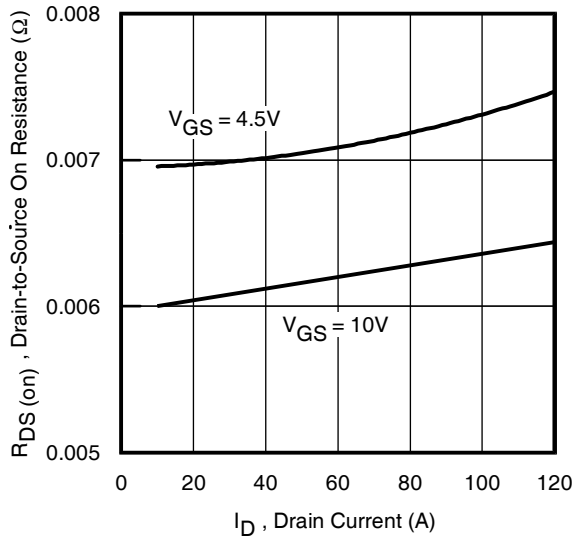
**Fig 10b.** Switching Time Waveforms



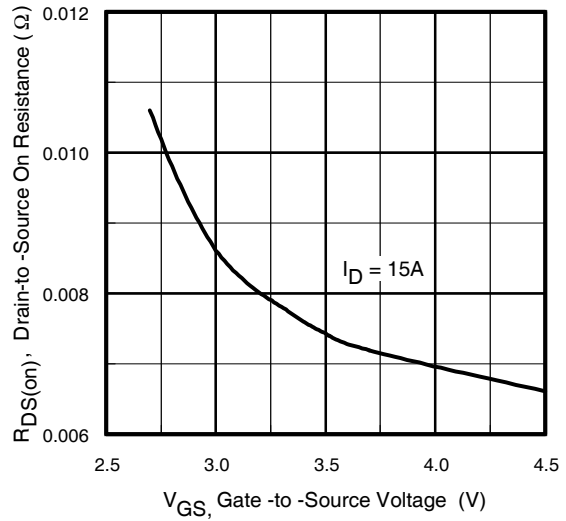
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

# IRF7809AVPbF

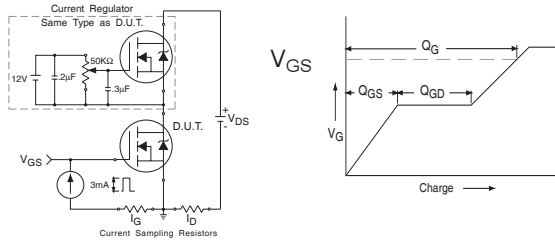
International  
**IR** Rectifier



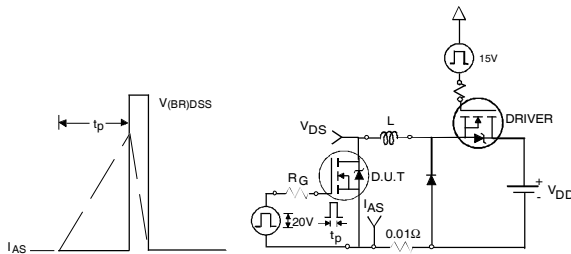
**Fig 12.** On-Resistance Vs. Drain Current



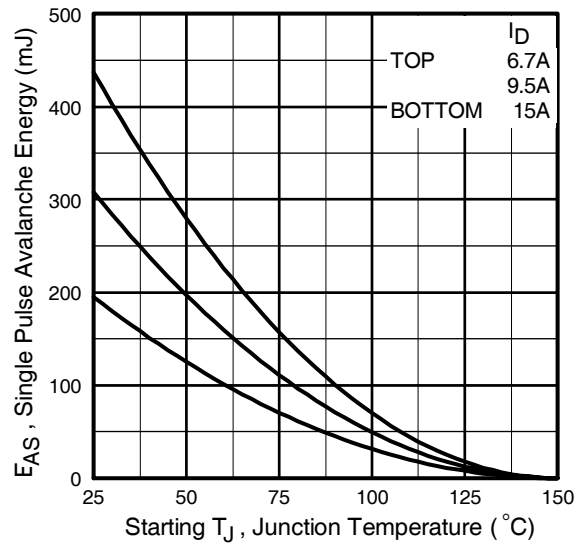
**Fig 13.** On-Resistance Vs. Gate Voltage



**Fig 13a&b.** Basic Gate Charge Test Circuit and Waveform



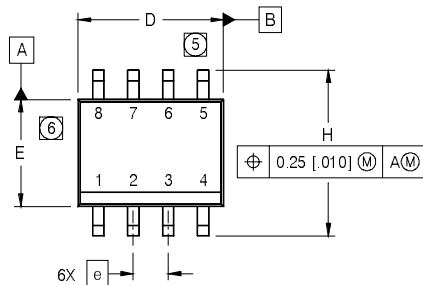
**Fig 14a&b.** Unclamped Inductive Test circuit and Waveforms



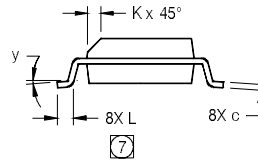
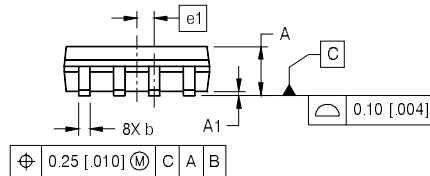
**Fig 14c.** Maximum Avalanche Energy Vs. Drain Current

## SO-8 Package Outline

Dimensions are shown in millimeters (inches)



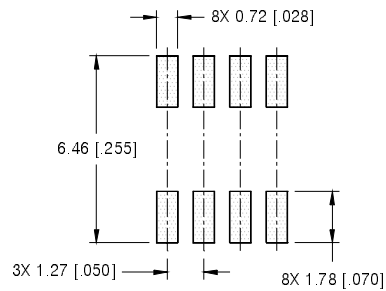
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



**NOTES:**

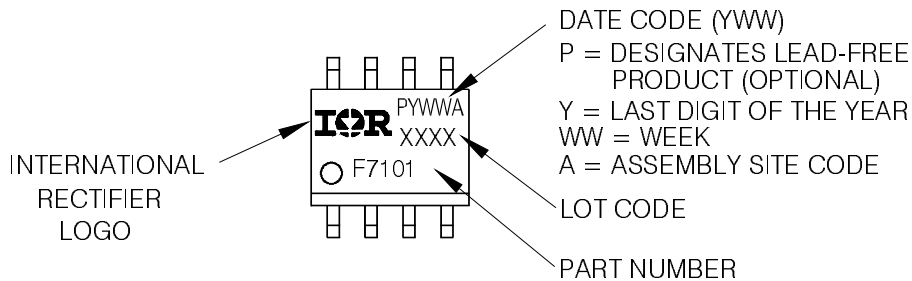
- DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- CONTROLLING DIMENSION: MILLIMETER
- DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤** DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- ⑥** DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [0.010].
- ⑦** DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

**FOOTPRINT**



## SO-8 Part Marking Information

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

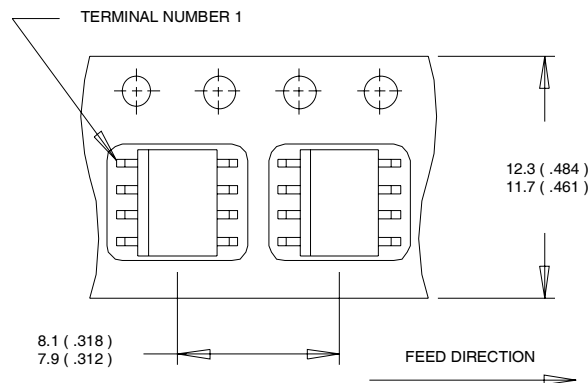


# IRF7809AVPbF

## SO-8 Tape and Reel

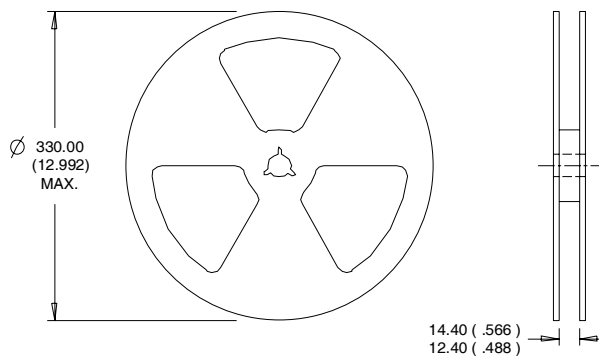
Dimensions are shown in millimeters (inches)

International  
**IR** Rectifier



### NOTES:

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



### NOTES :

1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

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

International  
**IR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
TAC Fax: (310) 252-7903

Visit us at [www.irf.com](http://www.irf.com) for sales contact information.08/05

[www.irf.com](http://www.irf.com)