

# IRF7341QPbF

HEXFET® Power MOSFET

## Benefits

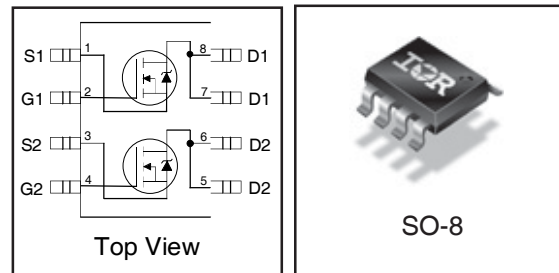
- Advanced Process Technology
- Dual N-Channel MOSFET
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
55V	0.050 @ V <sub>GS</sub> = 10V	5.1A
	0.065 @ V <sub>GS</sub> = 4.5V	4.42A

## Description

These HEXFET® Power MOSFET's in a Dual SO-8 package utilize the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of these HEXFET Power MOSFET's are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These benefits combine to make this design an extremely efficient and reliable device for use in a wide variety of applications.

The 175°C rating for the SO-8 package provides improved thermal performance with increased safe operating area and dual MOSFET die capability make it ideal in a variety of power applications. This dual, surface mount SO-8 can dramatically reduce board space and is also available in Tape & Reel.



## Absolute Maximum Ratings

	Parameter	Max.	Units
V <sub>DS</sub>	Drain-Source Voltage	55	V
I <sub>D</sub> @ T <sub>A</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	5.1	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	4.2	
I <sub>DM</sub>	Pulsed Drain Current <sup>①</sup>	42	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Maximum Power Dissipation <sup>③</sup>	2.4	W
P <sub>D</sub> @ T <sub>A</sub> = 70°C	Maximum Power Dissipation <sup>③</sup>	1.7	W
	Linear Derating Factor	16	mW/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>②</sup>	140	mJ
I <sub>AR</sub>	Avalanche Current <sup>①</sup>	5.1	A
E <sub>AR</sub>	Repetitive Avalanche Energy	See Fig. 14, 15, 16	mJ
T <sub>J</sub> , T <sub>STG</sub>	Junction and Storage Temperature Range	-55 to + 175	°C

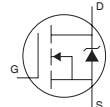
## Thermal Resistance

	Parameter	Max.	Units
R <sub>θJA</sub>	Maximum Junction-to-Ambient <sup>③</sup>	62.5	°C/W

## 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	55	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.052	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	0.043	0.050	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 5.1A ②
		—	0.056	0.065		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.42A ②
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	—	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	10.4	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 5.2A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	2.0	μA	V <sub>DS</sub> = 44V, V <sub>GS</sub> = 0V
		—	—	25		V <sub>DS</sub> = 44V, 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	—	29	44	nC	I <sub>D</sub> = 5.2A
Q <sub>gs</sub>	Gate-to-Source Charge	—	2.9	4.4		V <sub>DS</sub> = 44V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	7.3	11		V <sub>GS</sub> = 10V
t <sub>d(on)</sub>	Turn-On Delay Time	—	9.2	—	ns	V <sub>DD</sub> = 28V
t <sub>r</sub>	Rise Time	—	7.7	—		I <sub>D</sub> = 1.0A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	31	—		R <sub>G</sub> = 6.0Ω
t <sub>f</sub>	Fall Time	—	12.5	—		V <sub>GS</sub> = 10V ②
C <sub>iss</sub>	Input Capacitance	—	780	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	190	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	66	—		f = 1.0MHz

## Source-Drain Ratings and Characteristics

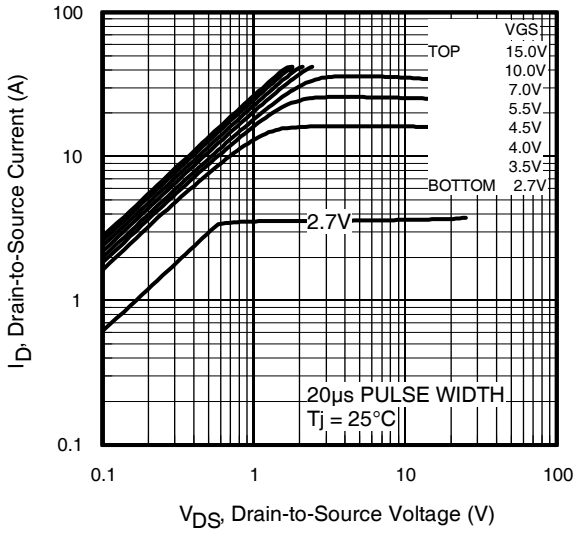
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	2.4	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	42		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.2	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 2.6A, V <sub>GS</sub> = 0V ②
t <sub>rr</sub>	Reverse Recovery Time	—	51	77	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 2.6A
Q <sub>rr</sub>	Reverse Recovery Charge	—	76	114	nC	di/dt = 100A/μs ②

### Notes:

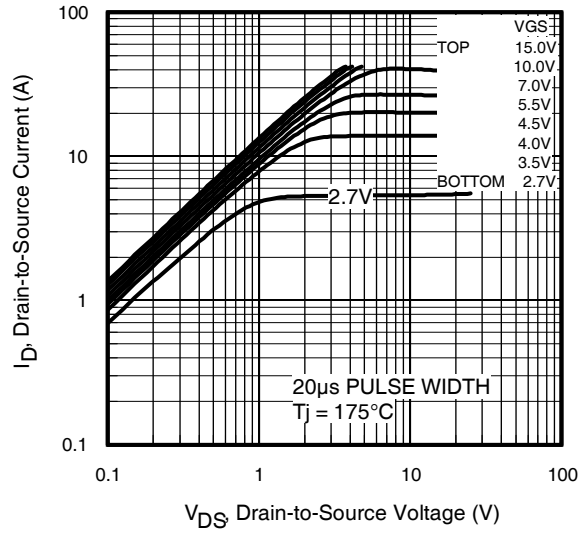
① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 300μs; duty cycle ≤ 2%.

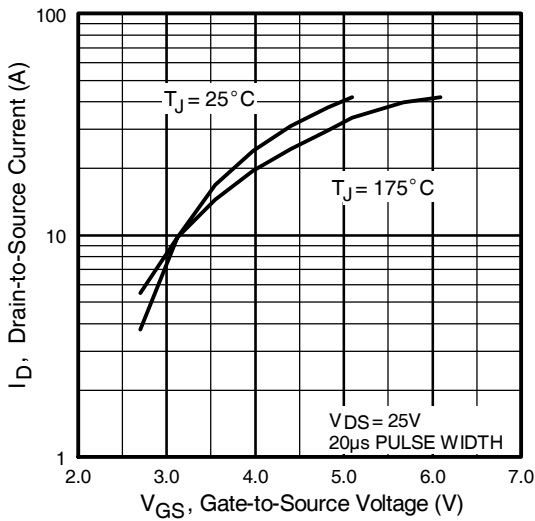
③ Surface mounted on FR-4 board, t ≤ 10sec.



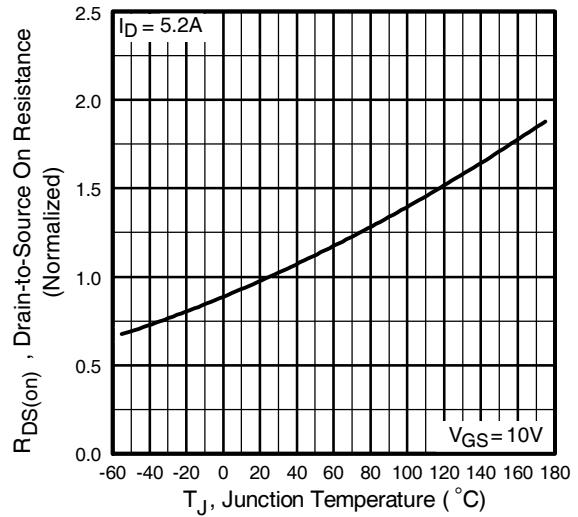
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



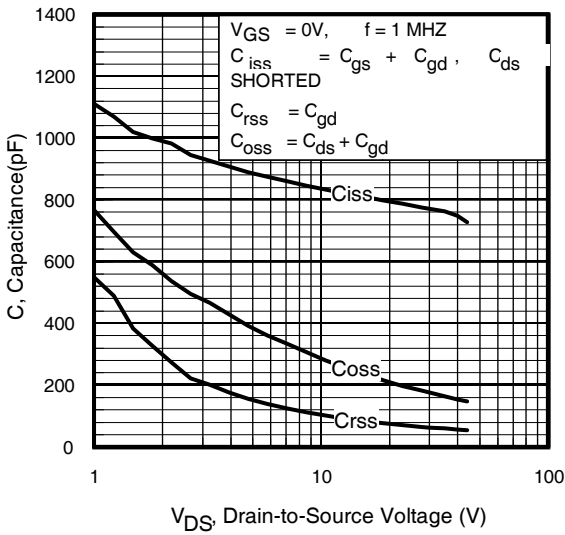
**Fig 3.** Typical Transfer Characteristics



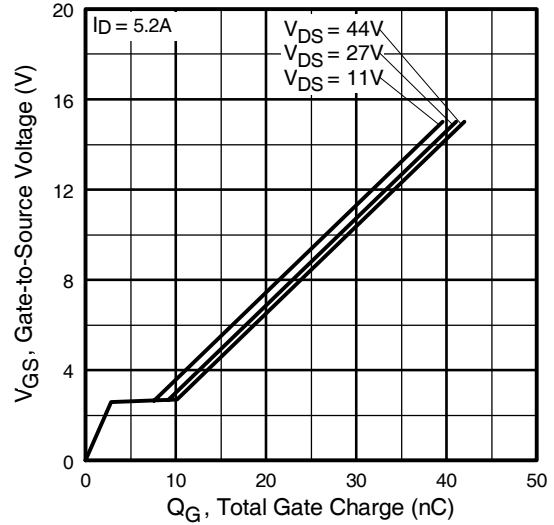
**Fig 4.** Normalized On-Resistance Vs. Temperature

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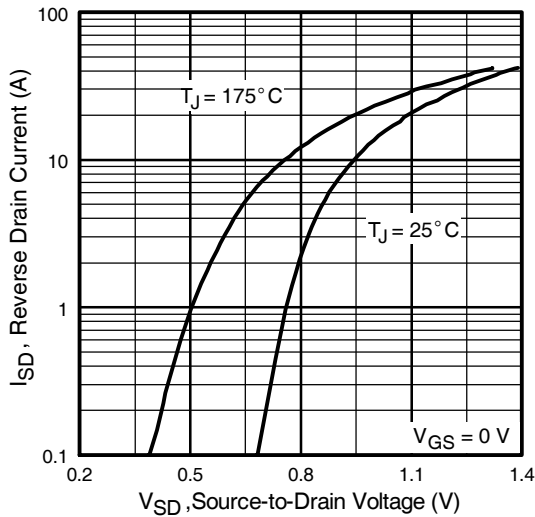
International  
**IR** Rectifier



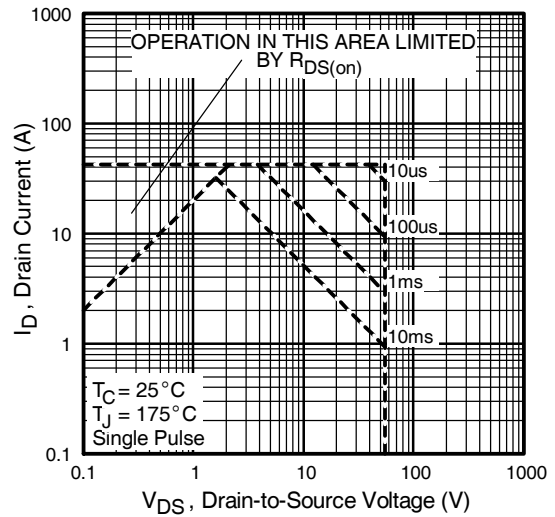
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



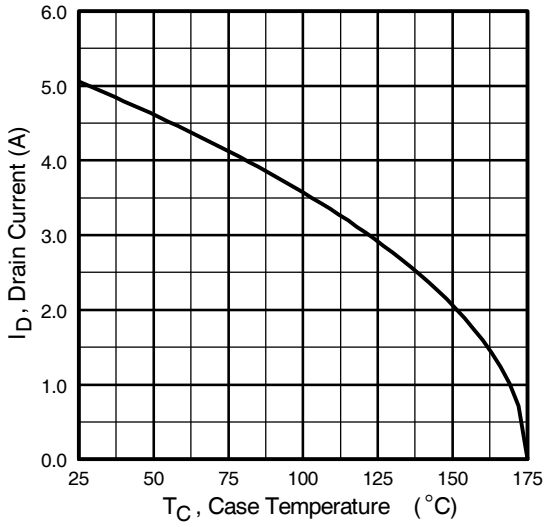
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



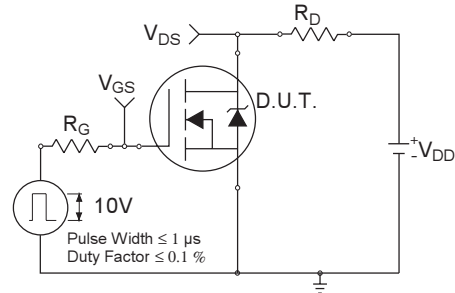
**Fig 7.** Typical Source-Drain Diode Forward Voltage



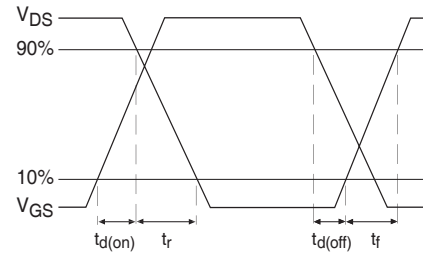
**Fig 8.** Maximum Safe Operating Area



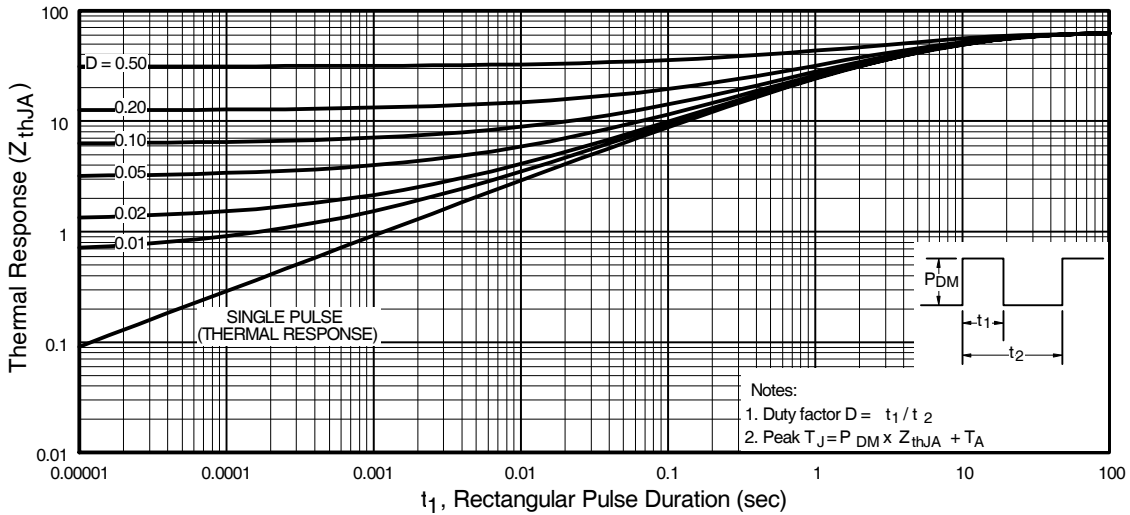
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



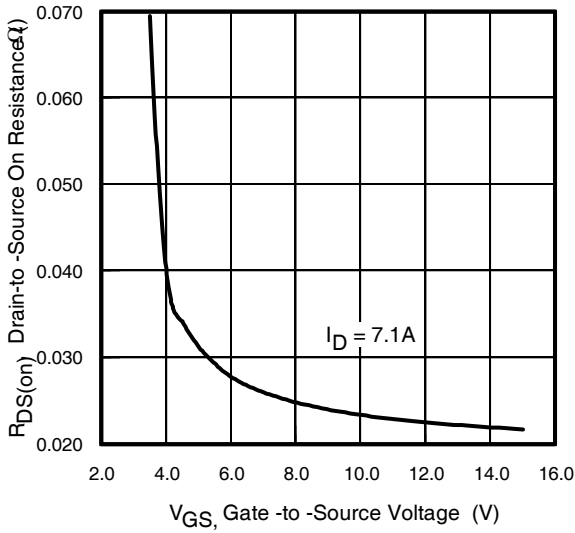
**Fig 10b.** Switching Time Waveforms



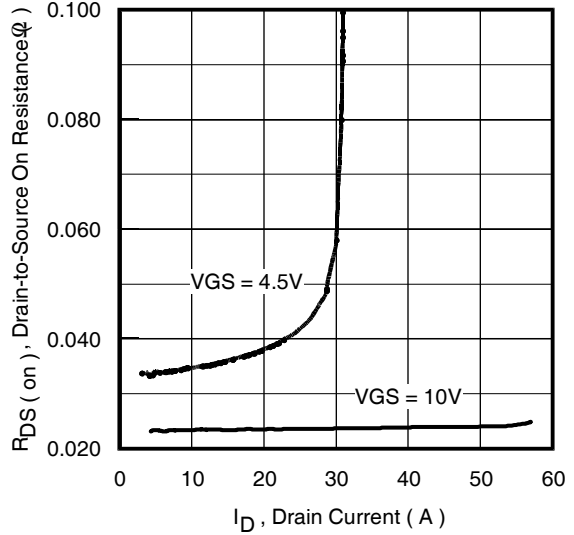
**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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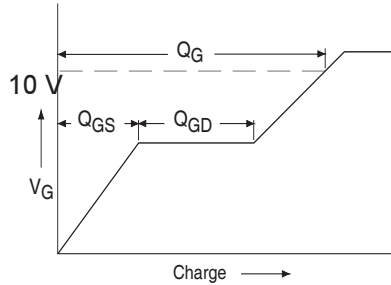
International  
**IR** Rectifier



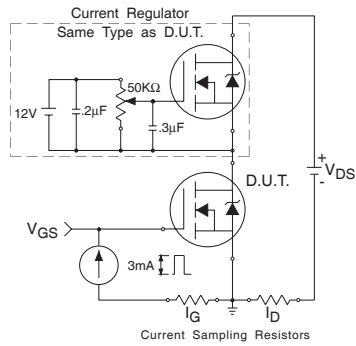
**Fig 11.** Typical On-Resistance Vs. Gate Voltage



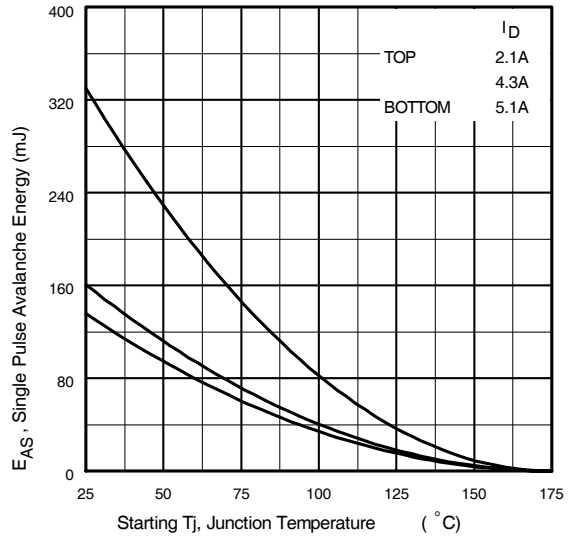
**Fig 12.** Typical On-Resistance Vs. Drain Current



**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit



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

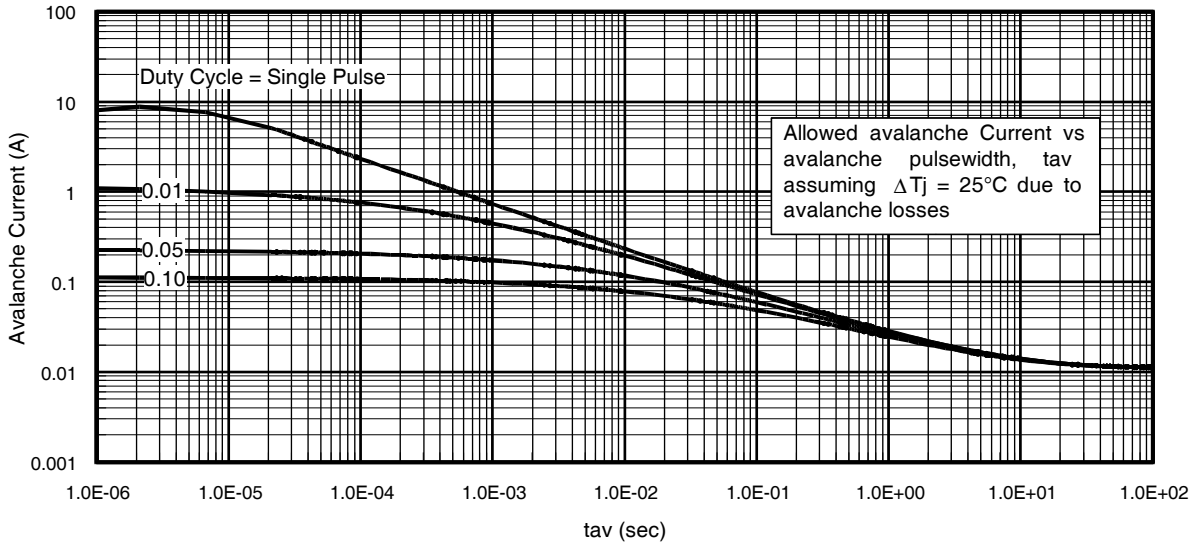


Fig 15. Typical Avalanche Current Vs.Pulsewidth

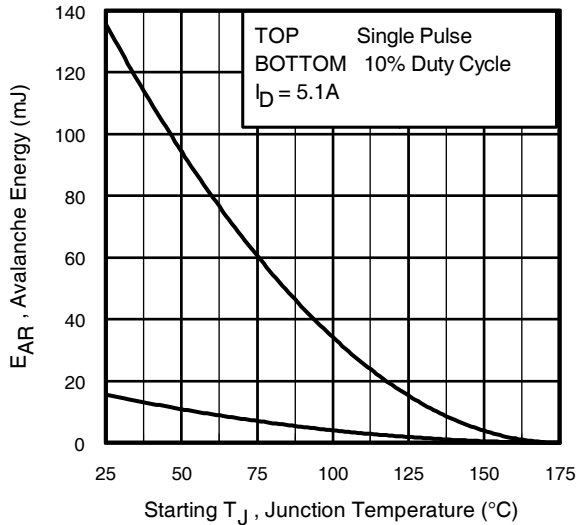


Fig 16. Maximum Avalanche Energy Vs. Temperature

**Notes on Repetitive Avalanche Curves , Figures 15, 16:  
(For further info, see AN-1005 at www.irf.com)**

1. Avalanche failures assumption:  
Purely a thermal phenomenon and failure occurs at a temperature far in excess of  $T_{jmax}$ . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as  $T_{jmax}$  is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
4.  $P_{D(ave)}$  = Average power dissipation per single avalanche pulse.
5.  $BV$  = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6.  $I_{av}$  = Allowable avalanche current.
7.  $\Delta T$  = Allowable rise in junction temperature, not to exceed  $T_{jmax}$  (assumed as 25°C in Figure 15, 16).  
 $t_{av}$  = Average time in avalanche.  
 $D$  = Duty cycle in avalanche =  $t_{av} \cdot f$   
 $Z_{thJC}(D, t_{av})$  = Transient thermal resistance, see figure 11)

$$P_{D(ave)} = 1/2 ( 1.3 \cdot BV \cdot I_{av} ) = \Delta T / Z_{thJC}$$

$$I_{av} = 2 \Delta T / [ 1.3 \cdot BV \cdot Z_{th} ]$$

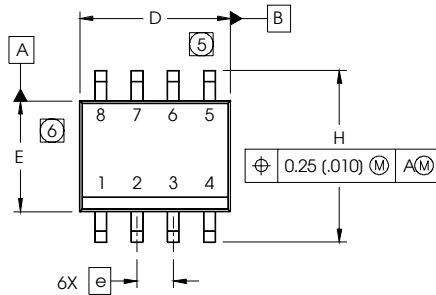
$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$

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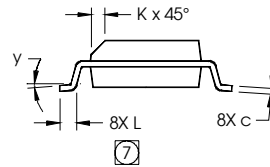
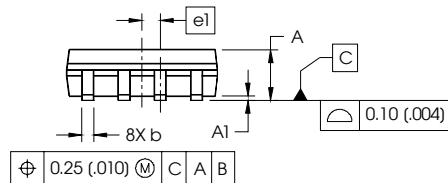
International  
**IR** Rectifier

## SO-8 Package Outline

Dimensions are shown in millimeters (inches)



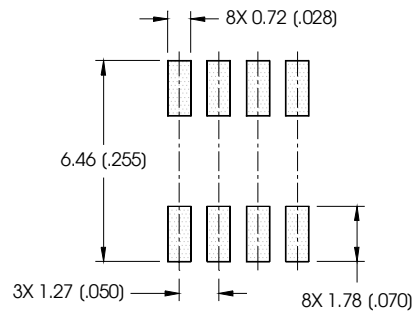
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
Al	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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



### NOTES:

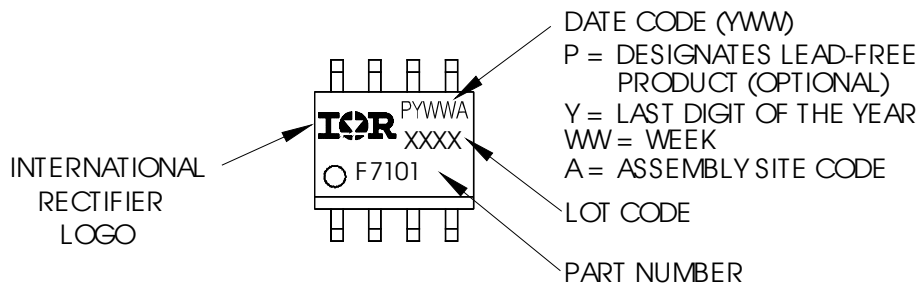
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
- ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).
- ⑦ DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

### FOOTPRINT



## SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)



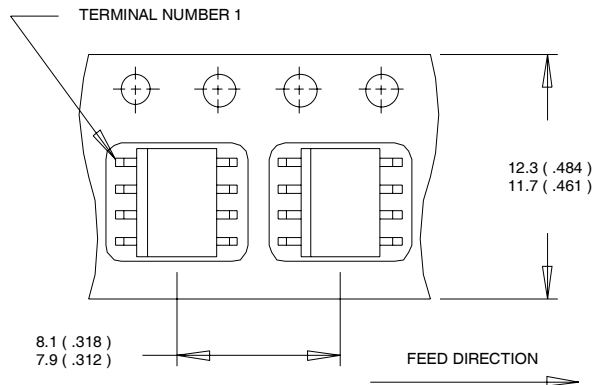
### Notes:

1. For an Automotive Qualified version of this part please see <http://www.irf.com/product-info/auto/>
2. For the most current drawing please refer to IR website at <http://www.irf.com/package/>



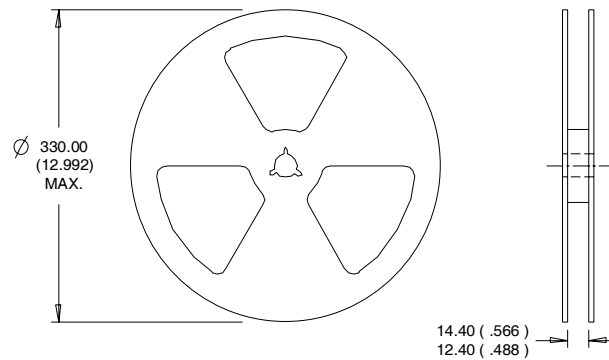
## SO-8 Tape and Reel

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. 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 Industrial market.  
 Qualification Standards can be found on IR's Web site.