

# IRFP3703PbF

HEXFET® Power MOSFET

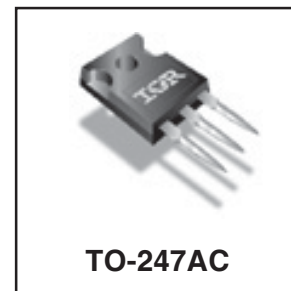
## Applications

- Synchronous Rectification
- Active ORing
- Lead-Free

## Benefits

- Ultra Low On-Resistance
- Low Gate Impedance to Reduce Switching Losses
- Fully Avalanche Rated

$V_{DSS}$	$R_{DS(on) \max}$	$I_D$
30V	0.0028Ω	210A <sup>⑥</sup>



## Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	210 <sup>⑥</sup>	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	100 <sup>⑥</sup>	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	1000	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	230	W
$P_D @ T_A = 25^\circ\text{C}$	Power Dissipation	3.8	
	Linear Derating Factor	1.5	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery dv/dt <sup>③</sup>	5.0	V/ns
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 175	°C

## Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.65	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

## Typical SMPS Topologies

- Forward and Bridge Converters with Synchronous Rectification for Telecom and Industrial Applications
- Offline High Power AC/DC Convertors using Synchronous Rectification

Notes <sup>①</sup> through <sup>⑥</sup> are on page 8

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## Static @ 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	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.028	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	2.3	2.8	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 76A ④
		—	2.8	3.9		V <sub>GS</sub> = 7.0V, I <sub>D</sub> = 76A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	200	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V <sub>GS</sub> = -20V

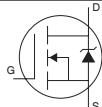
## Dynamic @ T<sub>J</sub> = 25°C (unless otherwise specified)

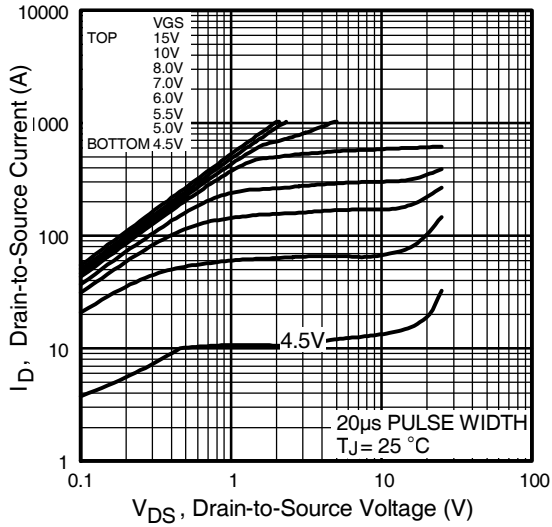
	Parameter	Min.	Typ.	Max.	Units	Conditions
g <sub>fs</sub>	Forward Transconductance	150	—	—	S	V <sub>DS</sub> = 24V, I <sub>D</sub> = 76A
Q <sub>g</sub>	Total Gate Charge	—	209	—	nC	I <sub>D</sub> = 76A
Q <sub>gs</sub>	Gate-to-Source Charge	—	62	—		V <sub>DS</sub> = 24V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	42	—		V <sub>GS</sub> = 10V, ④
t <sub>d(on)</sub>	Turn-On Delay Time	—	18	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V
t <sub>r</sub>	Rise Time	—	123	—		I <sub>D</sub> = 76A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	53	—		R <sub>G</sub> = 1.8Ω
t <sub>f</sub>	Fall Time	—	24	—		V <sub>GS</sub> = 10V ④
C <sub>iss</sub>	Input Capacitance	—	8250	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	3000	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	290	—		f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	10360	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	3060	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 24V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	2590	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 24V ⑤

## Avalanche Characteristics

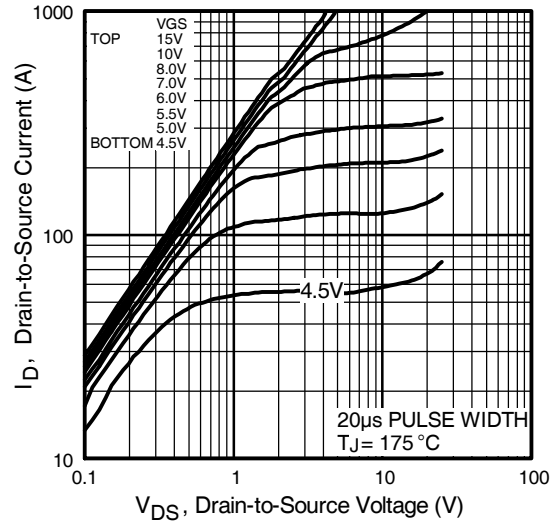
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	1700	mJ
I <sub>AR</sub>	Avalanche Current③	—	76	A
E <sub>AR</sub>	Repetitive Avalanche Energy④	—	23	mJ

## Diode Characteristics

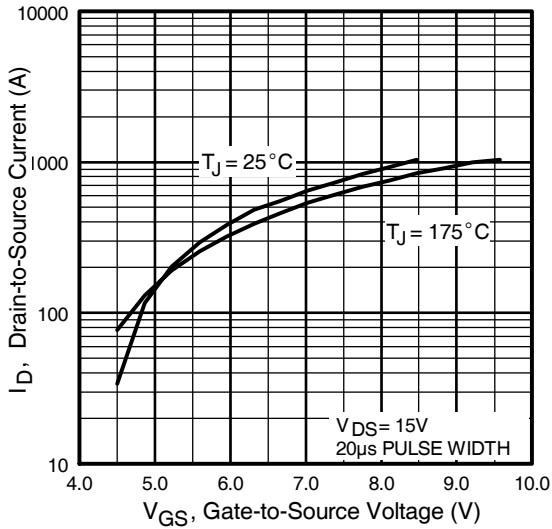
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	210⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	1000		
V <sub>SD</sub>	Diode Forward Voltage	—	0.8	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 76A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	80	120	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 76A, V <sub>DS</sub> = 16V
Q <sub>rr</sub>	Reverse Recovery Charge	—	185	275	nC	di/dt = 100A/μs ④



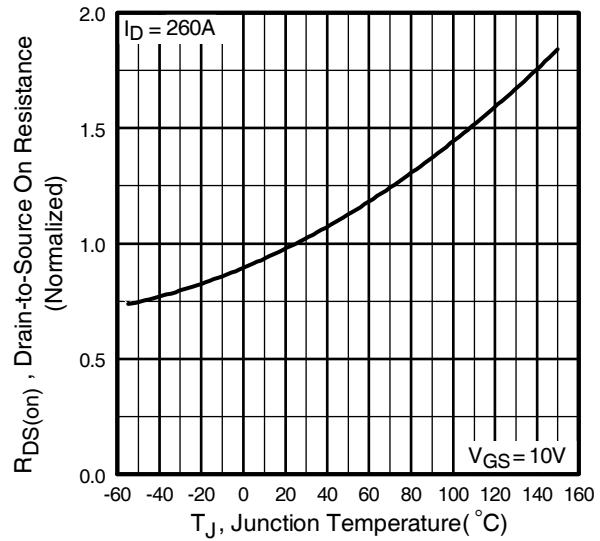
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

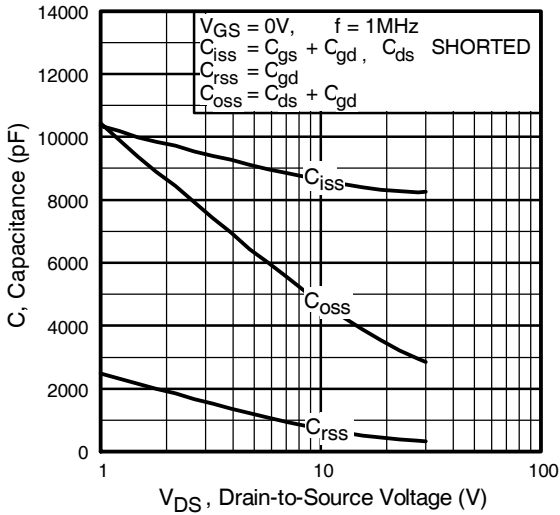


**Fig 3.** Typical Transfer Characteristics

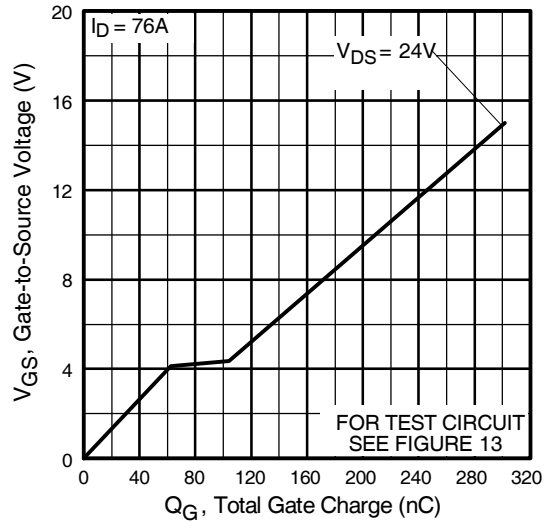


**Fig 4.** Normalized On-Resistance Vs. Temperature

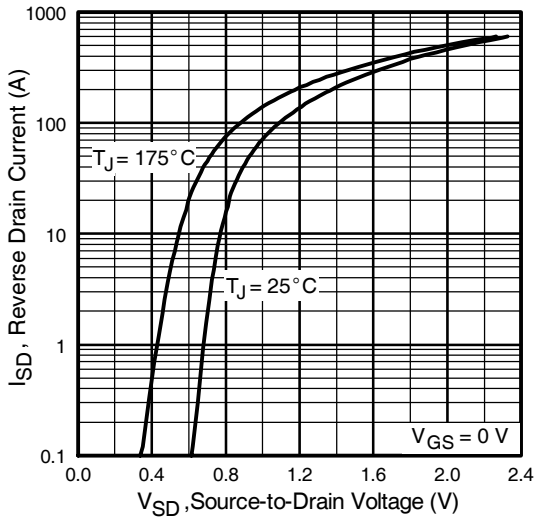
# IRFP3703PbF



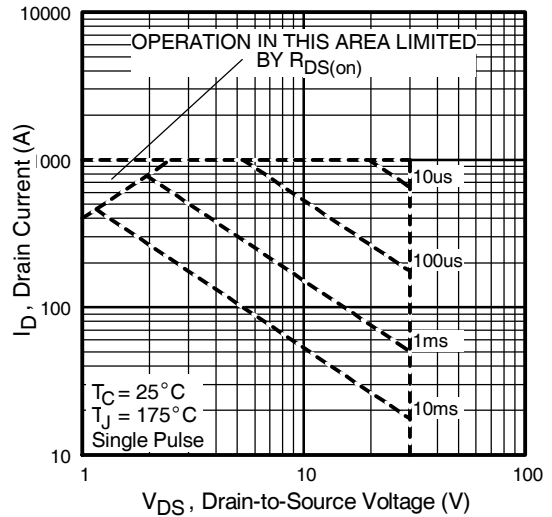
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



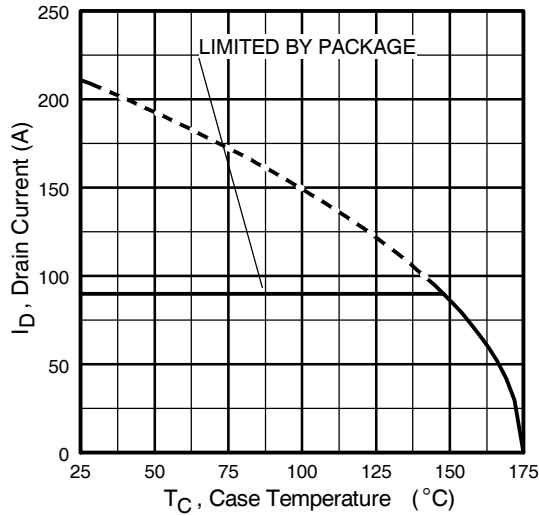
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



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



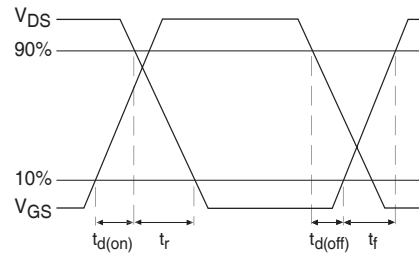
**Fig 8.** Maximum Safe Operating Area



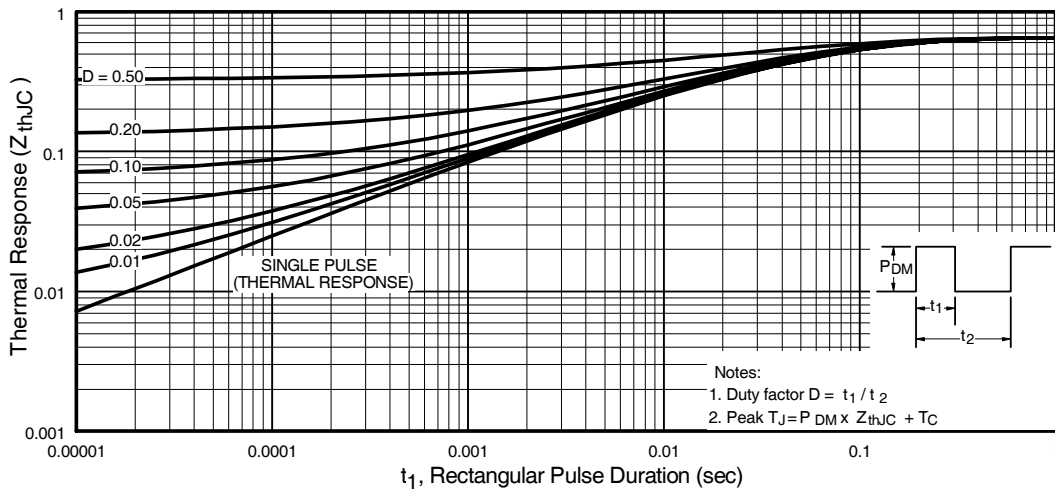
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



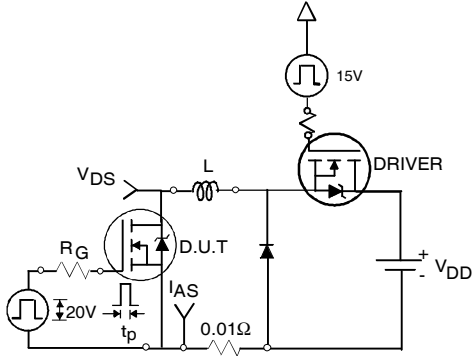
**Fig 10b.** Switching Time Waveforms



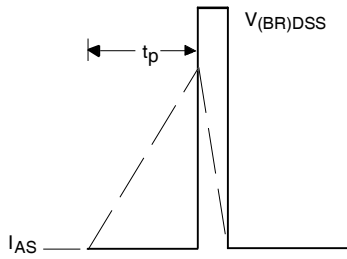
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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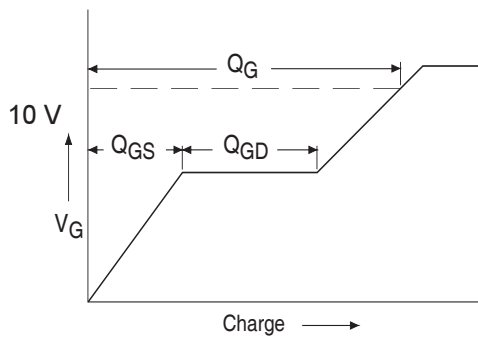
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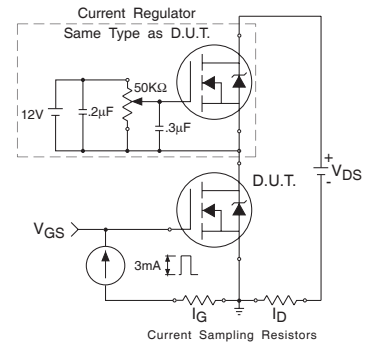
**Fig 12a.** Unclamped Inductive Test Circuit



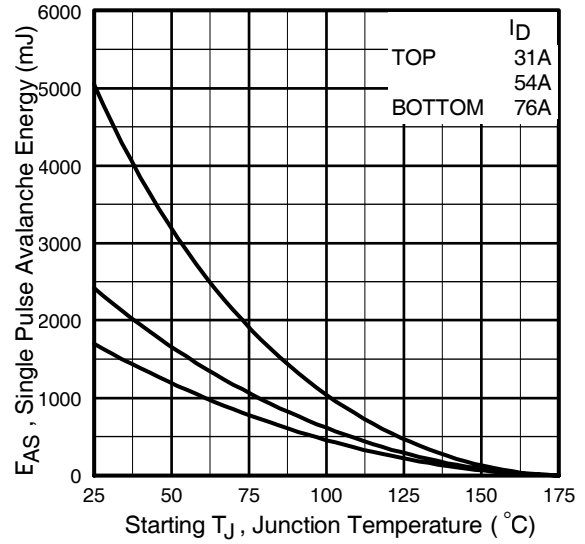
**Fig 12b.** Unclamped Inductive Waveforms



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

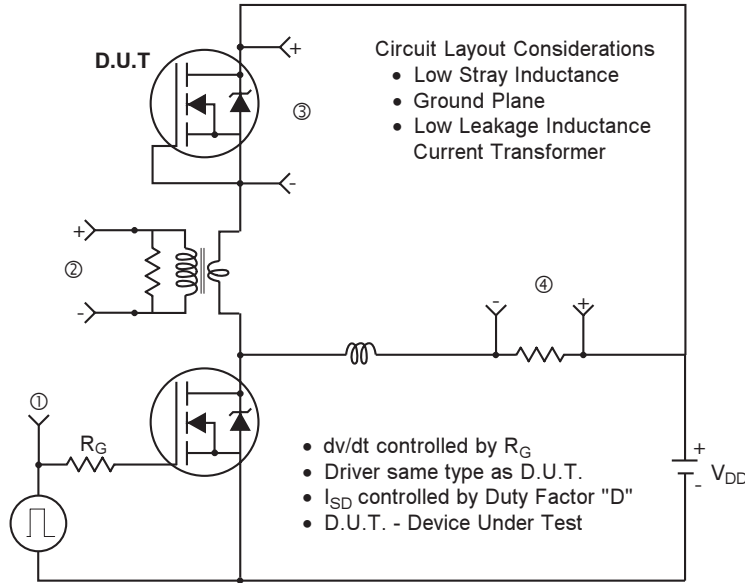


**Fig 13b.** Gate Charge Test Circuit



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

## Peak Diode Recovery dv/dt Test Circuit



\*  $V_{GS} = 5V$  for Logic Level Devices

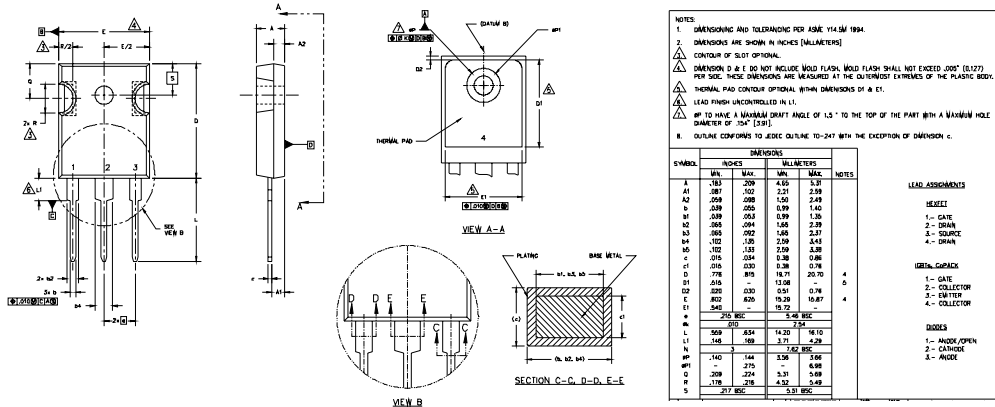
**Fig 14.** For N-Channel HEXFET® Power MOSFET

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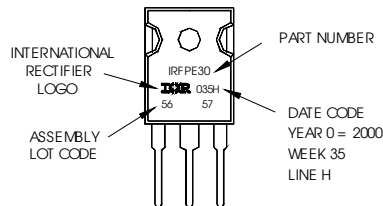
## TO-247AC Package Outline

Dimensions are shown in millimeters (inches)



## TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30  
WITH ASSEMBLY  
LOT CODE 5667  
ASSEMBLED ON WW 35, 2000  
IN THE ASSEMBLY LINE "H"  
**Note:** "P" in assembly line  
position indicates "Lead-Free"



### Notes:

- Repetitive rating; pulse width limited by max. junction temperature.
- Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.6\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 76\text{A}$ .
- $I_{SD} \leq 76\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 175^\circ\text{C}$
- Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- $C_{OSS}$  eff. is a fixed capacitance that gives the same charging time as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DS}$
- Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 90A

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.

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