

# IRF5806PbF

HEXFET® Power MOSFET

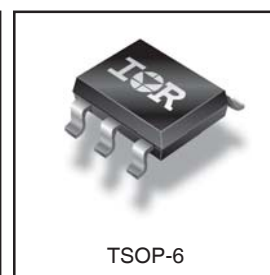
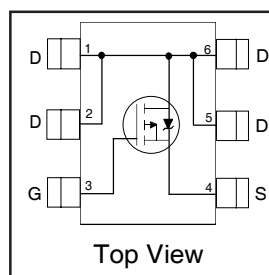
- Ultra Low On-Resistance
- P-Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- Low Gate Charge
- Lead-Free
- Halogen-Free

| $V_{DS}$ | $R_{DS(on)}$ max                 | $I_D$ |
|----------|----------------------------------|-------|
| -20V     | 86m $\Omega$ @ $V_{GS} = -4.5V$  | -4.0A |
|          | 147m $\Omega$ @ $V_{GS} = -2.5V$ | -3.0A |

## Description

These P-channel MOSFETs from International Rectifier utilize advanced processing techniques to achieve the extremely low on-resistance per silicon area. This benefit provides the designer with an extremely efficient device for use in battery and load management applications.

The TSOP-6 package with its customized leadframe produces a HEXFET® power MOSFET with  $R_{DS(on)}$  60% less than a similar size SOT-23. This package is ideal for applications where printed circuit board space is at a premium. It's unique thermal design and  $R_{DS(on)}$  reduction enables a current-handling increase of nearly 300% compared to the SOT-23.



## Absolute Maximum Ratings

|                            | Parameter                                  | Max.         | Units         |
|----------------------------|--------------------------------------------|--------------|---------------|
| $V_{DS}$                   | Drain-Source Voltage                       | -20          | V             |
| $I_D$ @ $T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V$ | -4.0         | A             |
| $I_D$ @ $T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V$ | -3.3         |               |
| $I_{DM}$                   | Pulsed Drain Current <sup>①</sup>          | -16.5        |               |
| $P_D$ @ $T_A = 25^\circ C$ | Maximum Power Dissipation <sup>③</sup>     | 2.0          | W             |
| $P_D$ @ $T_A = 70^\circ C$ | Maximum Power Dissipation <sup>③</sup>     | 1.3          | W             |
|                            | Linear Derating Factor                     | 0.02         | W/ $^\circ C$ |
| $V_{GS}$                   | Gate-to-Source Voltage                     | $\pm 20$     | V             |
| $T_J, T_{STG}$             | Junction and Storage Temperature Range     | -55 to + 150 | $^\circ C$    |

## Thermal Resistance

|                 | Parameter                                | Max. | Units        |
|-----------------|------------------------------------------|------|--------------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient <sup>③</sup> | 62.5 | $^\circ C/W$ |

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

|                                 | Parameter                            | Min.  | Typ.  | Max. | Units      | Conditions                                            |
|---------------------------------|--------------------------------------|-------|-------|------|------------|-------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | -20   | —     | —    | V          | $V_{GS} = 0V, I_D = -250\mu A$                        |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —     | 0.011 | —    | V/°C       | Reference to $25^\circ\text{C}$ , $I_D = -1\text{mA}$ |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —     | 47.1  | 86   | m $\Omega$ | $V_{GS} = -4.5V, I_D = -4.0A$ ②                       |
|                                 |                                      | —     | 67.5  | 147  |            | $V_{GS} = -2.5V, I_D = -3.0A$ ②                       |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | -0.45 | —     | -1.2 | V          | $V_{DS} = V_{GS}, I_D = -250\mu A$                    |
| $g_{fs}$                        | Forward Transconductance             | 6.4   | —     | —    | S          | $V_{DS} = -10V, I_D = -4.0A$                          |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —     | —     | -15  | $\mu A$    | $V_{DS} = -16V, V_{GS} = 0V$                          |
|                                 |                                      | —     | —     | -25  |            | $V_{DS} = -16V, V_{GS} = 0V, T_J = 70^\circ\text{C}$  |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —     | —     | -100 | nA         | $V_{GS} = -12V$                                       |
|                                 | Gate-to-Source Reverse Leakage       | —     | —     | 100  |            | $V_{GS} = 12V$                                        |
| $Q_g$                           | Total Gate Charge                    | —     | 8.3   | 11.4 | nC         | $I_D = -4.0A$                                         |
| $Q_{gs}$                        | Gate-to-Source Charge                | —     | 1.2   | —    |            | $V_{DS} = -16V$                                       |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —     | 2.6   | —    |            | $V_{GS} = -4.5V$                                      |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —     | 6.2   | 9.3  | ns         | $V_{DD} = -10V, V_{GS} = -4.5V$                       |
| $t_r$                           | Rise Time                            | —     | 27    | 41   |            | $I_D = -1.0A$                                         |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —     | 94    | 140  |            | $R_G = 6.0\Omega$                                     |
| $t_f$                           | Fall Time                            | —     | 126   | 190  |            | $R_D = 10\Omega$ ②                                    |
| $C_{iss}$                       | Input Capacitance                    | —     | 594   | —    | pF         | $V_{GS} = 0V$                                         |
| $C_{oss}$                       | Output Capacitance                   | —     | 114   | —    |            | $V_{DS} = -15V$                                       |
| $C_{rss}$                       | Reverse Transfer Capacitance         | —     | 87    | —    |            | $f = 1.0\text{MHz}$                                   |

## Source-Drain Ratings and Characteristics

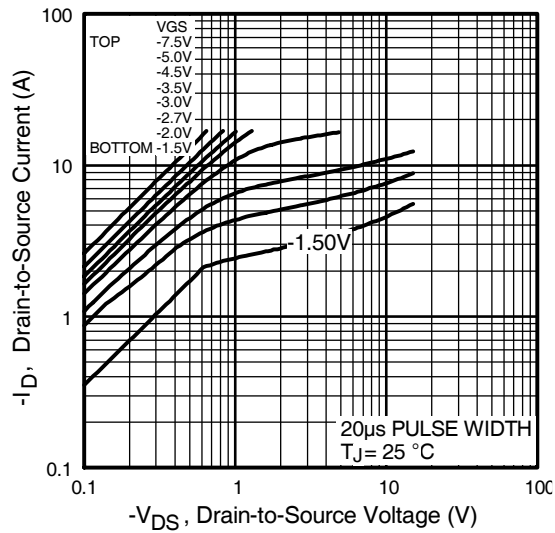
|          | Parameter                                 | Min. | Typ. | Max.  | Units | Conditions                                                              |
|----------|-------------------------------------------|------|------|-------|-------|-------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | -2.0  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —    | —    | -16.5 |       |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                     | —    | —    | -1.2  | V     | $T_J = 25^\circ\text{C}, I_S = -2.0A, V_{GS} = 0V$ ②                    |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 116  | 174   | ns    | $T_J = 25^\circ\text{C}, I_F = -2.0A$                                   |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 90   | 135   | nC    | $di/dt = -100A/\mu s$ ②                                                 |

### Notes:

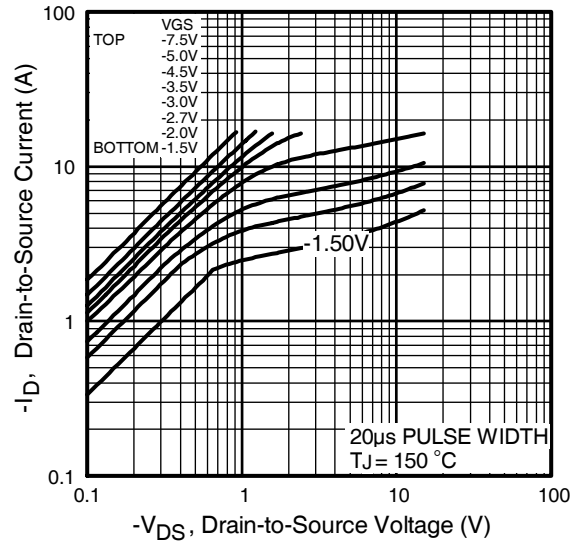
① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

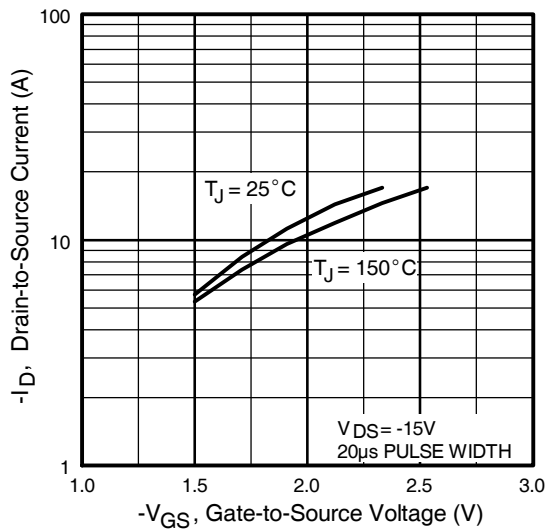
③ When mounted on 1 inch square Copper board,  $t \leq 10\text{sec}$ .



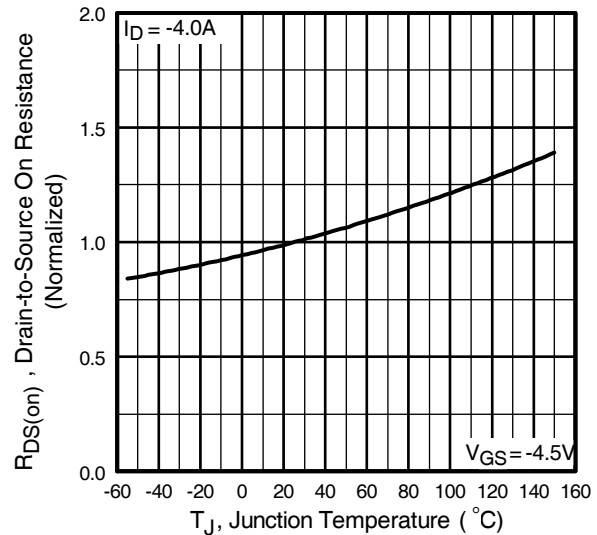
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



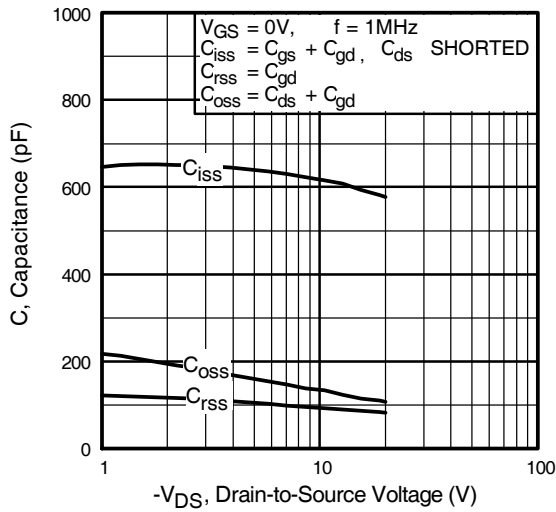
**Fig 3.** Typical Transfer Characteristics



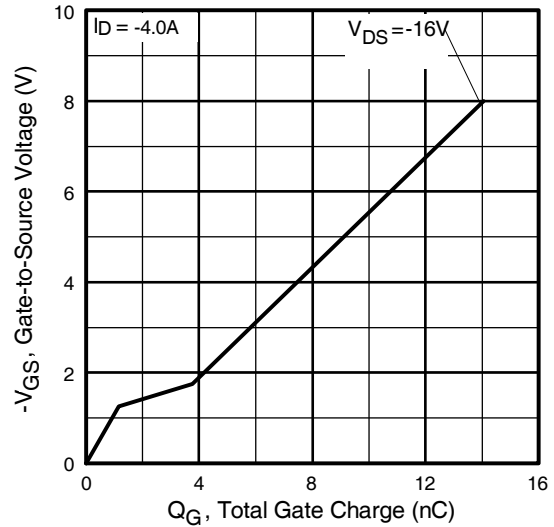
**Fig 4.** Normalized On-Resistance  
Vs. Temperature

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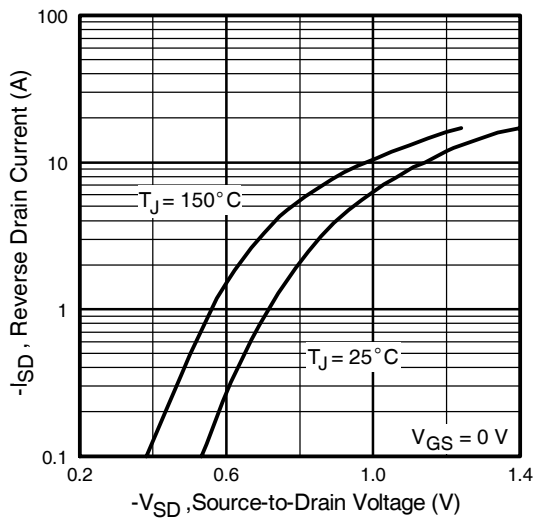
International  
**IR** Rectifier



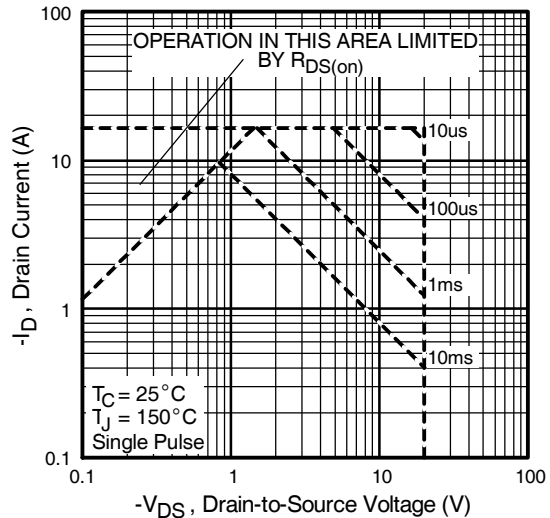
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



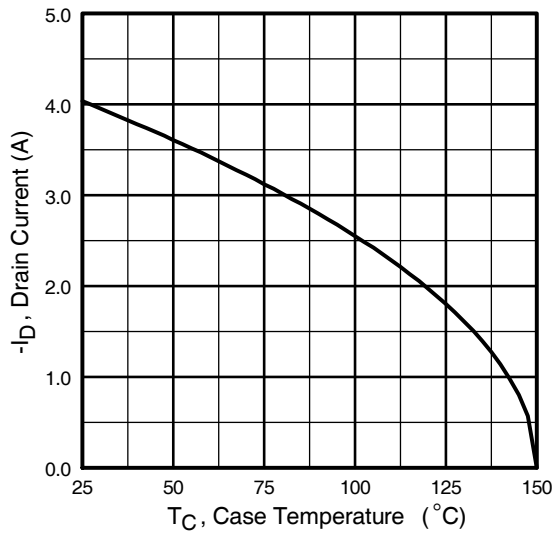
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



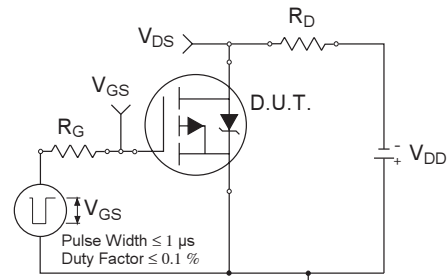
**Fig 7.** Typical Source-Drain Diode Forward Voltage



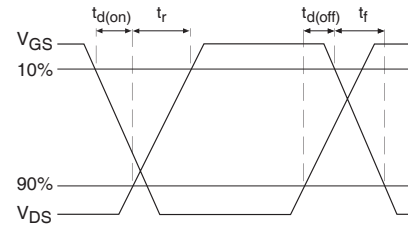
**Fig 8.** Maximum Safe Operating Area



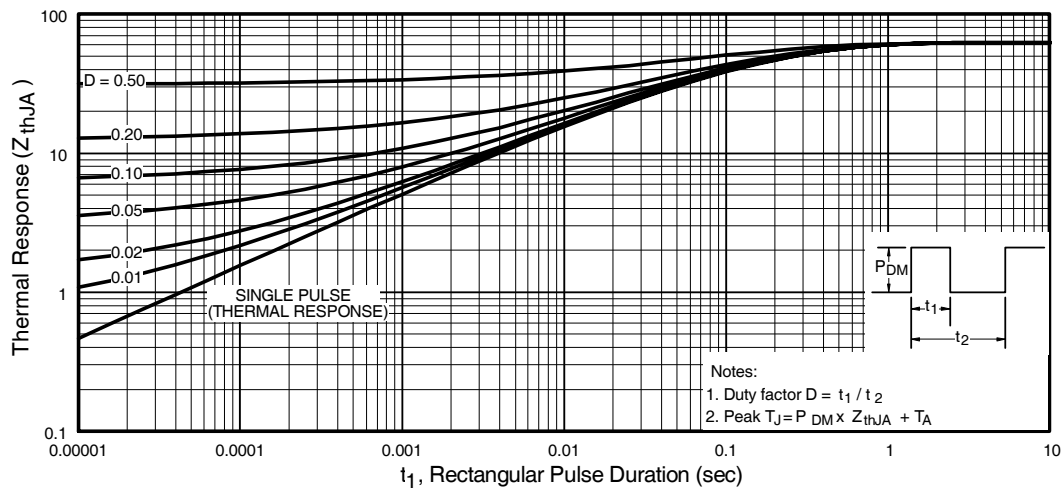
**Fig 9.** Maximum Drain Current Vs. Case Temperature



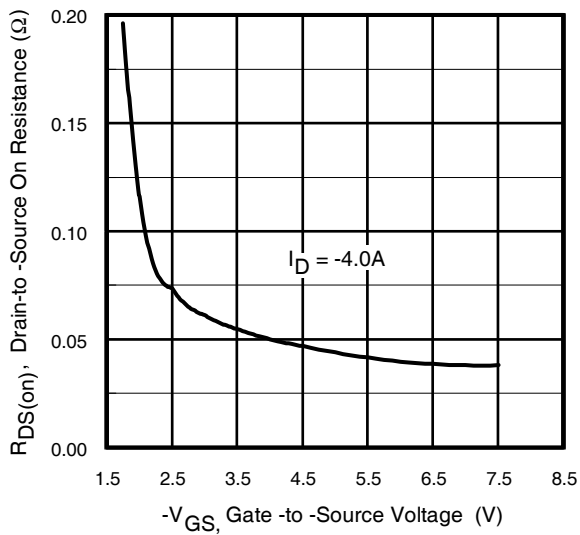
**Fig 10a.** Switching Time Test Circuit



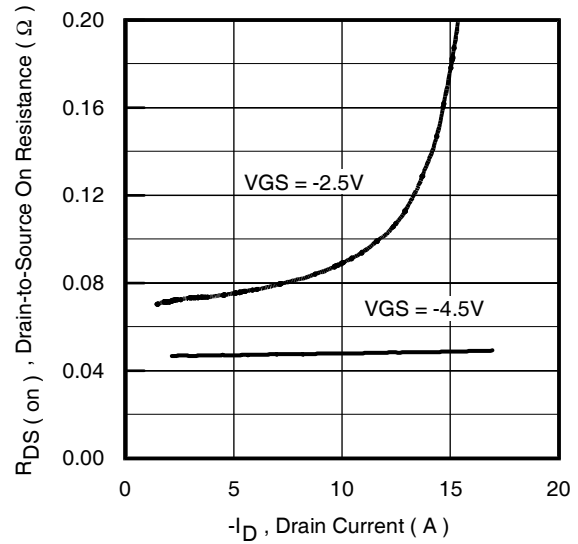
**Fig 10b.** Switching Time Waveforms



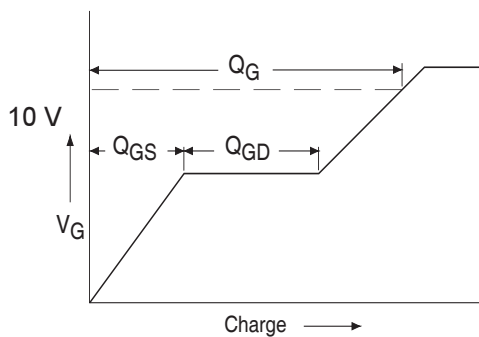
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



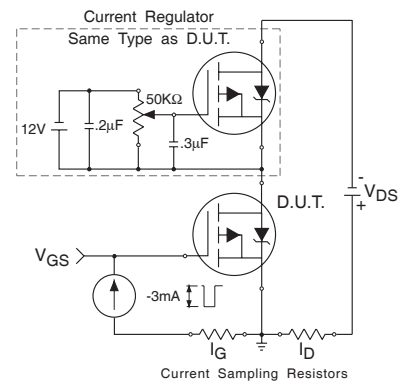
**Fig 12.** Typical On-Resistance Vs. Gate Voltage



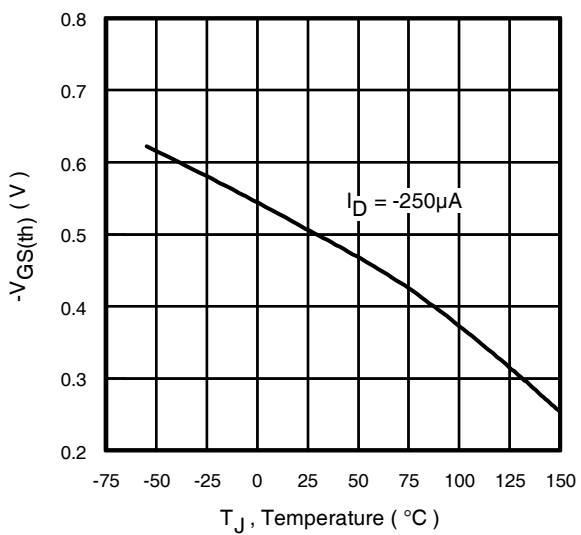
**Fig 13.** Typical On-Resistance Vs. Drain Current



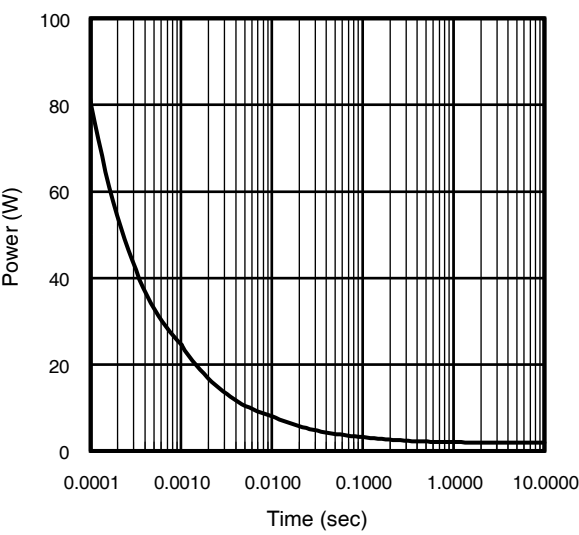
**Fig 14a.** Basic Gate Charge Waveform



**Fig 14b.** Gate Charge Test Circuit



**Fig 15.** Typical  $V_{GS(th)}$  Vs. Junction Temperature

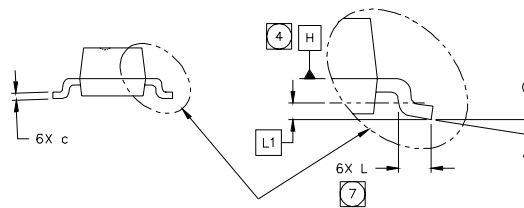
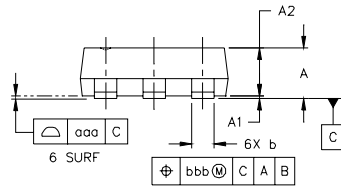
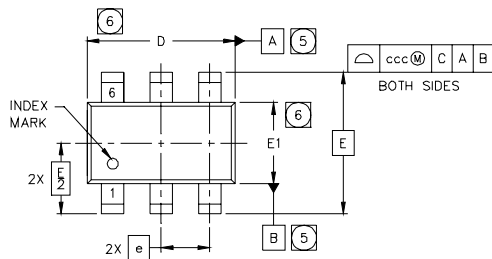


**Fig 16.** Typical Power Vs. Time

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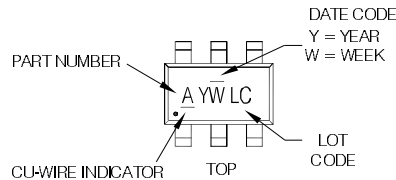
International  
**IR** Rectifier

## TSOP-6 Package Outline



| SYMBOL | MO-193AA DIMENSIONS |      |      |           |       |       |
|--------|---------------------|------|------|-----------|-------|-------|
|        | MILLIMETERS         |      |      | INCHES    |       |       |
|        | MIN                 | NOM  | MAX  | MIN       | NOM   | MAX   |
| A      | ---                 | ---  | 1.10 | ---       | ---   | .0433 |
| A1     | 0.01                | ---  | 0.10 | .0004     | ---   | .0039 |
| A2     | 0.80                | 0.90 | 1.00 | .0315     | .0354 | .0393 |
| b      | 0.25                | ---  | 0.50 | .0099     | ---   | .0196 |
| c      | 0.10                | ---  | 0.26 | .004      | ---   | .010  |
| D      | 2.90                | 3.00 | 3.10 | .115      | .118  | .122  |
| E      | 2.75 BSC            |      |      | .108 BSC  |       |       |
| E1     | 1.30                | 1.50 | 1.70 | .052      | .059  | .066  |
| e      | 1.00 BSC            |      |      | .039 BSC  |       |       |
| L      | 0.20                | 0.40 | 0.60 | .0079     | .0157 | .0236 |
| L1     | 0.30 BSC            |      |      | .0118 BSC |       |       |
| θ      | 0°                  | ---  | 8°   | 0°        | ---   | 8°    |
| aaa    | 0.10                |      |      | .004      |       |       |
| bbb    | 0.15                |      |      | .006      |       |       |
| ccc    | 0.25                |      |      | .010      |       |       |

## TSOP-6 Part Marking Information



### PART NUMBER CODE REFERENCE:

A = SI3443DV K = IRF5810  
B = IRF5800 L = IRF5804  
C = IRF5850 M = IRF5803  
D = IRF5851 N = IRF5802  
E = IRF5852  
F = IRF5801  
I = IRF5805  
J = IRF5806

### Notes:

- A line above the work week (as shown here) indicates Lead-Free
- A line below the part number (as shown here) indicates Cu-wire

W = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR

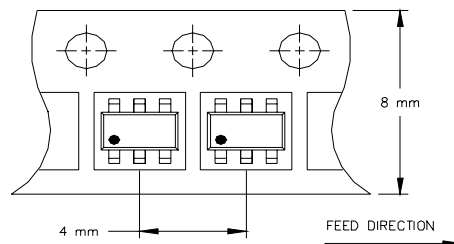
| YEAR | Y | WORK WEEK | W |
|------|---|-----------|---|
| 2001 | 1 | 01        | A |
| 2002 | 2 | 02        | B |
| 2003 | 3 | 03        | C |
| 2004 | 4 | 04        | D |
| 2005 | 5 |           |   |
| 2006 | 6 |           |   |
| 2007 | 7 |           |   |
| 2008 | 8 |           |   |
| 2009 | 9 |           |   |
| 2010 | 0 | 24        | X |
|      |   | 25        | Y |
|      |   | 26        | Z |

W = (27-52) IF PRECEDED BY A LETTER

| YEAR | Y | WORK WEEK | W |
|------|---|-----------|---|
| 2001 | A | 27        | A |
| 2002 | B | 28        | B |
| 2003 | C | 29        | C |
| 2004 | D | 30        | D |
| 2005 | E |           |   |
| 2006 | F |           |   |
| 2007 | G |           |   |
| 2008 | H |           |   |
| 2009 | J |           |   |
| 2010 | K | 50        | X |
|      |   | 51        | Y |
|      |   | 52        | Z |

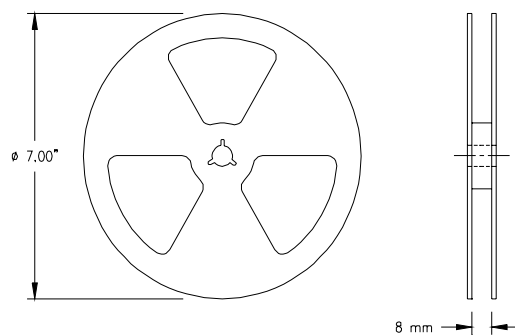
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

## TSOP-6 Tape & Reel Information



NOTES:

1. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES:

1. 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  
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**Стандарт  
Электрон  
Связь**

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Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

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Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

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**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

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