

IRF5804

HEXFET® Power MOSFET

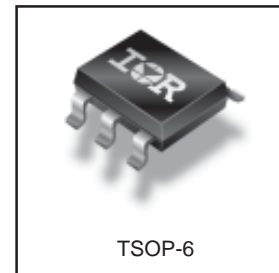
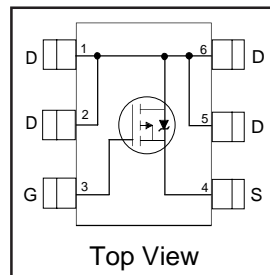
- Ultra Low On-Resistance
- P-Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- Low Gate Charge

| V_{DSS} | $R_{DS(on)}$ max (m Ω) | I_D |
|-------------|--------------------------------|-------|
| -40V | 198@ $V_{GS} = -10V$ | -2.5A |
| | 334@ $V_{GS} = -4.5V$ | -2.0A |

Description

These P-channel HEXFET® Power 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 | -40 | V |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -2.5 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -2.0 | |
| I_{DM} | Pulsed Drain Current ① | -10 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation ③ | 2.0 | W |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation ③ | 1.3 | |
| | Linear Derating Factor | 0.016 | mW/ $^\circ C$ |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to + 150 | $^\circ C$ |

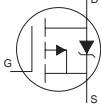
Thermal Resistance

| | Parameter | Max. | Units |
|-----------------|-------------------------------|------|--------------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient ③ | 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 | -40 | — | — | V | $V_{GS} = 0V, I_D = -250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.03 | — | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = -1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 198 | m Ω | $V_{GS} = -10V, I_D = -2.5$ ② |
| | | — | — | 334 | | $V_{GS} = -4.5V, I_D = -2.0A$ ② |
| $V_{GS(th)}$ | Gate Threshold Voltage | -1.0 | — | -3.0 | V | $V_{DS} = V_{GS}, I_D = -250\mu A$ |
| g_{fs} | Forward Transconductance | 2.5 | — | — | S | $V_{DS} = -10V, I_D = -2.5A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | -10 | μA | $V_{DS} = -32V, V_{GS} = 0V$ |
| | | — | — | -25 | | $V_{DS} = -32V, V_{GS} = 0V, T_J = 70^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | -100 | nA | $V_{GS} = -20V$ |
| | Gate-to-Source Reverse Leakage | — | — | 100 | | $V_{GS} = 20V$ |
| Q_g | Total Gate Charge | — | 14 | 21 | nC | $I_D = -2.5A$ |
| Q_{gs} | Gate-to-Source Charge | — | 2.8 | 4.2 | | $V_{DS} = -20V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | 2.1 | 3.2 | | $V_{GS} = -10V$ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 19 | — | ns | $V_{DD} = -20V$ ② |
| t_r | Rise Time | — | 430 | — | | $I_D = -1.0A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 100 | — | | $R_G = 6.0\Omega$ |
| t_f | Fall Time | — | 64 | — | | $V_{GS} = -10V$ |
| C_{iss} | Input Capacitance | — | 680 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 60 | — | | $V_{DS} = -25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 44 | — | | $f = 1\text{kHz}$ |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|------|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | -2.5 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | -10 | | |
| 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 | — | 24 | 36 | ns | $T_J = 25^\circ\text{C}, I_F = -2.0A$ |
| Q_{rr} | Reverse Recovery Charge | — | 32 | 49 | nC | $di/dt = -100A/\mu s$ ② |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.
- ③ Surface mounted on 1 in square Cu board

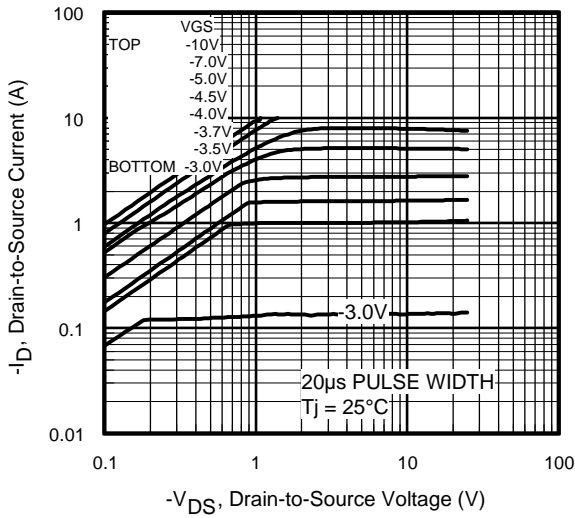


Fig 1. Typical Output Characteristics

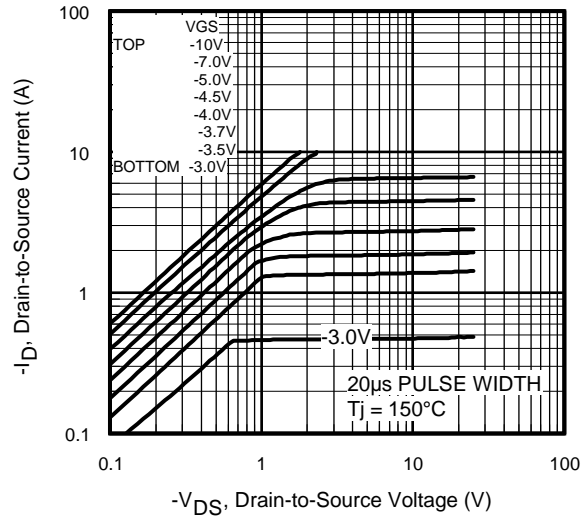


Fig 2. Typical Output Characteristics

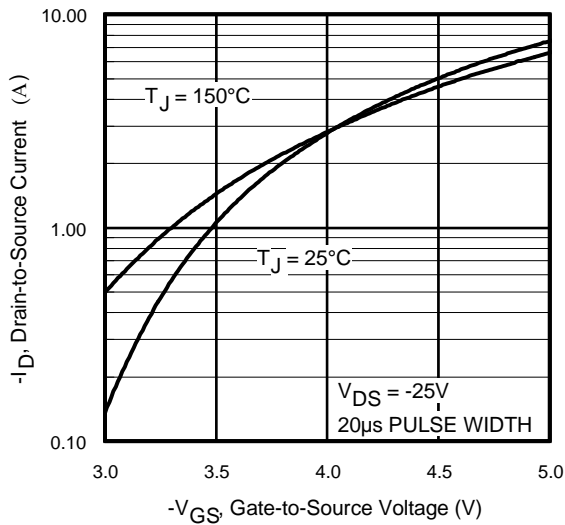


Fig 3. Typical Transfer Characteristics

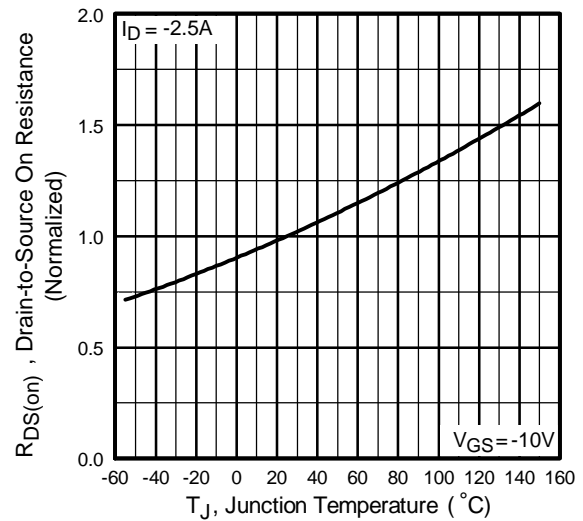


Fig 4. Normalized On-Resistance Vs. Temperature

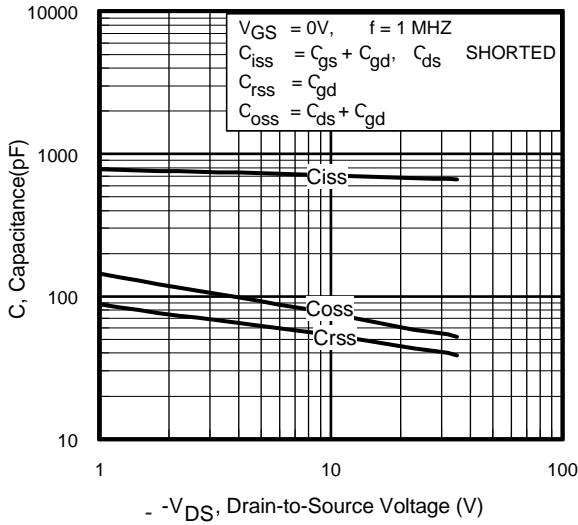


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

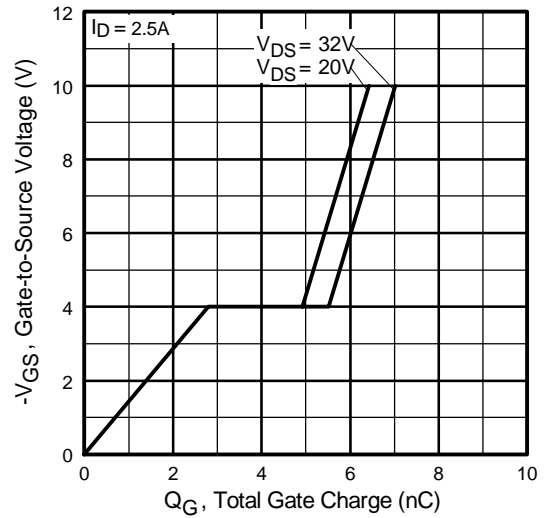


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

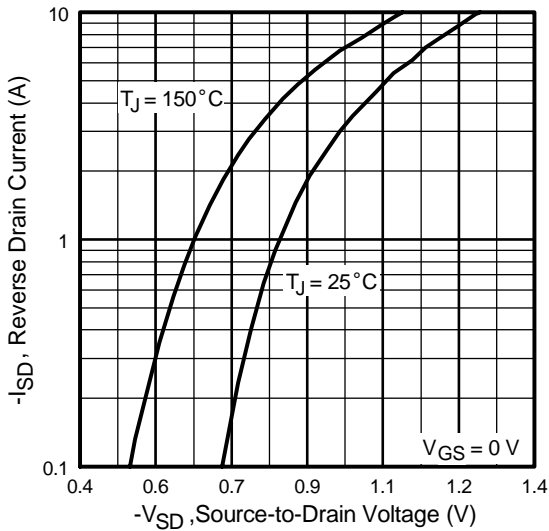


Fig 7. Typical Source-Drain Diode Forward Voltage

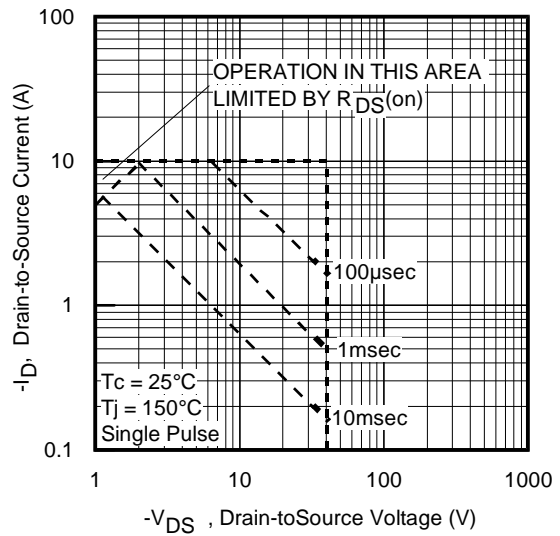


Fig 8. Maximum Safe Operating Area

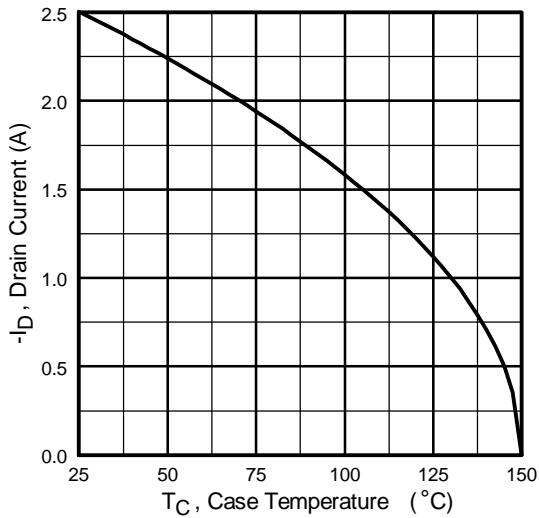


Fig 9. Maximum Drain Current Vs. Case Temperature

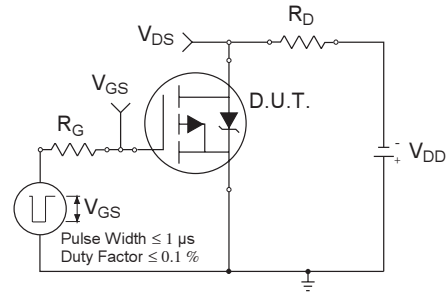


Fig 10a. Switching Time Test Circuit

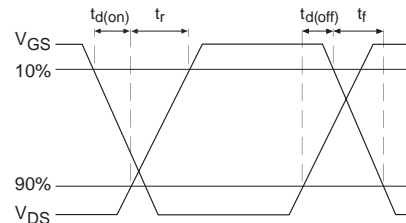


Fig 10b. Switching Time Waveforms

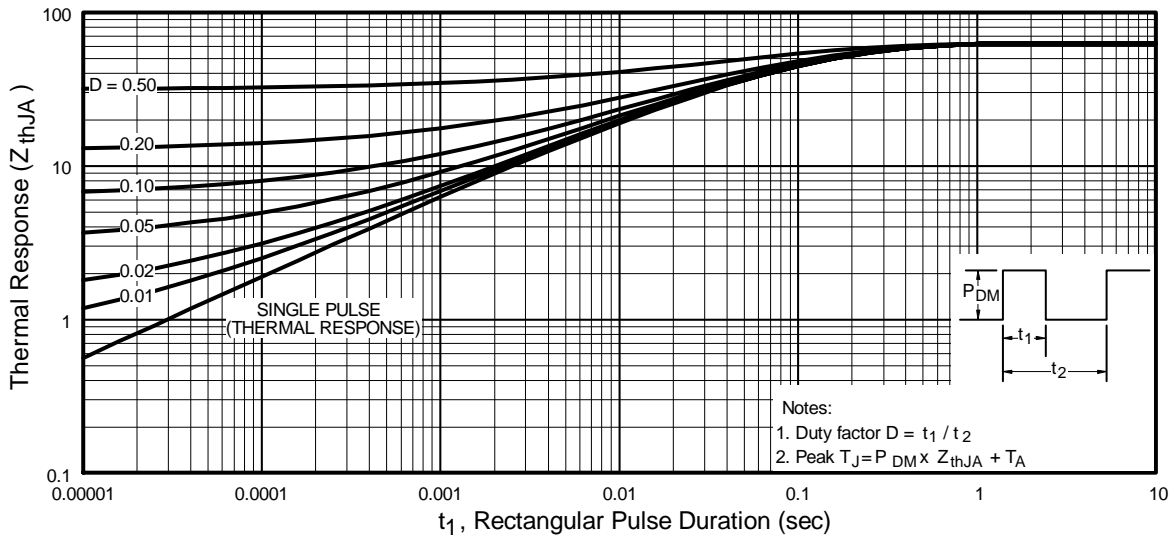


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

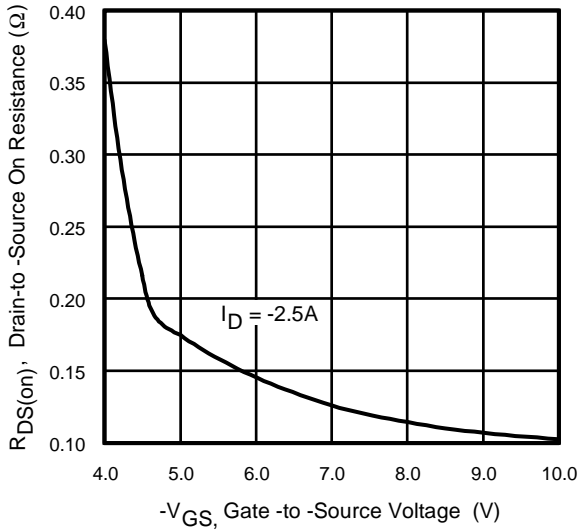


Fig 12. Typical On-Resistance Vs. Gate Voltage

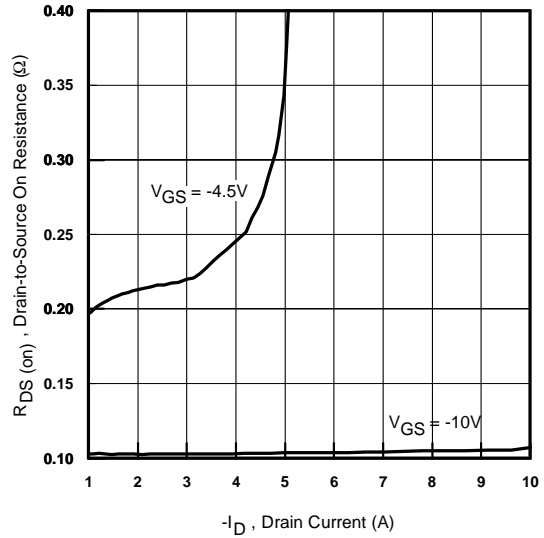


Fig 13. Typical On-Resistance Vs. Drain Current



Fig 14a. Basic Gate Charge Waveform

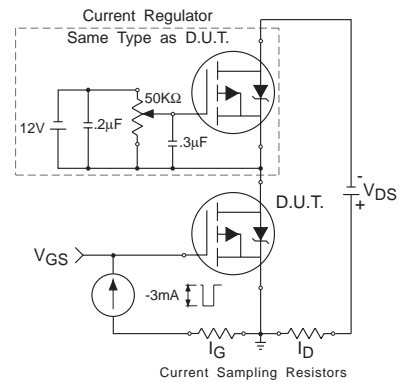


Fig 14b. Gate Charge Test Circuit

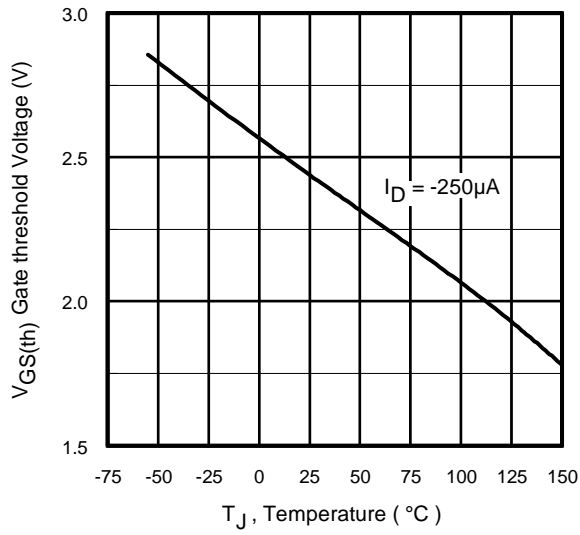


Fig 15. Typical Threshold Voltage Vs. Junction Temperature

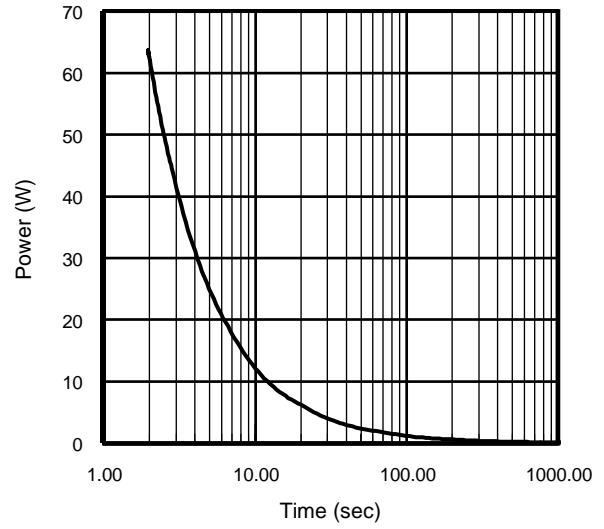
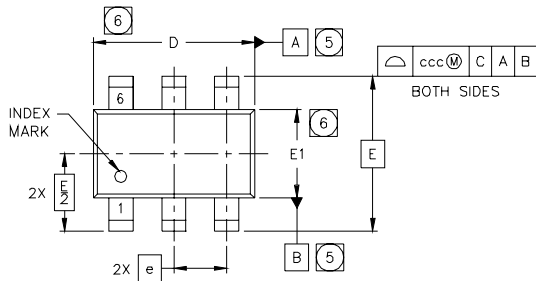


Fig 16. Typical Power Vs. Time

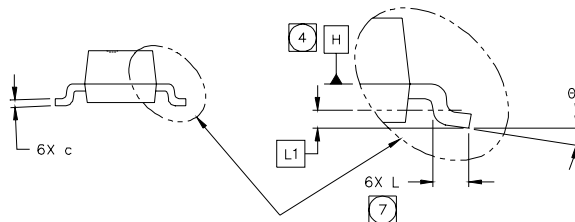
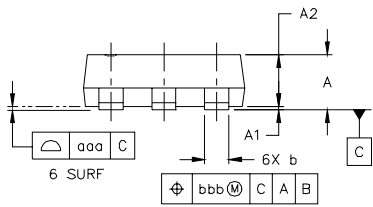
IRF5804

International
IR Rectifier

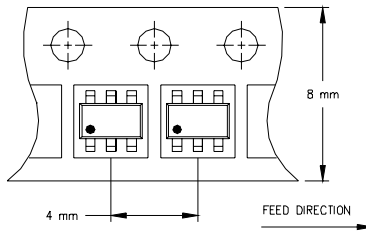
TSOP-6 Package Outline



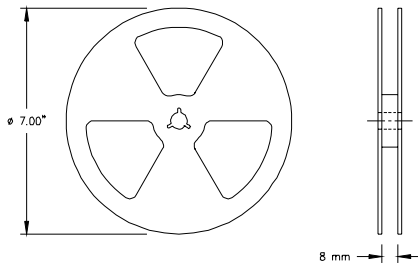
| SYMBOL | MO-193AA DIMENSIONS | | | | | |
|--------|---------------------|------|------|-----------|-------|-------|
| | MILLIMETERS | | | INCHES | | |
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | --- | --- | 1.10 | --- | --- | .0433 |
| A1 | 0.01 | --- | 0.10 | .0004 | --- | .0039 |
| A2 | 0.80 | 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 Tape & Reel Information



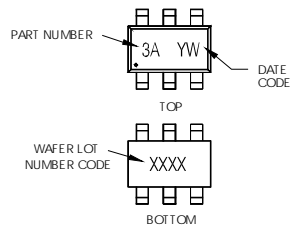
NOTES:
1. OUTLINE CONFORMS TO EIA-481 & EIA-541.



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TSOP-6 Part Marking Information

Notes: This part marking information applies to devices produced before 02/26/2001
 EXAMPLE: THIS IS AN S13443DV WW = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR



PART NUMBER CODE REFERENCE:

- 3A = S13443DV
- 3B = IRF5800
- 3C = IRF5850
- 3D = IRF5851
- 3E = IRF5852
- 3I = IRF5805
- 3J = IRF5806

DATE CODE EXAMPLES:

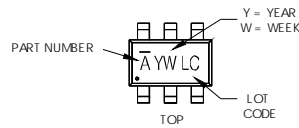
- YWW = 9603 = 6C
- YWW = 9632 = FF

| YEAR | Y | WORK WEEK | W |
|------|---|-----------|---|
| 2001 | 1 | 01 | A |
| 2002 | 2 | 02 | B |
| 2003 | 3 | 03 | C |
| 2004 | 4 | 04 | D |
| 2005 | 5 | | |
| 1996 | 6 | | |
| 1997 | 7 | | |
| 1998 | 8 | | |
| 1999 | 9 | | |
| 2000 | 0 | 24 | X |
| | | 25 | Y |
| | | 26 | Z |

WW = (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 | | |
| 1996 | F | | |
| 1997 | G | | |
| 1998 | H | | |
| 1999 | J | | |
| 2000 | K | 50 | X |
| | | 51 | Y |
| | | 52 | Z |

Notes: This part marking information applies to devices produced after 02/26/2001
 W = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR



PART NUMBER CODE REFERENCE:

- A = S13443DV
- B = IRF5800
- C = IRF5850
- D = IRF5851
- E = IRF5852
- T = IRF5805
- J = IRF5806
- K = IRF5810
- L = IRF5804
- M = IRF5803
- N = IRF5820

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 | | |
| 1996 | F | | |
| 1997 | G | | |
| 1998 | H | | |
| 1999 | J | | |
| 2000 | K | 50 | X |
| | | 51 | Y |
| | | 52 | Z |

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