

# SOT-23 Plastic-Encapsulate MOSFETS

TF3401

## TF3401 P-Channel 30-V(D-S) MOSFET

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
|---------------|-----------------|-------|
| -30V          | 0.060Ω@-10V     | -4.0A |
|               | 0.070Ω@-4.5V    |       |
|               | 0.100Ω@-2.5V    |       |

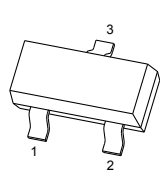
### General FEATURE

- TrenchFET Power MOSFET
- Lead free product is acquired
- Surface mount package

### APPLICATION

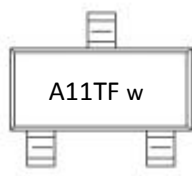
- Load Switch for Portable Devices
- DC/DC Converter

**SOT-23**



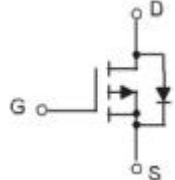
1.GATE  
2.SOURCE  
3.DRAIN

**MARKING**



\*w: week code

**Equivalent Circuit**



### Maximum ratings ( $T_a=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter  | Symbol          | Value     | Unit                        |
|--|-----------------|-----------|-----------------------------|
| Drain-Source Voltage                                       | $V_{DS}$        | -30       | V                           |
| Gate-Source Voltage  | $V_{GS}$        | ±12       |                             |
| Continuous Drain Current                                   | $I_D$           | -4.0      | A                           |
| Pulsed Drain Current                                       | $I_{DM}$        | -25       |                             |
| Maximum Power Dissipation                                  | $P_D$           | 1.2       | W                           |
| Thermal Resistance from Junction to Ambient( $t \leq 5s$ ) | $R_{\theta JA}$ | 104       | $^{\circ}\text{C}/\text{W}$ |
| Junction Temperature                                       | $T_J$           | 150       | $^{\circ}\text{C}$          |
| Storage Temperature  | $T_{stg}$       | -55 ~+150 |                             |



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## MOSFET ELECTRICAL CHARACTERISTICS

T<sub>a</sub> =25 °C unless otherwise specified

| Parameter                                 | Symbol              | Test Condition   | Min  | Typ | Max  | Units |
|---|---------------------|--|------|-----|------|-------|
| <b>Static characteristics</b>             |                     |  |      |     |      |       |
| Drain-source breakdown voltage            | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA  | -30  |     |      | V     |
| Zero gate voltage drain current           | I <sub>DSS</sub>    | V <sub>DS</sub> = -24V, V <sub>GS</sub> = 0V   |      |     | -1   | μA    |
| Gate-source leakage current               | I <sub>GSS</sub>    | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V   |      |     | ±100 | nA    |
| Drain-source on-resistance (note a)       | R <sub>DS(on)</sub> | V <sub>GS</sub> = -10V, I <sub>D</sub> = -4.0A   |      | 55  | 60   | mΩ    |
|   |                     | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.5A  |      | 65  | 70   | mΩ    |
|   |                     | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -1.2A  |      | 95  | 100  | mΩ    |
| Forward tranconductance (note a)          | g <sub>FS</sub>     | V <sub>DS</sub> = -5V, I <sub>D</sub> = -4.0A  | 7    | 10  |      | S     |
| Gate threshold voltage                    | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                      | -0.6 | -1  | -1.2 | V     |
| Diode forward voltage (note a)            | V <sub>SD</sub>     | I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V   |      |     | -1.2 | V     |
| <b>Dynamic characteristics (note b)</b>   |                     |  |      |     |      |       |
| Input capacitance                         | C <sub>iss</sub>    | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1MHz   |      | 950 |      | pF    |
| Output capacitance                        | C <sub>oss</sub>    |  |      | 115 |      | pF    |
| Reverse transfer capacitance              | C <sub>rss</sub>    |  |      | 75  |      | pF    |
| <b>Switching Characteristics (note b)</b> |                     |  |      |     |      |       |
| Turn-on delay time                        | t <sub>d(on)</sub>  | V <sub>GS</sub> = -10V, V <sub>DS</sub> = -15V,<br>I <sub>D</sub> = -4.0A, R <sub>GEN</sub> = 6Ω |      | 7.0 |      | ns    |
| Turn-on rise time                         | t <sub>r</sub>      |  |      | 3.0 |      | ns    |
| Turn-off delay time                       | t <sub>d(off)</sub> |  |      | 30  |      | ns    |
| Turn-off fall time                        | t <sub>f</sub>      |  |      | 12  |      | ns    |

**Notes:**

- a. Pulse Test : Pulse Width < 300μs, Duty Cycle ≤2%.
- b. These parameters have no way to verify.

Typical Electrical and Thermal Characteristics

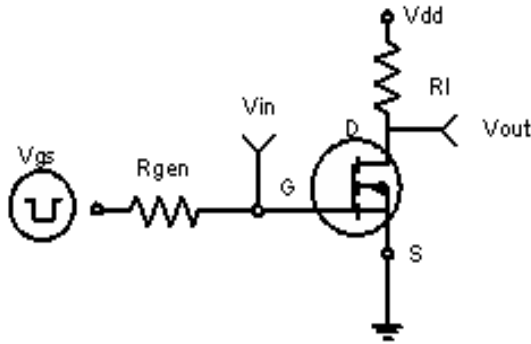


Figure 1: Switching Test Circuit

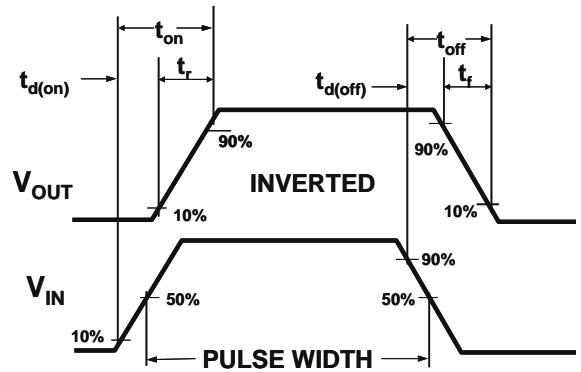
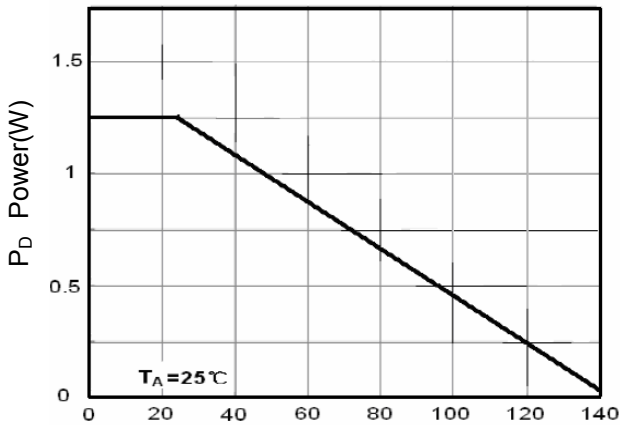
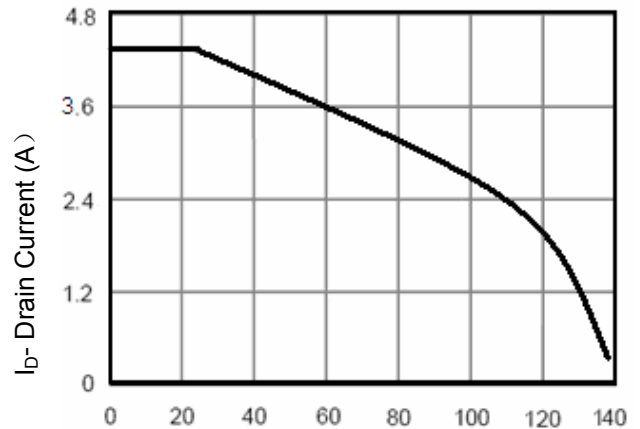


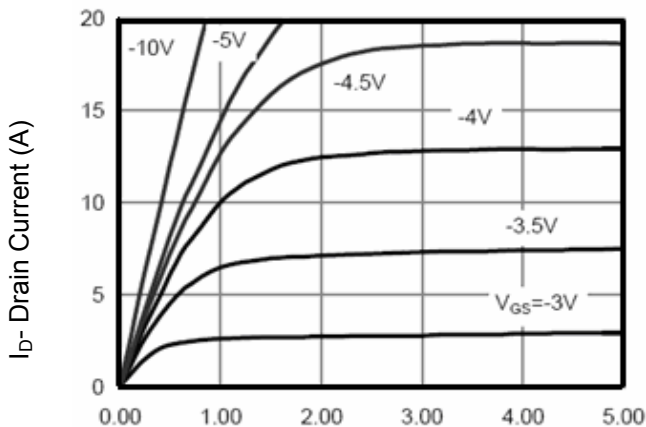
Figure 2: Switching Waveforms



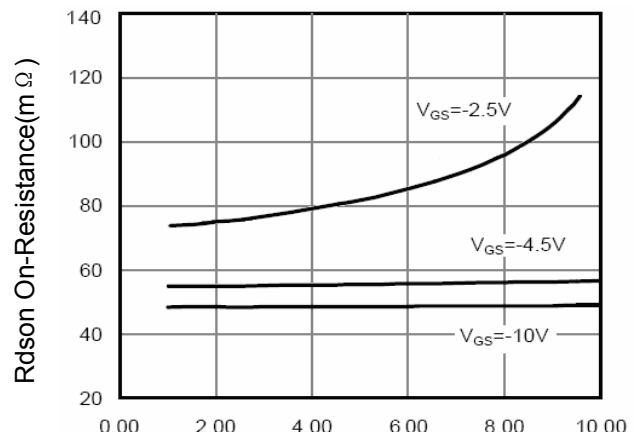
T<sub>J</sub>-Junction Temperature(°C)  
Figure 3 Power Dissipation



T<sub>J</sub>-Junction Temperature(°C)  
Figure 4 Drain Current



V<sub>ds</sub> Drain-Source Voltage (V)  
Figure 5 Output Characteristics



I<sub>D</sub>- Drain Current (A)  
Figure 6 Drain-Source On-Resistance

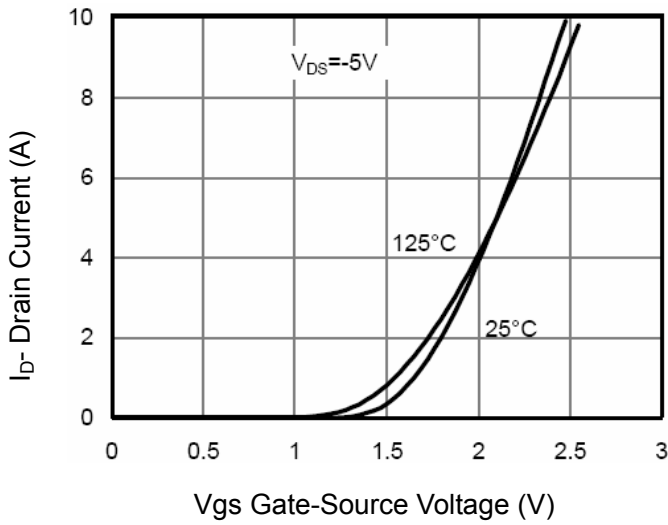


Figure 7 Transfer Characteristics

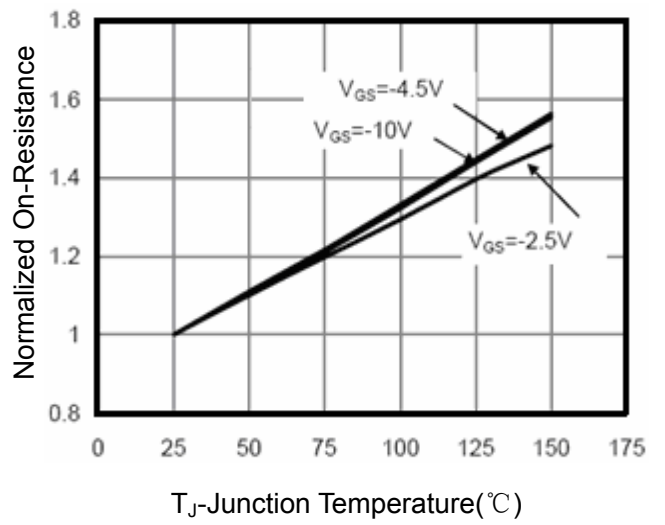


Figure 8 Drain-Source On-Resistance

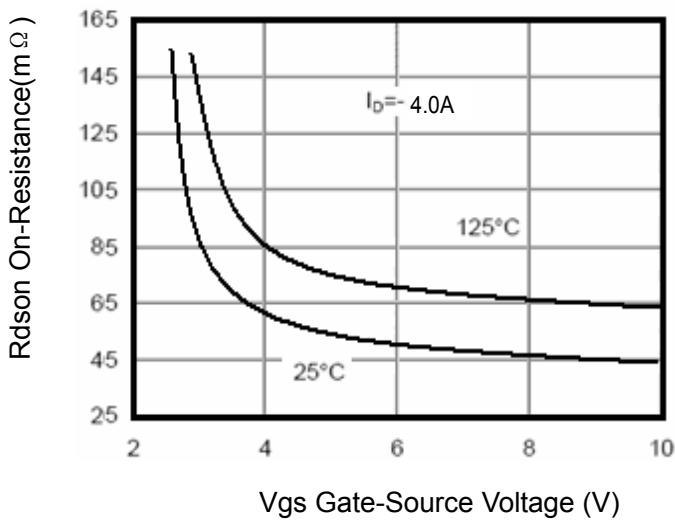


Figure 9 Rdson vs Vgs

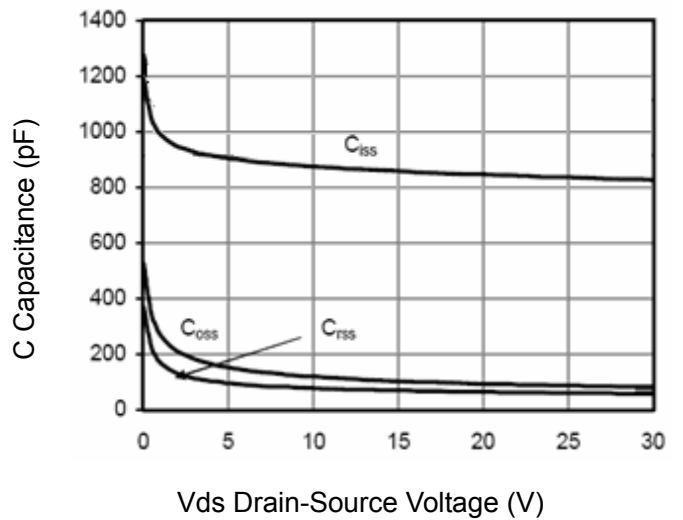


Figure 10 Capacitance vs Vds

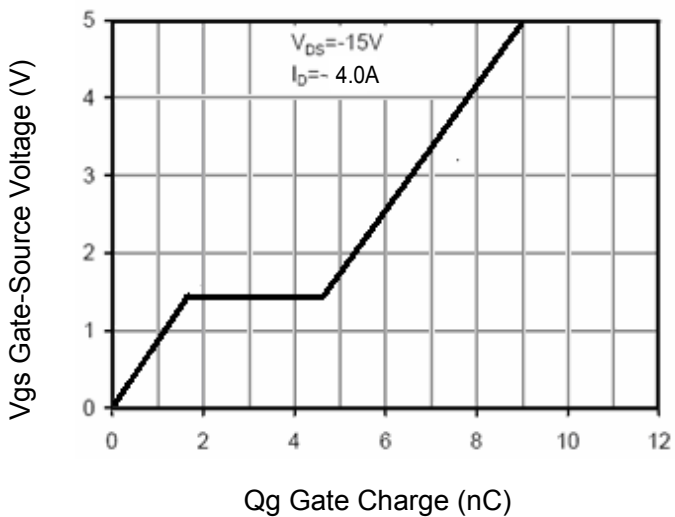


Figure 11 Gate Charge

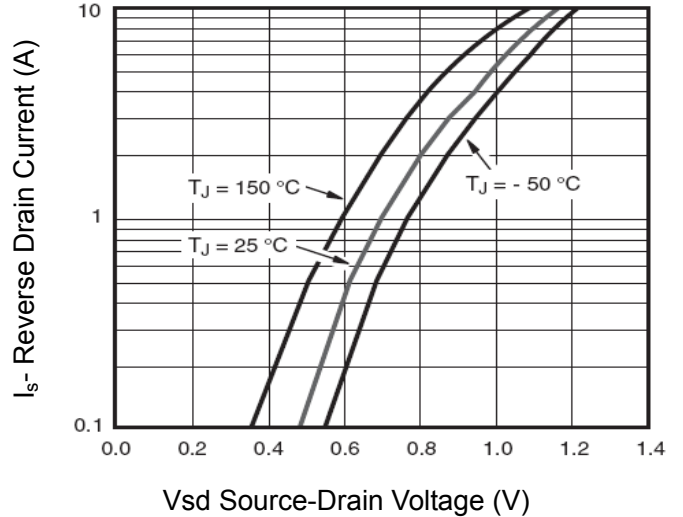


Figure 12 Source- Drain Diode Forward

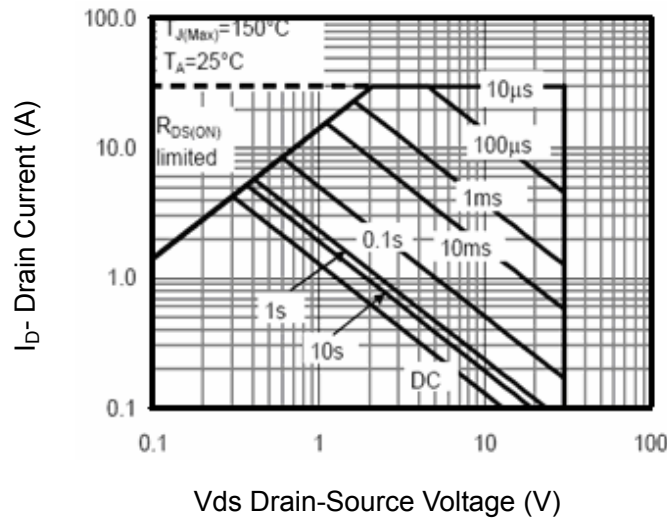


Figure 13 Safe Operation Area

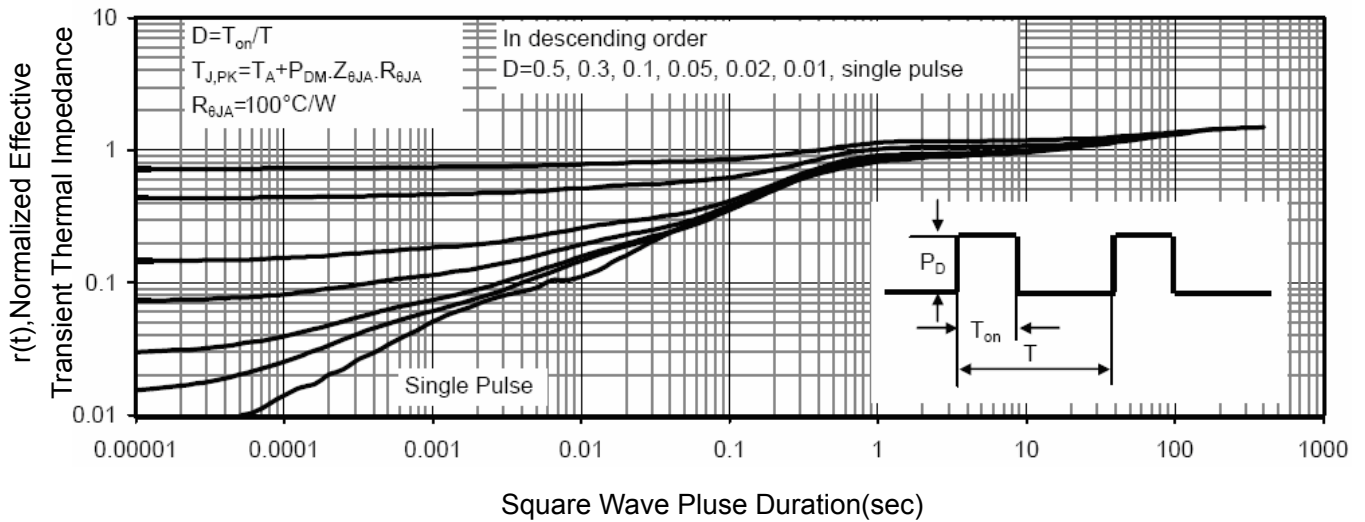
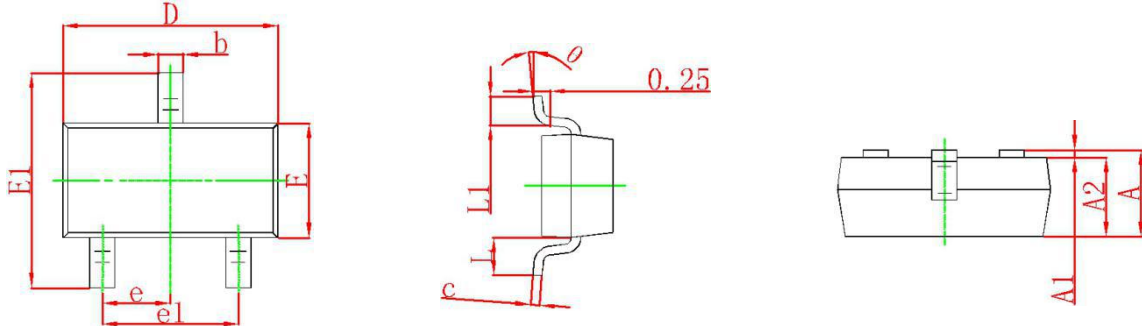


Figure 14 Normalized Maximum Transient Thermal Impedance

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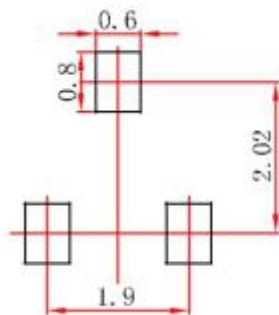
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## SOT-23 Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.050 | 0.035                | 0.041 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.800                     | 3.000 | 0.110                | 0.118 |
| E      | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                     | 2.550 | 0.089                | 0.100 |
| e      | 0.950 TYP                 |       | 0.037 TYP            |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.550 REF                 |       | 0.022 REF            |       |
| L1     | 0.300                     | 0.500 | 0.012                | 0.020 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

## SOT-23 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.