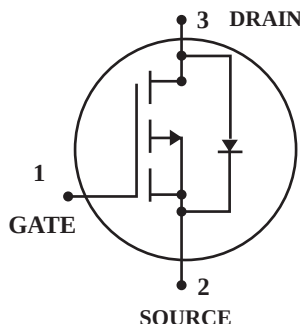


## P-Channel Enhancement Mode Power MOSFET

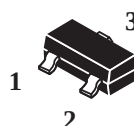
 Lead(Pb)-Free



**DRAIN CURRENT**  
-2.3 AMPERES  
**DRAIN SOURCE VOLTAGE**  
-20 VOLTAGE

### Features:

- \*Super High Dense Cell Design For Low  $R_{DS(ON)}$   
 $R_{DS(ON)} < 100m\Omega @ V_{GS} = -4.5V$
- \*Rugged and Reliable
- \*Simple Drive Requirement
- \*SOT-23 Package



**SOT-23**

### Applications

- \*Power Management in Notebook Computer
- \*Portable Equipment
- \*Battery Powered System

### Maximum Ratings ( $T_A = 25^\circ C$ Unless Otherwise Specified)

| Rating                                                                   | Symbol          | Value       | Unit         |
|--------------------------------------------------------------------------|-----------------|-------------|--------------|
| Drain-Source Voltage                                                     | $V_{DS}$        | -20         | V            |
| Gate-Source Voltage                                                      | $V_{GS}$        | $\pm 8$     |              |
| Continuous Drain Current <sup>3</sup>                                    | $I_D$           | -2.3        | A            |
| Pulsed Drain Current <sup>1,2</sup>                                      | $I_{DM}$        | -8          | A            |
| Total Power Dissipation ( $T_A = 25^\circ C$ )<br>( $T_A = 75^\circ C$ ) | $P_D$           | 0.9<br>0.57 | W            |
| Maximum Junction-ambient <sup>3</sup>                                    | $R_{\theta JA}$ | 140         | $^\circ C/W$ |
| Maximum Junction-case                                                    | $R_{\theta JC}$ | 100         | $^\circ C/W$ |
| Ambient Temperature                                                      | $T_a$           | 150         | $^\circ C$   |
| Case Temperature                                                         | $T_c$           | 150         | $^\circ C$   |
| Operating Junction Temperature Range                                     | $T_J$           | 150         | $^\circ C$   |
| Storage Temperature Range                                                | $T_{stg}$       | -55 ~ +150  | $^\circ C$   |

### Device Marking

WTC2301 = 01

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### Static

|                                                                                                                               |               |        |          |            |               |
|-------------------------------------------------------------------------------------------------------------------------------|---------------|--------|----------|------------|---------------|
| Drain-Source Breakdown Voltage<br>$V_{GS}=0, I_D=-250\mu\text{A}$                                                             | $V_{(BR)DSS}$ | -20    | -        | -          | V             |
| Gate-Source Threshold Voltage<br>$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$                                                         | $V_{GS(Th)}$  | -0.45  | -        | -0.95      |               |
| Gate-Source Leakage Current<br>$V_{GS} = \pm 8\text{V}$                                                                       | $I_{GSS}$     | -      | -        | $\pm 100$  | nA            |
| Drain-Source Leakage Current ( $T_J=25^\circ\text{C}$ )<br>$V_{DS}=-9.6\text{V}, V_{GS}=0$                                    | $I_{DSS}$     | -      | -        | -1         | $\mu\text{A}$ |
| Drain-Source On-Resistance <sup>2</sup><br>$V_{GS}=-4.5\text{V}, I_D=-2.8\text{A}$<br>$V_{GS}=-2.5\text{V}, I_D=-2.0\text{A}$ | $R_{DS(on)}$  | -<br>- | 69<br>83 | 100<br>150 | m $\Omega$    |
| Forward Transconductance<br>$V_{DS}=-5.0\text{V}, I_D=-4.0\text{A}$                                                           | $g_{fs}$      | -      | 6.5      | -          | S             |

### Dynamic

|                                                                                        |           |   |        |   |    |
|----------------------------------------------------------------------------------------|-----------|---|--------|---|----|
| Input Capacitance<br>$V_{GS}=0\text{V}, V_{DS}=-6\text{V}, f=1.0\text{MHz}$            | $C_{iss}$ | - | 882.51 | - | pF |
| Output Capacitance<br>$V_{GS}=0\text{V}, V_{DS}=-6\text{V}, f=1.0\text{MHz}$           | $C_{oss}$ | - | 145.54 | - |    |
| Reverse Transfer Capacitance<br>$V_{GS}=0\text{V}, V_{DS}=-6\text{V}, f=1.0\text{MHz}$ | $C_{rss}$ | - | 97.26  | - |    |

## Switching

|                                                                                                             |            |   |       |   |    |
|-------------------------------------------------------------------------------------------------------------|------------|---|-------|---|----|
| Turn-on Delay Time <sup>2</sup><br>$V_{DD} = -6V, V_{GEN} = -4.5V, I_D = -1A, R_L = 6\Omega, R_G = 6\Omega$ | $t_d(on)$  | - | 17.28 | - | ns |
| Rise Time<br>$V_{DD} = -6V, V_{GEN} = -4.5V, I_D = -1A, R_L = 6\Omega, R_G = 6\Omega$                       | $t_r$      | - | 3.73  | - |    |
| Turn-off Delay Time<br>$V_{DD} = -6V, V_{GEN} = -4.5V, I_D = -1A, R_L = 6\Omega, R_G = 6\Omega$             | $t_d(off)$ | - | 36.05 | - |    |
| Fall Time<br>$V_{DD} = -6V, V_{GEN} = -4.5V, I_D = -1A, R_L = 6\Omega, R_G = 6\Omega$                       | $t_f$      | - | 6.19  | - |    |
| Total Gate Charge <sup>2</sup><br>$V_{DS} = -6.0V, V_{GS} = -4.5V, I_D = -2.8A$                             | $Q_g$      | - | 15.23 | - | nC |
| Gate-Source Charge<br>$V_{DS} = -6.0V, V_{GS} = -4.5V, I_D = -2.8A$                                         | $Q_{gs}$   | - | 5.49  | - |    |
| Gate-Drain Charge<br>$V_{DS} = -6.0V, V_{GS} = -4.5V, I_D = -2.8A$                                          | $Q_{gd}$   | - | 2.74  | - |    |

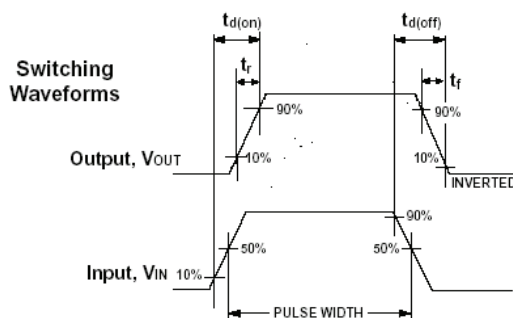
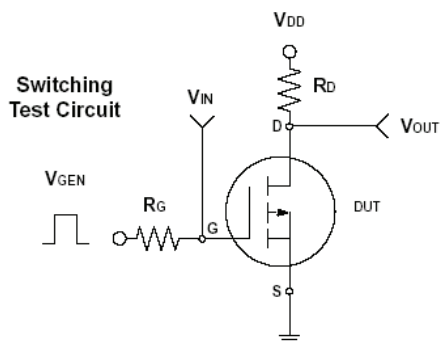
## Source-Drain Diode Characteristics

|                                                                                  |          |   |      |       |   |
|----------------------------------------------------------------------------------|----------|---|------|-------|---|
| Forward On Voltage <sup>2</sup><br>$V_{GS} = 0V, I_S = -0.75A, T_j = 25^\circ C$ | $V_{SD}$ | - | -0.8 | - 1.2 | V |
| Continuous Source Current(Body Diode)                                            | $I_S$    | - | -    | - 2.4 | A |

Note: 1. Pulse width limited by Max, junction temperature.

2. pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 270°C/W when mounted on min, copper pad.



## Typical Electrical Characteristics

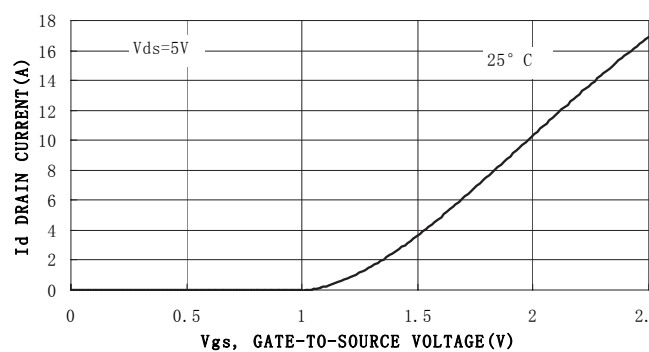


Figure 1. Transfer Characteristics

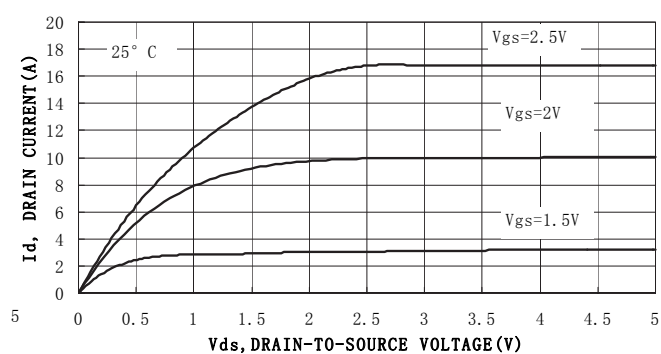


Figure 2. On-Region Characteristics

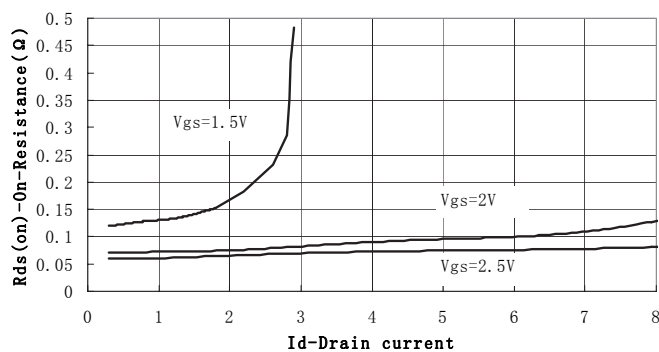


Figure 3. On-Resistance versus Drain Current

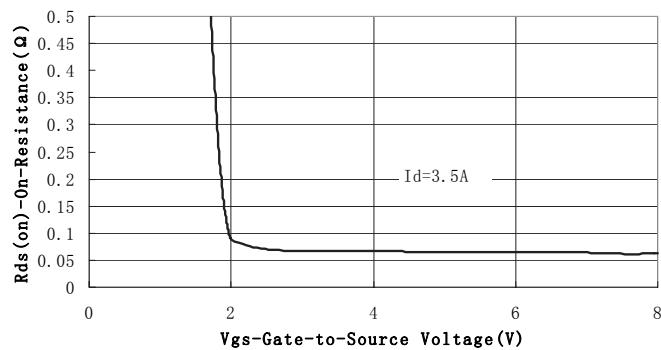


Figure 4. On-Resistance vs. Gate-to-Source Voltage

## Typical Electrical Characteristics

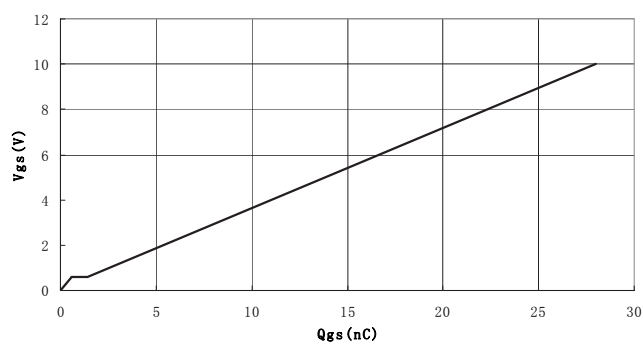


Figure 5. Gate Charge

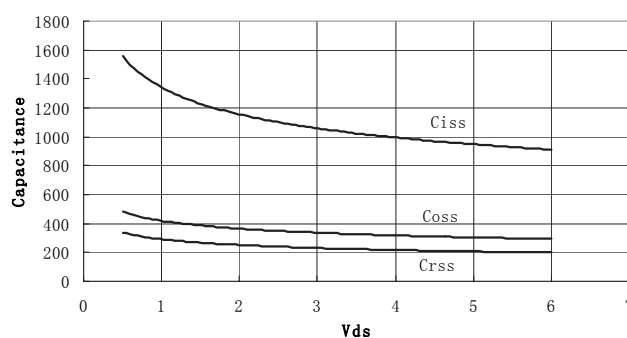


Figure 6. Capacitance

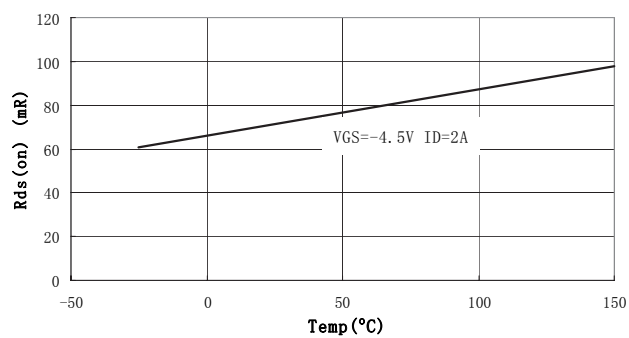


Figure 7. On-Resistance Vs. Junction Temperature

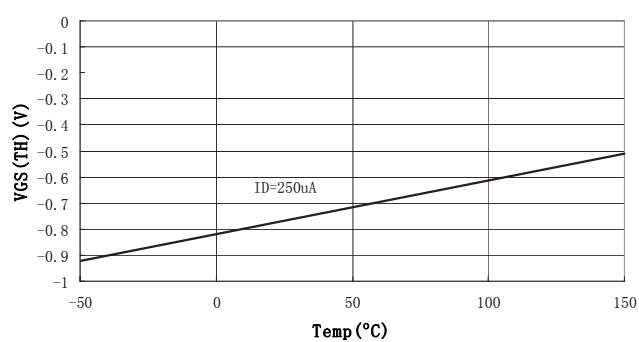
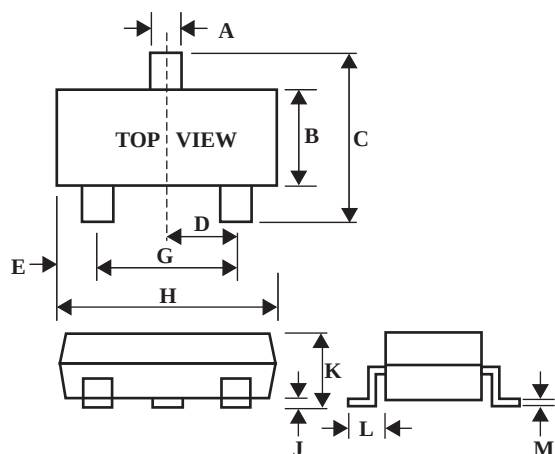


Figure 8. Vth Vs. Junction Temperature

## SOT-23 Outline Dimension



| SOT-23 |       |      |
|--------|-------|------|
| Dim    | Min   | Max  |
| A      | 0.35  | 0.51 |
| B      | 1.19  | 1.40 |
| C      | 2.10  | 3.00 |
| D      | 0.85  | 1.05 |
| E      | 0.46  | 1.00 |
| G      | 1.70  | 2.10 |
| H      | 2.70  | 3.10 |
| J      | 0.01  | 0.13 |
| K      | 0.89  | 1.10 |
| L      | 0.30  | 0.61 |
| M      | 0.076 | 0.25 |