

### Features

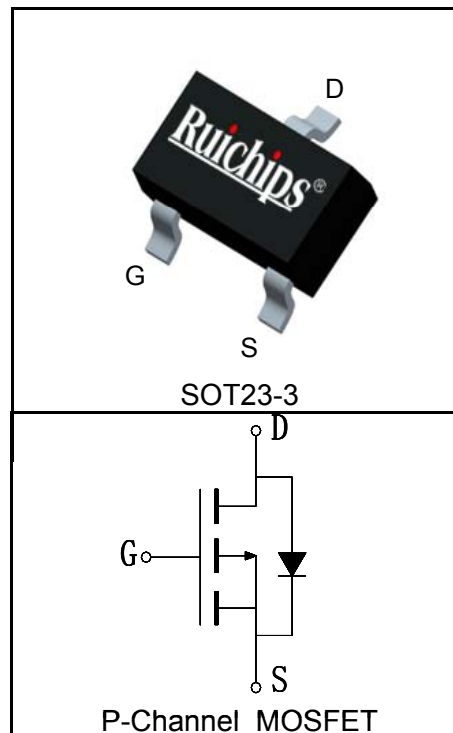
- -20V/-7A,  
 $R_{DS(ON)} = 20m\Omega(Typ.)@V_{GS} = -4.5V$   
 $R_{DS(ON)} = 30m\Omega(Typ.)@V_{GS} = -2.5V$
- Uses Ruichips advanced Trench™ technology
- Ultra Low On-Resistance
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)



### Applications

- Load Switch
- Power Management
- Battery Protection

### Pin Description



### Absolute Maximum Ratings

| Symbol                                                             | Parameter                                    | Rating                     | Unit         |
|--------------------------------------------------------------------|----------------------------------------------|----------------------------|--------------|
| <b>Common Ratings</b> ( $T_A = 25^\circ C$ Unless Otherwise Noted) |                                              |                            |              |
| $V_{DSS}$                                                          | Drain-Source Voltage                         | -20                        | V            |
| $V_{GSS}$                                                          | Gate-Source Voltage                          | $\pm 12$                   |              |
| $T_J$                                                              | Maximum Junction Temperature                 | 150                        | $^\circ C$   |
| $T_{STG}$                                                          | Storage Temperature Range                    | -55 to 150                 | $^\circ C$   |
| $I_S$                                                              | Diode Continuous Forward Current             | $T_A = 25^\circ C$<br>-7   | A            |
| <b>Mounted on Large Heat Sink</b>                                  |                                              |                            |              |
| $I_{DP}^{①}$                                                       | 300 $\mu s$ Pulse Drain Current Tested       | $T_A = 25^\circ C$<br>-24  | A            |
| $I_D^{②}$                                                          | Continuous Drain Current( $V_{GS} = -4.5V$ ) | $T_A = 25^\circ C$<br>-7   | A            |
|                                                                    |                                              | $T_A = 70^\circ C$<br>-5.5 |              |
| $P_D$                                                              | Maximum Power Dissipation                    | $T_A = 25^\circ C$<br>1.3  | W            |
|                                                                    |                                              | $T_A = 70^\circ C$<br>0.8  |              |
| $R_{\theta JC}$                                                    | Thermal Resistance-Junction to Case          | -                          | $^\circ C/W$ |
| $R_{\theta JA}^{③}$                                                | Thermal Resistance-Junction to Ambient       | 100                        | $^\circ C/W$ |
| <b>Drain-Source Avalanche Ratings</b>                              |                                              |                            |              |
| $E_{AS}^{④}$                                                       | Avalanche Energy, Single Pulsed              | -                          | mJ           |

**Electrical Characteristics** ( $T_A=25^{\circ}\text{C}$  Unless Otherwise Noted)

| Symbol                                   | Parameter                        | Test Condition                                                                                                       | RU20P02C |      |      | Unit |
|------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------|----------|------|------|------|
|                                          |                                  |                                                                                                                      | Min.     | Typ. | Max. |      |
| Static Characteristics                   |                                  |                                                                                                                      |          |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =-250μA                                                                         | -20      |      |      | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                                                           |          |      | -1   | μA   |
|                                          |                                  | T <sub>J</sub> =125°C                                                                                                |          |      | -30  |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250μA                                                           | -0.4     | -0.7 | -1.1 | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                                                           |          |      | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>⑤</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-7A                                                                         |          | 20   | 28   | mΩ   |
|                                          |                                  | V <sub>GS</sub> =-2.5V, I <sub>DS</sub> =-5A                                                                         |          | 30   | 38   | mΩ   |
| Diode Characteristics                    |                                  |                                                                                                                      |          |      |      |      |
| V <sub>SD</sub> <sup>⑤</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =-1A, V <sub>GS</sub> =0V                                                                            |          |      | -1.2 | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =-7A, dI <sub>SD</sub> /dt=100A/μs                                                                   |          | 17   |      | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                      |          | 23   |      | nC   |
| Dynamic Characteristics <sup>⑥</sup>     |                                  |                                                                                                                      |          |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                     |          | 0.9  |      | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =-10V,<br>Frequency=1.0MHz                                                   |          | 640  |      | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                      |          | 135  |      |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                      |          | 65   |      |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =-10V, R <sub>L</sub> =3.8Ω,<br>I <sub>DS</sub> =-7A, V <sub>GEN</sub> =-4.5V,<br>R <sub>G</sub> =6Ω |          | 9    |      | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                      |          | 16   |      |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                      |          | 45   |      |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                      |          | 21   |      |      |
| Gate Charge Characteristics <sup>⑥</sup> |                                  |                                                                                                                      |          |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-16V, V <sub>GS</sub> =-4.5V,<br>I <sub>DS</sub> =-7A                                               |          | 10   |      | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                      |          | 2    |      |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                      |          | 3    |      |      |

- Notes:
- ① Pulse width limited by safe operating area.
  - ② Calculated continuous current based on maximum allowable junction temperature.
  - ③ When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ . The value in any given application depends on the user's specific board design.
  - ④ Limited by  $T_{Jmax}$ . Starting  $T_J = 25^{\circ}\text{C}$ .
  - ⑤ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
  - ⑥ Guaranteed by design, not subject to production testing.

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**Ordering and Marking Information**

| Device   | Marking <sup>①</sup> | Package | Packaging | Quantity | Reel Size | Tape width |
|----------|----------------------|---------|-----------|----------|-----------|------------|
| RU20P02C | TXYWW                | SOT23-3 | Tape&Reel | 3000     | 7"        | 8mm        |

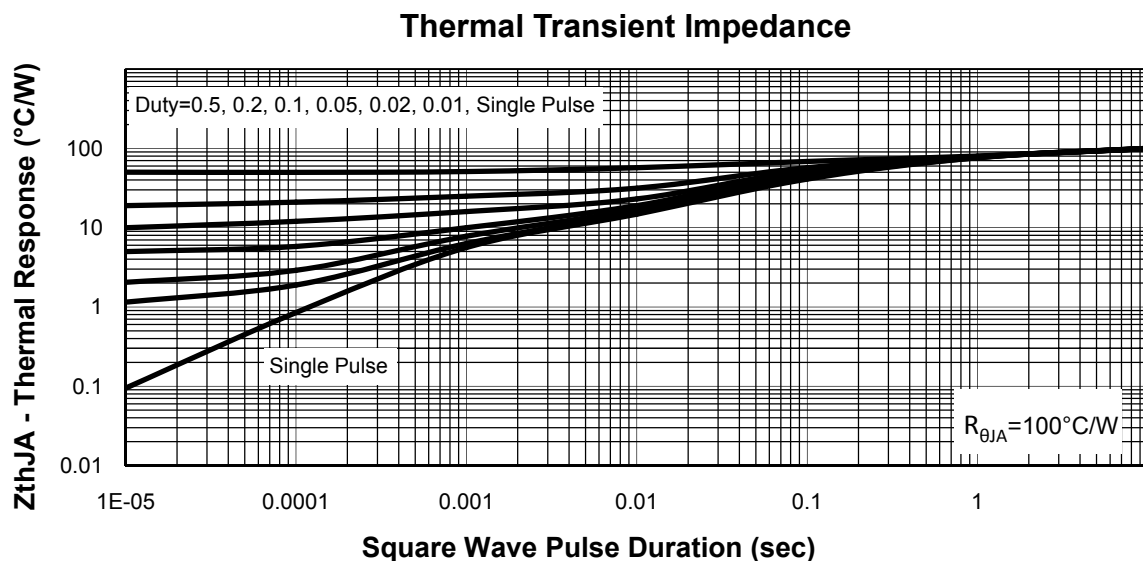
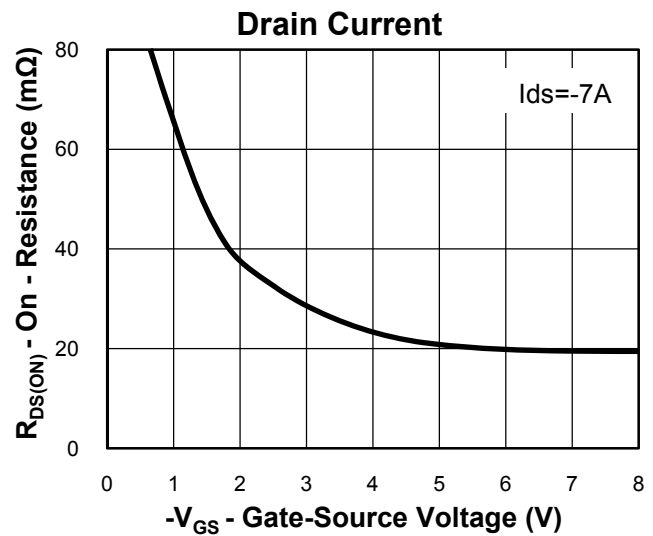
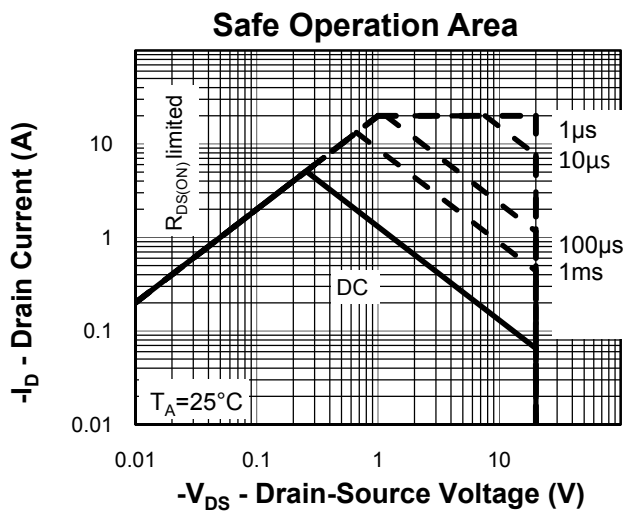
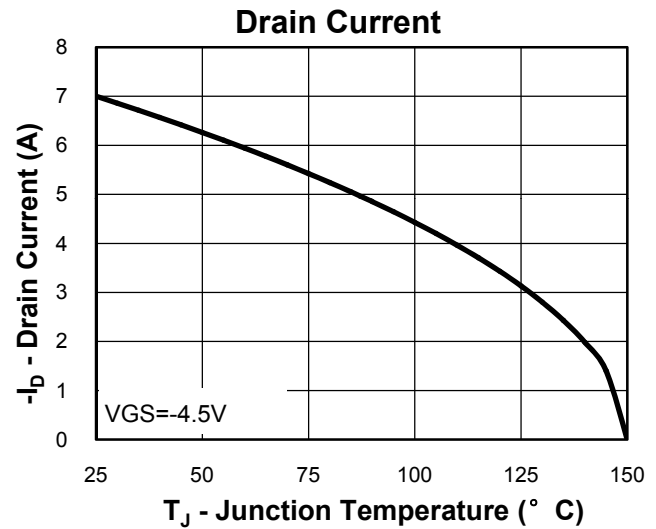
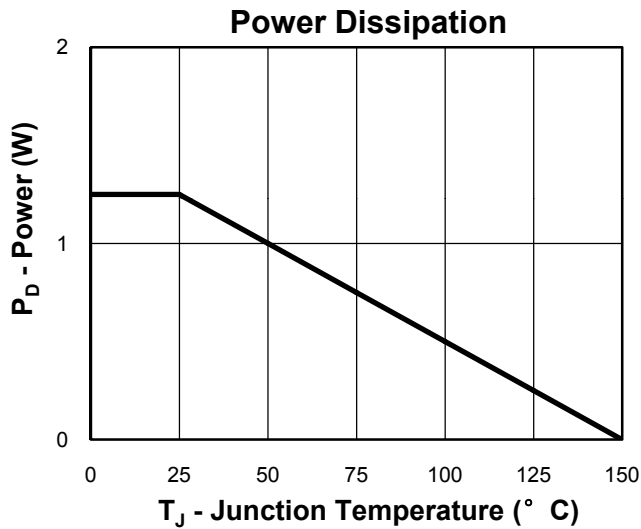
① The following characters could be different and means:

X =Assembly site code

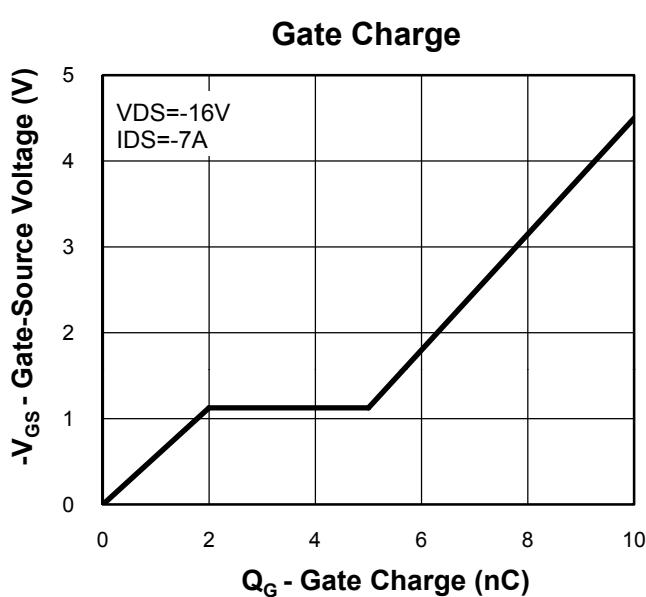
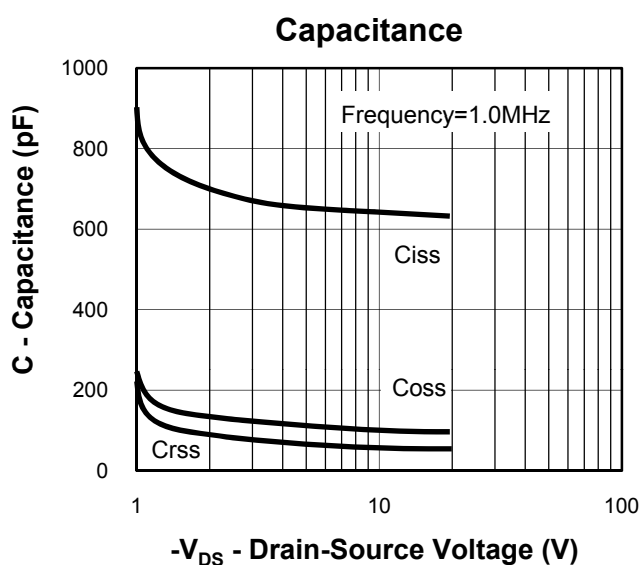
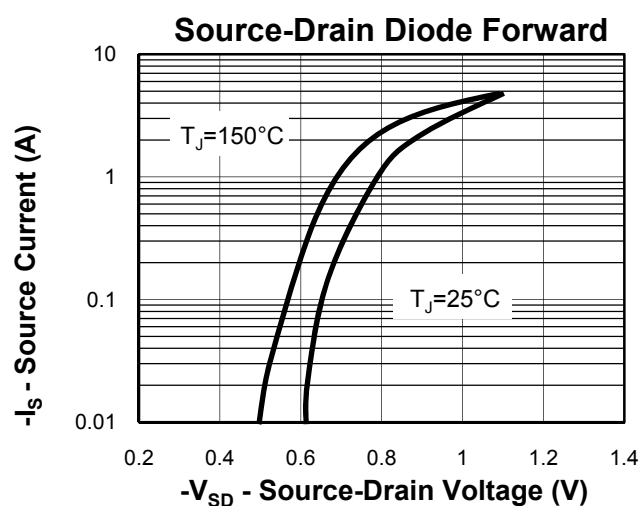
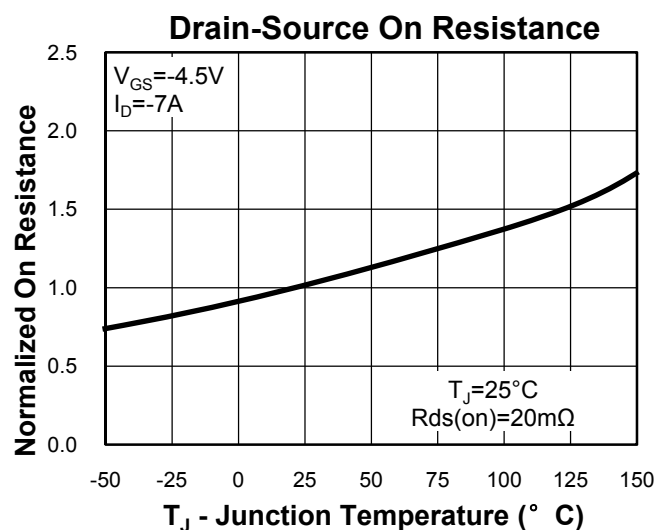
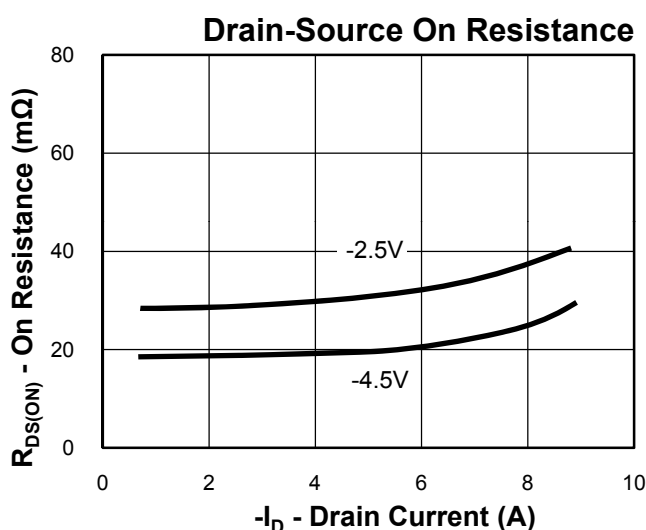
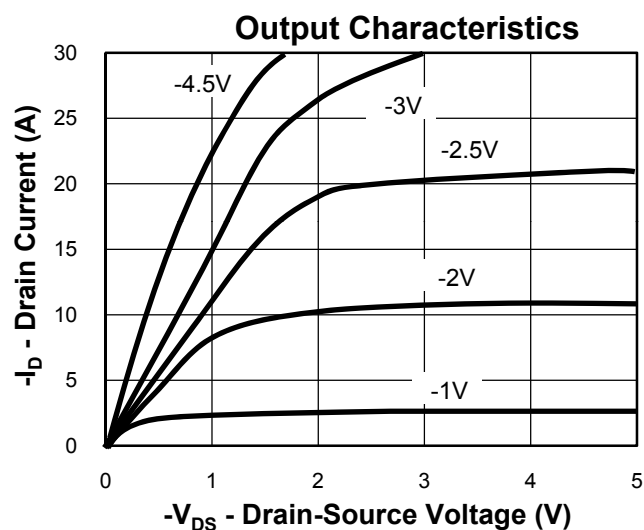
Y =Year

WW =Work Week

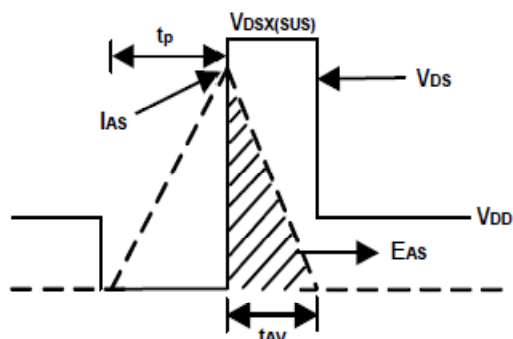
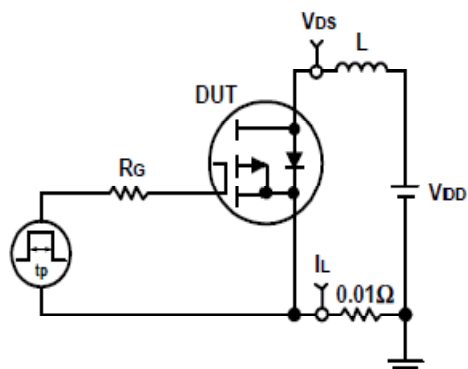
## Typical Characteristics



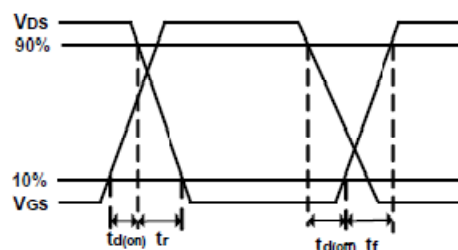
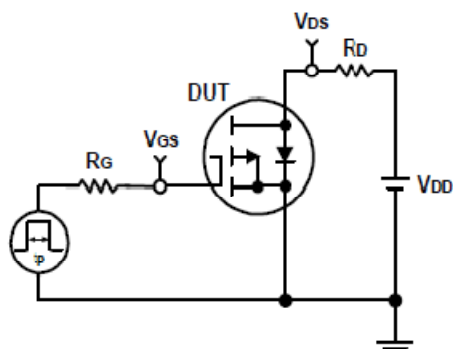
## Typical Characteristics



## Avalanche Test Circuit and Waveforms

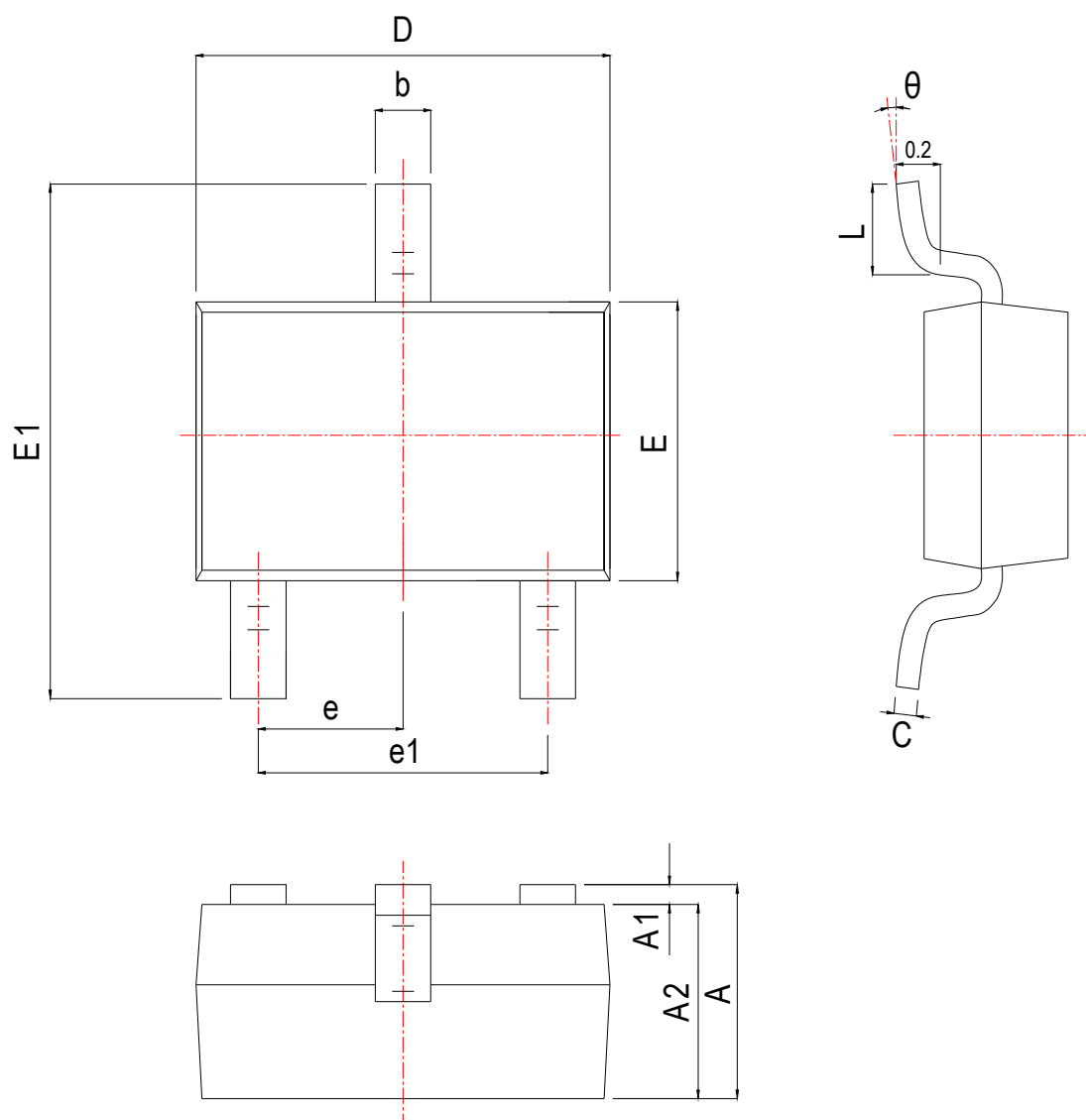


## Switching Time Test Circuit and Waveforms



**Package Information**

**SOT23-3**



| SYMBOL   | MM        |       |       | INCH      |       |       |
|----------|-----------|-------|-------|-----------|-------|-------|
|          | MIN       | NOM   | MAX   | MIN       | NOM   | MAX   |
| A        | 1.050     | 1.150 | 1.250 | 0.041     | 0.045 | 0.049 |
| A1       | 0.000     | 0.050 | 0.100 | 0.000     | 0.002 | 0.004 |
| A2       | 1.050     | 1.100 | 1.150 | 0.041     | 0.043 | 0.045 |
| b        | 0.300     | 0.400 | 0.500 | 0.012     | 0.016 | 0.020 |
| c        | 0.100     | 0.150 | 0.200 | 0.004     | 0.006 | 0.008 |
| D        | 2.820     | 2.920 | 3.020 | 0.111     | 0.115 | 0.119 |
| E        | 1.500     | 1.600 | 1.700 | 0.059     | 0.063 | 0.067 |
| E1       | 2.650     | 2.800 | 2.950 | 0.104     | 0.110 | 0.116 |
| e        | 0.950 BSC |       |       | 0.037 BSC |       |       |
| e1       | 1.800     | 1.900 | 2.000 | 0.071     | 0.075 | 0.079 |
| L        | 0.300     | 0.450 | 0.600 | 0.012     | 0.018 | 0.024 |
| $\theta$ | 0°        | 4°    | 8°    | 0°        | 4°    | 8°    |