

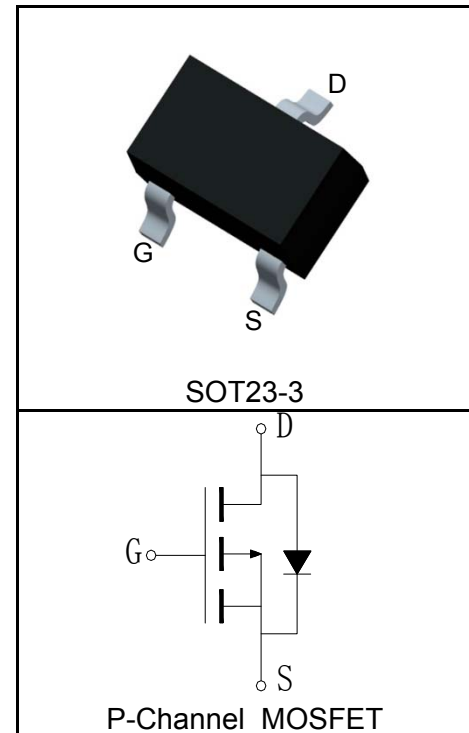
### Features

- -20V/-5A,  
 $R_{DS(ON)} = 20m\Omega(Typ.)@V_{GS} = -4.5V$   
 $R_{DS(ON)} = 30m\Omega(Typ.)@V_{GS} = -2.5V$
- 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> ( $T_A = 25^\circ\text{C}$ Unless Otherwise Noted) |   |                                  |                           |
| $V_{DSS}$  | Drain-Source Voltage                                | -20                              | V                         |
| $V_{GSS}$  | Gate-Source Voltage                                 | $\pm 10$                         |                           |
| $T_J$  | Maximum Junction Temperature                        | 150                              | $^\circ\text{C}$          |
| $T_{STG}$  | Storage Temperature Range                           | -55 to 150                       | $^\circ\text{C}$          |
| $I_S$  | Diode Continuous Forward Current                    | $T_A = 25^\circ\text{C}$<br>-1   | A                         |
| <b>Mounted on Large Heat Sink</b>  |   |                                  |                           |
| $I_{DP}^{①}$   | 300 $\mu\text{s}$ Pulse Drain Current Tested        | $T_A = 25^\circ\text{C}$<br>-20  | A                         |
| $I_D^{②}$  | Continuous Drain Current ( $V_{GS} = -10\text{V}$ ) | $T_A = 25^\circ\text{C}$<br>-5   | A                         |
|  |   | $T_A = 70^\circ\text{C}$<br>-3.1 |                           |
| $P_D$  | Maximum Power Dissipation                           | $T_A = 25^\circ\text{C}$<br>1.3  | W                         |
|  |   | $T_A = 70^\circ\text{C}$<br>0.8  |                           |
| $R_{\theta JC}$  | Thermal Resistance-Junction to Case                 | -                                | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}^{③}$  | Thermal Resistance-Junction to Ambient              | 100                              | $^\circ\text{C}/\text{W}$ |
| <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   | RU20P7C |      |           | Unit      |
|--|----------------------------------|--|---------|------|-----------|-----------|
|  |                                  |  | Min.    | Typ. | Max.      |           |
| <b>Static Characteristics</b>                    |                                  |  |         |      |           |           |
| $BV_{DSS}$                                       | Drain-Source Breakdown Voltage   | $V_{GS}=0V, I_{DS}=-250\mu A$  | -20     |      |           | V         |
| $I_{DSS}$  | Zero Gate Voltage Drain Current  | $V_{DS}=-20V, V_{GS}=0V$   |         |      | -1        | $\mu A$   |
|  |                                  | $T_J=125^\circ\text{C}$  |         |      | -30       |           |
| $V_{GS(th)}$                                     | Gate Threshold Voltage           | $V_{DS}=V_{GS}, I_{DS}=-250\mu A$  | -0.4    | -0.7 | -1.1      | V         |
| $I_{GSS}$  | Gate Leakage Current             | $V_{GS}=\pm 10V, V_{DS}=0V$  |         |      | $\pm 100$ | nA        |
| $R_{DS(ON)}^{(5)}$                               | Drain-Source On-state Resistance | $V_{GS}=-4.5V, I_{DS}=-5A$   |         | 20   | 28        | $m\Omega$ |
|  |                                  | $V_{GS}=-2.5V, I_{DS}=-4A$   |         | 30   | 38        | $m\Omega$ |
| <b>Diode Characteristics</b>                     |                                  |  |         |      |           |           |
| $V_{SD}^{(5)}$                                   | Diode Forward Voltage            | $I_{SD}=-1A, V_{GS}=0V$  |         |      | -1.2      | V         |
| $t_{rr}$   | Reverse Recovery Time            | $I_{SD}=-5A, di_{SD}/dt=100A/\mu s$  |         | 17   |           | ns        |
| $Q_{rr}$   | Reverse Recovery Charge          |  |         | 23   |           | nC        |
| <b>Dynamic Characteristics<sup>(6)</sup></b>     |                                  |  |         |      |           |           |
| $R_G$  | Gate Resistance                  | $V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$  |         | 0.9  |           | $\Omega$  |
| $C_{iss}$  | Input Capacitance                | $V_{GS}=0V,$<br>$V_{DS}=-10V,$<br>Frequency=1.0MHz                             |         | 640  |           | pF        |
| $C_{oss}$  | Output Capacitance               |  |         | 135  |           |           |
| $C_{riss}$                                       | Reverse Transfer Capacitance     |  |         | 65   |           |           |
| $t_{d(ON)}$                                      | Turn-on Delay Time               | $V_{DD}=-10V, R_L=3.8\Omega,$<br>$I_{DS}=-5A, V_{GEN}=-4.5V,$<br>$R_G=6\Omega$ |         | 9    |           | ns        |
| $t_r$  | Turn-on Rise Time                |  |         | 16   |           |           |
| $t_{d(OFF)}$                                     | Turn-off Delay Time              |  |         | 45   |           |           |
| $t_f$  | Turn-off Fall Time               |  |         | 21   |           |           |
| <b>Gate Charge Characteristics<sup>(6)</sup></b> |                                  |  |         |      |           |           |
| $Q_g$  | Total Gate Charge                | $V_{DS}=-16V, V_{GS}=-10V,$<br>$I_{DS}=-5A$                                    |         | 10   |           | nC        |
| $Q_{gs}$   | Gate-Source Charge               |  |         | 2    |           |           |
| $Q_{gd}$   | 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.

**Ordering and Marking Information**

| <b>Device</b> | <b>Marking<sup>①</sup></b> | <b>Package</b> | <b>Packaging</b> | <b>Quantity</b> | <b>Reel Size</b> | <b>Tape width</b> |
|---------------|----------------------------|----------------|------------------|-----------------|------------------|-------------------|
| RU20P7C       | QXYWW                      | SOT23-3        | Tape&Reel        | 3000            | 7"               | 8mm               |

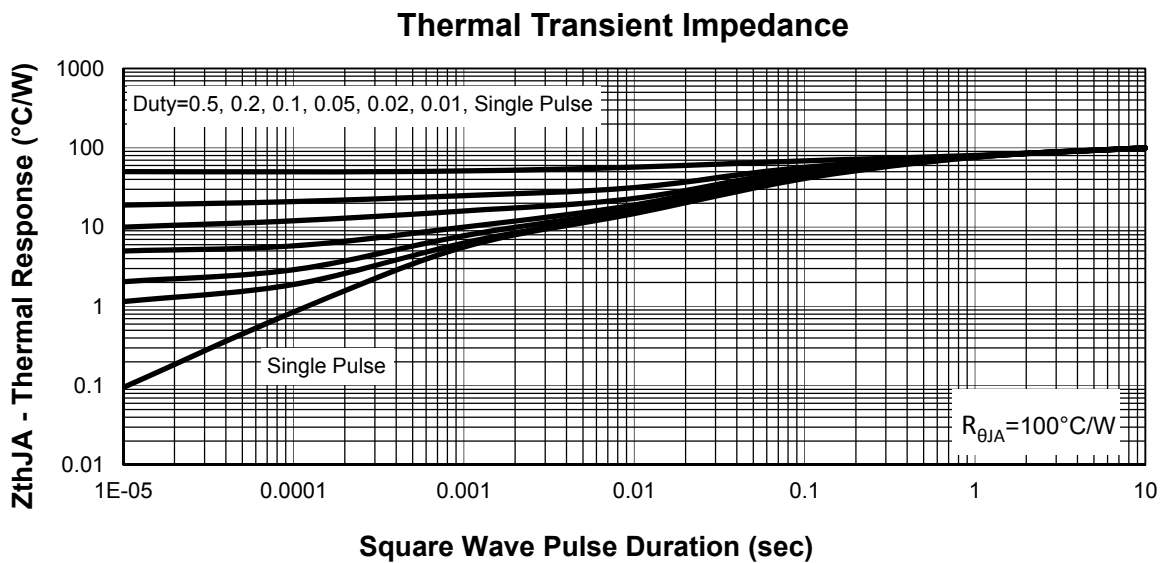
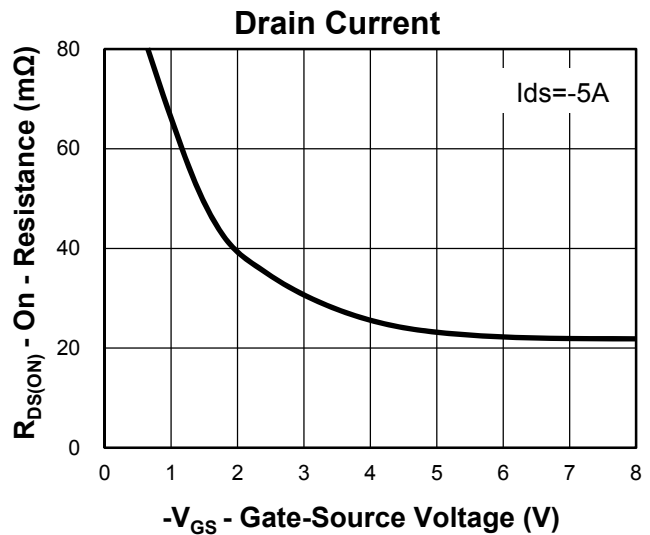
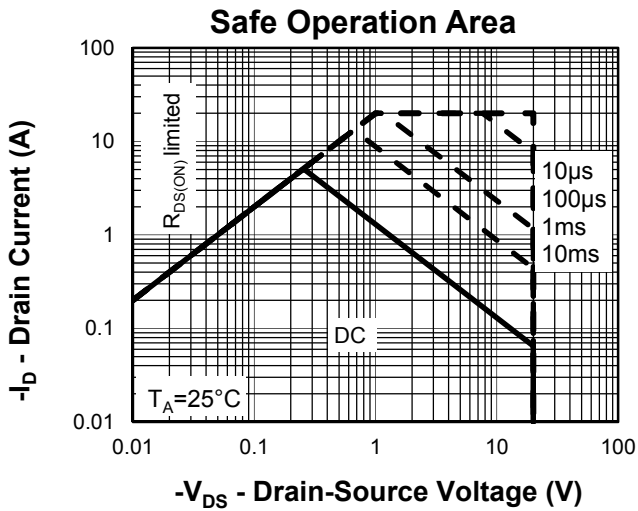
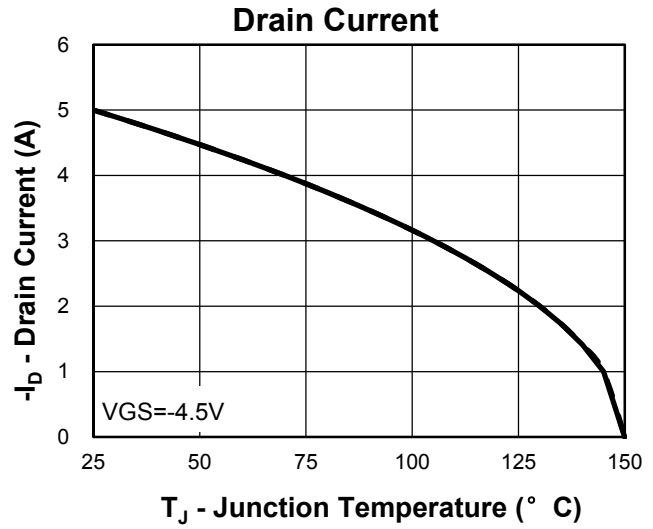
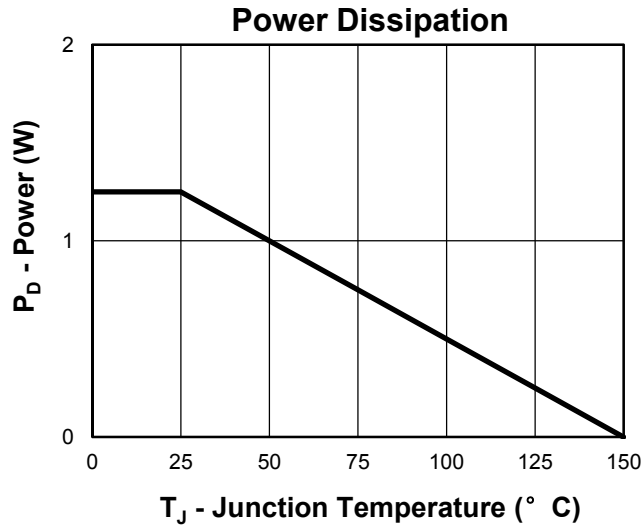
① The following characters could be different and means:

X =Assembly site code

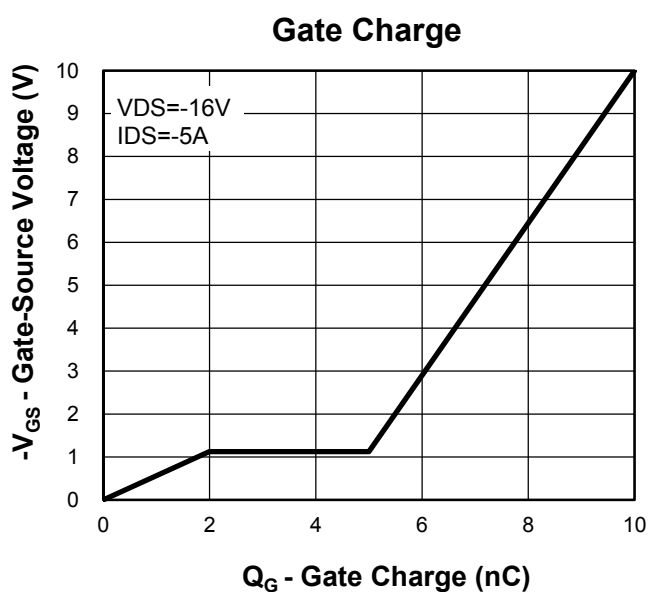
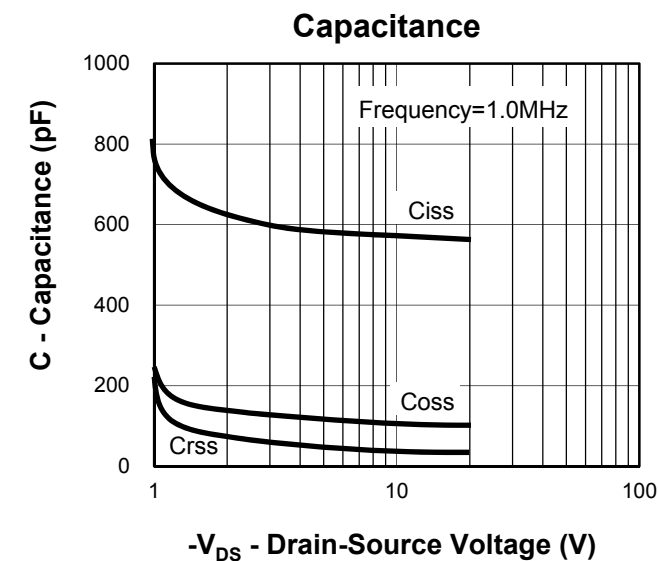
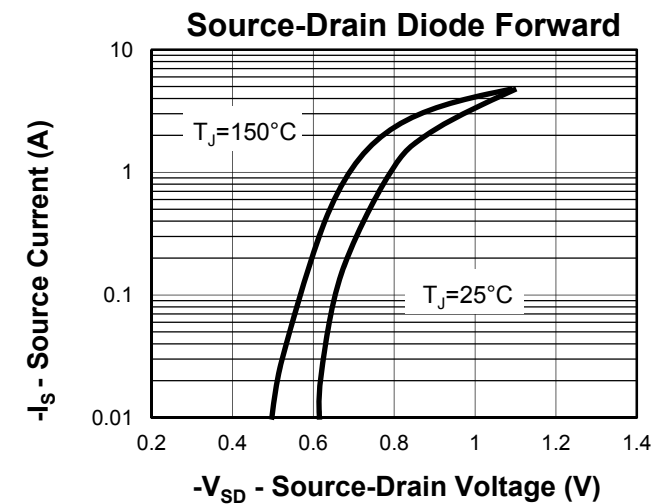
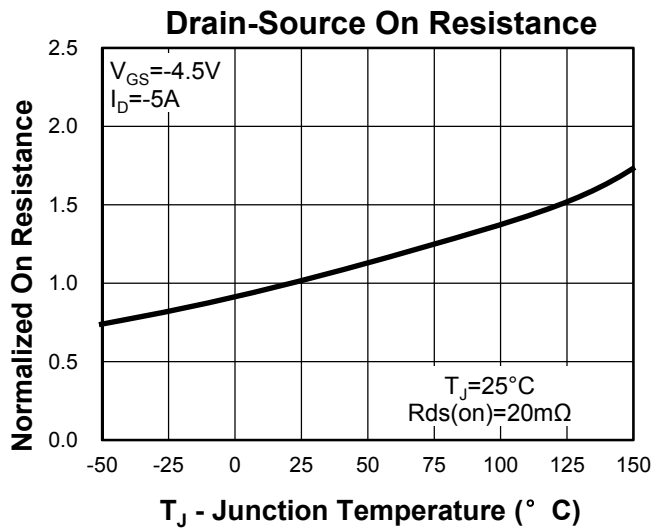
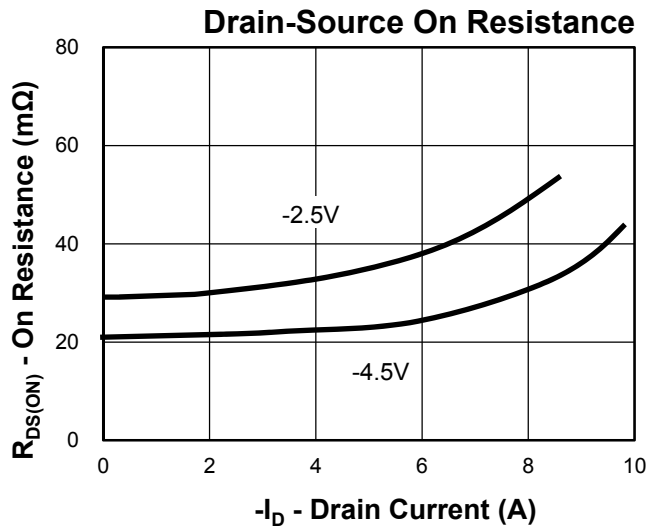
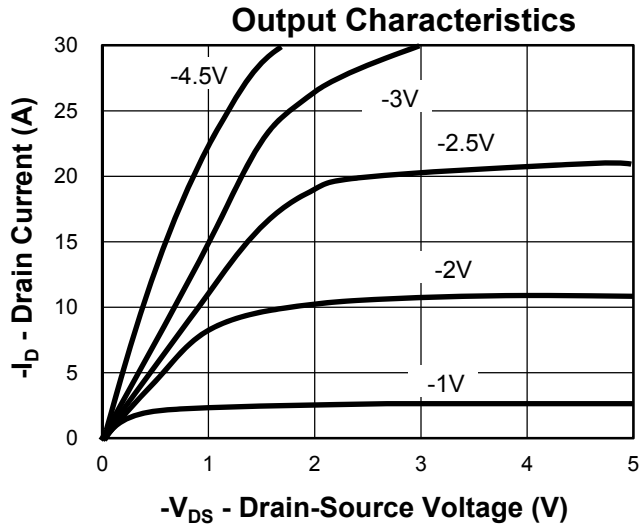
Y =Year

WW =Work Week

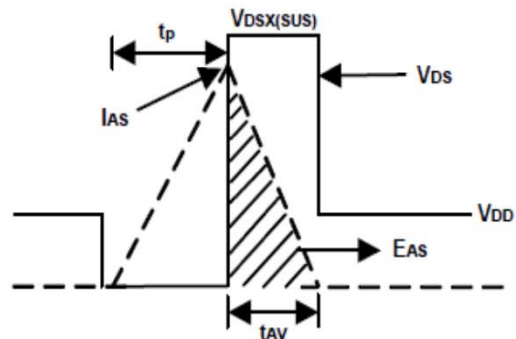
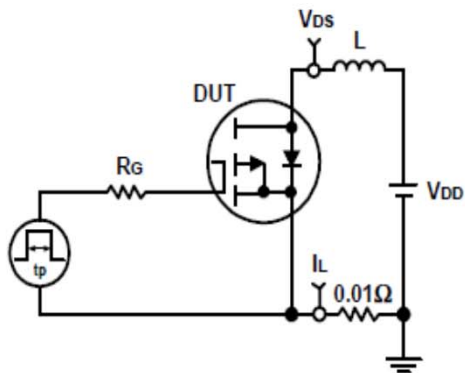
**Typical Characteristics**



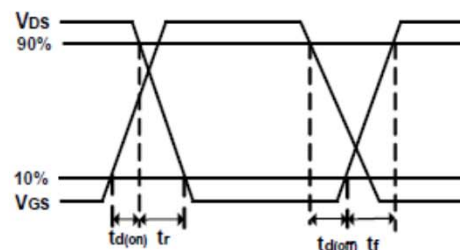
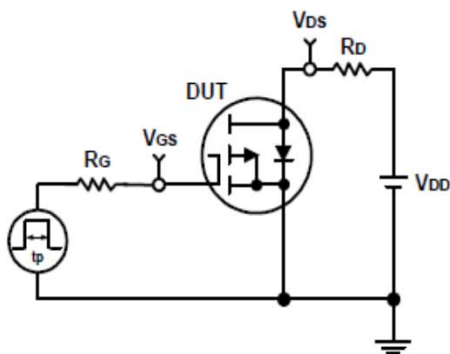
**Typical Characteristics**



**Avalanche Test Circuit and Waveforms**

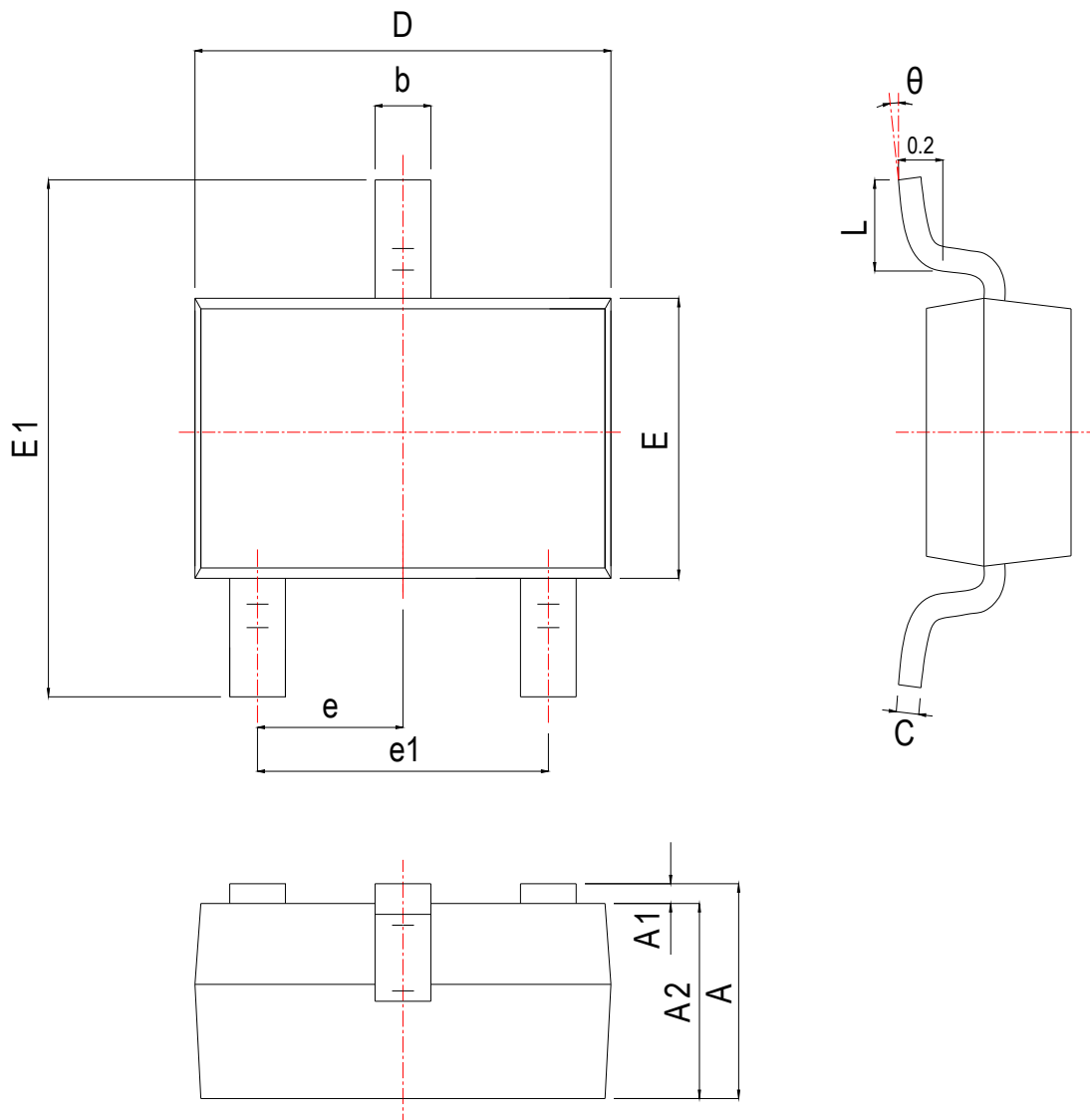


**Switching Time Test Circuit and Waveforms**



**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°    |

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