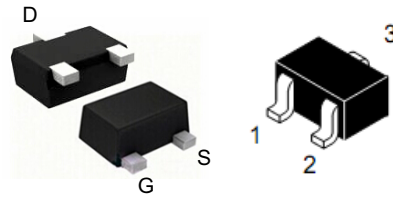
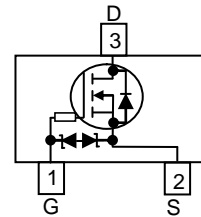
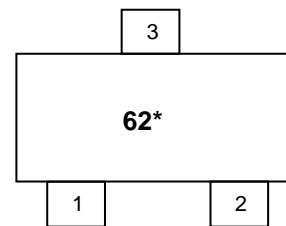


**WNM6002**
**Single N-Channel, 60V, 0.30A, Power MOSFET**
[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)

| $V_{DS}$ (V)         | $R_{ds(on)}$ ( $\Omega$ ) |
|----------------------|---------------------------|
| 60                   | 1.4 @ $V_{GS}=10V$        |
|                      | 1.7 @ $V_{GS}=4.5V$       |
| ESD Rating:2000V HBM |                           |


**SOT-323**
**Descriptions**

The WNM6002 is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product WNM6002 is Pb-free and Halogen-free.


**Pin configuration (Top view)**


62 = Device Code

\* = Month (A~Z)

**Marking**
**Features**

- Trench Technology
- Supper high density cell design
- Excellent ON resistance for higher DC current
- Extremely Low Threshold Voltage
- Small package SOT-323

**Applications**

- Driver for Relay, Solenoid, Motor, LED etc.
- DC-DC converter circuit
- Power Switch
- Load Switch
- Charging

**Order information**

| Device       | Package | Shipping       |
|--------------|---------|----------------|
| WNM6002-3/TR | SOT-323 | 3000/Reel&Tape |

| Parameter                               |                          | Symbol    | 10 s       | Steady State | Unit               |
|---|--------------------------|-----------|------------|--------------|--------------------|
| Drain-Source Voltage                    |                          | $V_{DS}$  | 60         |              | V                  |
| Gate-Source Voltage                     |                          | $V_{GS}$  | $\pm 20$   |              |                    |
| Continuous Drain Current <sup>ad</sup>  | $T_A=25^{\circ}\text{C}$ | $I_D$     | 0.30       | 0.28         | A                  |
|   | $T_A=70^{\circ}\text{C}$ |           | 0.24       | 0.22         |                    |
| Maximum Power Dissipation <sup>ad</sup> | $T_A=25^{\circ}\text{C}$ | $P_D$     | 0.37       | 0.31         | W                  |
|   | $T_A=70^{\circ}\text{C}$ |           | 0.23       | 0.20         |                    |
| Continuous Drain Current <sup>bd</sup>  | $T_A=25^{\circ}\text{C}$ | $I_D$     | 0.27       | 0.24         | A                  |
|   | $T_A=70^{\circ}\text{C}$ |           | 0.21       | 0.19         |                    |
| Maximum Power Dissipation <sup>bd</sup> | $T_A=25^{\circ}\text{C}$ | $P_D$     | 0.29       | 0.23         | W                  |
|   | $T_A=70^{\circ}\text{C}$ |           | 0.18       | 0.14         |                    |
| Pulsed Drain Current <sup>c</sup>       |                          | $I_{DM}$  | 1.0        |              | A                  |
| Operating Junction Temperature          |                          | $T_J$     | -55 to 150 |              | $^{\circ}\text{C}$ |
| Lead Temperature                        |                          | $T_L$     | 260        |              | $^{\circ}\text{C}$ |
| Storage Temperature Range               |                          | $T_{stg}$ | -55 to 150 |              | $^{\circ}\text{C}$ |

### Thermal resistance ratings

| Parameter   |                       | Symbol          | Typical | Maximum | Unit                 |
|---|-----------------------|-----------------|---------|---------|----------------------|
| Junction-to-Ambient Thermal Resistance <sup>a</sup> | $t \leq 10 \text{ s}$ | $R_{\theta JA}$ | 245     | 335     | $^{\circ}\text{C/W}$ |
|   | Steady State          |                 | 325     | 395     |                      |
| Junction-to-Ambient Thermal Resistance <sup>b</sup> | $t \leq 10 \text{ s}$ | $R_{\theta JA}$ | 375     | 430     |                      |
|   | Steady State          |                 | 445     | 535     |                      |
| Junction-to-Case Thermal Resistance                 |                       | $R_{\theta JC}$ | 260     | 300     |                      |

a Surface mounted on FR-4 Board using 1 square inch pad size, 1oz copper

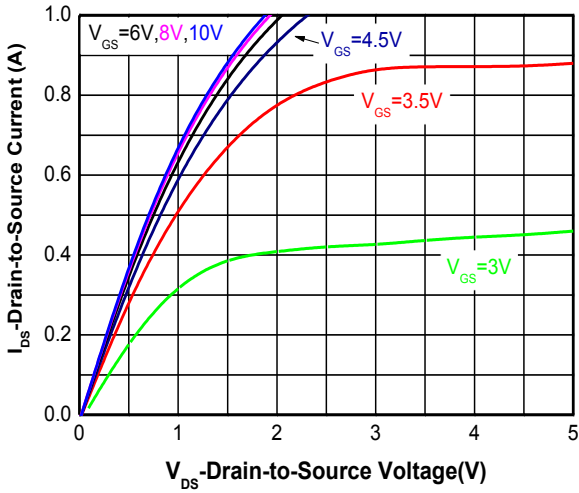
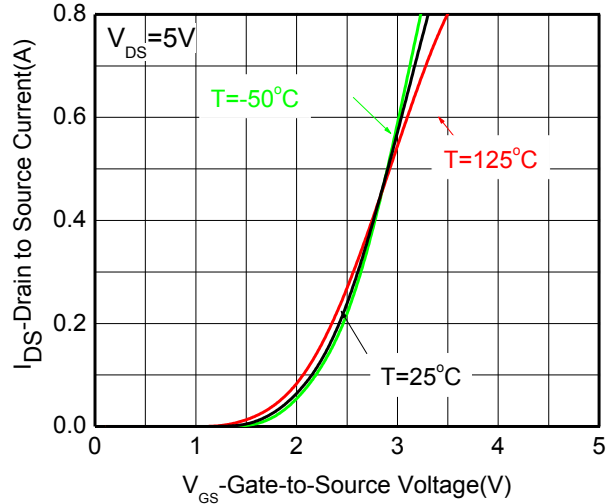
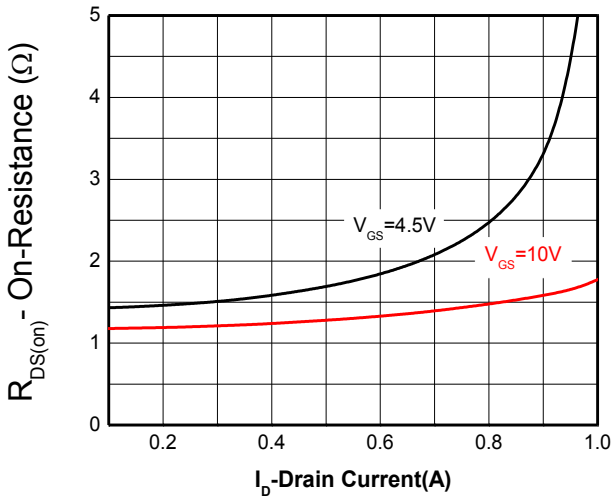
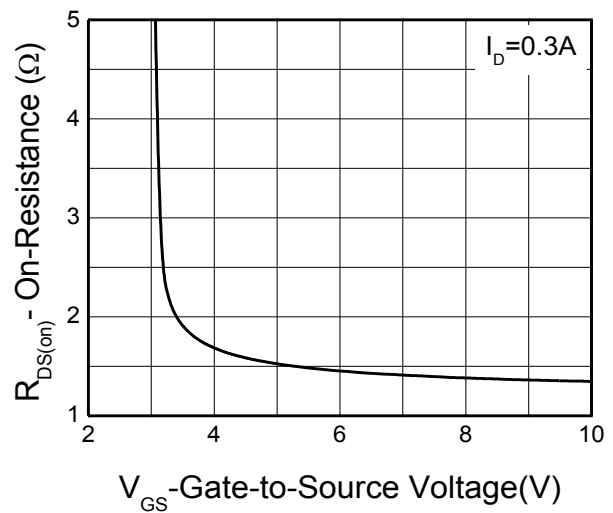
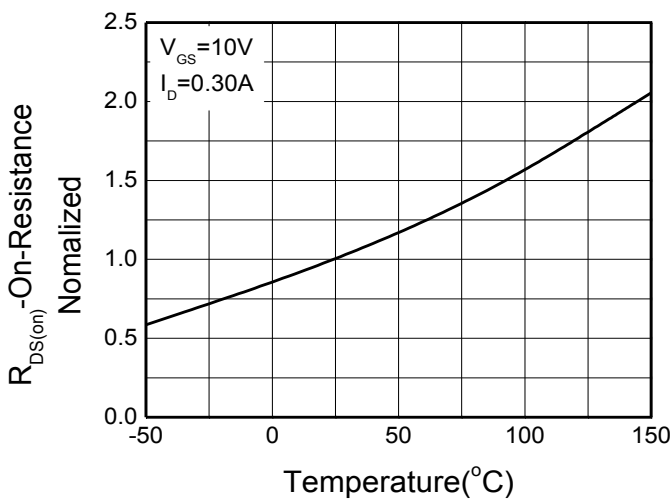
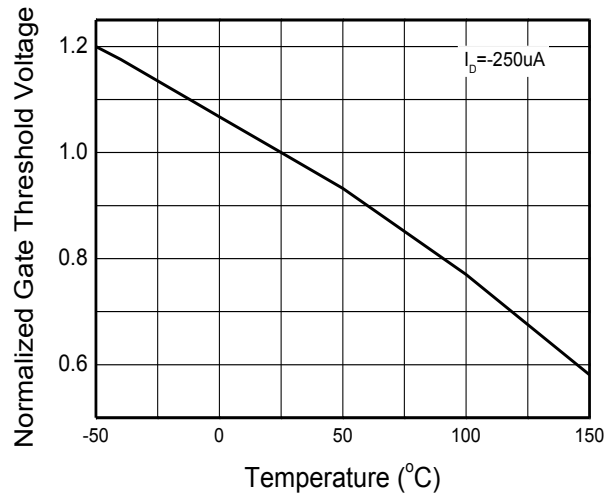
b Surface mounted on FR-4 board using minimum pad size, 1oz copper

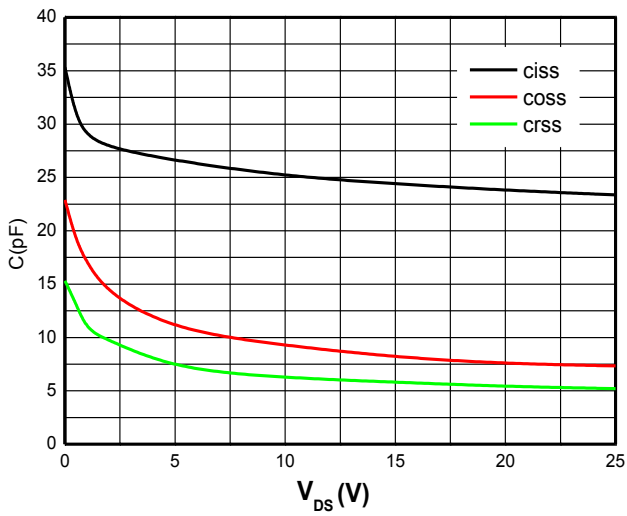
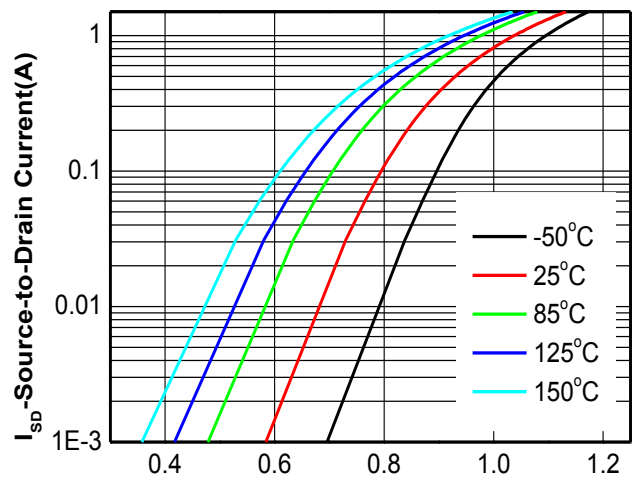
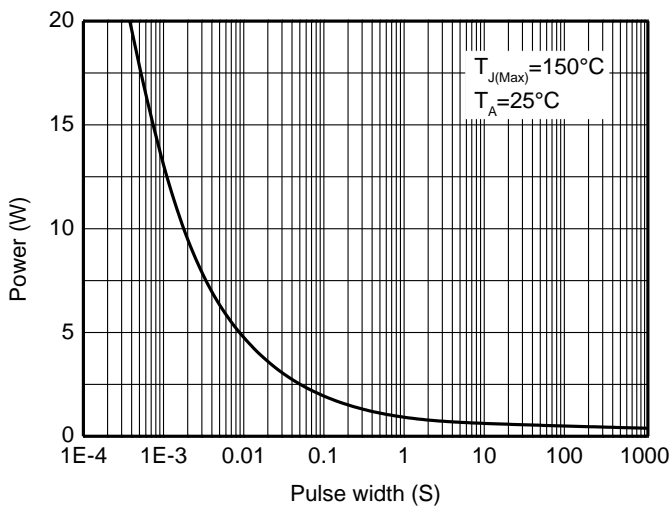
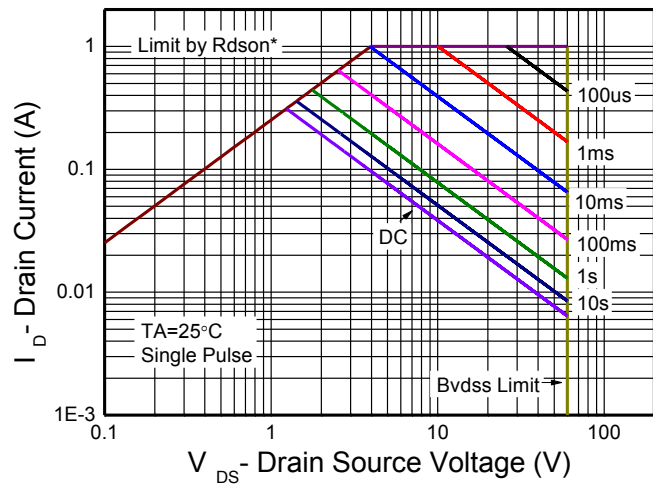
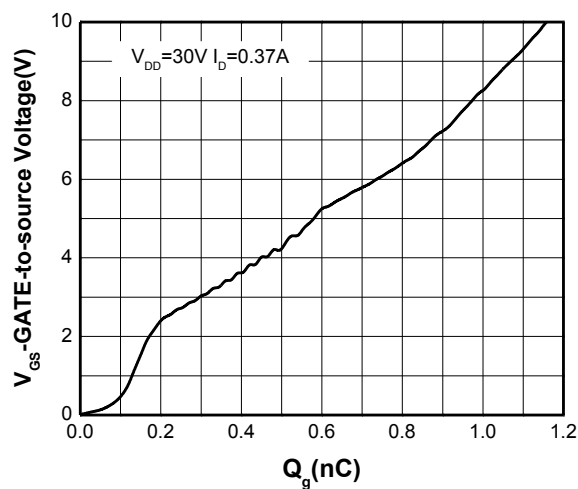
c Pulse width < 380 $\mu\text{s}$

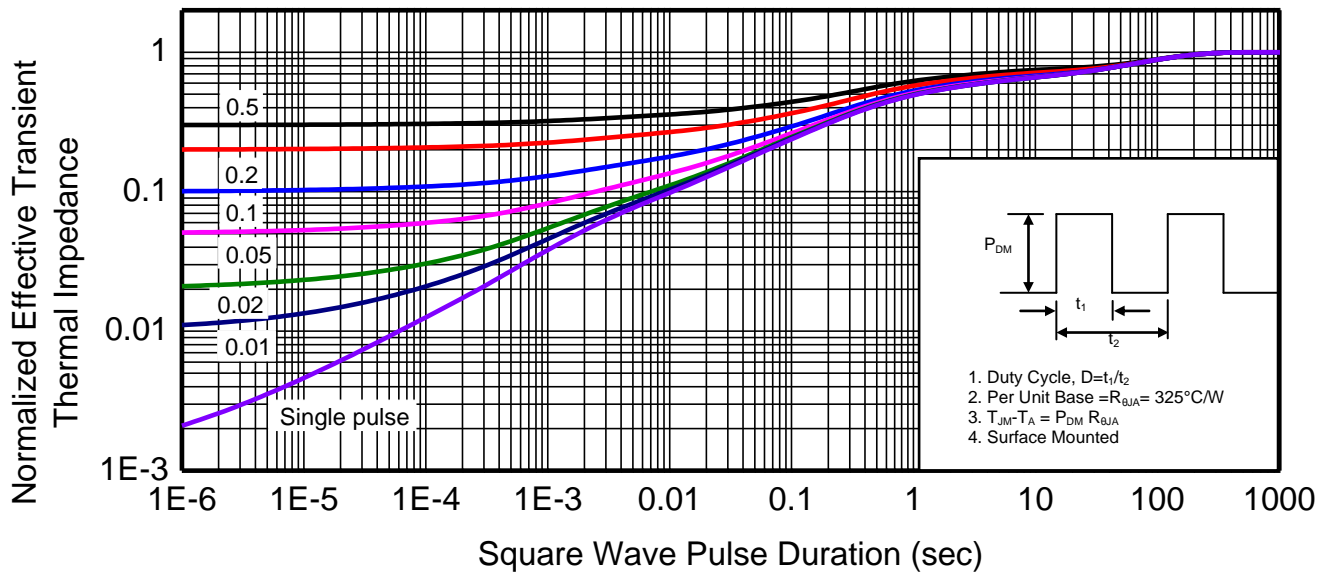
d Maximum junction temperature  $T_J=150^{\circ}\text{C}$ .

**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

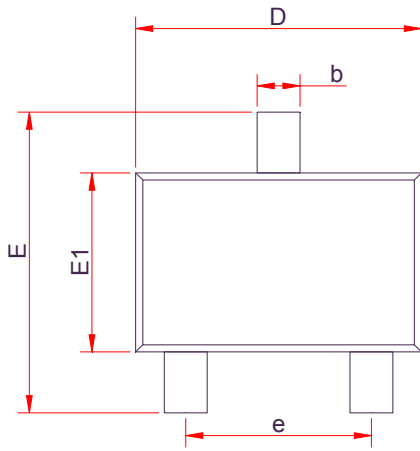
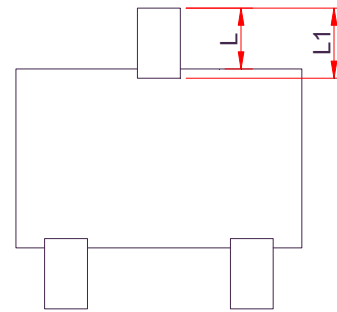
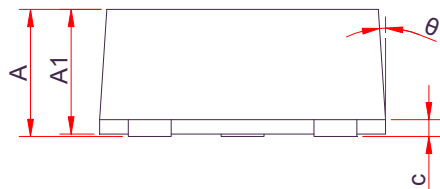
| Parameter                                     | Symbol       | Test Conditions  | Min | Typ   | Max     | Unit          |
|---|--------------|--|-----|-------|---------|---------------|
| <b>OFF CHARACTERISTICS</b>                    |              |  |     |       |         |               |
| Drain-to-Source Breakdown Voltage             | $BV_{DSS}$   | $V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$  | 60  |       |         | V             |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$  |     |       | 1       | $\mu\text{A}$ |
| Gate-to-source Leakage Current                | $I_{GSS}$    | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$  |     |       | $\pm 5$ | $\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>                     |              |  |     |       |         |               |
| Gate Threshold Voltage                        | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$  | 0.8 | 1.3   | 2       | V             |
| Drain-to-source On-resistance <sup>b, c</sup> | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 0.37\text{ A}$  |     | 1.4   | 2.0     | $\Omega$      |
|   |              | $V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$  |     | 1.7   | 2.6     |               |
| Forward Transconductance                      | $g_{FS}$     | $V_{DS} = 15\text{ V}, I_D = 0.25\text{ A}$  |     | 0.42  |         | S             |
| <b>CAPACITANCES, CHARGES</b>                  |              |  |     |       |         |               |
| Input Capacitance                             | $C_{ISS}$    | $V_{GS} = 0\text{ V},$<br>$f = 1.0\text{ MHz},$<br>$V_{DS} = 25\text{ V}$                |     | 23.37 |         | pF            |
| Output Capacitance                            | $C_{OSS}$    |  |     | 7.33  |         |               |
| Reverse Transfer Capacitance                  | $C_{RSS}$    |  |     | 5.2   |         |               |
| Total Gate Charge                             | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V},$<br>$V_{DD} = 30\text{ V},$<br>$I_D = 0.37\text{ A}$              |     | 1.2   |         | nC            |
| Threshold Gate Charge                         | $Q_{G(TH)}$  |  |     | 0.15  |         |               |
| Gate-to-Source Charge                         | $Q_{GS}$     |  |     | 0.21  |         |               |
| Gate-to-Drain Charge                          | $Q_{GD}$     |  |     | 0.12  |         |               |
| <b>SWITCHING CHARACTERISTICS</b>              |              |  |     |       |         |               |
| Turn-On Delay Time                            | $t_d(ON)$    | $V_{DD} = 30\text{ V}, I_D = 0.2\text{ A},$<br>$V_{GEN} = 10\text{ V}, R_G = 10\ \Omega$ |     | 7.6   |         | ns            |
| Rise Time                                     | $t_r$        |  |     | 5.1   |         |               |
| Turn-Off Delay Time                           | $t_d(OFF)$   |  |     | 24.6  |         |               |
| Fall Time                                     | $t_f$        |  |     | 10    |         |               |
| <b>BODY DIODE CHARACTERISTICS</b>             |              |  |     |       |         |               |
| Forward Voltage                               | $V_{SD}$     | $V_{GS} = 0\text{ V}, I_S = 0.3\text{ A}$  |     | 0.9   | 1.5     | V             |

**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**Output characteristics**

**Transfer characteristics**

**On-Resistance vs. Drain current**

**On-Resistance vs. Gate-to-Source voltage**

**On-Resistance vs. Junction temperature**

**Threshold voltage vs. Temperature**

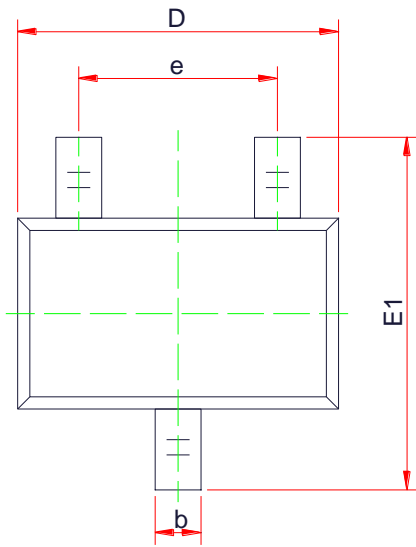
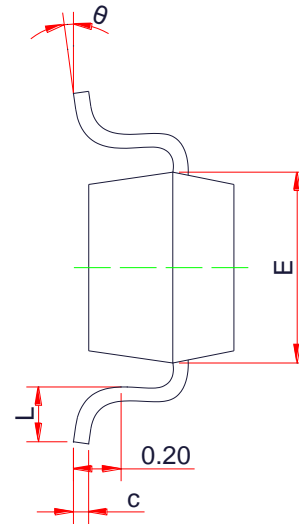
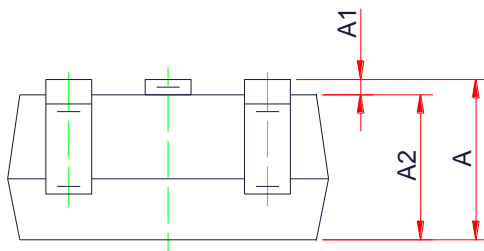

**Capacitance**

**Body diode forward voltage**

**Single pulse power**

**Safe operating power**

**Gate Charge Characteristics**



**Transient thermal response (Junction-to-Ambient)**

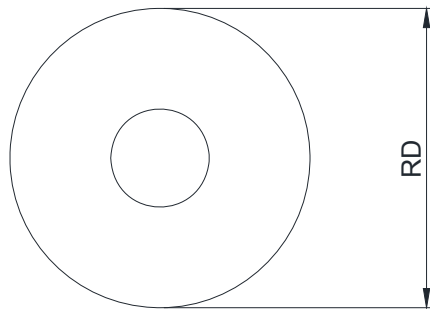
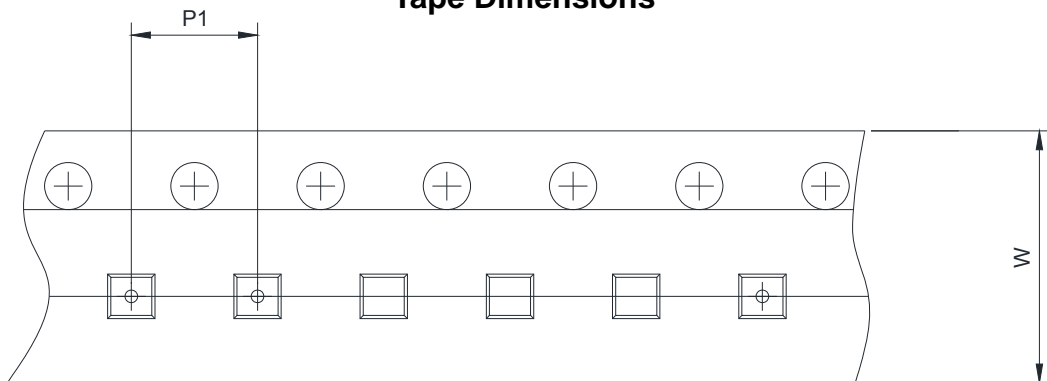
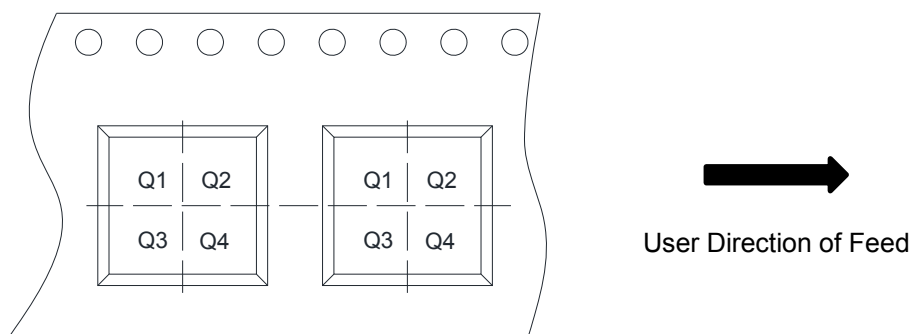
**Package outline dimensions**
**SOT-323**

**TOP VIEW**

**BOTTOM VIEW**

**SIDE VIEW**

| Symbol   | Dimensions in Millimeters |      |      |
|----------|---------------------------|------|------|
|          | Min.                      | Typ. | Max. |
| A        | 0.80                      | 0.90 | 1.00 |
| A1       | 0.89 Ref                  |      |      |
| b        | 0.28                      | 0.30 | 0.35 |
| e        | 1.20                      | 1.30 | 1.40 |
| c        | 0.11                      | 0.13 | 0.18 |
| D        | 1.80                      | 2.00 | 2.20 |
| E        | 2.00                      | 2.10 | 2.20 |
| E1       | 1.15                      | 1.25 | 1.35 |
| L1       | 0.49 Ref                  |      |      |
| L        | 0.42                      |      | 0.43 |
| $\theta$ | 5° Ref                    |      |      |

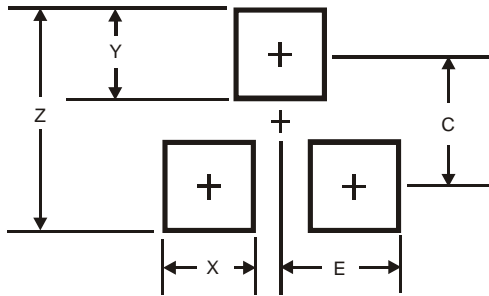
**Package outline dimensions**
**SOT-323**

**TOP VIEW**

**SIDE VIEW**

**SIDE VIEW**

| Symbol   | Dimensions in Millimeters |      |      |
|----------|---------------------------|------|------|
|          | Min.                      | Typ. | Max. |
| A        | 0.80                      | 0.95 | 1.10 |
| A1       | 0.00                      | -    | 0.10 |
| A2       | 0.80                      | 0.90 | 1.00 |
| b        | 0.20                      | 0.30 | 0.40 |
| c        | 0.05                      | 0.10 | 0.15 |
| D        | 1.90                      | 2.05 | 2.20 |
| E        | 1.15                      | 1.25 | 1.25 |
| E1       | 2.00                      | 2.20 | 2.45 |
| e        | 1.20                      | 1.30 | 1.40 |
| L        | 0.20                      | -    | -    |
| $\theta$ | 6° Ref                    |      |      |



**TAPE AND REEL INFORMATION**
**Reel Dimensions**

**Tape Dimensions**

**Quadrant Assignments For PIN1 Orientation In Tape**


|      |   |   |  |
|------|---|---|--|
| RD   | Reel Dimension                          | <input checked="" type="checkbox"/> 7inch | <input type="checkbox"/> 13inch  |
| W    | Overall width of the carrier tape       | <input checked="" type="checkbox"/> 8mm   | <input type="checkbox"/> 12mm <input type="checkbox"/> 16mm                                    |
| P1   | Pitch between successive cavity centers | <input type="checkbox"/> 2mm              | <input checked="" type="checkbox"/> 4mm <input type="checkbox"/> 8mm                           |
| Pin1 | Pin1 Quadrant                           | <input type="checkbox"/> Q1               | <input type="checkbox"/> Q2 <input checked="" type="checkbox"/> Q3 <input type="checkbox"/> Q4 |

**Recommend PCB Layout**
**Recommend PCB Layout (Unit: mm)**


| Dimensions | SOT323 |
|------------|--------|
| Z          | 2.8    |
| X          | 0.7    |
| Y          | 0.9    |
| C          | 1.9    |
| E          | 1.0    |

**Notes:**

This recommended land pattern is for reference purposes only. Please consult your manufacturing group to ensure your PCB design guidelines are met.