

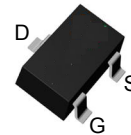
## Features

- -20V/-7A ,  
 $R_{DS(ON)} = 19m\Omega$  (typ.) @  $V_{GS} = -4.5V$   
 $R_{DS(ON)} = 26m\Omega$  (typ.) @  $V_{GS} = -2.5V$   
 $R_{DS(ON)} = 39m\Omega$  (typ.) @  $V_{GS} = -1.8V$
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

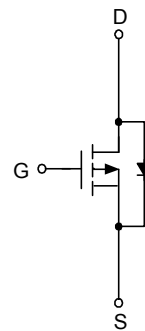
## Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems.

## Pin Description



Top View of SOT-23-3



P-Channel MOSFET

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Symbol             | Parameter                              |                      | Rating     | Unit |
|--------------------|----------------------------------------|----------------------|------------|------|
| V <sub>DSS</sub>   | Drain-Source Voltage                   |                      | -20        | V    |
| V <sub>GSS</sub>   | Gate-Source Voltage                    |                      | ±12        |      |
| I <sub>D</sub> *   | Continuous Drain Current               | T <sub>A</sub> =25°C | -7         | A    |
|                    |                                        | T <sub>A</sub> =70°C | -2.8       |      |
| I <sub>DM</sub> *  | 300μs Pulsed Drain Current             | T <sub>A</sub> =25°C | -21        |      |
|                    |                                        | T <sub>A</sub> =70°C | -17        |      |
| I <sub>S</sub> *   | Diode Continuous Forward Current       |                      | -7         |      |
| T <sub>J</sub>     | Maximum Junction Temperature           |                      | 150        | °C   |
| T <sub>STG</sub>   | Storage Temperature Range              |                      | -55 to 150 |      |
| P <sub>D</sub> *   | Maximum Power Dissipation              | T <sub>A</sub> =25°C | 1.6        | W    |
|                    |                                        | T <sub>A</sub> =70°C | 1.0        |      |
| R <sub>θJA</sub> * | Thermal Resistance-Junction to Ambient | t ≤ 10s              | 80         | °C/W |
|                    |                                        | Steady state         | 100        |      |
| R <sub>θJL</sub>   | Thermal Resistance-Junction to Lead    | Steady state         | 52         |      |

Note: \*Surface Mounted on 1in<sup>2</sup> pad area,  $t \leq 10\text{sec}$ .

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

| Symbol                                         | Parameter                        | Test Conditions                                                       | Min. | Typ. | Max.      | Unit          |
|------------------------------------------------|----------------------------------|-----------------------------------------------------------------------|------|------|-----------|---------------|
| <b>STATIC CHARACTERISTICS</b>                  |                                  |                                                                       |      |      |           |               |
| $BV_{DSS}$                                     | Drain-Source Breakdown Voltage   | $V_{GS}=0\text{V}$ , $I_{DS}=-250\mu\text{A}$                         | -20  | -    | -         | V             |
| $I_{DSS}$                                      | Zero Gate Voltage Drain Current  | $V_{DS}=-16\text{V}$ , $V_{GS}=0\text{V}$                             | -    | -    | -1        | $\mu\text{A}$ |
|                                                |                                  | $T_J=85^\circ\text{C}$                                                | -    | -    | -30       |               |
| $V_{GS(th)}$                                   | Gate Threshold Voltage           | $V_{DS}=V_{GS}$ , $I_{DS}=-250\mu\text{A}$                            | -0.5 | -0.7 | -1        | V             |
| $I_{GSS}$                                      | Gate Leakage Current             | $V_{GS}=\pm 12\text{V}$ , $V_{DS}=0\text{V}$                          | -    | -    | $\pm 100$ | nA            |
| $R_{DS(ON)}^a$                                 | Drain-Source On-State Resistance | $V_{GS}=-4.5\text{V}$ , $I_{DS}=-6\text{A}$                           | -    | 19   | 24        | m $\Omega$    |
|                                                |                                  | $V_{GS}=-2.5\text{V}$ , $I_{DS}=-3.7\text{A}$                         | -    | 26   | 36        |               |
|                                                |                                  | $V_{GS}=-1.8\text{V}$ , $I_{DS}=-2\text{A}$                           | -    | 39   | 55        |               |
| $V_{SD}^a$                                     | Diode Forward Voltage            | $I_{SD}=-1\text{A}$ , $V_{GS}=0\text{V}$                              | -    | -0.7 | -1        | V             |
| <b>GATE CHARGE CHARACTERISTICS<sup>b</sup></b> |                                  |                                                                       |      |      |           |               |
| $Q_g$                                          | Total Gate Charge                | $V_{DS}=-10\text{V}$ , $V_{GS}=-4.5\text{V}$ ,<br>$I_{DS}=-6\text{A}$ | -    | 13.3 | -         | nC            |
| $Q_{gs}$                                       | Gate-Source Charge               |                                                                       | -    | 1.6  | -         |               |
| $Q_{gd}$                                       | Gate-Drain Charge                |                                                                       | -    | 4.5  | -         |               |

## Electrical Characteristics (Cont.)

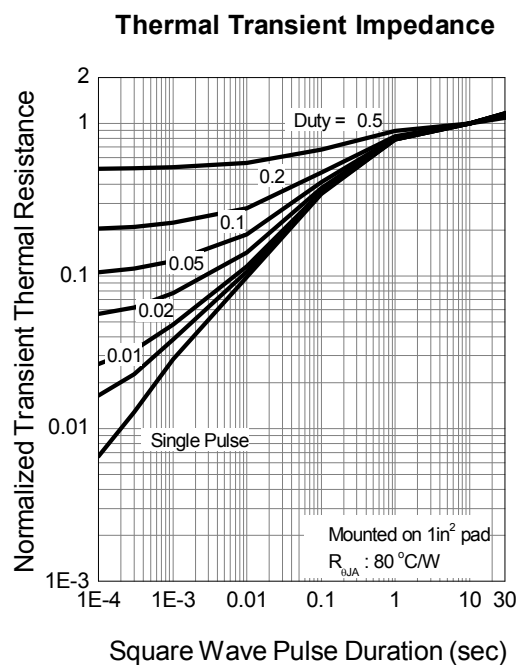
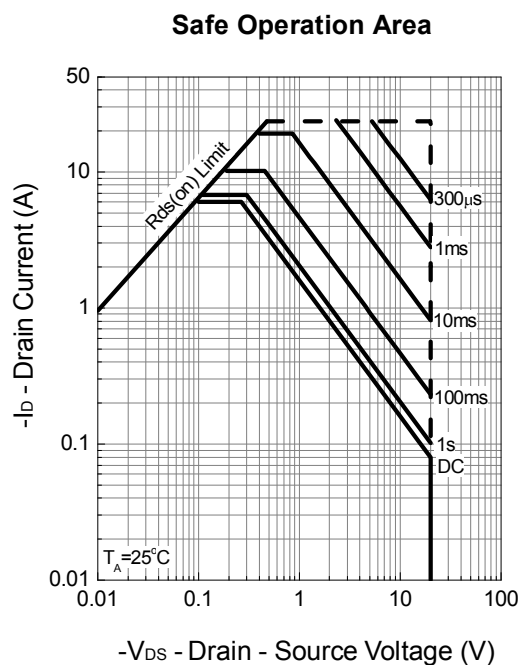
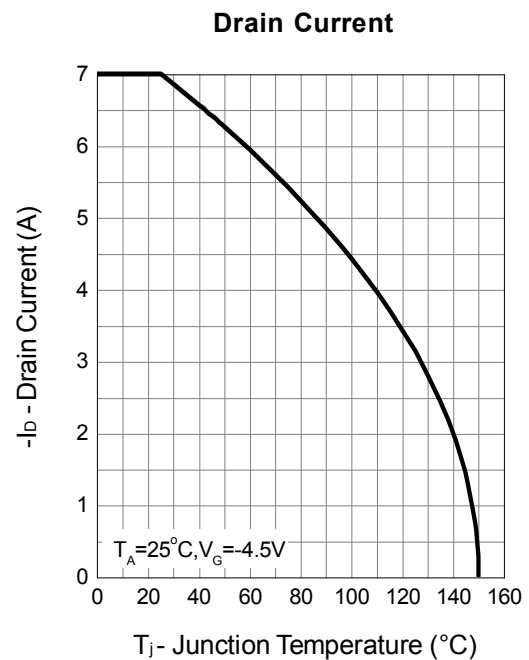
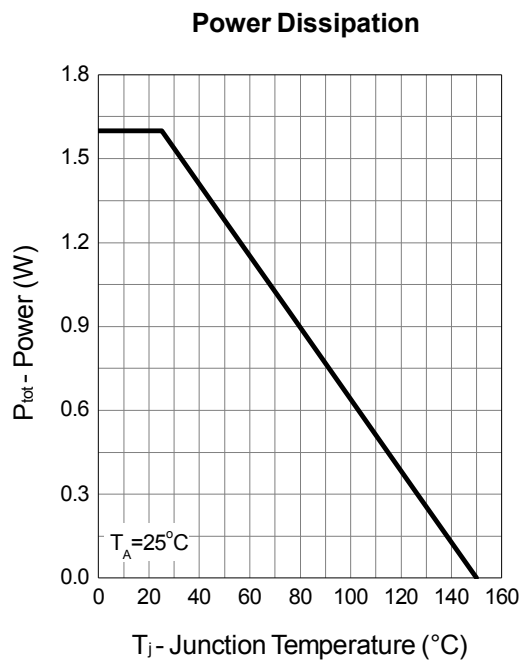
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Symbol                                     | Parameter                    | Test Conditions                                                               | Min. | Typ. | Max. | Unit     |
|--------------------------------------------|------------------------------|-------------------------------------------------------------------------------|------|------|------|----------|
| <b>DYNAMIC CHARACTERISTICS<sup>b</sup></b> |                              |                                                                               |      |      |      |          |
| $R_G$                                      | Gate Resistance              | $V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$                                         | -    | 6    | -    | $\Omega$ |
| $C_{iss}$                                  | Input Capacitance            | $V_{GS}=0V,$<br>$V_{DS}=-10V,$<br>Frequency=1.0MHz                            | -    | 1155 | -    | pF       |
| $C_{oss}$                                  | Output Capacitance           |                                                                               | -    | 205  | -    |          |
| $C_{rss}$                                  | Reverse Transfer Capacitance |                                                                               | -    | 165  | -    |          |
| $t_{d(ON)}$                                | Turn-on Delay Time           | $V_{DD}=-10V, R_L=10\Omega,$<br>$I_{DS}=-1A, V_{GEN}=-4.5V,$<br>$R_G=6\Omega$ | -    | 7.7  | -    | ns       |
| $t_r$                                      | Turn-on Rise Time            |                                                                               | -    | 13.8 | -    |          |
| $t_{d(OFF)}$                               | Turn-off Delay Time          |                                                                               | -    | 40   | -    |          |
| $t_f$                                      | Turn-off Fall Time           |                                                                               | -    | 19   | -    |          |
| $t_{rr}$                                   | Reverse Recovery Time        | $I_{SD}=-6A, dI_{SD}/dt = 100A/\mu s$                                         | -    | 17   | -    | ns       |
| $Q_{rr}$                                   | Reverse Recovery Charge      |                                                                               | -    | 8    | -    | nC       |

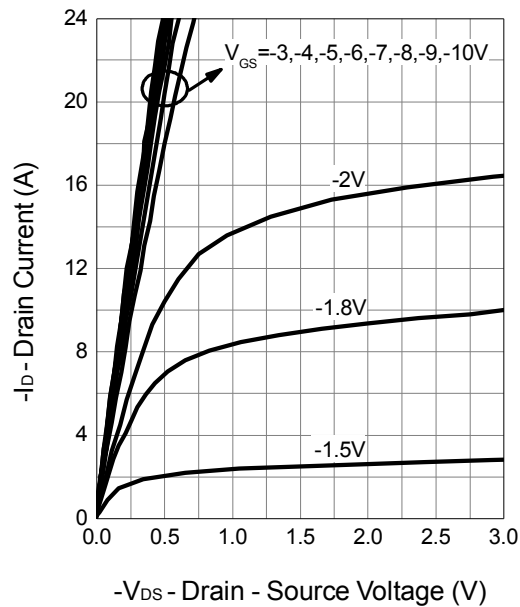
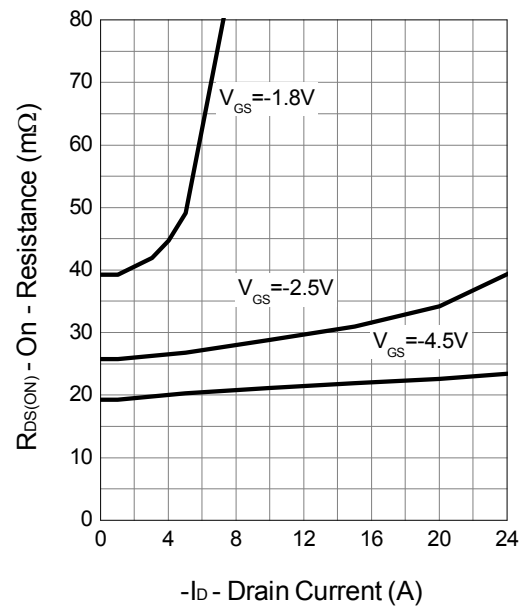
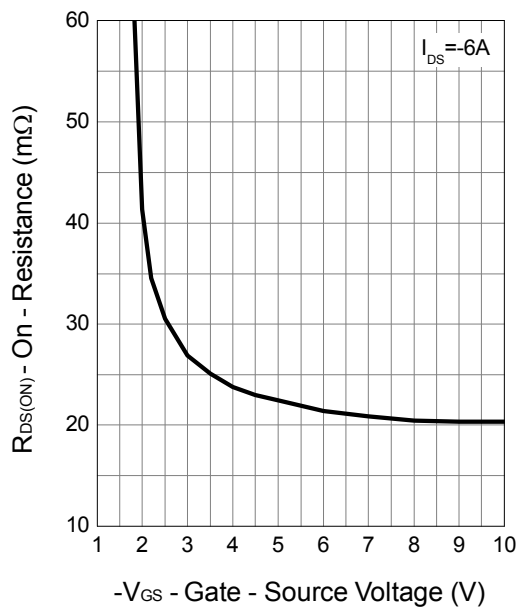
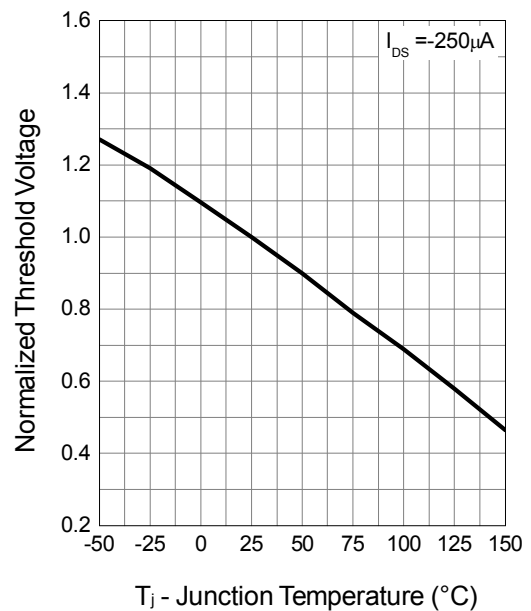
Note a : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

Note b : Guaranteed by design, not subject to production testing.

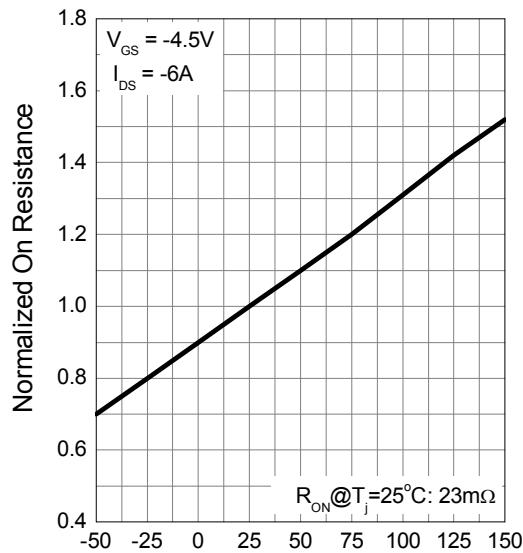
## Typical Operating Characteristics

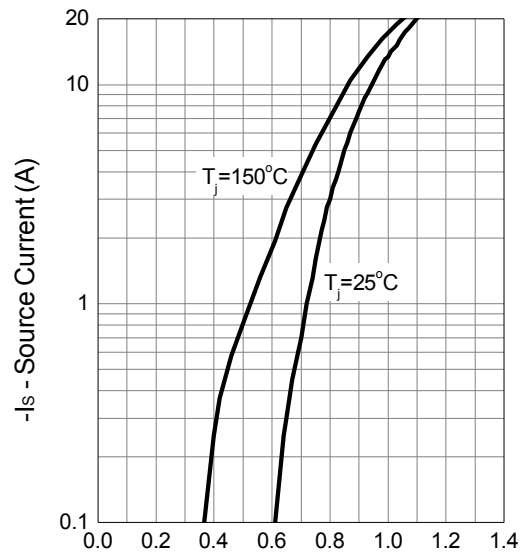


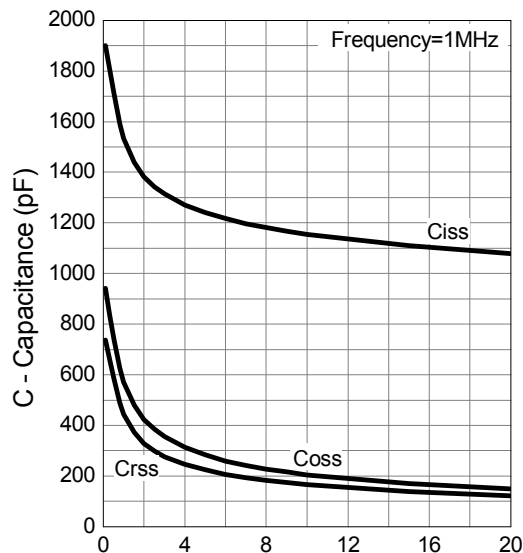
## Typical Operating Characteristics (Cont.)

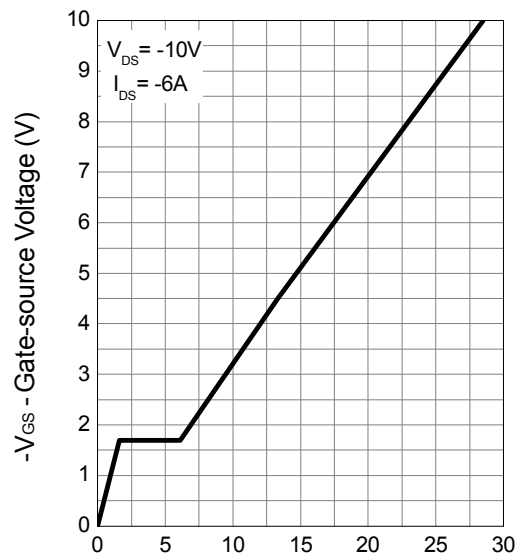
**Output Characteristics**

**Drain-Source On Resistance**

**Gate-Source On Resistance**

**Gate Threshold Voltage**


## Typical Operating Characteristics (Cont.)

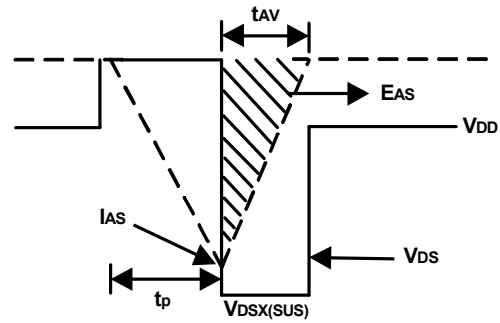
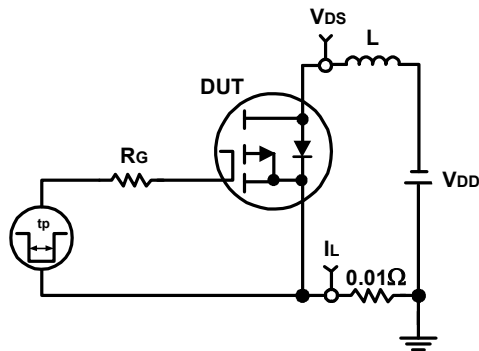
**Drain-Source On Resistance**

 $T_J$  - Junction Temperature ( $^{\circ}\text{C}$ )

**Source-Drain Diode Forward**

 $-V_{SD}$  - Source - Drain Voltage (V)

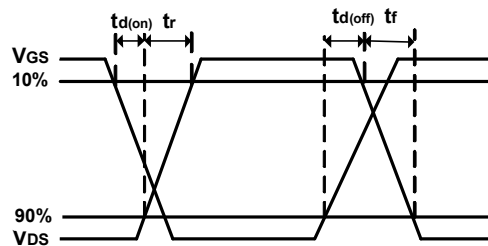
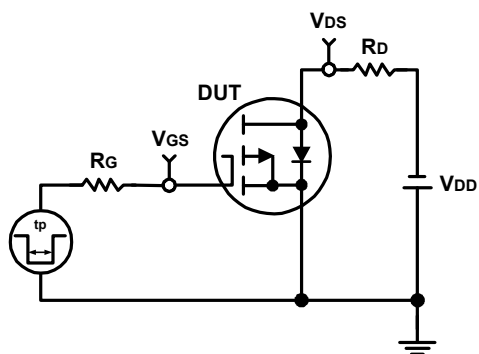
**Capacitance**

 $-V_{DS}$  - Drain - Source Voltage (V)

**Gate Charge**

 $Q_G$  - Gate Charge (nC)

## Avalanche Test Circuit and Waveforms

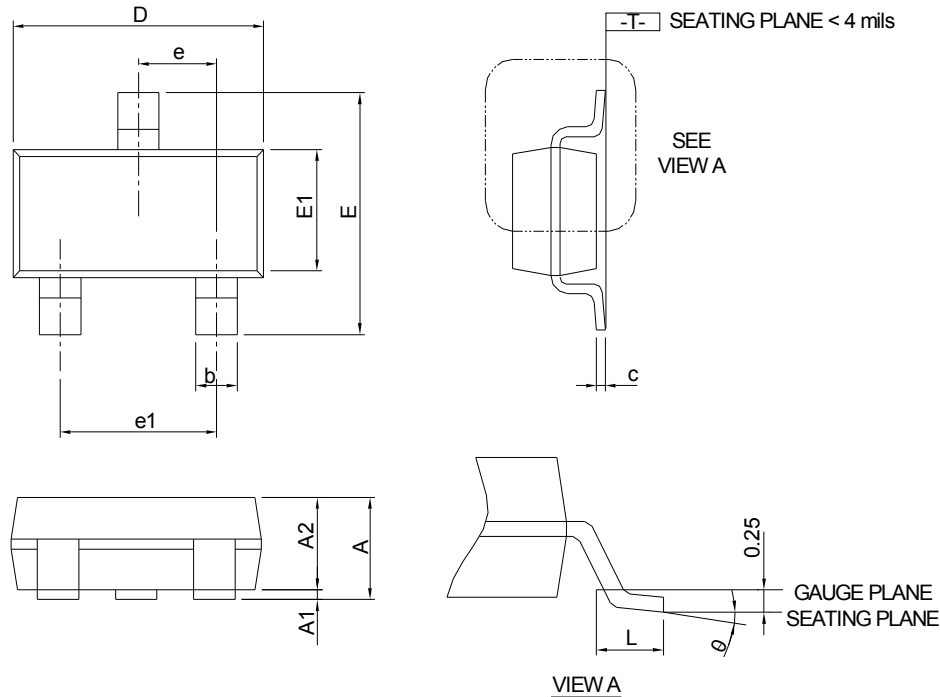


## Switching Time Test Circuit and Waveforms



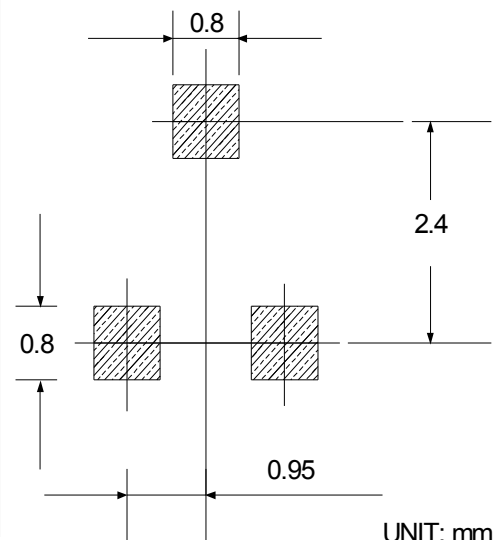
## Package Information

### SOT-23-3



| SYMBOL | SOT-23-3    |      |           |       |
|--------|-------------|------|-----------|-------|
|        | MILLIMETERS |      | INCHES    |       |
|        | MIN.        | MAX. | MIN.      | MAX.  |
| A      | -           | 1.20 | -         | 0.047 |
| A1     | 0.00        | 0.08 | 0.000     | 0.003 |
| A2     | 0.90        | 1.12 | 0.035     | 0.044 |
| b      | 0.30        | 0.50 | 0.012     | 0.020 |
| c      | 0.08        | 0.22 | 0.003     | 0.009 |
| D      | 2.70        | 3.10 | 0.106     | 0.122 |
| E      | 2.60        | 3.00 | 0.102     | 0.118 |
| E1     | 1.40        | 1.80 | 0.055     | 0.071 |
| e      | 0.95 BSC    |      | 0.037 BSC |       |
| e1     | 1.90 BSC    |      | 0.075 BSC |       |
| L      | 0.30        | 0.60 | 0.012     | 0.024 |
| θ      | 0°          | 8°   | 0°        | 8°    |

### RECOMMENDED LAND PATTERN



Note : Dimension D and E1 do not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.