

# MT2315

## P-Channel Enhancement Mode Field Effect Transistor

### Product Summary

| PRODUCT SUMMARY  |                |                              |
|------------------|----------------|------------------------------|
| V <sub>DSS</sub> | I <sub>D</sub> | R <sub>DS(ON)</sub> (mΩ) Typ |
| -15V             | -4.5A          | 45 @ V <sub>GS</sub> =-4.5V  |
|                  |                | 70 @ V <sub>GS</sub> =-2.5V  |

### Features

- Super high dense cell design for low R<sub>DS(ON)</sub>
- Rugged and reliable
- Simple drive requirement

### Applications

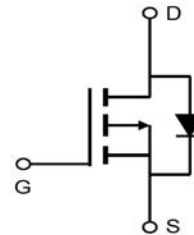
- LED Display



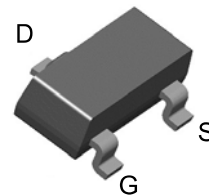
**MT Semiconductor®**

<http://www.mtsemi.com>

### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



**SOT-23**

### Absolute Maximum Ratings (T<sub>A</sub> = 25°C unless otherwise noted)

| Parameter                                                                      | Symbol                            | Limit      | Unit |
|--------------------------------------------------------------------------------|-----------------------------------|------------|------|
| Drain-Source Voltage                                                           | V <sub>DS</sub>                   | -15        | V    |
| Gate-Source Voltage                                                            | V <sub>GS</sub>                   | ±12        | V    |
| Drain Current-Continuous <sup>a</sup> @ T <sub>j</sub> =125°C<br>- Pulse $d^b$ | I <sub>D</sub>                    | -4.5       | A    |
|                                                                                | I <sub>DM</sub>                   | -12        | A    |
| Drain-source Diode Forward Current <sup>a</sup>                                | I <sub>S</sub>                    | -1.25      | A    |
| Maximum Power Dissipation <sup>a</sup>                                         | P <sub>D</sub>                    | 1.25       | W    |
| Operating Junction and Storage Temperature Range                               | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | ←    |

### THERMAL CHARACTERISTICS

|                                                      |                    |     |      |
|------------------------------------------------------|--------------------|-----|------|
| Thermal Resistance, Junction-to Ambient <sup>a</sup> | R <sub>th JA</sub> | 100 | °C/W |
|------------------------------------------------------|--------------------|-----|------|

## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Parameter                        | Symbol               | Condition                                                                                                                     | Min  | Typ  | Max  | Unit |
|----------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| OFF CHARACTERISTICS              |                      |                                                                                                                               |      |      |      |      |
| Drain-Source Breakdown Voltage   | BV <sub>DSS</sub>    | V <sub>GS</sub> =0V,I <sub>D</sub> =-250μA                                                                                    | -15  |      |      | V    |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>     | V <sub>DS</sub> =-12V,V <sub>GS</sub> =0V                                                                                     |      |      | 1    | μA   |
| Gate-Body Leakage                | I <sub>GSS</sub>     | V <sub>GS</sub> =±12V,V <sub>DS</sub> =0V                                                                                     |      |      | ±100 | nA   |
| ON CHARACTERITICS                |                      |                                                                                                                               |      |      |      |      |
| Gate Threshold Voltage           | V <sub>GS</sub> (th) | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =-250μA                                                                      | -0.5 | -0.6 | -1.5 | V    |
| Drain-Source On-State Resistance | R <sub>DS</sub> (ON) | V <sub>GS</sub> =-4.5V,I <sub>D</sub> =-2.8A                                                                                  |      | 45   | 50   | m Ω  |
|                                  |                      | V <sub>GS</sub> =-2.5V,I <sub>D</sub> =-2.0A                                                                                  |      | 70   | 80   |      |
|                                  |                      | V <sub>GS</sub> =-1.8V,I <sub>D</sub> =-1.0A                                                                                  |      | 100  | 130  |      |
| DAYNAMIC CHARACTERISTICS         |                      |                                                                                                                               |      |      |      |      |
| Input Capacitance                | C <sub>ISS</sub>     | V <sub>DS</sub> =-10V,V <sub>GS</sub> =0V<br>f=1.0MHz                                                                         |      | 586  |      | pF   |
| Output Capacitance               | C <sub>OSS</sub>     |                                                                                                                               |      | 101  |      | pF   |
| Reverse Transfer Capacitance     | C <sub>RSS</sub>     |                                                                                                                               |      | 59   |      | pF   |
| SWITCHING CHARACTERISISTICS      |                      |                                                                                                                               |      |      |      |      |
| Turn-On Delay Time               | t <sub>D</sub> (ON)  | V <sub>DD</sub> =-10V<br>I <sub>D</sub> =-2.8A,<br>V <sub>GEN</sub> =-4.5V<br>R <sub>L</sub> =10ohm<br>R <sub>GEN</sub> =6ohm |      | 6.5  |      | ns   |
| Rise Time                        | t <sub>r</sub>       |                                                                                                                               |      | 32.1 |      | ns   |
| Turn-Off Delay Time              | t <sub>D</sub> (OFF) |                                                                                                                               |      | 58.4 |      | ns   |
| Fall Time                        | t <sub>f</sub>       |                                                                                                                               |      | 48   |      | ns   |
| Total Gate Charge                | Q <sub>g</sub>       | V <sub>DS</sub> =-10V,I <sub>D</sub> =-3A<br>V <sub>GS</sub> =-4.5V                                                           |      | 6    |      | nC   |
| Gate-Source Charge               | Q <sub>gs</sub>      |                                                                                                                               |      | 1.35 |      | nC   |
| Gate-Drain Charge                | Q <sub>gd</sub>      |                                                                                                                               |      | 1.5  |      | nC   |

ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Parameter                          | Symbol          | Condition                                   | Min | Typ   | Max  | Unit |
|------------------------------------|-----------------|---------------------------------------------|-----|-------|------|------|
| DRAIN-SOURCE DIODE CHARACTERISTICS |                 |                                             |     |       |      |      |
| Diode Forward Voltage              | V <sub>SD</sub> | V <sub>GS</sub> =0V, I <sub>S</sub> =-1.25A |     | -0.81 | -1.2 | V    |

Notes

- Surface Mounted on FR4 Board, t ≤ 10sec
- Pulse Test: Pulse Width ≤ 300Us, Duty Cycle ≤ 2%
- Guaranteed by design, not subject to production testing.

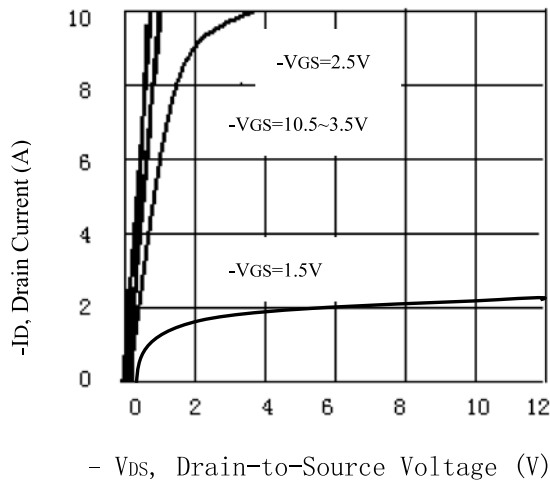


Figure 1. Output Characteristics

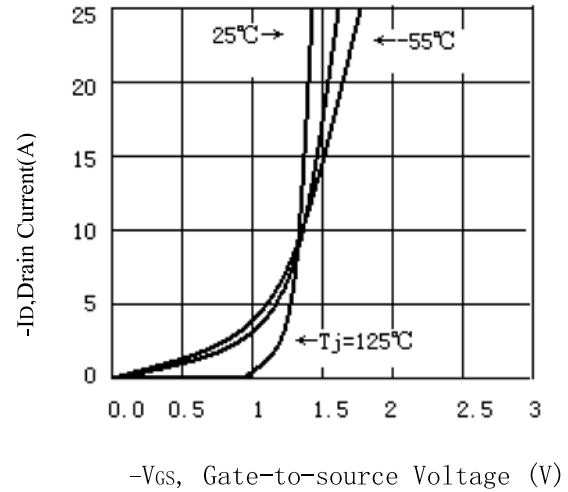


Figure 2. Transfer Characteristics

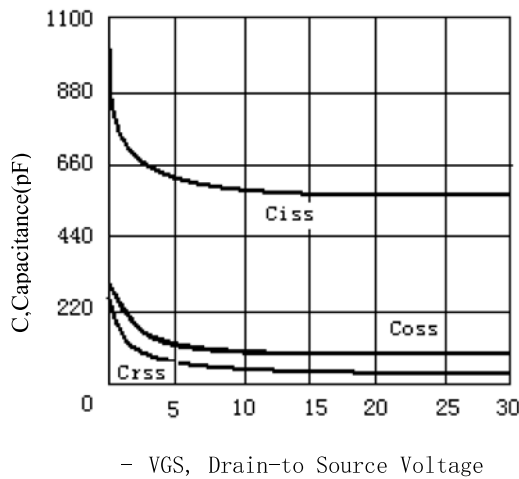


Figure3. Capacitance

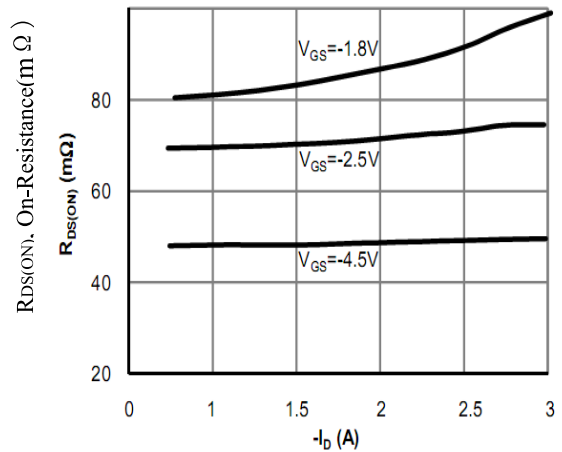


Figure4. On-Resistance Variation with Temperature

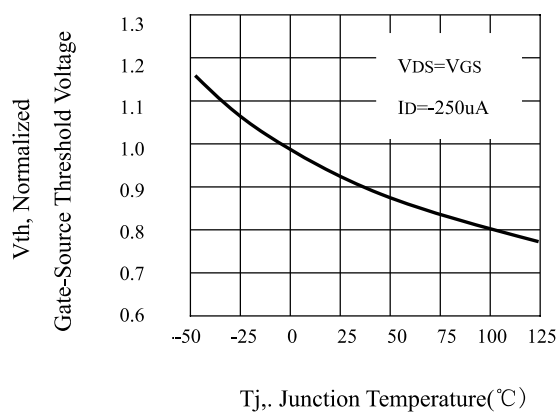


Figure 5. Gate Threshold Variation With Temperature

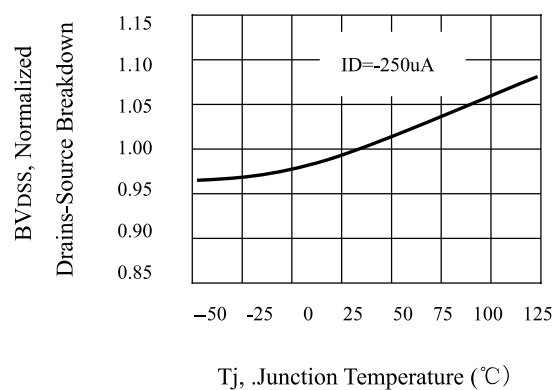


Figure 6. Breakdown Voltage Variation With Temperature

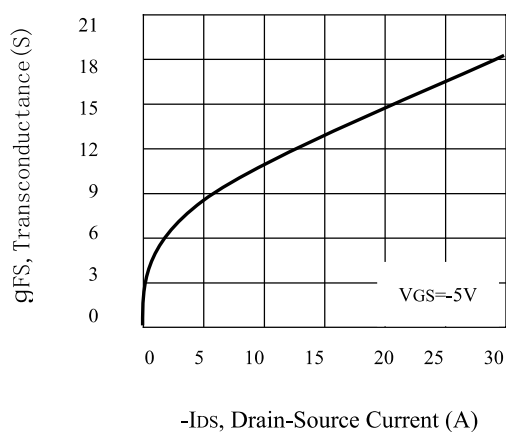


Figure 7. Transconductance Variation With Drain Current

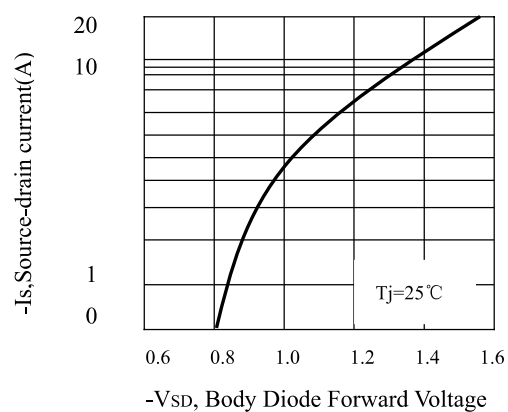


Figure 8. Body Diode Forward Voltage Variation with Source Current

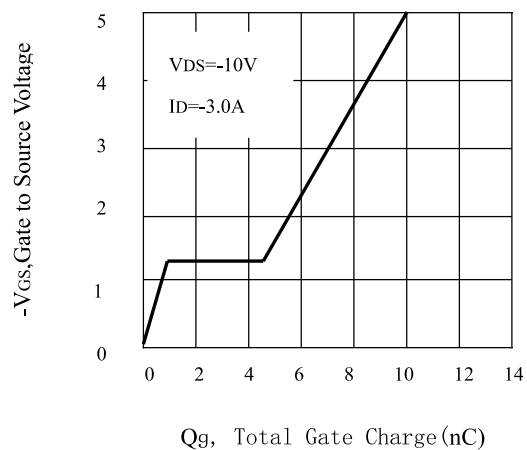


Figure 9. Gate Charge

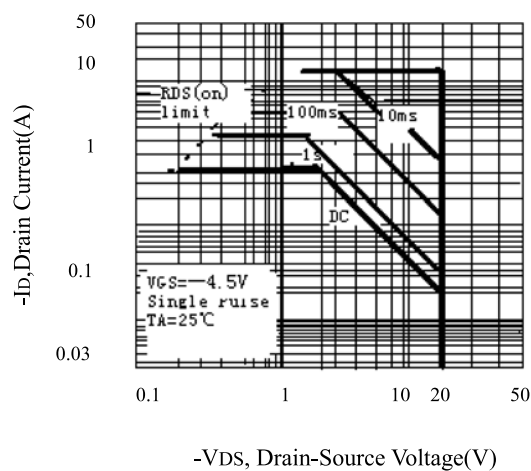
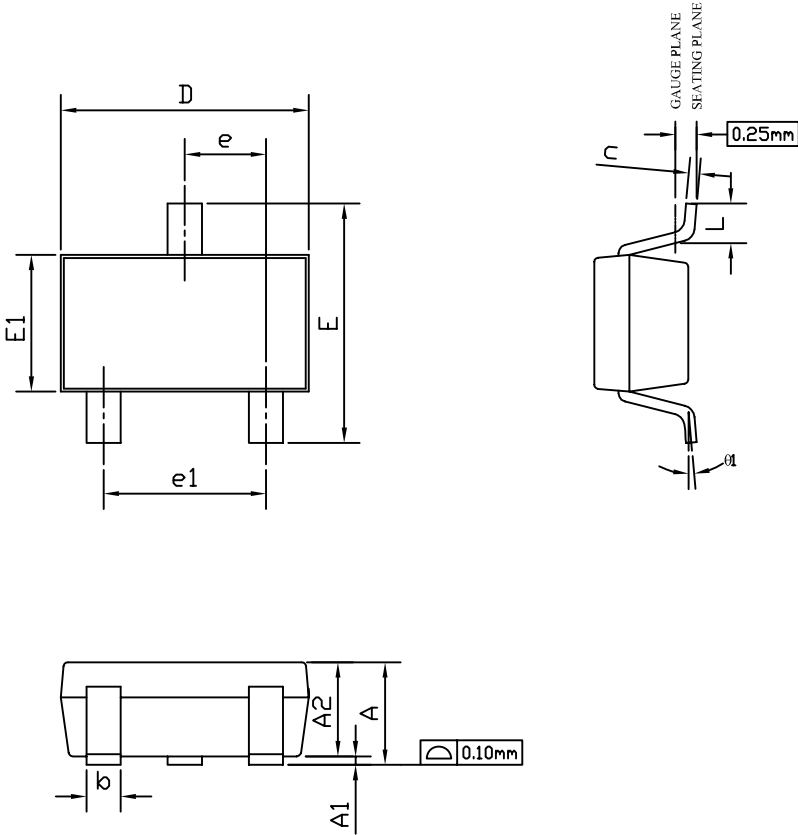


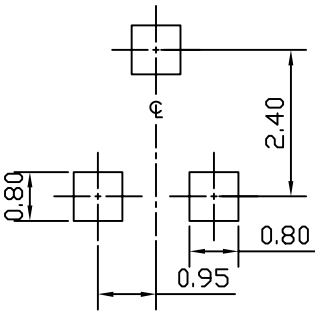
Figure 10. Maximum Safe Operating Area

|              |          |
|--------------|----------|
| Document No. | PO-00001 |
| Version      | L        |

# SOT23 PACKAGE OUTLINE



## RECOMMENDED LAND PATTERN



UNIT: mm

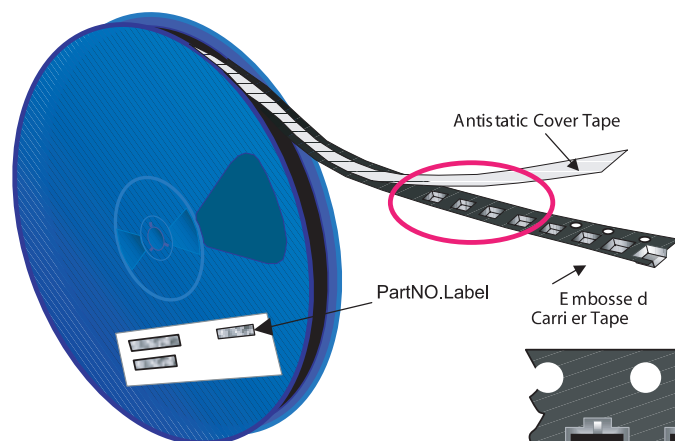
| SYMBOLS | DIMENSIONS IN MILLIMETERS |      |      | DIMENSIONS IN INCHES |       |       |
|---------|---------------------------|------|------|----------------------|-------|-------|
|         | MIN                       | NOM  | MAX  | MIN                  | NOM   | MAX   |
| A       | 0.85                      | —    | 1.25 | 0.033                | —     | 0.049 |
| A1      | 0.00                      | —    | 0.13 | 0.000                | —     | 0.005 |
| A2      | 0.70                      | 1.00 | 1.15 | 0.028                | 0.039 | 0.045 |
| b       | 0.30                      | 0.40 | 0.50 | 0.012                | 0.016 | 0.020 |
| c       | 0.08                      | 0.13 | 0.20 | 0.003                | 0.005 | 0.008 |
| D       | 2.80                      | 2.90 | 3.10 | 0.110                | 0.114 | 0.122 |
| E       | 2.60                      | 2.80 | 3.00 | 0.102                | 0.110 | 0.118 |
| E1      | 1.40                      | 1.60 | 1.80 | 0.055                | 0.063 | 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 |
| θ1      | 0°                        | 5°   | 8°   | 0°                   | 5°    | 8°    |

## NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH OR GATE BURRS.  
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MILS EACH.
2. TOLERANCE  $\pm 0.100$  mm (4 mil) UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAUGE PLANE.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. ALL DIMENSIONS ARE IN MILLIMETERS.

## SOT-23 Std Tape and Reel Data

### SOT23-3L Packaging Configuration: Figure 1.0

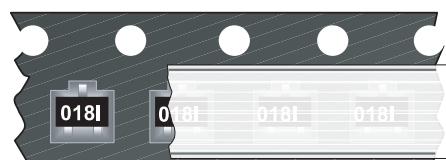


#### Packaging Description:

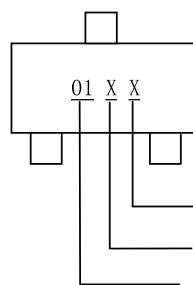
SOT23-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177mm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.

These full reels are individually labeled and placed inside a standard immediate box made of recyclable corrugated brown paper with a Fairchild logo printing. One box contains five reels maximum. And these immediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

| SOT23-3L Packaging Information |                         |            |
|--------------------------------|-------------------------|------------|
| Packaging Option               | Standard (no flow code) | D87Z       |
| Packaging type                 | TNR                     | TNR        |
| Qty per Reel/Tube/Bag          | 3,000                   | 10,000     |
| Reel Size                      | 7" Dia                  | 13"        |
| Box Dimension (mm)             | 193x183x80              | 355x333x40 |
| Max qty per Box                | 15,000                  | 30,000     |
| Weight per unit (gm)           | 0.0082                  | 0.0082     |
| Weight per Reel (kg)           | 0.1175                  | 0.4006     |
| Note/Comments                  |                         |            |



#### SOT23-3L Unit Orientation



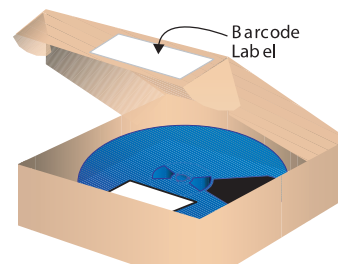
#### MARKING DIAGRAM

X:Month Code

X:Year Code

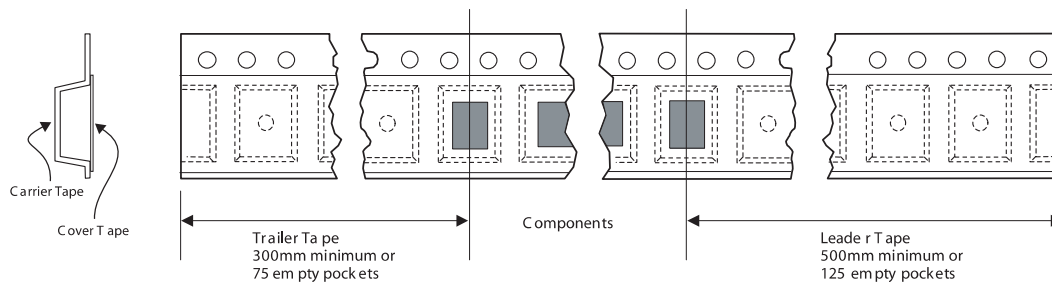
01: Manufacturer ID

#### Barcode Label sample



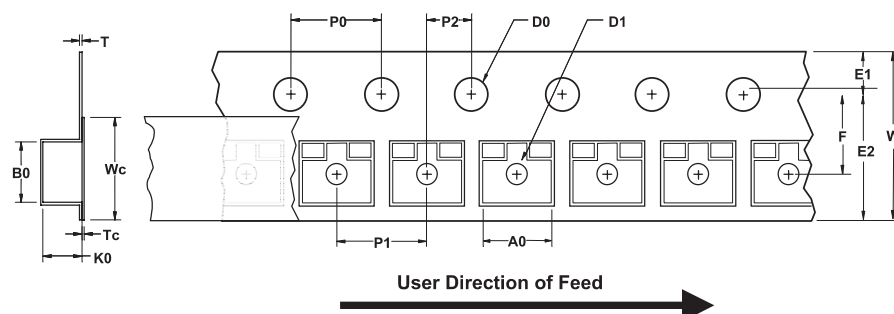
193mm x 183mm x 80mm  
Pizza Box for Standard Option

### SOT23-3L Tape Leader and Trailer Configuration: Figure 2.0



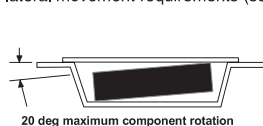
## SOT-23 Std Tape and Reel Data, continued

### SOT23-3L Embossed Carrier Tape Configuration: Figure 3.0

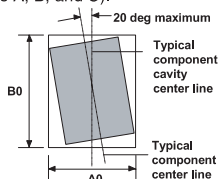


| Dimensions are in millimeter |                 |                 |               |                 |                   |                 |             |                 |               |               |                 |                   |               |                 |
|------------------------------|-----------------|-----------------|---------------|-----------------|-------------------|-----------------|-------------|-----------------|---------------|---------------|-----------------|-------------------|---------------|-----------------|
| Pkg type                     | A0              | B0              | W             | D0              | D1                | E1              | E2          | F               | P1            | P0            | K0              | T                 | Wc            | Tc              |
| SOT-23 (8mm)                 | 3.15<br>+/-0.10 | 2.77<br>+/-0.10 | 8.0<br>+/-0.3 | 1.55<br>+/-0.05 | 1.125<br>+/-0.125 | 1.75<br>+/-0.10 | 6.25<br>min | 3.50<br>+/-0.05 | 4.0<br>+/-0.1 | 4.0<br>+/-0.1 | 1.30<br>+/-0.10 | 0.228<br>+/-0.013 | 5.2<br>+/-0.3 | 0.06<br>+/-0.02 |

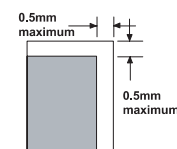
Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).



Sketch A (Side or Front Sectional View)  
Component Rotation

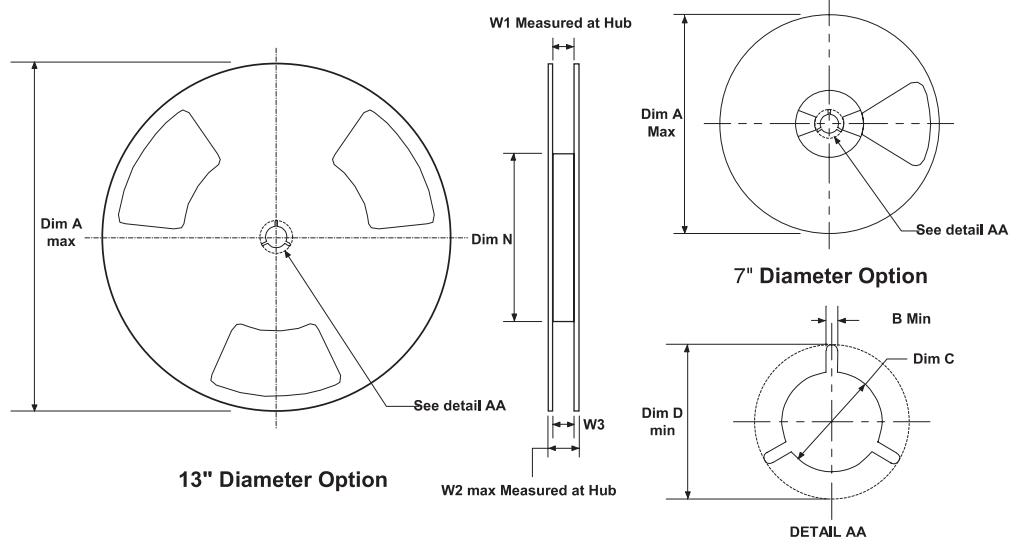


Sketch B (Top View)  
Component Rotation



Sketch C (Top View)  
Component lateral movement

### SOT23-3L Reel Configuration: Figure 4.0



| Dimensions are in inches and millimeters |             |               |              |                                   |               |             |                                   |               |                             |
|------------------------------------------|-------------|---------------|--------------|-----------------------------------|---------------|-------------|-----------------------------------|---------------|-----------------------------|
| Tape Size                                | Reel Option | Dim A         | Dim B        | Dim C                             | Dim D         | Dim N       | Dim W1                            | Dim W2        | Dim W3 (LSL-USL)            |
| 8mm                                      | 7" Dia      | 7.00<br>177.8 | 0.059<br>1.5 | 512 +0.020/-0.008<br>13 +0.5/-0.2 | 0.795<br>20.2 | 2.165<br>55 | 0.331 +0.059/-0.000<br>8.4 +1.5/0 | 0.567<br>14.4 | 0.311 - 0.429<br>7.9 - 10.9 |
| 8mm                                      | 13" Dia     | 13.00<br>330  | 0.059<br>1.5 | 512 +0.020/-0.008<br>13 +0.5/-0.2 | 0.795<br>20.2 | 4.00<br>100 | 0.331 +0.059/-0.000<br>8.4 +1.5/0 | 0.567<br>14.4 | 0.311 - 0.429<br>7.9 - 10.9 |

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  - 2) 植埋于人体使用的装置。
  - 3) 用于治疗（切除患部、给药等）的装置。
  - 4) 其他直接影响到人的生命的装置。
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### Keep safety first in your circuit designs!

1. MOS-TECH Semiconductor Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.  
Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.