

# MT2312

## N-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
20V	4.5A	30@ V <sub>GS</sub> =4.5V
		50@ 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

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	20	V
Gate-Source Voltage	V <sub>GS</sub>	±12	V
Drain Current-Continuous <sup>a</sup> @T <sub>j</sub> =125°C	I <sub>D</sub>	3.6	A
	I <sub>DM</sub>	12	A
- Pulse <sup>d</sup>			
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	°C

### THERMAL CHARACTERISTICS

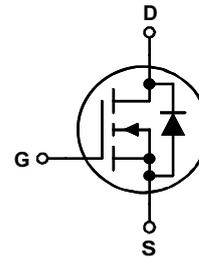
Thermal Resistance, Junction-to Ambient <sup>a</sup>	R <sub>th JA</sub>	100	°C/W
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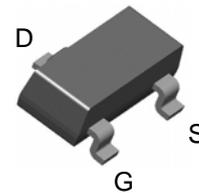
**MT Semiconductor®**

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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



**SOT-23**

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

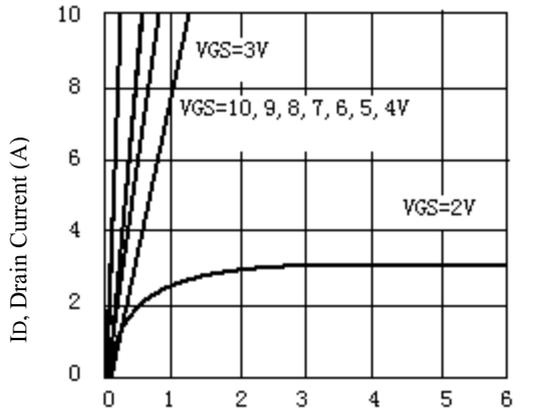
Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=16V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS}=\pm 8V, V_{DS}=0V$			$\pm 100$	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	0.5	0.8	1.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=2.8A$		30	45	m $\Omega$
		$V_{GS}=2.5V, I_D=2.0A$		50	60	
Forward Transconductance	$g_{FS}$	$V_{GS}=5V, I_D=5A$		5		S
DYNAMIC CHARACTERISTICS						
Input Capacitance	$C_{ISS}$	$V_{DS}=10V, V_{GS}=0V$ $f=1.0MHz$		586		pF
Output Capacitance	$C_{OSS}$			101		pF
Reverse Transfer Capacitance	$C_{RSS}$			59		pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=10V$ $I_D=3.6A,$ $V_{GEN}=4.5V$ $R_L=10\Omega$ $R_{GEN}=10\Omega$		6.5		ns
Rise Time	$t_r$			32.1		ns
Turn-Off Delay Time	$t_{D(OFF)}$			58.4		ns
Fall Time	$t_f$			48		ns
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=1A$ $V_{GS}=4.5V$		6		nC
Gate-Source Charge	$Q_{gs}$			1.35		nC
Gate-Drain Charge	$Q_{gd}$			1.5		nC

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

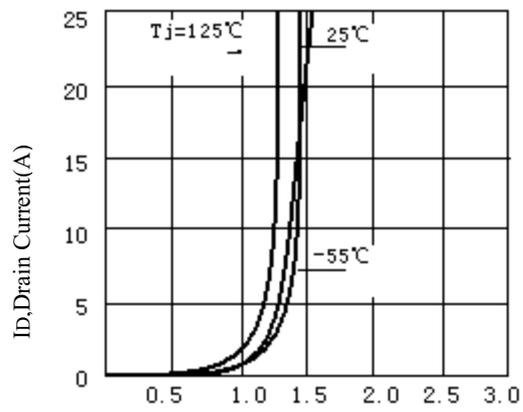
Parameter	Symbol	Condition	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode Forward Voltage	VSD	VGS=0V,Is=1.25A		0.84	1.2	V

Notes

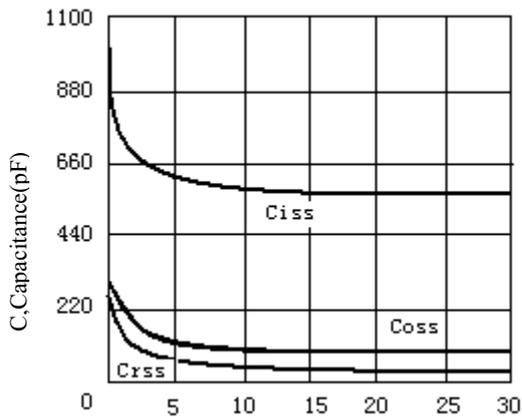
- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$
- b. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
- c. Guaranteed by design, not subject to production testing.



VDS, Drain-to-Source Voltage (V)  
Figure 1. Output Characteristics



VGS, Gate-to-source Voltage (V)  
Figure 2. Transfer Characteristics



VGS, Drain-to Source Voltage  
Figure3. Capacitance

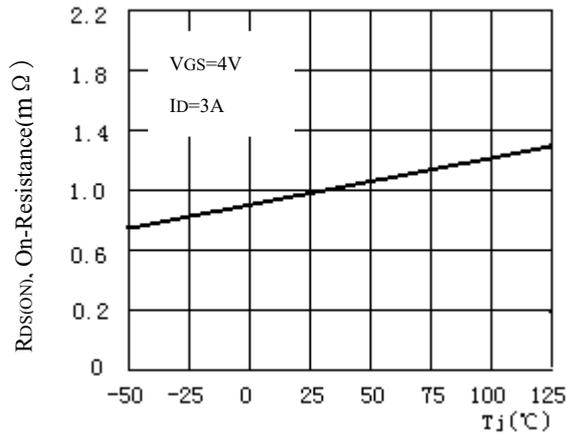
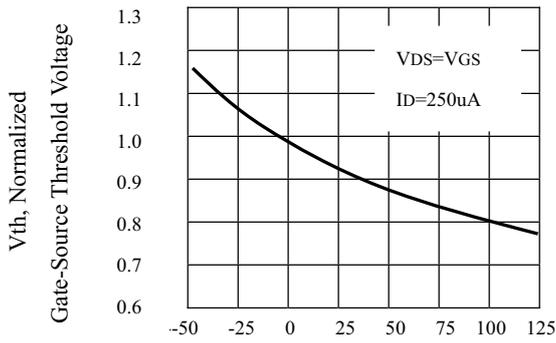
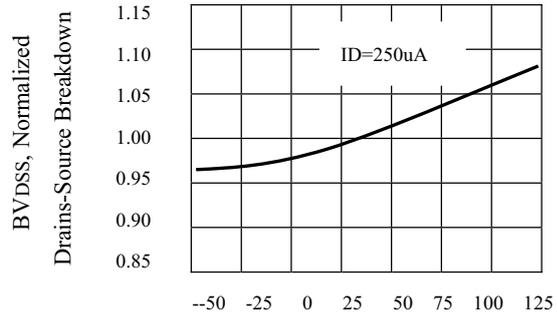


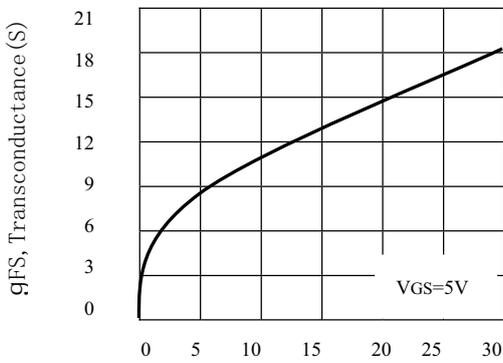
Figure4. On-Resistance Variation with Temperature



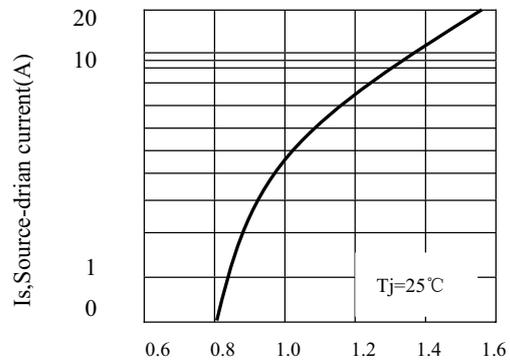
Tj, Junction Temperature(°C)  
 Figure5. Gate Threshold Variation With Temperature



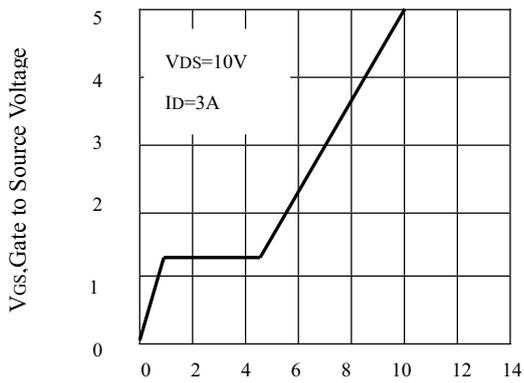
Tj, Junction Temperature (°C)  
 Figure6. Breakdown Voltage Variation With Temperature



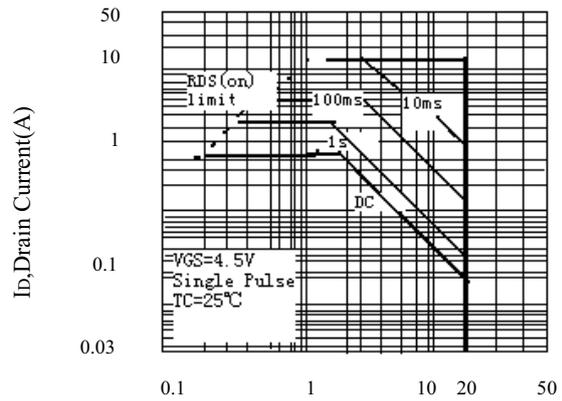
IDS, Drain-Source Current (A)  
 Figure7. Transconductance Variation With Drain Current



VSD, Body Diode Forward Voltage  
 Figure8. Body Diode Forward Voltage Variation with Source Current



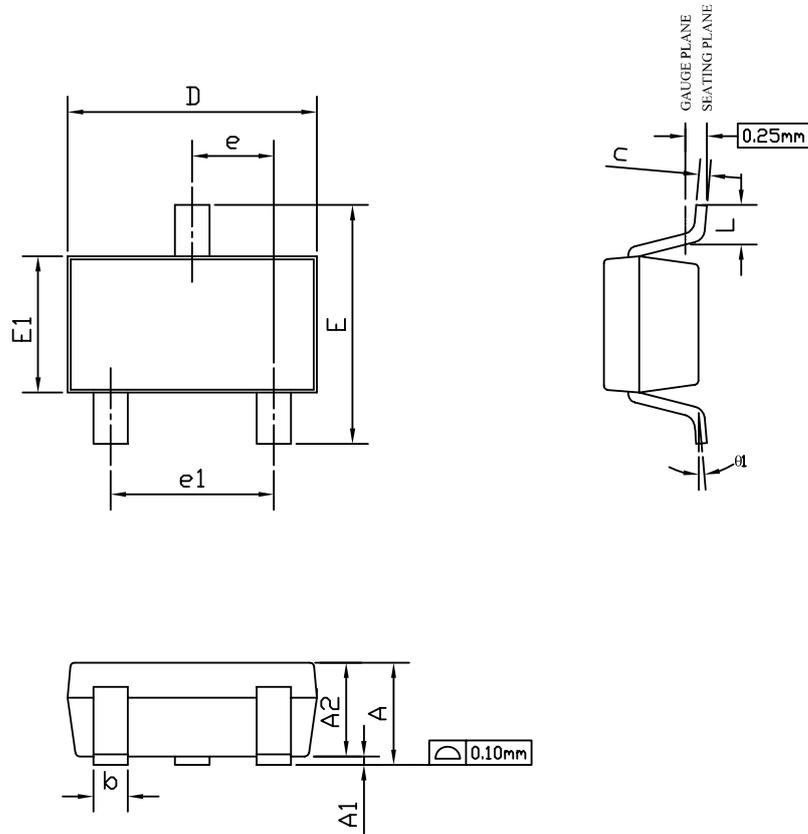
Qg, Total Gate Charge (nC)  
 Figure9. Gate Charge



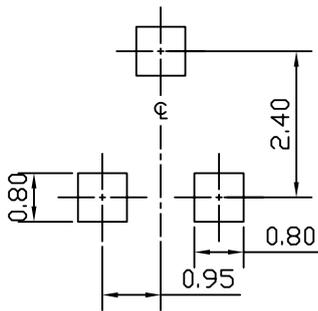
VDS, Drain-Source Voltage(V)  
 Figure10. Maximum Safe Operating Area

Document No.	PO-00001
Version	L

SOT23 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

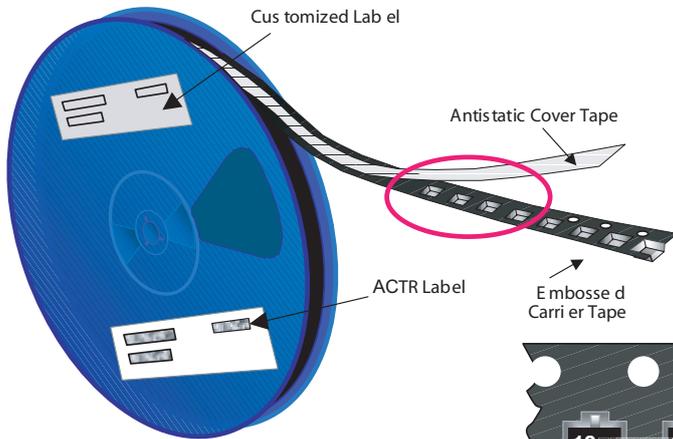
SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	—	1.25	0.033	—	0.049
A1	0.00	—	0.13	0.000	—	0.005
A2	0.70	1.00	1.15	0.028	0.039	0.045
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.80	2.90	3.10	0.110	0.114	0.122
E	2.60	2.80	3.00	0.102	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

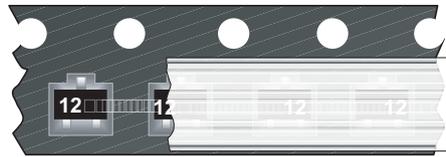
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH OR GATE BURRS.  
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MILS EACH.
2. TOLERANCE ±0.100 mm (4 mil) UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAUGE PLANE.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY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

## SOT-23 Std Tape and Reel Data

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

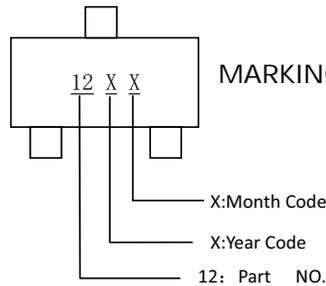


**Packaging Description:**  
SOT23-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed 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.

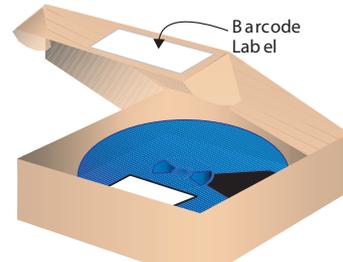


SOT23-3L Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	193x183x80	355x333x40
Max qty per Box	15,000	30,000
Weight per unit (gm)	0.0082	0.0082
Weight per Reel (kg)	0.1175	0.4006
Note/Comments		

### SOT23-3L Unit Orientation

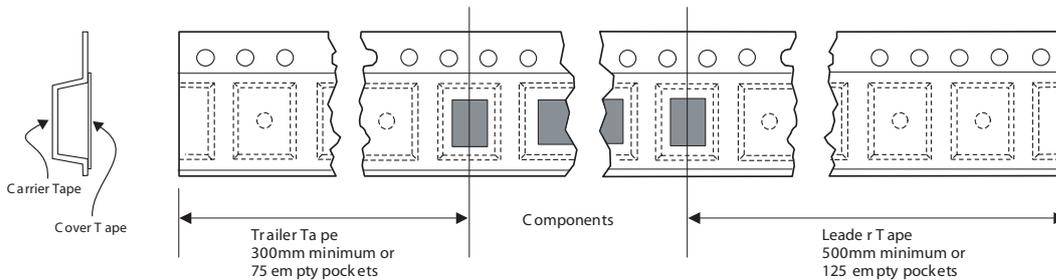


### Barcode Label sample



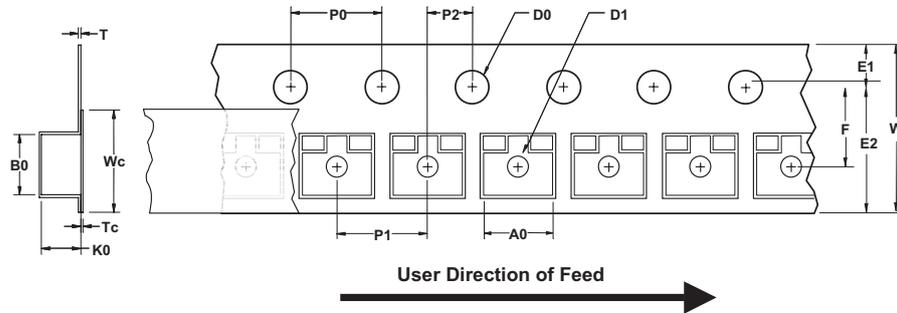
193mm x 183mm x 80mm Pizza Box for Standard Option

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



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

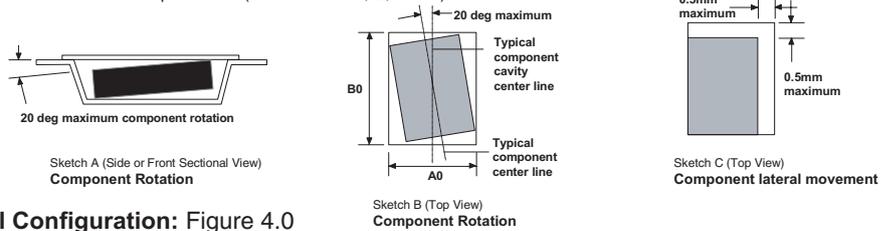
#### SOT23-3L Embossed Carrier Tape Configuration: Figure 3.0



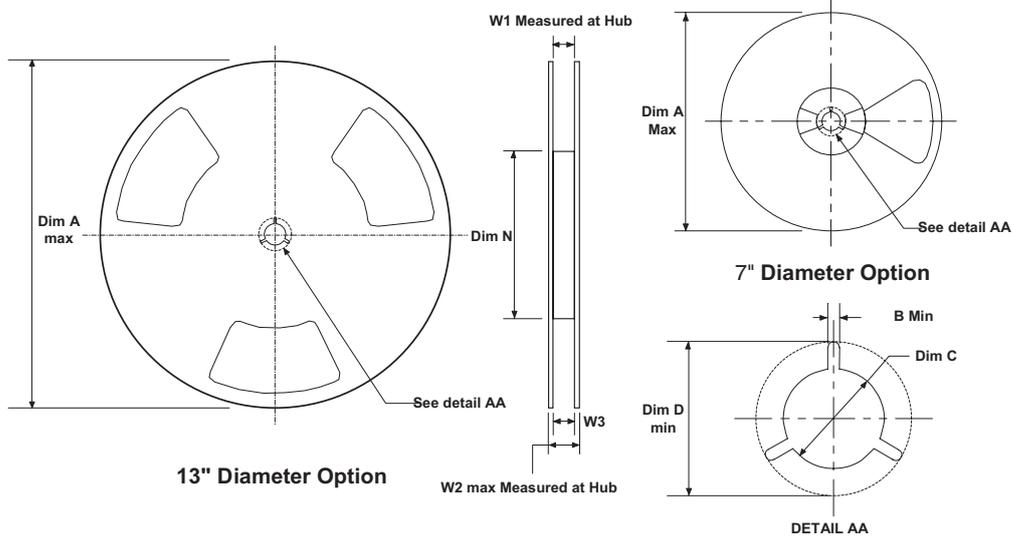
Dimensions are in millimeter

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



#### 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	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9
8mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9

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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.