LOW DROPOUT POSITIVE VOLTAGE REGULATOR

FEATURES
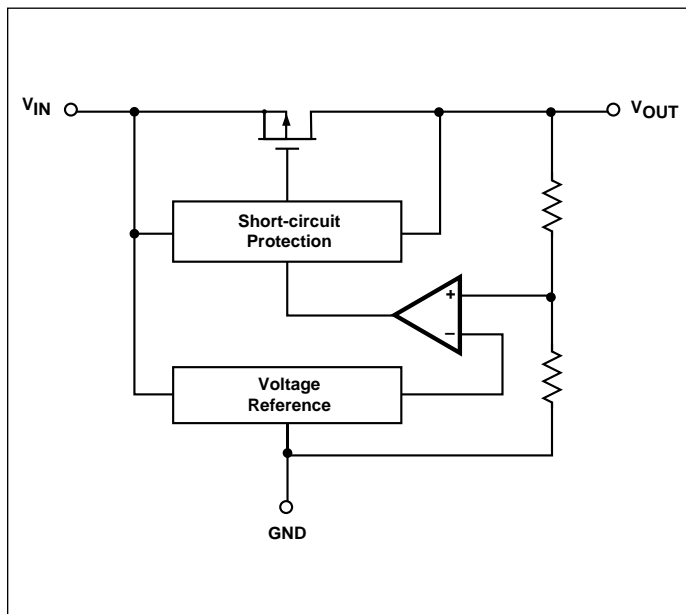
- **Very Low Dropout Voltage .... 120mV typ at 100mA**
  380mV typ at 200mA
- **High Output Current .... 250mA (V_{OUT} = 5.0V)**
- **High Accuracy Output Voltage .... ± 2%**
  (± 1% Semicustom Version)
- **Wide Output Voltage Range 2.1V-6.0V**
- **Low Power Consumption .... 1.1µA (Typ.)**
- **Low Temperature Drift .... ± 100ppm/°C Typ**
- **Excellent Line Regulation .... 0.2%/V Typ**
- **Package Options SOT-23A-3**
  SOT-89-3
  TO-92

- **Short Circuit Protected**
- **Standard 3.0V, 3.3V and 5.0V Output Voltages**
- **Custom Voltages Available from 2.1V to 6.0V in 0.1V Steps.**

APPLICATIONS

- **Battery-Powered Devices**
- **Cameras and Portable Video Equipment**
- **Pagers and Cellular Phones**
- **Solar-Powered Instruments**
- **Consumer Products**

GENERAL DESCRIPTION

The TC55 Series is a collection of CMOS low dropout positive voltage regulators which can source up to 250mA of current with an extremely low input-output voltage differential of 380mV.

The low dropout voltage combined with the low current consumption of only 1.1µA makes this part ideal for battery operation. The low voltage differential (dropout voltage) extends battery operating lifetime. It also permits high currents in small packages when operated with minimum V_{IN} − V_{OUT} differentials.

The circuit also incorporates short-circuit protection to ensure maximum reliability.

PIN CONFIGURATIONS

*SOT-23A-3 is equivalent to JEDEC (TO-236)

FUNCTIONAL BLOCK DIAGRAM
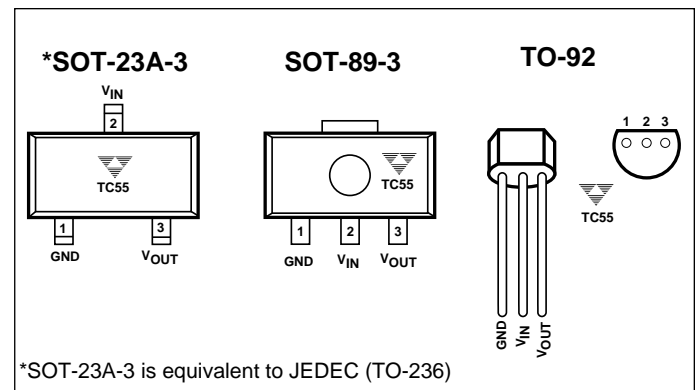
ORDERING INFORMATION

PART CODE   TC55 RP XX X X X XX XXX

Output Voltage:
    Ex: 21= 2.1V; 60 = 6.0V

Extra Feature Code: Fixed: 0

Tolerance:
    1 = ±1.0% (Custom)
    2 = ±2.0% (Standard)

Temperature: E: − 40°C to +85°C

Package Type and Pin Count:
    CB: SOT-23A-3 (equivalent to JEDEC (TO-236)
    MB: SOT-89-3
    ZB: TO-92-3

Taping Direction:
713: Standard Taping
723: Reverse Taping
    No suffix: TO-92 Bulk

TC55 Series

ABSOLUTE MAXIMUM RATINGS*

Item	Code	Ratings	Units
Input Voltage	V_{IN}	+12	V
Output Current	I_{OUT}	$Pd/(V_{IN} - V_{OUT})$	mA
Output Voltage	V_{OUT}	$(V_{SS} - 0.3)$ to $(V_{IN} + 0.3)$	V
Power Dissipation: SOT-23A-3 ($T_A \leq 70°C$) SOT-89 TO-92	Pd	240 400 440	mW
Operating Temperature Range	T_A	-40 to $+85$	°C
Storage Temperature Range	T_{stg}	-65 to $+150$	°C

TC55RP50 ELECTRICAL CHARACTERISTICS: $V_{OUT}(S) = 5.0V$, $T_A = 25°C$ unless otherwise specified (see REMARKS).

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{OUT}(A)$	Output Voltage	$I_{OUT} = 40mA$ $V_{IN} = 6.0V$	— 4.90	— 5.0	— 5.10	V
$I_{OUT}max$	Maximum Output Current	$V_{IN} = 6.0V$, $V_{OUT}(A) \geq 4.5V$	250	—	—	mA
ΔV_{OUT}	Load Regulation	$V_{IN} = 6.0$ V, 1 mA $\leq I_{OUT} \leq 100mA$	—	40	80	mV
V_{dif}	I/O Voltage Difference	$I_{OUT} = 100mA$ $I_{OUT} = 200$ mA	— —	120 380	300 600	mV
I_{SS}	Current Consumption	$V_{IN} = 6.0V$	—	1.1	3.0	μA
$\dfrac{V_{OUT}(A) \cdot 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$	Voltage Regulation	$I_{OUT} = 40mA$ $6.0V \leq V_{IN} \leq 10.0V$	—	0.2	0.3	%/V
V_{IN}	Input Voltage		—	—	10.0	V
$\dfrac{\Delta V_{OUT}(A) \cdot 10^6}{V_{OUT}(S) \cdot \Delta T_A}$	Temperature Coefficient of Output Voltage	$I_{OUT} = 40mA$ $-40°C \leq T_A \leq 85°C$	—	±100	—	ppm/°C
	Long Term Stability	$T_A = 125°C$, 1000 Hours	—	0.5	—	%

REMARKS: $V_{OUT}(S)$: Preset value of Output voltage
$V_{OUT}(A)$: Actual value of Output voltage
V_{dif}:   Definition of I/O voltage difference = $\{V_{IN}1 - V_{OUT}(A)\}$
$V_{OUT}(A)$: Output Voltage when I_{OUT} is fixed and $V_{IN} = V_{OUT}(S) + 1.0V$
$V_{IN}1$:   Input Voltage when the output voltage is 98% $V_{OUT}(A)$

TC55RP40 ELECTRICAL CHARACTERISTICS: $V_{OUT}(S) = 5.0V$, $T_A = 25°C$ unless otherwise specified (see REMARKS).

| Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{OUT}(A)$	Output Voltage	$I_{OUT} = 40mA$ $V_{IN} = 5.0V$	— 3.92	— 4.0	— 4.08	V
$I_{OUT}max$	Maximum Output Current	$V_{IN} = 5.0V$, $V_{OUT}(A) \geq 3.6V$	200	—	—	mA
ΔV_{OUT}	Load Regulation	$V_{IN} = 5.0$ V, 1 mA $\leq I_{OUT} \leq 100mA$	—	45	90	mV
V_{dif}	I/O Voltage Difference	$I_{OUT} = 100mA$ $I_{OUT} = 200mA$	— —	170 400	330 630	mV
I_{SS}	Current Consumption	$V_{IN} = 5.0V$	—	1.0	2.9	μA
$\dfrac{\Delta V_{OUT}(A) \cdot 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$	Voltage Regulation	$I_{OUT} = 40mA$ $5.0V \leq V_{IN} \leq 10.0V$	—	0.2	0.3	%/V
V_{IN}	Input Voltage		—	—	10.0	V
$\dfrac{\Delta V_{OUT}(A)}{V_{OUT}(S) \cdot \Delta T_A}$	Temperature Coefficient of Output Voltage	$I_{OUT} = 40mA$ $-40°C \leq T_A \leq 85°C$	—	±100	—	ppm/°C
	Long Term Stability	$T_A = 125°C$, 1000 Hours	—	0.5	—	%

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TC55RP30 ELECTRICAL CHARACTERISTICS: $V_{OUT}(S) = 5.0V$, $T_A = 25°C$ unless otherwise specified (see REMARKS).

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{OUT}(A)$	Output Voltage	$I_{OUT} = 40mA$ $V_{IN} = 4.0V$	— 2.94	— 3.0	— 3.06	V
$I_{OUT}max$	Maximum Output Current	$V_{IN} = 4.0V$, $V_{OUT}(A) \geq 2.7V$	150	—	—	mA
ΔV_{OUT}	Load Regulation	$V_{IN} = 4.0V$, $1\ mA \leq I_{OUT} \leq 80mA$	—	45	90	mV
V_{dif}	I/O Voltage Difference	$I_{OUT} = 80mA$ $I_{OUT} = 160mA$	— —	180 400	360 700	mV
I_{SS}	Current Consumption	$V_{IN} = 4.0V$	—	0.9	2.8	μA
$\dfrac{V_{OUT}(A)\cdot 100}{\Delta V_{IN}\cdot V_{OUT}(S)}$	Voltage Regulation	$I_{OUT} = 40mA$ $4.0V \leq V_{IN} \leq 10.0V$	—	0.2	0.3	%/V
V_{IN}	Input Voltage		—	—	10.0	V
$\dfrac{\Delta V_{OUT}(A)\cdot 10^6}{\Delta T_A\cdot V_{OUT}(S)}$	Temperature Coefficient of Output Voltage	$I_{OUT} = 40mA$ $-40°C \leq T_A \leq 85°C$	—	±100	—	ppm/°C
	Long Term Stability	$T_A = 125°C$, 1000 Hours	—	0.5	—	%

*Static-sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

MARKING
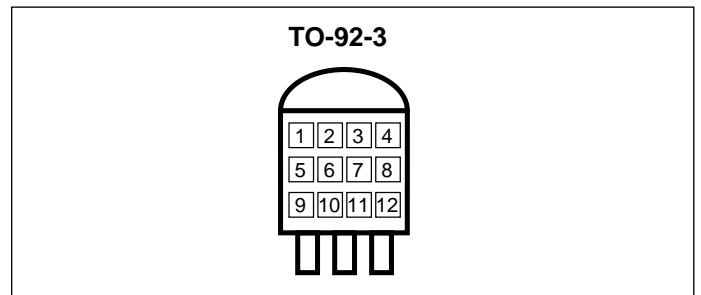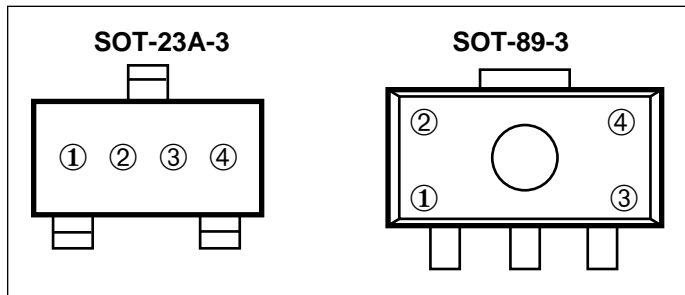
① represents first voltage digit
    2   3   4   5   6
    ex: 3.xv = ③○○○

② represents first decimal place voltage (x.0 - x.9)
    A = x.0   E = x.4   L = x.8
    B = x.1   F = x.5   M = x.9
    C = x.2   H = x.6
    D = x.3   K = x.7
    ex: 3.4V = ③Ⓔ○○

③ represents Polarity
    0 = Positive (fixed)

④ represents assembly lot number

①, ②, ③ & ④ = 55RP (fixed)

⑤ = first voltage digit (2-6)

⑥ = first voltage decimal (0-9)
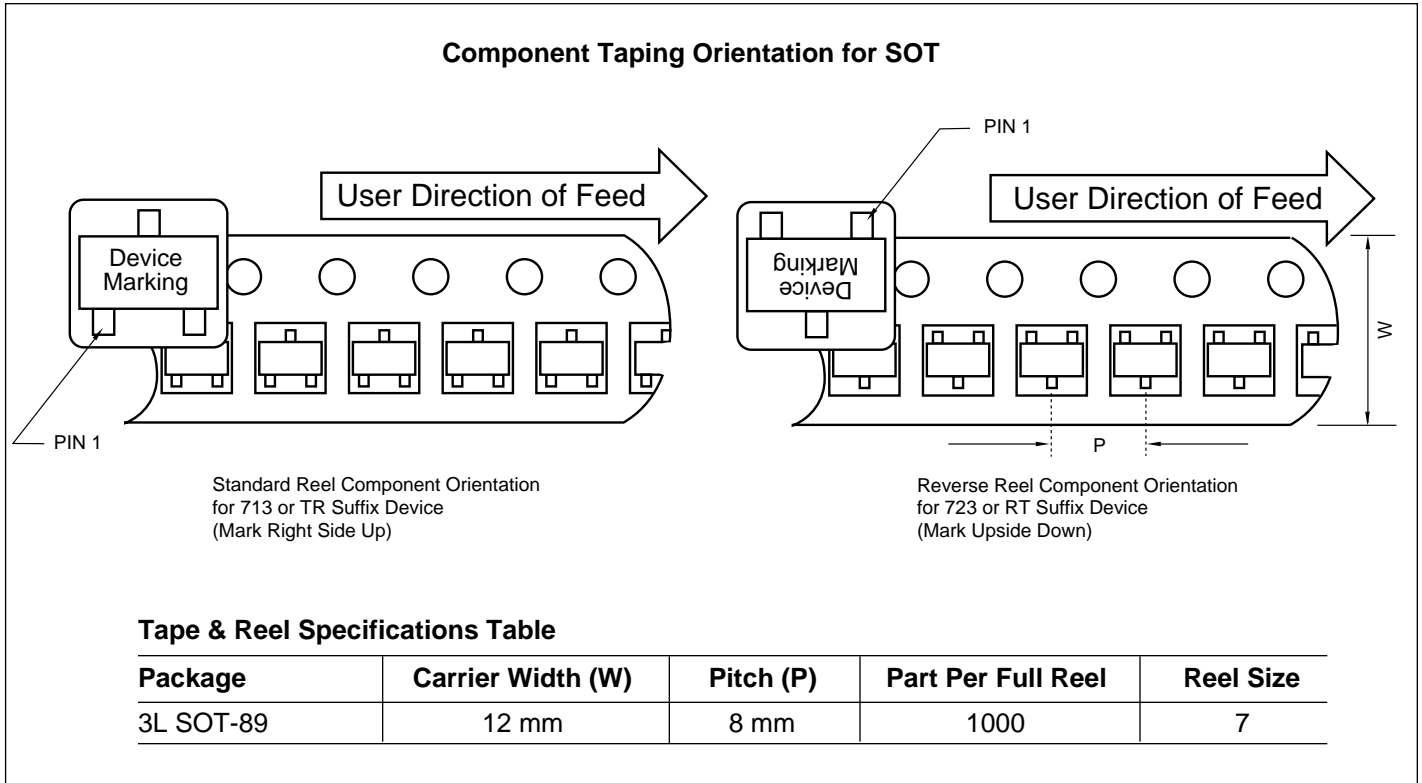
⑦ = extra feature code : fixed : 0

⑧ = regulation accuracy
    1 = ±1.0% (custom), 2 = ±2.0% (standard)

⑨, ⑩, ⑪ & ⑫ = assembly lot number

TC55 Series

TAPING FORMS

Component Taping Orientation for SOT

PIN 1

User Direction of Feed

Device Marking

Device Marking

W

PIN 1

P

Standard Reel Component Orientation
for 713 or TR Suffix Device
(Mark Right Side Up)

Reverse Reel Component Orientation
for 723 or RT Suffix Device
(Mark Upside Down)

Tape & Reel Specifications Table

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
3L SOT-89	12 mm	8 mm	1000	7

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TAPING FORMS (Cont.)

Component Taping Orientation for TO-92

User Direction of Feed

P

Mark
Face

MARK
FACE   MARK
FACE   MARK
FACE

Seal
Tape

Back
Tape

W

User Direction of Feed

P

Mark
Face

MARK
FACE   MARK
FACE   MARK
FACE

Seal
Tape

Back
Tape

W
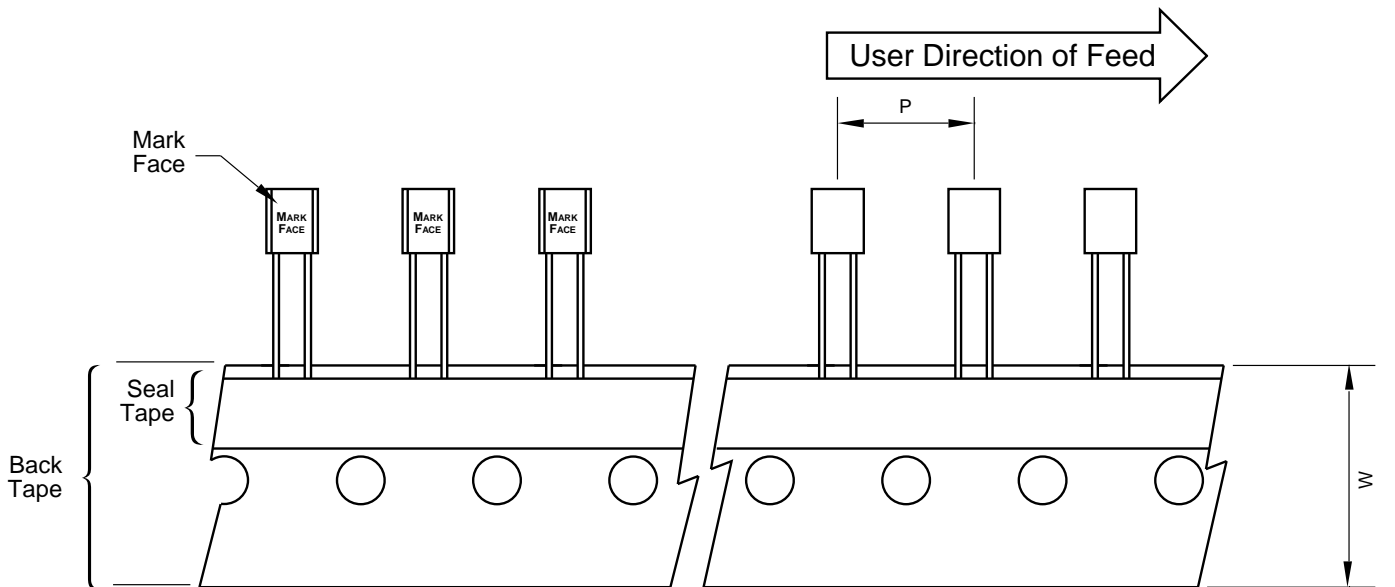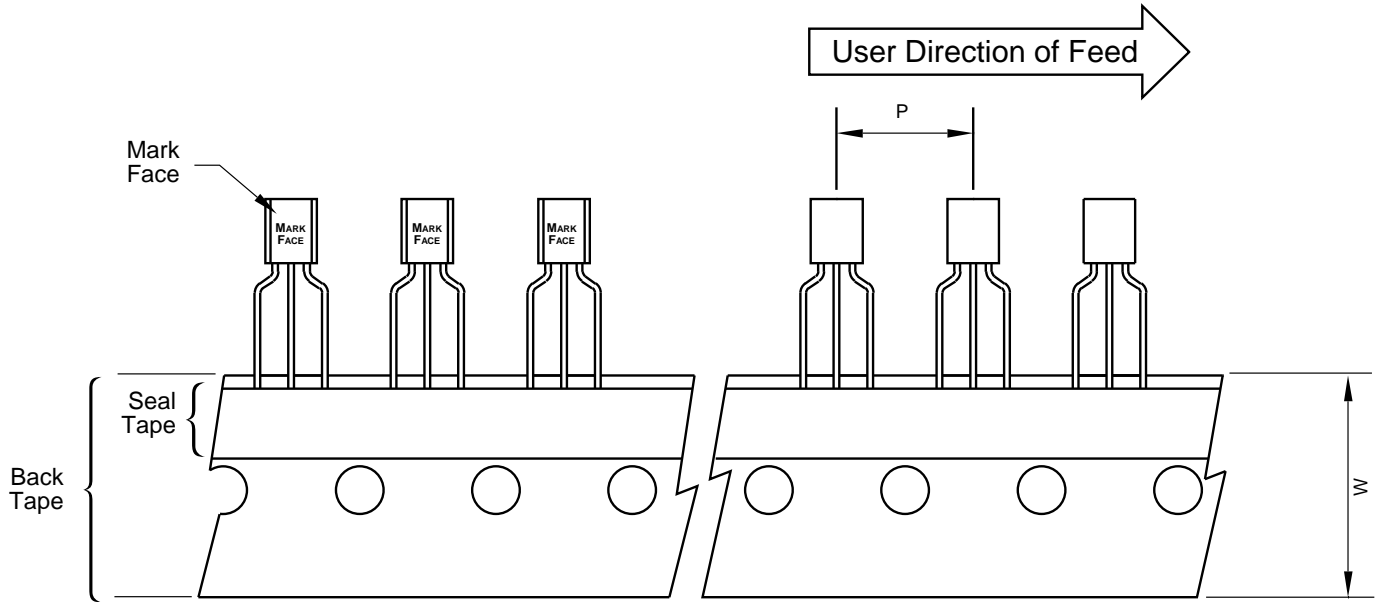
Standard Reel Component Orientation
for 713 or TR Suffix Device

Reverse Reel Component Orientation
for 723 or RT Suffix Device
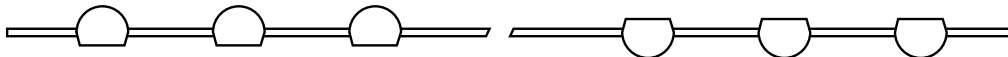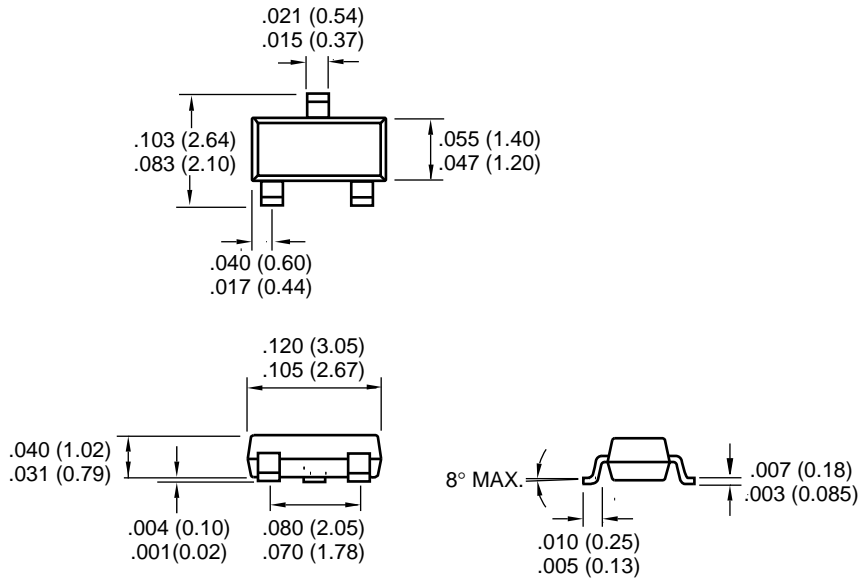
Tape & Reel Specifications Table

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
TO-92	18 mm	12.7 mm	1000/2000	13

TC55 Series

PACKAGE DIMENSIONS

*SOT-23B-3

.021 (0.54)
.015 (0.37)

.103 (2.64)
.083 (2.10)

.055 (1.40)
.047 (1.20)

.040 (0.60)
.017 (0.44)

.120 (3.05)
.105 (2.67)

.040 (1.02)
.031 (0.79)

.004 (0.10)
.001 (0.02)

.080 (2.05)
.070 (1.78)

8° MAX.

.007 (0.18)
.003 (0.085)

.010 (0.25)
.005 (0.13)

*NOTE: SOT-23B-3 is equivalent to JEDEC (TO-236)

SOT-89-3

.181 (4.60)
.173 (4.40)

.072 (1.83)
.055 (1.40)

.063 (1.60)
.055 (1.40)

.102 (2.60)
.090 (2.29)

.167 (4.25)
.155 (3.94)

.022 (0.56)
.017 (0.44)

.047 (1.20)
.035 (0.89)

.017 (0.44)
.014 (0.35)

.062 (1.60)
.056 (1.40)

.019 (0.48)
.014 (0.36)

Dimensions: inches (mm)

PACKAGE DIMENSIONS (Cont.)

TO-92-3

.210 (5.33)
.170 (4.32)

.500
(12.70)
MIN.

.205 (5.21)
.175 (4.45)

.105 (2.67)
.095 (2.41)

.018 (0.46)
.015 (0.38)

.055 (1.40)
.045 (1.14)

.165 (4.19)
.125 (3.18)

.105 (2.67)
.080 (2.03)

.135
(3.43)
MIN.

.018 (0.46)
.015 (0.38)

Dimensions: inches (mm)

Sales Offices

Printed in the U.S.A