

1 μ A LOW DROPOUT POSITIVE VOLTAGE REGULATOR

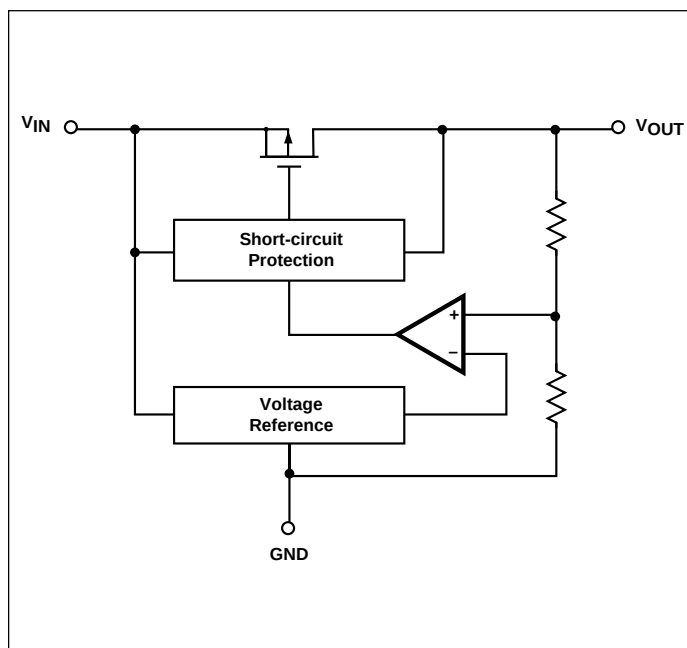
FEATURES

- Very Low Dropout Voltage 120mV typ at 100mA
380mV typ at 200mA
- High Output Current 250mA ($V_{OUT} = 5.0V$)
- High Accuracy Output Voltage $\pm 2\%$
($\pm 1\%$ Semicustom Version)
- Wide Output Voltage Range 1.1V-6.0V
- Low Power Consumption 1.1 μ A (Typ.)
- Low Temperature Drift $\pm 100\text{ppm}/^\circ\text{C}$ (Typ.)
- Excellent Line Regulation 0.2%/V (Typ.)
- Package Options 3-Pin SOT-23A
3-Pin SOT-89
- Short Circuit Protection
- Custom Voltages Available from 1.1V to 6.0V in
0.1V Steps for a 2%, and 2.0V to 6.0V for a 1%
Tolerance

APPLICATIONS

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

FUNCTIONAL BLOCK DIAGRAM



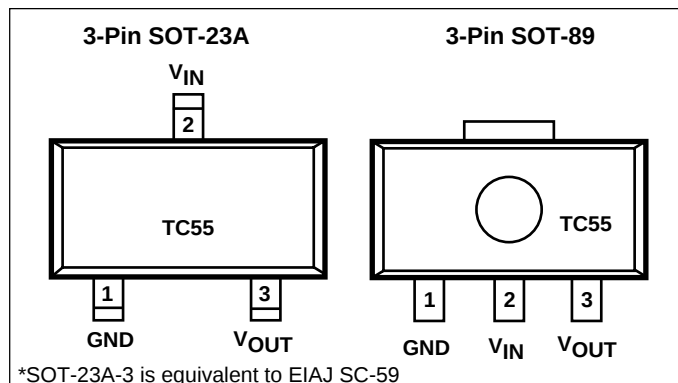
GENERAL DESCRIPTION

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 at 200mA.

The low dropout voltage combined with the low current consumption of only 1.1 μ A 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



ORDERING INFORMATION

PART CODE TC55 RP XX X X X XX XXX

Output Voltage: _____

Ex: 20 = 2.0V; 60 = 6.0V 1.0% Tol.

Ex: 11 = 1.1V; 60 = 6.0V 2.0% Tol.

Extra Feature Code: Fixed: 0

Tolerance: _____

1 = 1.0% (Custom)

2 = 2.0% (Standard)

Temperature: E: - 40 $^\circ\text{C}$ to +85 $^\circ\text{C}$

Package Type and Pin Count: _____

CB: 3-Pin SOT-23A (equivalent to EIAJ SC-59)

MB: 3-Pin SOT-89

Taping Direction: _____

TR or 713: Standard Taping

RT or 723: Reverse Taping

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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: ($T_A \leq 70^\circ\text{C}$)	3-Pin SOT-23A 3-Pin SOT-89 Pd	240 400	mW
Operating Temperature Range	T_A	- 40 to +85	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{OUT(A)}$	Output Voltage	$I_{OUT} = 40\text{mA}$ $V_{IN} = 6.0\text{V}$	— 4.90	— 5.0	— 5.10	V
I_{OUTmax}	Maximum Output Current	$V_{IN} = 6.0\text{V}$, $V_{OUT(A)} \geq 4.5\text{V}$	250	—	—	mA
ΔV_{OUT}	Load Regulation	$V_{IN} = 6.0\text{V}$, $1\text{mA} \leq I_{OUT} \leq 100\text{mA}$	—	40	80	mV
V_{dif}	I/O Voltage Difference	$I_{OUT} = 100\text{mA}$ $I_{OUT} = 200\text{mA}$	— —	120 380	300 600	mV
I_{SS}	Current Consumption	$V_{IN} = 6.0\text{V}$	—	1.1	3.0	μA
$\frac{V_{OUT(A)} \cdot 100}{\Delta V_{IN} \cdot V_{OUT(S)}}$	Voltage Regulation	$I_{OUT} = 40\text{mA}$ $6.0\text{V} \leq V_{IN} \leq 10.0\text{V}$	—	0.2	0.3	%/V
V_{IN}	Input Voltage		—	—	10.0	V
$\frac{\Delta V_{OUT(A)} \cdot 10^6}{V_{OUT(S)} \cdot \Delta T_A}$	Temperature Coefficient of Output Voltage	$I_{OUT} = 40\text{mA}$ $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$	—	± 100	—	ppm/ $^\circ\text{C}$
	Long Term Stability	$T_A = 125^\circ\text{C}$, 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 = $\{V_{IN1} - V_{OUT(A)}\}$
 $V_{OUT(A)}$: Output Voltage when I_{OUT} is fixed and $V_{IN} = V_{OUT(S)} + 1.0\text{V}$
 V_{IN1} : Input Voltage when the output voltage is 98% $V_{OUT(A)}$

TC55RP40 ELECTRICAL CHARACTERISTICS: $V_{OUT(S)} = 4.0\text{V}$, $T_A = 25^\circ\text{C}$ unless otherwise specified (see REMARKS).

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

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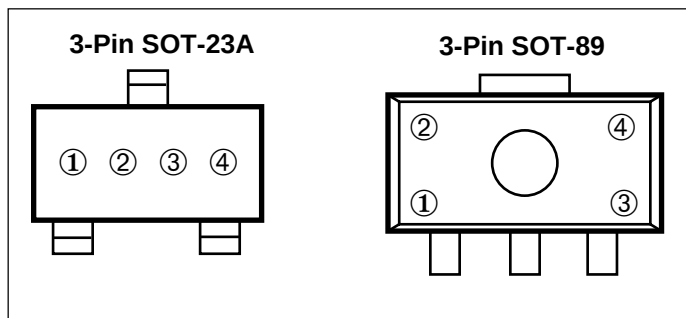
TC55 Series

TC55RP30 ELECTRICAL CHARACTERISTICS: $V_{OUT}(S) = 3.0V$, $T_A = 25^\circ C$ 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_{OUTmax}	Maximum Output Current	$V_{IN} = 4.0V$, $V_{OUT}(A) \geq 2.7V$	150	—	—	mA
ΔV_{OUT}	Load Regulation	$V_{IN} = 4.0V$, $1mA \leq I_{OUT} \leq 80mA$	—	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
$\frac{V_{OUT}(A) \cdot 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$	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
$\frac{\Delta V_{OUT}(A) \cdot 10^6}{\Delta T_A \cdot V_{OUT}(S)}$	Temperature Coefficient of Output Voltage	$I_{OUT} = 40mA$ $-40^\circ C \leq T_A \leq 85^\circ C$	—	±100	—	ppm/°C
	Long Term Stability	$T_A = 125^\circ C$, 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 = ③④○○○

③ represents Polarity
0 = Positive (fixed)

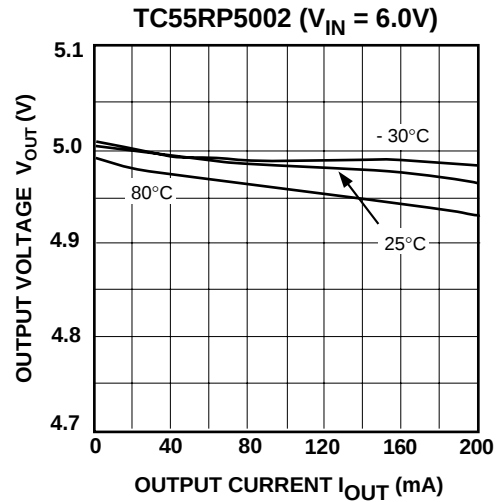
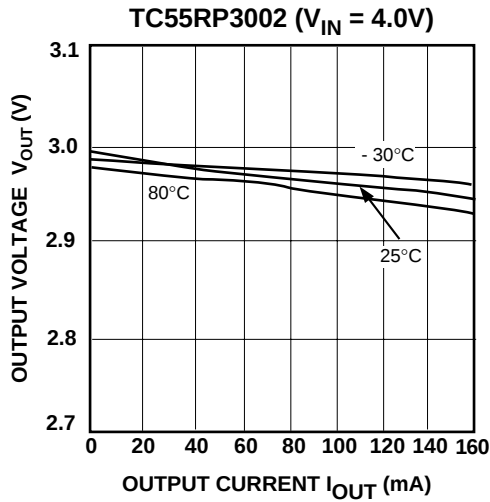
④ represents assembly lot number

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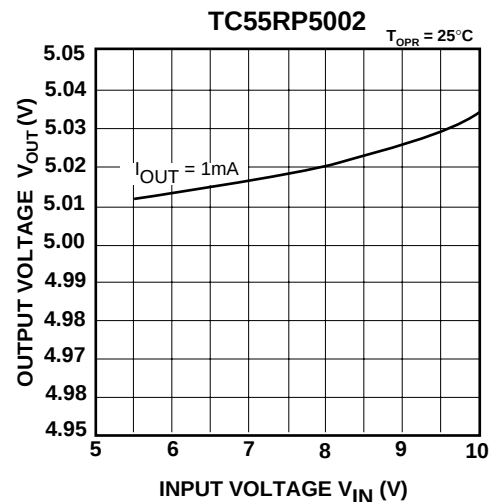
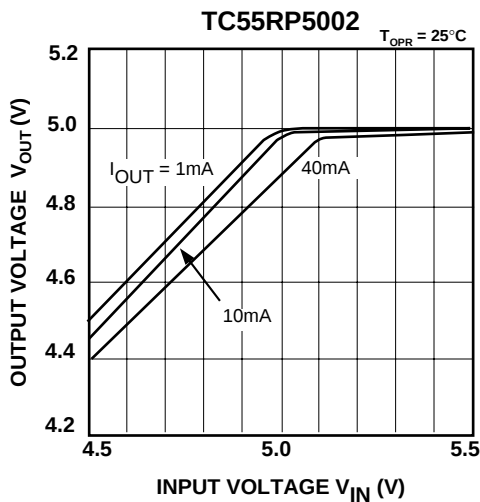
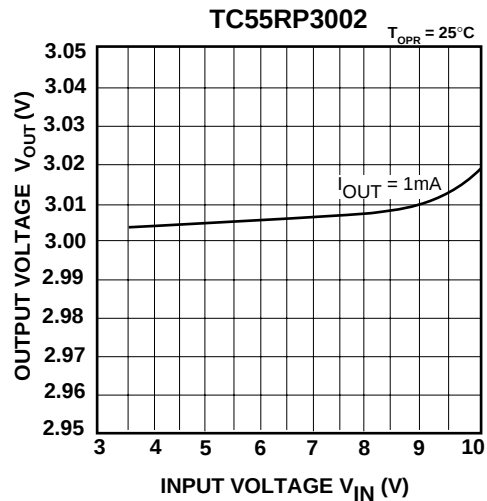
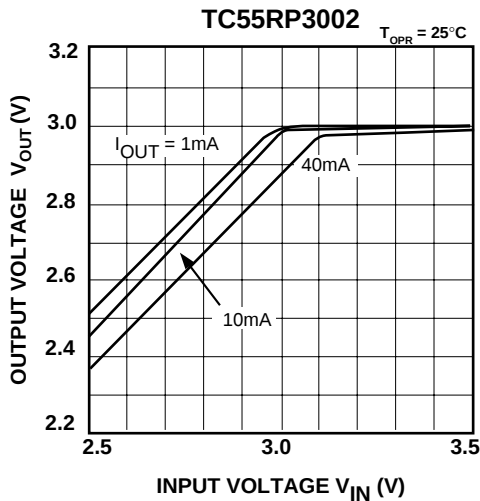
TC55 Series

TYPICAL CHARACTERISTICS

1. OUTPUT VOLTAGE vs. OUTPUT CURRENT



2. OUTPUT VOLTAGE vs. INPUT VOLTAGE

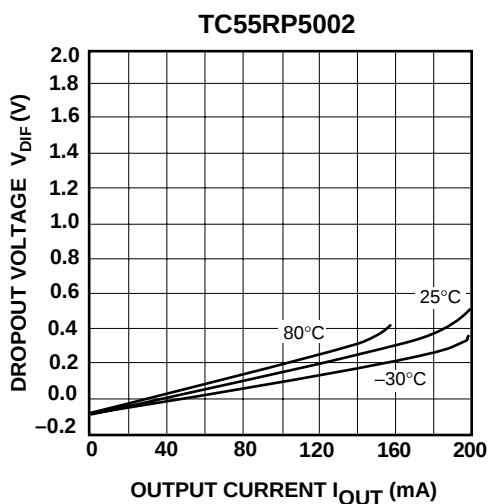
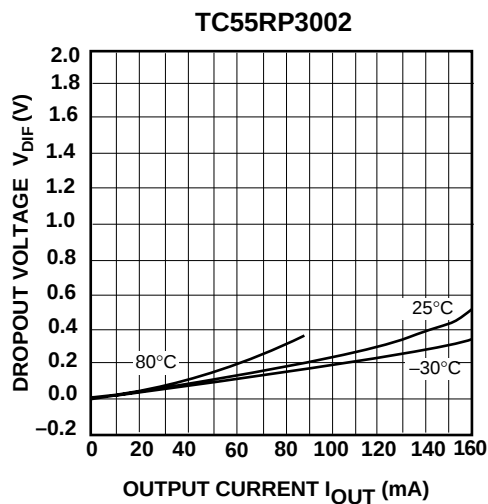


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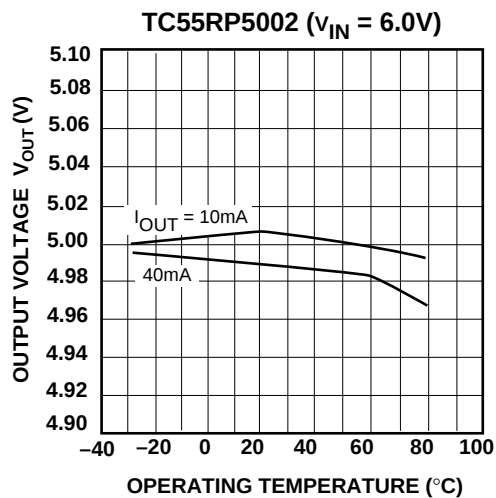
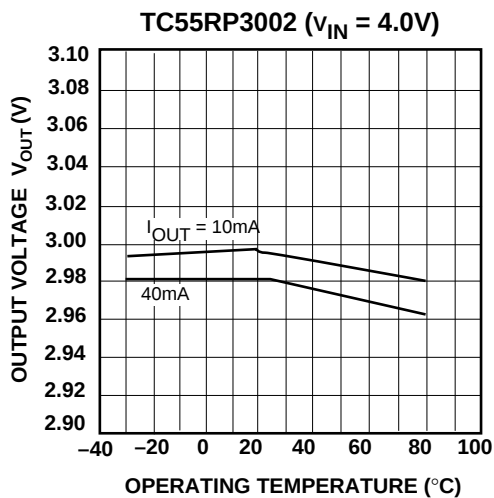
TC55 Series

TYPICAL CHARACTERISTICS

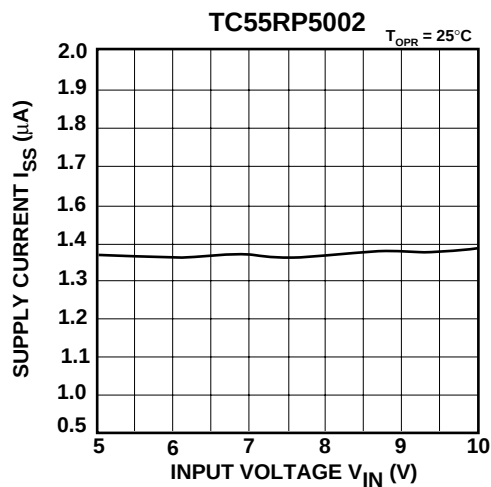
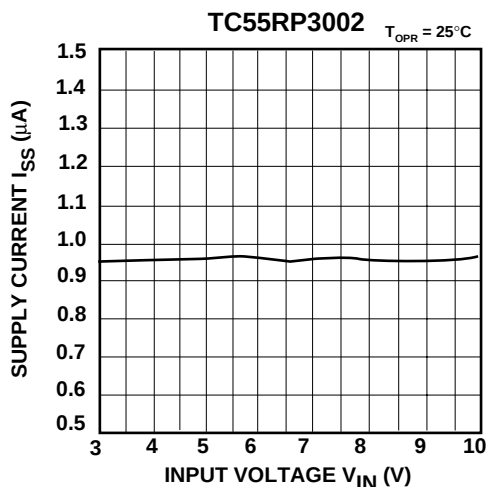
3. DROPOUT VOLTAGE vs. OUTPUT CURRENT



4. OUTPUT VOLTAGE vs. OPERATING TEMPERATURE



5. SUPPLY CURRENT vs. INPUT VOLTAGE

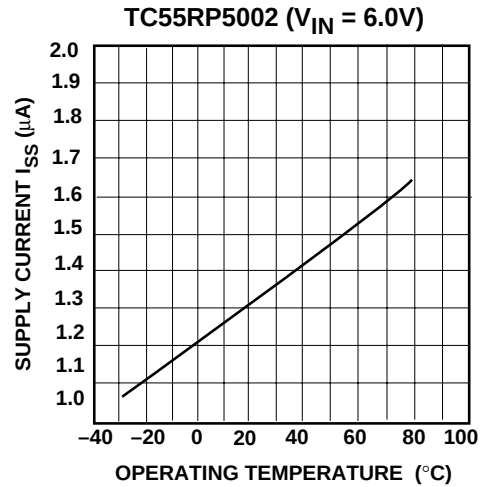
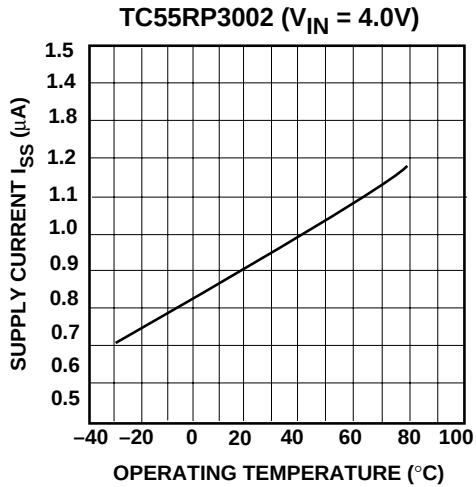


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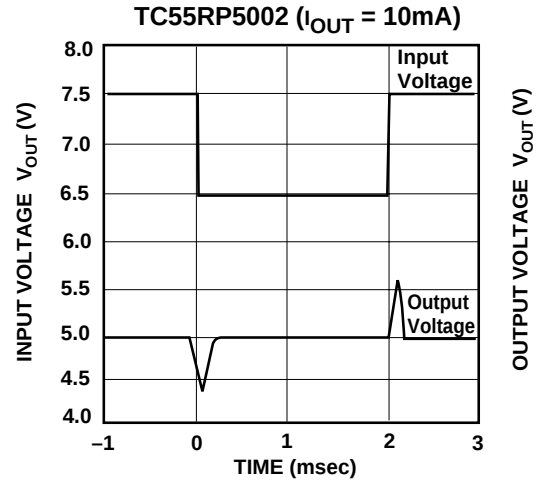
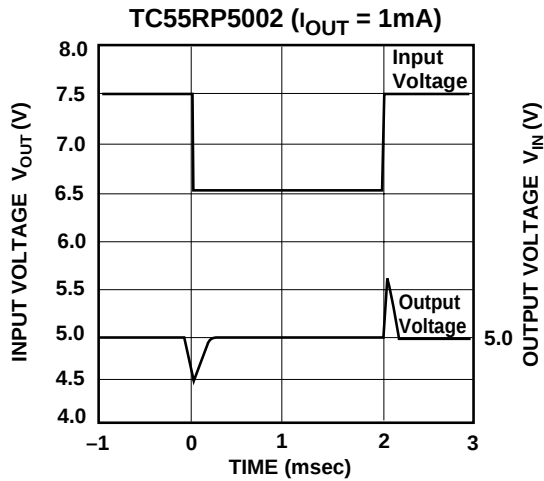
TC55 Series

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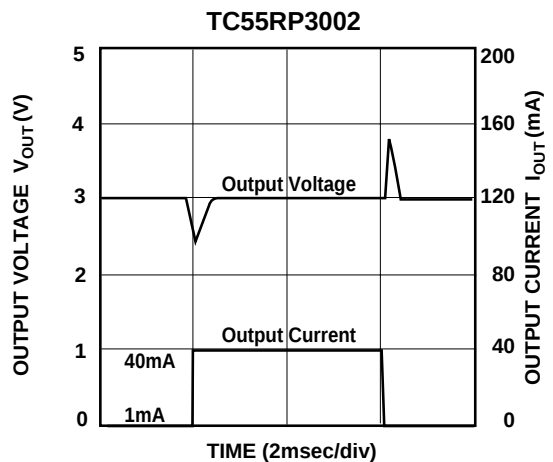
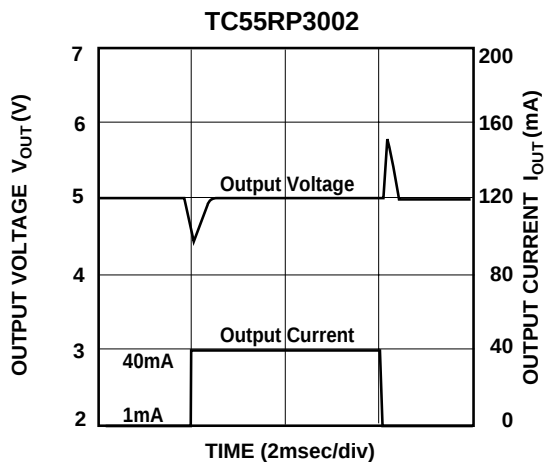
6. SUPPLY CURRENT vs. OPERATING TEMPERATURE



7. INPUT TRANSIENT RESPONSE

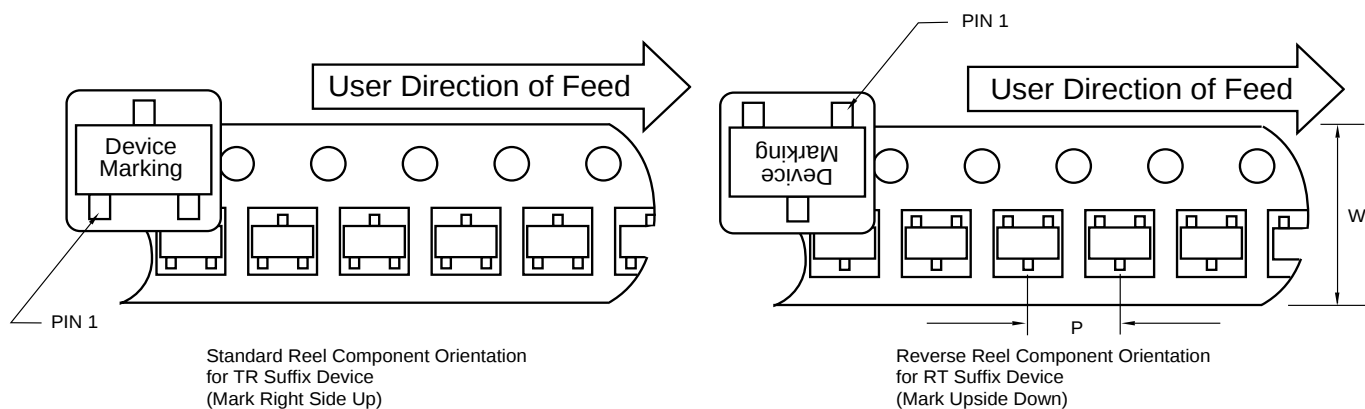


8. LOAD TRANSIENT RESPONSE



TAPING FORMS

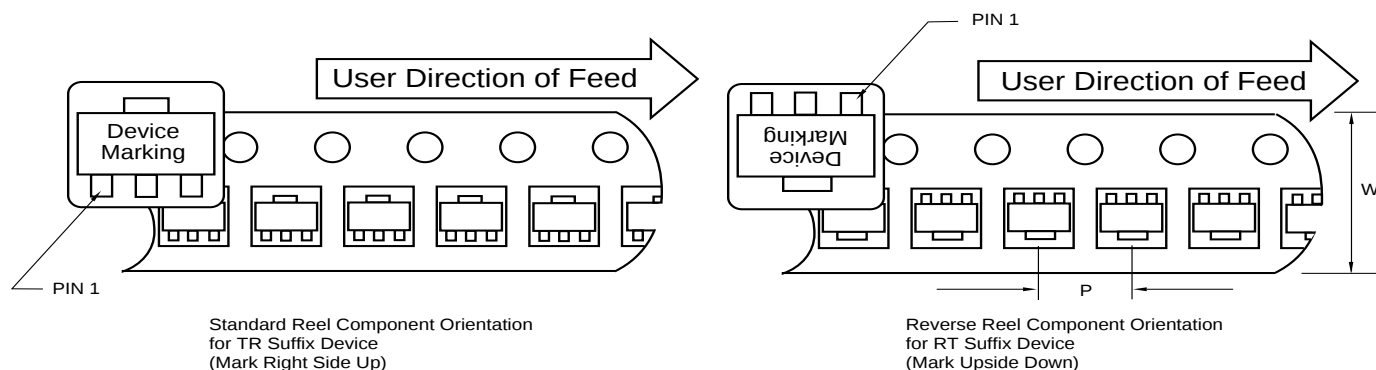
Component Taping Orientation for 3-Pin SOT-23A (EIAJ SC-59) Devices



Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
3-Pin SOT-23A	8 mm	4 mm	3000	7 in

Component Taping Orientation for 3-Pin SOT-89 Devices



Carrier Tape, Reel Size, and Number of Components Per Reel

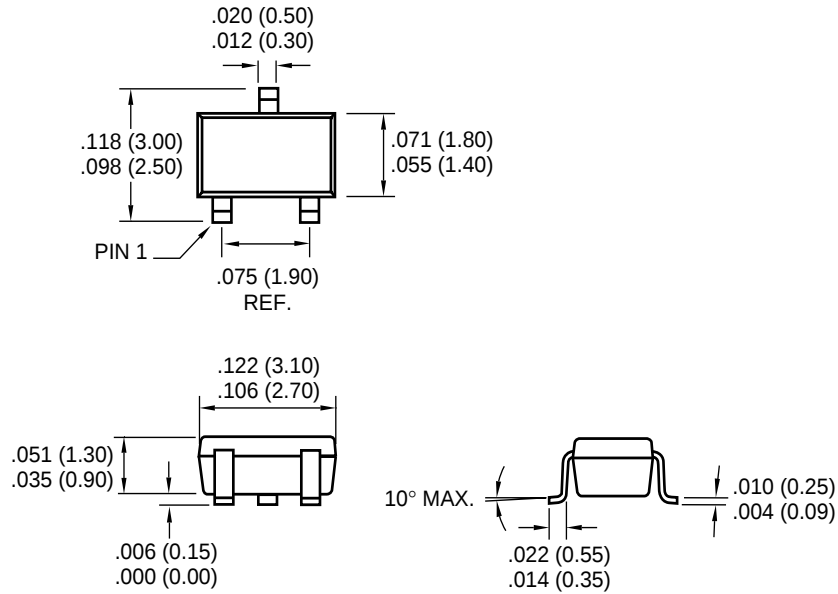
Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
3-Pin SOT-89	12 mm	8 mm	1000	7 in

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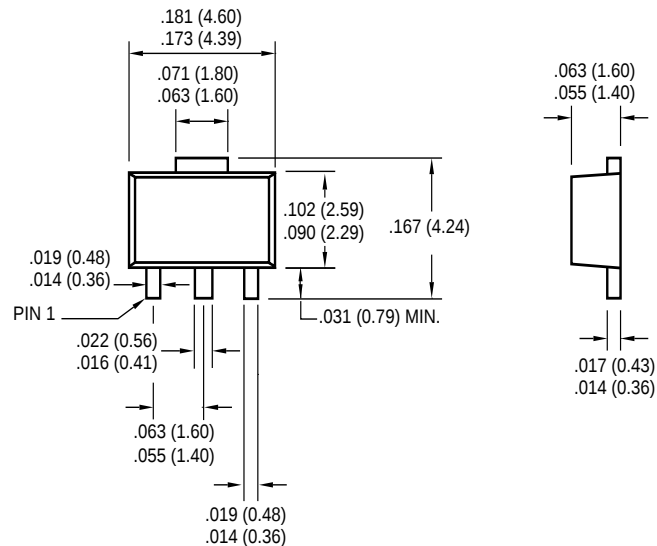
TC55 Series

PACKAGE DIMENSIONS

3-Pin SOT-23A (EIAJ SC-59)



3-Pin SOT-89



Dimensions: inches (mm)



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