

## LOW DROPOUT POSITIVE VOLTAGE REGULATOR

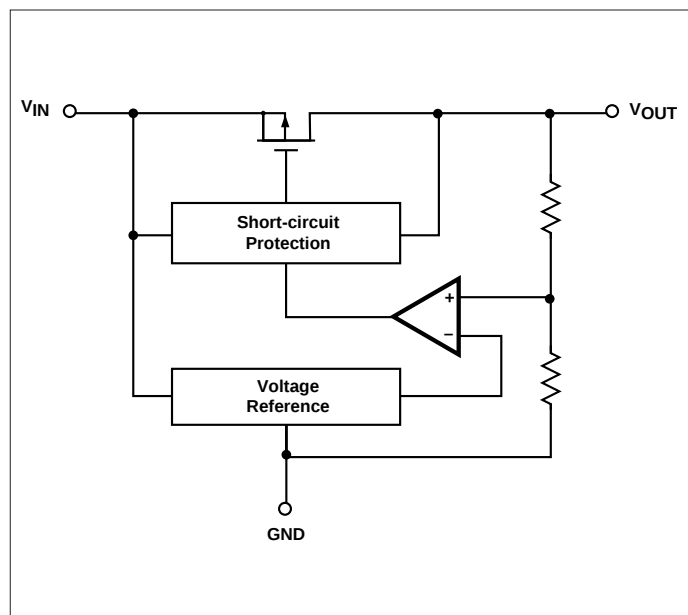
### FEATURES

- 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 ..... 2.1V-6.0V
- Low Power Consumption ..... 1.1 $\mu A$  (Typ.)
- Low Temperature Drift .....  $\pm 100ppm/^{\circ}C$  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

### FUNCTIONAL BLOCK DIAGRAM



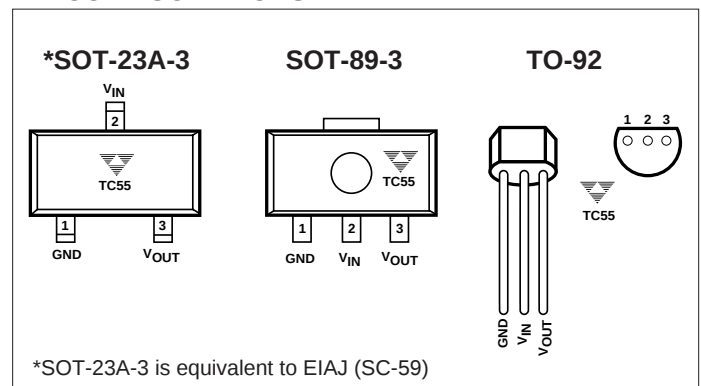
### GENERAL DESCRIPTION

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.

The low dropout voltage combined with the low current consumption of only 1.1 $\mu A$  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: 21 = 2.1V; 60 = 6.0V

**Extra Feature Code:** Fixed: 0

**Tolerance:** \_\_\_\_\_  
1 =  $\pm 1.0\%$  (Custom)  
2 =  $\pm 2.0\%$  (Standard)

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

**Package Type and Pin Count:** \_\_\_\_\_  
CB: SOT-23A-3 (Equivalent to EIAJ (SC-59))  
MB: SOT-89-3  
ZB: TO-92-3

**Taping Direction:** \_\_\_\_\_  
Standard Taping  
Reverse Taping  
No suffix: TO-92 Bulk

# LOW DROPOUT POSITIVE VOLTAGE REGULATOR

## 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:<br>( $T_A \leq 70^\circ\text{C}$ ) | SOT-23A-3<br>SOT-89<br>TO-92<br>Pd | 240<br>400<br>440                    | 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                            | $I_{OUT} = 40\text{mA}$<br>$V_{IN} = 6.0\text{V}$                             | —<br>4.90 | —<br>5.0   | —<br>5.10  | V                     |
| $I_{OUTmax}$                                                       | Maximum Output Current                    | $V_{IN} = 6.0\text{V}$ , $V_{OUT}(A) \geq 4.5\text{V}$                        | 250       | —          | —          | mA                    |
| $\Delta V_{OUT}$                                                   | 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                    | $I_{OUT} = 100\text{mA}$<br>$I_{OUT} = 200\text{mA}$                          | —<br>—    | 120<br>380 | 300<br>600 | mV                    |
| $I_{SS}$                                                           | Current Consumption                       | $V_{IN} = 6.0\text{V}$                                                        | —         | 1.1        | 3.0        | $\mu\text{A}$         |
| $\frac{V_{OUT}(A) \cdot 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$      | Voltage Regulation                        | $I_{OUT} = 40\text{mA}$<br>$6.0\text{V} \leq V_{IN} \leq 10.0\text{V}$        | —         | 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 | $I_{OUT} = 40\text{mA}$<br>$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ | —         | $\pm 100$  | —          | 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: $V_{OUT}(S) = 5.0\text{V}$ , $T_A = 25^\circ\text{C}$ unless otherwise specified (see REMARKS).

| Symbol                                                               | Parameter                                 | Test Conditions                                                               | Min       | Typ        | Max        | Unit                  |
|----------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------|-----------|------------|------------|-----------------------|
| $V_{OUT}(A)$                                                         | Output Voltage                            | $I_{OUT} = 40\text{mA}$<br>$V_{IN} = 5.0\text{V}$                             | —<br>3.92 | —<br>4.0   | —<br>4.08  | V                     |
| $I_{OUTmax}$                                                         | Maximum Output Current                    | $V_{IN} = 5.0\text{V}$ , $V_{OUT}(A) \geq 3.6\text{V}$                        | 200       | —          | —          | mA                    |
| $\Delta V_{OUT}$                                                     | 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                    | $I_{OUT} = 100\text{mA}$<br>$I_{OUT} = 200\text{mA}$                          | —<br>—    | 170<br>400 | 330<br>630 | mV                    |
| $I_{SS}$                                                             | Current Consumption                       | $V_{IN} = 5.0\text{V}$                                                        | —         | 1.0        | 2.9        | $\mu\text{A}$         |
| $\frac{\Delta V_{OUT}(A) \cdot 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$ | Voltage Regulation                        | $I_{OUT} = 40\text{mA}$<br>$5.0\text{V} \leq V_{IN} \leq 10.0\text{V}$        | —         | 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 | $I_{OUT} = 40\text{mA}$<br>$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ | —         | $\pm 100$  | —          | ppm/ $^\circ\text{C}$ |
|                                                                      | Long Term Stability                       | $T_A = 125^\circ\text{C}$ , 1000 Hours                                        | —         | 0.5        | —          | %                     |

LOW DROPOUT  
POSITIVE VOLTAGE REGULATOR

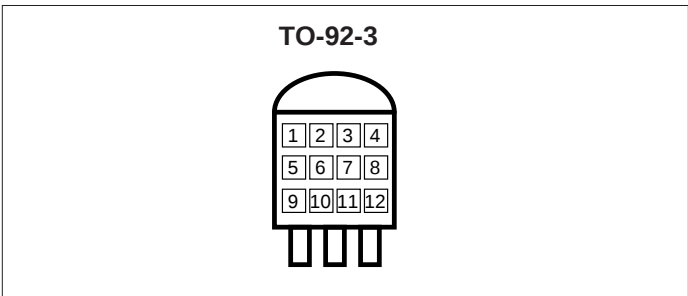
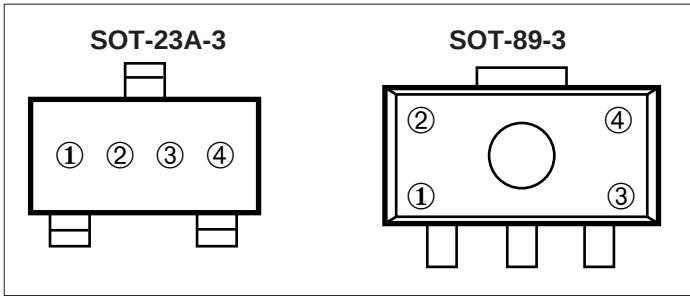
TC55 Series

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

| Symbol                                                             | Parameter                                 | Test Conditions                                              | Min       | Typ        | Max        | Unit             |
|--------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------|-----------|------------|------------|------------------|
| $V_{OUT(A)}$                                                       | Output Voltage                            | $I_{OUT} = 40mA$<br>$V_{IN} = 4.0V$                          | —<br>2.94 | —<br>3.0   | —<br>3.06  | V                |
| $I_{OUTmax}$                                                       | Maximum Output Current                    | $V_{IN} = 4.0V$ , $V_{OUT(A)} \geq 2.7V$                     | 150       | —          | —          | mA               |
| $\Delta V_{OUT}$                                                   | Load Regulation                           | $V_{IN} = 4.0V$ , $1\text{ mA} \leq I_{OUT} \leq 80mA$       | —         | 45         | 90         | mV               |
| $V_{dif}$                                                          | I/O Voltage Difference                    | $I_{OUT} = 80mA$<br>$I_{OUT} = 160mA$                        | —<br>—    | 180<br>400 | 360<br>700 | mV               |
| $I_{SS}$                                                           | Current Consumption                       | $V_{IN} = 4.0V$                                              | —         | 0.9        | 2.8        | $\mu A$          |
| $\frac{V_{OUT(A)} \cdot 100}{\Delta V_{IN} \cdot V_{OUT(S)}}$      | Voltage Regulation                        | $I_{OUT} = 40mA$<br>$4.0V \leq V_{IN} \leq 10.0V$            | —         | 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 | $I_{OUT} = 40mA$<br>$-40^{\circ}C \leq T_A \leq 85^{\circ}C$ | —         | $\pm 100$  | —          | ppm/ $^{\circ}C$ |
|                                                                    | 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

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 =  $\pm 1.0\%$  (custom), 2 =  $\pm 2.0\%$  (standard)

⑨, ⑩, ⑪ & ⑫ = assembly lot number