

## LOW DROPOUT POSITIVE VOLTAGE REGULATOR

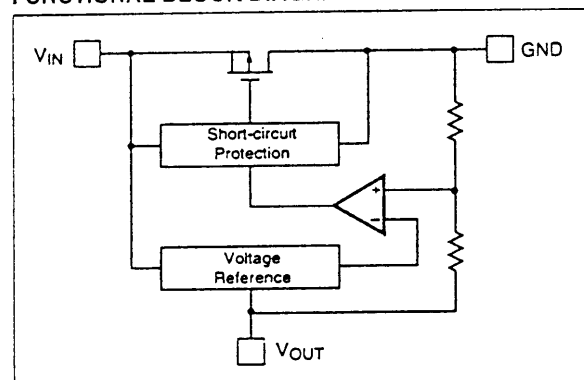
### FEATURES

- 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 $\mu A$  ( $V_{OUT}=5.0V$ )  
(at NO LOAD)
- Good Temperature Stability .....  $\pm 100ppm/^{\circ}C$  Typ
- Good Voltage Regulation ..... 0.1%/V Typ
- Package Options ..... SOT-23-3 (150mW) Surface Mount  
SOT-89-3 (500mW) Surface Mount  
TO-92 Through-hole Package
- Short Circuit Protected
- 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
- Portable Instruments

### FUNCTIONAL BLOCK DIAGRAM



### GENERAL DESCRIPTION

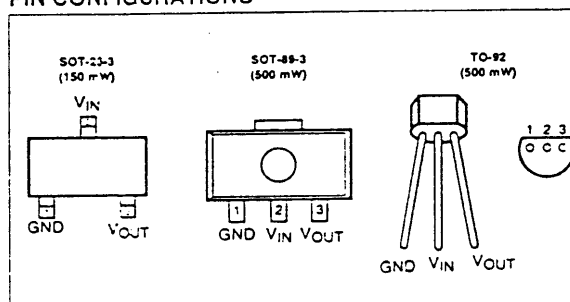
The TC55 Series is a collection of CMOS low dropout positive voltage regulators which can source up to 250mA of current with an extremely low input-output voltage differential of 380mV.

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.

**3**

### 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-23-3

MB: SOT-89-3

ZB: TO-92

**Taping Direction:** \_\_\_\_\_

723: Left Taping

713: Right 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-23<br>SOT-89<br>TO-92 | 150<br>500<br>500                    | mW    |
| Operating Temperature Range | $T_A$                     | -40 to +85                           | °C    |
| Storage Temperature Range   | $T_{stg}$                 | -65 to +150                          | °C    |

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

| Symbol   | Parameter                                 | Test Conditions  | Min            | Typ                 | Max            | Unit    |
|--|---|--|----------------|---------------------|----------------|---------|
| $V_{OUT}(A)$   | Output Voltage                            | $I_{OUT} = 40\text{ mA}$<br>$V_{IN} = 6.0V$                        | x 0.98<br>4.90 | $V_{OUT}(S)$<br>5.0 | x 1.02<br>5.10 | V       |
| $I_{OUTmax}$   | Maximum Output Current                    | $V_{IN} = 6.0V$ , $V_{OUT}(A) \geq 4.5V$                           | 250            |                     |                | mA      |
| $\Delta V_{OUT}$   | Load Regulation                           | $V_{IN} = 6.0V$ , $1\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$    |                | 40                  | 80             | mV      |
| $V_{dif}$  | I/O Voltage Difference                    | $I_{OUT} = 100\text{ mA}$<br>$I_{OUT} = 200\text{ mA}$             |                | 120<br>380          | 300<br>600     | mV      |
| $I_{SS}$   | Current Consumption                       | $V_{IN} = 6.0V$  |                | 1.1                 | 3.0            | $\mu A$ |
| $\frac{V_{OUT}(A) - 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$          | Voltage Regulation                        | $I_{OUT} = 40\text{ mA}$<br>$6.0V \leq V_{IN} \leq 10.0V$          |                | 0.2                 | 0.3            | %/V     |
| $V_{IN}$   | Input Voltage                             |  |                |                     | 10.0           | V       |
| $\frac{\Delta V_{OUT}(A) \cdot 10^6}{V_{OUT}(S) \cdot \Delta T_A}$ | Temperature Coefficient of Output Voltage | $I_{OUT} = 40\text{ mA}$<br>$-40^\circ C \leq T_A \leq 85^\circ C$ |                | $\pm 100$           |                | ppm/°C  |

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  $V_{IN} = V_{OUT}(S) + 1.0V$   
 $V_{IN1}$ : Input Voltage when the output voltage is 98%  $V_{OUT}(A)$

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

| Symbol   | Parameter                                 | Test Conditions  | Min            | Typ                 | Max            | Unit    |
|--|---|--|----------------|---------------------|----------------|---------|
| $V_{OUT}(A)$   | Output Voltage                            | $I_{OUT} = 30\text{ mA}$<br>$V_{IN} = 5.0V$                        | x 0.98<br>3.92 | $V_{OUT}(S)$<br>4.0 | x 1.02<br>4.08 | V       |
| $I_{OUTmax}$   | Maximum Output Current                    | $V_{IN} = 5.0V$ , $V_{OUT}(A) \geq 3.6V$                           | 200            |                     |                | mA      |
| $\Delta V_{OUT}$   | Load Regulation                           | $V_{IN} = 5.0V$ , $1\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$    |                | 45                  | 90             | mV      |
| $V_{dif}$  | I/O Voltage Difference                    | $I_{OUT} = 100\text{ mA}$<br>$I_{OUT} = 200\text{ mA}$             |                | 170<br>400          | 330<br>630     | mV      |
| $I_{SS}$   | Current Consumption                       | $V_{IN} = 5.0V$  |                | 1.0                 | 2.9            | $\mu A$ |
| $\frac{\Delta V_{OUT}(A) - 100}{\Delta V_{IN} \cdot V_{OUT}(S)}$ | Voltage Regulation                        | $I_{OUT} = 30\text{ mA}$<br>$5.0V \leq V_{IN} \leq 10.0V$          |                | 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 | $I_{OUT} = 30\text{ mA}$<br>$-40^\circ C \leq T_A \leq 85^\circ C$ |                | $\pm 100$           |                | ppm/°C  |

TC55 Series

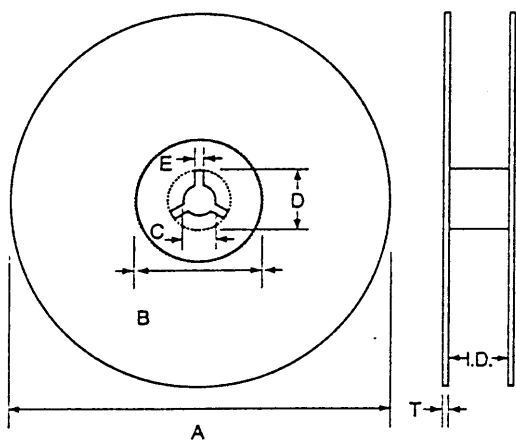
TC55RP30 ELECTRICAL CHARACTERISTICS:

$V_{OUT(S)} = 3.0V$ ,  $T_A = 25^\circ C$  (see REMARKS)

| Symbol   | Parameter                                 | Test Conditions  | Min                   | Typ                 | Max                   | Unit            |
|--|---|--|-----------------------|---------------------|-----------------------|-----------------|
| $V_{OUT(A)}$   | Output Voltage                            | $I_{OUT} = 20\text{ mA}$<br>$V_{IN} = 4.0V$                        | $\times 0.98$<br>2.94 | $V_{OUT(S)}$<br>3.0 | $\times 1.02$<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                           | $V_{IN} = 4.0V$ , $1\text{ mA} \leq I_{OUT} \leq 80\text{ mA}$     |                       | 45                  | 90                    | mV              |
| $V_{dl}$   | I/O Voltage Difference                    | $I_{OUT} = 80\text{ mA}$<br>$I_{OUT} = 160\text{ mA}$              |                       | 180<br>400          | 360<br>700            | mV              |
| $I_{SS}$   | Current Consumption                       | $V_{IN} = 4.0V$  |                       | 0.9                 | 2.8                   | $\mu A$         |
| $\frac{V_{OUT(A)} - 100}{\Delta V_{IN} - V_{OUT(S)}}$              | Voltage Regulation                        | $I_{OUT} = 20\text{ mA}$<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 | $I_{OUT} = 20\text{ mA}$<br>$-40^\circ C \leq T_A \leq 85^\circ C$ |                       | $\pm 100$           |                       | ppm/ $^\circ C$ |

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TAPING REEL



TAPING REEL

|      | SOT-23        | SOT-89         | TO-92 |
|------|---------------|----------------|-------|
| A    | 178 $\pm 1.0$ | 178 $\pm 2.0$  | 360   |
| B    | 60 $\pm 2.0$  | 80 $\pm 1.0$   | 80    |
| C    | 13 $\pm 0.2$  | 13 $\pm 0.05$  | 30    |
| D    | 22 $\pm 0.5$  | 21 $\pm 0.5$   | 45    |
| E    | 2 $\pm 0.2$   | 2 $\pm 0.2$    | 2     |
| I.D. | 8.5 $\pm 1.5$ | 14.0 $+1/-1.5$ | 43    |
| T    | 1.5 $\pm 0.3$ | 2.0 $\pm 0.5$  | 5     |

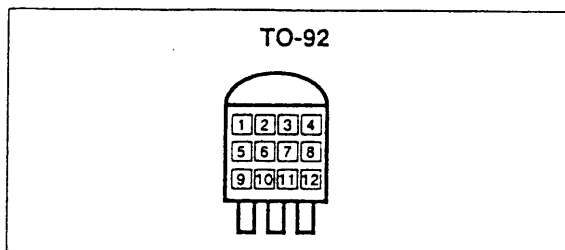
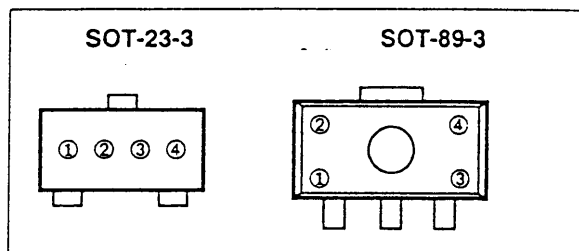
(unit = mm)

Reel Materials: SOT-23/SOT-89: Plastic  
TO-92: Cardboard + Plastic Hub

SOT-23-3: 3,000 pcs/Reel  
SOT-89-3: 1,000 pcs/Reel  
TO-92: 2,000 pcs/Reel

## TC55 Series

## MARKING



① represents first voltage digit

2 3 4 5 6

ex: 3.X = ○ ○ ③ ○

② first voltage decimal (0-9)

ex: 3.4 = ○ ○ ③ ④

③ represents tolerance/feature code

1 =  $\pm 1.0\%$  (custom)

2 =  $\pm 2.0\%$  (standard)

④ represents assembly lot number

①, ② & ③ = 55R<sub>-</sub> (fixed)

④ = output voltage polarity : P : positive

⑤ = first voltage digit (2-6)

⑥ = first voltage decimal (0-9)

⑦ = extra feature code : fixed : 0

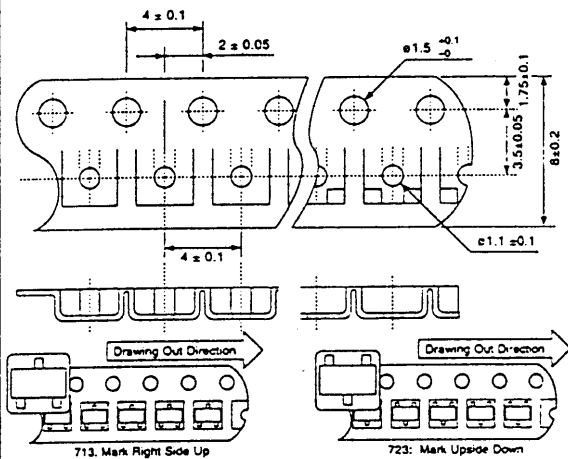
⑧ = regulation accuracy

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

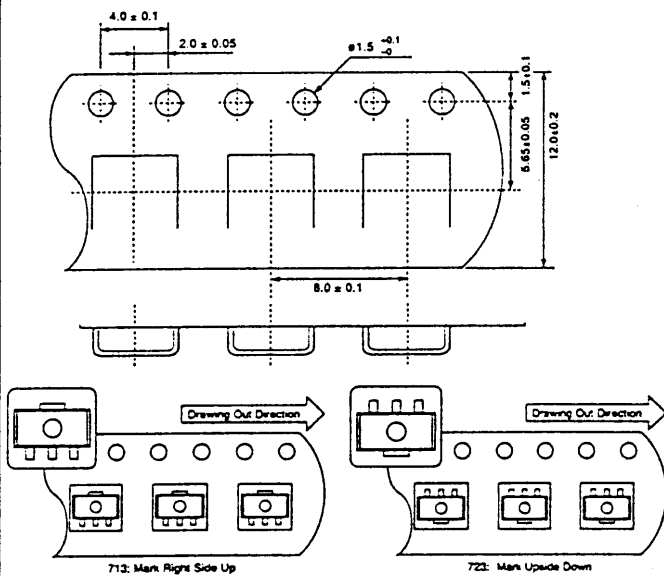
⑨, ⑩, ⑪ & ⑫ = assembly lot number

TAPING FORM

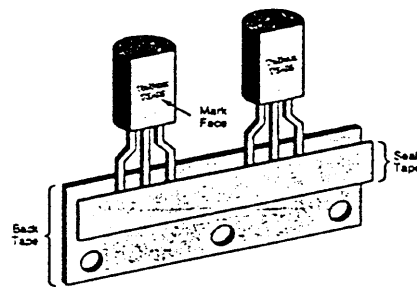
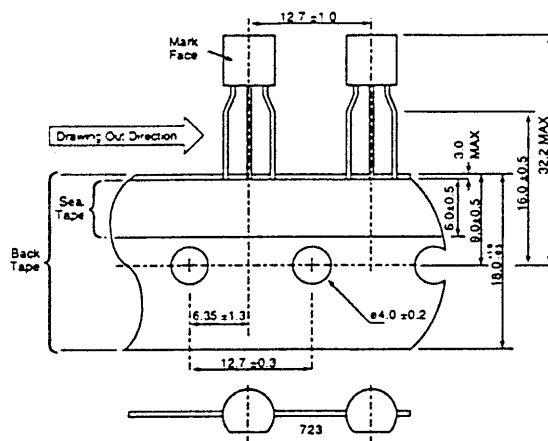
SOT-23-3



SOT-89-3



TO-92



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