



# HT71XX-1

## 30mA Low Power LDO

### Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient
- High input voltage (up to 24V)
- Output voltage accuracy: tolerance  $\pm 3\%$
- TO92, SOT89 and SOT23-5 package

### Applications

- Battery-powered equipment
- Communication equipment
- Audio/Video equipment

### General Description

The HT71XX-1 series is a set of three-terminal low power high voltage regulators implemented in CMOS technology. They allow input voltages as high as 24V. They are available with several fixed output voltages ranging from 2.1V to 5.0V. CMOS technology ensures low voltage drop and low quiescent current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

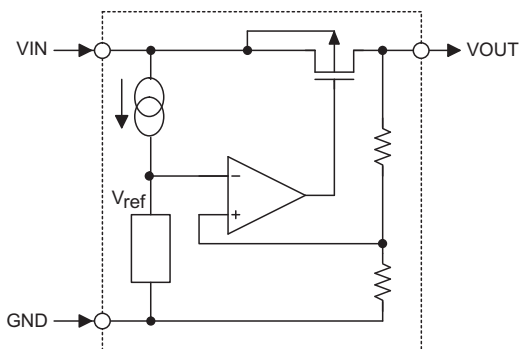
### Selection Table

| Part No. | Output Voltage | Package                  | Marking  |
|----------|----------------|--------------------------|--|
| HT7121-1 | 2.1V           | TO92<br>SOT89<br>SOT23-5 | 71XXA-1 (for TO92)<br>71XX-1 (for SOT89)<br>1XX1 (for SOT23-5) |
| HT7123-1 | 2.3V           |                          |  |
| HT7125-1 | 2.5V           |                          |  |
| HT7127-1 | 2.7V           |                          |  |
| HT7130-1 | 3.0V           |                          |  |
| HT7133-1 | 3.3V           |                          |  |
| HT7136-1 | 3.6V           |                          |  |
| HT7144-1 | 4.4V           |                          |  |
| HT7150-1 | 5.0V           |                          |  |

Note: "XX" stands for output voltages.

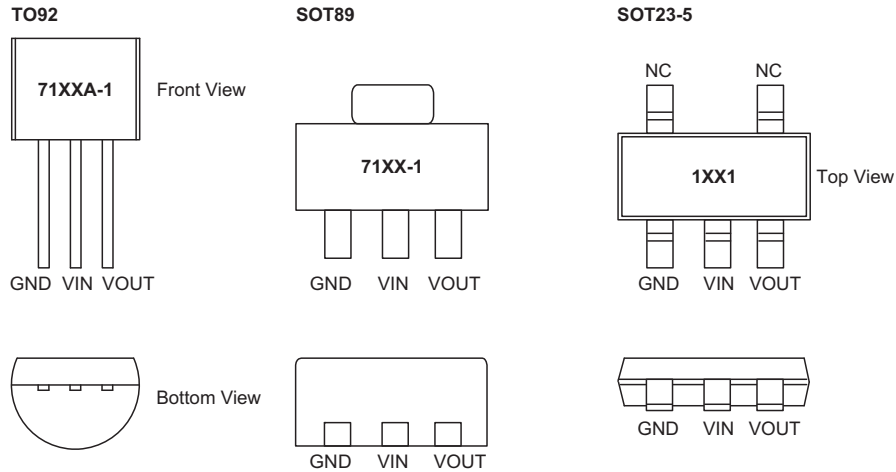
For lead free devices, TO92 package will add a "#" mark at the end of the date code, whereas SOT89 & SOT23-5 packages will add a "#" mark at the end of the marking.

### Block Diagram





**Pin Assignment**



**Absolute Maximum Ratings**

Supply Voltage .....-0.3V to 26V      Storage Temperature .....-50°C to 125°C  
 Operating Temperature .....-40°C to 85°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

**Thermal Information**

| Symbol        | Parameter   | Package | Max. | Unit |
|---------------|---|---------|------|------|
| $\theta_{JA}$ | Thermal Resistance (Junction to Ambient)<br>(Assume no ambient airflow, no heat sink) | SOT23-5 | 500  | °C/W |
|               |   | SOT89   | 200  | °C/W |
|               |   | TO92    | 200  | °C/W |
| $P_D$         | Power Dissipation   | SOT23-5 | 0.20 | W    |
|               |   | SOT89   | 0.50 | W    |
|               |   | TO92    | 0.50 | W    |

Note:  $P_D$  is measured at  $T_a = 25^\circ\text{C}$

## Electrical Characteristics

### HT7121-1, +2.1V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |   | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions  |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.1V            | I <sub>OUT</sub> =10mA                                | 2.037 | 2.100 | 2.163 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 4.1V            | —   | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 4.1V            | 1mA ≤ I <sub>OUT</sub> ≤ 20mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%          | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 4.1V            | No load   | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 3.1V ≤ V <sub>IN</sub> ≤ 24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —   | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.1V            | I <sub>OUT</sub> =10mA<br>0°C < T <sub>a</sub> < 70°C | —     | ±0.37 | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

### HT7123-1, +2.3V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |   | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions  |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.3V            | I <sub>OUT</sub> =10mA                                | 2.231 | 2.300 | 2.369 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 4.3V            | —   | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 4.3V            | 1mA ≤ I <sub>OUT</sub> ≤ 20mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%          | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 4.3V            | No load   | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 3.3V ≤ V <sub>IN</sub> ≤ 24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —   | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.3V            | I <sub>OUT</sub> =10mA<br>0°C < T <sub>a</sub> < 70°C | —     | ±0.39 | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7125-1, +2.5V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |  | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|--|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions   |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.5V            | I <sub>OUT</sub> =10mA                             | 2.425 | 2.500 | 2.575 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 4.5V            | —  | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 4.5V            | 1mA≤I <sub>OUT</sub> ≤20mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%       | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 4.5V            | No load  | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 3.5V≤V <sub>IN</sub> ≤24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —  | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.5V            | I <sub>OUT</sub> =10mA<br>0°C<T <sub>a</sub> <70°C | —     | ±0.41 | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7127-1, +2.7V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |  | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|--|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions   |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 4.7V            | I <sub>OUT</sub> =10mA                             | 2.619 | 2.700 | 2.781 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 4.7V            | —  | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 4.7V            | 1mA≤I <sub>OUT</sub> ≤20mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%       | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 4.7V            | No load  | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 3.7V≤V <sub>IN</sub> ≤24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —  | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 4.7V            | I <sub>OUT</sub> =10mA<br>0°C<T <sub>a</sub> <70°C | —     | ±0.43 | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7130-1, +3.0V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |   | Min. | Typ.  | Max. | Unit  |
|---|-------------------------|-----------------|---|------|-------|------|-------|
|   |                         | V <sub>IN</sub> | Conditions  |      |       |      |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 5V              | I <sub>OUT</sub> =10mA                                | 2.91 | 3.00  | 3.09 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 5V              | —   | 20   | 30    | —    | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 5V              | 1mA ≤ I <sub>OUT</sub> ≤ 20mA                         | —    | 60    | 100  | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%          | —    | 100   | —    | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 5V              | No load   | —    | 2.5   | 5.0  | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 4V ≤ V <sub>IN</sub> ≤ 24V<br>I <sub>OUT</sub> =1mA   | —    | 0.2   | —    | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —   | —    | —     | 24   | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 5V              | I <sub>OUT</sub> =10mA<br>0°C < T <sub>a</sub> < 70°C | —    | ±0.45 | —    | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7133-1, +3.3V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |   | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|---|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions  |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 5.5V            | I <sub>OUT</sub> =10mA                                | 3.201 | 3.300 | 3.399 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 5.5V            | —   | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 5.5V            | 1mA ≤ I <sub>OUT</sub> ≤ 30mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%          | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 5.5V            | No load   | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 4.5V ≤ V <sub>IN</sub> ≤ 24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —   | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 5.5V            | I <sub>OUT</sub> =10mA<br>0°C < T <sub>a</sub> < 70°C | —     | ±0.5  | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7136-1, +3.6V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |  | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|--|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions   |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 5.6V            | I <sub>OUT</sub> =10mA                             | 3.492 | 3.600 | 3.708 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 5.6V            | —  | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 5.6V            | 1mA≤I <sub>OUT</sub> ≤30mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%       | —     | 60    | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 5.6V            | No load  | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 4.6V≤V <sub>IN</sub> ≤24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —  | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 5.6V            | I <sub>OUT</sub> =10mA<br>0°C<T <sub>a</sub> <70°C | —     | ±0.6  | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

## HT7144-1, +4.4V Output Type

Ta=25°C

| Symbol  | Parameter               | Test Conditions |  | Min.  | Typ.  | Max.  | Unit  |
|---|-------------------------|-----------------|--|-------|-------|-------|-------|
|   |                         | V <sub>IN</sub> | Conditions   |       |       |       |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 6.4V            | I <sub>OUT</sub> =10mA                             | 4.268 | 4.400 | 4.532 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 6.4V            | —  | 20    | 30    | —     | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 6.4V            | 1mA≤I <sub>OUT</sub> ≤30mA                         | —     | 60    | 100   | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%       | —     | 100   | —     | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 6.4V            | No load  | —     | 2.5   | 5.0   | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 5.4V≤V <sub>IN</sub> ≤24V<br>I <sub>OUT</sub> =1mA | —     | 0.2   | —     | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —  | —     | —     | 24    | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 6.4V            | I <sub>OUT</sub> =10mA<br>0°C<T <sub>a</sub> <70°C | —     | ±0.7  | —     | mV/°C |

Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.



**HT7150-1, +5.0V Output Type**

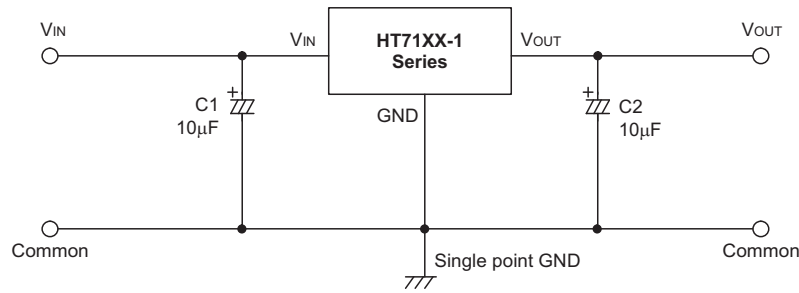
Ta=25°C

| Symbol  | Parameter               | Test Conditions |   | Min. | Typ.  | Max. | Unit  |
|---|-------------------------|-----------------|---|------|-------|------|-------|
|   |                         | V <sub>IN</sub> | Conditions  |      |       |      |       |
| V <sub>OUT</sub>                                      | Output Voltage          | 7V              | I <sub>OUT</sub> =10mA                                | 4.85 | 5.00  | 5.15 | V     |
| I <sub>OUT</sub>                                      | Output Current          | 7V              | —   | 20   | 30    | —    | mA    |
| ΔV <sub>OUT</sub>                                     | Load Regulation         | 7V              | 1mA ≤ I <sub>OUT</sub> ≤ 30mA                         | —    | 60    | 100  | mV    |
| V <sub>DIF</sub>                                      | Voltage Drop (Note)     | —               | I <sub>OUT</sub> =1mA, ΔV <sub>OUT</sub> =2%          | —    | 100   | —    | mV    |
| I <sub>SS</sub>                                       | Current Consumption     | 7V              | No load   | —    | 2.5   | 5.0  | μA    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation         | —               | 6V ≤ V <sub>IN</sub> ≤ 24V<br>I <sub>OUT</sub> =1mA   | —    | 0.2   | —    | %/V   |
| V <sub>IN</sub>                                       | Input Voltage           | —               | —   | —    | —     | 24   | V     |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$                   | Temperature Coefficient | 7V              | I <sub>OUT</sub> =10mA<br>0°C < T <sub>a</sub> < 70°C | —    | ±0.75 | —    | mV/°C |

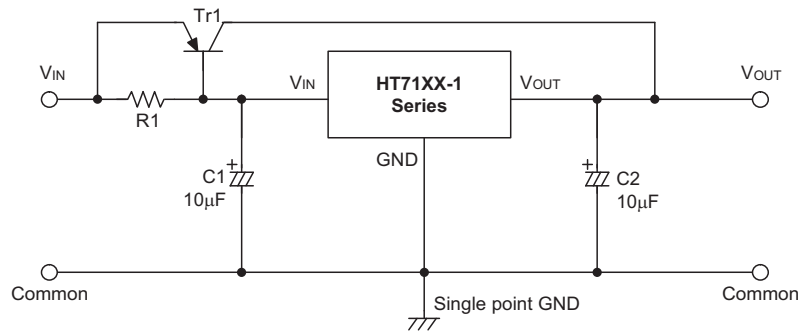
Note: Dropout voltage is defined as the input voltage minus the output voltage that produces a 2% change in the output voltage from the value at V<sub>IN</sub> = V<sub>OUT</sub>+2V with a fixed load.

**Application Circuits**

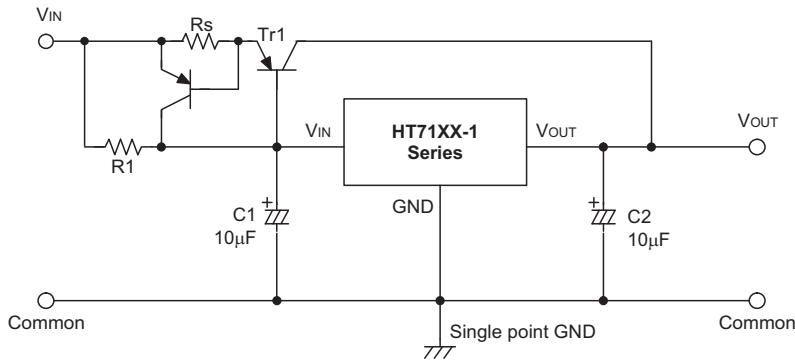
**Basic Circuits**



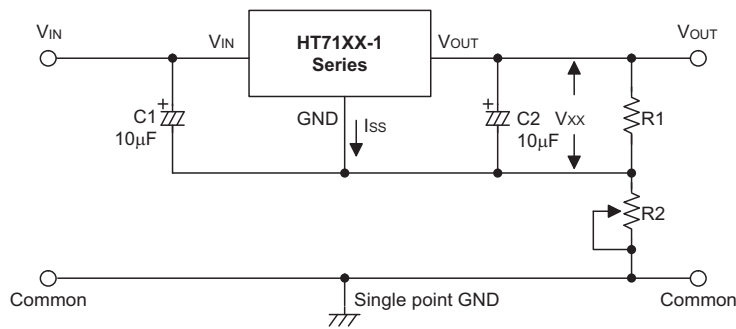
**High Output Current Positive Voltage Regulator**



**Short-Circuit Protection by Tr1**

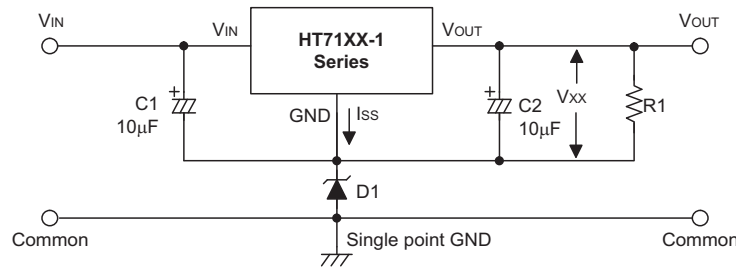


**Circuit for Increasing Output Voltage**



$$V_{OUT} = V_{xx} \left(1 + \frac{R2}{R1}\right) + I_{SS} R2$$

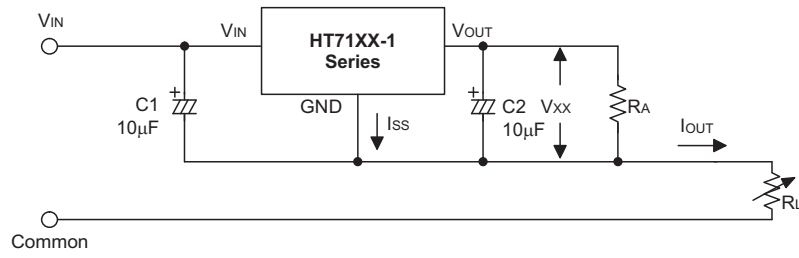
**Circuit for Increasing Output Voltage**



$$V_{OUT} = V_{xx} + V_{D1}$$

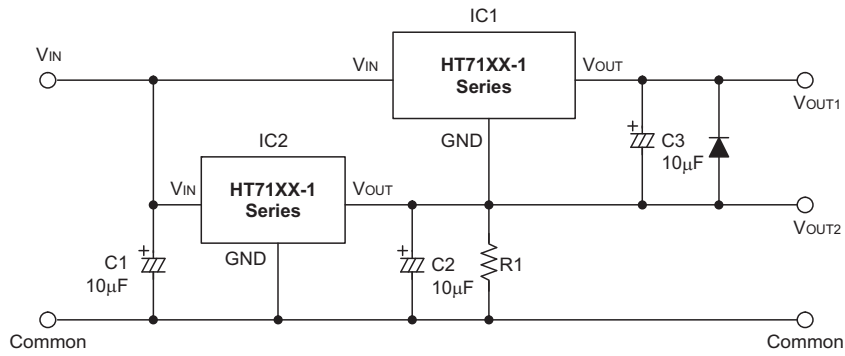


**Constant Current Regulator**



$$I_{OUT} = \frac{V_{XX}}{R_A} + I_{SS}$$

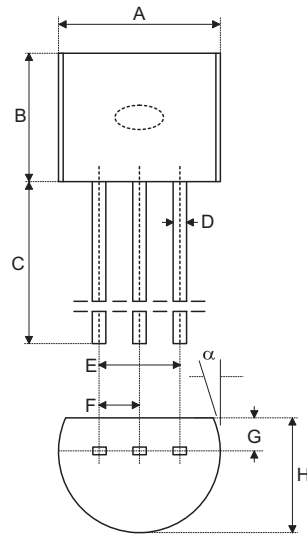
**Dual Supply**





**Package Information**

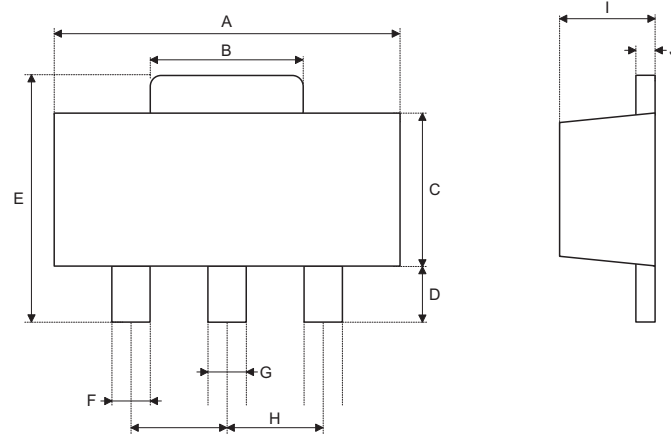
**3-pin TO92 Outline Dimensions**



| Symbol   | Dimensions in mil |      |      |
|----------|-------------------|------|------|
|          | Min.              | Nom. | Max. |
| A        | 170               | —    | 200  |
| B        | 170               | —    | 200  |
| C        | 500               | —    | —    |
| D        | 11                | —    | 20   |
| E        | 90                | —    | 110  |
| F        | 45                | —    | 55   |
| G        | 45                | —    | 65   |
| H        | 130               | —    | 160  |
| I        | 8                 | —    | 18   |
| $\alpha$ | 4°                | —    | 6°   |

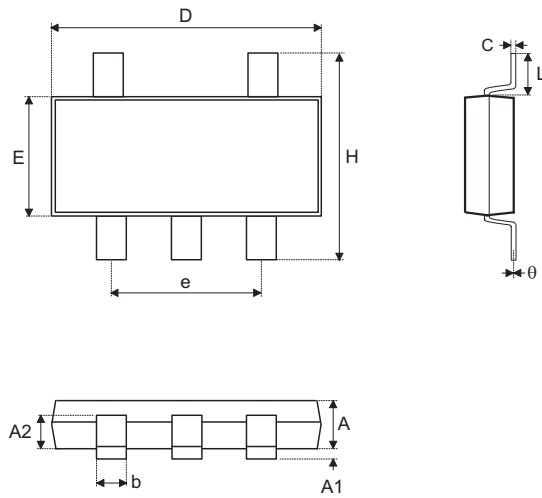


3-pin SOT89 Outline Dimensions



| Symbol | Dimensions in mil |      |      |
|--------|-------------------|------|------|
|        | Min.              | Nom. | Max. |
| A      | 173               | —    | 181  |
| B      | 59                | —    | 72   |
| C      | 90                | —    | 102  |
| D      | 35                | —    | 47   |
| E      | 155               | —    | 167  |
| F      | 14                | —    | 19   |
| G      | 17                | —    | 22   |
| H      | —                 | 59   | —    |
| I      | 55                | —    | 63   |
| J      | 14                | —    | 17   |

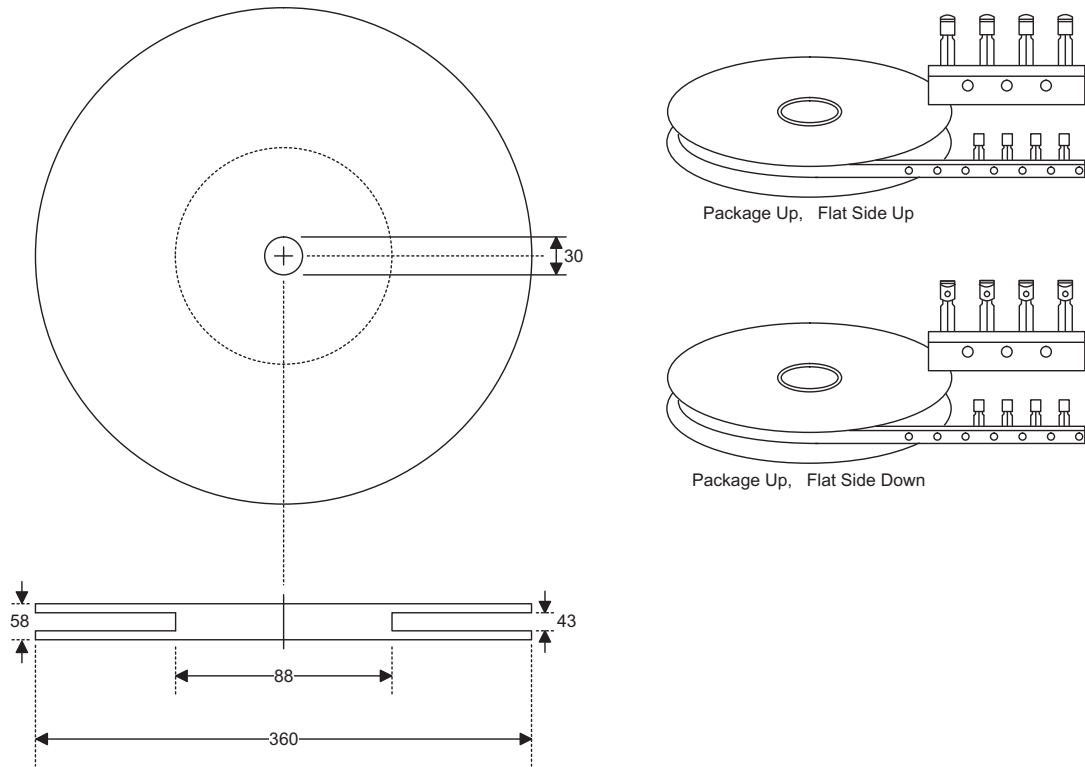
5-pin SOT23-5 Outline Dimensions



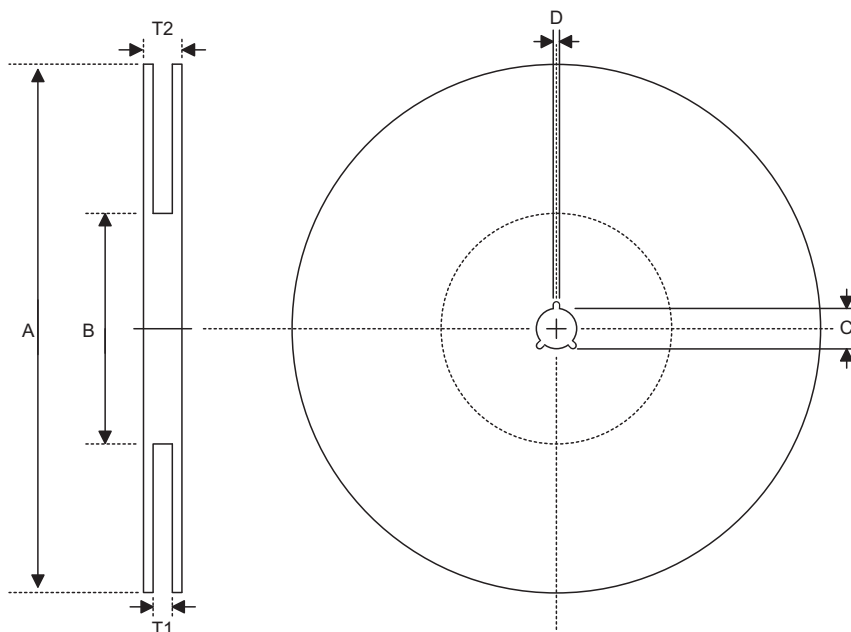
| Symbol | Dimensions in mm |      |      |
|--------|------------------|------|------|
|        | Min.             | Nom. | Max. |
| A      | 1.00             | —    | 1.30 |
| A1     | —                | —    | 0.10 |
| A2     | 0.70             | —    | 0.90 |
| b      | 0.35             | —    | 0.50 |
| C      | 0.10             | —    | 0.25 |
| D      | 2.70             | —    | 3.10 |
| E      | 1.40             | —    | 1.80 |
| e      | —                | 1.90 | —    |
| H      | 2.60             | —    | 3.00 |
| L      | 0.37             | —    | —    |
| θ      | 1°               | —    | 9°   |

**Product Tape and Reel Specifications**

3-pin TO92 Reel Dimensions (Unit: mm)



Reel Dimensions



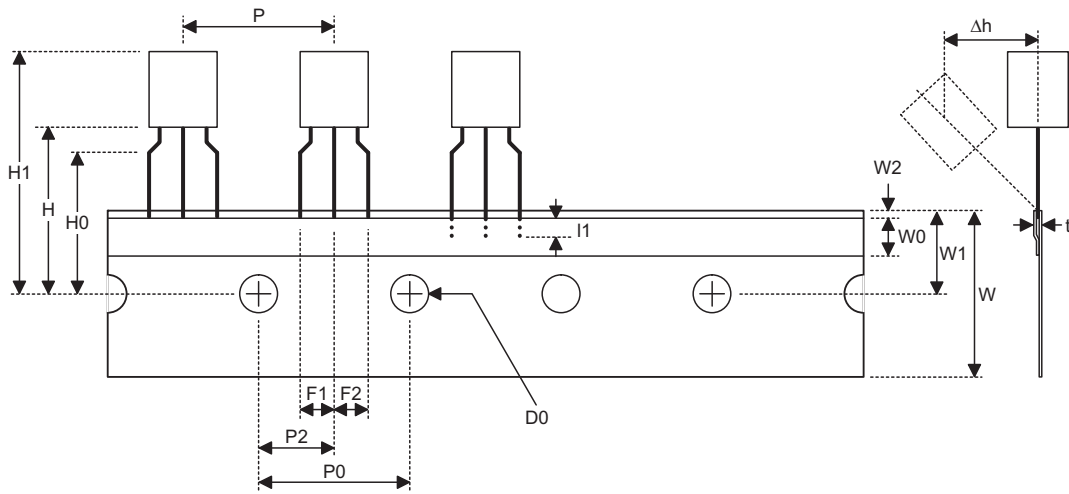
SOT89

| Symbol | Description           | Dimensions in mm             |
|--------|-----------------------|------------------------------|
| A      | Reel Outer Diameter   | 180.0±1.0                    |
| B      | Reel Inner Diameter   | 62.0±1.5                     |
| C      | Spindle Hole Diameter | 12.75 <sup>+0.15/-0.00</sup> |
| D      | Key Slit Width        | 1.90±0.15                    |
| T1     | Space Between Flange  | 12.4 <sup>+0.2/-0.00</sup>   |
| T2     | Reel Thickness        | 17.0 <sup>+0.0/-0.4</sup>    |

SOT23-5

| Symbol | Description           | Dimensions in mm          |
|--------|-----------------------|---------------------------|
| A      | Reel Outer Diameter   | 178.0±1.0                 |
| B      | Reel Inner Diameter   | 62.0±1.0                  |
| C      | Spindle Hole Diameter | 13.0±0.2                  |
| D      | Key Slit Width        | 2.50±0.25                 |
| T1     | Space Between Flange  | 8.4 <sup>+1.5/-0.0</sup>  |
| T2     | Reel Thickness        | 11.4 <sup>+1.5/-0.0</sup> |

Carrier Tape Dimensions

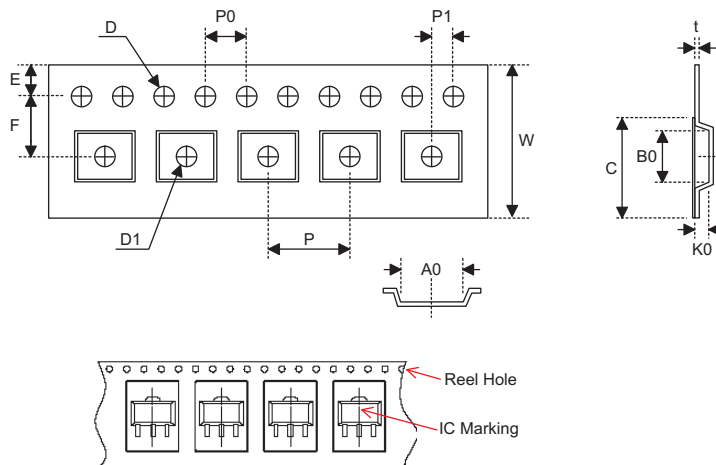


TO92

| Symbol         | Description                                 | Dimensions in mm          |
|----------------|---|---------------------------|
| l1             | Taped Lead Length                           | (2.5)                     |
| P              | Component Pitch                             | 12.7±1.0                  |
| P <sub>0</sub> | Perforation Pitch                           | 12.7±0.3                  |
| P <sub>2</sub> | Component to Perforation (Length Direction) | 6.35±0.40                 |
| F <sub>1</sub> | Lead Spread                                 | 2.5 <sup>+0.4/-0.1</sup>  |
| F <sub>2</sub> | Lead Spread                                 | 2.5 <sup>+0.4/-0.1</sup>  |
| Δh             | Component Alignment                         | 0.0±0.1                   |
| W              | Carrier Tape Width                          | 18.0 <sup>+1.0/-0.5</sup> |
| W <sub>0</sub> | Hold-down Tape Width                        | 6.0±0.5                   |
| W <sub>1</sub> | Perforation Position                        | 9.0±0.5                   |
| W <sub>2</sub> | Hold-down Tape Position                     | (0.5)                     |
| H <sub>0</sub> | Lead Clinch Height                          | 16.0±0.5                  |
| H <sub>1</sub> | Component Height                            | Less than 24.7            |
| D <sub>0</sub> | Perforation Diameter                        | 4.0±0.2                   |
| t              | Taped Lead Thickness                        | 0.7±0.2                   |
| H              | Component Base Height                       | 19.0±0.5                  |

Note: Thickness less than 0.38±0.05mm~0.5mm  
 P<sub>0</sub> Accumulated pitch tolerance: ±1mm/20pitches.  
 ( ) Bracketed figures are for consultation only

Carrier Tape Dimensions



SOT89

| Symbol | Description                              | Dimensions in mm          |
|--------|--|---------------------------|
| W      | Carrier Tape Width                       | 12.0 <sup>+0.3/-0.1</sup> |
| P      | Cavity Pitch                             | 8.0±0.1                   |
| E      | Perforation Position                     | 1.75±0.10                 |
| F      | Cavity to Perforation (Width Direction)  | 5.50±0.05                 |
| D      | Perforation Diameter                     | 1.5 <sup>+0.1/-0.0</sup>  |
| D1     | Cavity Hole Diameter                     | 1.5 <sup>+0.1/-0.0</sup>  |
| P0     | Perforation Pitch                        | 4.0±0.1                   |
| P1     | Cavity to Perforation (Length Direction) | 2.0±0.1                   |
| A0     | Cavity Length                            | 4.8±0.1                   |
| B0     | Cavity Width                             | 4.5±0.1                   |
| K0     | Cavity Depth                             | 1.8±0.1                   |
| t      | Carrier Tape Thickness                   | 0.300±0.013               |
| C      | Cover Tape Width                         | 9.3±0.1                   |

SOT23-5

| Symbol | Description                              | Dimensions in mm         |
|--------|--|--------------------------|
| W      | Carrier Tape Width                       | 8.0±0.3                  |
| P      | Cavity Pitch                             | 4.0±0.1                  |
| E      | Perforation Position                     | 1.75±0.10                |
| F      | Cavity to Perforation (Width Direction)  | 3.50±0.05                |
| D      | Perforation Diameter                     | 1.5 <sup>+0.1/-0.0</sup> |
| D1     | Cavity Hole Diameter                     | 1.5 <sup>+0.1/-0.0</sup> |
| P0     | Perforation Pitch                        | 4.0±0.1                  |
| P1     | Cavity to Perforation (Length Direction) | 2.00±0.05                |
| A0     | Cavity Length                            | 3.15±0.10                |
| B0     | Cavity Width                             | 3.2±0.1                  |
| K0     | Cavity Depth                             | 1.4±0.1                  |
| t      | Carrier Tape Thickness                   | 0.20±0.03                |
| C      | Cover Tape Width                         | 5.3±0.1                  |