# HOLTEK

# HT71XX
# *High Voltage Regulator*

## Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient

- High input voltage (up to 24V)
- TO-92 and SOT-89 packages

## Applications

- Battery-powered equipment
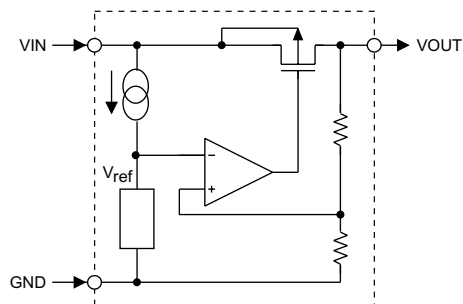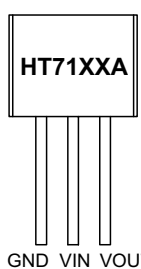- Communication equipment

- Audio/Video equipment

## General Description

The HT71XX 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 3.0V to 5.0V. CMOS technology ensures low voltage drop and low quiescent current.
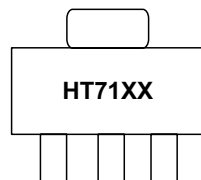
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

## Selection Table
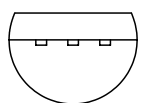
| Part No. | Output Voltage | Tolerance |
|----------|----------------|-----------|
| HT7130 | 3.0V | ±5% |
| HT7133 | 3.3V | ±5% |
| HT7136 | 3.6V | ±5% |
| HT7144 | 4.4V | ±5% |
| HT7150 | 5.0V | ±5% |

August 8, 2000

## Block Diagram



## Pin Assignment

**TO-92**

HT71XXA  Front View

GND  VIN  VOUT

Bottom View

**SOT-89**

HT71XX

GND  VIN  VOUT

## Pad Assignment



GND  VIN  VOUT

## Pad Coordinates

Unit: μm

| Pad No. | X | Y |
|---|---|---|
| 1 | −480.00 | −451.50 |
| 2 | 87.50 | −444.50 |
| 3 | 482.00 | −444.50 |
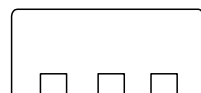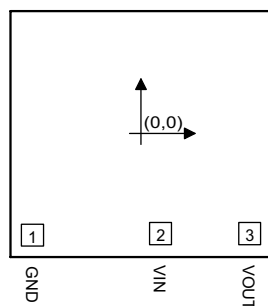
Chip size: $1374 \times 1294$ $(\mu m)^2$

* The IC substrate should be connected to VDD in the PCB layout artwork.

## Absolute Maximum Ratings

Supply Voltage ...............................–0.3V to 28V

Power Consumption ............................ 200mW

Storage Temperature ................–50°C to 125°C

Operating Temperature .................0°C to 70°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.

## Electrical Characteristics

**HT7130, +3.0V output type**                                                                              Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{IN}$ | Conditions | | | | |
| $V_{OUT}$ | Output Voltage | 5V | $I_{OUT}$=10mA | 2.85 | 3.0 | 3.15 | V |
| $I_{OUT}$ | Output Current | 5V | — | 20 | 30 | — | mA |
| $\Delta V_{OUT}$ | Load Regulation | 5V | 1mA≤$I_{OUT}$≤20mA | — | 60 | 100 | mV |
| $V_{DIF}$ | Voltage Drop | — | $I_{OUT}$=1mA | — | 100 | — | mV |
| $I_{SS}$ | Current Consumption | 5V | No load | — | 4 | 6.0 | μA |
| $\dfrac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | — | 4V≤$V_{IN}$≤24V $I_{OUT}$=1mA | — | 0.2 | — | %/V |
| $V_{IN}$ | Input Voltage | — | — | — | — | 24 | V |
| $\dfrac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5V | $I_{OUT}$=10mA 0°C<Ta<70°C | — | ±0.45 | — | mV/°C |

**HT7133, +3.3V output type**                                                                              Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{IN}$ | Conditions | | | | |
| $V_{OUT}$ | Output Voltage | 5.5V | $I_{OUT}$=10mA | 3.135 | 3.3 | 3.465 | V |
| $I_{OUT}$ | Output Current | 5.5V | — | 20 | 30 | — | mA |
| $\Delta V_{OUT}$ | Load Regulation | 5.5V | 1mA≤$I_{OUT}$≤30mA | — | 60 | 100 | mV |
| $V_{DIF}$ | Voltage Drop | — | $I_{OUT}$=1mA | — | 100 | — | mV |
| $I_{SS}$ | Current Consumption | 5.5V | No load | — | 4 | 6 | μA |
| $\dfrac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | — | 4.5V≤$V_{IN}$≤24V $I_{OUT}$=1mA | — | 0.2 | — | %/V |
| $V_{IN}$ | Input Voltage | — | — | — | — | 24 | V |
| $\dfrac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5.5V | $I_{OUT}$=10mA 0°C<Ta<70°C | — | ±0.5 | — | mV/°C |

**HT7136, +3.6V output type**

Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{IN}$ | Conditions | | | | |
| $V_{OUT}$ | Output Voltage | 5.6V | $I_{OUT}$=10mA | 3.42 | 3.6 | 3.78 | V |
| $I_{OUT}$ | Output Current | 5.6V | — | 20 | 30 | — | mA |
| $\Delta V_{OUT}$ | Load Regulation | 5.6V | 1mA≤$I_{OUT}$≤30mA | — | 60 | 100 | mV |
| $V_{DIF}$ | Voltage Drop | — | $I_{OUT}$=1mA | — | 60 | — | mV |
| $I_{SS}$ | Current Consumption | 5.6V | No load | — | 3.0 | 7.0 | μA |
| $\dfrac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | — | 4.6V≤$V_{IN}$≤12V $I_{OUT}$=1mA | — | 0.2 | — | %/V |
| $V_{IN}$ | Input Voltage | — | — | — | — | 24 | V |
| $\dfrac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 5.6V | $I_{OUT}$=10mA 0°C<Ta<70°C | — | ±0.6 | — | mV/°C |

**HT7144, +4.4V output type**

Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{IN}$ | Conditions | | | | |
| $V_{OUT}$ | Output Voltage | 6.4V | $I_{OUT}$=10mA | 4.18 | 4.4 | 4.62 | V |
| $I_{OUT}$ | Output Current | 6.4V | — | 20 | 30 | — | mA |
| $\Delta V_{OUT}$ | Load Regulation | 6.4V | 1mA≤$I_{OUT}$≤30mA | — | 60 | 100 | mV |
| $V_{DIF}$ | Voltage Drop | — | $I_{OUT}$=1mA | — | 100 | — | mV |
| $I_{SS}$ | Current Consumption | 6.4V | No load | — | 4 | 7.5 | μA |
| $\dfrac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | — | 5.4V≤$V_{IN}$≤24V $I_{OUT}$=1mA | — | 0.2 | — | %/V |
| $V_{IN}$ | Input Voltage | — | — | — | — | 24 | V |
| $\dfrac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 6.4V | $I_{OUT}$=10mA 0°C<Ta<70°C | — | ±0.7 | — | mV/°C |

**HT7150, +5.0V output type**

Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{IN}$ | Conditions | | | | |
| $V_{OUT}$ | Output Voltage | 7V | $I_{OUT}$=10mA | 4.75 | 5.0 | 5.25 | V |
| $I_{OUT}$ | Output Current | 7V | — | 20 | 30 | — | mA |
| $\Delta V_{OUT}$ | Load Regulation | 7V | 1mA≤$I_{OUT}$≤30mA | — | 60 | 100 | mV |
| $V_{DIF}$ | Voltage Drop | — | $I_{OUT}$=1mA | — | 100 | — | mV |
| $I_{SS}$ | Current Consumption | 7V | No load | — | 5 | 9 | μA |
| $\dfrac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | Line Regulation | — | 6V≤$V_{IN}$≤24V $I_{OUT}$=1mA | — | 0.2 | — | %/V |
| $V_{IN}$ | Input Voltage | — | — | — | — | 24 | V |
| $\dfrac{\Delta V_{OUT}}{\Delta T_a}$ | Temperature Coefficient | 7V | $I_{OUT}$=10mA 0°C<Ta<70°C | — | ±0.75 | — | mV/°C |

## Application Circuits

**Basic circuits**
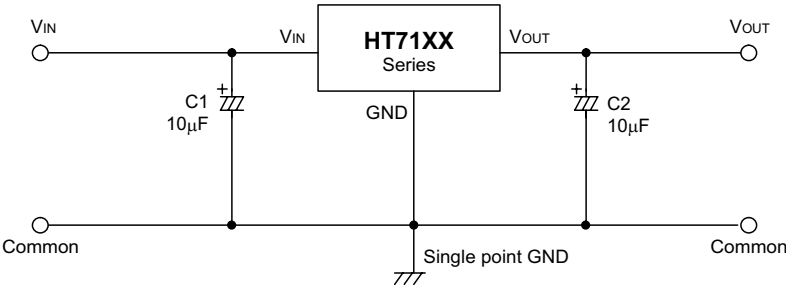
**High output current positive voltage regulator**
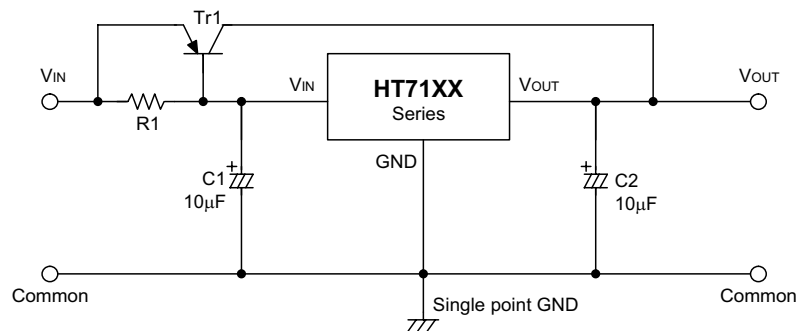


**Short-Circuit protection by Tr1**
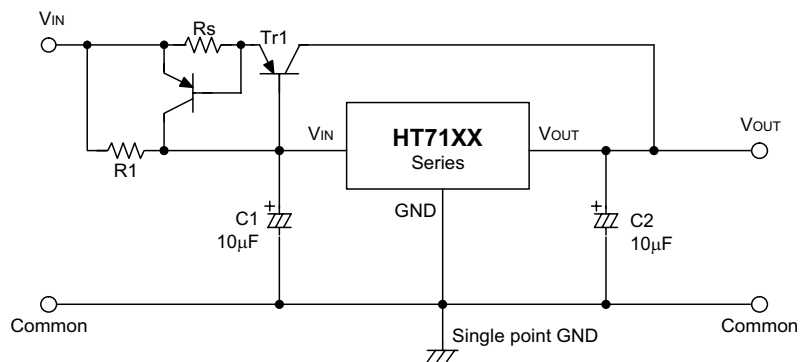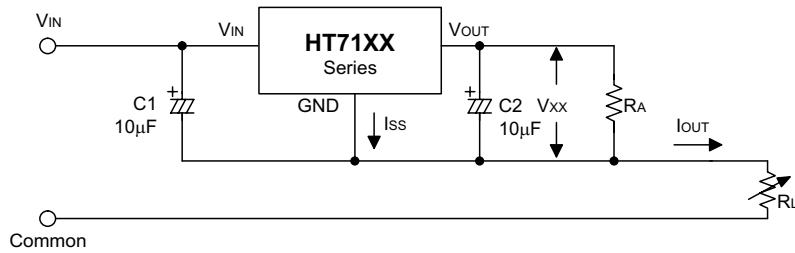


**Circuit for increasing output voltage**
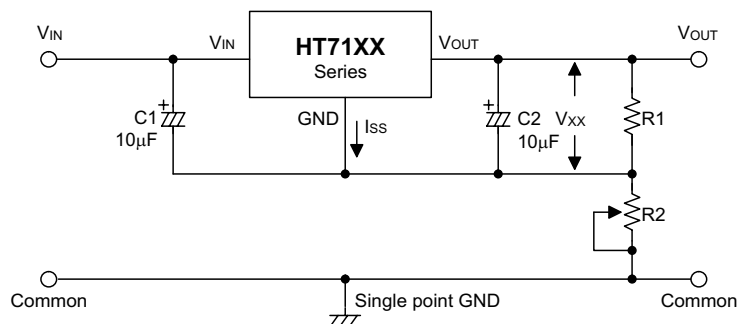


$$V_{OUT} = V_{XX} \ (1 + \frac{R2}{R1}) + I_{SS} \ R2$$
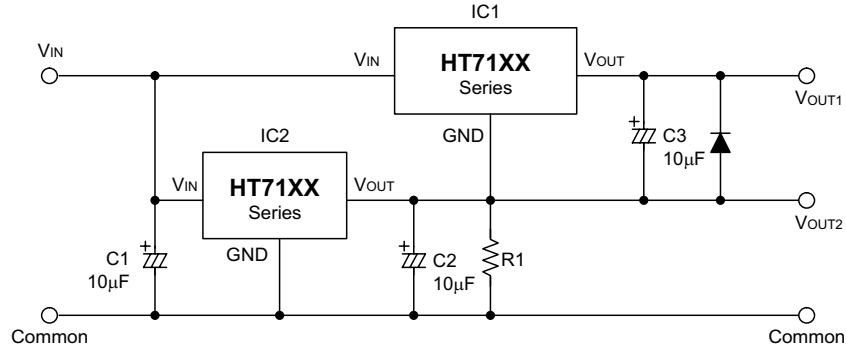
**Circuit for increasing output voltage**
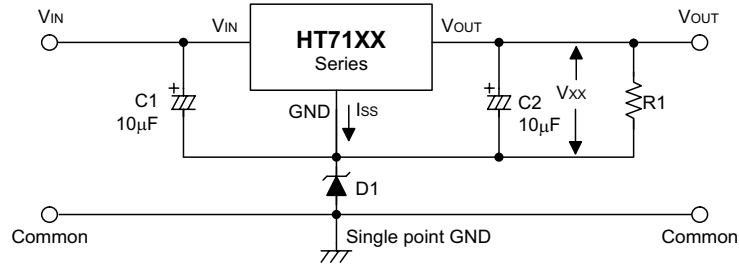


$$V_{OUT}=V_{XX}+V_{D1}$$

**Constant current regulator**



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

**Dual supply**

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