



HT72XX

General Purpose Regulator

Features

Low power consumption
Low voltage drop
Low temperature coefficient

High input voltage (up to 24V)
High output current : 100mA (P_d 250mW)
TO-92 package

Applications

Battery-powered equipment
Communication equipment

Audio/Video equipment

General Description

The HT72XX series is a set of three-terminal high current high voltage regulator implemented in CMOS technology. They can deliver 100mA output current and allow an input voltage as high as 24V. They are available with several fixed output voltages ranging from 2.4V to 15V. CMOS technology ensures low voltage drop and low quiescent current.

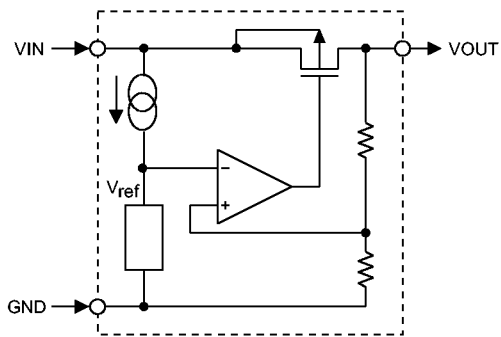
Although designed primarily as fixed voltage regulator, these devices can be used with external components to obtain variable voltages and currents.

Selection Table

| Part No. | Pin Assignment | Output Voltage | Tolerance |
|----------|----------------|----------------|-----------|
| HT7230 | B | 3.0V | 5% |
| HT7231 | A | | |
| HT7233 | B | 3.3V | 5% |
| HT7234 | A | | |
| HT7245 | B | 4.5V | 5% |
| HT7246 | A | | |
| HT7250 | B | 5.0V | 5% |
| HT7251 | A | | |
| HT7260 | B | 6.0V | 5% |
| HT7261 | A | | |
| HT7270 | B | 7.0V | 5% |
| HT7271 | A | | |
| HT7280 | B | 8.0V | 5% |
| HT7281 | A | | |
| HT7290 | B | 9.0V | 5% |
| HT7291 | A | | |
| HT72C0 | B | 12V | 5% |
| HT72C1 | A | | |

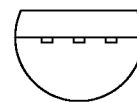
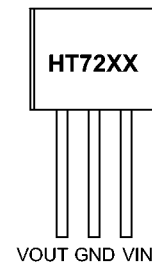
Note: For semi-custom parts, selectable regulated voltage range is from 2.4V to 12V in 0.1V increment.

Block Diagram

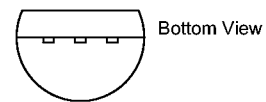
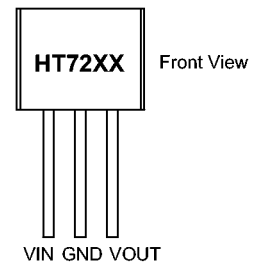


Pin Assignment

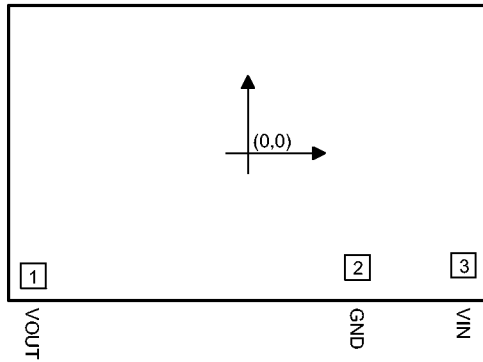
A. TO-92



B. TO-92



Pad Assignment



Pad Coordinates

Unit: m

| Pad No. | X | Y |
|---------|--------|--------|
| 1 | 838.50 | 479.00 |
| 2 | 429.00 | 446.50 |
| 3 | 843.50 | 439.50 |

Chip size: 2108 1371 (m)²

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

Absolute Maximum Ratings

Supply Voltage..... 0.3V to 26V Storage Temperature..... 50 C to 125 C
 Power Consumption..... 250mW Operating Temperature0 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

HT72XX series (HT7230, HT7231, +3.0V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|----------------------------------|--------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage Tolerance | 5V | I _{OUT} =10mA | 2.85 | 3.0 | 3.15 | V |
| I _{OUT} | Output Current | 5V | | 60 | 100 | | mA |
| V _{OUT} | Load Regulation | 5V | 1mA I _{OUT} 50mA | | 60 | 120 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 5V | No load | | 200 | 350 | A |
| $\frac{V_{OUT}}{V_{IN} V_{OUT}}$ | Line Regulation | | 4V V _{IN} 12V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 5V | I _{OUT} =10mA 0 C<Ta<70 C | | 0.45 | | mV/ C |

HT72XX series (HT7233, HT7234, +3.3V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|--------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage Tolerance | 5.5V | I _{OUT} =10mA | 3.14 | 3.3 | 3.47 | V |
| I _{OUT} | Output Current | 5.5V | | 60 | 100 | | mA |
| V _{OUT} | Load Regulation | 5.5V | 1mA I _{OUT} 50mA | | 60 | 100 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 5.5V | No load | | 220 | 400 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 4.5V V _{IN} 12V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 5.5V | I _{OUT} =10mA 0 C<Ta<70 C | | 0.5 | | mV/ C |

HT72XX series (HT7245, HT7246, +4.5V 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 | 4.27 | 4.5 | 4.72 | V |
| I _{OUT} | Output Current | 6.4V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 6.4V | 1mA I _{OUT} 70mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 6.4V | No load | | 300 | 450 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 5.4V V _{IN} 12V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 6.4V | I _{OUT} =10mA 0 C<Ta<70 C | | 0.7 | | mV/ C |

HT72XX series (HT7250, HT7251, +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 | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 7V | 1mA I _{OUT} 30mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 7V | No load | | 330 | 500 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 6V V _{IN} 15V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 7V | I _{OUT} =10mA 0 C<Ta<70 C | | 0.75 | | mV/ C |

HT72XX series (HT7260, HT7261, +6.0V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|-------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 8V | I _{OUT} =10mA | 7.6 | 8.0 | 8.4 | V |
| I _{OUT} | Output Current | 8V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 8V | 1mA I _{OUT} 30mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 8V | No load | | 390 | 600 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 6V V _{IN} 15V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 8V | I _{OUT} =10mA 0 C<Ta<70 C | | 0.9 | | mV/ C |

HT72XX series (HT7270, HT7271, +7.0V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|-------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage | 9V | I _{OUT} =10mA | 6.65 | 7.0 | 7.35 | V |
| I _{OUT} | Output Current | 9V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 9V | 1mA I _{OUT} 70mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 9V | No load | | 450 | 700 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 8V V _{IN} 20V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 9V | I _{OUT} =10mA 0 C<Ta<70 C | | 1.05 | | mV/ C |

HT72XX series (HT7280, HT7281, +8.0V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|--------------------------|-----------------|---|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage Tolerance | 10V | I _{OUT} =10mA | 7.61 | 8 | 8.4 | V |
| I _{OUT} | Output Current | 10V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 10V | 1mA I _{OUT} 70mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 10V | No load | | 500 | 800 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 9V V _{IN} 20V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 10V | I _{OUT} =10mA 0 C<Ta<70 C | | 1.2 | | mV/ C |

HT72XX series (HT7290, HT7291, +9.0V output type)

Ta=25 C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|--------------------------|-----------------|--|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage Tolerance | 12V | I _{OUT} =10mA | 8.55 | 9 | 9.45 | V |
| I _{OUT} | Output Current | 12V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 12V | 1mA I _{OUT} 70mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 12V | No load | | 600 | 900 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 10V V _{IN} 20V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 12V | I _{OUT} =10mA 0 C<Ta<70 C | | 1.35 | | mV/ C |

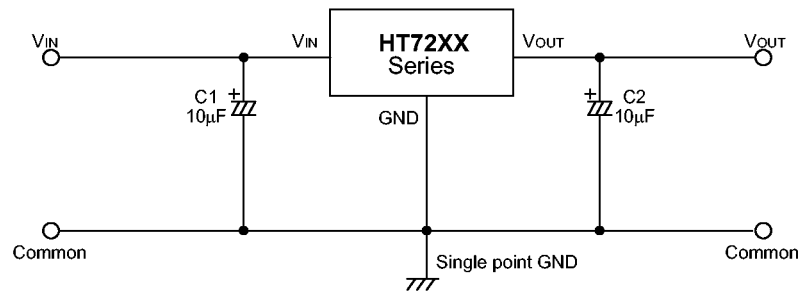
HT72XX series (HT72C0, HT72C1, +12V output type)

Ta=25 C

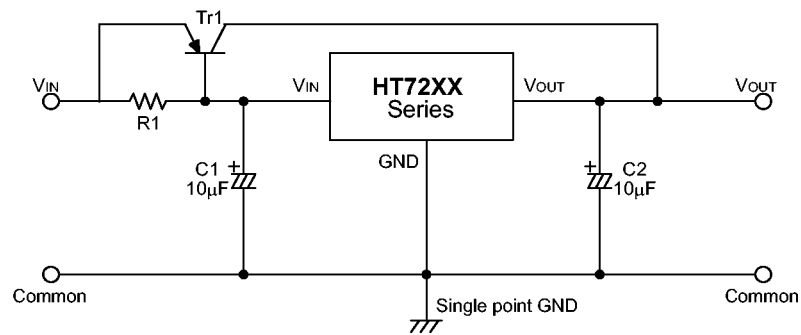
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|--------------------------|-----------------|--|------|------|------|-------|
| | | V _{IN} | Conditions | | | | |
| V _{OUT} | Output Voltage Tolerance | 15V | I _{OUT} =10mA | 11.4 | 12 | 12.6 | V |
| I _{OUT} | Output Current | 15V | | 100 | 150 | | mA |
| V _{OUT} | Load Regulation | 15V | 1mA I _{OUT} 70mA | | 60 | 150 | mV |
| V _{DIF} | Voltage Drop | | I _{OUT} =1mA | | 100 | | mV |
| I _{SS} | Current Consumption | 15V | No load | | 800 | 1200 | A |
| $\frac{V_{OUT}}{V_{IN}}$ | Line Regulation | | 14V V _{IN} 24V I _{OUT} =1mA | | 0.2 | | %/V |
| V _{IN} | Input Voltage | | | | | 24 | V |
| $\frac{V_{OUT}}{T_a}$ | Temperature Coefficient | 15V | I _{OUT} =10mA 0 C<Ta<70 C | | 1.8 | | mV/ C |

Application Circuits

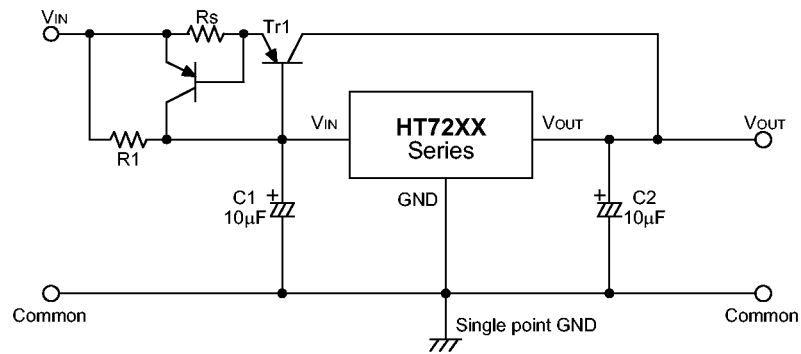
Basic circuit



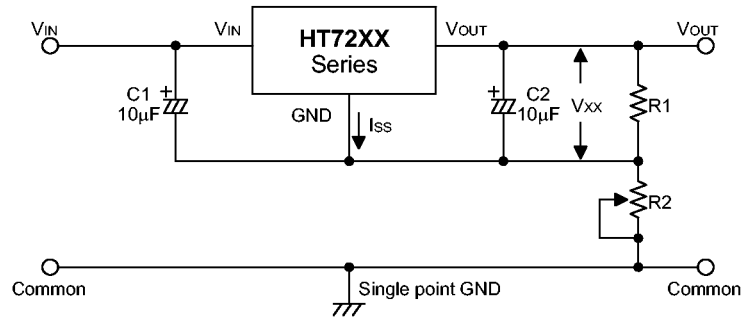
High output current positive voltage regulator



Short-Circuit protection by Tr1

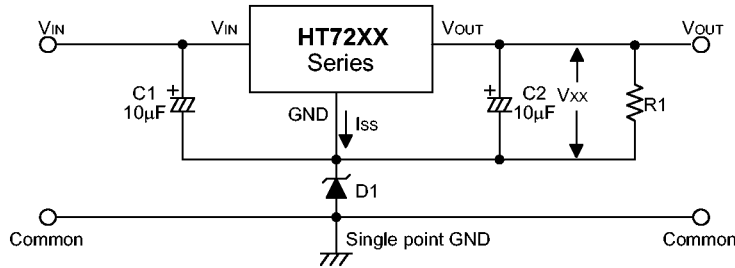


Circuit for increasing output voltage



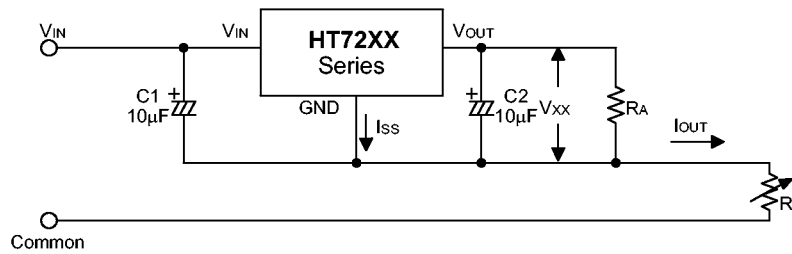
$$V_{OUT} = V_{XX} \left(1 + \frac{R2}{R1} \right) + I_{SS} R2$$

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

