

Features

- Low power consumption
- Low voltage drop
- Low temperature coefficient
- High input voltage (up to 12V)
- High output current : 100mA ($P_d \leq 250mW$)
- TO-92/SOT-89 package

Applications

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

General Description

The HT78XX series is a set of three-terminal high current low voltage regulator implemented in CMOS technology. They can deliver 100mA output current and allow an input voltage as high as 12V. They are available with several fixed output voltages ranging from 2.4V to 9V. 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.

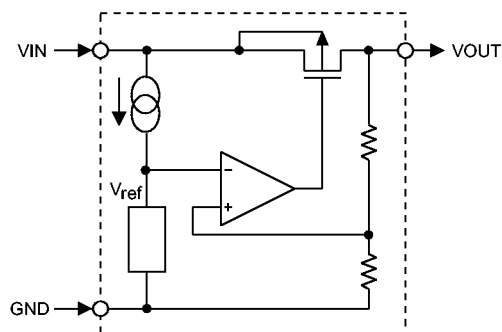
Selection Table

Part No.	Pin Assignment	Output Voltage	Tolerance
HT7830	B, C	3.0V	$\pm 5\%$
HT7831	A		
HT7833	B, C	3.3V	$\pm 5\%$
HT7834	A		
HT7836	B, C	3.6V	$\pm 5\%$
HT7837	A		
HT7838	B, C	3.8V	$\pm 5\%$
HT7839	A		
HT7844	B, C	4.4V	$\pm 5\%$
HT7845	A		
HT7850	B, C	5.0V	$\pm 5\%$
HT7851	A		
HT7860	B, C	6.0V	$\pm 5\%$
HT7861	A		

Part No.	Pin Assignment	Output Voltage	Tolerance
HT7870	B, C	7.0V	±5%
HT7871	A		
HT7880	B, C	8.0V	±5%
HT7881	A		
HT7890	B, C	9.0V	±5%
HT7891	A		

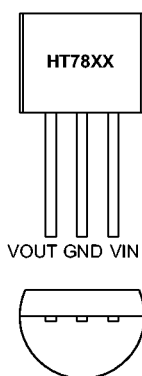
Note: For semi-custom parts, selectable regulated voltage range is from 2.4V to 9V in 0.1V increment.

Block Diagram

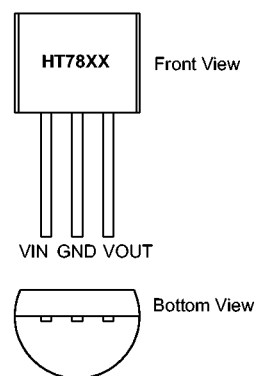


Pin Assignment

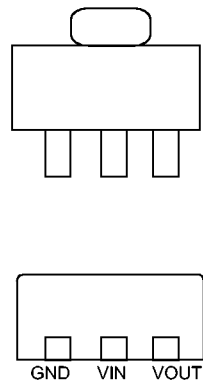
A. TO-92



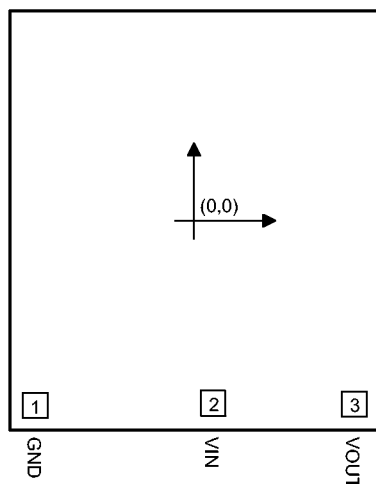
B. TO-92



C. SOT-89



Pad Assignment



Chip size: 1390×1530 (μm)²

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

Pad Coordinates

Unit: μm

Pad No.	X	Y
1	-506.50	-589.50
2	61.00	-582.50
3	510.50	-585.50

Absolute Maximum Ratings

Supply Voltage.....	-0.3V to 13V	Storage Temperature.....	-50°C to 125°C
Power Consumption.....	250mW	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

HT78XX series (HT7830, HT7831, +3.0V output type)
T_a=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
ΔV _{OUT}	Load Regulation	5V	1mA≤I _{OUT} ≤50mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	5V	No load	—	200	350	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	4V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.45	—	mV/°C

HT78XX series (HT7833, HT7834, +3.3V output type)
T_a=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
ΔV _{OUT}	Load Regulation	5.5V	1mA≤I _{OUT} ≤50mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	5.5V	No load	—	220	400	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	4.5V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.5V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.5	—	mV/°C

HT78XX series (HT7836, HT7837, +3.6V output type)
T_a=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5.6V	I _{OUT} =10mA	3.42	3.6	3.78	V
I _{OUT}	Output Current	5.6V	—	60	100	—	mA
ΔV _{OUT}	Load Regulation	5.6V	1mA≤I _{OUT} ≤50mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	5.6V	No load	—	240	410	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	4.6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.6V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.6	—	mV/°C

HT78XX series (HT7838, HT7839, +3.8V output type)
T_a=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	5.8V	I _{OUT} =10mA	3.61	3.8	3.99	V
I _{OUT}	Output Current	5.8V	—	60	100	—	mA
ΔV _{OUT}	Load Regulation	5.8V	1mA≤I _{OUT} ≤50mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	5.8V	No load	—	260	420	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	4.8V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.8V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.6	—	mV/°C

HT78XX series (HT7844, HT7845, +4.4V output type)
T_a=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	—	100	150	—	mA
ΔV _{OUT}	Load Regulation	6.4V	1mA≤I _{OUT} ≤50mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	6.4V	No load	—	300	450	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	5.4V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	6.4V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.7	—	mV/°C

HT78XX series (HT7850, HT7851, +5.0V output type)
T_a=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
ΔV _{OUT}	Load Regulation	7V	1mA≤I _{OUT} ≤70mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	7V	No load	—	330	500	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	7V	I _{OUT} =10mA 0°C<T _a <70°C	—	±0.75	—	mV/°C

HT78XX series (HT7860, HT7861, +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	5.7	6	6.3	V
I _{OUT}	Output Current	8V	—	100	150	—	mA
ΔV _{OUT}	Load Regulation	8V	1mA≤I _{OUT} ≤70mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	8V	No load	—	390	600	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	6V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	8V	I _{OUT} =10mA 0°C<Ta<70°C	—	±0.9	—	mV/°C

HT78XX series (HT7870, HT7871, +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
ΔV _{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	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	8V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	9V	I _{OUT} =10mA 0°C<Ta<70°C	—	±1.05	—	mV/°C

HT78XX series (HT7880, HT7881, +8.0V output type)
T_a=25°C

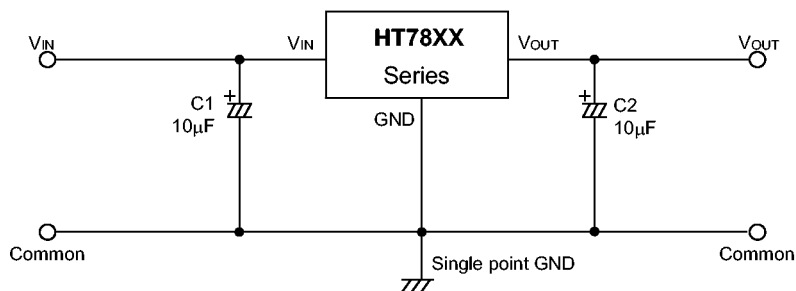
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	10V	I _{OUT} =10mA	7.61	8	8.4	V
I _{OUT}	Output Current	10V	—	100	150	—	mA
ΔV _{OUT}	Load Regulation	10V	1mA≤I _{OUT} ≤70mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	10V	No load	—	500	800	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	9V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	10V	I _{OUT} =10mA 0°C<T _a <70°C	—	±1.2	—	mV/°C

HT78XX series (HT7890, HT7891, +9.0V output type)
T_a=25°C

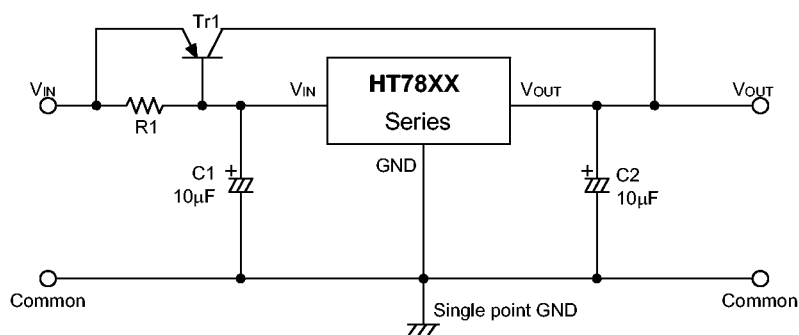
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{IN}	Conditions				
V _{OUT}	Output Voltage Tolerance	12V	I _{OUT} =10mA	8.55	9	9.45	V
I _{OUT}	Output Current	12V	—	100	150	—	mA
ΔV _{OUT}	Load Regulation	12V	1mA≤I _{OUT} ≤70mA	—	60	150	mV
V _{DIF}	Voltage Drop	—	I _{OUT} =1mA	—	100	—	mV
I _{SS}	Current Consumption	12V	No load	—	600	900	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	Line Regulation	—	10V≤V _{IN} ≤12V I _{OUT} =1mA	—	0.2	—	%/V
V _{IN}	Input Voltage	—	—	—	—	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	12V	I _{OUT} =10mA 0°C<T _a <70°C	—	±1.35	—	mV/°C

Application Circuits

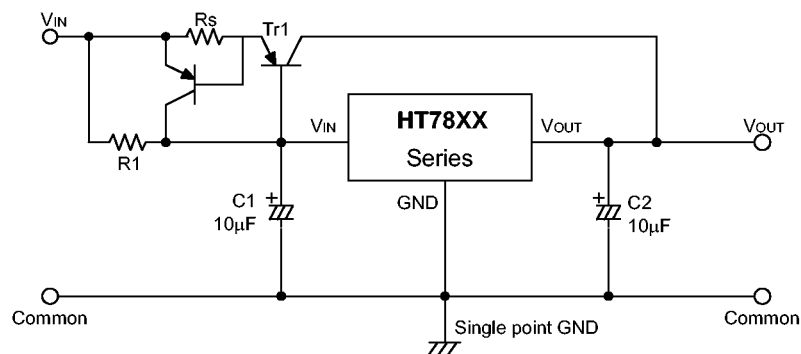
Basic circuit



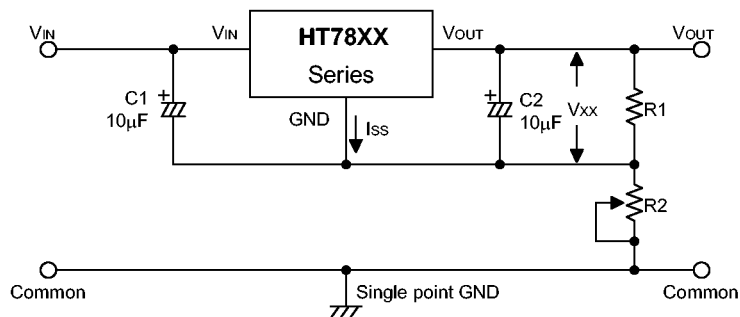
High output current positive voltage regulator



Short-Circuit protection by $Tr1$

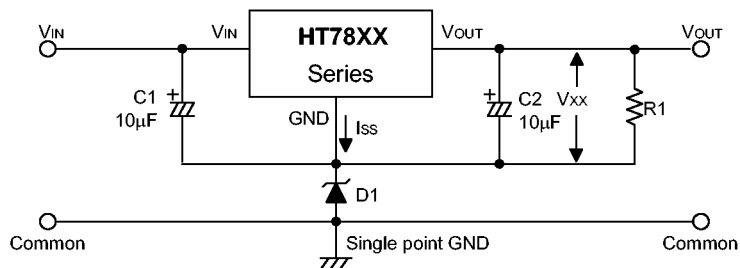


Circuit for increasing output voltage



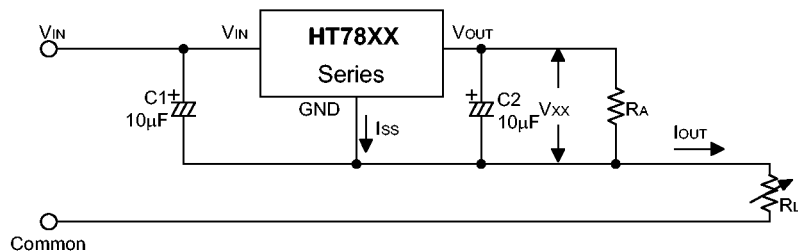
$$V_{OUT} = V_{XX} \left(1 + \frac{R2}{R1} \right) + I_{SS} R2$$

Circuit for increasing output voltage



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

Constant current regulator



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

