## 5.6 IC 723 – GENERAL PURPOSE REGULATOR

Disadvantages of fixed voltage regulator:

- Do not have the shot circuit
- Output voltage is not adjustable

These limitations can be overcomes in IC723.

Features of IC723:

- Unregulated dc supply voltage at the input between 9.5V & 40V
- Adjustable regulated output voltage between 2 to 3V.
- Maximum load current of 150 mA (ILmax = 150mA).
- With the additional transistor used, ILmax upto 10A is obtainable.
- Positive or Negative supply operation
- Internal Power dissipation of 800mW.
- Built in short circuit protection.
- Very low temperature drift.
- High ripple rejection.

## BLOCK DIAGRAM OF IC723

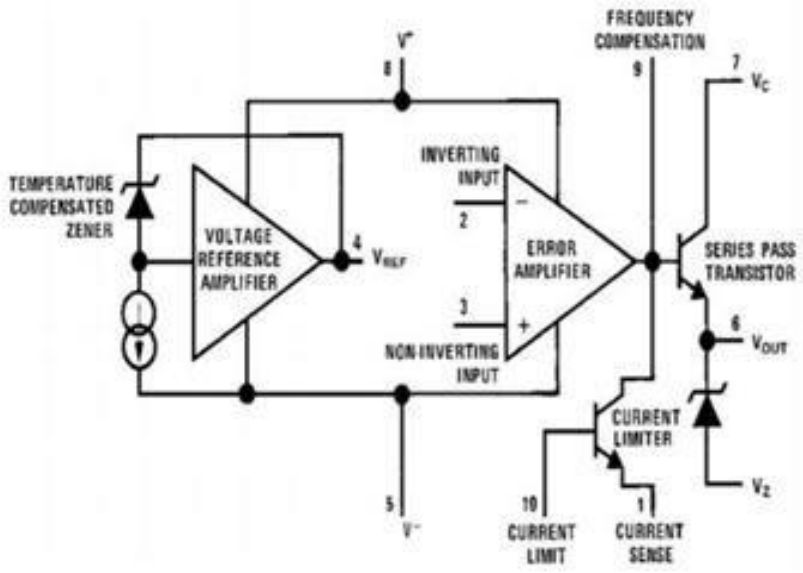


**Figure 5.6.1 Functional block diagram of IC723**

*[source: https://www.brainkart.com/subject/Linear-Integrated-Circuits_220/]*

Functional block diagram of IC723 is shown in figure 5.6.1.The simplified functional block diagram can be divided in to 4 blocks.

1. Reference Generating block:

The temperature compensated Zener diode, constant current source & voltage reference amplifier together from the reference generating block. The Zener diode is used to generate a fixed reference voltage internally. Constant current source will make the Zener diode to operate at affixed point & it is applied to the Non – inverting terminal of error amplifier. The Unregulated input voltage ±Vcc is applied to the voltage reference amplifier as well as error amplifier.

2. Error Amplifier:

Error amplifier is a high gain differential amplifier with 2 input (inverting & Noninverting). The Non-inverting terminal is connected to the internally generated reference voltage. The Inverting terminal is connected to the full regulated output voltage.

3. Series Pass Transistor:

Q1 is the internal series pass transistor which is driven by the error amplifier. This transistor actually acts as a variable resistor & regulates the output voltage. The collector of transistor Q1 is connected to the Un-regulated power supply. The maximum collector voltage of Q1 is limited to 36Volts. The maximum current which can be supplied by Q1 is 150mA.

4. Circuitry to limit the current:

The internal transistor Q2 is used for current sensing & limiting. Q2 is normally OFF transistor. It turns ON when the IL exceeds a predetermined limit.Low voltage, Low current is capable of supplying load voltage which is equal to or between 2 to 7Volts.Pin diagram of IC723 in figure 5.6.2.

$V_{load}$ = 2 to 7V and $I_{load}$= 50mA

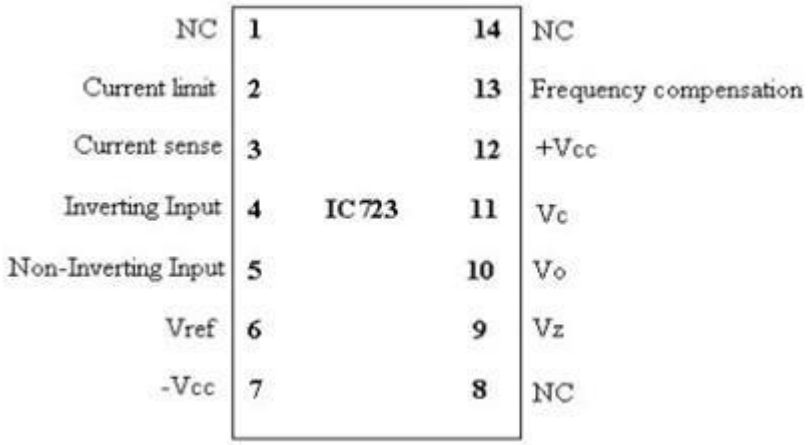


**Figure 5.6.2.Pin diagram of IC723**

*[source: https://www.brainkart.com/subject/Linear-Integrated-Circuits_220/]*

**IC723 as a LOW voltage LOW current:**

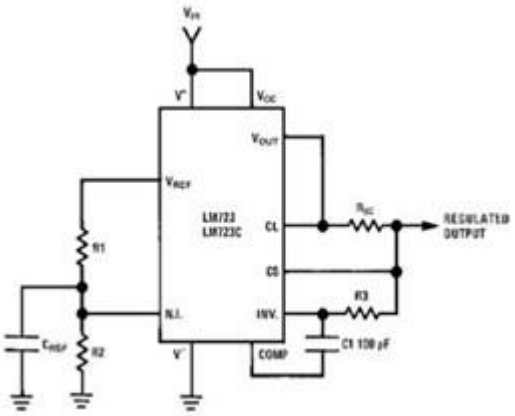


**Figure 5.6.3.Typical circuit connection diagram**

*[source: https://www.brainkart.com/subject/Linear-Integrated-Circuits_220/]*

- ✓ Circuit connection is shown in fig 3.$R_1$ & $R_2$ from a potential divider between $V_{ref}$ & Gnd.
- ✓ The Voltage across $R_2$ is connected to the Non – inverting terminal of the regulator

$$I_C\ V_{non\text{-}inv} = R_2/(R_1+R_2)\ Vref$$

- ✓ Gain of the internal error amplifier is large

$$V_{non\text{-}inv} = V_{in}$$

- ✓ Therefore the Vo is connected to the Inverting terminal through $R_3$ & $R_{SC}$ must also

  be equal to $V_{non\text{-}inv}$

$$V_o = V_{non\text{-}inv} = R_2/(R_1+R_2)\ V_{ref}$$

$R_1$ & $R_2$ can be in the range of 1 KΩ to 10KΩ & value of R3 is given by

$$R_3 = R_1 ll\ R_2 = R_1R_2/(R_1+R_2)$$

Rsc (current sensing resistor) is connected between Cs & CL. The voltage drop across Rsc is proportional to the IL.

- ✓ This resistor supplies the output voltage in the range of 2 to 7 volts, but the load current can be higher than 150mA.
- ✓ The current sourcing capacity is increased by including a transistor Q in the circuit.

 The output voltage , Vo $=R_2/(R_1+R_2)\ V_{ref}$

**IC723 as a HIGH voltage LOW Current:**

- ✓ This circuit is capable of supplying a regulated output voltage between the ranges of 7 to 37 volts with a maximum load current of 150 mA.
- ✓ The Non – inverting terminal is now connected to $V_{ref}$ through resistance $R_3$.
- ✓ The value of $R_1$ & $R_2$ is adjusted in order to get a voltage of Vref at the inverting terminal at the desired output.

$$V_{in} = V_{ref} = R_2 /(R_1+R_2)V_0$$

$$V_o = [1+R_1/R_2]\ V_{in}$$

- ✓ Rsc is connected between CL & Cs terminals as before & it provides the shortCircuit current limiting Rsc =0.6/Ilimit
- ✓ The value of resistors R3 is given by ,

$$R_3 = R_1 \text{ll } R_2 = R_1R_2/(R_1+R_2)$$

**IC723 as a HIGH voltage HIGH Current:**

- ✓ An external transistor Q is added in the circuit for high voltage low current regulator to improve its current sourcing capacity. Circuit connection of IC 723 as a High voltage High current regulator is shown in figure 5.6.4. below

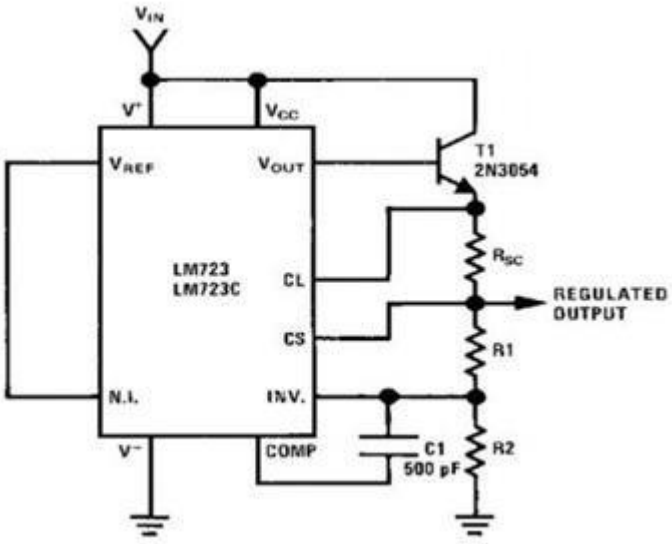


**Figure 5.6.4.Circuit connection of IC 723 as a High voltage High current regulator**

*[source: https://www.brainkart.com/subject/Linear-Integrated-Circuits_220/]*

- ✓ For this circuit the output voltage varies between 7 & 37V.
- ✓ Transistor Q increase the current sourcing capacity thus IL (MAX) is greater than 150mA.
- ✓ The output voltage Vo is given by ,

$$V_0 = Vo = [1+R_1/R_2]\ V_{in}$$

$$Rsc = 0.6/I\ limit$$