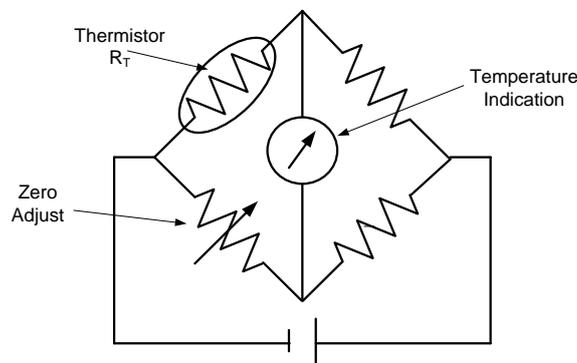


# NTC Thermistor : Application



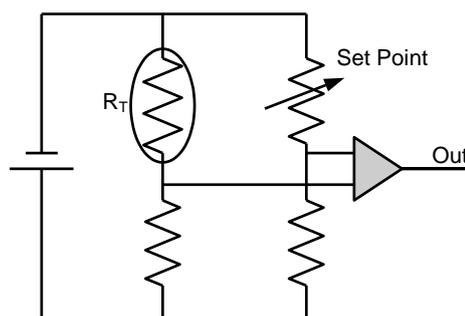
## ■ Temperature Measurement

NTC thermistor is a practical and low-cost solution to most temperature measurement applications. One of the circuits for temperature measurement is Wheatstone bridge with NTC thermistor as a bridge leg.



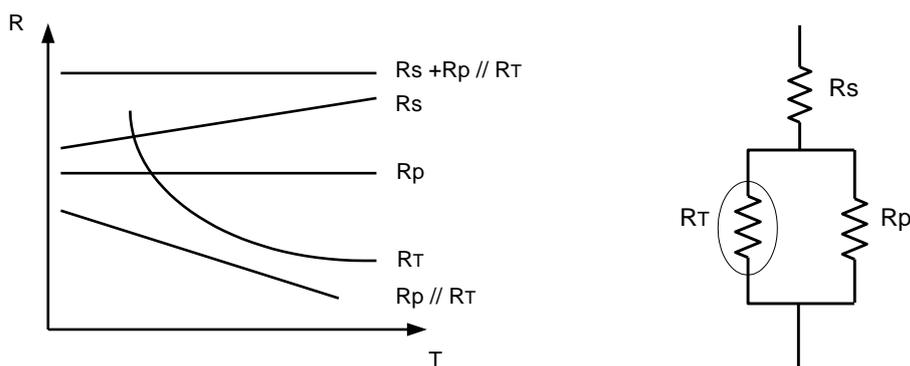
## ■ Temperature Control

NTC thermistor is a popular and simple solution for temperature control systems. The circuit below is control circuit that consists of thermistor and voltage comparator. The circuit converts temperature to comparator output voltage, and the voltage controls other switch components (such as transistor) to offer temperature control or over-temperature protection.



## ■ Temperature Compensation

Many semiconductors and ICs exhibit a positive temperature coefficient, which may cause some problems, such as poor accuracy. NTC thermistor with negative temperature coefficient offers temperature compensation and makes those devices to produce stable performance over a wide temperature range. The circuit below is a case of temperature compensation. Thermistor ( $R_T$ ) and linear resistor ( $R_p$ ) are connected in parallel, and then are connected in series with components with positive temperature coefficient ( $R_s$ ). After compensation, the resistance becomes more stable in a wide operating temperature range.

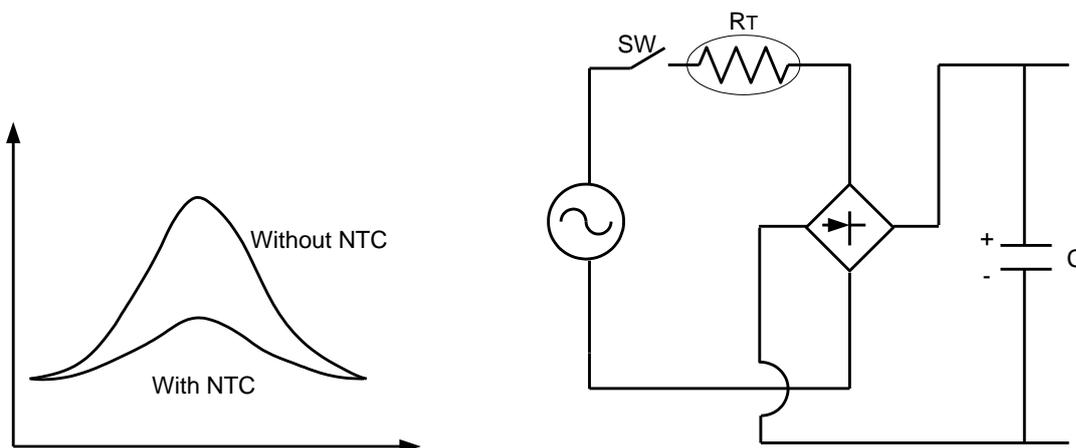


# NTC Thermistor : Application



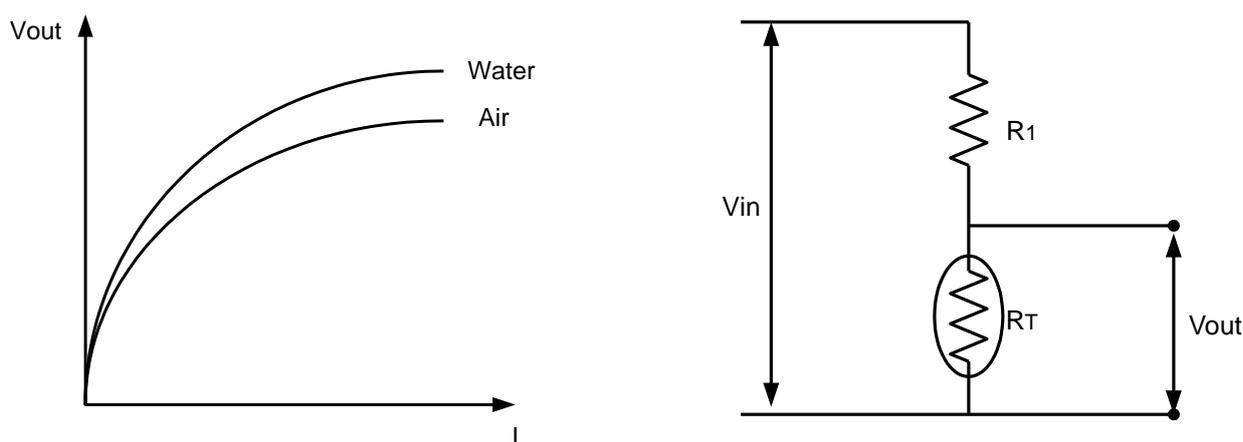
## ■ Inrush Current Suppressing

If circuits consist of capacitor, bulb filament, heater, or inverter for fluorescent lamp, they will produce a inrush current (10~100 times greater than a normal operating current) at the moment of switch's turn-on. Zero-power resistance of NTC thermistor limits the inrush current during initial turn-on, and then heats up the thermistor following continuous flow of current. The thermistor's resistance is reduced to a very low level and allows operating current to flow during normal operation.



## ■ Liquid Level Sensing

The difference of NTC thermistor's dissipation constant in liquid and that in the air or vapor enables it to detect the level of liquid and works as liquid level sensor.

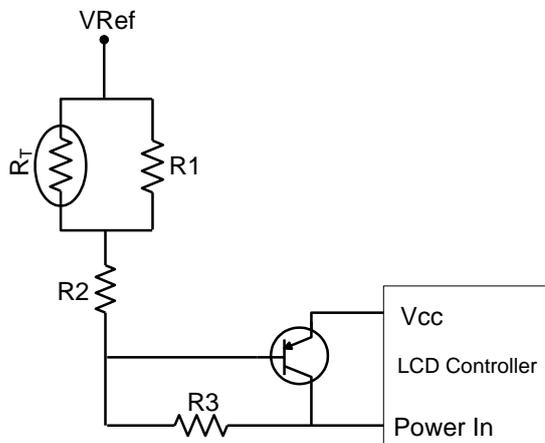


# NTC Thermistor : Application

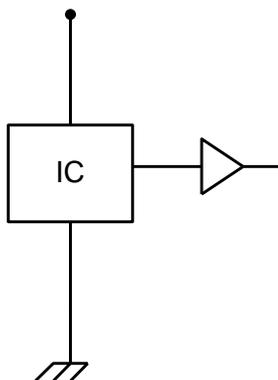


## ■ Example 1:

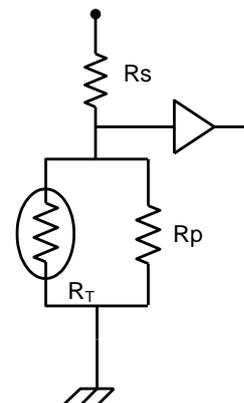
1.



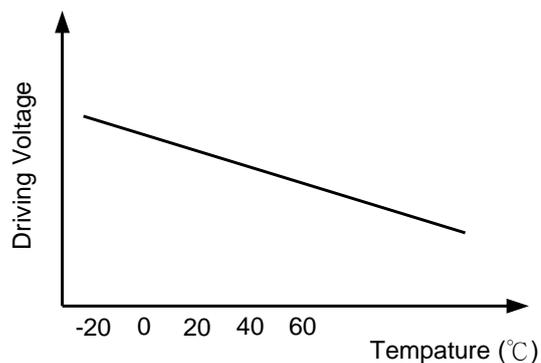
2. Temperature Sensor IC (High Cost)



NTC Thermistor (Low Cost)

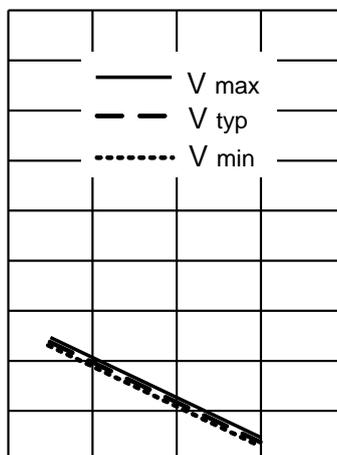


Driving Voltage Controlled by Temperature

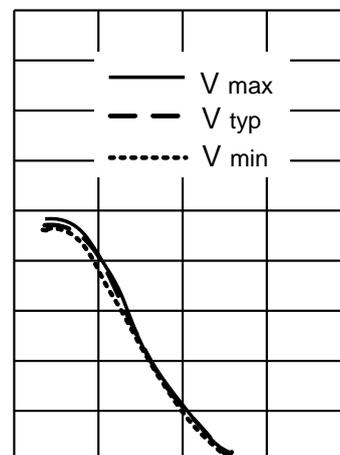


Voltage vs. Temperature Characteristics

Temperature Sensor IC



NTC Thermistor



# NTC Thermistor : Application



## ■ Example 2: Protecting LEDs from Thermal Stress

Thermal control is a very important aspect of high brightness LED control. NTC thermistor, a simple solution of LED temperature control, is used in LED control circuit to reduce the current as temperature increases. It is possible that current rises following the increase of temperature to protect LEDs from overheating.

