

NTC Inrush Limiter – SP & NT series

YAGEO provide SP & NT Series NTC inrush Limiter

- SP series: Surge Protection
- NT series: Surge Protection with Higher Max steady state Current

NTC Thermistors are made from transition metal oxide catalysts (Mn,Co,Ni,Cu) material . NTC thermistors are resistors that have high Negative Temperature Coefficient. The resistance of NTC will decrease by temperature increasing. NTCs are not only used as temperature sensors, but also can use as Inrush limiters to protect circuits and devices against inrush currents, and reduce damage. It's a way of making a low-cost and easy circuit for limiting inrush currents

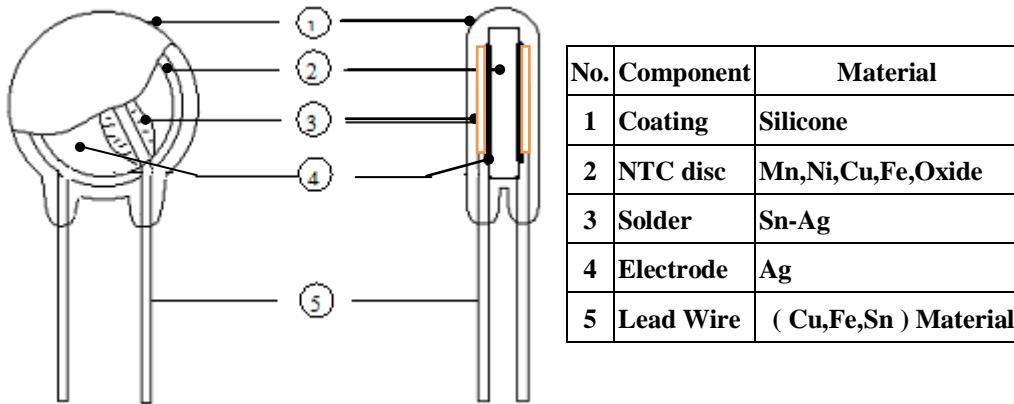


Fig-1. Construction of NTC Thermistor

At the time of powering on an electronic device , an instantaneous surge current is generated, and passing through the circuit. It might directly cause damage. we can use NTC to decrease inrush current (see fig-2). Because the resistance value of NTC also changes by its self-heating resulting from a current flowing through the device power applied. Then suppressing surge currents.

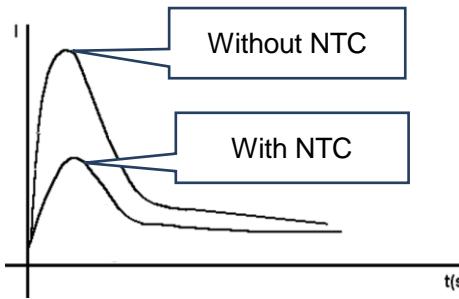


Fig-2. Inrush current limiting with NTC thermistor

After the surge current has passed, the device is running at steady state. the NTC heats up and its resistance drops (under $m\Omega$). Low resistance will cause less power. So it is greater using NTC as a inrush limiter than using a fixed resistor.

Therefore, NTC thermistors are widely used in power supplies, industrial inverters, AC-DC power modules and DC-DC converters.

Simple Application for Power supply

When NTC thermistor used as an inrush limiter, NTC is always connected in series with the load to protect.

How to select a right NTC as a Inrush limiter

$$(1) R_{Min} = R_{NTC} + R_{Load}$$

$$R_{Min} \geq 1.414 * V_{Ac} / I_{inrush}$$

- R_{NTC} : zero power resistance of NTC at 25°C

- I_{inrush} : Max Inrush Current

if you can't find the value of device's Max Inrush Current,

you can assume that inrush current as following

For power supply, industrial inverter, UPS...etc

100 times of steady state Current

For filament, heater

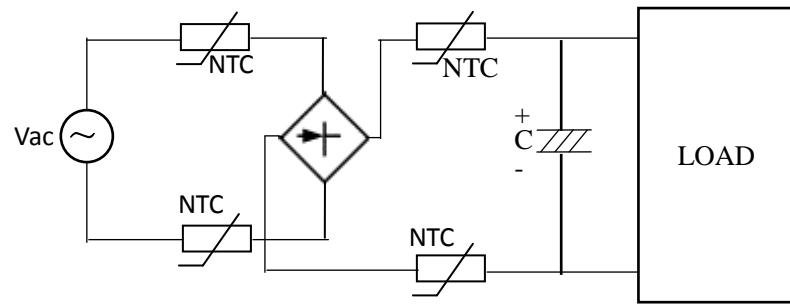
30 times of steady state Current

$$(2) \text{ Recommend Capacitance: } W_{NTC} \geq W_{min}$$

$$\cdot W_{NTC} = (C_{spec})(V_{p,spec})^2/2$$

$$\cdot W_{min} = (C_{filter}) * (V_p)^2/2$$

$$V_p = V_{dc} \text{ or } 1.414 V_{ac}$$



Features

- Low Residual Resistance at 25°C
- Low power loss under the stable state
- Surge currents suppressing effectively
- Wide range of electrical specifications
- Safety Approvals: UL, VDE, TUV
- RoHS & Halogen Free (HF) compliant

Benefits

High capability of surge current protection applicable to conversion power supply, switch power and UPS power.

Using NTC as inrush limiter is low-cost, Easy design and more efficiently.