RCC Medium Power Thick Film Chip Resistors

Product Overview

Rev. 2021-08-30

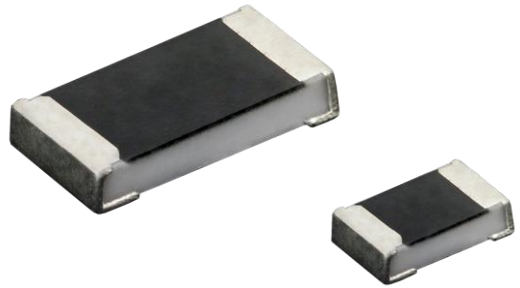
Introduction

Purpose

- Introduction of the Vishay RCC Medium Power Thick Film Chip Resistors

Objectives

- Discuss features
- Present Construction
- Compare performance to standard thick film chip resistors
- Discuss potential cost savings / circuit miniaturization using RCC series
- Show potential applications



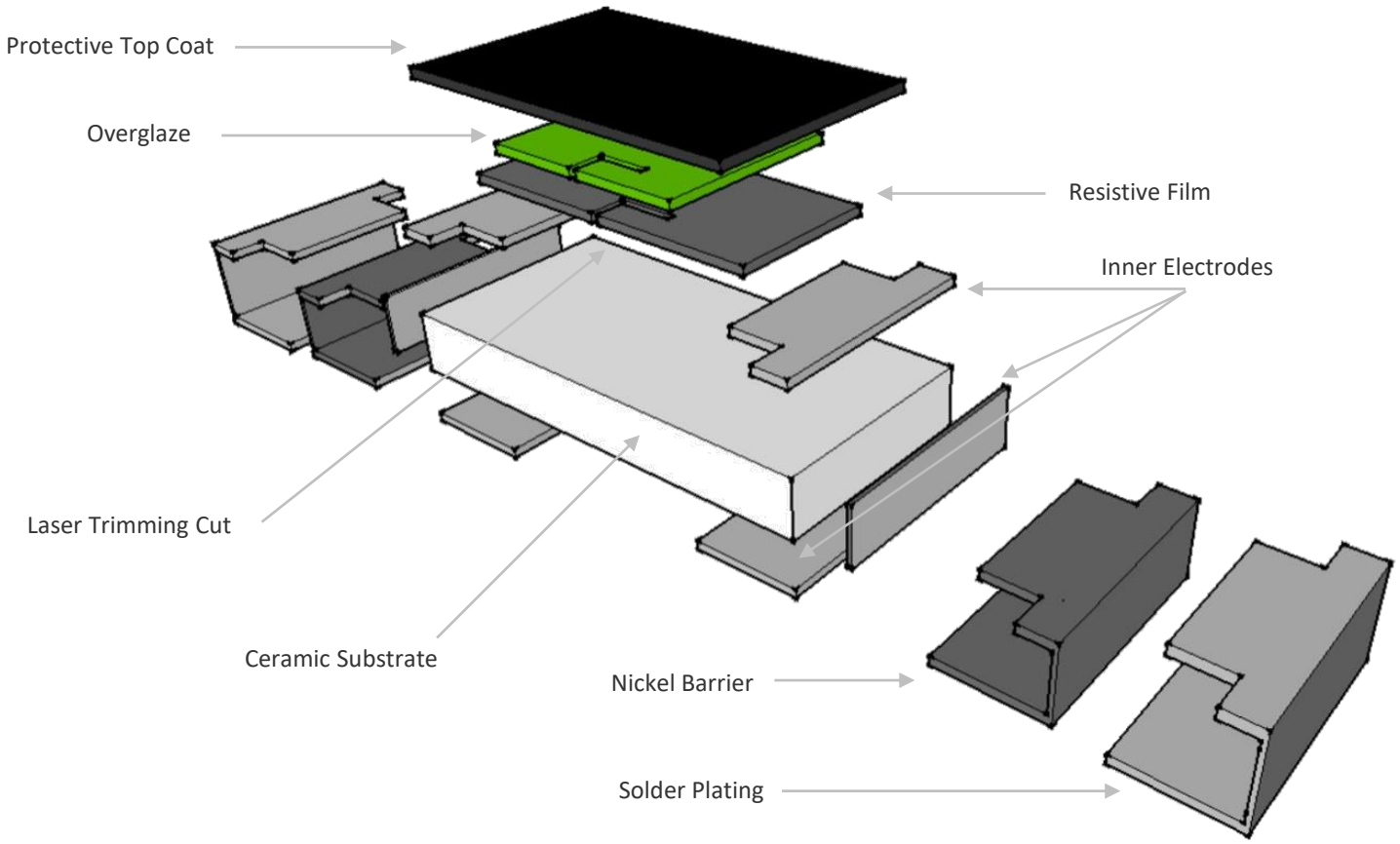
Welcome to the Vishay RCC Medium Power Thick Film Chip Resistors product overview. This presentation will provide an overview of the RCC thick film chip resistor series, including features and construction, competitive benefits and potential applications for this resistor series. Finally, we will discuss how RCC series parts can be used to reduce the cost of your design.

Main Features of the RCC series

- Package sizes: 0402, 0603, 0805, 1206
- Medium power dissipation: 0.125W, 0.2W, 0.25W, 0.5W
- Enhanced working voltage: 75V, 150V, and 200V
- Resistance range: 1Ω to 10MΩ, and 0R Jumper (1Ω to 1MΩ for 1206)
- Jumpers with enhanced maximum current ($I_{max.}$) up to 5.0A
- Tolerance & TCR: ±1% or ±5% & ±100ppm/°C or ±200ppm/°C
- AEC-Q200 qualified
- RoHS compliant

The Vishay RCC series is a thick film chip resistor series available in the most commonly used chip resistor sizes: 0402, 0603, 0805, and 1206. Compared to standard thick film chip resistors, RCC series parts have enhanced rated power up to 0.5W with 1206 case size, combined with enhanced maximum working voltage up to 200V for the 0805 size. RCC series parts are available with tolerance ±5% or ±1% along with 100ppm and 200ppm temperature coefficient. Many industries, including automotive, demand AEC-Q200 qualified resistors and Vishay's RCC series meets this standard. The series is offered with a broad resistance range from 1 ohm to 10Mohms, in addition to the 0 ohm Jumpers with enhanced maximum current capability up to 5A for the 1206 package size.

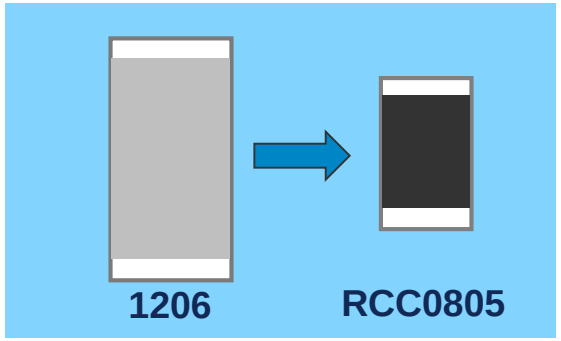
Construction of RCC series



The construction of RCC series parts is similar to the standard thick film chip resistors in most aspects, built on a ceramic substrate chip with wrap-around terminations on each side, with inner electrodes, covered by a nickel barrier, and with a solder plating. On the ceramic substrate, the thick film Ruthenium Oxide resistive element makes electrical connection between the part terminals, in which the resistive element is laser trimmed to achieve the desired final resistance value, allowing enhanced rated power and increased maximum working voltage. Above the thick film resistive element is an overglaze layer and a protective top coat.

Smaller resistors to replace next larger package size

- **Features**
  - Higher power and voltage rating than standard thick film resistors
  - Same long-term stability even at higher power and voltage ratings



- **Benefits**
  - Replacement of next larger size resistors
  - Board space saving
  - Potentially lower cost

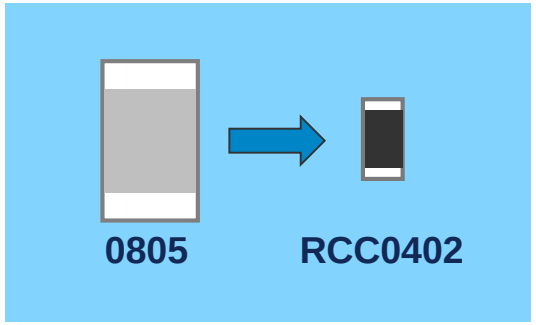
	Power (mW)		Voltage (V)	
	Standard	RCC	Standard	RCC
0402	63	125	50	75
0603	100	200	75	150
0805	125	250	150	200
1206	250	500	200	200
1210	500		200	

RCC series is recommended for all applications needing enhanced power rating and working voltage for the same package size, able to replace the next larger case size with a smaller resistor, offering board space savings and potentially lowering cost. The example above shows a standard 1206 thick film rated to 250 mW and 200V maximum working voltage that can be replaced by a smaller size component, RCC0805 resistor with same power (250mW) and same working voltage (200V). This can potentially reduce the component count on the application, with fewer number of components, in addition to approximately 51% of space saving of the PCB.

Design Benefit: RCC0402 to replace standard 0805

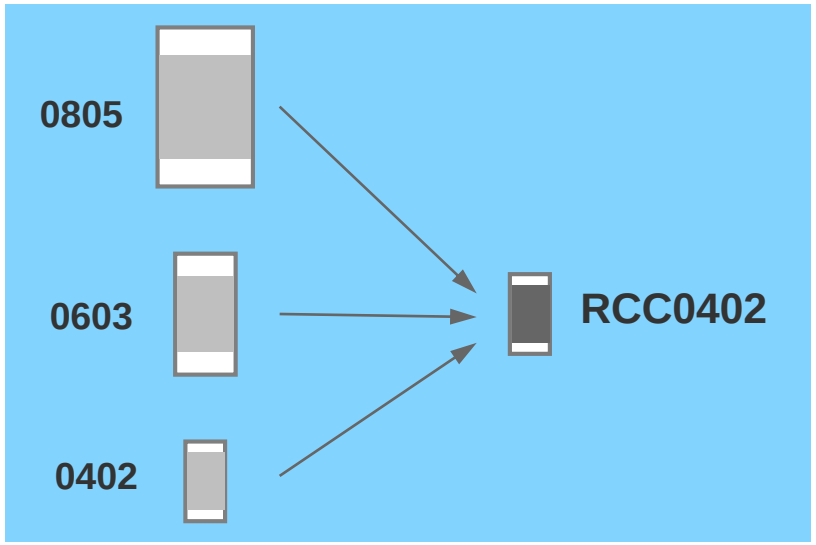
RCC0402 e3 –
Medium Power Thick Film Chip Resistor

- With 125 mW rated power and 75 V maximum operating voltage the RCC0402 is capable to replace most of the standard 0805 resistors
- Reduced number of component sizes
- 3x temperature cycling performance



80% board space saving

Parameter	std 0805	RCC0402
Power [mW]	125	125
Voltage [V]	150	75
Dimensions [mm²]	2.0 x 1.2	1.0 x 0.5
Temperature cycling [cycles]	<1000	3000



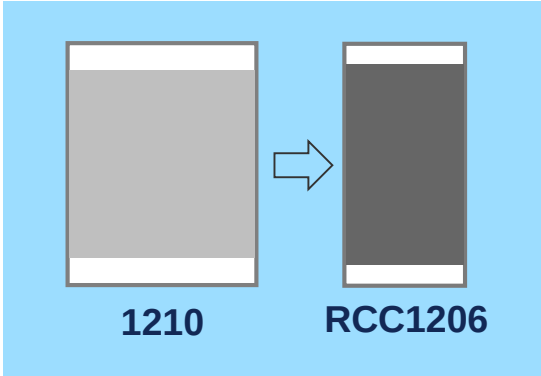
Reduced number of component sizes

This is an example of a design change that can significantly reduce the component size from a standard 0805 to the RCC0402, rated to 125mW and 75V maximum operating voltage. This represents approximately 80% PC board space saving in addition to the superior thermal cycling performance with 3000 cycles capability for the RCC0402 versus 1000 cycles for the standard 0805.

Design Benefit: RCC1206 to replace standard 1210

RCC1206 e3 – Medium Power Thick Film Chip Resistor

- RCC1206 features the same power and voltage rating as the standard 1210
- Almost 40% smaller component
- No PCB redesign necessary (1206 fits to 1210 solder pads)
- More cost competitive



40% board space saving

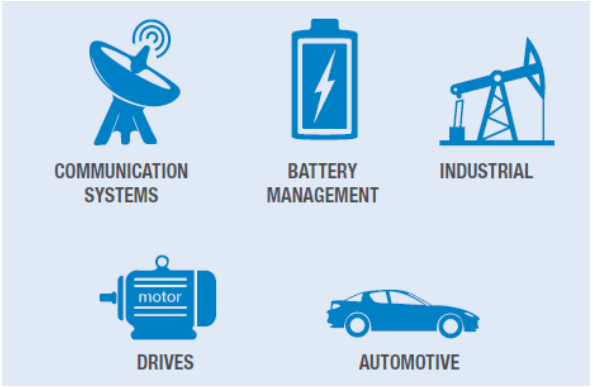
Parameter	std 1210	RCC1206
Power [mW]	500	500
Voltage [V]	200	200
Dimensions [mm²]	3.2 x 2.5	3.2 x 1.6

Design engineers can also consider the RCC1206 rated to 500mW and 200V working voltage as a good replacement for the standard 1210 thick film chip resistors, having the benefit of almost 40% space saving on PC board, offering a more cost competitive solution with 1206 case size.

Applications

Any application where…

- Reduced component count is desirable
- When reduced size of discrete components is needed
- More power and working voltage is needed for the same size
- An overall reduction in cost of resistors while meeting certain performance criteria is needed



ALTERNATIVE ENERGY
- Solar Inverter
- Power Meters

AMS
- Handset Radio
- Surveillance System

AUTOMOTIVE
- Climate Control Module
- LED Driver
- Powertrain
- Engine Control Unit
- Automotive Camera Module
- Door Latch
- Infotainment

COMPUTER
- HDD
- AC-DC Adapter
- Gaming
- RF repeater product

INDUSTRIAL
- DC-DC Converter
- Motor Control
- Electrical Circuit Breaker
- Amplifier

As the RCC series will allow for a circuit designer to reduce their component count, reduce resistor size, withstand higher rated power at same size, and reduce overall costs for resistors used in a design, this product series is used across the board in different market segments including alternative energy, AMS, automotive, computer and industrial. RCC series parts are a great fit for a wide variety of applications ranging from automotive modules, power electronics systems, industrial drives, AC-DC adapters, engine control units, DC-DC converters or any application in which thick film chip resistors are used.

Summary

- Technical option for smaller circuit boards and for reducing component count
- Medium power thick film chip resistor up to 0.5W with 1206 case size
- Enhanced working voltage at the same size
- Broad resistance range from 1Ω to 10MΩ, and jumper (0Ω)
- Jumpers with enhanced maximum current ($I_{max.}$) up to 5A
- AEC-Q200 qualified
- RoHS compliant

That concludes this Product Overview focused on Vishay's RCC series. The enhanced construction of Vishay's RCC series allows for the parts to have enhanced power rating and working voltage at the same size of the standard thick film resistors. Available with popular case sizes from 0402 to 1206, and with a wide range of resistance values, from 1Ω to 10MΩ in addition to enhanced 0Ω jumpers, the RCC series is ideal for applications requiring automotive AEC-Q200 qualified resistors.