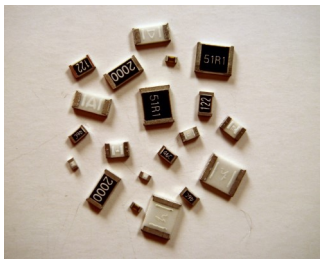
Thin Film Technology Corp.

Product Family: Ultra Reliable Chip Resistor
Part Number Series: CR Series



Construction:

- High Purity Alumina Substrate
- Ni alloy thin-film resistive element
- SiO2 protective barrier
- Wrap around electrodes
- 100% matte tin over Ni terminations
- AEC-Q200 qualified
- Anti-Sulfur

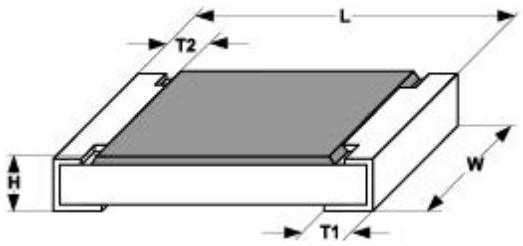
Features:

- 0402, 0603, 0805 and 1206 sizes
- TCR's down to ±5 ppm/°C
- Resistance down to 10Ω available
- SiO2 barrier provides exceptional stability and reliability
- Maximum reflow temperature = 260°C ±5°C, MSL = 1

Description:

These highly stable precision chip resistors are perfect for demanding applications where high reliability is a must, such as automotive applications. The incorporation of a SiO2 protective barrier protects the products and allows for a very stable product with excellent long term reliability.

Product Dimensions:



Dimension	CR0402 (1005)	CR0603 (1608)	CR0805 (2012)	CR1206 (3216)
L	0.040 ±0.002	0.063 ±0.008	0.079 ±0.008	0.126 ±0.008
W	0.020 ±0.002	0.031 ±0.008	0.049 ±0.008	0.063 ±0.008
H	0.014 ±0.002	0.016 ±0.004	0.016 ±0.004	0.016 ±0.004
T1	0.010 ±0.004	0.012 ±0.008	0.016 ±0.008	0.018 ±0.008
T2	0.008 ±0.004	0.012 ±0.008	0.016 ±0.008	0.016 ±0.008

All dimensions are shown in inches. Metric case sizes are shown in parenthesis.

Part Numbering: Ex: CR0603E2002B-T5

Product Designator	Size W x L (English)	Temp. Coefficient of Resistance (TCR)	Resistance Value	Resistance Tolerance	T&R Packaging Quantity
CR	**0402** **0603** **0805** **1206**	**M** = ±5ppm/°C **Y** = ±10ppm/°C **E** = ±25ppm/°C **Q** = ±50ppm/°C	4 digits with the first 3 being significant. The last digit specifies the number of zeros. "R" denotes decimal position as necessary	**Q** = ±0.02% **A** = ±0.05% **B** = ±0.10% **D** = ±0.50%	**-T1** = 1,000 **-T5** = 5,000 **-T10** = 10,000 (see note)

Note: Refer to available package sizes in the Electrical Specifications section of this document. When requesting quotes or ordering parts, it is not necessary to add the T&R package quantity (-T#) to the end of the part number. This will be added by us based on the quantity ordered.

Reflow/ Storage:

Moisture Sensitivity Level = MSL1	**Maximum Reflow Temperature** = 260°C ± 5°C
Recommended Reflow Profile: http://www.thin-film.com/uploadedcontent/documents/Soldering_Profile.pdf	

Electrical Specifications:

Type		CR0402				CR0603					
Power (see note)	High power	1/8 Watt (Old RGH1005-2B)				1/6 Watt (Old RGH1608-2C)					
	Normal power	1/16 Watt				1/10 Watt					
	Ultra-reliability	1/32 Watt				1/16 Watt					
Tolerance% (code)		±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.02(Q), ±0.05(A), ±0.1(B), ±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.02(Q), ±0.05(A), ±0.1(B), ±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.1(B), ±0.5(D)	±0.5(D)
Resistance Range (Ω)		10~46.4	47~97.6	100~2.94k	3k~100k	10~46.4	47~97.6	100~4.99k	5.1k~270k	274~332k	340~360k
Resistance Offering		E-24, E-96 Values									
TCR ppm/°C (code)		±100 (R)	±10 (Y) ±25 (E)	±5 (M) ±10 (Y) ±25 (E)	±10 (Y) ±25 (E)	±50 (Q)	±10 (Y) ±25 (E)	±5 (M) ±10 (Y) ±25 (E)	±10 (Y) ±25 (E)	±25 (E)	±25 (E)
Max Operating Voltage		75 V				100 V					
Operating Temperature		-55°C ~ 155°C									
Packaging		1,000pcs/reel (T1: 0.02% tolerance, 5ppm TCR only) 5,000 pcs/reel (T5) or 10,000pcs/reel (T10): All tolerance/TCR combinations other than 0.02% tolerance, 5ppm TCR)				1,000pcs/reel (T1: 0.02% tolerance, 5ppm TCR only) 5,000pcs/reel (T5: All tolerance/TCR combinations other than 0.02% tolerance, 5ppm TCR)					

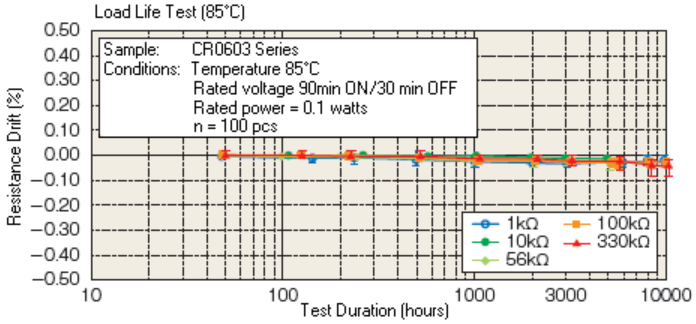
Type		CR0805					CR1206			
Power (see note)	High power	1/4 Watt (Old RGH2012-2E)					-----			
	Normal power	1/8 Watt					1/4 Watt			
	Ultra-reliability	1/10 Watt					1/8 Watt			
Tolerance% (code)		±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.02(Q), ±0.05(A), ±0.1(B), ±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.1(B), ±0.5(D)	±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)	±0.02(Q), ±0.05(A), ±0.1(B), ±0.5(D)	±0.05(A), ±0.1(B), ±0.5(D)
Resistance Range (Ω)		10~46.4	47~97.6	100~10k	10.2k~475k	487k~1M	10~46.4	47~97.6	100~33.2k	34k~1M
Resistance Offering		E-24, E-96 Values								
TCR ppm/°C (code)		±50 (Q)	±10 (Y) ±25 (E)	±5 (M) ±10 (Y) ±25 (E)	±10 (Y) ±25 (E)	±25 (E)	±50 (Q)	±10 (Y) ±25 (E)	±5 (M) ±10 (Y) ±25 (E)	±10 (Y) ±25 (E)
Max Operating Voltage		150 V					200 V			
Operating Temperature		-55°C ~ 155°C								
Packaging		1,000pcs/reel (T1: 0.02% tolerance, 5ppm TCR only) 5,000pcs/reel (T5: All tolerance/TCR combinations other than 0.02% tolerance, 5ppm TCR)					1,000pcs/reel (T1: 0.02% tolerance, 5ppm TCR only) 5,000pcs/reel (T5: All tolerance/TCR combinations other than 0.02% tolerance, 5ppm TCR)			
Note on Power Handling		These components can safely be used at all power levels listed for their respective size. The reliability levels obtained (see table below) will be relative to the power applied. As with most electronic devices, the higher the heat environment that the components are subjected to, the greater the performance drift, and ultimately the shorter the expected component life. As you apply more power to the components, they generate more heat. Therefore for a CR0805* component for example, if you were to apply 1/4 watt to the resistors it will generate more heat than if you were to apply 1/10 watt. Referring to the reliability tables below and specifically the Load Life test, if you were to apply 1/4 watt (high power) to a CR0805E1002B product (10KΩ), you can expect that after 1,000 hours of testing at those conditions, the change in resistance would be ±0.5% or less. Similarly, if you were to apply 1/10 watt (low power) and the same remaining conditions to that same component, after 1,000 hours of testing, the change in resistance would be ±0.1% or less.								

Reliability Specifications:

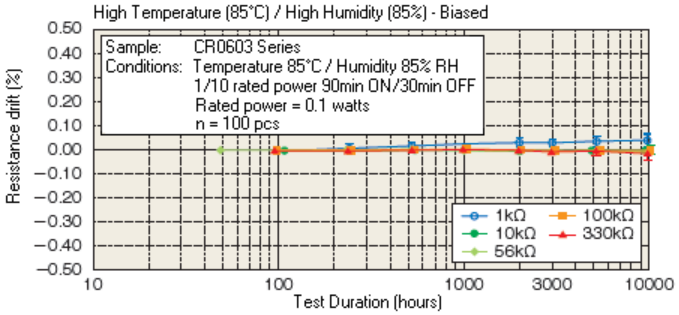
Test	Test Method	Specification: drift limits for each power rating						Typical
		Low Power (Ultra Reliable)		Regular Power		High Power		
		≤ 47Ω	≥ 47Ω	≤ 47Ω	≥ 47Ω	≤ 47Ω	≥ 47Ω	
Short Time Overload	Applied voltage: 2.5X rated voltage or 2X maximum operating voltage, whichever is less. Test duration: 5 seconds	± 0.1%	± 0.05%	± 0.1%	± 0.05%	---	± 0.1%	± (0.01%)
Load Life	Test Temperature: 85°C Applied voltage: rated voltage Test period: 1000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF,	± 0.25%	± 0.1%	± 0.5%	± 0.25%	---	± 0.5%	± (0.01%)
Moisture Load Life	Test Condition: 85°C/85% RH Applied voltage: 1/10 rated power Test period: 1000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF	± 0.25%	± 0.1%	± 0.5%	± 0.25%	---	± 0.5%	± (0.05%)
Temperature Cycle	Repeat 1000 cycles as follows: -55°C(30 min.) / Room temp (2 min) / +125°C(30 min.) / Room temp (2 min)	± 0.25%	± 0.1%	± 0.25%	± 0.1%	---	± 0.1%	± (0.01%)
High Temperature Exposure	+155°C for 1000 hours with no load	± 0.25%	± 0.1%	± 0.25%	± 0.1%	---	± 0.1%	± (0.01%)

Reliability Testing Graphs:

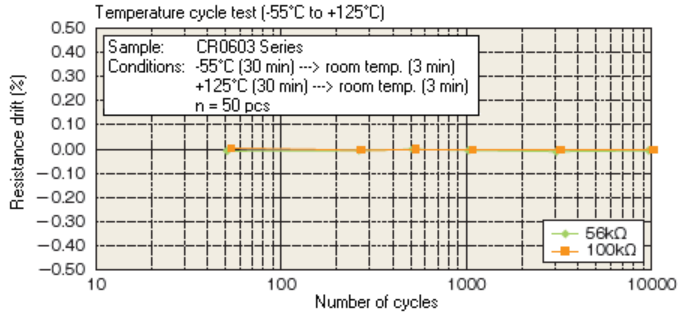
Load Life



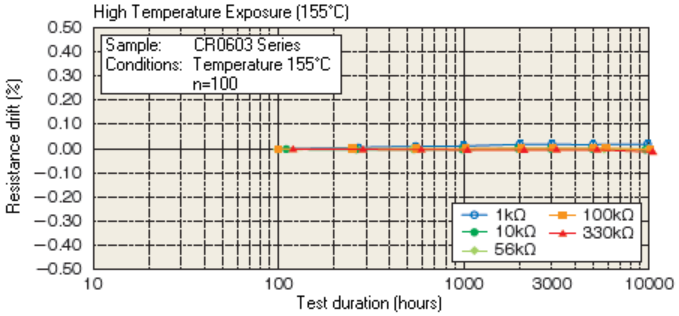
Moisture Load Life (85/85)



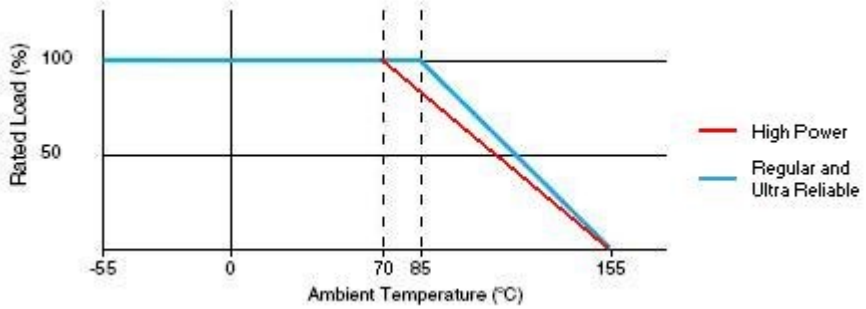
Temperature Cycle



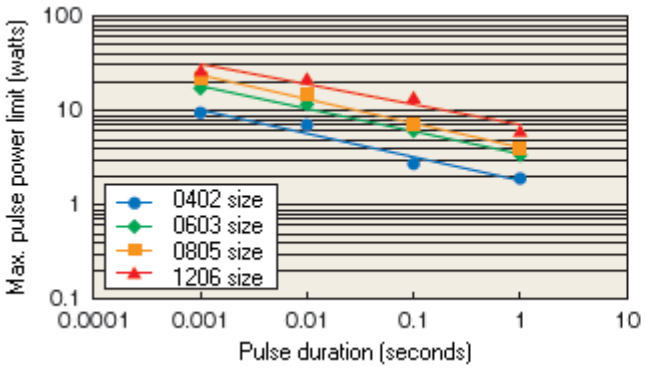
High Temperature Exposure



Power Derating Curve:



Pulse Power Limits:



Test Procedure

Voltage pulse is applied to the test samples which are mounted on a test board.

After each pulse, resistance drift is measured. The pulse voltage is increased until the drift exceeds ±0.5%. The power at the voltage is defined as the maximum pulse power.