Übersicht

SRT Widerstands-Serien

CHx-Series thick film Resistors with PtAg-terminals
(CHR, CHS, CHM, CHK, CHP, CRB)

- RohS-konform
- Non-magnetic resistors
- Thick film termination
  for soldering and conductive glueing– (Silver Epoxy)
- High temperature versions available
- Suitable for high vacuum applications – no organics
- Good wetting (< 3s @ 250°C) with all solders
- Excellent leaching resistance (> 40 s @ 260°C)
- Absolut no Tin whiskering

CRx-Series thick film Resistors with NiSn-terminals
(CRS, CRM, CRW, CRA)

- RohS-konform
- Nickel-barrier / matte Tin terminations
  for standard assembly by soldering
- No high temperature versions available
- Suitable for high vacuum applications – no organics
- Well-known termination for the customer
- Excellent wetting (< 3s @ 250°C) with all solders

SRT Resistor Series

Leaded thick film high value Resistors
(GST, HVR, HVM, HVT)

- RohS-konform
- Climatic protection by silicone lacquer coating
- Non-magnetic
- Different lead styles available
- Radial leads (standard), variable lead spacing
  by bending
- Pin type with single-in-line (SIL) pins Axial versions
- Unleaded version with solder pads available
- Various wire diameters (standard 0.6 and 0.4mm)
- Customized versions possible

Thin film and special Resistors
(CMF, CMF-V, SCN, SRN, CBW, CRD)

- RohS-konform
- High performance thin film chip resistors
- Thin film resistors networks in SO-packages
- Wire bondable resistors and networks
- Flip-chip resistors
- Thick film chip dividers

Übersicht der Eigenschaften

Summary of Characteristics

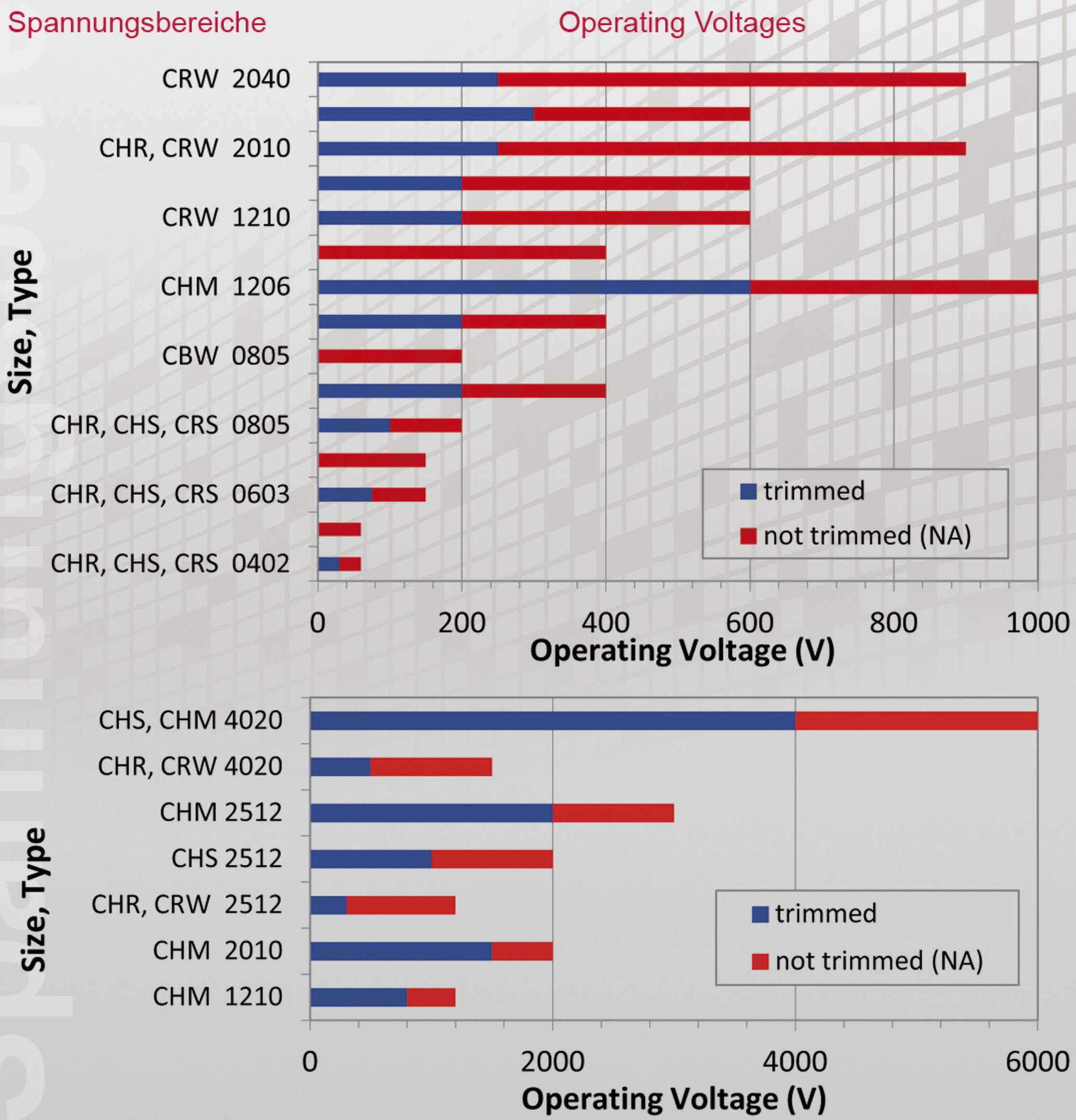
Type	Assembly			Termination					Base Material		Techno-logy		Spec. Characteristics					Range
	SMT (chip)	THT (leaded)	FC / C&W	NiSn	Sn	PtAg	Au / Al	AgPd	Al_2O_3	AlN	Thick film	Thin film	Standard	non-magnetic	high temp. version	cond. epoxy suitability	high vacuum	Resistance
CHR	•					•			•		•		•	•	•	•	•	1R0 – 10M
CHS	•					•			•		•		•	•	•	•	•	10M – 1T
CHM	•					•			•		•		•	•	•	•	•	100k – 10T
CHK	•							•	•		•			•		•		10M – 1T
CHP	•					•				•	•		•	•	•	•	•	1R0 – 1k6
CRB	•					•			•		•		•	•		•	•	1R0 – 10M
CRS	•			•					•		•		•				•	0R1 – 500M
CRW	•			•					•		•		•				•	0R1 – 100M
CRM	•			•					•		•		•				•	100k – 100G
CRA	•			•					•		•		•				•	1R0 – 10M
CMF	•			•					•			•	•					5R1 – 15M
CMF-V	•			•					•			•	•					5R1 – 15M
CBW	•		•					•	•		•		•	•		•	•	10R – 1T
CBW-Au	•		•				•		•		•		•	•		•	•	10R – 1T
CRD	•		•	•		•			•		•			•	•	•	•	10R – 1G
SCN	•				•							•	•					10R – 10M
SRN			•				•					•						10R – 2M5
GST		•			•				•		•		•	•				1M0 – 1T
HVR		•			•				•		•		•	•	•			1M – 10T
HVM		•			•				•		•		•	•				1M – 10T
HVT		•			•						•			•				≤ 20000:1

Baugrößen

Baugrößen der Chipwiderstände Sizes of Chip Resistors

Series / Size	CHR CHR-HT	CHS CHS-HT	CHM CHM-HT	CRB CRB-HT	CHP	CHK	CRS	CRM	CRA	CRW	CRD	CMF	CBW	CBW -Au	*GST*
0402	●	●				●	●						●	●	
0603	●	●		●		●	●		●			●	●	●	
0805	●	●	●	●		●	●	●	●			●	●	●	
1206	●	●	●	●		●	●	●	●			●	●	●	
1210		●	●	●		●		●	●	●					●
1216				●	●				●	●					
2010	●		●		●			●		●			●		
2040					●					●					
2512	●	●	●		●	●		●		●	●	●	●		●
4020	●	●	●		●	●		●		●	●		●		●

Spannungsbereiche Operating Voltages



Produkte

Produkt Überblick

Product Introduction

Type	Description	Values R / Tolerance / TCR	Remarks	Terminal
CHR	Standard thick film chip resistors	1R ~ 10M 0.5 ~ 20% 50 ~ 250 ppm/K	• Standard value range, non-magnetic • High temperature version CHR-HT (up to 300°C) • RF-versions untrimmed	PtAg
CHS	High value thick film chip resistors	10M ~ 1T 0.25 ~ 30% 50 ~ 3000 ppm/K	• High temperature version CHS-HT (up to 300°C) • Low temperature and voltage dependency (TCR, VCR) • Continuous operating voltage up to 6000 V	PtAg
CHM	High value precision thick film chip resistors	100k ~ 10T 0.25 ~ 30% 50 ~ 3000 ppm/K	• Meander structured chip resistors • High temperature version CHM-HT up to 300°C • Lower temperature and voltage dependency (TCR, VCR)	PtAg
CHK	Chip resistors for Silver Epoxy application	10M ~ 1T 0.25 ~ 30% 50 ~ 3000 ppm/K	• For conductive gluing only • For high volumes only • Parameters as CHR, CHS or CHM	AgPd
CHP	Power chip resistors on Aluminium-Nitride substrates (AlN)	1R0 ~ 1k6 1 ~ 20% 100 / 250 ppm/K	• High thermal conductivity • High temperature applicability up to 200°C • Untrimmed for improved pulse power rating (NA)	PtAg
CRB	Trimmable thick film chip resistors	1R ~ 10M 5 ~ 30% 50 ~ 250 ppm/K	• For active circuit adjustment • User-trimmable (not pre-trimmed) • Suitable for Laser and air-abrasive trimming	PtAg
CRS	Standard thick film chip resistors	0R1 ~ 500M 0.5 ~ 20% 50 ~ 250 ppm/K	• Standard value range • Resistance element glass-passivated • RF-versions untrimmed	NiSn
CRW	Power thick film chip resistors	0R1 ~ 100M 0.5 ~ 20% 50 ~ 250 ppm/K	• Resistance element glass-passivated • High pulse load at un-trimmed resistors • Power mode with increased power rating available	NiSn
CRM	Precision high-value chip resistors	0M1 ~ 100G 0.25 ~ 30% 25 ~ 2000 ppm/K	• Meander structured chip resistors • Lower temperature and voltage dependency (TCR, VCR) • Untrimmed for higher working voltage up to 6000 V	NiSn
CRA	Trimmable thick film chip resistors	1R ~ 10M 5 ~ 30% 50 ~ 250 ppm/K	• User-trimmable (not pre-trimmed) • Suitable for Laser and air-abrasive trimming • For soldering only	NiSn
CMF	Thin film precision chip resistors	5R1 ~ 15M 0.05 ~ 1% 5 ~ 50 ppm/K	• Close tolerances and low TCR (5 ppm/K) • Extreme low noise • Operating voltages up to 300V	NiSn
CMF-V	Thin film precision chip resistors	5R1 ~ 15M 0.05 ~ 1% 5 ~ 50 ppm/K	• Close tolerances, low TCR (5 ppm/K) and extreme low noise • Operating voltages up to 1000V • Sizes 1206, 2512	NiSn
CBW	Flip-chip resistors	10R ~ 1T 0.5 ~ 30% 25 ~ 3000 ppm/K	• For flip chip assembly (face-down; conductive epoxy) • No wrap-around; Bottom side completely insulated • High temperature version CBW-HT (up to 200°C)	AgPd
CBW-Au	Wire-bondable chip resistors	10R ~ 1T 0.5 ~ 30% 25 ~ 3000 ppm/K	• For wire bonding (US/TC; face-up) • No wrap-around; Bottom side completely insulated • High temperature version CBW-HT (up to 200°C)	Au
CRD	Precision thick film chip dividers	10R ~ 1G Resistance ratio up to 1000:1	• 2 integrated resistors with close relative data • Different terminations for flip chip assembly or standard soldering • Sizes 2512 and 4020	AgPd or NiSn
CHx-HT	High temperature chip resistors	1R ~ 1T 1 ~ 20% 50 ~ 2000 ppm/K	• High temperature applications up to 300°C (200°C) • Series CHR-HT, CHS-HT, CHM-HT, CBW-HT • Parameters corresponding to base series	PtAg
SCN	Thin film precision resistor arrays	10R ~ 10M 0.025 ~ 1% 1 ~ 25 ppm/K	• Thin film resistors on passivated Si- or Alumina-substrate • Standard types and customized arrayss with different schematics • Excellent ratio and tracking data • Different SO, SOT or SSOP packages available (up to 20 pins)	Sn
SRN	Precision thin film resistors networks for wire-bonding	10R ~ 2M5 0.05 ~ 1% 5 ~ 50 ppm/K	• Bare dies on Alumina- or passivated Si-substrate suitable • for wire bonding; Die-sizes 0.5x0.5 mm^2 to 6x10 mm^2 • Standard types and customized networks • Excellent ratio and tracking data	Bare Die
GST	High value resistors, radial leaded	1M0 ~ 1T 0.5 ~ 30% 25 ~ 1000 ppm/K	• Basing on chip resistor series CHR/CHM • Excellent values of tolerance, TCR and VCR • Untrimmed for higher working voltage up to 6000 V	Sn
HVR	Flat high voltage-/ high value thick film resistors	1M0 ~ 10T 0.25 ~ 30% 25 ~ 1000 ppm/K	• Close values of tolerance, TCR and VCR • Customized and low ohmic versions possible • Operating voltages up to 80000 V (80 kV)	Sn
HVM	Flat high voltage-/ high value resistors	1M0 ~ 10T 0.25 ~ 30% 25 ~ 500 ppm/K	• Excellent values of tolerance, TCR and VCR • Customized versions possible • Operating voltages up to 30000 V (30 kV)	Sn
HVT	Precision high voltage thick film dividers	Resistance ratio up to 20000:1	• Customer specific design, special versions possible • 2 to 10 resistors are feasible • High precision of ratio (0.25 %) and low tracking TCR • High operating voltages up to 40000 V (40 kV)	Sn
	Customized resistors and resistor networks	1R ~ 10T	• Special solutions dedicated to the specific application • Adapted to the required electrical and mechanical parameters (size, shape, base material, termination etc.)	

Technical Information

VCR – Voltage Coefficient of Resistance

The voltage coefficient or resistance is non-linear characteristic of resistors. It shows the resistance change in dependency on the applied voltage. The calculation is according the following formula:

$$VCR\ (ppm/V) = \frac{(R_o - R)}{R} * \frac{1}{(V_0 - V)} * 10^6$$

R_0: measured resistance @ measuring voltage V_0
R: measured resistance @ measuring voltage V

Both voltages are free selectable. The unit of the VCR is „ppm/V“, but “%/V” is quite common too, whereby 1% correlates to 10,000 ppm.

The resistance change at a given VCR is therefore as follows: $R = R_0 (1 + VCR * (V-V_0))$

The voltage coefficient according MIL-STD-202G, Method 309 will be generated as follows:

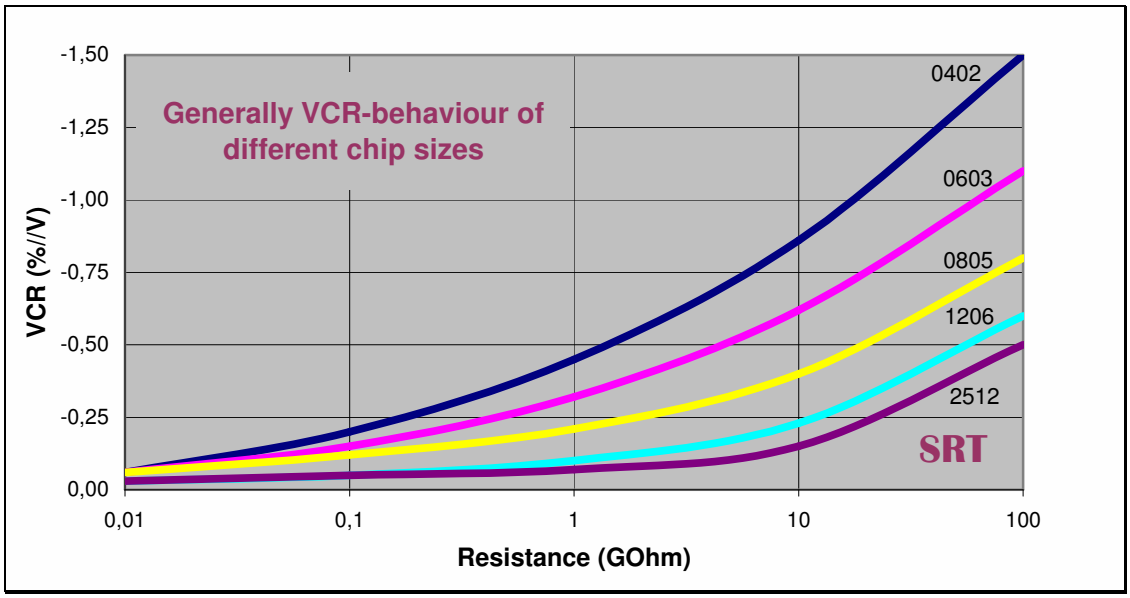
$$VC = \frac{(R-r) * 100}{0.9\ E\ r}$$

R: resistance @ specified max. working voltage E
r: resistance @ 10% of specified max. working voltage E

The voltage coefficient is commonly negative, i.e. the resistance is lower at higher measuring voltages (the reason are the conduction mechanisms in film resistors.
With increasing resistance values the VCR values are increasing as well (at the same chip size).
Contrary to that the VCR value is decreasing with increasing resistor sizes at the same resistance value (see graphic). Additional is to remark that the VCR is non-linear by itself, at higher measuring voltages the VCR values are lower.

In practice the VCR values are only mattering at large voltage differences (V_0-V; multiplier) as well as at high value resistors (high VCR-values).

Example: While a VCR of -5 ppm/V at a 1 kΩ-resistor with a voltage difference of 10V causes a change of resistance of -0,005%, is the resistance change at a 1GΩ-resistor with -500 ppm/V and 100 V voltage difference considerable -5%!



Issue 09/2006

SRT Resistor Technology GmbH
Ostlandstr. 31
D-90556 Cadolzburg

Fon: ++49 / 09103 / 79520
Fax: ++49 / 09103 / 5128
Mail to: webmaster@srt-restech.de
Internet: www.srt-restech.de

HT-Series: CHR-HT, CHS-HT, CHM-HT, CRB-HT, CBW-HT
High Temperature Chip Resistors
Sizes: 0402 ~ 4020

The SRT chip resistor series CHR, CHS, CHM, CRB and CBW are available with the extension “-HT” for the operating temperature range **up to 300°C.**

RoHS / ELV conform 2011/65/EC 2000/53/EC

e4

Non-Magnetic

Features:

- **High temperature applications up to 300°C**
- Chip resistors in thick film technology
- PtAg-terminals
- Suitable for conductive epoxy applications and soldering
- Suitable for high vacuum applications – no organics
- Wire bondable resistors series CBW with Au-terminals available (up to 200°C)
- Non-magnetic

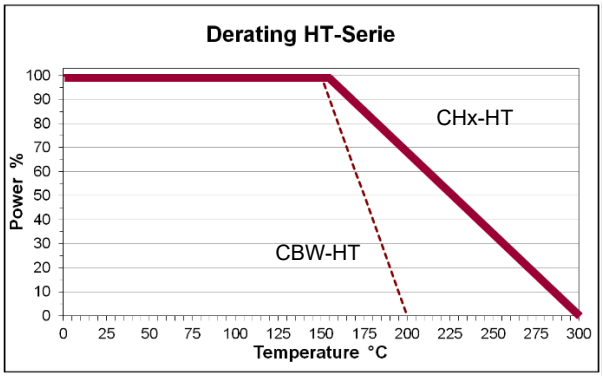
Dimensions / Technical data:

Dimensions and electrical data are corresponding to the data of the basic series CHR, CHS, CHM, CRB and CBW (shown in the actual data sheets).

Available sizes (value range according to the data sheets of the basic series):

Size \ Series	CHR-HT	CHS-HT	CHM-HT	CRB-HT	CBW-HT
0402	●	●			●
0603	●	●		●	●
0805	●	●	●	●	●
1206	●	●	●	●	●
1210		●	●	●	
1216				●	
2010	●		●		●
2512	●	●	●		●
4020	●	●	●		●

Derating curve:



SRT Resistor Technology GmbH
Ostlandstr. 31
D-90556 Cadolzburg
Germany

Fon: +49 (0)9103 / 7952-0
Fax: +49 (0)9103 / 5128
E-mail: info@srt-restech.de
Internet: www.srt-restech.de

Resistor Technology

HT-Series: CHR-HT, CHS-HT, CHM-HT, CRB-HT, CBW-HT
High Temperature Chip Resistors
Sizes: 0402 ~ 4020

Special Characteristics:

- The temperature coefficient is valid for the temperature range +25°C …+125°C (85°C for special TK)
- The final measuring of the resistors takes place at room temperature!
- Please pay attention to the interconnection technology at high temperature applications.
- Tolerance ranges (accordingly value range in basic series data sheet and additional restrictions in the table below):

Tolerance	Series	Sizes
from **1%**	CHR-HT	1206, 2010, 2512, 4020
	CHS-HT	1206, 1210, 2512, 4020
	CHM-HT	1206, 1210, 2010, 2512, 4020
from **2%**	CHR-HT	0402, 0603, 0805
	CHS-HT	0603, 0805
	CHM-HT	0805
from **5%**	CHS-HT	0402
	CRB-HT	0603, 0805, 1206, 1210, 1216, 1216H
	CBW-HT	0402, 0603, 0805, 1206

- Operating temperature range: **-55°C ... +300°C** (CBW-HT: -55°C … +200°C)
- Climatic category acc. to EN 60068-1: 55/300/56 (CBW-HT: 55/200/56)
- Stability complies with the values of the basic series with the exception that all values 0.25% and 0.5% are replaced by **1%**

Packaging:

Bulk in plastic bags: minimum 100 pieces per value
Blistertape acc. to EN 60286-3: minimum 500 pieces per value
Reel diameter 180 mm or 330 mm

Ordering Data:

Type – HT – value – tolerance – temperature coefficient TK
Example: CHR 0805-HT 100K ±10% TK250

Without data for the temperature coefficient TK, the highest value in the table will be supplied.

SRT Resistor Technology GmbH
Ostlandstr. 31
D-90556 Cadolzburg
Germany

Fon: +49 (0)9103 / 7952-0
Fax: +49 (0)9103 / 5128
E-mail: info@srt-restech.de
Internet: www.srt-restech.de