Precision Thick Film Chip Resistor
Low TCR AEC-Q200

CRAL Series

MERITEK

FEATURE

- Highly Reliable Multilayer Electrode Construction
- Small Size and Light Weight
- Compatible with All Soldering Process
- 100% CCD Inspection
- AEC-Q200 Qualified

RoHS

ELECTRICAL CHARACTERISTICS

Standard Electrical Specifications

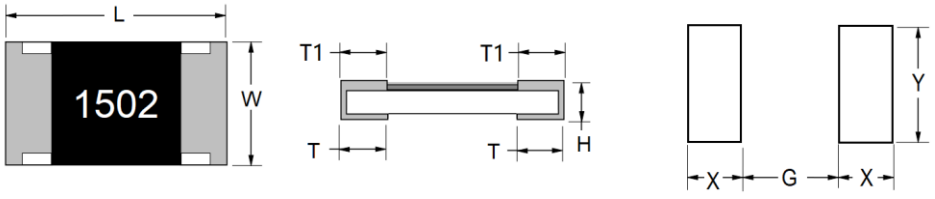
Size (Code)	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	TCR	Resistance Range			
					±0.1%	±0.25%	±0.5%	±1%
	(W)	(V)	(V)	(PPM/°C)	(Ω)			
0402 (20)	1/16W	50	100	±25(Note 4) ±50	300 ~ 1M			
0603 (16)	1/10W	75	150		10 ~ 1M			
0805 (10)	1/8W	150	300		10 ~ 3M	10 ~ 6.8M	10 ~ 10M	
1206 (08)	1/4W	200	400		10 ~ 5.1M		10 ~ 10M	

High Power Rating Electrical Specifications

Size (Code)	Rated Power at 85°C	Max Working Voltage	Max Overload Voltage	TCR	Resistance Range			
					±0.1%	±0.25%	±0.5%	±1%
	(W)	(V)	(V)	(PPM/°C)	(Ω)			
0402 (20)	1/8W	75	100	±25(Note 4) ±50	300 ~ 1M			
0603 (16)	1/5W	100	150		10 ~ 1M			
0805 (10)	1/4W	150	300		10 ~ 3M	10 ~ 6.8M	10 ~ 10M	
1206 (08)	1/3W	200	400		10 ~ 5.1M		10 ~ 10M	

Note:
1. Operating Temperature Range: -55ºC ～+155ºC
2. Operating Voltage=$\sqrt{P \times R}$ or Max. Operating Voltage listed above, whichever is lower.
3. Overload Voltage=2.5*$\sqrt{P \times R}$ or Max. Overload Voltage listed above, whichever is lower.
4. TCR (25ºC/-55ºC): -50~ +25 PPM/ºC
5. Customized specifications might be available upon request, please contact Meritek for more information

DIMENSIONS



Unit: mm

Size	L	W	H	T1	T	X	Y	G
0402	1.00 ± 0.05	0.50 ± 0.05	0.35 ± 0.05	0.18 ± 0.10	0.20 ± 0.10	0.45	0.60	0.50
0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	0.60	0.90	0.90
0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20	0.70	1.30	1.20
1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	0.90	1.60	2.00

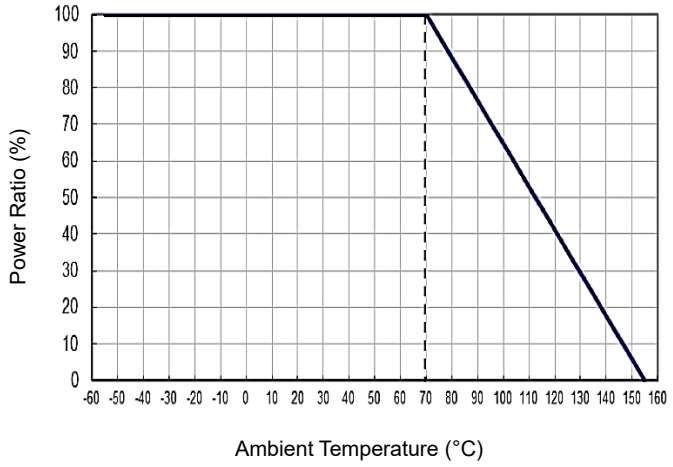
PART NUMBERING SYSTEM

CRAL	20	Y	3000	F	C
(1)	(2)	(3)	(4)	(5)	(6)

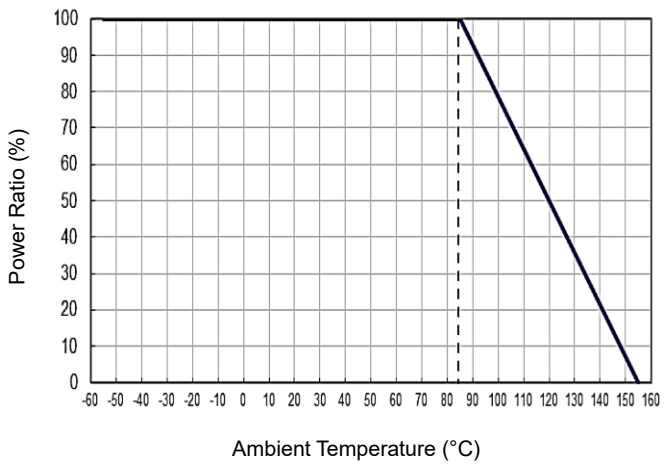
No.	Item	Code	Description	
(1)	**Product Code**	CRAL	Precision Thick Film Chip Resistor Series, Low TCR, AEC-Q200	
(2)	**Size Code**	20	20: 0402	08: 1206, 10: 0805, 16: 0603
(3)	**Power Rating**	Y	Y: 1/16W	O: 1/3W, V: 1/4W, P: 1/5W, W: 1/8W, X: 1/10W
(4)	**Resistance**	3000	3000: 300Ω	First 2 or 3 digits: Significant, Last: Multiplier
(5)	**Tolerance**	F	F: ±1%	B: ±0.10%, C: ±0.25%, D: ±0.50%
(6)	**TCR**	C	C: ±25 (PPM/°C)	D: ±50 (PPM/°C)

POWER DERATING CURVE

Power Derating Curve for Standard Power Rating



Power Derating Curve for High Power Rating



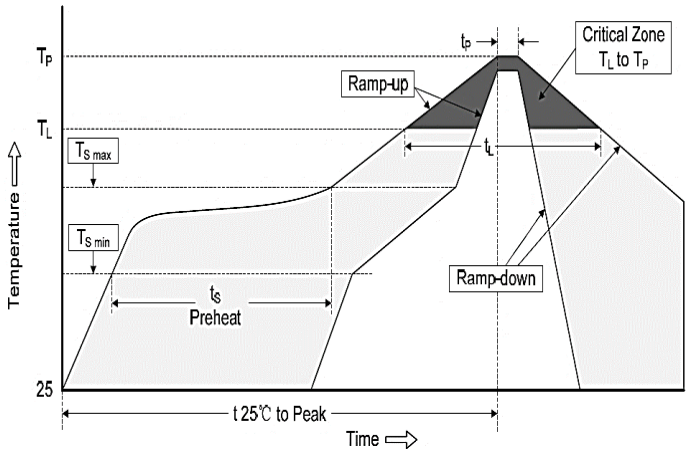
RELIABILITY TEST CONDITION

Item	Standard	Condition	Requirement
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	25°C/-55°C/ and 25°C/+155°C, 25°C is the reference temperature	As Specified
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5*RCWV or Max. Overload Voltage whichever is lower for 5sec	±(0.2%+0.05Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5ºC for 30 seconds.	Individual leaching area ≤5% Total leaching area ≤10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5ºC for 10 seconds.	±(0.2%+0.05Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply Max. Overload Voltage for 1 minute.	≥ 10GΩ
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +125°C, 1000 cycles	0402 (R≤30KΩ): ±(0.2%+0.05Ω) 20(R>30KΩ): ±(0.5%+0.05Ω) 16, 10, 08: ±(0.2%+0.05Ω)
High Temperature Exposure	MILSTD 202 Method 108	155ºC for 1000hrs.	20, 16 (R≤200KΩ): ±(0.2%+0.05Ω) 20, 16 (R>200KΩ): ±(0.5%+0.05Ω) 10, 08: ±(0.2%+0.05Ω)
Biased Humidity	MILSTD 202 Method 103	85°C/85% R.H., 10% of operating power (≤100V). for 1000hrs	±(1.0%+0.10Ω)
Endurance	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV for 1000hrs with 1.5 hrs “ON” and 0.5 hr “OFF” for standard power rating	20(R≤30KΩ): ±(0.2%+0.05Ω) 20(R>30KΩ): ±(0.4%+0.05Ω) 16, 10, 08: ±(0.2%+0.05Ω)
	MILSTD 202 Method 108	85±2°C, RCWV for 1000hrs with 1.5 hrs “ON” and 0.5 hr “OFF” for high power rating	20(R≤30KΩ): ±(0.2%+0.05Ω) 20(R>30KΩ): ±(0.4%+0.05Ω) 16, 10, 08: ±(0.2%+0.05Ω)
Voltage Proof	JIS-C-5201-1 4.7 IEC-60115-1 4.7	1.42 times Max. Operating Voltage for 1 minute	No breakdown or flashover
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17 J-STD-002	260±5ºC for 3 seconds.	>95% Coverage
Board Flex	AEC-Q200 005	Bending once for 60 seconds Bending displacement: 3mm	±(1.0%+0.05Ω)
Terminal Strength	AEC-Q200 006	Force of 1.8kg for 60 seconds	No broken
Vibration	MIL-STD 202 Method 204	5 g’s for 20 min., 12cycles each of 3 orientations, 10-2000 HZ	±(0.5%+0.05Ω)
Mechanical Shock	MIL-STD 202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g’s. Normal duration (D) is 6.	±(0.25%+0.05Ω)
ESD	AEC-Q200 002	Human body model 0402/0603: 1KV 0805 and above: 2KV	±(3%+0.05Ω)
Flammability	UL-94	V0 or V1 are acceptable. Electrical test not required.	No ignition of the tissue paper or scorching or the pinewood board
Sulfur Test	EIA-977 Condition A	60±2°C, no power rating for 500 hrs.	△R±1%

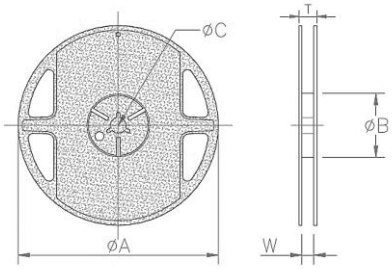
Note:
1. RCWV (Rated Continuous Working Voltage) = √(P*R) or Max operating voltage whichever is lower.
2. Storage Temperature: 15~28°C; Humidity < 80% RH
3. Shelf Life: 2 years from production date.

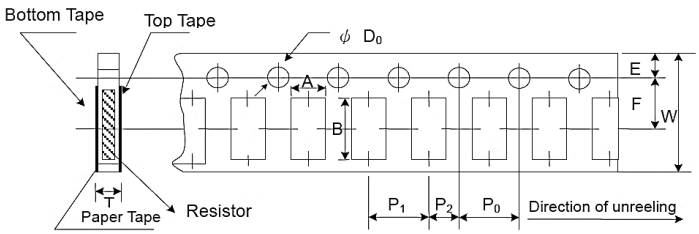
SOLDERING RECOMMENDATION

Reflow Condition		
Pre Heat	Temp. Min $T_{s(min)}$	150°C
	Temp. Max $T_{s(max)}$	200°C
	Time (min. to max.) (t_s)	60 ~120 seconds
Average ramp up rate (Liquidus Temperature) (T_L) to peak		3°C/second max
Reflow	Temp. (T_L)	217°C
	Time (min. to max.) (t_L)	60 ~150 seconds
Peak Temperature (T_P)		260°C
Time within 5°C of actual peak Temperature (t_p)		30 seconds max.
Ramp-down Rate (T_P to T_L)		6°C/second max
Time 25 °C to Peak Temperature		8 minutes max.



PACKAGING SPECIFICATIONS





Size	Reel Dimension (mm)					Tape Dimensions (mm)										Qty
	A ±1.5	B +1/-0	C ±0.2	W ±0.5	T ±0.5	A ±0.10	B ±0.20	W ±0.20	E ±0.10	F ±0.05	P0 ±0.10	P1 ±0.05	P2 ±0.05	D0 +0.05	T ±0.20	Paper
0402	178.5	60	13.0	9.0	12.5	0.65	1.15	8.00	1.75	3.50	4.00	2.00	2.00	1.55	0.45	10000
	254	100	13.0	9.5	13.5											20000
	330	100	13.0	9.5	13.5											40000
0603	178.5	60	13.0	9.0	12.5	1.10	1.90	8.00	1.75	3.50	4.00	4.00	2.00	1.55	0.70	5000
	254	100	13.0	9.5	13.5											10000
	330	100	13.0	9.5	13.5											20000
0805	178.5	60	13.0	9.0	12.5	1.60	2.40	8.00	1.75	3.50	4.00	4.00	2.00	1.55	0.85	5000
	254	100	13.0	9.5	13.5											10000
	330	100	13.0	9.5	13.5											20000
1206	178.5	60	13.0	9.0	12.5	1.90	3.50	8.00	1.75	3.50	4.00	4.00	2.00	1.55	0.85	5000
	254	100	13.0	9.5	13.5											10000
	330	100	13.0	9.5	13.5											20000

*Specifications subject to change without notice.