Thick Film Chip Resistor
High Power Lead (Pb) Free

CRAHG Series

MERITEK

FEATURE

- **Small Size and Light Weight**
- **Reliability, High Quality**
- **Lead (Pb) Free, Green type**
- **Application: Automotive Electronics, Navigation Equipment,TPMS Heating, Ventilating and Air Conditioning, Indoor Lighting, Central Door Locking, Wiper Module**
- **AEC-Q200 qualified**

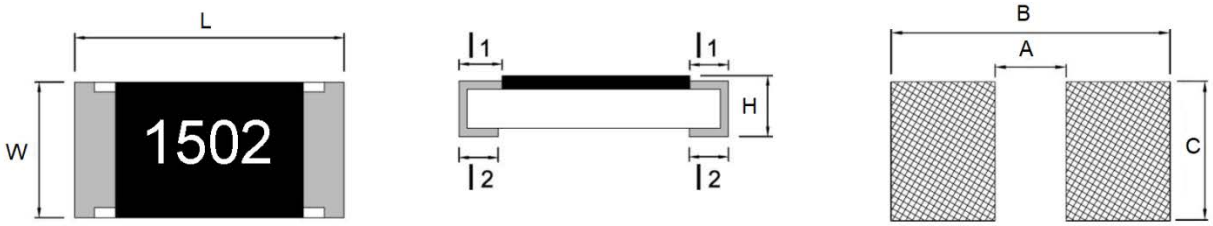
PART NUMBERING SYSTEM

CRAHG **10** **1002** **F** **13**
(1) (2) (3) (4) (5)

RoHS

No	Item	Code	Description	
(1)	**Meritek Series**	CRAHG	Thick Film Chip Resistor series, High Power AEC-Q200 Lead (Pb) Free Type	
(2)	**Size Code**	10	10:0805	01: 2512, 02: 2010, 04: 1210 08: 1206, 16: 0603, 20: 0402
(3)	**Resistance**	1002	1002: 10KΩ	First two digits: significant, Third: Multiplier First three digits: significant, Fourth: Multiplier
(4)	**Tolerance**	F	F:±1%	J: ±5%
(5)	**Packaging**	13	13:13” reel	Blank: Standrd 7”reel

DIMENSIONS



Size	L	W	H	I1	I2	A	B	C
0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10	0.60	1.60	0.70
0603	1.60 ± 0.20	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10	0.80	2.40	1.00
0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15	1.30	2.90	1.40
1206	3.05 ± 0.10	1.60 ± 0.20	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20	2.20	4.20	1.70
1210	3.05 ± 0.10	2.50 ± 0.20	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20	2.00	4.40	2.70
1812	4.50 ± 0.10	3.10 ± 0.20	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20	3.11	5.91	3.00
2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20	3.80	6.60	2.70
2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20	4.90	8.10	3.40

Unit: mm

ELECTRICAL CHARACTERISTICS

STANDARD TYPE

Size	Rated Power	Rated Voltage	Overload Voltage	TCR	Resistance Range	
					±1%	±5%
	(W), 70°C	(V) Max	(V) Max	(PPM/°C)	(Ω)	(Ω)
0402	0.1	50	100	±400	--	1≤R<10
				±250	10≤R<100K	10≤R<100K
				±100	100K≤R≤1M	100K≤R≤10M
0603	0.125	75	150	±400	--	1≤R≤10
				±250	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
0805	0.25	150	300	±400	--	1≤R≤10
				±200	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
1206	0.5	200	400	±400	--	1≤R≤10
				±200	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
1210	0.66	200	400	±400	--	1≤R≤10
				±200	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
1812	1.0	200	400	±400	--	1≤R≤10
				±200	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
2010	1.0	200	400	±400	--	1≤R≤10
				±200	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M
2512	2.0	200	400	±400	--	1≤R≤10
				±250	10<R<100K	10<R<100K
				±100	100K≤R≤1M	100K≤R≤10M

HIGH OHM TYPE

Size	Rated Power	Rated Voltage	Overload Voltage	TCR	Resistance Range
					±1%, 5%
	(W) 70°C	(V) Max	(V) Max	(PPM/°C)	(Ω)
0402	0.10	50	100	±200	10.1M~30M
0603	0.125	75	150	±200	10.1M~30M
0805	0.25	150	300	±200	10.1M~30M
1206	0.50	200	400	±200	10.1M~30M
1210	0.66	200	400	±200	10.1M~30M
2010	1.0	200	400	±200	10.1M~30M
2512	2.0	200	400	±200	10.1M~30M

Notes: For non-standard parts, please contact our sales dept.

Operating Temperature Range ：−55ºC～＋155ºC

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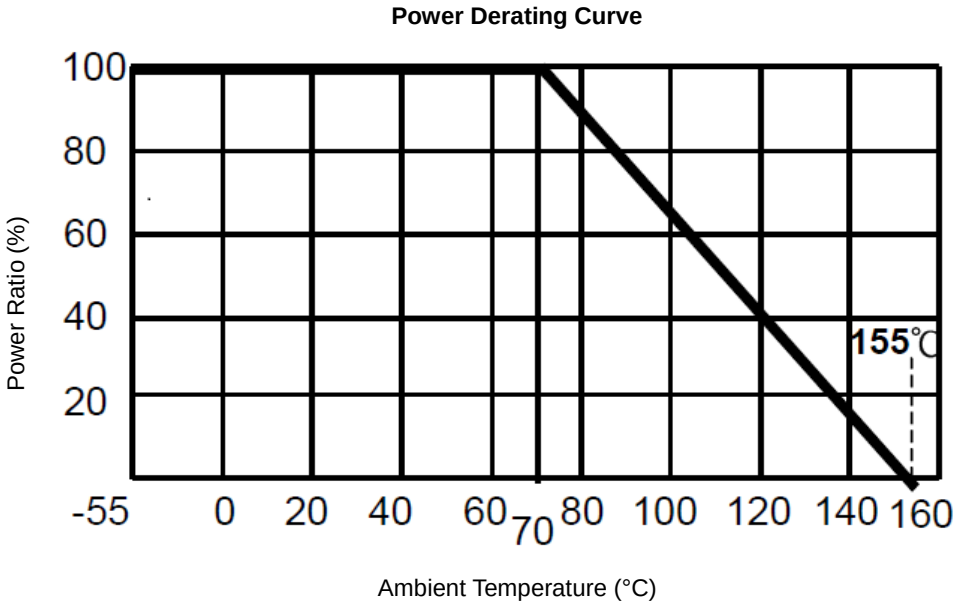
RELIABILITY TEST CONDITION AND REQUIREMENT

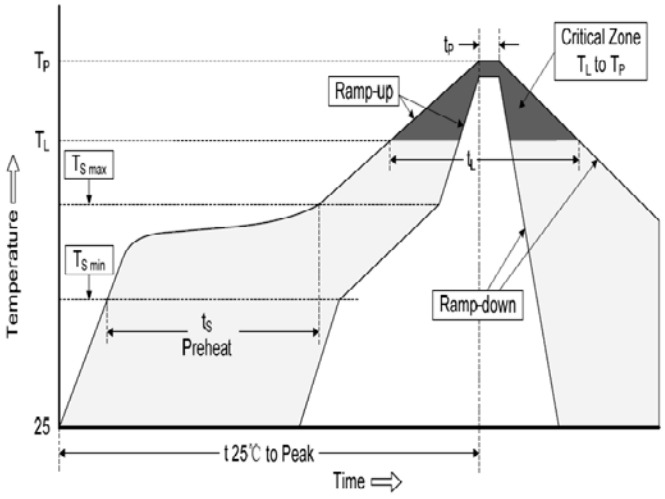
Item	Standard	Condition	Requirement	
			±1%	±5%
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55ºC and 25ºC /+155ºC, 25ºC is the reference temperature	As Specified	As Specified
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	High Power: 2.5 times RCWV or Max. Overload voltage whichever is less for 2 sec.	±(1.0%+0.05Ω)	±(2.0%+0.10Ω)
			Value <1Ω： ±(2.0%+0.1Ω)	
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58	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.	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)
			Value <1Ω：±(1.0%+0.05Ω)	
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≥ 10GΩ	≥ 10GΩ
Temperature Cycling	JESD22 Method JA-104	1,000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	±(0.5%+0.05Ω)	±(1.0%+0.10Ω)
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical - OKEM Clean or equivalent.	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω)	±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1,000 hrs. @ T=125°C. Unpowered. Measurement at 24±4 hours after test	±(0.5%+0.05Ω)	±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω)	±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	As Specified	As Specified
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total 18 shocks.	±(1.0%+0.05Ω)	±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±(1.0%+0.05Ω)	±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0402 / 0603：1KV 0805 and above：2KV	±(3%+0.05Ω)	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155ºC dry heat, (2) 245±5ºC 3 sec.	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC Q200-006	Pressurizing force for 60 seconds 0402 / 0603：8N ; 0805 and above：17.7N	No broken	
Board Flex	AEC Q200-005	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)

POWER DERATING CURVE



SOLDERING RECOMMENDATION

Reflow Condition		
Pre Heat	Temp. Min $T_{s(min)}$	150°C
	Temp. Max $T_{s(max)}$	180°C
	Time (min. to max.) (t_s)	90s ~ 120s
Average ramp up rate (T_L) to peak		3°C/s max.
$T_{s(max)}$ to T_L (Ramp-up rate)		3°C/s max.
Reflow	Temp. (T_L)	220°C
	Time (min. to max.) (t_L)	60s max.
Peak Temperature (T_P)		265°C
Time within 5°C of T_P (t_p)		10s
Ramp-down Rate		6°C/s



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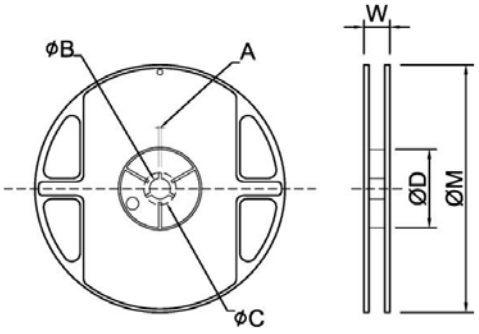
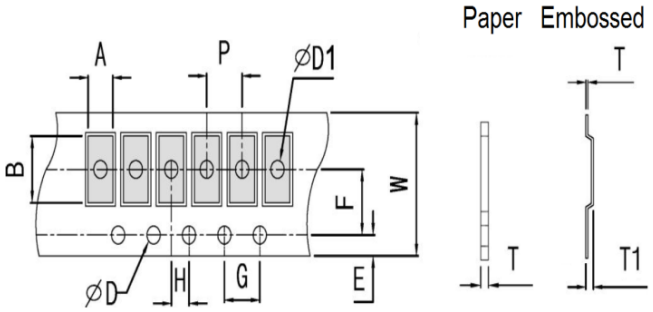
PACKAGING SPECIFICATIONS





Size	Reel Dimension (mm)								
	Type	Quantity	Reel Diameter	A ±0.5	ϕB ±1.0	ϕC ±1.0	ϕD ±1.0	W ±2.0	ϕM ±2.0
0402	Paper	10K	7”	2.0	13.5	21	60	11.5	178
	Paper	40K/50K	13”	2.0	13.5	21	100	11.5	330
0603 0805 1206	Paper	5K	7”	2.0	13.5	21	60	11.5	178
	Paper	10K	10”	2.0	13.5	21	100	11.5	254
	Paper	20K	13”	2.0	13.5	21	100	11.5	330
1210	Paper	5K	7”	2.0	13.5	21	60	11.5	178
1812	Plastic	4K	7”	2.0	13.5	21	60	16.0	178
2010	Plastic	4K	7”	2.0	13.5	21	60	16.0	178
2512	Plastic	4K	7”	2.0	13.5	21	60	16.0	178

Size	Tape Dimension (mm)												
	A	B	W ±0.2	E ±0.10	F ±0.05	G ±0.10	H ±0.05	T ±0.10	ΦD_0 ±0.05	ΦD_1 ±0.1	T1 ±0.15	P ±0.10	Type
0402	0.70±0.10	1.20±0.10	8.00	1.75	3.50	4.00	2.00	0.45	1.55	--	--	2.00	Paper
0603	1.05±0.20	1.80±0.20	8.00	1.75	3.50	4.00	2.00	0.60	1.55	--	--	4.00	Paper
0805	1.55±0.20	2.30±0.20	8.00	1.75	3.50	4.00	2.00	0.75	1.55	--	--	4.00	Paper
1206	1.90±0.20	3.50±0.20	8.00	1.75	3.50	4.00	2.00	0.75	1.55	--	--	4.00	Paper
1210	2.85±0.20	3.50±0.20	8.00	1.75	3.50	4.00	2.00	0.75	1.55	--	--	4.00	Paper
1812	3.30±0.20	4.60±0.20	12.0	1.75	5.50	4.0	2.0	0.23	1.55	1.50	0.85	4.00	Plastic
2010	2.80±0.20	5.60±0.20	12.0	1.75	5.50	4.0	2.0	0.23	1.55	1.50	0.85	4.00	Plastic
2512	3.40±0.20	6.70±0.20	12.0	1.75	5.50	4.0	2.0	0.23	1.55	1.50	0.85	4.00	Plastic

*Specifications subject to change without notice.