Data Sheet

Customer:	
Product:	Automotive Grade Chip Resistor – CR..A Series
Size:	0201/0402/0603/0805/1206/1210/2010/2512
Issued Date:	21-Oct-19
Edition:	REV.B1

VIKING TECH CORPORATION
光頡科技股份有限公司
No.70 Guangfu N. Rd., Hukou Township, Hsinchu County 303, Taiwan

TEL:886-3-5972931
FAX:886-3-5972935•886-3-5973494
E-mail:sales@viking.com.tw

VIKING TECH CORPORATION KAOHSIUNG BRANCH
光頡科技股份有限公司高雄分公司
No.248-3, Sin-Sheng Rd., Cian-Jhen Dist., Kaohsiung, 806, Taiwan

TEL:886-7-8217999
FAX:886-7-8228229
E-mail:sales@viking.com.tw

VIKING ELECTRONICS (WUXI) CO., LTD.
光頡電子(無錫)有限公司
No.22 Xixia Road, Machinery & Industry Park, National Hi-Tech Industrial Development Zone of Wuxi, Wuxi, Jiangsu Province, China
Zip Code:214028
TEL:86-510-85203339
FAX:86-510-85203667•86-510-85203977
E-mail:china@viking.com.tw

Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
21-Oct-19	21-Oct-19	21-Oct-19	21-Oct-19	
Susan Huang	***J.C. Liu***	***J.C. Liu***		

Automotive Grade Chip Resistor-CR..A Series

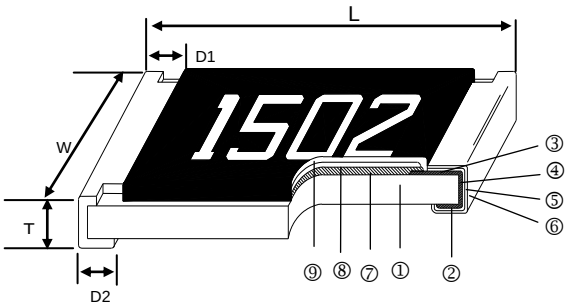
■Scope

—This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

■Features

—AEC-Q200 Compliance
—Highly reliable multilayer electrode construction
—Compatible with all soldering process
—100% CCD inspection

■Construction



■Applications

—Automotive Industry
—Telecommunication Equipments
—Radio and Tape Recorders, TV Tuners
—Digital Cameras, Watches, Pocket Calculators
—Computers, Instruments
—Medical Equipment

①	Alumina Substrate	④	Edge Electrode	⑦	Resistor Layer
②	Bottom Electrode	⑤	Barrier Layer	⑧	Primary Overcoat
③	Top Electrode	⑥	External Electrode	⑨	Secondary Overcoat

■Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
CR-01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.150
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

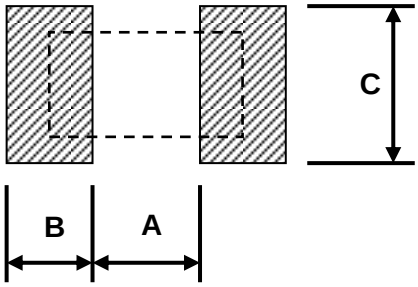
■Part Numbering

Part Number：CR-03FA7---10R

CR-	03	F	A	7	-	-	-	1	0	R

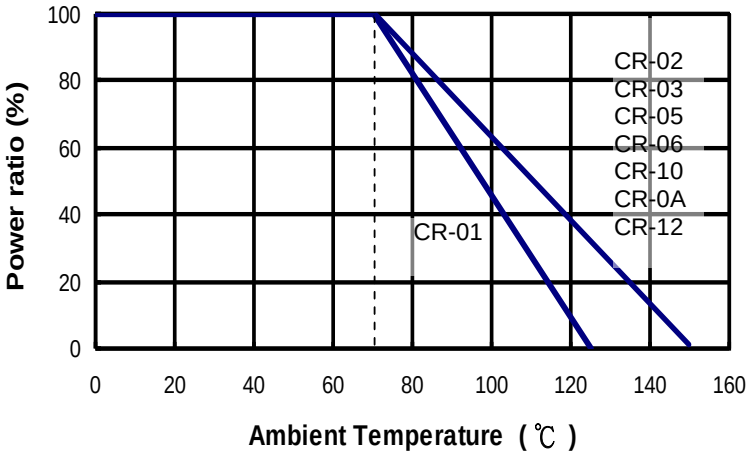
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
CR-	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	A: Automotive Grade C: High Power & Automotive Grade	4: 7” Reel 4Kpcs 6: 7” Reel 10Kpcs 7: 7” Reel 5Kpcs 9: 10” Reel 8Kpcs A: 10” Reel 10Kpcs B: 10” Reel 20Kpcs C: 13” Reel 40Kpcs D: 13” Reel 20Kpcs	- - - 1R2: 1.2Ω - - - 3K3: 3.3KΩ - - - 10K: 10KΩ - - 100K: 100KΩ “-“ to fill up 6 spaces

■Recommend Land Pattern

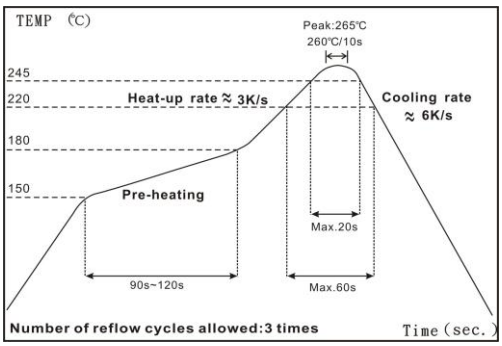


Type	A (mm)	B (mm)	C (mm)
CR-01	0.30	0.25	0.30
CR-02	0.50	0.45	0.60
CR-03	0.90	0.60	0.90
CR-05	1.20	0.70	1.30
CR-06	2.00	0.90	1.60
CR-10	2.00	0.90	2.80
CR-0A	3.80	0.90	2.80
CR-12	4.90	1.60	3.50

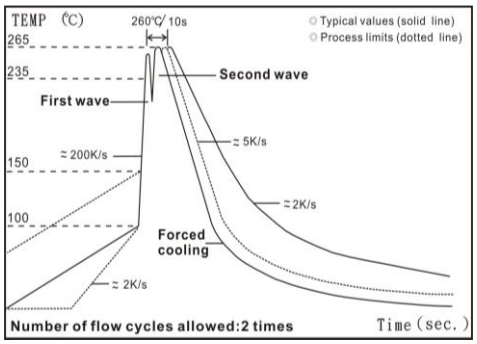
■Derating Curve



■Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

(1) Time of IR reflow soldering at maximum temperature point 260°C：10s

(2) Time of wave soldering at maximum temperature point 260°C：10s

(3) Time of soldering iron at maximum temperature point 410°C：5s

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%(E24、E96)	±5%(E24)	
CR-01 (0201)	1/20W	-55 ~ +125°C	25V	50V	1Ω - 10MΩ		±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CR-06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CR-10 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2.5A				-	0Ω (<50mΩ)	-
CR-0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 3.5A				-	0Ω (<50mΩ)	-
CR-12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 4A				-	0Ω (<50mΩ)	-

■High Precision Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24、E96)	TCR (PPM/°C)
					±0.5%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	10Ω - 1MΩ	±100
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ	±100
CR-05 (0805)	1/8W		150V	300V	10Ω - 1MΩ	±100
CR-06 (1206)	1/4W		200V	400V	10Ω - 1MΩ	±100
CR-10 (1210)	1/3W		200V	400V	10Ω - 1MΩ	±100
CR-0A (2010)	3/4W		200V	400V	10Ω - 1MΩ	±100
CR-12 (2512)	1W		250V	500V	10Ω - 1MΩ	±100

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1% (E24、E96)	±5% (E24)	
CR-02 (0402)	1/8W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ		±200 ±100
CR-03 (0603)	1/4W		75V	150V			
CR-05 (0805)	1/3W		150V	300V			
CR-06 (1206)	1/2W		200V	400V			
CR-0A (2010)	1W		200V	400V			
CR-12 (2512)	2W		250V	500V			

Operating Voltage=$\sqrt{}$(P*R) or Max. Operating Voltage listed above, whichever is lower.
Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. Overload Voltage listed above, whichever is lower.
The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155 ° C.
■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G			**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	**MIL-STD-202 Method 108** Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	**MIL-STD-202 Method 103** 1000 hrs 85°C/85%RH 10% of operating power
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	**MIL-STD-202 Method 108** at +125/+155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**AEC-Q200-005** Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm

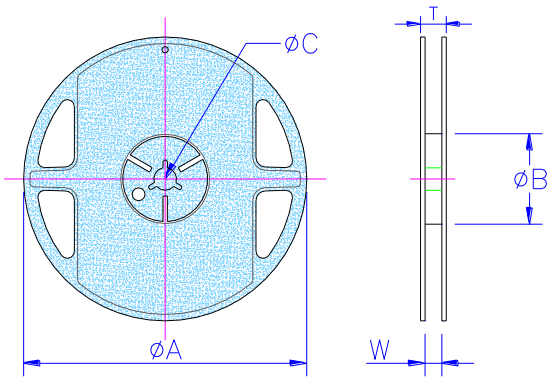
Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Solderability	95% min. coverage			**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** **J-STD-002** 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 210** 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			**JIS-C-5201-1 4.7** **IEC-60115-1 4.7** 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			**JIS-C-5201-1 4.18** **IEC-60068-2-58 8.2.1** 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	**JESD22 Method JA-104** -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)			**AEC-Q200-002** Human body model 0201: 0.5KV 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.			**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			**AEC-Q200-006** Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			**UL-94** V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%		<50mΩ	**EIA-977 (Condition A)** 60±2°C, no power rating for 480 hrs.

RCWV(Rated Continuous Working Voltage)=$\sqrt{}$(P*R) or Max. Operating Voltage whichever is lower.

■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

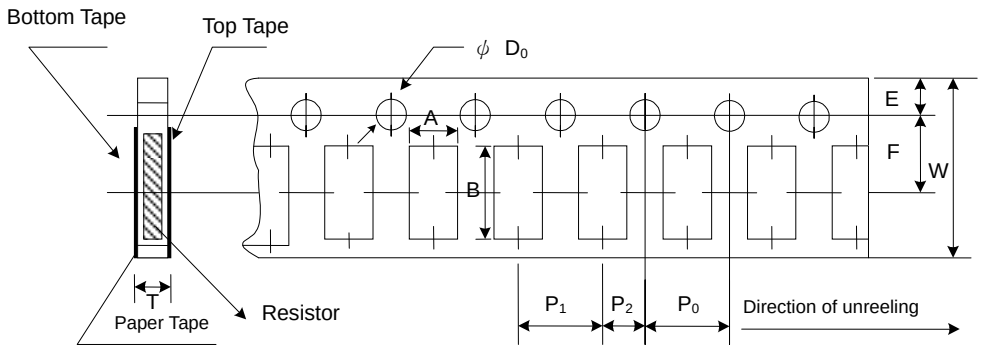
■Packaging

Reel Specifications & Packaging Quantity



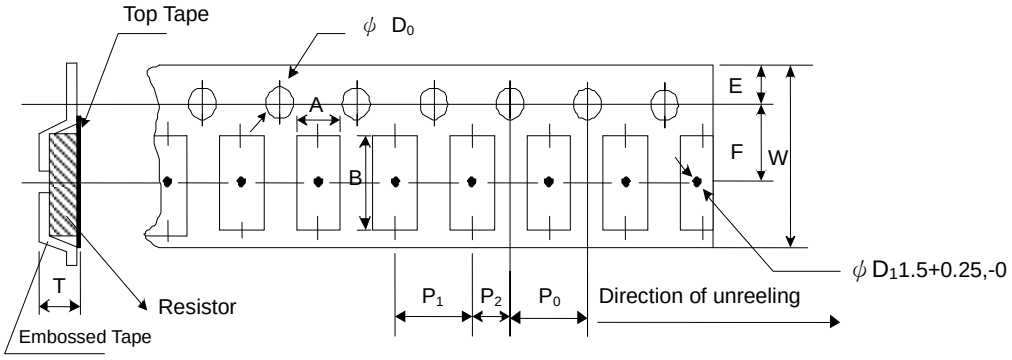
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
CR-01 CR-02	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-03 CR-05 CR-06 CR-10	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-0A CR-12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
CR-01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CR-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CR-05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
CR-0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
CR-12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Marking

No Marking for 0201/0402

Jumper for all: Letter “0”

1% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	1000	2201	1002	4992	1003

5% for 0603/0805/1206/1210/2010/2512: 3 digits marking in E24

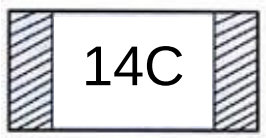
Example: 101=100Ω 102=1KΩ (1^{st} and 2^{nd} are E24 code and 3^{rd} code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91

1% for 0603(E24): 3 digits marking in E24, When the E24 and E96 are the same resistance, this marking in E96

Example: 01A= 100Ω 05C=11KΩ 123=12KΩ 273=27KΩ

1% for 0603(E96): 3 digits marking in E96



3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω

68B=4K99Ω 68X=49.9Ω

Marking Table

Code	E96	Code	E96	Code	E96	Code	E96
01	100	**25**	178	**49**	316	**73**	562
02	102	**26**	182	**50**	324	**74**	576
03	105	**27**	187	**51**	332	**75**	590
04	107	**28**	191	**52**	340	**76**	604
05	110	**29**	196	**53**	348	**77**	619
06	113	**30**	200	**54**	357	**78**	634
07	115	**31**	205	**55**	365	**79**	649
08	118	**32**	210	**56**	374	**80**	665
09	121	**33**	215	**57**	383	**81**	681
10	124	**34**	221	**58**	392	**82**	698
11	127	**35**	226	**59**	402	**83**	715
12	130	**36**	232	**60**	412	**84**	732
13	133	**37**	237	**61**	422	**85**	750
14	137	**38**	243	**62**	432	**86**	768
15	140	**39**	249	**63**	442	**87**	787
16	143	**40**	255	**64**	453	**88**	806
17	147	**41**	261	**65**	464	**89**	825
18	150	**42**	267	**66**	475	**90**	845
19	154	**43**	274	**67**	487	**91**	866
20	158	**44**	280	**68**	499	**92**	887
21	162	**45**	287	**69**	511	**93**	909
22	165	**46**	294	**70**	523	**94**	931
23	169	**47**	301	**71**	536	**95**	953
24	174	**48**	309	**72**	549	**96**	976

Code	A	B	C	D	E	F	G	X	Y		
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^{-1}	10^{-2}		

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A5	Apr 30, 2015	-	- Environmental Characteristics updated
Version A6	Jun 18, 2015	-	- Increased 0603(E24) 1% marking description
Version A7	Jul 15, 2016	-	- Remove Material Description - Size CR-01 specifications added - Modify Storage Temperature - Increased 0.5% Resistance Range - Increased High Power Rating Electrical Specifications
Version A8	Jan 12, 2018	-	- Environmental Characteristics updated - Modify Electrical Specifications (0R) - Modify 2512 Land Pattern
Version A9	May 20, 2019	-	- Modify TCR Test description - Features added 100% CCD inspection - Added Sulfur Test
Version B	Jun 1, 2019	-	- Modify ESD Test description & Spec.
Version B1	Oct 21, 2019	-	- increase 2512 2W Specifications - increase Special standard packaging specifications (disc 10" & 13")