



炬鹿科技有限公司
RIDEE TECH COMPANY LIMITED

Revision Date : 2023 / 07 / 05

APPROVAL SHEET

Product Name : AEC-Q200 Thick Film Chip Resistor

Part No. : TCQ Series

Description : Size 0402~2512

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For more contact information, please refer to our website: www.rideetech.com



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AEC-Q200 Thick Film Chip Resistor - TCQ Series

■ Applications

- Automotive electronics
- Heating, Ventilating and Air conditioning
- Indoor lighting, Central door locking, Wiper module
- Navigation equipment, TPMS



■ Features

- Small size available
- AEC-Q200 compliant
- CCD visual quality inspection
- Reliability, high quality

■ Part Number Explanation

TCQ	0603	F	10R0	T	P
Product	Size (Inch)	Tolerance	Resistance	Packaging	Functional
AEC-Q200 Thick Film Chip Resistor	0402 0603 0805 1206 1210 1812 2010 2512	B=±0.1% D=±0.5% F=±1% G=±2% J=±5%	0R00=0Ω R010=10mΩ R100=100mΩ 1R00=1Ω 10R0=10Ω 100R :100Ω 1K00 :1KΩ 1M00=1MΩ	T=Tape & Reel	S=Standard P=High Power U=Ultra High Power



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■ Standard Electrical Specifications

Type	Item	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range		
						B(±0.1%) D(±0.5%)	F(±1%) G(±2%)	J(±5%)
TCQ 0402	0.063W	50V	100V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 0603	0.1W	75V	150V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 0805	0.125W	150V	300V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 1206	0.25W	200V	400V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 1210	0.5W			±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 1812	0.75W			±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 2010	0.75W			±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 2512	1W			±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

Type	0402	0603	0805	1206	1210	1812	2010	1218	2512
Jumper Resistance Value	50mΩMax								
Jumper Rated Current	1A				2A				



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High Power Electrical Specifications

Item Type	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/ °C)	Resistance Range	
					F(±1%)	J(±5%)
TCQ 0402	0.1W	50V	100V	±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 0603	0.125 W	75V	150V	±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 0805	0.25 W	150V	300V	±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 1206	0.5 W	200V	400V	±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 1210	0.66 W			±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 1812	1 W			±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 2010	1 W			±400	1Ω≤R<10Ω	
				±100	10Ω≤R≤10MΩ	
TCQ 2512	2 W	±400	1Ω≤R<10Ω			
		±100	10Ω≤R≤10MΩ			

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ + 155°C.

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	50mΩMax							
Jumper Rated Current	1A				2A			



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■ Ultra High Power Rating Electrical Specifications

Type	Item	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/)	Resistance Range		
						D(±0.5%)	F(±1%) G(±2%)	J(±5%)
TCQ 0402	0.125W	50V	100V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 0603	0.33W	75V	125V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 0805	0.5W	200V	300V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 1206	0.75W	200V	400V	±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 1210	1 W			±400	-	1Ω≤R<10Ω		
				±100	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 2010	1.5 W			±400	-	1Ω≤R<10Ω		
				±150	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		
TCQ 2512	3W	250V	500V	±400	-	1Ω≤R<10Ω		
				±150	10Ω≤R≤1MΩ	10Ω≤R≤10MΩ		

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.



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■ Low Ohm Chip Resistor- Standard Electrical Specifications

Item Type	Rated Power at 70°C	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range (mΩ)
					F(±1%)、J(±5%)
TCQ 0402	0.063W	0.12~0.25V	0.624V	±1000	220≤R≤450
					±800
TCQ 0603	0.1W	0.09~0.31V	0.775V	±1000	75≤R<100
				±800	100≤R≤330
				±600	330<R<1000
TCQ 0805	0.125W	0.04~0.35V	0.875V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000
TCQ 1206	0.25W	0.05~0.5V	1.25V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000
TCQ 1210	0.5W	0.07~0.7V	1.75V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000
TCQ 1812	0.75W	0.08~0.8V	2.15V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000
TCQ 2010	0.75W	0.08~0.8V	2.15V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000
TCQ 2512	1W	0.1~0.99V	2.475V	±1800	10≤R<50
				±800	50≤R<100
				±600	100≤R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

■ High Ohm Chip Resistor - Standard Electrical Specifications

Item Type	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range	
					F(±1%)	J(±5%)
TCQ 0402	0.063W	50V	100V	±200	10.1MΩ	10.1MΩ
TCQ 0603	0.1W	75V	150V			
TCQ 0805	0.125W	150V	300V			
TCQ 1206	0.25W	200V	400V			
TCQ 1210	0.5W					
TCQ 1812	0.75W					
TCQ 2010	0.75W					
TCQ 2512	1W					

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.



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■ Low Ohm Chip Resistor- High Power Electrical Specifications

Item Type	Rated Power at 70°C	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range (mΩ)	
					F(±1%)、J(±5%)	
TCQ 0402	0.1W	0.15~0.31V	0.786V	±1000	220≤R≤450	
					450<R<1000	
TCQ 0603	0.125W	0.1~0.35V	0.879V	±1000	75≤R<100	
				±800	100≤R≤330	
				±600	330<R<1000	
TCQ 0805	0.25W	0.05~0.5V	1.244V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	
TCQ 1206	0.5W	0.07~0.7V	1.759V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	
TCQ 1210	0.66W	0.08~0.81V	2.021V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	
TCQ 1812	1W	0.1~0.99V	2.487V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	
TCQ 2010	1W	0.1~0.99V	2.487V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	
TCQ 2512	2W	0.14~1.41V	3.518V	±1800	10≤R<50	
				±800	50≤R<100	
				±600	100≤R<1000	

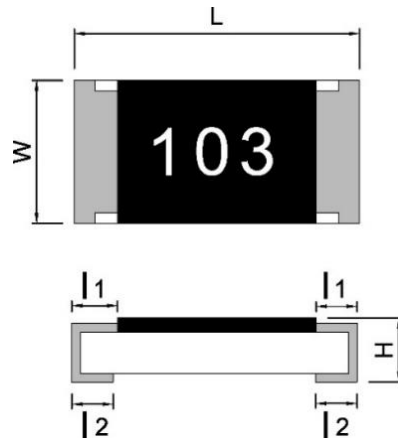
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

■ High Ohm Chip Resistor - High Power Electrical Specifications

Item Type	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range			
					F(±1%)	J(±5%)		
TCQ 0402	0.1W	50V	100V	±200	10.1MΩ	10.1MΩ		
TCQ 0603	0.125 W	75V	150V					
TCQ 0805	0.25 W	150V	300V					
TCQ 1206	0.5 W	200V	400V				~	~
TCQ 1210	0.66 W						30MΩ	30MΩ
TCQ 2010	1 W							
TCQ 2512	2 W							

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

■ Type Dimension



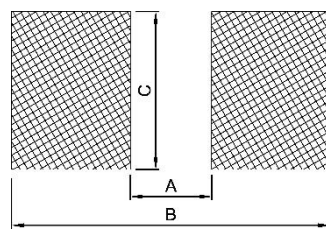
■ Dimension

Unit: mm

TYPE	L	W	H	l1	l2
0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
0603	1.60 ± 0.20	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
1206	3.05 ± 0.10	1.60 ± 0.20	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
1210	3.05 ± 0.10	2.50 ± 0.20	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
1812	4.50 ± 0.10	3.10 ± 0.20	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

● General Information

■ Recommend Land Pattern Design



■ Dimension

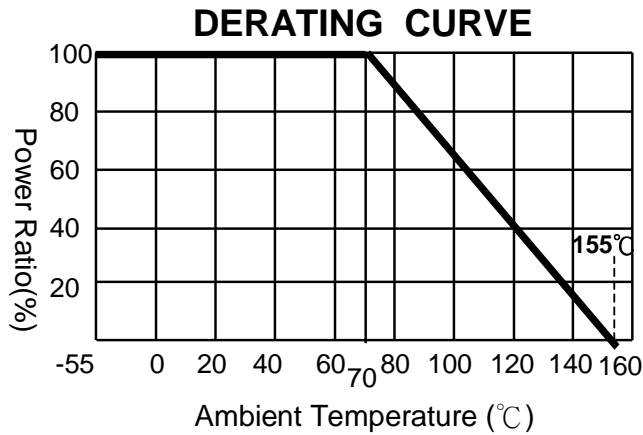
Unit:mm

Type	0402	0603	0805	1206	1210	1812	2010	2512
A	0.60	0.80	1.30	2.20	2.00	3.11	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	5.91	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	3.00	2.70	3.40



■ Performance Characteristics

■ Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

■ Voltage Rating or Current Rating

Resistance Range: $\geq 1\Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Power rating(W)

R=Nominal resistance(Ω)



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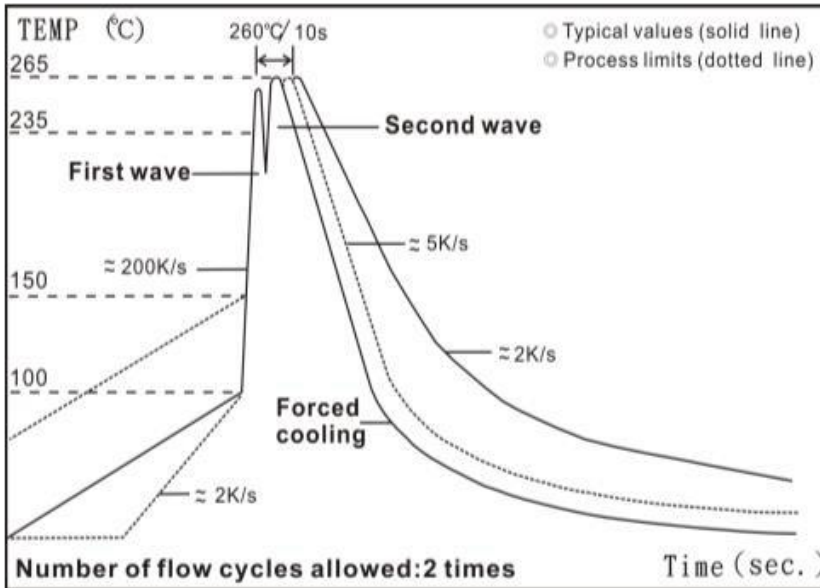
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■ Reliability Test and Requirement

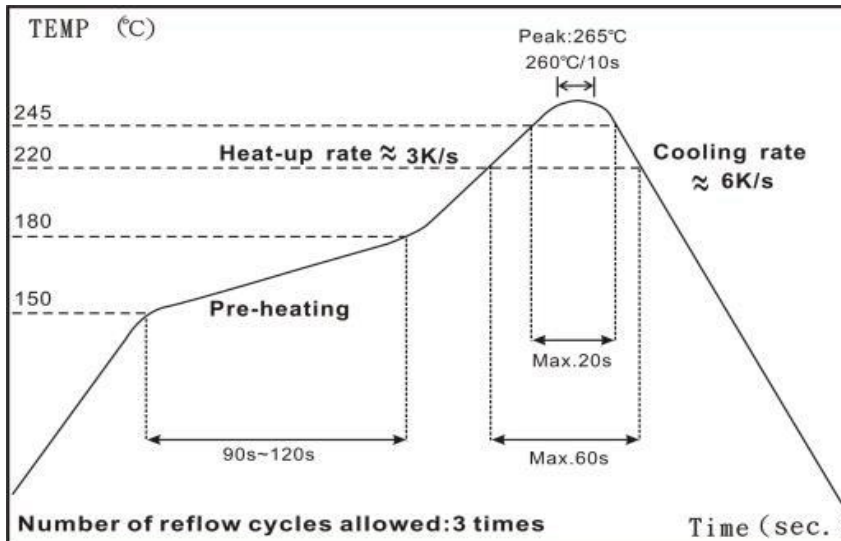
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+155°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	High Power : 2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds.	±1 : ±(1.0%+0.05Ω) ±5 : ±(2.0%+0.1Ω) Value <1Ω : ±(2.0%+0.1Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5°C for 30 seconds.	>95% Coverage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	±1 : ±(0.5%+0.05Ω) ±5 : ±(1.0%+0.05Ω) Value <1Ω : ±(1.0%+0.05Ω)
Insulation Resistance	JJIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≥10GΩ
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	1% : ±(0.5%+0.05Ω) 5% : ±(1.0%+0.10Ω)
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical - OKEM Clean or equivalent.	1% : ±(0.5%+0.05Ω) 5% : ±(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% : ±(1.0%+0.05Ω) 5% : ±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=125°C. Unpowered. Measurement at 24±4 hours after test conclusion.	1% : ±(0.5%+0.05Ω) 5% : ±(2.0%+0.05Ω)
Operation 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% : ±(1.0%+0.05Ω) 5% : ±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	-
Mechanical Shock	MIL-STD-202 Method 213)Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 10 shocks in each direction, total30 shocks.	±1 : ±(1.0%+0.05Ω) ±5 : ±(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 H	±1 : ±(1.0%+0.05Ω) ±5 : ±(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)
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat (2) 245±5°C 3 sec.	±1 : ±(0.5%+0.05Ω) ±5 : ±(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	Beading once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm	±1 : ±(1.0%+0.05Ω) ±5 : ±(1.0%+0.05Ω)

■ Recommended Customer Soldering Parameters

■ Wave solder Temperature condition



■ Solder reflow Temperature condition



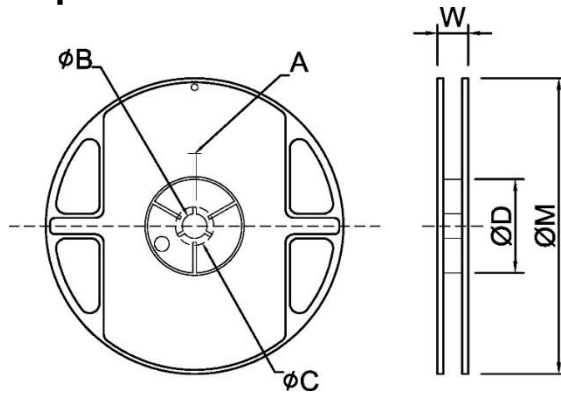
■ Rework temperature (hot air equipment) : 350°C, 3~5seconds

■ Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements

Appendix For SMD Chip Resistor Packaging Information

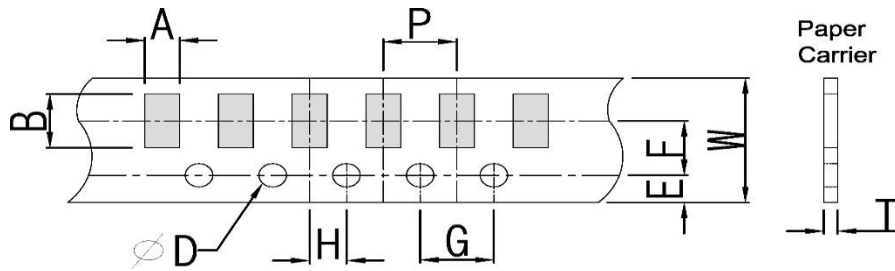


Dimension

Unit:mm

TYPE	SIZE	A	ϕB	ϕC	ϕD	W	ϕM	
0402	7"	10K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
0603 / 0805 / 1206 / 1210	7"	5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
2010 / 2512 / 1812	7"	4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0

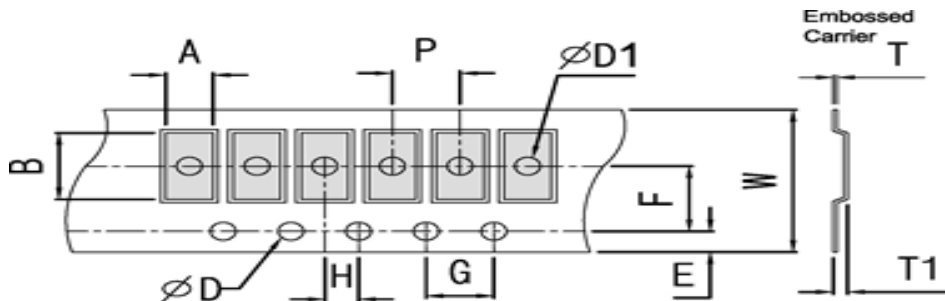
Tapping Specification



Dimension

Unit:mm

Packaging	Type	A	B	W	E	F	G	H	T	ϕD	P
Paper Type	0402	0.70±0.1	1.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.45±0.1	1.5 ^{+0.1}	2.0±0.1
	0603	1.05±0.2	1.80±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.60±0.1		
	0805	1.55±0.2	2.30±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1	1.5 ⁻⁰	4.0±0.1
	1206	1.90±0.2	3.50±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		
	1210	2.85±0.2	3.50±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		



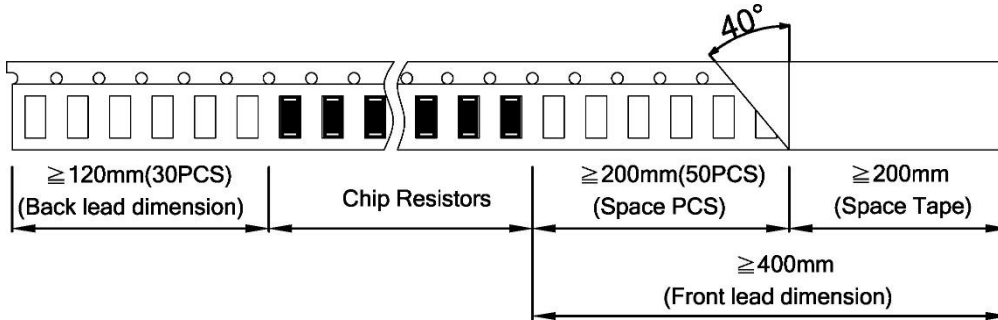
Dimension

Unit:mm

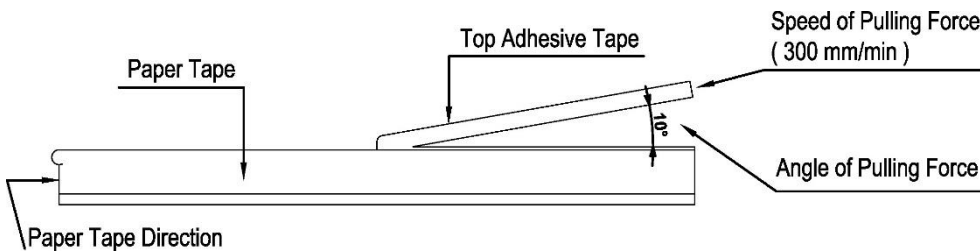
Packaging	Type	A	B	W	E	F	G	H	T	ϕD	$\psi D1$	T1	P
Embossed Type	2010	2.80±0.20	5.60±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10	1.5 ^{+0.1}	1.50±0.10	0.85±0.15	4.0±0.1
	2512	3.40±0.20	6.70±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10		1.50±0.10	0.85±0.15	
	1812	3.30±0.20	4.60±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10	1.50±0.10	0.85±0.15		

■ Packing Material Data/Storage Data

■ Front & Back Lead Dimension

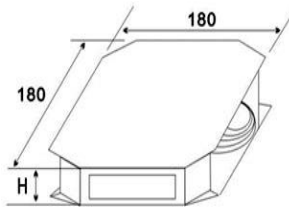


■ Top Adhesive Peel Off Strength : 10~70g

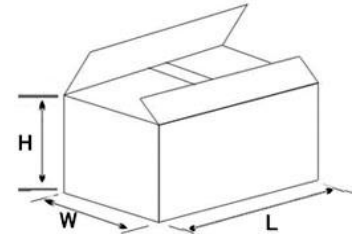


■ Package

Inner Box Size	
Reel	Size H(mm)
1	13
2	24
3	36
5	60
10	113



External Box Size			
Contain (Kpcs)	Length (mm)	Width (mm)	Height (mm)
25K	180	180	60
50K	180	180	110
150K	430	200	200
300K	400	400	200



■ Storage Data :

Storage time at the environment temp: $25\pm 5^\circ\text{C}$ & humidity: $60\pm 20\%$ is valid for one year from the date of delivery.

■ Product Testing Method:

Our products are tested with our company's tapping & testing equipments by using four-feet probe to touch at the back of both electrodes. Supposed different testing points or methods are requested, please advise beforehand and customized-made production is available.

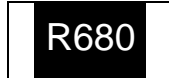
■ mΩ Resistance Codes



0402: no marking



0603: 3digits



0805~2512: 4digits

■0402 : No marking

■0603 : 3 digit marking

For E-24 values:

Resistance value	Code	Example
10mΩ ~ 99mΩ	0XX	068 = 68mΩ
100mΩ ~ 990mΩ	RXX	R68 = 680mΩ

E-24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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For E-96 values: excluding values 10/11/13/15/20/75 of E-24 series.

★Standard E-96 Values and 0603 Resistance Codes

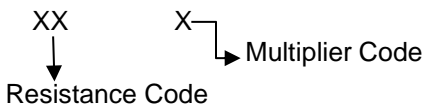
R-Value	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147	150	154	158	162	165	169	174
Code	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
R-Value	178	182	187	191	196	200	205	210	215	221	226	232	237	243	249	255	261	267	274	280	287	294	301	309
Code	25	26	27	28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

★E-96 Multiplier Code

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10 ⁰	10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁻¹	10 ⁻²	10 ⁻³

★0603 3 digits coding formula for E-96 values as following:

CODING FORMULA



$$\text{Example: } 499 \text{ m}\Omega = \frac{499}{68} \times \frac{10^{-3}}{Z} \Omega = \mathbf{68Z}$$

■0805~2512: 4 digit marking

For E-24 values

Resistance value	Code	Example
10mΩ ~ 990mΩ	RXXX	R680 = 680mΩ

■ Note : jumper zero ohm resistor marking code is one 「0」 (except type below 0402).