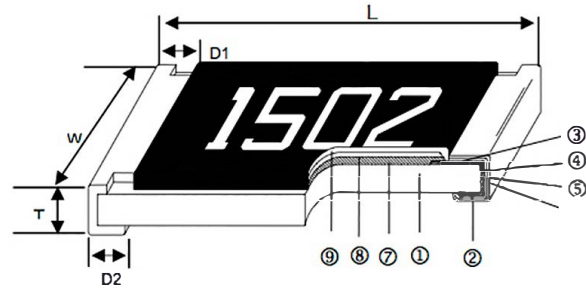




Automotive Grade Chip Resistor – CAR Series



Construction



Features

- AEC-Q200 Compliance
- Highly reliable multilayer electrode construction
- Compatible with all soldering process

Applications

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

① Alumina Substrate	④ Edge Electrode (NiCr)	⑦ Resistor Layer (RuO ₂ /Ag)
② Bottom Electrode (Ag)	⑤ Barrier Layer (Ni)	⑧ Primary Overcoat (Glass)
③ Top Electrode (Ag-Pd)	⑥ External Electrode (Sn)	⑨ Secondary Overcoat (Epoxy)

Dimensions

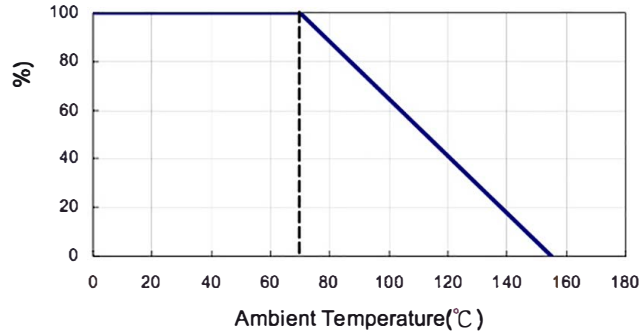
Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
CAR02	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.150
CAR04	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
CAR06	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
CAR10	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
CAR12	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
CAR14	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
CAR20	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
CAR25	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 :
CAR06F1002CT

Product Type	Dimensions	Resistance Tolerance	Resistance	Packaging Code	FUNCTION CODE
CAR	02: 0201 04: 0402 06: 0603 10: 0805 12: 1206 14: 1210 20: 2010 25: 2512	D: ±0.5% F: ±1% J: ±5%	5% - 3 Digit: 1st 2 are significant, 3rd is multiplier (10x), "R" indicates decimal on value <10ohm, 000 jumper "0" ohm .5%, 1% - 4 digit: 1st 3 are significant, 4th is multiplier (10x), "R" indicates decimal on value <100 ohm	CT: Taping Reel CTD: Package Designator page 6. CTG: Package Designator page 6. CTQ: Package Designator page 6.	_: Standard - H: High Power - X: High Precision

Derating Curve



Automotive Grade Chip Resistor

Standard Electrical Specifications

Type	Item	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)	
CAR02 (0201)	1/20W	Jumper: 1A	-55 ~ +125°C	25V	50V	1Ω - 10MΩ		±200
	-					0Ω (<50mΩ)	-	
CAR04 (0402)	1/16W	Jumper: 1A	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR06 (0603)	1/10W	Jumper: 1A	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR10 (0805)	1/8W	Jumper: 2A	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR12 (1206)	1/4W	Jumper: 2A	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR14 (1210)	1/2W	Jumper: 2.5A	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR20 (2010)	3/4W	Jumper: 3.5A	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	
CAR25 (2512)	1W	Jumper: 4A	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	-					0Ω (<50mΩ)	-	

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

■ Cal-Chip is capable of manufacturing the optional spec based on customer's requirement.

Automotive Grade Chip Resistor

High Precision Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24 · E96)	TCR (PPM/°C)
					±0.5%	
CAR04 (0402)	1/16W	-55 ~ +155°C	50V	100V	10Ω - 1MΩ	±100
CAR06 (0603)	1/10W		75V	150V	10Ω - 1MΩ	±100
CAR10 (0805)	1/8W		150V	300V	10Ω - 1MΩ	±100
CAR12 (1206)	1/4W		200V	400V	10Ω - 1MΩ	±100
CAR14 (1210)	1/3W		200V	400V	10Ω - 1MΩ	±100
CAR20 (2010)	3/4W		200V	400V	10Ω - 1MΩ	±100
CAR25 (2512)	1W		250V	500V	10Ω - 1MΩ	±100

Automotive Grade Chip Resistor

High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24 · E96)	±1% (E24 · E96)	±5% (E24)	
CAR04 (0402)	1/8W	-55 ~ +155°C	50V	100V	-	1Ω - 9.76Ω	±200	
					10Ω - 1MΩ	±100		
CAR06 (0603)	1/4W		75V	150V	-	1Ω - 9.76Ω	±200	
					10Ω - 1MΩ	±100		
CAR10 (0805)	1/3W		150V	300V	-	1Ω - 9.76Ω	±200	
					10Ω - 1MΩ	±100		
CAR12 (1206)	1/2W		200V	400V	-	1Ω - 9.76Ω	±200	
		10Ω - 1MΩ			±100			
CAR20 (2010)	1W	200V	400V	-	1Ω - 9.76Ω	±200		
				10Ω - 1MΩ	±100			
CAR25 (2512)	2W	250V	500V	-	1Ω - 9.76Ω	±200		
				10Ω - 1MΩ	±100			

Operating Voltage = $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage = $2.5 \cdot \sqrt{P \cdot R}$ 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.

Cal-Chip is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

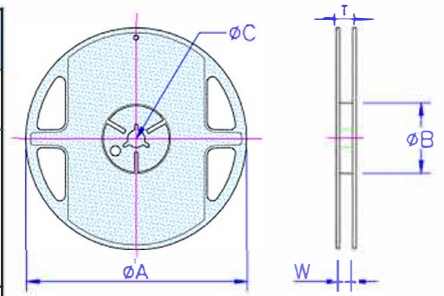
Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C--+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. Overload voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	70±2°C, Max. Working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Thermal Shock	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15minutes. Air-Air.
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%			260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	-55°C to +125°C, 1000 cycles
Moisture Resistance	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	24 hrs/cycle
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	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	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1%+0.05Ω)			Human body, 2KV
Flame Retardance	Not flame			Temperature sensing at 500°C, voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour.
Resistance to solvents	Marking Unsmearred			Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	Not Broken			Force of 1.8kg for 60 seconds.

■ Packaging

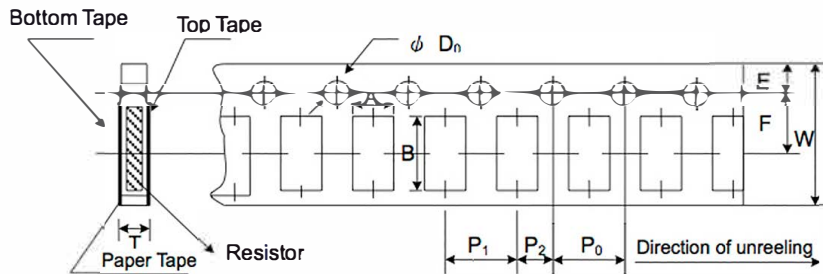
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
CAR04	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CAR06 CAR10 CAR12 CAR14	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CAR20 CAR25	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5



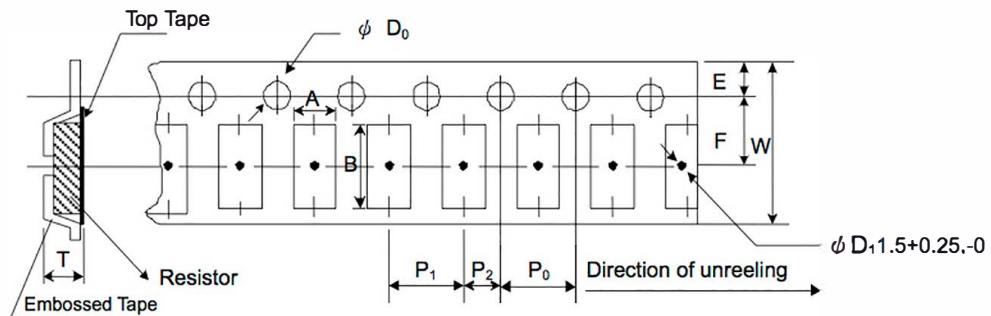
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CAR04	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
CAR06	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
CAR10	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
CAR12	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
CAR14	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

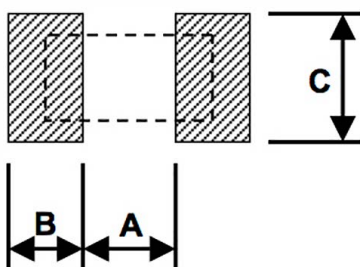


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CAR20	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
CAR25	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

■ Recommend Land Pattern

Unit: mm



Type	A	B	C
CAR04	0.50	0.45	0.60
CAR06	0.90	0.60	0.90
CAR10	1.20	0.70	1.30
CAR12	2.00	0.90	1.60
CAR14	2.00	0.90	2.80
CAR20	3.80	0.90	2.80
CAR25	3.80	1.60	3.50

RM PACKAGING DESIGNATORS

Type	BLANK	D	G
CAR02	15K		
CAR04	10K		
CAR06	5K		
CAR10	5K	10K	20K
CAR12	5K	10K	20K
CAR14	5K	10K	20K
CAR20	4K		
CAR25	4K		