

AUTOMOTIVE GRADE CHIP RESISTOR

- CAR SERIES -

FEATURES

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

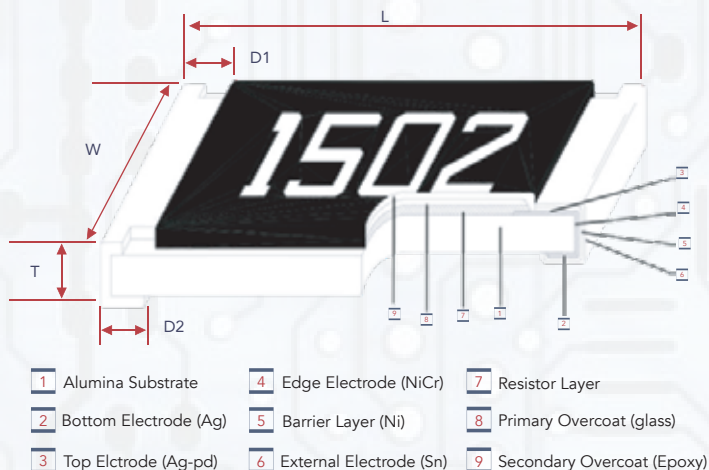
APPLICATIONS

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

PART NUMBERING GUIDE

CAR	06	F	1002	CT	
TYPE	DIMENSIONS	RESISTANCE TOLERANCE	NOMINAL RESISTANCE	PACKAGING CODE	FUNCTION CODE
CAR SERIES	02: 0201 04: 0402 06: 0603 10: 0805 12: 1206 14: 1210 20: 2010 25: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	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 CTG: Package	___: Standard -H: High Power -X: High Precision

CONSTRUCTION

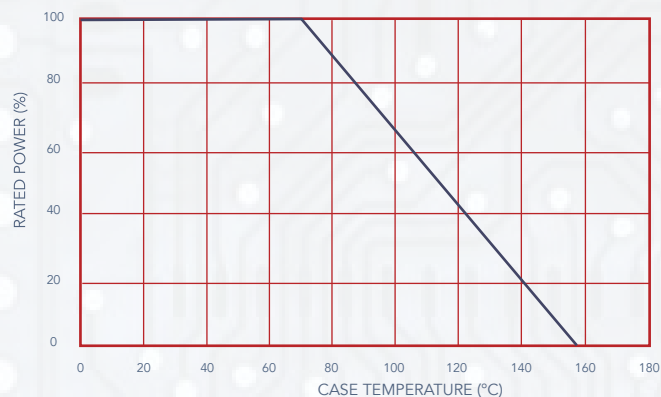


DIMENSIONS

TYPE	SIZE (INCH)	L	W	T	D1	D2	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		15.959		
CAR20	2010	5.00±0.10	2.50±0.15		24.241		
CAR25	2512	6.35±0.10	3.10±0.15		39.448		



DERATING CURVE



STANDARD ELECTRICAL SPECIFICATIONS

TYPE	POWER RATING AT 70°C	OPERATING TEMPERATURE	MAX OPERATING VOLTAGE	MAX OVERLOAD VOLTAGE	RESISTANCE RANGE		TCR (PPM/°C)
					±1% (E24 - E96)	±5% (E24)	
CAR02 (0201)	1/20W	-55 ~ +125°C	25V	50V	1Ω - 10MΩ		±200
	JUMPER: 1A				-	0Ω (<50mΩ)	-
CAR04 0402	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 1A				-	0Ω (<50mΩ)	-
CAR06 0603	1/10W		75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 2A				-	0Ω (<50mΩ)	-
CAR10 0805	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 2A				-	0Ω (<50mΩ)	-
CAR12 1206	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 2A				-	0Ω (<50mΩ)	-
CAR14 1210	1/2W				1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 2.5A				-	0Ω (<50mΩ)	-
CAR20 2010	3/4				1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 3.5A				-	0Ω (<50mΩ)	-
CAR25 2512	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	JUMPER: 4A				-	0Ω (<50mΩ)	-

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

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

CalChip is capable of manufacturing the optional spec based on customer's requirement



HIGH PRECISION ELECTRICAL SPECIFICATIONS

TYPE	POWER RATING AT 70°C	OPERATING TEMPERATURE	MAX OPERATING VOLTAGE	MAX OVERLOAD VOLTAGE	RESISTANCE RANGE	TCR (PPM/°C)	
					±0.05%		
CAR04 (0402)	1/16W	-55 ~ + 155°C	50V	100V	10Ω - 1MΩ	±100	
CAR06 (0603)	1/10W		150V	150V			
CAR10 (0805)	1/8W		150V	300V			
CAR12 (1206)	1/4W		200V	400V			
CAR14 (1210)	1/3W						
CAR20 (2010)	3/4W						
CAR25 (2512)	1W						

HIGH POWER RATING ELECTRICAL SPECIFICATIONS

TYPE	POWER RATING AT 70°C	OPERATING TEMPERATURE	MAX OPERATING VOLTAGE	MAX OVERLOAD VOLTAGE	RESISTANCE RANGE			TCR (PPM/°C)		
					±0.05% (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				-	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.

CalChip is capable of manufacturing the optional spec based on customer's requirement



ENVIRONMENTAL CHARACTERISTICS

ITEMS	REQUIREMENT			TEST METHODS
	1%	5%	JUMPER	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Term Overload	$\pm(1.0\% + 0.05\Omega)$	$\pm(2.0\% + 0.05\Omega)$	$<50m\Omega$	RCWV*2.5 or Max. Overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	$\geq 10G$			Max. Overload voltage for 1 minute
Endurance	$\pm(1.0\% + 0.10\Omega)$	$\pm(2.0\% + 0.10\Omega)$	$<100m\Omega$	70 $\pm$ 2°C, Max. Working voltage for 1000 hrs with 1.5hrs "ON" and 0.5hrs "OFF"
Biased Humidity	$\pm(1.0\% + 0.10\Omega)$	$\pm(2.0\% + 0.10\Omega)$	$<100m\Omega$	1000 hrs 85°C/85% RH 10% of operating power.
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	$\pm(1.5\%+0.10\Omega)$	$<50m\Omega$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	$<50m\Omega$	Bending once for 5 seconds 2010, 2512 sizes: 2mm other sizes: 3mm
Thermal Shock	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	$<50m\Omega$	-55°C~+155°C. Note: Number of cycles required -300, Maximum transfer time -20 seconds, Dwell time - 15 minutes. Air-Air
Solderability	95% min coverage			245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	$<50m\Omega$	260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$			260 $\pm$ 5°C for 30 seconds
Temperature Cycling	$\pm(0.5\%+0.05\Omega)$	$\pm(1.5\%+0.05\Omega)$	$<50m\Omega$	-55°C to +125°C, 1000 cycles
Moisture Resistance	$\pm(1.0\%+0.05\Omega)$	$\pm(2.0\%+0.05\Omega)$	$<50m\Omega$	24 hrs/cycle
Mechanical Shock	$\pm(0.25\% + 0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	$<50m\Omega$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\% + 0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	$<50m\Omega$	5g's for 20 min., 12 cycles each of 3 orientation, 10-2000 Hz
ESD	$\pm(1\%+0.05\Omega)$			Human Body, 2KV
Resistance to Solvents	Marking Unsmeared			Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	Not Broken			Force of 1.8kg for 60 seconds.

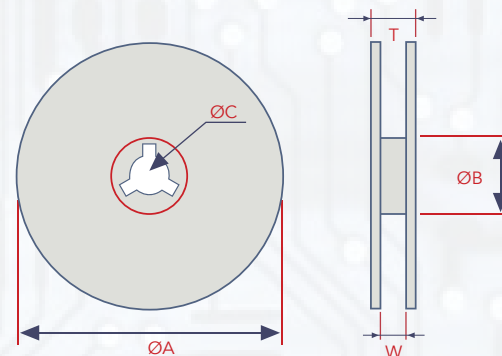


PACKAGING

Reel Specifications & Packaging Quantity

UNIT: MM									
TYPE	PACKAGING QUANTITY		TAPE WIDTH	REEL DIAMETER	ØA	ØB	ØC	W	T
CAR04	Paper	10K	8mm	7 inch	178.5 ± 1.5	60.0 ^{+1.0} / ₋₀	13.0±0.2	9.0±0.5	12.5±0.5
CAR06	Paper	5K	8mm						
CAR10									
CAR12									
CAR14									
CAR20	Embossed	4K	12mm				13.0±0.5	13.0±0.5	15.5±0.5
CAR25									

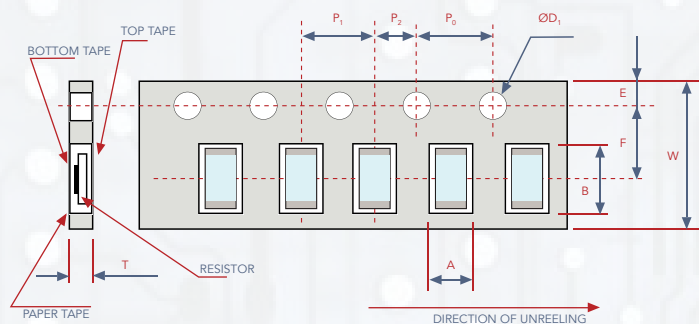
UNIT: MM



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PACKAGING

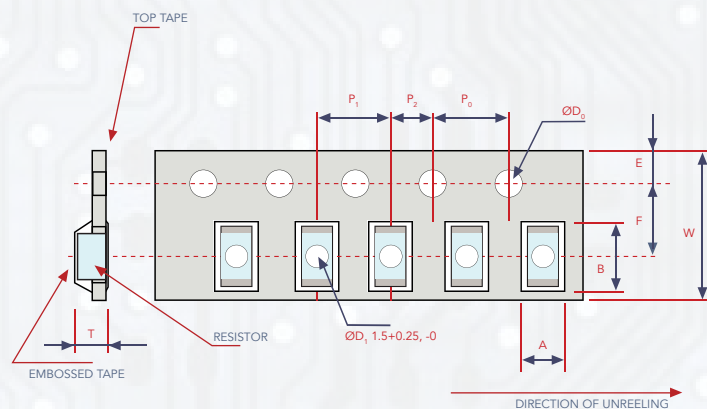
Paper Tape Specifications



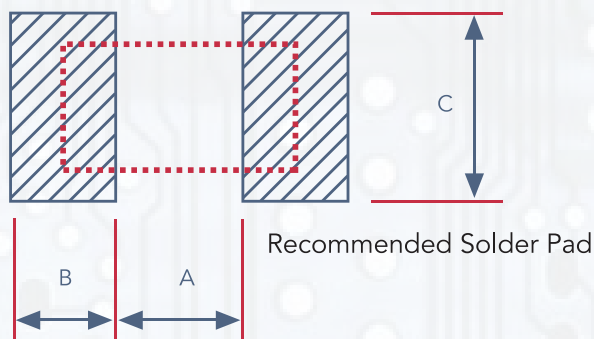
UNIT: MM										
TYPE	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₆	T
CAR04	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.44±0.10
CAR06	1.10±0.10	1.90±0.10					0.70±0.10			
CAR10	1.60±0.10	2.40±0.20					0.85±0.10			
CAR12	1.90±0.10	3.50±0.20								
CAR14	2.90±0.10									

Embossed Tape Specifications

TYPE	A	B	W	E	F	P ₀	P ₁	P ₂	ØD 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±0.05	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 [±]
CAR25	3.5±0.10	6.7±0.10								



RECOMMENDED LAND PATTERN



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		