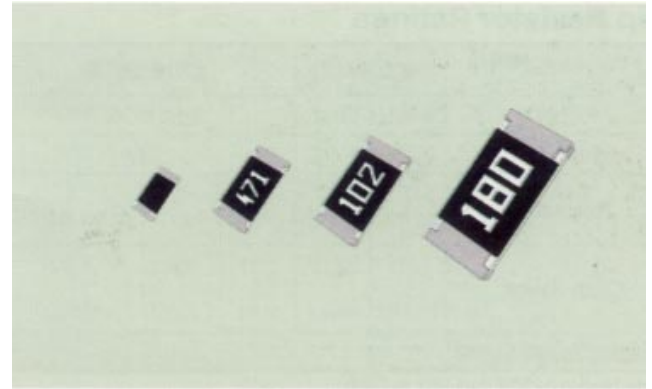


CR05 / CR10 / CR21 / CR32 Series

Features:

- 1) Wave, IR reflow and vapor phase soldering compatible.
- 2) Wrap-around nickel barrier terminations.
- 3) Suitable size & packaging for surface mount assembly.
- 4) Low noise.



How To Order:

CR 32 – 101 J – T

Packaging

- B = Bulk (1,000 pcs/bag)
- T = 7" Reel/Punched Paper Tape (5,000 pcs/reel) except CR05
- H = 7" Reel/Punched Paper Tape (10,000 pcs/reel, 2mm pitch taping) CR05 and CR10
- D = 10" Reel/Punched Paper Tape (10,000 pcs/reel) CR32, CR21, CR10
- K = 13" Reel/Punched Paper Tape (20,000 pcs/reel) except CR05 (optional)

Resistance Tolerance

- Blank = Jumper
- K = $\pm 10\%$
- J = $\pm 5\%$
- G = $\pm 2\%$
- F = $\pm 1\%$
- D = $\pm 0.5\%$

Resistance Code

- For G, J, and K Tolerances: 3 digit code (E-24)
2 significant digits plus number of zeros
Examples:
2.2 Ω = 2R2
10 Ω = 100
100 Ω = 101
1k Ω = 102
0 Ω = 000 (Jumper)
- For D and F Tolerances: 4 digit code (E-96)
3 significant digits plus number of zeros
Examples:
10 Ω = 10R0
100 Ω = 1000
1k Ω = 1001

Case Size

- 05 = 0402
- 10 = 0603
- 21 = 0805
- 32 = 1206

Style

- CR = Chip Resistor
- CJ = Zero Ohm Jumper

Dimensions:

	CR05 (CJ05)	CR10 (CJ10)	CR21 (CJ21)	CR32 (CJ32)
L	1.00 \pm 0.05 (.039 \pm .002)	1.60 \pm 0.10 (.063 \pm .004)	2.00 \pm 0.10 (.079 \pm .004)	3.10 \pm 0.10 (.122 \pm .004)
W	0.50 \pm 0.05 (.020 \pm .002)	0.80 $^{+0.15}_{-0.10}$ (.031 $^{+0.006}_{-.004}$)	1.25 $^{+0.15}_{-0.10}$ (.049 $^{+0.006}_{-.004}$)	1.55 $^{+0.15}_{-0.10}$ (.061 $^{+0.006}_{-.004}$)
T	0.35 \pm 0.05 (.014 \pm .002)	0.50 \pm 0.10 (.020 \pm .004)	0.55 \pm 0.10 (.022 \pm .004)	0.55 $^{+0.10}_{-0.05}$ (.022 $^{+0.004}_{-.002}$)
C	0.20 \pm 0.15 (.008 \pm .006)	0.25 \pm 0.20 (.010 \pm .008)	0.35 \pm 0.20 (.014 \pm .008)	0.45 \pm 0.20 (.018 \pm .008)
D	0.20 \pm 0.10 (.008 \pm .004)	0.20 $^{+0.20}_{-0.15}$ (.008 $^{+0.008}_{-.006}$)	0.40 \pm 0.20 (.016 \pm .008)	0.45 \pm 0.20 (.018 \pm .008)

mm (inches)

CR05 / CR10 / CR21 / CR32 Series Performance Characteristics

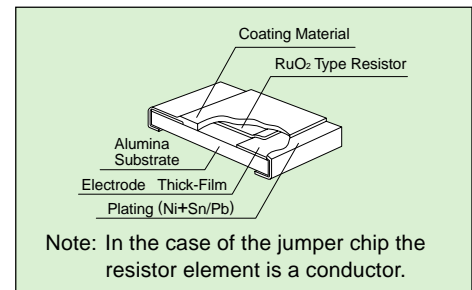
Chip Resistor Ratings

Spec \ Style	CR05 (0402)			CR10 (0603)				CR21 (0805)					CR32 (1206)				
Power	0.063 (1/16) W			0.063 (1/10) W				0.100 (1/8) W					0.125 (1/4) W*				
Voltage	50V			50V				100V					200V				
Tolerance	F (±1%)	J (±5%)	K (±10%)	F (±1%)	G (±2%)	J (±5%)	K (±10%)	D (±0.5%)	F (±1%)	G (±2%)	J (±5%)	K (±10%)	D (±0.5%)	F (±1%)	G (±2%)	J (±5%)	K (±10%)
Value Range	10Ω ↓ 1MΩ	10Ω ↓ 2.2MΩ	2.2Ω ↓ 10MΩ	10Ω ↓ 1MΩ	10Ω ↓ 2.2MΩ	1.0Ω ↓ 10MΩ	10Ω ↓ 1MΩ	10Ω ↓ 1MΩ	10Ω ↓ 2.2MΩ	1.0Ω ↓ 10MΩ	1.0Ω ↓ 10MΩ	10Ω ↓ 1MΩ	10Ω ↓ 1MΩ	10Ω ↓ 2.2MΩ	1.0Ω ↓ 10MΩ	0.36Ω ↓ 10MΩ	1.0Ω ↓ 10MΩ
Working Temperature	-55°C ~ +125°C																

Chip Zero Ohm Jumper Ratings

Spec \ Style	CJ05 (0402)	CJ10 (0603)	CJ21 (0805)	CJ32 (1206)
Rated Current	1A (70°C)			2A (70°C)
Resistivity	50 mΩ Maximum			
Working Temperature	-55°C ~ +125°C			

Construction



Temperature Coefficient of Resistance

Tolerance	CR05						CR10						
	F (±1%)	J (±5%)		K (±10%)			F (±1%)	G (±2%)		J (±5%)		K (±10%)	
Resistance Range	10Ω ↓ 1MΩ	10Ω ↓ 1MΩ	1MΩ ↓ 2.2MΩ	2.2Ω ↓ 10Ω	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ	10Ω ↓ 100Ω	100Ω ↓ 1MΩ	10Ω ↓ 1MΩ	1MΩ ↓ 2.2MΩ	1.0Ω ↓ 10Ω	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ
TCR (ppm/°C)	±100	±250	-500 ↓ +300	-100 ↓ +600	±250	-500 ↓ +300	±100	±100	±200	-500 ↓ +300	-100 ↓ +600	±200	-500 ↓ +300
Tolerance	CR21												
	D (±0.5%)	F (±1%)		G (±2%)		J (±5%)	K (±10%)						
Resistance Range	10Ω ↓ 1MΩ	10Ω ↓ 100Ω	100Ω ↓ 1MΩ	10Ω ↓ 1MΩ	1MΩ ↓ 2.2MΩ	1.0Ω ↓ 10Ω	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ	0.47Ω ↓ 1.0Ω	1.0Ω ↓ 10Ω	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ	
TCR (ppm/°C)	±100	±100	±100	±200	-500 ↓ +300	-100 ↓ +600	±200	-500 ↓ +300	-100 ↓ +1000	-100 ↓ +600	±200	-500 ↓ +300	
Tolerance	CR32												
	D (±0.5%)	F (±1%)		G (±2%)		J (±5%)	K (±10%)						
Resistance Range	10Ω ↓ 1MΩ	100Ω ↓ 1MΩ	10Ω ↓ 100Ω	1MΩ ↓ 2.2MΩ	10Ω ↓ 1MΩ	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ	1.0Ω ↓ 10Ω	0.36Ω ↓ 1.0Ω	1.0Ω ↓ 10Ω	10Ω ↓ 1MΩ	1MΩ ↓ 10MΩ	
TCR (ppm/°C)	±100	±100	±100	-500 ↓ +300	±200	±200	-500 ↓ +300	-100 ↓ +600	-100 ↓ +1000	-100 ↓ +600	±200	-500 ↓ +300	

Marking

Marking available as follows:
 Series: CR32, CJ32, CR21, CJ21, CR10, CJ10
 3 digit indication
 Example: 473=47 X 10³= 47000 Ω = 47 kΩ
 0 : 0 Ω (Jumper)
 100 : 10 Ω
 102 : 1 kΩ
 105 : 1 MΩ

Series: CR05 and CJ05 - No marking
 Note: On CR21 and CR32 4 digit marking is available for ±1% and ±0.5% tolerances.

Standard Decade Values

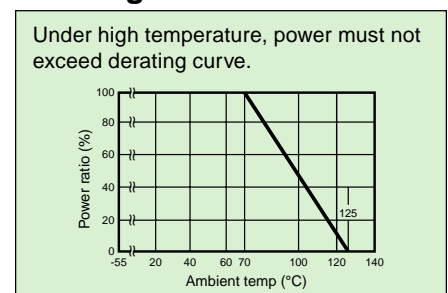
For ±10%, ±5%, ±2%, 1% and ±0.5% Tolerances (E-24)

1.0	1.1	1.2	1.3	1.5
1.6	1.8	2.0	2.2	2.4
2.7	3.0	3.3	3.6	3.9
4.3	4.7	5.1	5.6	6.2
6.8	7.5	8.2	9.1	

For ±1% and ±0.5% Tolerance (E-96)

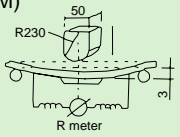
10.0	10.2	10.5	10.7	11.0	11.3	11.5	11.8	12.1	12.4
12.7	13.0	13.3	13.7	14.0	14.3	14.7	15.0	15.4	15.8
16.2	16.5	16.9	17.4	17.8	18.2	18.7	19.1	19.6	20.0
20.5	21.0	21.5	22.1	22.6	23.2	23.7	24.3	24.9	25.5
26.1	26.7	27.4	28.0	28.7	29.4	30.1	30.9	31.6	32.4
33.2	34.0	34.8	35.7	36.5	37.4	38.3	39.2	40.2	41.2
42.2	43.2	44.2	45.3	46.4	47.5	48.7	49.9	51.1	52.3
53.6	54.9	56.2	57.6	59.0	60.4	61.9	63.4	64.9	66.5
68.1	69.8	71.5	73.2	75.0	76.8	78.7	80.6	82.5	84.5
86.6	88.7	90.9	93.1	95.3	97.6				

Derating Curve



Specifications and Test Methods for Chip Resistors and Arrays

Mechanical Characteristics

Item		Specification		Test Method
			Jumpers	
Terminal Strength	$\Delta R/R$	$\leq \pm (1\% + 0.05\Omega)$ of initial value	$R \leq 50m\Omega$	Apply the load as shown: Measure resistance during load application. PC board: glass-epoxy (T=1.6M) CR/CJ32: 3mm CR/CJ21: 3mm CR/CJ10: 3mm CR/CJ05: 3mm 
	Visual	No evidence of mechanical damage after loading		
	Breaking strength	Lead Pull > 0.5kg		
Resistance to Soldering Heat	$\Delta R/R$	$\leq \pm (1 + 0.05\Omega)$ of the initial value		Immerse into molten solder at $260 \pm 5^\circ\text{C}$ for 10 ± 1 sec. Stabilize at room temperature for 60 min. Measure resistance.
	Visual	Visual: no evidence of leaching		
Solderability		Coverage $\geq 95\%$ Each termination end		Immerse for 2 ± 0.5 sec. in Sn62 solder at $235 \pm 5^\circ\text{C}$
Anti-vibration Test	$\Delta R/R$	$\leq \pm (1\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	2 hrs. each in x, y and z axis. (total 6 hrs.) 10 to 55Hz sweep in 1 min at 1.5mm amplitude.
	Visual	No evidence of mechanical damage		
Solvent Resistance	$\Delta R/R$	$\leq \pm (0.5\% + 0.05\Omega)$ of the initial value	$R \leq 50m\Omega$	Immerse in static state trichloroethylene at 20° to 25°C for 30 ± 5 sec. Dry in air @ 25°C for 30 minutes. Measure resistance.
	Visual	No evidence of mechanical damage		

Environmental Characteristics

Item		Specification		Test Method
			Jumpers	
Low Temperature Storage	$\Delta R/R$	$\leq \pm (2\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	Dwell in -65°C chamber without loading for 1000 +48/-0 hrs Stabilize at room temperature for 60 min. Measure resistance value.
	Visual	No evidence of mechanical damage		
High Temperature Exposure	$\Delta R/R$	$\leq \pm (3\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	Dwell in 125°C chamber for 1,000 +48/-0 hrs. without loading. Stabilize at room temperature for 60 minutes. Measure resistance value
	Visual	No evidence of mechanical damage		
Temperature Cycle	$\Delta R/R$	$\leq \pm (1\% + 0.05\Omega)$ of the initial value	$R \leq 50m\Omega$	① Perform 5 cycles as follows: $-55 \pm 3^\circ\text{C}$ for 30 min. → room temp. for 10~15 min. ↔ $125 \pm 3^\circ$ for 30 min. ② Stabilize at room temperature for 1 hr., then measure value.
	Visual	No evidence of mechanical damage		
Moisture Resistance	$\Delta R/R$	$\leq \pm (3\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	Dwell in test chamber at $+65^\circ\text{C}$, and 90-95% RH for 1000 +48/-0 hours Stabilize at room temperature for 60 min. Measure resistance value.
	Visual	No evidence of mechanical damage		
Salt Spray	$\Delta R/R$	$\leq \pm (3\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	Dwell in temp. $35 \pm 2^\circ\text{C}$ Salt density 5% for 24 ± 2 hrs.
	Visual	No evidence of mechanical damage		
Voltage Cycle in High Temperature	$\Delta R/R$	$\leq \pm (3\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	① Perform 1,000 +48/-0 hrs. in chamber ($70 \pm 3^\circ\text{C}$) ON: 90 min. at rated voltage; OFF: 30 min. ② Stabilize at room temperature for 1 hr., then measure value.
	Visual	No evidence of mechanical damage		
Voltage Cycle in High Humidity	$\Delta R/R$	$\leq \pm (3\% + 0.1\Omega)$ of the initial value	$R \leq 50m\Omega$	① Perform 1,000 +48/-0 hrs. in chamber ($40 \pm 2^\circ\text{C}$, 90-95%RH) ON: 90 min. at rated voltage; OFF: 30 min. ② Stabilize at room temperature for 1 hr., then measure value.
	Visual	No evidence of mechanical damage		

Specifications and Test Methods for Chip Resistors and Arrays

Electrical Characteristics

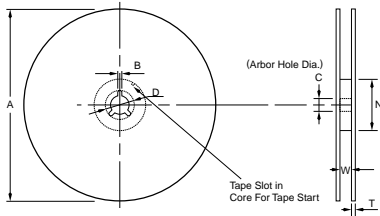
Item	Specification		Test Method	
		Jumpers		
DC Resistance	Within initial tolerance	R ≤ 50mΩ	Test Voltage	(20°C, 65% RH)
			Range of resistance (Ω)	Maximum voltage to be applied
			R < 10	0.1 (V)
			10 ≤ R < 100	0.3 (V)
			100 ≤ R < 1K	1.0
			1K ≤ R < 10K	3
			10K ≤ R < 100K	10
			100K ≤ R < 1M	35
			1M ≤ R	50
Resistance Temperature Characteristic	CR Series See Page 2 CRA Series See Page 6		Test temperature: - 55°C ~ 125°C $\Delta R/R = \frac{R_2 - R_1}{R_1} \times \frac{1}{T_2 - T_1} \times 10^6$ ΔR/R: Temp. coefficient (ppm/°C) T ₁ : 25 °C T ₂ : 125 °C R ₁ : Resistance at T1 (Ω) R ₂ : Resistance at T2 (Ω)	
Short-time Overload	ΔR/R	≤ ± (2.0% + 0.1Ω) of the initial value	R ≤ 50mΩ	① Apply 2.5 x rated voltage (rated current: Jumper Chip) for 5 sec. ② Wait 30 minutes ③ Measure resistance { CR32: 400V Max CR21: 200V Max CR10: 100V Max CR05: 50V Max CRA: 50V Max }
	Visual	No evidence of mechanical damage		
Intermittent Overload	ΔR/R	≤ ± (5% + 0.1Ω) of the of the initial value	R ≤ 50mΩ	① Perform 10000 voltage cycles as follows ON (2.5 x rated voltage or current) 1 sec. OFF 25 sec. ② Stabilization time 30 min. without loading ③ Measure resistance { CR32: 400V Max CR21: 200V Max CR10: 100V Max CR05: 50V Max CRA: 50V Max }
	Visual	No evidence of mechanical damage		
Dielectric Withstanding Voltage	No evidence of mechanical damage		For CR32 & CR21 apply 500VAC for 1 min. For CRA and CR05 apply 300VAC for 1 sec. For CR10 apply 300VAC for 1 min.	
Insulation Resistance	•CR05: 10 ⁹ Ω Min •CR10: 10 ⁹ Ω Min •CR21: 10 ¹⁰ Ω Min •CR32: 10 ¹² Ω Min •CRA: 10 ⁹ Ω Min	•CJ05: 10 ⁹ Ω Min •CJ10: 10 ⁹ Ω Min •CJ21: 10 ¹⁰ Ω Min •CJ32: 10 ¹² Ω Min •CJA: 10 ⁹ Ω Min	For CR32, CR21, CR10 CJ32, CJ21, CJ10 apply 500VDC For CRA, CR05 CJA, CJ05 apply 100VDC	
Noise Level	Resistance	Noise	Refer to JIS C5202 5.9 Measurement method of noise level Except CR05, CRA	
	R < 100Ω	-10dB (0.32μV/V)		
	100Ω ≤ R < 1KΩ	0dB (1.0μV/V)		
	1KΩ ≤ R < 10KΩ	10dB (3.2μV/V)		
	10KΩ ≤ R < 100KΩ	15dB (5.6μV/V)		
	100KΩ ≤ R < 1MΩ	20dB (10μV/V)		
	1MΩ ≤ R	30dB (32μV/V)		

Automatic Insertion Packaging

Tape & Reel Quantities (Punched Paper Tape)

Style	CR05	CR10, CR21, CR32
Punched Carrier	8mm	8mm
Pieces/7" Reel	10,000	5,000
Pieces/10" or 13" Reel	NA	10,000

Reel Dimensions (Metric dimensions will govern)



Tape Size	A Max.	B Min.	C	D Min.	N Min.	W	T Max.
8mm	178 (7)	1.5 (.059)	13.0±0.50 (.512±.020)	20.2 (.795)	50 (1.969)	10.0±1.5 (.394±.060)	2.5 (.098)
	260 (10)						
	330 (13)						

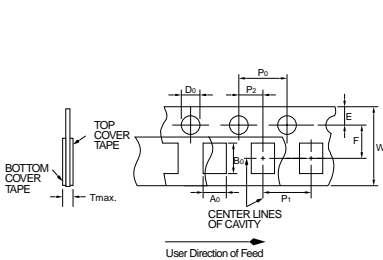
Metric dimensions will govern.

English measurements rounded and for reference only.

mm (inch)

Punched Tape Configuration

8mm Tape Only (Metric dimensions will govern, inches are in parentheses)



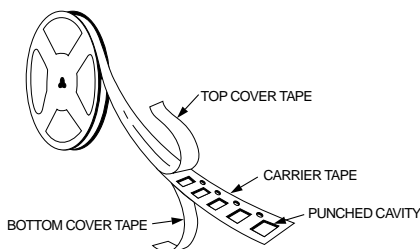
Constant Dimensions

Tape Size	D ₀	E	P ₀	P ₂	W	F
8mm	1.5 ^{+0.1} _{-0.0} (.059 ^{+0.004} _{-.000})	1.75±0.10 (.069±.004)	4.0±0.10 (.157±.004)	2.0±0.05 (.079±.002)	8.0±0.2 (.315±.008)	3.5±0.05 (.138±.002)

Variable Dimensions

Style	P ₁	A ₀	B ₀	T _{MAX.}
CR/CJ05	2.0±0.1 (.079±.004)	0.65±0.10 (.026±.004)	1.15±0.10 (.045±.004)	0.6 (.024)
CR/CJ/FR10	4.0±0.1 (.157±.004) or 2.0±0.1 (.079±.004)	1.1±0.20 (.043±.008)	1.9±0.20 (.075±.008)	1.1 (.043)
CR/CJ/FR21	4.0±0.10 (.157±.004)	1.65±0.20 (.065±.008)	2.4±0.20 (.094±.008)	
CR/CJ/FR32		2.0±0.20 (.079±.008)	3.6±0.20 (.142±.008)	
CRA3A CRB3A CRC3A				
CRA1A CRB1A CRC1A	2.0±0.1 (.079±.004)	1.25±0.2 (.049±.008)	2.5±0.2 (.098±.008)	

Punched Carrier



Bulk Packaging

- 1) Package: 100 × 60mm Plastic bag
- 2) Unit: 1,000 pcs/bag
- 3) Label includes the following:
 - Part Number
 - Quantity
 - Lot Number