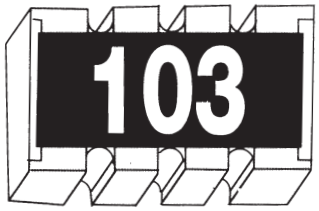
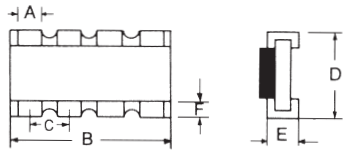
NCA 16-4, 32-4
CHIP RESISTOR ARRAY
(CONVEX TYPE)



Applications

Telecommunication Equipment
Lap-Top and Note-Book Computer

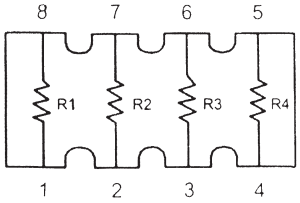
Dimensions



(Unit: PCS)

Type	Number of Resistors	A ± 0.15	B ± 0.2	C ± 0.5	D ± 0.15	E ± 0.1	F ± 0.15
NCA16	4	0.5	3.2	0.8	1.6	0.6	0.3
NCA32	4	0.9	5.0	1.27	3.2	0.6	0.5

Internal Circuit



R1 = R2 = R3 = R4

Characteristics

Item	NCA16	NCA32
Power Rating	1/10W	1/8W
Max Working Voltage	50V	200V
Resistance Tolerance	± 5%(J)	
Resistance Range	E-24 series (10 ohm~1M ohm)	
T. C. R.	± 200ppm/°C	
Number of Resistors	4	
Operating Temp. Range	– 55°C~125°C	
Rating Temperature	+ 70°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	±(2% + 0.05 Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	±(1% + 0.05 Ω)	260 ± 5°C, 10 ± 1 seconds
Temperature Cycling	±(1% + 0.05 Ω)	125°C (30min) → normal (15min) → – 30°C (30min) → normal (15min), 5cycles
Moisture Load-Life	±(2% + 0.05 Ω)	Rated Voltage, 40° ± 2°C, 90~95%RH, 1000 $^{+48}_{-0}$ Hrs.
Load-Life	±(3% + 0.1 Ω)	Rated Voltage, 70° ± 3°C, 1000 $^{+48}_{-0}$ Hrs.

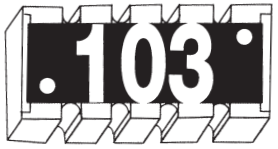
Part No. and Marking

NCA16	—	4	103	J
Type		No. of Resistor	Resistance	Tolerance

Marking

Example: 103 (10K Ohm)

10 PIN/8R
NCA SERIES
CHIP RESISTOR NETWORKS



NCA36

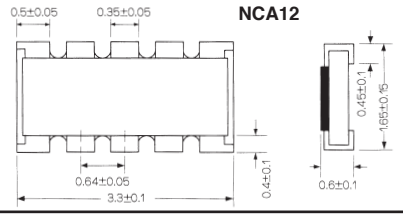
NCA12

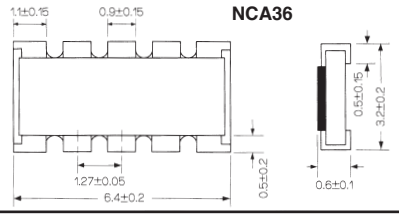
Applications

Telecommunication Equipment
Lap-Top and Note-Book Computer

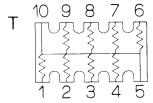
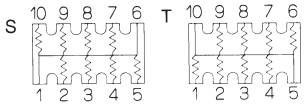
Dimensions

(Unit: mm)





Internal Circuit

Type	Circuit Diagram
NCA12	
NCA36	

Characteristics

Type	NCA12	NCA36
Power Rating (70°C)	1/32W	1/16W
Max Working Voltage	25V	50V
Resistance Tolerance	± 5%(J)	
Resistance Range	33-100K ohm	
T. C. R.	± 200ppm/°C	
Number of Resistors	8	
Operating Temp. Range	– 55°C~125°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	±(2% + 0.05 Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	±(1% + 0.05 Ω)	260 ± 5°C, 10 ± 1 seconds
Temperature Cycling	±(1% + 0.05 Ω)	125°C (30min) ➔ normal (15min) ➔ – 30°C (30min) ➔ normal (15min), 5cycles
Moisture Load-Life	±(2% + 0.05 Ω)	Rated Voltage, 40° ± 2°C, 90~95%RH, 1000 $^{+48}_{-0}$ Hrs.
Load-Life	±(3% + 0.1 Ω)	Rated Voltage, 70° ± 3°C, 1000 $^{+48}_{-0}$ Hrs.

Part No. and Marking

NCA36 — S 103 J

Type | Circuit | Resistance | Tolerance

Marking

Example: 103 (10K Ohm)

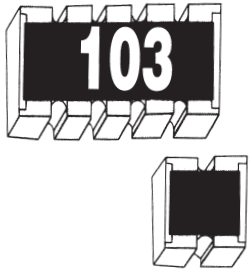
Dots are indications of common pins for NCA-36 only

Packing

(Unit: pcs)

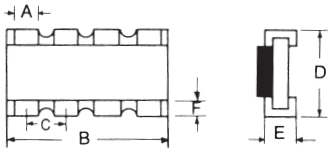
	NCA12	NCA36
Tape & Reel	Paper 5,000	Plastic 4,000
Tape Width	8.0 ± 0.1 m/m	12.0 ± 0.1 m/m
Bulk Pack	1,000	1,000

NCA 0402 X 4, 0402 X 2
THICK FILM CHIP RESISTOR ARRAY (CONVEX TYPE)



Applications
Telecommunication Equipment
Lap-Top and Note-Book Computer

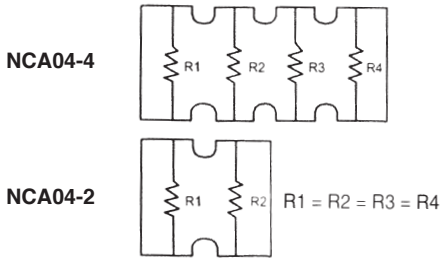
Dimensions



(Unit: PCS)

Type	Number of Resistors	A ± 0.1	B ± 0.2	C ± 0.1	D ± 0.15	E ± 0.1	F ± 0.1
NCA04	4	0.3	2.0	0.5	1.0	0.45	0.2
	2	0.22	1.0	0.67	1.0	0.35	0.2

Internal Circuit



Characteristics

Item	NCA04-4	NCA04-2
Power Rating	1/16W	
Max Working Voltage	50V	
Resistance Tolerance	± 5%(J), ± 1%(F)	
Resistance Range	E-24 series (10 ohm~1M ohm)	
T. C. R.	± 200ppm/°C	
Number of Resistors	4	2
Operating Temp. Range	– 55°C~125°C	
Rating Temperature	+ 70°C	

Specifications

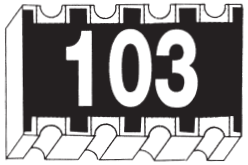
Requirements	Characteristics	Test Method
Short time Over-load	±(2% + 0.05 Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	±(1% + 0.05 Ω)	260 ± 5°C, 10 ± 1 seconds
Temperature Cycling	±(1% + 0.05 Ω)	125°C (30min) ➔ normal (15min) ➔ – 30°C (30min) ➔ normal (15min), 5cycles
Moisture Load-Life	±(2% + 0.05 Ω)	Rated Voltage, 40° ± 2°C, 90~95%RH, 1000 $^{+48}_{-0}$ Hrs.
Load-Life	±(3% + 0.1 Ω)	Rated Voltage, 70° ± 3°C, 1000 $^{+48}_{-0}$ Hrs.

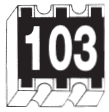
Part No. and Marking

NCA04	—	4	103	J
Type		No. of Resistor	Resistance	Tolerance

Marking
Example: 103 (10K Ohm) for NCA 04-04, NCA04-2 No Working

NCB SERIES THICK FILM CHIP RESISTOR ARRAY (CONCAVE TYPE)

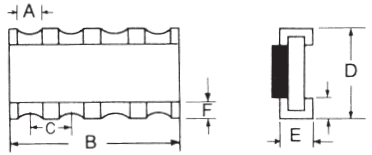




Applications

Telecommunication Equipment
Lap-Top and Note-Book Computer

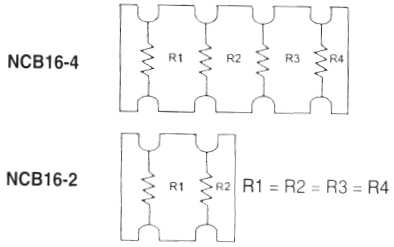
Dimensions



(Unit: PCS)

Type	Number of Resistors	A ± 0.15	B ± 0.2	C ± 0.5	D ± 0.2	E ± 0.15	F ± 0.15
NCB16	4	0.5	3.20	0.8	1.6	0.6	0.3
NCB16	2	0.25	1.60	0.8	1.6	0.6	0.3

Internal Circuit



Characteristics

Item	NCB16	
Power Rating	1/16W	
Max Working Voltage	50V	
Resistance Tolerance	± 5%(J), ± 1%(F)	
Resistance Range	E-24 series (10 ohm~1M ohm)	
T. C. R.	± 200ppm/°C	
Number of Resistors	4	2
Operating Temp. Range	– 55°C~125°C	
Rating Temperature	+ 70°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	±(2% + 0.05 Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	±(1% + 0.05 Ω)	260 ± 5°C, 10 ± 1 seconds
Temperature Cycling	±(1% + 0.05 Ω)	125°C (30min) ➔ normal (15min) ➔ – 30°C (30min) ➔ normal (15min), 5cycles
Moisture Load-Life	±(2% + 0.05 Ω)	Rated Voltage, 40° ± 2°C, 90~95%RH, 1000 $^{+48}_{-0}$ Hrs.
Load-Life	±(3% + 0.1 Ω)	Rated Voltage, 70° ± 3°C, 1000 $^{+48}_{-0}$ Hrs.

Part No. and Marking

NCB16	—	4	103	J
Type		No. of Resistor	Resistance	Tolerance

Marking

Example: 103 (10K Ohm)

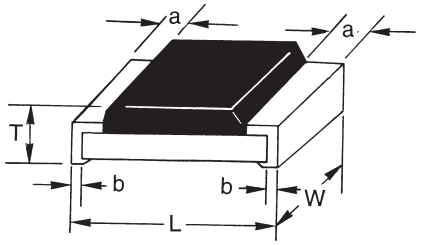
THICK FILM CHIP RESISTOR

On a high grade ceramic body (aluminum oxide) a metal glaze layer is screened. Depending on the composition of the metal glaze different resistance values can be obtained. On both ends a contact is made in such a way that optimum solderability is guaranteed. This is achieved by applying three layers. The resistive layer is covered with a protective coat.

Features

1. Miniature size can compact P.C. Board.
2. 8mm tape carrier packaging available for automatic surface mounting.
3. Excellent mechanical strength and electrical stability.
4. Reduce assembly costs.

Dimensions



Style	Dimensions: mm				
	L	W	a	b	T
CR0201 0201	0.6 ± 0.08	0.3 ± 0.03	0.13 ± 0.08	0.15 ± 0.08	0.23 ± 0.03
CR0402 0402	1.00 ± 0.10	0.50 ± 0.05	0.20 ± 0.10	0.25 ± 0.10	0.35 ± 0.05
CR0603 0603	1.60 ± 0.10	0.80 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	0.45 ± 0.05
CR0805 0805	2.00 ± 0.10	1.25 ± 0.10	0.40 ± 0.20	0.40 ± 0.20	0.50 ± 0.05
CR1206 1206	3.10 ± 0.10	1.60 ± 0.10	0.50 ± 0.25	0.50 ± 0.25	0.55 ± 0.05
CR1210 1210	3.10 ± 0.10	2.60 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	0.55 ± 0.05
CR2010 2010	5.00 ± 0.10	2.50 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	0.55 ± 0.05
CR2512 2512	6.35 ± 0.10	3.20 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	0.55 ± 0.05

General Specification

Style	**CR0201 0201**	**CR0402 0402**	**CR0603 0603**	**CR0805 0805**	**CR1206 1206**	**CR1210 1210**	**CR2010 2010**	**CR2512 2512**
Power Rating @ 70°C	1/20W	1/16W	1/10W	1/8W	1/4W	1/3W	3/4W	1W
Operating Temp. Range	– 55°C to + 125°C							
Derated to 0 Load at	+ 125°C							
Maximum Working Voltage	25V	50V	50V	150V	200V	200V	200V	200V
Maximum Overload Voltage	50V	100V	100V	300V	400V	400V	400V	400V
Resistance Range								
1%, E-96	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω
5%, E-24	10 Ω ~ 1M Ω	2 Ω ~ 5.6M Ω	1 Ω ~ 10M Ω	1 Ω ~ 10M Ω	1 Ω ~ 10M Ω	1 Ω ~ 10M Ω	1 Ω ~ 10M Ω	1 Ω ~ 10M Ω
Zero Ohm jumper < 0.05 Ω								
TCR ± 100ppm/°C			10 Ω ~ 1M Ω					
TCR ± 200ppm/°C	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	1Ω ~10 Ω >1M Ω					
TCR ± 400ppm/°C		1 Ω ~ 1M Ω						

Characteristics

PERFORMANCE TEST	TEST METHOD	1% TOLERANCE	5% TOLERANCE
Temperature Coefficient (by Type)	MIL-STD-202F, Method 304 – 55°C to + 125°C	± 100 ppm/°C	± 200 ppm/°C
Thermal Shock	MIL-STD-202F, Method 107 5 cycles, – 55°C to + 125°C	± (0.5% + 0.05 Ω)	± (1.0% + 0.05 Ω)
Low Temperature Operation	MIL-R-55342D, Para.4.7.4 One hour at – 65°C followed by 45 minutes RCWV	± (0.5% + 0.05 Ω)	± (1.0% + 0.05 Ω)
Short Time Overload	MIL-R-55342D, Para.4.7.5 2.5 times RCWV for 5 seconds	± (1.0% + 0.05 Ω)	± (2.0% + 0.05 Ω)
High Temperature	MIL-R-55342D, Para.4.7.6 125°C for 100 hours	± (1.0% + 0.05 Ω)	± (2.0% + 0.1 Ω)
Resistance to Soldering Heat	MIL-R-55342D, Para.4.7.7 Soldered to test board at 26°C for 10 seconds	± (0.5% + 0.05 Ω)	± (1.0% + 0.05 Ω)
Moisture Resistance	MIL-STD-202F, Method 106 10 cycles. Total 240 hours.	± (0.5% + 0.05 Ω)	± (2.0% + 0.05 Ω)
Life	MIL-STD-202F, Method 108A 100 hours at 70°C RWV intermittent	± (1.0% + 0.05 Ω)	± (3.0% + 0.1 Ω)
Solderability	MIL-STD-202F, Method 208 230°C for 5 seconds	95%min. coverage	95%min. coverage
Bending Strength	Unit mounted in center 208 90mm board length, deflected 5mm in either direction for 10 seconds	± (1.0% + 0.05 Ω)	± (1.0% + 0.05 Ω)

Parts Number System

CR0805 **F** **1002** **T1** **LF**

Size
CR0201(0201) CR1206(1206)
CR0402(0402) CR1210(1210)
CR0603(0603) CR2010(2010)
CR0805(0805) CR2512(2512)

Tolerance
F = ± 1%
J = ± 5%
D = ± 0.5% on request

Resistance Value
Please refer to marking explanation.
000=Jumper 0 ohm

Standard Packaging
T = See page 10 for plastic or paper tape
1 = 5K reels
2 = 10K reels
3 = 20K reels

RoHS
Blank = Non-RoHS Compliant
LF = RoHS Compliant

Marking

5% marking
Value = 10K Ω

CR0603(0603)
CR0805(0805)
CR1206(1206)
CR1210(1210)
CR2010(2010)
CR2512(2512)

1% marking
Value = 10K Ω

CR0805(0805)
CR1206(1206)
CR1210(1210)
CR2010(2010)
CR2512(2512)

CR0603(0603)
EIA-96
marking

1% marking
Value = 12.4K Ω

CR0402(0402)
CR0201(0201)

NO marking

Marking explanation

- 5% tolerance: 3 digits, first two digits are significant figures, third digit is number of zeros. Letter R is decimal point.
- 1% tolerance: 4 digits, first three digits are significant figures, Letter R is decimal point.
- 0603 1%: EIA-96 marking (see page 9)
- 02021 and 0402 no marking
- Paper tape 7" reel
  CR0201/0402: 10,000pcs
  CR0603/0805/1206/1210: 5,000pcs
- Plastic tape per 7" reel
  RMC-22/24: 4,000pcs
- Bulk bag: 5,000 per plastic bag, 2 bags per box.
- Standard packaging is 8mm tape reel per EIA481.

THIN FILM CHIP RESISTORS

Features

1. Low TCR
2. High precision (± 0.5up% up to ± 0.01%)
3. Low current noise
4. High stability

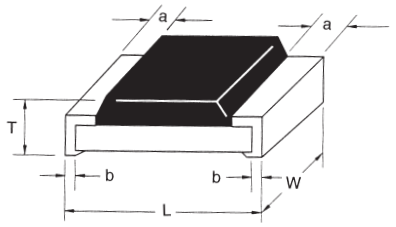
Electrical Characteristics

Style	CRT0402 0402	CRT0603 0603	CRT0805 0805	CRT1206 1206	CRT1210 1210	CRT2010 2010	CRT2512 2512
Power Rating @ 70°C	1/16W	1/16W	1/10W	1/8W	1/4W	1/2W	3/4W
Operating Temp. Range	– 55°C ~ + 125°C						
Derated to 0 Load at	+ 125°C						
Maximum Working Voltage	25V	50V	100V	150V	150V	150V	150V
Maximum Overload Voltage	100V	100V	200V	250V	300V	300V	300V
Dielectric Withstanding Voltage	100V	100V	250V	250V	400V	400V	400V
Resistance Range	10 Ω ~ 100K Ω	10 Ω ~ 330K Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω	10 Ω ~ 1M Ω
Temperature Coefficient	± 10ppm/°C ; ± 15ppm/°C ; ± 25ppm/°C ; ± 50ppm/°C						

Environmental Characteristics

PERFORMANCE TEST	TEST METHOD	RATING
Temperature Coefficient (by Type)	MIL-STD-202F, Method 304 – 55°C to +125°C	± 10 – 50ppm/°C
Thermal Shock	MIL-STD-202F, Method 107 5 cycles, – 55°C to +125°C	± (0.5% + 0.05 Ω)
Low Temperature Operation	MIL-R-55342D, Para.4.7.4 One hour at – 55°C followed by 45 minutes RCWV	± (0.5% + 0.05 Ω)
Short Time Overload	MIL-R-55342D, Para.4.7.5 2.5 times RCWV for 5 seconds	± (0.5% + 0.05 Ω)
High Temperature Exposure	MIL-R-55342D, Para.4.7.6 125°C for 100 hours	± (0.5% + 0.05 Ω)
Resistance to Soldering Heat	MIL-R-55342D, Para.4.7.7 Soldered to test board at 260°C for 10 seconds	± (0.5% + 0.05 Ω)
Moisture Resistance	MIL-STD-202F, Method 106 10 cycles. Total 240 hours.	± (0.5% + 0.05 Ω)
Life	MIL-STD-202F, Method 108A 1000 hours at 70°C RCWV intermittent	± (0.5% + 0.05 Ω)
Solderability	MIL-STD-202F, Method 208 230°C for 5 seconds	95% min. coverage
Bending Strength	Unit mounted in center of 90mm board length, deflected 5mm in either direction for 10 seconds	± (0.5% + 0.05 Ω)

Dimensions



Unit: mm

Style	Size Code	L	W	T	a	b
CRT0402	0402	1.00 ± 0.10	0.50 ± 0.05	0.25 ± 0.05	0.20 ± 0.10	0.25 ± 0.10
CRT0603	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.15	0.25 ± 0.15	0.25 ± 0.15
CRT0805	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.35 ± 0.20
CRT1206	1206	3.10 ± 0.10	1.60 ± 0.10	0.55 ± 0.10	0.45 ± 0.20	0.40 ± 0.20
CRT1210	1210	3.10 ± 0.10	2.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20
CRT2010	2010	5.00 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.50 ± 0.20
CRT2512	2512	6.35 ± 0.10	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.50 ± 0.20

Parts Number System

CRT0603 1002 DR E

Type

CRT0805 (0805)

CRT0603 (0603)

Resistance Value

Please refer to marking explanation.

Tolerance

D = ± 0.5%
B = ± 0.1%
C = ± 0.25%

Packaging Codes

R = Paper tape reel
K = Embossed plastic tape reel
Please refer to packaging explanation.

TCR

T = ± 10ppm/°C
E = ± 25ppm/°C
C = ± 50ppm/°C

Marking

5% marking
Value = 10K Ω

CRT0603(0603)
CRT0805(0805)
CRT1206(1206)
CRT1210(1210)
CRT2010(2010)
CRT2512(2512)

1% marking
Value = 10K Ω

CRT0805(0805)
CRT1206(1206)
CRT1210(1210)
CRT2010(2010)
CRT2512(2512)

1% marking
Value = 12.4K Ω

CRT0603(0603)
EIA-96
marking

NO marking

CRT0402

Marking explanation

- 5% tolerance: 3 digits, first two digits are significant figures, third digit is number of zeros. Letter R is decimal point.
- 1% tolerance: 4 digits, first three digits are significant figures, Letter R is decimal point.
- 0603 1%: EIA-96 marking (see page 9)
- 0402 no marking

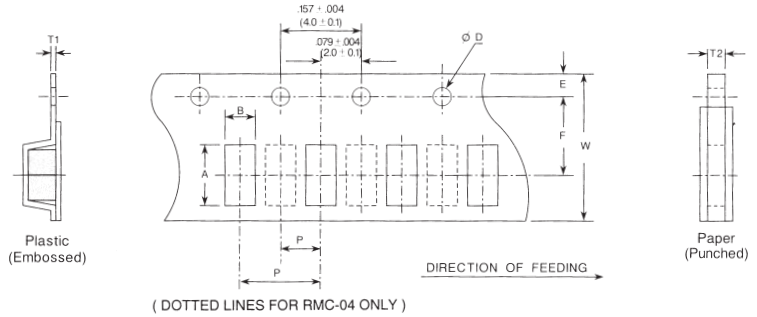
EIA-96 Marking

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

This table shows the first two digits for the three-digit EIA-96 part marking scheme. The third character is a letter multiplier:

Y=10^{-2} X=10^{-1} A=10^{0} B=10^{1} C=10^{2} D=10^{3} E=10^{4} F=10^{5}

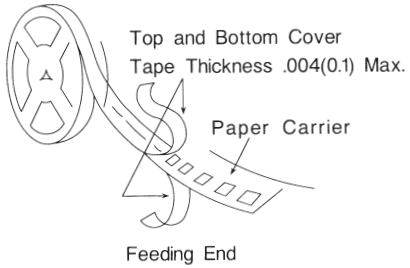
Tape Dimensions

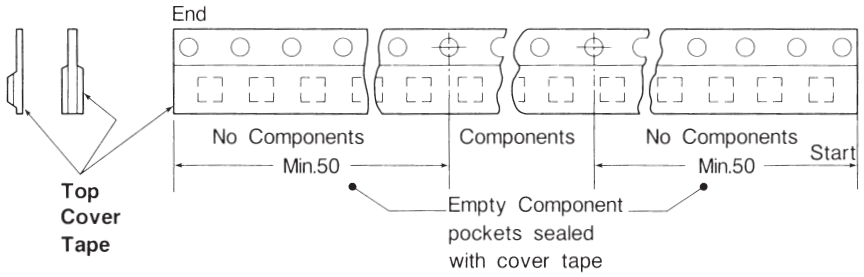


Unit: mm

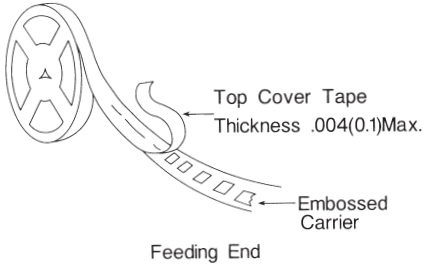
Dimension	A	B	W	E	F	T1	T2	P	D
CR0201 0201	0.68 ± 0.05	0.68 ± 0.05	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	–	0.31 ± .05	2.0 ± .1	0.68 ± 0.05
CR0402 0402	1.15 ± .1	.65 ± .1	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	–	.45 ± .1	2.0 ± .1	1.5 ± .1/-0
CR0603 0603	1.9 ± .1	1.1 ± .1	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	–	.60 ± .1	4.0 ± .1	1.5 ± .1/-0
CR0805 0805	2.4 ± .1	1.65 ± .1	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	.25 ± 0.5	.75 ± .1	4.0 ± .1	1.5 ± .1/-0
CR1206 1206	3.5 ± .1	1.9 ± .1	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	.25 ± 0.5	.75 ± .1	4.0 ± .1	1.5 ± .1/-0
CR1210 1210	3.5 ± .1	2.8 ± .1	8.0 ± .1	1.75 ± .1	3.5 ± 0.5	.2 ± 0.5	.75 ± .1	4.0 ± .1	1.5 ± .1/-0
CR2010 2010	5.6 ± .2	2.8 ± .2	12.0 ± .1	1.75 ± .1	5.5 ± 0.5	.2 ± 0.5	–	4.0 ± .1	1.5 ± .1/-0
CR2512 2512	6.7 ± .2	3.6 ± .2	12.0 ± .1	1.75 ± .1	5.5 ± 0.5	.2 ± 0.5	–	8.0 ± .1	1.5 ± .1/-0

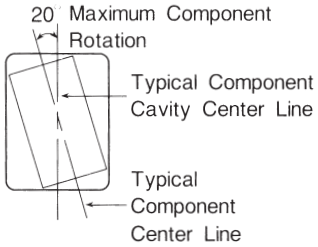
Paper Carrier





Embossed Plastic Carrier





Reel Dimensions

A (Max.)	Component/Reel		
	Paper		Plastic
	CR0201/0402	CR0603/0805/1206/1210	CR2010/2512
7" (178mm)	10,000	5,000	4,000
10" (254mm)	20,000	10,000	–
13" (330mm)	40,000	20,000	–