Tantalum Chip Capacitors

NTC-T Series

FEATURES

- MOLDED CONSTRUCTION FOR HIGH SOLDERING HEAT RESISTANCE
- NINE CASE SIZES, MANY NEW EXTENDED RANGE RATINGS
- BOTH FLOW AND REFLOW SOLDERING APPLICABLE
- TAPE & REEL PACKAGING COMPATIBLE WITH AUTOMATIC PICK & PLACE EQUIPMENT

RoHS Compliant

SPECIFICATIONS & PERFORMANCE CHARACTERISTICS *See Part Number System for Details

Capacitance Range	0.1µF to 470µF								
Capacitance Tolerance	±20%(M), ±10%(K)								
Rated Voltage Range @ 85C (Vdc)	2.5	4.0	6.3	10	16	20	25	35	50
Surge Voltage Rating @ 85°C (Vdc)	3.3	5.2	8.0	13	20	26	33	46	65
Derated Voltage@ 125°C (Vdc)	1.6	2.5	4.0	6.3	10	13	16	22	32
Operating Temperature Range	-55°C to + 85°C (to +125°C With Derating)								
Dissipation Factor	See Case Size and Specifications Table								
Leakage Current @ +25°C (After 5 Minutes at Rated Voltage)	Not More Than 0.01 CV or 0.5µA, whichever is greater								
Capacitance Change With Temperature	-55°C			+85°C			+125°C		
A2, A, B2, B, C, D & E Case Size	ΔC -12%			ΔC ±12%			ΔC ±15%		
J & P Case Size	ΔC -20%			ΔC ±20%			ΔC ±20%		
Soldering Heat Resistance (+260°C for 5 Seconds)	ΔC ±5%* Max., LC = Less than initial specification. DF = Less than initial specification.								
Moisture Resistance (500 hours; 90~95% RH @ 40°C)	ΔC ±5%* Max., LC = Less than initial specification. DF = 150% of initial specification								
Temperature Cycling (5 cycles; -55°C ~ +125°C)	ΔC ±5%* Max, LC = Less than initial specification. DF = Less than initial specification								
Load Life (At Rated Voltage) (2000 hours @ +85°C)	ΔC ±10%* Max, LC = 125% of initial specification. DF = Less than initial specification								
Base Failure Rate (1.0Ω/Volt)	1%/1000 hours at 60% confidence level. (+85°C)								

*±12% ~ ±15% for extended values, ±20% for J & P case size values

RIPPLE CURRENT CORRECTION FACTOR:

Ambient Temperature	+25°C	+55°C	+85°C	+105°C	+125°C
Correction Factor	1.0	0.90	0.80	0.40	0.15

RIPPLE CURRENT/VOLTAGE RATINGS:

$$I\text{max.} = \sqrt{\frac{Pd}{ESR}} \qquad V\text{ max.} = Z \bullet \sqrt{\frac{Pd}{ESR}}$$

Imax. = Ripple Current rating (Arms)

Pd = Power dissipation (watt)

ESR = Equivalent series resistance (ohm)

V max. = Ripple voltage rating (Vrms)

Z = The capacitors impedance (ohm) = $\sqrt{(ESR)^2+(XL-XC)^2}$

POWER DISSIPATION @ 25°C (FREE AIR) & EQUIVALENT SERIES INDUCTANCE (ESL)

Case Code	Pd MAX. (W)	ESL (nH)
P	0.025	1.00
A2	0.050	1.20
A	0.070	1.20
B2	0.070	1.50
B	0.080	1.50
C	0.110	2.70
D	0.150	3.00
E	0.165	3.00

PART NUMBERING SYSTEM

NTC-T 106 M 16 TR B F

- F — Pb-free/RoHS Compliant*
- B — Case Code
- TR — Packaging: TR=Tape/Reel
- 16 — Voltage
- M — Tolerance Code: K=±10%, M=± 20%
- 106 — Capacitance Code
- NTC-T — Series

*"F" suffix denotes RoHS compliant parts

STANDARD AND EXTENDED PRODUCT SPECIFICATIONS TABLE

* Extended Case Sizes
Chart shows Case Size, Max Tan δ @ 120Hz/+20°C, Max. ESR @ 100Khz/+20°C

Cap. (µF)	Code	Working Voltage (Vdc)								
		2.5	4.0	6.3	10	16	20	25	35	50
0.1	104						A2*6%/40Ω		A 4%/18Ω	
0.15	154						A2*6%325Ω		A 4%/18Ω	A 4%/19Ω
0.22	224						A2*6%/35Ω		A 4%/18Ω	B 4%/14Ω
0.33	334					P 10%/40Ω	A2*6%/30Ω		A 4%/15Ω	B 4%/10Ω
0.47	474					P 10%/35Ω	A2*6%/27Ω	A 4%/14Ω	A*6%/12Ω B 4%/8.0Ω	B 4%/9.0Ω
0.68	684				P 10%/25Ω	P 10%/25Ω A2*6%/25Ω	A2*6%/15Ω A 4%/12Ω	A*6%/10Ω	A*6%/9.0Ω B 4%/5.4Ω	C 4%/7.0Ω
1.0	105			P 10%/25Ω	P 10%/25Ω A2*8%/25Ω	J 10%/30Ω P 20%/25Ω A2*6%/16Ω A 4%/10Ω	A2*6%/13Ω A*6%/9.0Ω	A*6%/8.0Ω	A*6%/8.0Ω B 4%/4.8Ω	C 4%/5.5Ω
1.5	155		P 10%/25Ω	P 10%/25Ω A2*8%/25Ω	J 20%/30Ω P 20%/25Ω A2*8%/20Ω A 4%/8.0Ω	A2*6%/13Ω A 4%/8.0Ω	A2*6%/13Ω A*6%/6.5Ω	A*6%/8.0Ω B 4%/4.6Ω	A*6%/8.0Ω B*6%/4.0Ω C 4%/3.0Ω	C 4%/4.0Ω
2.2	225	P 10%/25Ω	P 10%/25Ω A2*8%/25Ω	J 20%/20Ω P 20%/20Ω A2*8%/18Ω A 4%/8.0Ω	J 20%/30Ω P 20%/20Ω A2*8%/12Ω A 4%/7.0Ω	A2*6%/13Ω A*6%/6.0Ω	A*6%/6.0Ω B 4%/3.5Ω	A*6%/8.0Ω B*6%/4.0Ω	B*6%/4.2Ω C 4%/3.0Ω	D 4%/1.8Ω
3.3	335	P 10%/25Ω	P 20%/20Ω A2*8%/18Ω A 4%/8.0Ω	J 20%/20Ω P 20%/13Ω A2*8%/9.0Ω A 4%/7.5Ω	P 20%/20Ω A2*8%/12Ω A*8%/5.5Ω	A*6%/5.0Ω B 4%/3.5Ω	A*6%/5.0Ω B*6%/3.0Ω	B*6%/3.5Ω C 4%/2.5Ω	B*6%/4.0Ω C 4%/2.5Ω D 4%/2.0Ω	D 4%/1.4Ω
4.7	475	P 20%/20Ω A2*8%/18Ω	P 20%/12Ω A2*8%/10Ω A 4%/7.5Ω	J 20%/15Ω P 20%/12Ω A2*8%/7.5Ω A*8%/6.0Ω	P 20%/10Ω A2*8%/8.0Ω A*8%/5.0Ω B 4%/3.5Ω	A*6%/5.0Ω B*6%/3.0Ω	A*6%/5.0Ω B*6%/3.0Ω C 4%/2.4Ω	B*6%/3.0Ω C 4%/2.4Ω	C*6%2.2Ω D 4%/1.5Ω	D 4%/1.4Ω
6.8	685	P 20%/20Ω A2*8%/16Ω	J 20%/15Ω P 20%/12Ω A2*8%/8.0Ω A*8%/6.0Ω	P 20%/12Ω A2*8%/7.5Ω A*8%/5.0Ω B 6%/3.5Ω	A*8%/4.5Ω B 8%/3.0Ω	A2*6%/5.0Ω A*6%/5.0Ω B2 6%/5.0Ω B*6%/2.5Ω C 6%/1.9Ω	B*6%/2.8Ω C 6%/1.9Ω	C*6%/1.9Ω D6%/1.4Ω	C*6%/1.9Ω D 6%/1.3Ω	
10	106	J 20%/12Ω P 20%/12Ω A2*8%/15Ω	J 20%/12Ω P 20%/12Ω A2*12%/8.0Ω A*8%/5.0Ω B 6%/3.5Ω	P 20%/12Ω A2*8%/10Ω A*8%/4.0Ω B 6%/3.0Ω	A2 8%/5.0Ω A*8%/3.2Ω B2*8%/3.2Ω B*8%/2.5Ω C 6%/1.8Ω	A 8%/5.0Ω B2 8%/4.0Ω B*6%/2.4Ω C 6%/1.8Ω	B*6%/2.5Ω C*6%/1.8Ω D 6%/1.3Ω	C*6%/1.8Ω D 6%/1.2Ω	D*6%/1.0Ω	
15	156	A2*12%/10Ω A*8%/5.0Ω	P 20%/ A2*12%/8.0Ω A*8%/4.0Ω B*8%/3.0Ω	A2 12%/ A*8%/3.5Ω B2*8%/3.5Ω B*8%/2.5Ω C 6%/1.8Ω	B2*8%/2.5Ω C 6%/1.8Ω	B2*6%/2.5Ω C*6%/1.8Ω D 6%/1.8Ω	C*6%/1.7Ω D 6%/0.8Ω	D*6%/1.0Ω	D*6%/0.9Ω	
22	226	A2*12%/10Ω A*8%/4.0Ω	P 20%/5.0Ω A2 12%/4.0Ω A*8%/3.5Ω B2*8%/3.5Ω B*8%/2.8Ω C 6%/1.8Ω	A*10%/4.5Ω B2*12%/4.5Ω B*8%/2.3Ω C 6%/1.8Ω	B2 12%/4.0Ω B*8%/2.4Ω C*8%/1.8Ω D 6%/1.5Ω	B*6%/2.5Ω C*6%/1.6Ω D 6%/0.8Ω	C*6%/1.5Ω D*6%/0.8Ω	D*6%/0.8Ω		

STANDARD AND EXTENDED PRODUCT SPECIFICATIONS TABLE

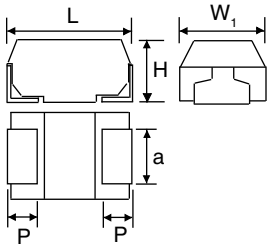
* Extended Case Sizes
Chart shows Case Size, Max Tan δ @ 120Hz/+20°C, Max. ESR @ 100Khz/+20°C

Cap. (µF)	Code	Working Voltage (Vdc)								
		2.5	4.0	6.3	10	16	20	25	35	50
33	336	P 20%/5.0Ω A*8%/3.5Ω B2*8%/3.5Ω B*8%/3.0Ω	A*10%/4.5Ω B2*12%/4.5Ω B*8%/2.4Ω C 6%/1.8Ω	A 12%/5.0Ω B*8%/2.0Ω C*8%/1.8Ω D 6%/1.5Ω	B*8%/2.0Ω C*8%/1.6Ω D 6%/0.8Ω	C*6%/1.2Ω D*6%/0.8Ω	D*6%/0.8Ω			
47	476	A*12%/4.5Ω B2*12%/4.5Ω B*8%/2.4Ω	A 12%/5.0Ω B2 12%/3.0Ω B*8%/2.0Ω C*8%/1.8Ω D 6%/1.2Ω	B2 12%/3.0Ω B*8%/2.0Ω C*8%/1.6Ω D 6%/0.8Ω	B 8%/3.0Ω C*8%/1.6Ω D*8%/0.8Ω	C*6%/1.2Ω D*6%/0.8Ω	D*6%/0.8Ω			
68	686	A 18%/3.0Ω B*8%/2.0Ω	B2 15%/3.0Ω B*8%/2.0Ω C*8%/1.6Ω D 6%/0.8Ω	B*10%/1.8Ω C*8%/1.2Ω D*8%/0.8Ω	C*8%/1.2Ω D*8%/0.8Ω	D*6%/0.7Ω				
100	107	B2 18%/2.0Ω B*8%/2.0Ω	B*12%/2.0Ω C*8%/1.2Ω D*8%/0.8Ω	B 12%/1.2Ω C*10%/0.9Ω D*8%/0.8Ω	C 10%/1.2Ω D*8%/0.7Ω	D*10%/1.0Ω				
150	157	B*16%/5.0Ω	B 18%/2.0Ω C*10%/1.0 D*8%/0.7Ω	C 10%/1.2Ω D*8%/0.7Ω	D*10%/0.7Ω	D*6%/0.9				
220	227	B 18%/2.0Ω C*12%/1.0Ω	C 12%/1.2Ω D*8%/0.7Ω	C 14%/1.2Ω D*12%/0.8Ω	D 12%/1.0Ω E*8%/0.9Ω					
330	337	C 16%/1.2Ω	C 14%/1.2Ω D*14%/0.7Ω	D 14%/1.0Ω						
470	477	C 18%/1.2Ω D*14%/0.7Ω	D 16%/1.0Ω							

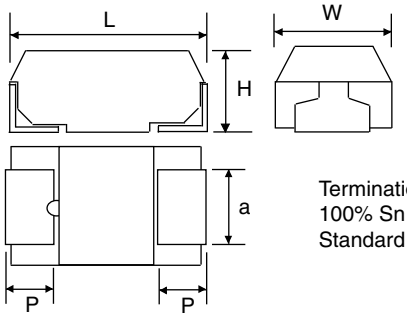
DIMENSIONS (mm)

Case Code	Metric Code	English Code	L	W	H	P	a
J	1608	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.3 ± 0.15	0.6 ± 0.1
P	2012	0805	2.0 ± 0.2	1.25 ± 0.2	1.2 MAX.	0.5 ± 0.2	0.9 ± 0.1
A	3216	1206	3.2 ± 0.2	1.6 ± 0.2	1.6 ± 0.2	0.8 ± 0.3	1.2 ± 0.1
A2	3216	1206	3.2 ± 0.2	1.6 ± 0.2	1.2 MAX.	0.8 ± 0.3	1.2 ± 0.1
B	3528	1411	3.5 ± 0.2	2.8 ± 0.2	1.9 ± 0.2	0.8 ± 0.3	2.2 ± 0.1
B2	3528	1411	3.5 ± 0.2	2.8 ± 0.2	1.2 MAX.	0.8 ± 0.3	2.3 ± 0.1
C	6032	2412	6.0 ± 0.3	3.2 ± 0.3	2.6 ± 0.3	1.3 ± 0.3	2.2 ± 0.1
D	7343	2916	7.3 ± 0.2	4.3 ± 0.2	2.9 ± 0.3	1.3 ± 0.3	2.4 ± 0.1
E	7343H	2917	7.3 ± 0.2	4.3 ± 0.2	4.1 ± 0.2	1.3 ± 0.3	2.4 ± 0.1

J, P, A, A2, C, D & E CASE SIZE



B & B2 CASE SIZE



Terminations:
100% Sn (Lead-Free)
Standard

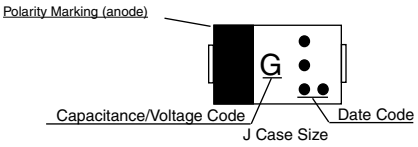
CAPACITANCE CODES

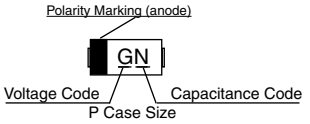
Cap. (µF)	STD EIA Code	EIA Code 198D	Code for P Case Size	Code for J Case Size		
				2.5Vdc	4Vdc	6.3Vdc
0.1	104	A5	-	-	-	-
0.15	154	E5	-	-	-	-
0.22	224	J5	-	-	-	-
0.33	334	N5	N	-	-	-
0.47	474	S5	S	-	-	-
0.68	684	W5	W	-	-	-
1.0	105	A6	A	-	-	-
1.5	155	E6	E	-	-	-
2.2	225	J6	J	-	-	ſ
3.3	335	N6	N	-	-	⊃
4.7	475	S6	S	-	↺	J
6.8	685	W6	W	-	G	-
10	106	A7	a	e	↺	-
22	226	J7	-	-	-	-

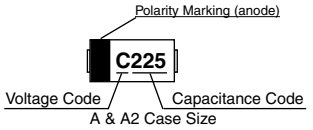
VOLTAGE CODES

Volts	Code
2.5	e
4	G
6.3	J
10	A
16	C
20	D
25	E
35	V
50	H

COMPONENT MARKING

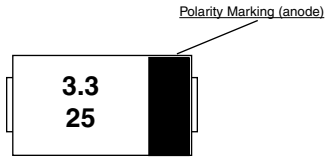




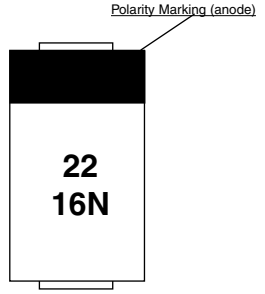


PRODUCTION CODE

2000											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	3	4	5	6	7	8	9	10	11	12
2001											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
13	14	15	16	17	18	19	20	21	22	23	24

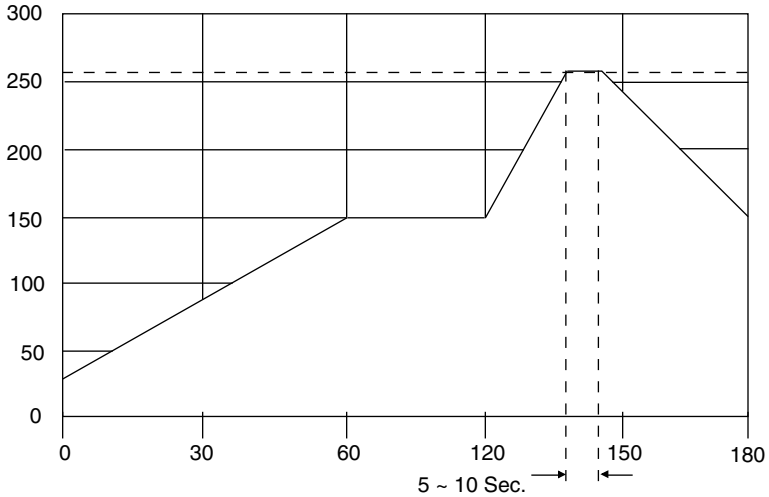


B, B2 and D1 Case Size
2.5V marked 2, 6.3V marked 6



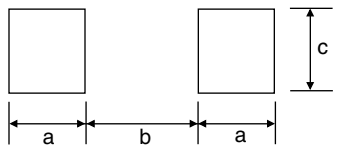
C and D Case Size
2.5V marked 2, 6.3V marked 6

Flow/Reflow Soldering
Maximum Temperature/Time: Flow 260°C/5 Sec.
Reflow 260°C/10 Sec.



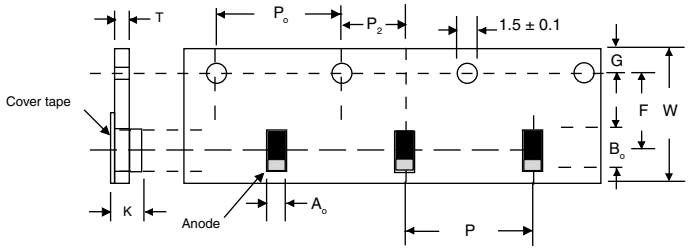
RECOMMENDED LAND PATTERN DIMENSIONS (mm)

Case Size	a	b	c
J	0.90	0.70	1.00
P	1.05	0.50	1.20
A & A2	1.35	1.10	1.50
B & B2	1.35	1.40	2.70
C	2.00	2.90	2.70
D	2.05	4.10	2.90



TAPE DIMENSIONS (mm)

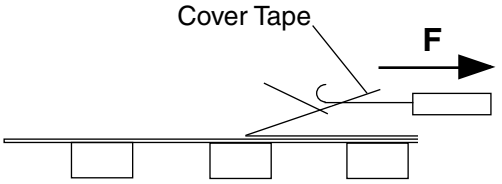
Metric Code	Case Code	A_0 ±0.2	B_0 ±0.2	W ±.30	F ±.05	P_0 ±0.1	P_1 ±0.1	P_2 ±0.05	G ±0.1	K ±0.2	T	7" Reel
1608	J	1.0	1.8	8.0	3.5	4.0	4.0	2.0	1.75	1.1	0.2	4000
2012	P	1.4	2.2	8.0	3.5	4.0	4.0	2.0	1.75	1.4	0.2	3000
3216	A2	1.9	3.5	8.0	3.5	4.0	4.0	2.0	1.75	1.4	0.2	3000
3216	A	1.9	3.5	8.0	3.5	4.0	4.0	2.0	1.75	1.9	0.2	2000
3528	B2	3.2	3.8	8.0	3.5	4.0	4.0	2.0	1.75	1.4	0.2	3000
3528	B	3.2	3.8	8.0	3.5	4.0	4.0	2.0	1.75	2.1	0.2	2000
6032	C	3.7	6.4	12.0	5.65	4.0	8.0	2.0	1.5	3.0	0.3	500
7343	D	4.8	7.7	12.0	5.65	4.0	8.0	2.0	1.5	3.3	0.3	500
7343H	E	4.7	7.7	12.0	5.5	4.0	8.0	2.0	1.5	4.5	0.6	500



Cover tape peel-off specification

1. Peel-off speed : 300 mm/min.
2. Peel-off force : F = 30 - 75g
3. Peel-off angle : Θ = 0 - 15°

Peel-off speed
(F) = 50mm/Sec.



REEL DIMENSIONS (mm)

Tape Width	A	C	D	E	N	W1	W2
8mm	178 ±2.0	13 ±0.5	21 ±0.5	2.0 ±0.5	50 min.	10 ± 2.0	14.5 max
12mm	178 ±2.0	13 ±0.5	21 ±0.5	2.0 ±0.5	50 min.	14.5 ± 2.0	18.5 max