


Miniature Aluminum Electrolytic Capacitors

NRWS Series

RADIAL LEADS, POLARIZED, NEW FURTHER REDUCED CASE SIZING,
FROM NRWA WIDE TEMPERATURE RANGE

EXTENDED TEMPERATURE
NRWA  NRWS
(today's standard) (reduced sizes)

RoHS
Compliant
includes all homogeneous materials



*See Part Number System for Details

CHARACTERISTICS

Rated Voltage Range		6.3 ~ 100VDC							
Capacitance Range		1.0 ~ 15,000 μ F							
Operating Temperature Range		-55°C ~ +105°C							
Capacitance Tolerance		\pm 20% (M)							
Maximum Leakage Current @ +20°C		After 1 min.		0.03CV or 4 μ A whichever is greater					
		After 2 min.		0.01CV or 3 μ A whichever is greater					
Max. Tan δ at 120Hz/20°C	W.V. (Vdc)	6.3	10	16	25	35	50	63	100
	S.V. (Vdc)	8	13	20	32	44	63	79	125
	C \leq 1,000 μ F	0.28	0.24	0.20	0.16	0.14	0.12	0.10	0.08
	C = 2,200 μ F	0.30	0.26	0.22	0.18	0.16	0.14	-	-
	C = 3,300 μ F	0.32	0.28	0.24	0.20	0.18	0.16	-	-
	C = 4,700 μ F	0.34	0.30	0.26	0.22	0.20	-	-	-
	C = 6,800 μ F	0.36	0.32	0.28	0.24	-	-	-	-
	C = 10,000 μ F	0.38	0.34	0.30	-	-	-	-	-
Low Temperature Stability Impedance Ratio @ 120Hz	Z-25°C/Z+20°C	5	4	3	2	2	2	2	2
	Z-40°C/Z+20°C	12	10	8	5	4	4	4	4
Load Life Test at +105°C & Rated W.V 2,000 Hours: 16V ~ 100V D \geq 10 ϕ 1,000 Hours: All others	Δ Capacitance	Within \pm 20% of initial measured value							
	Δ Tan δ	Less than 200% of specified value							
	Δ LC	Less than specified value							
Shelf Life Test +105°C 1,000 Hours No Load	Δ Capacitance	Within \pm 20% of initial measured value							
	Δ Tan δ	Less than 200% of specified value							
	Δ LC	Less than specified value							

Note: Capacitors shall conform to JIS-C-5141, unless otherwise specified here.

*1. Add 0.5 every 1000 μ F for more than 1000 μ F *2. Add 1.0 every 1000 μ F for more than 1000 μ F

STANDARD PRODUCT AND CASE SIZE TABLE D ϕ xL (mm)

Cap. (μ F)	Code	Working Voltage (Vdc)							
		6.3	10	16	25	35	50	63	100
1.0	1R0	-	-	-	-	-	5x11	5x11	-
2.2	2R2	-	-	-	-	-	5x11	5x11	-
3.3	3R3	-	-	-	-	-	5x11	5x11	-
4.7	4R7	-	-	-	-	-	5x11	5x11	-
10	100	-	-	-	-	-	5x11	5x11	-
22	220	-	-	-	-	-	5x11	5x11	8x11.5
33	330	-	-	-	-	5x11	5x11	6.3x11	8x12.5
47	470	-	-	-	5x11	5x11	6.3x11	6.3x11	10x12.5
100	101	-	5x11	5x11	6.3x11	6.3x11	8x11.5	8x12.5	10x20
220	221	5x11	6.3x11	6.3x11	8x11.5	8x11.5	10x12.5	10x16	12.5x25
330	331	6.3x11	6.3x11	8x11.5	8x11.5	10x12.5	10x16	10x20	16x25
470	471	6.3x11	6.3x11	8x11.5	10x12.5	10x16	10x20	12.5x20	16x31
1,000	102	8x11.5	10x12.5	10x16	10x20	12.5x20	12.5x25	16x25	-
2,200	222	10x16	10x20	12.5x20	12.5x25	16x25	16x31	-	-
3,300	332	10x20	12.5x20	12.5x25	16x25	16x35	18x36	-	-
4,700	472	12.5x20	12.5x25	16x25	16x31	18x36	-	-	-
6,800	682	12.5x25	16x25	16x31	18x36	-	-	-	-
10,000	103	16x25	16x31	18x36	-	-	-	-	-
15,000	153	16x36	18x36	-	-	-	-	-	-

LEAD SPACING AND DIAMETER (mm)

Case Dia. (D ϕ)	5	6.3	8	10	12.5	16	18
Lead Dia. (D ϕ)	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead Spacing (F)	2.0	2.5	3.5	5.0	5.0	7.5	7.5
Dim. α	0.5	0.5	0.5	0.5	0.5	0.5	0.5



STANDARD VALUES, SPECIFICATIONS AND CASE SIZES (mm)

Part Number	Cap. (µF)	W.V. (Vdc)	Dissipation Factor +20°C/120Hz	Ripple Current Rating (mA) +105°C/100kHz	Max. Impedance (Ω) +20°C/100KHz	Load Life Hours @+105°C
NRWS221M6.3V5x11F	220	6.3	0.28	160	1.40	1,000
NRWS331M6.3V6.3x11F	330		0.28	240	0.58	1,000
NRWS471M6.3V6.3x11F	470		0.28	250	0.55	1,000
NRWS102M6.3V8x11.5F	1,000		0.28	450	0.26	1,000
NRWS222M6.3V10x16F	2,200		0.30	760	0.12	2,000
NRWS332M6.3V10x20F	3,300		0.32	900	0.10	2,000
NRWS472M6.3V12.5x20F	4,700		0.34	1100	0.072	2,000
NRWS682M6.3V12.5x25F	6,800		0.36	1420	0.054	2,000
NRWS103M6.3V16x25F	10,000		0.38	1700	0.043	2,000
NRWS153M6.3V16x36F	15,000		0.56	2100	0.032	2,000
NRWS100M10V5x11F	100	10	0.24	150	1.40	1,000
NRWS220M10V6.3x11F	220		0.24	240	0.58	1,000
NRWS331M10V6.3x11F	330		0.24	250	0.55	1,000
NRWS471M10V6.3x11F	470		0.24	370	0.39	1,000
NRWS102M10V10x12.5F	1,000		0.24	560	0.16	2,000
NRWS222M10V10x20F	2,200		0.26	900	0.10	2,000
NRWS332M10V12.5x20F	3,300		0.28	1100	0.074	2,000
NRWS472M10V12.5x25F	4,700		0.30	1420	0.054	2,000
NRWS682M10V16x25F	6,800		0.32	1700	0.043	2,000
NRWS103M10V16x31F	10,000		0.34	1950	0.035	2,000
NRWS153M10V18x36F	15,000	0.52	2400	0.028	2,000	
NRWS101M16V5x11F	100	16	0.20	150	1.40	1,000
NRWS221M16V6.3x11F	220		0.20	240	0.55	1,000
NRWS331M16V8x11.5F	330		0.20	370	0.35	1,000
NRWS471M16V8x11.5F	470		0.20	450	0.28	1,000
NRWS102M16V10x16F	1,000		0.20	760	0.13	2,000
NRWS222M16V12.5x20F	2,200		0.22	1100	0.075	2,000
NRWS332M16V12.5x25F	3,300		0.24	1320	0.054	2,000
NRWS101M16V16x25F	4,700		0.26	1600	0.043	2,000
NRWS682M16V16x31F	6,800		0.28	1900	0.035	2,000
NRWS103M16V18x36F	10,000		0.30	2300	0.028	2,000
NRWS470M25V5x11F	47	25	0.16	150	1.40	1,000
NRWS101M25V6.3x11F	100		0.16	240	0.60	1,000
NRWS221M25V8x11.5F	220		0.16	370	0.39	1,000
NRWS331M25V8x11.5F	330		0.16	400	0.34	1,000
NRWS471M25V10x12.5F	470		0.16	560	0.17	2,000
NRWS102M25V10x20F	1,000		0.16	900	0.10	2,000
NRWS222M25V12.5x25F	2,200		0.18	1320	0.062	2,000
NRWS332M25V16x25F	3,300		0.20	1600	0.043	2,000
NRWS472M25V16x31F	4,700		0.22	1900	0.035	2,000
NRWS682M25V18x36F	6,800		0.24	2200	0.028	2,000
NRWS330M35V5x11F	33	35	0.14	120	2.10	1,000
NRWS470M35V5x11F	47		0.14	140	2.10	1,000
NRWS101M35V6.3x11F	100		0.14	180	1.10	1,000
NRWS221M35V8x11.5F	220		0.14	360	0.46	1,000
NRWS331M35V10x12.5F	330		0.14	580	0.26	1,000
NRWS471M35V10x16F	470		0.14	650	0.18	1,000
NRWS102M35V12.5x20F	1,000		0.14	900	0.11	2,000
NRWS222M35V16x25F	2,200		0.16	1400	0.056	2,000
NRWS332M35V16x35F	3,300		0.18	1800	0.038	2,000
NRWS472M35V18x36F	4,700		0.20	2000	0.035	2,000
NRWS1R0M50V5x11F	1.0	50	0.12	30	7.0	1,000
NRWS2R2M50V5x11F	2.2		0.12	40	5.5	1,000
NRWS3R3M50V5x11F	3.3		0.12	50	4.0	1,000
NRWS4R7M50V5x11F	4.7		0.12	80	2.80	1,000
NRWS100M50V5x11F	10		0.12	90	2.30	1,000
NRWS220M50V5x11F	22		0.12	110	2.20	1,000

For Automotive Applications see part number system



STANDARD VALUES, SPECIFICATIONS AND CASE SIZES (mm)

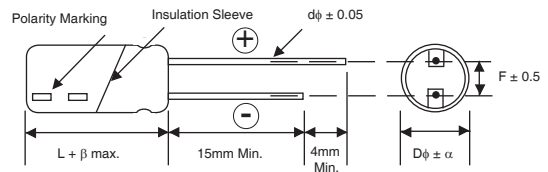
Part Number	Cap. (μF)	W.V. (Vdc)	Dissipation Factor +20°C/120Hz	Ripple Current Rating (mA) +105°C/100KHz	Max. Impedance (Ω) +20°C/100KHz	Load Life Hours @ +105°C
NRWS330M50V5x11F	33	50	0.12	120	2.10	1,000
NRWS470M50V6.3x11F	47		0.12	180	1.10	1,000
NRWS101M50V8x11.5F	100		0.12	310	310	1,000
NRWS221M50V10x12.5F	220		0.12	500	0.30	2,000
NRWS331M50V10x16F	330		0.12	650	0.20	2,000
NRWS471M50V10x20F	470		0.12	800	0.13	2,000
NRWS102M50V12.5x25F	1,000		0.12	1100	0.10	2,000
NRWS222M50V16x31F	2,200		0.14	1650	0.055	2,000
NRWS332M50V18x36F	3,300		0.16	2000	0.035	2,000
NRWS1R0M63V5x11F	1.0		63	0.10	30	10.5
NRWS2R2M63V5x11F	2.2	0.10		42	8.3	1,000
NRWS3R3M63V5x11F	3.3	0.10		58	6.0	1,000
NRWS4R7M63V5x11F	4.7	0.10		64	4.20	1,000
NRWS100M63V5x11F	10	0.10		90	2.80	1,000
NRWS220M63V5x11F	22	0.10		140	2.40	1,000
NRWS330M63V6.3x11F	33	0.10		200	1.40	1,000
NRWS470M63V6.3x11F	47	0.10		240	1.30	1,000
NRWS101M63V8x12.5F	100	0.10		300	300	1,000
NRWS221M63V10x16F	220	0.10		520	0.22	2,000
NRWS331M63V10x20F	330	0.10	765	0.17	2,000	
NRWS471M63V12.5x20F	470	0.10	960	0.14	2,000	
NRWS102M63V16x25F	1,000	0.10	1100	0.065	2,000	
NRWS220M100V8x11.5F	22	100	0.08	235	0.83	1,000
NRWS330M100V8x12.5F	33		0.08	300	0.60	1,000
NRWS470M100V10x12.5F	47		0.08	330	0.39	2,000
NRWS101M100V10x20F	100		0.08	450	450	2,000
NRWS221M100V12.5x25F	220		0.08	700	0.15	2,000
NRWS331M100V16x25F	330		0.08	950	0.09	2,000
NRWS471M100V16x31F	470		0.08	1100	0.085	2,000

For Automotive Applications see part number system

RIPPLE CURRENT CORRECTION FACTORS

Cap. (μF)	Frequency (Hz)		
	100	1K	10K ~
~ 47	0.50	0.80	1.0
> 47 ~ 220	0.55	0.85	1.0
> 220 ~ 1,000	0.65	0.90	1.0
> 1,000	0.75	0.90	1.0

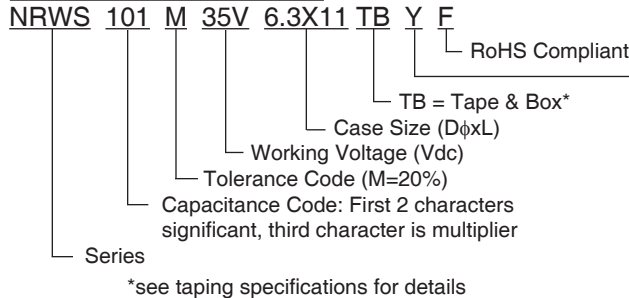
DIMENSIONS (mm)



$$\beta = L < 20\text{mm} = 1.5\text{mm}, L \geq 20\text{mm} = 2.0\text{mm}$$

Drawing is representative of parts as supplied in bulk or straight lead format, please see taping specification for details on taped format packaging.

PART NUMBER SYSTEM



Optional: For automotive equipment, sourced to special production and inspection at TS-16949 certified production site

PRECAUTIONS

Please review the notes on correct use, safety and precautions found on pages T10 & T11 of NIC's Electrolytic Capacitor catalog. Also found at www.niccomp.com/precautions. If in doubt or uncertainty, please review your specific application - process details with NIC's technical support personnel: tpmg@niccomp.com



RADIAL LEADS, POLARIZED, NEW FURTHER REDUCED CASE SIZING,
FROM NRWS WIDE TEMPERATURE RANGE

EXTENDED TEMPERATURE
NRWS → **NRWP**
(today's standard) (reduced sizes)

RoHS
Compliant
includes all homogeneous materials

*See Part Number System for Details



CHARACTERISTICS

Rated Voltage Range	6.3 ~ 100VDC									
Capacitance Range	33 ~ 33,000 μ F									
Operating Temperature Range	-55°C ~ +105°C									
Capacitance Tolerance	$\pm 20\%$ (M)									
Maximum Leakage Current After 2 minutes	0.01CV or 3 μ A whichever is greater									
Max. Tan δ at 120Hz/20°C	W.V. (Vdc)	6.3	10	16	25	35	50	63	100	
	S.V. (Vdc)	8	13	20	32	44	63	79	125	
	C \leq 1,000 μ F	0.28	0.24	0.20	0.16	0.14	0.12	0.10	0.08	
	C = 2,200 μ F	0.30	0.26	0.22	0.18	0.16	0.14	0.12	-	
	C = 3,300 μ F	0.32	0.28	0.24	0.20	0.18	0.16	-	-	
	C = 4,700 μ F	0.34	0.30	0.26	0.22	0.20	-	-	-	
	C = 6,800 μ F	0.38	0.34	0.30	0.26	0.24	-	-	-	
	C = 10,000 μ F	0.46	0.42	0.38	0.34	-	-	-	-	
	C = 15,000 μ F	0.56	0.52	0.48	-	-	-	-	-	
Low Temperature Stability Impedance Ratio @ 120Hz	Z-40°C/Z+20°C	5	4	3	2	2	2	2	2	
	Z-55°C/Z+20°C	10	8	6	4	3	3	3	3	
Load Life Test @ 105°C	Duration	$\phi D \leq 8$: 1,000 hours, $\phi D \geq 10$: 2,000 hours								
	Δ Capacitance	Within $\pm 25\%$ of initial measured value								
	Δ Tan δ	Less than 200% of specified value								
	Δ LC	Less than specified value								

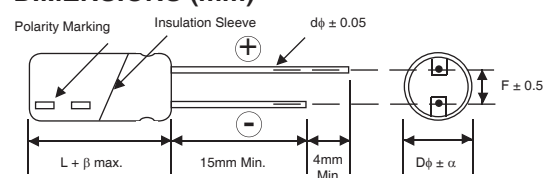
STANDARD PRODUCT AND CASE SIZE TABLE D ϕ xL (mm)

Capacitance (μ F)	Code	Working Voltage (Vdc)							
		6.3	10	16	25	35	50	63	100
33	330	-	-	-	-	-	-	-	8x11.5
47	470	-	-	-	-	-	-	-	8x11.5
100	101	-	-	-	-	-	8x11.5	8x11.5	10x16
220	221	-	-	-	6.3x11	8x11.5	10x12.5	10x16	12.5x20
330	331	-	-	6.3x11	8x11.5	10x12.5	10x16	10x20	12.5x25
470	471	-	6.3x11	8x11.5	8x11.5	10x12.5	10x20	12.5x20	16x25
680	681	6.3x11	8x11.5	8x11.5	10x12.5	10x16	12.5x20	12.5x25	16x31.5
1,000	102	8x11.5	8x11.5	10x12.5	10x16	10x20	12.5x25	16x25	18x35.5
2,200	222	10x16	10x16	10x20	12.5x20	16x25	16x31.5	18x31.5	-
3,300	332	10x20	10x20	12.5x20	16x25	16x25	18x35.5	-	-
4,700	472	12.5x20	12.5x20	12.5x25	16x25	16x35.5	-	-	-
6,800	682	12.5x25	16x25	16x25	16x35.5	18x35.5	-	-	-
10,000	103	16x25	16x25	16x31.5	18x35.5	-	-	-	-
15,000	153	16x31.5	16x35.5	18x35.5	-	-	-	-	-
22,000	223	18x31.5	18x35.5	-	-	-	-	-	-
33,000	333	18x40	-	-	-	-	-	-	-

LEAD SPACING AND DIAMETER (mm)

Case Dia. (D ϕ)	5	6.3	8	10	12.5	16	18
Lead Dia. (D ϕ)	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead Spacing (F)	2.0	2.5	3.5	5.0	5.0	7.5	7.5
Dim. α	0.5	0.5	0.5	0.5	0.5	0.5	0.5

DIMENSIONS (mm)



$\beta = D < 16\text{mm} = 1.5\text{mm}$, $L \geq 16\text{mm} = 2.0\text{mm}$

Drawing is representative of parts as supplied in bulk or straight lead format, please see taping specification for details on taped format packaging.

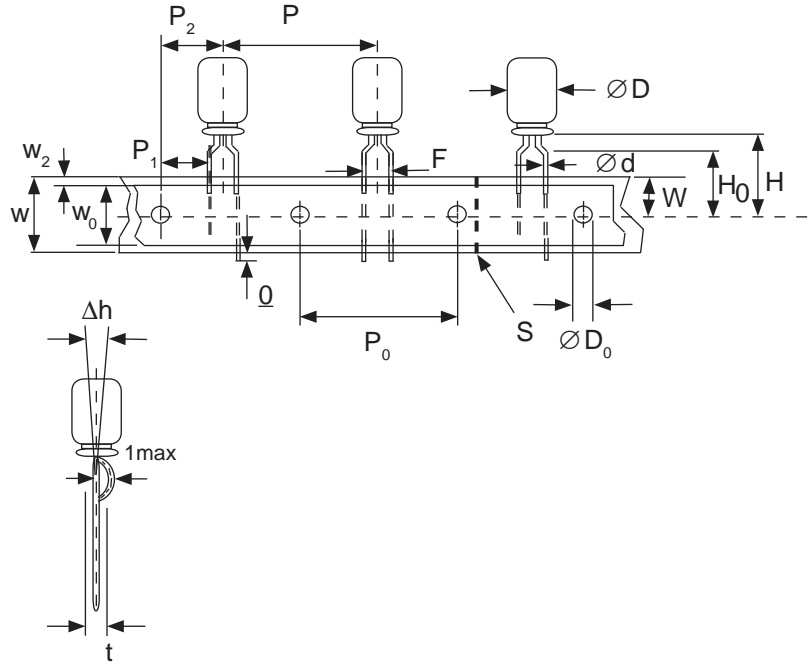


Miniature Aluminum Electrolytic Capacitors Taping Specifications

STANDARD RADIAL TAPING (5mm LEAD SPACING, FORMED LEADS) TB

Taping Dimensions (mm)

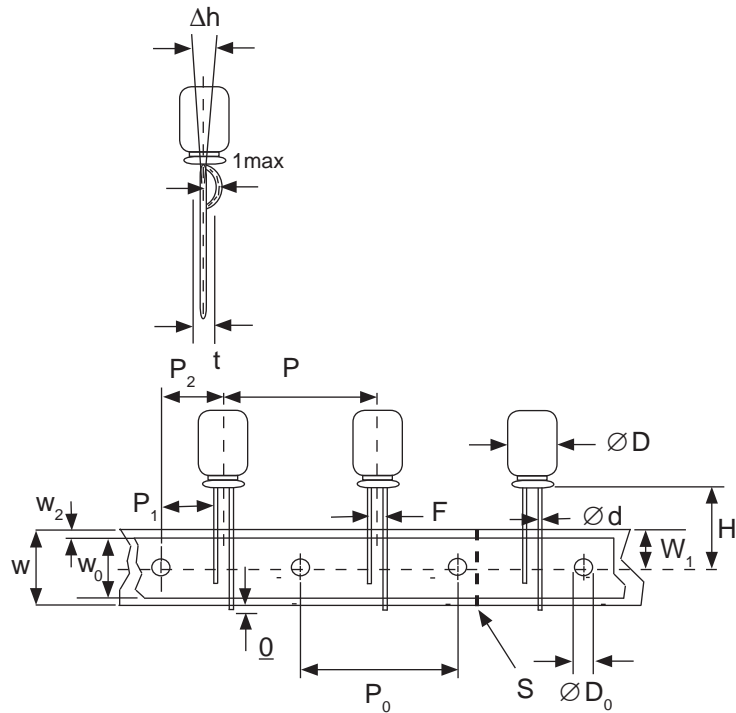
Case Dia. (D ϕ)	4	5	6.3	8
Case Size	4x5	5x5	6.3x5	8x11.5
Dim.	4x7	5x7	6.3x7	6.3x11
d ϕ \pm 0.05	0.45	0.45	0.5	0.5
H \pm 0.75	17.5	17.5	18.5	17.5
F $+0.8 \sim -0.2$	5.0 $-0.2 \sim +0.8$			
P	12.7 \pm 1.0			
P ₀	12.7 \pm 0.2			
P ₁	3.85 \pm 0.5 (at end of tape)			
P ₂	6.35 \pm 1.0			
W	18.0 \pm 0.5			
W ₀	11.5 min.			
W ₁	9.0 \pm 0.5			
W ₂	0 \sim 2.5			
H ₀	16.0 \pm 0.5			
l	1.0 max.			
D ₀ ϕ	4.0 \pm 0.2			
Δ h	0 \pm 1.0 (at top of can)			
t	0.7 \pm 0.2 (not including lead)			



STANDARD RADIAL TAPING (5mm LEAD SPACING, STRAIGHT LEADS) TB

Taping Dimensions (mm)

Case Dia. (D ϕ)	10	12.5
Case Size	All	All
Dim.	All	All
d ϕ \pm 0.05	0.6	0.6
H \pm 0.75	19.0	19.0
F $+0.8 \sim -0.2$	5.0	5.0
P \pm 1.0	25.4*	
P ₀	12.7 \pm 0.2	
P ₁	3.85	
P ₂	6.35 \pm 1.0	
W	18.0 \pm 0.5	
W ₀	11.5 min	
W ₁	9.0 \pm 0.5	
W ₂	0 \sim 2.5	
H ₀	16.0 \pm 0.5	
l	1.0 max.	
D ₀ ϕ	4.0 \pm 0.2	
Δ h	0 \pm 1.0 (at top of can)	
t	0.7 \pm 0.2 (not including lead)	



*Optional Taping Specifications

10mm diameter available with P dim. = 12.7mm
(P/N Suffix: TB12.7MMP)

12.5mm diameter available with P dim. = 15mm, P₁ = 5.0mm,
P₀ = 15.0mm & P₂ = 7.5mm (P/N Suffix: TB15MMP)

NOTE: ANODE (+) LEAD FEEDS OFF FIRST.
FOR OPTION OF NEGATIVE (-) LEAD FIRST,
SPECIFY "TBN".

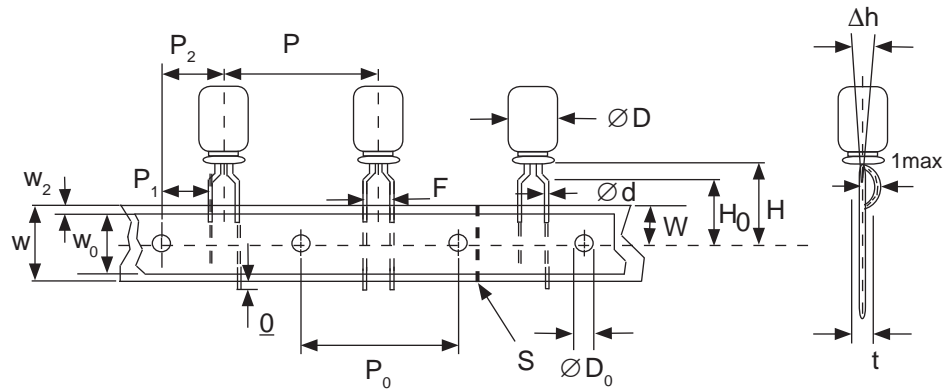


Miniature Aluminum Electrolytic Capacitors Taping Specifications

SPECIAL RADIAL TAPING (2.5mm LEAD SPACING, FORMED LEADS) TBF1

Taping Dimensions (mm)

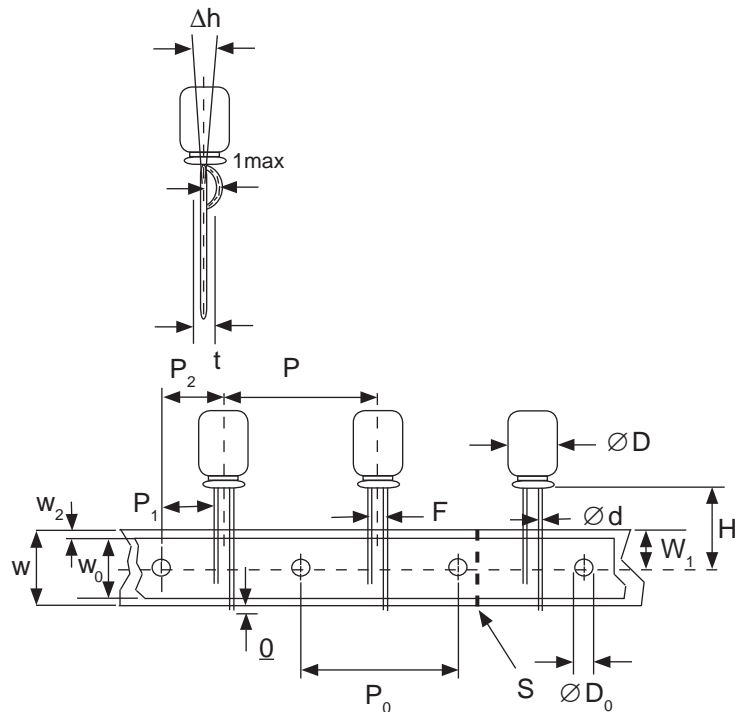
Case Dia. (D ϕ)	4		5	
Case Size Dim.	4x5 4x7	5x5 5x7	5x11	
d ϕ \pm 0.05	0.45	0.45	0.5	
H \pm 0.75	17.5	17.5	18.5	
H ₀ \pm 0.5	16.0	-	-	
F	2.5 -0.2 ~ +0.8			
P	12.7 \pm 1.0			
P ₀	12.7 \pm 0.2			
P ₁	5.1 \pm 0.5			
P ₂	6.35 \pm 1.0			
W	18.0 \pm 0.5			
W ₀	11.5 min.			
W ₁	9.0 \pm 0.5			
W ₂	0 ~ 1.5			
l	1.0 max.			
D ₀ ϕ	4.0 \pm 0.2			
Δ h	0 \pm 1.0			
t	0.7 \pm 0.2			



SPECIAL STRAIGHT LEAD TAPING TBST

Taping Dimensions (mm)

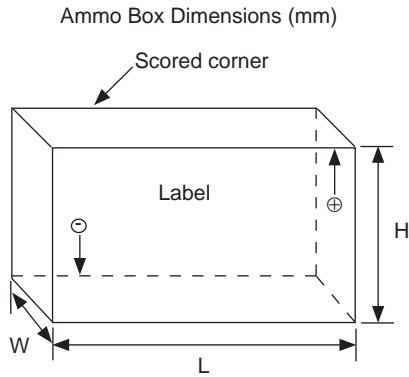
Case Dia. (D ϕ)	4			5			6.3		8	
Case Size Dim.	4x5 4x7	5x5 5x7	5x11		6.3x5 6.3x7	6.3x11	8x11.5			
d ϕ \pm 0.05	0.45	0.45	0.5	0.45	0.5	0.6				
H \pm 0.75	17.5	17.5	18.5	17.5	18.5	20.0				
F +0.8 ~ -0.2	2.0*	2.0	2.0	2.5	2.5	3.5				
P \pm 1.0	12.7 \pm 0.2									
P ₀	12.7 \pm 0.2									
P ₁	5.1	5.1	5.1	5.1	5.1	4.6				
P ₂	6.35 \pm 1.0									
W	18.0 \pm 0.5									
W ₀	11.5 min.									
W ₁	9.0 \pm 0.5									
W ₂	0 ~ 2.5									
H ₀	16.0 \pm 0.5									
l	1.0 max.									
D ₀ ϕ	4.0 \pm 0.2									
Δ h	0 \pm 1.0 (at top of can)									
t	0.7 \pm 0.2 (not including lead)									



* Parts with 4mm diameter are taped with a slight flare in the lead and a 2.0mm lead-space.



RADIAL TAPED PACKAGING



Ammo Box (Tape & Box) TB, TBF1, TBST

Size of box and component quantity

Case Dia (D ϕ) or Case Size	Q'ty per Box (pcs)	Dim. L	Dim. H	Dim. W
4x5, 4x7	2,000	331	175	43
5x5, 5x7	2,000	331	220	43
5x11	2,000	340	255	55
6.3x5, 6.3x7	2,000	331	280	43
6.3x11	2,000	331	280	48
8x11.5, 8x12.5	1,000	335	235	53
10x12.5*	500	335	190	53
10x16*	500	335	300	53
10x20*	500	335	300	55
12.x20*	500	335	300	55
12.5x25*	500	335	300	61

*Special Taping Consult Factory For Availability