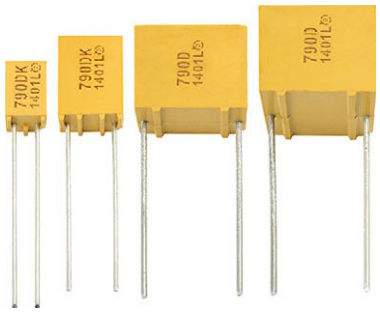
Resin-Molded, Radial-Lead Solid Tantalum Capacitors



FEATURES

- Terminations: tin / lead (SnPb), 100 % tin (Sn)
- Four case sizes precisely molded with a flame retardant epoxy resin
- Stand off on all case sizes
- Available on tape for automatic insertion equipment (only A- and B-case, C- and D-case on request)
- Low leakage current
- Low impedance
- Extended value ranges available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS* Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

PERFORMANCE CHARACTERISTICS

Operating Temperature: -55 °C to +125 °C (above 85 °C, voltage derating is required)

Capacitance Range: 0.1 µF to 330 µF

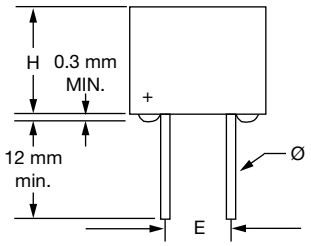
Capacitance Tolerance: ± 10 %, ± 20 %

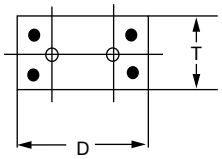
Voltage Rating: 6.3 V_{DC} to 50 V_{DC}

ORDERING INFORMATION

790D	157	X0	6R3	C	2	B	E3
MODEL	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING	CASE CODE	STYLE NUMBER	PACKAGING	RoHS COMPLIANT
790D = standard and extended range	Expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros following.	X0 = ± 20 % X9 = ± 10 %	Expressed in volts. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V)	See Ratings and Case Codes table	Insulated case (standard)	See packing information B: bulk G: ammopack (H = 16.5 mm) H: ammopack (H = 18.5 mm) I: ammopack shouldered leads (A case) X: reel pack (H = 16.5 mm) Y: reel pack (H = 18.5 mm) Z: reel pack shouldered leads (A case)	E3 = 100 % tin termination (RoHS-compliant) Blank = SnPb termination

DIMENSIONS in inches [millimeters]





CASE CODE	H MAX.	D MAX.	T MAX.	E ± 0.006 [0.15]	Ø 0.002 [0.05] (+10 %)
A	0.287 [7.3]	0.185 [4.7]	0.165 [4.2]	0.100 [2.54]	0.020 [0.5]
B	0.413 [10.5]	0.287 [7.3]	0.189 [4.8]	0.200 [5.08]	0.020 [0.5]
C	0.413 [10.5]	0.484 [12.3]	0.287 [7.3]	0.400 [10.16]	0.024 [0.6]
D	0.413 [10.5]	0.484 [12.3]	0.484 [12.3]	0.400 [10.16]	0.024 [0.6]

RATINGS AND CASE CODES

C_R (µF)	RATED VOLTAGE U_R AT +85 °C															
	6.3 V		10 V		16 V		20 V		25 V		35 V		40 V		50 V	
	CATEGORY VOLTAGE U_C AT +125 °C															
	4.0 V		6.3 V		10 V		13 V		16 V		23 V		25 V		32 V	
	STD.	EXT.	STD.	EXT.	STD.	EXT.	STD.	EXT.	STD.	EXT.	STD.	EXT.	STD.	EXT.	STD.	EXT.
0.10													A		A	
0.15														A	A	
0.22														A	A	
0.33													A			
0.47													A			
0.68															A	
1.0													A		A / B	
1.5									A				B		B	
2.2					A		A						B		B	
3.3					A							A	B	A	B	
4.7			A							A			B		B	
6.8	A							A					B		C	
10						A			B			B	C		C	
15				A	B		B			B			C		C	
22		A			B			B		B			C			
33			B			B			C			C		D		
47		B		B	C		C			D				D		
68				B	C			C								
100			C		D	C	D									
150	C			C		D										
220		C	D													
330	D															

STANDARD RATINGS / EXTENDED RATINGS

CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C (µA)	MAX. DF 120 Hz, AT +25 °C (%)	MAX. IMPEDANCE 100 kHz, AT +25 °C (Ω)
U_R = 6.3 V_{DC} AT +85 °C, SURGE = 8 V; U_C = 4 V_{DC} AT +125 °C, SURGE = 5 V					
6.8	A	790D685X(1)6R3A2(2)	1.0	6	4.0
22	**A**	**790D226X(1)6R3A2(2)**	**1.3**	**6**	**2.1**
47	B	790D476X(1)6R3B2(2)	2.9	6	1.3
68	**B**	**790D686X(1)6R3B2(2)**	**4.2**	**6**	**1.3**
150	C	790D157X(1)6R3C2(2)	9.4	6	0.6
220	**C**	**790D227X(1)6R3C2(2)**	**13.8**	**6**	**0.6**
330	D	790D337X(1)6R3D2(2)	20.7	8	0.4

Notes

- Part number definitions:
  (1) Insert 0 for ± 20 % tolerance or 9 for ± 10 %
  (2) See Ordering Information, packaging code
- Extended ratings in bold print

STANDARD RATINGS / EXTENDED RATINGS

CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C (µA)	MAX. DF 120 Hz, AT +25 °C (%)	MAX. IMPEDANCE 100 kHz, AT +25 °C (Ω)
U_R = 10 V_{DC} AT +85 °C, SURGE = 13 V; U_C = 6.3 V_{DC} AT +125 °C, SURGE = 8 V					
4.7	A	790D475X(1)010A2(2)	1.0	6	4.0
15	**A**	**790D156X(1)010A2(2)**	**1.5**	**6**	**2.5**
33	B	790D336X(1)010B2(2)	3.3	6	1.3
47	**B**	**790D476X(1)010B2(2)**	**4.7**	**6**	**1.4**
68	**B**	**790D686X(1)010B2(2)**	**6.8**	**6**	**1.3**
100	C	790D107X(1)010C2(2)	10.0	6	0.6
150	**C**	**790D157X(1)010C2(2)**	**15.0**	**6**	**0.6**
220	D	790D227X(1)010D2(2)	22.0	8	0.4
U_R = 16 V_{DC} AT +85 °C, SURGE = 20 V; U_C = 10 V_{DC} AT +125 °C, SURGE = 13 V					
2.2	A	790D225X(1)016A2(2)	1.0	6	5.5
3.3	A	790D335X(1)016A2(2)	1.0	6	4.4
10	**A**	**790D106X(1)016A2(2)**	**1.6**	**6**	**2.7**
15	B	790D156X(1)016B2(2)	2.4	6	1.6
22	B	790D226X(1)016B2(2)	3.5	6	1.3
33	**B**	**790D336X(1)016B2(2)**	**5.2**	**6**	**1.6**
47	C	790D476X(1)016C2(2)	7.5	6	0.8
68	C	790D686X(1)016C2(2)	10.8	6	0.6
100	**C**	**790D107X(1)016C2(2)**	**16.0**	**6**	**0.7**
100	D	790D107X(1)016D2(2)	16.0	6	0.5
150	D	790D157X(1)016D2(2)	24.0	8	0.4
U_R = 20 V_{DC} AT +85 °C, SURGE = 26 V; U_C = 13 V_{DC} AT +125 °C, SURGE = 16 V					
2.2	A	790D225X(1)020A2(2)	1.0	6	5.5
6.8	**A**	**790D685X(1)020A2(2)**	**1.3**	**6**	**3.5**
15	B	790D156X(1)020B2(2)	3.0	6	1.5
22	**B**	**790D226X(1)020B2(2)**	**4.4**	**6**	**2.1**
47	C	790D476X(1)020C2(2)	9.4	6	0.7
68	**C**	**790D686X(1)020C2(2)**	**13.6**	**6**	**0.8**
100	D	790D107X(1)020D2(2)	20.0	6	0.7
U_R = 25 V_{DC} AT +85 °C, SURGE = 32 V; U_C = 16 V_{DC} AT +125 °C, SURGE = 20 V					
1.5	A	790D155X(1)025A2(2)	1.0	6	6.0
4.7	**A**	**790D475X(1)025A2(2)**	**1.1**	**6**	**4.5**
10	B	790D106X(1)025B2(2)	2.5	6	1.6
15	**B**	**790D156X(1)025B2(2)**	**3.7**	**6**	**2.4**
22	**B**	**790D226X(1)025B2(2)**	**5.5**	**6**	**2.1**
33	C	790D336X(1)025C2(2)	8.2	6	0.8
47	D	790D476X(1)025D2(2)	11.8	6	1.0
U_R = 35 V_{DC} AT +85 °C, SURGE = 45 V; U_C= 23 V_{DC} AT +125 °C, SURGE = 29 V					
3.3	**A**	**790D335X(1)035A2(2)**	**1.2**	**6**	**6.0**
10	**B**	**790D106X(1)035B2(2)**	**3.5**	**6**	**2.6**
33	**C**	**790D336X(1)035C2(2)**	**11.6**	**6**	**1.3**

Notes

- Part number definitions:
  (1) Insert 0 for ± 20 % tolerance or 9 for ± 10 %
  (2) See Ordering Information, packaging code
- Extended ratings in bold print

STANDARD RATINGS / EXTENDED RATINGS

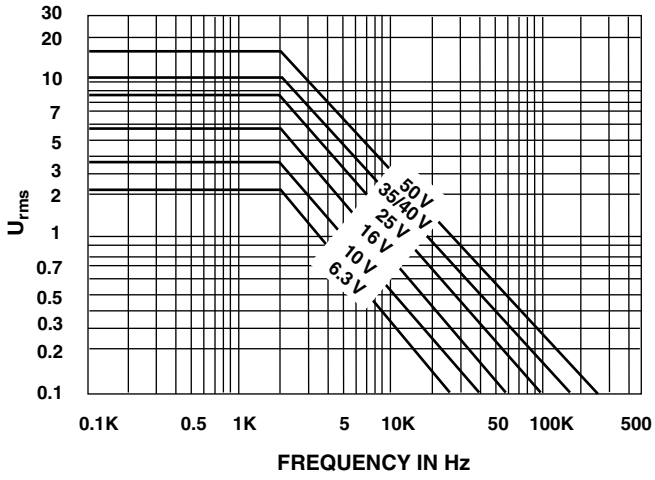
CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C (µA)	MAX. DF 120 Hz, AT +25 °C (%)	MAX. IMPEDANCE 100 kHz, AT +25 °C (Ω)
U_R = 40 V_{DC} AT +85 °C, SURGE = 52 V; U_C = 25 V_{DC} AT +125 °C, SURGE = 32 V					
0.10	A	790D104X(1)040A2(2)	1.0	6	30.0
0.15	A	790D154X(1)040A2(2)	1.0	6	24.0
0.22	A	790D224X(1)040A2(2)	1.0	6	18.0
0.33	A	790D334X(1)040A2(2)	1.0	6	14.0
0.47	A	790D474X(1)040A2(2)	1.0	6	11.0
1.0	A	790D105X(1)040A2(2)	1.0	6	6.5
1.5	B	790D155X(1)040B2(2)	1.0	6	5.2
2.2	B	790D225X(1)040B2(2)	1.0	6	4.0
3.3	A	790D335X(1)040A2(2)	1.3	6	2.8
3.3	B	790D335X(1)040B2(2)	1.3	6	2.8
4.7	B	790D475X(1)040B2(2)	1.8	6	2.0
6.8	B	790D685X(1)040B2(2)	2.7	6	1.6
10	C	790D106X(1)040C2(2)	4.0	6	1.3
15	C	790D156X(1)040C2(2)	6.0	6	1.0
22	C	790D226X(1)040C2(2)	8.8	6	0.8
33	D	790D336X(1)040D2(2)	13.2	6	0.6
47	D	790D476X(1)040D2(2)	18.8	6	0.5
U_R = 50 V_{DC} AT +85 °C, SURGE = 65 V; U_C = 32 V_{DC} AT +125 °C, SURGE = 41 V					
0.10	A	790D104X(1)050A2(2)	1.0	6	30
0.15	A	790D154X(1)050A2(2)	1.0	6	24
0.22	A	790D224X(1)050A2(2)	1.0	6	18
0.68	A	790D684X(1)050A2(2)	1.0	6	8.0
1.0	A	790D105X(1)050A2(2)	1.0	6	6.5
1.0	B	790D105X(1)050B2(2)	1.0	6	6.5
1.5	B	790D155X(1)050B2(2)	1.0	6	5.2
2.2	B	790D225X(1)050B2(2)	1.1	6	4.0
3.3	B	790D335X(1)050B2(2)	1.6	6	2.8
4.7	B	790D475X(1)050B2(2)	2.3	6	2.0
6.8	C	790D685X(1)050C2(2)	3.4	6	1.6
10	C	790D106X(1)050C2(2)	5.0	6	1.3
15	C	790D156X(1)050C2(2)	7.5	6	1.0

Notes

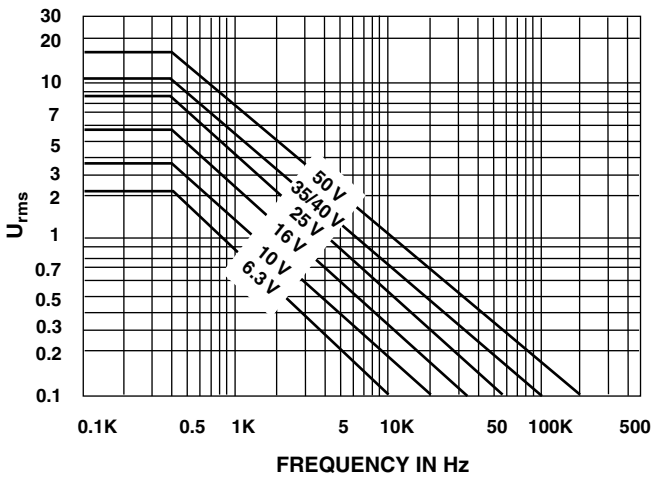
- Part number definitions:
  (1) Insert 0 for ± 20 % tolerance or 9 for ± 10 %
  (2) See Ordering Information, packaging code
- Extended ratings in bold print

MAXIMUM PERMISSIBLE RIPPLE VOLTAGE AT +25 °C

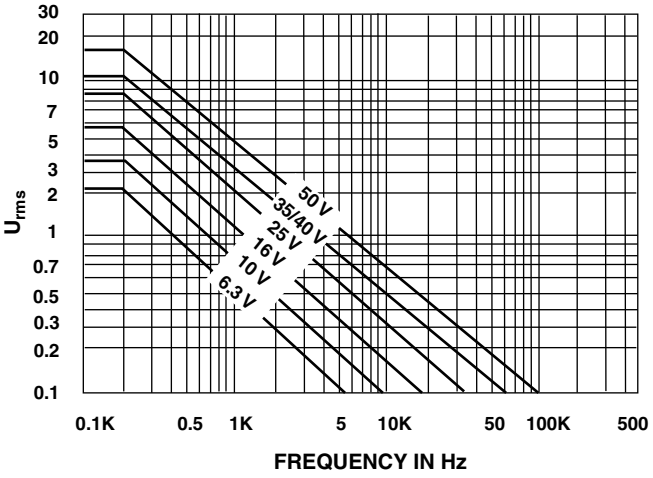
CASE SIZE "A"



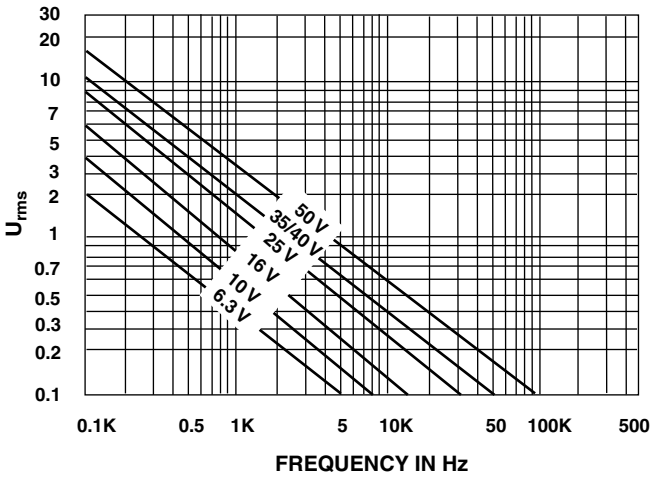
CASE SIZE "B"



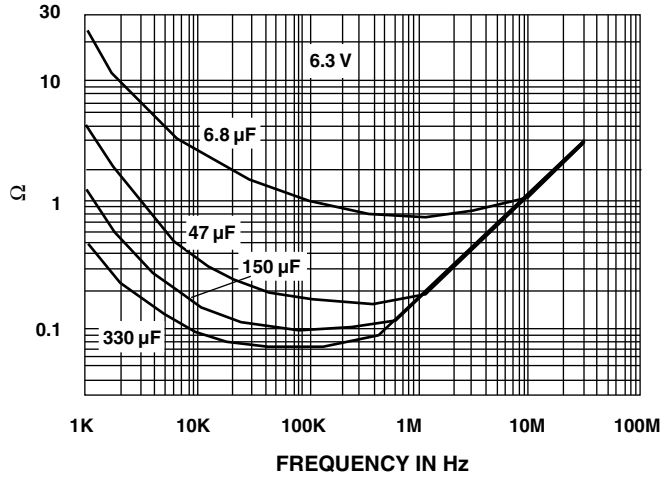
CASE SIZE "C"

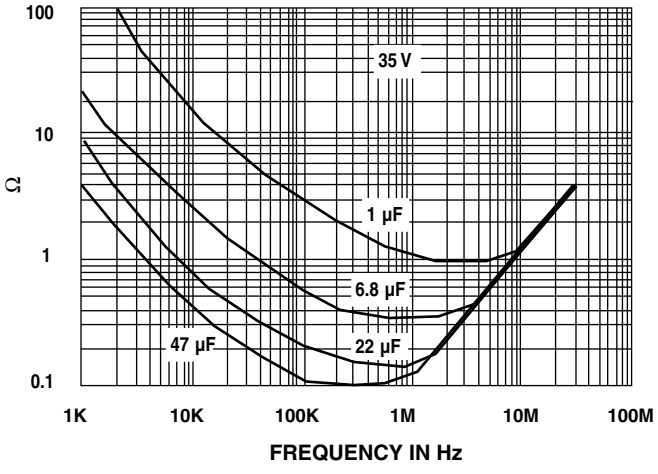


CASE SIZE "D"



TYPICAL CURVES OF IMPEDANCE VS FREQUENCY





PACKAGING QUANTITIES			
CASE CODE	TAPE AND REEL	AMMO	BULK
A	1000	1000	500
B	1000	1000	250
C	300	300	100
D	200	200	50

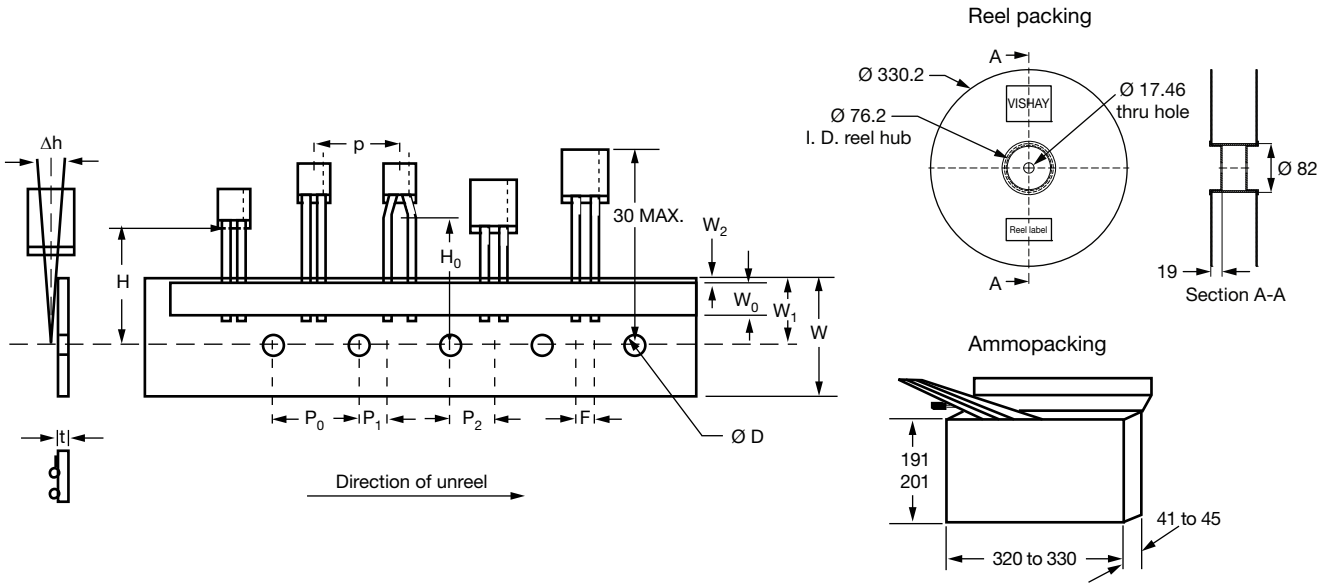
PERFORMANCE CHARACTERISTICS

1. **Operating Temperature:** -55 °C to +85 °C with rated voltage U_R applied. +85 °C to 125 °C with linear voltage derating to category voltage U_C (see general information) applied.
2. **Capacitance and Tolerance:** capacitance measured at 100 Hz and +25 °C shall be within the specified tolerance limits of the nominal rating.
3. **Reverse Voltage:** 15 % of rated voltage at +25 °C
   5 % of rated voltage at +85 °C
4. **Surge Voltage:** 130 % of U_R at +85 °C
   130 % of U_C at +125 °C
5. **Impedance at 100 kHz:** measured at +20 °C ± 5 °C, impedance shall not exceed the values listed in datasheet.
6. **Stability at low and high temperatures:** capacitance change with temperature, dissipation factor and DC leakage current shall not exceed the limits of the following table.

TEMP.	CAPACITANCE CHANGE	DISSIPATION FACTOR $C_RU_R \leq 1900$ / $C_RU_R > 1900$	LEAKAGE CURRENT I_L
-55 °C	-10 %	9 % / 11 %	-
+25 °C	-	6 % / 8 %	0.01 x C_R x U_R or 1 µA, whichever is greater
+85 °C	+12 %	9 % / 11 %	0.1 x C_R x U_R or 10 µA, whichever is greater
+125 °C	+15 %	12 % / 14 %	0.125 x C_R x U_R or 12.5 µA, whichever is greater

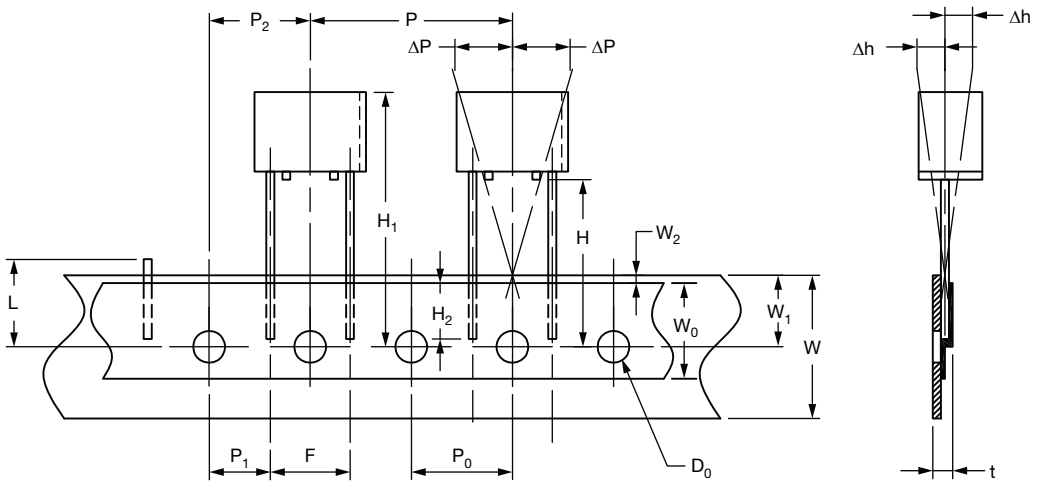
7. **Life Test:** 2000 h at +85 °C with rated voltage applied
   2000 h at +125 °C with category voltage applied
   $\Delta C/C \leq 10$ % of initial value
   IL ≤ 1.25 initial limit
   DF ≤ initial limit
8. **Humidity Test:** 56 days at +40 °C, 90 % relative humidity
   $\Delta C/C \leq 8$ % of initial value
   IL ≤ initial limit
   DF ≤ initial limit
9. **Charge and Discharge Test:**
   1 million cycles at +85 °C,
   0.5 s charge at U_R
   0.5 s discharge
   Series resistance < 0.5 Ω
   $\Delta C/C \leq 5$ % of initial value
   IL ≤ initial limit
   DF ≤ initial limit
10. **Marking:**
    Top: Rating and polarity
    Front: Type, date code, Vishay identification

TAPE AND REEL PACKING (Case A and B - meets IEC 286-2)



DESIGNATIONS	SYMBOL	DIMENSIONS (mm)		
Pitch of component	P	12.7 ± 1.0		
Feed hole pitch	P_0	12.7 ± 0.3		
Tape width	W	18 (+ 1/- 0.5)		
Hold down tape width	W_0	12		
Hole position	W_1	9 (+ 0.75/-0.5)		
Hold down tape position	W_2	0 (+ 3/-0)		
Feed hole diameter	D_0	4.0 ± 0.3		
Tape thickness	T	0.5 ± 0.2		
Component alignment	Δh	0 ± 2		
Lead clinch height	H_0	16.0 ± 0.5		
Hole center to component center	P_2	6.35 ± 1.3		
Lead wire spacing Feed hole center to wire center		**CASE A**	**CASE A**	**CASE B**
	F	2.5 + 0.6/- 0.1	5 + 0.6/- 0.1	5 + 0.6/- 0.1
	P_1	5.1 ± 0.7	3.85 ± 0.7	3.85 ± 0.7
Reel pack options	H = 16.5	X	Z	X
	H = 18.5	Y		Y
Ammopack options	H = 16.5	G	I	G
	H = 18.5	H		H

TAPE AND REEL PACKING (Case C and D)



DESIGNATIONS	SYMBOL	DIMENSIONS (mm)	
Pitch of component	P	25.4 ± 1.0	
Feed hole pitch	P_0	12.7 ± 0.3	
Tape width	W	18.0 (+ 1/- 0.5)	
Hold down tape width	W_0	12	
Hole position	W_1	9.0 (+ 0.75/- 0.5)	
Hold down tape position	W_2	0 (+ 3/- 0)	
Maximum height of components	H_1	32 max.	
Tolerance of positioning parts sideways	ΔP	0 ± 1.0	
Feed hole diameter	D_0	4.0 ± 0.3	
Tape thickness	t	0.5 ± 0.2	
Component alignment	Δh	0 ± 2	
Cut out length	L	11 max.	
Lead wire spacing	F	10.16 + 0.6/- 0.1	
Feed hole center to wire center	P_1	7.62 ± 0.7	
Hole center to component center	P_2	12.7 ± 1.0	
Length of leads under adhesive tape	H_2	5.0 min. to 9.0 max.	
Reel pack options		CASE C	CASE D
	H = 16.5	X	X
	H = 18.5	Y	Y
Ammopack options	H = 16.5	G	G
	H = 18.5	H	H

PRODUCT INFORMATION	
Quick Reference Guide	www.vishay.com/doc?40037
Selector Guide	www.vishay.com/doc?49054
Parameter Comparison Guide	www.vishay.com/doc?40033
Mounting of Through-Hole Components	www.vishay.com/doc?40108
Frequently Asked Questions	www.vishay.com/doc?40110
Solid Tantalum Capacitors (With MnO_2 Electrolyte) Voltage Derating	www.vishay.com/doc?40246

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