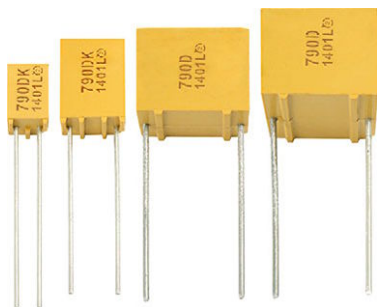


## Resin-Molded, Radial-Lead Solid Tantalum Capacitors



### 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<sub>DC</sub> to 50 V<sub>DC</sub>

### 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](http://www.vishay.com/doc?99912)



**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

### 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: ammpack (H = 16.5 mm) H: ammpack (H = 18.5 mm) I: ammpack 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 <sub>R</sub> (μF)	RATED VOLTAGE U <sub>R</sub> AT +85 °C															
	6.3 V		10 V		16 V		20 V		25 V		35 V		40 V		50 V	
	CATEGORY VOLTAGE U <sub>C</sub> 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 $C_R$ ( $\mu F$ )	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C ( $\mu A$ )	MAX. DF 120 Hz, AT +25 °C (%)	MAX. IMPEDANCE 100 kHz, AT +25 °C ( $\Omega$ )
$U_R = 6.3 V_{DC}$ 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
<b>22</b>	<b>A</b>	<b>790D226X(1)6R3A2(2)</b>	<b>1.3</b>	<b>6</b>	<b>2.1</b>
47	B	790D476X(1)6R3B2(2)	2.9	6	1.3
<b>68</b>	<b>B</b>	<b>790D686X(1)6R3B2(2)</b>	<b>4.2</b>	<b>6</b>	<b>1.3</b>
150	C	790D157X(1)6R3C2(2)	9.4	6	0.6
<b>220</b>	<b>C</b>	<b>790D227X(1)6R3C2(2)</b>	<b>13.8</b>	<b>6</b>	<b>0.6</b>
330	D	790D337X(1)6R3D2(2)	20.7	8	0.4

**Notes**

- Part number definitions:
  - Insert 0 for  $\pm 20\%$  tolerance or 9 for  $\pm 10\%$
  - See Ordering Information, packaging code
- Extended ratings in bold print



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

## Notes

- Part number definitions:
  - Insert 0 for  $\pm 20$  % tolerance or 9 for  $\pm 10$  %
  - See Ordering Information, packaging code
- Extended ratings in bold print



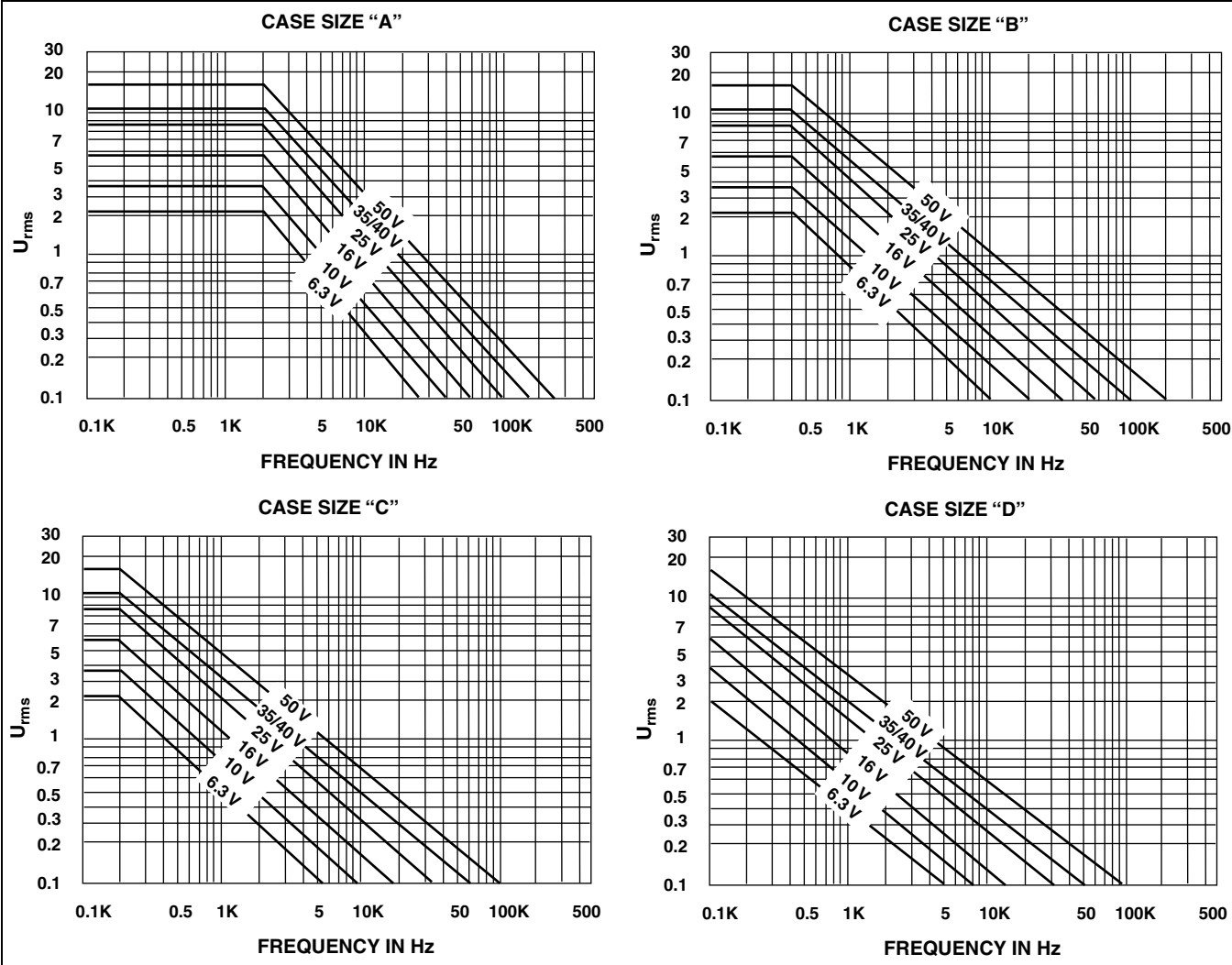
STANDARD RATINGS / EXTENDED RATINGS					
CAPACITANCE $C_R$ ( $\mu$ F)	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C ( $\mu$ A)	MAX. DF 120 Hz, AT +25 °C (%)	MAX. IMPEDANCE 100 kHz, AT +25 °C ( $\Omega$ )
<b><math>U_R = 40 V_{DC}</math> AT +85 °C, SURGE = 52 V; <math>U_C = 25 V_{DC}</math> AT +125 °C, SURGE = 32 V</b>					
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
<b><math>U_R = 50 V_{DC}</math> AT +85 °C, SURGE = 65 V; <math>U_C = 32 V_{DC}</math> AT +125 °C, SURGE = 41 V</b>					
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**

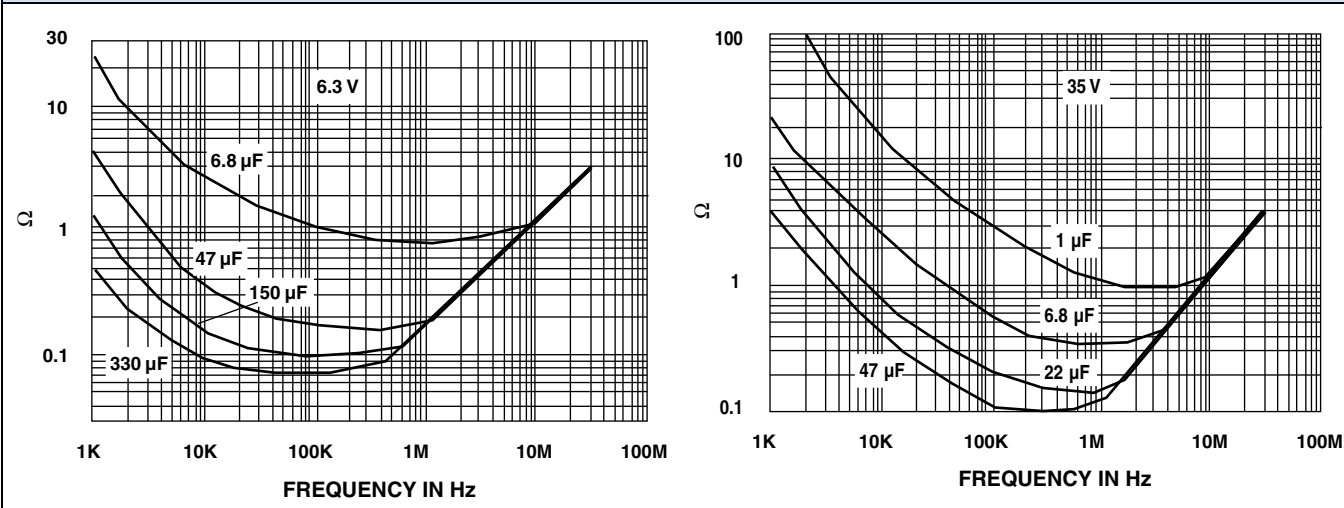
- Part number definitions:
  - Insert 0 for  $\pm 20$  % tolerance or 9 for  $\pm 10$  %
  - See Ordering Information, packaging code
- Extended ratings in bold print



### MAXIMUM PERMISSIBLE RIPPLE VOLTAGE AT +25 °C



### TYPICAL CURVES OF IMPEDANCE VS FREQUENCY



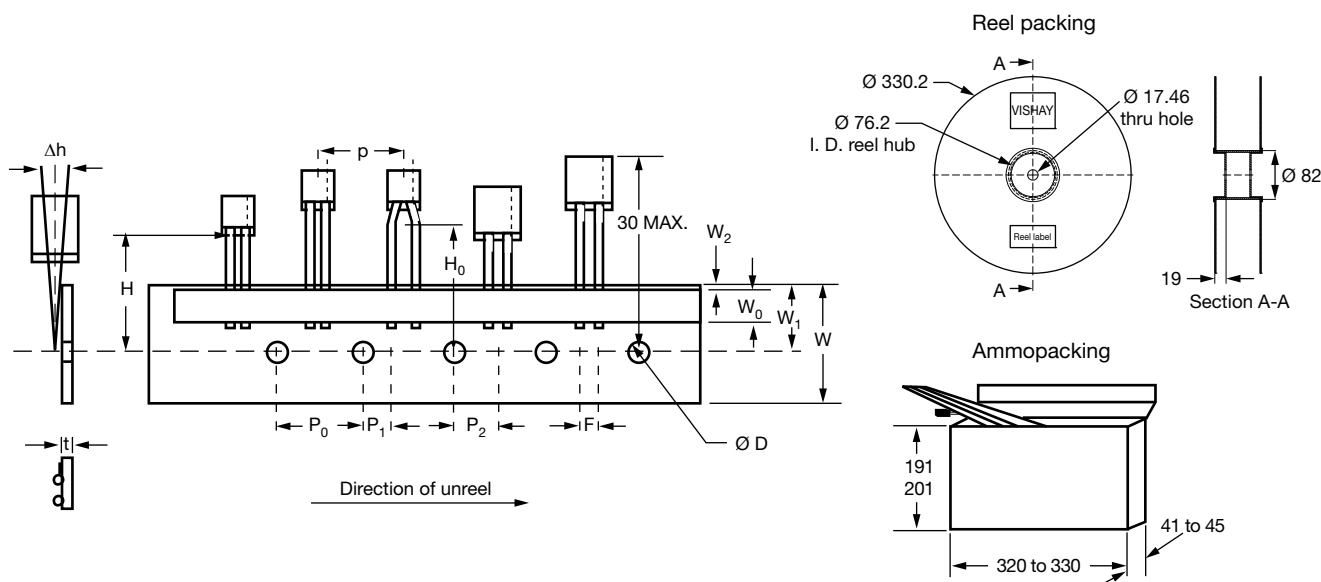
**PACKAGING QUANTITIES**

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

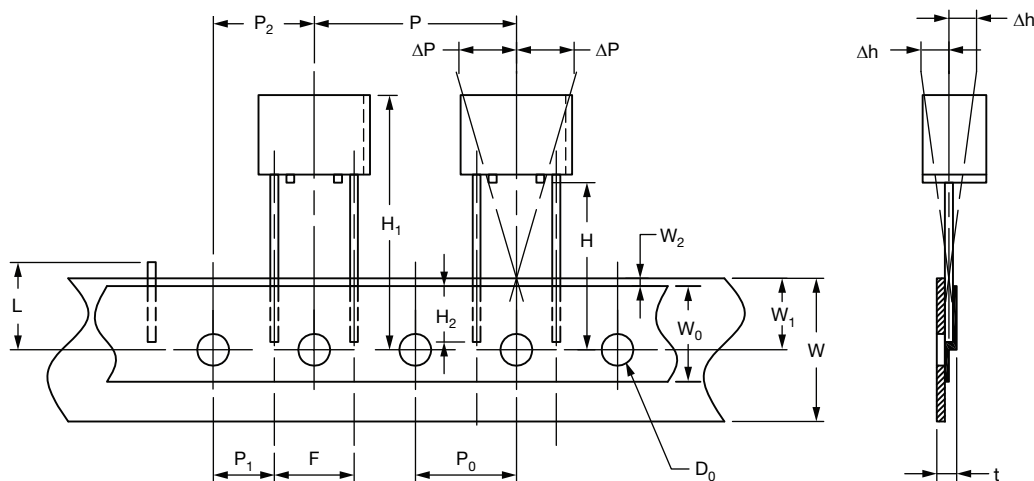
**PERFORMANCE CHARACTERISTICS**

- 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.
- Capacitance and Tolerance:** capacitance measured at 100 Hz and +25 °C shall be within the specified tolerance limits of the nominal rating.
- Reverse Voltage:** 15 % of rated voltage at +25 °C  
5 % of rated voltage at +85 °C
- Surge Voltage:** 130 % of  $U_R$  at +85 °C  
130 % of  $U_C$  at +125 °C
- Impedance at 100 kHz:** measured at +20 °C  $\pm$  5 °C, impedance shall not exceed the values listed in datasheet.
- 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.
- 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  
 $IL \leq 1.25$  initial limit  
 $DF \leq$  initial limit
- Humidity Test:** 56 days at +40 °C, 90 % relative humidity  
 $\Delta C/C \leq 8$  % of initial value  
 $IL \leq$  initial limit  
 $DF \leq$  initial limit
- 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  $\Omega$   
 $\Delta C/C \leq 5$  % of initial value  
 $IL \leq$  initial limit  
 $DF \leq$  initial limit
- Marking:**  
Top: Rating and polarity  
Front: Type, date code, Vishay identification

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

**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 <sub>0</sub>	12.7 ± 0.3		
Tape width	W	18 (+ 1/- 0.5)		
Hold down tape width	W <sub>0</sub>	12		
Hole position	W <sub>1</sub>	9 (+ 0.75/-0.5)		
Hold down tape position	W <sub>2</sub>	0 (+ 3/-0)		
Feed hole diameter	D <sub>0</sub>	4.0 ± 0.3		
Tape thickness	T	0.5 ± 0.2		
Component alignment	Δh	0 ± 2		
Lead clinch height	H <sub>0</sub>	16.0 ± 0.5		
Hole center to component center	P <sub>2</sub>	6.35 ± 1.3		
Lead wire spacing Feed hole center to wire center	F	<b>CASE A</b> 2.5 + 0.6/- 0.1	<b>CASE A</b> 5 + 0.6/- 0.1	<b>CASE B</b> 5 + 0.6/- 0.1
	P <sub>1</sub>	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 <sub>0</sub>	12.7 ± 0.3	
Tape width	W	18.0 (+ 1/- 0.5)	
Hold down tape width	W <sub>0</sub>	12	
Hole position	W <sub>1</sub>	9.0 (+ 0.75/- 0.5)	
Hold down tape position	W <sub>2</sub>	0 (+ 3/- 0)	
Maximum height of components	H <sub>1</sub>	32 max.	
Tolerance of positioning parts sideways	ΔP	0 ± 1.0	
Feed hole diameter	D <sub>0</sub>	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 <sub>1</sub>	7.62 ± 0.7	
Hole center to component center	P <sub>2</sub>	12.7 ± 1.0	
Length of leads under adhesive tape	H <sub>2</sub>	5.0 min. to 9.0 max.	
Reel pack options	H = 16.5 H = 18.5	<b>CASE C</b>	<b>CASE D</b>
		X Y	X Y
Ammopack options	H = 16.5 H = 18.5	G H	G H

**PRODUCT INFORMATION**

Quick Reference Guide	<a href="http://www.vishay.com/doc?40037">www.vishay.com/doc?40037</a>
Selector Guide	<a href="http://www.vishay.com/doc?49054">www.vishay.com/doc?49054</a>
Parameter Comparison Guide	<a href="http://www.vishay.com/doc?40033">www.vishay.com/doc?40033</a>
Mounting of Through-Hole Components	<a href="http://www.vishay.com/doc?40108">www.vishay.com/doc?40108</a>
Frequently Asked Questions	<a href="http://www.vishay.com/doc?40110">www.vishay.com/doc?40110</a>
Solid Tantalum Capacitors (With MnO <sub>2</sub> Electrolyte) Voltage Derating	<a href="http://www.vishay.com/doc?40246">www.vishay.com/doc?40246</a>





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