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ETPW

Vishay Roederstein

VISHAY

Resin-Coated, Radial-Leaded Solid Tantalum Capacitors

FEATURES

- Flame retardant encapsulation
- Practically without epoxy run down
- Very high temperature range
- Improved humidity class
- Low leakage current
- Very high CV product
- Low temperature dependence
- Low failure rate
- High operational reliability

MECHANICAL SPECIFICATIONS

Colour: Gold

Laser Marked: Capacity and voltage in clear text; Plus pole marked

Leads : Tinned

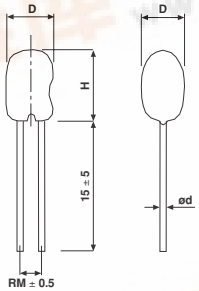
Tantalum capacitors with sintered anode and solid semiconductor electrolyte with flame retardant fluidized bed coating. The type ETPW is characterized by very favorable electrical values even at higher ambient temperatures. The capacitors comply with DIN 45910 part 146 and they are also available as a radially taped version.

ORDERING INFORMATION

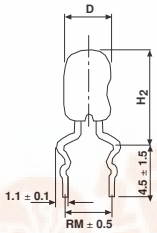
P1A	685	603	M	00	D
TYPE	CAPACITANCE	DC VOLTAGE RATING @ + 85°C	CAPACITANCE TOLERANCE	LEAD STYLES AND PACKAGING	
ETPW 1A .... ETPW 6R	Expressed in picofarads. The first two digits are significant figures. The third is the number of zeros following.	Expressed by zeros if needed to complete the 3 digit block. A decimal point is indicated by an "0" (603 = 6.3 Volts)	M = ± 20% K = ± 10%	See Lead styles and packaging table	

DIMENSIONS in millimeters

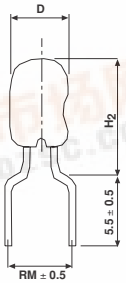
BASIC VERSION



FORM DS



FORM L



MODEL	D MAX.	H MAX.	RM ± 0.5	ØD±0.05	FORM DS H2 MAX	FORM DS RM	FORM L H2 MAX	FORM L RM
ETPW - 1 A,B	4.0	7.1	2.5	0.5	10.5	5	10.5	5
ETPW - 2 C,D	4.5	8.0	2.5	0.5	11.0	5	11.0	5
ETPW - 2 E	5.0	9.5	2.5	0.5	12.5	5	12.5	5
ETPW - 3 F	5.0	9.5	2.5	0.5	12.5	5	12.5	5
ETPW - 3 G	5.5	10.0	2.5	0.5	13.0	5	13.0	5
ETPW - 4 H	6.0	10.0	2.5	0.5	13.0	5	13.0	5
ETPW - 5 J,K*	8.6	12.5	2.5	0.5	15.5	5	15.5	5
ETPW - 5 J,K,L	8.6	12.5	5.0	0.5	15.5	5	-	-
ETPW - 6 M,N	9.5	15.0	5.0	0.5	18.0	5	-	-
ETPW - 6 P,R	9.5	16.0	5.0	0.5	19.0	5	-	-

* J,K with RM 2.5mm : 100µF-6.3V, 68µF-10V, 47µF-16V, 22µF - 25V

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STANDARD RATINGS AND CASE CODES

C_R	RATED VOLTAGE U_R at +85°C						
µF	3.0V	6.3V	10V	16V	25V	35V	50V
0.10						1A	1A
0.15						1A	1A
0.22						1A	1A
0.33						1A	1B
0.47						1A	1B
0.68						1A	2C
1.0					1A	1A	2D
1.5					1A	1B	2E
2.2				1A	1B	2C	3F
3.3			1A	1B	2C	2D	3G
4.7		1A	1B	2C	2D	2E	4H
6.8	1A	1B	2C	2D	2E	3F	5J
10	1A	2C	2D	2E	3F	3G	5L
15	1B	2D	2E	3F	4H	5J	6M
22	2C	2E	3F	3G	5J	5L	6P
33	2D	3F	3G	4H	5K	6M	
47	2E	3G	4H	5K	6M	6P	
68	3F	4H	5J	5L	6N		
100	3G	5J	5L	6N			
150	4H	5L	6N	6R			
220	5J	6M	6P				
330	5L	6P					
470							

STANDARD RATINGS

CR (µF)	CASE CODE	PART NUMBER	DIMENSIONS D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM ± 0.05	d ± 0.05	MAX. DCL @ + 20°C, (µA)	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
U_R= 3 Volt @ + 85 °C, Surge = 3.9 V							U_C = 2 V @ + 125 °C			
6.8	1A	P1A685003(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	6.0	0.06
10.0	1A	P1A106003(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	5.0	0.08
15.0	1B	P1B156003(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	4.0	0.08
22.0	2C	P2C226003(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.7	3.2	0.08
33.0	2D	P2D336003(*)_ _D	4.5	8.0	11.0	2.5	0.5	1.0	2.5	0.08
47.0	2E	P2E476003(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.4	2.0	0.08
68.0	3F	P3F686003(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.0	1.6	0.08
100.0	3G	P3G107003(*)_ _D	5.5	10.0	13.0	2.5	0.5	3.0	1.2	0.10
150.0	4H	P4H157003(*)_ _D	6.0	10.0	13.0	2.5	0.5	4.5	1.0	0.10
220.0	5J	P5J227003(*)_ _D	8.6	12.5	15.5	5.0	0.5	6.6	0.8	0.10
330.0	5L	P5L337003(*)_ _D	8.6	12.5	15.5	5.0	0.5	9.9	0.6	0.10

(*) Insert M for ± 20% tolerance or K for ± 10%

_ _ Lead style and packaging code, see lead style and packaging

• Preliminary values, contact factory for availability. For 10% tolerance, specify "9"; for 20% tolerance, change to "0". **Extended Ratings in bold print.**

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Solid Tantalum Capacitors

STANDARD RATINGS

CR (μF)	CASE CODE	PART NUMBER	DIMENSIONS D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM ± 0.05	d ± 0.05	MAX. DCL @ + 20°C, (μA)	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
U_R= 6.3 Volt @ + 85 °C, Surge = 7.8 V								**U_C = 4 V @ + 125 °C**		
4.7	1A	P1A475603(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	6.0	0.06
6.8	1B	P1B685603(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	5.0	0.06
10.0	2C	P2C106603(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.6	4.0	0.08
15.0	2D	P2D156603(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.9	3.2	0.08
22.0	2E	P2E226603(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.4	2.5	0.08
33.0	3F	P3F336603(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.1	2.0	0.08
47.0	3G	P3G476603(*)_ _D	5.5	10.0	13.0	2.5	0.5	3.0	1.6	0.08
68.0	4H	P4H686603(*)_ _D	6.0	10.0	13.0	2.5	0.5	4.3	1.2	0.08
100.0	5J	P5J107603(*)_ _D	8.6	12.5	15.5	2.5	0.5	6.3	1.0	0.10
150.0	5L	P5L157603(*)_ _D	8.6	12.5	15.5	5.0	0.5	9.5	0.8	0.10
220.0	6M	P6M227603(*)_ _D	9.5	15.0	18.0	5.0	0.5	13.9	0.6	0.10
330.0	6P	P6P337603(*)_ _D	9.5	16.0	19.0	5.0	0.5	20.8	0.5	0.10
U_R= 10 Volt @ + 85 °C, Surge = 13 V								**U_C = 6.3 V @ + 125 °C**		
3.3	1A	P1A335010(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	6.5	0.06
4.7	1B	P1B475010(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	5.0	0.06
6.8	2C	P2C685010(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.7	4.0	0.06
10.0	2D	P2D106010(*)_ _D	4.5	8.0	11.0	2.5	0.5	1.0	3.2	0.08
15.0	2E	P2E156010(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.5	2.5	0.08
22.0	3F	P3F226010(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.2	2.0	0.08
33.0	3G	P3G336010(*)_ _D	5.5	10.0	13.0	2.5	0.5	3.3	1.6	0.08
47.0	4H	P4H476010(*)_ _D	6.0	10.0	13.0	2.5	0.5	4.7	1.2	0.08
68.0	5J	P5J686010(*)_ _D	8.6	12.5	15.5	2.5	0.5	6.8	1.0	0.08
100.0	5L	P5L107010(*)_ _D	8.6	12.5	15.5	5.0	0.5	10.0	0.8	0.10
150.0	6N	P6N157010(*)_ _D	9.5	15.0	18.0	5.0	0.5	15.0	0.6	0.10
220.0	6P	P6P227010(*)_ _D	9.5	16.0	19.0	5.0	0.5	22.0	0.5	0.10
U_R= 16 Volt @ + 85 °C, Surge = 20.8 V								**U_C = 10 V @ + 125 °C**		
2.2	1A	P1A225016(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	7.0	0.06
3.3	1B	P1B335016(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	6.0	0.06
4.7	2C	P2C475016(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.8	4.5	0.06
6.8	2D	P2D685016(*)_ _D	4.5	8.0	11.0	2.5	0.5	1.1	3.2	0.06
10.0	2E	P2E106016(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.6	2.5	0.08
15.0	3F	P3F156016(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.4	2.0	0.08
22.0	3G	P3G226016(*)_ _D	5.5	10.0	13.0	2.5	0.5	3.5	1.6	0.08
33.0	4H	P4H336016(*)_ _D	6.0	10.0	13.0	2.5	0.5	5.3	1.2	0.08
47.0	5K	P5K476016(*)_ _D	8.6	12.5	15.5	2.5	0.5	7.5	1.0	0.08
68.0	5L	P5L686016(*)_ _D	8.6	12.5	15.5	5.0	0.5	10.9	0.8	0.08
100.0	6N	P6N107016(*)_ _D	9.5	15.0	18.0	5.0	0.5	16.0	0.6	0.10
150.0	6R	P6R157016(*)_ _D	9.5	16.0	19.0	5.0	0.5	24.0	0.5	0.10
U_R= 25 Volt @ + 85 °C, Surge = 32.5 V								**U_C = 16 V @ + 125 °C**		
1.0	1A	P1A105025(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	8.5	0.04
1.5	1A	P1A155025(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	7.5	0.04
2.2	1B	P1B225025(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.6	6.0	0.06
3.3	2C	P2C335025(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.8	4.5	0.06
4.7	2D	P2D475025(*)_ _D	4.5	8.0	11.0	2.5	0.5	1.2	3.2	0.06
6.8	2E	P2E685025(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.7	2.5	0.06
10.0	3F	P3F106025(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.5	2.0	0.08
15.0	4H	P4H156025(*)_ _D	6.0	10.0	13.0	2.5	0.5	3.8	1.6	0.08
22.0	5J	P5J226025(*)_ _D	8.6	12.5	15.5	2.5	0.5	5.5	1.2	0.08
33.0	5K	P5K336025(*)_ _D	8.6	12.5	15.5	5.0	0.5	8.3	1.0	0.08
47.0	6M	P6M476025(*)_ _D	9.5	15.0	18.0	5.0	0.5	11.8	0.8	0.08
68.0	6N	P6N686025(*)_ _D	9.5	15.0	18.0	5.0	0.5	17.0	0.6	0.08

(*) Insert M for ± 20% tolerance or K for ± 10%

_ _ Lead style and packaging code, see lead style and packaging

STANDARD RATINGS

CR (μF)	CASE CODE	PART NUMBER	DIMENSIONS D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM ± 0.05	d ± 0.05	MAX. DCL @ + 20°C, (μA)	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
U_R= 35 Volt @ + 85 °C, Surge = 45.5 V							**U_C = 23 V @ + 125 °C**			
0.1	1A	P1A104035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	38.0	0.04
0.15	1A	P1A154035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	30.0	0.04
0.22	1A	P1A224035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	23.0	0.04
0.33	1A	P1A334035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	18.0	0.04
0.47	1A	P1A474035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	14.0	0.04
0.68	1A	P1A684035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	10.0	0.04
1.0	1A	P1A105035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	8.0	0.04
1.5	1B	P1B155035(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	6.5	0.04
2.2	2C	P2C225035(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.8	5.0	0.06
3.3	2D	P2D335035(*)_ _D	4.5	8.0	11.0	2.5	0.5	1.2	3.5	0.06
4.7	2E	P2E475035(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.6	2.5	0.06
6.8	3F	P3F685035(*)_ _D	5.0	9.5	12.5	2.5	0.5	2.4	2.0	0.06
10.0	3G	P3G106035(*)_ _D	5.5	10.0	13.0	2.5	0.5	3.5	1.6	0.08
15.0	5J	P5J156035(*)_ _D	8.6	12.5	15.5	5.0	0.5	5.3	1.2	0.08
22.0	5L	P5L226035(*)_ _D	8.6	12.5	15.5	5.0	0.5	7.7	1.0	0.08
33.0	6M	P6M336035(*)_ _D	9.5	15.0	18.0	5.0	0.5	11.6	0.8	0.08
47.0	6P	P6P476035(*)_ _D	9.5	16.0	19.0	5.0	0.5	16.5	0.6	0.08
U_R= 50 Volt @ + 85 °C, Surge = 65 V							**U_C = 33 V @ + 125 °C**			
0.1	1A	P1A104050(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	38.0	0.04
0.15	1A	P1A154050(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	30.0	0.04
0.22	1A	P1A224050(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	23.0	0.04
0.33	1B	P1B334050(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	18.0	0.04
0.47	1B	P1B474050(*)_ _D	4.0	7.1	10.5	2.5	0.5	0.5	14.0	0.04
0.68	2C	P2C684050(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.5	10.0	0.04
1.0	2D	P2D105050(*)_ _D	4.5	8.0	11.0	2.5	0.5	0.5	8.0	0.04
1.5	2E	P2E155050(*)_ _D	5.0	9.5	12.5	2.5	0.5	0.8	6.5	0.04
2.2	3F	P3F225050(*)_ _D	5.0	9.5	12.5	2.5	0.5	1.1	5.0	0.06
3.3	3G	P3G335050(*)_ _D	5.5	10.0	13.0	2.5	0.5	1.7	3.5	0.06
4.7	4H	P4H475050(*)_ _D	6.0	10.0	13.0	2.5	0.5	2.4	2.5	0.06
6.8	5J	P5J685050(*)_ _D	8.6	12.5	15.5	5.0	0.5	3.4	2.0	0.06
10.0	5L	P5L106050(*)_ _D	8.6	12.5	15.5	5.0	0.5	5.0	1.6	0.08
15.0	6M	P6M156050(*)_ _D	9.5	15.0	18.0	5.0	0.5	7.5	1.2	0.08
22.0	6P	P6P226050(*)_ _D	9.5	16.0	19.0	5.0	0.5	11.0	1.0	0.08

(*) Insert M for ± 20% tolerance or K for ± 10%

_ _ Lead style and packaging code, see lead style and packaging

ETPW

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Resin-Coated, Radial-Leaded
Solid Tantalum Capacitors

PERFORMANCE CHARACTERISTICS

1. **Climatic Category :** 55/125/56 acc. to IEC

2. **Temperature Range: -** 55°C up to + 125°C with linear voltage derating to category voltage UC

3. **Rated Voltage, Category Voltage:** 3V_ to 50V_; 2V_ to 33V_

4. **Surge Voltage:** 1.3 times of rated voltage at + 85°C

5. **Reverse Voltage (Temporary):**
   15% of the rated DC voltage at + 20°C
   10% of the rated DC voltage at + 55°C
   5% of the rated DC voltage at + 85°C

6. **Rated Capacitance:** 0.1μF to 330μF

7. **Capacitance Tolerance :** ± 20%, ± 10%,

8. **Leakage Current in μA:** Measured at + 20°C after 5 minutes: ≤ 0.01 x C_R x U_R or 0.5 μA, whichever is greater

9. **Dissipation Factor:** at 120Hz and + 20°C
   See table

10. **Impedance:** Measured at 100kHz and + 20°C
    See table.

11. **Permissible AC Voltage Stress:** The highest permissible AC voltage for the respective frequency may be taken from the brochure “General information”.

    The values apply for + 20°C For higher temperatures, the values have to be multiplied with the following factors:

TEMPERATURE	FACTOR
+ 50°C	0.7
+ 85°C	0.5
+ 125°C.	0.3

    Intermediate values can be obtained by linear interpolation.
    For further notes on AC voltage stress: See general information

12. **Service life :** > 300.000 h**

13. **Failure percentage:** ≤ 0.6% within 100.000 h**

14. **Failure rate (λ):** ≤ 0.6 10^{-7} /h = ≤ 60 fit**

15. **Failure criteria:** Catastrophic failure : Short circuit or interruption

    Drift failure: ΔC/C > +5 - 15%
    Z > 3 times initial limit value
    IR > 5 times initial value + 5μA

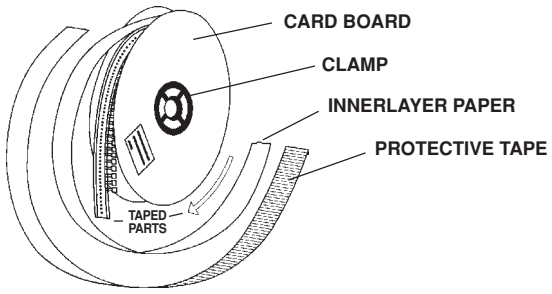
** related to UR, + 40°C and a circuit resistance of ≥ 3 Ω/V

16. **Characteristics at high and low temperatures** (the values shall not exceed the following limits)

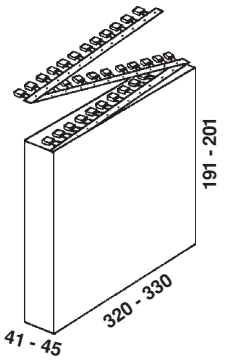
TEST TEMPERATURE	- 55°C	+ 20°C	+ 85°C	+ 125°C
ΔC/C <	- 10%	-	+ 12%	+ 15%
tanδ				
≤ 1.5μF	0.04	0.04	0.04	0.06
< 10μF	0.06	0.06	0.06	0.08
< 100μF	0.08	0.08	0.08	0.08
≥ 100μF	0.10	0.10	0.10	0.10
Leakage current IR	-	≤ 0.01 x C_R x U_R or 0.5μA whichever is greater	≤ 0.1 x C_R x U_R or 10μA whichever is greater	≤ 0.125 x C_R x U_R or 12.5μA whichever is greater* *Measured at category voltage

LEAD STYLES AND PACKAGING

REEL PACKING



AMMO PACKAGING (mm)



CASE SIZE	CODE	RM in mm ± 0.5	SPECIFICATION	REMARKS
1 - 6	00	2.5 / 5	Bulk	Reel with positive pole in tape run direction in front is standard
1 - 4 (5)	C0	5	Form L, Bulk	
1 - 6	V0	5	Form DS, Bulk	
1 - 4 (5)	W0	2.5	Reel, positive pole in front of unreeling direction	
1 - 4 (5)	T0	2.5	Reel, negative pole in front of unreeling direction	
1 - 4 (5)	H0	2.5	Ammo	
1 - 5	V2	5	Reel, positive pole in front of unreeling direction	
1 - 5	R0	5	Reel, negative pole in front of unreeling direction	
1 - 5	08	5	Ammo	

(5): 100µF - 6.3V, 68µF - 10V, 47µF - 16V, 22µF - 25V

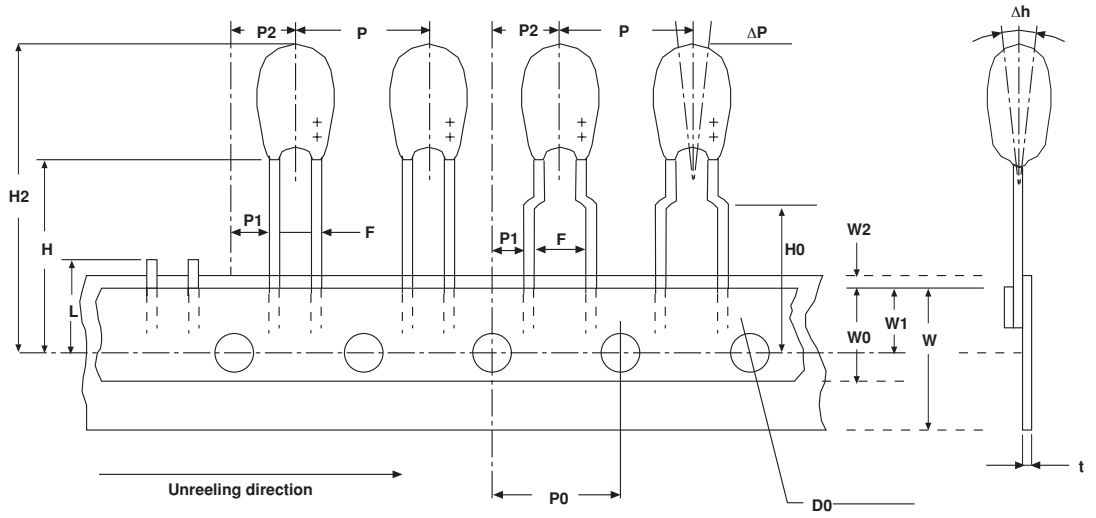
CASE SIZE	BULK 00, V0, C0	REEL W0, T0, V2, R0	AMMO H0, O8
ETPW 1 A,B	500	2500	2500
ETPW 2 C,D,E	500	2000	2000
ETPW 3 F,G	500	1500	1500
ETPW 4 H	500	1500	1500
ETPW 5 J,K,L	100	500	500
ETPW 6 M,N,P,R	100	-	-

ETPW

Vishay Roederstein

Resin-Coated, Radial-Leaded
Solid Tantalum Capacitors

TAPING ACCORDING TO IEC 286-2



DESIGNATION	SYMBOL	DIMENSIONS (mm)
Holding tape width	W	18.0 (+ 1 / - 0.5)
Adhesive tape width	W0	Min. 5.0
Distance of components	P	12.7 ± 1
Hole center to component center	P2	6.35 ± 1.3
Hole center to lead	P1	5.1 / 3.8 ± 0.7
Distance of body to hole center	H*)	18.0 (+ 2 / - 0)
Distance of lead to hole center	H0	16.0 ± 0.5
Component upper edge to hole center	H1	Max. 32.0
Adhesive tape location	W2	Max. 3.0
Hole location	W1	9.0 (+ 0.75 / - 0.5)
Distance of holes	P0	12.7 ± 0.3
Hole diameter	D0	4.0 ± 0.3
Lead diameter	d	0.5 ± 0.05
Component alignment	Δh	Max. ± 2.0
Pitch	F	2.5 / 5.0 (+ 0.6 / - 0.1)
Holding tape thickness	t	0.5 ± 0.2
Component alignment	ΔP	Max. ± 1.3
Length of snipped leads	L	Max. 11.0

(*)also available : 16mm and 20mm taping according to DIN-IEC 286 part 2