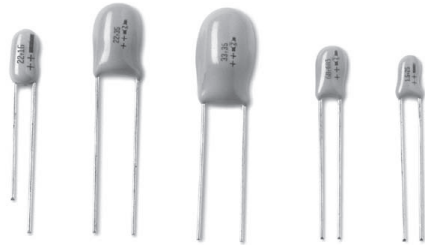


## Resin-Coated, Radial-Leaded Solid Tantalum Capacitors



### 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**

TYPE

ETPW 1A ....  
ETPW 6R

**685**

CAPACITANCE

Expressed in picofarads. The first two digits are significant figures. The third is the number of zeros following.

**603**

DC VOLTAGE RATING  
@ + 85°C

Expressed by zeros if needed to complete the 3 digit block. A decimal point is indicated by an "0" (603 = 6.3 Volts)

**M**

CAPACITANCE  
TOLERANCE

M = ± 20%  
K = ± 10%

**00**

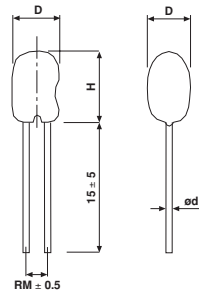
LEAD STYLES AND  
PACKAGING

See Lead styles  
and  
packaging table

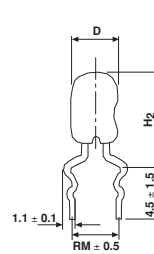
**D**

### DIMENSIONS in millimeters

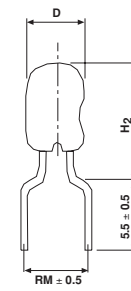
#### BASIC VERSION



#### FORM DS



#### FORM L



MODEL	D MAX.	H MAX.	RM ± 0.5	ØD±0.05	FORM DS		FORM L	
					H2 MAX	RM	H2 MAX	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



<b>STANDARD RATINGS AND CASE CODES</b>							
$C_R$	RATED VOLTAGE $U_R$ at +85°C						
$\mu F$	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							

<b>STANDARD RATINGS</b>										
CR ( $\mu F$ )	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL @ + 20°C, ( $\mu A$ )	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM $\pm 0.05$	d $\pm 0.05$			
$U_R = 3 \text{ Volt @ } + 85^\circ \text{C, Surge} = 3.9 \text{ V}$						$U_C = 2 \text{ V @ } + 125^\circ \text{C}$				
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  $\pm 20\%$  tolerance or K for  $\pm 10\%$   
 \_ \_ 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.**

STANDARD RATINGS										
CR ( $\mu$ F)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL @ + 20°C, ( $\mu$ A)	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM $\pm 0.05$	d $\pm 0.05$			
$U_R = 6.3$ 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  $\pm 20\%$  tolerance or K for  $\pm 10\%$   
 \_\_ Lead style and packaging code, see lead style and packaging



Resin-Coated, Radial-Leaded  
Solid Tantalum Capacitors

Vishay Roederstein

STANDARD RATINGS										
CR ( $\mu$ F)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL @ + 20°C, ( $\mu$ A)	MAX. Z @ 100kHz (OHMS)	MAX. DF @ 120Hz + 20°C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM $\pm 0.05$	d $\pm 0.05$			
<b><math>U_R = 35</math> Volt @ + 85 °C, Surge = 45.5 V</b>						<b><math>U_C = 23</math> V @ + 125 °C</b>				
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
<b><math>U_R = 50</math> Volt @ + 85 °C, Surge = 65 V</b>						<b><math>U_C = 33</math> V @ + 125 °C</b>				
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  $\pm 20\%$  tolerance or K for  $\pm 10\%$   
 \_\_ Lead style and packaging code, see lead style and packaging

**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<sub>U</sub> to 50V<sub>U</sub>;  
2V<sub>U</sub> to 33V<sub>U</sub>
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 × C<sub>R</sub> × U<sub>R</sub> 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.

**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 < tanδ ≤ 1.5µF < 10µF < 100µF ≥ 100µF	- 10% 0.04 0.06 0.08 0.10	- 0.04 0.06 0.08 0.10	+ 12% 0.04 0.06 0.08 0.10	+ 15% 0.06 0.08 0.08 0.10
Leakage current IR	-	≤ 0.01 × C <sub>R</sub> × U <sub>R</sub> or 0.5µA whichever is greater	≤ 0.1 × C <sub>R</sub> × U <sub>R</sub> or 10µA whichever is greater	≤ 0.125 × C <sub>R</sub> × U <sub>R</sub> or 12.5µA whichever is greater*

\*Measured at category voltage

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

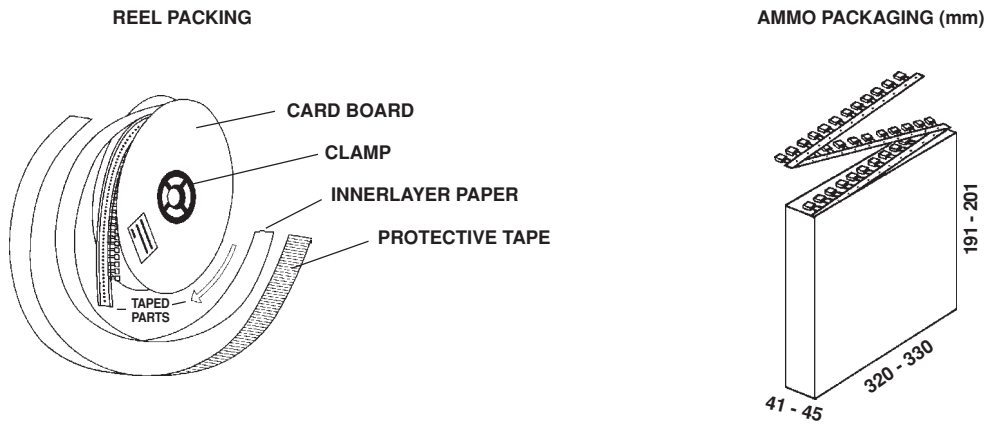
The values apply for + 20°C For higher temperatures, the values have to be multiplied with the following factors:

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

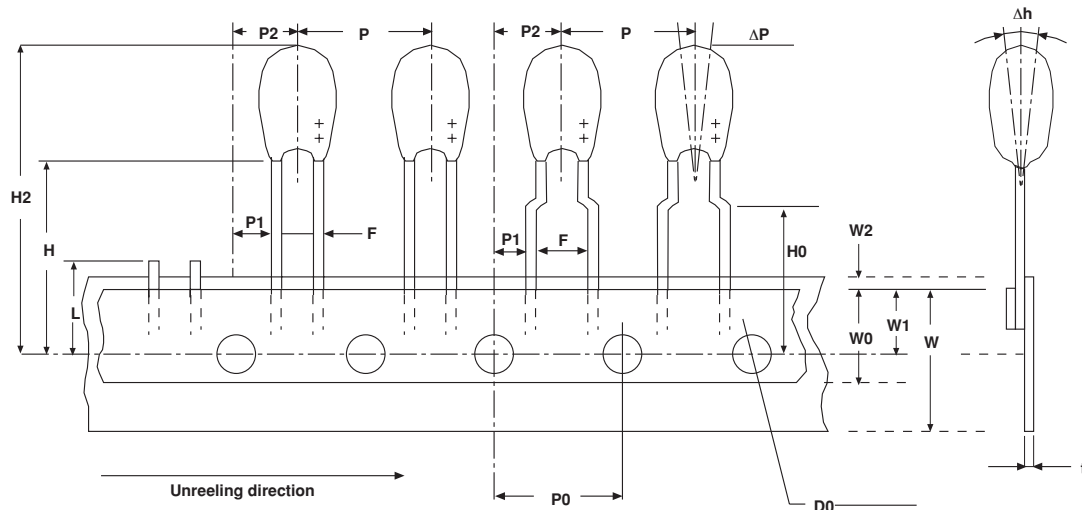
12. **Service life** : > 300.000 h\*\*
  13. **Failure percentage**: ≤ 0.6% within 100.000 h\*\*
  14. **Failure rate (λ)**: ≤ 0.6 10<sup>-7</sup> /h = ≤ 60 fit\*\*
  15. **Failure criteria**: Catastrophic failure : Short circuit or interruption  
**Drift failure**: ΔC/C > +5 - 15%  
Z > 3 times initial limit value  
IR > 5 times initial value + 5µA
- \*\* related to UR, + 40°C and a circuit resistance of ≥ 3 Ω/V

**LEAD STYLES AND PACKAGING**


CASE SIZE	CODE	RM in mm ± 0.5	SPECIFICATION	REMARKS
1 - 6	00	2.5 / 5	Bulk	Reel with positive pole in front of unreeing direction 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 unreeing direction	
1 - 4 (5)	T0	2.5	Reel, negative pole in front of unreeing direction	
1 - 4 (5)	H0	2.5	Ammo	
1 - 5	V2	5	Reel, positive pole in front of unreeing direction	
1 - 5	R0	5	Reel, negative pole in front of unreeing 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	-	-

**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



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