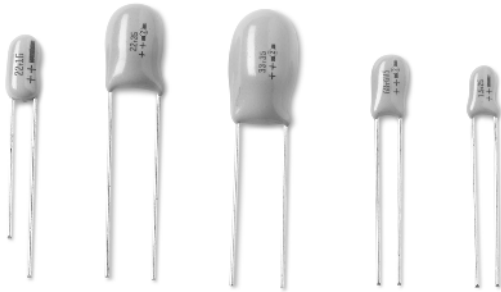


Resin-Coated, Radial-Leaded Solid Tantalum Capacitors



FEATURES

- RoHS Compliant design available
- Flame retardant encapsulation
- Very high temperature range
- Improved humidity class
- Low leakage current
- Very high CV product
- Low failure rate



Pb-free
Available
RoHS*
COMPLIANT

MECHANICAL SPECIFICATIONS

Colour: Gold

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

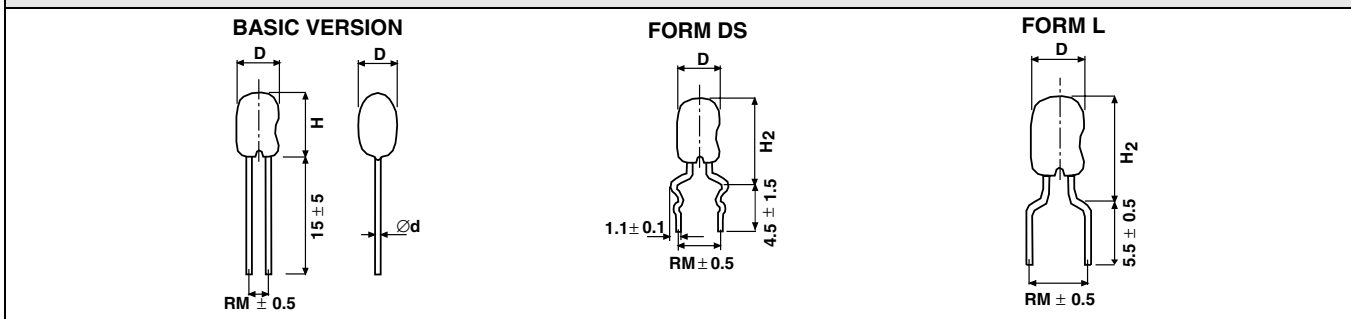
Leads: Standard (Tin/Lead), RoHS compliant (100 % Tin)

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	686 CAPACITANCE	603 DC VOLTAGE RATING AT + 85 °C	M CAPACITANCE TOLERANCE	00 LEAD STYLE AND PACKAGING	D	E3 RoHS COMPLIANT
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		E3 = 100 % tin termination (RoHS compliant design) Blank = SnPb termination (standard design)

DIMENSIONS in millimeters



MODEL	D MAX.	H MAX.	RM ± 0.5	∅ D ± 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 2.5 mm : 100 µF - 6.3 V, 68 µF - 10 V, 47 µF - 16 V, 22 µF - 25 V

* Pb containing terminations are not RoHS compliant, exemptions may apply



STANDARD RATINGS AND CASE CODES							
C _R μF	RATED VOLTAGE U _R at + 85 °C						
	3.0 V	6.3 V	10 V	16 V	25 V	35 V	50 V
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										
C _R (μF)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT + 20 °C, (μA)	MAX. Z AT 100 kHz (OHMS)	MAX. DF AT 120 Hz + 20 °C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM ± 0.05	d ± 0.05			
U _R = 3 Volt AT + 85 °C, Surge = 3.9 V						U _C = 2 V AT + 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

STANDARD RATINGS										
CR (μ F)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT + 20 °C, (μ A)	MAX. Z AT 100 kHz (OHMS)	MAX. DF AT 120 Hz + 20 °C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM \pm 0.05	d \pm 0.05			
$U_R = 6.3$ Volt AT + 85 °C, Surge = 7.8 V						$U_C = 4$ V AT + 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 AT + 85 °C, Surge = 13 V						$U_C = 6.3$ V AT + 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 AT + 85 °C, Surge = 20.8 V						$U_C = 10$ V AT + 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 AT + 85 °C, Surge = 32.5 V						$U_C = 16$ V AT + 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 Sprague

STANDARD RATINGS										
CR (μ F)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT + 20 °C, (μ A)	MAX. Z AT 100 kHz (OHMS)	MAX. DF AT 120 Hz + 20 °C
			D MAX (mm)	H MAX (mm)	H2 MAX (mm)	RM \pm 0.05	d \pm 0.05			
$U_R = 35$ Volt AT + 85 °C, Surge = 45.5 V						$U_C = 23$ V AT + 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	0.8	0.08
$U_R = 50$ Volt AT + 85 °C, Surge = 65 V						$U_C = 33$ V AT + 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 \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:** 3 V_⊥ to 50 V_⊥; 2 V_⊥ to 33 V_⊥
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:** 0.1 μF to 330 μF
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 120 Hz and + 20 °C
See table
10. **Impedance:** Measured at 100 kHz 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: DC/C > + 5 - 15 %

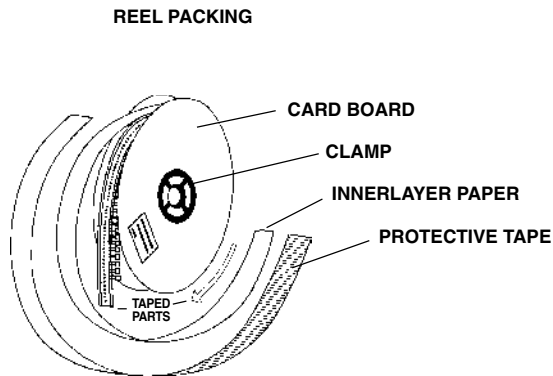
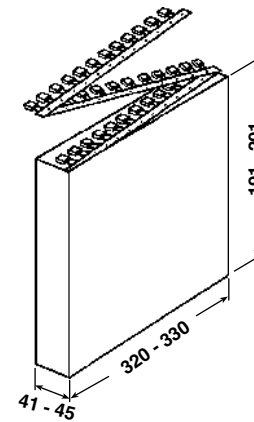
Z > 3 times initial limit value

IR > 5 times initial value + 5 μA

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

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

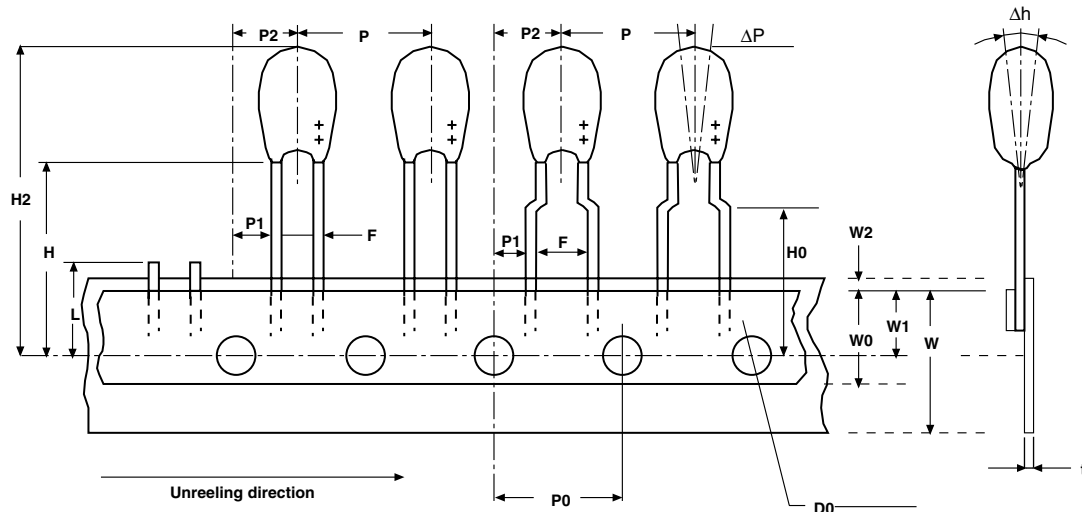
* Measured at category voltage

LEAD STYLES AND PACKAGING

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	O8	5	Ammo	

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

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: 16 mm and 20 mm taping according to DIN-IEC 286 part 2



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