Resin-Coated, Radial-Lead Solid Tantalum Capacitors

FEATURES

- Flame retardant encapsulation
- Very high temperature range
- Improved humidity class
- Very low leakage current
- Very high CV product
- Very low leakage current
- Very low failure rate
- Preaged under temperature and voltage
- Tantalum capacitors with sintered anode and solid semiconductor electrolyte with flame retardant fluidized bed coating. The type ETQW is characterized by very favorable electrical values even at higher ambient temperatures. The capacitor complies with DIN 45910 part 147. This type is also available as a radially taped version.
- 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.

MECHANICAL SPECIFICATIONS

Color: gold

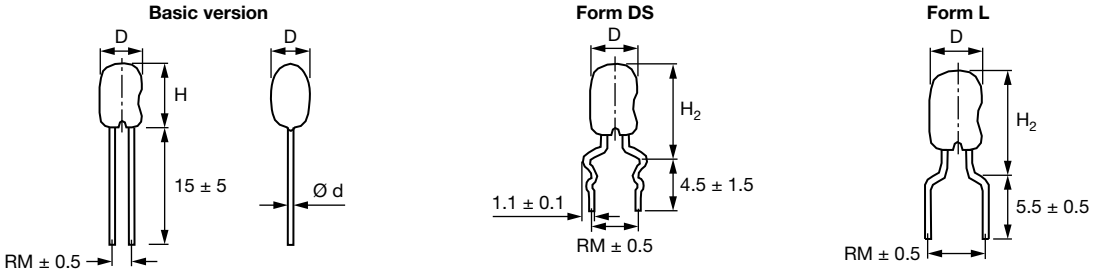
Laser Marked: capacity and voltage in clear text; plus pole marked, date code (year / month) according to DIN IEC 62

Leads: standard (tin / lead), RoHS-compliant (100 % tin)

ORDERING INFORMATION

Q1B	685	603	M	00	D	E3
TYPE	CAPACITANCE	DC VOLTAGE RATING AT +85 °C	CAPACITANCE TOLERANCE	LEAD STYLE AND PACKAGING		RoHS COMPLIANT
ETQW 1A .... ETQW 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 V)	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	Ø D ± 0.05	FORM DS		FORM L	
					H_2 MAX.	RM	H_2 MAX.	RM
ETQW - 1	4.5	7.5	2.5	0.5	10.5	5	10.5	5
ETQW - 2	5.0	9.5	2.5	0.5	12.5	5	12.5	5
ETQW - 3	6.0	10.5	2.5	0.5	13.5	5	13.5	5
ETQW - 4	6.5	11.5	2.5	0.5	14.5	5	14.5	5
ETQW - 5	9.0	14.0	5.0	0.5	17.0	5	-	-
ETQW - 6	9.5	17.0	5.0	0.5	20.0	5	-	-

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

CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT +20 °C (µA)	MAX. Z AT 100 kHz (Ω)	MAX. DF AT 120 Hz +20 °C
			D MAX. (mm)	H MAX. (mm)	H_2 MAX. (mm)	RM ± 0.05	d ± 0.05			
U_R = 3 V_{DC} AT +85 °C, SURGE = 3.9 V; U_C = 2 V_{DC} AT +125 °C										
6.8	1A	Q1A685003(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.4	0.06
10	1A	Q1A106003(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	4.5	0.06
15	1B	Q1B156003(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	3.6	0.06
22	2C	Q2C226003(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.5	2.9	0.06
33	2D	Q2D336003(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.8	2.3	0.06
47	2E	Q2E476003(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.1	1.8	0.06
68	3F	Q3F686003(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.6	1.4	0.06
100	3G	Q3G107003(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.4	1.1	0.08
150	4H	Q4H157003(1)(2)D	6.5	11.5	14.5	2.5	0.5	3.6	0.9	0.08
220	5J	Q5J227003(1)(2)D	9.0	14.0	17.0	5.0	0.5	5.3	0.7	0.08
330	5L	Q5L337003(1)(2)D	9.0	14.0	17.0	5.0	0.5	7.9	0.6	0.08

Note

- Part number definitions:
  (1) Insert M for ± 20 % tolerance or K for ± 10 %
  (2) Lead style and packaging code, see Lead Styles and Packaging table

STANDARD RATINGS

CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT +20 °C (µA)	MAX. Z AT 100 kHz (Ω)	MAX. DF AT 120 Hz +20 °C
			D MAX. (mm)	H MAX. (mm)	H_2 MAX. (mm)	RM ± 0.05	d ± 0.05			
U_R = 6.3 V_{DC} AT +85 °C, SURGE = 7.8 V; U_C = 4 V_{DC} AT +125 °C										
4.7	1A	Q1A475603(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.4	0.06
6.8	1B	Q1B685603(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	4.5	0.06
10	2C	Q2C106603(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.5	3.6	0.06
15	2D	Q2D156603(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.8	2.9	0.06
22	2E	Q2E226603(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.1	2.3	0.06
33	3F	Q3F336603(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.7	1.8	0.06
47	3G	Q3G476603(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.4	1.7	0.06
68	4H	Q4H686603(1)(2)D	6.5	11.5	14.5	2.5	0.5	3.4	1.1	0.06
100	5J	Q5J107603(1)(2)D	9.0	14.0	17.0	5.0	0.5	5.0	0.9	0.08
150	5L	Q5L157603(1)(2)D	9.0	14.0	17.0	5.0	0.5	7.6	0.7	0.08
220	6M	Q6M227603(1)(2)D	9.5	17.0	20.0	5.0	0.5	11.1	0.6	0.08
330	6P	Q6P337603(1)(2)D	9.5	17.0	20.0	5.0	0.5	16.6	0.5	0.08
U_R = 10 V_{DC} AT +85 °C, SURGE = 13 V; U_C = 6.3 V_{DC} AT +125 °C										
3.3	1A	Q1A335010(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.9	0.06
4.7	1B	Q1B475010(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	4.5	0.06
6.8	2C	Q2C685010(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.5	3.6	0.06
10	2D	Q2D106010(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.8	2.9	0.06
15	2E	Q2E156010(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.2	2.3	0.06
22	3F	Q3F226010(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.8	1.8	0.06
33	3G	Q3G336010(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.6	1.4	0.06
47	4H	Q4H476010(1)(2)D	6.5	11.5	14.5	2.5	0.5	3.8	1.1	0.06
68	5J	Q5J686010(1)(2)D	9.0	14.0	17.0	5.0	0.5	5.4	0.9	0.06
100	5L	Q5L107010(1)(2)D	9.0	14.0	17.0	5.0	0.5	8.0	0.7	0.08
150	6N	Q6N157010(1)(2)D	9.5	17.0	20.0	5.0	0.5	12.0	0.6	0.08
220	6P	Q6P227010(1)(2)D	9.5	17.0	20.0	5.0	0.5	17.6	0.5	0.08
U_R = 16 V_{DC} AT +85 °C, SURGE = 20.8 V; U_C = 10 V_{DC} AT +125 °C										
2.2	1A	Q1A225016(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	6.3	0.06
3.3	1B	Q1B335016(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.4	0.06
4.7	2C	Q2C475016(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.6	4.1	0.06
6.8	2D	Q2D685016(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.9	2.9	0.06
10	2E	Q2E106016(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.3	2.3	0.06
15	3F	Q3F156016(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.9	1.8	0.06
22	3G	Q3G226016(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.8	1.4	0.06
33	4H	Q4H336016(1)(2)D	6.5	11.5	14.5	2.5	0.5	4.2	1.1	0.06
47	5K	Q5K476016(1)(2)D	9.0	14.0	17.0	5.0	0.5	6.0	0.9	0.06
68	5L	Q5L686016(1)(2)D	9.0	14.0	17.0	5.0	0.5	8.7	0.7	0.06
100	6N	Q6N107016(1)(2)D	9.5	17.0	20.0	5.0	0.5	12.8	0.6	0.08
150	6R	Q6R157016(1)(2)D	9.5	17.0	20.0	5.0	0.5	19.2	0.5	0.08

Note

- Part number definitions:
  (1) Insert M for ± 20 % tolerance or K for ± 10 %
  (2) Lead style and packaging code, see Lead Styles and Packaging table

STANDARD RATINGS

CAPACITANCE C_R (µF)	CASE CODE	PART NUMBER	DIMENSIONS					MAX. DCL AT +20 °C (µA)	MAX. Z AT 100 kHz (Ω)	MAX. DF AT 120 Hz +20 °C
			D MAX. (mm)	H MAX. (mm)	H_2 MAX. (mm)	RM ± 0.05	d ± 0.05			
U_R = 25 V_{DC} AT +85 °C, SURGE = 32.5 V; U_C = 16 V_{DC} AT +125 °C										
1.0	1A	Q1A105025(1)(2)D	4.5	7.1	10.5	2.5	0.5	0.5	7.7	0.04
1.5	1A	Q1A155025(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	6.8	0.04
2.2	1B	Q1B225025(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.4	0.06
3.3	2C	Q2C335025(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.7	4.1	0.06
4.7	2D	Q2D475025(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.9	2.9	0.06
6.8	2E	Q2E685025(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.4	2.3	0.06
10	3F	Q3F106025(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.0	1.8	0.06
15	4H	Q4H156025(1)(2)D	6.5	11.5	14.5	2.5	0.5	3.0	1.4	0.06
22	5J	Q5J226025(1)(2)D	9.0	14.0	17.0	5.0	0.5	4.4	1.1	0.06
33	5K	Q5K336025(1)(2)D	9.0	14.0	17.0	5.0	0.5	6.6	0.9	0.06
47	6M	Q6M476025(1)(2)D	9.5	17.0	20.0	5.0	0.5	9.4	0.7	0.06
68	6N	Q6N686025(1)(2)D	9.5	17.0	20.0	5.0	0.5	13.6	0.6	0.06
U_R = 35 V_{DC} AT +85 °C, SURGE = 45.5 V; U_C = 23 V_{DC} AT +125 °C										
0.10	1A	Q1A104035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	34.2	0.04
0.15	1A	Q1A154035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	27.0	0.04
0.22	1A	Q1A224035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	20.7	0.04
0.33	1A	Q1A334035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	16.2	0.04
0.47	1A	Q1A474035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	12.6	0.04
0.68	1A	Q1A684035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	9.0	0.04
1.0	1A	Q1A105035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	7.2	0.04
1.5	1B	Q1B155035(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	5.9	0.04
2.2	2C	Q2C225035(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.6	4.5	0.06
3.3	2D	Q2D335035(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.9	3.2	0.06
4.7	2E	Q2E475035(1)(2)D	5.0	9.5	12.5	2.5	0.5	1.3	2.3	0.06
6.8	3F	Q3F685035(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.9	1.8	0.06
10	3G	Q3G106035(1)(2)D	6.0	10.5	13.5	2.5	0.5	2.8	1.4	0.06
15	5J	Q5J156035(1)(2)D	9.0	14.0	17.0	5.0	0.5	4.2	1.1	0.06
22	5L	Q5L226035(1)(2)D	9.0	14.0	17.0	5.0	0.5	6.2	0.9	0.06
33	6M	Q6M336035(1)(2)D	9.5	17.0	20.0	5.0	0.5	9.2	0.7	0.06
47	6P	Q6P476035(1)(2)D	9.5	17.0	20.0	5.0	0.5	13.2	0.6	0.06
U_R = 50 V_{DC} AT +85 °C, SURGE = 65 V; U_C = 33 V_{DC} AT +125 °C										
0.10	1A	Q1A104050(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	34.2	0.04
0.15	1A	Q1A154050(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	27.0	0.04
0.22	1A	Q1A224050(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	20.7	0.04
0.33	1B	Q1B334050(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	16.2	0.04
0.47	1B	Q1B474050(1)(2)D	4.5	7.5	10.5	2.5	0.5	0.5	12.6	0.04
0.68	2C	Q2C684050(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.5	9.0	0.04
1.0	2D	Q2D105050(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.5	7.2	0.04
1.5	2E	Q2E155050(1)(2)D	5.0	9.5	12.5	2.5	0.5	0.6	5.9	0.04
2.2	3F	Q3F225050(1)(2)D	6.0	10.5	13.5	2.5	0.5	0.9	4.5	0.06
3.3	3G	Q3G335050(1)(2)D	6.0	10.5	13.5	2.5	0.5	1.3	3.2	0.06
4.7	4H	Q4H475050(1)(2)D	6.5	11.5	14.5	2.5	0.5	1.9	2.3	0.06
6.8	5J	Q5J685050(1)(2)D	9.0	14.0	17.0	5.0	0.5	2.7	1.8	0.06
10	5L	Q5L106050(1)(2)D	9.0	14.0	17.0	5.0	0.5	4.0	1.4	0.06
15	6M	Q6M156050(1)(2)D	9.5	17.0	20.0	5.0	0.5	6.0	1.1	0.06
22	6P	Q6P226050(1)(2)D	9.5	17.0	20.0	5.0	0.5	8.8	0.9	0.06

Note

- Part number definitions:
  (1) Insert M for ± 20 % tolerance or K for ± 10 %
  (2) Lead style and packaging code, see Lead Styles and Packaging table

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 min: ≤ 0.008 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 (1)
13. **Failure percentage:** ≤ 0.3 % within 100 000 h (1)
14. **Failure rate (λ):** ≤ 0.3 10- 7/h = ≤ 30 fit (1)
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

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				
≤ 1.5 µF	0.04	0.04	0.04	0.04
< 10 µF	0.06	0.06	0.06	0.06
< 100 µF	0.08	0.06	0.08	0.08
≥ 100 µF	0.10	0.08	0.10	0.10
Leakage current I_R	-	≤ 0.008 x C_R x U_R or 0.5 µA whichever is greater	≤ 0.08 x C_R x U_R or 5.0 µA whichever is greater	≤ 0.1 x C_R x U_R or 6.25 µA whichever is greater (2)

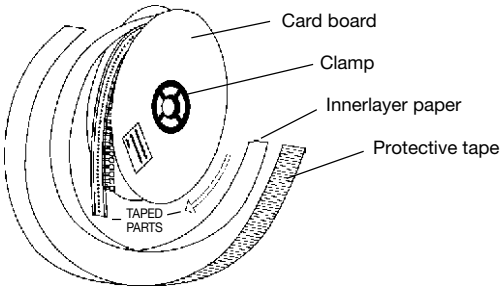
Notes

(1) Related to U_R, +40 °C and a circuit resistance of ≥ 3 Ω/V

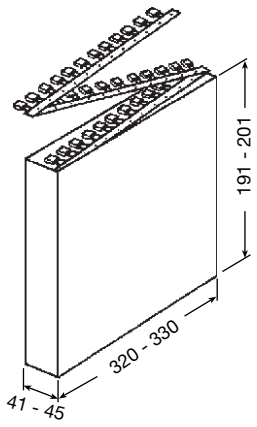
(2) Measured at category voltage

LEAD STYLES AND PACKAGING

Reel packaging



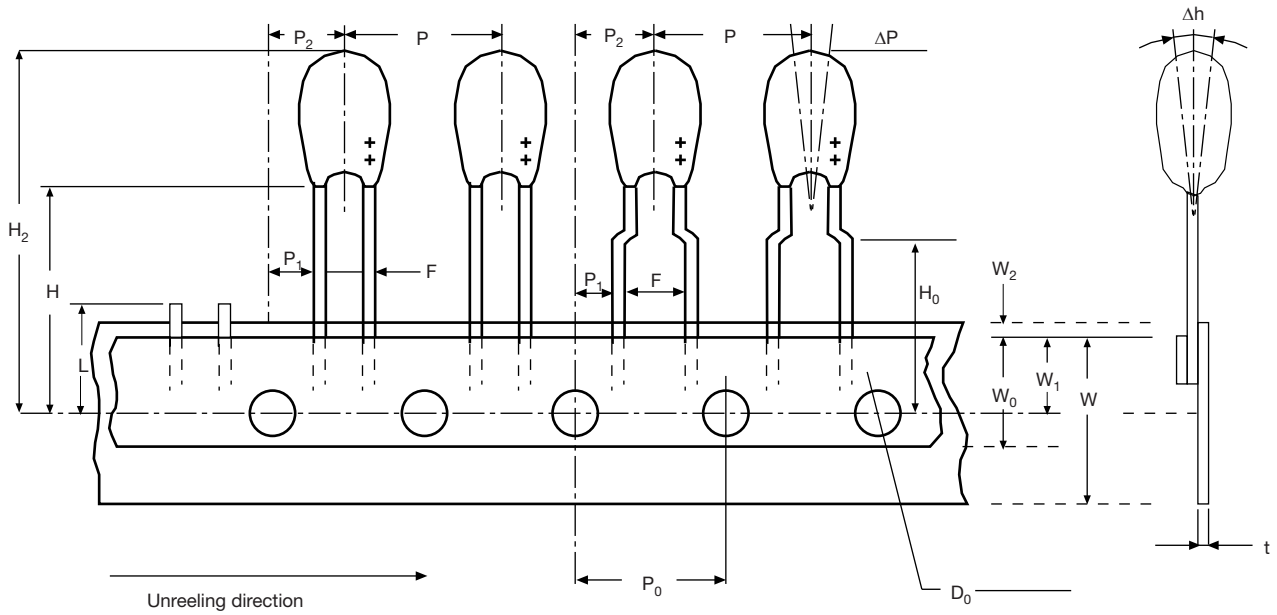
Ammo packaging (mm)



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 - 6	V0	5	Form DS, bulk	
1 - 4	W0	2.5	Reel, positive pole in front of unreeling direction	
1 - 4	T0	2.5	Reel, negative pole in front of unreeling direction	
1 - 4	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	
1 - 4	C0	5	Style “L“ bulk	

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

TAPING according to IEC 286-2



Dimensions for components on tape and tolerances:

DESIGNATION	SYMBOL	DIMENSIONS (mm)
Holding tape width	W	18.0 (+ 1 / - 0.5)
Adhesive tape width	W_0	Min. 5.0
Distance of components	P	12.7 ± 1
Hole center to component center	P_2	6.35 ± 1.3
Hole center to lead	P_1	5.1 / 3.8 ± 0.7
Distance of body to hole center	H (1)	18.0 (+ 2 / - 0)
Distance of lead to hole center	H_0	16.0 ± 0.5
Component upper edge to hole center	H_1	Max. 32.0
Adhesive tape location	W_2	Max. 3.0
Hole location	W_1	9.0 (+ 0.75 / - 0.5)
Distance of holes	P_0	12.7 ± 0.3
Hole diameter	D_0	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

Note

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

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