

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

DESCRIPTION:

RoHS compliant (*)

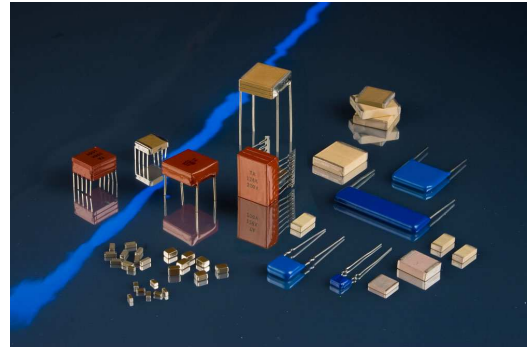
Case sizes: 0805 to 7565

Rated voltage: 200V to 10KV

Dielectric Type I and II

SMD and leaded versions

** Non-RoHS version still maintained for current applications.*



I. Foreword

The High voltage series is intended for such typical application as high voltage power supplies and high voltage multiplier circuits. Available in bare chips, they can be used in surface mounting or hybrid circuit applications. Their multilayer construction offers significant size and space saving advantage. Combination of standard case sizes may be obtained for special applications. They are suited for use in commercial, industrial and High-Rel military circuits.

II. Description

The capacitors here mentioned concern the voltage equal or higher than 1KV, in bare chips or leaded devices. The dielectrics used are from 2 types: ultra stable NP0 and X7R dielectrics.

Bare chips:



Radial leaded devices:



The standard wires are straight but on special request they can be bended to meet customer specification. Ask us for specific demand!

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III Capacitance Ranges

Case size	Rated Voltage	NPO dielectric		X7R dielectric		Radial Leaded version Avail. in A term
		Capacitance Range A term.	Capacitance Range S term.	Capacitance Range A term.	Capacitance Range S term.	
R15 (0805)	200V	10pF to 220pF	2pF to 1.2nF	560pF to 4.7nF	470pF to 47nF	-
	500V	10pF to 180pF	2pF to 680pF	270pF to 2.2nF	470pF to 22nF	-
	1000V	-	-	-	470pF to 1.0nF	-
R18 (1206)	200V	10pF to 1nF	2pF to 5.6nF	1nF to 10nF	180pF to 100nF	-
	500V	10pF to 470pF	180pF to 2.2nF	680pF to 4.7nF	180pF to 56nF	-
	1000V	-	10pF to 1nF	-	220pF to 10nF	-
	2000V	-	10pF to 390pF	-	220pF to 1.5nF	-
	3000V	-	2pF to 39pF	-	-	-
S41 (1210)	200V	100pF to 2.7nF	10pF to 8.2nF	1.5nF to 47nF	10nF to 470nF	-
	500V	100pF to 1nF	47pF to 3.9nF	1.5nF to 22nF	10nF to 100nF	-
	1000V	-	-	390pF to 1.8nF	10nF to 27nF	-
	2000V	-	-	220pF to 390pF	220pF to 2.7nF	-
S43 (1812)	200V	180pF to 5.6nF	68pF to 8.2nF	2.7nF to 100nF	220pF to 1µF	✓
	500V	180pF to 2.2nF	68pF to 8.2nF	2.7nF to 47nF	220pF to 220nF	✓
	1000V	-	68pF to 6.8nF	680pF to 12nF	220pF to 47nF	✓
	2000V	-	68pF to 1.5nF	390pF to 4.7nF	270pF to 10nF	✓
	3000V	-	10pF to 1.0nF	270pF to 1.8nF	680pF to 2.7nF	✓
	4000V	-	-	150pF to 680pF	-	✓
S47 (2220)	200V	680pF to 10nF	1nF to 10nF	6.8nF to 220nF	100nF to 2.2µF	✓
	500V	680pF to 4.7nF	1nF to 10nF	6.8nF to 100nF	100nF to 470nF	✓
	1000V	-	2pF to 150pF	680pF to 33nF	10nF to 100nF	✓
	2000V	-	2pF to 150pF	680pF to 10nF	1nF to 10nF	✓
	3000V	-	2pF to 150pF	470pF to 4.7nF	-	✓
	4000V	-	2pF to 150pF	470pF to 2.2nF	-	✓
	5000V	-	2pF to 150pF	-	-	-

Available capacitance series (cf end of this chapter):
 NPO dielectric: E12 in standard, E24 upon request
 X7R dielectric: E6 in standard, E12 upon request

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Case size	Rated Voltage	NP0 dielectric	X7R dielectric	Radial Leaded version Avail.
		Capacitance Range P term.	Capacitance Range P term.	
1515	1000V	470pF to 820pF	330pF to 12nF	✓
	2000V	270pF to 470pF	270pF to 2.7nF	✓
	3000V	100pF to 220pF	150pF to 820pF	✓
	4000V	12pF to 150pF	120pF to 1nF	✓
2020	1000V	680pF to 1.5nF	680pF to 22nF	✓
	2000V	470pF to 1nF	470pF to 6.8nF	✓
	3000V	220pF to 470pF	390pF to 2.7nF	✓
	4000V	100pF to 270pF	390pF to 1.2nF	✓
2520	1000V	1.2nF to 2.2nF	1nF to 33nF	✓
	2000V	680pF to 1.8nF	680pF to 10nF	✓
	3000V	330pF to 560pF	330pF to 3.9nF	✓
	4000V	270pF to 330pF	220pF to 1.8nF	✓
	5000V	120pF to 220pF	120pF to 1nF	✓
3333	1000V	2.7nF to 5.6nF	22nF to 100nF	✓
	2000V	1.2nF to 4.7nF	4.7nF to 27nF	✓
	3000V	560pF to 1.8nF	2.2nF to 12nF	✓
	4000V	470pF to 1nF	1.5nF to 5.6nF	✓
	5000V	330pF to 680pF	820pF to 3.3nF	✓
	6000V	220pF to 470pF	470pF to 2.2nF	✓
4020	4000V	390pF to 390pF	-	✓
	5000V	680pF to 270pF	1.2nF to 5.6nF	✓
	6000V	180pF to 220pF	470pF to 1.5nF	✓
	7000V	150pF to 150pF	330pF to 1.2nF	✓
	8000V	150pF to 120pF	470pF to 820pF	✓
	9000V	100pF to 100pF	390pF to 680pF	✓
	10 000V	-	330pF to 560pF	✓
4040	1000V	4.7nF to 10nF	39nF to 120nF	✓
	2000V	3.3nF to 5.6nF	10nF to 47nF	✓
	3000V	1.8nF to 2.7nF	3.3nF to 18nF	✓
	4000V	1nF to 1.8nF	2.7nF to 8.2nF	✓
	5000V	680pF to 1nF	1.2nF to 5.6nF	✓
	6000V	390pF to 820pF	680pF to 3.3nF	✓
	7000V	-	390pF to 2.2nF	✓
	8000V	-	680pF to 1.2nF	✓
	9000V	-	560pF to 1nF	✓
	10 000V	-	470pF to 680pF	✓

Available capacitance series (cf end of this chapter):
 NP0 dielectric: E12 in standard, E24 upon request
 X7R dielectric: E6 in standard, E12 upon request

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Case size	Rated Voltage	NPO dielectric	X7R dielectric	Radial Leaded version Avail.
		Capacitance Range P term.	Capacitance Range P term.	
5440	1000V	8.2nF to 12nF	82nF to 220nF	✓
	2000V	4.7nF to 8.2nF	15nF to 68nF	✓
	3000V	2.2nF to 3.3nF	6.8nF to 22nF	✓
	4000V	1.5nF to 2.7nF	4.7nF to 12nF	✓
	5000V	1.5nF to 1.8nF	3.3nF to 10nF	✓
	6000V	470pF to 1nF	330pF to 560pF	✓
5550	1000V	8.2nF to 15nF	120F to 270pF	✓
	2000V	5.6nF to 10nF	18nF to 82nF	✓
	3000V	2.7nF to 4.7nF	10nF to 39nF	✓
	4000V	1.8nF to 2.7nF	5.6nF to 15nF	✓
	5000V	1.5nF to 1.8nF	3.3nF to 10nF	✓
	6000V	820pF to 1.2nF	2.2nF to 6.8nF	✓
	7000V	-	1.2nF to 3.9nF	✓
	8000V	-	820pF to 2.7nF	✓
6560	1000V	12nF to 22nF	150nF to 390nF	✓
	2000V	6.8nF to 15nF	39nF to 150nF	✓
	3000V	3.9nF to 6.8nF	18nF to 56nF	✓
	4000V	2.7nF to 4.7nF	6.8nF to 22nF	✓
	5000V	2.2nF to 2.7nF	4.7nF to 18nF	✓
	6000V	1.2nF to 2.7nF	2.7nF to 12nF	✓
	7000V	-	1.5nF to 6.8nF	✓
	8000V	-	1nF to 3.9nF	✓
6666	7000V	-	2.2nF to 8.2nF	✓
	8000V	-	1.5nF to 5.6nF	✓
	9000V	-	1nF to 3.9nF	✓
	10 000V	-	680nF to 2.7nF	✓
7565	1000V	-	470nF	✓
	4000V	-	10nF to 27nF	✓

Available capacitance series (cf end of this chapter):
 NPO dielectric: E12 in standard, E24 upon request
 X7R dielectric: E6 in standard, E12 upon request

These hereinabove tables define the standard products, other components may be built, don't hesitate to contact us (cf chapter VIII).

Capacitance series:

E6: 10, 15, 22, 33, 47, 68

E12: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82

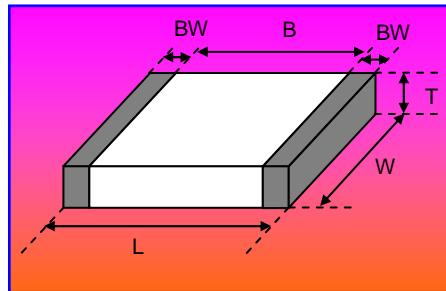
E24: 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91

Are included their multiples and sub-multiples of 10.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

IV Dimensions

SMD components



All dimensions in mm

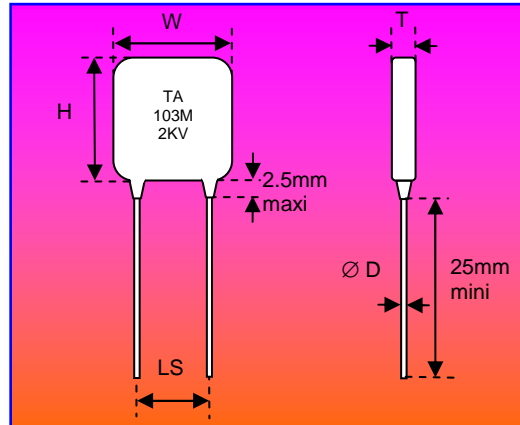
Case size	A termination							S termination						
	L	Tol. (±)	W	Tol. (±)	T maxi	BW min	B min	L	Tol. (±)	W	Tol. (±)	T maxi	BW min	B min
R15 (0805)	2.0	0.3	1.25	0.3	1.3	0.13	0.5	2.0	0.2	1.25	0.2	1.4	0.2	0.7
R18 (1206)	3.2	0.3	1.6	0.3	1.6	0.25	1.4	3.2	0.3	1.6	0.2	1.8	0.3	1.5
S41 (1210)	3.2	0.4	2.5	0.3	2.5	0.25	1.4	3.2	0.3	2.5	0.2	2.6	0.3	1.6
S43 (1812)	4.5	0.5	3.2	0.4	2.5	0.25	2.2	4.6	0.3	3.2	0.3	3.0	0.3	2.5
S47 (2220)	5.7	0.5	5.0	0.5	2.5	0.25	2.9	5.7	0.4	5.0	0.4	3.0	0.3	3.5

Case size	L	Tol. (±)	W	Tol. (±)	Thickness maxi (T)										BW min	B Min
					Voltage (KV)											
					1	2	3	4	5	6	7	8	9	10		
1515	3.8	0.38	3.8	0.38	3.9	3.9	3.9	3.9							0.3	2.22
2020	5.1	0.51	5.1	0.51	3.9	3.9	3.9	3.9							0.3	3.19
2520	6.4	0.64	5.1	0.51	3.9	3.9	4.5	4.5	4.5						0.3	4.36
3333	8.4	0.84	8.4	0.84	4.5	4.5	4.5	4.5	5.9	5.9					0.5	5.56
4020	10.2	1	5.1	0.51	3.9	3.9	4.5	4.5	4.5	4.5	5.1	5.1	5.1	5.1	0.5	7.2
4040	10.2	1	10.2	1	3.9	4.5	5.1	5.1	5.1	5.1					0.5	7.2
5440	13.7	1.4	10.2	1	4.5	5.1	5.1	5.1	6.4	6.4	6.4	6.4			0.5	10.3
5550	14	1.4	12.7	1.3	4.5	5.1	6.4	6.4	6.4	6.4	6.4	6.4			0.5	10.6
6560	16.5	1.7	15.2	1.5	4.5	5.1	5.1	5.1	6.4	6.4	6.4	6.4			0.5	12.8
6666	16.8	1.7	16.8	1.7	3.9	4.5	4.5	5.1	6.4	6.4	6.4	6.4	6.4	6.4	0.5	13.1
7565	19	1.9	16.5	1.7	4.5	5.1	5.1	5.1	6.4	6.4	6.4	6.4			0.5	15.1

Regarding the thickness for exact values for each part number, please consult us.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

Radial leaded components



All dimensions in mm

Case size	Thickness maxi (T)																		
	W	H	L.S.	D	Voltage (KV)														
					maxi	maxi	±0.5	±12%	0.2	0.5	1	2	3	4	5	6	7	8	9
S43 (1812)	7.1	6.6	5.08	0.6	3.7	3.7													
S47 (2220)	8.3	8.5	5.08	0.6	3.7	3.7													
1515	6.3	5.8	5.08	0.6			5.2	5.2	5.2	5.2									
2020	7.6	7.1	5.08	0.6			5.2	5.2	5.2	5.2									
2520	8.9	7.1	7.62	0.6			5.2	5.2	5.8	5.8	5.8								
3333	11.4	10.4	10.16	0.9			5.8	5.8	5.8	5.8	7.2	7.2							
4020	13.2	7.1	12.7	0.9			5.2	5.2	5.8	5.8	5.8	5.8	6.4	6.4	6.4	6.4			
4040	13.2	12.2	12.7	0.9			5.2	5.8	6.4	6.4	6.4	6.4							
5440	16.7	12.2	15.24	0.9			5.8	6.4	6.4	6.4	6.4	7.7	7.7	7.7	7.7				
5550	17	14.7	15.24	0.9			5.8	6.4	7.7	7.7	7.7	7.7	7.7	7.7	7.7				
6560	19.5	17.2	17.78	0.9			5.8	6.4	6.4	6.4	7.7	7.7	7.7	7.7					
6666	19.8	18.8	17.78	0.9			5.2	5.8	5.8	6.4	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
7565	22	18.5	20.32	0.9			5.8	6.4	6.4	6.4	7.7	7.7	7.7	7.7					

For exact values regarding the thickness, please consult us.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

V Marking

Size	Marking codes	Example
1515 2020	Cap Code Tolerance Code	103 M
2520 4020	Cap Code + Tolerance Code Rated voltage value	103M 1KV
Other sizes	« TA » logo Cap Code + Tolerance Code Rated voltage value	TA 103M 2KV

Note: the marking is only available for leaded capacitors.

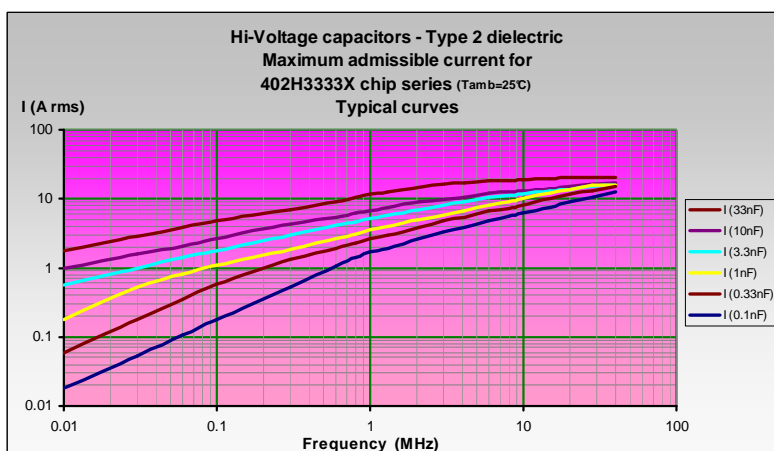
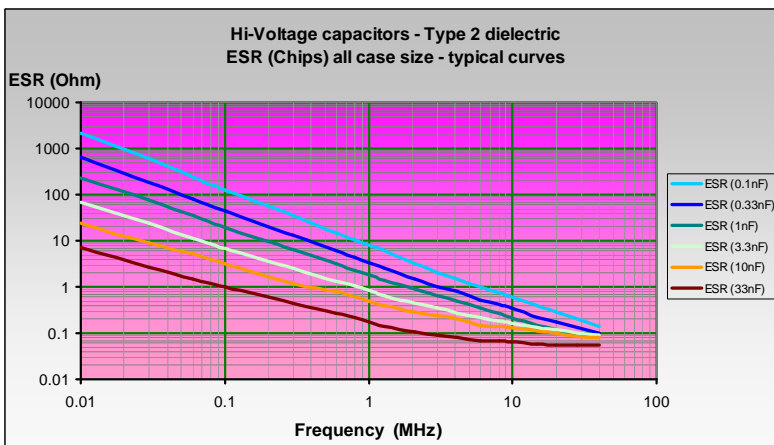
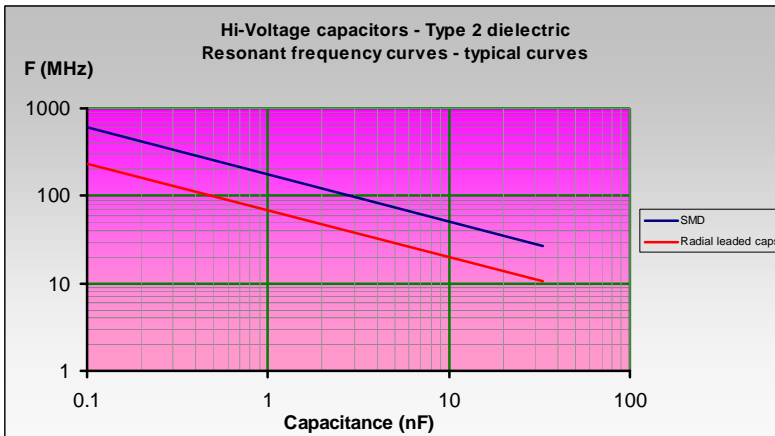
VI Dielectric characteristics

Description	NP0 dielectric (class 1)	X7R dielectric (class 2)
CECC	1B CG	2R1
EIA	COG	X7R
Temex Ceramics Code	N	X
Operating temperature range	-55°C / +125°C	-55°C / +125°C
Storage temperature range	-55°C / +125°C	-55°C / +125°C
Temperature coefficient	0 ± 30ppm / °C	NA
Maximum ΔC/C over Temperature range without voltage applied	NA	± 15%
Ageing	None	≤2.5% per decade hour
Dissipation Factor (D.F.)	≤ 0.15%	≤ 2.5%
Voltage proof	Ur = 200V : 2.0 x Ur (1.5xUr for S term) Ur = 500V: 1.5 x Ur Ur ≥ 1000V: 1.2 x Ur	Ur = 200V : 2.0 x Ur (1.5xUr for S term) Ur = 500V: 1.5 x Ur Ur ≥ 1000V: 1.2 x Ur
Insulation Resistance (IR) @ 25°C (Under Ur or under 1000V DC if Ur > 1000V DC)	200V/500V: 10GΩ or 500Ω.F* > 500V: 100GΩ or 1000Ω.F*(A/P term) > 500V: 10GΩ or 500Ω.F* (S term.)	200V/500V: 10GΩ or 500Ω.F* > 500V: 100GΩ or 1000Ω.F*(A/P term) > 500V: 10GΩ or 500Ω.F* (S term.)
Measurement Conditions for C and D.F. @ 20°C	≤ 1000pF: 1MHz / 1Vrms (no bias) > 1000pF: 1KHz / 1Vrms (no bias)	≤ 100pF: 1MHz / 1Vrms (no bias) > 100pF: 1KHz / 1Vrms (no bias)

(*): whichever is the less.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

VII Electrical characteristics



The ESR (Equivalent Serial Resistance) curves are given here for SMD (chips) capacitors. Regarding the curves for the leaded capacitors, they are rather the same.

Indeed, due to the resistivity of the raw material used and the wire diameters, the resistance of the wires is much lower than the ESR of the chips. So, in a first approach, their influence can be considered as negligible.

These typical curves are an example of admissible currents for one family of chip capacitors. For other curves and products or for further information, please contact us.

Note: for the calculations, we have considered that the terminations are directly connected to an infinite heat sink. In other words, the thermal resistance of the circuit itself which depends of its type and design has not been taken into account. Moreover, the ambient temperature taken is 25°C.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

VIII Termination types

Description	P (RoHS)	A (RoHS)	S (RoHS)	R (RoHS version)	R (non RoHS version)
Chip (SMD)	✓	✓	✓	-	-
Radial wires	-	-	-	✓	✓
Materials	R15/R18/ S41/S43/S47: AgPdPt Other sizes: Pure Ag Or AgPd	R15/R18/ S41/S43/S47: AgPdPt Other sizes: Non available	100% tinned Nickel barrier	100% tinned Copper	Sn(70%) Pb(30%) plated Copper
Magnetic status	Non magnetic	Non magnetic	Magnetic	Non magnetic	Non magnetic
Lead status (% of Pb)	0%	0%	0%	0%	30% of the plated layer

Note: for R15, R18, S41, S43 and S47 sizes, the "P" and "A" terminations are exactly the same. Due to historical reasons, both denominations are kept.

IX Special products

As standard products can't meet all the specificities of all applications, special applications may require special features (higher voltage, burn-in, dimensions, coating, leading, marking...) not described in this catalogue.



Based on the "state of the Art", and our knowledge of the technology, our Engineers may study at your request all special components to meet your application. Please, consult us for more information.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

X How to order

802	H	6560	X	182	K	P	E	-RoHS
Rated Voltage 1st two digits are significant; third digit denotes number of zeros Examples: 201 = 200V 501 = 500V 102 = 1000V 202 = 2000V	Series Left blank Series H	Size R15 R18 S41 S43 S47 Size 1515 2020 2520 3333 5440 5550 6560 6666 7565	Dielectric N = NP0 X = X7R	Capacitance 1st two digits are significant; third digit denotes number of zeros Examples: 101 = 100pF 472 = 4.7nF 683 = 68nF 104 = 0.1μF	Tolerance (*) For N dielectric A (±0.05pF) B (±0.1pF) C (±0.25pF) D (±0.5pF) F (±1%) G (±2%) J (±5%) K (±10%) M (±20%) For X dielectric K (±10%) M (±20%)	Termination P A S R Termination P R	Packaging Left blank: Blister boxes E: Tape and reel for chips	RoHS Compliance (**) If left blank non-RoHS compliant

(*): capacitance values lower than 10pF, tolerances A, B, C and D apply. For capacitance values equal or higher than 10pF, tolerances F, G, J and K apply.

(**): For "Radial Leaded (R)" capacitors, both RoHS and non-RoHS versions exist. This is due to the wishes of some customers who still need non-RoHS components in their applications. This suffix must be required for RoHS compliancy.

For "P", "A" and "S" terminations, only the RoHS version exists. The RoHS suffix can be added for information.

HIGH VOLTAGE MULTILAYER CERAMIC CAPACITORS

XI Packaging

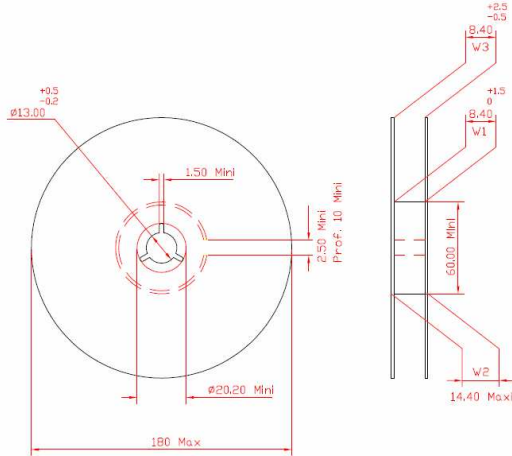
According to their dimensions, the components can be delivered in tape or individually protected in “blister” boxes. Please, refer to the following table:

Tape and reel (SMD components):

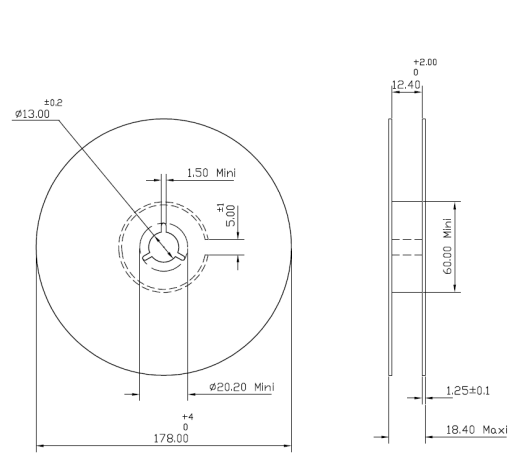
Case size	Qty per reel *	Tape type
0805 - R15	3000 - 4000	8mm
1206 - R18	3000 - 4000	8mm
1210 - S41	2000 - 4000	8mm
1812 - S43	500 - 1000	12mm
2220 - S47	500 - 1000	12mm
H1515	500	12mm
H2020	500 - 1000	12mm
H2520	400	12mm

* Depending upon the thickness of the components, please consult us.

Dimensions diameter reel (in mm)



Tape type: 8mm



Tape type: 12mm

Regarding the reels and tape dimensions, they are compliant to the IEC 60286-3 standard.

“Blister” Boxes (SMD and leaded components):

Case sizes for 1515 and above can be delivered with plastic “blister” boxes especially designed to protect the components which could be large and quite heavy. Depending upon the termination (with or without connection) and the size, the number of the parts in each box is defined. Please, consult us for more details.