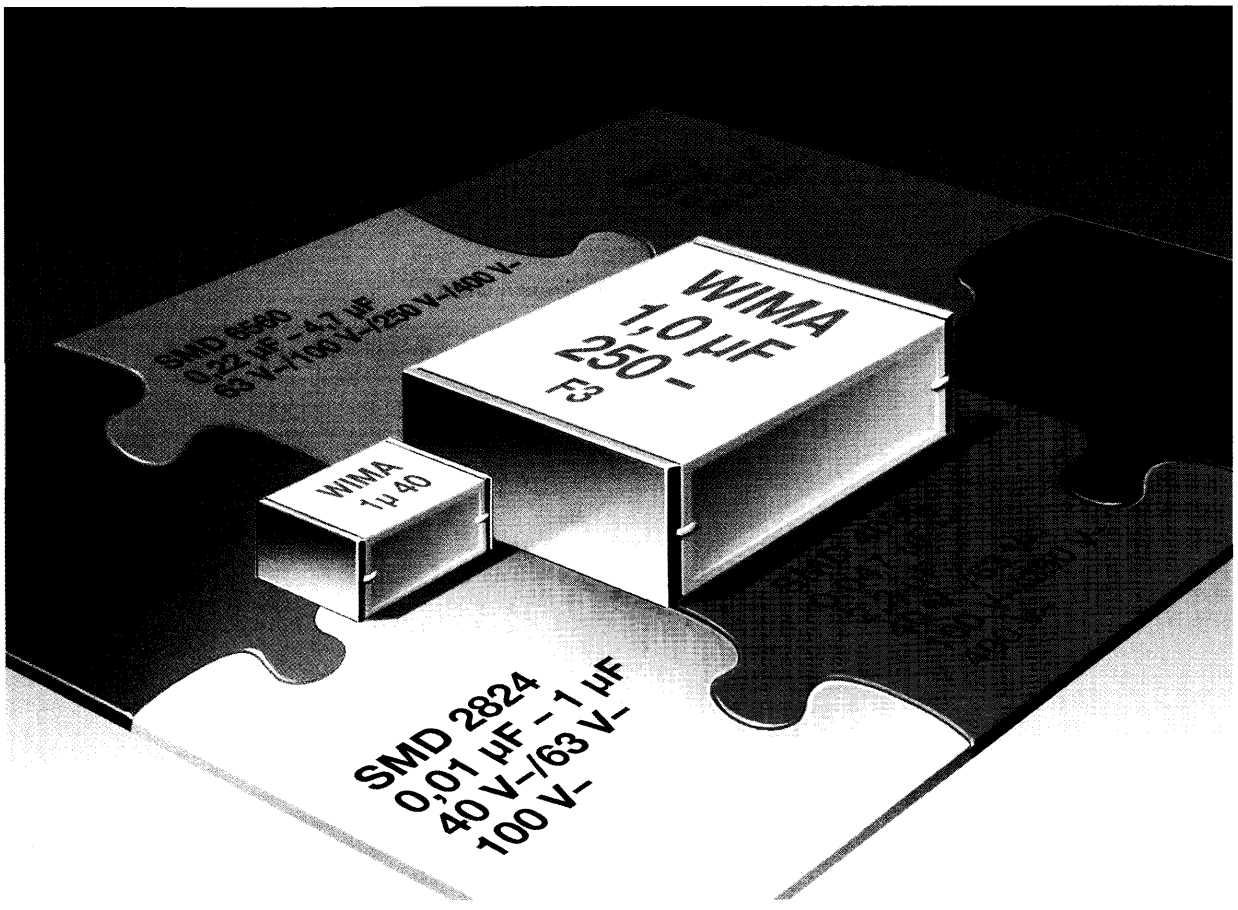
The SMD component you can rely on



Based on international size codes used worldwide, WIMA has developed a new generation of polyester SMD capacitors with capacitance values from **1000 pF** to **4.7 µF** and voltages ranging from **40 VDC** to **400 VDC.** The new SMDs are available in the size codes **2220, 2824, 4036, 5045** and **6560.** For the first time, plastic film SMD capacitors are now available to the user for a wide spectrum of applications which could so far only be covered by leaded components.

All WIMA series are manufactured in proven resin-potted case technology, which has substantial advantages in comparison with non-encapsulated or moulded SMD capacitor versions.

- No danger of delamination. Safe protection of the capacitor element against mechanical stress which occurs during processing when assembling, soldering or washing.
- No danger of internal cracks or tearing away of the contacts due to similar expansion coefficients and the elasticity of the construction.
- Excellent protection against environmental influences during processing and operation.
- Flame-retardent plastic case in accordance with UL 94-0.

The use of polyester as a dielectric also provides a number of further advantages in comparison to PEN or PPS films.

- Polyester is easily available as a standard film and is thus well suited for widescale serial production.
- Statements about reliability can be made based on an enormous number of component hours, since there have been decades of experience in production and application of leaded components.
- Advantageous cost/performance ratio.

Due to these positive qualities and the wide range of products, WIMA SMDs have a good chance of substituting other capacitor techniques and establishing themselves as the de facto standard in future electronic developments.

WIMA SMD 4036
WIMA SMD 5045
WIMA SMD 6560

Metallized polyester capacitors

■ Capacitance values from 0.047 µF through 4.7 µF with rated voltages from 40 VDC through 400 VDC. The entire range is spread over the three size codes 4036, 5045 and 6560 allowing to realize SMD plastic film capacitors with higher capacitances and rated voltages. ■ The entire surface of the end sides being used as soldering surface results in excellent soldering quality. ■ The excellent electrical properties open up applications where quality and reliability are of importance. ■ Available taped and reeled.

Technical Data

Dielectric: Polyethylene terephthalate film.
Capacitor electrodes: Vacuum-deposited aluminium.
Encapsulation: Flame-retardent plastic case, UL 94 V–O, with epoxy resin seal. Colour: White or Black. Marking: Silver.
Temperature range: – 55° C to + 100° C.
Test specifications: In accordance with IEC 384-19 and CECC 32 200.
Test category: 55/100/56 in accordance with IEC.
Insulation resistance at + 20° C:

V_r	V_{test}	C ⩽ 0.33 µF	0.33 µF < C ⩽ 4.7 µF
40 VDC 63 VDC 100 VDC	10 V 50 V 100 V	⩾ 3.75×10^3 MΩ Mean value: 1×10^4 MΩ	⩾ 1250 sec (MΩ × µF) Mean value: 3000 sec
⩾ 250 VDC	100 V	⩾ 1×10^4 MΩ Mean value: 5×10^4 MΩ	⩾ 3000 sec Mean value: 10 000 sec

In accordance with IEC 384-19 and CECC 32 200.
Measuring time: 1 min.
Dissipation factors at + 20° C: tan δ

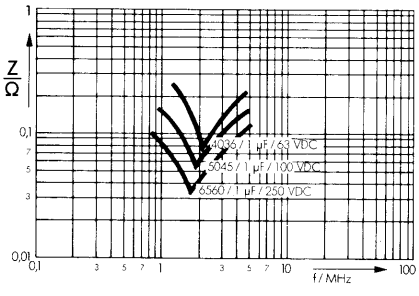
at f	C ⩽ 0.1 µF	0.1 µF < C ⩽ 1.0 µF	C > 1.0 µF
1 kHz	⩽ 8×10^{-3}	⩽ 8×10^{-3}	⩽ 10×10^{-3}
10 kHz	⩽ 15×10^{-3}	⩽ 15×10^{-3}	–
100 kHz	⩽ 30×10^{-3}	–	–

Capacitance tolerances: ± 20 % (closer tolerances are available subject to special enquiry).
Vibration: 6 hours at 10 . . . 2000 Hz and 0.75 mm displacement amplitude or 10 g in accordance with IEC 68-2-6.

Low air density: 1 kPa = 10 mbar in accordance with IEC 68-2-13.
Bump test: 4000 bumps at 390 m/sec² in accordance with IEC 68-2-29.
Maximum pulse rise time:

Capacitance µF	Pulse rise time V/µsec max. operation / test 40 VDC	63 VDC	100 VDC	250 VDC	400 VDC
0.047 – 0.068					32/320
0.1 – 0.15				20/200	26/260
0.22 – 0.33			15/150	16/160	20/200
0.47 – 1.0		9/90	10/100	11/110	15/150
1.5 – 2.2	6/60	6/60	8/80		
3.3 – 4.7	5/50	5/50	6/60		

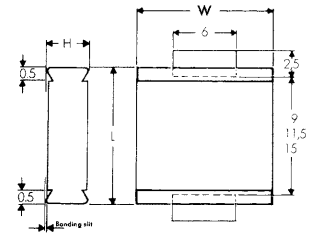
for pulses equal to the rated voltage.
Test voltage: 1.6 Vr, 2 sec.
Resistance to soldering heat:
Solder bath temperature max. 260° C.
Soldering duration max. 5 sec.
Change in capacitance $\left|\frac{\Delta C}{C}\right| < 3\,\%$.
In accordance with DIN IEC 68-2-20 (test Tb.)/CECC 32 200.
Soldering process: Wave soldering and re-flow soldering.



Impedance change with frequency (general guide)

General Data

Capacitance	40 VDC/25 VAC	63 VDC/40 VAC	100 VDC/63 VAC	250 VDC/160 VAC	400 VDC/200 VAC
0.047 µF					4036
0.068 „					4036
0.1 µF				4036	5045
0.15 „				4036	5045
0.22 „			4036	5045	6560
0.33 „			4036	5045	6560
0.47 „			5045	6560	6560
0.68 „			5045	6560	
1.0 µF		4036	5045	6560	
1.5 „		4036	6560		
2.2 „	4036	5045	6560		
3.3 „	4036	5045	6560		
4.7 „	5045	6560			



Dims. in mm.

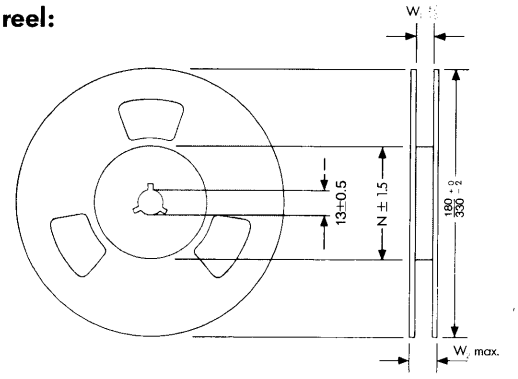
Solder pad recommendation

Size code	L ± 0.2	W ± 0.3	H ± 0.2
4036	10.2	9.1	5.5
5045	12.7	11.5	6.5
6560	16.5	15.0	7.0

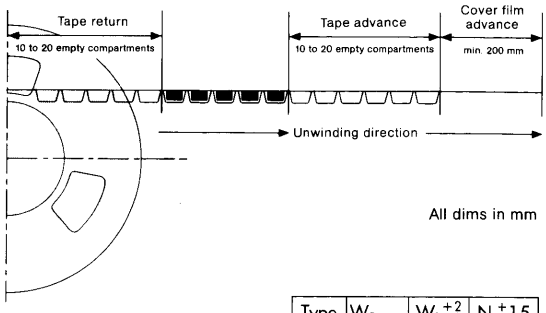
Dimensional specification for blister tape packaging of the WIMA SMD capacitors

WIMA SMD

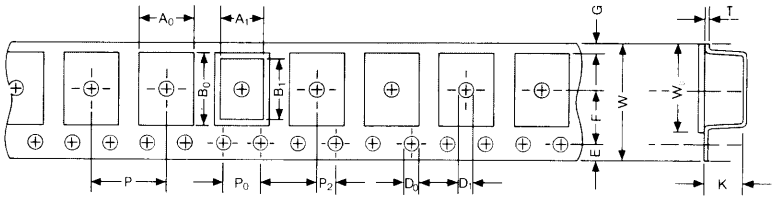
Tape reel:



Tape advance and return:



All dims in mm



Type	$W_{2\,max.}$	$W_1{}^{+2}_{-0}$	$N^{+1.5}_{-}$
2220	19	12.4	62
2824	19	12.4	62
4036	22.4	16.4	60
5045	30.4	24.4	90
6560	30.4	24.4	90
7.3	19	12.4	62

SMD 2220 Box size	A_0 ±0.1	A_1	B_0 ±0.1	B_1	D_0 +0.1 −0	D_1 +0.1 −0	P ±0.1	P_0* ±0.1	P_2 ±0.05	E ±0.1	F ±0.05	G	W ±0.3	W_0 ±0.2	K ±0.1	T ±0.1
5.7 x 5 x 2.5	6.1	5.7	5.6	5	⌀ 1.5	⌀ 1.5	8	4	2	1.75	5.5	1.95	12	9.5	2.8	0.3
5.7 x 5 x 3	6.1	5.7	5.6	5	⌀ 1.5	⌀ 1.5	8	4	2	1.75	5.5	1.95	12	9.5	3.3	0.3
5.7 x 5 x 4	6.1	5.7	5.6	5	⌀ 1.5	⌀ 1.5	8	4	2	1.75	5.5	1.95	12	9.5	4.3	0.3

Packing units

taped Reel 180 mm ⌀	taped Reel 330 mm ⌀	bulk
800	3000	1000
650	2400	1000
500	1800	1000

SMD 2824 Box size	A_0 ±0.1	A_1	B_0 ±0.1	B_1	D_0 +0.1 −0	D_1 +0.1 −0	P ±0.1	P_0* ±0.1	P_2 ±0.05	E ±0.1	F ±0.05	G	W ±0.3	W_0 ±0.2	K ±0.1	T ±0.1
7.3 x 6 x 2.5	6.4	6	7.7	7.3	⌀ 1.5	⌀ 1.5	8	4	2	1.75	5.5	0.9	12	9.5	2.8	0.3
7.3 x 6 x 3	6.4	6	7.7	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	3.3	0.3
7.3 x 6 x 3.5	6.4	6	7.7	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	3.8	0.3
7.3 x 6 x 4.5	6.4	6	7.7	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	4.8	0.3

taped Reel 330 mm ⌀	bulk
3000	1000
1500	1000
1200	1000
1000	1000

	A_0 ±0.2	A_1	B_0 ±0.2	B_1	D_0 ±0.1	D_1 +0.1 −0	P ±0.1	P_0* ±0.1	P_2 ±0.1	E ±0.1	F ±0.1	G −0.2	W ±0.3	W_0 ±0.2	K ±0.2	T ±0.1
SMD 4036	10.7	10.2	9.7	9.1	⌀ 1.5	⌀ 1.5	16	4	2	1.75	7.5	1.9	16	13.3	5.9	0.3
SMD 5045	13.2	12.7	12.1	11.5	⌀ 1.5	⌀ 1.5	16	4	2	1.75	11.5	4.7	24	21.3	7.0	0.3
SMD 6560	17.0	16.5	15.6	15.0	⌀ 1.5	⌀ 1.5	20	4	2	1.75	11.5	2.95	24	21.3	7.5	0.3

taped Reel 330 mm ⌀	bulk
775	500
600	200
450	200

SMD 7.3 Box size	A_0 +0.2 −0	A_1	B_0 +0.2 −0	B_1	D_0 +0.1 −0	D_1 +0.1 −0	P ±0.1	P_0* ±0.1	P_2 ±0.05	E ±0.1	F ±0.05	G −0.2	W ±0.3	W_0 ±0.2	K max.	T ±0.1
7.3 x 7 x 3	7.5	7	7.5	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	3.5	0.4
7.3 x 9 x 3.5	9.5	9	7.5	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	4	0.4
7.3 x 10 x 4.5	10.5	10	7.5	7.3	⌀ 1.5	⌀ 1.5	12	4	2	1.75	5.5	0.9	12	9.5	5	0.4

taped Reel 330 mm ⌀	bulk
1500	1000
1200	1000
1000	1000

* cumulative after 10 steps ± 0.2 mm max.

Recommendations for processing and application

WIMA SMD

Layout form

The components can generally be positioned on the carrier material as desired. In order to prevent soldering shadows or ensure regular temperature distribution, extreme concentration of the components should be avoided.
In practice, it has proved best to keep a minimum distance of the soldering surfaces between two WIMA SMDs of twice the height of the components.

As a basic principle, the aligning of the soldering surfaces in accordance with the transport direction of the printed circuit board through the soldering wave is recommended for wave soldering.

For solder pad recommendation – see SMD series concerned.

The solder pad sizes given for each individual series are to be understood as minimum measurements which can at any time be suited to the layout form.

Processing

The processing of SMD components:

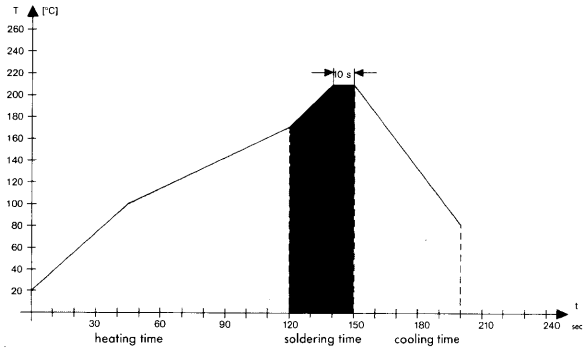
- **assembling**
- **soldering**
- **washing**
- **electr. final inspection / calibrating**

must be regarded as a complete process. The soldering of the printed circuit board, for example, can constitute considerable stress on all the electronic components. The manufacturer's instructions on the processing of the components are mandatory.

Soldering process

Re-flow soldering

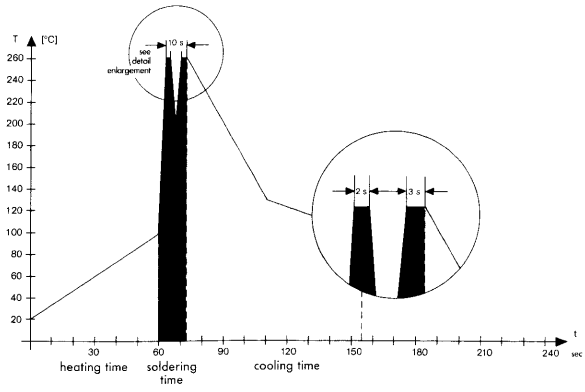
Temperature / time graph for the maximal permissible internal temperature of the WIMA SMD film capacitor for typical infrared soldering processes:



Due to the diverse procedures and the varying heat requirements of the different types of components, an exact processing temperature for re-flow soldering processes cannot be specified.
The manufacturer can only take as a guideline the internal temperature of the component which is reached during the soldering process. Accordingly the given temperature / time profile represents the permissible internal temperature of the WIMA SMD series during a typical infrared soldering process.

Wave soldering

Temperature / time graph for the maximal permissible solder bath heat for wave soldering of WIMA SMD film capacitors.



Washing

Basically, all plastic encapsuled components, regardless of which manufacturer cannot be considered as being hermetically sealed. They are therefore only suitable for industrial washing processes to a limited extent. During the washing process, washing agents can penetrate the interior of the component by capillary action through microcracks which might have occurred.

This is dependent on a number of parameters e. g.

- **washing agents**
- **viscosity of the washing solution**
- **temperature / time of the washing process**
- **mechanical washing aids such as**
  ultrasound
  water pressure
  rinsing and spraying pressure

The type of washing agent to be used is largely specific to the individual user or is often laid down by the manufacturer of the washing equipment. The agressiveness of the washing agent to be used can thus only be judged in appropriate test series relating to each individual washing process. By and large, the basic rule ist that the washing process should be carried out as gently as possible.

Drying

During the washing process, watery solutions can seep into the component. This can lead to changes in the electric parameters. Suitable drying measures should ensure that no remaining moisture or traces of washing substances is left in the component.

Initial operation / calibration of the device

Due to the stress which the components are subjected to during processing, reversible parameter changes occur in almost all electronic components. In accordance with CECC 32200 specifications the capacitance recovery accuracy to be expected with careful processing is in the region of

$|\Delta C/C| \leqslant 3\%$.

For the initial operation of the device a minimum settling time of

$t \geqslant 24$ h

is to be taken into account. With calibrated devices or when the application is largely dependent on capacitance it is advisable to prolong the settling time to

$t \geqslant 10$ d

In this way ageing effects of the capacitor structure can be anticipated. Parameter changes due to processing are not to be expected after this period of time.

Reliability

Taking account of the manufacturer's guidelines and compatible processing, the WIMA SMD series stand out for the same high quality and reliability as the analogous leaded WIMA series. The technology of metallized polyester film capacitors used in WIMA SMD achieves the best values for all fields of application.

The expected value is about

$\lambda_0 \leqslant 2$ fit.

Furthermore the production of all WIMA components is subject to the regulations laid down by ISO 9000 as well as the guidelines for component specifications set out by CECC quality assessment standards for electronic components.

Electrical characteristics and fields of application

Basically the WIMA SMD series have the same electrical characteristics as leaded metallized polyester capacitors.

The diagrams show the course of the most important electric parameters in comparison with X7R and Z5U ceramic capacitors.

Apart from the advantages shown in the diagrams, WIMA SMD capacitors have a number of other outstanding qualities compared to ceramic or tantalum dielectrics:

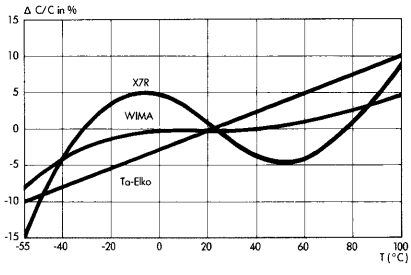
- **favorable pulse rise time**
- **low ESR**
- **outstanding self-healing properties**
- **low dielectric absorption**
- **available in high voltage series**
- **large capacitance spectrum**
- **stand up to high mechanical stress**
- **good long-term stability**

As regards technical performance as well as the quality and reliability of the WIMA SMD series, it is possible to substitute practically all ceramic and tantalum applications.

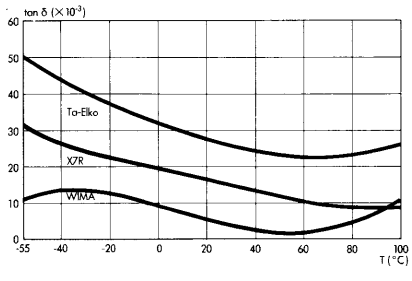
Furthermore, the WIMA SMD series can now be used for all the demanding capacitor applications for which, in the past, the use of wired components was mandatory:

- **measuring techniques**
- **oscillator circuits**
- **differentiating and integrating circuits**
- **D/A or A/D transformers**
- **'sample and hold' circuits**
- **automotive electronics**

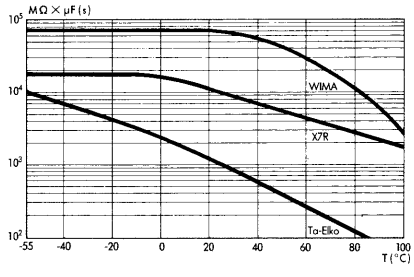
With the WIMA SMD programme available today, 70% of all MKT capacitor applications can be covered with WIMA SMD components. The field of application ranges from standard coupling capacitors to use in switch-mode power supplies as filter or charging capacitors with high voltage and capacitance values, and to use in telecommunications e. g. the well-known telephone capacitor 1 µF / 250 V.



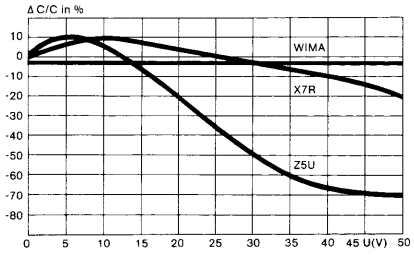
Capacitance change with temperature (f = 1 kHz) (general guide)



Dissipation factor change with temperature (f = 1 kHz) (general guide)



Insulation resistance change with temperature (general guide)



Capacitance change with voltage (general guide)