Metallized Polyester (PET) SMD Film Capacitors with Box Encapsulation

Special Features
- Size codes 1812, 2220, 2824, 4030, 5040 and 6054 with PET and encapsulated
- Operating temperature up to 100°C
- Self-healing
- According to RoHS 2011/65/EU

Typical Applications
For general DC-applications e.g.
- By-pass
- Blocking
- Coupling and decoupling
- Timing

Construction
Dielectric:
Polyethylene-terephthalate (PET) film
Capacitor electrodes:
Vacuum-deposited
Internal construction:
Plastic film
Vacuum-deposited electrode (choopage)
Metal contact layer
Terminating plate

Encapsulation:
Solvent-resistant, flame-retardant plastic case, UL 94 V-0

Marking:
Box colour: Black.

Capacitance range:
0.01 μF to 6.8 μF

Rated voltages:
63 VDC, 100 VDC, 250 VDC, 400 VDC, 630 VDC, 1000 VDC

Capacitance tolerances:
±20%, ±10% (±5% available subject to special enquiry)

Operating temperature range:
-55°C to +100°C (+125°C available subject to special enquiry)

Climatic test category:
55/100/21 according to IEC for size codes 1812 to 2824
55/100/56 according to IEC for size codes 4030 to 6054

Insulation resistance at +20°C:
U \( \times \) 0.33 μF 0.33 μF < C \leq 6.8 μF
63 VDC 50 V \( \geq 3.75 \times 10^3 \, MΩ \) \( \geq 1250 \, sec \) (mean value: 3000 sec)
100 VDC 100 V (mean value: 1 \times 10^4 MΩ)
100 VDC 100 V (mean value: 5 \times 10^4 MΩ)
250 VDC 100 V \( \geq 1 \times 10^4 \, MΩ \)

Dissipation factors at +20°C:
\( \tan \delta \)
at f C \leq 0.1 μF 0.1 μF < C \leq 1.0 μF C > 1.0 μF
1 kHz \( \leq 8 \times 10^{-3} \) \( \leq 8 \times 10^{-3} \) \( \leq 10 \times 10^{-3} \)
10 kHz \( \leq 15 \times 10^{-3} \) \( \leq 15 \times 10^{-3} \) –
100 kHz \( \leq 30 \times 10^{-3} \) – –

Maximum pulse rise time:
For pulses equal to the rated voltage

Dip Solder Test/Processing
Resistance to soldering heat:
Test Tb in accordance with DIN IEC 60068-2-58/DIN EN 60384-19.
Soldering bath temperature max. 260°C.
Soldering duration max. 5 sec.
Change in capacitance \( \Delta C/C < 5\% \).
Soldering process:
Re-flow soldering (see temperature/time graphs page 121).

Packing
Available taped and reeled in 12 mm blister pack.
Detailed tapping information and graphs at the end of the catalogue.
For further details and graphs please refer to Technical Information.

For general DC-applications e.g.
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Dissipation factors at +20°C:
\( \tan \delta \)
at f C \leq 0.1 μF 0.1 μF < C \leq 1.0 μF C > 1.0 μF
1 kHz \( \leq 8 \times 10^{-3} \) \( \leq 8 \times 10^{-3} \) \( \leq 10 \times 10^{-3} \)
10 kHz \( \leq 15 \times 10^{-3} \) \( \leq 15 \times 10^{-3} \) –
100 kHz \( \leq 30 \times 10^{-3} \) – –

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Encapsulation:
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Marking:
Box colour: Black.

Dissipation factors at +20°C:
\( \tan \delta \)
at f C \leq 0.1 μF 0.1 μF < C \leq 1.0 μF C > 1.0 μF
1 kHz \( \leq 8 \times 10^{-3} \) \( \leq 8 \times 10^{-3} \) \( \leq 10 \times 10^{-3} \)
10 kHz \( \leq 15 \times 10^{-3} \) \( \leq 15 \times 10^{-3} \) –
100 kHz \( \leq 30 \times 10^{-3} \) – –

Maximum pulse rise time:
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### General Data

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* AC voltage: \( f = 50 \text{ Hz}, 1.4 \times U_{\text{rms}} + U_{\text{DC}} \leq U_{\text{r}} \)

Dims. in mm.

Rights reserved to amend design data without prior notification.

Part number completion:
- Tolerance: 20% = M
- 10% = K
- 5% = J
- Packing: bulk = S
- Pin length: none = 00
- Taped version see page 127.
## General Data

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* AC voltage: f = 50 Hz; 1.4 x U_{rms} + U_{DC} ≤ U_{r}

Dims. in mm.

The values of the WIMA SMD-PEN range according to the main catalogue 2009 are still available on request.

Solder pad recommendation

Part number completion:
- Tolerance: 20 % = M
- 10 % = K
- 5 % = J
- Packing: bulk = S
- Pin length: none = 00
- Taped version see page 127.

## Sizing

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<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>4030</td>
<td>10.2</td>
<td>7.6</td>
<td>0.5</td>
<td>2.5</td>
<td>6.9</td>
<td>6.9</td>
</tr>
<tr>
<td>5040</td>
<td>12.7</td>
<td>10.2</td>
<td>0.7</td>
<td>2.5</td>
<td>11.5</td>
<td>11.5</td>
</tr>
<tr>
<td>6054</td>
<td>15.3</td>
<td>13.7</td>
<td>0.7</td>
<td>2.5</td>
<td>14.0</td>
<td>14.0</td>
</tr>
</tbody>
</table>

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Recommendation for Processing and Application of SMD Capacitors

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 proven best to keep a minimum distance of the soldering surfaces between two WIMA SMDs of twice the height of the components.

Solder Pad Recommendation

The solder pad size recommendations given for each individual series are to be understood as minimum dimensions which can at any time be adjusted to the layout form.

Processing

The processing of SMD components
- assembling
- soldering
- electrical 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

Temperature/time graph for the permissible processing temperature of the WIMA SMD film capacitor for typical convection soldering processes.

Due to versatile procedures exact processing parameters for re-flow soldering processes cannot be specified. The graph depicted is to be understood as a recommendation to help establishing a suitable soldering profile fulfilling the requirements in practice at the user. During processing a max. temperature of T=210° C inside the component should not be exceeded. Due to the differing heat absorption the length of the soldering process should be kept as short as possible for smaller size codes.

SMD Handsoldering

WIMA SMD capacitors with plastic film dielectric are generally suitable for hand-soldering, e.g. for lab purposes, with a soldering iron where, however, similar to automated soldering processes, a certain duration and temperature should not be exceeded. These parameters are dependent on the physical size of the components and the relevant heat absorption involved.

The below data are to be regarded as guideline values and should serve to avoid damage to the dielectric caused by excessive heat during the soldering process. The soldering quality depends on the tool used and on the skill and experience of the person with the soldering iron in hand.

<table>
<thead>
<tr>
<th>Size code</th>
<th>Temperature °C / °F</th>
<th>Time duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1812</td>
<td>250 / 482</td>
<td>2 sec plate 1 / 5 sec off / 2 sec plate 2</td>
</tr>
<tr>
<td>2220</td>
<td>250 / 482</td>
<td>3 sec plate 1 / 5 sec off / 3 sec plate 2</td>
</tr>
<tr>
<td>2824</td>
<td>260 / 500</td>
<td>3 sec plate 1 / 5 sec off / 3 sec plate 2</td>
</tr>
<tr>
<td>4030</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
<tr>
<td>5040</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
<tr>
<td>6054</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
</tbody>
</table>
**Recommendation for Processing and Application of SMD Capacitors**

(Continuation)

### Solder Paste

To achieve reliable soldering results one of the following solder alloys have from case to case proven being workable:

- **Lead free solder paste**
  - Sn - Bi
  - Sn - Zn (Bi)
  - Sn - Ag - Cu (suitable for SMD-PET 5040/6054 and SMD-PPS)

- **Solder paste with lead**
  - Sn - Pb - Ag (Sn60-Pb40-A, Sn63-Pb37-A)

### Washing

WIMA SMD components with plastic encapsulation - like all other components of similar construction irrespective of the make - cannot be regarded as hermetically sealed. Due to today's common washing substances, e.g. on aqueous basis instead of the formerly used halogenated hydrocarbons, with enhanced washing efficiency it became obvious that assembled SMD capacitors may show an impermissibly high deviation of the electrical parameters after a corresponding washing process. Hence it is recommended to refrain from applying industrial washing processes for WIMA SMD capacitors in order to avoid possible damages.

### Initial Operation/Calibration

Due to the stress which the components are subjected to during processing, reversible parameter changes occur in almost all electronic components. The capacitance recovery accuracy to be expected with careful processing is within a scope of

\[ |\Delta C/C| < 5\% \]

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

\[ t > 24 \text{ hours} \]

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

\[ t > 10 \text{ days} \]

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.

### Humidity Protection Bags

Taped WIMA SMD capacitors are shipped in humidity protection bags according to JEDEC standard (ESD/EMI-shield/water-vapour proof).

Under controlled conditions the components can be stored two years and more in the originally sealed bag. Opened packing units should immediately be used up for processing. If storage is necessary the opened packing units should be stored air-tight in the original plastic bag.

### Reliability

Taking account of the manufacturer’s guidelines and compatible processing, the WIMA SMD stand out for the same high quality and reliability as the analogous through-hole WIMA series. The technology of metalized film capacitors used e.g. in WIMA SMD-PET achieves the best values for all fields of application. The expected value is about:

\[ \lambda_0 < 2 \text{ fit} \]

Furthermore the production of all WIMA components is subject to the regulations laid down by ISO 9001:2008 as well as the guidelines for component specifications set out by IEC quality assessment system (IECQ) for electronic components.

### Electrical Characteristics and Fields of Application

Basically the WIMA SMD series have the same electrical characteristics as the analogous through-hole WIMA capacitors. Compared to ceramic or tantalum dielectrics WIMA SMD capacitors have a number of other outstanding qualities:

- favourable pulse rise time
- low ESR
- 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 quality and reliability, the WIMA SMD series offer the possibility to cover nearly all applications of conventionally through-hole film capacitors with SMD components. Furthermore, the WIMA SMD series can now be used for all the demanding capacitor applications for which, in the past, the use of through-hole components was mandatory:

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

With the WIMA SMD programme available today, the major part of all plastic film capacitors can be replaced by 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, as well as in telecommunications e.g. the well-known telephone capacitor 1µF/250VDC.
Blister Tape Packaging and Packing Units of the WIMA SMD Capacitors

| Size Code 1812 | Box size Code | A0 | ±0.1 | A1 | ±0.1 | B0 | ±0.1 | B1 | ±0.1 | D0 | ±0.1 | D1 | ±0.1 | P | ±0.1 | P0* | ±0.05 | E | ±0.1 | F | ±0.05 | G | ±0.3 | W | ±0.3 | W5 | ±0.2 | K | ±0.1 | T | ±0.1 |
|---------------|--------------|----|------|----|------|----|------|----|------|----|------|----|------|---|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|
| 1812 | KA | 3.55 | 5.1 | 1.5 | 1.5 | | 4 | 2 | 1.75 | 5.5 | 2.2 | 12 | 9.5 | 3.4 |
| 1812 | KB | 3.55 | 5.1 | 1.5 | 1.5 | | 4 | 2 | 1.75 | 5.5 | 2.2 | 12 | 9.5 | 4.4 |

| Size Code 2220 | Box size Code | A0 | ±0.1 | A1 | ±0.1 | B0 | ±0.1 | B1 | ±0.1 | D0 | ±0.1 | D1 | ±0.1 | P | ±0.1 | P0* | ±0.05 | E | ±0.1 | F | ±0.05 | G | ±0.3 | W | ±0.3 | W5 | ±0.2 | K | ±0.1 | T | ±0.1 |
|----------------|--------------|----|------|----|------|----|------|----|------|----|------|----|------|---|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|
| 2220 | QA | 6.3 | 5.1 | 1.3 | 1.3 | | 8 | 8 | 1.75 | 5.5 | 1.95 | 12 | 9.5 | 3.7 |
| 2220 | QB | 6.3 | 5.1 | 1.3 | 1.3 | | 8 | 8 | 1.75 | 5.5 | 1.95 | 12 | 9.5 | 4.7 |

| Size Code 2824 | Box size Code | A0 | ±0.1 | A1 | ±0.1 | B0 | ±0.1 | B1 | ±0.1 | D0 | ±0.1 | D1 | ±0.1 | P | ±0.1 | P0* | ±0.05 | E | ±0.1 | F | ±0.05 | G | ±0.3 | W | ±0.3 | W5 | ±0.2 | K | ±0.1 | T | ±0.1 |
|----------------|--------------|----|------|----|------|----|------|----|------|----|------|----|------|---|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|
| 2824 | TA | 6.6 | 7.1 | 1.5 | 1.5 | | 12 | 4 | 2 | 1.75 | 5.5 | 0.9 | 12 | 9.5 | 3.4 |
| 2824 | TB | 6.6 | 7.1 | 1.5 | 1.5 | | 12 | 4 | 2 | 1.75 | 5.5 | 0.9 | 12 | 9.5 | 5.4 |

| Size Code 4030 | Code | A0 | ±0.1 | A1 | ±0.1 | B0 | ±0.1 | B1 | ±0.1 | D0 | ±0.1 | D1 | ±0.1 | P | ±0.1 | P0* | ±0.05 | E | ±0.1 | F | ±0.05 | G | ±0.3 | W | ±0.3 | W5 | ±0.2 | K | ±0.1 | T | ±0.1 |
|----------------|-----|----|------|----|------|----|------|----|------|----|------|----|------|---|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|
| 4030 | VA | 10.7 | 10.2 | 1.5 | 1.5 | 4 | 16 | 16 | 1.75 | 7.5 | 1.9 | 12 | 13.3 | 5.5 |

| Size Code 5040 | Code | A0 | ±0.1 | A1 | ±0.1 | B0 | ±0.1 | B1 | ±0.1 | D0 | ±0.1 | D1 | ±0.1 | P | ±0.1 | P0* | ±0.05 | E | ±0.1 | F | ±0.05 | G | ±0.3 | W | ±0.3 | W5 | ±0.2 | K | ±0.1 | T | ±0.1 |
|----------------|-----|----|------|----|------|----|------|----|------|----|------|----|------|---|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|
| 5040 | VA | 13.5 | 12.7 | 11 | 11.5 | 16 | 4 | 4 | 1.75 | 11.5 | 9.7 | 24 | 21.3 | 6.5 |
| 5040 | VA | 17.0 | 16.5 | 15.0 | 1.5 | 16 | 4 | 4 | 1.75 | 11.5 | 2.95 | 24 | 21.3 | 7.5 |

* cumulative after 10 steps ± 0.2 mm max.
Samples and pre-production needs on request or 1 Reel minimum.

<table>
<thead>
<tr>
<th>Packing units</th>
<th>taped Reel 180 mm Ø</th>
<th>taped Reel 330 mm Ø</th>
<th>bulk Standard</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>2220</td>
<td>500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
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<td>1500</td>
<td>3000</td>
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</table>

<table>
<thead>
<tr>
<th>Part number codes for SMD packing</th>
<th>W (Blister) Ø in mm</th>
<th>Code</th>
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</thead>
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<tr>
<td>12</td>
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<td>P</td>
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<tr>
<td>12</td>
<td>330</td>
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<td>24</td>
<td>330</td>
<td>T</td>
</tr>
<tr>
<td>Bulk Standard</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>
A WIMA part number consists of 18 digits and is composed as follows:

Field 1 - 4: Type description
Field 5 - 6: Rated voltage
Field 7 - 10: Capacitance
Field 11 - 12: Size and PCM
Field 13 - 14: Version code (e.g., Snubber versions)
Field 15: Capacitance tolerance
Field 16: Packing
Field 17 - 18: Pin length (untaped)

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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<tbody>
<tr>
<td>1 - 4</td>
<td>Type description</td>
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<tr>
<td>5 - 6</td>
<td>Rated voltage</td>
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<td>7 - 10</td>
<td>Capacitance</td>
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<tr>
<td>11 - 12</td>
<td>Size and PCM</td>
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<td>13 - 14</td>
<td>Version code</td>
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<tr>
<td>15</td>
<td>Capacitance tolerance</td>
</tr>
<tr>
<td>16</td>
<td>Packing</td>
</tr>
<tr>
<td>17 - 18</td>
<td>Pin length</td>
</tr>
</tbody>
</table>

Type description:
- SMD-PET = SMDT
- SMD-PPS = SMDI
- FKP 02 = FKP0
- MKS 02 = MKS0
- FKS 2 = FKS2
- FKP 2 = FKP2
- MKS 2 = MKS2
- MKP 2 = MKP2
- FKS 3 = FKS3
- MKS 3 = MKS3
- MKS 4 = MKS4
- MKP 4 = MKP4
- MKP 10 = MKP1
- FKP 4 = FKP4
- FKP 1 = FKP1
- MKP-X2 = MKPX2
- MKP-X2 R = MKPXXR
- MKP-Y2 = MKPY2
- MP 3-X2 = MPX2
- MP 3-X1 = MPX1
- MP 3-Y2 = MPY2
- MP 3-Y1 = MPY1
- Snubber MKP = SNMKP
- Snubber FKP = SNFKP
- GTO MKP = GTOMKP
- DC-LINK MKP 3 = DCP3
- DC-LINK MKP 4 = DCP4
- DC-LINK MKP 4S = DCP4S
- DC-LINK MKP 5 = DCP5
- DC-LINK MKP 6 = DCP6
- DC-LINK HC = DCHC
- DC-LINK HY = DCHY

Rated voltage:
- 50 VDC = B0
- 63 VDC = C0
- 100 VDC = D0
- 250 VDC = F0
- 400 VDC = G0
- 450 VDC = H0
- 600 VDC = I0
- 630 VDC = J0
- 700 VDC = K0
- 800 VDC = L0
- 850 VDC = M0
- 900 VDC = N0
- 1000 VDC = O1
- 1100 VDC = P0
- 1200 VDC = Q0
- 1500 VDC = R0
- 1600 VDC = T0
- 2000 VDC = U0
- 2500 VDC = V0
- 3000 VDC = W0
- 4000 VDC = X0
- 5000 VDC = Y0
- 6000 VDC = Z0

Capacitance:
- 22 pF = 0022
- 47 pF = 0047
- 100 pF = 0100
- 150 pF = 0150
- 220 pF = 0220
- 330 pF = 0330
- 470 pF = 0470
- 680 pF = 0680
- 1000 pF = 1100
- 1500 pF = 1500
- 2200 pF = 2200
- 3300 pF = 3300
- 4700 pF = 4700
- 6800 pF = 6800
- 10000 pF = 10000
- 15000 pF = 15000
- 22000 pF = 22000
- 33000 pF = 33000
- 47000 pF = 47000
- 68000 pF = 68000
- 100000 pF = 100000

Size:
- 50 VDC = B0
- 63 VDC = C0
- 100 VDC = D0
- 250 VDC = F0
- 400 VDC = G0
- 450 VDC = H0
- 600 VDC = I0
- 630 VDC = J0
- 700 VDC = K0
- 800 VDC = L0
- 850 VDC = M0
- 900 VDC = N0
- 1000 VDC = O1
- 1100 VDC = P0
- 1200 VDC = Q0
- 1500 VDC = R0
- 1600 VDC = T0
- 2000 VDC = U0
- 2500 VDC = V0
- 3000 VDC = W0
- 4000 VDC = X0
- 5000 VDC = Y0
- 6000 VDC = Z0

Capacitance tolerance:
- ±20% = M
- ±10% = K
- ±5% = J
- ±2.5% = H
- ±1% = E

Packing:
- A1 3.5 ±0.5 = C9
- A1 6.2 = SD
- A2 16 ±1 = P1

The data on this page is not complete and serves only to explain the part number system. Part number information is listed on the pages of the respective WIMA range.