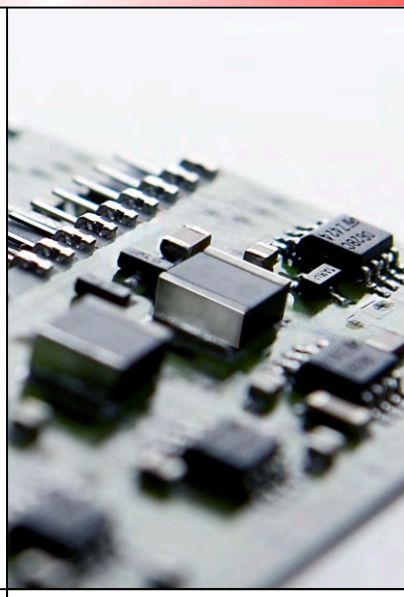
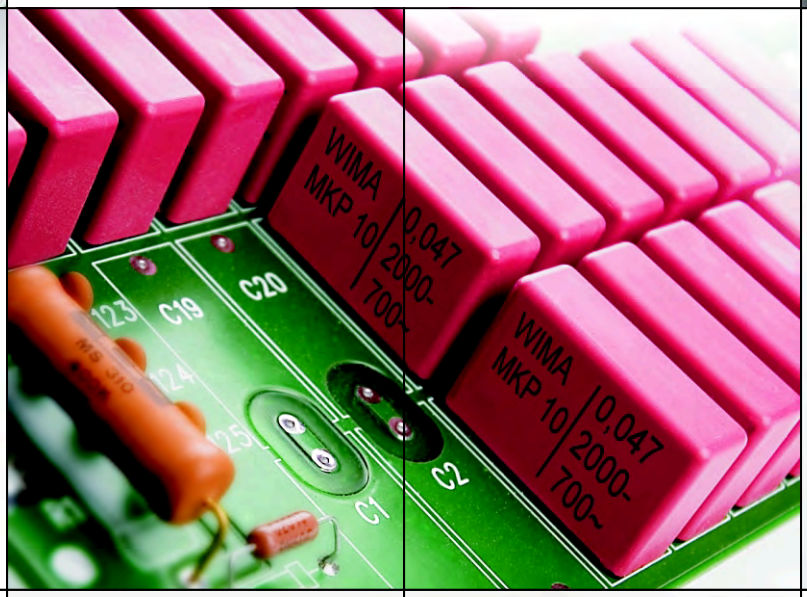
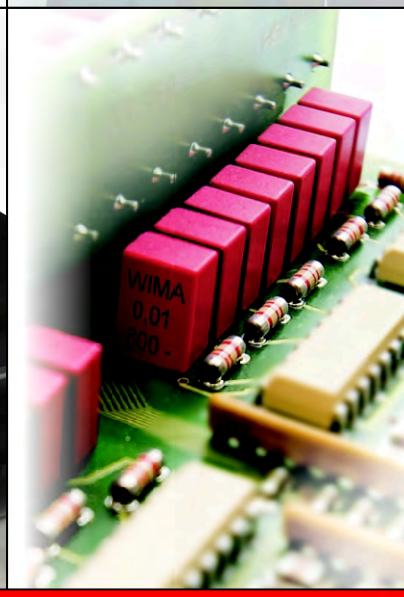
BEST CAPACITORS MADE IN GERMANY







WIMA Application Guide

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Overview

Product Family	Range Description	Picture	Fields of Application: Automotive	Power	Lighting	Medical	Consumer	Telecom/ Data	New Energy
SMD Capacitors	**Size Codes 1812-6054** SMD-PET/-PEN/-PPS		✓	✓		✓	✓	✓	
Film Capacitors	**PCM 2.5 - 52.5 mm** MKS, MKP, FKS, FKP		✓	✓	✓	✓	✓	✓	
Pulse Duty Capacitors	**PCM 7.5 - 52.5 mm** MKP 10, FKP 4, FKP 1		✓	✓	✓	✓	✓	✓	
EMI Suppression Capacitors	**PCM 7.5 - 27.5 mm** MKP-X2/-X1 R/-Y2 MP 3-X2/-X1/-Y2/R-Y2			✓	✓	✓	✓	✓	✓
Snubber Capacitors	**Variable terminations** Snubber MKP/FKP		✓	✓		✓	✓		✓
GTO Capacitors	**Axial screw connection** GTO MKP			✓					✓
DC-LINK Capacitors	**Variable contacts** DC-LINK MKP 3/4/5/6/ HC/HY		✓	✓					✓

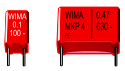
Automotive

WIMA Products		Fields of Application: Safety: Airbag control unit	Braking system control unit (ABS/ESC)	Tire pressure monitoring unit	HID lamps	Auxiliaries: Small motor drives (e.g. seats, mirrors, windows etc.)	Electrical power steering	Remote keyless entry	Powertrain: DC/DC converter and inverter. Electric drives	Fuel pump, diesel filter control unit	Features
SMD 0.01 µF - 6.8 µF 63 -1000 VDC 1812 - 6054		SMD-PPS	SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS		SMD-PET, SMD-PEN	SMD-PET, SMD-PEN	SMD-PET, SMD-PEN		SMD-PET, SMD-PEN	■ Operating temp. up to 140°C ■ Operating life >300.000 h ■ Suitable for lead-free soldering at T≤ 250°C
Film 1000 pF -220 µF 50 - 2000 VDC PCM 2.5 - 52.5			MKS, FKS	MKS, FKS		MKP	MKS, MKP, FKS	MKP		MKS	■ Operating temp. up to 125°C ■ Operating life >300.000 h ■ Smallest PCM 2.5 mm
Pulse Duty 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5					MKP 10, FKP 1/4, MKP				MKP 10, FKP 1/4, MKP		■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
Snubber 0.01 µF - 25 µF 250 - 4000 VDC Variable contacts									Snubber MKP/FKP		■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Various contact configurations
DC-LINK 2 µF - 8250 µF 450 -1500 VDC Variable contacts									DC-LINK		■ Operating temp. up to 100°C ■ Operating life >200.000 h ■ 2-pin, 4-pin, screwable plate or screw connections

Power Electronics

WIMA Products		Fields of Application: Power Electronics: Battery charger	Frequency converter	Power supply/ SMPS	UPS	Electronic power meter	Features
SMD Capacitors 0.01 µF - 6.8 µF 63 -1000 VDC Size codes 1812 - 6054		SMD-PET, SMD-PEN				SMD-PET, SMD-PEN, SND-PPS	■ Operating temp. up to 140°C ■ Operating life >300.000 h ■ Suitable for lead-free soldering at T≤ 250°C
Film Capacitors 1000 pF - 220 µF 50 - 2000 VDC PCM 2.5 - 52.5 mm		MKS, MKP, FKS				MKS, MKP, FKS	■ Operating temp. up to 125°C ■ Operating life >300.000 h ■ Smallest PCM 2.5 mm
Pulse Duty Capacitors 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm			MKP 10, FKP 1/4, MKP	MKP 10, FKP 1/4, MKP			■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
EMI Suppression Cap. 1000 pF - 10 µF 250 - 500 VAC PCM 7.5 - 37.5 mm		MP 3-X1/-X2/ -Y2, MKP-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2, MKP-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2, MKP-X1/-X2/ -Y2			■ Operating temp. up to 110°C ■ Operating life >300.000 h ■ High reliability against active or passive flammability (MP)
Snubber Capacitors 0.01 µF - 25 µF 250 - 4000 VDC Variable terminations			Snubber MKP/FKP	Snubber MKP/FKP	Snubber MKP/FKP		■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Various contact configura-tions
DC-LINK Capacitors 2 µF - 8250 µF 450 -1500 VDC Variable terminations			DC-LINK				■ Operating temp. up to 100°C ■ Operating life >200.000 h ■ 2-pin, 4-pin, screwable plate or screw connections

Lighting

WIMA Products		Fields of Application: Lighting: Electronic ballasts	Energy saving lamps	Features
Metallized Capacitors 1000 pF - 220 µF 50 -2000 VDC PCM 5 - 52.5 mm		MKP 2, MKS 4, MKP 4	MKS 2, MKP 2, MKS 4, MKP 4	■ Polyethylene-therephthalate (PET) dielectric ■ Good resistiveness to increased temperatures ■ Low dissipation factor ■ Self-healing properties ■ Polypropylene (PP) dielectric ■ Negative capacitance change versus temperature ■ Very low dissipation factor ■ Self-healing properties
Pulse Duty Capacitors 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm		MKP 10, FKP 4, FKP 1	MKP 10, FKP 4, FKP 1	■ Polypropylene (PP) dielectric ■ High pulse duty ■ Internal series connection (MKP 10 ⩾ 630 VDC, FKP 4, FKP 1) ■ Negative capacitance change versus temperature ■ Very low dissipation factor ■ Self-healing properties
EMI Suppression Capacitors 1000 pF - 10 µF 305 VAC, 440 VAC PCM 7.5 - 37.5 mm Class X1, X2, Y2		MKP-X1, MKP-X2, MKP-Y2	MKP-X1, MKP-X2, MKP-Y2	■ Polypropylene (PP) dielectric ■ High degree of interference suppression due to good attenuation and low ESR ■ Self-healing properties

Medical

WIMA Products		Fields of Application						Features
		Medical Equipment						
		Imaging equipment (CT, MRT, X-Ray, ultrasound)	Anesthesia equipment	Cleaning equipment	Defibrillation devices	Patient care monitoring (glucose meter, blood gas analyser, telemetry)	Respiration technology	
SMD Capacitors 0.01 µF - 6.8 µF 63 -1000 VDC Size 1812 - 6054			SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS		SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS	■ Operating temp. up to 140°C ■ Operating life >300.000 h ■ Suitable for lead-free soldering at T≤ 250°C
Film Capacitors 1000 pF - 220 µF 50 - 2000 VDC PCM 2.5 - 52.5 mm		MKP	MKS, MKP	MKS, MKP		MKS, MKP	MKS, MKP	■ Operating temp. up to 125°C ■ Operating life >300.000 h ■ Smallest PCM 2.5 mm
Pulse Duty Cap. 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm		MKP 10, FKP 1/4			MKP 10, FKP 1/4	MKP 10, FKP 1/4		■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
EMI Suppr. Cap. 1000 pF - 1.0 µF 250 - 500 VAC PCM 7.5 - 27.5 mm		MP 3-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2	■ Operating temp. up to 110°C ■ Operating life >300.000 h ■ High reliability against active or passive flammability
Snubber Cap. 0.01 µF - 25 µF 250 - 4000 VDC Variable terminations		Snubber MKP/FKP						■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Various contact configura-tions

Consumer

WIMA Products		Fields of Application							Features
		Consumer Electronics							
		High-end audio systems	Amplifier	LCD/ Plasma TVs	Set top boxes	Video systems	Control units for home appliances	White goods (induction cooker, ignition units etc.)	
SMD Capacitors 0.01 µF - 6.8 µF 63 -1000 VDC Size 1812 - 6054		SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN		SMD-PET, SMD-PEN	SMD-PET, SMD-PEN	SMD-PET, SMD-PEN	■ Operating temp. up to 140°C ■ Operating life >300.000 h ■ Suitable for lead-free soldering at T≤ 250°C
Film Capacitors 27 pF - 220 µF 50 - 2000 VDC PCM 2.5 - 52.5 mm		MKS, MKP, FKP	MKS, MKP, FKP		MKP	MKS	MKS, MKP	MKS, MKP, FKS	■ Operating temp. up to 125°C ■ Operating life >300.000 h ■ Smallest PCM 2.5 mm
Pulse Duty Cap. 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm		MKP 10	MKP 10	MKP 10		MKP 10, FKP 1/4		MKP 10 FKP 1/4	■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
EMI Suppr. Cap. 1000 pF - 10 µF 250 - 500 VAC PCM 7.5 - 37.5 mm		MP 3-X1/-X2/ -Y2 MKP-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2 MKP-X1/-X2/ -Y2	MKP-X1/-X2/ -Y2		MKP-X1/-X2/ -Y2	MKP-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2 MKP-X1/-X2/ -Y2	■ Operating temp. up to 110°C ■ Operating life >300.000 h ■ High reliability against active or passive flammability (MP)
Snubber Cap. 0.01 µF - 25 µF 250 - 4000 VDC Variable terminations								Snubber MKP/FKP	■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Various contact configura-tions

Telecom/Data

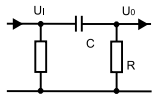
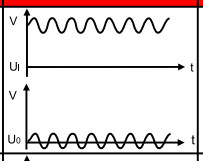
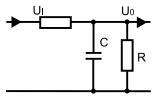
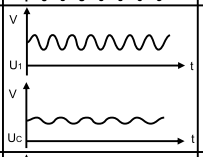
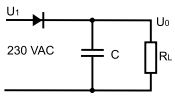
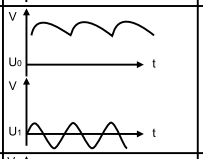
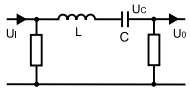
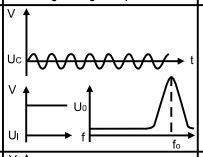
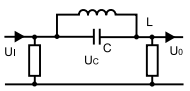
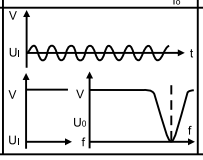
WIMA Products		Fields of Application: Telecommunication/Data Processing – Power supply	Splitter	Data processing systems (server etc.)	Network devices (router, switcher, hubs, modems)	Wireless communication (WLAN, UMTS etc.)	Features
SMD Capacitors 0.01 µF - 6.8 µF 63 - 1000 VDC Size 1812 - 6054			SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS	SMD-PET, SMD-PEN, SMD-PPS	■ Operating temp. up to 140°C ■ Operating life >300.000 h ■ Suitable for lead-free soldering at T⩽ 250°C
Film Capacitors 1000 pF - 220 µF 50 - 2000 VDC PCM 2.5 - 52.5 mm			MKS, MKP	MKS, MKP, FKS	MKS, MKP, FKS	MKS, MKP, FKS	■ Operating temp. up to 125°C ■ Operating life >300.000 h ■ Smallest PCM 2.5 mm
Pulse Duty Cap. 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm		MKP 10, FKP 1/4		MKP 10, FKP 1/4	MKP 10, FKP 1/4	MKP 10, FKP 1/4	■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
EMI Suppr. Cap. 1000 pF - 10 µF 250 - 500 VAC PCM 7.5 - 37.5 mm		MP 3-X1/-X2/ -Y2, MKP-X1/-X2/ -Y2		MP 3-X1/-X2/ -Y2 MKP-X1/-X2/ -Y2	MP 3-X1/-X2/ -Y2 MKP-X1/-X2/ -Y2		■ Operating temp. up to 110°C ■ Operating life >300.000 h ■ High reliability against active or passive flammability (MP)

New Energy

WIMA Products		Fields of Application: New Energy – Converter	Power supply	UPS	Features
Pulse Duty Capacitors 100 pF - 47 µF 100 - 6000 VDC PCM 7.5 - 52.5 mm		MKP 10, FKP 1/4, MKP	MKP 10, FKP 1/4, MKP	MKP 10, FKP 1/4, MKP	■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Highest du/dt
Snubber Capacitors 0.01 µF - 25 µF 250 - 4000 VDC Variable terminations		Snubber MKP/FKP	Snubber MKP/FKP	Snubber MKP/FKP	■ Operating temp. up to 100°C ■ Operating life >300.000 h ■ Various contact configura-tions
GTO Capacitors 1.0 µF - 100 µF 400 - 2000 VDC Axial screw connection		GTO MKP	GTO MKP	GTO MKP	■ Operating temp. up to 85°C ■ Operating life >300.000 h ■ Axial screw and thread connections
DC-LINK Capacitors 2 µF - 8250 µF 450 - 1500 VDC Variable terminations		DC-LINK	DC-LINK	DC-LINK	■ Operating temp. up to 100°C ■ Operating life >200.000 h ■ 2-pin, 4-pin, screwable plate or screw connections

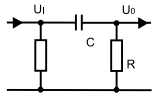
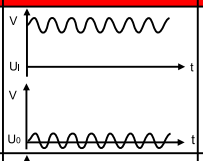
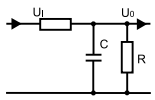
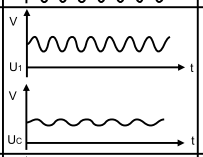
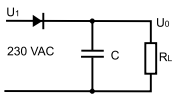
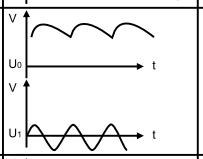
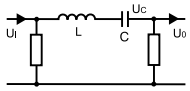
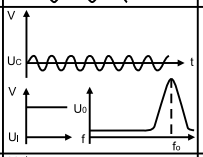
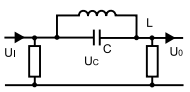
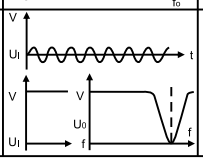
WIMA SMD Capacitors

Fields of Application: Automotive, Power, Medical, Consumer, Telecom/Data

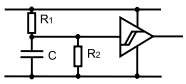
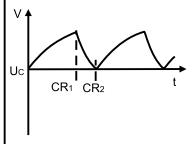
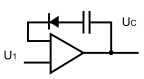
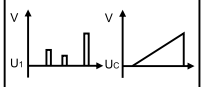
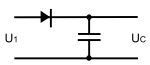
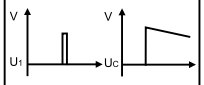
Product Type	Application Function	Circuit Application	Waveform	Requirements	Special Characteristics
SMD-PET, SMD-PEN, SMD-PPS	**Blocking/Coupling** High-Pass Filter: • preventing DC voltages • transferring AC voltages			• High insulation resistance • Low self-inductance (to observe voltage rating)	■ Operating temperatures up to 100°C (PET), 125°C (PEN) and 140°C (PPS) ■ Suitable for lead-free soldering at elevated processing temperature T_{peak} = 250°C (SMD-PPS) ■ Suitable for filtering due to low dissipation factor (SMD-PPS) **Compared to Ceramic SMD (MLCC):** ■ No internal cracks or delamination ■ ΔC/C over temperature: very low (PET, PEN) or extremely low (PPS) ■ Self-healing capability results in high withstanding voltage, high reliability 
	Bypass/Decoupling Low-Pass Filter: • suppressing transmission of high frequencies (AC voltages)			• High insulation resistance • Low self-inductance	
	Smoothing • smoothing of pulsating DC-voltages from AC-rectifier			• Comparably high capacitance • Low dissipation factor (to observe frequency)	
SMD-PPS	**Band-Pass Filter (e.g. Audio, TV)** • pass frequencies within a certain range • attenuate frequencies outside that range			• Low dissipation factor • Stable capacitance	
	Band-Stop Filter (e.g. Audio, TV) • attenuate frequencies within a specific range • pass frequencies outside that range			• Low dissipation factor • Stable capacitance	

WIMA Film Capacitors (PCM 2.5 - 52.5 mm)

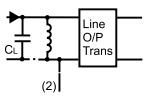
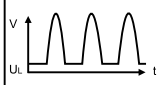
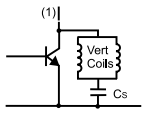
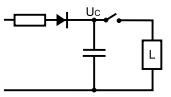
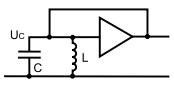
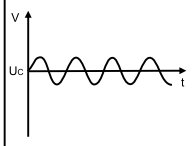
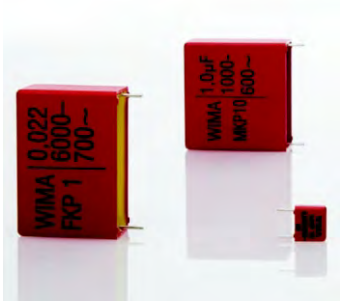
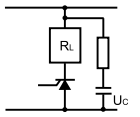
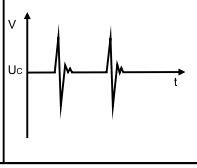
Fields of Application: Automotive, Power, Lighting, Medical, Consumer, Telecom/Data, New Energy

Product Type	Application Function	Circuit Application	Waveform	Requirements	Special Characteristics
MKS 02, MKS 2, MKS 4, FKS 2, FKS 3 **MKP 2, MKP 4 (HF-Coupling/ Decoupling)**	**Blocking/Coupling** High-Pass Filter: • preventing DC voltages • transferring AC voltages			• High insulation resistance • Low self-inductance (to observe voltage rating)	**Metallized Film Capacitors (MK-Types):** ■ High capacitance values in small box sizes ■ Smallest PCM: 2.5 mm (MKS 02) ■ ΔC/C over temperature: very low (MKS, MKP) ■ Self-healing capability results in high withstanding voltage, high reliability ■ Very low dissipation factor (MKP) ■ High-frequency application (MKP) due to low dissipation factor **Film/Foil Capacitors (FK-Types):** ■ High pulse and current rating ■ Smallest PCM: 2.5 mm (FKP 02) ■ ΔC/C over temperature: very low (FKS, FKP) ■ High insulation resistance (FKS) or very high insulation resistance (FKP)
	Bypass/Decoupling Low-Pass Filter: • suppressing transmission of high frequencies (AC voltages)			• High insulation resistance • Low self-inductance	
MKS 02, MKS 2, MKS 4, MKP 4	**Smoothing** • smoothing of pulsating DC-voltages from AC-rectifier			• Comparably high capacitance • Low dissipation factor (to observe frequency)	
FKP 02, FKP 2, FKP 3, MKP 2, MKP 4,	**Band-Pass Filter (e.g. Audio, TV)** • pass frequencies within a certain range • attenuate frequencies outside that range			• Low dissipation factor • Stable capacitance	
	Band-Stop Filter (e.g. Audio, TV) • attenuate frequencies within a specific range • pass frequencies outside that range			• Low dissipation factor • Stable capacitance	

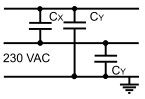
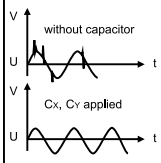
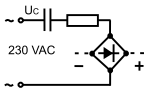
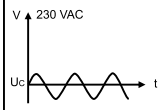
Continuation ...

Fields of Application: Automotive, Power, Lighting, Medical, Consumer, Telecom/Data, New Energy					
Product Type	**Application Function**	**Circuit Application**	**Waveform**	**Requirements**	**Special Characteristics**
FKP 02, FKP 2, FKP 3, MKP 2, MKP 4	**Timing (e.g. Signal Light)** • when capacitor is charged voltage is increasing over time • after passing certain value a new state change occurs			• High insulation resistance • Stable capacitance	**... Continuation** ■ Close tolerances up to ±1% (FKP) ■ High-frequency application (FKP) due to very low dissipation factor ■ High reliability
FKP 02, FKP 2, FKP 3, MKP 2, MKP 4	**Sample & Hold (e.g. Amplifier)** Analogue-Digital Converter: • capacitor is used to store analogue voltage value • electronic switch is used to connect/ disconnect capacitor from analogue input (sampling rate)			• Low dielectric absorption • High insulation resistance	
	Peak Voltage Detectors • diode conducts positive "half cycles" to charge capacitor to peak voltage • DC "peak" stored in the capacitor, the diode is blocking current flow • capacitor retains the peak value even if the waveform drops to zero			• Low dielectric absorption • High insulation resistance	

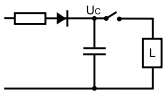
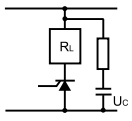
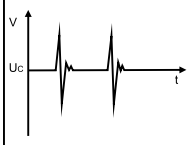
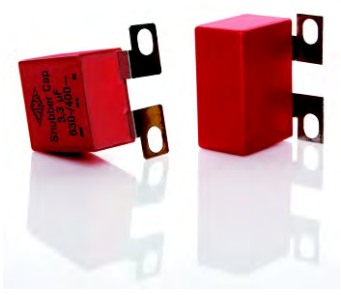
WIMA Pulse Duty Capacitors (PCM 7.5 - 52.5 mm)

Fields of Application: Automotive, Power, Lighting, Medical, Consumer, Telecom/Data, New Energy					
Product Type	**Application Function**	**Circuit Application**	**Waveform**	**Requirements**	**Special Characteristics**
MKP 10, FKP 4, FKP 1	**Fly-Back (e.g. Monitor, TV)** • current flows from deflection coil to fly-back capacitor • electron beam is rapidly shifted from right to left side of screen			• Low dissipation factor • High pulse rise time • High dielectric strength	■ Pulse and current rating: high (MKP 10), very high (FKP 4) or extremely high (FKP 1) ■ Self-healing capability results in high withstanding voltage, outstanding reliability ■ Very low dissipation factor ■ High insulation resistance
MKP 10 (MKP 4)	**S-Correction (Smoothing)** • current flows from C_L through trafo deflection coils to C_S • C_S is smoothing pulsating DC-voltages			• Low dissipation factor • Good pulse rise time	
MKP 10, FKP 4, FKP 1	**Energy Storage (e.g. Ballasts)** • capacitor is charged to a high voltage, stores the energy and then releases it in short time			• High pulse rise time • High (surge) current carrying capacity • High insulation resistance	
MKP 10, FKP 4, FKP 1	**Oscillating Circuit** Resonant system (LC): • AC voltage oscillates at resonant frequency • see also filter applications			• Low dissipation factor • Stable capacitance (please refer to technical data)	
MKP 10, FKP 4, FKP 1, (FKP 02, FKP 2, FKP 3)	**Snubbing (e.g. Relay)** • capacitor attenuates over-voltage peaks by high current switching			• Low dissipation factor • High pulse rise time (please refer to technical data)	

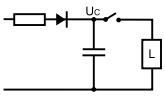
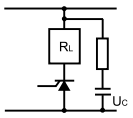
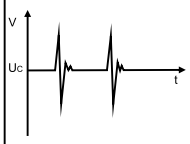
WIMA EMI Suppression Capacitors

Fields of Application: Automotive, Power, Lighting, Medical, Consumer, Telecom/Data, New Energy					
Product Type	**Application Function**	**Circuit Application**	**Waveform**	**Requirements**	**Special Characteristics**
MKP-X2, MKP-X1 R, MKP-Y2, MP 3-X2, MP 3-X1, MP 3-Y2, MP 3R-Y2	**EMI Suppression** • capacitor suppress high-frequency disturbances of electrical equipment on the mains • class X capacitors are connected between phase and neutral or phase and phase conductors • class Y capacitors are connected between phase conductors and earthed casing and thus by-pass operating insulation			• Particular high reliability against active and passive flammability	■ High reliability against active and passive flammability (MP 3-X2, MP 3-X1, MP 3-Y2, MP 3R-Y2) ■ High degree of interference suppression due to good attenuation and low ESR ■ High volume/capacitance ratio (MKP-X2, MKP-X2 R, MKP-X1 R, MKP-Y2)
MKP-X2, MKP-X2 R, (MP 3-X1), (MKS 4), (⩾ 630 VDC, ⩾ PCM 10)	**Voltage Dropper** • capacitor voltage divider			• High capacitance stability • Flame retardant (please check if approvals are required)	

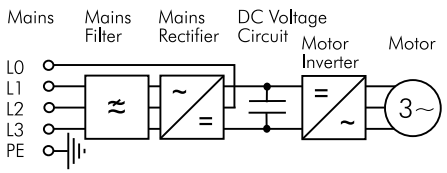
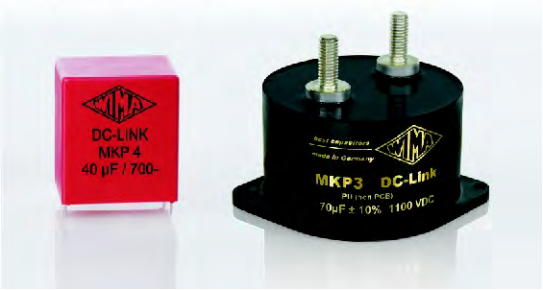
WIMA Snubber Capacitors

Fields of Application: Power, Medical, Consumer, New Energy					
Product Type	**Application Function**	**Circuit Application**	**Waveform**	**Requirements**	**Special Characteristics**
Snubber MKP, Snubber FKP	**Energy Storage** • capacitor is charged to a high voltage, stores the energy and releases it in short time			• High pulse rise time • High (surge) current carrying capacity • High insulation resistance	■ Pulse and current rating: high (Snubber MKP) or very high (Snubber FKP) ■ High volume/capacitance ratio (Snubber MKP) ■ Self-healing capability results in high withstanding voltage, outstanding reliability ■ Very low dissipation factor ■ High insulation resistance ■ Low self-inductance ■ Particularly reliable contact configurations: 4-lead versions or screwable plate connections
Snubber MKP, Snubber FKP	**Snubbing (e.g. IGBT)** • capacitor attenuates over-voltage peaks by high current switching			• Low dissipation factor • High pulse rise time (please refer to technical data) • Low self- inductivity	

WIMA GTO Capacitors

Fields of Application: Power, New Energy					
Product Type	**Application Function**	**Circuit Application**	**Waveform**	**Requirements**	**Special Characteristics**
GTO MKP	**Energy Storage** • capacitor is charged to a high voltage, stores the energy and releases it in short time			• High pulse rise time • High (surge) current carrying capacity • High insulation resistance	■ Very high pulse and current rating ■ Self-healing capability results in high withstanding voltage, outstanding reliability ■ Very low dissipation factor ■ High insulation resistance ■ Low self-inductance ■ High mechanical stability ■ High shock and vibration resistance
GTO MKP	**Snubbing (e.g. GTO-Thyristor)** • capacitor attenuates over-voltage peaks by high current switching			• Low dissipation factor • High pulse rise time (please refer to technical data) • Low self-inductivity	

WIMA DC-LINK Capacitors

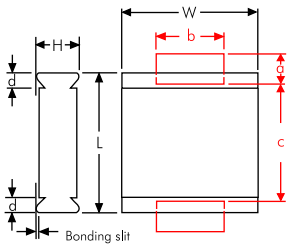
Fields of Application: Power, New Energy			
Product Type	**Application Function**	**Requirements**	**Special Characteristics**
DC-LINK MKP 3, DC-LINK MKP 4, DC-LINK MKP 4S, DC-LINK MKP 5, DC-LINK MKP 6, DC-LINK HC, DC-LINK HY	**Energy Buffer (e.g. Converter)** • capacitor stores DC-voltage in an intermediate circuit • high frequency ripple voltage generated by inverter is short-circuited	• High volume/capacitance ratio • High DC-voltage strength • Low dissipation factor	■ Volume/capacitance ratio: high (DC-LINK MKP 3/4/4S/5) or very high (DC-LINK MKP 6, DC-LINK HC, DC-LINK HY) ■ High mechanical stability ■ Particularly reliable contact configurations: 2-pin, 4-pin, screwable plate or screw connections (male or female) **Advantages Compared to Aluminium Electrolytic Capacitors:** ■ Low self-inductance ■ High ripple current capability ■ High voltage/over-voltage strength by specific metallization (≥ 450 VDC) due to self-healing capability ■ Very constant ΔC/C ■ Very low ESR and dissipation factor ■ Dry construction without electrolyte results in high reliability ■ Non polar construction ■ High insulation resistance
	Circuit Application 		

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



Size Code	L ±0.3	W ±0.3	d	a min.	b min.	c max.
1812	4.8	3.3	0.5	1.2	3.5	3.5
2220	5.7	5.1	0.5	1.2	4	4.5
2824	7.2	6.1	0.5	1.2	4	6.5
4030	10.2	7.6	0.5	2.5	6	9
5040	12.7	10.2	0.7	2.5	6	11.5
6054	15.3	13.7	0.7	2.5	6	14

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

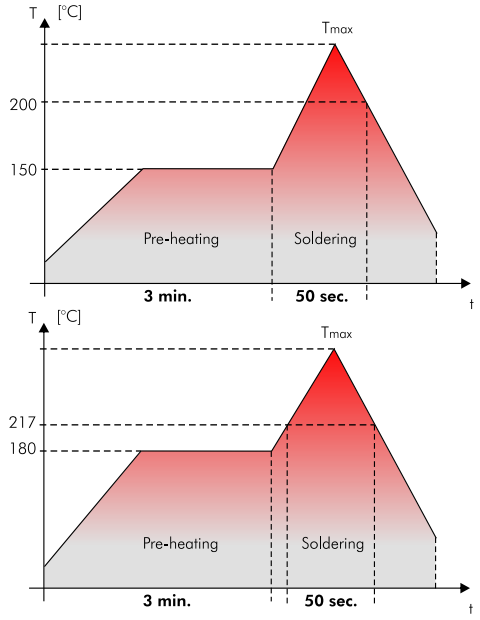
The processing of SMD components

- 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

Re-flow soldering



SMD-PET	
Size code	Tmax.
1812	220° C
2220	230° C
2824	230° C
4030	230° C
5040	240° C
6054	250° C

SMD-PEN	
Size code	Tmax.
1812	220° C
2220	230° C
2824	230° C

SMD-PPS	
Size code	Tmax.
1812	250° C
2220	250° C
2824	250° C
4030	250° C
5040	250° C
6054	250° C

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.

Size code	Temperature °C / °F	Time duration
1812	250/482	2 sec plate 1 / 5 sec off / 2 sec plate 2
2220	250/482	3 sec plate 1 / 5 sec off / 3 sec plate 2
2824	260/500	3 sec plate 1 / 5 sec off / 3 sec plate 2
4030	260/500	5 sec plate 1 / 5 sec off / 5 sec plate 2
5040	260/500	5 sec plate 1 / 5 sec off / 5 sec plate 2
6054	260/500	5 sec plate 1 / 5 sec off / 5 sec plate 2

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 und 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

$|\Delta C/C| \leqslant 5\%$.

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

$t \geqslant 24$ 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

$t \geqslant 10$ 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 metallized film capacitors used e.g. 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 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**
- **large capacitance spectrum**
- **available in high voltage series**
- **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**
- **differenciating 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.

WIMA Spezialvertrieb elektronischer Bauelemente GmbH & Co.KG.
Besselstr. 2-4
D-68219 Mannheim · Germany

Tel: +49-621-862950
Fax:+49-621-8629595
E-mail: sales@wima.de
Internet: www.wima.com

Recommendation for Processing and Application of Through-Hole Capacitors

Soldering Process

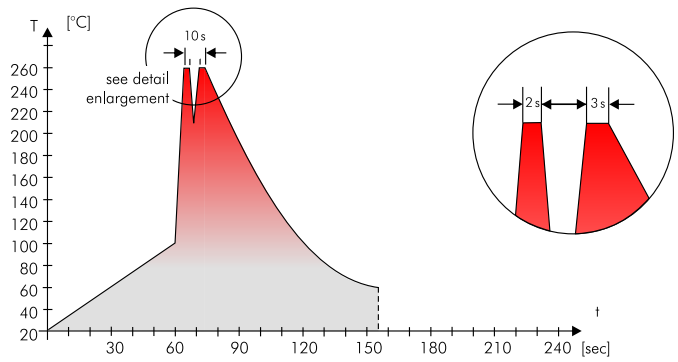
Internal temperature of the capacitor must be kept as follows:

Polyester:	preheating:	$T_{max.} \leqslant 125°$ C
	soldering:	$T_{max.} \leqslant 135°$ C
Polypropylene:	preheating:	$T_{max.} \leqslant 100°$ C
	soldering:	$T_{max.} \leqslant 110°$ C

Single wave soldering
Soldering bath temperature: T < 260° C
Dwell time: t < 5 sec

Double wave soldering
Soldering bath temperature: T < 260° C
Dwell time: Σt < 5 sec

Wave soldering



Typical temperature/time graph for double wave soldering

Due to different soldering processes and heat requirements the graphs are to be regarded as a recommendation only.

WIMA Quality and Environmental Philosophy

ISO 9001:2008 Certification

ISO 9001:2008 is an international basic standard of quality assurance systems for all branches of industry. The approval according to ISO 9001:2008 of our factories by the VDE inspectorate certifies that organisation, equipment and monitoring of quality assurance in our factories correspond to internationally recognized standards.

WIMA WPCS

The WIMA Process Control System (WPCS) is a quality surveillance and optimization system developed by WIMA. WPCS is a major part of the quality-oriented WIMA production. Points of application of WPCS during production process:

- **incoming material inspection**
- **metallization**
- **film inspection**
- **schoopage**
- **pre-heating**
- **pin attachement**
- **cast resin preparation/encapsulation**
- **100% final inspection**
- **testing as per customer requirements**

WIMA Environmental Policy

All WIMA capacitors, irrespective of whether through-hole devices or SMD, are made of environmentally friendly materials. Neither during manufacture nor in the product itself any toxic substances are used, e.g.

- **Lead**
- **PCB**
- **CFC**
- **Hydrocarbon chloride**
- **Chromium 6+**
- **PBB/PBDE**
- **Arsenic**
- **Cadmium**
- **Mercury**
- **etc.**

We merely use pure, recyclable materials for packing our components, such as:

- **carton**
- **cardboard**
- **adhesive tape made of paper**
- **polystyrene**

We almost completely refrain from using packing materials such as:

- **foamed polystyrene Styropor®**
- **adhesive tape made of plastic**
- **metal clips**

RoHS Compliance

According to the RoHS Directive 2011/65/EU certain hazardous substances like e.g. lead, cadmium, mercury must not be used any longer in electronic equipment as of July 1st, 2006. For the sake of the environment WIMA has refraind from using such substances since years already.

Tape for lead-free WIMA capacitors

DIN EN ISO 14001:2004

WIMA's environmental management has been established in accordance with the guidelines of DIN EN ISO 14001:2004 to optimize the production processes with regard to energy and resources.