

Film and Foil Capacitors with Mixed Dielectric for Pulse Applications in PCM 5 mm

Special Features

- Pulse duty construction
- Constant capacitance value versus temperature (similar to the obsolete Polycarbonate)
- Low dissipation factor
- According to RoHS 2002/95/EC

Typical Applications

For general DC-applications requiring a high capacitance stability versus temperature e.g.

- Automotive electronics
- Lighting

Construction

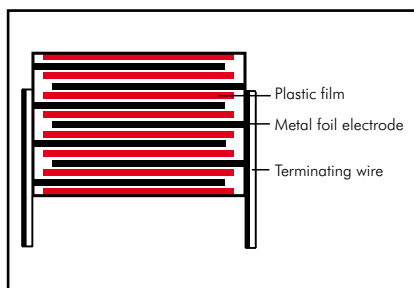
Dielectric:

Mixed film

Capacitor electrodes:

Metal foil

Internal construction:



Encapsulation:

Solvent-resistant, flame-retardant plastic case with epoxy resin seal, UL 94 V-0

Terminations:

Tinned wire.

Marking:

Colour: Red. Marking: Gold.

Epoxy resin seal: Yellow.

Electrical Data

Capacitance range:

1000 pF to 0.022 μ F (E12-values on request)

Rated voltages:

100 VDC, 250 VDC, 400 VDC

Capacitance tolerances:

$\pm 20\%$, $\pm 10\%$, $\pm 5\%$ ($\pm 2.5\%$ available subject to special enquiry)

Operating temperature range:

-55°C to $+100^{\circ}\text{C}$

Climatic test category:

55/100/56 in accordance with IEC

Insulation resistance at $+20^{\circ}\text{C}$:

$\geq 5 \times 10^5 \text{ M}\Omega$

(mean value: $1 \times 10^6 \text{ M}\Omega$)

Measuring voltage: 100 V/1 min.

Test voltage: $2 U_r$, 2 sec.

Dissipation factors at $+20^{\circ}\text{C}$: $\tan \delta$

at f	$C \leq 0.022 \mu\text{F}$
1 kHz	$\leq 3 \times 10^{-3}$
10 kHz	$\leq 5 \times 10^{-3}$
100 kHz	$\leq 8 \times 10^{-3}$

Maximum pulse rise time:

1000 V/ μ sec for pulses equal to the rated voltage

Mechanical Tests

Pull test on leads:

10 N in direction of leads according to IEC 60068-2-21

Vibration:

6 hours at 10...2000 Hz and 0.75 mm displacement amplitude or 10 g in accordance with IEC 60068-2-6

Low air density:

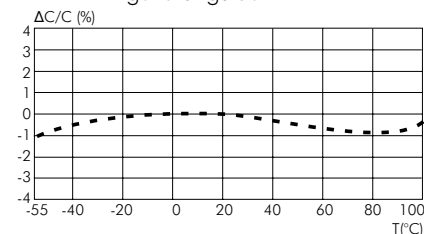
1 kPa = 10 mbar in accordance with IEC 60068-2-13

Bump test:

4000 bumps at 390 m/sec² in accordance with IEC 60068-2-29

Capacitance change versus temperature

(f = 1 kHz) (general guide)



Voltage derating:

A voltage derating factor of 1.35 % per K must be applied from $+85^{\circ}\text{C}$ for DC voltages and from $+75^{\circ}\text{C}$ for AC voltages

Reliability:

Operational life > 300 000 hours

Failure rate < 5 fit ($0.5 \times U_r$ and 40°C)

Packing

Available taped and reeled.

Detailed taping information and graphs at the end of the catalogue.

For further details and graphs please refer to Technical Information.

Continuation

General Data

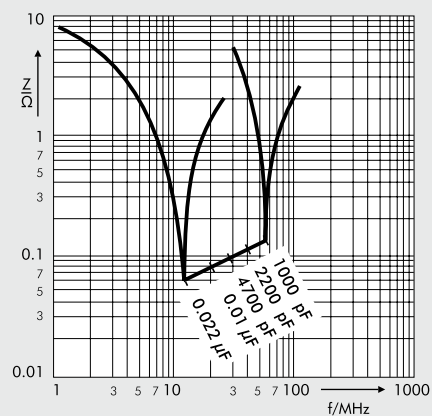
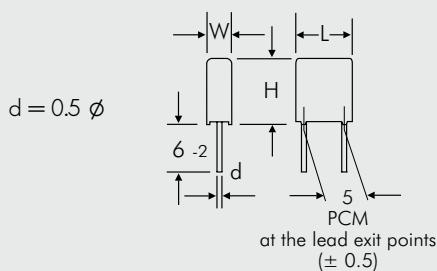
Capacitance	100 VDC/63 VAC*					250 VDC/160 VAC*				
	W	H	L	PCM**	Part number	W	H	L	PCM**	Part number
1000 pF	2.5	6.5	7.2	5	FKM2D011001A00_	2.5	6.5	7.2	5	FKM2F011001A00_
1500 "	2.5	6.5	7.2	5	FKM2D011501A00_	2.5	6.5	7.2	5	FKM2F011501A00_
2200 "	2.5	6.5	7.2	5	FKM2D012201A00_	2.5	6.5	7.2	5	FKM2F012201A00_
3300 "	2.5	6.5	7.2	5	FKM2D013301A00_	3.5	8.5	7.2	5	FKM2F013301C00_
4700 "	3.5	8.5	7.2	5	FKM2D014701C00_	3.5	8.5	7.2	5	FKM2F014701C00_
6800 "	3.5	8.5	7.2	5	FKM2D016801C00_	4.5	9.5	7.2	5	FKM2F016801E00_
0.01 µF	4.5	9.5	7.2	5	FKM2D021001E00_	5.5	11.5	7.2	5	FKM2F021001H00_
0.015 "	5.5	11.5	7.2	5	FKM2D021501H00_	7.2	13	7.2	5	FKM2F021501K00_
0.022 "	7.2	13	7.2	5	FKM2D022201K00_					

Capacitance	400 VDC/200 VAC*				
	W	H	L	PCM**	Part number
1000 pF	2.5	6.5	7.2	5	FKSMG011001A00_
1500 "	3.5	8.5	7.2	5	FKSMG011501C00_
2200 "	3.5	8.5	7.2	5	FKSMG012201C00_
3300 "	4.5	9.5	7.2	5	FKSMG013301E00_
4700 "	4.5	9.5	7.2	5	FKSMG014701E00_
6800 "	5.5	11.5	7.2	5	FKSMG016801H00_
0.01 µF	7.2	13	7.2	5	FKSMG021001K00_

* AC voltage: $f \leq 400 \text{ Hz}$; $1.4 \times U_{\text{rms}} + U_{\text{DC}} \leq U_r$

** PCM = Printed circuit module = lead spacing

Dims. in mm.



Part number completion:

Tolerance: 20 % = M

10 % = K

5 % = J

2.5 % = H

Packing: bulk = S

Lead length: 6-2 = SD

Taped version see page 140.

Rights reserved to amend design data without prior notification.

Recommendation for Processing and Application of Through-Hole Capacitors

Soldering Process

A preheating of through-hole WIMA capacitors is allowed for temperatures $T_{\max} < 100^{\circ}\text{C}$. In practice a preheating duration of $t < 5$ min. has been proven to be best.

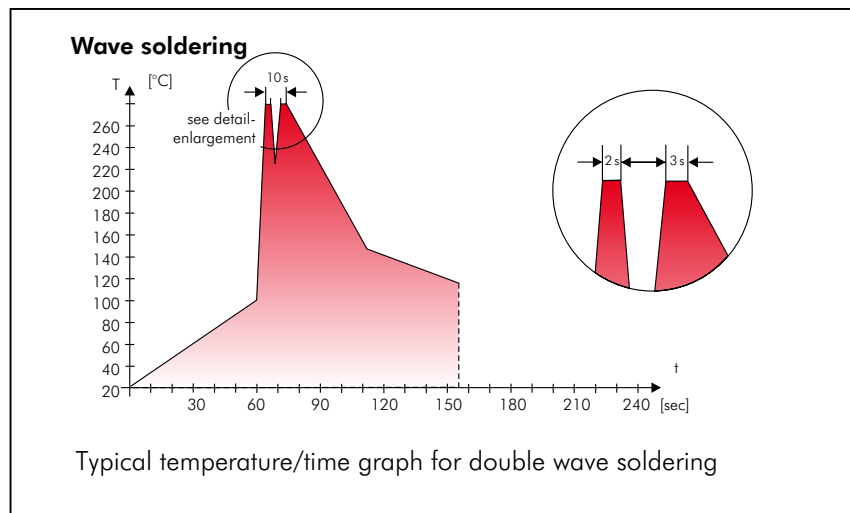
Single wave soldering

Soldering bath temperature: $T < 260^{\circ}\text{C}$
Immersion time: $t < 5$ sec

Double wave soldering

Soldering bath temperature: $T < 260^{\circ}\text{C}$
Immersion time: $2 \times t < 3$ sec

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



WIMA Quality and Environmental Philosophy

ISO 9001:2000 Certification

ISO 9001:2000 is an international basic standard of quality assurance systems for all branches of industry. The approval according to ISO 9001:2000 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-healing
- lead attachment
- cast resin preparation/encapsulation
- 100% final inspection
- AQL check

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 | – PBB/PBDE |
| – PCB | – Arsenic |
| – CFC | – Cadmium |
| – Hydrocarbon chloride | – Mercury |
| – Chromium 6+ | – 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 tapes made of plastic
- metal clips

RoHS Compliance

According to the RoHS Directive 2002/95/EC 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 refrained from using such substances since years already.



WIMA Kondensatoren sind bleifrei
konform RoHS 2002/95/EG

WIMA capacitors are lead free
in accordance with RoHS 2002/95/EC

Tape for lead-free WIMA capacitors

DIN EN ISO 14001:2005

WIMA's environmental management has been established in accordance with the guidelines of DIN EN ISO 14001:2005. The certification has been granted in June 2006.

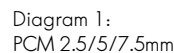


Diagram 3: PCM 22.5 and 27.5*mm

*PCM 27.5 taping possible with two feed holes between components

Dims in mm.

- Diameter of leads see General Data.

Please clarify customer-specific deviations with the manufacturer.

- * PCM 10 and PCM 15 can be crimped to PCM 7.5.

Position of components according to PCM 7.5 (sketch 1). $P_0 = 12.7$ or 15.0 is possible



Packing Quantities for Bulk Capacitors and TPS*

PCM	Size				pcs. per packaging unit bulk			pcs. per packaging unit/TPS*	
	W	H	L	Codes	Mini	Standard	Maxi	Mini	Standard
2.5 mm	2.5	7	4.6	0B	1000	5000	10000	–	–
	3	7.5	4.6	0C	1000	5000	10000	–	–
	3.8	8.5	4.6	0D	1000	5000	10000	–	–
	4.6	9	4.6	0E	1000	5000	10000	–	–
	5.5	10	4.6	0F	1000	5000	10000	–	–
5 mm	2.5	6.5	7.2	1A	2000	5000	10000	–	–
	3	7.5	7.2	1B	1000	5000	–	–	–
	3.5	8.5	7.2	1C	1000	5000	–	–	–
	4.5	6	7.2	1D	1000	6000	–	–	–
	4.5	9.5	7.2	1E	1000	4000	–	–	–
	5	10	7.2	1F	1000	3500	–	–	–
	5.5	7	7.2	1G	1000	4000	–	–	–
	5.5	11.5	7.2	1H	500	2500	–	–	–
	6.5	8	7.2	1I	1000	2500	–	–	–
	7.2	8.5	7.2	1J	500	2500	–	–	–
	7.2	13	7.2	1K	500	2000	–	–	–
	8.5	10	7.2	1L	500	2000	–	–	–
	8.5	14	7.2	1M	500	1500	–	–	–
	11	16	7.2	1N	250	1000	–	–	–
7.5 mm	2.5	7	10	2A	1000	5000	–	–	–
	3	8.5	10	2B	1000	5000	–	–	–
	4	9	10	2C	1000	4000	–	–	–
	4.5	9.5	10.3	2D	1000	3500	–	–	–
	5	10.5	10.3	2E	1000	3000	–	–	–
	5.7	12.5	10.3	2F	500	2000	–	–	–
	7.2	12.5	10.3	2G	500	1500	–	–	–
10 mm	3	9	13	3A	1000	3000	–	–	–
	4	8.5	13.5	3B	500	3000	–	–	–
	4	9	13	3C	1000	3000	–	–	–
	4	9.5	13	3D	1000	3000	–	–	–
	5	10	13.5	3E	500	2000	–	–	–
	5	11	13	3F	1000	3000	–	–	–
	6	12	13	3G	800	2400	–	–	–
	6	12.5	13	3H	800	2400	–	–	–
15 mm	8	12	13	3I	500	2000	–	–	–
	5	11	18	4B	800	2400	–	–	–
	5	13	19	4C	200	1000	–	–	–
	6	12.5	18	4D	500	2000	–	–	–
	6	14	19	4E	250	1000	–	–	–
	7	14	18	4F	400	1600	–	–	–
	7	15	19	4G	250	1000	–	–	–
	8	15	18	4H	400	1200	–	–	–
	8	17	19	4I	100	500	–	–	–
	9	14	18	4J	400	1200	–	–	–
	9	16	18	4K	300	900	–	–	–
	10	18	19	4L	100	500	–	–	–
22.5 mm	11	14	18	4M	300	1000	–	–	–
	5	14	26.5	5A	300	1200	–	–	–
	6	15	26.5	5B	250	1000	–	–	–
	7	16.5	26.5	5C	190	760	–	–	–
	8	20	28	5D	–	–	–	115	690
	8.5	18.5	26.5	5E	–	–	–	220	880
	10	22	28	5F	–	–	–	90	540
	10.5	19	26.5	5G	–	–	–	170	680
	10.5	20.5	26.5	5H	–	–	–	170	680
	11	21	26.5	5I	–	–	–	170	680
27.5 mm	12	24	28	5J	–	–	–	75	450
	9	19	31.5	6A	–	–	–	160	640
	11	21	31.5	6B	–	–	–	136	544
	13	24	31.5	6C	–	–	–	112	448
	13	25	33	6D	–	–	–	56	336
	15	26	31.5	6E	–	–	–	96	384
	15	26	33	6F	–	–	–	48	288
	17	29	31.5	6G	–	–	–	88	176
	17	34.5	31.5	6H	–	–	–	88	176
	20	32	33	6I	–	–	–	36	216
37.5 mm	20	39.5	41.5	6J	–	–	–	36	144
	9	19	41.5	7A	–	–	–	60	480
	11	22	41.5	7B	–	–	–	51	408
	13	24	41.5	7C	–	–	–	84	252
	15	26	41.5	7D	–	–	–	72	144
	17	29	41.5	7E	–	–	–	66	132
	19	32	41.5	7F	–	–	–	54	108
	20	39.5	41.5	7G	–	–	–	27	108
	24	45.5	41.5	7H	–	–	–	21	84

Rights reserved to amend design data without prior notification.
Samples and pre-production needs on request.

■ Moulded versions.

* Tray-Packing-System



Packing Units for Taped Capacitors with Radial Leads

PCM	Size				ROLL		REEL				AMMO			
					H16.5	H18.5	ø 360		ø 500		340 × 340		490 × 370	
	W	H	L	Codes	N	O	F	I	H	J	A	C	B	D
2.5 mm	2.5	7	4.6	0B	2200		2500		–		2800		–	
	3	7.5	4.6	0C	2000		2300		–		2300		–	
	3.8	8.5	4.6	0D	1500		1800		–		1800		–	
	4.6	9	4.6	0E	1200		1500		–		1500		–	
	5.5	10	4.6	0F	900		1200		–		1200		–	
5 mm	2.5	6.5	7.2	1A	2200		2500		–		2800		–	
	3	7.5	7.2	1B	2000		2300		–		2300		–	
	3.5	8.5	7.2	1C	1600		2000		–		2000		–	
	4.5	6	7.2	1D	1300		1500		–		1500		–	
	4.5	9.5	7.2	1E	1300		1500		–		1500		–	
	5	10	7.2	1F	1100		1400		–		1400		–	
	5.5	7	7.2	1G	1000		1200		–		1200		–	
	5.5	11.5	7.2	1H	1000		1200		–		1200		–	
	6.5	8	7.2	1I	800		1000		–		1000		–	
	7.2	8.5	7.2	1J	700		1000		–		1000		–	
	7.2	13	7.2	1K	700		950		–		1000		–	
	8.5	10	7.2	1L	600		800		–		800		–	
	8.5	14	7.2	1M	600		800		–		800		–	
	11	16	7.2	1N	500		700		–		700		–	
7.5 mm	2.5	7	10	2A	–		2500		4400		2500		–	
	3	8.5	10	2B	–		2200		4300		2300		4150	
	4	9	10	2C	–		1700		3200		1700		3100	
	4.5	9.5	10.3	2D	–		1500		2900		1400		2800	
	5	10.5	10.3	2E	–		1300		2500		1300		–	
	5.7	12.5	10.3	2F	–		1000		2200		1100		–	
	7.2	12.5	10.3	2G	–		900		1800		1000		–	
10 mm	3	9	13	3A	–		1100		2200		–		1900	
	4	8.5	13.5	FA	–		900		1600		–		1450	
	4	9	13	3C	–		900		1600		–		1450	
	4	9.5	13	3D	–		900		1600		–		1400	
	5	10	13.5	FB	–		700		1300		–		1200	
	5	11	13	3F	–		700		1300		–		1200	
	6	12	13	3G	–		550		1100		–		1000	
	6	12.5	13	3H	–		550		1100		–		1000	
15 mm	8	12	13	3I	–		400		800		–		740	
	5	11	18	4B	–		600		1200		–		1150	
	5	13	19	FC	–		600		1200		–		1200	
	6	12.5	18	4C	–		500		1000		–		1000	
	6	14	19	FD	–		500		1000		–		1000	
	7	14	18	4D	–		450		900		–		850	
	7	15	19	FE	–		450		900		–		850	
	8	15	18	4H	–		400		800		–		740	
	8	17	19	FF	–		400		800		–		740	
	9	14	18	4F	–		350		700		–		650	
	9	16	18	4J	–		350		700		–		650	
22.5 mm	10	18	19	FG	–		300		650		–		590	
	11	14	18	4M	–		300		600		–		540	
	5	14	26.5	5A	–		–		800		–		770	
	6	15	26.5	5B	–		–		700		–		640	
	7	16.5	26.5	5D	–		–		600		–		550	
	8	20	28	FH	–		–		500		–		480	
	8.5	18.5	26.5	5F	–		–		480		–		450	
	10	22	28	FI	–		–		420		–		380	
27.5 mm	10.5	19	26.5	5G	–		–		400		–		360	
	10.5	20.5	26.5	5H	–		–		400		–		360	
	11	21	26.5	5I	–		–		380		–		350	
	12	24	28	FJ	–		–		350		–		310	
	9	19	31.5	6A	–		–		460/340*		–		420	
	11	21	31.5	6B	–		–		380/280*		–		350	
	13	24	31.5	6D	–		–		300		–		290	
27.5 mm	15	26	31.5	6F	–		–		270		–		250	

* for 2-inch transport pitches.

Samples and pre-production needs 1 packing unit minimum.

■ Moulded versions.

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WIMA Part Number System

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: Special features (e.g. Snubber versions)
 Field 15: Capacitance tolerance
 Field 16: Packing
 Field 17 - 18: Lead length (untaped)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
M	K	S	2	C	0	2	1	0	0	1	A	0	0	M	S	S	D
MKS 2				63 VDC		0.01 μF				2.5x6.5x7.2		-		20%	bulk	6-2	
Type description:				Rated voltage:		Capacitance:				Size:				Tolerance:			
SMD-PET = SMDT				16 VDC = A0		22 pF = 0022				4.8x3.3x3 Size 1812 = X1				20% = M			
SMD-PEN = SMDN				2.5 VDC = A1		47 pF = 0047				4.8x3.3x4 Size 1812 = X2				10% = K			
SMD-PPS = SMDI				4 VDC = A2		100 pF = 0100				5.7x5.1x3.5 Size 2220 = Y1				5% = J			
FKP 02 = FKP0				14 VDC = A3		150 pF = 0150				5.7x5.1x4.5 Size 2220 = Y2				2.5% = H			
MKS 02 = MKS0				28 VDC = A4		220 pF = 0220				7.2x6.1x3 Size 2824 = T1				1% = E			
FKS 2 = FKS2				40 VDC = A5		330 pF = 0330				7.2x6.1x5 Size 2824 = T2				...			
FKM 2 = FKM2				5 VDC = A6		470 pF = 0470				10.2x7.6x5 Size 4030 = K1				Packing:			
FKP 2 = FKP2				50 VDC = B0		680 pF = 0680				12.7x10.2x6 Size 5040 = V1							
MKS 2 = MKS2				63 VDC = C0		1000 pF = 1100				15.3x13.7x7 Size 6054 = Q1				AMMO H16.5 340x340 = A			
MKP 2 = MKP2				100 VDC = D0		1500 pF = 1150				2.5x7x4.6 PCM 2.5 = 0B				AMMO H16.5 490x370 = B			
MKI 2 = MKI2				160 VDC = E0		2200 pF = 1220				3x7.5x4.6 PCM 2.5 = 0C				AMMO H18.5 340x340 = C			
FKS 3 = FKS3				250 VDC = F0		3300 pF = 1330				2.5x6.5x7.2 PCM 5 = 1A				AMMO H18.5 490x370 = D			
FKM 3 = FKM3				400 VDC = G0		4700 pF = 1470				3x7.5x7.2 PCM 5 = 1B				REEL H16.5 360 = F			
FKP 3 = FKP3				450 VDC = H0		6800 pF = 1680				2.5x7x10 PCM 7.5 = 2A				REEL H16.5 500 = H			
MKS 4 = MKS4				600 VDC = I0		0.01 μF = 2100				3x8.5x10 PCM 7.5 = 2B				REEL H18.5 360 = I			
MKM 4 = MKM4				630 VDC = J0		0.022 μF = 2220				3x9x13 PCM 10 = 3A				REEL H18.5 500 = J			
MKP 4 = MKP4				700 VDC = K0		0.047 μF = 2470				4x9x13 PCM 10 = 3C				ROLL H16.5 = N			
MKP 10 = MKP1				800 VDC = L0		0.1 μF = 3100				5x11x18 PCM 15 = 4B				ROLL H18.5 = O			
FKP 4 = FKP4				850 VDC = M0		0.22 μF = 3220				6x12.5x18 PCM 15 = 4C				BLISTER W12 180 = P			
FKP 1 = FKP1				900 VDC = N0		0.47 μF = 3470				5x14x26.5 PCM 22.5 = 5A				BLISTER W12 330 = Q			
MKP-X2 = MKX2				1000 VDC = O1		1 μF = 4100				6x15x26.5 PCM 22.5 = 5B				BLISTER W16 330 = R			
MKP-X2 R = MKXR				1100 VDC = P0		2.2 μF = 4220				9x19x31.5 PCM 27.5 = 6A				BLISTER W24 330 = T			
MKP-Y2 = MKY2				1200 VDC = Q0		4.7 μF = 4470				11x21x31.5 PCM 27.5 = 6B				Bulk Mini = M			
MP 3-X2 = MPX2				1250 VDC = R0		10 μF = 5100				9x19x41.5 PCM 37.5 = 7A				Bulk Standard = S			
MP 3-X1 = MPX1				1500 VDC = S0		22 μF = 5220				11x22x41.5 PCM 37.5 = 7B				Bulk Maxi = G			
MP 3-Y2 = MPY2				1600 VDC = T0		47 μF = 5470				94x49x182 DCH_ = H0				TPS Mini = X			
MP 3R-Y2 = MPRY				2000 VDC = U0		100 μF = 6100				94x77x182 DCH_ = H1				TPS Standard = Y			
Snubber MKP = SNMP				2500 VDC = V0		220 μF = 6220						
Snubber FKP = SNFP				3000 VDC = W0		1 F = A010											
GTO MKP = GTOM				4000 VDC = X0		2.5 F = A025											
DC-LINK MKP 4 = DCP4				6000 VDC = Y0		50 F = A500											
DC-LINK MKP C = DCPC				250 VAC = 0W		100 F = B100				Special features:				Lead length (untaped)			
DC-LINK HC = DCH_				275 VAC = 1W		110 F = B110				Standard = 00				3.5 ±0.5 = C9			
SuperCap C = SCSC				300 VAC = 2W		600 F = B600				Version A1 = 1A				6-2 = SD			
SuperCap MC = SCMC				400 VAC = 3W		1200 F = C120				Version A1.1.1 = 1B				16-1 = P4			
SuperCap R = SCSR				440 VAC = 4W		...				Version A1.2 = 1C				...			
SuperCap MR = SCMR				500 VAC = 5W													

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.