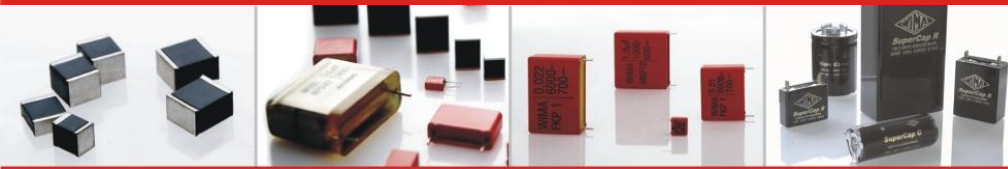


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WIMA Snubber / GTO Capacitors

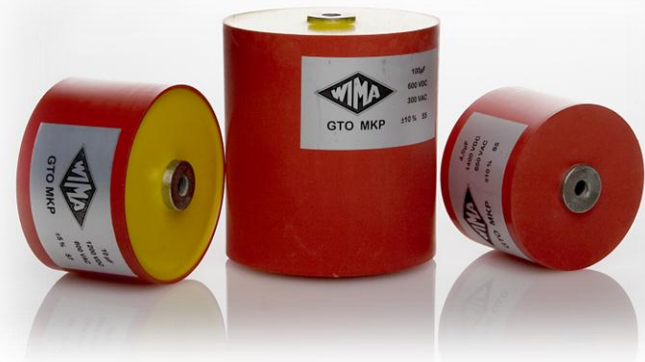
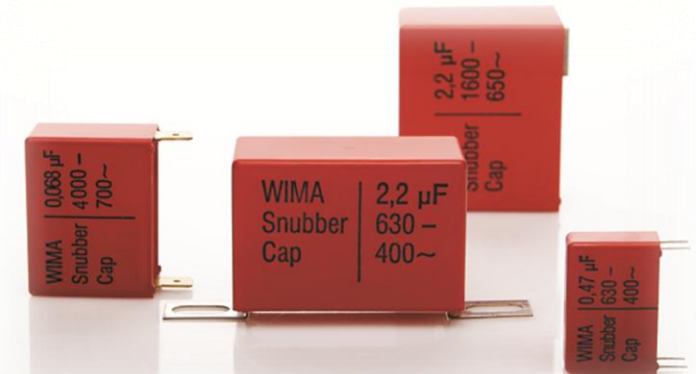


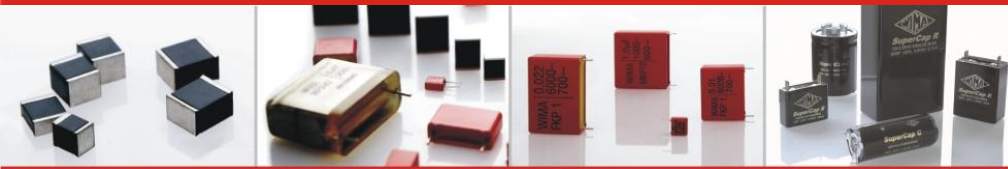
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Outline

- IGBT (Insulated Gate Bipolar Transistor)
- Typical Snubber Circuits used with IGBTs
- Features of WIMA Snubber Capacitors
- Versions of WIMA Snubber Capacitors
- Typical GTO (Gate Turn Off) Circuit
- Features of WIMA GTO Capacitors
- Application Guide for WIMA Capacitors





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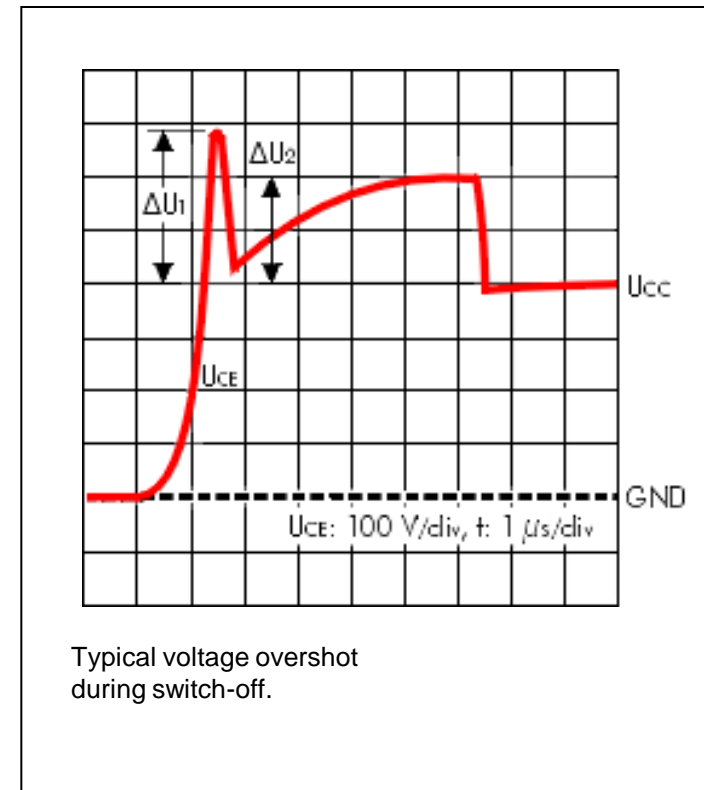


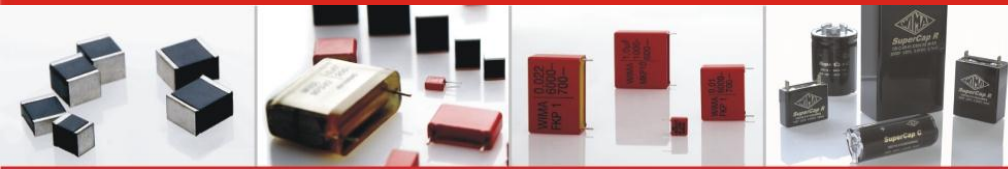
IGBT (Insulated Gate Bipolar Transistor)

Requirements of advanced power semiconductors
IGBT (Insulated Gate Bipolar Transistor) and IGBT-Modules

- increased switching voltage and current
- increased switching speed
- low inductance circuit

Risk: Even the low self-inductance of the power bus may induce dangerous voltage overshots between collector and emitter which may result in the destruction of the valuable power semiconductors.





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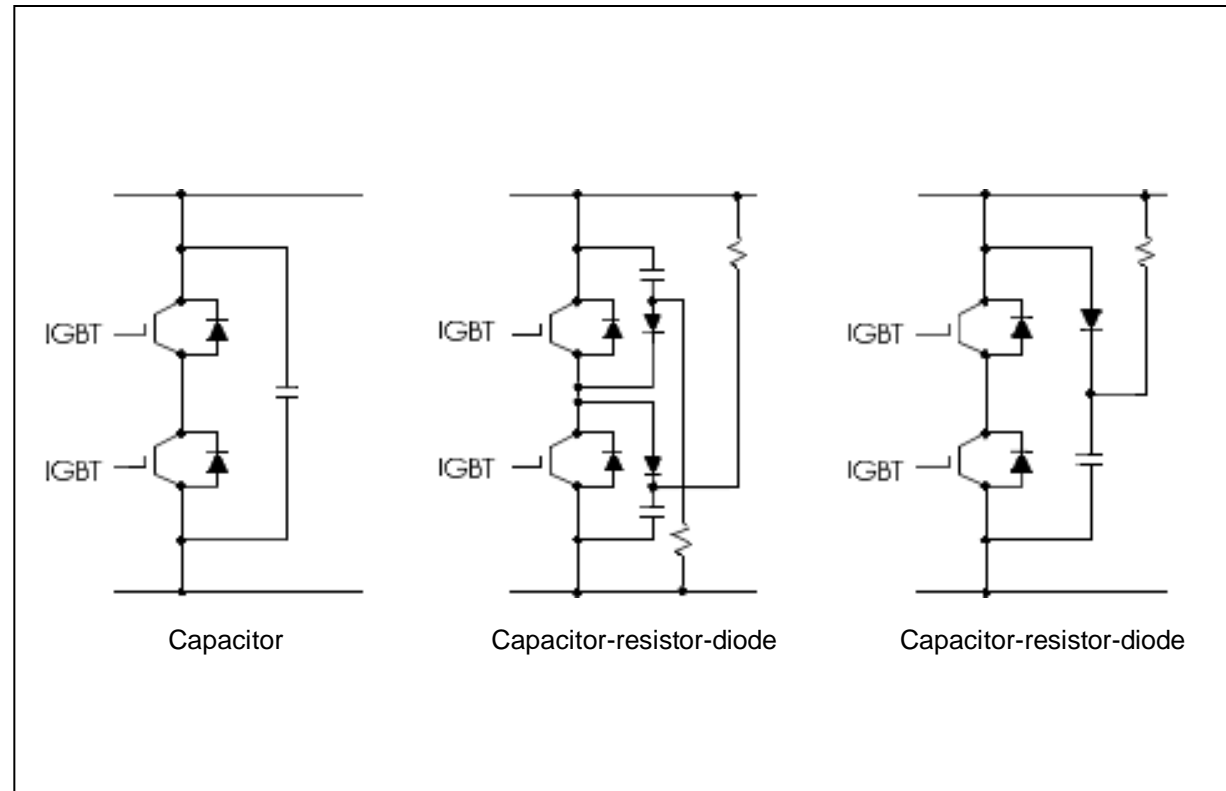
Typical Snubber Circuits used with IGBTs

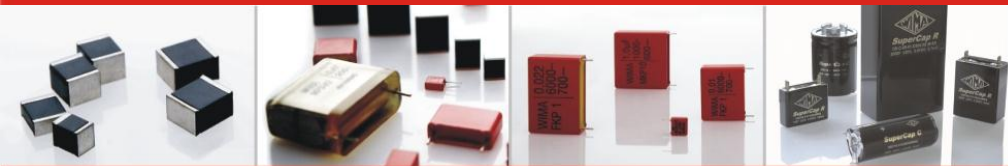
Requirement to protect IGBTs

- snubber suppressor circuits based on low-inductance pulse capacitors to attenuate or cut off peak voltages
- in general, three basic snubber circuits are used with IGBTs to suppress dangerous induced voltages produced during switching of high currents

Criteria in selecting capacitors

- low self-inductance
- high pulse load capability
- low loss factor / ESR
- high mechanical stability





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Snubber Capacitors for High Power Conversion

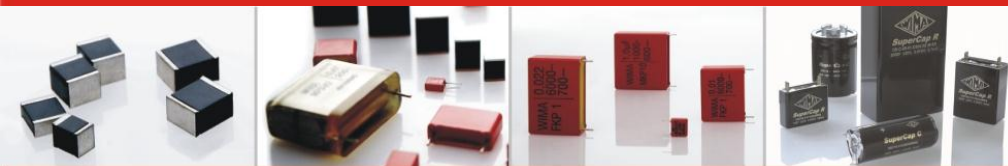
Features of WIMA Snubber Capacitors

- Capacitances:** 0.01 μF - 25 μF
Voltages: 250 VDC - 4000 VDC
Dielectric: Polypropylene (PP) film
Properties:
- Plates soldered directly to the schoopage for safe contacts at high rms currents
 - Low inductance construction achieved by end-surface contacts
 - High pulse reliability due to double-sided metallization and/or film/foil construction
 - High voltage/overvoltage strength by internal series connection with self-healing metallized floating electrode
 - Available in various contact configurations
 - Flame retardent plastic case in accordance with UL 94 V-0

Fields of Application

- IGBT applications subject to high pulse and high frequency requiring extremely reliable contacts





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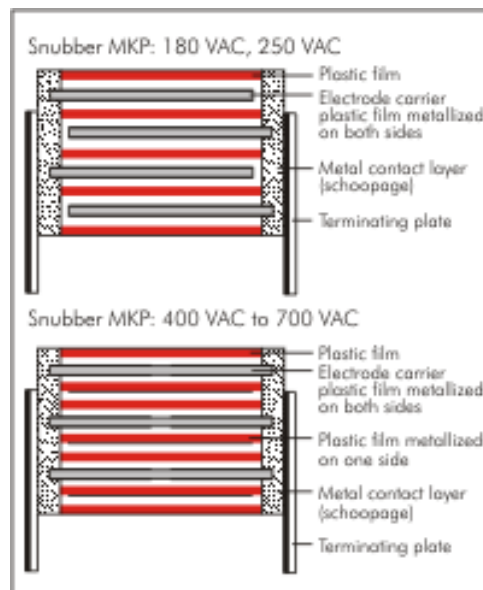


WIMA Snubber Capacitors

WIMA Snubber MKP

Capacitance range: 0.047 μ F - 25 μ F
Rated voltages: 250 VDC - 3000 VDC
Dielectric: Polypropylene (PP) film
Climatic test category: 55/100/56 according to IEC
Reliability: Operational life > 300 000 hours
 Failure rate < 1 fit (0.5 x U_r / 40°C)

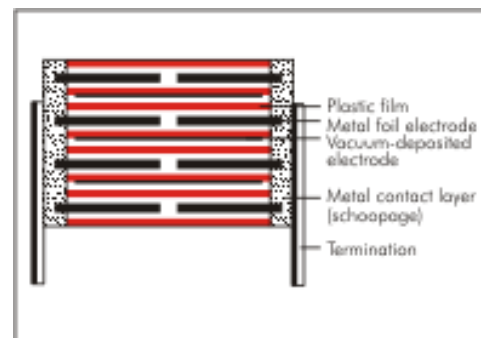
Internal construction:

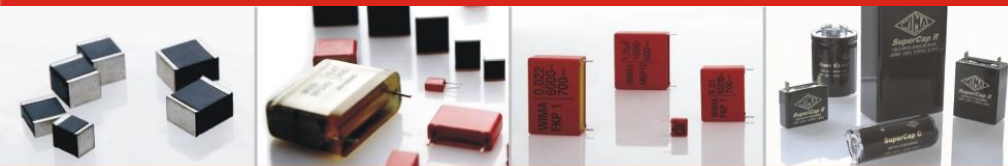


WIMA Snubber FKP

Capacitance range: 0.01 μ F - 2.2 μ F
Rated voltages: 630 VDC - 4000 VDC
Dielectric: Polypropylene (PP) film
Climatic test category: 55/100/56 according to IEC
Reliability: Operational life > 300 000 hours
 Failure rate < 1 fit (0.5 x U_r / 40°C)

Internal construction:



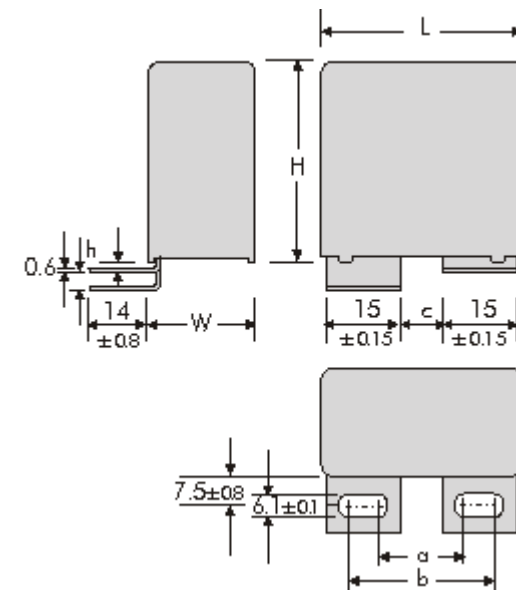
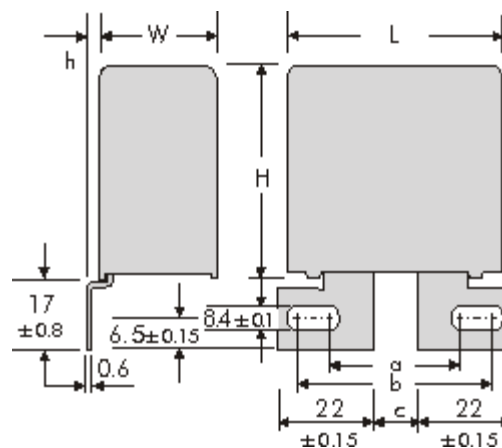
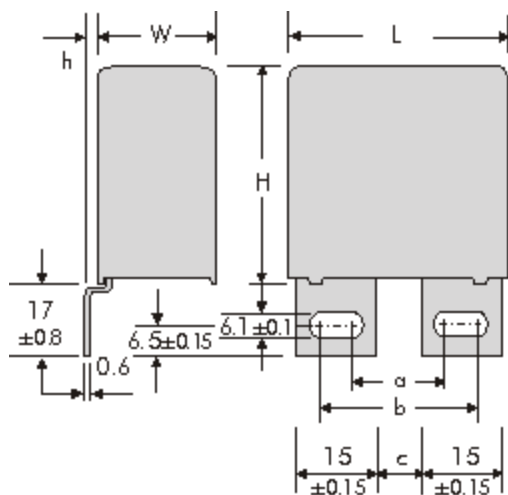
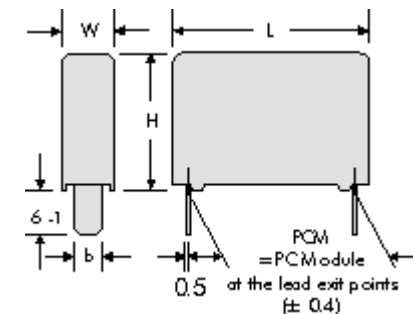
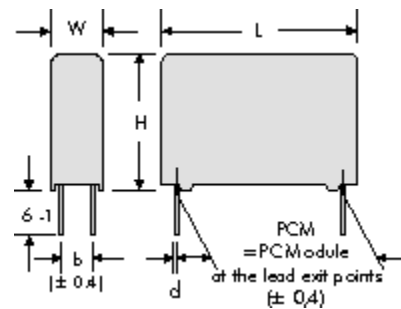


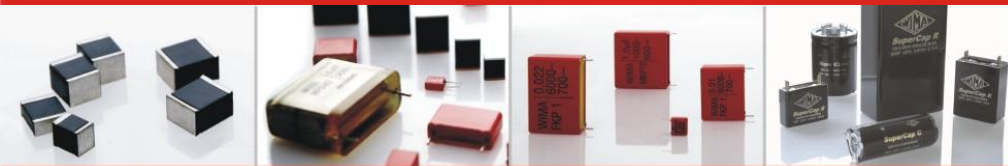
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Versions of WIMA Snubber Capacitors

WIMA Snubber capacitors are available
in various contact configurations
- customized versions on request





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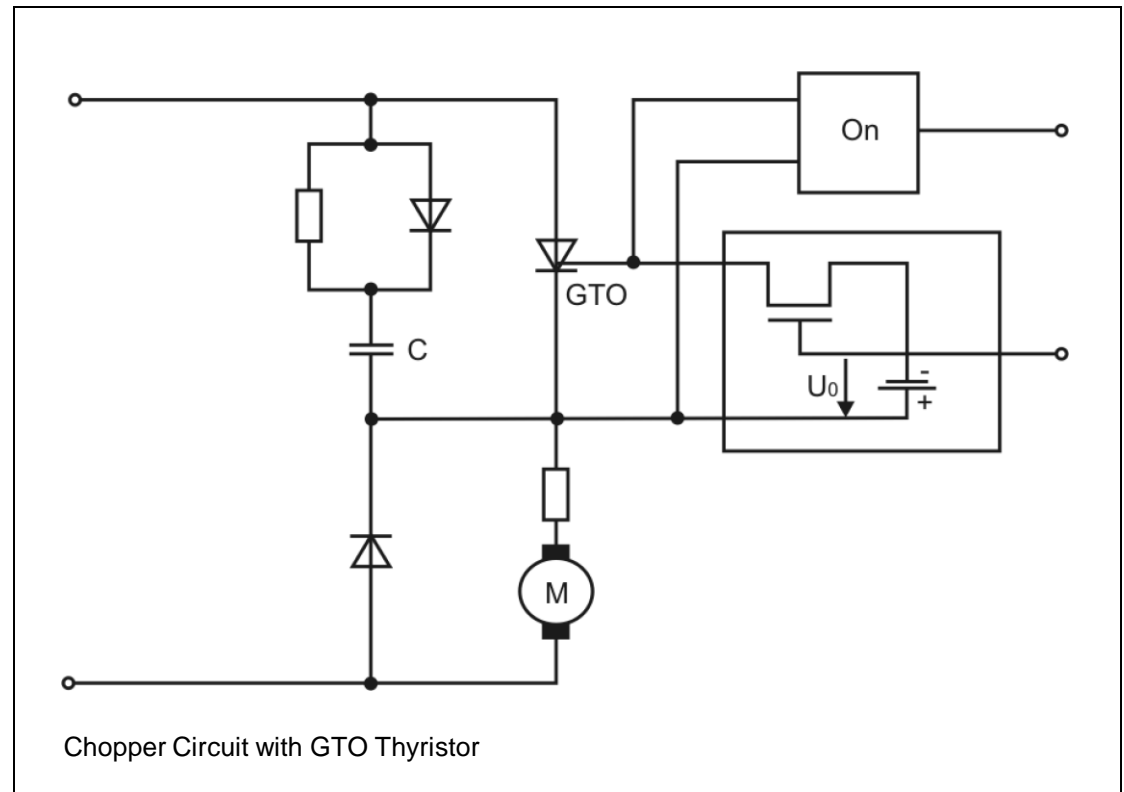
Typical GTO (Gate Turn Off) Circuit

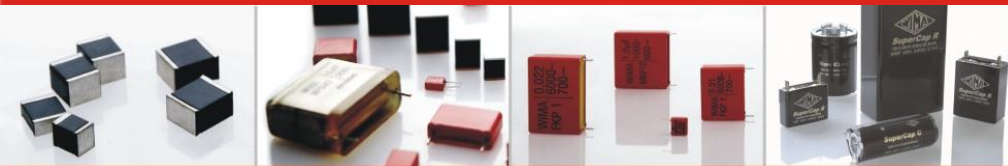
Purpose of GTO Capacitors

- to attenuate voltage rise during switch off phase of GTO thyristor

GTO Applications

- stationary and mobile drives or traction systems with GTO thyristors subjected to voltages up to 2000V and currents exceeding 1000A respectively





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GTO (Gate-Turn-Off) Capacitors with Screw Connection

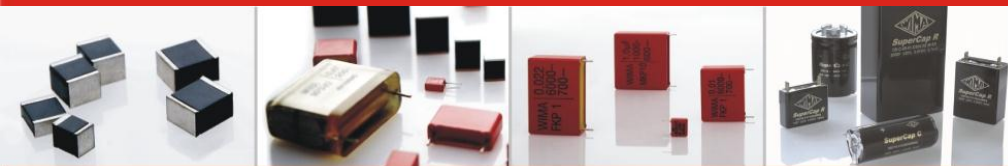
Features of WIMA GTO Capacitors

Capacitances:	1.0 μ F - 100 μ F
Voltages:	400 VDC - 1500 VDC
Dielectric:	Polypropylene (PP) film
Properties:	<ul style="list-style-type: none">- Very low self-inductance- High pulse capability- High rms current carrying capability- Excellent self-healing property- High shock and vibration resistance- Outstanding mechanical stability- Almost unlimited life expectancy

Fields of Application

GTO applications subject to high current and voltage, e.g.
- converter equipment in power generation or in traction
technology for train drives, hoists, crane drives etc.





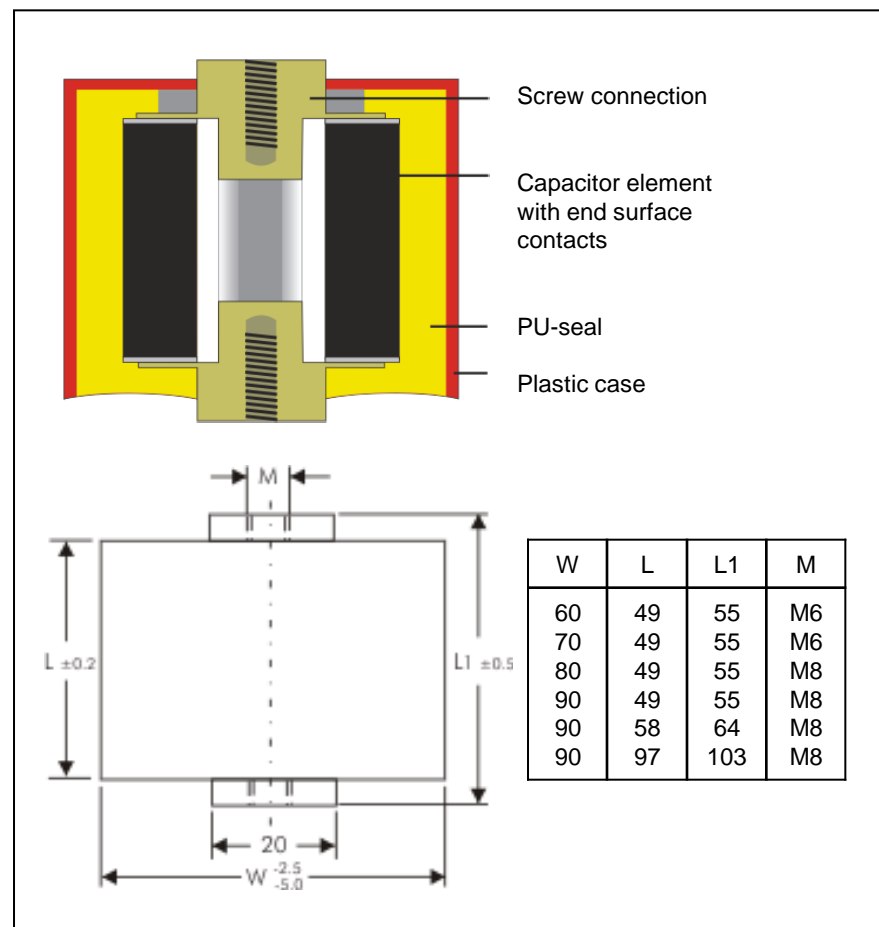
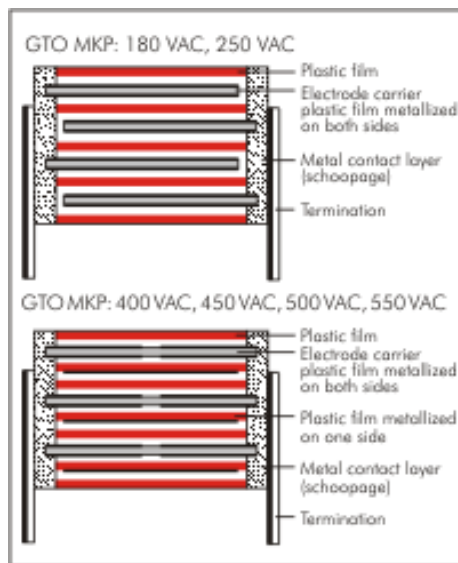
**BEST CAPACITORS
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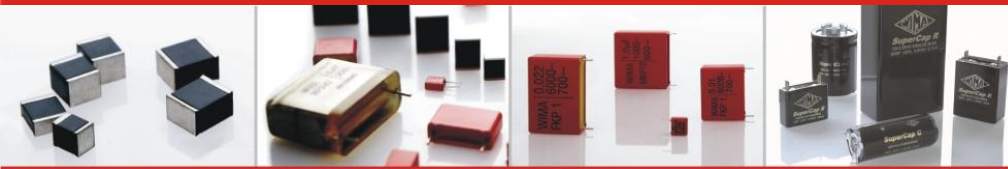


WIMA GTO Capacitors

WIMA GTO MKP

Capacitance range: 1.0 μF - 100 μF
Rated voltages: 400 VDC - 1500 VDC
Dielectric: Polypropylene (PP) film
Climatic test category: 55/085/56 according to IEC
Reliability: Operational life > 300 000 hours
 Failure rate < 1 fit (0.5 x U_r / 40°C)
Terminations: Axial screw connection M6 or M8
Internal construction:



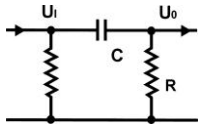


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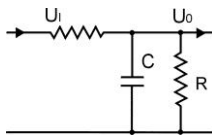
Industrial Electronics · Power Supplies/UPS/SMPS · AC/DC Converters · Measuring and Control Equipment

Coupling/
Blocking



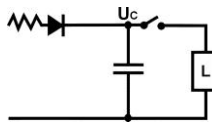
SMD	MKS 2
MKS 02	MKS 4

Decoupling/
Bypassing



SMD	MKS 2
MKS 02	FKS 3
FKS 2	MKS 4

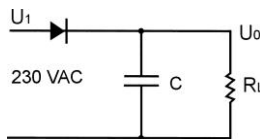
Energy
Storing



MKP 2 *	FKP 1
MKP 10	Snubber
FKP 4	GTO

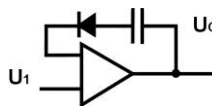
* ≥ 250VDC

Smoothing



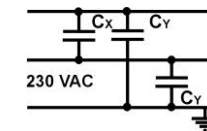
SMD	MKS 4
MKS 02	MKP 4
MKS 2	MKP 10

A/D
Conversion



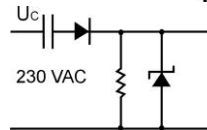
FKP 02	FKP 3
FKP 2	MKP 4
MKP 2	

RFI -
Suppression



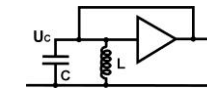
MKP-X2	MP3-X1
MKP-Y2	MP3-Y2
MP3-X2	MP3R-Y2

Voltage
Dropper



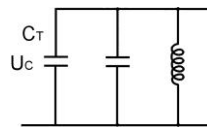
MP3-X2	MKS 4 *
MP 3-X2	* ≥ 630VDC ≥ PCM 10

Oscillating



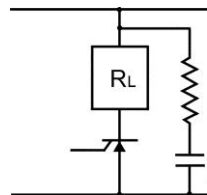
SMD-PPS	MKP 4
FKP 02	MKP 10
FKP 2	FKP 4
MKP 2 *	FKP 1
FKP 3	* ≥ 250VDC

Temperature
Compensating



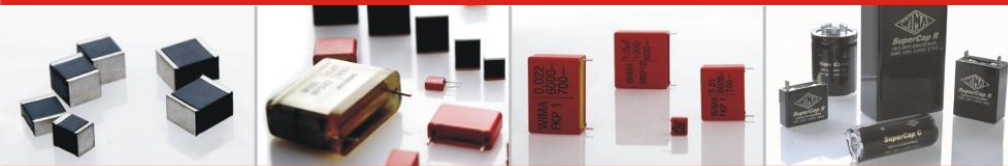
FKP 02/2	FKP 3
MKP 2	MKP4

Snubbing



FKP 02/2	FKP 4
MKP 2 *	FKP 1
FKP 3	Snubber
MKP 10	GTO

* ≥ 250VDC



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Selection of Capacitors for Customized Applications

Operational Data Required for Capacitor Calculation

- **Electrical data of the capacitor**
 - Capacitance
 - Voltage (DC / AC)
 - Tolerance*
 - Dimensions* / PCM*
- **Electrical data of the application**
 - Voltage
 - Current
 - Pulse frequency / Repetition frequency
 - Time axis
 - Pulse rise time*
- **Application data**
 - Ambient temperature
 - Kind of application*
- **Oscillogramme (voltage and current) appreciated**

*optional

Betriebsdaten für Kondensatoren
Operational Data of Capacitors

Firma/ Company's Name: _____

Sachbearbeiter/ Person Responsible: _____

Entwicklungs-Nr. des Gerätes/Design No. of Set: _____

Schaltbild-Nr. des Kondensators/Circuit No. of Capacitor: _____

Vorgesehene Nenndaten/ Nominal Data Considered

Kapazität/ Capacitance: _____ pF/µF Toleranz/ Tolerance: _____ %

Nennspannung/ Rated Voltage: _____ V~

Gleichspannung/ D.C. Voltage: _____ V- Wechsellspannung/ A.C. Voltage: _____ V~

Gemessene Betriebswerte
Operational Data Measured

Betriebsspannung/ Working Voltage

Gleichspannung/ D.C. Voltage: _____ V~ VDC

Wechsellspannung/ A.C. Voltage: _____ V_{eff}/V_{rms}

Impulsspannung/ Pulse Voltage: _____ V_{sp}/V_{pp}

(Spitze-Spitze/ peak to peak)

Schaltspannung/ Peak Voltage: _____ V_e/V_p

Flankensteilheit (du/dt)/ Pulse rise time (du/dt): _____ V/µsec

Betriebsstrom/ Working Current

Effektiver Wechselstrom/ R.M.S. Current: _____ A (Amp)

Impulsstrom/ Pulse Current: _____ A_{sp}/A_{pp}

(Spitze-Spitze/ peak to peak)

Schaltstrom/ Peak Current: _____ A_e/A_p

Frequenz/ Frequency

Frequenz der Wechsellspannung/ Frequency of A.C. Voltage: _____ Hz/cps

Impulsfrequenz/ Pulse Frequency: _____ Hz/cps

Max. Umgebungstemperatur des Kondensators/
Max. Ambient Temperature of the Capacitor: _____ °C

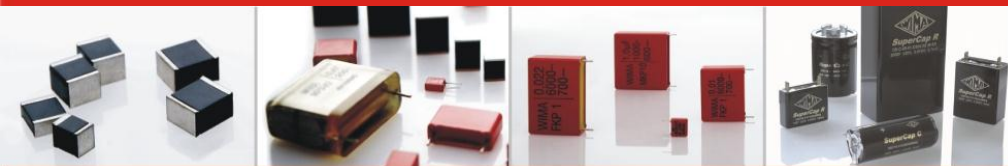
Oszillogramme bitte auf der Rückseite eintragen oder Foto aufkleben/
Please insert drawings or photographs of the oscillogrammes on the reverse

Datum/ Date: _____ Name/ Name: _____

So wird gemessen/ Method of Measurement:

Ströme und Spannungen sind mit einem Oszillografen zu messen.
Currents and voltages must be measured by means of an oscilloscope.

WILHELM WESTERMANN - Spezialvertrieb elektronischer Bauelemente
D - 68177 Mannheim, P. O. Box 24 07 61, Fax: + 49-621-862-95-95 / 95-96



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Thank you!

PT ELECTRONICS

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