IXYS

One of the essential advantages of power semiconductor modules compared to discrete designs is the electrical isolation between the baseplate of the module and the parts subject to voltage (3.6 kV_{RMS} tested). This makes possible the mount-down of any number of the same or different modules on a common heatsink. It is feasible to use standard housings with appropriate accessories for designing compact power converter operating from AC mains up to 690 V.

Plastic Housing with DCB Substrate

IXYS has succeeded in simplifying the conventional multilayer module construction by the DCB (Direct Copper Bonding) technique.

Other features are:

- top-side electrical terminals with captured nuts;
- series-connected diode/diode, thyristor/diode and thyristor/thyristor modules;
- easy assembly.

All thyristor modules with DCB ceramic base contacts are available in volume with two standardized twin plugs (2.8 mm x 0.8 mm) for gate and auxiliary cathode control terminals (version 1). Modules in TO-240 housing of the version 8 are delivered with gate plugs only (without auxiliary cathode terminal; mounting srews available on request). The module housing is designed for adequate clearance and creepage distance resulting in recognition by Underwriters Laboratories, Inc., USA for all types.

New Generation Silicon Chips

The figures 1 a-c show cross sections of the used thyristor and diode chips in the passivation area. All chips are designed by applying separation diffusion processes such that the zones responsible for the surface field strength are located at the upper chip side. This results in the capability of soldering the entire chip area onto the DCB ceramic substrate without a molybdenum strain buffer, which in turn leads to good stability of the chips as well as to large area heat dissipation if a load is applied. All zones at the edges which are decisive for the blocking stability are coated with passivation glasses the coefficient of expansion of which match that of silicon. Silicon chips increasingly use planar technology with guard rings and channel stoppers to reduce electrical surface fields. This chip design supercedes the design of thyristor chips which were fabricated with passivation moats so that modules of the new series designed with the updated state-of-the-art utilize planar passivated chips processed by separation diffusion techniques. The contact areas of the chips possess physical vapor deposited metal layers. For the user the improved properties are:

- Excellent long-term stability of blocking currents and blocking voltages,
- increased life time of the internal soldered connections,
- high power cycling capability (≥ 50 000).

The thyristor/diode chips have been optimized with regard to their turn-off parameters: decreasing the carrier lifetime results in reduced stored charges Q_S, which in turn significantly reduces requirements for RC-snubbers for over-voltage protection. Cost reduction and improved efficiency are the benefits of these characteristics. By re-developing the silicon chips, improvements of the firing characteristics were achieved by speci-fying a higher "gate current not to fire" I_{GD} resulting in substantially less suscepibility to misfiring. This leads to greater safety of operation and higher reliability of the equipment.

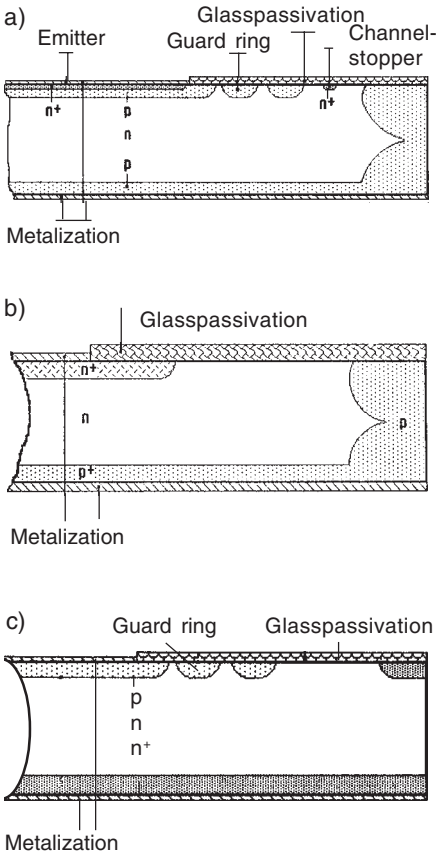


Fig. 1a-c: Cross sections of thyristor and diode chips in the passivation area

a) glassivated planar thyristor chip with separation diffusion, type CWP
b) glassivated planar diode chip with separation diffusion, type DWN
c) glassivated planar diode chip, type DWP (reverse polarity of DWN chips

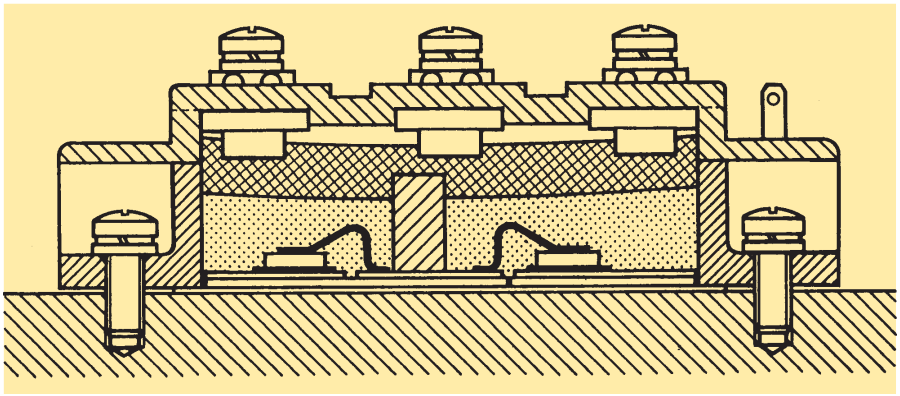


Fig. 2: Principal cross section of an IXYS module with DCB technology

Thyristors, SCRs

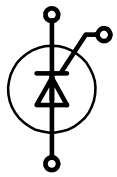
(SCR = Silicon Controlled Rectifier)

Phase Control Thyristors

Thyristors are very rugged devices. Compared to all other controlled semi-conductor components, they feature the highest current capacity per chip area, especially at high voltage. They are mainly used as control devices in 50 and 60 Hz AC mains equipment.

Principal applications are static converter circuits for speed control of DC-drives, or switching and control functions for temperature, lighting, soft-start, etc. in single-phase and three-phase AC switch configurations . Phase control thyristors are designed for optimal forward conduction and reverse blocking characteristics, due to only moderate requirements for turn-on and turn-off parameters.

Phase Control Thyristors



I_{TAV} = 16 - 60 A

Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} T_C = 85°C A	I_{TRMS} A	I_{TSM} 45°C 10 ms A	$\left[\frac{dv}{dt}\right]_c$ V/µs	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} K/W	R_{thCH} K/W	Fig. No.	Package style Outline drawings on page 188 - 224
CS 8-08 io2 **CS 8-12 io2**	800 1200	16	25	250	1000	1.0	18	125	1.5	1.0	X208	X005a **TO-220AB** Weight = 2 g
CS 19-08 ho1 **CS 19-12 ho1**	800 1200	19	29	160	500	0.85	27.0	125	1.0	0.25	X005a	
CS 19-08 ho1S **CS 19-12 ho1S**	800 1200	19	29	160	500	0.85	27.0	125	1.0	0.25	X011b	X007a **TO-220ABFP** Weight = 2
CS 19-08 ho1C **CS 19-12 ho1C**	800 1200	13	35	100	500	0.87	29	125	1.7	0.6	X010a	
CS 20-12 io1 **CS 20-14 io1** **CS 20-16 io1**	1200 1400 1600	19	30	200	1000	1.1	40	125	0.62	0.2	X014a	X010a **ISOPLUS220™** Weight = 2 g
CS 20-22 moF1	2200	18		200	2500			125	0.92	0.15	X024c	
CS 22-08 io1M **CS 22-12 io1M**	800 1200	22	30	300	500	0.9	18	150	2.5	0.5	X007A	
CS 23-08 io2 **CS 23-12 io2** **CS 23-16 io2**	800 1200 1600	25	50	450	1000	1.0	10	125	1.0	0.6	X209	X011b **TO-263AB** Weight = 2 g
CS 29-08 io1C **CS 29-12 io1C**	800 1200	23 T_C = 95°C	35	200	1000	0.82	16.5	150	1.2	0.6	X010a	
CS 30-12 io1 **CS 30-14 io1** **CS 30-16 io1**	1200 1400 1600	31	49	300	1000	0.9	15	125	0.62	0.2	X014a	X014a **TO-247 AD** Weight = 6 g
CS 35-08 io4 **CS 35-12 io4** **CS 35-14 io4**	800 1200 1400	63	120	1200	1000	0.85	3.5	125	0.4	0.2	X210	
CS 45-08 io1 **CS 45-12 io1** **CS 45-16 io1**	800 1200 1600	48 T_C = 75 °C	75	520	1000	0.85	11	140	0.62	0.2	X014a	X016a **ISOPLUS247™** Weight = 5 g
CS 45-16 io1R ①	1600										X016a	
➤ **CLA 50E1200HB** ➤ **CLA 50E1200TC**	1200	50 T_C = 125°C	75	550	1000	0.92	7.8	150	0.4	0.25	X014a X019	
CS 60-12 io1 **CS 60-14 io1** **CS 60-16 io1**	1200 1400 1600	48 T_C = 105°C	75	1500	1000	0.85	3.7	140	0.32	0.15	X015	X019 **TO-268 AA** Weight = 5 g
FCC 21-12 io	1200	21 T_C = 90°C	-	300	1000	-	-	125	1.00	0.32	X024a	

① isolated 2500 V_{RMS}

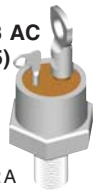
X208 **TO-64** Weight = 6 g

M 5

X209 **TO-208 AA (TO-48)** Weight = 12 g

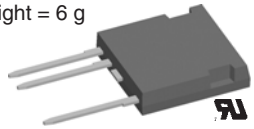
M 6

X210 **TO-208 AC (TO-65)** Weight = 20 g

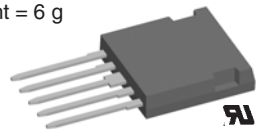


1/4"-28 UNF-2 A

X024c **ISOPLUS i4-PAC™** Weight = 6 g

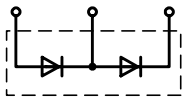


X024a **ISOPLUS i4-PAC™** Weight = 6 g

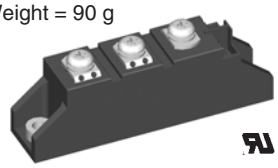


Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Diode Modules, Single and Dual

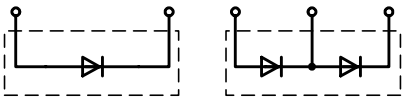

MDD

I_{FAV} = 36-224 A

Type ➤New	V_{RRM} V	I_{FAV} @ T_C A °C	I_{FRMS} A	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T m Ω	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MDD 26-08N1B **MDD 26-12N1B** **MDD 26-14N1B** **MDD 26-16N1B** **MDD 26-18N1B**	800 1200 1400 1600 1800	36 100	60	650	0.8	6.1	150	1.0	0.2	X125e	X125e **TO-240 AA** Weight = 90 g 
MDD 44-08N1B **MDD 44-12N1B** **MDD 44-14N1B** **MDD 44-16N1B** **MDD 44-18N1B**	800 1200 1400 1600 1800	59 100	100	1150	0.8	4.3	150	0.59	0.2		
MDD 56-08N1B **MDD 56-12N1B** **MDD 56-14N1B** **MDD 56-16N1B** **MDD 56-18N1B**	800 1200 1400 1600 1800	71 100	150	1400	0.8	3.0	150	0.51	0.2		
MDD 72-08N1B **MDD 72-12N1B** **MDD 72-14N1B** **MDD 72-16N1B** **MDD 72-18N1B**	800 1200 1400 1600 1800	99 100	180	1700	0.8	2.3	150	0.35	0.2		
MDD 95-08N1B **MDD 95-12N1B** **MDD 95-14N1B** **MDD 95-16N1B** **MDD 95-18N1B** **MDD 95-20N1B** **MDD 95-22N1B**	800 1200 1400 1600 1800 2000 2200	120 105	180	2800	0.75	1.95	150	0.26	0.2		
MDD 142-08N1 **MDD 142-12N1** **MDD 142-14N1** **MDD 142-16N1** **MDD 142-18N1**	800 1200 1400 1600 1800	165 100	300	4700	0.8	1.3	150	0.21	0.1	X126c	X126c Weight 150 g 
MDD 172-08N1 **MDD 172-12N1** **MDD 172-14N1** **MDD 172-16N1** **MDD 172-18N1**	800 1200 1400 1600 1800	190 100	300	6600	0.8	0.8	150	0.21	0.1		
MDD 200-14N1 **MDD 200-16N1** **MDD 200-18N1** **MDD 200-22N1**	1400 1600 1800 2200	224 100	350	10500	0.8	1.5	150	0.13	0.1		

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Diode Modules, Single and Dual



I_{FAV} = 270-950 A

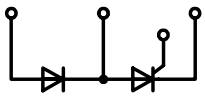
Type ➤New	V_{RRM} V	I_{FAV} A	T_C °C	I_{FRMS} A	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MDD 220-08N1 **MDD 220-12N1** **MDD 220-14N1** **MDD 220-16N1** **MDD 220-18N1**	800 1200 1400 1600 1800	270	100	450	8500	0.75	0.9	150	0.129	0.04	X129c	X129c Weight = 310 g
MDD 250-08N1 **MDD 250-12N1** **MDD 250-14N1** **MDD 250-16N1**	800 1200 1400 1600	290	100	450	11000	0.75	0.75	150	0.129	0.04		
MDD 255-12N1 **MDD 255-14N1** **MDD 255-16N1** **MDD 255-18N1** **MDD 255-20N1** **MDD 255-22N1**	1200 1400 1600 1800 2000 2200	270	100	450	9500	0.8	0.6	150	0.140	0.04	X131c	X131c Weight = 750 g
MDD 310-08N1 **MDD 310-12N1** **MDD 310-14N1** **MDD 310-16N1** **MDD 310-18N1** **MDD 310-20N1** **MDD 310-22N1**	800 1200 1400 1600 1800 2000 2200	305	100	480	11500	0.75	0.63	150	0.129	0.04	X129c	
MDD 312-12N1 **MDD 312-14N1** **MDD 312-16N1** **MDD 312-18N1** **MDD 312-20N1** **MDD 312-22N1**	1200 1400 1600 1800 2000 2200	310	100	520	10500	0.8	0.6	150	0.120	0.04	X131c	X132b Weight = 730 g
MDD 600-12N1* **MDD 600-16N1** **MDD 600-18N1** **MDD 600-22N1**	1200 1600 1800 2200	600	111	1818	24000 150°C	0.75	0.2	150	0.062	0.02	X136a	
MDO 500-12N1 **MDO 500-14N1** **MDO 500-16N1** **MDO 500-18N1** **MDO 500-20N1** **MDO 500-22N1**	1200 1400 1600 1800 2000 2200	560	85	880	15000	0.8	0.38	140	0.072	0.024	X132b	
➤**MDD 950-12N1W*** ➤**MDD 950-16N1W** ➤**MDD 950-18N1W** ➤**MDD 950-22N1W**	1200 1600 1800 2200	950	T_W = 45°C	1773	2400 150°C	0.75	0.2	150	R_{thJW} = 0.09	-	X136b	X136a Weight = 1550 g

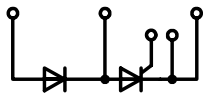
* for other configurations please contact factory

X136b
Weight = 2100 g

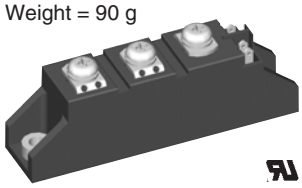
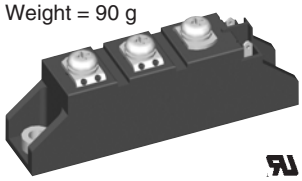
Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Thyristor / Diode Modules


MCD...io8/...io6

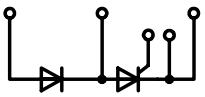

MCD...io1

I_{TAV} = 27-165 A

Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} @ T_C A °C	I_{TRMS} A	I_{TSM} 45°C 10ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MCD 26-08io1B **MCD 26-12io1B** **MCD 26-14io1B** **MCD 26-16io1B**	800 1200 1400 1600	27 85	50	520	0.85	11	125	0.88	0.2	X125b	X027a **SOT-227B** Weight = 30 g **miniBLOC**
MCD 26-08io8B **MCD 26-12io8B** **MCD 26-14io8B** **MCD 26-16io8B**	800 1200 1400 1600	27 85	50	520	0.85	11	125	0.88	0.2	X125d	
MCD 40-12io6 **MCD 40-16io6**	1200 1600	38 85	60	500	0.85	9.5	125	0.6	0.1	X027a	
MCD 44-08io1B **MCD 44-12io1B** **MCD 44-14io1B** **MCD 44-16io1B** **MCD 44-18io1B**	800 1200 1400 1200 1600	49 85	80	1150	0.85	5.3	125	0.53	0.2	X125b	X125b **TO-240 AA** Weight = 90 g
MCD 44-08io8B **MCD 44-12io8B** **MCD 44-14io8B** **MCD 44-16io8B** **MCD 44-18io8B**	800 1200 1400 1600 1800	49 85	80	1150	0.85	5.3	125	0.53	0.2	X125d	
MCD 56-08io1B **MCD 56-12io1B** **MCD 56-14io1B** **MCD 56-16io1B** **MCD 56-18io1B**	800 1200 1400 1600 1800	60 85	100	1500	0.85	3.7	125	0.45	0.2	X125b	
MCD 56-08io8B **MCD 56-12io8B** **MCD 56-14io8B** **MCD 56-16io8B** **MCD 56-18io8B**	800 1200 1400 1600 1800	60 85	100	1500	0.85	3.7	125	0.45	0.2	X125d	X125d **TO-240 AA** Weight = 90 g
MCD 72-08io1B **MCD 72-12io1B** **MCD 72-14io1B** **MCD 72-16io1B** **MCD 72-18io1B**	800 1200 1400 1600 1800	85 85	180	1700	0.85	3.2	125	0.3	0.2	X125b	
MCD 72-08io8B **MCD 72-12io8B** **MCD 72-14io8B** **MCD 72-16io8B** **MCD 72-18io8B**	800 1200 1400 1600 1800	85 85	180	1700	0.85	3.2	125	0.3	0.2	X125d	
MCD 94-20io1B **MCD 94-22io1B**	2000 2200	104 85	180	1700	0.85	3.2	125	0.22	0.2	X125b	
MCD 95-08io1B **MCD 95-12io1B** **MCD 95-14io1B** **MCD 95-16io1B** **MCD 95-18io1B**	800 1200 1400 1600 1800	116 85	180	2250	0.8	2.4	125	0.22	0.2		X126b Weight 150 g
MCD 95-08io8B **MCD 95-12io8B** **MCD 95-14io8B** **MCD 95-16io8B** **MCD 95-18io8B**	800 1200 1400 1600 1800	116 85	180	2250	0.8	2.4	125	0.22	0.2	X125d	
MCD 132-08io1 **MCD 132-12io1** **MCD 132-14io1** **MCD 132-16io1** **MCD 132-18io1**	800 1200 1400 1600 1800	130 85	300	4750	0.8	1.5	125	0.23	0.1	X126b	
MCD 161-20io1 **MCD 161-22io1**	2000 2200	165 85	300	6000	0.8	1.6	125	0.155	0.07		

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Thyristor / Diode Modules


MCD...io1

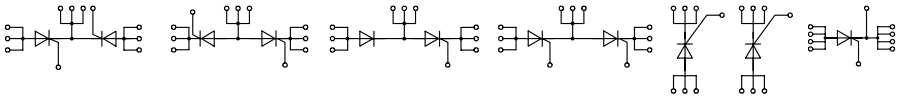
I_{TAV} = 181 - 700 A

Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} @ T_C A °C	I_{TRMS} A	I_{TSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MCD 162-08io1 **MCD 162-12io1** **MCD 162-14io1** **MCD 162-16io1** **MCD 162-18io1**	800 1200 1400 1600 1800	181 85	300	6000	0.88	1.15	125	0.155	0.07	X126b	X126b Weight 150 g
MCD 200-14io1 **MCD 200-16io1** **MCD 200-18io1**	1400 1600 1800	216 85	340	8000	0.8	1.0	125	0.13	0.05		
MCD 224-20io1 **MCD 224-22io1**	2000 2200	240 85	400	8000	0.8	0.76	130	0.139	0.04	X131b	
MCD 220-08io1 **MCD 220-12io1** **MCD 220-14io1** **MCD 220-16io1**	800 1200 1400 1600	250 85	400	8500	0.9	1.0	140	0.139	0.04	X129b	X129b Weight = 750 g
MCD 225-12io1 **MCD 225-14io1** **MCD 225-16io1** **MCD 225-18io1**	1200 1400 1600 1800	221 85	400	8000	0.8	0.76	130	0.157	0.04	X131b	
MCD 250-08io1 **MCD 250-12io1** **MCD 250-14io1** **MCD 250-16io1** **MCD 250-18io1**	800 1200 1400 1600 1800	287 85	450	9000	0.85	0.82	140	0.129	0.04	X129b	X131b Weight = 750 g
MCD 255-12io1 **MCD 255-14io1** **MCD 255-16io1** **MCD 255-18io1**	1200 1400 1600 1800	250 85	450	9000	0.8	0.68	130	0.14	0.04	X131b	
MCD 310-08io1 **MCD 310-12io1** **MCD 310-14io1** **MCD 310-16io1** **MCD 310-18io1**	800 1200 1400 1600 1800	320 85	500	9200	0.8	0.82	140	0.112	0.04	X129b	
MCD 310-20io1 **MCD 310-22io1**	2000 2200	320 85	500	8000	0.8	0.82	140	0.112	0.04	X129b	X136a Weight = 1550 g
MCD 312-12io1 **MCD 312-14io1** **MCD 312-16io1** **MCD 312-18io1**	1200 1400 1600 1800	320 85	520	9200	0.8	0.68	140	0.12	0.04	X131b	
MCD 500-12io1* **MCD 500-16io1** **MCD 500-18io1**	1200 1600 1800	500 89	1294	18200 125°C	0.85	0.27	125	0.062	0.02	X136a	
MCD 500-22io1	2200	500 80	1071	15400 125°C	0.88	0.46	125	0.062	0.02		X136b Weight = 2100 g
MCD 700-12io1W* **MCD 700-16io1W** **MCD 700-18io1W**	1200 1600 1800	700 T_W = 42°C	1331	18200 125°C	0.85	0.27	125	0.062	R_{thJW} = 0.09	X136b	

* for other configurations please contact factory

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Thyristor Modules

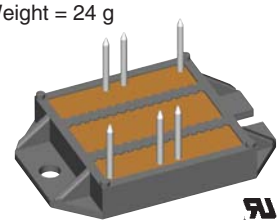


VCK VCA VCD VCC VCC 2x105 VCO

I_{TAV} = 105 - 180 A

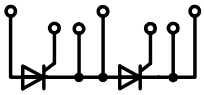
Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} @ T_C A °C	I_{TRMS} A	I_{TSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
VCK 105-08io7	800	105 85	180	2250	0.8	2.4	125	0.26	0.2	X102	
VCK 105-12io7	1200										
VCK 105-14io7	1400										
VCK 105-16io7	1600										
VCK 105-18io7	1800										
VCA 105-08io7	800	105 85	180	2250	0.8	2.4	125	0.26	0.2		
VCA 105-12io7	1200										
VCA 105-14io7	1400										
VCA 105-16io7	1600										
VCA 105-18io7	1800										
VCD 105-08io7	800	105 85	180	2250	0.8	2.4	125	0.26	0.2		
VCD 105-12io7	1200										
VCD 105-14io7	1400										
VCD 105-16io7	1600										
VCD 105-18io7	1800										
VCC 105-08io7	800	105 85	180	2250	0.8	2.4	125	0.26	0.2		
VCC 105-12io7	1200										
VCC 105-14io7	1400										
VCC 105-16io7	1600										
VCC 105-18io7	1800										
VCC 2x105-08io7	800	105 85	180	2250	0.8	2.4	125	0.26	0.2		
VCC 2x105-12io7	1200										
VCC 2x105-14io7	1400										
VCC 2x105-16io7	1600										
VCC 2x105-18io7	1800										
VCO 132-08io7	800	130 85	200	3600	0.8	1.65	150	0.25	0.1		
VCO 132-12io7	1200										
VCO 132-14io7	1400										
VCO 132-16io7	1600										
VCO 132-18io7	1800										
VCO 180-08io7	800	180 90	280	4500	0.75	1.23	150	0.17	0.06		
VCO 180-12io7	1200										
VCO 180-14io7	1400										
VCO 180-16io7	1600										
VCO 180-18io7	1800										

X102 **ECO-PAC 2**
Weight = 24 g

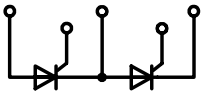


See data sheet for pin arrangement

Thyristor Modules



MCC...io1B



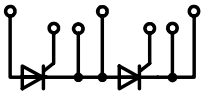
MCC...io8B

I_{TAV} = 18-116 A

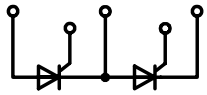
Type	V_{RRM} V_{DRM} V	I_{TAV} @ T_C A °C	I_{TRMS} A	I_{TSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MCC 19-08io1B **MCC 19-12io1B** **MCC 19-14io1B** **MCC 19-16io1B**	800 1200 1400 1600	18 85	40	400	0.85	18	125	1.3	0.2	X125a	
MCC 19-08io8B **MCC 19-12io8B** **MCC 19-14io8B** **MCC 19-16io8B**	800 1200 1400 1600	18 85	40	400	0.85	18	125	1.3	0.2	X125c	X125a **TO-240 AA** Weight = 90 g
MCC 21-08io8B **MCC 21-12io8B** **MCC 21-14io8B** **MCC 21-16io8B**	800 1200 1400 1600	21 85	33	320	0.85	15	125	1.1	0.2	X125c	
MCC 26-08io1B **MCC 26-12io1B** **MCC 26-14io1B** **MCC 26-16io1B**	800 1200 1400 1600	27 85	50	520	0.85	11	125	0.88	0.2	X125a	
MCC 26-08io8B **MCC 26-12io8B** **MCC 26-14io8B** **MCC 26-16io8B**	800 1200 1400 1600	27 85	50	520	0.85	11	125	0.88	0.2	X125c	
MCC 44-08io1B **MCC 44-12io1B** **MCC 44-14io1B** **MCC 44-16io1B** **MCC 44-18io1B**	800 1200 1400 1600 1800	49 85	80	1150	0.85	5.3	125	0.53	0.2	X125a	
MCC 44-08io8B **MCC 44-12io8B** **MCC 44-14io8B** **MCC 44-16io8B** **MCC 44-18io8B**	800 1200 1400 1600 1800	49 85	80	1150	0.85	5.3	125	0.53	0.2	X125c	X125c **TO-240 AA** Weight = 90 g
MCC 56-08io1B **MCC 56-12io1B** **MCC 56-14io1B** **MCC 56-16io1B** **MCC 56-18io1B**	800 1200 1400 1600 1800	60 85	100	1500	0.85	3.7	125	0.45	0.2	X125a	
MCC 56-08io8B **MCC 56-12io8B** **MCC 56-14io8B** **MCC 56-16io8B** **MCC 56-18io8B**	800 1200 1400 1600 1800	60 85	100	1500	0.85	3.7	125	0.45	0.2	X125c	
MCC 72-08io1B **MCC 72-12io1B** **MCC 72-14io1B** **MCC 72-16io1B** **MCC 72-18io1B**	800 1200 1400 1600 1800	85 85	180	1700	0.85	3.2	125	0.3	0.2	X125a	
MCC 72-08io8B **MCC 72-12io8B** **MCC 72-14io8B** **MCC 72-16io8B** **MCC 72-18io8B**	800 1200 1400 1600 1800	85 85	180	1700	0.85	3.2	125	0.3	0.2	X125c	
MCC 94-20io1B **MCC 94-22io1B**	2000 2200	104 85	180	1700	0.85	3.2	125	0.22	0.2	X125a	
MCC 95-08io1B **MCC 95-12io1B** **MCC 95-14io1B** **MCC 95-16io1B** **MCC 95-18io1B**	800 1200 1400 1600 1800	116 85	180	2250	0.8	2.4	125	0.22	0.2	X125a	

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Thyristor Modules, Dual



MCC...io1B



MCC...io8B

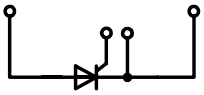
I_{TAV} = 116-700 A

Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} @ T_C A °C	I_{TRMS} A	I_{TSM} 45°C 10 ms A	V_{T0} V	r_T m Ω	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MCC 95-08io8B **MCC 95-12io8B** **MCC 95-14io8B** **MCC 95-16io8B** **MCC 95-18io8B**	800 1200 1400 1600 1800	116 85	180	2250	0.8	2.4	125	0.22	0.2	X125c	X125c **TO-240 AA** Weight = 90 g
MCC 132-08io1 **MCC 132-12io1** **MCC 132-14io1** **MCC 132-16io1** **MCC 132-18io1**	800 1200 1400 1600 1800	130 85	300	4750	0.8	1.5	125	0.23	0.1	X126a	
MCC 161-20io1 **MCC 161-22io1**	2000 2200	165 85	300	6000	0.8	1.6	125	0.155	0.07		X126a Weight 150 g
MCC 162-08io1 **MCC 162-12io1** **MCC 162-14io1** **MCC 162-16io1** **MCC 162-18io1**	800 1200 1400 1600 1800	181 85	300	6000	0.88	1.15	125	0.155	0.07		
MCC 170-12io1 **MCC 170-14io1** **MCC 170-16io1** **MCC 170-18io1**	1200 1400 1600 1800	203 85	350	5400	0.8	1.0	130	0.164	0.04	X131a	
MCC 200-14io1 **MCC 200-16io1** **MCC 200-18io1**	1400 1600 1800	216 85	340	8000	0.8	1.0	125	0.13	0.05	X126a	X129a Weight = 750 g
MCC 220-08io1 **MCC 220-12io1** **MCC 220-14io1** **MCC 220-16io1** **MCC 220-18io1**	800 1200 1400 1600 1800	250 85	400	8500	0.9	1.0	140	0.139	0.04	X129a	
MCC 224-20io1 **MCC 224-22io1**	2000 2200	240 85	400	8000	0.8	0.76	130	0.139	0.04	X131a	
MCC 225-12io1 **MCC 225-14io1** **MCC 225-16io1** **MCC 225-18io1**	1200 1400 1600 1800	221 85	400	8000	0.8	0.76	130	0.157	0.04		X131a Weight = 750 g
MCC 250-08io1 **MCC 250-12io1** **MCC 250-14io1** **MCC 250-16io1** **MCC 250-18io1**	800 1200 1400 1600 1800	287 85	450	9000	0.85	0.82	140	0.129	0.04	X129a	
MCC 255-12io1 **MCC 255-14io1** **MCC 255-16io1** **MCC 255-18io1**	1200 1400 1600 1800	250 85	450	9000	0.8	0.68	130	0.14	0.04	X131a	
MCC 310-08io1 **MCC 310-12io1** **MCC 310-14io1** **MCC 310-16io1** **MCC 310-18io1**	800 1200 1400 1600 1800	320 85	500	9200	0.8	0.82	140	0.112	0.04	X129a	X136a Weight = 1550 g
MCC 312-12io1 **MCC 312-14io1** **MCC 312-16io1** **MCC 312-18io1**	1200 1400 1600 1800	320 85	520	9200	0.8	0.68	140	0.12	0.04	X131a	
MCC 500-12io1*	1200	500 89	785	18200	0.85	0.27	125	0.062	0.02	X136a	
MCC 500-14io1 **MCC 500-16io1** **MCC 500-18io1**	1400 1600 1800			125°C							X136b Weight = 2100 g
MCC 500-22io1*	2200	500 80	1071	15400 125°C	0.88	0.46	125	0.062	0.02		
MCC 700-12io1W **MCC 700-16io1W** **MCC 700-18io1W**	1200 1600 1800	700 T_W = 42°C	1331	18200 125°C	0.85	0.27	125	0.062	R_{thJW} = 0.09	X136b	

* for other configurations please contact factory

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

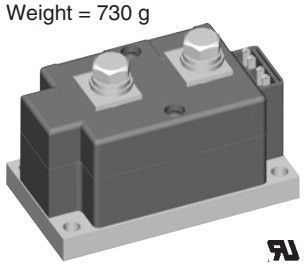
Thyristor Modules, Single



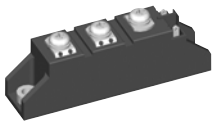
MCO

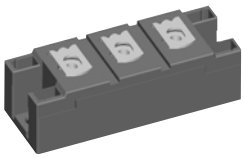
I_{TAV} = 31-600 A

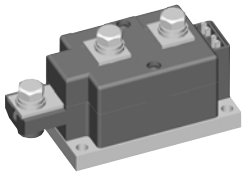
Type ➤ New	V_{RRM} V_{DRM} V	I_{TAV} A	T_C °C	I_{TRMS} A	I_{TSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thCH} per Chip K/W	Fig. No.	Package style Outline drawings on page 188 - 224
MCO 25-12io6 **MCO 25-16io6**	1200 1600	31	80	49	370	0.85	14	150	1.1	0.5	X027a	X027a **SOT-227B** Weight = 30 g **miniBLOC**
MCO 50-12io6 **MCO 50-16io6**	1200 1600	54	80	85	740	0.9	5.8	150	0.72	0.4		
➤ **MCO 75-12io6** ➤ **MCO 75-16io6**	1200 1600	77	80	121	1070	0.85	5.5	150	0.45	0.2		
MCO 100-12io6 **MCO 100-16io6**	1200 1600	99	80	156	1400	0.85	4.5	150	0.35	0.15		
MCO 150-12io1 **MCO 150-16io1**	1200 1600	149	80	234	2000	0.8	3.8	150	0.2	0.1		
MCO 450-20io1 **MCO 450-22io1**	2000 2200	464	85	750	15000	0.77	0.42	130	0.072	0.024	X132a	X132a Weight = 730 g
MCO 500-12io1 **MCO 500-14io1** **MCO 500-16io1** **MCO 500-18io1**	1200 1400 1600 1800	560	85	880	17000	0.8	0.38	140	0.072	0.024		
MCO 600-16io1 **MCO 600-18io1** **MCO 600-20io1** **MCO 600-22io1**	1600 1800 2000 2200	600	85	928	15000	0.77	0.42	140	0.065	0.02		

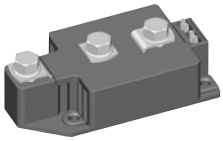


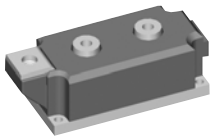
Optional Accessories for Thyristor / Diode Modules





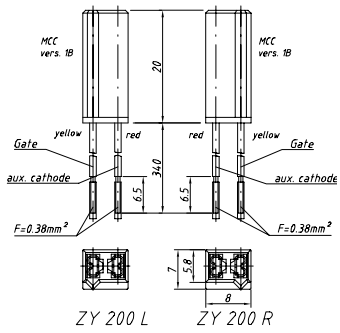






For module-types MCC 19, 26, 44, 56, 60, 72, 94 and 95 version 1:
Keyed Gate Cathode twin plugs with wire length = 350 mm;
gate = yellow, cathode = red

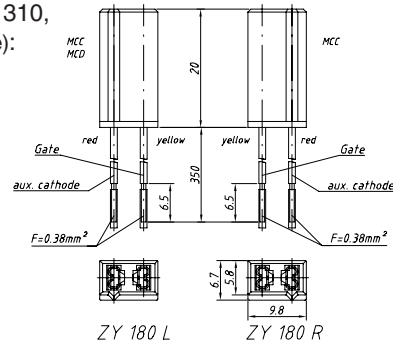
Type **ZY 200 L** (L = Left for pin pair 4/5)
Type **ZY 200 R** (R = Right for pin pair 6/7)



For ZY 180 and ZY 200: UL Styles 1385

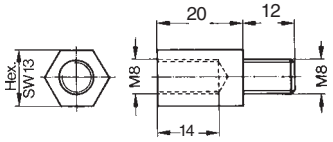
For module types MCC/MCD/MCO 122, 132, 161, 162, 170, 200, 220, 224, 225, 250, 255, 310, 312, 500 and MII 400 (for MCD/MCO only L-type):
Keyed Gate Cathode twin plugs
with wire length = 350 mm
gate = yellow, cathode = red

Type **ZY 180 L** (L = Left for pin pair 4/5)
Type **ZY 180 R** (R = Right for pin pair 6/7)



For module types
MCC/MCD/MDD 220, 250, 310
Threaded spacer for higher Anode / Cathode construction:

Type **ZY 250** (material brass)



Design Information

For Thyristors, Diodes, Thyristor / Diode Modules and Rectifier Bridges

Surge current

The 60 Hz value of I_{TSM} is 10 % higher than the 50 Hz value
The I_{TSM} value at T_{VJM} is 10 to 15 % lower than the 45°C value

Limiting I^2t

50 Hz: I^2t (in A^2s) = I_{TSM} (A) • I_{TSM} (A) • 0.005 (s); use rated I_{TSM} value (10 ms)
60 Hz: I^2t (in A^2s) = I_{TSM} (A) • I_{TSM} (A) • 0.0042 (s); use 60-Hz-value of I_{TSM}

Forward current

The average current ratings in tables are mostly specified for temperature conditions of: T_A = 45°C, T_C = 85°C or T_C = 100°C.
For other temperature conditions, the current ratings can be calculated using the following formulas, applicable up to 400 Hz.

$$I_{TAV} = \frac{-V_{T0} + \sqrt{V_{T0}^2 + 4 \bullet k^2 \bullet r_T \bullet P}}{2 \bullet k^2 \bullet r_T} \quad \text{where} \quad P = \frac{T_{VJM} - T_C}{R_{thJC}} \quad \text{or} \quad P = \frac{T_{VJM} - T_A}{R_{thJA}}$$

I_{TAV} (A), P (W); V_{TO} (V); r_T (Ω), T_{VJM} (°C), T_C (°C), T_A (°C)
R_{thJC} (K/W), R_{thJA} (K/W)

k^2 = 1 for DC current
k^2 = 2.5 for sinusoidal half wave current
k^2 = 3.0 for 120° rectangular current
k^2 = 6.0 for 60° rectangular current

The average forward current is limited by the RMS current value I_{TRMS}. When the **calculated** value I_{TAV} is higher than I_{TRMS}/ k, replace it by $I_{TAV} = I_{TRMS}$/k.

Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.