Sixpack Modules

I_{C80} [A]	NPT	NPT[3]	Trench IGBT	PT IGBT	Package
➤ New			600 V		
41				➤ MWI 60 - 06 G6K	E1
30 50 60	MWI 30 - 06 A7 MWI 50 - 06 A7 MWI 75 - 06 A7				E2
88 115 155	MWI 100 - 06 A8 MWI 150 - 06 A8 MWI 200 - 06 A8				E3
			1200 V		
13 21 31 36 41 56	MWI 15 - 12 A6K	➤ MWI 30 - 12 E6K ➤ MWI 50 - 12 E6K	➤ MWI 45 - 12 T6K ➤ MWI 60 - 12 T6K ➤ MWI 80 - 12 T6K		E1
20 35 44 50 60 62 75	MWI 15 - 12 A7 MWI 25 - 12 A7 MWI 35 - 12 A7 MWI 50 - 12 A7	MWI 25 - 12 E7 MWI 50 - 12 E7	➤ MWI 50-12T7* ➤ MWI 75-12T7*		E2
75 85 90 100 110 115 150	MWI 75 - 12 A8 MWI 100 - 12 A8	MWI 75 - 12 E8 MWI 100 - 12 E8	➤ MWI 75-12T8* ➤ MWI 100-12T8* ➤ MWI 150-12T8*		E3
250 375 440		➤ MWI 225 - 12 E9 ➤ MWI 300 - 12 E9 ➤ MWI 450 - 12 E9			E+
			1700 V		
235 350 440		➤ MWI 225 - 17 E9 ➤ MWI 300 - 17 E9 ➤ MWI 450 - 17 E9			E+

* different pin-out compared to NPT and NPT[3] modules

CBI Modules

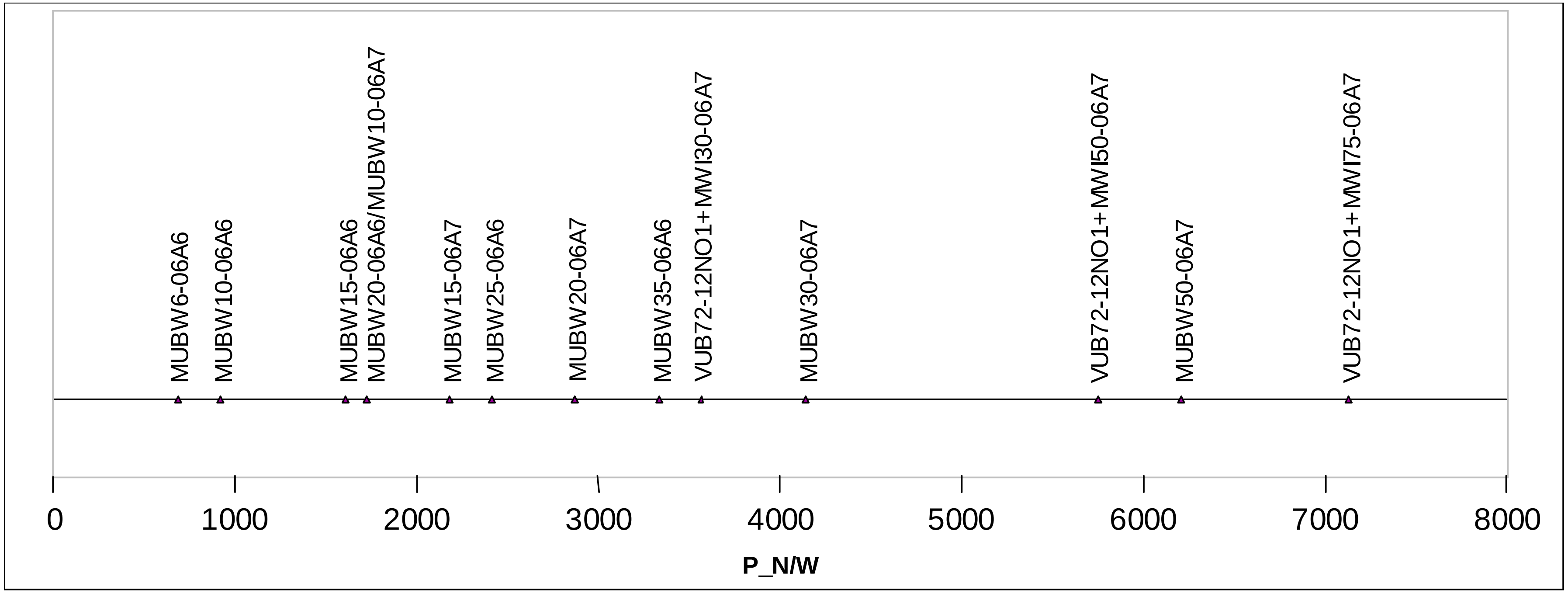
I_{C80} [A]	NPT	NPT^3	Trench IGBT	Package
➤ New		600 V		
8	MUBW 10 - 06 A6K			
14	MUBW 15 - 06 A6K			
17	MUBW 20 - 06 A6K			E1
21	MUBW 25 - 06 A6K			
29	MUBW 35 - 06 A6K			
15	MUBW 10 - 06 A7			
18	MUBW 15 - 06 A7			
25	MUBW 20 - 06 A7			E2
35	MUBW 30 - 06 A7			
50	MUBW 50 - 06 A7			
50	MUBW 50 - 06 A8			
65	MUBW 75 - 06 A8			E3
85	MUBW 100 - 06 A8			
		1200 V		
13	MUBW 15 - 12 A6K			
21	MUBW 30 - 12 A6K	➤ MUBW 30 - 12 E6K		E1
32			➤ MUBW 45 - 12 T6K	
15	MUBW 10 - 12 A7		➤ MUBW 15-12T7	
25	MUBW 15 - 12 A7		➤ MUBW 25-12T7	E2
35	MUBW 25 - 12 A7			
35	MUBW 35 - 12 A7	MUBW 35 - 12 E7		
35	MUBW 35 - 12 A8			
50			➤ MUBW 50 - 12 T8	
60	MUBW 50 - 12 A8	MUBW 50 - 12 E8		E3
75			➤ MUBW 75 - 12 T8	

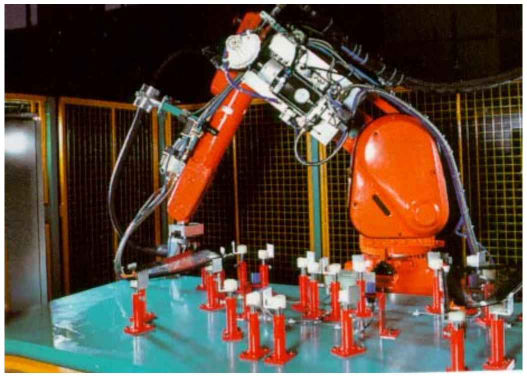
Full Bridge Modules (Four Pack)

I_{C80} [A]	NPT	Fast NPT	NPT^3	Package
➤ New		600 V		
45	MKI 50 - 06 A7			E2
85	MKI 75 - 06 A7			
		1200 V		
45		➤ MKI 50 - 12 F7		E2
62			➤ MKI 50 - 12 E7	
85		➤ MKI 100 - 12 F8		
90			MKI 75 - 12 E8	E3
115			MKI 100 - 12 E8	

CBI-Modules 600 V

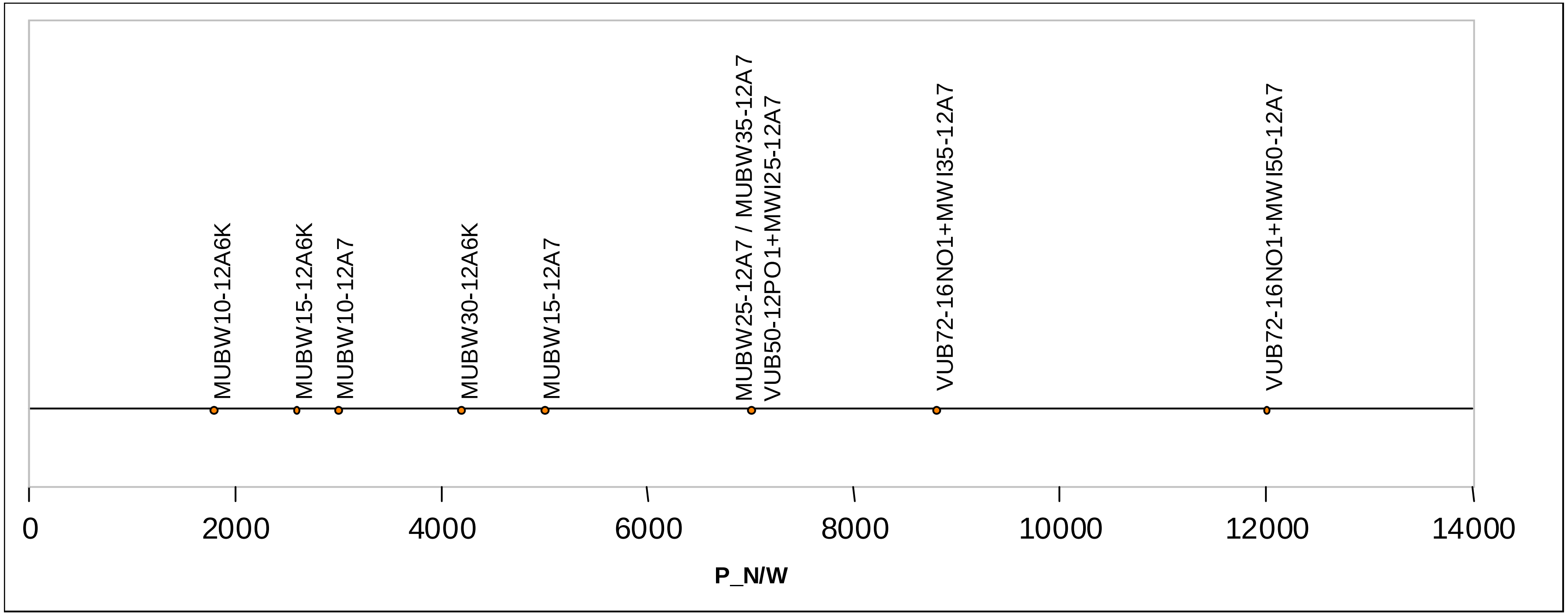
Estimation of typ. nom. power of the drive connection to 230 V 1~ or 127 V 3~

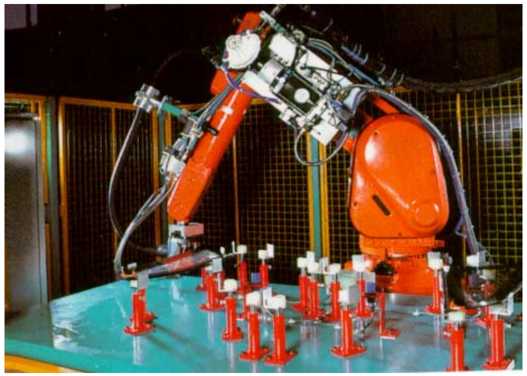




CBI-Modules 1200 V

Estimation of typ. nom. power of the drive connection to 230 V 3~





IGBT and Rectifier Combination

Sixpack Modules

	$Pnom_{Mot}$	$Inom_{Mot}$	Input Stage	Pkg.	V_{RRM}	I_{dAV}	Output Stage	Pkg.	B_{VCES}	I_{C80}	
Rectifier	5.5 kW	11.2 A	VUO 22	V1	800-1800 V	22 A	MWI 15-12 A7	E2	1200 V	22 A	Sixpack
	7.5 kW	16 A	VUO 34			36 A	MWI 25-12 A7			35 A	
	11 kW	22 A	VUO 52			54 A	MWI 35-12 A7			44 A	
	15 kW	30 A	VUO 80			82 A	MWI 50-12 A7			60 A	
	22 kW	44 A	VUO 120	V2	800-1800 V	121 A	MWI 75-12 A8	E3	1200 V	100 A	
	30 kW	60 A	VUO 155			157 A	MWI 100-12 A8			123 A	
Rectifier & Brake chopper	11 kW	22 A	VUB 50	Ec2 [1]	1200-1600 V	56 A	MWI 35-12 A7	E2	1200 V	44 A	Sixpack
	15 kW	30 A	VUB 50			56 A	MWI 50-12 A7			60 A	
	15 kW	30 A	VUB 72	V2	1200-1600 V	110 A	MWI 50-12 A7	E2	1200 V	60 A	
	22 kW	44 A	VUB 116	E2		116 A	MWI 75-12 A8	E3		100 A	
			VUB 120	V2		121 A	MWI 75-12 A8			100 A	
	30 kW	60 A	VUB 145	E2		145 A	MWI 100-12 A8			123 A	
			VUB 160	V2		157 A	MWI 100-12 A8			123 A	
[2]	22 kW	44 A	VVZB 120	V	1200-1600 V	120 A	MWI 75-12 A8	E2	1200 V	100 A	

[1] ECO-PAC 2

[2] half controlled Rectifier

Estimation based on the assumption of a max. motor current of 1.6 x nominal motor current for 1 minute.

Insulated Gate Bipolar Transistors (IGBT)

The IGBT is a combination of bipolar and MOS technologies. The best features of bipolar transistors are merged with the voltage-controlled properties of MOSFETs.

Advantages to the user:

- rugged, short-circuit-proof device (S-series, D-series and E-series)
- operation without protective snubber networks possible
- frequency range to well above 100 kHz
- low switching losses
- compact equipment design
- high efficiency

The IGBT is suitable for numerous applications in power electronics, especially in Pulse Width Modulated servo and three-phase drives requiring high dynamic range control and low noise. It also can be used in Uninterruptible Power Supplies (UPS), Switch Mode Power Supplies (SMPS), and other power circuits requiring high switch repetition rates. IGBTs improve dynamic performance and efficiency and reduce the level of audible noise. IGBTs are equally suitable in resonant converter circuits. Optimized IGBTs are available for both low conduction loss and low switching loss. See table 1 and 2.

Discrete standard "G" series IGBTs are characterized by a high control gain, which limits their short-circuit withstand time. Newer "S", "D" and "E" series products utilize newly developed IGBT chips capable of withstanding up to 10 µs in short-circuit, even with a 15 V gate drive.

A switch is only as good as its companion free-wheeling diode. For this reason, all IGBTs with integrated diodes incorporate ultra-fast-recovery epitaxial diodes (FREDs) with very low reverse recovery charge (Q_{rr}). These same diodes are also available as separate elements for use in IGBT circuits or any other application requiring high diode switching speeds.

The IGBT modules use **D**irect **C**opper **B**onded (DCB) substrates, which consist of an aluminium oxide (Al_2O_3) insulator to which copper is directly bonded using the latest techniques developed by IXYS.

Die Type	Low V_{CEsat}	Low Switching losses	R_{thJC}	Short Circuit Rated	Optimized Operation frequency
Low loss NPT	-	-	++	yes	
Fast NPT	- -	++	++	yes	up to 30 kHz
NPT³	o	+	++	yes	10 to 20 kHz
Trench	++	o	+	yes	up to 10 kHz
PT IGBT	-	+++	++	no	up to 50 kHz

IGBT Modules

PT IGBT — punch through IGBT, very low switching losses

NPT IGBT — non-punch through insulated gate bipolar transistor; square RBSOA, short circuit rated

NPT³ IGBT — improved NPT IGBT
- reduced Vcesat
- reduced switching losses
- optimized for switching frequencies from 10 kHz up to 25 kHz

Trench IGBT — improved NPT IGBT
- very low Vcesat
- reduced switching losses
- optimized for switching frequencies up to 10 kHz

IGBT Modules - Sixpack configuration

Package style

Outline drawings on page O-5...O-17

6-pack

IGBT Modules

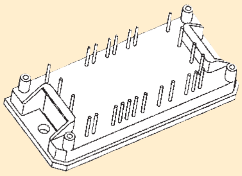
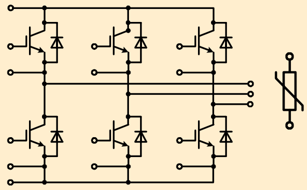


Fig. 49a

Package style

Outline drawings on pages O-1...O-3

See data sheet for pin arrangements



Type ➤ New	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V PT IGBT									
➤ **MWI 60-06G6K**	600	60	41	2.3	0.5	0.7	48	33	●
1200 V NPT IGBT									
➤ **MWI 15-12A6K**	1200	19	13	3.0	1.1	1.37	24	16	●
1200 V NPT³ IGBT									
➤ **MWI 30-12E6K**	1200	29	21	2.5	1.8	0.95	24	16	●
➤ **MWI 50-12E6K**		51	36	2.4	2.6	0.6	49	32	●
1200 V Trench IGBT									
➤ **MWI 45-12T6K**	1200	43	31	1.9	3.4	0.8	49	32	●
➤ **MWI 60-12T6K**		58	41	1.9	4.8	0.62	49	32	●
➤ **MWI 80-12T6K**		80	56	2.0	6.5	0.46	80	51	●

6-pack

IGBT - Modules

➤ New

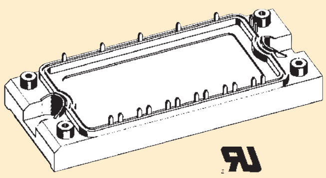
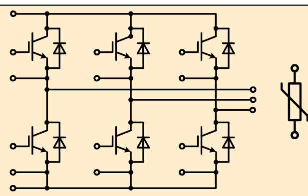


Fig. 81

Package style

Outline drawings on pages O-1...O-3



Type	V_{CES} V	I_{C25} A 25°C IGBT	I_{C80} A 80°C IGBT	$V_{CE(sat)\ typ}$ V 25°C IGBT	E_{off} mJ 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A 25°C diode	I_{F80} A 80°C diode	NTC optinal
600 V NPT IGBT									
MWI 30-06A7	600	45	30	1.9	1.0	0.88	36	24	●
MWI 50-06A7		75	50	1.9	1.7	0.55	72	45	●
MWI 75-06A7		90	60	2.1	2.5	0.44	140	85	●
1200 V NPT IGBT									
MWI 15-12A7	1200	30	20	1.0	1.8	0.88	25	17	
MWI 25-12A7		50	35	2.2	2.8	0.55	50	33	●
MWI 35-12A7		62	44	2.2	4.2	0.44	50	33	●
MWI 50-12A7		85	60	2.2	5.6	0.35	110	70	●
1200 V NPT³ IGBT									
➤ **MWI 25-12E7**	1200	52	36	1.9	2.5	0.55	50	33	
MWI 50-12E7		90	62	2.1	4.0	0.35	110	70	
1200 V Trench IGBT									
➤ **MWI 50-12T7**	1200	75	50	1.7	6.5	0.49	110	70	
➤ **MWI 75-12T7**		105	75	1.7	9.5	0.35	150	100	

IGBT Modules - Sixpack configuration

6-pack
IGBT - Modules

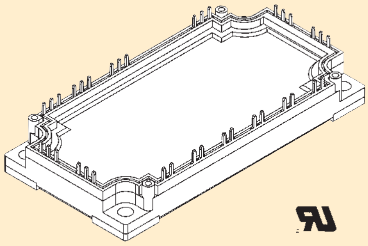
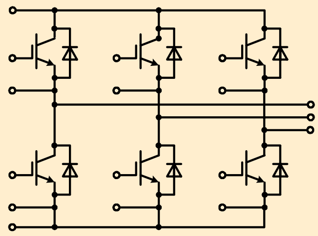


Fig. 77

Package style

Outline drawings on pages O-1...O-3



➤ New

Type	V_{CES} V	I_{C25} A $T_C = 25°C$ IGBT	I_{C80} A $T_C = 80°C$ IGBT	$V_{CE(sat)\ typ}$ V $T_J = 25°C$ IGBT	E_{off} mJ $T_J = 125°C$ IGBT	R_{thJC} K/W IGBT	I_{F25} A $T_C = 25°C$ diode	I_{F80} A $T_C = 80°C$ diode
600 V NPT IGBT								
MWI 100-06A8	600	130	88	2.0	2.9	0.3	140	88
MWI 150-06A8		170	115	2.0	4.6	0.24	210	130
MWI 200-06A8		215	155	2.0	6.3	0.18	260	165
1200 V NPT IGBT								
MWI 75-12A8	1200	125	85	2.2	10.5	0.25	150	100
MWI 100-12A8		160	110	2.2	14.6	0.19	200	130
1200 V NPT³ IGBT								
MWI 75-12E8	1200	130	90	2.0	7.5	0.25	150	100
MWI 100-12E8		165	115	2.0	10.0	0.19	200	130
1200 V Trench IGBT								
➤ **MWI 75-12T8**	1200	100	75	1.7	9.5	0.35	150	100
➤ **MWI 100-12T8**		140	100	1.7	12	0.26	200	130
➤ **MWI 150-12T8**		200	150	1.7	17	0.18	tbd	tbd

NPT³ IGBT Modules in E+ package

NPT IGBT = non-punch through insulated gate bipolar transistor; square RBSOA, short circuit rated

6-pack
IGBT - Modules

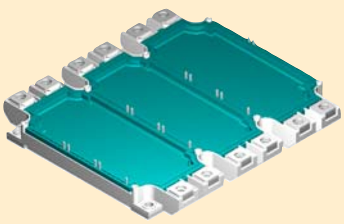
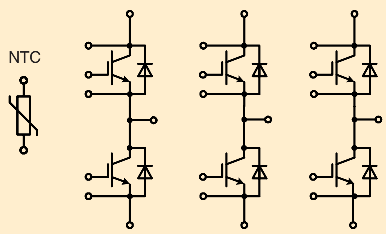


Fig. 95

Package style

Outline drawings on pages O-1...O-3



Type ➤ New	V_{CES} V	I_{C25} A $T_C =$ 25°C IGBT	I_{C80} A $T_C =$ 80°C IGBT	$V_{CE(sat)\ typ}$ V $T_J =$ 25°C IGBT	E_{off} mJ $T_J =$ 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A $T_C =$ 25°C diode	I_{F80} A $T_C =$ 80°C diode	ther-mistor
1200 V NPT³ IGBT									
➤ **MWI 225-12E9**	1200	355	250	2.1	20	0.09		205	●
➤ **MWI 300-12E9**		530	375	2.0	30	0.06		300	●
➤ **MWI 450-12E9**		640	440	2.2	45	0.057		450	●
1700 V NPT³ IGBT									
➤ **MWI 225-17E9**	1700	335	235	2.5	54	0.085		200	●
➤ **MWI 300-17E9**		500	350	2.3	80	0.057		290	●
➤ **MWI 450-17E9**		580	405	2.25	90	0.057		450	●

CBI Modules

CBI = Converter Brake Inverter
three phase rectifier, IGBT brake chopper, three phase IGBT inverter, temperature sensor

CBI 1

IGBT Modules

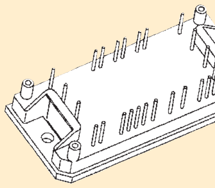
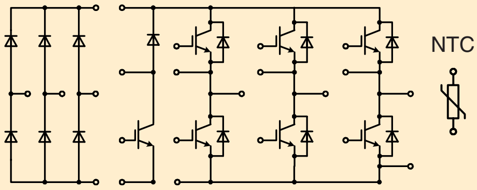


Fig. 49a

Package style

Outline drawings on pages O-1...O-3



Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM}	I_{DAVM} T_H = 80°C	R_{thJC} typ.	V_{CES}	I_C T_C = 25°C	I_C T_C = 80°C	$V_{CE(sat)}$ typ.	R_{thJC} typ.	V_{CES}	I_C T_C = 80°C	R_{thJC} typ.
➤ New	V	A	K/W	V	A	A	V	K/W	V	A	K/W
600 V NPT IGBT											
MUBW 10-06A6K	1600	61	2.1	600	12	8	2.5	2.8	600	8	2.8
MUBW 15-06A6K		65	1.9		19	14	2.4	1.7		8	2.8
MUBW 20-06A6K		65	1.9		25	17	2.0	1.5		8	2.8
MUBW 25-06A6K		65	1.9		31	21	2.1	1.25		14	1.7
MUBW 35-06A6K		89	1.4		42	29	2.3	0.95		17	1.5
1200 V NPT IGBT											
MUBW 15-12A6K	1600	89	1.4	1200	19	13	3.0	1.35	1200	13	1.35
MUBW 30-12A6K		89	1.4		30	21	3.0	0.95		13	1.35
1200 V NPT³ IGBT											
➤ **MUBW 30-12E6K**	1600	89	1.4	1200	30	21	3.1	0.95	1200	13	1.35
1200 V Trench IGBT											
➤ **MUBW 45-12T6K**	1600			1200					1200		

CBI 2

IGBT - Modules

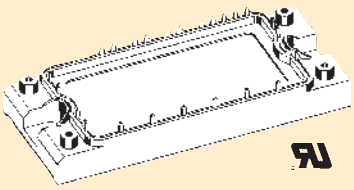
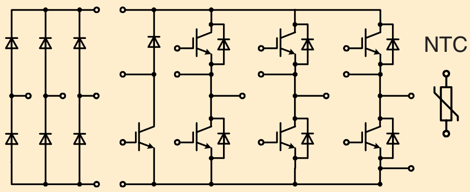


Fig. 81

Package style

Outline drawings on pages O-1...O-3



Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM}	I_{DAVM} T_C = 80°C d = $^1/_3$	R_{thJC} max.	V_{CES}	I_C T_C = 25°C	I_C T_C = 80°C	$V_{CE(sat)}$ typ.	R_{thJC} max.	V_{CES}	I_C T_C = 80°C	R_{thJC} max.
➤ New	V	A	K/W	V	A	A	V	K/W	V	A	K/W
600 V NPT IGBT											
MUBW 10-06A7	1600	18	1.5	600	20	15	1.9	1.5	600	15	1.5
MUBW 15-06A7		18	1.5		25	18	1.9	1.3		15	1.5
MUBW 20-06A7		24	1.3		35	25	1.9	1.0		18	1.4
MUBW 30-06A7		24	1.3		50	35	1.9	0.7		18	1.3
MUBW 50-06A7		29	1.1		75	50	1.9	0.5		25	1.0
1200 V NPT IGBT											
MUBW 10-12A7	1600	18	1.5	1200	20	15	2.3	1.2	1200	15	1.2
MUBW 15-12A7		24	1.3		35	25	2.0	0.7		15	1.2
MUBW 25-12A7		24	1.3		50	35	2.2	0.55		15	1.2
MUBW 35-12A7		29	1.1		50	35	2.5	0.55		25	0.7
1200 V NPT³ IGBT											
MUBW 35-12E7	1600	29	1.1	1200	52	36	2.2	0.55	1200	25	0.7
1200 V Trench IGBT											
➤ **MUBW15-12T7**	1600	24	1.3	1200	25	15	1.7	1.2	1200	15	1.2
➤ **MUBW 25-12T7**		24	1.3		40	25	1.7	0.8		15	1.2

CBI Modules

CBI = Converter Brake Inverter
three phase rectifier, IGBT brake chopper, three phase IGBT inverter, temperature sensor

CBI 3

IGBT - Modules

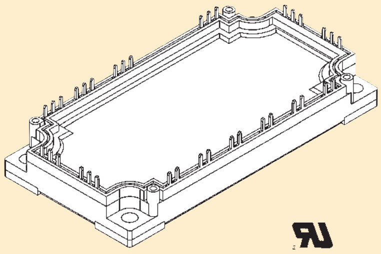
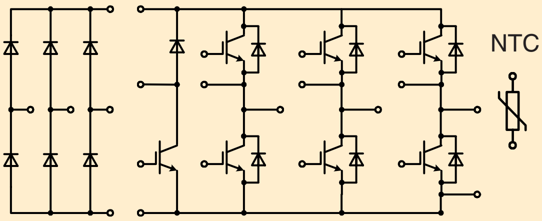


Fig. 77



Package style

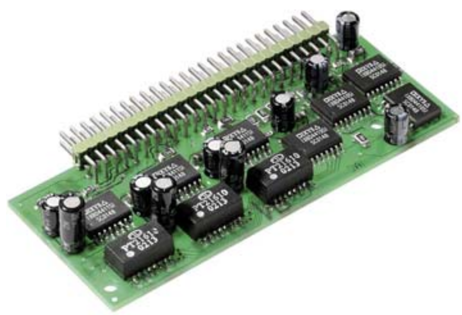
Outline drawings on pages O-5...O-17

Type ➤ New	Rectifier 3~ V_{RRM} V	 I_{DAVM} T_C= 80°C d = 1/3 A	 R_{thJC} max. K/W	Inverter 3~ V_{CES} V	 I_C T_C = 25°C A	 I_C T_C = 80°C A	 $V_{CE(sat)}$ typ. V	 R_{thJC} max. K/W	Brake chopper V_{CES} V	 I_C T_C = 80°C A	 R_{thJC} max. K/W
600 V NPT IGBT											
MUBW 50-06A8	1600	40	1.1	600	75	50	1.9	0.5	600	25	1.0
MUBW 75-06A8		46	0.94		100	65	2.0	0.39		35	0.75
MUBW 100-06A8		60	0.73		125	85	1.9	0.3		50	0.55
1200 V NPT IGBT											
MUBW 35-12A8	1600	27	1.3	1200	50	35	2.5	0.55	1200	25	0.7
MUBW 50-12A8		46	0.94		85	60	2.2	0.35		35	0.55
1200 V NPT³ IGBT											
MUBW 50-12E8	1600	50	0.94	1200	90	62	1.9	0.35	1200	35	0.55
1200 V Trench IGBT											
➤ **MUBW 50-12T8**	1600	50	0.94	1200	75	50	1.7	0.45	1200	35	0.55
➤ **MUBW 75-12T8**		50	0.94		105	75	1.7	0.35		35	0.55

Gate Driver Board *GDBD 4410*

drives 7 Gates of a Converter – Break – Inverter IGBT Power Module for Industrial Applications

GDBD 4410 simplifies driving CBI2 and CBI3 module types. Pin locations of the driver board match that of the CBI modules. Thus it can be mounted very close to the gate control pins of the module, providing the shortest possible traces from driver to the gate and an easy routing on the main inverter board. GDBD4410 is a fast and easy to use solution and ideal for small and medium inverter series.



Main features are:

- Drives CBI modules up to 100A/600V and 50A/1200V
- Driver for brake IGBT included
- Design is based on IXBD4410/11 chipset
- High output gate current up to ± 2A peak per gate
- Integrated charge pump for negative gate drive to speed up IGBT turn off and the suppress spurious gate noise triggering
- Noise immune pulse transformer for high dV/dt applications (>50kV/µs)
- V_{CEsat} sensing for short circuit protection
- Failure status signal
- Ground referenced and TTL/CMOS compatible interface for control signals
- +15V unipolar power supply required
- Operating frequency up to 25 kHz

IGBT Modules - Full Bridge configuration

Full Bridge

IGBT - Modules

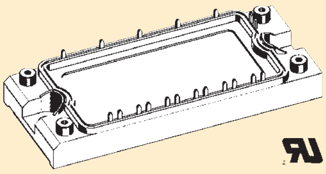
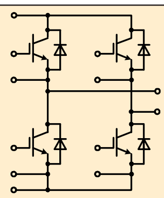


Fig. 81

Package style

Outline drawings on pages O-1...O-3



➤ New

Type	V_{CES} V	I_{C25} A 25°C IGBT	I_{C80} A 80°C IGBT	$V_{CE(sat)\ typ}$ V 25°C IGBT	E_{off} mJ 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A 25°C diode	I_{F80} A 80°C diode
600 V NPT IGBT								
MKI 50-06A7 **MKI 75-06A7**	600	72 90	50 60	1.9 2.1	1.7 2.5	0.55 0.44	72 140	45 85
1200 V Fast NPT IGBT								
➤ **MKI 50-12F7**	1200	65	45	3.2	2.5	0.35	110	70
1200 V NPT³ IGBT								
➤ **MKI 50-12E7**	1200	90	62	1.9	4.0	0.35	110	70

Full Bridge

IGBT - Modules

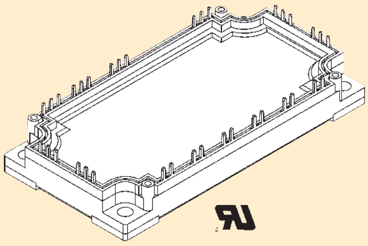
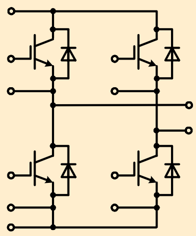


Fig. 77

Package style

Outline drawings on pages O-1...O-3



➤ New

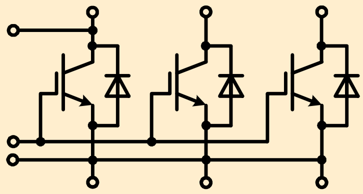
Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode
1200 V Fast NPT IGBT								
➤ **MKI 100-12F8**	1200	125	85	3.3	5.0	0.19	200	130
1200 V NPT³ IGBT								
MKI 75-12E8 **MKI 100-12E8**	1200	130 165	90 115	2.0 2.0	7.5 10.0	0.25 0.19	150 200	100 130

IGBT Modules

NPT³ IGBT Modules

- low loss and smooth switching
- AlSiC base plate for high power cycling capacity
- AlN substrate for low thermal resistance

High Power Single Switch



Type ➤ New	V_{CES} V	$I_{C\ 25}$ A T_C = 25°C IGBT	$I_{C\ 80}$ A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	$I_{F\ 25}$ A T_C = 25°C diode	$I_{F\ 80}$ A T_C = 80°C diode	Fig.
MIO 1800-17E10	1700	2500	1800	2.3	670	0,009	tbd	tbd	96
MIO 2400-17E10	1700	3300	2400	2.3	980	0,007			
➤ MIO 1200-25E10	2500	1650	1200	2.5	1250	0,009			
➤ MIO 1500-25E10	2500	2100	1500	2.7	1450	0,008			
MIO 1200-33E10	3300	1650	1200	3.1	1950	0,0085			
High Voltage Package with enlarged strike and creepage distance									
➤ MIO 1200-33E11	3300	1650	1200	3.1	2000	0,0085	tbd	tbd	97
➤ MIO 600-65E11	6500	840	600	4.2	3500	0,011			

Package style

Outline drawings on pages O-1...O-3

Fig. 96
Weight = 1500 g

Fig. 97
Weight = 1500 g

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 Under-writers 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.

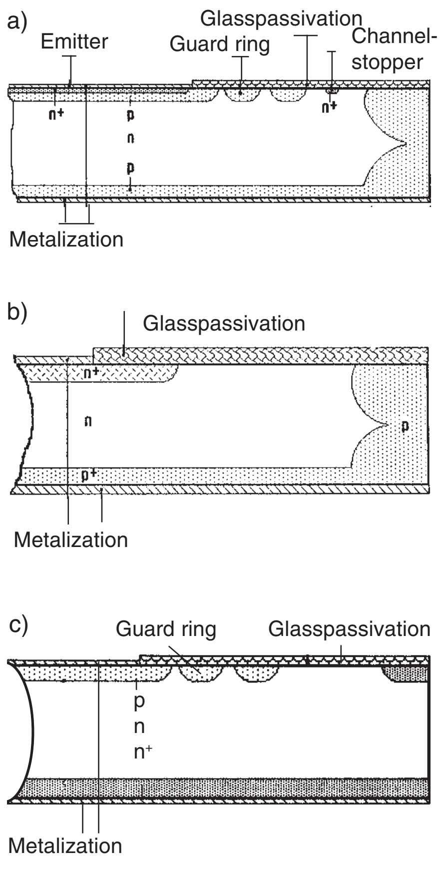


Fig. 1a-c: Cross sections of thyristor and diode chips in the passivation area

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

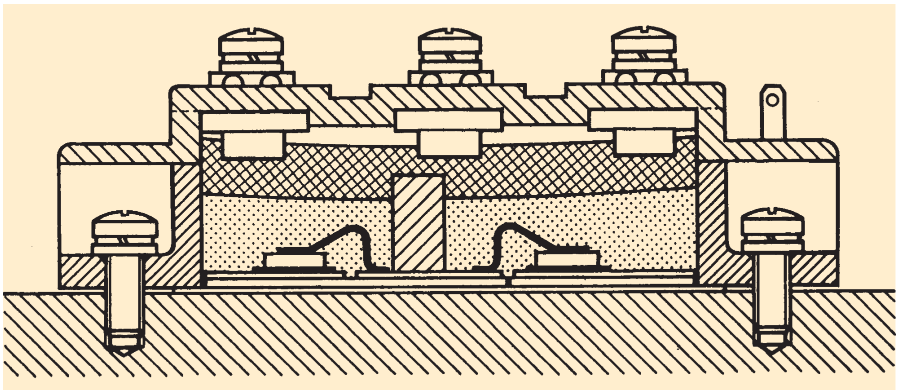
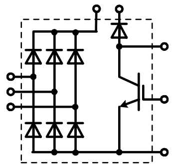


Fig. 2: Principal cross section of an IXYS module with DCB technology

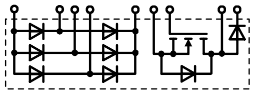
3~ Rectifier Bridges

with IGBT and Diode for Brake Unit

VUB...



VUBM...



Type	Rectifier			IGBT		fast Diode			Fig. No.
	V_{RRM}	I_{dAV} @	T_H	V_{CES}	I_{C80}	V_{RRM}	$I_{F(AV)}$	t_{rr}	
➤ New	V	A	°C	V	A	V	A	ns	
VUB 33-06P1 VUBM 33-05P1	600 500	22 48	90 T_C = 100	600 500	33 36/MOSFET	600 600	24 30	30 30	25
VUB 50-12PO1 VUB 50-16PO1	1200 1600	56	T_C = 100	1200	10	1200	10	110	25
VUB 72-12NO1 VUB 72-16NO1	1200 1600	110	80	1200	35	1200	40	130	47
VUB 116-16NO1	1600	116	100	1200	67	1200	27	40	81
VUB 120-12NO2 VUB 120-16NO2	1200 1600	130	75	1200	102/75°C	1200	32	40	48
VUB 145-16NO1	1600	145	100	1200	100	1200	27	40	81
VUB 160-12NO2 VUB 160-16NO2	1200 1600	170	75	1200	127/75°C	1200	32	40	48

Package style

Outline drawings on pages O-5...O-17

Fig. 25 ECO-PAC 2
Weight = 24 g
See data sheet for pin arrangement

Fig. 47
Weight = 35 g

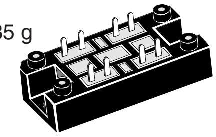
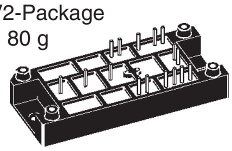
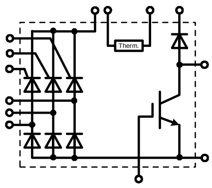


Fig. 48 V2-Package
Weight = 80 g



3~ Half Controlled Rectifier Bridges

with IGBT and Diode for Brake Unit

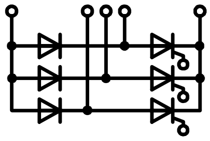


VVZB 120-12io1 VVZB 120-16io1	1200 1600	120	T_C = 80	1200	52	1200	27	40	48
VVZB 135-16NO1	1600	135	T_C = 85	1200	67	1200	27	40	81
VVZB 170-16NO1	1600	170	T_C = 85	1200	100	1200	27	40	81

Fig. 81
Weight = 180 g

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

3~ Rectifier Bridges



3~ Half Controlled Rectifier Bridges, B6HK

Type ➤ New	V_{RRM} V	V_{vRMS} V	I_{dAV} T_H=100°C A	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thJH} per Chip K/W	Fig. No.
VVZ 12-12io1	1200	400	15	110	1.1	30	125	2.5	3.1	45
VVZ 12-14io1	1400	440								
VVZ 12-16io1	1600	500								
VVZ 24-12io1	1200	400	21	300	1.0	16	125	2.1	2.7	
VVZ 24-14io1	1400	440								
VVZ 24-16io1	1600	500								
VVZ 39-08ho7	800	250	T_C = 85°C	200	0.85	27	125	1.3	1.8	24
VVZ 39-12ho7	1200	400								
VVZ 40-12io1	1200	400	34	320	0.85	15	125	1.0	1.6	45
VVZ 40-14io1	1400	440								
VVZ 40-16io1	1600	500								

Package style

Outline drawings on pages O-5...O-17

Fig. 45
Weight = 28 g

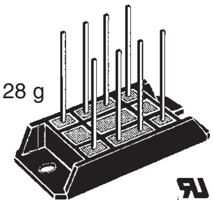
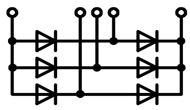


Fig. 24 ECO-PAC 1
Weight = 19 g

See data sheet for pin arrangement

3~ Rectifier Bridges, B6U



Type ➤ New	V_{RRM} V	V_{vRMS} V	I_{dAV} A	T_C °C	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thJH} per Chip K/W	Fig. No.
VUO 16-08NO1	800	250	15		100	0.8	50	130	-	4.5	47
VUO 16-12NO1	1200	400									
VUO 16-14NO1	1400	440	T_H = 90°C								
VUO 16-16NO1	1600	500									
VUO 16-18NO1	1800	575									
FUO 22-12N	1200	400	27	90	100	0.83	28	150	4	5	84
FUO 22-16N	1600	500									
VUO 22-08NO1	800	250	22		100	0.8	40	130	-	3.1	47
VUO 22-12NO1	1200	400									
VUO 22-14NO1	1400	440	T_H = 90°C								
VUO 22-16NO1	1600	500									
VUO 22-18NO1	1800	575									
VUO 34-08NO1	800	250	36		300	0.8	15	130	-	2.5	47
VUO 34-12NO1	1200	400									
VUO 34-14NO1	1400	440									
VUO 34-16NO1	1600	500									
VUO 34-18NO1	1800	575									
FUO 50-16N	1600	500	50	90	200 25°C	tbd	tbd	150	2.1	3.2	84
VUO 52-08NO1	800	250	54		350	0.8	12.5	130	-	1.5	47
VUO 52-12NO1	1200	400									
VUO 52-14NO1	1400	440	T_H = 90°C								
VUO 52-16NO1	1600	500									
VUO 52-18NO1	1600	500									
VUO 52-20NO1	1800	575									

Package style

Outline drawings on pages O-5...O-17

Fig. 47
Weight = 35 g

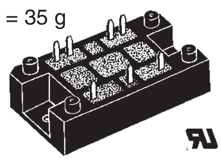
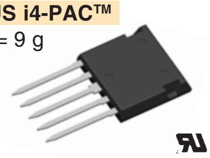
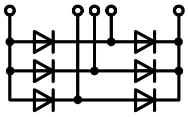


Fig. 84
ISOPLUS i4-PAC™
Weight = 9 g



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

3~ Rectifier Bridges, B6U



Type	V_{RRM}	V_{vRMS}	I_{dAVM}	T_C	I_{FSM} 45°C 10 ms	V_{T0}	r_T	T_{VJM}	R_{thJC} per Chip	R_{thJH} per Chip	Fig. No.
➤ New	V	V	A	°C	A	V	mΩ	°C	K/W	K/W	
VUO 68-08NO7	800	250	68	100	300	0.8	13	150	1.1	1.6	24
VUO 68-12NO7	1200	400									
VUO 68-14NO7	1400	440									
VUO 68-16NO7	1600	500									
VUO 80-08NO1	800	250	82		600	0.8	7.5	150	-	1.63	47
VUO 80-12NO1	1200	400	T_H = 90°C								
VUO 80-14NO1	1400	440									
VUO 80-16NO1	1600	500									
VUO 80-18NO1	1800	575									
VUO 86-08NO7	600	125	86	90	530	0.8	7.5	150	1.2	1.5	24
VUO 86-12NO7	1200	400									
VUO 86-14NO7	1400	440									
VUO 86-16NO7	1600	500									
VUO 98-08NO7	800	250	95	85	750	0.8	8	150	1.0	1.4	25
VUO 98-12NO7	1200	400									
VUO 98-14NO7	1400	440									
VUO 98-16NO7	1600	500									
VUO 100-08NO7	800	250	100	100	1000	0.8	5	150	1.12	1.5	57
VUO 100-12NO7	1200	400									
VUO 100-14NO7	1400	440									
VUO 100-16NO7	1600	500									
VUO 120-12NO1	1200	1200	121	75	650	0.8	6.1	150	1.0	1.3	48
VUO 120-16NO1	1600	1600									
VUO 121-16NO1	1600	575	118	100	650	0.8	5	150	1.1	0.1	81
VUO 122-08NO7	800	250	125	95	900	0.8	4	150	0.8	1.25	25
VUO 122-12NO7	1200	400									
VUO 122-14NO7	1400	440									
VUO 122-16NO7	1600	500									
VUO 122-18NO7	1800	575									
VUO 155-12NO1	1200	1200	157	75	850	0.75	4.6	150	0.8	1.1	48
VUO 155-16NO1	1600	1600									
VUO 160-08NO7	800	250	175	90	1800	0.8	3	150	0.65	0.83	54
VUO 160-12NO7	1200	400									
VUO 160-14NO7	1400	440	T_H = 90°C								
VUO 160-16NO7	1600	500									
VUO 160-18NO7	1800	575									
VUO 190-08NO7	800	250	248	90	2800	0.8	2.2	150	0.45	0.6	54
VUO 190-12NO7	1200	400									
VUO 190-14NO7	1400	440									
VUO 190-16NO7	1600	500									
VUO 190-18NO7	1800	575									

Package style

Outline drawings on pages O-5...O-17

Fig. 24 ECO-PAC 1
Weight = 19 g

See data sheet for pin arrangement

Fig. 25 ECO-PAC 2
Weight = 24 g

See data sheet for pin arrangement

Fig. 47
Weight = 35 g

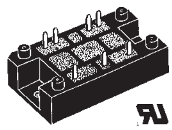


Fig. 48 V2-Package
Weight = 80 g

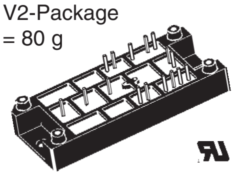


Fig. 54
Weight = 270 g

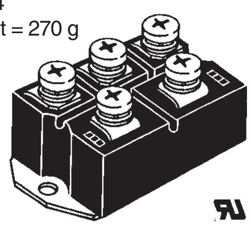
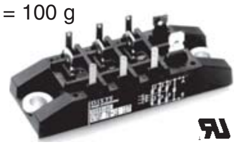


Fig. 57
Weight = 100 g

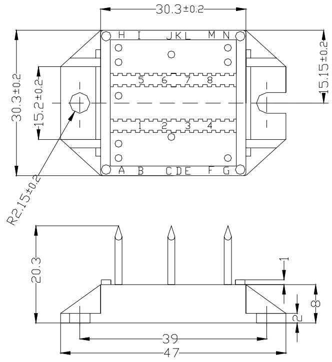


Data according to IEC 60747 and refer to a single diode or thyristor unless otherwise stated.

Outline drawings

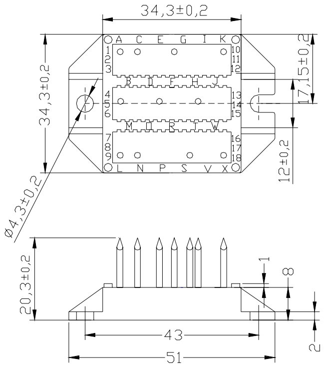
Dimensions in mm and inches (1 mm = 0.0394")

24 ECO-PAC1



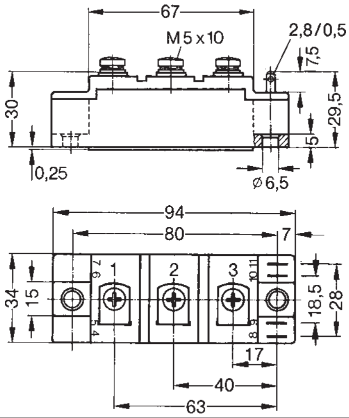
See data sheet for pin arrangement

25 ECO-PAC2

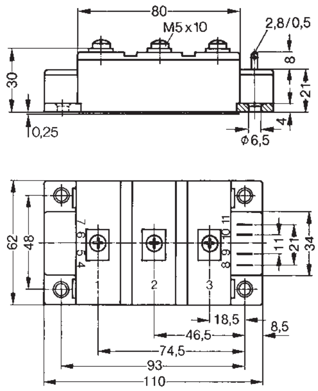


See data sheet for pin arrangement

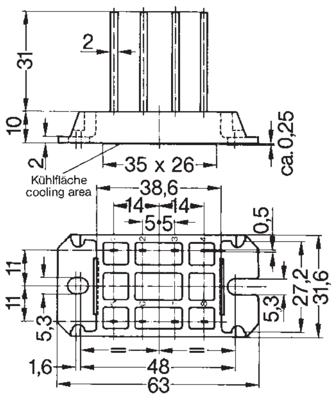
28



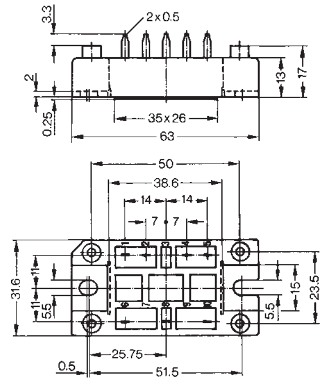
33



45

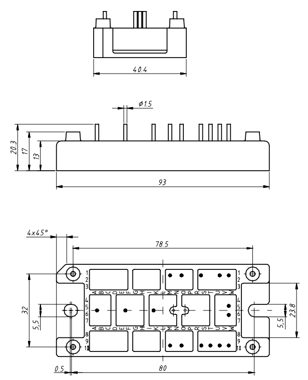


47 V1-Pack



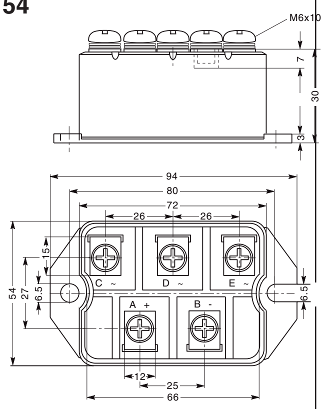
See data sheet for pin arrangement

48 V2-Pack



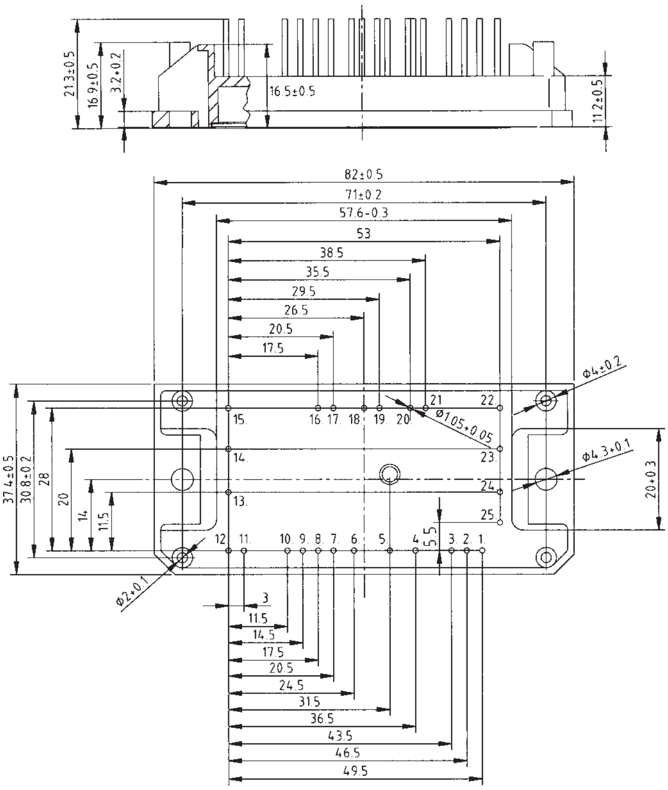
See data sheet for pin arrangement

54

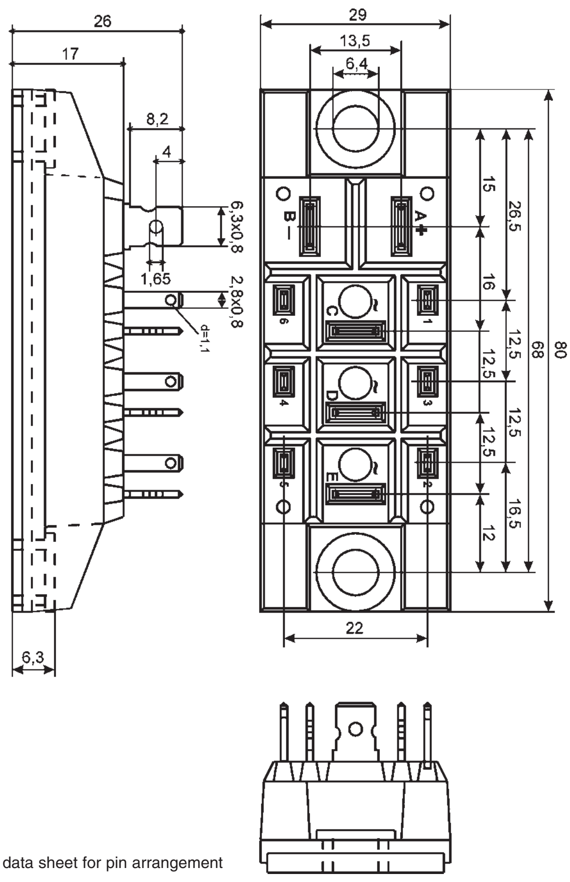


For 1~ bridges without middle connection

49a E1 Package



57



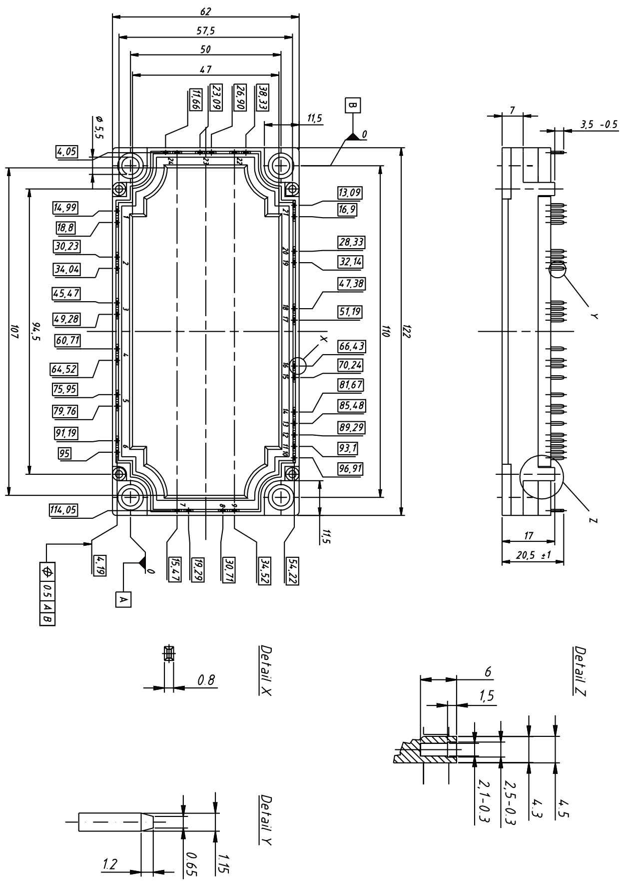
See data sheet for pin arrangement

Outline drawings

Dimensions in mm and inches (1 mm = 0.0394")

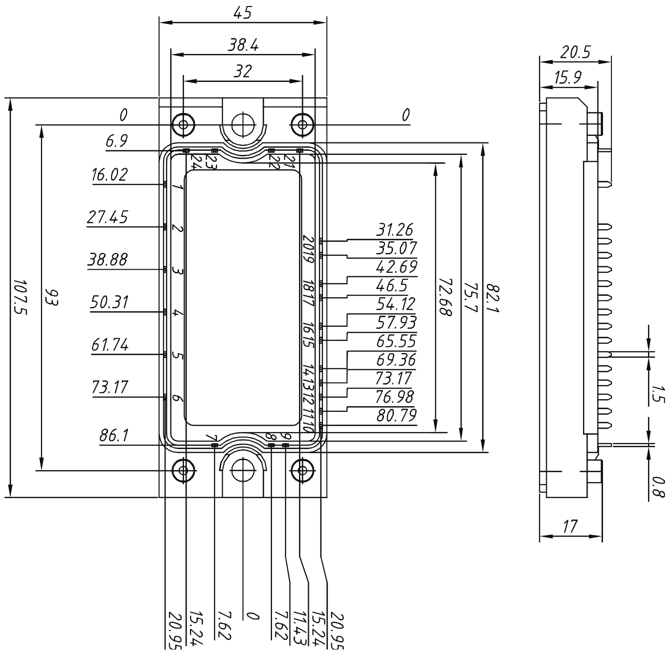
77 E3 package

See data sheet for pin arrangement

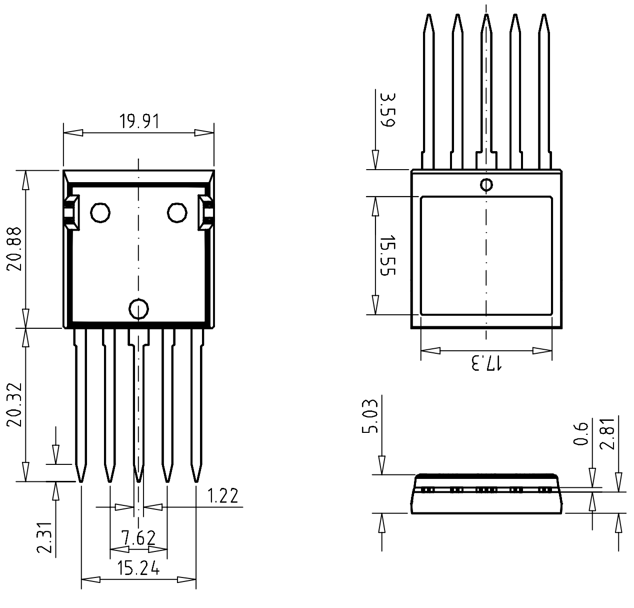


81 E2 package

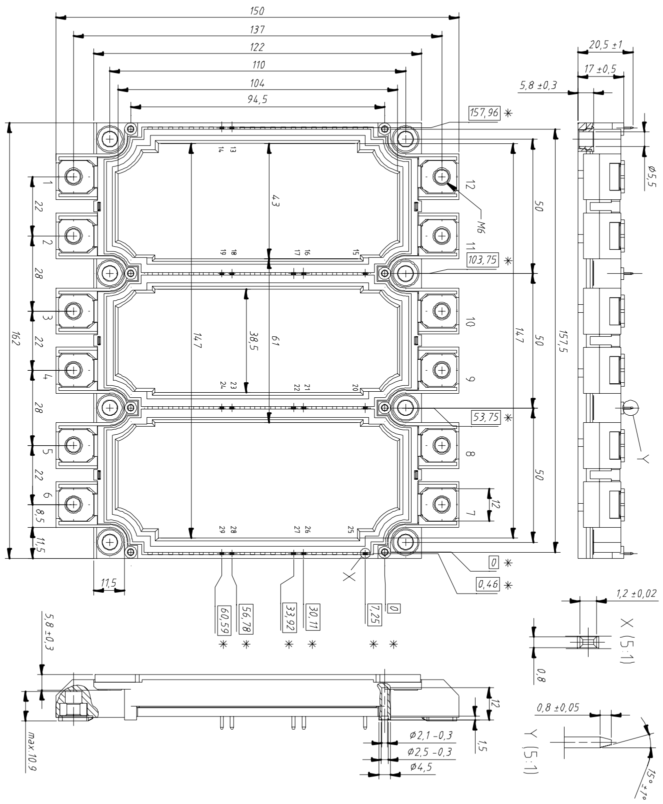
See data sheet for pin arrangement



84 ISOPLUS i4-Pac™



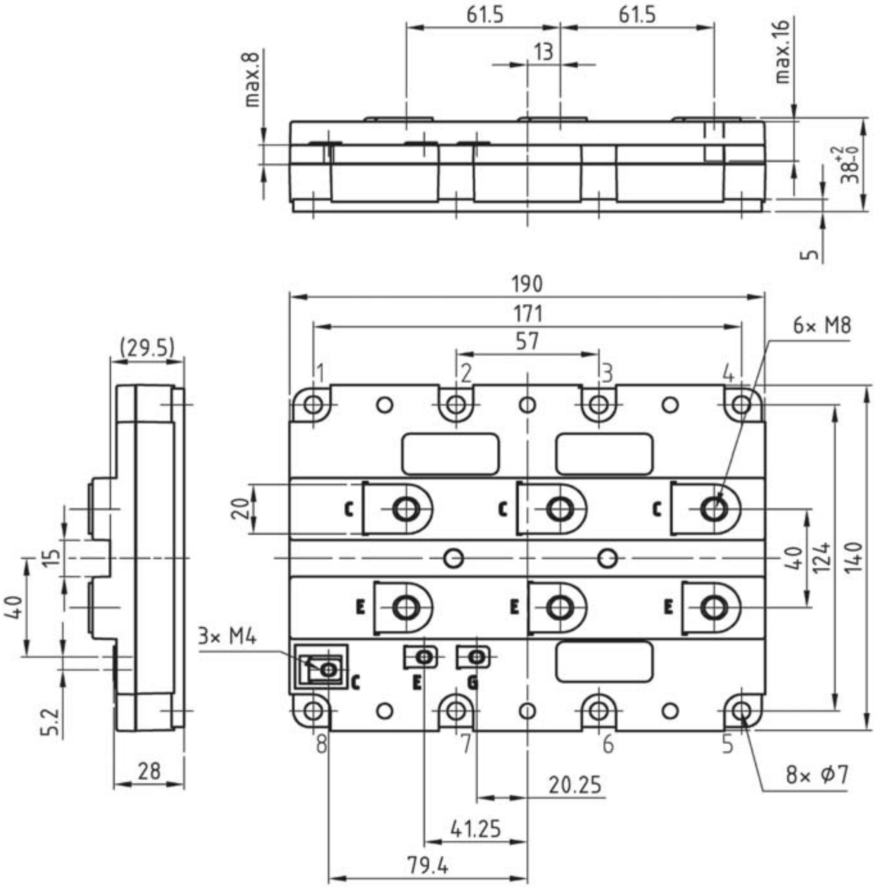
95 E+ Package



IXYS

Dimensions in mm and inches (1 mm = 0.0394")

96



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