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Converter - Brake - Inverter Module (CBI 1)
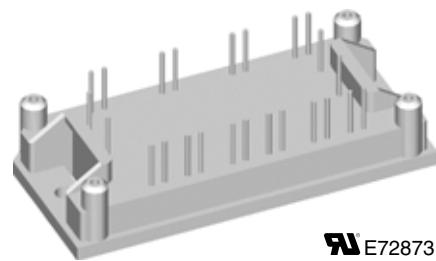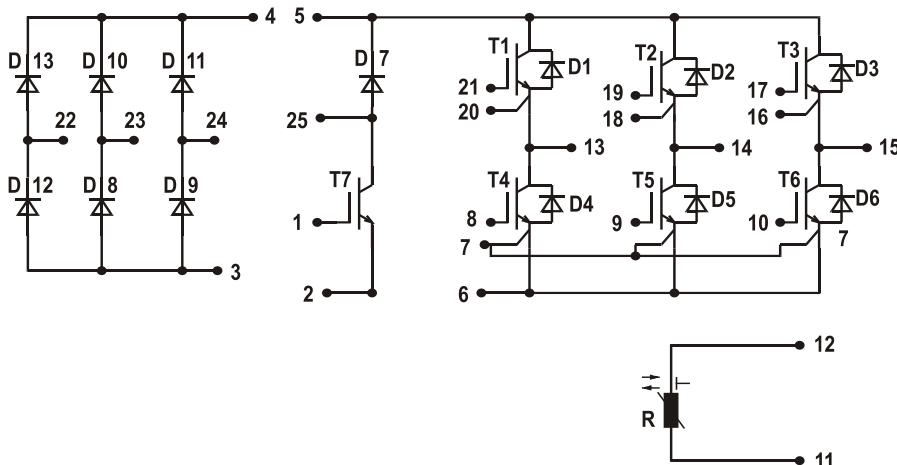## NPT IGBT

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 600 V	V_{CES} = 600 V
I_{DAVM25} = 90 A	I_{C25} = 12 A	I_{C25} = 52 A
I_{FSM} = 300 A	$V_{CE(sat)}$ = 2.5 V	$V_{CE(sat)}$ = 2.5 V

Preliminary data

Part name (Marking on product)

MUBW10-06A6K

🛡 E72873

Pin configuration see outlines.

Features:
- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with NPT IGBTs
- low saturation voltage
  - positive temperature coefficient
  - fast switching
  - short tail current
- Epitaxial free wheeling diodes with hiperfast and soft reverse recovery
- Industry standard package with insu lated copper base plate and soldering pins for PCB mounting
- Temperature sense included

Application:

AC motor drives with
- Input from single or three phase grid
- Three phase synchronous or asynchronous motor
- Electric braking operation

Package:
- UL registered
- Industry standard E1-pack

IXYS reserves the right to change limits, test conditions and dimensions.

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Ouput Inverter T1 - T6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
						Ratings	
V_{CES}	collector emitter voltage	T_{VJ} = 25°C to 150°C				600	V
V_{GES}	max. DC gate voltage	continuous				±20	V
V_{GEM}	max. transient collector gate voltage	transient				±30	V
I_{C25}	collector current	T_C = 25°C				11	A
I_{C80}		T_C = 80°C				8	A
P_{tot}	total power dissipation	T_C = 25°C				50	W
$V_{CE(sat)}$	collector emitter saturation voltage	I_C = 10 A; V_{GE} = 15 V	T_{VJ} = 25°C		2.7	3.3	V
			T_{VJ} = 125°C		3.1		V
$V_{GE(th)}$	gate emitter threshold voltage	I_C = 0.2 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	4.5		6.5	V
I_{CES}	collector emitter leakage current	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			65	µA
			T_{VJ} = 125°C		1.0		mA
I_{GES}	gate emitter leakage current	V_{CE} = 0 V; V_{GE} = ±20 V				120	nA
C_{ies}	input capacitance	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			220		pF
$Q_{G(on)}$	total gate charge	V_{CE} = 300 V; V_{GE} = 15 V; I_C = 6 A			32		nC
$t_{d(on)}$	turn-on delay time	inductive load	T_{VJ} = 125°C		20		ns
t_r	current rise time	V_{CE} = 300 V; I_C = 6 A			10		ns
$t_{d(off)}$	turn-off delay time	V_{GE} = ±15 V; R_G = 54 Ω			110		ns
t_f	current fall time				30		ns
E_{on}	turn-on energy per pulse				0.22		mJ
E_{off}	turn-off energy per pulse				0.26		mJ
I_{CM}	reverse bias safe operating area	RBSOA; V_{GE} = ±15 V; R_G = 54 Ω L = 100 µH; clamped induct. load V_{CEmax} = V_{CES} - L_S·di/dt	T_{VJ} = 125°C		18		A
t_{SC} (SCSOA)	short circuit safe operating area	V_{CE} = 600 V; V_{GE} = ±15 V; R_G = 54 Ω; non-repetitive	T_{VJ} = 125°C		10		µs
R_{thJC}	thermal resistance junction to case	(per IGBT)				2.75	K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.95		K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
						Ratings	
V_{RRM}	max. repetitve reverse voltage	T_{VJ} = 150°C				600	V
I_{F25}	forward current	T_C = 25°C				21	A
I_{F80}		T_C = 80°C				14	A
V_F	forward voltage	I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 25°C			2.2	V
			T_{VJ} = 125°C			1.6	V
I_{RM}	max. reverse recovery current	V_R = 100 V				4.4	A
t_{rr}	reverse recovery time	di$_F$/dt = -100 A/µs	T_{VJ} = 100°C		80		ns
$E_{rec(off)}$	reverse recovery energy	I_F = 12 A; V_{GE} = 0 V			tbd		µJ
R_{thJC}	thermal resistance junction to case	(per diode)				2.5	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.85		K/W

T_C = 25°C unless otherwise stated

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Brake Chopper T7

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
					Ratings		
V_{CES}	collector emitter voltage	T_{VJ} = 25°C to 150°C				600	V
V_{GES}	max. DC gate voltage	continuous				±20	V
V_{GEM}	max. transient collector gate voltage	transient				±30	V
I_{C25}	collector current	T_C = 25°C				11	A
I_{C80}		T_C = 80°C				8	A
P_{tot}	total power dissipation	T_C = 25°C				50	W
$V_{CE(sat)}$	collector emitter saturation voltage	I_C = 10 A; V_{GE} = 15 V	T_{VJ} = 25°C		2.65	3.3	V
			T_{VJ} = 125°C		3.1		V
$V_{GE(th)}$	gate emitter threshold voltage	I_C = 0.2 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	4.5		6.5	V
I_{CES}	collector emitter leakage current	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			0.1	mA
			T_{VJ} = 125°C		0.7		mA
I_{GES}	gate emitter leakage current	V_{CE} = 0 V; V_{GE} = ±20 V				120	nA
C_{ies}	input capacitance	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			220		pF
$Q_{G(on)}$	total gate charge	V_{CE} = 300 V; V_{GE} = 15 V; I_C = 6 A			32		nC
$t_{d(on)}$	turn-on delay time	inductive load V_{CE} = 300 V; I_C = 6 A V_{GE} = ±15 V; R_G = 54 Ω	T_{VJ} = 125°C		20		ns
t_r	current rise time				10		ns
$t_{d(off)}$	turn-off delay time				110		ns
t_f	current fall time				30		ns
E_{on}	turn-on energy per pulse				0.21		mJ
E_{off}	turn-off energy per pulse				0.26		mJ
I_{CM}	reverse bias safe operating area	RBSOA; V_{GE} = ±15 V; R_G = 54 Ω L = 100 µH; clamped induct. load V_{CEmax} = V_{CES} - $L_S \cdot di/dt$	T_{VJ} = 125°C		18		A
t_{SC} (SCSOA)	short circuit safe operating area	V_{CE} = 600 V; V_{GE} = ±15 V; R_G = 54 Ω; non-repetitive	T_{VJ} = 125°C		10		µs
R_{thJC}	thermal resistance junction to case	(per IGBT)				2.75	K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.9		K/W

Brake Chopper D7

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
					Ratings		
V_{RRM}	max. repetitive reverse voltage	T_{VJ} = 150°C				600	V
I_{F25}	forward current	T_C = 25°C				21	A
I_{F80}		T_C = 80°C				14	A
V_F	forward voltage	I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 25°C			2.1	V
			T_{VJ} = 125°C		1.25		V
I_R	reverse current	V_R = V_{RRM}	T_{VJ} = 25°C			0.06	mA
			T_{VJ} = 125°C		0.2		mA
I_{RM}	max. reverse recovery current	V_R = 100 V; I_F = 12 A			3.5		A
t_{rr}	reverse recovery time	di_F /dt = -100 A/µs	T_{VJ} = 100°C		80		ns
R_{thJC}	thermal resistance junction to case	(per diode)				2.5	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.85		K/W

T_C = 25°C unless otherwise stated

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Input Rectifier Bridge D8 - D13

Symbol	Definitions	Conditions		Maximum Ratings	
V_{RRM}	max. repetitive reverse voltage			1600	V
I_{FAV}	average forward current	sine 180°	$T_C = 80°C$	22	A
I_{DAVM}	max. average DC output current	rectangular; d = $^1/_3$; bridge	$T_C = 80°C$	61	A
I_{FSM}	max. surge forward current	t = 10 ms; sine 50 Hz	$T_C = 25°C$	300	A
P_{tot}	total power dissipation		$T_C = 25°C$	50	W

Symbol	Conditions			min.	typ.	max.	
V_F	forward voltage	$I_F = 30 A$	$T_{VJ} = 25°C$		1.1	1.45	V
			$T_{VJ} = 125°C$		1.2		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25°C$			0.01	mA
			$T_{VJ} = 125°C$		0.3		mA
R_{thJC}	thermal resistance junction to case	(per diode)	$T_{VJ} = 25°C$			2.1	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.7		K/W

Temperature Sensor NTC

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
R_{25}	resistance		$T_C = 25°C$	4.45	4.7	5.0	kΩ
$B_{25/85}$					3510		K

Module

Symbol	Definitions	Conditions	min.	typ.	max.	Unit
T_{VJ}	operating temperature		-40		150	°C
T_{VJM}	max. virtual junction temperature				150	°C
T_{stg}	storage temperature		-40		125	°C
V_{ISOL}	isolation voltage	$I_{ISOL} \le 1$ mA; 50/60 Hz			2500	V~
M_d	mounting torque	(M4)	2.0		2.2	Nm
d_S	creep distance on surface		12.7			mm
d_A	strike distance through air		9.6			mm
Weight				40		g

Equivalent Circuits for Simulation
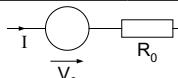
Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_0	rectifier diode	D8 - D13	$T_{VJ} = 125°C$		0.90		V
R_0					12		mΩ
V_0	IGBT	T1 - T6	$T_{VJ} = 125°C$		1.4		V
R_0					150		mΩ
V_0	free wheeling diode	D1 - D6	$T_{VJ} = 125°C$		1.25		V
R_0					26		mΩ
V_0	IGBT	T7	$T_{VJ} = 125°C$		1.4		V
R_0					150		mΩ
V_0	free wheeling diode	D7	$T_{VJ} = 125°C$		1.25		V
R_0					26		mΩ

T_C = 25°C unless otherwise stated

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Outline Drawing

Dimensions in mm (1 mm = 0.0394")
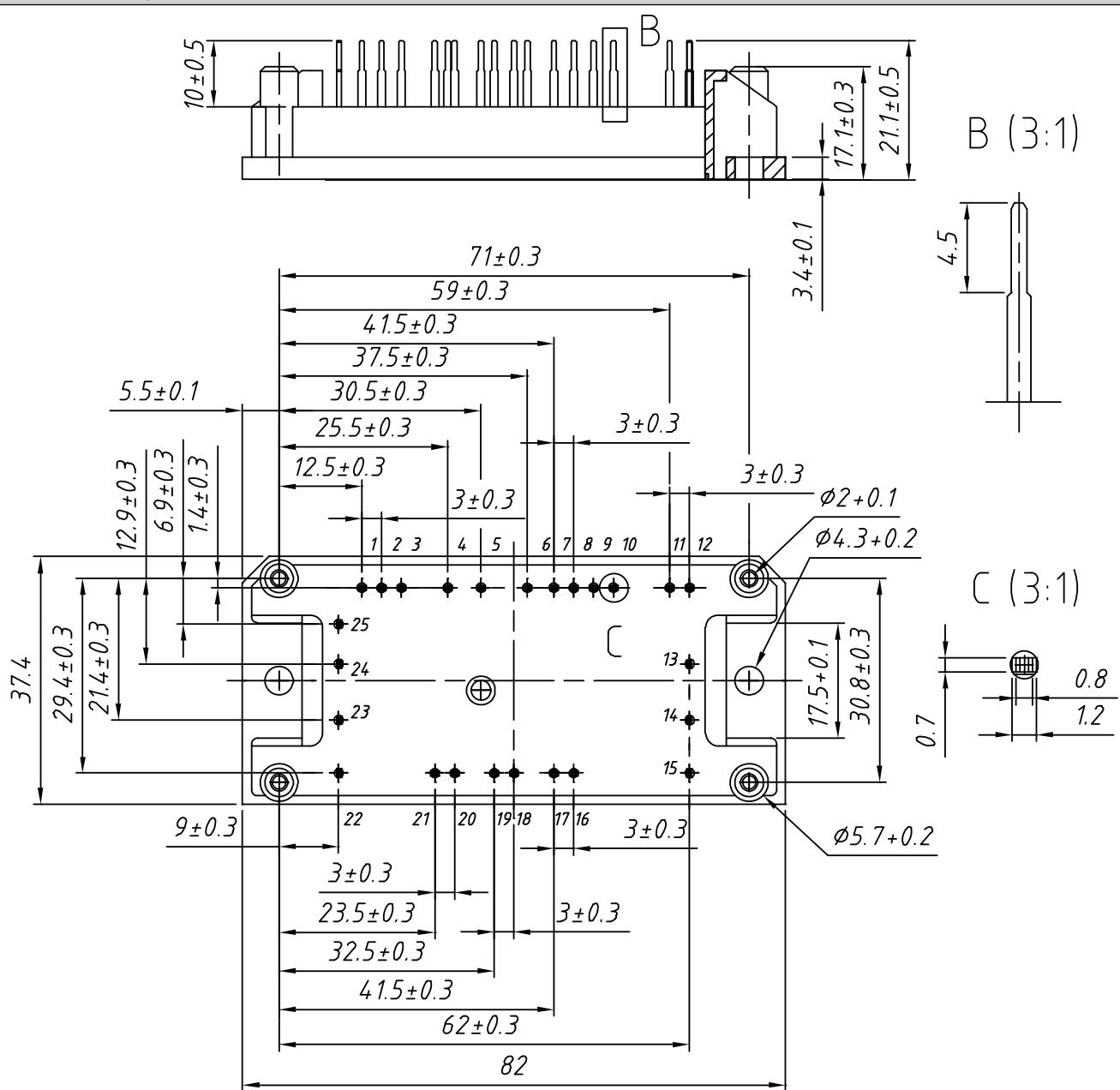
Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MUBW 10-06A6K	MUBW10-06A6K	Box	10	500 087

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