

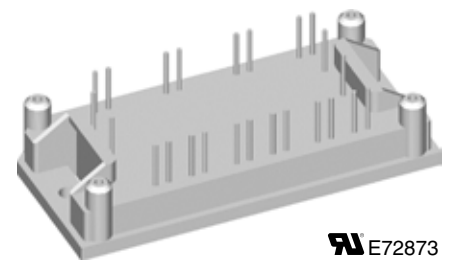
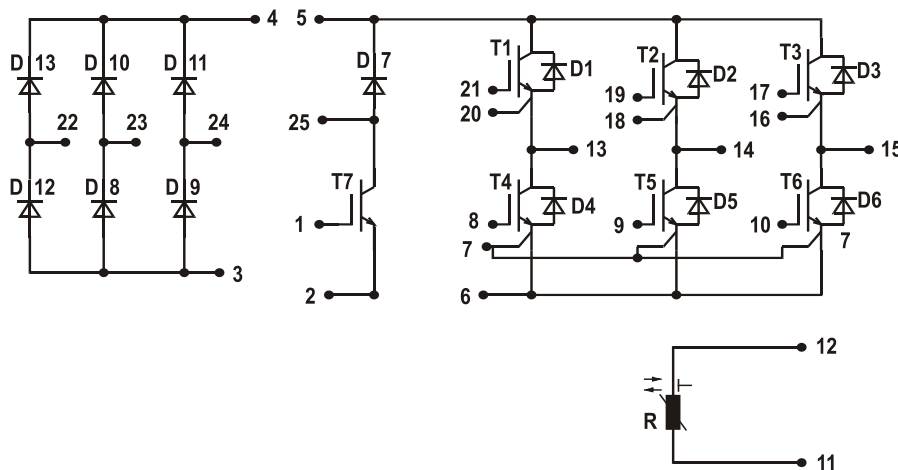
Converter - Brake - Inverter Module (CBI 1) **NPT IGBT**

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 600 \text{ V}$	$V_{CES} = 600 \text{ V}$
$I_{DAVM25} = 95 \text{ A}$	$I_{C25} = 12 \text{ A}$	$I_{C25} = 25 \text{ A}$
$I_{FSM} = 250 \text{ A}$	$V_{CE(sat)} = 2.25 \text{ V}$	$V_{CE(sat)} = 2.0 \text{ V}$

Preliminary data

Part name (Marking on product)

MUBW20-06A6K



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 insulated 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

Output Inverter T1 - T6

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$ 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	$T_C = 25^{\circ}\text{C}$			25		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			17		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			85		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 15\text{ A}; V_{GE} = 15\text{ V}$		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.0 2.3	2.4	V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.4\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	4.5		6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.3	0.6	mA mA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$				100	nA
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$			800		pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 300\text{ V}; V_{GE} = 15\text{ V}; I_C = 15\text{ A}$			57		nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 300\text{ V}; I_C = 15\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_{G(on)} = 39\ \Omega$ $R_{G(off)} = 22\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		30		ns
t_r	current rise time				25		ns
$t_{d(off)}$	turn-off delay time				160		ns
t_f	current fall time				50		ns
E_{on}	turn-on energy per pulse				0.42		mJ
E_{off}	turn-off energy per pulse				0.44		mJ
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 68\ \Omega$ $L = 100\ \mu\text{H};$ clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$		30		A
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = 600\text{ V}; V_{GE} = \pm 15\text{ V};$ $R_G = 68\ \Omega;$ non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$		10		μs
R_{thJC}	thermal resistance junction to case	(per IGBT)				1.5	K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.55		K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 150^{\circ}\text{C}$			600		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			36		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			24		A
V_F	forward voltage	$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		2.1		V
I_{RM}	max. reverse recovery current	$V_R = 300\text{ V}$ $di_F/dt = -400\text{ A}/\mu\text{s}$ $I_F = 15\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 100^{\circ}\text{C}$		14		A
t_{rr}	reverse recovery time				80		ns
$E_{rec(off)}$	reverse recovery energy				tbd		μJ
R_{thJC}	thermal resistance junction to case	(per diode)				1.6	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.55		K/W

 $T_C = 25^{\circ}\text{C}$ unless otherwise stated

Brake Chopper T7

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$ 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	$T_C = 25^{\circ}\text{C}$			11		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			8		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			50		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 10\text{ A}$; $V_{GE} = 15\text{ V}$		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.65 3.1	3.3	V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.2\text{ mA}$; $V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	4.5		6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}$; $V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.7	0.1	mA mA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}$; $V_{GE} = \pm 20\text{ V}$				120	nA
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}$; $V_{GE} = 0\text{ V}$; $f = 1\text{ MHz}$			220		pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 300\text{ V}$; $V_{GE} = 15\text{ V}$; $I_C = 6\text{ A}$			32		nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 300\text{ V}$; $I_C = 8\text{ A}$ $V_{GE} = \pm 15\text{ V}$; $R_{G(on)} = 54\ \Omega$ $R_{G(off)} = 22\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		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; $V_{GE} = \pm 15\text{ V}$; $R_G = 54\ \Omega$ $L = 100\ \mu\text{H}$; clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$		18		A
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = 600\text{ V}$; $V_{GE} = \pm 15\text{ V}$; $R_G = 54\ \Omega$; non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$		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.	Ratings			Unit
				typ.	max.		
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 150^{\circ}\text{C}$			600		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			21		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			14		A
V_F	forward voltage	$I_F = 10\text{ A}$; $V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.25	2.1		V V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	0.2	0.06		mA mA
I_{RM}	max. reverse recovery current	$V_R = 100\text{ V}$; $I_F = 12\text{ A}$ $di_F/dt = -100\text{ A}/\mu\text{s}$	$T_{VJ} = 100^{\circ}\text{C}$		3.5		A
t_{rr}	reverse recovery time				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

 $T_C = 25^{\circ}\text{C}$ unless otherwise stated

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°	$T_C = 80^\circ\text{C}$	23 A
I_{DAVM}	max. average DC output current	rectangular; $d = 1/3$; bridge	$T_C = 80^\circ\text{C}$	65 A
I_{FSM}	max. surge forward current	$t = 10\text{ ms}$; sine 50 Hz	$T_C = 25^\circ\text{C}$	250 A
P_{tot}	total power dissipation	$T_C = 25^\circ\text{C}$	65	W

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V _F	forward voltage	I _F = 30 A	T _{VJ} = 25°C T _{VJ} = 125°C	1.1 1.2	V V
I _R	reverse current	V _R = V _{RRM}	T _{VJ} = 25°C T _{VJ} = 125°C	0.4	0.02 mA mA
R _{thJC}	thermal resistance junction to case	(per diode)	T _{VJ} = 25°C		1.9 K/W
R _{thCH}	thermal resistance case to heatsink	(per diode)		0.65	K/W

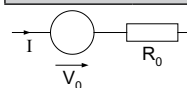
Temperature Sensor NTC

Symbol	Definitions	Conditions	Ratings		
			min.	typ.	max.
R_{25}	resistance	$T_C = 25^\circ\text{C}$	4.45	4.7	5.0
$B_{25/85}$				3510	K

Module

Symbol	Definitions	Conditions	Ratings		
			min.	typ.	max.
T_{VJ}	operating temperature		-40		125 °C
T_{VJM}	max. virtual junction temperature				150 °C
T_{stg}	storage temperature		-40		125 °C
V_{ISOL}	isolation voltage	$I_{ISOL} \leq 1\text{ mA}$; 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		12.7		mm
Weight				40	g

Equivalent Circuits for Simulation

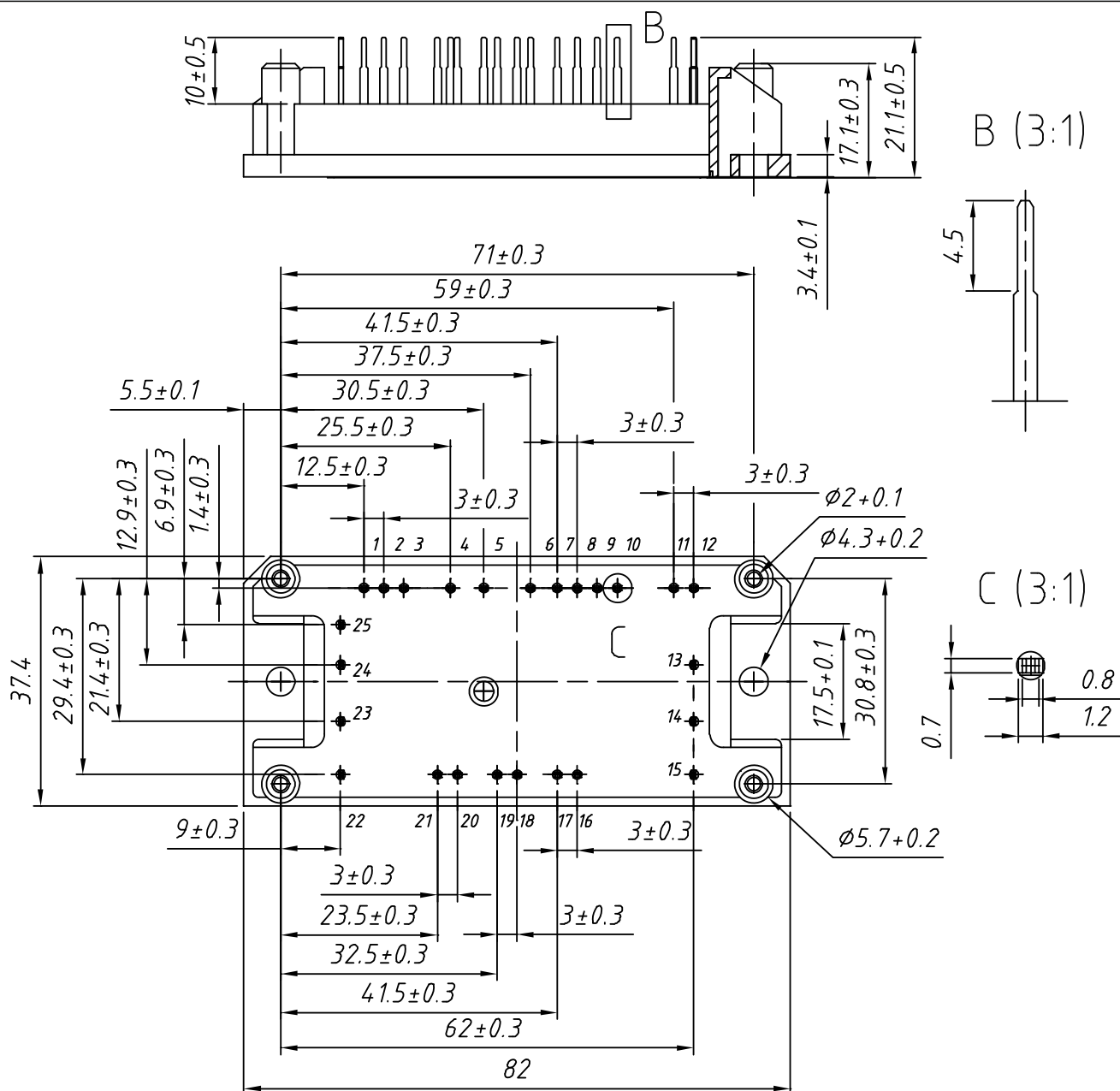


Symbol	Definitions	Conditions	Ratings		
			min.	typ.	max.
V_0	rectifier diode	D8 - D13	$T_{VJ} = 125^\circ\text{C}$	0.90	V
R_0				12	mΩ
V_0	IGBT	T1 - T6	$T_{VJ} = 125^\circ\text{C}$	1.0	V
R_0				70	mΩ
V_0	free wheeling diode	D1 - D6	$T_{VJ} = 125^\circ\text{C}$	1.25	V
R_0				13	mΩ
V_0	IGBT	T7	$T_{VJ} = 125^\circ\text{C}$	1.4	V
R_0				150	mΩ
V_0	free wheeling diode	D7	$T_{VJ} = 125^\circ\text{C}$	1.25	V
R_0				26	mΩ

$T_C = 25^\circ\text{C}$ unless otherwise stated

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 20-06A6K	MUBW20-06A6K	Box	10	500 103