

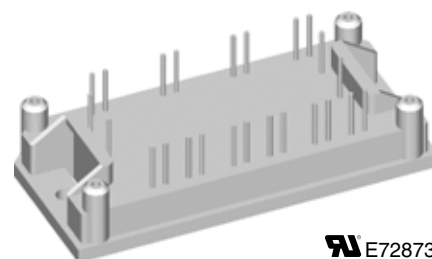
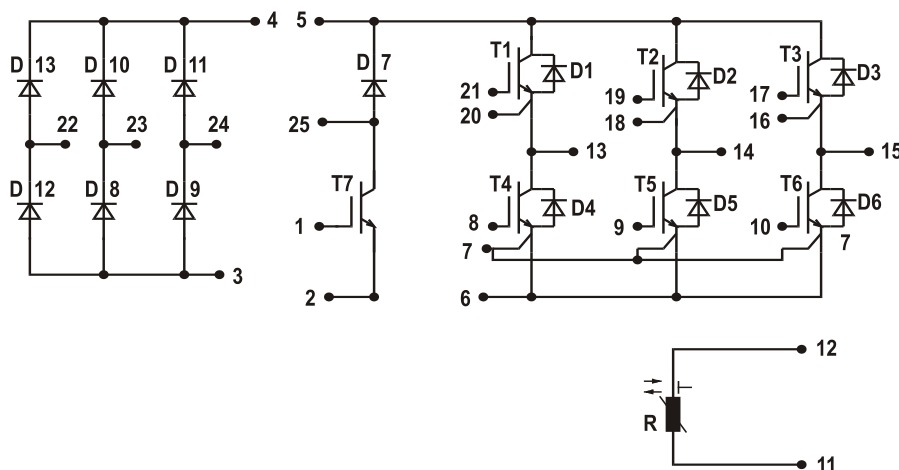
Converter - Brake - Inverter Module (CBI 1) **NPT IGBT**

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	$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.5	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

				Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
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 T _{VJ} = 125°C	2.65 3.1	3.3	V 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 T _{VJ} = 125°C	0.7	0.1	mA 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 V _{CE} = 300 V; I _C = 8 A V _{GE} = ±15 V; R _{G(on)} = 54 Ω R _{G(off)} = 22 Ω		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 •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

					Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	Unit	
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 T _{VJ} = 125°C	1.25	2.1	V V	
I _R	reverse current	V _R = V _{RRM}	T _{VJ} = 25°C T _{VJ} = 125°C	0.2	0.06	mA mA	
I _{RM}	max. reverse recovery current	} V _R = 100 V; I _F = 12 A di _F /dt = -100 A/μs	T _{VJ} = 100°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°C	23	A
I _{DAVM}	max. average DC output current	rectangular; d = 1/3; bridge	T _C = 80°C	65	A
I _{FSM}	max. surge forward current	t = 10 ms; sine 50 Hz	T _C = 25°C	250	A
P _{tot}	total power dissipation		T _C = 25°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

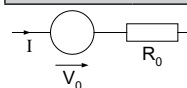
Temperature Sensor NTC

				Ratings		
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

			Ratings			
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
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} ≤ 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		12.7			mm
Weight				40		g

Equivalent Circuits for Simulation

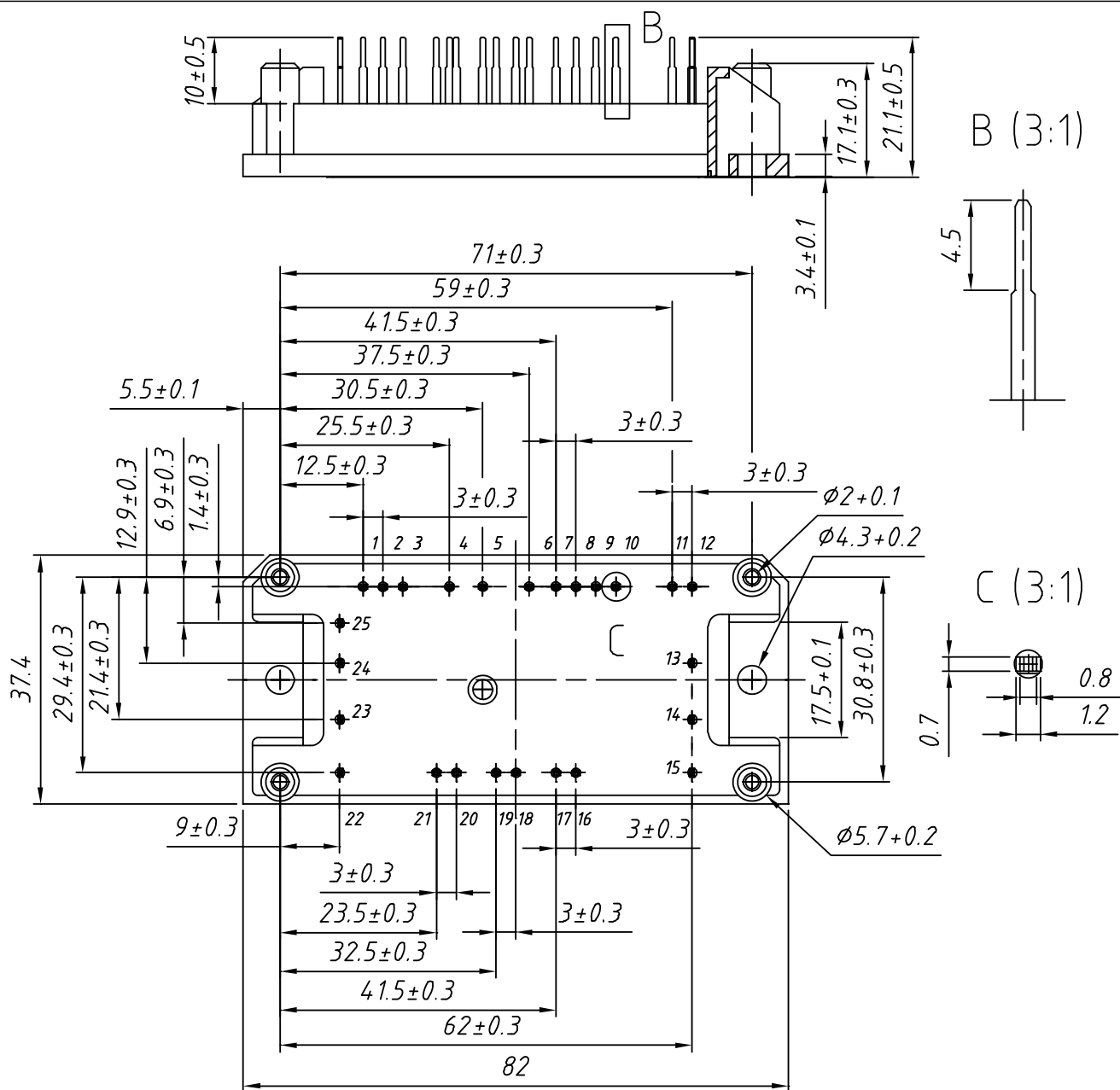


V_0			Ratings			
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
V_0 R_0	rectifier diode	D8 - D13	$T_{VJ} = 125^{\circ}\text{C}$	0.90 12		V m Ω
V_0 R_0	IGBT	T1 - T6	$T_{VJ} = 125^{\circ}\text{C}$	1.0 70		V m Ω
V_0 R_0	free wheeling diode	D1 - D6	$T_{VJ} = 125^{\circ}\text{C}$	1.25 13		V m Ω
V_0 R_0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

$T_C = 25^\circ\text{C}$ 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