

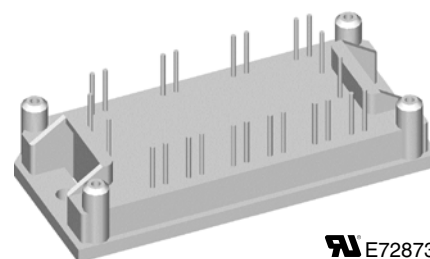
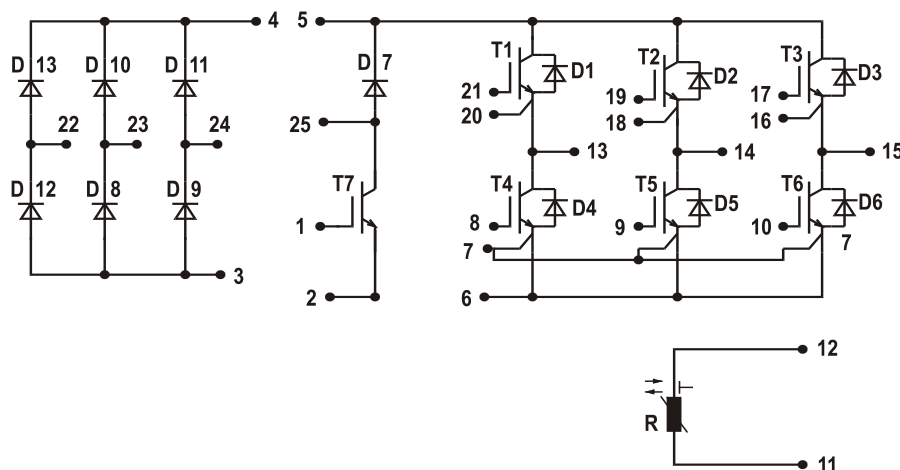
Converter - Brake - Inverter Module (CBI 1) **NPT IGBT**

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 1200 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAVM25} = 130 \text{ A}$	$I_{C25} = 19 \text{ A}$	$I_{C25} = 30 \text{ A}$
$I_{FSM} = 320 \text{ A}$	$V_{CE(sat)} = 2.9 \text{ V}$	$V_{CE(sat)} = 3 \text{ V}$

Preliminary data

Part name (Marking on product)

MUBW30-12A6K



 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			1200		V
V_{GES}	max. DC gate voltage	continuous			± 20		V
V_{GEM}	max. transient collector gate voltage	transient			± 30		V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$			30		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			21		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			130		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 30\text{ A}; V_{GE} = 15\text{ V}$		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	3.0 3.4	3.8	V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.6\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	4.5		6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.5	1	mA mA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$				200	nA
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		1000			pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 17.5\text{ A}$		70			nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 15\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$	100			ns
t_r	current rise time			80			ns
$t_{d(off)}$	turn-off delay time			500			ns
t_f	current fall time			70			ns
E_{on}	turn-on energy per pulse			2.3			mJ
E_{off}	turn-off energy per pulse			1.8			mJ
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$ $L = 100\ \mu\text{H}$; clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$	45			A
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = 1200\text{ V}; V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$; non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$	10			μs
R_{thJC}	thermal resistance junction to case	(per IGBT)			0.95		K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)		0.35			K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 150^{\circ}\text{C}$			1200		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			49		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			32		A
V_F	forward voltage	$I_F = 30\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		2.9		V V
I_{RM}	max. reverse recovery current	$V_R = 600\text{ V}$ $di_F/dt = -500\text{ A}/\mu\text{s}$ $I_F = 30\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$	27			A
t_{rr}	reverse recovery time			150			ns
$E_{rec(off)}$	reverse recovery energy			tbd			μJ
R_{thJC}	thermal resistance junction to case	(per diode)			0.9		K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)		0.3			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			1200		V
V_{GES}	max. DC gate voltage	continuous			± 20		V
V_{GEM}	max. transient collector gate voltage	transient			± 30		V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$			19		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			13		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			90		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 15\text{ A}; V_{GE} = 15\text{ V}$		2.9 3.5	3.4		V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.4\text{ mA}; V_{GE} = V_{CE}$	4.5		6.5		V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$		0.8	0.5		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	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		600			pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 10\text{ A}$		45			nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 10\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$	45			ns
t_r	current rise time			40			ns
$t_{d(off)}$	turn-off delay time			290			ns
t_f	current fall time			60			ns
E_{on}	turn-on energy per pulse			1.2			mJ
E_{off}	turn-off energy per pulse			1.1			mJ
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$ $L = 100\ \mu\text{H}$; clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$	20			A
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = 720\text{ V}; V_{GE} = \pm 15\text{ V}; R_G = 82\ \Omega$; non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$	10			μs
R_{thJC}	thermal resistance junction to case	(per IGBT)			1.37		K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)		0.45			K/W

Brake Chopper D7

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 150^{\circ}\text{C}$			1200		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			15		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			10		A
V_F	forward voltage	$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$		2.0	3.5		V V
I_R	reverse current	$V_R = V_{RRM}$		0.2	0.06		mA mA
I_{RM}	max. reverse recovery current	$V_R = 600\text{ V}; I_F = 10\text{ A}$ $di_F/dt = -400\text{ A}/\mu\text{s}$	$T_{VJ} = 125^{\circ}\text{C}$	13			A
t_{rr}	reverse recovery time			110			ns
R_{thJC}	thermal resistance junction to case	(per diode)			2.5		K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)		0.05			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°	$T_C = 80^\circ\text{C}$	31 A
I_{DAVM}	max. average DC output current	rectangular; $d = 1/3$; bridge	$T_C = 80^\circ\text{C}$	89 A
I_{FSM}	max. surge forward current	$t = 10\text{ ms}$; sine 50 Hz	$T_C = 25^\circ\text{C}$	320 A
P_{tot}	total power dissipation		$T_C = 25^\circ\text{C}$	80 W

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V _F	forward voltage	I _F = 30 A	T _{VJ} = 25°C T _{VJ} = 125°C	1.0 1.1	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		1.4 K/W
R _{thCH}	thermal resistance case to heatsink	(per diode)		0.45	K/W

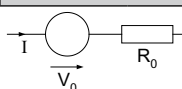
Temperature Sensor NTC

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

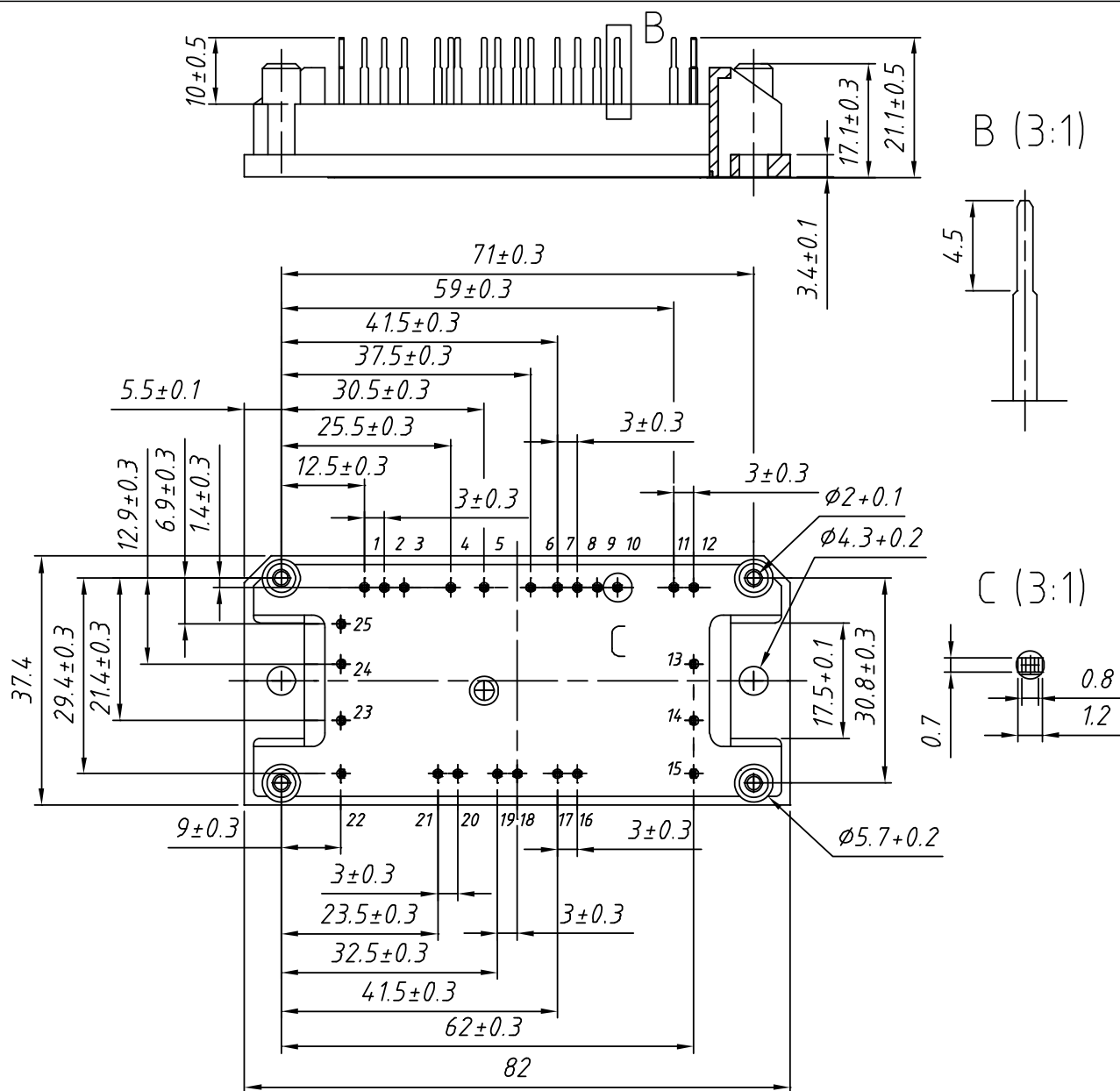


Symbol	Definitions	Conditions	min.	Ratings		Unit
				typ.	max.	
V_0	rectifier diode	D8 - D13	$T_{VJ} = 125^\circ\text{C}$	0.90		V
R_0				9		mΩ
V_0	IGBT	T1 - T6	$T_{VJ} = 125^\circ\text{C}$	tbd		V
R_0				tbd		mΩ
V_0	free wheeling diode	D1 - D6	$T_{VJ} = 125^\circ\text{C}$	1.5		V
R_0				14		mΩ
V_0	IGBT	T7	$T_{VJ} = 125^\circ\text{C}$	1.5		V
R_0				120		mΩ
V_0	free wheeling diode	D7	$T_{VJ} = 125^\circ\text{C}$	1.46		V
R_0				63		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 30-12A6K	MUBW30-12A6K	Box	10	499 854