

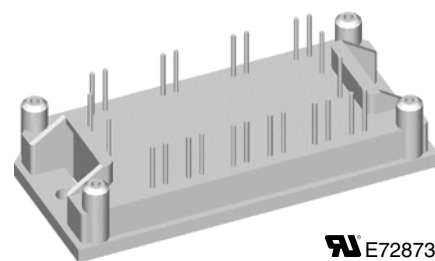
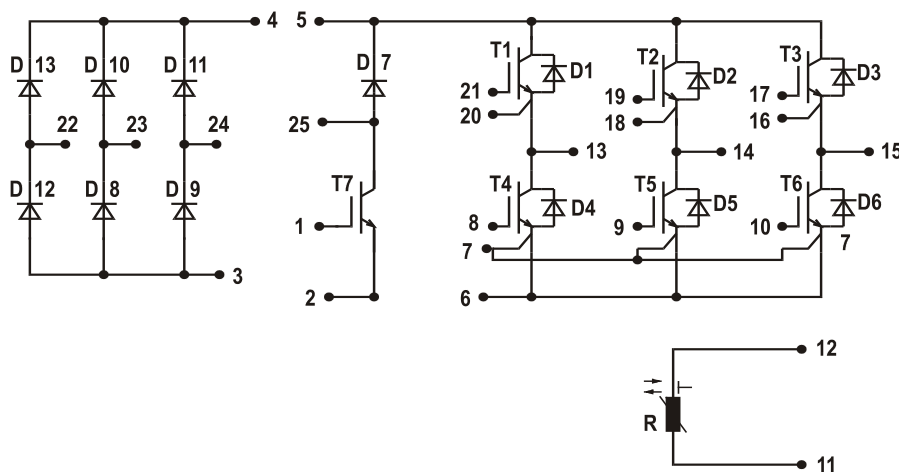
Converter - Brake - Inverter Module (CBI 1) **NPT IGBT**

Preliminary data

Part name (Marking on product)

MUBW35-06A6K

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 600 \text{ V}$	$V_{CES} = 600 \text{ V}$
$I_{DAVM25} = 130 \text{ A}$	$I_{C25} = 25 \text{ A}$	$I_{C25} = 42 \text{ A}$
$I_{FSM} = 320 \text{ A}$	$V_{CE(sat)} = 2.0 \text{ V}$	$V_{CE(sat)} = 2.3 \text{ V}$



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	$T_C = 25^{\circ}\text{C}$			42		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			29		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			130		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 35\text{ A}; V_{GE} = 15\text{ V}$		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.3 2.6	2.7	V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.7\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	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	0.75	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	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		1600			pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 300\text{ V}; V_{GE} = 15\text{ V}; I_C = 30\text{ A}$		95			nC
$t_{d(on)}$	turn-on delay time	} inductive load $V_{CE} = 300\text{ V}; I_C = 30\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 33\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		50		ns
t_r	current rise time				50		ns
$t_{d(off)}$	turn-off delay time				270		ns
t_f	current fall time				40		ns
E_{on}	turn-on energy per pulse				1.4		mJ
E_{off}	turn-off energy per pulse				1.0		mJ
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 33\ \Omega$ $L = 100\ \mu\text{H}$; clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$		60		A
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = 600\text{ V}; V_{GE} = \pm 15\text{ V};$ $R_G = 82\ \Omega$; 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	$T_{VJ} = 150^{\circ}\text{C}$			600		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			69		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			46		A
V_F	forward voltage	$I_F = 35\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.2	1.7	V V
I_{RM}	max. reverse recovery current	} $V_R = 100\text{ V}$ $di_f/dt = -100\text{ A}/\mu\text{s}$ $I_F = 50\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 100^{\circ}\text{C}$		5		A
t_{rr}	reverse recovery time				100		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

				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		25	A	
I _{C80}			T _C = 80°C		17	A	
P _{tot}	total power dissipation		T _C = 25°C		80	W	
V _{CE(sat)}	collector emitter saturation voltage	I _C = 15 A; V _{GE} = 15 V	T _{VJ} = 25°C T _{VJ} = 125°C	2.0 2.3	2.4	V V	
V _{GE(th)}	gate emitter threshold voltage	I _C = 0.4 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	0.8	0.5	mA mA	
I _{GES}	gate emitter leakage current	V _{CE} = 0 V; V _{GE} = ±20 V			100	nA	
C _{ies}	input capacitance	V _{CE} = 25 V; V _{GE} = 0 V; f = 1 MHz		800		pF	
Q _{G(on)}	total gate charge	V _{CE} = 300 V; V _{GE} = 15 V; I _C = 15 A		57		nC	
t _{d(on)}	turn-on delay time	} inductive load V _{CE} = 300 V; I _C = 15 A V _{GE} = ±15 V; R _G = 68 Ω	T _{VJ} = 125°C	30		ns	
t _r	current rise time			50		ns	
t _{d(off)}	turn-off delay time			270		ns	
t _f	current fall time			40		ns	
E _{on}	turn-on energy per pulse			0.7		mJ	
E _{off}	turn-off energy per pulse			0.5		mJ	
I _{CM}	reverse bias safe operating area	RBSOA; V _{GE} = ±15 V; R _G = 68 Ω L = 100 μH; clamped induct. load V _{CEmax} = V _{CES} - L _S ·di/dt	T _{VJ} = 125°C	30		A	
t _{SC} (SCSOA)	short circuit safe operating area	V _{CE} = 600 V; V _{GE} = ±15 V; R _G = 82 Ω; non-repetitive	T _{VJ} = 125°C	10		μs	
R _{thJC}	thermal resistance junction to case	(per IGBT)			1.55	K/W	
R _{thCH}	thermal resistance case to heatsink	(per IGBT)		0.5		K/W	

Brake Chopper D7

					Ratings			
Symbol	Definitions	Conditions	min.	typ.	max.	Unit		
V_{RRM}	<i>max. repetitive reverse voltage</i>		$T_{VJ} = 150^{\circ}\text{C}$		600	V		
I_{F25}	<i>forward current</i>		$T_C = 25^{\circ}\text{C}$		21	A		
I_{F80}			$T_C = 80^{\circ}\text{C}$		14	A		
V_F	<i>forward voltage</i>	$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.5	2.3	V V		
I_R	<i>reverse current</i>	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	0.2	0.06	mA mA		
I_{RM}	<i>max. reverse recovery current</i>	$\left. \begin{array}{l} V_R = 100\text{ V}; I_F = 12\text{ A} \\ di_F/dt = -100\text{ A}/\mu\text{s} \end{array} \right\}$	$T_{VJ} = 100^{\circ}\text{C}$	3.5		A		
t_{rr}	<i>reverse recovery time</i>			80			ns	
R_{thJC}	<i>thermal resistance junction to case</i>	(per diode)			2.5	K/W		
R_{thCH}	<i>thermal resistance case to heatsink</i>	(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}	<i>max. repetitive reverse voltage</i>			1600	V
I_{FAV}	<i>average forward current</i>	sine 180°	T _C = 80°C	31	A
I_{DAVM}	<i>max. average DC output current</i>	rectangular; d = 1/3; bridge	T _C = 80°C	89	A
I_{FSM}	<i>max. surge forward current</i>	t = 10 ms; sine 50 Hz	T _C = 25°C	320	A
P_{tot}	<i>total power dissipation</i>		T _C = 25°C	80	W

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V_F	forward voltage	$I_F = 30\text{ A}$	$T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	1.0 1.1	1.35 V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	0.4	0.02 mA
R_{thJC}	thermal resistance junction to case	(per diode)	$T_{VJ} = 25^\circ\text{C}$		1.4 K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)		0.45	K/W

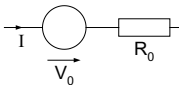
Temperature Sensor NTC

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

Module

Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
T_{VJ}	operating temperature		-40		125	$^\circ\text{C}$
T_{VJM}	max. virtual junction temperature				150	$^\circ\text{C}$
T_{stg}	storage temperature		-40		125	$^\circ\text{C}$
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

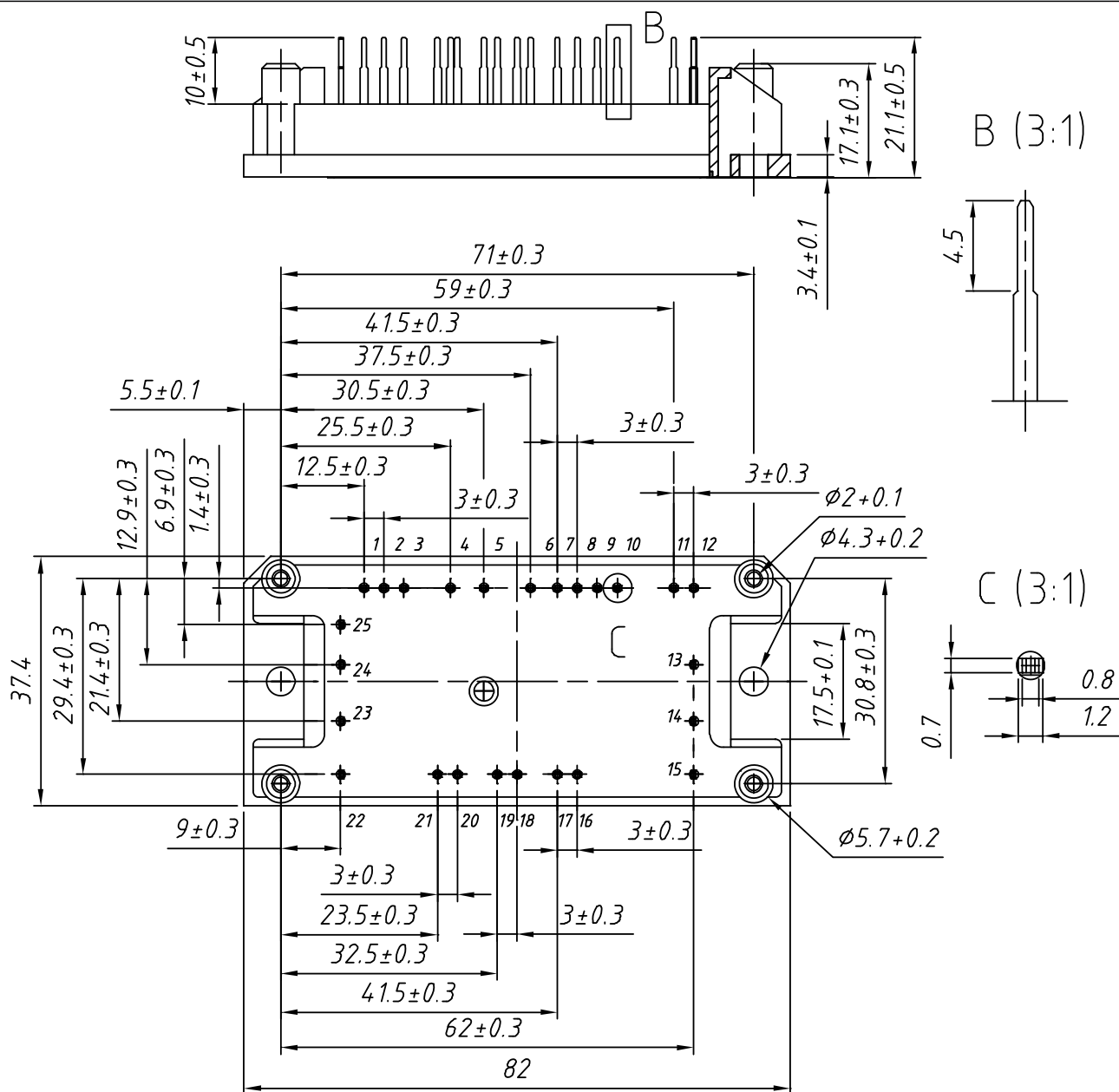


Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
V_0	rectifier diode	D8 - D13	$T_{VJ} = 125^\circ\text{C}$	0.90		V
R_0				9		m Ω
V_0	IGBT	T1 - T6	$T_{VJ} = 125^\circ\text{C}$	1.0		V
R_0				4		m Ω
V_0	free wheeling diode	D1 - D6	$T_{VJ} = 125^\circ\text{C}$	1.05		V
R_0				7		m Ω
V_0	IGBT	T7	$T_{VJ} = 125^\circ\text{C}$	1.0		V
R_0				70		m Ω
V_0	free wheeling diode	D7	$T_{VJ} = 125^\circ\text{C}$	1.25		V
R_0				26		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 35-06A6K	MUBW35-06A6K	Box	10	500 117