

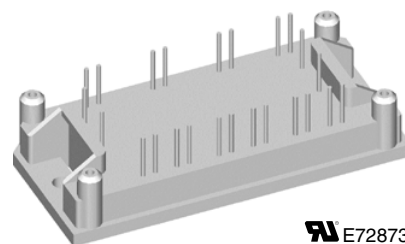
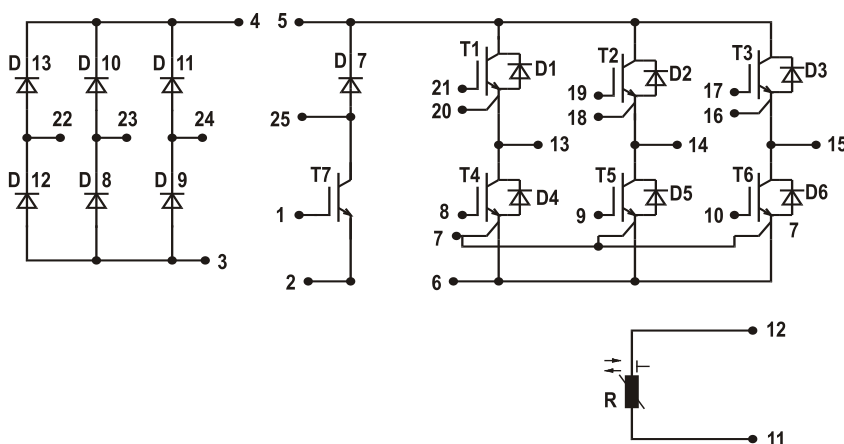
Converter - Brake - Inverter Module (CBI 1) NPT IGBT

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	Ratings			
			min.	typ.	max.	Unit
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	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	Ratings			
			min.	typ.	max.	Unit
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	$I_F = 30\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.0	2.9	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	Ratings			
			min.	typ.	max.	Unit
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	$I_C = 15\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.9 3.5	3.4	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	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	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	Ratings			
			min.	typ.	max.	Unit
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	$I_F = 15\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.0	3.5	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	$V_R = 600\text{ V}; I_F = 10\text{ A}$ $di_F/dt = -400\text{ A}/\mu\text{s}$	$T_{VJ} = 125^{\circ}\text{C}$	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°C	31	A
I _{DAVM}	max. average DC output current	rectangular; d = 1/3; bridge	T _C = 80°C	89	A
I _{FSM}	max. surge forward current	t = 10 ms; sine 50 Hz	T _C = 25°C	320	A
P _{tot}	total power dissipation		T _C = 25°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	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

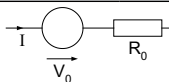
Temperature Sensor NTC

					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

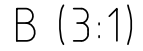
Equivalent Circuits for Simulation



$\frac{V_0}{R_0}$	R_0	Ratings				
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
V_0 R_0	<i>rectifier diode</i>	D8 - D13	$T_{VJ} = 125^{\circ}\text{C}$	0.90 9		V m Ω
V_0 R_0	<i>IGBT</i>	T1 - T6	$T_{VJ} = 125^{\circ}\text{C}$	tbd tbd		V m Ω
V_0 R_0	<i>free wheeling diode</i>	D1 - D6	$T_{VJ} = 125^{\circ}\text{C}$	1.5 14		V m Ω
V_0 R_0	<i>IGBT</i>	T7	$T_{VJ} = 125^{\circ}\text{C}$	1.5 120		V m Ω
V_0 R_0	<i>free wheeling diode</i>	D7	$T_{VJ} = 125^{\circ}\text{C}$	1.46 63		V m Ω

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

Dimensions in mm (1 mm = 0.0394")



Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MUBW 30-12A6K	MUBW30-12A6K	Box	10	499 854