IXYS

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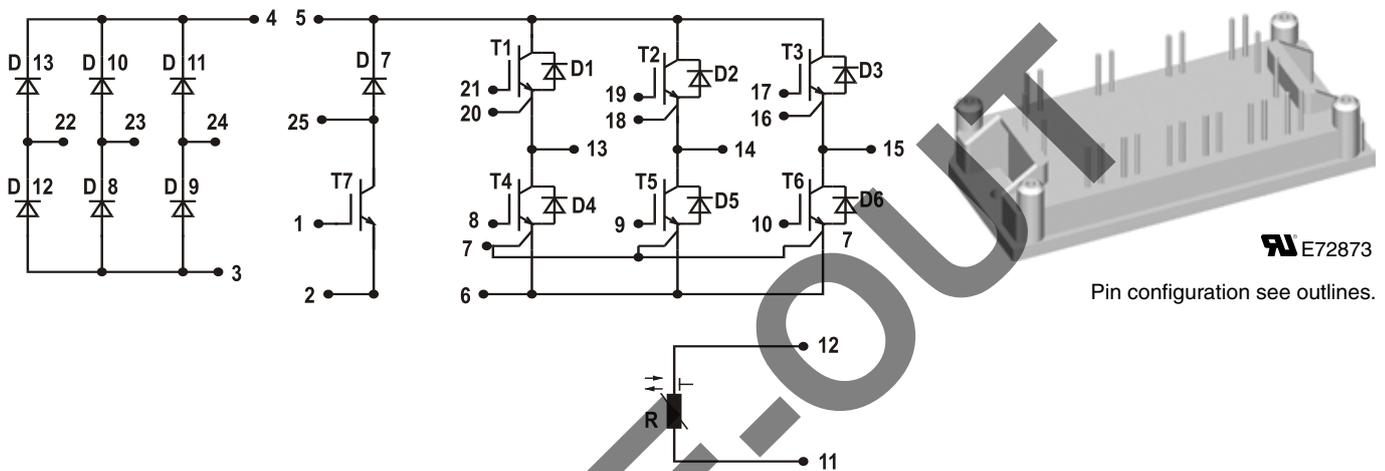# NPT IGBT

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
$V_{RRM} = 1600$ V	$V_{CES} = 600$ V	$V_{CES} = 600$ V
$I_{DAVM25} = 96$ A	$I_{C25} = 12$ A	$I_{C25} = 19$ A
$I_{FSM} = 250$ A	$V_{CE(sat)} = 2.25$ V	$V_{CE(sat)} = 2.4$ V

Preliminary data

Part name (Marking on product)

MUBW15-06A6K

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

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Ouput Inverter T1 - T6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
						Ratings	
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			19	A
I_{C80}			T_C = 80°C			14	A
P_{tot}	total power dissipation		T_C = 25°C			75	W
$V_{CE(sat)}$	collector emitter saturation voltage	I_C = 15 A; V_{GE} = 15 V	T_{VJ} = 25°C		2.4	2.9	V
			T_{VJ} = 125°C		2.8		V
$V_{GE(th)}$	gate emitter threshold voltage	I_C = 0.35 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			0.6	mA
			T_{VJ} = 125°C		1.1		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			600		pF
$Q_{G(on)}$	total gate charge	V_{CE} = 300 V; V_{GE} = 15 V; I_C = 10 A			39		nC
$t_{d(on)}$	turn-on delay time				40		ns
t_r	current rise time	inductive load	T_{VJ} = 125°C		40		ns
$t_{d(off)}$	turn-off delay time	V_{CE} = 300 V; I_C = 10 A			230		ns
t_f	current fall time	V_{GE} = ±15 V; R_G = 82 Ω			30		ns
E_{on}	turn-on energy per pulse				0.4		mJ
E_{off}	turn-off energy per pulse				0.3		mJ
I_{CM}	reverse bias safe operating area	RBSOA; V_{GE} = ±15 V; R_G = 82 Ω L = 100 µH; clamped induct. load V_{CEmax} = V_{CES} - L_S·di/dt	T_{VJ} = 125°C		20		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)				1.7	K/W
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.6		K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
						Ratings	
V_{RRM}	max. repetitve 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 = 15 A; V_{GE} = 0 V	T_{VJ} = 25°C			2.3	V
			T_{VJ} = 125°C		1.7		V
I_{RM}	max. reverse recovery current	V_R = 300 V			13		A
t_{rr}	reverse recovery time	di_F/dt = -400 A/µs	T_{VJ} = 100°C		80		ns
$E_{rec(off)}$	reverse recovery energy	I_F = 15 A; V_{GE} = 0 V			tbd		µJ
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°C unless otherwise stated

IXYS reserves the right to change limits, test conditions and dimensions.

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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				45	W
$V_{CE(sat)}$	collector emitter saturation voltage	I_C = 10 A; V_{GE} = 15 V	T_{VJ} = 25°C		2.65	3.3	V
			T_{VJ} = 125°C		3.1		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			0.1	mA
			T_{VJ} = 125°C		0.7		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				20		ns
t_r	current rise time	inductive load	T_{VJ} = 125°C		10		ns
$t_{d(off)}$	turn-off delay time	V_{CE} = 300 V; I_C = 8 A			110		ns
t_f	current fall time	V_{GE} = ±15 V; R_G = 54 Ω			30		ns
E_{on}	turn-on energy per pulse	R_{Goff} = 22 Ω			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			2.1	V
			T_{VJ} = 125°C		1.25		V
I_R	reverse current	V_R = V_{RRM}	T_{VJ} = 25°C			0.06	mA
			T_{VJ} = 125°C		0.2		mA
I_{RM}	max. reverse recovery current	V_R = 100 V; I_F = 12 A			3.5		A
t_{rr}	reverse recovery time	di$_F$/dt = -100 A/µs	T_{VJ} = 100°C		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°C unless otherwise stated

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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		1.1	1.45	V
			T_{VJ} = 125°C		1.2		V
I_R	reverse current	V_R = V_{RRM}	T_{VJ} = 25°C			0.01	mA
			T_{VJ} = 125°C		0.4		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			Unit
				min.	typ.	max.	
R_{25}	resistance		T_C = 25°C	4.45	4.7	5.0	kΩ
$B_{25/85}$					3510		K

Module

Symbol	Definitions	Conditions		Ratings			Unit
				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 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
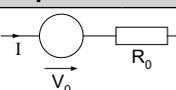
Symbol	Definitions	Conditions		Ratings			Unit
				min.	typ.	max.	
V_0	rectifier diode	D8 - D13	T_{VJ} = 125°C		0.90		V
R_0					12		mΩ
V_0	IGBT	T1 - T6	T_{VJ} = 125°C		1.0		V
R_0					110		mΩ
V_0	free wheeling diode	D1 - D6	T_{VJ} = 125°C		1.25		V
R_0					26		mΩ
V_0	IGBT	T7	T_{VJ} = 125°C		1.4		V
R_0					150		mΩ
V_0	free wheeling diode	D7	T_{VJ} = 125°C		1.25		V
R_0					26		mΩ

T_C = 25°C unless otherwise stated

IXYS reserves the right to change limits, test conditions and dimensions.

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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 15-06A6K	MUBW15-06A6K	Box	10	500 094

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