# Converter - Brake - Inverter Module (CBI2)

Trench-IGBT

NTC
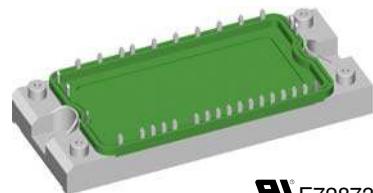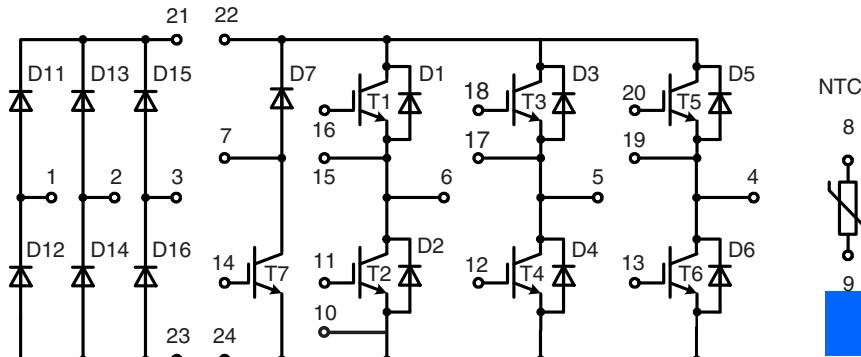
E72873

See outline drawing for pin arrangement

Preliminary data

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{FAVM25} = 42 A	I_{C25} = 35 A	I_{C25} = 62 A
I_{FSM} = 300 A	$V_{CE(sat)}$ = 2.3 V	$V_{CE(sat)}$ = 2 V

Input Rectifier Bridge D11 - D16

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	T_C = 80°C; sine 180°	30	A
I_{DAVM}	T_C = 80°C; rectangular; d = $^1/_3$; bridge	80	A
I_{FSM}	T_{VJ} = 25°C; t = 10 ms; sine 50 Hz	300	A
P_{tot}	T_C = 25°C	100	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified)			
		min.	typ.	max.	
V_F	I_F = 35 A; T_{VJ} = 25°C		1.2	1.4	V
	T_{VJ} = 125°C		1.2		V
I_R	V_R = V_{RRM}; T_{VJ} = 25°C			0.02	mA
	T_{VJ} = 125°C		0.4		mA
R_{thJC}	(per diode)			1.3	K/W

Application: AC motor drives with

- Input from single or three phase grid
- Three phase synchronous or
- asynchronous motor
- electric braking operation

Features

- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with Trench 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

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

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Output Inverter T1 - T6

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}	Continuous	± 20	V
I_{C25}	T_C = 25°C	62	A
I_{C80}	T_C = 80°C	44	A
I_{CM}	RBSOA; V_{GE} = ±15 V; R_G = 27 Ω; T_{VJ} = 125°C	100	A
V_{CEK}	Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 27 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	220	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	I_C = 40 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.0	2.6	V
	T_{VJ} = 125°C		2.4		V
$V_{GE(th)}$	I_C = 1.5 mA; V_{GE} = V_{CE}	5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			1.75	mA
	T_{VJ} = 125°C		3		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			400	nA
$t_{d(on)}$			90		ns
t_r	Inductive load, T_{VJ} = 125°C		50		ns
$t_{d(off)}$	V_{CE} = 600 V; I_C = 40 A		520		ns
t_f	V_{GE} = ±15 V; R_G = 27 Ω		90		ns
E_{on}			4		mJ
E_{off}			4.7		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		2.5		nF
Q_{Gon}	V_{CE} = 600V; V_{GE} = 15 V; I_C = 35 A		330		nC
R_{thJC}	(per IGBT)			0.6	K/W

Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	50	A
I_{F80}	T_C = 80°C	33	A

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V_F	I_F = 40 A; V_{GE} = 0 V; T_{VJ} = 25°C			3.0	V
	T_{VJ} = 125°C		1.9	2.2	V
I_{RM}			51		A
t_{rr}	I_F = 30 A; di_F/dt = -1100 A/µs; T_{VJ} = 125°C		180		ns
$E_{rec(off)}$	V_R = 600 V; V_{GE} = 0 V		1.8		mJ
R_{thJC}	(per diode)			1.19	K/W

Equivalent Circuits for Simulation

Conduction
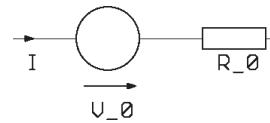
D11 - D16

Rectifier Diode (typ. at T_J = 125°C)
V_0 = 0.83 V; R_0 = 11 mΩ

T1 - T6 / D1 - D6

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = tbd; R_0 = tbd

Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.26V; R_0 = 15 mΩ

T7 / D7

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 1.37 V; R_0 = 62 mΩ

Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.39 V; R_0 = 56 mΩ

Thermal Response
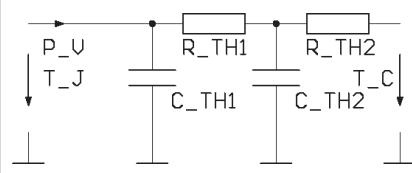
D11 - D16

Rectifier Diode (typ.)
C_{th1} = 0.106 J/K; R_{th1} = 1.06 K/W
C_{th2} = 0.79 J/K; R_{th2} = 0.239 K/W

T1 - T6 / D1 - D6

IGBT (typ.)
C_{th1} = tbd; R_{th1} = tbd
C_{th2} = tbd; R_{th2} = tbd

Free Wheeling Diode (typ.)
C_{th1} = 0.116 J/K; R_{th1} = 0.973 K/W
C_{th2} = 0.879 J/K; R_{th2} = 0.217 K/W

T7 / D7

IGBT (typ.)
C_{th1} = 0.156 J/K; R_{th1} = 0.545 K/W
C_{th2} = 1.162 J/K; R_{th2} = 0.155 K/W

Free Wheeling Diode (typ.)
C_{th1} = 0.043 J/K; R_{th1} = 2.738 K/W
C_{th2} = 0.54 J/K; R_{th2} = 0.462 K/W

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Brake Chopper T7

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	35	A
I_{C80}	T_C = 80°C	25	A
I_{CM}	RBSOA; V_{GE} = ±15 V; R_G = 82 Ω; T_{VJ} = 125°C	35	A
V_{CEK}	Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = V_{CES}; V_{GE} = ±15 V; R_G = 82 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	180	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	I_C = 20 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.3	3	V
	T_{VJ} = 125°C		2.6		V
$V_{GE(th)}$	I_C = 0.6 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.8	mA
	T_{VJ} = 125°C		0.8		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$			100		ns
t_r	Inductive load, T_{VJ} = 125°C		75		ns
$t_{d(off)}$	V_{CE} = 600 V; I_C = 20 A		500		ns
t_f	V_{GE} = ±15 V; R_G = 82 Ω		70		ns
E_{off}			2.4		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MH z		1000		pF
Q_{Gon}	V_{CE} = 600V; V_{GE} = 15 V; I_C = 20 A		70		nC
R_{thJC}				0.7	K/W

Brake Chopper D7

Symbol	Conditions	Maximum Ratings	
V_{RRM}	T_{VJ} = 25°C to 150°C	1200	V
I_{F25}	T_C = 25°C	16	A
I_{F80}	T_C = 80°C	11	A

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V_F	I_F = 20 A; T_{VJ} = 25°C			3.6	V
	T_{VJ} = 125°C		2.6		V
I_R	V_R = V_{RRM}; T_{VJ} = 25°C			0.06	mA
	T_{VJ} = 125°C		0.07		mA
I_{RM}	I_F = 20 A; di_F/dt = -400 A/µs; T_{VJ} = 125°C		13		A
t_{rr}	V_R = 600 V		110		ns
R_{thJC}				3.2	K/W

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Temperature Sensor NTC

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
R_{25}	T = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$			3375		K

Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	°C
T_{JM}		150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	2500	V~
M_d	Mounting torque (M5)	2.7 - 3.3	Nm

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$R_{pin-chip}$			5		mΩ
d_S	Creepage distance on surface	6			mm
d_A	Strike distance in air	6			mm
R_{thCH}	with heatsink compound		0.02		K/W
Weight			180		g

Dimensions in mm (1 mm = 0.0394")

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