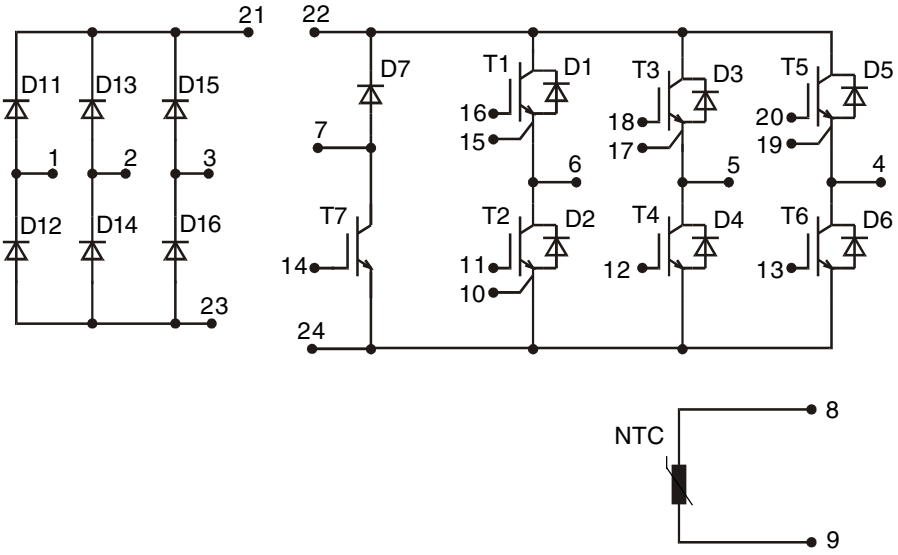
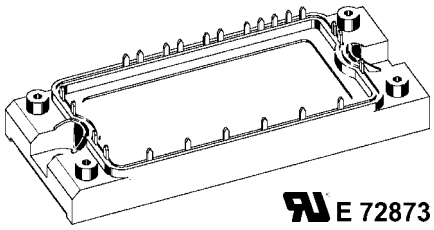
Converter - Brake - Inverter Module (CBI2)





Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{DAVM} = 36 A	I_{C25} = 20 A	I_{C25} = 50 A
I_{FSM} = 300 A	$V_{CE(sat)}$ = 2.9 V	$V_{CE(sat)}$ = 2.2 V

Input Rectifier Bridge D11 - D16

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	T_C = 80°C; sine 180°	25	A
I_{DAVM}	T_C = 80°C; rectangular; d = 1/3	24	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 = 25 A; T_{VJ} = 25°C		1.4	1.7	V
	T_{VJ} = 125°C		1.4		V
I_R	$V_R = V_{RRM}$; T_{VJ} = 25°C			0.15	mA
	T_{VJ} = 125°C		1.2		mA
t_{rr}	V_R = 100 V; I_F = 15 A; di/dt = -15 A/µs		1		µs
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
- Fast rectifier diodes for enhanced EMC behaviour
- NPT IGBT technology with low saturation voltage, low switching losses, high RBSOA and short circuit ruggedness
- 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

Output Inverter T1 - T6

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	50	A
I_{C80}	T_C = 80°C	35	A
RBSOA	V_{GE} = ±15 V; R_G = 47 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 50 $V_{CEK} \le V_{CES}$	A
t_{SC} (SCSOA)	V_{CE} = V_{CES}; V_{GE} = ±15 V; R_G = 47 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	225	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 25 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.2	2.7	V
	T_{VJ} = 125°C		2.5		V
$V_{GE(th)}$	I_C = 1 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.9	mA
	T_{VJ} = 125°C		0.9		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 600 V; I_C = 25 A V_{GE} = ±15 V; R_G = 47 Ω		100		ns
t_r			70		ns
$t_{d(off)}$			500		ns
t_f			70		ns
E_{on}			2.8		mJ
E_{off}			3.8		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		1650		pF
Q_{Gon}	V_{CE} = 600V; V_{GE} = 15 V; I_C = 25 A		120		nC
R_{thJC}	(per IGBT)			0.55	K/W

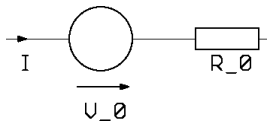
Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	28	A
I_{F80}	T_C = 80°C	18	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 15 A; V_{GE} = 0 V; T_{VJ} = 25°C			3.1	V
	T_{VJ} = 125°C		2.1		V
I_{RM}	I_F = 25 A; di_F/dt = -400A/µs; T_{VJ} = 125°C		16		A
t_{rr}	V_R = 600 V; V_{GE} = 0 V		130		ns
R_{thJC}	(per diode)			2.1	K/W

Equivalent Circuits for Simulation

Conduction



D11 - D16

Rectifier Diode (typ. at T_J = 125°C)
V_0 = 1.16 V; R_0 = 9 mΩ

T1 - T6 / D1 - D6

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 1.38 V; R_0 = 46 mΩ

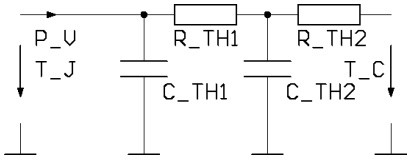
Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.32 V; R_0 = 30 mΩ

T7 / D7

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 1.32 V; R_0 = 131 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} = 0.201 J/K; R_{th1} = 0.419 K/W
C_{th2} = 1.25 J/K; R_{th2} = 0.131 K/W

Free Wheeling Diode (typ.)
C_{th1} = 0.065 J/K; R_{th1} = 1.758 K/W
C_{th2} = 0.639 J/K; R_{th2} = 0.342 K/W

T7 / D7

IGBT (typ.)
C_{th1} = 0.09 J/K; R_{th1} = 0.954 K/W
C_{th2} = 0.809 J/K; R_{th2} = 0.246 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

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	20	A
I_{C80}	T_C = 80°C	15	A
RBSOA	V_{GE} = ±15 V; R_G = 82 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 20 $V_{CEK} \le V_{CES}$	A
t_{SC} (SCSOA)	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 82 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	105	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 15 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.9	3.3	V
	T_{VJ} = 125°C		3.3		V
$V_{GE(th)}$	I_C = 0.4 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.5	mA
	T_{VJ} = 125°C		0.3		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 600 V; I_C = 15 A V_{GE} = ±15 V; R_G = 82 Ω		50		ns
t_r			40		ns
$t_{d(off)}$			290		ns
t_f			60		ns
E_{on}			1.8		mJ
E_{off}			1.6		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MH z		600		pF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 15 A		45		nC
R_{thJC}				1.2	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	17	A
I_{F80}	T_C = 80°C	11	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 15 A; T_{VJ} = 25°C			3.2	V
	T_{VJ} = 125°C		2.3		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 = 10 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

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}	Operating	-40...+125	°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.	
$R_{pin\text{-}chip}$			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")