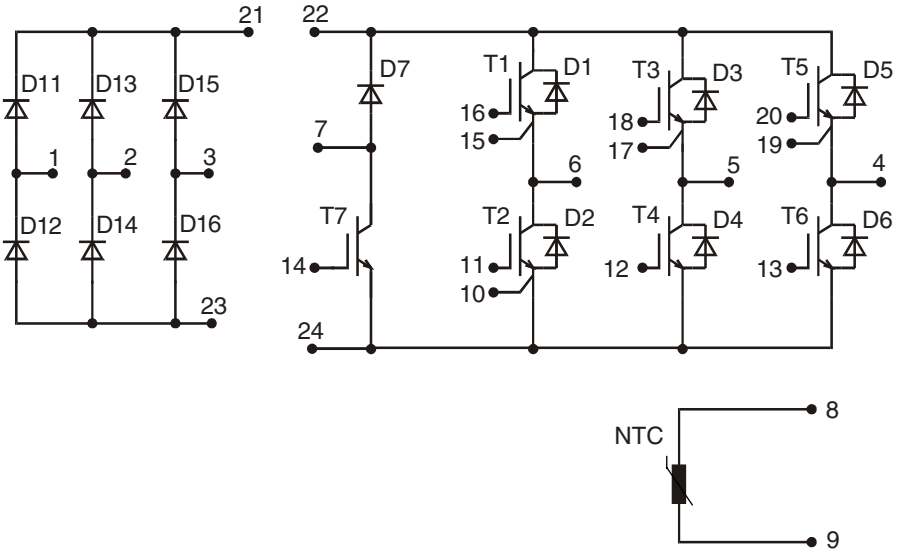
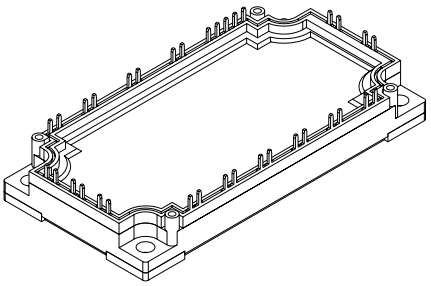
Converter - Brake - Inverter Module (CBI3)





Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 2200 V	V_{CES} = 1700 V	V_{CES} = 1700 V
I_{FAVM} = 70 A	I_{C25} = 48 A	I_{C25} = 113 A
I_{FSM} = 700 A	$V_{CE(sat)}$ = 2.1 V	$V_{CE(sat)}$ = 2.0 V

Input Rectifier Bridge D11 - D16

Symbol	Conditions	Maximum Ratings	
V_{RRM}		2200	V
I_{FAV}	T_C = 80°C; sine 180°	50	A
I_{DAVM}	T_C = 80°C; rectangular; d = $^1/_3$; bridge	140	A
I_{FSM}	T_{VJ} = 25°C; t = 10 ms; sine 50 Hz	700	A
P_{tot}	T_C = 25°C	135	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 75 A; T_{VJ} = 25°C		1.3	1.5	V
	T_{VJ} = 125°C		1.3		V
I_R	$V_R = V_{RRM}$; T_{VJ} = 25°C			0.05	mA
	T_{VJ} = 125°C		0.8		mA
R_{thJC}	(per diode)			0.95	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
- IGBT technology with low saturation voltage, low switching losses and tail current, 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	1700	V
V_{GES}	Continuous	± 20	V
I_{C25} I_{C80}	T_C = 25°C T_C = 80°C	113 80	A A
I_{CM} V_{CEK}	V_{GE} = ±15 V; R_G = 18 Ω; T_{VJ} = 125°C RBSOA; Clamped inductive load; L = 100 µH	150 V_{CES}	A
t_{SC} (SCSOA)	V_{CE} = 1000 V; V_{GE} = ±15 V; R_G = 18 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	450	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 75 A; V_{GE} = 15 V; T_{VJ} = 25°C T_{VJ} = 125°C		2.0 2.4	2.4	V V
$V_{GE(th)}$	I_C = 3 mA; V_{GE} = V_{CE}	5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C T_{VJ} = 125°C		 0.8	0.8	mA mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			400	nA
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	Inductive load, T_{VJ} = 125°C V_{CE} = 900 V; I_C = 75 A V_{GE} = ±15 V; R_G = 18 Ω		220 100 880 200 30 25		ns ns ns ns mJ mJ
C_{ies} Q_{Gon}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz V_{CE}= 900 V; V_{GE} = 15 V; I_C = 75 A		6.6 850		nF nC
R_{thJC}	(per IGBT)			0.28	K/W

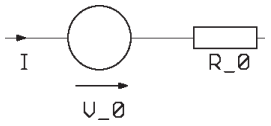
Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	92	A
I_{F80}	T_C = 80°C	63	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 75 A; V_{GE} = 0 V; T_{VJ} = 25°C T_{VJ} = 125°C		2.4 2.4	2.9	V V
I_{RM} t_{rr}	I_F = 75 A; di_F/dt = -500 A/µs; T_{VJ} = 125°C V_R = 900 V; V_{GE} = 0 V		tbd tbd		A ns
R_{thJC}	(per diode)			0.4	K/W

Equivalent Circuits for Simulation

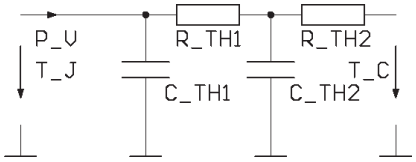
Conduction



IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
T1-T6
V_0 = 0.98 V; R_0 = 28 mΩ
T7
V_0 = 1.0 V; R_0 = 50 mΩ

Diode (typ. at T_J = 125°C)
D1-D6
V_0 = 1.4 V; R_0 = 11 mΩ
D7
V_0 = 2.1 V; R_0 = 41 mΩ
D11-D16
V_0 = tbd V; R_0 = tbd mΩ

Thermal Response



IGBT (typ.)
T1-T6
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W
T7
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W

Diode (typ.)
D1-D6
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W
D7
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W
D11-D16
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W

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Brake Chopper T7

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1700	V
V_{GES}	Continuous	±20	V
I_{C25}	T_C = 25°C	48	A
I_{C80}	T_C = 80°C	34	A
I_{CM}	V_{GE} = ±15 V; R_G = 45 Ω; T_{VJ} = 125°C	60	A
V_{CEK}	RBSOA; Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 45 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	200	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 30 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.1	2.5	V
	T_{VJ} = 125°C		2.5		V
$V_{GE(th)}$	I_C = 1.2 mA; V_{GE} = V_{CE}	5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.3	mA
	T_{VJ} = 125°C		0.6		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			400	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C		220		ns
t_r	V_{CE} = 900 V; I_C = 30 A		100		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 45 Ω		880		ns
t_f			200		ns
E_{off}			10		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MH z		2.5		nF
Q_{Gon}	V_{CE}= 900 V; V_{GE} = 15 V; I_C = 30 A		330		nC
R_{thJC}				0.62	K/W

Brake Chopper D7

Symbol	Conditions	Maximum Ratings	
V_{RRM}	T_{VJ} = 25°C to 150°C	1700	V
I_{F25}	T_C = 25°C	30	A
I_{F80}	T_C = 80°C	21	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 30 A; T_{VJ} = 25°C		2.8	3.3	V
	T_{VJ} = 125°C		2.2		V
I_R	V_R = V_{RRM}; T_{VJ} = 25°C			0.05	mA
	T_{VJ} = 125°C		0.1		mA
I_{RM}	I_F = 15 A; di_F/dt = -400 A/µs; T_{VJ} = 125°C		tbd		A
t_{rr}	V_R = 900 V		tbd		ns
R_{thJC}				0.9	K/W

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Temperature Sensor NTC

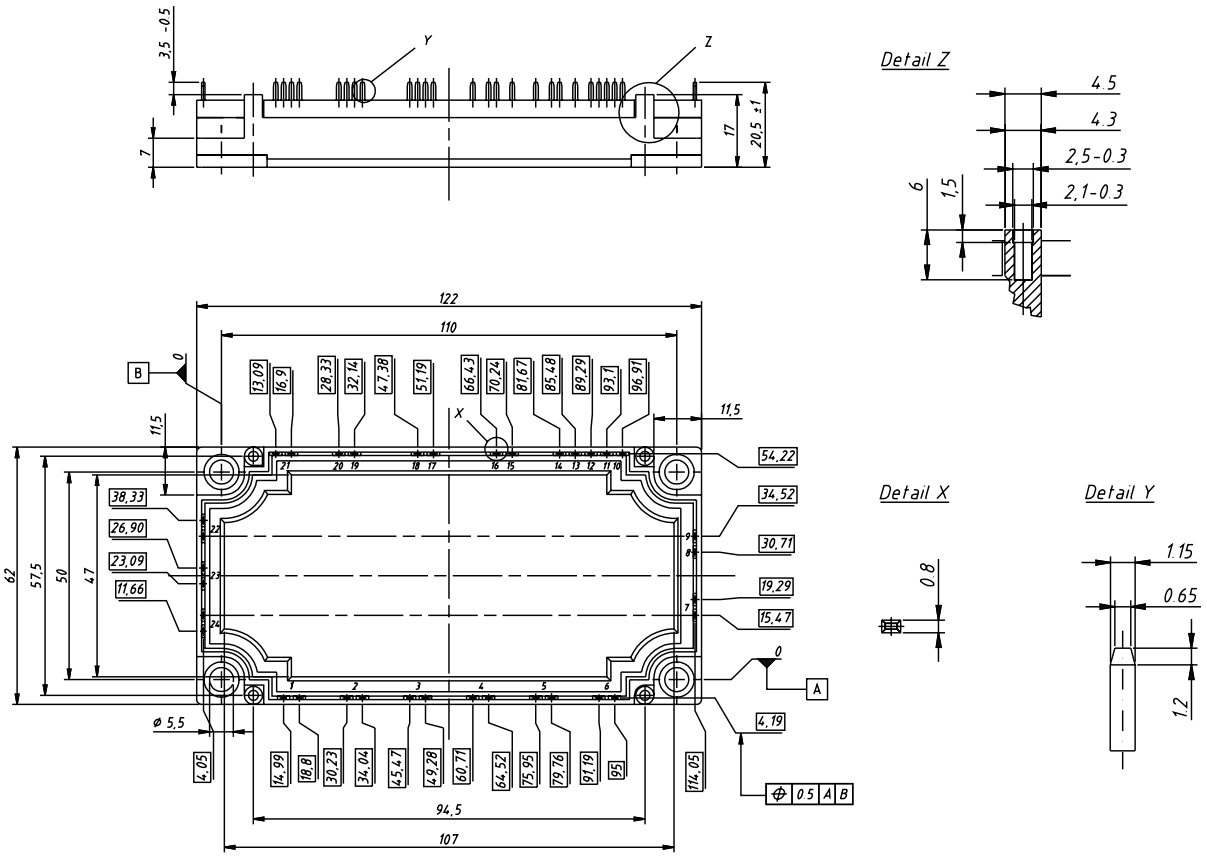
Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{25}	T = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$			3375		K

Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}	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)	3 - 6	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		0.01		K/W
Weight			300		g

Dimensions in mm (1 mm = 0.0394")



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