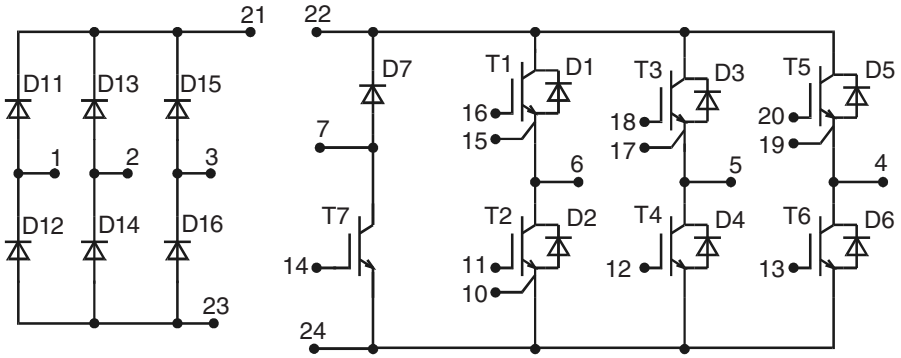
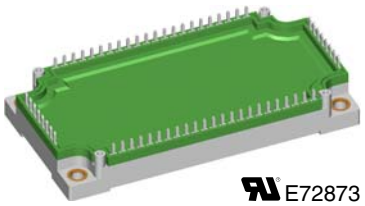
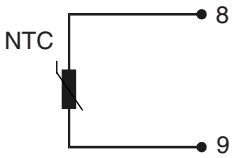
Converter - Brake - Inverter Module (CBI3)





See outline drawing for pin arrangement

Preliminary data



Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 600 V	V_{CES} = 600 V
I_{FAVM} = 90 A	I_{C25} = 50 A	I_{C25} = 125 A
I_{FSM} = 850 A	$V_{CE(sat)}$ = 1.9 V	$V_{CE(sat)}$ = 1.9 V

Input Rectifier D11 - D16

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	T_C = 80°C; sine 180°	65	A
I_{DAVM}	T_C = 80°C; rectangular; d = 1/3; bridge	180	A
I_{FSM}	T_{VJ} = 25°C; t = 10 ms; sine 50 Hz	850	A
P_{tot}	T_C = 25°C	170	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 100 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		1		mA
R_{thJC}	(per diode)			0.73	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
- 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

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Output Inverter T1 - T6

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	600	V
V_{GES}	Continuous	± 20	V
I_{C25}	T_C = 25°C	125	A
I_{C80}	T_C = 80°C	85	A
RBSOA	V_{GE} = ±15 V; R_G = 2.2 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 200 $V_{CEK} \le V_{CES}$	A
t_{SC} **(SCSOA)**	$V_{CE} = V_{CES}$; V_{GE} = ±15 V; R_G = 2.2 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	410	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 100 A; V_{GE} = 15 V; T_{VJ} = 25°C		1.9	2.5	V
	T_{VJ} = 125°C		2.2		V
$V_{GE(th)}$	I_C = 1.5 mA; $V_{GE} = V_{CE}$	4.5		6.5	V
I_{CES}	$V_{CE} = V_{CES}$; V_{GE} = 0 V; T_{VJ} = 25°C			1.4	mA
	T_{VJ} = 125°C		1.5		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			400	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 300 V; I_C = 100 A V_{GE} = ±15 V; R_G = 2.2 Ω		25		ns
t_r			11		ns
$t_{d(off)}$			150		ns
t_f			30		ns
E_{on}			1.0		mJ
E_{off}			2.9		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		4.3		nF
Q_{Gon}	V_{CE}= 300V; V_{GE} = 15 V; I_C = 125 A		340		nC
R_{thJC}	(per IGBT)			0.3	K/W

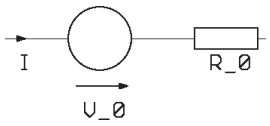
Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	140	A
I_{F80}	T_C = 80°C	85	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 100 A; V_{GE} = 0 V; T_{VJ} = 25°C		1.9	2.2	V
	T_{VJ} = 125°C		1.4		V
I_{RM}	I_F = 60 A; di_F/dt = -500 A/µs; T_{VJ} = 125°C		28		A
t_{rr}	V_R = 300 V; V_{GE} = 0 V		100		ns
R_{thJC}	(per diode)			0.61	K/W

Equivalent Circuits for Simulation

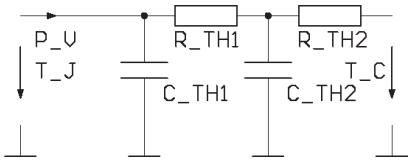
Conduction



IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
T1-T6
V_0 = 1.05 V; R_0 = 11.5 mΩ
T7
V_0 = 1.05 V; R_0 = 21.5 mΩ

Diode (typ. at T_J = 125°C)
D1-D6
V_0 = 1.15 V; R_0 = 2.5 mΩ
D7
V_0 = 1.15 V; R_0 = 12.5 mΩ
D11-D16
V_0 = 0.85 V; R_0 = 4 mΩ

Thermal Response



IGBT (typ.)
T1-T6
C_{th1} = 0.232 J/K; R_{th1} = 0.223 K/W
C_{th2} = 1.504 J/K; R_{th2} = 0.077 K/W
T7
C_{th1} = 0.123 J/K; R_{th1} = 0.419 K/W
C_{th2} = 0.944 J/K; R_{th2} = 0.131 K/W

Diode (typ.)
D1-D6
C_{th1} = 0.138 J/K; R_{th1} = 0.48 K/W
C_{th2} = 0.957 J/K; R_{th2} = 0.13 K/W
D7
C_{th1} = 0.038 J/K; R_{th1} = 1.74 K/W
C_{th2} = 0.435 J/K; R_{th2} = 0.36 K/W
D11-D16
C_{th1} = 0.112 J/K; R_{th1} = 0.568 K/W
C_{th2} = 0.745 J/K; R_{th2} = 0.162 K/W

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

Brake Chopper T7

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	600	V
V_{GES}	Continuous	± 20	V
I_{C25}	T_C = 25°C	75	A
I_{C80}	T_C = 80°C	50	A
RBSOA	V_{GE} = ±15 V; R_G = 22 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 100 $V_{CEK} \leq V_{CES}$	A
t_{SC} (SCSOA)	$V_{CE} = V_{CES}$; V_{GE} = ±15 V; R_G = 22 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 = 50 A; V_{GE} = 15 V; T_{VJ} = 25°C		1.9	2.3	V
	T_{VJ} = 125°C		2.1		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			0.5	mA
	T_{VJ} = 125°C		0.5		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 300 V; I_C = 50 A V_{GE} = ±15 V; R_G = 22 Ω		50		ns
t_r			55		ns
$t_{d(off)}$			300		ns
t_f			30		ns
E_{on}			2.3		mJ
E_{off}			1.7		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MH z		2.8		nF
Q_{Gon}	V_{CE}= 300 V; V_{GE} = 15 V; I_C = 50 A		120		nC
R_{thJC}				0.55	K/W

Brake Chopper D7

Symbol	Conditions	Maximum Ratings	
V_{RRM}	T_{VJ} = 25°C to 150°C	600	V
I_{F25}	T_C = 25°C	35	A
I_{F80}	T_C = 80°C	24	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 50 A; T_{VJ} = 25°C		2.2	2.5	V
	T_{VJ} = 125°C		1.8		V
I_R	$V_R = V_{RRM}$; T_{VJ} = 25°C			0.1	mA
	T_{VJ} = 125°C		0.1		mA
I_{RM}	I_F = 15 A; di_F/dt = -400 A/µs; T_{VJ} = 125°C		13		A
t_{rr}	V_R = 300 V		90		ns
R_{thJC}				2.1	K/W

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Temperature Sensor NTC

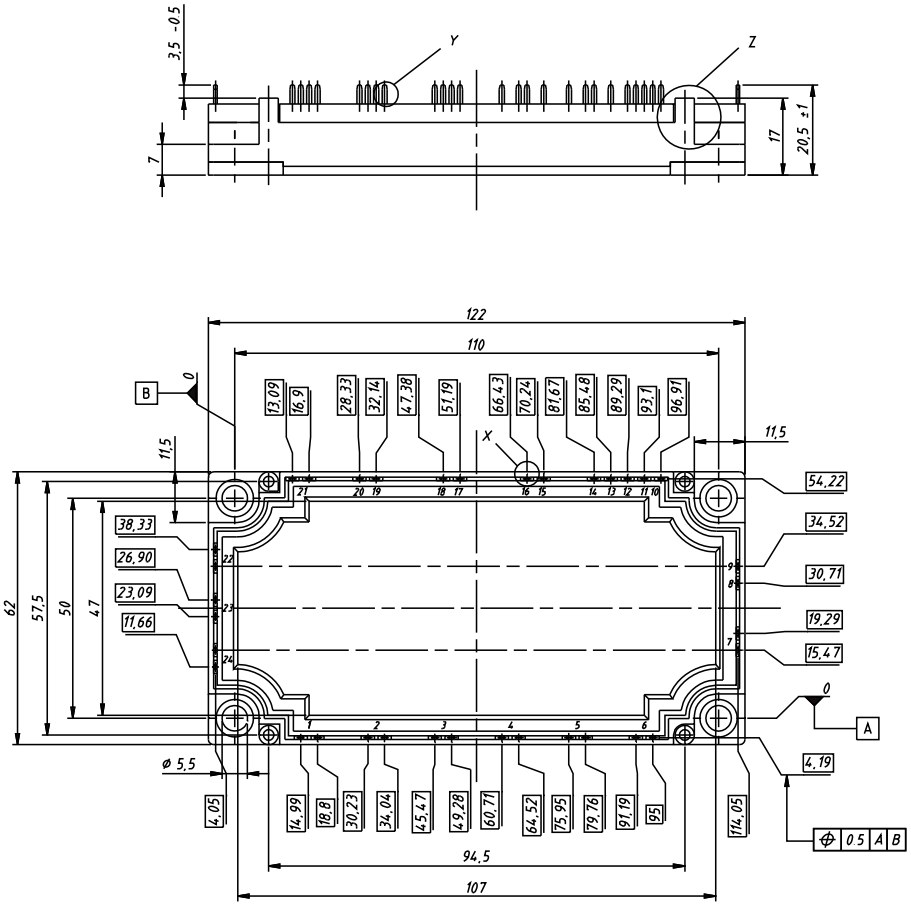
Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{25}	T = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$			3375		K

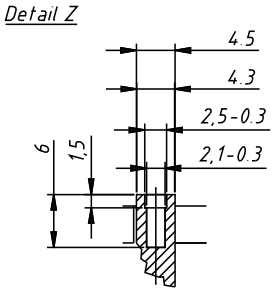
Module

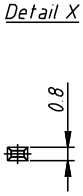
Symbol	Conditions	Maximum Ratings	
T_{VJ}	operating	-40...+125	°C
T_{JM}		+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	2500	V~
M_d	Mounting torque (M5)	3 - 6	Nm

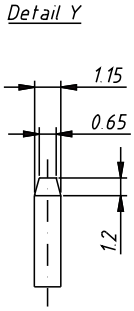
Symbol	Conditions	Characteristic Values min.	typ.	max.	
$R_{pin-chip}$			5		mΩ
d_S	Creepage distance on surface	6			mm
d_A	Strike distance in air	6			mm
R_{thCH}	with heatsink compound		0.01		K/W
Weight			300		g

Dimensions in mm (1 mm = 0.0394")









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