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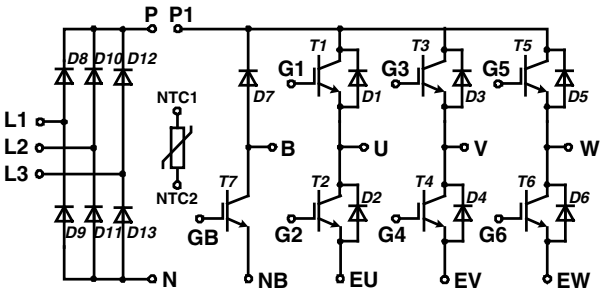
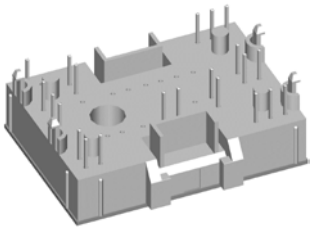
Converter - Brake - Inverter Module
Trench IGBT





Pin configuration see outlines.

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{DAVM25} = 90 A	I_{C25} = 30 A	I_{C25} = 30 A
I_{FSM} = 300 A	$V_{CE(sat)}$ = 1.8 V	$V_{CE(sat)}$ = 1.8 V

Input Rectifier Bridge D8 - D13

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	T_C = 80°C; sine 180°	22	A
I_{DAVM}	bridge output current; T_C = 80°C; rect.; d = $^1/_3$	62	A
I_{FSM}	T_{VJ} = 25°C; t = 10 ms; sine 50 Hz	300	A
P_{tot}	T_C = 25°C	50	W

Symbol	Conditions		Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 30 A	T_{VJ} = 25°C		1.3	1.6	V
		T_{VJ} = 125°C		1.4		V
I_R	$V_R = V_{RRM}$	T_{VJ} = 25°C			0.01	mA
		T_{VJ} = 125°C		0.3		mA
R_{thJC}	(per diode)				2.1	K/W
R_{thCH}				0.7		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

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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
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	30	A
I_{C80}	T_C = 80°C	21	A
RBSOA	V_{GE} = ±15 V; R_G = 75 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 30 $V_{CEK} \le V_{CES}$	A
t_{SC} (SCSOA)	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 75 Ω T_{VJ} = 125°C; non-repetitive	10	µs
P_{tot}	T_C = 25°C	120	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		1.8	2.2	V
	T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	I_C = 0.5 mA; V_{GE} = V_{CE}	5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.6	mA
	T_{VJ} = 125°C		0.8		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			150	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C		90		ns
t_r	V_{CE} = 600 V; I_C = 15 A		50		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 75 Ω		520		ns
t_f			90		ns
E_{on}			2.1		mJ
E_{off}			1.5		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		1100		pF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 15 A		150		nC
R_{thJC}	(per IGBT)			1.1	K/W
R_{thCH}			0.35		K/W

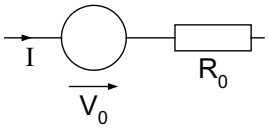
Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	24	A
I_{F80}	T_C = 80°C	16	A

Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
V_F	I_F = 10 A; V_{GE} = 0 V; T_{VJ} = 25°C			2.4	V
	T_{VJ} = 125°C		1.5		V
I_{RM}	V_R = 600 V; di_F/dt = -400A/µs		16		A
t_{rr}	I_F = 10 A; V_{GE} = 0 V; T_{VJ} = 125°C		125		ns
R_{thJC}	(per diode)			1.6	K/W
R_{thCH}			0.55		K/W

Equivalent Circuits for Simulation

Conduction



D8 - D13

Rectifier Diode (typ. at T_J = 125°C)
V_0 = 0.90 V; R_0 = 12 mΩ

T1 - T6 / D1 - D6

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 0.9 V; R_0 = 80 mΩ

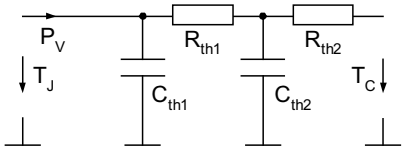
Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.35 V; R_0 = 41 mΩ

T7 / D7

IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 0.9 V; R_0 = 80 mΩ

Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.45 V; R_0 = 63 mΩ

Thermal Response



D8 - D13

Rectifier Diode (typ.)
C_{th1} = tbd J/K; R_{th1} = tbd K/W
C_{th2} = tbd J/K; R_{th2} = tbd K/W

T1 - T6 / D1 - D6

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

Free Wheeling Diode (typ.)
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	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	30	A
I_{C80}	T_C = 80°C	20	A
RBSOA	V_{GE} = ±15 V; R_G = 75 Ω; T_{VJ} = 125°C Clamped inductive load; L = 100 µH	I_{CM} = 30 $V_{CEK} \leq V_{CES}$	A
t_{SC} (SCSOA)	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 75 Ω T_{VJ} = 125°C; non-repetitive	10	µs
P_{tot}	T_C = 25°C	120	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		1.8	2.2	V
		T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	I_C = 0.5 mA; V_{GE} = V_{CE}		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				150	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 600 V; I_C = 15 A V_{GE} = ±15 V; R_G = 75 Ω			90		ns
t_r				50		ns
$t_{d(off)}$				520		ns
t_f				90		ns
E_{on}				2.1		mJ
E_{off}				1.5		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			1100		pF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 15 A			150		nC
R_{thJC}	(per IGBT)				1.1	K/W
R_{thCH}				0.35		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	15	A
I_{F80}	T_C = 80°C	10	A

Symbol	Conditions		Characteristic Values min.	typ.	max.	
V_F	I_F = 10 A; V_{GE} = 0 V;	T_{VJ} = 25°C			3.1	V
		T_{VJ} = 125°C		2.0		V
I_R	V_R = V_{RRM}	T_{VJ} = 25°C			0.06	mA
		T_{VJ} = 125°C		0.2		mA
I_{RM}	V_R = 600 V; di_F/dt = -400A/µs			13		A
t_{rr}	I_F = 10 A; T_{VJ} = 125°C			100		ns
R_{thJC}					2.5	K/W
R_{thCH}				0.85		K/W

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

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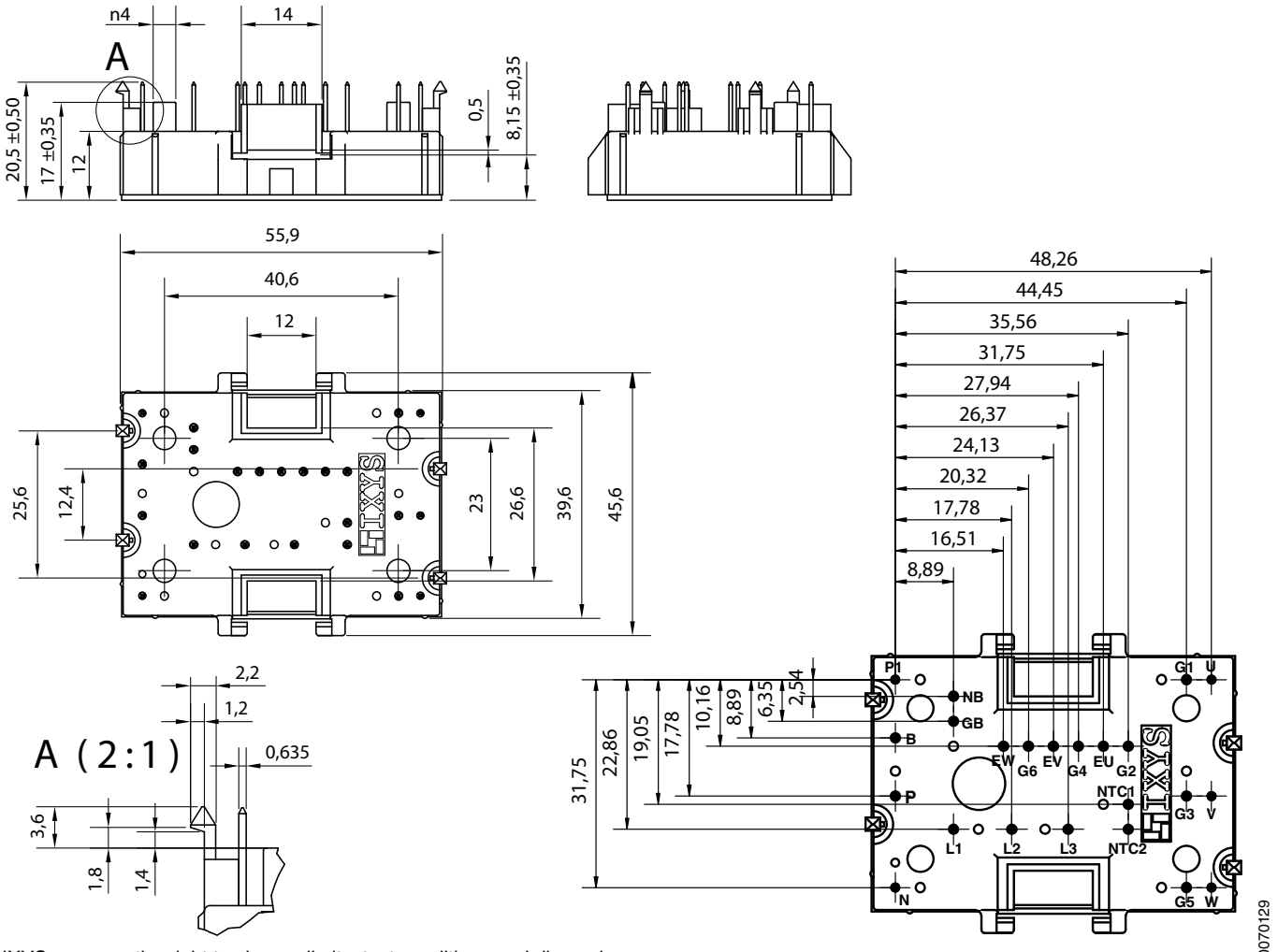
Temperature Sensor NTC					
Symbol	**Conditions**	**Characteristic Values**			
		min.	**typ.**	**max.**	
R_{25}	T = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$			3375		K

Module			
Symbol	**Conditions**	**Maximum Ratings**	
T_{VJ}	Operating	-40...+125	°C
T_{VJM}		150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	2500	V~
F_C	Mounting force	40...80	N

Symbol	**Conditions**	**Characteristic Values**			
		min.	**typ.**	**max.**	
d_S	Creepage distance (towards heatsink)	12.7			mm
d_A		12			mm
Weight			35		g

Dimensions in mm (1 mm = 0.0394“)



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