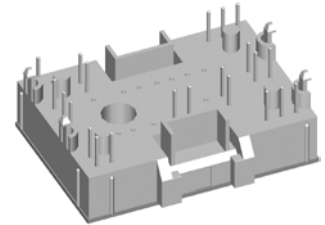
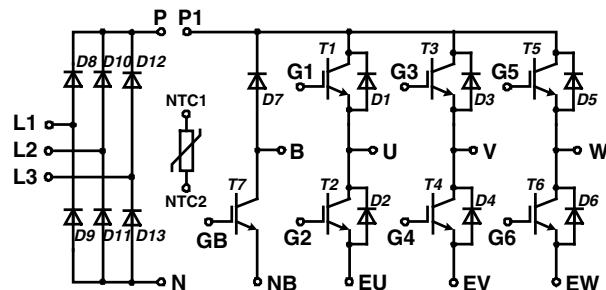


Converter - Brake - Inverter Module

Trench IGBT



Pin configuration see outlines.

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

Input Rectifier Bridge D8 - D13

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	$T_C = 80^\circ\text{C}$; sine 180°	22	A
I_{DAVM}	bridge output current; $T_C = 80^\circ\text{C}$; rect.; $d = 1/3$	62	A
I_{FSM}	$T_{VJ} = 25^\circ\text{C}$; $t = 10 \text{ ms}$; sine 50 Hz	300	A
P_{tot}	$T_C = 25^\circ\text{C}$	50	W

Symbol	Conditions	Characteristic Values				
		$(T_{VJ} = 25^\circ\text{C}, \text{ unless otherwise specified})$				
		min.	typ.	max.		
V_F	$I_F = 30 \text{ A}$	$T_{VJ} = 25^\circ\text{C}$		1.3	1.6	V
		$T_{VJ} = 125^\circ\text{C}$		1.4		V
I_R	$V_R = V_{RRM}$			0.01	mA	
			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

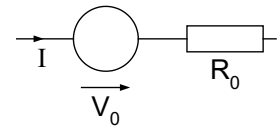
- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with Trench IGBTs
 - low saturation voltage
 - positive temperature coefficient
 - fast switching
 - short tail current
- Epitaxial free wheeling diodes with hiperfast and soft reverse recovery
- Industry standard package with insulated copper base plate and soldering pins for PCB mounting
- Temperature sense included

Output Inverter T1 - T6			
Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^{\circ}\text{C}$	30	A
I_{C80}	$T_C = 80^{\circ}\text{C}$	21	A
RBSOA	$V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$; $T_{VJ} = 125^{\circ}\text{C}$ Clamped inductive load; $L = 100\ \mu\text{H}$	$I_{CM} = 30$ $V_{CEK} \leq V_{CES}$	A
t_{SC} (SCSOA)	$V_{CE} = 720\text{ V}$; $V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$ $T_{VJ} = 125^{\circ}\text{C}$; non-repetitive	10	μs
P_{tot}	$T_C = 25^{\circ}\text{C}$	120	W

Symbol	Conditions	Characteristic Values			
		(T _{VJ} = 25°C, unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	$I_C = 15\text{ A}$; $V_{GE} = 15\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.8	2.2	V
				2.1	V
$V_{GE(th)}$	$I_C = 0.5\text{ mA}$; $V_{GE} = V_{CE}$	5		6.5	V
I_{CES}	$V_{CE} = V_{CES}$; $V_{GE} = 0\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.8	0.6	mA mA
I_{GES}	$V_{CE} = 0\text{ V}$; $V_{GE} = \pm 20\text{ V}$			150	nA
$t_{d(on)}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 600\text{ V}$; $I_C = 15\text{ A}$ $V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$		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}	$V_{CE} = 25\text{ V}$; $V_{GE} = 0\text{ V}$; $f = 1\text{ MHz}$		1100		pF
Q_{gon}	$V_{CE} = 600\text{ V}$; $V_{GE} = 15\text{ V}$; $I_C = 15\text{ A}$		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}	$T_C = 25^{\circ}\text{C}$	24	A
I_{F80}	$T_C = 80^{\circ}\text{C}$	16	A

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

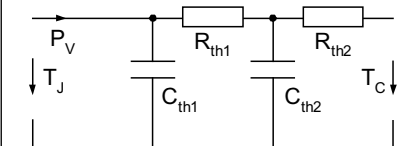
Equivalent Circuits for Simulation
Conduction

D8 - D13

 Rectifier Diode (typ. at $T_J = 125^{\circ}\text{C}$)
 $V_0 = 0.90\text{ V}$; $R_0 = 12\text{ m}\Omega$
T1 - T6 / D1 - D6

 IGBT (typ. at $V_{GE} = 15\text{ V}$; $T_J = 125^{\circ}\text{C}$)
 $V_0 = 0.9\text{ V}$; $R_0 = 80\text{ m}\Omega$

 Free Wheeling Diode (typ. at $T_J = 125^{\circ}\text{C}$)
 $V_0 = 1.35\text{ V}$; $R_0 = 41\text{ m}\Omega$
T7 / D7

 IGBT (typ. at $V_{GE} = 15\text{ V}$; $T_J = 125^{\circ}\text{C}$)
 $V_0 = 0.9\text{ V}$; $R_0 = 80\text{ m}\Omega$

 Free Wheeling Diode (typ. at $T_J = 125^{\circ}\text{C}$)
 $V_0 = 1.45\text{ V}$; $R_0 = 63\text{ m}\Omega$
Thermal Response

D8 - D13

 Rectifier Diode (typ.)
 $C_{th1} = tbd\text{ J/K}$; $R_{th1} = tbd\text{ K/W}$
 $C_{th2} = tbd\text{ J/K}$; $R_{th2} = tbd\text{ K/W}$
T1 - T6 / D1 - D6

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

 Free Wheeling Diode (typ.)
 $C_{th1} = tbd\text{ J/K}$; $R_{th1} = tbd\text{ K/W}$
 $C_{th2} = tbd\text{ J/K}$; $R_{th2} = tbd\text{ K/W}$

Brake Chopper T7			
Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^{\circ}\text{C}$	30	A
I_{C80}	$T_C = 80^{\circ}\text{C}$	20	A
RBSOA	$V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$; $T_{VJ} = 125^{\circ}\text{C}$ Clamped inductive load; $L = 100\ \mu\text{H}$	$I_{CM} = 30$ $V_{CEK} \leq V_{CES}$	A
t_{SC} (SCSOA)	$V_{CE} = 720\text{ V}$; $V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$ $T_{VJ} = 125^{\circ}\text{C}$; non-repetitive	10	μs
P_{tot}	$T_C = 25^{\circ}\text{C}$	120	W

Symbol	Conditions	Characteristic Values			
		$(T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	$I_C = 15\text{ A}$; $V_{GE} = 15\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.8	2.2	V
			2.1		V
$V_{GE(th)}$	$I_C = 0.5\text{ mA}$; $V_{GE} = V_{CE}$	5		6.5	V
I_{CES}	$V_{CE} = V_{CES}$; $V_{GE} = 0\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.5	0.5	mA mA
I_{GES}	$V_{CE} = 0\text{ V}$; $V_{GE} = \pm 20\text{ V}$			150	nA
$t_{d(on)}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 600\text{ V}$; $I_C = 15\text{ A}$ $V_{GE} = \pm 15\text{ V}$; $R_G = 75\ \Omega$		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}		$V_{CE} = 25\text{ V}$; $V_{GE} = 0\text{ V}$; $f = 1\text{ MHz}$		1100	
Q_{gon}	$V_{CE} = 600\text{ V}$; $V_{GE} = 15\text{ V}$; $I_C = 15\text{ A}$		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}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	1200	V
I_{F25}	$T_C = 25^{\circ}\text{C}$	15	A
I_{F80}	$T_C = 80^{\circ}\text{C}$	10	A

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

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Temperature Sensor NTC

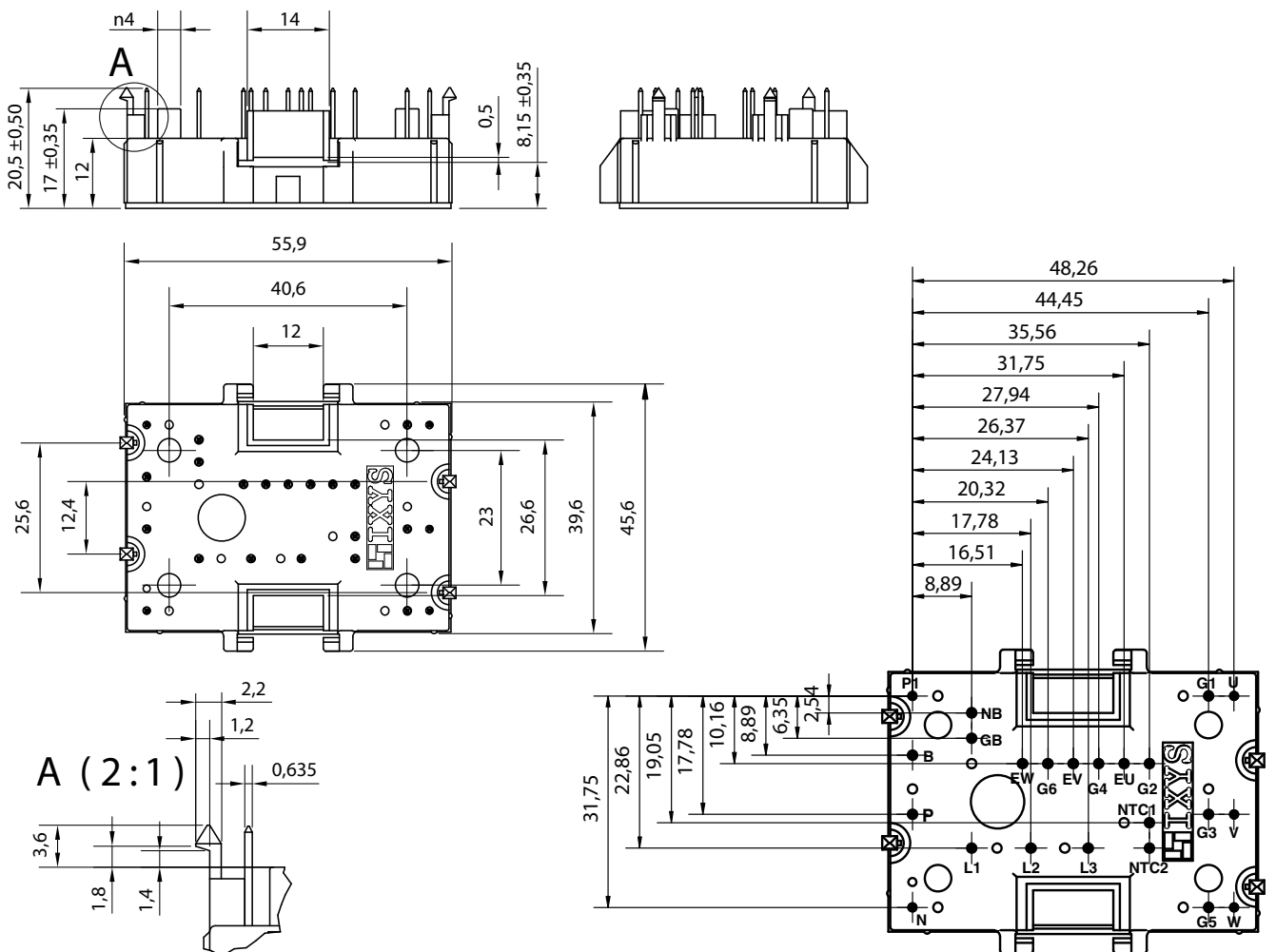
Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
R_{25}	$T = 25^{\circ}\text{C}$	4.75	5.0	5.25	k Ω
$B_{25/50}$			3375		K

Module

Symbol	Conditions	Maximum Ratings		
T_{VJ}	Operating	-40...+125		$^{\circ}\text{C}$
T_{VJM}		150		$^{\circ}\text{C}$
T_{stg}		-40...+125		$^{\circ}\text{C}$
V_{ISOL}	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$	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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