Technical Information

MIPAQ™ serve

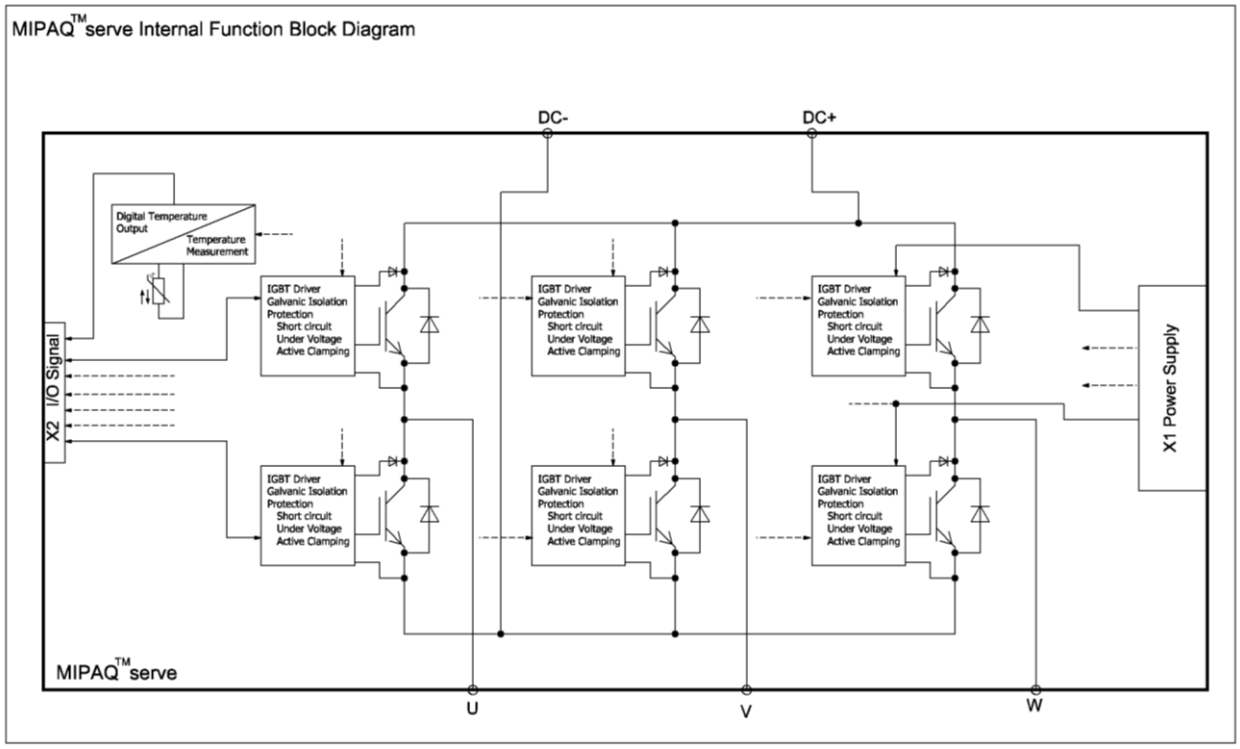
IFS150V12PT4

preliminary data

Key data

Power module using IGBT4 technology in sixpack configuration.
Isolated IGBT driver, protection and temperature sensor included.

Topology	B6I
Rated semiconductor data	1200V, 150A
Load type	Inductive, resistive
Typical applications	Industrial drives, UPS, solar inverters, auxiliary inverters
Sensors and protection	temperature, short circuit, signal transmission, UVLO for all power supplies
Interface IGBT	Electrical, 5V-CMOS, Galvanic Isolation according to IEC61800-5-1
Standards	IEC61800-5-1, UL94, RoHS



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Electrical data – power part

			min	typ	max	
DC link voltage	L_s = 30nH -40 < T_{vj} < 150°C 0 < $I_{C\ turn\ off}$ < 2*$I_{C\ max}$	U_{DC}			850V	V
IGBT continuous DC collector current	T_{case} = 100°C T_{vj} = $T_{vjop\ max}$	$I_{C\ nom}$			150	A
IGBT collector-emitter voltage	T_{vj}=25°C	U_{CES}			1200	V
IGBT collector-emitter saturation voltage	T_{vj} =25°C @ I_C=150A T_{vj} =150°C @ I_C=150A	U_{CEsat}		1,75 2,10	2,15	V
Diode repetitive peak reverse voltage	T_{vj}=25°C	U_{RRM}			1200	V
Diode forward voltage	T_{vj} =25°C @ I_C=150A T_{vj} =150°C @ I_C=150A	U_F		1,70 1,65	2,20	V
Operating junction temperature	IGBT and Diode	T_{vjop}			150	°C
Turn on energy loss per pulse	IGBT, U_{DC}=600V, I_C=150A T_{vj}=150°C, di/dt,= 2,8kA/µs	E_{on}		15,0		mJ
Turn off energy loss per pulse	IGBT, U_{DC}=600V, I_C=150A T_{vj}=150°C, du/dt = 3,5kV/µs	E_{off}		13,9		mJ
Reverse recovery energy	Diode, U_{DC}=600V, I_F=150A T_{vj}=150°C, di/dt = 2,8kA/µs	E_{rec}		12,0		mJ

Electrical data – control part

Auxiliary power supply: IGBT Gate (on X1)			min	typ	max	
IGBT driver positive supply	Voltage	$U_{GS\ P1,2,3,4}$	13	16	18	V
	Current at f_{sw} = 20kHz, $U_{GSP1,2,3}$ = +15V T_{vj} = 25°C	$I_{GS\ P1,2,3}$			19	mA
		$I_{GS\ P4}$			31	mA
IGBT driver negative supply	Voltage	$U_{GS\ N1,2,3,4}$	-10	-8	-5	V
	Current @ f_{sw} = 20kHz, U_{GSN} = -8V T_{vj} = 25°C	$\|I_{GS\ N1,2,3}\|$			18	mA
		$\|I_{GS\ N4}\|$			23	mA
IGBT driver undervoltage lockout threshold	For each channel	U_{GS_UVLO}	10,4		12,6	V
IGBT driver undervoltage lockout hysteresis	For each channel	$U_{GS\_UVLO\_H}$	0,7			V

Auxiliary power supply: Logic (on X2)			min	typ	max	
Logic power supply	Voltage	U_{LS}	4,5	5	5,5	V
	Current @ f_{sw} = 20kHz, U_{LS} = +5V	I_{LS}			55	mA
Logic power supply undervoltage lockout threshold		U_{LS_UVLO}	3,5		4,3	V
Logic power supply undervoltage lockout hysteresis		$U_{LS\_UVLO\_H}$	0,3			V

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Driver logic input/output, protection and sensors (on X2)			min	typ	max	
Digital input (IGBT turn-on/off and RESET)	High level voltage	U_{IN_H}	3,5		5,5	V
	Low level voltage	U_{IN_L}	-0,3		1,5	V
	Input current per input	I_{IN}		100	400	µA
	Minimum pulse width on /RST for ENABLE/SHUTDOWN	$t_{min\ RST1}$		40		ns
	Minimum pulse width on /RST for resetting $/FLT_{BOT}$, $/FLT_{TOP}$	$t_{min\ RST2}$		500		ns
Digital output level	Open drain, internally pulled up, max. 10 mA	U_{RDYT}, U_{RDYB}, U_{FLTT}, U_{FLTB}, U_{TMP}	0		U_{LS}	V
Digital temperature output	Frequency depends on measured temperature	f_{TMP}	0,2		18	kHz
	Pulses counted in 100ms	N	20		1800	
Minimum pulse width	IGBT-turn-on signal (=high) on each channel @ $U_{DC\ max}$	t_{PW_min}	1			µs
Minimum dead time	Between TOP IGBT and BOT IGBT	t_{dead}	1			µs
Switching frequency	Each driver channel	f_{sw}	0		20	kHz
Short circuit protection	Desaturation threshold. Shutdown when exceeded. Each channel	U_{CE_desat}	8,5	9	9,5	V
	Reaction time. Shutdown after short circuit was detected. Each channel	t_{desat}			8	µs
Propagation delay	Each channel	t_{prop_delay}		320		ns
Propagation delay deviation	Between two channels	$t_{prop\ delay\ dev}$			15	ns

Isolation Management			min	typ	max	
Isolation management designed for		U_{Line}		480		V_{RMS}
Isolation test voltage	Logic to power side f=50Hz, t=1s	V_{isol}		2,5		kV_{RMS}
	Life parts to base plate F=50Hz, 1=1min	V_{isol}		2,5		kV_{RMS}
Comparative tracking index		CTI		225		
Clearance distance, including internal clearance DIN7984 with flat head, SKS-5 spring washer, DIN125 flat washer,	terminal – terminal (AC-DC, AC-AC, DC-DC)	l_{cl1}		11		mm
	power side – heat sink	l_{cl2}		11		mm
	Logic side - heatsink	l_{cl3}		4,5		mm
	Logic side - power side	l_{cl4}		8		mm
Creepage distance Under usage of screws according DIN7984 with flat head, SKS-5 spring washer, DIN125 flat washer	terminal – terminal (AC-DC, AC-AC, DC-DC)	l_{cr1}		25		mm
	terminal – heat sink	l_{cr2}		20		mm
	Logic side - heatsink	l_{cr3}		8,5		mm
	Logic side - power side	l_{cr4}		8		mm

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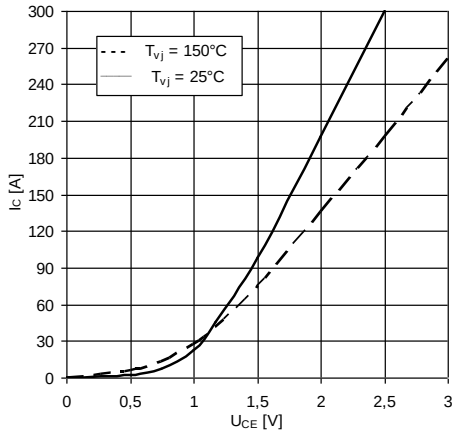
Environmental conditions			min	typ	max	
Storage temperature		T_{stg}	-40		+125	°C
Operating ambient temperature	f_{SW} ≤ 20kHz		-40		+65	°C
Humidity	no condensation	Rel. H.	5		85	%
Installation height					1000	m
Vibration	according to IEC60721				12	g
Shock	according to IEC60721				10	g
Protection degree			IP00			
Pollution degree			2			
Terminal connection torque	Screw M6	M_{M6}	3,0		6,0	Nm
Mounting torque	Screw M5	M_{M5}	3,0		6,0	Nm
Dimensions	length x width x height		130 x 103 x 28,5			mm^3
Weight				419		g

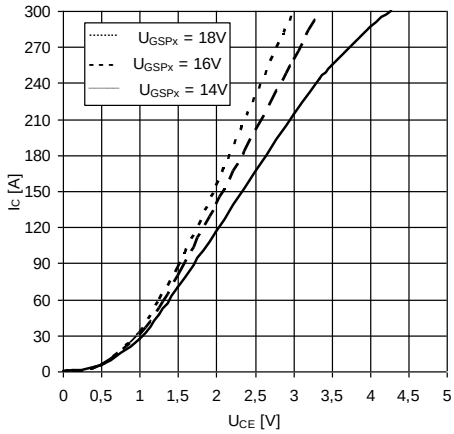
Thermal data			min	typ	max	
Thermal resistance junction to case	Each IGBT	R_{thjc_IGBT}			0,22	K/W
Thermal resistance junction to case	Each Diode	R_{thjc_FWD}			0,4	K/W
Thermal resistance case to heatsink	Complete module	R_{thch_Module}			0,009	K/W

Module			min	typ	max	
Stray inductance module		L_{sCE}		20		nH
Material of module baseplate			Cu			

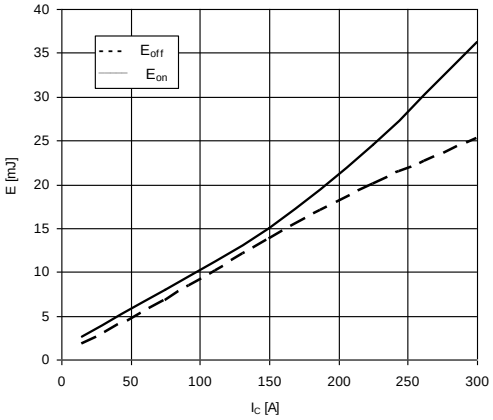
Output characteristic IGBT
$I_C = f(U_{CE})$ @ $U_{GSPx} = 16V$



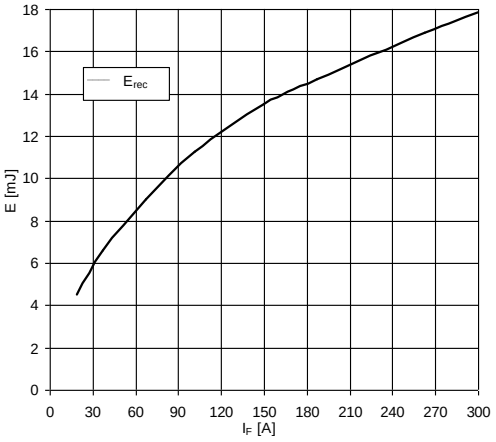
Output characteristic IGBT
$I_C = f(U_{CE})$ @ $T_{vj} = 150°C$



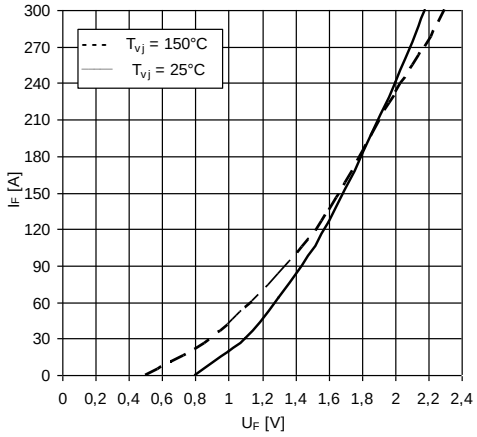
Switching losses IGBT
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$U_{GSPx} = 16V$, $U_{GSNx} = -8V$, $T_{vj} = 150°C$



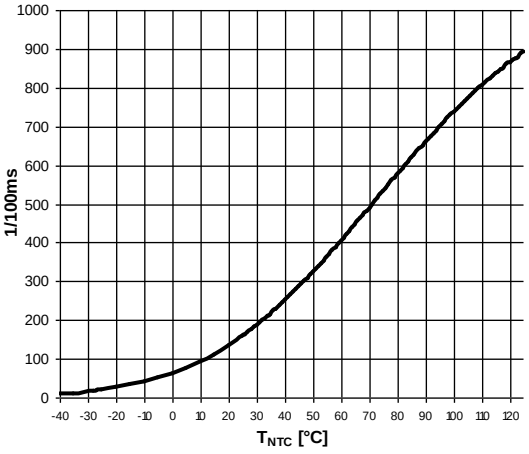
Switching losses diode
$E_{rec} = f(I_F)$ @ $U_{CE} = 600V$, $T_{vj} = 150°C$



Forward characteristic diode
$I_F = f(U_F)$



Digital temperature output
Number of pulses within 100ms



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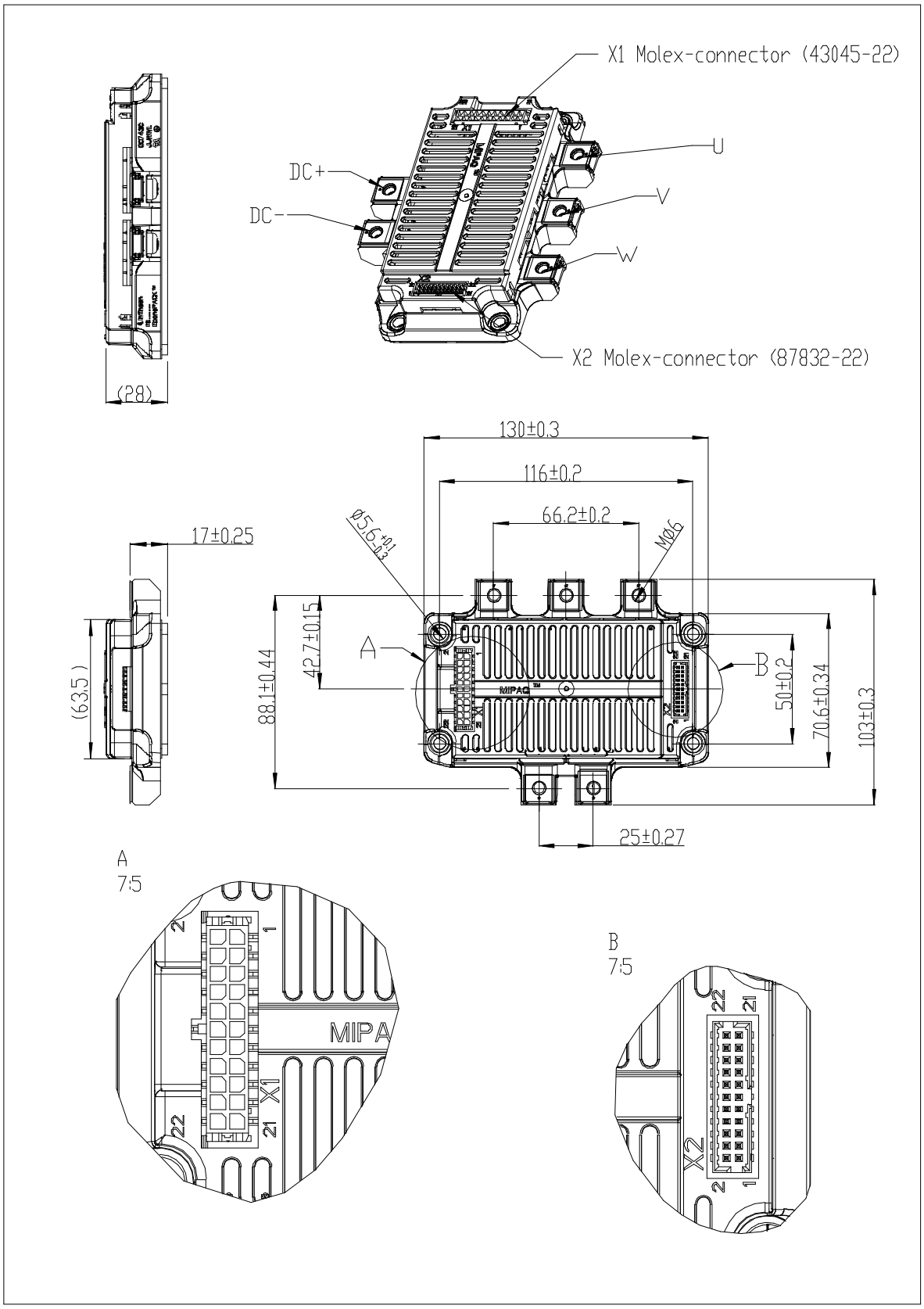
Mechanical drawing



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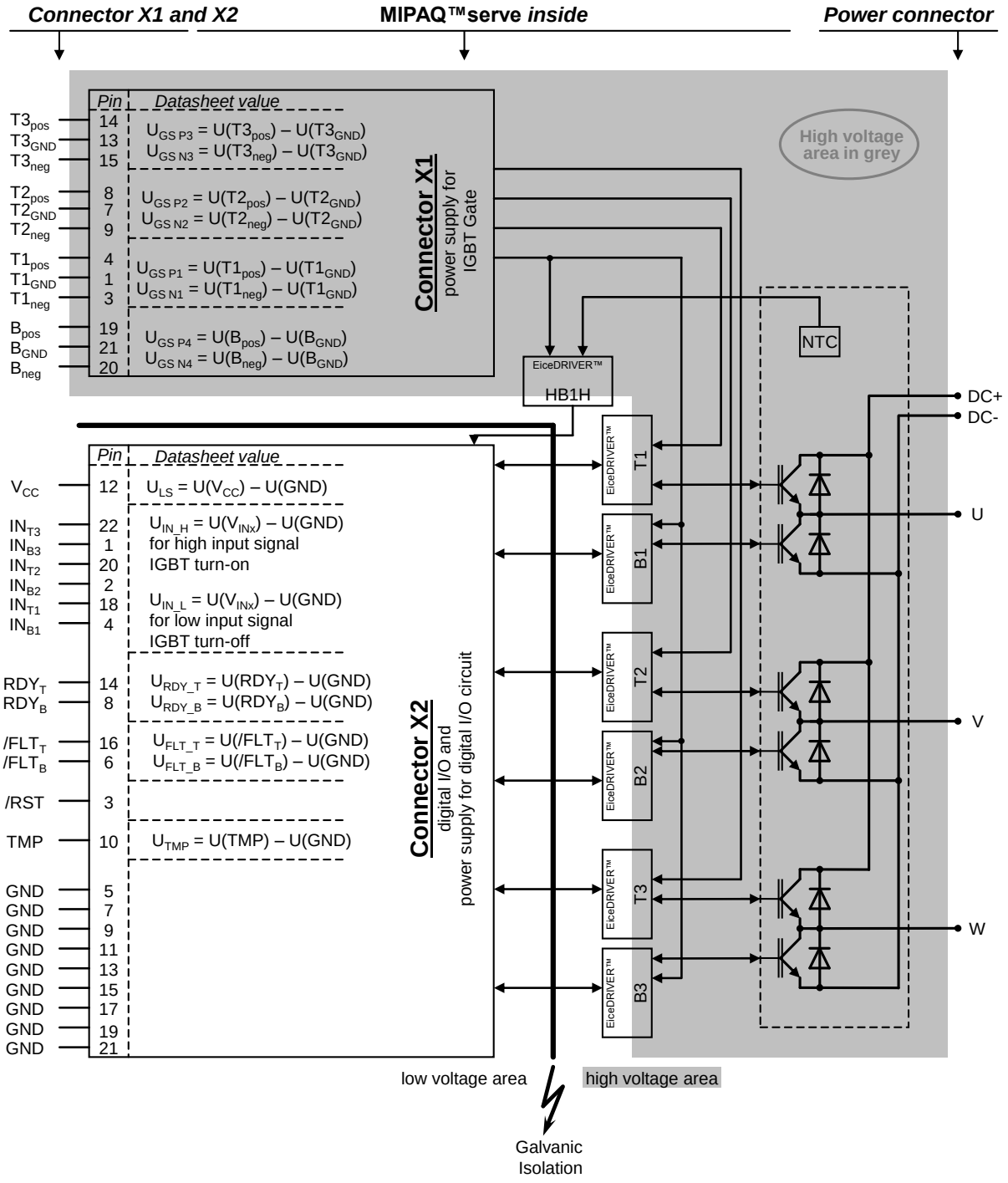
Circuit diagram



Further information

X1: Molex Microfit 22 pins
X2: Molex Milligrid 22 pins

All information regarding connectors can be found in AN2009-07

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