

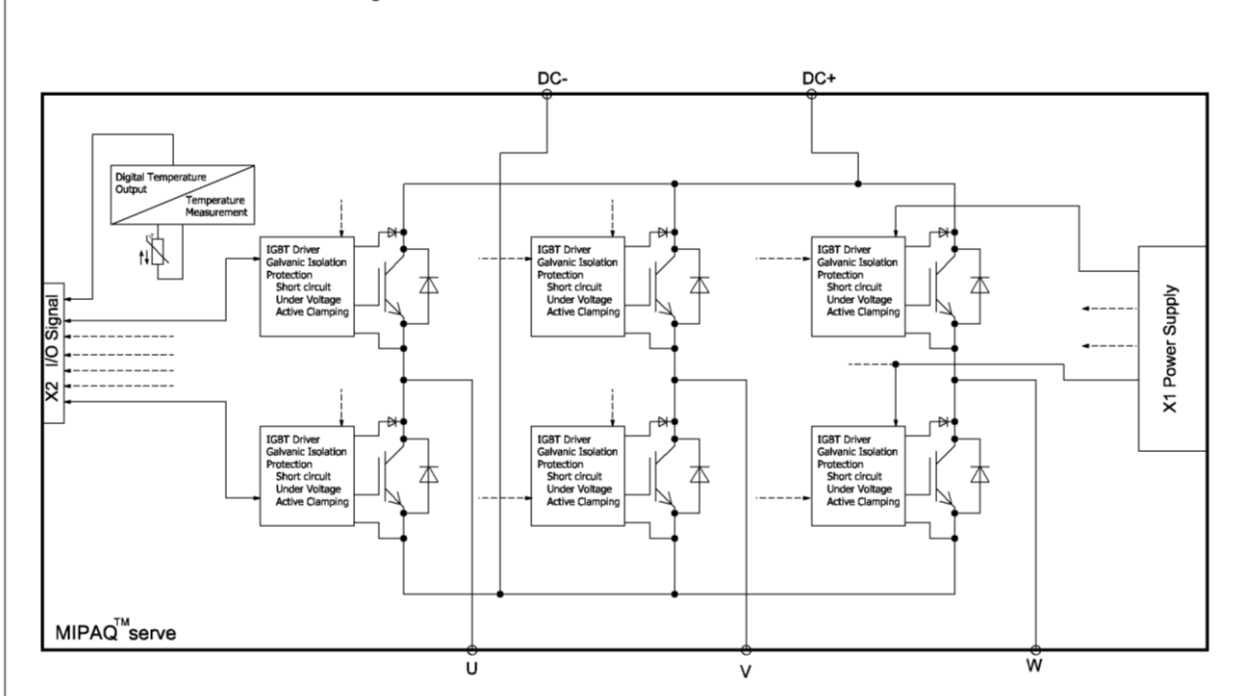
Key data

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

| | |
|--------------------------|--|
| Topology | B6I |
| Rated semiconductor data | 1200V, 100A |
| 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 |



MIPAQ™ serve Internal Function Block Diagram



Electrical data – power part

| | | | min | typ | max | |
|---|--|---------------------|-----|--------------|------|----|
| DC link voltage | $L_s = 30\text{nH}$ $-40 < T_{vj} < 150^\circ\text{C}$ $0 < I_{C, \text{turn off}} < 2 \cdot I_{C, \text{max}}$ | U_{DC} | | | 850 | V |
| IGBT continuous DC collector current | $T_{\text{case}} = 100^\circ\text{C}$ $T_{vj} = T_{vj, \text{op max}}$ | $I_{C, \text{nom}}$ | | | 100 | A |
| IGBT collector-emitter voltage | $T_{vj} = 25^\circ\text{C}$ | U_{CES} | | | 1200 | V |
| IGBT collector-emitter saturation voltage | $T_{vj} = 25^\circ\text{C} @ I_C = 100\text{A}$ $T_{vj} = 150^\circ\text{C} @ I_C = 100\text{A}$ | U_{CEsat} | | 1,75 2,10 | 2,15 | V |
| Diode repetitive peak reverse voltage | $T_{vj} = 25^\circ\text{C}$ | U_{RRM} | | | 1200 | V |
| Diode forward voltage | $T_{vj} = 25^\circ\text{C} @ I_C = 100\text{A}$ $T_{vj} = 150^\circ\text{C} @ I_C = 100\text{A}$ | U_F | | 1,70 1,65 | 2,15 | V |
| Operating junction temperature | IGBT and Diode | $T_{vj, \text{op}}$ | | | 150 | °C |
| Turn on energy loss per pulse | IGBT, $U_{DC} = 600\text{V}$, $I_C = 100\text{A}$ $T_{vj} = 150^\circ\text{C}$, $di/dt = 1,8\text{kA}/\mu\text{s}$ | E_{on} | | 10,2 | | mJ |
| Turn off energy loss per pulse | IGBT, $U_{DC} = 600\text{V}$, $I_C = 100\text{A}$ $T_{vj} = 150^\circ\text{C}$, $du/dt = 3,6\text{kV}/\mu\text{s}$ | E_{off} | | 8,0 | | mJ |
| Reverse recovery energy | Diode, $U_{DC} = 600\text{V}$, $I_F = 100\text{A}$ $T_{vj} = 150^\circ\text{C}$, $di/dt = 1,8\text{kA}/\mu\text{s}$ | E_{rec} | | 8,0 | | 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 $f_{sw} = 20\text{kHz}$, $U_{GSP1,2,3} = +15\text{V}$, $T_{vj} = 25^\circ\text{C}$ | $I_{GS, P1,2,3}$ | | | 14 | mA |
| | | $I_{GS, P4}$ | | | 26 | mA |
| IGBT driver negative supply | Voltage | $U_{GS, N1,2,3,4}$ | -10 | -8 | -5 | V |
| | Current @ $f_{sw} = 20\text{kHz}$, $U_{GSN} = -8\text{V}$, $T_{vj} = 25^\circ\text{C}$ | $ I_{GS, N1,2,3} $ | | | 13 | mA |
| | | $ I_{GS, N4} $ | | | 18 | 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 @ $f_{sw} = 20\text{kHz}$, $U_{LS} = +5\text{V}$ | 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 |

Technical Information

MIPAQ™ serve

IFS100V12PT4



preliminary data

| 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 | μ A |
| | 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 | | | μ s |
| Minimum dead time | Between TOP IGBT and BOT IGBT | t_{dead} | 1 | | | μ s |
| 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 | μ s |
| 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 $f=50\text{Hz}$, $t=1\text{s}$ | V_{isol} | | 2,5 | | kV_{RMS} |
| | Life parts to base plate $F=50\text{Hz}$, $1=1\text{min}$ | 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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| approved by: KS | revision: 2.1 |

Technical Information

MIPAQ™ serve

IFS100V12PT4



preliminary data

| Environmental conditions | | | min | typ | max | |
|-------------------------------|-------------------------|-----------|------------------|-----|------|-----------------|
| Storage temperature | | T_{stg} | -40 | | +125 | °C |
| Operating ambient temperature | $f_{sw} \leq 20kHz$ | | -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} | | | 0,3 | K/W |
| Thermal resistance junction to case | Each Diode | R_{thjc_FWD} | | | 0,55 | K/W |
| Thermal resistance case to heatsink | Complete module | R_{thch_Module} | | | 0,009 | K/W |

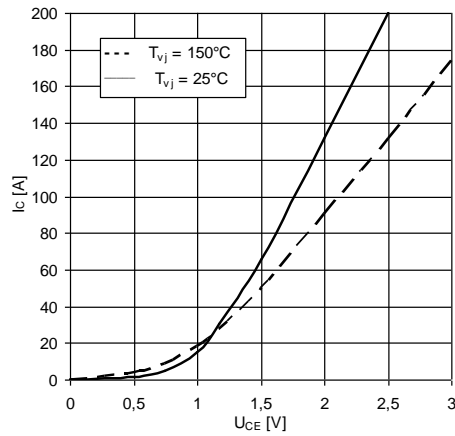
Module

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

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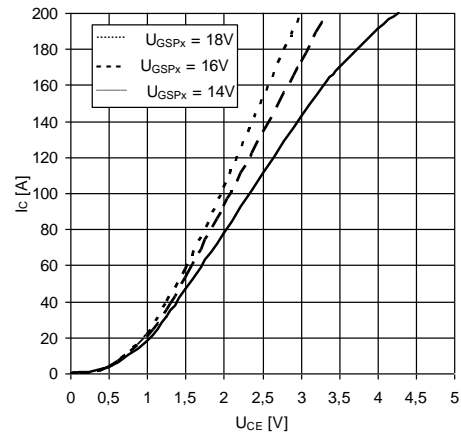
Output characteristic IGBT

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



Output characteristic IGBT

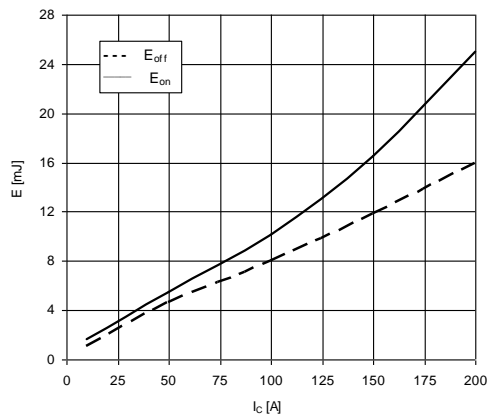
$I_C = f(U_{CE}) @ T_{vj} = 150°C$



Switching losses IGBT

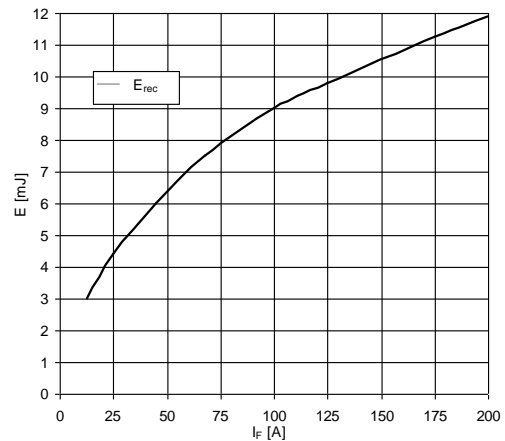
$E_{on} = f(I_C), E_{off} = f(I_C)$

$U_{GSPx} = 16V, U_{GSNk} = -8V, T_{vj} = 150°C$



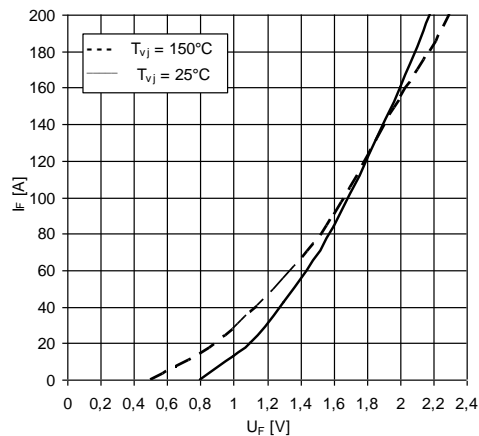
Switching losses diode

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



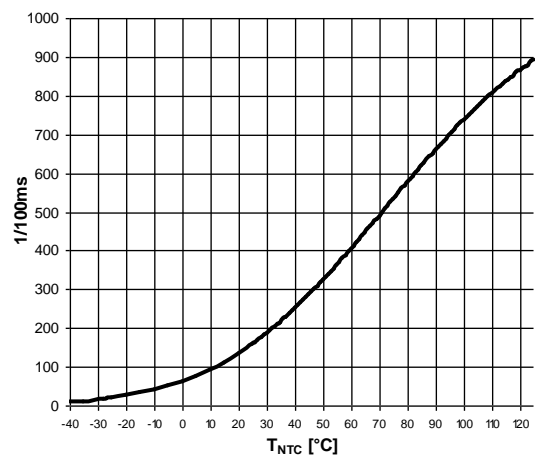
Forward characteristic diode

$I_F = f(U_F)$

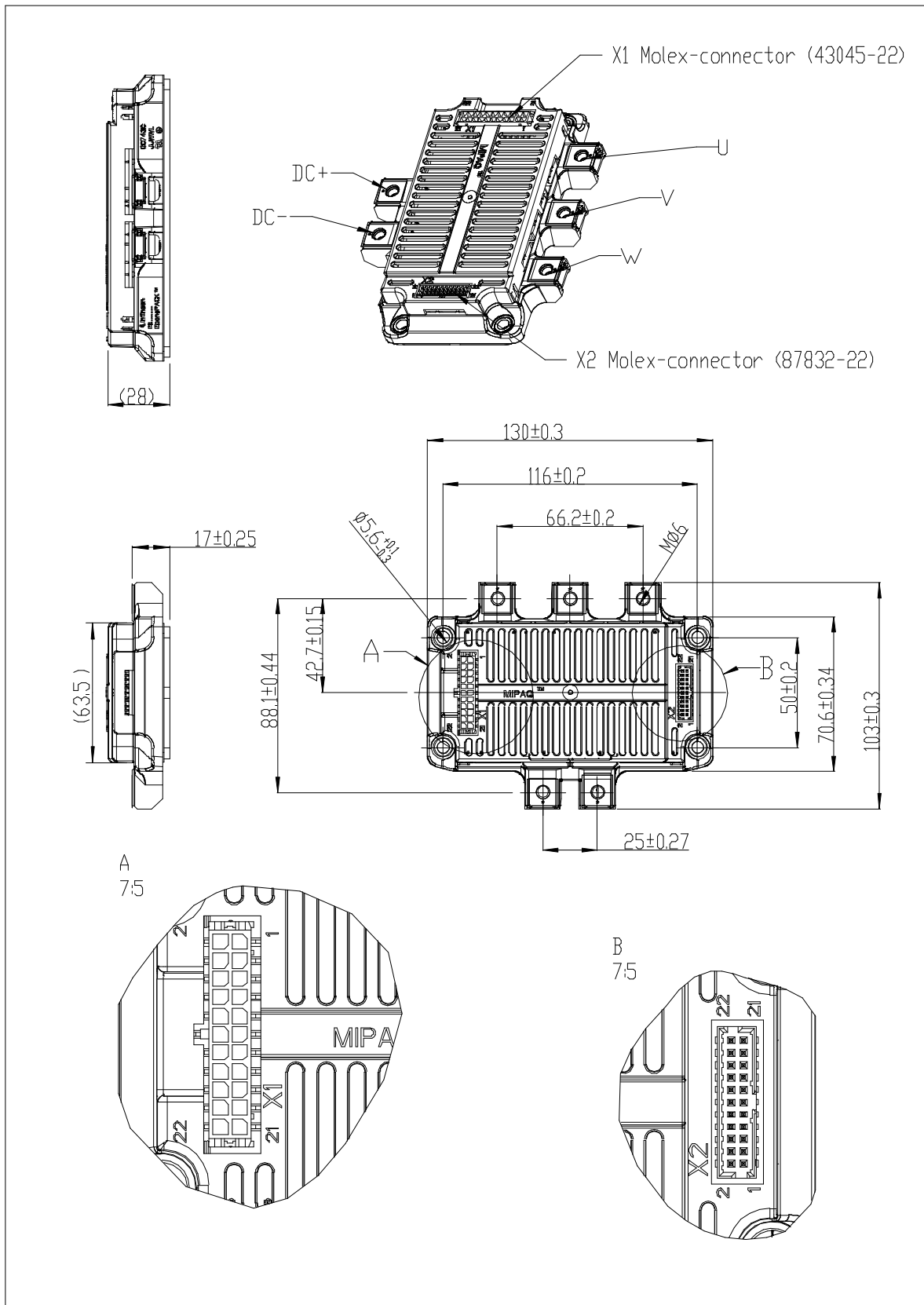


Digital temperature output

Number of pulses within 100ms

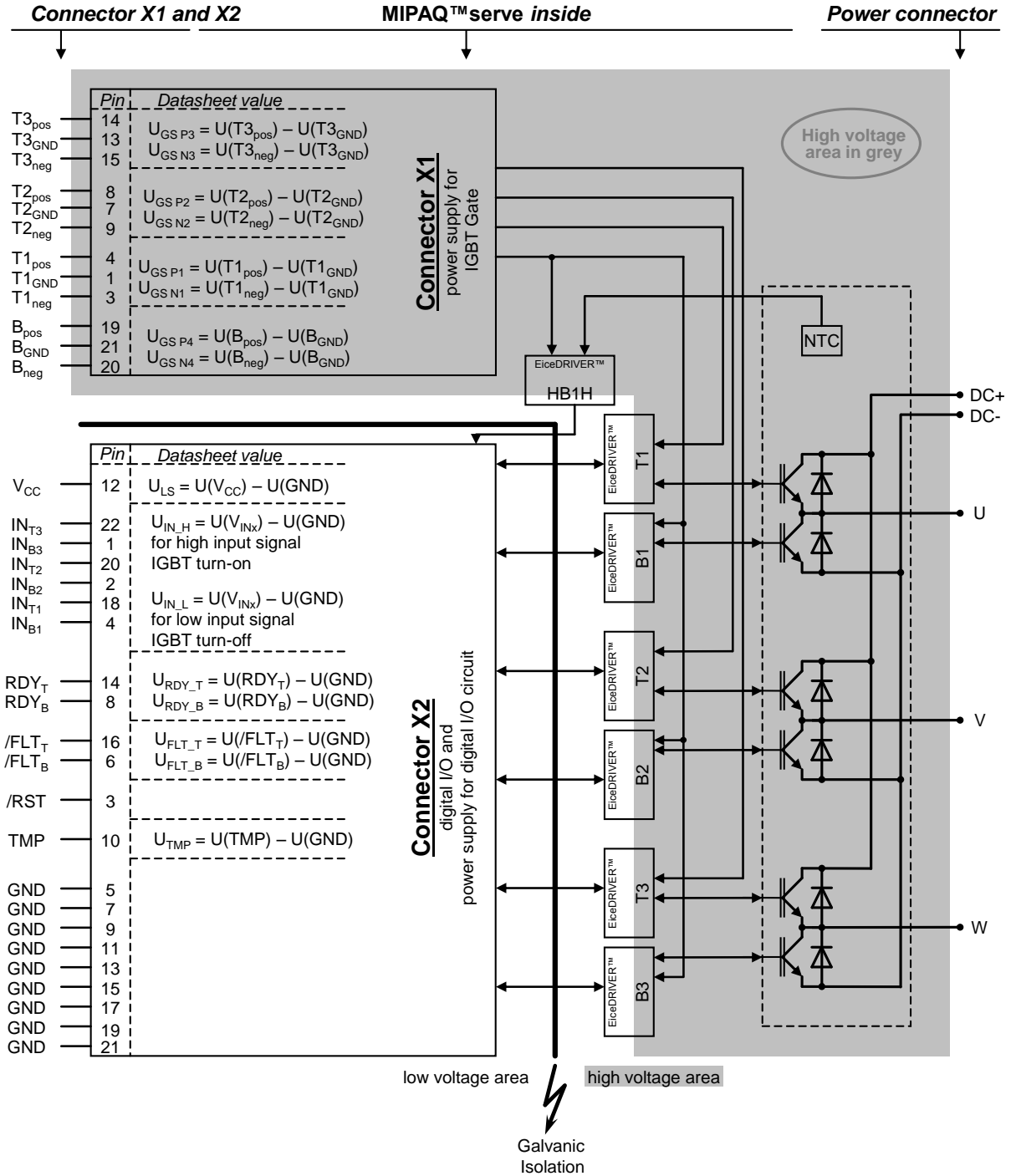


Mechanical drawing



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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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