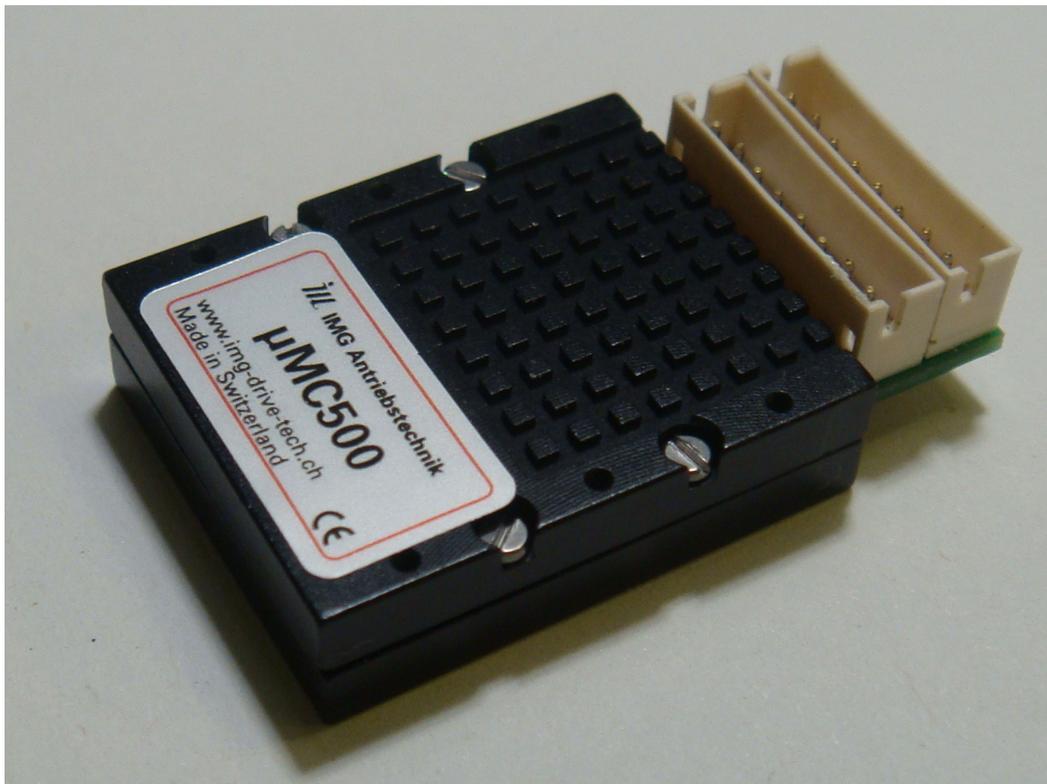


μMC500V10 Hardware Manual



Miniaturized Drive Controller for DC Motors with Incremental Encoder

- + Outer dimensions only 31 x 18 x 7.1mm
- + For servo drives of up to 24W power consumption
- + Incremental encoder input, integrated 5V supply
- + Positioning tracks up to 31Bit, speed dynamics 14bit
- + 3 acceleration profiles, 4 different current regulation modes
- + Large supply voltage range: 9...30VDC
- + RS485 interface, easily programmable EasyRSx protocol, optional available with I2C Bus.
- + Customer-specific variants available

Electrical data

Absolute maximum ratings

Rating	Note	Symbol	Value	Unit
Supply voltage		UB	32	V
Output current power stage servo drive peak	2)	Iop	3	A
Output current power stage servo drive cont.		Ioc	0.8	A
Supply current for incremental sensor		Iols	0.1	A
RS485: voltage on any pins A, B, Y, Z		U485	-9 to 14	V
RS485: voltage transient pulse pins A, B, Y, Z	1)	Ut485	-50 to +50	V
I2C/UART: Input voltage on SDA/SCL/RxD/TxD		USi	0 to 5	V
Index0/1: input voltage		Uidx	-0.1 to 32	V
Incremental sensor inputs: input voltage on CHA/CHB		Uchab	-0.1 to 6	V
Operating temperature		Top	-10 to +85	°C
Storage temperature range		Tstg	-20 to +100	°C

Notes:

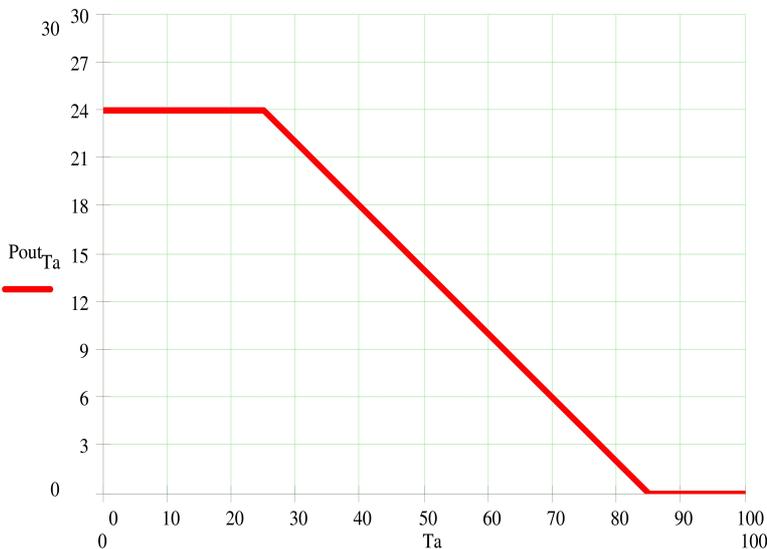
- 1) through 100 Ohms, max. 15µs, duty cycle 1%
- 2) Overcurrent protection delay 2µs

Load conditions exceeding those listed under absolute maximum ratings may cause permanent damage to the device. These are maximum ratings; functional operation of the device in this range or any other condition other than indicated under recommended operating conditions is not intended. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Thermal characteristics

Characteristics	Symbol	Value	Unit
Thermal resistance, power stage to case	RthPsC	max. 1	C/W

Figure 1: Output power derating versus ambient temperature



Electrical operating characteristics (T_a=25°C, unless otherwise stated)

Characteristic	Note	Symbol	min	max	Unit
Supply voltage range	1)	UB	9	30	V
Supply voltage ripple 50/60Hz		UBr	0	10	%
Output current power stage servo drive cont.	4)	loc	0	0.8	A
Output current incremental sensor supply		Iols	0	0.05	A
Output voltage incremental sensor supply		Uols	4.75	5.25	V
RS485: voltage on any bus terminal		U485	-7	12	V
RS485: high level output current, signal Y/Z		IoH485	-60	-	mA
RS485: low level output current, signal Y/Z		IoL485	-	60	mA
RS485: differential output voltage	2)	Uod485	3	5	V
RS485: differential output voltage	3)	Uod485	1.5	-	V
RS485: High-impedance state output current, Y/Z		IoZ (Y/Z)	-1	1	µA
RS485: Hysteresis voltage (VIT+ - VIT-), A/B		UHy485	30	30	mV
I2C/UART: Input voltage on SDA/SCL/RxD/TxD	5)	USi	0	5	V
Index0/1: Input voltage	6)	Uidx	0	30	V
Incremental encoder inputs: input voltage on CHA/CHB	7)	Uchab	0	5	V
Operating ambient temperature (see fig. 1 output power derating versus ambient temperature)		Ta	0	85	°C
Storage ambient temperature		Tstg	-20	100	°C

Notes:

- 1) Under voltage lockout at Ub=8V +/- 10%
- 2) Io=0
- 3) RL=54 Ohms
- 4) Over current/short-circuit protection at output currents >3A, delay 2µs, continuous 0.8A @ Ta=30C, see figure 1, thermal characteristics
- 5) SDA/SCL resp. RxD/TxD leads directly to I/O port of processor without protection; higher voltages may damage processor
- 6) Internal pull-up resistors 22k to 5V, low pass 22k+100pF
- 7) Internal pull-up resistors 2.7k to 5V, low pass 2.7k+100pF

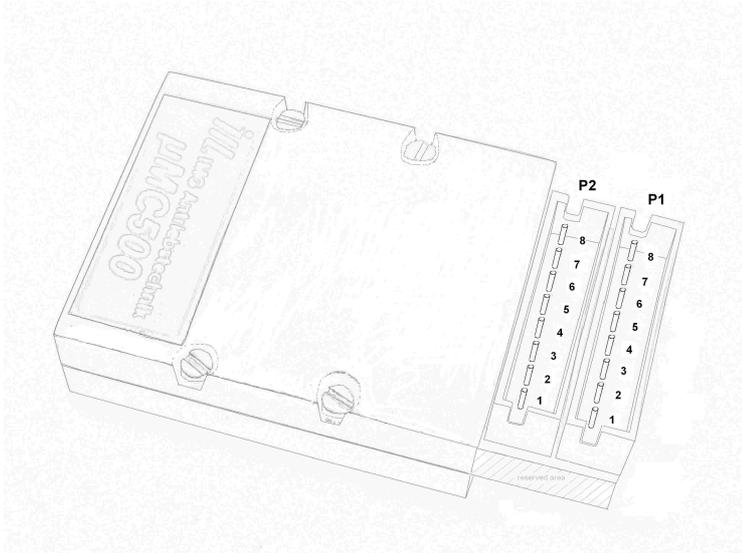


Figure 2: Location of connectors P1 and P2, variant -JST 1.50t, 1.5mm - JST connector on upper side, Top view

P1

Pin	Designation	Function	Input/Output
1	UB	B supply voltage 9..30V	I
2	VSS	0V	I
3	PO0	Motor + (power output 0)	O
4	VC50	5V supply for incremental encoder	O
5	CHA	CHA incremental encoder (5V TTL)	I
6	CHB	CHB incremental encoder (5V TTL)	I
7	VSS	0V supply for incremental encoder	O
8	PO1	Motor - (power output 1)	O

P2

Pin	Designation	Function	Input/output (dep. on options)	
			RS485	UART / I2C
1	UB	Supply voltage 9..30V	I	I
2	VSS	0V	I	I
3	RxD/A	UART RxD (*) of RS485 A (RX+)	I	I
4	TxD/B	UART TxD (*) of RS485 B (RX-)	I	O
5	SCL/Y	I2C SCL (*) of RS485 Y (TX+)	O	I
6	SDA/Z	I2C SDA (*) of RS485 Z (TX-)	O	I/O
7	Index0	Index0 (function depending on firmware)	I	I
8	Index1	Index1 (function depending on firmware)	I	I

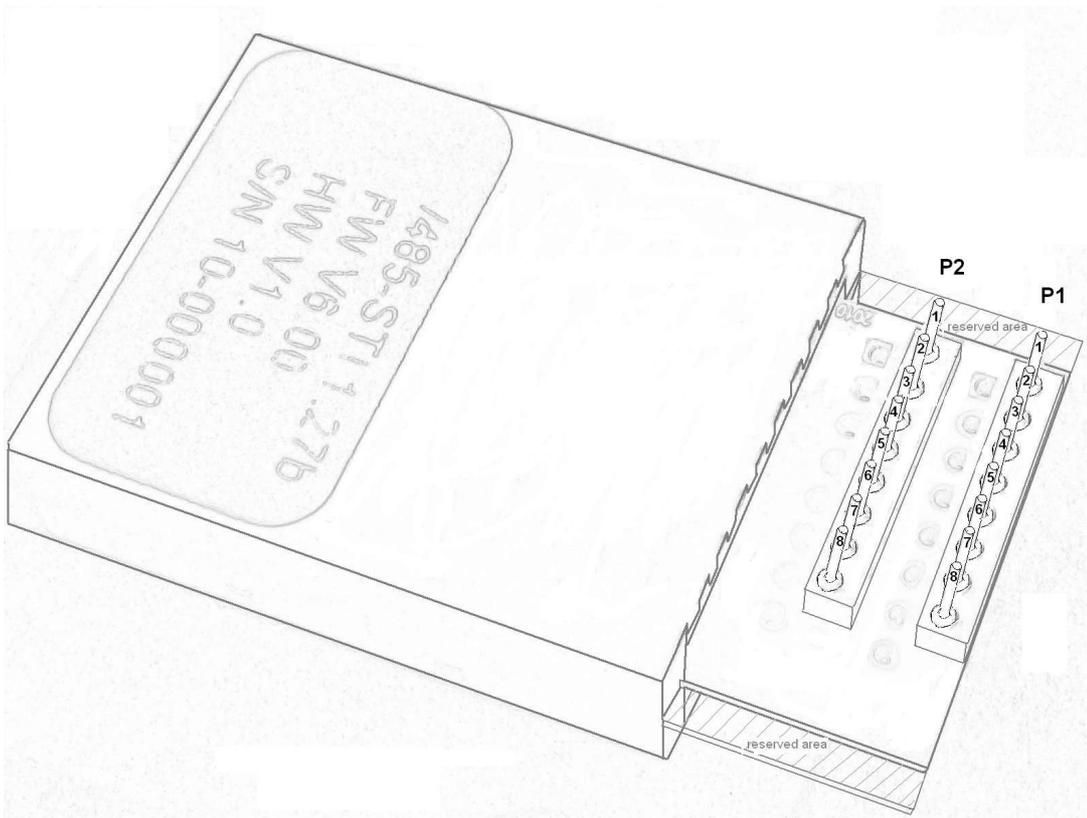


Figure 3: Location of connectors P1 and P2, variant -STI 1.27b, 1.27mm pin header on underside Bottom view

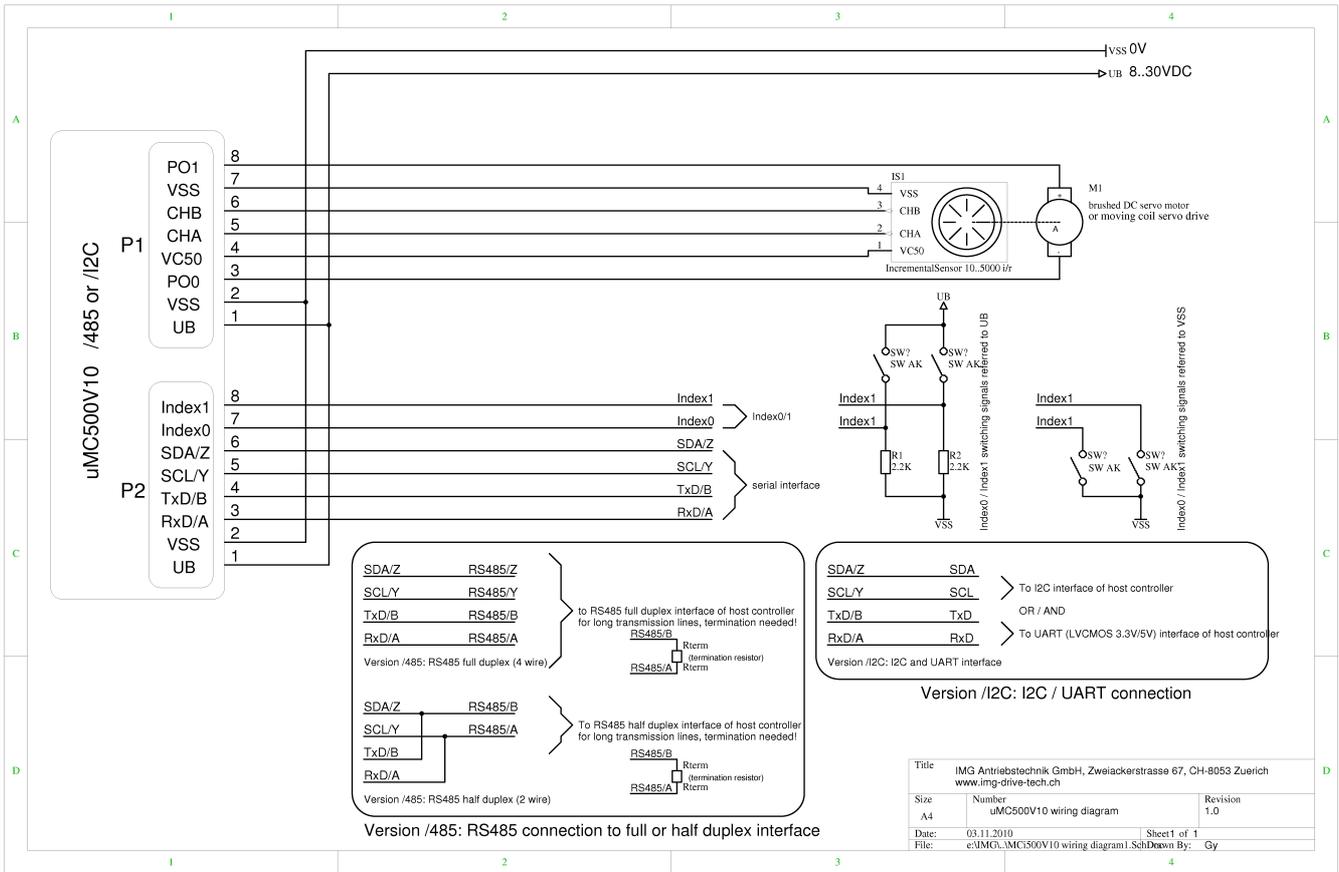
P1

Pin	Designation	Function	Input/output
1	UB	Supply voltage 9..30V	I
2	VSS	0V	I
3	PO0	Motor + (power output 0)	O
4	VC50	5V supply for incremental encoder	O
5	CHA	CHA incremental encoder (5V TTL)	I
6	CHB	CHB incremental encoder (5V TTL)	I
7	VSS	0V supply for incremental encoder	O
8	PO1	Motor - (power output 1)	O

P2

Pin	Designation	Function	Input/Output (dep. on options)	
			RS485	UART / I2C
1	UB	Supply voltage 9..30V	I	I
2	VSS	0V	I	I
3	RxD/A	UART RxD (*) of RS485 A (RX+)	I	I
4	TxD/B	UART TxD (*) of RS485 B (RX-)	I	O
5	SCL/Y	I2C SCL (*) of RS485 Y (TX+)	O	I
6	SDA/Z	I2C SDA (*) of RS485 Z (TX-)	O	I/O
7	Index0	Index0 (function depending on firmware)	I	I
8	Index1	Index1 (function depending on firmware)	I	I

4: μ MC500V10 wiring diagram



Serial interface

The following figures show the connections between the drive controller and the serial interface of the host computer.

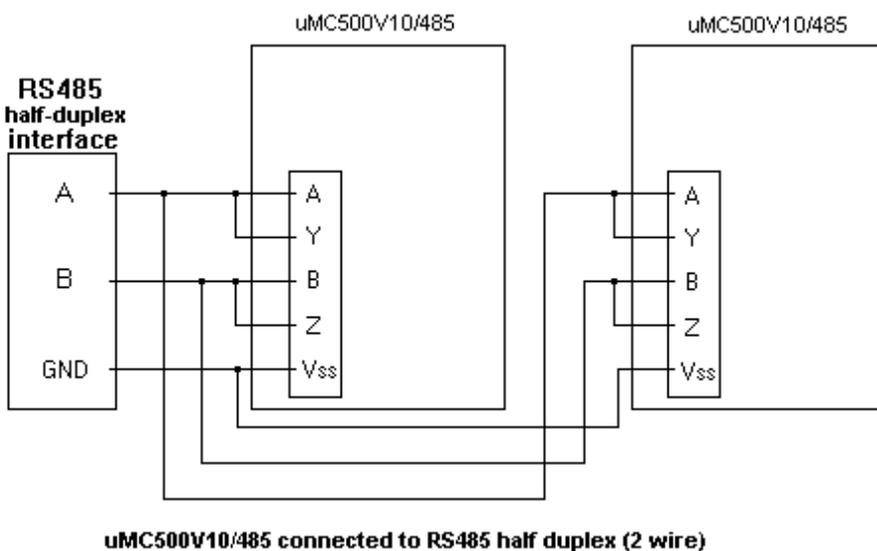
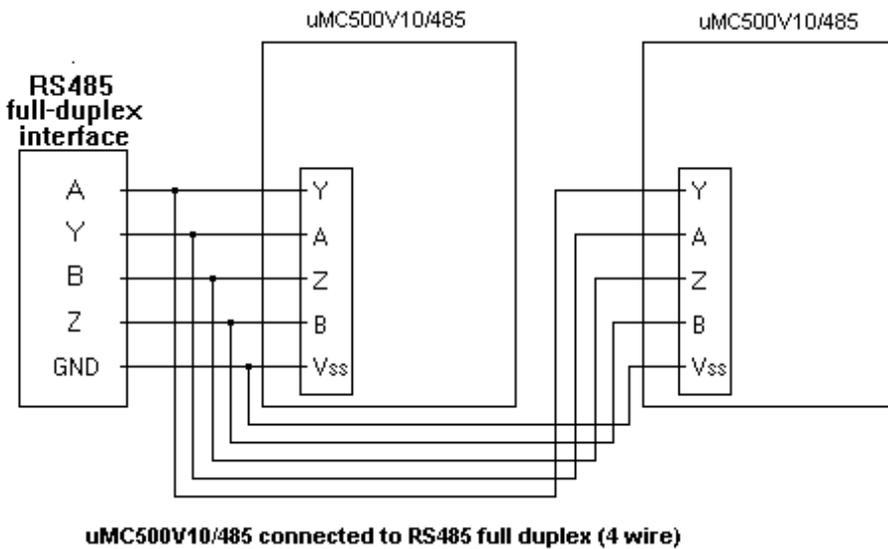
For a secure data transmission in an RS485 network with long data cables >10m, we recommend to use termination resistors adapted to the cable impedance on both sides between A and B.

In the µMC500 the following termination pull-up and pull-down resistors in the signal lines A and B are already integrated:

- Termination: 1kOhm || 100pF
- Pull-up and pull-down: 10kOhms (A to +5V, B to VSS) each

In many applications with cable lengths of <10m, the integrated termination resistors are correctly dimensioned, so that no further measures with regard to reflection damping are necessary.

Figure 5: Several µMC500 on RS485



RS485 interface

The RS485 interface can be realized with a USB to RS485 adapter or can be an RS485 interface installed in the host computer. Since the μ MC500 features a full duplex interface with half duplex ability (switching of data direction), a simple RS232 to RS485 converter without data direction switching mode can be connected. By means of this device, merely the TxD/RxD signals of approx. $\pm 10V$ of the RS232 interface are converted to differential 5V- A/B und Y/Z signals of the RS485 interface.

USB to RS485, as well as RS232 to RS485 adapters are produced by a variety of manufacturers and are made commercially available by most distributors.

Manufacturers: ADLINK, Spectra, Exsys, Trigress Security, Moxa, Athen, Maxxtro, IPC-DAS, etc.

For integration of an RS-485 interface in a custom specific host controller, there is a large selection of RS485 transceivers available from different manufacturers: Fairchild Semiconductor, TI, ON Semiconductor, Linear Technology, Analog Devices, Maxim, etc., to mention only a few of them.

Writing and saving address of the controller

The individual address „n“ of each drive controller is determined via the serial interface, i.e. the μ MC500 is not equipped with hardware switches, such as DIP switches or similar devices for address setting.

It is important to pay attention to the fact that the command for address assignment is a broadcast command, which is accepted by all drive controllers bearing any module address 1..9. Consequently, this command must not be sent in an RS485 network array with several connected drive controllers, since all drive controllers would adopt the same module address. A individual communication would not be possible anymore.

For that reason, the address assignment needs to be performed on a single, isolated specimen connected to an RS485 bus, before this drive controller is integrated in an RS485 network array with several modules. Only after performing this procedure can the drive controller be addressed individually.

In addition to this, it is also important to save all parameters ($nE1=1<LF>$) after assigning the module address in order to make the individual address setting available after a new power up.

The factory setting for the module address of all μ MC500 is 4. The device / module address can be adjusted from 1 to 9, the easiest way to do this is using the PC software STM7000.

The command to determine the module / device address runs as follows:

	<u>Command</u>	<u>Range x</u>	<u>Response</u>
- Write module / device address:	nAdress=x<LF>	0...9	n*<LF>
- Save parameter set:	nE1=1<LF>	-	n*<LF>

Immediately after receipt and evaluation of this command the drive controller only responses to commands with the correct address anymore. Afterwards, do not forget to save all parameters with $nE1=1<LF>$.

Example: 4Adress=1<LF> changes the address of the connected module, which had any address before, to 1.
nE1=1<LF> saves the parameter set including module / device address.

Status LEDs

A red and a green LED next to the connectors display the following states:

- Module ready
- Communication active
- Tracking error and overdrive monitor active
- Low voltage or over voltage, over temperature, short-circuit

LED1, green:

This LED flashes for a few seconds at power on without communication via the serial interface and then lights continuously. This indicates that the self-test was successful and that the drive controller is ready for operation. As soon as there are valid commands, with address codes that correspond to this module, sent via the serial interface this LED flashes. This indicator is active for approx. 5 seconds after receipt of the last valid, correctly addressed command.

LED2, red:

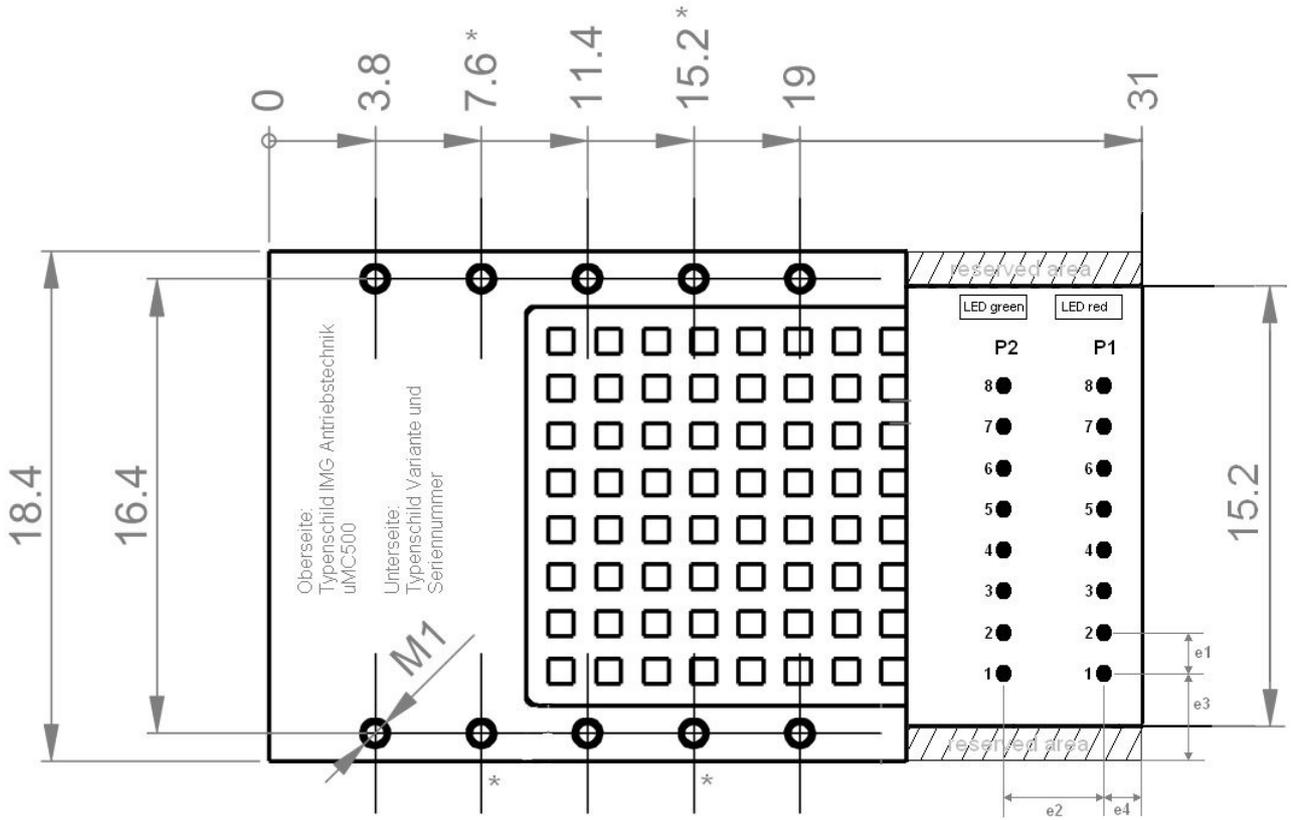
Lights continuous: Indicates active hardware protection systems, i.e. in case of an over temperature, over voltage or short-circuit event. This status deactivates the power stage and is accessible for the host computer by means of the status word 1 and 3.

Flashing: Indicates that the position does not correspond to the last defined position anymore; this may have different causes:

- The current regulation is active, i.e. the actual position does not correspond to the setpoint position anymore.
- The overdrive or tracking error monitor of the drive protection is active.
- Low voltage

A reset of these protection states is possible at any time, with the exception of the over temperature, low voltage or over voltage shutdown.

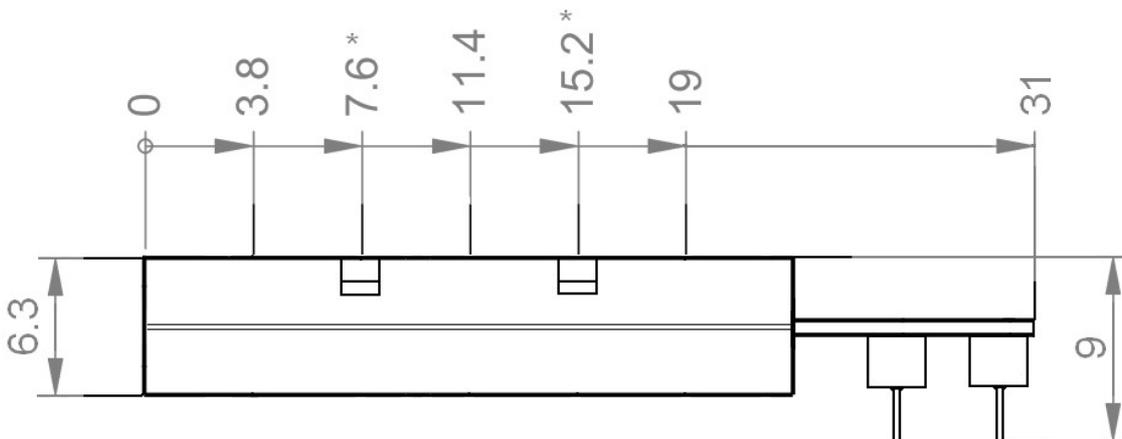
Figure 6: Mechanical data, dimensions



Mit * gekennzeichnete M1-Gewindebohrungen sind nur auf der Unterseite mit einer Tiefe von maximal 2mm verfügbar

Variante -STI 1.27b	Variante -JST 1.50t
e1: 1.27mm / 50mils	e1: 1.49mm / 59mils
e2: 3.55mm / 140mils	e2: 3.68mm / 145mils
e3: 4.00mm / 157mils	
e4: 1mm / 39.37mils	

Top view of μ MC500V10, variant -STI 1.27b and -JST 1.50t; M1 threads marked with * are not usable on the upper side.



Side view μMC500V10, variant -STI 1.27b7. **Variants and order numbers**

The μMC500 is available in the following variants:

Variant	Order number
<u>μMC500V10:</u>	
μMC500V10 with 2 x 8-pin 1.5mm JST - pin headers on upper side, RS485 - Interface	μMC500V10/485-JST1.50t
μMC500V10 with 2 x 8-pin 1.27mm - pin headers on underside, RS485 - Interface	μMC500V10/485-STI1.27b
μMC500V10 with 2 x 8-pin 1.27mm - pin headers on upper side, RS485 - Interface	μMC500V10/485-STI1.27t
μMC500V10 with 2 x 8-pin 1.5mm JST - pin headers on upper side, I ² C and 3.3V UART- Interface	μMC500V10/I2C-JST1.50t
μMC500V10 with 2 x 8-pin 1.27mm - pin headers on underside, I ² C and 3.3V UART - Interface	μMC500V10/I2C-STI1.27b
μMC500V10 with 2 x 8-pin 1.27mm - pin headers on upper side, I ² C and 3.3V UART - Interface	μMC500V10/I2C-STI1.27t
<u>μMC500V20:</u>	
μMC500V20 with 3 x 7-pin 2.54mm - pin headers on upper side, RS485 - Interface and 2 digital/analog I/O	μMC500V20/485-STI2.54t
μMC500V20 with 3 x 7-pin 2.54mm - pin headers on underside, RS485 - Interface and 2 digital/analog I/O	μMC500V20/485-STI2.54b
μMC500V20 with 3 x 7-pin 2.54mm - pin headers on upper side, I ² C and 3.3V UART - Interface and 2 digital/analog I/O	μMC500V20/I2C-STI2.54t
μMC500V20 with 3 x 7-pin 2.54mm - pin headers on underside, I ² C and 3.3V UART - Interface and 2 digital/analog I/O	μMC500V20/I2C-STI2.54b