

### General Information

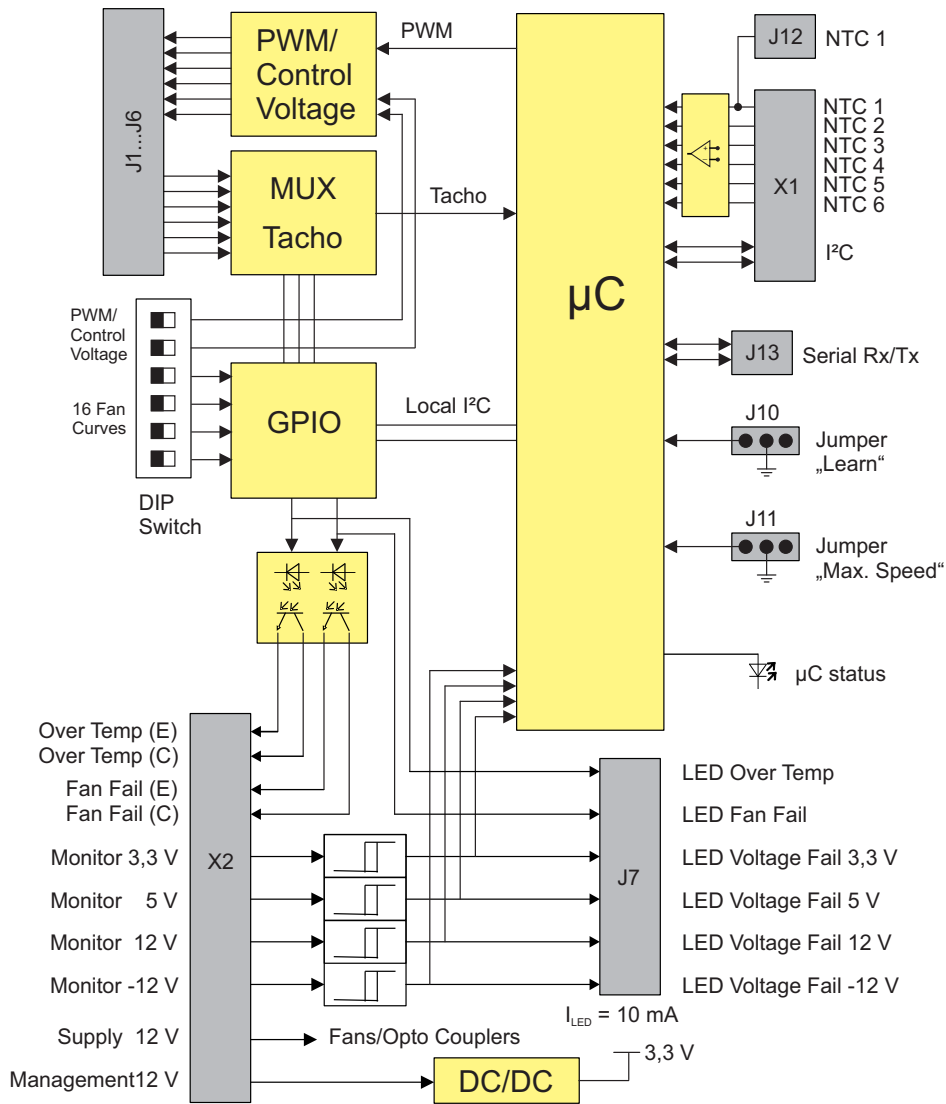
The Fan Control Module 2 (FCM2) is a stand-alone fan controller. The FCM2:

- Monitors and controls up to 6 fans
- PWM and Control voltage 0 ... 10 V
- Monitors the signals from up to 6 temperature sensors
- Can monitor the presence of a 3.3 V, 5 V, 12 V and -12 V voltage
- Controls status LEDs (Over Temp, Fan Fail, 3.3 V, 5 V, 12 V, -12 V)
- Speed up the fans in case of a failure of one fan or temperature sensor
- Provide status informations through an I<sup>2</sup>C Interface
- Hot-Swap Controller

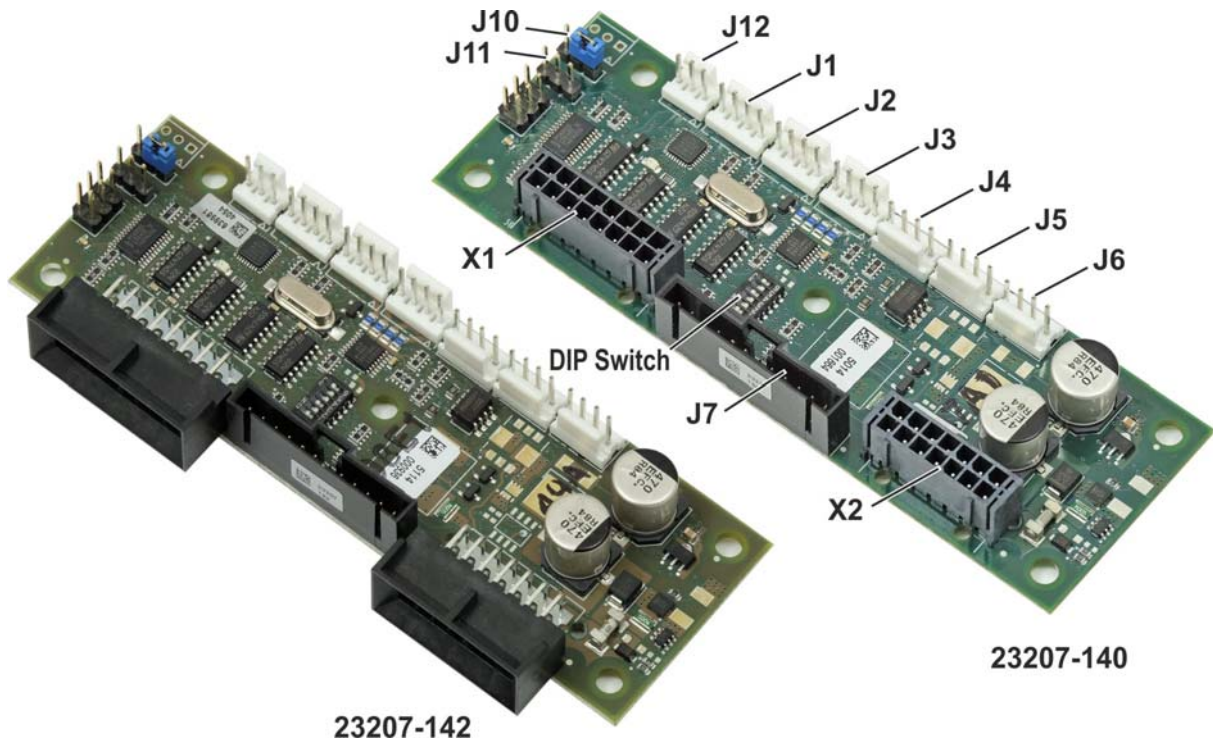
There are 2 different variants available:

- **23207-140 (Catalog No. with package 23207-160):** Connector X1 and X2 vertical
- **23207-142 (Catalog No. with package 23207-162):** Connector X1 and X2 right angle

### Block Diagram:



FCM2 with vertical and right angle Connectors:



Up to 6 NTC temperature sensors can be connected to the FCM2. The highest temperature level is the reference for the fan speed. If a sensor temperature exceeds the maximum temperature of the selected fan curve by 5 °C, the output for the temperature fail LED and a digital output are activated.

The FCM2 can monitor up to 6 fan tachometer signals (Open collector or voltage source) and can control the fans as a group by a PWM or 0 ... 10 VDC signal. The FCM2 performs every 5 minutes a fan behaviour test. If the speed of a single fan is 30% below normal speed, the FCM will send a fan fail alarm.

**Learning Mode: (Jumper J10)**

When the jumper is assembled in position 1-2 and the FCM2 is powered-up, the FCM2 is in „Learning Mode“. The FCM2 detect all fans and temperature sensors connected and save the speed of each fan at different PWM duty cycles. If a fan or temperature sensor is removed or added in „Normal Mode“, the FCM2 will send a fan-fail or temp-fail signal.

**Max. Speed: (Jumper J11)**

When the jumper is assembled in position 1-2, all fans are rotating with full speed.

**I<sup>2</sup>C Interface**

Bus voltage is 3.3 V, pull-ups must be provided by the master. General call is not provided, the typical read cycle is > 10 ms. The fan controller can hold down the clock to reduce the bus speed and supports I2C standard mode up to 100 kbit/s. The following informations are available.

- Fan fail status
- Over Temp status
- Fan speed of all fans
- Temperature of all sensors
- Presence of all voltages
- The max. rpm of all fans can be set

**I<sup>2</sup>C Register Description:**

Register	8 bit Address (read)	Command	8 bit Address (write)
Fan fail	38h	0	39h (return 1 Byte)
Temp fail	38h	1	39h (return 1 Byte)
Voltage available	38h	2	39h (return 1 Byte)
Fan speed	38h	3	39h (return 12 Byte)
Temperature	38h	4	39h (return 6 Byte)
Max speed	38h	5	-
Max speed disable	38h	6	-
Fan behaviour fail	38h	7	39h (return 1Byte)

**Fan fail:**

*1. Byte*

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

Bit 0: '0' = fan\_1 ok                    '1' = fan\_1 fail  
 Bit 1: '0' = fan\_2 ok                    '1' = fan\_2 fail  
 Bit 2: '0' = fan\_3 ok                    '1' = fan\_3 fail  
 Bit 3: '0' = fan\_4 ok                    '1' = fan\_4 fail  
 Bit 4: '0' = fan\_5 ok                    '1' = fan\_5 fail  
 Bit 5: '0' = fan\_6 ok                    '1' = fan\_6 fail

**Temp fail:**

*1. Byte*

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

Bit 0: '0' = temp\_1 ok                  '1' = temp\_1 fail  
 Bit 1: '0' = temp\_2 ok                  '1' = temp\_2 fail  
 Bit 2: '0' = temp\_3 ok                  '1' = temp\_3 fail  
 Bit 3: '0' = temp\_4 ok                  '1' = temp\_4 fail  
 Bit 4: '0' = temp\_5 ok                  '1' = temp\_5 fail  
 Bit 5: '0' = temp\_6 ok                  '1' = temp\_6 fail

**Voltage available:**

*1. Byte*

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

Bit 0: '1' = voltage\_3,3V ok            '0' = voltage\_3,3V fail  
 Bit 1: '1' = voltage\_5V ok             '0' = voltage\_5V fail  
 Bit 2: '1' = voltage\_12V ok           '0' = voltage\_12V fail  
 Bit 3: '1' = voltage\_-12V ok         '0' = voltage\_-12V fail

**Fan speed:**

*High Byte*

*Low Byte*

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Byte 0 & Byte 1:                    Fan\_1                    Fan\_speed (Integer)  
 Byte 2 & Byte 3:                    Fan\_2  
 Byte 4 & Byte 5:                    Fan\_3  
 Byte 6 & Byte 7:                    Fan\_4  
 Byte 8 & Byte 9:                    Fan\_5  
 Byte 10 & Byte 11:                 Fan\_6

**Fan speed is RPM only for fans with 2 pulses/rev**

**For fans with 3 pulses/rev you have to recalculate the actual speed**

**Temperature:**

*1. Byte*

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

Temperature

Byte 0: Temp\_1                    Byte 3: Temp\_4  
 Byte 1: Temp\_2                    Byte 4: Temp\_5  
 Byte 2: Temp\_3                    Byte 5: Temp\_6

**Max speed:**

All fans are set to max speed.

**Max speed disable:**

All fans are set to normal speed (depends on temperature).

**Fan behaviour fail:**

*1. Byte*

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	---

Bit 0: '0' = fan\_1 ok                    '1' = fan\_1 fail  
 Bit 1: '0' = fan\_2 ok                    '1' = fan\_2 fail  
 Bit 2: '0' = fan\_3 ok                    '1' = fan\_3 fail  
 Bit 3: '0' = fan\_4 ok                    '1' = fan\_4 fail  
 Bit 4: '0' = fan\_5 ok                    '1' = fan\_5 fail  
 Bit 5: '0' = fan\_6 ok                    '1' = fan\_6 fail

Pinout Connectors:

J7 (Molex 70543 or similar)			
1	Anode LED 3.3 V	7	Anode LED -12 V
2		8	
3	Anode LED 5 V	9	Anode LED Fan Fail
4		10	Anode LED Temp Fail
5	Anode LED 12 V	11	GND
6		12	GND

Info:  $I_{LED} = 10 \text{ mA}$

J1 - J6 (TE MTA100)	
1	+12 V
2	GND
3	Tacho
4	Control

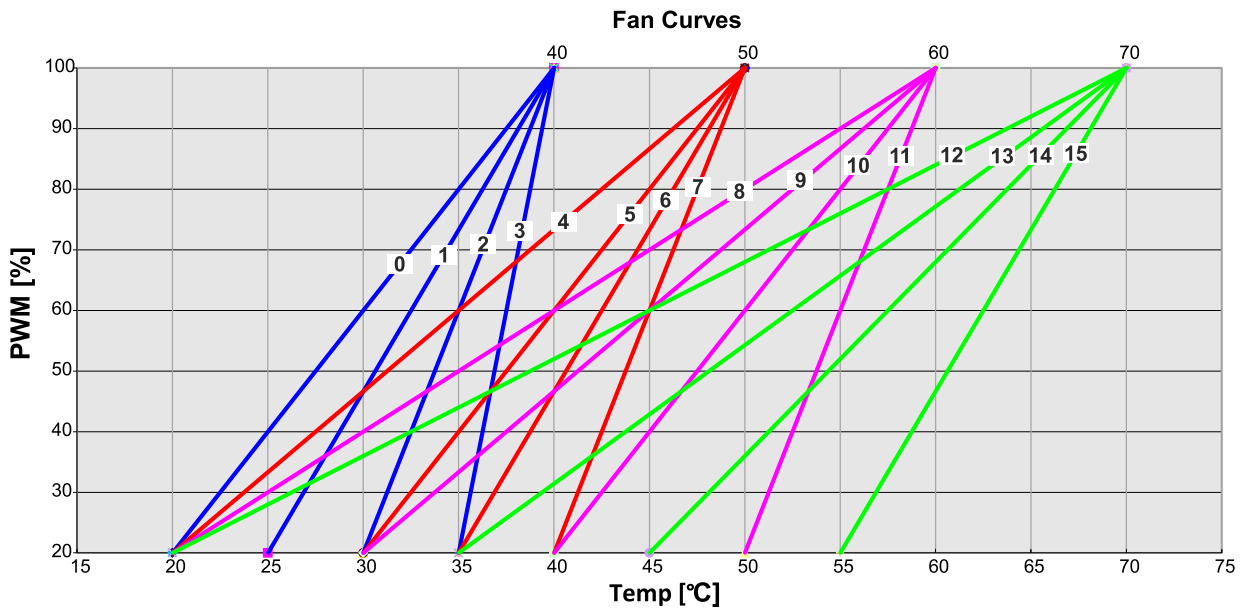
J12	
1	NTC1_1
2	NTC1_2
3	GND

J13	
1	Rx
2	Tx
3	GND

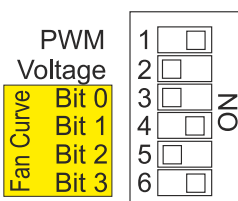
X1 (Molex 44428 or similar (right angle) (Molex 43045 or similar (vertical))			
16	NTC1_1	8	NTC1_2
15	NTC2_1	7	NTC2_2
14	NTC3_1	6	NTC3_2
13	NTC4_1	5	NTC4_2
12	NTC5_1	4	NTC5_2
11	NTC6_1	3	NTC6_2
10	SCL	2	SDA
9		1	GND

X2 (Molex 44428 or similar (right angle) (Molex 43045 or similar (vertical))			
14	Temp Fail Collector	7	Temp Fail Emitter
13	Fan Fail Collector	6	Fan Fail Emitter
12	Monitor 5 V	5	Monitor 3.3 V
11	Monitor -12 V	4	Monitor 12 V
10	12 V Management	3	GND Management
9	PGND	2	PGND
8	12 V Supply	1	12 V Supply

FAN Curves:



DIP Switch



Example for DIP switch settings:

PWM Control  
Fan Curve 10

**Initial operation and configuration:**

- Connect all fans and temperature sensors.
- Set the jumper J10 to learning mode (position 1-2).
- Switch on the power supply.
- All fans run with full speed and then slowly reduce the speed. Thereby the FCM determines the reference speed for various PWM values.
- Upon completion of the learning mode, the Fan Fail LED start blinking according to the number of fans found, and the Temp Fail LED start blinking according to the number of sensors found. If no LEDs are connected wait 5 min to ensure that the configuration is terminated.
- Switch off the power supply and set the jumper J10 to normal mode.

**Note:** When the FCM is factory fresh (never powered-up before) it is not necessary to set the jumper in learning mode, just connect the fans and sensors and power-up the FCM, the learning mode will start automatically.

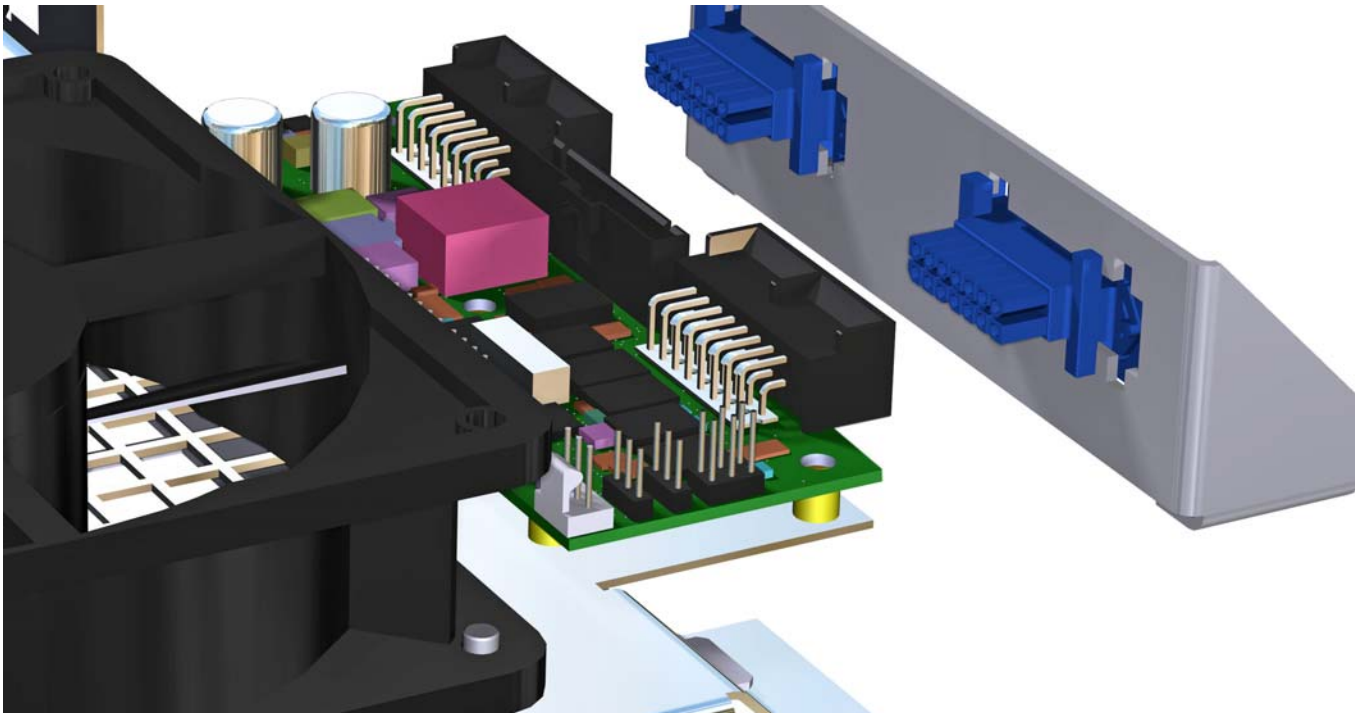
**Temperature sensor specifications:**

Schroff temperature sensor 20710-138 is recommended.

$$R_{25} = 30 \text{ kOhm}$$

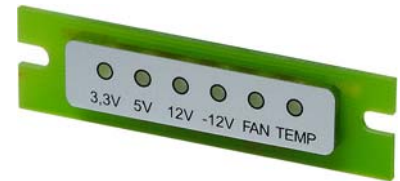
$$B_{25/50} = 4177 \text{ K}$$

**Example: Hot swappable Fan Tray with FCM2 with right angle connectors.**

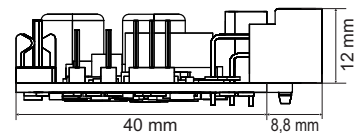
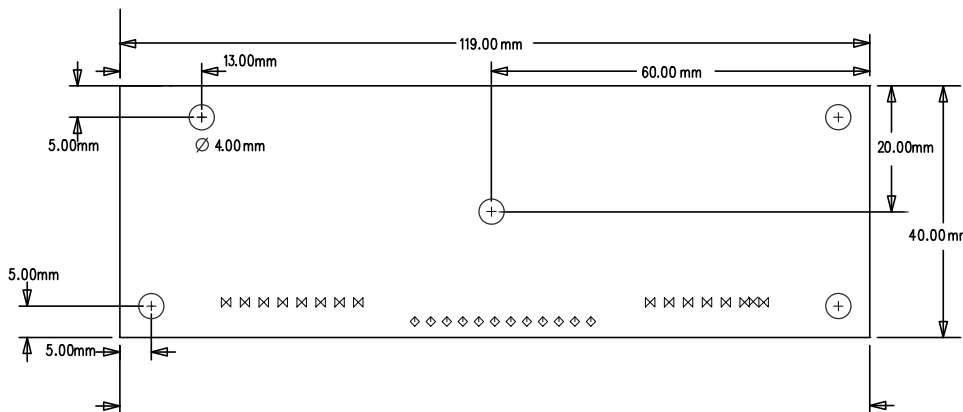


Technical Data	
Operating Voltage	11 - 13 VDC
Input fuse	8 A
Max. current for all fans	6 A
Max. current for a single fan	4 A (fused)
Ambient Temperature Operating	0 °C .....+70 °C
Ambient Temperature Storage	-40 °C .....+85 °C
Humidity	30 ...80% non condensating

Catalog Numbers (with package)	Part Numbers	Description
23207-160	23207-140	PWM and Control voltage 0 ... 10 V, vertical connectors
23207-162	23207-142	PWM and Control voltage 0 ... 10 V, right angle connectors
23204-882	20710-138	NTC Sensor with 400 mm cable and connector
23204-883		Display Unit with 6 LEDs (3.3 V, 5 V, 12 V, -12 V, Fan Fail, Temp Fail) 350 mm cable and connector



Dimensions



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