HYDAC INTERNATIONAL

Universal Mobile Controller
HY-TTC 540

Functional Safety
PL d
SIL 2

Description

The controller HY-TTC 540 is based on a modern 32 bit microcontroller platform.

Practically all the system diagnostics is handled by an optimised safety component, so the entire computing capacity is available to the main processor for the actual application.

The HY-TTC 540 has an impressive number of highly flexible inputs and outputs. The outputs in particular provide high individual and total currents or can alternatively be used as inputs.

To achieve differentiated safety levels, two separate PWM shutdown groups are available.

The HY-TTC 540 was developed in accordance with the international standards IEC 61508 and ISO/EN 13849 and is certified by TÜV NORD. It meets the requirements of Functional Safety according to **SIL 2** and **PL d**.

The module is protected in a proven, robust and compact housing, specially designed for the off-highway automotive industry.

Special features

- **SIL 2 / PL d certified**
- Safety Companion CPU
- CODESYS® Safety SIL 2 with CANopen Safety Master
- CODESYS® 3.X
- Two alternative PWM shutdown groups
- 28 PWM power outputs with current measurement
- 96 configurable inputs and outputs give great flexibility to the I/O groups
- Excellent computing performance
- 4 CAN-bus interfaces

Technical data

Ambient conditions	
Operating temperature	-40 .. +85 °C (with full load)
Operating altitude	0 .. 4,000 m
Supply voltage	8 .. 32 V (Bat+) (5.5 .. 32 V CPU operative)
Peak voltage	45 V max. (1 ms)
Idle current	400/200 mA at 12/24 V
Standby current	≤1 mA max.
Current consumption	60 A max. (complete voltage and temperature range)

Fulfils the following standards	
CE mark	Compliant with 2004/108/EC
E-mark	ECE-R10 Rev.4
Functional safety	EN ISO 13849 -PL d- IEC 61508 -SIL 2-
EMC	EN 13309; ISO 14982; CISPR 25
ESD	ISO 10605
Protection class	EN 60529 IP 67; ISO 20653 IP 6k9k
Electrical	ISO 16750-2; ISO 7637-2,-3
Temperature	ISO 16750-4
Vibration, shock, bump	ISO 16750-3

Dimensions and weight	
Housing dimensions	231.3 x 204.9 x 38.8 mm
Minimum clearance for connection	316 x 205 x 40 mm
Weight	1,200 g

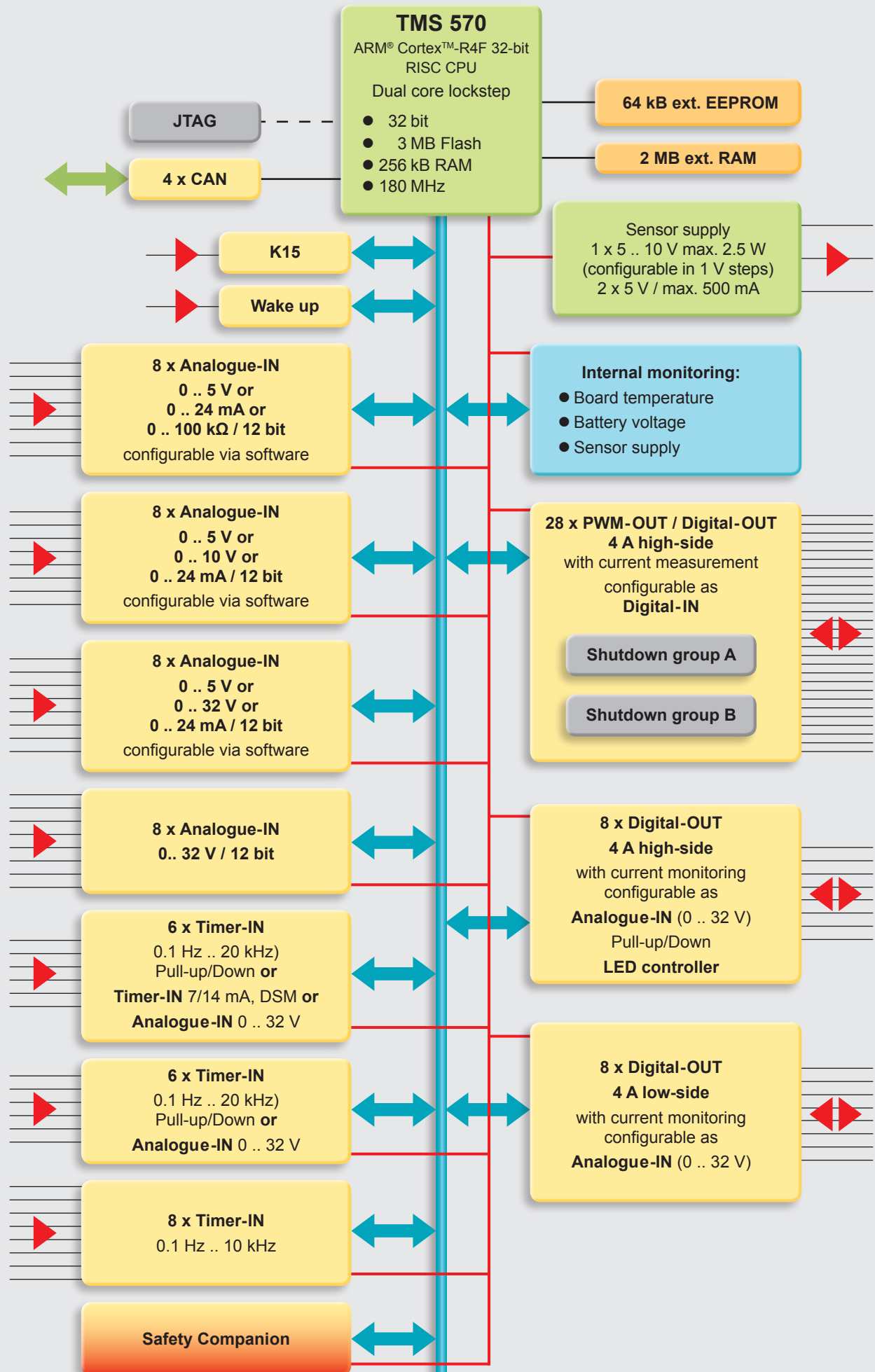| Features[1)2)3)] |
|---|
| 32-Bit TI TMS 570 Dual-core lockstep CPU, 180 MHz, 298 DMIPS, FPU; 3MB int. Flash, 256 kB int RAM, 2 MB ext RAM |
| 64 KB EEPROM |
| Safety Companion CPU |
| 4 x CAN, 50 kbit/s up to 1 Mbit/s |
| 4 x configurable CAN Node terminations |
| **IN** |
| 8 x Analogue-IN 0 .. 5 V, 0 .. 24 mA or 0 .. 100kΩ, range configurable via software |
| 8 x Analogue-IN 0 .. 5 V, 0 .. 10 V or 0 .. 24 mA, range configurable via software |
| 8 x Analogue-IN 0 .. 5 V, 0 .. 32 V or 0 .. 24 mA, range configurable via software |
| 6 x Timer-IN (timer input 0.1 Hz .. 20 kHz) / Timer-IN (7/14 mA (DSM) / Analogue-IN (0 .. 32 V) configurable pull-up/down, encoder |
| 6 x Timer-IN (timer inputs 0.1 Hz .. 20 kHz)/ Analogue-IN (0 .. 32 V) configurable pull-up/down, encoder |
| 8 x Timer-IN (0.1 HZ.. 10 kHz) |
| 8 x Analogue-IN, 0 .. 32V |
| K 15 and wake up |
| **OUT** |
| 28 x PWM-OUT 4 A high-side, current measurement, configurable as Digital-OUT |
| 8 x Digital-OUT 4 A high-side, with current monitoring, overload and load detection, configurable as 8 x Analogue-IN (0 .. 32 V) with configurable pull-up/down or LED controller |
| 8 x Digital-OUT 4 A low-side, with current monitoring, overload and load detection, configurable as 8 x Analogue-IN (0 .. 32 V) |
| Wiring up to 8 Digital-OUT high-side and 8 Digital-OUT low-side as full bridge control for the control of direct current motors |
| Internal monitoring of board temperature, sensor supply and battery voltage |
| Connector types: 154 pole male |
| 1 x Sensor supply 5 .. 10 V / max. 2.5 W configurable with 1V increments |
| 2 x sensor supply 5 V (500 mA) |
| Programming in C or CODESYS® Safety SIL 2 with CANopen Safety Master |

Note: [1)] All I/Os and interfaces are protected against short circuit to GND and BAT+.
[2)] All I/Os are configurable as digital-IN
[3)] All I/Os have 12 bit resolution.

Block circuit diagram

HY-TTC 540

TMS 570

ARM® Cortex™-R4F 32-bit
RISC CPU

Dual core lockstep

- 32 bit
- 3 MB Flash
- 256 kB RAM
- 180 MHz

JTAG

4 x CAN

64 kB ext. EEPROM

2 MB ext. RAM

K15

Wake up

Sensor supply
1 x 5 .. 10 V max. 2.5 W
(configurable in 1 V steps)
2 x 5 V / max. 500 mA

8 x Analogue-IN
0 .. 5 V or
0 .. 24 mA or
0 .. 100 kΩ / 12 bit
configurable via software

Internal monitoring:
- Board temperature
- Battery voltage
- Sensor supply

8 x Analogue-IN
0 .. 5 V or
0 .. 10 V or
0 .. 24 mA / 12 bit
configurable via software

28 x PWM-OUT / Digital-OUT
4 A high-side
with current measurement
configurable as
Digital-IN

Shutdown group A

Shutdown group B

8 x Analogue-IN
0 .. 5 V or
0 .. 32 V or
0 .. 24 mA / 12 bit
configurable via software

8 x Analogue-IN
0.. 32 V / 12 bit

8 x Digital-OUT
4 A high-side
with current monitoring
configurable as
Analogue-IN (0 .. 32 V)
Pull-up/Down
LED controller

6 x Timer-IN
0.1 Hz .. 20 kHz)
Pull-up/Down **or**
Timer-IN 7/14 mA, DSM **or**
Analogue-IN 0 .. 32 V

6 x Timer-IN
0.1 Hz .. 20 kHz)
Pull-up/Down **or**
Analogue-IN 0 .. 32 V

8 x Digital-OUT
4 A low-side
with current monitoring
configurable as
Analogue-IN (0 .. 32 V)

8 x Timer-IN
0.1 Hz .. 10 kHz

Safety Companion

Model code

HY-TTC 540 – XX – 2.3M – 003M – 00 – S2Pd – 000

Programming environment
CP = C programming
CD = CODESYS® or CODESYS® 3.X

RAM
2.3M = 2 MB ext. RAM, 256 kB int. RAM

Flash
003M = 3 MB Flash (3 MB int. Flash)

Equipment options
00 = standard

Functional safety
S2Pd = **SIL 2** and **P**erformance **L**evel **d**

Modification number
000 = standard

Note:
On instruments with a different modification number, please read the label
or the technical amendment details supplied with the instrument.

Accessories
Appropriate accessories, such as cables and connectors, service tools,
software etc. can be found in the Accessories section.

Dimensions