The Vehicle Control Unit VCU is a highly powerful processing unit for customer-developed functions integrating a flexible logging device with high speed logging capability of up to 200 kHz. The processing cores feature floating-point arithmetic and a high-end FPGA for ultimate performance and flexibility. The customer software development process is based on MATLAB/Simulink to significantly speed up algorithm development (automatic code and documentation generation). It offers real time Ethernet functionality to exchange e.g. data used in control algorithms between devices (guaranteed latency time 1 ms). This device comes with a basic software consisting of operating system, H/W-drivers and low-level functions like pin setup, diagnostics, etc. The customer can freely develop his own application software using the MATLAB/Simulink environment.

**Technical Specifications**

**Mechanical Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>166 x 121 x 41 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>≤ 660 g</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP67</td>
</tr>
<tr>
<td>Operating temp. int</td>
<td>-20 to 80°C</td>
</tr>
<tr>
<td>Motorsport conn.</td>
<td>198 pins in total</td>
</tr>
<tr>
<td>Max. vibration</td>
<td>Vibration profile 1 (see Appendix or <a href="http://www.bosch-motorsport.com">www.bosch-motorsport.com</a>)</td>
</tr>
</tbody>
</table>

**Electrical Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>5 to 18 V</td>
</tr>
</tbody>
</table>

**Inputs**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog channels</td>
<td>20</td>
</tr>
<tr>
<td>Digital PWM inputs</td>
<td>8</td>
</tr>
<tr>
<td>Tooth count differential*</td>
<td>4</td>
</tr>
</tbody>
</table>

**Application**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor for customer code</td>
<td>667 MHz Dual Core</td>
</tr>
<tr>
<td>Processor for logger</td>
<td>667 MHz Dual Core</td>
</tr>
<tr>
<td>Configurable math channels</td>
<td></td>
</tr>
<tr>
<td>User configurable CAN in/out</td>
<td></td>
</tr>
<tr>
<td>messages</td>
<td></td>
</tr>
<tr>
<td>Sampling rate logger</td>
<td>1 ms</td>
</tr>
<tr>
<td>Optional: Sampling rate high</td>
<td></td>
</tr>
<tr>
<td>speed logger</td>
<td>5 µs</td>
</tr>
<tr>
<td>Online data compression</td>
<td></td>
</tr>
<tr>
<td>Logging rate</td>
<td>Max. 500 kB/s</td>
</tr>
<tr>
<td>Internal storage capacity</td>
<td>6 GB</td>
</tr>
<tr>
<td>LTE Ethernet telemetry support</td>
<td></td>
</tr>
<tr>
<td>RS232 interface for GPS</td>
<td></td>
</tr>
</tbody>
</table>
Fixed pullup 2.15 kOhm (required for Hall), Tooth count differential
Thermocouple 4 universal
Bosch Laptrigger 1
TimeSync master and slave (specific to Bosch measurement system)
Internal measurement 1 ambient pressure
1 ECU temperature
20 supply voltage
20 supply current
1 battery voltage (external VCU supply)
1 external VCU supply current
4 HS output current

Outputs
PWM High side 2*; 7.5 A each, PWM, 50 Hz
PWM Low side 4*; 2.2 A each, PWM, 10 kHz
*can be enhanced by Upgrade I/O Package, see below

Power Supplies
12 V, 400 mA each 5*
Switchable 5 V/12 V, 400 mA each 5*
Max overall current 4 A on all 12 V
2 A on all 5 V
Precision 12 V ± 1 % on the pin
Precision 5 V ± 0.1 % on the pin
Sensor ground 20
*can be enhanced by Upgrade I/O Package, see below

Adaptation and Documentation
Function documentation Automatically created during code generation
MatLab code generation Support for customer own MatLab function development

Software Tools (free download)
Data Analysis tool WinDarab 7 Free
System Configuration tool RaceCon Logger configuration, calibration and online measurement

USB Kit
Software license for USB-port unlocked
Rugged USB flash drive
Adapter cable to USB-port
Adapter for wiring harness

Upgrade High Speed Logging Package
6 ANA 0 to 5 V, 200 kHz logging rate

Upgrade I/O Package
Communication
4 CAN

Inputs
4 Analog channels
0 to 20 V,
0.5 % precision between 0.8 and 19.2 V, switchable pull-up
4 Digital PWM inputs
f_max=30 kHz
Hall-type speed measurement possible,
Fixed pullup 2.15 kOhm (required for Hall), Tooth count differential
4 LVDT, 5 pin configuration, excitation frequency 1 to 20 kHz, excitation voltage 0 to 5 V (rms)

Outputs
4 "TTL" Digital output, 10 kHz, PWM, 250 mA each
2 PWM High side; 7.5 A each, PWM, 50 Hz
4 PWM Low side; 2.2 A each, PWM, 10 kHz

Power Supplies
5 x12 V, 400 mA each
5 switchable 5 V/12 V, 400 mA each
* The tooth count differential between any two of the PWM inputs is available two measure e.g. shaft torsion.

Upgrade Real Time Ethernet
Enables the VCU to operate as a real time Ethernet master or slave. Guaranteed latency time of 1 ms. Ideal for time critical data transfer as needed in online control algorithms involving data from different devices.
Two interfaces allow for a ring topology (redundancy in case the RTE line experiences damage).
The VCU features a reasonable set of SERCOS3 instructions although not the full SERCOS3 standard is implemented. The ECU side can act as a SERCOS3 master; the logger side can act as a SERCOS3 slave.

Upgrade CCP Master
Enables CCP master functionality to request data from foreign devices via CAN/CCP protocol.

Connectors
Connector LIFE (red) Connector SENS-A (yellow) Connector SENS-B (blue)
AS018-35PN AS018-35PA AS018-35PB Mating connector Mating connector Mating connector
AS618-35SN (not included) AS618-35SA (not included) AS618-35SB (not included)

Communication
3 Ethernet 100 Mbit
2 Realtime Ethernet SERCOS3
4 CAN
1 LIN
1 USB
1 RS232 interface for GPS
1 Time sync synchronization Ethernet
*can be enhanced by Upgrade I/O Package, see below

Installation Notes

Inspection services recommended after 220 h or 2 years, no components to replace.
Please remember that the mating connectors and the programming interface MSA-Box II are not included and must be ordered separately.

Ordering Information

Vehicle Control Unit VCU

Order number F02U.V02.724-01

Accessories

Breakout Box BOB MS 7
Order number F02U.V02.293-01
Opening tool for shellssize 18
Order number F02U.V01.394-01
USB Kit for C 70, DDU 9, DDU 10 and VCU
Order number F02U.V02.214-01

Software Options

High Speed Logging Package
Order number F02U.V02.779-01
I/O Package
Order number F02U.V02.777-01
Real Time Ethernet
Order number F02U.V02.782-01
CCP_MASTER
Order number F02U.V02.213-01

Dimensions