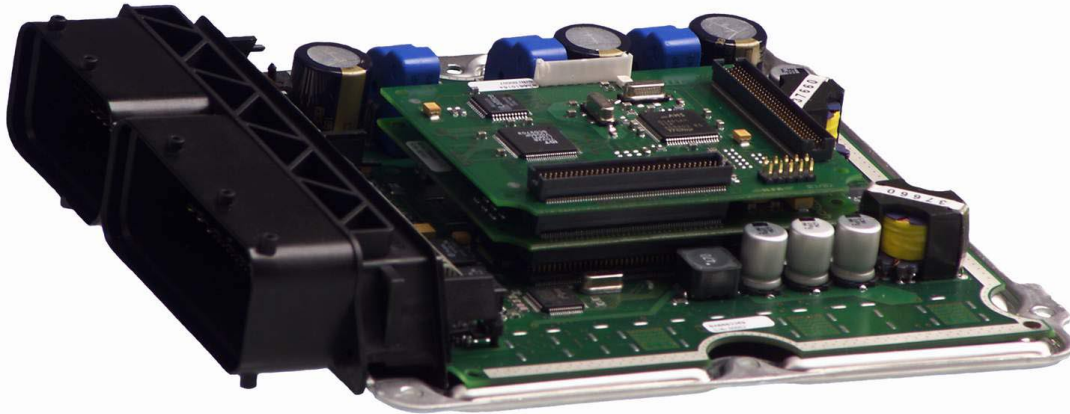


## Distributed Real-Time System Prototyping



### **TTP By-Wire Box – The Rapid Prototyping Box for High-Power Actuators**

TTP By-Wire Box is the ideal platform for rapid development of TTP<sup>®</sup>-based distributed control systems with high-power actuators. This box is an actuator control unit that offers full hardware and software support for direct control of a brushless DC motor. Therefore it is ideally suited for implementing by-wire functionality, such as brake-by-wire, steer-by-wire, or clutch-by-wire. Additionally, TTP By-Wire Box is an advanced development system that provides a wide range of standard I/O interfaces that are driven by the automotive-qualified Freescale MPC555 PowerPC<sup>®</sup> microprocessor.

#### **Integration into Hard Real-Time Architecture**

The TTP communication controller AS8202NF and the TTPTools software development suite provide all the facilities needed to integrate several TTP By-Wire Boxes into a hard real-time architecture. TTP supports the design of fault-tolerant systems with distributed control loops and minimal jitter. TTP By-Wire Box works with 12 Volt to 42 Volt power supplies and can be upgraded for future high-speed TTP communication controllers.

#### **Rapid Prototyping with TTPTools**

TTP By-Wire Box is designed to be used in combination with TTPTools, the software development suite for TTP. This toolset supports rapid prototyping and algorithm testing for vehicle dynamics models and control systems.

#### **DSP option for TTP By-Wire Box**

The DSP option of the TTP By-Wire Box enhances control functions of DC motors. The developer can now choose between 6-step motor control and advanced sinusoidal mode control of the brushless DC motor. This control method produces low levels of acoustic noise and low motor torque ripple. TTP By-Wire Box is an advanced development system that supports a wide range of standard I/O interfaces for this dual-CPU solution.

#### **I/O Toolbox for MATLAB/Simulink**

TTP By-Wire Box comes with an I/O Toolbox for MATLAB<sup>®</sup>/Simulink<sup>®</sup>. It contains blocks for all available input and output ports. After verifying the Simulink model through simulations, highly efficient C-code for the application can be generated by The MathWorks, Inc.'s code generator (Real-Time Workshop<sup>®</sup> Embedded Coder).

### System CPU

- Freescale MPC555 PowerPC core with floating point running at 40 MHz
- Optional Digital Signal Processor board with ADMC300 from Analog Devices
- 0.5 Mbyte RAM (128 K x 32 bit), qualified for industrial temperature range or 1 Mbyte RAM (256 K x 32 bit), qualified for industrial temperature range or 0.5 Mbyte RAM (128 K x 32 bit), qualified for automotive temperatures
- 26 Kbyte internal static RAM
- 4 Mbyte burstable Flash plus 448 Kbyte internal Flash

### Interfaces

- TTP interface based on austriamicrosystems AS8202NF TTP communication controller with:
  - CAN physical layer (1 Mbit/s) or RS 485 (5 Mbit/s) with MFM/Manchester coding (up to 5 Mbit/s)
  - MII 100Base-TX (25 Mbit/s; requires 100Base-TX hub and star architecture)
- ISO 9141 physical layer suitable for LIN
- CAN interface (125 – 500 Kbit/s)

### Motor Control

- 3 wire powerstage outputs driving up to 1 kW brushless DC motors
- Motor supply voltage 12 – 42 V
- Motor current 25 A continuous and 40 A peak
- Analog resolver input for sinusoidal motor control
- 3 hall sensor inputs for commutation point sensing including 5 or 10 V supply
- Powerstage disable input

### Specifications

- Dimensions: 205 x 181 x 47 (in mm)
- Weight: 780 g
- Ambient temperature: -40 °C – +85 °C
- Vibration: 4 g / 5 – 500 Hz

### Supported I/Os

- 7 analog inputs, 0 – 5 V / 10 bit
- 3 x 10 bit analog input (temperature sensor)
- 12 digital inputs
- 2 high-side switches, 2 A, current controlled PWM
- 2 low-side switches, 1 A
- 1 wheel speed sensor (active 2-wire ABS type) including 12 V supply

### Housing

- Aluminum injection molded housing
- Cooling fins for optimal temperature reduction
- IP 65 standard protection against dust and low-pressure jets of water
- Protection: ISO 7637-1,2,3 (external load dump protection must be provided)

### Internal

- Board temperature monitoring
- Supply voltage monitoring
- Supply voltage: 9 – 50 V
- Wake and stand-by control (optional)
- Flexible isolated supplies for motor and control unit; both can be supplied from 12 V (conventional car battery) up to 42 V (PowerNet)
- Maximum peak voltage: 58 V for 200 ms
- Maximum power consumption: 20 Watt (without actuator)
- Operating altitude: 0 – 4000 m
- Connector: 154 Pin
- On-board sensor supply: four 5 V / two 12 V; 20 mA each

Subject to changes and corrections.

For further information, including price and availability, contact [products@tttech.com](mailto:products@tttech.com).

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