Services, products and expertise in: Concept, design and manufacturing of electronics and mechatronic systems

Control Driver
The Intelligent Motion Control System (IMCS) is a cost and time effective solution to implement simple or complex and high-performance motion control/test systems or prototypes.

The Intelligent Motion Control Unit (IMCU) is a DSP and CPLD based controller suitable for a large spectrum of control applications. Its modular design includes:
• common for all applications main board (MAIN),
• designed for each specific application mezzanine (MEZZ)
• range of power amplifier(s) (PA)

Versatile:
• Research, development and test platforms
• Singular industrial, robotics and mechatronic applications
• Educational platforms (student and PhD works)

Customized:
• Short time development, test and verification applications
• Specific implementation

The Control Driver (CD) is an autonomous controller DSP-CPLD based which combine all the functions necessary to control one actuator or custom applications.

Control (active) extension
Customized for given application (passive) amplifier

Customized:
• Short serial manufacturing
• Cost optimization

www.electronics-lis.com info@electronics-lis.com
CD control driver (top and bottom sides)

Emergency loops configuration:
1. Isolated Enable input
2. Isolated State output
3. Configurable as loop’s Master or Slave

CAB 2.0B bus isolated interface:
1. High Speed (1MHz),
2. Separated supply (internal DC/DC converter)
3. Manual or Software termination resistor switching

High Speed isolated RS485/422: (500 kbps)
synchronisation link:
1. Bidirectional (can be applied as Modbus interface).
2. Master/slave configuration by SW.
3. Termination resistor switched by SW

Supply configuration: USB or external:

High Speed isolated USB to UART (Rx/Tx):

Isolated digital I/O to use as high speed isolated UART (Rx/Tx), SPI etc:
7 bits I/O bus: configurable (CPLD) 0-3.3 [V]

Debugger, programming, reset:

SPI (Clock and MOSI):

External serial memories:
1. 256kb EEPROM (SPI)
2. 128Mb FLASH (SPI) (optional)
3. 2kb EEPROM (I2C) including MAC address

CPU: 16 bits fix-point, DSP, 70 MIPS
1. enhanced performances as single-Cycle MAC, MPY and Mixed-sign MUL,
2. Hardware divide and 32 bits Multiply support
3. High precision PWM (8.32 [ns] resolution)
4. 2 x 32-bits Quadrature Encoder Interface
5. 4 x high speed (15 [MHz]) SPI
6. Large DMA possibilities including separated RAM memory

4 x ADC: configurable as:
1. Internal DSP’s not isolated 10/12 bits (0-3.3[V])
2. External isolated 12 or 16 bits (250 kbps, 0-5[V])

CPLD: 256 Macrocells, 6000 gates

16 bits I/O bus: configurable (CPLD) 0-3.3 [V]

I2C bus:

5 x ADC: additional internal DSP’s not isolated 10/12 bits

1 x DAC: isolated serial 14 or 16 bits (0 – 5 [V])
CD control driver (block diagram)

J9 (Micro USB)

J1

J2
CD control driver (motion control applications)

- Enable and Emergency stop loops
- CAN bus including different protocols
- RS485 Modbus / hardware synchronization
- Boot loader

Firmware configuration

Command interpreter
Command execution
xx.parm
Integer and floating parameters

Initiation, configuration, communication, scheduler ...

USB/UART
CAN, SPI

Prompt
Command
Argument
Result
Number of error

GP02> [CR]
GP02> po21 [CR] IntRet=2 NErr=0
⇒ Command “po21” (PARAMETER_OUTPUT) => lecture of the Integer Parameter number 21
GP02> ff10 [CR] IntRet=0 NErr=1
⇒ not implemented command; one error is generated
GP02> el1 [CR] IntRet=26 NErr=1
⇒ first error lecture from list, Error number 1 is equal to 26
GP02> ec [CR] IntRet=0 NErr=0
⇒ Initialization of the list of errors (errors cancelation)

Communication protocol

3 phases driver

Isolator
Dig IO

Brushless /Stepper actuator

ADCin

Linear amplifier

DACout

Voice coil

- LVDT
- Resolver
- EtherCat
- High precision ADC
- Sensors …
SW development (Real Time and application)

**Real Time**
- Simulation model
- OneClick direct programming
- Application function call

**Application**
- User’s application
- Provided firmware including all necessary drivers and initialization procedures

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**Main features:**
1. Microchip’s development (MPLAB), compiler (XC16), JTAG and boot loader programming tools
2. Large application libraries and demos
3. Windows and Linux platforms
4. Possibility of the Ethernet and e-Cloud configurations.

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**Scope**
USB/UART/RS485/422 monitoring based on the Hardware In the Loop technology

**Scope**
HMI, CD etc..
**SW development** (Hardware in the Loop applied to identify and control Flex mechanism)

- **Flex mechanic (very low friction and stickiness)**
- **Position sensor**
- **Linear actuator**
- **Actuator (k<sub>i</sub>)**
- **m**

Simulated on the DSP and measured by DSP position comparison (free oscillation)

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**Parameter adjustment**

- Flex mechanic (very low friction and stickiness)
- Position sensor
- Linear actuator
- Actuator (k<sub>i</sub>)
- m

Simulated on the DSP and measured by DSP position comparison (free oscillation)
SW development (Brushless motor control, Microchip’s example)