NXP i.MX RT series solution

ARROW AE 白松

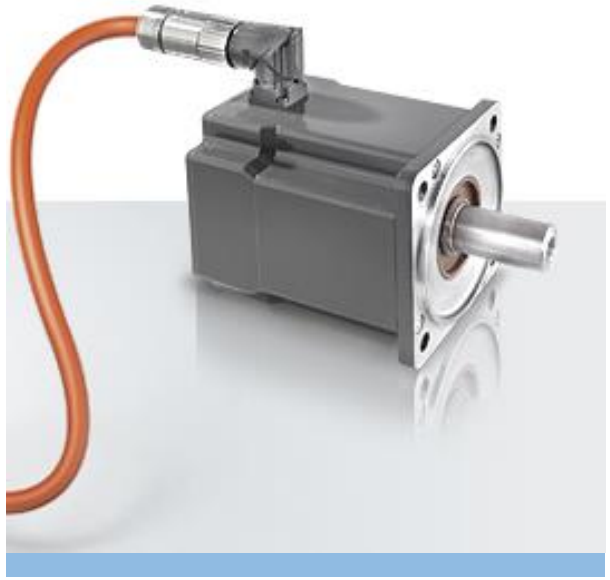
ARROW

Five Years Out

Contents

Applications

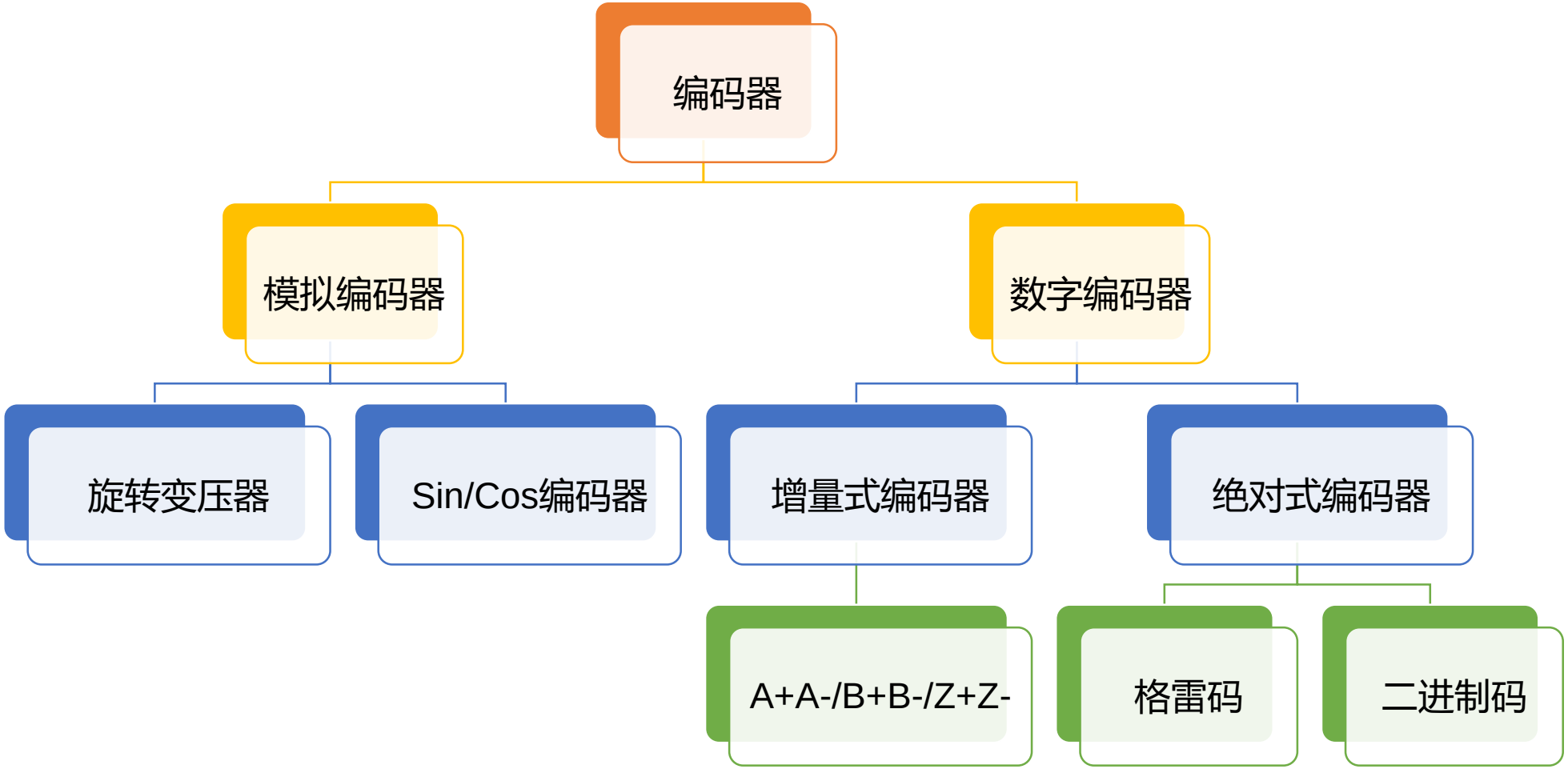
Motor control



Industry Automation

EtherCAT

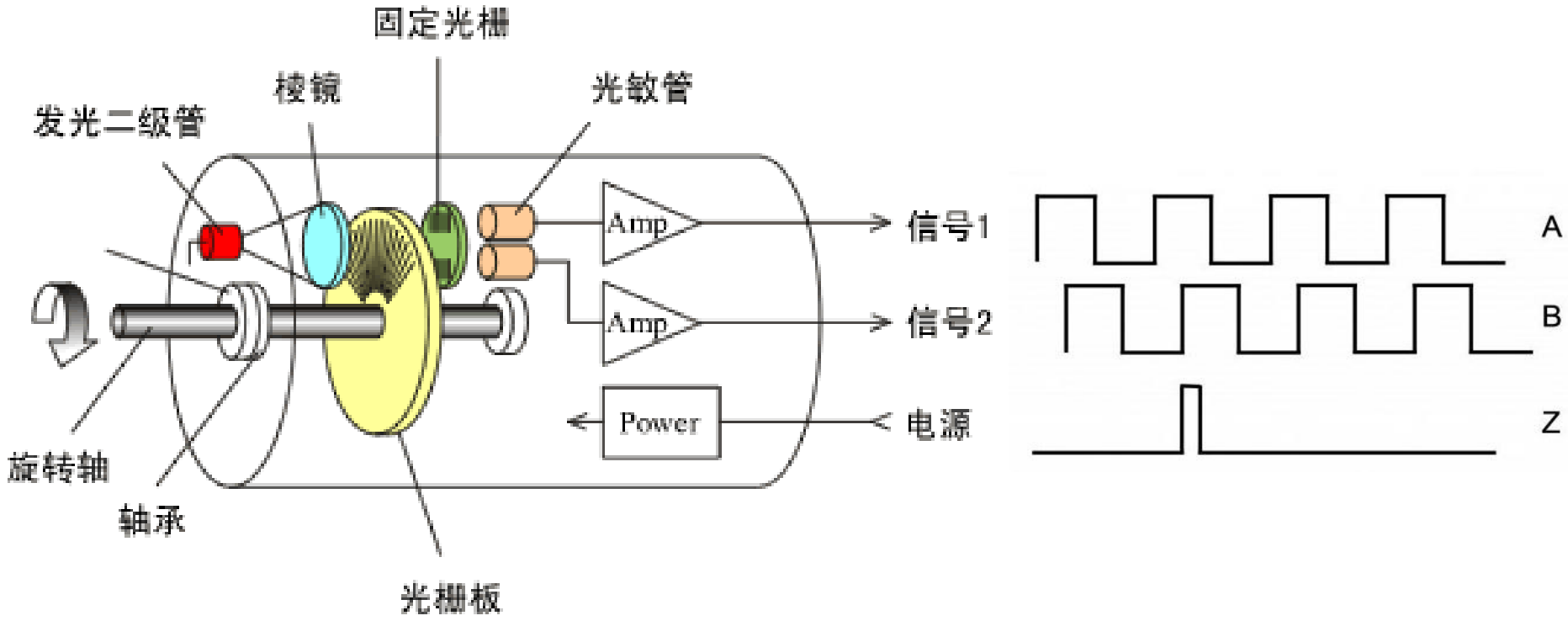
Encoder


编码器
模拟编码器
数字编码器
旋转变压器
Sin/Cos编码器
增量式编码器
绝对式编码器
A+A-/B+B-/Z+Z-
格雷码
二进制码

Encoder & i.MX RT peripheral

■增量式编码器（无通讯协议）

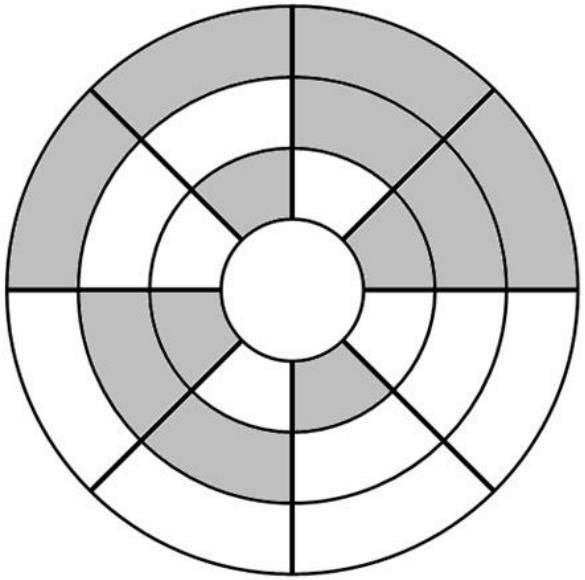
◆2500线（10000个脉冲信号）



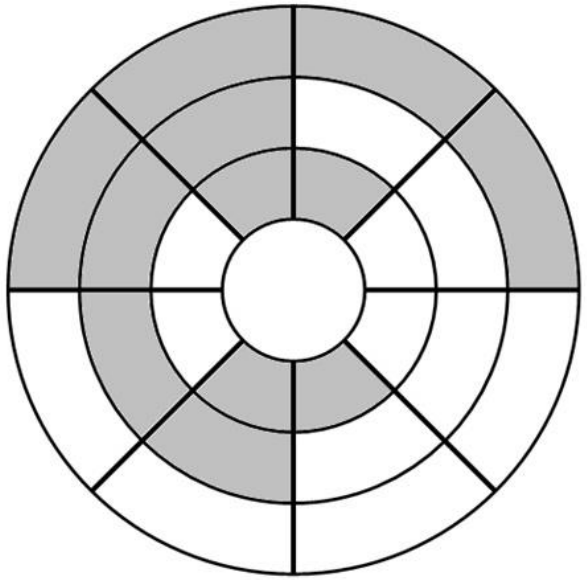
Encoder & i.MX RT peripheral

■绝对式编码器（有通讯协议）

- ◆SSI
- ◆EnDAT
- ◆BISS
- ◆多摩川



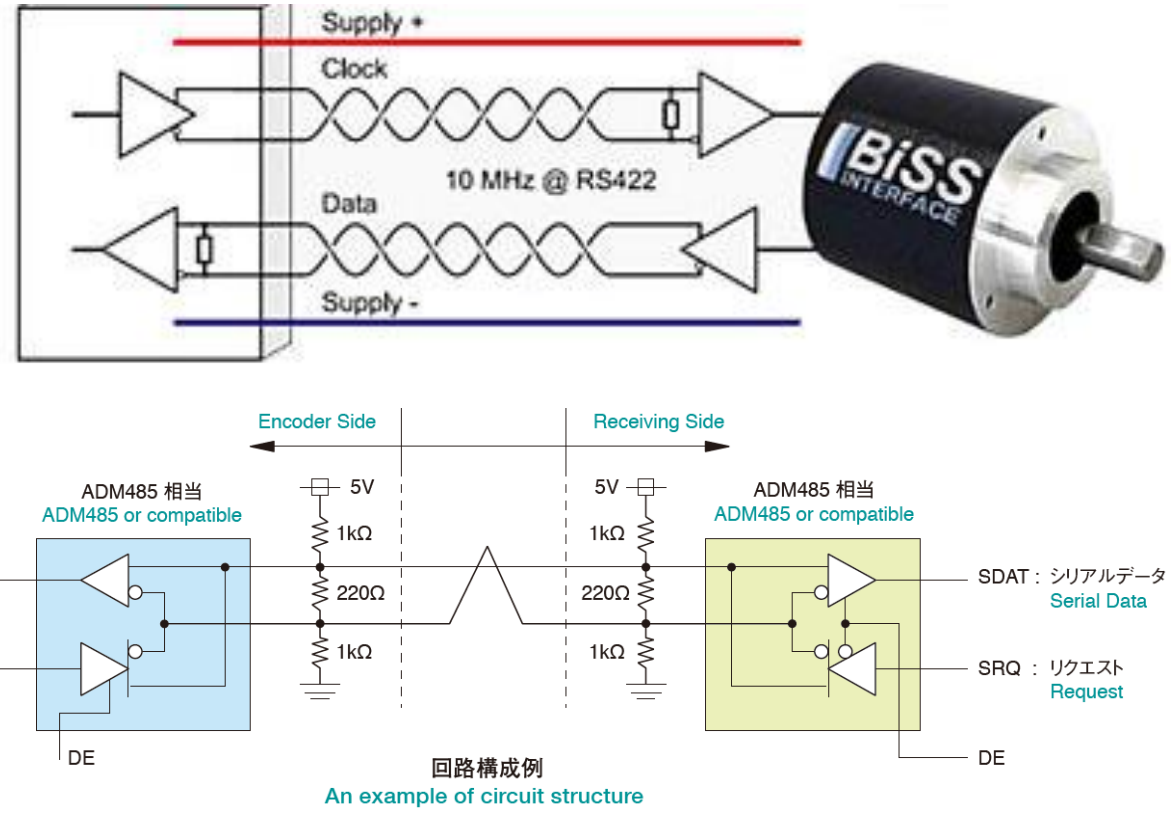
格雷码

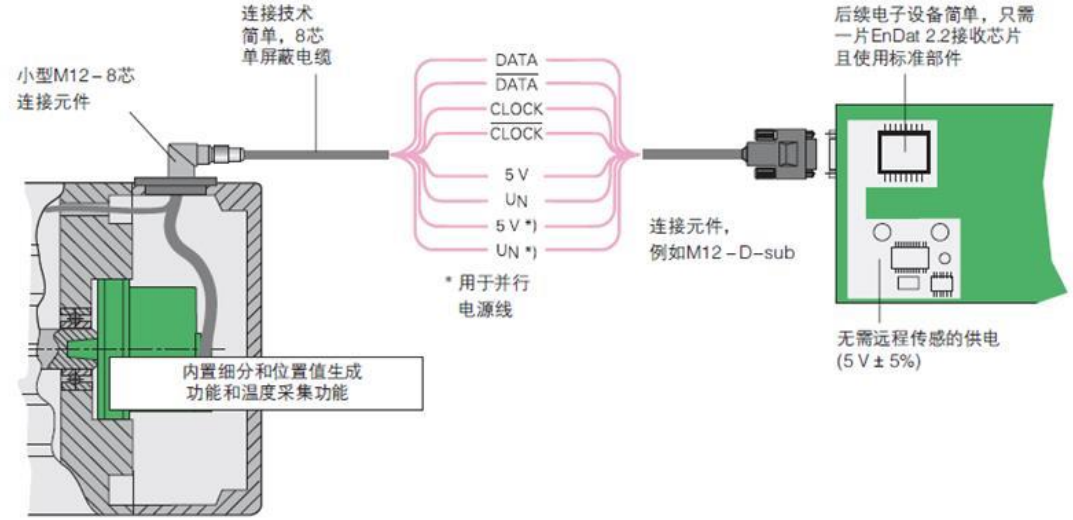


二进制码

Encoder & i.MX RT peripheral

■绝对式编码器（有通讯协议）





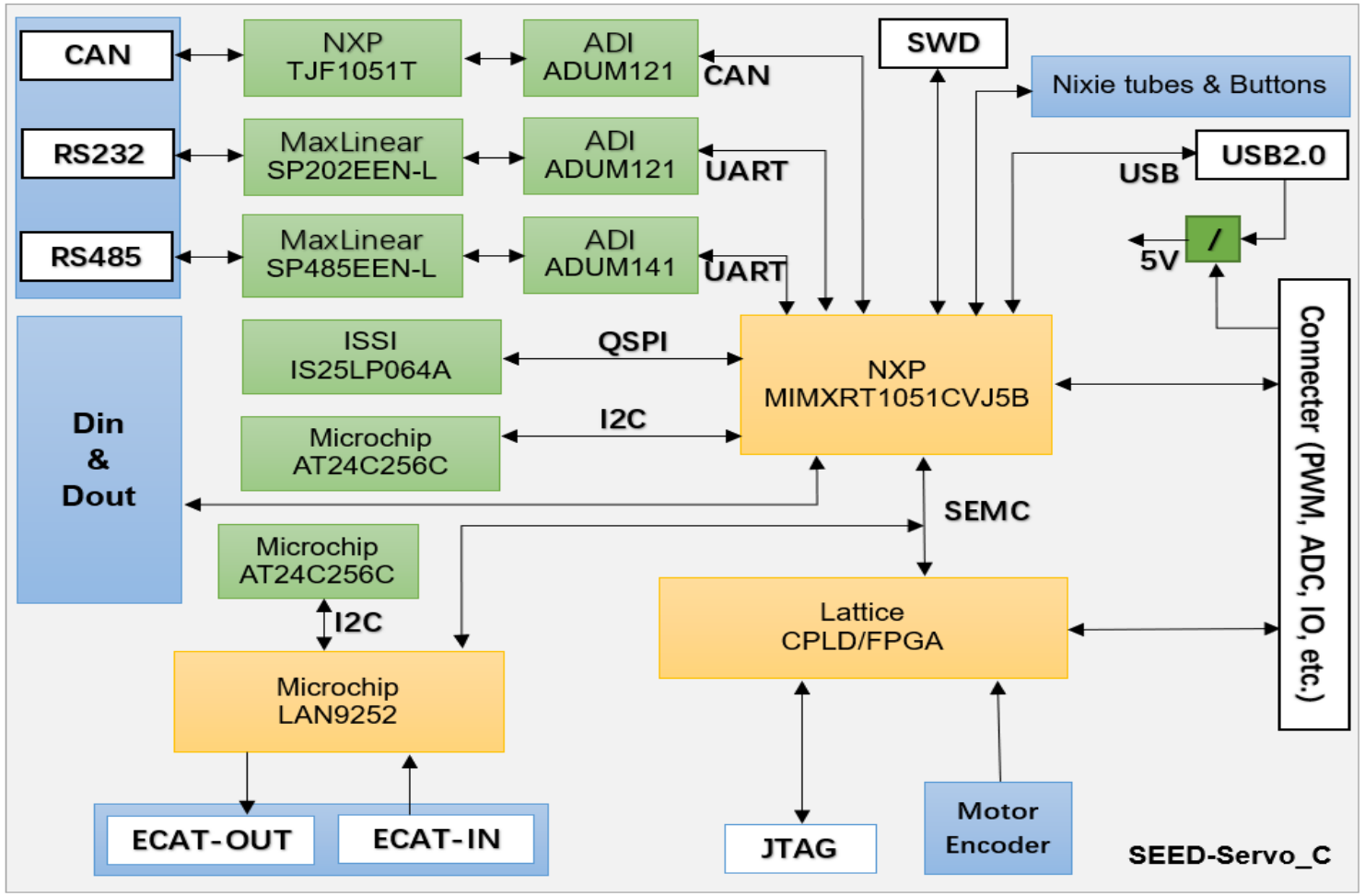
Encoder & i.MX RT peripheral

- 增量式编码器
  - ENC（**Quadrature Encoder/Decoder**）
- 绝对式编码器
  - SEMC（**Smart External Memory Controller**） + CPLD

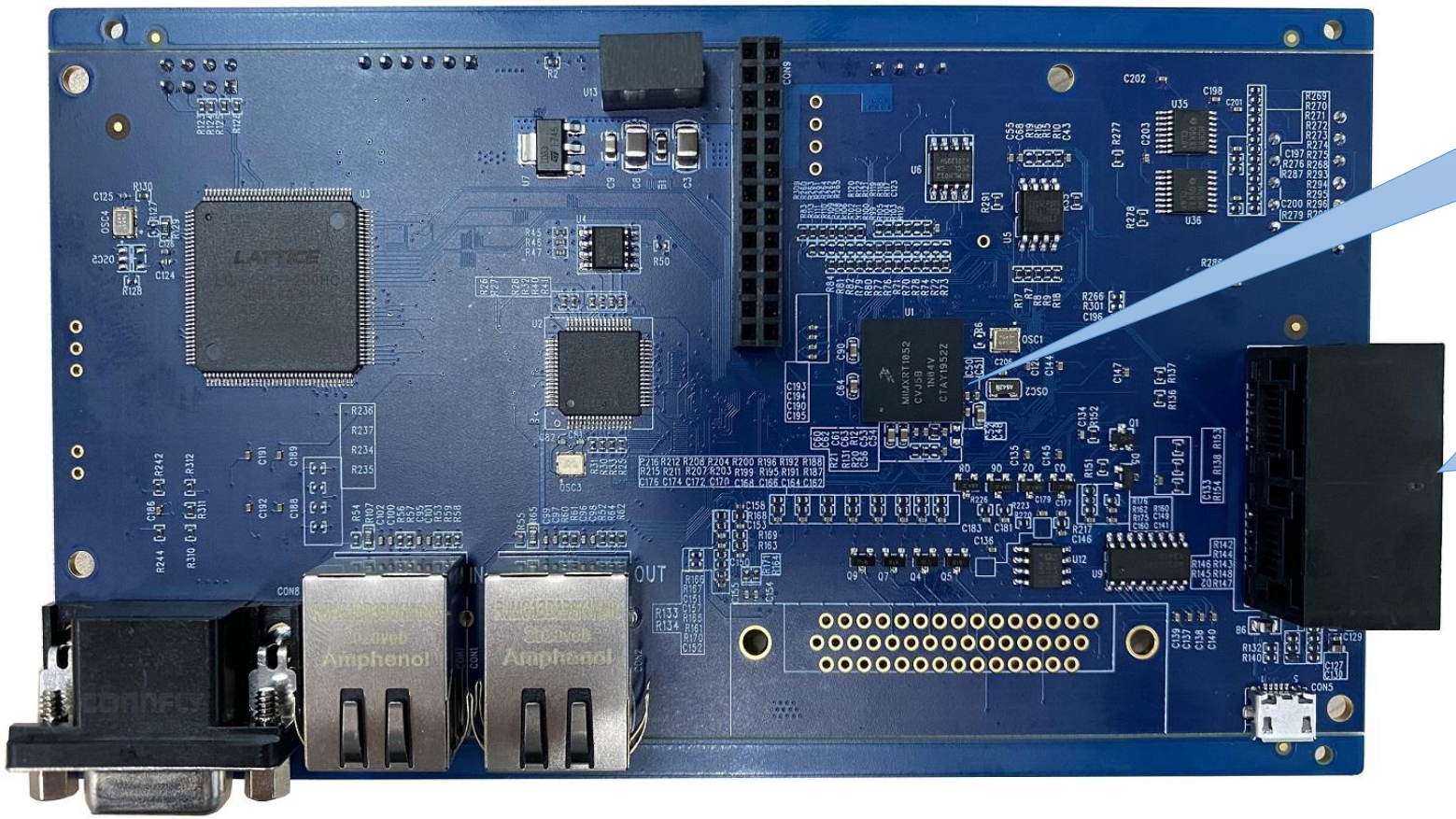
i.MX RT

Key Features										
Product	CPU	Package	Memory	Graphics Acceleration	Display Interfaces	Camera Interfaces	Audio	USB with PHY	Ethernet	CAN
i.MX RT1170	Cortex-M7 @1 GHz + Cortex-M4 @400 MHz	289 BGA	2MB SRAM	2D GPU, PxP	Parallel, MIPI	Parallel, MIPI	4x I2S, SPDIF, DMIC	2	2x Gbps, 1x10/100	3x CANFD
i.MX RT1064	Cortex-M7 @600 MHz	196 BGA	1 MB SRAM, 4MB Flash	PxP	Parallel	Parallel	3x I2S, SPDIF	2	2x 10/100	2x FlexCAN, 1x CANFD
i.MX RT1060	Cortex-M7 @600 MHz	196 BGA	1 MB SRAM	PxP	Parallel	Parallel	3x I2S, SPDIF	2	2x 10/100	2x FlexCAN, 1x CANFD
i.MX RT1050	Cortex-M7 @600 MHz	196 BGA	512 kB SRAM	PxP	Parallel	Parallel	3x I2S, SPDIF	2	1x 10/100	2x FlexCAN
i.MX RT1020	Cortex-M7 @500 MHz	100 LQFP, 144 LQFP	256 kB SRAM	-	-	-	3x I2S, SPDIF	1	1x 10/100	2x FlexCAN
i.MX RT1015	Cortex-M7 @500 MHz	100 LQFP	128 kB SRAM	-	-	-	3x I2S, SPDIF	1	-	-
i.MX RT1010	Cortex-M7 @500 MHz	80 LQFP	128 kB SRAM	-	-	-	2x I2S, SPDIF	1	-	-
i.MX RT600	Cortex-M33 @300 MHz + Cadence® Tensilica® HiFi 4 @600 MHz	176 BGA, 249 FOWLP, 114 CSP	4.5 MB SRAM	-	-	-	8 x I2S 8-ch DMIC	1	-	-
i.MX RT500	Cortex-M33 @200 MHz + Cadence® Tensilica® Fusion F1 @200 MHz	249 FOWLP	5 MB SRAM	2D GPU	Parallel, MIPI	Parallel	12 x I2S 8-ch DMIC	1	-	-

SEED-Servo_AEncoder block diagram



SEED-Servo_AEncoder



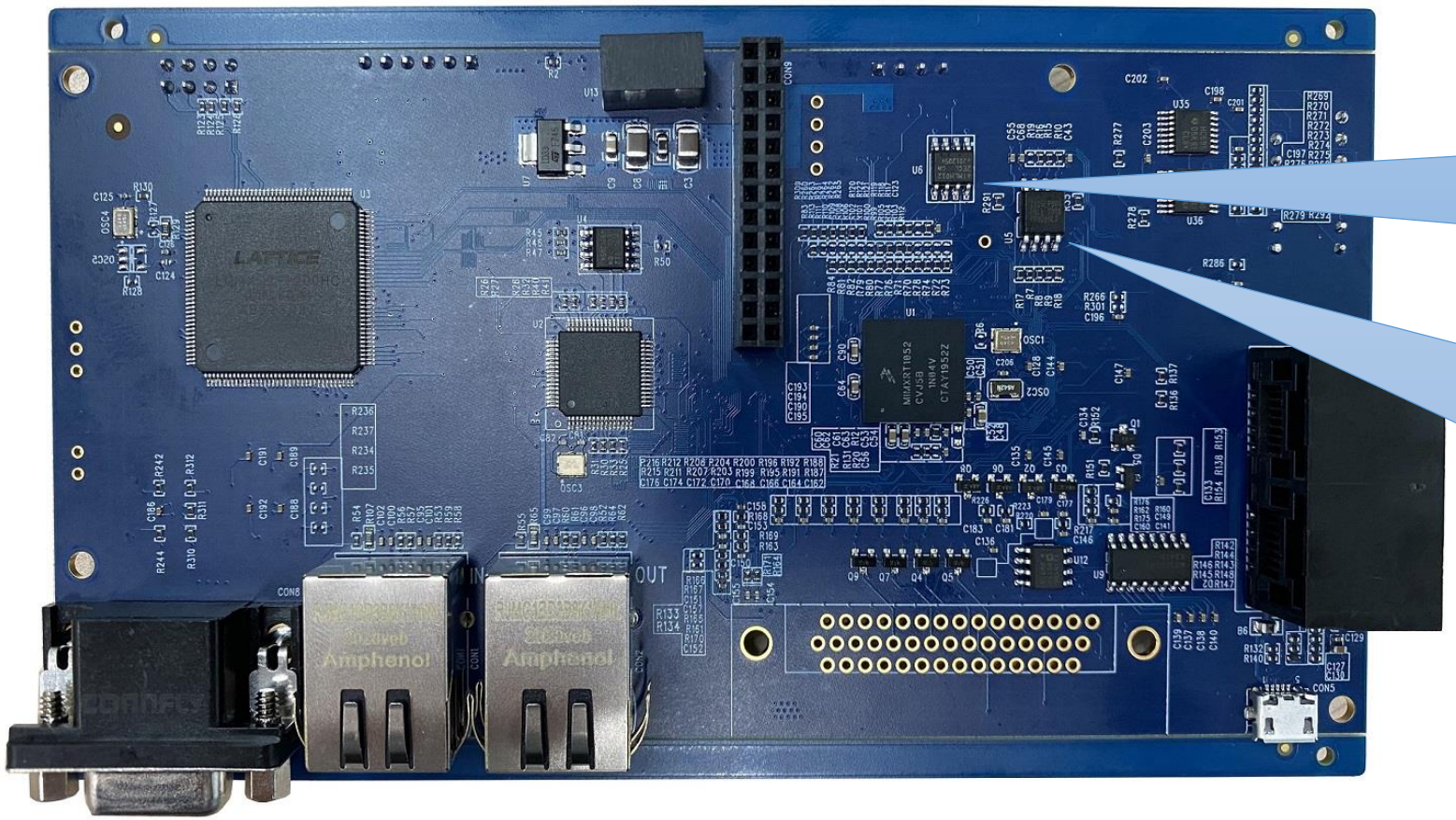
Microcontroller(U1)

i.MX RT 1052

Communication interface(CON6)

CON6 is connected to i.MX RT1052 used for CAN/RS232/ RS485 bus.

SEED-Servo_AEncoder



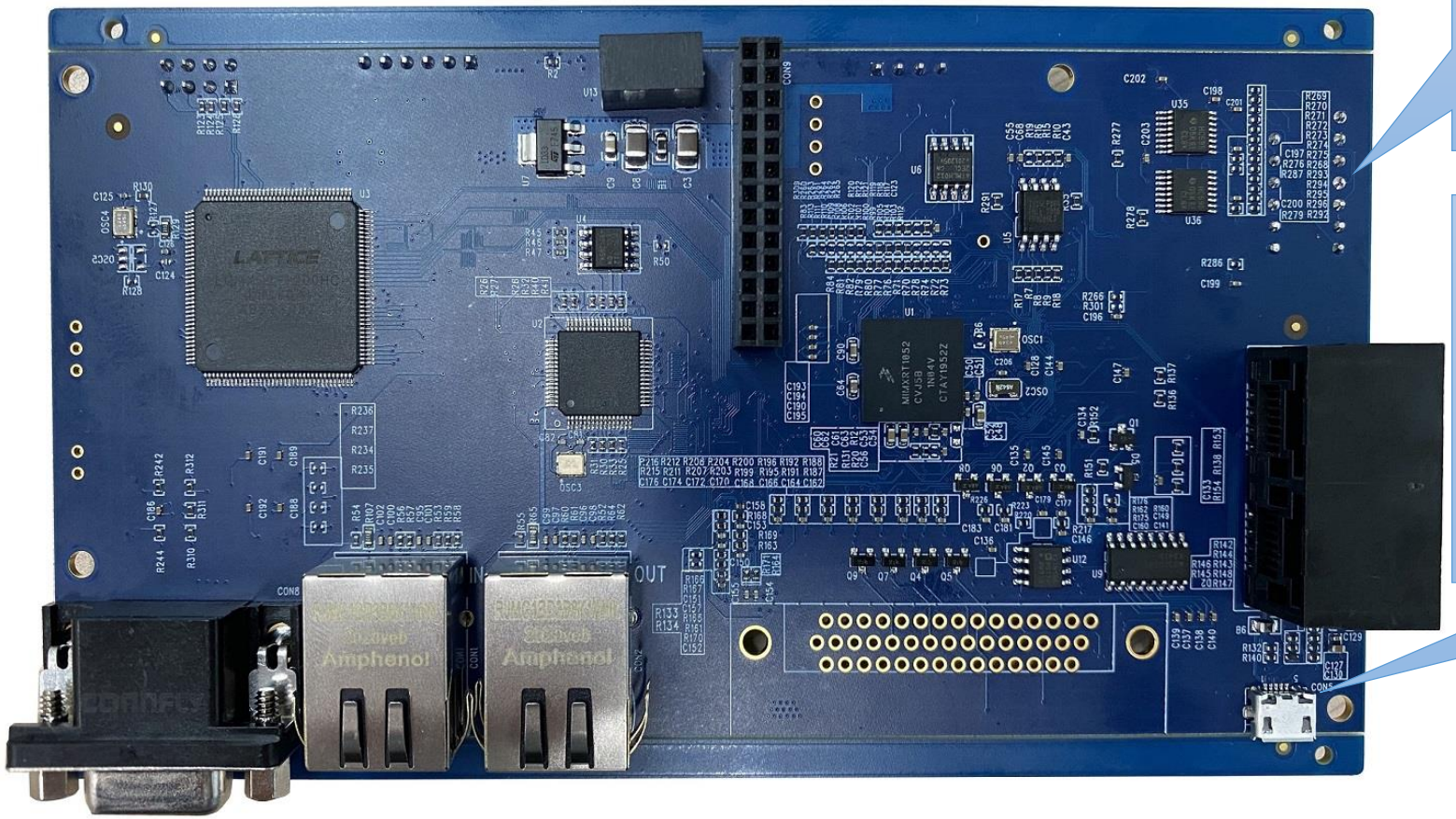
EEPROM(U6)

U6 is connected to i.MX RT1052 by I2C. Used to store drive parameters.

SPI NorFLASH(U5)

U5 is connected to i.MX RT1052 by FlexSPI, supports Execute-In-Place (XIP),. Used to store program code.

SEED-Servo_AEncoder



Nixie tube & Button(backside)

Used to display and control.

Micro USB 2.0 (CON5)

CON5 as a micro USB 2.0 interface， is connected to i.MX RT1052 which can be used as a audio/hid/cdc/msc.. device..

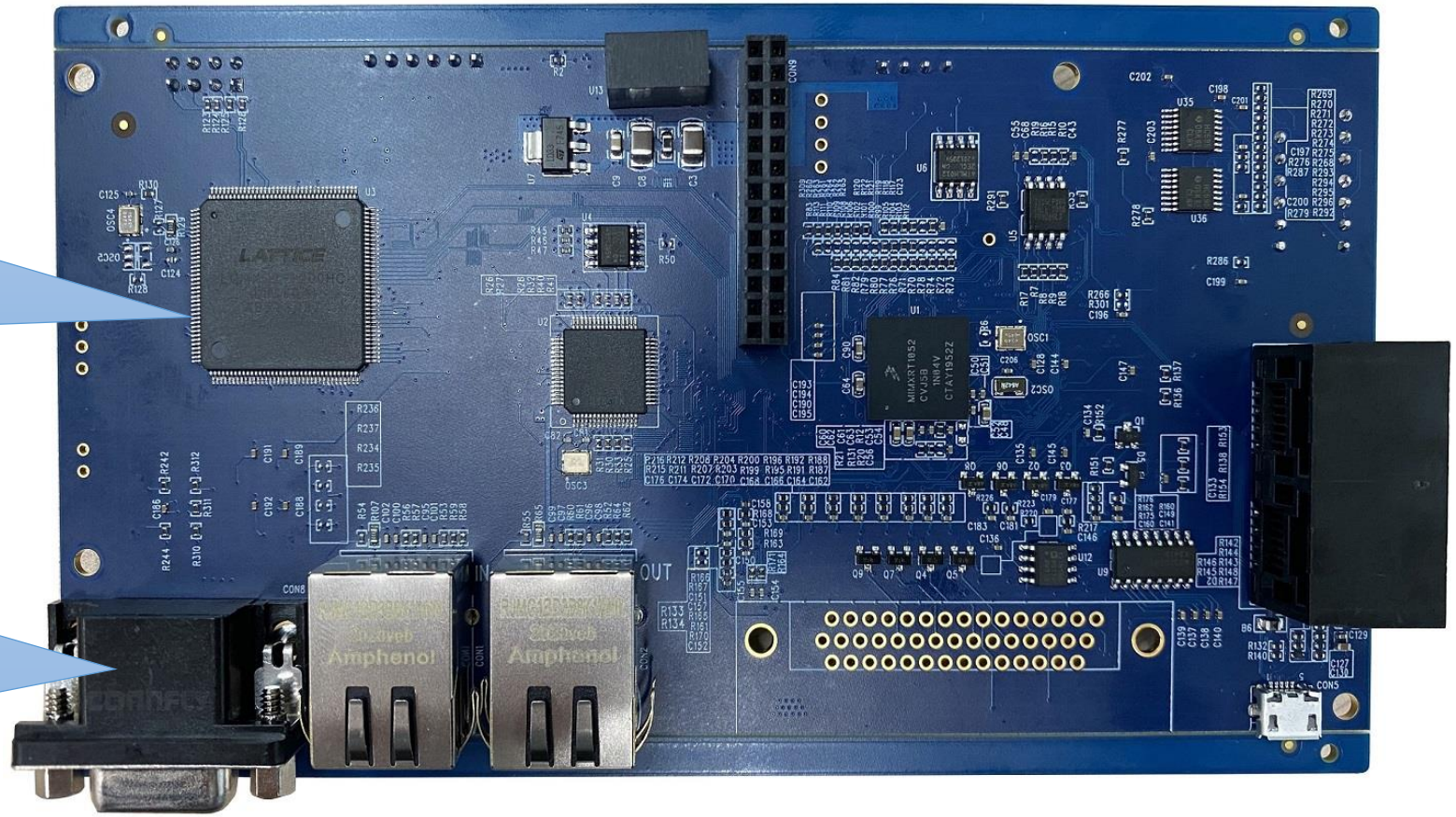
SEED-Servo_AEncoder

CPLD(U3)

U3 is a CPLD，which is used for real-time communications with encoders.

Encoder interface(CON8)

CON8 is a 2.54mm 5x3 Pin encoder connector，which is used for communication with encoder .



SEED-Servo_AEncoder

LAN9252 (U2)

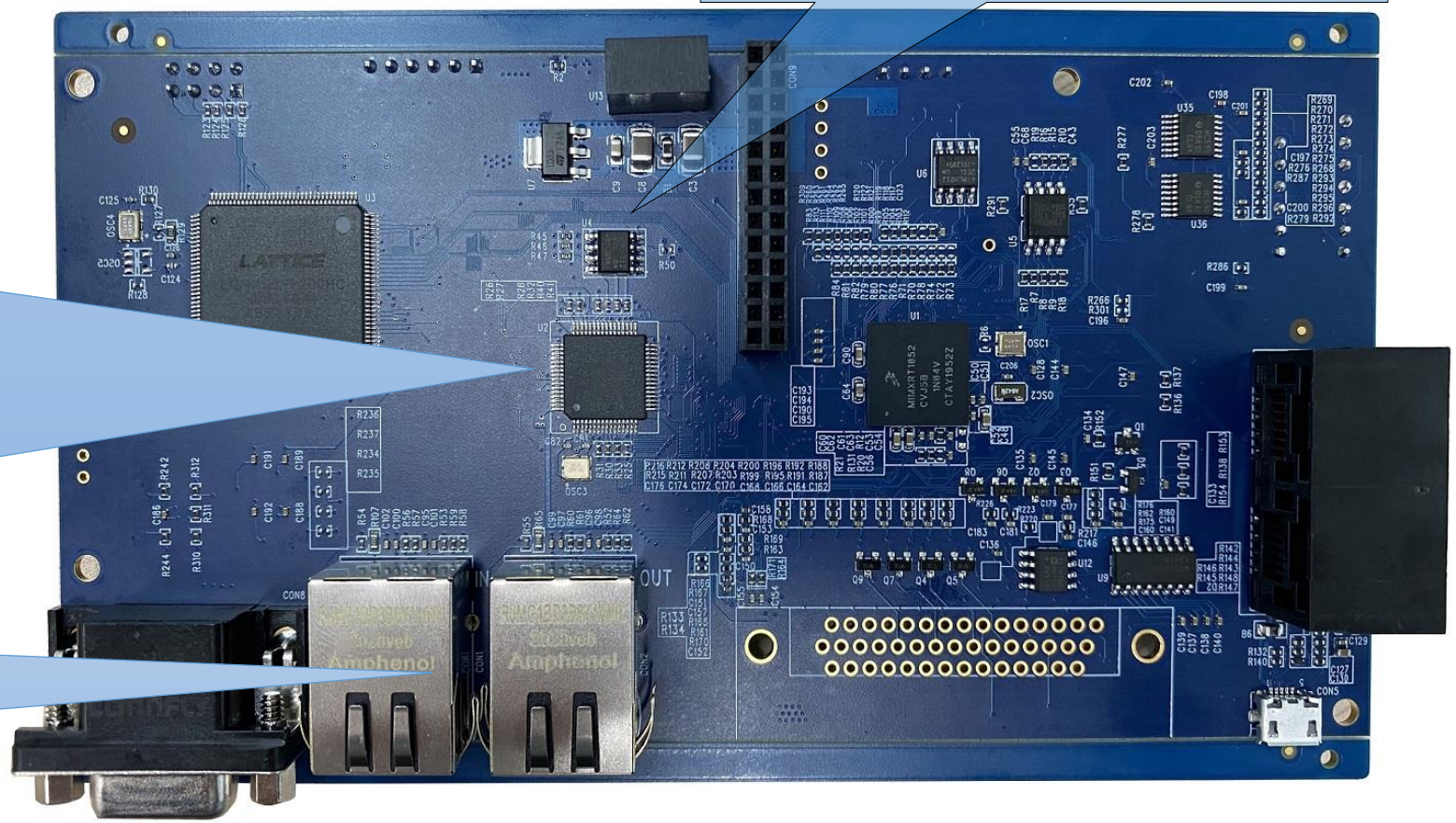
It’s a 2/3-port EtherCAT slave controller with dual integrated Ethernet PHYs which each contain a fullduplex 100BASE-TX transceiver and support 100Mbps (100BASE-TX) operation. It‘s connected to i.MX RT1052 by SEMC.

RJ45 (CON1、CON2)

100 BASE-T MAGJACK CON1 and CON2 is used for the EtherCAT，CON1 for IN and CON2 for OUT.

EEPROM (U4)

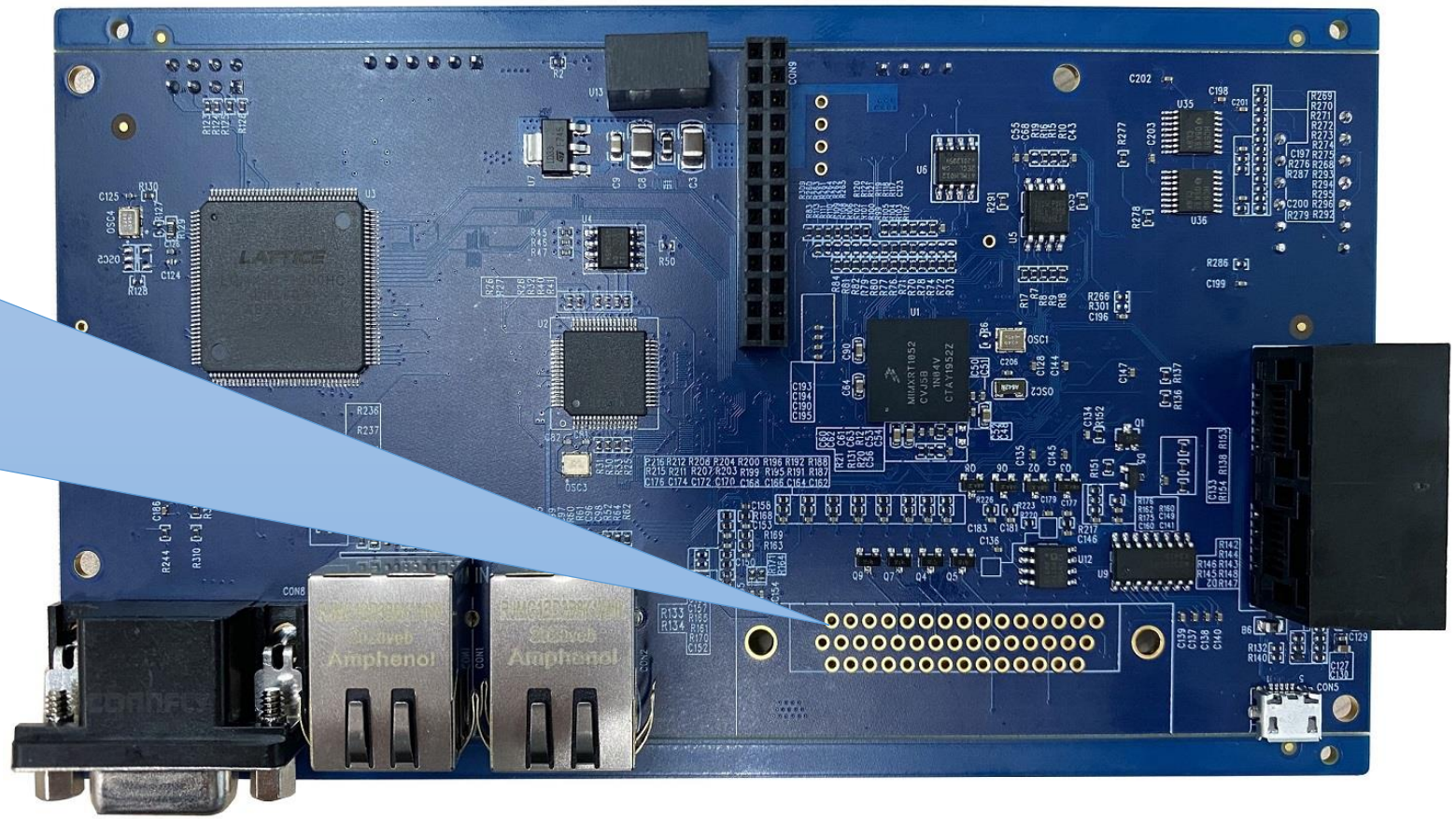
U4 is connected to LAN9252 by I2C，which is used to store the ESI data .



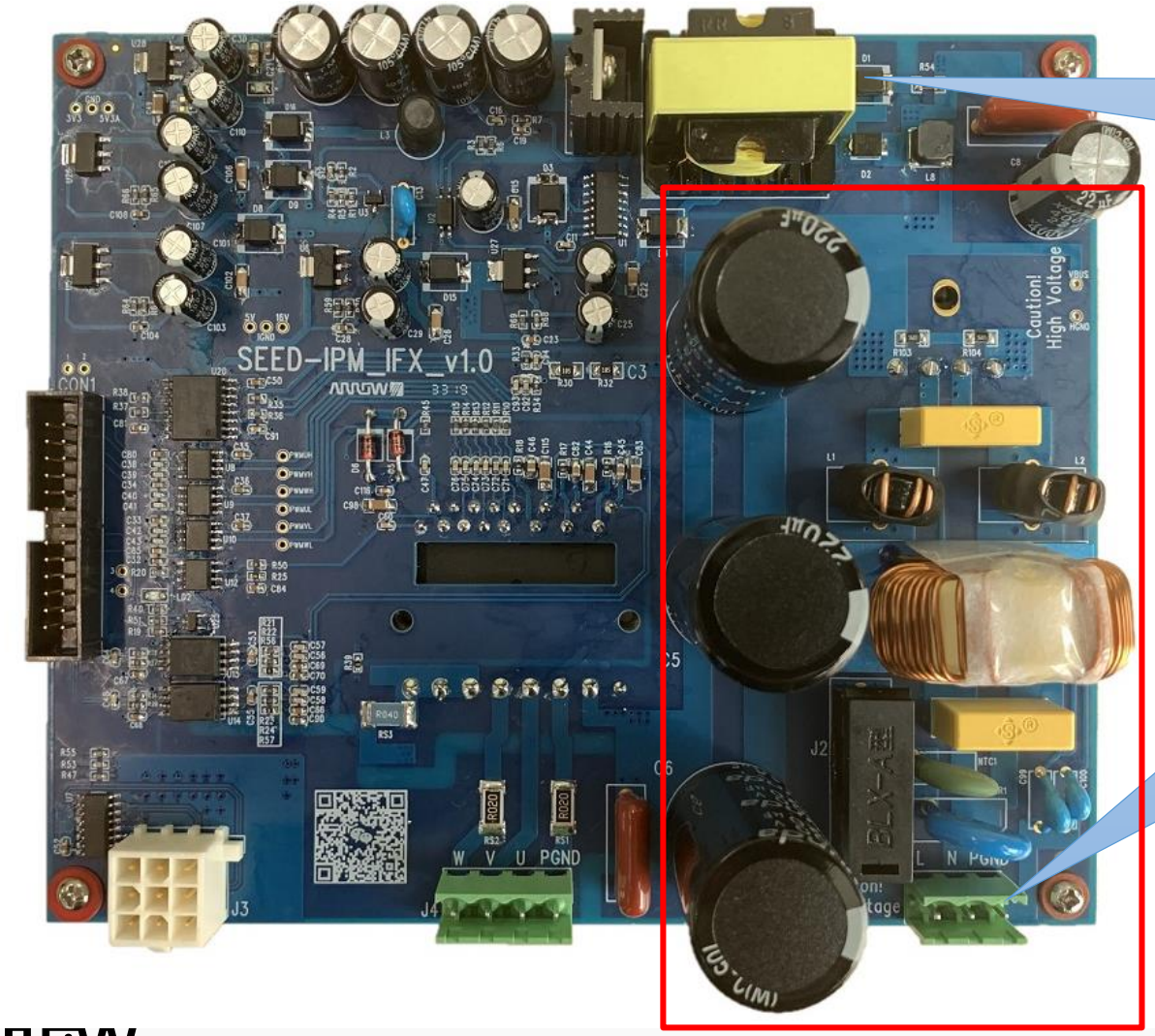
SEED-Servo_AEncoder

In/Out Interface

- 脉冲指令
- 模拟量指令
- 方向指令
- 8路数字量输入
- 4路数字量输出



SEED-IPM_IFX core



DC~DC transformer

Provide high voltage to low voltage.

AC~DC

Input:100 ~ 240V/50Hz (Requirements to the working voltage of the motor).

Support bus current up to 6A.

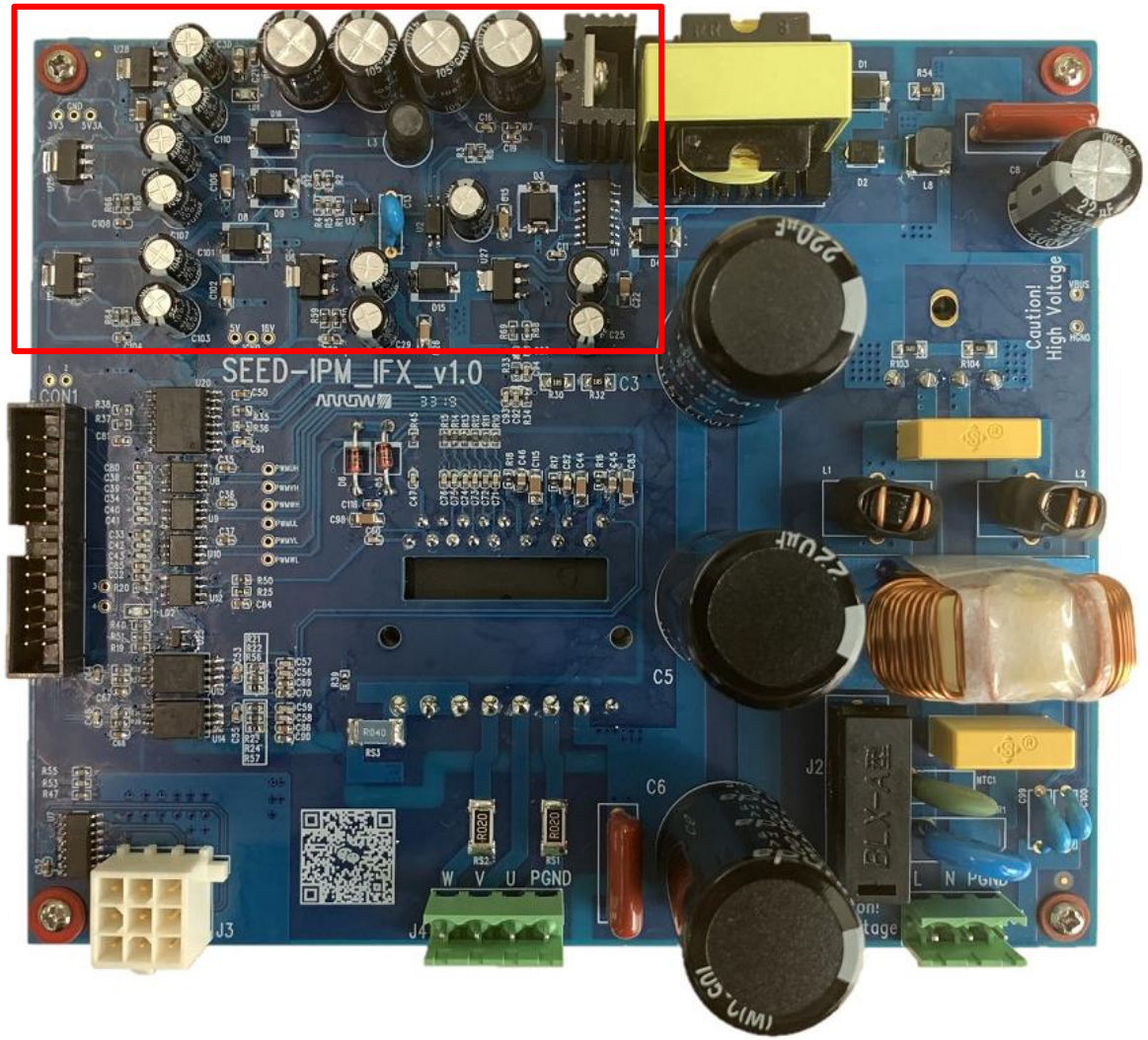
SEED-IPM_IFX component illustration

DC supply

Provide a variety of voltage specifications.
+5V/+3.3V/+16V

Motor control (CON1)

CON1 is a 2.54mm 13x2 Pin Connector used for motor control. User should connect SEED-IPM_IFX board to this connector. it contains PWM, DSD, IO and ADC multiple signals and power source.



SEED-IPM_IFX component illustration

Reinforced Isolated

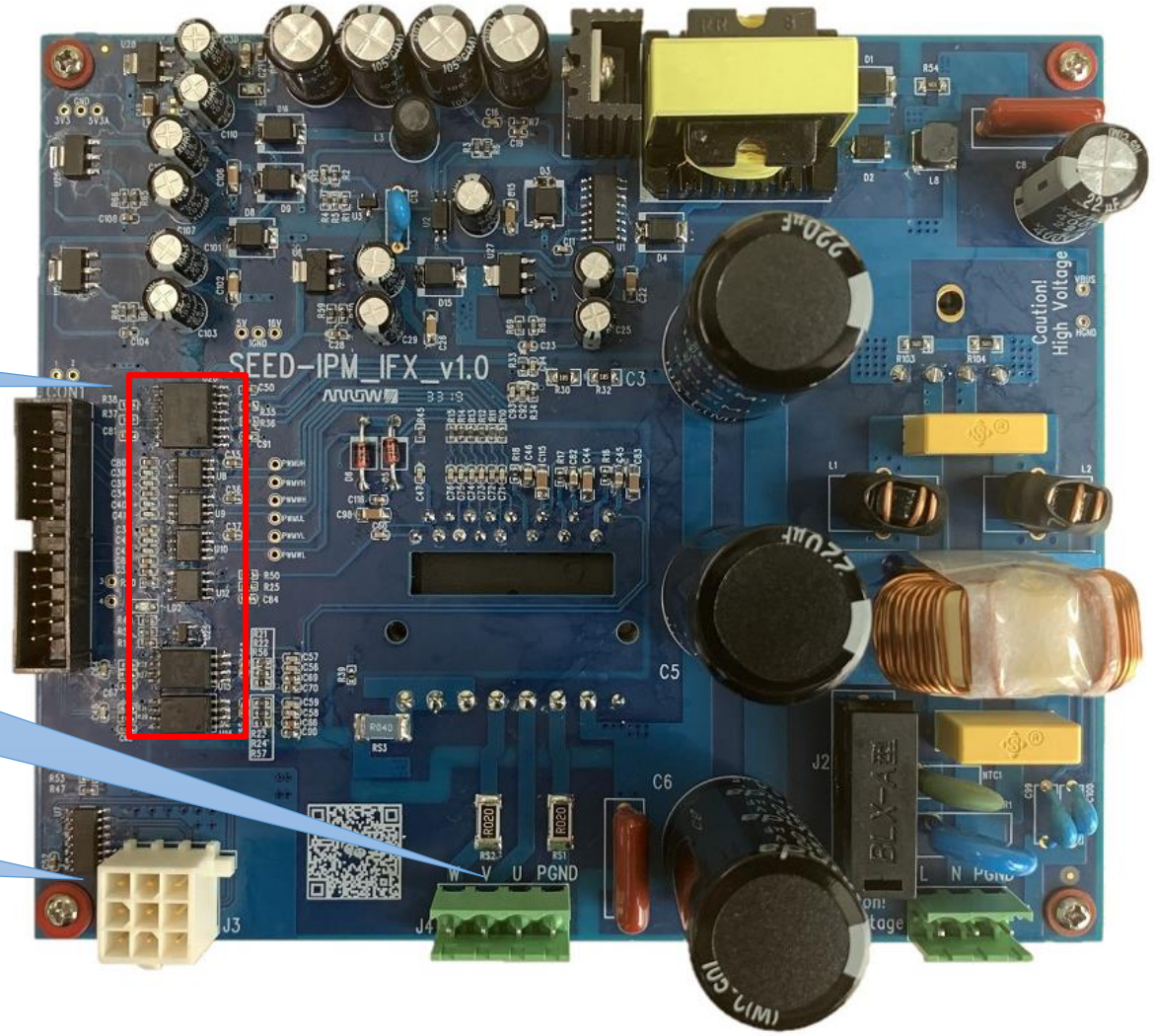
They provide reinforced isolation.

Motor Power (J4)

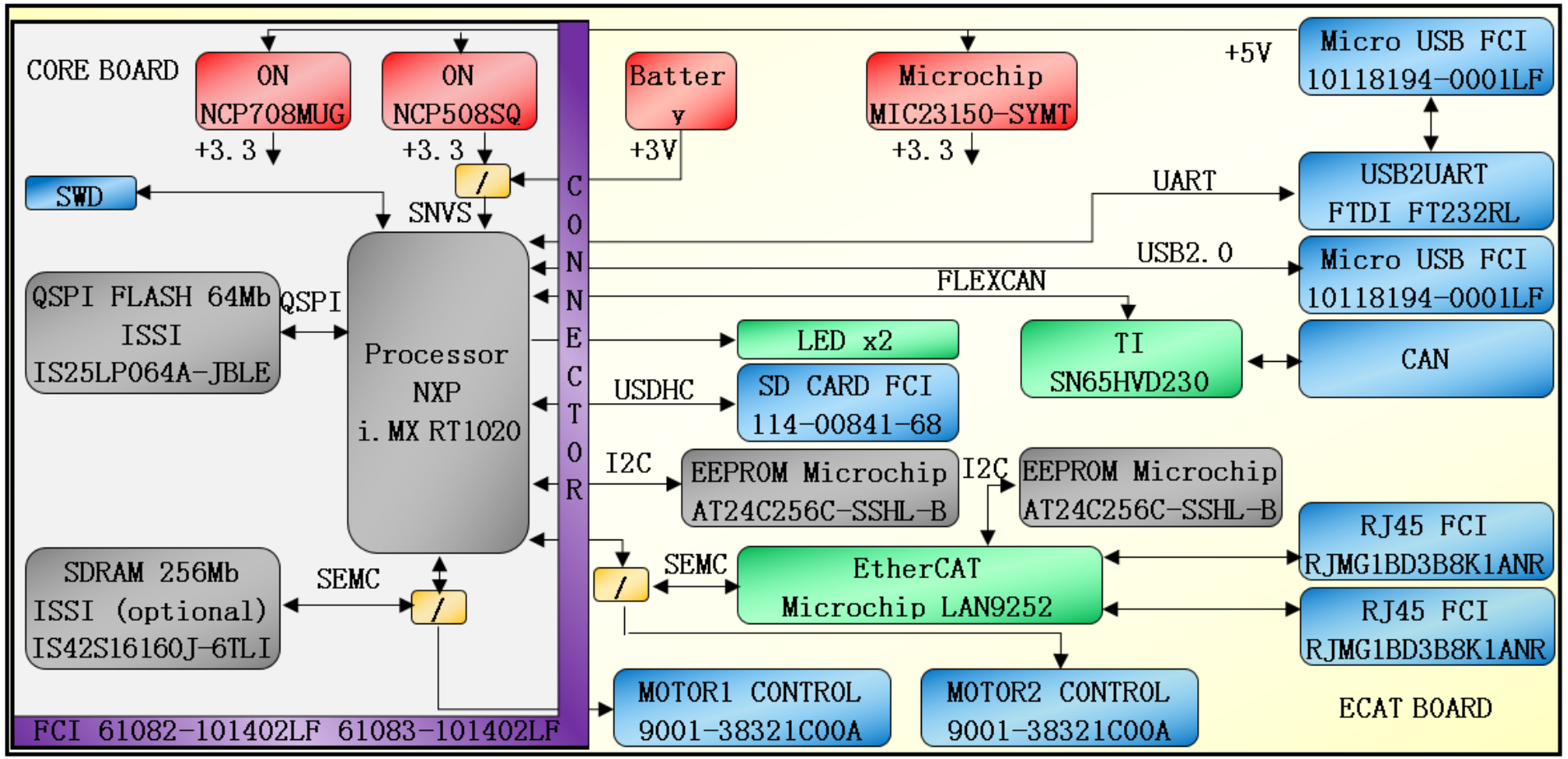
J4 is used for motor power. User should connect the power cable PMSM motor to this connector.

Motor Power (J3)

J4 is used for motor encoder. User should connect the encoder cable of PMSM motor to this connector.



SEED-DBS1020 Block diagram



SEED-DBS1020_CORE component illustration

i.MX1020(U1)

Button(SW1)

Button SW1 is used to request main SoC power state changes. Once the button is pressed longer than the configuration time, the state machine will transition from the OFF to the ON state.

JTAG interface(CON3)

CON3 is a 2.54mm 4x1 Pin，which is used for JTAG debug by JLINK. It is important to notice that user should config the JLINK to SWD mode.

Power LED(LED1、LED2)

It means that board's power is OK when LED1 and LED2 light up. When LED1 lights up，LED2 lights off, it means that chip is in the dumb mode.

NOR FLASH(U5)

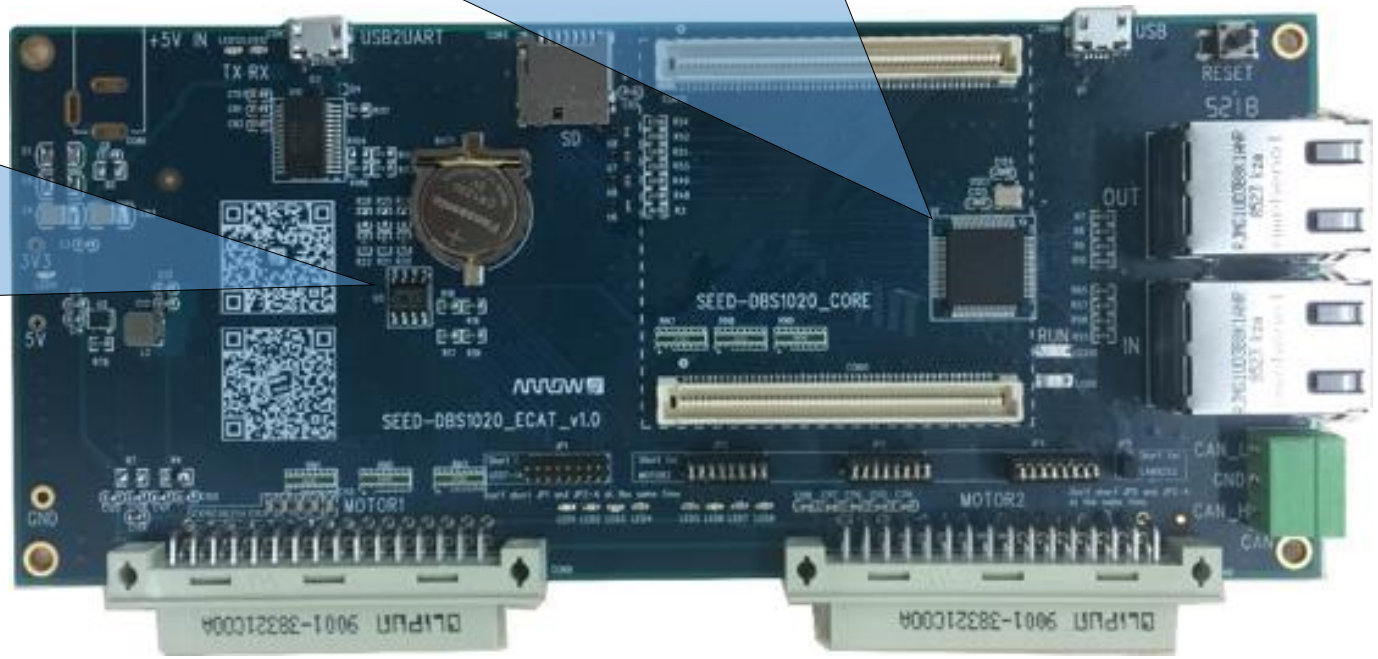
SEED-DBS1020_ECAT component illustration

LAN9252 (U1)

The LAN9252 is a 2/3-port EtherCAT slave controller with dual integrated Ethernet PHYs which each contain a fullduplex 100BASE-TX transceiver and support 100Mbps (100BASE-TX) operation. It is connected to i.MX RT1020 by host buf interface.

EEPROM (U3)

EEPROM U3 is connected to LAN9252 by I2C， which is used to store the configuration data , according which the LAN9252 is configured. EEPROM can be write by the EtherCAT master station.



SEED-DBS1020_ECAT component illustration

Micro USB 2.0 (CON2)
CON2 is a micro USB 2.0 interface， which is bridged to a UART of i.MX RT1020 by FT232. User need a FT232 driver in the PC to use this port by the COM debug assistant. Meanwhile ,this port is used for power supply.

Micro USB 2.0(CON4)
CON4 as a micro USB 2.0 interface， is connected to i.MX RT1020 which can be used as a USB slave device.

Default UART configuration	
BaudRate	115200
DataBits	8
Parity	None
stop	1

SEED-DBS1020_ECAT component illustration

Micro SD socket(CON3)
User can insert their own SD card into this socket.

EEPROM(U4)(backside)
U4 is connected to i.MX RT1020 by I2C

button(SW1)
SW1 is used to reset the kit except the VDD_SNVS_IN

Power socket(CON1)
CON1 is used as power socket but not mounted by default. If given users want to use this socket ,they should mount it and move the bead from position B3 to B2

SEED-DBS1020_ECAT component illustration

Battery socket(BAT1)
This battery supply power to the pin VDD_SNVS_IN of i.MX RT 1020.It enables i.MX RT 1020 enter into low power mode when external power is off。

RJ45 (CON5、CON6)
100 BASE-T MAGJACK CON5 and CON6 is used for the EtherCAT， CON6 for IN and CON5 for OUT.

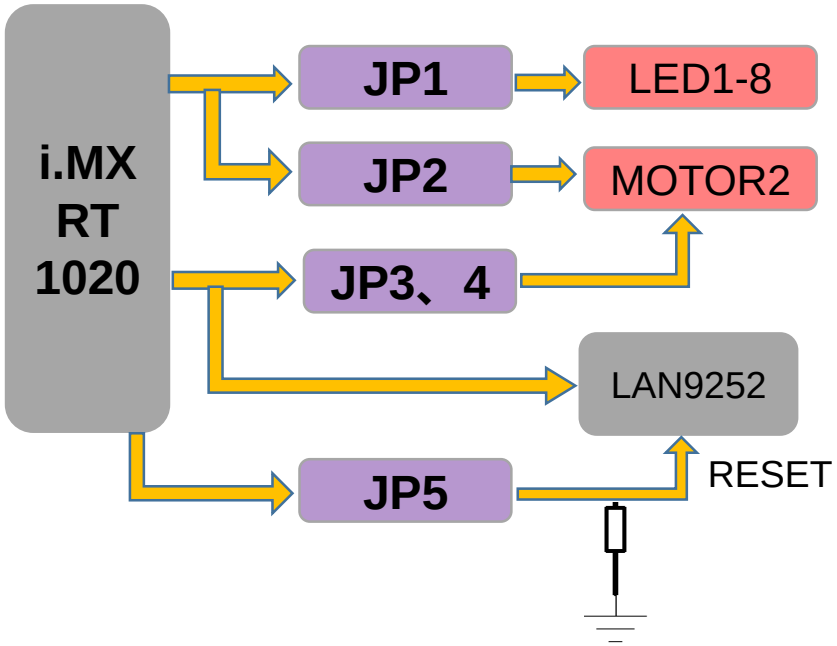
CAN(CON7)
CON7 is connected to i.MX RT1020 by SN65HVD230D used for CAN bus

Motor control (CON8、CON9)
CON8 and CON9 is used for motor control. User should connect NXP MAPS board to this two connector.

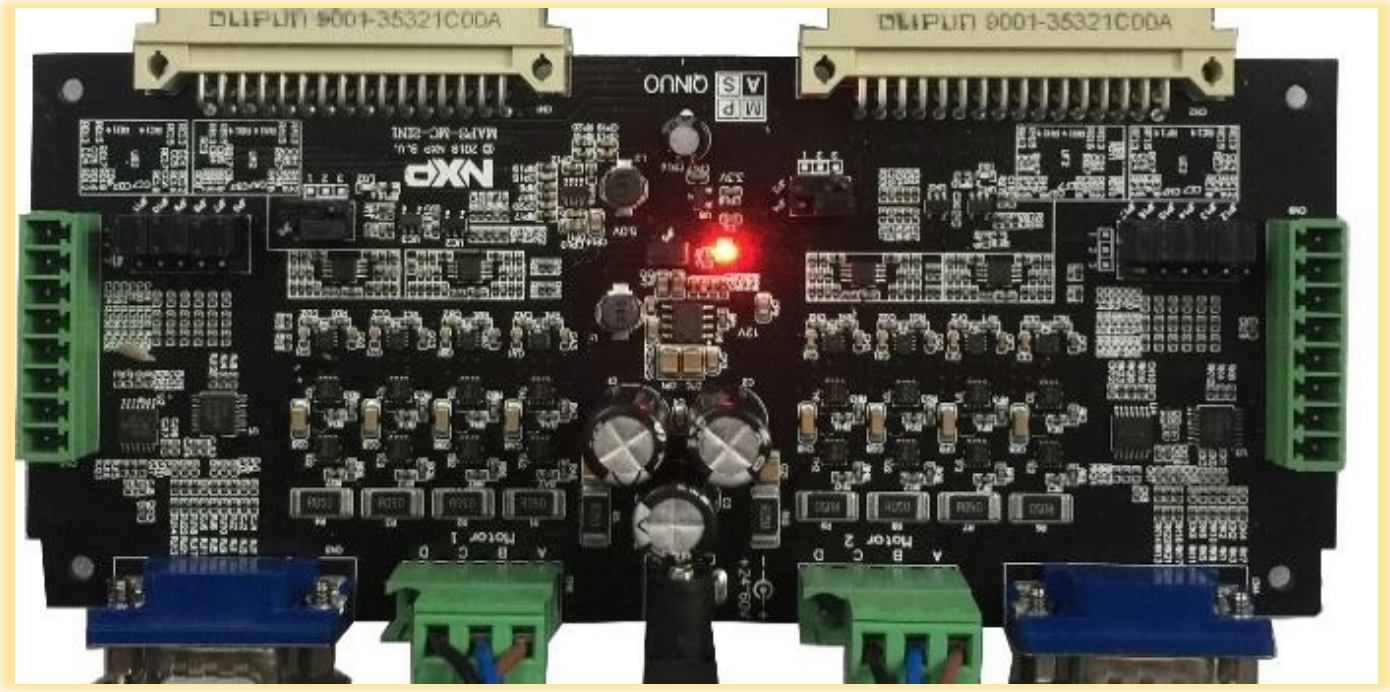
SEED-DBS1020_ECAT component illustration

Jumper(JP1-JP5)
Used for board mode select

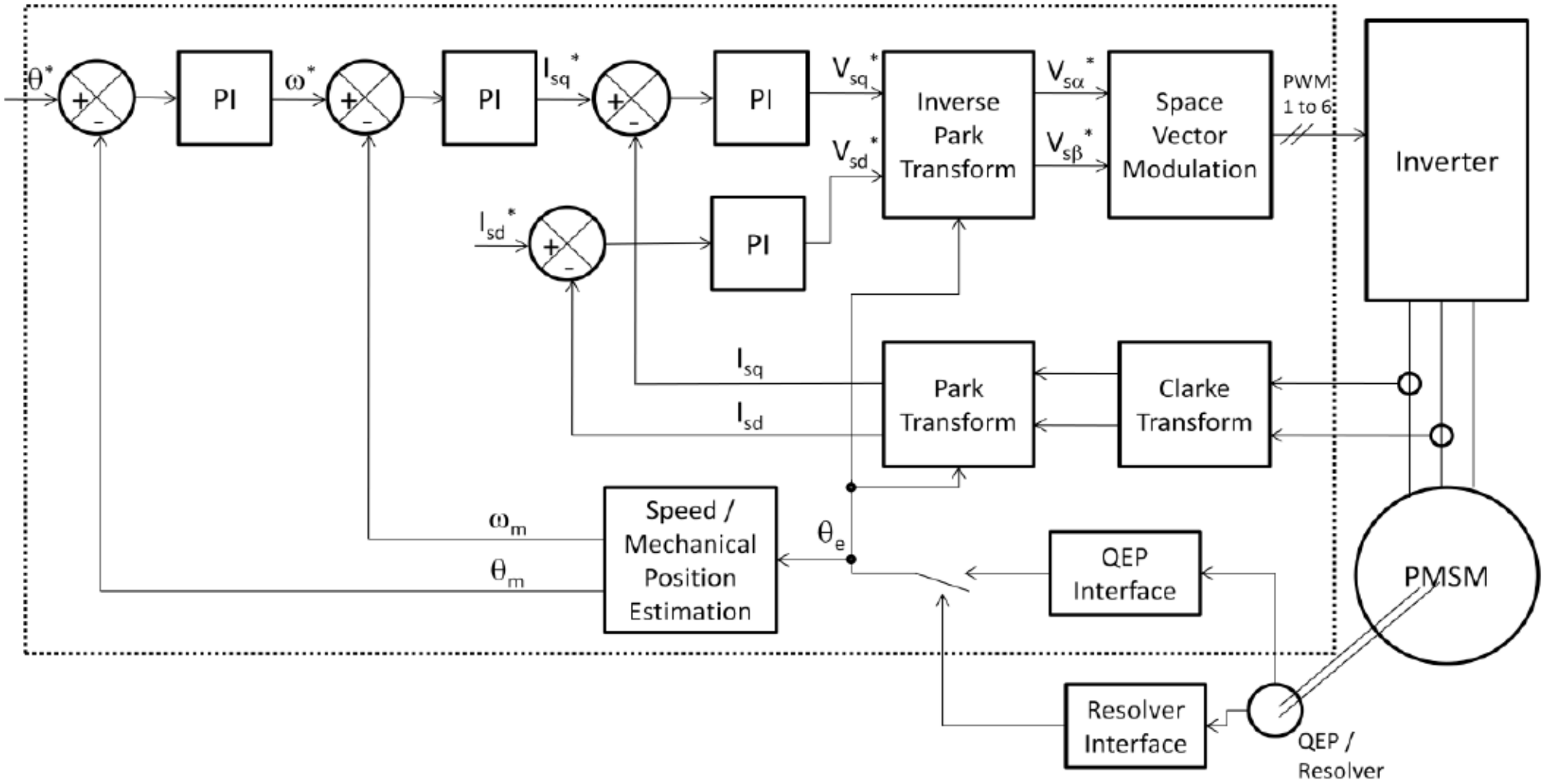
LED1-8	JP1 short
Motor2 control	JP1short、JP2-4 short、JP5 open
EtherCAT	JP2-4 open、JP5 short



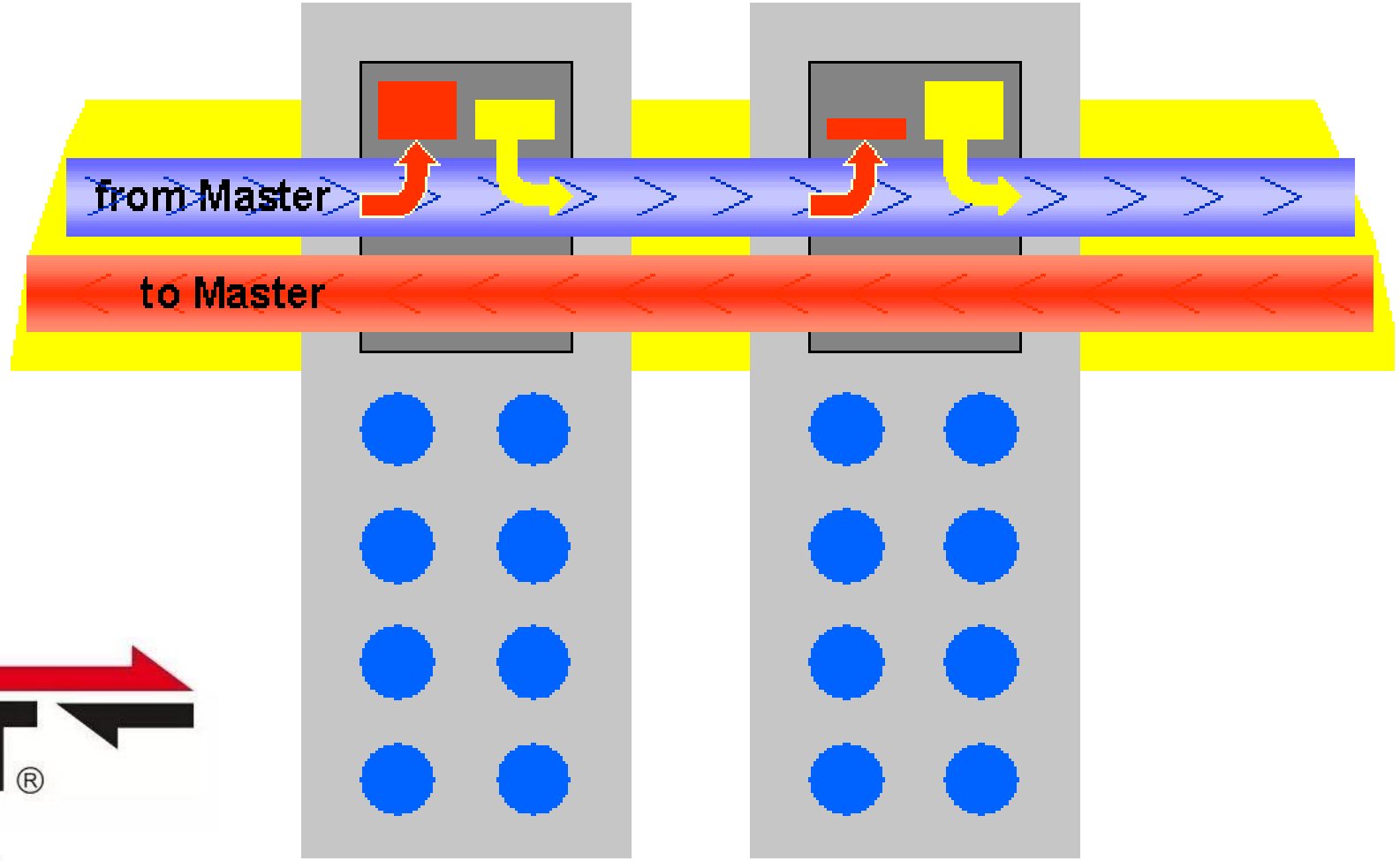
NXP MAPS



Motor Control



EtherCAT



EtherCAT®

EtherCAT APP SSC Slave Example

› Beckhoff Slave Stack Tool can be downloaded with a Link from the EtherCAT Technology Group as a ETG Member.
– https://www.ethercat.org

› TwinCAT 3 can be download from the beckhoff Web.
– https://www.beckhoff.com/english.asp?download/tc3-downloads.htm

CiA402 Example

- csv/csp supported (inclusive dynamic switching), the mode is selectable by loading different module
  - 0x1600/0x1A00: dynamic csv/csp
  - 0x1601/0x1A01: csp
  - 0x1602/0x1A02: csv

Demo show