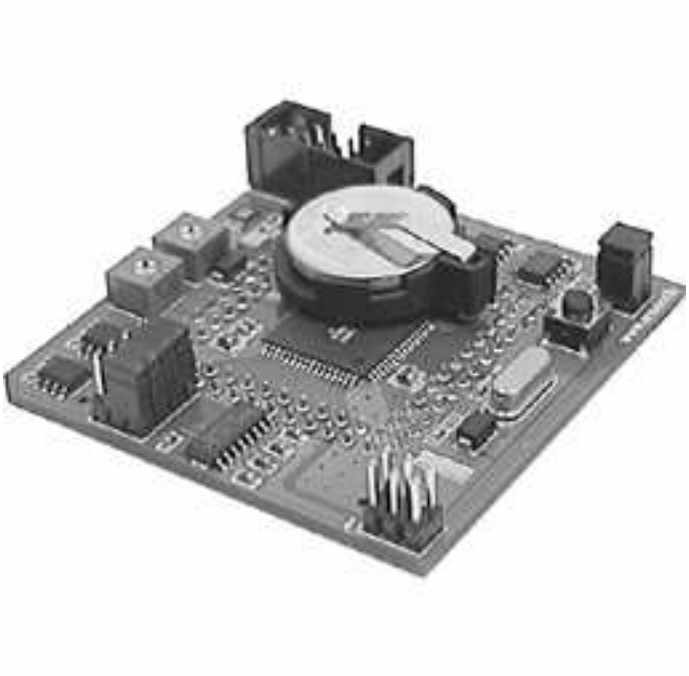
EMB128

ATMEGA128 Embedded Board



Main Features

- Atmega128 8-bit RISC CPU (AVR family)
- Serial EEPROM (I2C), 24LC256
- Real Time Clock, DS1307
- 3V lithium battery keeping time and date
- 2 channels RS485
- 2 channels RS232
- 10-bit 8 channels on MCU providing variable resistor for reference voltage
- 10-bit 2 channels digital to analog providing variable resistor for reference voltage
- 6-pin ISP connector for ISP loader cable
- JTAG connector
- Reset switch
- Diode protection for power supply and reset

1. Introduction

The EMB128 is designed by ERE CO., LTD. for embedded applications and development board. It supports rapid or no mass development of applications for ATMEGA128 AVR microcontroller from ATMEL by providing a multi-function hardware features. Also it is a second generation of the MEGABRAIN128. But it has more features than. Such as serial EEPROM size is 32KB, diode protection both power supply and reset pin, smaller components, new 6-pin ISP connector and the PCB is new designed for improving noise cancel. However its PCB size and pin connector are same as the MEGABRAIN128 so that it can be used as a replacement of the MEGABRAIN128 for the old user of MEGABRAIN128.

1. Pin Description

The CON1, CON2, CON3 and CON4 connectors in figure 2-1 are referred from the schematic. So the users need to see the schematic simultaneously when reading this user's manual for more understanding the pin connector and how the circuit work.

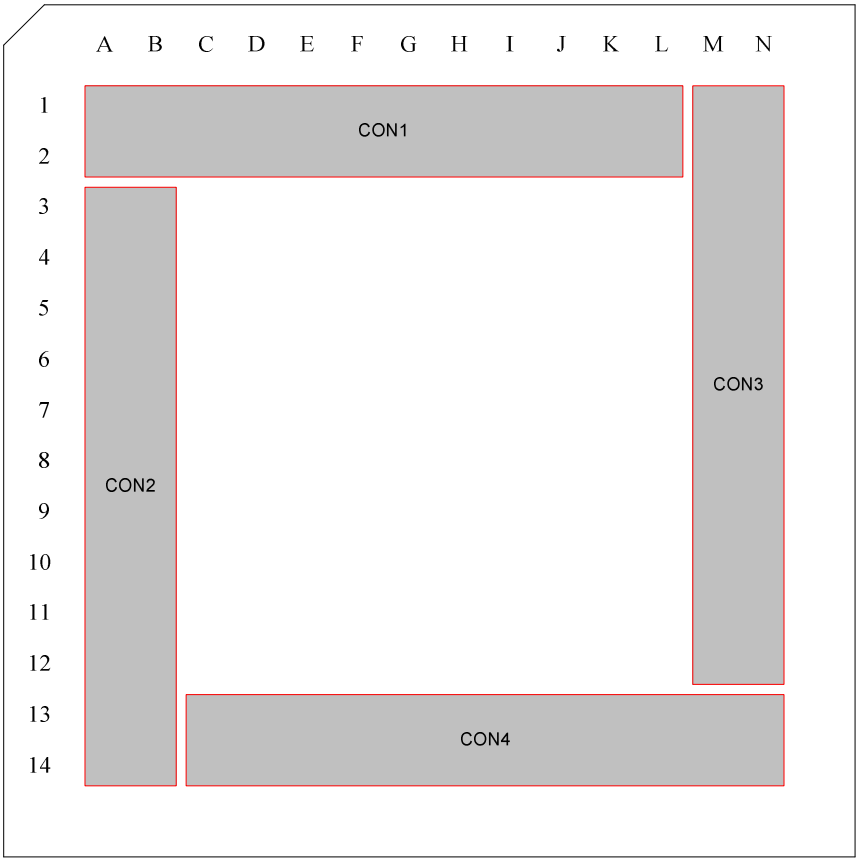


Figure 2-1 pin connector location (top view)

The pin numbers in figure 2-2 are counted by rows and columns. The columns are counted as the characters A to N and the rows are counted as numeric 1 to 14.

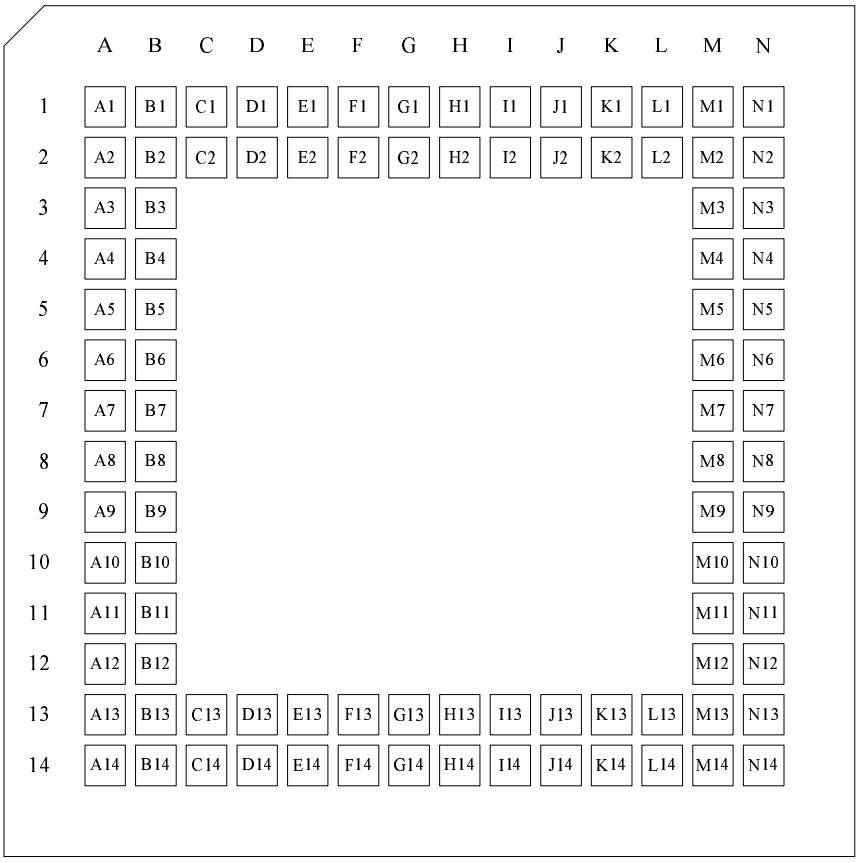


Figure 2-2 pin location (top view)

The table 2-1 is details of pin signals of EMB128. The first column is pin number referred from figure 2-2. The second column is pin signal name referred from the schematic and the last column is description of each pin.

PIN	Name	Description
A1	TX1	TX of RS232 line driver channel1
B1	B1	B(-) of RS485 line driver channel1
A2	RX1	RX of RS232 line driver channel1
B2	A1	A(+) of RS485 line driver channel1
A3	RX0	RX of RS232 line driver channel0
B3	TX0	TX of RS232 line driver channel0
A4	PEN	PEN of Atmega128
B4	PE0	PE0/RXD0/PDI of Atmega128
A5	PE1	PE1/TXD0/PD0 of Atmega128
B5	PE2	PE2/XCK0/AIN0 of Atmega128
A6	PE3	PE3/OC3A/AIN1 of Atmega128
B6	PE4	PE4/OC3B/INT4 of Atmega128
A7	PE5	PE5/OC3C/INT5 of Atmega128
B7	PE6	PE6/T3/INT6 of Atmega128
A8	PE7	PE7/IC3/INT7 of Atmega128
B8	PB0	PB0/SS of Atmega128
A9	PB1	PB1/SCK of Atmega128
B9	PB2	PB2/MOSI of Atmega128
A10	PB3	PB3/MISO of Atmega128
B10	PB4	PB4/OC0 of Atmega128
A11	PB5	PB5/OC1A of Atmega128
B11	PB6	PB6/OCB of Atmega128
A12	NC	No connect

B12	NC	No connect
A13	GND	Digital Ground
B13	GND	Digital Ground
A14	GND	Digital Ground
B14	GND	Digital Ground
C13	GND	Digital Ground
C14	GND	Digital Ground
D13	PG3	PG3/TOSC2 of Atmega128
D14	PB7	PB4/OC0 of Atmega128
E13	RESET	Reset pin of Atmega128
E14	PG4	PG4/TOSC1 of Atmega128
F13	GND	Digital Ground
F14	VCC	+5V power supply
G13	XTAL1	XTAL1 of Atmega128
G14	XTAL2	XTAL2 of Atmega128
H13	PD1	PD1/SDA/INT1 of Atmega128
H14	PD0	PD0/SCL/INT0 of Atmega128
I13	PD3	PD3/TXD1/INT3 of Atmega128
I14	PD2	PD2/RXD1/INT2 of Atmega128
J13	PD5	PE5/XCK1 of Atmega128
J14	PD4	PD4/IC1 of Atmega128
K13	PD7	PD7/T2 of Atmega128
K14	PD6	PD6/T1 of Atmega128
L13	GND	Digital Ground
L14	GND	Digital Ground
M13	GND	Digital Ground
M14	GND	Digital Ground
N13	GND	Digital Ground
N14	GND	Digital Ground
M12	NC	No Connect
N12	NC	No Connect
M11	PG11	PG1/RD of Atmega128
N11	PG0	PG0/WR of Atmega128
M10	PC1	PC1/A9 of Atmega128
N10	PC0	PC0/A8 of Atmega128
M9	PC3	PC3/A11 of Atmega128
N9	PC2	PC2/A10 of Atmega128
M8	PC5	PC5/A13 of Atmega128
N8	PC4	PC4/A12 of Atmega128
M7	PC7	PC7/A15 of Atmega128
N7	PC6	PC6/A14 of Atmega128
M6	PA7	PA7/AD7 of Atmega128
N6	PG2	PG2/ALE of Atmega128
M5	PA5	PA5/AD5 of Atmega128
N5	PA6	PA6/AD6 of Atmega128
M4	PA3	PA3/AD3 of Atmega128
N4	PA4	PA4/AD4 of Atmega128
M3	GND	Digital ground
N3	GND	Digital ground
M2	AGND	Analog ground for DAC
N2	OUTA	Analog output A of DAC
M1	AGND	Analog ground for DAC
N1	OUTB	Analog output B of DAC
L1	NC	No connect
L2	NC	No connect
K1	PA2	PA2/AD2 of Atmega128
K2	PA1	PA1/AD1 of Atmega128
J1	PA0	PA0/AD0 of Atmega128

J2	VCC	+5V power supply
I1	GND	Digital ground
I2	PF7	PF7/ADC7/TDI of Atmega128
H1	PF6	PF6/ADC6/TD0 of Atmega128
H2	PF5	PC0/ADC5/TMS of Atmega128
G1	PF4	PF4/ADC4/TCK of Atmega128
G2	PF3	PF3/ADC3 of Atmega128
F1	PF2	PF2/ADC2 of Atmega128
F2	PF1	PF1/ADC1 of Atmega128
E1	PF0	PF0/ADC0 of Atmega128
E2	AREF	Analog voltage for referent voltage of ADC on Atmega128
D1	AGND	Analog ground of Atmega128
D2	VCC	+5V power supply
C1	B0	B(-) of RS485 line driver channel0
C2	A0	B(+) of RS485 line driver channel0

Table 2-1 pin description

2. Real Time Clock

The real time clock in this board is driven by DS1307, 3V lithium battery and 32.768 KHz crystal. Also the board has a jumper for linking the SQW/OUT signal on DS1307 to interrupt pin on the Atmega128. The SQW/OUT signal is linked to the interrupt pin on the MCU where the JP8 is closed. That the users can control frequency of the SQW/OUT signal by sending some command into the DS1037. However the interrupt pin on the MCU can be used for other work where the JP8 is opened**.**

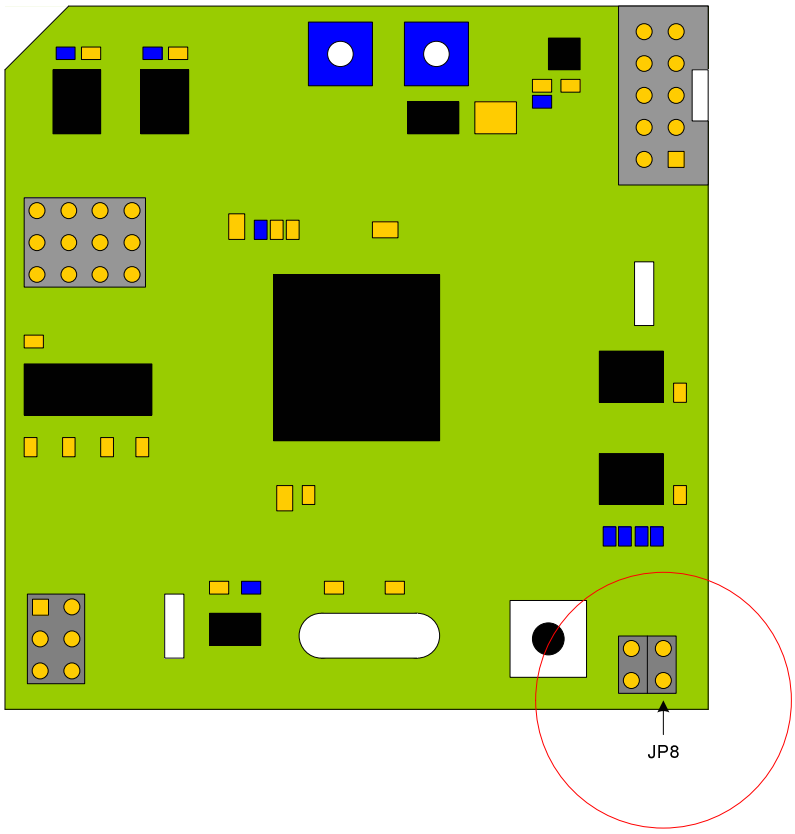


Figure 3-1 RTC interrupt jumper

3. Serial EEPROM (I2C)

In the MEGABRAIN128, the external EEPROM is 24LC16 that is not enough for a large data. So, in the EMB128, we provide the 24LC256 for external EEPROM that can store data up to 32 KB. Also we have added a jumper, JP7 for memory protection. Where the JP7 is close the WP pin of 24LC256 is connected to GND, which the 24LC256 allows both read and write operation. In opposite the write operation doesn't where the JP7 is opened.

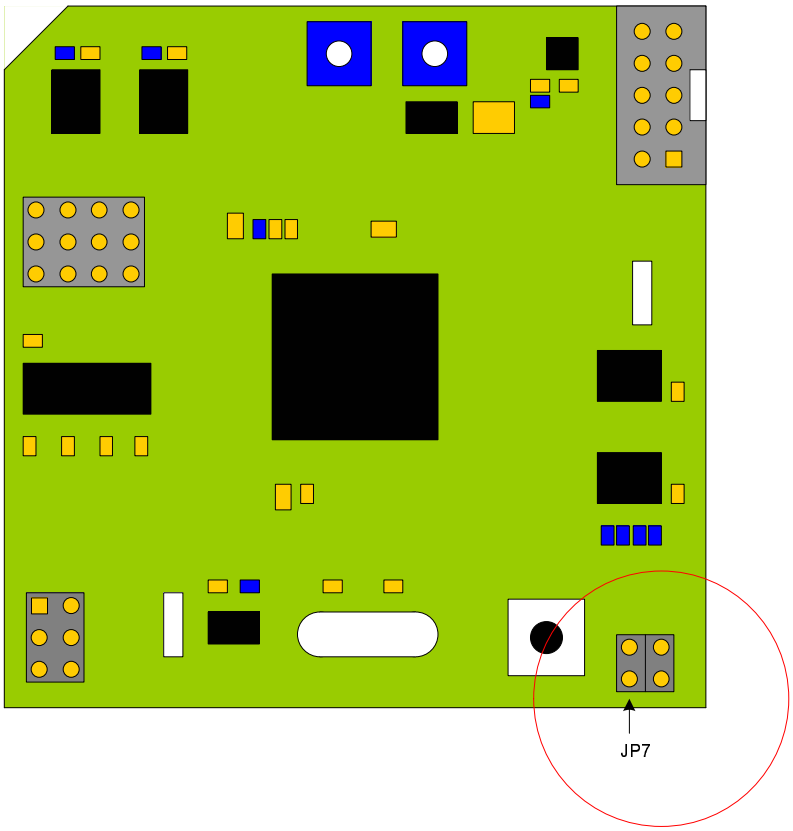


Figure 3-2 EEPROM jumper

4. RS232

Two channels RS232 are built in this board same as the MEGABRAIN128. Pin signals and jumpers about RS232 are compatible to the MEGABRAIN128 so the old user of MEGABRAIN128 can used RS232 on this board same as the RS232 on the MEGABRAIN128. The figure 5-1 shows pin signals of both channels RS232.

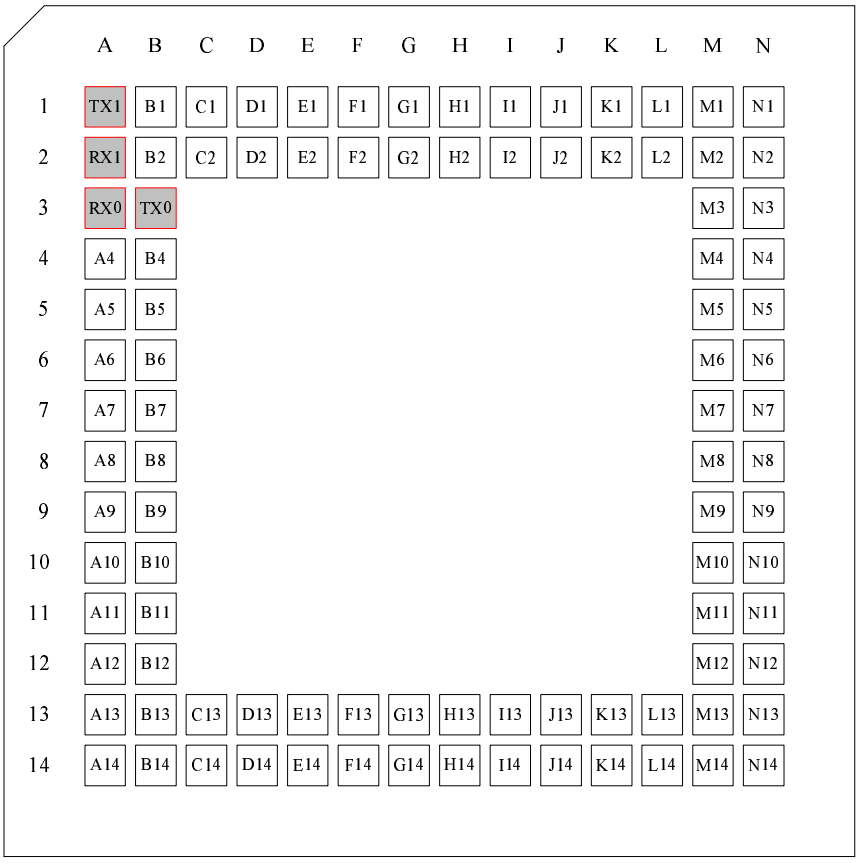


Figure 5-1 RS232 pin location (top view)

Where the RS232 are used the user need to select the jumpers accordingly. The jumpers for RS232 are JP1 to JP5 which these jumpers are used both RS323 and RS485. Use these jumpers for RS232 see in figure5-3 and figure5-4. Select JP2 and JP5 same as in figure5-3 where channel0 of RS232 is used. Also in figure 5-4 shows the jumper selection of JP1 and JP4 for channel1 of RS232.

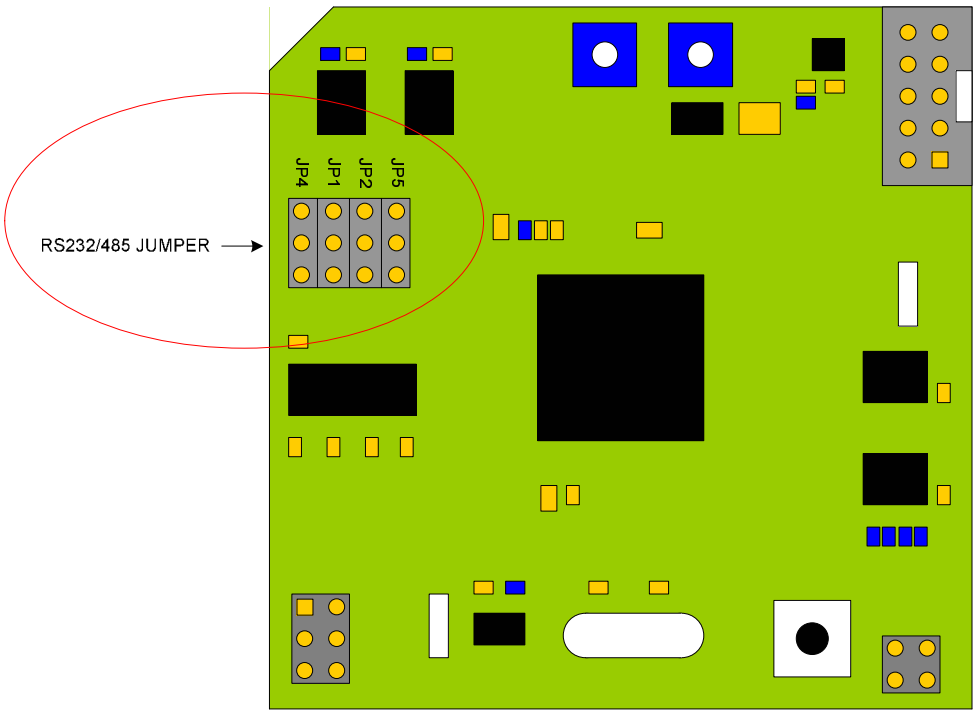


Figure 5-2 RS232 jumper location

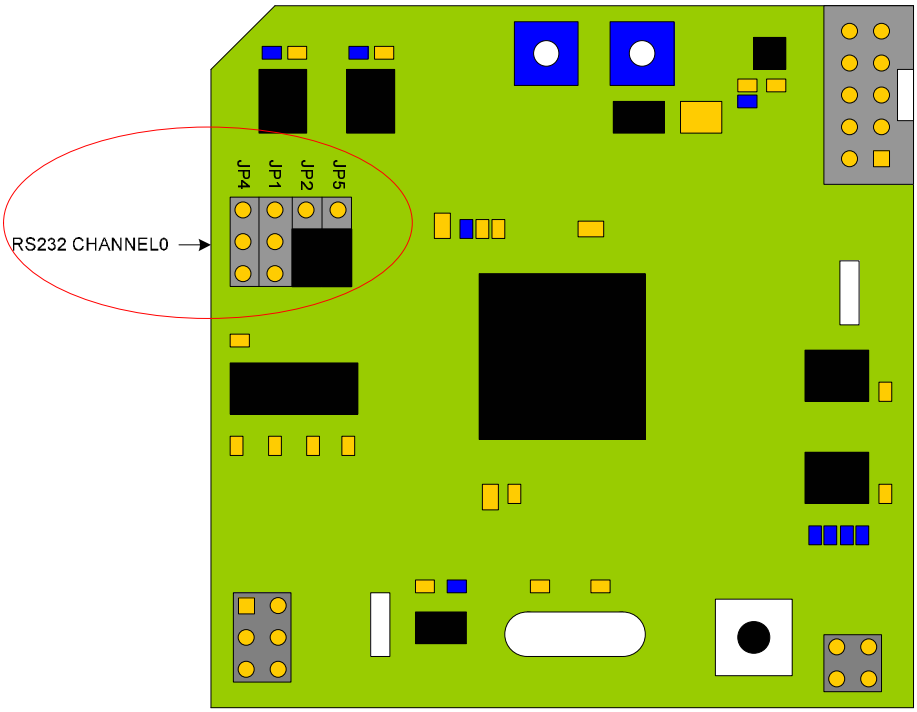


Figure 5-3 RS232 channel 0

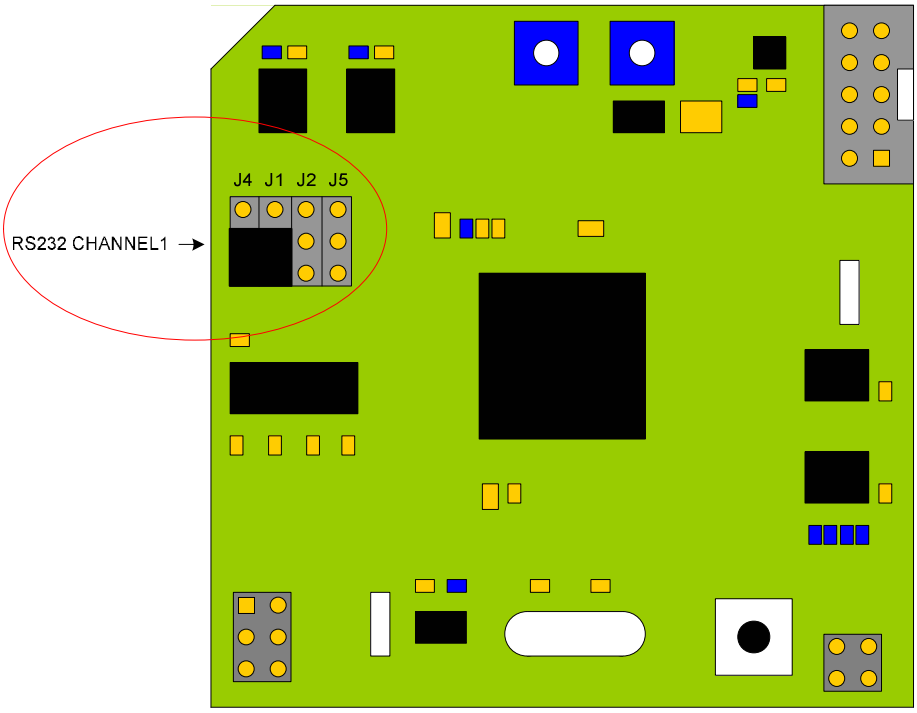


Figure 5-4 RS232 channel 1

5. RS485

Pin signals of RS485 are shown in figure 6-1 that same as the MEGABRAIN128's RS485 pins. Then the old users of MEGABRAIN128 can use this board instead of the MEGABRAIN128 same as the RS232. Where they are using this board the jumpers need to select accordingly. In figure 6-2 shows a method for select the jumper JP2 and JP5 for use channel0 of RS485. And in figure 6-3 shows JP1 and JP4 for use channel1 of RS485.

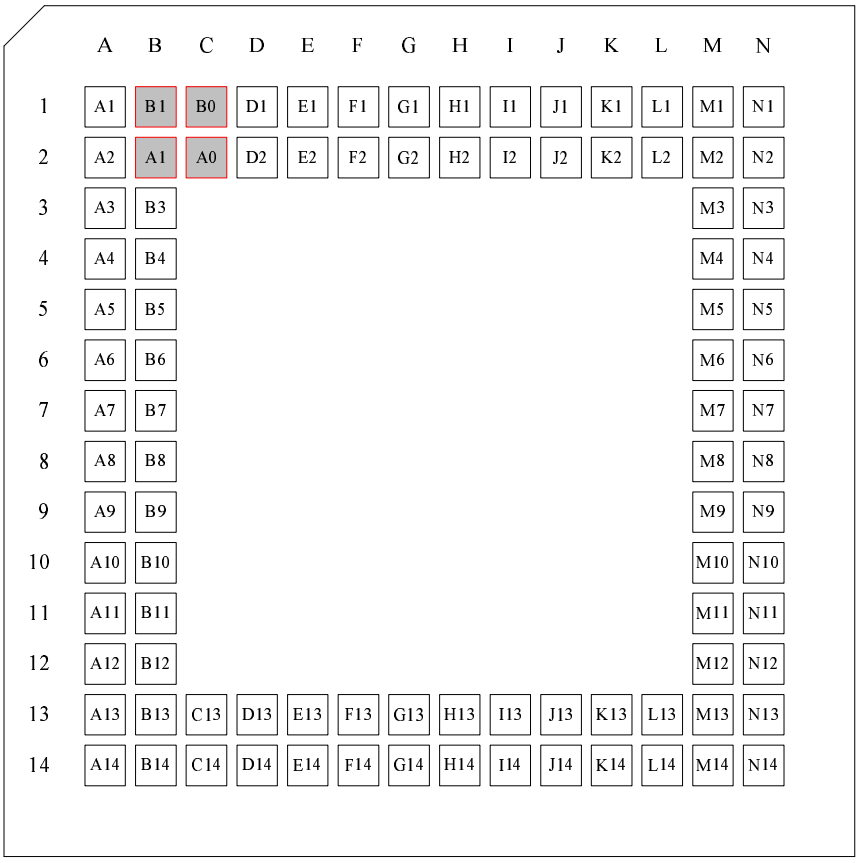


Figure 6-1 RS485 pin location (top view)

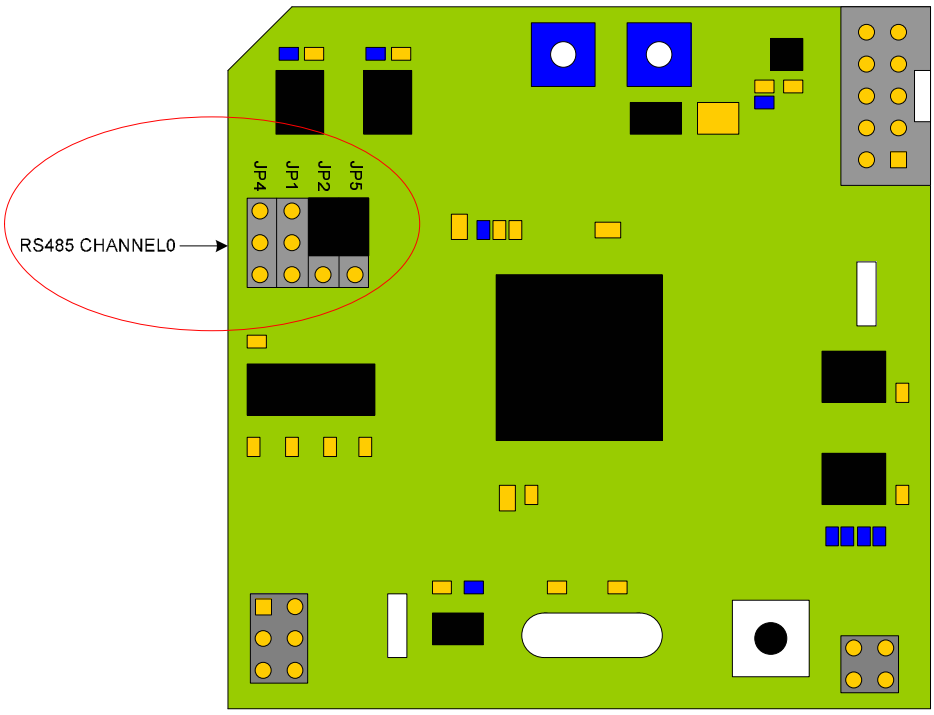


Figure 6-2 channel0 of RS485 (top view)

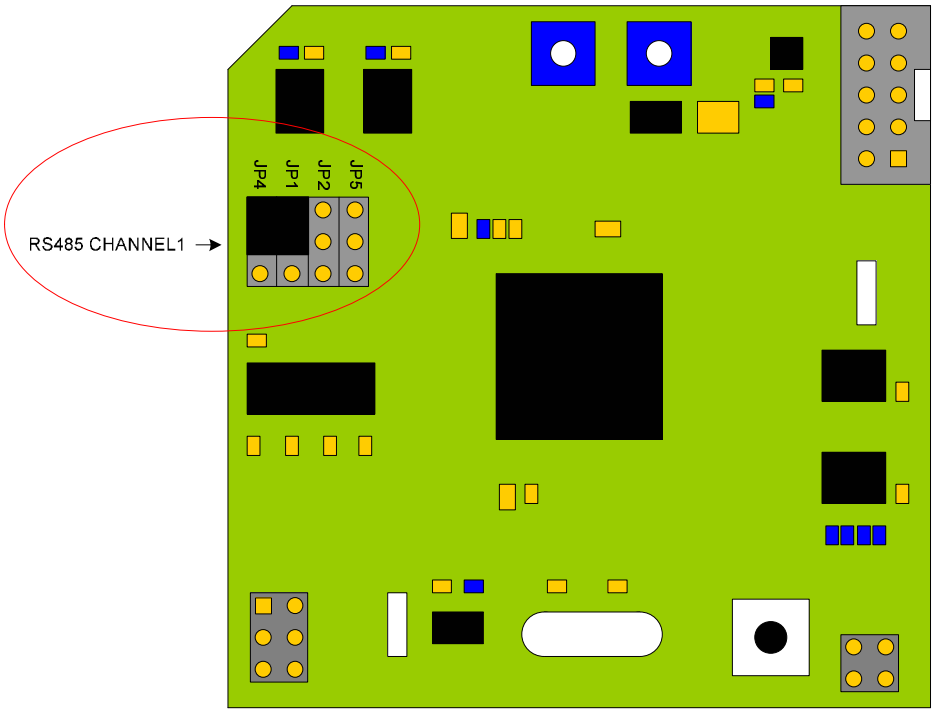


Figure 6-3 channel1 of RS485 (top view)

Although this board is same as the MEGABRAIN128 but in this board it has a difference in RS485. It is JP3 and JP6 which are added in this board. Please simultaneously view the schematic where the JP3 and JP6 are used. These jumpers will short the RS485 direction lines to pull-low resistors when these jumpers are soldered. The figure 6-4 shows bottom view of the EMB128, showing the JP3 and JP6.

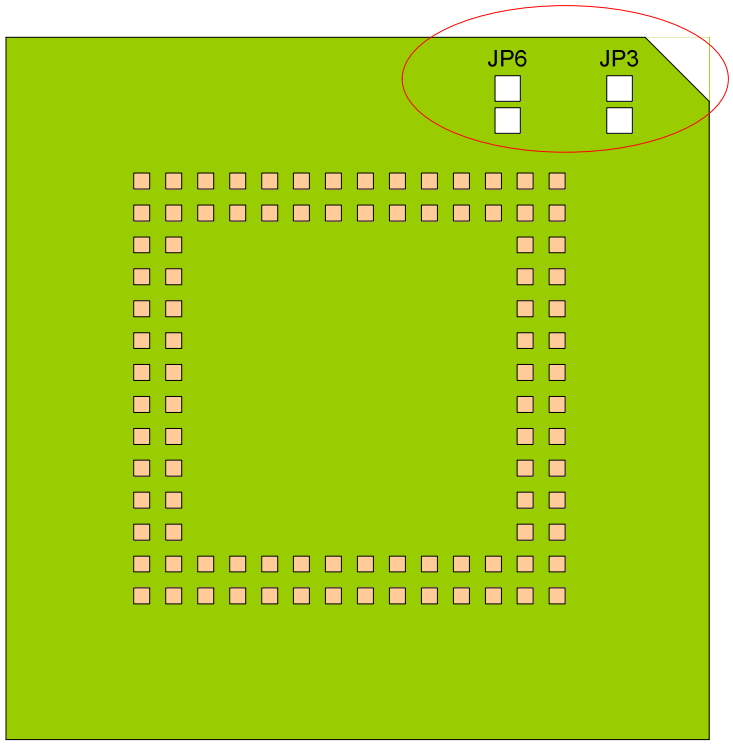


Figure 6-4 RS485 jumper (bottom view)

7. Digital To Analog

The EMB128 is designed supports both digital and analog applications so the digital to analog is build on this board. The DAC on this board is 10-bit 2 channels, LTC1661 from Linear Technology. It is a serial DAC use only 3 wires for control. In figure 7-1 shows pin signals of DAC and its ground, AGND. The DAC has a pin for reference voltage that the user can adjust this voltage by trimming the VR on this board as shown in figure 7-2.

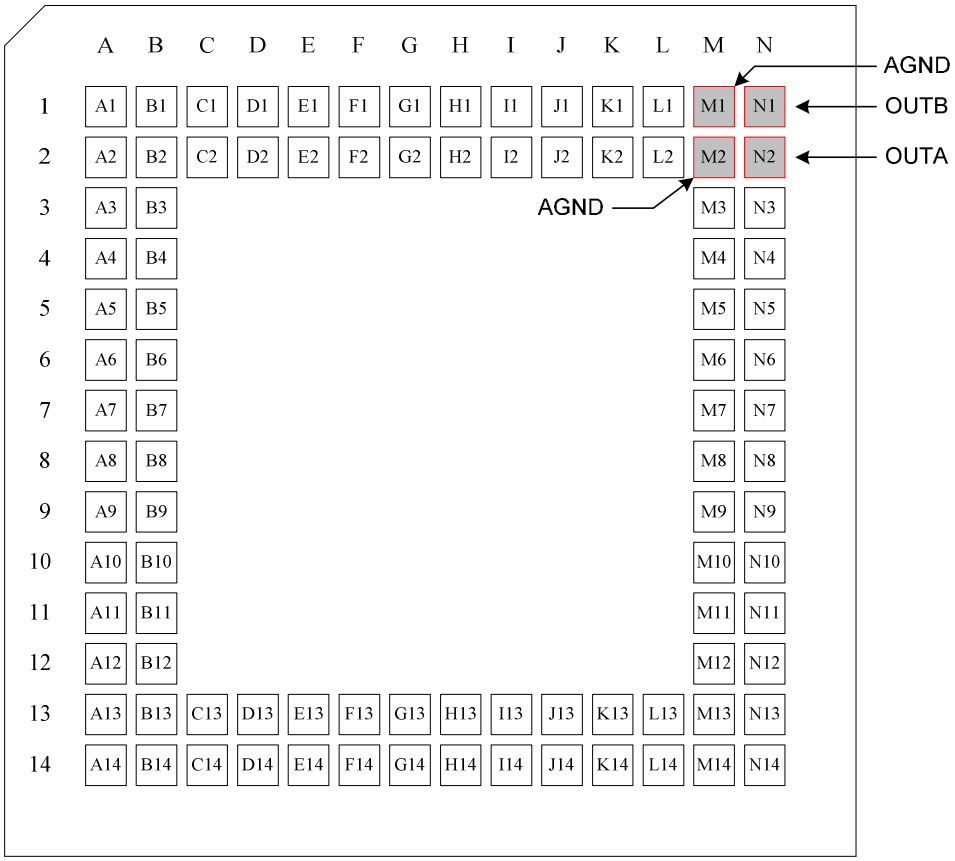


Figure 7-1 DAC pin location

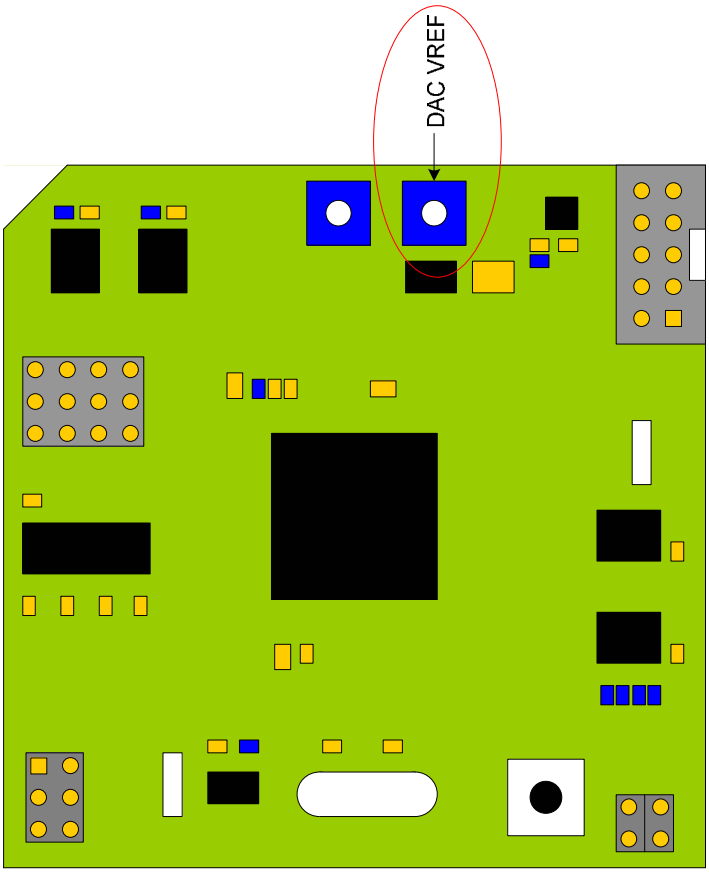


Figure 7-2 VR for adjusting DAC VREF

8. In-System Programming

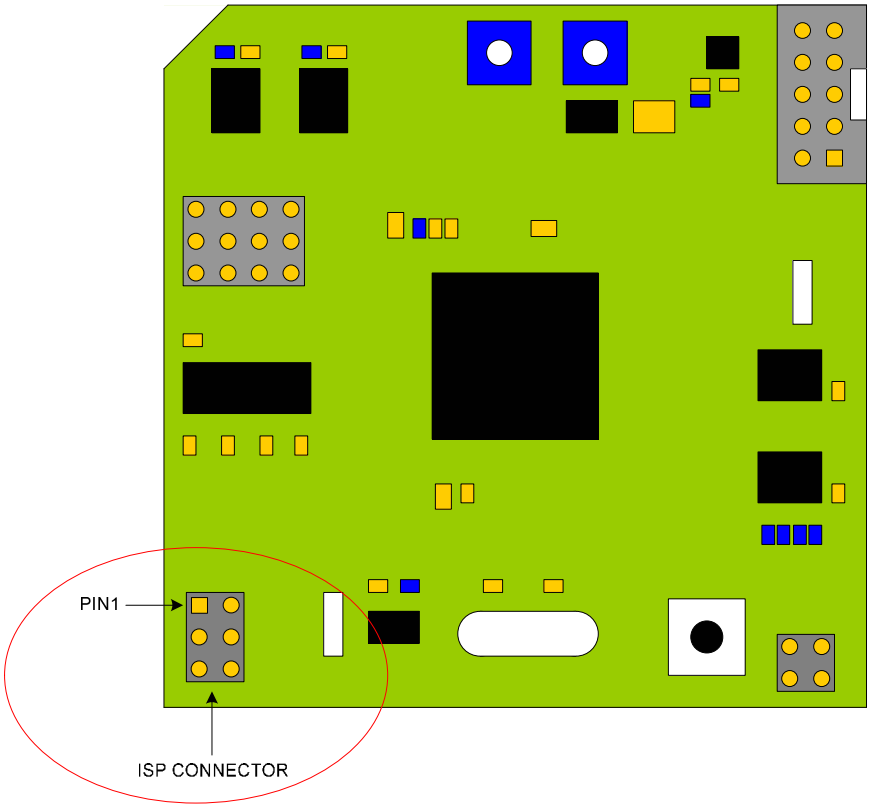


Figure 8-1 ISP connector location

The ISP connector on this board uses 6-pin connector, which compatible to ATMEL AVR programmer. In figure8-1 shows ISP connector on this board also in figure8-2 shows pin signals of ISP programming system.

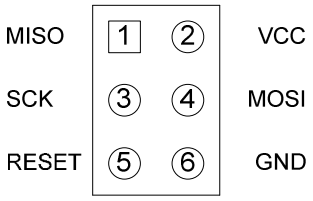


Figure 8-2 ISP pin signals (top view)

9. JTAG Debugging

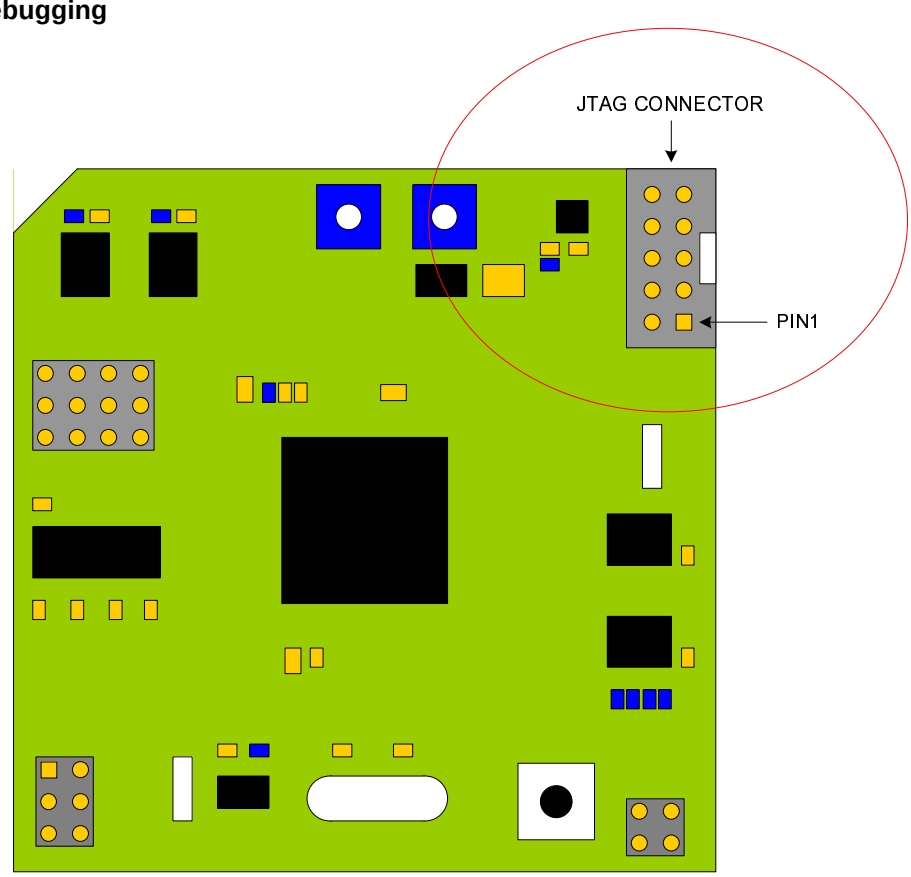


Figure 9-1 JTAG connector location

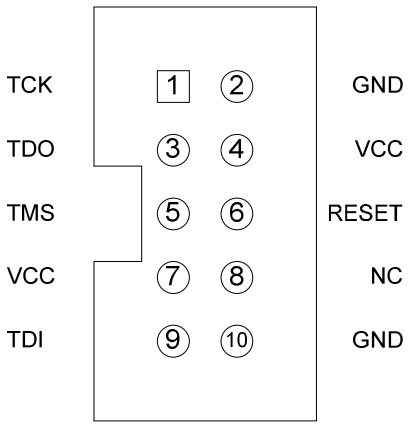


Figure 9-2 JTAG pin signals (top view)

10. Analog to Digital

The analog to digital on this module is built in the MCU. It can be used up to 8 channels. Each channel has 10 bits for resolution. They can be adjusted the maximum voltage range by VR in figure10-2. Also in figure 10-1 shows necessary pins for using of the ADC, analog input pins, analog referent voltage pin and analog ground pin.

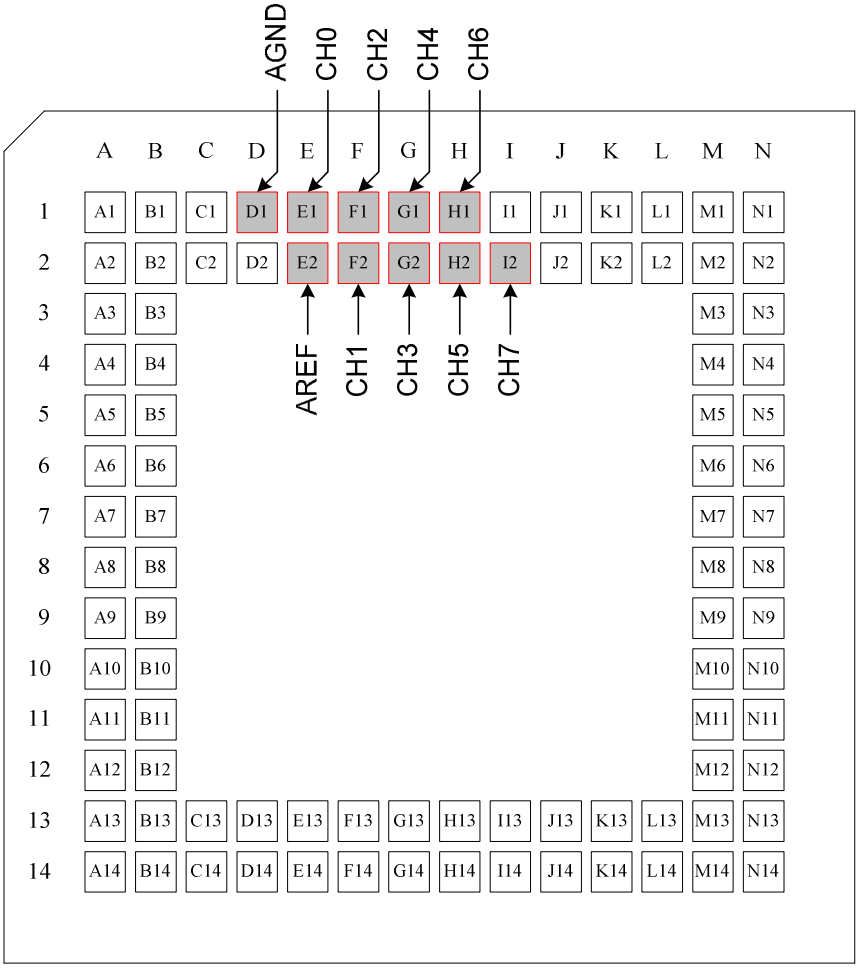


Figure 10-1 ADC pin signals

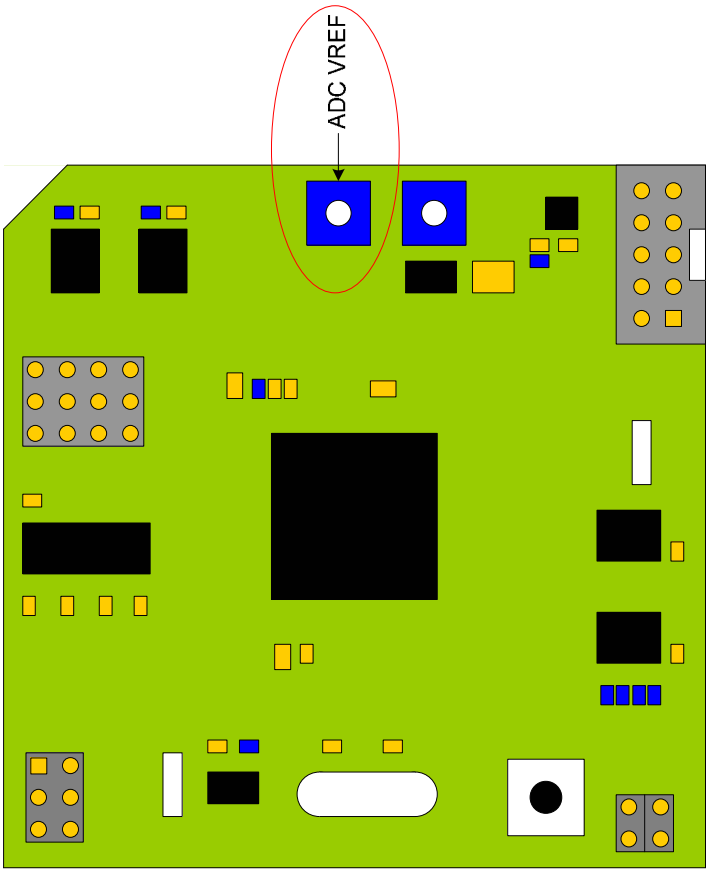


Figure 10-2 VR for adjustable ADC VREF

11. Reset

The EMB128 provides a reset switch that the users can use this switch for manual reset.

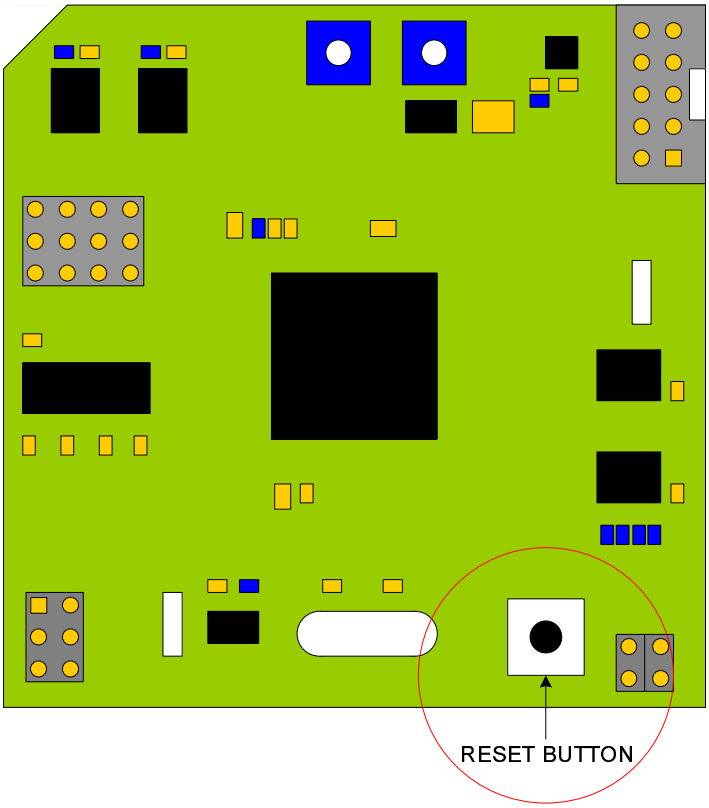


Figure 11-1 reset button

12. Power Supply

The supply on this board used 5V. So the users need to supply 5V only. The board is damaged where the power supply is excess 5V supplies into the board. The board provides power supply pin as shows in figure 12-1.

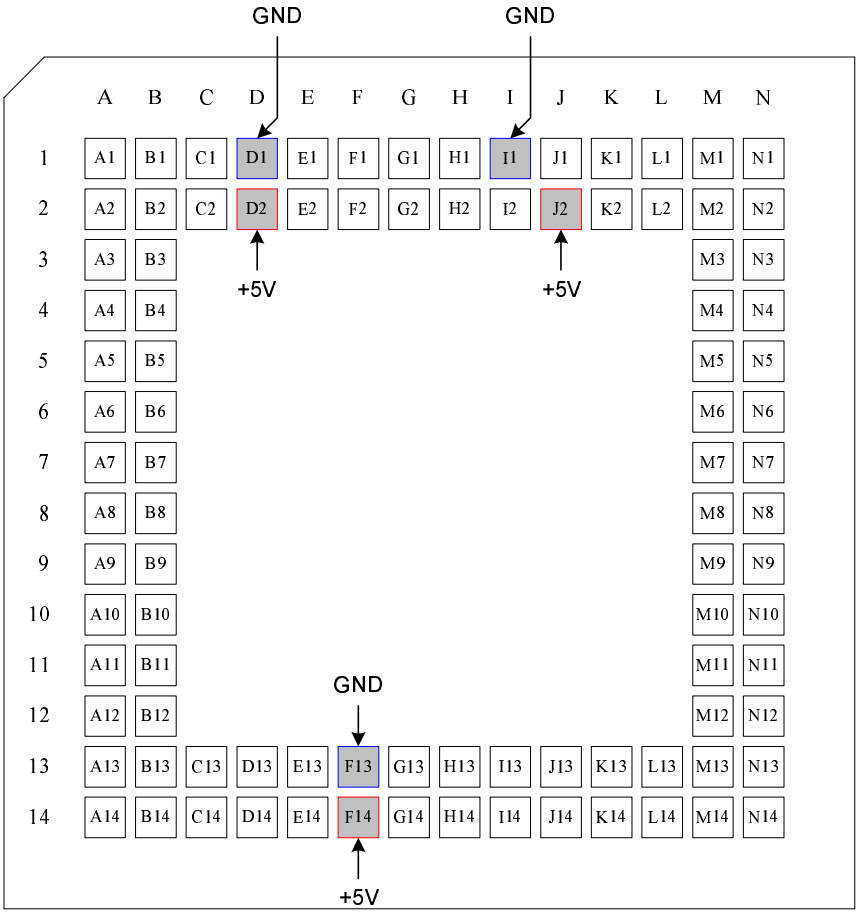
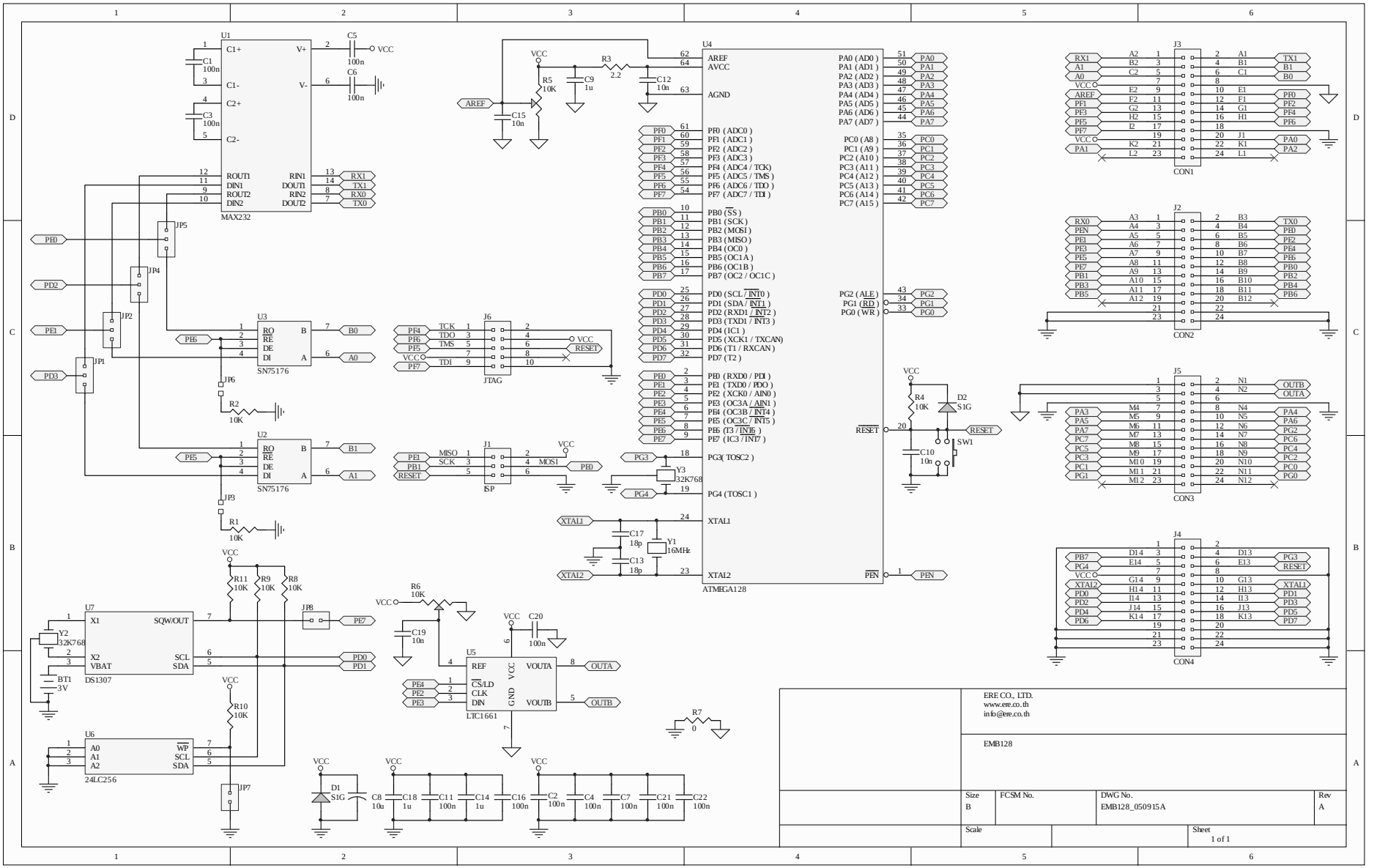


Figure 12-1 power supply pin


U1
MAX232
C1+
C1-
C2+
C2-
V+
V-
ROUT1
ROUT2
DIN1
DIN2
RIN1
RIN2
DOUT1
DOUT2
RX1
TX1
RX0
TX0
U4
ATMEGA128
AREF
AVCC
AGND
PA0 (AD0)
PA1 (AD1)
PA2 (AD2)
PA3 (AD3)
PA4 (AD4)
PA5 (AD5)
PA6 (AD6)
PA7 (AD7)
PC0 (A8)
PC1 (A9)
PC2 (A10)
PC3 (A11)
PC4 (A12)
PC5 (A13)
PC6 (A14)
PC7 (A15)
PB0 (SS)
PB1 (SCK)
PB2 (MOSI)
PB3 (MISO)
PB4 (OC0)
PB5 (OC1A)
PB6 (OC1B)
PB7 (OC2 / OC1C)
PD0 (SCL / INT0)
PD1 (SDA / INT1)
PD2 (RXD1 / INT2)
PD3 (TXD1 / INT3)
PD4 (IC1)
PD5 (XCK1 / TXCAN)
PD6 (T1 / RXCAN)
PD7 (T2)
PE0 (RXD0 / PDI)
PE1 (TXD0 / PDO)
PE2 (XCK0 / AIN0)
PE3 (OC3A / AIN1)
PE4 (OC3B / INT4)
PE5 (OC3C / INT5)
PE6 (T3 / INT6)
PE7 (IC3 / INT7)
PG2 (ALE)
PG1 (RD)
PG0 (WR)
PG3(TOSC2)
PG4 (TOSC1)
XTAL1
XTAL2
PEN
RESET
VCC
U2
U3
SN75176
RO
RE
DE
DI
B
A
JP1
JP2
JP3
JP4
JP5
JP6
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
Y1
16MHz
Y2
32K768
Y3
32K768
D1
S1G
D2
S1G
SW1
BT1
3V
U5
LTC1661
REF
CS/LD
CLK
DIN
VOUTA
VOUTB
GND
U6
24LC256
A0
A1
A2
WP
SCL
SDA
U7
DS1307
X1
X2
VBAT
SQW/OUT
J1
ISP
MISO
SCK
MOSI
J2
CON2
J3
CON1
J4
CON4
J5
CON3
J6
JTAG
TCK
TDO
TMS
TDI
OUTA
OUTB
PEN
ERE CO., LTD.
www.ere.co.th
info@ere.co.th
EMB128
Size
B
FCSM No.
DWG No.
EMB128_050915A
Rev
A
Scale
Sheet
1 of 1