

ET-dsPIC33WEB V1.0

ET-dsPIC33WEB V1.0 is a dsPIC Board Microcontroller from Microchip that uses 16 Bit Microcontroller No.dsPIC33FJ128GP708 for processing data. The remarkable feature of dsPIC33FJ128GP708 is Digital Signal Processing and there are resources as follows;

Central Processing Unit (CPU)

- 40 MIPS speed for processing data (16 Bit Data/ 24 Bit Instruction Code)
- Hardware supports 16 x 16 Bit multiplication and only use 1 Instruction Cycle
- Hardware supports 32-Bit x 16 Bit division
- C Compiler is designed to be Optimized Instruction Set
- Support maximum Interrupts up to 118 Vector Interrupt from 63 sources 7 Priority Level Program
- Support 8 Channels of DMA and Peripheral Hardware with DMA Buffer 2KByte

System

- Internal and External Clock Generator
- Power-Up Timer Circuit and oscillator Start-Up Circuit
- Fail-Safe Clock Monitor
- Watchdog Timer System uses RC Oscillator that is separated from other parts
- Voltage 3.0 - 3.6 Volt
- I/O Pin 4mA Sink can be connected with signal 5VTTL (5V Tolerant)
- Support Run Mode, Idle Mode, and Sleep Mode
- Can adjust operation of Signal Clock Mode to various modes, so it makes operation more efficient and correspond with power management

Analog Features

- 24 Channel 10-Bit Module Analog to Digital Converter and can program it to be 2 Channel 12 Bit with the maximum speed 1.1 MSPS for Sampling

General Specifications of MCU No.dsPIC33FJ128GP708

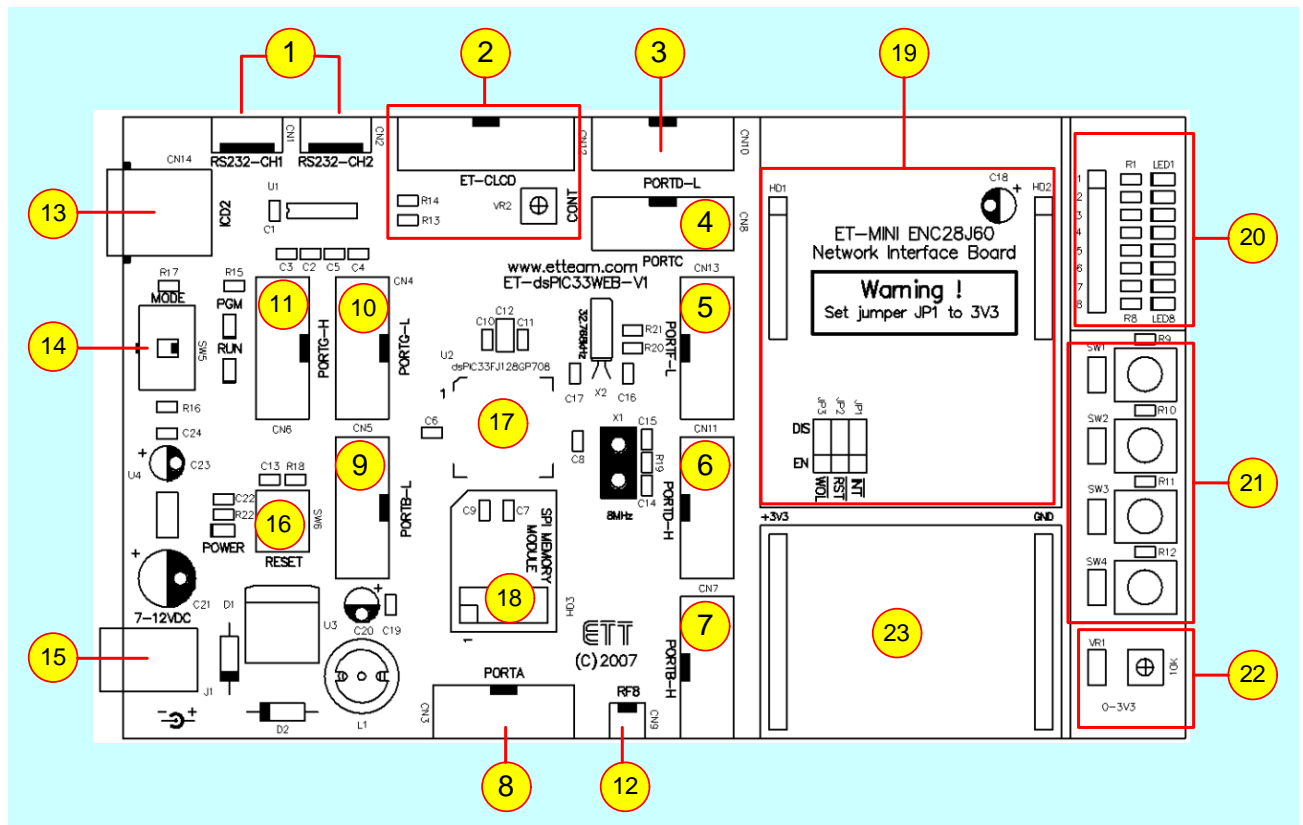
- 128 K Byte Flash Memory
- 16 K Byte SRAM
- 69 Bit I/O Ports (Including Peripheral Functions)
 - 2 Channel Module UART Communication
 - 2 Channel Module SPI Communication support both Master Mode and Slave Mode
 - 2 Channel Module I2C Communication support both Master Mode and Slave Mode
 - 2 Channel Module CAN Communication
 - 9 Channel 16-Bit Module Timer, moreover it can be matched to use it as 4 Channel 32 Bit Timer
 - 8 Module Capture, Compare/PWM
 - RTCC Hardware System, Real-Time Clock calendar with external Alarms
 - 24 Channel 10 Bit Module ADC and can program value to be 2 Channel 12 Bit
 - 1 Channel parallel DCI Communication System(Data Converter Interface)

General specifications of Board ET-dsPIC33WEB V1.0

- 80 PIN dsPIC33FJ128GP708 Microcontroller
- 8 MHz Signal Clock Crystal Oscillator (can use PLL to run up to 40 MHz)
- 32.768 KHz Signal Clock Oscillator for RTC
- 9 Port 10 PIN I/O Port (ETT standard arrangement)
- 2 Port Line Driver RS232 Circuit
- 1 Port 14 Pin ET-CLCD to interface LCD (ETT standard arrangement)
- ICD2 Connector to download program and Switch ON/OFF of signal Run/Program
- 8 Channel LED Circuit to test Digital Output
- 4 Channel Switch Push-Button Circuit to test Digital Input
- 1 Channel Circuit to create 0-3.3V Voltage from adjustable Resistor to test Module A/D
- Port to connect with Module Ethernet version ET-MINI ENC28J60 (use SPI1)
- 1 Port to connect with EEPROM 25LCxxx (Use SPI2)
- Switching Regulate to convert DC Input Power into 5V and 3.3V

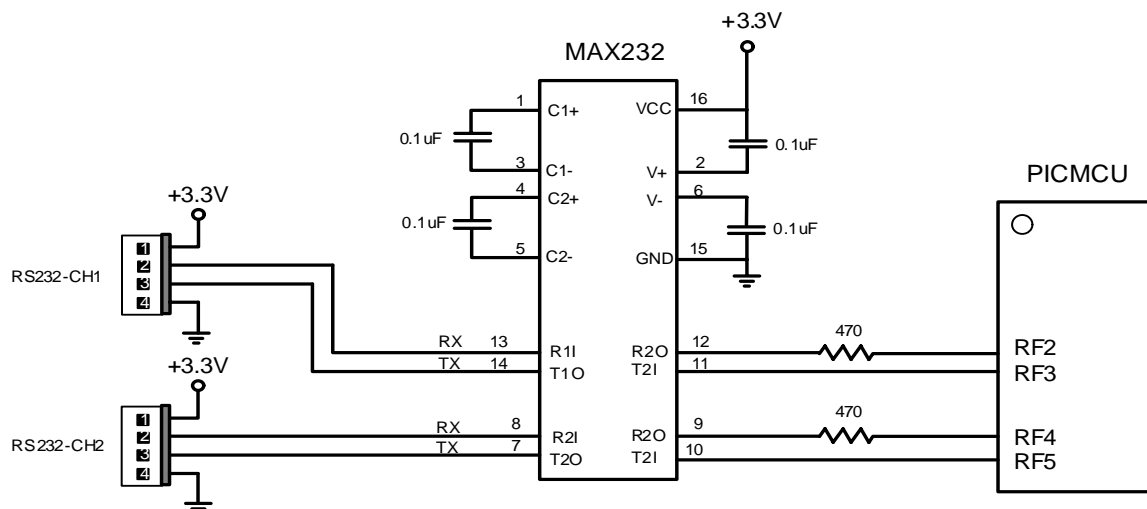
- LED to display status of Power(Red), Program(Red), and Run(Green)
- Connector VCC and GND to use with 7-12VAC/DC

Structure of Board ET-dsPIC33WEB V1.0

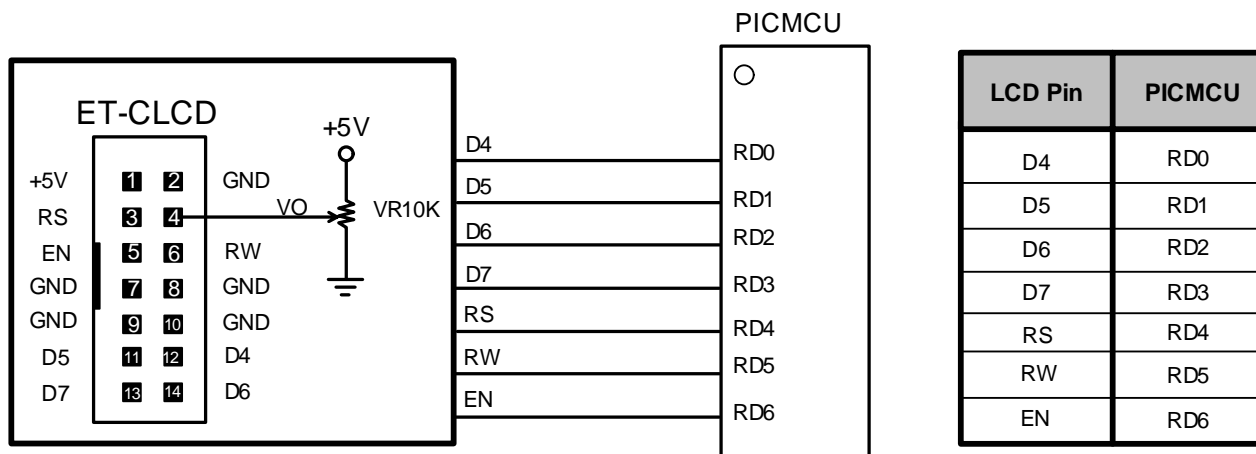


Details

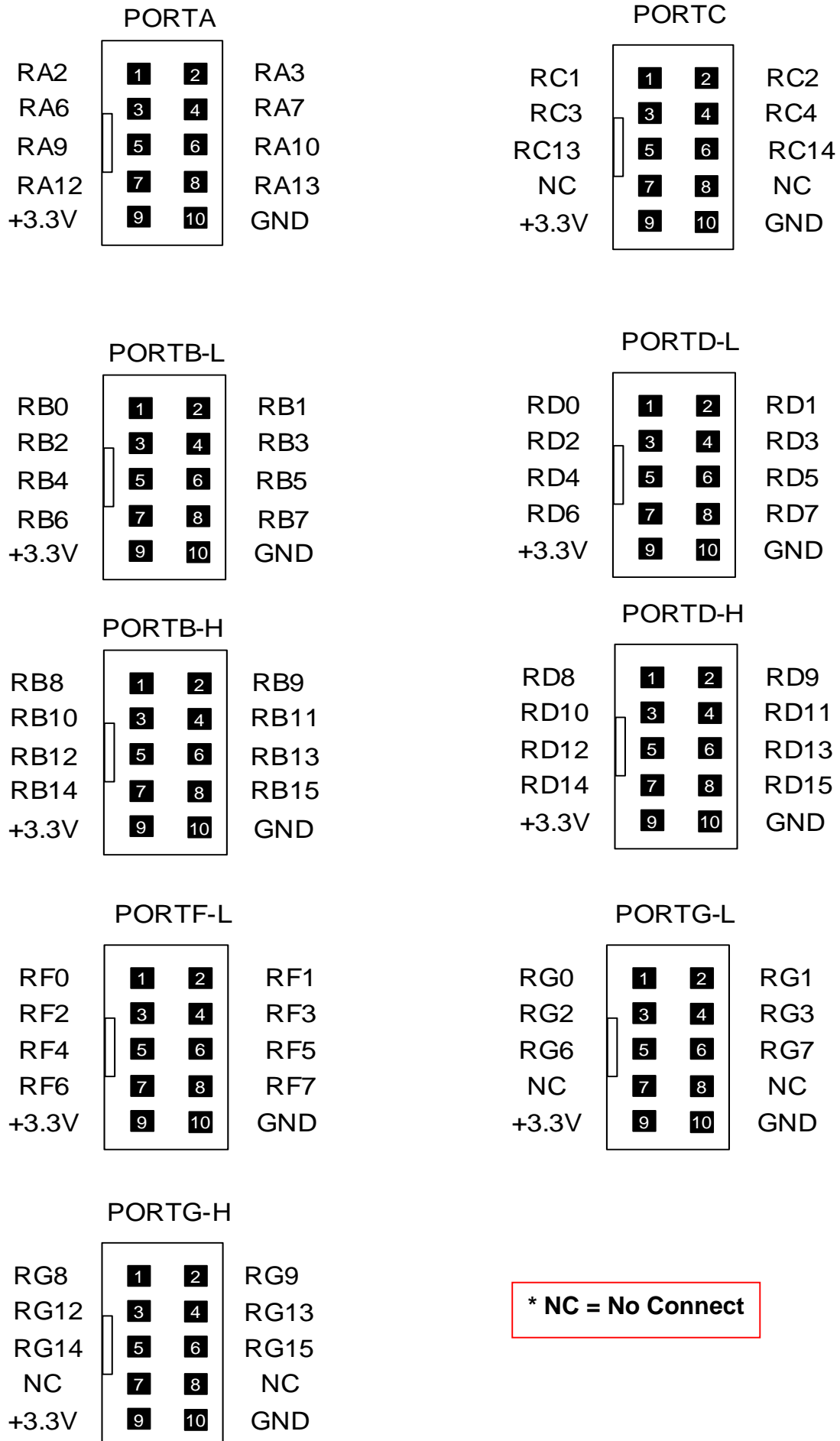
No.1 is 2 Ports to connect with Signal RS-232; connection circuit is shown below.



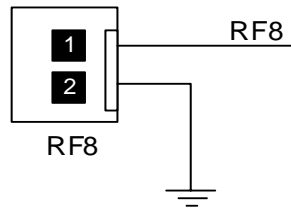
No.2 is Port ET-CLCD to connect with Character LED Display; its pin arrangement is shown below.



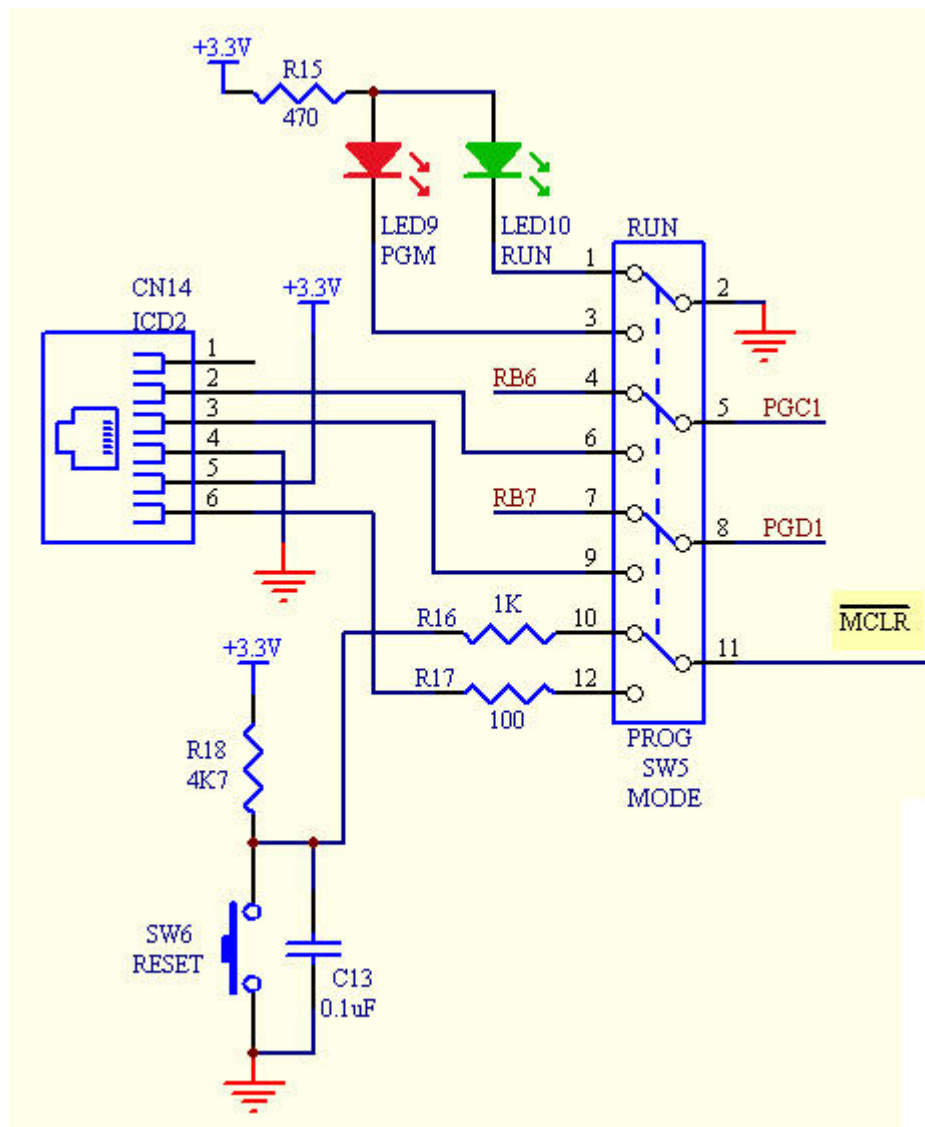
- No.3, 4, 5, 6, 7, 8, 9, 10, and 11** is Port I/O of Microcontroller that is designed to be in the format of standard 10-PIN ETT Port. Signal of each Port is arranged as follows;



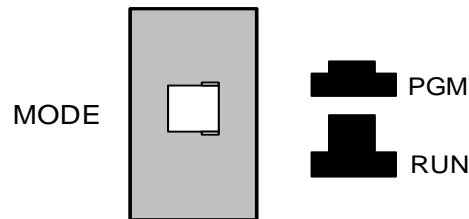
- **No.12** is 2 PIN I/O Port; signal RF8 and GND as follows;



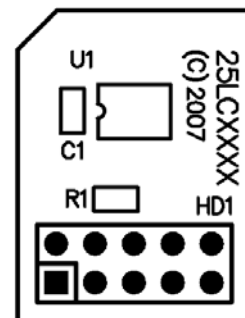
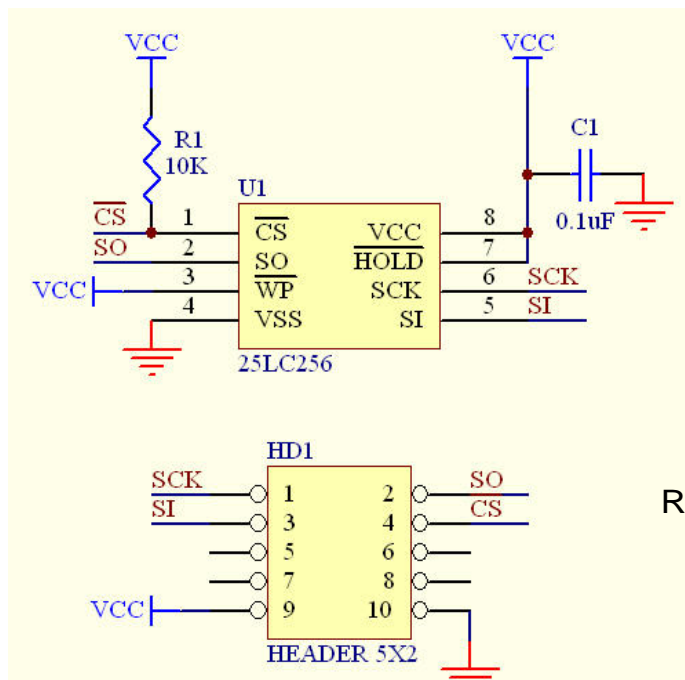
- **No.13** is Connector to download progra that is arranged under ICD2 Statndard and it can support Programmer that is connected follows the standard of ICD2 such as PICKIT2, ICD2 and ETT Programmer version ET-PGMPIC USB. User must always press Switch MODE to be PGM position before start using program to on/off signal pin with external Programmer.



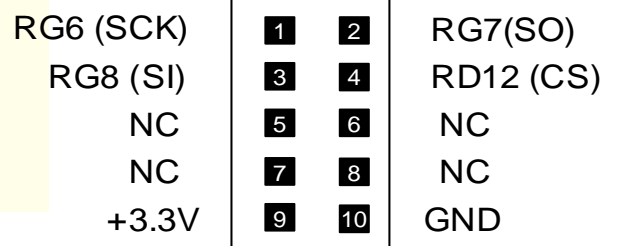
- **No.14** is Switch to select RUN Mode and PGM Mode. When this Switch is shifted to PGM position, it will on/off signal pin that is used to program data code into programmer to program the designed data by user. When this Switch is shifted to RUN position, it makes signal pins normal I/O.



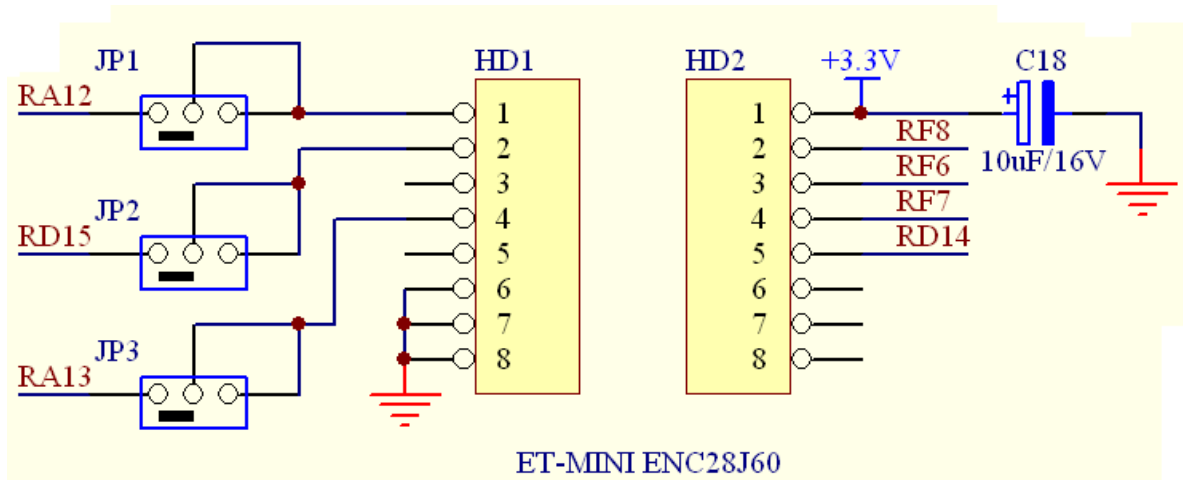
- **No.15** is Connector DC-JACK to supply power into board and support external voltage 7-12 VDC.
- **No.16** Is Switch Reset.
- **No.17** is IC Microcontroller dsPIC33FJ128GP708.
- **No.18** is EEPROM No.25LCxxx from Microchip that is SPI Interface.



SPI MEMORY



- **No.19** is Connector to interface with Module Ethernet Communication version ET-MINI ENC28J60.



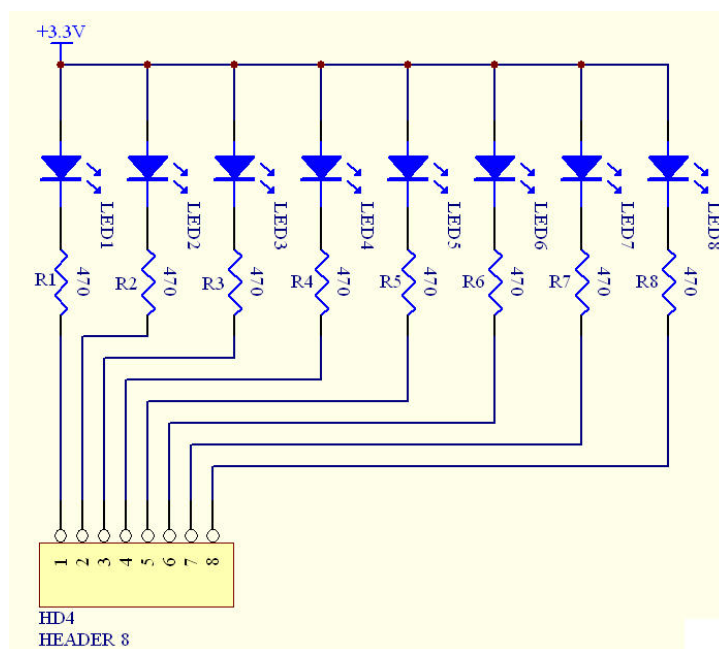
	RA12	RA13	RD15
DIS	●	●	●
EN	●	●	●
	INT	RST	WOL

Jumper to select the connection of RA12, RD15, and RA13 of Microcontroller with Pin INT, Pin RST, and Pin WOL of Module ET-MINI ENC28J60.

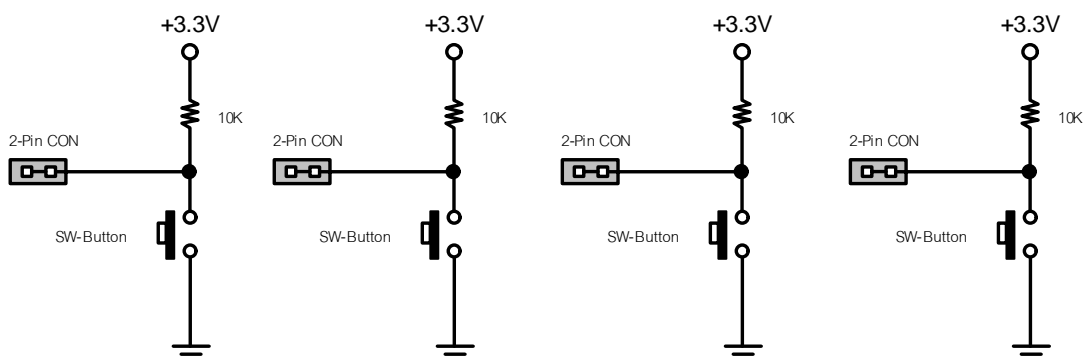
DIS = Disable: Not connect signal.

EN = Enable: Connect signal.

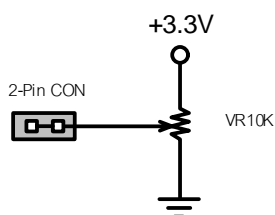
- **No.20** is Test I/O LED that consists of 8 LEDs as shown in the circuit below;



- **No.21** is device set to test signal Input from 4 sets of Switch; it can create signal Logic 0 (0 Volt) and Logic 1 (+3.3 Volt) as shown in the circuit below.



- **No.22** is 4 device sets to test Analog Voltage and can adjust voltage level in the range of 0-3.3 Volt. The connection circuit is shown below.



- **No.23** is available space to interface further circuit.

Module ET-MINI ENC28J60

ET-MINI ENC28J60 is the designed module to be a medium between the communication system of Microcontroller and Ethernet Network. It supports operation of Protocol TCP/IP by using IC ENC28J60 that is IC Ethernet Controller and support IEEE 802.3 standard communication. It connects signal control through SPI Bus with maximum speed 10 Mb/s. Microchip supports Microchip TCP/IP Stack to develop program and user can download free without any charge from Microchip website (www.microchip.com). The briefly specifications of ENC28J60 is described below;

Specifications of IC ENC28J60

General:

- IEEE 802.3 compatible Ethernet Controller
- Integrated MAC and 10BASE-T PHY
- 8 Kbyte Transmit/Receive Packet Dual Port Buffer SRAM
- Programmable Automatic Retransmit on Collision
- Programmable Padding and CRC Generation
- Programmable Automatic Rejection of Erroneous Packets
- SPI™ Interface with speeds up to 10 Mb/s
- Supports Full and Half-Duplex modes

Buffer:

- Configurable transmit/receive buffer size
- Hardware managed circular receive FIFO
- Byte-wide random and sequential access
- Internal DMA for fast memory copying
- Hardware assisted IP checksum calculation

PHY:

- Wave shaping output filter
- Loopback mode

MAC:

- Support for Unicast, Multicast and Broadcast packets
- Programmable pattern matching of up to 64 bytes within packet at user defined offset
- Programmable wake-up on multiple packet formats, including Magic Packet®, Unicast, Multicast, Broadcast, specific packet match or any packet

The connection with Microcontroller is simple because it uses SPI Bus Interface that uses fewer pins. In this case, its power system must be modified if user wants to use it with Microcontroller that runs with Voltage 5 Volt because ENC28J60 is IC that runs with Voltage 3 Volt. ETT team designs Buffer circuit to support the connection of power system between 3 Volt and 5 Volt internal Board ET-MINI ENC28J60; so, user can select power type by setting Jumper 5V/3V3.

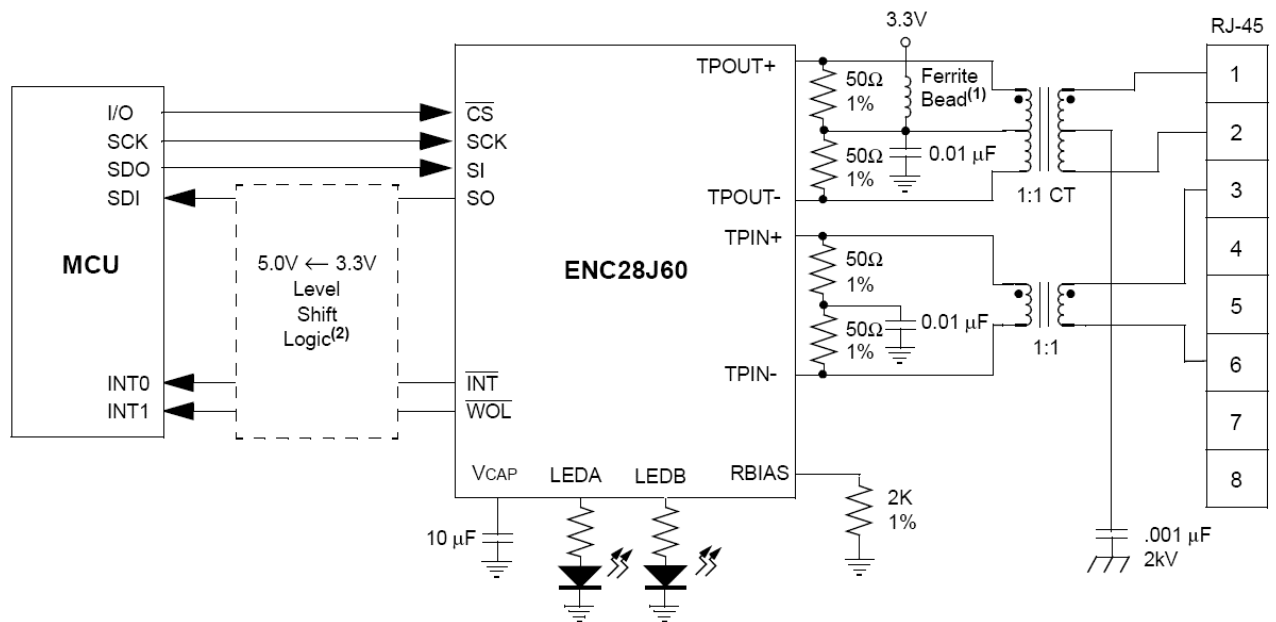
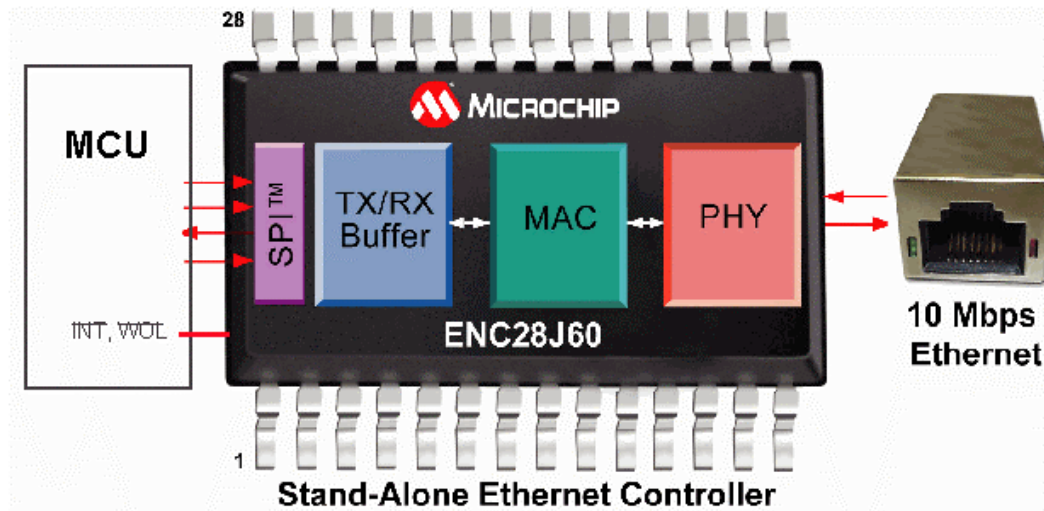


Figure displays block diagram of connection between ENC28J60 and Microcontroller.

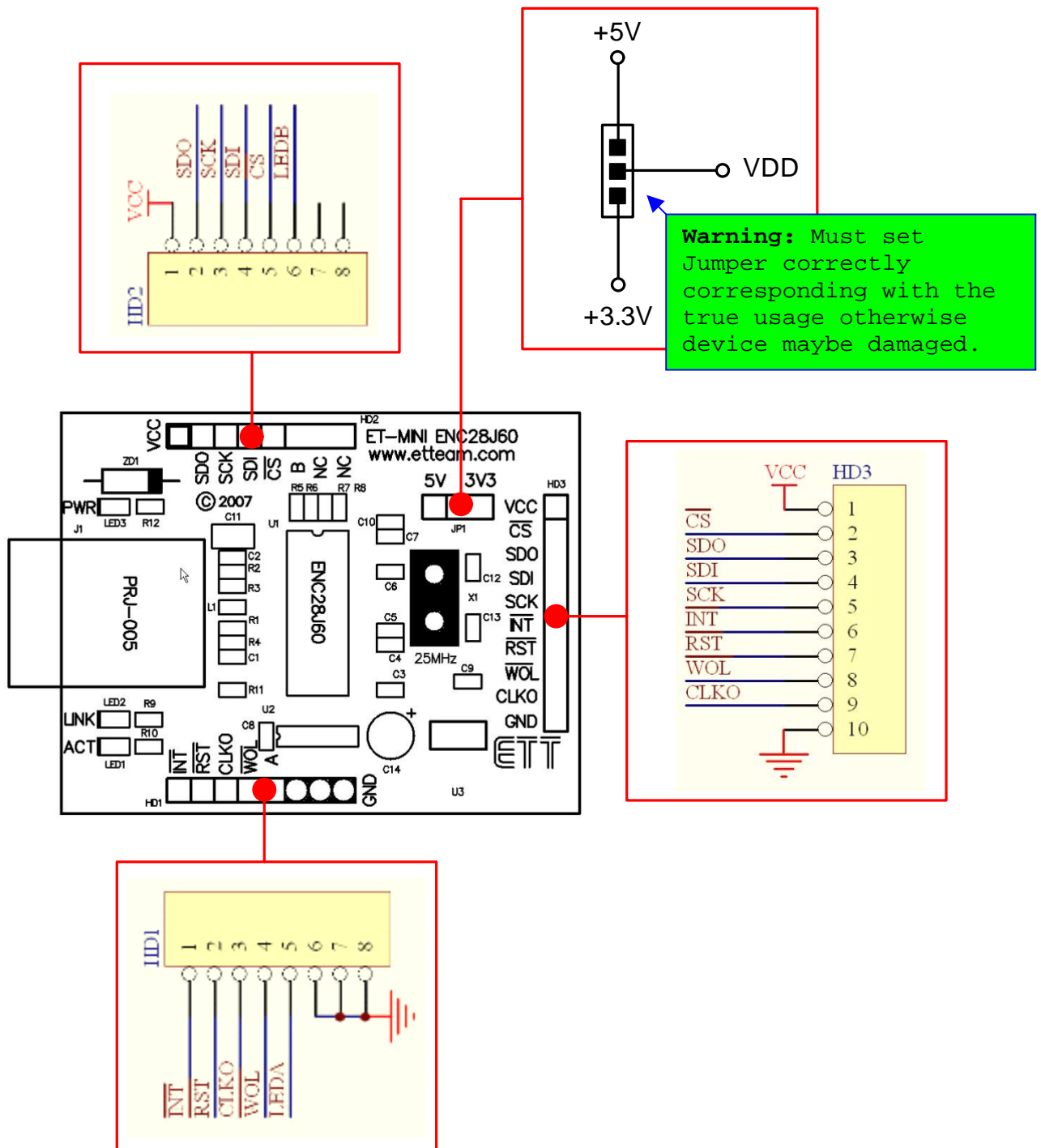


Figure displays structure of Board ET-MINI ENC28J60.

From figure above, HD1 and HD2 are designed to connect with Board ET-dsPIC33WEB V1.0; in this case, user can interface Board ET-MINI ENC28J60 at the provided Connector Female over Board ET-dsPIC33WEB V1.0 instantly. For HD3 is designed to connect with other desired Microcontroller.

Signal Name	Signal Type	Functions
\overline{CS}	INPUT	Signal Enable/Disable for SPI Bus connection of ENC28J60 CS = 0 is Enable the SPI connection of ENC28J60 CS = 1 is Disable the SPI connection of ENC28J60
SDO	OUTPUT	Signal Serial Data Output
SCK	INPUT	Signal Serial Clock
SDI	INPUT	Signal Serial Data input
\overline{INT}	OUTPUT	Signal Interrupt Active Logic 0
\overline{RST}	INPUT	Signal Reset Active Logic 0
\overline{WOL}	OUTPUT	Signal Wake-up on LAN interrupt Active Logic 0
CLKO	OUTPUT	Signal Programmable clock output
LEDA	OUTPUT	Display status of Signal LINK
LEDB	OUTPUT	Display status of Signal ACT

Table shows name and function of pins of ENC28J60.

ENC28J60	ET-dsPIC33WEB V1.0 (dsPIC33FJ128GP708)
\overline{CS}	RD14
SDO	RF8
SCK	RF6
SDI	RF7
\overline{INT}	RA12 (Set Jumper)
\overline{RST}	RD15 (Set Jumper)
\overline{WOL}	RA13 (Set Jumper)
CLKO	-
LEDA	-
LEDB	-

Table shows the connection between ENC28J60 and ET-dsPIC33WEB V1.0.

Summarize Allocation and Application of Board ET-dsPIC33WEB V1.0

Normally, MCU NO.dsPIC33FJ128GP708 that is used with Board ET-dsPIC33WEB V1.0 has signal Pin up to 69 I/O to independently apply. Some pin has already designed and connected with particular I/O device completely, so user can not use these I/O as general. We can summarize these pins as below;

MCU Oscillator

- **RC12** is used to be **OSC1** to connect with Crystal 8.00MHz to be signal Clock of MCU.
- **RC15** is used to be **OSC2** to connect with Crystal 8.00MHz to be signal Clock of MCU.

RTC Oscillator

- **RC13** is used to be **OSC1** to connect with Crystal 32.768KHz to be signal Clock of RTC.
- **RC14** is used to be **OSC2** to connect with Crystal 32.768KHz to be signal Clock of RTC.

RS232-CH1 Serial Port Communication (UART)

- **RF2** is used to be Pin **RXD** to receive data from RS232 Channel 1.
- **RF3** is used to be Pin **TXD** to transmit data to RS232 Channel 1.

RS232-CH2 Serial Port Communication (UART)

- **RF4** is used to be Pin **RXD** to receive data from RS232 Channel 2.
- **RF6** is used to be Pin **TXD** to transmit data to RS232 Channel 2.

Ethernet Module (SPI-1)

- **RF6** is used to be **SCK** to connect with Ethernet Module (ET-MINI ENC28J60).
- **RF7** is used to be **SDI** to connect with Ethernet Module (ET-MINI ENC28J60).
- **RF8** is used to be **SDO** to connect with Ethernet Module (ET-MINI ENC28J60).
- **RD14** is used to be **CS** to connect with Ethernet Module (ET-MINI ENC28J60).
- **RA12** is used to be **INT1** to connect with Ethernet Module (ET-MINI ENC28J60). In this case, user can select to use or not use as preferred by setting Jumper INT (EN/DS); normally, Jumper is set as DS (Disable: Not use).
- **RA13** is used to be **WOL** to connect with Ethernet Module (ET-MINI ENC28J60). In this case, user can select to use or not use as preferred by setting Jumper WOL (EN/DS); normally, Jumper is set as DS (Disable = Not use).
- **RD15** is used to be **RST** to connect with Ethernet Module (ET-MINI ENC28J60). In this case, user can select to use or not use as preferred by setting Jumper RST (EN/DS); normally, Jumper is set as DS (Disable = Not use).

SPI Memory Module (SPI-2)

- **RG6** is used to be **SCK** to connect with SPI Memory.
- **RG7** is used to be **SDI** to connect with SPI Memory.
- **RG8** is used to be **SD0** to connect with SPI Memory.
- **RD12** is used to be **CS** to connect with SPI Memory.

Character LCD Display

- **RD0** is used to be **LCD D4** to connect with 4 Bit Character LED.
- **RD1** is used to be **LCD D5** to connect with 4 Bit Character LED.
- **RD2** is used to be **LCD D6** to connect with 4 Bit Character LED.

- **RD3** is used to be **LCD D7** to connect with 4 Bit Character LED.
- **RD4** is used to be **LCD RS** to connect with 4 Bit Character LED.
- **RD5** is used to be **LCD RW** to connect with 4 Bit Character LED.
- **RD6** is used to be **LCD EN** to connect with 4 Bit Character LED.