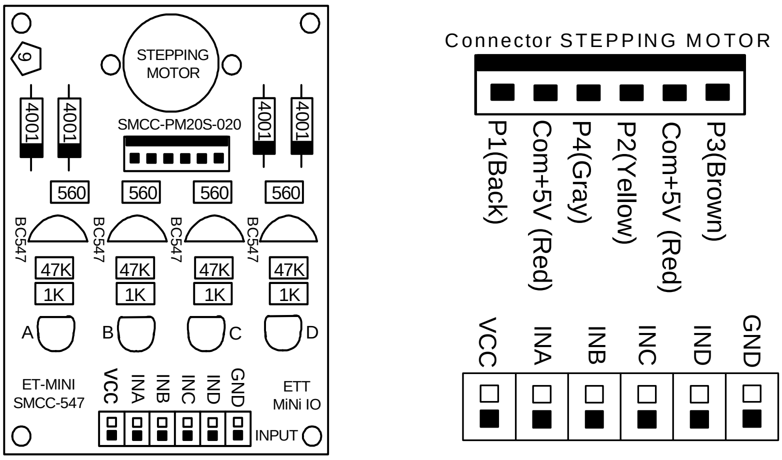
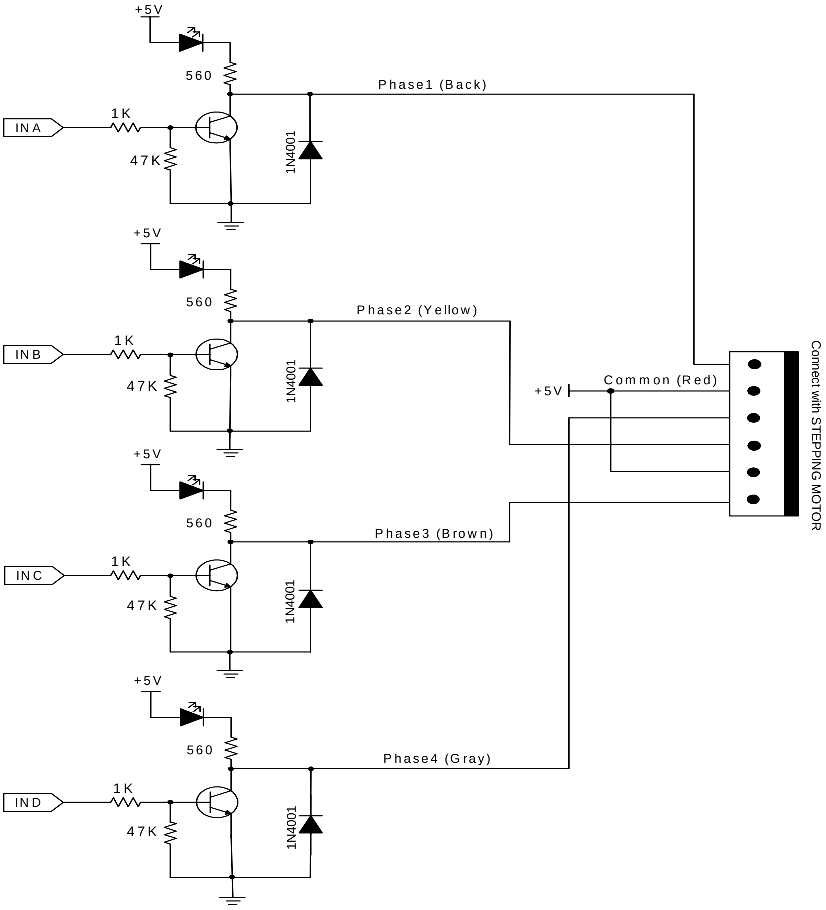
ET-MINI SMCC-547

Module ET-MINI SMCC-547 which is STEPPING MOTOR uses fine STEPPING about 18° per each step. This Module uses Transistor BC547 to be driver and uses LED to display operation of sending Logic “1” when Logic “1” is controlling each phase. LED will be in status ON to display which phase is running. User must continuously send Logic one phase by one phase and can start sending at any phase. There’s Pin INA, INB, INC and IND in this Module for interfacing with I/O Pin of MCU and it makes MCU can send Logic “1” to control Step of phase rotation as one phase by one phase. Its pin position’s arrangement is shown as in the picture below. In the Vcc part, it uses 5V power supply and if using 3.3V MCU, must have OPTO to transform Logic from 3V into 5V.



Picture displays structure of ET-MINI SMCC-547 and Port Pin position.



Picture displays circuit of ET-MINI SMCC-547.

ET-MINI DC-MOTOR

Module ET-MINI DC-MOTOR which is DC Motor 5V can control left and right rotate directions and can read rotate cycle by using Opto as Sensor. The feature of using connectors and sending Logic to control rotation are shown in the picture below. Function of IN1 connector and IN2 connector are directional controller and function of EN connector is Enable. It runs with Logic “1”. OPA and OPB Connector send Signal Logic “1” into MCU when fan blade of DC Motor touches Opto Sensor. If nothing touches Sensor of OPA and OPB connector, it will display as “0”. It is suitable for reading Motor’s rotate cycle and user can select to read default values of OPA connector or OPB connector.

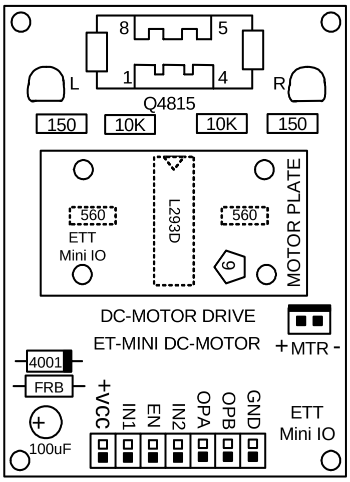
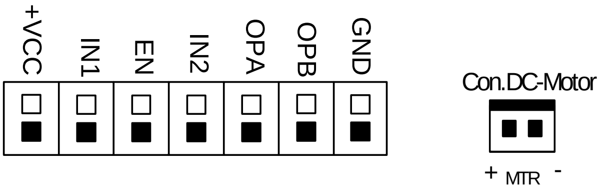
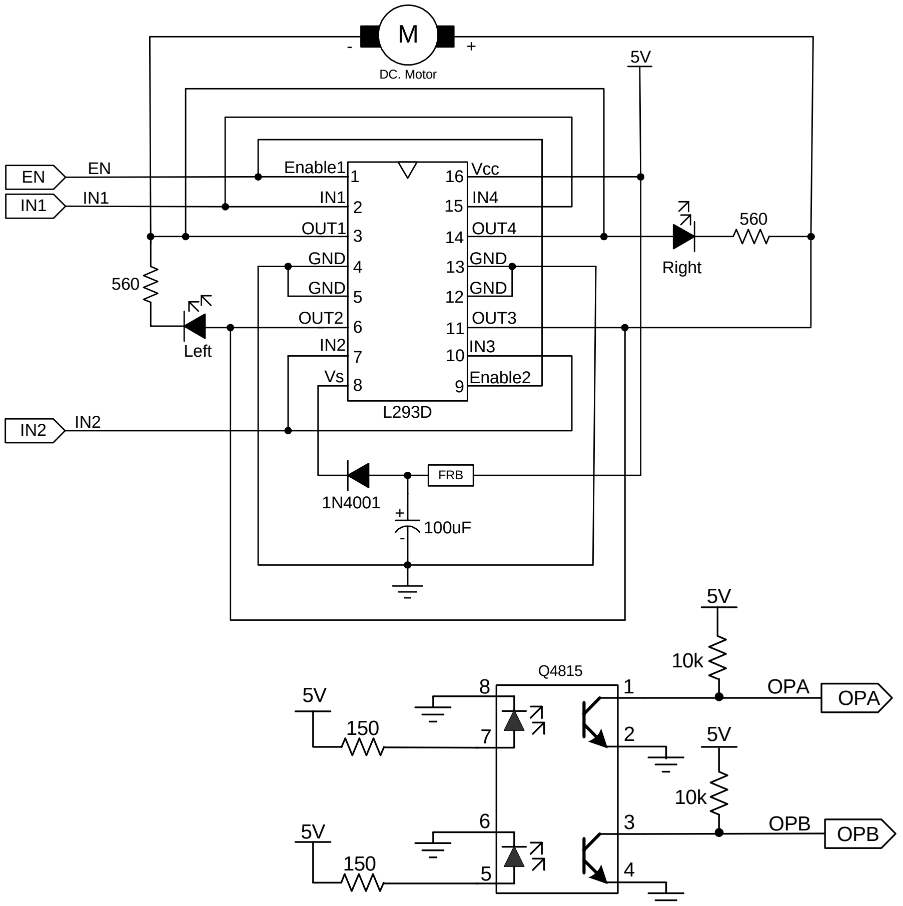


Table of Control DC-MOTOR

Control DC MOTOR								
RIGHT(R)			LEFT(L)			STOP		
EN	IN1	IN2	EN	IN1	IN2	EN	IN1	IN2
1	1	0	1	0	1	0	x	x



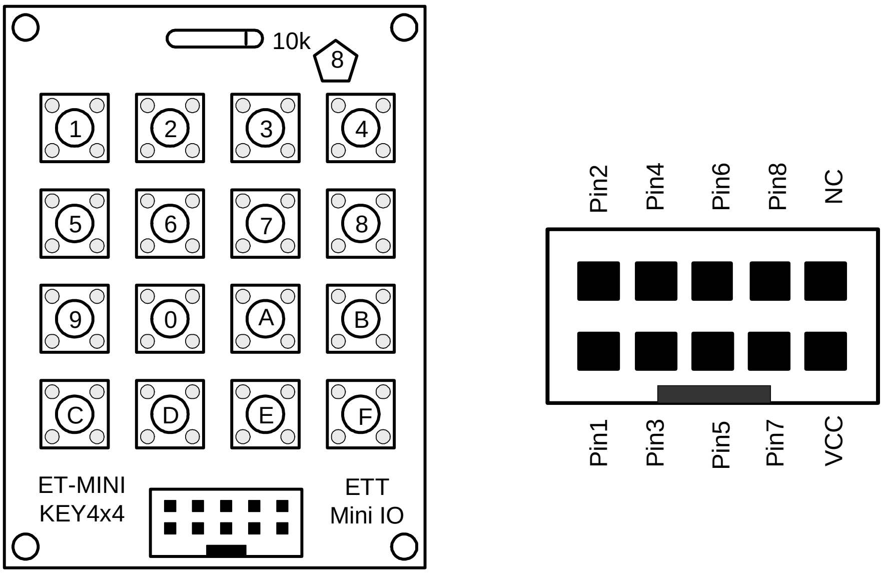
Picture displays structure of ET-MINI DC-MOTOR and Port Pin position.



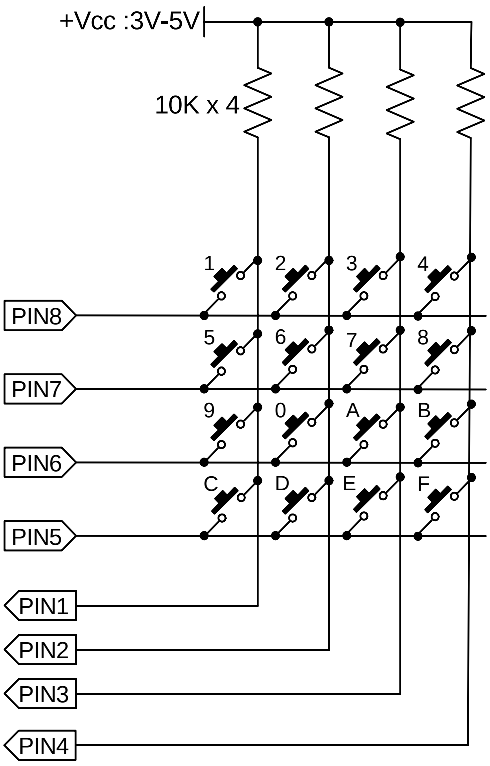
Picture displays circuit of ET-MINI DC-MOTOR.

ET-MINI KEY 4x4

Module ET-MINI KEY 4x4 which is Matrix Keyboard 4x4 has 8 PIN to interface with Microcontroller. PIN1-PIN4 (Column) is INPUT and MCU reads codes through key pressing and PIN5-PIN8 (ROW) is OUTPUT and MCU sends Logic “0” to scan key in each row. MCU operation is reading status Logic of Key in each unit through PIN1-PIN4. If any key is not pressed, status Logic is “1” but if any key is pressed, status Logic is “0”. Before reading status Logic in each unit, MCU always sends Logic “0” into each key’s ROW (PIN5-PIN8). Picture below displays PIN position and circuit.



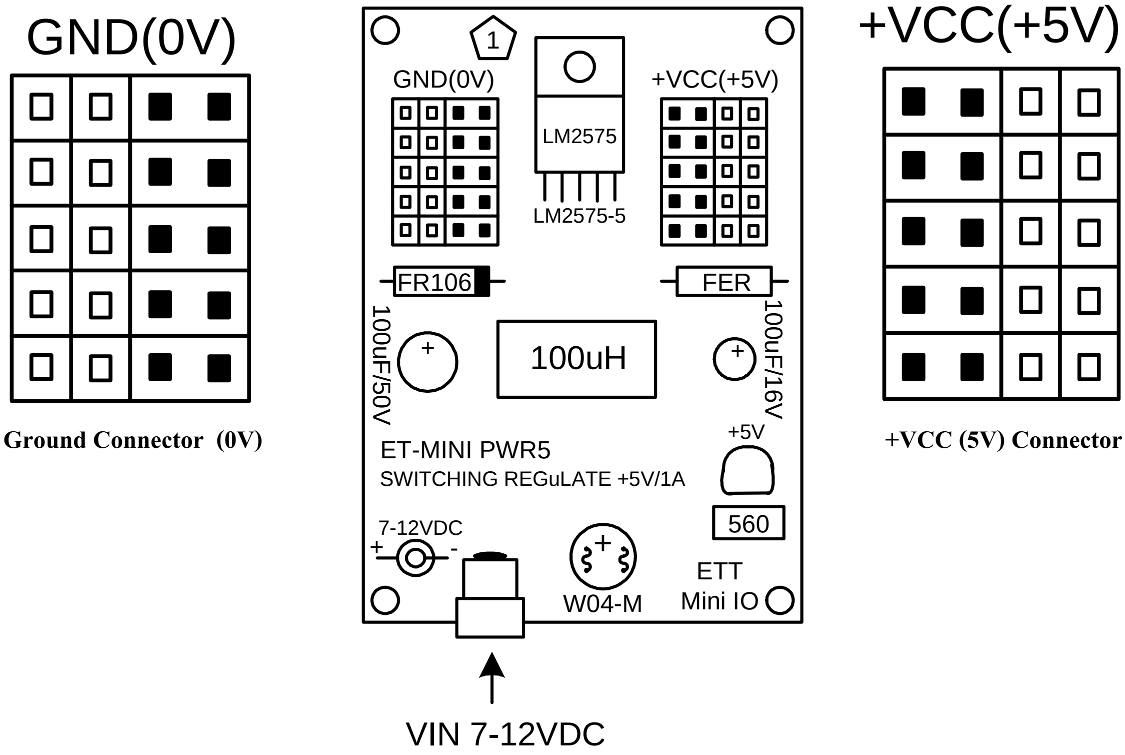
Picture displays structure of ET-MINI KEY 4x4 and Port PIN position.



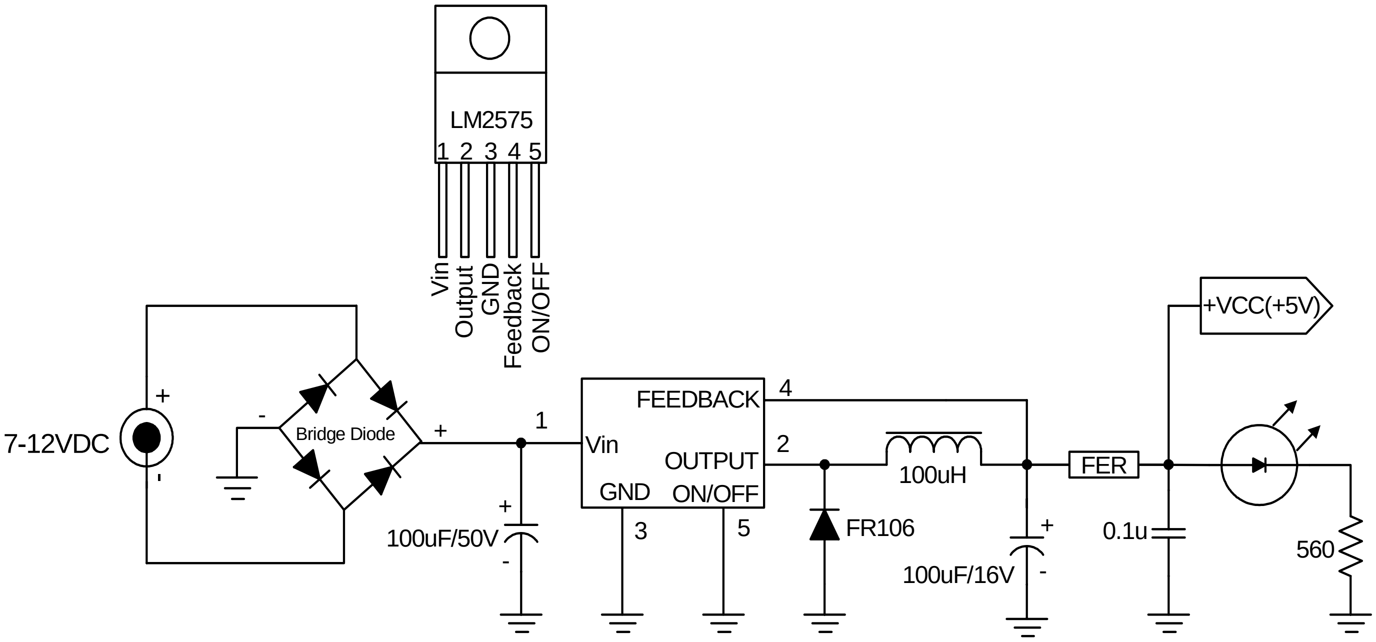
Picture displays circuit of ET-MINI KEY 4x4.

ET-MINI PWR5

Module ET-MINI PWR5 which is 1A Switching Regulate +5V has LED display status operation of Module. Using this Module, must interface 7V-12V DC Output adapter with Jack connector as in the picture below. If Module runs as normally, LED will displays as red color and then user can interface cable with OUTPUT 10 PIN Connector at position of +VCC(+5V) and GND(0). It uses 5V OUTPUT power supply.



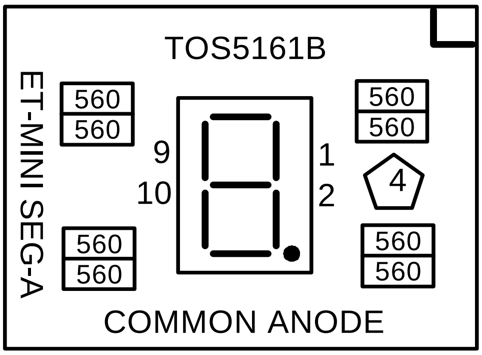
Picture displays structure of ET-MINI PWR5 and OUTPUT Connector.



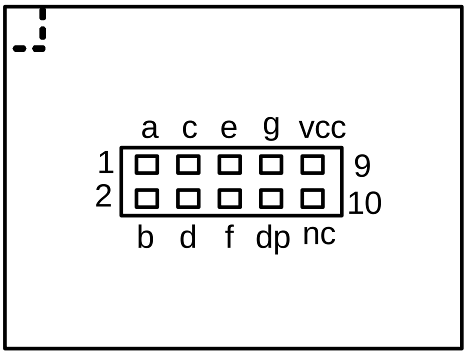
Picture displays circuit of ET-MINI PWR5.

ET-MINI SEG-A

Module ET-MINI SEG-A which is Common Anode 7-SEGMENT is interfaced with Resistor completely. So, user can interface signal from I/O Pin of MCU with Connector below of MCU and pin position's arrangement on Module is shown in the picture below. Using this Module, must interface Common Pin with Vdd and must interface a-dp Pin with 8 Pin Port I/o of MCU. If sending Logic "0" to which Segment, that Segment will be in status ON and if displaying number, must decode and decide to send Logic "0" to which Bit. It is easier to decode if user interfaces I/O of MCU as same as 7-Segment's pin arrangement.

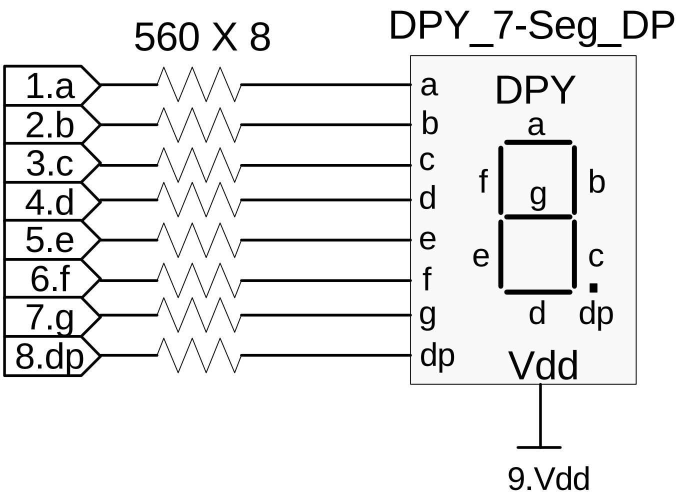


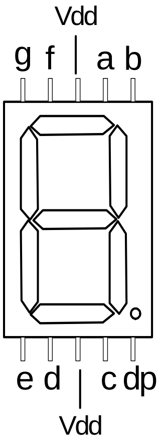
Picture above



Picture below (not use 10 Pin)

Picture displays structure of ET-MINI SEG-A and Port Pin position.



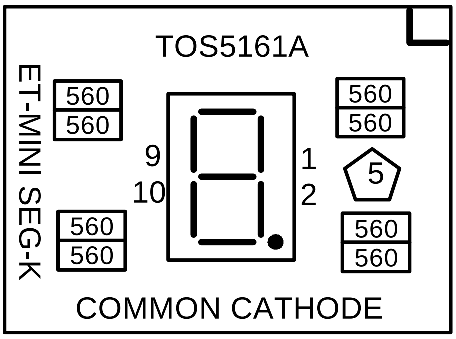


Pin Position of 7-Segment

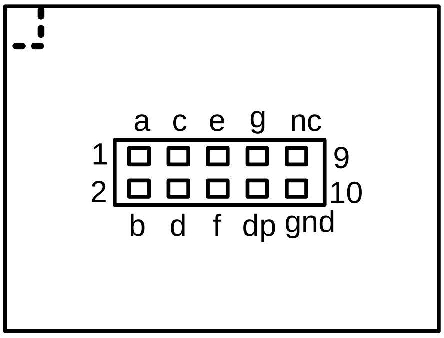
Picture displays circuit of ET-MINI SEG-A.

ET-MINI SEG-K

Module ET-MINI SEG-K which is Common Cathode 7-SEGMENT is interfaced with Resistor completely. So, user can interface signal from I/O Pin of MCU with Connector below of Module and pin position's arrangement on Module is shown in the picture below. Using this Module, must interface Common Pin with Ground and interface a-dp Pin with 8 Pin Port I/O of MCU. If sending Logic "1" to which Segment, that Segment will be in status ON and if displaying number, must decode and decide to send Logic "1" to which Bit. It is easier to decode if user interfaces I/O of MCU as same as 7-Segment's pin arrangement.

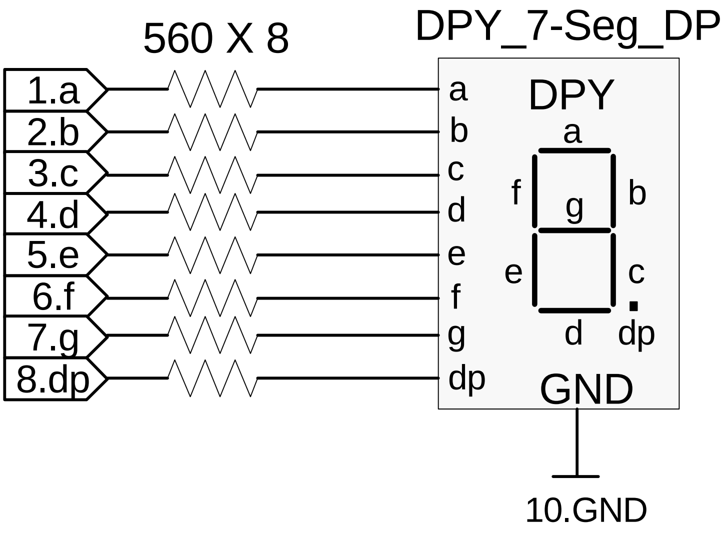


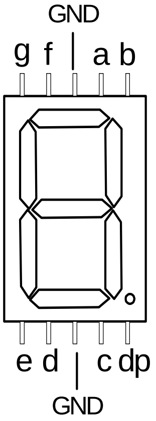
Picture above



Picture below (not use 9 Pin)

Picture displays structure of ET-MINI SEG-K and Port Pin position.



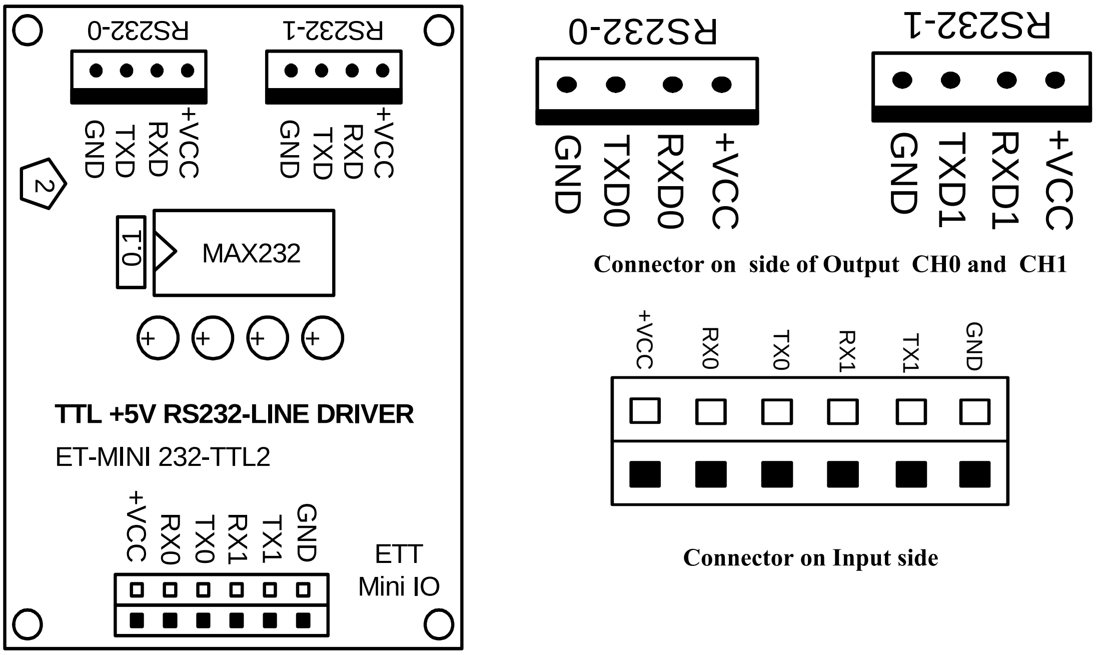


Pin position of 7-Segment

Picture displays circuit of ET-MINI SEG-K.

ET-MINI 232-TTL2

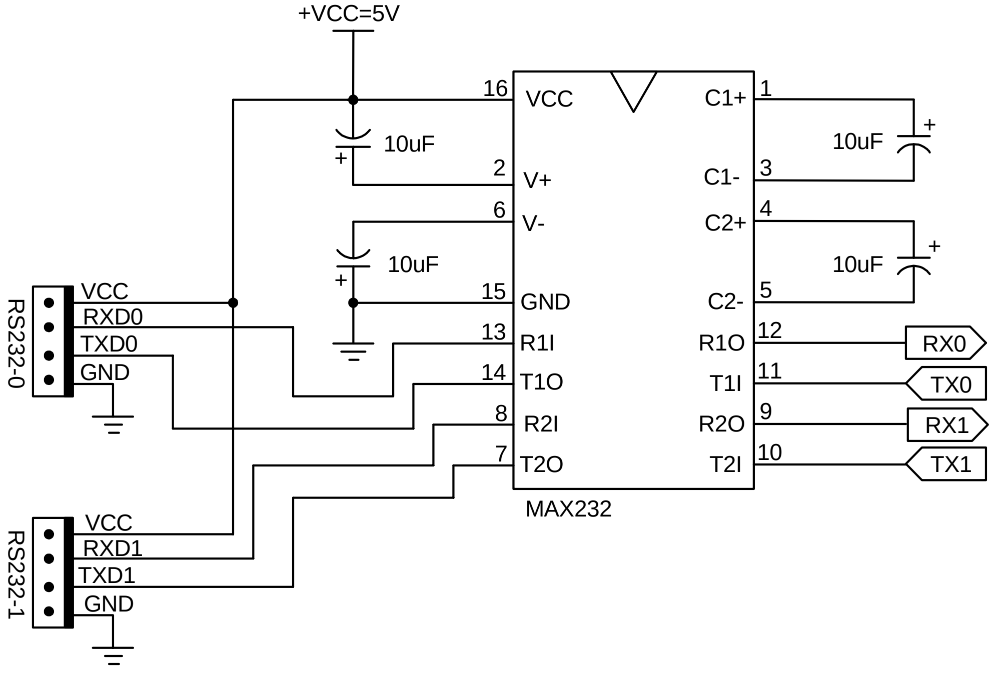
Module ET-MINI 232-TTL2 which is RS232 Communication Line Driver uses 5V power supply. It transforms TTL signal of MCU into RS232(±12V). There's 2 channels for using. Firstly, Connector on Input side, must interface Tx PIN and Rx PIN with Tx PIN and Rx PIN of MCU respectively. User must interface Tx PIN and Rx PIN in the same channel (Tx0:Rx0, Tx1:Rx1). In the part of +VCC PIN and GND PIN, must interface with power supply of MCU. Secondly, Connector on Output side, uses the same channel as Input side and then interfaces Rx PIN with Tx PIN and interfaces Tx PIN with Rx PIN of communicate device. Finally, interfaces GND PIN with GND PIN of communicate device but in the part of +VCC, does not interface its.



Connector on side of Output CH0 and CH1

Connector on Input side

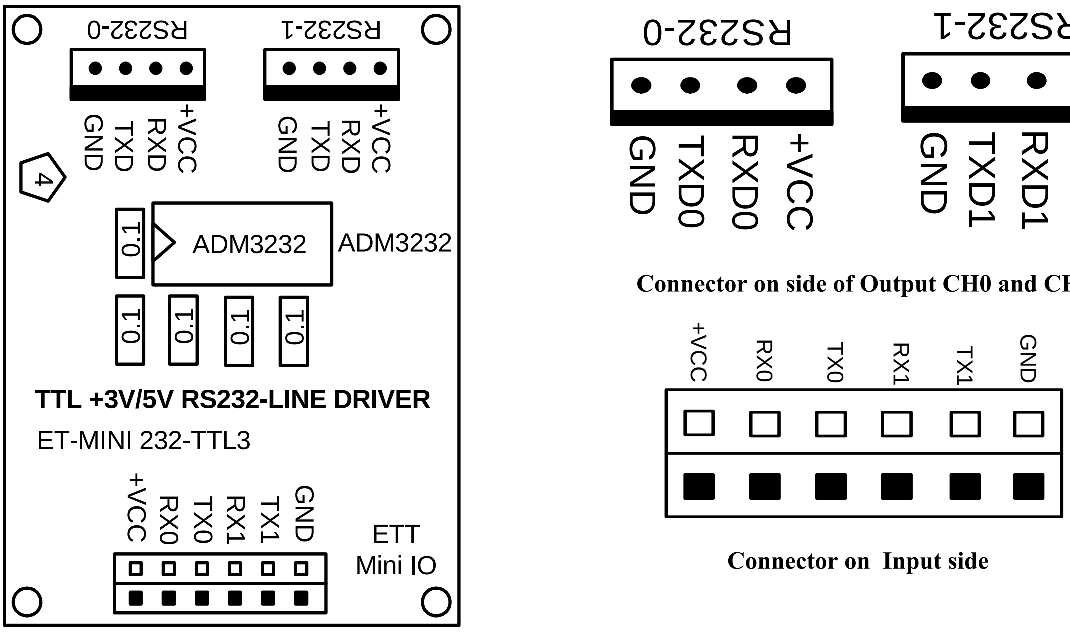
Picture displays structure of ET-MINI 232-TTL2 and Port PIN position.



Picture displays circuit of ET-MINI 232-TTL2.

ET-MINI 232-TTL3

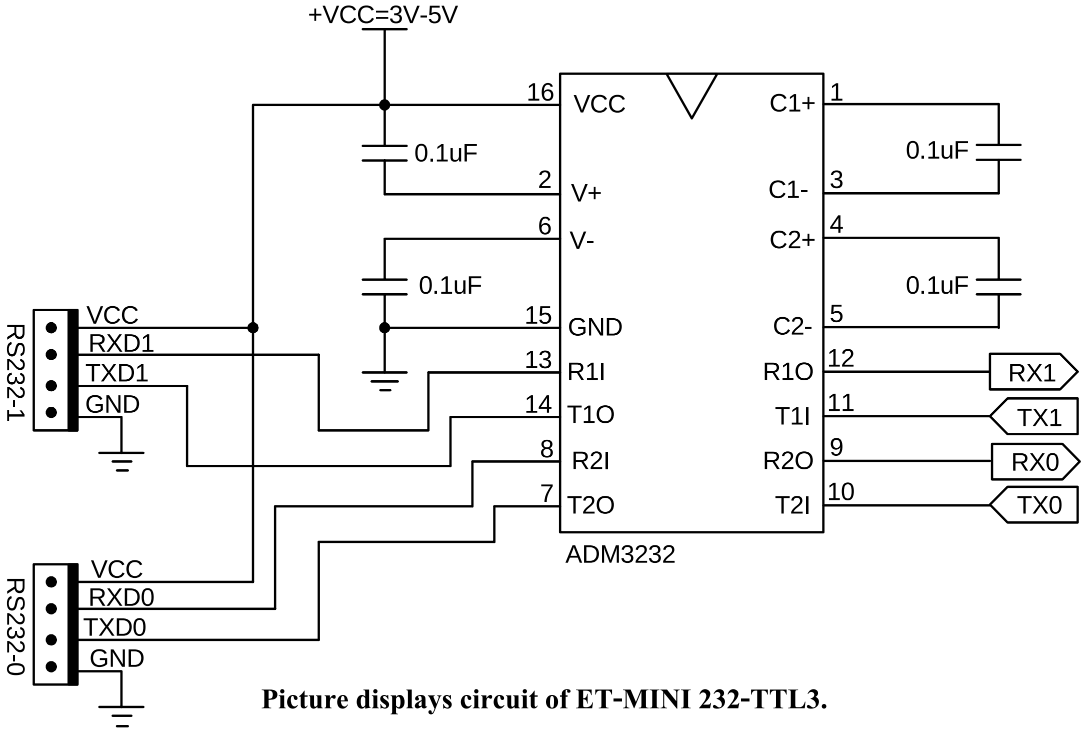
Module ET-MINI 232-TTL3 which is RS232 Communication Line Driver uses 3V-5V power supply. It transforms TTL signal of MCU into RS232(±12V). There's 2 channels for using. Firstly, Connector on Input side, must interface Tx PIN and Rx PIN with Tx PIN and Rx PIN of MCU respectively. User must interface Tx PIN and Rx PIN in the same channel (Tx0:Rx0, Tx1:Rx1). In the part of +VCC PIN and GND PIN, must interface with power supply of MCU. Secondly, Connector on Output side, uses the same channel as Input side and then interfaces Rx PIN with Tx PIN and interfaces Tx PIN with Rx PIN of communicate device. Finally, interfaces GND PIN with GND PIN of communicate device but in the part of +VCC, does not interface its.



Connector on side of Output CH0 and CH1

Connector on Input side

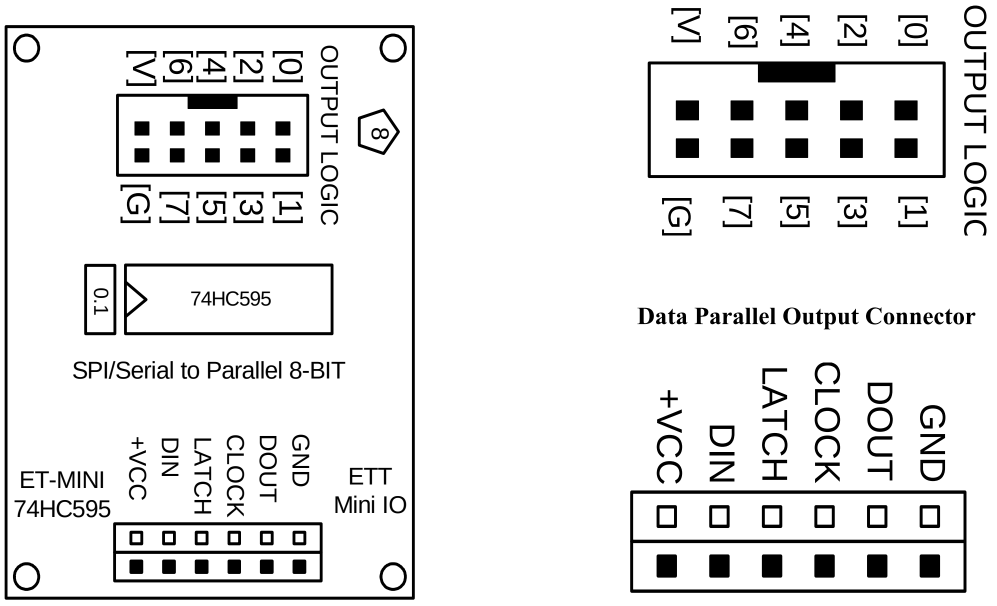
Picture displays structure of ET-MINI 232-TTL3 and Port PIN position.



Picture displays circuit of ET-MINI 232-TTL3.

ET-MINI 74HC595

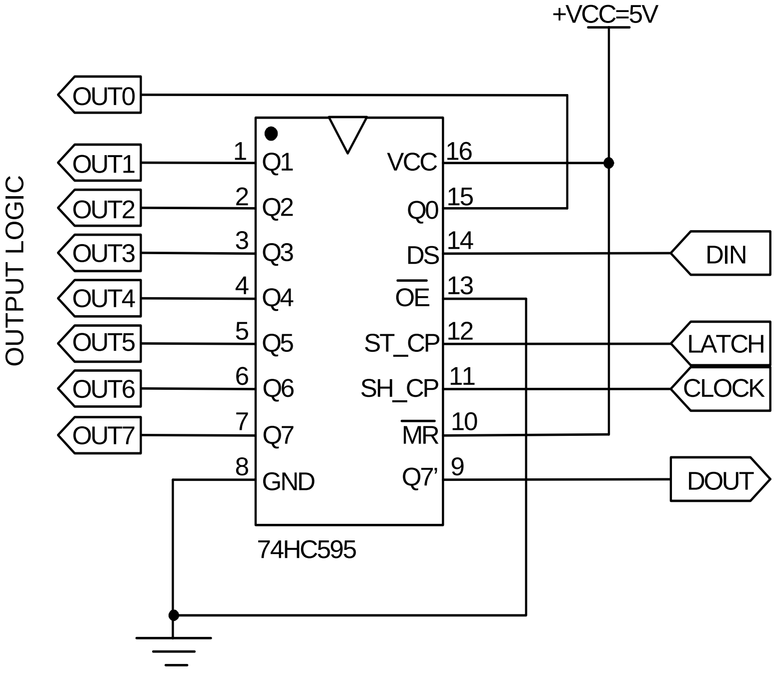
Module ET-MINI 74HC595 is 8 Bit Serial-IN, Serial or Parallel-OUT Shift Register. It can test MCU's SPI communication and its features of Module and Connector display in picture below. When using SPI communication, we use DIN Connector to receive Serial data from MCU (interfaced with MOSI of MCU). LATCH Connector is interfaced with I/O PIN of MCU. It runs at edge rising time of Clock (from 0 to 1)and it delivers Parallel data through 10 PIN Connector in Output Logic side of Module. CLOCK Connector runs at edge rising time and interfaces with SCLK PIN of MCU(SPI). Signal CLOCK that is received from MCU, we use its for Shift 8 Bit data that is entered per time. DOUT Connector is Output PIN for sending Serial data and 10 PIN Connector is Output PIN for sending Parallel data.



Data Parallel Output Connector

Connectoron Input Side

Picture displays structure of ET-MINI 74HC595 and Port Pin position.

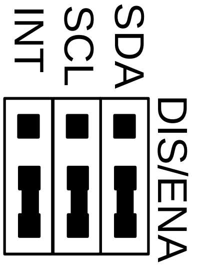


Picture displays circuit of ET-MINI 74HC595.

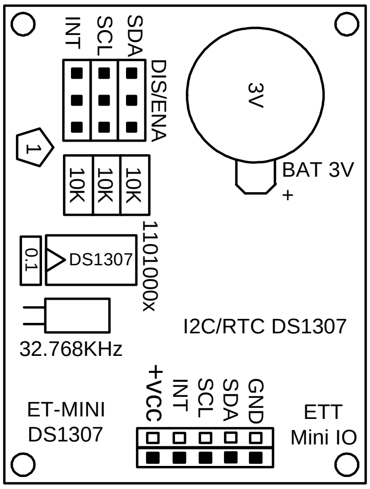
ET-MINI DS1307

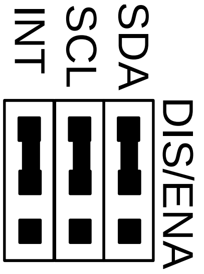
Module ET-MINI DS1307 which is Real Time Clock (RTC) I^{2}C displays Time Base such as Clock, Timer, and Calendar. There's SDA Connector and SCL Connecter for interfacing with SDA PIN and SCL PIN of MCU respectively and for external INT Connector interfaces with MCU when uses Interrupt. It uses VDC 3V-5V power supply and this I^{2}C No. has Control Byte "1101000X". Moreover, there's battery box to back UP Time Base correctly when Module is not supplied power.

Using this Module, firstly, Set Jumper SDA, SCL and INT and place on ENA side as in the picture. It interfaces R Pull Up with all 3 PIN of I^{2}C. If interface R Pull Up with 3 PIN of I^{2}C. If R Pull Up is interfaced in Line SDA and SCL from external or is interfaced from other Module, must Set Jumper of all 3 PIN and place on DIS side because it does not interface R Pull Up once.

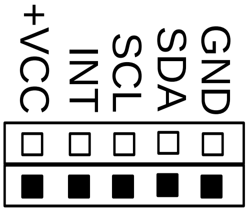


Set Jumper when interface with R Pull Up

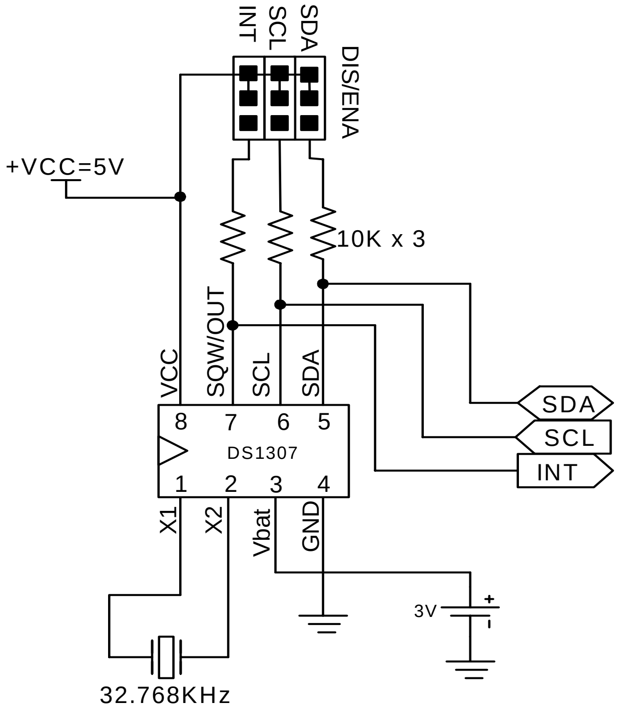




Set Jumper when not interface with R Pull Up



Picture displays structure of ET-MINI DS1307 and Port PIN position.

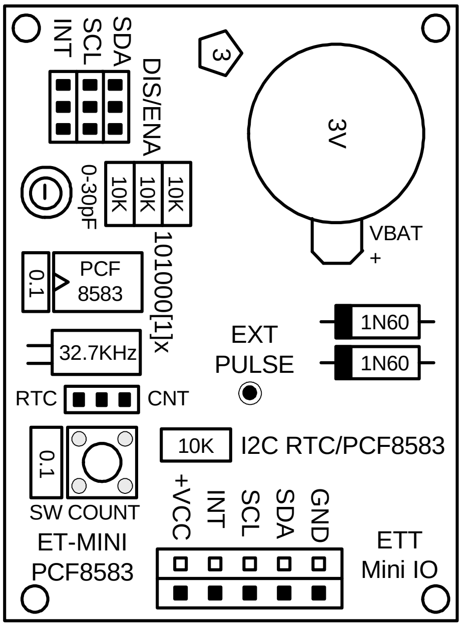


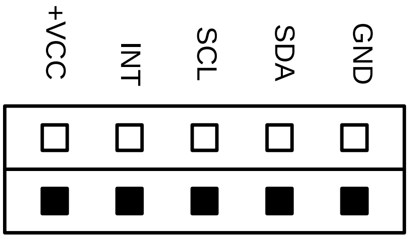
Picture displays circuit of ET-MINI DS1307.

ET-MINI PCF8583

Module ET-MINI PCF8583 which is Real Time Clock (RTC) I^{2}C displays Time Base such as Clock, Timer, and Calendar. Moreover, it can adapt to be Counter for external Clock. There's 2 Modes that are Mode RTC and Mode Counter. When using Mode RTC, there's C adjustment for Frequency Crystal. It makes Crystal create frequency correctly and get accurate Time Base. There's battery box to back up I^{2}C because it makes Time Base can run continuously, otherwise there's no power supply into Module. When using Mode Counter(CNT), there's pulse Connector that can input Pulse signal from external generator into I^{2}C. Moreover, there's SW COUNT that can create pulse signal by self.

Control Byte of I^{2}C Module is assigned as 101000[1]x. Interface SDA Connector and SCL Connector with SDA PIN and SCL PIN of MCU respectively. In case of not use INT Connector, it is not necessary to interface its but in case of using this connector, must interface INT connector with PIN of MCU that is assigned to receive INT signal. In part of +VCC PIN and GND PIN interface with power supply of MCU instantly.

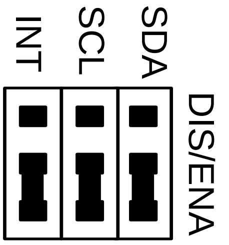




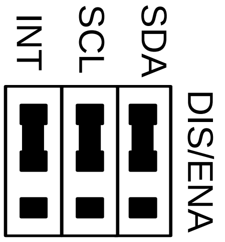
Pin Connector's arrangement On Input side.

Picture displays structure of ET-MINI PCF8583 and Port PIN position.

Using this I^{2}C Module, there's 2 points to Set Jumper. Firstly, it is at Jumper DIS/ENA point, must Set Jumper SDA, SCL and INT on ENA side. It interfaces R Pull Up with I^{2}C PIN of SDA, SCL and INT. In case of interface R Pull Up from external or other Module I^{2}C in Line of SDA and SCL, it is not necessary to interface R Pull Up once. User only Set Jumper all 3 of them on DIS side and R Pull Up will be taken off as in the picture below.

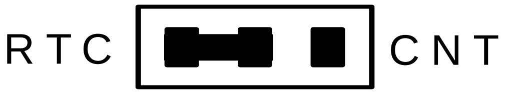


Set Jumper when interface with R Pull Up

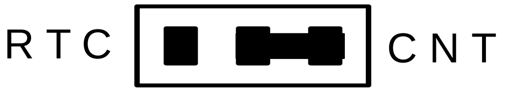


Set Jumper when not interface with R Pull Up

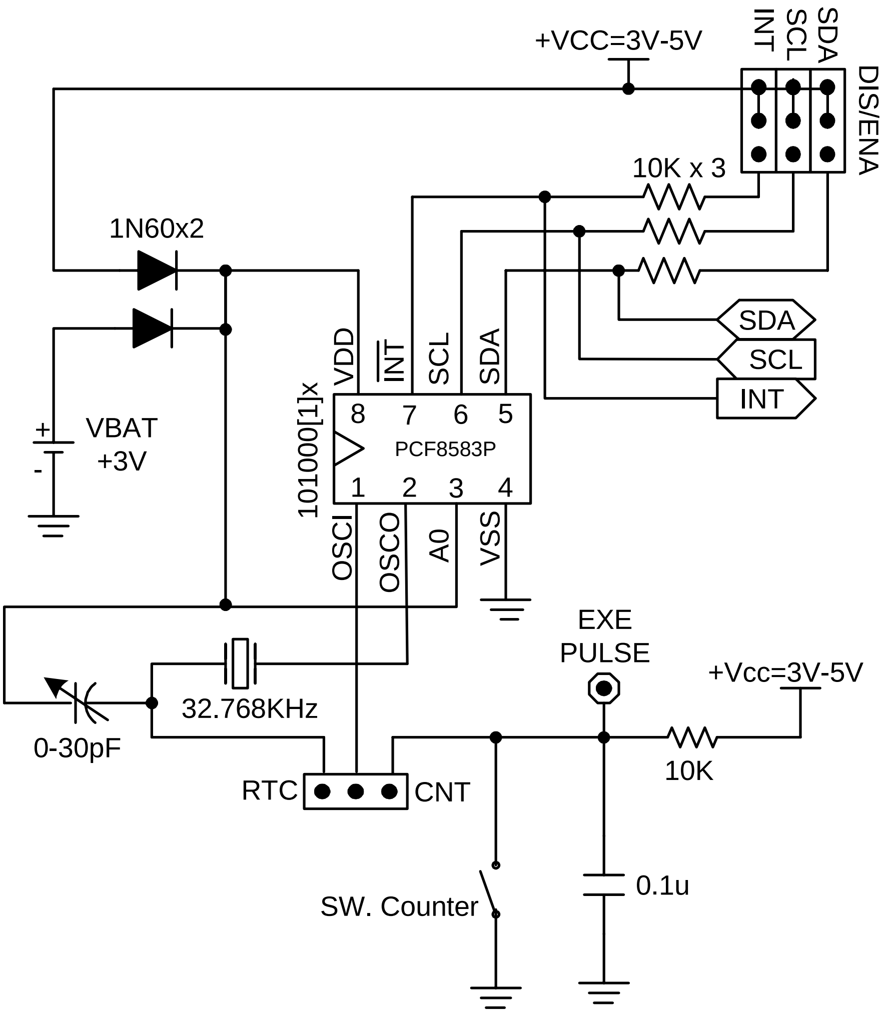
Secondly, it is at RTC/CNT point. It chooses mode operation of I^2C. In case of using Mode RTC, must Set Jumper on RTC side. It interfaces Crystal Pin with OSCI Pin. In case of using Mode Counter, must Set Jumper on CNT side. It interfaces Pin that receives Pulse signal from external and from SW Counter with OSCI Pin of I^2C as in the picture below.



Set Jumper when using I^2C to be RTC



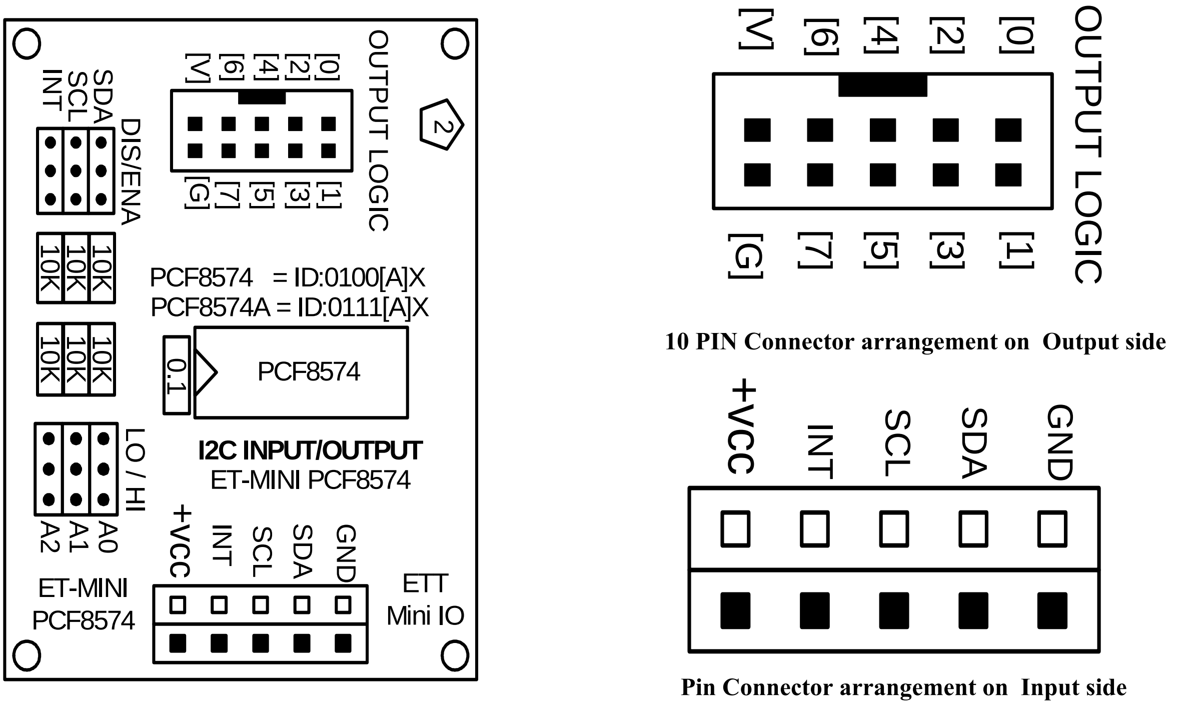
Set Jumper when using I^2C to be to be Counter



Picture displays circuit of ET-MINI PCF8583.

ET-MINI PCF8574

Module ET-MINI PCF8574 is 8 Bit I^{2}C Port I/O expansion for Microcontroller. There's 2 Module No. and both Module No.PCF8574 and Module No.PCF8574A are replaceable. Both of them have the same specifications but some Control Byte are only differently. Using this Module, interface SDA Connector and SCL Connector of Module with SDA PIN and SCL PIN of MCU respectively. In part of +VCC and GND can interface with power supply of MCU instantly. This I^{2}C No. uses 2.6V-6.0V power supply. It is not necessary to interface INT PIN, in case of not using its. Port on Output side of I^{2}C must interface with 10 PIN Connector and feature of PIN arrangement is displayed in picture below. It can interface to control I/O device that uses less power supply such as LED.

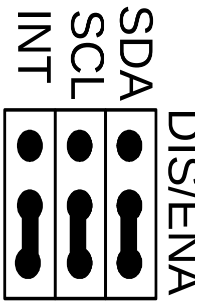


10 PIN Connector arrangement on Output side

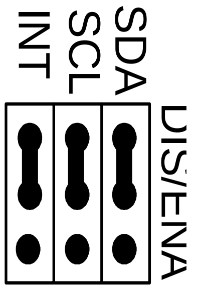
Pin Connector arrangement on Input side

Picture displays structure of ET-MINI PCF8574 and Port PIN position.

Using this I^{2}C Module, there's 2 points to Set Jumper. Firstly, it is at Jumper ENA/DIS point, must Set Jumper SDA, SCL and INT on END side. It interfaces R Pull Up with I^{2}C PIN of SDA, SCL and INT. In case of interface R Pull Up from external or other Module I^{2}C in Line of SDA and SCL, it is not necessary to interface R Pull Up once. User only Set Jumper all 3 of them on DIS side and R Pull Up will be taken off as in the picture below.

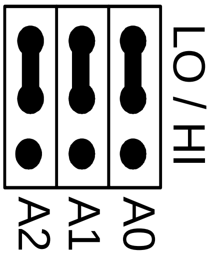


Set Jumper when interface with R Pull Up

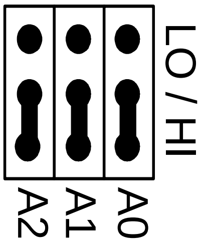


Set Jumper when not interface with R Pull Up

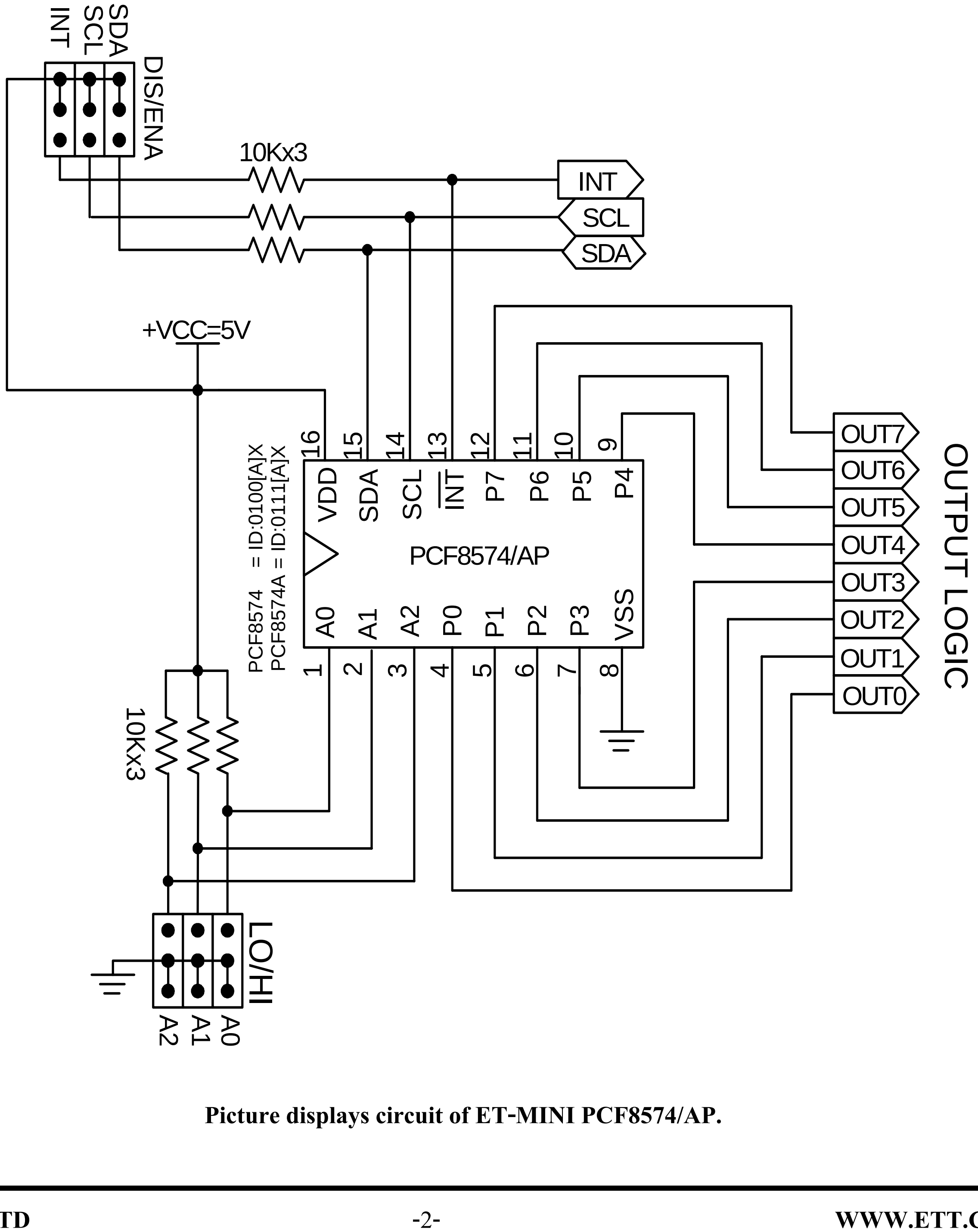
Secondly, it is at LO/HI point. It chooses position address for I^2C and user can Set Jumper as required. Then combine default value of position address and Control Byte of I^2C together because it can control I^2C No. correctly. If Set Jumper on Lo side, Address PIN is “0”, and if Set Jumper on HI side, Address PIN is “1” as an example in the picture.



Set Jumper A0,A1,A2 = 000



Set Jumper A0,A1,A2 = 111



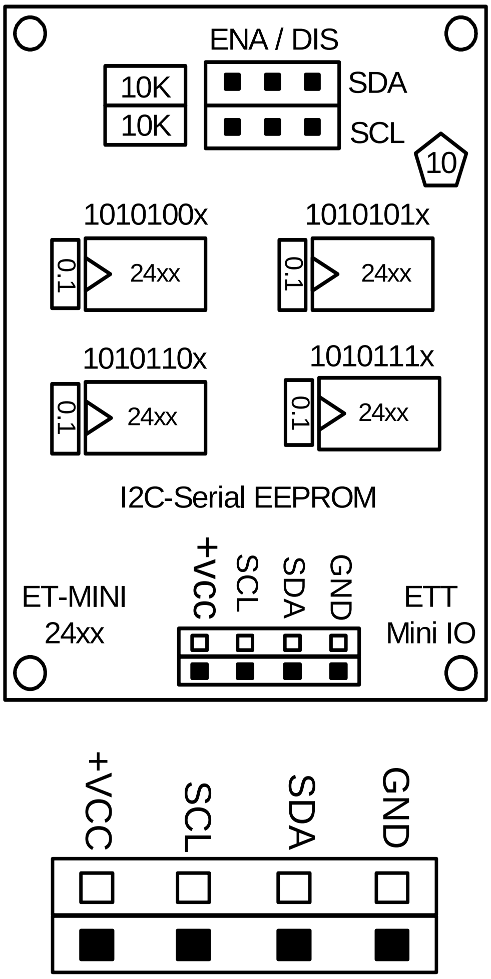
Picture displays circuit of ET-MINI PCF8574/AP.

ET-MINI 24xx

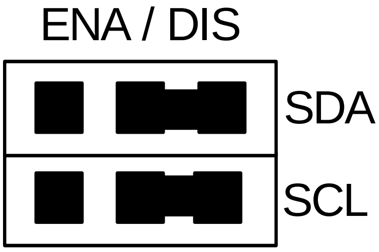
Module ET-MINI 24xx which is I^2C E^2PROM 24xx family collects data. There's 4 Modules, so user can communicate which Module. Each Module has different address and shows on board, so user must select correct address for using Module.

Using this Module, must select Set Jumper SDA and SCL to place in ENA side and then interface R Pull UP with SDA PIN and SCL of I^2C. If R Pull UP is interfaced from external in Line of SDA and SCL or from other Module I^2C, it is not necessary to interface R Pull Up once. In this case, only interface both Set Jumper to place in DIS side for taking off R Pull Up from SDA PIN and SCL of I^2C in Module.

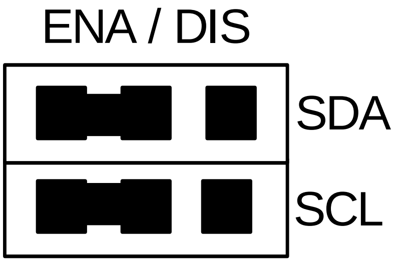
In part of Module Connector, interface SDA Connector with SDA PIN of MCU and also interface SCL Connector with SCL PIN of MCU and then user can read and write this E^2Prom No. In this case, user must have knowledge of using this E^2Prom No. because can control its writing and reading correctly.



Picture displays position of Module Connection.

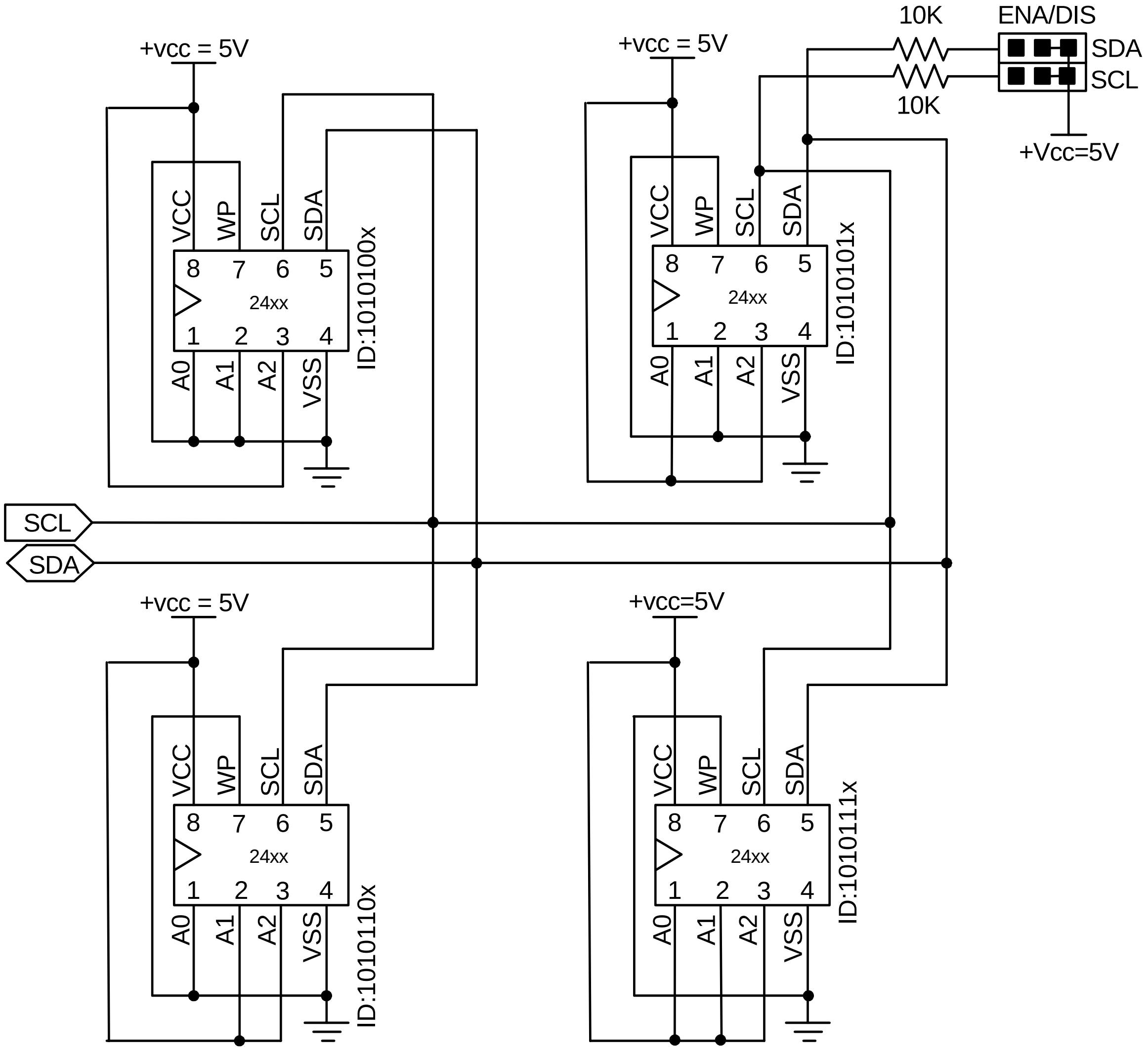


Picture displays Set Jumper when it does not interface with R Pull Up.



Picture displays Set Jumper when it interfaces with R Pull Up.

Picture displays structure of ET-MINI 24xx, Port Pin position and Set Jumper.

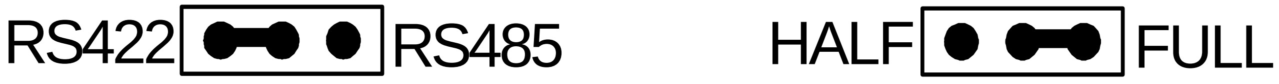


Picture displays circuit of ET-MINI 24xx.

ET-MINI 422/485

Module ET-MINI 422/485 which is Line Driver transform TTL Signal of CPU into Balance Line for sending/receiving signal in the same Balance Line. This Module can use as RS232 and RS485 communication. In case of using RS232 communication, it uses 2 IC Line Drivers and in case of using RS485 Communication, it uses 1 IC Line Driver. It usually communicate in Network type and method for using Module is ;

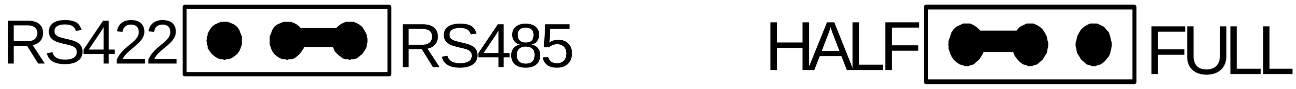
1. Using RS422 Communication : Connector on Input side of Module, must interface RX Connector and TX connector with RX PIN and TX PIN of MCU respectively and then interface +5V power supply. Then Set Jumper near IC Line Driver and place on RS422 side and FULL side as in the picture. In this case, we do not use DIR Connector.



Picture displays Set Jumper when using RS422 Communication.

For Connector on Output side of Module, must interface with RS422 communicative device. It uses 4 cables and then interface T(+) PIN and T(-) PIN of Module with R(+) PIN and R(-) PIN of communicative device respectively. After that interface R(+) PIN and R(-) PIN of Module with T(+) PIN and T(-) PIN of communicative device respectively.

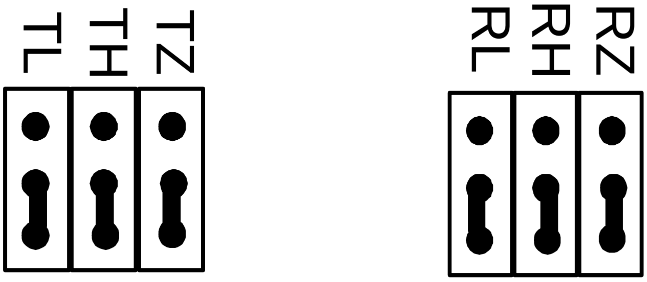
2. Using RS485 Communication : Connector on Input side of Module, must interface RX Connector and TX connector with RX PIN and TX PIN of MCU respectively and then interface +5V power supply. In this case, we use DIR Connector by interfacing its with I/O PIN of MCU, after that MCU sends Logic to control sending/receiving interval of IC Line Driver. If DIR Pin is Logic “1”, IC Line Driver will be sender and if DIR Pin is Logic “0”, IC Line Driver will be recipient. Then Set Jumper near IC Line Driver and place on RS485 side and HALF side as in the picture below.



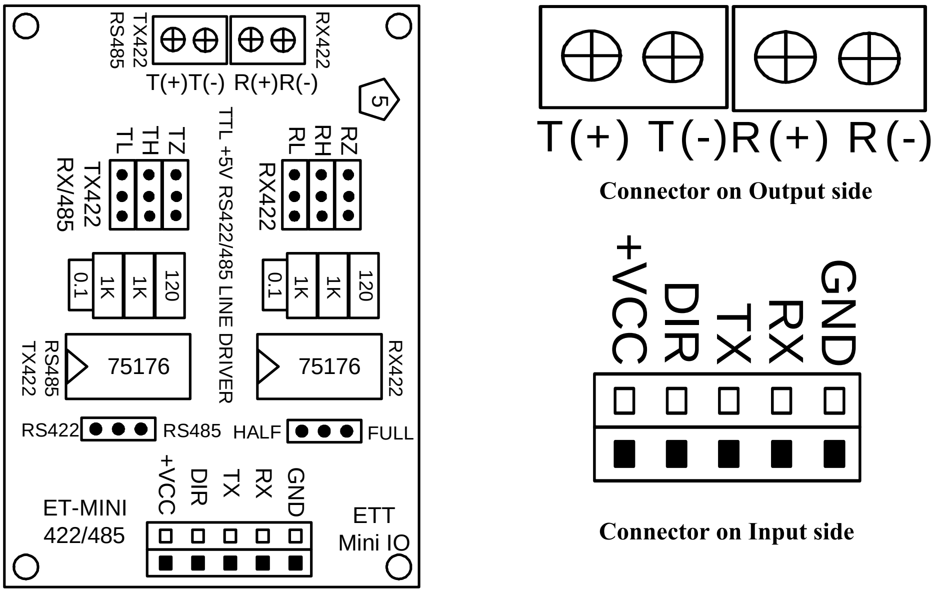
Picture displays Set Jumper when using RS485 Communication.

For Connector on Output side of Module, must interface with RS485 communicative device. It uses 2 cables and then interface T(+) PIN and T(-) PIN of Module with T(+) PIN and T(-) PIN of communicative device. Using this method, must control one communication is sender and other one communication is recipient but one communication can not be both sender and recipient in the same time. In this case, we do not use R(+) PIN and R(-) PIN of Module.

Jumper RZ, RH, RL and TZ, TH, TL, we Set them for interfacing R Pull UP with Line on Output side. It makes RS422 and RS485 Communication can send/receive signal a longer distance. The feature of Set Jumper is in the picture below.



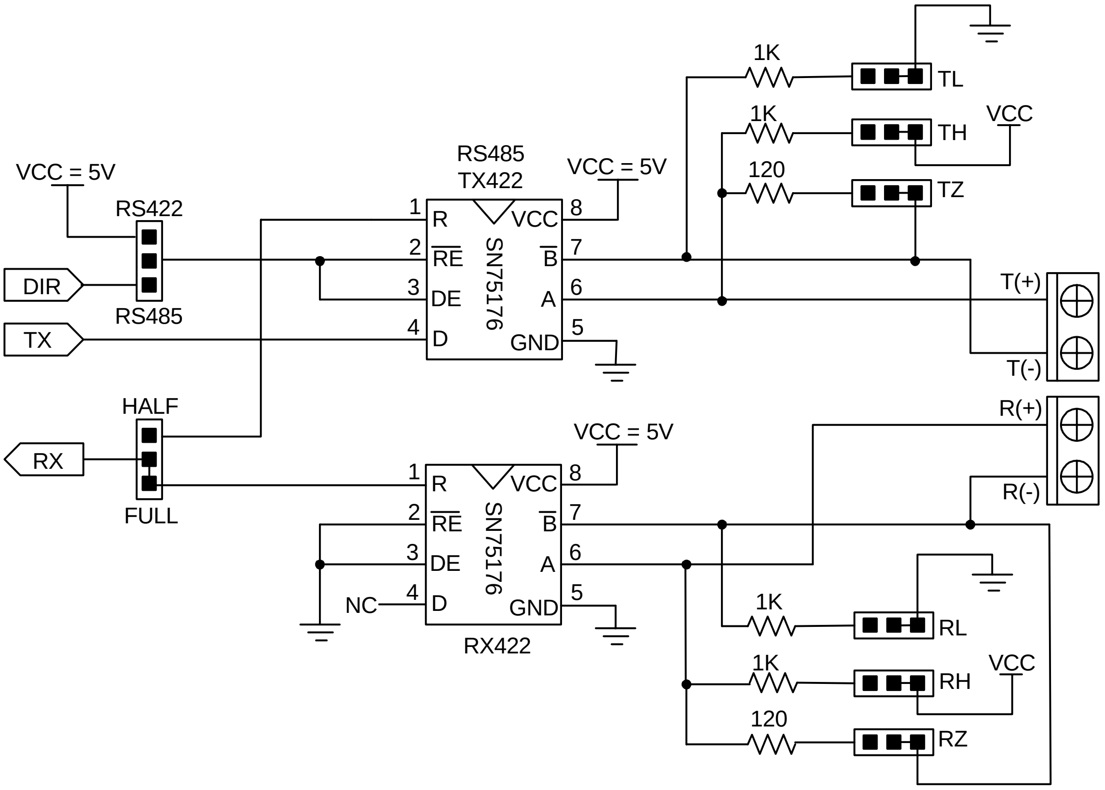
Picture displays Set Jumper to interface R Pull Up because it makes communication a longer distance.



Connector on Output side

Connector on Input side

Picture displays structure of ET-MINI 422/485 and Port Pin position.



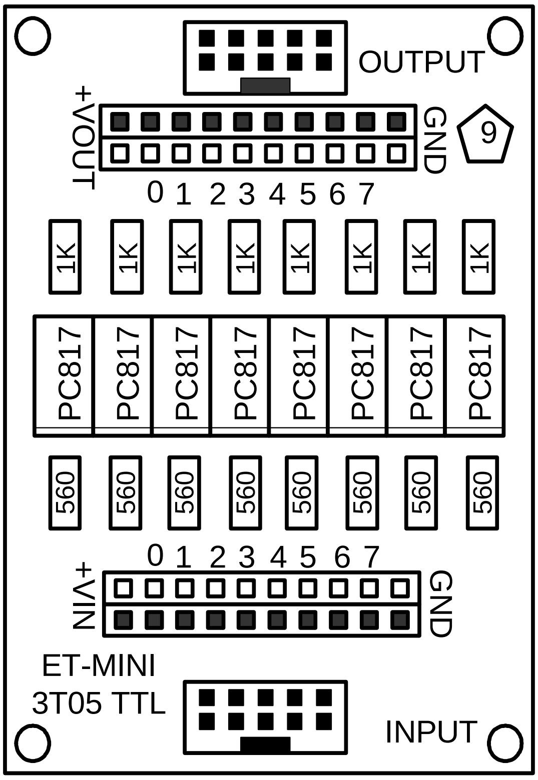
Picture displays circuit of ET-MINI 422/485.

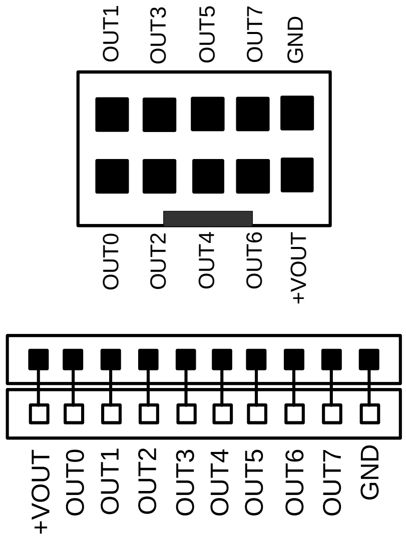
ET-MINI 3T05 TTL

Module ET-MINI 3T05 TTL which is OPTO to transform level of Logic from 3V into 5V or from 5 V into 3V has 8 channels. It uses with MCU that uses 3.3V power supply to drive or load with 5V power supply. All 8 channels of this Module can use as 2 types; only Input or only Output but can not use as both Input/Output in the same time. Its proceedings are ;

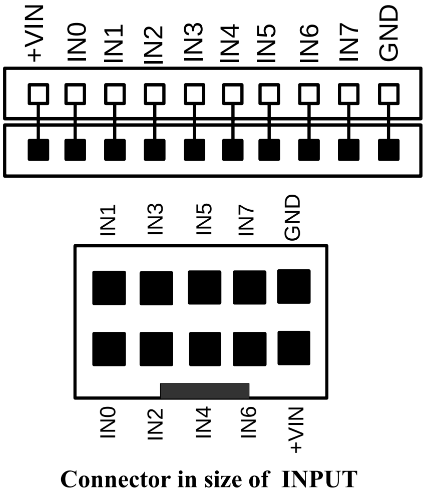
1). It is external INPUT for receiving signal Logic 5V into MCU that can receive Logic 3.3V, interface 5V power supply with +VIN Connector and Ground with GND of Module respectively and then interface Input [0..7] with connector for sending signal into MCU. In Output part of Module, interface 3.3V power supply with +VOUT Connector and Ground with GND of Module respectively and then interface Output [0…7] Connector with I/O Pin of MCU.

2). It is OUTPUT for sending signal Logic 3.3V from MCU to control external device that can receive Logic 5V, interface 3.3V power supply with +VIN Connector and Ground of MCU with GND of Module respectively and then interface Input [0..7] with I/O Pin of MCU. In Output part of Module, interface external 5V power supply with +VOUT Connector and external Ground with GND of Module respectively and then interface Output [0…7] Connector with controller device.



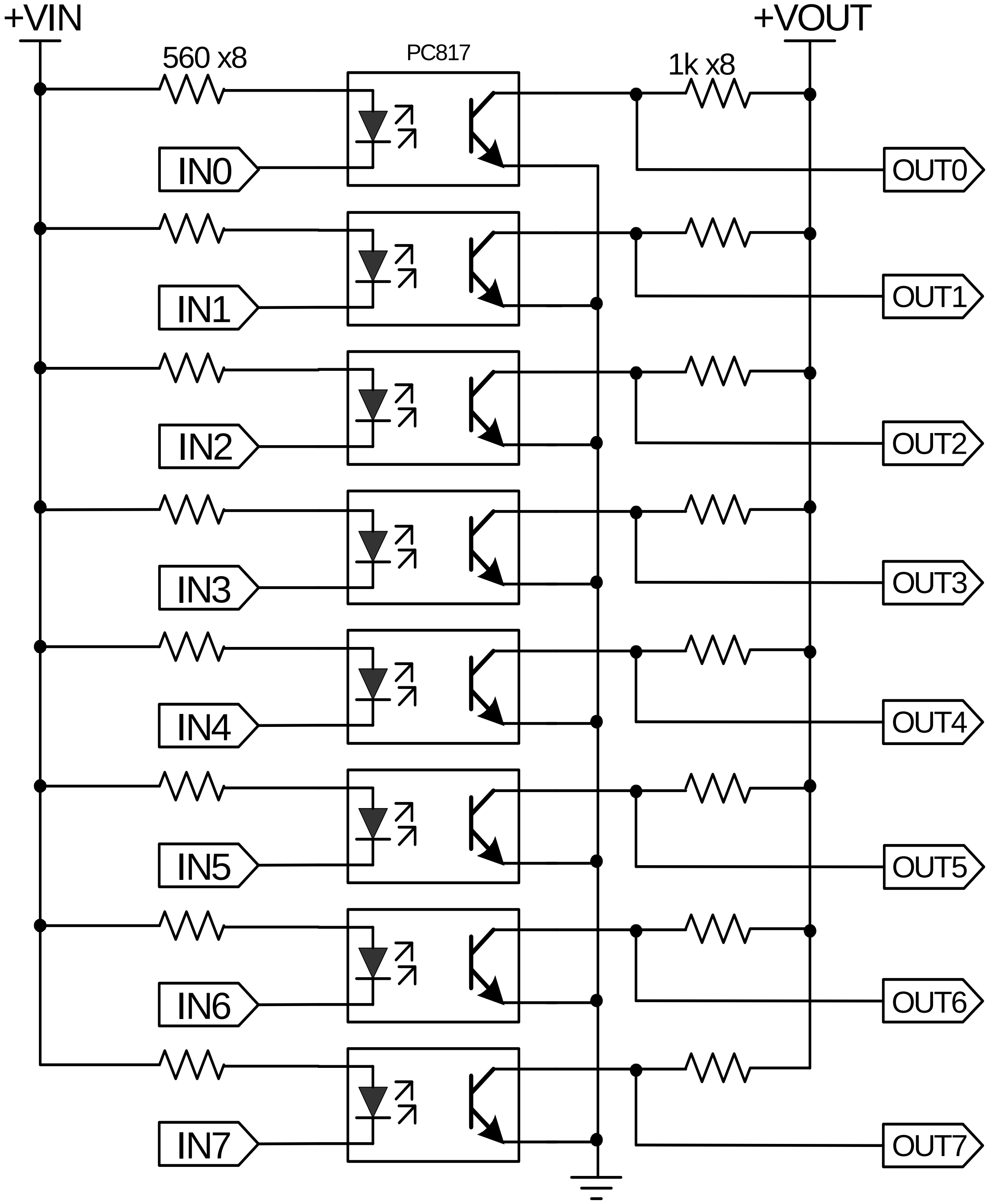


Connector in side of OUTPUT



Connector in size of INPUT

Picture displays structure of ET-MINI 3TO5 TTL and Port PIN position .



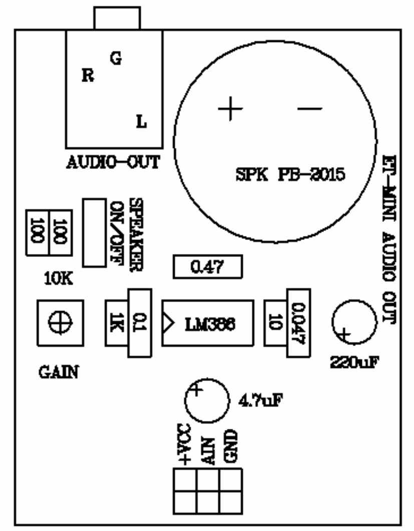
Picture displays circuit of ET-MINI 3TO5 TTL.

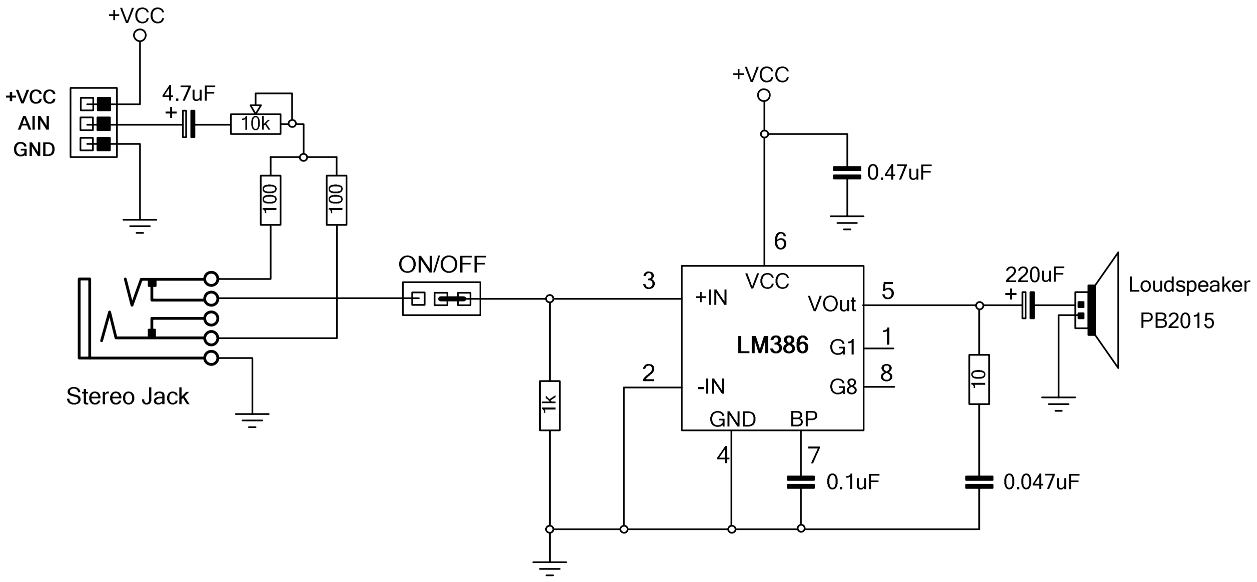
ET-MINI AUDIO OUT

It is a mini amplifier with speaker that receives Input as Analog audio signal type and sends audio signal out through speaker. Moreover, there is Stereo Jack that can be interfaced with headphone or external amplifier.

Specifications of Board ET-MINI AUDIO OUT

- Mini Speaker Model PB-2015
- Receive signal as Analog Input
- Auto-cut audio of speaker PB-2015 on board when Stereo Jack is inserted.
- IC LM386 is designed to be circuit amplifier



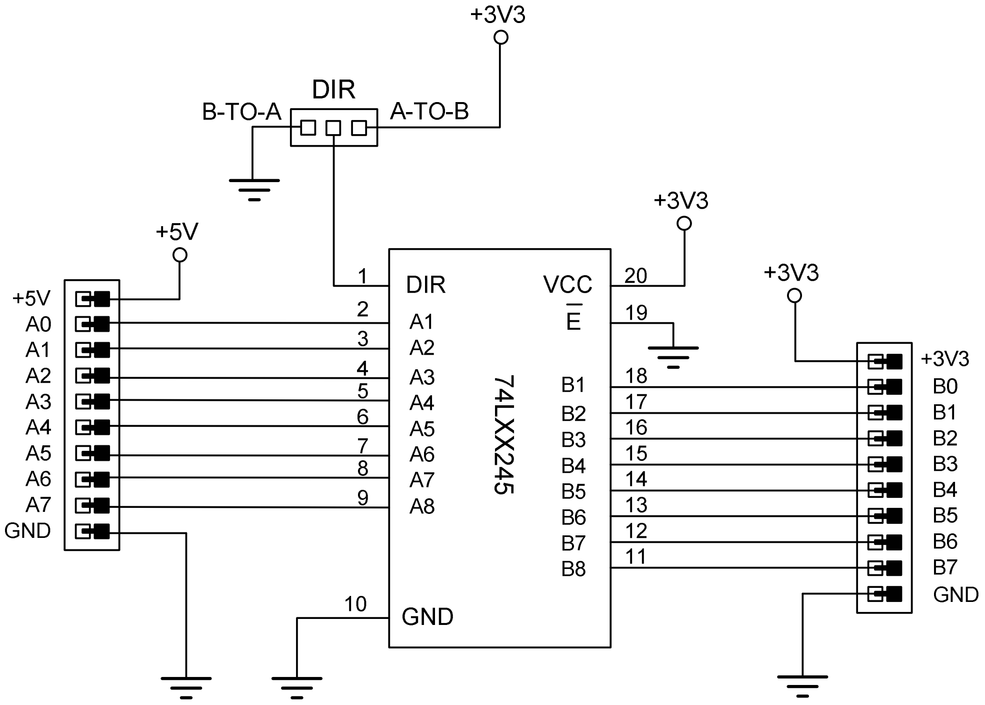


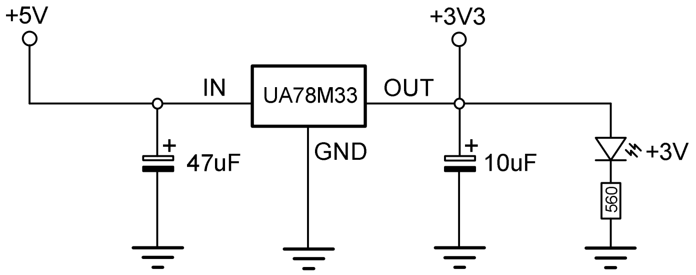
ET-MINI LOGIC LEVEL SHIFTER
The connection Logic Voltage between 3.3V and 5V

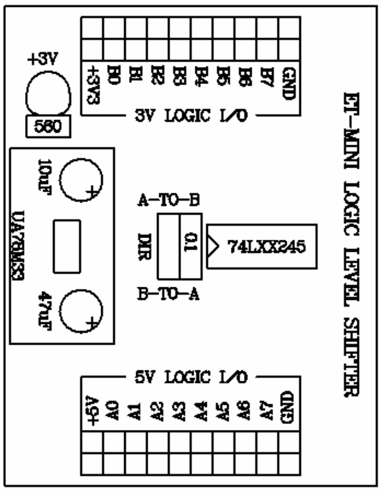
ET-MINI LOGIC LEVEL SHIFTER is a circuit for connection signal Logic between +5V device and 3.3V device (or 3V) by using IC Buffer 74LXX245. Specifications of this IC run with Voltage 3.3V but it can support Voltage Input up to 5V, so we can use it to be Buffer of Voltage from 3.3V to 5V.

Specifications of ET-MINI LOGIC LEVEL SHIFTER

- Can send signal Logic 5V to be signal Logic 3.3V
- 8 Channels for connection
- Can configure directions of signal
- IC Regulator 3.3V/500mA for supplying power into 3.3V device







****NOTE****

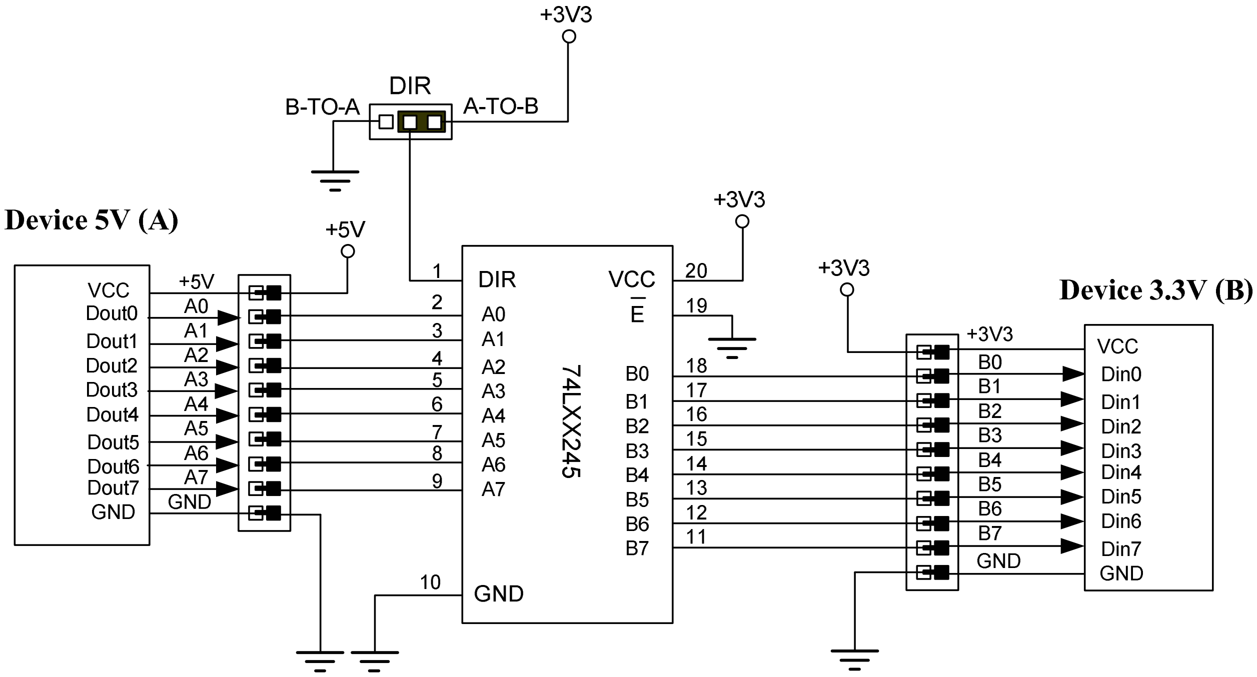
Regulator 3.3V/500mA is provided internal circuit, so we only supply power into Connector 5+5V and Voltage 3.3V at Connector 3V3 can supply power into external devices. If external device has already had 3.3V power supply, we must interface GND only and should not interface external Voltage with +3V3 internal board because circuit maybe damaged.

Applications

We can divide it into groups of application as follows;

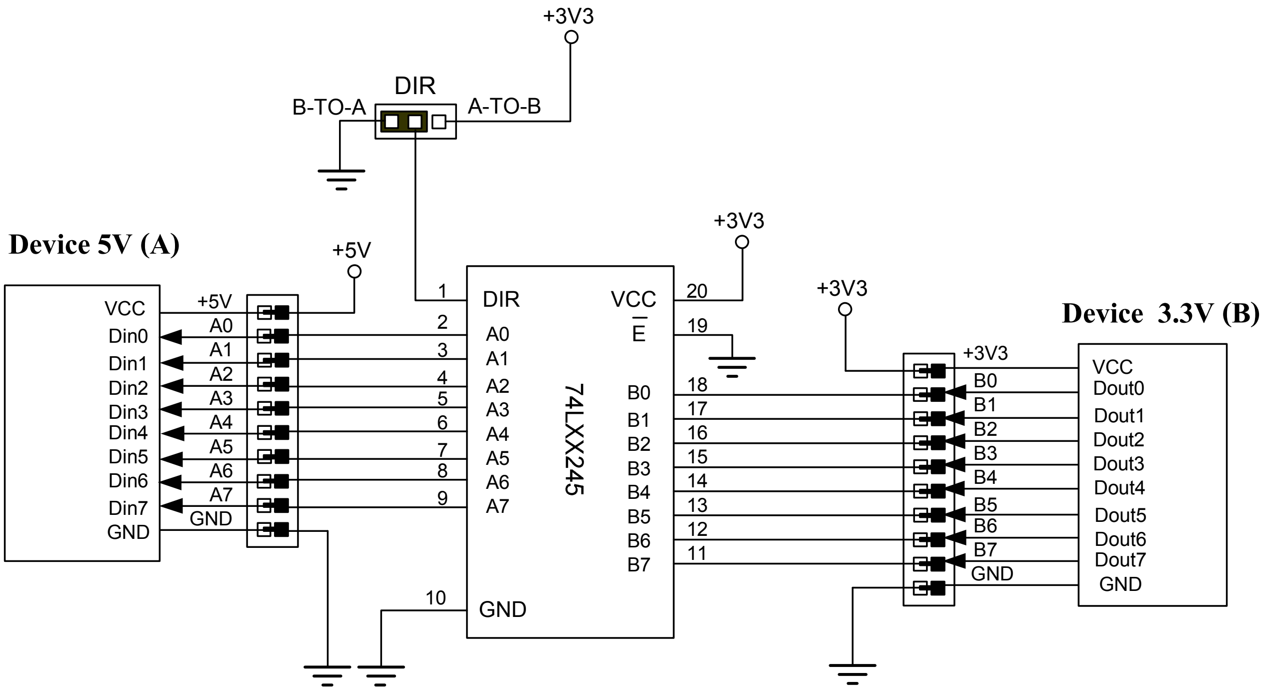
1. Connection as only one direction type from 5V device into 3.3V device.

   We must set Jumper DIR on the position A-TO-B, Logic 5V must be interfaced on A side and Logic 3.3V must be interfaced on B side. Signal Logic 5V on A side is sent through Buffer to be Logic 3.3V on B side.

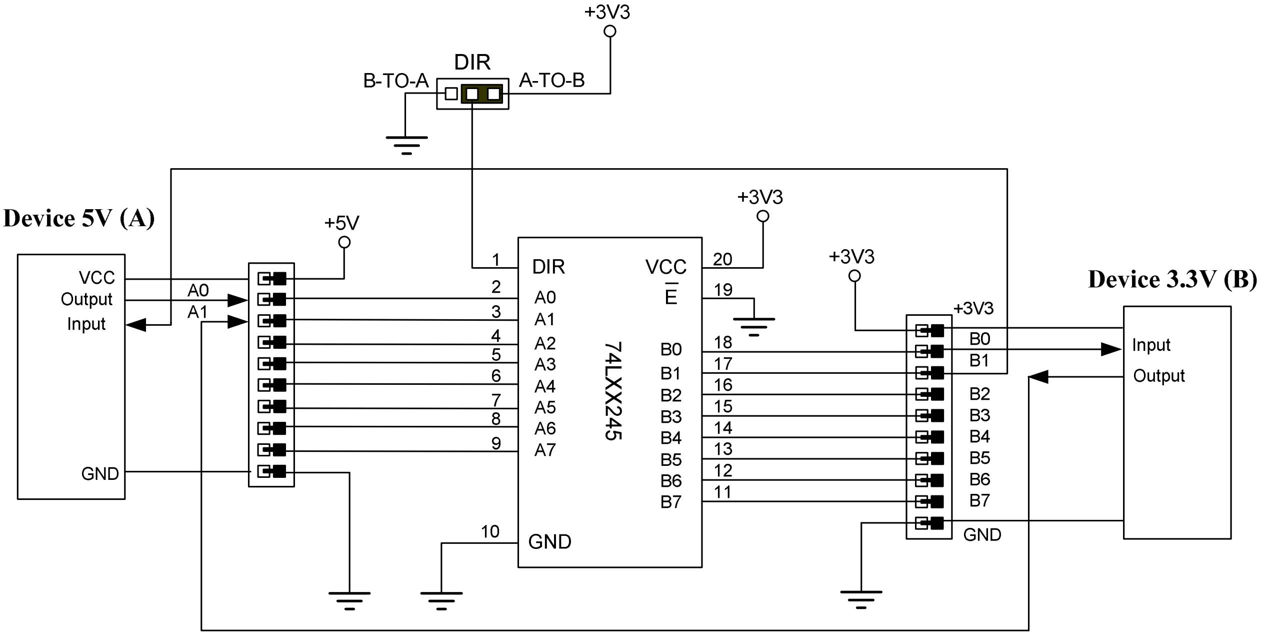


2. Connection as only one direction type from 3.3V device into 5V device.

We must set Jumper DIR on the position B-TO-A, Logic 5V must be interfaced on A side and Logic 3.3V must be interfaced on B side. Signal Logic 3.3V on B side is sent through Buffer to be Logic of device on A side. Voltage that is sent into A device is 3.3V and it is enough for A device to know Logic "1" and "0".

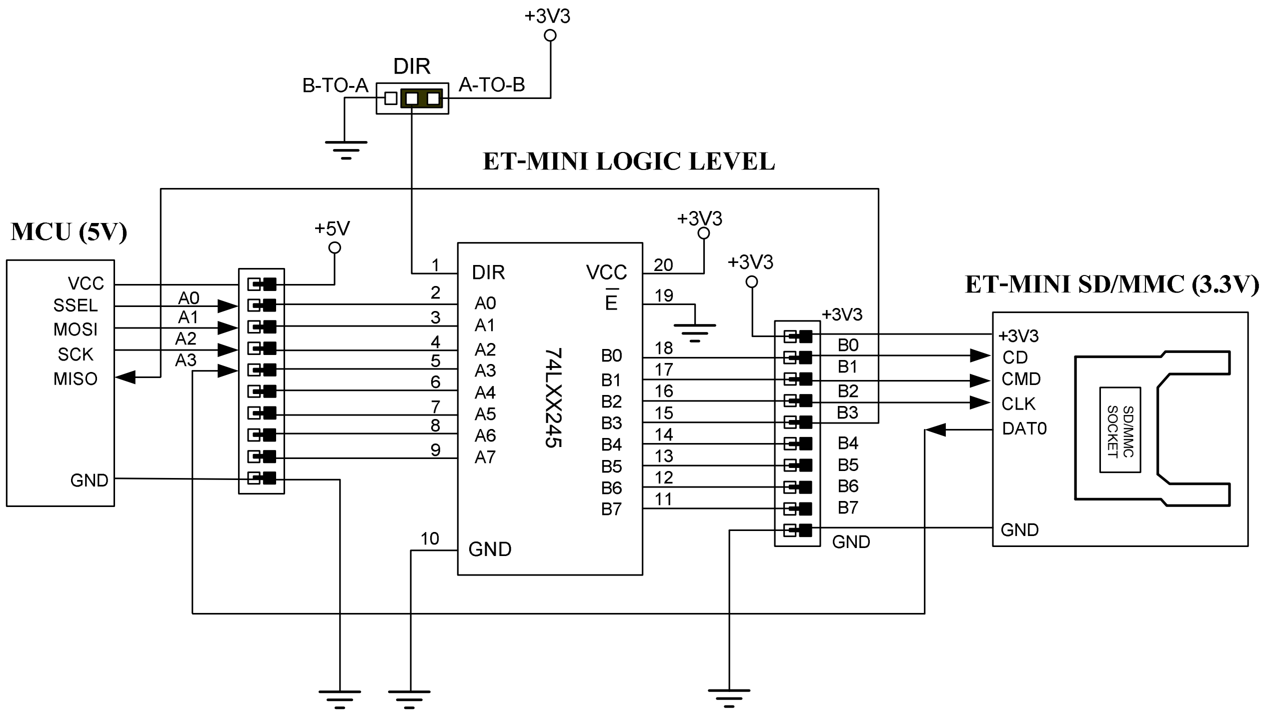


3. Connection as bi-direction type between 3.3V device and 5V device.



From the circuit above, it is the connection signal Logic between 5V device and 3V device. We must interface signal Pin Output of A device with signal Pin Input of B device and then interface signal Pin Output of B device with signal Pin Input of A device. To configure directions of IC 74LXX245 must n=be configured all 8 bit and we can configure in each bit, so if we must connect signal of both sender and receptor (both 3.3V device and 5V device), we must configure DIR to be A-TO-B as in the example circuit above.

Example: The connection signal between Microcontroller (5V device) and SD/MMC CARD (3V device) by using ET-MINI SD/MMC in SPI MODE.


+3V3
DIR
B-TO-A
A-TO-B
ET-MINI LOGIC LEVEL
MCU (5V)
VCC
SSEL
MOSI
SCK
MISO
GND
A0
A1
A2
A3
+5V
+3V3
+3V3
1
2
3
4
5
6
7
8
9
10
DIR
A0
A1
A2
A3
A4
A5
A6
A7
GND
VCC
E
B0
B1
B2
B3
B4
B5
B6
B7
74LXX245
20
19
18
17
16
15
14
13
12
11
+3V3
B0
B1
B2
B3
B4
B5
B6
B7
GND
ET-MINI SD/MMC (3.3V)
+3V3
CD
CMD
CLK
DAT0
GND
SD/MMC
SOCKET

ET-MINI SD/MMC
The connection SD/MMC MEMORY CARD

ET-MINI SD/MMC is a device for connection components with SD/MMC memory Card; for example, the connection between Microcontroller and Memory Card (SD/MMC). This set contains Socket for inserting Memory Card such as SD and MMC and it provides external signal Pin at Connector Pin, so it is quite convenient to apply. Moreover, there are many circuits such as Circuit Card Detect, Circuit Pull-Up and etc.

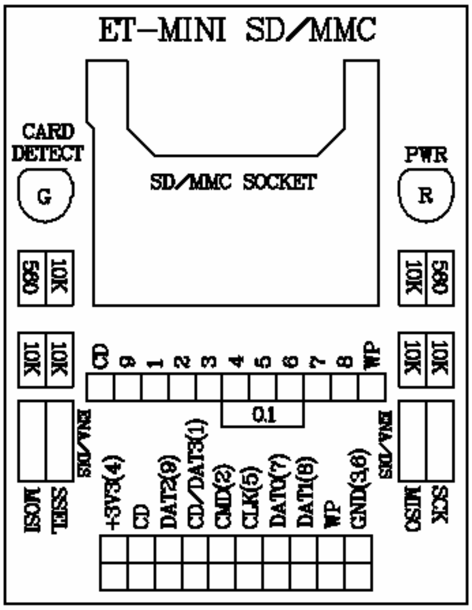
Specifications of ET-MINI SD/MMC

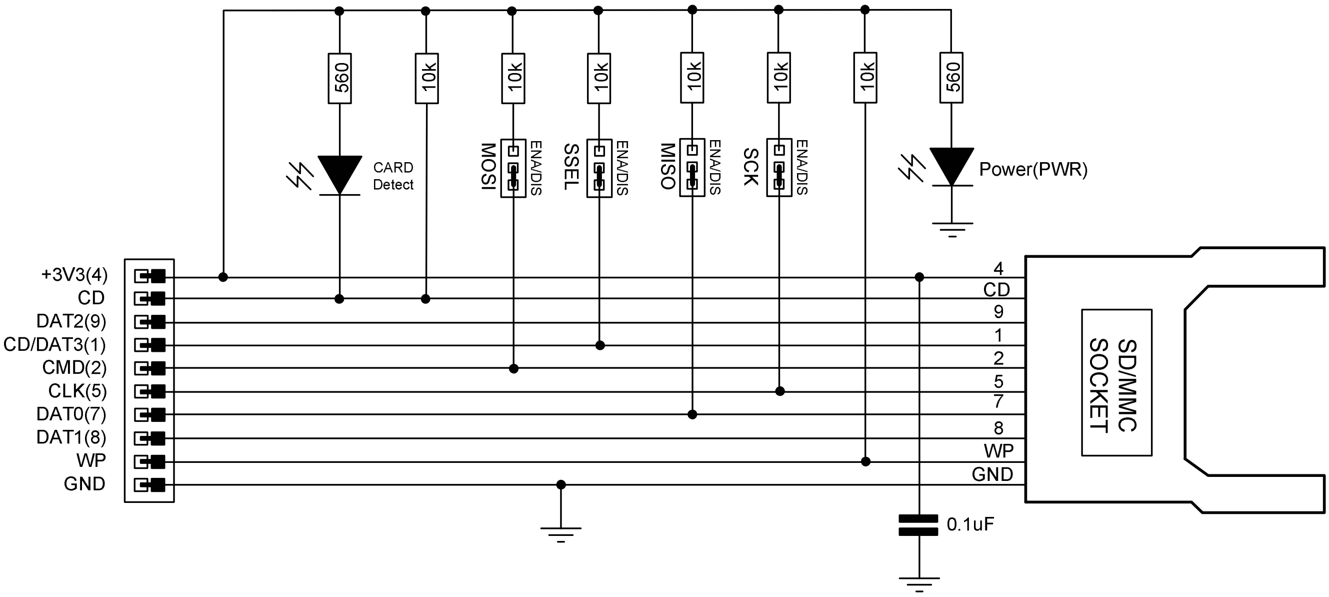
- Support Memory Card as SD type and MMC type
- Can select Enable/ Disable for Circuit Pull-Up
- Can display status of inserting Card or CARD DETECT by using LED and send signal OUTPUT through Pin signal CD. There is specification as follows;

  CD = 1; It means that there is no Card.
  CD = 0; It means that there is Card.

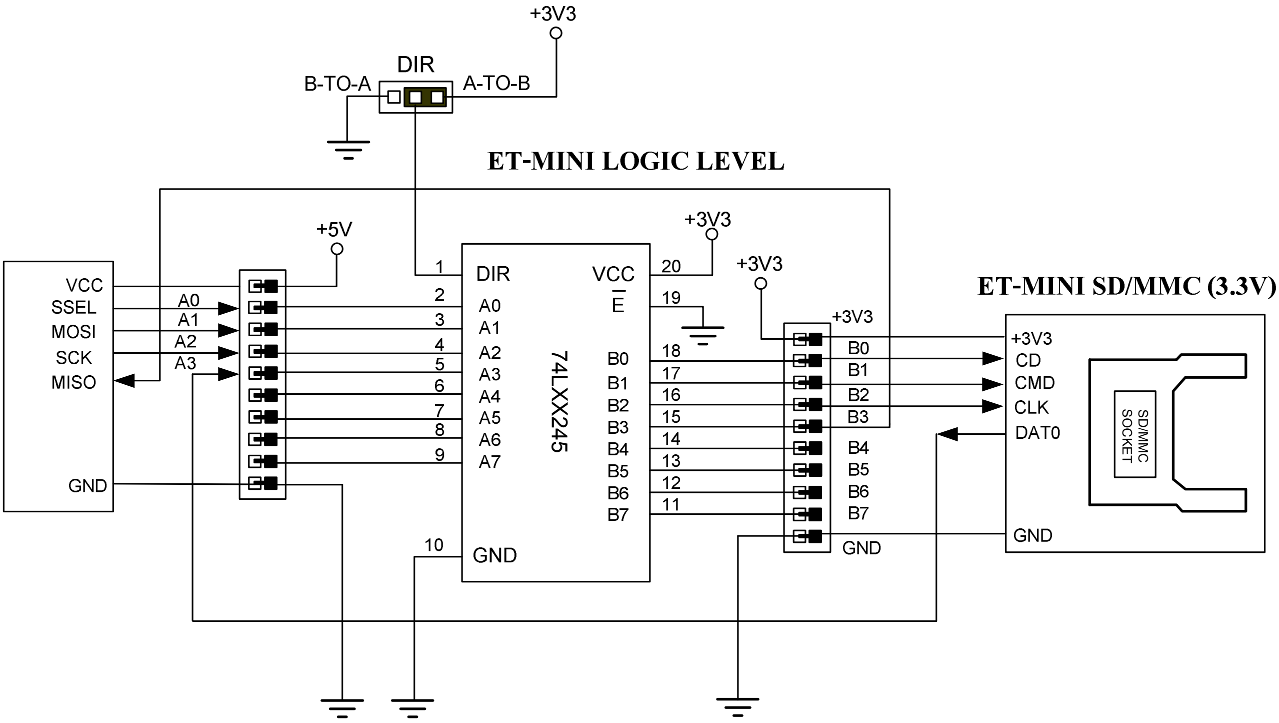
- Can display status of Switch Write Protection on SD/MMC Card and send signal OUTPUT through signal Pin WP as follows;

  WP = 1; It is OFF position of Switch Write Protection.
  WR = 0; It is ON position of Switch Write Protection.





Example: The connection signal between Microcontroller (5V device) and SD/MMC CARD (3V device) by using ET-MINI LOGIC LEVEL and ET-MINI SD/MMC in SPI Mode.



Details of Signal Pin SD CARD

There are 2 proceedings to connect SD CARD; SD MODE type and SPI MODE type as the details in the table below.

- Details of signal Pin when it is connected as SD MODE type.

Pin No.	Name	Type[1]	Description
SD Mode			
1	CD/DAT3[2]	I/O[3], PP	Card detect/Data line [Bit 3]
2	CMD	I/O, PP	Command/Response
3	V_{SS1}	S	Supply voltage ground
4	V_{DD}	S	Supply voltage
5	CLK	I	Clock
6	V_{SS2}	S	Supply voltage ground
7	DAT0	I/O, PP	Data line [Bit 0]
8	DAT1	I/O, PP	Data line [Bit 1]
9	DAT2	I/O, PP	Data line [Bit 2]

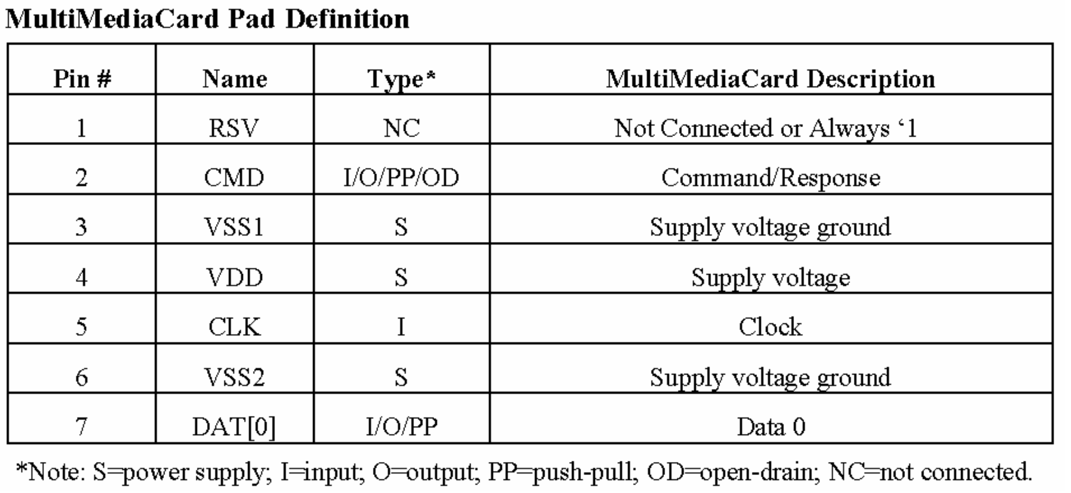
- Details of signal Pin when it is connected as SPI MODE type.

SPI Mode			
1	CS	I	Chip Select (active low)
2	DataIn	I	Host-to-card Commands and Data
3	V_{SS1}	S	Supply voltage ground
4	V_{DD}	S	Supply voltage
5	CLK	I	Clock
6	V_{SS2}	S	Supply voltage ground
7	DataOut	O	Card-to-host Data and Status
8	RSV[4]	---	Reserved
9	RSV[5]	---	Reserved

Details of Signal Pin MMC CARD

There are 2 proceedings to connect MMC CARD; MultiMediaCard MODE and SPI MODE as the details in the table below;

- Details of signal Pin when it is connected as Multimedia Card Mode type.

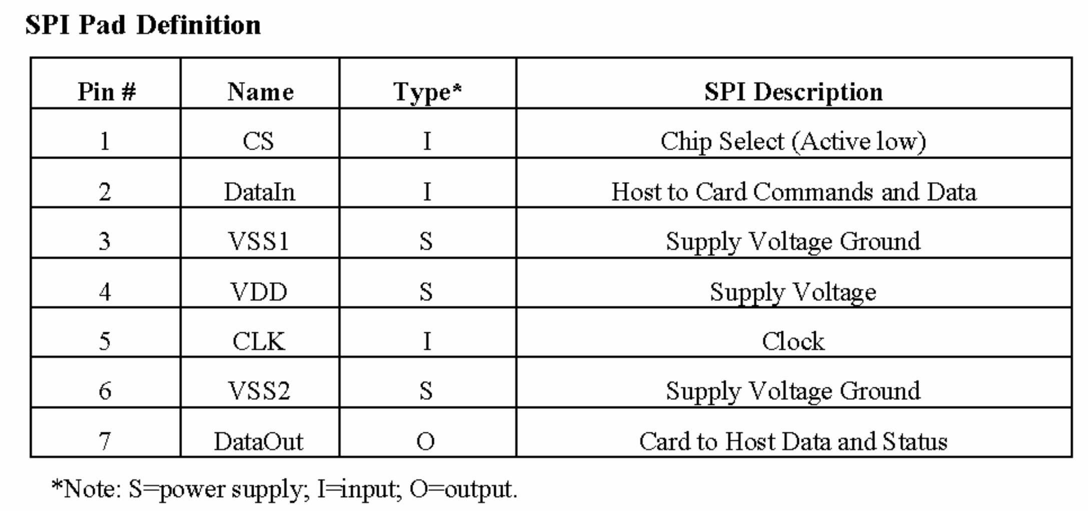


MultiMediaCard Pad Definition

Pin #	Name	Type*	MultiMediaCard Description
1	RSV	NC	Not Connected or Always '1
2	CMD	I/O/PP/OD	Command/Response
3	VSS1	S	Supply voltage ground
4	VDD	S	Supply voltage
5	CLK	I	Clock
6	VSS2	S	Supply voltage ground
7	DAT[0]	I/O/PP	Data 0

*Note: S=power supply; I=input; O=output; PP=push-pull; OD=open-drain; NC=not connected.

- Details of signal Pin when it is connected as SPI Mode type.

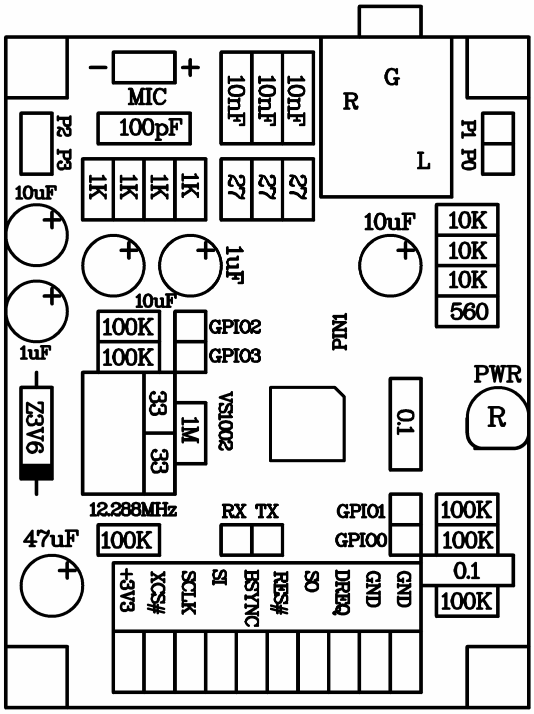


SPI Pad Definition

Pin #	Name	Type*	SPI Description
1	CS	I	Chip Select (Active low)
2	DataIn	I	Host to Card Commands and Data
3	VSS1	S	Supply Voltage Ground
4	VDD	S	Supply Voltage
5	CLK	I	Clock
6	VSS2	S	Supply Voltage Ground
7	DataOut	O	Card to Host Data and Status

*Note: S=power supply; I=input; O=output.

ET-MINI MP3



Board ET-MINI MP3 is a MP3 Decoder to convert signal into voice. ETT uses IC VLSI No.VS1002D to decode file MP3 and to be the permanent IC on board. VS1002D is the IC MP3 Decoder that is one of the highest quality and the easiest application. It can decode File MP3 and File WAVE instantly and there is Analog OUTPUT to be Stereo audio type, so we can connect it with headphone or amplifier instantly. Additionally, we can connect with Microcontroller easily by using SPI Serial Port standard. So, we can apply ET-MINI MP3 with Microcontrollers as desired.

The structural feature of Board ET-MINI MP3 is just a part of basic circuit VS1002D because it is not applied to be processed MP3 Player or connect with any version of Board Microcontroller but Board ET-MINI MP3 can apply with other project works independently. Concept of circuit is designed to connect VS1002D with necessary components such as circuit amplifier with Jack Stereo, it is quite convenient to connect with headphone or amplifier; and circuit Pre-Amplifier to receive signal from Microphone as Condenser type and including to circuit Crystal Oscillator Generator. Circuit VS1002D is arranged to be ready to active but there is no signal controller only. In the part of signal controller, there is Connector to connect with external microcontroller easily.

Specifications of Board ET-MINI MP3

- IC MP3 Decoder of VLSI No.VS1002D
- Be able to decode File MPEG that accesses decoder as MPEG 1.0 & 2.0 Audio layer III (CBR + VBR) and including of WAV and PCM
- Be able to access decode audio signal from Microphone to be standard ADPCM data
- Support Streaming Data for File MP3 or WAVE.
- Be able adjust Bass Control
- Active with signal Clock 12.288 MHz and can use X2 Mode internal PLL
- There is circuit to convert data into high quality of DAC voice with stereo Amplifier. We can connect Audio Out with amplifier or standard stereo headphone that has Impedance value about 30Ω instantly. Connector Audio Out of Board uses high quality Jack Stereo that can be interfaced with headphone or amplifier of computer PC instantly.
- Active with DC Voltage from 2.5V to 3.6V with LED to display status of Power and Zener Diode to protect over voltage
- Support connection between signal and Microcontroller through SPI Serial Port
- Be able to modify operation of board to be MP3 player as Standalone type without using the any controller from Microcontroller (see more information from "Application Note" of VLSI)
- Board size 4.4 x 5.6 cm.

Applications for Board ET-MINI MP3

We can apply Board ET-MINI MP3 for many types, especially the connection with Microcontroller. We can configure preferred conditions by self from program controller that is developed. We can apply it by using memories components such as SD/MMC or others to save File data for sending into VS1002D to decode and convert into voice. In this case, we do not mention about the memory management and File systems, so user must study and learn more information by self.

The well-known and easiest proceeding to connect Board ET-MINI MP3 with Microcontroller is connecting with SPI Serial Port. If Microcontroller is active with power supply from +2.5V to +3.3V, we can connect signal between Microcontroller and IC VS10002D of Board ET-MINI MP3 instantly; on the other hand, if Board Microcontroller is active with power supply +5V, we must find circuit to convert Logic +5V into Logic +3.3V first. ETT designs Board "ET-MINI LOGIC LEVEL SHIFTER" to support this application as shown in the diagram below.

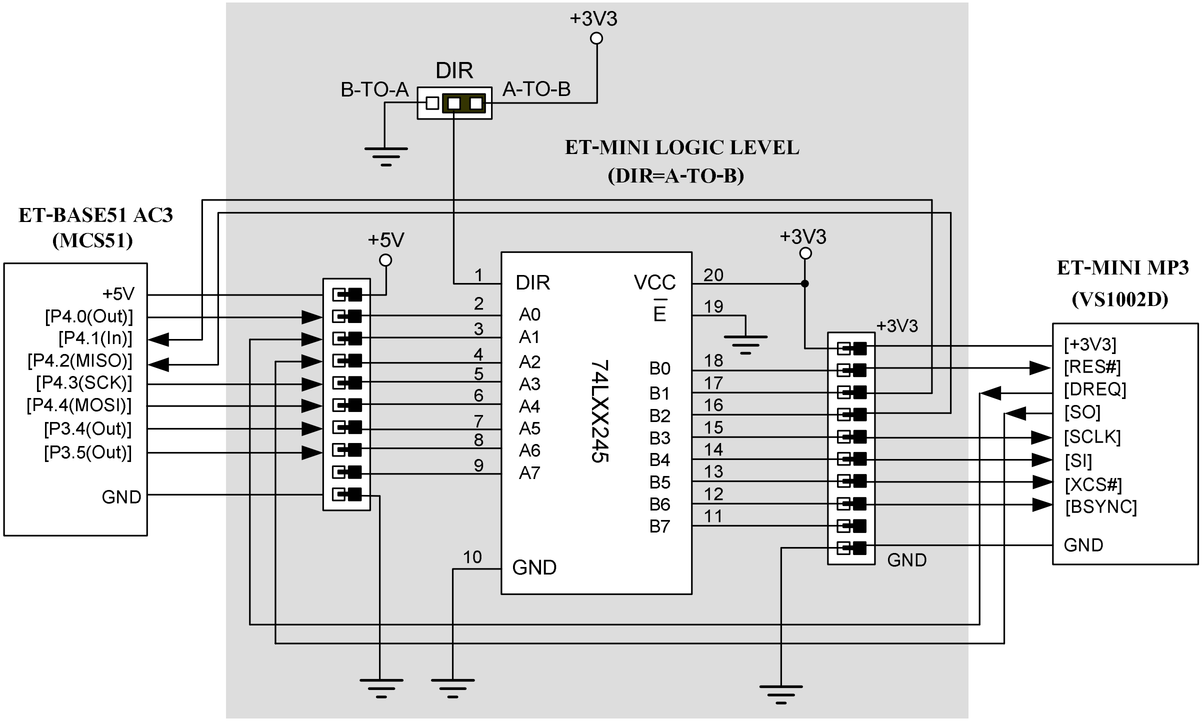
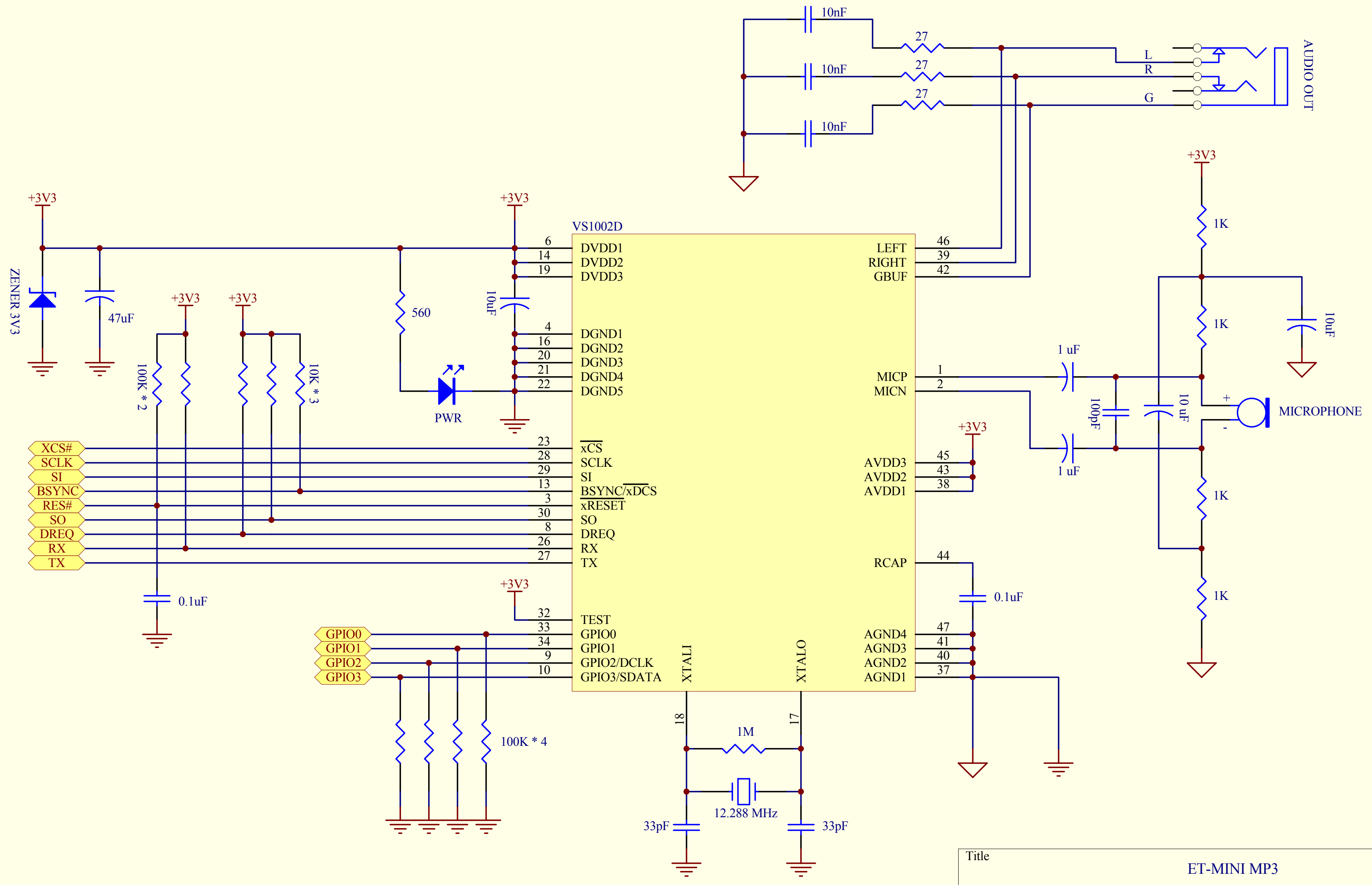


Figure displays the connection between board ET-MINI MP3 and Microcontroller that uses +5V Power Supply.



Title	ET-MINI MP3		
Size A4	Number WWW.ETT.CO.TH		Revision 1.0
Date:	21-Jun-2006	Sheet1 of 1	
File:	D:\My Circuit\MINI-MP3\MINI-MP3.Ddb	Drawn By:	Eakachai Makarn

An Example Connection ET-MINI MP3 with MCS51

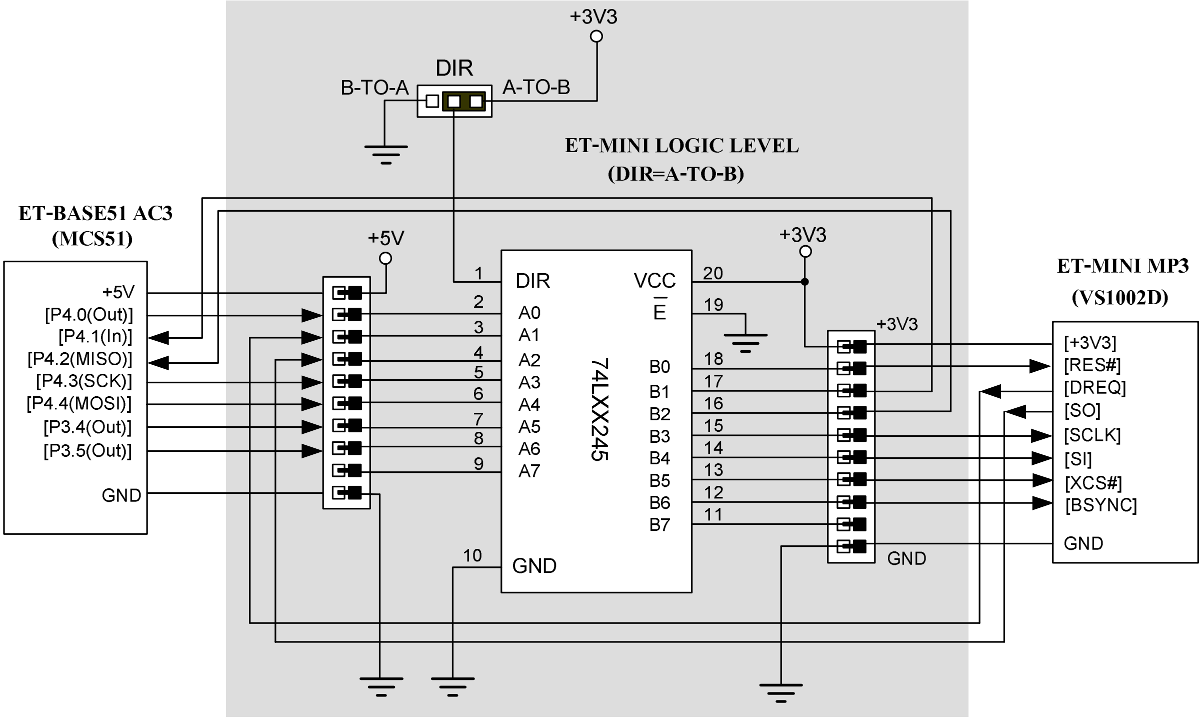
This example displays using Port SPI of MCS51 No.AT89C51AC3 to connect and command IC VS1002D that is a MP3 Decoder. The sample program will mention about proceeding to connect and command IC VS1002D to play music and voice only. We do not mention about the File systems management, so user must learn more how to read file data and send it into MP3 Decoder to convert into voice by self; for example, the proceeding to use Memory's types as SD/MMC memory or others.

In this case, we use Board Microcontroller MCS51 version ET-BASE51 AC3 to control operation of MP3 Decoder and use Board ET-MINI MP3. Remember, Board Microcontroller version ET-BASE51 AC3 actives with Voltage +5V; on the other hand, ET-MINI MP3 actives with Voltage +3V3, so IC VS1002D that is a MP3 Decoder in Board ET-MINI MP3 can not connect with signal Logic TTL with +5V signal level. So, we can not connect signal from both boards directly, we must find device to convert signal +5V into +3V3. In this case, we use ET-MINI LOGIC LEVEL SHIFTER for connection both boards. Additionally, it is necessary to use these devices as follows;

1. Board Microcontroller MCS51 version ET-BASE51 AC3
2. Board ET-MINI LOGIC LEVEL SHIFTER to convert signal Logic 5V into 3.3V
3. Board MP3 Decoder version ET-MINI MP3
4. +5V Adapter to supply power into Board ET-BASE51 AC3

In this case, we use 3 small File Wave that are not higher than 48 Kbytes totally and we use File Wave Format that we can hear it counting number from "0" to "2" in English version to store in Flash memory of AT89C51AC3 as Table type. Next, we must refer to memory position that stores the file and we must send it to MP3 Decoder to convert into voice as byte by byte respectively until it is completely. In this example, it converts File into data as Byte type and it is arranged as Table type in Flash memory. If it is C Language, it declares variable as Array type and saves it in Flash memory of CPU because it is more convenient to open file. This sample is written by C Language and uses Keil-C51 to interpret commands. Remember, C Language Program (Keil-C51) is used for Complier; if it just Demo Version, it can not interpret Source Code in this sample program because there is some restriction for using Program Keil-C51 Demo version that is not able to Complier Source Code higher than 2KByte. However, ETT provides Hex File that has already interpreted completely, so user can download "MCS51_MP3_PLAY_WAVE.HEX" into CPU instantly. This file is saved in Folder named "FINAL_HEX_TEST" to download into CPU of Board ET-BASE51 AC3 and can test it instantly. If everything is correct without any error after downloaded completely, when we press RESET and connect headphone or amplifier of computer PC with Board ET-MINI MP3 completely, we will hear counting number from 0 to 2 in English version and it will be repeated continuously.

The connection signal between boards



ET-BASE51 AC3 (MCS51)		Board ET-MINI LOGIC (DIR = A-TO-B)		Board ET-MINI MP3 (VS1002D)
[+5V]	→	[+5V] → [+3V3]	→	[+3V3]
[P4.0(Out)]	→	[A0] → [B0]	→	[RES#]
[P4.1(In)]	←	[B1] ← [A1]	←	[DREQ]
[P4.2(MISO)]	←	[B2] ← [A2]	←	[SO]
[P4.3(SCK)]	→	[A3] → [B3]	→	[SCLK]
[P4.4(MOSI)]	→	[A4] → [B4]	→	[SI]
[P3.4(Out)]	→	[A5] → [B5]	→	[XCS#]
[P3.5(Out)]	→	[A6] → [B6]	→	[BSYNC]
[GND]	↔	[GND] ↔ [GND]	↔	[GND]

show the directions and signal to connect MCS51 and MINI-MP3

An example Connection ET-MINI MP3 by AVR

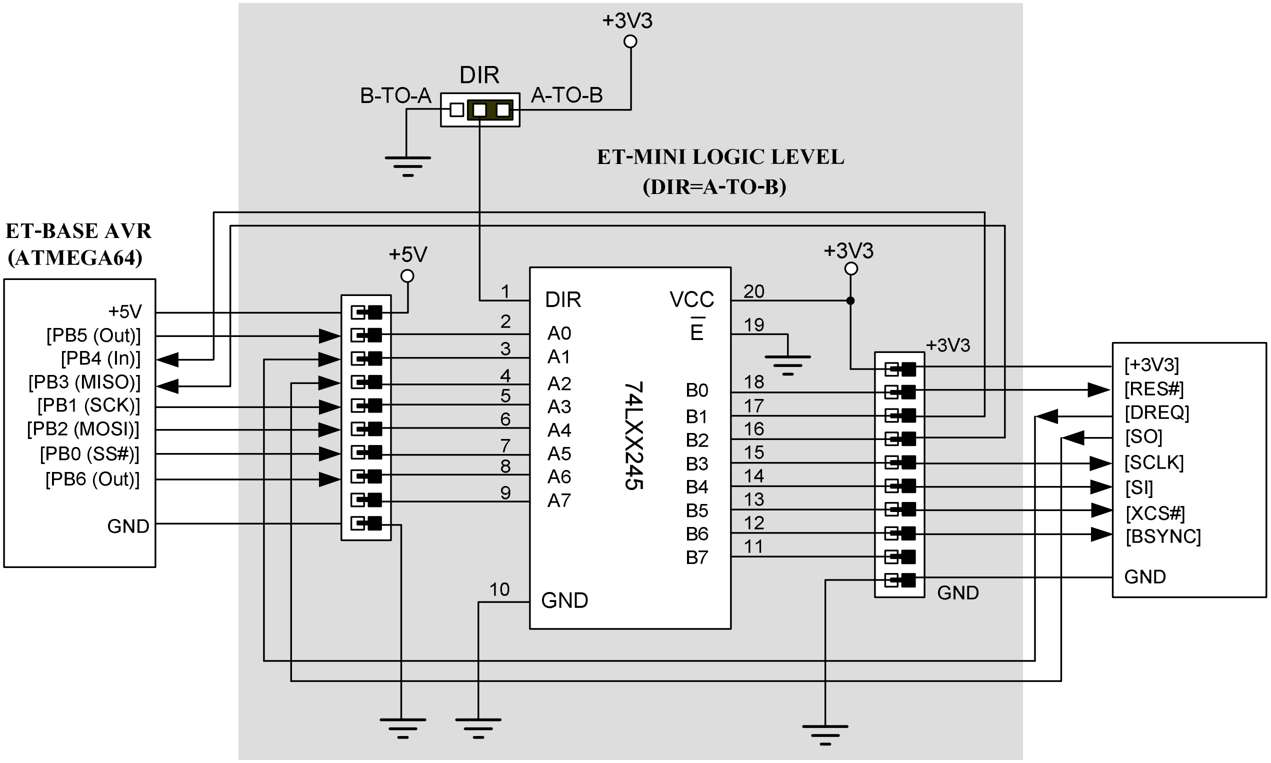
This example displays using Port SPI of AVR No.ATMEGA64 to connect and command IC VS1002D that is a MP3 Decoder. The sample program will mention about proceeding to connect and command IC VS1002D to play music and voice only. We do not mention about the File systems management, so user must learn more how to read file data and send it into MP3 decoder to convert into voice by self; for example, the proceeding to use Memory's types as SD/MMC memory or others.

In this case, we use Board Microcontroller AVR version ET-BASE AVR ATMEGA64 to control operation of MP3 Decoder and use Board ET-MINI MP3. Remember, Board Microcontroller version ET-BASE AVR ATMEGA64 runs with Voltage +5V; on the other hand, ET-MINI MP3 runs with Voltage +3V3, so IC VS1002D that is a MP3 Decoder in Board ET-MINI MP3 can not connect with signal Logic TTL with +5V signal level. So, we can not connect signal from both boards directly, we must find device to convert signal +5V into +3V3. In this case, we use ET-MINI LOGIC LEVEL SHIFTER for connection both boards. Additionally, it is necessary to use these devices as follows;

1. Board Microcontroller AVR version ET-BASE AVR ATMEGA64
2. Board to convert signal Logic 5V into 3.3V
3. Board MP3 Decoder version ET-MINI MP3
4. +5V Adapter to supply power into Board ET-BASE AVR

In this case, we use 3 small File Wave that are not higher than 48 Kbytes totally. For this example, we use File Wave Format that we can hear it counting number from "0" to "2" in English version to store in Flash memory of ATMEGA64 as Table type. Next, we must refer to memory position that stores the file and we must send it to MP3 Decoder to convert into voice as byte by byte respectively until it is completely. In this example, it converts File into data as Byte type and it is arranged as table type in Flash memory. If it is C Language, it declares variable as Array type and saves it in Flash memory of CPU because it is more convenient to open file. This sample is written by C Language and uses Code Vision AVR to interpret commands. Remember, C Language Program (Code Vision AVR) is used for Complier if it just Demo Version, it can not interpret Source Code in this sample program because there is some restriction for using Program Code Vision AVR version Demo that is not able to Complier Source Code higher than 2KByte. However, ETT provides Hex File that has already interpreted completely, so user can download into CPU instantly (ATMEGA64_MP3_PLAY_WAVE.HEX). This file is saved in Folder named "FINAL_HEX_TEST" to download into CPU of Board ET-BASE AVR ATMEGA64 and can test it instantly. If everything is correct without any error after downloaded completely, when we press RESET and connect headphone or amplifier of computer PC with Board ET-MINI MP3 completely, we will hear counting number in English version from 0 to 2 and it will be repeated continuously.

The connection signal between boards



ET-BASE AVR (ATMEGA64)		ET-MINI LOGIC LEVEL (DIR = A-TO-B)		ET-MINI MP3 (VS1002D)
[+5V]	→	[+5V] → [+3V3]	→	[+3V3]
[PB5(Out)]	→	[A0] → [B0]	→	[RES#]
[PB4(In)]	←	[B1] ← [A1]	←	[DREQ]
[PB3(MISO)]	←	[B2] ← [A2]	←	[SO]
[PB1(SCK)]	→	[A3] → [B3]	→	[SCLK]
[PB2(MOSI)]	→	[A4] → [B4]	→	[SI]
[PB0(SS#)]	→	[A5] → [B5]	→	[XCS#]
[PB6(Out)]	→	[A6] → [B6]	→	[BSYNC]
[GND]	↔	[GND] ↔ [GND]	↔	[GND]

show the directions and signal to connect MEGA64 and MINI-MP3

An Example Connection ET-MINI MP3 by ARM7

We will mention about an example using Port SPI of LPC2138/LPC2148 for connection IC VS1002D that is MP3 Decoder. The sample program will mention about proceeding to connect and command IC VS1002D to play music and voice only. We do not mention about the File systems management, so user must learn more how to read file data and send it into MP3 decoder to convert into voice by self; for example, the proceeding to use Memory's types as SD/MMC memory or others.

For this example, we use 11 small Wave File type and the memory of each file is not higher than 16 KB. We can hear it counting number from "0" to "10" and is saved in Flash memory of LPC2138/LPC2148. Next, we must refer to memory position that stores the file and we must send it to MP3 Decoder to convert into voice. In the first time, we intend to arrange File as Array table type and include them together in Code program because it is quite convenient to open file. Remember, C Language Program (Keil-C51) that is used for Complier is just Demo Version, so there is some restriction that does not Compiler Source Code is higher than 16KByte. Therefore, we should solve this problem by dividing Code program and Audio file first, so each file is not higher than 16KByte. After Files are interpreted into HEX completely, we must combine Code program and Audio File together. Structure of Memory space for saving Code program and code of Audio file are configured as follows;

Memory Position (Code)	Application
0x00000 - 0x03FFF (16KB)	Monitor Code Program
0x04000 - 0x07FFF (16KB)	Voice "Zero" (0f.wav)
0x08000 - 0x0BFFF (16KB)	Voice "One" (1f.wav)
0x0C000 - 0x0FFFF (16KB)	Voice "Two" (2f.wav)
0x10000 - 0x13FFF (16KB)	Voice "Three" (3f.wav)
0x14000 - 0x17FFF (16KB)	Voice "Four" (4f.wav)
0x18000 - 0x1BFFF (16KB)	Voice "Five" (5f.wav)
0x1C000 - 0x1FFFF (16KB)	Voice "Six" (6f.wav)
0x20000 - 0x23FFF (16KB)	Voice "Seven" (7f.wav)
0x24000 - 0x27FFF (16KB)	Voice "Eight" (8f.wav)
0x28000 - 0x2BFFF (16KB)	Voice "Nine" (9f.wav)
0x2C000 - 0x2FFFF (16KB)	Voice "Ten" (10f.wav)

Table shows the memory management for LPC2138/LPC2148

There are many proceedings to convert audio file into HEX; for example, using program Utility of EPROM programmer to open audio file as Binary File type and save in the Buffer of program. Next, we must save file that is converted into Hex file completely and we must configure Offset position value for storing data as 0x4000 up as shown in the table above. In this case, we will mention about using program Utility named "BIN2HEX" that is downloaded from Website of Keil and we can download this program free without any charge. Program BIN2HEX is a program that runs as Command Line and user can study User's Manual of program from HELP of program. While we running Program on Dos Prompt, program will display the proceeding. However, we create Batch File named "VOIC.BAT" to convert audio file into HEX File follow by the position address that is configured as in the table above, so it is quite convenient for user to apply. It is saved in Folder named "AudioData" that is overlapped internal Folder of C Language Source Code. Details of Batch File are described as follows;

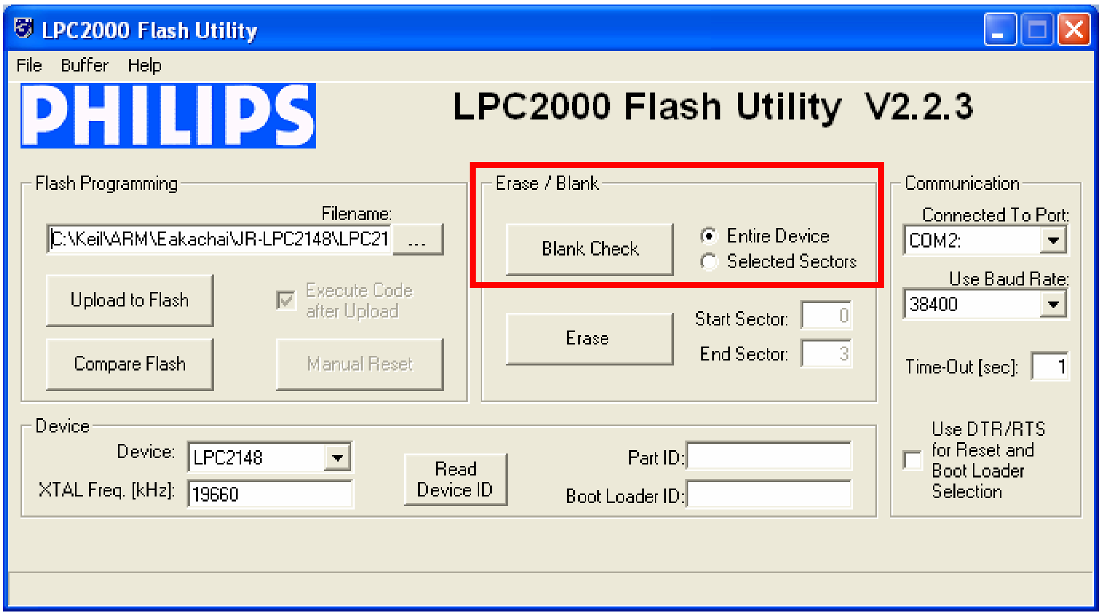
```
ECHO OFF
ECHO Generating VOICE.HEX with Wave Files...
DEL VOICE.HEX
BIN2HEX /L16384 /O16384  /4    /T /Q  0f.wav VOICE.HEX
BIN2HEX /L16384 /O32768  /4 /A /T /Q  1f.wav VOICE.HEX
BIN2HEX /L16384 /O49152  /4 /A /T /Q  2f.wav VOICE.HEX
BIN2HEX /L16384 /O65536  /4 /A /T /Q  3f.wav VOICE.HEX
BIN2HEX /L16384 /O81920  /4 /A /T /Q  4f.wav VOICE.HEX
BIN2HEX /L16384 /O98304  /4 /A /T /Q  5f.wav VOICE.HEX
BIN2HEX /L16384 /O114688 /4 /A /T /Q  6f.wav VOICE.HEX
BIN2HEX /L16384 /O131072 /4 /A /T /Q  7f.wav VOICE.HEX
BIN2HEX /L16384 /O147456 /4 /A /T /Q  8f.wav VOICE.HEX
BIN2HEX /L16384 /O163840 /4 /A /T /Q  9f.wav VOICE.HEX
BIN2HEX /L16384 /O180224 /4 /A    /Q  10f.wav VOICE.HEX
```

Figure displays commands in Batch File to interpret audio file into HEX.

When we open Batch File, we will get file named "VOICE.HEX" that is a part of 11 audio files and each file is arranged in memory as 16KB respectively as shown in the table above.

When we get both HEX files; Code Program (it is interpreted by Keil-CARM) and HEX File that is voice that is interpreted by Batch file (VOICE.BAT). Next step is downloading both Hex files into CPU by using program LPC2000 from Philips. In this case, there are two proceedings to do as follows;

1. Command to download Hex file as file by file. When we open Hex File that is audio file, must select type of delete memory as Enter Device that command to delete all memory and then command to download audio file first. Next, open HEX File of Source Code but we must select type of delete memory as Select Sectors type and must configure position Sector to be 0..3 and then command to download as in the picture below.



Filename: C:\Keil\ARM\Eakachai\JR-LPC2148\LPC21

☑ Execute Code after Upload

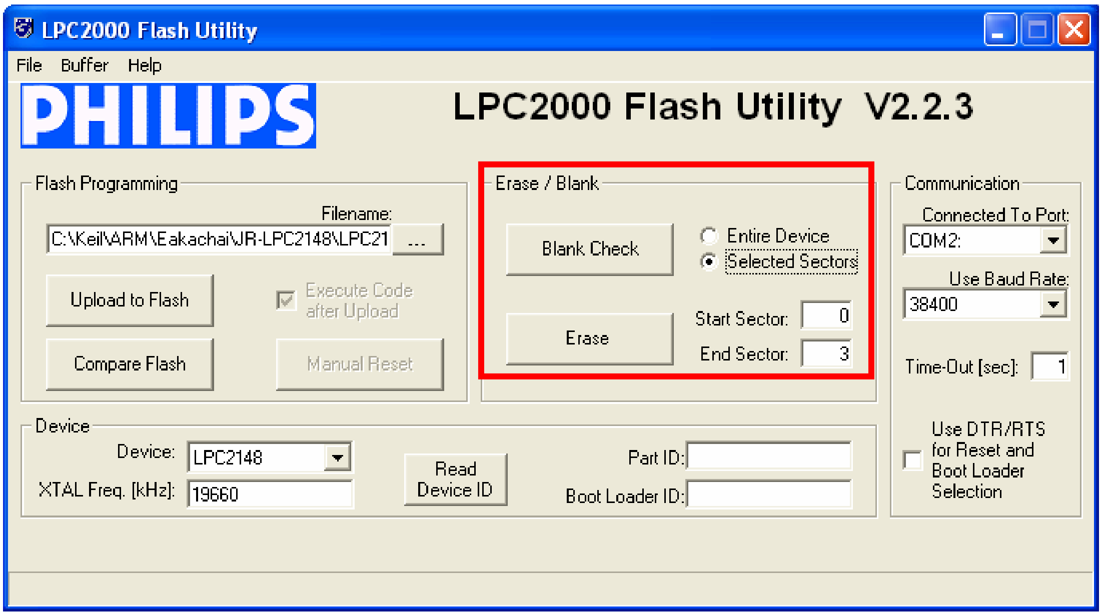
● Entire Device
○ Selected Sectors

Start Sector: 0
End Sector: 3

Connected To Port: COM2:
Use Baud Rate: 38400
Time-Out [sec]: 1
□ Use DTR/RTS for Reset and Boot Loader Selection

Device: LPC2148
XTAL Freq. [kHz]: 19660
Part ID:
Boot Loader ID:

↓



Filename: C:\Keil\ARM\Eakachai\JR-LPC2148\LPC21

☑ Execute Code after Upload

○ Entire Device
● Selected Sectors

Start Sector: 0
End Sector: 3

Connected To Port: COM2:
Use Baud Rate: 38400
Time-Out [sec]: 1
□ Use DTR/RTS for Reset and Boot Loader Selection

Device: LPC2148
XTAL Freq. [kHz]: 19660
Part ID:
Boot Loader ID:

2. Must combine both 2 Hex Files into only one file and then command to download only one time as follows;

   a. Open Hex file of Source Code that is interpreted by Keil-CARM of Program Text Editor such as Notepad. Then command to delete the last line that is the end of file Intel HEX (End of HEX Record). The feature of the last line is shown as in the picture below.

```
:00000001FF
```

   b. Open HEX File of audio file that is interpreted by Batch File (VOIC.BAT). Next, copy all data in HEX file to place at the end of HEX File of Source Code and then save HEX File of Source Code that is combined together.
   c. Command to download HEX File that is combined together into board.

*****NOTE*****

For HEX File named that is combined together is “LPC2148_MP3_PLAY_WAVE.HEX” and “LPC2138_MP3_PLAY_WAVE.HEX” and is saved in Folder name “FINAL_HEX_TEST. This folder is overlapped internal Folder of C Language Source Code and Hex File that is in the same Folder of Source Code is Hex File of Source Code that does not combine with audio file. We can take Hex File in Folder named FINAL_HEX_TEST to download and test instantly. If everything is correct without any error after downloaded completely, when we press RESET and connect with headphone or amplifier of computer PC, we will hear the counting number from 0 to 10 in English version and it will be repeated continuously.

The connection signal between boards

Board CP-JR ARM7 LPC2138 CP-JR ARM7 USB-LPC2148		Board ET-MINI MP3 (VS1002D)
[+3V3]	↔	[+3V3]
[GPIO0.2(Input)]	←	[DREQ]
[GPIO0.3(Output)]	→	[RES#]
[GPIO0.4(SPI0-SCLK)]	→	[SCLK]
[GPIO0.5(SPI0-MISO)]	←	[SO]
[GPIO0.6(SPI0-MOSI)]	→	[SI]
[GPIO0.7(Output)]	→	[XCS#]
[GPIO0.8(Output)]	→	[BSYNC]
[GND]	↔	[GND]

Shows directions and signal of connection between ARM7 and MINI-MP3