光電子技研

OELBBBPoE01

PoE/PSE Board for BBB(BeagleBone Black]

*PoE ; Power over Ethernet
*PSE ; Power Sourcing Equipment

GENERAL DESCRIPTION:
The OELBBBPoE01 is PoE(Power over Ethernet) / PSE (Power Sourcing Equipment) board docked on BBB (BeagleBone Black) with a needed intermediate board.
The Battery charger board OELBBBPWR01 is also available for the needed intermediate board.
The OELBBBPoE01 provides +48V/15.4W(IEEE802.3af) power sourcing into PoE/PD(Powered Device). The voltage input range is wide from 9V upto 20V, and then DCDC48V converter is mounted in board. The LED1 on board indicates PoE/PD detecting status. The SW1 on board is available for power-off of PoE.
Operating temperature range is －15deg.C to +50deg.C.
Two ethernet port RJ-45 are mounted on the board.One RJ-45 is for PoE/PD, and another RJ-45 is for non-PoE devices. These two RJ-45 separate PoE power line and ethernet signal line via isolation transformer.
When you apply total set with having docked BBB and OELBBBPoE01 and OELBBPWR01, it is very useful and very convenient for user as easy placed IoT/Solar&Li-ion battery/BBB server systems outside installation with PoE devices such as network camera.

FEATURES:
・PoE/PSE Board for BBB(BeagleBone Black)
・Compliant with IEEE802.3af(48V/15.4W) ; Alternative-B
・10/100BASE-TX
・Vin = +9V to +20V
・DCDC48V converter on board
・Operating Temperature Range: －15 degC to +50 degC
・PoE/PD(Powered Device) Detecting indicator LED
・Power off SW1 for PoE/PSE 48V
・Board style docked on BBB via expansion connector
・Board Size ; 54mm × 100mm
・RJ-45(for PoE/PD) and RJ-45(for Non-PoE) separate PoE power line and ethernet signal line via isolation transformer.
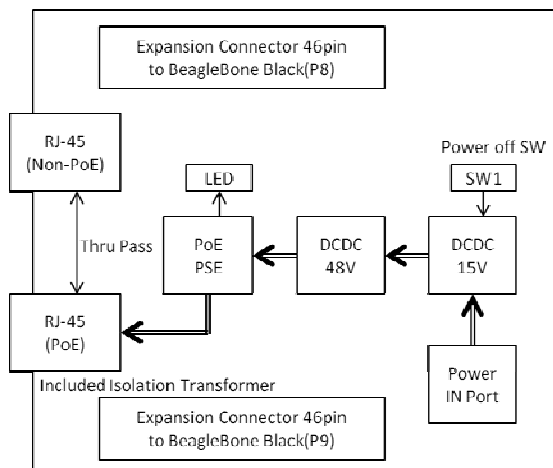・Applicable to be docked to OELBBBPWR01.

Pic.1 Top view of board OELBBBPoE01

APPLICATIONS:
For use Beaglebone black outside installation with PoE Network Camera and solar panel and battery.
PoE Network Camera solution.
IOT Server Systems applications.
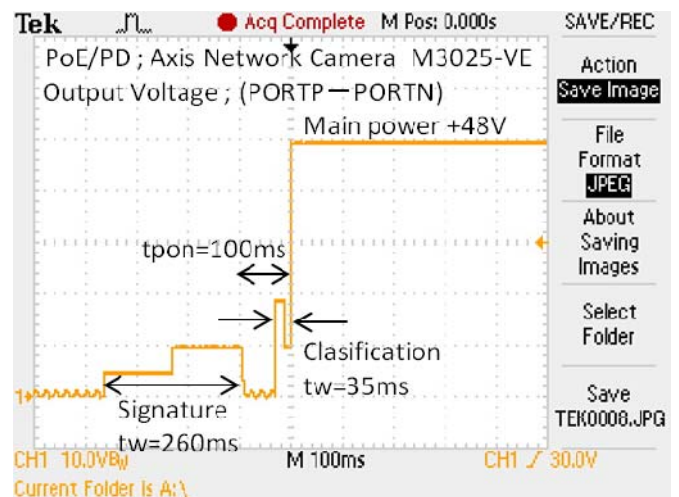Embedded Linux Systems with BBB.

Pic.2 Skew view of board OELBBBPoE01

Fig.1 Functional Block Diagram of OELBBBPoE01

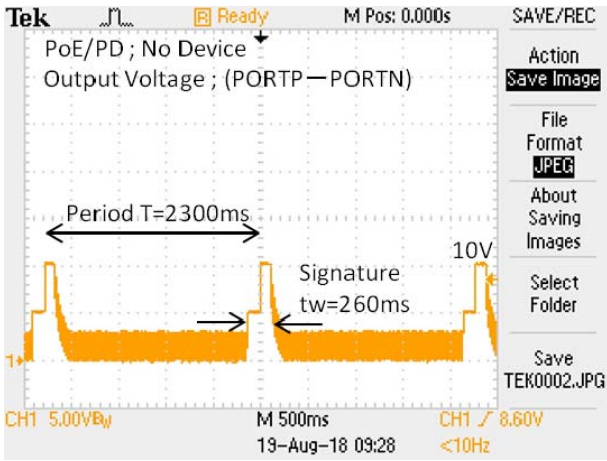**Fig.2 PoE/PD Classification Waveform**

Fig.3 Signature Cycle Waveform

Fig.2 shows the PoE/PD Classification waveform that detects PoE/Powered Device.
To ensure that the PoE/PSE does not apply power to a non PoE enabled device, the Port output first checks for a valid PoE signature by 10V. ThePoE/PD should present a nominal 25kΩ (23.75kΩ to 26.25kΩ) Signature resistance. If the PoE/PSE does not see a valid signature then it will disconnect, wait approximately 2 seconds then try again, see Fig.3.
PSE will then interrogate the PD to see if a classification signature is present. The classification signature is used to determine the amount of power the PD will draw and limits the output power accordingly. (See Table.1)

Class	PD Power(W)	PSE Power(W)	standards
0	13	15.4	IEEE802.3af
1	3.84	4	IEEE802.3af
2	6.49	7	IEEE802.3af
3	12.95	15.4	IEEE802.3af

Table.1 Classification Table

Pic.3 shows the locations of LED1,SW1.The SW1 is capable to turns on PoE function(classification,detecting,biasing). The LED1 turns on when the PoE PSE module detects PoE/PD and supplys biasing +48V.
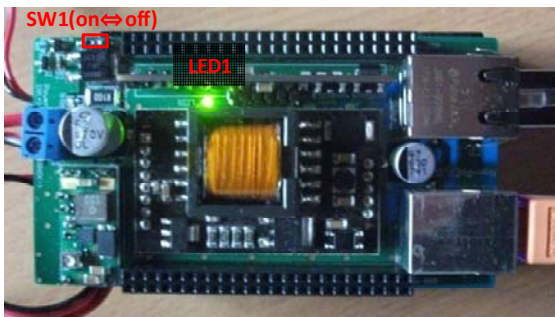
Pic.3 Locations of LED1,SW1
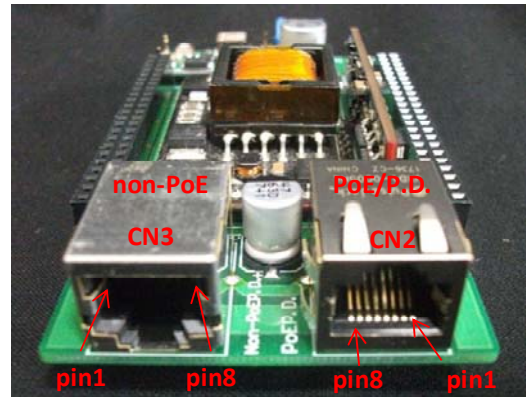
Pic.4 RJ-45 configuration(CN2, CN3)

CN2 ; for PoE/P.D.	
pin1	TX+
pin2	TX−
pin3	RX+
pin4	PoE Positive Bias(+48V)
pin5	PoE Positive Bias(+48V)
pin6	RX−
pin7	PoE return GND(0V)
pin8	PoE return GND(0V)

CN3 ; for non-PoE	
pin1	TX+
pin2	TX−
pin3	RX+
pin4	shorted to pin5
pin5	shorted to pin4
pin6	RX−
pin7	shorted to pin8
pin8	shorted to pin7

**Table.2 RJ-45 pin configuration(CN2, CN3)**

Pic.4 shows the ethernet connector CN2,CN3 pin assignments. The table.2 shows the RJ-45 pin configirations.
The OELBBBPoE01 has 10/100BASE TX and compliant with IEEE802.3af and alternative-B.
CN2 is for PD/PoE and CN3 is for non-PoE devices.

**About how to do docking to BeagleBone Black:**
The OELBBBPoE01 can not be mounted to BeagleBone Black board directly. So it is needed to use some intermediate board such as in Pic.5(OELBBBPWR01) or Pic.6(Mid universal board OELBBBMidBoard01). When user use OELBBBMidBoard01, it is needed to apply the external power source +12VDC to OELBBBPoE01.Pic.7 shows the view of OELBBBPoE01 docked to BeagleBone Black via OELBBBMidBoard01. Pic.8 shows the view of mounting direction of OELBBBMidBoard01. If user has wrong direction mounting, the OELBBBMidBoard01 can not be docked to BeagleBone Black.
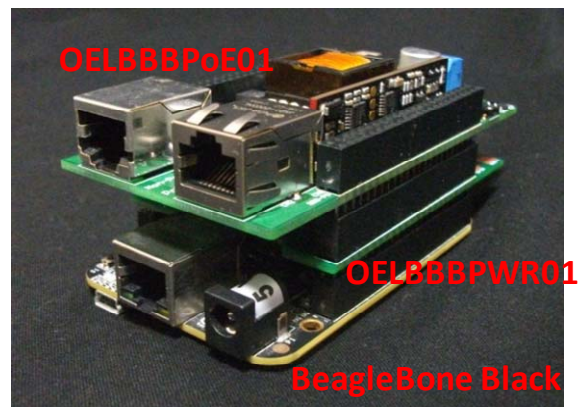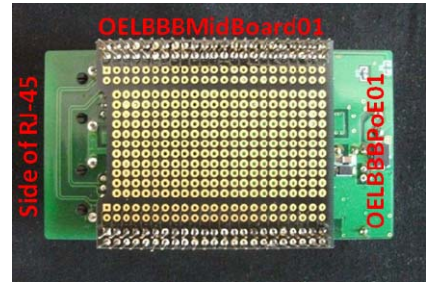

Pic.5 View of OELBBBPoE01 docked to BeagleBone Black and to OELBBBPWR01
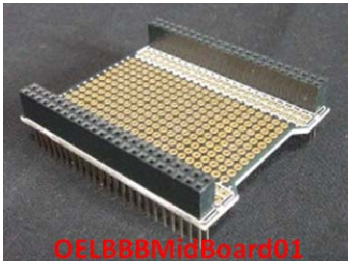
Pic.6 Intermadiate board
OELBBBMidBoard01
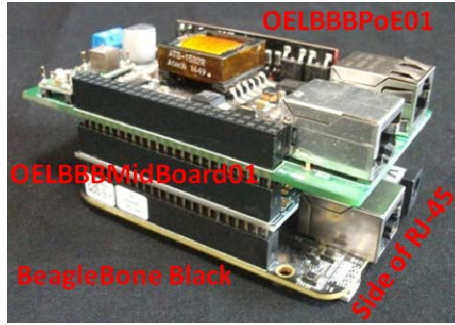
Pic.7 View of OELBBBPoE01 docked to
BeagleBone Black via OELBBBMidBoard01

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Pic.8 View of Mounting Direction of
OELBBBMidBoard01

Application Examples:
Pic.9 shows application examples that are configured of Solar Panel,Li-ion Battery, BeagleBone Black, OELBBBPoE01, OELBBBPWR01, Mobile Gateway(Router), Ethernet Cradle, LANHUB, PoE network camera. Fig.4 shows the application example experimental configuration.

In the example,the beaglebone black has been mounting Web Server which has several features of ADC(monitoring and alarming analog voltage and displaying time-based graph with date & time), DAC(outputing analog voltage), GPIO(digital input/output), displaying network camera live view, e-mail notifier for alarm, synchronizing datet & time to NTP.
The OELBBBPoE01 provides PoE power sourcing with compliant IEEE.802.3af. The PoE network camera is available via OELBBBPoE01. User can access the network camera server html page directory or via iframe on BeagleBone Black server html page.
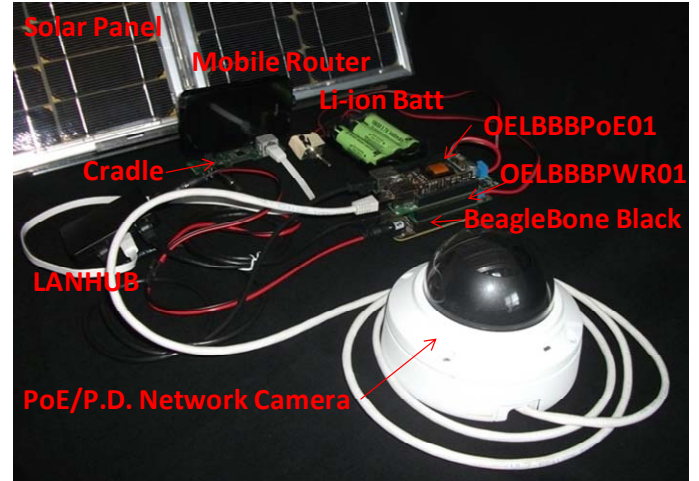
Pic.10 shows a access screen shot to network camera Web server html page through mobile router gateway(port 80).
Pic.11 shows a access screen shot to network camera iframe on BeagleBone Black server html page through mobile router gateway(port 5000).
Thus the sets of BeagleBone Black, OELBBBPoE01, OELBBBPWR01 are asset for solar/battery IoT solution such as agriculture, structural health monitoring(SHM), remote sensing & logging, security, construction filed monitoring.
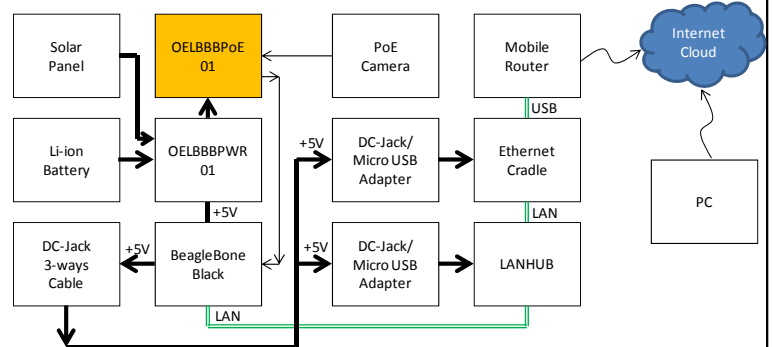

Pic.9 Application Examples

Fig.4 Application Example Experimental Configuration

Pic.10 Access screen shot to Network Camera Web Server html page through mobile router gateway(port 80)

Pic.11 Access screen shot to Network Camera iframe on the BBB Web Serverhtml page
through mobile router gateway(port 5000)

Note ;
Take caution to avoid reverse connection of power cable to battery and solar panel terminal block port. If you do reverse connection, we never ensure the operating guarantee about our board OLEBBBPWR01 and claim our immunity from exchange.