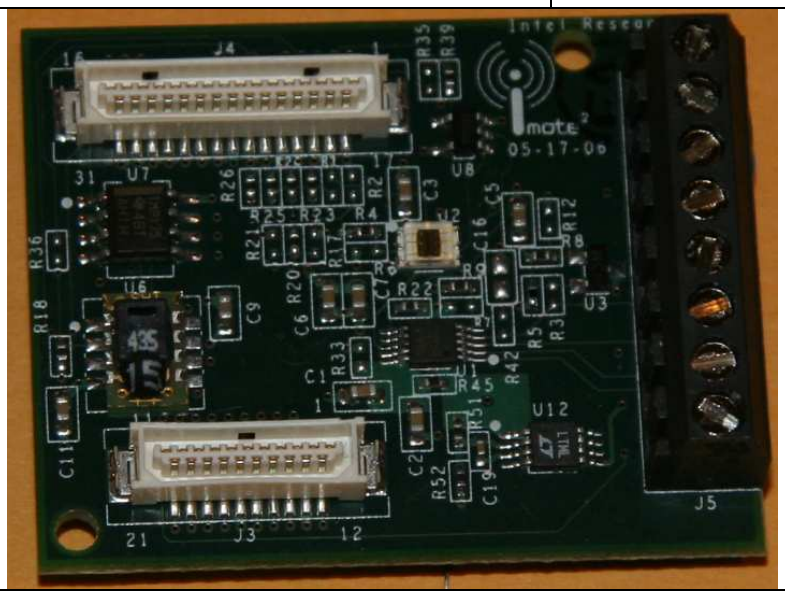
Intel® Sensor Board	DATA SHEET	Rev1.02
The basic sensor board is designed to connect to the basic connectors on the Imote2. It contains a 3d Accelerometer, advanced temp/humidity sensor, light sensor and 4 channel A/D. It is a pass through board to allow stacking with another sensor/communication board.		

Description

This basic sensor board is multi-sensor board that combines a popular set of sensors for wireless sensor network applications, including:

- ✓ ST Micro LIS3L02DQ 3d 12 bit +-2g accelerometer
- ✓ High Accuracy, +-.3°C Sensirion SHT15 temperature/humidity sensor
- ✓ TAOS TSL2651Light Sensor
- ✓ Maxim MAX1363 4 Channel General Purpose A/D for quick proto-typing.
- ✓ TI Tmp175 Digital Temperature Sensor with two-wire interface

Board Revision

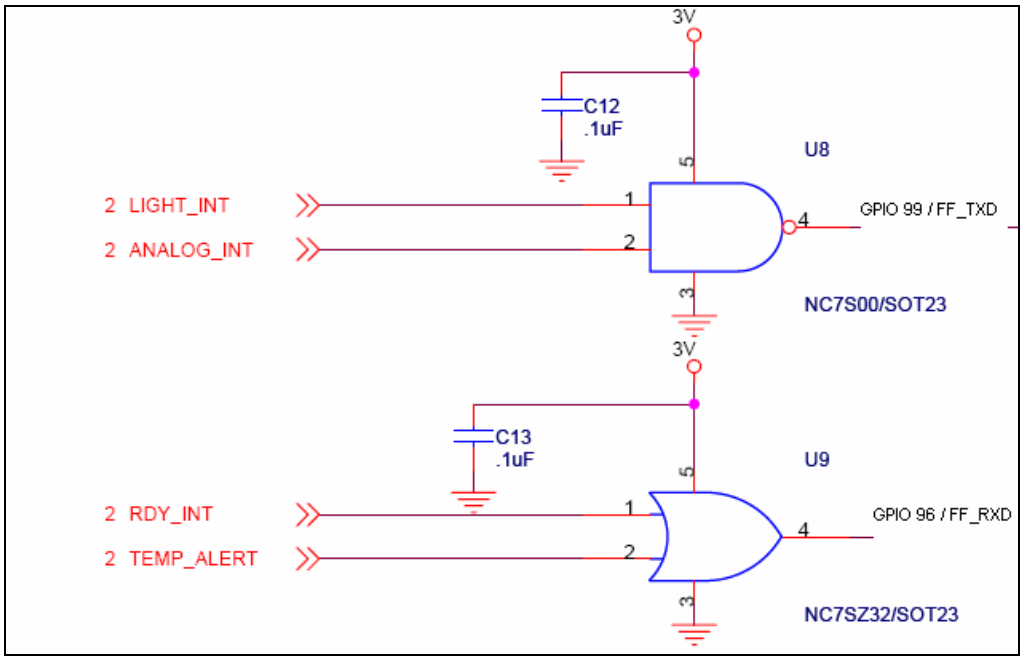
This data sheet applies to Revision 2.0 of the basic sensor board. The revision number can be found on the bottom side of the sensor board.

Sensor Details

1 3d Accelerometer

This board includes an ST Micro LIS3L02DQ 3d accelerometer. This sensor has a range of +/- 2g with 12 bit resolution. It offers two possible interfaces, SPI or I2C, either of which is selectable using 0-ohm resistors including on the board. To communicate with the sensor using the I2C interface, populate R17 and remove R21. To communicate with

the sensor using SPI, populate R21 and remove R17. By default, the sensor is connected to SSP1 on the Imote2. In the event that another stacked board conflicts with the basic sensor board use of SSP1, the sensor may be disconnected from the port by removing R23, R24, R25 and R26, and connected to SSP2 instead by populating R29, R30, R31, R32 with zero ohm resistors. The sensor's data ready (RDY_INT) interrupt is connected to GPIO96 through an OR gate as shown in the schematic below. If another board conflicts with the use of GPIO 96, the BT_RXD pin can be used instead by loading R34. For more info on this sensor, the datasheet can be found at http://www.stmicro.fr/stonline/products/literature/ds/10175.pdf.



2 Temperature and Humidity Sensor

The boards include a Sensirion SHT15 sensor which can be used for applications requiring high accuracy temp reading (+/- 0.3 degC) and humidity. This sensor interfaces to the Imote2 through two GPIO pins. The data pin of the SHT11 is connected to GPIO 100, whereas the clock pin is connected to GPIO 98. Another set of connections is available by loading R36 and R37 if no conflict exists with another stacked board. For more information on the SHT11 sensor, please reference its datasheet located at: http://www.sensirion.com/images/getFile?id=25

3 Light Sensor

The board includes a TAOS TSL2651 light sensor. This sensor interfaces to the Imote2 through the I2C bus. The interrupt pin (LIGHT_INT) is connected to GPIO99 through a NAND gate as shown in the schematic above. If another board conflicts with the use of GPIO 99, the BT_TXD pin can be used instead by loading R35. The address select line is driven by R4 and R6 and is set to 1 by default (R4 in, R6 out). To set it to 0, populate

R6 and remove R4. To float it, remove both R4 and R6. Refer to data sheet for address mapping. The data sheet can be found at
http://www.taosinc.com/product_detail.asp?cateid=4&proid=60

4 General purpose A/D

The board includes a Maxim MAX1363, 4 channel, 12 bit resolution general purpose ADC for quick prototyping. Each channel supports 0-3 V input signals. The ADC interfaces to the Imote2 through the I2C bus. The analog pins are brought out to a Molex PN-39357-0003 connector (J5) and the pin assignment is shown below. Pin A0 which controls the I2C address of the ADC is driven to 0 by default (R7 out, R9 in). If the I2C address needs to be changed, A0 can be driven to 1 (as specified in the data sheet) by removing R9 and populating R7.
The interrupt line (ANALOG_INT) is connected to GPIO99 through a NAND gate as shown in schematic above. If another board conflicts with the use of GPIO 99, the BT_TXD pin can be used instead by loading R35. The datasheet can be found at http://pdfserv.maxim-ic.com/en/ds/MAX1363-MAX1364.pdf.

5 Digital Temperature Sensor with two wire interface

The board includes a TI TMP175, a digital temperature sensor with a two wire output serial interface. The device is capable of a +/- 1.5°C accurace over the range of -25°C to 85°C. The sensor allows up to 27 I2C devices on the bus. TMP175 address can be configured via resistors R13,R14,R15,R16,R27,R28. See schematic and TMP175 datasheet for more details. The interrrupt line(TEMP_ALERT) is connected to GPIO96(FF_TXD) as shown in the schematic above. The datasheet for the device can be found at http://focus.ti.com/lit/ds/symlink/tmp175.pdf

6 Boost Switcher and Linear Regulator

The board includes a switching voltage regulator(U11-LTC3426), followed by linear regulator(U12-LTC1962). The input to the boost regulator is provided from the battery. In order to provide a cleaner power supply the output of the switcher is regulated further with a linear regulator. Regulated voltage output is provided externally through the connector J5 pin 5. It could be used for prototyping purposes in the case where a user of the board requires a voltage that is higher than anything provided by the board. All boards are shipped with the switcher/regulator disabled. See schematic and datasheet details on how to enable the switcher and set the voltages on both the switcher and the regulator.

Communication and Addressing

The Light Sensor (U2), Simple Temp Sensor (U7) and general purpose A/D (U1) can only be accessed via the I2C bus. Resistor settings control device addressing.
The default I2C addresses are shown below.

Sensor	Address
TS2561(U2)	1001001
TMP175(U7)	1001010
MAX1363(U1)	0110100

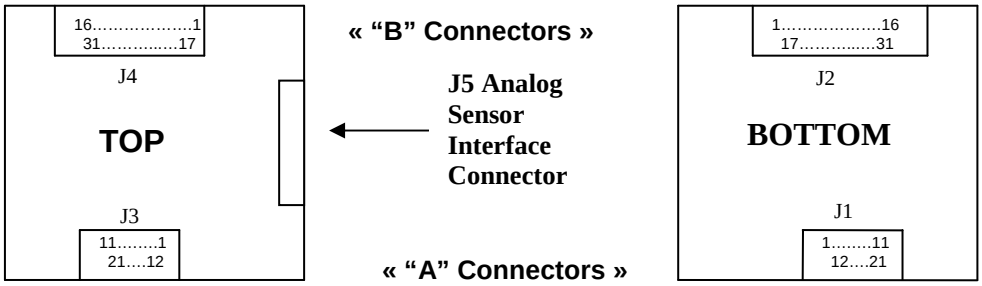
Notes:

- Temp Sensor (U6) is not I2C compatible and utilizes a proprietary serial communication protocol. Please see its datasheet for more information.
- 3D Accelerometer can be configured to communicate over either I2C or SPI serial buses.

Absolute Maximum Ratings

Operating temperature range	T_o	0 - 70	ºC
Storage temperature range	T_s	-40 - 150	ºC
Humidity (non condensing)	H	80	%

Pin Assignments



Small "A" connector

Pin #	Type	Name	Description
A1[1]	PWR	VBAT	Not used by the sensor board, serves as input to the switcher
A2[1]	PWR	VBAT	Not used by the sensor board, serves as input to the switcher
A3		GND	Ground
A4[1]	PWR	PMIC_TBAT	Not used by the sensor board
A5	*R*	*Reserved*	*Do not connect*
A6	*R*	*Reserved*	*Do not connect*
A7	*R*	*Reserved*	*Do not connect*
A8	*R*	*Reserved*	*Do not connect*
A9	*R*	*Reserved*	*Do not connect*
A10	*R*	*Reserved*	*Do not connect*
A11	*R*	*Reserved*	*Do not connect*
A12[1]	PWR	1.8V	Not used by the sensor board
A13[1]	PWR	3.0V	Sensor Board Power Supply
A14[1]	*R*	*Reserved*	*Do not connect*
A15[1]		Alarm	Not used by the sensor board
A16[1]		Reset	Not used by the sensor board
A17		*GND*	*Ground*
A18[1]		VRTC	Not used by the sensor board
A19[1]		nCHARGE_EN	Not used by the sensor board
A20[1]		STD_RXD	Not used by the sensor board

A21[1]		STD_TXD	Not used by the sensor board

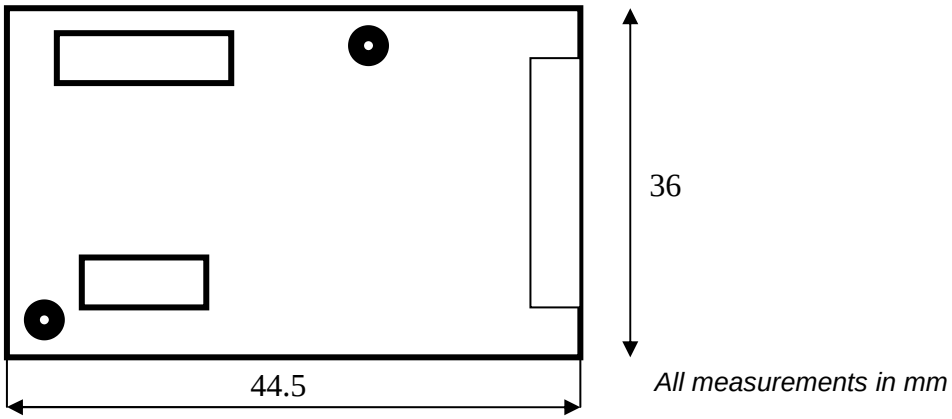
Large "B" connector

Pin #	Type	Name	Description
B1	O	FF_RXD	Logical OR of RDY_INT and TEMP_ALERT(Note1.1)
B2	O	FF_TXD	Logical NAND of LIGHT_INT and ANALOG_INT(Note1.2)
B3	I/O	FF_CTS	Serial Data for SHT15
B4	I	FF_RTS	Serial Clock for SHT15
B5[1]		BT_RXD	An alternative connection to B1
B6[1]		BT_TXD	An alternative connection to B2
B7[1]		BT_CTS	An alternative connection to B3
B8[1]		BT_RTS	An alternative connection to B4
B9		GND	Ground
B10[1]		SSP2_SCLK	An alternative connection to B19
B11[1]		*SSP2_SFRM*	An alternative connection to B20
B12[1]		SSP2_TXD	An alternative connection to B21
B13[1]		SSP2_RXD	An alternative connection to B22
B14[1]		GPIO_94	Not used by the sensor board
B15	*R*	*RFU8*	*Do not connect*
B16	*R*	*RFU9*	*Do not connect*
B17[1]	I	I2C_SCL/SCL_SPC	I2C Clock/SPI Serial Port Clock
B18[1]	I/O	I2C_SDA/SDL_SDI_SDO	I2C Data/SPI Serial Data Input
B19[1]	I/O	SSP1_SCLK/SCL_SPC	SPI serial clock
B20[1]	I	SSP1_SFRM/SPI_CS	SPI chip select
B21[1]	I	SSP1_TXD/SDA_SDI_SDO	SPI serial data input for accelerometer
B22[1]	O	SSP1_RXD/SDO	SPI serial data output for accelerometer
B23[1]		GPIO10	Not used by the sensor board
B24		GND	Ground
B25[1]		MM_CLK	Not used by the sensor board
B26[1]		MM_CMD	Not used by the sensor board
B27[1]		MM_DATA0	Not used by the sensor board
B28[1]		MM_DATA1	Not used by the sensor board
B29[1]		MM_DATA2	Not used by the sensor board
B30[1]		MM_DATA3	Not used by the sensor board
B31		GPIO_93	Not used by the sensor board

J5-Analog Sensor Interface Connector

Pin #	Type	Name	Description
1	Analog Input	AIN0	Input to an ADC
2	Analog Input	AIN1	Input to an ADC
3	Analog Input	AIN2	Input to an ADC

4	Analog Input	AIN3	Input to an ADC
5	PWR	3V	Switcher/Regulator output supplied from the Sensor Board
6	GND	GND	Ground
7	I/O	I2C SDA	I2C Data
8	I/O	I2C SCL	I2C Clock



All measurements in mm

Datasheet Errata

Rev#	**Changes**
1.01	Initial Revision
1.02	Page 1-Sensirion sensor information corrected, TMP175 info added Page 2-Sensirion sensor information corrected Page 4-TMP175 section added, I2C address information corrected Page 4-pins A1 and A2 use clarified Page 5-J5 pin 5 use clarified

Hardware Errata(Board Rev 2.0)

U7(TMP175) TEMP_ALERT signal requires a 10Kohm pull up to 3V. It's missing in the current revision.

U2(TSL2561) LIGHT_INT signal requires a 10Kohm pull up to 3V. It's missing in the current revision.

[1] Passed through to the bottom connectors J3 & J4 on the same pins.