UM11079

IoT Module Base Board User Manual

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Document information

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Abstract	IoT Module Baseboard User Manual

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1. Introduction

The OM40006 IoT Module Baseboard is designed to provide access to the broad range of peripherals available on NXP WiFi-enabled IoT modules, such as the LPC54018 IoT Module (OM40007). The board includes a debug probe based on the LPC-Link2 design used in many of NXP's range of LPCXpresso boards, and in the standalone debug LPC-Link2 probe (OM13054). The combination IoT Module and this baseboard are supported by NXP's MCUXpresso suite of tools, including a fully featured, Eclipse-based IDE and an SDK which includes drivers, middleware and example applications. The SDK also includes ready to use projects for IAR EWARM and Keil MDK tools. Note that the OM40006 Baseboard is sold standalone (i.e. modules are sold separately.)

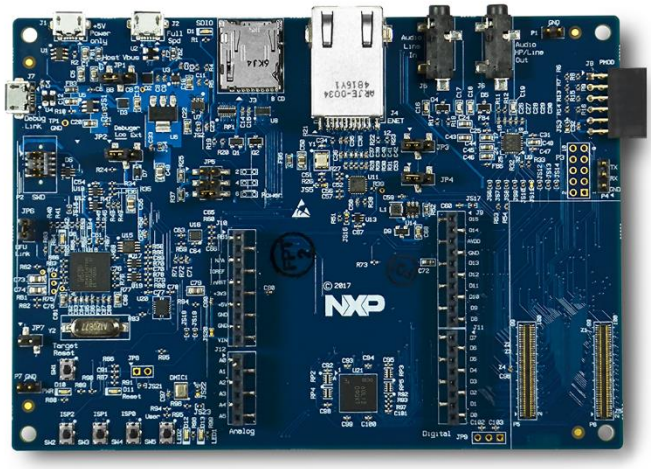

Fig 1. IoT Module Baseboard underside view (no module fitted)

This document describes the hardware of the OM40006 board. The following aspects of interfacing to the board are covered by this guide:

- Main board features
- Setup for use with development tools
- Board interface connectors
- Jumper settings

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2. Feature summary

The OM40006 board includes support for the following features (availability of these features depends on the capabilities of the installed IoT Module):

- On-board, high-speed USB based, Link2 debug probe with CMSIS-DAP and SEGGER J-Link protocol options for debug of installed module
  - UART bridging from installed Module to USB (via debug probe)
  - Can be used with external debug probe connected to target Module
  - On-board Link2 can be used to debug off-board target
- 2 x user LEDs
- Target Reset, ISP/User (3) and User buttons
- Arduino UNO compatible expansion site
- On-board 3.3V regulator with external power supply options
- 128Mb Winbond SDRAM
- Knowles SPH0641LM4H digital microphone
- Micro SD card slot
- NXP MMA8652FCR1 accelerometer
- Stereo audio codec with line in/out
- Full speed USB port with micro A/B connector for host or device functionality
- 10/100Mbps Ethernet (RJ45 connector)
- 272x480 color LCD with capacitive touch screen

2.1 Board layout and settings

This section provides a quick reference guide to the main board components, configurable items, visual indicators and expansion connectors. The layout of the components on the OM40006 board is shown in Fig 2 below:

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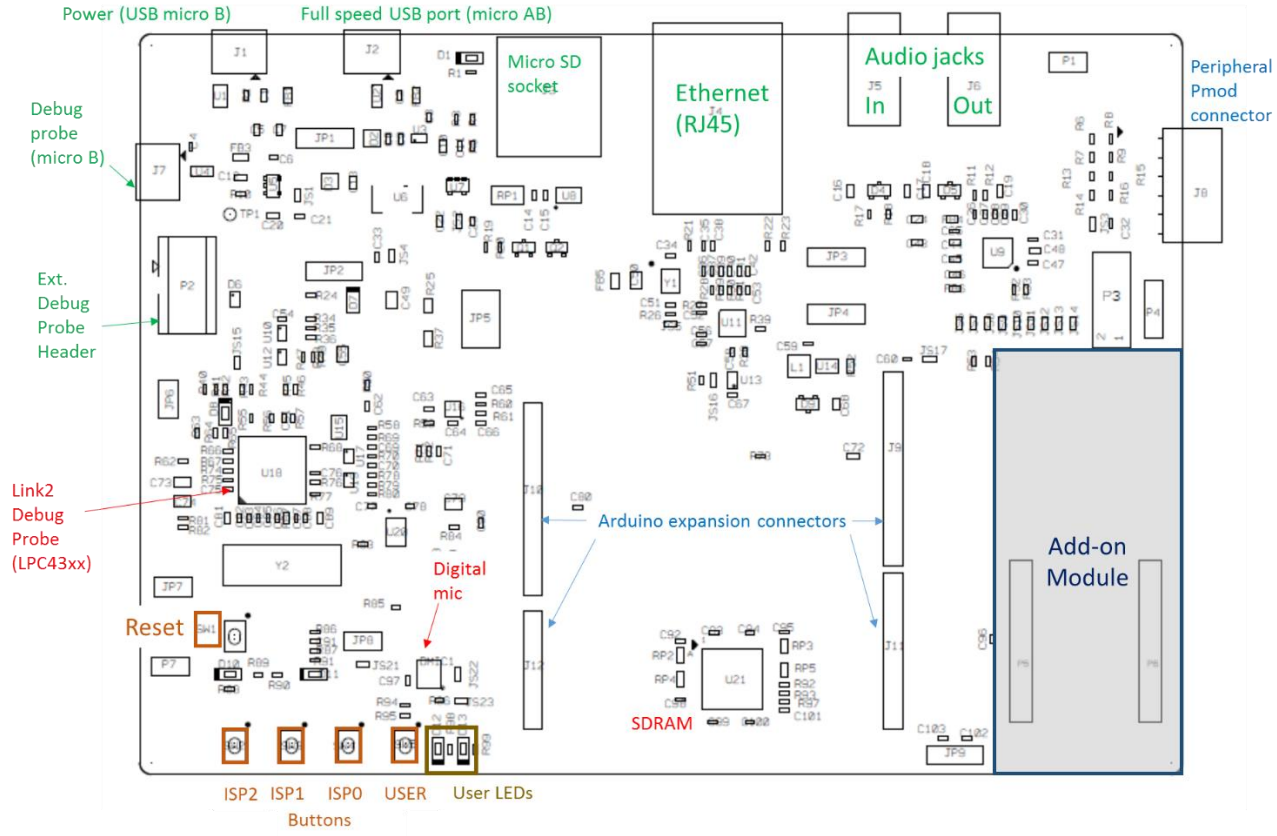

(1) Red is used to highlight key components, brown for buttons and LEDs, green for connectors and blue for expansion connectors.

Fig 2. OM40006 main feature layout

The LCD panel is mounted on the reverse side of the board, connected to the circuitry via two flex cable connectors. It should not normally be necessary to remove the LCD or access these connectors; the LCD is held in place by 4 double-sided adhesive pads.

The location of indicators and jumpers is shown in Fig 3.

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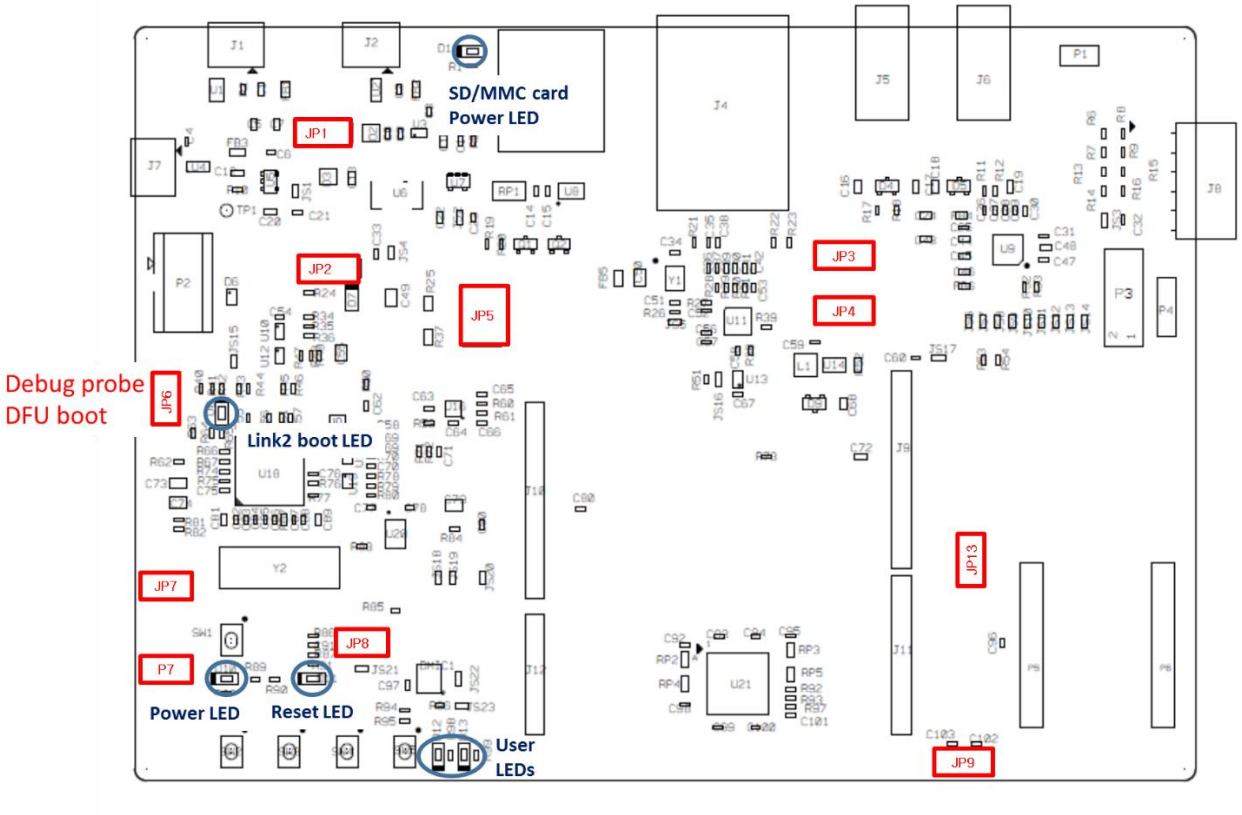

Fig 3. Jumper and LED locations

The function of each jumper is listed in Table 1.

Table 1. Jumpers

Circuit ref	Description	Ref section
JP1	**USB0 Vbus select** When using USB0 as a device interface, place in position 1-2 (default) When using USB0 as a host interface, place in position 2-3 (power must be supplied at J10 or via Arduino connector.	See schematic
JP2	**Buffer Power Selection** Level translating buffers are placed between the on-board debug probe and the target (installed module or off-board target). This jumper determines the power supply for the target side supply of those buffers (i.e. whether the VDD connection at pin 1 of the P2 header is sourcing current from the Baseboard or from an off-board target.) For On-board Target place in position 1-2 (default) For Off-board Target place in position 2-3	4

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Circuit ref	Description	Ref section
JP3 & JP4	**USB0 host / Ethernet TXD/RXD selection** Due to sharing of pin functionality on this development board, it is not possible to support the Ethernet port and USB0 overcurrent feature (USB0 in Host mode) simultaneously. For both JP3 and JP4: Install jumper in position 1-2 to enable Ethernet (Default) Install jumper in position 2-3 for USB hosting capability	6.3
JP5	**Power measurement** This set of 3 jumpers control various selections for power measurement: Position 1-2 and 3-4 are in parallel with 1 ohm resistors. Current can be measured across these jumper headers to determine current flow into the Module. Position 5-6 (installed by default) can be left open and a current meter connected between these pins to directly measure current flow into the Module.	5
JP6	**Link2 DFU boot control** Link2 (LPC43xx) force DFU boot – 2 position jumper pins. 1) Jumper open (default) for Link2 to follow the normal boot sequence. The Link2 will boot from internal flash if image is found there. With the internal flash erased the Link2 normal boot sequence will fall through to DFU boot. Jumper shunted to force the Link2 to DFU boot mode. Use this setting to reprogram the Link2 internal flash with a new image (using the LPCScrypt utility) or to use the MCUXpresso IDE with CMSIS-DAP protocol. Note that the OM40006 Link2 flash is pre-programmed with a version of CMSIS-DAP firmware by default.	4
JP7	**UART Bridge / P4 Header selector**. When open (default), the “Bridge” (or VCOM) UART connections from the Link2 probe are driven to the Module. Install JP7 when using the UART header connector at P4. Note that this disables the Debug Probe UART bridge probe connections.	6.1
JP8 (not fitted by default)	JP8 may be fitted to provide a convenient way to enable/disable the reset signal to/from the Module connector P6 (pin 22). Solder jumper JS21 should be removed if JP8 is to be used.	Refer to schematic
JP9 (not fitted by default)	This header provides a convenient connection point to provide external ADC positive and negative voltages (if supported by Module).	See Schematic

Board LED and button functions, and connectors are described in Table 2 below.

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Table 2. LEDs, buttons and connectors

Circuit Ref	Description	Ref section
D1	**SD card slot power enable** This LED illuminates when power is enabled to the SD card slot (controlled by Module P5 pin 83 (port P2-5))	n/a
D8	**Link2 boot mode** Link2 LPC43xx BOOT0_LED indicator. Reflects the state of LPC43xx Link2 MCU P1_1. When the boot process fails, D1 will toggle at a 1 Hz rate for 60 seconds. After 60 seconds, the LPC43xx is reset.	n/a
D10	**Power-on LED** This LED illuminates when the 3.3V supply to the Baseboard is present.	n/a
D11	**Reset LED** This LED illuminates when reset is asserted either via the expansion connector or when reset button SW1 is pressed.	n/a
D12, D13	**User LEDs** These LEDs are for application use. They are illuminated when the driving signal from the Module is low. The LEDs are driven by ports P6 pin 60 (port P3-3 of LPC54018 IoT Module) (D12) and P5 pin 66 (port P3-14 of LPC54018 IoT Module) (D13).	n/a
SW1	**Reset button** Press and release this button to reset the LPC546xx. Note that this does not reset the Link2 debug probe.	n/a
SW2, SW3, SW4	**ISP / User buttons** These switches can be used to force the Module in to ISP boot modes. The boot mode is dependent on the Module. The ISP pins are sampled by the Module's boot ROM code immediately following reset, so to initiate an ISP boot press and hold the required ISP buttons while pressing and releasing the reset button (SW1.) Following reset, these buttons may also be used by a user application.	Refer to Module MCU User Manual
SW5	**User button** This button is connected to Module connector P6 pin 41 (port P1-1 of LPC54018 IoT Module), and is provided for user applications. The port pin is pulled to ground when the button is pressed (a 100k pull-up is also present on the Base board.)	Refer to Module MCU User Manual
J1	**External +5V power** Micro USB connection for power to the Baseboard and peripheral circuitry (excluding Link2 Debug Probe).	n/a

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Circuit Ref	Description	Ref section
J2	**Module Full Speed USB connector (USB0)** This micro AB connector enables connection from the Module USB0 port to host or slave devices. An adaptor (not supplied) is typically required to connect USB slave devices (mouse, keyboard, etc.) Note that when using this USB port in host mode, power must be supplied via the J1 connector to power the USB device being connected to the board. Also note that jumpers JP8 & JP9 must be changed from their default position to use this port in host mode.	6.2.2
J3	**SD/MMC card slot** Full size SD/MMC card slot connected to the SDIO interface of the installed module (if supported).	8.3
J4	**Ethernet connector** This RJ45 connector provides a 10/100Mbps connection to the Ethernet PHY being driven by the installed module (if supported). Note that jumpers J3 and J4 need to be installed correctly (at default positions) for correct operation of Ethernet.	6.6
J5	**Audio line input jack** 3.5mm audio input jack for the audio codec	8.2
J6	**Audio line output jack** 3.5mm audio input jack for the audio code	8.2
J7	**Link2 debug probe connector** Micro USB type B connection for the on-board Link2 debug probe. The debug probe is only powered if this connector issued. Note: do not use this connection when using an external debug probe.	4
J8	**Peripheral expansion PMod connector** 0.1” pitch 2x6 connector following the PMod standards. This connector is primarily intended for adding external peripherals using I^2C and/or SPI bus, but is also suitable for general purpose I/O connections.	6.4
J9, J10, J11, J12	**Expansion connectors** 0.1” pitch connectors for addition of Arduino R3 shield or other expansion daughter boards / circuitry.	6.5
J13, J14	**LCD and touch screen display connectors** These connector is dedicated for the LCD and touch screen. They are located under the LCD panel and should not be handled by the user unless instructed to do so by NXP.	n/a

3. Getting Started

The Getting Started process will vary depending on the module to be used with the Baseboard. This section describes how to install a module on the baseboard, and how to set up the on-board debug probe for use with popular development tools. NXP provides free drivers and middleware, along with examples and applications to use these, in its MCUXpresso SDK packages available from https://mcuxpresso.nxp.com. At this site

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select the SDK package for your board by selecting the module you are using, and the SDK package will include examples for combination of module and this Baseboard.

The MCUXpresso SDK packages also include examples that use Amazon FreeRTOS. In order to use these examples with Amazon AWS you will need to set up an AWS account and go through various steps to register your board as a “thing”, create policies and generate certificates. The Amazon Github site (https://github.com/aws/amazon-freertos) includes tutorials for supported NXP modules; the tutorials may only include specific toolchain examples, but by using the example code from MCUXpresso SDK packages you can use MCUXpresso IDE, Keil or IAR tools.

3.1 Installing an IoT Module

Antistatic precautions should be followed during this process. Disconnect power to the board and module.

Carefully align the Module with the white outline on the Baseboard silkscreen; you should feel the Module connectors align with those on the Baseboard. Gently but firmly squeeze the Module and Baseboard together, applying pressure above the connectors. The Module should click into place. Do not apply excessive force; if the Module does not click into place easily, re-check alignment of the connectors.

3.2 Starting a debug session using the on-board (Link2) debug probe

An LPC4322 MCU is used to implement the on-board debug probe of the Baseboard – this is known as the on-board Link2. When using the MCUXpresso IDE, it is recommended that the Link2 is booted in DFU mode by installing a jumper on JP5; if this is done then the IDE will download CMSIS-DAP to the probe as needed. Using DFU boot mode will ensure that the most up-to-date / compatible firmware image is used with this IDE. Note: if DFU boot mode is used then the VCOM port functionality will not be available until/unless the debug probe is booted by the IDE.

When using other development tools the Link2 flash will need to be programmed using the LPCScrypt utility (see later in this section).

Note that spare jumpers are provided in the board packaging.

3.2.1 Installation steps for use with MCUXpresso IDE

This section describes how to set up the board for use with MCUXpresso IDE. This development tool set is available for free download at NXP.com.

1. Download and install the MCUXpresso IDE.
2. Recommended: Install JP6 (DFU Link) to force the Link2 debug probe to boot in DFU mode (see notes above).
3. Ensure jumper JP2 is fitted in position 1-2 (local target powered) – this is the default position set during board manufacture.
4. Connect the OM40006 board to the USB port of your host computer, connecting a micro USB cable to connector J7 (“Debug-Link”). The Module installed will boot and run any pre-installed software (refer to the manual for the module being used.)
5. Allow about 10 seconds for the OM40006 devices to enumerate for the first time; the device will appear as “LPC Device”.

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The board is now ready for code development using the on-board debug probe. If you are using the MCUXpresso SDK be sure to reference the documentation (under the doc directory) for specific instructions related to IAR and Keil tools.

The first time the board is used, it is recommended to force the Module target into known state by performing an ISP boot before attempting to run your first example code. This can be achieved by pressing and holding down one of the ISP buttons while pressing and releasing the reset button. Refer to the Module and/or associated MCU documentation for information on the ISP boot settings/controls.)

3.2.2 Installation steps for use with 3rd party tools (e.g. Keil and IAR)

1. Download and install LPCScrypt or the Windows drivers for LPCXpresso boards (http://www.nxp.com/lpcutilities). This will also install required drivers for the board.
2. Ensure JP6 (DFU Link) is open to force the Link2 debug probe to boot from internal flash.
3. Ensure jumper JP2 is fitted in position 1-2; this is the default position set during board manufacture.
4. Connect the OM40006 board to the USB port of your host computer, connecting a micro USB cable to connector J7 (“Debug-Link”).
5. Allow about 10 seconds for the OM40006 devices to enumerate for the first time. It is not necessary to check the Hardware Manager, however if this is done there will be five devices; four under Human Interface Devices (CMSIS-DAP, LPC-SIO, two HID Compliant Devices, and a USB Input Device) and one under Ports (LPC-LinkII Ucom.)
6. If you wish to use J-link protocol or ensure you have the latest CMSIS-DAP firmware version, follow these steps:
    a. Remove power from the board by disconnecting J7, install JP6, then reconnect power.
    b. Run either the “Program LPC-Link2 with CMSIS-DAP” or “Program LPC-Link2 with SEGGER J-link” script provided in your LPCScrypt installation, and follow the on-screen instructions. These scripts can be seen in the Windows Start menu for the LPCScrypt installation.
    c. After the script has run, remove JP6 and power cycle the board (note that resetting the board does not reset the Link2, so power cycling is required).
7. Your board is now ready to use with your 3rd party tool. Follow the instructions for those tools for using a CMSIS-DAP (or J-Link probe, if you have updated the firmware for this option using LPCScrypt.) If you are using the MCUXpresso SDK be sure to reference the documentation (under the doc directory) for specific instructions related to IAR and Keil tools.

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3.3 Starting a debug session using an external debug probe

Code running on the installed IoT Module may be debugged using an external debug probe that conforms to the standard ARM debug connector. To use an external debug probe connect the probe to the SWD connector on the Module, and connect power via the micro USB connector J1. Note that the Debug link connector J7 must be left unconnected so that the Link2 debug probe is left unpowered and does not contend with the SWD interface signals from the external debug probe.

4. Link2 debug features

This section describes the features provided by the on-board Link2 debug probe. See the Getting Started section for more information on how to program the device.

The Link2 debug probe is implemented using an LPC432x MCU (circuit reference U18), which provides a high-speed USB port interface to the host computer which is running the development tools. This device is not intended for developer use, and should only be used with approved firmware images from NXP. The Link2 on-chip flash memory is factory programmed with a firmware image that support CMSIS-DAP debug protocol, but also includes other USB end point functions:

- Virtual COM (VCOM) port: a serial device that can be used with any host computer application design for serial port communication (e.g. Teraterm, puTTY, etc.)
- SWO trace end point: this virtual device is used by MCUXpresso to retrieve SWO trace data. See the MCUXpresso IDE documentation for more information.

All of these devices are independent of each other and of the CMSIS-DAP debug device that is enumerated when the board is connected to a host computer; for example the VCOM port can be used if the board is running an application when no debugger is running.

In order to correctly install and use the Link2 device on the OM40006 (as will be required for any debugging) for host computers running Window 7 or 8, drivers must first be installed. These drivers will automatically be installed when MCUXpresso IDE has already been installed. If these IDEs are not being used, it is recommended LPCScrypt be installed as this also includes the required drivers. All these tools and utilities are available for free download at www.nxp.com.

The CMSIS-DAP firmware image installed at the factory (and by LPCScrypt) will uniquely identify itself to the host computer so that more than one board can be connected to that host computer at any time. Some toolchains cannot discern between multiple debug devices; refer to your toolchain documentation for more information (note the MCUXpresso does support multiple LPCXpresso board targets.)

Note that the Link2 only boots when the board is power cycled; the reset button on the board does not reset the Link2.

When using MCUXpresso IDE, the Link2 can be automatically booted with the latest / most appropriate firmware for that IDE version by installing JP6 before powering up the board. This is the recommended approach for the MCUXpresso IDE. Note that if JP6 is installed the VCOM port (and other devices mentioned above) device will not appear until

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the IDE boots the debug probe. The debug probe is booted once a debug session is started (i.e. the IDE attempts to download code to the target).

4.1 What the Link2 boot LED indicates

LED D8 is the Link2 MCU BOOT0_LED indicator. This LED reflects the state of Link2 MCU pin P1_1. When the boot process fails, D8 will toggle at a 1 Hz rate for 60 seconds. After 60 seconds, the Link2 MCU is reset.

4.2 Programming the Link2 firmware

As mentioned earlier in this section, it is not normally necessary to program the Link2 firmware. However, this can easily be accomplished using the supporting utility, LPCScrypt.

To program the Link2 Flash the Link2 device (LPC432x) must be in DFU mode. If the Link2 already has a valid image in the flash, it will need to be forced into DFU mode by placing a jumper shunt on JP5, and power cycling (disconnecting then reconnecting power via J8.) Link2 MCU programming is performed using the LPCScrypt utility (see http://www.nxp.com/lpcutilities). Instructions for using the tool are located at the same web page.

4.3 VCOM port

The identifier of the VCOM port will vary between boards and hosts. To determine the COM port, open the Windows operating system Device Manager. This can be achieved by going to the Windows operating system Start menu and typing “Device Manager” in the search bar. In the device manager look under “Ports”; the LPC-LinkII UCom Port device and its name should be visible.

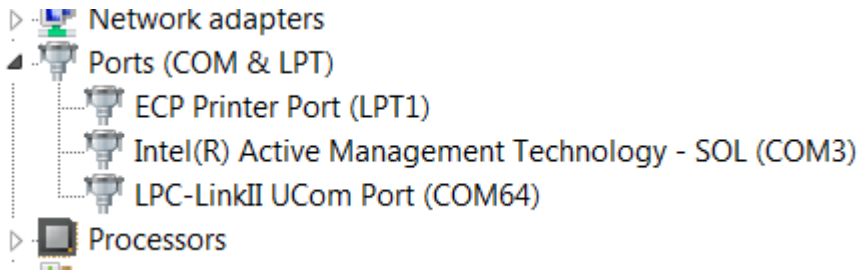

Fig 4. Identifying the VCOM port

Note that the J-Link firmware image also includes a VCOM port capability; this will appear as a device called JLink CDC UART Port (COMxxx), where xxx indicates a number that will vary depending on your system.

4.4 Using the on-board Link2 to debug an external target

The on-board Link2 debug probe may be used to debug an off-board target (other than the Module. To do this install a jumper on JP2 in position 2-3, and connect SWD

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connector P2 to the external target (it is recommended that power is removed while making these changes/connections). The Link2 can then be used in the same way (using CMSIS-DAP or J-link firmware with any supported IDE, or using DFU boot if using MCUXpresso IDE) as described earlier in this section.

5. Board power connections & measurement

The OM40006 board requires +5V input to power the on-board voltage regulators which in turn power the Link2 debug probe and other +3.3V circuits, the installed module and and the Arduino +5V and +3.3V power rails. When the main external power source is from the Link2 side USB micro B-type connector (J7), both the Link side and Module sections of the board are powered. When the main external power is from the power only USB micro B-type connector (J1), or one of more of the USB device ports (USB0 or USB1), only the Module and supporting devices and peripherals are powered.

5.1.1 Module Vsense resistor current measurement

The voltage across a pair of 1Ω resistors in series with the target Module VDD can be manually measured at JP5 across pins 1 and 4 on the PCB. For a higher range of current a jumper should be installed between pins 3 and 4 of JP5 to short out one of these resistors. The voltmeter positive probe is applied to JP5 pin 1 (see silkscreen labelling) and pin 4. Use Ohm's law to calculate the current (Module current = measured voltage / 2Ω). As an example if the measured voltage is 20mV, then 20e-3 / 2Ω = 10mA.

5.1.2 Module VDD current measurement using a current meter

A current meter may be inserted at JP5 between pins 5 and 6 to measure the Module VDD input current. Note that a jumper needs to be installed in the 5-6 position when an ammeter is not present so power can reach the Module.

6. Board peripheral connections

6.1 USART ports and VCOM support

The OM40006 board provides access to USART connections from the installed module J4 connector pins 93 and 97 to the Link2 debug probe or external UART connector P4. When using P4, install jumper JP7 to prevent contention with the Link2 probe.

The factory default CMSIS-DAP Link2 image and optional J-Link image include UART bridge functionality (VCOM support); this firmware can be programmed using the LPCScrypt utility, available at http://www.nxp.com/lpcutilities.

The P4 header is designed to be used with an external serial to USB or other 3.3V serial device. Note that the connections at P4 are made directly to the Module, so care should be taken to avoid ESD discharge and voltages outside the ratings of the device I/O pins.

Table 3. P4 connections

Pin	Function
1	Ground
2	RXD (from Module)

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Pin	Function
3	TXD (from Module)

6.2 USB Full Speed port (USB0)

The Full Speed (FS) USB port from the installed Module is connected to micro AB USB connector J2. This section describes functionality support by this port and associated jumper settings.

6.2.1 Device mode

The FS port supports USB device mode operation; no jumper settings are needed to configure this mode. When using the port in device mode, a standard micro USB cable can be used.

6.2.2 Host mode

The FS port supports USB device mode operation but, due to sharing of some signals and power supply circuitry, requires the following settings:

- Connect external +5V power via USB connector J1. This is required for the FS USB port to be able to power the devices connected to it.
- Install JP1 in position 1-2 (labelled BB) to connect +5V from J1 as the source of VBUS (this is the default position.)
- Install a jumper in position 2-3 of JP3 and JP4 to select USB0 host operation (default is position 1-2, which selects Ethernet operation.)
- Use of a micro AB adaptor to connect an external USB device may be required, as most USB device have either a type A or micro B connector.

Note that the Ethernet functions are disabled when the board is configured for FS USB Host operation.

6.3 USB High Speed ports

Note that modules (such as the LPC54018 IoT Module) with an additional USB ports are only available on the Module itself.

6.4 PMod compatible Expansion Header (J8)

This header provides connectivity from the Module to a remote Host, peripherals or other devices. The table below shows the connections (LPC54018 IoT Module connections in parenthesis).

Table 4. Host Expansion Header signals

Pin	J8 signal	Expansion port connection
1	GPIO/SPI-SSELn1 or n0 in/out	P6 pin 89 (P4_6) default JS3 position (1-2) or P5 pin 15 (P3_30) if JS3 moved to position 2-3
2	GPIO/SPI-MOSI in/out	P5 pin 9 (P3_21)
3	GPIO/SPI-MISO out/in	P5 pin 11 (P3_22)
4	GPIO/SPI-SCK in/out	P5 pin 13 (P3_20)

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Pin	J8 signal	Expansion port connection
5	GND	GND
6	VDD (3.3V)	VDD (3.3V)
7	GPIO/INT (out/in)	P5 pin 21 (P2_0)
8	GPIO/RESET (out)	P5 pin 89 (P3_11)
9	SCL	P5 pin 75 (P3_24)
10	SDA	P5 pin 77 (P3_23)
11	GND	GND
12	VDD (3.3V)	VDD (3.3V)

This connector shares SPI interface signal connections with the Arduino expansion connector J9.

The I^2C interface signal connections used for this connector are shared with the Arduino expansion connector J9, and are also connected to the accelerometer and the touch screen controller. Note that the Base Board includes 2.2kΩ pull-ups for the I^2C interface signals.

6.5 Arduino UNO expansion connectors

The OM40006 board includes four expansion connectors (J9-J12) compatible with Arduino UNO revision 3. These connectors provide access to I^2C, USART, SPI and several GPIO/INT/PWM connections. Note that several of the signals available at these connectors are shared with other connectors or board functions, so might not be usable if those other functions are being used by other devices.

Table 5 below shows the connector circuit references and purposes.

Table 5. Expansion connectors

Reference	Description
J9	Arduino Uno rev3 Digital 15:8, AREF, SDA & SCL connector. Also includes two interrupt / PWM connections.
J11	Arduino Uno rev3 Digital 7:0. Includes 6 interrupt/GPIO/PWM signals and USART interface.
J10	The even numbered pins 6 – 20 are compatible with the Arduino Uno rev3 Power connector standard.
J12	Arduino Uno rev3 Analog connector. Provides 3 ADC connections plus 3 GPIO/interrupt signals.

Below shows the sharing of signals between the expansion connectors and other connectors or circuit functions. Refer to the board schematics for more details.

Table 6. Expansion Connector signal sharing

Function	Connector	Shared with
I^2C	J9 pin 14 & 15	Accelerometer, PMod Connector, Audio Codec, LCD touch panel controller
SPI	J9 pins 9, 11,13,15	PMod Connector

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Function	Connector	Shared with
GPIO	J9 pin 8	User LED 2
GPIO	J11 pin 1	User LED 3
GPIO	J11 pin 3	User LED 1
GPIO	J12 pin 4	PMod Connector
GPIO	J12 pin 5	Accelerometer interrupt
GPIO	J12 pin 6	User push button

6.6 Ethernet port

The OM40006 board includes an on-board LAN8720A-CP PHY and RJ45 jack with integrated link status LEDs. The MCUXpresso SDK package for each NXP Module includes drivers for use of this Ethernet PHY.

7. On-board memory

7.1 SDRAM

The board includes an 128Mb Winbond W9812G6JB-6 SDRAM, connected to the 16-bit external memory interface available from the Module connectors J4 and J5. The MCUXpresso SDK package for each NXP Module includes drivers that have optimized external memory settings for use of this memory.

8. Other board features

This section describes board functions not mentioned elsewhere in this document.

8.1 LCD with capacitive touch

The OM40006 includes a Rocktech RK043FN02H-CT color LCD display panel with a resolution of 272x480 pixels and a capacitive touch controller. The LCD and capacitive touch controller interface to the main board via flex cables routed beneath the LCD panel. The LCD panel is secured using multiple adhesive pads. It is not recommended that the panel be removed as these adhesive pads will need to be replaced afterwards to ensure the mechanical integrity of the flex cable connections.

On-board voltage pump circuitry is provided to drive the LCD backlight using an AP5724WG device. This is enabled using PIO3-31 (pin 28 of Module connector P6).

The MCUXpresso SDK for any NXP supplied Module includes drivers and example applications for the LCD and capacitive touch controller (for Modules that include an LCD controller interface.)

8.2 Audio codec

The OM40006 board incorporates a Cirrus Logic (Wolfson) WM8904 audio codec, powered via a dedicated regulator. This codec has both I^2C (for control) and I^2S (for data) interfaces.

The I^2C interface of the codec is routed to Module connector P5 pins 75 & 77, and is shared with the other I^2C devices on the board; the Codec has an address of 0b0011010.

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The line input to the codec is routed to a 3.5mm stereo jack socket (J5) through the circuit shown in Fig 5.

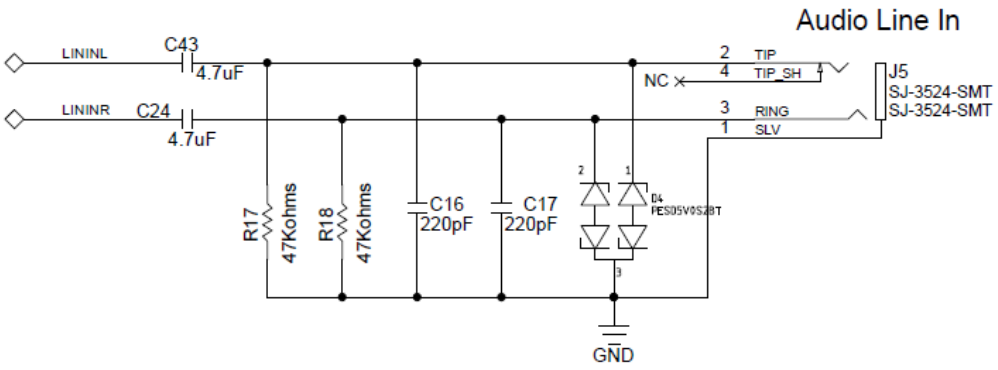

Fig 5. Line input circuitry

A second 3.5mm stereo jack socket (J6) provides a headphone / line out from the codec, via the circuit shown in Fig 6.

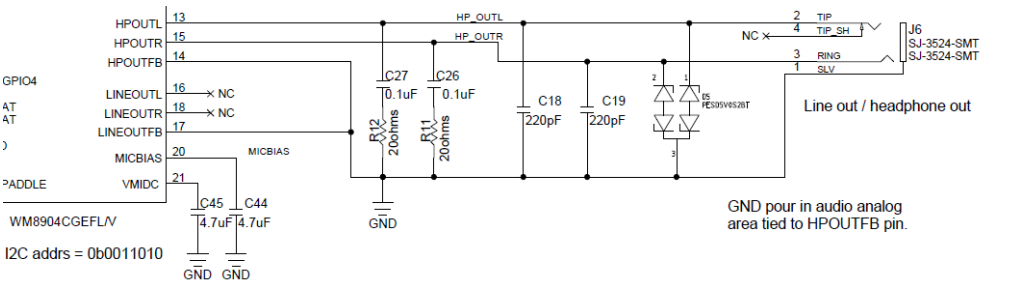

Fig 6. Headphone / line output circuitry

The MCUXpresso SDK includes drivers and example code for the audio codec (if supported by the Module used.)

8.3 SD card

The micro SD card (J3) includes in the OM40006 board provides a 4-bit SDIO interface to support memory cards and other compatible modules. Power enable to the socket is provided via P5 pin 83 (PIO2-5), with LED D1 providing a visual indication when power is applied.

8.4 Accelerometer

The board includes an NXP MMA8652FCR1 accelerometer, interfaced to P5 pins 75 and 77 (P3_24 and P3_23), which is the same port as the touch screen controller, audio codec, Arduino and PMod expansion connectors use. The accelerometer has an I^2C address of 0b0011101. The reset for this device is sourced from P6 pin 30 (P2_27) and the interrupt is routed to P6 pin 32 (P4_0.)

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8.5 Digital Microphone

A low power Knowles SPH0641LM4H digital microphone is incorporated on the board, for use with Modules that support direct interfacing to this type of PDM microphone. Note that the Knowles digital microphone is designed to be mounted on the underside of a board, with audio passing through a hole in the board.

8.6 USER button

User Button (SW5) can be used to generate an interrupt by pulling down the P6 pin 41 (PIO1-1) of the Module to ground. A 100KΩ pull-up resistor is also connected to this pin.

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