

4F, 90, Chien 1 Road, Chungho, New Taipei City

235, Taiwan, R.O.C.

TEL: +886-2-2222-6181

Fax: +886-2-2222-3882

光寶科技股份有限公司

台北縣中和市建一路 90 號 4F

電話: 02-2222-6181 傳真: 02-2222-3882

客 戶 名 稱:

Customer Name: YAMAHA

承 認 書 (Specification Sheet)
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Frank Gung		

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Revision History

Date	Version	Description
10/09/2013	Rev 00	Preliminary

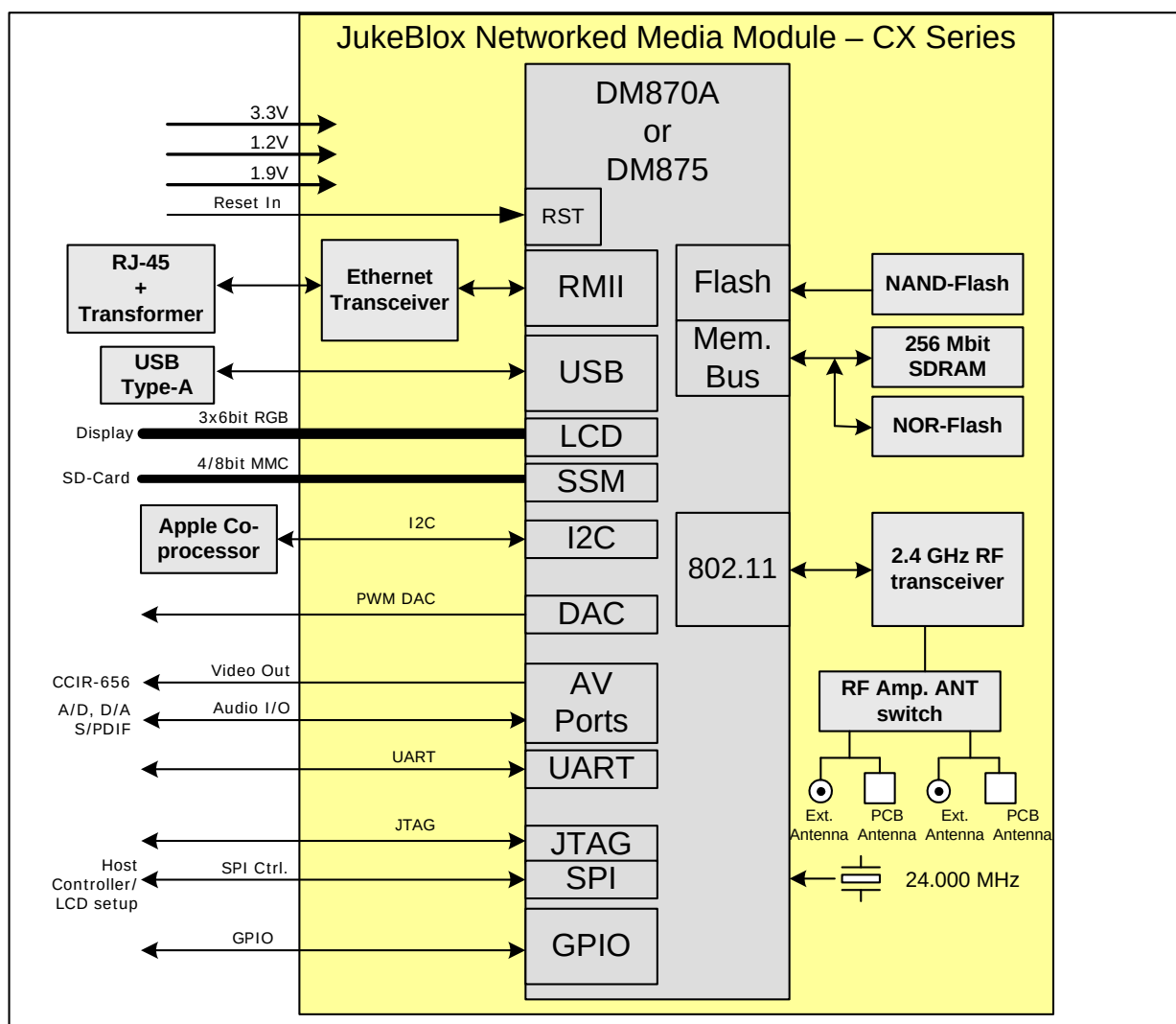
This documentation describes the marketing requirements specification of the Lite-on made CX870 Wireless module. It is a confidential document of LITEON.

Part1. Module Spec Sheet

1 Introduction

The CX-series module is a single-board networked media player module, based on SMSC's DM870A and DM875 media processors, and enables fast product developments with Ethernet, USB and optional WiFi connectivity. The module connects to standard legacy components in various audio, video/LCD and control formats.

2 Block Diagram

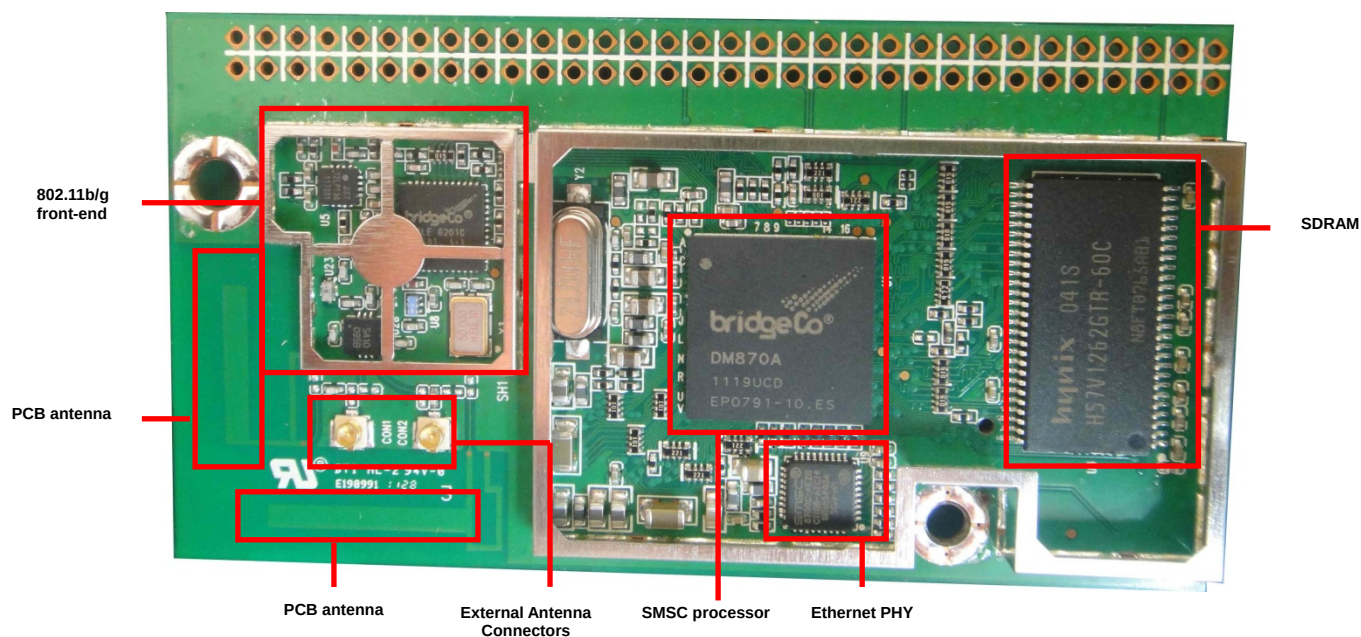


Note: Choice of antenna is a build option, see Ordering Guide.

3 Board Pictures

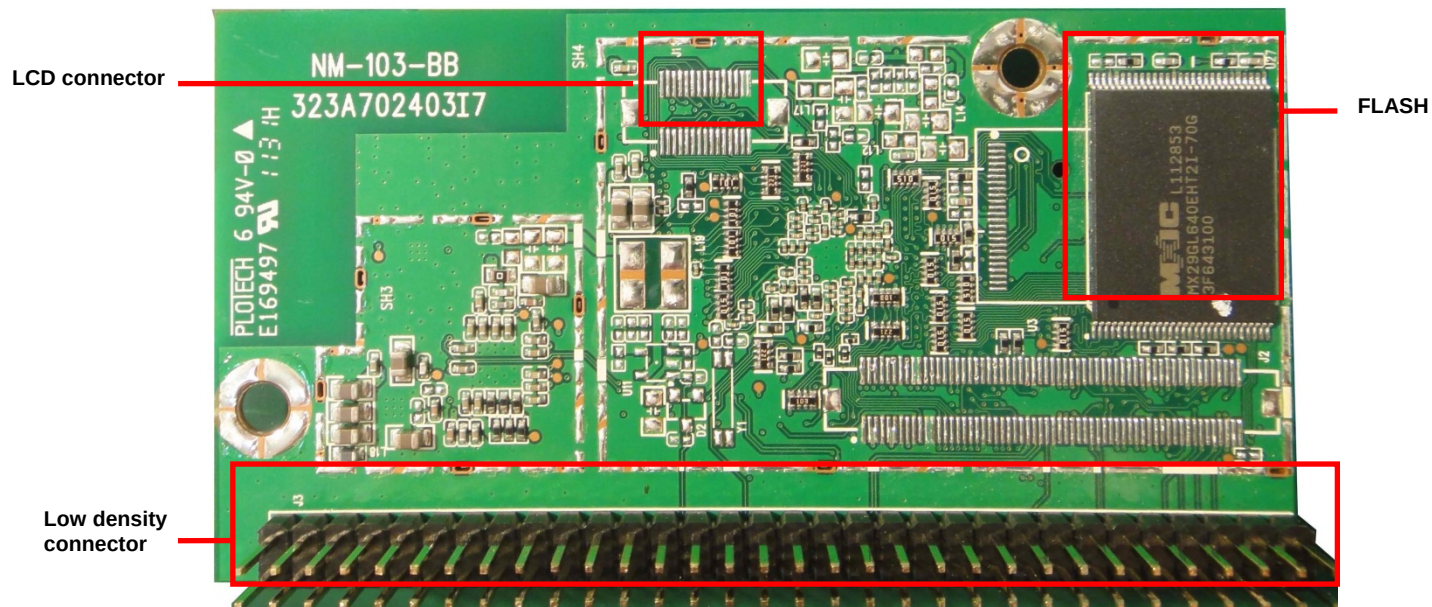
Please note that all production modules include the RF and top shield. The below top view has the shields temporarily removed to show the components. Also, please note that the 64-pin connector mounted on the module is the male gender.

3.1 Top View of CX Module

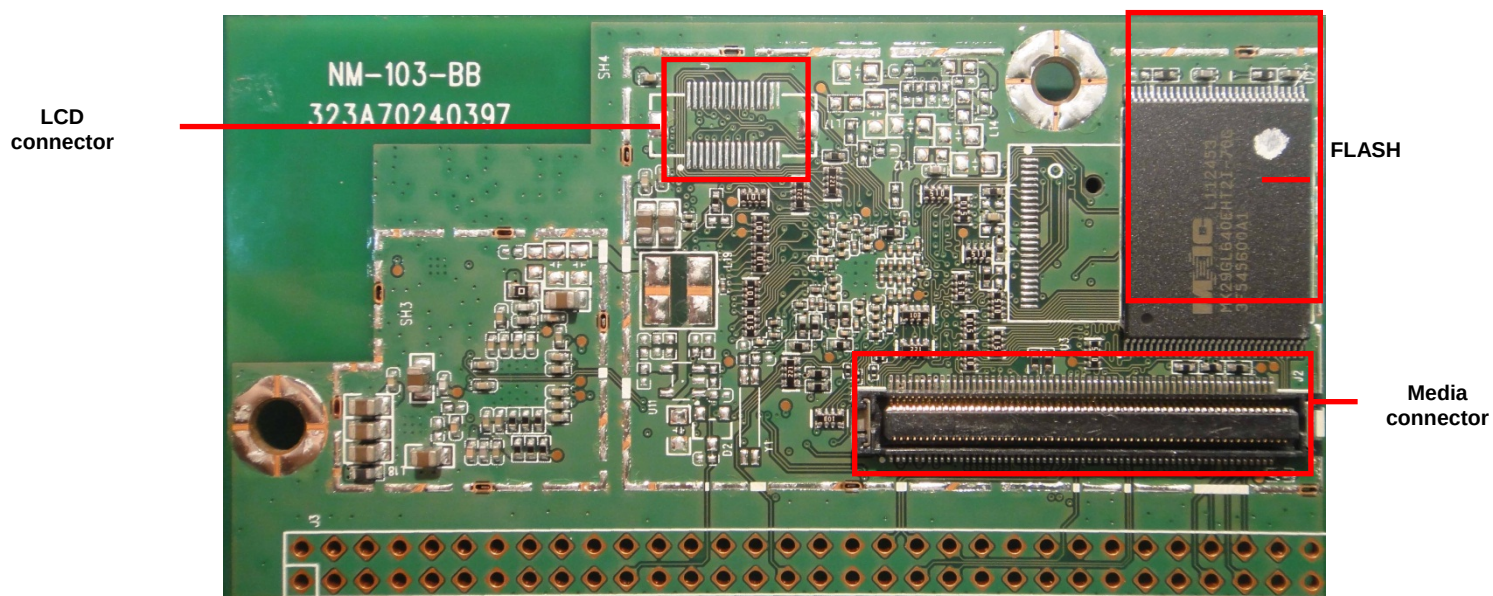


3.2 Bottom View of CX Module

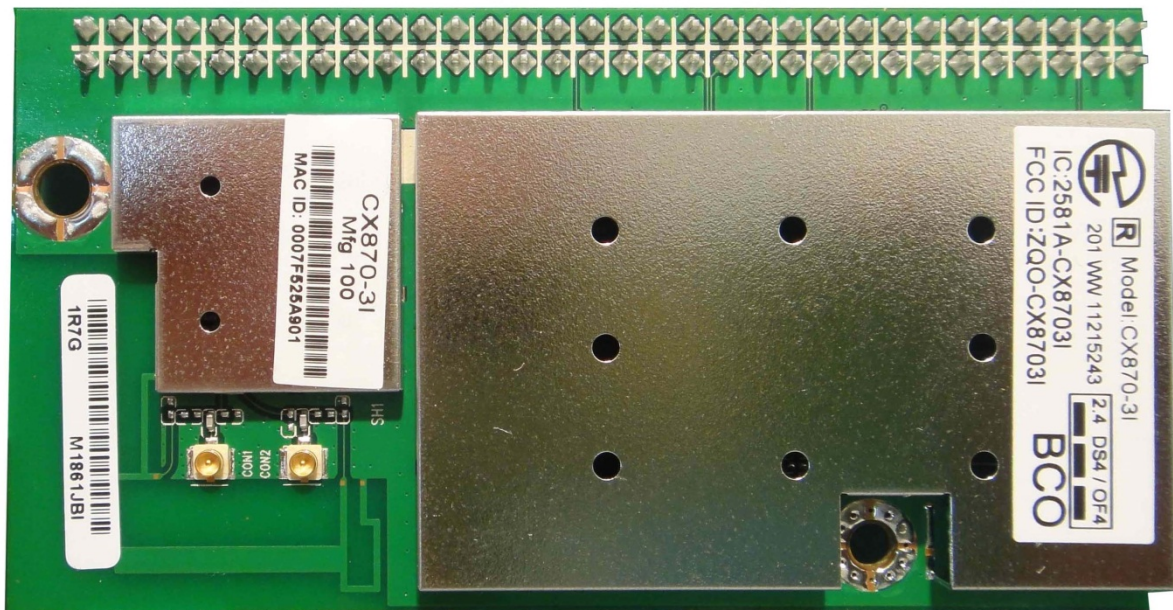
3.2.1 CX Module Bottom View w/64-pin Low Density Connector



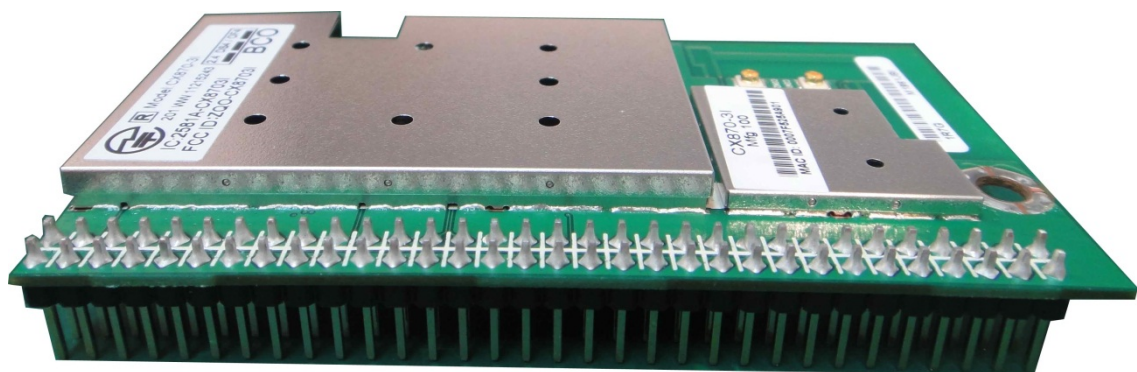
3.2.2 CX Module Bottom View w/120-pin Media Connector



3.3 Production Module with Top and RF shields in place – Top View



3.4 Production Module with 64-pin Connector Option – Side View

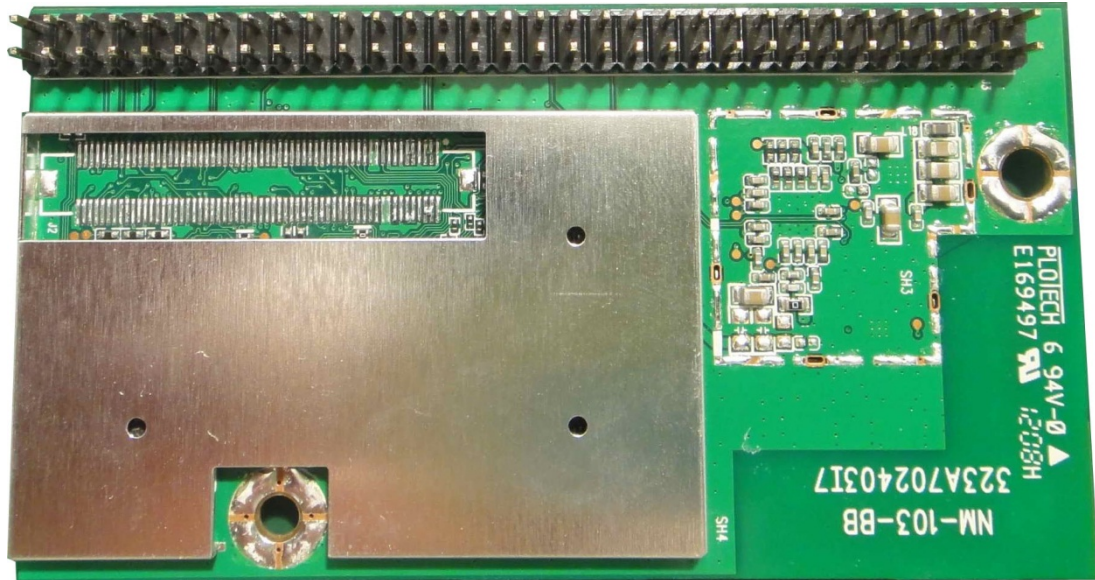


3.5 Example Production Module Showing Soldered RF Shield

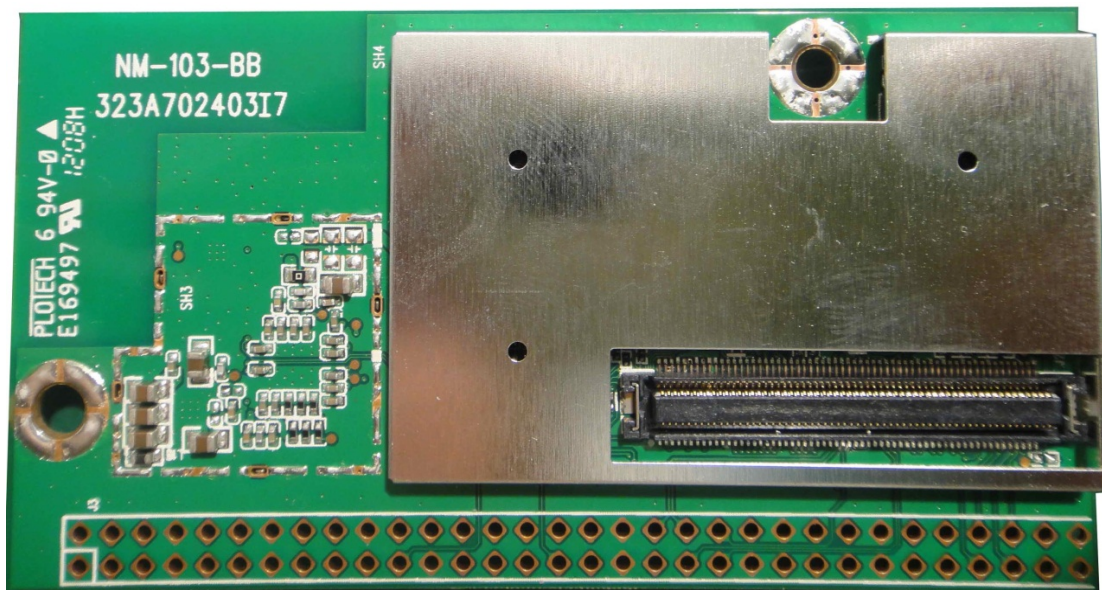


3.6 Production Module with Bottom Shield (Part Numbers with a “B” after the configuration letter)

3.6.1 Including J3 Low Density 64-pin connector – Bottom View



3.6.2 Including J2 High Density 120-pin connector – Bottom View



4 Ordering Guide

Part Number	IC's	Phase	WiFi (on-module PCB diversity)	Ext. Diversity Antennas (UFL)	Eth	USB Host	Low Density 64-pin conn.	Hi-Density 120-pin Conn.	Hi-Density LCD Conn.	64MB SDRAM	32MB SDRAM	16MB SDRAM	8MB SDRAM	1Gb NAND	32MB NOR	8MB NOR	Top Module Shield	Bottom Module Shield	1.9V	Status
				One Ant.	Two Ant.															
CX870-3OB	DM870A+T6201	Released		x		X	X	X			X				X		X	X	X	CA

Note: Please note that the Apple Authentication Coprocessor will not be provided on the CX module. The Apple Authentication Coprocessor should be provided on the product motherboard, connected to the SDA, SCL signals from the CX module.

Note: Shaded rows indicate Custom or Obsolete configuration - NOT TO BE USED FOR NEW/STANDARD MP DESIGNS.

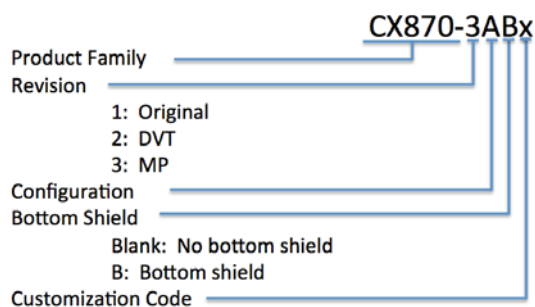
Status code: C - Custom | S - Standard | O - Obsolete | A - Available

* Connector on board, but requires board modification to enable the connector.

+ The position of the X in the One Ant. column indicates that there is one external antenna connector provided. The position of the X in the Two Ant. column indicates that there are two external antenna connectors provided. Do not use a module which has two external antenna connectors with only one external antenna connected. Leaving one antenna socket open will degrade WiFi performance. SMSC recommends always using modules with two external antennas for best performance.

% The CX870-3DS is the same as CX870-3D, except that the RF shield is soldered in place.

4.1 Part Number Syntax



5 Electrical Specifications

Parameter	State	Model	Voltage	Symbol	min.	typ.	max.	Units
Power Supply Input Voltage				VIN	3.0	3.3	3.6	V
					1.08	1.2	1.32	V
					1.8	1.9	2.0	V
Logic Input high voltage				V _{IH}	1.7		5.5	V
Logic Input low voltage				V _{IL}	-0.3		0.7	V
Logic Input threshold voltage				V _{IT}	1.29	1.39	1.5	V
Schmitt-trigger input low to high threshold voltage				V _{IT+}	1.58	1.65	1.71	V
Schmitt-trigger input high to low threshold voltage				V _{IT-}	0.95	1.01	1.06	V
Logic Output high voltage				V _{OH}	2.4			V
Logic Output low voltage				V _{OL}			0.4	V
Logic Low-level output current (V _{OL} =0.4V)				I _{OL}	-9.6	-15.6	-19.3	mA
Logic High-level output current (V _{OH} =2.4V)				I _{OH}	11.1	22.5	35.3	mA
Current Consumption	Reset State	CX870	3.3	I _{3.3}		60	78	mA
			1.2	I _{1.2}		32	42	mA
			1.9	I _{1.9}		18	23	mA
	Operating in idle state		3.3	I _{3.3}		185	241	mA
			1.2	I _{1.2}		337	438	mA
			1.9	I _{1.9}		257	334	mA
	Playback over WiFi high mips & rate condition		3.3	I _{3.3}		240	312	mA
			1.2	I _{1.2}		347	451	mA
			1.9	I _{1.9}		258	335	mA

Note: The maximum current values are 30% larger than the typical values. The maximum values are intended to be used for power supply sizing calculations.

5.1 Absolute Maximum Ratings

Parameter	Component	Min	Max	Units
3.3V Supply Voltage	Main	-0.5	4.6	V
1.2V Supply Voltage		-0.5	1.8	V
1.9V Supply Voltage		-0.5	2.2	V
Logic Input Voltage		-0.5	6	V
Logic Output Voltage		-0.5	4.6	V

5.2 Operating Conditions

Parameter	Min	Max	Units
Operating Temperature	0	+70	°C
Operating Humidity	10	90 (non condensing)	%RH
Storage Temperature	-10	+75	°C
Storage Humidity	10	95 (non condensing)	%RH
Storage Temperature Cycle Test 24 hrs	-10	+75	°C

5.3 WiFi Specification (CX870 only)

Feature	Description
WLAN Standards	IEEE 802.11b IEEE 802.11g
Frequency Band	2.412 – 2.472 GHz (2.4GHz ISM Band, 13 Channels) Channel 1 - Channel 13 North America FCC, Japan Telec, Europe ETSI
Modulation	802.11b mode (DS-SS: IEEE 802.11b) 802.11g mode (OFDM: IEEE 802.11g)
Transmission Speed	802.11b mode 11Mbps, 5.5Mbps, 2Mbps, 1Mbps 802.11g mode 54Mbps, 48Mbps, 36Mbps, 24Mbps, 18Mbps, 12Mbps, 9Mbps, 6Mbps
Tx Power	802.11b mode: 16.5dBm, +/-1dB 802.11g mode: 15.0dBm, +/-1dB Using nominal production settings as follows: Channel RF11 Rate: 11B = '3' (11Mbps), 11G = '8' (54Mbps) MIB: 11B=9, 11G=1 (Reference for Tx Power Tuning) Room temperature The above TX Power specifications will apply to modules shipped from Liteon after 9 April 2012.
Power-on Ramp	< 2us
RF Carrier Suppression	< 15dBc
TX EVM	802.11b mode: <-22dB 802.11g mode: <-25dB
Rx Sensitivity (incl. CE2 Mother board)	802.11b mode: <=-82dBm @ 1Mbps, <=-81dBm @ 2Mbps, <=-81dBm @ 5.5Mbps, <=-78dBm @ 11Mbps 802.11g mode: <=-82dBm @ 9Mbps, <=-81dBm @ 18Mbps, <=-75dBm @ 36Mbps, <=-70dBm @ 54Mbps
Throughput Rate (measured for each module)	See factory test specification

Note: About Tx Power, different (higher/lower) RF output power settings may be used for specific regions, antennas and/or enclosures, in which case re-certification may be required.

6 Regulatory Compliance and Quality

Description	Country	Compliance	Module Versions Passed
Electromagnetic Compatibility (Prescan)	USA Europe	FCC CFR47 Part15B EN 300328	
Radio Regulations (CX870 only)	USA Japan Canada Europe	FCC Part 15C Telec IC RSS-210 CE	CX870-3OB

6.0.1 Antenna Considerations

Here are the antennas used for certification:

Cfg Code	Ant. Type	Ant. Gain (dBi)	Ant. Model Name
CX870-3OB	Dipole	2.0	Cable : ACA-0200-6G0C6-A1 Antenna : EDA-8709-2G4R2-B7

Notes about antenna changes:

- 1) Equivalent antennas from other manufacturers may be substituted, and then marketed without a Class II permissive change
- 2) Equivalent antennas must be of the same type (e.g. dipole, PIFA, etc.), must be of equal or less gain than the antennas listed and previously authorized under the same FCC ID, and must have similar in band and out of band characteristics (consult specification sheet for cutoff frequencies).
- 3) In case of new antenna types, or higher gain antennas, a Class II permissive change is required and compliance with FCC section 15.203 must be met.

6.0.2 CX Power Settings Used For Modular Approval

SKU of Module : CX870-3OB				
FCC (2.4G)				
11b	Channel	2412 (1)	2437 (6)	2462(11)
	Power Setting	8	8	8
11g	Channel	2412 (1)	2437 (6)	2462(11)
	Power Setting	1	0	1

SKU of Module : CX870-3OB				
CE (2.4G)				
11b	Channel	2412 (1)	2437 (6)	2472(13)
	Power Setting	9	9	9
11g	Channel	2412 (1)	2437 (6)	2472(13)
	Power Setting	1	1	1

6.0.3 FCC IC Warning Message

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/ TV technician for help.

CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

Labeling requirements

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

- This device is intended for OEM integrators only.

- Please See the full Grant of Equipment document for other restrictions.

- This device must be operated and used with a locally approved access point.

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations.

Host system must be labeled with "Contains FCC ID:A6RVX77A ", FCC ID displayed on label.

Canada, Industry Canada (IC) Notices

This Class B digital apparatus complies with Canadian ICES-003 and RSS-210.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Radio Frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

This device has been certified for use in Canada. Status of the listing in the Industry Canada's REL (Radio Equipment List) can be found at the following web address:

<http://www.ic.gc.ca/app/sitt/reltel/srch/nwRdSrch.do?lang=eng>

Additional Canadian information on RF exposure also can be found at the following web address:

<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08792.html>

Canada, avis d'Industry Canada (IC)

Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003 et RSS-210.

Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l'appareil de sans fil Dell est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l'appareil de sans fil Dell de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (les antennes se situent à moins de 20 cm du corps d'une personne).

Ce périphérique est homologué pour l'utilisation au Canada. Pour consulter l'entrée correspondant à l'appareil dans la liste d'équipement radio (REL - Radio Equipment List) d'Industry Canada rendez-vous sur:

<http://www.ic.gc.ca/app/sitt/reltel/srch/nwRdSrch.do?lang=eng>

Pour des informations supplémentaires concernant l'exposition aux RF au Canada rendez-vous sur :

<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08792.html>

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations. Host system must be labeled with "Contains IC: 740B-VX77A ", IC ID displayed on label.

6.1 RoHS

Uses only RoHS compliant components

6.2 Environmental Test

With stands 4 hours at 70°C, 90% RH

6.3 ESD and Transient Test (Applies to LAN and USB external connections only)

ESD: +/- 2kV operation, +/- 4kV no destruction (part of CE test)

Fast electrical transients: +/- 500V operation, +/- 1000V no destruction (part of CE test)

6.4 Magnetic Field Test

Passes EN55022 and EN55024 (part of CE test)

6.5 MTBF

>10000 hours

6.6 Mechanical Specifications

Passes drop test according to I.E.C. 68-2-32, height 100 cm, 1 corner, 6 faces.

Passes vibration test with sine, vertical, 60 minutes, 600 to 18000 cpm, 1G

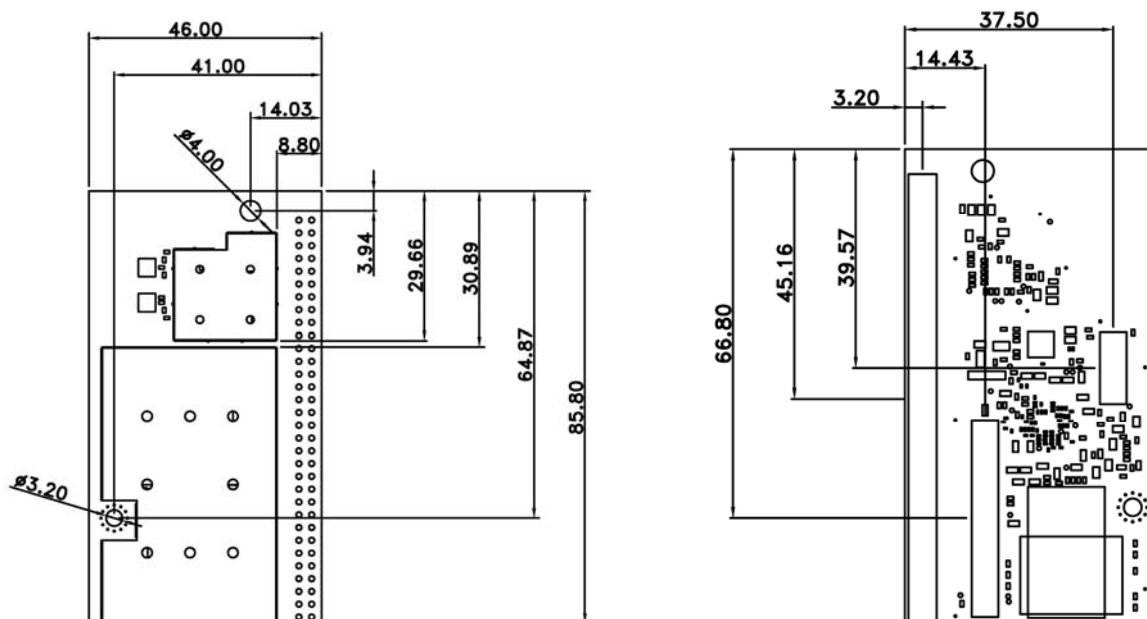
6.7 Module Quality

Defect Rate: < 1%

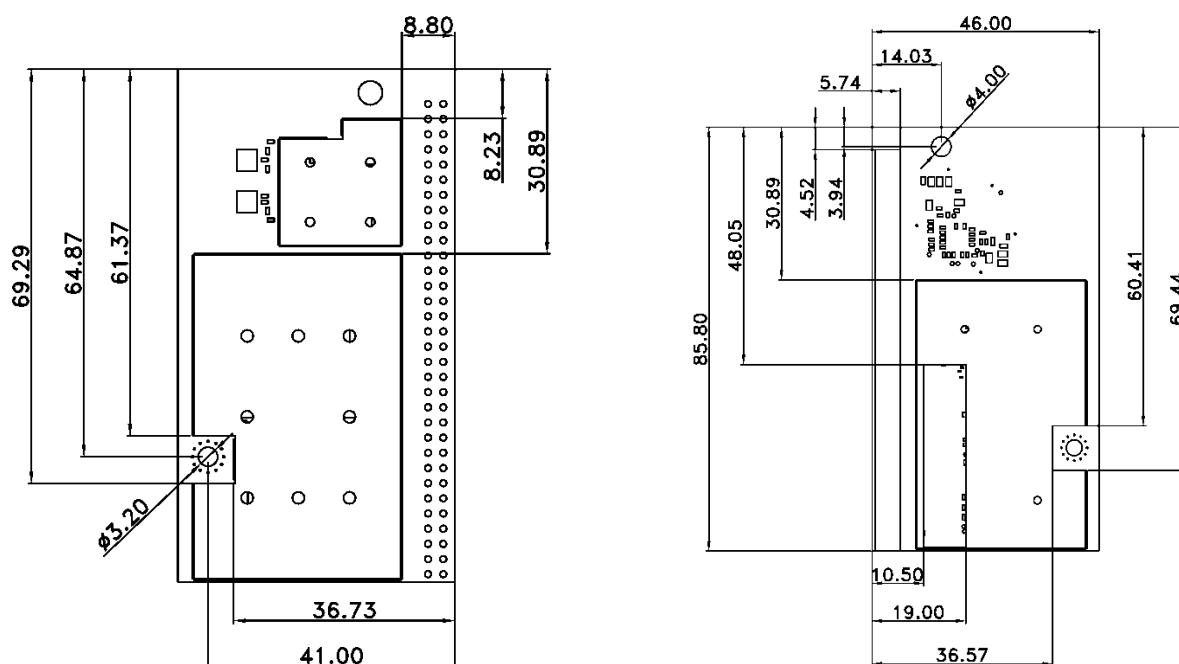
AQL CR=0, MA=0.4, MI=0.4

7 Board Dimensions and Weight

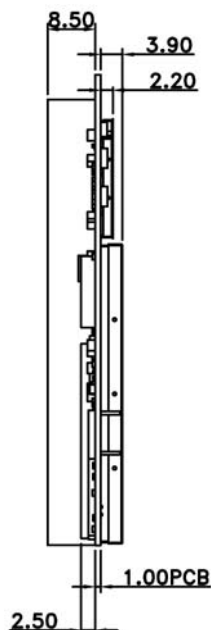
7.1 Top & Bottom View of CX870 Module without Bottom Shield



7.1.1 Top & Bottom View of CX Module with Bottom Shield

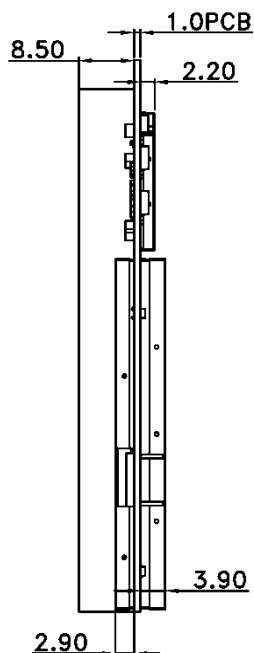


7.2 Side View of CX870 module without Bottom Shield

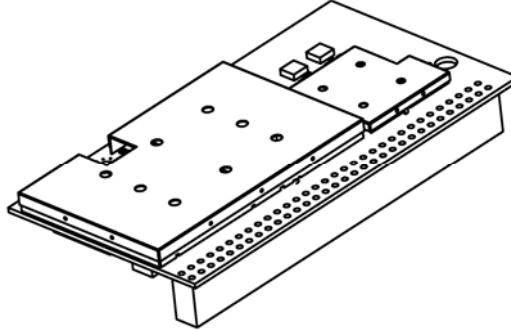

Note:

1. All dimensions are measured in **millimetres** (mm).
2. PCB's thickness: 1.00 +/- 0.10mm
3. Tolerance: +/-0.10mm
4. Outline Tolerance: +/-0.10mm
5. NPTH Hole: +/-0.05mm
6. PTH Hole: +/-0.075mm
7. Connector positions, board dimensions, mounting hole positions and sizes are the same for all module variants.
8. Connector position tolerance: +/- 0.38mm
9. The 64-pin connector mounted on the module along one edge is the male gender.
10. Not all module variants have all connectors. Please see the Ordering Guide table for details of connector options.

7.2.1 Side View of CX Module with Bottom Shield except CX870-3JB



7.3 3D View of CX870 Module without Bottom Shield



Note: A 3D file of the CX module in .stp format is available from the SMSC Customer Portal.

7.4 Module Weight

CX870: 20g

Note: Module weight applies to all versions of the module.

8 Connectors and Connections

8.1 WLAN UFL Antenna Connector (optional)

The module includes two PCB strip antennas operated in diversity mode. Alternatively, one or two coaxial antenna connectors are provided for connecting external (to the module) antennas. The choice between using the strip antenna or using the coaxial sockets is a build option, determined by the position of surface mount capacitors on the module PCB. If the PCB antennas are chosen, then diversity mode is always used. If external (to the module) antenna sockets are used, then two external antennas should be used to provide 2X diversity operation.

If external antenna is used, please choose the proper part number indicating two external antenna sockets. Do not use a module which has two external antenna sockets with only one external antenna connected; this will result in reduced WiFi performance.

Please see ordering guide for build option details.

The surface-mount antenna socket used in the CX module is:

UFL type Ultra Small Surface Mount Coaxial Connector

8.2 Module Connectors

The CX860/870 module uses 3 board-to-board connectors as interfaces to the product main board. The part numbers for the connectors needed on the product main board, which mate with the connectors on the CX module, are shown in the table below.

Connector Number	Connector Purpose	Connector Type	Number of Pins	Pin Configuration	Mating Connector Part Numbers
J1	LCD	B2B Connector	30	2 x 15 x 0.5mm	14-5046-030-145-829+ (Kyocera)
J2	Media		120	2 x 60 x 0.5mm	14-5046-120-145-829+ (Kyocera)
J3	Low Density		64	2 x 32 x 2.54mm	CSHA201-3202A001A1AB

The pinout and signal names are shown on the next page. The following table provides an overview for the most important control and interface signals.

8.2.1 Pin Descriptions

Signal(s)	Type	Description
-----------	------	-------------

POWER

VIN(+3.3V)	P	Power supply input ; +3.3V.
VIN (+1.2V)	P	Power supply input ; +1.2V.
VIN (+1.9V)	P	Power Supply input; +1.9V for powering RF section. Make sure this is a clean supply.
3V3RTC	P	The RTC function is no longer supported. This pin should be left open.
GND	P	Ground (GND) connection for power supply 0V, signal returns and shielding.

SPI

SPI_DOUT	O	SPI data from DM870A to host controller.
SPI_DIN	I	SPI data from host controller to DM870A.
SPI_CLK	I	SPI clock from host controller to DM870A. Maximum recommended frequency is 2MHz, typical frequency is 1MHz. See Note 2 below.
SPI_NCS0	I	SPI chip select from host controller to DM870A.
PDOUT1	O	This signal is used as SPI_REQ, SPI request signal, from DM870A to host controller for eDMP applications. Logic 1 indicates that there is an SPI message waiting to be read, the host controller should start the SPI clock and read any changed registers. Logic 0 indicates that all changed register messages have been read and the message buffer is empty. Also GPIO-06.
SPI_NCS1	I	Not used. Leave open.

UART

RXD1	I	UART1 input to the DM870A, used for shell access. SMSC recommends providing a connection to an external RS-232 transceiver and DB9 connector to connect to a PC COM port. Such a connection can be used for product development debugging, and for module programming control on the product manufacturing line and for module control during certification procedures.
TXD1	O	UART1 output from the DM870A, used for shell access. SMSC recommends providing a connection to an external RS-232 transceiver and DB9 connector to connect to a PC COM port. Such a connection can be used for product development debugging, and for module programming control on the product manufacturing line and for module control during certification procedures.
RXD0	I	UART0 input. Optionally used for controlling an iPod via UART.
TXD0	O	UART0 output. Optionally used for controlling an iPod via UART.

AUDIO

AV2DATA0	O	I2S or left justified audio data output. Typically connected to external D/A converter input or to external DSP for further audio processing. Used for main left and right channel audio output data. See Note 3.
AV2CTRL0	O	LRCK, audio data word clock at the audio sample rate (Fs). Maximum currently supported frequency is 192kHz.
AV2CTRL1	O	MCLK, audio master clock at 256Fs. This can be used to clock an external D/A converter or DSP.
AV2CLK	O	SCLK, audio data bit clock at 64Fs. Allows for up to 32 audio data bits per sample word.
AV4DATA1	O	SPDIF format output. Can support samples rates up to 192kHz, so the maximum instantaneous frequency on this pin is 24.576MHz.
AV4DATA0	I	SPDIF input. Not used at present. Leave open.
AV2DATA1	O	I2S or left justified audio data output. Not used at present. Leave open.
AOUTLP/AOUTLN, AOUTRP/AOUTRN	O	Differential stereo output from PWM-DAC, right and left channels. These signals require analog low pass filtering. SMSC is not recommending using the PWM-DAC outputs because of the potential for high out-of-band noise and uncharacterized audio quality. SMSC recommends using an external D/A converter connected to AV2DATA0.
AV2DATA2	I	I2S or left justified audio data input. Can be driven from an optional external A/D converter used to interface to iPod analog output or other analog audio sources. If not used, leave open.
AV2DATA3	I	I2S or left justified audio data input. Not used at present. Leave open.

CONTROL

NCS3	I	This signal is configured as GPIO-17 and is currently not used. DM870A-internal pull-up. Leave this pin open.
PDOU0	I	Factory Reset. GPIO-04. Return the CnE to factory settings. High-active input, DM870A-internal pull-down. Pull to GND with a 10kohm resistor, unless return to factory settings from a hardware control is needed. Normally, return to factory settings is controlled from the host controller via SPI register. This pin is only monitored during the boot up process.
VCO0	I	Infrared sensor input. GPIO-05. This is a Schmitt-Trigger input and can handle inputs with slow slopes. Used for aDMP firmware builds for infrared remote control sensor output connection to DM870A. For applications with a host controller, pull this pin to +3.3V via a 10kohm resistor.
AV3CLK	O	ETH_NRESET Low-active reset for the on-board ethernet PHY. This output is driven by the DM870A. GPIO-12. Leave this pin open.
AV3CTRL0, AV3CTRL1	I/O	I2C_SCL, I2C_SDA bus created by GPIO-13 and GPIO-14. No internal pull-ups; Use 4.7kohm pull up resistor on each pin to +3.3V. Maximum frequency is 400kHz.
NRESET_MOD	I	Low-active input to reset the module. This signal must be driven by an external reset generator, or by a GPIO output from a host controller. See the application section of this data sheet for the timing requirements for NRESET_MOD. Includes internal 10K pull-up resistor to +3.3V.
NPD_RF	I	Active low input to shut down the power for the 802.11 RF section. Internal 10kohm pull-up resistor to +3.3V. Leave open if powering down the RF section is not required.

ETHERNET

ETH_RXN, ETH_RXP, ETH_TXN, ETH_TXP	M	Ethernet signals between the PHY on the module and the external magnetics (transformer). See Note 4. Maximum bit rate is 100Mbps.
ETH_LED_SPEED, ETH_LED_ACT	O	3.3V push-pull outputs (max. $\pm 12\text{mA}$) to drive the ethernet LEDs. 100Mbps speed mode and activity are indicated by the outputs being low. Connect to LEDs through 220ohm resistors.

USB

USB_DN, USB_DP	M	USB data signals, normally connected to type A connector, USB switch or iPod dock connector. Maximum bit rate is USB High Speed at 480Mbps.
USB_VBUS	M	Analog input for monitoring USB type A connector power. Connect to the +5V power which is driving the USB type A connector power pins. If this pin drops below 4.6V, then the DM870A will drive the USBVBUSDRV signal low to control an external power MOSFET to disconnect +5V power from the USB type A connector. See Note 5.
USBVBUSDRV	O	Logic output to control an external MOSFET that is in series with USB type A connector power. See USB_VBUS above and Note 5.

JTAG

TMS, TCK, TDI, TDO	I/O	JTAG port for DM870A. Leave open.
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SSM

SSMD4, SSMD5, SSMD6, SSMD7	I/O	Can be used to drive external shift registers to make extended GPIO signals (see Note 6), or as individual GPIO signals, or to make an SD card interface. SD card firmware is not supported at present in JB2. Can be mapped to GPIO #s 08,09,10,11. Leave open if not used.
SSMD0, SSMD1, SSMD2, SSMD3, SSMCLK, SSMCP, SSMCMD, SSMWP	I/O	Used to make an SD card interface. SD card firmware is not supported at present in JB2. Leave open.

VIDEO

AV0CLK, AV0CTRL0, AV0CTRL1, AV0CTRL2, AV0DATA0, AV0DATA1, AV0DATA2, AV0DATA3, AV1DATA0, AV1DATA1, AV1DATA2, AV1DATA3	O	ITU-R BT.656 digital video output signals. Optionally used to make a TVout menu display, or to display decoded album art. Can be connected to video D/A converter (see Note 7), or connected to a video DSP.
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GPIO (not already mentioned elsewhere in this table)

A22	O	GPIO18 Reserved for NOR flash address A22. Leave open.
A23	O	GPIO-16 Reserved for NOR flash address A23. Leave open.
NWAIT	I/O	GPIO-15 Not currently assigned. Leave open.
NCS2	I	GPIO-19 Assigned to iPod dock connector iPod NDETECT. See Note 8.
VCO1	I/O	GPIO-07 Not currently assigned. Leave open.
MIICRS	I/O	GPIO-00 Not currently assigned. Leave open.
MIICOL	I/O	GPIO-01 Not currently assigned. Leave open.
MIITXER	I/O	GPIO-02 Not currently assigned. Leave open.
MIITXCLK	I/O	GPIO-03 iPod dock connector Accessory Power signal. See Note 8.

MII

MIITXD0, MIITXD1, MIIRXD0, MIIRXD1	I/O	Can be used, with GPIO signals above, to drive an external ethernet PHY. This is not supported by JB2 firmware. Leave open.
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LCD

LCDD0, LCDD1, LCDD2, LCDD3, LCDD4, LCDD5, LCDD6, LCDD7, LCDD8, LCDD9, LCDD10, LCDD11, LCDD12, LCDD13, LCDD14, LCDD15, LCD16, LCDD17, LCDCLK, LCDCTRL0, LCDCTRL1, LCDCTRL2, LCDCTRL3	O	Uses optional J1 LCD connector. Connect to local LCD display. See Note 9. Leave open if not used.
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Notes:

1. Signal type codes:
 - I – 3.3V level Digital Logic Input into the DM870A
 - O – 3.3V level Digital Logic Output from the DM870A
 - IO – 3.3V level Digital Logic Input and Output (bi-directional) signal
 - M – Miscellaneous, see text for description
 - P – Power Supply
2. For SPI timing diagram for eDMP applications, please see:
BridgeCo_JB2x - DeviceControlProtocol_Registers_v_2_1.pdf, or later version.
For detailed setup and hold timing details, see DM870A IC data sheet:
DM870A DS rev. 1.3_12-15-11.pdf, or later version.
3. For audio port timing diagrams, and for detailed setup and hold timing, please see DM870A IC data sheet:
DM870A DS rev. 1.3_12-15-11.pdf, or later version.
4. For example ethernet external schematic, see:
CX Module Ethernet (RJ45 + Ext.Magnetics)_V1.2.pdf, or later version.
This schematic is typically compressed into a zip file, for example:
CX Module_Interface Schematics_one_page_V1.2_Jun_11.rar
5. For example USB schematics, see:
CX Module USB_V1.2.pdf, or later version.
This schematic is typically compressed into a zip file, for example:
CX Module_Interface Schematics_one_page_V1.2_Jun_11.rar
6. For example use of extended GPIO shift registers, see CE2 schematic:
A EVMCE2-4_schematic.pdf, or later version.
7. For example connection to a video D/A converter, see CE2 schematic:
A EVMCE2-4_schematic.pdf, or later version.
8. iPod dock connector pin and GPIO assignments are under discussion. Please contact SMSC for recommendations for iPod dock connections to CX870 module.
9. For example connection to an LCD display, see CE2 schematic:
A EVMCE2-4_schematic.pdf, or later version.
10. All the above signals are brought out to J2 pins. Not all the above signals are brought out to J3, the 64-pin low density connector. The J3 pin assignments table shows which signals are brought out to the J3 pins.
11. SMSC has a set of example motherboard schematics that shows example external circuitry that is typically connected to the module. Please check the SMSC/BridgeCo customer portal at <https://portal.bridgeco.net/> for a copy of these example schematics. These schematics are typically compressed into a zip file, for example:
CX Module_Interface Schematics_one_page_V1.2_Jun_11.rar
12. Please check the SMSC/BridgeCo Customer Portal *Download* area for the latest version of the SMSC documents. Go to <https://portal.bridgeco.net/>. If you do not have an account, please contact SMSC.

J2 – Media Connector

Function		GPIO	IC PIN	Signal	PIN Number		Signal	IC PIN	GPIO	Function	
				GND	1	2	GND				
				VIN (+3.3V)	3	4	VIN (+3.3V)				
				VIN (+3.3V)	5	6	VIN (+3.3V)				
				GND	7	8	GND				
				VIN (+1.2V)	9	10	VIN (+1.2V)				
				VIN (+1.2V)	11	12	VIN (+1.2V)				
				GND	13	14	GND				
				VIN (+1.9V)	15	16	VIN (+1.9V)				
				GND	17	18	GND				
				3V3RTC	19	20	GND				
SPI		D15 D14 B16	SPI_DOUT	25	26	TMS	B15 C14 A16 A15	JTAG			
			SPI_DIN	27	28	TCK					
			SPI_CLK	29	30	TDI					
				31	32	TDO					
		C13 B14	TXD0	33	34	SPI_NCS0	C15 B17	SPI			
			RXD0	35	36	SPI_NCS1					
Debug UART		A14 B13	RXD1	37	38	NRESET_MOD	C12 A12 C11 B11 A13 D9 H18 J17	GPIO-10 GPIO-08	Module reset input SPI_E_CLK SPI_E_SDO		
SPI_E_NCS SPI_E_SDI	GPIO-11 GPIO-09		D12 B12 D11 A11 C10 D10	TXD1	39	40				SSMD6	
		GND		41	42	SSMD4					
		SSMD7		43	44	SSMD2					
		SSMD3		45	46	SSMD1					
		SSMD0		47	48	SSMCMD					
		SSMCLK		49	50	SSMWP					
		SSMCP		51	52	NCS3					
		GND		53	54	NCS2					
		USB		A1 B1 E3	USB_DN	55	56	GND	D2	USB	
		USB_DP			57	58	AOUTRN				
USBVBUSDRV	59	60	AOUTRP								
	61	62	GND								
I2C SDA I2C SCL	GPIO-16 GPIO-18 GPIO-14 GPIO-13	K4 L2 H17 H16 T3 U2	AOUTLP	63	64	PDOUT1	J1 J2 K1 K2 R4	GPIO-06 GPIO-07	SPI_REQ Factory reset IR input ETH NRESET		
			AOUTLN	65	66	VCO1					
			GND	67	68	PDOUT0					
			A23	69	70	VCO0					
			A22	71	72	AV3CLK					
			AV3CTRL1	73	74	AV0CTRL0					
			AV3CTRL0	75	76	AV1DATA3					
			AV0CTRL2	77	78	AV1DATA2					
			AV0CTRL1	79	80	AV1DATA1					
			AV0CLK	81	82	AV1DATA0					
Video Output		M3 M2 L1 M4 N1 N2 N3	AV0DATA3	83	84	GND	M1 N4 P1 P2 P3	Video Output			
			AV0DATA2	85	86	AV2CTRL1					
			AV0DATA1	87	88	GND					
			AV0DATA0	89	90	AV2CLK					
			GND	91	92	GND					
			AV2CTRL0	93	94	AV4DATA1					
			AV2DATA3	95	96	AV4DATA0					
			AV2DATA2	97	98	GND					
			AV2DATA1	99	100	ETH_LED_ACT					
			AV2DATA0	101	102	ETH_LED_SPEED					
LRCK A/D data 1 A/D data 0 D/A data 1 D/A data 0		T1 P4 R3 T2 U1	GND	103	104	MIICRS	R14 T13 T11 R12 U10 V10 U12 V12	Ethernet			
			AV2CTRL0	105	106	MIICL					
			AV2DATA3	107	108	MIITXER					
			AV2DATA2	109	110	MIITXCLK					
			AV2DATA1	111	112	MIITXD0					
			AV2DATA0	113	114	MIITXD1					
			GND	115	116	MIIRXD0					
			NWAIT	117	118	MIIRXD1					
			NPD RF	119	120	GND					
			Ethernet			GND				103	104
ETH_RXN	105	106				MIICL					
ETH_RXP	107	108				MIITXER					
ETH_TXN	111	112				MIITXD0					
ETH_TXP	113	114				MIITXD1					
	GPIO-15	K18	GND	115	116	MIIRXD0	U12 V12				
			NWAIT	117	118	MIIRXD1					
			NPD RF	119	120	GND					

Note: The IC PIN column indicates the pin number on the DM860A or DM870A integrated circuit. This allows for easy cross-reference to the DM860A or DM870A data sheet information.

J1 – LCD Connector

Function	GPIO	IC PIN	Signal	PIN Number		Signal	IC PIN	GPIO	Function
			GND	1	2	GND			
LCD Interface		V8	LCDD0	3	4	LCDD1	U8	LCD Interface	
		T8	LCDD2	5	6	LCDD3	R8		
		V7	LCDD4	7	8	LCDD5	U7		
		T7	LCDD6	9	10	LCDD7	R7		
		V6	LCDD8	11	12	LCDD9	U6		
		T6	LCDD10	13	14	LCDD11	R6		
		V5	LCDD12	15	16	LCDD13	U5		
		T5	LCDD14	17	18	LCDD15	V4		
		U4	LCDD16	19	20	LCDD17	V3		
			GND	21	22	GND			
LCD Interface		T10	LCDCCLK	23	24	LCDCCTRL0	R9	LCD Interface	
		T9	LCDCCTRL1	25	26	LCDCCTRL2	U9		
		V9	LCDCCTRL3	27	28	GND			
			GND	29	30	GND			

Note: The IC PIN column indicates the pin number on the DM860A or DM870A integrated circuit. This allows for easy cross-reference to the DM860A or DM870A data sheet information.

J3 – Low Density Connector

Function	GPIO	IC PIN	Signal	PIN Number		Signal	IC PIN	GPIO	Function
Free iPod NDETECT	GPIO-15 GPIO-19		GND	1	2	GND			
			VIN (+3.3)	3	4	RXD0	B14		
			VIN (+3.3)	5	6	TXD0	C13		
			GND	7	8	GND			
			VIN (+1.9)	9	10	VIN (+1.2)			
			VIN (+1.9)	11	12	VIN (+1.2)			
			GND	13	14	GND			
		K18	NWAIT	15	16	RXD1	A14		Debug UART
		J17	NCS2	17	18	TXD1	B13		
		D13	NRESET	19	20	GND			
SPI			3V3RTC	21	22	AV2CTRL1	R2		MCLK LRCK SCLK A/D data 0 D/A data 0 SPDIF output SPDIF input
			GND	23	24	AV2CTRL0	T1		
		D14	SPI_DIN	25	26	AV2CLK	R1		
		D15	SPI_DOUT	27	28	AV2DATA2	R3		
Free	GPIO-17	B16	SPI_CLK	29	30	AV2DATA0	U1		
		C15	SPI_NCS0	31	32	AV4DATA1	T2		
		H18	NCS3	33	34	AV4DATA0	V2		
			GND	35	36	GND			
E-GPIO_NCS/TBA I2C SDA I2C SCL	GPIO-11 GPIO-14 GPIO-13	D12	SSMD7	37	38	USB_DN	A1		USB
		T3	AV3CTRL1	39	40	USB_DP	B1		
		U2	AV3CTRL0	41	42	USBVBUSDRV	E3		
			GND	43	44	USB_VBUS	D2		
SPI_REQ	GPIO-06	J1	PDOUT1	45	46	GND			
Factory Reset	GPIO-04	K1	PDOUT0	47	48	SSMD5	B12	GPIO-09	E-GPIO_SDI/TBA
IR input	GPIO-05	K2	VCO0	49	50	SSMD4	A12	GPIO-08	E-GPIO_SDO/TBA
			GND	51	52	GND			
Ethernet			ETH_LED_SPEED	53	54	ETH_LED_ACT			Ethernet
iPod Access Power	GPIO-03	R12	MIITXCLK	55	56	SSMD6	C12	GPIO-10	E-GPIO_CLK/TBA
Ethernet			ETH_RXN	57	58	ETH_RXP			Ethernet
			ETH_TXN	59	60	ETH_TXP			
Free	GPIO-00	R14	MIICRS	61	62	MIICOL	T13	GPIO-01	Free
			GND	63	64	GND			

Note: The IC PIN column indicates the pin number on the DM860A or DM870A integrated circuit. This allows for easy cross-reference to the DM860A or DM870A data sheet information.

8.2.3 GPIO Assignments

GPIO Assignments for J3 64-pin Low Density Connector

GPIO	PIN Name	PIN Number	Function
00	MIICRS	61	Free
01	MIICOL	62	Free
03	MIITXCLK	55	iPOD Access Power
04	PDOUT0	47	Factory Reset
05	VCO0	49	IR Input
06	PDOUT1	45	Host NIREQ
08	SSMD4	50	E_GPIO_SDO/TBA
09	SSMD5	48	E_GPIO_SDI/TBA
10	SSMD6	56	E_GPIO_CLK/TBA
11	SSMD7	37	E_GPIO_NCS/TBA
13	AV3CTRL0	41	I2C_SCL
14	AV3CTRL1	39	I2C_SDA
15	NWAIT	15	Free
17	NCS3	33	Free
19	NCS2	17	IPOD NDETECT

Note: Not all 20 GPIO signals are brought out to J3 64-pin low density connector. For the CX870-3K, GPIOs 00, 01 and 03 are not brought out to J3 64-pin low density connector. J3 pin numbers 61, 62 and 55 are not connected to any signal in the CX870-3K module.

9 Application Guidelines

9.1 Power Supply sequencing and Reset Timing

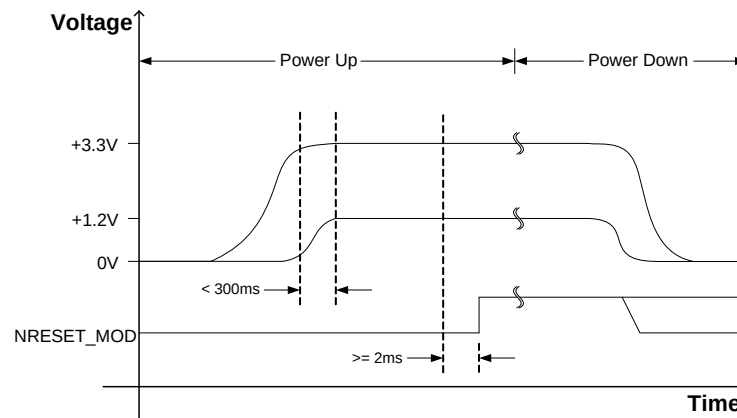
There are strict power sequencing and reset timing requirements.

- Power up the I/O voltage (3.3V) first and hold NRESET_MOD low.
- The core voltage (1.2V) must never be higher than (I/O voltage +0.5 V).
- The core voltage (1.2V) must be within the specified core voltage limits less than 300ms after the I/O voltage (3.3V) reaches the specified I/O voltage limits.
- Throughout the power down process, the 3.3V supply must maintain a higher voltage than the 1.2V supply, until both have reached ground potential.
- To assure a proper IC reset, the power supplies must be present for a minimum time of 2ms before NRESET_MOD is de-asserted.

Please see the power and reset timing figure in Section 9.1.1 below.

About 1.9V, the arrival of 1.9V supply should lag behind the arrival of the 3.3V. The delay between the 1.9V and the 3.3V is not critical. Typical delay is approximately 10ms, for example using 10kohm resistor and 0.1uF capacitor on the enable pin of a 1.9V dc-to-dc converter.

9.1.1 Power up, Reset and Power Down Timing



9.2 RF Considerations

Note that overall system, RF and WiFi performance is significantly affected by the product design, environment and the application. It is the responsibility of the product designer to ensure proper system level shielding (if required) and to verify performance and fitness for the given product features and applications.

The WiFi performance will be affected by the RF environment surrounding the CX module. Please ensure that the CX module is positioned in a "quiet" RF environment, as far away as possible from high frequency clock signals and any other sources of RF energy. Also, make sure the antenna is not shielded by any metal objects, for example loudspeakers or other metal parts. Please make sure that the power supplies, in particular the +1.9V supply, are quiet and free from noise.

SMSC recommends that systems implementing AirPlay should use a module configuration that includes on-module shielding, as well as paying particular attention to system configuration and shielding. In particular, SMSC is recommending the use of the Bottom Shield versions of the modules, which allows greater freedom in antenna positioning.

Also, please see the SMSC Application Note:

SMSCAppNote - CX870_Antenna_Placement_V1_4.pdf
regarding antenna positioning guidelines.

Please see below picture for the recommended keep out area and cable routing for the antennas.

