

## Airplay Module CX Series

### Preliminary Datasheet



Complete audio networking system on a small module

Integrated Ethernet + USB2.0

WiFi-certified 802.11b/g (optional)

Built-in strip antenna

Optional 2X Diversity Antenna

Glueless audio, video and control ports

FCC certified

Ideal for enabling network and USB audio playback for iPod docks, audio systems, AV Receivers, active speaker systems, internet radios, network playback adaptors

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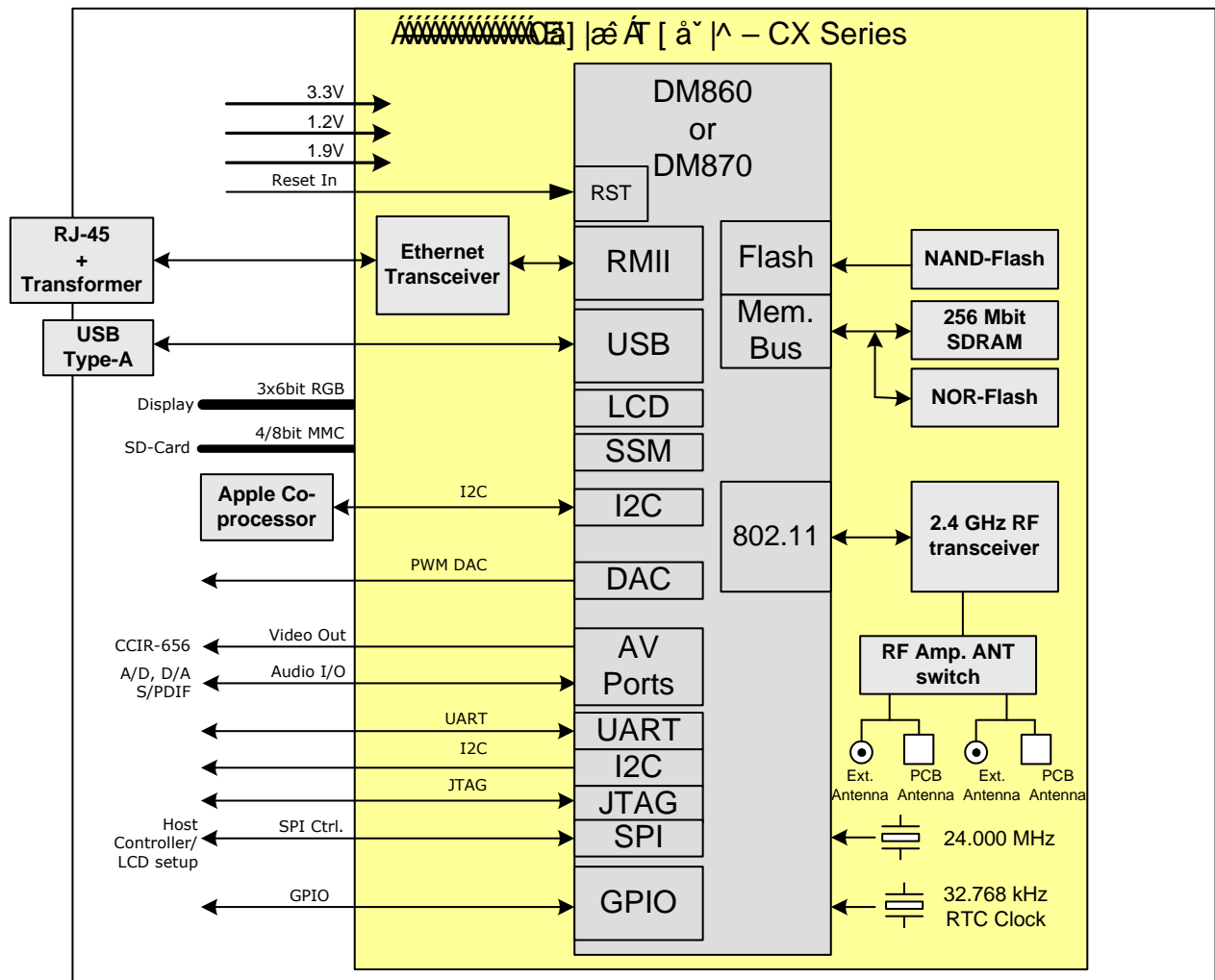
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# 1. Introduction

The CX-series module is a single-board networked media player module, based on BridgeCo’s DM860 and DM870 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

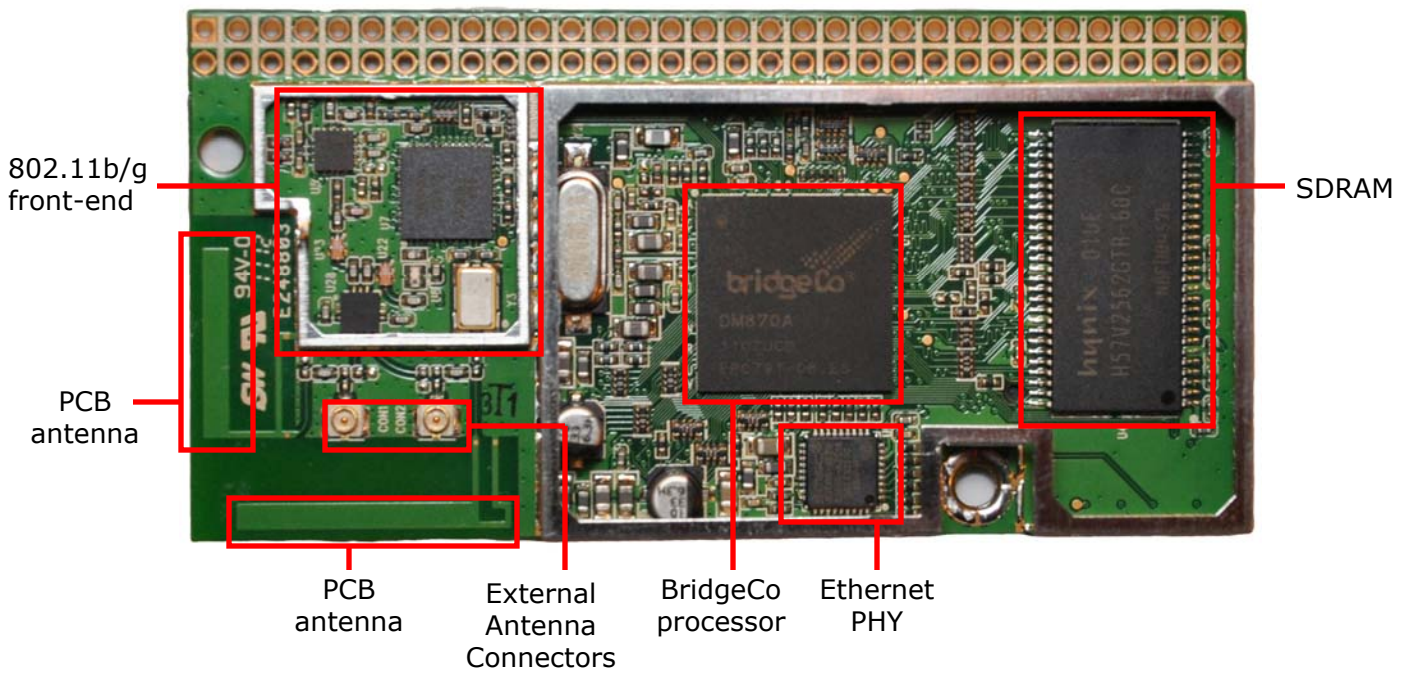


**Note:** Choice of antenna is a build option, see Ordering Guide.

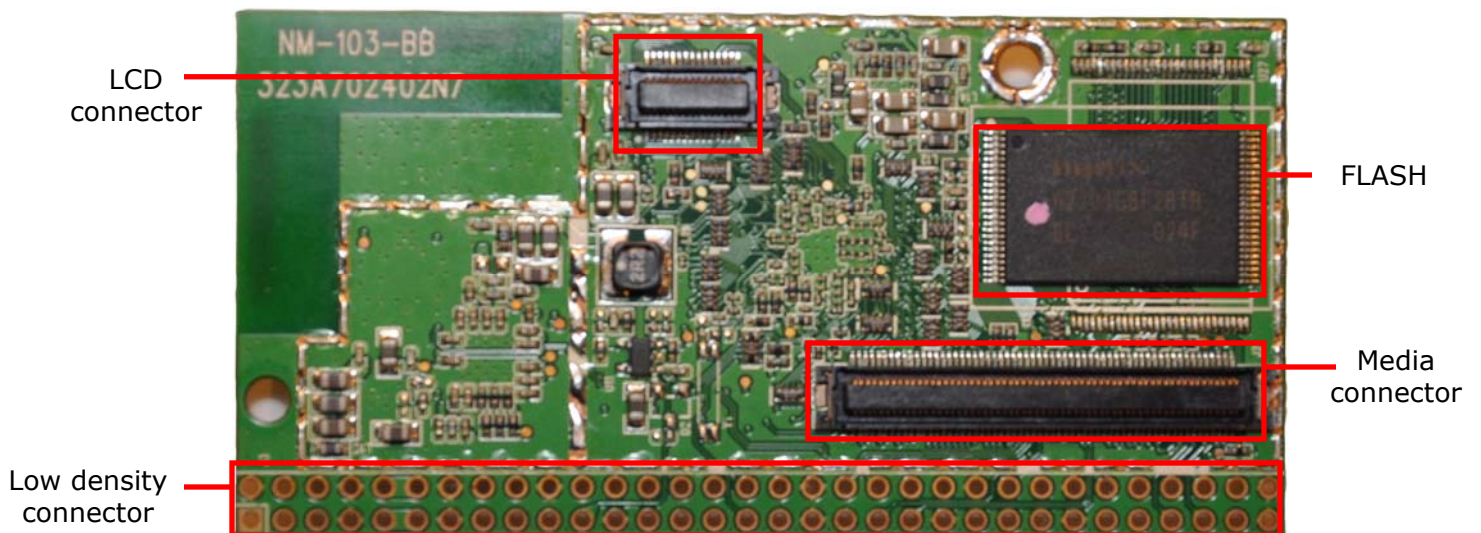
### 3. Board Pictures

Please note that the below pictures show the prototype version of the layout, and do not include the RF and top shields that will be present on production modules. Pictures of production version modules will be added as soon as possible. Also, please note that the 64-pin connector mounted on the module is the male gender.

#### 3.1 Top View of CX870



#### 3.2 Bottom View of CX870





## 4. Ordering Guide

Part Number	BridgeCo IC's	WiFi (on-module PCB diversity)	Ext. Diversity Antennas (UFL Conn.)	Ethernet	USB Host	Low density 64-pin Conn.	Media 120-pin Conn.	LCD Conn.	32MByte SDRAM	16MByte SDRAM	1Gbit NAND FLASH	8MByte NOR FLASH	Top Module Shield
CX870-3A	DM870+T6201	X	(X)*	X	X		X	X	X		X		X
CX870-3B	DM870+T6201		X	X	X	X			X		X		X
CX870-3D	DM870+T6201	X	(X)*	X	X		X			X	X		X
CX870-3F	DM870+T6201	X		X	X X					X		X	X
CX870-3G	DM870+T6201	X			X	X				X		X	X
CX870-3H	DM870+T6201		X	X	X X					X		X	X
CX870-3I	DM870+T6201		X		X	X				X		X	X
CX870-3J	DM870+T6201		X		X		X			X		X	X

**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.

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

## 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 <sub>IH</sub>	1.7		5.5	V
Logic Input low voltage				V <sub>IL</sub>	-0.3		0.7	V
Logic Input threshold voltage				V <sub>IT</sub>	1.29	1.39	1.5	V
Schmitt-trigger input low to high threshold voltage				V <sub>IT+</sub>	1.58	1.65	1.71	V
Schmitt-trigger input high to low threshold voltage				V <sub>IT-</sub>	0.95	1.01	1.06	V
Logic Output high voltage				V <sub>OH</sub>	2.4			V
Logic Output low voltage				V <sub>OL</sub>			0.4	V
Logic Low-level output current (V <sub>OL</sub> =0.4V)				I <sub>OL</sub>	-9.6	-15.6	-19.3	mA
Logic High-level output current (V <sub>OH</sub> =2.4V)				I <sub>OH</sub>	11.1	22.5	35.3	mA
Current Consumption	Reset State	CX870	3.3	I3.3		60	78	mA
			1.2	I1.2		32	42	mA
			1.9	I1.9		18	23	mA
	Operating in idle state		3.3	I3.3		185	241	mA
			1.2	I1.2		337	438	mA
			1.9	I1.9		257	334	mA
	Playback over WiFi high mips & rate condition		3.3	I3.3		240	312	mA
			1.2	I1.2		347	451	mA
			1.9	I1.9		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, 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, 1Mbps 802.11g mode 54Mbps, 48Mbps, 36Mbps, 24Mbps, 18Mbps, 12Mbps, 9Mbps, 6Mbps
Tx Power	802.11b mode (16.5dBm, +/-1dBm) 802.11g mode (21dBm, +/-1dBm)
Power-on Ramp	< 2us
RF Carrier Suppression	< 15dBc
TX EVM	< -5dB @ 6Mbps < -25dB @ 54Mbps
Rx Sensitivity (incl. CE2 Mother board)	802.11b mode =<-88dBm @ 1Mbps, =<-85dBm @ 5.5Mbps, =<-83dBm @ 11Mbps 802.11g mode =<-86dBm @ 6Mbps, =<-75dBm @ 36Mbps, =<-69dBm @ 54Mbps
Throughput Rate (measured for each module)	See factory test specification

## 6. Regulatory Compliance and Quality

Description	Country	Compliance	Module Versions Passed
Electromagnetic Compatibility (Prescan)	USA Europe	FCC CFR47 Part15B EN 55022 EN 55024 EN 61000-3-2 EN 61000-3-3 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-4-8 EN 61000-4-11	
Radio Regulations (CX870 only)	USA Japan Canada Europe New Zealand/Australia China Korea	FCC Part 15C Telec IC RSS-210 CE CE SRRC KCC	tbd tbd tbd tbd tbd tbd tbd

**Note:** BridgeCo does not certify all module variants for all countries. Please contact your BridgeCo sales office for the latest information about which modules are certified for which countries, and arranging for additional certification for your chosen module if needed. Product manufacturers are responsible for the end product certification.

BridgeCo can help manufacturers to prepare for the WiFi Alliance tests by providing an example test plan and the required commands to enable special test modes. Please contact your BridgeCo sales office about WiFi Alliance logo certification assistance.



### 6.1 RoHS

Uses only RoHS compliant components

### 6.2 Environmental Test

Withstands 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

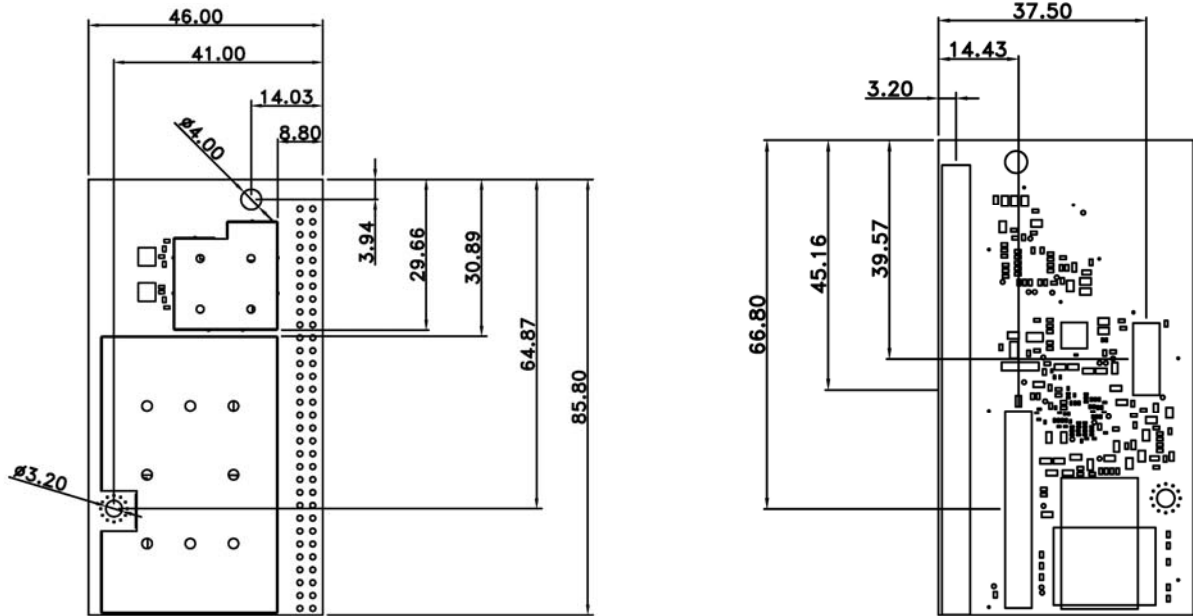
### 6.7 Module Quality

Defect Rate: TBD

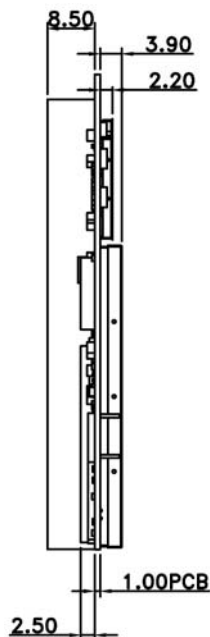
AQL CR=0, MA=0.4, MI=0.4

## 7. Board Dimensions and Weight

### 7.1 Top & Bottom View of CX870 module



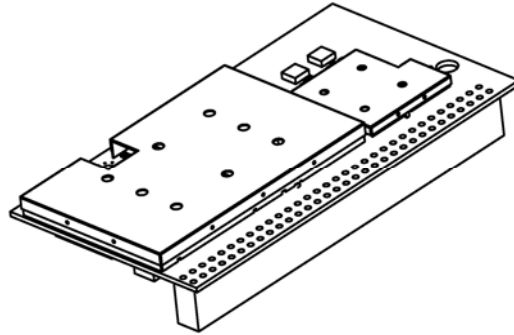
### 7.2 Side View of CX870 module



#### 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.

### 7.3 3D View of CX870 module



### 7.4 Module weight

CX860: 14g  
CX870: 15g

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

## 8. Connectors and Connections

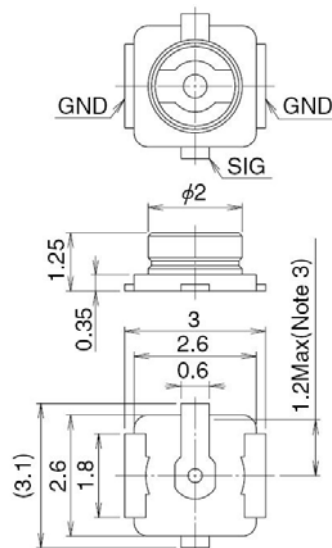
### 8.1 WLAN UFL Antenna Connector (optional)

The module includes two PCB strip antennas operated in diversity mode. Alternatively, 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 either one or two external antennae may be connected. Using two antennae is preferred since this provides 2X diversity operation. Please see ordering guide for build option details.

The surface-mount receptacle parts:

Hirose  
U.FL-R-SMT (CL No. 331-0471-0)

#### 8.1.1 Coaxial antenna connector dimensions



### 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
<b>POWER</b>		
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	For module versions without Real Time Clock (RTC) option, and for module versions with RTC option where the RTC function is not used, this pin should be left open. For module versions with RTC option, and the RTC function is used, then this pin should be connected to the positive terminal of a 1F capacitor connected to GND. This capacitor will power the RTC circuits in the DM870 IC when the module power supply is switched off.
GND	P	Ground (GND) connection for power supply 0V, signal returns and shielding.

<b>SPI</b>		
SPI_DOUT	O	SPI data from DM870 to host controller.
SPI_DIN	I	SPI data from host controller to DM870.
SPI_CLK	I	SPI clock from host controller to DM870. Maximum recommended frequency is 2MHz, typical frequency is 1MHz. See Note 2 below.
SPI_NCS0	I	SPI chip select from host controller to DM870.
PDOUT1	O	This signal is used as SPI_REQ, SPI request signal, from DM870 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.

<b>UART</b>		
RXD1	I	UART1 input to the DM870, used for shell access. BridgeCo 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 DM870, used for shell access. BridgeCo 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.



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### 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. BridgeCo is not recommending using the PWM-DAC outputs because of the potential for high out-of-band noise and uncharacterized audio quality. BridgeCo 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	BIST activate. Low-active input to invoke the Built In Self Test (BIST) function. This only applies to factory fresh modules. After JB2 firmware is loaded, this signal becomes GPIO-17 and is currently not used. DM870-internal pull-up. Leave this pin open.
PDOUT0	I	Factory Reset. GPIO-04. Return the CnE to factory settings. High-active input, DM870-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 DM870. 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 DM870. 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. ±12mA) 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 DM870 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 DM870. 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.
MMIICRS	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 DM870
  - O – 3.3V level Digital Logic Output from the DM870
  - 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 DM870 IC data sheet:  
*dat\_DM870\_16\_datasheet.pdf*, or later version.
3. For audio port timing diagrams, and for detailed setup and hold timing, please see DM870 IC data sheet:  
*dat\_DM870\_16\_datasheet.pdf*, or later version.
4. For example ethernet external schematic, see:  
*CX Module Ethernet (RJ45 + Ext.Magnetics)\_V1.2.pdf*, or later version.
5. For example USB schematics, see:  
*CX Module USB\_V1.2.pdf*, or later version.
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 BridgeCo 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. BridgeCo has a set of example motherboard schematics that shows example external circuitry that is typically connected to the module. Please check the BridgeCo customer portal for a copy of these example schematics.
12. Please check the BridgeCo Customer Portal *Download* area for the latest version of the BridgeCo documents. Go to [bridgeco.com](http://bridgeco.com), click on Client Login button. If you do not have an account, please contact BridgeCo.



### 8.2.2 Connector PIN Assignments

#### J2 – Media Connector

Function	GPIO	IC PIN	Signal	PIN Number	Signal	IC PIN	GPIO	Function
			GND	1	2			
			VIN (+3.3V)	3	4			
			VIN (+3.3V)	5	6			
			GND	7	8			
			VIN (+1.2V)	9	10			
			VIN (+1.2V)	11	12			
			GND	13	14			
			VIN (+1.9V)	15	16			
			GND	17	18			
		F4	3V3RTC	19	20			
			GND	21	22			
			GND	23	24			
			SPL_DOUT	25	26			
SPI		E17	SPL_DIN	27	28			JTAG
		F17	SPL_CLK	29	30			
		D17	TXD0	31	32			SPI
		C17	RXD0	33	34			
		A18	RXD1	35	36			
Debug UART		B17	TXD1	37	38			
		A17	GND	39	40			
SPI_E_NCS	GPIO-11	C16	SSMD7	41	42			
SPI_E_SDI	GPIO-09	A16	SSMD5	43	44			
		B15	SSMD3	45	46			
		B14	SSMD0	47	48			
		C13	SSMCLK	49	50			
		C12	SSMCP	51	52			
			GND	53	54			
			USB_DN	55	56			USB
USB		A1	USB_DP	57	58			
		B1	USBVBSDRV	59	60			
			GND	61	62			
		H3	AOUTLP	63	64			
		J3	AOUTLN	65	66			
			GND	67	68			
		GPIO-16	A23	69	70			
		GPIO-18	A22	71	72			
I2C SDA	GPIO-14	K19	AV3CTRL1	73	74			
I2C SCL	GPIO-13	V1	AV3CTRL0	75	76			
		V2	AV0CTRL2	77	78			
		K3	AV0CTRL1	79	80			
		L3	AV0CLK	81	82			
Video Output		N1	AV0DATA3	83	84			
		N2	AV0DATA2	85	86			
		N3	AV0DATA1	87	88			
		P1	AV0DATA0	89	90			
		P2	GND	91	92			
LRCK		T2	AV2CTRL0	93	94			
A/D data 1		T3	AV2DATA3	95	96			
A/D data 0		T4	AV2DATA2	97	98			
D/A data 1		U1	AV2DATA1	99	100			
D/A data 0		U2	AV2DATA0	101	102			
			GND	103	104			
			ETH_RXN	105	106			
			ETH_RXP	107	108			
				109	110			
Ethernet			ETH_TXN	111	112			
			ETH_TXP	113	114			
			GND	115	116			
	GPIO-15	N18	NWAIT	117	118			
			NPD_RF	119	120			
			GND					
			GND					
			VIN (+3.3V)					
			VIN (+3.3V)					
			GND					
			VIN (+1.2V)					
			VIN (+1.2V)					
			GND					
			VIN (+1.9V)					
			GND					
			GND					
			TMS			B20		
			TCK			A20		
			TDI			B19		
			TDO			A19		
			SPI_NCS0			D16		
			SPI_NCS1			D15		
			NRESET_MOD					
			SSMD6			B16	GPIO-10	Module reset input
			SSMD4			C15	GPIO-08	SPI_E_CLK
			SSMD2			A15		SPI_E_SDO
			SSMD1			C14		
			SSMCMD			A14		
			SSMWP			C11		
			NCS3			M18	GPIO-17	BIST activate
			NCS2			L18	GPIO-19	iPod NDETECT
			GND					
			USB_VBUS					
			GND					
			AOUTRN			K2		
			AOUTRP			J2		
			GND					
			PDOUT1			L1	GPIO-06	SPI_REQ
			VCO1			L2	GPIO-07	
			PDOUT0			M1	GPIO-04	Factory reset
			VCO0			M2	GPIO-05	IR input
			AV3CLK			U3	GPIO-12	ETH NRESET
			AV0CTRL0			M3		
			AV1DATA3			P3		
			AV1DATA2			R1		
			AV1DATA1			R2		
			AV1DATA0			R3		
			GND					
			AV2CTRL1			T1		MCLK
			GND					
			AV2CLK			R4		SCLK
			GND					
			AV4DATA1			W2		SPDIF output
			AV4DATA0			Y1		SPDIF input
			GND					
			ETH_LED_ACT					
			ETH_LED_SPEED					
			GND					
			MICRS			Y14	GPIO-00	
			MIICOL			W14	GPIO-01	
			MIITXER			V10	GPIO-02	
			MIITXCLK			V11	GPIO-03	iPod Access Power
			MIITXD0			W10		
			MIITXD1			Y10		
			MIIRXD0			W12		
			MIIRXD1			Y12		
			GND					

**Note:** The IC PIN column indicates the pin number on the DM860 or DM870 integrated circuit. This allows for easy cross-reference to the DM860 or DM870 data sheet information.

### J1 – LCD Connector

Function	GPIO	IC PIN	Signal	PIN Number		Signal	IC PIN	GPIO	Function
			GND	1	2	GND			
LCD Interface		Y7	LCDD0	3	4	LCDD1	W7	LCD Interface	
		V7	LCDD2	5	6	LCDD3	Y6		
		W6	LCDD4	7	8	LCDD5	V6		
		U6	LCDD6	9	10	LCDD7	Y5		
		W5	LCDD8	11	12	LCDD9	V5		
		U5	LCDD10	13	14	LCDD11	Y4		
		W4	LCDD12	15	16	LCDD13	V4		
		U4	LCDD14	17	18	LCDD15	Y3		
		W3	LCDD16	19	20	LCDD17	Y2		
			GND	21	22	GND			
LCD Interface		Y9	LCDCCLK	23	24	LCDCCTRL0	W9	LCD Interface	
		Y8	LCDCCTRL1	25	26	LCDCCTRL2	W8		
		V8	LCDCCTRL3	27	28	GND			
		GND	29	30	GND				

**Note:** The IC PIN column indicates the pin number on the DM860 or DM870 integrated circuit. This allows for easy cross-reference to the DM860 or DM870 data sheet information.

### J3 – Low Density Connector

Function	GPIO	IC PIN	Signal	PIN Number		Signal	IC PIN	GPIO	Function
			GND	1	2	GND			
			VIN (+3.3)	3	4	RXD0			
			VIN (+3.3)	5	6	TXD0			
			GND	7	8	GND			
			VIN (+1.9)	9	10	VIN (+1.2)			
			VIN (+1.9)	11	12	VIN (+1.2)			
			GND	13	14	GND			
Free iPod NDETECT	GPIO-15 GPIO-19	N18	NWAIT	15	16	RXD1	B17		Debug UART
		L18	NCS2	17	18	TXD1	A17		
		F4	NRESET	19	20	GND			
			3V3RTC	21	22	AV2CTRL1	T1		MCLK
			GND	23	24	AV2CTRL0	T2		LRCK
SPI		F17	SPI_DIN	25	26	AV2CLK	R4		SCLK
		E17	SPI_DOUT	27	28	AV2DATA2	T4		A/D data 0
		D17	SPI_CLK	29	30	AV2DATA0	U2		D/A data 0
		D16	SPI_NCS0	31	32	AV4DATA1	W2		SPDIF output
Free	GPIO-17	D15	NCS3	33	34	AV4DATA0	Y1		SPDIF input
			GND	35	36	GND			
E-GPIO_NCS/TBA	GPIO-11	C16	SSMD7	37	38	USB_DN	A1	USB	
I2C SDA	GPIO-14	V1	AV3CTRL1	39	40	USB_DP	B1		
I2C SCL	GPIO-13	V2	AV3CTRL0	41	42	USBVBUSDRV			
			GND	43	44	USB_VBUS			
SPI_REQ	GPIO-06	L1	PDOUT1	45	46	GND			
Factory Reset	GPIO-04	M1	PDOUT0	47	48	SSMD5	K20	GPIO-09	E-GPIO_SDI/TBA
IR input	GPIO-05	M2	VCO0	49	50	SSMD4	C15	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	V11	MIITXCLK	55	56	SSMD6	B16	GPIO-10	E-GPIO_CLK/TBA
Ethernet			ETH_RXN	57	58	ETH_RXP			Ethernet
			ETH_TXN	59	60	ETH_TXP			Ethernet
Free	GPIO-00		MMIICRS	61	62	MIICOL		GPIO-01	Free
			GND	63	64	GND			

**Note:** The IC PIN column indicates the pin number on the DM860 or DM870 integrated circuit. This allows for easy cross-reference to the DM860 or DM870 data sheet information.

### 8.2.3 GPIO Assignments

#### GPIO Assignments for J3 64-pin Low Density Connector

GPIO	PIN Name	PIN Number	Function
00	MMIICRS	61	Free
01	MIICOL	62	Free
03	MIITXCLK	55	iPOD Access Power
04	PDOOUT0	47	Factory Reset
05	VCO0	49	IR Input
06	PDOOUT1	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.

## 9. Application Guidelines

### 9.1 Power Supply sequencing and Reset Timing

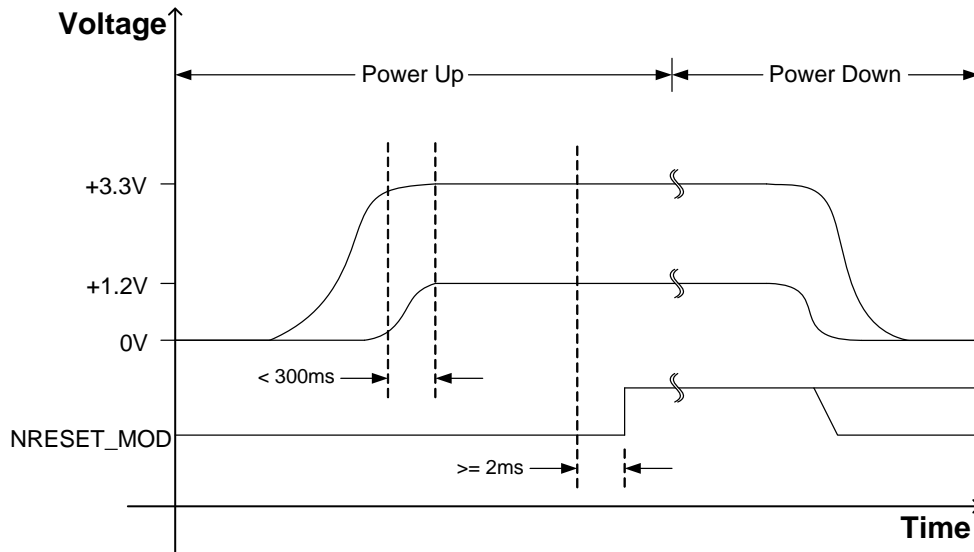
There are strict power sequencing and reset timing requirements.

- 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.

BridgeCo 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.

## 10. Revision Control

Revision	Date / Author	Remarks
V1.7 c	May 13, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated "Module Quality" Defect Rate field entry</li> <li>Updated "Board Dimensions &amp; Weight" drawings</li> <li>Updated the "Electrical Specifications" table</li> <li>Added another Note to the "Pin Descriptions" section</li> </ul>
V1.7 b	May 11, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated Note 8 in "Pin Descriptions" table</li> <li>Re-imported "Board Dimensions &amp; Weight" drawings</li> <li>Updated "Board Pictures" images</li> <li>Updated board photo on Cover page</li> <li>Updated the Feature list on Cover page</li> <li>Updated J1, J2 &amp; J3 "Connector PIN Assignments" tables: removed Power column &amp; re-organised columns</li> <li>Changed "Application Notes" title to "Application Guidelines"</li> <li>Updated Copyright date to "2011"</li> <li>Updated Table of Contents font styling</li> </ul>
V1.7 a	May 6, 2011 / SHs	<ul style="list-style-type: none"> <li>Re-imported Block Diagram as a wmf file</li> <li>Updated "Power up, Reset &amp; Power down Timing" figure</li> <li>Updated "Pin Descriptions" table</li> <li>Re-organised text in "Power Supply sequencing &amp; Reset Timing"</li> <li>Re-imported J2 &amp; J3 Connector PIN Assignment tables</li> </ul>
V1.7	May 4, 2011 / SHs	<ul style="list-style-type: none"> <li>Added note to Module Weight section</li> <li>Updated the Ordering Guide – Part Numbers &amp; added new J version</li> <li>Added new text to the Board Pictures section</li> <li>Updated all Mechanical Drawings and added &amp; removed Notes</li> <li>Updated the J3 Low Density Connector table</li> <li>Updated the GPIO Assignment table</li> <li>Added new Power Supply &amp; Timing figure</li> <li>Updated the text in the "Power Supply sequencing and Reset Timing" section</li> <li>Updated the Key Connections table</li> <li>Updated "Key Connections" section title to "Pin Descriptions"</li> <li>Updated "Detailed Connector PIN Descriptions" section title to "Connector PIN Assignments"</li> <li>Updated J2 Media Connector table</li> </ul>
V1.6 d	March 3, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated J3 Low Density Connector table</li> <li>Update GPIO Assignments section and table</li> </ul>
V1.6 c	February 24, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated all mechanical drawings in "Board Dimensions and Weights" section</li> <li>Deleted warning note in "Board Dimensions and Weights" section</li> </ul>
V1.6 b	February 23, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated "J3-Low density connector" pin description table</li> <li>Updated "GPIO Assignments" table</li> </ul>
V1.6	February 11, 2011 / SHs	<ul style="list-style-type: none"> <li>Entirely updated the "Ordering Guide"</li> <li>Added a Note to the "Ordering Guide"</li> <li>Updated the subsection titles for the "Board Pictures" section</li> <li>Updated the Block Diagram – changed 'WiFi Antenna' to 'Ext. Antenna'</li> </ul>

V1.5 b	January 27, 2011 / SHs	<ul style="list-style-type: none"> <li>Added Note to "Board Dimensions and Weight" section</li> </ul>
V1.5 a	January 24, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated the "Ordering Guide" – removed Mfg column and consolidated into one table</li> <li>Updated the Header to reflect Preliminary nature of datasheet</li> </ul>
V1.5	January 22, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated the datasheet to be a Preliminary Datasheet</li> <li>Added new feature to Summary on Front Page</li> <li>Updated "J3 - Low Density Connector" table</li> <li>Updated "GPIO Assignments" table</li> <li>Added note to "Board Dimensions &amp; Weight – Side Views of CX870 module" section</li> <li>Updated text in "Application Notes – Power Supply Sequencing &amp; Reset Timing" section</li> <li>Updated "Block Diagram"</li> <li>Updated text in "Connectors &amp; Connections – WLAN UFL Antenna Connector" section</li> </ul>
V1.4 b	January 11, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated the Application Notes, RF Considerations section</li> </ul>
V1.4	January 3, 2011 / SHs	<ul style="list-style-type: none"> <li>Updated the module photo on the Title page</li> <li>Updated the Application Notes, RF Considerations section</li> </ul>
V1.3	December 23, 2010 / SHs	<ul style="list-style-type: none"> <li>Updated Ordering Guide</li> <li>Added Notes to Ordering Guide</li> <li>Updated Block Diagram</li> <li>Updated "J3 – Low Density Connector" table</li> <li>Updated "Electrical Specifications" table</li> <li>Added Power Consumption data to "Electrical Specifications" table</li> <li>Updated the Board Dimensions and Weight images</li> <li>Updated the "GPIO Assignments" table</li> <li>Added another Application Note</li> <li>Added titles to Application Notes</li> </ul>
V1.2	December 19, 2010 / SHs	<ul style="list-style-type: none"> <li>Inserted CX860 and CX870 Module Weights</li> <li>Updated module image on Front Page</li> </ul>
V1.1	December 13, 2010 / SHs	<ul style="list-style-type: none"> <li>Added the Ordering Guide.</li> <li>Updated the Block Diagram.</li> <li>Updated the "Electrical Specifications" table</li> <li>Updated the "Absolute Maximum Ratings" table</li> <li>Updated the Notes for "Regulatory Compliance and Quality" section</li> <li>Updated "Key Connections" table</li> <li>Updated "J2 – Media Connector" table</li> <li>Updated "J3 – Low Density Connector" table</li> <li>Updated "GPIO Assignments" table</li> <li>Added Board Pictures</li> <li>Replaced Mechanical Drawings in "Board Dimensions and Weight" section</li> </ul>
V1.0	October 18, 2010 / SHs	<ul style="list-style-type: none"> <li>Initial Version</li> </ul>

## Module Revision History

To be determined.

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## **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 provide 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: ZQO-CX8703x ", FCC ID displayed on label.

The "x "is for different versions of CX870-3 serial modules, the label text should be updated according to the table shown in Chapter 4. The proper letter shown in Chapter 4 should be substituted for X. For example, The FCC ID:ZQO -CX8703B is for model CX870-3B.



## **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: 2581A-CX8703x ", IC ID displayed on label.

The "x" is for different versions of CX870-3 serial modules, the label text should be updated according to the table shown in Chapter 4. The proper letter shown in Chapter 4 should be substituted for x. For example, The IC: 2581A-CX8703H is for model CX870-3H

This radio transmitter IC: 2581A-CX8703H has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

**Antenna List**

No.	Manufacturer	Model Number	Antenna Gain	Final test
1	MAG.LAYERS	EDA-8709-2G4C1-A66	2.0 dBi	No
2	LITE-ON	MSA-3810-2G4C1-A9-S (main)(aux)	3.0 dBi	Yes
3	LITE-ON	MSA-3810-2G4C1-A2-S (main)(aux)	2.8 dBi	No