MMB Networks LKT00 ZigBee Module based on the NCS36510

The MMB Networks LKT00 ZigBee module is a drop-in ZigBee/802.15.4 module for use in wireless mesh networking applications. The module is based on ON Semiconductor's NCS36510 SoC. The NCS36510 is a low power, fully integrated, System on Chip that integrates a 2.4 GHz IEEE 802.15.4–2006 compliant transceiver, ARM® Cortex®–M3 microprocessor, RAM and FLASH memory, a true random number generator, and multiple peripherals to support design of a complete and secure wireless network with minimal external components.

<MODULE PHOTO GOES HERE>

The NCS36510 incorporates an industry leading 32 bit ARM Cortex−M3 for high performance, low power and low cost processing. The NCS36510 includes 640 kB of embedded FLASH memory for program storage along with 48 kB of RAM for data storage. NCS36510 uses a hardware accelerated MAC to minimize processor overhead while maximizing available processor power for running application software.

Peripherals include DMA, UART(2), SPI(2), I2C(2), PWM, RTC, three programmable timers, WDT, 18 GPIO, 10 bit ADC with four external inputs and integrated temperature and voltage sensors.

Table of Contents

1   General Information

Note that some of the specifications refer to either "NCS36510" or "Module". Please note specifications cited as NCS36510 are taken from the NCS36510 datasheet (this should also be noted where referred to). "Module" means measurements taken with the MMB Networks production module.

2   Memory

RAM (kB)	On-Chip Flash (kB)
48	640

3   Module Pinout

Module Pad	NCS36510 GPIO (NCS36510 Pin Number)
1	Test (35)
2	DIO17 (40)
3	DIO10 (1)
4	DIO16 (4)
5	VDDIO (5)
6	GND
7	DIO8 (3)
8	DIO7 (7)
9	DIO6 (8)
10	DIO5 (9)
11	DIO4 (10)
12	DIO3 (11)
13	DIO2 (12)
14	DIO1 (13)
15	DIO0 (14)
16	nReset (36)
17	DIO9 (2)
18	VDD (22, 34)
19	GND
20	A0 (23)
21	DIO13 (37)
22	DIO12 (38)
23	DIO11 (39)
24	GND
25	A1 (24)
26	DIO15 (6)
27	DIO14 (15)
28	A2 (29)
29	A3 (30)

3.1   Debug and Programming Interface

DRAFT TBD

4 Electrical Specifications

4.1 Absolute Maximum Ratings

Parameter	Minimum	Maximum	Units
Supply Voltage (VDD, VDDIO)	-0.3	3.9	V
Voltage on any GPIO (DIO0:DIO17, nReset, Test)	-0.3	VDDIO+0.3, <=3.9	V
Analog pin voltage (A0:A3)	-0.3	VDD+0.3, <=3.9	V
Storage Temperature Range	-40	+125	°C

4.2 Recommended Operating Conditions

Parameter	Minimum	Typical	Maximum	Units
Supply Voltage (VDD) – 3V Mode	TBD	3.3	3.6	V
Supply Voltage (VDDIO)	TBD	3.3	3.6	V
Ambient Temperature Range	-40	27	85	°C

4.3 DC Electrical Characteristics

For typical values TA = 27°C, for min/max values TA = −40°C to 85°C; unless otherwise noted. Power supplies VDD = 3.3 V, VDDIO = 3.3 V, unless otherwise noted.

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Coma Mode Sleep Current[1]	3 V Mode, Switching Regulator		0.65		µA
	3 V Mode, Linear Regulator[2]		4.96		µA
FLASH Erase Cycles Before Failure[3]		10k			cycles
FLASH Read Current[3]				2.3	mA
FLASH Erase Current[3]				5	mA
FLASH Write Current[3]				3	mA
Data Retention at 85°C		10			years

4.3.1 Core Power Consumption

Parameter	Test Condition	Minimum	Typical	Maximum	Units
3V Mode Transmit Current – Switching Regulator[4]	+7.6 dBm (Max. Power Setting)		TBD		mA
	0 dBm		TBD		mA
	−16 dBm (Min. Power Setting)		TBD		mA
3V Mode Transmit Current – Linear Regulator[4]	+7.6 dBm (Max. Power Setting)		TBD		mA
	0 dBm		TBD		mA
	−16 dBm (Min. Power Setting)		TBD		mA
3V Mode Receive Current − Switching Regulator[4]			TBD		mA
3V Mode Receive Current − Linear Regulator[4]			TBD		mA

Notes:
1. Coma mode = CPU running on internal 32 kHz osc and waiting for interrupt, both retention RAMS disabled, all other functions powered down

2. VDD = 2.0V
3. Guaranteed by design
4. Peripherals disabled, CPU halted, 32 MHz crystal oscillator, CW Mode, 2.44GHz, ON Semiconductor evaluation board, conducted measurement, 50 ohm system

Please refer to the NCS36510 data sheet for DIO specifications including internal resistor values, switching voltages, thresholds, etc.

4.4   TX Power Setting

The RF Output power of the Module can be adjusted via the SoC's TX Power settings. The Transmit Current will also vary according to the TX Power setting. The charts below show the relationship between the Transmit Current or Output Power vs the TX Power setting.

CHART TBD

5   RF Specifications

5.1   Receive Specifications

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Frequency range		2400		2485	MHz
Sensitivity			-97	-92	dBm
RSSI range			40	60	dB

5.2   Transmit Specifications

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Output Power	Max Power Setting	2	7.6	10	dBm
Error Vector Magnitude (EVM)	Max Power		10	35	%
Spurious emissions, relative	Max power			-20	dBc
Spurious emissions, absolute	Max power			-30	dBm

6   Mechanical Specifications

6.1   Physical Dimensions

Dimension Drawing TBD

Symbol	Description	Distance
L	Length of the module	
W	Width of the module	
H	Height of the module	
A1	Pitch	
A2	Distance center of pad to PCB edge	

Symbol	Description	Distance
A3	Distance center of pad to PCB edge	
A	Length of keep-out zone	
B	Width of keep-out zone	
C	Keep-out zone from corner of PCB	
D	Keep-out zone from corner of PCB	

6.2   Recommended Land Pattern (Surface Mount)
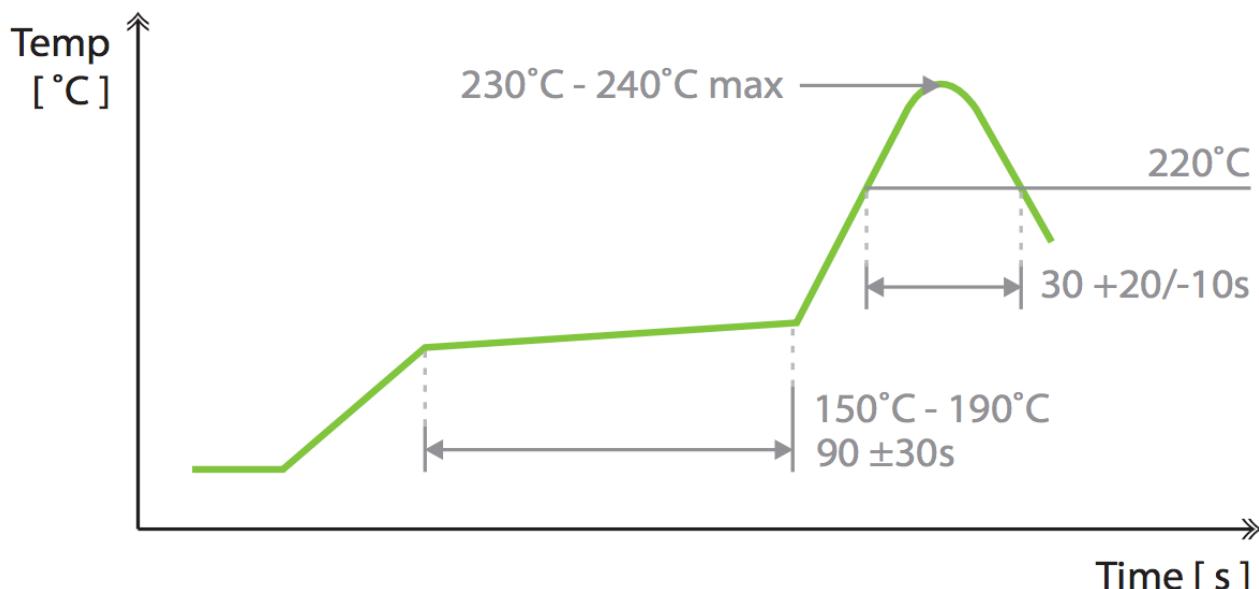
Land Pattern TBD

Symbol	Description	Distance
F1	Distance pad edge to pad edge	
F2	Distance pad edge to pad edge	
F3	Distance pad edge to pad center	
F4	Pitch	
F5	Module silkscreen outline	
F6	Module silkscreen outline	

6.3   Labeling

ON

MODEL   LKT00
FCC   XFF-LKT00
IC   8365A-LKT00
AYYWWG
002446
00AABBCCDD

7   Soldering Temperature Time Profile for Reflow Soldering (Lead-Free Solder)

8 Regulatory Approvals

8.1 Approved Antennae

The LKT00 module has been certified with one onboard chip antenna. See the individual jurisdictions below for the detailed output power settings.

8.2 Federal Communications Commission (FCC - US)

8.2.1 RF Output Power Settings

For the LKT00 module using the onboard chip antenna, the approved power level settings are 10 (max power) for channels 11- 25 and X for channel 26.

8.2.2 FCC Notice

The LKT00 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.

To comply with FCC RF Exposure requirements, users of this device must ensure that the module be installed and/or configured to operate with a separation distance of 20cm or more from all persons. Usage of Channel 26 at full power will result in non-compliance to FCC standards. MMB recommends avoiding use of channel 26 and if necessary only use with a reduced power setting. For further details please contact MMB.

8.2.3 Modular Approval

The LKT00LKT00 device meets the requirements for modular transmitter approval as detailed in the FCC public notice DA 00-1407.

It should be noted that:

"While the applicant for a device into which an authorized module is installed is not required to obtain a new authorization for the module, this does not preclude the possibility that some other form of authorization or testing may be required for the device (e.g., a WLAN into which an authorized module is installed must still be authorized as a PC peripheral, subject to the appropriate equipment authorization)."
-- FCC Public Notice DA 00-1407

Caution:
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

8.2.4 Labeling Requirements

The user of this device is responsible for meeting the FCC labeling requirements. A clearly visible label on the exterior enclosure of an incorporating device must list the MMB Research Inc. FCC ID "XFF-LKT00" and the FCC Notice above
.
The exterior label should use the wording "Contains" or "Contains Transmitter Module". For example:

Contains FCC ID: XFF-LKT00

or

Contains Transmitter Module FCC ID: XFF-LKT00

Any similar wording that expresses the same meaning may be used.

8.3   Industry Canada (IC)

8.3.1   RF Output Power Settings

For the LKT00 module using the onboard chip antenna, the approved power level settings are 10 (max power) for channels 11- 25 and X for channel 26.

8.3.2   IC Notice

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

8.3.3   Labeling Requirements

The host device shall be properly labeled to identify the modules within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains transmitter module IC: 8365A-LKT00

8.4   ETSI (EU)

8.4.1   RF Output Power Settings

For the LKT00 module using the onboard chip antenna, the approved power level settings are 10 (max power for all channels).

8.4.2   ETSI Approval

Provided that the above TX Power settings are used, the LKT00 module is compliant with the following EU standards: ETSI EN 300 328 (v1.9.1), ETSI EN 301 489 1 (v1.9.2) and ETSI EN 301 489 17 (v2.2.1)

9 Ordering Information

SKU	Description
NCAT00LKT00082G4MNG	