Bluetooth Module - Part Code LM-400

Top view

Bottom view

Contents:

Side view

Device Overall Description

The BTM400 is designed to provide Bluetooth2.0 + EDR function on a small form factor. The Bluetooth function is based on CSR BlueCore4-Ext Bluetooth System, which implements the full speed class 1 Bluetooth operations with full 7 slave piconet support. The interface of BTM400 to host system is UART.

Bluetooth

Features

-CSR BlueCore4

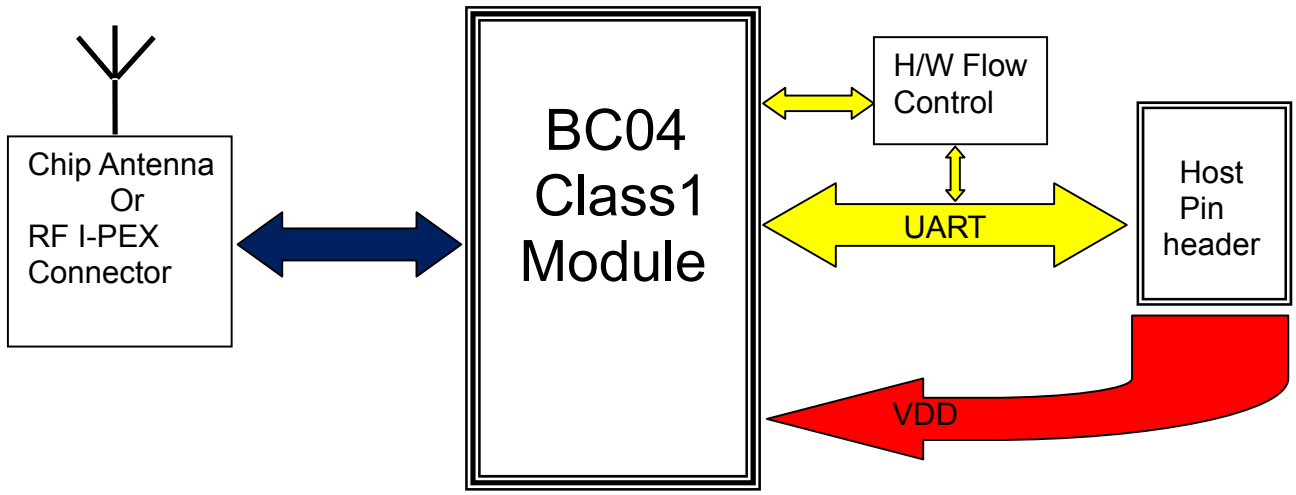
-Bluetooth 2.0 + EDR support

-Full Speed Class 1 Bluetooth operation with full 7 slave piconet support

-Single onboard Antenna connector support (Optional)

-Chip antenna on board

Bluetooth Block Diagram



Modulation Methods

FHSS (Frequency Hopping Spread Spectrum) defined in Bluetooth Specification.

	Data Rate	Modulation scheme
Basic Data Rate	1 Mbps	GFSK
Enhanced Data Rate	2Mbps	π/4 – DQPSK
	3Mbps	8DPSK

Bluetooth Power Consumption

Absolute Maximum Ratings			
Parameter	**Min.**	**Max.**	**Unit**
Storage Temperature	-40	+85	℃
Supply Voltage(VDD)	2.7	3.6	DCV
Supply Voltage(PVCC)	3.0	3.3	DCV
Other Pin Voltage	Vss-0.4	VDD+0.4	DCV

Recommended Operating Conditions			
Parameter	**Min.**	**Max.**	**Unit**
Temperature	-10	+70	℃
Supply Voltage for UART	3.0	3.6	DCV
Supply Voltage for USB	3.0	3.6	DCV

General Electrical Specification

Parameter	Description	Min.	Typ.	Max.	Unit
Carrier Frequency		2.402		2.480	GHz
RF Output Power	Measured in 50ohm	15	16.5	18	dBm
RX sensitivity		-	-88	-86	dBm
Load Impedance	No abnormal Oscillation			5:1	
Input Low Voltage	RESET,UART,GPIO,PCM	-0.30	-	0.80	DCV
Input High Voltage	RESET,UART,GPIO,PCM	0.7VDD	-	VDD+0.3	DCV
Output Low Voltage	UART,GPIO,PCM	-	-	0.40	DCV
Output High Voltage	UART,GPIO,PCM	VDD-0.4	-	-	DCV
Average Current Consumption	Receive DM1		114		mA

Radio Characteristics - Basic Data Rate

Transmitter , VDD = 3.3V Temperature =+20°C						
	Frequency (GHz)	**Min.**	**Typ.**	**Max.**	**Bluetooth Specification**	**Unit**
Maximum RF transmit power(note)	2.402	-	6	-	-6 to +20	dBm
	2.441	-	6	-		dBm
	2.480	-	7	-		dBm
Relative transmit power		-	-1.6	-	-4 to +1	dB
$\pi/4$ DQPSK Maximum carrier frequency stability w_0		-	2	-	≤ ±10 for all blocks	kHz
$\pi/4$ DQPSK Maximum carrier frequency stability w_i		-	6	-	≤ ±75 for all packets	kHz
$\pi/4$ DQPSK Maximum carrier frequency stability $\lvert w_0 + w_i \rvert$		-	8	-	≤ ±75 for all blocks	kHz
8 DPSK Maximum carrier frequency stability w_0		-	2	-	≤ ±10 for all blocks	kHz
8 DPSK Maximum carrier frequency stability w_i		-	6	-	≤ ±75 for all packets	kHz
8 DPSK		-	8	-	≤ ±75 for all blocks	kHz

Maximum carrier frequency stability | $w_0 + w_i$ |						
π/4 DQPSK Modulation Accuracy	RMS DVEM	-	7	-	≤ 20	%
	99% DEVM	-	13	-	≤ 30	%
	Peak DEVM	-	19	-	≤ 35	%
8 DPSK Modulation Accuracy	RMS DVEM	-	7	-	≤ 13	%
	99% DEVM	-	13	-	≤ 20	%
	Peak DEVM	-	17	-	≤ 25	%
In-band spurious emissions	$F>F_0+3$ MHz	-	<-50	-	≤ -40	dBm
	$F<F_0-3$ MHz	-	<-50	-	≤ -40	dBm
	$F=F_0-3$ MHz	-	-46	-	≤ -40	dBm
	$F=F_0-2$ MHz	-	-34	-	≤ -20	dBm
	$F=F_0-1$ MHz	-	-35	-	≤ -26	dBm
	$F=F_0+1$ MHz	-	-35	-	≤ -26	dBm
	$F=F_0+2$ MHz	-	-31	-	≤ -20	dBm
	$F=F_0+3$ MHz	-	-33	-	≤ -40	dBm
EDR Differential Phase Encoding			No Errors		≥ 99	%

Receiver , VDD = 3.3V Temperature =+20°C

	Modulation	Min.	Typ.	Max.	Bluetooth Specification	Unit
Sensitivity at 0.1% BER	π/4 DQPSK	-	-87	-	≤ -70	dBm
	8 DPSK	-	-78	-	≤ -70	dBm
Maximum received signal level at 0.1% BER	π/4 DQPSK	-	-8	-	≥ -20	dBm
	8 DPSK	-	-10	-	≥ -20	dBm
C/I co-channel at 0.1% BER	π/4 DQPSK	-	10	-	≤ +13	dB
	8 DPSK	-	19	-	≤ +21	dB
Adjacent channel selectivity C/I $F=F_0+1$ MHz	π/4 DQPSK	-	-10	-	≤ 0	dB
	8 DPSK	-	-5	-	≤ +5	dB
Adjacent channel selectivity C/I $F=F_0-1$ MHz	π/4 DQPSK	-	-11	-	≤ 0	dB
	8 DPSK	-	-5	-	≤ +5	dB
Adjacent channel selectivity C/I $F=F_0+2$ MHz	π/4 DQPSK	-	-40	-	≤ -30	dB
	8 DPSK	-	-40	-	≤ -25	dB
Adjacent channel selectivity C/I $F=F_0-2$ MHz	π/4 DQPSK	-	-23	-	≤ -20	dB
	8 DPSK	-	-20	-	≤ -13	dB
Adjacent channel selectivity C/I $F=F_0+3$ MHz	π/4 DQPSK	-	-45	-	≤ -40	dB
	8 DPSK	-	-45	-	≤ -33	dB
Adjacent channel selectivity C/I $F=F_0-5$ MHz	π/4 DQPSK	-	-45	-	≤ -40	dB
	8 DPSK	-	-45	-	≤ -33	dB
F_0 = 2405, 2441, 2477 MHz						
Adjacent channel selectivity C/I $F=F_{image}$	π/4 DQPSK		-20		≤ -7	dB
	8 DPSK		-15		≤ 0	dB

Note Measurement made using a POWER_TABLE entery of TX_PRE 80, INT PA63, EXT PA255. This ensures that the Bluetooth requirements for ACP and those defined by the FCC and ETSI are satisfied over the operating temperature range of -5Ð to +45Ð. Although the design is capable of generating in excess of +18dBm, regulatory compliance over the full temperature range of -5Ð to +45Ð will not be satisfied if the transmit power approaches this value.

Radio Characteristics – Enhanced Data Rate

Transmitter , VDD = 3.3V Temperature =+20°C						
	Frequency (GHz)	**Min.**	**Typ.**	**Max.**	**Bluetooth Specification**	**Unit**
Maximum RF transmit power(note)	2.402	-	6	-	-6 to +20	dBm
	2.441	-	6	-		dBm
	2.480	-	7	-		dBm
Relative transmit power		-	-1.6	-	-4 to +1	dB
π/4 DQPSK Maximum carrier frequency stability w_0		-	2	-	≤ ±10 for all blocks	kHz
π/4 DQPSK Maximum carrier frequency stability w_i		-	6	-	≤ ±75 for all packets	kHz
π/4 DQPSK Maximum carrier frequency stability $\lvert w_0 + w_i \rvert$		-	8	-	≤ ±75 for all blocks	kHz
8 DPSK Maximum carrier frequency stability w_0		-	2	-	≤ ±10 for all blocks	kHz
8 DPSK Maximum carrier frequency stability w_i		-	6	-	≤ ±75 for all packets	kHz
8 DPSK Maximum carrier frequency stability $\lvert w_0 + w_i \rvert$		-	8	-	≤ ±75 for all blocks	kHz
π/4 DQPSK Modulation Accuracy	RMS DVEM	-	7	-	≤ 20	%
	99% DEVM	-	13	-	≤ 30	%
	Peak DEVM	-	19	-	≤ 35	%
8 DPSK Modulation Accuracy	RMS DVEM	-	7	-	≤ 13	%
	99% DEVM	-	13	-	≤ 20	%
	Peak DEVM	-	17	-	≤ 25	%
In-band spurious emissions	$F>F_0+3$ MHz	-	<-50	-	≤ -40	dBm
	$F<F_0-3$ MHz	-	<-50	-	≤ -40	dBm
	$F=F_0-3$ MHz	-	-46	-	≤ -40	dBm
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	$F=F_0+2$ MHz	-	-31	-	≤ -20	dBm
	$F=F_0+3$ MHz	-	-33	-	≤ -40	dBm
EDR Differential Phase Encoding			No Errors		≥ 99	%

Receiver , VDD = 3.3V Temperature =+20°C						
	Modulation	**Min.**	**Typ.**	**Max.**	**Bluetooth Specification**	**Unit**
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Maximum received signal level at 0.1% BER	π/4 DQPSK	-	-8	-	≥ -20	dBm
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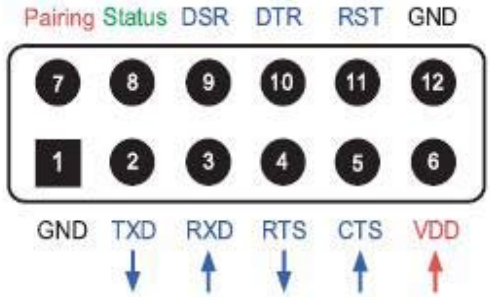
C/I co-channel at 0.1% BER	π/4 DQPSK	-	10	-	≤ +13	dB
	8 DPSK	-	19	-	≤ +21	dB
Adjacent channel selectivity C/I $F=F_0+1$ MHz	π/4 DQPSK	-	-10	-	≤ 0	dB
	8 DPSK	-	-5	-	≤ +5	dB

Adjacent channel selectivity C/I F=F_0 -1 MHz	π /4 DQPSK	-	-11	-	≤ 0	dB
	8 DPSK	-	-5	-	≤ +5	dB
Adjacent channel selectivity C/I F=F_0 +2 MHz	π /4 DQPSK	-	-40	-	≤ -30	dB
	8 DPSK	-	-40	-	≤ -25	dB
Adjacent channel selectivity C/I F=F_0 -2 MHz	π /4 DQPSK	-	-23	-	≤ -20	dB
	8 DPSK	-	-20	-	≤ -13	dB
Adjacent channel selectivity C/I F=F_0 +3 MHz	π /4 DQPSK	-	-45	-	≤ -40	dB
	8 DPSK	-	-45	-	≤ -33	dB
Adjacent channel selectivity C/I F=F_0 -5 MHz	π /4 DQPSK	-	-45	-	≤ -40	dB
	8 DPSK	-	-45	-	≤ -33	dB
F_0 = 2405, 2441, 2477 MHz						
Adjacent channel selectivity C/I F=F_{image}	π /4 DQPSK		-20		≤ -7	dB
	8 DPSK		-15		≤ 0	dB

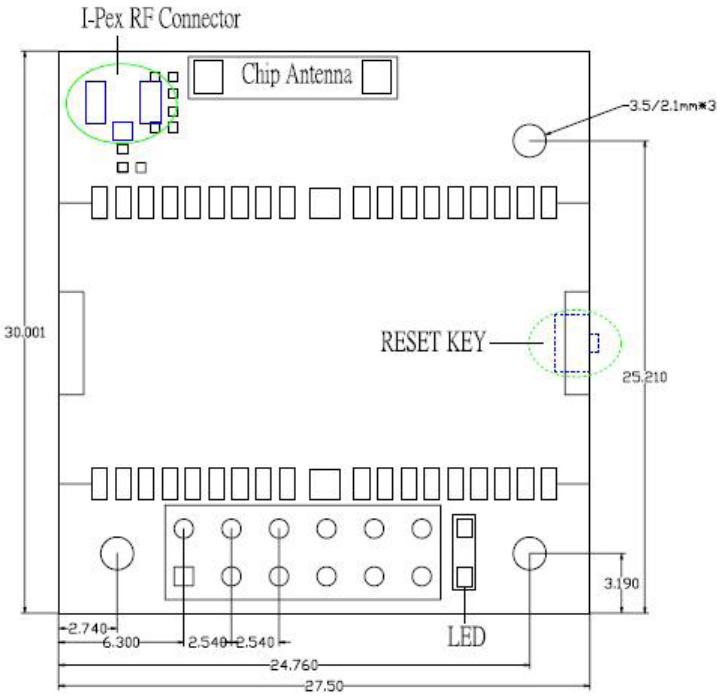
Pinout and Definition

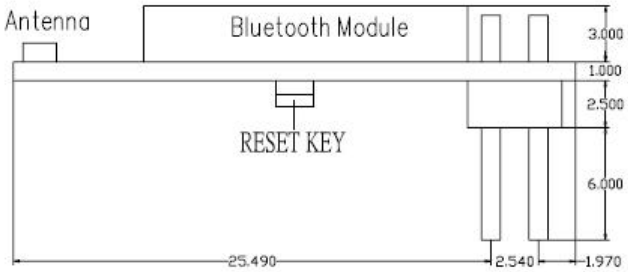


Pin no.	Pin name	Direction	Description	Signal Lev
1	GND		Power Ground	Ground
2	TXD	Output	UART data out	TTL
3	RXD	Input	UART data input	TTL
4	RTS	Output	UART Ready to Send	TTL
5	CTS	Input	UART Clear to Send	TTL
6	VDD	Input	DC input (3.0 ~ 3.3V)	Power
7	Pairing	Input	Pairing input (Active Low)	TTL
8	Status	Output	Bluetooth Connect Detect (Active Low)	TTL
9	DSR	Input	Data Set Ready	TTL
10	DTR	Output	Data Terminal Ready	TTL
11	RST	Input	Reset (Active Low)	TTL
12	GND		Power Ground	Ground

Mechanical Dimension

-30mm x 27.5mm (L x W) +- 0.15mm





-Component height (unit: mm)

Notes :

1. PIN9,10 DSR/DTR don't use, they are no function currently.
2. PIN5 Pairing, the function have been changed to Data led indication
3. PIN6 Status, the function have not been specified.
4. RESET KEY

By pressing the Reset button, you can:

- Disconnect and reconnect a wireless connection (a short press).
- Restore the factory COM port 19200bps settings (over three seconds' press).

5. LED

Bluetooth link status

Pin No.	Pin Name	Pin Type	Description
1	GND	GND	Common ground
2	PVCC	Power	Power Amp. Power Supply(3.3V)
3	AIO (0)	Bi-directional	Programmable I/O terminal , 32KHz sleep clock input
4	AIO (1)	Bi-directional	Programmable I/O terminal
5	PIO (0)	Bi-directional	Programmable I/O terminal , RX Enable
6	PIO (1)	Bi-directional	Programmable I/O terminal , TX Enable
7	PIO (2)	Bi-directional	Programmable I/O terminal , USB_PULL_UP , CLK_REQ_OUT
8	PIO (3)	Bi-directional	Programmable I/O terminal , USB_WAK E_UP , CLK_REQ_IN
9	PIO (4)	Bi-directional	Programmable I/O terminal , USB_ON , BT_Priority/Ch_Clk output for co-existence signalling
10	GND	GND	Common ground
11	PIO (5)	Bi-directional	Programmable I/O terminal , USB_DETACH , BT_Active output for co - existence signalling
12	PIO (6)	Bi-directional	Programmable I/O terminal , CLK_REQ , WLAN_Active/Ch_Data input for for co-existence signalling
13	PIO (7)	Bi-directional	Programmable I/O terminal
14	PIO (8)	Bi-directional	Programmable I/O terminal
15	PIO (9)	Bi-directi onal	Programmable I/O terminal
16	RESET	CMOS input	Reset input of module, Active low reset
17	VCC	Power	Module power supply input
18	GND	GND	Common ground
19	GND	GND	Common ground
20	USB_DP	Bi-directional	USB data plus
21	USB_DN	Bi-directional	USB da ta minus
22	PCM_SYNC	Bi-directional	Synchronous data sync
23	PCM_IN	CMOS input	Synchronous data input
24	PCM_OUT	CMOS output	Synchronous data output
25	PCM_CLK	Bi-directional	Synchronous data clock
26	UART_RX	CMOS input	UART data input
27	UART_TX	CMOS output	UART data output
28	UART_RTS	CMOS output	UART request to send(active low)
29	GND	GND	Common ground
30	UART_CTS	CMOS input	UART clear to send(active low)
31	SPI_MOSI	CMOS input	Serial Peripheral Interface data input
32	SPI_CSB	CMOS input	Chip select for Synchronous Serial Interface(active low)
33	SPI_CLK	CMOS input	Serial Peripheral Interface clock
34	SPI_MISO	CMOS output	Serial Peripheral Interface data output
35	PIO (11)	Bi-directional	Programmable I/O terminal
36	PIO (10)	Bi-directional	Programmable I/O terminal
37	RF_IO	Analogue	Antenna interface
38	GND	GND	Common ground

FCC WARNING

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.

The antenna provided is a unique antenna. By installation of unauthorized antenna to this equipment. Such unauthorized installation could void the user's authority to opearte the equipment.

NOTE: The manufacturer is not responsible for and radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user’s authority to operate the equipment.