BTM41

Bluetooth Module Data Sheet

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Document Version:	V1.0
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Revision History

Date	Version	Description	Author
2012-03-14	V1.0	■ First Release	

CONTENT

1. INTRODUCTION

The BTM41 Bluetooth® module is a perfect solution for data transmission applications, such as sensors and controllers for cable replacement. It can be connected with any Bluetooth® devices in an operating range. It is slim and light so the designers can have better flexibilities for the product shapes.

The BTM41 Bluetooth® module complies with Bluetooth® specification version 2.1. It supports HSP,HFP,PBAP,OPP,SPP, profiles. It integrates RF Baseband controller, antenna, etc. and provide UART interface, programmable I/O, stereo speaker output, microphone input, etc.

The detail information of BTM41 Bluetooth® module is presented in this document below.

1.1 Block Diagram

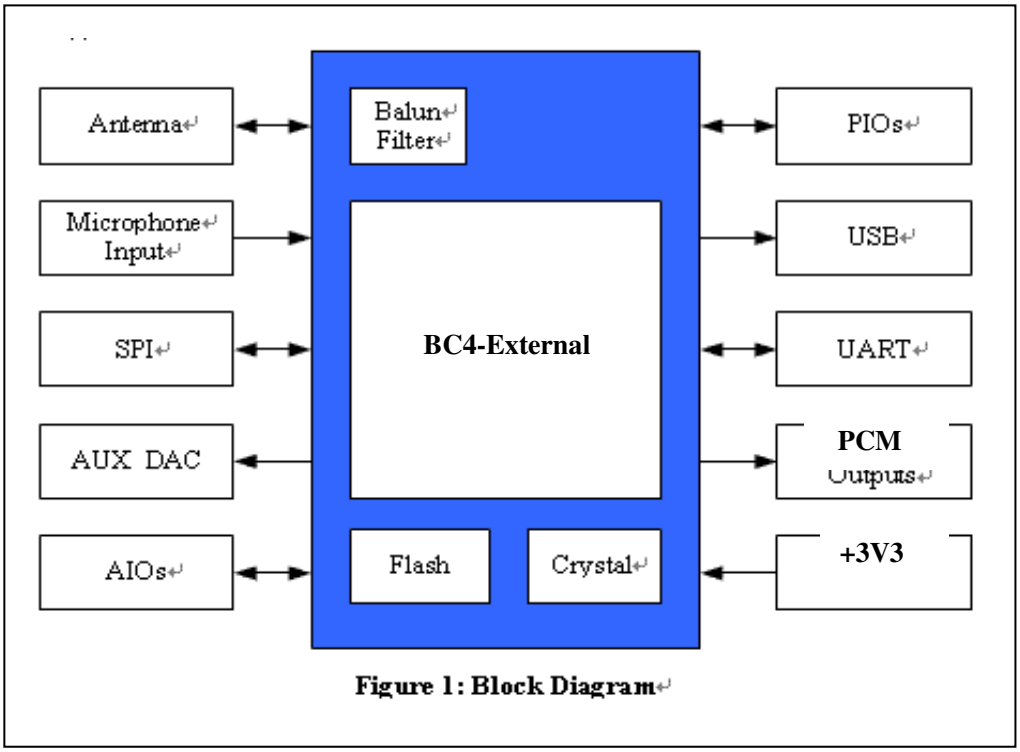


Figure 1: Block Diagram

1.2 Features

- ✓ Small overall dimension(25.8mm x 13.2mm x 2mm)
- ✓ Bluetooth Specification V2.1
- ✓ Class 2 and Class 3 support
- ✓ Physical connection as SMD type
- ✓ Built-in RF combo filter, Integrated 26M Crystal.
- ✓ Supports up to 8 Mbits on module flash memory.
- ✓ Support active inquire BT device and pairing.
- ✓ Support HSP, HFP, OPP, SPP, PBAP, profile.
- ✓ Support customizable PIN code and device name.
- ✓ Support pairing up to 8 Bluetooth® device.
- ✓ No radio signal interference, support for 802.11 co-existence

※ ***Some features are optional for customization on demand.***

1.3 Application

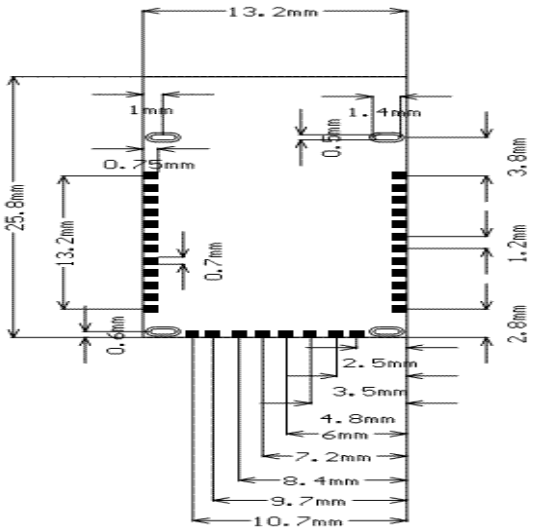
- ✓ Automobile hands-free applications
- ✓ Hands-Free Car Kits for embedded Car audio systems
- ✓ Industrial sensors and controls
- ✓ Measurement and monitoring systems

2. GENERAL SPECIFICATION

Bluetooth Specification	
Chip Set	CSR BC4-External
Module ID	BTM41
BT Standard	Bluetooth® V2.1 + EDR specification
RF TX Output Power	4dBm (Class II)
Sensitivity	-86dBm@0.1%BER
Frequency Band	2.402GHz~2.480GHz ISM Band
Baseband Crystal OSC	26MHz
Hopping	1600hops/sec, 1MHz channel space
RF Input Impedance	50 ohms
Major Interface	• Microphone : Input (Differential) • Speaker : Output (Differential) • PCM : Output • UART : Tx/Rx • USB : DP/DN • PIOs • Antenna
Profile	HSP, HFP, PBAP, OPP,SPP…….. detailed profiles depends on the firmware
Power	
Supply Voltage	3.0V ~ 3.6V DC
Working Current	35mA typical, Depends on profiles
Standby Current	<1mA
Operating Environment	
Temperature	-40ºC to +85ºC
Humidity	10%~90% Non-Condensing
Environmental	RoHS Compliant

3. PHYSICAL CHARACTERISTIC

Dimension:



Top View:

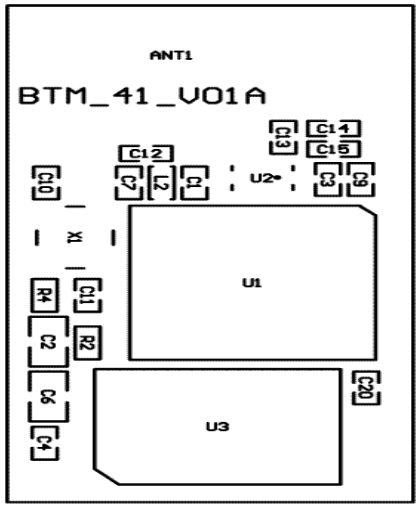


Figure 3

Pin Definition:

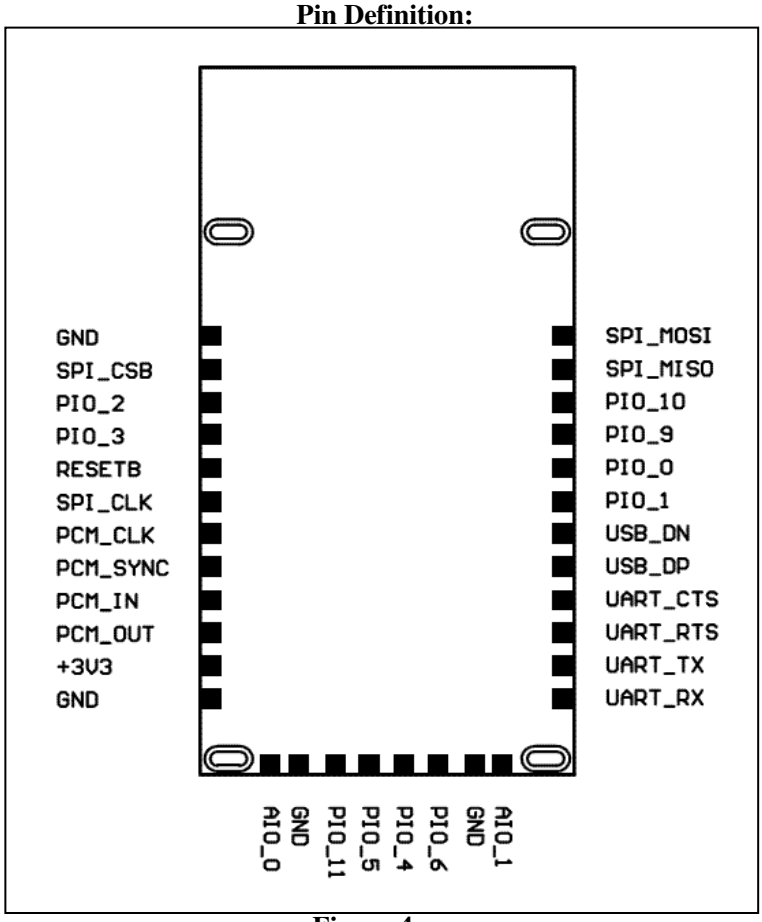


Figure 4

3.1 Pin Description

Pin#	Pin Name	Pad Type	Description
1	GND	Ground	Digital Ground
2	SPI_CSB	Input with weak internal pull-up	Chip select for Serial Peripheral Interface (SPI),active low
3	PIO_2	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
4	PIO_3	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
5	RESETB	CMOS input with weak internal pull-up	Active LOW reset
6	SPI_CLK	Input with weak internal pull-down	SPI clock
7	PCM_CLK	Bi-directional with weak internal pull-down	Synchronous data clock
8	PCM_SYNC	Bi-directional with weak internal pull-down	Synchronous data sync
9	PCM_IN	CMOS input, with weak internal pull-down	Synchronous data input
10	PCM_OUT	CMOS output, tri-state, with weak internal pull-down	Synchronous data output
11	+3V3	Power Supply	Positive supply for BT Module(3.0V~3.6V)
12	GND	Ground	Digital Ground
13	AIO_0	Bi-directional VDD/Low-voltage regulator output	Analogue programmable input/ output line circuitry and 1.5V regulated output (from internal low-voltage regulator)
14	GND	Ground	Digital Ground
15	PIO_11	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
16	PIO_5	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
17	PIO_4	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
18	PIO_6	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
19	GND	Ground	Digital Ground

20	AIO_1	Bi-directional VDD/Low-voltage regulator output	Analogue programmable input/ output line circuitry and 1.5V regulated output (from internal low-voltage regulator)
21	UART_RX	CMOS input with weak internal pull-down	UART data input
22	UART_TX	Bi-directional CMOS output, tri-state, with weak internal pull-up	UART data output
23	UART_RTS	Bi-directional CMOS output, tri-state, with weak internal pull-up	UART request to send active low
24	UART_CTS	CMOS input with weak internal pull-down	UART clear to send active low
25	USB_DP	Bi-directional	USB data plus with selectable internal 1.5kΩ pull-up resistor
26	USB_DN	Bi-directional	USB data minus
27	PIO_1	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
28	PIO_0	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
29	PIO_9	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
30	PIO_10	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line
31	SPI_MISO	CMOS output, tri-state, with weak internal pull-down	SPI data output
32	SPI_MOSI	CMOS input, with weak internal pull-down	SPI data input

4. REFERENCE SCHEMATIC

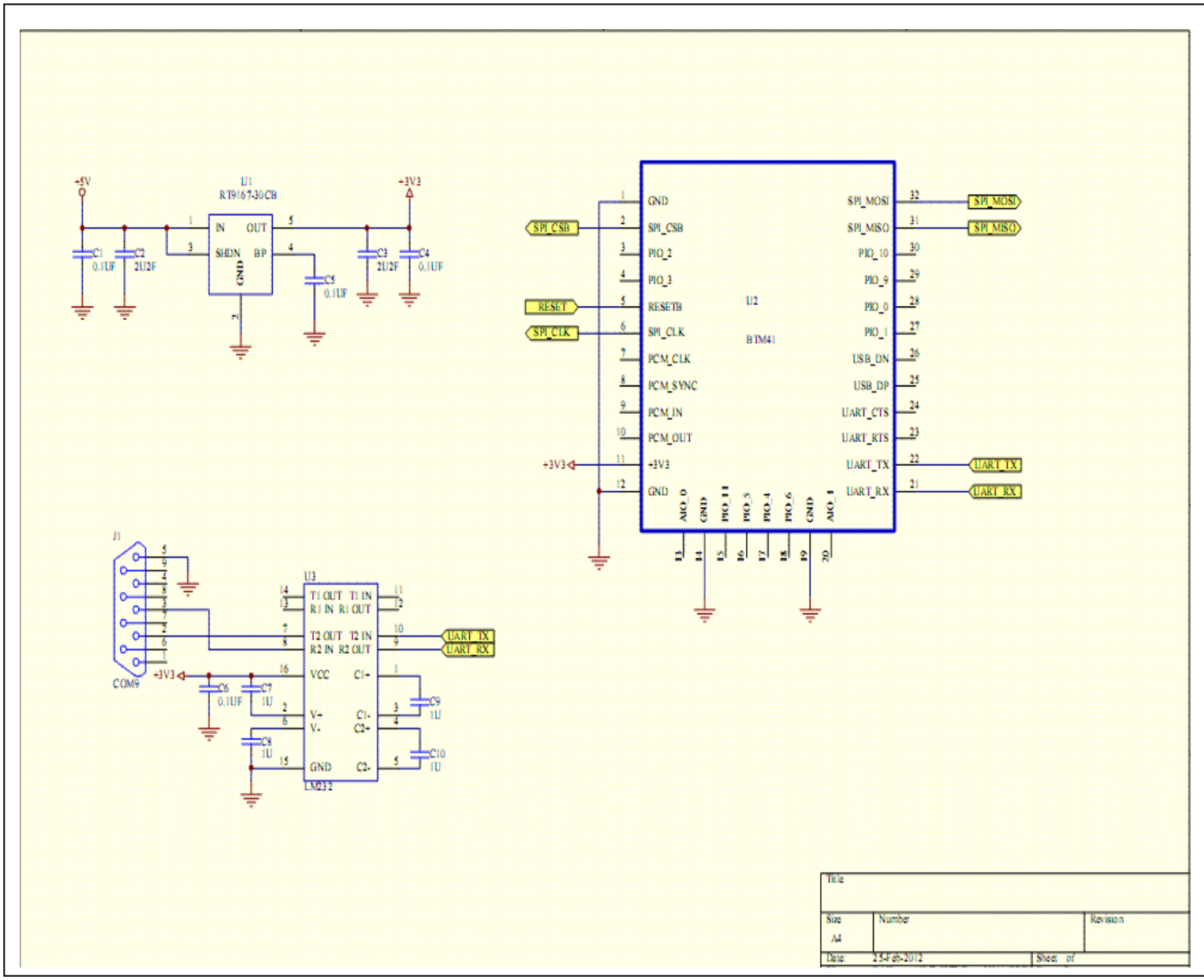


Figure 5

5. PHYSICAL INTERFACE

5.1 Power Supply

The transient response of the regulator is important. If the power rails of the module are supplied from an external voltage source, the transient response of any regulator used should be 20μs or less.

5.2 Audio Interfaces

5.2.1 PCM

The audio pulse code modulation (PCM) interface supports continuous transmission and reception of PCM encoded audio data over Bluetooth.

Pulse Code Modulation (PCM) is a standard method used to digitize audio (particularly voice) for transmission over digital communication channels. Through its PCM interface, BTM41 provide hardware support for continual transmission and reception of PCM data, thus reducing processor overhead for wireless headset applications.BTM41offers a bi-directional digital audio interface that routes directly into the baseband layer of the on-chip firmware. It does not pass through the HCI protocol layer.

Hardware on BTM41 allows the data to be sent to and received from a SCO connection. Up to three SCO connections can be supported by the PCM interface at any time.

5.3 RF Interface

The module integrates a balun filter. The user can connect a 50ohms antenna directly to the RF port.

5.4 General Purpose Analog IO

The general purpose analog IOs can be configured as ADC inputs by software. Do not connect them if not use.

5.5 General Purpose Digital IO

There are nine general purpose digital IOs defined in the module. All these GPIOs can be configured by software to realize various functions, such as button controls, LED displays or interrupt signals to host controller, etc. Do not connect them if not use.

5.6 Serial Interfaces

5.6.1 UART

This is a standard UART interface for communicating with other serial devices. The UART interface provides a simple mechanism for communicating with other serial devices using the RS232 protocol.

When the module is connected to another digital device, UART_RX and UART_TX transfer data between the two devices. The remaining two signals, UART_CTS and UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators.

5.6.2 USB

There is a full speed (12M bits/s) USB interface for communicating with other compatible digital devices. The module acts as a USB peripheral, responding to request from a master host controller, such as a PC.

The module features an internal USB pull-up resistor. This pulls the USB_DP pin weakly high when module is ready to enumerate. It signals to the USB master that it is a full speed (12Mbit/s) USB device. The USB internal pull-up is implemented as a current source, and is compliant with section7.1.5 of the USB specification v1.2. The internal pull-up pulls USB_DP high to at least 2.8V when loaded with a 15kΩ ±5% pull-down resistor (in the hub/host) when VDD =3.1V. This presents a The venin resistance to the host of at least 900Ω. Alternatively, an external 1.5kΩ pull-up resistor can be placed between a PIO line and DP on the USB cable.

5.6.3 SPI

The synchronous serial port interface (SPI) can be used for system debugging. It can also be used for in-system programming for the flash memory within the module. SPI interface uses the SPI_MOSI, SPI_MISO, SPI_CSB and SPI_CLK pins. Testing points for the SPI interface are reserved on board in case that the firmware shall be updated during manufacture.

The module operates as a slave and thus SPI_MISO is an output of the module. SPI_MISO is not in high-impedance state when SPI_CSB is pulled high. Instead, the module outputs 0 if the processor is running and 1 if it is stopped. Thus the module should NOT be connected in a multi-slave arrangement by simple parallel connection of slave SPI_MISO lines.

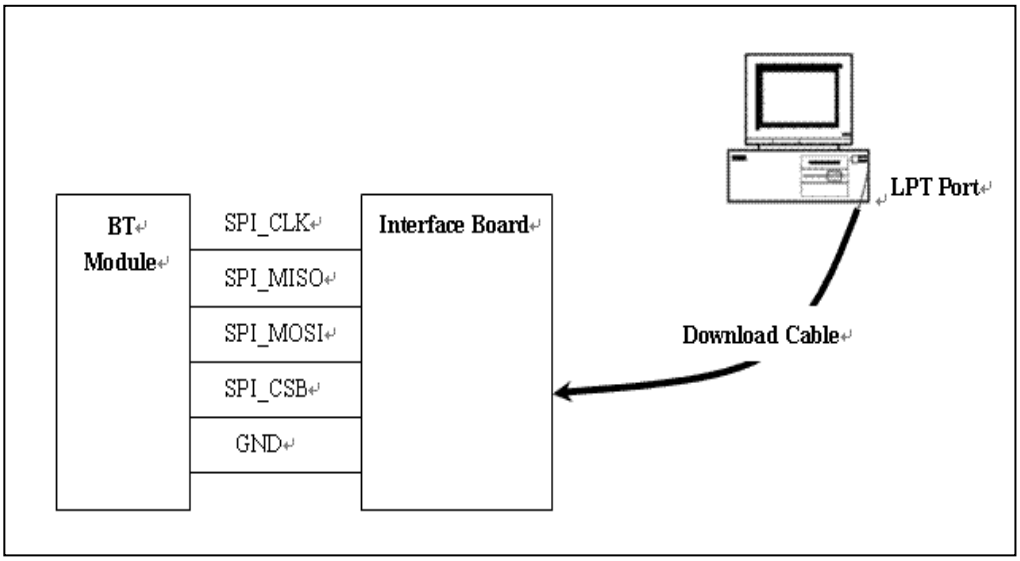


Figure 6

6. ELECTRICAL CHARACTERISTIC

6.1 Absolute Maximum Rating

Rating	Min	Max	Unit
Storage Temperature	-40	+150	°C
Operating Temperature	-40	+105	°C
PIO/AIO Voltage	-0.4	+3.6	V
+3V3 Voltage	-0.4	+3.6	V
USB_DP/USB_DN Voltage	-0.4	+3.6	V
Other Terminal Voltages except RF	-0.4	3V3+0.4	V

Table 1

6.2 Recommended Operating Conditions

Operating Condition	Min	Typical	Max	Unit
Operating Temperature Range	-40	--	+85	°C
+3V3 Voltage	+3.0	+3.3	+3.6	V

Table 2

6.3 Input/output Terminal Characteristics

6.3.1 Digital Terminals

Supply Voltage Levels	Min	Typical	Max	Unit
Input Voltage Levels				
VIL input logic level low	-0.3	-	+0.25x3V3	V
VIH input logic level high	0.625*3V3	-	3V3+0.3	V
Output Voltage Levels				
V_{OL} output logic level low, I_{OL} = 4.0mA	-	-	0.125	V
V_{OH} output logic level high, I_{OH} = -4.0mA	0.75x3V3	-	0.625x3V3	V
Input and Tri-state Current				
Ii input leakage current at Vin=+3V3 or 0V	-100	0	100	nA
Ioz tri-state output leakage current at Vo=+3V3 or 0V	-100	0	100	nA
With strong pull-up	-100	-40	-10	µA
With strong pull-down	10	40	100	µA
With weak pull-up	-5	-1.0	-0.2	µA
With weak pull-down	0.2	+1.0	5.0	µA
I/O pad leakage current	-1	0	+1	µA

CI Input Capacitance	1.0	-	5.0	pF
Resistive Strength				
Rpuw weak pull-up strength at +3V3-0.2V	500k	-	2M	Ω
Rpdw weak pull-up strength at 0.2V	500k	-	2M	Ω
Rpus strong pull-up strength at +3V3-0.2V	10k	-	50k	Ω
Rpds strong pull-up strength at 0.2V	10k	-	50k	Ω

Table 3

6.3.2 USB

USB Terminals	Min	Typical	Max	Unit
Input Threshold				
V_{IL} input logic level low	-	-	0.3*3V3	V
V_{IH} input logic level high	0.7*3V3	-	-	V
Input Leakage Current				
GND < VIN < +3V3[(a)]	-1	1	5	µA
CI Input capacitance	2.5	-	10.0	pF
Output Voltage Levels to Correctly Terminated USB Cable				
V_{IL} output logic level low	0.0	-	0.2	V
V_{IH} output logic level high	2.8	-	+3V3	V

Table 4

6.4 Power consumptions

Operating Condition	Min	Typical	Max	Unit
Connected Idle (Sniff 1.28 secs)		0.19		mA
Connected with audio streaming	30	35	40	mA
Deep Sleep Idle mode		60		µA

Table 5

7. RECOMMENDED TEMPERATURE REFLOW PROFILE

The soldering profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder reflow.

2F Friday March 09, 2012 10:21:21

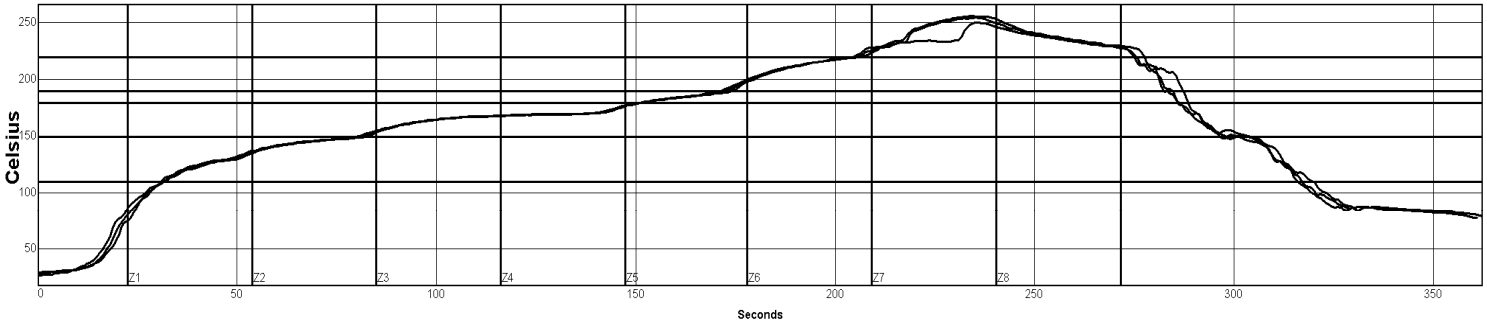
Site:

Oven Name: WQ Process Window Name: 无铅

Setpoints (Celsius)

Zone	1	2	3	4	5	6	7	8
Top	140	150	170	170	190	225	265	230
Bottom	140	150	170	170	190	225	265	230

Conveyor Speed (cm/min): 75.0



PWI= 304%	Max Rising Slope		Preheat 110-190C		Soak Time 150-180C		Reflow Time /220C		Peak Temp	
2	3.9	189%	141.4	157%	70.4	-296%	71.1	111%	254.8	97%
3	4.0	197%	139.7	149%	70.6	-294%	70.3	103%	250.6	11%
4	3.9	192%	142.1	160%	69.6	-304%	71.2	112%	256.5	130%

Process Window:

Solder Paste: SYSTEM DEFAULT

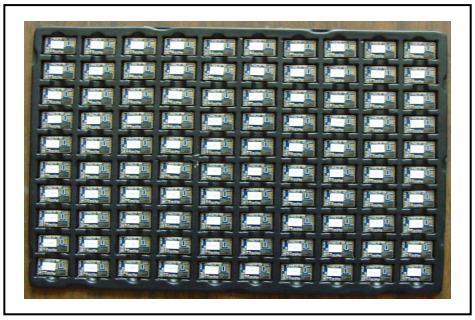
Statistic Name	Low Limit	High Limit	Units
Max Rising Slope (Target=2.0)	0.0	3.0	Degrees/Second
Preheat Time 110-190C	90	130	Seconds
Soak Time 150-180C	90	110	Seconds
Time Above Reflow - 220C	50	70	Seconds
Peak Temperature	245	255	Degrees Celsius

Description:

8. PACKAGING INFORMATION

1. BLUETOOTH® Module: BTM41

2. Assembly



3. Dimension