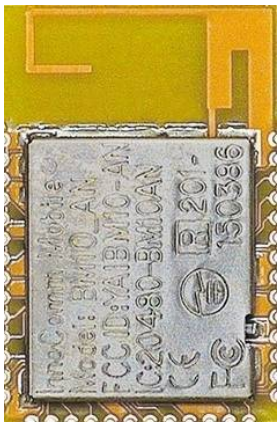


BM10_AN R2 BLE Single Mode Module
Product Specification

Model Name	BM10_AN R2
Project code	
Description	BLE Single Mode Module
Revision	1.2
Issue Date	2017/06/03

Approved by	Reviewed by	Issued by
Harrison Chen	Taka Wei	Aaron Lai

Revision History

Revision	Released Date	Comments/Remark	Author
1.0	2017/03/07	Initial release	Aaron Lai
1.1	2017/03/29	Update reflow profile	Aaron Lai
1.2	2017/06/03	Update GPIO pin count to 31	Aaron Lai

TABLE OF CONTENT

1. INTRODUCTION

Based on TI's outstanding CC2640R2 BLE technology, Innocomm's BM10_AN R2 module is a wireless microcontroller (MCU) targeting Bluetooth® 4.2 and Bluetooth 5 low-energy applications.

It is with very low active RF and MCU current and low-power mode current consumption provide excellent battery lifetime and allow for operation on small coin cell batteries and in energy-harvesting applications and embedded PCB antenna.

BM10_AN R2 module contains a powerful 32-bit Cortex M3 running up to 48 MHz as the main processor and a rich peripheral feature set that includes a unique ultra-low power sensor controller.

Bluetooth low energy controller and host libraries are embedded in ROM and run partly on an ARM® Cortex®-M0 processor. This architecture improves overall system performance and power consumption and frees up significant amounts of flash memory for the application.

.

2. General Information

2.1 Key Features

RF

- 2.4-GHz RF Transceiver Compatible With Bluetooth low energy (BLE) 4.2 and 5 Specifications
- Supports data rates between 1 Mbps
- Programmable output power up to +5 dBm
- Excellent Receiver Sensitivity (–97 dBm for BLE), Selectivity, and Blocking Performance
- Suitable for Systems Targeting Compliance With Worldwide Radio Frequency Regulations
  – ETSI EN 300 328 (Europe)
  – EN 300 440 class 2 (Europe)
  – FCC CFR47 Part 15 (US)
  – ARIB STD-T66 (Japan)

Layout

- Few External Components
- 25.45 mm × 16.7 mm × 2.2 mm, 40 pin LCC Package

Low Power

- Wide supply voltage range : 1.9 – 3.8V
- Differential RF mode : 6.4±3 mA
- Differential RF mode TX at 0 dBm: 6.8±0.3 mA
- Differential RF mode TX at +5 dBm: 8.9±0.3mA
- Low Power Mode: 1 µA (RTC Running + RAM/CPU retention)
- Low Power Mode: 100 nA (Flash retention)

Peripherals

- Integrated Temperature Sensor
- Four General-Purpose Timer Modules (Eight 16-Bit or Four 32-Bit Timers, PWM Each)
- 12-bit ADC, 200-ksamples/s, 8-Channel Analog MUX
- Ultra-Low-Power Analog Comparator
- UART
- 2x SSI (SPI, MICROWIRE, TI)
- Ultra-low power
- I2C, I2S
- Real-time clock
- AES-128 security module
- 31 GPIOs
- Support for 8 capacitive sensing channels

Application

- Home and Building Automation
  – Connected Appliances
  – Lighting
  – Locks
  – Gateways
  – Security Systems

- Industrial
  – Logistics
  – Production and Manufacturing Automation
  – Asset Tracking and Management
  – HMI and Remote Display

– Access Control

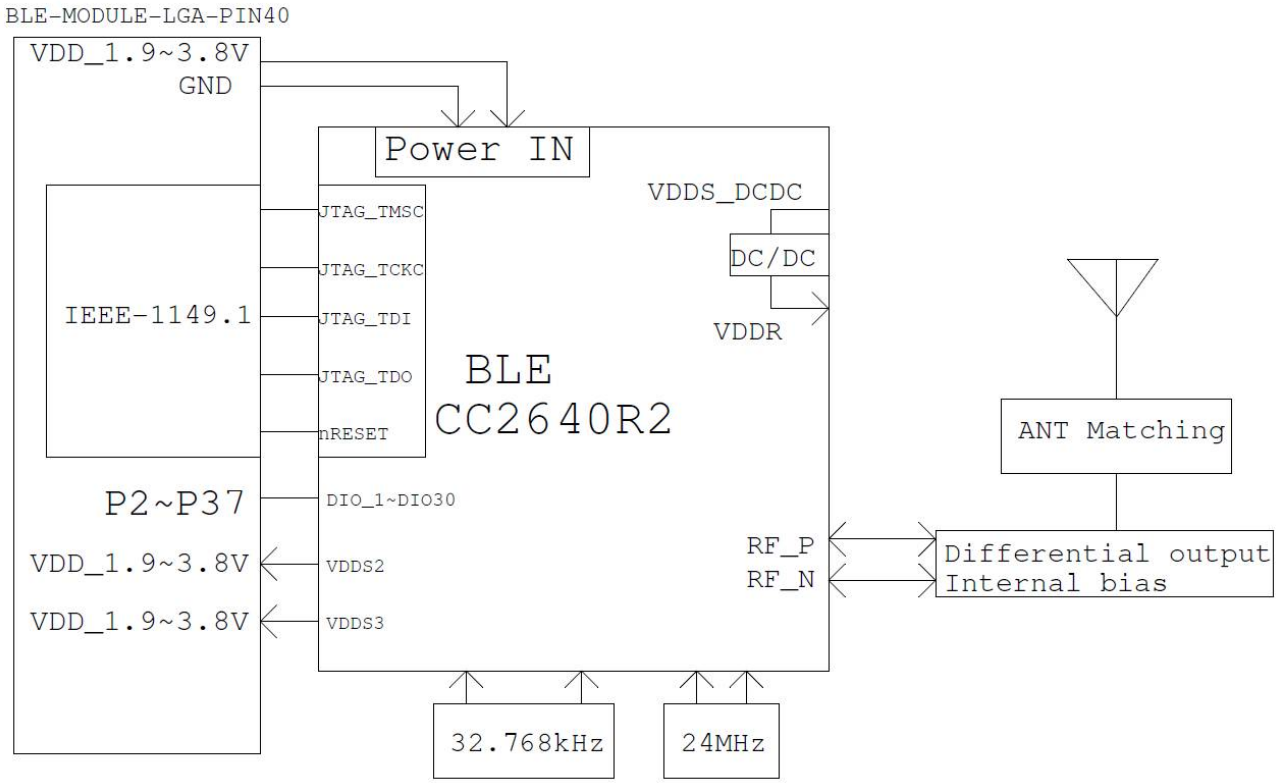
- Retail
  – Beacons
  – Advertising
  – ESL and Price Tags
  – Point of Sales and Payment Systems

- Health and Medical
  – Thermometers
  – SpO2
  – Blood Glucose and Pressure Meters
  – Weight Scales
  – Hearing Aids

- Sports and Fitness
  – Activity Monitors and Fitness Trackers
  – Heart Rate Monitors
  – Running and Biking Sensors
  – Sports Watches
  – Gym Equipment
  – Team Sports Equipment

- HID
  – Voice Remote Controls
  – Gaming
- – Keyboards and Mice

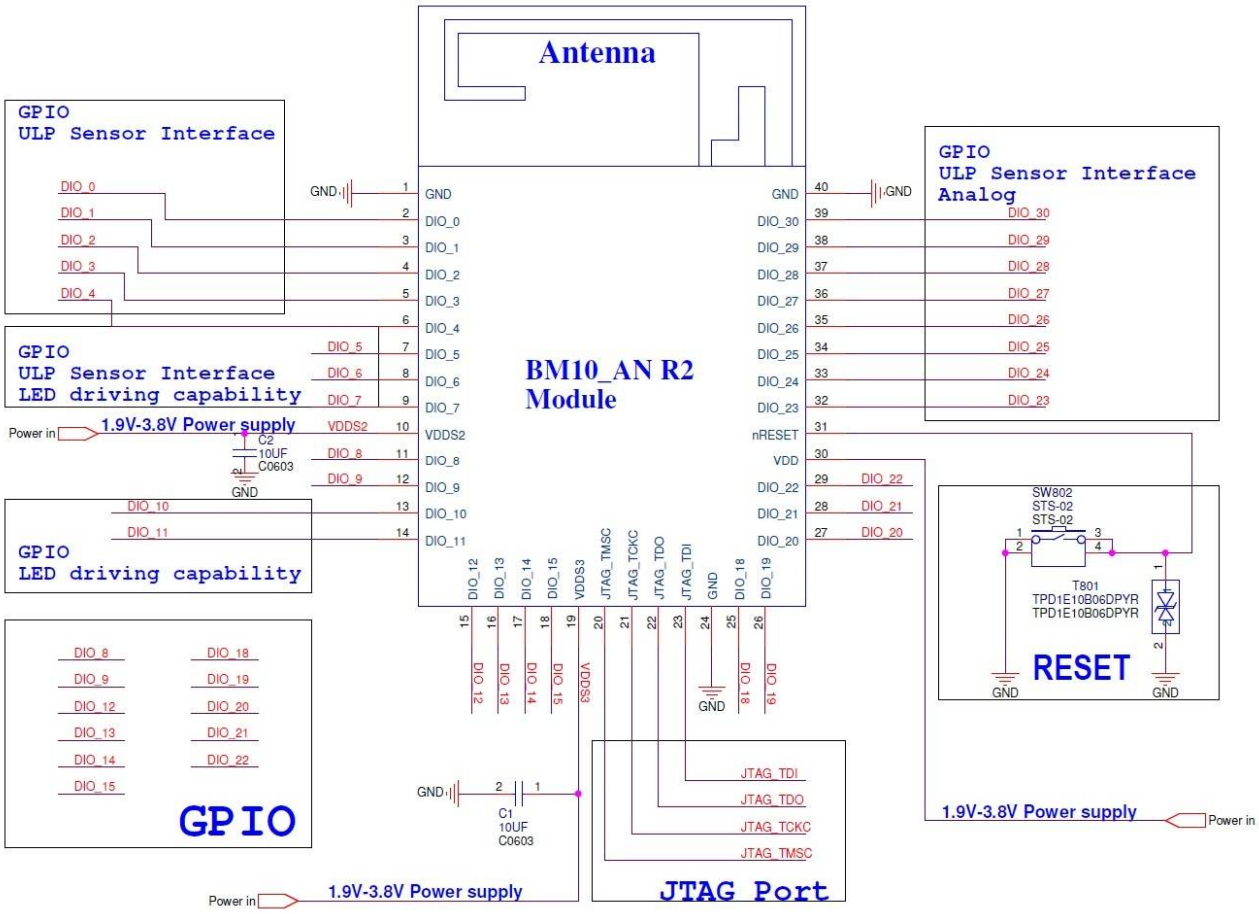
2.2 Block Diagram



3. PIN Map and Signal Description

Pin #	Pin Name	Direction/Type	Description
1	GND	Power	Ground
2	DIO_0	Digital I/O	GPIO, Sensor Controller
3	DIO_1	Digital I/O	GPIO, Sensor Controller
4	DIO_2	Digital I/O	GPIO, Sensor Controller
5	DIO_3	Digital I/O	GPIO, Sensor Controller
6	DIO_4	Digital I/O	GPIO, Sensor Controller
7	DIO_5	Digital I/O	GPIO, Sensor Controller, high-drive capability
8	DIO_6	Digital I/O	GPIO, Sensor Controller, high-drive capability
9	DIO_7	Digital I/O	GPIO, Sensor Controller, high-drive capability
10	VDDS2	Power	1.9V to 3.8V DIO supply (DIO 0 to DIO 11)
11	DIO_8	Digital I/O	GPIO
12	DIO_9	Digital I/O	GPIO
13	DIO_10	Digital I/O	GPIO
14	DIO_11	Digital I/O	GPIO
15	DIO_12	Digital I/O	GPIO
16	DIO_13	Digital I/O	GPIO
17	DIO_14	Digital I/O	GPIO
18	DIO_15	Digital I/O	GPIO
19	VDDS3	Power	1.9V to 3.8V DIO supply (DIO 12 to DIO 22 & JTAG)
20	JTAG_TMSC	Digital I/O	JTAG_TMSC
21	JTAG_TCKC	Digital I/O	JTAG_TCKC
22	JTAG_TDO	Digital I/O	GPIO, JTAG_TDO, high-drive capability
23	JTAG_TDI	Digital I/O	GPIO, JTAG_TDI, high-drive capability
24	GND	Power	Ground
25	DIO_18	Digital I/O	GPIO
26	DIO_19	Digital I/O	GPIO
27	DIO_20	Digital I/O	GPIO
28	DIO_21	Digital I/O	GPIO
29	DIO_22	Digital I/O	GPIO
30	VDD	Power	1.9V to 3.8V main chip supply (DIO 23 to DIO 30 & nRESET)
31	nRESET	Digital input	Reset, active-low. No internal pull up.
32	DIO_23	Digital/Analog I/O	GPIO, Sensor Controller, Analog
33	DIO_24	Digital/Analog I/O	GPIO, Sensor Controller, Analog
34	DIO_25	Digital/Analog I/O	GPIO, Sensor Controller, Analog
35	DIO_26	Digital/Analog I/O	GPIO, Sensor Controller, Analog
36	DIO_27	Digital/Analog I/O	GPIO, Sensor Controller, Analog
37	DIO_28	Digital/Analog I/O	GPIO, Sensor Controller, Analog
38	DIO_29	Digital/Analog I/O	GPIO, Sensor Controller, Analog
39	DIO_30	Digital/Analog I/O	GPIO, Sensor Controller, Analog
40	GND	Power	Ground

3.1 Reference Circuit



4. ELECTRICAL CHARACTERISTICS

4.1 Recommended Operating Range

PARAMETER	CONDITIONS	MIN	NOM	MAX	UNIT
Operating ambient temperature range, T_A		–40		85	°C
Operating supply voltage	For operation in battery-powered and 3.3V systems	1.9		3.8	V

4.2 Power Consumption

Unless noted, all specifications are at 25 °C and Vbat = 3.0 V.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Low Power Mode (LPM4.5)	Shutdown. No clocks running, no retention		100		nA
Low Power Mode (LPM3)	With RTC, CPU, RAM and (partial) register retention		1		uA
Power consumption radio RX(2)	With DC/DC	6.1	6.4	6.7	mA
Power consumption radio TX(2)	With DC/DC, 0 dBm output power	6.5	6.8	7.1	mA
Power consumption radio TX(2)	With DC/DC, 5 dBm output power	8.6	8.9	9.2	mA

5. RF Characteristics

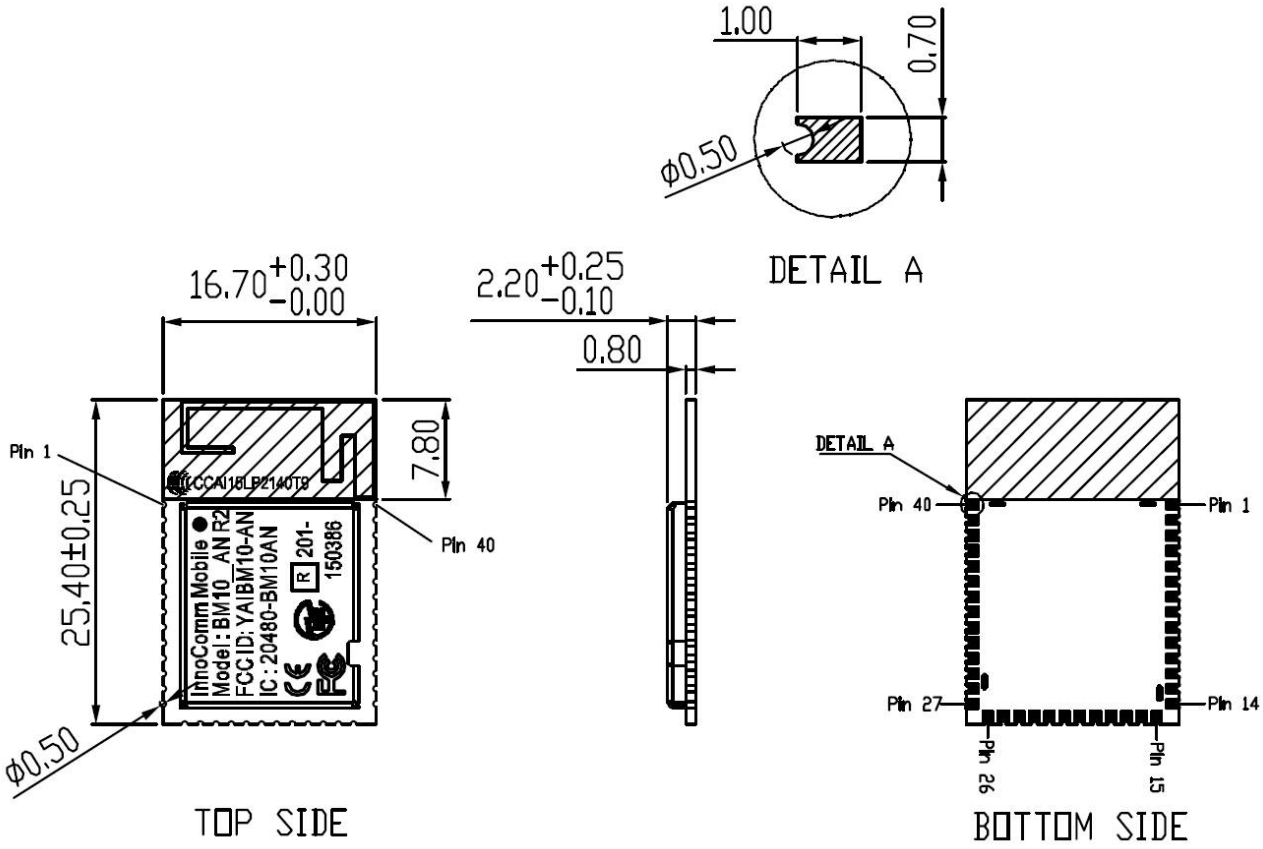
1 Mbps GFSK (Bluetooth low energy)

Unless noted, all specifications are at 25 °C, Vbat = 3.0 V and f_{RF} = 2440MHz.

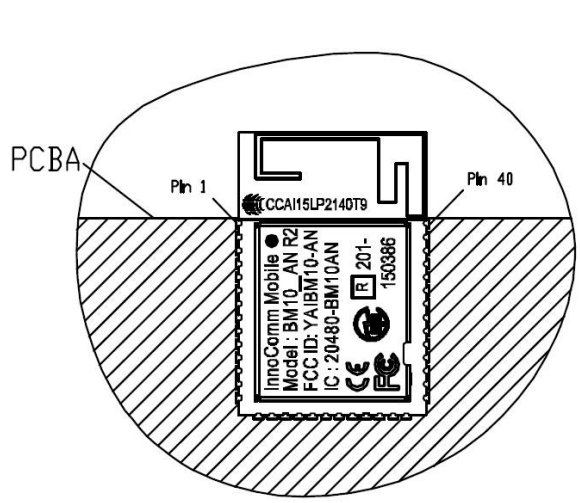
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
RX Receiver sensitivity	Differential mode, measured in 50Ω single-ended, BER=10-3		-97		dBm
TX Output power, highest setting	Differential mode, delivered to a single ended 50 Ω load		+5		dBm
TX Output power, lowest setting	Delivered to a single ended 50Ω load		-20		dBm
Spurious emission 30-1000 MHz	Conducted measurement in a 50Ω single ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66			-57	dBm
Spurious emission 1-12.75 GHz				-47	dBm

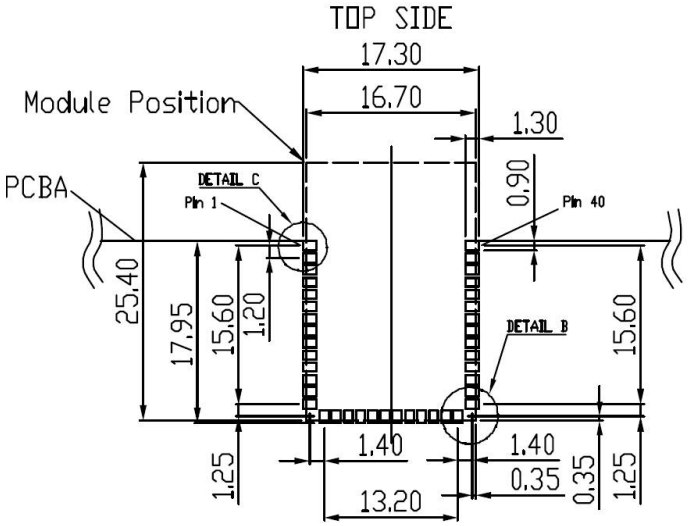
Note: BM10_AN R2 module is with “Internal bias” mode design and related SW setting need to match with “Internal bias” mode.

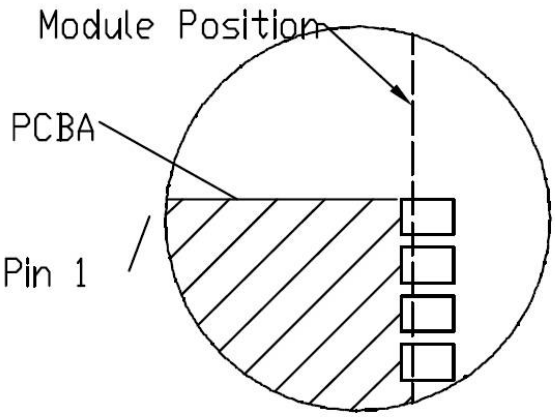
6. Mechanical Information



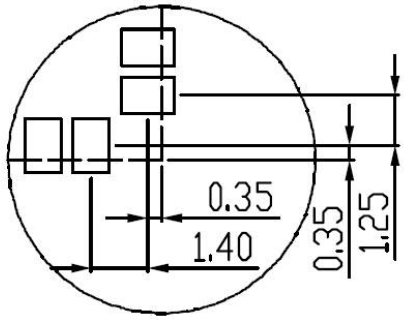
7. PCB Layout Recommendation







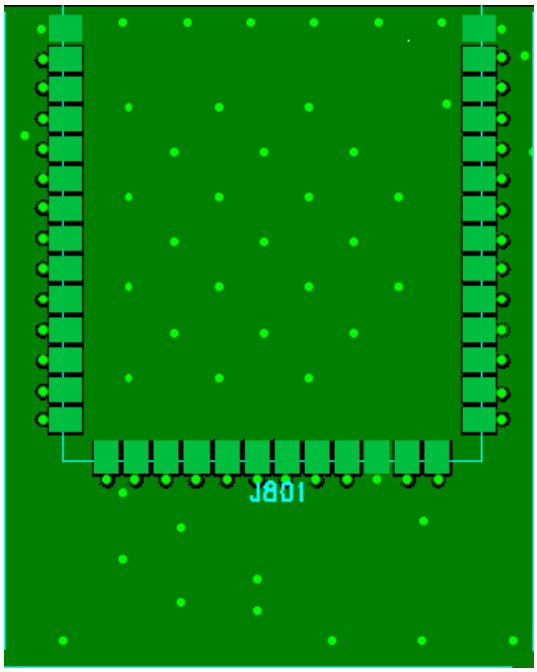
DETAIL C



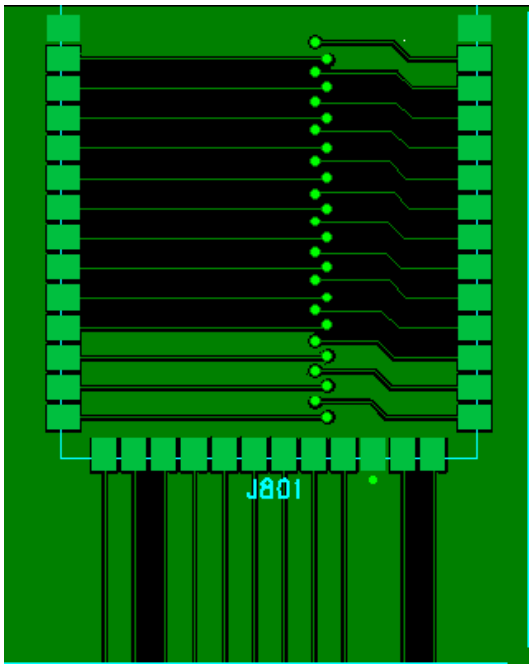
DETAIL B

8. Module Placement Layout Guide

Note: Do not route any trace under module to avoid interference.

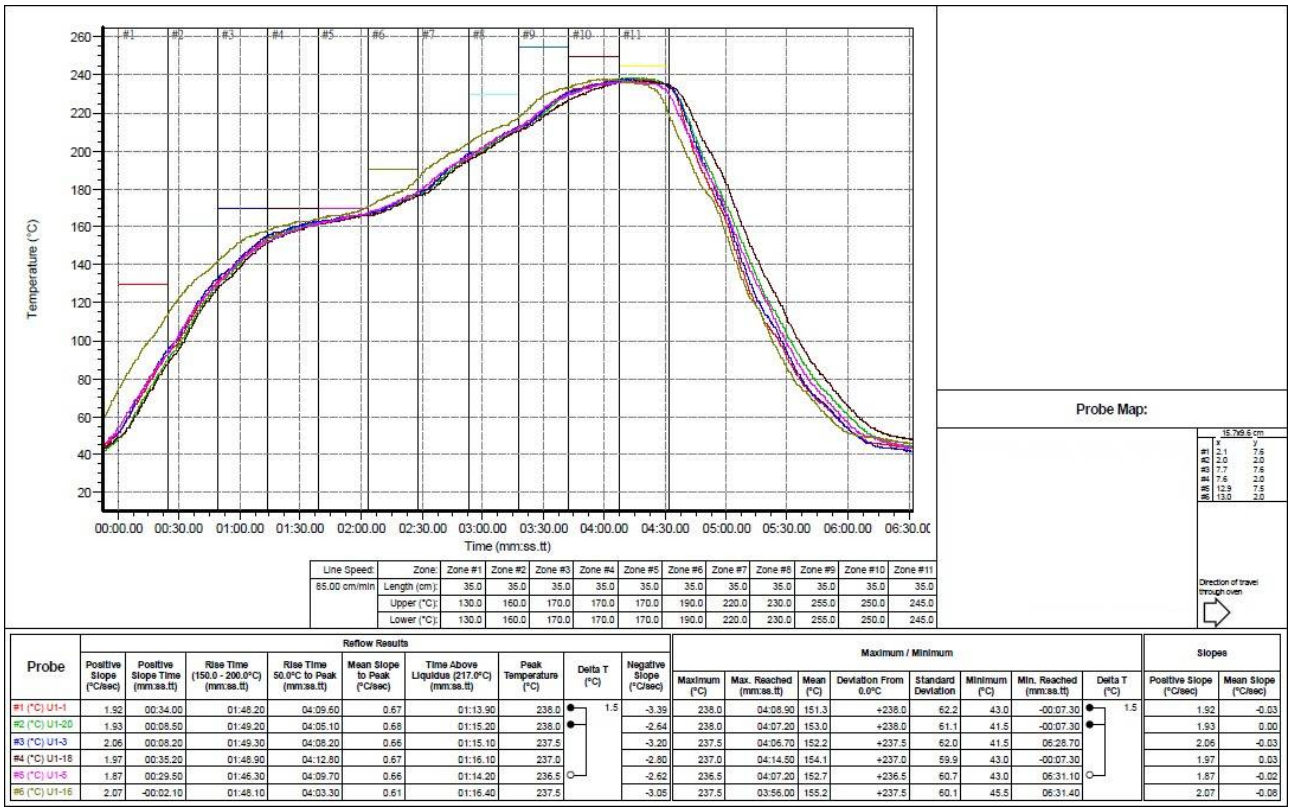


(O)



(X)

9. SMT Solder Reflow Recommendation



Line Speed:	Zone:	Zone #1	Zone #2	Zone #3	Zone #4	Zone #5	Zone #6	Zone #7	Zone #8	Zone #9	Zone #10	Zone #11
65.00 cm/min	Length (cm):	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	Upper (°C):	130.0	160.0	170.0	170.0	170.0	190.0	220.0	230.0	255.0	250.0	245.0
	Lower (°C):	130.0	160.0	170.0	170.0	170.0	190.0	220.0	230.0	255.0	250.0	245.0

Probe	Reflow Results									Maximum / Minimum								Slopes	
	Positive Slope (°C/sec)	Positive Slope Time (mm:ss.tt)	Rise Time (150.0 - 200.0°C) (mm:ss.tt)	Rise Time 50.0°C to Peak (mm:ss.tt)	Mean Slope to Peak (°C/sec)	Time Above Liquidus (217.0°C) (mm:ss.tt)	Peak Temperature (°C)	Delta T (°C)	Negative Slope (°C/sec)	Maximum (°C)	Max. Reached (mm:ss.tt)	Mean (°C)	Deviation From 0.0°C	Standard Deviation	Minimum (°C)	Min. Reached (mm:ss.tt)	Delta T (°C)	Positive Slope (°C/sec)	Mean Slope (°C/sec)
#1 (°C) U1-1	1.92	00:34.00	01:48.20	04:09.60	0.67	01:13.90	238.0	1.5	-3.39	238.0	04:08.90	151.3	+238.0	62.2	43.0	-00:07.30	1.5	1.92	-0.03
#2 (°C) U1-20	1.93	00:08.50	01:49.20	04:05.10	0.68	01:15.20	238.0		-2.64	238.0	04:07.20	153.0	+238.0	61.1	41.5	-00:07.30		1.93	0.00
#3 (°C) U1-3	2.06	00:08.20	01:49.30	04:08.20	0.66	01:15.10	237.5		-3.20	237.5	04:06.70	152.2	+237.5	62.0	41.5	06:28.70		2.06	-0.03
#4 (°C) U1-18	1.97	00:35.20	01:48.90	04:12.80	0.67	01:16.10	237.0		-2.80	237.0	04:14.50	154.1	+237.0	59.9	43.0	-00:07.30		1.97	0.03
#5 (°C) U1-5	1.87	00:29.50	01:46.30	04:09.70	0.66	01:14.20	236.5		-2.62	236.5	04:07.20	152.7	+236.5	60.7	43.0	06:31.10		1.87	-0.02
#6 (°C) U1-16	2.07	-00:02.10	01:48.10	04:03.30	0.61	01:16.40	237.5		-3.05	237.5	03:56.00	155.2	+237.5	60.1	45.5	06:31.40		2.07	-0.08

Note: Allowable reflow soldering times: 2 times base on recommended reflow profile.

10. Product and Documentation Support

10.1. Development Support

TI offers an extensive line of development tools, including tools to evaluate the performance of the processors, generate code, develop algorithm implementations, and fully integrated and debug software and hardware modules.

The following products support development of the CC2640 R2 device applications:

Software Tools:

SmartRF™ Studio 7 is a PC application that helps designers of radio systems to easily evaluate the RF-IC at an early stage in the design process.

- Test functions for sending and receiving radio packets, continuous wave transmit and receive
- Evaluate RF performance on custom boards by wiring it to a supported evaluation board or debugger
- Can also be used without any hardware, but then only to generate, edit and export radio configuration settings
- Can be used in combination with several development kits for Texas Instruments' CCxxxx RF-ICs

Sensor Controller Studio provides a development environment for the CC26xx Sensor Controller. The Sensor Controller is a proprietary, power-optimized CPU in the CC26xx, which can perform simple background tasks autonomously and independent of the System CPU state.

- Allows for Sensor Controller task algorithms to be implemented using a C-like programming language
- Outputs a Sensor Controller Interface driver, which incorporates the generated Sensor Controller machine code and associated definitions
- Allows for rapid development by using the integrated Sensor Controller task testing and debugging functionality. This allows for live visualization of sensor data and algorithm verification.

IDEs and Compilers:

Code Composer Studio:

- Integrated development environment with project management tools and editor
- Code Composer Studio (CCS) 7.0 and later has built-in support for the CC26xx device family
- Best support for XDS debuggers; XDS100v3, XDS110 and XDS200
- High integration with TI-RTOS with support for TI-RTOS Object View

IAR Embedded Workbench for ARM

- Integrated development environment with project management tools and editor
- IAR EWARM 7.80.1 and later has built-in support for the CC26xx device family
- Broad debugger support, supporting XDS100v3, XDS200, IAR I-Jet and Segger J-Link
- Integrated development environment with project management tools and editor
- RTOS plug in available for TI-RTOS

For a complete listing of development-support tools for the CC2640 R2 platform, visit the Texas Instruments website athttp://www.ti.com. For information on pricing and availability, contact InnoComm Mobile Technology Corporation sales office or authorized distributor.

10.2. Documentation Support

To receive notification of documentation updates, navigate to the device product folder on ti.com (CC2640R2F). In the upper right corner, click on Alert me to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.
The current documentation that describes the CC2640R2F devices, related peripherals, and other technical collateral is listed in the following.

Technical Reference Manual

SWCU117 ***Technical Reference Manual.*** Texas Instruments CC26xx Family of Products

10.3. Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

TI Embedded Processors Wiki ***Texas Instruments Embedded Processors Wiki.*** Established to help developers get started with Embedded Processors from Texas Instruments and to foster innovation and growth of general knowledge about the hardware and software surrounding these devices.