



BCM92046MD_EMB

Bluetooth® Embedded Module

CONFIDENTIAL FOR AMTRAN TECHNOLOGY CORPORATION

Section 1: Overview

INTRODUCTION

The BCM92046MD_EMB is a Bluetooth® embedded module based on the BCM2046 Bluetooth 2.1 specification-compliant stand-alone baseband processor with an integrated 2.4 GHz transceiver. It is fully compliant with the Bluetooth radio specification and incorporates new modulation schemes to support enhanced data rates (EDRs) of 2 Mbps and 3 Mbps. The BCM92046MD_EMB module supports both UART and Universal Serial Bus (USB) version 2.0 full-speed interfaces, and is fully compatible with the HCI interface specification. The module includes EEPROM, a crystal, and a Printed Circuit Board (PCB) antenna.

FEATURES

The module supports the following features:

- A Bluetooth 2.1 compliant embedded USB module with the following features:
 - Secure Simple Pairing (SSP)
 - Link Supervision Time Out (LSTO)
 - Encryption Pause Resume (EPR)
 - Enhance Inquiry Response (EIR)
 - Sniff Subrating (SSR)
 - Erroneous Data (ED)
 - Packet Boundary Flag (PBF)
- A Programmable collaborative coexistence interface
- Class 1 output power capability
- Class 2 RF maximum output power specification of 4 dBm
- Full piconet and scatternet operation
- EDR rates of 2 MBps and 3 MBps
- A high-speed UART interface
- A USB 2.0 full-speed compliant interface
- Built-in Low Power Oscillator (LPO) clock or operation using an external LPO clock
- Full support for power-saving modes.
- Advanced Audio Distribution Profile (A2DP)
- Upgradable firmware through an EEPROM download
- A PCB antenna

PHYSICAL DESCRIPTION

MODULE PINOUT

The BCM92046MD_EMB is a 27.6 mm x 14.6 mm FR4 PCB with a maximum thickness of 0.925 mm (36.4 mil) and 31 pads located around the perimeter. Figure 3 shows the module pinout diagram.

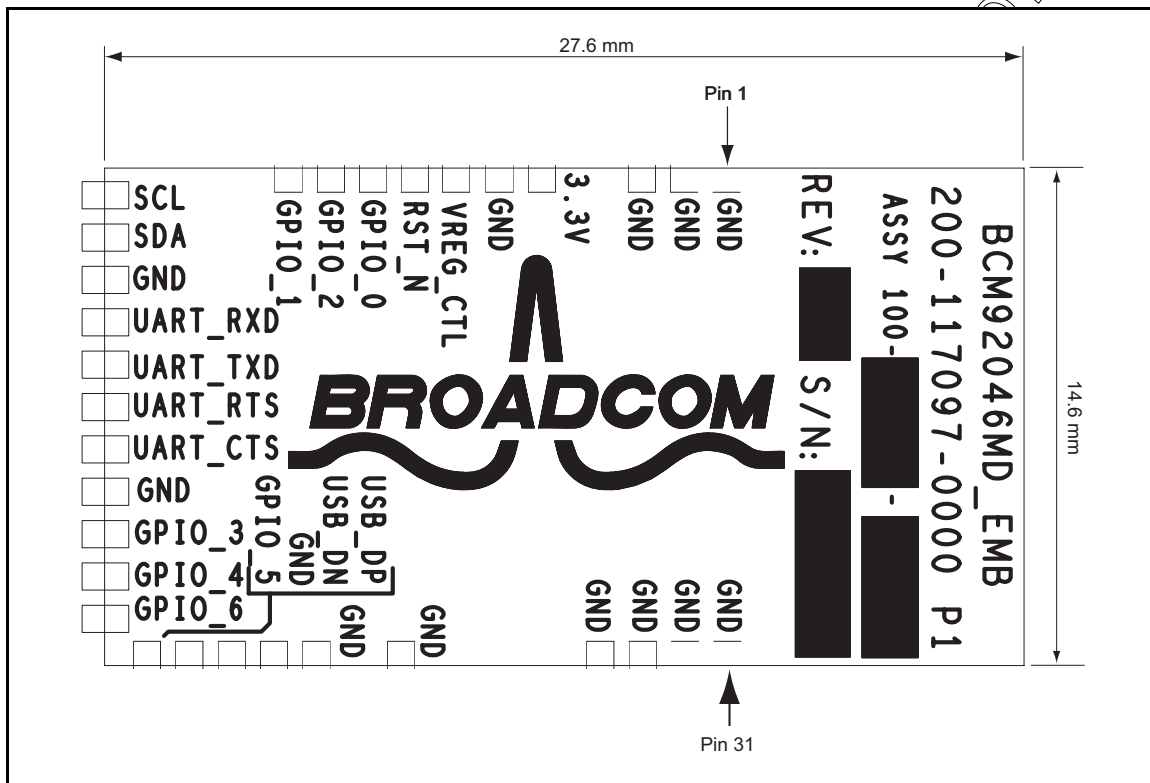


Figure 3: 2046MD_EMB Pinout

MODULE PINOUT DESCRIPTION

Table 1 shows the BCM92046MD_EMB pinout description.

Table 1: Pinout Description

Pin	Pin Name	I/O	Description
1, 2, 3, 5, 13, 18, 23, 26, 27, 28, 29, 30, 31	GND	Power	System ground
4	3.3V	Power	3.3V power supply to the module
6	VREG_CTL	Input	Pre-regulator and VREG1 enable/disable control
7	RST_N	Input	Active low system reset
8	GPIO_0	Input/ Output	GPIO
9	GPIO_2	Input/ Output	GPIO
10	GPIO_1	Input/ Output	GPIO
11	SCL	Input/ Output	Broadcom serial control clock (I ² C compatible)
12	SDA	Input/ Output	Broadcom serial data (I ² C compatible)
14	UART_RXD	Input	UART serial input
15	UART_TXD	Output	UART serial output
16	UART_RTS	Output	UART request to send
17	UART_CTS	Input	UART clear to send
19	GPIO_3	Input/ Output	GPIO
20	GPIO_4	Input/ Output	GPIO
21	GPIO_6	Input/ Output	GPIO
22	GPIO_5	Input/ Output	GPIO
24	USB_DN	Input/ Output	Downstream USB differential data
25	USB_DP	Input/ Output	Downstream USB differential data

APPLICATION CODE

Application code resides in the on-module EEPROM. During power-on reset, the application code must be downloaded to BCM2046 RAM before the board performs any Bluetooth activity.

Application code can also be patched directly to BCM2046 RAM from the host during power-on reset without an external EEPROM.

The 2046 on-chip serial port can be used to download application code from a host computer file to EEPROM or on-chip RAM using either the UART or USB transport mechanisms.

MODULE RF SPECIFICATIONS AND MEASUREMENTS

Table 3, Table 4 on page 19, and Table 5 on page 21 show the Class 2 RF specifications and measurements as referenced to the module's RF input/output port without the PCB antenna (that is, all measurements are conducted not radiated).

Table 3: Module Class 2 GFSK RF Specification (T = 25° C)

Parameter	Specification		Measurement Data			Conditions	
	Criteria	Minimum	Maximum	Frequency (MHz)	Measurement		Units
Transmitter							
Output power	-	-6	4	2402	1.84 (Pavg min.) 1.85 (Pavg max.) 2.09 (Peak)	dBm	<ul style="list-style-type: none"> DH5 packet Hopping on Loopback Number of packets = 10
				2441	1.44 (Pavg min.) 1.45 (Pavg max.) 1.77 (Peak)		
				2480	0.61 (Pavg min.) 0.62 (Pavg max.) 1.03 (Peak)		
Power density	-	-	20	-	.87	dBm per 100 kHz EIRP	<ul style="list-style-type: none"> DH5 packet Hopping off Loopback Number of packets = 10
Tx output spectrum frequency range	-	2400	2483.5	2402	2401.23	MHz	<ul style="list-style-type: none"> Payload = Tx DH1 packet PRBS9 Tx power [dBm] = 1.00
				2480	2480.7		
Tx output spectrum 20 dB bandwidth	-	0	1	2402	.92	MHz	<ul style="list-style-type: none"> DH5 packet Hopping off Loopback; Number of packets = 10
				2441	.92		
				2480	.92		
Tx output spectrum, adjacent channel power	M-N = 2	-	-20	2405	-54.09	dBm	<ul style="list-style-type: none"> DH5 Hopping Off Loopback Number of packets = 10
				2441	-54.32		
				2477	-55.09		
	M-N ≥ 3	-	-40	2405	-56.96	dBm	
				2441	-49.38		
				2477	-49.35		
	Exceptions	0	3	2405	0	-	
				2441	0		
				2477	0		
Fails	0	0	2405	0	-		
			2441	0			
			2477	0			

Table 3: Module Class 2 GFSK RF Specification (T = 25° C) (Cont.)

Parameter	Specification			Measurement Data			Conditions						
	Criteria	Minimum	Maximum	Frequency (MHz)	Measurement	Units							
Modulation	Delta f2max ≥ 99.9% of all delta f2max	115	-	2402	132.8	kHz	<ul style="list-style-type: none"> DH5 Loopback Number of packets = 10 Change payload = Toggle payload = Continue. 						
				2441	136								
				2480	139.1								
	Delta f1 (Avg)	140	175	2402	151.9	kHz							
				2441	149.3								
				2480	148.1								
	Delta f2 / Delta f1 0.8	-	-	2402	.94	-							
				2441	.98								
				2480	1.01								
Initial carrier frequency tolerance		-75	75	2402	-16.8 (Minimum) -15.5 (Average) -13.8 (Maximum)	kHz	<ul style="list-style-type: none"> Hopping on Number of packets = 10 Loopback 						
				2441	-16.1 (Minimum) -15.0 (Average) -13.6 (Maximum)								
				2480	-16.3 (Minimum) -13.1 (Average) -11.5 (Maximum)								
				Carrier frequency drift	One slot packet drift [DH1]			-25	25	2402	-6	kHz	<ul style="list-style-type: none"> DH1 and DH3 and DH5 Hopping on Number of packets = 10 Loopback
										2441	-5		
										2480	-6		
				Three slot packet drift [DH3]	-40			40	2402	-6	kHz		
									2441	-6			
									2480	-6			
Five slot packet drift [DH5]	-40	40	2402	-7	kHz								
			2441	-6									
			2480	-6									
Drift rate	-	-	2402	5.33	dB								
			2441	-4.79									
			2480	-6.03									
Receiver													
Sensitivity (BER)	-70 dBm, single-slot packets	-	0.1	2402	0.00E+00	BER	<ul style="list-style-type: none"> Hopping off Number of packets = 740 Payload = T Dirty TX = On Tx power = -70 dBm 						
				2441	0.00E+00								
				2480	0.00E+00								
	-70 dBm, multislot packets	-	0.1	2402	0.00E+00	BER							
				2441	0.00E+00								
				2480	0.00E+00								
C/I performance	Number of fails	0	0	2405	0	-	<ul style="list-style-type: none"> Payload = Tx DH1 packet PRBS9 Tx power [dBm] = 1.00 						
				2441	0								
				2477	0								
	Number of exceptions	0	5	2405	0	-							
				2441	0								
				2477	0								

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Table 3: Module Class 2 GFSK RF Specification (T = 25° C) (Cont.)

Parameter	Specification			Measurement Data			Conditions
	Criteria	Minimum	Maximum	Frequency (MHz)	Measurement	Units	
Intermodulation performance	IP3+5	-	0.1	2402	0.00E+00	BER	<ul style="list-style-type: none"> DH5 Hopping off Payload = Tx Dirty TX = Off
				2441	0.00E+00		
				2480	0.00E+00		
	IP3-5	-	0.1	2402	0.00E+00	BER	
				2441	0.00E+00		
				2480	0.00E+00		
Maximum input level (BER)	At -20 dBm input	-	0.1	2402	0.00E+00	BER	<ul style="list-style-type: none"> Payload = Tx Number of packets = 7408 Tx power = -20 dBm
				2441	0.00E+00		
				2480	0.00E+00		
Single-Slot Sensitivity Level Search		-	-70	2402	-87.83	dBm	<ul style="list-style-type: none"> Hopping Off Number of packets = 7408 Payload = Tx Dirty TX = On
				2441	-88.59		
				2480	-88.36		

Table 4: Module Class 2 EDR RF 2 MBPS Specification (T = 25°C)

Parameter	Specification		Measurement Data				Conditions
	Criteria	Minimum	Maximum	Freq. (MHz)	Measurement	Units	
Transmitter							
EDR relative transmit powers	EUT maximum relative transmit power	-4	1	2402	.05 (Minimum) .05 (Average) .06 (Maximum)	dB	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Loopback • EUT maximum and minimum • Number of packets = 10
				2441	.06 (Minimum) .08 (Average) .09 (Maximum)		
				2480	.08 (Minimum) .10 (Average) .11 (Maximum)		
	EUT minimum relative transmit power	-4	1	2402	.11 (Minimum) .13 (Average) .14 (Maximum)	dB	
				2441	.18 (Minimum) .19 (Average) .20 (Maximum)		
				2480	.23 (Minimum) .24 (Average) .25 (Maximum)		
EDR carrier frequency stability and modulation accuracy	99% DEVM \leq 0.30	99	-	-	100 (Minimum) 100 (Maximum)	%	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Loopback • Number of packets = 200
	Peak DEVM	-	0.35	-	.11 (Minimum) .15 (Maximum)	-	
	RMS DEVM	-	0.2	-	.48 (Minimum) .68 (Maximum)	-	
	Initial frequency error	-75	75	-	-16.8 (Minimum) -13.4 (Maximum)	kHz	
	Frequency error	-10	10	-	-1.3 (Minimum) -1.0 (Maximum)	kHz	
	Block frequency error	-75	75	-	-17.3 (Minimum) -13.8 (Maximum)	kHz	
EDR differential phase encoding	% Good Packets	99	-	2402	100	%	<ul style="list-style-type: none"> • 2-DH1 • Hopping off • Number of packets = 100
				2441	100	%	
				2480	100	%	
EDR in-band spurious emission	Number of fails	0	0	2405	0	-	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Loopback • EUT maximum
				2441	0	-	
				2477	0	-	
	Number of exceptions	0	3	2405	0	-	
				2441	0	-	
				2477	0	-	
Receiver							
EDR sensitivity (BER)	1.6e6 payload bits @ 70 dBm	-	.00007	2402	0.00E+00	BER	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Payload = Tx • Dirty TX = On • Tx power = -70 dBm
				2441	0.00E+00		
				2480	0.00E+00		
	16e6 payload bits @ -70 dBm, if a failure occurs in the first 1.6e6 bits	-	.0001	2402	-	BER	
				2441	-		
				2480	-		
Receive sensitivity level search	EDR receiver 0.0001 BER sensitivity Level	-	-70	2402	-90	dBm	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Payload = Tx • Dirty TX = On
				2441	-90		
				2480	-90		

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Table 4: Module Class 2 EDR RF 2 MBPS Specification (T = 25°C) (Cont.)

Parameter	Specification			Measurement Data			Conditions
	Criteria	Minimum	Maximum	Freq. (MHz)	Measurement	Units	
EDR BER floor	8e6 payload bits @ -60 dBm	-	.000007	2402	0.00E+00	BER	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Payload = Tx • Dirty TX = Off • Tx power = -60 dBm
				2441	0.00E+00		
				2480	0.00E+00		
	160e6 payload bits @ -60 dBm, if a failure occurs in the first 8e6 bits	-	.00001	2402	-	BER	
				2441	-		
				2480	-		
EDR C/I performance	Number of fails	0	0	2405	0	-	<ul style="list-style-type: none"> • 3-DH5 • Hopping Off • Payload = Tx • Dirty TX = Off
				2441	0		
				2477	0		
	Number of exceptions	0	5	2405	0	-	
				2441	0		
				2477	0		
EDR maximum input level	1.6e6 payload bits @ -20 dBm	-	.001	2402	0.00E+00	BER	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Payload = Tx • Tx power = -20 dBm
				2441	0.00E+00		
				2480	0.00E+00		

Table 5: Module Class 2 EDR RF 3MBPS Specification (T = 25° C)

Parameter	Specification			Measurement Data			Conditions
	Criteria or Condition	Minimum	Maximum	Freq. (MHz)	Measurement	Units	
Transmitter							
EDR relative transmit powers	EUT maximum relative transmit power	-4	1	2402	.04 (Minimum) .05 (Average) .06 (Maximum)	dB	<ul style="list-style-type: none"> 3-DH5; Hopping off; Loopback; EUT maximum and minimum Number of packets = 10
				2441	.05 (Minimum) .06 (Average) .07 (Maximum)		
				2480	.08 (Minimum) .10 (Average) .10 (Maximum)		
	EUT minimum relative transmit power	-4	1	2402	.10 (Minimum) .12 (Average) .14 (Maximum)	dB	
				2441	.14 (Minimum) .14 (Average) .16 (Maximum)		
				2480	.17 (Minimum) .19 (Average) .20 (Maximum)		
EDR carrier frequency stability and modulation accuracy	99% DEVM ≤ 0.30	99	-	-	100 (Minimum) 100 (Maximum)	%	<ul style="list-style-type: none"> 3-DH5 Hopping off Loopback Number of packets = 200
	Peak DEVM	-	0.25	-	.13 (Minimum) .17 (Maximum)	-	
	RMS DEVM	-	0.13	-	.05 (Minimum) .067 (Maximum)	-	
	Initial frequency error	-75	75	-	-17.1 (Minimum) -13.0 (Maximum)	kHz	
	Frequency error	-10	10	-	-1.7 (Minimum) -1.2 (Maximum)	kHz	
	Block frequency error	-75	75	-	-17.6 (Minimum) -13.9 (Maximum)	kHz	
EDR differential phase encoding	% Good Packets	99	-	2402	100	%	<ul style="list-style-type: none"> 3-DH1 Hopping Off Number of packets = 100
				2441	100	%	
				2480	100	%	
EDR in-band spurious emission	Number of fails	0	0	2405	0	-	<ul style="list-style-type: none"> 3-DH5 Hopping off Loopback EUT maximum
				2441	0	-	
				2477	0	-	
	Number of exceptions	0	3	2405	0	-	
				2441	0	-	
				2477	0	-	
Receiver							
EDR sensitivity (BER)	1.6e6 payload bits @ -70 dBm	-	.00007	2402	0.00E+00	BER	<ul style="list-style-type: none"> 3-DH5 Hopping off Payload = Tx Dirty TX = On Tx power = -70 dBm
				2441	0.00E+00		
				2480	0.00E+00		
	16e6 payload bits @ -70 dBm, if a failure occurs in the first 1.6e6 bits	-	.0001	2402	-	BER	
				2441	-		
				2480	-		
Receive sensitivity level search	EDR receiver 0.0001 BER sensitivity level	-	-70	2402	-84.32	dBm	<ul style="list-style-type: none"> 3-DH5 Hopping off Payload = Tx Dirty TX = On
				2441	-84.49		
				2480	-84.26		

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Table 5: Module Class 2 EDR RF 3MBPS Specification (T = 25°C) (Cont.)

Parameter	Specification			Measurement Data			Conditions
	Criteria or Condition	Minimum	Maximum	Freq. (MHz)	Measurement	Units	
EDR BER floor	8e6 payload bits @ -60 dBm	-	.000007	2402	0.00E+00	BER	<ul style="list-style-type: none"> • 3-DH5 • Hopping off • Payload = Tx • Dirty TX = Off • Tx power = -60 dBm
				2441	0.00E+00		
				2480	0.00E+00		
	160e6 payload bits @ -60 dBm, if a failure occurs in the first 8e6 bits	-	.00001	2402	-	BER	
				2441	-		
				2480	-		
EDR C/I performance	Number of fails	0	0	2405	0	-	<ul style="list-style-type: none"> • 2-DH5 • Hopping off • Payload = Tx • Dirty TX = Off
				2441	0		
				2477	0		
	Number of exceptions	0	5	2405	0	-	
				2441	0		
				2477	0		
EDR maximum input level	1.6e6 payload bits @ -20 dBm	-	.001	2402	0.00E+00	BER	<ul style="list-style-type: none"> • 3-DH5 • Hopping off • Payload = Tx • Tx power = -20 dBm
				2441	0.00E+00		
				2480	0.00E+00		

Section 3: Ordering Information

Contact your Broadcom representative for a BCM92046MD_EMB kit. See [Table 6](#) for ordering information.

Table 6: Ordering Information

Description	Part Number
BCM92046 Bluetooth Embedded Module	BCM92046MD_EMB

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Declaration of Conformity Label & Marking Requirements

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.

FCC Caution: The user is cautioned that any changes or modifications not expressly approved by Renishaw plc, or authorised representative could void the user's authority to operate the equipment.

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.

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