Operational Description

FCC ID ZH4K336

EUT is a Bluetooth Wireless Keyboard designed as an “Communication Device ”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

Operating Frequency	2402 – 2480 MHz
Rated Output Power	-0.03dBm
CMOS chip	BCM2042
Modulation	GFSK
Number of Channels	79
Channel Separation	1 MHz
Antenna Designation	Integrated Antenna
Antenna Gain	0.8 dBi
Power Supply	DC 3.7 V by Built-in Li-ion Battery or by USB Port. (Data transfer is not supported)

BROADCOM.
Connecting everything®

BCM2042 PRODUCT Brief

SINGLE-CHIP BLUETOOTH® MOUSE AND KEYBOARD

FEATURES

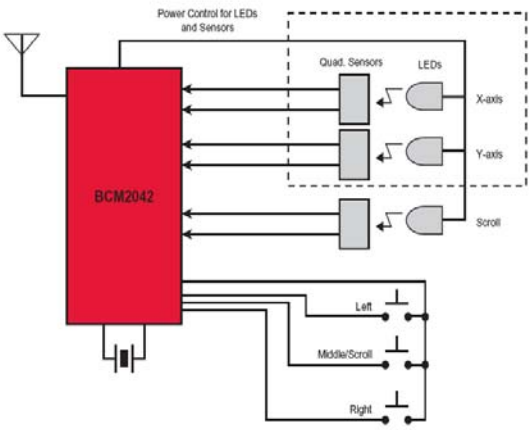
- Single-chip Bluetooth® device with fully integrated Human Interface Device (HID) profile and full Bluetooth stack
- On-board 8051 processor and RAM/ROM memory
- Custom-integrated Bluetooth core processor has been optimized to support the HID v1.0 profile and minimize power consumption
- Bluetooth version 2.0 compliant including support for adaptive frequency hopping and fast connect
- Integrated 8 Kbytes of non-volatile flash memory for storing Bluetooth address and configuration data
- Fully integrated radio eliminates all filters and matching components and features a single-pin interface directly to antenna
- Direct interface to keyboard scan matrix with full support for up to 8 x 20 keys and user-customizable hot keys
- Integrated quadrature signal decoder to support both ball and optical mouse designs
- Direct interface to LED and LCD displays
- Drive capability to power external optoelectronics
- ROM-based design eliminates external flash memories
  - Flash option offered to support feature development
- Fully integrated low dropout (LDO) regulator provides direction interface to batteries
- Integrated switching regulator to support external sensor and more to further reduce BOM cost
- Available in 88-pin fpBGA and 120-pin fpBGA packages

SUMMARY OF BENEFITS

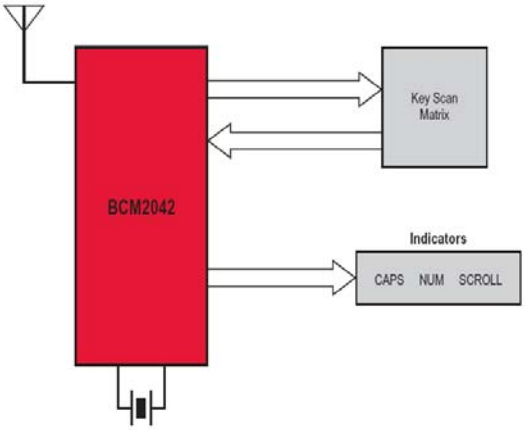
- Cost-optimized solution for mouse and keyboard applications
  - Achieves lowest possible cost through the integration of all external components
  - Direct interface to key scan matrix or ball/optical mouse encoders
- Replaces existing mouse or keyboard processor and memory and adds Bluetooth functionality
- Lowest power consumption solution provides greater than six-month battery life
- Adaptive frequency hopping support ensures full interoperability and coexistence with WLAN enabled personal computers
- Optimized radio provides long-range, interference-free operation in high-interference environments
  - Transmitter provides +4 dBm output power and satisfies Class 2 operation
  - Receiver provides -85 dBm receiver sensitivity
- Single monolithic bulk CMOS device providing low cost and high availability of manufacturing supply

APPLICATIONS

- Bluetooth mouse
- Bluetooth keyboard
- Combination mouse/keyboard
- Remote control HID devices
- Game controllers



BCM2042 Mouse Block Diagram



BCM2042 Keyboard Block Diagram

The BCM2042 is a major breakthrough in the design of low-cost Bluetooth mouse and keyboard devices. The BCM2042 is a true single chip that integrates the entire profile, application, and Bluetooth protocol stack and is fully compliant with the Bluetooth SIG specification for human interface devices. The BCM2042 is fully compliant with the version 2.0 Bluetooth specification, including adaptive frequency hopping and fast connection, which are essential to mouse and keyboard applications in personal computers.

Integration is key to achieving the system cost targets of today's PC OEMs. By integrating all components within today's mouse and keyboard into the BCM2042, low system costs can be achieved to approach the price points of legacy-wired mice and keyboards. The BCM2042 can interface directly to mouse optical or ball encoders and keyboard scan matrices.

Two key integrated components enable the BCM2042 to reach extremely low system BOM costs and dramatically extend battery life. The BCM2042 integrates 8 KB of non-volatile memory on-chip. Because of this, the BCM2042 does not require external flash or EEPROM when designing bluetooth mice or keyboards. Also, the BCM2042 integrates a high-performance boost regulator enabling direct connection with mice electronics. The integration of non-volatile RAM and the boost regulator enable extremely low system costs.

The Bluetooth baseband core has been optimized to maximize the battery life and functionality required for a mouse or keyboard application. Battery life has been optimized in the BCM2042 to meet greater than 6 months for the typical user using standard battery technology.

The BCM2042 integrates a high-performance radio implemented in standard bulk CMOS. It incorporates a proprietary self-calibrating VCO structure for both excellent phase noise and fast frequency hopping covering the entire band. All filters have been fully integrated into the device and are also self-calibrating to automatically compensate for changes in temperature and any process variation during manufacturing. The RF interface to the device fully integrates the T/R switch and its associates matching circuits, enabling direct interface with the antenna.

The block diagrams show how the BCM2042 can be used in either a mouse or keyboard application.

Rating	*Symbol*	*Value*	*Unit*
DC supply voltage for RF (VDD_RF)	–	1.65	V
DC supply voltage for Core (VDD_CORE)	–	1.65	V
DC supply voltage for I/O (VDD_IO or VDD_R3V)	–	4.1	V
DC supply voltage for Switching Regulator (1 cell)	–	1.6	V
DC supply voltage for Switching Regulator (2 cells in serial)	–	3.63	V
Voltage on the switching regulator #1 output pin	SW1_HI	3.3	V
Voltage on the switching regulator #2 output pin	SW2_HI	1.8	V
Voltage on input or output pin	–	V_{SS} – 0.3 to V_{DD} + 0.3	V
Storage temperature range	Tstg	–40 to 125	°C

Parameter	*Minimum*[1]	*Typical*	*Maximum*[1]	*Unit*
DC supply voltage for RF (VDD_RF)	1.4	1.5	1.65	V
DC supply voltage for Core (VDD_CORE)	1.35	1.5	1.65	V
DC Supply voltage for VDD_IO	1.62	–	3.6	V
DC supply voltage for VDD_MEM or VDD_R3V	1.71	1.8	3.63	V
DC supply voltage for switching regulators (1 cell)	0.80	1.45	1.60	V
DC supply voltage for switching regulators (2 cells in series)	1.8	2.9	3.6	V
Voltage on the switching regulator #1 output pin SW1	2.7	3	3.3	V
Voltage on the switching regulator #2 output pin SW2	1.5	1.6	1.8	V

1. Overall performance degrades beyond Minimum and Maximum supply voltages.

Characteristics	*Symbol*	*Min*	*Typ*	*Max*	*Unit*
Input low voltage (3.3V I/O supply)	V_{IL}	–	–	0.8	V
Input high voltage (3.3V I/O supply)	V_{IH}	2.0	–	–	V
Input low voltage (1.8V I/O supply)	V_{IL}	–	–	0.6	V
Input high voltage (1.8V I/O supply)	V_{IH}	1.1	–	–	V
Output low voltage	V_{OL}	–	–	0.4	V
Output high voltage	V_{OH}	V_{DD} – 0.4	–	–	V
Input low current	I_{IL}	–	15	–	µA
Input high current	I_{IH}	–	15	–	µA
Output low current (3.3V I/O supply)	I_{OL}	–	–	2.0	mA
Output high current (3.3V I/O supply)	I_{OH}	–	–	2.0	mA
Input capacitance	C_{IN}	–	0.12	–	pF

Operational Mode	*Minimum*	*Typical*	*Maximum*
Transmit[a]	–	43 mA	–
Receive[b]	–	38 mA	–
DM1 (TX mode)	–	28 mA	–
DM1 (RX mode)	–	25 mA	–
Sniff mode, 10 ms	–	2.35 mA	–
Sniff mode, 60 ms	–	0.39 mA	–
Sniff mode, 100 ms	–	0.24 mA	–
Sniff mode, 1.28 s	–	0.018 mA	–
Sleep (disconnected or Inter-Sniff, state preserved)	–	50 µA	–
Deep sleep (disconnected, wake on interrupt)	–	16 µA	–

a. Max current when receiver and baseband are both operating, 100% on.
b. Max current when transmitter and baseband are both operating, 100% on.

Parameter	*Minimum*	*Typical* [3]	*Maximum*	*Unit*
Receiver Section				
Frequency range	2402	–	2480	MHz
Overall Rx sensitivity[1]	–	-85	-80	dBm
Input IP3	–	-10	–	dBm
Maximum input	-20	-10	–	dBm
Input impedance	–	50	–	Ω
Input impedance for RF_IO:	–	|S11| < -10 dB	–	–
Interference Performance				
Co-Channel interference, $C/I_{co\text{-}channel}$	–	9	11 [2]	dB
Adjacent (1 MHz) interference, $C/I_{1\ MHz}$	–	-5	0	dB
Adjacent (2 MHz) interference, $C/I_{2\ MHz}$	–	-35	-30	dB
Adjacent (≥3 MHz) interference, $C/I_{\geq 3\ MHz}$	–	-43	-40	dB
Image frequency interference, C/I_{Image}	–	-20	-9 [2]	dB
Adjacent (1 MHz) interference to in-band image frequency, $C/I_{Image\pm 1\ MHz}$	–	-35	-20 [2]	dB

1. The receiver sensitivity is measured at a BER of 0.1% on the device interface.
2. The maximum value represents the actual Bluetooth specification required for Bluetooth qualification as defined in the version 1.2 specification.
3. Typical operating conditions are 1.8V operating voltage and 25°C ambient temperature.

Parameter	*Minimum*	*Typical*	*Maximum*	*Unit*
Transmitter Section				
Frequency range	2402	–	2480	MHz
Output power—at max power setting[3]	-2	0	4	dBm
Output power—at minimum power setting[3]	-26	–	-18	dBm
Output power step size	–	2	–	dB
Output impedance [3]	–	50	–	Ω
Output impedance for RF_IO:	–	|S11| < -10 dB	–	–
In-Band Spurious Emission	–	–	–	–
± 500 kHz	–	–	-20	dBc
20 dB bandwidth	–	900	1000	kHz
|M-N| = 2	–	–	-20 [1]	dBm
|M-N| ≥ 3	–	–	-40 [1]	dBm
Out-of-Band Spurious Emission	–	–	–	–
30 MHz – 1 GHz	–	–	-36 [1,2]	dBm

30 MHz – 1 GHz	–	–	-36 [1,2]	dBm
1 GHz – 12.75 GHz	–	–	-30 [1,2]	dBm
1.8 GHz – 1.9 GHz	–	–	-47 [1]	dBm
5.15 GHz – 5.3 GHz	–	–	-47 [1]	dBm
LO Performance				
Lock time	–	180	–	µs
Initial carrier frequency tolerance	–	±25	±75	kHz
Frequency drift	–			
DH1 packet	–	±20	±25	kHz
DH3 packet	–	±20	±40	kHz
DH5 packet	–	±20	±40	kHz
Drift rate	–	10	20	kHz/50 µs
Frequency deviation	–			
00001111 sequence in payload[4]	140	–	175	kHz
10101010 sequence in payload[5]	115	–	–	kHz
Channel spacing	–	1	–	MHz

1. Maximum value represents the actual Bluetooth specification required for Bluetooth qualification as defined in the version 1.2 specification.
2. The spurious emissions during Idle Mode are the same as specified in Table 1: Receiver RF Specifications.
3. The RF characteristics are measured at the chip interface.