BK3432 Bluetooth Dual Mode SoC

Classic and Low Energy

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Disclaimer: Descriptions of specific implementations are for illustrative purpose only, actual hardware implementation may differ.

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1   General Description

1.1 Overview

The BK3432 chip is a highly integrated Bluetooth 5.0 dual mode data SoC with 2 Mbps data rate supported. It integrates a high-performance RF transceiver, baseband, MCU, rich feature peripheral units, programmable protocol and profile to support Bluetooth classic and low energy application. The Flash program memory makes it suitable for customized applications.

The BK3432 is designed with advanced technology process and integrated with switch DCDC regulator, that it has ultra-low power consumption and ultra-low leakage power. The embedded high order interference suppression filter and fast automatic gain control logic make it work well in high interference environment.

1.2 Block Diagram
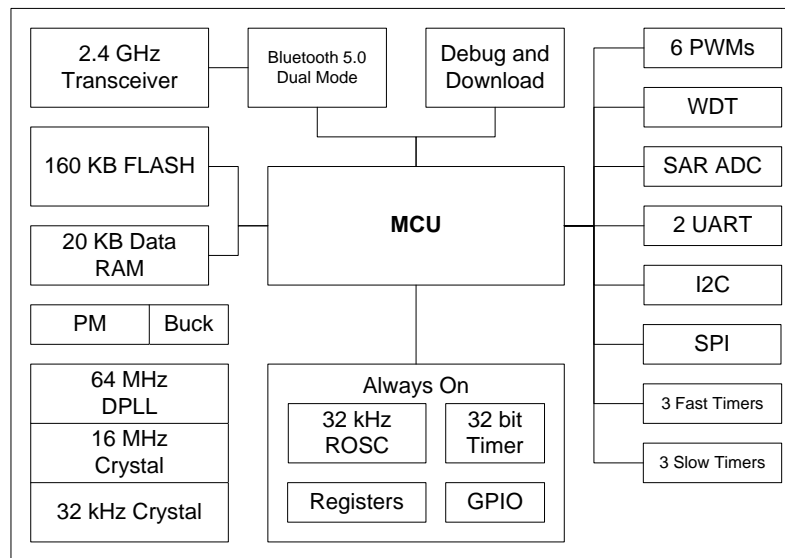
Figure 1 BK3432 Block Diagram

1.3 Features

● Bluetooth® SIG Bluetooth Dual Mode 5.0 compliant

● Low-power 2.4GHz Transceiver

● MCU integrated

● 160 KB programmable Flash for Program and 20 KB RAM for Data

● Program code read protection

● Operation voltage from 0.9 V to 3.6 V

● Clock

   ■ 16 MHz crystal reference clock

   ■ 64 MHz digital PLL clock

   ■ 32 kHz ring oscillator

   ■ External 32 kHz crystal oscillator

   ■ MCU can run with any clock source with internal frequency divider

● Interface and peripheral units

- ■ JTAG, I2C, SPI interface

- ■ Two UART interface

- ■ Multi-channels PWM output

- ■ On-chip 10 bit general ADC

- ■ GPIO with multiplexed interface functions

- ■ True random number generator

- ● Typical Package Type

  - ■ 32-pin QFN 4x4

2 PIN information

2.1 QFN32
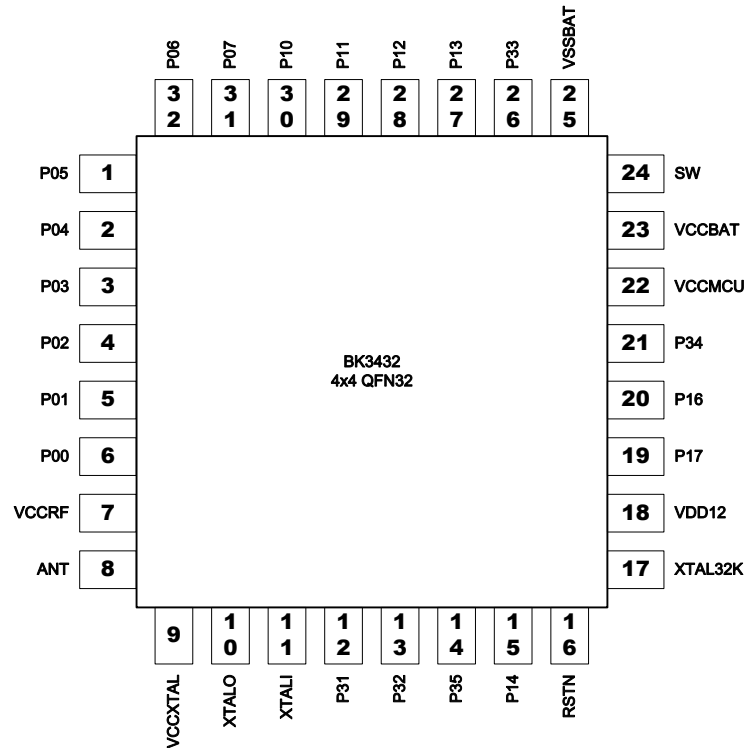
Figure 2 BK3432 QFN32 pin assignment

Table 1 BK3432 QFN32 Pin Description

PIN	Name	Pin Function	Description
1	P05	Digital I/O	General purpose IO
2	P04	Digital I/O	General purpose IO
3	P03	Digital I/O	General purpose IO
4	P02	Digital I/O	General purpose IO
5	P01	Digital I/O	General purpose IO
6	P00	Digital I/O	General purpose IO
7	VCCRF	Power	RF power, 1.5 V
8	ANT	RF	RF signal port

9	VCCXTAL	Power	Crystal power, 1.5 V
10	XTALO	Analog	16 MHz crystal output
11	XTALI	Analog	16 MHz crystal input
12	P31	Digital I/O	General purpose IO
13	P32	Digital I/O	General purpose IO
14	P35	Digital I/O	General purpose IO
15	P14	Digital I/O	General purpose IO
16	RSTN	Analog	Active low pin reset
17	XTAL32K	Analog	32 kHz Crystal input
18	VDD12	Analog	LDO output, 1.5 V
19	P17	Digital I/O	General purpose IO
20	P16	Digital I/O	General purpose IO
21	P34	Digital I/O	General purpose IO
22	VCCMCU	Power	Power, 1.5
23	VCCBAT	Analog	Power, 3 V
24	SW	Analog	Switch regulator pin for two battery mode
25	VSSBAT	Analog	Ground
26	P33	Digital I/O	General purpose IO
27	P13	Digital I/O	General purpose IO
28	P12	Digital I/O	General purpose IO
29	P11	Digital I/O	General purpose IO
30	P10	Digital I/O	General purpose IO
31	P07	Digital I/O	General purpose IO
32	P06	Digital I/O	General purpose IO

3 Functional Description

3.1 GPIO

The BK3432 QFN32 has totally 20 GPIO pins, which can be configured as either input or output. There are secondary functions available for GPIO pins and configurable by firmware.

At the beginning of the chip starts up, the chip will enter programming mode, JTAG mode or normal according received command from Mode Selecting Pin.

Table 2 BK3432 GPIO function mapping

		Description	I/O	PROGRAM Mode	Mode Selection Pin	Jtag mode
P00	UART1	UART_TX	O			
P01		UART_RX	I			
P02	I2C	SCL	I/O			
P03		SDA	I/O			JTAG_NTRST
P04	SPI	SPI_SCK	I/O	SPI_MOSI	SPI_MOSI	JTAG_TDI
P05		SPI_MOSI	I/O	SPI_MISO	SPI_MISO	JTAG_TDO
P06		SPI_MISO/PWM[4]	I/O	SPI_SCK	SPI_SCK	JTAG_TCK
P07		SPI_NSS/PWM[5]	I/O	SPI_CS	SPI_CS	JTAG_TMS
P10	PWM	PWM[0] (20mA)	O			
P11		PWM[1] (20mA)	O			
P12		PWM[2]	O			
P13		PWM[3]	O			
P14		PWM[4]				
P16	UART2	UART2_TX	O			
P17		UART2_RX	O			
P31		Ch1	I			
P32		Ch2	I			
P33		Ch3				
P34		Ch4	I			
P35		Ch5	I			

Each GPIO pin can be the source to wake up MCU from shut down state. In the shutdown state, any voltage level change on the pre-configured GPIO pin will trigger the wake-up procedure.

3.2 Timers

3.2.1 PWM Timers

There are six 16 bits PWM timers. The clock of PWM timers can be selected as 32 KHz clock or 16 MHz clock by register.

There are two modes of PWM timers. One is timer mode and another is PWM mode. The timer mode can generate interrupt to MCU. The PWM mode can generate PWM waveform and output to GPIO pins to drive external device such as LED. Six GPIO pins can be used to output PWM waveform separately.

3.2.2 Watch dog timer and RTC timer

The watch dog timer and RTC timer run on the always on power domain, whose clock source is 32 kHz clock.

The 16 bits watch dog timer runs with 4 kHz frequency that its period can be up to 16 second. After watch dog timer is expired, it will reset the whole chip.

The 32 bits RTC timer in always on power domain run with ROSC frequency that its period can be up to one day. After RTC timer is expired, it will wake up the MCU.

3.3 ADC

A 10-bit generic ADC is integrated in BK3432. Total five external channels and one internal channel can be selected for ADC transfer. It supports both single and continuous mode.

ADC Channel Number	ADC Source
Channel 1	GPIO31
Channel 2	GPIO32
Channel 3	GPIO33
Channel 4	GPIO34
Channel 5	GPIO35
Channel 7	VCCBAT-pin

3.4 UART, I2C and SPI

There are two set UARTs, one set I2C and one set SPI interface, which support both master and slave mode.

The UART baud rate can be up to 3.2 MHz, and the SPI clock speed can be up to 4 MHz。

3.5 Security

There is a true random number generator to make system get better security communcation.

The FLASH content will be protected (not readable, but erasable) as long as the LSB bit 3 or bit 5 of the last 32-bit word of last address 0x9FFF is write to zero.

4 Electrical Specifications

Table 3 BK3432 RF Characteristics

Name	Parameter (Condition)	Min	Typical	Max	Unit	Comment
	Operating Condition					
VCC	Voltage	0.9	3.0	3.6	V	
TEMP	Temperature	-40	+27	+125	°C	
	Digital input Pin					
VIH	High level	VCC-0.3		VCC+0.3	V	
VIL	Low level	VSS		VSS+0.3	V	
	Digital output Pin					
VOH	High level (IOH=-0.25mA)	VCC- 0.3		VCC	V	
VOL	Low level(IOL=0.25mA)	VSS		VSS+0.3	V	
	Normal condition					
IVDD	Deep sleep		0.5		uA	
IVDD	Sleep current (RF OFF, 32 kHz clock, DIG Retention)		1.8		uA	
IVDD	Active RX (3.3 V)		5.1		mA	With DCDC regulator
IVDD	Active TX @ -1 dBm (3.3 V)		4.8		mA	With DCDC regulator
	Normal RF condition					
FOP	Operating frequency	2400		2480	MHz	
FXTAL	Crystal frequency		16		MHz	
RFSK	Air data rate		1	2	Mbps	
	Transmitter (1 Mbps mode)					
PRF	Output power	-20	-1	+4	dBm	
PBW	Modulation 20 dB bandwidth			1	MHz	
PRF1	Out of band emission 2 MHz		-20		dB	

PRF2	Out of band emission 3 MHz		-58		dB	
Dev	Transmit FM deviation	115	250	300	kHz	
Drift	Transmit drift in any position			400	Hz/us	
	Receiver BLE Mode (Classic Mode is to be provided)					
Max Input	1 E-3 BER		-10		dBm	
RXSENS	1 E-3 BER sensitivity		-96	-97	dBm	
Intermodulation	Pin=-64 dBm; Punwant=-50 dBm; f0=2f1-f2, f2-f1=3 MHz or 4 MHz or 5 MHz		-25	-22	dBm	
C/ICO	Co-channel C/I		7		dB	
C/I1ST	ACS C/I 1MHz	-9		-6	dB	
C/I2ND	ACS C/I 2MHz		-44		dB	
C/I3RD	ACS C/I 3MHz		-50		dB	
C/I1STI	ACS C/I Image channel		-25		dB	
C/I2NDI	ACS C/I 1 MHz	-35		dB		
Block	Block @ 2399,and 2484		-15		dBm	
Block	Block @ 2 GHz and 3 GHz		-15		dBm	
Leakage	Leakage @ < 1GHz		-71		dBm	
Leakage	Leakage @ >1GHz		-56		dBm	

5 Package Information

5.1 QFN 4x4 32-Pin

The BK3432 32-Pin uses the 4mmx4mm QFN package.

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.02	0.05
A2	0.60	0.65	0.70
A3		0.20REF	
b	0.15	0.20	0.25
D	3.90	4.00	4.10
E	3.90	4.00	4.10
D2	2.80	2.90	3.00
E2	2.80	2.90	3.00
e	0.30	0.40	0.50
H		0.30REF	
K		0.25REF	
L	0.25	0.30	0.35
R	0.09	–	–
c1	–	0.10	–
c2	–	0.10	–
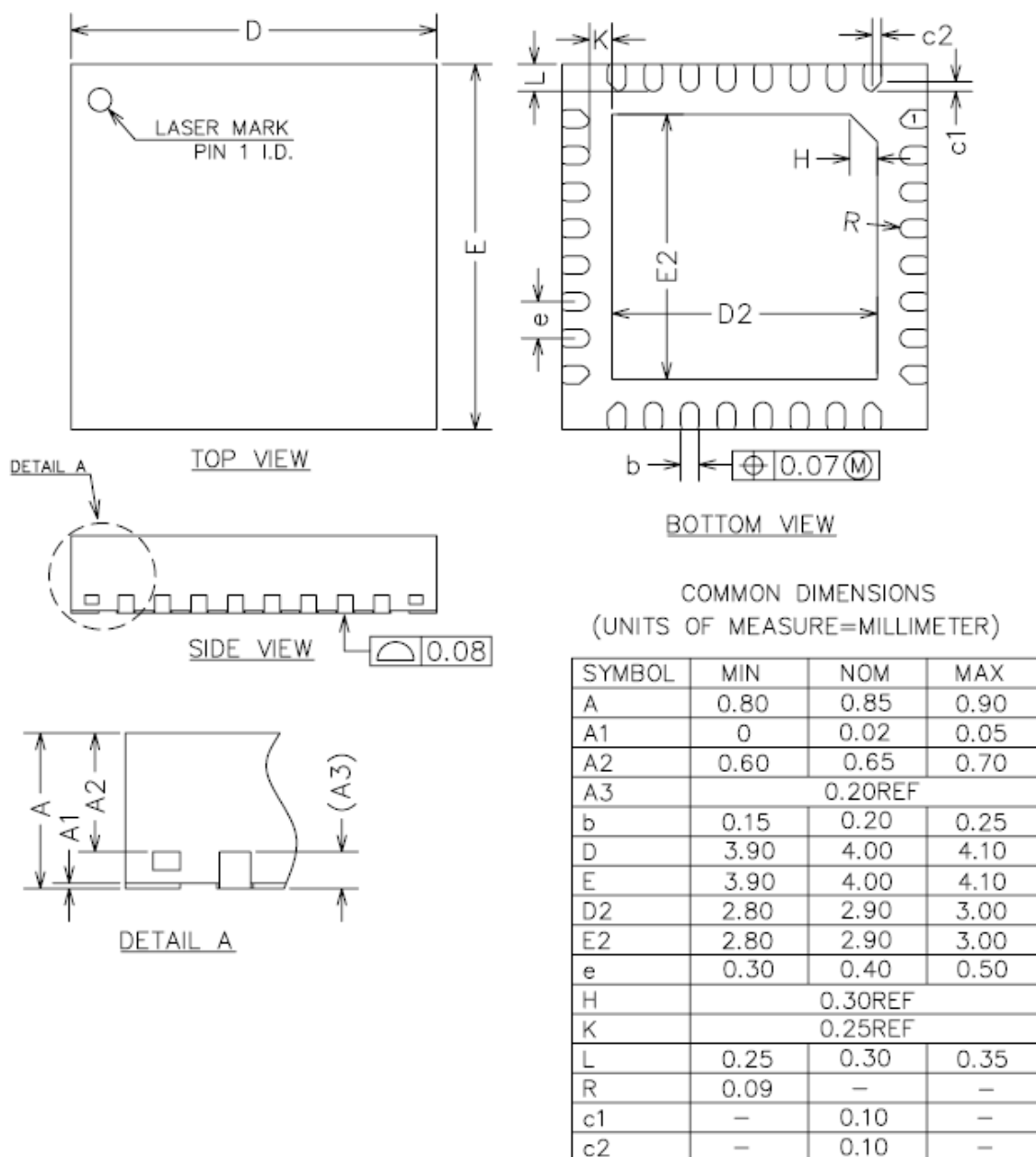
6 Order Information

Part number	Package	Packing	Minimum Order Quantity
BK3432QN32C	QFN 4mmx4mm 32-Pin	Tape Reel	3K

Revision History

Version	Date	Author(s)	Description
0.1	12/Mar/2017	WF	Initial
0.2	11/Nov/2018	MS	Modified the order information