



BK3435 Bluetooth Low Energy Single Mode SoC

Beken Corporation
Building 41, Capital of Tech Leaders, 1387 Zhangdong Road,
Zhangjiang High-Tech Park, Pudong New District, Shanghai, China

Tel: (86)21 51086811

Fax: (86)21 60871089

This document contains information that may be proprietary to, and/or secrets of, Beken Corporation. The contents of this document should not be disclosed outside the companies without specific written permission.

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

Table of Contents

1	General Description	3
1.1	Overview	3
1.2	Block Diagram	3
1.3	Features	4
2	PIN information	5
2.1	QFN32.....	5
2.2	QFN40.....	6
2.3	QFN48.....	8
3	Functional Description.....	11
3.1	GPIO	11
3.2	Timers	13
3.2.1	PWM Timers.....	13
3.2.2	3DS Timers	13
3.2.3	Watch dog timer and RTC timer.....	13
3.3	ADC	13
3.4	UART, I2C and SPI	14
3.5	Audio interface.....	14
3.6	IrDA Transceiver	14
3.7	USB.....	15
3.8	True random number generator	15
3.9	I2S Digital Audio.....	15
4	Electrical Specifications.....	15
5	Package Information	17
5.1	QFN 4x4 32-Pin.....	17
5.2	QFN 5x5 40-Pin.....	18
5.3	QFN 6x6 48-Pin.....	19
6	Order Information	20

1 General Description

1.1 Overview

The BK3435 chip is a highly integrated Bluetooth 4.2 low energy single mode device, with 2 Mbps data rate option. It integrates a high-performance RF transceiver, baseband, ARM9E core, rich feature peripheral units, programmable protocol and profile to support BLE application. The Flash program memory makes it suitable for customized applications.

The BK3435 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

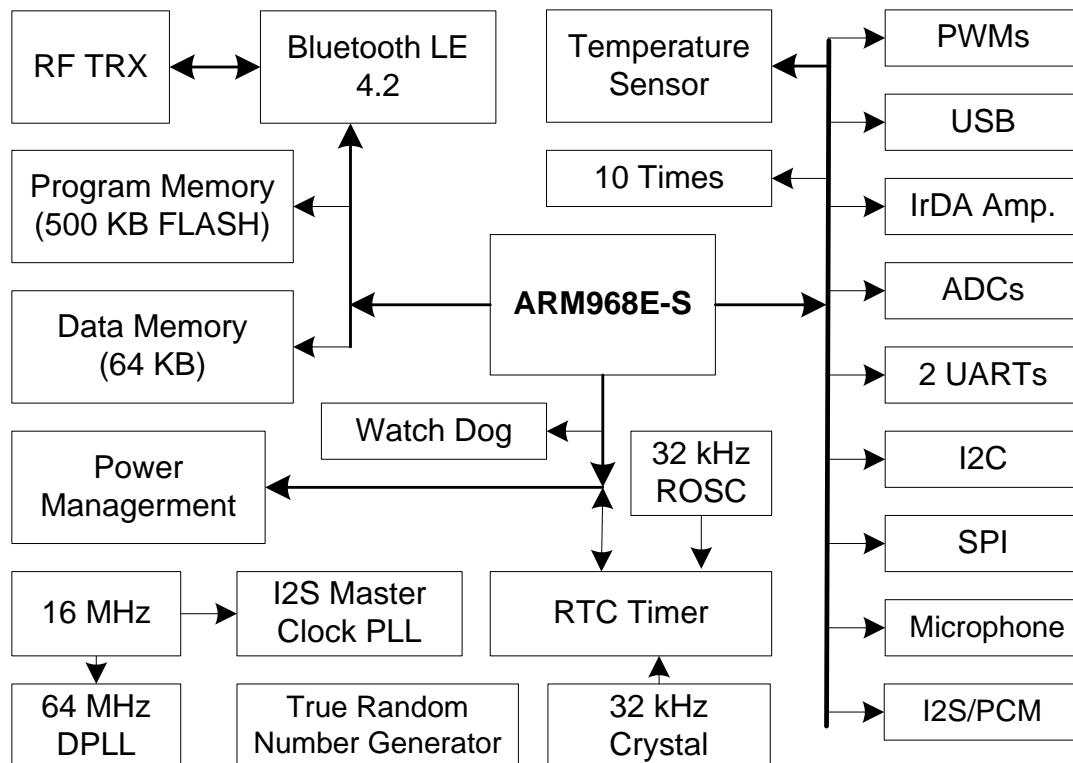


Figure 1 BK3435 Block Diagram

1.3 Features

- Bluetooth® SIG Bluetooth Low Energy Single-Mode (BLE) compliant
- Low-power 2.4GHz Transceiver
- ARM968E Core Microprocessor integrated
- 500 KB programmable Flash for Program and 64 KB RAM for Data
- 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 32KHz crystal oscillator
 - MCU can run with any clock source with internal frequency divider
 - Dedicate audio PLL clock for I2S main clock
- Interface and peripheral units
 - Quad IO FLASH programming
 - JTAG, I2C, SPI interface
 - Two UART interface
 - Multi-channels PWM output
 - USB Host and Device interface
 - IrDA receiver and transmitter amplify
 - On-chip high accurate temperature sensor
 - On-chip 10 bit general ADC
 - On-chip audio gain amplify and 16 bit microphone ADC
 - GPIO with multiplexed interface functions
 - True random number generator
 - I2S/PCM digital audio interface with master and slave mode
- Typical Package Type
 - 32-pin QFN 4x4, 40-pin QFN5x5 and 48-pin QFN6x6

2 PIN information

2.1 QFN32

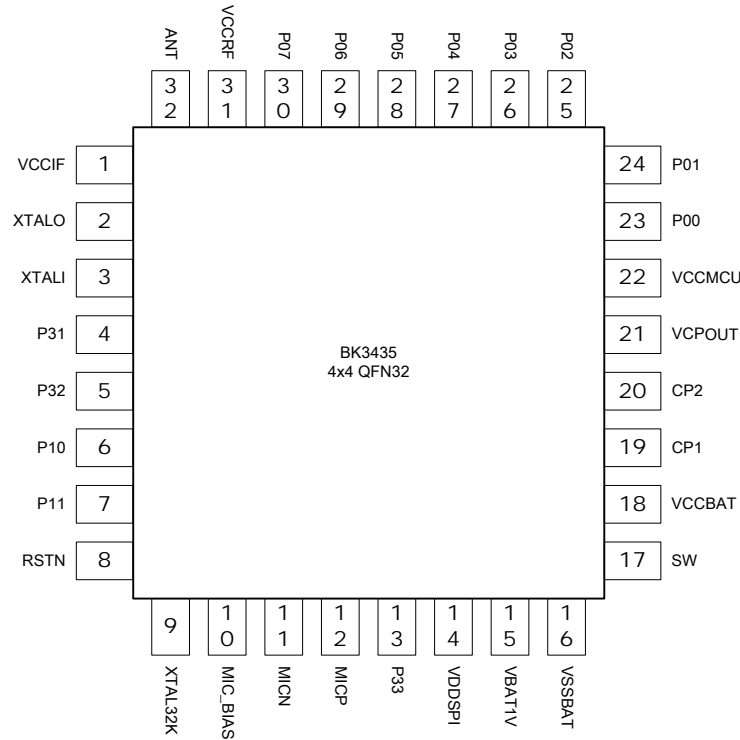


Figure 2 BK3435 QFN32 pin assignment

Table 1 BK3435 QFN32 Pin Description

PIN	Name	Pin Function	Description
1	VCCIF	Power	IF power, 1.5 V
2	XTALO	Analog	16 MHz crystal output
3	XTALI	Analog	16 MHz crystal input
4	P31	Digital I/O	General purpose IO
5	P32	Digital I/O	General purpose IO
6	P10	Digital I/O	General purpose IO
7	P11	Digital I/O	General purpose IO
8	RSTN	Analog	Active low pin reset
9	XTAL32K	Analog	32 kHz Crystal input
10	MIC_BIAS	Analog	Microphone bias voltage output, 1.5 V
11	MIC_N	Analog	Microphone input N
12	MIC_P	Analog	Microphone input P
13	P33	Digital I/O	General purpose IO
14	VDDSPI	Analog	LDO output, 1.5 V

15	VBAT1V	Analog	One battery mode (battery input) or two battery mode (Ground)
16	VSSBAT	Ground	Ground
17	SW	Analog	Switch regulator pin for two battery mode
18	VCCBAT	Power	Power, 3 V
19	CP1	Analog	Charge pump component for FLASH
20	CP2	Analog	Charge pump component for FLASH
21	CPOUT	Power	Charge pump output voltage for FLASH
22	VCCMCU	Power	Power, 1.5 V
23	P00	Digital I/O	General purpose IO
24	P01	Digital I/O	General purpose IO
25	P02	Digital I/O	General purpose IO
26	P03	Digital I/O	General purpose IO
27	P04	Digital I/O	General purpose IO
28	P05	Digital I/O	General purpose IO
29	P06	Digital I/O	General purpose IO
30	P07	Digital I/O	General purpose IO
31	VCCRF	Power	RF power, 1.5 V
32	ANT	RF	RF signal port

2.2 QFN40

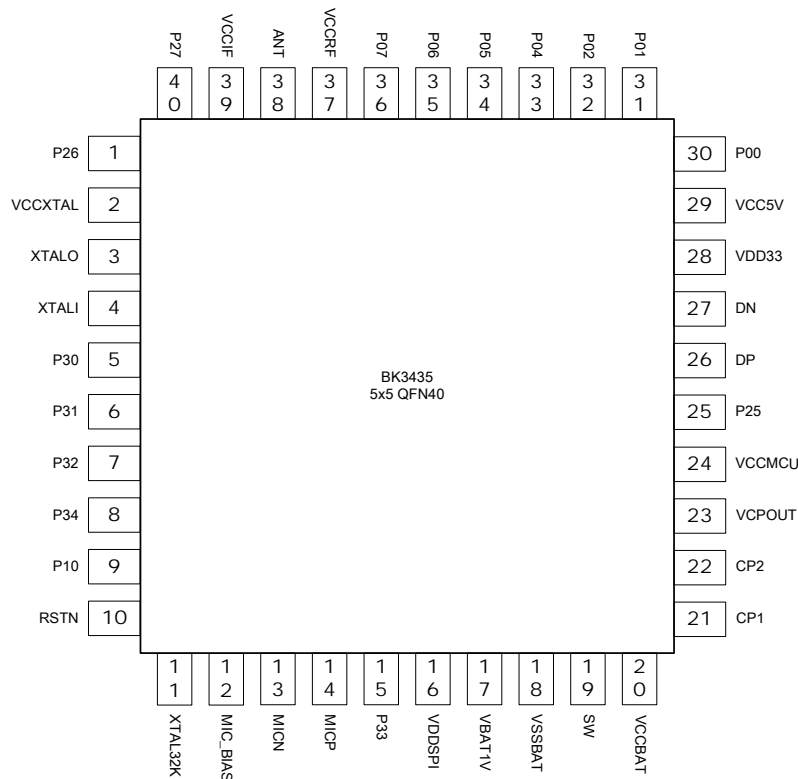


Figure 3 BK3435 QFN40 pin assignment

Table 2 BK3435 QFN40 Pin Description

PIN	Name	Pin Function	Description
1	P26	Digital I/O	General purpose IO
2	VCCXTAL	Power	XTAL power
3	XTALO	Analog	16 MHz crystal output
4	XTALI	Analog	16 MHz crystal input
5	P30	Digital I/O	General purpose IO
6	P31	Digital I/O	General purpose IO
7	P32	Digital I/O	General purpose IO
8	P34	Digital I/O	General purpose IO
9	P10	Digital I/O	General purpose IO
10	RSTN	Analog	Active low pin reset
11	XTAL32K	Analog	32kHz Crystal input
12	MIC_BIAS	Analog	Microphone bias voltage output
13	MIC_N	Analog	Microphone input N
14	MIC_P	Analog	Microphone input P
15	P33	Digital I/O	General purpose IO
16	VDDSPI	Analog	LDO output
17	VBAT1V	Analog	One battery mode (battery input) or two battery mode (Ground)
18	VSSBAT	Ground	Ground
19	SW	Analog	Switch regulator pin for two battery mode
20	VCCBAT	Power	Power
21	CP1	Analog	Charge pump component for FLASH
22	CP2	Analog	Charge pump component for FLASH
23	CPOUT	Power	Charge pump output voltage for FLASH
24	VCCMCU	Power	Power
25	P25	Digital I/O	General purpose IO
26	DP	Analog	USB positive
27	DN	Analog	USB negative
28	VDD33	Power	USB LDO output, works only VCCBAT is applied
29	VCC5V	Power	USB power supply
30	P00	Digital I/O	General purpose IO
31	P01	Digital I/O	General purpose IO
32	P02	Digital I/O	General purpose IO
33	P04	Digital I/O	General purpose IO
34	P05	Digital I/O	General purpose IO
35	P06	Digital I/O	General purpose IO
36	P07	Digital I/O	General purpose IO
37	VCCRF	Power	RF power
38	ANT	RF	RF signal port
39	VCCIF	Power	IF power
40	P27	Digital I/O	General purpose IO

2.3 QFN48(BK3435QN48A)

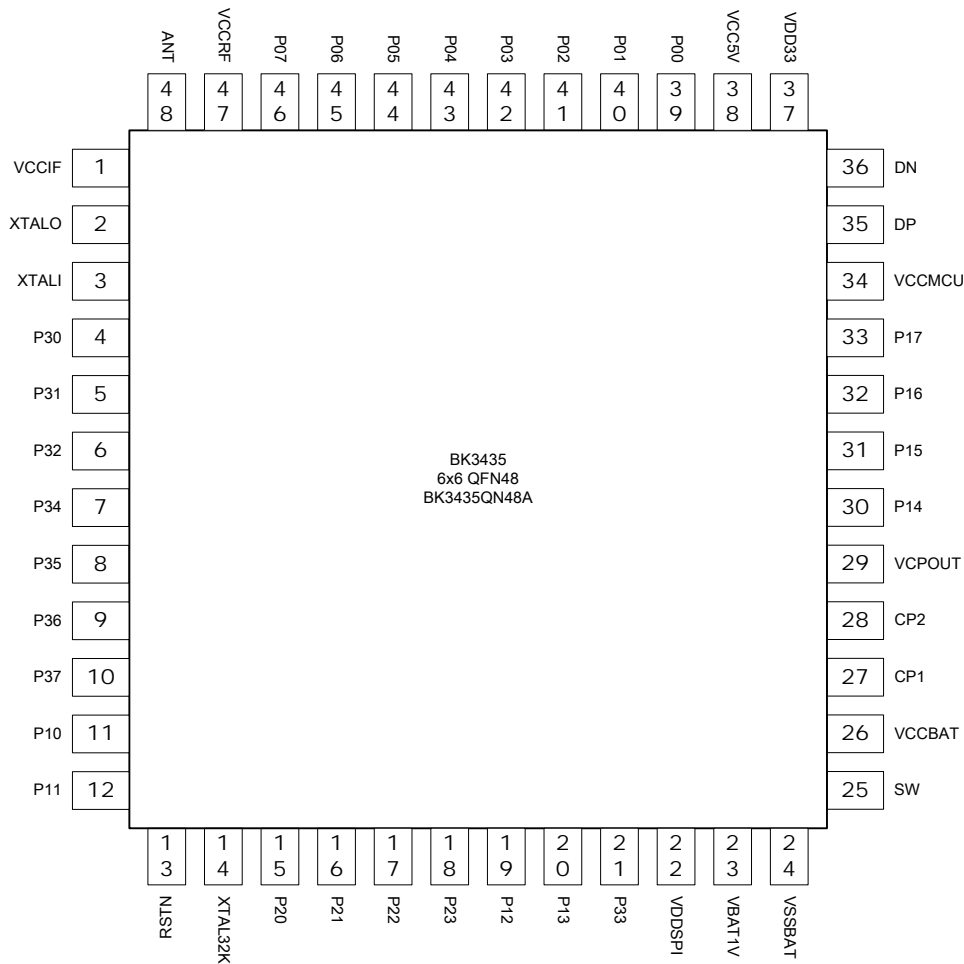


Figure 4 BK3435 QFN48 pin assignment(BK3435QN48A)

Table 3 BK3435 QFN48 Pin Description(BK3435QN48A)

PIN	Name	Pin Function	Description
1	VCCIF	Power	IF power
2	XTALO	Analog	16 MHz crystal output
3	XTALI	Analog	16 MHz crystal input
4	P30	Digital I/O	General purpose IO
5	P31	Digital I/O	General purpose IO
6	P32	Digital I/O	General purpose IO
7	P34	Digital I/O	General purpose IO
8	P35	Digital I/O	General purpose IO
9	P36	Digital I/O	General purpose IO
10	P37	Digital I/O	General purpose IO



BK3435 Datasheet

V 2.6

11	P10	Digital I/O	General purpose IO
12	P11	Digital I/O	General purpose IO
13	RSTN	Analog	Active low pin reset
14	XTAL32K	Analog	32kHz Crystal input
15	P20	Digital I/O	General purpose IO
16	P21	Digital I/O	General purpose IO
17	P22	Digital I/O	General purpose IO
18	P23	Digital I/O	General purpose IO
19	P12	Digital I/O	General purpose IO
20	P13	Digital I/O	General purpose IO
21	P33	Digital I/O	General purpose IO
22	VDDSPI	Analog	LDO output
23	VBAT1V	Analog	One battery mode (battery input) or two battery mode (Ground)
24	VSSBAT	Ground	Ground
25	SW	Analog	Switch regulator pin for two battery mode
26	VCCBAT	Power	Power
27	CP1	Analog	Charge pump component for FLASH
28	CP2	Analog	Charge pump component for FLASH
29	CPOUT	Power	Charge pump output voltage for FLASH
30	P14	Digital I/O	General purpose IO
31	P15	Digital I/O	General purpose IO
32	P16	Digital I/O	General purpose IO
33	P17	Digital I/O	General purpose IO
34	VCCMCU	Power	Power
35	DP	Analog	USB positive
36	DN	Analog	USB negative
37	VDD33	Power	USB LDO output
38	VCC5V	Power	USB power supply
39	P00	Digital I/O	General purpose IO
40	P01	Digital I/O	General purpose IO
41	P02	Digital I/O	General purpose IO
42	P03	Digital I/O	General purpose IO
43	P04	Digital I/O	General purpose IO
44	P05	Digital I/O	General purpose IO
45	P06	Digital I/O	General purpose IO
46	P07	Digital I/O	General purpose IO
47	VCCRF	Power	RF power
48	ANT	RF	RF signal port

2.4 QFN48(BK3435QN48B)

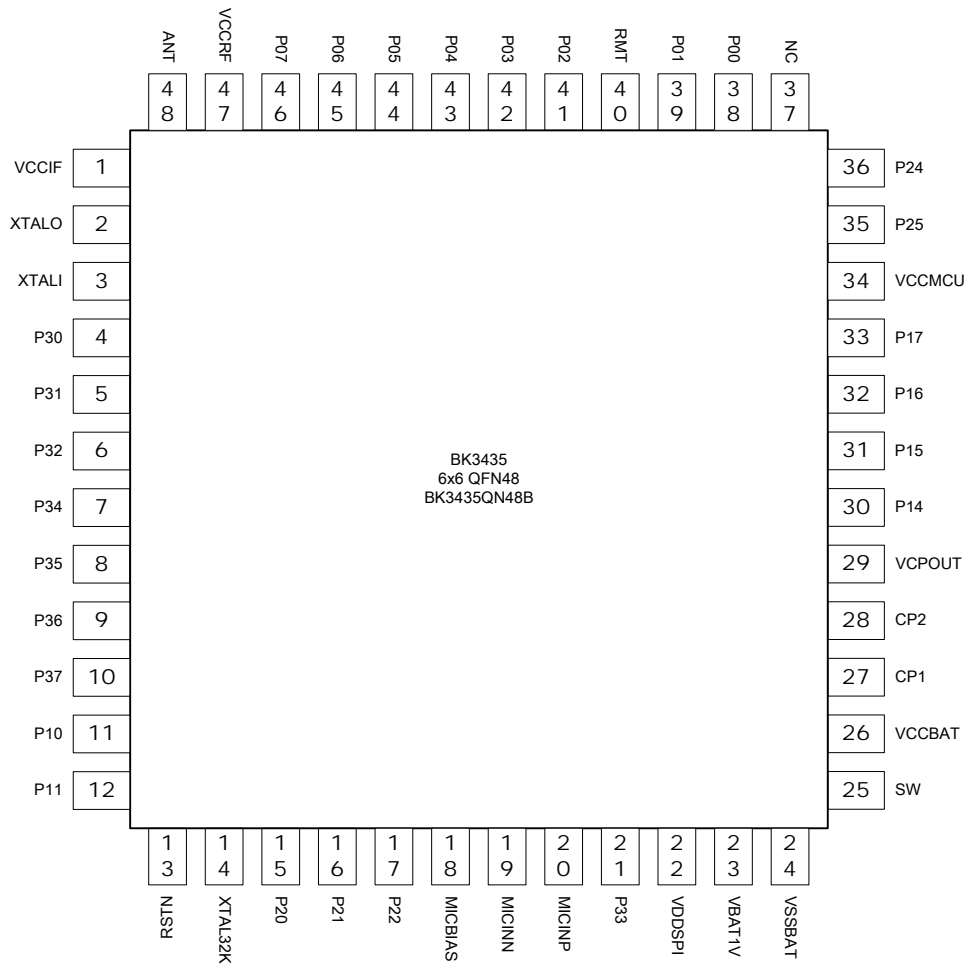


Figure 5 BK3435 QFN48 pin assignment(BK3435QN48B)

Table 4 BK3435 QFN48 Pin Description(BK3435QN48B)

PIN	Name	Pin Function	Description
1	VCCIF	Power	IF power
2	XTALO	Analog	16 MHz crystal output
3	XTALI	Analog	16 MHz crystal input
4	P30	Digital I/O	General purpose IO
5	P31	Digital I/O	General purpose IO
6	P32	Digital I/O	General purpose IO
7	P34	Digital I/O	General purpose IO
8	P35	Digital I/O	General purpose IO
9	P36	Digital I/O	General purpose IO

10	P37	Digital I/O	General purpose IO
11	P10	Digital I/O	General purpose IO
12	P11	Digital I/O	General purpose IO
13	RSTN	Analog	Active low pin reset
14	XTAL32K	Analog	32kHz Crystal input
15	P20	Digital I/O	General purpose IO
16	P21	Digital I/O	General purpose IO
17	P22	Digital I/O	General purpose IO
18	MICBIAS	Analog	Microphone bias voltage output, 1.5 V
19	MICINN	Analog	Microphone input N
20	MICINP	Analog	Microphone input P
21	P33	Digital I/O	General purpose IO
22	VDDSPI	Analog	LDO output
23	VBAT1V	Analog	One battery mode (battery input) or two battery mode (Ground)
24	VSSBAT	Ground	Ground
25	SW	Analog	Switch regulator pin for two battery mode
26	VCCBAT	Power	Power
27	CP1	Analog	Charge pump component for FLASH
28	CP2	Analog	Charge pump component for FLASH
29	CPOUT	Power	Charge pump output voltage for FLASH
30	P14	Digital I/O	General purpose IO
31	P15	Digital I/O	General purpose IO
32	P16	Digital I/O	General purpose IO
33	P17	Digital I/O	General purpose IO
34	VCCMCU	Power	Power
35	P25	Digital I/O	General purpose IO
36	P24	Digital I/O	General purpose IO
37	NC	No connect	NA
38	P00	Digital I/O	General purpose IO
39	P01	Digital I/O	General purpose IO
40	RMT	Analog	IR TRX ended
41	P02	Digital I/O	General purpose IO
42	P03	Digital I/O	General purpose IO
43	P04	Digital I/O	General purpose IO
44	P05	Digital I/O	General purpose IO
45	P06	Digital I/O	General purpose IO
46	P07	Digital I/O	General purpose IO
47	VCCRF	Power	RF power
48	ANT	RF	RF signal port

3 Functional Description

3.1 GPIO

The BK3435 has totally many 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 5 BK3435 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-IR_TRX	I/O	HOLD_FL A		
P03		SDA	I/O	WP_FL A		JTAG_NTRST
P04	SPI	SPI_SCK	I/O	SI_FL A (Output To FLASH)	SPI_MOSI	JTAG_TDI
P05		SPI_MOSI	I/O	SO_FL A	SPI_MISO	JTAG_TDO
P06		SPI_MISO	I/O	SCK_FL A	SPI_SCK	JTAG_TCK
P07		SPI_NSS	I/O	CSN_FL A	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]	O			
P15		PWM[5]	O			
P16	UART2	UART2_TX	O			
P17		UART2_RX	O			
P20	3DS	PWM_3DS	O			
P21		PWM_3DS	O			
P22		PWM_3DS	O			
P23		PWM_3DS	O			
P25	I2S	PCM_BCLK	O			
P26		PCM_SCLK	O			
P27		PCM_DOUT	O			
P30	ADC	Ch0/PCM_DIN	I			
P31		Ch1	I			
P32		Ch2	I			
P33		Ch3/CKAUDIO				
P34		Ch4	I			
P35		Ch5	I			

P36		Ch6	I			
P37		Ch7	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 3DS Timers

There are four 22 bits timers for 3D glasses, who run with 16 MHz clock. The 3DS timers can be used to generate differential PWM waveform, and also can be used as general timer.

3.2.3 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 ROOSC 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 BK3435. Total eight external channels and two internal channels can be selected for ADC transfer. It supports both single and continuous mode. There is a 0~30 dB audio amplifier for the external input, with 3 dB gain step.

ADC Channel Number	ADC Source
Channel 0	GPIO30
Channel 1	GPIO31
Channel 2	GPIO32
Channel 3	GPIO33
Channel 4	GPIO34
Channel 5	GPIO35
Channel 6	GPIO36
Channel 7	GPIO37
Channel 8	VCCBAT-pin
Channel 9 - Internal Channel	Temperature Sensor

3.4 UART, I2C and SPI

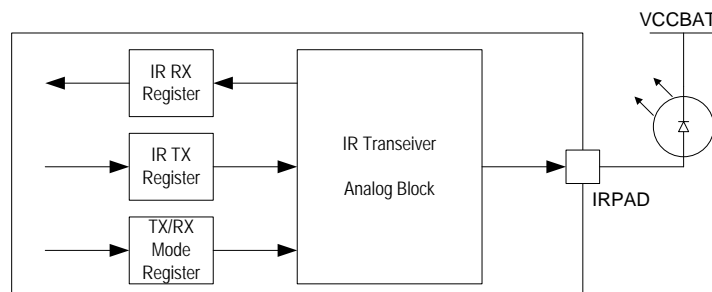
There are two set UARTs, one set I2C and one set SPI interface, which support both master and slave mode.

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

3.5 Audio interface

To convert audio signal from microphone input to digital, there is a 0 to 42 dB gain audio PGA with 3 dB gain step and 16 bit 16 kHz sigma-delta ADC.

3.6 IrDA Transceiver



It integrates IR receiver and transmitter amplify that the chip can support IR function without any external amplifier.

3.7 USB

It integrates USB host and device transceiver and base band.

3.8 True random number generator

By using device noise variation characteristic, it provides one bit true random number generator.

3.9 I2S Digital Audio

The I2S audio interface is mapped to GPIO[25,26,27,30], which support arbitrate sample rate from 8 kHz to 96 kHz. When working as master, the main clock can be output from GPIO33.

The I2S interface supports both PCM mono channel mode and I2S stereo channel mode. The data width can be 16, 24 and 32 bit.

4 Electrical Specifications

Table 6 BK3435 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		TBD		uA	
IVDD	Sleep current (RF OFF, 32 kHz clock, DIG Retention)		2		uA	



BK3435 Datasheet

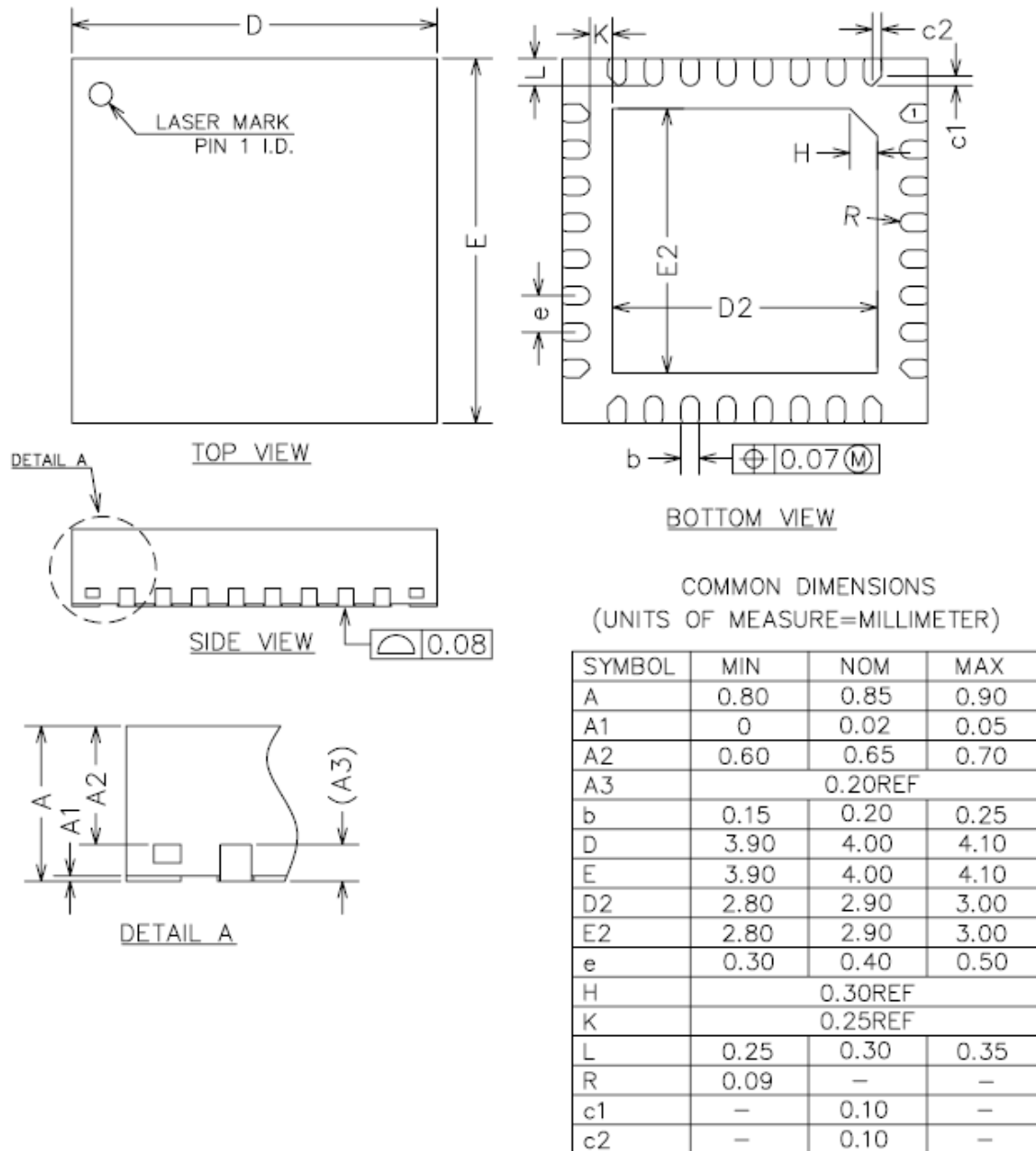
V 2.6

IVDD	Active RX (3.3 V)		5.2		mA	With DCDC regulator
IVDD	Active TX @ -1 dBm (3.3 V)		5		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	185	250	300	kHz	
Drift	Transmit drift in any position			400	Hz/us	
Receiver						
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 □adjacent to image channel		-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

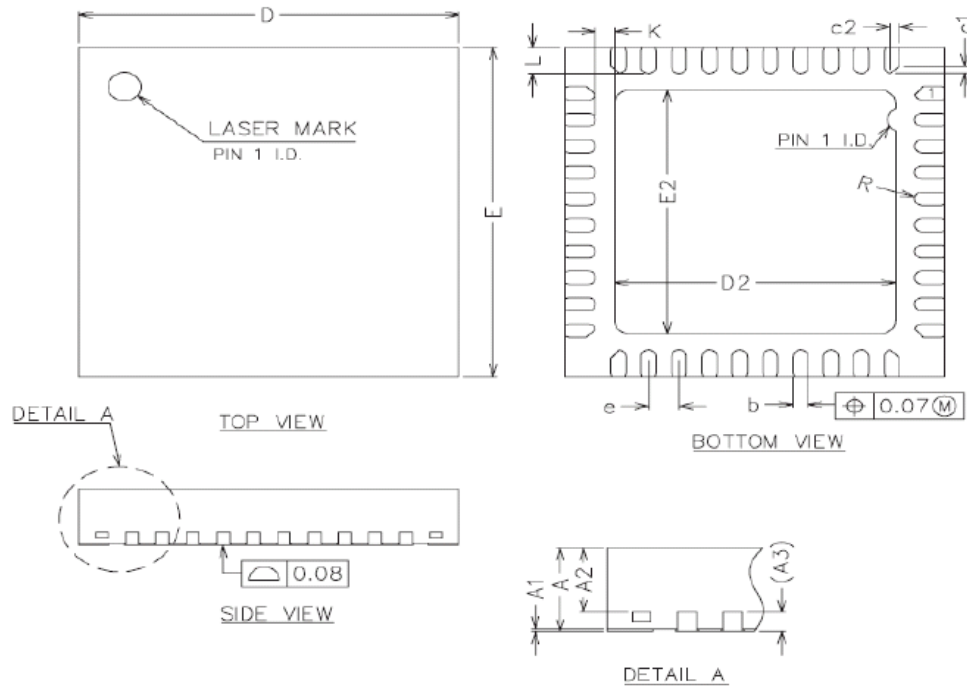
5.1 QFN 4x4 32-Pin

The BK3435 32-Pin uses the 4mmx4mm QFN package.



5.2 QFN 5x5 40-Pin

The BK3435 40-Pin uses the 5mmx5mm QFN package.

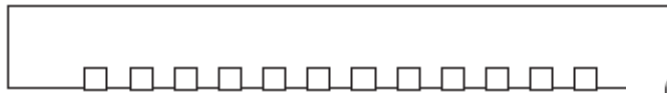
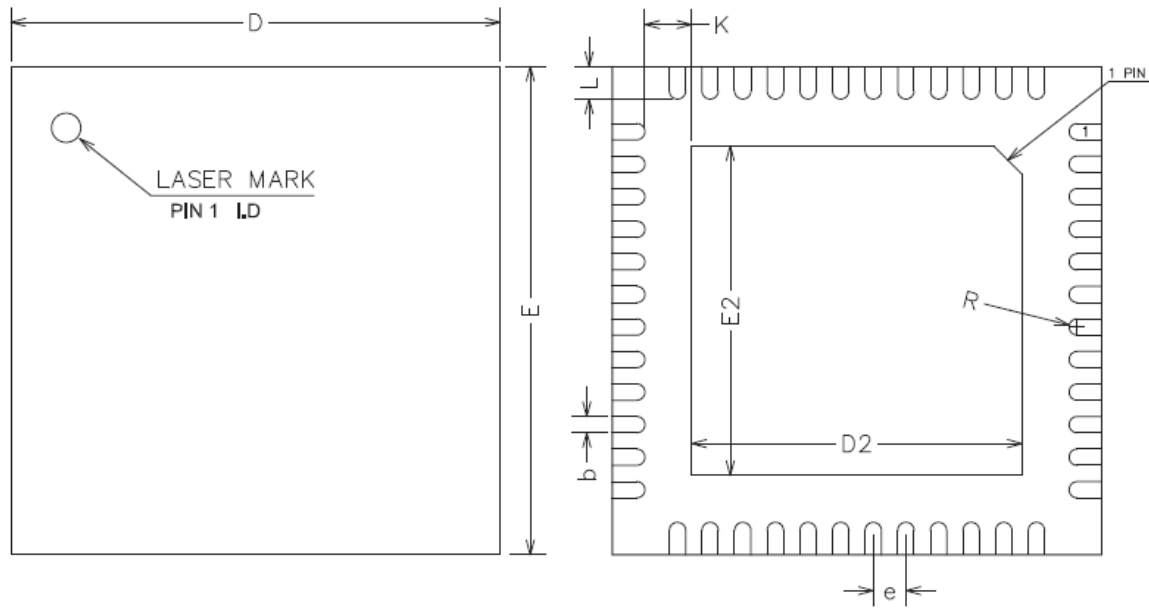


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.02	0.05
A2	0.50	0.65	0.60
A3	0.20REF		
b	0.15	0.20	0.25
D	4.90	5.00	5.10
E	4.90	5.00	5.10
D2	3.60	3.70	3.80
E2	3.60	3.70	3.80
e	0.35	0.40	0.45
K	0.20	—	—
L	0.35	0.40	0.45
R	0.075	—	—
C1	—	0.12	—
C2	—	0.12	—

5.3 QFN 6x6 48-Pin

The BK3435 48-Pin uses the 6mmx6mm QFN package.



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.20REF		
b	0.15	0.20	0.25
D	5.90	6.00	6.10
E	5.90	6.00	6.10
D2	3.95	4.05	4.15
E2	3.95	4.05	4.15
e	0.35	0.40	0.45
K	0.20	—	—
L	0.35	0.40	0.45
R	0.09	—	—



6 Order Information

Part number	Package	Packing	Minimum Order Quantity
BK3435QN32B	QFN 4mmx4mm 32-Pin	Tape Reel	3K
BK3435QN40C	QFN 5mmx5mm 40-Pin	Tape Reel	3K
BK3435QN48B	QFN 6mmx6mm 48-Pin	Tape Reel	3K

Revision History

Version	Date	Author(s)	Description
1.0	14/Feb/2017	WF	Initial
	14/July/2017	WF	Update resource and feature
2.0	28/July/2017	WF	Update pin information and ADC channel assignment
2.1	29/July/2017	WF	Add 48-pin package((BK3435QN48A)
2.2	22/Aug/2017	WF	Add 40-pin package and update description
2.4	7/Sep/2017	WF	Update 40-pin package with USB added
2.5	26/Dec/2017	WF	Correct/Swap ADC channe 8 and 9
2.6	28/June/2018	MS	Add 48-pin package(BK3435QN48B)