BK2480 Series Datasheet

DS-BK2480-E04 V1.0

2022/6/14

Contents

1. Features

2.4 GHz Proprietary

• Worldwide 2.4 GHz ISM band operation

• 250 kbps, 1 Mbps, and 2 Mbps air data rates

• TX power up to +5 dBm

• RX sensitivity -95 dBm

Core and Memory

• 8051 compliant MCU

• 2 KB extension RAM (XRAM)

• 256 B internal RAM (IRAM)

• 8 KB OTP memory for program with read-out protection

• I2C for OTP programming

Clock Management

• External oscillator: 16 MHz crystal oscillator (X16M)

• Internal oscillator: 32 kHz ring oscillator (ROSC)

• 48 MHz PLL

Power Management

• 1.8 to 3.6 V VDD3V supply

• 4.75 to 5.25 V VUSB5V supply (only BK2481)

• On-chip power-on reset (POR) and brown-out detector (BOD)

• Embedded LDO regulators

• Low power consumption:

    − Active mode RX, 2 Mbps: 15 mA

    − Active mode TX 0 dBm, 2 Mbps: 14 mA

    − Normal standby mode: TBD

    − Low voltage standby mode: TBD

    − Deep sleep mode: TBD

Peripherals

- GPIOs: 7 in QFN16 (BK2481QN16), 11 in QFN20 (BK2481QN20), 9 in SOP16 (BK2482SO16), 25 in QFN32 (BK2482QN32), 40 in QFN48 (BK2483QN48)

- 1x UART

- 1x full-speed USB 2.0/1.1

- 1x RGB LED controller

- 1x comparator

- 2x general-purpose timer/counter

- 1x watchdog timer

- 1x low-power timer

- 1x true random number generator (TRNG)

- AES 128-bit hardware accelerator

Packaging

- BK2481

  - QFN16 package, 3 x 3 mm

  - QFN20 package, 4 x 4 mm

- BK2482

  - SOP16 package

  - QFN32 package, 4 x 4 mm

- BK2483

  - QFN48 package, 6 x 6 mm

- Operating temperature range: -20 to +85 ℃

2. Overview

The BK2480 is a single-chip 2.4 GHz RF system-on-chip (SoC) intended for low power wireless applications. The BK2480 combines advantages of the high-performance 2.4 GHz RF transceiver with an enhanced 8051 compliant MCU, 2 KB of RAM and 8 KB of OTP memory and essential peripherals.

Using advanced design techniques and ultra-low-power process technology, the BK2480 delivers high integration and minimal power consumption in small packages for target applications such as USB dongles, mouse devices, keyboards, remote controls, toys, and lighting.

The BK2480 series includes BK2481, BK2482 and BK2483.

Figure 2-1 shows the general block diagram of the BK2480.

Figure 2-1 BK2480 Block Diagram
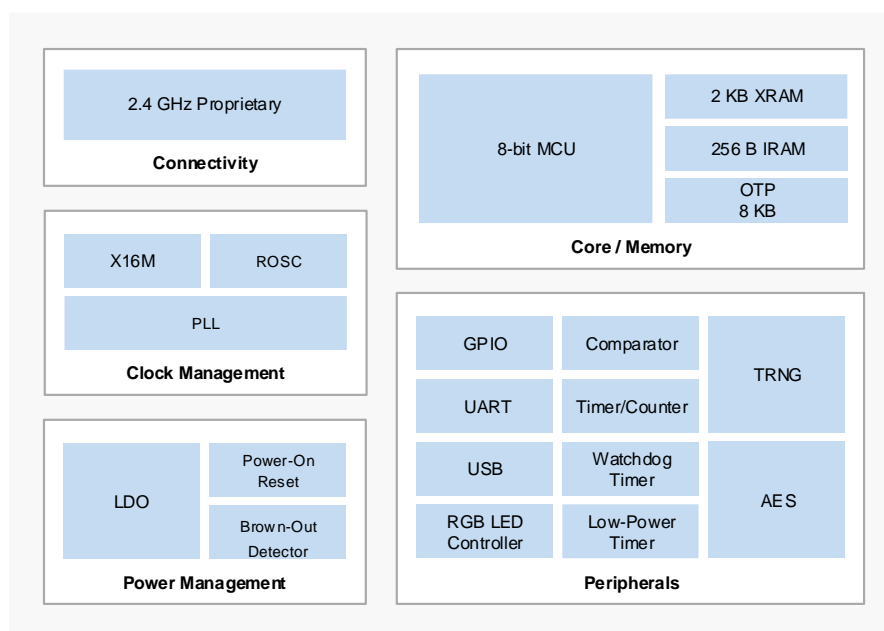
The BK2480 devices are offered in several packages. The set of included peripherals varies depending on package. Table 2-1 shows the list of peripherals available on each part number.

Table 2-1 Device Options and Features

Feature	BK2481QN16	BK2481QN20	BK2482SO16	BK2482QN32	BK2483QN48
GPIO	7	11	9	25	40
UART	1	1	1	1	1
USB	1	1	-	-	-

Feature		BK2481QN16	BK2481QN20	BK2482SO16	BK2482QN32	BK2483QN48
RGB LED Controller		-	-	1	1	1
Comparator		1	1	1	1	1
Timer	General-purpose timer/counter	2	2	2	2	2
	Watchdog timer	1	1	1	1	1
	Low-power timer	1	1	1	1	1
TRNG		Yes				
AES hardware accelerator		Yes				
Package		3 x 3 mm QFN16	4 x 4 mm QFN20	SOP16	4 x 4 mm QFN32	6 x 6 mm QFN48
Operating voltage		4.75 to 5.25 V	4.75 to 5.25 V	1.8 to 3.6 V	1.8 to 3.6 V	1.8 to 3.6 V
Operating temperature		-20 to +85 ℃				

3. Pin Description

The BK2480 provides 2.4 GHz proprietary functionality in several packages ranging from 16 pins to 48 pins.

3.1 BK2481QN16 Pin Description

Figure 3-1 shows the pin assignments of the 3 x 3 mm, 16-pin QFN package for BK2481QN16.

Figure 3-1 QFN16 Pin Assignments of BK2481QN16
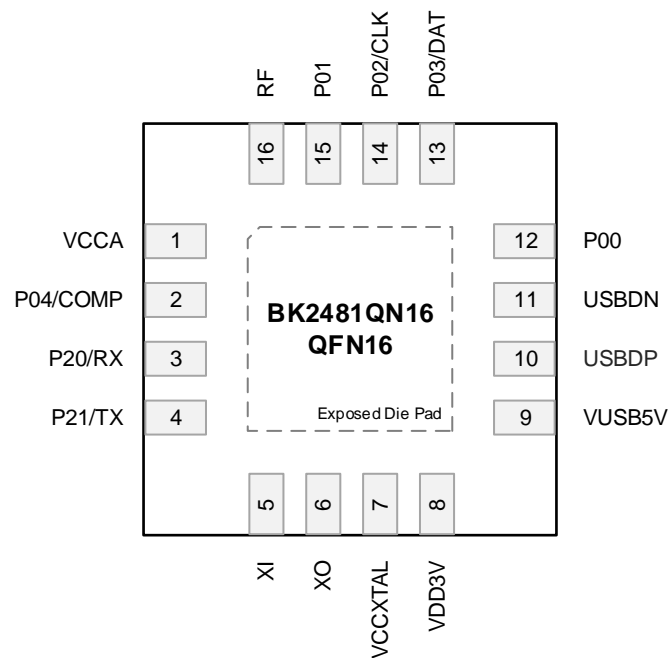
Table 3-1 shows the pin descriptions of BK2481QN16.

Table 3-1 QFN16 Pin Descriptions of BK2481QN16

Pin #	Name	I/O	Type	Description
1	VCCA	-	Analog input	Analog power supply
2	P04/COMP	I/O	Digital/Analog	• GPIO04 • Comparator input
3	P20/RX	I/O	Digital	• GPIO20 • UART: RX

Pin #	Name	I/O	Type	Description
4	P21/TX	I/O	Digital	• GPIO21 • UART: TX
5	XI	-	Analog input	16 MHz crystal input
6	XO	-	Analog output	16 MHz crystal output
7	VCCXTAL	-	Analog input	Crystal power supply
8	VDD3V	-	Analog output	3.0 V output
9	VUSB5V	-	Analog input	USB 5.0 V input
10	USBDP	I/O	Digital	USB DP
11	USBDN	I/O	Digital	USB DN
12	P00	I/O	Digital	GPIO00
13	P03/DAT	I/O	Digital	• GPIO03 • I2C Serial data for OTP programming
14	P02/CLK	I/O	Digital	• GPIO02 • I2C serial clock for OTP programming
15	P01	I/O	Digital	GPIO01
16	RF	-	RF	2.4 GHz RF signal port
Die pad	GND_SLUG	-	GND	Ground

3.2 BK2481QN20 Pin Description

Figure 3-2 shows the pin assignments of the 4 x 4 mm, 20-pin QFN package for BK2481QN20.

Figure 3-2 QFN20 Pin Assignments of BK2481QN20
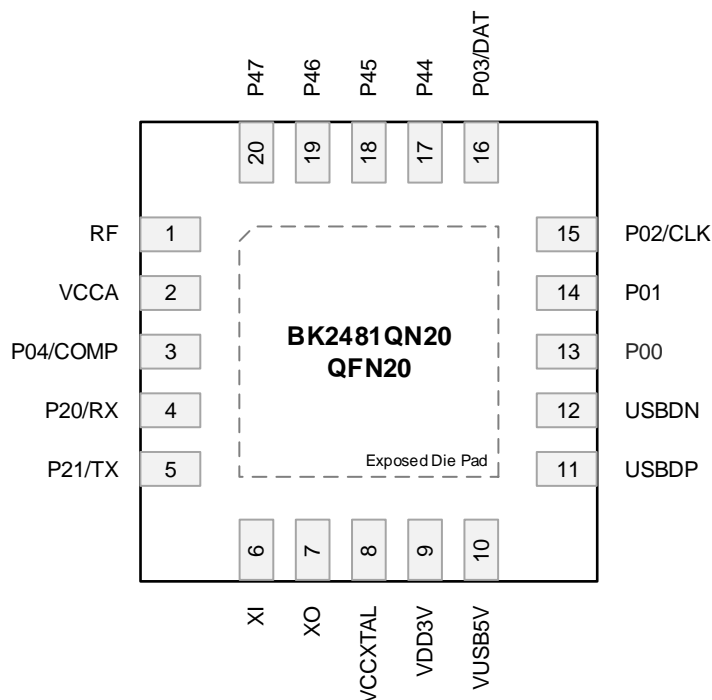
Table 3-2 shows the pin descriptions of BK2481QN20 .

Table 3-2 QFN20 Pin Descriptions of BK2481QN20

Pin #	Name	I/O	Type	Description
1	RF	-	RF	2.4 GHz RF signal port
2	VCCA	-	Analog input	Analog power supply
3	P04/COMP	I/O	Digital/Analog	• GPIO04 • Comparator input
4	P20/RX	I/O	Digital	• GPIO20 • UART: RX
5	P21/TX	I/O	Digital	• GPIO21 • UART: TX
6	XI	-	Analog input	16 MHz crystal input
7	XO	-	Analog output	16 MHz crystal output
8	VCCXTAL	-	Analog input	Crystal power supply
9	VDD3V	-	Analog output	3.0 V output

Pin #	Name	I/O	Type	Description
10	VUSB5V	-	Analog input	USB 5.0 V input
11	USBDP	I/O	Digital	USB DP
12	USBDN	I/O	Digital	USB DN
13	P00	I/O	Digital	GPIO00
14	P01	I/O	Digital	GPIO01
15	P02/CLK	I/O	Digital	• GPIO02 • I2C serial clock for OTP programming
16	P03/DAT	I/O	Digital	• GPIO03 • I2C serial data for OTP programming
17	P44	I/O	Digital	GPIO44
18	P45	I/O	Digital	GPIO45
19	P46	I/O	Digital	GPIO46
20	P47	I/O	Digital	GPIO47
Die pad	GND_SLUG	-	GND	Ground

3.3 BK2482SO16 Pin Description

Figure 3-3 shows the pin assignments of the 16-pin SOP package for BK2482SO16.

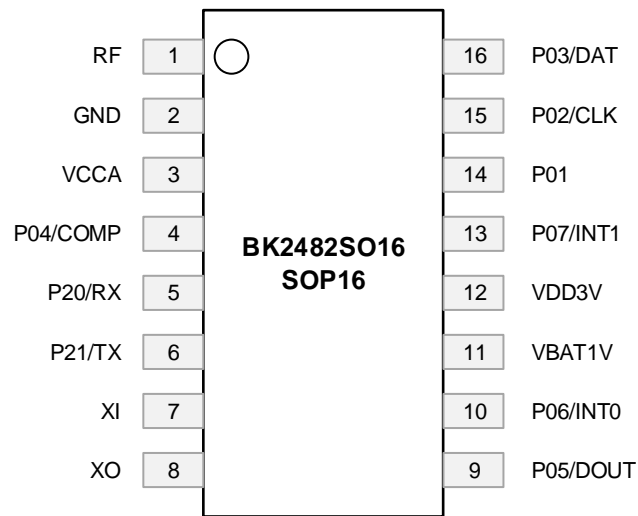**Figure 3-3 SOP16 Pin Assignments of BK2482SO16**

Table 3-3 shows the pin descriptions of BK2482SO16.

Table 3-3 SOP16 Pin Descriptions of BK2482SO16

Pin #	Name	I/O	Type	Description
1	RF	-	RF	2.4 GHz RF signal port
2	GND	-	GND	Ground
3	VCCA	-	Analog input	Analog power supply
4	P04/COMP	I/O	Digital/Analog	• GPIO04 • Comparator input
5	P20/RX	I/O	Digital	• GPIO20 • UART: RX
6	P21/TX	I/O	Digital	• GPIO21 • UART: TX
7	XI	-	Analog input	16 MHz crystal input
8	XO	-	Analog output	16 MHz crystal output
9	P05/DOUT	I/O	Digital	• GPIO05 • RGB data output
10	P06/INT0	I/O	Digital	• GPIO06 • External interrupt 0 input, active low
11	VBAT1V	-	GND	Ground
12	VDD3V	-	Analog input	3.0 V battery input
13	P07/INT1	I/O	Digital	• GPIO07 • External interrupt 1 input, active low
14	P01	I/O	Digital	GPIO01
15	P02/CLK	I/O	Digital	• GPIO02 • I2C serial clock for OTP programming
16	P03/DAT	I/O	Digital	• GPIO03 • I2C serial data for OTP programming

3.4 BK2482QN32 Pin Description

Figure 3-4 shows the pin assignments of the 4 x 4 mm, 32-pin QFN package for BK2482QN32.

Figure 3-4 QFN32 Pin Assignments of BK2482QN32
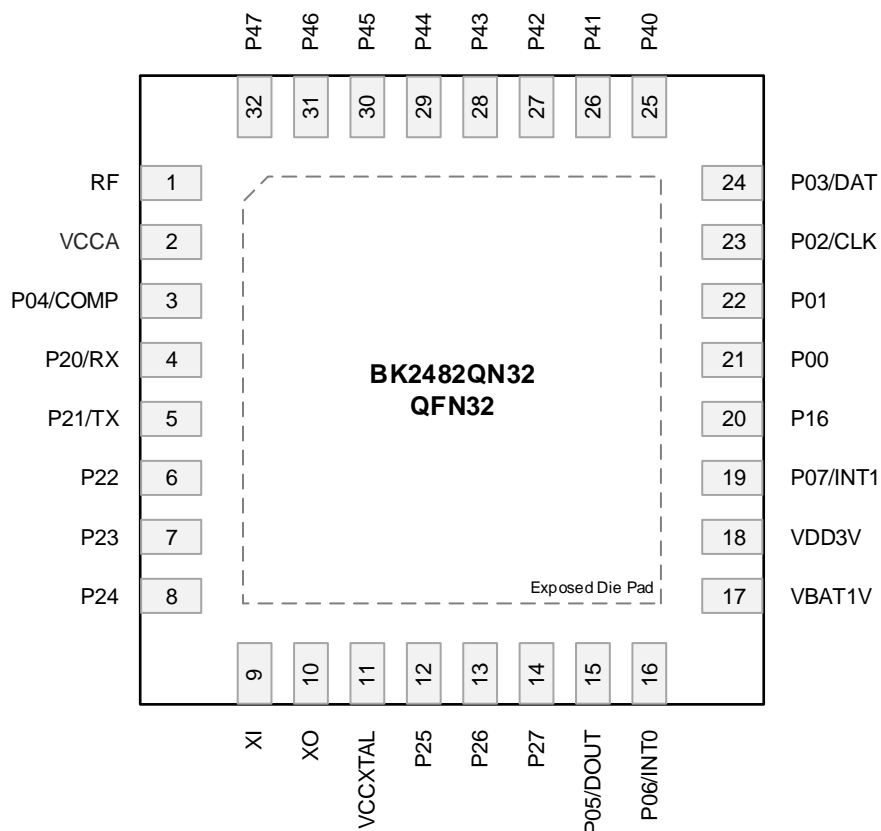
Table 3-4 shows the pin descriptions of BK2482QN32.

Table 3-4 QFN32 Pin Descriptions of BK2482QN32

Pin #	Name	I/O	Type	Description
1	RF	-	RF	2.4 GHz RF signal port
2	VCCA	-	Analog input	Analog power supply
3	P04/COMP	I/O	Digital/Analog	• GPIO04 • Comparator input
4	P20/RX	I/O	Digital	• GPIO20 • UART: RX
5	P21/TX	I/O	Digital	• GPIO21 • UART: TX
6	P22	I/O	Digital	GPIO22

Pin #	Name	I/O	Type	Description
7	P23	I/O	Digital	GPIO23
8	P24	I/O	Digital	GPIO24
9	XI	-	Analog input	16 MHz crystal input
10	XO	-	Analog output	16 MHz crystal output
11	VCCXTAL	-	Analog input	Crystal power supply
12	P25	I/O	Digital	GPIO25
13	P26	I/O	Digital	GPIO26
14	P27	I/O	Digital	GPIO27
15	P05/DOUT	I/O	Digital	• GPIO05 • RGB data output
16	P06/INT0	I/O	Digital	• GPIO06 • External interrupt 0 input, active low
17	VBAT1V	-	GND	Ground
18	VDD3V	-	Analog input	3.0 V battery input
19	P07/INT1	I/O	Digital	• GPIO07 • External interrupt 1 input, active low
20	P16	I/O	Digital	GPIO16
21	P00	I/O	Digital	GPIO00
22	P01	I/O	Digital	GPIO01
23	P02/CLK	I/O	Digital	• GPIO02 • I2C serial clock for OTP programming
24	P03/DAT	I/O	Digital	• GPIO03 • I2C serial data for OTP programming
25	P40	I/O	Digital	GPIO40
26	P41	I/O	Digital	GPIO41
27	P42	I/O	Digital	GPIO42
28	P43	I/O	Digital	GPIO43
29	P44	I/O	Digital	GPIO44
30	P45	I/O	Digital	GPIO45

Pin #	Name	I/O	Type	Description
31	P46	I/O	Digital	GPIO46
32	P47	I/O	Digital	GPIO47
Die pad	GND_SLUG	-	GND	Ground

3.5 BK2483QN48 Pin Description

Figure 3-5 shows the pin assignments of the 6 x 6 mm, 48-pin QFN package for BK2483QN48.

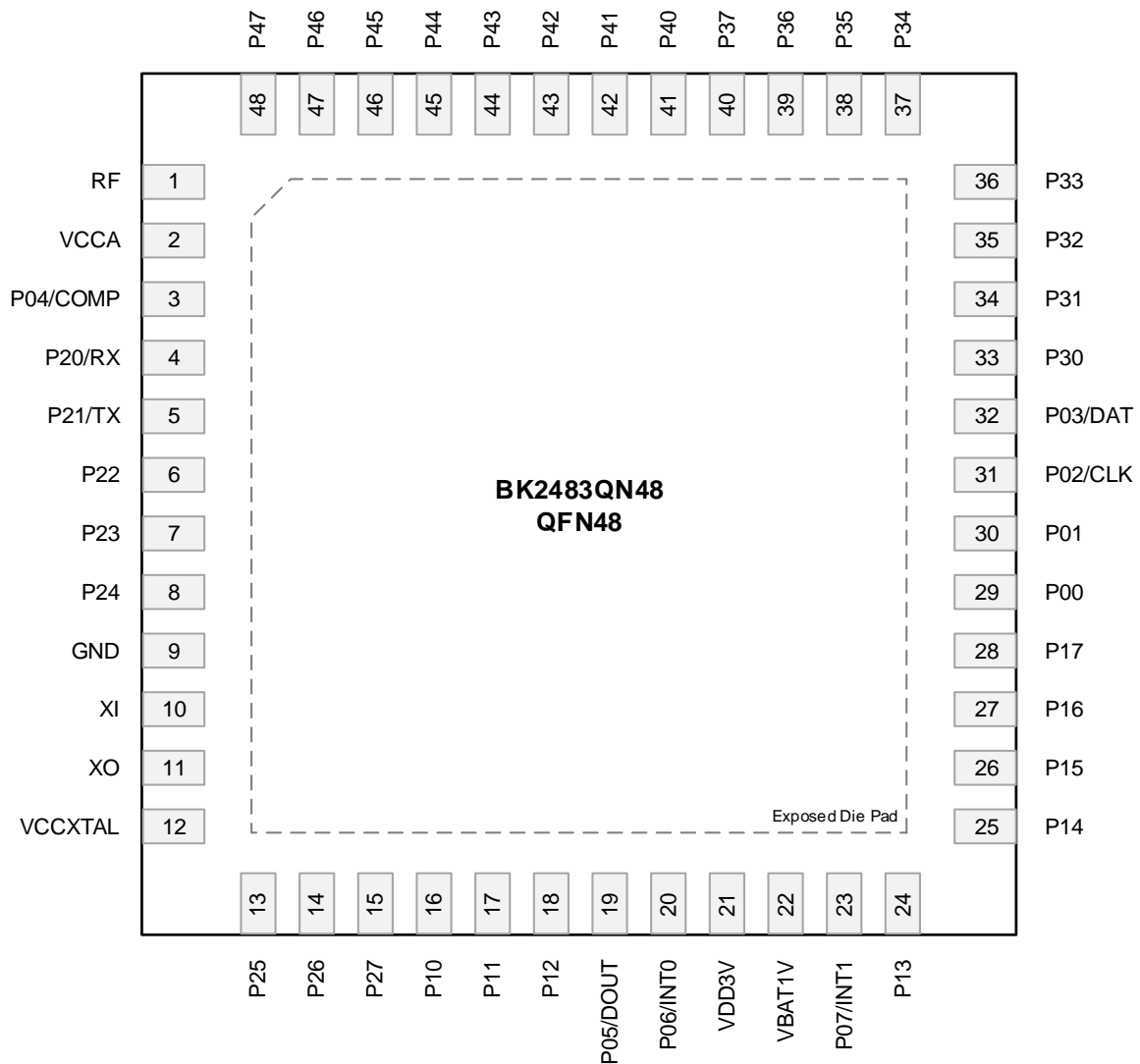**Figure 3-5 QFN48 Pin Assignments of BK2483QN48**

Table 3-5 shows the pin descriptions of BK2483QN48.

Table 3-5 QFN48 Pin Descriptions of BK2483QN48

Pin #	Name	I/O	Type	Description
1	RF	-	RF	2.4 GHz RF signal port
2	VCCA	-	Analog input	Analog power supply
3	P04/COMP	I/O	Digital/Analog	• GPIO04 • Comparator input
4	P20/RX	I/O	Digital	• GPIO20 • UART: RX
5	P21/TX	I/O	Digital	• GPIO21 • UART: TX
6	P22	I/O	Digital	GPIO22
7	P23	I/O	Digital	GPIO23
8	P24	I/O	Digital	GPIO24
9	GND	-	GND	Ground
10	XI	-	Analog input	16 MHz crystal input
11	XO	-	Analog output	16 MHz crystal output
12	VCCXTAL	-	Analog input	Crystal power supply
13	P25	I/O	Digital	GPIO25
14	P26	I/O	Digital	GPIO26
15	P27	I/O	Digital	GPIO27
16	P10	I/O	Digital	GPIO10
17	P11	I/O	Digital	GPIO11
18	P12	I/O	Digital	GPIO12
19	P05/DOUT	I/O	Digital	• GPIO05 • RGB data output
20	P06/INT0	I/O	Digital	• GPIO06 • External interrupt 0 input, active low
21	VDD3V	-	Analog input	3.0 V battery input
22	VBAT1V	-	GND	Ground
23	P07/INT1	I/O	Digital	• GPIO07

Pin #	Name	I/O	Type	Description
				• External interrupt 1 input, active low
24	P13	I/O	Digital	GPIO13
25	P14	I/O	Digital	GPIO14
26	P15	I/O	Digital	GPIO15
27	P16	I/O	Digital	GPIO16
28	P17	I/O	Digital	GPIO17
29	P00	I/O	Digital	GPIO00
30	P01	I/O	Digital	GPIO01
31	P02/CLK	I/O	Digital	• GPIO02 • I2C serial clock for OTP programming
32	P03/DAT	I/O	Digital	• GPIO03 • I2C serial data for OTP programming
33	P30	I/O	Digital	GPIO30
34	P31	I/O	Digital	GPIO31
35	P32	I/O	Digital	GPIO32
36	P33	I/O	Digital	GPIO33
37	P34	I/O	Digital	GPIO34
38	P35	I/O	Digital	GPIO35
39	P36	I/O	Digital	GPIO36
40	P37	I/O	Digital	GPIO37
41	P40	I/O	Digital	GPIO40
42	P41	I/O	Digital	GPIO41
43	P42	I/O	Digital	GPIO42
44	P43	I/O	Digital	GPIO43
45	P44	I/O	Digital	GPIO44
46	P45	I/O	Digital	GPIO45
47	P46	I/O	Digital	GPIO46
48	P47	I/O	Digital	GPIO47

Pin #	Name	I/O	Type	Description
Die pad	GND_SLUG	-	GND	Ground

4. Functional Description

4.1 Modes of Operation

The BK2480 supports three low power modes except active mode, namely deep sleep mode, low voltage standby mode and normal standby mode, where deep sleep mode has the lowest power consumption.

Deep Sleep Mode – In this mode, all circuits are powered down except GPIOs and the always on logic. Any GPIO edge transition or low-power timer time-out event can wake up the system again.

Low Voltage Standby Mode – In this mode, the MCU and all digital logic stop their clocks, and their power supply decreases to a much lower retention voltage, thus the current can be much lower. In this mode, only GPIOs and the RTC timer can resume the system to active mode with normal voltage.

Normal Standby Mode – In this mode, the MCU stops running and all peripheral interrupts can resume the MCU.

Active Mode – Normal operating mode where the MCU is active and all the peripherals are available.

4.2 RF Transceiver

The BK2480 integrates a high-performance 2.4 GHz GFSK RF transceiver that is designed for operating in the world wide ISM frequency band at 2400 - 2483.5 MHz. Burst mode transmission and up to 2 Mbps air data rate make them suited for low power wireless applications. The embedded packet processing engines enable full operation with a very simple MCU as a radio system. Auto re-transmission and auto acknowledge provide reliable link without any MCU interference.

The transceiver operates in time-division duplexing (TDD) mode either as a transmitter or as a receiver.

4.3 Crystal Oscillator

The BK2480 contains an integrated crystal oscillator driver circuit to drive an external 16 MHz crystal. The 16 MHz crystal frequency provides the reference frequency for the frequency synthesizer and can also be selected as the reference clock for internal PLLs. The startup time of the clock signal is about one milliseconds.

If an external reference clock is used, the clock input should be applied to the XI pin. Care must be taken not to overdrive the XI input with a voltage above 1.05 V.

4.4 Clock

The system has several root clock signals: X16M, D32K, ROSC and PLL.

- X16M: 16 MHz crystal oscillator.

- D32K: 32 kHz clock signal divided from X16M

- ROSC: 32 kHz internal low frequency ring oscillator

- PLL: 48 MHz PLL clock

The clock selection options for MCU and peripherals are listed as follows.

Table 4-1 Clock Selection

MCU and Peripherals	X16M	PLL	32 kHz Clock[a]
MCU	√		√
UART	√		
USB		√	
RGB LED controller	√		
Timer0	√		
Timer1	√		
Watchdog timer			√
Low-power timer			√

a.   The 32 kHz clock can be derived from D32K or ROSC.

4.5 Reset

A reset can be triggered by the following sources: Power-on reset, brown-out reset, watchdog reset, software reset, and wakeup from deep sleep mode.

System power on, digital power on and watchdog reset have the same reset effect on major blocks except always on logic, that any of them will reset corresponding blocks to initial state. The always on logic has a 32-bit timer which can only be reset to initial value by system power on reset.

Wakeup from deep sleep mode will power on digital from power down mode, which triggers the whole system reset procedure.

4.6 Power Management

The power management system on the BK2480 includes several internal LDO regulators to provide voltage and noise isolation to various parts of the chip.

The BK2481 is powered directly from a 4.75 V to 5.25 V USB power supply via the VUSB5V pin. Figure 4-1 below shows the power supply diagram of BK2481. The BK2482/BK2483 is powered directly from a 1.8 V to 3.6 V power supply via the VDD3V pin. All modules are powered by the SYS LDO regulator. Outputs from LDO regulators require proper bypass capacitors to reduce supply noise. Please refer to the BK2480 EVB User Guide and application note for more details about choosing the proper bypass capacitors.

Figure 4-1 BK2481 Power Supply
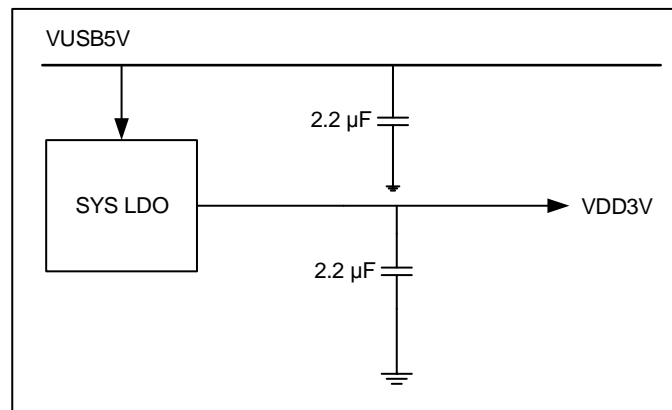
4.7 GPIO

The BK2480 has up to 40 GPIOs. Each can be configured as either input or output.

All GPIO pins can wake up the internal MCU from deep sleep mode. In deep sleep mode, any level change on the set GPIO will trigger the wakeup procedure.

4.8 UART

The Universal Asynchronous Receiver/Transmitter (UART) interface offers full-duplex, asynchronous serial communication at a baud rate up to 3.5 Mbps. It supports 5/6/7/8 bits data, and even, odd or none parity check. The stop bit can be either 1 bit or 2 bits.

4.9 USB

The full-speed USB controller is compliant with the USB 1.1 and 2.0 specification. The USB controller can operate as a device and supports full-speed (FS) operation (up to 12 Mbps).

The device supports 7 endpoints in addition to control endpoint 0. Endpoints 1 - 7 can be configured as IN or OUT and support bulk, interrupt, and isochronous data transfer. The FIFO memory available for each endpoint is as follows: 64 bytes for endpoint 0, 64 -512 bytes (configurable) for endpoints 1 - 7.

4.10 RGB LED Controller

The BK2480 has a RGB LED controller that supports Return-to-Zero (RZ) communication protocol. GPIO05 can be configured as an output capable of driving LEDs. With the external LED driver IC, the RGB LED controller can support up to 1024 LED beads. The duty cycle of code 0 and code 1 of RZ communication can be configured by register. The reset signal length can also be configured by register.

4.11 Comparator

The BK2480 embeds a comparator that compares an input voltage against a reference voltage. The reference voltage ranges from 0.85 V to 1.65 V. The external input can be derived from the analog input pin COMP (GPIO04). The internal input can be VDD3V/2 or VBAT1V. The reference offset can be calibrated, and the calibration data is stored in the OTP memory.

4.12 Timers

The BK2480 includes two general-purpose timers, a watchdog timer and a low-power timer.

The two timers, Timer0 and Timer1, are both 16-bit wide. Timer0/Timer1 uses 16 MHz clock as the main clock. Timer0 and Timer1 can be individually configured to operate as either a timer or as an event counter.

The watchdog timer runs on a 32 kHz clock and has a maximum programmable period of up to 16.4 ($2^{16}/32$ kHz * 8) seconds.

The low-power timer runs on a 32 Hz clock. It is used for low-power timing and it can keep running even when the MCU is powered off.

4.13 Security

The BK2480 includes a AES 128-bit hardware accelerator and a true random number generator (TRNG) to ensure system and communication security.

The hardware accelerator supports AES encryption/decryption with 128 bit key length and greatly reduces the execution time for cryptographic operations.

The random number generator module generates true, nondeterministic random numbers based on thermal noise for the purpose of creating keys, initialization vectors and nonces needed for cryptographic operations.

5. Electrical Characteristics

Note: Values currently listed in this section are preliminary measurements and are subject to change.

5.1 Absolute Maximum Ratings

Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for prolonged periods may affect the reliability of the device.

Parameter	Description	Min.	Max.	Unit
VDD3V	Battery input or USB LDO output	-0.3	3.6	V
VUSB5V	USB power supply	-0.3	5.25	V
P_{RX}	RX input power	-	10	dBm
T_{STR}	Storage temperature range	-40	150	℃

5.2 Recommended Operating Conditions

Parameter	Description	Min.	Typ.	Max.	Unit
VDD3V	Battery input or USB LDO output	1.8	3.3	3.6	V
VUSB5V	USB power supply	4.75	5.0	5.25	V
VCCA	Analog power supply	1.8	3.3	3.6	V
VCCXTAL	Crystal power supply	1.8	3.3	3.6	V
T_{OPR}	Operating temperature range	-20	-	85	℃

5.3 System LDO

Parameter	Description	Min.	Typ.	Max.	Unit
VUSB5V	USB power supply	4.75	5.0	5.25	V
VDD3V	USB LDO output	2.8	3.0	3.3	V
Load current	-	-	-	150	mA

5.4 Crystal and Reference Clock

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency	Crystal and reference frequency	-	16	-	MHz
Tolerance	Crystal and reference frequency tolerance	-10	-	+10	ppm
XI Pin	Input voltage range for reference clock input	-0.3	-	1.05	V

5.5 Current Consumption

Measured with T = 25 ℃, VDD3V = 3.0 V or VUSB5V = 5.0 V unless otherwise stated.

Parameter	Condition	Min.	Typ.	Max.	Unit
Active Mode					
RX current	2 Mbps	-	15	-	mA
	1 Mbps	-	TBD	-	mA
TX current	2 Mbps @ 0 dBm	-	14	-	mA
	1 Mbps @ 0 dBm	-	TBD	-	mA
Standby Mode					
Normal standby	-	-	TBD	-	µA
Low voltage standby	-	-	TBD	-	µA
Deep Sleep Mode					
Deep sleep	-	-	TBD	-	µA

5.6 Receiver RF Characteristics

Measured with T = 25 ℃, VDD3V = 3.0 V or VUSB5V = 5.0 V unless otherwise stated.

Parameter	Condition	Min.	Typ.	Max.	Unit
General					
Frequency range	-	2400	-	2483.5	MHz
Air data rate	250 kbps, 1 Mbps and 2 Mbps				

Parameter	Condition	Min.	Typ.	Max.	Unit
Sensitivity					
Sensitivity - 1 Mbps	GFSK, 0.1% BER	-	-95	-	dBm
Sensitivity - 2 Mbps	GFSK, 0.1% BER	-	-92	-	dBm
Sensitivity - 250 kbps	GFSK, 0.1% BER	-	TBD	-	dBm
Interference					
C/I co-channel - 1 Mbps	GFSK, 0.1% BER	-	11	-	dB
C/I 1 MHz adjacent channel - 1 Mbps	GFSK, 0.1% BER	-	0	-	dB
C/I 2 MHz adjacent channel - 1 Mbps	GFSK, 0.1% BER	-	-36	-	dB
C/I ≥ 3 MHz adjacent channel - 1 Mbps	GFSK, 0.1% BER	-	-39	-	dB
C/I image channel - 1 Mbps	GFSK, 0.1% BER	-	-19	-	dB
C/I 1 MHz adjacent to image channel - 1 Mbps	GFSK, 0.1% BER	-	-36	-	dB
C/I co-channel - 2 Mbps	GFSK, 0.1% BER	-	10	-	dB
C/I 2 MHz adjacent channel - 2 Mbps	GFSK, 0.1% BER	-	-1	-	dB
C/I 4 MHz adjacent channel - 2 Mbps	GFSK, 0.1% BER	-	-38	-	dB
C/I ≥ 6 MHz adjacent channel - 2 Mbps	GFSK, 0.1% BER	-	-46	-	dB
C/I image channel - 2 Mbps	GFSK, 0.1% BER	-	-20	-	dB
C/I 2 MHz adjacent to image channel - 2 Mbps	GFSK, 0.1% BER	-	-39	-	dB
Out-of-Band Blocking					
30-2000 MHz - 1 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
2000-2399 MHz - 1 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
2498-3000 MHz - 1 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
3000 MHz-12.75 GHz - 1 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
30-2000 MHz - 2 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm

Parameter	Condition	Min.	Typ.	Max.	Unit
2000-2399 MHz - 2 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
2498-3000 MHz - 2 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
3000 MHz-12.75 GHz - 2 Mbps	GFSK, 0.1% BER	-	TBD	-	dBm
Leakage					
Leakage @ < 1 GHz	-	-	TBD	-	dBm
Leakage @ > 1 GHz	-	-	TBD	-	dBm

5.7 Transmitter RF Characteristics

Measured with T = 25 ℃, VDD3V = 3.0 V or VUSB5V = 5.0 V unless otherwise stated.

Parameter	Condition	Min.	Typ.	Max.	Unit
General					
Frequency range	-	2400	-	2483.5	MHz
TX Power					
TX power	-	-20	0	5	dBm
Modulation 20 dB Bandwidth					
Modulation 20 dB bandwidth - 1 Mbps	-	-	TBD	-	MHz
Modulation 20 dB bandwidth - 2 Mbps	-	-	TBD	-	MHz

6. Package Information

6.1 QFN16 3 x 3 mm Package
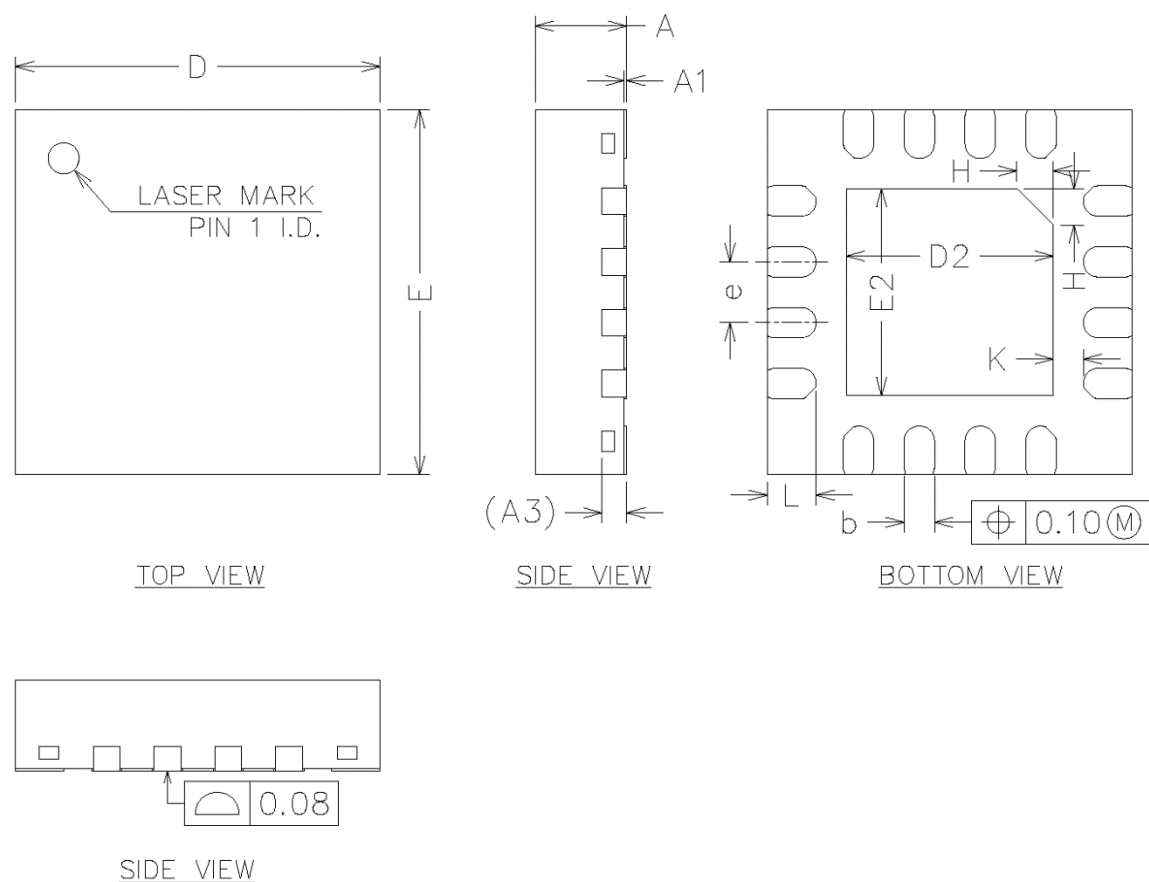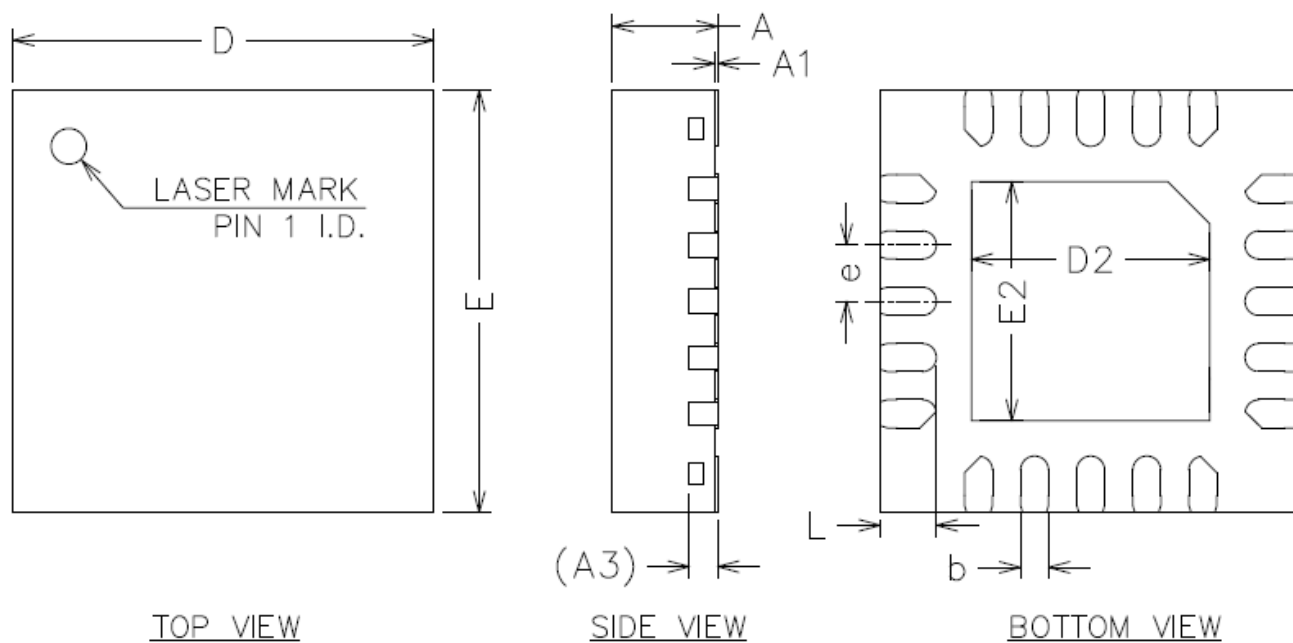
Figure 6-1 QFN16 3 x 3 mm Package Outline

Table 6-1 QFN16 Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.20 REF		
b	0.20	0.25	0.30

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
D	2.95	3.00	3.05
E	2.95	3.00	3.05
D2	1.60	1.70	1.75
E2	1.60	1.70	1.75
e	0.40	0.50	0.60
H	0.30 REF		
K	0.15	-	-
L	0.35	0.40	0.45

6.2 QFN20 4 x 4 mm Package

Figure 6-2 QFN20 4 x 4 mm Package Outline

Table 6-2 QFN20 Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	**Nom.**	**Max.**
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3	0.20 REF		
b	0.18	0.23	0.30
D	3.95	4.00	4.05
E	3.95	4.00	4.05
D2	2.55	2.70	2.80
E2	2.55	2.70	2.80
e	0.50 REF		
L	0.30	0.40	0.50

6.3 SOP16 Package

Figure 6-3 SOP16 Package Outline

TOP View   Side View   Detail "X"

BTM View   Side View
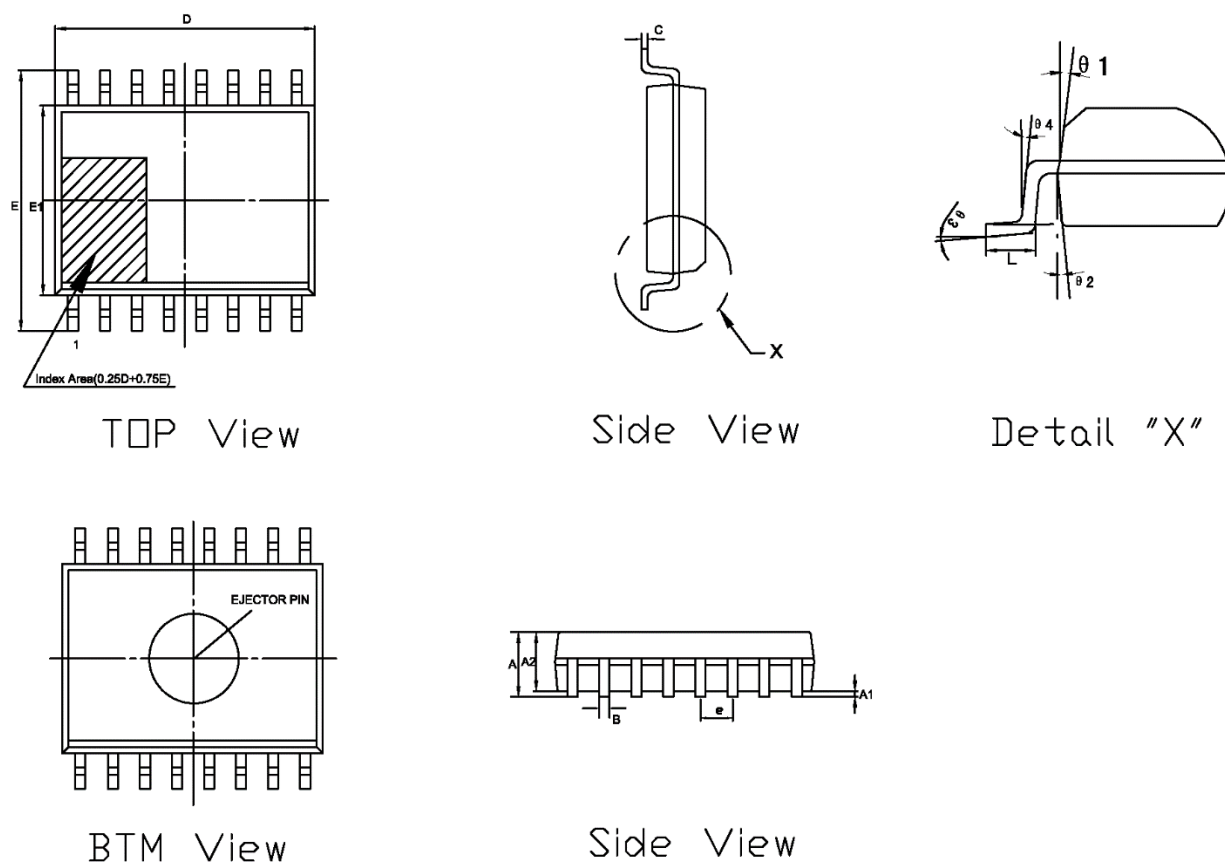
Table 6-3 SOP16 Package Dimensions

Symbol	Dimensions in Millimeters (Angles in Degrees)		
	Min.	Nom.	Max.
A	1.40	-	1.73
A1	0.05	-	0.18
A2	1.35	-	1.55
E	5.84	-	6.24
E1	3.84	-	4.04
D	9.90	-	10.10
L	0.40	-	0.70

Symbol	Dimensions in Millimeters (Angles in Degrees)		
	Min.	Nom.	Max.
e	1.27 TYP		
B	0.36	-	0.46
C	0.2 TYP		
θ1	8 °TYP		
θ2	8 °TYP		
θ3	0 °	-	8 °
θ4	15 °TYP		

6.4 QFN32 4 x 4 mm Package

Figure 6-4 QFN32 4 x 4 mm Package Outline
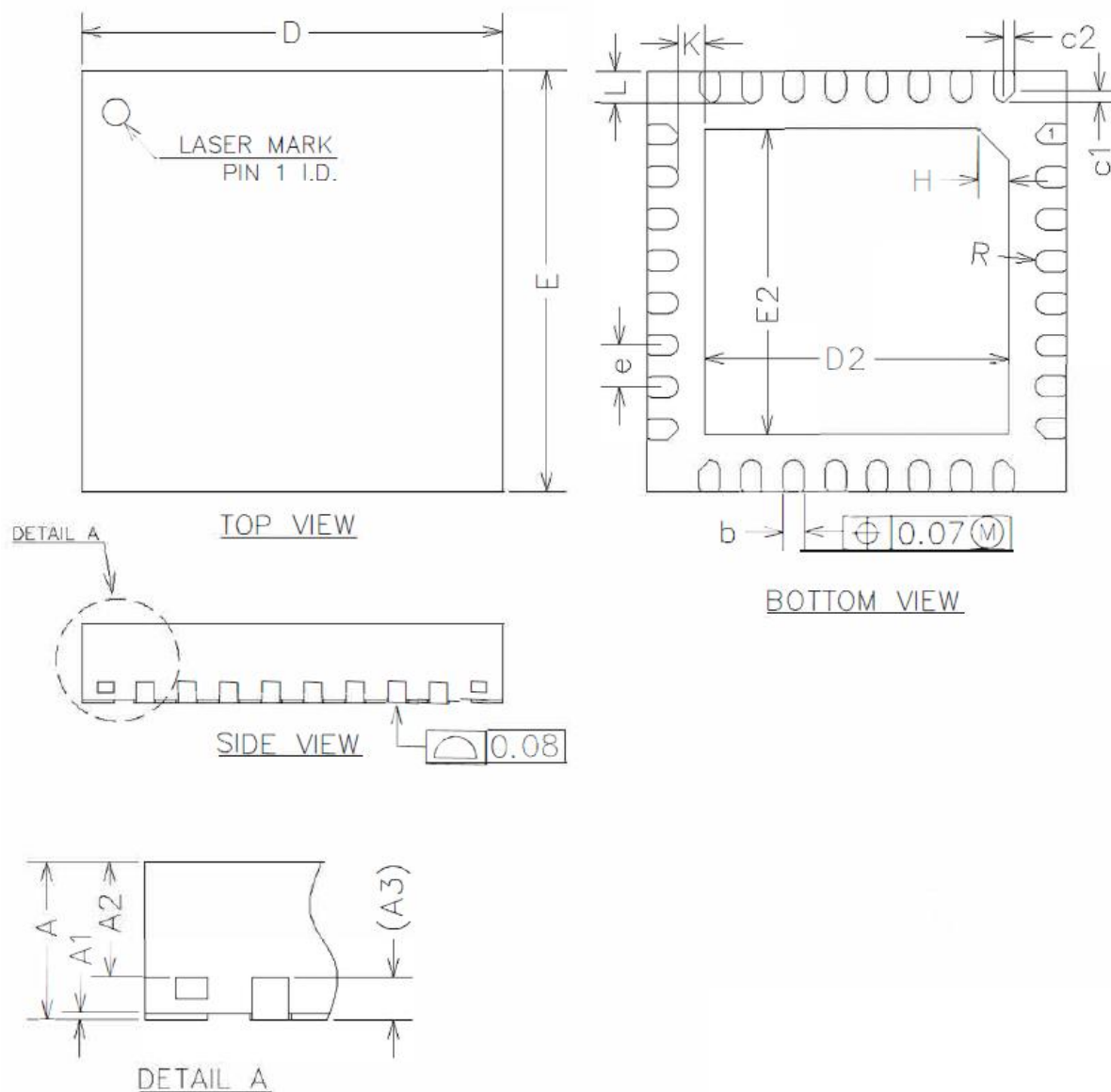
Table 6-4 QFN32 Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A2	0.50	0.55	0.60
A3	0.20 REF		
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	0.30 REF		
K	0.25 REF		
L	0.25	0.30	0.35
R	0.09	-	-
c1	-	0.10	-
c2	-	0.10	-

6.5 QFN48 6 x 6 mm Package

Figure 6-5 QFN48 6 x 6 mm Package Outline
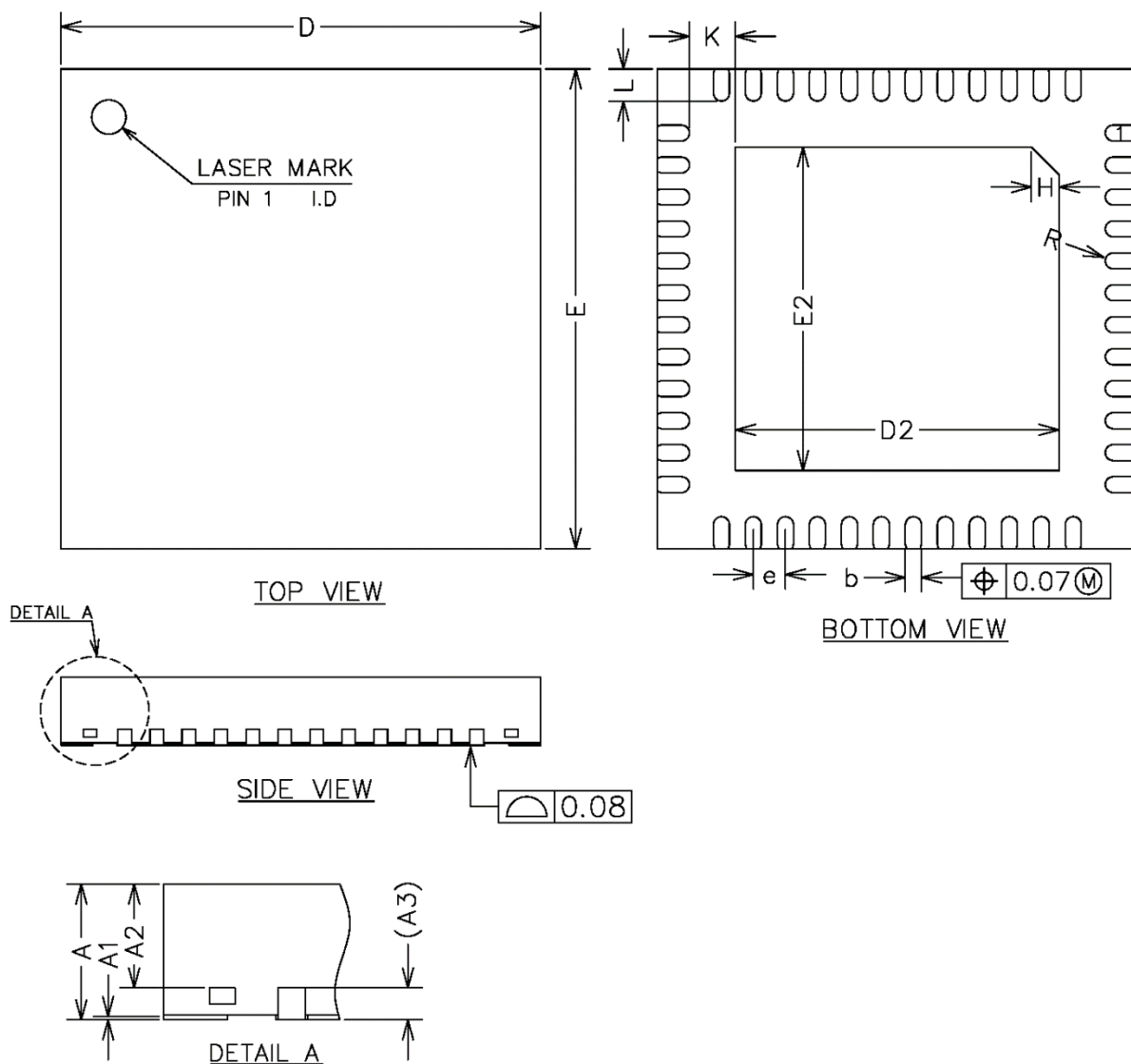
Table 6-5 QFN48 Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05

Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A2	0.50	0.55	0.60
A3	0.20 REF		
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
H	0.35 REF		
K	0.20	-	-
L	0.35	0.40	0.45
R	0.09	-	-

7. Ordering Information

Table 7-1 Ordering Information

Part Number	Package	Operating Temp	Packing	Minimum Ordering Qty (MOQ)
BK2481QN16	3 mm x 3 mm QFN16	-20 to +85 ℃	Tape and Reel	3000
BK2481QN20	4 mm x 4 mm QFN20	-20 to +85 ℃	Tape and Reel	3000
BK2482SO16	SOP16	-20 to +85 ℃	Tape and Reel	3000
BK2482QN32	4 mm x 4 mm QFN32	-20 to +85 ℃	Tape and Reel	3000
BK2483QN48	6 mm x 6 mm QFN48	-20 to +85 ℃	Tape and Reel	3000

Revision History

Version	Date	Description
0.7	2021/11/19	Initial release. First version of the preliminary specification.
0.8	2022/4/28	• Updated the target applications in Section 2 Overview • Added Section 4.10 RGB LED Controller
0.9	2022/5/20	• Updated SOP16 pin assignments of BK2482SO16 • Updated QFN20 package dimensions of BK2481QN20 to 4 mm x 4 mm
1.0	2022/6/14	Updated QFN32 pin assignments of BK2482QN32

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