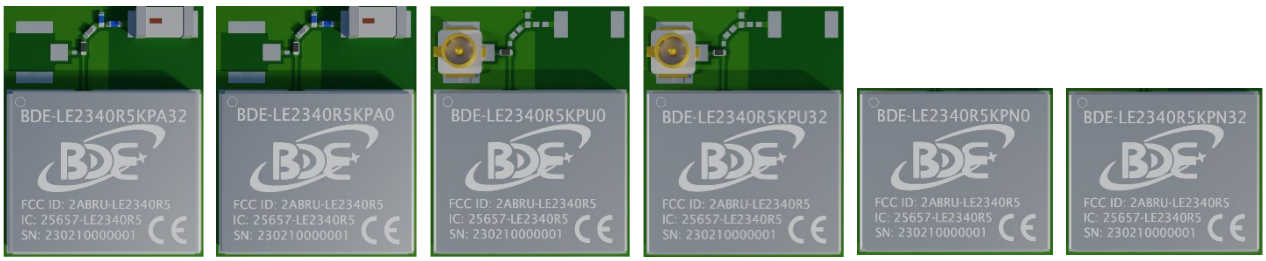
General Description



BDE-LE2340R5KP is a Bluetooth 2.4GHz wireless module series consisting of CC2340R52E0RKPR single-chip wireless microcontroller (MCU). This series provides below six options, customer can choose the suitable version for different application scenario.

BDE-LE2340R5KPA32 (with chip antenna and on-board 32M-bit SPI flash)
BDE-LE2340R5KPU32 (with U.FL connector and on-board 32M-bit SPI flash)
BDE-LE2340R5KPN32 (without antenna and with on-board 32M-bit SPI flash)
BDE-LE2340R5KPA0 (with chip antenna and without on-board 32M-bit SPI flash)
BDE-LE2340R5KPU0 (with U.FL connector and without on-board 32M-bit SPI flash)
BDE-LE2340R5KPN0 (without antenna and without on-board 32M-bit SPI flash)

The BDE-LE2340R5KP is a Bluetooth 2.4G wireless module that integrates an Arm® Cortex®-M0+ MCU, which supports Bluetooth ® 5.3 Low Energy, Zigbee, SimpleLink™ TI 15.4-stack, Proprietary systems. This device is optimized for low-power wireless communication with on-chip dual image Over the Air Download (OAD) support in Building automation (wireless sensors, lighting control, beacons), asset tracking, medical, retail EPOS (electronic point of sale), ESL (electronic shelf label), and Personal electronics (toys, HID, stylus pens) markets.

The BDE-LE2340R5KP supports operation in the 2360 to 2510-MHz frequency band. It can support +8 dBm output power in 2.4GHz band, and a receive sensitivity of -102 dBm for 125-kbps Bluetooth® Low Energy Coded PHY. The BDE-LE2340R5KP has an ultra-low standby current less than 0.71 µA with RTC operational and full RAM retention that enables significant battery life extension especially for applications with longer sleep intervals. The module supports for Bluetooth® 5 features: High Speed Mode (2 Mbps PHY), Long Range (LE Coded 125 kbps and 500 kbps PHYs), Privacy 1.2.1 and Channel Selection Algorithm #2, as well as backwards compatibility and support for key features from the Bluetooth® 4.2 and earlier Low Energy specifications.

The BDE-LE2340R5KP highly integrates radio, stack, profile and applications in a SoC, without the need of using an external MCU. The module also offers flexible hardware interfaces for the sensor application. It enables ultra-low power connectivity and data transfer for the applications that are sensitive to power consumption, size and cost.

Key Features

- BDE-LE2340R5KP is a Bluetooth 2.4GHz module consisting of CC2340R52E0RKPR single-chip wireless microcontroller (MCU)
- Fully integrated module includes all required clocks and passives
- Wireless microcontroller
  - Optimized 48-MHz Arm® Cortex®-M0+ processor
  - Integrated 32M-bit SPI Flash
    - BDE-LE2340R5KPA32
    - BDE-LE2340R5KPU32
    - BDE-LE2340R5KPN32
  - 512KB of in-system programmable flash
  - 12KB of ROM for bootloader and drivers
  - 36KB of ultra-low leakage SRAM. Full RAM retention in standby mode
  - 2.4 GHz RF transceiver compatible with Bluetooth®5.3 Low Energy
  - Supports over-the-air upgrade (OTA)
  - Serial Wire Debug (SWD)
- Low power consumption
  - MCU consumption:
    - 2.6 mA active mode, CoreMark®
    - 53 µA/MHz running CoreMark®
    - <710 nA standby mode, RTC, 36KB RAM
    - 150 nA shutdown mode, wake-up on pin
  - Radio Consumption:
    - 5.3 mA RX
    - 5.1 mA TX at +0 dBm
    - <11.0 mA TX at +8 dBm
- Wireless protocol support
  - Bluetooth®5.3 Low Energy
  - Zigbee®
  - SimpleLink™ TI 15.4-stack
  - Proprietary systems
- High performance radio
  - -102 dBm for Bluetooth® Low Energy 125-kbps
  - -96.5 dBm for Bluetooth® Low Energy 1 Mbps
  - Output power up to +8 dBm with temperature compensation
- Regulatory compliance (On-going)
  - FCC
  - IC
  - CE-RED
- MCU peripherals
  - Up to 26 I/O Pads
    - 2 IO pads SWD, muxed with GPIOs
    - 2 IO pads LFXT, muxed with GPIOs
    - Up to 22 DIOs (analog or digital IOs)
  - Three 16-bit or one 124-bit general-purpose timers, quadrature decode mode support
  - 12-bit ADC, 1.2 Msps with external reference, 267 ksps with internal reference, up to 12 external ADC inputs
  - One low power comparator
  - UART, SPI, I2C
  - Real-time clock (RTC)
  - Integrated temperature and battery monitor
  - Watchdog timer
- Security enablers
  - AES 128-bit cryptographic accelerator
  - Random number generator from on-chip analog noise
- Operating range
  - On-chip buck DC/DC converter
  - 1.71-V to 3.8-V single supply voltage
  - -40 to +85℃
- Package
  - Dimension:
    - 12 mm x 15 mm x 2.15 mm (With Shielding) – A/U versions
    - 12 mm x 10.2 mm x 2.15 mm (With Shielding) – N versions
  - QFM-50 (20 GPIOs)
    - BDE-LE2340R5KPA32
    - BDE-LE2340R5KPU32

  - ✧ BDE-LE2340R5KPN32
  - ➢ QFM-50 (24 GPIOs)
    - ✧ BDE-LE2340R5KPA0
    - ✧ BDE-LE2340R5KPU0
    - ✧ BDE-LE2340R5KPN0
  - ➢ RoHS-compliant package
- Antenna:
  - ➢ BDE-LE2340R5KPA32/BDE-LE2340R5KPA0: chip antenna
  - ➢ BDE-LE2340R5KPU32/BDE-LE2340R5KPU0: U.FL connector for connecting external antenna
  - ➢ BDE-LE2340R5KPN32/BDE-LE2340R5KPN0: No antenna included, RF pad for connecting external antenna
- Additional integrated components:
  - ➢ 48.0-MHz crystal
  - ➢ 32.768-kHz crystal (RTC)
  - ➢ 32M-bit SPI Serial Flash
    - ✧ BDE-LE2340R5KPA32
    - ✧ BDE-LE2340R5KPU32
    - ✧ BDE-LE2340R5KPN32
  - ➢ RF filter and passive components

Applications

- Medical
- Building automation
- Lighting
- Factory automation and control
- Retail automation & payment – Electronic point of sale
- Communication equipment
- Personal electronics

Device Family

Table 0-1. BDE-LE2340R5KP Device Family

Part Number	Core Chip	Description	Size (mm)	Package
BDE-LE2340R5KPA32	CC2340R52E0RKPR	With chip antenna, with 32M-bit SPI flash	12 x 15 x 2.15	SMD-50
BDE-LE2340R5KPU32	CC2340R52E0RKPR	With U.FL connector for external antenna, with 32M-bit SPI flash	12 x 15 x 2.15	SMD-50
BDE-LE2340R5KPN32	CC2340R52E0RKPR	Without antenna, RF pad out for external antenna, with 32M-bit SPI flash	12 x 10.2 x 2.15	SMD-50
BDE-LE2340R5KPA0	CC2340R52E0RKPR	With chip antenna, without 32M-bit SPI flash	12 x 15 x 2.15	SMD-50
BDE-LE2340R5KPU0	CC2340R52E0RKPR	With U.FL connector for external antenna, without 32M-bit SPI flash	12 x 15 x 2.15	SMD-50
BDE-LE2340R5KPN0	CC2340R52E0RKPR	Without antenna, RF pad out for external antenna, without 32M-bit SPI flash	12 x 10.2 x 2.15	SMD-50

Reference

[1] CC2340R5 resources: https://www.ti.com/product/CC2340R5

Contents

1. Block Diagram

BDE-LE2340R5KP module is based on the TI Instruments CC2340R5 single chip wireless MCU. With clocks, other required passives and antenna/connector (optional), it allows faster time to market at reduced development cost.

The modules BDE-LE2340R5KPA32, BDE-LE2340R5KPU32 and BDE-LE2340R5KPN32 as seen in Figure 1-1, comprises of:

- 48-MHz XTAL
- 32.768-kHz XTAL
- 32M-bit SPI Flash
- Power Inductors and Capacitors
- Pull-up Resistors
- Matching Circuit
- Chip antenna integrated or U.FL connector / RF pad for external antenna

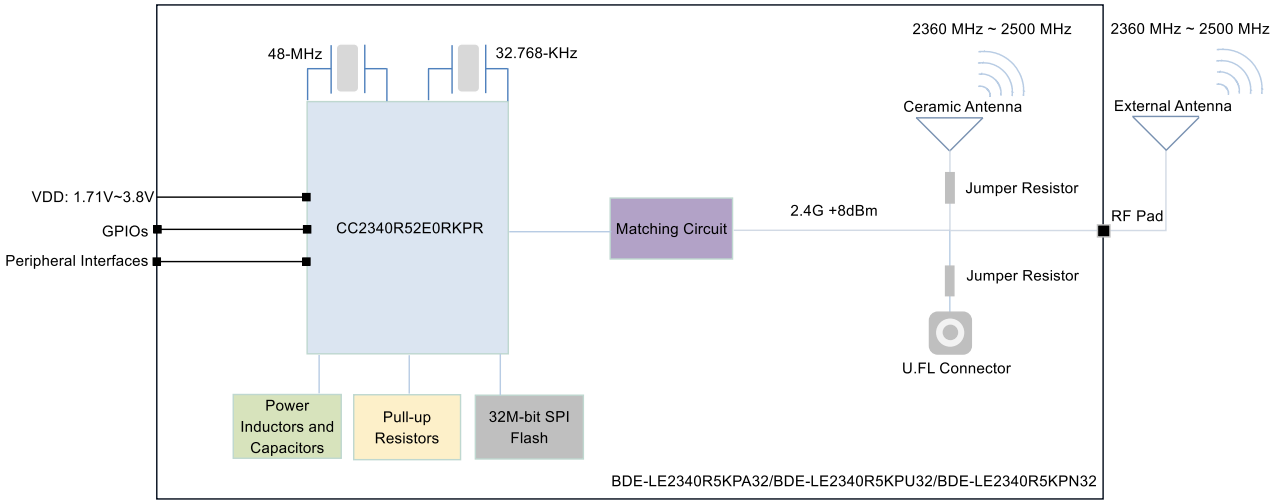


Figure 1-1. The block diagram of BDE-LE2340R5KP

The modules BDE-LE2340R5KPA0, BDE-LE2340R5KPU0 and BDE-LE2340R5KPN0 as seen in Figure 1-2, comprises of:

- 48-MHz XTAL
- 32.768-kHz XTAL
- Power Inductors and Capacitors
- Pull-up Resistors
- Matching Circuit
- Chip antenna integrated or U.FL connector / RF pad for external antenna

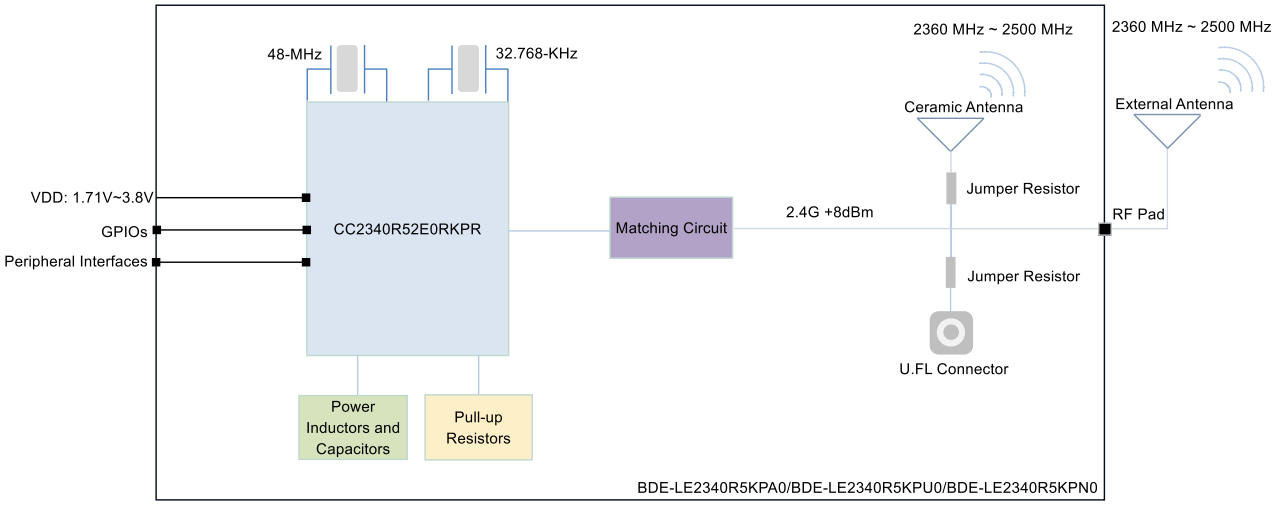


Figure 1-2. The block diagram of BDE-LE2340R5KP

2. Pinout

2.1. Pinout Diagram

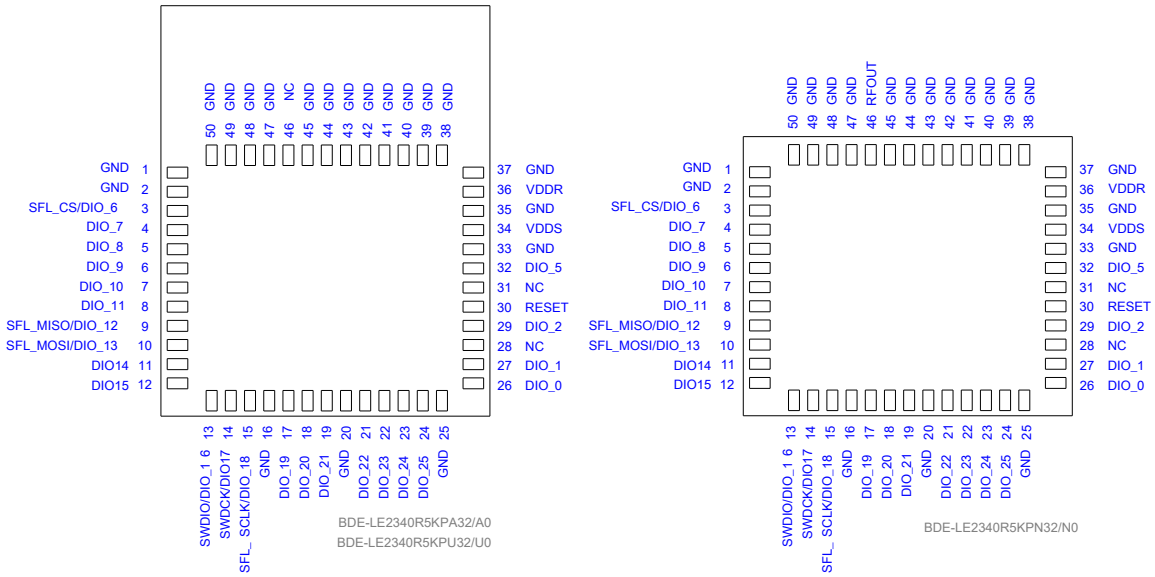


Figure 2-1. Pinout Diagram of BDE- LE2340R5KP Bottom View

2.2. Pinout Discription

Table 2-1 describes the definitions of the pins of the module. Pin number of CC2340R5 chip is also stated here, because the VQFN pin is referred to in the software design kit (SDK).

Table 2-1. Pin Description

Module Pin #	Pin Name	Type	CC2340R5 Pin #	Description
1	GND	-	-	Ground
2	GND	-	-	Ground
3	SFL_CS/DIO_6	I/O	32	SFL_CS(2)/ GPIO(1)
4	DIO_7	I/O	33	GPIO(1)
5	DIO_8	I/O	2	GPIO(1)
6	DIO_9	I/O	3	GPIO(1)
7	DIO_10	I/O	4	GPIO(1)
8	DIO_11	I/O	5	GPIO(1)
9	SFL_MISO /DIO_12	I/O	6	SFL_MISO(2)/ GPIO(1) , High-drive Capability
10	SFL_MOSI/DIO_13	I/O	7	SFL_MOSI(2)/ GPIO(1)
11	DIO_14	I/O	9	GPIO(1)
12	DIO_15	I/O	10	GPIO(1)
13	SWDIO/DIO_16	I/O	11	GPIO(1) ,SWDIO, high-drive Capability
14	SWCLK/DIO_17	I/O	12	GPIO(1) ,SWCLK, high-drive Capability
15	SFL_SCLK/DIO_18	I/O	13	SFL_SCLK(2)/GPIO(1) , High-drive Capability
16	GND	-	-	Ground
17	DIO_19	I/O	14	GPIO(1) , High-drive Capability
18	DIO_20	I/O	15	GPIO(1)
19	DIO_21	I/O	16	GPIO(1)
20	GND	-	-	Ground
21	DIO_22	I/O	18	GPIO(1)
22	DIO_23	I/O	19	GPIO(1)
23	DIO_24	I/O	20	GPIO(1) , High-drive Capability
24	DIO_25	I/O	21	GPIO(1)
25	GND	-	-	Ground
26	DIO_0	I/O	22	GPIO(1)
27	DIO_1	I/O	23	GPIO(1)
28	NC	-	-	NC
29	DIO_2	I/O	24	GPIO(1)
30	RESET	I	25	Reset, Active Low. No Internal Pullup Resistor
31	NC	-	-	NC
32	DIO_5	I/O	29	GPIO(1)
33	GND	-	-	Ground
34	VDDS	Power		1.71-V to 3.8-V Analog Supply
35	GND	-	-	Ground
36	NC	-	-	NC
37	GND	-	-	Ground

Module Pin #	Pin Name	Type	CC2340R5 Pin #	Description
38	GND	-	-	Ground
39	GND	-	-	Ground
40	GND	-	-	Ground
41	GND	-	-	Ground
42	GND	-	-	Ground
43	GND	-	-	Ground
44	GND	-	-	Ground
45	GND	-	-	Ground
46	RFOUT/NC	-	-	RFOUT(3)/NC
47	GND	-	-	Ground
48	GND	-	-	Ground
49	GND	-	-	Ground
50	GND	-	-	Ground

Note (1): For pin multiplexing details, refer to the CC2340R5 SimpleLink™ 32-bit Arm® Cortex®-M0+ Bluetooth® Low Energy wireless MCU.

Note (2): These four pins can be used as GPIOs in modules BDE-LE2340R5KPA0, BDE- LE2340R5KPU0 and LE2340R5KPN0; these four pins are used as SPI for 32M-bit flash in modules BDE-LE2340R5KPA32, BDE- LE2340R5KPU32 and BDE- LE2340R5KPN32.

Note (3): Pin 46 used as RFOUT in modules BDE-LE2340R5KPN32 and BDE-LE2340R5KPN0; Leave NC in other modules.

3. Characteristics

3.1. Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Table 3-1. Absolute Maximum Ratings

PARAMETER	MIN	MAX	UNIT	Notes
VDDS	-0.3	4.1	V	
Other Digital Terminals	-0.3	VDDS+0.3≤4.1	V	
Voltage on ADC input	0	VDDS	V	Voltage scaling enabled
Storage Temperature	-40	125	°C	

3.2. Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)(1)

Table 3-2. Recommended Operating Conditions

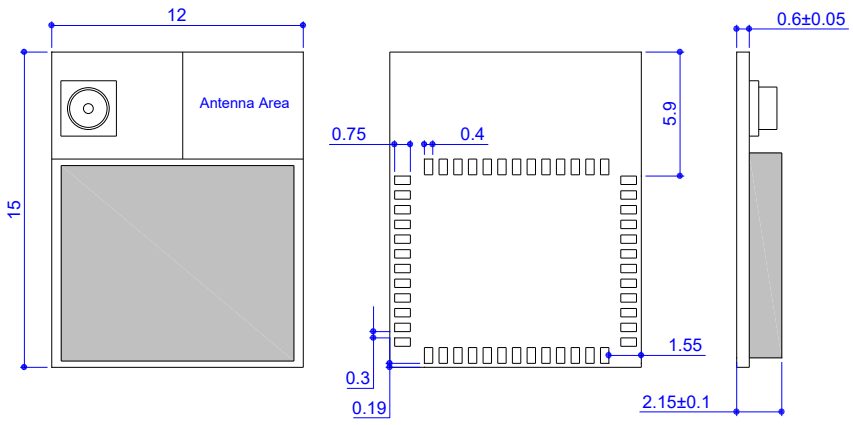
PARAMETER	MIN	TYP	MAX	UNIT
VDDS	1.71	3.3	3.8	V
Operating Temperature	-40		85	°C
Rising supply voltage slew rate	0		100	mV/µs
Falling supply voltage slew rate	0		1	mV/µs

4. Mechanical Specifications

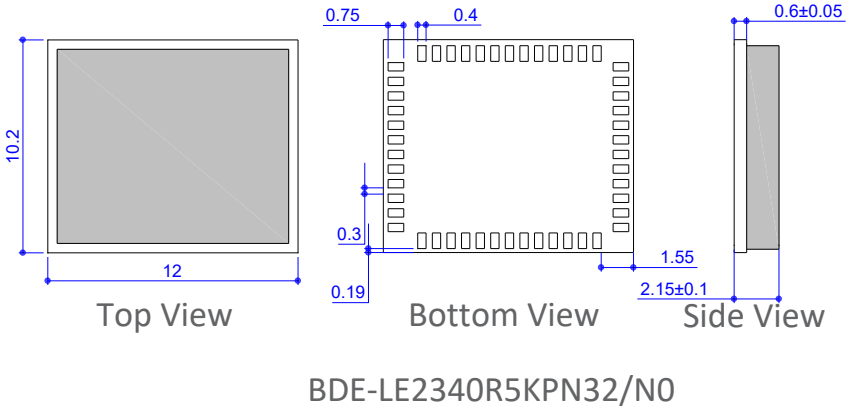
The following pages include mechanical, footprint drawings, and marking information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document.

4.1. Dimensions

The module dimensions are presented in the following figure:



BDE-LE2340R5KPA32/A0
BDE-LE2340R5KPU32/U0

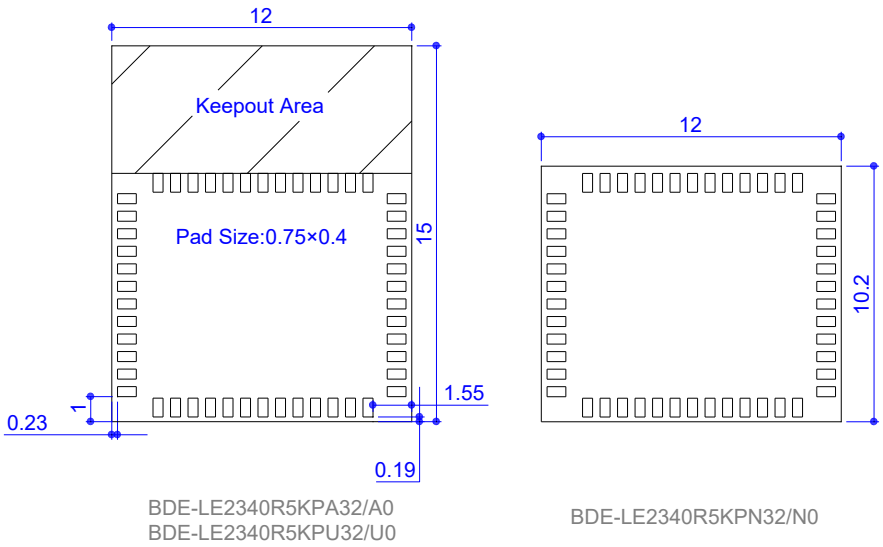


Note: All dimensions are in millimeter

Figure 4-1. Mechanical Drawing for BDE-LE2340R5KP

4.2. PCB Footprint

The footprint for the PCB is presented in the following figures:



Note:

1. All dimensions are in millimeter
2. Solder mask should be the same or 5% larger than the dimension of the pad
3. Solder paste must be the same as the pin for all peripheral pads. For ground pins, make the solder paste 20% smaller than the pad.

Figure 4-2. Module Footprint for BDE-LE2340R5KP Top View

5. Marking

TBD

6. Typical Reflow Profile

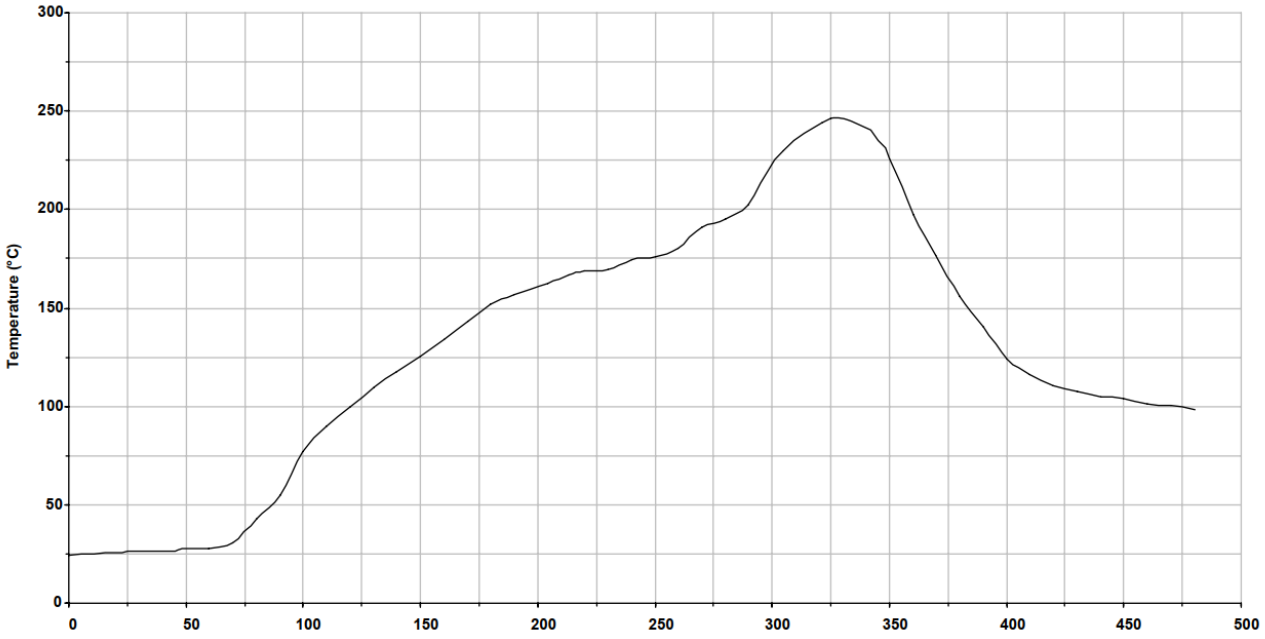


Figure 6-1. Typical Reflow Profile

Key features of the profile:

- Initial ramp = 1-2.5°C/sec to 175°C ±25°C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to maximum temperature (245°C) = 3°C/sec max.
- Time above liquidus temperature (217°C): 45-90 seconds
- Device absolute maximum reflow temperature: 260°C

7. Ordering Information

TBD

8. Revision History

Revision	Date	Description
V0.1	16-May-2023	Preliminary, draft

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