Multi-Protocol Wireless Module with PA

Key Features

- **Microcontroller**
  - Powerful 48-MHz Arm® Cortex®-M4F processor
  - 352KB of in-system Programmable Flash
  - 256KB of ROM for protocols and library functions
  - 8KB of Cache SRAM (Alternatively available as general-purpose RAM)
  - 80KB of ultra-low leakage SRAM. The SRAM is protected by parity to ensure high reliability of operation.
  - 2-Pin cJTAG and JTAG debuggingRF performance
  - Supports Over-the-Air upgrade (OTA)
- **Ultra-low power sensor controller with 4KB of SRAM**
  - Sample, store, and process sensor data
  - Operation independent from system CPU
  - Fast wake-up for low-power operationBQB, FCC, CE, RoHS compliant
- **TI-RTOS, drivers, Bootloader, Bluetooth® 5 Low Energy Controller, and IEEE 802.15.4 MAC in ROM for optimized application size**
- **Peripherals**
  - Digital peripherals can be routed to any GPIO
  - 4× 32-bit or 8× 16-bit general-purpose timers
  - 12-Bit ADC, 200 kSamples/s, 8 channels
  - 2× comparators with internal reference DAC
  - (1× continuous time, 1× ultra-low power)
  - Programmable current source
  - 2× UART
  - 2× SSI (SPI, MICROWIRE, TI)
  - I2C
  - I2S
  - Real-Time Clock (RTC)
  - AES 128- and 256-bit Crypto Accelerator
  - ECC and RSA Public Key Hardware Accelerator
  - SHA2 Accelerator (Full suite up to SHA-512)
  - True Random Number Generator (TRNG)

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- ➢ Capacitive sensing, up to 8 channels
- ➢ Integrated temperature and battery monitor
- ■ External system
  - ➢ On-chip Buck DC/DC converter
- ■ Low power
  - ➢ Wide supply voltage range: 1.8 V to 3.8 V
  - ➢ Active-Mode RX: 6.9 mA
  - ➢ Active-Mode TX 0 dBm: 7.3 mA
  - ➢ Active-Mode TX 5 dBm: 9.6 mA
  - ➢ Active-Mode TX at +10 dBm: 22 mA
  - ➢ Active-Mode TX at +20 dBm: 85 mA
  - ➢ Active-Mode MCU 48 MHz (CoreMark):
  - ➢ 3.4 mA (71 µA/MHz)
  - ➢ Sensor Controller, Low Power-Mode, 2 MHz, running infinite loop: 30.1 µA
  - ➢ Sensor Controller, Active-Mode, 24 MHz, running infinite loop: 808 µA
  - ➢ Standby: 0.94 µA (RTC on, 80KB RAM and CPU retention)
  - ➢ Shutdown: 150 nA (wakeup on external events)
- ■ Radio section
  - ➢ 2.4 GHz RF transceiver compatible with Bluetooth 5 Low Energy and IEEE 802.15.4 PHY and MAC
  - ➢ Excellent receiver sensitivity:
    - ◆ -100 dBm for 802.15.4 (2.4 GHz),
    - ◆ −105 dBm for Bluetooth 125-kbps (LE Coded PHY)
  - ➢ Output power up to +20 dBm with temperature compensation
  - ➢ Suitable for systems targeting compliance with worldwide radio frequency regulations
- ■ Wireless protocols
  - ➢ Thread, Zigbee®, Bluetooth® 5 Low Energy, IEEE 802.15.4g, IPv6-enabled smart objects (6LoWPAN), Wi-SUN®, proprietary systems, SimpleLink™ TI 15.4-Stack (2.4 GHz), and Dynamic Multiprotocol Manager (DMM) driver.
- ■ Size: 29.86 mm x 19.98 mm x 2.15 mm (With Shielding)
- ■ FCC, CE Compliant

Descriptions

BDE-RFM207 is a multiprotocol 2.4G wireless module targeted at low power sensors and PC/Phone accessories. It supports Thread, Zigbee, Bluetooth 5 Low Energy, IEEE 802.15.4g, IPv6-enabled smart objects (6LoWPAN), Wi-SUN, proprietary systems, SimpleLink TI 15.4-Stack (2.4 GHz), and Dynamic Multiprotocol Manager (DMM) driver.

BDE-RFM207P has an integrated power amplifier, which enable 20 dBm output power.

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BDE-RFM207 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.

Applications

- 2400 to 2480 MHz ISM and SRD systems with down to 4 kHz of receive bandwidth
- Building automation
- Grid infrastructure
- Industrial transport – asset tracking
- Factory automation and control
- Medical
- Electronic point of sale (EPOS) – Electronic Shelf Label (ESL)

Electrical Characteristics

■ Absolute maximum rating

Rating	Min	Typ	Max	Unit	Notes
Storage Temperature	-40	-	125	℃	
VDD	-0.3	-	4.1	V	
Other Digital Terminals	-0.3	-	VDDS+0.3≤4.1	V	
Voltage on ADC input	-0.3	-	VDDS	V	Voltage scaling enabled
	-0.3	-	1.49	V	Voltage scaling disabled, internal reference
	-0.3	-	VDDS/2.9	V	Voltage scaling disabled, VDDS as reference
RF pin	-	-	2	dBm	

■ Recommended operating conditions

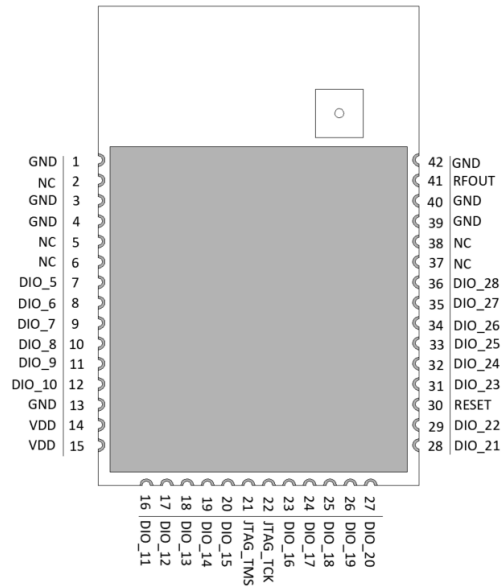| Rating	Min	Typ	Max	Unit
Operating Temperature	-40	-	85	℃
VDD	2.1	3.3	3.8	V

Pinout

Fig. 2: The pinout of BDE-RFM207P (TOP VIEW)
Table 1: Pin definitions of BDE-RFM207P

Pin Number	Pin Name	Definitions
1	GND	Power Ground
2	NC	NC
3	GND	Power Ground
4	GND	Power Ground
5	NC	NC
6	NC	NC
7	DIO_5	GPIO, High-drive Capability
8	DIO_6	GPIO, High-drive Capability
9	DIO_7	GPIO, High-drive Capability
10	DIO_8	GPIO
11	DIO_9	GPIO
12	DIO_10	GPIO
13	GND	Power Ground
14	VDD	Supply Power
15	VDD	Supply Power
16	DIO_11	GPIO
17	DIO_12	GPIO
18	DIO_13	GPIO
19	DIO_14	GPIO
20	DIO_15	GPIO
21	JTAG_TMSC	JTAG TMSC, High-drive Capability

22	JTAG_TCKC	JTAG TCKC
23	DIO_16	GPIO, JTAG_TDO, High-drive Capability
24	DIO_17	GPIO, JTAG_TDI, High-drive Capability
25	DIO_18	GPIO
26	DIO_19	GPIO
27	DIO_20	GPIO
28	DIO_21	GPIO
29	DIO_22	GPIO
30	RESET	Reset, Active Low
31	DIO_23	GPIO, Analog Capability
32	DIO_24	GPIO, Analog Capability
33	DIO_25	GPIO, Analog Capability
34	DIO_26	GPIO, Analog Capability
35	DIO_27	GPIO, Analog Capability
36	DIO_28	GPIO, Analog Capability
37	NC	NC
38	NC	NC
39	GND	Power Ground
40	GND	Power Ground
41	RFOUT	2.4G RF Output Port
42	GND	Power Ground

Overall Dimensions

Fig. 3 shows the overall dimensions of BDE-RFM207P. The module measures 29.86mm long by 19.97mm wide by 2.15mm high with the shield.
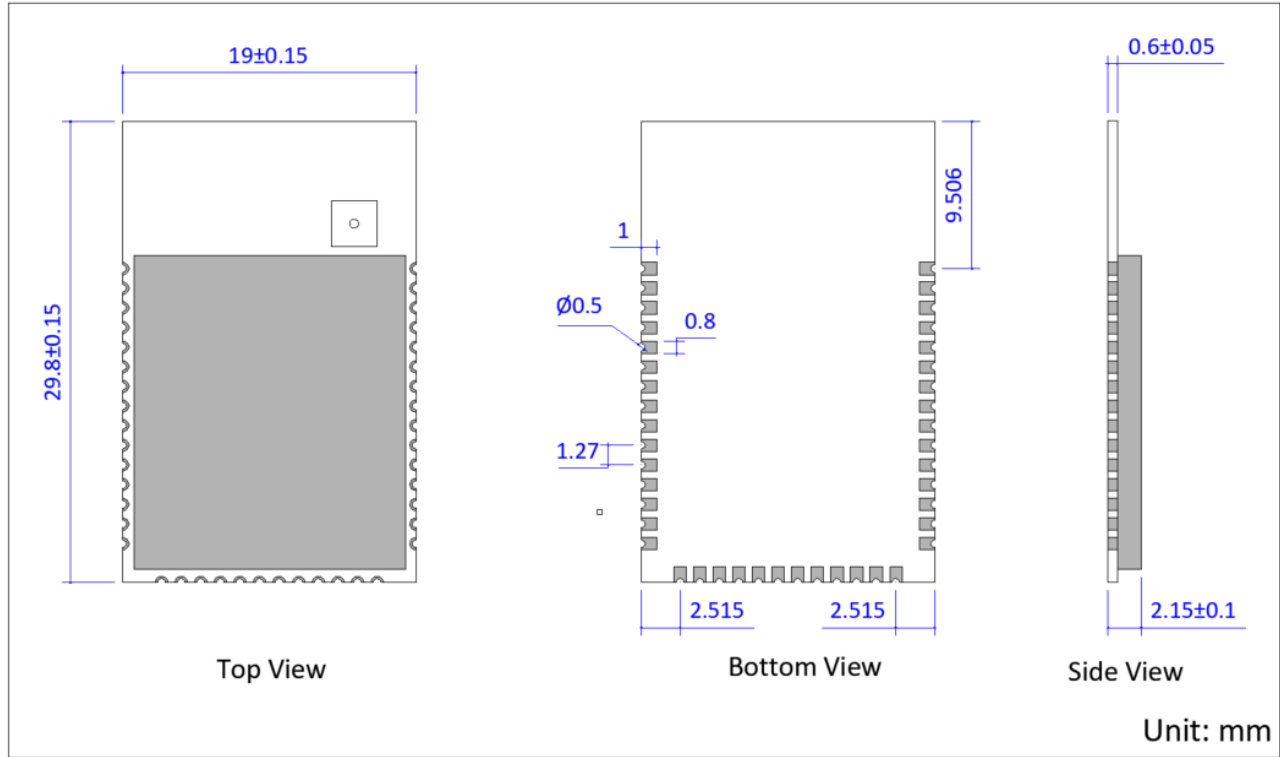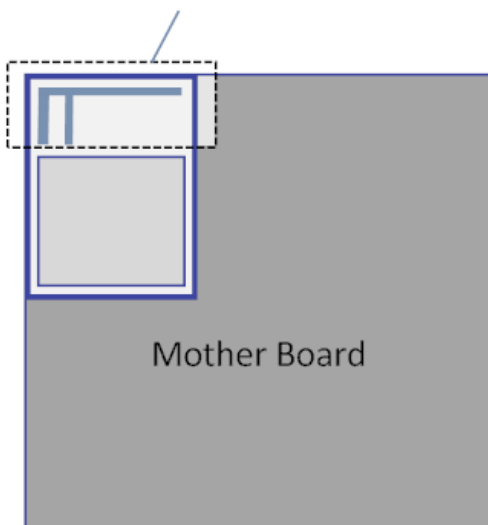
Fig. 3: Overall Dimensions of BDE-RFM207P

Module Location

In order to get a fine performance when integrate the module to your product, it is advised to use the recommended module location to the respective PCB.
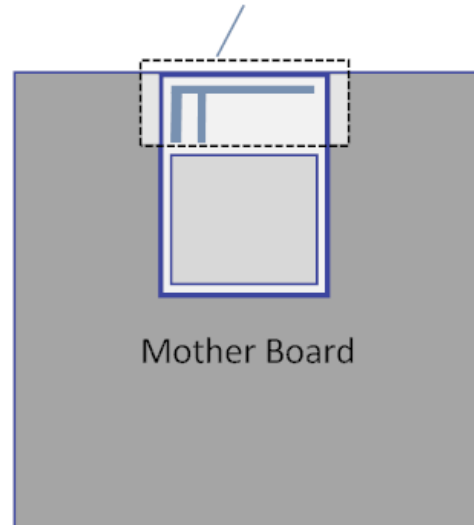
■ Location in X-Y plane

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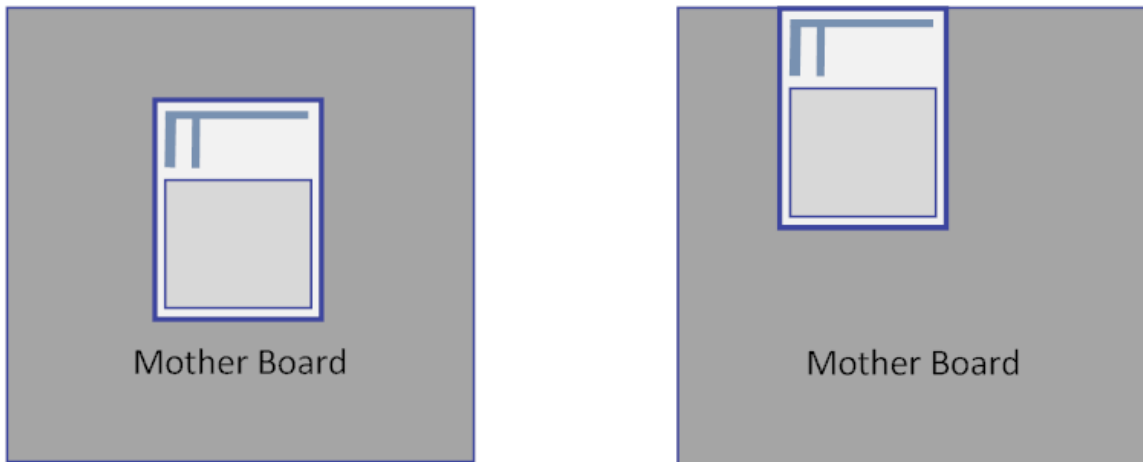Fig. 4: Recommended location in X-Y plane

Fig. 5: Not recommended location in X-Y plane
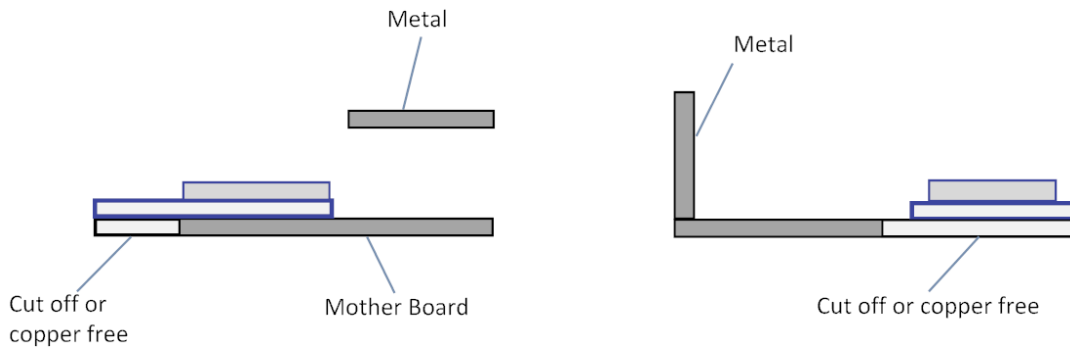
■ Location in Z plane
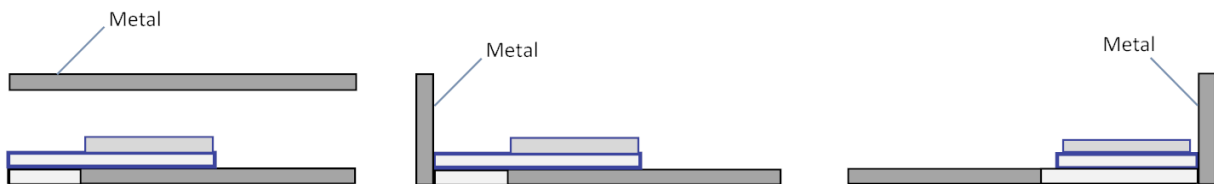

Fig. 6: Recommended location in Z plane

Fig. 7: Not recommended location in Z plane
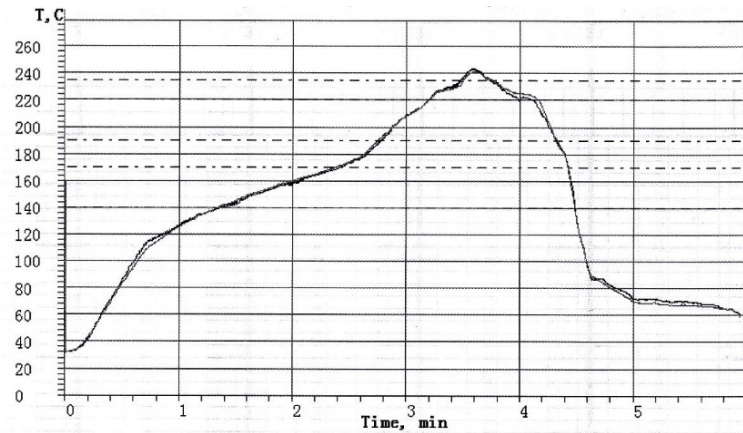
Typical Solder Reflow Profile

Fig. 8: Typical Solder Reflow Profile

Package Information

Fig. 9: Package

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Regulatory Information

FCC Warning

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15.247

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

It is "not applicable" as trace antenna which is not used on the module.

2.6 RF exposure considerations

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This compliance to FCC radiation exposure limits for an uncontrolled environment, and minimum of 20cm separation between antenna and body.

The host product manufacturer would provide the above information to end users in their end-product manuals.

2.7 Antennas

PCB Antenna; 2.9dBi; 2402-2480MHz; 2405-2480MHz

2.8 Label and compliance information

The end product must carry a physical label or shall use e-labeling followed KDB784748D01 and KDB 784748 stating "Contains Transmitter Module FCC ID: 2ABRU-RFM207P".

2.9 Information on test modes and additional testing requirements
For more information on testing, please contact the manufacturer.

2.10 Additional testing, Part 15 Subpart B disclaimer

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The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuity.

FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated" has to be labeled with an auxiliary label stating the FCC ID of the RF Module, such as "Contains FCC ID: 2ABRU-RFM207P

"This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

(1)this device may not cause harmful interference, and

(2)this device must accept any interference received, including interference that may cause undesired operation."

"Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

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The Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

1) The radio elements have the radio frequency circuitry shielded.

2) The module has buffered modulation/data inputs to ensure that the device will complywith Part 15 requirements with any type of input signal.

3) The module contains power supply regulation on the module.

4) The module contains a permanently attached antenna.

5) The module demonstrates compliance in a stand-alone configuration.

6) The module is labeled with its permanently affixed FCC ID label.

7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.

8) The module complies with RF exposure requirements.

NOTE: This equipment has been tested and found to comply with the limits for a

Class B digital device, pursuant to part 15 of the FCC Rules. These limits are

designed to provide reasonable protection against harmful interference in a

residential installation. This equipment generates uses and can radiate radio

frequency energy and, if not installed and used in accordance with the instructions,

may cause harmful interference to radio communications. However, there is no

guarantee that interference will not occur in a particular installation. If this

equipment does cause harmful interference to radio or television reception, which

can be determined by turning the equipment off and on, the user is encouraged to

try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the

receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help

IC Statements

The final host device, into which this RF Module is integrated" has to be labeled with an auxiliary label stating the IC of the RF Module, such as" Contains transmitter module IC: 25657-RFM207P

Le périphériquehôte final, danslequelce module RF estintégré "doitêtreétiqueté avec uneétiquetteauxiliaireindiquant le CI du module RF, tel que" Contient le module émetteur IC: 25657-RFM207P

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

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L'émetteur/récepteur exempt de licencecontenudans le présentappareilestconforme aux CNR d'Innovation, Sciences et Développementéconomique Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes :

(1) L' appareil ne doit pas produire de brouillage;

(2) L' appareildoit accepter tout brouillageradioélectriquesubi, mêmesi le brouillageest susceptible d' encompromettre le fonctionnement.

RF Exposure Warning Statements:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment shall be installed and operated with minimum distance 20cm between the radiator & body.

Radio Frequency Exposure Statement for IC:

The device has been evaluated to meet general RF exposure requirements. The device can be used in mobile exposure conditions. The min separation distance is 20cm.

Déclaration d'exposition aux radiofréquences pour IC:

L'appareil a été évalué pour répondre aux exigences générales en matière d'exposition aux RF. L'appareil peut être utilisé dans des conditions d'exposition mobiles. La distance de séparation minimale est de 20 cm.

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