REXENSE

Data Sheet of ZigBee Module

REX3B

V5.0

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Document Change List

V1.0.0	20170401	Initial version
V5.0.0	20190919	Update to MG21 series chips
V5.0.1	20210608	Increase dimensional tolerance

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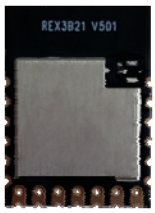
1. Product Introduction

1.1 Introduction



REX3B is a low-power ZigBee module with high sensitivity and compact in dimension. Based on EFR32 platform of SiliconLabs, this module conforms to IEEE 802.15.4 specification and ZigBee3.0 protocol standard. It has been widely used in applications of smart home, building automation and industrial monitoring. By utilizing this module, much time and energy will be saved during the development work.

1.2 Application

REX3B module conforms to IEEE 802.15.4 specification and ZigBee3.0, supports the mesh network which is self-healing and self-assembling, optimizes the network rate and power consumption. This module supports the setting and configuration as below:

- Standard ZigBee 3.0

Application of module, included but not limited to:

- Smart home
  - Light control
  - Security system
  - Air quality monitoring
  - Smart lock
  - Motorized curtain
  - Air-conditioning, heating and ventilation
  - Scenario automation
- Building automation and monitoring
- HVAC monitoring and control
- Industrial monitoring
- Wireless meter reading

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1.3 Main Characteristics

- Dimension：20.4*14.8*2.4mm
- Max output power: -0.59dBm
- Max receiving sensitivity: -102.5dBm(Zigbee)
- Multiple antenna options
- Extreme low power consumption
  - Sleep mode：<5.0μA
  - Receiving mode：9.4mA(Zigbee)

- 15 GPIOs can be configured for various functional interfaces according to application
  - GPIO
  - External interrupts
  - 12 bytes precision ADC sampling channel
  - USART Hardware flow control
  - TWI interface
  - UART / SPI / I^2C interface
  - PWM output

1.4 Product Advantage

- Small Package fits small devices well.
- Advanced link budget in the industry
- Outstanding battery longevity
- Rich storage resource for various software application
- Powerful mesh network management ability
- With development kit easy to use and cost-effective
- ISM band license free

1.5 Abbreviations

ADC	Analog-to -Digital Converter
GPIO	General Purpose Input/Output
HVAC	Heating, Ventilating and Air Conditioning
TWI	Inter-Integrated Circuit

IEEE	Institute of Electrical and Electronics Engineers
ISM	Industrial, Scientific and Medical radio band
JTAG	Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface
MAC	Medium Access Control layer
PCB	Printed Circuit Board
RAM	Random Access Memory
RF	Radio Frequency
RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly
SPI	Serial Peripheral Interface
TX	Transmitter
UART	Universal Asynchronous Receiver/Transmitter
ZigBeePRO	Wireless networking standards targeted at low-power applications

1.6 Related Documents

[1] ZigBee 3.0 – The Open, Global Standard for the Internet of Things December 2, 2014

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2. Product Overview

2.1 Overview

REX3B is a compact IOT module, higher sensitivity and lower power. It conforms to IEEE 802.15.4 and ZigBee 3.0 standard protocol. This module has outstanding RF characteristics, lower power consumption, and powerful processor core.

REX3B module conforms to the FCC, IC, CE, and RoHS, which can be applied to various devices in different environments.

At the same time, our company also provides a complete set of development and evaluation kits, users can choose kits of different versions for testing and development according to their requirement

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3. Technical Specification

3.1. Electrical Specification

3.1.1. Electrical Specification

Table 3-1. Absolute Maximum Ratings

Parameter	Min	Max
Module input voltage (VCC)	1.71V	3.8V
Pin voltage (except ADC pin)	-0.3V	VDD_PADS+0.3
ADC Pin voltage	0V	3.3V
Data of maximum drive current of all I/Os		50 mA
Maximum RF signal receiving density of chips		+10 dBm

Note: exceeding the absolute maximum ratings may damage module. In any case, the user shall not violate the absolute maximum ratings listed in the previous table. If there is a violation, it may cause irreparable damage to the module.

3.1.2. Power Consumption

Table 3-2. Test conditions (unless otherwise agreed), VCC = 3.3V, temperature = 25°C

Parameter	Range	Unit
Receiving current	9.4	mA
Transmitting current	186	mA
Sleeping current	5.0	μA
(90%) Receiving sensitivity	-102.5	dBm

3.1.3. RF Electrical Characteristics

Table 3-3. RF Electrical Characteristics

Parameter	Range	Unit
Frequency range	2405~2480	MHz
Quantity of Channels	16	
Channel spacing	5	MHz
Receiving sensitivity	-102.5	dBm
Max transmitting rate	250	kbps
Rated Input / Output Impedance	50	Ω

3.1.4. Processor Characteristics

Table 3-4. Processor Characteristics

Parameter	
Processor core	32bit ARM®-M33
Max operating frequency	80MHz

3.1.5. Module Interface Characteristics

Table 3-5. Module Interface Characteristics

Parameter	Test Conditions	Range	Unit
UART Max baud rate		230400	bps
The resolution / conversion time of the analog channel	Half-duplex mode	12/4096	Bits/μs
Analog input impedance		>1	MΩ
Analog reference voltage (VREF)		3.3	V
Analog input voltage		0 - VREF	V
I2C bus maximum clock frequency		1000	KHz
GPIO output voltage (logic 0)	-8/ 4 mA	0 ~ 0.18*VCC	V
GPIO output voltage (logic 1)	-8/ 4 mA	0.82*VCC ~ VCC	V
Real-time clock frequency		32.768	KHz

3.2. Physical/Ambient Characteristics

Table 3-6. Physical/Ambient Characteristics

Parameter	Value	Note
Physical size	20.4*14.8*2.4mm	
Weight	<1g	
Working temperature	-40°C to +85°C (default)	
Relative working Humidity	<95%	

3.3. Pin Configuration

Dimension tolerance: length and width ± 0.25 mm thick ± 10%;

Figure3-1. Dimensions

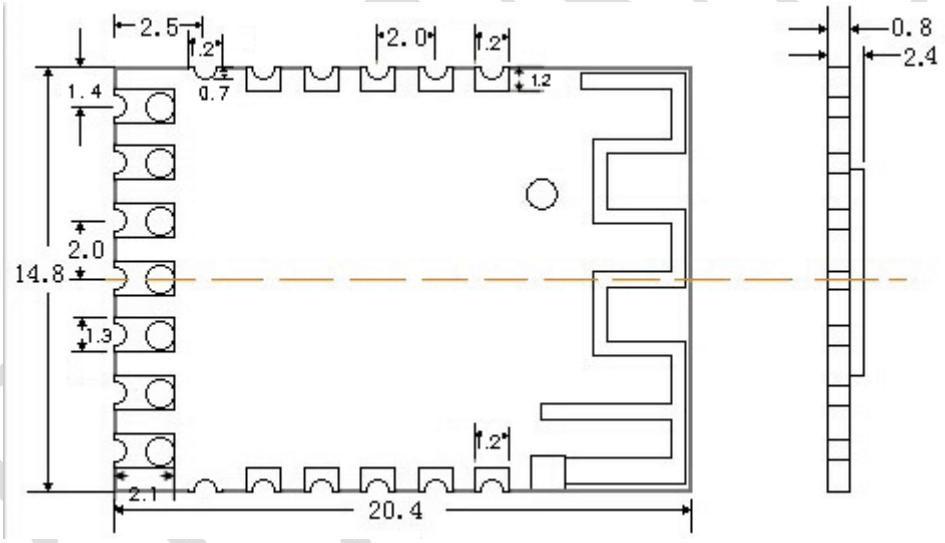

Figure3-2. Footprint

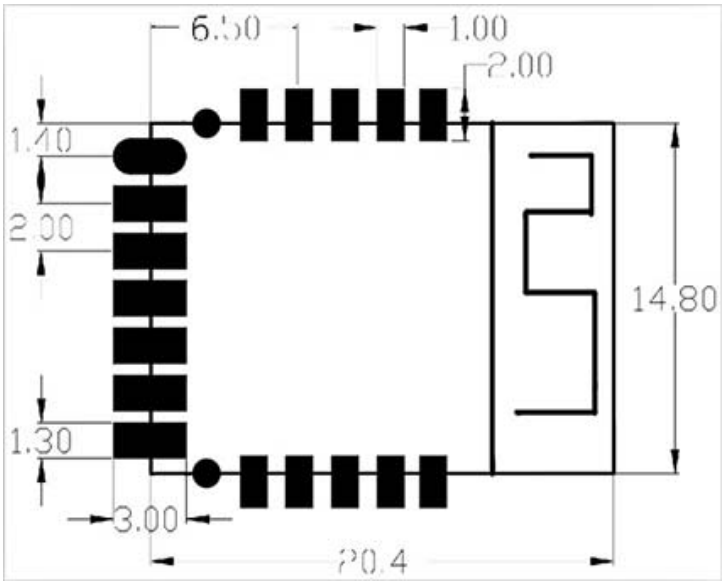

Figure 3-3. Pin Definition

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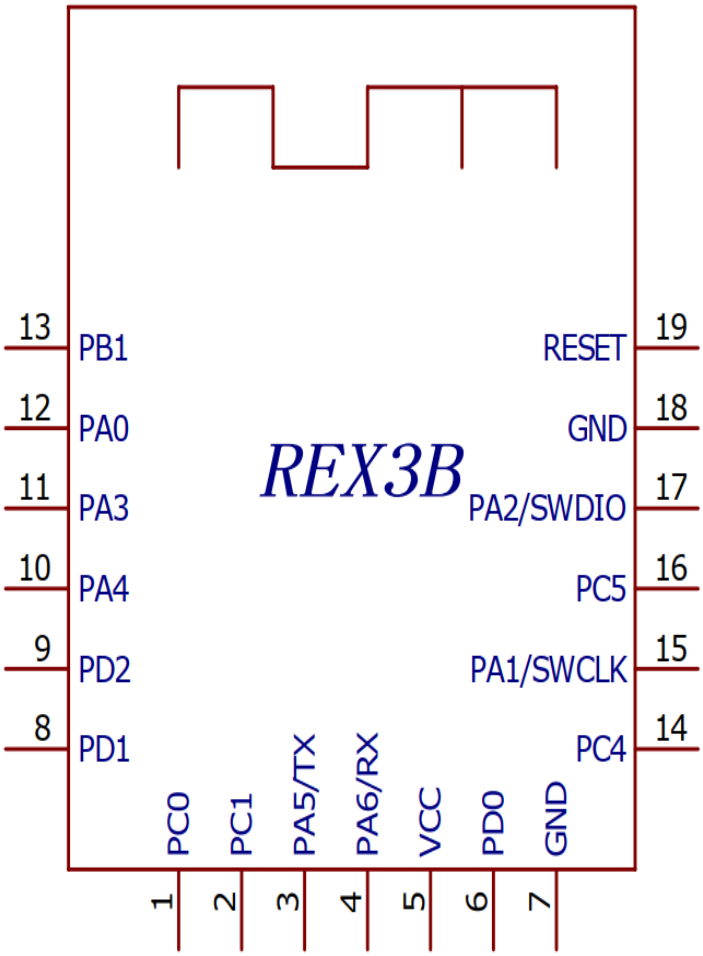

Table 3-7. Pin Description

No. of module pins	No. of QFN32 package pins	Pin signal	Direction	Pin specification
1	1	PC0	I/O	GPIO
2	2	PC1	I/O	GPIO
3	22	PA5	I/O	GPIO;TXD
4	23	PA6	I/O	GPIO;RXD
5	10 ,25 ,26 , 27	3.3V	I	VCC
6	32	PD0	I/O	GPIO
7	11 , 0	GND	I	GND

No. of module pins	No. of QFN32 package pins	Pin signal	Direction	Pin specification
8	31	PD1	I/O	GPIO
9	30	PD2	I/O	GPIO
10	21	PA4	I/O	GPIO
11	20	PA3	I/O	GPIO
12	17	PA0	I/O	GPIO
13	15	PB1	I/O	GPIO
14	5	PC4	I/O	GPIO
15	18	PA1	IO	GPIO; SWCLK
16	6	PC5	IO	GPIO
17	19	PA2	IO	GPIO; SWDIO
18	11，0	GND	I	GND
19	9	RESET	I	RESET

3.4 Antenna Specification

3.4.1 On Board PCB Antenna

REX3B has an on board PCB antenna. Notes for using PCB antenna:

- Avoid placing module in a metal shell.
- Keep metal object from the PCB antenna (at least 1cm above, 2.7cm plus recommend).
- Do not keep module nearby the devices with electromagnetic radiation source, such as transformers.

The design of a user's PCB should prevent the module's PCB antenna from the interference of its components, traces and bottom. The basic principles are:

- No traces, bottom around the PCB antenna with no other components placed
- The PCB antenna shall be out of PCB board

- Do not cover the PCB antenna with metal shell

Components, traces, copper allowed
No components around, or traces or copper at bottom. Preferred is hollow on top or at bottom of PCB antenna.

Figure 3-4. PCB Antenna Placement

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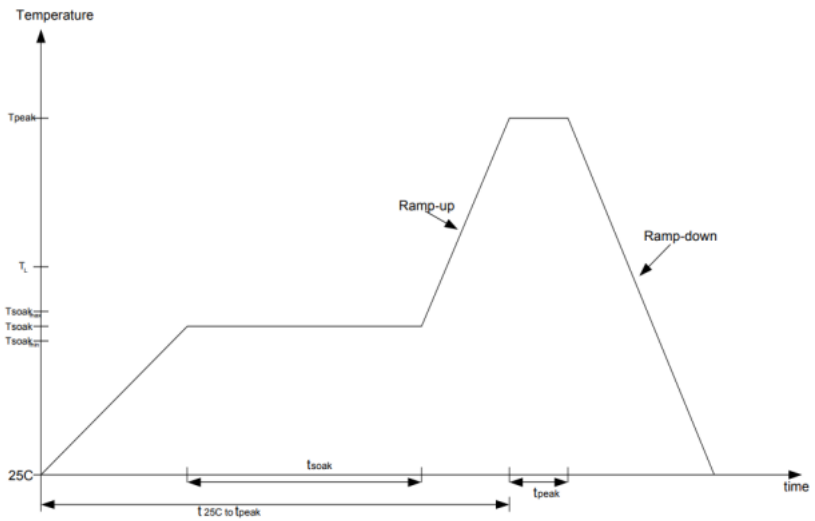
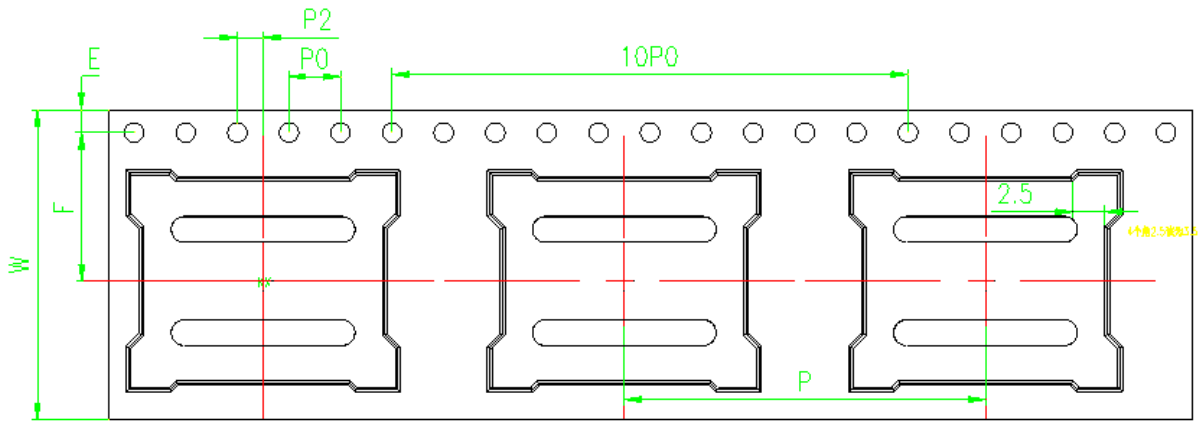
3.6. Soldering Temperature for Module

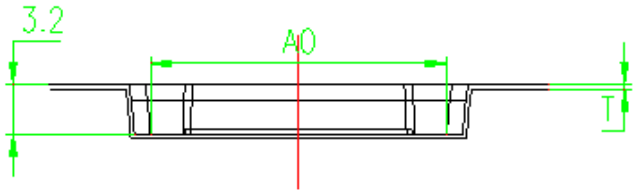
The max temperature for soldering module shall be within 237-245℃ in 20s.



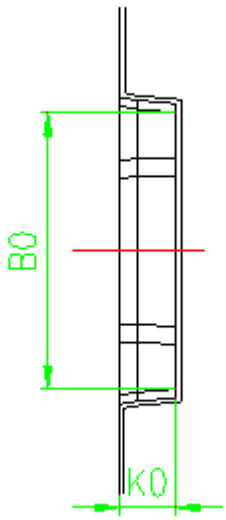
Parameter	Value
Average Ramp Up Rate (from Tsoakmax to Tpeak)	3 °C per second max
Minimum Soak Temperature (Tsoakmin)	150 °C
Maximum Soak Temperature (Tsoakmax)	200 °C
TL	21 7°C
Time above TL	60–150 seconds
Tpeak	260 + 0 °C
Time within 5 °C of Tpeak	20–40 seconds
Ramp Down Rate	6 °C per second max
Time from 25 °C to Tpeak	8 minutes, max

3.7. Packing





ITEM	SPEC(mm)
W	32.00±0.30
F	14.5±0.10
P	1.75±0.10
ΦD0	1.5
P0	4.00±0.10
A0	21.00±0.30
B0	15.5±0.30



4. Ordering Information

REX 3 B 212 B - V5 B1

Manufacturer

REX=REXENSE

Series

3=Zigbee and Bluetooth

Packaging Type

M = Mini

B = On board PC**B** antenna **(This)**

P = Full GPIO **P**in

Core

Antenna

B = PCB Antenna(No IPEX connector)

U=U.FL Interface

Hardware Version

V5

Appearance

B1 = Black Color with Shielding (default)
B = Black Color
1 = Shielding
0 = No Shielding

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5. Contact Us

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OEM/Integrators Installation Manual

List of applicable FCC rules

This module has been tested and found to comply with part 15.247 requirements for Modular Approval.

Summarize the specific operational use conditions

This module can be applied in household electrical appliances as well as TV and IP camera. The input voltage to the module should be nominally 2.97-3.63 VDC ,typical value 3.3VDC and the ambient temperature of the module should not exceed 85℃.

Limited module procedures

N/A

Trace antenna designs

N/A

RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

Antennas

The module has one PCB antenna and the antenna gain is 0dBi.

Label and compliance information

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains Transmitter Module FCC ID: 2AOE2-REX3B” or “Contains FCC ID:2AOE2-REX3B”.
The FCC ID can be used only when all FCC ID compliance requirements are met.

Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).
b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.
c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected , Zigbee testing using QRCT in FTM mode.

Additional testing, Part 15 Subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part15 digital device.
The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation. When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publiclyavailable drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details. The product under test is set into a link/association with a partnering WLAN device, as per the normal intended use of the product.
To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

FCC statement

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

ISED RSS Warning:

This device complies with Innovation, Science and Economic Development Canada Licence-exempt RSS standard(s). Operation is subject to the following two conditions:
(1) This device may not cause interference, and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED RF exposure statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le rayonnement de la classe b repecte ISED fixaient un environnement non contrôlés.Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d’autres.

IC Label Instructions:

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: “Contains Transmitter Module IC: 22670-REX3BX”,or “Contains IC: 22670-REX3BX”. Any similar wording that expresses the same meaning may be used.

Instructions d'étiquetage IC: L'extérieur des produits finis contenant ce module doit afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser des libellés tels que: "contient le module émetteur IC: 22670-REX3BX” ou "contient IC: 22670-REX3BX”, tout libellé similaire exprimant le même sens peut être utilisé.

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