

GBM52832QF MFi Bluetooth Low Energy Module Data Sheet

The GBM52832QF is a module designed and built to meet the performance, security, and reliability requirements of battery-powered IoT products running on Bluetooth networks.

Based on the nRF52832 SoC, the GBM52832QF enables Bluetooth® Low Energy connectivity while delivering best-in-class RF range and performance, future-proof capability for feature and OTA firmware updates, enhanced security features, and low energy consumption.

GBM52832QF modules are a full solution that comes with fully-upgradeable, robust software stacks, world-wide regulatory certifications, advanced development and debugging tools, and support that will minimize and simplify the engineering and development of your end-products helping to accelerate their time-to-market.

The GBM52832QF is intended for a broad range of applications, including:

Internet of Things (IoT)

- Home automation
- Sensor networks
- Building automation
- Industrial
- Retail

Personal area networks

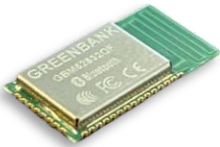
- Health/fitness sensor and monitor devices
- Medical devices
- Key fobs and wrist watches

Interactive entertainment devices

- Remote controls
- Gaming controllers

KEY FEATURES

- Bluetooth 5.2
- Built-in antenna
- Built-in Mfi chip
- -96 dBm sensitivity in Bluetooth® low energy mode
- Supported data rates: 1 Mbps, 2 Mbps Bluetooth® low energy mode
- -20 to +4 dBm TX power, configurable in 4 dB steps
- 5.3 mA peak current in TX (0 dBm)
- 5.4 mA peak current in RX
- RSSI (1 dB resolution)
- 1.7 V–3.6 V supply voltage range
- Fully automatic LDO and DC/DC regulator system



Functional Specifications

The GBM52832QF requires a single nominal supply level of 3.0 V to operate. All necessary decoupling and filtering components are included in the module.

Items	Specifications
Antenna	PCB Antenna
Main Chip	nRF52832
Application	IoT products running on Bluetooth networks.
Transmit Power	Transmit Mode output power: 0~+4 dBm
Wireless Standards	Bluetooth [®] 5.2
Data Rates	Bluetooth [®] 5: 2 Mbps, 1 Mbps, 500kbps, and 125kbps
Frequency Range	2405MHz---2480MHz
Power Consumption	Radio transmitting @ 0 dBm output power, 1 Mbps BLE : 6.4mA
Supply Voltage	1.7V to 3.6V
RAM/ Flash	64 kB/ 512 kB
Certification	BQB
Operating temperature	-40 to + 85°C
Storage temperature	-40 to + 125°C

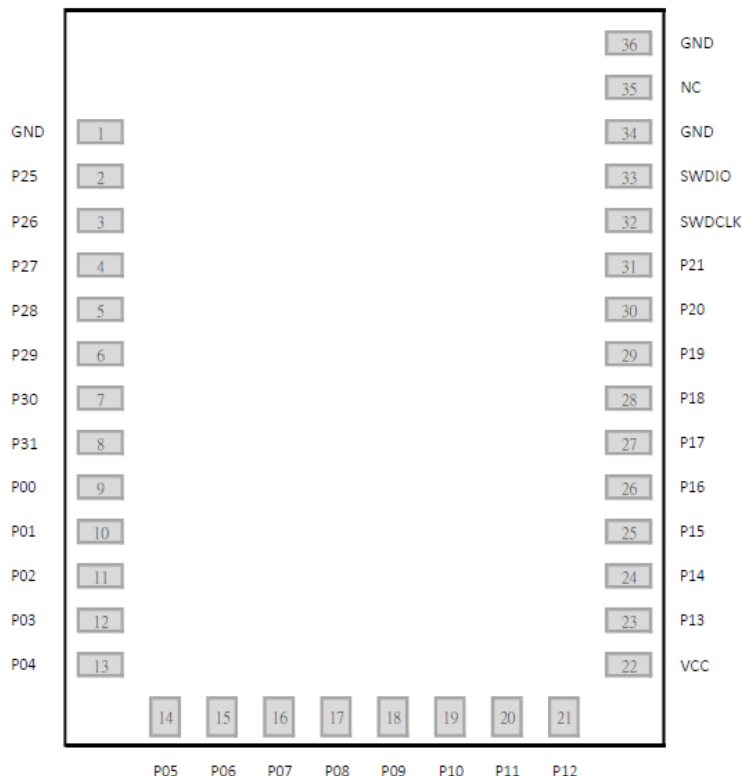
Electrical specification

All electrical parameters in all tables are specified under the following conditions, unless stated otherwise:

Symbol	Description	Min.	Typ.	Max.	Units
IRADIO_TX0	0 dBm TX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO		7.1		mA
IRADIO_TX1	-40 dBm TX @ 1 Mb/s Bluetooth Low Energy mode, Clock =HFXO		4.1		mA
IRADIO_RX0	Radio RX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO		6.5		mA
IS0	CPU running CoreMark from Flash, Radio 0 dBm TX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO, Cache enabled		9.2		mA
IS1	CPU running CoreMark from Flash, Radio RX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO, Cache enabled		9.2		mA
ION_RAMOFF_EVENT	System ON, No RAM retention, Wake on any event		1.2		μA
ION_RAMON_EVENT	System ON, Full RAM retention, Wake on any event		1.5		μA
ION_RAMOFF_RTC	System ON, No RAM retention, Wake on RTC		1.9		μA
IOFF_RAMOFF_RESET	System OFF, No RAM retention, Wake on reset		0.3		μA
IOFF_RAMOFF_GPIO	System OFF, No RAM retention, Wake on GPIO		0.3		μA
IOFF_RAMOFF_LPCOMP	System OFF, No RAM retention, Wake on LPCOMP		1.9		μA
IOFF_RAMOFF_NFC	System OFF, No RAM retention, Wake on NFC field		0.7		μA
IOFF_RAMON_RESET	System OFF, Full 64 kB RAM retention, Wake on reset		0.7		μA

Pin Definitions

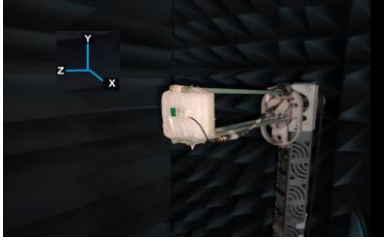
36-Pin PCB Module With LF Crystal Device Pinout



The following table provides package pin connections and general descriptions of pin functionality. For detailed information on the supported features for each GPIO pin

Pin(s)	Pin Name	Description	Pin(s)	Pin Name	Description
1	GND	Ground	21	P11	Digital I/O
2	P25	Digital I/O	22	VCC	Power supply
3	P26	Digital I/O	23	P13	Digital I/O
4	P27	Digital I/O	24	P14/TRACEDATA[3]	Digital I/O
5	P28/AIN4	Digital I/O (Analog input)	25	P15/TRACEDATA[2]	Digital I/O
6	P29/AIN5	Digital I/O (Analog input)	26	P16/TRACEDATA[1]	Digital I/O
7	P30/AIN6	Digital I/O (Analog input)	27	P17	Digital I/O
8	P31/AIN7	Digital I/O (Analog input)	28	P18/TRACEDATA[0]	Digital I/O
9	P00/XL1	Digital I/O (Analog input)	29	P19	Digital I/O
10	P01/XL2	Digital I/O (Analog input)	30	P20/TRACECLK	Digital I/O
11	P02/AIN0	Digital I/O (Analog input)	31	P21/nRESET	Digital I/O
12	P03/AIN1	Digital I/O (Analog input)	32	SWDCLK	Digital input
13	P04/AIN2	Digital I/O (Analog input)	33	SWDIO	Digital I/O
14	P05/AIN3	Digital I/O (Analog input)	34	GND	Ground
15	P06	Digital I/O	35	NC	NC
16	P07	Digital I/O	36	GND	Ground
17	P08	Digital I/O			
18	P09/NFC1	Digital I/O (NFC input)			
19	P10/NFC2	Digital I/O (NFC input)			
20	P12	Digital I/O			

Antenna Spec



Typical GBM52832QF radiation patterns and efficiency for the on-board chip antenna under optimal operating conditions are plotted in the figures that follow. Antenna gain and radiation patterns have a strong dependence on the size and shape of the application PCB the module is mounted on, as well as on the proximity of any mechanical design to the antenna.

Frequency	2402	2440	2441	2480
Ant. Port Input Pwr. (dBm)	0	0	0	0
Tot. Rad. Pwr. (dBm)	-12.0928	-11.0689	-11.0125	-9.33888
Peak EIRP (dBm)	-7.36381	-7.6145	-7.5179	-6.16653
Directivity (dBi)	4.729	3.45438	3.49461	3.17235
Efficiency (dB)	-12.0928	-11.0689	-11.0125	-9.33888
Efficiency (%)	6.17617	7.81829	7.92043	11.6443
Gain (dBi)	-7.36381	-7.6145	-7.5179	-6.16653
NHPRP $\pm\pi/4$ (dBm)	-13.664	-12.6906	-12.6378	-11.113
NHPRP $\pm\pi/6$ (dBm)	-15.2967	-14.2553	-14.195	-12.6765
NHPRP $\pm\pi/8$ (dBm)	-16.437	-15.4083	-15.3523	-13.9372
Upper Hem. PRP (dBm)	-16.655	-14.8432	-14.7533	-12.4351
Lower Hem. PRP (dBm)	-13.9621	-13.4297	-13.3977	-12.265
NHPRP4 / TRP Ratio (dB)	-1.57123	-1.62174	-1.62532	-1.77413
NHPRP4 / TRP Ratio (%)	69.6429	68.8376	68.7809	66.464
Near Horz. TRP for $\pm\pi/4$ (dBm)	-12.1589	-11.1855	-11.1327	-9.60786
NHPRP6 / TRP Ratio (dB)	-3.20386	-3.18645	-3.18248	-3.33764
NHPRP6 / TRP Ratio (%)	47.8204	48.0126	48.0564	46.3698
Near Horz. TRP for $\pm\pi/6$ (dBm)	-12.2864	-11.245	-11.1847	-9.66622
NHPRP8 / TRP Ratio (dB)	-4.34422	-4.33944	-4.33978	-4.59835
NHPRP8 / TRP Ratio (%)	36.7772	36.8177	36.8148	34.6868
Near Horz. TRP for $\pm\pi/8$ (dBm)	-12.2654	-11.2367	-11.1807	-9.76563
UHPRP / TRP Ratio (dB)	-4.56223	-3.77429	-3.74075	-3.09619
UHPRP / TRP Ratio (%)	34.9766	41.9345	42.2596	49.0209
Upper Hem.Total Radiated Pwr (dBm)	-13.6447	-11.8329	-11.743	-9.42476
LHPRP / TRP Ratio (dB)	-1.8693	-2.36082	-2.3852	-2.92608
LHPRP / TRP Ratio (%)	65.0234	58.0655	57.7404	50.9791
Lower Hem. Total Radiated Pwr(dBm)	-10.9518	-10.4194	-10.3874	-9.25466
Front/Back Ratio (dB)	9.8864	7.70097	5.35338	2.77639
Phi BW (°)	88	129	113	64
+ Phi BW (°)	24	23	28	26
- Phi BW (°)	64	106	85	38
Theta BW (°)	45	62	97	40
+ Th. BW (°)	30	46	55	13
- Th. BW (°)	15	16	42	27
Boresight Phi (°)	343.35	345	302.25	92.9
Boresight Th. (°)	135	135	105	150
Maximum Power (dBm)	-7.36381	-7.6145	-7.5179	-6.16653
Minimum Power (dBm)	-25.5377	-28.3058	-27.2639	-24.7524
Average Power (dBm)	-11.9924	-10.9946	-10.9299	-9.23286
Max/Min Ratio (dB)	18.1738	20.6913	19.746	18.5859
Max/Avg Ratio (dB)	4.62862	3.38005	3.41196	3.06634
Min/Avg Ratio (dB)	-13.5452	-17.3112	-16.334	-15.5195
Average Gain (dB)	-12.0928	-11.0689	-11.0125	-9.33888
E-Plane BW (°)	42	48	61	61
+ E-Plane BW (°)	29	35	37	38
- E-Plane BW (°)	13	13	24	23
H-Plane BW (°)	138	165	167	41
+ H-Plane BW (°)	76	74	121	13
- H-Plane BW (°)	62	91	46	28

Certifications

Bluetooth Qualification

The GBM52832QF come with a pre-qualified RF-PHY component having Declaration ID of D051666 and QDID of 152918.

This component can be combined with the latest Link Layer and Host pre-qualified components when in the process of qualifying the end-product via the SIG's Launch Studio.

USA – FCC

FCC ID: 2AX6SGBM52832

FCC Warning Statement

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

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

This device complies with Part 15 of the FCC Rules when operating with the embedded antenna. 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 undesirable operation.

Any changes or modifications not expressly approved by Silicon Labs could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

This transmitter meets the Mobile requirements at a distance of 20 cm and above from the human body, in accordance to the limit(s) exposed in the RF Exposure Analysis.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

End Product Labeling

GBM52832QF modules are labeled with their own FCC ID. If the FCC ID is not visible when the module is installed inside another device,

then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case,

the final end product must be labeled in a visible area with the following:

"Contains Transmitter Module FCC ID: 2AX6SGBM52832 "

Or

"Contains FCC ID: 2AX6SGBM52832 "

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module or

change RF related parameters in the user manual of the end product.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for

testing their end-product for any additional compliance requirements required with this module installed.

Class B Device Notice

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.

NCC ID:  CCXXxxYYyyZzW

LP0002 :

※取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

※低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

-前述合法通信，指依電信管理法規定作業之無線電通信。

-低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本模組於取得認證後將依規定於模組本體標示審驗合格標籤，並要求最終產品平台廠商(OEM Integrator)於最終產品平台

(End Product)上標示“ 本產品內含射頻模組，

其NCC型式認證號碼為：  CCXXxxYYyyZzW 。

公司名稱: 綠銀科技

產品名稱: MFi Bluetooth Low Energy Module

型號: GBM52832QF

廠牌: GREENBANK