

User Manual (TM16FNROBM0)

FCC ID: BEJTM16FNROBM0

History

Ver.	Date	Contents	Written by	Checked by	Approved by	Note
1.0	2024.03.19					

Contents

- 1. Product Introduction 4
 - 1.2 Environmental Specifications 5
 - 1.3 Electrical Specifications 5
 - 1.3.1 Absolute Maximum Rating and ESD Ratings 5
 - 1.3.2 Current Consumption 6
 - 1.4 Mechanical Specifications 6
 - 1.4.1 Physical Dimensions 6
 - 1.4.2 Mechanical Drawing 6
- 2. RF Specification 7
 - 2.1 Module support Band
 - 2.2 Module Support Power Level 9
- 3. Module Installation 10

1. Product Introduction

The TM16FNROBM0 are designed for the automotive industry. They support 5G NR, LTE, WCDMA and GSM air Interface standards. The TM16FNROBM0 are based on the Qualcomm wireless chipsets and support the following bands.

Table 1. Supported Band

Region		Rest of World
Band	NR	n1/n3/n7/n8/n20/n28/n41/n77/n78/n79
	LTE	B1/B2/B3/B4/B5/B7/B8/B12/B17/B18/B19 /B20/B25/B26/B28/B38/B40/B41//B42/B43
	LTE ULCA	CA_3A-8A, CA_7C
	WCDMA	B1/B2/B4/B5/B8/B19
	GSM	GSM850/900/1800/1900

1.1 Environmental Specifications

The environmental specification for operating and storage of the TM16FNROBM0 are defined in the the table below.

Table 2. Environmental Specifications

Parameter	Temperature Range
Operating Temperature	-40°C to 90°C (ecall 95°C)
Storage Temperature	-40°C to +95°C
Humidity	95% or less

1.2 Electrical Specifications

This section provides details for some of the key electrical specifications of the TM16FNROBM0 embedded modules.

1.2.1 Absolute Maximum Rating and ESD Ratings

This section defines the Absolute Maximum and Electrostatic Discharge (ESD) Ratings of the TM16FNROBM0 embedded modules.

Warning: If these parameters are exceeded, even momentarily, damage may occur to the device.

Table 3. Absolute Maximum Ratings

Parameter		Min	Max	Units
VPH_PWR	Power Supply Input	-	6	V
VIN	Voltage on any digital input or output pin	-	2.145	V
ESD Ratings				
ESD ¹⁾	Primary, Diversity antenna pads - Contact		1	kV

1) The ESD Simulator configured with 330pF, 2000Ω.

Caution: The TM16FNROBM0 embedded modules are sensitive to Electrostatic Discharge. ESD countermeasures and handling methods must be used when handling the TM16FNROBM0 devices.

1.2.2 Current Consumption

Table 4. TM16FNROBM0 Current Consumption (@4.1V)

Mode	Parameter	Typical	Max	Units
LTE	Max TX Output /Full RB	550	TBD	mA
WCDMA	Max TX Output /Full RB	850	TBD	mA
LTE	Idle, Registered	2	-	mA
WCDMA	Idle, Registered	2	-	mA

1.4 Mechanical Specifications

1.4.1 Physical Dimensions

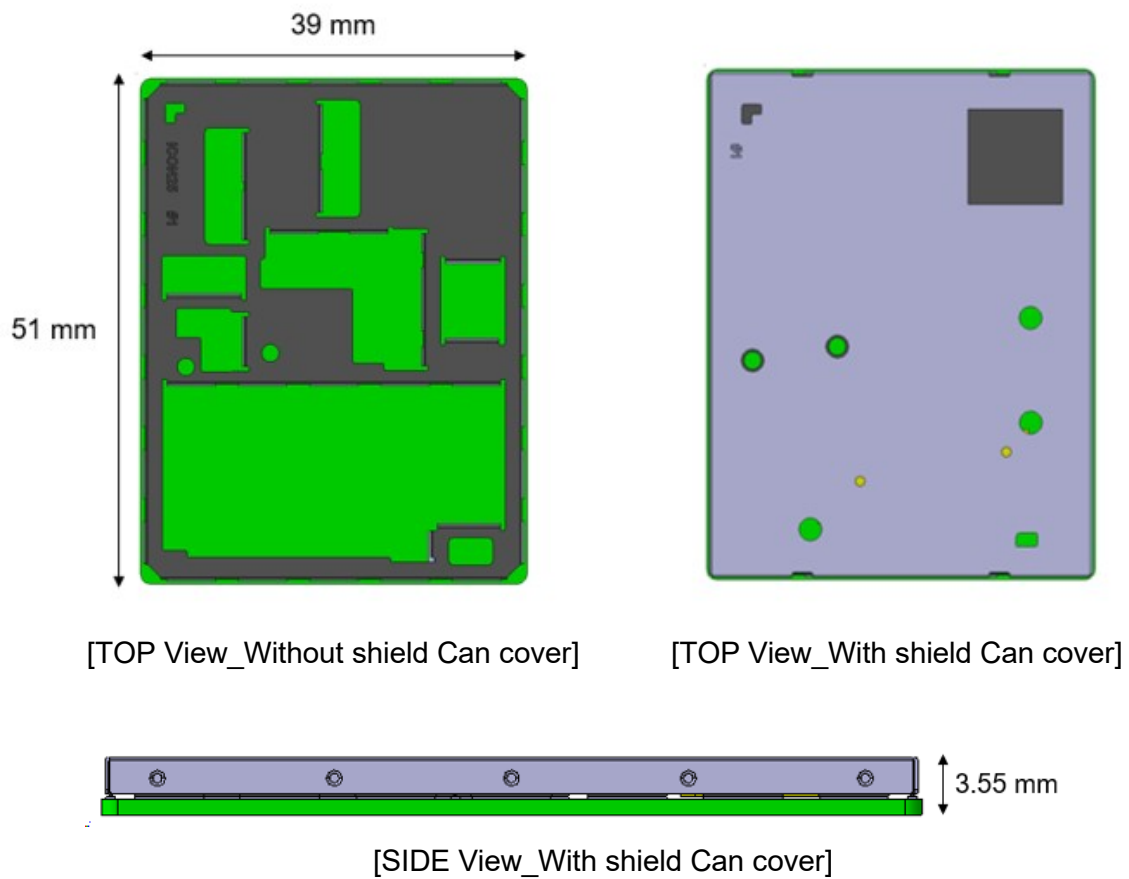
The TM16FNROBM0 embedded modules are a Land Grid Array (LGA) form factor device. The device does not have a System or RF connectors. All electrical and mechanical connections are made via the lga pad on the underside of the PCB.

1.4.2 Mechanical Drawing

8.1 Module Dimension

Parameter	Nominal	Max	Units
Overall Dimension	39 x 51	39.35 x 51.35	mm
Overall Module Height	3.55	3.8	mm
PCB Thickness	1.0	1.1	mm
Flatness Specification		0.1	mm
Weight	TBD		g

Module Mechanical Design



2. RF Specification

The specifications for the 5G NR, LTE and WCDMA interfaces are defined.
 TM16FNROBM0 is designed to be compliant with the standard shown in the table below.

Table6. Standards Compliance

Technology	Standards
5G NR	• 3GPP Release 16
LTE	• 3GPP Release 15
WCDMA	• 3GPP Release 9
GSM	• 3GPP Release 9

2.1 Module support Band

UMTS/LTE	Frequency		FDD / TDD	
	Band	Tx		
B1	1920~1980	2110~2170	FDD	W,L,NR
B2	1850~1910	1930~1990	FDD	G,W,L
B3	1710~1785	1805~1880	FDD	G,L,NR
B4	1710~1755	2100~2155	FDD	W,L
B5 (n5)	824~849	869~894	FDD	G,W,L
B6	830~840	875~885	FDD	
B7	2500~2570	2620~2690	FDD	L,NR
B8	880~915	925~960	FDD	G,W,L,NR
B9	1749.9~1784.9	1844.9~1879.9	FDD	
B10	1710~1770	2110~2170	FDD	
B11	1427.9~1447.9	1475.9~1495.9	FDD	
B12	669~716	729~746	FDD	L
B13	777~787	746~756	FDD	
B14	788~798	758~768	FDD	
B17	704~716	734~746	FDD	L
B18	815~830	860~875	FDD	L
B19	830~845	875~890	FDD	W,L
B20	832~862	791~821	FDD	L,NR
B21	1447.9~1462.9	1495.9~1510.9	FDD	
B24	1626.5~1660.5	1525~1559	FDD	
B25 (n25)	1850~1915	1930~1995	FDD	L
B26	814~849	859~894	FDD	L
B28 (n28)	703~748	758~803	FDD	L,NR
B29 (n29)	-	717~728	FDD	
B30	(2305~2315)	2350~2360	FDD	
B32	-	1452~1496	FDD	
B34	2010~2025		TDD	
B38(n38)	2570~2620		TDD	L

B39	1880~1920		TDD	
B40	2300~2400		TDD	L
B41 (n41)	2496~2690		TDD	L,NR
B42	3400~3600		TDD	L
B43	3600~3800		TDD	L
B47(C-V2X)	5855~5925		TDD	
B48	3550~3700		TDD	
B66 (n66)	1710~1780	2110~2200	FDD	
B71 (n71)	663~698	617~652	FDD	
B75	1432~1517		SDL	
n77	3300~4200		TDD	NR
n78	3300~3800		TDD	NR
n79	4400~5000		TDD	NR

- G : GSM
- W : WCDMA
- L : LTE
- NR : 5G NR

2.2 Module Support Power Level

RAT	Power Level (dBm)
GSM	33dBm (GSM850, 900) 30dBm (GSM1800) 29dBm (GSM1900)
WCDMA	24 dBm
LTE*	23 dBm
5G NR*	23 dBm

3. Module Installation

Module should be covered its shield-can cover before operation. In case of modules were supplied separately with shield-can cover, it should be covered by shield-can before use. Shield-can can covers whole part of module as below picture.



Installation of Shield-can cover

Notice

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

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.

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.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with minimum distance 45mm between the radiating element of this device and the user.

Notice

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

This equipment should be installed and operated with minimum distance 4.5 cm between the radiator & your body.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

Avis d'Industrie Canada sur l'exposition aux rayonnements

Cet appareil est conforme aux limites d'exposition aux rayonnements d'Industrie Canada pour un environnement non contrôlé.

Il doit être installé de façon à garder une distance minimale de 4.5 centimètres entre la source de rayonnements et votre corps.

REMARQUE: LE FABRICANT N'EST PAS RESPONSABLE DES INTERFÉRENCES RADIOÉLECTRIQUES CAUSÉES PAR DES MODIFICATIONS NON AUTORISÉES APPORTÉES À CET APPAREIL. DE TELLES MODIFICATIONS POURRAIT ANNULER L'AUTORISATION ACCORDÉE À L'UTILISATEUR DE FAIRE FONCTIONNER L'APPAREIL.

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.

L'exploitation est autorisée aux deux conditions suivantes :

- 1.L'appareil ne doit pas produire de brouillage;
- 2.L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

KDB 996369 D03 OEM Manual

2.2 List of Applicable FCC Rules

Part 22, 24, 27, 90

2.3 Summarize the specific operational use conditions

Limited module, designated enclosure that contains specific antenna inside. Professional installation equipment. Vehicle-use only. Only vehicle manufacturer can use/install this device on their vehicle.

2.4 Limited module procedure

Limited module, only specific host equipment can be used with this module. Applying this module to other host equipment may require additional test and permissive change procedure. RF Exposure was evaluated with specific host and certain condition.

2.4.1 Test plan for different host configuration

Module was tested with a specific host configuration. Any other host configuration for this module would require additional test. New host configuration shall be approved with additional test.

Following tests shall be considered to add new host configuration on this modular approval with Class II permissive change.

- All radiated testing shall be performed on new host equipment and new antenna.
- RF Exposure shall be evaluated on new host equipment.

TEST ITEM	RULE PART
ERP/EIRP	§22.913(a)(5) §24.232(c) §27.50(b)(9) §27.50(d)(4) §27.50(h)(2) §27.50(j)(3) §27.50(k)(3) §90.635(b)
Radiated Spurious Emissions	§22.917(a) §24.238(a) §27.53(g) §27.53(h)(1) §27.53(m)(4) §27.53(l)(2) §27.53(n)(2) §90.691(a)
RF Exposure	§2.1091, §2.1093

2.5 Trace antenna designs

N/A

2.6 RF Exposure consideration

RF Exposure evaluation was performed with very specific installation condition at 45 mm. Any other installation condition may require additional RF exposure evaluation procedure in the module or host equipment.

2.7 Antennas

Radiated emission test was performed with internal antenna configuration with host device.

Any other antenna may require additional test and permissive change procedure.

Internal antenna configuration with host equipment

- MIMO1 & 3 antenna: 3GHz below bands
- MIMO2 antenna: 3GHz above bands

2.8 Label and compliance information

Host equipment shall have compliance information and label information. 'Contains FCC ID" with FCC ID: BEJTM16FNROBM0