

User Manual (TM05NNNABM0)

BEJTM05NNNABM0 [FCC ID]
2703H-TM05NNNABM0 [ISED ID]

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1. Product Introduction

The **TM05NNNABM0** are designed for the automotive industry. They support 5G NR, LTE and WCDMA air Interface standards. The **TM05NNNABM0** are based on the Qualcomm SA515M wireless chipsets and support the following bands.

Table 1. Supported Band

Region		NA SIM1	NA SIM2
Band	NR	n1/n2/n3/n5/n20/n25/n41/n66/n71	n25/n41/n66/n71/n77
	LTE	B1/B2/B3/B4/B5/B7/B12/B13/B17 /B20/B25/B26/B29/B30/B41/B66/B71	B2/B4/B5/B7/B12/B13/B17/B25 /B26/B29/B30/B41/B66/B71
	WCDMA	B1/B2/B3/B4/B5	
	GSM	GSM850, GSM1900	GSM850, GSM1900

1.1 Block Diagram

Confidential

Figure 1.1. TM05NNNABM0 Block diagram

1.2 Environmental Specifications

The environmental specification for operating and storage of the **TM05NNNABM0** are defined in 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

1.3 Electrical Specifications

This section provides details for some of the key electrical specifications of the **TM05NNNABM0** embedded modules.

1.3.1 Absolute Maximum Rating and ESD Ratings

This section defines the Absolute Maximum and Electrostatic Discharge (ESD) Ratings of the **TM05NNNABM0** 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	-	18	V
VIN	Voltage on any digital input or output pin	-	18	V
ESD Ratings				
ESD ¹⁾	Primary, Diversity antenna pads - Contact		1	kV

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

Caution: The **TM05NNNABM0** embedded modules are sensitive to Electrostatic Discharge. ESD countermeasures and handling methods must be used when handling the **TM05NNNABM0** devices.

1.3.2 Current Consumption

Table 4. **TM05NNNABM0** Current Consumption (@12.5V TBD)

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

1.4 Mechanical Specifications

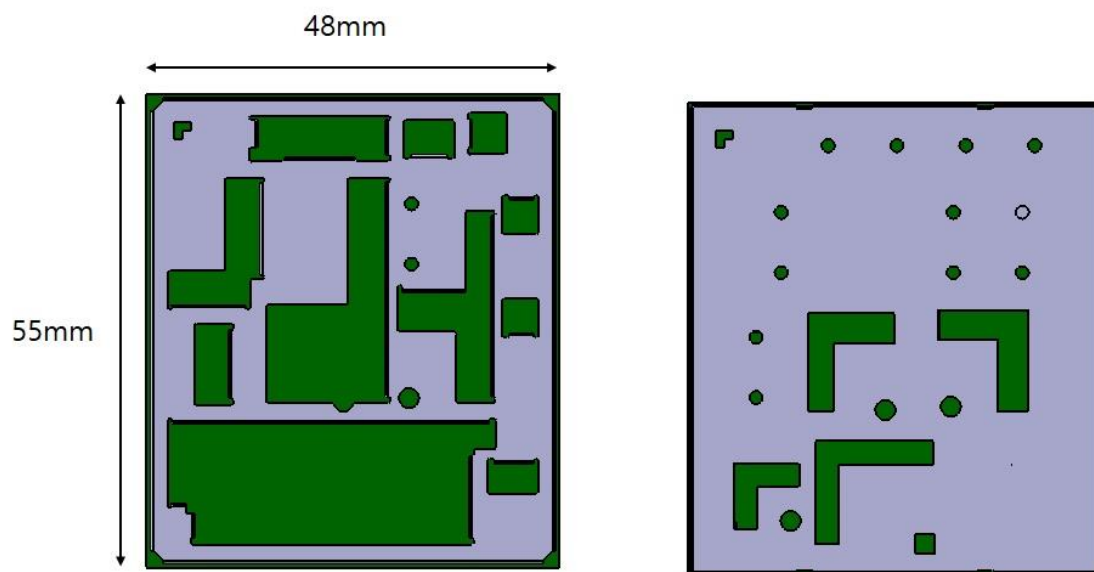
1.4.1 Physical Dimensions and Connection Interface

The **TM05NNNABM0** 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.

Table5. **TM05NNNABM0** Embedded Module Dimensions

Parameter	Nominal	Max	Units
Overall Dimension	48 x 55	48.35 x 55.35	mm
Overall Module Height	3.6	3.8	mm
PCB Thickness	1.0	1.1	mm
Flatness Specification		0.1	mm
Weight	TBD		g

1.4.2 Mechanical Drawing



1.4.2.1 NAD PCB

[TOP View_Without shield Can cover]

[TOP View_With shield Can cover]



[SIDE View_With shield Can cover]

2. RF Specification

The specifications for the 5G NR, LTE and WCDMA interfaces are defined.

TM05NNNABM0 is designed to be compliant with the standard shown in the table below.

Table6. Standards Compliance

Technology	Standards
5G NR	• 3GPP Release 15
LTE	• 3GPP Release 11
WCDMA	• 3GPP Release 9
GSM	• 3GPP Release 8

3. Antenna requirement [WWAN]

This device contains BEJTM05NNNABM0 [FCC ID], 2703H-TM05NNNABM0 [ISED ID] as WWAN module. All the configuration related to the module comply module requirement with following antenna gain.

- An antenna may be connected to connector within following condition.
- This product has been tested with antenna and cable configuration listed below.

Host manufacturer shall use antenna and cable that has gain less or equal to the configuration.

- Antenna gain calculated with cable loss and gain shall not be greater than final antenna gain listed below.

SIM 1

There are 2 difference antenna types connected to the module for SIM 1.

Antenna Box has generally highest gain among the antennas.

Antenna Type	Antenna No.	Antenna Name	Antenna Part Number
Trunk	1	Antenna Box (basic)	8705921
	2	MSA TEL	920631001
	3	MSA TEL SDARS	920361002
Roof	4	DA WAVE HAF 5G-US	8705914-05
	5	DA WAVE High 5G-US	5A09D90-03

Operating Frequency (MHz)		Antenna Peak Gain (dB i)			
		Ant. No	Ant. Gain	Cable Loss	Final Gain
LTE Band 71 NR Band 71	663 ~ 698	Ant. 1	-3.00	0.22	-3.22
		Ant. 2	2.20	0.52	1.68
		Ant. 3	2.50	0.52	1.98
		Ant. 4	-3.80	-	-3.80
		Ant. 5	-3.40	-	-3.40
LTE Band 12/17	669 ~ 716	Ant. 1	3.00	0.22	2.78
		Ant. 2	2.60	0.52	2.08

		Ant. 3	2.50	0.52	1.98
		Ant. 4	-3.00	-	-3.00
		Ant. 5	-3.10	-	-3.10
LTE Band 13	777 ~ 787	Ant. 1	3.00	0.22	<u>2.78</u>
		Ant. 2	2.60	0.52	2.08
		Ant. 3	2.50	0.52	1.98
		Ant. 4	-3.00	-	-3.00
		Ant. 5	-3.10	-	-3.10
GSM 850 WCDMA V LTE Band 26/5 NR Band 5	824 ~ 849	Ant. 1	3.00	0.22	<u>2.78</u>
		Ant. 2	2.10	0.52	1.58
		Ant. 3	2.30	0.52	1.78
		Ant. 4	-0.40	-	-0.40
		Ant. 5	-0.20	-	-0.20
LTE Band 26	814 ~ 824	Ant. 1	3.00	0.22	<u>2.78</u>
		Ant. 2	2.10	0.52	1.58
		Ant. 3	2.30	0.52	1.78
		Ant. 4	-0.30	-	-0.30
		Ant. 5	0.00	-	0.00
WCDMA IV LTE Band 66/4 NR Band 66	1 710 ~ 1 780	Ant. 1	5.00	0.30	4.70
		Ant. 2	5.40	0.73	4.67
		Ant. 3	5.80	0.73	<u>5.07</u>
		Ant. 4	2.70	-	2.70
		Ant. 5	3.00	-	3.00
GSM 1900 WCDMA II LTE Band 25/2 NR Band 2, 25	1 850 ~ 1 915	Ant. 1	5.00	0.34	4.66
		Ant. 2	6.20	0.82	<u>5.38</u>
		Ant. 3	5.90	0.82	5.08
		Ant. 4	2.80	-	2.80
		Ant. 5	2.30	-	2.30
LTE Band 7/41 NR Band 41	2 496 ~ 2 690	Ant. 1	5.00	0.40	4.60
		Ant. 2	6.60	0.96	<u>5.64</u>
		Ant. 3	6.50	0.96	5.54
		Ant. 4	3.30	-	3.30
		Ant. 5	3.00	-	3.00

- The Roof type antennas are directly connected to the EUT, so there is no cable loss.

SIM 2

HKL Mobilradioantenna has generally highest gain among the antennas for SIM 2.

Antenna Type	Antenna No.	Antenna Name	Antenna Part Number
Trunk	1	Antenna Box	8705921
	2	FSA WAVE 5G (left/right)	8705919/8705920
	3	HKL Mobilradioantenna (basic)	5A2D602
	4	ZB Spoilerantenna	5A0C5B0

Operating Frequency (MHz)		Antenna Peak Gain (dB i)			
		Ant. No	Ant. Gain	Cable Loss	Final Gain
LTE Band 71 NR Band 71	663 ~ 698	Ant. 1	-3.00	0.57	-3.57
		Ant. 2	4.00	0.57	3.43
		Ant. 3	5.00	0.57	4.43
		Ant. 4	4.00	0.57	3.43
LTE Band 12/17	669 ~ 716	Ant. 1	3.00	0.57	2.43
		Ant. 2	4.00	0.57	3.43
		Ant. 3	5.00	0.57	4.43
		Ant. 4	3.00	0.57	2.43
LTE Band 13	777 ~ 787	Ant. 1	3.00	0.57	2.43
		Ant. 2	4.00	0.57	3.43
		Ant. 3	5.00	0.57	4.43
		Ant. 4	3.00	0.57	2.43
GSM 850 LTE Band 26/5	814 ~ 849	Ant. 1	3.00	0.57	2.43
		Ant. 2	4.00	0.57	3.43
		Ant. 3	5.00	0.57	4.43
		Ant. 4	3.00	0.57	2.43
LTE Band 66/4 NR Band 66	1 710 ~ 1 780	Ant. 1	5.00	0.79	4.21
		Ant. 2	4.00	0.79	3.21
		Ant. 3	5.00	0.79	4.21
		Ant. 4	4.00	0.79	3.21
GSM 1900 LTE Band 25/2 NR Band 25	1 850 ~ 1 915	Ant. 1	5.00	0.89	4.11
		Ant. 2	4.00	0.89	3.11
		Ant. 3	5.00	0.89	4.11
		Ant. 4	4.00	0.89	3.11
LTE Band 7/41 NR Band 41	2 496 ~ 2 690	Ant. 1	5.00	1.04	3.96
		Ant. 2	5.00	1.04	3.96
		Ant. 3	5.00	1.04	3.96
		Ant. 4	4.00	1.04	2.96
NR Band 77	3300~4200	Ant. 1	5.00	1.15	3.85
		Ant. 2	5.00	1.15	3.85
		Ant. 3	5.00	1.15	3.85
		Ant. 4	3.00	1.15	1.85

4. Label Requirement

OEM host manufacturer must label “Contains FCC ID: BEJTM05NNNABM0”,

“Contains IC: 2703H-TM05NNNABM0”.

5. Notice

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 not expressly approved by the manufacturer (or party responsible) for compliance could void the user's authority to operate the equipment

This equipment complies with FCC and IC RF Radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.