Technical Specification
(TM03LNCAHK0)

History

Ver.	Date	Contents	Written by	Checked by	Approved by	Note
1.0	2016.12.16					

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1. Product Introuction

The TM03LNCAHK0 **are designed for the automotive industry. They support LTE and CDMA air Interface standards. The** TM03LNCAHK0 **are based on the Qualcomm MDM9628 wireless chipsets and support the following bands.**

Table 1. Supported Band

Region		Canada
Band	LTE	B2/B4/B5/B17
	WCDMA	B2/B5

1.1 Block Diagram

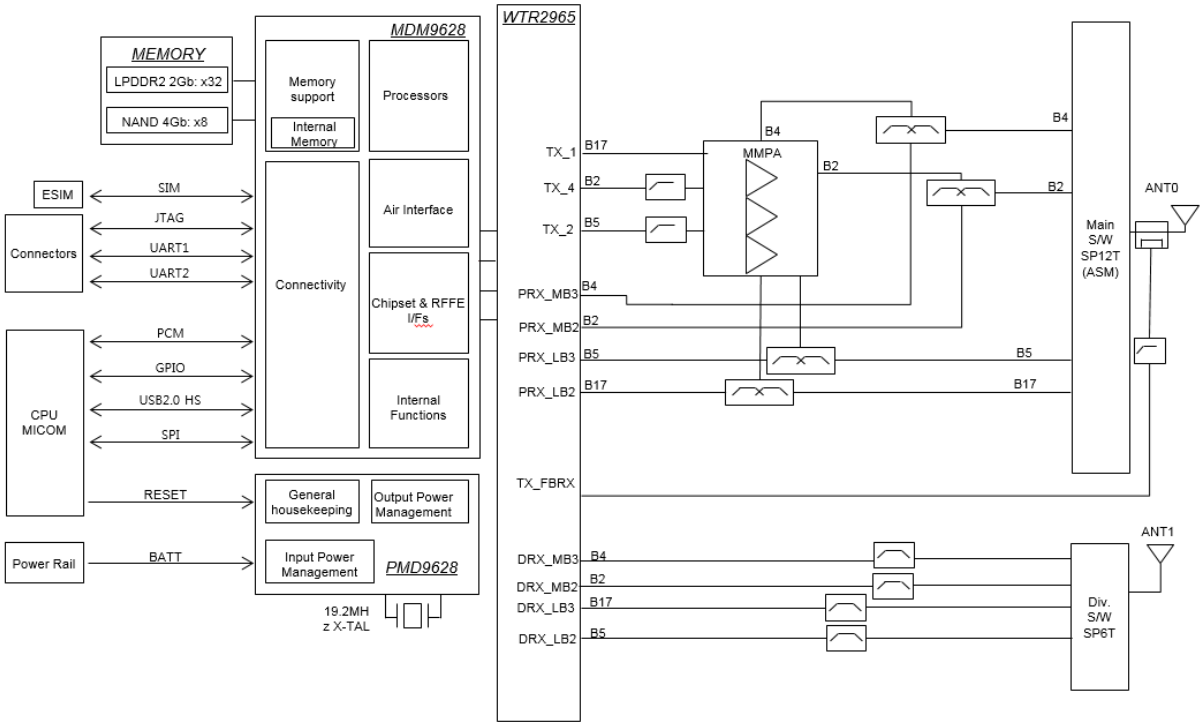


Figure 1.1. TM03LNCAHK0 Block diagram

1.2 Environmental Specifications

The environmental specification for operating and storage of the TM03LNCAHK0 **are defined in the the table below.**

Table 2. Environmental Specifications

Parameter	Temperature Range
Operating Temperature	-40℃ to 85℃
Storage Temperature	-40℃ to +90℃
Humidity	95% or less

1.3 Electrical Specifications

This section provides details for some of the key electrical specifications of the **TM03LNCAHK0** embedded modules.

1.3.1 Absolute Maximum Rating and ESD Ratings

This section defines the Absolute Maximum and Electrostatic Discharge (ESD) Ratings of the **TM03LNCAHK0** 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
+4.0_VPWR	Power Supply Input	-	4.4V	V
VIN	Voltage on any digital input or output pin	-	VREG_MDME+0.5	V
ESD Ratings				
ESD[1)]	Primary, Diversity antenna pads - Contact		10	kV

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

Caution: The TM03LNCAHK0 embedded modules are sensitive to Electrostatic Discharge. ESD countermeasures and handling methods must be used when handling the TM03LNCAHK0 devices.

1.3.2 Current Consumption

Table 4. TM03LNCAHK0 **Current Consumption**

Mode	Parameter	Typical	Max	Units
LTE	Band2, Max TX Output /Full RB	600	650	mA
	Band4, Max TX Output /Full RB	600	650	
	Band5, Max TX Output /Full RB	550	600	
	Band17, Max TX Output /Full RB	550	600	
WCDMA	Band2	600	650	mA
	Band5	550	600	
LTE	Idle, Registered	1.8	2.2	mA
WCDMA	Idle, Registered	1.8	2.2	mA
LTE	Sleep Mode, Average Current	1.8	2.2	mA
WCDMA	Sleep Mode, Average Current	1.8	2.2	mA

1.4 Mechanical Specifications

1.4.1 Physical Dimensions and Connection Interface

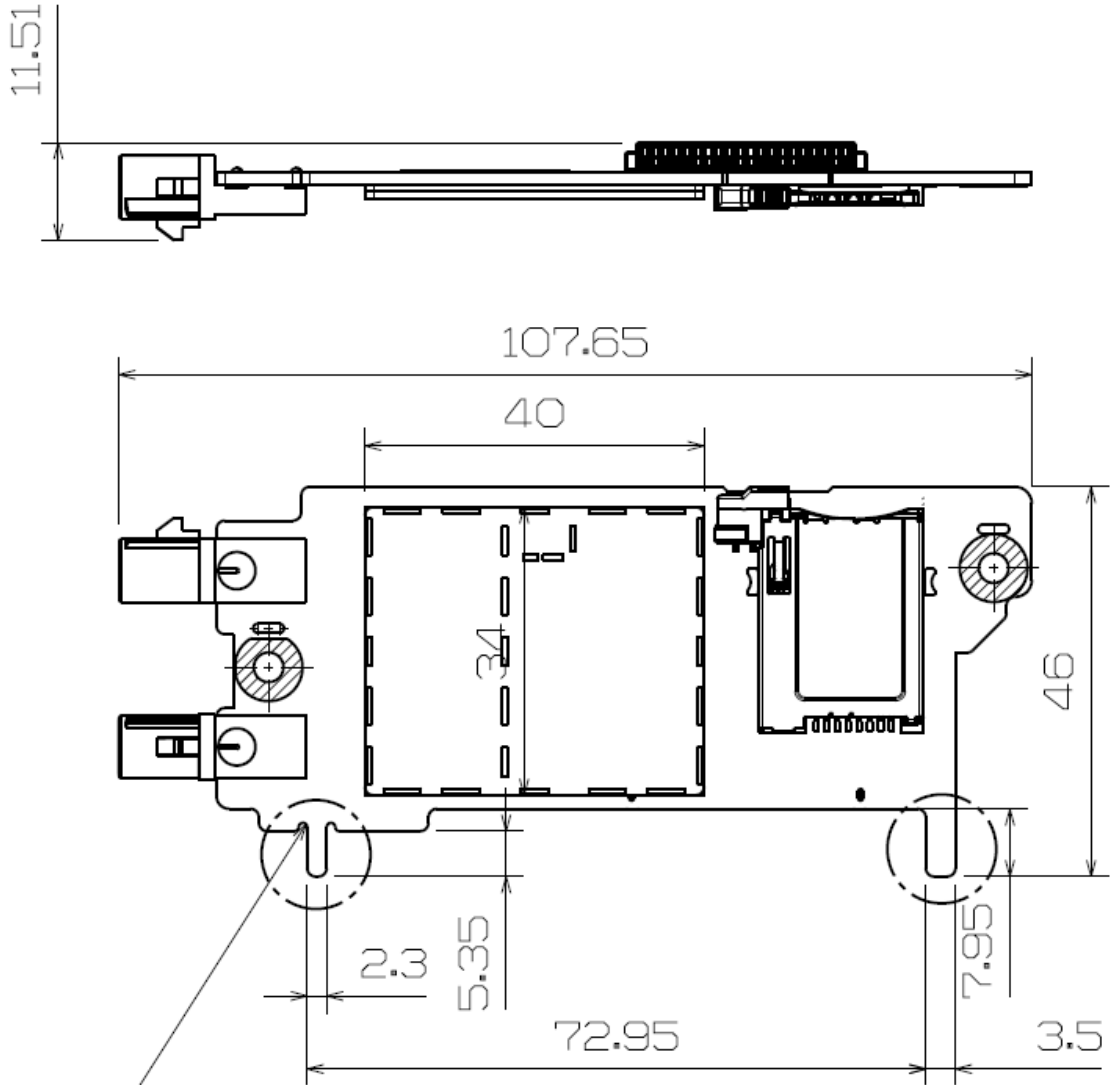
The **TM03LNCAHK0** embedded modules are a Land Grid Array (LGA) form factor device. The device does not have a System or RF connectors. All electrical and mechanical connections are made via the 323 pad **TM03LNCAHK0** on the underside of the PCB.

Table5. **TM03LNCAHK0** Embedded Module Dimensions

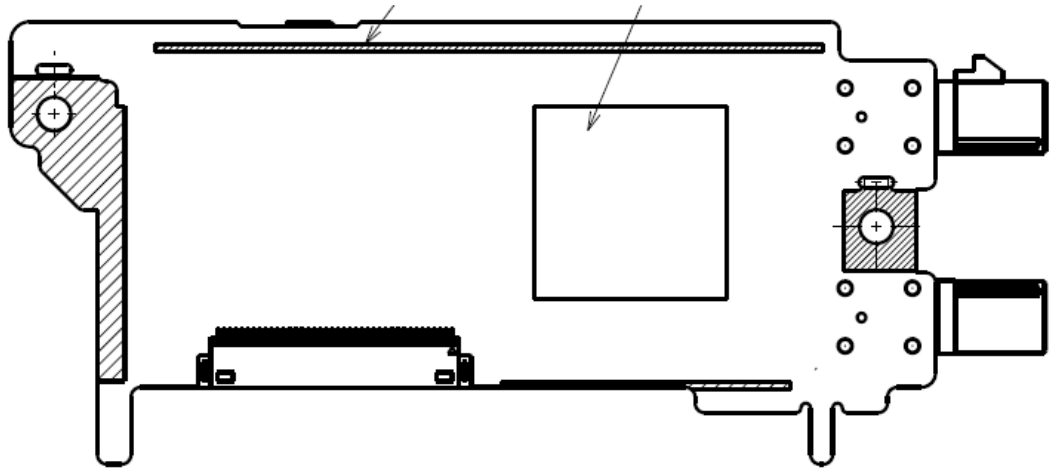
Parameter	Nominal	Max	Units
Overall Dimension	34 x 40	34.35 x 40.35	mm
Overall Module Height	3.5	3.85	mm
PCB Thickness	1.0	1.1	mm
Flatness Specification		0.1	mm
Weight	TBD		g

1.4.2 Mechanical Drawing

1.4.2.1 Carrier PCB



[TOP View]



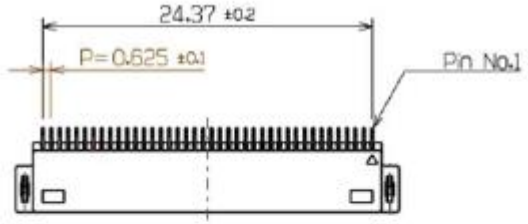
[Bottom View]

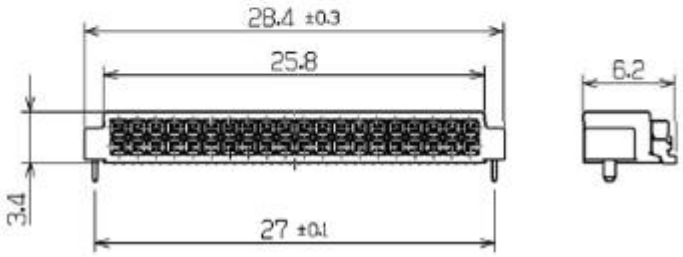
2. Pin Definitions

Table6. PIN Definitions

40pin connector
KM17E-40DS-1.25H (Hirose)

Level	모듈 신호					모뎀신호	Level
1.8V	MDM UART2	DEBUG_UART_TXD	1	2	DEBUG_UART_RXD	MDM UART2	1.8V
	-	NC	3	4	NC	-	
	-	NC	5	6	NC	-	
3.3V	MDM UART1	UART_RFR	7	8	UART_CTS	MDM UART1	1.8V
	-	NC	9	10	NC	-	
1.8V	MDM GPIO	BOOT_OK	11	12	MSG	MDM GPIO	1.8V
	-	NC	13	14	NC	-	
	-	NC	15	16	PCM_3.3V_TXD	MDM PCM	1.8V
	-	NC	17	18	PCM_3.3V_RXD	MDM PCM	1.8V
1.8V	MDM PCM	PCM_3.3V_CLK	19	20	PCM_3.3V_SYNC	MDM PCM	1.8V
	-	GND	21	22	GND	-	
	-	NC	23	24	NC	-	
	-	NC	25	26	NC	-	
1.8V	MDM GPIO	96H_END	27	28	RESET_IN	PMIC	1.8V
5.0V	PMIC	USB_VBUS	29	30	ACC_ON_SLEEP	MDM GPIO	1.8V
4.0V	PMIC	V_BATT	31	32	V_BATT	PMIC	4.0V
	-	GND	33	34	GND	-	
400mV	MDM USB	USB_D+	35	36	USB_D-	MDM USB	400mV
1.8V	MDM UART_RXD	UART_RXD	37	38	NC	-	
1.8V	MDM UART	UART_TXD	39	40	GND	-	





3. RF Specification

The specifications for the LTE and CDMA interfaces are defined.
TM03LNCAHK0 **is designed to be compliant with the standard shown in the table below.**

Table20. Standards Compliance

Technology	Standards
LTE	**• 3GPP Release 8**
WCDMA	**• 3GPP Release 9**

3.1 LTE B2, B4, B5, B17 Specification

3.1.1 LTE TX Output Power

The Maximum / Minimum Transmitter Output Power of the **TM03LNCAHK0** are specified in the following table.

Table21. Conducted TX (Transmit) Max output Power Tolerances – LTE Bands

BAND	Method (UL CH)	Specification
BAND2 UE Maximum Output Power	Measure Max and Min and Min Transmit Power of Low Channel (18650)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of Mid Channel (18900)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of High Channel (19150)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
BAND4 UE Maximum Output Power	Measure Max and Min and Min Transmit Power of Low Channel (20000)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of Mid Channel (20175)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of High Channel (20350)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
BAND5 UE Maximum Output Power	Measure Max and Min and Min Transmit Power of Low Channel (20450)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of Mid Channel (20525)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of High Channel (20600)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
BAND17 UE Maximum Output Power	Measure Max and Min and Min Transmit Power of Low Channel (23780)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of Mid Channel (23790)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm
	Measure Max and Min Transmit Power of High Channel (23800)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm

3.1.2 LTE RX Sensitivity

The Receiver Sensitivity of the **TM03LNCAHK0** are specified in the following table.

Table22. Conducted RX (Receive) Sensitivity – LTE Bands

BAND	Method (DL CH)	Specification
BAND2 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (650)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of Mid Channel (900)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of High Channel (1150)	sensitivity : ≤-94 BLER : ≤ 5%
BAND4 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (2000)	sensitivity : ≤-97 BLER : ≤ 5%
	Measure BLER of Mid Channel (2175)	sensitivity : ≤-97 BLER : ≤ 5%
	Measure BLER of High Channel (2350)	sensitivity : ≤-97 BLER : ≤ 5%
BAND5 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (2450)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of Mid Channel (2525)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of High Channel (2600)	sensitivity : ≤-94 BLER : ≤ 5%
BAND17 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (5780)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of Mid Channel (5790)	sensitivity : ≤-94 BLER : ≤ 5%
	Measure BLER of High Channel (5800)	sensitivity : ≤-94 BLER : ≤ 5%

3.2 WCDMA B2/B5 Specification

3.2.1 WCDMA TX Output Power

The Maximum Transmitter Output Power of the **TM03LNCAHK0** are specified in the following table.

Table23. Conducted TX (Transmit) Max output Power Tolerances – WCDMA Bands

Item	Method (DL CH)	Specification
WCDMA B2 Power Level	Measure Max Transmit Power of Low Channel (CH= 10563)	Max Power : 20.3~25.7dBm
	Measure Max Transmit Power of Middle Channel (CH= 10700)	Max Power : 20.3~25.7dBm
	Measure Max Transmit Power of High Channel (CH= 10837)	Max Power : 20.3~25.7dBm
WCDMA B5 Power Level	Measure Max Transmit Power of Low Channel (CH=25)	Max Power : 20.3~25.7dBm
	Measure Max Transmit Power of Middle Channel (CH=600)	Max Power : 20.3~25.7dBm
	Measure Max Transmit Power of High Channel (CH=1175)	Max Power : 20.3~25.7dBm

3.2.2 WCDMA RX Sensitivity

The Receiver Sensitivity of the **TM03LNCAHK0** are specified in the following table.

Table24. Conducted RX (Receive) Sensitivity –WCDMA Bands

Item	Method (DL CH)	Specification
WCDMA B2 Power Level	Measure BER of Low Channel (CH= 10563)	0.1% @≤-106dBm
	Measure BER of Low Channel (CH= 10700)	0.1% @≤-106dBm
	Measure BER of Low Channel (CH= 10837)	0.1% @≤-106dBm
WCDMA B5 Power Level	Measure BER of Low Channel (CH=25)	0.1% @≤-106dBm
	Measure BER of Low Channel (CH=600)	0.1% @≤-106dBm
	Measure BER of Low Channel (CH=1175)	0.1% @≤-106dBm

<Warning Statements>

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

RF Exposure Statement

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.
The highest permitted antenna gains including cable loss for use with this device are: WCDMA850 : 0.89 dBi, WCDMA 1900 : 3.20 dBi, LTE Band 4: 2.41 dBi, LTE Band 2: 3.20 dBi, LTE Band 5: 0.89 dBi, LTE Band 17: -1.44 dBi

End Product Labeling

The module is labeled with its 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 FCC ID: BEJGEN21CA
"Contains IC: 2703H-GEN21CA

OEM Responsibilities to comply with FCC Regulations

The module has been certified for integration into products only by OEM integrators under the following condition:
- The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.
As long as the two condition above is met, further transmitter testing 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 (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions can ' t be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can't be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
Manual Information To the End UserThe 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.

l'exposition aux RF

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique.

Étiquetage du produit final

Le module BT111 est étiqueté avec sa propre identification FCC et son propre numéro de certification IC. Si l'identification FCC et le numéro de certification IC ne sont pas visibles lorsque le module est installé à l'intérieur d'un autre dispositif, la partie externe du dispositif dans lequel le module est installé devra également présenter une étiquette faisant référence au module inclus. Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations suivantes :
« Contient module émetteur identification FCC ID : BEJGEN21CA
« Contient module émetteur IC : 2703H-GEN21CA

RSS-GEN, Sec. 8.3
This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.