Technical Specification
(TM13LNNAHK1)

History

Ver.	Date	Contents	Written by	Checked by	Approved by	Note
1.0	2018.06.12					

Contents

1. Product Introuction

The **TM13LNNAHK1** are designed for the automotive industry. They support LTE and CDMA air Interface standards. The **TM13LNNAHK1** are based on the Qualcomm MDM9628 wireless chipsets and support the following bands.

Table 1.   Supported Band

Region		US
Band	LTE	B2/B4/B5/B13
	CDMA	BC0/BC1

1.1 Block Diagram

❑ Block Diagram - NA

|	GSM	CDMA	WCDMA	LTE
NA	-	BC0,BC1		B2,B4,B5,B13
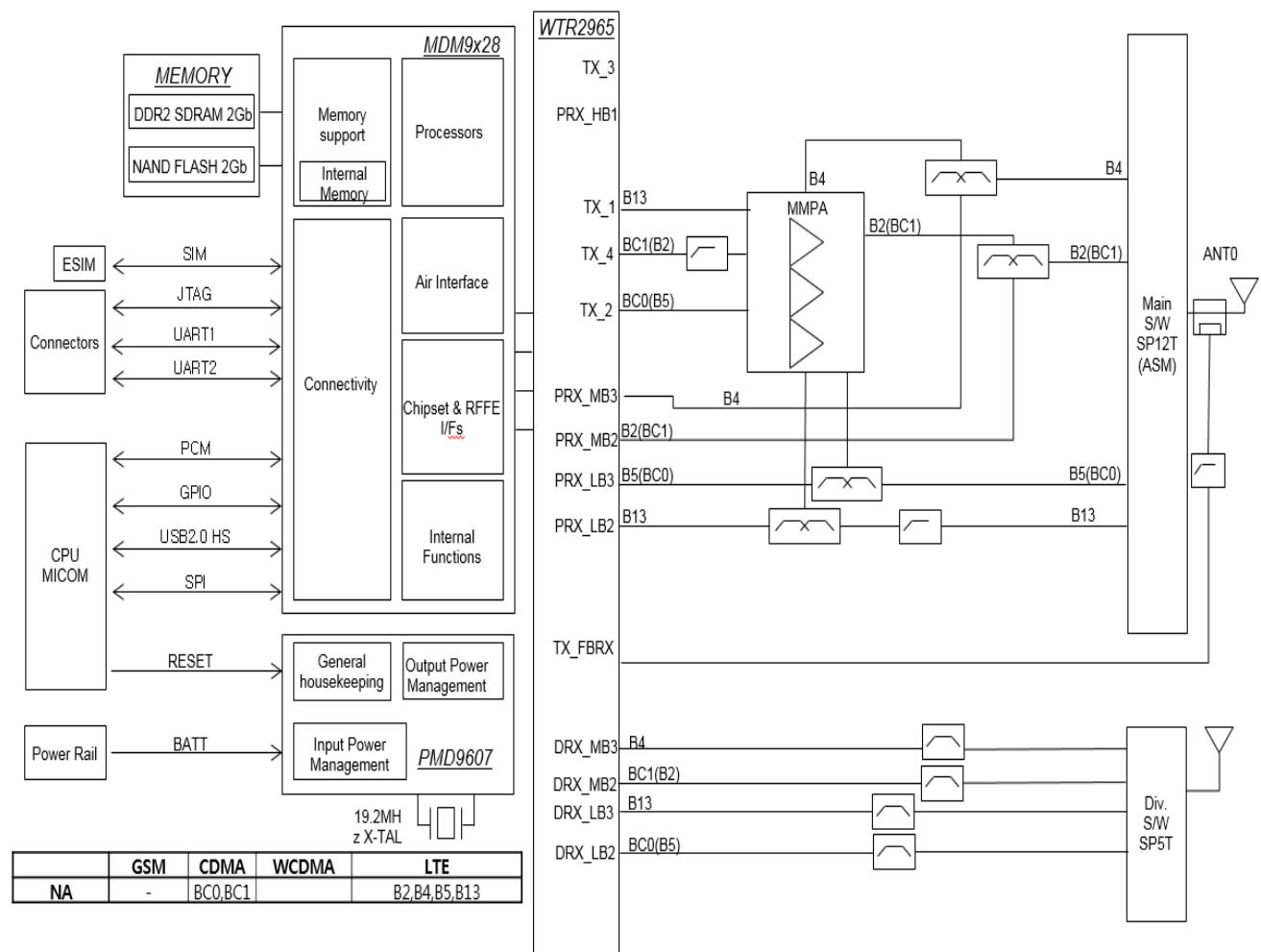
Figure 1.1. TM13LNNAHK1 Block diagram

1.2 Environmental Specifications

The environmental specification for operating and storage of the **TM13LNNAHK1** 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 **TM13LNNAHK1** embedded modules.

1.3.1 Absolute Maximum Rating and ESD Ratings

This section defines the Absolute Maximum and Electrostatic Discharge (ESD) Ratings of the **TM13LNNAHK1** 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 TM13LNNAHK1 embedded modules are sensitive to Electrostatic Discharge. ESD countermeasures and handling methods must be used when handling the TM03LNNAHK0 devices.

1.3.2 Current Consumption

Table 4. **TM13LNNAHK1** Current Consumption (TBD)

Mode	Parameter	Typical	Max	Units
LTE	Band2/4/13, Max TX Output /Full RB	600	650	mA
	Band5, Max TX Output /Full RB	550	600	
CDMA	800MHz	550	600	mA
	1900MHz	600	650	
LTE	Idle, Registered	1.8	2.2	mA
CDMA	Idle, Registered	1.8	2.2	mA
LTE	Sleep Mode, Average Current	1.8	2.2	mA
CDMA	Sleep Mode, Average Current	1.8	2.2	mA

1.4 Mechanical Specifications

1.4.1 Physical Dimensions and Connection Interface

The **TM13LNNAHK1** 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 **TM13LNNAHK1** on the underside of the PCB.

Table5. **TM13LNNAHK1** 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	12	TBD	g

1.4.2 Mechanical Drawing
1.4.2.1 Module PCB

2. Pin Definitions
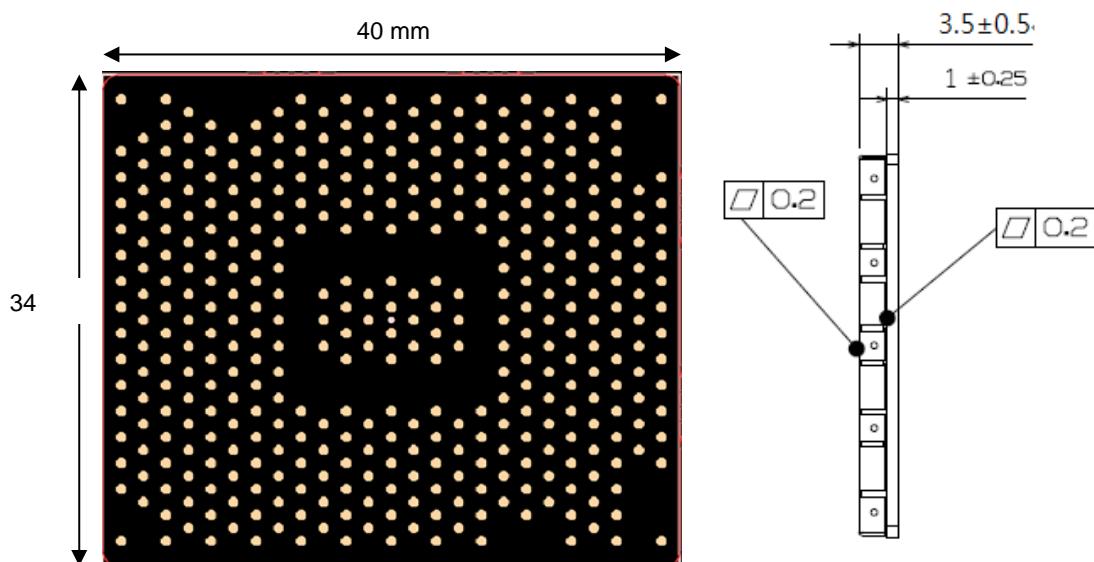
HMC_MDM9628
module_Pinmap.xls

2.1 PIN Definitions

SR Open
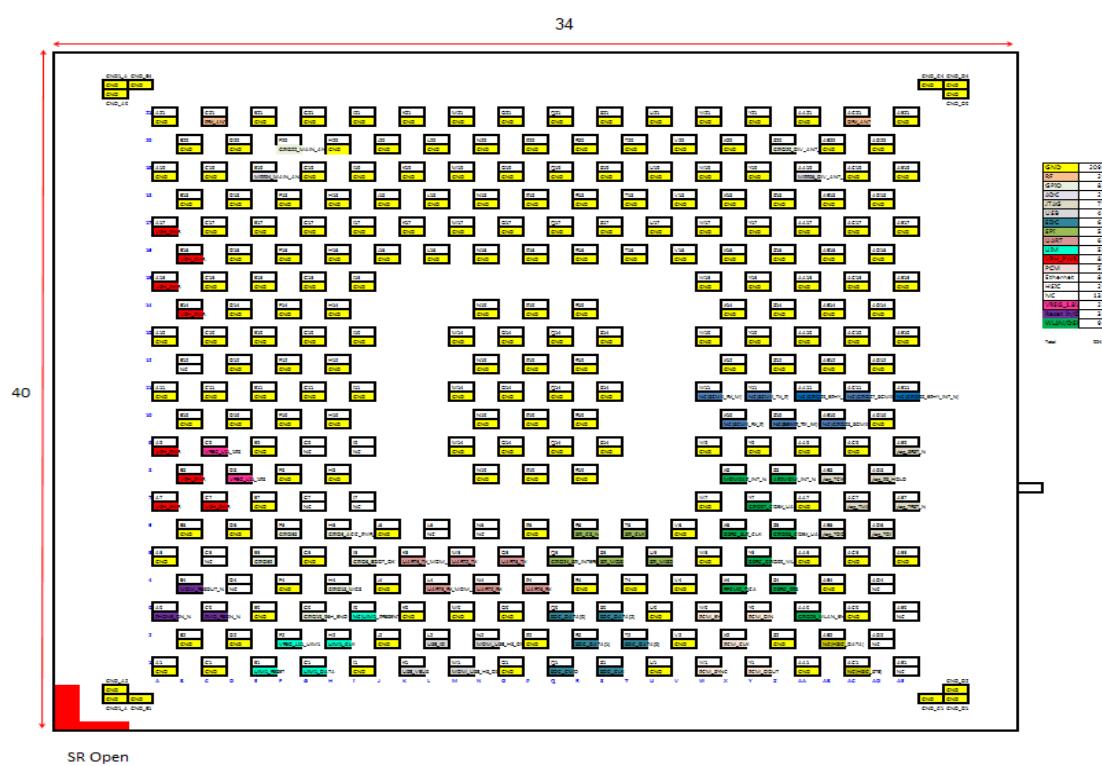
3. RF Specification

The specifications for the LTE and CDMA interfaces are defined.
TM13LNNAHK1 is designed to be compliant with the standard shown in the table below.

Table20.　Standards Compliance

Technology	Standards
LTE	• 3GPP Release 8
CDMA	• 3GPP2 Release IxEVDO, REV.H

3.1 LTE B2,B4, B5, B13 Specification

3.1.1 LTE TX Output Power

The Maximum / Minimum Transmitter Output Power of the **TM13LNNAHK1** 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
BAND13 UE Maximum Output Power	Measure Max and Min Transmit Power of Mid Channel (23230)	Max Power : 20.3~25.7dBm Min Power : ≤ -39dBm

3.1.2 LTE RX Sensitivity

The Receiver Sensitivity of the **TM13LNNAHK1** 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 (18650)	sensitivity : ≤-95 BLER : ≤ 5%
	Measure BLER of Mid Channel (18900)	sensitivity : ≤-95 BLER : ≤ 5%
	Measure BLER of High Channel (19150)	sensitivity : ≤-95 BLER : ≤ 5%
BAND4 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (20000)	sensitivity : ≤-97 BLER : ≤ 5%
	Measure BLER of Mid Channel (20175)	sensitivity : ≤-97 BLER : ≤ 5%
	Measure BLER of High Channel (20350)	sensitivity : ≤-97 BLER : ≤ 5%
BAND5 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (20450)	sensitivity : ≤-95 BLER : ≤ 5%
	Measure BLER of Mid Channel (20525)	sensitivity : ≤-95 BLER : ≤ 5%
	Measure BLER of High Channel (20600)	sensitivity : ≤-95 BLER : ≤ 5%
BAND13 Reference sensitivity level(DUAL)	Measure BLER of Low Channel (23230)	sensitivity : ≤-94 BLER : ≤ 5%

3.2 CDMA 800/1900 Specification

3.2.1 CDMA TX Output Power

The Maximum Transmitter Output Power of the **TM13LNNAHK1** are specified in   the following table.

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

Item	Method (DL CH)	Specification
CDMA800 Power Level	Measure Max Transmit Power of Low Channel (CH=384) in CDMA Mode	Max Power : 23~30dBm
	Measure Max Transmit Power of Middle Channel (CH=779) in CDMA Mode	Max Power : 23~30dBm
	Measure Max Transmit Power of High Channel (CH=1013) in CDMA Mode	Max Power : 23~30dBm
PCS1900 Power Level	Measure Max Transmit Power of Low Channel (CH=25) in DCS1900 Mode	Max Power : 23~30dBm
	Measure Max Transmit Power of Middle Channel (CH=600) in DCS1900 Mode	Max Power : 23~30dBm
	Measure Max Transmit Power of High Channel (CH=1175) in DCS1900 Mode	Max Power : 23~30dBm

3.2.2 CDMA RX Sensitivity

The Receiver Sensitivity of the **TM13LNNAHK1** are specified in the following table.

Table24. Conducted RX (Receive) Sensitivity – CDMA Bands

Item	Method (DL CH)	Specification
CDMA800 BER(Bit Error Rate)	Measure BER of Low Channel (CH=384) in EGSM Mode	0.5% @≤-104dBm
	Measure BER of Middle Channel (CH=779) in EGSM Mode	0.5% @≤-104dBm
	Measure BER of High Channel (CH=1013) in EGSM Mode	0.5% @≤-104dBm
PCS1900 BER(Bit Error Rate)	Measure BER of Low Channel (CH=25) in PCS1900 Mode	0.5% @≤-104dBm
	Measure BER of Middle Channel (CH=600) in PCS1900 Mode	0.5% @≤-104dBm
	Measure BER of High Channel (CH=1175) in PCS1900 Mode	0.5% @≤-104dBm

FCC Warning Statement

FCC Part 15.19
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.
FCC Part 15.21
Any changes or modifications (including the antennas) to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

Please notice that if the FCC identification number 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. This exterior label can use wording such as the following: "Contains FCC ID : BEJTM13LNNAHK1" any similar wording that expresses the same meaning may be used.

Manual Information to the End User
The module is limited to OEM installation ONLY.
The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
The module is limited to installation in mobile application;
A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.
There is requirement that the grantee provide guidance to the host manufacturer for compliance with Part 15B requirements.