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User Manual: Radar Module (RM68-NTA)



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Revision Sheet (history)

Release No.	Date	Revision Description
Rev. 0.1	02/07/2020	Initial Work
Rev. 0.2	03/27/2024	Add the LVDS interface connector.

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1. Overview and Package Contents

1.1 Introduction

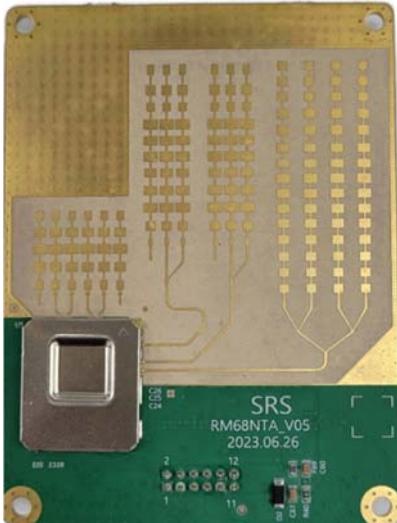
The RM68-NTA Module from Smart Radar System (SRS) is an easy-to-use evaluation board for the IWR6843 mmWave sensing device. The RM68-NTA Module contains everything required to start developing software for on-chip C67x DSP core and low-power ARM R4F controllers, including onboard emulation for programming and debugging as well as onboard LEDs for quick integration of a simple user interface.

1.2 Features

- 12-pin connectors interface connector
- FTDI with a serial port for onboard QSPI flash programming
- Back-channel UART through USB-to-PC for logging purposes
- On-board antenna
- 4 LEDs for basic user interface
- 5-V power to power the board
- LVDS interface connector.
- 4-pin Dip switch

1.3 Package Contents

Table 1. List of Package

Number	Name & Description	Picture
RM68-NTA	Radar Module	
RM68_DBG	Radar Module Debugger board	

2. Hardware Description

2.1 Board image

2.1.1 Radar module (RM68-NTA)

Figure 1 and Figure 2 show top and bottom view of the RM68-NTA, respectively.

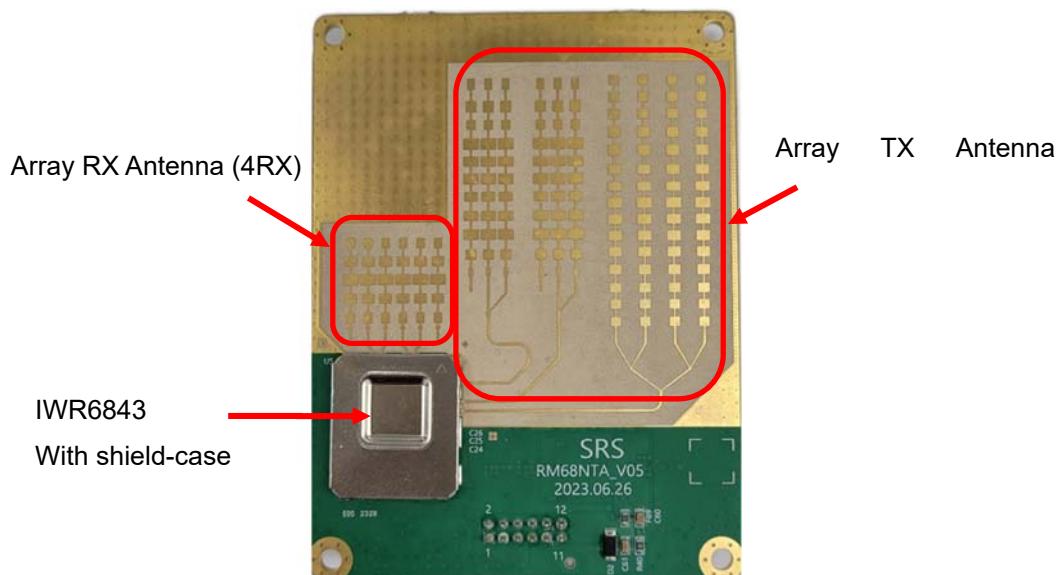


Figure 1. RM68-NTA (Top)

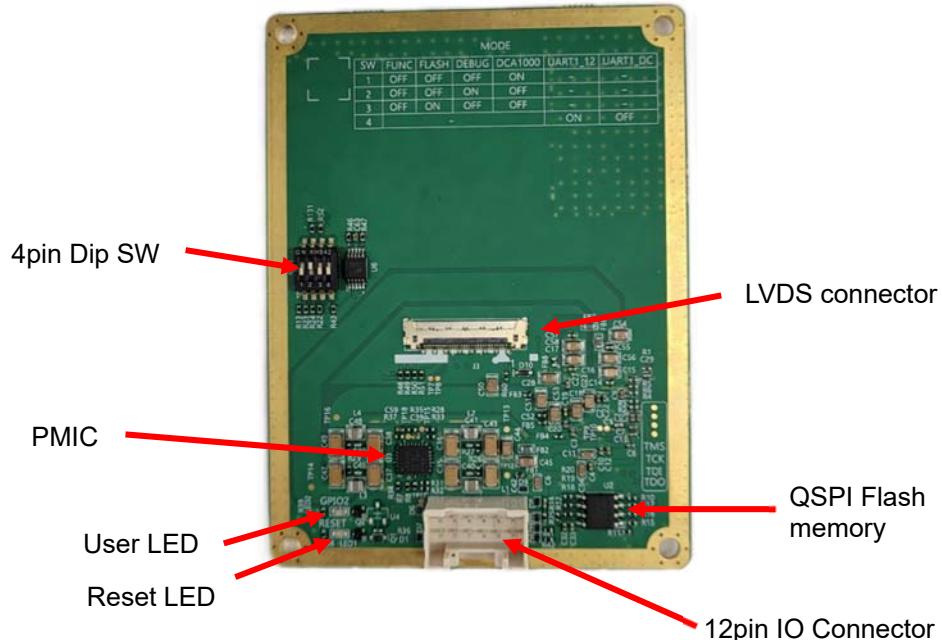


Figure 2. RM68-NTA (Bottom)

2.1.2 Radar module Debugger Board (RM68_DBG).



Figure 3. RM68 Debugger Board (Top)

2.2 Connectors

2.2.1 12-pin Connector

Connector - P/N : B12B-PUDSS-1(LF) (JST)



Table 2 12-Pin IO Connector Pin

Description	IN/OUT	Name	No	No	Name	IN/OUT	Description
Internal pulldown (1kohm).	Input	SOP2	2	1	UART2_TX	Output	For MSS logger.
For flashing and send the config data	Output	UART1_TX	4	3	UART2_RX	Input	Not used
	Input	UART1_RX	6	5	AR_RESET_N	Input	Low Reset. Internal pullup (10kohm)
High Enable. Internal pulldown (100kohm)	Input	PWR_EN	8	7	GND		
		GND	10	9	GND		
5V/2A	Input	VDD_5V0	12	11	VDD_5V0	Input	5V/2A

2.2.2 LVDS Connector

Connector - P/N : 20682-030E-02 (I-PEX)



Table 3 LVDS Connector Pin

No.	Name	IN/OUT	Description
1	GND		
2	AR_RESET_DC_N	Input	Reset. - Active Low
3	AR_HOST_INTR	Output	SPI - host interrupt
4	PGOOD_PMIC	Output	Internal pullup (2.2kohm)
5	GND		
6	AR_LVDS_FRCLKP	Output	Differential Frame Clock
7	AR_LVDS_FRCLKM	Output	Differential Frame Clock
8	GND		
9	GND		
10	AR_LVDS_CLKP	Output	Differential Clock out
11	AR_LVDS_CLKM	Output	Differential Clock out
12	GND		
13	GND		
14	GND		
15	AR_LVDS_1P	Output	Differential data Out – Lane 1
16	AR_LVDS_1M	Output	Differential data Out – Lane 1
17	GND		
18	GND		
19	AR_LVDS_0P	Output	Differential data Out – Lane 0
20	AR_LVDS_0M	Output	Differential data Out – Lane 0
21	GND	Output	
22	GND		
23	AR_SPI_MOSI	Input	SPI - MOSI
24	AR_SPI_MISO	Output	SPI - MISO
25	GND		
26	AR_SPI_CLK	Input	SPI - Clock
27	GND		
28	AR_SPI_CS	Input	SPI – Chip select
29	AR_UART1_TX_DC	Output	UART signal- For flashing and send the config data
30	AR_UART1_RX_DC	Input	

2.2.3 Power Jack

The RM68-NTA is powered by the 5-V power jack (4-A current limit), shown in Figure 7. As soon as the power is provided, the RESET, PWR_OK and PWR LEDs should glow, indicating that the board is powered on.

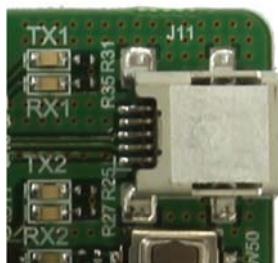
NOTE1: A 5-V, > 2.5-A supply brick with a 2.1-mm barrel jack (center positive) is not included. SRS recommends using an external power supply that complies with applicable regional safety-standards, such as UL, CSA, VDE, CCC, PSE, and more. The length of the power cable should be < 3 m.

NOTE2: After the 5-V power supply is provided to the RM68 debugger Board, it is recommended to press the RESET switch (SW50) one time to ensure a reliable boot-up state.



2.2.4 Mini-USB Connector

The connectivity is provided through the mini USB connector over the onboard FT2232H(FTDI). The FT2232H is a USB 2.0 High Speed to Dual UART IC.



2.3 Switches and LEDs

2.3.1 Sense-on-Power (SOP) Switch

The IWR6843 device can be set to operate in three different modes based on the state of the SOP lines. These lines are sensed only during boot up of the IWR device. The state of the device is detailed by Table 4.



Table 4 SOP Switch for Boot mode

Switch No.	Net name	MODE			UART 1	
		FUNCTION	Flashing	Debug	IO Connector	LVDS Connector
1	SOP 0	OFF	OFF	OFF	-	-
2	SOP 1	OFF	OFF	ON	-	-
3	SOP 2	OFF	ON	OFF	-	-
4	Selector	-			ON	OFF

2.3.2 Reset Switch

It is used to RESET the IWR6843 device.



2.3.3 LEDs

Table 5 provides the switch and LED information.

Table 5 LEDs Information

Ref Num.	Usage	Comments
LED1	RESET LED	This LED is used to indicate the state of RESET pin. If this LED is glowing, the device is out of reset. This LED will glow only after the 5-V supply is provided.
LED2	GPIO2 (USER LED)	Glows when the GPIO2 is logic-1

3. Specifications

Absolute Maximum Ratings

Signals	Description	Usage	Min	Max	Unit
VDD_5V0	Supply voltage input		-0.3	6	V
VIH	Voltage Input High	UART1_RX, UART2_RX	2.25		V
VIL	Voltage Input Low		0.62		V
VIH	Voltage Input High	RESET_N, SOP2	1.57		V
VIL	Voltage Input Low		0.3		V
VOH	High-level output threshold (IOH = 6 mA)	UART1_TX, UART2_TX,	2.85		V
VOL	Low-level output threshold (IOL = 6 mA)		0.45		V

Recommended Operating Conditions

Signals	Description	Usage	Min	Max	Unit
VDD_5V0	Supply voltage input		4.75	5.25	V
	Supply Current input		2		A
VIH	Voltage Input High	UART1_RX, UART2_RX	2.25		V
VIL	Voltage Input Low		0.62		V
VIH	Voltage Input High	RESET_N, SOP2	1.57		V
VIL	Voltage Input Low		0.1		V
VOH	High-level output threshold (IOH = 6 mA)	UART1_TX, UART2_TX	2.85		V
VOL	Low-level output threshold (IOL = 6 mA)		0.3		V

4. Software Setup

4.1 Configure Your PC

This connection provides the following interfaces to the PC:

- UART1 for flashing the onboard serial flash, downloading FW through Radar Studio, and getting application data sent through the UART. (ex, COM5)
- MSS logger UART2 (can be used to get MSS code logs on the PC).(ex, COM6)

When the USB is connected to the PC, the device manager should recognize the following COM ports.

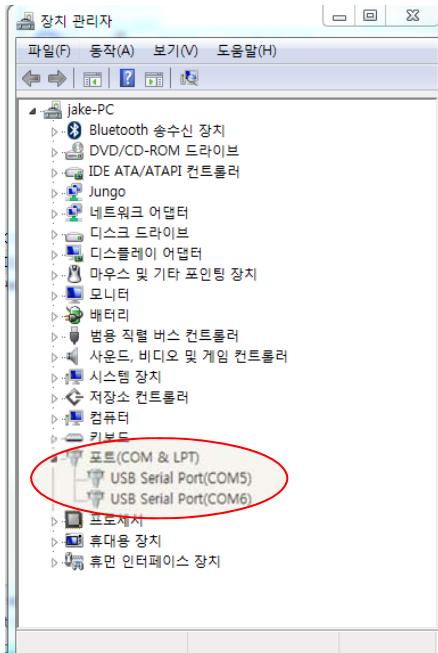


Figure 4. Device manager on the PC

4.2 Software, Development Tools, and Example Code

To enable quick development of end applications on the C67x DSP and R4F core in the IWR6843, TI provides a software development kit (SDK) that includes demo codes, software drivers, emulation packages for debug, and more. These can be found at mmwave-sdk.

5. Mechanical Mounting of PCB

* Unit : mm

L x W x H : 60 x 80 x 9.6

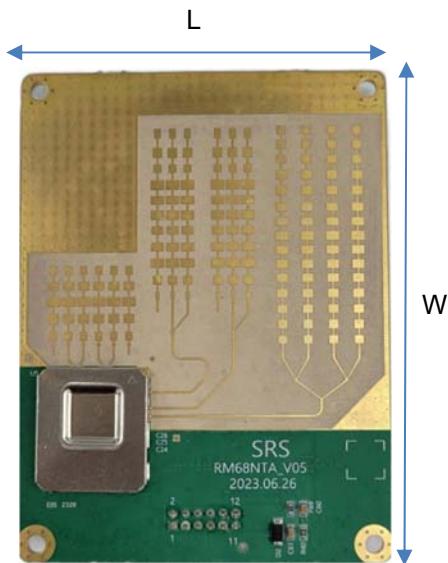


Figure 5. Mechanical Size

6. PCB Storage and Handling Recommendations

The surface finish of the PCB provides a better high-frequency performance, but is also prone to oxidation in open environments. This oxidation causes the surface around the antenna region to blacken. To avoid oxidation, the PCB should be stored in an ESD cover and kept at a controlled room temperature with low humidity conditions. All ESD precautions must be taken while using and handling the RM68-NTA.

7. Notice For FCC/ISED

FCC Approval

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

This device should be installed and operated with minimum 20Cm between the radiator and your body.

ISED Approval

This device contains license-exempt transmitter(s)/receiver that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). 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.

Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes aux RSS exempts de licence d'Innovation, Sciences et Développement économique Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) Cet appareil ne doit pas provoquer d'interférences. (2) Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent provoquer un fonctionnement indésirable de l'appareil.

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

Cet appareil doit être installé et utilisé avec un minimum de 20 cm entre le radiateur et votre corps.

INTEGRATION INSTRUCTIONS

List of applicable FCC/ISED rules

This module complies with Part 15.255 of the FCC rule.

This module complies with RSS-210 of ISED rule.

Summarize the specific operational use conditions

15.255(a) General. Operation under the provisions of this section is not permitted for equipment used on satellites.

Per RSS-210 Annex J, the following devices are not permitted:

(a) devices used on satellites

(b) field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation or used as short-range devices for interactive motion sensing (for the purposes of this section, reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment)

The module is limited to installation in fixed applications only.

Limited module procedures

Not applicable

Trace antenna designs

Not applicable

RF exposure considerations

This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This device should be installed and operated with minimum 20Cm between the radiator and your body.

The host manual shall include the RF exposure statements.

If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Antennas

The module itself has antenna.

Label and compliance information

The module is labeled with its own FCC/ISED. If the FCC ID/ISED 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;

For FCC: "Contains FCC ID: 2AVKZRM68-NTA"

For ISED: "Contains ISED: 26970-RM68NTA"

The host manual shall include the following regulatory statement:

For FCC:

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.

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



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This device should be installed and operated with minimum 20Cm between the radiator and your body.

For ISED:

This device contains license-exempt transmitter(s)/receiver that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). 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.

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

Cet appareil doit être installé et utilisé avec un minimum de 20 cm entre le radiateur et votre corps.

Information on test modes and additional testing requirements

Testing of the host product with all the transmitters installed - referred to as the composite investigation test- is recommended, to verify that the host product meets all the applicable FCC rules. The host manufacturer can use the software to control the RF signal during test.

For more information, please contact us.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The host product may need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.