

ioNODE Series LoRa End Device RF Module

NanoMOD-22

Datasheet

Document Version:

SSTPL/HW/EDDS/NMD/1.02

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1. Brief Description

NanoMOD-22 is the smallest LoRa Module Developed by SSTPL for low power wide area network (LPWAN) wireless module that supports the Semtech LoRaWAN® Long range wireless protocol.

The LoRa® modules enable wireless connectivity to almost all devices, systems, and sensors communicating at a low data rate over a long distance.

This new stand-alone module measures 13x13 mm Based upon a second-generation Semtech SX1262 radio frequency IC (RFIC), the LoRa module also features an open STM32 series ARM Cortex-M0+ 32 Bit microcontroller (MCU) from STMicroelectronics along with an RF switch and 192kB of Flash memory and 20kB of RAM.

NanoMOD-22 Supports LoRa® Point to Point communications as well as LoRaWAN® protocols, Different Firmware required.

1.1 Features

- Small size (13*13 mm)
- SX1262 Based LoRa® Module.
- Ultra-Low Power STM32L0 MCU
- LoRaWAN Class A & C Protocol
- Open MCU Firmware Support
- AT Commands over UART
- RF Output Power up to +21.6 dBm
- Single Part No. Supports multiple frequency bands.
- Supported Bands : IN865, US915, AU915, EU868
- Wide Range of working voltage 3V to 3.7V
- Single VDD Supply option

- TCXO Based operation for high Efficiency.
- Receiving Sensitivity -137 dBm
- Stamp Holes pads for easy integration in customer's PCB
- 13 GPIOs , 2 I2C, 4 UART, 1 LPUART , 4 ADC Support

1.2 Applications

Typical applications for this module include smart metering, wearables, tracking, M2M and internet of things (IoT) edge nodes.

The module's applications are as following -

- Low Data-Rate IoT use cases.
- Smart Metering
- Wireless Sensing
- Industrial & Home Automation
- Low Power RF Systems
- Industrial Monitoring & Control
- Smart City Application
- Long Range Irrigation Systems

2. Module Overview

NanoMOD-22 is the smallest, ultra-long range, high-performance, RF module for wireless communication. It operates in the 862 to 928 MHz (license free) ISM frequency band and includes all necessary passive components for wireless communication as depicted in the following figure.

Note:-

It is Recommended to use 15µH Inductor (Wirewound Inductor 300 mA 1.3Ω Max 0805 SMD) (Part No. BRL2012T150M / MGFL2012F150MT_LF) on DCC_CW & VREF Pins for Better Power Efficiency & RF Communication.

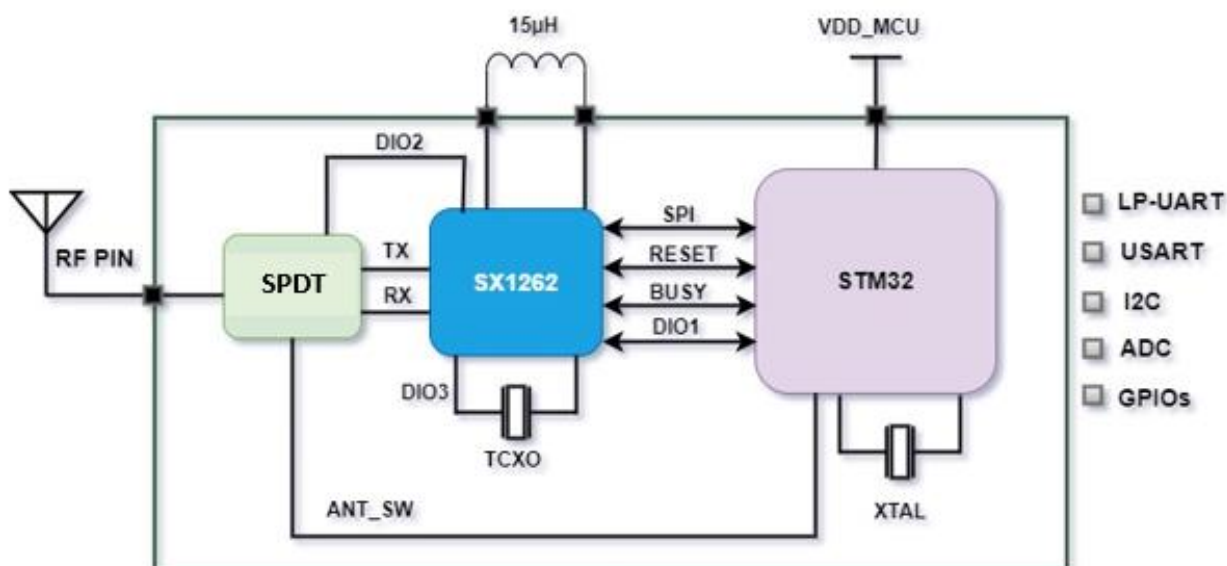


Fig. Block Diagram NanoMOD-22

Modulation	LoRa® Spread-Spectrum
Frequency range	862 - 928 MHz
Frequency Bands	IN865, US915, AU915, EU868
RF output power	Up to 21.6 dBm
Receiver sensitivity	-137 dBm (SF 12; SB 125 kHz, CR 4/6)
RF data rate	0.24 to 5 kbps
RF range	up to 5000 m (line of sight)

Operating voltage	3 V to 3.7 V
Interfaces	UART, I2C
IO's	Digital I / Os, Analog Inputs
Dimension	13x13x2.7 mm

3. Electrical Characteristics

3.1 Maximum Ratings

Condition	Min	Typ.	Max	Unit
Supply Voltage (VDD)	3.0	3.5	3.7	V
Storage Temperature	-40	+25	+85	°C
Operating Temperature	-40	+25	+85	°C
RF Input Power	+10			dBm
ESD (Human Body Model)	2000			V
ESD (Charge Device Model)	500			V
Notes:				
1) Unless otherwise noted, all voltages are with respect to GND				

3.2 General Electrical Characteristics

T = 25°C, VDD = 3.5 V (typ.) if nothing else stated					
Parameter	Condition	Min	Typ.	Max	Unit
Supply Voltage (VDD)		3	3.5	3.7	V
Current Consumption System Sleep	RF idle mode, MCU Sleep Mode	4			µA
Current Consumption RECEIVE LoRa	RF receive mode,	17			mA
Current Consumption TRANSMIT	RF transmit mode, max. RF power level MCU Active mode,	130			mA
MCU operation frequency		32 MHz & 32.768 KHz			

3.3 Module Interface Characteristics

Symbol	Parameter	Conditions	Min.	Max.	Unit
V _{OL}	Output Low level voltage for an I/O pin	CMOS port, I _{IO} = +8 mA 2.8V ≤ V _{DD} ≤ 3.7V	-	0.4	V
V _{OH}	Output High level voltage for an I/O pin		V _{DD} - 0.4	-	
V _{OL}	Output Low level voltage for an I/O pin	TTL port, I _{IO} = +8 mA 2.8V ≤ V _{DD} ≤ 3.7V	-	0.4	V
V _{OH}	Output High level voltage for an I/O pin	TTL port I _{IO} = -6 mA 2.8V ≤ V _{DD} ≤ 3.7V	2.4	-	V
V _{OL}	Output Low level voltage for an I/O pin	I _{IO} = +15 mA 2.8V ≤ V _{DD} ≤ 3.7V	-	1.3	V
V _{OH}	Output High level voltage for an I/O pin	I _{IO} = -15 mA 2.8V ≤ V _{DD} ≤ 3.7V	V _{DD} -1.3	-	V
V _{OL}	Output Low level voltage for an I/O pin	I _{IO} = +4 mA 1.65V ≤ V _{DD} ≤ 3.7V	-	0.45	V
V _{OH}	Output High level voltage for an I/O pin	I _{IO} = -4 mA 1.65V ≤ V _{DD} ≤ 3.7V	V _{DD} -0.45	-	V
V _{OLFM+}	Output low level voltage for an FTf I/O pin in FM+ mode	I _{IO} = 20 mA 2.8V ≤ V _{DD} ≤ 3.7V	-	0.4	V
		I _{IO} = 10mA 1.65V ≤ V _{DD} ≤ 3.7V	-	0.4	

3.4 Transmitter RF Characteristics

T = 25°C, VDD = 3.5 V (typ.)					
Modulation Techniques		LoRa™			
Parameter	Condition	Min	Typ.	Max	Unit
Frequency Range		865	-	867	MHz
RF Output Power	865 MHz Band	-8	21.6	21.8	dBm
Frequency Range		912	-	928	MHz
RF Output Power	915 MHz Band	-8	20.8	21.0	dBm
TX Frequency Variation vs. Temperature	-40 to +85°C	-	±10	-	kHz
TX Power Variation vs. Temperature		-	±0.5	-	dB

4 Module Package

4.1 Pinout

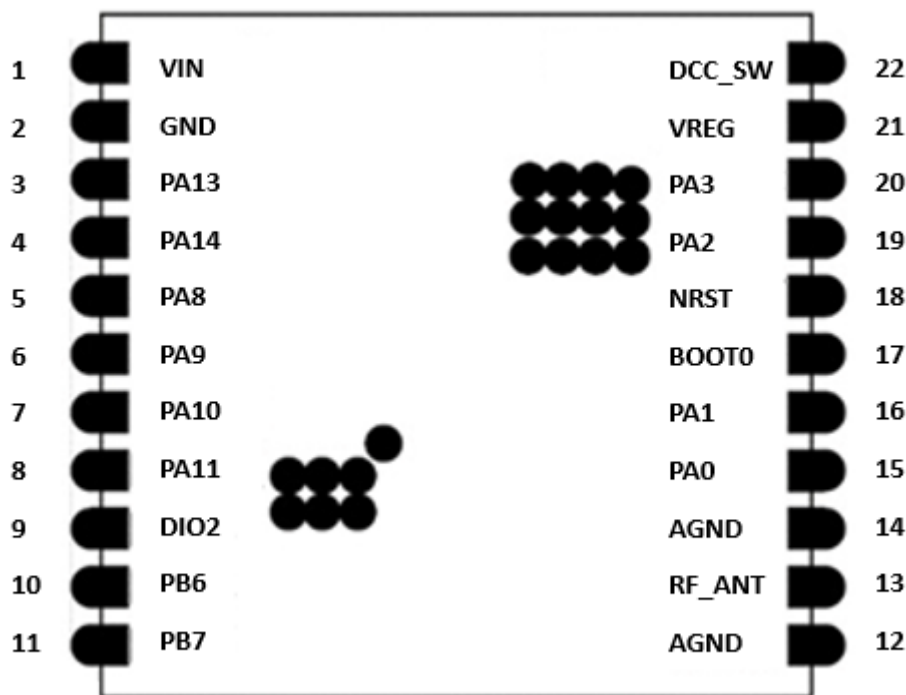


Fig. Pinout diagram NanoMOD-22

4.2 Pinout Description

PIN	PIN Name	PIN Type	Primary Function	5 V Tolerance	Alternate Function
1	VIN	Input Supply	3 to 3.7V DC Input	Yes	Input DC Supply
2	GND	Analog GND	Ground connection	Yes	
3	PA13	D I/O	SWDIO -Module Program Pin	Yes	LPUART1_RX
4	PA14	D I/O	SWCLK - Module Program Pin	Yes	LPUART1_TX
5	PA8	D I/O	General I/O	Yes	GPIO
6	PA9	D I/O	USART1_TX	Yes	I2C1_SCL (Ext. 3.3V pullup required)
7	PA10	D I/O	USART1_RX	Yes	I2C1_SDA (Ext. 3.3V pullup required)
8	PA11	D I/O	General I/O	Yes	GPIO
9	PB5	D I/O	General I/O	Yes	GPIO
10	PB6	D I/O	I2C1_SCL	Yes	Ext. 3.3V pullup required
11	PB7	D I/O	I2C1_SDA	Yes	Ext. 3.3V pullup required

12	AGND	Analog GND	Ground connection	Yes	
13	RF_ANT	RF Output	Antenna	No	
14	AGND	Analog GND	Ground connection	Yes	
15	PA0	D I/O	USART4_TX	No	ADC_IN0/WKUP1
16	PA1	D I/O	USART4_RX	Yes	ADC_IN1
17	BOOT0	Supply	Bootloader	No	
18	NRST	D IN	Module Reset	No	
19	PA2	D I/O	USART2_TX /LPUART1_TX	Yes	ADC IN2
20	PA3	D I/O	USART2_RX/LPUART1_RX	Yes	ADC IN3
21	VREG		Pins to Connect 15uH Inductor	N/A	
22	DCC_SW				

5 RF Test Report (Conducted Measurement)

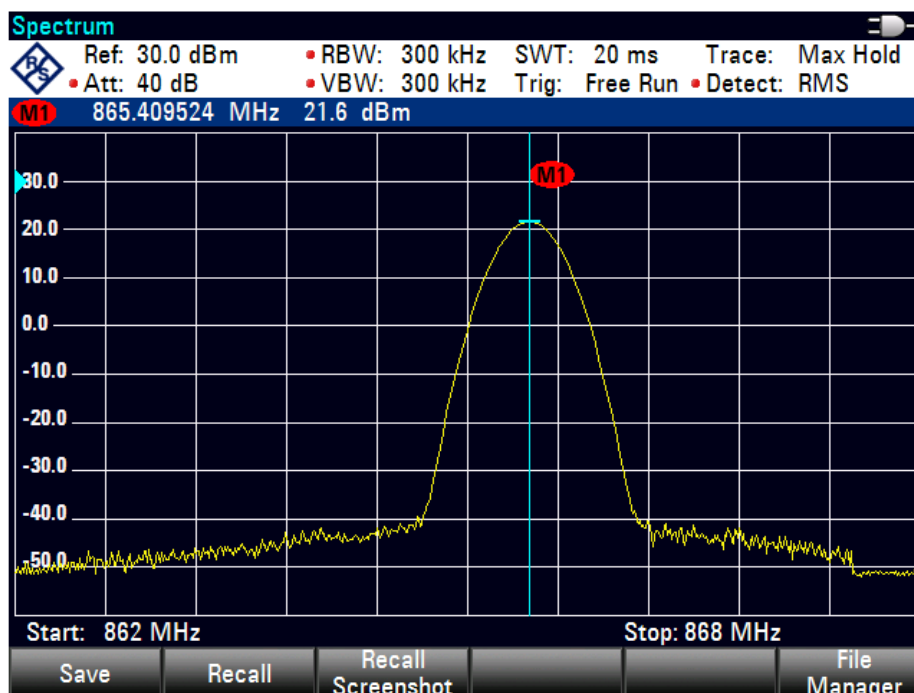
EUT Test Configuration: - Transmit on Max power on each 125 KHz Channel, Transmission on 1st, Mid and Last channel in each 15 minutes.

EUT Height: - 0.8m from Ground (EUT placed on nonconductive table).

Voltage: - + 3.5V DC

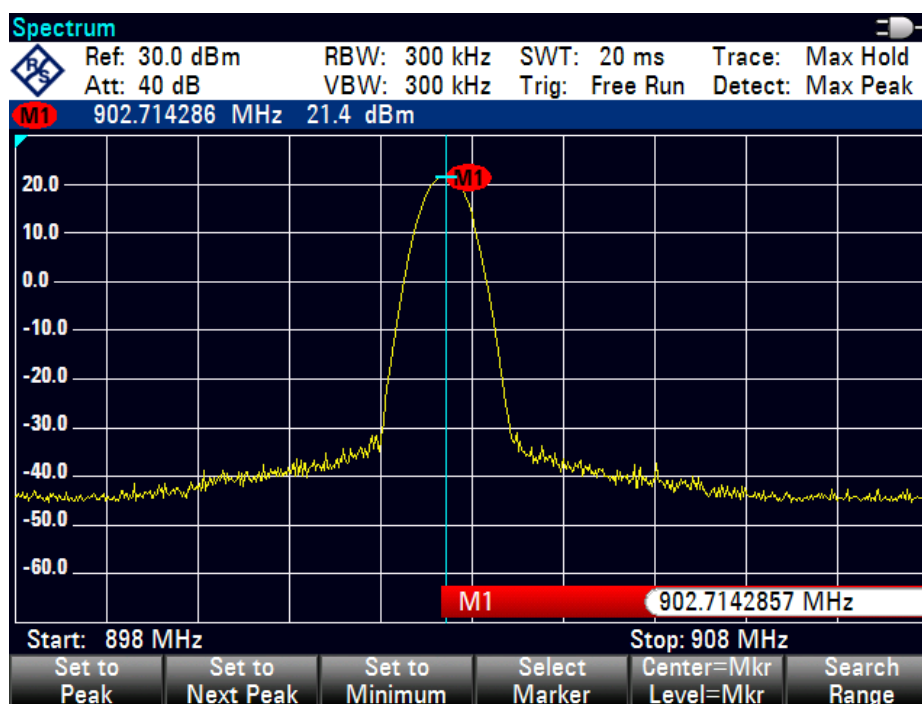
EUT antenna port connected to RF connector.

5.1 Max Conducted RF Power



Observation Table: -

Channel Frequency (MHz)	Conducted Power Measured (dBm) (A)	Cable Loss (dB) (B)	Max Conducted Power (dBm)	EIRP Test Status
865.409524	21.6	0	21.6	Pass



Channel Frequency (MHz)	Conducted Power Measured (dBm) (A)	Cable Loss (dB) (B)	Max Conducted Power (dBm)	EIRP Test Status
902.714286	21.4	0	21.4	Pass

6 Antenna Mounting Options

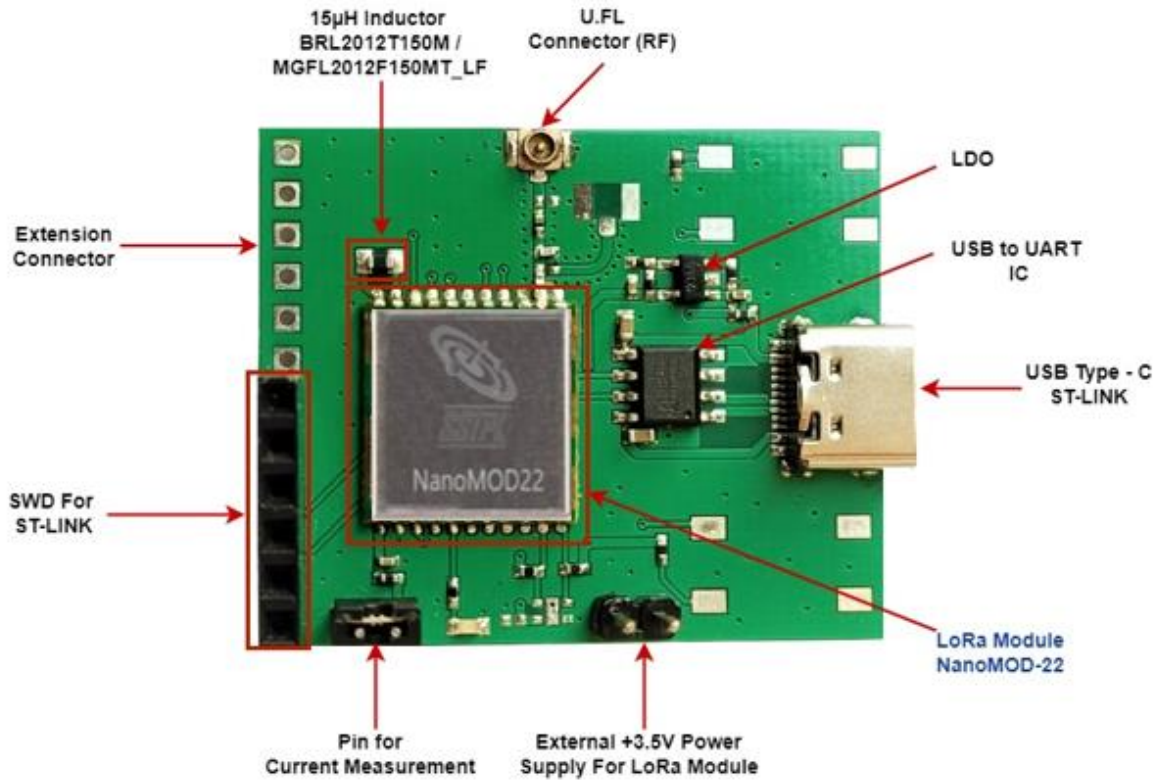
To serve the propose of multiple antenna requirement, NanoMOD-22 comes with External Antenna option (RF Pin, Pin No=10) .

User can Connect Helical Antenna, U.FL Port at RF Pin to connect LoRa Antenna.

7 Quick Start

How to Connect

A User can use a Daughter Board(as shown) to Connect & Program NanoMOD-22.



8 Mechanical Dimensions

8.1 Mechanical Dimensions of the Module

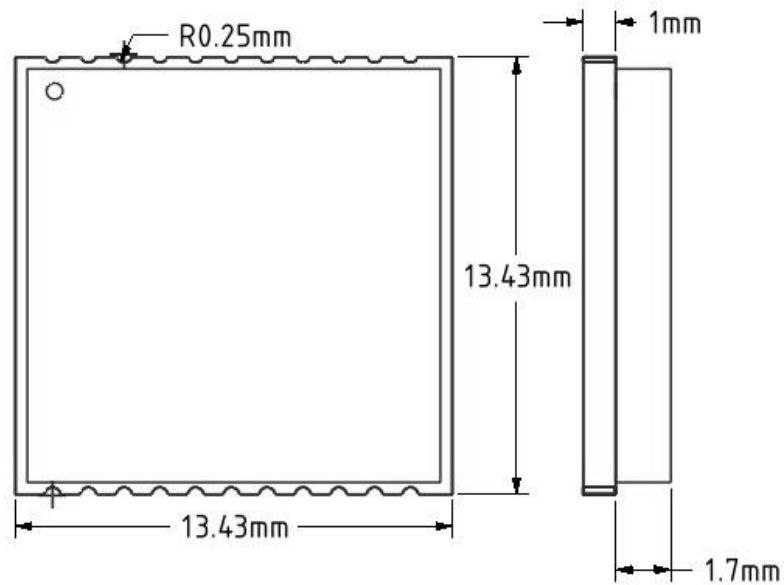


Fig: Module Top and Side Dimensions

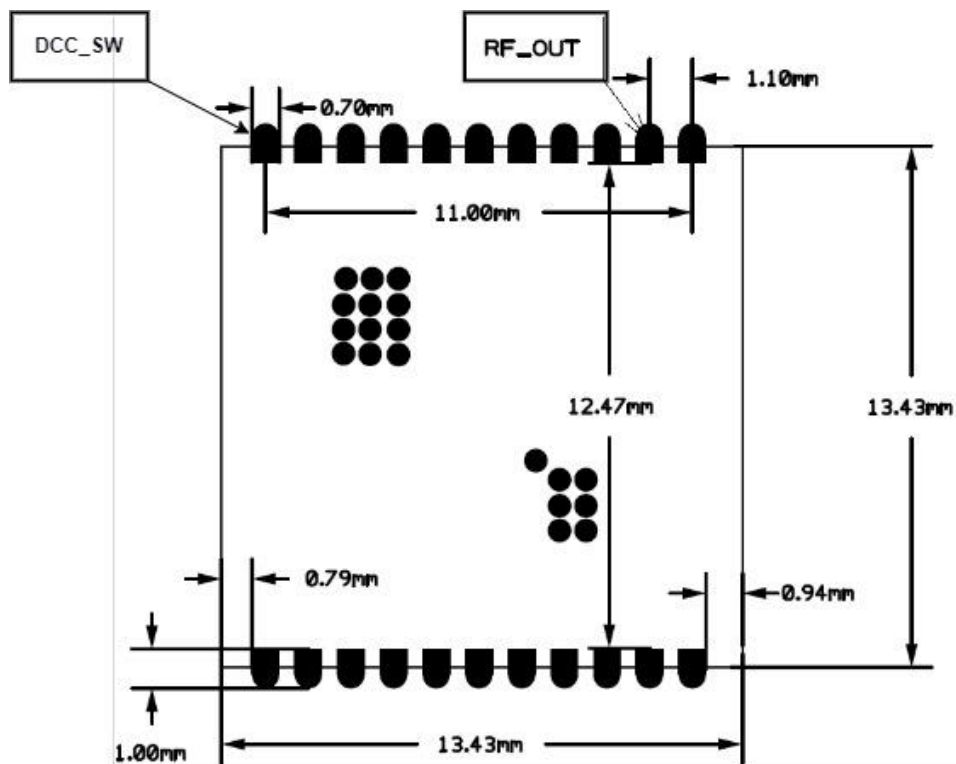


Fig. Module Bottom Dimension

9 Important Notice

9.1 Disclaimer

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9.3 Document Revision History

V1.01 – First Version

V1.02 – Pinout & Pinout Description Updated Page No. 8 - 9.