

Ultra low power DASH7 Modem

based on MuRata CMWX1ZZABZ

868 / 915 MHz

1 Introduction

Features

- Complete DASH7 modem v1.2, optimized for power, targeted for battery powered sensor application.
- SMA connector
- Connection to host application using standard UART link at 115200bps with DASH7 ALP command set.
- 868 and 915 MHz ISM band operation.
- Modulation schemes: 2-FSK, GFSK, LoRa
- Output power up to +18 dBm (at the SMA)
- FSK data rates : 9.6 / 55.6 / 167.7 kbps
- LoRa data rates : all spreading factors
- Operates from a single 2.4V to 3.6V supply.
- Operating temperature: -40 °C to 85 °C
- Battery Monitoring
- Light Sensor (TEMT6000)
- Magnetometer (LSM303C/AGR)
- Accelerometer (LSM303C/AGR)
- Humidity Sensor (HTS221)
- Temperature Sensor (HTS221)

- Pressure Sensor (LPS25HB)

Applications

- Wireless sensor network
- Data acquisition equipment
- Security systems
- Industrial monitor and control
- Internet of things (IoT)

Description

- The SH2050 is a fully integrated DASH7 modem operating in the 868 and 915 MHz ISM band.
- Compatible with D7A 1.2 specification (www.dash7-alliance.org)
- Controlled using an ALP command set over a serial link.
- Allows for bi-directional communication with battery operated sensor and actuators.
- Supports operation with D7A::D7A-LoRa compatible gateways and nodes
- WizziLab product line at www.wizzilab.com/products



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2 Hardware specification

2.1 Recommended operating conditions

Table 1. Recommended operating conditions

Symbol	Parameter	Min.	Typ.	Max.	Units
T _A	Operating ambient temperature range	-40	-	85	°C
V _{CC}	Operating supply voltage	2.4 ⁽¹⁾	3.0V	3.6 ⁽²⁾	V

(1) SX1231H operation limit.

(2) Above 3.0V the Idle/Stop current consumption is increased. See Error: Reference source not found for more details.

2.2 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Min.	Typ.	Max.	Units
T _{STG}	Storage temperature range	-40	-	85	°C
V _{CC}	Supply voltage	-0.3	-	3.9	V
V _{IO}	I/O pin voltage	-0.3	-	4.0	V

2.3 I/O operating characteristics

Table 3. I/O operating characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units
V _{IL}	I/O input low level voltage	-0.3	-	0.3*V _{CC}	V
V _{IH}	I/O input high level voltage	0.7*V _{CC}	-	4.0	V

2.4 Current consumption

Table 4. Current consumption

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
I _{CC}	Supply current @VDD 2.4V	Operating mode TX	-	29 ⁽¹⁾	120 ⁽²⁾	mA
		Operating mode RX	0.008 ⁽³⁾	0.030 ⁽⁴⁾	11 ⁽⁵⁾	mA
		Sleep	4	4	4	µA

(1) TX output power 13 dBm

(2) TX output power 20 dBm

(3) Idle (no RX scan).

(4) RX scan on 2 channels with 200 KHz bandwidth, once per second

(5) Continuous RX

2.5 Current consumption measurements

Table 5. Test parameters

Parameter	Value
Supply Voltage	2.4 V
Operating mode	RX Scan (Clear Channel Assessment)
RX Scan period	1 s
Number of scanned D7A channels	2
D7A Channel width (normal rate mode)	200 kHz

Table 6. Test results

Result	Tool value	Value	Units
Baseline	DC	3	μA
Average current consumption with above RX scan parameters	DC	25	μA
Max RX current consumption	High	20	mA
Typical TX current consumption @13 dBm	High	40	mA
Max TX current consumption @18 dBm	High	140	mA

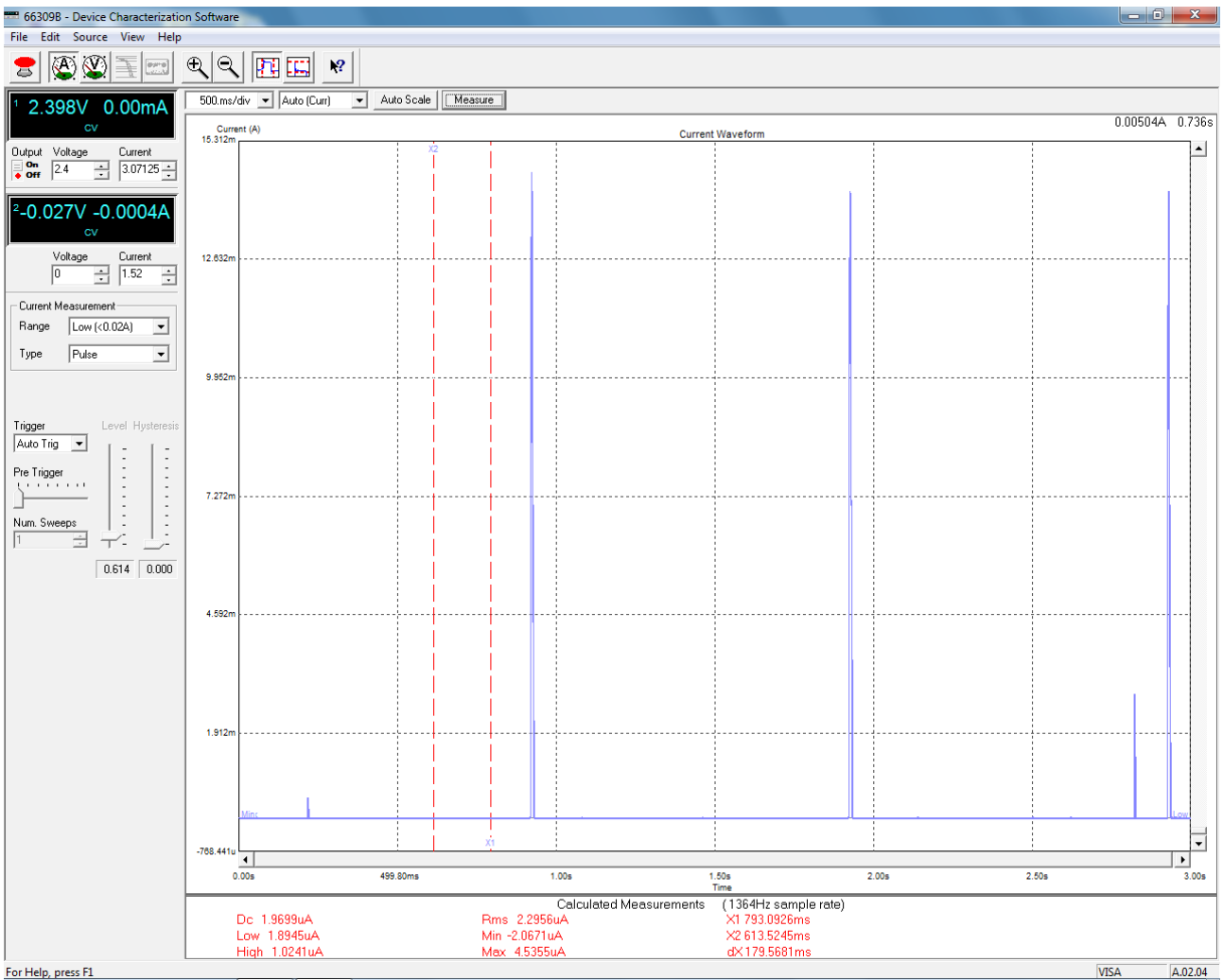


Figure 1: RX scan power profile

3 Operating modes

3.1 Data rates

Table 7. Data rates

Parameter	Test conditions	Value	Units
Data Rate	Low rate mode	9 600	baud
	Normal rate mode	55 556	baud
	High rate mode	166 667	baud

3.2 RX Sensitivity

The test is performed in real conditions - the receiver and the transmitter are placed at a distance of 5 m in a non-anechoic room with dimensions of 10x10m and the transmission power is ramped up and down. The receiver is in continuous RX and receives D7A packets consisting of 27 uncoded payload bytes encoded with ½ Forward Error Correction channel coding, resulting in 60 encoded payload bytes + 2 bytes sync word + 8 bytes preamble. See the [D7A specification](#) for more details. The test sources are available [here](#). The following values are the RSSI sensitivity limits when 90% of the packets are still received.

Table 8. RX Sensitivity

Parameter	Test conditions	Min.	Typ.	Max.	Units
RX Sensitivity (10% PER)	LoRa SF10	-	-130	-	dBm
	Low rate mode with FEC	-	-110	-	dBm
	Normal rate mode with FEC	-	-102	-	dBm
	High rate mode with FEC	-	-97	-	dBm

3.3 TX Power

Table 9. TX Power

Parameter	Min.	Typ.	Max.	Units
TX Power	-2 ⁽¹⁾	-	18 ⁽¹⁾	dBm

(1) At the SMA connector. Antenna insertion loss not counted.

4 Hardware design

4.1 Pin placement

All non-indicated pins are Not Connected.

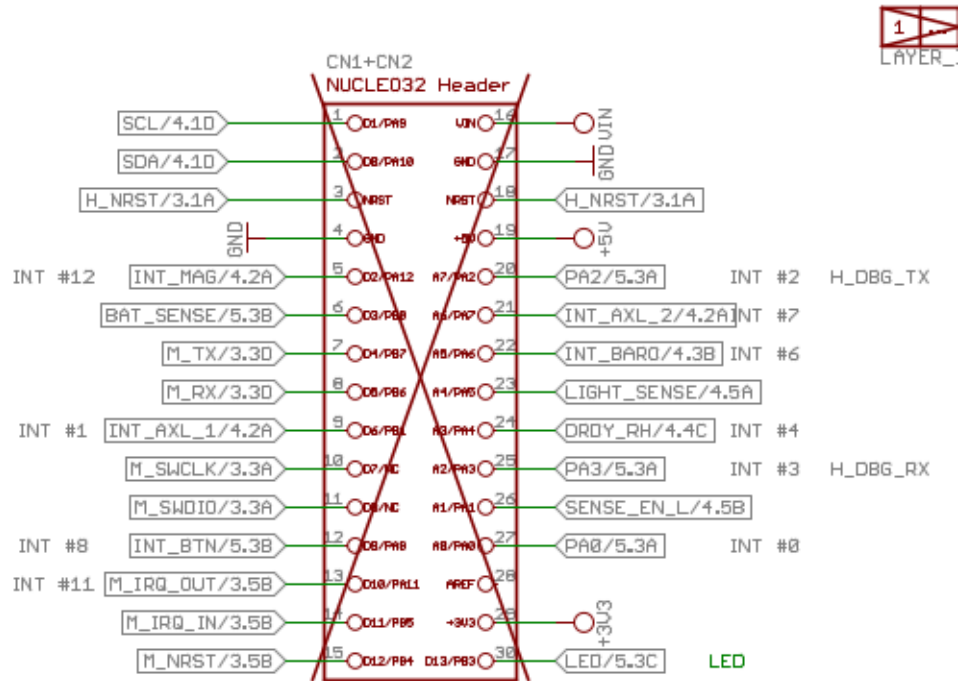


Figure 2: Pin placement

4.2 Pin assignment

SH2050

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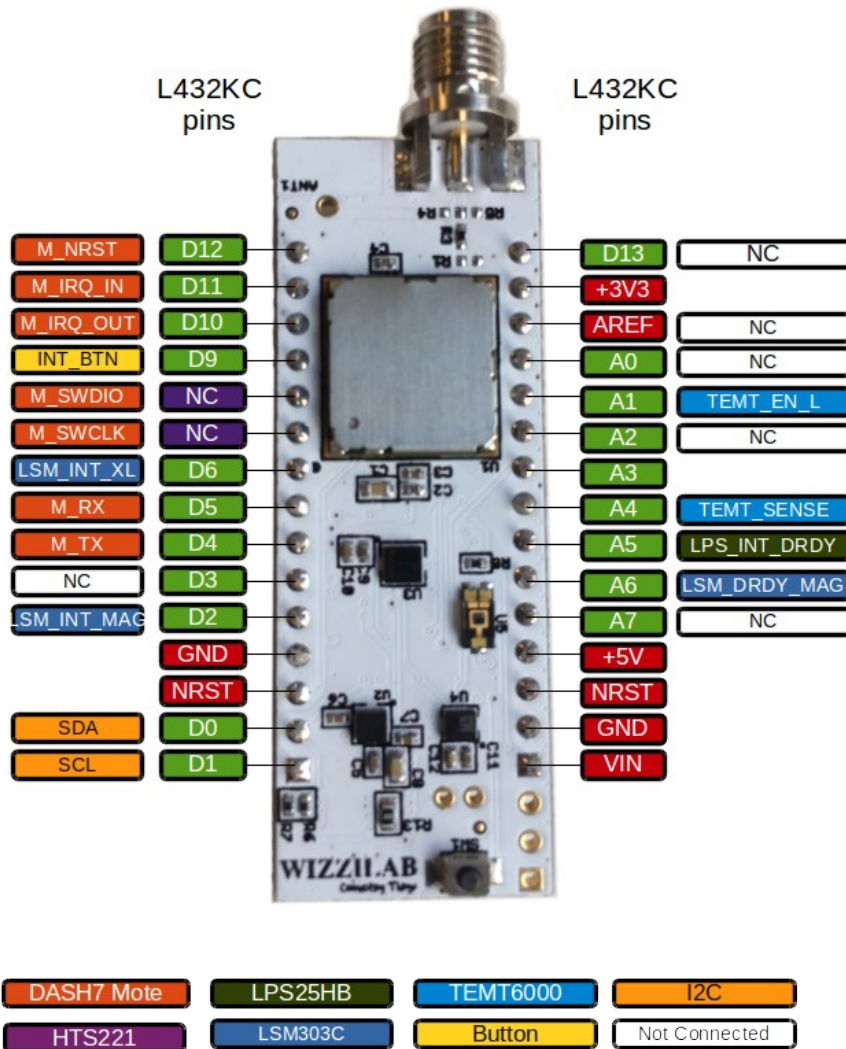


Figure 3: Pin assignment

4.3 Sensors

The shield features the following list of MEMS sensors

- Battery Monitoring
- Light Sensor (TEMT6000)
- Magnetometer (LSM303C/AGR)
- Accelerometer (LSM303C/AGR)
- Humidity Sensor (HTS221)
- Temperature Sensor (HTS221)
- Pressure Sensor (LPS25HB)

5 Information

You may check our wiki : <http://wizzilab.com/wiki/#!/wizzikit/>

Or visit our website: <http://www.wizzilab.com/products/>

Contact us at : contact@wizzilab.com

Revision history

Table 10. Document revision history

Date	Revision	Changes
20-Mar-2017	1.0	Document creation.
06-Jun-2019	1.1	Update pin assignment table