



**Ultra low power DASH7
Modem**
868MHz

1 Introduction

Features

- Complete DASH7 modem (V1.x), 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 MHz ISM band operation.
- Modulation schemes: 2-FSK, GFSK
- Output power up to +13 dBm (at the SMA)
- Data rates 9.6 / 55.6 / 167.7 kbps
- Operates from a single 2.4V to 3.6V supply.
- Operating temperature: -40 °C to 85 °C

Applications

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

Description

- The SH1001 is a fully integrated DASH7 modem operating in the 868 MHz ISM band.
- Compatible with D7A 1.x 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.
- 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 Figure 2 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	-	-	40 ⁽¹⁾	mA
		Operating mode RX	0.009 ⁽²⁾	0.042 ⁽³⁾	16 ⁽⁴⁾	mA
		Sleep	4	4	See Figure 2	µA

(1) TX output power 13 dBm

(2) Idle (no RX scan).

(3) RX scan on 2 channels with 200 KHz bandwidth, once per second, see Figure 1.

(4) 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 (see Figure 1)	Value	Units
Average current consumption	DC	42.1	μ A
Idle current consumption	Low	9.5	μ A
Max current consumption	High	20.5	mA

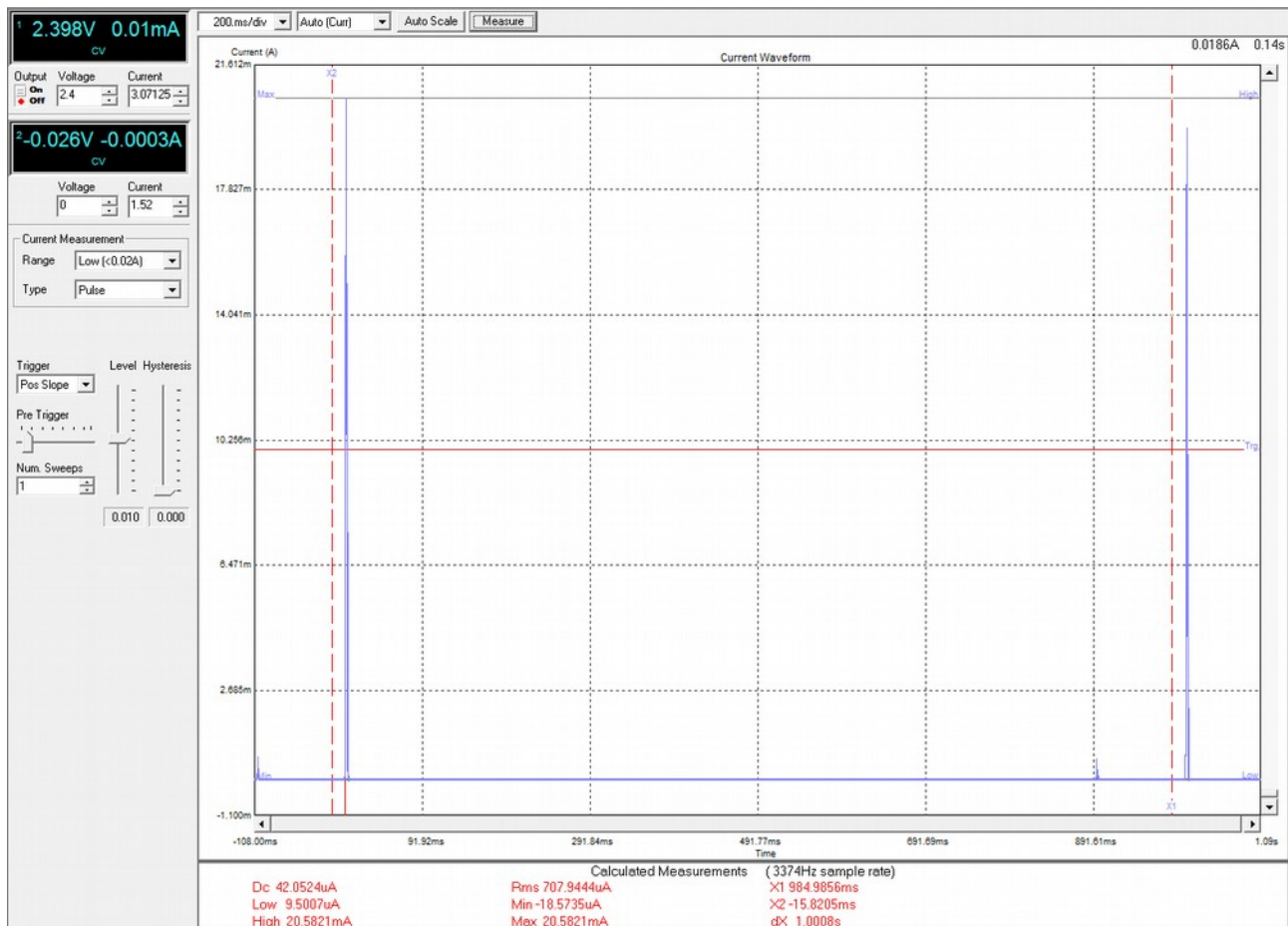
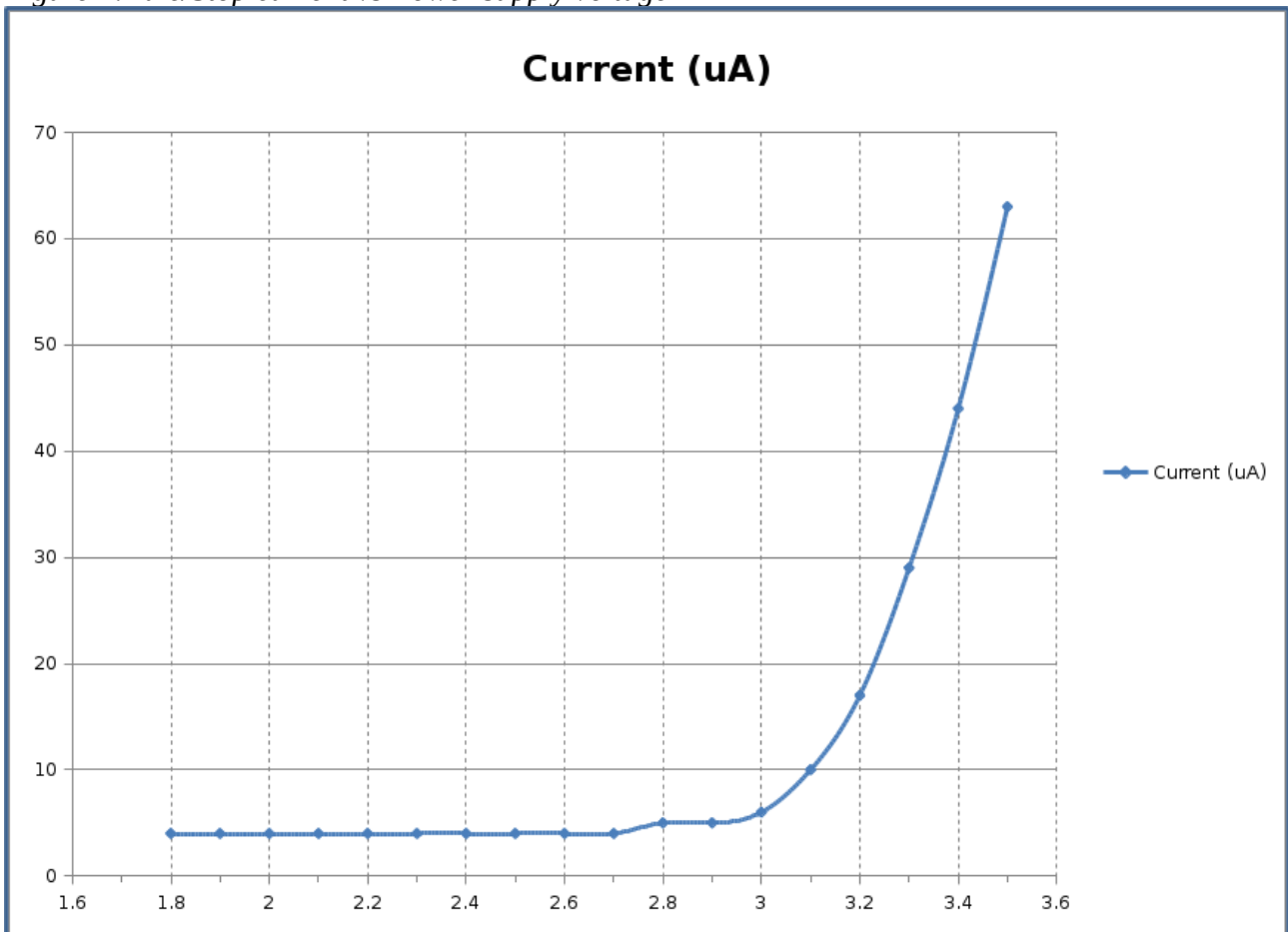


Figure 1: Current consumption measurement

Figure 2: Idle/Stop current vs Power supply voltage



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)	Low rate mode with FEC	-	-109	-	dBm
	Normal rate mode with FEC	-	-102	-	dBm
	High rate mode with FEC	-	-88	-	dBm

3.3 TX Power

Table 9. TX Power

Parameter	Min.	Typ.	Max.	Units
TX Power	-18 ⁽¹⁾	-	13 ⁽¹⁾	dBm

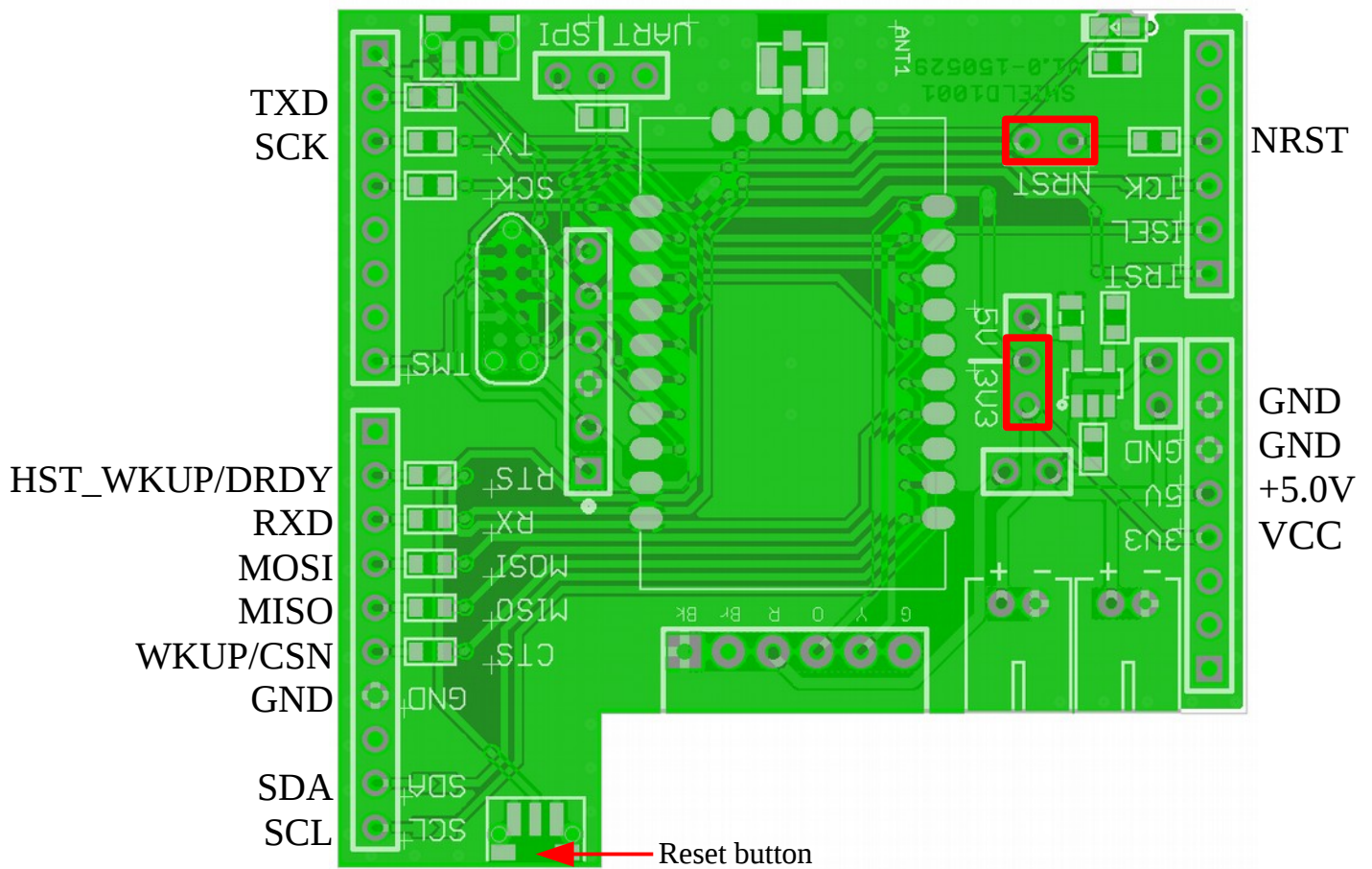
(1) At the SMA connector. Antenna insertion loss not counted.

4 Hardware design

4.1 Pin placement

All non-indicated pins are Not Connected.

Figure 3: Pin placement



 Jumper (put jumpers only at these locations)

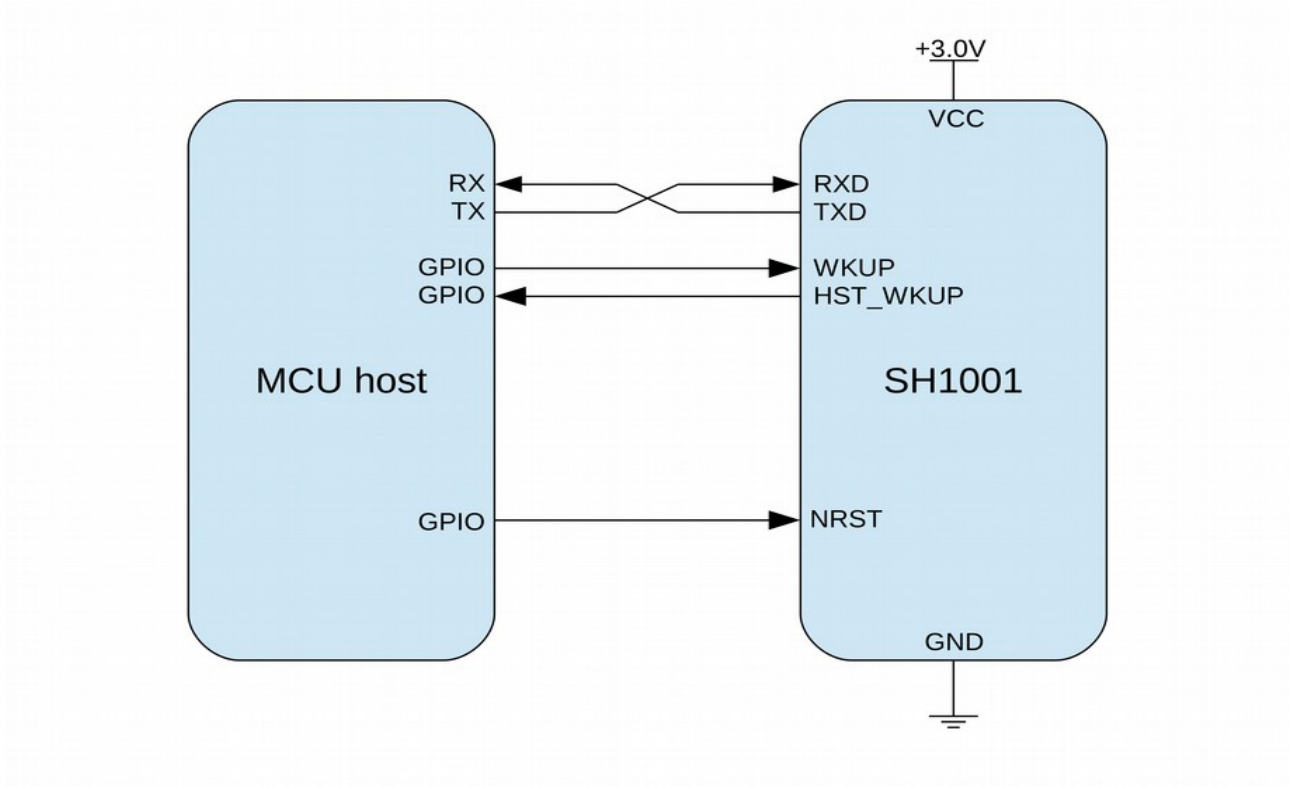
4.2 Pin assignment

Table 10: Pin assignment

Name	Type	Description
VCC	Power	Supply input voltage
GND	Power	Ground
TXD	O	Serial data out
RXD	I	Serial data in
WKUP	I	Device wake-up pin
HST_WKUP	O	Host wake-up pin
NRST	I	Reset pin
DRDY	O	Data ready interrupt
MOSI	I	SPI data in
MISO	O	SPI data out
SCK	I	SPI clock in
CSN	I	SPI chip select
SDA	I/O	I2C data
SCL	I	I2C clock

4.3 Typical application circuit

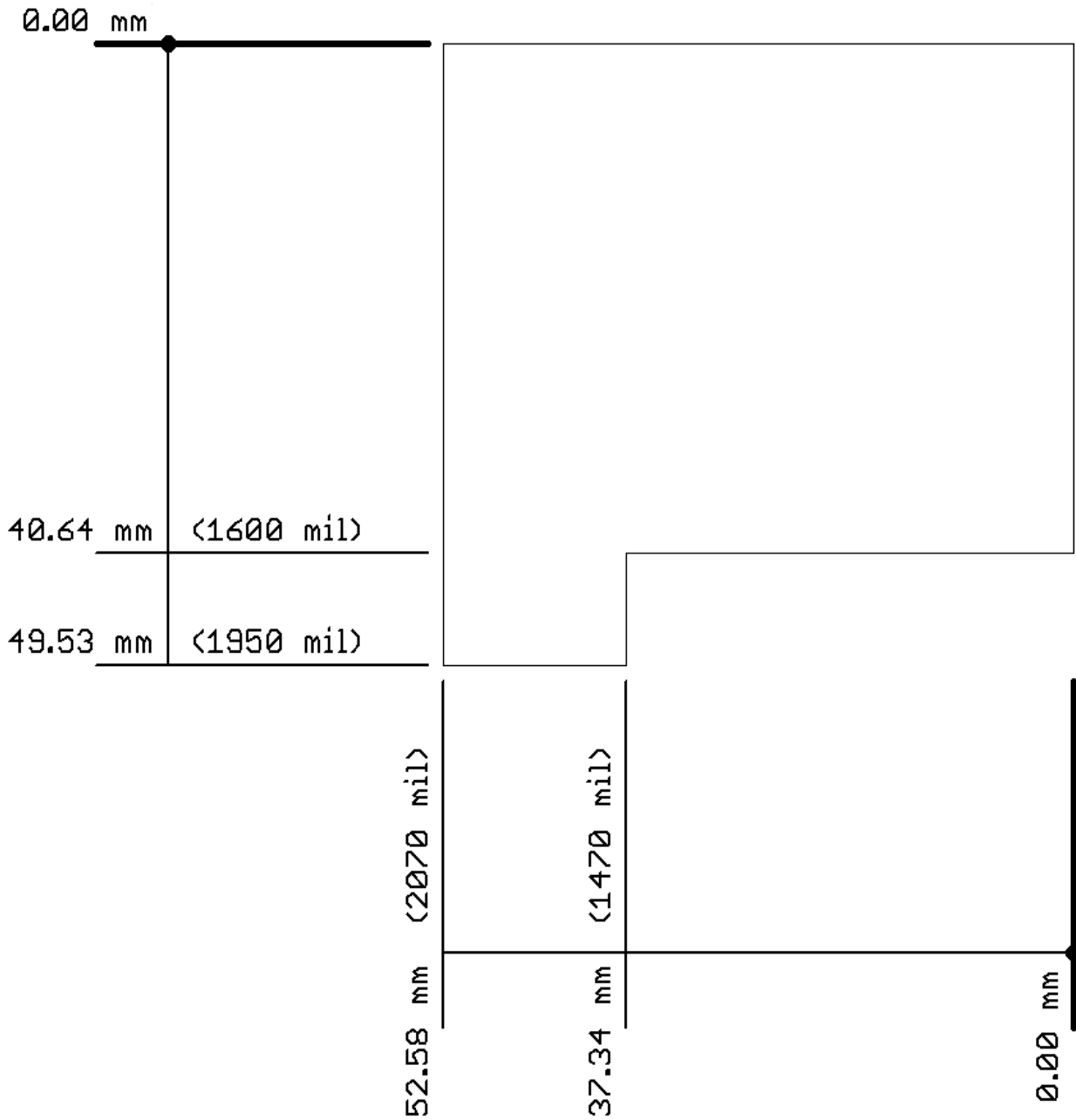
Figure 4: Typical application circuit



4.4 Package mechanical data

All dimensions are in millimeters $\pm 0.1\text{mm}$

Figure 5. Package mechanical data (top view)



5 Ordering information

Contact us at : contact@wizzilab.com

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

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
11-Jun-2015	1.0	Document creation.
25-Oct-2016	1.1	Added Operating modes section.
28-Oct-2016	1.2	Added Current consumption measurements section.