

DPM1276C433C868

433MHz + 868MHz Transceiver Modul with LoRa[®] Modulation High Range Low Power Modul for ISM/SRD Band Application

GENERAL DESCRIPTION

The DPM1276C433C868 module is build to be part of a wireless network which is designed for industrial and measurement applications. The basic radio protocol is designed for use in the European area. Controlled via UART Interface, it is build for point to point or star network configuration. Its outstanding feature is high link budget, efficiency, good blocking Immunity, stabile clock source and at the same time it is easy to implement.

The intended applications of the Modul are all kinds of IoT applications for example Tracking-Tracing or Meter-Reading. With a performance of up to 151 dB link budget this Modul can faces even very difficult tasks. Integrating it can significantly reduce development time and cost.

APPLICATIONS

- Industrial monitoring and control
- Wireless sensor networks
- Tracking and Tracing
- Meter Reading
- Internet of Things (IoT)
- Alarm and Security

KEY PRODUCT FEATURES

- OEM radio module with LoRa[®] and GFSK Modulation
- 151dB maximum link budget
- +14dBm at 45mA constant RF output at 3.3V
- Long rang Application
- Dimensions 26 x 17 x 3,5 mm
- Software Stack
- Point-to-Point and Point-to-Multipoint operation
- Respects EU R&TTE 1999/5/CE directive
- Connecting via UART

DEVICE OPTIONS

Part	Frequency band	Pin Package
DPM1276C433C868	433MHz and 868MHz	Board

Table 1

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1 PIN DESCRIPTION

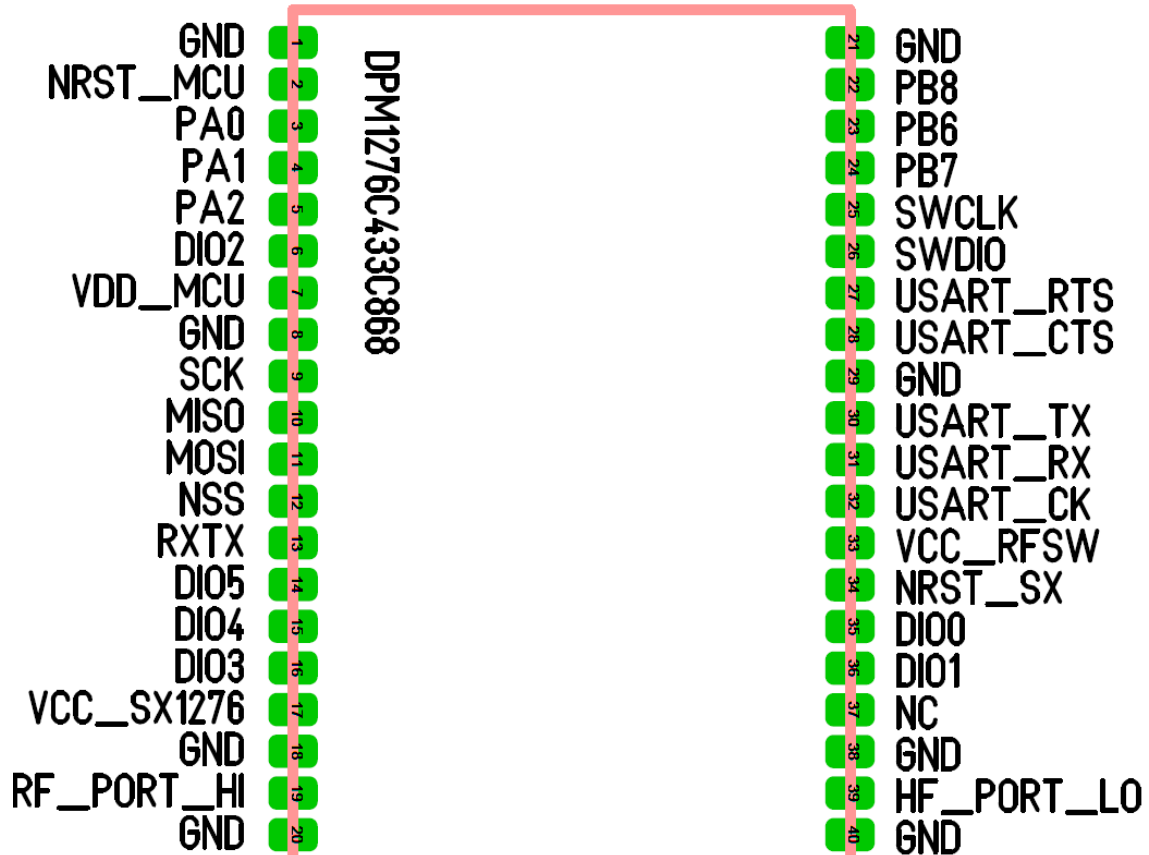


Figure 1: Pin description

Top View

PIN	NAME	I/O	DESCRIPTION
1	GND	SUPPLY	Ground
2	NRST_MCU	IN	Reset trigger input
3	PA0	IN/OUT	General purpose input / output
4	PA1	IN/OUT	General purpose input / output
5	PA2	IN/OUT	General purpose input / output
6	DIO2		Keep floating internal use only
7	VDD_MCU	SUPPLY	Voltage supply for microcontroller
8	GND	SUPPLY	Ground
9	SCK		Keep floating internal use only
10	MISO		Keep floating internal use only
11	MOSI		Keep floating internal use only
12	NSS		Keep floating internal use only
13	RXTX		Keep floating internal use only
14	DIO5		Keep floating internal use only
15	DIO4		Keep floating internal use only
16	DIO3		Keep floating internal use only
17	VCC_SX1276	SUPPLY	Voltage supply for SX1276
18	GND	SUPPLY	Ground
19	RF_PORT_HI	IN/OUT	RF input / output 868MHz band
20	GND	SUPPLY	Ground
21	GND	SUPPLY	Ground
22	PB8	IN/OUT	General purpose input / output
23	PB6	IN/OUT	General purpose input / output
24	PB7	IN/OUT	General purpose input / output
25	SWCLK		Debugger / keep floating
26	SWDIO		Debugger / keep floating
27	USART_RTS		Keep floating
28	USART_CTS		Keep floating
29	GND	SUPPLY	Ground
30	USART_TX	OUT	UART output
31	USART_RX	IN	UART input
32	USART_CK		Keep floating
33	VCC_RFSW		Keep floating internal use only
34	NRST_SX		Keep floating internal use only
35	DIO0		Keep floating internal use only
36	DIO1		Keep floating internal use only
37	NC		Keep floating not connected
38	GND	SUPPLY	Ground
39	RF_PORT_LO	IN/OUT	RF input / output 433MHz band
40	GND	SUPPLY	Ground

Table 2

ELECTRICAL CHARACTERISTICS

2 ABSOLUT MAXIMUM RATINGS

Description	Min	Max	Unit
Supply voltage	0.5	3.8	V
Storage temperature	-55	+115	°C
RF Input Level	-	0	dBm

Table 3

3 OPERATING RANGE

Description	Min	Max	Unit
Supply voltage	2.1	3.6	V
Operating temperature	-20	+75	°C
RF Input Level	-	0	dBm
RF Output Level	-4	+14	dBm
Soldering temperature (max 15 sec)		260	°C

Table 4



CAUTION: ESD sensitive device.

Precaution should be taken when handling the device in order to prevent permanent damage



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4 SPECIFICATIONS

4.1 POWER CONSUMPTION SPECIFICATION

Symbol	Description	Conditions	Min	Typ.	Max	Unit
IDDSL	Supply current in Sleep mode		-	0.4	-	µA
IDDR	Supply current in Receive mode	Min @ LoRa in HI / Max @ GFSK in LO	13.5		15.5	mA
IDDT	Supply current in Transmit mode	14 dBm	-	37	-	mA

Table 5

4.2 I/O PIN SPECIFICATION

PIN NAME	Description	Conditions
PA1	General purpose Input or output	Analog Input possible
PA2	General purpose Input or output	Analog Input possible
PB7	General purpose Input or output	
PB8	General purpose Input or output	
PB9	General purpose Input or output	
USART_CK	General purpose Input or output	
USART_CTS	General purpose Input or output	Alternative Function USB DM
USART_RTS	General purpose Input or output	Alternative Function USB DP

Table 6

4.3 SLEEP CONFIGURATION

To use Sleep Mode simply pull PA0 PIN low and the Modul will atomically go to sleep. Pull high during the Modul has to work. For continues use of the Modul without using the sleep mode let the PA0 pin float.

After a Reset the Sleep PIN is pulled up automatically, when pulled low the first time the internal pull resistor is disconnected for better power consumption during sleep.

4.4 UART INTERFACE

UART Interface is configured to the following settings:

Baud rate: 112500 bit/s
 Stop bit: 1 bit
 Frame size: 8 bit
 Flow control: None
 Parity: None

PIN NAME	Description
USART_TX	UART TX of Modul
USART_RX	UART RX of Modul

Table 7

5 RADIO PARAMETER

5.1 FREQUENCY RANGE

The Modul is build and tested to work within the certified frequency Band from MHz to MHz and form MHz to MHz

Symbol	Description	Conditions	Min	Typ.	Max	Unit
FOPHI	Operation Frequency High Band	HI Port only	863	868.3	870	MHz
FOPLO	Operation Frequency Low Band	LO Port only	433		435	MHz

Table 8

5.2 OUTPUT POWER

The output power can be configured from min -4dBm to max 14 dBm in 1 dB steps.

Symbol	Description	Conditions	Min	Typ.	Max	Unit
TXPHI	Transmitter power at HI PORT		-4		14	dBm
TXPLO	Transmitter power at LO PORT		-4		14	dBm

Table 9

Measured Power versus configured power and Current consumption at 3.3V, using LoRa Modulation.

Power Setting	-4	-3	-2	-1	0	1	2	3	4	5	Unit
LO	-6	-5.2	-4.3	-3.3	-2.3	-1.2	-0,2	1	1.9	2.9	dBm
PTXL	16.4	16.8	17.4	17.9	18.5	19.2	19.8	20.4	20.9	21.4	mA
HI	-4.5	-3.1	-2.2	-1.1	0.0	0.9	1.8	2.7	3.6	4.5	dBm
PTXH	15.2	15.6	16.1	16.6	17.2	17.7	18.5	19.1	19.7	20.3	mA
Power Setting	6	7	8	9	10	11	12	13	14	15	Unit
LO	4.3	5.7	7	8	8.6	9.8	10.9	11.9	12.9	13.9	dBm
PTXL	21.8	22.1	22.4	22.7	29.5	30.4	31.4	32.7	34.0	36.3	mA
HI	5.5	6.5	7.4	8.1	9.4	10.4	11.5	12.4	13.3	14.1	dBm
PTXH	21.2	21.7	22.5	23	28.2	29.8	31.7	33.7	35.9	38.6	mA

Table 10

5.3 RECEIVER SENSITIVITY FSK

Receiver Sensitivity test at HI port were performed with dividend Receiver Bandwidth (RxBw) (Single Side Bandwidth)

Symbol	Modulation	Frequency Deviation	Bitrate	RxBw	Min	Typ.	Max	Unit
RFS_1_2	FSK	5 kHz	1200 bps(bit per second)	10 kHz		-119		dBm
RFS_4_8	FSK	5 kHz	4800 bps	10 kHz		-115		dBm
RFS_38_4	FSK	20 kHz	38400 bps	50 kHz		-105		dBm
RFS_250	FSK	62.5 kHz	250000 bps	250 kHz		-92		dBm

Table 11

Receiver Sensitivity test at LO port were performed with dividend Receiver Bandwidth (RxBw) (Single Side Bandwidth)

Symbol	Modulation	Frequency Deviation	Bitrate	RxBw	Min	Typ.	Max	Unit
RFS_1_2	FSK	5 kHz	1200 bps(bit per second)	10 kHz		-121		dBm
RFS_4_8	FSK	5 kHz	4800 bps	10 kHz		-117		dBm
RFS_38_4	FSK	20 kHz	38400 bps	50 kHz		-108		dBm

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RFS_250	FSK	62.5 kHz	250000 bps	250 kHz		-95		dBm
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Table 12

5.4 RECEIVER SENSITIVITY LoRa®

All values are calculated with the “LoRa® Modem Calculator Tool” for Semtech. Use the Semtech Tool for you individual calculation. The table should be used as referent only. Spreading Factor 6, 7, 8, 9, 10, 11 and 12 can be used with the Modul, but only factors for 6 and 12 are shown in this Table as an example for HI Port.

Symbol	Modulation	Bandwith Config	Sprading Faktor	Bitrate (bps)	Min	Typ.	Max	Unit
RLS_62_5	LoRa®	62.5 kHz	SF = 6 SF = 12	4687 146			-118 -137	dBm
RLS_125	LoRa®	125 kHz	SF = 6 SF = 12	9375 292			-115 -134	dBm
RLS_250	LoRa®	250 kHz	SF = 6 SF = 12	18750 585			-112 -131	dBm
RLS_500	LoRa®	500 kHz	SF = 6 SF = 12	37500 1171			-109 -128	dBm

Table 13

The table shows the data for the LO Port.

Symbol	Modulation	Bandwith Config	Sprading Faktor	Bitrate (bps)	Min	Typ.	Max	Unit
RLS_62_5	LoRa®	62.5 kHz	SF = 6 SF = 12	4687 146			-119 -138	dBm
RLS_125	LoRa®	125 kHz	SF = 6 SF = 12	9375 292			-116 -135	dBm
RLS_250	LoRa®	250 kHz	SF = 6 SF = 12	18750 585			-113 -132	dBm
RLS_500	LoRa®	500 kHz	SF = 6 SF = 12	37500 1171			-110 -129	dBm

Table 14

6 RADIO CANNELS

The table shows all relevant bands of the EN-300-220 which can be addressed by the Modul. The currently used bands are specified in detail below.

Band	Frequency Bands/frequencies	Applications	Maximum radiated power, e.r.p. / power spectral density	Channel spacing	Spectrum access and mitigation requirement (e.g. Duty cycle or LBT + AFA)
g1	433.05 to 434.79 MHz		10 dBm		No requirement
g2a	433.05 to 434.79 MHz		1 dBm		No requirement
g2b	433.05 to 434.79 MHz		-13dbm/10kHz		No requirement
g3	434.04 to 434.79 MHz		10 dBm		No requirement
h1.2a	865 to 868 MHz		+6.2 dBm /100kHz		1 % or LTB + AFA
h1.2b	865 to 870 MHz		-0,8 dBm /100kHz		0.1 % or LTB + AFA
h1.4	868 to 868.6 MHz		14 dBm		1 % or LTB + AFA
h1.5	868.7 to 869.2 MHz		14 dBm		0.1 % or LTB + AFA
h1.6	869.4 to 869.65 MHz		27 dBm		10 % or LTB + AFA
h1.7a	869.7 to 870 MHz		7dBm		No requirement
h1.7b	869.7 to 870 MHz		14 dBm		1 % or LTB + AFA

Table 15

6.1 CHANNEL SPACING

Symbol	Description	Conditions	Min	Typ.	Max	Unit
CSF	Spacing for GFSK Cannel		10		500	kHz
CSL	Spacing for LoRa [®] Cannel		62.5		500	kHz

Table 16

6.2 RECOMMENDED RADIO CHANNEL CONFIGURATIONS LoRa®

All LoRa® Radio Channel configurations are compliant to European legal requirements.

Band	Center Frequency (MHz) + Spacing (MHz)	Bandwidth Config (kHz)	Power Setting Max	Channels	Time on Air using Duty cycle	LBT + AFA
h1.2a	865.05 + 0.1	62,5	6dBm	30	36 sec / hr	G(note7)
	865.1 + 0.2	125	6dBm	15	36 sec / hr	G(note7)
	865.2 + 0.3	250	6dBm	10	36 sec / hr	G(note7)
	865.6 + 0.6	500	6dBm	4	36 sec / hr	G(note7)
h1.2b						
h1.4	868.05 + 0.1	62,5	13dBm	6	36 sec / hr	G1
	868.10 + 0.2	125	13dBm	3	36 sec / hr	G1
	868.30	250	13dBm	1	36 sec / hr	G1
	868.30	500	13dBm	1	36 sec / hr	G1
h1.5	868.8 + 0.1	62,5	14dBm	4	3.6 sec / hr	G2
	868.85 + 0.2	125	14dBm	2	3.6 sec / hr	G2
	868.95	250	14dBm	1	3.6 sec / hr	G2
h1.6	869.475 +0.1	62,5	14dBm	2	360 secs / hr	G3
	869.525	125	14dBm	1	360 secs / hr	G3
h1.7a	869.8 + 0.1	62,5	6dBm	2	No	G4
	869.85	125	6dBm	1	No	G4
h1.7b	869.8 + 0.1	62,5	14dBm	2	36 sec / hr	G4
	869.85	125	14dBm	1	36 sec / hr	G4

Table 17

7 MECHANICAL DIMENSIONS

The following drawing shows the physical footprint and dimensions of the DPM1276C433C868 module.

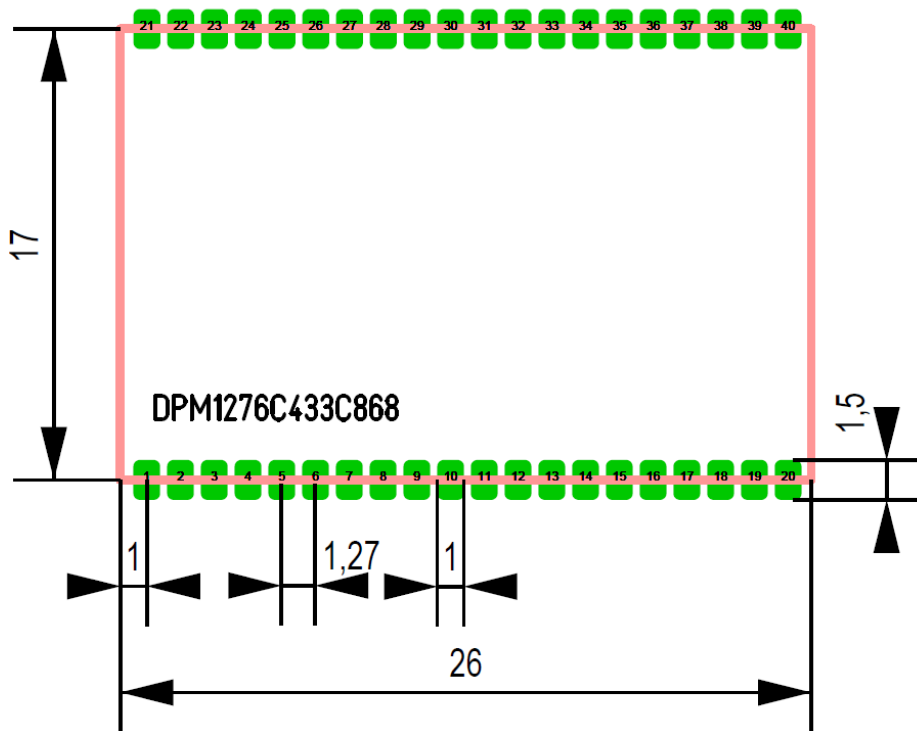


Figure 2: Top view of mechanical dimensions

8 APPLICATION LAYOUT

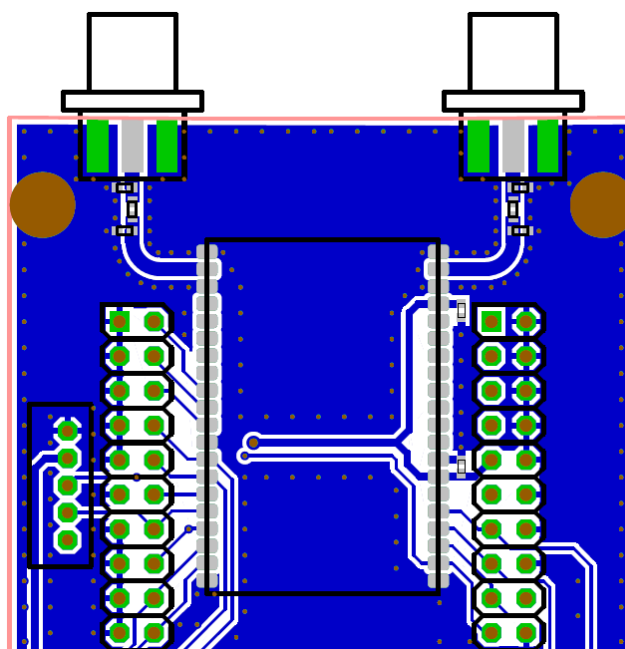


Figure 3: Application layout example

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Version	Create Date:	Creator	Changes
0.1	23.05.2016	Holler	Create new Datasheet

Table 18

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