

# DPH1276C169

## 169 MHz 27dBm Transceiver Modul with LoRa Modulation

### Very long Range low Data rate ISM Band Application

#### GENERAL DESCRIPTION

The DPH1276C169 module is build to be part of a wireless network which is designed for industrial measurement applications. The 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, efficient Power Amplifier, very good blocking Immunity, precise clock source and at the same time it is easy to implement.

The intended application of the Modul is Tracking-Tracing and Meter-Reading. With an unreached performance of up to 175 dB link budget this Modul can faces even very difficult tasks. Using it can significantly reduce development time and cost even for specialists.

#### APPLICATIONS

- Industrial monitoring and control
- Wireless sensor networks
- Tracking and Tracing
- Meter Reading

#### KEY PRODUCT FEATURES

- OEM radio module with GFSK and LoRa Modulation
- 175 dB maximum link budget
- +27 dBm at <400 mA constant RF output at 3.6V
- Long rang Application
- Dimensions 35 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
DPH1276C169	169 MHz	Board

Table 1

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1 PIN DESCRIPTION

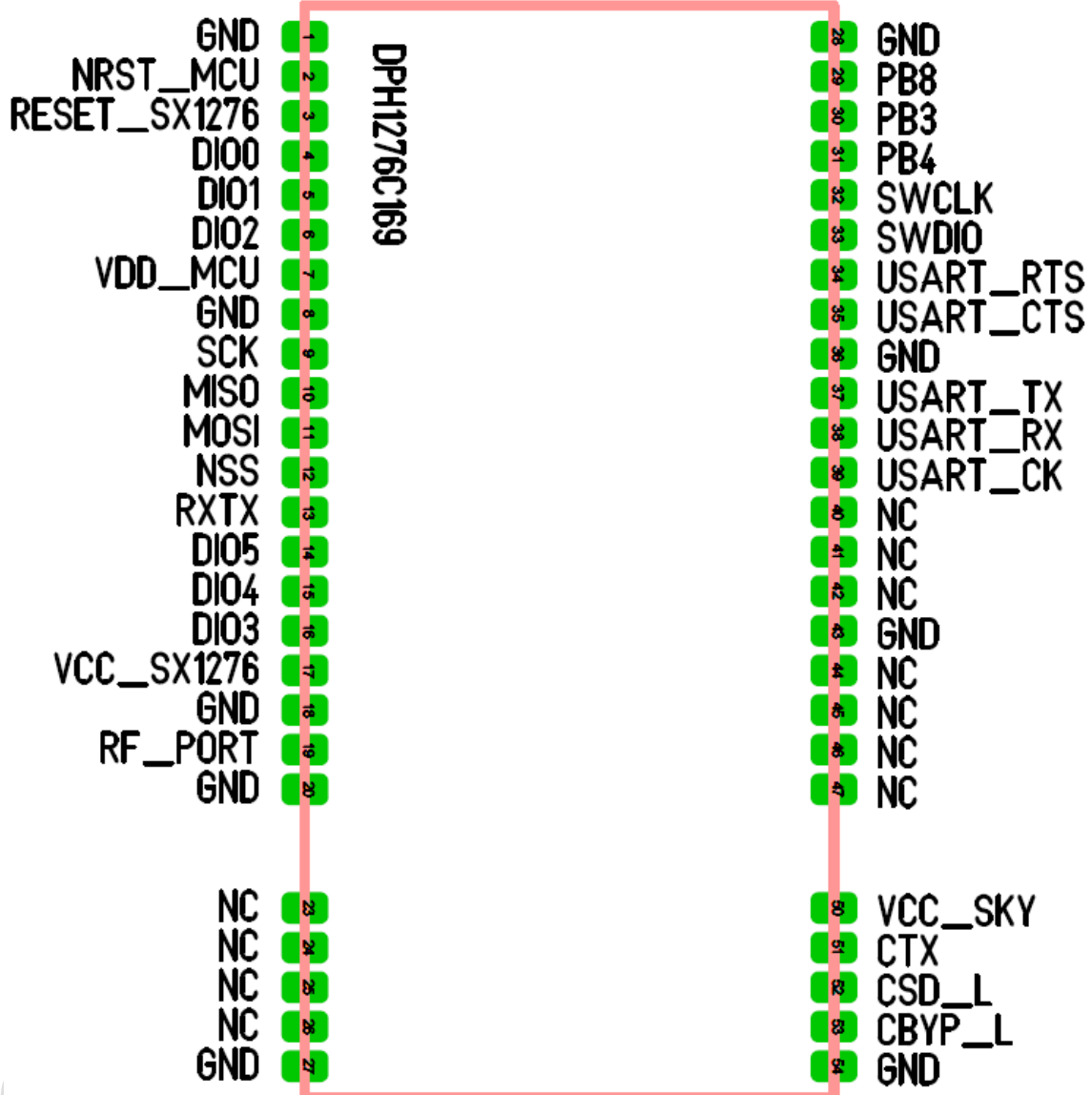


Figure 1: Pin description

Top View

PIN	NAME	I/O	DESCRIPTION
1	GND	SUPPLY	Ground
2	NRST_MCU	IN	Reset trigger input
3	RESET_SX1276		Keep floating internal use only
4	DIO0		Keep floating internal use only
5	DIO1		Keep floating internal use only
6	DIO2		Keep floating internal use only
7	VDD_MCU	SUPPLY	Voltage supply for microcontroller
8	GND	SUPPLY	Ground

WIRELESS PRODUCTS

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	IN/OUT	RF input / output
20	GND	SUPPLY	Ground
21			
22			
23	NC		Keep floating not connected
24	NC		Keep floating not connected
25	NC		Keep floating not connected
26	NC		Keep floating not connected
27	GND	SUPPLY	Ground
28	GND	SUPPLY	Ground
29	PB8	IN/OUT	General purpose input / output
30	PB3	IN/OUT	General purpose input / output
31	PB4	IN/OUT	General purpose input / output
32	SWCLK		Debugger / keep floating
33	SWDIO		Debugger / keep floating
34	USART_RTS		Keep floating
35	USART_CTS		Keep floating
36	GND	SUPPLY	Ground
37	USART_TX	OUT	UART output
38	USART_RX	IN	UART input
39	USART_CK		Keep floating
40	VCC_RFSW		Keep floating internal use only
41	NC		Keep floating not connected
42	NC		Keep floating not connected
43	GND	SUPPLY	Ground
44	NC		Keep floating not connected
45	NC		Keep floating not connected
46	NC		Keep floating not connected
47	NC		Keep floating not connected
48			
49			
50	VCC_SKY	SUPPLY	Voltage supply for power amplifier / buffer capacitor
51	CTX		Keep floating internal use only
52	CSD_L		Keep floating internal use only
53	CBYP_L		Keep floating internal use only
54	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	-8.5	+27	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



### Life Support Policy and Use in Safety Critical Applications

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## 4 SPECIFICATIONS

### 4.1 POWER CONSUMPTION SPECIFICATION

Symbol	Description	Conditions	Min	Typ	Max	Unit
IDDSL	Supply current in Sleep mode		-	TBD	-	µA
IDDR	Supply current in Receive mode		-	18.5	-	mA
IDDT	Supply current in Transmit mode		-	375	-	mA

Table 5

## 5 RADIO PARAMETER

### 5.1 FREQUENCY RANGE

The Modul is build and tested to work within the certified frequency Band from 169.4 MHz to 169.6 MHz.

Symbol	Description	Conditions	Min	Typ	Max	Unit
FOP	Operation Frequency	related to SAW spec.	166	169.4	172	MHz

Table 6

### 5.2 OUTPUT POWER

While using the power Amplifier for 27 dBm no output power configuration is possible. In bypass mode the output power can be configured from min -8dBm to max 12 dBm in 1 dB steps.

Symbol	Description	Conditions	Min	Typ	Max	Unit
TXP	Transmitter power	Power step size 1 dB for -8 dBm to 12dBm and 27 in PA on Configuration	-8		27	dBm

Table 7

### 5.3 RECEIVER SENSITIVITY GFSK

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

Symbol	Modulation	Frequency Deviation	Bitrate	RxBw	Min	Typ	Max	Unit
RFS_1_2	GFSK	5 kHz	1200 bps( bit per second)	10 kHz		-121		dBm
RFS_2_4	GFSK	5 kHz	2400 bps	10 kHz		Tbd.		dBm
RFS_4_8	GFSK	5 kHz	4800 bps	10 kHz		-117		dBm
RFS_9_6	GFSK	10 kHz	8600 bps	25 kHz		Tbd.		dBm
RFS_19_2	GFSK	20 kHz	19200 bps	50 kHz		Tbd.		dBm

Table 8

### 5.4 RECEIVER SENSITIVITY LoRa

Symbol	Modulation	Bandwith Config	Sprading Faktor	Min	Typ	Max	Unit
RLS_7_8	LoRa	7.8 kHz	SF = 7 SF = 12	133		148	dBm
RLS_10_2	LoRa	10.4 kHz	SF = 7 SF = 12	131		146	dBm
RLS_15_6	LoRa	15.6 kHz	SF = 7 SF = 12	129		145	dBm

Table 9

## 6 RADIO CANNELS

Die Tabelle zeigt alle Relevanten Bänder aus der EN-300-220 Norm welche für das Modul in fragen kommen. Die Momentan genuteten werden unterhalb genauer spezifiziert.

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)
B1	169,400 MHz to 169,475 MHz	Tracking and tracing	500 mW	≤50 kHz	1 % (see note 3)
B1	169,400 MHz to 169,475 MHz	Meter Reading	500 mW	≤50 kHz	10 %

Table 10

All "NOTE's" are related to EN300220 document.

### 6.1 CHANNEL SPACING

Symbol	Description	Conditions	Min	Typ	Max	Unit
CSF	Spacing for GFSK Cannel		10		50	kHz
CSL	Spacing for LoRa Cannel		7.8		15.6	kHz

Table 11

### 6.2 RECOMMENDED RADIO CANNEL CONFIGURATIONS GFSK

All GFSK Radio Cannel configurations are compliant to European legal requirements at 27 dBm Output power.

Band	Modulation	Frequency (Hz)			Bitrate Bps.	Frequency Deveation (kHz)	RxBw (kHz)
		Min	Center	Max			
B1	GFSK		169.437.500		19200	10	50
B2	GFSK		169.437.500		9600	10	25
B3	GFSK		169.437.500		4800	5	10
B4	GFSK		169.437.500		2400	5	10
B5	GFSK		169.437.500		1200	5	10

Table 12

### 6.3 RECOMMENDED RADIO CANNEL CONFIGURATIONS LoRa

All LoRa Radio Cannel configurations are compliant to European legal requirements at 27 dBm Output power.

Band	Modulation	Center Frequency (Hz)	Bandwith Config (kHz)	Spreading Faktor
L1	LoRa	169.437.500	15,2	7-12
L2.1	LoRa	169 422 500	10,4	7-12
L2.2	LoRa	169 437 500	10,4	7-12
L2.3	LoRa	169 452 500	10,4	7-12
L3.1	LoRa	169 417 500	7,6	7-12
L3.2	LoRa	169 427 500	7,6	7-12
L3.3	LoRa	169 437 500	7,6	7-12
L3.4	LoRa	169 447 500	7,6	7-12
L3.5	LoRa	169 457 500	7,6	7-12

Table 13

## 7 MECHANICAL DIMENSIONS

The following drawing shows the physical footprint and dimensions of the DPH1276C169 module.

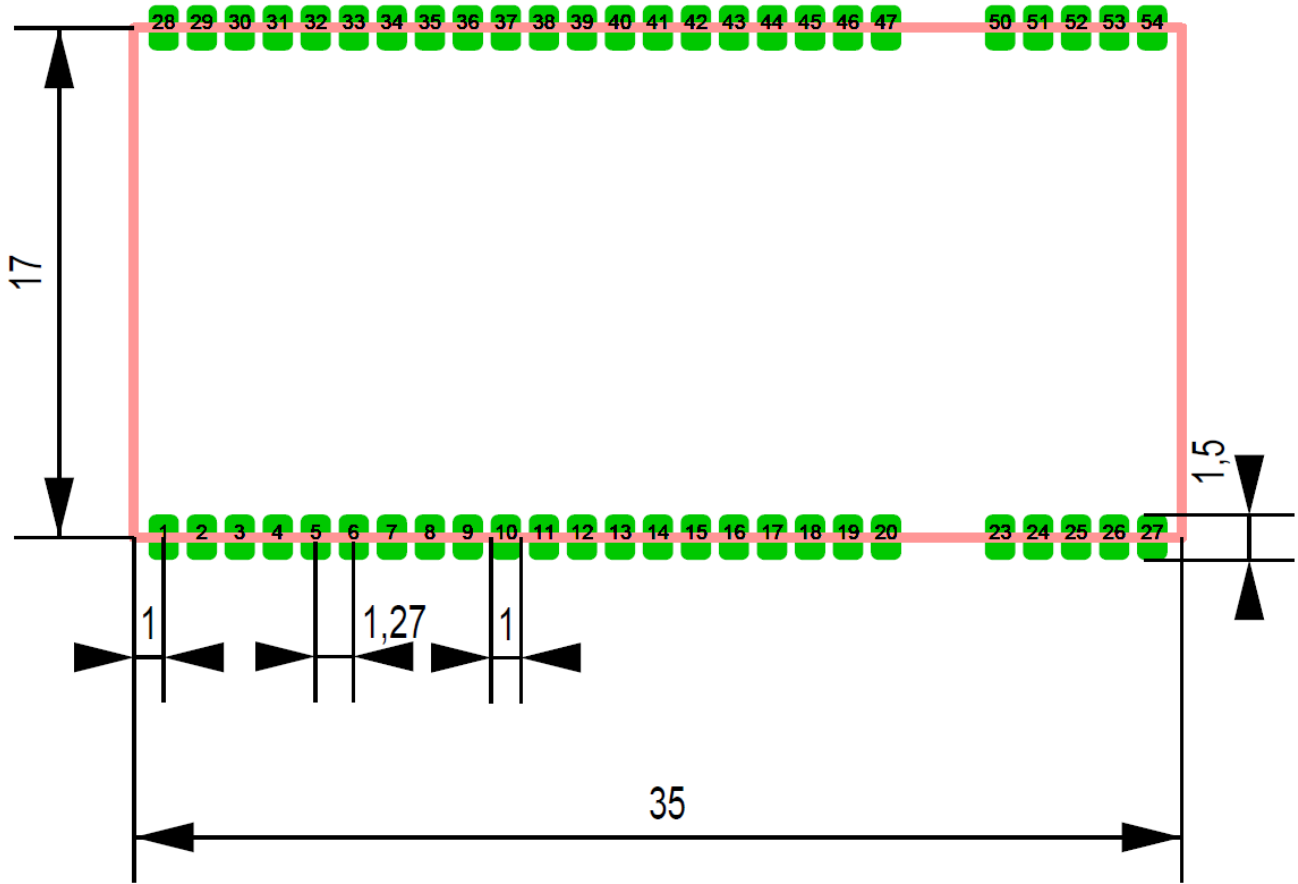


Figure 2: Top view of mechanical dimensions

prelim



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Version	Create Date:	Creater	Changes
0.1	01.08.2015	Holler	Create new Datasheet
0.2	02.10.2015	Holler	Swap Pin 37 and 38
0.3	10.11.2016	Holler	Current TX RX ,Sensitivity
0.4	15.11.2016	Holler	RX Sensitivity

Table 14

**Contact Information:**

**Anylink Systems AG**  
  
 Ringlerstrasse 19  
 85057 Ingolstadt  
 Germany  
  
 Phone (+49) 841-881-1200  
 Fax: (+49) 841-881-1201