PAN2450
Low power RF transceiver for narrow band systems
Datasheet

- preliminary -

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0. Document History

Revision	Date	Modification / Remarks
01	4.2.2004	Initial DRAFT version 01
02	19.2.2004	Add some limits

1. Applications

- wireless control
- 868 and 915 MHz ISM/SRD band systems
- RKE – Two-way Remote Keyless Entry
- Home automation
- Wireless alarm and security systems
- AMR – Automatic Meter Reading
- Low power telemetry
- Toys

2. Product Description

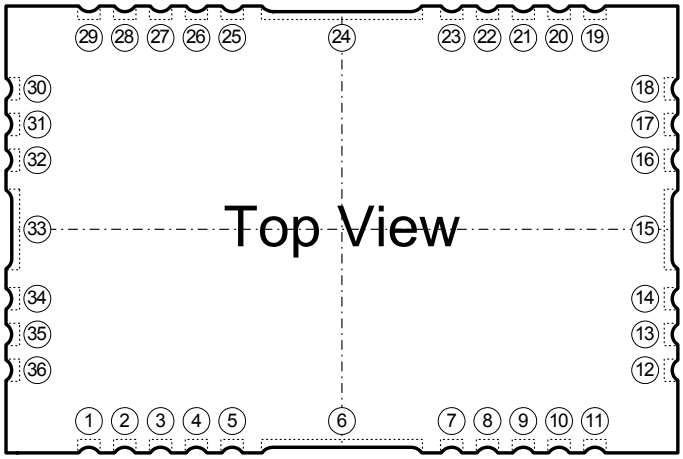
The Module consists of an rf transceiver and a microcontroller. It is suited for a wide range of wireless communication applications using the license free ISM frequency bands at 868 or 915MHz. With its high Tx power, narrow channel bandwidth and high Rx sensitivity the transceiver is especially suited for reliable long range communication links. Ultra low power modes allow the use in battery powered devices. PAN2450 complies with EN 300-220.

3. Features

- Small dimensions (30mm x 20mm x 3.7mm)
- Frequency range 868 - 928 MHz
- Low current consumption
- High sensitivity (typically -114dBm at 2.4 kBaud)
- Data rates from 1.8 to 4.8 kBaud
- Variable Tx output power
- Low supply voltage (2.7 V to 3.3 V)
- Digital RSSI and carrier sense
- Single port antenna connection
- Programmable frequency in 600 Hz steps and AFC feature provided for crystal oscillator drift compensation
- Development kit available

4. Pin Assignment

Table 1 shows an overview of the PAN2450 pins. The package for this module is a SMD package, for details please see chapter 14 Module Drawing .



PAN2450 package (Top View)

Table 1 Pin Assignment

Pin no	Pin name	Pin type	Description
1	GND	ground	ground connection (0Vdc)
2	VCC	supply	+3Vdc
3	GND	ground	ground connection (0Vdc)
4	GND	ground	ground connection (0Vdc)
5	P1.6	I/O	digital I/O(1)
6	GND	ground	ground connection (0Vdc)
7	P1.7	I/O	digital I/O(1)
8	P1.5	I/O	digital I/O(1)
9	P1.4	I/O	digital I/O(1)
10	P1.2	I/O	digital I/O(1)
11	P1.1	I/O	digital I/O(1)
12	TEST	input	select of test mode for JTAG pins on port1
13	P2.5	I/O	digital I/O(1)
14	RST/NMI	input	reset (active low) or non maskable interrupt input
15	GND	ground	ground connection (0Vdc)
16	P2.1	I/O	digital I/O(1)
17	P2.2	I/O	digital I/O(1)
18	P3.0	I/O	digital I/O(1)
19	P3.3	I/O	digital I/O(1)
20	P3.2	I/O	digital I/O(1)
21	P3.1	I/O	digital I/O(1)
22	P2.4	I/O	digital I/O(1)
23	P3.4	I/O	digital I/O(1)
24	GND	ground	ground connection (0Vdc)
25	P3.5	I/O	digital I/O(1)
26	GND	ground	ground connection (0Vdc)

Pin no	Pin name	Pin type	Description
27	ANT	antenna	single ended antenna connection (2)
28	GND	ground	ground connection (0Vdc)
29	GND	ground	ground connection (0Vdc)
30	GND	ground	ground connection (0Vdc)
31	GND	ground	ground connection (0Vdc)
32	GND	ground	ground connection (0Vdc)
33	GND	ground	ground connection (0Vdc)
34	GND	ground	ground connection (0Vdc)
35	GND	ground	ground connection (0Vdc)
36	GND	ground	ground connection (0Vdc)

Note (1) digital I/O pins are fed through to the corresponding pins of the microcontroller MSP430F1232 on the module. The pin names at the module and at the microcontroller are the same.

Note (2) The integrated circuit used in PAN2450 is a CHIPCON® CC1020, available at www.chipcon.com. Additional information and application hints can be found in the datasheet of CC1020 and the related application notes.

5. Electrical Specification

Table 2 Electrical Specification

Conditions: 50Ω load, Tc = 25°C, Vdd = 3.0 V, 869MHz, 14dBm output power, GFSK,4.8kBaud, 4.95kHz separation, PN9 sequence as modulation data, 25kHz channel width if not otherwise stated.

Note (7) Specification of minimum/maximum data is intended to be inserted after evaluation of data from mass production and / or corresponding data sheet updates of CC1020.

Parameter	Min.	Typ.	Max.	Unit	Condition / Note
Overall					
Supply voltage Vdd	2.7	3.0	3.3	Vdc	
Storage temperature range	-40		+85	°C	
Operating temperature range	-10		+55	°C	
Supply current		53	tbd(7)	mA	Transmit
Supply current		29	(7)	mA	Transmit +3dBm output pwr.
Supply current		18	(7)	mA	Receive mode
Supply current		802	(7)	uA	Power down mode
RF Frequency Range	868		928	MHz	
nominal load impedance		50		Ohm	
Frequency steps			600	Hz	
Frequency deviation			2.475	kHz	limited by ACP limitations
Channel width	12.5		25	kHz	
Modulation	FSK, GFSK				
Coding	NRZ, Manchester				
Transmit Section					
Transmit data rate	1.8		4.8	kBaud	
Binary FSK frequency separation	2.7	4.95	4.95	kHz	A logic "0" data input voltage corresponds to the rf output frequency f0, whilef1 corresponds to a logic "1". The frequency separation f1-f0 is programmable in 250 Hz

Parameter	Min.	Typ.	Max.	Unit	Condition / Note
					steps..The RF carrier center frequency, fc, is fc=(f0+f1)/2. The frequency deviation fd is fd=+/-(f1-f0)/2.
Output power					GFSK pseudo random modulated carrier
note (3)	(7)	+15	(7)	dBm	for CC1020 setting +5dBm
note (3)	+12	+14	+16	dBm	for CC1020 setting +3dBm
note (3)	(7)	+13,5	(7)	dBm	for CC1020 setting +0dBm
	(7)	+9	(7)	dBm	for CC1020 setting -10dBm
	(7)	+5	(7)	dBm	for CC1020 setting -18dBm
	(7)	+3	(7)	dBm	for CC1020 setting -20dBm
RF output impedance		50		Ω	
Harmonics		-37	-30	dBm	general
Adjacent channel power		-39,5	-37	dBm	25kHz channel width. Measured in a ±8.5kHz bandwidth at 25kHz offset
Spurious emissions					
47-74, 87.5-118, 174-230, 470-862MHz		-52	tbd (7)	dBm	(3) +14dBm output power
		-57	-54	dBm	for +9dBm output power @ **25°C** (7)
<1GHz		tbd(7)	-36	dBm	
>1GHz		tbd(7)	-30	dBm	

Note (3) for an output power > 9dBm antenna attenuation has to be provided for compliance with the EN300220 spurious emissions limit of –54dBm. For +14dBm module output power setting an antenna with at least 5dB attenuation has to be used.

Receive Section

rf input levels stated for Bit Error Rate B.E.R.=10E-3

Receiver class		2			EN 300220-1 V1.3.1 part 4.1
Receiver Sensitivity					Modulation: FSK NRZ PN9 sequence
1.8kBaud		tbd (7)		dBm	±1.35kHz frequ. deviation
1.8kBaud		-114		dBm	±2.4 kHz frequ. deviation
2.4kBaud		-113		dBm	±2.4 kHz frequ. deviation
4.8kBaud		-111		dBm	±2.4 kHz frequ. deviation
Saturation (maximum input level)	10	(7)		dBm	
Co-channel rejection	(7)	-11		dB	Wanted signal 3dB above the sensitivity level, Co-channel with FM jammer (4)
Adjacent channel rejection (ACR)	(7)	32		dB	Wanted signal 3dB above the sensitivity level, Adj. channel with FM jammer (4)
Blocking/Desensitation					Wanted signal 3dB above the sensitivity level, CW jammer at 1, 2, 5 and 10MHz offset.
+-1MHz	(7)	60		dB	
+-2MHz	(7)	71		dB	
+-5MHz	(7)	71		dB	
+-10MHz	(7)	78		dB	

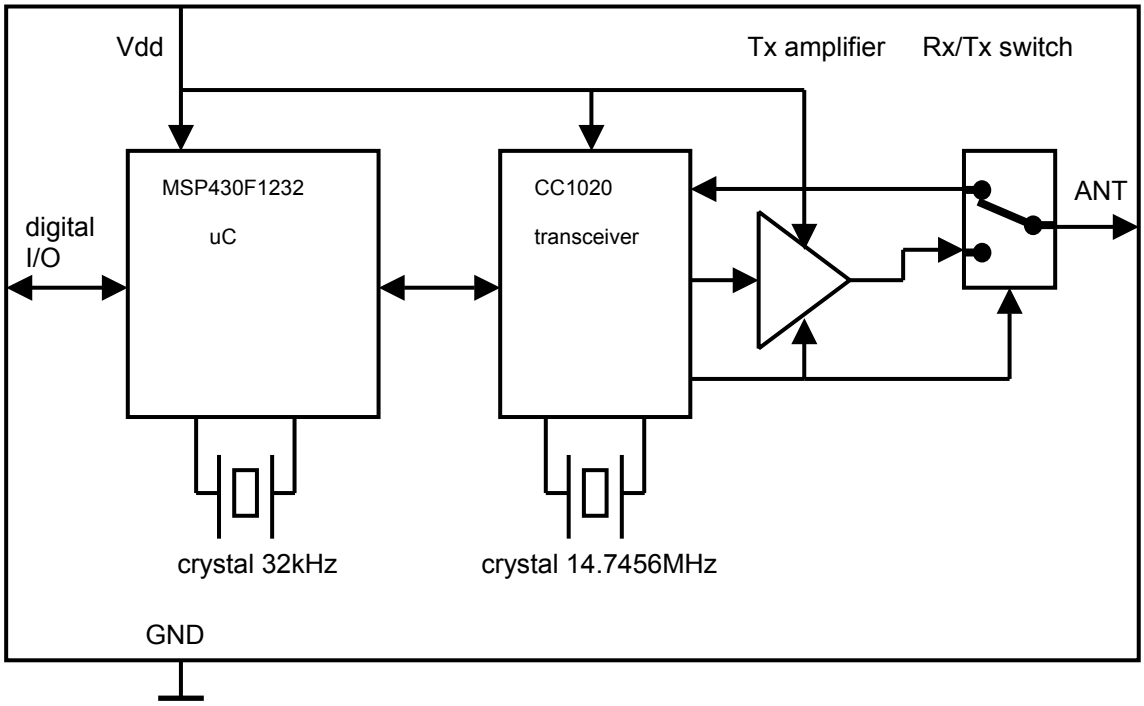
Note (4) 1kHz sine, +-2.5kHz deviation

Parameter	Min.	Typ.	Max.	Unit	Condition / Note
RSSI					
Carrier sense programmable range		40		dB	
RSSI dynamic range		63		dB	
RSSI accuracy	(7)	±3		dB	
RSSI linearity	(7)	±1		dB	
IF section					
AFC resolution		150		Hz	at 2.4kBaud
Frequency synthesizer					
Reference frequency f_{REF}		14.7456		MHz	internal
f_{REF} tolerance		±10		ppm	Note (5)
f_{REF} temp. characteristics		±20		ppm	-40°C to +85°C (Ref. +25°C)
f_{REF} aging tolerance		±2		ppm	per year

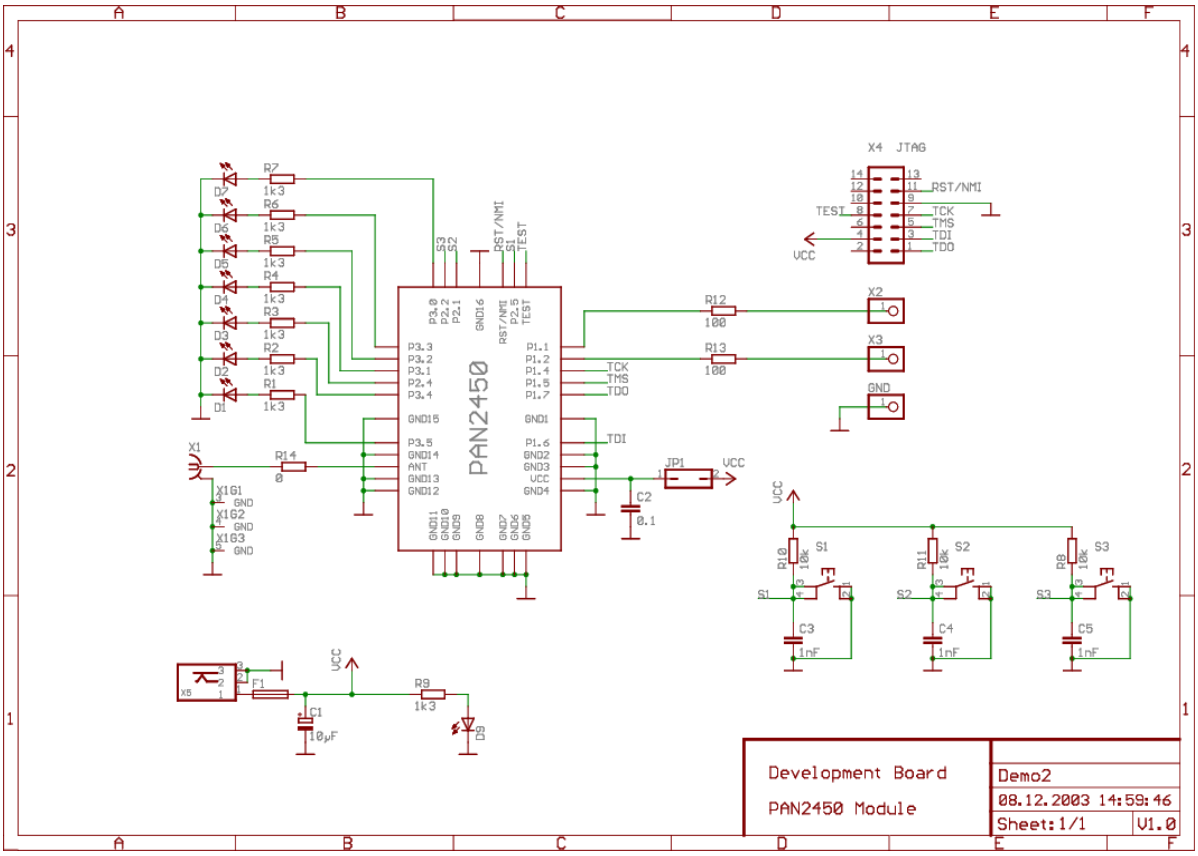
Note (5) The deviation of the rf output carrier frequency f_C from the programmed carrier frequency f_P is Δf_C = (tolerance + temp.char. + years x aging tol./year) x f_p

Digital Inputs/Outputs					
Logic “0” input voltage	0		0.3	V	
Logic “1” input voltage	0.7		Vdd	V	
Logic “0” output voltage	0		0.4	V	-2mA output current
Logic “1” output voltage	2.5		Vdd	V	2mA output current

6. Simplified schematic



7. Application Circuit



Typical application and test circuit

0 shows a typical application circuit for the action. To set the module in different modes, can be done over the groper after flashing the µ PAN2450 module. There are different sensors (D1 to D7 [LEDs]) and actors (S1 to S3 [groper]) to activate or indicate a special C with your software over the JTAG adapter (X4). The SMA connector (X1), is used for the rf signal in transmit and receive mode. Pins X2 and X3 are mainly used for the received data and clock data.

8. Configuration Overview

see CHIPCON CC1020 Datasheet (rev.1.4), 2003-11-18

necessary register settings		
REGISTER	VALUE	COMMENT
MATCH	0x0F0	
FRONTEND	0x076	
ANALOG	0x087	
INTERFACE	0x00F[8]	
PLL_BW	0x0AE	

[8] when entering the power down mode, this register has to be changed to 0x001 to ensure lowest power consumption

9. Configuration Software

see CHIPCON CC1020 Datasheet (rev.1.4), 2003-11-18

10. Microcontroller Interface

see TEXAS INSTRUMENTS Inc. MSP430x12x2 Datasheet 2002-2003

11. Frequency Programming

see CHIPCON CC1020 Datasheet (rev.1.4), 2003-11-18

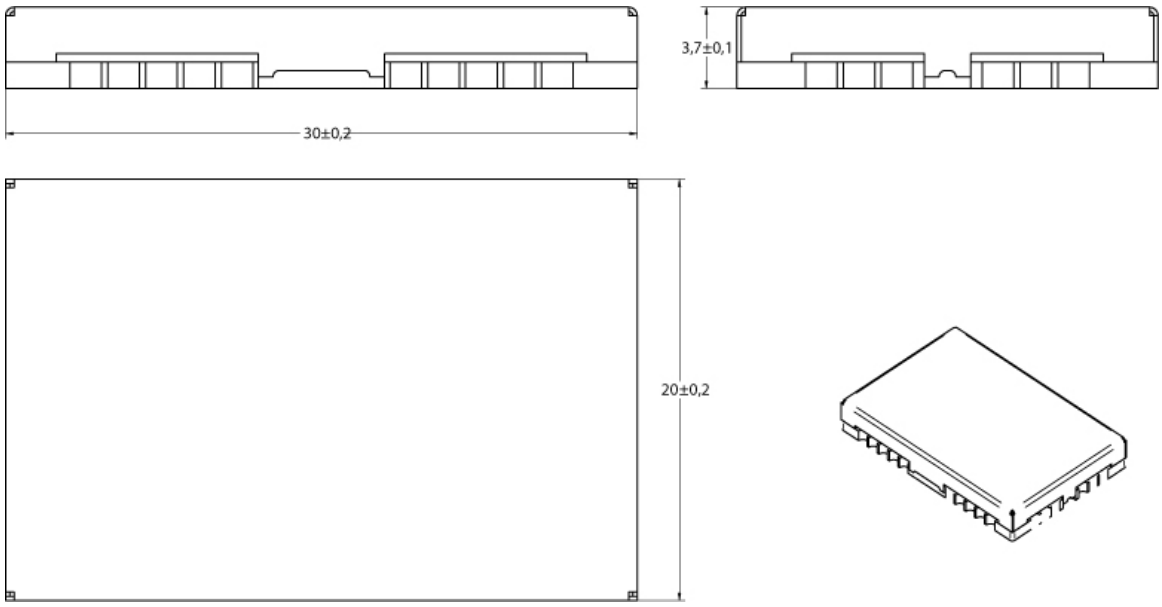
12. Application Guidelines for use in European ISM bands

see CHIPCON CC1020 Datasheet (rev.1.4), 2003-11-18 pg.56-58 and ETSI EN300220

13. Configuration Registers

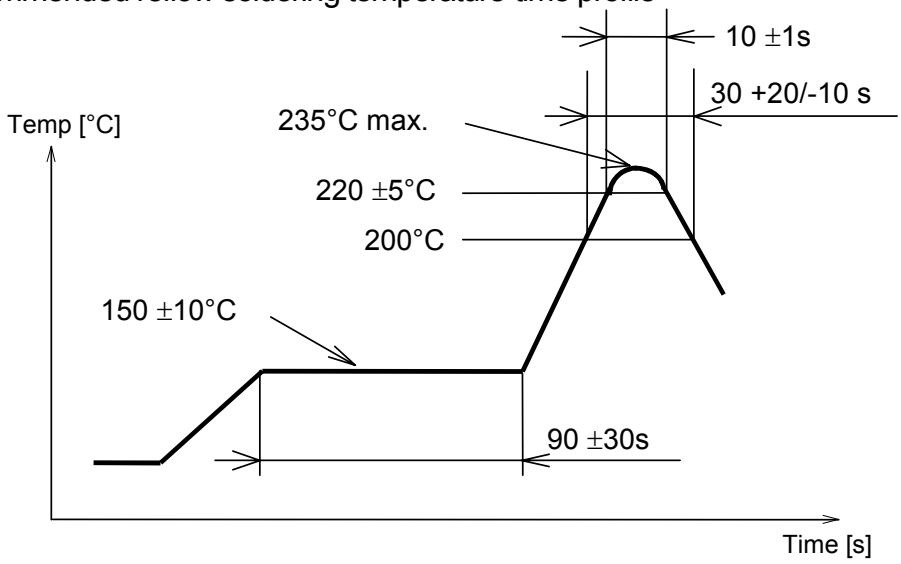
see CHIPCON CC1020 Datasheet (rev.1.4), 2003-11-18

14. Module Drawing



15. Soldering Information

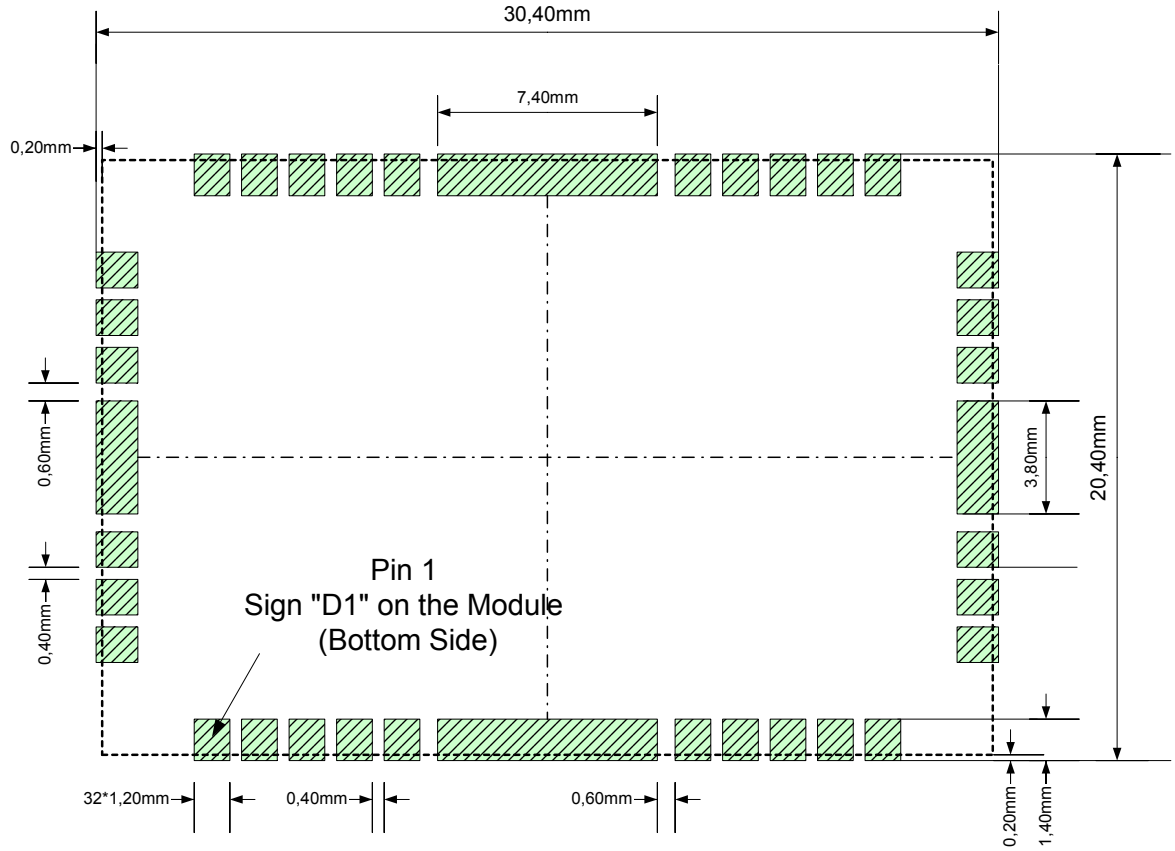
15.1 Recommended reflow soldering temperature-time profile



Recommended temperature profile for PAN2450

15.2 Recommended land pattern

We prefer the same dimensions for the solder paste screen but it depends on your solder screen thickness.

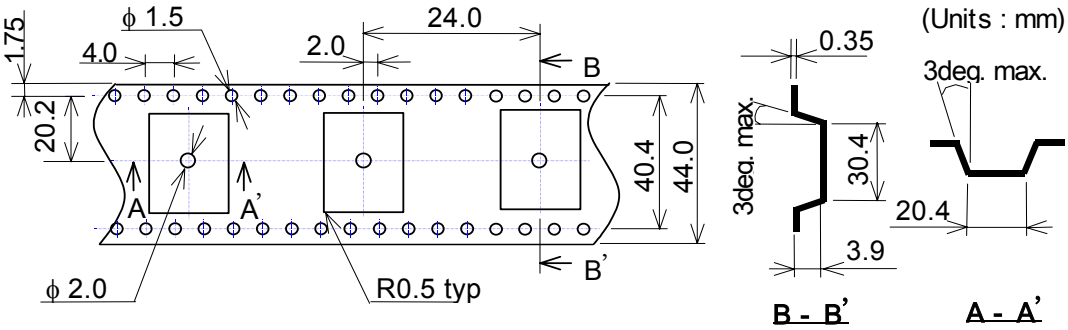


Recommended foot pattern for PAN2450

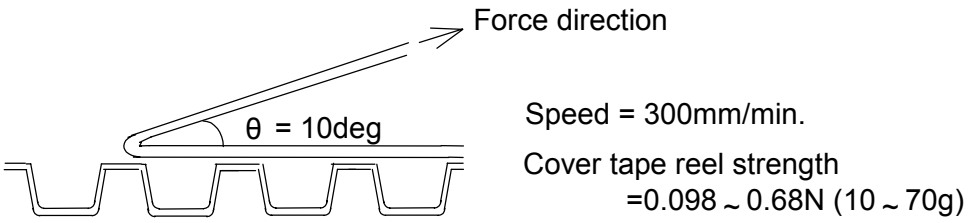
16. Carrier Tape and Reel Specification

16.1 Embossed Tape

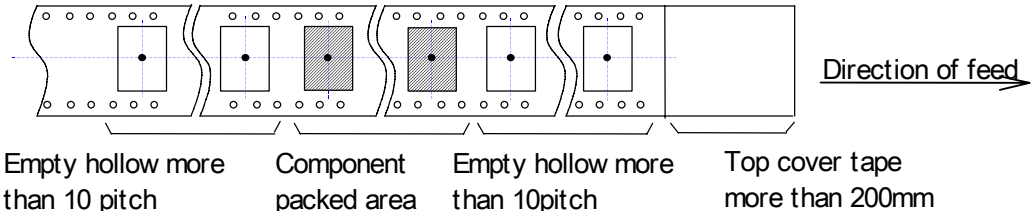
(1) Dimension of the tape (EIAJ-tbd)



(2) Cover tape reel strength



(3) Empty hollow



Empty hollow in component packed area shall be less than two per reel and those hollows shall not be consecutive.

16.2 Component Direction

Top cover tape shall not be found on reel holes and shall not stick out from reel.

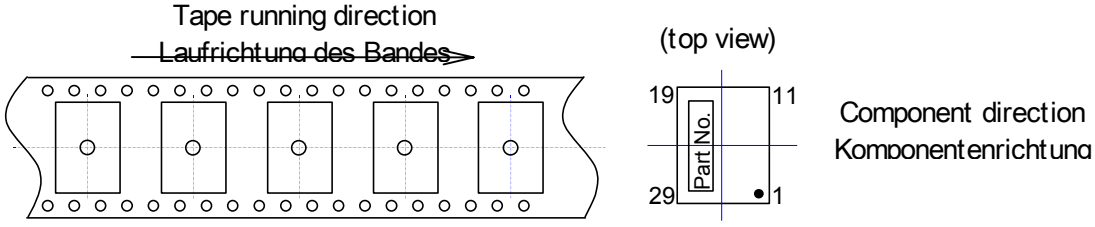
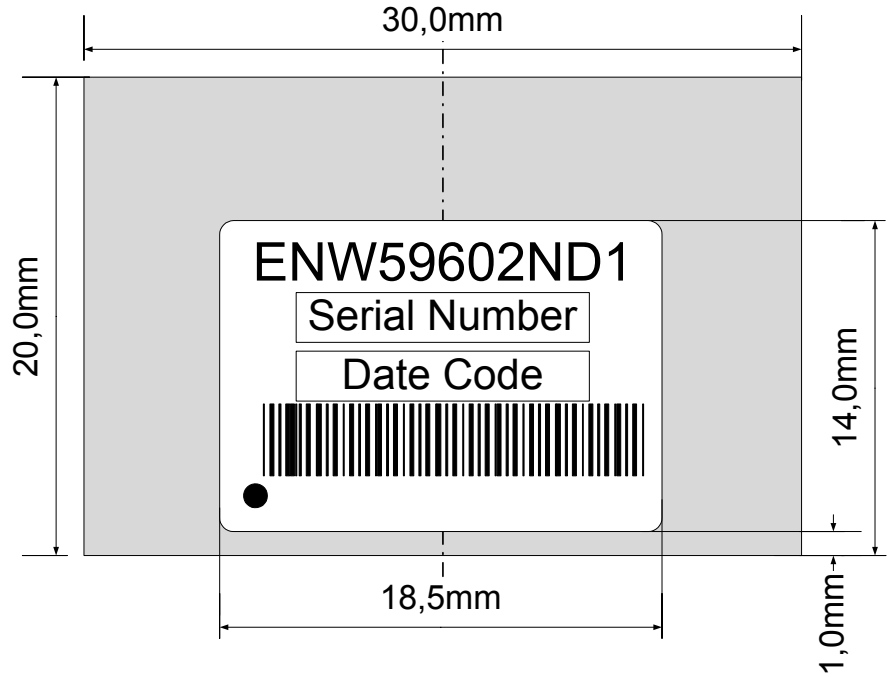


fig . 1

17. Labeling Information



Labeling drawing for the Module

The black circle indicates the pinning 1 , please see also the chapter Pin Assignment and Recommended land pattern.

18. Ordering Information

Table 3 Ordering table

Ordering part number	Description	MOQ
ENW5Z602ND1	Engineering Sample PAN2450, Version 868 MHz, Output 14dBm	1
ENW59602ND1	PAN2450, Version 868 MHz, Output 14dBm	tbd
ENW5Y602ND1	Application Board for PAN2450	1

19. General Information

This product description does not lodge the claim to be complete and free of mistakes.
Please contact the related product manager in every case.

If we deliver samples to the customer, these samples have the status **Engineering Samples**. This means, the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and there may be differences to be published Data Sheet.
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