SEMTECH
WIRELESS AND SENSING PRODUCTS

DP1203F – C433 / 868 / 915

433, 868 and 915 MHz Drop-In RF Transceiver Modules

Combine Small Form Factor with High Performance

GENERAL DESCRIPTION

The DP1203Fs are complete Radio Transceiver Modules operating in the 433, 868 and 915 MHz license free ISM (Industrial Scientific and Medical) frequency bands. Based on the XE1203F transceiver, the DP1203F offers the unique advantage of high data rate communication up to 152.3 kbit/s. Combining high output power and exceptional receiver sensitivity, the radio modules is suitable for applications seeking to satisfy the European (ETSI EN300-220-1 and EN301 439-3) or the North American (FCC part 15.247 and 15.249) regulatory standards.

The DP1203F modules can be used in any environment where wireless remote connection is an advantage. The DP1203F modules are perfect for complex wireless networks involving high speed data rate applications.

APPLICATIONS

- Home automation and access control

- Wireless Network

- Process and building control
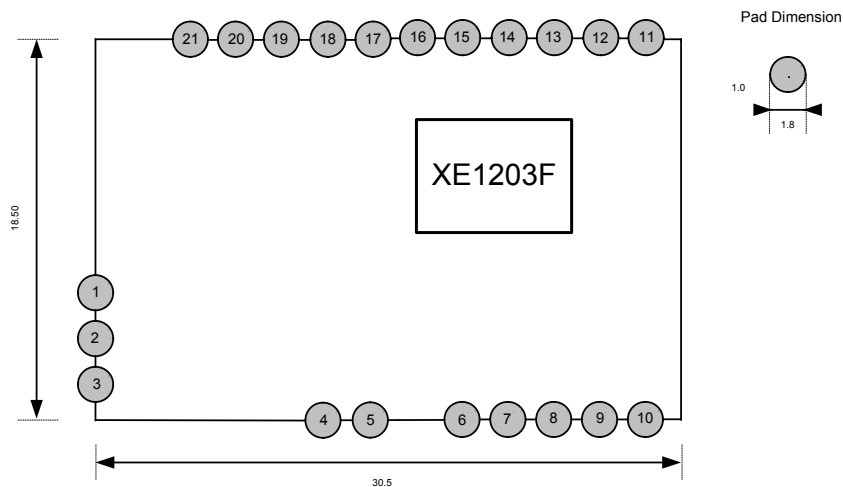
KEY PRODUCT FEATURES

- No RF knowledge required
- Direct Digital interface
- Fully assembled and tested
- Surface mount
- 30.5 mm x 18.5 mm
- Available on tape&reel for Automatic assembly system
- Supply voltage 2.4 V – 3.6 V
- Frequency synthesizer steps 500 Hz
- Output power is programmable up to 15 dBm
- High Rx 0.1% sensitivity down to -111 dBm
- Data rate up to 152.3 kbit/s
- Current consumption Tx=62 mA at15 dBm
- Current consumption Rx=14 mA
- Digital RSSI (Received Signal Strength Indicator)
- Digital FEI (Frequency Error Indicator)

DEVICE OPTIONS

Part Number	Frequency band	Package
DP1203C4333LF	433-435 MHz	Board
DP1203C8683LF	868-870 MHz	Board
DP1203C9153LF	902-928 MHz	Board

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1 PIN DESCRIPTION

Pad Dimension

XE1203F

PIN	NAME	I/O	DESCRIPTION
1	GND	IN	Ground
2	RFIN/OUT	IN/OUT	RF input / output terminal
3	GND		Ground
4	VDDP		Supply voltage / Advised NC
5	VDDA		Supply voltage
6	GND		Ground
7	VDD		Supply voltage
8	EN	IN	3-wire interface communication enable signal
9	SWITCH	IN/OUT	Operating mode selection
10	GND		Ground
11	GND		Ground
12	SO	OUT	Data output of the 3-wires interface
13	SI	IN	Data input of the 3-wires interface
14	SCK	IN	Input clock of the 3-wires interface
15	CLKOUT	OUT	Output clock at quartz frequency divided by 4, 8, 16 or 32
16	DCLK	OUT	Transmitter or Receiver clock
17	DATA	IN/OUT	Transmitter input data or Receiver output data
18	DATAIN	IN	Transmitter input data
19	PATTERN	OUT	Output of the pattern recognition block
20	RX	IN	Antenna switch RX Select
21	TX	IN	Antenna switch TX select

WIRELESS AND SENSING PRODUCTS

2   ELECTRICAL CHARACTERISTICS

2.1   ABSOLUTE MAXIMUM OPERATING RANGES

Description	Min	Max	Unit
Supply voltage	2.4	3.6	V
Operating temperature	-40	+85	^{o}C
Storage temperature	-55	125	^{o}C
Soldering temperature (max 15 sec)		260	^{o}C

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

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK.

2.2   SPECIFICATIONS

The table below gives the specifications of the DP1203F under the following conditions:
Supply Voltage VDD = 3.3V, temperature = 25°C, 2-level FSK without pre-filtering, carrier frequency fc = 434 MHz for DP1203C4333LF, fc = 869 MHz for DP1203C8683LF and fc = 915 MHz for DP1203C9153LF, frequency deviation Δf = 55 kHz, bit rate BR = 4.8kbps, Base band filter bandwidth BBW = 200 KHz, bit error rate BER = 0.1 % (measured at the output of the bit synchronizer), antenna output matched at 50 Ω.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
FR	Synthesizer Frequency Range	DP1203C4333LF	433	-	435	MHz
		DP1203C8683LF	868	-	870	MHz
		DP1203C9153LF	902	-	928	MHz
IDDSL	Sleep mode supply current			0.2	1	uA
IDDST	Standby mode supply current	39 MHz running		0.85	1.1	mA
IDDR	RX mode supply current			14	17	mA
IDDT	TX mode supply current	P_{RF} = 5 dBm		33	40	mA
		P_{RF} = 15dBm		62	75	mA
RFS	RF Sensitivity	A-mode, BR = 4.8 kbps / BER = 0.1%		-111	-108	dBm
FDA	Frequency Deviation	Programmable	1	-	255	kHz
BR	Bit rate	Programmable	1.2	-	152.3	Kb/s
P_{RF}	RF output power	Programmable.				
		RFOP1	-3	0	-	dBm
		RFOP2	+2	+5	-	dBm
		RFOP3	+7	+10	-	dBm
		RFOP4	+12	+15	-	dBm
TS_TR	Transmitter wake-up time	From oscillator enabled	-	150	250	us
TS_RE	Receiver base-band wake up time	From oscillator enabled	-	0.5	0.8	ms
TS_OS	Quartz oscillator wake up time	Fundamental	-	1	2	ms
XTAL	Quartz oscillator frequency			39		MHz
VIH	Digital input level high	% VDD	75	-	-	%
VIL	Digital input level low	% VDD	-	-	25	%

3 FUNCTIONAL DESCRIPTION

The True RF DP1203F is a cost effective high performance radio transceiver module designed for the wireless transmission of digital information over distances of >500 meters in free space.

The module is based on the RF transceiver circuit from SEMTECH, the XE1203F. For more information on the XE1203F, please refer to the XE1203F datasheet.

The module incorporates an antenna switch and a SAW Filter placed on the Rx path.

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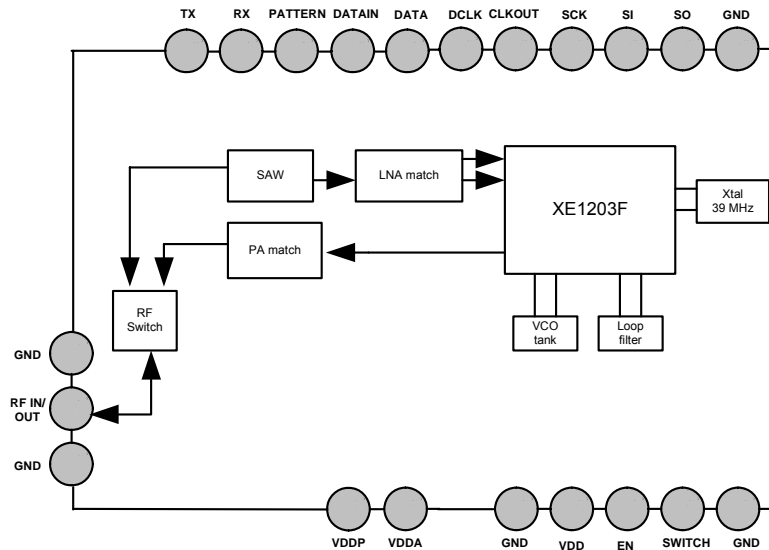
4   SERIAL CONTROL INTERFACE

A 3-wire bi-directional bus (SCK, SI, SO) is used to control the DP1203F. The output signal, SO, is provided by the DP1203F in opposition to the SCK and SI which needs to be provided by the external application as an 8-bit microcontroller. An access *Read* or *Write* with the XE1203F is possible only when the enable signal is active (active LOW).

For more information about the 3-wire bus, please refer to the XE1203F datasheet chapter; *Serial interface definition and principles of operation.*
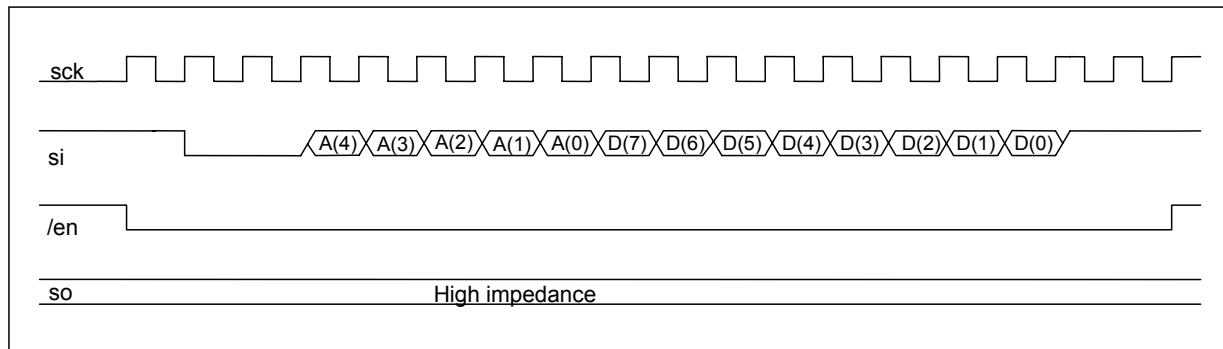
Write sequence into configuration register
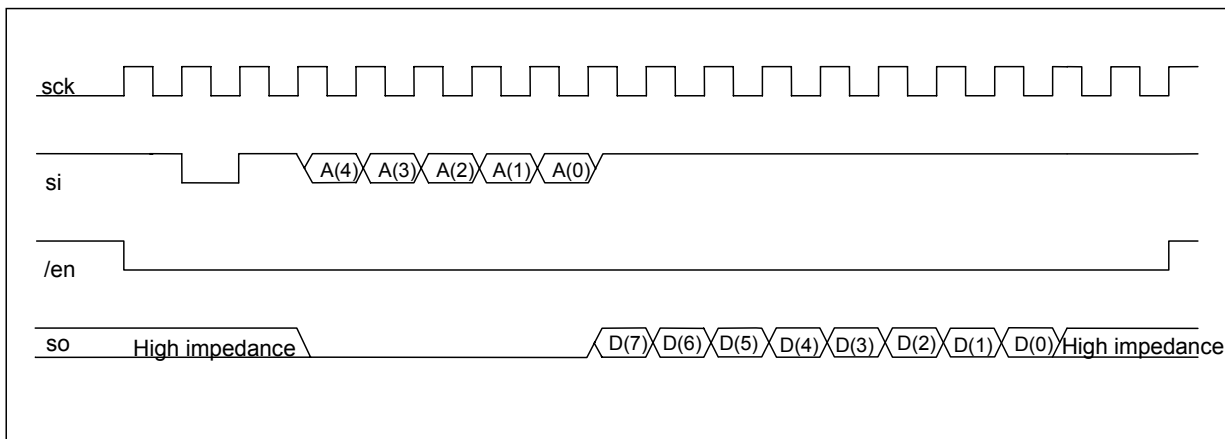
Read sequence of configuration register

5 OPERATION MODES

When operating the XE1203F, it might by useful to quickly switch between two pre-defined operating modes, to save time and traffic on the 3-wire serial interface bus. This may occur when the XE1203F is required to switch quickly between receive and transmit mode, when it has to operate on two different carrier frequencies, or when it has to switch between the high linearity mode B and the high sensitivity mode A. For that purpose, the five parameters stored in the SWParam Configuration Register are duplicated: the configuration set#1 and the configuration set #2.

Depending on the ConfigSwitch 1-bit Register or the input level at the SWITCH pin, the XE1203F transceiver will use either the SWParam configuration set#1 or the set #2. If the RTPParam_Switch_ext configuration parameter is low, then the SWParam configuration set is selected by the ConfigSwitch parameter – set#1 if ConfigSwitch is "0", set#2 if ConfigSwitch is "1". If the RTPParam_Switch_ext configuration parameter is high, then the SWParam configuration set is selected by the SWITCH pin – set#1 if SWITCH is low, set#2 if SWITCH is high.

ConfigSwitch Register	SWITCH pin	RTPParam_switch_ext configuration parameter	SWParam configuration set selected
0	SWITCH is an output: '1' in transmitter mode '0' in the other modes	0	Set #1: SWParam_mode_1 SWParam_Power_1 SWParam_Rmode_1 SWParam_t_delsig_in_1 SWParam_freq_1
1	SWITCH is an output: '1' in transmitter mode '0' in the other modes	0	Set #2: SWParam_mode_2 SWParam_Power_2 SWParam_Rmode_2 SWParam_t_delsig_in_2 SWParam_freq_2
X	0	1	Set #1: SWParam_mode_1 SWParam_Power_1 SWParam_Rmode_1 SWParam_t_delsig_in_1 SWParam_freq_1
X	1	1	Set #2: SWParam_mode_2 SWParam_Power_2 SWParam_Rmode_2 SWParam_t_delsig_in_2 SWParam_freq_2

ConfigSwitch, SWITCH pin and SWParam Configuration Register

For more information about the modes of operation, please refer to the XE1203F Datasheet.

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5.1 STANDARD SEQUENCE FOR SWITCHING BETWEEN RECEIVER AND TRANSMITTER

The drop-in module DP1203F is able to switch between any configuration by using the 3-wire bus or by using the pin SWITCH. This section describes the switching sequence from Set #1 to Set #2.
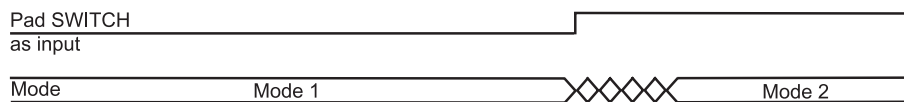
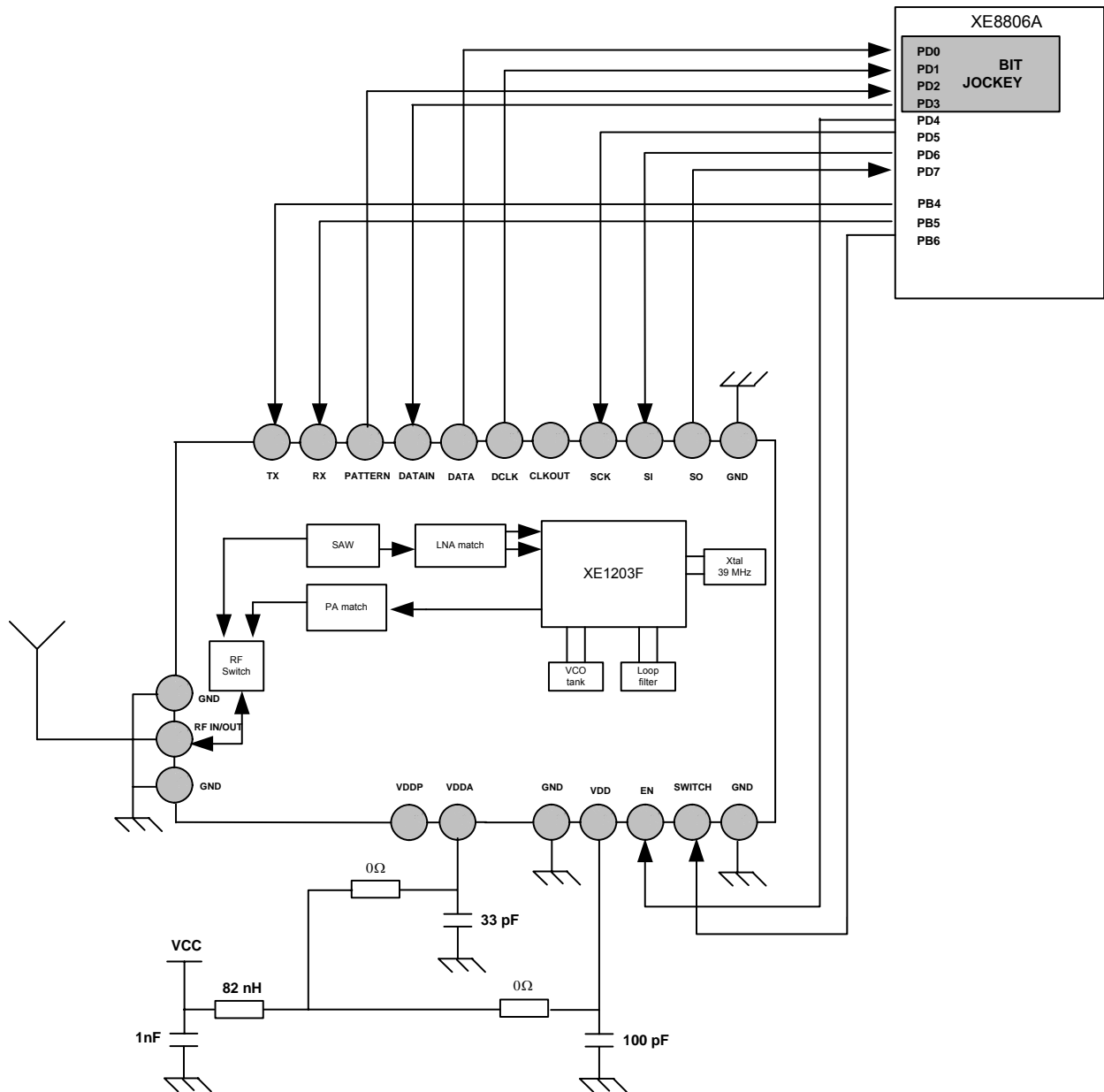**Switching sequence by using the 3-wire bus**

RTParam_switch_ext = 0
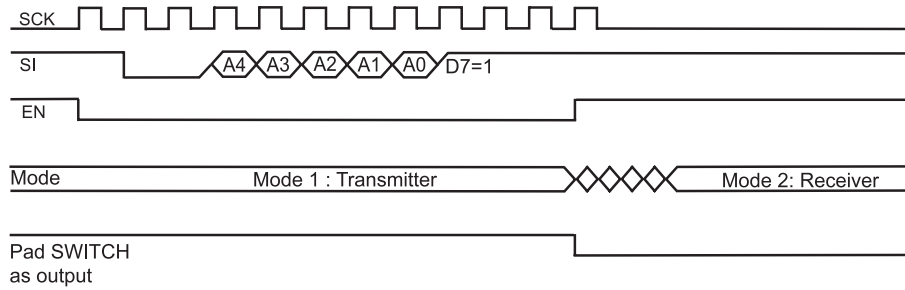
**Switching sequence by pad SWITCH**

RTParam_switch_ext = 1

6   TYPICAL APPLICATION

The schematic below shows the DP1203F interfaced with a SEMTECH's microcontroller XE8806A.

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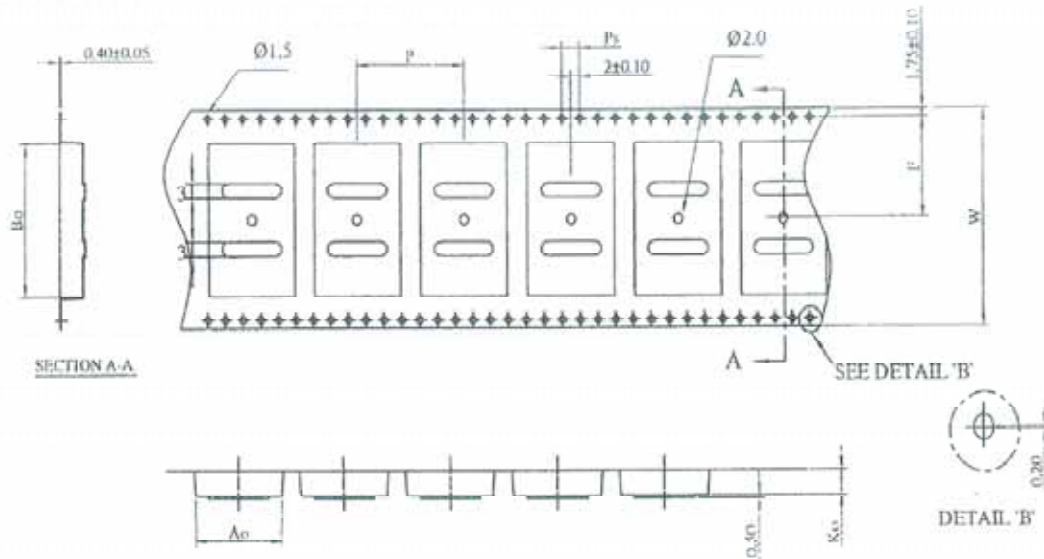**WIRELESS AND SENSING PRODUCTS**

7   MECHANICAL DIMENSIONS

The following diagram shows the physical footprint and dimensions of the DP1203F drop-in module, which should be implemented on the mother board.

Top view

Bottom view
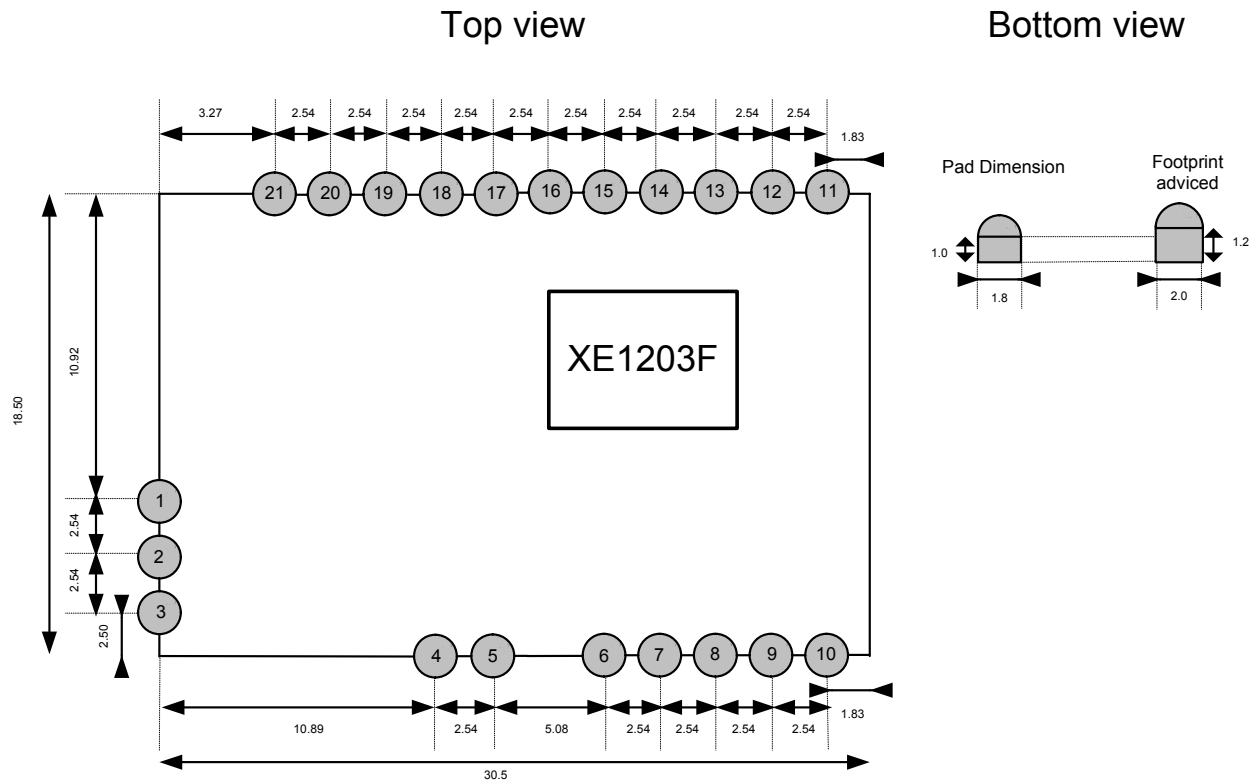
8   PACKAGING INFORMATION

MATERIAL TYPE   : HIGH IMPACT POLYSTRENE (CONDUCTIVE, BLACK)

CARRIER TAPE DRAWING:

DIMENSIONS	W	P	Ao	Bo	Ko	Ps	F
SPECS' Nominal	44.00	24.00	10.50	31.10	5.30	4.00	20.20
Tolerance +/-	0.30	0.10	0.10	0.10	0.10	0.10	0.10

- All dimensions are in mm.
- Cambers do not exceed 1.0 mm in 100mm
- The maximum cumulative tolerance is +/-0.2 for 10 sprocket hole pitch
- The thickness of carrier tape is 0.4mm

9   REFERENCES

- The XE1203F and the XE8806A datasheets, as well as the TN8000.18 Technical Note (XE8000 driving XE1200 transceivers standard API definitions) are available from Semtech website (www.semtech.com).

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