

swarm bee LE Module V2

Embedded 2.4 GHz Chirp Radio

Location Awareness and Concurrent Wireless Communication

Overview

swarm bee LE is nanotron's *swarm* product family combining flexibility and integration with enhanced power management housed in a rugged module suitable for embedded industrial environments. The *swarm bee* module provides continuous autonomous distance calculation, real-time location monitoring and concurrent wireless data communication using the same short RF signal.

Integrated API

The integrated firmware *swarm* API enables customers to speed up development and get the products to market quickly.

Ranging & Communication

swarm bee LE radios can measure distance to each other using Time of Flight (TOF) using the incorporated nanoLOC Chirp chip. At the same time, data can be exchanged between them.

Movement & Temperature Detection

The on-board MEMS sensor detects 3D acceleration and temperature changes. The sensor is controlled by *swarm* API.

RSSI Detection

RSSI values of signals from remote nodes are readable through *swarm* API.

Low Energy (LE)

With a new power saving concept, the radios can go to power-down mode to save energy consumption and thus ensure a longer battery lifetime. The power-down period is configurable through *swarm* API.

Key Features

Frequency range.....	ISM-band 2.4 GHz
.....	(2.4~2.4835)
Modulation.....	Chirp Spread Spectrum (CSS)
Transmission Modes.....	80 MHz, 1 Mbps
ToA resolution.....	< 1 ns (better than 30 cm)
Typical air time per ranging cycle	1.8 ms
RF output power configurable	-22 to +16 ± 2 dBm
RF sensitivity @ 80/1 mode.....	-89 dBm typ.
RF sensitivity @ 80/4 mode.....	-95 dBm typ.
RF interface.....	50 Ohm RF Port
Host interface (UART).....	115 kbps ~ 2 Mbps
Supply voltage	3.3 V ~ 5.5 V
Maximum supply voltage ripple	20 mVpp
Active current consumption.....TX max.	120 mA
.....RX max.	60 mA
.....	(at 20 °C, 3.3 V, in 80/1 mode)
Current consumption in standby mode	6.5 mA
.....	(CPU stopped, all peripherals on)
Current consumption in snooze mode . max.	6 µA
(Autonomous mode enabled, all peripherals off)	
Current consumption in nap mode..... max.	20 µA*
(CPU stopped, GPIO off, UART off, MEMS alert)	
Current consumption in nap mode... max.	500 µA
(CPU stopped, GPIO alert, UART off, MEMS off)	
Current consumption in deep-sleep mode. ≤	1 µA
.....	(module completely disabled)
Operating temperature range.....	-30°C to +85°C
Dimensions	40 mm x 24 mm x 3.5 mm
Weight.....	7 g

* mode dependent

swarm API

The common swarm API supports three protocols: ASCII and BINARY on the host interface and AIR for controlling the module over the air. The ability of the module to be configured over the air allows for entirely autonomous operation even stand-alone without a host controller.

Using API commands, MEMS sensor data, RSSI value, battery level etc. of *swarm* radios can be accessed.

Power Supply & Power Management

A single 3.3 V supply voltage is required to operate the radio. Supply voltage tolerances allow for direct connection to a 3.6 V LiPo battery or 5 V USB.

The *swarm* bee LE radio can go to sleep and only wake up periodically. The underlying power management concept enables the co-operation between the radios even if they sleep most of the time.

Module Dimension & Pin Assignment

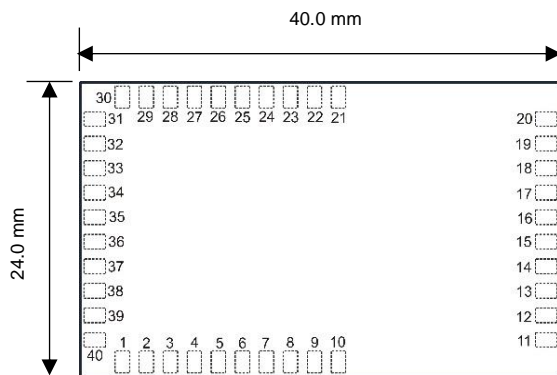


Figure 1 swarm bee LE V2 Module – Bottom View

Pin Description

Pin No.	Pin Name	Pin No.	Pin Name
1,7,9,11,23,28,31-33,37-40	Reserved	25	DIO_0
2	VIN	26	DIO_1
3,10,12,14-22	GND	27	DIO_2
4	A_MODE	34	DIO_3
6	MOD_EN	29	UART_TX
13	RF_PORT	30	UART_RX
24	ADC_IN	35	TX_ON
5	/NRST	36	COEX_DIV
8	+2V6	11	/TX_RX



Figure 2 swarm bee LE V2 Module – Top View

Applications

The *swarm* bee LE radio is a fully integrated wireless node. It works in applications with both collaborative location technology based on TOF (ranging) and fixed location technology based on TDOA (time difference of arrival) and supports concurrent data communication. Moreover, it can range and be located at the same time. Depending on application requirements, *swarm* bee LE can be designed as a basic tag without host controller or as a smart tag with an external host.

swarm bee DK+

The swarm bee Development Kit Plus (DK+) is a useful tool for users to get quick acquaintance with the basic functionality of swarm bee LE.



Figure 3 swarm bee LE V2 DK Plus Board

Ordering Information

Order No.	Description
MN02SWBLE	swarm bee LE V2
BN02SWBLP	swarm bee LE V2 DK+ Board, including antenna

About nanotron

Nanotron is a leading provider of electronic location awareness solutions. If knowing what, where and when is mission-critical to your business, rely on nanotron with Location Running. Nanotron's solutions deliver precise position data augmented by context information in real-time. Location Running means, reliably offering improved safety and increased productivity, 24 hours a day, 7 days per week: Location-Awareness for the Internet of Things (IoT).

Nanotron Technologies GmbH is a wholly owned subsidiary of Sensera Limited (ASX: SE1), an IoT solution provider that delivers sensor-based products transforming real-time data into meaningful information, action and value.

Visit www.nanotron.com or for more information on nanotron's complete line of products and tools or write to us at nanotron Technologies GmbH, Alt-Moabit 60, 10555 Berlin, Germany.

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