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LAMBDA80-24D

LAMBDA80C-24D

LAMBDA80C-24S

LAMBDA80-24S

ΕN

This Datasheet is presented by the manufacturer

DE

Dieses Datenblatt wird vom Hersteller bereitgestellt

FR

Cette fiche technique est présentée par le fabricant

+12.5dBm LoRa 2.4GHz Transceiver

Features

- Long Range 2.4GHz RF Module
- Integrated LoRa™ Transceiver Semtech SX1280
- Highly Efficient Integral Impedance Matching Network
- Provides Full Functionality of the RFIC:
- High sensitivity: down to -132 dBm
- Transmit power +12.5 dBm at 118mA constant RF output vs. V supply
- +14 dBm high efficiency PA
- 170 dB maximum link budget
- Built in RF switch
- Bullet-proof front end: IIP3 = -12.5 dBm
- 89 dB blocking immunity
- Small Form Factor: 23mm x 20mm
- Programmable bit rate up to 300 kbps
- Low RX current of 4.6 mA, (Lora Operating Mode)
- LoRa, FSK, GFSK, MSK, GMSK, OOK modulation
- Built-in bit synchronizer for clock recovery
- Preamble detection
- 127 dB Dynamic Range RSSI
- Automatic RF Sense and CAD with ultra-fast AFC
- Packet engine up to 256 bytes with CRC
- Built-in temperature sensor and low battery indicator
- 868MHz CE Compliant
- 915MHz "Modular" FCC Certification Pending





Applications

- RF Alarms
- Sensor networks
- Long Range Telemetry
- Meter Reading
- Environmental Sensors
- Building Control & Automation
- Agricultural Applications

Description

The LAMBDA80 RF module is an extremely high performance, cost effective radio module featuring the Semtech SX1280 LoRa™ long range providing ultra-long range, spread spectrum communication and high interference immunity within minimal current consumption operating at the only world wide acceptable 2.4GHz band.

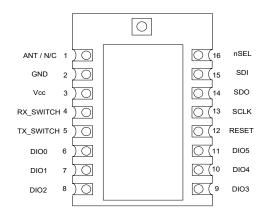
This module including crystal, RF Changeover switch, impedance matching network and track layout provide a simple digital interface and direct antenna connection. This enables a plug in RF solution with maximum efficiency. Programming of the module is via SPI interface.

The LAMBDA80 Module is CE compliant. Providing that certain procedures are followed. (please refer to application schematic later in this datasheet).





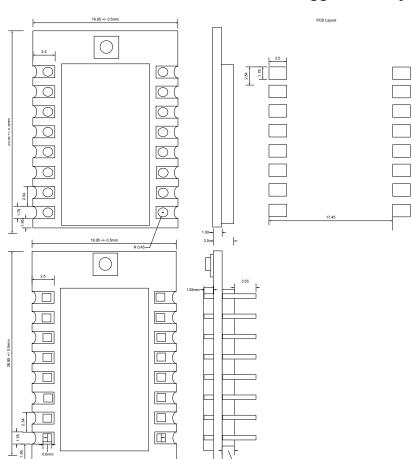
Pin Description



Mechanical Dimensions

Suggested Layout

SMT Version



DIP Version

Part Numbers

| Part Number | Description | Package |
|---------------|---|---------|
| LAMBDA80-24S | Transceiver Module, 868MHz Open Module | SMT |
| LAMBDA80-24D | Transceiver Module, Open Module | DIP |
| LAMBDA80C-24S | Transceiver Module, Module with Screen Can | SMT |
| LAMBDA80C-24D | LAMBDA80C-24D Transceiver Module, with Screen Can | |

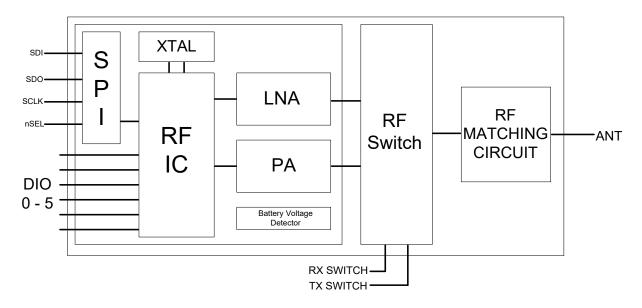


Pin Description

| Pin | Definition | Direction | Function | | |
|-----|-----------------|-----------|--|--|-------------|
| 1 | Antenna | In/Out | 868MHz Versions: Antenna connection 915MHz Versions: No Connect | | |
| 2 | GND | - | Ground connection | | |
| 3 | Vcc | In | Power connection | | |
| | | | Enable RX RF Path Active High | | |
| 4 | RX_SWITCH | In | TX PIN5 RX PIN4 | | |
| | | | RX Mode 0 1 | | |
| | | | Enable TX RF Path Active High | | |
| 5 | TX SWITCH | In | TX PIN5 RX PIN4 | | |
| | J IX_SWITGH | | | | TX Mode 1 0 |
| 6 | DIOO | In/Out | Digital I/O software configured | | |
| 7 | DIO1 | In/Out | Digital I/O software configured | | |
| 8 | DI02 | In/Out | Digital I/O software configured | | |
| 9 | DIO3 | In/Out | Digital I/O Software configured | | |
| 10 | DIO4 | In/Out | Digital I/O software configured | | |
| 11 | DI05 | In/Out | Digital I/O software configured | | |
| 12 | RESET | In | Reset Trigger Input | | |
| 13 | Serial Clock | In | SPI Serial Clock Input | | |
| 14 | Serial Data Out | Out | SPI Serial Data Output | | |
| 15 | Serial Data In | In | SPI Serial Data Input | | |
| 16 | nSEL | ln | Device Select Active Low | | |



Block Diagram



Application Resources

The LAMBDA80 is a ready to use application of the Semtech SX1280.

Access to the programming and configuration of Semtech 1280 Transceiver are via the modules interface SPI line.

The LAMBDA80 has been developed with Semtech to provide a low cost platform application of the 1280 transceiver. This offers optimal design realisation and easy integration within the end application. The most important aspect of any RF Module is to maximise the performance of the transceiver at the external module pads.

In particular the impedance matching network which is the most sensitive section of the RF module design.

In order to maximise signal propagation to the external pad of the module, a specific layout is required which is not (usually) the smallest physical size (beware of small RF modules!).

Many RF Module manufacturers simply reproduce the IC manufacturers data characteristics where in practice the Module RF performance is considerably lower.

We have measured the conducted power transmitted from the LAMBDA80 ufl connector at +12.4dBm, which demonstrates the efficiency of the LAMBDA80 module.

To ensure that the latest details in programming this device are offered, we have not included the 1280's programming information in this document.

You can find the datasheet at the link below:

https://www.rfsolutions.co.uk/downloads/1537522490DS SX1280-1 V2.2 SEMTECH.pdf

Programming, configuration and further resource data including;

LoRa Calculator: fast evaluation of link budget, time on air and energy consumption.

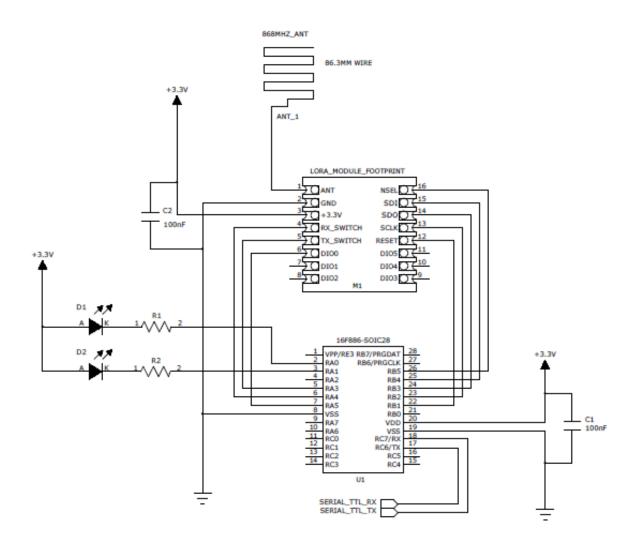
Packet Error Rate Firmware User Guide.

LoRa Modem Designer's Guide.

is available from Semtech at the below links Semtec Website



Application schematic Interfacing a PIC™ Micro Controller



The above schematic shows an easy interface to a PIC Microcontroller

This is the same application circuit that we used for range testing (please see our range test information later in the document).

We also have application source code available for download on our website. This configures the RF LoRa Module for maximum range.

Walk Test application

Also available is the source code used to carry out a simple range test.

In order to use this two application boards are required, one acts as a beacon transmitter, the other as the beacon receiver. The TX board will illuminate the GREEN LED when transmitting and the Receiver will illuminate the RED LED when RECEIVING

The Transmitter board transmits an RF beacon every second (Green LED flashes to indicate transmission).

This enables a one man range test, by placing either board in a fixed location and monitoring the beacon signals.



Electrical Specifications

Absolute Maximums

| Symbol | Parameter | Minimum | Maximum | Unit |
|----------|---------------------------|---------|---------|------|
| V_{dd} | Positive power supply | -0.5 | +3.9 | V |
| V_{in} | Voltage on Digital Inputs | -0.3 | Vdd+0.3 | V |
| RX | Max Rx input power | | +10 | dBm |
| T_{op} | Operating temperature | -40 | +85 | °C |
| T_{st} | Storage temperature | -55 | 115 | °C |

Recommended Operating Conditions

| Symbol | Parameter | Minimum | Maximum | Unit |
|-----------------|-----------------------|---------|---------|------|
| V_{dd} | Positive power supply | 1.8 | 3.7 | V |
| T _{op} | Working temperature | -40 | 85 | °C |

DC Characteristics

| Parameter | Symbol | Test Condi- | Min | Тур | Max | Unit |
|----------------------|-----------------------------|---|-----|------|-----|------|
| | | tion | | | | |
| Supply Voltage Range | $V_{\scriptscriptstyle DD}$ | | 1.8 | 3.3 | 3.7 | V |
| Power Saving Modes | | Data Ram not Retained Data Buffer Retained Instruction RAM flushed. | _ | 0.25 | 1 | uA |
| | I _{DDSL} | Sleep Mode Data Ram Retained Data Buffer Flushed Instruction RAM flushed. | | 0.25 | 1 | uA |
| | | Sleep Mode Data Ram Retained Data Ram Retained Data Buffer Retained Instruction RAM Retained | | 1.2 | 1.8 | mA |



General Electrical Specifications

| Symbol | Description | Min | Тур | Max | Unit |
|--------------|--|------|----------------|------|------------|
| IDDSTDBYRNC | Supply Current in STDBY_RC Mode | | 700 | | uA |
| IDDSTDBYXOSC | Supply Current in STDBY_XOSC Mode | | 1 | | uA |
| IDDFS | Supply Current in FS Mode | | 2.8 | | uA |
| FR | Synthesizer Frequency Range | 2400 | | 2500 | MHz |
| FSTEP | Synthesizer Frequency Step (52MHz Ref) | | 198 | | Hz |
| PHN | Phase Noise at 2.45GHz 1MHz Offset 10MHz Offset | | -115 -135 | | dBc/ Hz |
| FXOSC | Crystal Oscillator Frequency | | 52 | | MHz |
| TS_FS | Freq Synt wakeup time (XOSC Enabled) | | 54 | | uS |
| TS_HOP | Freq Synth Hop Time within 10KHz of target Freq 1MHz 10MHz 100MHz | | 20 30 50 | | uS |
| TX_OS | XTAL Osc wakeup time from STDBY_RC | | 40 | | uS |

Receiver Specifications

| Symbol | Description | Тур | Max | Unit |
|--------|--|-----|-----------------|------|
| IP3 | 3rd Order Input intercept for max Low Power Gain Setting In Band Interferer <6MHz In Band Interferer @6MHz In Band Interferer @10MHz In Band Interferer @20MHz | | -25 -12 0 | dBm |
| IMR | Image Rejection (CW Tone 1% PER) | | 30 | dB |

Transmitter Electrical Specifications

| Symbol | Description | Min | Тур | Max | Unit |
|---------|--------------------------------------|------|------|------|------|
| IDD_T13 | 12.5dBm | | 24 | | mA |
| IDD_T10 | 10dBm | | 18 | | mA |
| IDD_TO | OdBm | | 10 | | mA |
| RFOPMIN | Min RF Output power | | -18 | | dBm |
| RFOPMAX | Max RF Output power | | 12.5 | | dBm |
| FDA | Programmable FSK Frequency Deviation | 62.5 | | 1000 | KHz |



LAMBDA80 Device Marking

The LAMBDA80 module is available in two versions.

LAMBDA module is CE Compliant and at the time of writing is being submitted for modular FCC part 15 certification

Note:

915MHz include a screening can shield and ufl antenna connector, (requirement for FCC modular apprival) 868MHz versions antenna connection is via pin 1 of the module

Module with Screen Can Fitted



Open Module Version

Green
Pass Test

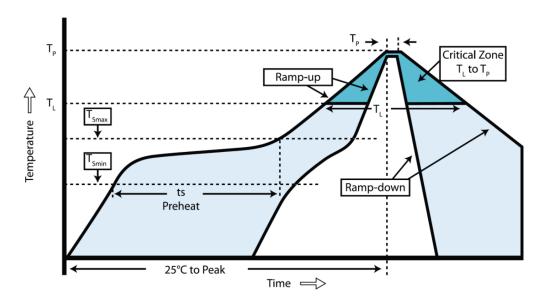
Frequency
Pink = 2.4GHz

Module Revision

| Module versions Uses std Colour Coding | | |
|---|-----|--|
| Colour Dot | Rev | |
| Brown | 1 | |
| Red | 2 | |
| Orange | 3 | |
| Yellow | 4 | |
| Green | 5 | |
| Blue | 6 | |
| Violet | 7 | |
| Grey | 8 | |
| White | 9 | |



Module re-flow guide



| Profile feature | Value (lead free) |
|--|---------------------------|
| Ramp up rate | 3°C /s |
| Pre-heat Temperature - Temperature Min (T _{Smin}) - Temperature Max (T _{smax}) - Pre-heat time | 150°C 200°C 60-100s |
| Peak Temperature (T _P) | 240°C |
| Time at T _P | 10-20sec |
| Ramp down rate | 6°C/s |
| Time from 25°C to peak | 8 mins max. |

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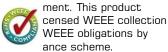
ROHS Directive 2002/95/EC

Specifies certain limits for hazardous substances.



WEEE Directive 2002/96/EC

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