DPL24G11
Low Power Radar Module

Version	Date	Editor	Change Description
1.0	Jan-28-2016	Jowen Lin	Initial release
1.1	Feb-17-2016	Jowen Lin	Remove block diagram and schematics
1.2	Mar-08-2016	Joanne	Add to FCC module warnings

Description

This is a CMOS single-chip 24-GHz Radar sensor module with a variable-frequency transmitter and an ultra-high sensitivity radio wave receiver. This module has 3 sensing modes of Doppler mode, FSKCW mode, and FMCW mode, detecting stationary or moving objects and measuring the distance.

Features

- High-performance clutter cancellation function to prevent the direct leakage of transmission wave and cancel out the unnecessary reflected wave, enabling the highly accurate motion sensing.
- Automatic adjustment function for the variation of components or the variation with temperature in transmission power, receiver gain, and other parameters

Application

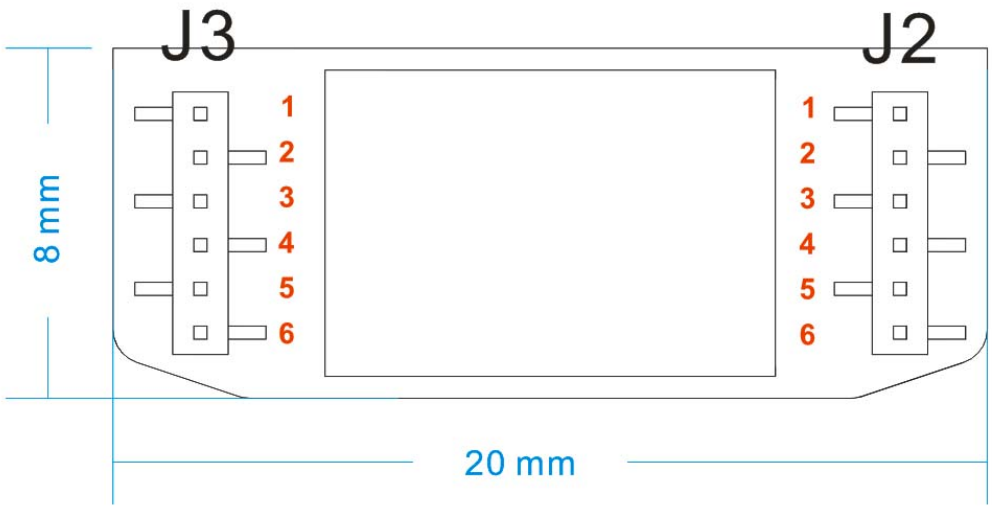
Digital Signage

Turns ON/OFF as people approach/leave. Available for outdoor use, with excellent environmental resistance.

Observation (non-contact heart rate /respiration sensor)

Detects heart or lung movement and other small movements as Doppler shift.

Pin Assignment (Bottom view)



Pin Definition

PIN NO	J2	Input/Output	Description
1	VDD(2.5V)	Power	+2.5V
2	VDD(2.5V)	Power	+2.5V
3	SPI2-CLK	Output	SPI2 clock (default) Low output w/o Pull-down
4	GND	Power	Ground
5	NSRT	Input	Logic master reset (default) Pull-up
6	GND	Power	Ground

PIN NO	J3	Input/Output	Description
1	NC.		
2	SPI1-CS	Input	SPI1 chip select
3	SPI1-MOSI	Input	SPI1 signal input
4	SPI1-MISO	Output	SPI1 signal output
5	SPI1-CLK	Input	SPI1 clock
6	GND	Power	Ground

Functional Specification

Feature	Typical characteristics	Description
ARIB T73 compliant	24.15 ±0.1 GHz	Specified low-power radio stations, ISM band
Sensor type	CW, FSKCW, FMCW	Sensor type selectable depending on the target object (moving or stationary)
Transmission power	0.8mW	Transmission output power of RFLSI
Detection of motion direction	Detection of approaching and leaving	I/Q output, SSB transmitter and image rejection receiver
Detection of motion speed	Up to 220 km/h	Detecting frequency (Doppler frequency): up to 10 kHz
Detection of wide-range distance	0.5 m to 8 m 80°@-3dB	Receiver gain control
Variable frequency width	24.15 ±0.1 GHz	Built-in VCO varactor, Frac-N PLL
Fast frequency pull-in	100 µs	Frac-N PLL
Automatic adjustment	Built-in initial adjustment function (e.g., adjustment of RC for filter)	
Power supply voltage	2.5 V	The RF circuit operates at 1.2 V with the internal regulator.
Power consumption	200 mA	Intermittent operation allows operating current to be reduced.

Temperature Limit Ratings

Parameter	Min.	Max.	Units
Storage Temperature	-20	+80	°C
Ambient Operating Temperature	-10	+70	°C

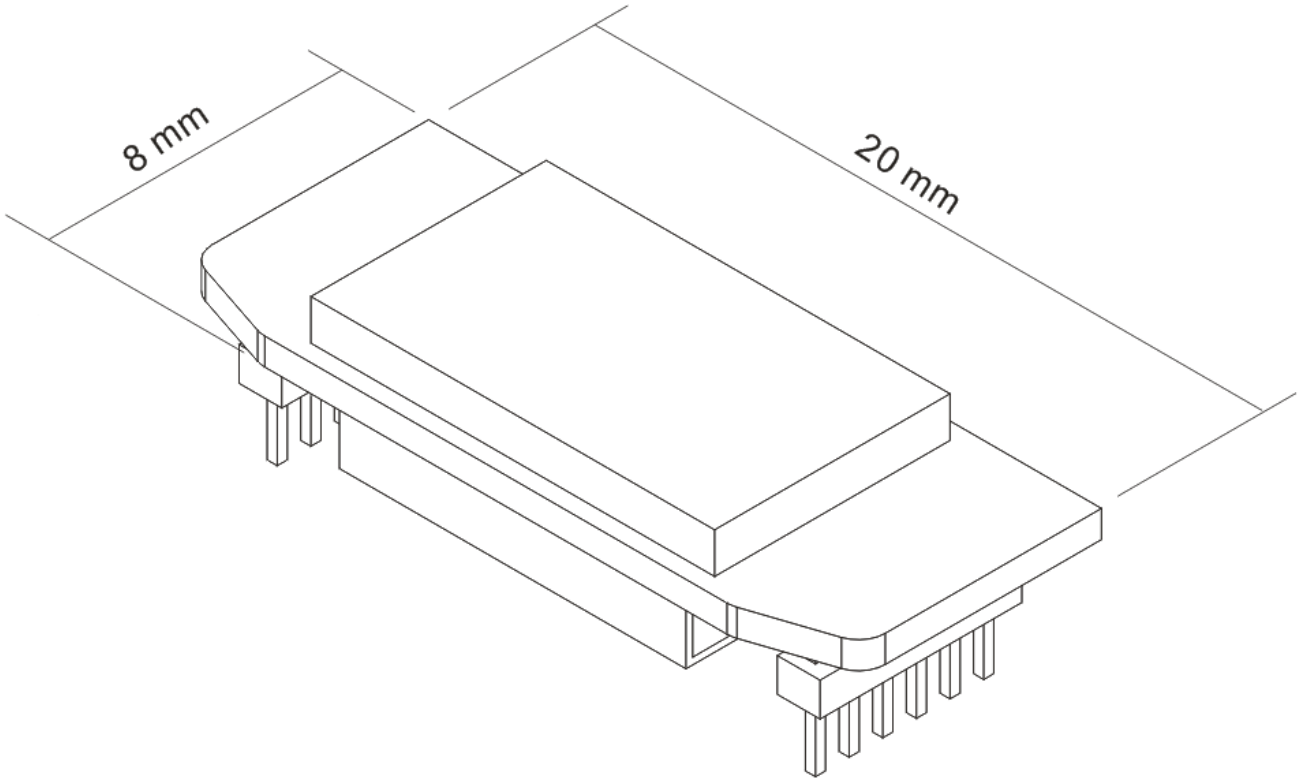
Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VDD(2.5V)	SPI interface VDD	-0.2 to 2.7	V

Recommended Operating Range

Symbol	Parameter	Min	Typ	Max	Units
VDD(2.5V)	SPI interface VDD	2.3	2.5	2.7	V

Module Dimensions



All dimensions are in millimeters.
Tolerance: +/- 0.15mm

Compliance Information

- **Federal Communication Commission Interference Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- **Radiation Exposure Statement:**

  This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

- **This device is intended only for OEM integrators under the following conditions:**

  1) The transmitter module may not be co-located with any other transmitter or antenna.
  As long as 1 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

  IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

  End Product Labeling

  This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: O5PDPL24G11”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

  Manual Information To the End User

  The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

  The end user manual shall include all required regulatory information/warning as show in this manual.

■ IC Caution

This device complies with Industry Canada's RSS-310. Operation is subject to the condition that this device must not cause harmful interference and must accept any interference, including interference that may cause undesired operation of the device.

End Product Labeling

Industry Canada RSS-310 Compliance Label:
Manufacturer's Name or Brand Name
Model: (model number)
Canada 310

■ NCC 警語

根據 NCC 低功率電波輻射性電機管理辦法　規定:

第十二條　經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條　低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

此模組於取得認證後將依規定於模組本體標示審驗合格標籤，並要求平台廠商於平台上標示「本產品內含射頻模組：ID 編號」字樣。