

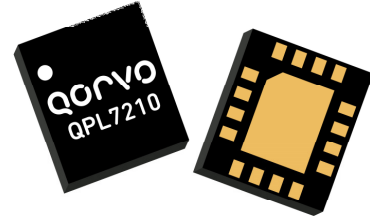


QPL7210

2.4GHz Wi-Fi LNA+BAW Receive Module

Product Overview

The QPL7210 provides a complete integrated receive solution in a single placement front end module (FEM) for Wi-Fi 802.11a/n/ac/ax systems. The full integration minimizes layout area in the customer's application and greatly reduces the design complexity and the number of external components. Performance is focused on best in class Rx immunity from interferes and out of band blockers while achieving leading edge Rx sensitivity accros all Wi-Fi channels. The QPL7210 integrates a 2.4GHz low noise amplifier (LNA) with power, an LNA bypass, and high selectivity receive BAW filter for wireless coexistence. The QPL7210 integrated filtering also includes 2nd and 3rd harmonics and 5GHz rejection for dual-band dual-concurrent operation. The device is provided in a 3.0mm x 3.5mm x 1mm max laminate package. This module meets or exceeds the RF front end needs of IEEE 802.11b/g/n/ac/ax Wi-Fi RF systems.

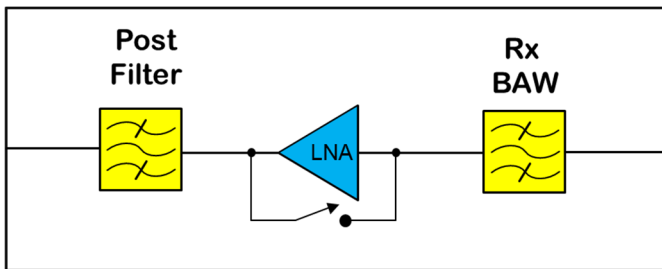


16-pin 3.0mm x 3.5mm x 1mm leadless SMT Package

Key Features

- Fully integrated LNA module including highly selective BAW filter for coexistence attenuation over operating conditions
- Optimized for 3.3 - 5V Operation
- 13.5 dB Rx Gain
- 2.5 dB Noise Figure
- +30dBm OIP3, 3,3V
- +3.5dBm IP1dB, 3.3V

Functional Block Diagram



Top View

Applications

- IEEE 802.11b/g/n/ac/ax WLAN Applications
- Wi-Fi Consumer Premise Equipment
- Access Points
- Wireless Routers
- Residential Gateways
- Internet of Things

Ordering Information

| Part Number | Description |
|---------------|----------------------------|
| QPL7210SB | Sample bag with 5 pieces |
| QPL7210SQ | Sample bag with 25 pieces |
| QPL7210SR | 7" Reel with 100 pieces |
| QPL7210TR7 | 7" Reel with 2500 pieces |
| QPL7210EVB-01 | Assembled Evaluation Board |

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|--------------|------|
| Storage Temperature | -40 to 125 | °C |
| Case Temperature, Survival | -40 to 100 | °C |
| DC Supply Voltage (No RF Applied) | -0.5 to +6.0 | VDC |
| DC Supply Current | 0.3 | A |
| LNA On Maximum RX input power (No damage), 50Ω, Vcc=5V, T = 25°C | +24 | dBm |
| Bypass Mode Maximum RX input power (No damage), 50Ω, Vcc=5V, T = 25°C | +24 | dBm |
| Moisture Sensitivity | MSL3 | |

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|-----------------------|-------------------|--------|------|--------|-------|
| Compliance | 802.11b/g/n/ac/ax | | | | |
| Operating Frequency | CH1-CH13 | 2402.5 | | 2481.5 | MHz |
| Operating Temperature | | -40 | | +95 | °C |
| Power Supply VCC | | 3.13 | 3.3 | 5.25 | V |
| Control Voltage-High | | 1.8 | 3.0 | 3.3 | V |
| Control Voltage-Low | | | 0 | 0.5 | V |

Degraded performance at extended operating range.

Logic Truth Table

| Operating Mode | VPD | VBYP |
|---|-------------|-------------|
| Standby | High | Low |
| High Gain Mode | Low | Low |
| Bypass Mode | Low | High |
| Unutilized state (LNAOFF, Bypass is ON) | High | High |

Electrical Specifications – 3.3V

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|--|--------|------|--------|-------|
| | VCC=3.3V, T=25°C unless otherwise noted; CH1-13 | | | | |
| Frequency Range | | 2402.5 | - | 2481.5 | MHz |
| Gain – LNA mode | LNA Enabled | 10 | 13 | - | dB |
| Gain – Bypass mode | LNA Disabled | - | -8.0 | - | dB |
| Gain Flatness – LNA mode | For any 19 MHz channel over the frequency range. Ch: 2-12. | - | 0.6 | 2.0 | dB |
| Gain Flatness – LNA mode | For any 19 MHz channel over the frequency range. Ch: 1 and 13. | - | 0.9 | 2.5 | dB |
| Noise Figure – LNA mode | LNA Enabled | - | 2.8 | 4.7 | dB |
| Current – LNA mode | LNA Enabled | - | 40 | - | mA |
| Output IP3 – LNA mode | LNA Enabled | - | +30 | - | dBm |
| Input P1dB – LNA mode | LNA Enabled | - | +3.5 | - | dBm |
| Input P1dB – Bypass mode | LNA Disabled | - | +17 | - | dBm |
| Out of Band Rejection (ref to CH6) LNA turn on/off time Return Loss – RF input LNA mode | <500MHz | - | 96 | - | dBc |
| | 807 – 915 | - | 85 | - | dBc |
| | 699 - 803 | - | 91 | - | dBc |
| | 925 - 960 | - | 78 | - | |
| | 1427 – 1511 | - | 76 | - | |
| | 1427-1511, 1559-1661 (GPS) | - | 73 | - | |
| | 1710 – 2170 | - | 50 | - | |
| | 2300 – 2370 | - | 36 | - | |
| | 2496-2500 | - | 11 | - | |
| | 2500 - 2505 | - | 54 | - | |
| | 2505 - 2570 | - | 50 | - | |
| | 2570 - 2620 | - | 55 | - | |
| | 2620 - 2690 | - | 55 | - | |
| | 3.4 – 3.8GHz | - | 48 | - | |
| | 4800 – 6GHz | - | 62 | - | |
| 7200 - 7500 | - | 58 | - | | |
| LNA turn on/off time | LNA Enabled | - | 400 | 550 | |
| Return Loss – RF input LNA mode | LNA Enabled | - | 12 | - | dB |
| Return Loss – RF input Bypass mode | LNA Disabled | - | 12 | - | dB |
| Return Loss – RF output LNA mode | LNA Enabled | - | 15 | - | dB |
| Return Loss – RF output Bypass mode | LNA Disabled | - | 15 | - | dB |

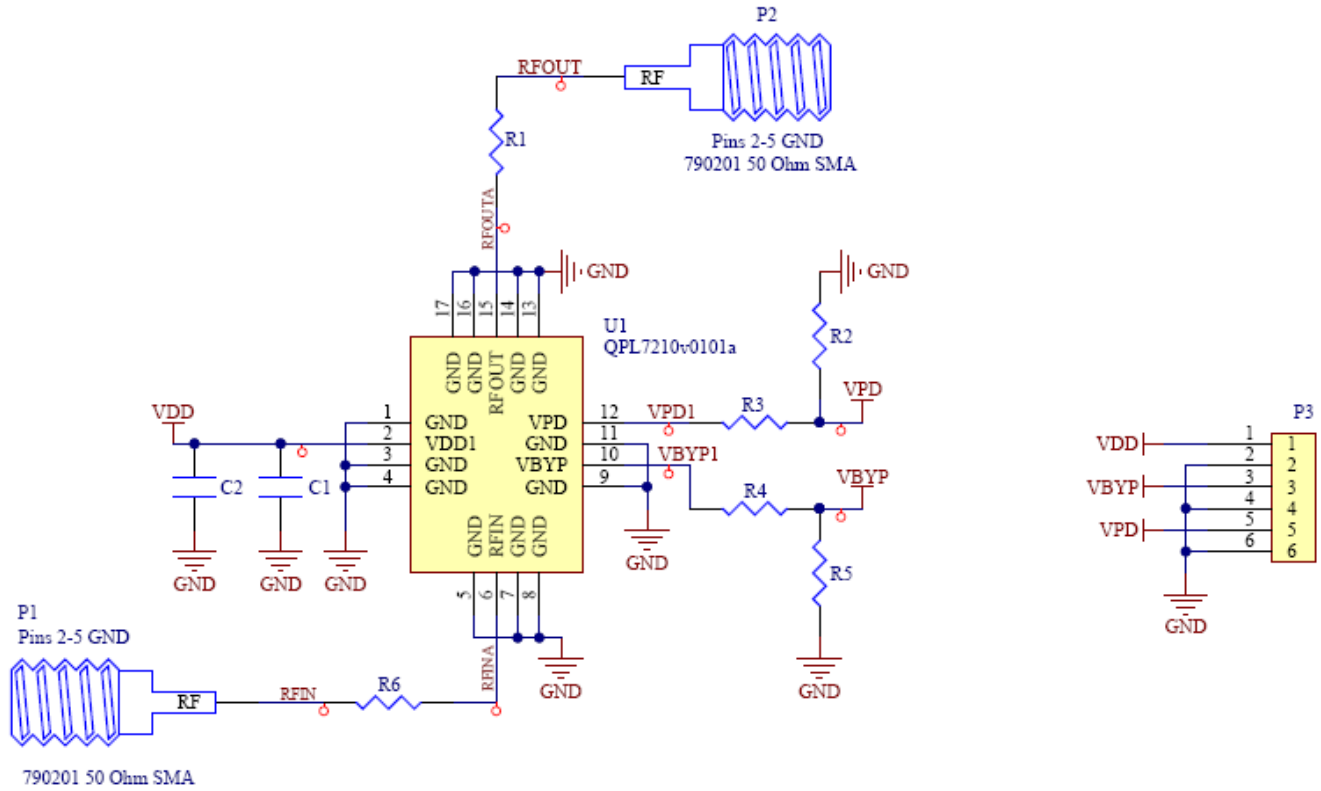
Electrical Specifications – 5V

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|--|--------|------|--------|-------|
| | VCC=5.0V, T=25°C unless otherwise noted; CH1-13 | | | | |
| Frequency Range | | 2402.5 | - | 2481.5 | MHz |
| Gain – LNA mode | LNA Enabled | 10 | 13 | - | dB |
| Gain – Bypass mode | LNA Disabled | - | -8.0 | - | dB |
| Gain Flatness – LNA mode | For any 19 MHz channel over the frequency range. Ch: 2-12. | - | 0.6 | 2.0 | dB |
| Gain Flatness – LNA mode | For any 19 MHz channel over the frequency range. Ch: 1 and 13. | - | 0.9 | 2.5 | |
| Noise Figure – LNA mode | LNA Enabled | - | 2.8 | 4.7 | dB |
| Current – LNA mode | LNA Enabled | - | 60 | - | mA |
| Output IP3 – LNA mode | LNA Enabled | - | +33 | - | dBm |
| Input P1dB – LNA mode | LNA Enabled | - | +4.5 | - | dBm |
| Input P1dB – Bypass mode | LNA Disabled | - | +17 | - | dBm |
| Out of Band Rejection (ref to CH6) LNA turn on/off time Return Loss – RF input LNA mode | <500MHz | - | 96 | - | dBc |
| | 807 – 915 | - | 85 | - | dBc |
| | 699 - 803 | - | 91 | - | dBc |
| | 925 - 960 | - | 78 | - | |
| | 1427 – 1511 | - | 76 | - | |
| | 1427-1511, 1559-1661 (GPS) | - | 73 | - | |
| | 1710 – 2170 | - | 50 | - | |
| | 2300 – 2370 | - | 36 | - | |
| | 2496-2500 | - | 11 | - | |
| | 2500 - 2505 | - | 54 | - | |
| | 2505 - 2570 | - | 50 | - | |
| | 2570 - 2620 | - | 55 | - | |
| | 2620 - 2690 | - | 55 | - | |
| | 3.4 – 3.8GHz | - | 48 | - | |
| 4800 – 6GHz | - | 62 | - | | |
| 7200 - 7500 | - | 58 | - | | |
| LNA turn on/off time | LNA Enabled | - | 400 | 550 | nS |
| Return Loss – RF input LNA mode | LNA Enabled | - | 12 | - | dB |
| Return Loss – RF input Bypass mode | LNA Disabled | - | 12 | - | dB |
| Return Loss – RF output LNA mode | LNA Enabled | - | 15 | - | dB |
| Return Loss – RF output Bypass mode | LNA Disabled | - | 15 | - | dB |

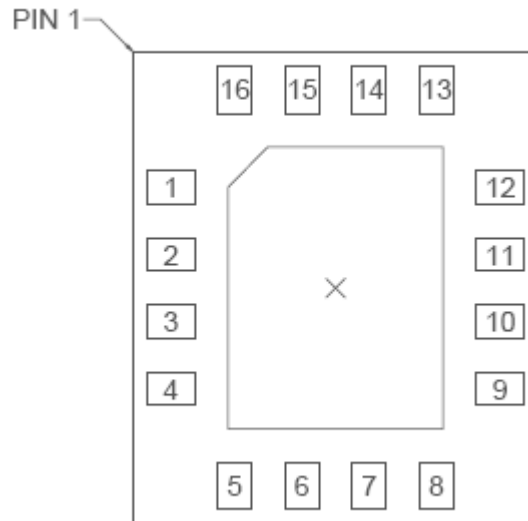
General Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------|--|------|------|------|-------|
| | Vcc=5V, T=+25°C; CH1-13 | | | | |
| FEM Leakage Current | | | 10 | | μA |
| Controls Current | | | 100 | | μA |
| Switching Speed | | | | 550 | nS |
| LNA Stability | Unconditional into 10:1 VSWR; No spurs above -41.25dBm/MHz, Pin = 0 dBm | | | | |

Evaluation Board Schematic

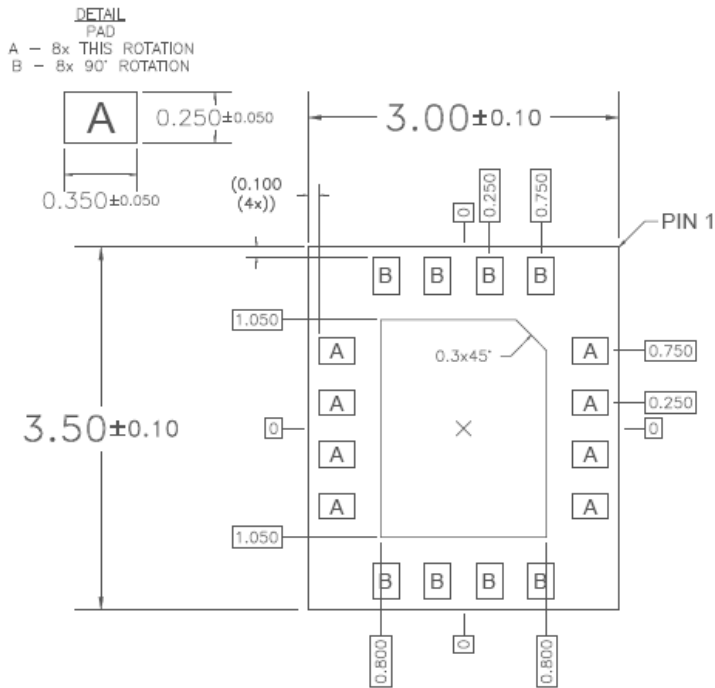


Pin Configuration and Description

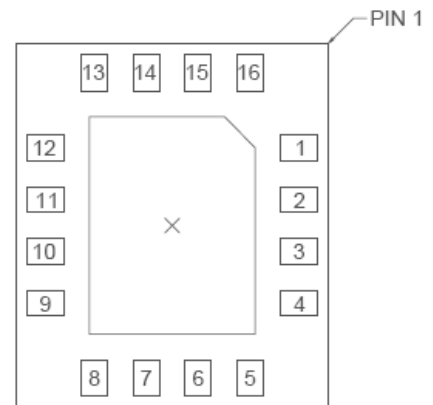


| Pin Number | Label | Description |
|------------------------|-------|---|
| 1,3,4,5,7,8,9,13,14,16 | GND | Pin grounds |
| 2 | VDD1 | Module Voltage supply |
| 6 | RFIN | Module RFIN |
| 12 | VPD | Module Power down, turn on and off module |
| 11 | GND | Pin ground |
| 10 | VBYP | Module Switch Bypass mode |
| 15 | RFOUT | Module RF Output |
| Pkg Base | | Ground connection. The backside of the package should be connected to the ground plane through a short path, i.e., PCB vias under the device are recommended. |

Package Outline Drawing



BOTTOM
VIEW

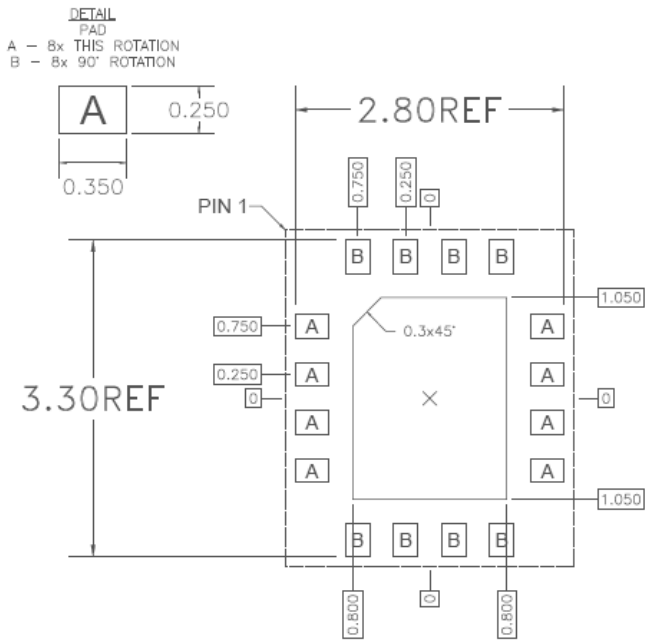


BOTTOM PINS
VIEW

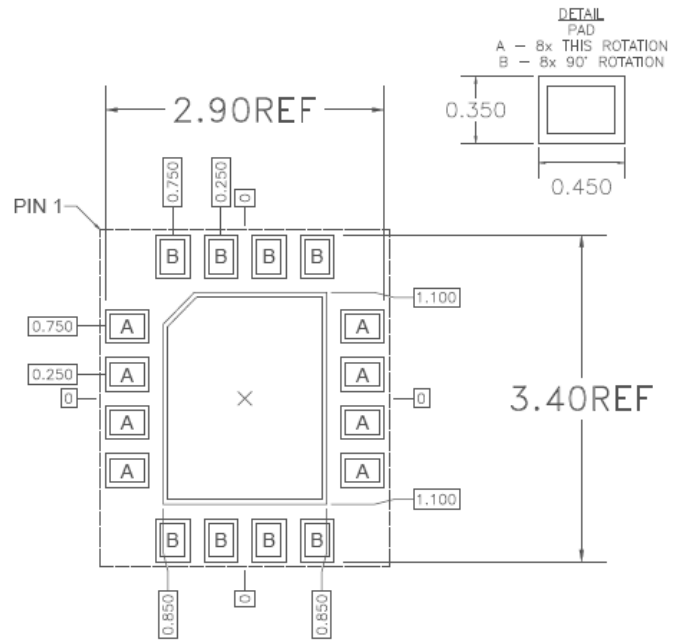
Notes:

1. All dimensions are in millimeter. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

PCB Mounting Patterns



RECOMMENDED
LAND PATTERN



RECOMMENDED
LAND PATTERN MASK

Notes:

4. All dimensions are in millimeter. Angles are in degrees.
5. Dimension and tolerance formats conform to ASME Y14.4M-1994.
6. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|----------|------------------------|
| ESD – Human Body Model (HBM) | Class 1C | ESDA/JEDEC JS-001-2012 |
| ESD – Charged Device Model (CDM) | Class C3 | JEDEC JESD22-C101F |
| MSL – Moisture Sensitivity Level | 3 | IPC/JEDEC J-STD-020 |



Caution!

ESD sensitive device

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Package lead plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free



Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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