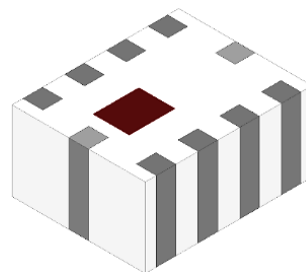




## Impedance-Matched Integrated Passive Device (IPD) for the Semtech LR11xx (LR1110, LR1120, LR1121) Chipset Family

- Designed for the Semtech LoRa Connect™ and LoRa Edge™ series chipsets
- Covers ISM bands 863 - 870MHz and 902 - 928MHz
- Provides necessary attenuation to meet FCC and ETSI regulations
- Integrated impedance transformation balun and harmonic filter
- Replaces complex RF front end with a single integrated passive device (IPD)



### General Specifications<sup>1</sup>

| TX Passband Frequencies (MHz)                     |  | 863 – 870 & 902 - 928                                           |
|---------------------------------------------------|--|-----------------------------------------------------------------|
| TX Passband Frequency 1 (MHz)                     |  | 863 - 870                                                       |
| Balanced Impedance, transceiver side ( $\Omega$ ) |  | Impedance-matched to Semtech chipsets<br>LR1110, LR1120, LR1121 |
| Unbalanced Impedance, antenna side ( $\Omega$ )   |  | 50                                                              |
| Insertion Loss (dB)                               |  | 1.0 Typ. (1.4 Max.)                                             |
| Return Loss (dB)                                  |  | 10 Min.                                                         |
| Attenuation                                       |  |                                                                 |
| Frequency Range (MHz)                             |  | 1736                                                            |
| Attenuation (dB)                                  |  | 38 Min.                                                         |
| Frequency Range (MHz)                             |  | 2604                                                            |
| Attenuation (dB)                                  |  | 33 Min.                                                         |
| Frequency Range (MHz)                             |  | 3472                                                            |
| Attenuation (dB)                                  |  | 35 Min.                                                         |
| Frequency Range (MHz)                             |  | 4340                                                            |
| Attenuation (dB)                                  |  | 37 Min.                                                         |
| Frequency Range (MHz)                             |  | 5208                                                            |
| Attenuation (dB)                                  |  | 23 Min.                                                         |
| Frequency Range (MHz)                             |  | 1804 - 1856                                                     |
| Attenuation (dB)                                  |  | 18 Min.                                                         |

<sup>1</sup> Typical value represents average measurement at 25°C. Min./Max. values represent measurements from -40°C to +85°C

**General Specifications (continued)**

|                                                   |                                                                 |
|---------------------------------------------------|-----------------------------------------------------------------|
| <b>TX Passband Frequency 2 (MHz)</b>              | <b>902 - 928</b>                                                |
| Balanced Impedance, transceiver side ( $\Omega$ ) | Impedance-matched to Semtech chipsets<br>LR1110, LR1120, LR1121 |
| Unbalanced Impedance, antenna side ( $\Omega$ )   | 50                                                              |
| Insertion Loss (dB)                               | 1.5 Max.                                                        |
| Return Loss (dB)                                  | 10 Min.                                                         |
| <b>Attenuation</b>                                |                                                                 |
| Frequency Range (MHz)                             | 1804 - 1856                                                     |
| Attenuation (dB)                                  | 18 Min.                                                         |
| Frequency Range (MHz)                             | 2706 - 2784                                                     |
| Attenuation (dB)                                  | 47 Min.                                                         |
| Frequency Range (MHz)                             | 3608 - 3712                                                     |
| Attenuation (dB)                                  | 47 Min.                                                         |
| Frequency Range (MHz)                             | 4510 - 4640                                                     |
| Attenuation (dB)                                  | 30 Min.                                                         |
| Frequency Range (MHz)                             | 5412 - 5568                                                     |
| Attenuation (dB)                                  | 20 Min.                                                         |
| <b>RX Passband Frequency (MHz)</b>                | <b>863 – 870 &amp; 902 - 928</b>                                |
| Balanced Impedance, transceiver side ( $\Omega$ ) | Impedance-matched to Semtech chipsets<br>LR1110, LR1120, LR1121 |
| Unbalanced Impedance, antenna side ( $\Omega$ )   | 50                                                              |
| Insertion Loss (dB)                               | 1.7 Typ. (2.3 Max.)                                             |
| Return Loss (dB)                                  | 10 Min.                                                         |

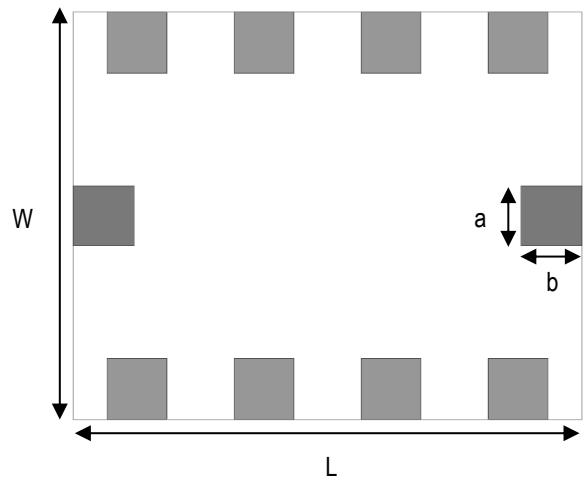
**Maximum Ratings**

|                                                                                         |                                                                |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>Power Capacity (W)</b>                                                               | 2 (CW)                                                         |
| <b>Operating Temperature (<math>^{\circ}\text{C}</math>)</b>                            | -40 to +85                                                     |
| <b>Recommended Storage Conditions post-installation (<math>^{\circ}\text{C}</math>)</b> | -40 to +85                                                     |
| <b>Recommended Storage Conditions and Period for Unused T&amp;R Product</b>             | 45% - 60% RH<br>+5 to +35 $^{\circ}\text{C}$<br>18 Months Max. |

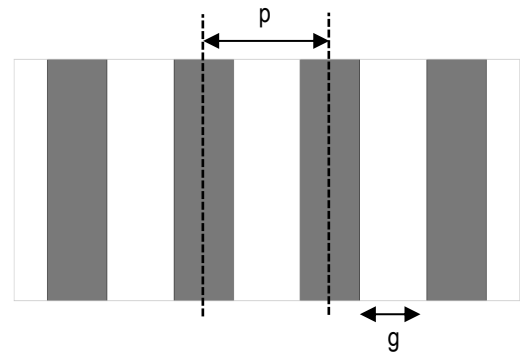
## Mechanical Dimensions

|          | Inches |   |       | Millimeters |   |      |
|----------|--------|---|-------|-------------|---|------|
| <b>L</b> | 0.079  | ± | 0.006 | 2.00        | ± | 0.15 |
| <b>W</b> | 0.063  | ± | 0.006 | 1.60        | ± | 0.15 |
| <b>T</b> | 0.037  | ± | 0.004 | 0.95        | ± | 0.1  |
| <b>a</b> | 0.009  | ± | 0.004 | 0.235       | ± | 0.1  |
| <b>b</b> | 0.009  | ± | 0.004 | 0.24        | ± | 0.1  |
| <b>g</b> | 0.010  | ± | 0.004 | 0.265       | ± | 0.1  |
| <b>p</b> | 0.020  | ± | 0.004 | 0.5         | ± | 0.1  |

Bottom view



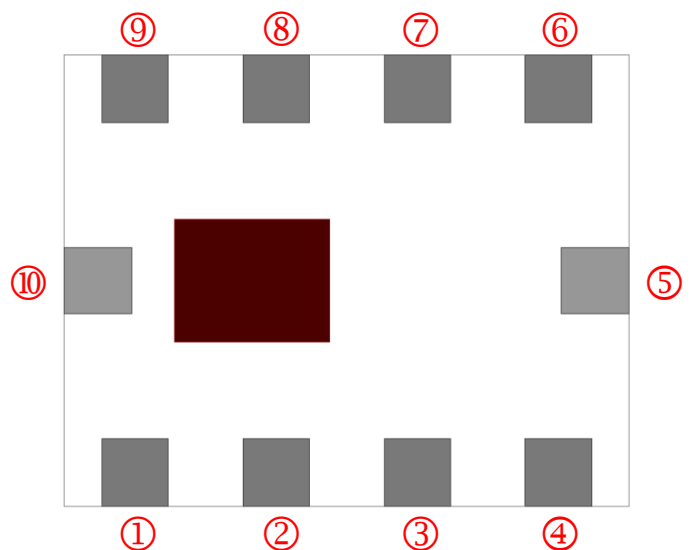
Side view



## Terminal Configuration

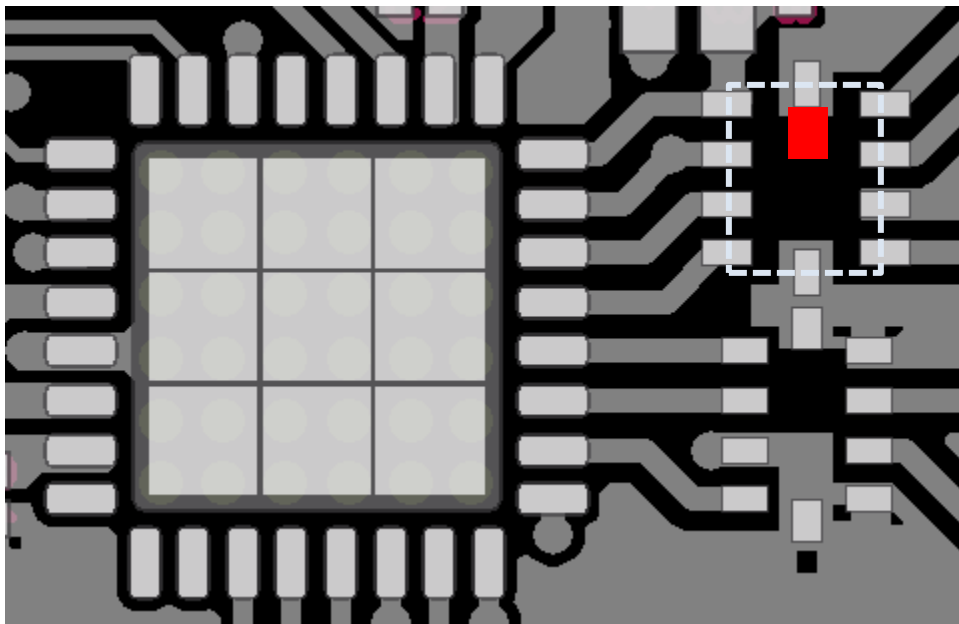
| Pin Number | Function  |
|------------|-----------|
| 1          | RFO_HP_LF |
| 2          | RFO_LP_LF |
| 3          | RFI_P_LFO |
| 4          | RFI_N_LFO |
| 5          | GND       |
| 6          | RX        |
| 7          | GND       |
| 8          | TX_LP     |
| 9          | TX_HP     |
| 10         | GND       |

Top view





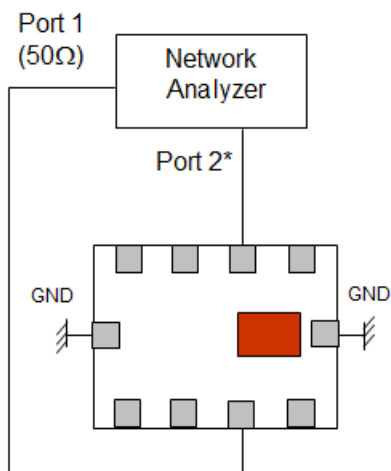
**PCB Layout**



Please contact us for the full reference design package: <https://www.johansontechnology.com/ask-a-question>



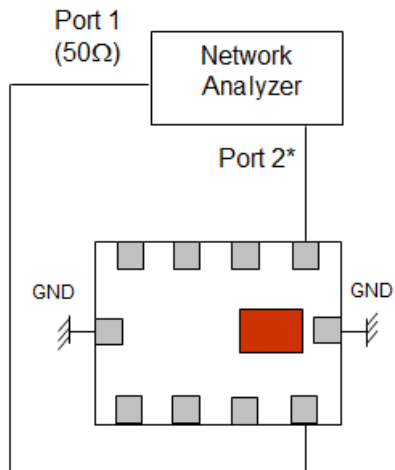
**Measurement Diagram**



**TX\_LP**

Port 1 : ANT port, 50Ω

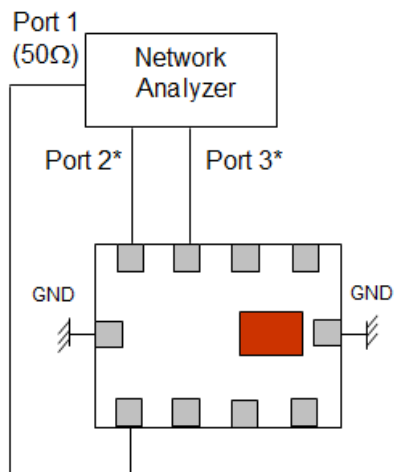
\*Port 2 : RFO\_LP\_LF Port, Impedance match to Semtech chipset



**TX\_HP**

Port 1 : ANT port, 50Ω

\*Port 2 : RFO\_HP\_LF Port, Impedance match to Semtech chipset



**RX**

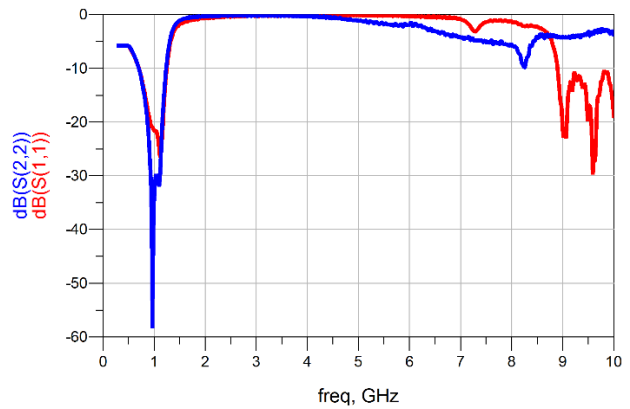
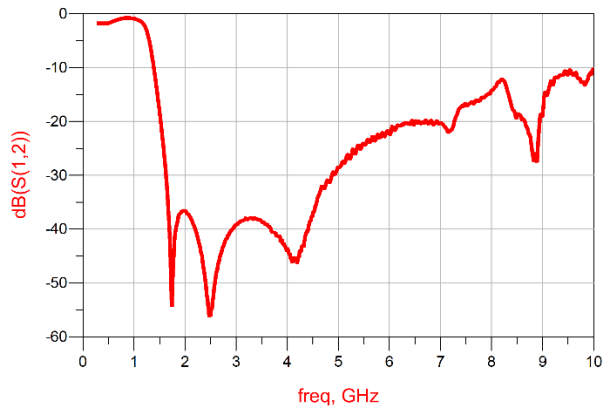
Port 1 : ANT port, 50Ω

\*Ports 2 & 3 : RFI\_P / N, Impedance match to Semtech chipset

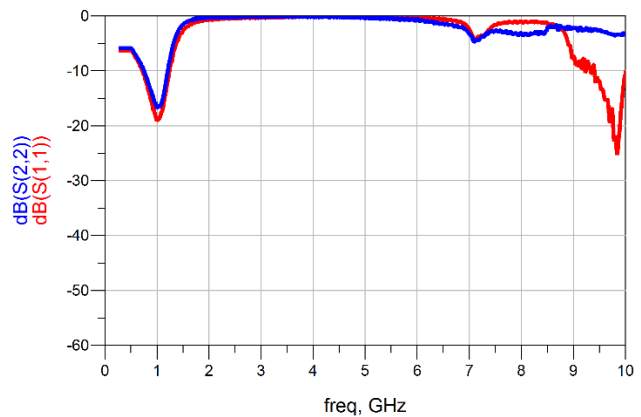
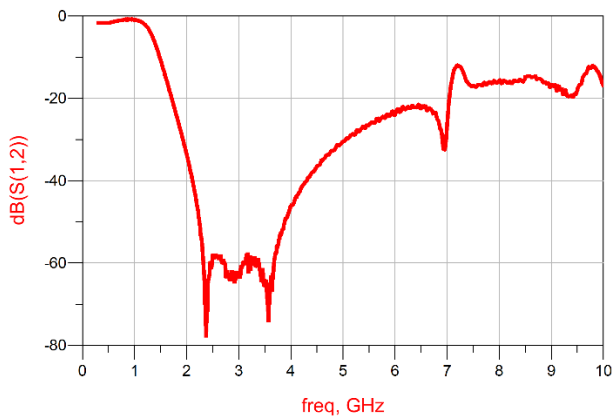


**RF Measurement**

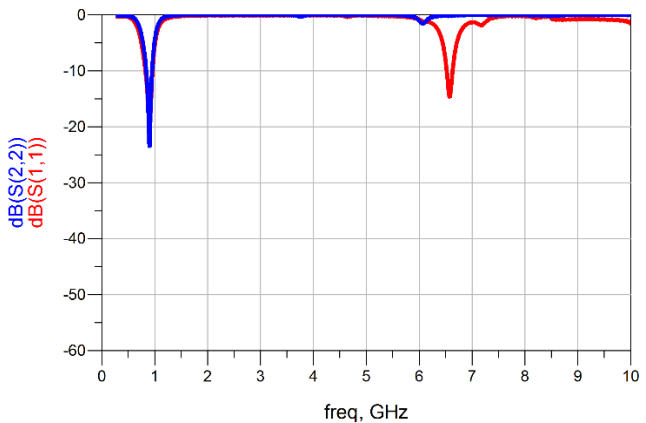
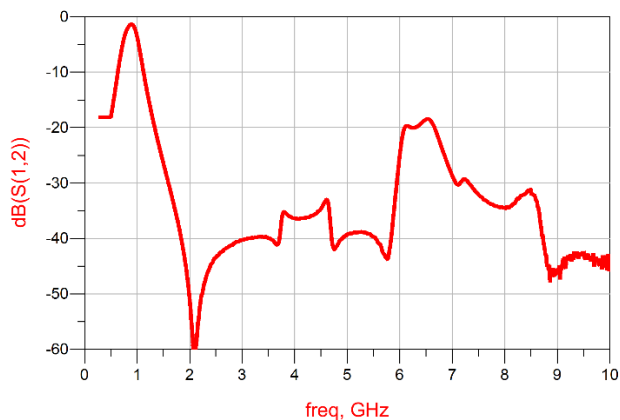
**TX\_LP (863 - 870MHz)**



**TX\_HP (902 - 928MHz)**



**RX (863 - 870MHz, 902 - 928MHz)**



S-parameter and layout file available upon request. Please contact <https://www.johansontechnology.com/ask-a-question>

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