ADVANCED DATA SHEET

# SKY65214: WLAN 802.11a/b/g Dual-Band Front-End Module

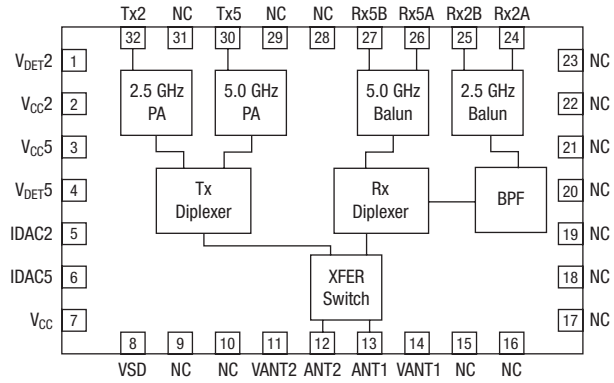
## Features

- Fully integrated front-end module.
- Advanced InGaP HBT PAs
- GaAs PHEMT transfer switch
- Includes second harmonic filtering
- $P_{OUT}$: 19 dBm (11b), 16 dBm (11g), 15 dBm (11a)
- Gain: 25 dB (11b,g), 23 (11a)
- 3.3 V operation
- Built in dual power detection
- Balanced RF receive outputs
- Low cost plastic package
- Available on tape and reel

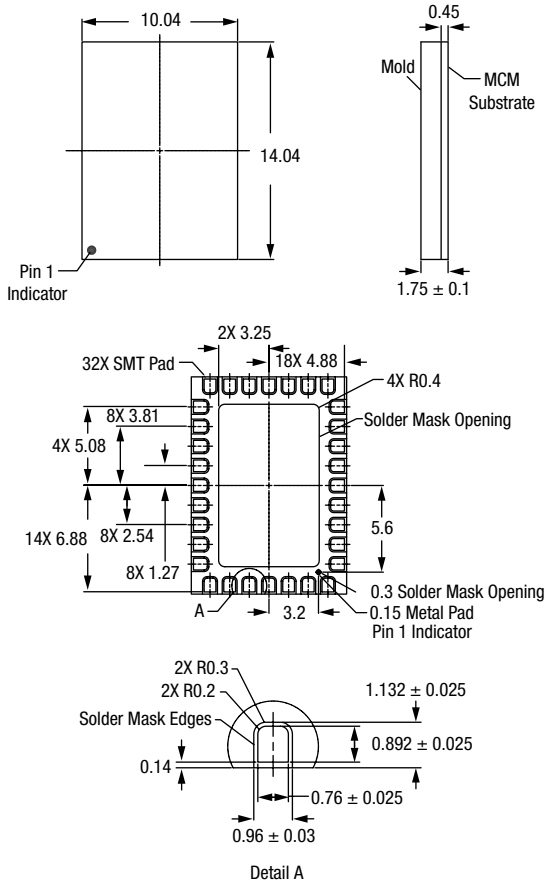
## Description

The SKY65214 is a fully integrated RF front-end module for dual-band 802.11a/b/g WLAN applications. The GaAs HBT Power amplifiers provide individual power control as well as power detection functionality. PAs are manufactured on our advanced InGaP HBT process. The GaAs PHEMT broadband switch combines T/R and antenna diversity. No additional filtering is required external to the module. Modules are 100% RF tested prior to shipment for guaranteed performance. SKY65214 is targeted for high-volume WLAN applications.

## Block Diagram




## Package Dimensions (mm)



## DC Voltage Control Table

| MODE | VANT1 | VANT2 | $V_{CC}$ 2 | $V_{CC}$ 5 | IDAC2 | IDAC5 | $V_{CC}$ | VSD |
|---|---|---|---|---|---|---|---|---|
| Tx2 to ANT1 | 0.0 | 3.3 | 3.3 | 3.3 | 1.6 | 0.0 | 3.3 | 3.3 |
| Tx2 to ANT2 | 3.3 | 0.0 | 3.3 | 3.3 | 1.6 | 0.0 | 3.3 | 3.3 |
| Rx2 to ANT1 | 3.3 | 0.0 | 3.3 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rx2 to ANT2 | 0.0 | 3.3 | 3.3 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tx5 to ANT1 | 0.0 | 3.3 | 3.3 | 3.3 | 0.0 | 1.6 | 3.3 | 3.3 |
| Tx5 to ANT2 | 3.3 | 0.0 | 3.3 | 3.3 | 0.0 | 1.6 | 3.3 | 3.3 |
| Rx5 to ANT1 | 3.3 | 0.0 | 3.3 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rx5 to ANT2 | 0.0 | 3.3 | 3.3 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 |

All data presented within this data sheet uses these bias condition unless otherwise specified.
All data presented within this data sheet is taken at a temperature of: TA = 25 °C, unless otherwise specified.

## Pin Assignments

| Pin | Symbol | Description |
|---|---|---|
| 1 | $V_{DET}2$ | Detector output voltage for the 2.0 GHz path. |
| 2 | $V_{CC}2$ | DC voltage supply to the 2.0 GHz PA. |
| 3 | $V_{CC}5$ | DC voltage supply to the 5.0 GHz PA. |
| 4 | $V_{DET}5$ | Detector output voltage for the 5.0 GHz path. |
| 5 | IDAC2 | DC control voltage to regulate the 2.0 GHz PA output power. |
| 6 | IDAC5 | DC control voltage to regulate the 5.0 GHz PA output power. |
| 7 | $V_{CC}$ | DC supply voltage to the bias controller. |
| 8 | VSD | DC control voltage to enable/disable the bias controller. |
| 9 | GND | There in no connection to this pin, therefore it is grounded. |
| 10 | GND | There in no connection to this pin, therefore it is grounded. |
| 11 | VANT2 | DC control voltage to the diversity antenna switch. |
| 12 | ANT2 | RF antenna output port 2. |
| 13 | ANT1 | RF antenna output port 2. |
| 14 | VANT1 | DC control voltage to the diversity antenna switch. |
| 15 | GND | There in no connection to this pin, therefore it is grounded. |
| 16 | GND | There in no connection to this pin, therefore it is grounded. |
| 17 | GND | There in no connection to this pin, therefore it is grounded. |
| 18 | GND | There in no connection to this pin, therefore it is grounded. |
| 19 | GND | There in no connection to this pin, therefore it is grounded. |
| 20 | GND | There in no connection to this pin, therefore it is grounded. |
| 21 | GND | There in no connection to this pin, therefore it is grounded. |
| 22 | GND | There in no connection to this pin, therefore it is grounded. |
| 23 | GND | There in no connection to this pin, therefore it is grounded. |
| 24 | Rx2A | Single-ended 2.0 GHz receive output port. |
| 25 | Rx2B | Single-ended 2.0 GHz receive output port. |
| 26 | Rx5A | Single-ended 5.0 GHz receive output port. |
| 27 | Rx5B | Single-ended 5.0 GHz receive output port. |
| 28 | GND | There in no connection to this pin, therefore it is grounded. |
| 29 | GND | There in no connection to this pin, therefore it is grounded. |
| 30 | Tx5 | RF 5.0 GHz transmit input port. |
| 31 | GND | There in no connection to this pin, therefore it is grounded. |
| 32 | Tx2 | RF 2.0 GHz transmit input port. |

## General Receive Specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency band | F | | 2.4 | | 2.500 | GHz |
| Insertion loss | $S_{21}$ IL | Small signal | | 3.5 | | dB |
| In-band ripple | $\Delta S_{21}$ IL | Small signal | | 0.3 | | dB |
| Rejection loss | $S_{21}$ RL | DC–1.8 GHz | | 20.0 | | dB |
| Rejection loss | $S_{21}$ RL | 5.0–8.0 GHz | | 20.0 | | dB |
| Input return loss | $S_{11}$ | Small signal | | 12.0 | | dB |
| Output return loss | $S_{22}$ | Small signal | | 12.0 | | dB |
| Tx-Rx isolation | $S_{21}$ ISO | Small signal | | 20.0 | | dB |
| ANT1 to ANT2 diversity isolation | $S_{21}$ DIV | Small signal | | 17.0 | | dB |
| Frequency band | F | | 4.9 | | 5.925 | GHz |
| Insertion loss | $S_{21}$ IL | Small signal | | 4.0 | | dB |
| In-band ripple | $\Delta S_{21}$ IL | Small signal | | 0.3 | | dB |
| Rejection loss | $S_{21}$ RL | DC–2.5 GHz | | 20.0 | | dB |
| Rejection loss | $S_{21}$ RL | 7.0–11.0 GHz | | 20.0 | | dB |
| Input return loss | $S_{11}$ | Small signal | | 12.0 | | dB |
| Output return loss | $S_{22}$ | Small signal | | 12.0 | | dB |
| Tx-Rx isolation | $S_{21}$ ISO | Small signal | | 20.0 | | dB |
| ANT1 to ANT2 diversity isolation | $S_{21}$ DIV | Small signal | | 17.0 | | dB |

## General Transmit Specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency band | F | | 2.4 | | 2.500 | GHz |
| Gain | $S_{21}$ G | Small signal | | 28.0 | | dB |
| Gain flatness | $\Delta S_{21}$ G | Small signal | | 0.2 | | dB |
| Input return loss | $S_{11}$ | Small signal | | 12.0 | | dB |
| Output return loss | $S_{22}$ | Small signal | | 12.0 | | dB |
| 1 dB compression | $P_{1\ dB}$ | CW | | 23.0 | | dBm |
| Tx-Rx isolation | $S_{21}$ ISO | Small signal | | 20.0 | | dB |
| ANT1 to ANT2 diversity isolation | $S_{21}$ DIV | Small signal | | 17.0 | | dB |
| Detector voltage | $V_{DET}$ | $P_{OUT}$ = 0 dBm | | 0.100 | | V |
| Frequency band | F | | 4.9 | | 5.925 | GHz |
| Gain | $S_{21}$ G | Small signal | | 24.0 | | dB |
| Gain flatness | $\Delta S_{21}$ G | Small signal | | 0.2 | | dB |
| Input return Loss | $S_{11}$ | Small signal | | 12.0 | | dB |
| Output return Loss | $S_{22}$ | Small signal | | 12.0 | | dB |
| 1 dB compression | $P_{1\ dB}$ | CW | | 21.0 | | dBm |
| Tx-Rx isolation | $S_{21}$ ISO | Small signal | | 20.0 | | dB |
| ANT1 to ANT2 diversity isolation | $S_{21}$ DIV | Small signal | | 17.0 | | dB |
| Detector voltage | $V_{DET}$ | $P_{OUT}$ = 0 dBm | | 0.100 | | V |

## 802.11a Transmit Specifications

### OFDM Modulation, Datarate: 54 Mbps

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency band | F | | 4.9 | | 5.925 | GHz |
| Linear power | $P_{OUT}$ | 4.5% EVM | | 15.00 | | dBm |
| Current consumption | $I_{CC}$ | Linear power | | 190.00 | | mA |
| Detector voltage | $V_{DET}$ | Linear power | | 0.56 | | V |

## 802.11b Transmit Specifications

### CCK Modulation, Datarate: 11 Mbps

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency band | F | | 2.4 | | 2.5 | GHz |
| Mask compliant power | $P_{OUT}$ | Mask compliant power | | 19.0 | | dBm |
| Current consumption | $I_{CC}$ | Mask compliant power | | 230.0 | | mA |
| Detector voltage | $V_{DET}$ | Mask compliant power | | 0.80 | | V |

802.11b data is taken with a raised cosine filter and an alpha factor of 0.7.

## 802.11g Transmit Specifications

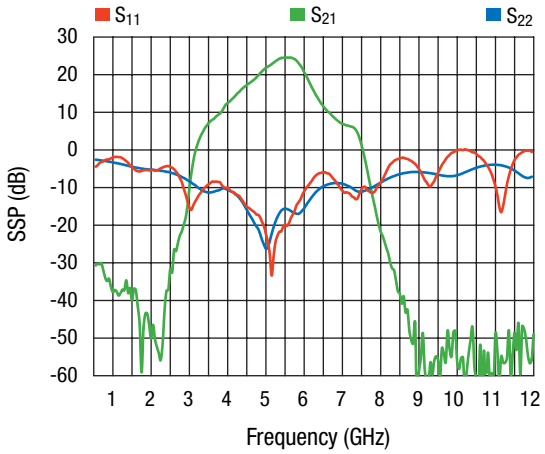
### OFDM Modulation, Datarate: 54 Mbps

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency band | F | | 2.4 | | 2.5 | GHz |
| Linear power | $P_{OUT}$ | 4.5% EVM | | 18.0 | | dBm |
| Current consumption | $I_{CC}$ | Linear power | | 170.0 | | mA |
| Detector voltage | $V_{DET}$ | Linear power | | 0.7 | | V |

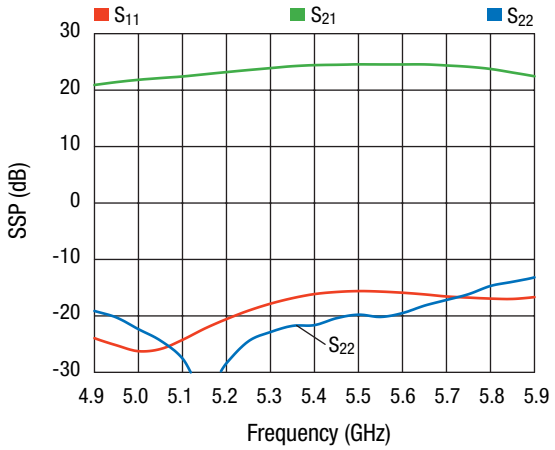
## Absolute Maximum Ratings

| Characteristic | Value |
|---|---|
| Supply voltage | 5.0 V |
| Supply current | 500 mA |
| Regulator supply voltage | 2.7–3.3 V |
| Operating temperature | -40 to +85 °C |
| Storage temperature | -65 to +85 °C |
| RF input power | +10 dBm |
| Moisture sensitivity | MSL3/240 |

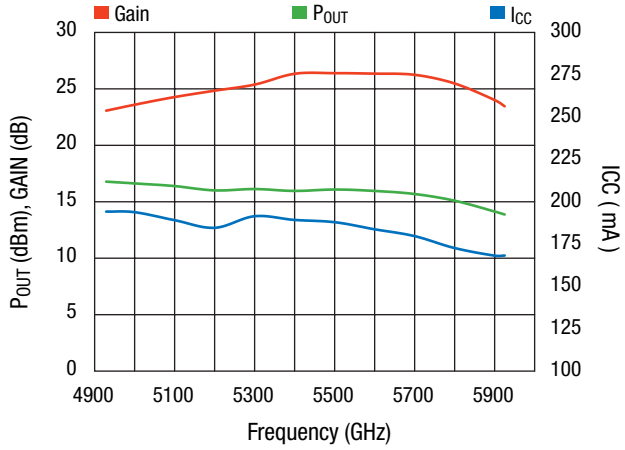
## Typical Performance Data



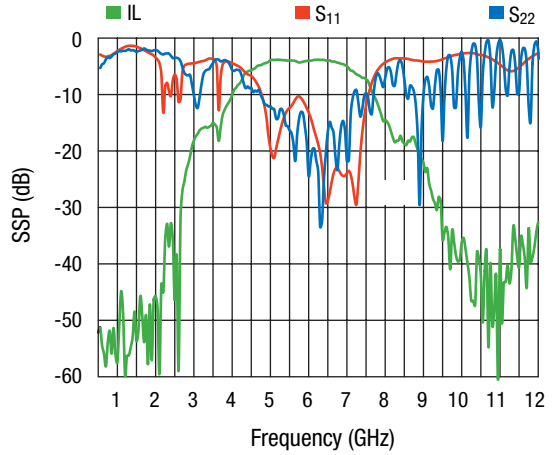

**802.11a Transmit Small Signal Parameters**



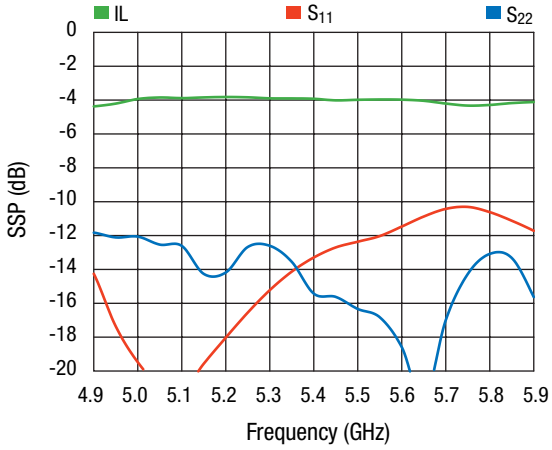

**802.11a Transmit Small Signal Parameters**



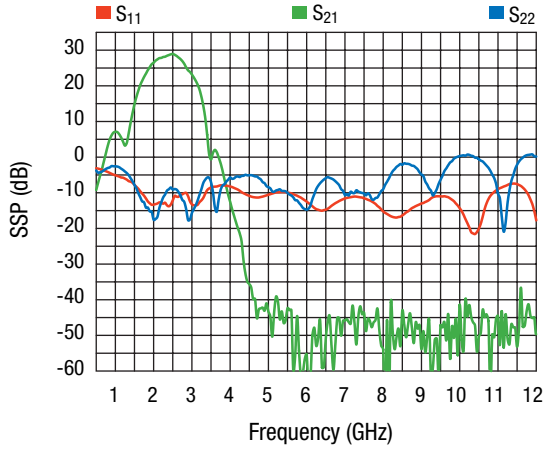

**802.11a Transmit Gain, $P_{OUT}$, and $I_{CC}$ vs. Frequency OFDM modulation, 54 Mbps, 4.5% EVM, TA = 25 °C**



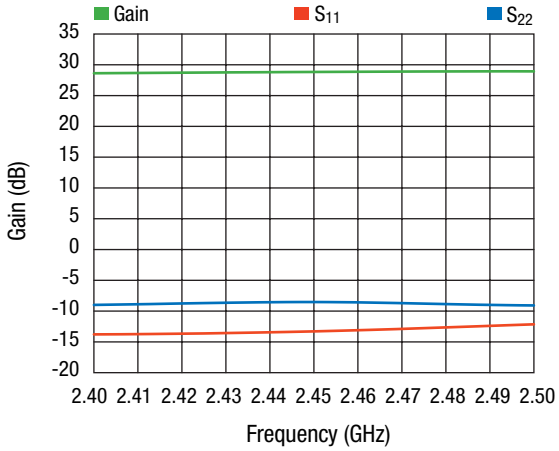

**802.11a Receive Small Signal Parameters**



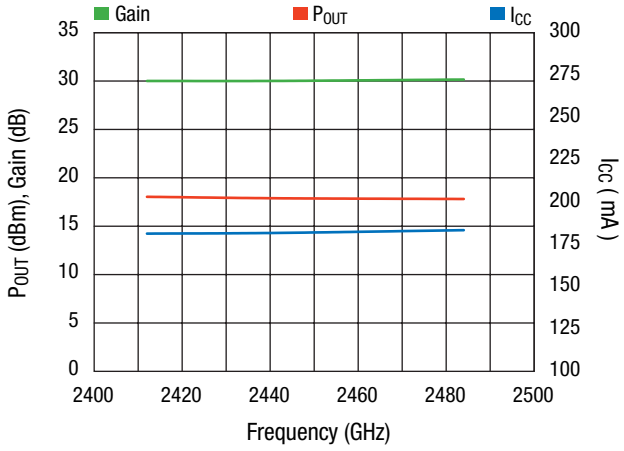

**802.11a Receive Small Signal Parameters**



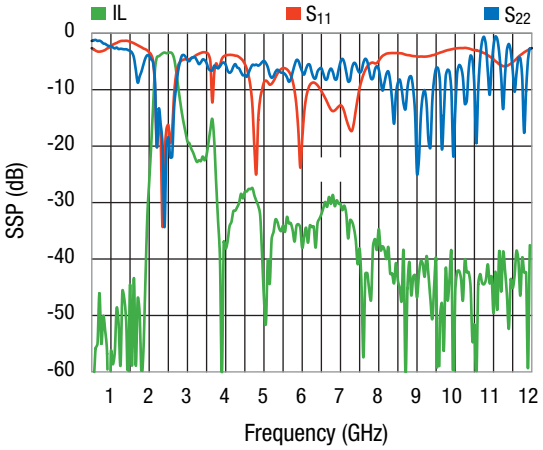

**802.11b/g Transmit Small Signal Parameters**



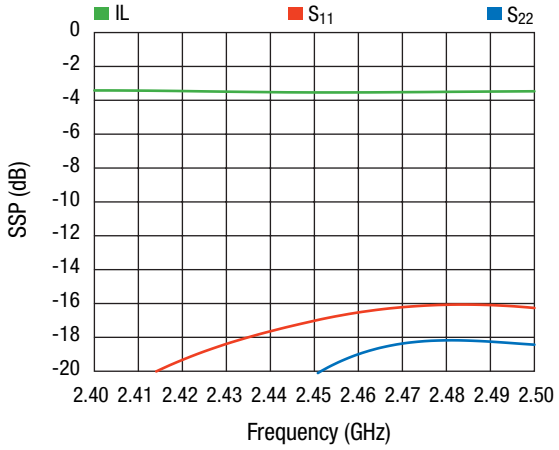

**802.11b/g Transmit Small Signal Parameters**




**802.11g Transmit Gain, $P_{OUT}$, and $I_{CC}$ vs. Frequency OFDM Modulation, 54 Mbps, 4.5% EVM, TA = 25 °C**

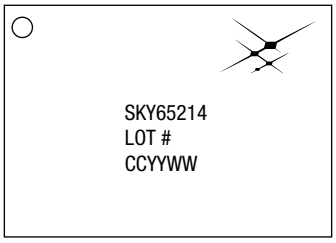



**802.11b/g Receive Small Signal Parameters**

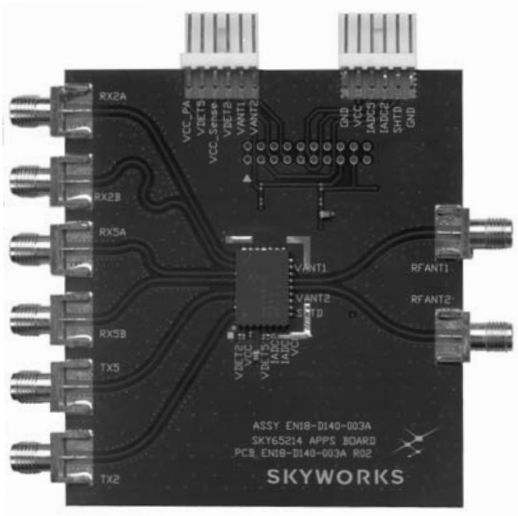



**802.11b/g Receive Small Signal Parameters**

## Device Branding Specifications



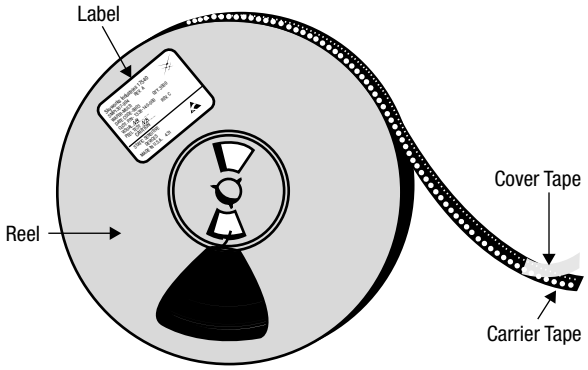

## Applications Board



## Tape and Reel Specifications

| Description | Sym. | QFN 3 x 3 |
|---|---|---|
| **Cavity** | | |
| Length | $A_0$ | 10.35 ± 0.1 |
| Width | $B_0$ | 14.35 ± 0.1 |
| Depth | $K_0$ | 2.0 ± 0.1 |
| Pitch | $P_1$ | 12.0 ± 0.1 |
| Bottom hole diameter | $D_1$ | 1.5 ± 0.1 |
| **Perforation** | | |
| Diameter | $D_0$ | 1.55 ± 0.05 |
| Pitch | $P_0$ | 4.0 ± 0.1 |
| Position | $E_1$ | 1.75 ± 0.1 |
| **Carrier Tape** | | |
| Width | W | 24.0 ± 0.3 |
| Thickness | T | 0.3 ± 0.05 |
| **Cover Tape** | | |
| Width | $W_1$ | 20.35 ± 0.01 |
| Tape thickness | $T_1$ | 0.051 ± 0.01 |
| **Distance** | | |
| Cavity to perforation (width direction) | F | 11.5 ± 0.1 |
| Cavity to perforation (length direction) | $P_2$ | 2.0 ± 0.1 |

Note: All dimensions are in mm.




## Tape Dimensions