

**DATA SHEET**

# SKY85806-11: Dual-Band 802.11a/g/n/ac Wireless LAN Front End

## Applications

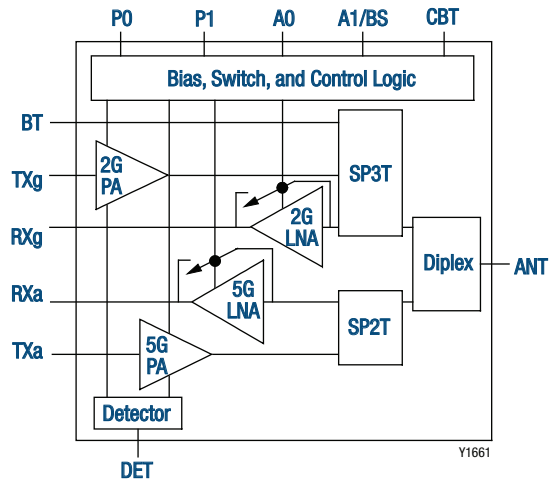
- WLANs:
  - IEEE 802.11b DSSS
  - IEEE 802.11a/g OFDM
  - IEEE 802.11ac/n
- Access points
- PCMCIA cards
- PC cards

## Features

- All RF ports matched to 50  $\Omega$
- Integrated 2.4 GHz PA, 5 GHz PA, transmit filter, diplexers, and T/R switches
- Integrated logarithmic power detector for each transmit chain
- +21 dBm power, 802.11b, 11 Mbps, ACPR = +35 dBc
- +19 dBm @ 3.0% EVM, MCS7, HT40, 2G
- +17 dBm @ 3.0% EVM, MCS7, HT40, 5G
- +17 dBm @ 1.8% EVM, MCS9, HT40, 2G
- +15 dBm @ 1.8% EVM, MCS9, HT80, 5G
- Single supply voltage: 3.3 V  $\pm$  10%
- Sleep mode: < 1  $\mu$ A
- Bluetooth® ready; functional when Vcc = 0 V or 3.3 V
- Bluetooth and 5 GHz WiFi concurrent operation
- Multiple receive bypass step attenuation
- Small QFN (28-pin, 4.0 x 3.0 x 0.8 mm) package (MSL3, 240 °C per JEDEC J-STD-020)



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.



**Figure 1. SKY85806-11 Block Diagram**

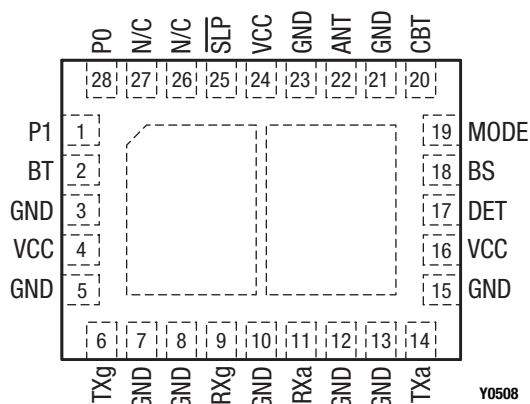
## Description

The SKY85806-11 is a complete 802.11a/b/g/n/ac Wireless Local Area Network (WLAN), RF front-end module (FEM) that provides all the functionality of a power amplifier (PA), filtering, power detector, transmit/receive (T/R) switch, diplexer, and associated matching. The SKY85806-11 provides a complete 2.4 GHz and 5 GHz WLAN RF solution, from the output of the transceiver to the antenna in an ultra-compact form factor. Designed to meet the stringent linearity conditions of the 802.11ac standard, the SKY85806-11 delivers less than 2% error vector magnitude (EVM) at the rated Alternating Current (AC) power.

Designed for ease of use, all RF ports are matched to 50  $\Omega$  to simplify the layout of the printed circuit board (PCB) and the interface to the transceiver. The SKY85806-11 also includes a transmitter power detector with +20 dB of dynamic range for each transmit chain. Each power amplifier has a separate digital enable control for transmitter on/off control. The power ramp rise/fall time is less than 0.5  $\mu$ s.

The SKY85806-11 provides Local Oscillator (LO) filters for the 2 GHz and 5 GHz transmit paths. The SKY85806-11 is packaged in a small 4.0 x 3.0 x 0.8 mm, Quad Flat No-Lead (QFN) package.

A block diagram of the SKY85806-11 is shown in Figure 1. The device package and pinout are shown in Figure 2. Signal pin assignments and functional pin descriptions are described in Table 1.



**Figure 2. SKY85806-11 Pinout  
(Top View)**

**Table 1. SKY85806-11 Signal Descriptions**

| Pin | Name | Description                     | Pin | Name | Description               |
|-----|------|---------------------------------|-----|------|---------------------------|
| 1   | P1   | Register control 1 select       | 15  | GND  | Ground                    |
| 2   | BT   | Bluetooth bidirectional RF port | 16  | VCC  | 5 GHz supply voltage      |
| 3   | GND  | Ground                          | 17  | DET  | Detector output           |
| 4   | VCC  | Supply voltage                  | 18  | BS   | Band select               |
| 5   | GND  | Ground                          | 19  | MODE | Mode select               |
| 6   | TXg  | 2GHz TX RF input                | 20  | CBT  | Bluetooth switch control  |
| 7   | GND  | Ground                          | 21  | GND  | Ground                    |
| 8   | GND  | Ground                          | 22  | ANT  | Antenna                   |
| 9   | RXg  | 2 GHz RX RF output              | 23  | GND  | Ground                    |
| 10  | GND  | Ground                          | 24  | VCC  | Supply voltage            |
| 11  | RXa  | 5 GHz RX RF output              | 25  | SLP  | Sleep (when pulled low)   |
| 12  | GND  | Ground                          | 26  | NC   | Not connected             |
| 13  | GND  | Ground                          | 27  | NC   | Not connected             |
| 14  | TXa  | 5 GHz TX RF input               | 28  | P0   | Register control 0 select |

## Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY85806-11 are provided in Table 2. The recommended operating conditions are specified in Table 3. The electrical specifications are provided in

Tables 4 through 13. The state of the SKY85806-11 is determined by the logic provided in Table 14.

The typical performance characteristics of the SKY85806-11 are illustrated in Figures 3 and 4.

**Table 2. SKY85806-11 Absolute Maximum Ratings (Note 1)**

| Parameter                                                                                                                                     | Symbol           | Minimum | Maximum  | Units    |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------|----------|----------|
| Supply voltage                                                                                                                                | VCC              | −0.3    | 3.6      | V        |
| PA enable pins: ENa, ENg                                                                                                                      | Pu               | −0.3    | 3.6      | V        |
| Maximum power input to TXa, TXg, with ANT terminated in 10:1 load or better                                                                   | TX <sub>RF</sub> |         | 12.0     | dBm      |
| Operating temperature                                                                                                                         | T <sub>A</sub>   | −40     | +85      | °C       |
| Storage temperature                                                                                                                           | T <sub>STG</sub> | −40     | +150     | °C       |
| Electrostatic discharge:<br>Human Body Model (HBM), Class 1C (ANT pin zap to ground)<br>Human Body Model (HBM), Class 1C (all remaining pins) | ESD              |         | 1.5<br>1 | kV<br>kV |

**Note 1:** Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

**CAUTION:** Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

**Table 3. SKY85806-11 Recommended Operating Conditions**

| Parameter              | Symbol          | Minimum | Typical | Maximum | Units |
|------------------------|-----------------|---------|---------|---------|-------|
| Supply voltage         | V <sub>CC</sub> | 3.0     | 3.3     | 3.6     | V     |
| Ground pad temperature | T <sub>A</sub>  | −40     | +25     | +85     | °C    |

**Table 4. SKY85806-11 Electrical Specifications: DC Characteristics (Note 1)**

(V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

| Parameter                      | Symbol                        | Test Condition                                                             | Minimum | Typical  | Maximum | Units          |
|--------------------------------|-------------------------------|----------------------------------------------------------------------------|---------|----------|---------|----------------|
| Total transmit supply current: |                               |                                                                            |         |          |         |                |
| 802.11a                        | ICQ-A                         | Control state 9 or 18, no RF                                               |         | 175      | 185     | mA             |
| 802.11g                        | ICQ-G                         | Control state 4, no RF                                                     |         | 145      | 160     | mA             |
| 802.11g                        | ICC-G                         | Control state 4, P <sub>OUT</sub> = +18 dBm, 54 Mbps OFDM signal, 64 QAM   |         | 220      | 245     | mA             |
| 802.11b                        | ICC-B                         | Control state 4, P <sub>OUT</sub> = +21 dBm, 11 Mbps CCK signal, BT = 0.45 |         | 275      | 300     | mA             |
| 802.11a/n                      | ICC-A                         | Control state 9 or 18, P <sub>OUT</sub> = +16.5 dBm, MCS7, 40 MHz          |         | 230      | 245     | mA             |
| 802.11ac – 2G                  | ICC-AC2G                      | Control state 4, P <sub>OUT</sub> = +17 dBm, 256 QAM, MCS9, 40 MHz         |         | 200      | 225     | mA             |
| 802.11ac – 5G                  | ICC-AC5G                      | Control state 9, P <sub>OUT</sub> = +15 dBm, 256 QAM, MCS9, 80 MHz         |         | 215      | 230     | mA             |
| Total receive supply current:  |                               |                                                                            |         |          |         |                |
| 2G                             | ICC-RX2                       | Control state 1                                                            |         |          | 13.5    | mA             |
| 5G                             | ICC-RX5                       | Control states 6 or 15                                                     |         |          | 14      | mA             |
| Total supply current           | IBYPASS<br>IBTREADY<br>ISLEEP | Control state 2, 3, 7, 8<br>Control state 20<br>Control state 21           |         | 12<br>12 | 1       | μA<br>μA<br>μA |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 5. SKY85806-11 Electrical Specifications: AC Characteristics: 2.4 GHz Transmit Characteristics (Note 1)****(V<sub>CC</sub> = 3.3 V, Control State 4, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                             | Symbol                                     | Test Condition                                                                                                                                                           | Minimum                                               | Typical                 | Maximum                 | Units          |
|-------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|-------------------------|----------------|
| Frequency range                                       | f <sub>IN</sub>                            |                                                                                                                                                                          | 2400                                                  |                         | 2500                    | MHz            |
| Error vector magnitude                                | EVM                                        | MCS9, 40 MHz, P <sub>OUT</sub> ≤ +16 dBm<br>MCS9, 40 MHz, P <sub>OUT</sub> ≤ +17 dBm<br>MCS7, 40 MHz, P <sub>OUT</sub> ≤ +19 dBm                                         |                                                       | –37.0<br>–36.0<br>–32.0 | –35.0<br>–34.0<br>–30.5 | dB<br>dB<br>dB |
| 802.11b mask                                          | Mask 11b                                   | P <sub>OUT</sub> = +21dBm, 11 Mbps, CCK ± RBW = VBW = 100 kHz<br>+ 11 MHz offset<br>+ 22 MHz offset                                                                      |                                                       | –35<br>–56              | –32<br>–52              | dBc<br>dBc     |
| 802.11ac mask                                         | Mask 11ac                                  | P <sub>OUT</sub> = +18 dBm, 40 MHz, MCS0, RBW = 100 kHz,<br>BW = 30 kHz                                                                                                  | Compliant                                             |                         |                         |                |
| Small signal gain:<br>Standard<br>Variation over band | S <sub>21</sub><br>ΔS <sub>21</sub>        |                                                                                                                                                                          | +28<br>–0.5                                           |                         | +32.5<br>+1.5           | dB<br>dB       |
| VCO gain:<br>Gain at ½ reference<br>Gain at reference | S <sub>21</sub> 1.2<br>S <sub>21</sub> 3.6 | 1206 MHz to 1242 MHz<br>3618 MHz to 3726 MHz                                                                                                                             |                                                       |                         | +11<br>–11              | dB<br>dB       |
| Reverse isolation                                     | S <sub>12</sub>                            |                                                                                                                                                                          | 43                                                    | 50                      |                         | dB             |
| TxG to non-RF pin isolation                           | LTxGbcd                                    | Isolation between TxG and any bias control pin or power<br>detector pin                                                                                                  | +40                                                   |                         |                         | dB             |
| Harmonics                                             | 2f <sub>o</sub><br>3f <sub>o</sub>         | P <sub>OUT</sub> = ≤ +20 dBm, CCK<br>P <sub>OUT</sub> = ≤ +20 dBm, CCK                                                                                                   |                                                       |                         | –50<br>–50              | dBm/<br>MHz    |
| Delay and rise and fall time                          | t <sub>DR</sub> , t <sub>DF</sub>          | 50% of V <sub>EN</sub> edge to 10%/90% of final ANT power:<br>State 1 to state 4, 5, 9, or 10<br>State 2 or 3 to state 4, 5, 9, or 10<br>State 4, 5, 9, or 10 to state 1 |                                                       | 350<br>350<br>350       | 500<br>500<br>500       | ns<br>ns<br>ns |
| Return loss:<br>Input<br>Output                       | S <sub>11</sub><br>S <sub>22</sub>         |                                                                                                                                                                          |                                                       |                         | –10<br>–8               | dB<br>dB       |
| Stability                                             | S <sub>TAB</sub>                           | CW, P <sub>OUT</sub> = +21 dBm<br>0.1 GHz to 21.0 GHz<br>Load VSWR = 6:1                                                                                                 | All non-harmonically related outputs<br>< –42 dBm/MHz |                         |                         |                |
| Ruggedness                                            | R <sub>U</sub>                             | T <sub>g</sub> = +12 dBm, ANT load varies over 10:1 VSWR                                                                                                                 | No irreversible damage                                |                         |                         |                |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 6. SKY85806-11 Electrical Specifications: AC Characteristics: 2.4 GHz Receive Characteristics (Note 1)**  
**(V<sub>CC</sub> = 3.3 V, Control State 1, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                                                                 | Symbol                                    | Test Condition                                                                                                                                                                            | Minimum                              | Typical              | Maximum           | Units                                  |
|-------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------|-------------------|----------------------------------------|
| Frequency range                                                                           | f <sub>OUT</sub>                          |                                                                                                                                                                                           | 2400                                 |                      | 2500              | MHz                                    |
| Receive gain:<br>LNA enabled<br>Bypass mode                                               | S <sub>21</sub>                           | Control state 1<br>LNA bypassed:<br>Control state 2<br>Control state 3                                                                                                                    | +11<br>-3.2<br>-10                   | +12<br>-3<br>-9      | +14<br>-2<br>-8.5 | dB<br>dB<br>dB                         |
| Gain step                                                                                 | GSg                                       | LNA gain vs LNA bypass, control state 1 – control state 3                                                                                                                                 | 20                                   | 21                   | 23                | dB                                     |
| ANT → RXg isolation                                                                       | L <sub>TXRXg</sub>                        | Control state 4                                                                                                                                                                           | +36                                  |                      |                   | dB                                     |
| Gain variation                                                                            | ΔS <sub>21</sub>                          | Over the full range                                                                                                                                                                       | -0.5                                 |                      | +0.5              | dB                                     |
| Noise figure                                                                              | NF                                        | Control state 1                                                                                                                                                                           |                                      | 2.7                  | 3.2               | dB                                     |
| Delay and rise and fall time                                                              | t <sub>DR</sub> , t <sub>DF</sub>         | 50% of V <sub>EN</sub> edge and 90%/10% of final output power level                                                                                                                       |                                      | 200                  | 500               | ns                                     |
| Return loss:<br>Input<br>Output                                                           | S <sub>11</sub><br>S <sub>22</sub>        | At antenna port for all 2 GHz receive gain states<br>At RXg port for all 2 GHz receive gain states                                                                                        |                                      |                      | -10<br>-10        | dB<br>dB                               |
| Input:<br>1 dB Input Compression Point<br><br>3 <sup>rd</sup> Order Input Intercept Point | IP <sub>1dB</sub><br><br>IIP <sub>3</sub> | Control state 1<br>Control state 2<br>Control state 3<br>Control state 1<br>Control state 2<br>Control state 3                                                                            | -6<br>+15<br>+15<br>+3<br>+25<br>+25 | -4.5<br><br><br>+4.5 |                   | dBm<br>dBm<br>dBm<br>dBm<br>dBm<br>dBm |
| Rx gain switching                                                                         | t <sub>EN</sub>                           | 50% edge of the P0/P1 signal to 90%/10% of the final output power at the RXG port:<br><br>From state 1 to state 2 and 3<br>From state 2 to state 1 and 3<br>From state 3 to state 1 and 2 |                                      | 120<br>120<br>120    | 200<br>200<br>200 | ns<br>ns<br>ns                         |
| High band gain                                                                            | S <sub>21_00B</sub>                       | Control states 1, 2, or 3                                                                                                                                                                 |                                      |                      | -25               | dB                                     |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 7. SKY85806-11 Electrical Specifications: AC Characteristics: 5 GHz Transmit Characteristics (Note 1)**  
**(V<sub>CC</sub> = 3.3 V, Control States 9 or 18, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                             | Symbol                                                | Test Condition                                                                                                                                                           | Minimum                                               | Typical           | Maximum            | Units                             |
|-------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------|--------------------|-----------------------------------|
| Frequency range                                       | f                                                     |                                                                                                                                                                          | 5150                                                  |                   | 5900               | MHz                               |
| Error vector magnitude                                | EVM                                                   | MCS9, 40 MHz, P <sub>OUT</sub> ≤ +14 dBm<br>MCS9, 40 MHz, P <sub>OUT</sub> ≤ +15 dBm<br>MCS7, 40 MHz, P <sub>OUT</sub> ≤ +16.5 dBm                                       |                                                       | −39<br>−37<br>−33 | −37<br>−35<br>−31  | dB<br>dB<br>dB                    |
| 802.11ac mask                                         | Mask 11ac                                             | P <sub>OUT</sub> = +20 dBm, HT20 to HT80, MCS0,<br>RBW = 100 kHz, BWV = 30 kHz                                                                                           | Compliant                                             |                   |                    |                                   |
| Small signal gain:<br>Standard                        | S <sub>21</sub><br>S <sub>21</sub><br>S <sub>21</sub> | 5150 MHz<br>5700 MHz<br>5875 MHz                                                                                                                                         | +26.5<br>+26.5<br>+26.5                               |                   | +32<br>+32<br>+32  | dB<br>dB<br>dB                    |
| Variation over band                                   | ΔS <sub>21</sub><br>ΔS <sub>21</sub>                  | 5150 MHz to 5700 MHz<br>5700 MHz to 5875 MHz                                                                                                                             | −0.8<br>−0.75                                         |                   | +0.8<br>+0.75      | dB<br>dB                          |
| VCO gain:<br>Gain at ½ reference<br>Gain at reference | S <sub>21</sub> 1.6<br>S <sub>21</sub> 3.2            | 1640 MHz to 1942 MHz<br>3280.0 MHz to 3883.3 MHz                                                                                                                         |                                                       |                   | +12<br>−1.5        | dB<br>dB                          |
| Reverse isolation                                     | S <sub>12</sub>                                       |                                                                                                                                                                          | −40                                                   | −45               |                    | dB                                |
| Harmonics                                             | 2f<br><br>3f                                          | P <sub>OUT</sub> = ≤ +20 dBm, 802.11a/ac/n, all data rates<br>5.1 to 5.3 GHz<br>5.3 to 5.9 GHz                                                                           |                                                       | −46<br>−49<br>−50 | <br>−45.5<br>−46.5 | <br>dBm/MHz<br>dBm/MHz<br>dBm/MHz |
| Delay and rise and fall time                          | t <sub>DR</sub> , t <sub>DF</sub>                     | 50% of V <sub>EN</sub> edge to 10%/90% of final ANT power:<br>State 6 to state 4, 5, 9, or 10<br>State 7 or 8 to state 4, 5, 9, or 10<br>State 4, 5, 9, or 10 to state 6 |                                                       | 350<br>350<br>350 | 500<br>500<br>500  | ns<br>ns<br>ns                    |
| Return loss:<br>Input<br>Output                       | S <sub>11</sub><br>S <sub>22</sub>                    |                                                                                                                                                                          |                                                       |                   | −5<br>−8.5         | dB<br>dB                          |
| Stability                                             | S <sub>TAB</sub>                                      | CW, P <sub>OUT</sub> = +20 dBm, 0.1 GHz to 21.0 GHz,<br>Load VSWR = 10:1                                                                                                 | All non-harmonically related outputs<br>< −42 dBm/MHz |                   |                    |                                   |
| Ruggedness                                            | R <sub>U</sub>                                        | T <sub>g</sub> = +12 dBm, ANT load varies over 10:1 VSWR                                                                                                                 | No irreversible damage                                |                   |                    |                                   |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 8. SKY85806-11 Electrical Specifications: AC Characteristics: 5 GHz Receive Characteristics (Note 1)****(V<sub>CC</sub> = 3.3 V, Control States 6 or 15, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                                                 | Symbol                             | Test Condition                                                                                                                                                                                                                             | Minimum                | Typical           | Maximum               | Units                    |
|---------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|-----------------------|--------------------------|
| Frequency range                                                           | f <sub>OUT</sub>                   |                                                                                                                                                                                                                                            | 5150                   |                   | 5900                  | MHz                      |
| Receive gain:<br>LNA enabled<br>Bypass mode                               | S <sub>21</sub>                    | 5150 MHz to 5900 MHz, control state 6 or 15<br>LNA bypassed:<br>Control state 7 or 16<br>Control state 8 or 17                                                                                                                             | +9.5<br>−6.2<br>−9.2   | +11<br>−6<br>−9   | +12.5<br>−4.7<br>−7.7 | dB<br>dB<br>dB           |
| Gain step                                                                 | GSg                                | LNA gain vs LNA bypass, from control state 6 or 15 to control state 8 or 17                                                                                                                                                                | 19                     | 20                | 21                    | dB                       |
| ANT → RXa isolation                                                       | L <sub>TXRXa</sub>                 | Control states 9, 10, 18, and 19                                                                                                                                                                                                           | +37                    |                   |                       | dB                       |
| BT → RXa isolation                                                        | L <sub>BTRXa</sub>                 | Control states 9, 10, 18, and 19                                                                                                                                                                                                           | +37                    |                   |                       | dB                       |
| Gain variation                                                            | ΔS <sub>21</sub>                   | Over any 80 MHz band<br>Over the entire range                                                                                                                                                                                              | −0.5<br>−1.3           |                   | +0.5<br>+1.3          | dB<br>dB                 |
| Noise figure                                                              | NF                                 | Control state 6 or 15                                                                                                                                                                                                                      |                        | +3.6              | +3.8                  | dB                       |
| Return loss:<br>Input<br>Output                                           | S <sub>11</sub><br>S <sub>22</sub> | At antenna port for all 5 GHz receive gain states<br>At RXa port for all 5 GHz receive gain states                                                                                                                                         |                        | −14               | −6<br>−10             | dB<br>dB                 |
| Input:<br>1 dB Input Compression Point<br>3rd Order Input Intercept Point | IP1dB<br>IIP3                      | Control state 6 or 15<br>Control state 7, 8, 16, or 17<br>Control state 6 or 15<br>Control state 7, 8, 16, or 17                                                                                                                           | −4<br>+13<br>+3<br>+23 |                   |                       | dBm<br>dBm<br>dBm<br>dBm |
| Rx gain switching                                                         | t <sub>EN</sub>                    | 50% edge of the P0/P1 signal to 90%/10% of final output power at the RXa port:<br>State 6 (or 15) to state 7 (or 16) and 8 (or 17)<br>State 7 (or 16) to state 6 (or 15) and 8 (or 17)<br>State 8 (or 18) to state 6 (or 15) and 7 (or 16) |                        | 160<br>160<br>160 | 250<br>250<br>250     | ns<br>ns<br>ns           |
| Low band gain                                                             | S <sub>21_00B</sub>                | 2400 MHz to 2500 MHz, control states 6, 7, 8, 15, 16, or 17                                                                                                                                                                                |                        | −40               | −37                   | dB                       |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.**Table 9. SKY85806-11 Electrical Specifications: Logic Characteristics (Note 1)****(V<sub>CC</sub> = V<sub>EN</sub> = 3.3 V, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                                                                                  | Symbol                                                             | Test Condition                                                                                                       | Minimum         | Typical | Maximum                | Units       |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------|---------|------------------------|-------------|
| Control voltage:<br>On state (Bluetooth only)<br>On state (all other controls)<br>Off state (all controls) | V <sub>CBT_ON</sub><br>V <sub>CTL_ON</sub><br>V <sub>CTL_OFF</sub> |                                                                                                                      | 3.0<br>3.0<br>0 | 3.3     | 3.6<br>3.6<br>0.2      | V<br>V<br>V |
| Loss switch control:<br>Low<br>High                                                                        | SW <sub>ON</sub><br>SW <sub>OFF</sub>                              | High state = V <sub>CTL_ON</sub> to V <sub>CTL_OFF</sub><br>Low state = V <sub>CTL_OFF</sub> to V <sub>CTL_OFF</sub> | 1.8<br>0        |         | V <sub>CC</sub><br>0.3 | V<br>V      |
| Bias current, each control line                                                                            | I <sub>CTL_ON</sub>                                                | No unused pull-up/down resistors<br>(excludes CBT pin when CBT = 3.3 V and V <sub>DD</sub> = 0.0 V)                  |                 |         | 1                      | μA          |
| Control input capacitance                                                                                  | C <sub>CTL</sub>                                                   |                                                                                                                      |                 |         | 0.500                  | pF          |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 10. SKY85806-11 Electrical Specifications: Special States (Note 1)**

| Special State   | Test Condition                                | Control Logic                        |
|-----------------|-----------------------------------------------|--------------------------------------|
| Bluetooth ready | All other control pins = V <sub>CTL_OFF</sub> | VCC = 0 V; CBT = V <sub>CTL_ON</sub> |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 11. SKY85806-11 Electrical Specifications: Low-Band Bluetooth Path Specifications (Note 1)**

(V<sub>CC</sub> = 3.3 V, Control States 11 through 19 and Bluetooth Ready, T<sub>a</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

| Parameter                                             | Symbol             | Test Condition                                                                   | Minimum | Typical | Maximum | Units   |
|-------------------------------------------------------|--------------------|----------------------------------------------------------------------------------|---------|---------|---------|---------|
| Loss:                                                 |                    |                                                                                  |         |         |         |         |
| Input return                                          | S <sub>11</sub>    | At ANT port                                                                      |         |         | −10     | dB      |
| Output return                                         | S <sub>22</sub>    | At BT port                                                                       |         |         | −10     | dB      |
| Insertion                                             | S <sub>21</sub>    | ANT port to BT port                                                              | −1.7    |         |         | dB      |
| Insertion variation                                   | ΔS <sub>21</sub>   | Over entire frequency range                                                      | −0.2    |         | +0.2    | dB      |
| Bluetooth high-band gain                              | S <sub>21HB</sub>  | ANT port to BT port gain,<br>measured at 5.1 to 5.9 GHz                          |         |         | −15     | dB      |
| Bluetooth to non-RF pin isolation                     | L <sub>BTbcd</sub> | External bypass capacitor required on the BT control<br>line (see the schematic) | +40     |         |         | dB      |
| Input:                                                |                    |                                                                                  |         |         |         |         |
| 1dB Input Compression Point                           | IP <sub>1dB</sub>  |                                                                                  | +24     |         |         | dBm     |
| 3 <sup>rd</sup> Order Input Intercept Point           | IIP <sub>3</sub>   |                                                                                  | +35     |         |         | dBm     |
| 2nd and 3rd harmonic power<br>spectral density (PSD): |                    |                                                                                  |         |         |         |         |
| HD <sub>2</sub>                                       |                    | P <sub>OUT</sub> = +18 dBm                                                       |         |         | −55     | dBm/MHz |
| HD <sub>3</sub>                                       |                    | P <sub>OUT</sub> = +18 dBm                                                       |         |         | −55     | dBm/MHz |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.

**Table 12. SKY85806-11 Electrical Specifications: Power Detector Characteristics (Note 1)**

(V<sub>CC</sub> = 3.3 V, Control State 4, T<sub>a</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

| Parameter                                            | Symbol               | Test Condition                        | Minimum | Typical | Maximum | Units |
|------------------------------------------------------|----------------------|---------------------------------------|---------|---------|---------|-------|
| Frequency range                                      | f <sub>OUT</sub>     |                                       | 2400    |         | 2500    | MHz   |
| Power detect range, peak power                       | PDR                  | Measured at ANT                       | 0       |         | +22     | dBm   |
| DC output impedance                                  | PDZ <sub>OUT</sub>   |                                       |         | 4       |         | kΩ    |
| Output voltage:                                      |                      |                                       |         |         |         |       |
| +21 dBm                                              | PDV <sub>P21</sub>   | P <sub>OUT</sub> = +21 dBm            | 820     | 900     | 950     | mV    |
| No RF                                                | PDV <sub>pnoRF</sub> | P <sub>OUT</sub> = No RF              | 125     |         | 225     | mV    |
| Power detect low pass filter, +3 dB corner frequency | LPF−3dB              | Measured at P <sub>OUT</sub> = 18 dBm |         | 900     |         | kHz   |
| Power detector accuracy                              | Pdet <sub>acc</sub>  | Measured into 2:1 load at ANT port    | −1.5    |         | +1.5    | dB    |
| Power detector:                                      |                      |                                       |         |         |         |       |
| Operating voltage                                    | V <sub>PDOP</sub>    | 0 dBm to +22 dBm                      | 200     |         | 975     | mV    |
| Maximum limit                                        | V <sub>PDLIM</sub>   | Maximum PDET voltage                  |         |         | 1.2     | V     |
| Sensitivity                                          | V <sub>PDSENS</sub>  | 0 dBm to +22 dBm                      | ±10     |         | ±100    | mV/dB |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.



**Table 13. SKY85806-11 Electrical Specifications: Power Detector Characteristics (Note 1)****(V<sub>CC</sub> = 3.3 V, Control State 9 or 18, T<sub>A</sub> = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)**

| Parameter                                              | Symbol                                      | Test Condition                        | Min        | Typical | Max        | Units    |
|--------------------------------------------------------|---------------------------------------------|---------------------------------------|------------|---------|------------|----------|
| Frequency                                              | f <sub>out</sub>                            |                                       | 5150       |         | 5900       | MHz      |
| Power detector range, peak power                       | PDR                                         | Measured at ANT pin                   | 0          |         | +20        | dBm      |
| DC output impedance                                    | PDZ <sub>out</sub>                          |                                       |            | 4       |            | kΩ       |
| Output voltage                                         | PDV <sub>p20</sub><br>PDV <sub>pnoirf</sub> | @ +20 dBm<br>No RF                    | 850<br>135 | 900     | 950<br>215 | mV<br>mV |
| Power detector low pass filter, +3 dB corner frequency | LPF <sub>-3db</sub>                         | Measured at P <sub>OUT</sub> = 18 dBm |            | 800     |            | kHz      |
| Power detector accuracy                                | PDET <sub>acc</sub>                         | Measured into 2:1 load at ANT port    | -1.25      |         | +1.25      | dB       |
| Power detector operating voltage                       | V <sub>pdop</sub>                           | 0 dBm to +20 dBm                      | 200        |         | 900        | mV       |
| Power detector maximum limit                           | V <sub>pdlim</sub>                          | Maximum PDET voltage                  |            |         | 1.2        | V        |
| Power detector sensitivity                             | V <sub>pdsens</sub>                         | 0 dBm to +20 dBm                      | ±10        |         | ±100       | mV/dB    |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.**Table 14. SKY85806-11 Electrical Specifications: Switch Control Logic (Note 1)**

| State            | Logic |       |    |    |      |       | Register Description                           |
|------------------|-------|-------|----|----|------|-------|------------------------------------------------|
|                  | CBT   | A1/BS | P1 | P0 | Mode | Sleep |                                                |
| 1                | 0     | 0     | 0  | 0  | X    | 1     | 2 GHz LNA enabled                              |
| 2                | 0     | 0     | 0  | 1  | X    | 1     | 2 GHz LNA bypassed<br>(insertion loss = +3 dB) |
| 3                | 0     | 0     | 1  | 0  | X    | 1     | 2 GHz LNA bypass (insertion loss = +9 dB)      |
| 4                | 0     | 0     | 1  | 1  | 1    | 1     | 2 GHz PA, high linearity, with loopback        |
| 5                | 0     | 0     | 1  | 1  | 0    | 1     | 2 GHz PA, low linearity, with loopback         |
| 6                | 0     | 1     | 0  | 0  | X    | 1     | 5 GHz LNA enabled                              |
| 7                | 0     | 1     | 0  | 1  | X    | 1     | 5 GHz LNA bypass (insertion loss = +4 dB)      |
| 8                | 0     | 1     | 1  | 0  | X    | 1     | 5 GHz LNA bypass (insertion loss = +7 dB)      |
| 9                | 0     | 1     | 1  | 1  | 1    | 1     | 5 GHz PA, high linearity, with loopback        |
| 10               | 0     | 1     | 1  | 1  | 0    | 1     | 5 GHz PA, low linearity, with loopback         |
| 11               | 1     | 0     | 0  | 0  | X    | 1     | BT                                             |
| 12               | 1     | 0     | 0  | 1  | X    | 1     | BT                                             |
| 13               | 1     | 0     | 1  | 0  | X    | 1     | BT                                             |
| 14               | 1     | 0     | 1  | 1  | X    | 1     | BT                                             |
| 15               | 1     | 1     | 0  | 0  | X    | 1     | BT, 5 GHz LNA enabled                          |
| 16               | 1     | 1     | 0  | 1  | X    | 1     | BT, 5 GHz LNA bypass (IL = +4 dB)              |
| 17               | 1     | 1     | 1  | 0  | X    | 1     | BT, 5 GHz LNA bypass (IL = +7 dB)              |
| 18               | 1     | 1     | 1  | 1  | 1    | 1     | BT, 5 GHz PA, high linearity, with loopback    |
| 19               | 1     | 1     | 1  | 1  | 0    | 1     | BT, 5 GHz PA, low linearity, with loopback     |
| 20               | 1     | X     | X  | X  | X    | 0     | BT ready                                       |
| 21               | 0     | X     | X  | X  | X    | 0     | Sleep mode                                     |
| All other states |       |       |    |    |      |       | Not supported                                  |

**Note 1:** Performance is guaranteed only under the conditions listed in this table.**Note 2:** X = Don't Care.

Typical Performance Characteristics

(Vcc = 3.3 V, TA = 25 °C as Measured on the Evaluation Board, All Unused Ports are Terminated with 50 Ω, Unless Otherwise Noted)

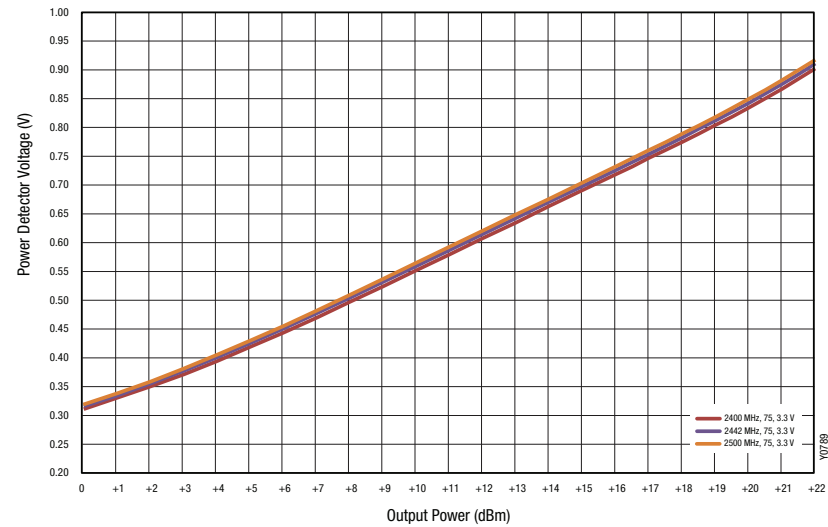


Figure 3: SKY85806-11 Power Detector vs Output Power Over Frequency (2 GHz Band)

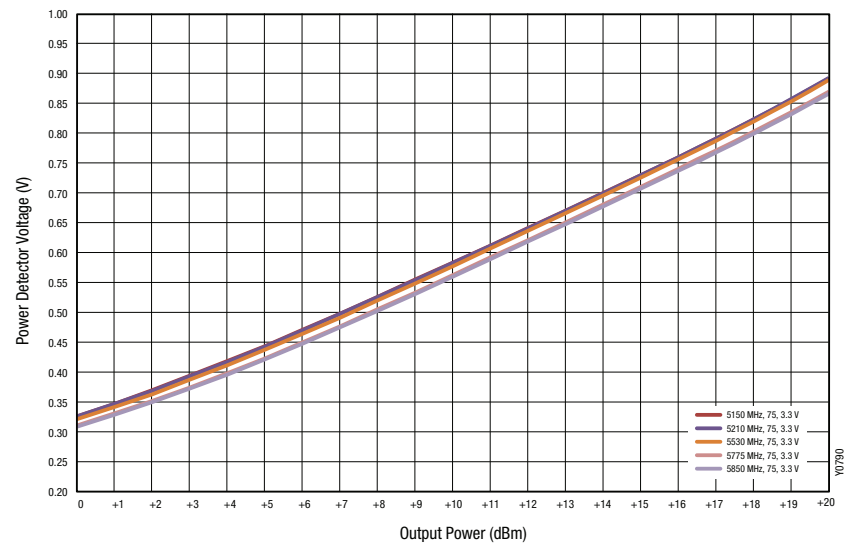


Figure 4: SKY85806-11 Power Detector vs Output Power Over Frequency (5 GHz Band)

## Evaluation Board Description

The SKY85806-11 Evaluation Board is used to test the performance of the SKY85806-11 WLAN PA. The Evaluation Board schematic diagram is shown in Figure 5. A photograph of the SKY85806-11 Evaluation Board is shown in Figure 6. Table 15 provides the Bill of Materials (BOM) for Evaluation Board components.

## Evaluation Board Test Procedure

1. Connect system ground to pin 3 on connectors J7 and J8.
2. Apply 3.3 V to pin1 on connector J7; apply 3.3 V to pins 1 and 2 on connector J8.
3. Apply 0 V and 3.3 V to appropriate control pin(s) as specified in Table 13 for a given mode of operation.
4. Select an RF path to test according to the modes shown in Table 13.
5. Connect a multimeter or oscilloscope to pin 11 of connector J7 (labeled VDET).
6. Apply an RF signal to connector J6 (ANT) to monitor the BT port. Measure the response from the output of connector J1 (BT).
7. Apply an RF signal to connector J6 (ANT) to monitor the RXg to ANT performance. Measure the response from the output of connector J4 (RXg).
8. Apply an RF signal to connector J6 (ANT) to monitor the RXa to ANT performance. Measure the response from the output of connector J2 (RXa).
9. Apply an RF signal to connector J5 (TXg) to monitor the ANT to TXg performance. Monitor the output power on connector J6 (ANT). Take care not to overdrive the amplifier by applying too much RF on the input to the device (–20 dBm provides a suitable starting input power).
10. Apply an RF signal to connector J3 (TXa) to monitor the ANT to TXa performance. Monitor the output power on connector J6 (ANT). Take care not to overdrive the amplifier by applying too much RF on the input to the device (–20 dBm provides a suitable starting input power).

## Package Dimensions

Typical case markings for the SKY85806-11 are shown in Figure 7. The PCB layout footprint for the SKY85806-11 is provided in Figure 8. Package dimensions for the 28-pin QFN are shown in Figure 9, and tape and reel dimensions are provided in Figure 10.

## Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY85806-11 is rated to Moisture Sensitivity Level 3 (MSL3) at 240 °C, and can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information* (Document Number 200164).

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.



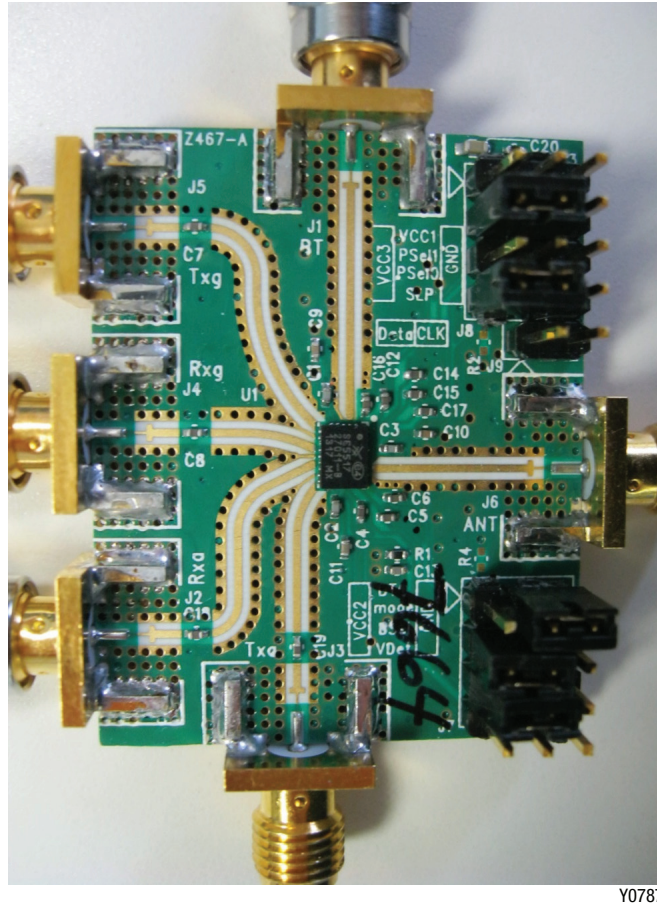
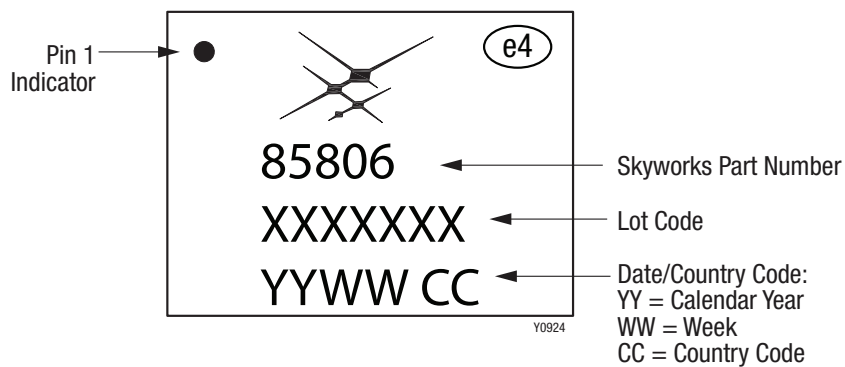


Figure 6. SKY85806-11 Evaluation Board

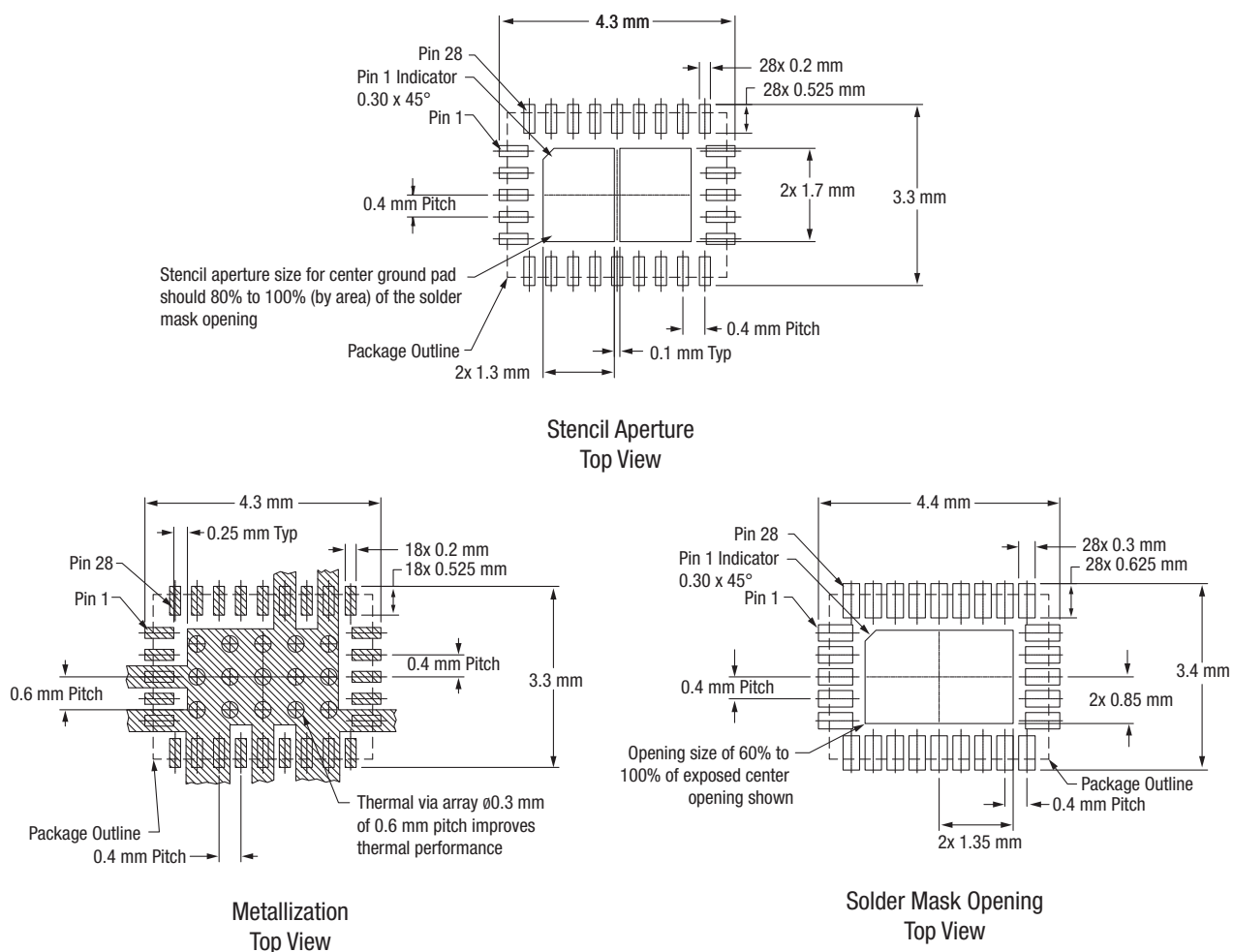
Table 15. SKY85806-11 Evaluation Board Bill of Materials (BOM)

| Component               | Value       | Size       | Manufacturer       | Mfr Part Number    | Characteristics                                      |
|-------------------------|-------------|------------|--------------------|--------------------|------------------------------------------------------|
| C1                      | 2200 pF     | 0402       | Murata             | GRM155R71H222KA01D | Multilayer ceramic capacitor                         |
| C3                      | 100 pF      | 0402       | Murata             | GRM1555C1H101JZ01  | Multilayer ceramic capacitor                         |
| C4, C5, C6, C7, C8      | 22 pF       | 0402       | Murata             | GRM1555C1H220JZ01  | Multilayer ceramic capacitor                         |
| C9, C10                 | 1 $\mu$ F   | 0402       | TDK                | C1005X5R1A105K     | Multilayer ceramic capacitor                         |
| C12, C16, C17, C18, C19 | 10 pF       | 0402       | Murata             | GRM1555C1H100JZ01  | Multilayer ceramic capacitor                         |
| C2, C11, C13            | DNI         | —          | —                  | —                  | —                                                    |
| C20                     | 4.7 $\mu$ F | 0603       | Murata             | GRM188R60J475KE19  | Multilayer ceramic capacitor                         |
| J1, J2, J3, J4, J5, J6  | SMA         | end launch | Johnson Components | 142-0701-851       | SMA end launch straight jack receptacle, tab contact |
| J7, J8                  | 100 mil     | 4x3        | Samtec             | TSW-104-07-G-T     | 100 mil header                                       |
| R2, R3, R4              | DNI         | —          | —                  | —                  | —                                                    |

**Note:** DNI components are not shown in the Evaluation Board schematic.



**Figure 7. SKY85806-11 Typical Case Markings (Top View)**

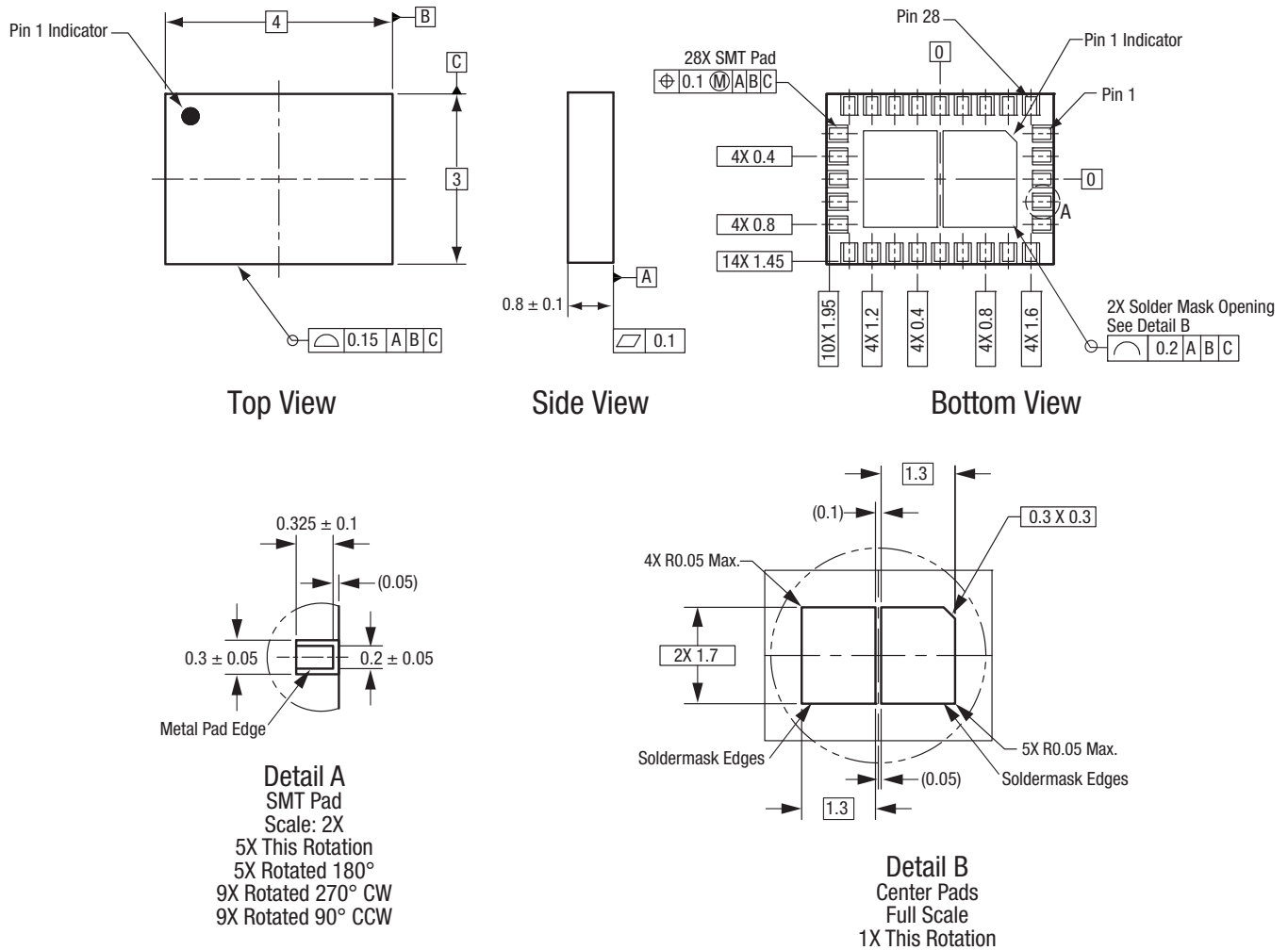


**Note:**

Thermal vias should be resin filled and capped in accordance with IPC-4761 type VII vias.  
Recommended Cu thickness is 30 to 35  $\mu$ m.

Y0788

**Figure 8. SKY85806-11 PCB Layout Footprint**

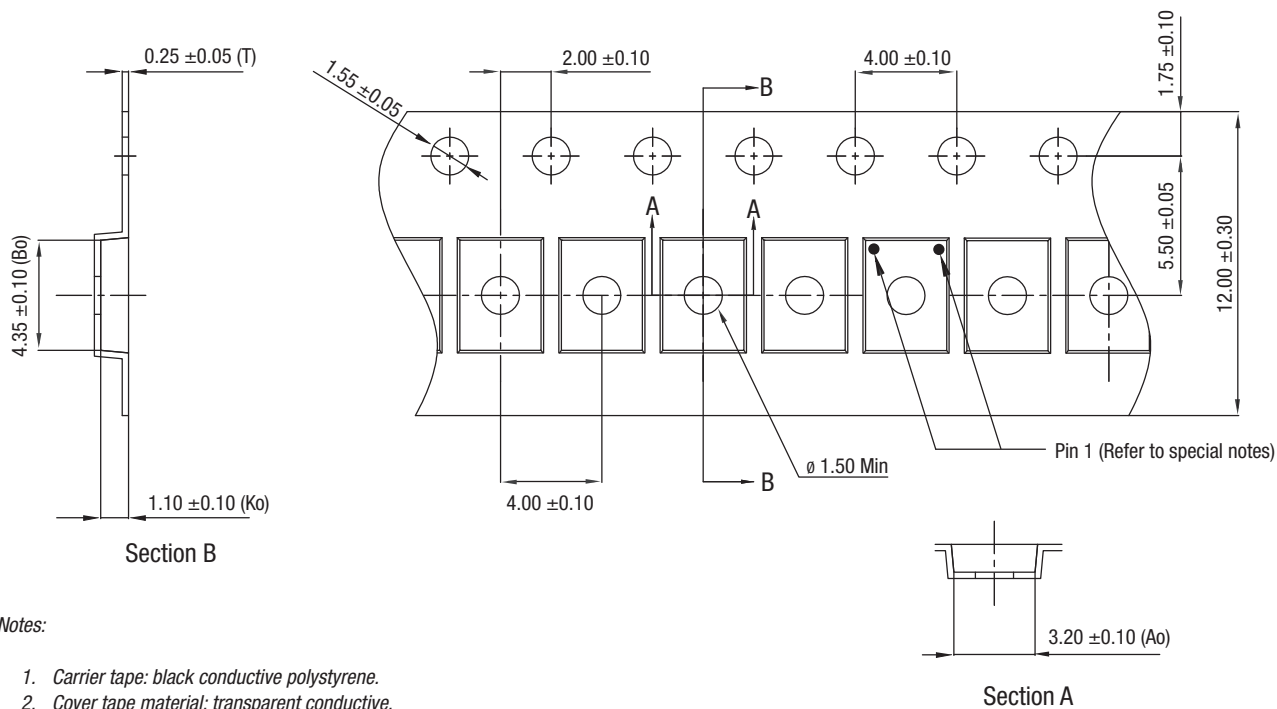


**NOTES:**

1. All measurements are in millimeters.
2. Dimensioning and tolerancing according to ASME Y14.5M-1994.

S2898

**Figure 9. SKY85806-11 28-Pin QFN Package Dimensions**



Notes:

1. Carrier tape: black conductive polystyrene.
2. Cover tape material: transparent conductive.
3. ESD-surface resistivity shall meet GP01-D232.
4. 10-sprocket hole pitch cumulative tolerance:  $\pm 0.20$  mm.
5. Ao and Bo measurement point to be 0.30 mm from bottom pocket.
6. All dimensions are in millimeters.

Special Notes:

Y0786

1. Pin orientation shall be on top right for SKY85806 and SKY85809 products.
2. Pin orientation shall be on top left for all other 3 x 4 mm products.

**Figure 10. SKY85806-11 28-Pin QFN Tape and Reel Dimensions**



## Ordering Information

| Model Name                            | Manufacturing Part Number | Evaluation Board Part Number |
|---------------------------------------|---------------------------|------------------------------|
| SKY85806-11: Dual-Band WLAN Front End | SKY85806-11               | SKY85806-11-EK1              |

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