PRELIMINARY DATA SHEET

SKY65137: Power Amplifier for 802.11a WLAN Applications

Applications

- IEEE802.11a WLAN enabled:
  - access points
  - media gateways
  - set top boxes
  - LCD TVs
- Other broadband triple-play multimedia applications

Features

- Linear output power of +24 dBm for IEEE802.11a 64-QAM EVM <2.5%
- High gain of 26 dB
- Output power detector: 20 dB dynamic range
- Power shutdown mode
- Superior gain flatness
- Internal RF match and bias circuits
- Small footprint, MCM (20-pin, 6 x 6 mm) Pb-free (MSL3, 260 °C per JEDEC J-STD-020) SMT package

NEW

Skyworks offers lead (Pb)-free RoHS (Restriction of Hazardous Substances) compliant packaging.

Description

Skyworks SKY65137 is a Microwave Monolithic Integrated Circuit (MMIC) Power Amplifier (PA) with superior output power, linearity, and efficiency. These features make the SKY65137 ideal for Wireless Local Area Network (WLAN) applications.

The device is fabricated using Skyworks high reliability Indium Gallium Phosphide (InGaP) Heterojunction Bipolar Transistor (HBT) technology. The device is internally matched and mounted in a 20-pin, 6 x 6 mm Multi-Chip Module (MCM) Surface-Mounted Technology (SMT) package, which allows for a highly manufacturable low cost solution.

The device package and pinout for the 20-pin MCM are shown in Figure 1. A block diagram of the SKY65137 is shown in Figure 2.

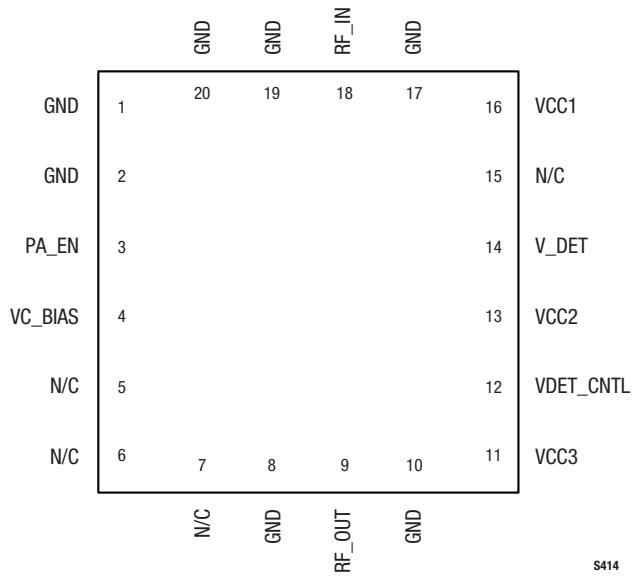


Figure 1. SKY65137 Pinout – 20-Pin MCM (Top View)

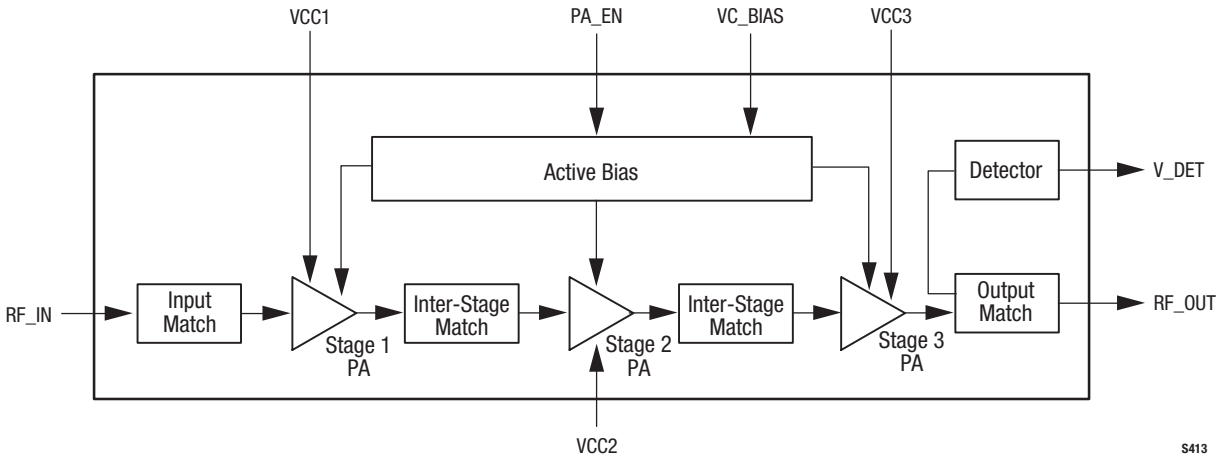


Figure 2. SKY65137 Block Diagram

Technical Description

The SKY65137 PA contains all of the needed RF matching and DC biasing circuits. The device also provides an output power detector voltage.

The SKY65137 is a three-stage, HBT InGaP device optimized for high linearity and power efficiency. These features make the device suitable for wideband digital applications, where PA linearity and power consumption are of critical importance (e.g., WLANs).

The device has been characterized with the highest specified data rates for IEEE802.11a (54 Mbps). Under these stringent test conditions, the device exhibits excellent spectral purity and power efficiency.

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 SKY65137 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to Skyworks Application Note, *PCB Design and SMT Assembly/Rework Guidelines for MCM-L Packages*, document number 101752.

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. For packaging details, refer to the Skyworks Application Note, *Tape and Reel*, document number 101568.

Electrical and Mechanical Specifications

Signal pin assignments and functional pin descriptions are described in Table 1. The absolute maximum ratings of the SKY65137 are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the SKY65137 are illustrated in Figures 3 through 9.

Figure 10 provides a typical evaluation board schematic. An assembly drawing for the Evaluation Board is shown in Figure 11. The PCB layout footprint for the SKY65137 is provided in Figure 12. Package dimensions for the 20-pin MCM are shown in Figure 13, and tape and reel dimensions are provided in Figure 104.

Electrostatic Discharge (ESD) Sensitivity

The SKY65137 is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper ESD precautions.

Table 1. SKY65137 Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	GND	Ground	11	VCC3	Stage 3 collector voltage
2	GND	Ground	12	VDET_CNTL	Detector voltage control
3	PA_EN	Power shutdown enable	13	VCC2	Stage 2 collector voltage
4	VC_BIAS	Bias voltage	14	V_DET	Detector output signal
5	N/C	No connection	15	N/C	No connection
6	N/C	No connection	16	VCC1	Stage 1 collector voltage
7	N/C	No connection	17	GND	Ground
8	GND	Ground	18	RF_IN	RF input
9	RF_OUT	RF output	19	GND	Ground
10	GND	Ground	20	GND	Ground

Table 2. SKY65137 Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
RF output power	P_{OUT}		+28	dBm
Supply voltage, measured at pin of package (Note 2)	VCC1, VCC2, VCC3, VC_BIAS, PA_EN		5.5	V
Total supply current (I_{CC} + I_{BIAS} + I_{REF})	I_{CC_TOTAL}		1200	mA
Case operating temperature	T_C	–40	+85	°C
Storage temperature	T_{ST}	–55	+125	°C
Junction temperature	T_J		+150	°C

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.

Note 2: Evaluation Board supply voltage levels can be different. Refer to the Evaluation Board schematic diagram in Figure 12.

Table 3. SKY65137 Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
RF input power	P_{IN}			+2	dBm
Supply voltage, measured at pin of package (Note 1)	VCC1, VCC2, VCC3, VC_BIAS, PA_EN	4.5	5.0	5.5	V
Power shutdown enable voltage @ PA_EN		2.5	3.0	5.5	V
Case operating temperature	T_C	–40		+85	°C
Storage temperature	T_{ST}	–55		+125	°C

Note 1: Evaluation Board supply voltage levels can be different. Refer to the Evaluation Board schematic diagram in Figure 12.

Table 4. SKY65137 Electrical Specifications
(VCC1, VCC2, VCC3 = 5 V, T_C = +25 °C, Test Frequency = 5.75 GHz unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Using Continuous Wave Input Signals						
Small signal gain	G	P_{IN} = –20 dBm		26		dB
Gain flatness over band		From 5.6 to 5.9 GHz		±0.9		dB
Gain flatness over channel (16.25 MHz)		Over any 16.25 MHz within band		±0.1		dB
Output power @ 1 dB compression	P1dB			+32		dBm
Quiescent Current	I_Q	No RF input		420		mA
Noise Figure	NF			6		dB
Power added efficiency @ P1dB	PAE			29		%
Shutdown mode current draw				2		µA
Using IEEE802.11a Orthogonal Frequency Division Multiplexing Input Signal, Data Rate = 54 Mbps						
Total supply current	I_{CC_TOTAL}	P_{OUT} = +24 dBm		490		mA
Output power @ EVM = 2.5%	P_{OUT_EVM}			+24		dBm

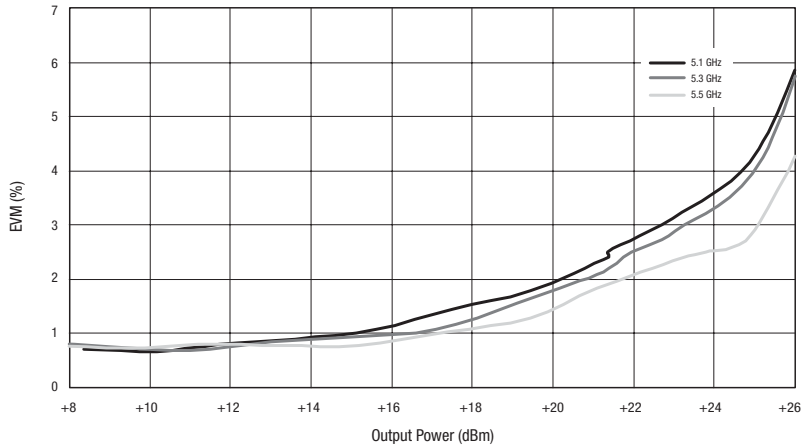


Figure 3. Low Band EVM vs Output Power

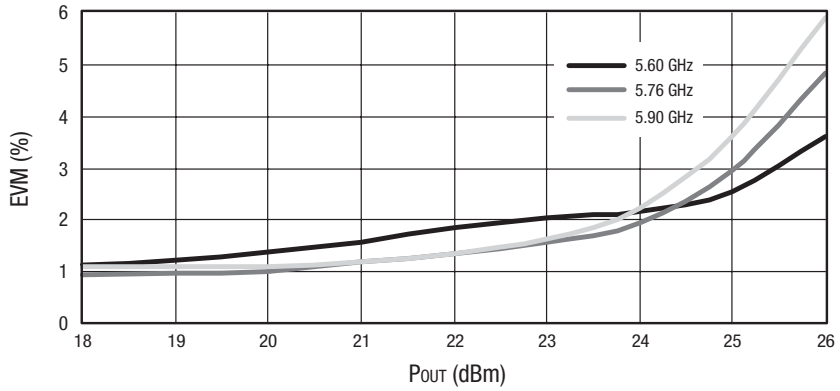


Figure 4. High Band EVM vs Output Power

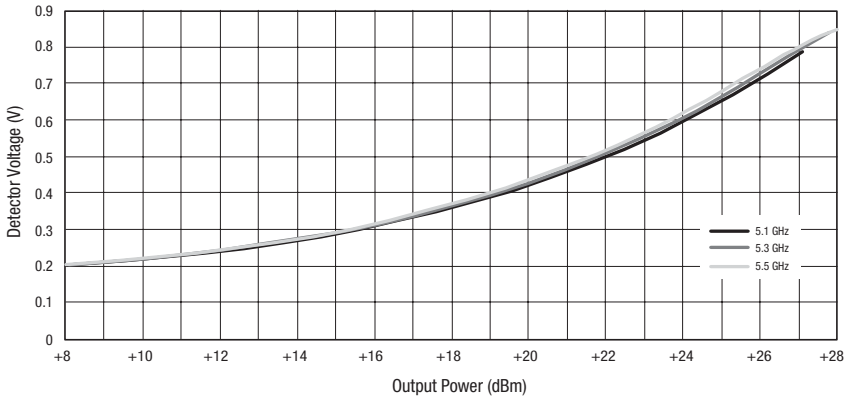


Figure 5. Low Band Detector Voltage vs Output Power

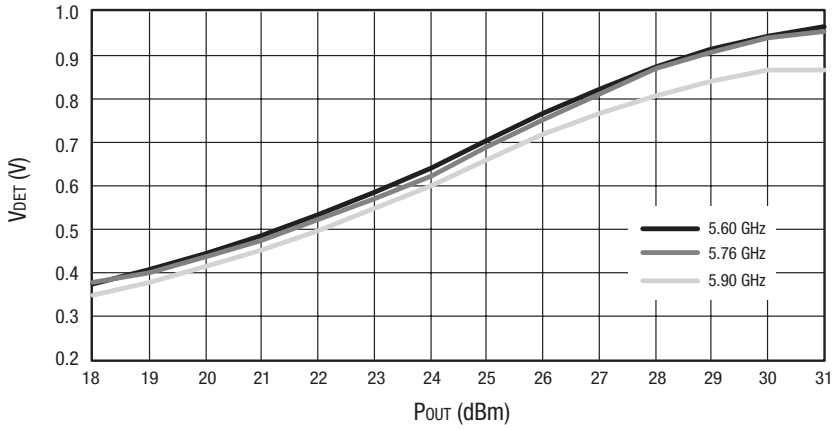


Figure 6. High Band Detector Voltage vs Output Power

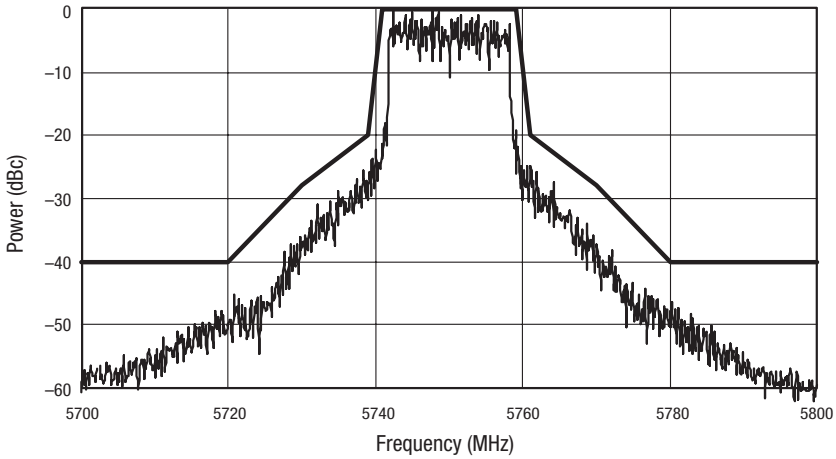


Figure 7. Typical Spectral Response With 802.11a 64-QAM OFDM Signal (Output Power = +27 dBm)

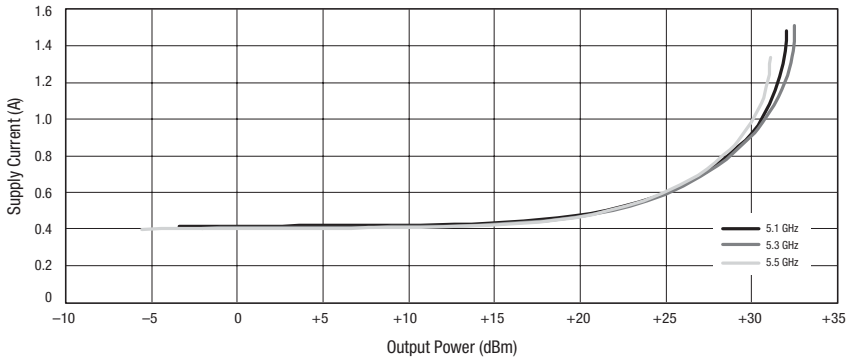


Figure 8. Supply Current vs Output Power, CW Input

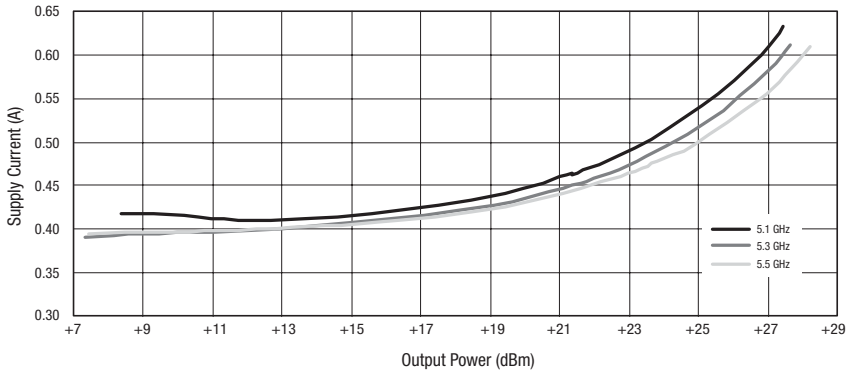
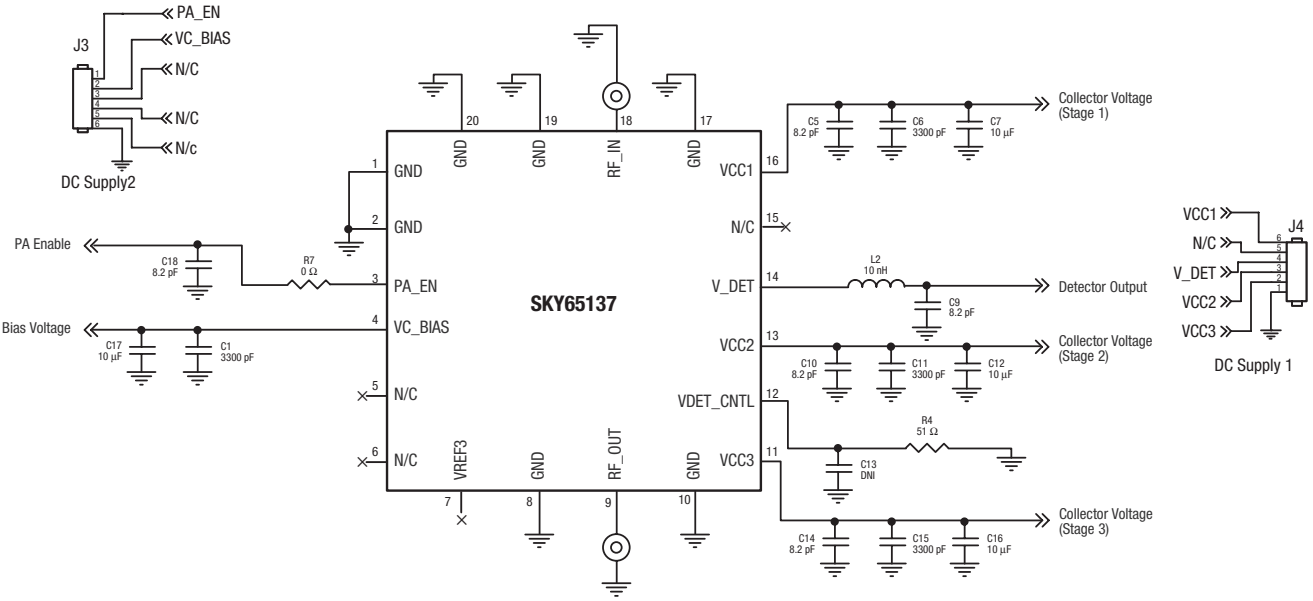


Figure 9. Supply Current vs Output Power, Modulated Input



Note: Some component labels may be different than the corresponding component symbol shown here. Component values, however, are accurate as of the date of this Data Sheet.

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Figure 10. SKY65137 Evaluation Board Schematic

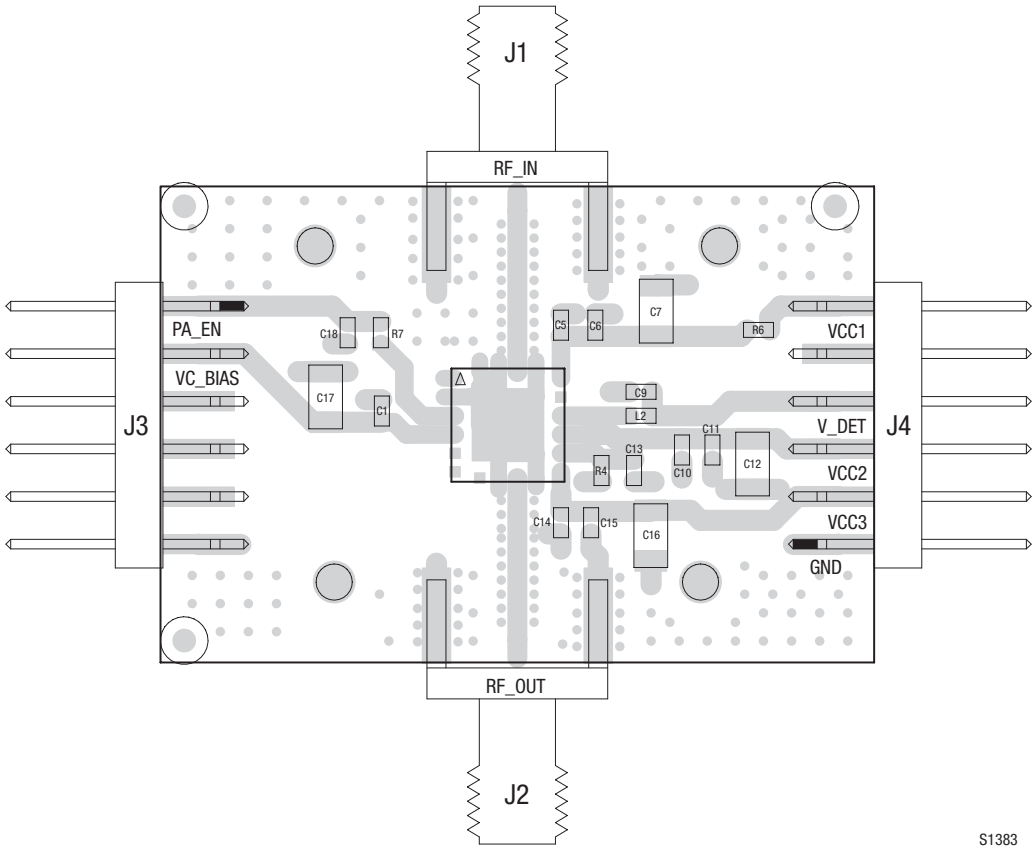
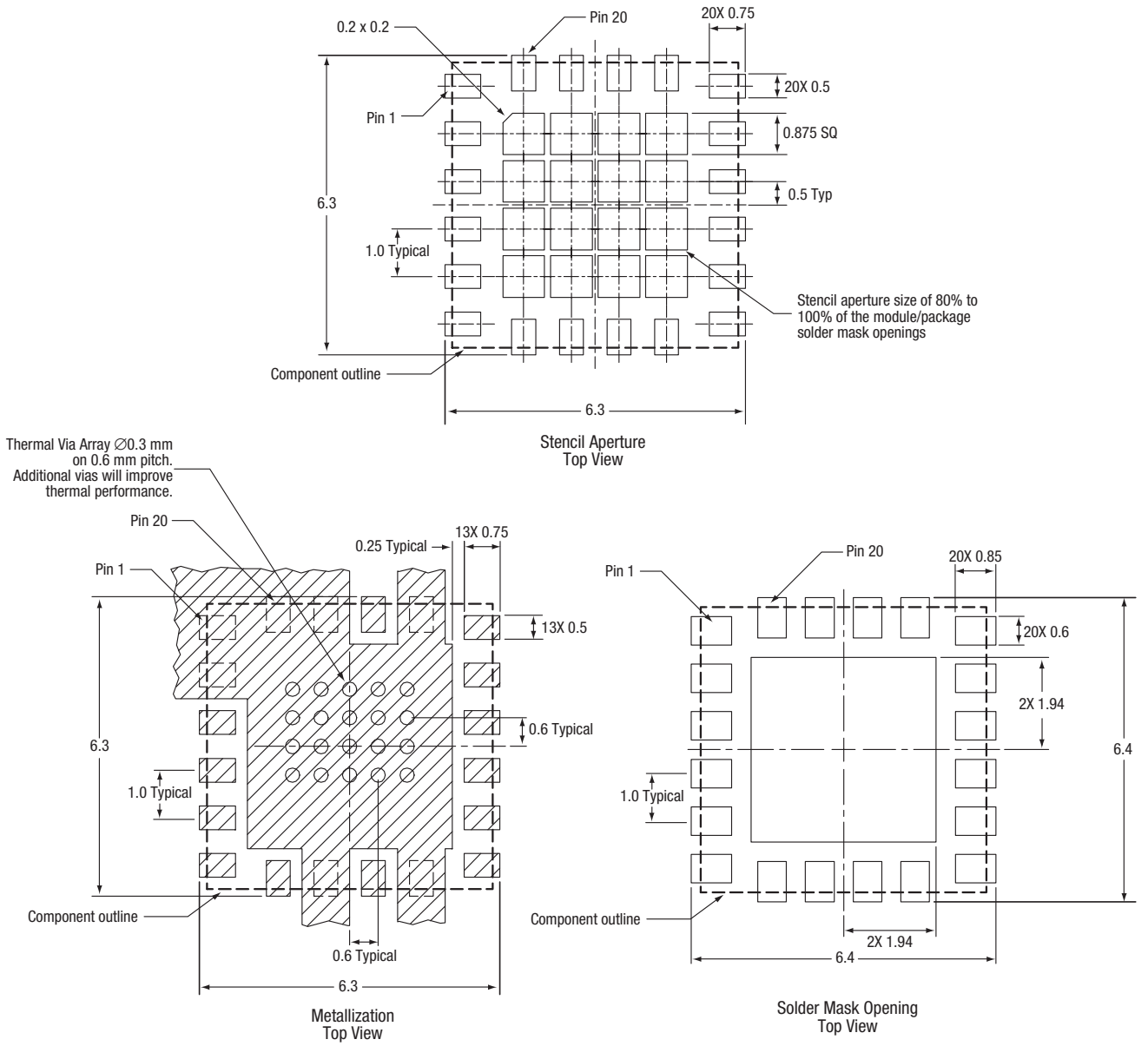


Figure 11. Evaluation Board Assembly Drawing



All measurements are in millimeters

Note: Thermal vias should be tented and filled with solder mask: 30 to 35 µm Cu plating recommended.

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Figure 12. PCB Layout Footprint For The SKY65137

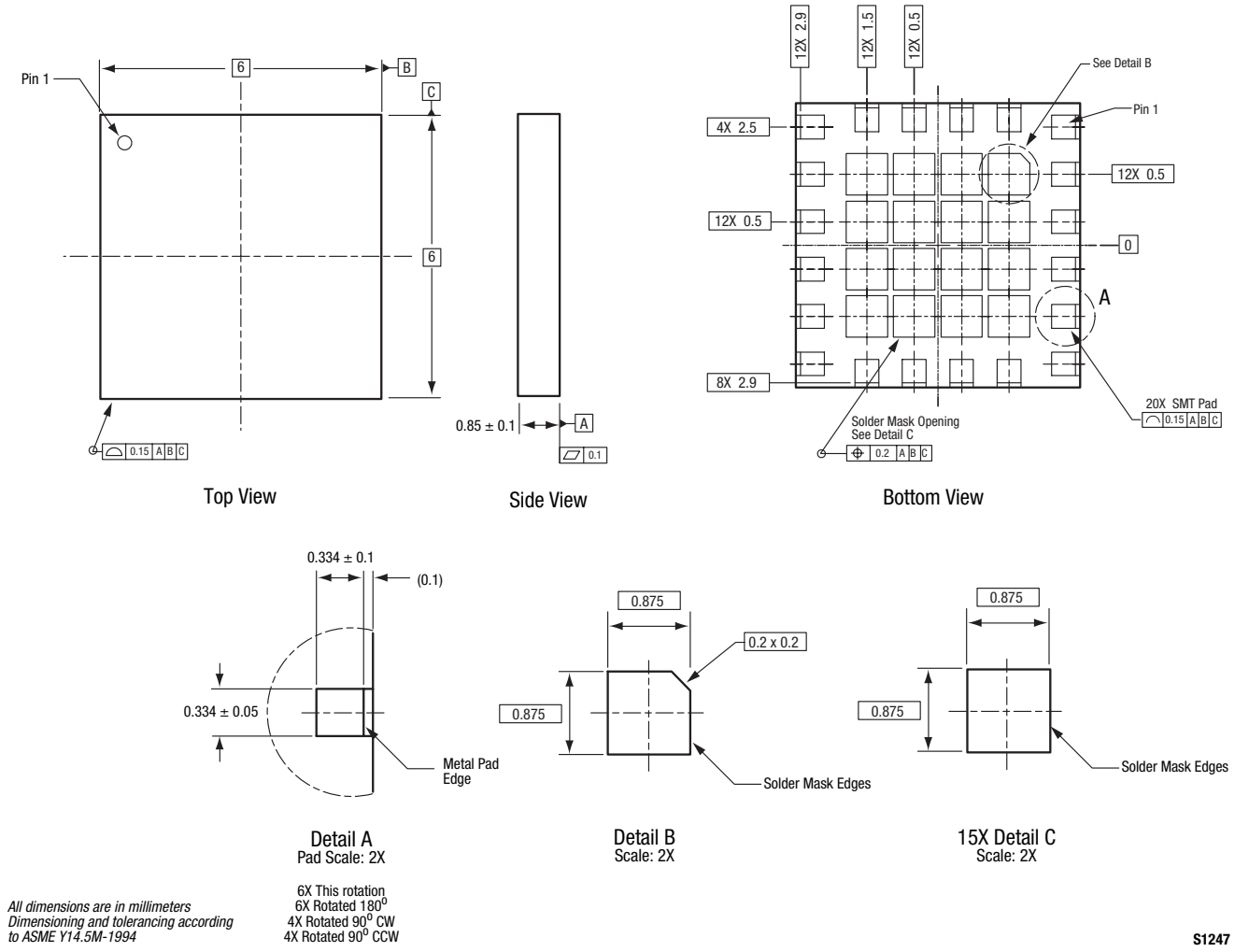

Figure 13. SKY65137 20-Pin MCM Package Dimensions

*** TBD ***

Figure 14. SKY65137 20-Pin MCM Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Kit Part Number
SKY65137 WLAN Power Amplifier	SKY65137 (Pb-free package)	TW17-D330-031