DATA SHEET

SKY77331 Power Amplifier Module with Integrated Coupler for Quad-Band GSM / EDGE

Applications

- Quad-band cellular handsets:
  - Class 4 GSM850/900
  - DCS1800
  - PCS1900
  - Class 12 GPRS multi-slot operation
  - EDGE polar modulation

Features

- High efficiency
  - GSM850, 55% (Peak)
  - GSM900, 55% (Peak)
  - DCS, 52% (Peak)
  - PCS, 52% (Peak)
- Integrated coupler
- Wideband envelope control path
- Input/output matching
- 16-pad MCM
- Small outline
  - 6 x 8 mm
- Low profile
  - 1.2 mm
- Gold-plated, lead-free contacts

NEW

Skyworks offers lead (Pb)-free "environmentally friendly" packaging that is RoHS compliant (European Parliament for the Restriction of Hazardous Substances).

Description

The SKY77331 Power Amplifier Module (PAM) is designed in a compact form factor for quad-band cellular handsets comprising GSM850/900, DCS1800, PCS1900, and supports Class 12 General Packet Radio Service (GPRS) multi-slot operation.

The module consists of a GSM850/900 PA block and a DCS1800/PCS1900 PA block, impedance-matching circuitry for 50 Ω input and output impedances, a Power Amplifier Control (PAC) block, and an Integrated Coupler. A custom CMOS IC provides the internal PAC function and interface circuitry.

Two separate Heterojunction Bipolar Transistor (HBT) PA blocks are fabricated onto InGaP/GaAs die; one supports the GSM850/900 bands, the other supports the DCS1800 and PCS1900 bands. Both PA blocks share common power supply pads to distribute current. The GaAs die, the silicon die, and the passive components are mounted on a multi-layer laminate substrate and the entire assembly is encapsulated with plastic overmold.

RF input and output ports are internally matched to 50 Ω to reduce the number of external components for a quad-band design. Extremely low leakage current (10 μA, maximum) of the dual PA module maximizes handset standby time. The SKY77331 also contains band select switching circuitry to select GSM (logic 0) and DCS/PCS (logic 1) as determined from the Band Select (BS) signal. In the functional block diagram (Figure 1), the BS pad selects the PA output (DCS/PCS_OUT or GSM_OUT) while the Power Control (VPC) controls the level of output power.

The integrated power amplifier control (PAC) function provides envelope amplitude control by reducing sensitivity to input drive, temperature, power supply, and process variation. The Enable input signal (pad 1) allows initial turn-on of the PAC circuitry to minimize battery drain.

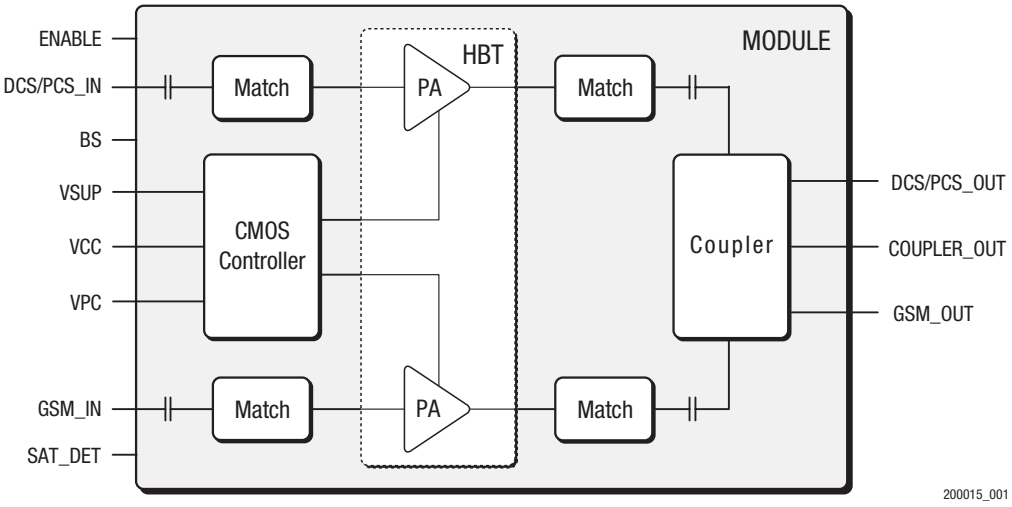


Figure 1. SKY77331 Functional Block Diagram

Electrical Specifications

Table 1 lists the absolute maximum ratings of the SKY77331 and the recommended operating conditions are specified in Table 2. SKY77331 electrical specifications are provided in Table 3.

Table 1. SKY77331 Absolute Maximum Ratings [1]

Parameter	Minimum	Maximum	Units
Input power (P_{IN})	—	15	dBm
Supply voltage (V_{CC}), standby, $V_{ENV} \leq 0.3$ V, TX enable ≤ 0.2 V	—	7	V
Envelope control voltage (V_{ENV})	–0.5	$V_{CC\ MAX}$ – 0.2	V
Storage temperature	–55	+150	°C

[1] Stresses above these absolute maximum ratings may cause permanent damage. These are stress ratings only and functional operation at these conditions is not implied. Exposure to maximum rating conditions for extended periods may reduce device reliability.

Table 2. SKY77331 Recommended Operating Conditions

Parameter	Minimum	Typical	Maximum	Units
Supply voltage (V_{CC})	2.9	3.5	4.8 [1]	V
Supply current (I_{CC})	0	—	2.5 [1]	A
Operating case temperature (T_{CASE}), bottom surface of package				°C
1-slot (12.5% duty cycle)	–20		+100	
2-slot (25% duty cycle)	–20		+100	
3-slot (37.5% duty cycle)	–20		+85	
4-slot (50% duty cycle)	–20		+85	

[1] For charging conditions with $V_{CC} > 4.8$ V, derate I_{CC} linearly down to 0.5 A maximum at $V_{CC} = 5.0$ V.

Table 3. SKY77331 Electrical Specifications [1] *(1 of 7)*

General							
Parameter		**Symbol**	**Test Condition**	**Minimum**	**Typical**	**Maximum**	**Units**
Supply voltage		V_{CC}		2.9	3.5	4.8	V
Amplitude control impedance		Z_{VPC}		3	—	—	kΩ
PA enable control voltage	Low	V_{TE}		–0.1	—	+0.5	V
	High			1.2	—	2.8	
PA enable current		I_{TE}		—	—	5	µA
Band select control voltage	Low	V_{BS}		–0.1	—	+0.5	V
	High			1.2	—	2.8	
Band select current		I_{BS}		—	—	5	µA
Standby mode leakage current		I_Q	$V_{CC} \leq 4.5$ V $V_{PC} \leq V_{THRESHOLD}$ PA Enable ≤ 0.2 V $T_{CASE} = +25$ °C $P_{IN} \leq –60$ dBm	—	—	10	µA

Table 3. SKY77331 Electrical Specifications [1] *(2 of 7)*

GSM850 TX Mode							
Parameter		**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Frequency range		f		824	—	849	MHz
Input power	Normal	P_{IN}	$P_{OUT} \geq 10$ dBm	0	—	6	dBm
	For low P_{OUT}	P_{IN_LOW}	$P_{OUT} < -15$ dBm	–15	–10	—	
Analog power amplitude control voltage (allowable input range)		V_{PC}		0	—	2.5	V
Power Added Efficiency	GSM rated power	PAE_{GSM_850}	V_{CC} = 3.5 V P_{OUT} = 34.5 dBm $V_{PC} \leq 1.7$ V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	45	50	—	%
	EDGE rated power	PAE_{EDGE_850}	V_{CC} = 3.5 V P_{OUT} = 28.5 dBm $V_{PC} \leq 1.7$ V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	20	25	—	
Harmonics	2nd	2f0	BW = 3 MHz $P_{OUT} \leq 34.5$ dBm	—	–15	–10	dBm
	3rd to 13th	3f0 to 13f0		—	–15	–10	
Output power		P_{OUT}	V_{CC} = 3.5 V $V_{PC} \leq 1.8$ V T_{CASE} = +25 °C	34.5	35.0	—	dBm
Output power over extremes		P_{OUT}	V_{CC} = 2.9 V T_{CASE} = –20 to +85 °C	32	—	—	dBm
Input VSWR		Γ_{IN}	P_{IN} = 0 to 6 dBm P_{OUT} = 6.5 to 34.5 dBm V_{PC} controlled	—	1.5:1	2.3:1	–
Forward isolation		$P_{OUT\_STANDBY}$	P_{IN} = –10 dBm $V_{PC} = V_{THRESHOLD}$ – 10 mV PA Enable > 1.2 V	—	—	–20	dBm
Noise power		PNOISE	f0 + 20 MH z RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–82	dBm
			1930 to 1990MHz RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ Pout ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–84	
Spurious		Spur	V_{PC} = controlled $P_{IN} = P_{IN\_LOW\_MIN}$ to P_{IN_MAX} $P_{OUT} = P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 8:1 all phase angles	No parasitic oscillation > –36 dBm			

Table 3. SKY77331 Electrical Specifications [1] *(3 of 7)*

GSM850 TX Mode [continued]							
Parameter		**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Load mismatch		Load	V_{PC} = controlled P_{IN} = $P_{IN\_LOW\_MIN}$ to P_{IN_MAX} P_{OUT} = $P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 10:1 all phase angles	No module damage or permanent degradation			
Maximum controlled P_{OUT} at P_{IN_LOW}		P_{OUT}	P_{IN} = –10 dBm V_{PC} = controlled T_{CASE} = –20 to +85 °C	10	—	—	dBm
Minimum controlled P_{OUT} at P_{IN_LOW}		$P_{OUT\_LOW\_CTRL}$	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ T_{CASE} = –20 to +85 °C	—	—	–18	
GSM900 TX Mode							
Parameter		**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Frequency range		f		880	—	915	MHz
Input power	Normal	P_{IN}	$P_{OUT} \geq$ 10 dBm	0	—	6	dBm
	For low P_{OUT}	P_{IN_LOW}	P_{OUT} < –15 dBm	–15	–10		
Analog amplitude power control voltage (allowable input range)		V_{PC}		0	—	2.5	V
Power Added Efficiency	GSM rated power	PAE_{GSM_900}	V_{CC} = 3.5 V P_{OUT} = 34.5 dBm $V_{PC} \leq$ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	45	50	—	%
	EDGE rated power	PAE_{EDGE_900}	V_{CC} = 3.5 V P_{OUT} = 28.5 dBm $V_{PC} \leq$ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	20	25	—	
Harmonics	2^{nd}	$2f_0$	BW = 3 MHz $P_{OUT} \leq$ 34.5 dBm	—	–15	–10	dBm
	3^{rd} to 13^{th}	$3f_0$ to $13f_0$		—	–15	–10	
Output power		P_{OUT}	V_{CC} = 3.5 V $V_{PC} \leq$ 1.8 V T_{CASE} = +25 °C	34.5	35.0	—	dBm
Output power over extremes		P_{OUT}	V_{CC} = 2.9 V T_{CASE} = –20 to +85 °C	32	—	—	dBm
Input VSWR		Γ_{IN}	P_{IN} = 0 to 6 dBm P_{OUT} = 6.5 to 34.5 dBm V_{PC} controlled	—	1.5:1	2.3:1	—
Forward isolation		$P_{OUT\_STANDBY}$	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ – 10 mV PA Enable > 1.2 V	—	—	–20	dBm

Table 3. SKY77331 Electrical Specifications [1] *(4 of 7)*

GSM900 TX Mode [continued]						
Parameter	**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Noise power	P_{NOISE}	f_O + 20 MHz RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–82	dBm
		f_O + 10 MHz RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–73	
		1805 to 1880 MHz RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–84	
Spurious	Spur	V_{PC} = controlled P_{IN} = $P_{IN\_LOW\_MIN}$ to P_{IN_MAX} P_{OUT} = $P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 8:1 all phase angles	No parasitic oscillation > –36 dBm			
Load mismatch	Load	V_{PC} = controlled P_{IN} = $P_{IN\_LOW\_MIN}$ to P_{IN_MAX} P_{OUT} = $P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 10:1 all phase angles	No module damage or permanent degradation			
Maximum controlled P_{OUT} at P_{IN_LOW}	P_{OUT}	P_{IN} = –10 dBm V_{PC} = controlled T_{CASE} = –20 to +85 °C	10	—	—	dBm
Minimum controlled P_{OUT} at P_{IN_LOW}	$P_{OUT\_MIN\_CTRL}$	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ T_{CASE} = –20 to +85 °C	—	—	–18	dBm

DCS1800 TX Mode						
Parameter	**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Frequency range	f		1710	—	1785	MHz
Input power Normal	P_{IN}	P_{OUT} ≥ 10 dBm	0	—	6	dBm
Input power For low P_{OUT}	P_{IN_LOW}	P_{OUT} < –15 dBm	–15	–10	—	
Analog amplitude power control voltage (allowable input range)	V_{PC}		0	—	2.5	V

Table 3. SKY77331 Electrical Specifications [1] *(5 of 7)*

DCS1800 TX Mode [continued]							
Parameter		**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Power Added Efficiency	DCS rated power	PAE_{DCS_1800}	V_{CC} = 3.5 V P_{OUT} = 32 dBm $V_{PC} \leq$ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	40	44	—	%
	EDGE rated power	PAE_{EDGE_1800}	V_{CC} = 3.5 V P_{OUT} = 28 dBm $V_{PC} \leq$ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	23	27	—	
Harmonics	2nd	2fo	BW = 3 MHz $P_{OUT} \leq$ 32 dBm	—	–15	–10	dBm
	3rd to 13th	3fo to 13fo		—	–15	–10	
Output power		P_{OUT}	V_{CC} = 3.5 V $V_{PC} \leq$ 1.8 V T_{CASE} = +25 °C	32.0	32.9	—	dBm
Output power over extremes		P_{OUT}	V_{CC} = 2.9 V T_{CASE} = –20 to +85 °C	29	—	—	dBm
Input VSWR		Γ_{IN}	P_{IN} = 0 to 6 dBm P_{OUT} = 0 to 32 dBm V_{PC} controlled f = 1710–1785 MHz	—	1.5:1	2.3:1	—
Forward isolation		$P_{OUT\ STANDBY}$	P_{IN} = –10 dBm $V_{PC} = V_{THRESHOLD}$ – 10 mV PA Enable > 1.2 V	—	—	–32	dBm
Noise power		P_{NOISE}	fo + 20 MHz RBW = 100 kHz V_{CC} = 3.5 V 2 dBm ≤ P_{OUT} ≤ 32 dBm T_{CASE} = +25 °C	—	—	–79	dBm
			925 to 960 MHz RBW = 100 kHz V_{CC} = 3.5 V 2 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–85	
Spurious		Spur	V_{PC} = controlled $P_{IN} = P_{IN\_LOW\_MIN}$ to P_{IN_MAX} $P_{OUT} = P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 8:1 all phase angles	No parasitic oscillation > –36 dBm			
Load mismatch		Load	V_{PC} = controlled $P_{IN} = P_{IN\_LOW\_MIN}$ to P_{IN_MAX} $P_{OUT} = P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 10:1 all phase angles	No module damage or permanent degradation			
Maximum controlled P_{OUT} at P_{IN_LOW}		P_{OUT}	P_{IN} = –10 dBm V_{PC} = controlled T_{CASE} = –20 to +85 °C	10	—	—	dBm

Table 3. SKY77331 Electrical Specifications [1] *(6 of 7)*

DCS1800 TX Mode [continued]							
Parameter		**Symbol**	**Test Condition [2]**	**Minimum**	**Typical**	**Maximum**	**Units**
Minimum controlled P_{OUT} at P_{IN_LOW}		$P_{OUT\_MIN\_CTRL}$	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ T_{CASE} = –20 to +85 °C	—	—	–30	dBm
PCS1900 TX Mode							
Parameter		**Symbol**	**Test Condition**	**Minimum**	**Typical**	**Maximum**	**Units**
Frequency range		f		1850	—	1910	MHz
Input power	Normal	P_{IN}	P_{OUT} ≥ 10 dBm	0	—	6	dBm
	For low P_{OUT}	P_{IN_LOW}	P_{OUT} < –15 dBm	–15	–10	—	
Analog amplitude control voltage (allowable input range)		V_{PC}		0	—	2.5	V
Power Added Efficiency	PCS rated power	$PAE_{\_PCS\_1900}$	V_{CC} = 3.5 V P_{OUT} = 32 dBm V_{PC} ≤ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	40	43	—	%
	EDGE rated power	$PAE_{\_EDGE\_1900}$	V_{CC} = 3.5 V P_{OUT} = 28 dBm V_{PC} ≤ 1.7 V PA Enable > 1.2 V pulse width = 577.05 µs duty cycle = 12.5% T_{CASE} = +25 °C	23	27	—	
Harmonics	2nd	$2f_0$	BW = 3 MHz P_{OUT} ≤ 32 dBm	—	–15	–10	dBm
	3rd to 13th	$3f_0$ to $13f_0$		—	–15	–10	
Output power		P_{OUT}	V_{CC} = 3.5 V V_{PC} ≤ 1.8 V T_{CASE} = +25 °C	32.0	32.8	—	dBm
Output power over extreme		P_{OUT}	V_{CC} = 2.9 V T_{CASE} = –20 to +85 °C	29	—	—	dBm
Input VSWR		Γ_{IN}	P_{IN} = 0 to 6 dBm P_{OUT} = 2 to 32 dBm V_{PC} controlled f = 1850–1910 MHz	—	1.5:1	2.3:1	–
Forward isolation		$P_{OUT\_STANDBY}$	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ – 10 mV PA_Enable > 1.2 V	—	—	–32	dBm
Noise power		P_{NOISE}	f_0 + 20 MHz RBW = 100 kHz V_{CC} = 3.5 V 2 dBm ≤ P_{OUT} ≤ 32 dBm T_{CASE} = +25 °C	—	—	–79	dBm
			869 to 894 MHz RBW = 100 kHz V_{CC} = 3.5 V 6.5 dBm ≤ P_{OUT} ≤ 34.5 dBm T_{CASE} = +25 °C	—	—	–85	

Table 3. SKY77331 Electrical Specifications [1] *(7 of 7)*

PCS1900 TX Mode [continued]						
Parameter	**Symbol**	**Test Condition**	**Minimum**	**Typical**	**Maximum**	**Units**
Spurious	Spur	V_{PC} = controlled P_{IN} = $P_{IN\_LOW\_MIN}$ to P_{IN_MAX} P_{OUT} = $P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 8:1 all phase angles	No parasitic oscillation > –36 dBm			
Load mismatch	Load	V_{PC} = controlled P_{IN} = min. to max. P_{OUT} = $P_{OUT\_MIN\_CTRL}$ to P_{OUT} V_{CC} = 2.9 to 4.8 V load VSWR = 10:1 all phase angles	No module damage or permanent degradation			
Maximum controlled P_{OUT} at P_{IN_LOW}	P_{OUT}	P_{IN} = –10 dBm V_{PC} = controlled T_{CASE} = –20 to +85 °C	10	—	—	dBm
Minimum controlled P_{OUT} at P_{IN_LOW}	P_{OUT}	P_{IN} = –10 dBm V_{PC} = $V_{THRESHOLD}$ T_{CASE} = –20 to +85 °C	—	—	–30	dBm
Coupler Section (Coupler specified standalone with 50 Ω terminations.)						
Parameter	**Symbol**	**Test Condition**	**Minimum**	**Typical**	**Maximum**	**Units**
Frequency	f	—	824	—	1910	MHz
Coupling factor	C	T_{CASE} = –20 to +85 °C, 824–849 MHz	—	—	—	dB
		T_{CASE} = –20 to +85 °C, 880–925 MHz	—	—	—	
		T_{CASE} = –20 to +85 °C, 1710–1785 MHz	—	—	—	
		T_{CASE} = –20 to +85 °C, 1850–1910 MHz	19	20	24	
Coupling factor variation vs. frequency within each band	C	T_{CASE} = –20 to +85 °C, 824–849 MHz	—	—	0.5	dB
		T_{CASE} = –20 to +85 °C, 880–925 MHz	—	—	0.5	
		T_{CASE} = –20 to +85 °C, 1710–1785 MHz	—	—	1.0	
		T_{CASE} = –20 to +85 °C, 1850–1910 MHz	—	—	1.0	
Coupler isolation from module output port to coupler output port	I	T_{CASE} = –20 to +85 °C, 824–849 MHz	35	38	—	dB
		T_{CASE} = –20 to +85 °C, 880–925 MHz				
		T_{CASE} = –20 to +85 °C, 1710–1785 MHz				
		T_{CASE} = –20 to +85 °C, 1850–1910 MHz				

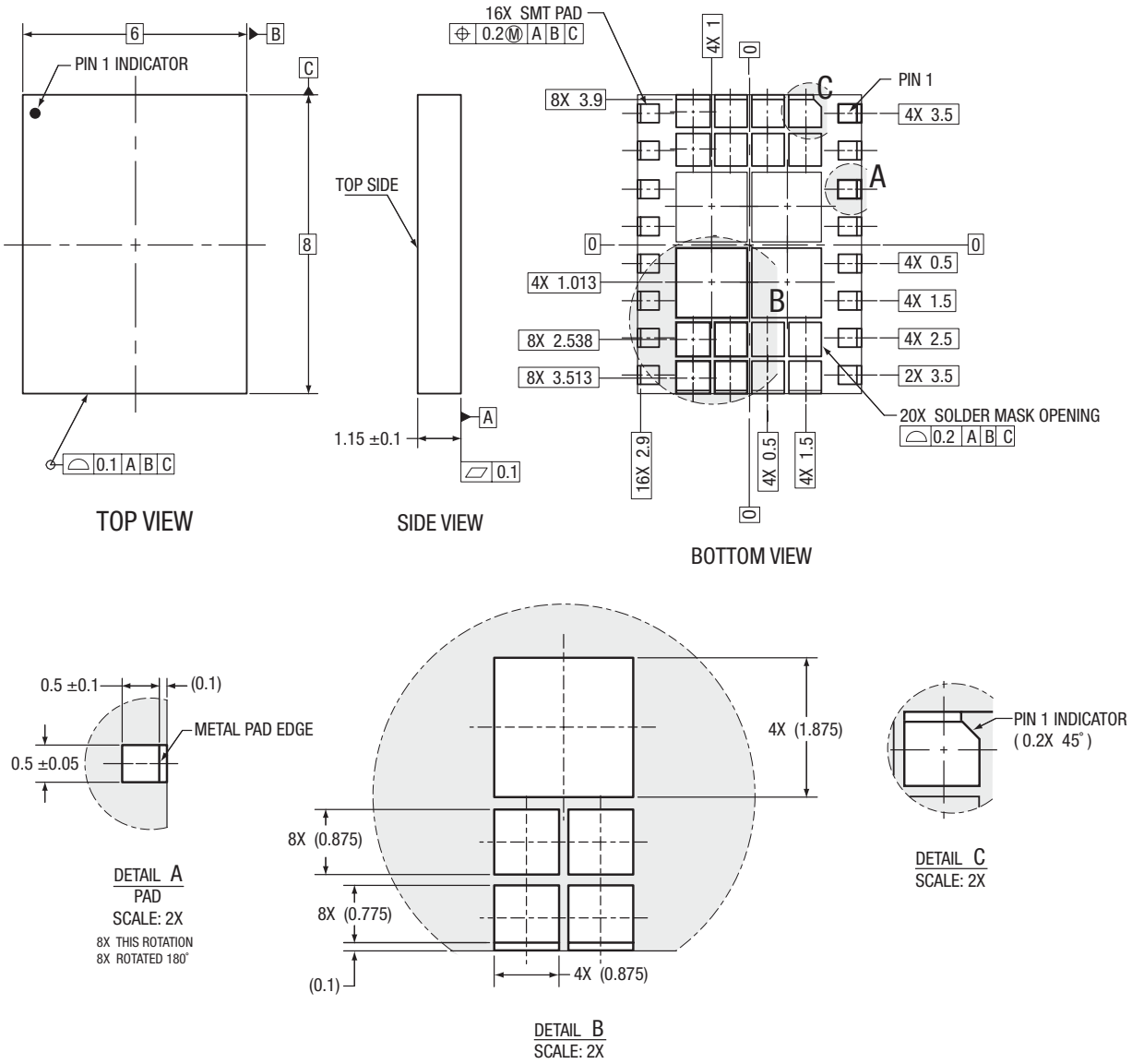
[1] All electrical specifications apply over these conditions unless otherwise specified:
T_{CASE} = –20 °C to max. operating temp
ZS = ZL = 50 Ω
pulse width = 577.05 µs
duty cycle = 12.5%
V_{CC} = 2.9 to 4.8 V
Normal input power (P_{IN}) = 0 to +6 dBm

[2] Threshold is defined as the point where output power crosses –30 dBm

Package Dimensions and Pad Descriptions

Figure 2 is a mechanical diagram of the pad layout for the SKY77331, a 16-pad leadless quad-band PA module. Figure 3 provides a recommended phone board layout footprint for the PAM to help the designer attain optimum thermal conductivity, good grounding, and minimum RF discontinuity for the 50-ohm terminals.

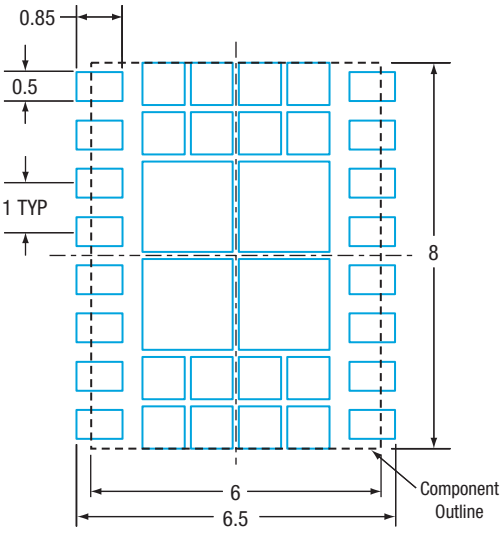
Figure 4 shows the device pad configuration and numbering convention, which starts with pad 1 at the upper left, as indicated, and increments counter-clockwise around the package. Table 4 lists the pad names and signal descriptions. Figure 5 interprets typical case markings.



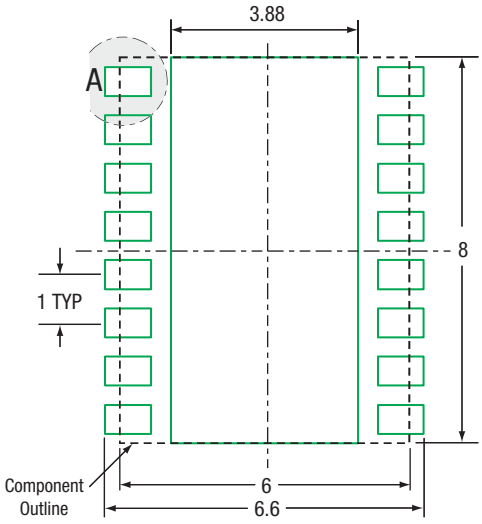
NOTES: Unless otherwise specified.
1. Dimensioning and Tolerancing in accordance with ASME Y14.5M–1994.
2. Pads are solder mask defined on 3 edges.

200015_003

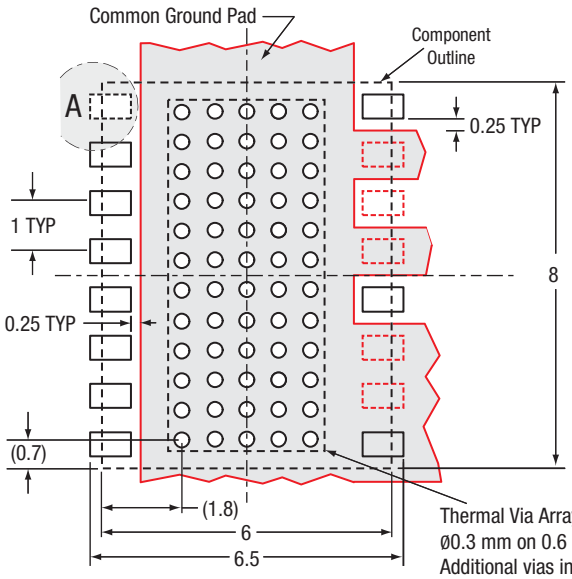
Figure 2. SKY77331 16-Pad MCM Package Dimensional Drawing



STENCIL APERTURE
TOP VIEW
(0–20% reduction of openings
for Center Ground Pads by area.
Shown same as package footprint.)

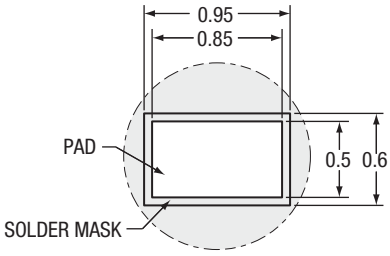


SOLDER MASK OPENING
TOP VIEW



METALLIZATION
TOP VIEW

Thermal Via Array (12 rows x 5 columns)
ø0.3 mm on 0.6 mm Pitch
Additional vias in Common Ground Pad
will improve thermal performance.
NOTE: Thermal vias should be
tented and filled with solder
mask 30-35 µm Cu plating recommended.



DETAIL A
16X

ALL DIMENSIONS IN MILLIMETERS

200015_004

Figure 3. PCB Symbol for 6 x 8 mm Package with Grid Center Ground Pad – SKY77331 Specific

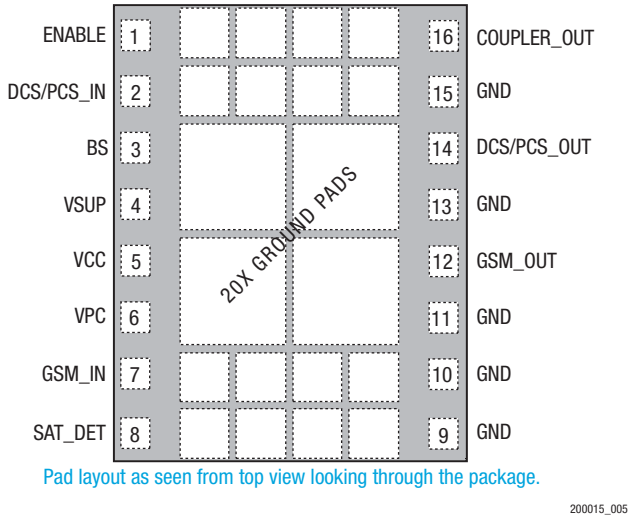


Figure 4. SKY77331 PAM Pad Configuration – 16-Pad Leadless (Top View)

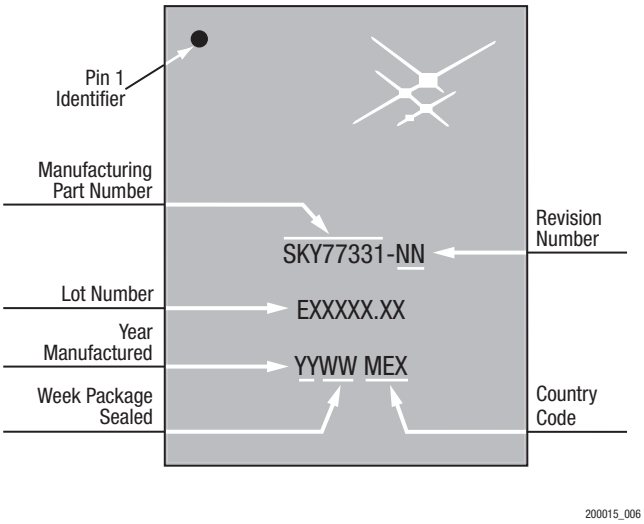


Figure 5. Typical Case Markings

Table 4. SKY77331 Pad Names and Signal Descriptions

PAD #	NAME	DESCRIPTION
1	ENABLE	PA Module Enable
2	DCS/PCS_IN	RF input 1710-1910 MHz (DCS1800/PCS1900)
3	BS	Band Select
4	VSUP	Supply Voltage for Module
5	VCC	Supply Voltage for Module
6	VPC	Analog Power Control voltage
7	GSM_IN	RF Input 824-925 MHz (GSM850/900)
8	SAT_DET	Saturation detection control output bit
9	GND	RF and DC ground
10	GND	RF and DC ground
11	GND	RF and DC ground
12	GSM_OUT	RF Output 824-925 MHz (GSM850/900)
13	GND	RF and DC ground
14	DCS/PCS_OUT	RF Output 1710-1910 MHz (DCS1800/PCS1900)
15	GND	RF and DC ground
16	COUPLER_OUT	RF Coupler Output
20x GROUND PAD	Ground Pad Grid (underside)	RF and DC ground

Package and Handling Information

Because of its sensitivity to moisture absorption, this device package is baked and vacuum-packed prior to shipment in accordance with IPC J-STD 033 guidelines. Instructions on the shipping container label are in accordance with IPC J-STD 020 regarding exposure to moisture after the container seal is broken. These instructions must be followed; otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY77331 is capable of withstanding an MSL3/250 °C solder reflow. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. If the part is attached in a reflow oven, the average temperature ramp-up rate should not exceed 3 °C per second; maximum temperature should not exceed 250 °C. If the part is manually attached, precaution should be taken to insure that the part is not subjected to temperatures exceeding 250 °C for more than 10 seconds. For details on attachment techniques, precautions, and handling procedures recommended by Skyworks, please refer to Skyworks Application Note: *PCB Design and SMT Assembly/Rework*, Document Number 101752. Additional information on standard SMT reflow profiles can also be found in the *JEDEC Standard J-STD–020*.

Production quantities of this product are shipped in the standard tape-and-reel format. For packaging details, refer to Skyworks Application Note: *Tape and Reel Information – RF Modules*, Document Number 101568.

Electrostatic Discharge Sensitivity

The SKY77331 is a Class I device. ESD testing was performed in compliance with IEC 61000-4-2 requirements.

Various failure criteria can be utilized when performing ESD testing. Many vendors employ relaxed ESD failure standards, which fail devices only after “the pad fails the electrical specification limits” or “the pad becomes completely non-functional”. Skyworks’ most stringent criteria fail devices as soon as the pad begins to show any degradation on a curve tracer.

To avoid ESD damage, both latent and visible, it is very important that the product assembly and test areas follow the Class-1 ESD handling precautions listed in Table 5.

Table 5. Precautions for Handling GaAs IC-based Products to Avoid Induced Damage

Personnel Grounding	Wrist Straps Conductive Smocks, Gloves and Finger Cots Antistatic ID Badges
Facility	Relative Humidity Control and Air Ionizers Dissipative Floors (less than 10^9 Ω to GND)
Protective Workstation	Dissipative Table Tops Protective Test Equipment (Properly Grounded) Grounded Tip Soldering Irons Conductive Solder Suckers Static Sensors
Protective Packaging and Transportation	Bags and Pouches (Faraday Shield) Protective Tote Boxes (Conductive Static Shielding) Protective Trays Grounded Carts Protective Work Order Holders

Ordering Information

Model Number	Manufacturing Part Number	Revision Level	Package	Operating Temperature
SKY77331	SKY77331–15	–15	6 x 8 x 1.2 mm	–20 °C to +100 °C

Revision History

Revision	Level	Date	Description
A		September 20, 2006	Initial Release

References

Application Note: Tape and Reel Information – RF Modules, Document Number 101568

Application Note: PCB Design and SMT Assembly/Rework, Document Number 101752

JEDEC Standard J–STD–020

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