

ADVANCE DATA SHEET

SKY77425 Front-End Module for CDMA (Tx 824-849 MHz), (Rx 869-894 MHz)

Applications

- Digital cellular (CMDA) handsets
- Wireless Local Loop (WLL)

Features

- Low quiescent current
 - 10 mA Low Mode
- Low current consumption
 - 500 mA @ 26.0 dBm
- Integrated Coupler
- 20-pad package
- Small profile
 - 4 mm x 7 mm x 1.1 mm
- Low voltage
 - 3.2 V to 4.2 V
- Digital enable pad
- Highly integrated, user friendly solution
- InGaP HBT
- Integrated interstage filter and duplexer
- Requires few external components

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



Description

The SKY77425 Front-End Module (FEM) is a fully matched, 20-pad surface mount module developed for CDMA applications. Small and efficient, this CDMA FEM integrates the interstage filter, the input matching, the power amplifier, the output matching, the directional coupler, and the duplexer into a single 4 mm x 7 mm x 1.1 mm package.

The SKY77425 meets the stringent spectral requirements of IS95/198 standards up to 26.0 dBm output power. The FEM includes an InGaP HBT PA incorporating three selectable bias levels to enhance the performance of the FEM at different power levels.

Integration of the RF front-end greatly simplifies the design of the handset radio as all critical matching between the interstage filter, PA, directional coupler, and duplexer is optimized within the module. By optimizing the efficiency of the InGaP HBT PA MMIC and reducing the RF loss between the integrated components, this FEM achieves current as low as 500 mA at maximum output power (26.0 dBm) that significantly improves the talk time of the CDMA handset. This small package uses Skyworks' low cost, multi-laminate substrate technology and is approximately half the size of individually packaged component solutions. The SKY77425 front-end module can save handset designers significant board space and design-cycle time.

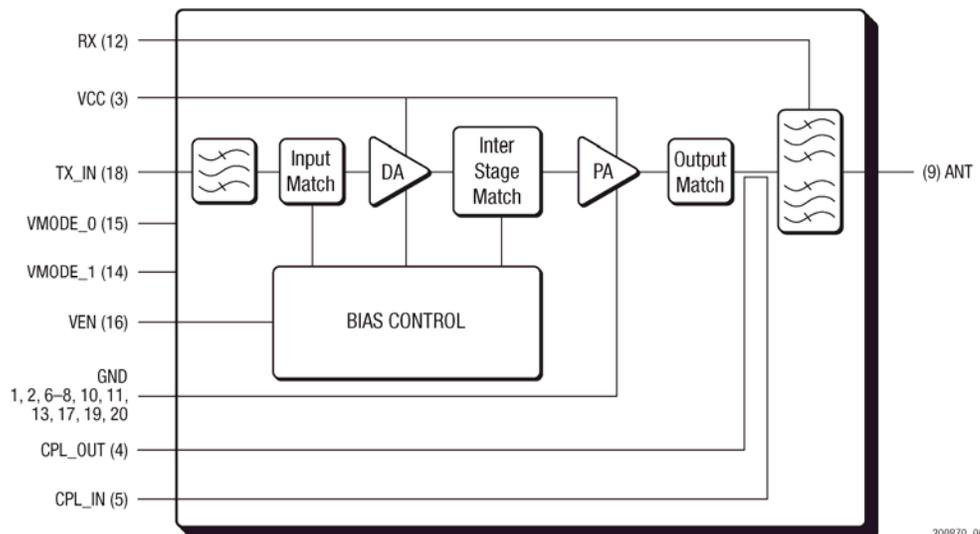


Figure 1. Functional Block Diagram

Electrical Specifications

The following tables list the electrical characteristics of the SKY77425 Front-End Module for CDMA. [Table 1](#) lists the absolute maximum ratings; [Table 2](#) specifies the recommended operating

conditions necessary for achieving the electrical performance listed in [Table 3](#).

Table 1. Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Nominal	Maximum	Unit	
RF Input Power	Pin	—	0.0	10.0	dBm	
Supply Voltages	No RF	Vcc	—	3.4	6.0	Volt
	With RF		—	3.4	4.7	Volt
Mode Control Voltage	Vmode_0, Vmode_1	—	2.6	3.0	Volts	
Enable Control Voltage	VEN	—	2.6	3.0	Volt	
Temperatures	Operating	Tcase	-20	25	85	°C
	Storage	Tstg	-55	—	125	

¹ No damage assuming only one parameter at a time is set to limit with all other parameters set at nominal values.

Table 2. Recommended Operating Conditions

Parameter	Symbol	Minimum	Nominal	Maximum	Unit	
Tx Channel Center Frequency	Ftx	824.7	836.52	848.31	MHz	
Rx Channel Center Frequency	Frx = Ftx + 45 MHz	869.7	881.52	893.31	MHz	
Supply Voltage	Vcc	3.2	3.4	4.2	Volt	
Mode Control	HPM	Vmode_0	2.0	2.6	3.0	Volt
		Vmode_1	0.0	0.0	0.5	
	MPM	Vmode_0	2.0	2.6	3.0	
		Vmode_1	2.0	2.6	3.0	
	LPM	Vmode_0	0.0	0.0	0.5	
		Vmode_1	0.0	0.0	0.5	
Enable Control Setting	Disabled	VEN_L	0.0	0.0	0.5	Volt
	Enabled	VEN_H	2.0	—	3.0	
Operating Temperature	Tcase	-30	25	85	°C	

Table 3. Electrical Specifications for Nominal Operating Conditions ¹

CDMA (Code Division Multiple Access)							
Characteristic	Symbol	Conditions	Minimum	Typical	Maximum	Unit	
Linear Output Power	PO_HIGH	HPM V _{CC} = 3.4 V...4.2 V T _{CASE} = 25 °C...60 °C	26	—	—	dBm	
	PO_MID4	MPM	16	—	—		
	PO_LOW	LPM	7	—	—		
Gain	High Power	G _{HIGH}	V _{CC} = 3.4 V P _{O_HIGH} T _{CASE} = 25 °C	—	26	—	dB
	Mid Power	G _{MID}	V _{CC} = 3.4 V P _{O_MID} T _{CASE} = 25 °C	—	20	—	
	Low Power	G _{LOW}	V _{CC} = 3.4 V P _{O_LOW} T _{CASE} = 25 °C	—	15	—	
Gain Flatness Over Frequency	ΔG _{PWR}	P _O = fixed HPM, MPM, LPM	-2	—	2	dB	
Current Consumption	High Power	I _{CC}	V _{CC} = 3.4 V P _{O_HIGH} = 26 dBm T _{CASE} = 25 °C	—	500	—	mA
	Mid Power		V _{CC} = 3.4 V P _{O_MID} = 13 dBm T _{CASE} = 25 °C	—	50	—	
	Low Power		V _{CC} = 3.4 V P _{O_LOW} = 0 dBm T _{CASE} = 25 °C	—	25	—	
Power Added Efficiency	High Power	PAE _{HIGH}	HPM V _{CC} = 3.4 V P _O = 26 dBm	—	22	—	%
Error Vector Magnitude		EVM	—	—	7	%	
Adjacent Channel Power ratio ²	5 MHz	ACP1	HPM	—	-50	-45	dBc
	10 MHz	ACP2		—	-58	-53	
Harmonic Suppression			HPM BW = 1 MHz	—	-58	-45	dBc
Tx Power in Rx Port		NRx	—	—	-22	dBm	
Input Voltage Standing Wave Ratio		VSWR	—	—	2:1		
Quiescent Current		I _{CC}	LPM	—	10	—	mA
Control Current			—	—	1.5	mA	
Digital Enable Current		I _{EN}	—	—	1.5	mA	
Leakage Current		I _{LEAK}	V _{EN} = 0.5 V V _{MODE_0} , V _{MODE_1} = 0 V	—	—	15	μA
Stability (spurious output)		S	10:1 VSWR, all phases	—	—	-90	dBc
Ruggedness		R _u	P _O = 26 dBm	10:1	—	—	
RxBN			—	—	-178	—	dBm/Hz

¹ Unless otherwise specified: V_{CC} = 3.4 V, Temp. = 25 °C.

² ACP is specified per RC1 as the ratio of the total in-band power (1.23 MHz BW) to adjacent power in a 30 kHz BW.

Table 4. Electrical Specifications for Power Coupler

Antenna to Coupled Port						
Characteristic	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Coupling Factor	CPL	—	—	22	—	dB

Table 5. Nominal Duplexer Performance

Antenna to Rx Parameter						
Characteristic	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Insertion Loss	IL _{Rx}	869 MHz to 894 MHz	—	—	2.8	dB
Attenuation		DC to 12750 MHz	20.0	—	—	dB
		824 MHz to 849 MHz	35.0	—	—	
		1850 MHz to 1910 MHz	35.0	—	—	
		2400 MHz to 2484 MHz	35.0	—	—	
		1738 MHz to 1788 MHz	30.0	—	—	
		1850 MHz to 1910 MHz	30.0	—	—	
		2607 MHz to 2682 MHz	30.0	—	—	
		3476 MHz to 3576 MHz	30.0	—	—	
VSWR		—	—	—	2.0	
Input		—	—	—	30.0	dBm

Evaluation Board Description

The evaluation board is a platform for testing and interfacing design circuitry. To accommodate the interface testing of the SKY77425, the evaluation board schematic and assembly

diagrams are included for preliminary analysis and design. [Figure 2](#) is the basic schematic for the board assembly which appears in [Figure 3](#).

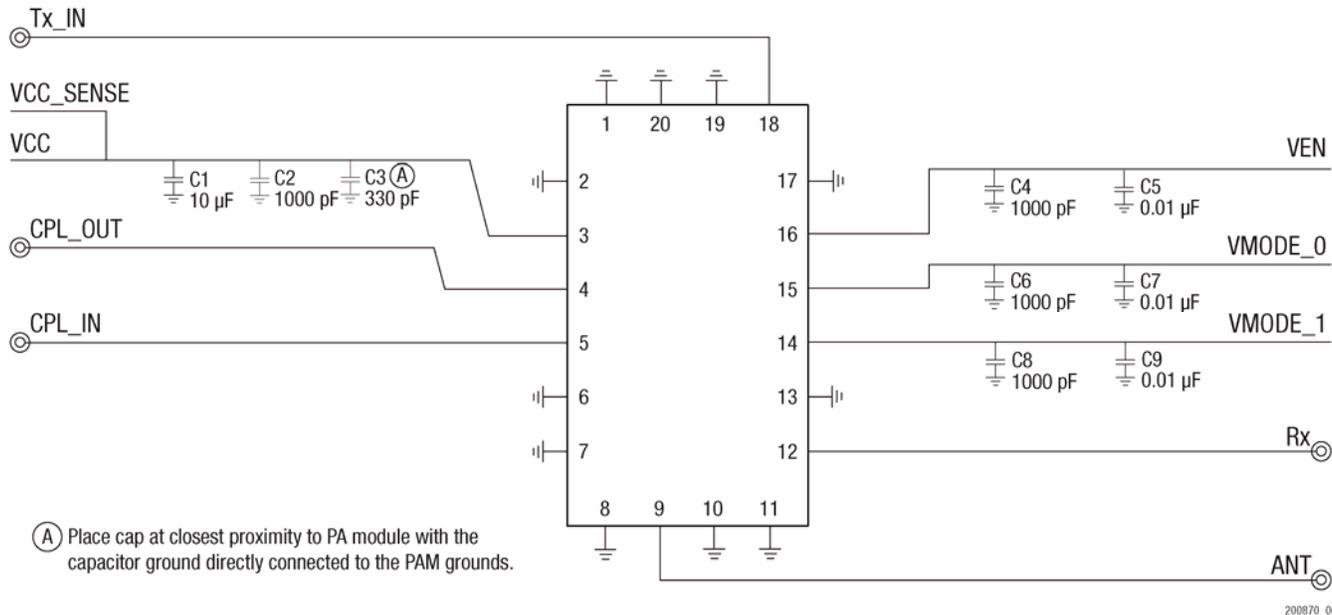


Figure 2. Evaluation Board Schematic Diagram

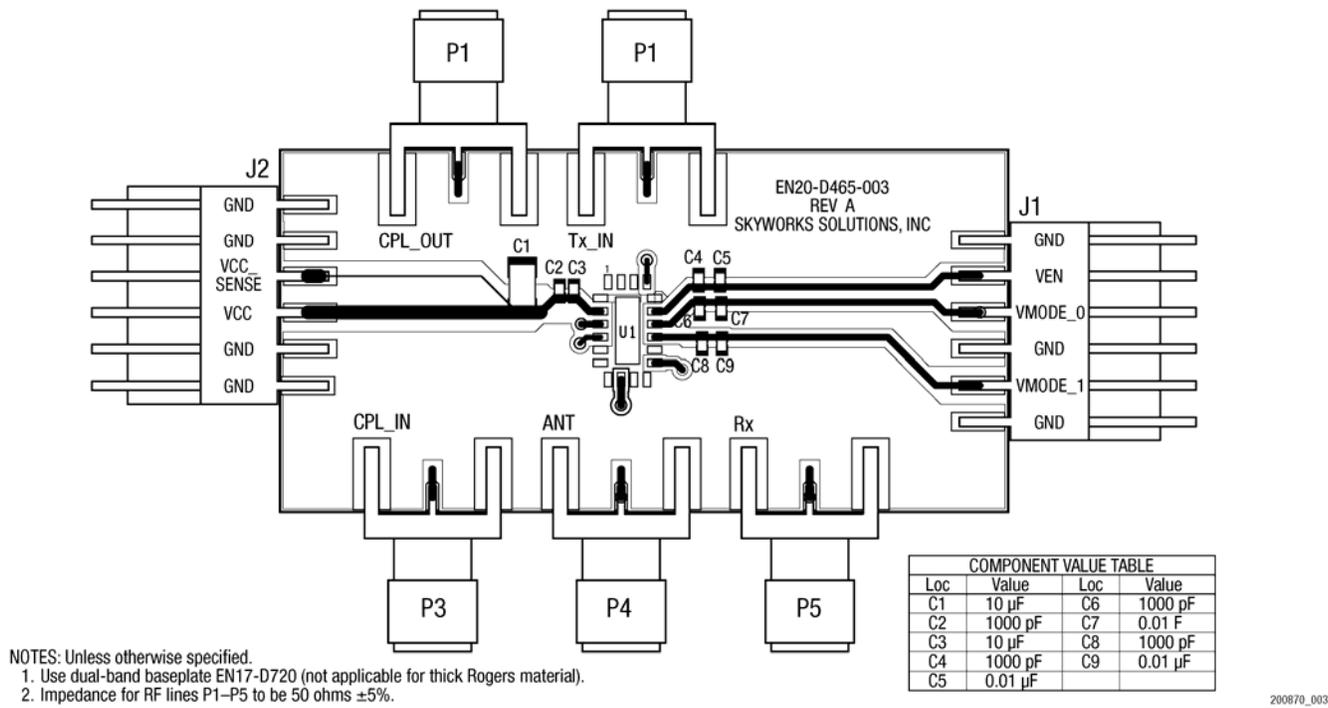
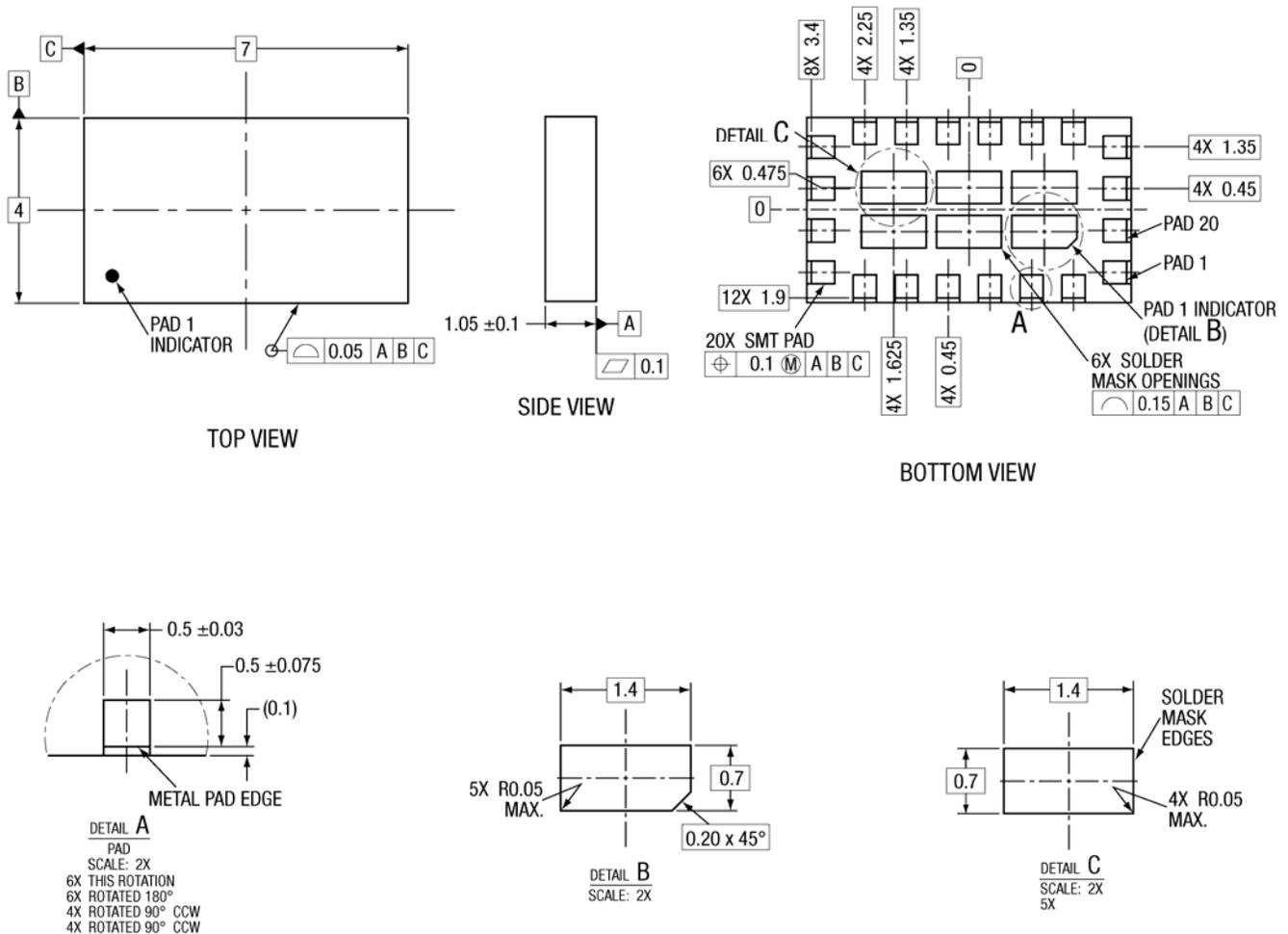


Figure 3. Evaluation Board Assembly Diagram

Package Dimensions

The SKY77425 is a multi-layer laminate base, overmold encapsulated modular package designed for surface-mounted solder attachment to a printed circuit board. Figure 4 is a mechanical drawing of the pad layout for this package. Figure 5

provides a recommended phone board layout footprint for the FEM to help the designer attain optimum thermal conductivity, good grounding, and minimum RF discontinuity for the 50 ohm terminals.

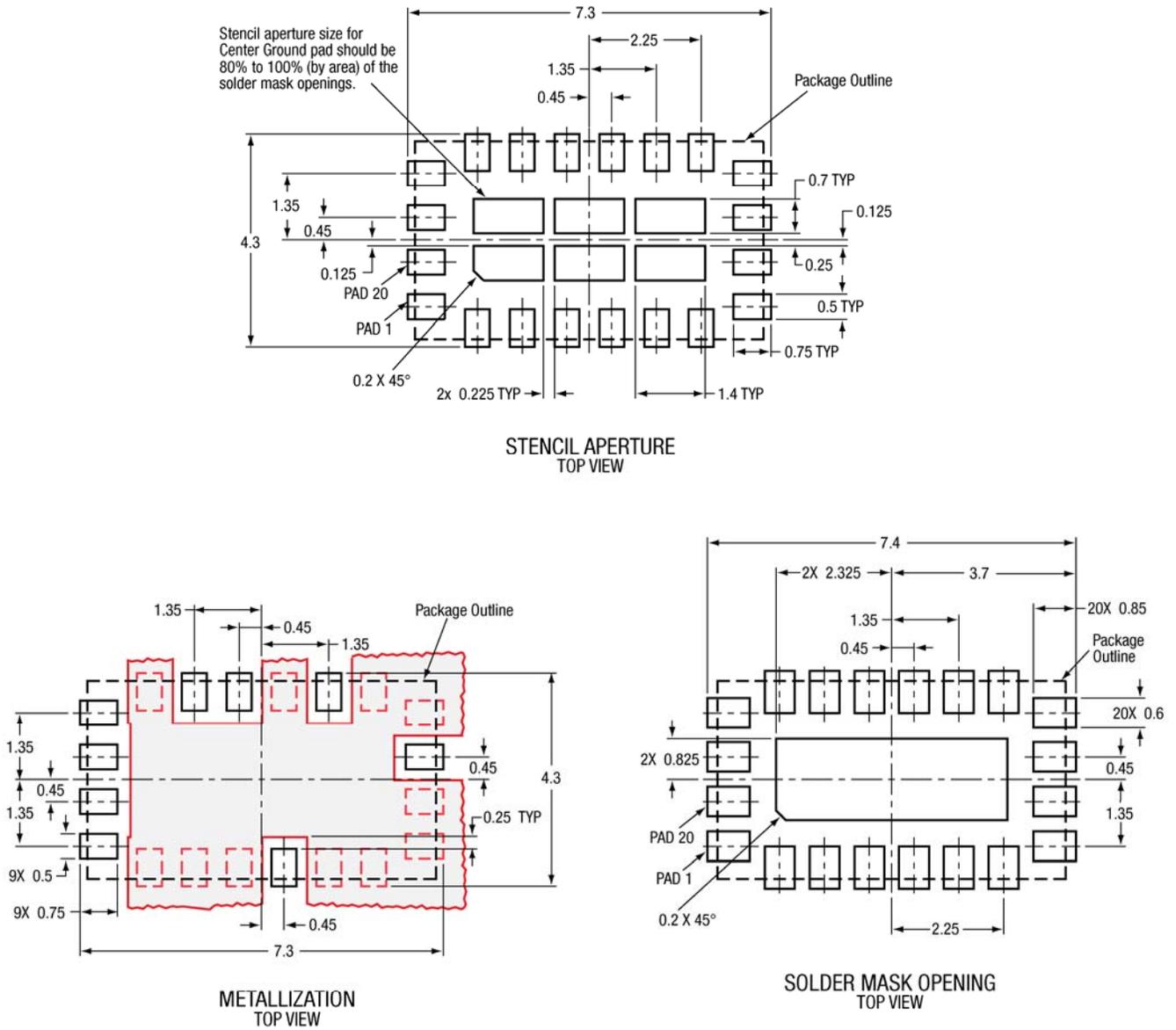


NOTES: Unless otherwise specified.

1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5-1994
2. SEE APPLICABLE BONDING DIAGRAM AND DEVICE ASSEMBLY DRAWING FOR DIE AND COMPONENT PLACEMENT.
3. PAD DEFINITIONS PER DETAILS ON DRAWING.
4. PCB TYPE 4L PP TEV MCM (150)
5. ALL DIMENSIONS ARE IN MILLIMETERS.

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Figure 4. Dimensional Diagram for 4 x 7 x 1.1 mm, 20-Pad Package (All Views) – SKY77425



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 1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5M-1994
 2. ALL DIMENSIONS ARE IN MILLIMETERS.

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Figure 5. Phone PCB Layout Footprint for 4 x 7 x 1.1 mm, 20-Pad Package — SKY77425

Pad Configuration and Descriptions

Figure 6 shows each pad name and the pad numbering convention, which starts with pad 1, in the upper left as indicated, and increments counter-clockwise around the package. Figure 7 illustrates typical case markings.

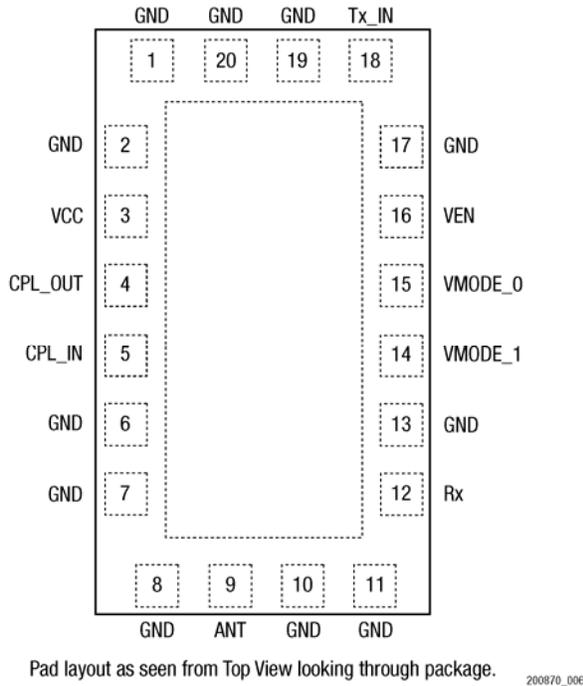


Figure 6. SKY77425 Pad Configuration – (Top View)

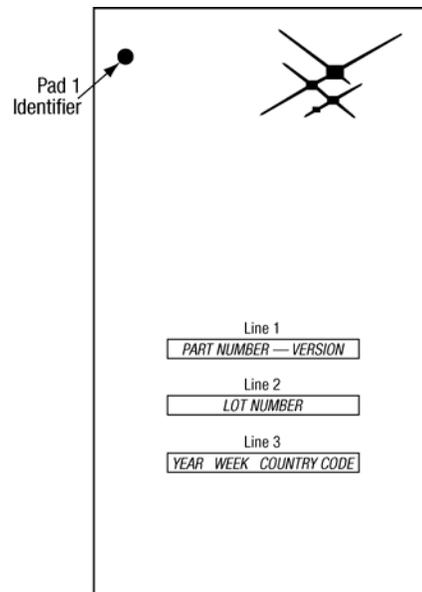
Package and Handling Information

Because of its sensitivity to moisture absorption, this device package is baked and vacuum-packed prior to shipment. Instructions on the shipping container label must be followed regarding exposure to moisture after the container seal is broken, otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY77425 is currently qualified for MSL3/260 °C. 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 temperature ramp rate should not

exceed 3 °C per second; maximum temperature should not exceed 260 °C. If the part is manually attached, precaution should be taken to insure that the part is not subjected to temperatures exceeding 260 °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 – RF Modules*, Document Number 101568.



NOTE: SKY77425
Lines 1, 2, 3 have a maximum of 11 characters
YEAR = Year of Manufacture
WEEK = Week Package Was Sealed
Country Code = Country of Manufacture (MX)

Figure 7. Typical Case Markings (Top View)

Ordering Information

Model Number	Manufacturing Part Number	Product Revision	Package	Operating Temperature
SKY77425	SKY77425		MCM 4x7x1.2 mm	-30 °C to 85 °C

Revision History

Revision	Level	Date	Description
A		April 3, 2008	Initial Release - Advance Information

References

Application Note: Tape and Reel – 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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