

DATA SHEET

SKY65343-11: 2.4 GHz Transmit/Receive Front-End Module

Applications

- 2.4 GHz ISM band radios
- ZigBee® FEMs
- IEEE 802.15.4 applications

Features

- Transmit output power > +20 dBm
- Bidirectional path NF < 1.6 dB
- High efficiency PA
- Programmable transmit power levels
- Configurable transmit/bidirectional paths
- Internal switching and control circuits
- Internal RF match and bias circuits
- Single DC supply = 3.3 V
- Interfaces seamlessly with Ember EM250 and EM260 ZigBee transceivers
- All RF ports are internally DC blocked
- Small footprint, MCM (20-pin, 6 x 6 mm) SMT package (MSL3, 260 °C per JEDEC J-STD-020)

Description

Skyworks SKY65343-11 is a high-efficiency Front-End Module (FEM) for ZigBee and other 2.4 GHz ISM band applications. The small, 6 x 6 mm Multi-Chip Module (MCM) contains a 2400 to 2500 MHz high-efficiency transmit path and a low-loss bidirectional path. The bidirectional path can be used to directly connect the antenna port to a directional RF port.

The transmit path consists of an harmonic filter and high efficiency Power Amplifier (PA) capable of providing +20 dBm of power at the antenna port. Also included is an internal balun to allow use of differential input signals.

The bidirectional path contains a high isolation transmit/receive (T/R) switch and balun for low-noise differential output. The bidirectional path can be used for either transmit or receive.

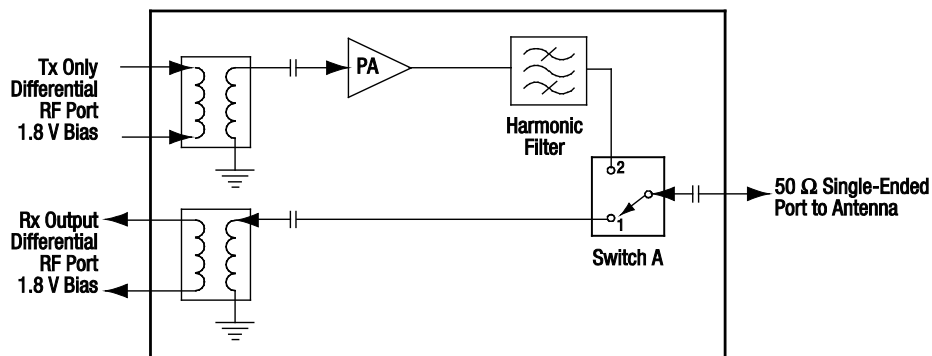
The differential output receiver port is bidirectional and can be used to operate the module in a low-power transmit mode.

The device is mounted in a 20-pin, 6 x 6 mm MCM Surface-Mounted Technology (SMT) package, which allows for a highly manufacturable low-cost solution.

A block diagram of the SKY65343-11 is shown in Figure 1. The device package and pinout for the 20-pin MCM are shown in Figure 2.



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



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Figure 1. SKY65343-11 Block Diagram

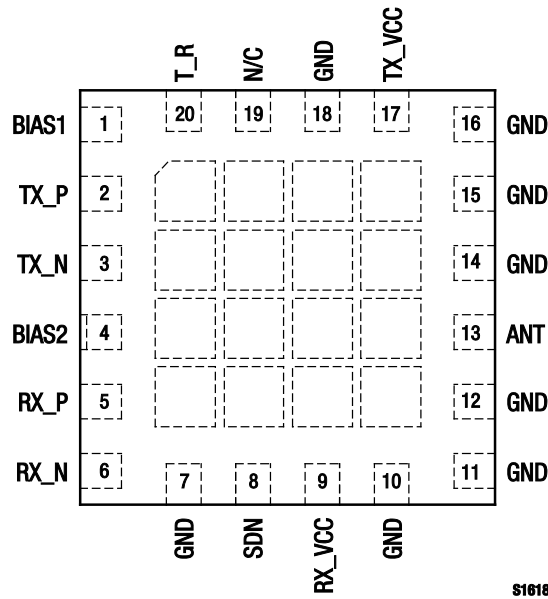


Figure 2. SKY65343-11 Pinout – 20-Pin MCM (Top View)

Technical Description

Shut Down and T/R Switch Mode Control

Pin 8 (SDN) is used to enable the device while pin 20 (T_R) enables transmit or receive mode. The following control logic is used to configure the transmit, receive, or shut down mode of the SKY65343-11:

SDN (Pin 8)	T_R (Pin 20)	Mode
High	High	Transmit mode
High	Low	Receive mode
Low	Low	Shut Down mode

Bottom Center Paddle

The bottom center paddles must be electrically grounded for proper RF performance. Customers should place adequate thermal vias under the ground paddles for optimum thermal performance. The Evaluation Board layout can be used as a guide for RF ground and thermal layout.

Electrical and Mechanical Specifications

Signal pin assignments and functional pin descriptions are described in Table 1. The absolute maximum ratings of the

SKY65343-11 are provided in Table 2. The recommended operating conditions are specified in Table 3 and electrical specifications are provided in Table 4.

Typical performance characteristics are illustrated in Figures 3 through 6.

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 SKY65343-11 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.

Table 1. SKY65343-11 Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	BIAS1	Transmit port bypass voltage	11	GND	Ground
2	TX_P	Positive transmit input port	12	GND	Ground
3	TX_N	Negative transmit input port	13	ANT	Antenna port
4	BIAS2	Receive port bypass voltage	14	GND	Ground
5	RX_P	Positive receive output port	15	GND	Ground
6	RX_N	Negative receive output port	16	GND	Ground
7	GND	Ground	17	TX_VCC	Transmit DC supply, +3.3 V
8	SDN	Shut down enable	18	GND	Ground
9	RX_VCC	Receive DC supply, +3.3 V	19	N/C	No connection
10	GND	Ground	20	T_R	Transmit/receive control

Note: The bottom ground pad **must be** connected to RF ground.

Table 2. SKY65343-11 Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	RX_VCC, TX_VCC	1.8	4.0	V
Control voltage	SDN, T_R		3.6	V
Bypass voltage	BIAS1, BIAS2		1.9	V
RF input power, antenna port	P _{IN_ANT}		2	W
RF input power, transmit port	P _{IN_TX}		+8	dBm
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. 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. SKY65343-11 Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Frequency range	f	2400		2500	MHz
Supply voltage (TX_VCC, RX_VCC)	VCC	2.7	3.3	3.6	V
Shut down and T/R control voltage:					
Low	T_RL, SDN _L		0	0.1	V
High	T_RH, SDN _H	1.62	1.80	3.60	V

Table 4. SKY65343-11 Electrical Specifications (Note 1)
(Vcc = 3.3 V, Tc = 25 °C, Pin = +3 dBm, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Frequency range	f		2400		2500	MHz
Return loss (Note 2)	RL	All RF ports	6	10		dB
Transmit differential port impedance (TX_P, TX_N) (Note 2)	Z _{DTX}			30 + j76		Ω
Receive differential port impedance (RX_P, RX_N) (Note 2)	Z _{DRX}			47 + j65		Ω
Transmitter Section						
Input power range	P _{IN}	CW		+3		dBm
Maximum saturated output power (Note 2)	P _{SAT}			+21.5		dBm
Transmit output power	P _{OUT}	CW	+19.5	+20.0		dBm
Operating current	I _{OP}	CW		110	140	mA
2 nd harmonic	P _{n2}	IEEE 802.15.4 OQPSK modulated		-53	-43	dBm
3 rd harmonic	P _{n3}	IEEE 802.15.4 OQPSK modulated		-63	-43	dBm
Small signal gain (Note 2)	G _H	P _{IN} = -10 dBm		20		dB
Spur (Note 2)		P _{IN} = +3 dBm, VSWR up to 10:1 (all phase angles)	No parasitic oscillation > -44 dBm			-
Ruggedness (Note 2)		P _{IN} = +3 dBm, VSWR up to 10:1 (all phase angles)	No module damage or permanent degradation			-
Bidirectional (Receive) Section						
Insertion loss	IL	CW		1.5	2.0	dB
Leakage current	I _{leak}	No RF input, VCC = 3.3 V, SDN = 0 V, T _R = 0 V		4	10	μA

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

Note 2: Parameter is characterized under the conditions in this Table, but is not production tested.

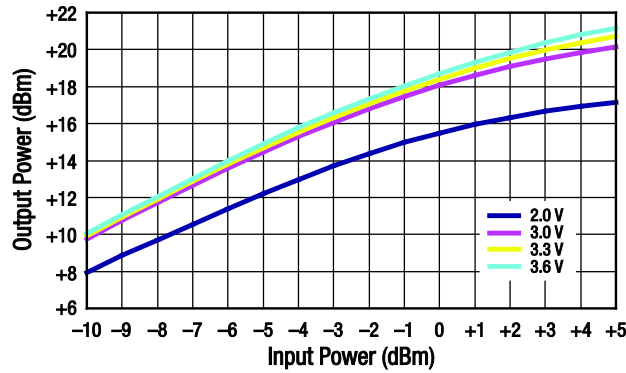


Figure 3. Output Power vs Input Power Across Vcc @ 2450 MHz (Tc = 25 °C)

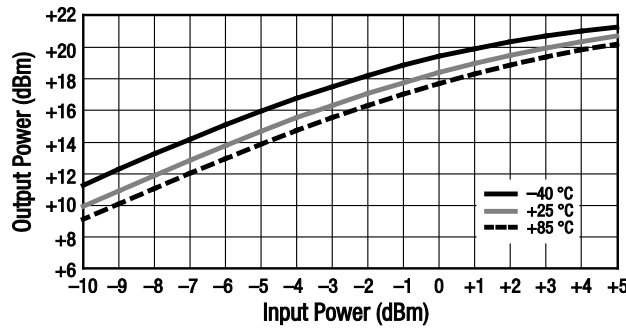


Figure 4. Output Power vs Input Power Across Temperature @ 2450 MHz (Vcc = 3.3 V)

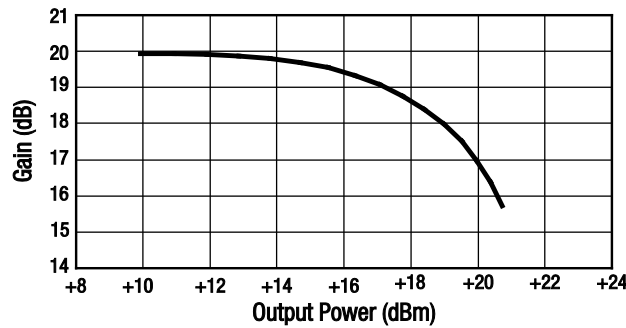


Figure 5. Gain vs Output Power @ 2450 MHz (Tc = 25 °C, Vcc = 3.3 V)

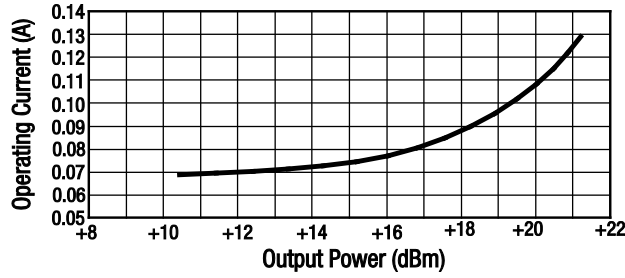


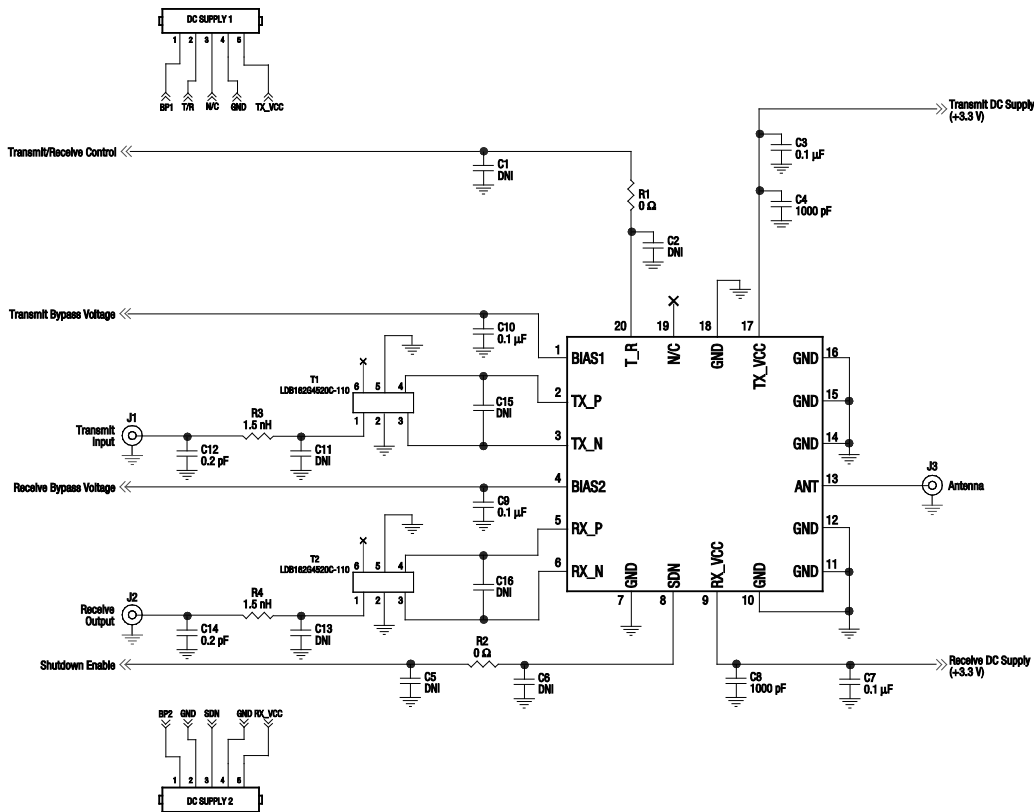
Figure 6. Transmit Operating Current vs Output Power @ 2450 MHz (Tc = 25 °C, Vcc = 3.3 V)

Evaluation Board Description

The SKY65343-11 Evaluation Board is used to test the performance of the SKY65343-11 FEM. The Evaluation Board schematic diagram is shown in Figure 7. An assembly drawing for the Evaluation Board is shown in Figure 8.

Package Dimensions

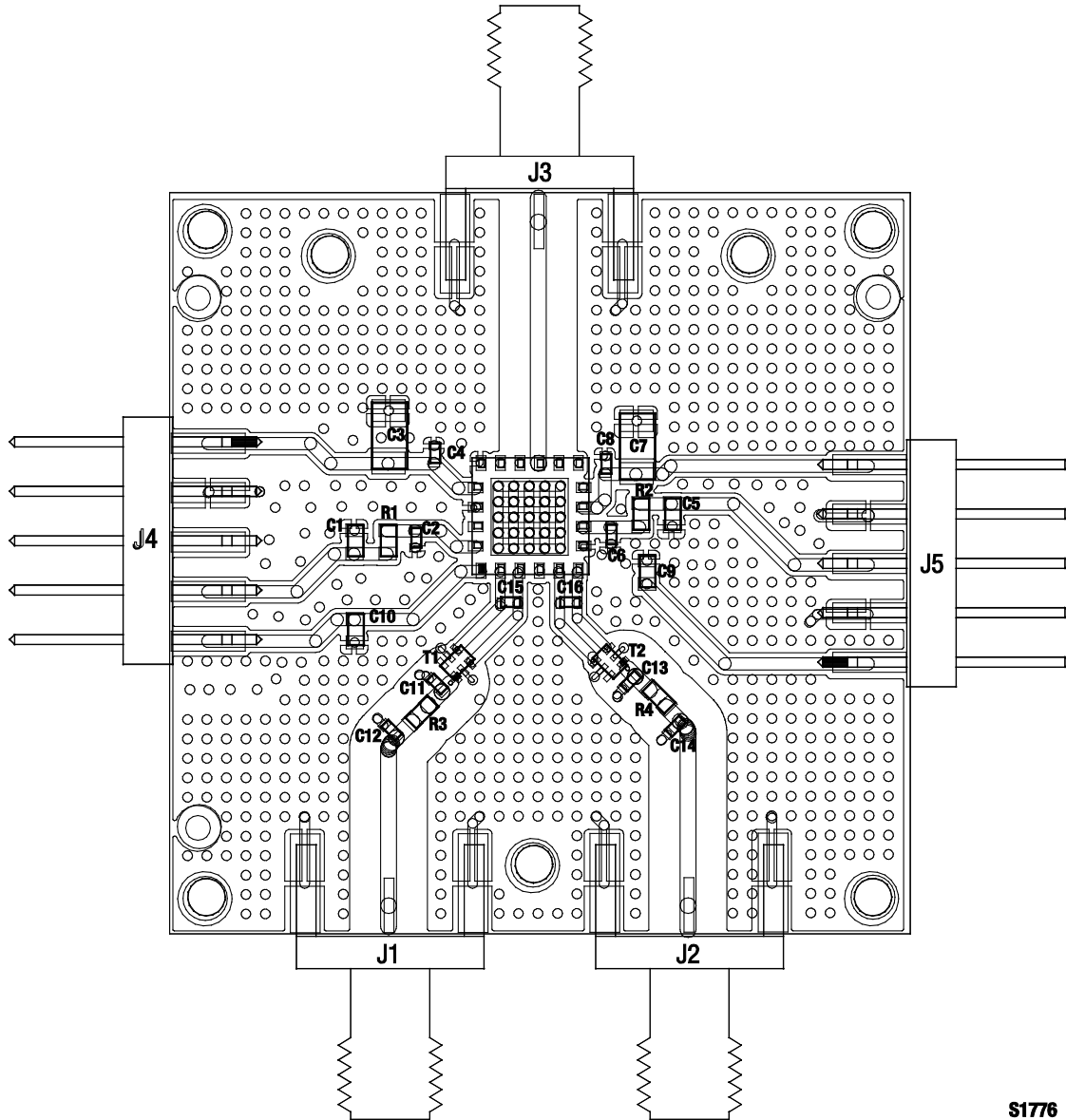
The phone board layout footprint for the SKY65343-11 is shown in Figure 9. Package dimensions for the 20-pin MCM are shown in Figure 10, and tape and reel dimensions are provided in Figure 11.



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.

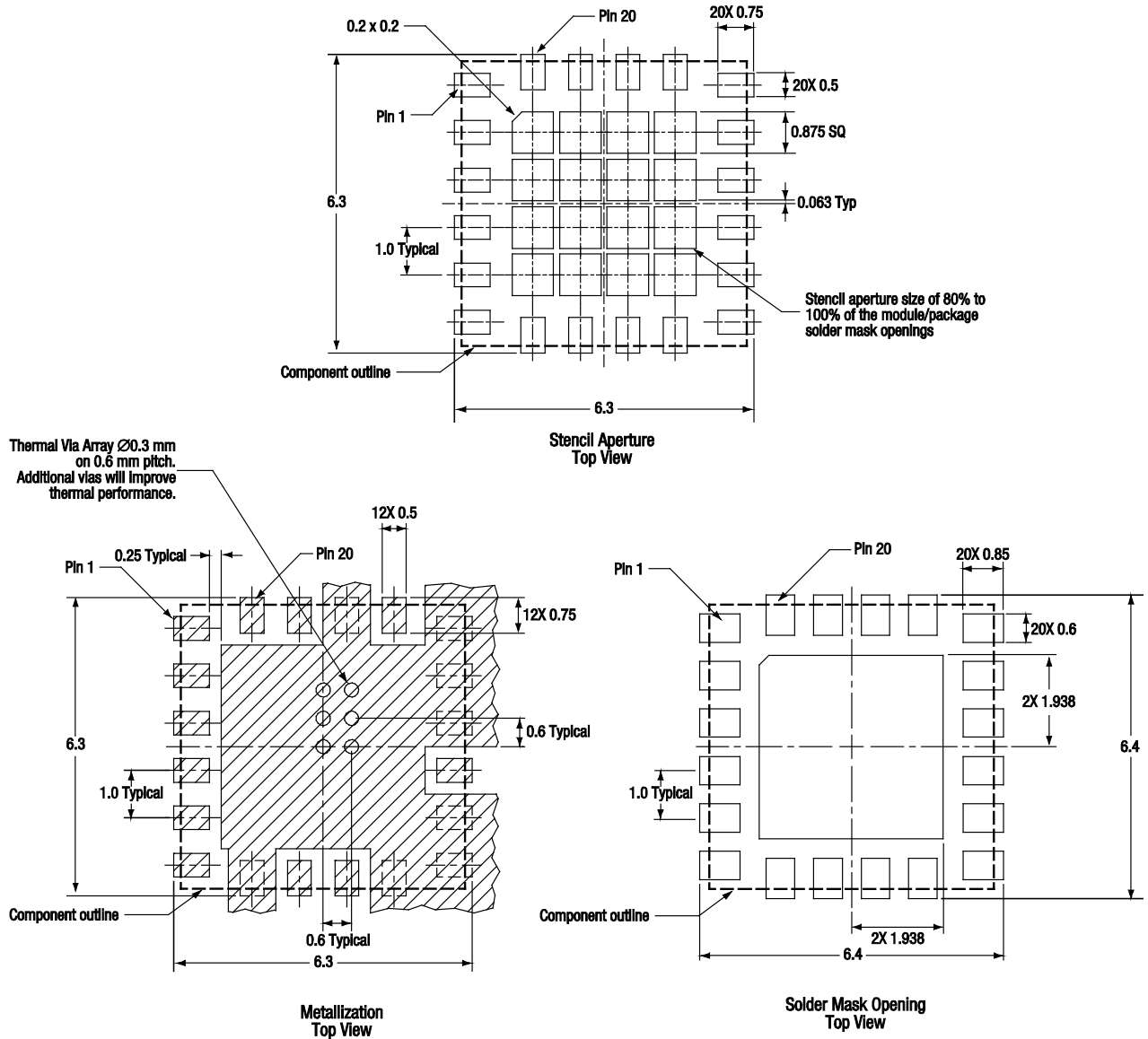
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Figure 7. SKY65343-11 Evaluation Board Schematic



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Figure 8. SKY65343-11 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 9. SKY65343-11 Phone Board Layout Footprint

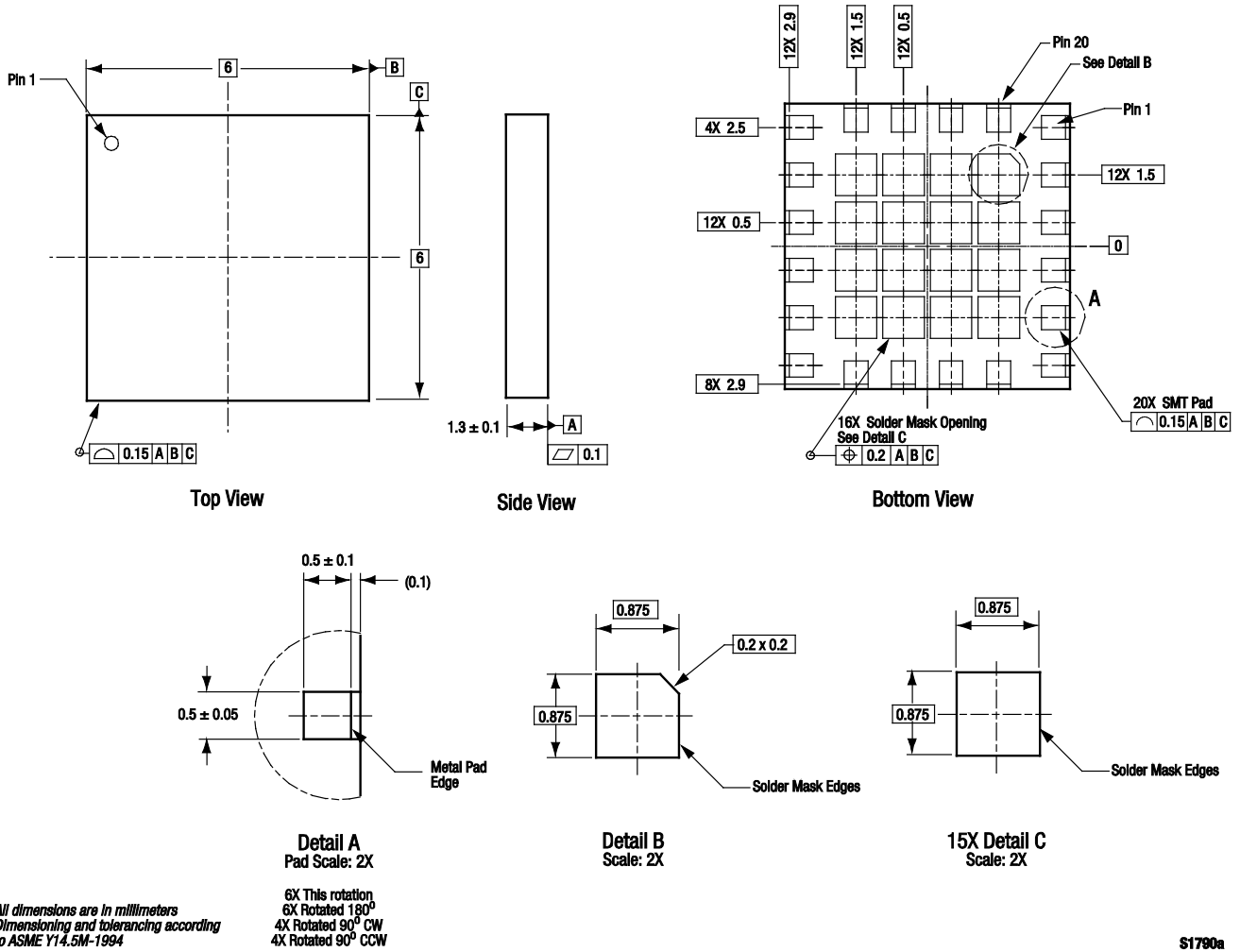
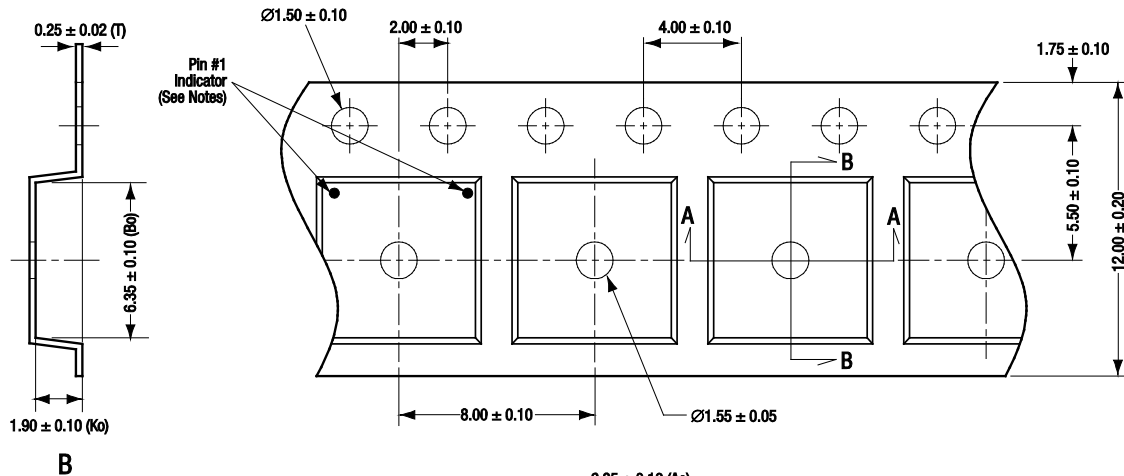


Figure 10. SKY65343-11 20-Pin MCM Package Dimensions



Notes:

1. Carrier tape: black conductive polystyrene
2. Cover tape material: transparent conductive PSA
3. Cover tape size: 9.3 mm width
4. All dimensions are in millimeters
5. A0 and B0 measurement point is 0.3 mm from bottom pocket
5. Pin 1 orientation is in top left corner for the following Skyworks products:

SKY65205-11
 SKY65208-11
 SKY65215-11

For all other 6 x 6 mm MCM/RFLGA products, pin 1 orientation is in top right corner.

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Figure 11. SKY65343-11 20-Pin MCM Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY65343-11 T/R Front-End Module	SKY65343-11	TW17-D755

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