

DATA SHEET
SE2568U: 2.4 GHz High Efficiency Wireless LAN PA

Applications

- IEEE802.11b DSSS WLAN
- IEEE802.11g OFDM WLAN
- IEEE802.11n OFDM WLAN
- General Applications

Features

- Dual Mode IEEE802.11b & IEEE802.11g
- Integrated PA, digital bias control, 50Ω input and output match, 3.2GHz TX Filter.
- Integrated harmonic filter.
- Integrated load insensitive Power Detector, with <1dB error at 2:1 mismatch
- 20 dBm, 802.11b, 11 Mbps, ACPR <-30 dBc, 3.3V
- 18dBm 802.11g, @ 3.0 % EVM, 54 Mbps, 3.3V
- 20.5dBm, 802.11g @ 3.0 % EVM, 54Mbps, 5.0V
- Lead free, Halogen free, ROHS compliant , 2 x2x0.5 mm QFN package, MSL 1

Product Description

The SE2568U is a complete 802.11 b/g WLAN discrete power amplifier. The device provides all the functionality of the power amplifier, power detector, filter, associated input, inter-stage and output matching in an ultra compact 2mm x 2mm x 0.5mm form factor.

The SE2568U is designed for ease of use, with all the critical input and output matching integrated. The SE2568U includes a transmitter power detector with 20 dB of dynamic range and a digital Enable for power on/off control. Harmonic filters and an input 3.2GHz LO rejection filter are integrated on-chip. The power ramp rise/fall time is 0.7 μs typical.

Ordering Information

Part No.	Package	Remark
SE2568U	8 pin QFN	Samples
SE2568U-R	8 pin QFN	Tape and Reel
SE2568U-EK1	N/A	Evaluation kit

Functional Block Diagram

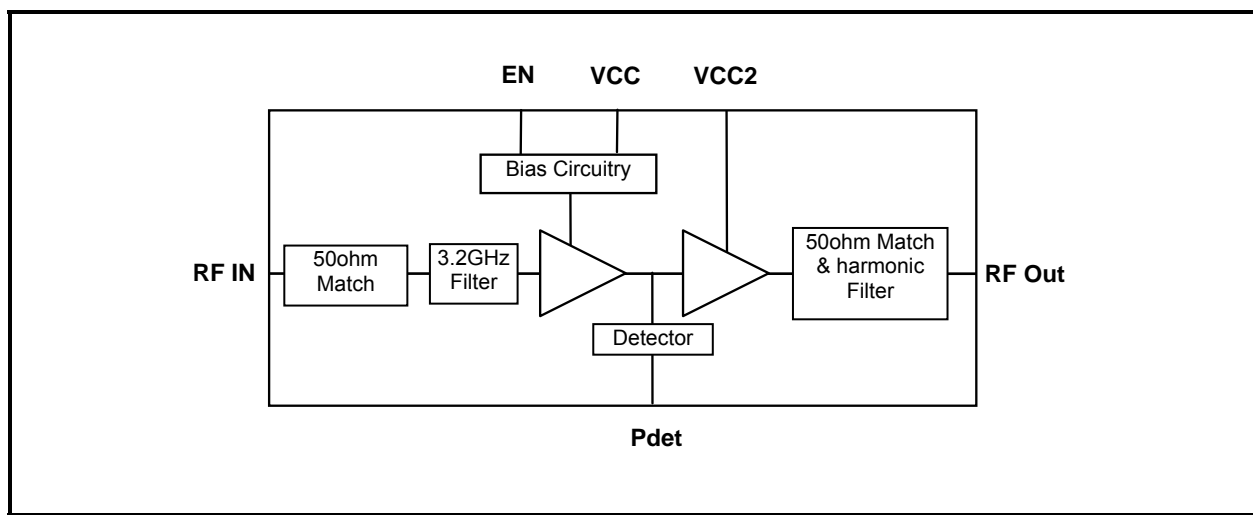


Figure 1: Functional Block Diagram

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Pin Out Diagram

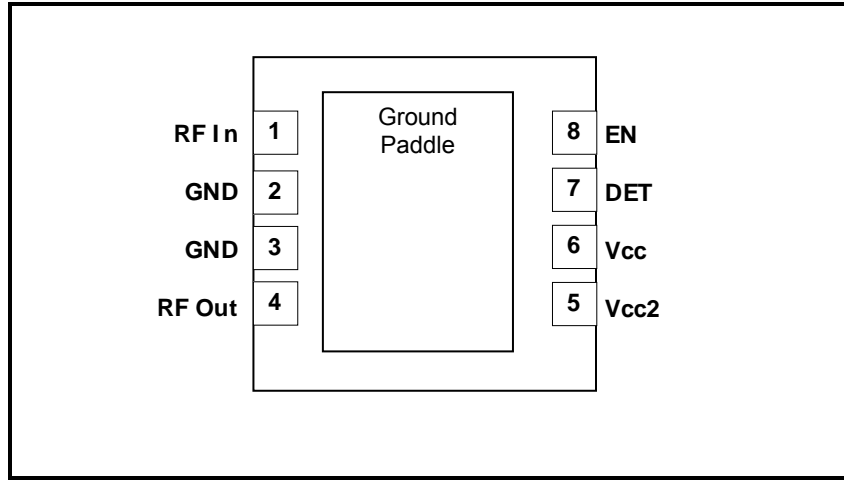


Figure 2: SE2568U Pin Out (Top View Through Package)

Pin Out Description

Pin No.	Name	Description
1	RF In	RF Input (No DC voltage on the pin, but DC short to ground)
2	GND	Ground
3	GND	Ground
4	RF Out	RF Output (No DC voltage on the pin, DC open to ground)
5	VCC2	Final Stage Supply Voltage (May attach directly to battery)
6	VCC	First Stage Supply Voltage (May attach directly to battery)
7	DET	Power Detector Output
8	EN	Power Amplifier Enable
Die paddle	GND	Ground

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Absolute Maximum Ratings

These are stress ratings only. Exposure to stresses beyond these maximum ratings may cause permanent damage to, or affect the reliability of the device. Avoid operating the device outside the recommended operating conditions defined below. This device is ESD sensitive. Handling and assembly of this device should be at ESD protected workstations.

Symbol	Definition	Min.	Max.	Unit
VCC	Supply Voltage on VCC	-0.3	5.5	V
EN	DC input on EN	-0.3	4.0	V
TX	RF Input Power. ANT terminated in 50Ω match	-	12.0	dBm
T _A	Operating Temperature Range	-40	85	°C
T _{STG}	Storage Temperature Range	-40	150	°C
ESD _{HBM}	JEDEC JESD22-A114 all pins	-	500	V

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
T _A	Ambient temperature	-40	25	85	°C
VCC	Supply voltage, nominal operation	3.0	3.3	5.0	V
	Supply voltage, output power reduced by 2dB typ	2.3	3.0	-	

DC Electrical Characteristics

Conditions: VCC = 3.3V (default) or VCC = 5.0V (as noted), EN = 3.3V, T_A = 25 °C, as measured on Skyworks Solutions' SE2568U-EK1 evaluation board, all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _{CC-G}	Total Supply Current	54 Mbps OFDM signal, 64QAM 18dBm, VCC = 3.3V 20.5dBm, VCC = 5.0V	-	135 150	-	mA
I _{CC-N}	Total Supply Current	802.11n, MCS7 17dBm, VCC = 3.3V 19dBm, VCC = 5.0V	-	115 130	-	mA
I _{CC-B}	Total Supply Current	11 Mbps CCK signal, BT = 0.45 20dBm, VCC = 3.3V 22dBm, VCC = 5.0V	-	160 175	-	mA
I _{CC}	Total Supply Current	No RF VCC = 3.3V VCC = 5V	-	90 100	-	mA
I _{CC_OFF}	Total Supply Current	EN = 0 V, No RF Applied	-	1	10	µA

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Logic Characteristics

Conditions: VCC = 3.3V (default) or VCC = 5.0V (as noted), EN = 3.3V, TA = 25 °C, as measured on Skyworks Solutions' SE2568U-EK1 evaluation board, all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{ENH}	Logic High Voltage (Module On)		1.8	-	3.6	V
V _{ENL}	Logic Low Voltage (Module Off)	-	0	-	0.4	V
I _{ENH}	Input Current Logic High Voltage	-	-	2	10	μA
I _{ENL}	Input Current Logic Low Voltage	-	-	2	10	μA

AC Electrical Characteristics

802.11g/n Transmit Characteristics

Conditions: VCC = 3.3V (default) or VCC = 5.0V (as noted), EN = 3.3V, TA = 25 °C, as measured on Skyworks Solutions' SE2568U-EK1 evaluation board, all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
F _{IN}	Frequency Range	-	2400	-	2500	MHz
P _{out}	Output Power, 3.3V	54Mbps, OFDM, 64 QAM, EVM = 3%	-	18	-	dBm
		11Mbps, CCK, BT = 0.45, Mask	-	20	-	
		802.11n, HT20, all data rates, Mask	-	22	-	
		802.11n, HT40, all data rates, Mask	-	20	-	
	Output Power, 5.0V	54Mbps, OFDM, 64 QAM, EVM = 3%	-	20.5	-	
		11Mbps, CCK, BT = 0.45, Mask	-	22	-	
		802.11n, HT20, all data rates, Mask	-	24	-	
		802.11n, HT40, all data rates, Mask	-	22	-	
P _{1dB}	P1dB	-	-	25.0	-	dBm
S ₂₁	Small Signal Gain	-	25	28	29	dB
ΔS ₂₁	Small Signal Gain Variation	Gain variation over single 20MHz channel	-	0.5	-	dB
		Gain Variation over band	-	-	1.1	
S _{21 3.2}	Gain @ limit at Ref-vco spur frequency	3206 to 3312 MHz	-	-	15	dB
2f	Harmonics	1 Mbps, BPSK, 20dBm, 3.3V	-	-50	-45	dBm/MHz

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Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
3f		22dBm, 5.0V				
		20dBm, 3.3V 22dBm, 5.0V	-	-50 -48	-45 -43	dBm/MHz
t _{dr} , t _{df}	Delay & rise/fall Time	50 % of V _{EN} edge and 90/10 % of final output power level	-	0.7	-	μs
S ₁₁	Input Return Loss	-	7	10	-	dB
STAB	Stability	CW, P _{OUT} = 20 dBm, VCC = 3.3V 0.1 GHz – 20 GHz Load VSWR = 10:1	All non-harmonically related outputs less than -42 dBm/MHz			
RU	Ruggedness	P _{IN} = 12dBm, VCC = 3.3V Load VSWR = 10:1	No permanent damage			

Power Detector Characteristics

Conditions: VCC = 3.3V (default) or VCC = 5.0V (as noted), EN = 3.3V, T_A = 25 °C, as measured on Skyworks Solutions' SE2568U-EK1 evaluation board, all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	VCC = 3.3V			VCC = 5V			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
F _{OUT}	Frequency Range	-	2400	-	2500	2400	-	2500	MHz
PDR	Power detect range, CW	Measured at ANT	0	-	23	0	-	23	dBm
PDZ _{src}	DC source impedance on PD_OUT	-	-	1	-	-	1	-	k Ω
PDV _{NoRF}	Output Voltage, P _{OUT} = No RF	Measured into 1MΩ	-	0.12	-	-	0.12	-	V
PDV _{p18}	Output Voltage, P _{OUT} = 18 dBm CW	Measured into 1MΩ	-	0.60	-	-	0.55	-	V
PDV _{p20}	Output Voltage, P _{OUT} = 20 dBm CW	Measured into 1MΩ	-	0.75	-	-	0.70	-	V
PDV _{p23}	Output Voltage, P _{OUT} = 23 dBm CW	Measured into 1MΩ	-	NA	-	-	1.00	-	V
LPF _{-3dB}	Power detect low pass filter -3dB corner frequency	Measured into 1MΩ	260	290	400	270	290	400	kHz

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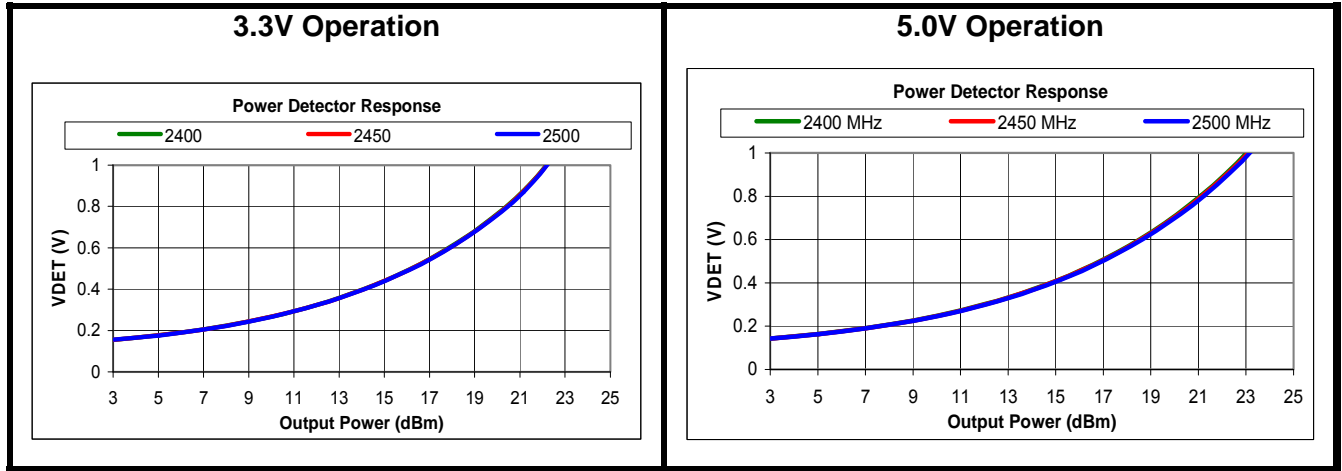


Figure 3: SE2568U Power Detector Characteristics

Package Diagram

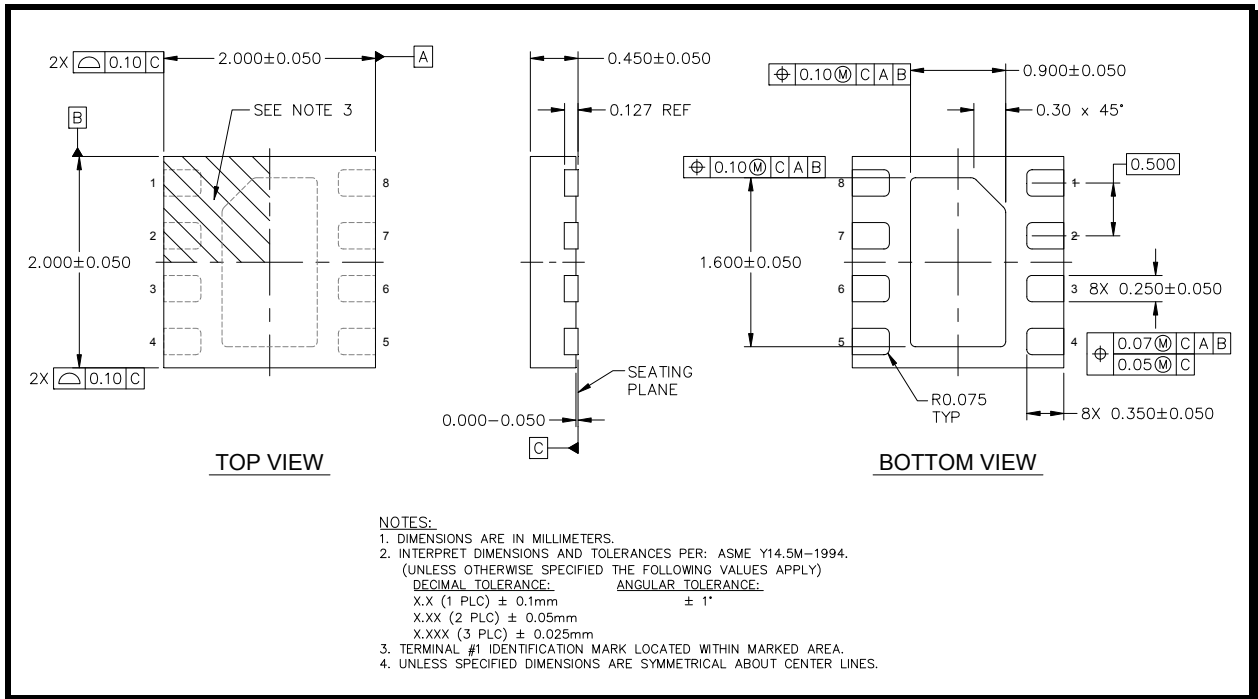


Figure 4: SE2568U Package Diagram



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Recommended PCB Footprint and Solder pattern

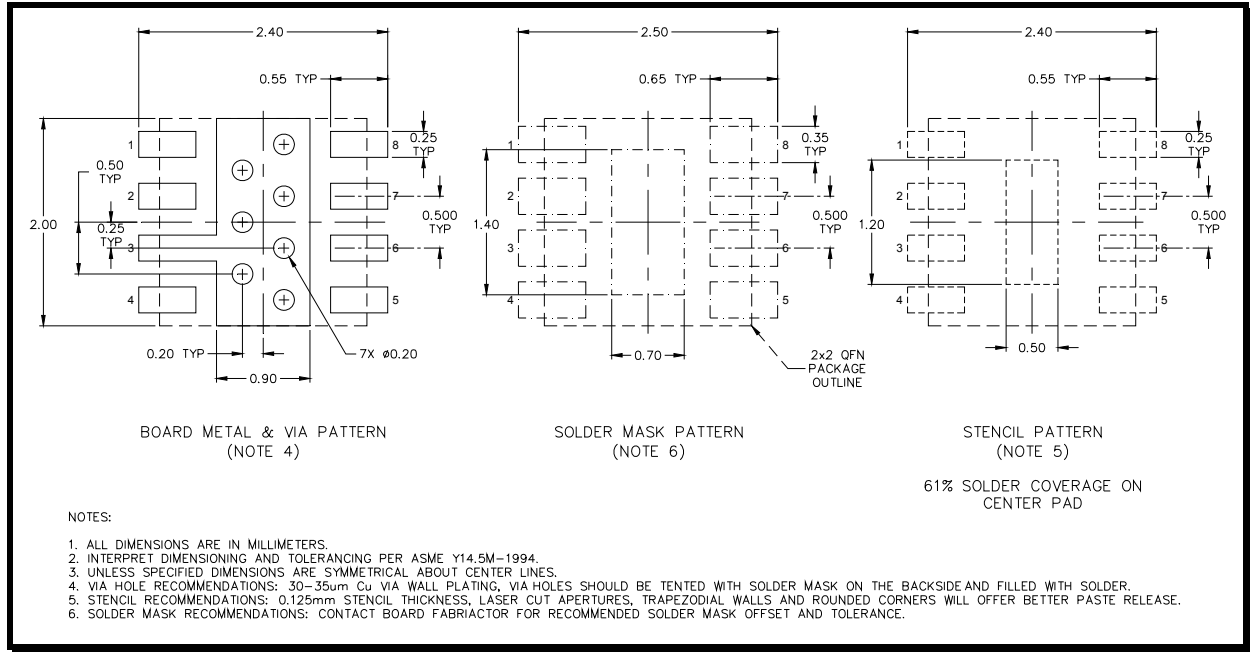


Figure 5: QFN8 2x2mm PCB Footprint

Branding Information

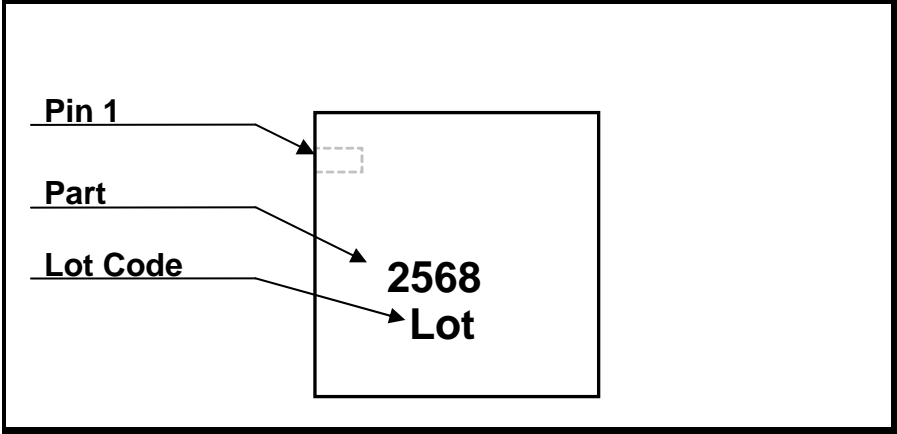


Figure 6: SE2568U Branding and Pin 1 Location (Top View)

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Package Handling Information

Because of its sensitivity to moisture absorption, 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 SE2568u is capable of withstanding a Pb free 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 manually attached, precaution should be taken to insure that the device is not subjected to temperatures above its rated peak temperature for an extended period of time. For details on both attachment techniques, precautions, and handling procedures recommended, please refer to:

- “QFN solder reflow and rework information application note”, Document Number QAD-00045
- “Handling, packing, shipping and use of moisture sensitive QFN application note”, Document Number QAD-00044



Caution! Class 1B ESD sensitive device

Tape and Reel Information

Parameter	Value
Devices Per Reel	3000
Reel Diameter	7 inches
Tape Width	12 millimeters

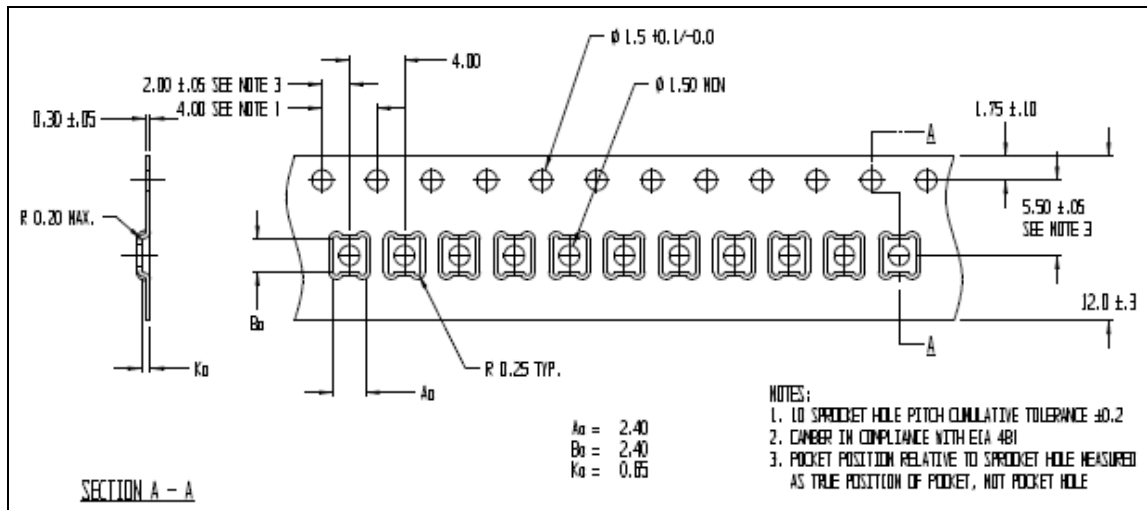


Figure 8: SE2568U-R Tape and Reel Information



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Document Change History

Revision	Date	Notes
1.0	3/17/2008	Created
1.1	5/01/2008	Updated pin-out
1.2	7/14/2008	Updated pin-out
1.3	7/28/2008	Added T&R and pcb footprint recommendation.
1.4	11/13/2008	Updated CCK performance
1.5	12/10/08	Updated top marking
1.6	01/08/2009	Clarified pin designation
1.7	.2/09/2009	Updated Power detector characteristics
1.8	03/17/2009	Clarified harmonic measurement condition
1.9	05/26/2009	Amended back page
2.0	09/29/2009	Updated leakage current
2.1	11/12/2009	Corrected Pin 2 definition from "NU" to "GND"
2.2	1/12/2010	Updated specifications to include 5V operating limits
2.3	6/10/2010	Updated tape and reel information
2.4	9/29/2010	Updated minimum recommended operating temperature
2.5	12/18/2010	Updated ESD rating Added 802.11n Mask Compliant Power Rating
2.6	4/10/2012	Updated with Skyworks logo and disclaimer statement



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