

## DATA SHEET

# SE2579U: 2.4 GHz High Efficiency Front-End for Wireless LAN and a Port Suitable for Bluetooth® Applications

## **Applications**

- IEEE802.11b DSSS WLAN
- IEEE802.11g,n OFDM WLAN
- Embedded applications for mobile functions leveraging the ISM band

## **Features**

- Dual mode IEEE802.11b and IEEE802.11g
- Integrated PA, harmonic filter with support for LNA and a port suitable for Bluetooth<sup>®</sup> signals
- Integrated positive slope power detector
- 19 dBm @ 4.0 % EVM, 802.11g, 54 Mbps
- For simultaneous WLAN and Bluetooth® receive mode
- Direct connection to battery with 3.3 V nominal supply
- Lead free, Halogen free and RoHS compliant
- Compact package, 3 x 3 x 0.5 mm, MSL 1



Skyworks Green<sup>TM</sup> products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green*<sup>TM</sup>, document number SQ04-0074.

## **Description**

The SE2579U is a complete 802.11 b/g/n WLAN RF front-end module with a port suitable for Bluetooth<sup>®</sup> signals. The device provides all the functionality of the power amplifier, power detector, filter, switch, low noise amplifier, 2170 MHz notch filter and associated matching. The SE2579U provides a complete 2.4 GHz WLAN RF solution from the output of the transceiver to the antennas, and from the antennas to the input of the transceiver, in an ultra-compact form factor.

The SE2579U is designed for ease of use, with all the critical matching and harmonic filtering integrated, also offering a simple 50  $\Omega$  interface to the antenna.

The SE2579U includes a low noise amplifier to increase the receive sensitivity of embedded solutions to improve range or to overcome the insertion loss of cellular filters often included for mobile applications. It offers simultaneous WLAN and receive mode for a port suitable for Bluetooth<sup>®</sup> signals.

The SE2579U also includes a transmitter power detector with 20 dB of dynamic range and a digital enable control for transmitter power ramp on/off control. The power ramp rise/fall time is 0.5  $\mu$ S typical.

1



Figure 1. SE2579U Functional Block Diagram



Pin No.	Name	Description
1	DNC	Do not connect
2	CRX	WLAN receive antenna switch control
3	DNC	Do not connect
4	CTX	WLAN transmit antenna switch control
5	CREF	Control pin reference 'high' level input
6	ANT	Antenna port (must be AC-coupled)
7	CBTB	Antenna switch control for port suitable for Bluetooth® signals
8	LEN	LNA enable
9	GND	Ground
10	VCC3	LNA power supply
11	BT	Port suitable for Bluetooth <sup>®</sup> signals (must be AC coupled)
12	RX	WLAN receive port (must be AC-coupled)
13	GND	Ground
14	ТΧ	WLAN transmit port (must be AC-coupled)
15	DNC	Do not connect
16	DET	Transmit power detector output
17	VCC1	Power amplifier power supply
18	PEN	Power amplifier enable
19	CBTR	Function back-end switch control for port suitable for Bluetooth® signals
20	VCC2	Power amplifier power supply
Die paddle	GND	Ground

## Table 1. SE2579U Signal Descriptions

## **Electrical and Mechanical Specifications**

#### Table 2. SE2579U Absolute Maximum Ratings<sup>1</sup>

Symbol	Definition	Min.	Max.	Unit				
VCC	Supply voltage on VCC	-0.3	5.5	V				
VIN	DC input on control pins	-0.3	3.6	V				
PTXIN	TX input power, ANT terminated in $50\Omega$ match	-	5	dBm				
ТА	Operating temperature range	-30	85	°C				
TSTG	Storage temperature range	-40	150	°C				
JEDEC JESD22-A114   All pins except ANT, CBTB, LEN, Vcc3, Bluetooth®   signal, RX pins ANT, Bluetooth® signal pins with   recommended application circuit ANT, CBTB, LEN,   Vcc3, Bluetooth® signal, RX pins								
<sup>1</sup> 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.								

ESD HANDLING: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

#### Table 3. SE2579U Recommended Operating Conditions<sup>1</sup>

Symbol	Parameter	Min.	Тур.	Max.	Unit			
ТА	Ambient temperature	-30	25	85	°C			
VCC	Supply voltage, relative to $GND = 0 V$	2.7	3.3	4.8	V			
Note 1: Performance is guaranteed only under the conditions listed in this Table and is not guaranteed over the full operating or storage temperature ranges. Operation at elevated temperatures may reduce reliability of the device.								

#### Table 4. SE2579U DC Electrical Characteristics<sup>1</sup>

(VCC = PEN = 3.3 V, TA = 25  $^{\circ}$ C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
ICC-G	Total supply current	POUT = 18 dBm, 54 Mbps OFDM signal, 64 QAM		185	210	mA
ICC-B	Total supply current	POUT = 20  dBm, 11  Mbps CCK signal, BT = 0.45		215	248	mA
ICQ	Quiescent current	No RF		133	148	mA
ICC_0FF	Total supply current	$\begin{array}{l} PEN=0 \ V, \ No \ RF \ Applied, \ CBTR=\\ CBTB=CTX\\ = \ CRX=0 \ V \end{array}$		5	10	μΑ
Icc_LNA	Total supply current	LEN = Vcc		8	12	mA
ICC_LNA_ BYP	Total supply current in bypass mode	LEN = 0 V		50	100	μΑ
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Note 1: Performance is guaranteed only under the conditions listed in this Table and is not guaranteed over the full operating or storage temperature ranges. Operation at elevated temperatures may reduce reliability of the device.

## Table 5. SE2579U Control Logic Characteristics

(VCC = PEN = 3.3 V, TA =  $25 \degree$ C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.)

Symbol	Parameter	Min.	Тур.	Max.	Unit
VIH	Logic high voltage	2.7.		3.3	V
VIL	Logic low voltage	0		0.4	V
IIH	Input current logic high voltage			10	μA
IIL	Input current logic low voltage			1	μA

## Table 6. SE2579U Control Logic

Mode#	Mode Description	СТХ	CRX	CBTB	CREF	PEN	LEN	CBTR
0	All off	0	0	0	Х	0	0	0
1	Port suitable for Bluetooth <sup>®</sup> signal	0	0	1	1	0	0	0
2	WLAN Rx, high gain		1	0	1	0	1	0
3	WLAN Rx, low gain	0	1	0	1	0	0	0
4	WLAN TX	1	0	0	1	0	0	0
5	WLAN TX + PA enabled	1	0	0	1	1	0	0
6	(Bluetooth $^{\otimes}$ signal +WLAN) Rx, high gain	0	1	0	1	0	1	1
7	(Bluetooth $^{\ensuremath{ extsf{s}}}$ signal +WLAN) Rx, low gain	0	1	0	1	0	0	1
8	ANT to (Bluetooth $^{\ensuremath{ extsf{s}}}$ signal +WLAN) connect	0	0	1	1	0	0	1

## Table 7. SE2579U AC Electrical Characteristics, 802.11g Transmit

VCC = PEN = 3.3 V, TA = 25 °C, as measured on Skyworks Solutions SE2579U-EK1 evaluation bo	ard (de-embedded to
device), all unused ports terminated with 50 ohms, unless otherwise noted.	

Symbol	Parameter	Condition	Min.	Тур.	Max.	Unit
FIN	Frequency range		2400		2500	MHz
		VCC = 3.3 V, POUT = 19 dBm, 54 Mbps OFDM signal, 64 QAM				
EVM	EVM	Vcc = 3.0V, POUT = 18 dBm, 54Mbps, 0FDM signal, 64 QAM			4	%
		Vcc = 2.7V, POUT = 17 dBm, 54 Mbps, OFDM signal, 64 QAM				
ACPRb	Adjacent channel	Pout = 20 dBm, 11 Mbps CCK, Bluetooth® signal (BT) = 0.45				dBc
	powerrado rib	±11 MHz offset		-37	-32	
		±22 MHz offset		-58	-55	
		Pout = 18 dBm, 54 Mbps OFDM, 64QAM				
ACPRg	Adjacent channel	±11 MHz offset			-20	dBc
	ponoriano rig	±20 MHz offset			-28	
		±30 MHz offset			-40	
		11g - 54 Mbps 11b – 11 Mbps				
Pmax-00B	Out-of-band limited output power	PSDOOB = -43	16	17		dBm
T max 000		uDIII/IVITZ, RD = I IVITZ	20	20		dom
		2310 to 2390 MHZ				
Cot	Small signal gain	2405.5 to 2500 WHZ	25	07	20	dP
321			20	21		UD
Δ <b>S</b> 21	variation over band				1.5	dBpp
2f		POUT = 20 dBm, 1 Mbps, 802.11b		-35	-25	
	Harmonics	POUT = 18 dBm, 54 Mbps				dBm/MHz
3f		OFDM signal, 64 QAM		-52	-43	
tdr, tdf	Delay and rise/fall time	50% of VPEN edge and 90/10% of final output power level		0.5	1	μS
S11	Input return loss	TX port		-15	-10	
S <sub>21WCDMA</sub>	Small signal gain in WCDMA band	2110 to 2170 MHz, relative to min in-band gain			-11	dBr
P <sub>NWCDMA</sub>	Output noise power in WCDMA band	2110 to 2170 MHz POUT = 20 dBm, 1 Mbps, 802.11b POUT = 18 dBm, 54 Mbps OFDM signal, 64 QAM		-130	-127	dBm/Hz

#### Table 7. SE2579U AC Electrical Characteristics, 802.11g Transmit

VCC = PEN = 3.3 V, TA = 25 °C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Тур.	Max.	Unit
STAB	Stability	CW, Pin = -5 dBm 0.1 GHz - 20 GHz Load VSWR = 6:1	All non-harmonically related outputs less than -43 dBm/MHz			
RGGD	Ruggedness	CW, PIN = $-5 \text{ dBm}$ 0.1 GHz - 20 GHz Load VSWR = 10:1	No permanent damage or performance degradation			

## **Table 8. SE2579U Power Detector Characteristics**

VCC = PEN = 3.3 V, TA = 25 °C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Тур.	Max.	Unit
Fout	Frequency range		2400		2500	MHz
PDR	Power detect range, CW	Measured at ANT	0		22	dBm
PDZload	Output impedance			2.2		ΚΩ
PDVNoRF	Output voltage, POUT = No RF	Measured in to 1 $\text{M}\Omega$	0.1	0.125	0.150	V
PDVp18.5	Output voltage, POUT = 18.5 dBm CW	Measured in to 1 $\text{M}\Omega$	0.56	0.66	0.76	V
PDVp20	Output voltage, POUT = 20 dBm CW	Measured in to 1 $\text{M}\Omega$	0.70	0.80	0.90	V
PDtTVAR	Detector variation over temperature	-30 to 25 $^{\rm o}\text{C}$ 25 to 85 $^{\rm o}\text{C}$ given detector voltage	-0.6		+0.5	dB
PDFVAR	Detector variation over frequency	2400 to 2500 MHz given detector voltage	-0.5		0.5	dB
PDVSWR	Detector variation over load VSWR	Forward power ANT VSWR 3:1 all phases given detector voltage	-2		+1	dB
PDBW	Detector bandwidth			1		MHz



Figure 3. SE2579U Power Detector Characteristics

## Table 9. SE2579U Bluetooth® Function Characteristics

VCC = 3.3 V, TA = 25 °C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Тур.	Max.	Unit
Fout	Frequency range		2400		2500	MHz
BT⊫	Insertion loss	ANT, CBTB = hi, CBTR = CTX = CRX = lo for port suitable for Bluetooth <sup>®</sup> signals		1.2	1.5	dB
S11	Function return loss for port suitable for Bluetooth <sup>®</sup> signals	CBTB = hi, CBTR = CTX = CRX = lo			-12	dB
ISOLsw	Switch isolation	ANT-RX, $CBTB = hi$ , $CBTR = CTX = CRX = lo$	20			dB

## Table 10. SE2579U 2.4 GHz Receive Characteristics

VCC = 3.3 V, LEN = CRX = CBTR= CREF= 3.3 V, PEN = CBTB = CTX = 0 V, TA = 25 °C, as measured on Skyworks Solutions SE2579U-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Тур.	Max.	Unit
Fout	Frequency range		2400		2500	MHz
		(Port suitable for Bluetooth <sup>®</sup> signal +WLAN) Rx, high gain	11	13	15	dB
S21	Receive gain, LNA enabled	WLAN Rx, high gain only, LEN = CRX = CREF= 3.3 V, PEN = CBTB = CTX =CBTR= 0 V	14	16	18	dB
∆S21	Gain variation	2400 to 2485 MHz, over any 20 MHz band			0.5	dB
NF	Noise figure			2.0	2.5	dB
IIP3	Third order intercept		-3			dBm
S11	Input return loss				-10	dB
S12	Reverse isolation				-20	dB
IP1dB	Input P1dB	CW	-13			dBm
TEN	Enable time	10% to 90% of RX RF power, from time that LEN is at 50%			500	nsec
S21-BYP	Receive gain, LNA bypassed	LEN = 0 V	-20		-10	dB
S11-BYP	Input return loss, LNA bypassed	LEN = 0 V			-7	dB
ISOLSW	Switch isolation	$\label{eq:BTB} \begin{array}{l} CBTB = CBTR = lo, \ CRX = hi, \ ANT\text{-}Bluetooth^{\circledast} \\ signal + Bluetooth^{\circledast} \ signal \ -RX \end{array}$	20			dB

## **Package Dimensions**

The PCB layout footprint for the SE2579U is shown in Figure 5. Typical part markings are shown in Figure 6. Package dimensions are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

## **Package and 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 SE2579U 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 ensure that the device is not subjected to temperatures above its rated peak temperature for an extended period of time.



2012/11/12

Cold.





Figure 6. Typical Part Markings (Top View)







#### Notes

Devices per reel: 3000

Reel diameter: 13 inches

Tape width: 12 millimeters

#### Figure 8. SE2579U-R Tape and Reel Dimensions

## **Ordering Information**

Part Number	Product Description
SE2579U, 20 pin QFN	6 GHz 802.11be Front-End Module, Product Samples
SE2579U-R, 20 pin QFN	6 GHz 802.11be Front-End Module, Tape and Reel
SE2579U-EK1	Evaluation Kit

#### **Document Change History**

Revision	Date	Notes
1.0	03/02/2009	Initial Release
1.1	3/17/2009	Updated specification
1.2	04/06/2009	Updated maximum control pin voltage to 3.6V
1.3	05/27/2009	Updated specification, and updated back page
1.4	06/25/2009	Updated ESD specification
1.5	08/26/2009	Updated ACPRb specification
1.6	09/20/2009	Updated Power detector specification, and pcb footprint recommendation
1.7	Jan-12-2010	Clarified ESD ratings
1.8	Apr-10-2012	Updated with Skyworks logo and disclaimer statement
А	Sept 25, 2012	Updated with Skyworks logo and disclaimer statement
В	Oct 5, 2022	Corrected Bluetooth <sup>®</sup> references, updated to current format
C	Dec 7, 2022	Additional Bluetooth <sup>®</sup> corrections per Legal
D	January 30, 2023	As above, page 1

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