Applications

- IEEE802.11b DSSS WLAN
- IEEE802.11g OFDM WLAN
- IEEE802.11a OFDM WLAN
- IEEE802.11n WLAN
- Access Points, PCMCIA, PC cards

Features

- 5GHz RF output port is matched to 50 Ω
- 2GHz RF output port is externally matched
- Integrated Harmonic Filter for each TX Chain
- Integrated Power Detector for each TX Chain
- 19 dBm @ 3.0 % EVM, 802.11g, 54 Mbits
- 18 dBm @ 3.0 % EVM, 802.11a, 54 Mbits
- 21 dBm O/P Power, 802.11b, 11 Mbits, ACPR = 35 dBc
- Lead free, Halogen free, RoHS compliant, MSL 1
- 3mm x 3mm x 0.9mm, QFN Package

Product Description

The SE2580L is a matched 802.11a/b/g/n WLAN RF Power Amplifier module providing all the functionality of the power amplifiers, match, harmonic filters and power detector.

Designed for ease of use, 5GHz RF port is matched to 50 Ω to simplify PCB layout and the interface to the transceiver RFIC and switch/diplexer. The SE2580L includes a transmitter power detector for each band and transmit chain with 20 dB of dynamic range for each transmit chain. Each transmit chain has a separate 1.8V CMOS digital Enable control for transmitter power ramp on/off control. The power ramp rise/fall time is less than 0.4 µsec.

The SE2580L packaged in 3mm x 3mm x 0.9mm, Halogen free, Lead free, ROHS compliant, MSL 1 QFN package.

Ordering Information

Part No.	Package	Remark
SE2580L	20 pin QFN	Samples
SE2580L-R	20 pin QFN	Tape and Reel
SE2580L-EK1	N/A	Evaluation kit

Functional Block Diagram

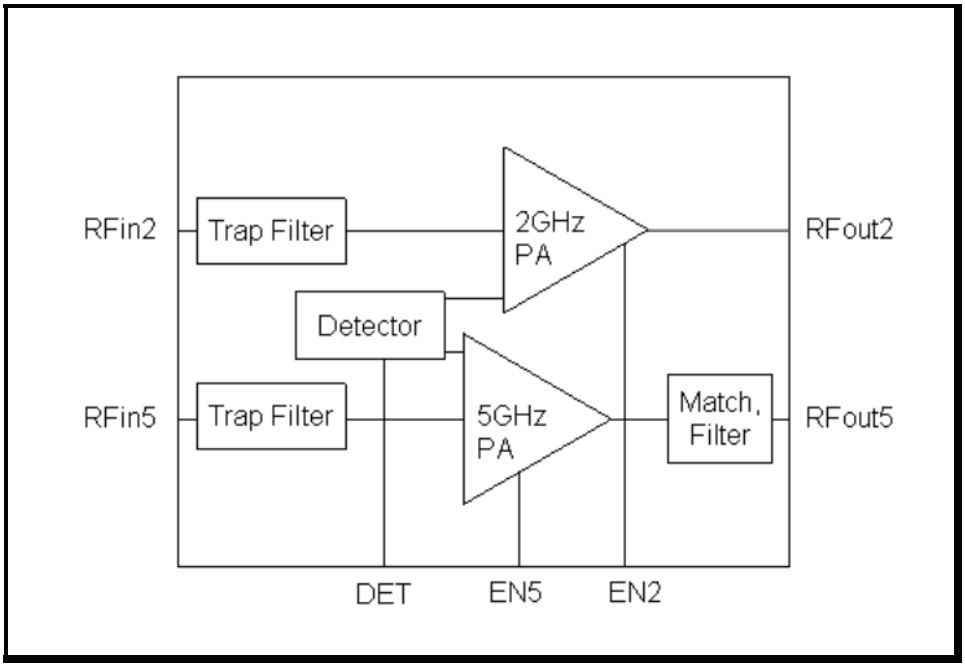


Figure 1: SE2580L Functional Block Diagram

Pin Out Diagram

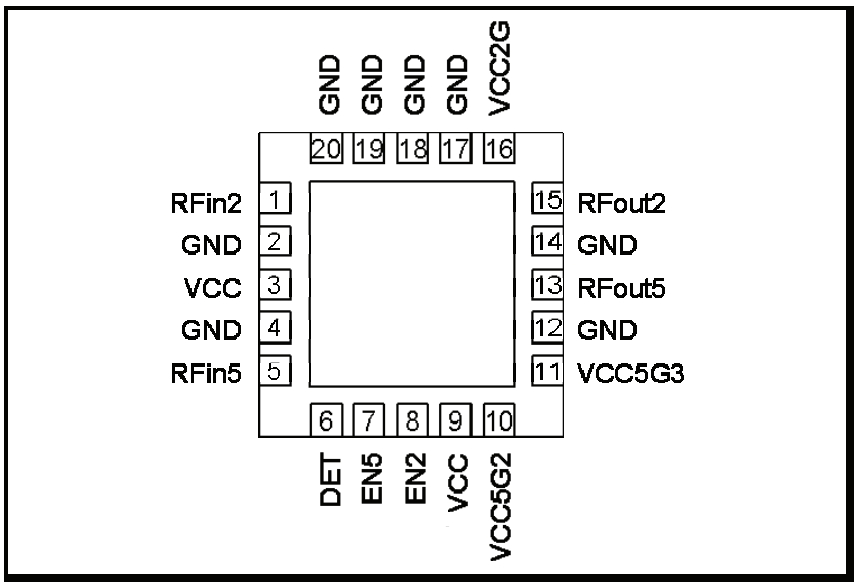


Figure 2: SE2580L Pin Out (Top View Through Package)

Pin Out Description

Pin No.	Name	Description
1	RFin2	2GHz RF Input
2	GND	Ground
3	VCC	2GHz First Stage Supply
4	GND	Ground
5	RFin5	5GHz RF Input
6	DET	2GHz and 5GHz Detector Output
7	EN5	5GHz PA Enable
8	EN2	2GHz PA Enable
9	VCC	5GHz First Stage Supply
10	VCC5G2	5GHz Power Stage supply
11	VCC5G3	5GHz Power Stage Supply
12	GND	Ground
13	RFout5	5GHz RF Output
14	GND	Ground
15	RFout2	2GHz RF Output
16	VCC2G	2GHz Power Stage supply
17-20	GND	Ground
Paddle	GND	Ground

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
V_{CC}	Supply Voltage	-0.3	4.0	V
PU	EN5, EN2	-0.3	4.0	V
TX_{RF}	RFin2, RFin5, RFout2, RFout5 terminated into 50 ohms	-	12.0	dBm
T_A	Operating Temperature Range	0	85	°C
T_{SRFIN2}	Storage Temperature Range	-40	150	°C

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	3.0	3.3	3.6	V
T_A	Ambient Temperature	-10	25	85	°C

DC Electrical Characteristics

Conditions: V_{CC} = 3.3 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_{CC-G}	Total 802.11g Transmit Supply Current	P_{OUT} = 19 dBm, 54 Mbps OFDM signal, 64 QAM EN2 = 3.3 V, EN5 = 0 V	-	165	-	mA
I_{CQ-G}	Quiescent current, 802.11g Transmit supply current	No RF applied EN2 = 3.3V, EN5 = 0V,	-	115	-	mA
I_{CC-B}	Total 802.11b Transmit Supply Current	P_{OUT} = 21 dBm, 11 Mbps CCK signal, BT = 0.45, EN2 = 3.3 V, EN5 = 0 V	-	190	-	mA
I_{CC-A}	Total 802.11a Transmit Supply Current	P_{OUT} = 18 dBm, 54 Mbps OFDM signal, 64 QAM, EN5 = 3.3 V, EN2 = 0 V	-	230	-	mA
I_{CQ-A}	Quiescent current, 802.11a Transmit supply current	No RF applied EN5 = 3.3V, EN2 = 0V,	-	145	-	mA
I_{CC_OFF}	Total Supply Current	No RF, EN2 = EN5 = 0 V	-	10	100	µA

Logic Characteristics

Conditions: V_{CC} = 3.3 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 evaluation board (de-embedded to device), all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{ENH}	Logic High Voltage for EN2, EN5 (Module On)	-	1.8	-	V_{CC}	V
V_{ENL}	Logic Low Voltage EN2, EN5 (Module Off)	-	0	-	0.5	V
I_{ENH}	Input Current Logic High Voltage (EN2, EN5)	-	-	350	400	µA
I_{ENL}	Input Current Logic Low Voltage (EN2, EN5)	At V_{ENL} = 0.4V	-	45	-	µA

2.4 GHz AC Electrical Characteristics

2.4 GHz Transmit Characteristics

Conditions: V_{CC} = EN2 = 3.3 V, EN5 = 0 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 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
$P_{802.11g}$	Output power	54 Mbps OFDM signal, 64QAM, EVM = 3.0 %	-	19	-	dBm
$P_{802.11b}$	Output power	11 Mbps CCK signal, BT = 0.45 ACPR(± 11MHz offset) < -35 ACPR(± 22MHz offset) < -56	-	21	-	dBm
P_{1dB}	P1dB	-	-	27	-	dBm
S_{21}	Small Signal Gain	-	26	-	32	dB
ΔS_{21}	Small Signal Gain Variation Over Band	-	-	1.0	2.0	dB
2f,3f	Harmonics	Pout ≤ 21 dBm, 11Mbps, CCK	-	-50	-45	dBm/MHz
t_{dr}, t_{df}	Delay and rise/fall Time	50 % of EN2 edge and 90/10 % of final output power level	-	-	0.25	µs
S_{11}	Input Return Loss	-	-	-7	-	dB
STAB	Stability	CW, P_{OUT} = 21 dBm 0.1 GHz – 21 GHz Load VSWR = 6:1	All non-harmonically related outputs less than -42 dBm/MHz			
Ru	Ruggedness	CW, P_{OUT} = 21dBm, Load VSWR = 10:1	No Irreversible damage			

5 GHz AC Electrical Characteristics

5 GHz Transmit Characteristics

Conditions: V_{CC} = EN5 = 3.3 V, EN2 = 0 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 evaluation board, all unused ports terminated with 50 ohms, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
F_{IN}	Frequency Range	-	4900	-	5875	MHz
$P_{802.11a}$	Nominal Output Power	54 Mbps OFDM signal, 64 QAM, EVM = 3.0 %	-	18	-	dBm
P_{1dB}	P1dB	-	-	24	-	dBm
S_{21}	Small Signal Gain	-	27	-	34	dB
ΔS_{21}	Small Signal Gain Variation Over 40 MHz Channel		-	-	0.5	dB
	Small Signal Gain Variation Over sub-bands	4.9 – 5.1 GHz 5.15 – 5.7 GHz 5.7 – 5.85 GHz	-	1	3	dB
2f,3f	Harmonics @19dBm, 54Mbps, 802.11a	-	-	-50	-	dBm/MHz
t_{dr}, t_{df}	Delay and rise/fall Time	50 % of V_{EN} edge and 90/10 % of final output power level	-	-	0.25	µs
S_{11}	Input Return Loss	-	-	-8	-	dB
STAB	Stability	64 QAM, P_{OUT} = 19 dBm 0.1 GHz – 21 GHz Load VSWR = 6:1	All non-harmonically related outputs less than -42 dBm/MHz			
Ru	Ruggedness	CW, P_{OUT} = 21 dBm, Load VSWR = 10:1	No Irreversible damage			

2.4 GHz Power Detector Characteristic

Conditions: V_{CC} = EN2 = 3.3 V, EN5 = 0V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 evaluation board (de-embedded to device), all unused ports terminated with 50 Ω, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
F_{OUT}	Frequency Range	-	2400	-	2500	MHz
PDR	Power detect range, peak power	Measured at RFout2	0	-	22	dBm
PDZ_{OUT}	DC Output impedance	-	-	2400	-	Ω
PDV_{P21}	Output Voltage, P_{OUT} = 21dBm	-	-	0.75	-	V
PDV_{p19}	Output Voltage, P_{OUT} = 19dBm	-	-	0.65	-	V
PDV_{pnoRF}	Output Voltage, P_{OUT} = No RF	-	-	0.30	-	V
LPF_{-3dB}	Power detect low pass filter -3dB corner frequency	Load = high impedance Typ: 500 kΩ	-	300	-	KHz

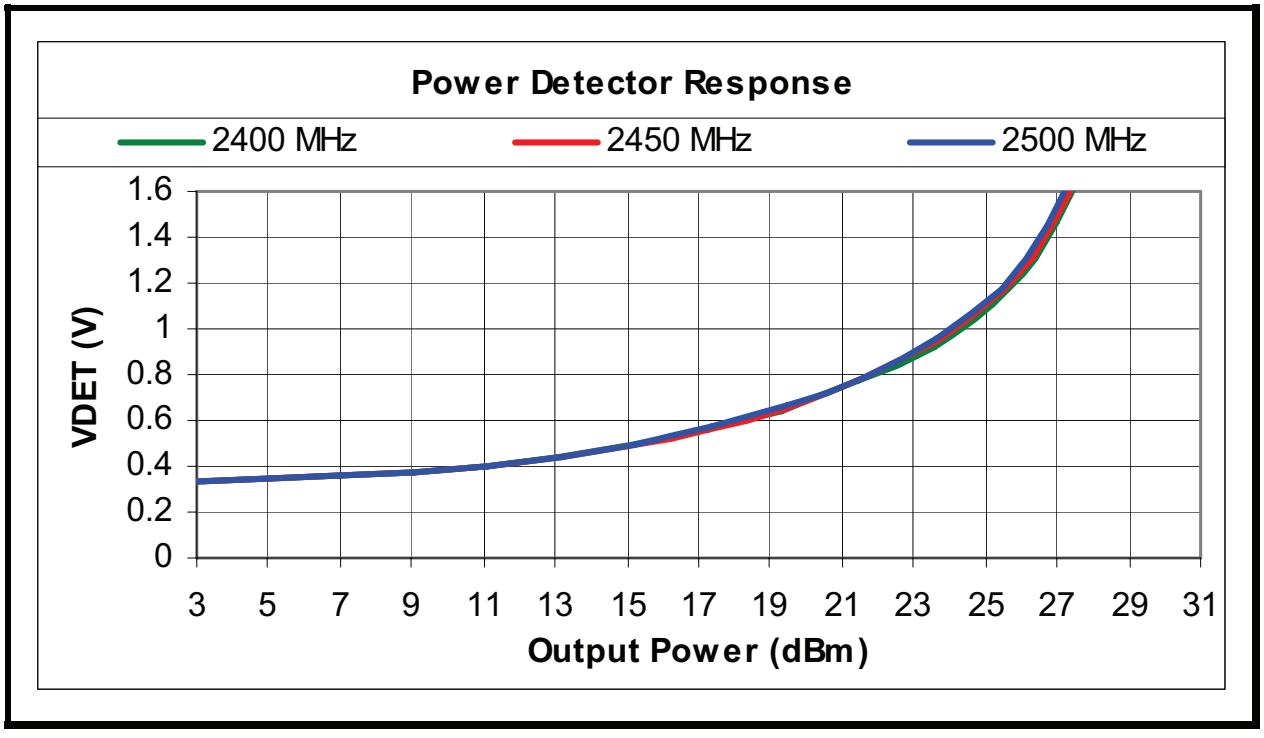


Figure 3: SE2580L Power Detector vs. Output Power over Frequency into 1Mohm

5 GHz Power Detector Characteristic

Conditions: V_{CC} = EN5 = 3.3, EN2 = 0V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2580L-EV1 evaluation board (de-embedded to device), all unused ports terminated with 50 Ω, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
F_{OUT}	Frequency Range	-	4900	-	5850	MHz
PDR	Power detect range, peak power	Measured at ANT	0	-	21	dBm
PDZ_{OUT}	DC Output impedance	-	-	2400	-	Ω
PDV_{p18}	Output Voltage, P_{OUT} = 18dBm	-	-	0.72	-	V
PDV_{p15}	Output Voltage, P_{OUT} = 15dBm	-	-	0.55	-	V
PDV_{NoRF}	Output Voltage, P_{OUT} = No RF	-	-	0.30	-	V
LPF_{-3dB}	Power detect low pass filter -3dB corner frequency	Load = high impedance Typ: 500 kΩ	-	300	-	KHz

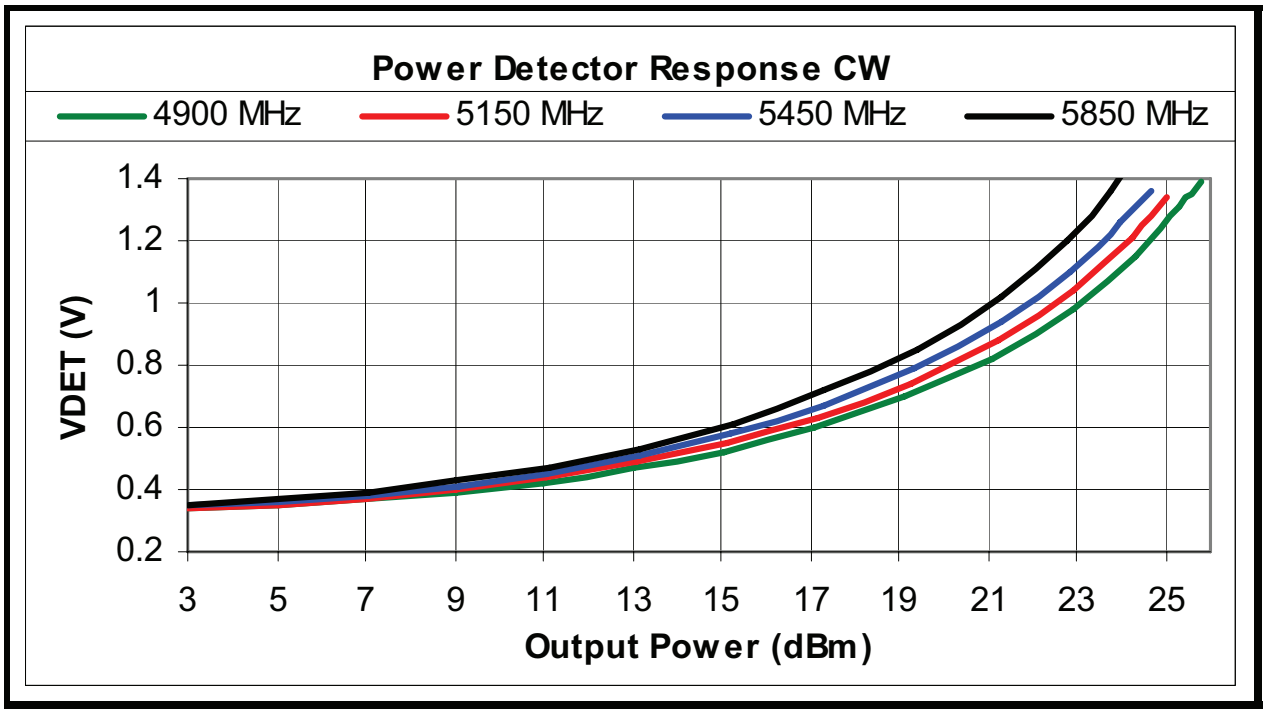
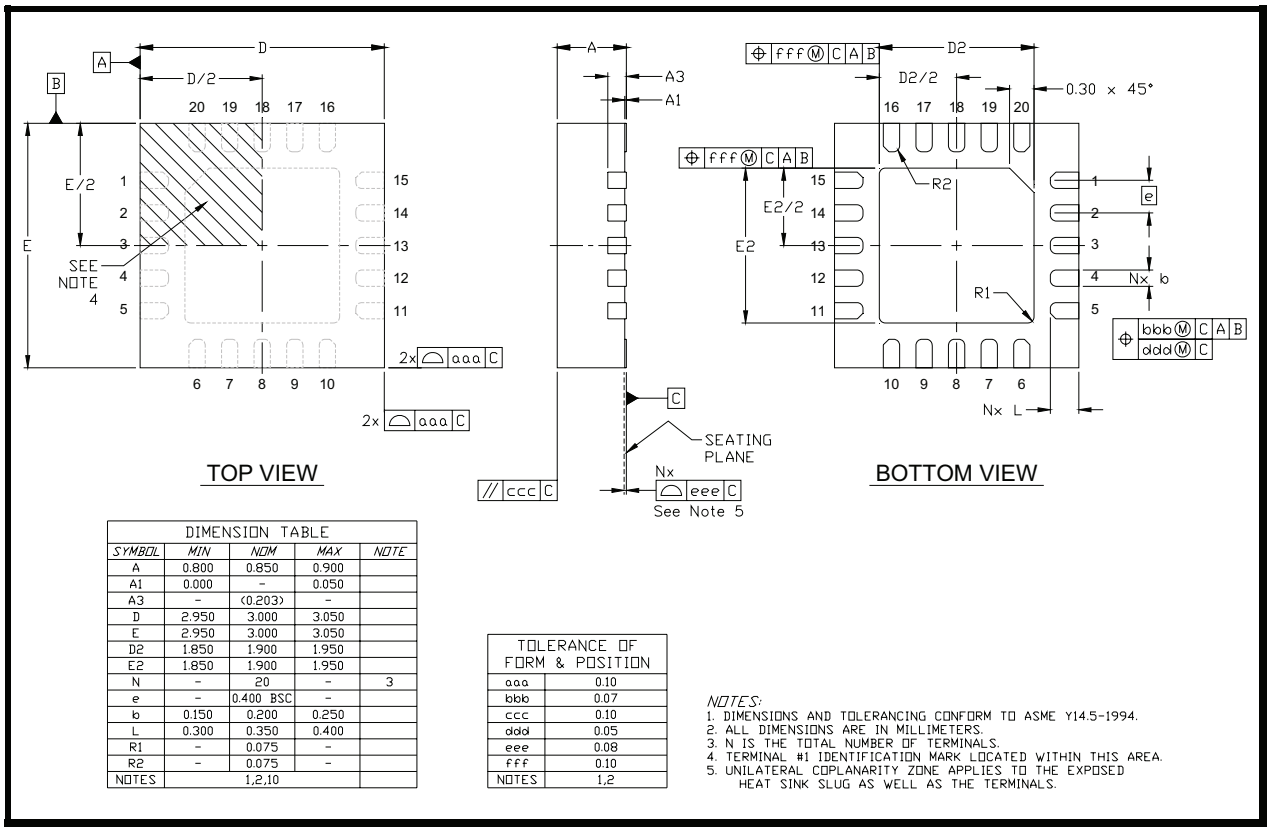


Figure 4: Preliminary SE2580L Power Detector vs. Output Power over Frequency into 1Mohm

Package Diagram



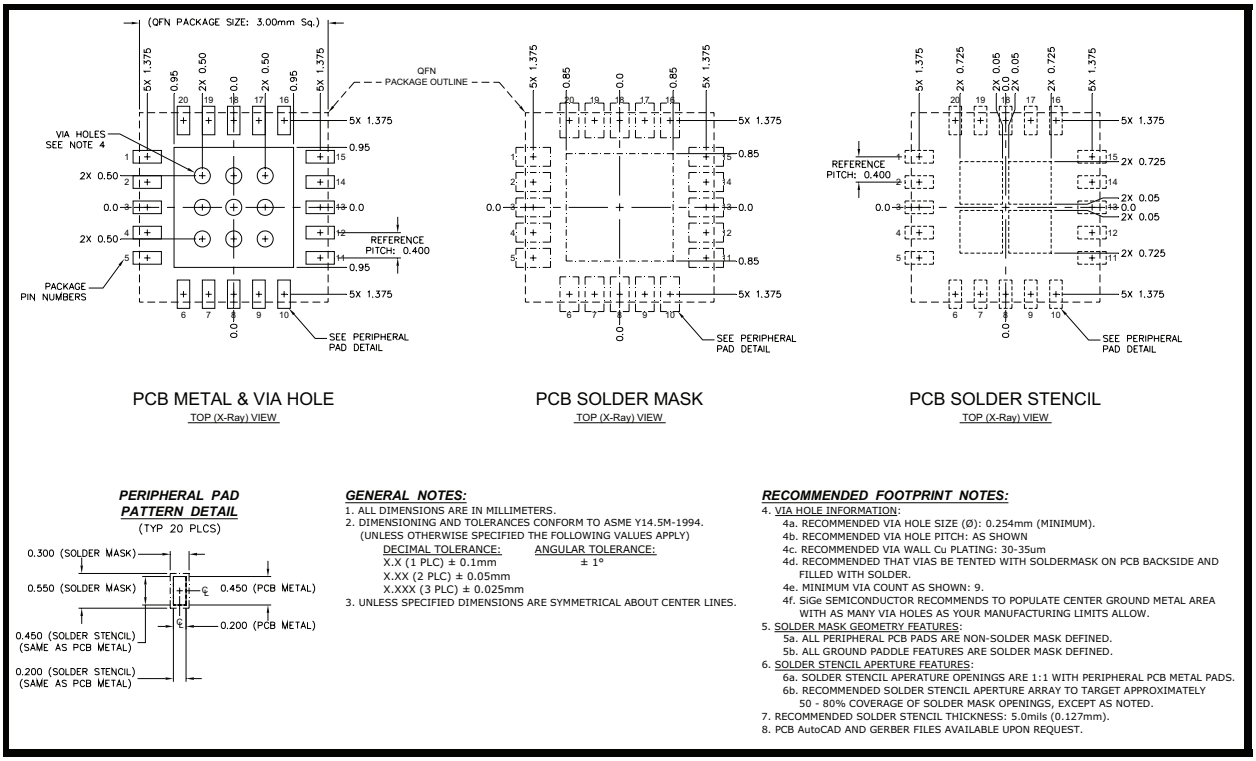
DIMENSION TABLE				
SYMBOL	MIN	NOM	MAX	NOTE
A	0.800	0.850	0.900	
A1	0.000	–	0.050	
A3	–	(0.203)	–	
D	2.950	3.000	3.050	
E	2.950	3.000	3.050	
D2	1.850	1.900	1.950	
E2	1.850	1.900	1.950	
N	–	20	–	3
e	–	0.400 BSC	–	
b	0.150	0.200	0.250	
L	0.300	0.350	0.400	
R1	–	0.075	–	
R2	–	0.075	–	
NOTES	1,2,10			

TOLERANCE OF FORM & POSITION	
aaa	0.10
bbb	0.07
ccc	0.10
ddd	0.05
eee	0.08
fff	0.10
NOTES	1,2

NOTES:
1. DIMENSIONS AND TOLERANCING CONFORM TO ASME Y14.5-1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. TERMINAL #1 IDENTIFICATION MARK LOCATED WITHIN THIS AREA.
5. UNILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

Figure 5: Package Diagraqm

Recommended Land and Solder Patterns



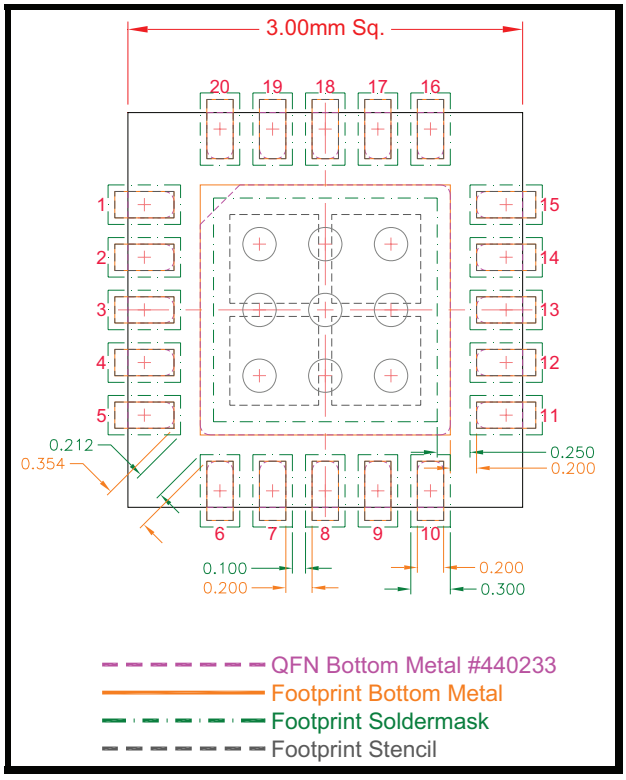


Figure 6: Recommended Land and Solder Patterns

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 SE2580L 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 by SiGe, please refer to:

- SiGe's Application Note: "Quad Flat No-Lead Module Solder Reflow & Rework Information", *Document Number QAD-00045*
- SiGe's Application Note: "Handling, Packing, Shipping and Use of Moisture Sensitive QFN", *Document Number QAD-00044*

Caution! Class 1C ESD sensitive device

Product Branding

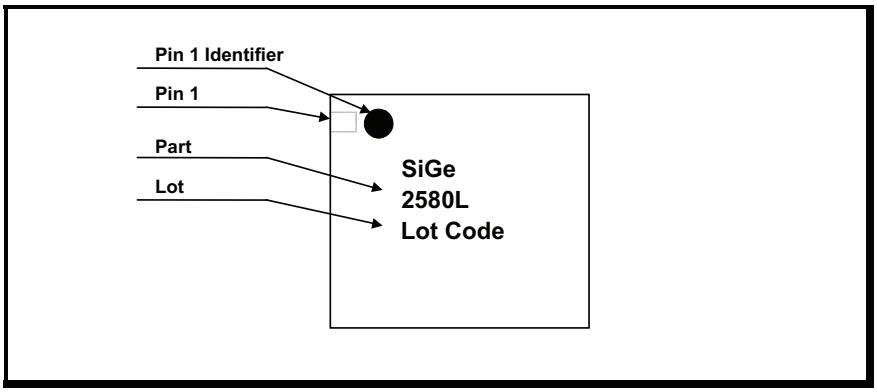


Figure 8: SE2580L Branding Information

Tape and Reel Information

Parameter	Value
Devices Per Reel	3000
Reel Diameter	13 inches
Tape Width	12 millimeters

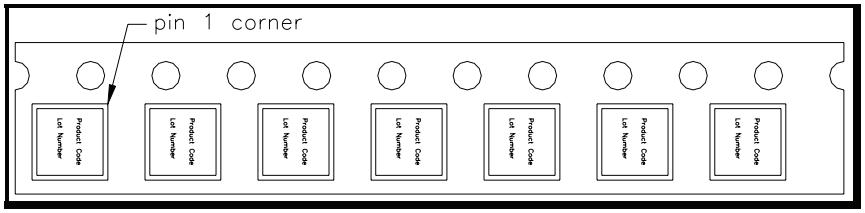


Figure 9: Detailed Tape and Reel Information (All diminensions in Millimeters)

Document Change History

Revision	Date	Notes
1.0	May 6, 2009	Created
1.1	Jul 30, 2009	Updated Ruggedness Specification
1.2	Dec 15, 2009	Corrected pin out definition, updated performance per design validation test
1.3	Aug 20, 2010	Updated ESD classification from Class 0 to Class 1C Corrected pin description.
1.4	Sep 4, 2010	Update I_{EN}(Low) Update LO Gain at 5GHz band Update S11 return loss Update Rise/Fall time
1.5	Sep 30, 2010	Removed LO filter specifications.
1.6	Nov 15, 2010	Updated marking diagram

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Product Preview
The datasheet contains information from the product concept specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

Preliminary Information
The datasheet contains information from the design target specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

Production testing may not include testing of all parameters.

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