Preliminary

SZA-3044

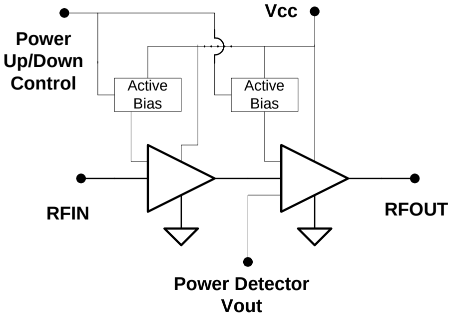
2.8-3.8GHz 5V 1W Power Amplifier

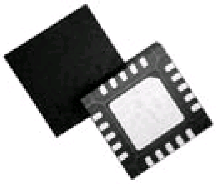
Product Description

Sirenza Microdevices' SZA-3044 is a high linearity class AB Heterojunction Bipolar Transistor (HBT) amplifier housed in a low-cost surface-mountable plastic package. This HBT amplifier is made with InGaP on GaAs device technology and fabricated with MOCVD for an ideal combination of low cost and high reliability.

This product is specifically designed as a final or driver stage for 802.16 equipment in the 3.3-3.8 GHz bands. It can run from a 3V to 5V supply. Optimized on-chip impedance matching circuitry provides a 50Ω nominal RF input impedance. The external output match and bias adjustability allows load line optimization for other applications or over narrower bands. It features an output power detector, on/off power control and high RF overdrive robustness.

Functional Block Diagram





4mm x 4mm QFN Package

Product Features

- **P1dB = 31dBm @ 5V**
- **IM3 < -39dBc @ 20dBm/tone**
- **802.11a 54Mb/s Class AB Performance**
  Pout = 24dBm @ 2.5% EVM, 5V, 450mA
- **On-chip Output Power Detector**
- **Robust - Survives RF Input Power = +15dBm**
- **On Chip ESD Protection Class 1C (1000V)**
- **Power up/down control < 1µs**
- **Pin compatible with SZA-2044 and SZA-5044**

Applications

- **802.16 WiMAX Driver or Output Stage**
- **Fixed Wireless, WLL**

Key Specifications

Symbol	Parameters: Test Conditions, App circuit page 4 $Z_0 = 50\Omega$, V_{CC} = 5.0V, Iq = 360mA, T_{BP} = 30ºC	Unit	Min.	Typ.	Max.
f_O	Frequency of Operation	MHz	2800		3800
P_{1dB}	Output Power at 1dB Compression – 3.4GHz	dBm	29.5	31.0	
	Output Power at 1dB Compression – 3.6GHz		29.5	31.0	
S_{21}	Small Signal Gain – 3.4GHz	dB	23	25	27
	Small Signal Gain – 3.6GHz		22.5	24.5	26.5
Pout	Output power at 2.5% EVM 802.11a 54Mb/s - 3.6GHz	dBm		24	
IM3	Third Order Suppression (Pout = 20dBm per tone) - 3.6GHz	dBc		-39	-36
NF	Noise Figure at 3.6 GHz	dB		6.5	
IRL	Worst Case Input Return Loss 3.3-3.8GHz	dB	12	15	
ORL	Worst Case Output Return Loss 3.3-3.8GHz		7	9	
Vdet Range	Output Voltage Range for Pout=15dBm to 30dBm	V		0.9 to 2.0	
I_{cq}	Quiescent Current (V_{cc} = 5V)	mA	310	360	410
I_{VPC}	Power Up Control Current, Vpc=5V, ($I_{VPC1} + I_{VPC2}$)	mA		3.3	
$R_{th, j-l}$	Thermal Resistance (junction - lead)	ºC/W		20	

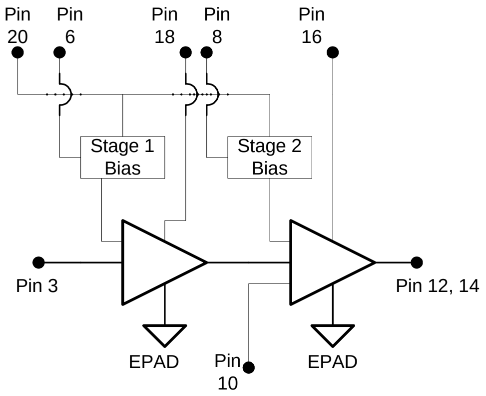
Typical Performance (Vcc=5V, Icq=360mA, * 802.11a 54Mb/s 64QAM)

Parameter	Units	2.8GHz	3.0GHz	3.2GHz	3.3GHz	3.5GHz	3.7GHz	3.8GHz
Gain	dB	26	26	25.5	25.0	24.5	24.0	23.5
P1dB	dBm	30.5	30.5	30.5	31	31	31	30.5
Pout @ 2.5% EVM*	dBm	23.5	23.5	23.5	24.0	24.0	23.5	23.5
I @ Pout 2.5% EVM*	mA	450	445	445	445	450	450	450

Pin Out Description

Pin #	Function	Description
1,2,4,5,7,9,11,13,15,17,19	N/C	These are unused pins and not wired inside the package. They may be grounded or connected to adjacent pins.
6	VPC1	VPC1 is the bias control pin for the stage 1 active bias circuit. An external series resistor is required for proper setting of bias levels. Refer to the evaluation board schematic for resistor value. To prevent potential damage, do not apply voltage to this pin that is +1V greater than voltage applied to pin 20 (Vbias) unless Vpc supply current capability is less than 10 mA.
8	VPC2	VPC2 is the bias control pin for the stage 2 active bias circuit. An external series resistor is required for proper setting of bias levels. Refer to the evaluation board schematic for resistor value. To prevent potential damage, do not apply voltage to this pin that is +1V greater than voltage applied to pin 20 (Vbias) unless Vpc supply current capability is less than 10 mA.
10	Vdet	Output power detector voltage. Load with > 10K ohms for best performance
3	RFIN	RF input pin. This is DC grounded internal to the IC. Do not apply voltage to this pin.
12,14	RFOUT	RF output pin. This is also another connection to the 2nd stage collector.
16	VC2	2nd stage collector bias pin. Apply 3.0 to 5.0V to this pin.
18	VC1	1st stage collector bias pin. Apply 3.0 to 5.0V to this pin.
20	Vbias	Active bias network VCC. Apply 3.0 to 5.0V to this pin.
EPAD	Gnd	Exposed area on the bottom side of the package needs to be soldered to the ground plane of the board for optimum thermal and RF performance. Several vias should be located under the EPAD as shown in the recommended land pattern (page 5).

Simplified Device Schematic



Absolute Maximum Ratings

Parameters	Value	Unit
VC2 Collector Bias Current (I_{VC2})	600	mA
VC1 Collector Bias Current (I_{VC1})	300	mA
Device Voltage (V_D)	7.0	V
Power Dissipation	3.5	W
Operating Lead Temperature (T_L)	-40 to +85	ºC
Max RF Input Power for 50 ohm output load	15	dBm
Max RF Input Power for 10:1 VSWR RF out load	8	dBm
Storage Temperature Range	-40 to +150	ºC
Operating Junction Temperature (T_J)	+150	ºC
ESD Human Body Model	1000	V

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation the device voltage and current must not exceed the maximum operating values specified in the table on page one.

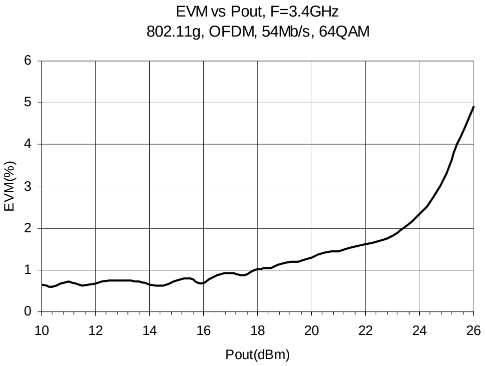
Bias conditions should also satisfy the following expression:

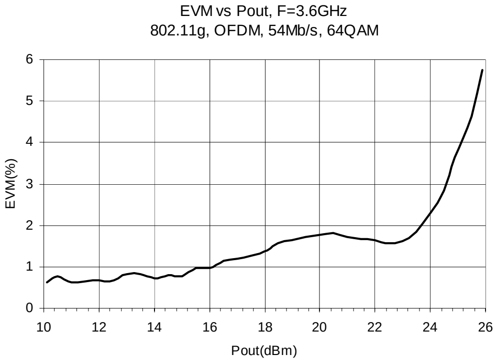
$$I_D V_D < (T_J - T_L) / R_{TH},\ j\text{-}l$$

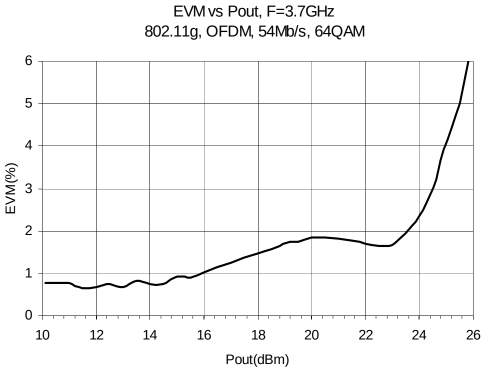
Caution: ESD Sensitive

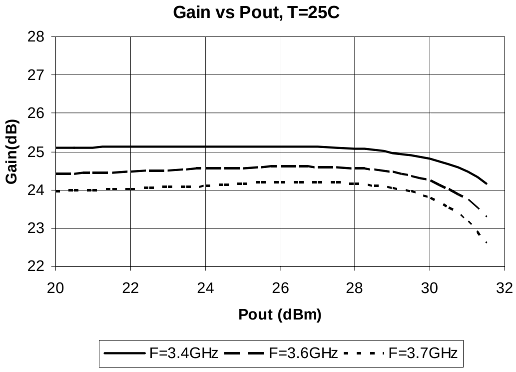
Appropriate precaution in handling, packaging and testing devices must be observed.

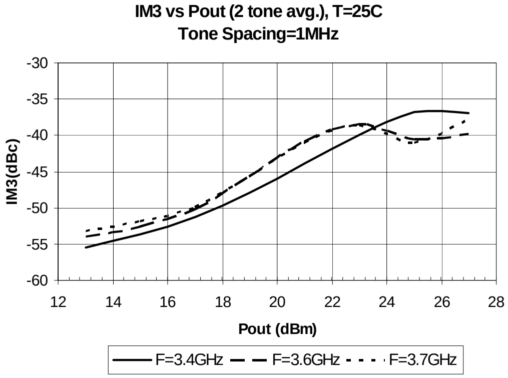
Measured 3.4 - 3.7 GHz Evaluation Board Data ($V_{cc} = V_{pc} = 5.0V$, $I_q = 364mA$, T=25C)











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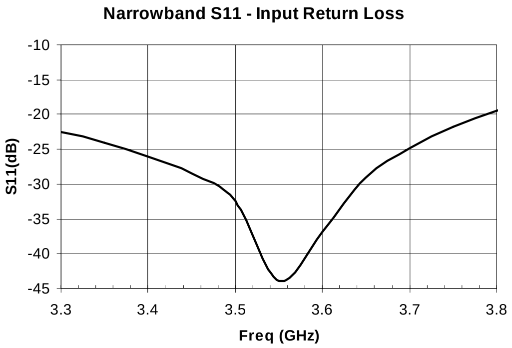
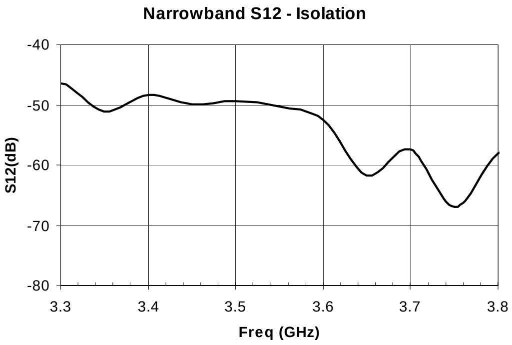
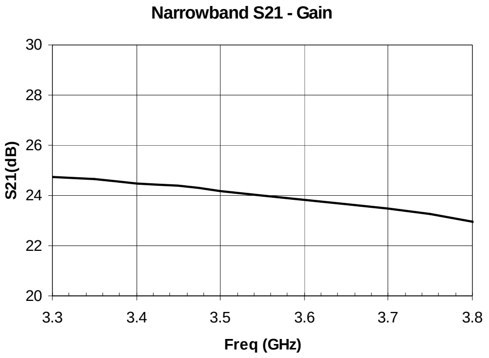
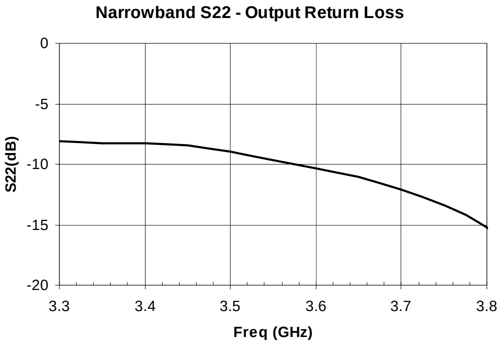
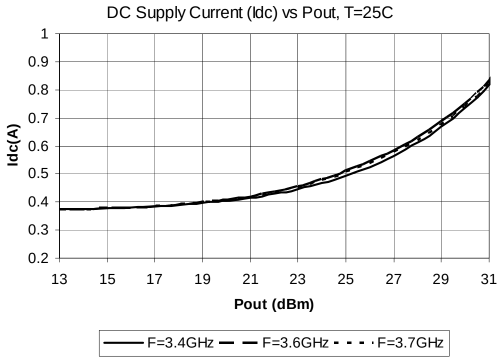
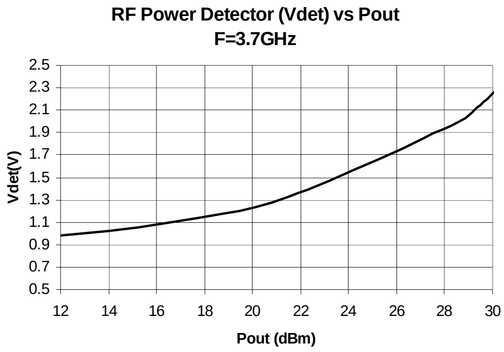

Narrowband S11 - Input Return Loss


Narrowband S12 - Isolation


Narrowband S21 - Gain

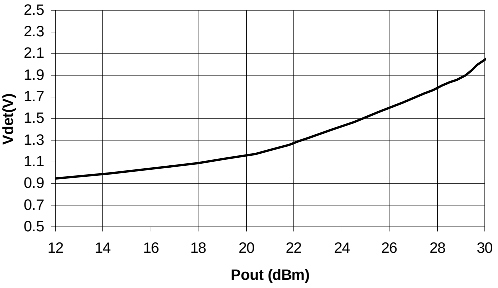

Narrowband S22 - Output Return Loss


DC Supply Current (Idc) vs Pout, T=25C

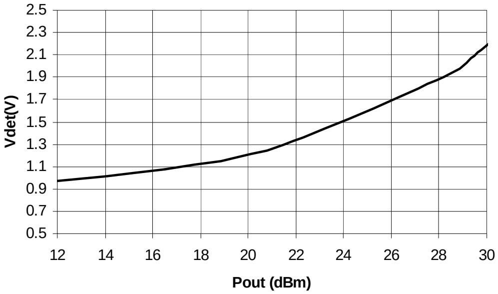

RF Power Detector (Vdet) vs Pout
F=3.7GHz

Measured 3.4 - 3.7 GHz Evaluation Board Data ($V_{cc} = V_{pc} = 5.0V$, $I_q = 364mA$, T=25C)

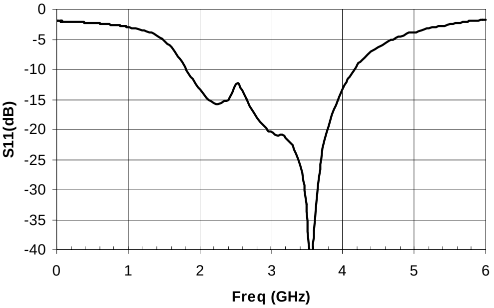
RF Power Detector (Vdet) vs Pout
F=3.4GHz



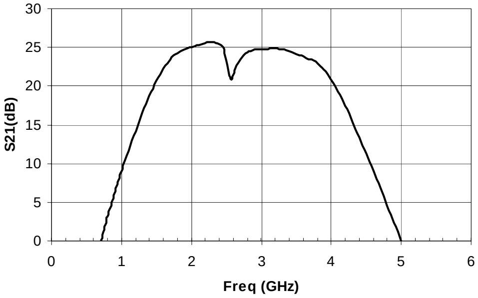
RF Power Detector (Vdet) vs Pout
F=3.6GHz



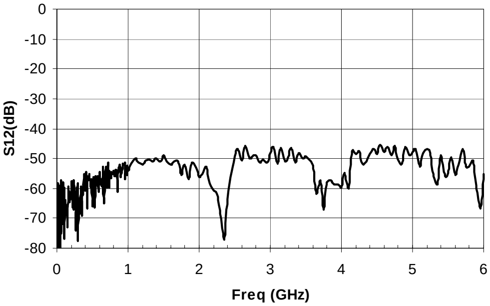
Broadband S11 - Input Return Loss



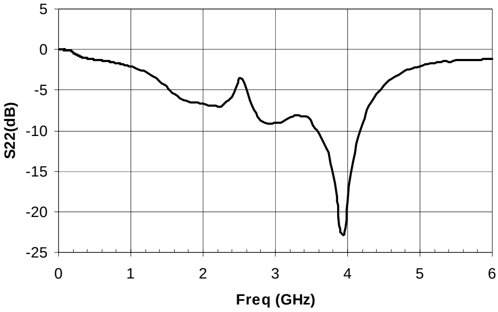
Broadband S21 - Gain



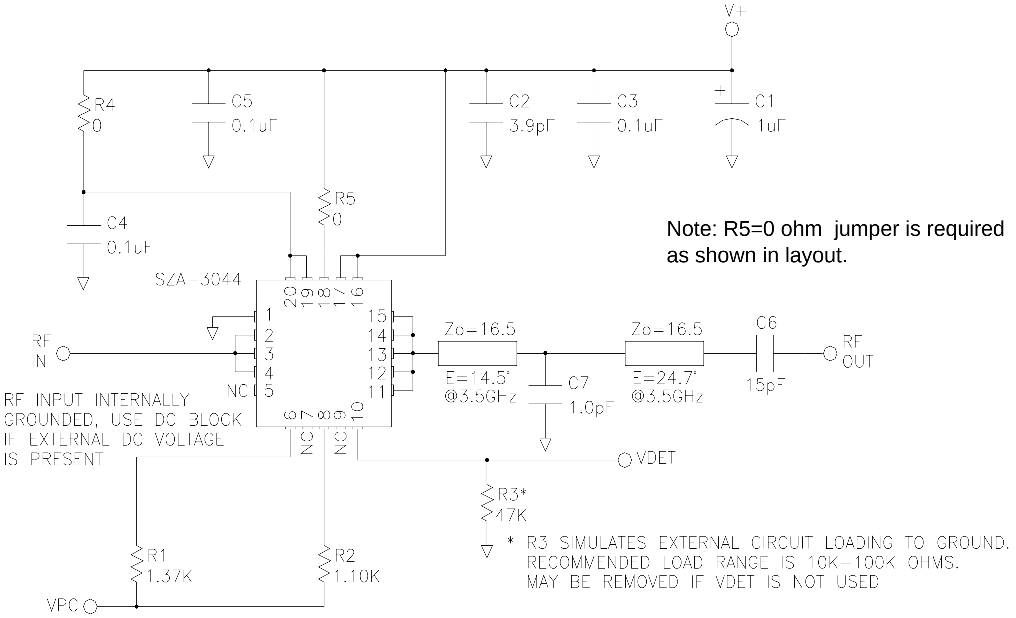
Broadband S12 - Isolation



Broadband S22 - Output Return Loss



3.4-3.7 GHz Evaluation Board Schematic For Vcc = V+ = Vpc = 5.0V



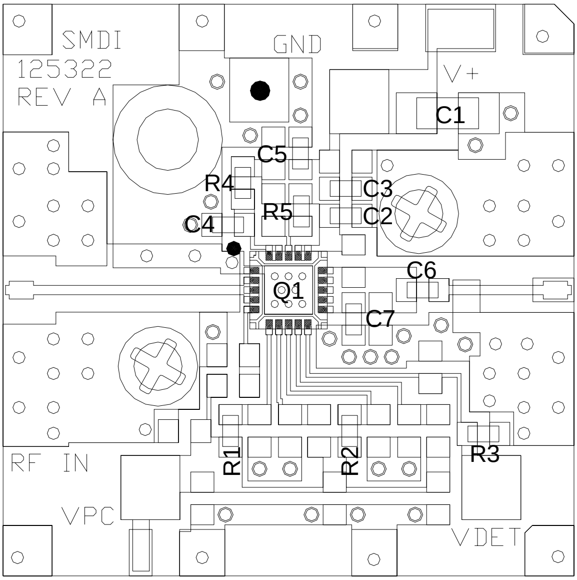
Note: R5=0 ohm jumper is required as shown in layout.

RF INPUT INTERNALLY GROUNDED, USE DC BLOCK IF EXTERNAL DC VOLTAGE IS PRESENT

* R3 SIMULATES EXTERNAL CIRCUIT LOADING TO GROUND. RECOMMENDED LOAD RANGE IS 10K–100K OHMS. MAY BE REMOVED IF VDET IS NOT USED

3.4-3.7 GHz Evaluation Board Layout For Vcc = V+ = Vpc = 5.0V

Board material GETEK, 10mil thick, Dk=3.9, 2 oz. copper



DESG	DESCRIPTION
Q1	SZA–3044
R1	1.37K OHM, 0603 1%
R2	1.10K OHM, 0603 1%
R3	47K OHM, 0603
R4,5	0 OHM, 0603
C1	1uF 16V CAP
C3,4,5	0.1uF CAP, 0603
C2	3.9pF CAP, 0603
C6	15pF CAP, 0603
C7	1.0pF CAP, 0603

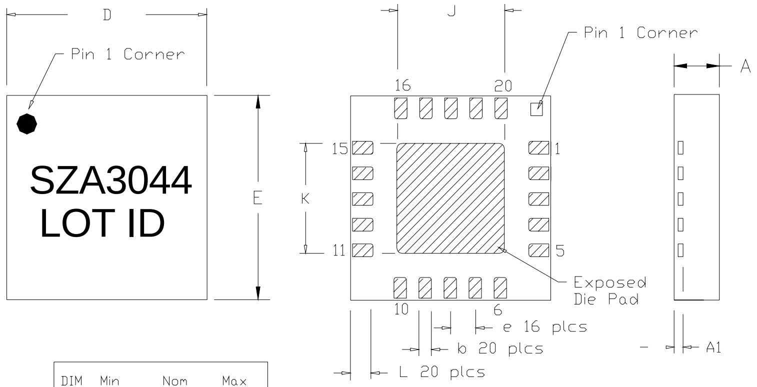
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SZA-3044	13”	3000

Part Symbolization

The part will be symbolized with an “SZA-3044” marking designator on the top surface of the package.

Package Outline Drawing (dimensions in mm):



DIM	Min	Nom	Max
A	.80		1.00
A1	.19		.21
b	.20	.25	.30
D		4.0 BSC	
e		0.5 BSC	
E		4.0 BSC	
J	2.04		2.24
K	2.04		2.24
L	.34	.44	.54

Recommended Land Pattern (dimensions in mm[in]):