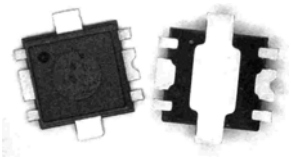
Preliminary

SZP-2026Z

2.2-2.7GHz 2W InGaP Amplifier



RoHS Compliant & Green Package

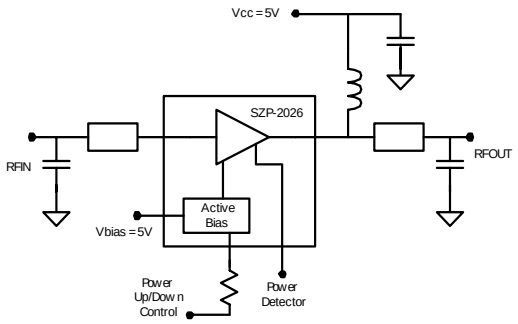
Proprietary SOF-26 Package

Product Description

Sirenza Microdevices' SZP-2026Z is a high linearity single stage class AB Heterojunction Bipolar Transistor (HBT) amplifier housed in a proprietary surface-mountable plastic encapsulated 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 flexible final or driver stage for 802.16 and 802.11 equipment in the 2.2-2.7GHz bands. It can run from a 3V to 6V supply. It is pre-matched to ~5 ohms on the input for broadband performance and ease of matching at the board level. It features an output power detector, on/off power control, ESD protection, excellent overall robustness and a proprietary hand reworkable and thermally enhanced SOF-26 package. This product features a RoHS Compliant and Green package with matte tin finish, designated by the 'Z' suffix.

Functional Block Diagram



Product Features

- **P1dB = 33.5dBm @ 5V, 2.4GHz**
- **802.11g 54Mb/s Class AB Performance**
  Pout = 26dBm @ 2.5%EVM, Vcc 5V
  Pout = 27dBm @ 2.5% EVM, Vcc 6V
- **On-chip Output Power Detector**
- **Input Prematched to ~5 ohms**
- **Proprietary Low Thermal Resistance Package**
  Hand Solderable and Easy Rework
- **Power up/down control < 1μs**

Applications

- **802.16 WiMAX Driver or Output Stage**
- **2.4GHz 802.11 WLAN and ISM Applications**

Key Specifications

Symbol	Parameters: Test Conditions, 2.5-2.7GHz App circuit, Z_0 = 50Ω, V_{CC} = 5.0V, Iq = 445mA, T_{BP} = 30°C	Unit	Min.	Typ.	Max.
f_O	Frequency of Operation	MHz	2200		2700
P_{1dB}	Output Power at 1dB Compression – 2.7GHz	dBm	31.5	33	
S_{21}	Small Signal Gain – 2.7GHz	dB	11.3	12.8	
Pout	EVM (802.11g 54Mb/s) at Pout=26dBm - 2.7GHz	%		2.5	
IM3	Third Order Suppression (Pout=23dBm per tone) - 2.7GHz	dBc		-45	-42
NF	Noise Figure at 2.7GHz	dB		4.3	
IRL	Worst Case Input Return Loss 2.5-2.7GHz	dB	8	12	
ORL	Worst Case Output Return Loss 2.5-2.7GHz		8	12	
Vdet Range	Output Voltage Range for Pout=10dBm to 33dBm	V		0.85 to 1.4	
I_{cq}	Quiescent Current (V_{cc} = 5V)	mA	395	445	495
I_{VPC}	Power Up Control Current (V_{pc} = 5V)	mA		2.1	
I_{leak}	Vcc Leakage Current (V_{cc} = 5V, V_{pc} = 0V)	μA			10
$R_{th, j-l}$	Thermal Resistance (junction - lead)	°C/W		12	

Typical Performance 2.4-2.5GHz and 2.5-2.7GHz App Circuits (Vcc=5V, 802.11g 54Mb/s 64QAM)

Parameter	Units	*2.4GHz	*2.5GHz	**2.6GHz	**2.7GHz
Gain	dB	13.3	13.0	12.8	12.7
P1dB	dBm	33.5	33.3	33.6	33.3
Pout @ 2.5% EVM*	dBm	26	26	26.2	26
Current @ Pout 2.5% EVM*	mA	550	545	570	570
Input Return Loss	dB	16	12	17	13
Output Return Loss	dB	16	16	17	15

***Measured with 2.4-2.5GHz Applications Circuit - Refer to page 10.**
****Measured with 2.5-2.7GHz Applications Circuit - Refer to page 11.**

Pin Out Description

Pin #	Function	Description
1	VBIAS	This is the supply voltage for the active bias circuit.
2	RFIN	This is the RF input pin and has a DC voltage present. An external DC block is required.
3	VPC	Power up/down control pin. The voltage on this pin should never exceed the voltage on pin 1 by more than 0.5V unless the supply current from pin 3 is limited < 10mA.
4	VDET	This is the output port for the power detector. It samples the power at the input of the amplifier.
5	RFOUT/VCC	This is the RF output pin and DC connection to the collector.
6	NC	This pin is not connected internal to the package. Buss it to pin 5 as shown on the app circuit to achieve the specified performance.
GND	GND	These pins are DC connected to the backside paddle. They provide good thermal connection to the backside paddle for hand soldering and rework. Many thermal and electrical GND vias are recommended as shown in the landing pattern.

Absolute Maximum Ratings

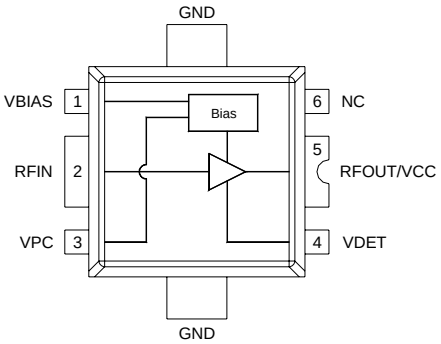
Parameters	Value	Unit
VC1 Collector Bias Current (I_{VC1})	1500	mA
**Device Voltage (V_{cc})	7.0	V
Power Dissipation	6	W
Operating Lead Temperature (T_L)	-40 to +85	ºC
*Max RF output Power for 50 ohm continuous long term operation	30	dBm
Max RF Input Power for 50 ohm output load	28	dBm
Max RF Input Power for 10:1 VSWR output load	23	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-l

* With specified application circuit.
** No RF Drive

Simplified Device Schematic

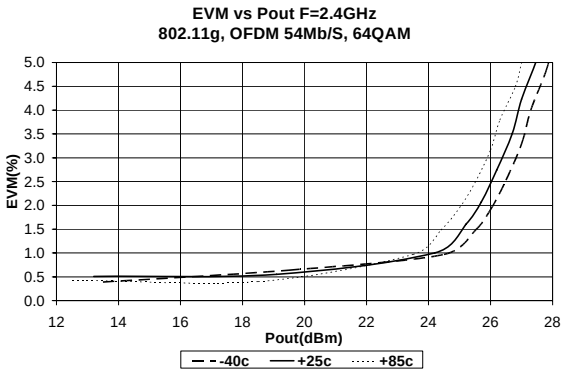


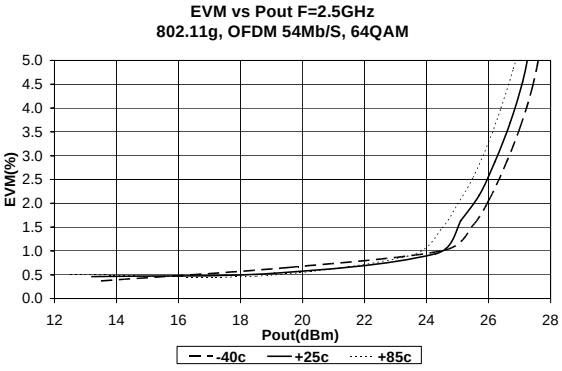
Caution: ESD Sensitive

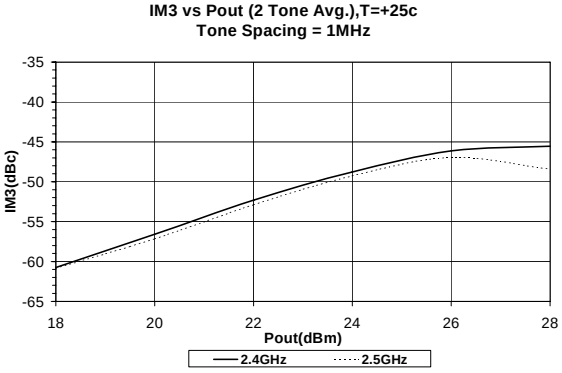
Appropriate precaution in handling, packaging and testing devices must be observed.

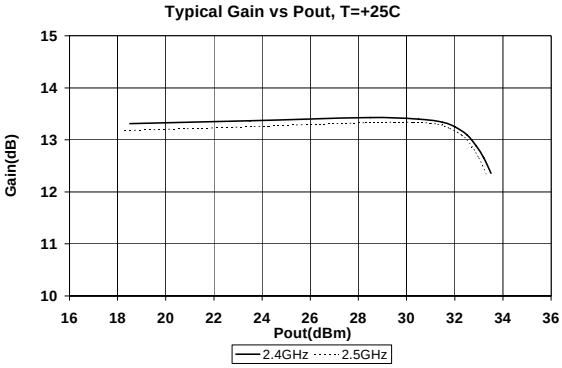
Measured 2.4-2.5 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

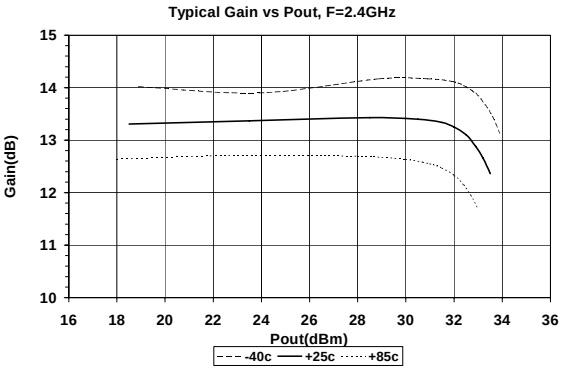
Source EVM = 0.6%, not deembedded from data.

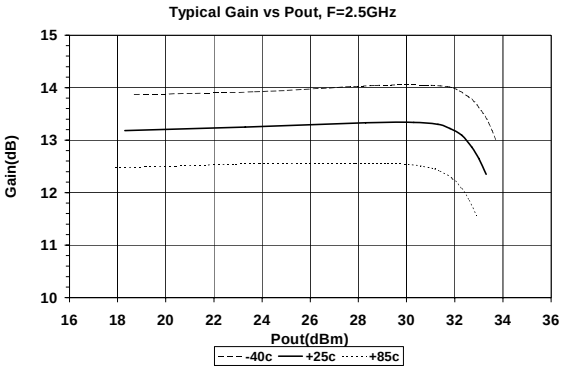






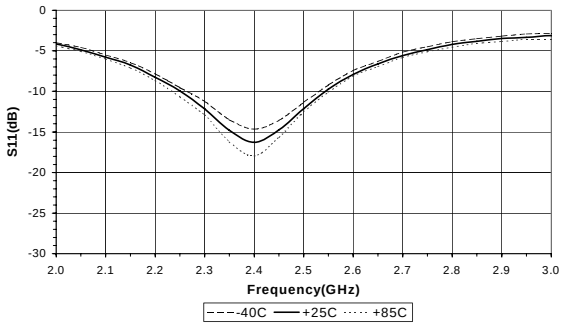




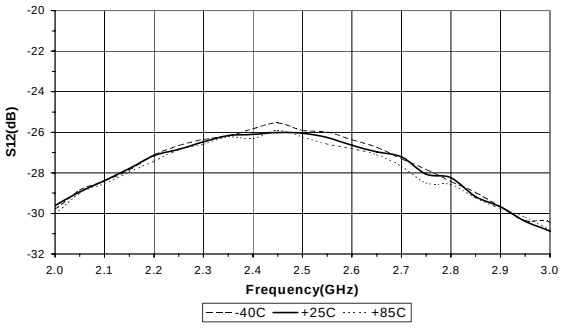


Measured 2.4-2.5 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

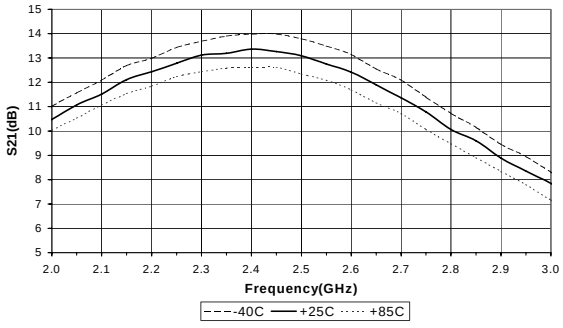
Narrowband S11 - Input Return Loss



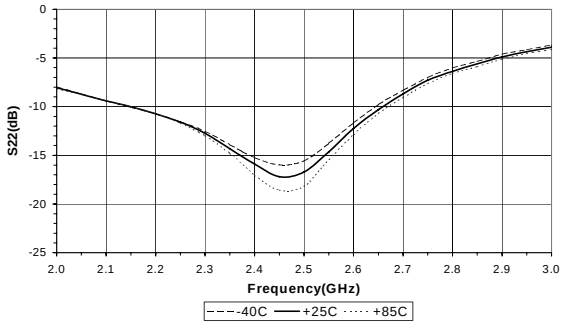
Narrowband S12 - Reverse Isolation



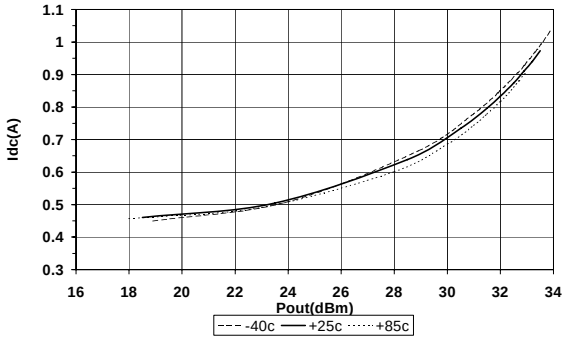
Narrowband S21 - Forward Gain



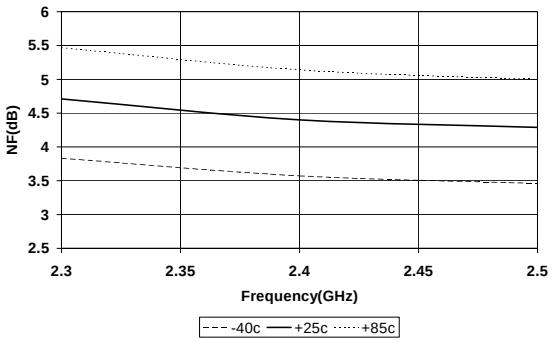
Narrowband S22 - Output Return Loss



DC Supply Current vs Pout, F=2.4GHz

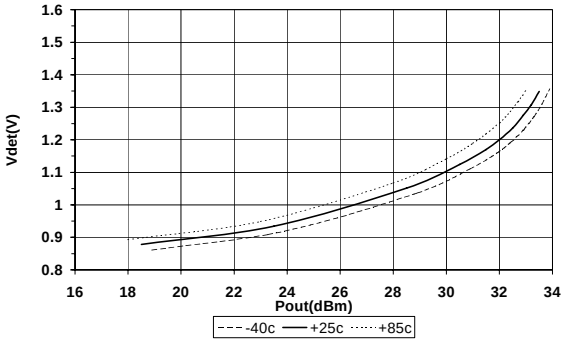


Noise Figure vs Frequency, O.T.

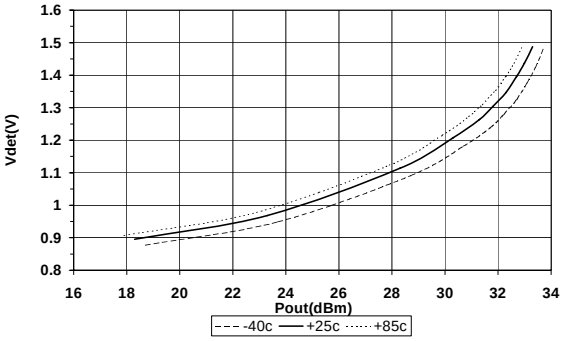


Measured 2.4-2.5 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

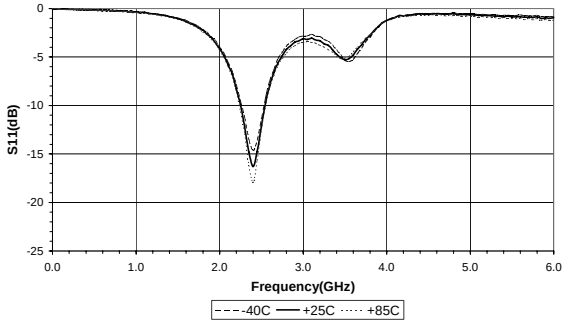
RF Power Detector (Vdet) vs Pout, F=2.4GHz



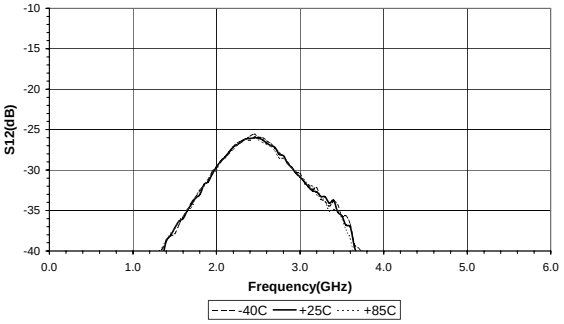
RF Power Detector (Vdet) vs Pout, F=2.5GHz



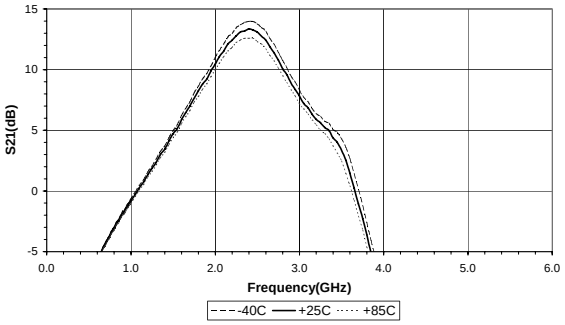
Broadband S11 - Input Return Loss



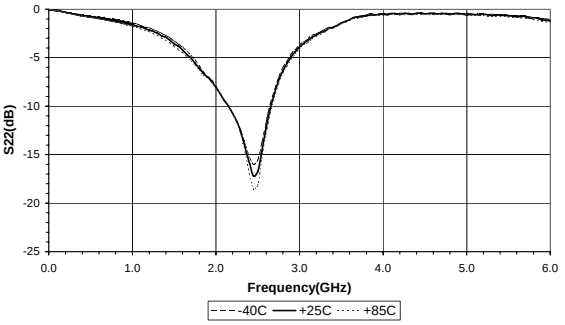
Broadband S12 - Reverse Isolation



Broadband S21 - Forward Gain



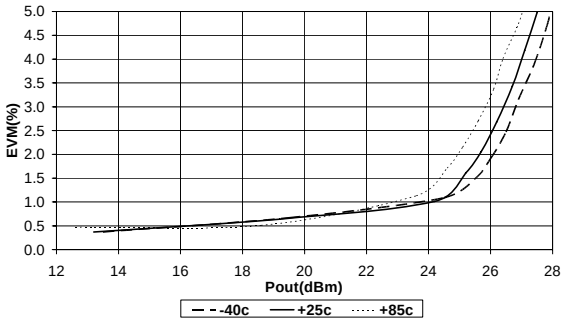
Broadband S22 - Output Return Loss



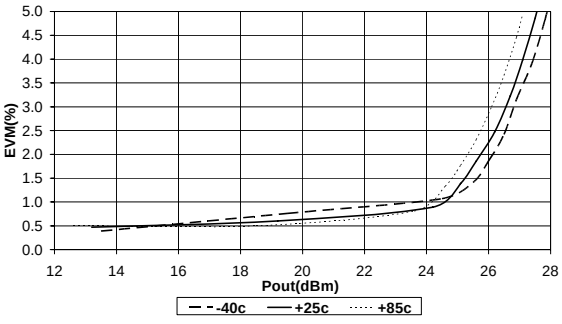
Measured 2.5-2.7 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

Source EVM = 0.6%, not deembedded from data.

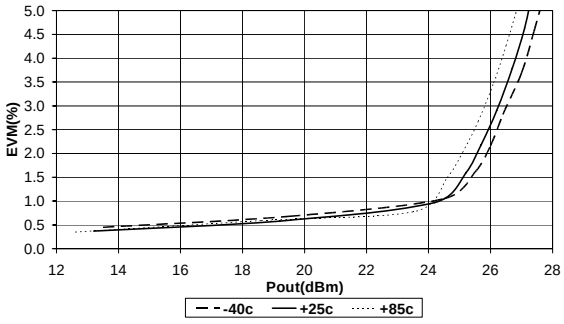
EVM vs Pout F=2.5GHz
802.11g, OFDM 54Mb/S, 64QAM



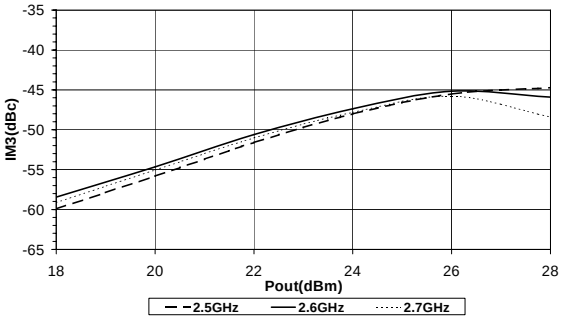
EVM vs Pout F=2.6GHz
802.11g, OFDM 54Mb/S, 64QAM



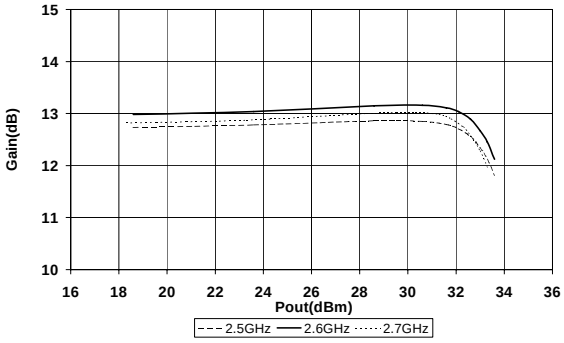
EVM vs Pout F=2.7GHz
802.11g, OFDM 54Mb/S, 64QAM



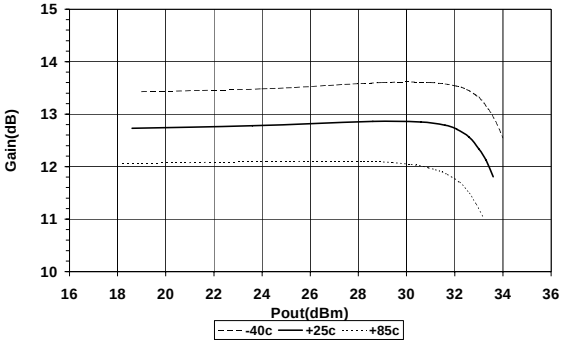
IM3 vs Pout (2 Tone Avg.),T=+25c
Tone Spacing = 1MHz



Typical Gain vs Pout, T=+25C

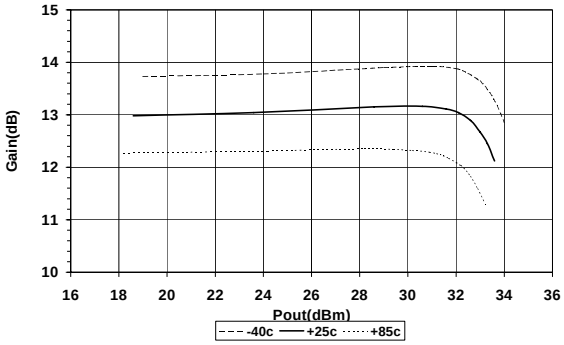


Typical Gain vs Pout, F=2.5GHz

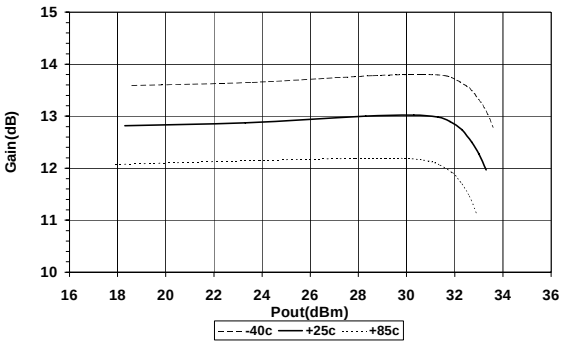


Measured 2.5-2.7 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

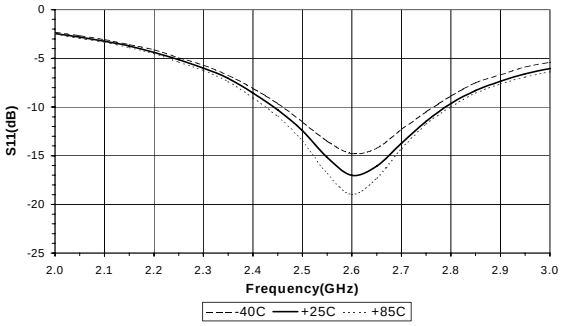
Typical Gain vs Pout, F=2.6GHz



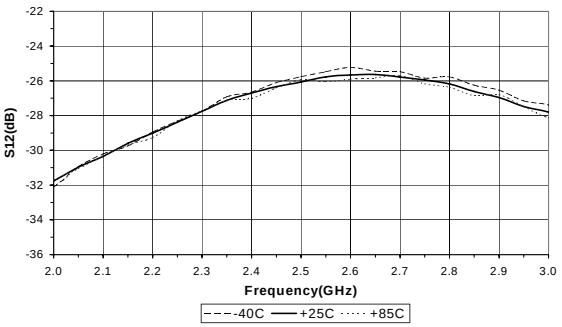
Typical Gain vs Pout, F=2.7GHz



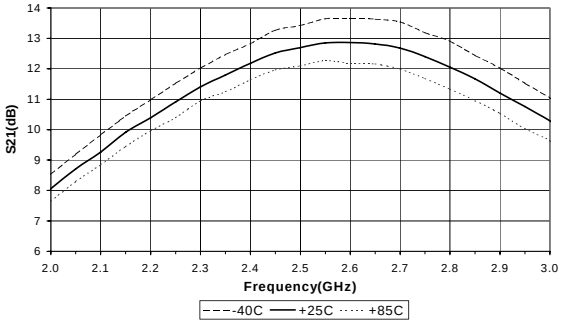
Narrowband S11 - Input Return Loss



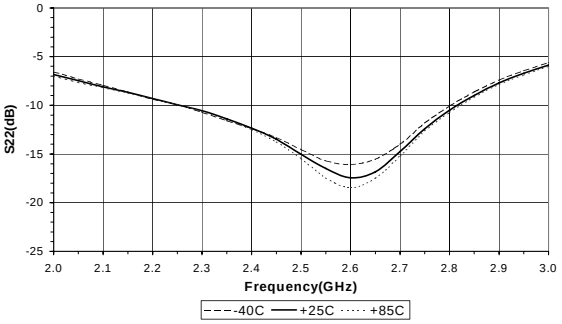
Narrowband S12 - Reverse Isolation



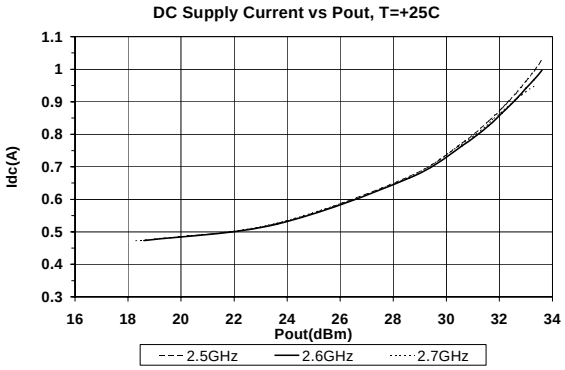
Narrowband S21 - Forward Gain

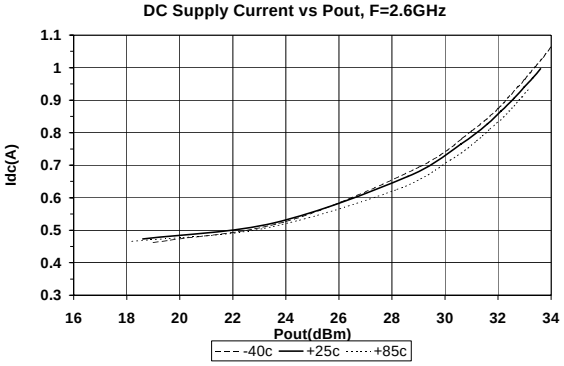


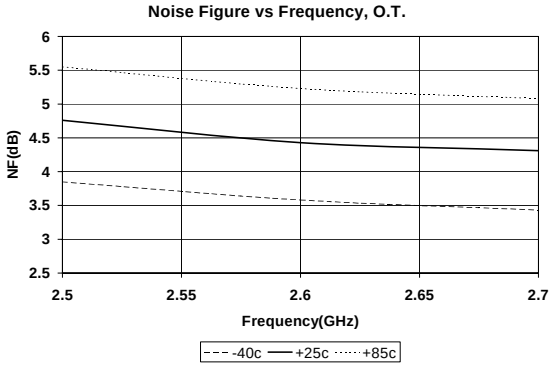
Narrowband S22 - Output Return Loss

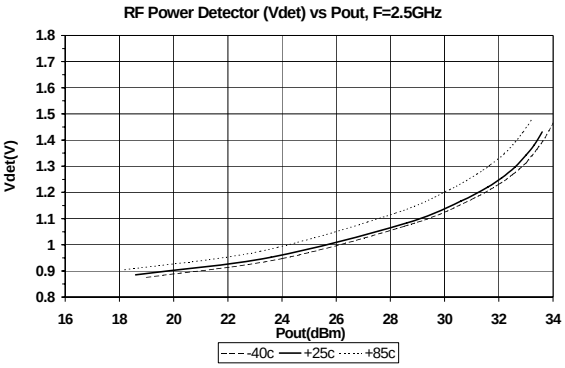


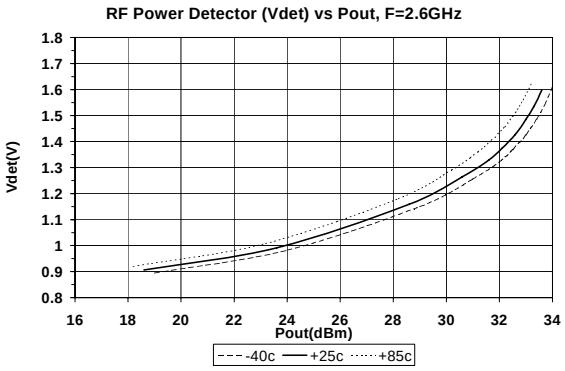
Measured 2.5-2.7 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

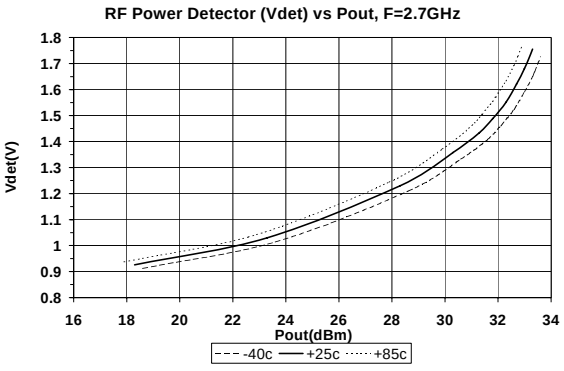






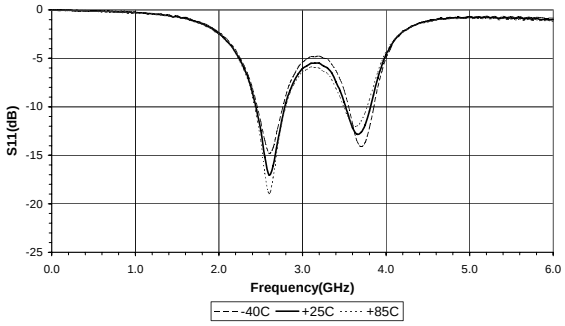




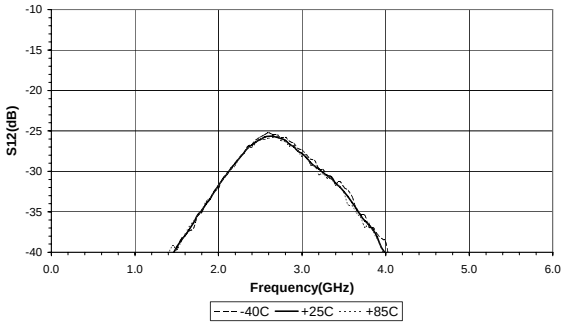


Measured 2.5-2.7 GHz Application Circuit Data (V_{cc} = V_{pc} = 5.0V, I_q = 445mA, T=25C)

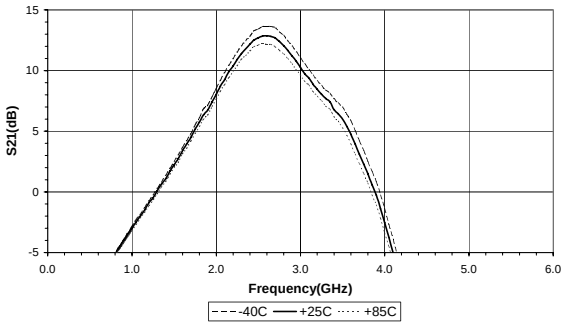
Broadband S11 - Input Return Loss



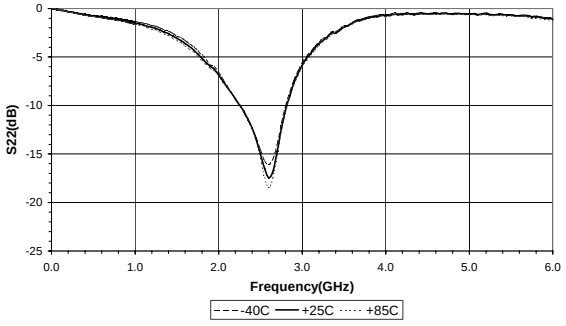
Broadband S12 - Reverse Isolation



Broadband S21 - Forward Gain

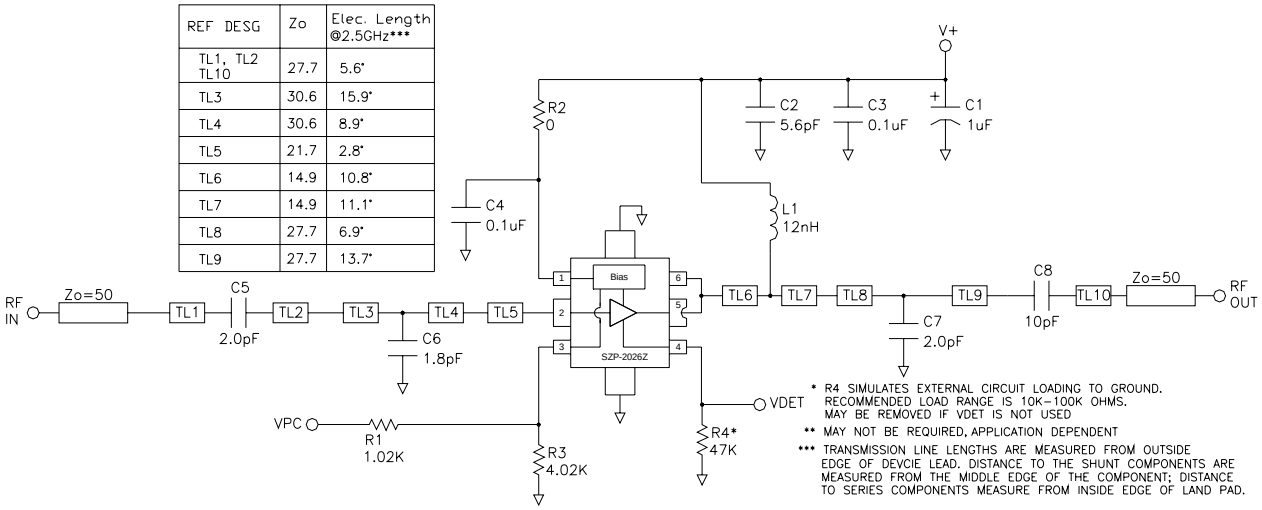


Broadband S22 - Output Return Loss



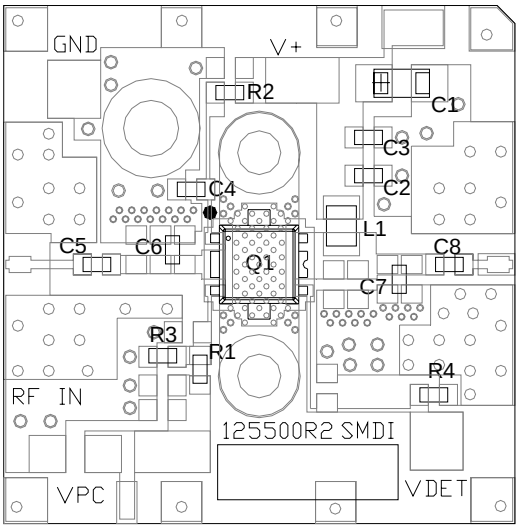
2.4-2.5 GHz Application Circuit For V+ = Vcc = Vpc = 5.0V

REF DESG	Zo	Elec. Length @2.5GHz***
TL1, TL2 TL10	27.7	5.6°
TL3	30.6	15.9°
TL4	30.6	8.9°
TL5	21.7	2.8°
TL6	14.9	10.8°
TL7	14.9	11.1°
TL8	27.7	6.9°
TL9	27.7	13.7°



2.4-2.5GHz Evaluation Board Layout For V+ = Vcc = Vpc = 5.0V

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

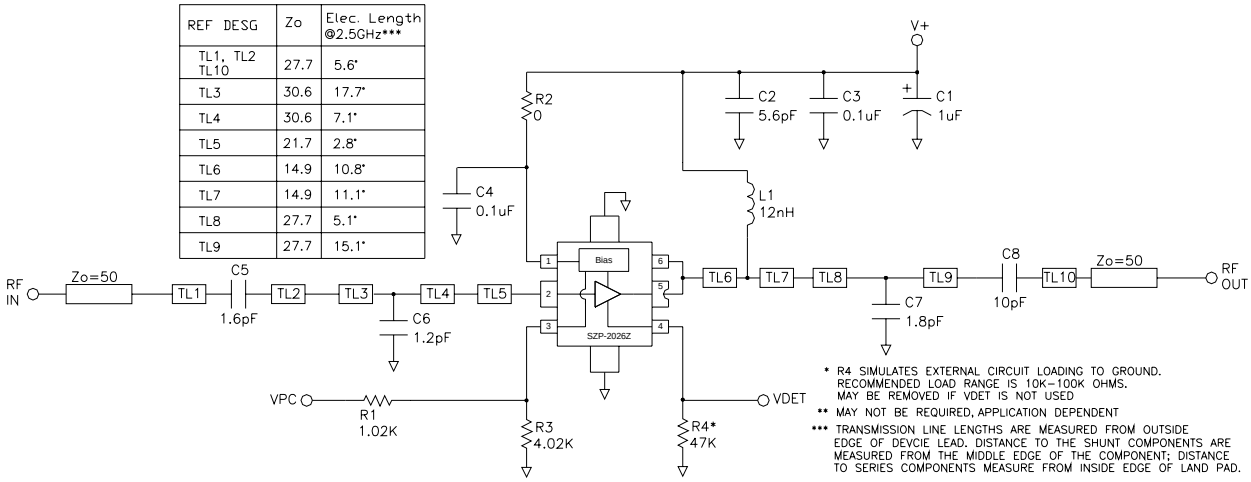


DESG	DESCRIPTION	NOTES
Q1	SZP-2026Z	SOF-26
R1	1.02K OHM, 0603 1%	0402 may be used
R2	0 OHM, 0603	"
R3	4.02K OHM, 0603 1%	"
R4	47K OHM, 0603	"
C1	1uF 16V MLCC CAP	Tantalum ok for EVM performance. Use MLCC type for best IM3 levels.
C2	5.6pF CAP, 0603	NPO ROHM MCH185A5R6DK or equiv.
C3,4	0.1uF CAP, 0603	NPO, 0402 ok ROHM MCH184CN105K or equiv.
C5	2.0pF CAP, 0603	NPO, low ESR ATC 600S2R0JW250 or equiv.
C6	1.8pF CAP, 0603	NPO, low ESR ATC 600S1R8CW250 or equiv.
C7	2.0pF CAP, 0603	NPO, low ESR ATC 600S2R0CW250 or equiv.
C8	10pF CAP, 0603	NPO, low ESR ATC 600S100JW250 or equiv.
L1	12nH IND, 0805	Coilcraft 0805HQ-12NXJBB

PCB NOTES: Do not use less than the recommended number of via holes under the device ground paddle.
RF layers thicker than .020 inches (0.5mm) not recommended.

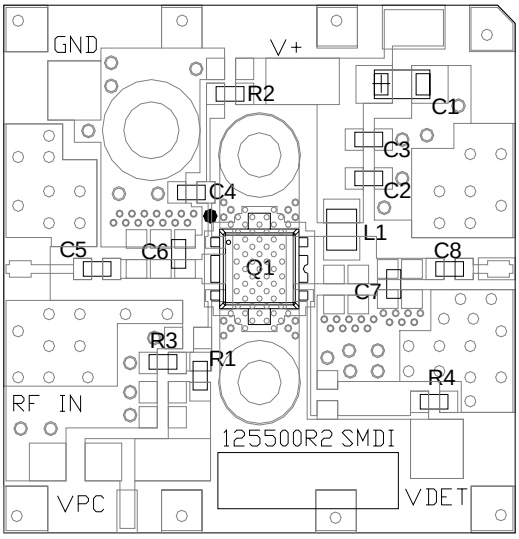
2.5-2.7 GHz Application Circuit For V+ = Vcc = Vpc = 5.0V

REF DESG	Zo	Elec. Length @2.5GHz***
TL1, TL2 TL10	27.7	5.6°
TL3	30.6	17.7°
TL4	30.6	7.1°
TL5	21.7	2.8°
TL6	14.9	10.8°
TL7	14.9	11.1°
TL8	27.7	5.1°
TL9	27.7	15.1°



2.5-2.7GHz Evaluation Board Layout For V+ = Vcc = Vpc = 5.0V

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



DESG	DESCRIPTION	NOTES
Q1	SZP-2026Z	SOF-26
R1	1.02K OHM, 0603 1%	0402 may be used
R2	0 OHM, 0603	"
R3	4.02K OHM, 0603 1%	"
R4	47K OHM, 0603	"
C1	1uF 16V MLCC CAP	Tantalum ok for EVM performance. Use MLCC type for best IM3 levels.
C2	5.6pF CAP, 0603	NPO ROHM MCH185A5R6DK or equiv.
C3,4	0.1uF CAP, 0603	NPO, 0402 ok ROHM MCH184CN105K or equiv.
C5	1.6pF CAP, 0603	NPO, low ESR ATC 600S1R6JW250 or equiv.
C6	1.2pF CAP, 0603	NPO, low ESR ATC 600S1R2CW250 or equiv.
C7	1.8pF CAP, 0603	NPO, low ESR ATC 600S1R8CW250 or equiv.
C8	10pF CAP, 0603	NPO, low ESR ATC 600S100JW250 or equiv.
L1	12nH IND, 0805	Coilcraft 0805HQ-12NXJBB

PCB NOTES: Do not use less than the recommended number of via holes under the device ground paddle.
RF layers thicker than .020 inches (0.5mm) not recommended.

Part Symbolization

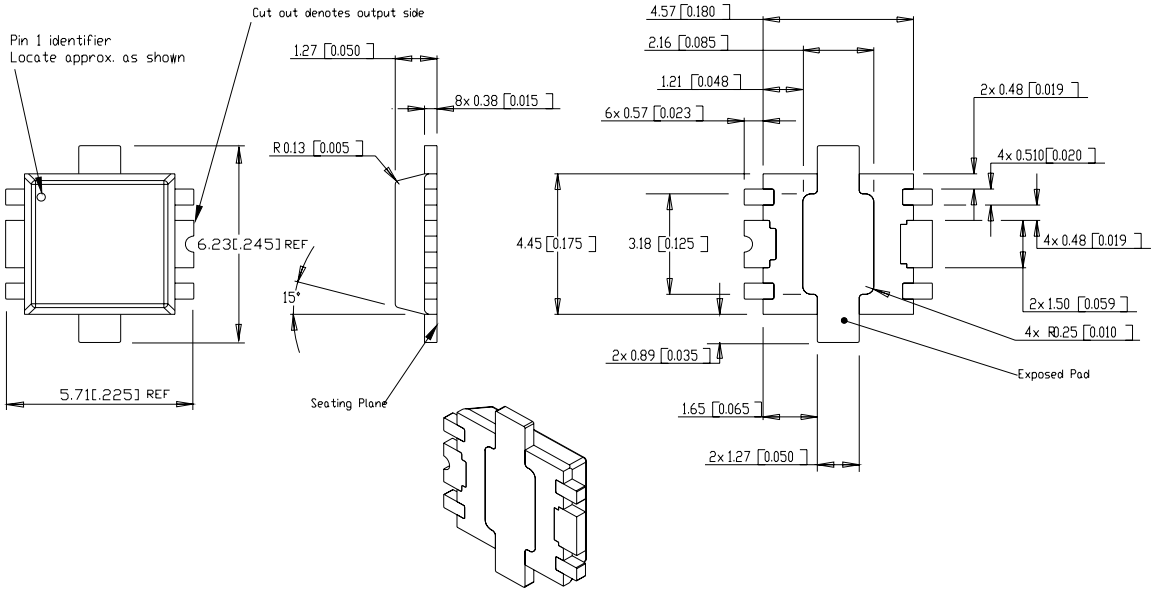
The part will be symbolized with "SZP-2026Z" to designate it as a RoHS green compliant product. Marking designator will be on the top surface of the package.

Part Number Ordering Information

Part Number	Description	Reel Size	Devices/ Reel
SZP-2026Z*	Lead Free RoHS compliant	13"	3000
SZP-2026Z EVB1	2.4-2.5GHz Evaluation Board	N/A	N/A
SZP-2026Z EVB2	2.5-2.7GHz Evaluation Board	N/A	N/A

* Matte tin finish

Package Outline Drawing (dimensions in mm [in]):



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