STPAC01F2

IPAD™, RF detector for power amplifier control

Features

- STPAC01F2 has two outputs
  - one for the signal detection
  - one for the temperature compensation
- V_{DCout} = 0.88 V at 0.85 GHz at 10 dBm
- V_{DCout} = 1.07 V at 1.85 GHz at 10 dBm
- V_{supply} = 5 V max
- Lead-free package

Benefit

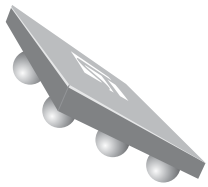
- The use of IPAD technology allows the RF front-end designer to save PCB area and to drastically reduce parasitic inductances.

Applications

Target applications are cellular phones and PDA using GSM, DCS, PCS, AMPS, TDMA, CDMA and 800 MHz to 1900 MHz frequency ranges.

Description

The STPAC01F2 is an integrated RF detector for the power control stage. It converts RF signal coming from the coupler into a DC signal usable by the digital stage. It is based on the use of two similar diodes, one providing the signal detection while the second one is used to provide temperature information to a thermal compensation stage. A biasing stage suppresses the detection diode drop voltage effect.



Flip Chip
(8 bumps)

Figure 1. Pin layout (bump side)

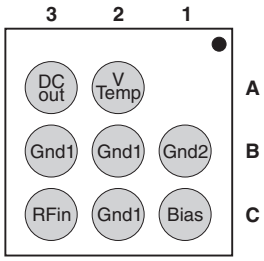
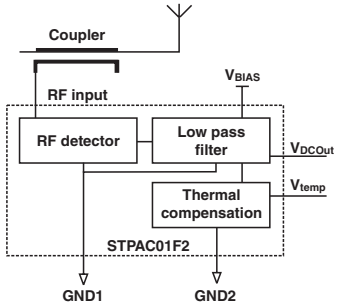


Figure 2. Functional diagram



TM: IPAD is a trademark of STMicroelectronics.

1 Characteristics

Table 1. Absolute ratings (T_{amb} = 25 °C)

Symbol	Parameter	Value	Unit
V_{BIAS}	Bias voltage	5	V
P_{RF}	RF power at the RF input	20	dBm
F_{OP}	Operating frequency range	0.8 to 2	GHz
V_{PP}	ESD level as per MIL-STD 883E method 3015.7 notice 8 (HBM)	250	V
T_{OP}	Operating temperature range	- 30 to + 85	°C
T_{STG}	Storage temperature range	- 55 to + 150	°C

Table 2. Parameters related to bias voltage

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{BIAS}	Operating bias voltage		2.2		3.2	V
I_{BIAS}	Bias current	V_{BIAS} = 3.2 V			0.5	mA

Table 3. Parameters related to detection function (V_{BIAS} + 2.7 V, DC output load = 100 kΩ)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{DCout}	DC output voltage (see *Figure 1*, I_{DC} = 50 µA)	F = 1.85 GHz, P_{RF} = 10 dBm	0.97	1.07	1.17	V
		F = 1.85 GHz, P_{RF} = - 20 dBm	1.83	1.93	2.03	
		F = 0.85 GHz, P_{RF} = 10 dBm	0.78	0.88	0.98	
		F = 0.85 GHz, P_{RF} = - 20 dBm	1.83	1.93	2.03	
ΔV_{DCout}	DC output voltage variation (see *Figure 7*, I_{DC} = 50 µA)	0 < T_{amb} < 70 °C F = 1.85 GHz, P_{RF} = 10 dBm		0.09		V
		2.2 < V_{BIAS} < 3.2 V F = 1.85 GHz, P_{RF} = 10 dBm		0.44		

Table 4. Parameters related detection function

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{Temp}	Temperature output voltage (see *Figure 8*)	I_{DC} = 50 µA	1.83	1.93	2.03	V
ΔV_{Temp}	Temperature output voltage variation (see *Figure 8*)	I_{DC} = 50 µA, 0 < T_{amb} < 70 °C		0.09		V
		I_{DC} = 50 µA, 2.2 < V_{BIAS} < 3.2V		0.44		

Figure 3. V_{DCout} measurement circuit

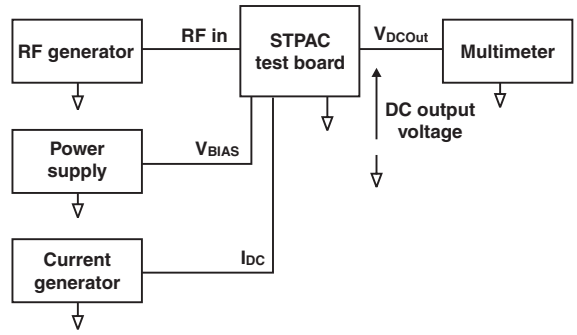


Figure 4. V_{DCout} versus RF input power

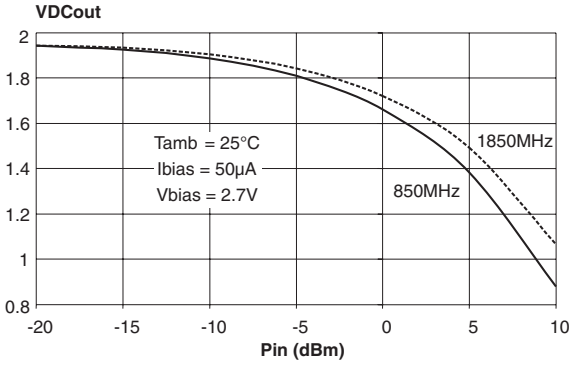


Figure 5. Relative variation of V_{DCout} versus frequency (from 800 to 900 MHz)

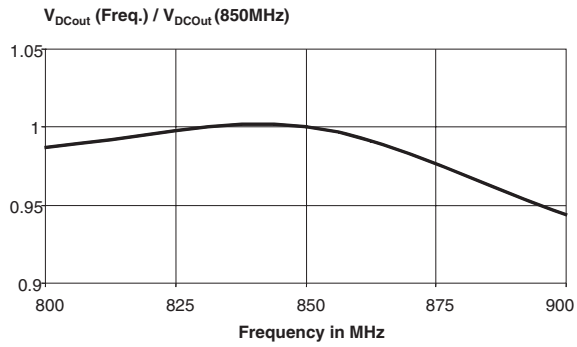


Figure 6. Relative variation of V_{DCout} versus frequency (from 1800 to 1900 MHz)

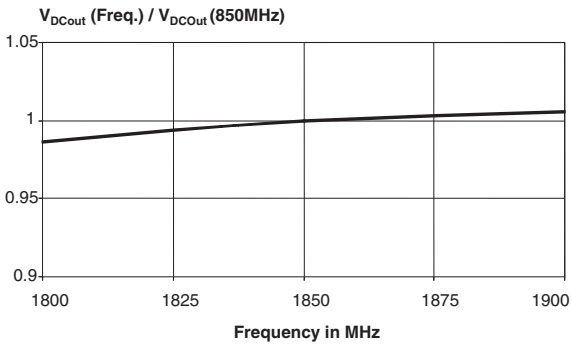


Figure 7. Temperature effect measurement circuit on V_{DCout}

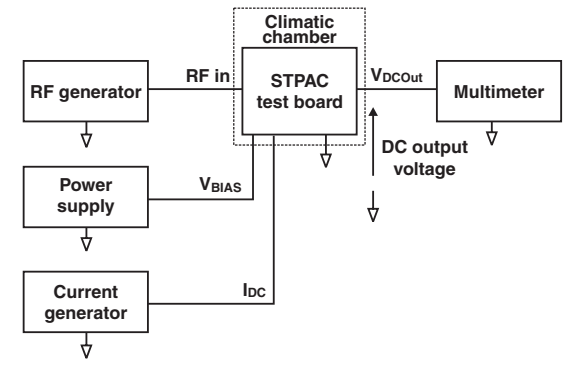


Figure 8. V_{temp} measurement circuit

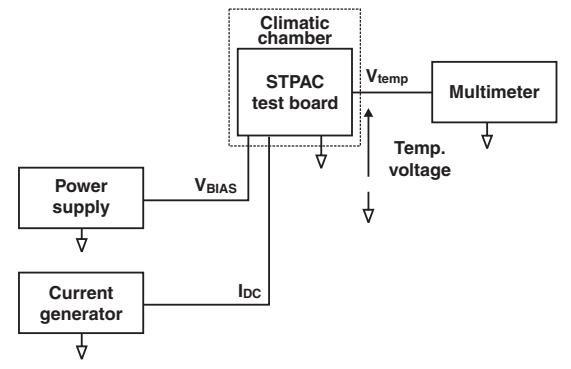
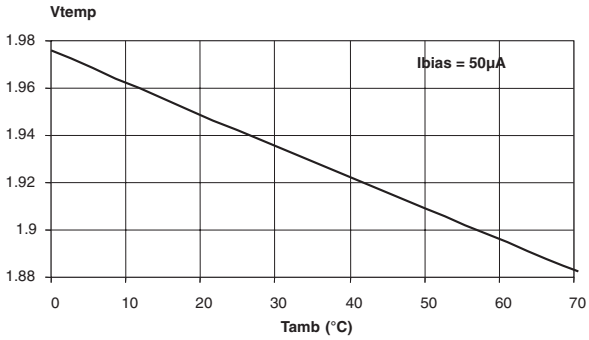
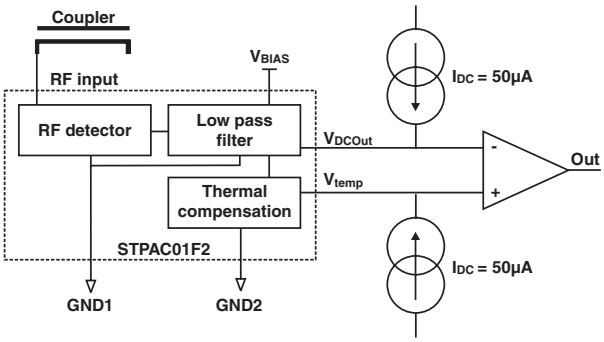


Figure 9. V_{temp} output voltage versus ambient temperature



2 Application information

Figure 10. Application diagram



The STPAC01 is the first part of the power amplifier stage and provides both RF power and die temperature measurements. *Figure 10* shows the basic circuit of RF detector.

A coupler located on the line between RF amplifier output and the antenna takes a part of the available power and applies it to STPAC01 RF input.

The RF detector and the low-pass filter provide a DC voltage depending on the input power. Thermal compensation provides a DC voltage depending on the ambient temperature. As the detection system and the thermal compensation are based on the same topology, VDCout will have the same temperature variation as Vtemp. Connected to a differential amplifier, the output will be a voltage directly linked to the RF input power. VDCout and Vtemp must be biased with 50 µA DC current.

This topology offers the most accurate output value as it is 100% compensated.

3 Package information

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at *www.st.com*.

Figure 11. Flip Chip dimensions

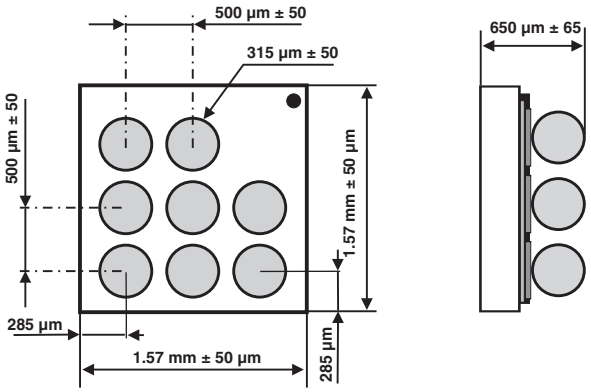


Figure 12. Footprint

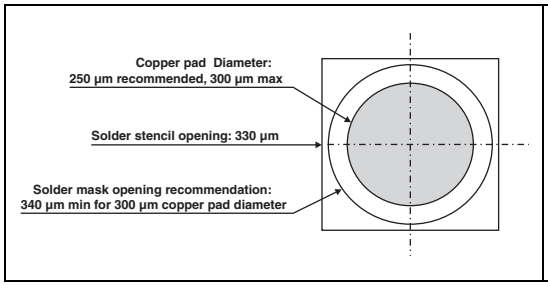


Figure 13. Marking

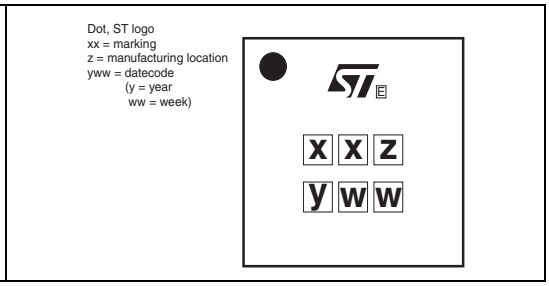
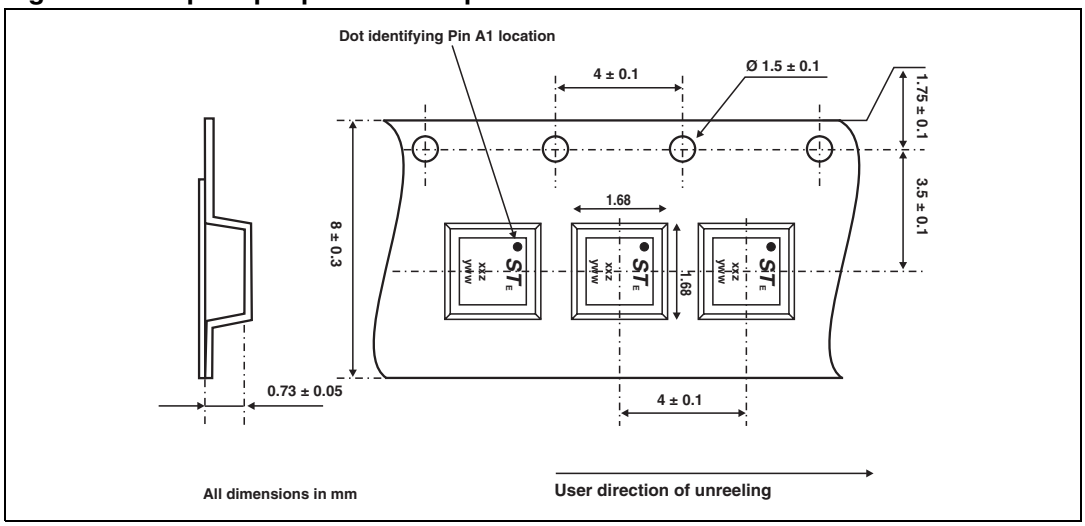


Figure 14. Flip Chip tape and reel specification



Note: More informations are available in the application notes:
AN1235:"Flip Chip: Package description and recommendations for use"
AN1751: “EMI filters: Recommendations and measurements”

4 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPAC01F2	RA	Flip Chip	3.3 mg	5000	Tape and reel 7”

5 Revision history

Table 6. Document revision history

Date	Revision	Changes
21-Oct-2004	1	Initial release.
29-Apr-2008	2	Updated ECOPACK statement. Updated *Figure 11*, *Figure 12*, *Figure 13* and *Figure 14.* Reformatted to current standards.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZE REPRESENTATIVE OF ST, ST PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS, WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2008 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А