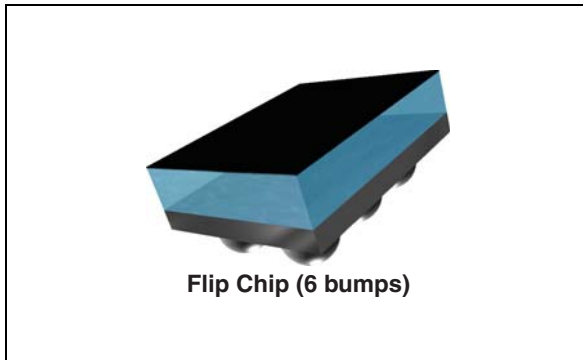


## Wide band directional coupler with ISO port

Datasheet - production data


**Features**

- 50  $\Omega$  nominal input / output impedance
- Wide operating frequency range (704 MHz to 2570 MHz)
- Low insertion Loss (< 0.2 dB)
- 34 dB typical coupling factor
- High directivity (typical 25 dB)
- High ESD robustness (IEC 61000-4-2 Level 4)
- Flip-Chip package
- Small footprint: 1300 x 1000  $\mu\text{m}$

**Benefits**

- Very low profile (< 690  $\mu\text{m}$ )
- Lead-free package
- High RF performance
- RF module size reduction

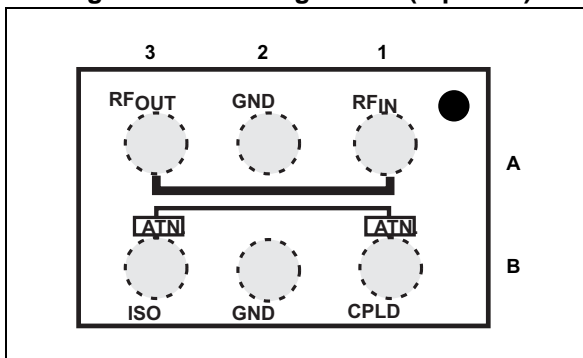
**Applications**

- Quad band power amplifier module
- Quad band front end module
- GSM / WCDMA mobile phone

**Description**

The CPL-WB-00D3 is a wide band directional coupler designed to measure RF antenna output power in GSM / WCDMA / TD-SCDMA / LTE applications. This CPL has been customized for wide band operating frequencies (EGSM and CELL, PCS, DCS, TD-SCDMA, WCDMA Band I, B7, B17, LTE) with less than 0.2 dB insertion losses in the transmit bandwidth (704 MHz to 2570 MHz).

The CPL-WB-00D3 has been designed using STMicroelectronics IPD (integrated passive device) technology on non conductive glass substrate to optimize RF performance. The device is delivered 100% tested in tape and reel.

**Figure 1. Pin configuration (top view)**


# 1 Characteristics

**Table 1. Absolute maximum rating (limiting values)**

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P <sub>IN</sub>	Input Power RF <sub>IN</sub>			35	dBm
V <sub>ESD (IEC)</sub>	ESD ratings IEC 61000-4-2 (C = 150 pF, R = 330 Ω, 10 shots with both polarities and each condition, cumulative method) ISO and CPLD pins connected to ground: RF <sub>IN</sub> , RF <sub>OUT</sub> , air discharge RF <sub>IN</sub> , RF <sub>OUT</sub> , contact discharge	±15 ±8			kV kV
V <sub>ESD (HBM)</sub>	Human body model, JESD22-A114F, all I/O	2			kV
V <sub>ESD (MM)</sub>	Machine model, JESD22-A115-A, all I/O	100			V
V <sub>ESD (CDM)</sub>	Charge device model, JESD22-C101-C, all I/O	500			V
T <sub>OP</sub>	Operating temperature	-30		+85	°C

**Table 2. Electrical characteristics (T<sub>amb</sub> = 25 °C) - impedances**

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z <sub>OUT</sub>	Nominal output impedance	-	50	-	Ω
Z <sub>IN</sub>	Nominal input impedance	-	50	-	
Z <sub>CPLD</sub>	Nominal coupling impedance	-	50	-	
Z <sub>OUT</sub>	Nominal ISO impedance	-	50	-	

Table 3. Electrical characteristics ( $T_{amb} = 25\text{ °C}$ ) - RF performance

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
f	Frequency range (bandwidth)		824		2170	MHz
$I_L$	Insertion loss in bandwidth	From 704 MHz to 2570 MHz		0.1	0.2	dB
$R_L$	Return loss in bandwidth	From 704 MHz to 2570 MHz	15			dB
CPLD	Coupling factor (including attenuation)	From 824 MHz to 915 MHz	35		41	dB
		From 1710 MHz to 2025 MHz	27		33	dB
Ripple	Coupling ripple in individual band	(824 to 849 MHz) (880 to 915 MHz) (1710 to 1785 MHz) (1850 to 1910 MHz) (1880 to 2025 MHz) (1920 to 1980 MHz)			0.5	dB
DIR	Coupler directivity	From 704 MHz to 2025 MHz	20	25		dB
		From 2500 MHz to 2570 MHz	16	19		

### 1.1 RF measurement (on reference evaluation board)

Measurements done on reference evaluation board under 50 Ω , de-embedding at CPL-WB-00D3 bumps.

Figure 2. Insertion loss

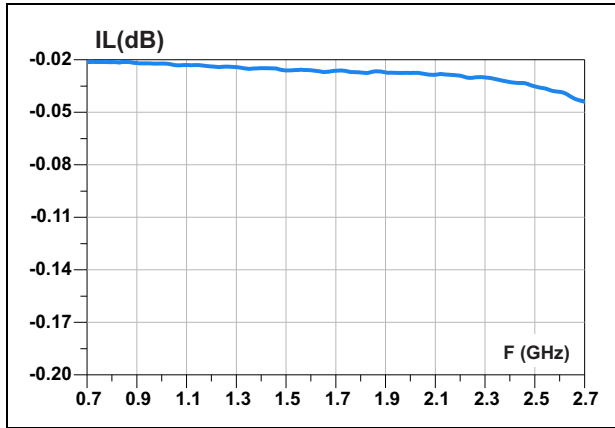


Figure 3. Directivity

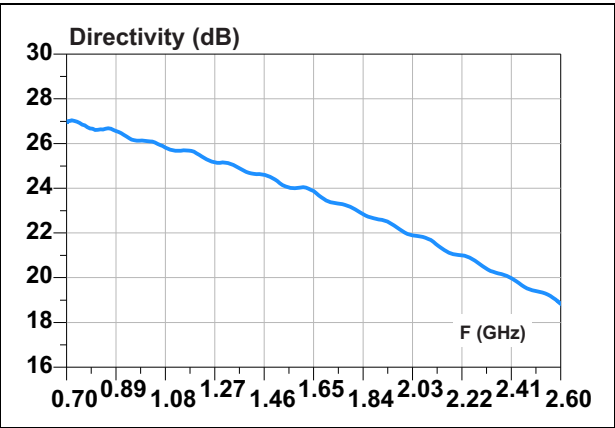


Figure 4. Low band coupling factor

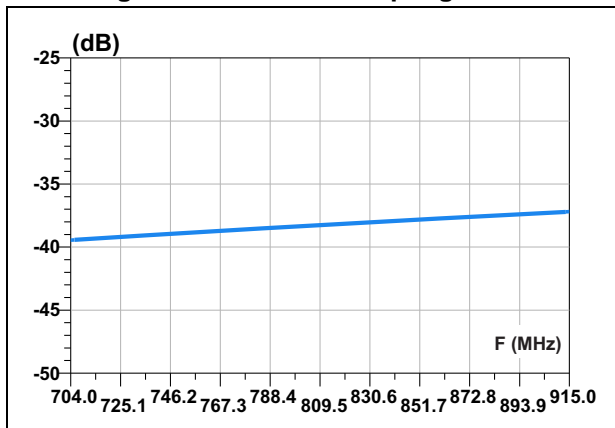
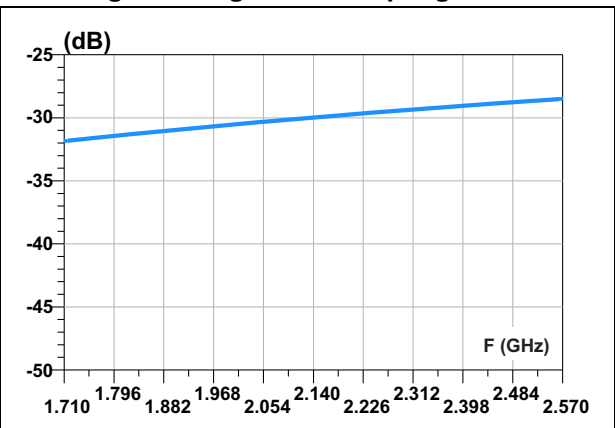
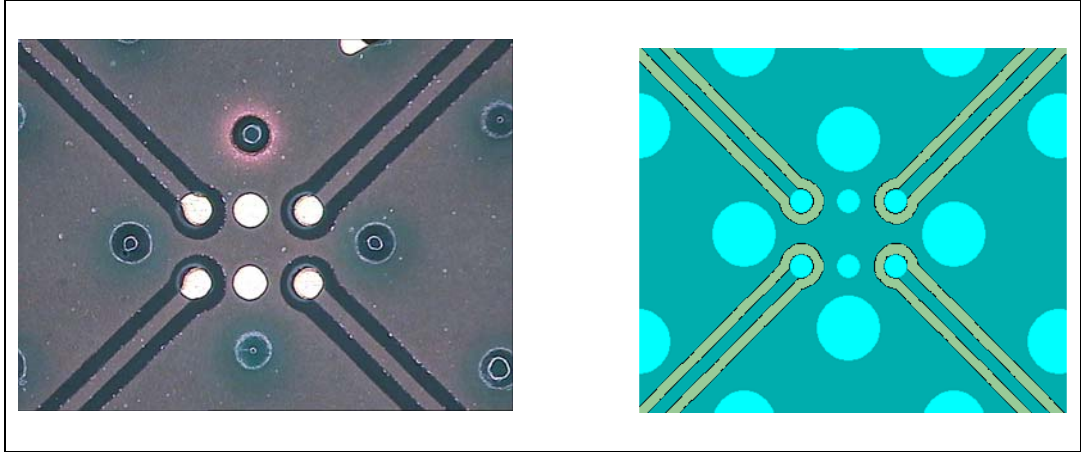


Figure 5. High band coupling factor



## 2 Reference evaluation board

Figure 6. CPW lines ( $W = 127 \mu\text{m}$  with gap to gnd =  $100 \mu\text{m}$ ) on top layer + GND on layer 2



- Material: 4 layers FR4 with solder mask on top and bottom layer
- Substrate thickness: 0.8 mm
- Line lengths: 14.3 mm
- TRL cal kit available

### 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

Figure 7. Package dimensions (bump side)

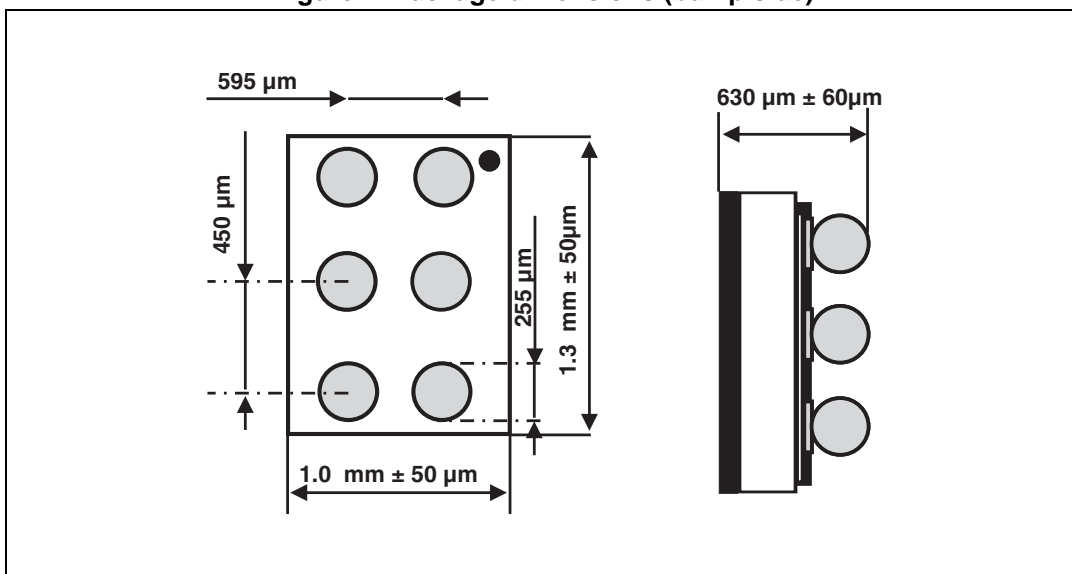


Figure 8. Footprint

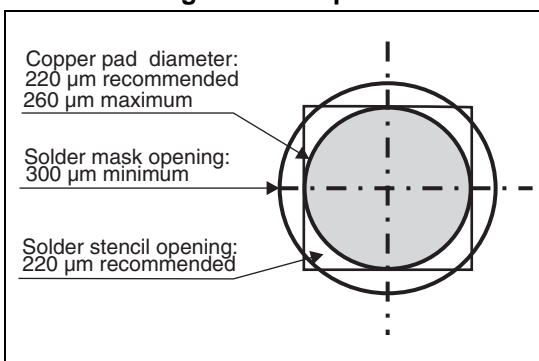


Figure 9. Marking

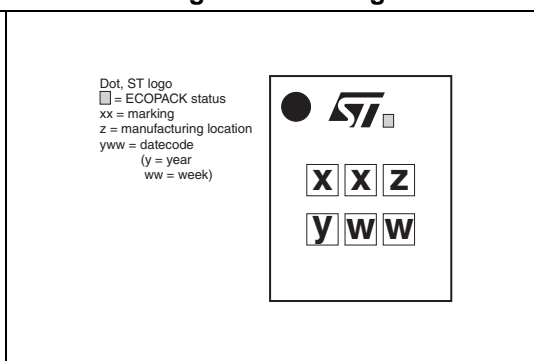
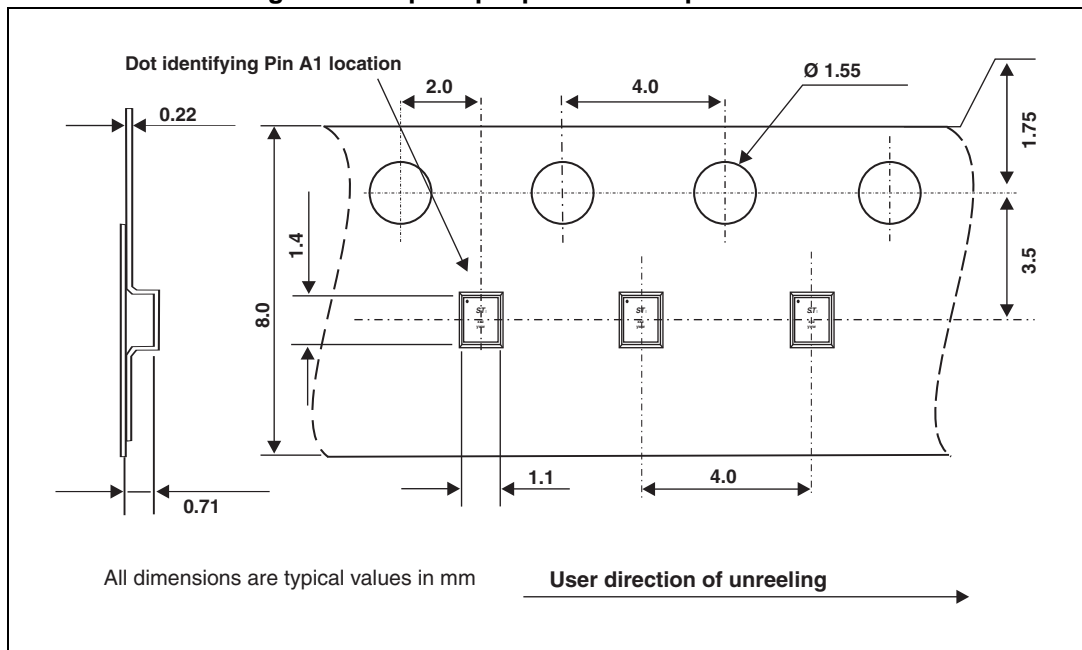


Figure 10. Flip Chip tape and reel specifications



Note: More information is available in the application note:  
 AN1235: "Flip Chip: package description and recommendations for use"

## 4 Ordering information

Table 4. Ordering information

Order code	Marking	Base qty	Delivery mode
CPL-WB-00D3	RX	5000	Tape and reel

## 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
21-Apr-2010	1	Initial release.
14-Mar-2014	2	Updated <a href="#">Features</a> , <a href="#">Description</a> , <a href="#">Table 3</a> , <a href="#">Figure 2</a> , <a href="#">Figure 3</a> and <a href="#">Figure 4</a> .



**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.**

**ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.**

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.

© 2014 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 - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)

