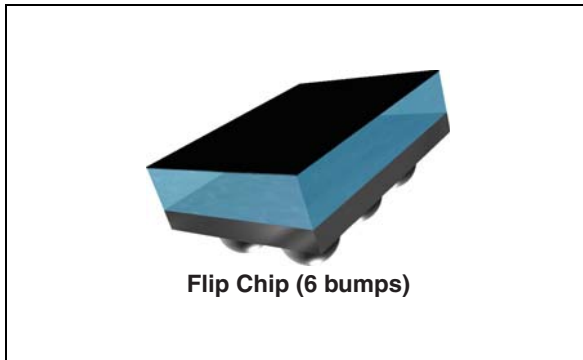


## Wide band directional coupler with ISO port

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

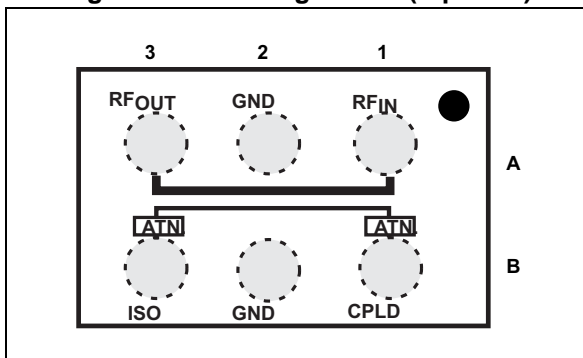
**Applications**

- 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

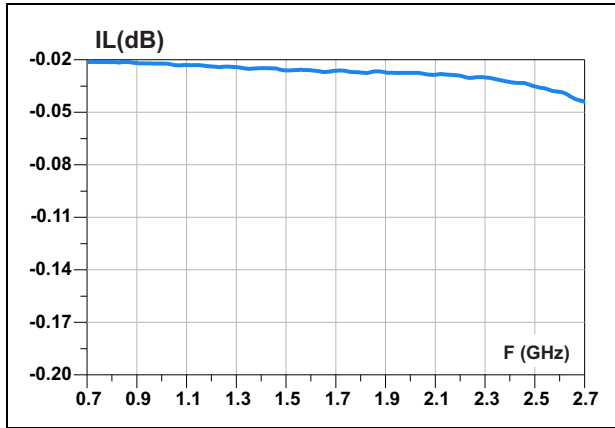


Figure 3. Directivity

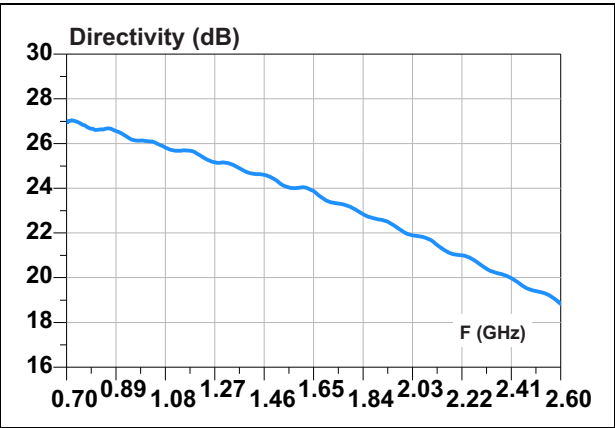


Figure 4. Low band coupling factor

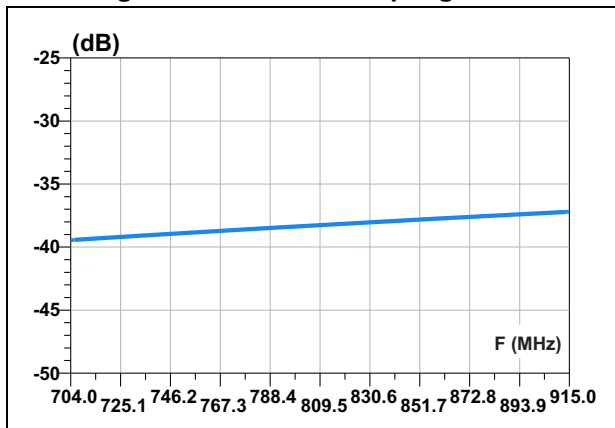
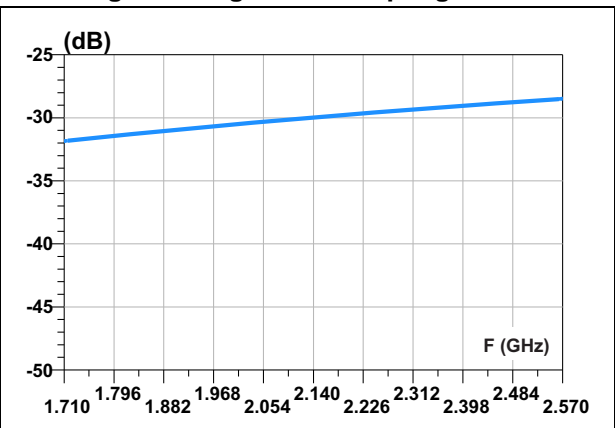
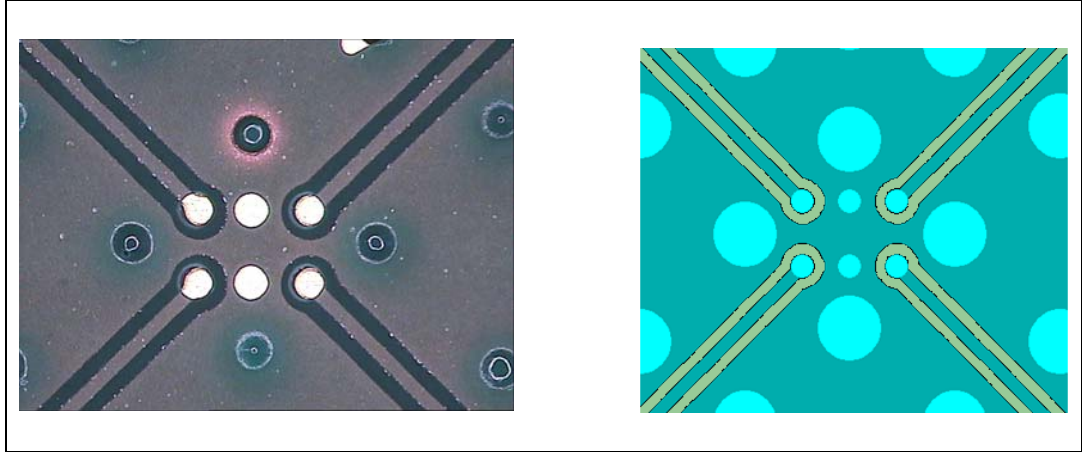


Figure 5. High band coupling factor



## 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)

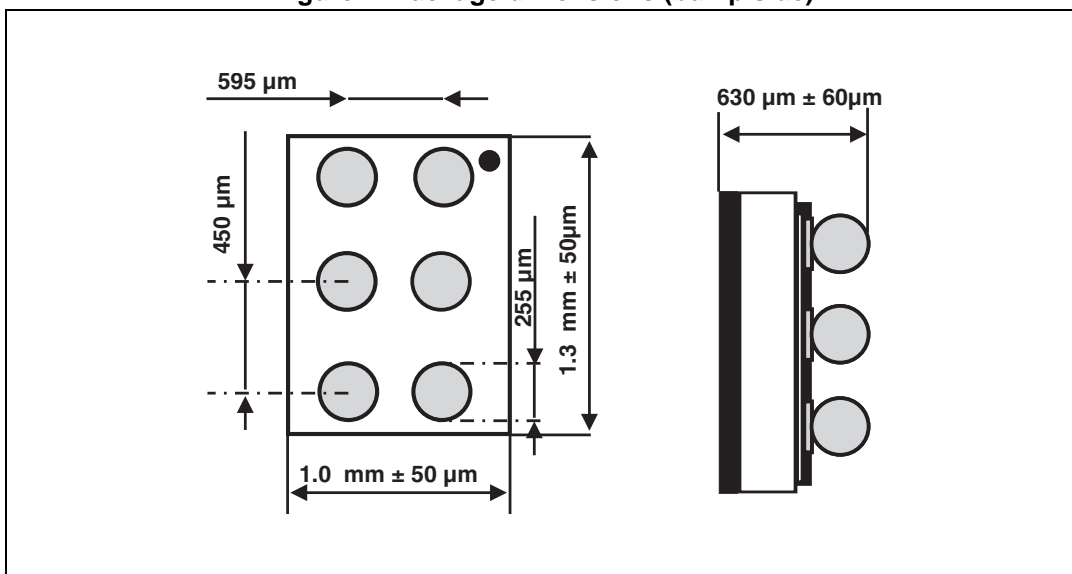


Figure 8. Footprint

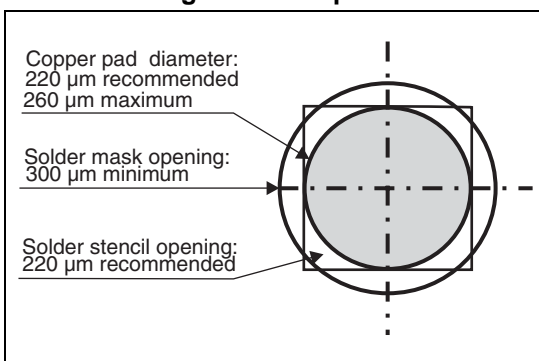


Figure 9. Marking

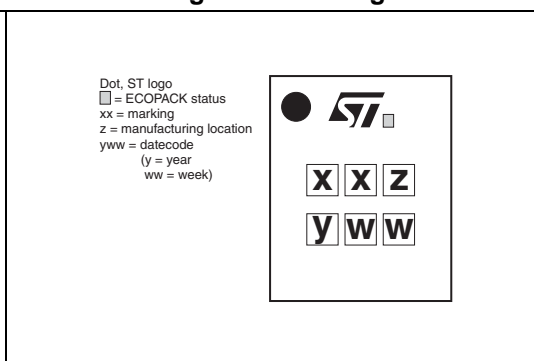
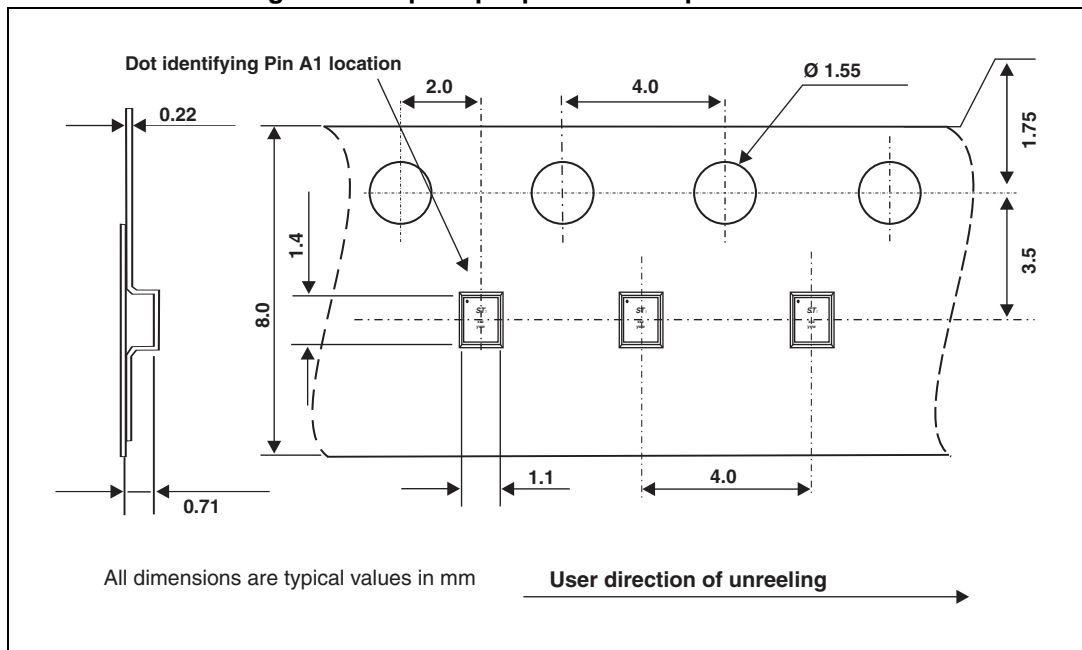


Figure 10. Flip Chip tape and reel specifications



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> .



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