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## Wide band directional coupler with ISO port

### Features

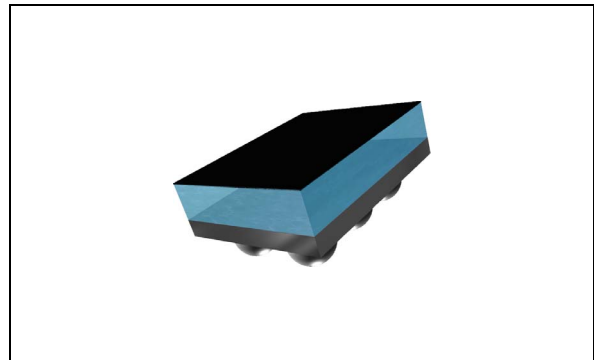
- 50  $\Omega$  nominal input / output impedance
- Wide operating frequency range (824 MHz to 2025 MHz)
- Low Insertion Loss (< 0.2 dB)
- 34 dB typical coupling factor
- High directivity (typical 25 dB)
- High ESD robustness (IEC 61000-4-2 Level 4)
- Flip-Chip package
- Small footprint: 1700 x 1200  $\mu\text{m}$

### Benefits

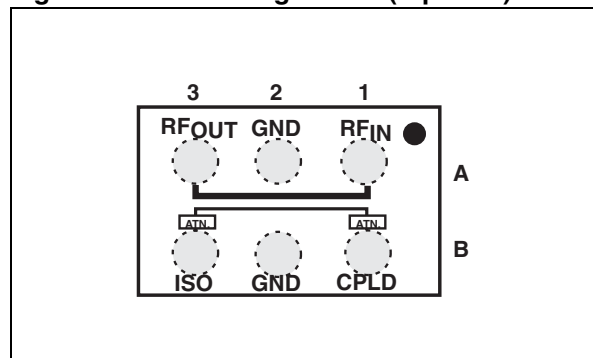
- Very low profile (< 690  $\mu\text{m}$  thickness)
- Lead-free package
- High RF performance
- RF module size reduction

### Applications

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



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



### Description

The CPL-WB-01C2 is a wide band directional coupler designed to measure RF antenna output power in GSM / TD-SCDMA applications. This CPL has been customized for wide band operating frequencies (EGSM and CELL, PCS, DCS, TD-SCDMA) with less than 0.2 dB insertion losses in the transmit bandwidth (824 MHz to 2025 MHz).

The CPL-WB-01C2 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.

# 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)				
	RF <sub>IN</sub> , RF <sub>OUT</sub> , air discharge	±15			kV
	RF <sub>IN</sub> , RF <sub>OUT</sub> , contact discharge	±8			kV
V <sub>ESD (HBM)</sub>	Human body model, JESD22-A114-B, 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 - impedances (T<sub>amb</sub> = 25 °C)**

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

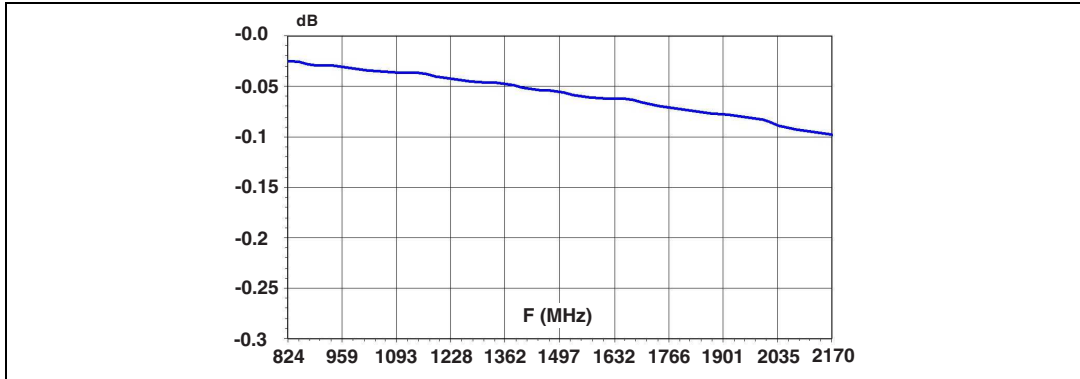
**Table 3. Electrical characteristics - RF performance (T<sub>amb</sub> = 25 °C)**

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
T <sub>OP</sub>	Operating temperature		-30		+85	°C
f	Frequency range (bandwidth)		824		2025	MHz
I <sub>L</sub>	Insertion loss in bandwidth	From 824 MHz to 2025 MHz		0.1	0.2	dB
R <sub>L</sub>	Return loss in bandwidth	From 824 MHz to 2025 MHz	15			dB
CPLD	Coupling factor (including attenuator)	From 824 MHz to 915 MHz	35		39	dB
		From 1710 MHz to 2025 MHz	28		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)			0.5	dB
DIR	Coupler directivity	From 824 MHz to 2025 MHz	20	25		dB

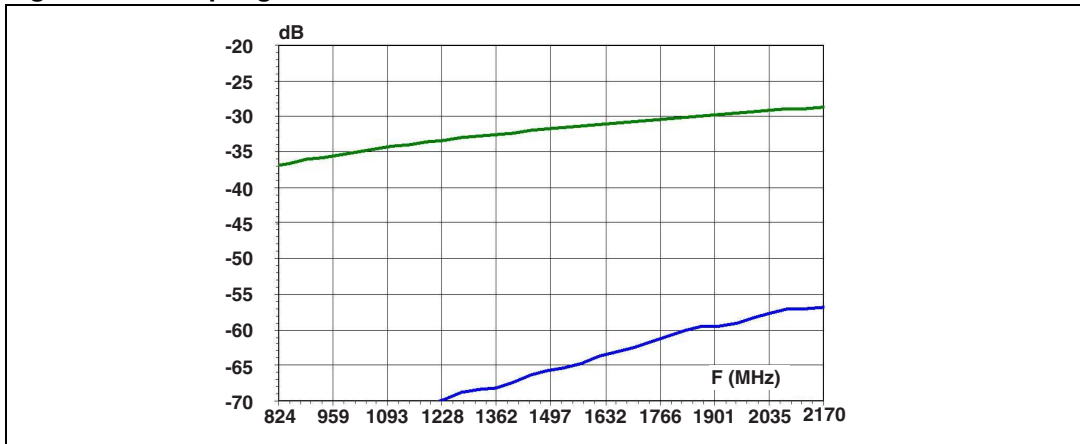
### 1.1 RF measurement (on reference evaluation board)

Measurements done on reference evaluation board under 50  $\Omega$ , de-embedding at CPL-WB-01C2 bumps.

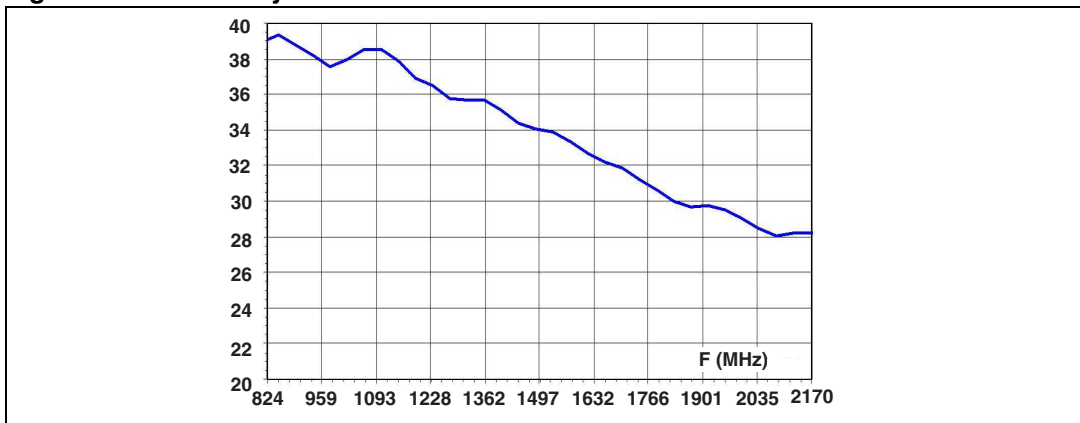
**Figure 2. Insertion loss**



**Figure 3. Coupling and isolation**



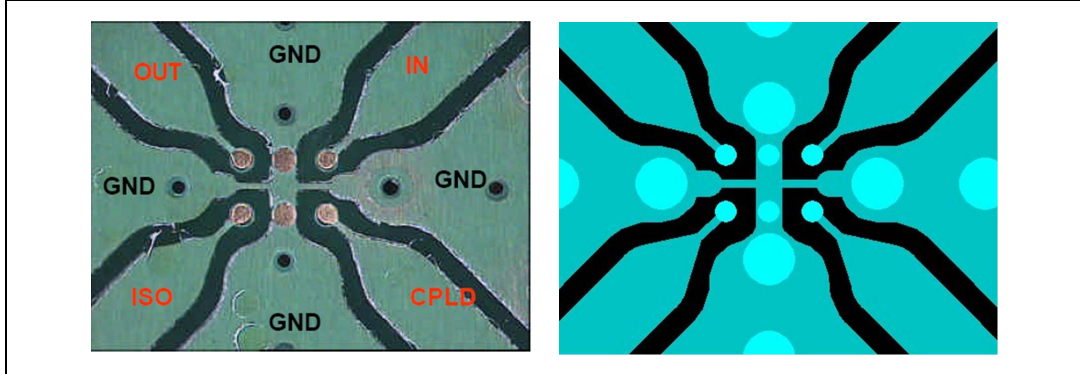
**Figure 4. Directivity**





## 2 Reference evaluation board

Figure 5. CPW lines ( $W = 850 \mu\text{m}$  with gap to gnd =  $260 \mu\text{m}$ ) on top layer + GND on bottom layer

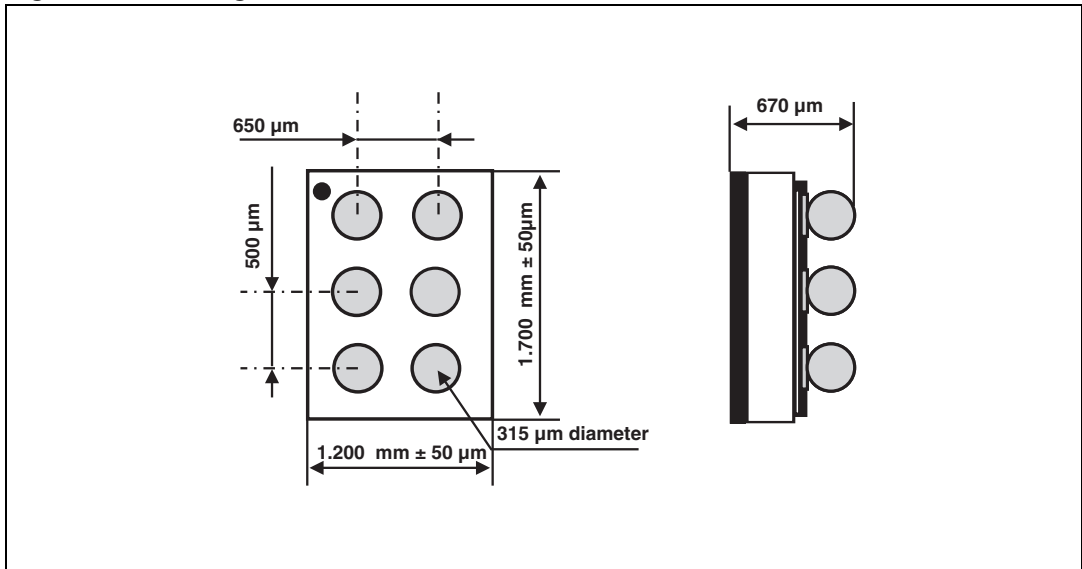


- Material: 2 layers FR4 with solder mask on top and bottom layer
- Substrate thickness: 0.8 mm
- Line lengths: 10.2 mm
- Extension values on short line measurement: 102 ps
- Through insertion loss: 0.20 dB @ 1 GHz , 0.24 dB @ 2 GHz

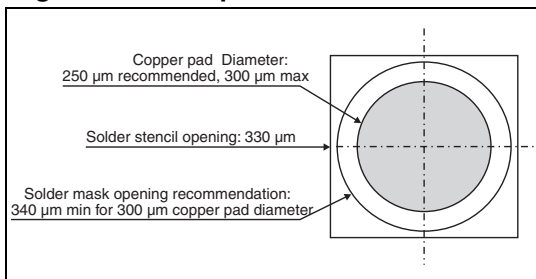
### 3 Package information

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 6. Package dimensions**



**Figure 7. Footprint**



**Figure 8. Marking**

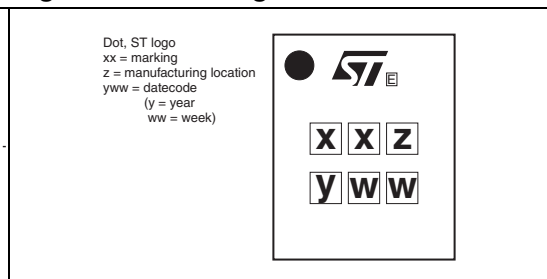
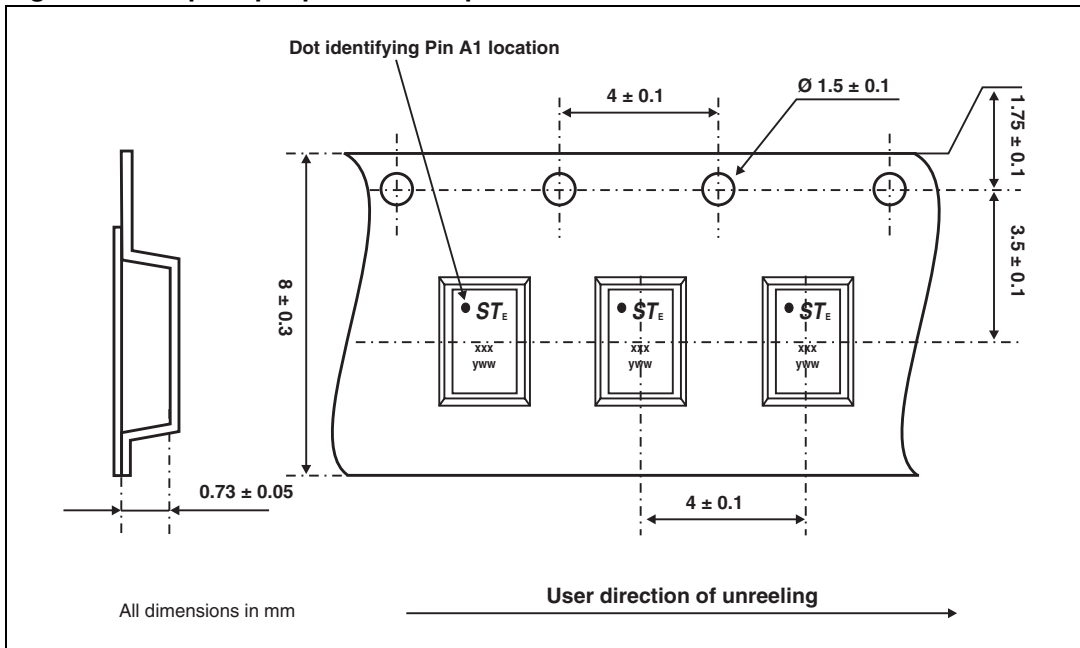


Figure 9. Flip Chip tape and reel specifications



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-01C2	RE	5000	Tape and reel

## 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
15-Jan-2009	1	Initial release.
12-Oct-2009	2	Updated Table 3 value frequency range.
06-Jan-2010	3	Updated applications and description on page 1. Updated page layout.



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