DCPL-WB-00D3

Wide-band, dual-path directional coupler with ISO port

Features

- 50 Ω nominal input / output impedance
- Wide operating frequency range:
  - 824 MHz-2170 MHz
- Low insertion loss (< 0.2 dB)
- High directivity (> 20 dB)
- High ESD ruggedness
- Lead-free CSP package
- Small footprint: 1670 x 1440 µm
- Very low profile (< 650 µm thickness)

Benefits

- High RF performance
- RF module size reduction

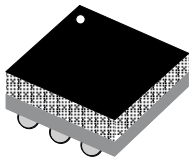
Complies with the following standards:

- IEC 61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)

Applications

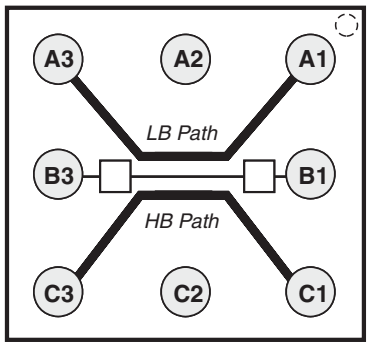
Multi-band equipment such as:

- Power amplifier module
- Front end module
- GSM/WCDMA mobile phone



Lead-free Flip Chip (8 bumps)

Figure 1. Pin configuration (bump view)



Description

The DCPL-WB-00D3 is a wide-band, dual-path directional coupler designed to measure cell phone transmission output power in GSM/WCDMA applications. This dual path CPL has been customized for wide-band operating frequencies (EGSM and CELL, PCS, DCS, WCDMA band I) with less than 0.2 dB insertion losses in the transmission bandwidth (824 MHz - 1980 MHz).

This device is built with two different RF couplers (one dedicated to LB, the other dedicated to HB) sharing the same coupled and isolated ports.The DCPL-WB-00-D3 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. Device pin configuration

Bump	Name	Description
A1	Lbin	LB coupler RF input
A2	GND	RF ground
A3	Lbout	LB coupler RF output
B1	CPLD	Coupler port
B3	ISO	Isolated port
C1	Hbin	HB coupler RF input
C2	GND	RF ground
C3	Hbout	HB coupler output

Table 2. Absolute maximum rating (limiting values)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P_{IN}	Input Power RF_{IN} (CW mode)			35	dBm
$V_{ESD\ (IEC)}$	ESD ratings IEC 61000-4-2 (C = 150 pF, R = 330 Ω) LB_{IN}, LB_{OUT}, HB_{IN}, HB_{OUT}, air discharge LB_{IN}, LB_{OUT}, HB_{IN}, HB_{OUT}, contact discharge	 ±15 ±8			kV
$V_{ESD\ (HBM)}$	Human body model, JESD 22-A114F, all I/O	2			kV
$V_{ESD\ (MM)}$	Machine model, JESD 22-A115-A, all I/O	100			V
$V_{ESD\ (CDM)}$	Charge device model, JESD 22-C101-C, all I/O	500			V
T_{OP}	Operating temperature	-30		+85	°C

Table 3. Electrical characteristics - impedances (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{OUT}	Nominal output impedance (LB and HB paths)		50		Ω
Z_{IN}	Nominal input impedance (LB and HB paths)		50		Ω
Z_{CPL}	Nominal coupled port impedance		50		Ω
Z_{ISO}	Nominal isolated port impedance		50		Ω

Table 4. Electrical characteristics - LB path RF performance (T_{amb} = 25 °C)

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
f	Frequency range (bandwidth)		824		960	MHz
IL_{LB}	LB path insertion loss	From 824 MHz to 960 MHz		0.1	0.2	dB
RL_{LB}	LB path return loss	From 824 MHz to 960 MHz	15			dB
$CPLD_{LB}$	LB path coupling factor	From 824 MHz to 915 MHz	32		37	dB
$Ripple_{LB}$	Coupling ripple in LB	(824 to 849 MHz) (880 to 915 MHz)			0.5	dB
DIR_{LB}	LB coupler directivity	From 824 MHz to 915 MHz	20			dB

Table 5. Electrical characteristics - HB path RF performance (T_{amb} = 25 °C)

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
f	Frequency range (bandwidth)		1710		1980	MHz
IL_{HB}	HB path insertion loss	From 1710 MHz to 2170 MHz		0.1	0.2	dB
RL_{HB}	HB path return loss	From 1710 MHz to 2170 MHz	15			dB
$CPLD_{HB}$	HB path coupling factor	From 1710 MHz to 1980 MHz	29		34	dB
$Ripple_{HB}$	Coupling ripple in HB	(1710 to 1785 MHz) (1850 to 1910 MHz) (1920 to 1980 MHz)			0.5	dB
DIR_{HB}	HB coupler directivity	From 1710 MHz to 1980 MHz	20			dB

1.1 RF measurement (on reference evaluation board)

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

Figure 2. Low band path insertion loss

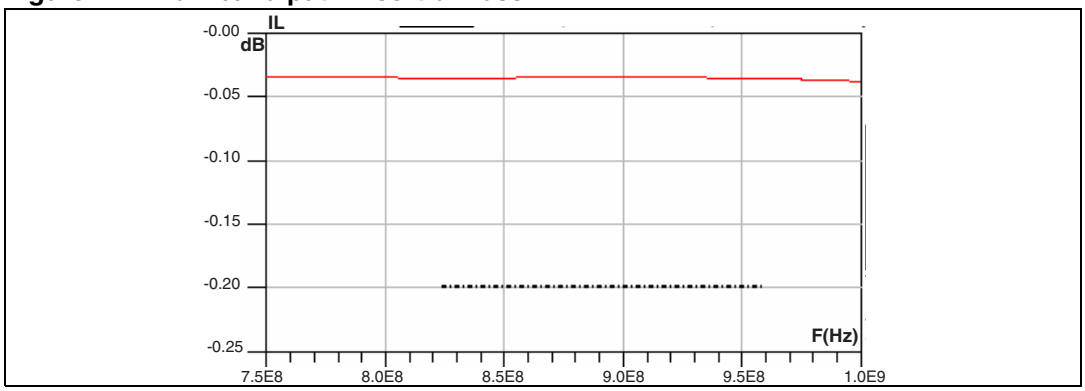


Figure 3. High band path insertion loss

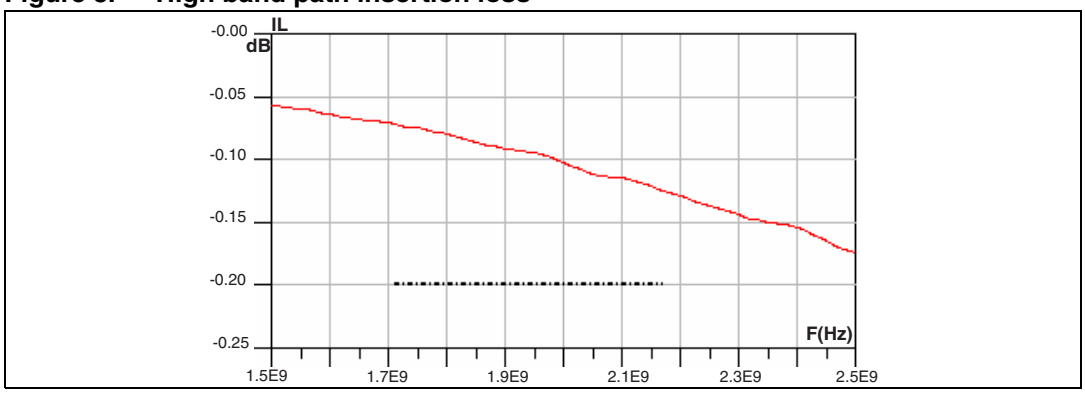


Figure 4. Low band path coupling factor

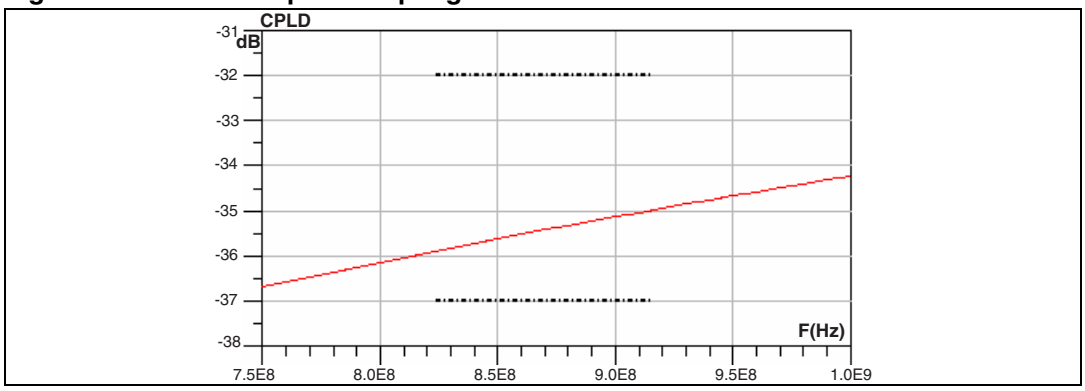


Figure 5. High band path coupling factor

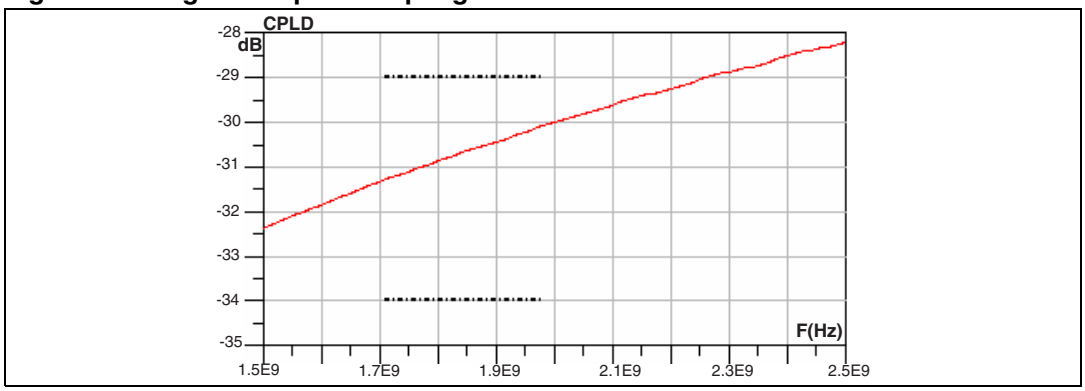


Figure 6. Low band path directivity

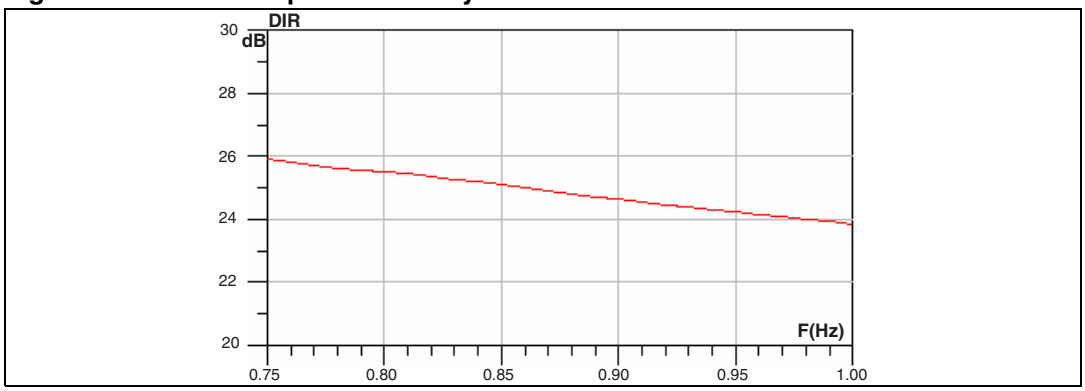


Figure 7. High band path directivity

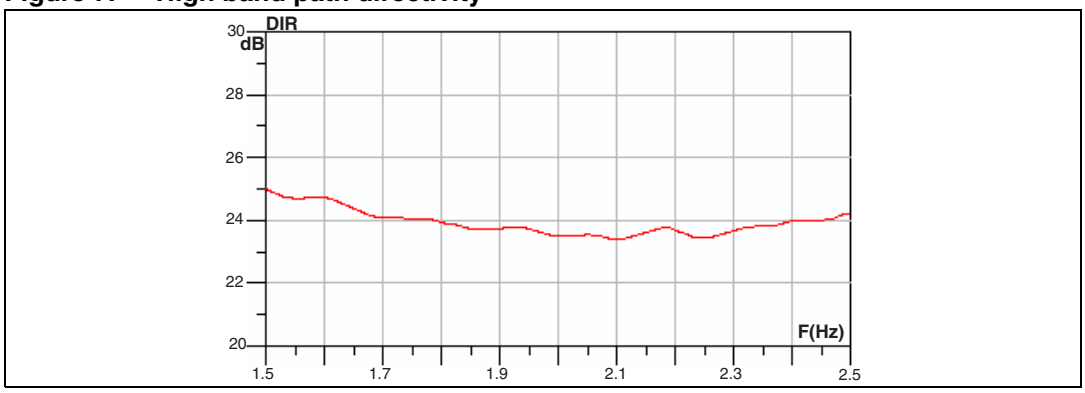


Figure 8. Demo board description - layer 1

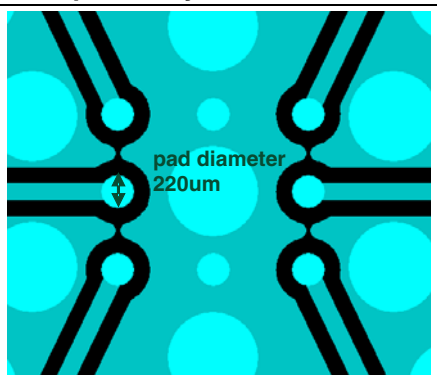
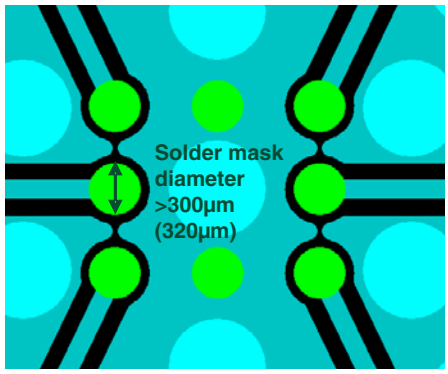
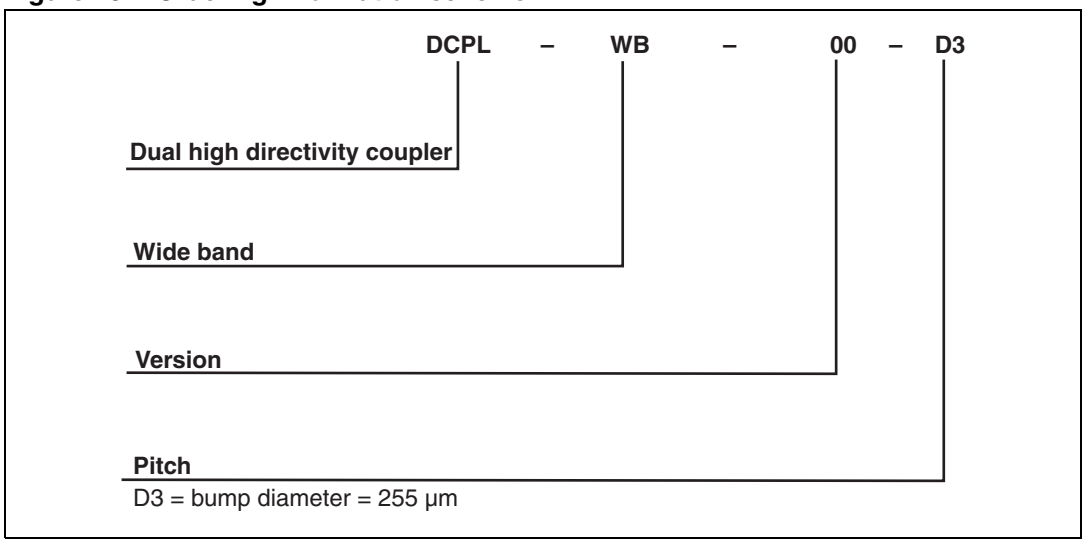


Figure 9. Solder mask 1 + layer 1



2 Ordering information scheme

Figure 10. Ordering information scheme



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. ECOPACK® is an ST trademark.

Figure 11. Package dimensions

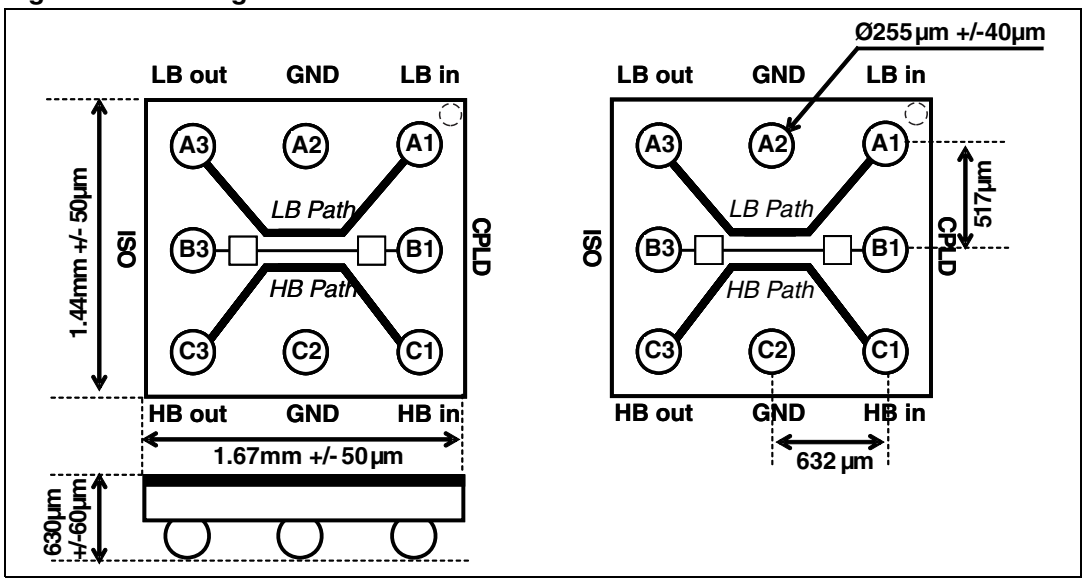


Figure 12. Footprint

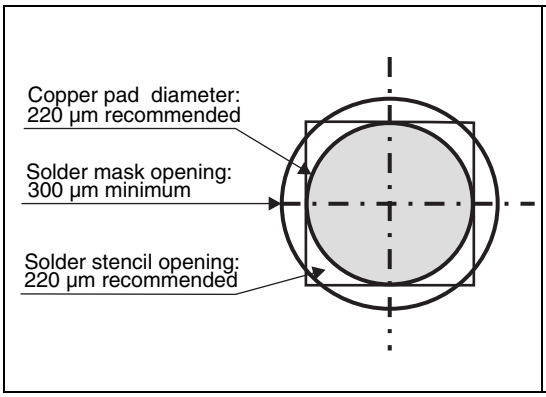


Figure 13. Marking

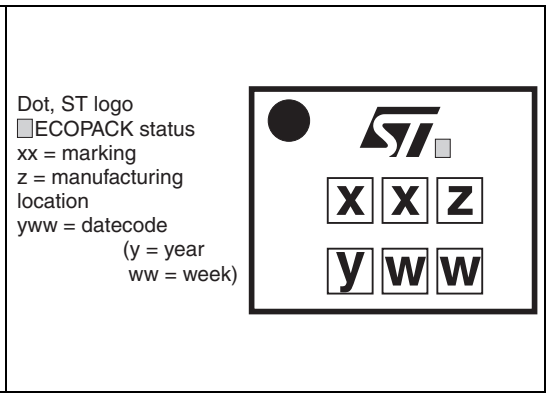
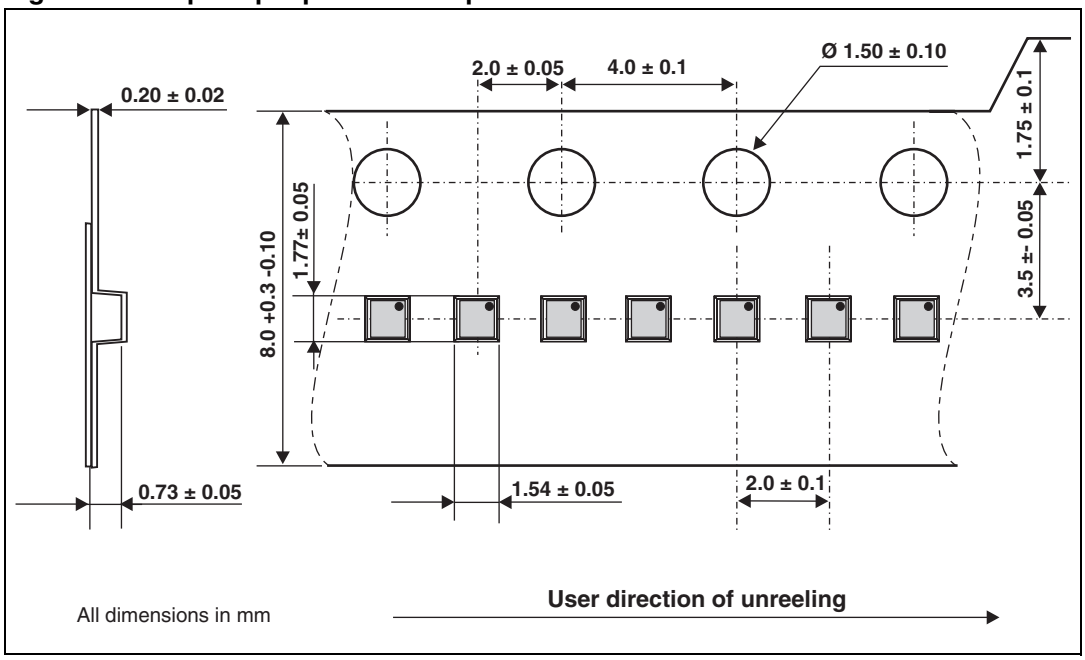


Figure 14. Flip-Chip tape and reel specifications



Note: More packing information is available in the application notes:
AN2348: "400 µm Flip-Chip: Package description and recommendations for use"
AN1751: "EMI Filters: Recommendations and measurements"

4 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
DCPL-WB-00D3	RS	Flip Chip	2.5 mg	5000	Tape and reel 7”

5 Revision history

Table 7. Document revision history

Date	Revision	Changes
14-Apr-2010	1	Initial release

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