

Data Sheet bPCA-100-05-10-800

Photoconductive THz antenna for laser excitation wavelength ~ 800 nm
and Bow-tie structure



PCA – Photo Conductive Antenna

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1 Mounting Options

bPCA-100-05-10-800-0	Unmounted PCA chip
bPCA-100-05-10-800-h	Mounted on hyperhemispherical Si lens
bPCA-100-05-10-800-h-l	Mounted on hyperhemispherical Si lens plus Adjusted focusing optical lens for free space laser excitation
bPCA-100-05-10-800-h-f	Mounted on hyperhemispherical Si lens plus Adjusted optical fiber
bPCA-100-05-10-800-c	Mounted on collimating aspheric Si lens
bPCA-100-05-10-800-c-l	Mounted on collimating aspheric Si lens plus Adjusted focusing optical lens for free space laser excitation
bPCA-100-05-10-800-c-f	Mounted on collimating aspheric Si lens plus Adjusted optical fiber
bPCA-100-05-10-800-a	Mounted on aspheric focusing Si lens
bPCA-100-05-10-800-a-l	Mounted on aspheric focusing Si lens plus Adjusted focusing optical lens for free space laser excitation
bPCA-100-05-10-800-a-f	Mounted on aspheric focusing Si lens plus Adjusted optical fiber

Nomenclature

bPCA-100-05-10-800-X-Y

bPCA-100-05-10-800-X-Y	Antenna design	Bow-tie
bPCA-100-05-10-800-X-Y	Antenna length	100 μm
bPCA-100-05-10-800-X-Y	Gap distance	05 μm
bPCA-100-05-10-800-X-Y	Gap width	10 μm
bPCA-100-05-10-800-X-Y	Excitation wavelength	800 nm
bPCA-100-05-10-800-X-Y	Mounted Si lens	0 / h / c / a
bPCA-100-05-10-800-X-Y	Adjusted	l / f

2 PCA Specification

2.1 bPCA-100-05-10-800-0

- Unmounted PCA chip

Table 1: Specification bPCA-100-05-10-800-0

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Spot diameter	5 μm	6 μm	-
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ¹		> 3 MΩ	-	-
Parameter		Typical		
PCA chip	Width	4 mm ± 0.2 mm		
	Depth	4 mm ± 0.2 mm		
	Height	625 μm ± 25 μm		
THz Beam	Focal length	Dot source		

¹ Measurement conditions: room temperature & measuring voltage of 3.3 V

2.2 bPCA-100-05-10-800-h

- Mounted on hyperhemispherical Si lens (LSH-D12-T7.13)

Table 2: Specification bPCA-100-05-10-800-h

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Spot diameter	5 μm	6 μm	-
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ²		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 9.5 mm		
THz Beam	Virtual focal length ³	26.5 mm		
	Divergence angle	17°		

² Measurement conditions: room temperature & measuring voltage of 3.3 V

³ Measured from the apex

2.3 bPCA-100-05-10-800h-I

- Mounted on hyperhemispherical Si lens (LSH-D12-T7.13)
- Adjusted focusing optical lens for free space laser excitation

Table 3: Specification bPCA-100-05-10-800-h-I

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ⁴	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ⁵		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 20.9 mm		
THz Beam	Virtual focal length ⁶	26.5 mm		
	Divergence angle	17°		

⁴ Collimated laser beam

⁵ Measurement conditions: room temperature & measuring voltage of 3.3 V

⁶ Measured from the apex

2.4 bPCA-100-05-10-800-h-f

- Mounted on hyperhemispherical Si lens (LSH-D12-T7.13)
- Adjusted optical fiber

Table 4: Specification bPCA-100-05-10-800-h-f

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ⁷	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ⁸		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 30.5 mm Min. length 54.6 mm (without fiber)		
THz Beam	Virtual focal length ⁹	26.5 mm		
	Divergence angle	17°		

⁷ Collimated laser beam

⁸ Measurement conditions: room temperature & measuring voltage of 3.3 V

⁹ Measured from the apex

2.5 bPCA-100-05-10-800-c

- Mounted on collimating Si lens (LSA-D20-T13.77)

Table 5: Specification bPCA-100-05-10-800-c

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Spot diameter	5 μm	6 μm	-
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ¹⁰		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 16.0 mm		
THz Beam	Focal length ¹¹	∞		
	FWHM ¹²	11.0 mm		

¹⁰ Measurement conditions: room temperature & measuring voltage of 3.3 V

¹¹ Measured from the apex

¹² Full Width at Half Maximum

2.6 bPCA-100-05-10-800-c-I

- Mounted on collimating Si lens (LSA-D20-T13.77)
- Adjusted focusing optical lens for free space laser excitation

Table 6: Specification bPCA-100-05-10-800-c-I

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ¹³	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ¹⁴		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 25.0 mm		
THz Beam	Focal length ¹⁵	∞		
	FWHM ¹⁶	11.0 mm		

¹³ Collimated laser beam

¹⁴ Measurement conditions: room temperature & measuring voltage of 3.3 V

¹⁵ Measured from the apex

¹⁶ Full Width at Half Maximum

2.7 bPCA-100-05-10-800-c-f

- Mounted on collimating Si lens (LSA-D20-T13.77)
- Adjusted optical fiber

Table 7: Specification bPCA-100-05-10-800-c-f

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ¹⁷	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ¹⁸		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 30.5 mm Min. length 54.6 mm (without fiber)		
THz Beam	Focal length ¹⁹	∞		
	FWHM ²⁰	11.0 mm		

¹⁷ Collimated laser beam

¹⁸ Measurement conditions: room temperature & measuring voltage of 3.3 V

¹⁹ Measured from the apex

²⁰ Full Width at Half Maximum

2.8 bPCA-100-05-10-800-a

- Mounted on focusing Si lens (LSA-D20-T14-F50)

Table 8: Specification bPCA-100-05-10-800-a

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Spot diameter	5 μm	6 μm	-
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ²¹		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 16.0 mm		
THz Beam	Focal length ²²	50.0 mm		
	Convergence angle	10°		

²¹ Measurement conditions: room temperature & measuring voltage of 3.3 V

²² Measured from the apex

2.9 bPCA-100-05-10-800-a-I

- Mounted on focusing Si lens (LSA-D20-T14-F50)
- Adjusted focusing optical lens for free space laser excitation

Table 9: Specification bPCA-100-05-10-800-a-I

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ²³	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ²⁴		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 25.4 mm Min. length 25.0 mm		
THz Beam	Focal length ²⁵	50.0 mm		
	Convergence angle	10°		

²³ Collimated laser beam

²⁴ Measurement conditions: room temperature & measuring voltage of 3.3 V

²⁵ Measured from the apex

2.10 bPCA-100-05-10-800-a-f

- Mounted on focusing Si lens (LSA-D20-T14-F50)
- Adjusted optical fiber

Table 10: Specification bPCA-100-05-10-800-a-f

Parameter		Min	Recommended	Max
Laser source	Wavelength	650 nm	780 nm	850 nm
	Avg. optical power	-	10 mW	15 mW
	Avg. power density	-	-	50 000 W/cm ²
	Fluence	-	-	750 μJ/cm ²
	Pulse duration	-	100 fs	200 fs
	Repetition rate	70 MHz	80 MHz	-
	Beam diameter ²⁶	-	1.4 mm	1.6 mm
Bias source	Voltage [V _e]	-	-	20 V
	Modulation frequency	0 Hz (Dc)	10 kHz	10 MHz
Dark resistance [R _d] ²⁷		> 3 MΩ	-	-
Parameter		Typical		
Package		Max. diameter 30.5 mm Min. length 54.6 mm (without fiber)		
THz Beam	Focal length ²⁸	50.0 mm		
	Convergence angle	10°		

²⁶ Collimated laser beam

²⁷ Measurement conditions: room temperature & measuring voltage of 3.3 V

²⁸ Measured from the apex

3 Application Note

3.1 Measurement Setup

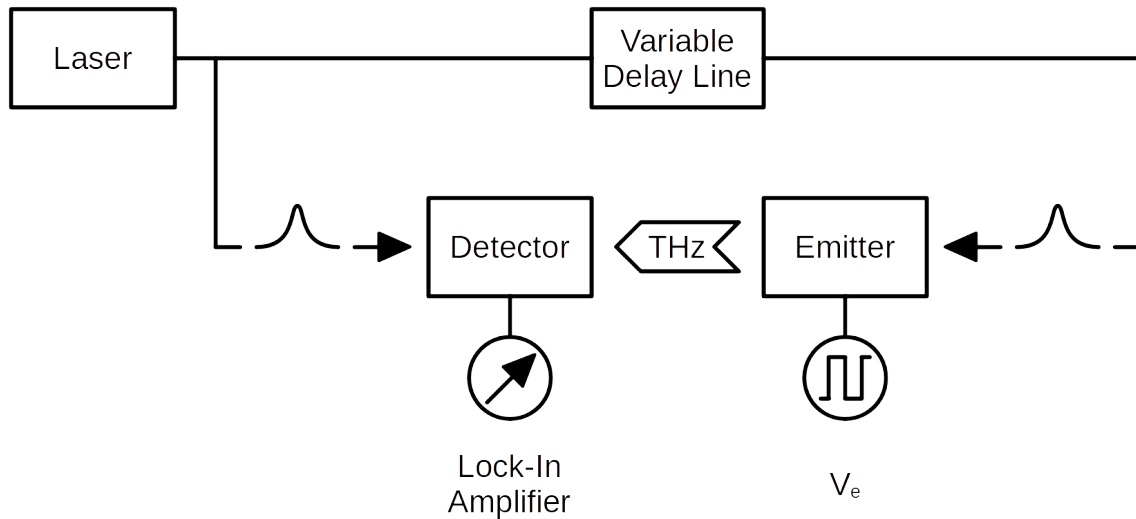


Figure 1: Setup for THz measurements

3.2 PCA Design

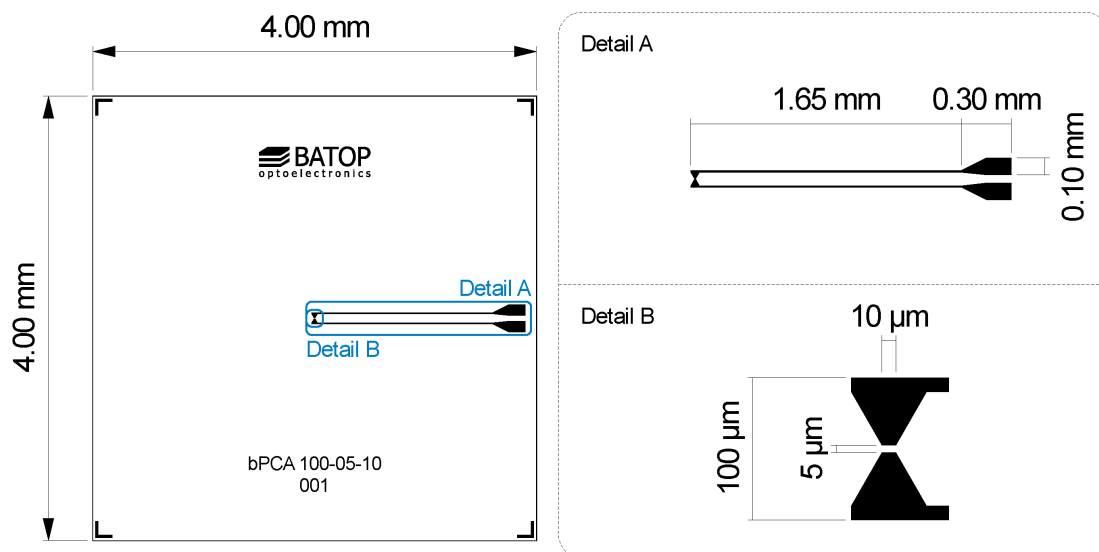


Figure 2: PCA dimensions

Antenna length = 100 μm / Gap distance = 5 μm / Gap width = 10 μm

3.3 PCA Performance

Performance of the recommended PCA combination:

PCA-40-05-10-800 (Emitter) & bPCA-100-05-10-800 (Detector)

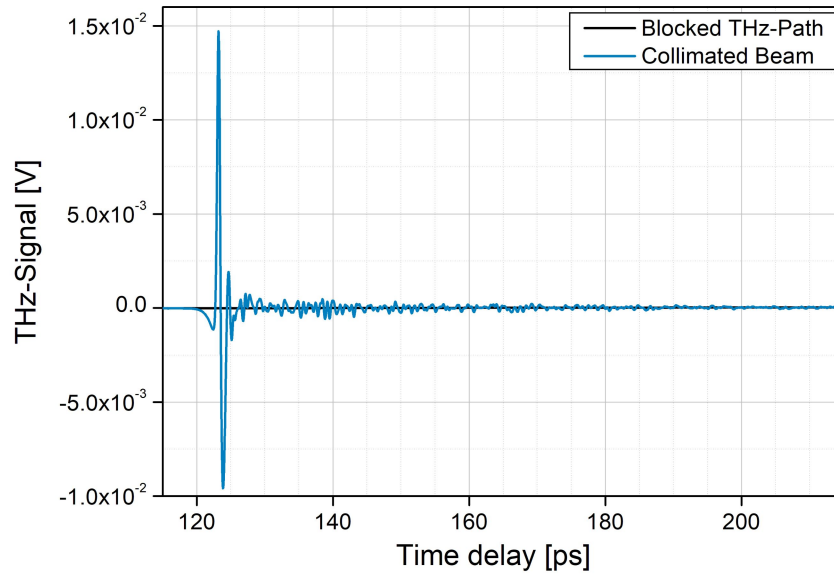


Figure 3: THz signal

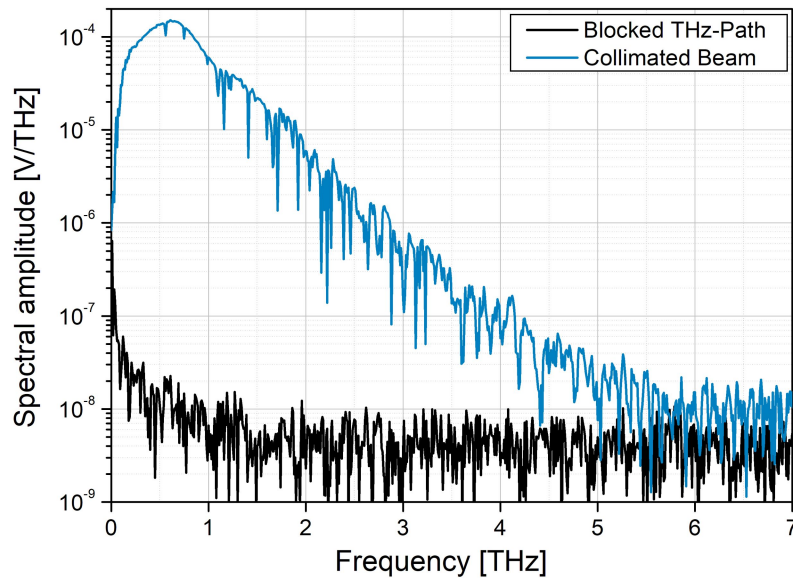


Figure 4: THz spectrum

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