

Datasheet

HCA-S-400M-SI

400 MHz Photoreceiver  
with Si-PIN Photodiode



The picture shows model HCA-S-400M-SI-FS.  
The photoreceiver will be delivered without post holder and post.

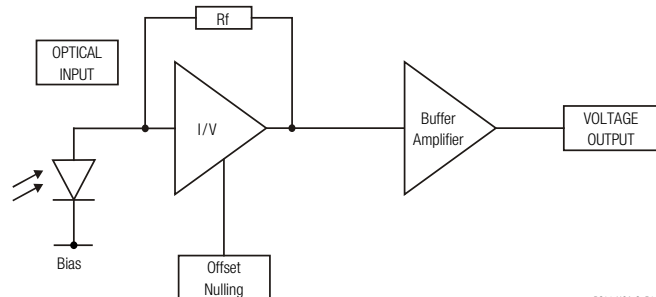
Features

- Si-PIN photodiode, 0.8 mm active diameter
- Bandwidth DC – 400 MHz
- Amplifier transimpedance gain  $5.0 \times 10^3$  V/A
- Max. conversion gain  $2.7 \times 10^3$  V/W @ 800 nm
- Spectral range 320 – 1000 nm
- Free-space input 1.035"-40 threaded, alternatively 25 mm diameter unthreaded
- Easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters
- Fiber optic input also available as permanently mounted FC- or FSMA-input
- UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread

Applications

- Spectroscopy
- Fast pulse and transient measurements
- Optical triggering
- Optical front-end for oscilloscopes, A/D converters and HF lock-in amplifiers

Block Diagram



BS01-HCA-S\_R02

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



HCA-S-400M-SI\_R5/TH\_JMa/04MAY2022

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Available Versions

HCA-S-400M-SI-FST



Picture shows 1.035"-40 threaded flange with internally threaded coupler ring (outer diameter 30 mm)

1.035"-40 threaded flange for free space applications. Compatible with many optical standard accessories and for use with various types of fiber connector adapters.

Optionally available:  
Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA. The coupling efficiency will depend on fiber type. With the relative large 0.8 mm dia. photodiode installed in the HCA-S-400M-SI input coupling is not critical. However, standard SM 9/125 fibers (PC or APC) with low numerical aperture (NA) are recommended for ensuring near 100% coupling efficiency.

HCA-S-400M-SI-FS



Picture shows unthreaded flange with 25 mm diameter

25 mm dia. unthreaded flange for free space applications. Compatible with many optical standard accessories.

HCA-S-400M-SI-FC



Fix/permanent FC fiber connector for high coupling efficiency and excellent conversion gain accuracy.

HCA-S-400M-SI-SMA



Fix/permanent FSMA fiber connector for high coupling efficiency and excellent conversion gain accuracy.

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Related Models	<p>HCA-S-400M-IN-FST InGaAs-PIN, Ø 0.3 mm, 900 - 1700 nm free space input, 1.035"-40 threaded flange</p> <p>HCA-S-400M-IN-FS InGaAs-PIN, Ø 0.3 mm, 900 - 1700 nm free space input, 25 mm dia. unthreaded flange</p> <p>HCA-S-400M-IN-FC InGaAs-PIN, integrated ball lens, 900 - 1700 nm FC fiber connector (fix/permanent)</p>
Available Accessories	<p>PRA-FC PRA-FCA PRA-FSMA  Fiber-adaptor with external 1.035"-40 thread (suitable for FST models only).</p> <p>PRA-PAP  Alternative mounting option: Post adapter plate, easy to mount on FEMTO photoreceiver series OE, FWPR, PWPR, HCA-S and LCA-S.</p> <p>PS-15-25-L  Power supply Input: 100 – 240 VAC Output: ±15 VDC</p>
Specifications	<p>Test conditions <math>V_s = \pm 15\text{ V}</math>, <math>T_A = 25\text{ }^\circ\text{C}</math>, output load impedance 50 <math>\Omega</math>, warm-up 20 minutes (min. 10 minutes recommended)</p> <p>Gain Transimpedance gain <math>5.0 \times 10^3\text{ V/A}</math> (@ output load 50 <math>\Omega</math>) Gain accuracy <math>\pm 1\%</math> (electrical) Conversion gain <math>2.7 \times 10^3\text{ V/W}</math> typ. (@ 800 nm, output load 50 <math>\Omega</math>)</p> <p>Frequency Response Lower cut-off frequency DC Upper cut-off frequency (-3 dB) 400 MHz (<math>\pm 10\%</math>) Gain flatness <math>\pm 1\text{ dB}</math></p> <p>Time Response Rise/fall time (10% – 90%) 1.0 ns</p> <p>Input Noise equivalent power (NEP) 40 pW/<math>\sqrt{\text{Hz}}</math> (@ 800 nm, 100 MHz) Optical saturation power 400 <math>\mu\text{W}</math> (for linear amplification, @ 800 nm) Input offset compensation range <math>\pm 200\text{ }\mu\text{A}</math>, adjustable by offset potentiometer</p> <p>Detector Detector Si-PIN photodiode Active area <math>\varnothing 0.8\text{ mm}</math> Spectral range 320 – 1000 nm Max. sensitivity 0.55 A/W typ. (@ 800 nm)</p>

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

**Datasheet**

**HCA-S-400M-SI**

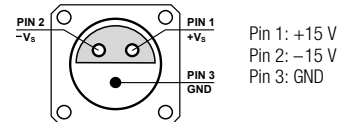
**400 MHz Photoreceiver  
with Si-PIN Photodiode**

Specifications (continued)

Output	Output voltage range	±1.0 V (@ 50 Ω output load) for linear operation and low harmonic distortion
	Max. output voltage range	±1.5 V (@ 50 Ω load)
	Output impedance	50 Ω (terminate with 50 Ω load)
	Output noise	3 mV <sub>RMS</sub> (20 mV <sub>pp</sub> ) typ. (@ 50 Ω load, no signal on detector, measurement bandwidth 1.5 GHz)
Input Flange	Material	1.4305 stainless steel, nickel-plated (FST flange) AlMg4.5Mn, nickel-plated (FS flange)
Coupler Ring (FST version only)	Material	1.4305 stainless steel, glass bead blasted
Power Supply	Supply voltage	±15 V (±14.5 V ... ±16.5 V)
	Supply current	±55 mA (depends on operating conditions, recommended power supply capability min. ±150 mA)
Case	Weight	209 g (0.46 lbs) HCA-S-400M-SI-FST incl. coupler ring 196 g (0.43 lbs) HCA-S-400M-SI-FS 188 g (0.41 lbs) HCA-S-400M-SI-FC 200 g (0.44 lbs) HCA-S-400M-SI-SMA
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage temperature	-30 °C ... +85 °C
	Operating temperature	0 °C ... +60 °C

Absolute Maximum Ratings	Optical input power (CW)	20 mW
	Power supply voltage	±20 V

Connectors	Input	HCA-S-400M-SI-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories
		HCA-S-400M-SI-FS	25 mm dia. unthreaded flange for free space applications
		HCA-S-400M-SI-FC	FC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible)
		HCA-S-400M-SI-SMA	FSMA fiber optic connector (fix/permanent)
	Output	BNC jack (female)	
Power supply	LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)		



Scope of Delivery	HCA-S-400M-SI, internally threaded coupler ring (FST version only), LEMO® 3-pin connector, datasheet, transport package
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**SOPHISTICATED TOOLS FOR SIGNAL RECOVERY**



HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

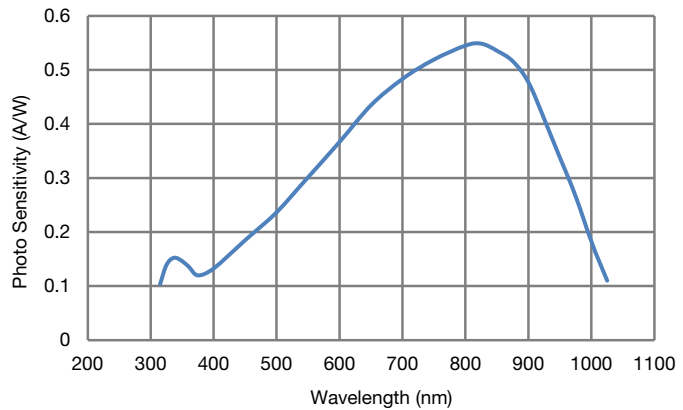
**Datasheet**

**HCA-S-400M-SI**

**400 MHz Photoreceiver  
with Si-PIN Photodiode**

Ordering Information	HCA-S-400M-SI-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories.
	HCA-S-400M-SI-FS	25 mm dia. unthreaded flange for free space applications.
	HCA-S-400M-SI-FC	FC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible).
	HCA-S-400M-SI-SMA	FSMA fiber optic connector (fix/permanent).

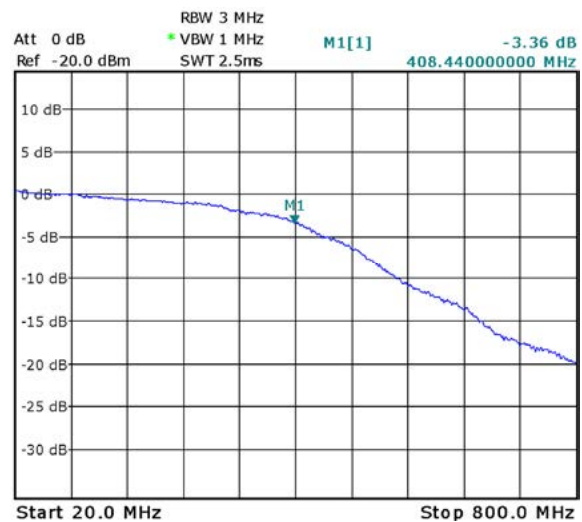
Spectral Responsivity



DB-Sens-HCA-S-400M-SI\_R01

Typical Performance Characteristics

Frequency response



FD-HCA-S-400M-SI-bw\_R01

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HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

Datasheet

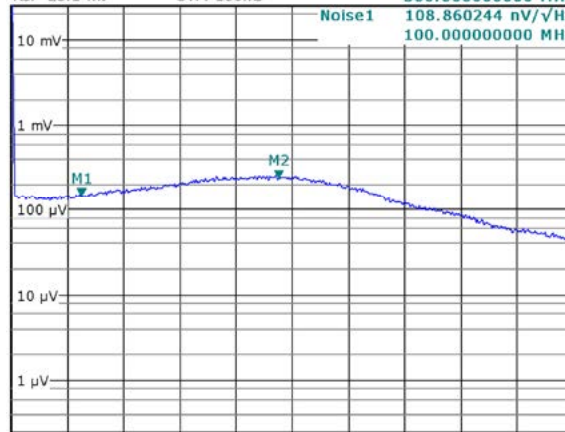
HCA-S-400M-SI

400 MHz Photoreceiver  
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Typical Performance  
Characteristics (continued)

Noise spectrum

Att 0 dB RBW 3 MHz  
Ref 25.1 mV VBW 3 kHz Noise2 182.709394 nV/√Hz  
SWT 180ms Noise1 108.860244 nV/√Hz  
100.00000000 MHz



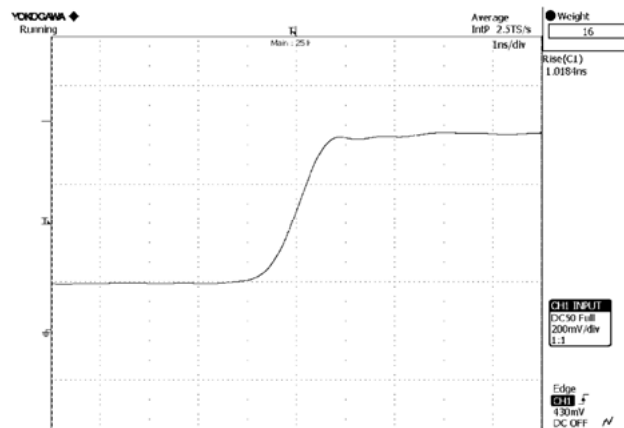
Start 0.0 Hz Stop 800.0 MHz PD-HCA-S-400M-SI-noise-R01

Note: spectral noise data is measured at the amplifier output with no signal on the photodiode. To determine the spectral input noise divide the measured output noise by the amplifier conversion gain.

Conversion gain (V/W) = amplifier gain (V/A) × photo sensitivity (A/W).

Marker	frequency	output noise	resulting input noise (NEP)
1	100 MHz	109 nV/√Hz	40 pW/√Hz (@ 800 nm)

Pulse response to square wave input signal  
(with 16 times averaging)



PD-HCA-S-400M-SI-pulse-2ns-R01

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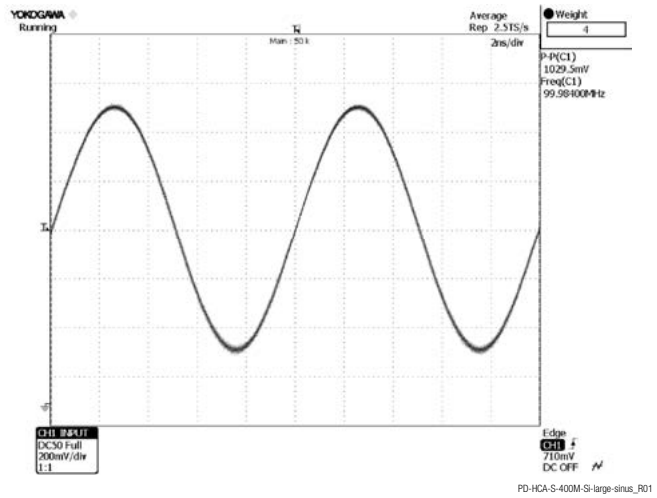
Datasheet

HCA-S-400M-SI

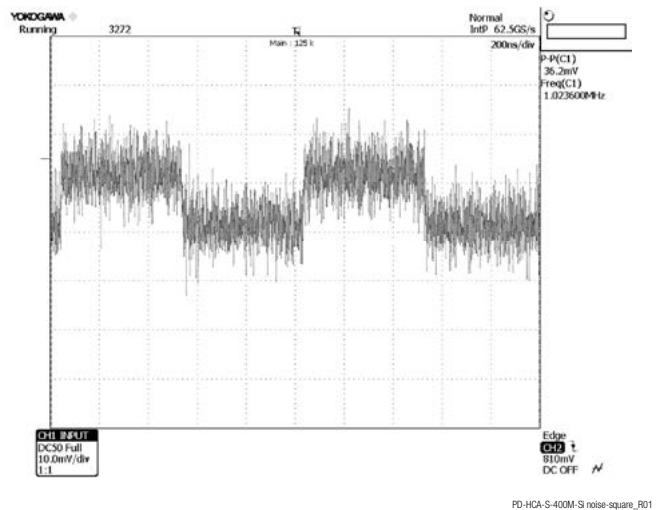
400 MHz Photoreceiver  
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Typical Performance  
Characteristics (continued)

Large signal response  
output signal for 100 MHz, 370  $\mu$ W modulated optical input signal  
(with 4 times averaging)



Small signal response  
output signal for 3.7  $\mu$ W modulated optical input signal, 1 MHz square wave, without averaging



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

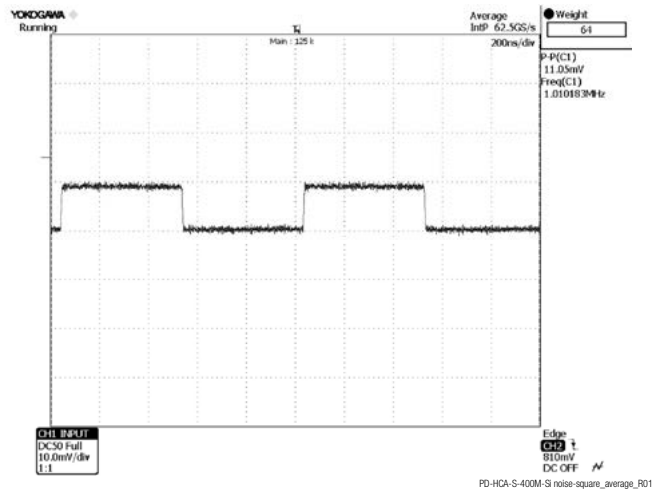
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HCA-S-400M-SI

400 MHz Photoreceiver  
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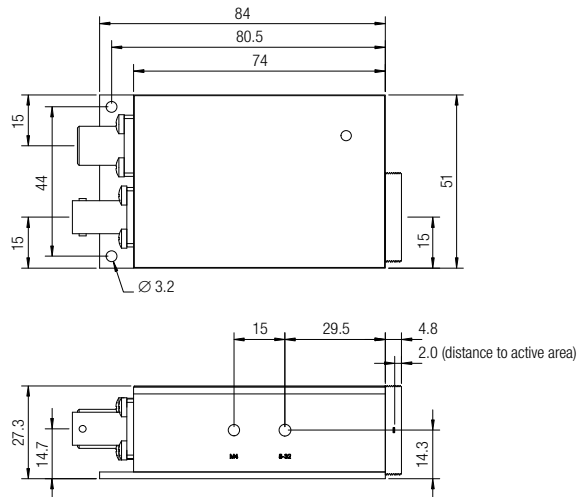
Typical Performance  
Characteristics (continued)

Small signal response  
output signal for 3.7  $\mu$ W modulated optical input signal, 1 MHz square wave,  
with 64 times averaging



Dimensions

HCA-S-400M-SI-FST (1.035"-40 threaded free space input)



all dimensions in mm unless otherwise noted

DZ-HCA-S-X00-SI-FST\_R1

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



HCA-S-400M-SI\_R5/TH\_JMa/04MAY2022



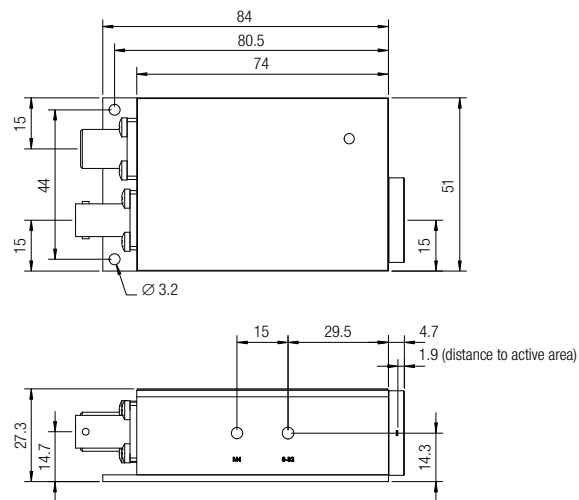
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Dimensions (continued)

HCA-S-400M-SI-FS (25 mm dia. unthreaded free space input)



DZ-HCA-S-400-SI-FS\_R1

all dimensions in mm unless otherwise noted

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HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

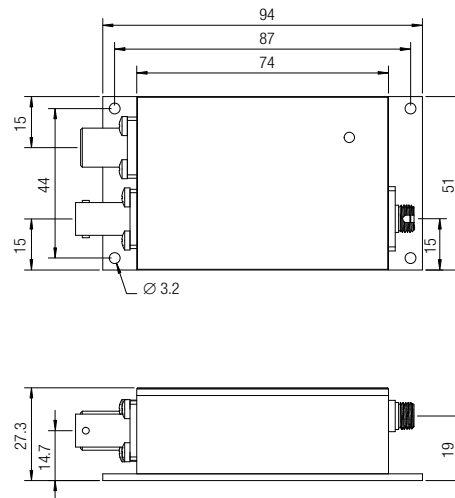
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**HCA-S-400M-SI**

**400 MHz Photoreceiver  
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Dimensions (continued)

HCA-S-400M-SI-FC (FC fiber optic connector)



DZ:HCA-S-XX-XX\_FC\_R1

all dimensions in mm unless otherwise noted

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HCA-S-400M-SI\_R5/TH, JMa/04MAY2022

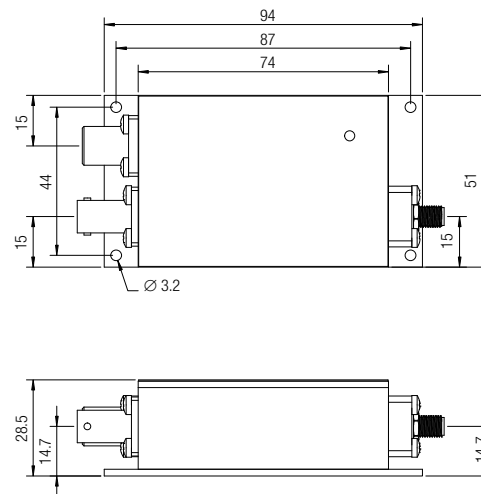
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**HCA-S-400M-SI**

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Dimensions (continued)

HCA-S-400M-SI-SMA (FSMA fiber optic connector)



DZ-HCA-S-XX-XX-SMA\_R1

all dimensions in mm unless otherwise noted

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