

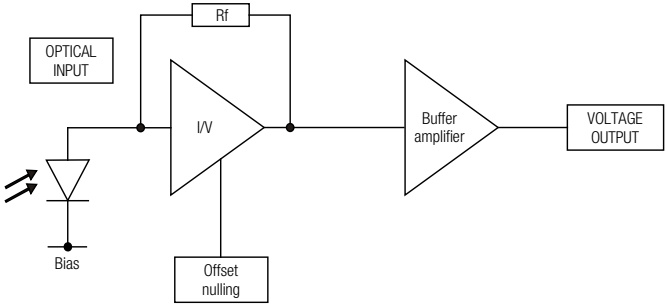
Datasheet

HCA-S-400M-SI

400 MHz Photoreceiver with Si-PIN Photodiode



The picture shows model HCA-S-400M-SI-FST

Features	• Si-PIN photodiode, 0.8 mm active diameter • Bandwidth DC – 400 MHz • Amplifier transimpedance gain 5.0×10^3 V/A • Max. conversion gain 2.7×10^3 V/W @ 800 nm • Spectral range 320 – 1000 nm • Free-space input 1.035"-40 threaded, easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters • Fiber optic input also available as permanently mounted FC-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
Intended Use	The HCA-S-400M-SI photoreceiver consists of an Si photodiode and a subsequent low-noise fixed gain transimpedance amplifier. It is designed for fast conversion of small optical signals into equivalent output voltages. Operation is mostly self-explanatory. If in doubt, consult this document or contact support@femto.de. For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and "Power Supply" sections of this document. The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance.

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY

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HCA-S-400M-SI_R6/TH_JMa/06MAR2024

Datasheet
HCA-S-400M-SI
**400 MHz Photoreceiver
with Si-PIN Photodiode**
Available Versions
HCA-S-400M-SI-FST


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


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

Related Models
HCA-S-400M-IN-FST

InGaAs-PIN, Ø 0.3 mm, 900 - 1700 nm free space input, 1.035"-40 threaded flange

HCA-S-400M-IN-FC

InGaAs-PIN, integrated ball lens, 900 - 1700 nm FC fiber connector (fix/permanent)

Available Accessories
**PRA-FC
PRA-FCA
PRA-FSMA**


Fiber-adapter with external 1.035"-40 thread (suitable for FST models only).

PRA-PAP


Alternative mounting option: Post adapter plate, easy to mount on FEMTO photoreceiver series OE, FWPR, PWPR, HCA-S and LCA-S.

PS-15-25-L


Power Supply
Input: 100 – 240 VAC
Output: ±15 VDC

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Specifications	Test conditions	$V_s = \pm 15\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, output load impedance $50\ \Omega$, warm-up 20 minutes (min. 10 minutes recommended)
Gain	Transimpedance gain Gain accuracy Conversion gain	$5.0 \times 10^3\text{ V/A}$ (@ output load $50\ \Omega$) $\pm 1\%$ (electrical) $2.7 \times 10^3\text{ V/W typ.}$ (@ 800 nm, output load $50\ \Omega$)
Frequency Response	Lower cut-off frequency Upper cut-off frequency (-3 dB) Gain flatness	DC 400 MHz ($\pm 10\%$) $\pm 1\text{ dB}$
Time Response	Rise/fall time (10 % – 90 %)	1.0 ns
Input	Noise equivalent power (NEP) Optical saturation power Input offset compensation range	40 pW/ $\sqrt{\text{Hz}}$ (@ 800 nm, 100 MHz) 400 μW (for linear amplification, @ 800 nm) $\pm 200\ \mu\text{A}$, adjustable by offset potentiometer
Detector	Detector Active area Spectral range Max. sensitivity	Si-PIN photodiode $\varnothing 0.8\text{ mm}$ 320 – 1000 nm 0.55 A/W typ. (@ 800 nm)
Output	Output voltage range Max. output voltage range Output impedance Output noise	$\pm 1.0\text{ V}$ (@ $50\ \Omega$ output load) for linear operation and low harmonic distortion $\pm 1.5\text{ V}$ (@ $50\ \Omega$ load) $50\ \Omega$ (terminate with $50\ \Omega$ load) 3 mV RMS (20 mV peak-peak) typ. (@ $50\ \Omega$ load, no signal on detector, measurement bandwidth 1.5 GHz)
Optical Input Connector	Material FST flange Material FST coupler ring Material FC receptacle	1.4305 stainless steel, nickel-plated 1.4305 stainless steel, glass bead blasted nickel silver
Power Supply	Supply voltage Supply current	$\pm 15\text{ V}$ ($\pm 14.5\text{ V} \dots \pm 16.5\text{ V}$) $\pm 55\text{ mA}$ (depends on operating conditions, recommended power supply capability min. $\pm 150\text{ mA}$)
Case	Weight Material	209 g (0.46 lbs) HCA-S-400M-SI-FST incl. coupler ring 188 g (0.41 lbs) HCA-S-400M-SI-FC AlMg4.5Mn, nickel-plated
Temperature Range	Storage temperature Operating temperature	$-30\text{ }^\circ\text{C} \dots +85\text{ }^\circ\text{C}$ $0\text{ }^\circ\text{C} \dots +60\text{ }^\circ\text{C}$
Absolute Maximum Ratings	Optical input power (CW) Power supply voltage	20 mW $\pm 20\text{ V}$

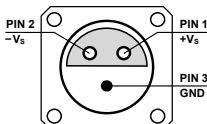
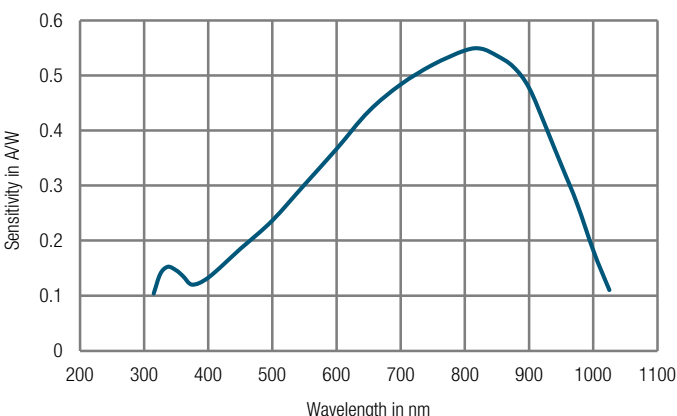
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HCA-S-400M-SI_R6/TH_JMa/06MAR2024

Datasheet

HCA-S-400M-SI

400 MHz Photoreceiver with Si-PIN Photodiode

Connectors	Input	HCA-S-400M-SI-FST	1.035"-40 threaded flange for free space applications and for use with various types of optical
		HCA-S-400M-SI-FC	FC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible)
	Output	BNC jack (female)	
	Power supply	LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)	
			Pin 1: +15 V Pin 2: -15 V Pin 3: GND
Scope of Delivery	HCA-S-400M-SI, internally threaded coupler ring (FST version only), LEMO® 3-pin connector, datasheet, transport package		
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-FC	FC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible).	
Spectral Response	 DB-Sens-HCA-S-400M-SI_R01		

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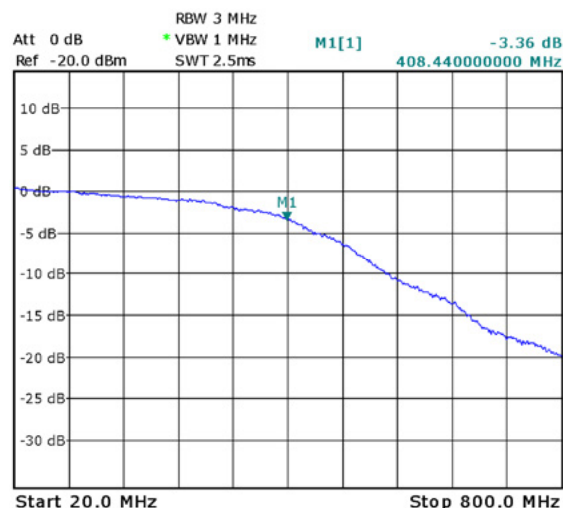
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HCA-S-400M-SI

400 MHz Photoreceiver with Si-PIN Photodiode

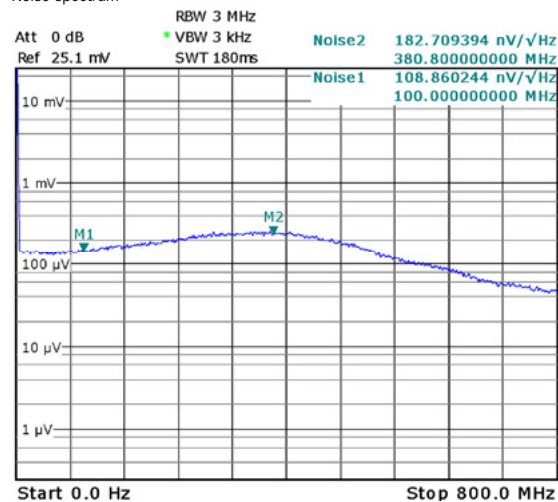
Typical Performance
Characteristics

Frequency response



PD-HCA-S-400M-SI-bw_R01

Noise spectrum



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)

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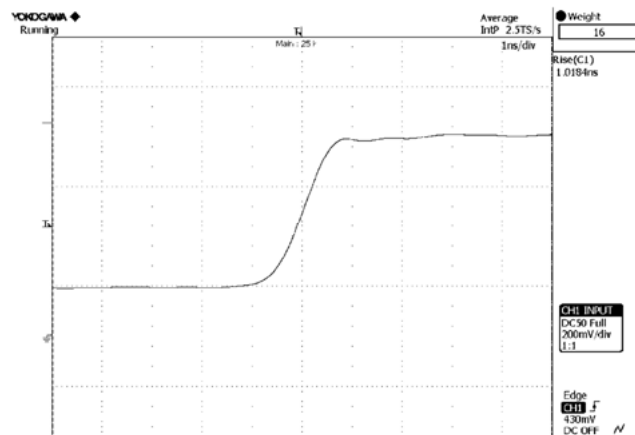
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HCA-S-400M-SI

400 MHz Photoreceiver with Si-PIN Photodiode

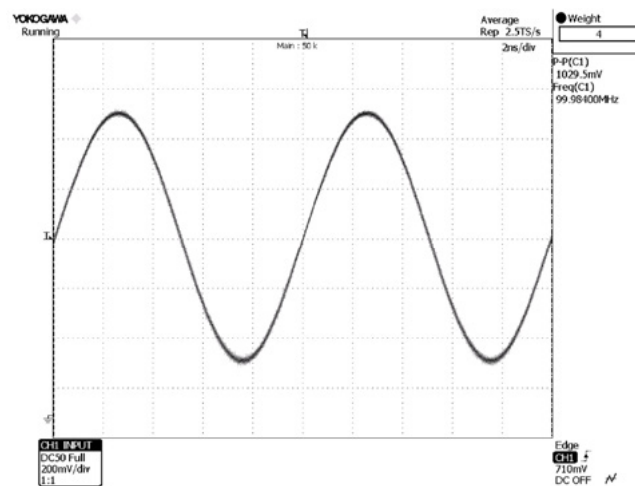
Typical Performance
Characteristics (continued)

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



PD-HCA-S-400M-SI-pulse-2ns_R01

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



PD-HCA-S-400M-SI-large-sinus_R01

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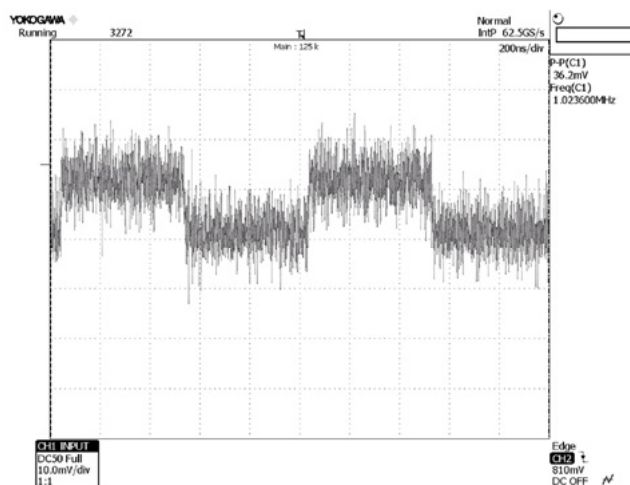
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400 MHz Photoreceiver with Si-PIN Photodiode

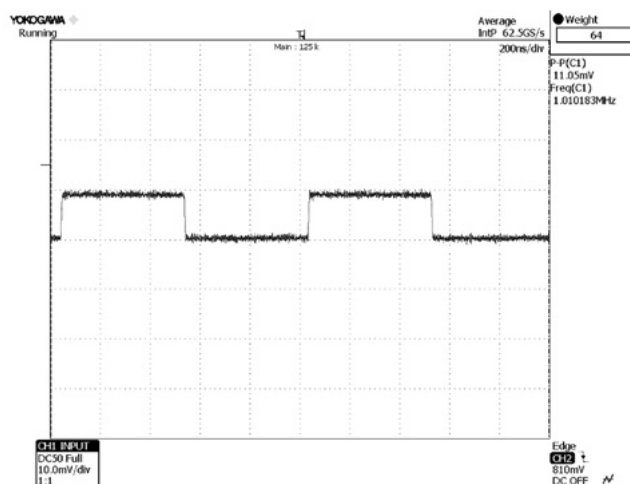
Typical Performance
Characteristics (continued)

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



PD-HCA-S-400M-SI noise-square_R01

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



PD-HCA-S-400M-SI noise-square_average_R01

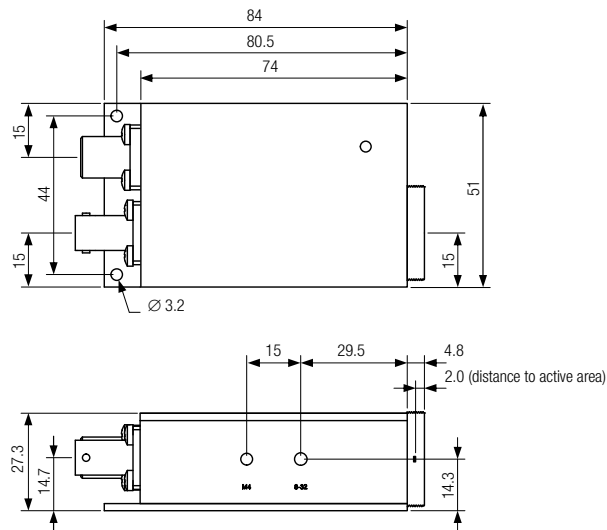
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HCA-S-400M-SI
**400 MHz Photoreceiver
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Dimensions

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



DZ-HCA-S_FST_R1

all dimensions in mm unless otherwise noted

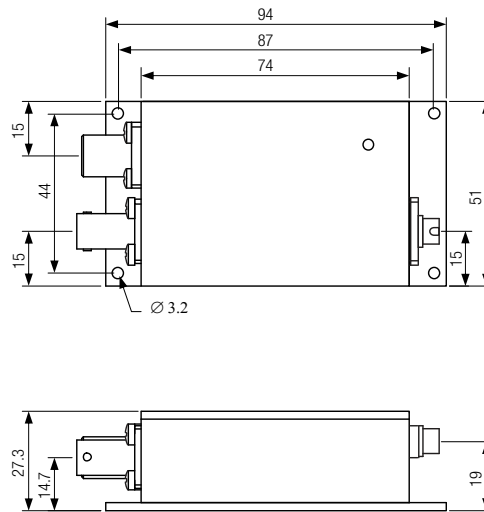
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Dimensions (continued)

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



DZ-HCA-S_FC_R1

all dimensions in mm unless otherwise noted

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