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Datasheet HCA-S-400M-SI

400 MHz Photoreceiver with Si-PIN Photodiode

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

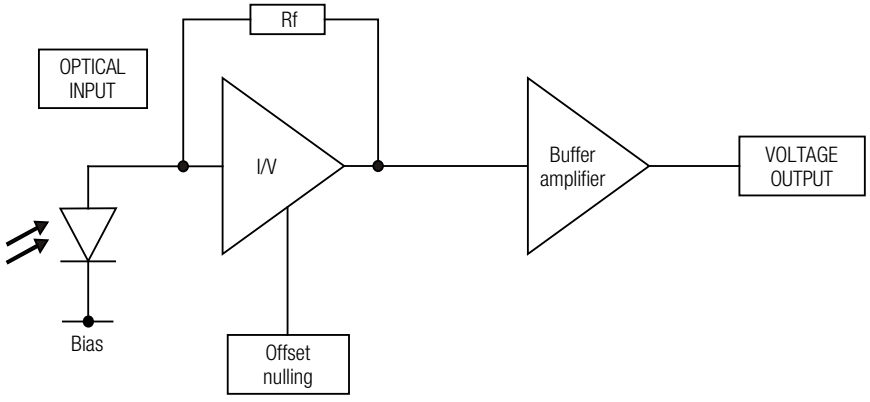
Features

- **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.

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, ∅ 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

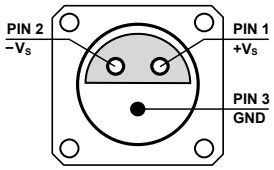
Power Supply
Input: 100 – 240 VAC
Output: ±15 VDC

400 MHz Photoreceiver with Si-PIN Photodiode

Specifications	Test conditions	$V_S = \pm 15$ V, $T_A = 25$ °C, output load impedance 50 Ω, warm-up 20 minutes (min. 10 minutes recommended)
Gain	Transimpedance gain	5.0×10^3 V/A (@ output load 50 Ω)
	Gain accuracy	±1 % (electrical)
	Conversion gain	2.7×10^3 V/W typ. (@ 800 nm, output load 50 Ω)
Frequency Response	Lower cut-off frequency	DC
	Upper cut-off frequency (–3 dB)	400 MHz (±10 %)
	Gain flatness	±1 dB
Time Response	Rise/fall time (10 % – 90 %)	1.0 ns
Input	Noise equivalent power (NEP)	40 pW/√Hz (@ 800 nm, 100 MHz)
	Optical saturation power	400 µW (for linear amplification, @ 800 nm)
	Input offset compensation range	±200 µA, adjustable by offset potentiometer
Detector	Detector	Si-PIN photodiode
	Active area	∅ 0.8 mm
	Spectral range	320 – 1000 nm
	Max. sensitivity	0.55 A/W typ. (@ 800 nm)
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 RMS (20 mV peak-peak) typ. (@ 50 Ω load, no signal on detector, measurement bandwidth 1.5 GHz)
Optical Input Connector	Material FST flange	1.4305 stainless steel, nickel-plated
	Material FST coupler ring	1.4305 stainless steel, glass bead blasted
	Material FC receptacle	nickel silver
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 188 g (0.41 lbs) HCA-S-400M-SI-FC
	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

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)	

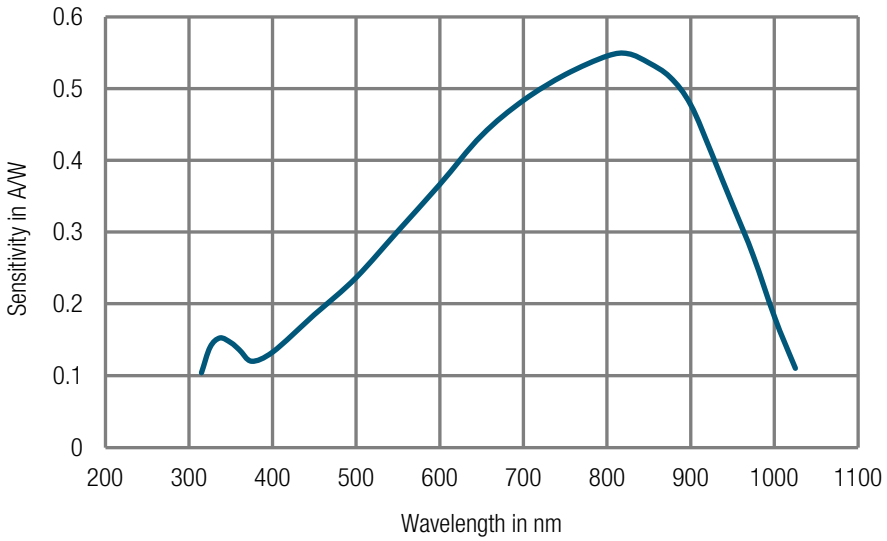


Pin 1: +15 V
Pin 2: −15 V
Pin 3: GND

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

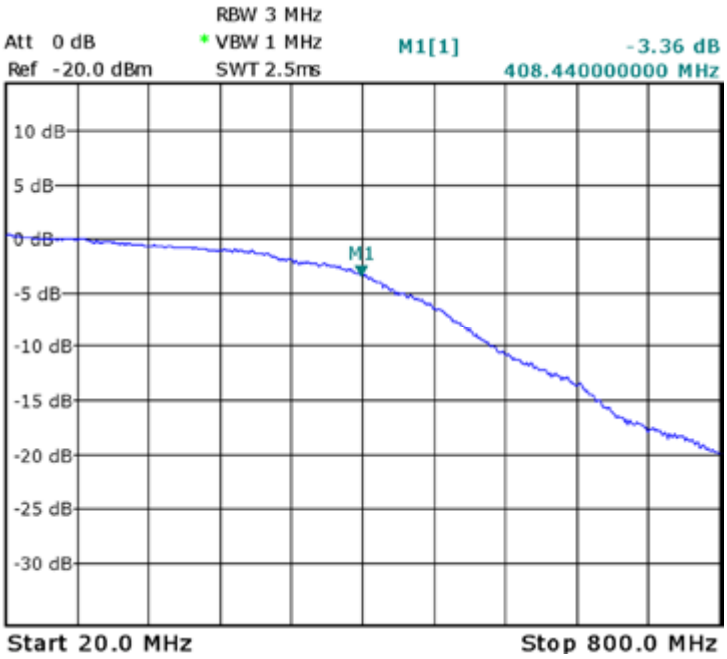


DB-Sens-HCA-S-400M-SI_R01

400 MHz Photoreceiver with Si-PIN Photodiode

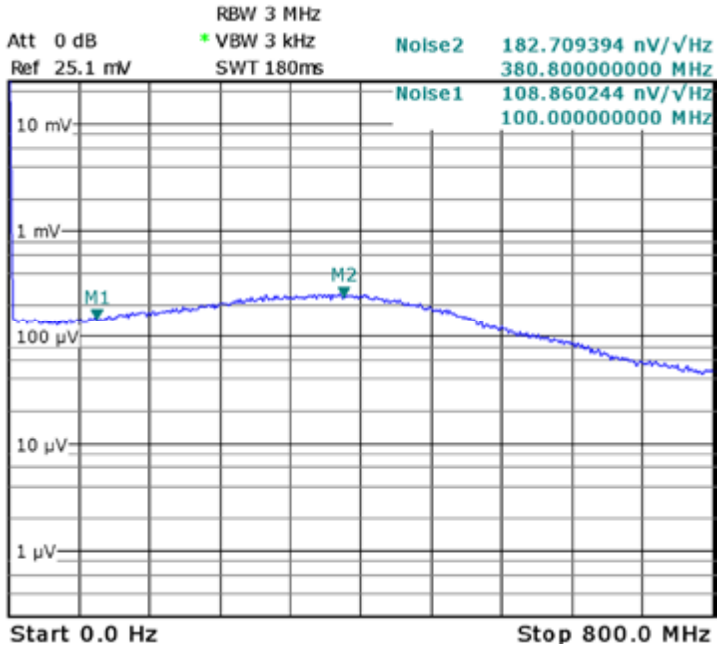
Typical Performance Characteristics

Frequency response



PD-HCA-S-400M-Si-bw_R01

Noise spectrum



PD-HCA-S-400M-Si-noise-R01

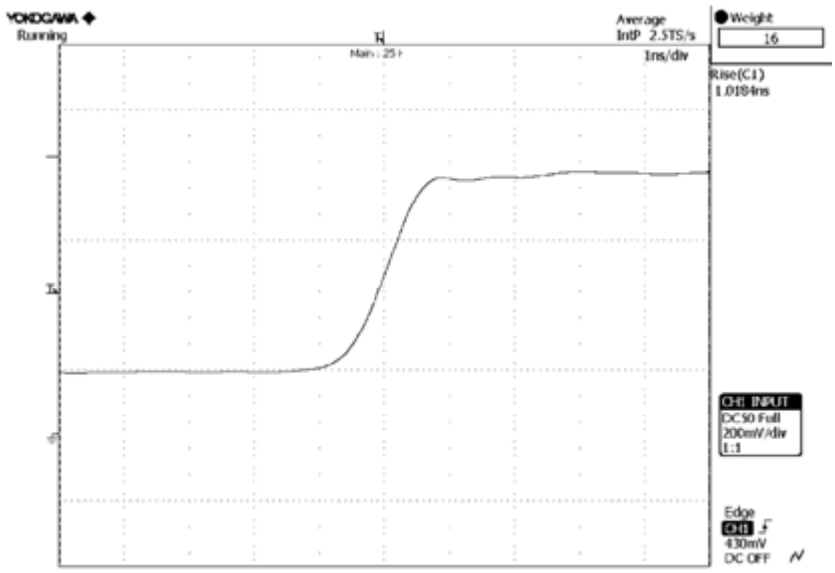
Note: spectral noise data is measured at the amplifier output with no signal on the photodiode. To determine the spectral input noise divide the measured output noise by the amplifier conversion gain. Conversion gain (V/W) = amplifier gain (V/A) × photo sensitivity (A/W).

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

400 MHz Photoreceiver with Si-PIN Photodiode

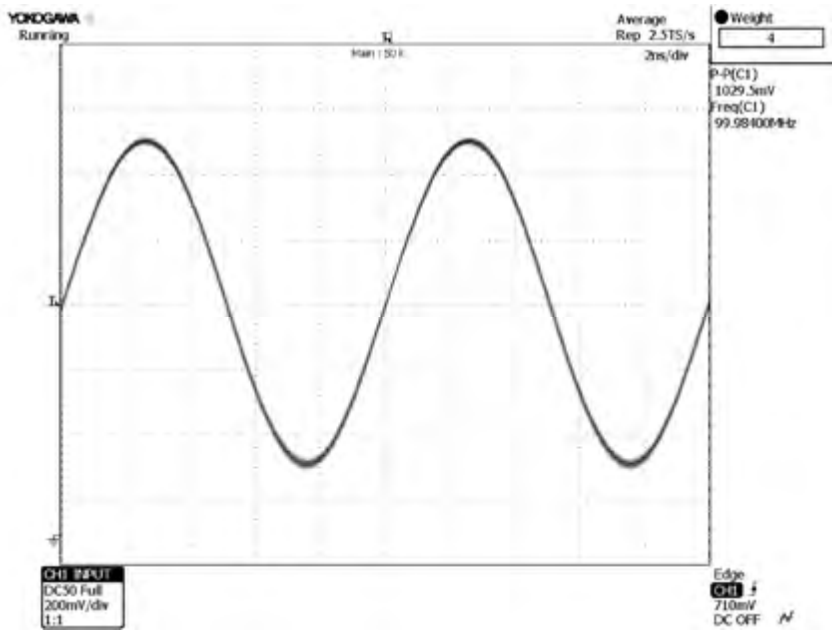
Typical Performance Characteristics (continued)

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 µW modulated optical input signal
(with 4 times averaging)

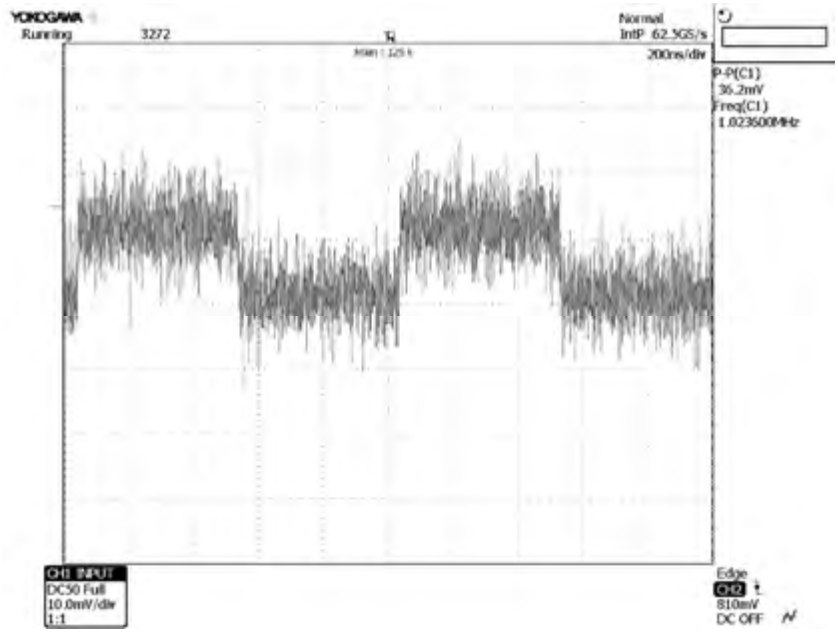


PD-HCA-S-400M-Si-large-sinus_R01

400 MHz Photoreceiver with Si-PIN Photodiode

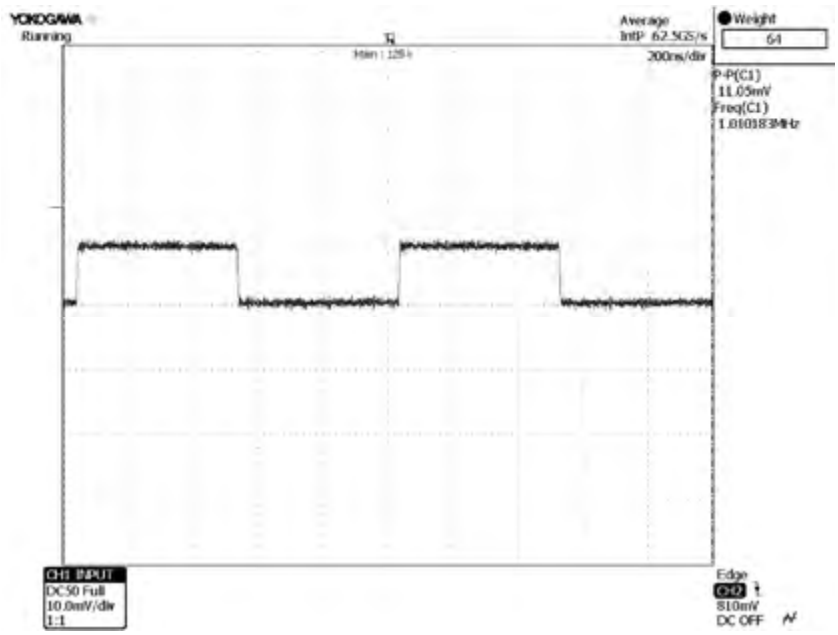
Typical Performance Characteristics (continued)

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

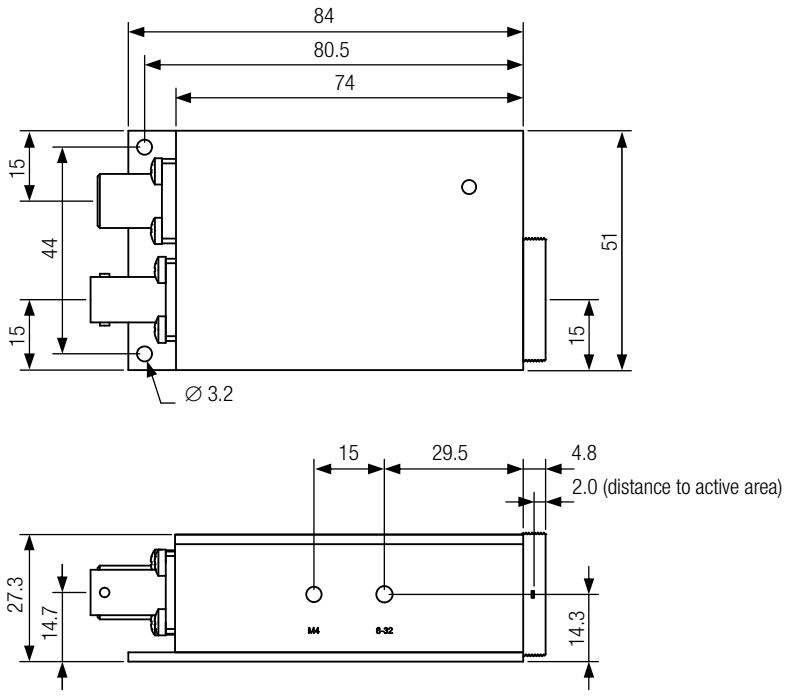


PD-HCA-S-400M-Si noise-square_average_R01

400 MHz Photoreceiver with Si-PIN Photodiode

Dimensions

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



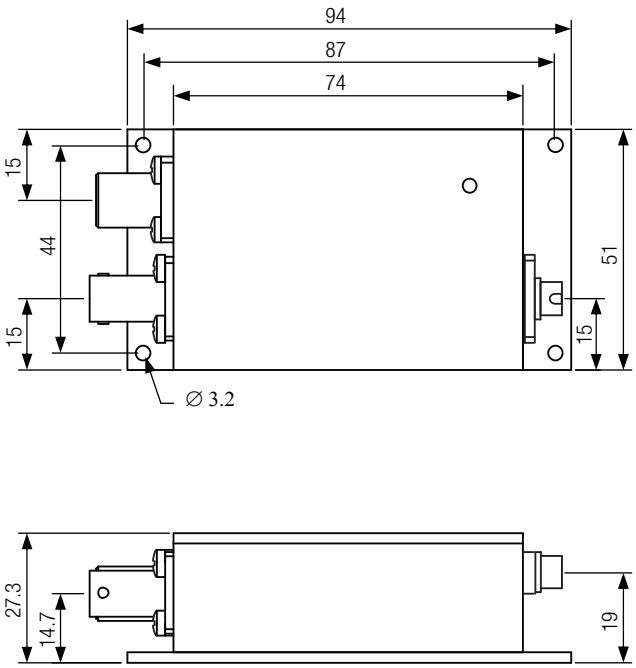
DZ-HCA-S_FST_R1

all dimensions in mm unless otherwise noted

400 MHz Photoreceiver with Si-PIN Photodiode

Dimensions (continued)

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



DZ-HCA-S_FC_R1

all dimensions in mm unless otherwise noted