



# Datasheet

# HCA-S-400M-SI

## 400 MHz Photoreceiver with Si PIN Photodiode



The picture shows the HCA-S-400M-SI-FS with free space input. The photoreceiver will be delivered without post holder and post.

Features	<ul style="list-style-type: none"> <li>• <b>Si PIN Detector, 0.8 mm Active Diameter</b></li> <li>• <b>Spectral Range 320 ... 1000 nm</b></li> <li>• <b>Bandwidth DC ... 400 MHz</b></li> <li>• <b>Amplifier Transimpedance (Gain) <math>5.0 \times 10^3</math> V/A</b></li> <li>• <b>Max. Conversion Gain <math>2.7 \times 10^3</math> V/W @ 800 nm</b></li> </ul>																															
Applications	<ul style="list-style-type: none"> <li>• <b>Spectroscopy</b></li> <li>• <b>Fast Pulse and Transient Measurements</b></li> <li>• <b>Optical Triggering</b></li> <li>• <b>Optical Front-End for Oscilloscopes and A/D Converters</b></li> </ul>																															
Specifications	<table border="0"> <tr> <td></td> <td><i>Test Conditions</i></td> <td><i><math>V_s = \pm 15</math> V, <math>T_a = 25^\circ</math>C</i></td> </tr> <tr> <td rowspan="2">Gain</td> <td>Transimpedance</td> <td><math>5.0 \times 10^3</math> V/A (@ 50 <math>\Omega</math> load)</td> </tr> <tr> <td>Max. Conversion Gain</td> <td><math>2.7 \times 10^3</math> V/W (@ 800 nm)</td> </tr> <tr> <td rowspan="4">Frequency Response</td> <td>Lower Cut-Off Frequency</td> <td>DC</td> </tr> <tr> <td>Upper Cut-Off Frequency (- 3 dB)</td> <td>400 MHz (<math>\pm 10</math> %)</td> </tr> <tr> <td>Rise/Fall Time (10% - 90%)</td> <td>1.0 ns</td> </tr> <tr> <td>Gain Flatness</td> <td><math>\pm 1</math> dB</td> </tr> <tr> <td rowspan="3">Detector</td> <td>Detector Material</td> <td>Si PIN photodiode</td> </tr> <tr> <td>Active Area</td> <td><math>\varnothing 0.8</math> mm</td> </tr> <tr> <td>Spectral Response</td> <td>320 ... 1000 nm</td> </tr> <tr> <td rowspan="3">Input</td> <td>Input Offset Compensation Range</td> <td><math>\pm 200</math> <math>\mu</math>A adjustable by offset trimpot</td> </tr> <tr> <td>Optical Saturation Power</td> <td>400 <math>\mu</math>W (for linear amplification, @ 800 nm)</td> </tr> <tr> <td>Min. NEP</td> <td>40 pW/<math>\sqrt</math>Hz (@ 800 nm, 100 MHz)</td> </tr> </table>		<i>Test Conditions</i>	<i><math>V_s = \pm 15</math> V, <math>T_a = 25^\circ</math>C</i>	Gain	Transimpedance	$5.0 \times 10^3$ V/A (@ 50 $\Omega$ load)	Max. Conversion Gain	$2.7 \times 10^3$ V/W (@ 800 nm)	Frequency Response	Lower Cut-Off Frequency	DC	Upper Cut-Off Frequency (- 3 dB)	400 MHz ( $\pm 10$ %)	Rise/Fall Time (10% - 90%)	1.0 ns	Gain Flatness	$\pm 1$ dB	Detector	Detector Material	Si PIN photodiode	Active Area	$\varnothing 0.8$ mm	Spectral Response	320 ... 1000 nm	Input	Input Offset Compensation Range	$\pm 200$ $\mu$ A adjustable by offset trimpot	Optical Saturation Power	400 $\mu$ W (for linear amplification, @ 800 nm)	Min. NEP	40 pW/ $\sqrt$ Hz (@ 800 nm, 100 MHz)
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**Datasheet****HCA-S-400M-SI****400 MHz Photoreceiver with  
Si PIN Photodiode**

Specifications (continued)		
Output	Output Voltage Range	$\pm 1.0$ V (@ 50 $\Omega$ load) for linear operation and low harmonic distortion
	Max. Output Voltage Range	$\pm 1.5$ V (@ 50 $\Omega$ load)
	Output Impedance	50 $\Omega$ (designed for 50 $\Omega$ load)
	Output Noise	ca. 20 mV peak-peak or 3 mV rms (@ 50 $\Omega$ load, no signal on detector)
Power Supply	Supply Voltage	$\pm 15$ V
	Supply Current	$\pm 55$ mA typ. (depends on operating conditions, recommended power supply capability minimum $\pm 150$ mA)
Case	Weight	210 g (0.5 lbs)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage Temperature	- 40 ... + 100 °C
	Operating Temperature	0 ... + 60 °C

Absolute Maximum Ratings	Optical Input Power	20 mW
	Power Supply Voltage	$\pm 22$ V

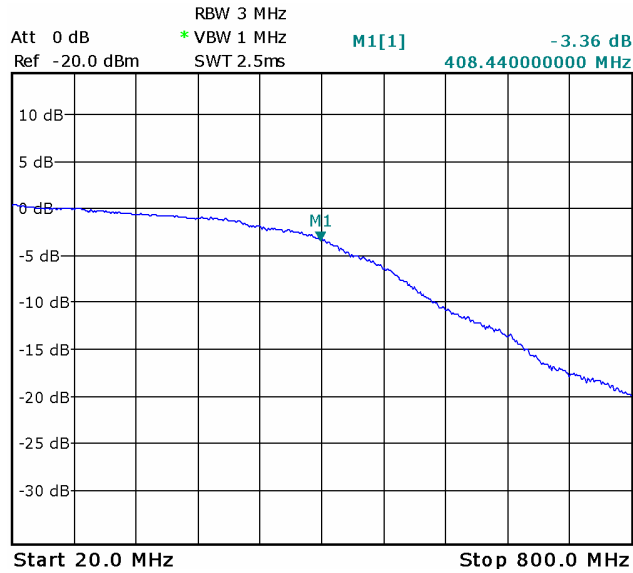
Spectral Response		
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Connectors	Input	HCA-S-400M-SI-FS	25 mm round flange for free space applications
		HCA-S-400M-SI-FC	FC fiber optic receptacle
		HCA-S-400M-SI-SMA	SMA fiber optic receptacle
	Output	BNC	
	Power Supply	LEMO series 1S, 3-pin fixed socket	
		Pin 1:	+ 15V
		Pin 2:	- 15V
		Pin 3:	GND

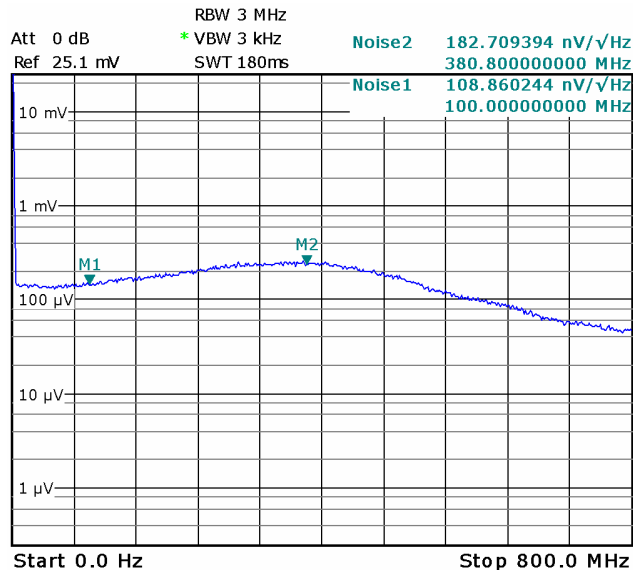
# 400 MHz Photoreceiver with Si PIN Photodiode

Typical Performance Characteristics

## Frequency Response



## Noise Spectrum



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.

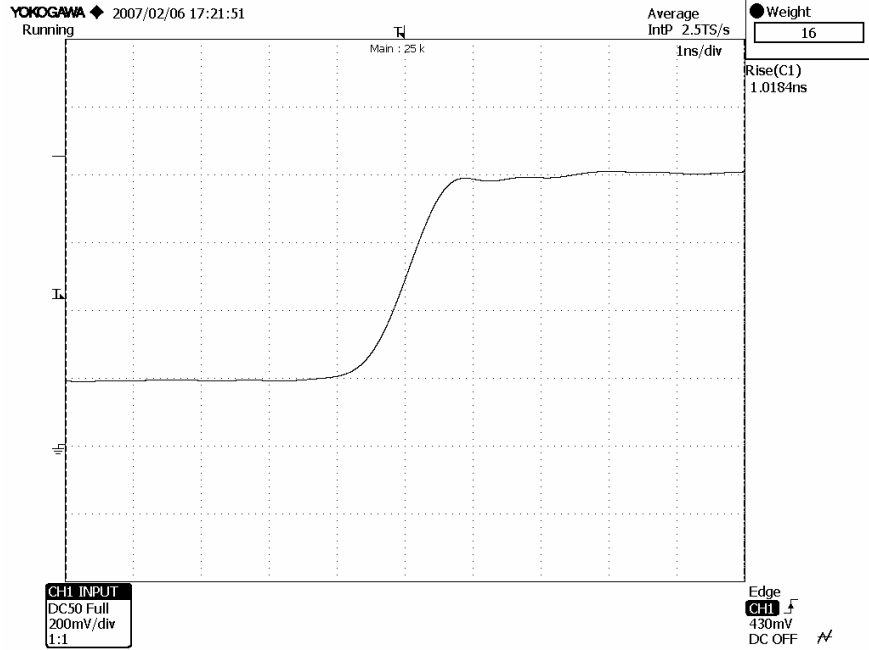
Conversion gain (V/W) = amplifier gain (5,000 V/A) x photo sensitivity (A/W).

Marker	Frequency	Output Noise	Resulting Input Noise (NEP)
1	100 MHz	109 nV/√Hz	40 pW/√Hz (@ 800 nm)
2	380 MHz	183 nV/√Hz	68 pW/√Hz (@ 800 nm)

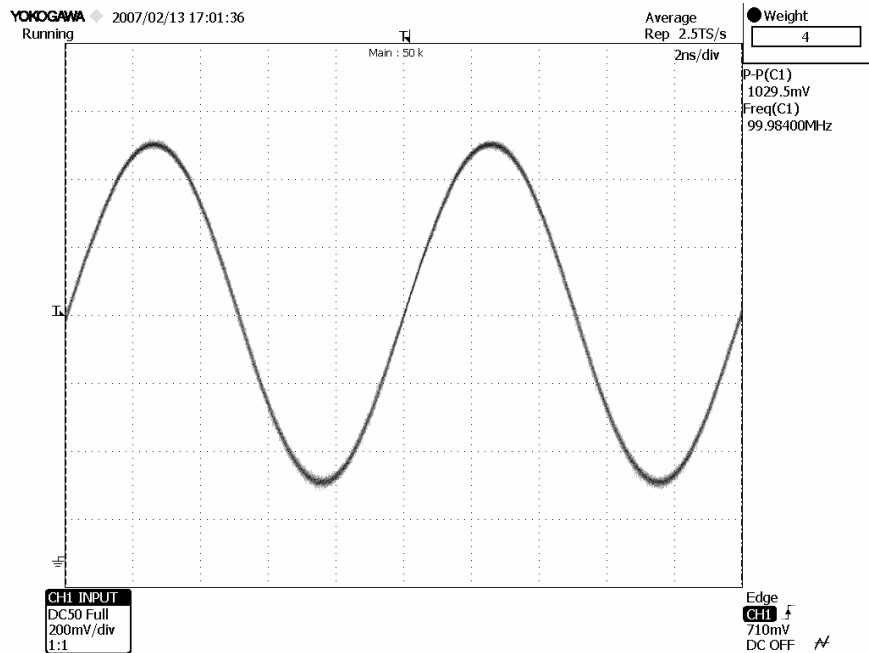
# 400 MHz Photoreceiver with Si PIN Photodiode

Typical Performance Characteristics  
(continued)

Pulse Response to Square Wave Input Signal  
(with 16 times averaging)



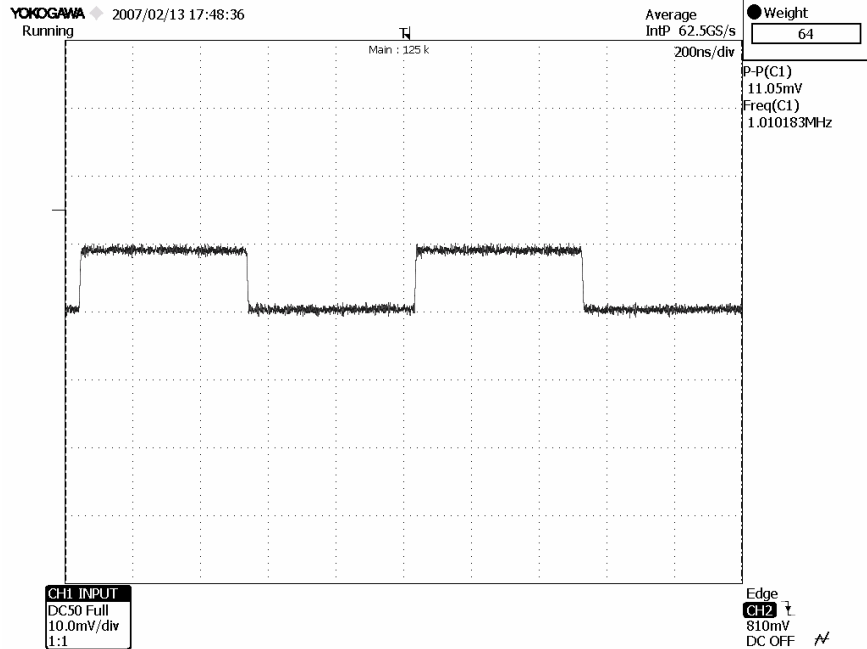
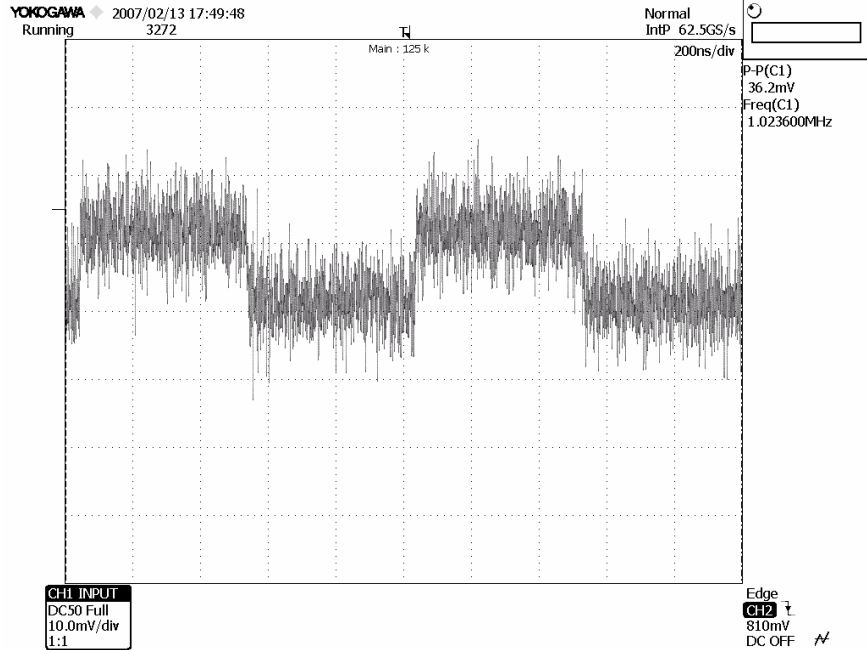
Large Signal Response  
output signal for 100 MHz, 370  $\mu$ W modulated optical input signal  
(with 4 times averaging)



# 400 MHz Photoreceiver with Si PIN Photodiode

Typical Performance Characteristics (continued)

Small Signal Response  
output signal for 3.7  $\mu$ W modulated optical input signal, 1 MHz square wave (without (top) and with 64 times averaging (bottom))



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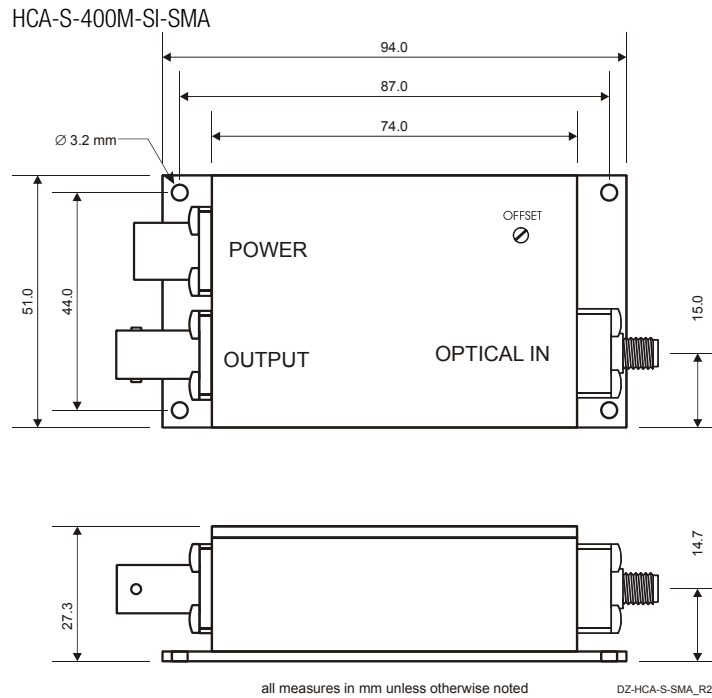
# HCA-S-400M-SI

## 400 MHz Photoreceiver with Si PIN Photodiode

Available Models	HCA-S-400M-SI-FS HCA-S-400M-SI-FC HCA-S-400M-SI-SMA HCA-S	free space input FC fiber optic receptacle SMA fiber optic receptacle customized versions available on request
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Dimensions	<p><b>HCA-S-400M-SI-FS</b></p> <p style="text-align: center;">all measures in mm unless otherwise noted      DZ-HCA-S-FS_R2</p> <p><b>HCA-S-400M-SI-FC</b></p> <p style="text-align: center;">all measures in mm unless otherwise noted      DZ-HCA-S-FC_R4</p>	
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## 400 MHz Photoreceiver with Si PIN Photodiode



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