

# 400 MHz Photoreceiver with InGaAs PIN Photodiode



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

Features	<ul style="list-style-type: none"> <li>• <b>InGaAs PIN detector</b></li> <li>• <b>Spectral range 900 ... 1700 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>4.8 \times 10^3</math> V/W @ 1550 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>Test conditions</td> <td colspan="2"><math>V_S = \pm 15</math> V, <math>T_A = 25</math> °C, system impedance = 50 <math>\Omega</math></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>4.8 \times 10^3</math> V/W (@ 1550 nm)</td> </tr> <tr> <td rowspan="3">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 15</math> %)</td> </tr> <tr> <td>Rise/fall time (10 % - 90 %)</td> <td>1.0 ns</td> </tr> <tr> <td rowspan="3">Detector</td> <td>Detector material</td> <td>InGaAs PIN photodiode</td> </tr> <tr> <td>Active area</td> <td><math>\varnothing</math> 300 <math>\mu</math>m (free space "-FS" version only)</td> </tr> <tr> <td>Spectral response</td> <td>900 ... 1700 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 potentiometer</td> </tr> <tr> <td>Optical saturation power</td> <td>200 <math>\mu</math>W (for linear amplification, @ 1550 nm)</td> </tr> <tr> <td>NEP</td> <td>24 pW/<math>\sqrt</math>Hz (@ 1550 nm, 100 MHz)</td> </tr> </table>	Test conditions	$V_S = \pm 15$ V, $T_A = 25$ °C, system impedance = 50 $\Omega$		Gain	Transimpedance	$5.0 \times 10^3$ V/A (@ 50 $\Omega$ load)	Max. conversion gain	$4.8 \times 10^3$ V/W (@ 1550 nm)	Frequency Response	Lower cut-off frequency	DC	Upper cut-off frequency (-3 dB)	400 MHz ( $\pm 15$ %)	Rise/fall time (10 % - 90 %)	1.0 ns	Detector	Detector material	InGaAs PIN photodiode	Active area	$\varnothing$ 300 $\mu$ m (free space "-FS" version only)	Spectral response	900 ... 1700 nm	Input	Input offset compensation range	$\pm 200$ $\mu$ A adjustable by offset potentiometer	Optical saturation power	200 $\mu$ W (for linear amplification, @ 1550 nm)	NEP	24 pW/ $\sqrt$ Hz (@ 1550 nm, 100 MHz)
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# 400 MHz Photoreceiver with InGaAs PIN Photodiode

Typical Performance  
Characteristics

### Frequency response

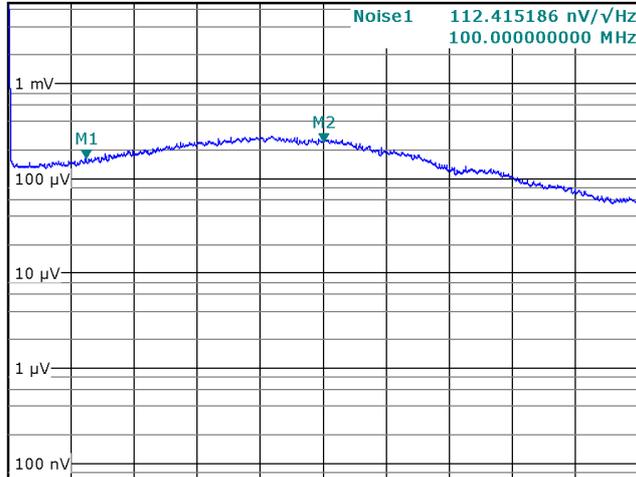
Offs 5.00 dB      \* RBW 300 kHz  
Att 0 dB          VBW 1 MHz      M1[1]      -3.06 dB  
Ref -15.00 dBm    SWT 10ms      400.00000000 MHz



Start 10.0 MHz      Stop 800.0 MHz

### Noise spectrum

\* RBW 3 MHz      Noise2 181.939740 nV/√Hz  
Att 0 dB          \* VBW 3 kHz      400.00000000 MHz  
Ref 7.07 mV      SWT 180ms



CF 400.0 MHz      Span 800.0 MHz

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.

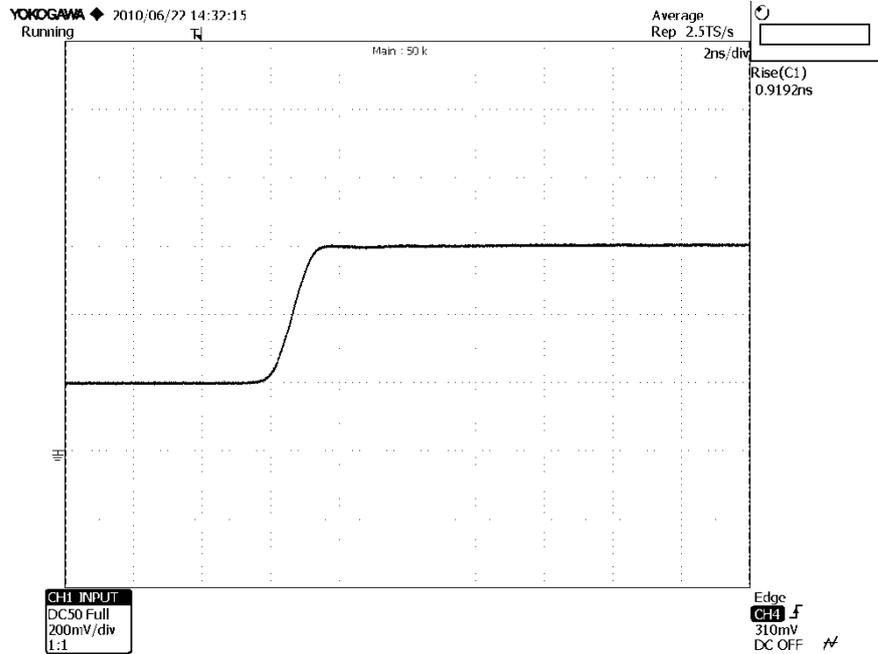
Conversion gain (V/W) = amplifier gain (5,000 V/A) x photo sensitivity (A/W).

Marker	Frequency	Output noise	Resulting input noise (NEP)
1	100 MHz	112 nV/√Hz	24 pW/√Hz (@ 1550 nm)
2	400 MHz	182 nV/√Hz	38 pW/√Hz (@ 1550 nm)

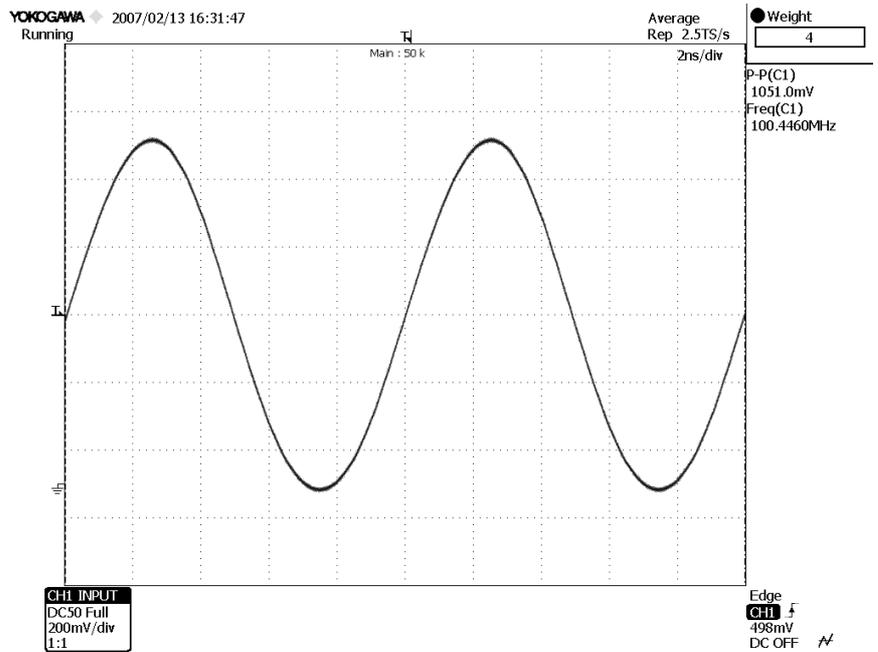
### 400 MHz Photoreceiver with InGaAs PIN Photodiode

Typical Performance  
Characteristics  
(continued)

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



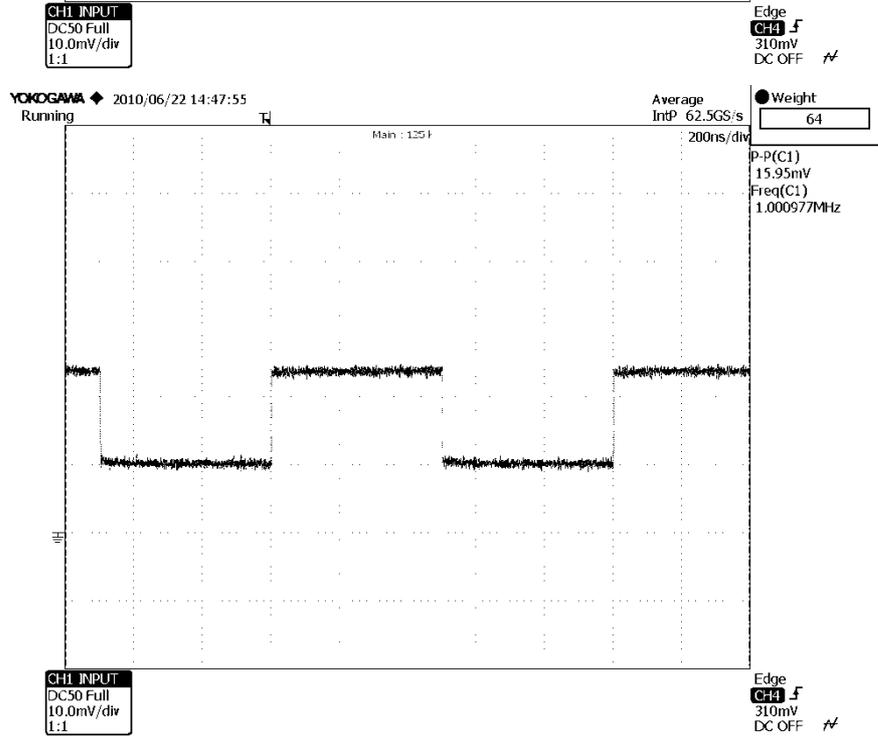
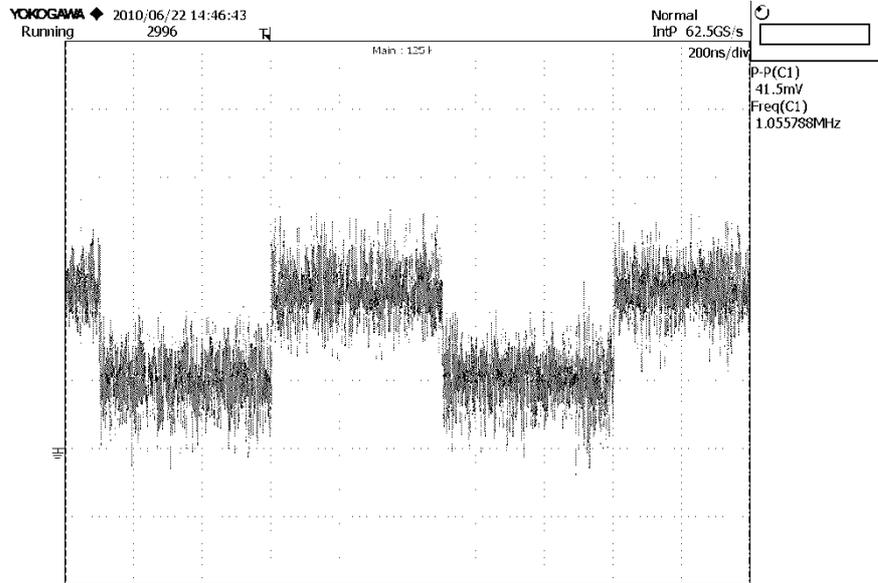
Large signal response  
output signal for 100 MHz, 210  $\mu$ W modulated optical input signal  
(with 4 times averaging)



# 400 MHz Photoreceiver with InGaAs PIN Photodiode

Typical Performance  
Characteristics  
(continued)

Small signal response  
output signal for 3  $\mu$ W modulated optical input signal, 1 MHz square wave  
(without (top) and with 64 times averaging (bottom))



Available Models

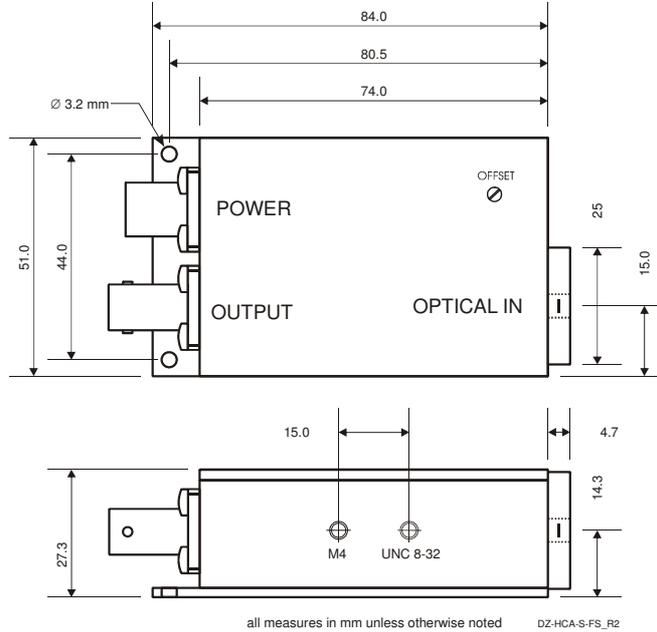
HCA-S-400M-IN-FS  
HCA-S-400M-IN-FC  
HCA-S

free space input  
FC fiber optic receptacle  
customized versions available on request

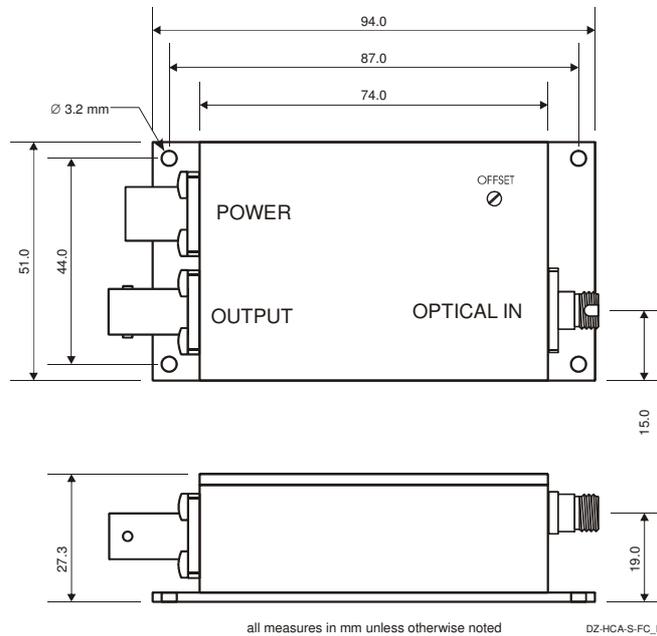
# 400 MHz Photoreceiver with InGaAs PIN Photodiode

Dimensions

HCA-S-400M-IN-FS



HCA-S-400M-IN-FC



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