# Balanced Photodetector Module
# ----HC-BPRM Series

## Product introduction

HC-BPRM series balanced photodetector module integrates two matched high-linearity analog PIN detectors and a low-noise broadband transimpedance amplifier, featuring high gain, high sensitivity, DC-coupled output and high common-mode rejection ratio, which can effectively reduce the common-mode noise of the input light and improve the signal-to-noise ratio of the system. The power supply of the module is positive 12 V, the input optical interface can select optical fiber interface or space incidence, and the electrical signal is output from the SMA port. The module is mainly used in the fields of nanosecond optical pulse detection, laser radar, optical fiber coherent tomography and optical fiber sensing system.

## Product features

- Spectral range:

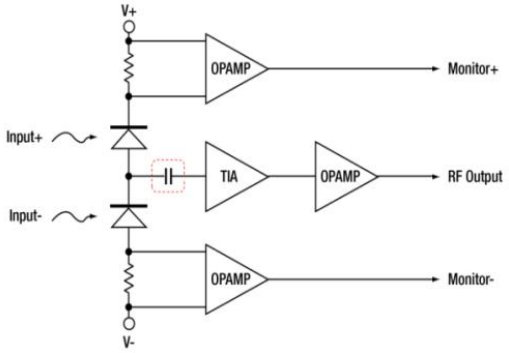
  Si：400~1100nm；

  InGaAs：800~1700nm；

  Enhanced InGaAs: 800 ~ 2200nm
- 3dB bandwidth multiple options
- Optional with output monitoring
- Response Time Min. < 0.2 ns
- CMRR > 30dB
- Low noise
- DC 12V single power supply
- Compact 47x42x20mm
- Can be customized

## Scope of application

- Laser radar
- Distributed optical fiber sensing system
- Optical coherence tomography (OCT)



## Technical parameters

| silicon balanced photodetector module | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | | | HC-BPRM-XX-S-FA/FS | | | |
| Detector type | | | Si / PIN | | | |
| Optical input | | | Free Space or FC/APC | | | |
| Wavelength range | | | 400-1100nm | | | |
| Peak responsivity | | | 0.5 A/W @ 905 nm | | | |
| Photosensitive surface diameter | | | 1.2mm | 0.8mm | 0.2mm | |
| Common Mode Rejection Ratio (CMRR) | | | >25 dB (typ. >30 dB) | | | |
| Bandwidth (3dB) | | RF OUTPUT | 10MHz | 100MHz | 200MHz | 350MHz | 1GHz |
| Conversion gain @ high impedance | | | $1x10^5$V/W | $2.5x10^4$V/W | $2x10^4$V/W | 5x $10^3$ V/W | 2x $10^3$ V/W |
| Rise time | | | 30ns | 3ns | 0.7ns | 1ns | 0.3ns |
| Saturated optical power | Out of balance | | 50uW | 152 uW | 190uW | 760uW | 2mW |
| | Balance | | 5mW | | | | |
| Coupling mode | | | DC (AC optional) | | | | AC |
| Output impedance | | | 50Ω | | | | |
| Equivalent noise power NEP | | | 7.0pW/√Hz | 12pW/√Hz | 23.5pW/√Hz | 42.7pW/√Hz | 59.6pW/√Hz |
| Total Output Noise Voltage * | | | <0.3$mV_{RMS}$ | <5$mV_{RMS}$ | <6$mV_{RMS}$ | <4$mV_{RMS}$ | <2.1$mV_{RMS}$ |

* When the load is high resistance, if the load is 50 ohms, the corresponding value is halved.

| InGaAs balanced photodetector module (fiber input) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | | | HC-BPRM-XX-I-FA | | | | | |
| Detector type | | | InGaAs / PIN | | | | | |
| Optical input | | | FC/APC | | | | | |
| Wavelength range | | | 800-1700nm | | | | | |
| Peak responsivity | | | 0.9A/W @ 1550 nm | | | | | |
| Photosensitive surface diameter | | | 75μm | | | | | |
| Bandwidth (3dB) | | RF OUTPUT | 10MHz | 75MHz | 200MHz | 400MHz | 500MHz | 30K~1.5GHz |
| Conversion gain @ high impedance | | | 51x $10^3$ V/W | 250x $10^3$ V/W | 40 x $10^3$ V/W | 10x $10^3$ V/W | 2x $10^3$ V/W | 2x $10^3$ V/W |
| Rise time | | | 30ns | 4.5ns | 1.8ns | 0.9ns | 0.7ns | 0.2ns |
| Common Mode Rejection Ratio (CMRR) | | | >30 dB | >30 dB | >25 dB | | | |
| Saturated Light Power | Out of balance | | 58.8uW | 12.5uW | 97.5uW | 0.38mW | 1mW | 1mW |
| | Balance | | 5mW | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coupling mode | | DC | | | | | AC only |
| Output impedance | | 50Ω | | | | | |
| Equivalent noise power NEP | | 3.6pW/√Hz | 6.9pW/√Hz | 5.9pW/√Hz | 17.9 pW/√Hz | 15pW/√Hz | 12.9pW/√Hz |
| Total Output Noise Voltage * | | <0.3$mV_{RMS}$ | <15$mV_{RMS}$ | < 6.3$mV_{RMS}$ | <4$mV_{RMS}$ | <1$mV_{RMS}$ | <2$mV_{RMS}$ |

* When the load is high resistance, if the load is 50 ohms, the corresponding value is halved.

| InGaAs balanced photodetector module (spatial light input) | | | | | |
|---|---|---|---|---|---|
| Parameter | | | HC-BPRM-75M-I-FS-500um | | |
| Detector type | | | InGaAs / PIN | | |
| Optical input | | | Free Space | | |
| Wavelength range | | | 800-1700nm | | |
| Peak responsivity | | | 0.9A/W @ 1550 nm | | |
| Photosensitive surface diameter | | | 500μm | | 200um |
| Bandwidth (3dB) | | RF OUTPUT | 75MHz | 200MHz | 500MHz |
| Conversion gain @ high impedance | | | 10x $10^3$ V/W | 40 x $10^3$ V/W | 2x $10^3$ V/W |
| Rise time | | | 4.7ns | 1.8ns | 0.7ns |
| Common Mode Rejection Ratio (CMRR) | | | >30 dB | | |
| Saturated optical power | Out of balance | | 0.38mW | 97.5uW | 1mW |
| | Balance | | 5mW | | |
| Coupling mode | | | DC | | |
| Output impedance | | | 50Ω | | |
| Equivalent noise power NEP | | | 13.5 pW/√Hz | 5.1pW/√Hz | 12.8pW/√Hz |
| Total Output Noise Voltage * | | | < 2.1 $mV_{RMS}$ | < 6.0$mV_{RMS}$ | <0.8$mV_{RMS}$ |

* When the load is high resistance, if the load is 50 ohms, the corresponding value is halved.

| Enhanced InGaAs balanced photodetector module | | | | | |
|---|---|---|---|---|---|
| Parameter | | HC-BPRM-XX-IE-XX | | | |
| Detector type | | InGaAs / PIN | | | |
| Optical input | | FC/APC or space input | | | |
| Wavelength range | | 800-2200nm | | | |
| Peak responsivity | | 1.2A/W@2000nm | | | |
| Photosensitive surface diameter | | 100μm | | | |
| Bandwidth (3dB) | RF OUTPUT | 10MHz | 200MHz | 500MHz | 30K~1GHz |
| Conversion gain @ high impedance | | 50x $10^3$ V/W | 40 x $10^3$ V/W | 2x $10^3$ V/W | 2x $10^3$ V/W |
| Rise time | | 30ns | 1.8ns | 0.6ns | 0.2ns |
| Common Mode Rejection | | >30 dB | >25 dB | | |

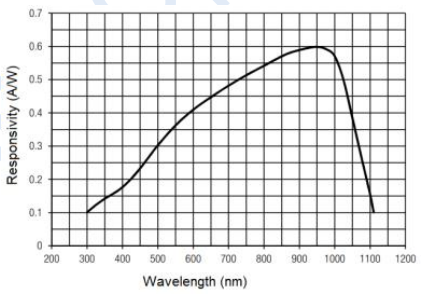
| | | | | | | |
|---|---|---|---|---|---|---|
| Ratio (CMRR) | | | | | | |
| Saturated Light Power | Out of balance | | 58.8uW | 97.5uW | 1mW | 1mW |
| | Balance | | 5mW | | | |
| Coupling mode | | | DC | | | AC only |
| Output impedance | | | 50Ω | | | |
| Equivalent noise power NEP | | | 3.0pW/√Hz | 5.1pW/√Hz | 12.8pW/√Hz | 12.0pW/√Hz |
| Total Output Noise Voltage * | | | <0.2mV$_{RMS}$ | < 6.0mV$_{RMS}$ | <0.8mV$_{RMS}$ | <1.8mV$_{RMS}$ |

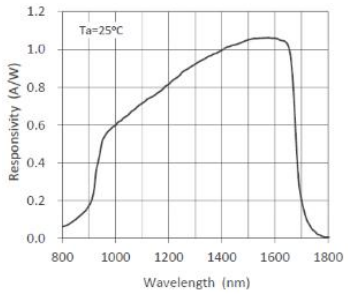
* When the load is high resistance, if the load is 50 ohms, the corresponding value is halved.

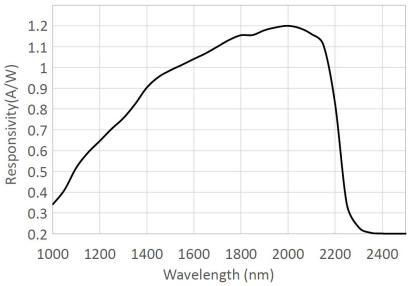
## General parameters

| Parameter | | Typical value | Remark |
|---|---|---|---|
| RF out terminal | Output electrical signal interface | SMA(Female) | |
| | Maximum output voltage | ±2V | High impedance, BW > = 1GHz product |
| | | ±3.8V | High impedance, bandwidth < = 500MHz product |
| Monitoring terminal (optional) | Bandwidth | DC-1MHz | |
| | Output voltage | 0-5V | @ High resistance |
| | Gain | 1KV/W | @1550nm |
| | Resistance | 100Ω | |
| | Saturated optical power | 5mW | @ High resistance |
| Power connector | | Aviation plug | 2P or 4P |
| Power supply | | DC 12V, <100mA | Operating voltage |
| Photodamage threshold | | 10mW | CW or peak power |
| Operating temperature | | -20~65°C | |

## Typical spectral response curves

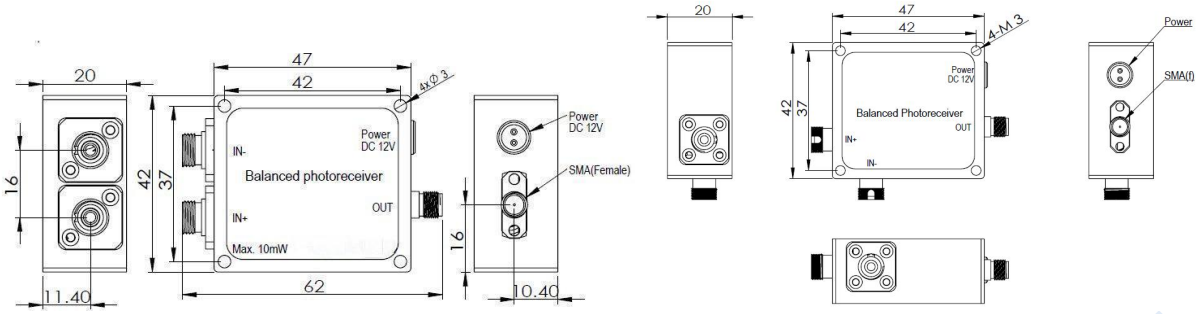


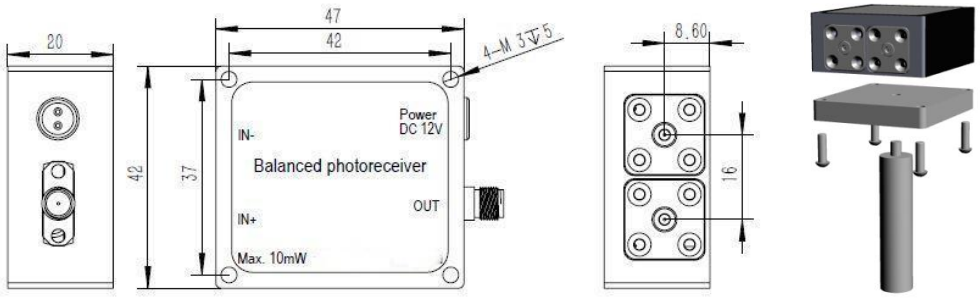




400-1100nm Si 800-1700nm InGaAs 800-2200 nm Enhanced InGaAs

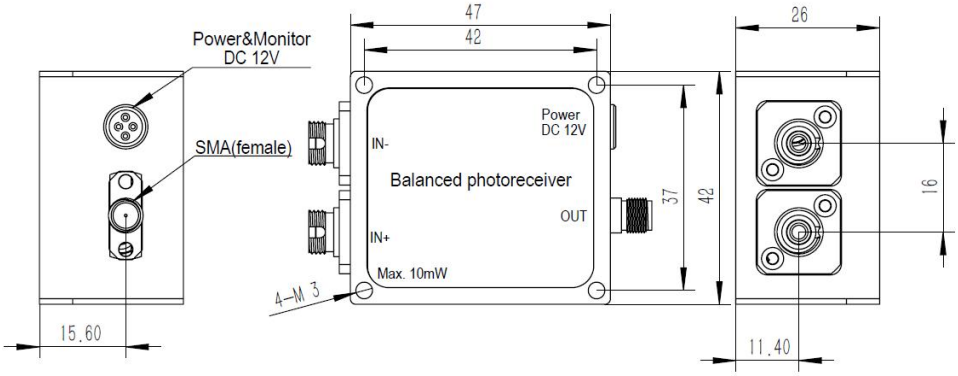
## Mechanical dimensions in mm




Optical interface (left side: products with bandwidth less than 1G; right side: products with bandwidth more than 1G)




Space optical interface (with adapter board to adapt to M4 optical connector)




Optical interface (with output monitoring)


Power supply interface (without monitoring output and with monitoring output)

## Ordering Information (HC-BPRM-BW-S/I-FA/FS-XX)

BW--Operating Bandwidth

S/I --- S: Si； I: InGaAs； IE：

FA/FS --- FA: FC/APC； FS: Free Space

XX--Other special requirements