

10Gb/s surface mount coplanar APD preamp receiver with integrated MEMS VOA

ATV10GC

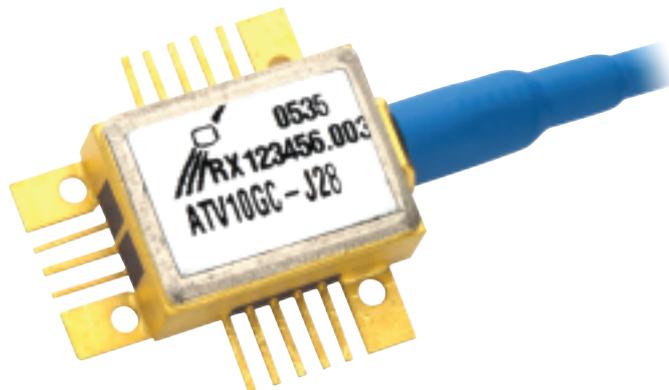
The ATV10GC receiver consists of an avalanche photodiode, a low-noise preamplifier, a MEMS variable optical attenuator (VOA), and a precision NTC thermistor in a hermetic coplanar package with a connectorized single-mode fiber pigtail. Differential outputs are provided to improve noise rejection for enhanced sensitivity. It has been optimised for use in 10Gb/s metro or long-haul applications, either as a discrete device or within a transponder, using NRZ modulation, with or without FEC, at data rates up to 10.709Gb/s.

Features:

- High sensitivity, -26.5dBm typical
- Integrated MEMS VOA extends overload beyond +10dBm
- Low capacitance high speed InGaAs APD photodetector
- Supports FEC rates up to 10.709Gb/s
- Best in class power consumption, only 350mW
- Designed to exceed the environmental requirements of Telcordia GR-468-CORE
- RoHS 5/6 compliant 

Applications:

- Client or line side links
- DWDM TDM transponder applications



Operating Characteristics

Case Temperature = 25°C unless otherwise specified

| Parameter | Symbol | Measurement Conditions | Min | Typ | Max | Unit |
|--|---------------------|---|-------|-------|-------|------|
| Optical sensitivity BOL [1] [2] | Sens | 2 ³¹ -1 PRBS BER<10 ⁻¹² V _{APD} =V _{M10} | | -26.5 | -25.0 | dBm |
| Sensitivity penalty EOL over temperature [1] [2] | | 2 ³¹ -1 PRBS BER<10 ⁻¹² V _{APD} =V _{M10} T=-5 to +75°C | | 0.75 | 1.0 | dB |
| Deviation from linear phase | | DC - 6GHz | -10 | | +10 | ° |
| High frequency -3dB corner | f _H | V _{APD} =V _{M10} Small signal | 7 | 7.5 | | GHz |
| Low frequency -3dB corner | f _L | | | | 40 | kHz |
| Transimpedance gain [3] [4] [5] | T _Z | Small signal | 1.1 | 1.6 | 2.3 | kΩ |
| Maximum output voltage ₆ | V _{OUT} | Peak-to-peak | | 600 | 700 | mV |
| Return loss | S ₂₂ | DC to 7.0GHz | | | -8 | dB |
| Optical overload [2] | P _{SAT} | 0dB Attenuation V _{APD} =V _{M3} BER<10 ⁻¹² | -3 | -1 | | dBm |
| Optical overload extension | | With VOA actuated | +13 | | | dBm |
| APD breakdown voltage | V _{br} | T=25°C I _{APD} =10mA | 25 | | 40 | V |
| APD breakdown voltage temperature coefficient | T _{Vbr} | | 0.030 | 0.045 | 0.061 | V/°C |
| Dark current | I _d | At 90% of V _{br} | | | 100 | nA |
| Amplifier bias current | I _{cc} | | | 75 | 95 | mA |
| Input current for output limiting | I _{in lim} | Peak-to-peak | | 0.5 | | mA |
| VOA maximum attenuation | Att | | 20 | 30 | | dB |
| VOA control voltage [7] | V _{Att} | Attenuation = 20dB | | 5.5 | 9 | V |
| VOA current | I _{Att} | Attenuation = 20dB | | 6 | 7.2 | mA |
| VOA power dissipation (continuous) | P _{Att} | Attenuation = 20dB | | 33 | 65 | mW |
| VOA response time [8] | | From attenuation = 1dB to 20dB | | 5 | 10 | ms |
| Polarisation dependent loss | PDL | VOA unbiased | | | 0.15 | dB |
| Polarisation dependent loss | PDL | VOA biased | | | 0.4 | dB |
| Thermistor resistance | R _{TH} | T=25°C | | 10 | | kΩ |

Notes:

[1] Optical Wavelength between 1525-1575nm. Data to 1610nm available on request.

[2] Measured with 9.95328Gb/s NRZ 1031-1 PRBS data and no FEC.

[3] Load impedance is 50Ω AC-coupled.

[4] Excludes APD responsivity.

[5] Differential.

[6] Single ended.

[7] Not polarity sensitive.

[8] Response time quoted is to achieve 99% of the desired attenuation value.

Absolute Maximum Ratings

The table below provides maximum and/or minimum values of critical parameters which will not permanently damage the device, but for which the operating specification may not hold

| Parameter | Symbol | Min | Max | Unit |
|---------------------------|--------|-----|----------|------|
| Amplifier bias voltage | VCC | -6 | 0.5 | V |
| Operating temperature [1] | Top | -40 | +85 | °C |
| Storage temperature [2] | Tstg | -40 | +85 | °C |
| Input photocurrent [3] | IPD | | 3 | mA |
| APD bias voltage | VAPD | 0 | V_{br} | V |
| VOA control voltage [4] | VATT | 0 | 9 | V |
| Fiber bend radius | | 20 | | mm |

Notes:

[1] The operating temperature is defined as the temperature of the module case.

[2] The rating is referred to the ambient temperature.

[3] $V_{APD} \cdot V_{M3}$. Although implementation of a current limit is intuitive, it is not recommended as biasing below the specified $M = 3$ voltage in the presence of a high optical power has been shown to cause device damage.

[4] Polarity Independent.

Class 2 ESD precautions must be observed when handling these devices.

Pin Out

| Pin # | Symbol | Parameter | Pin # | Function | Parameter |
|-------|-----------|--------------------------|-------|----------|-------------------------|
| 1 | V_{ATT} | VOA control | 10 | Out_P | Positive RF data output |
| 2 | V_{APD} | APB bias voltage | 11 | GND | Case RF ground |
| 3 | NC | No connection | 12 | GND | Case ground |
| 4 | V_{ee} | Amplifier supply (-5.2V) | 13 | FB_in | Output offset control |
| 5 | NC | No connection | 14 | NC | No connection |
| 6 | GND | Case ground | 15 | NC | No connection |
| 7 | GND | Case RF ground | 16 | RTH | Thermistor |
| 8 | Out_N | Negative RF data output | 17 | GND | Case ground |
| 9 | GND | Case ground | | | |

Circuit Schematic

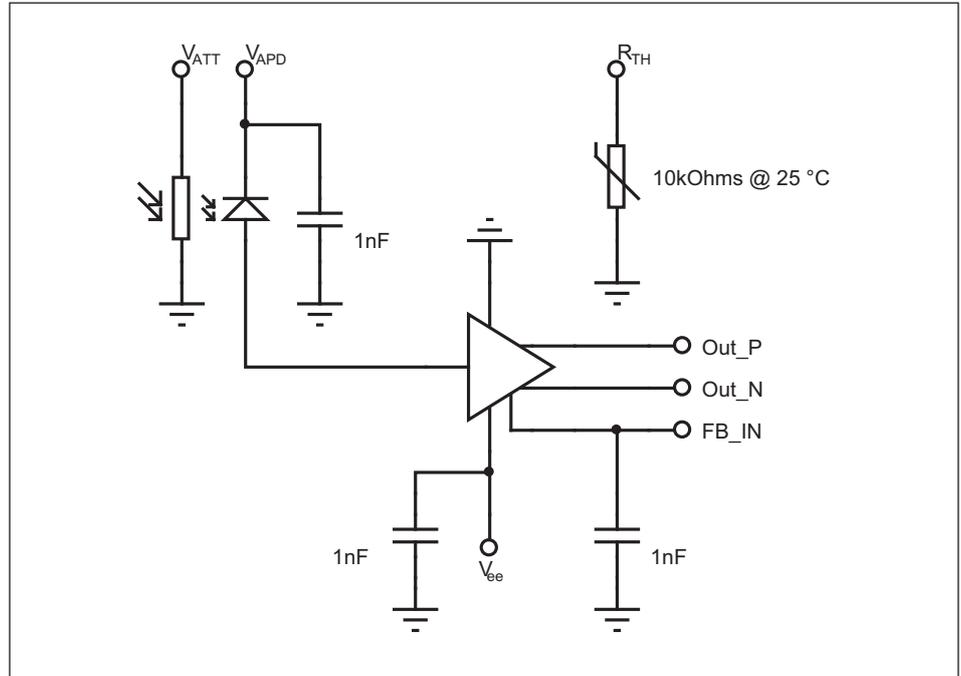


Figure [1] ATV10GC Circuit schematic.

Outline Drawing

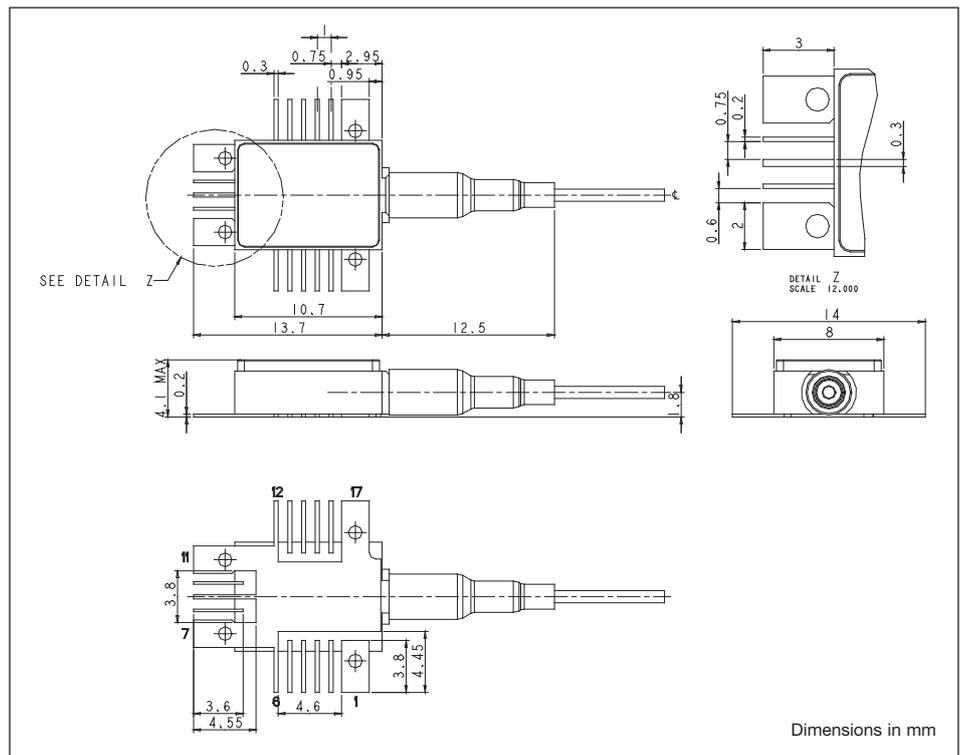


Figure [2] Outline diagram (Illustration only. For full details, refer to appropriate assembly drawing).
Note: Fiber is 900mm secondary coated single-mode fiber, length = 1200 +/-200mm.

Typical Performance Characteristics

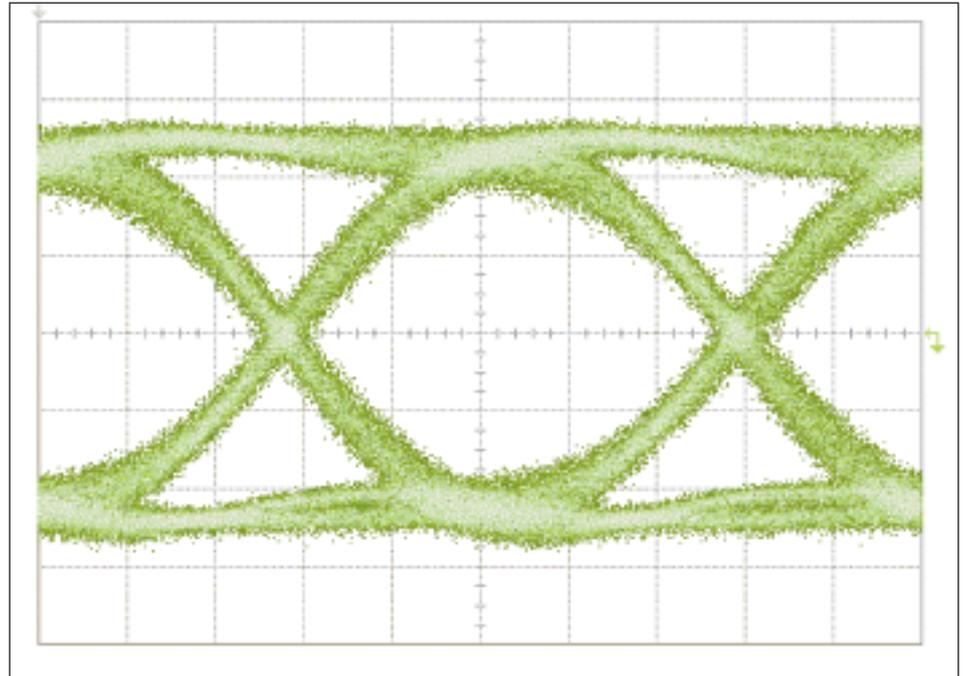


Figure [3] Electrical output data eye, M = 10, 10Gb/s $2^{31}-1$ PRBS, -20dBm optical input.

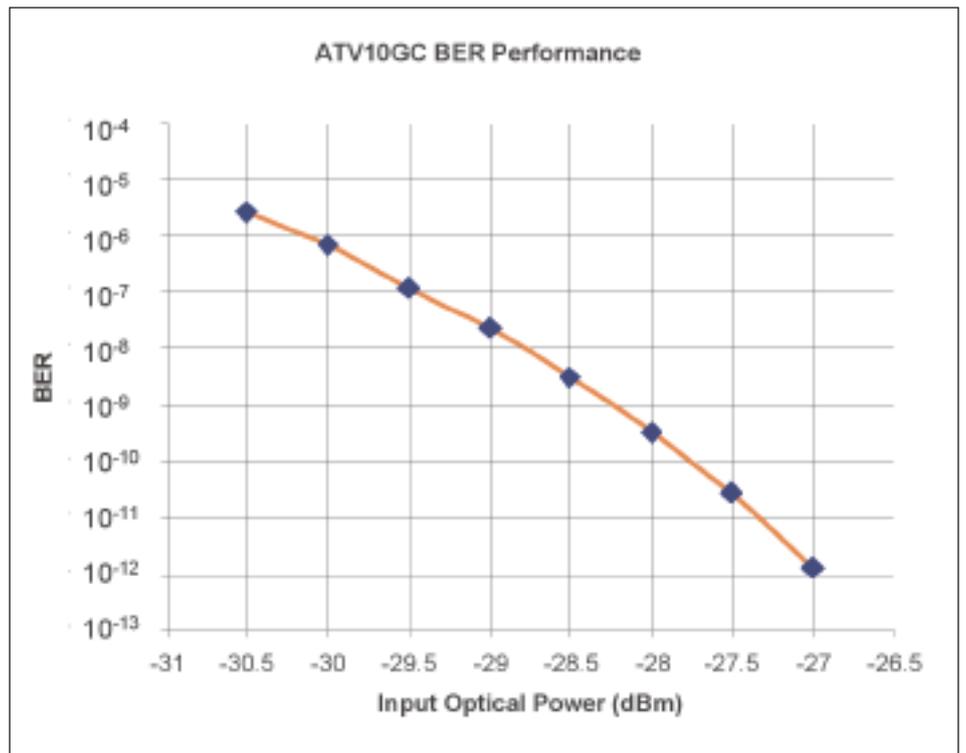


Figure [4] Typical BER performance, M = 10, 10Gb/s $2^{31}-1$ PRBS, optical extinction ratio = 12dB.

Typical Performance Characteristics (continued)

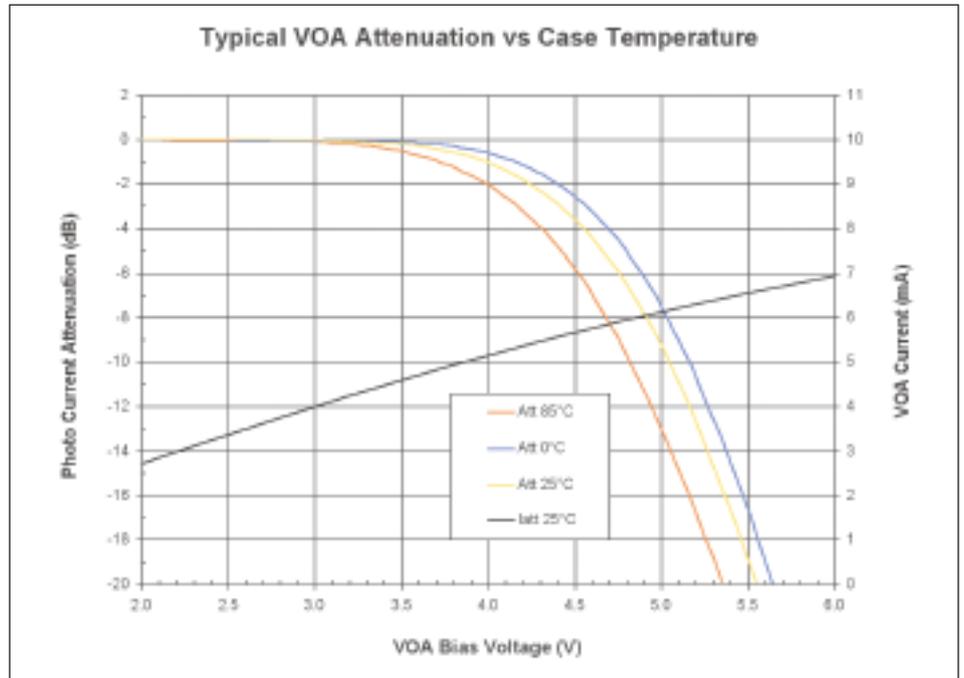


Figure [5] Typical VOA attenuation.

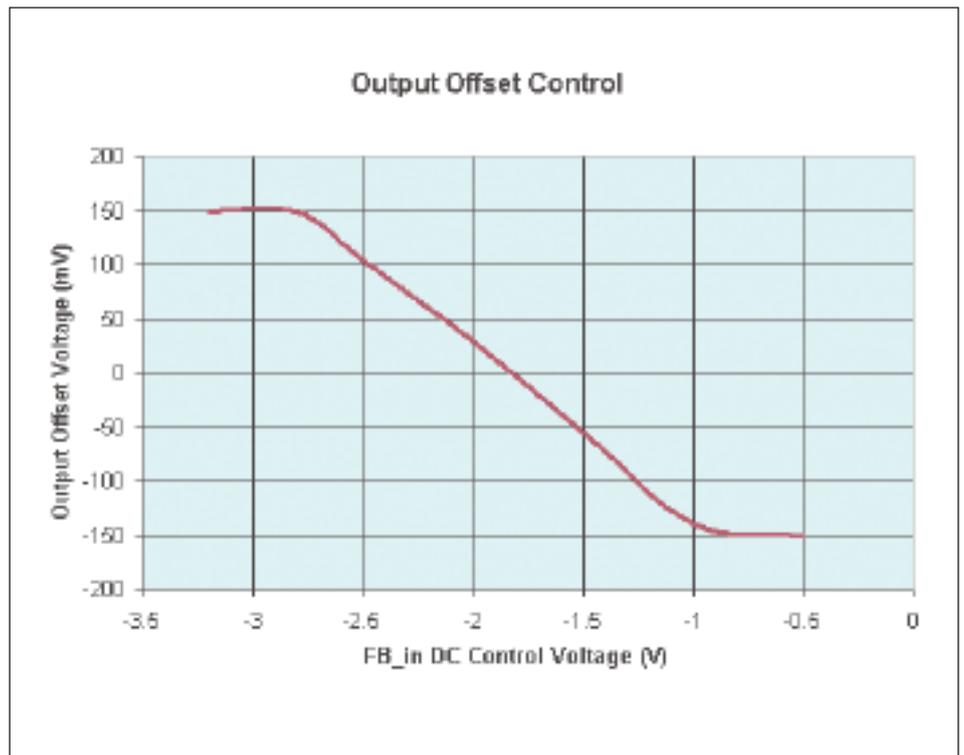


Figure [6] FB_in transfer function.

RoHS Compliance



Bookham is fully committed to environment protection and sustainable development and has set in place a comprehensive program for removing polluting and hazardous substances from all of its products. The relevant evidence of RoHS compliance is held as part of our controlled documentation for each of our compliant products. RoHS compliance parts are available to order, please refer to the ordering information section for further details.

Ordering Information:

ATV10GC - (Connector)
 J28 = SC/PC
 J57 = LC

e.g. ATV10GC-J28 is an ATV10GC with an SC/PC connector.

Other options available on request.

Contact Information

North America Bookham Worldwide Headquarters

2584 Junction Ave.
 San Jose
 CA 95134
 USA

- Tel: +1 408 919 1500
- Fax: +1 408 919 6083

www.bookham.com
sales@bookham.com

Europe Paignton Office

Brixham Road
 Paignton
 Devon
 TQ4 7BE
 United Kingdom

- Tel: +44 (0) 1803 66 2000
- Fax: +44 (0) 1803 66 2801

Asia Shenzhen Office

2 Phoenix Road
 Futian Free Trade Zone
 Shenzhen 518038
 China

- Tel: +86 755 33305888
- Fax: +86 755 33305805
 +86 755 33305807

Important Notice

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by Bookham before they become applicable to any particular order or contract. In accordance with the Bookham policy of continuous improvement specifications may change without notice. The publication of information in this data sheet does not imply freedom from patent or other protective rights of Bookham or others. Further details are available from any Bookham sales representative.

