


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

## ATV10GC

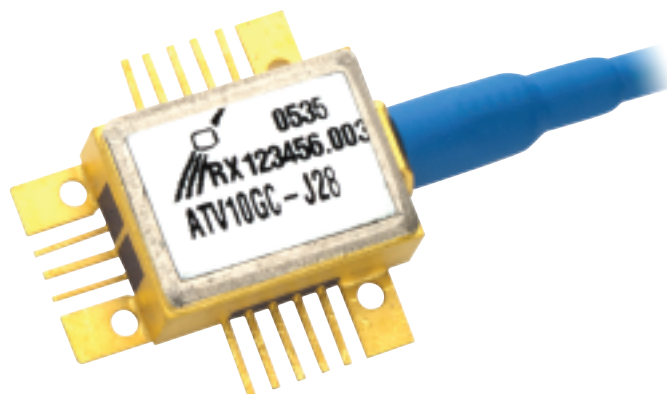
The ATV10GC receiver consists of an avalanche photodiode, a low-noise preamplifier, a MEMS variable optical attenuator (VOA), and a precision NTC thermistor in a hermetic coplanar package with a connectorized single-mode fiber pigtail. Differential outputs are provided to improve noise rejection for 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 <sup>31</sup> -1 PRBS BER<10 <sup>-12</sup> V <sub>APD</sub> =V <sub>M10</sub>		-26.5	-25.0	dBm
Sensitivity penalty EOL over temperature [1] [2]		2 <sup>31</sup> -1 PRBS BER<10 <sup>-12</sup> V <sub>APD</sub> =V <sub>M10</sub> T=-5 to +75°C		0.75	1.0	dB
Deviation from linear phase		DC - 6GHz	-10		+10	°
High frequency -3dB corner	f <sub>H</sub>	V <sub>APD</sub> =V <sub>M10</sub> Small signal	7	7.5		GHz
Low frequency -3dB corner	f <sub>L</sub>				40	kHz
Transimpedance gain [3] [4] [5]	T <sub>Z</sub>	Small signal	1.1	1.6	2.3	kΩ
Maximum output voltage <sub>6</sub>	V <sub>OUT</sub>	Peak-to-peak		600	700	mV
Return loss	S <sub>22</sub>	DC to 7.0GHz			-8	dB
Optical overload [2]	P <sub>SAT</sub>	0dB Attenuation V <sub>APD</sub> =V <sub>M3</sub> BER<10 <sup>-12</sup>	-3	-1		dBm
Optical overload extension		With VOA actuated	+13			dBm
APD breakdown voltage	V <sub>br</sub>	T=25°C I <sub>APD</sub> =10mA	25		40	V
APD breakdown voltage temperature coefficient	T <sub>Vbr</sub>		0.030	0.045	0.061	V/°C
Dark current	I <sub>d</sub>	At 90% of V <sub>br</sub>			100	nA
Amplifier bias current	I <sub>cc</sub>			75	95	mA
Input current for output limiting	I <sub>in lim</sub>	Peak-to-peak		0.5		mA
VOA maximum attenuation	Att		20	30		dB
VOA control voltage [7]	V <sub>Att</sub>	Attenuation = 20dB		5.5	9	V
VOA current	I <sub>Att</sub>	Attenuation = 20dB		6	7.2	mA
VOA power dissipation (continuous)	P <sub>Att</sub>	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 <sub>TH</sub>	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

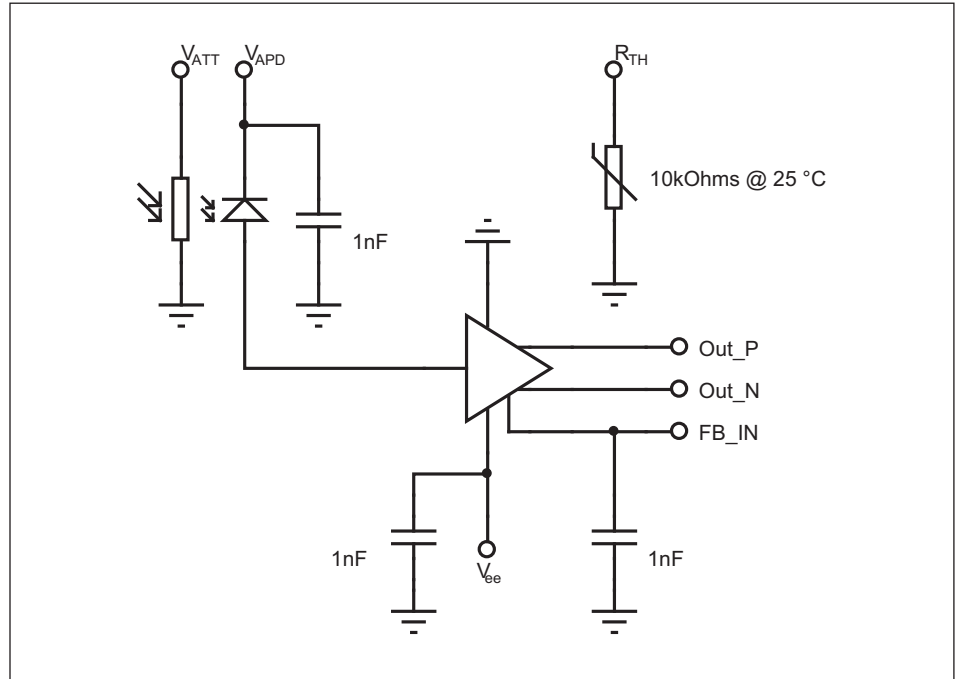


Figure [1] ATV10GC Circuit schematic.

### Outline Drawing

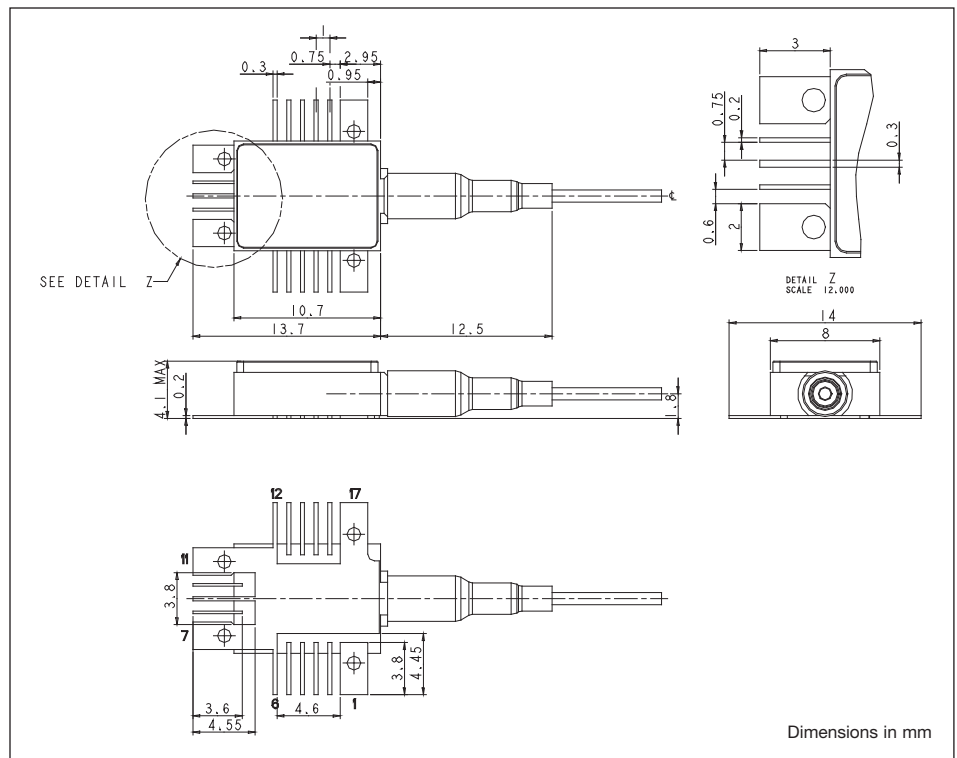


Figure [2] Outline diagram (Illustration only. For full details, refer to appropriate assembly drawing).  
**Note:** Fiber is 900mm secondary coated single-mode fiber, length = 1200 +/-200mm.

**Typical Performance Characteristics**

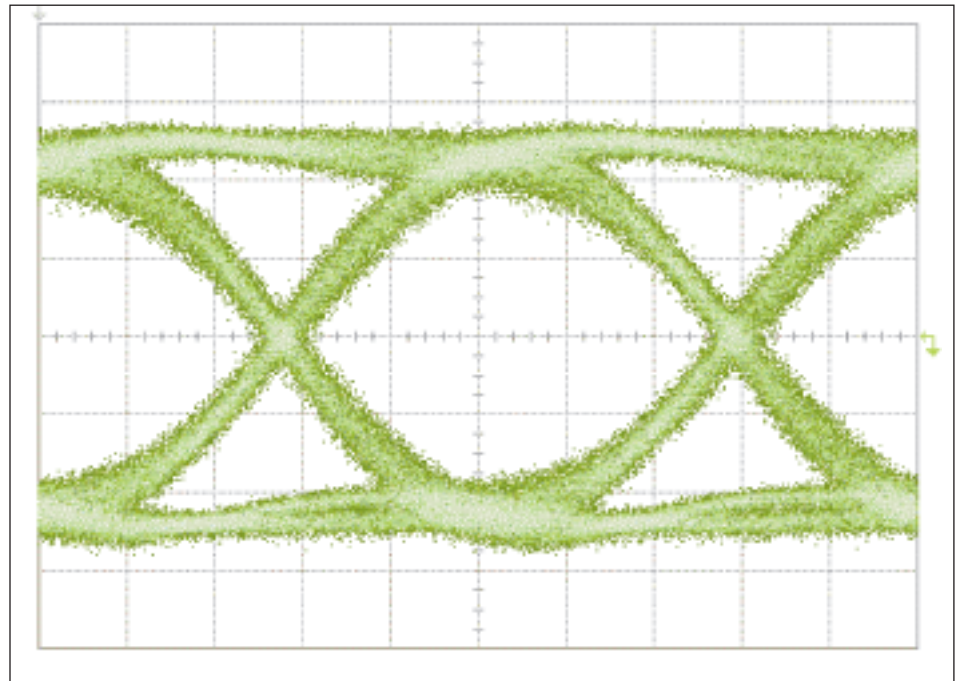


Figure [3] Electrical output data eye, M = 10, 10Gb/s  $2^{31}-1$  PRBS, -20dBm optical input.

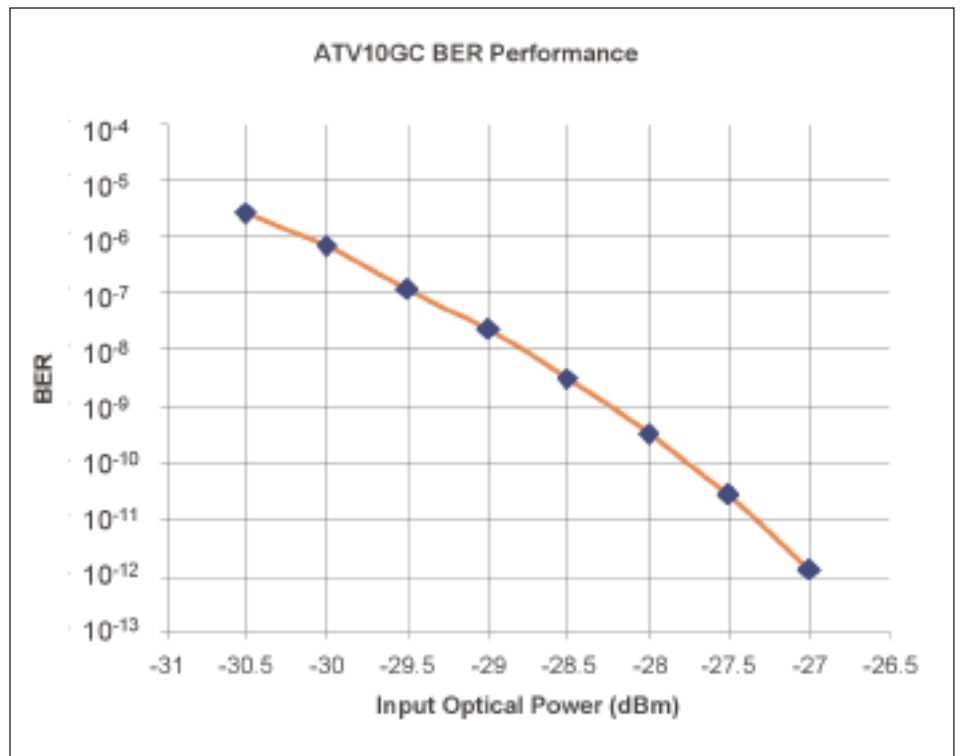


Figure [4] Typical BER performance, M = 10, 10Gb/s  $2^{31}-1$  PRBS, optical extinction ratio = 12dB.

Typical Performance Characteristics (continued)

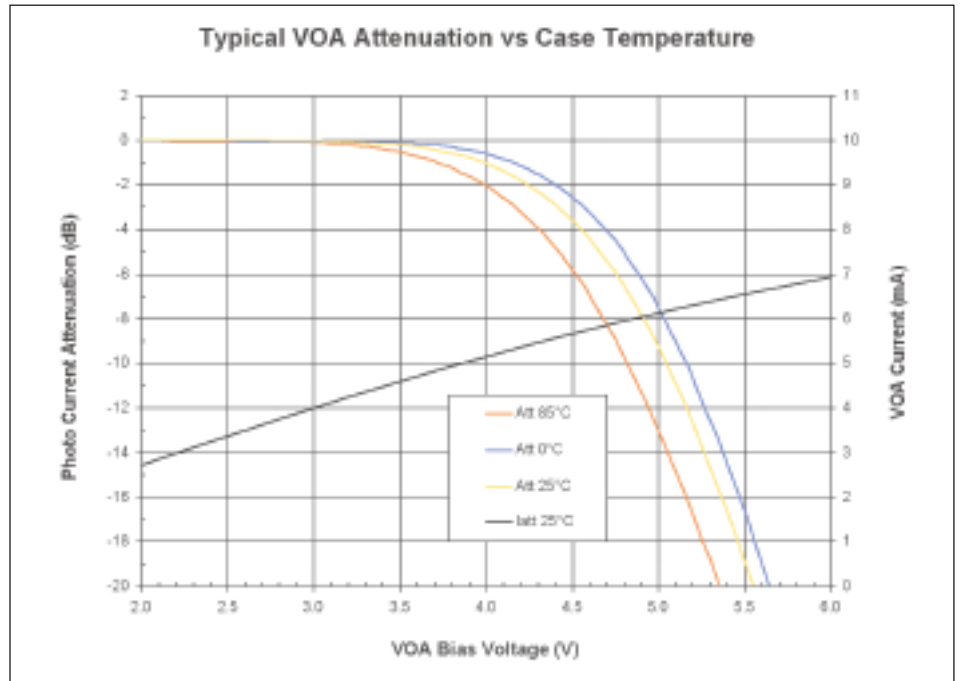


Figure [5] Typical VOA attenuation.

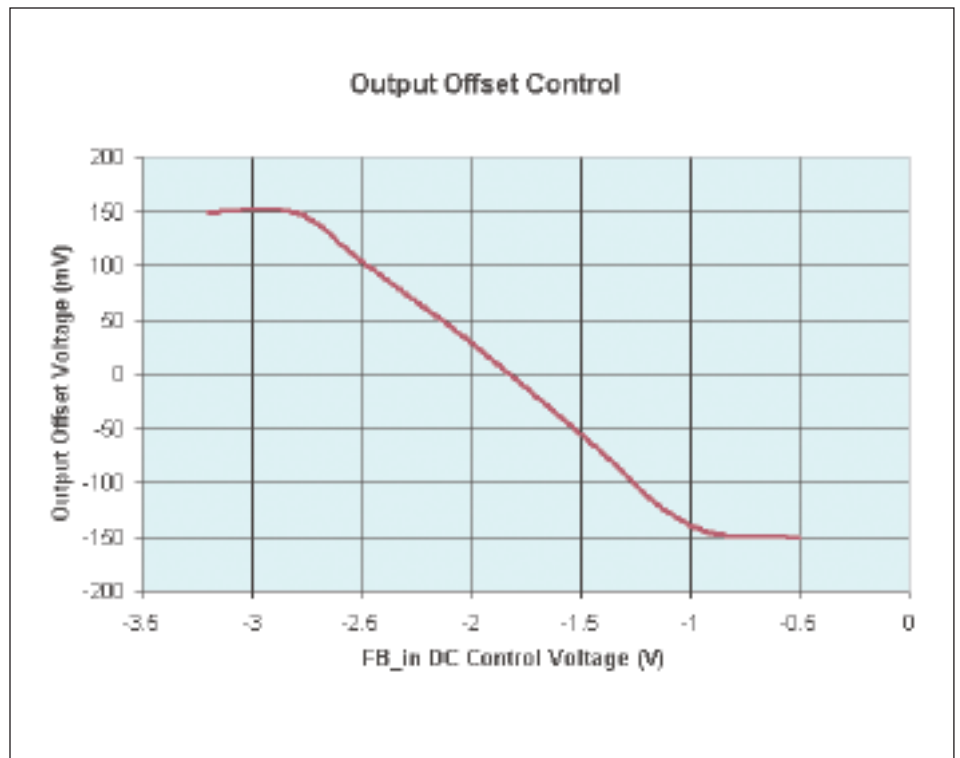


Figure [6] FB\_in transfer function.

## 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.

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