SIEMENS

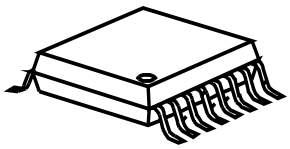
1.25 Gbit/s Transimpedance Amplifier

FOA1121A1
FOA1122A1

Preliminary Data

Bipolar IC

Features



P-TSSOP-16-1

- Data rate up to 1.25 Gbit/s
- Input sensitivity –27.0 dBm at BER = 10^{-9}
- High overload: 2 mA_{pp} maximum input current
- Single supply voltage: + 4.5 V to + 5.5 V
- Internal DC-compensation loop increases dynamic range
- No external components needed
- Internal bias generation for PIN-photodiode
- Internal low-pass filter to improve power supply rejection
- Operates with PIN- or APD-photodiode
- Monitor output for mirrored photodiode current

Applications

- Fibre optics data communication systems
- SONET OC-24, Gigabit-Ethernet
- Pre-amplifier modules

Type	Ordering Code	Package
FOA1121A1	Q67000-H4131	P-TSSOP-16-1
FOA1122A1	Q67000-H4132	bare die

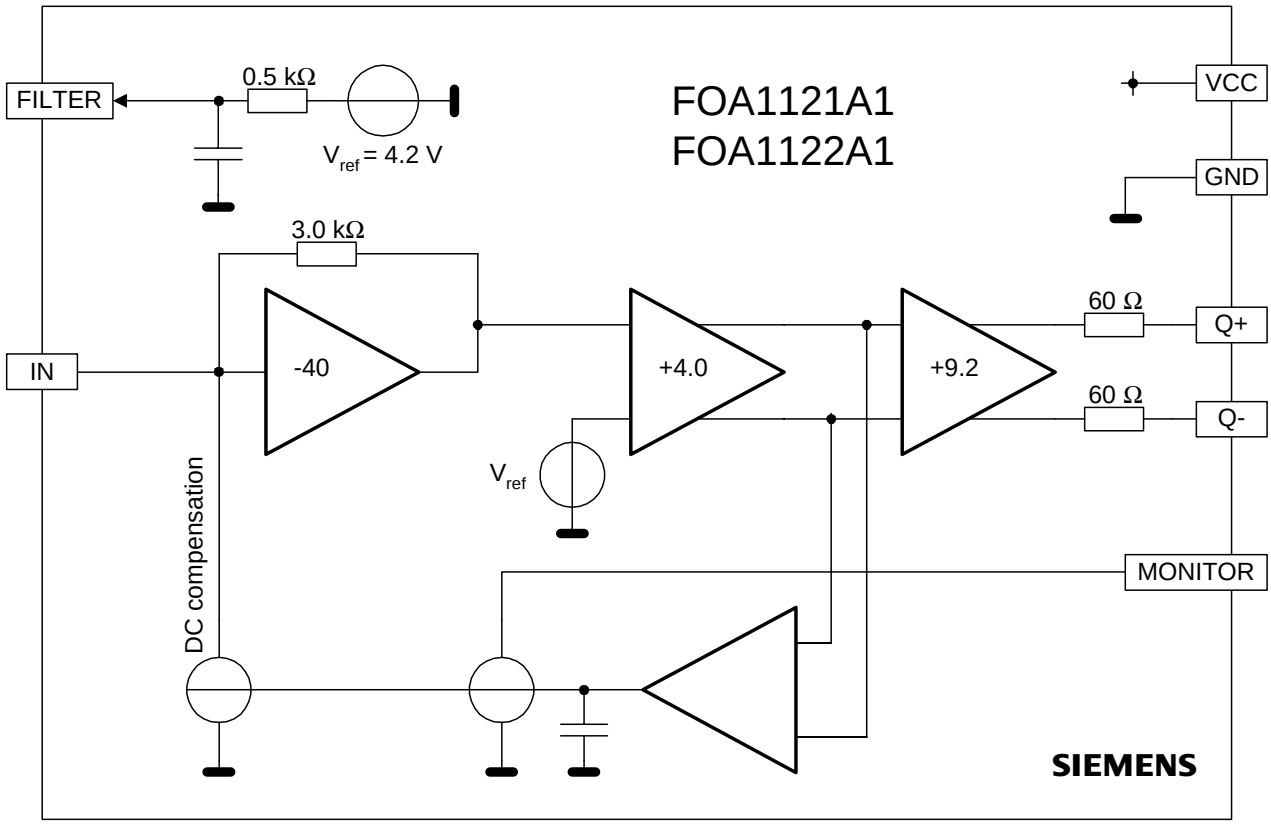


Figure 1 Block diagram.

Table 1 Pin Description

Symbol	Function
V_{CC}	Supply voltage
IN	Data input from PIN- or APD-photodiode
Q_+	Non-inverting data output
Q_-	Inverting data output
FILTER	Bias voltage for PIN-diode
MONITOR	Mirrored photodiode current (connect pin via 0 ... 2 kΩ to V_{CC})
GND	Ground

Electrical Characteristics

Absolute Maximum Ratings

Stresses listed below here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Ambient temperature T_{amb} = -40 °C ... +85 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_{CC}	-0.5	6.0	V	
Junction temperature	T_j	-40	125	°C	
Storage temperature	T_S	-40	150	°C	
Relative ambient humidity			85/85	%/°C	no condensation
ESD voltage	V_{ESD}	500		V	note 1) and 2)

Note: 1) Except IN-pin
2) HBM according to MIL STD 883D, method 3015.7 and ESD Assn. Standard S5.1-1993.

Recommended Operating Conditions

Ambient temperature T_{amb} = -40 °C ... +85 °C

Parameter	Symbol	Limit Values			Unit	Remarks
		min.	typ.	max.		
Supply voltage	V_{CC}	+4.5	+5.0	+5.5	V	
Data transmission rate			1.25		Gbit/s	
Supply current	I_{CC}		46		mA	
Thermal resistance	Θ_{JA}		140		K/W	see note 1)
Junction temperature	T_j	-10		+125	°C	see note 2)

Note: 1) Junction-to-ambient thermal resistance measurement conditions for packaged device: PCB area: 10 cm × 10 cm × 1.5 mm; copper area approx. 60 %; via holes to ground layer underneath the device; all pins soldered.
2) Do not exceed the maximum junction temperature. If used as packaged version, provide sufficient PCB heat sink to the device by soldering all pins and sufficient copper area underneath the chip (see note 1).

AC/DC Characteristics

Conditions: T_{amb} = +25 °C, V_{CC} = +5.0 V, $C_{external}$ = 0.85 pF

Parameter	Symbol	Limit Values			Unit	Remarks
		min.	typ.	max.		
Supply current	I_{VCC}		46	56	mA	
Input voltage	V_{IN}		+1.65		V	
Input current	I_{IN}			2000	μA_{pp}	*(Note 1)*
Input current before clipping	$I_{IN,CL}$		15		μA_{pp}	
Input resistance	R_{IN}		75		Ω	
Input sensitivity	P_{IN}		-27.0		dBm	BER < 10^{-9} *(Note 1)*
Optical overload	P_{OVL}		0		dBm	BER < 10^{-9} *(Note 1)*
Transimpedance	R_T		48		kΩ	differential into 2 × 50 Ω
Output voltage swing (Q_+ - Q_-)	ΔV_{OUT}	0.6	0.78	1.1	Vpp	
Bandwidth (–3 dB)	f_{3db}		800		MHz	
Output resistance	R_{out}	48	60	72	Ω	internally connected to V_{CC}
Output voltage	VCM_{OUT}		V_{CC} - 0.6		V	(Q_+ + Q_-)/2
Output pattern jitter *(Note 1)*	$t_{j,P}$		15 45		ps ps	3.2 μA_{pp} < I_{IN} < 160 μA_{pp} 160 μA_{pp} < I_{IN} < 1.6 mA_{pp}
Power supply rejection ratio	$PSSR$		35		dB	f < 10 MHz *(Note 2)*
Bias resistance	R_{BIAS}	400	500	600	Ω	
Bias voltage	V_{BIAS}		+4.2		V	
Low frequency cutoff	$f_{3db, low}$		65		kHz	AC-coupled outputs (via 22 nF)

Note: 1) Data rate: 1.25 Gbit/s; data sequence: PRBS 2^{23}-1
2) Generated noise on power supply: sine curve, 100 mV_{pp} (see application note b)

Package information

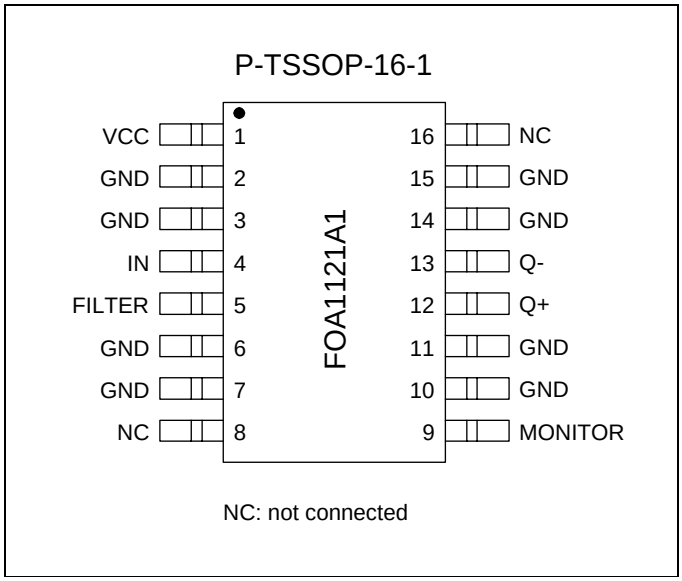


Figure 2 Package pinning.

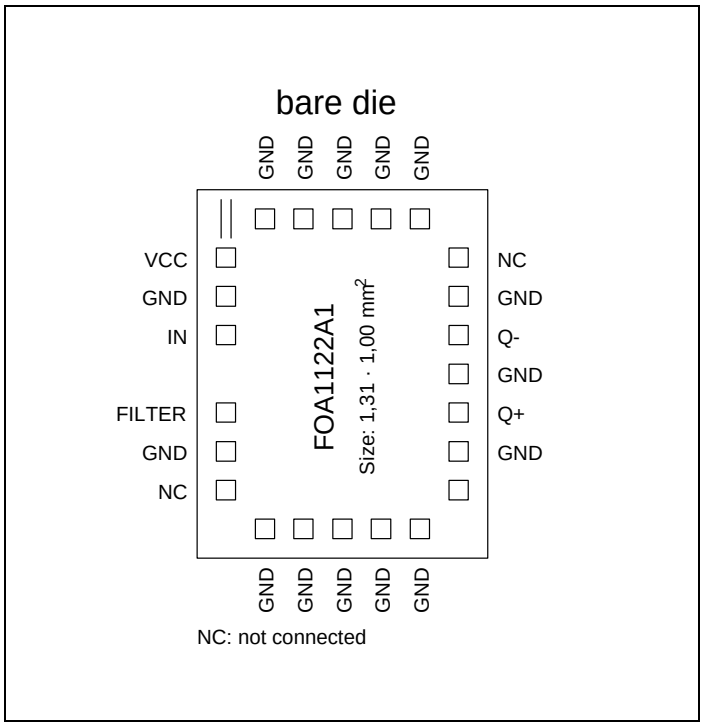


Figure 3 Pad assignment.

Eye-diagrams measured at data rates of 1.25 Gbit/s

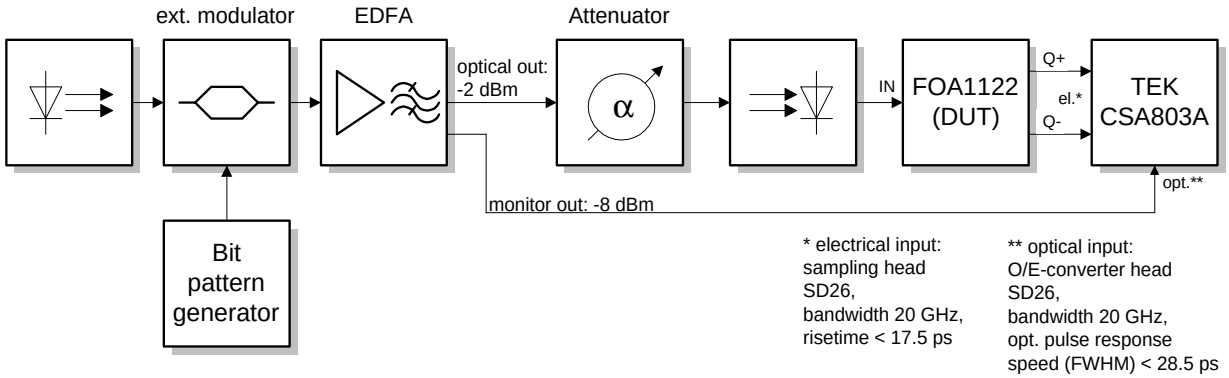


Figure 4 Measurement set-up.

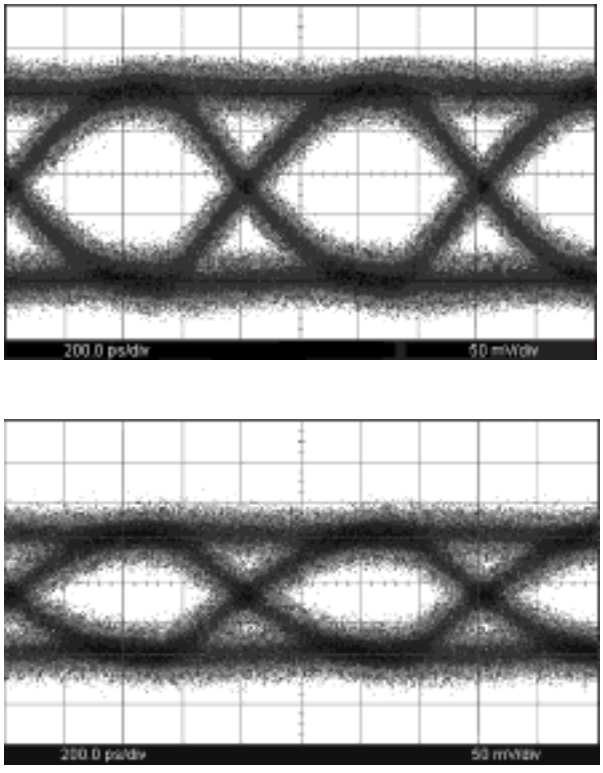


Figure 5 Eye diagrams at input power -25 dBm (top) and -27 dBm (bottom).

Bit error rate (BER) measurements

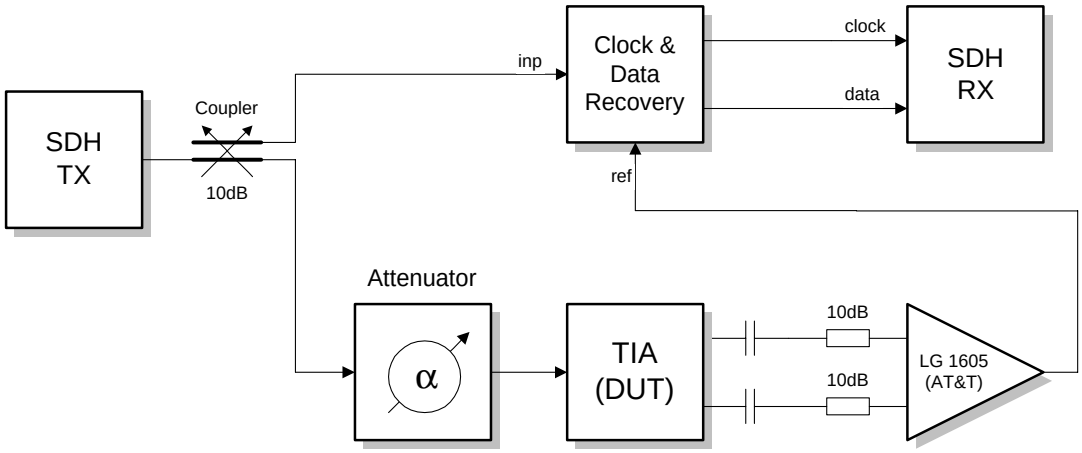


Figure 6 Measurement set-up.

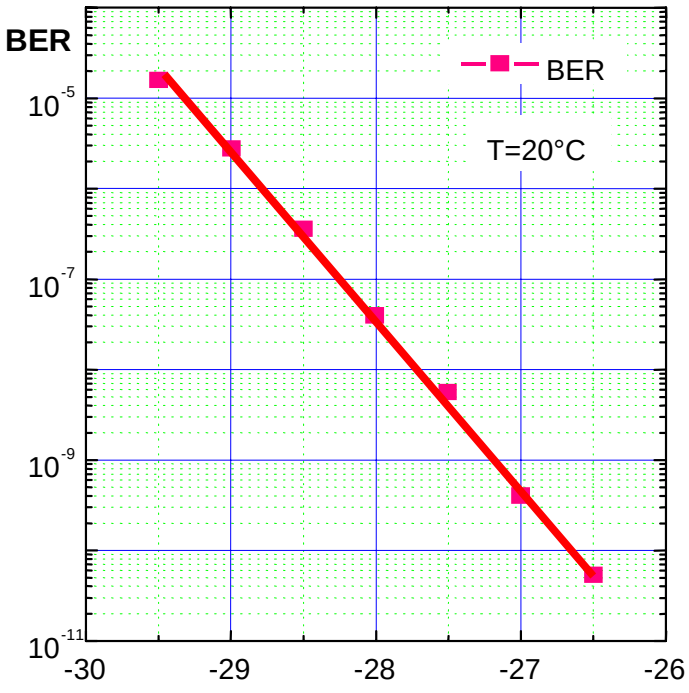


Figure 7 Measured bit error rate at 1.25 Gbit/s

Application notes

a) General information

- The output pins Q_+ and Q_- must be terminated equally to prevent instabilities.
- It is recommended to minimize stray capacitance when connecting photodiode to transimpedance amplifier.
- To improve power supply rejection ratio (PSRR), V_{CC} should be supplied via resistor (4.7 Ω), capacitor (100 nF) to GND, and inductor (BLM11A601, Murata) to V_{CC}-pin.
- The monitor pin (not used in these application notes) must be left open or connected to V_{CC} via resistor of 0 … 2 kΩ.

b)

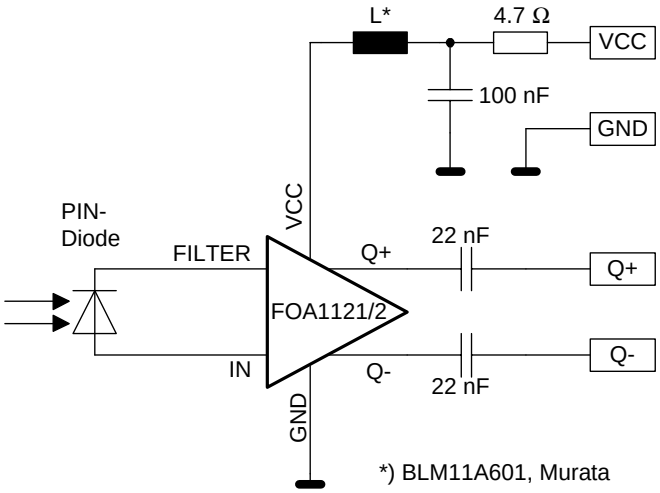


Figure 8 Application using PIN-photodiode.

c)

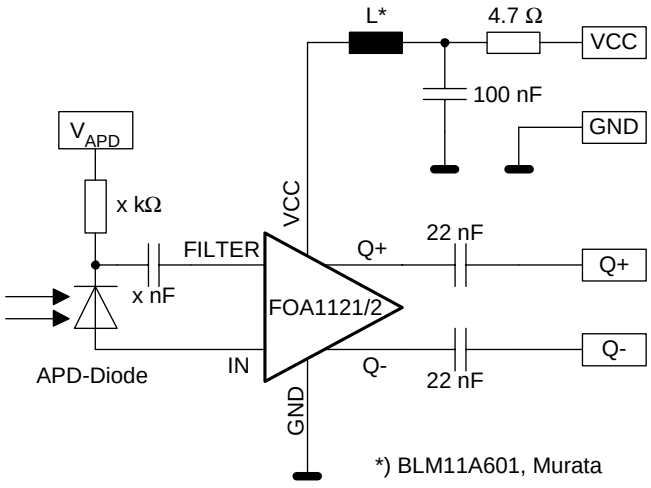
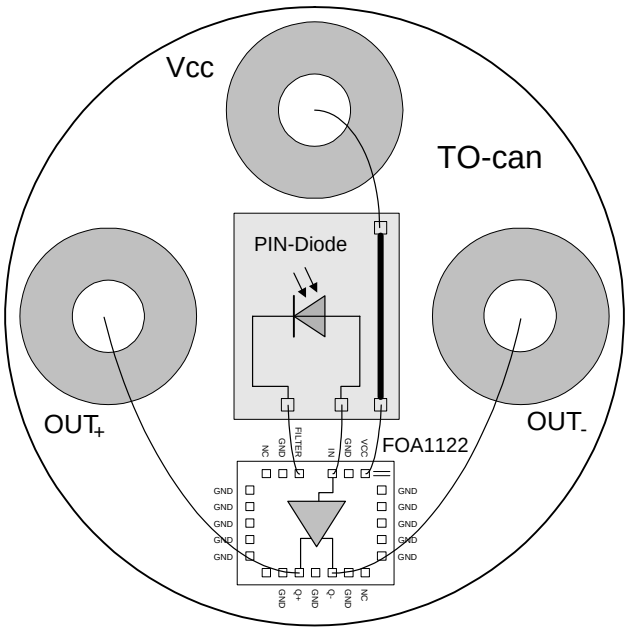


Figure 9 Application using APD-photodiode.

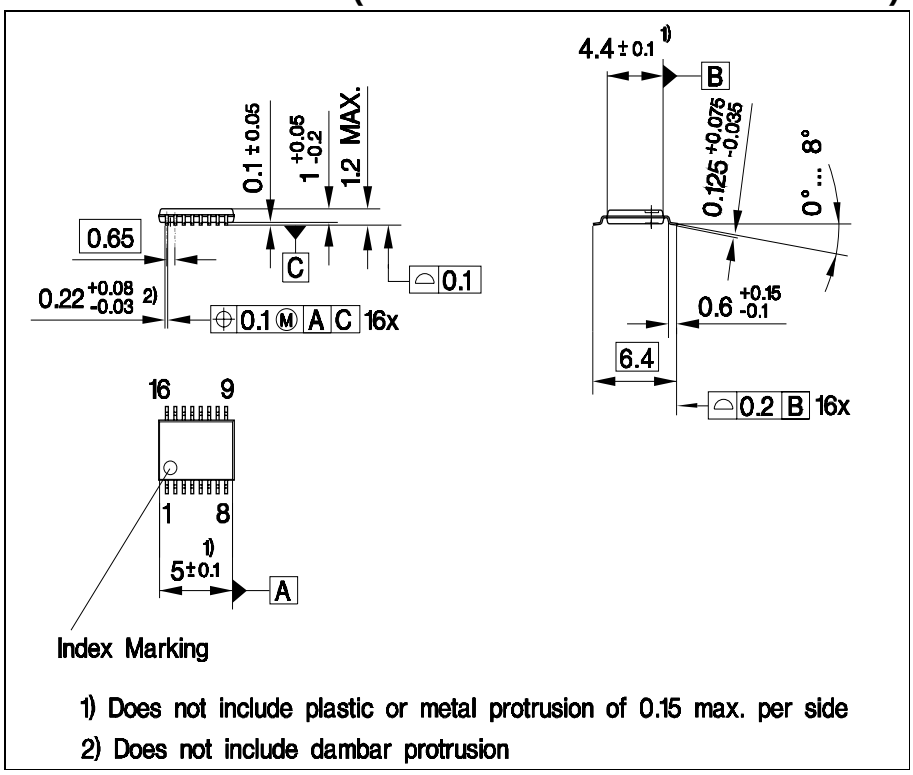
c)



Note:
no external components needed

Figure 10 Application example of FOA1122 mounted in TO-can.

Package outline of P-TSSOP-16-1 (Plastic Thin Shrink Small Outline)



Sorts of Packing

For more information on package outlines for tubes, trays, etc. see our Data Book “Package Information” (Ordering No. B192-H663-7400).

SMD = Surface Mounted Device

Dimensions in mm