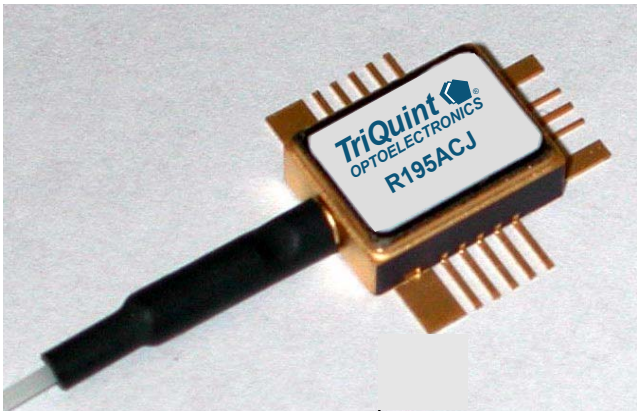
Preliminary Data Sheet, Rev. 2.0
October 2003

R195A 10 Gb/s Surface-Mount APD-TIA Receiver



Description

The R195A receiver integrates a 10 Gb/s APD and TIA into a true surface-mount package. It is part of the industry's first multisource agreement (MSA) to standardize surface-mount 10 Gb/s receivers. These compact receivers can be mounted directly to a printed-circuit board, thus avoiding the space, routing, and EMI problems of a mechanical cut-out.

The R195A provides features optimized for WDM applications, most notably, linearity and flat group delay.

Features

- High data-rate capability, up to 10.7 Gb/s
- –26 dBm typical sensitivity
- –2 dBm overload typical
- 2000 Ω typical differential gain
- Flat group delay
- Excellent linearity
- –5.2 volt single power supply
- Very small, surface-mount form factor

Applications

- WDM
- SONET transponders
- Very dense line cards

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Storage Case Temperature Range	T_{stg}	–40	85	°C
TIA Supply Voltage	V_{EE}	–5.75	0.5	V
Photodiode Bias Voltage	V_{PD}	GND	V_{BR}	V
Optical Input Power, with $V_{PD} = V_{BR}$[1], with External Current Limiting Circuit	P_{IN}	— —	0 6	dBm dBm
ESD-susceptibility, All Pins[2]	—	—	500	V

1. V_{BR} = breakdown voltage, defined at I_{DARK} = 10 μA.
2. Based on human-body model of R = 1500 Ω and C = 100 pF. In general, ESD precautions should be taken to avoid damage to the device.

Recommended Operating Conditions

Table 1. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Optical Wavelength	λ	1280	—	1610	nm
Operating Case Temperature Range	T_{OP}	0	25	70	°C
TIA Supply Voltage	V_{EE}	–5.5	–5.2	–4.95	V

Electrostatic Discharge

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

TriQuint employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 kΩ, capacitance = 100 pF) is widely used and can be used for comparison purposes.

Electrical/Optical Characteristics

Specified characteristics apply for the recommended operating conditions at beginning of life, unless noted otherwise. Temperatures are case temperature.

Table 2. Electrical/Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Sensitivity[1]	—	OC-192, PRBS 2^{31} – 1 NRZ, BER = 10^{-12}, 25 °C	—	–26.0	–25.0	dBm
Overload[1]	—	OC-192, PRBS 2^{31} – 1 NRZ, BER = 10^{-12}, 25 °C	–4	–2	—	dBm
Responsivity, λ = 1550 nm	R_{1550}	M = 1 25 °C 0 °C to 70 °C	 0.75 0.7	 0.8 0.75	—	A/W
Dark Current[2]	I_D	25 °C	—	—	250	nA
APD Voltage[3]	V_{OP}	25 °C	25	30	37	V
Breakdown Voltage	V_{BR}	I_D = 10 μA 25 °C	 26	 33	 38	V
Temperature Coefficient of V_{BR}	—	—	—	0.2	—	%/°C
Thermistor Resistance[4]	R_{TH}	25 °C	9.5	10.0	10.5	kΩ
Thermistor Temperature Coefficient	—	—	—	–4.3	—	%/°C
Transimpedance[5]	Z_T	Small Signal, Differential	1.6	2.0	2.4	kΩ
Small Signal Bandwidth[5]	S_{21}	M = 9	7.5	8.5	—	GHz
Low-frequency cutoff	—	P_{IN} = –20 dBm –3 dB relative to 1 MHz	—	25	40	KHz
Output Return Loss[5]	S_{22}	50 Ω on each output 0.2 GHz—8 GHz	—	—	–8	dB
Group Delay[5]	GD	M = 9 0.5 GHz—5 GHz 5 GHz—8 GHz	 — —	 — —	 ±25 ±40	 ps,p-p ps,p-p
TIA Supply Current	I_{EE}	0 °C—70 °C	—	130	155	mA
Output Voltage	V_{OUT}	Single-ended, 50 Ω load	—	700	1000	mVp-p
Optical Return Loss	RL	1300 nm—1610 nm; without connector	27	—	—	dB

1. PRBS 2^{31} – 1, 10^{-12} BER, external modulator T_X, BW > 10 GHz, λ = 1550 nm ± 10 nm, extinction ratio > 12 dB, NRZ (e.g., *Agilent* ® Model 83433).
2. Dark current is measured at V_{OP} = 0.9 V_{BR}.
3. Optimum APD bias voltage (V_{OP}) varies from device to device. The optimum value of V_{OP} will be provided with each device.
4. The resistance of the thermistor is inversely proportional to the temperature. The temperature, in degree-Kelvin (T_K), can be calculated from the resistance value using the Steinhart-Hart equation: $1/T_K = A + B \ln(R_{TH}) + C [\ln(R_{TH})]^3$, where R_{TH} is the resistance and A, B, and C are constants: A = 1.0267 x 10^{-3}; B = 2.565 x 10^{-4}; C = –4.5421 x 10^{-8}. The temperature in degree-Celsius is $T_C = T_K – 273.15$.
5. For 25 °C, nominal bias voltage and optical input = –20 dBm ± 0.2 dB.

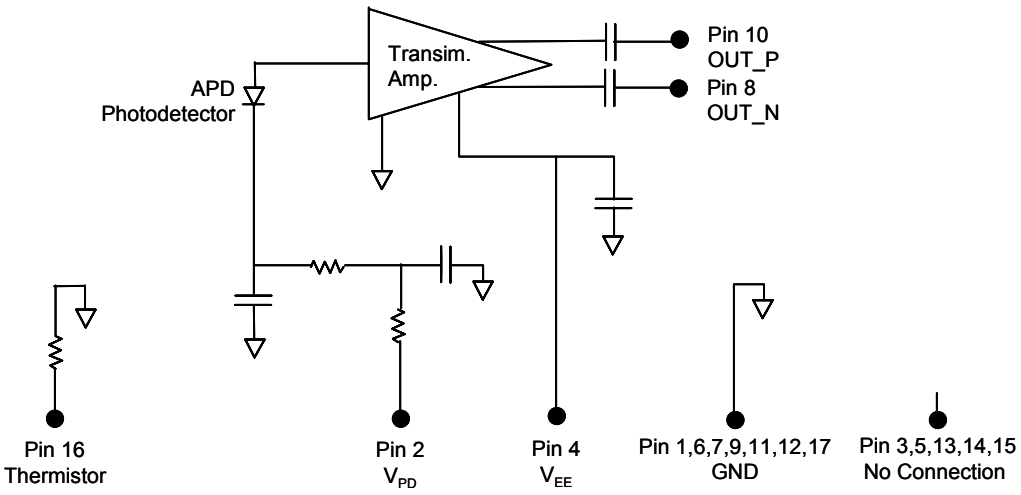
Note: Accuracy of optical powers in test condition column is ± 0.2 dB.

Pin Information

Table 3. Pin Information

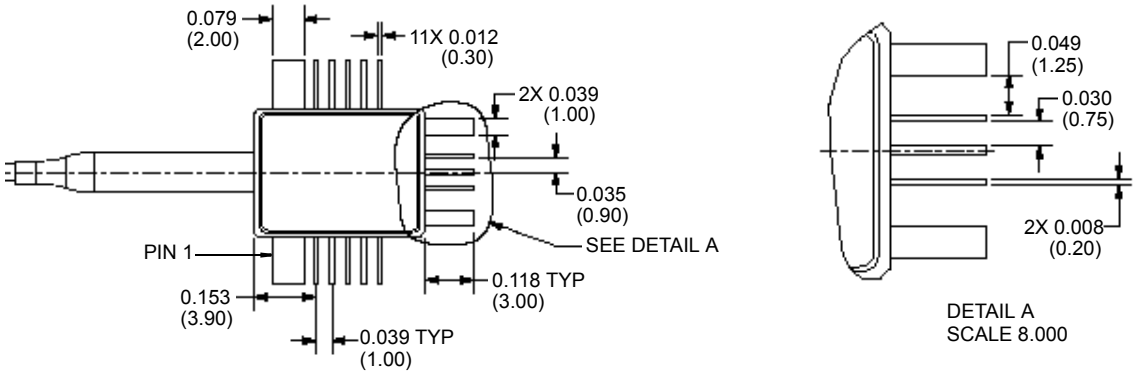
Pin	Symbol	Function
1	GND	Case Ground
2	V_{PD}	Photodiode Bias
3	NC	No Connection
4	V_{EE}	TIA Bias (–5.2V)
5	NC	No Connection
6	GND	Case Ground
7	GND	Case Ground
8	Out_N	$\overline{\text{Data}}$ Output
9	GND	Case Ground
10	Out_P	Data Output
11	GND	Case Ground
12	GND	Case Ground
13	NC	No Connection
14	NC	No Connection
15	NC	No Connection
16	R_{TH}	Thermistor
17	GND	Case Ground

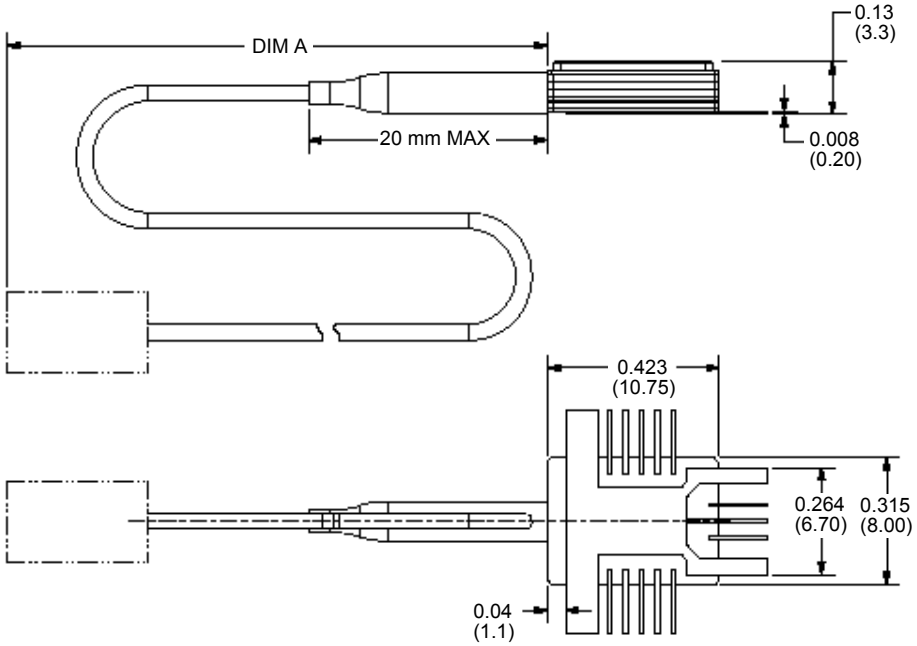
Block Diagram



Outline Diagram

Dimensions are in inches and (millimeters).





Ordering Information

Table 4. R195A-Type Receiver Ordering Information

Product Code	Detector Type	Connector type	Fiber type
R195ACA	APD	SC/PC	SMF
R195ACF	APD	FC/PC	SMF
R195ACS	APD	LC	SMF
R195ACJ	APD	MU	SMF
R195ACJJ	APD	MU-J	SMF

Additional Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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