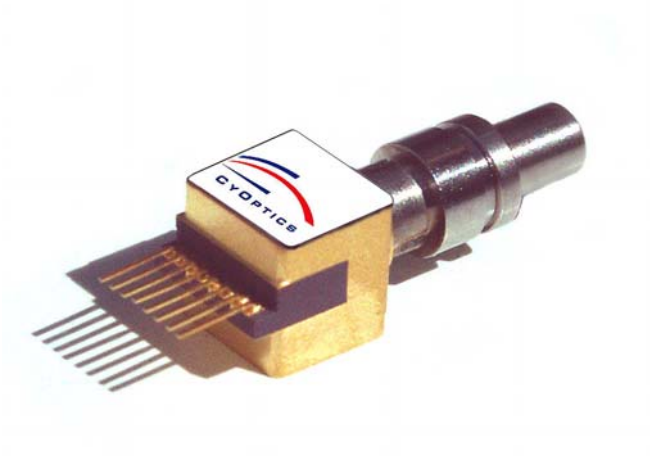
Data Sheet
November 2006

1640L1 (PIN) & 1641L1 (APD) 10 Gb/s Small Form-Factor ROSAs with Linear TIA



Features

- Up to 11.3 Gb/s data-rate capability
- –26.5 dBm typical sensitivity (APD version)
- –19 dBm typical sensitivitiy (PIN version)
- Flat group delay
- Excellent linearity for EDC applications
- +3.3V single power supply
- LC receptacle

Description

The 1640 and 1641 -Type 10 Gb/s receiver optical subassemblies (ROSAs) integrate a 10 Gb/s PIN (1640L1) or Avalanche Photodiode (1641L1) with a linear transimpedance amplifier (TIA) in a metal/ ceramic package. These receiver optical engines are designed for use in transceivers and transponders for high-speed data and telecommunications applications.

The "L1" variants are an extension of CyOptics' existing 10Gb/s ROSA family and include a linear TIA suitable for use in applications using Electronic Dispersion Compensation (EDC) that require low harmonic distortion.

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_{CC}	0	3.8	V
Photodiode Bias Voltage (APD versions) Photodiode Bias Voltage (PIN versions)	V_{PD} V_{PD}	GND 0	V_{BR} 20	V V
Photodiode Reverse Current (PIN or APD)	I_{PD}	0	2	mA
Optical Input Power with $V_{PD} = V_{BR}$[1] (APD versions)[3] Optical Input Power (PIN versions)	P_{IN}	— —	5 10	dBm dBm
Eye crossing control (Pin 2) Voltage	V_{CR}	2.5	3.5	V
Eye crossing control (Pin 2) Current	I_{CR}	-30	+30	μA
Soldering temperature (10s max. duration)	T_S		260	°C
ESD-susceptibility, All Pins[2]	—	—	200	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
3. Requires external current limiting circuit to meet the stated rating for reverse current

Recommended Operating Conditions

Table 1. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Optical Wavelength	λ	1270	—	1610	nm
Operating Case Temperature Range	T_{OP}	-5	—	75	°C
TIA Supply Voltage	V_{CC}	+3.14	+3.3	+3.47	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).

CyOptics 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 (1640L1: PIN Version with Linear TIA)

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

Table 1. Electrical/Optical Characteristics (1640L1 type PIN receiver)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Sensitivity (up to 10.7Gb/s)	SENS	PBRS 2^{31} – 1 NRZ, BER = 10^{-12}	—	-19	-17.5	dBm
Overload (up to 11.3Gb/s)	OL	PBRS 2^{31} – 1 NRZ, BER=10^{-12} Decision threshold optimized	+2	+4	—	dBm
Responsivity	R	λ = 1310 or 1550 nm	0.8	—	1.1	A/W
Dark Current	I_D	5V bias, 25°C	—	—	10	nA
PIN Operating Voltage	V_{OP}	25°C	5	—	12	V
Small Signal Bandwidth	S21	P_{IN} = -30dBm	7.5	8.5	—	GHz
Low-frequency Cutoff	—	-20dBm input, -3dB from 1.5GHz	—	—	50	kHz
Transimpedance [1]	ZT	Small signal, Single Ended with AGC Operating	—	7	—	kΩ
TIA Supply Current	ICC	0 °C—70 °C	—	65	80	mA
Saturated Output Voltage	Vout	Differential, 50 Ω load	—	—	1000	mVp-p
Optical Return Loss	RL	1300 nm—1610 nm;	27	—	—	dB
Group delay	GD	1-8GHz	—		±40	ps, p-p
Output return loss	S_{22}	0.2 - 8GHz	8	—	—	dB
Open circuit eye crossing control voltage[2]	Vcr	—	—	3	—	V

1. Transimpedance is reduced as average power is increased, in order to maintain low signal distortion (not limiting)
2. The eye crossing level will be nominally ~50% if Vcr (pin2) is left floating, when the voltage at pin2 will be approximately Vcc - 0.5V. Vcr can be used to adjust the eye crossing level during gain saturation, by sourcing or sinking a current at pin2, which has a typical input resistance of ~18kOhm. An input current range of +/-15uA provides a full range of eye crossing adjustment.

Electrical/Optical Characteristics (1641L1: APD Version with Linear TIA)

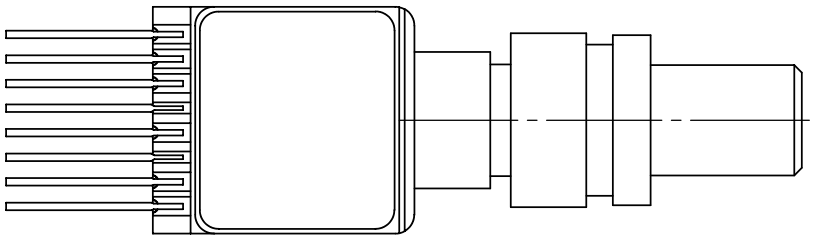
Specified characteristics apply for the recommended operating conditions at beginning of life, unless noted otherwise. Temperatures are case temperature.

Table 1. Electrical/Optical Characteristics (1641L1 type APD receiver)

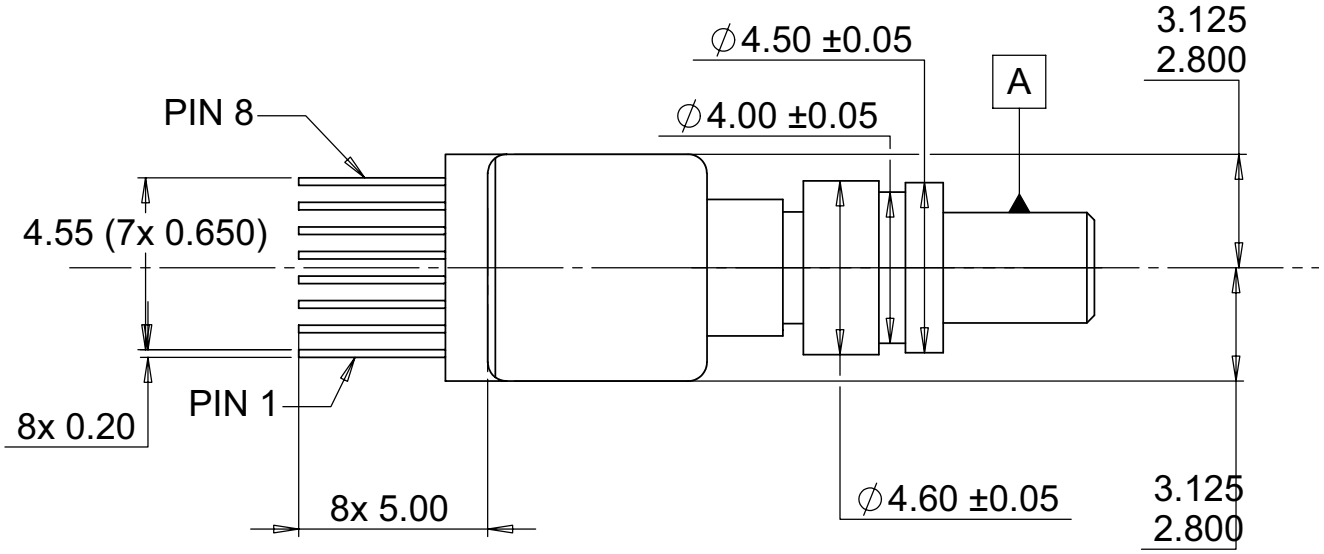
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Sensitivity	SENS	Up to 10.7Gb/s, PBRS 2^{31} – 1 NRZ, BER = 10^{-12}	—	-26.5	-25	dBm
Overload	OL	Up to 11.3Gb/s, PBRS 2^{31} – 1 NRZ, BER = 10^{-12} Decision threshold optimized	-4	0	—	dBm
Responsivity	R	M = 1, λ = 1310, 1550 nm	0.7	—	1.1	A/W
Dark Current	I_D	$0.9V_{BR}$, 25°C	—	—	250	nA
APD Operating Voltage	V_{OP}	25°C	25	—	37	V
APD Breakdown Voltage[1]	V_{BR}	I_D = 10 μA, -20dBm input, 25°C	26	33	38	V
Temperature Coefficient of V_{BR}	—	—	—	0.07	—	V/°C
Small Signal Bandwidth	S_{21}	M = 9, P_{IN} = -30dBm	7	8	—	GHz
Low-frequency Cutoff	—	-20dBm input, -3dB from 1.5GHz	—	—	50	kHz
Transimpedance [2]	Z_T	Small signal, Single Ended with AGC Operating	—	7	—	kΩ
TIA Supply Current	I_{CC}	0 °C—70 °C	—	65	80	mA
Saturated Output Voltage	Vout	Differential, 50 Ω load	—	—	1000	mVp-p
Optical Return Loss	RL	1300 nm—1610 nm;	27	—	—	dB
Group delay	GD	1-8GHz	—		±40	ps, p-p
Output return loss	S_{22}	0.2-8GHz	8	—	—	dB
Eye crossing control voltage[3]	Vcr	—	—	3	—	V

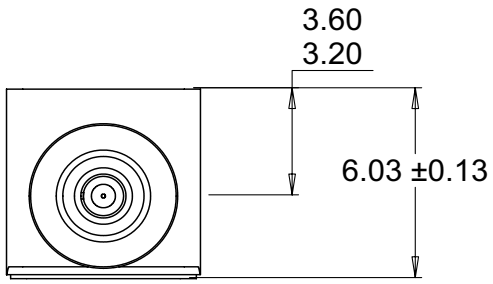
1. Optimum APD bias voltage (V_{OP}) varies from device to device. The optimum value of V_{OP} will be provided with each device
2. Transimpedance is reduced as average power is increased, in order to maintain low signal distortion (not limiting)
3. The eye crossing level will be nominally ~50% if Vcr (pin2) is left floating, when the voltage at pin2 will be approximately Vcc - 0.5V. Vcr can be used to adjust the eye crossing level during gain saturation, by sourcing or sinking a current at pin2, which has a typical input resistance of ~18kOhm. An input current range of +/-15uA provides a full range of eye crossing adjustment.

Outline Diagram (Dimensions are in millimeters)**.**

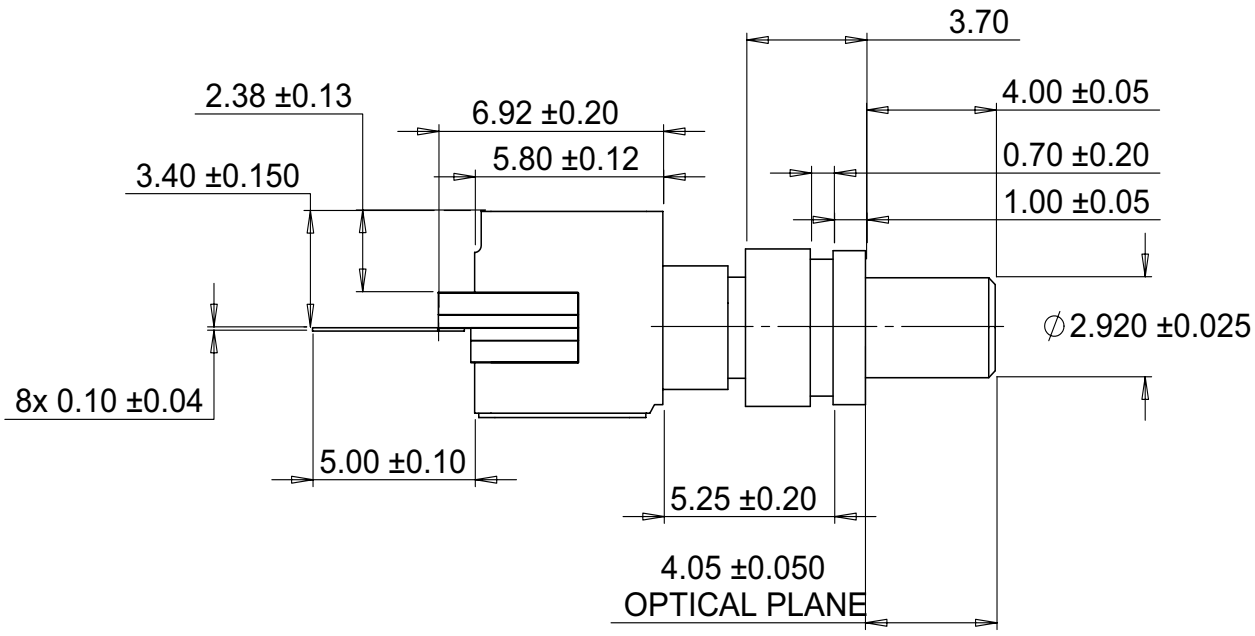


BOTTOM VIEW





Outline Diagram (continued)



Pin Information

Table 2. Pin Information

Pad	Symbol	Function
1	V_{PD}	Photodiode supply voltage
2	V_{CR}	Eye crossing/ threshold adjust voltage
3	GND	Ground
4	DOUTB	Data out bar
5	GND	Ground
6	DOUT	Data out
7	GND	Ground
8	Vcc	Power supply voltage

Ordering Information

Code	Description
1640L1	10Gb/s LC receptacle PIN ROSA with Linear TIA
1641L1	10Gb/s LC receptacle APD ROSA with Linear TIA

For additional information, contact your CyOptics Account Manager or the following:
INTERNET: http://www.cyoptics.com
Telephone: 484-397-3800
Fax: 484-397-3592
Email: mailto:sales@cyoptics.com
Info Email: mailto:sales@cyoptics.com