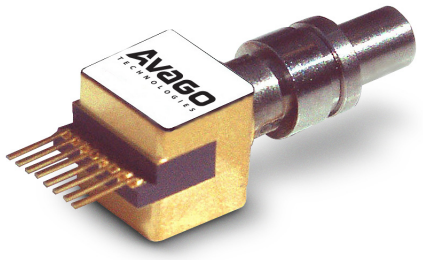
1640 (PIN) and 1641 (APD)

10 Gb/s Small Form-Factor Detector + TIA
Receiver Optical Sub-Assemblies (ROSAs)

Product Brief



Description

The 1640 and 1641 -Type 10 Gb/s receiver optical subassembly (ROSA) integrates a 10 Gb/s APD or PIN photodetector and a 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.

Applications

- XFP, X2, and Xenpak Transceivers
- 300-pin transponders, LFF and SFF

Features

- Up to 11.3 Gb/s data-rate capability
- –28 dBm typical sensitivity (APD version)
- –20.5 dBm typical sensitivity (PIN version)
- 12 kΩ typical differential transimpedance gain
- Flat group delay
- 3.3V single power supply
- LC receptacle
- Wide operating temperature range: -5 to +85°C

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)	V_{PD}	GND	V_{BR}	V
Photodiode Bias Voltage (PIN)	V_{PD}	0	20	V
Photodiode Reverse Current (PIN or APD)	I_{PD}	—	2	mA
Optical Input Power with $V_{PD} = V_{BR}$[1,3] (APD versions) Optical Input Power (PIN versions)	P_{IN} 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	mA
Soldering temperature (10s max duration)	T_S		260	C
ESD-susceptibility, All Pins[2]	—	—	200	V

Notes:
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

Parameter	Symbol	Min	Typ	Max	Unit
Optical Wavelength	λ	1270	—	1610	nm
Operating Case Temperature Range	T_{OP}	-5	—	85	°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).

Avago Technologies 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 = 100pF) is widely used and can be used for comparison purposes.

Electrical/Optical Characteristics (1640: PIN Version)

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Sensitivity (up to 10.7Gb/s)	SENS	PBRS 231– 1 NRZ, ER=8.2dB BER = 10^{-12}	—	-20.5	-18.5	dBm
Stressed Rx sensitivity	SRS	Per IEEE 10G Ethernet Specifications 10-BASE-ER, 10BASE-EW	—	—	-12	dBm, OMA
Overload	OL	Up to 11.3Gb/s, PBRS 231 – 1 NRZ, ER=8.2dB, BER = 10^{-12}	+2	+4	—	dBm
Responsivity λ = 1310 or 1550 nm	R	—	0.8	—	1.1	A/W
Dark Current	I_D	V_{PD} = 5V, T=25°C	—	—	10	nA
PIN operating voltage	V_{PD}	—	5	—	12	V
Small Signal Bandwidth	S_{21}	—	7.5	8.5	—	GHz
Low-frequency Cutoff	—	—	—	—	50	kHz
Transimpedance (Differential)	Z_T	—	10	12	—	kΩ
TIA Supply Current	I_{CC}	—	—	34	46	mA
Saturated Output Voltage	Vout	Differential, 50 Ω load	—	—	650	mVp-p
Optical Return Loss	RL	1300 nm—1610 nm;	27	—	—	dB
Group delay deviation	GD	1-8GHz			*40	ps
Output return loss	S_{22}	200MHz-5.5GHz 5.5-8.0GHz	8 4	— —	— —	dB dB
Open circuit eye crossing control voltage [1]	Vcr	—	—	3	—	V

Notes:

1. 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 (1641: APD Version)

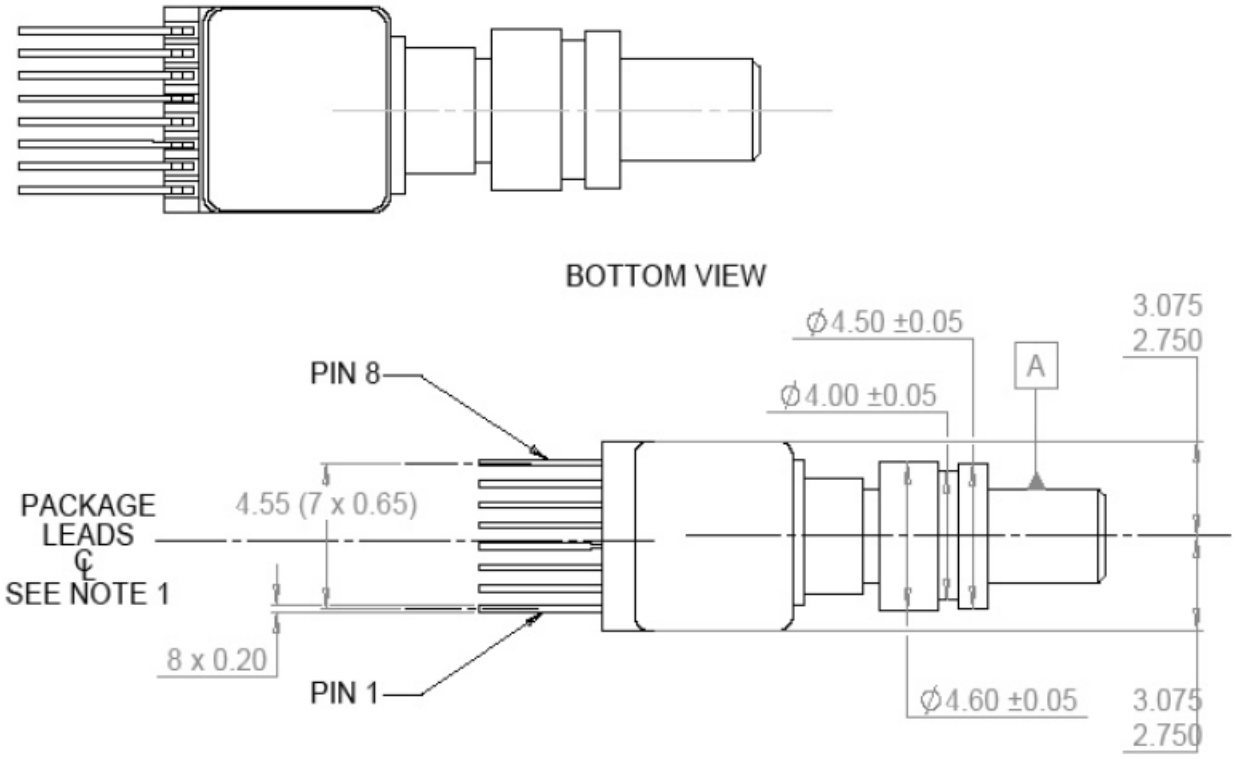
Specified characteristics apply for the recommended operating conditions at beginning of life, unless noted otherwise. Temperatures are case temperature.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Sensitivity	SENS	Up to 10.7Gb/s, PBRS $2^{31} - 1$ NRZ, ER=8.2dB BER = 10^{-12}	—	-28	-26	dBm
Overload	OL	Up to 11.3Gb/s, PBRS $2^{31} - 1$ NRZ, ER=8.2dB BER = 10^{-12}	-4	0	—	dBm
Responsivity λ = 1310 or 1550 nm	R	M = 1	0.7	—	1.1	A/W
APD Operating Voltage [1]	V_{OP}		25	—	37	V
APD Breakdown Voltage	V_{BR}	I_D = 10 μA	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	—	—	—	—	50	kHz
Transimpedance (Differential)	Z_T	—	10	12	—	kΩ
TIA Supply Current	I_{CC}	—	—	34	46	mA
Saturated Output Voltage	Vout	Differential, 50Ω load	—	—	650	mVp-p
Optical Return Loss	RL	1300 nm—1610 nm;	27	—	—	dB
Group delay deviation	GD	1-8GHz			*40	ps
Output return loss	S_{22}	200MHz - 5.5GHz 5.5 - 8.0GHz	8 4	— —	— —	dB dB
Open circuit eye crossing control voltage [2]	Vcr	—	—	3	—	V

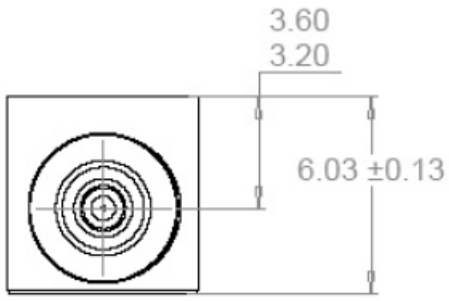
Notes:

1. Optimum APD bias voltage (VOP) varies from device to device. The optimum value of VOP will be provided with each device.
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.

Outline Diagram

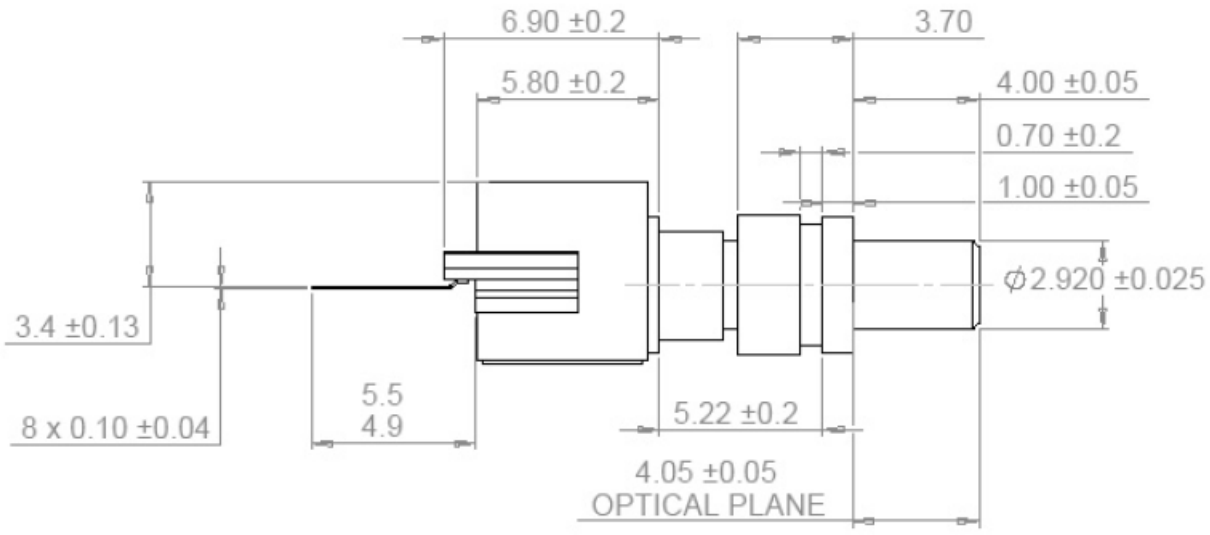


NOTE 1: THE LATERAL DEVIATION ALLOWED BETWEEN THE PACKAGE LEADS ℄ (AXIS OF SYMMETRY) AND THE OPTICAL ℄ OF THE PACKAGE IS ±0.200MM MAX.



(Dimensions are in millimeters).

Outline Diagram (continued)



(Dimensions are in millimeters).

Pin Information

Pad	Symbol	Function
1	VPD	Photodiode supply voltage
2	VCR	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
1640L0	10Gb/s PIN ROSA with LC connector
1641L0	10Gb/s APD ROSA with LC connector

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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