

## Advance Product Information VSC7809

Photodetector/Transimpedance Amplifier  
Family for Optical Communication

### Features

- Integrated Photodetector/Transimpedance Amplifier Optimized for High-Speed Optical Communications Applications
- Fibre Channel/Gigabit Ethernet Compatible
- High Bandwidth
- Low Input Noise Equivalent Power
- Large Optically Active Area
- Single 3.3V Power Supply

Part Number	Data Rate	Bandwidth (MHz)	Input Noise ( $\mu\text{W rms}$ )	Optically Active Area ( $\mu\text{m diameter}$ )
VSC7809	1.25Gb/s	800	1.4	100

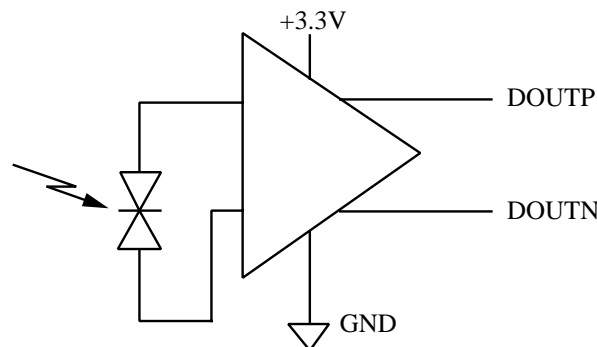
### General Description

The VSC7809 integrated Photodetector/Transimpedance Amplifier provides a highly integrated solution for converting light from a fiber optic communications channel into a differential output voltage. The benefits of Vitesse Semiconductor's Gallium Arsenide H-GaAs process are fully utilized to provide very high bandwidth and low noise in a product with a large optically active area for easy alignment. The sensitivity, duty cycle distortion and jitter meet or exceed all Fibre Channel and Gigabit Ethernet application requirements. Parts are available in either die form, flat-windowed packages or in ball-lens packages.

By using a metal-semiconductor-metal (MSM) photodetector with a monolithic integrated transimpedance amplifier, the input capacitance is lowered which allows for a larger optically active area than in discrete photodetectors. Integration also allows superior tracking over process, temperature and voltage between the photodetector and the amplifier, resulting in higher performance. This part can easily be used in developing Fibre Channel Electro-Optic Receivers which exhibit very high performance and ease of use.

### VSC7809 Block Diagram

Photodetector/Transimpedance Amplifier



Both DOUTP and DOUTN are back-terminated to 25 $\Omega$ .

**Table 1: Electro-Optical Specifications<sup>(1)</sup>**

<i>Symbol</i>	<i>Parameter</i>	<i>Min</i>	<i>Typ<sup>(2)</sup></i>	<i>Max</i>	<i>Units</i>	<i>Conditions</i>
V <sub>SS</sub>	Supply Voltage	3.0	3.3	3.6	V	
I <sub>DD</sub>	Supply Current	14	23	40	mA	
PSRR	Power Supply Rejection Ratio	-	-10	-	dB	Frequencies up to 40MHz Use external filter to get PSRR of -35dB <sup>(3)</sup> .
λ	Wavelength	700	840	850	nm	
f <sub>C</sub>	Low Frequency Cutoff	-	1.8	2.5	MHz	-3db, P <sup>(4)</sup> = -15dBm @ 50MHz
BW	Optical Modulation Bandwidth	800	1100	-	MHz	-3db, P = -15dBm @ 50MHz
S	Sensitivity	-20	-21		dBm	1.25Gb/s, BER10 <sup>-12(5)</sup>
R <sub>O</sub>	Single Ended Output Impedance	20	25	30	Ω	
V <sub>O</sub>	Differential Output Voltage	0.2	0.26	0.4	V	P = -5dBm, R <sub>LOAD</sub> = 100Ω differential
R <sub>D</sub>	Differential Responsivity	0.8	1.2	-	mV/μW	R <sub>LOAD</sub> = 100Ω P = -15dBm @ 50MHz
V <sub>DC</sub>	Output Bias Voltage	1.0	-	-	V	
ΔV <sub>DC</sub>	Bias Offset Voltage	-	-	200	mV	
NEP <sub>O</sub>	Input Noise Equivalent Power	-	1	1.4	μW rms	P = 0mW
V <sub>NO</sub>	Output Noise Voltage	-	1.0	1.25	mV rms	P = 0mW
DCD	Duty Cycle Distortion	-	-	4.5	%	P = -5dBm
I <sub>OUT</sub>	Output Drive Current	2.0	2.6	-	mA	P = -5dBm
PDJ	Pattern Dependent Jitter	-	35	60	ps	P = -5dBm +/-10% Voltage Window
----	Optically Active Area	-	100	-	μm	Diameter
PPJ	PP Jitter	-	190	250	ps	P = -5 dBm
t <sub>R</sub>	Rise Time	-	-	400	ps	20%-80% P = -5dBm
t <sub>F</sub>	Fall Time	-	-	400	ps	20%-80% P = -5dBm

- Notes: (1) Specified over 0°C (ambient) to 70°C (case).  
 (2) Typical conditions 25°C and 3.3V power supply.  
 (3) See Note 1 in Application Note 48.  
 (4) P = Incident Optical Power  
 (5) See Note 2 In Application Note 48.

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**Table 2: Absolute Maximum Ratings**

<i>Symbol</i>	<i>Parameter</i>	<i>Limits</i>
V <sub>SS</sub>	Power Supply	6V Required
T <sub>STG</sub>	Storage Temperature	-55°C to 125°C (case temperature under bias)
H <sub>STG</sub>	Storage Humidity	5 to 95% R.H. (including condensation)
H <sub>OP</sub>	Operating Humidity	8 to 80% R.H. (excluding condensation)
P <sub>INC</sub>	Incident Optical Power	+3dBm
IS	Impact Shock	500 G. Half Sine Wave Pulse Duration 1 +/-0.5 ms 3 blows in each direction
V <sub>IB</sub>	Vibration	20 > 2000 > 20Hz, 10 Minutes 10 G. Peak Acceleration 4 Complete Cycles, 3 Perpendicular Axes

**Table 3: Recommended Operating Conditions**

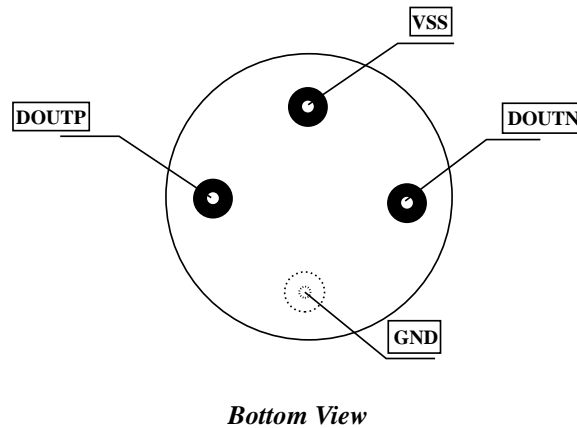
<i>Symbol</i>	<i>Parameter</i>	<i>Limits</i>
V <sub>SS</sub>	Power Supply	3.0VP-3.6V (3.3V nominal)
T <sub>OP</sub>	Operating Temperature	0°C (ambient) to 70°C (case)
P <sub>MAX</sub>	Maximum Optical Power	0dBm

**Table 4: Pin Table Specifications for Ball Lens Packages, Flat Window Packages and Bare Die**

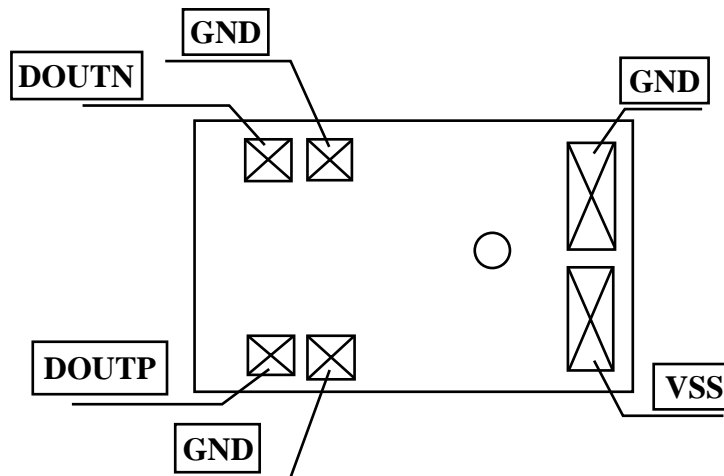
<i>Symbol</i>	<i>Description</i>
DOUTP	Data output normal (with reference to incident light)
DOUTN	Data output complement (inverting) (with reference to incident light)
VSS	Power supply
GND	Ground (package case)

NOTE: Pin Diagram is identical for both TO-46 and TO-56 package styles.

**Figure 1: Pin Diagram**



**Figure 2: Schematic View of Bare Die Pad Assignments**

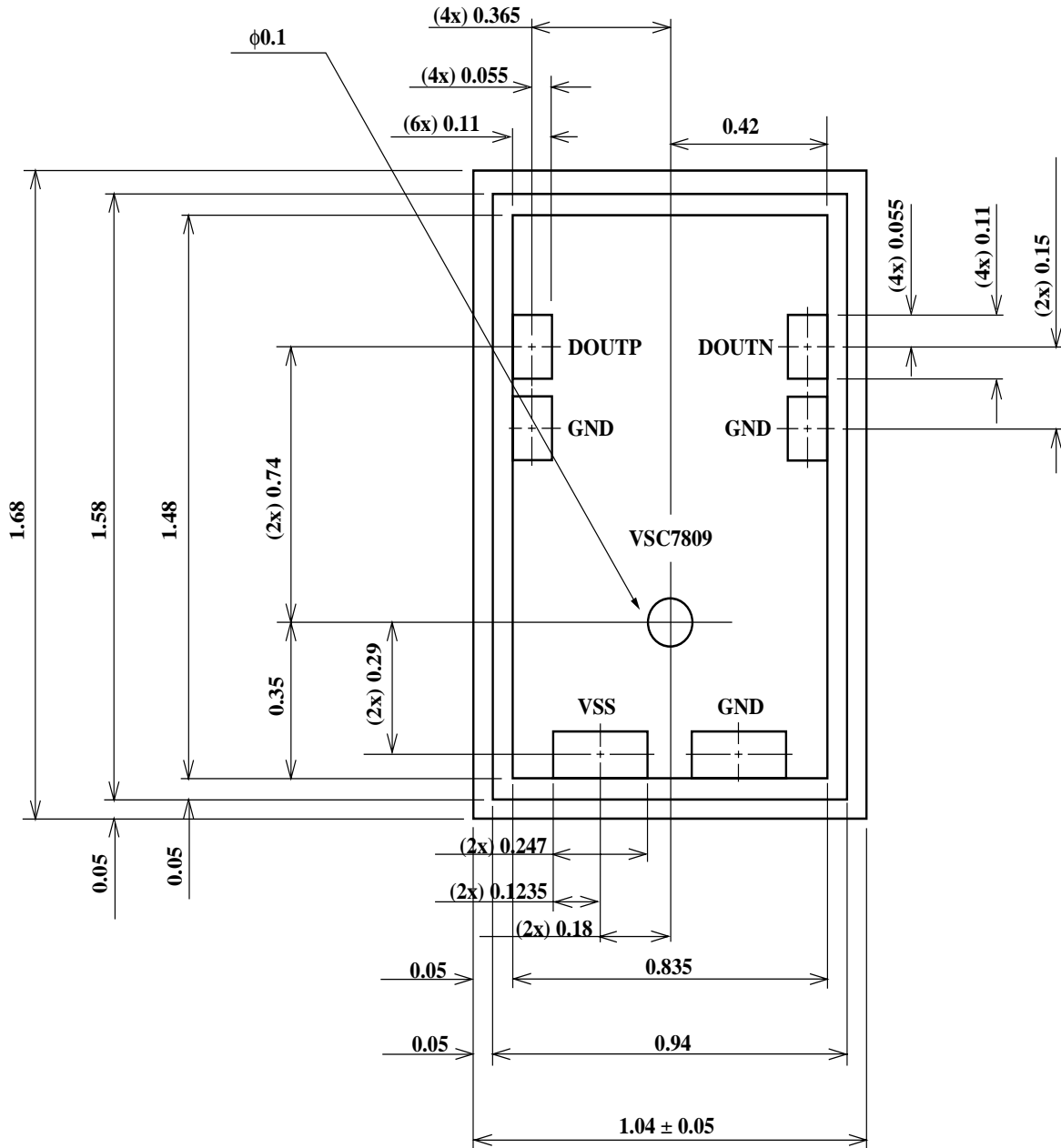


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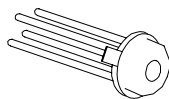
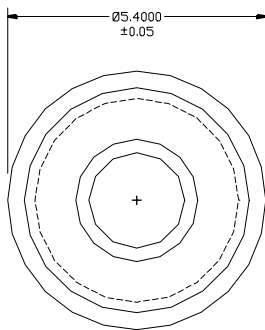
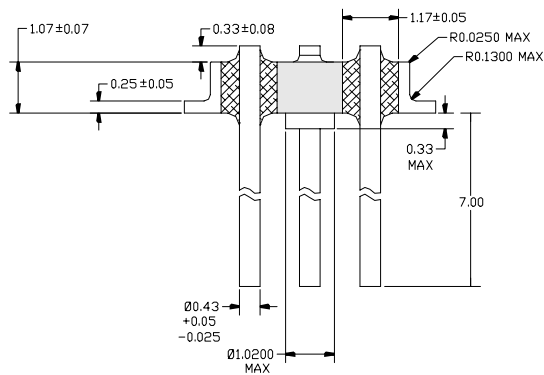
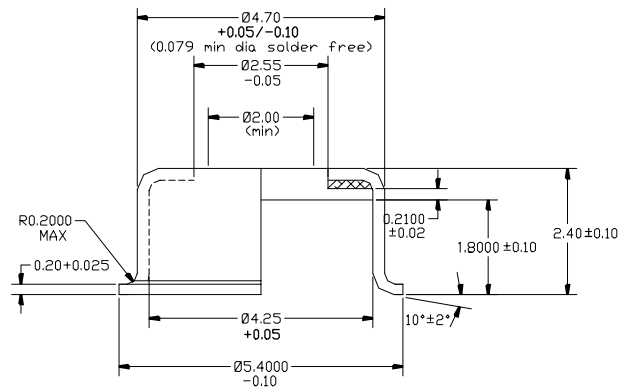
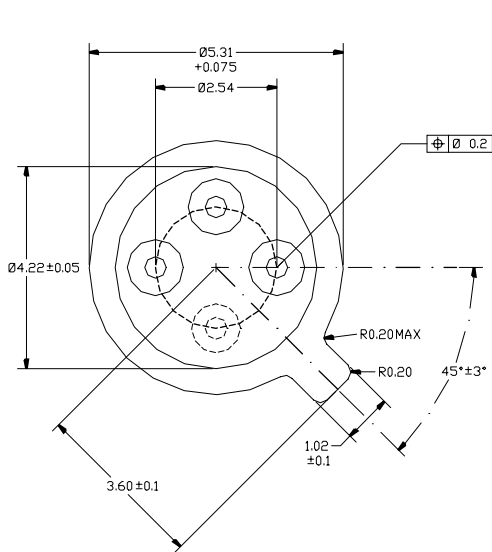
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### Package Information

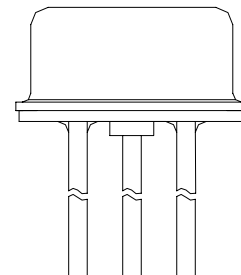
Individual Die



**TO-46 Flat Window Package**



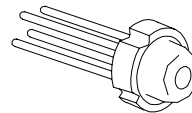
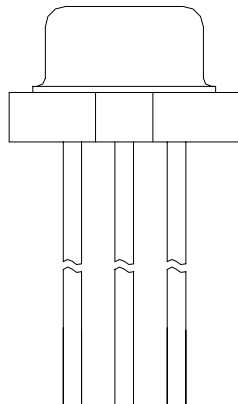
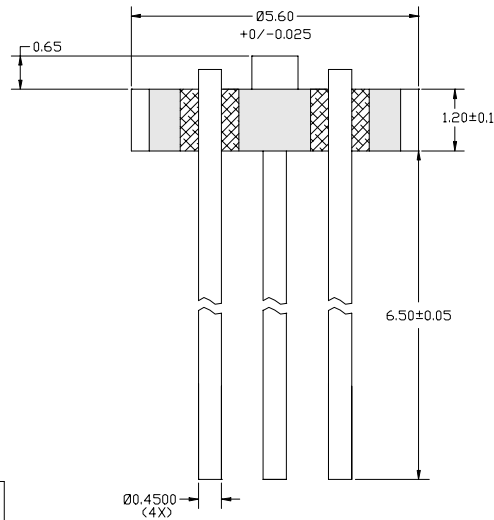
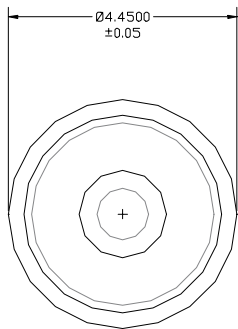
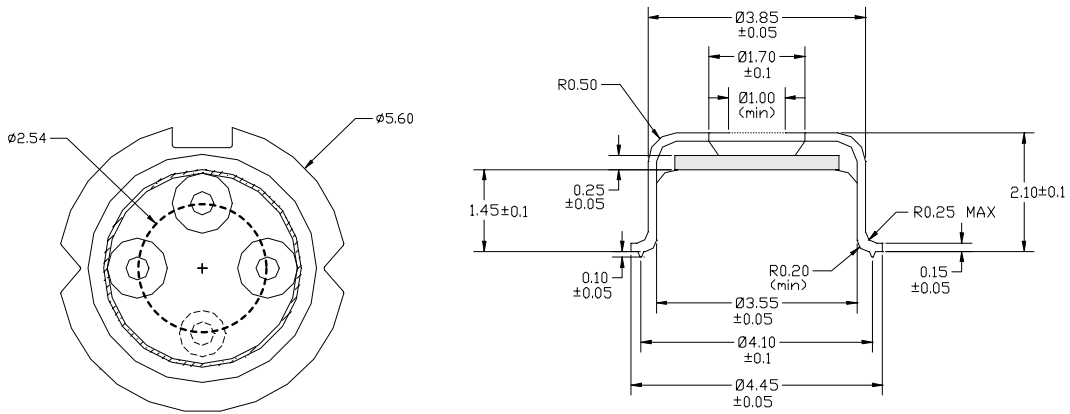
Reference Isometric



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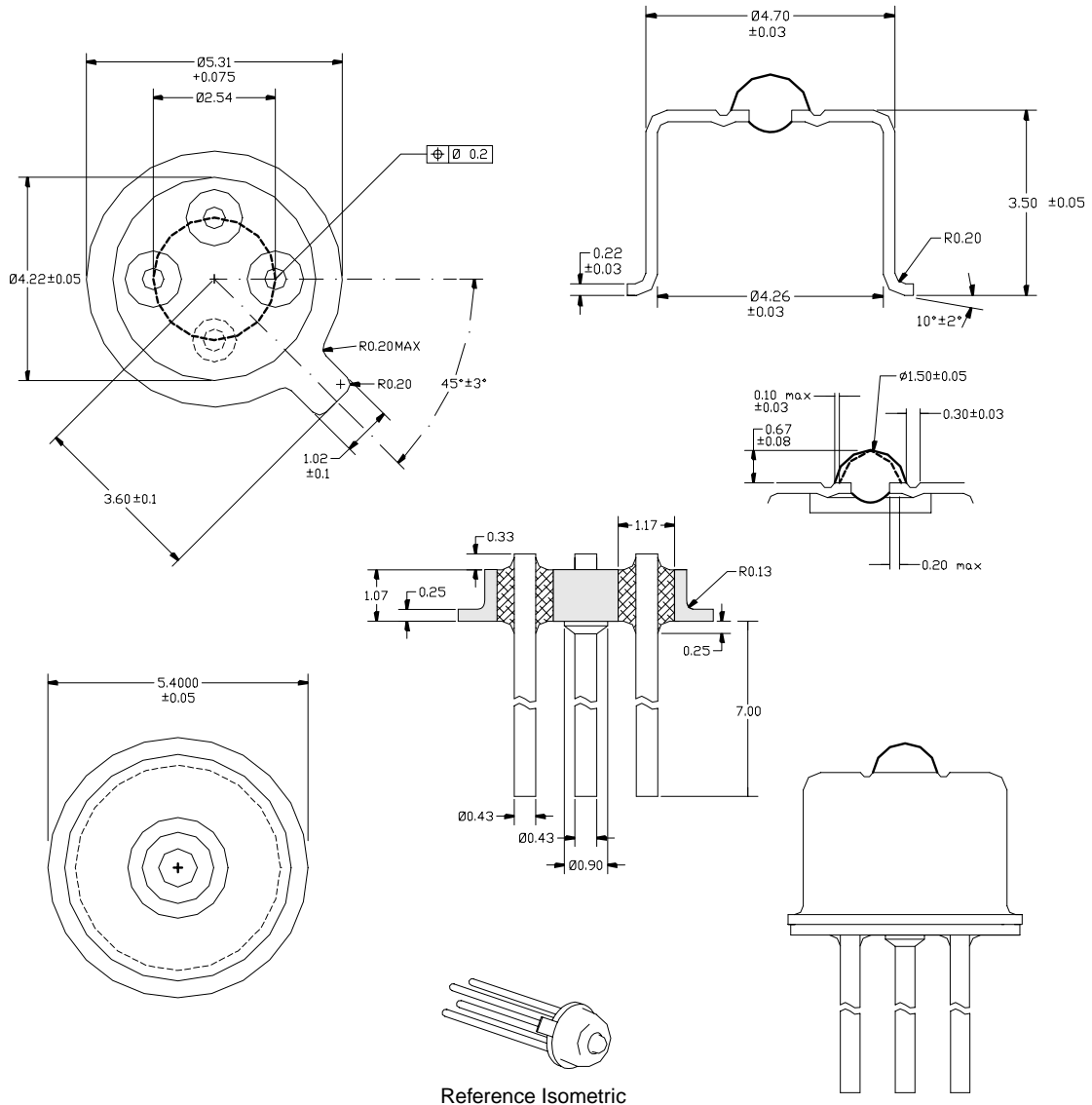
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### TO-56 Flat Window Package



Reference Isometric

**TO-46 Ball Lens Package—7mm Lead Length**

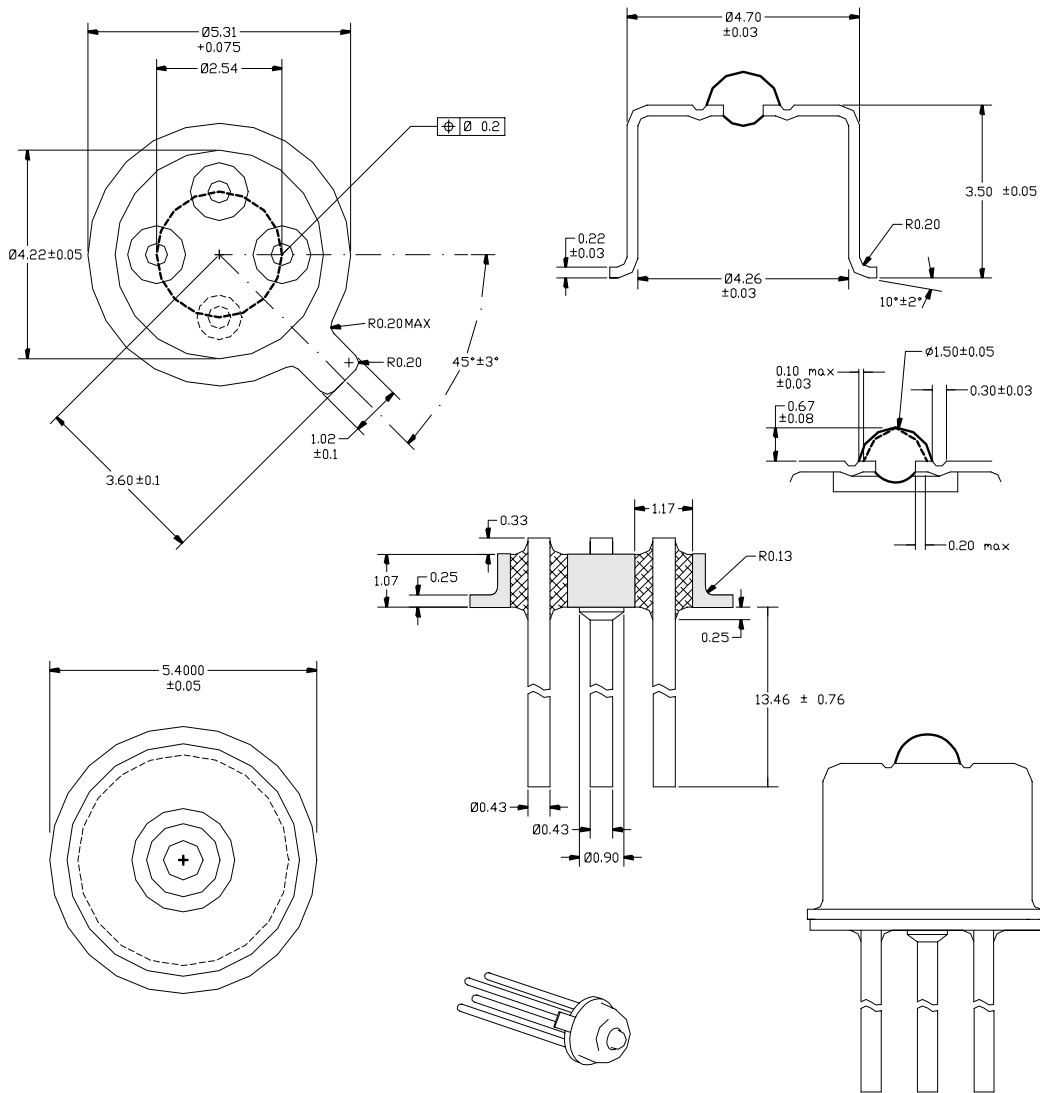




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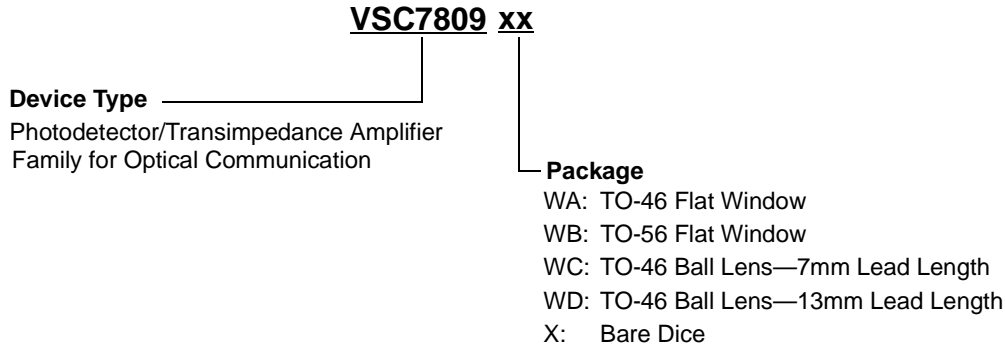
### TO-46 Ball Lens Package—13mm Lead Length



Reference Isometric

## Ordering Information

The order number for this product is formed by a combination of the device type and package type.



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