

## Advance Product Information

### VSC7807

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: 1300MHz
- Low Input Noise Equivalent Power: 2.2 $\mu$ W
- Large Optically Active Area
- Single 3.3V Power Supply
- 2.125Gb/s Data Rate
- 70 $\mu$ m Optically Active Area
- Packages: TO-46, TO-56, Bare Die

#### Applications

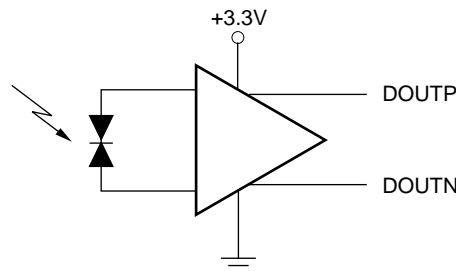
- Gigabit Ethernet Optical Receivers
- Fibre Channel Optical Receivers
- ATM Optical Receivers
- SONET/SDH
- System Interconnect

#### General Description

The VSC7807 integrated Photodetector/Transimpedance Amplifier provides a highly integrated solution for converting 850nm 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. The VSC7807 is available in either die form, flat-windowed packages or 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. The VSC7807 can easily be used in developing Fibre Channel Electro-Optic Receivers which exhibit very high performance and ease of use.

#### VSC7807 Block Diagram



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

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

Symbol	Parameters	Min	Typ <sup>(2)</sup>	Max	Units	Conditions
V <sub>SS</sub>	Supply Voltage	3.0	3.3	3.6	V	
I <sub>DD</sub>	Supply Current	-	-	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	-	1.0	2.5	MHz	-3dB, P <sup>(4)</sup> = -15dBm
BW	Optical Modulation Bandwidth	-	1300	-	MHz	-3dB, P = -15dBm
S	Sensitivity	-	20	-	dBm	2.488Gb/s, BER10 <sup>-12</sup> <sup>(5)</sup>
R <sub>o</sub>	Single-Ended Output Impedance	-	25	-	Ω	
V <sub>D</sub>	Differential Output Voltage	0.2	-	-	V	P = -5 dBm, R <sub>L</sub> = 100Ω differential
R <sub>D</sub>	Differential Responsivity	1.6	2.0	-	mV/μW	R <sub>L</sub> = 100Ω At 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	2.2	μW rms	P = 0mW
V <sub>NO</sub>	Output Noise Voltage	-	-	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	-	-	40	ps	P = -5dBm +/-10% Voltage Window
	Optically Active Area	-	70	-	μm	Diameter
PPJ	PP Jitter	-	190	200	ps	P = -5dBm
T <sub>R</sub>	Rise Time	-	-	200	ps	20% to 80% P = -5dBm
T <sub>F</sub>	Fall Time	-	-	200	ps	20% to 80% P = -5dBm

NOTES: (1) Specified over 10°C to 90°C junction. (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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### Absolute Maximum Ratings<sup>(1)</sup>

Power Supply Voltage ( $V_{SS}$ ) .....	6V
Storage Humidity s(relative humidity, including condensation).....	5% to 95%
Operating Humidity (relative humidity, excluding condensation) .....	8% to 80%
Impact Shock (IS) <sup>(2)</sup> .....	500G
Incident Optical Power .....	+3dBm
Storage Temperature Range (case temperature under bias) .....	-55°C to +125°C

NOTES: (1) CAUTION: Stresses listed under "Absolute Maximum Ratings" may be applied to devices one at a time without causing permanent damage. Functionality at or above the values listed is not implied. Exposure to these values for extended periods may affect device reliability. (2) Half sine wave, pulse duration  $1 \pm 0.5ms$ , 3 blows in each direction.

### Recommended Operating Conditions

Positive Voltage Rail ( $V_{SS}$ ) .....	3.0V to 3.6V
Optical Power .....	0dBm
Operating Temperature Range ( $T_A$ ).....	0°C Ambient to +85°C Case

Figure 1: Pin Diagram (TO-46 and TO-56 packages)

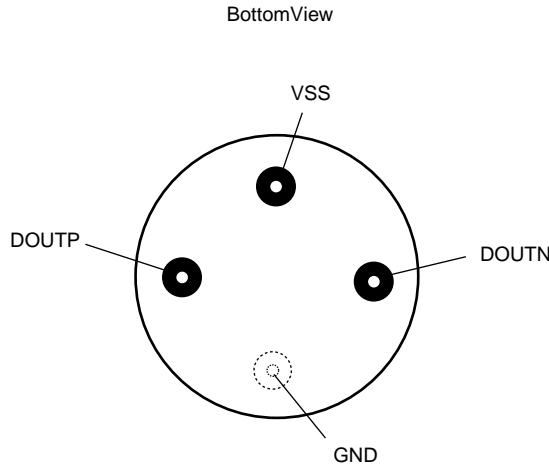
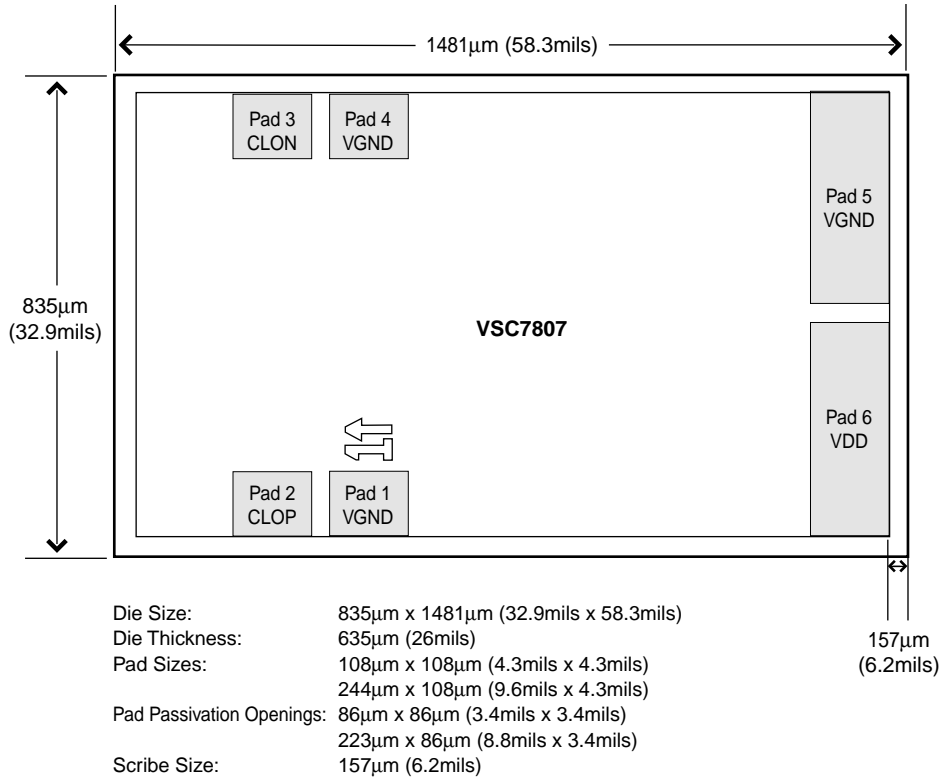


Table 2: Pin Table Specifications for Ball Lens Packages, Flat Window Packages and Bare Die

Symbol	Description
DOUTP	Data output normal (with reference to incident light)
DOUTN	Data output complement (invertng) (with reference to incident light)
VSS	Power supply
GND	Ground (package case)

**Figure 2: Pad Assignments**



**Table 3: Pad Coordinates**

Signal Name	Pad Number	Coordinates (µm)		Description
		X	Y	
VGND	1	55	943.6	Ground
CLOP	2	55	1093.6	Data output, true (with reference to incident light)
CLON	3	780	1093.6	Data output, complement (with reference to incident light)
VGND	4	780	943.6	Ground
VGND	5	596.7	61.4	Ground
VDD	6	244.2	61.4	Power Supply

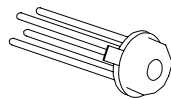
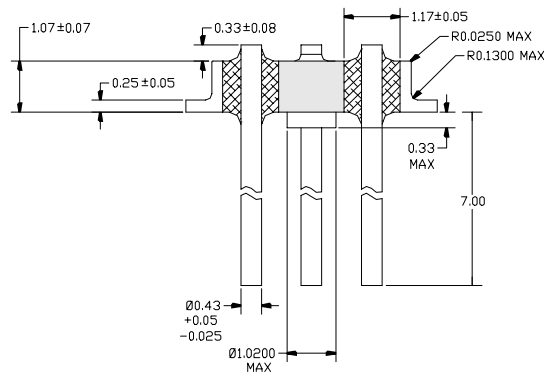
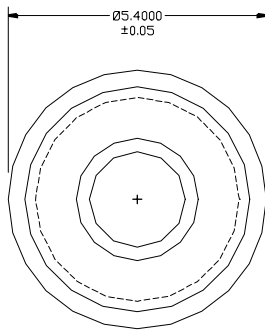
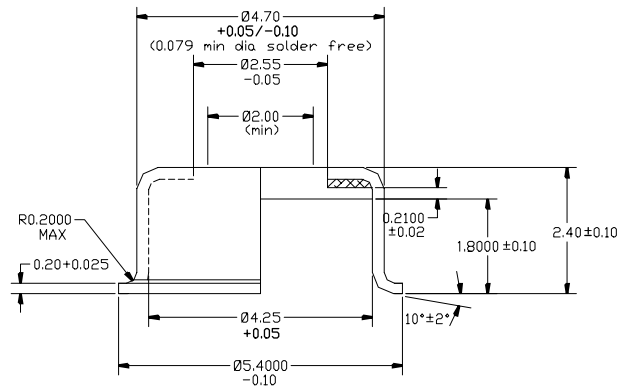
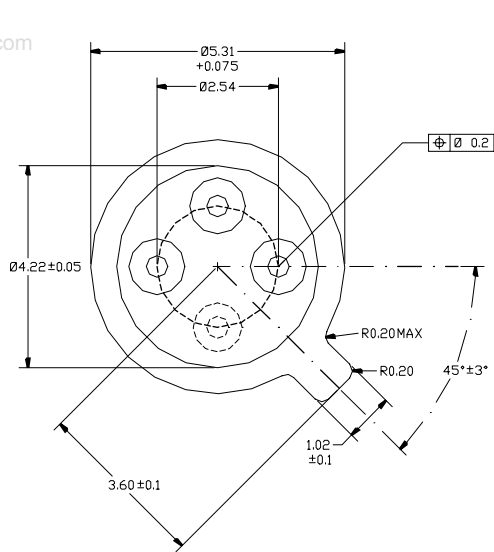
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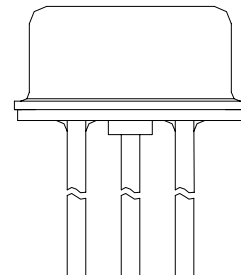
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### Package Information

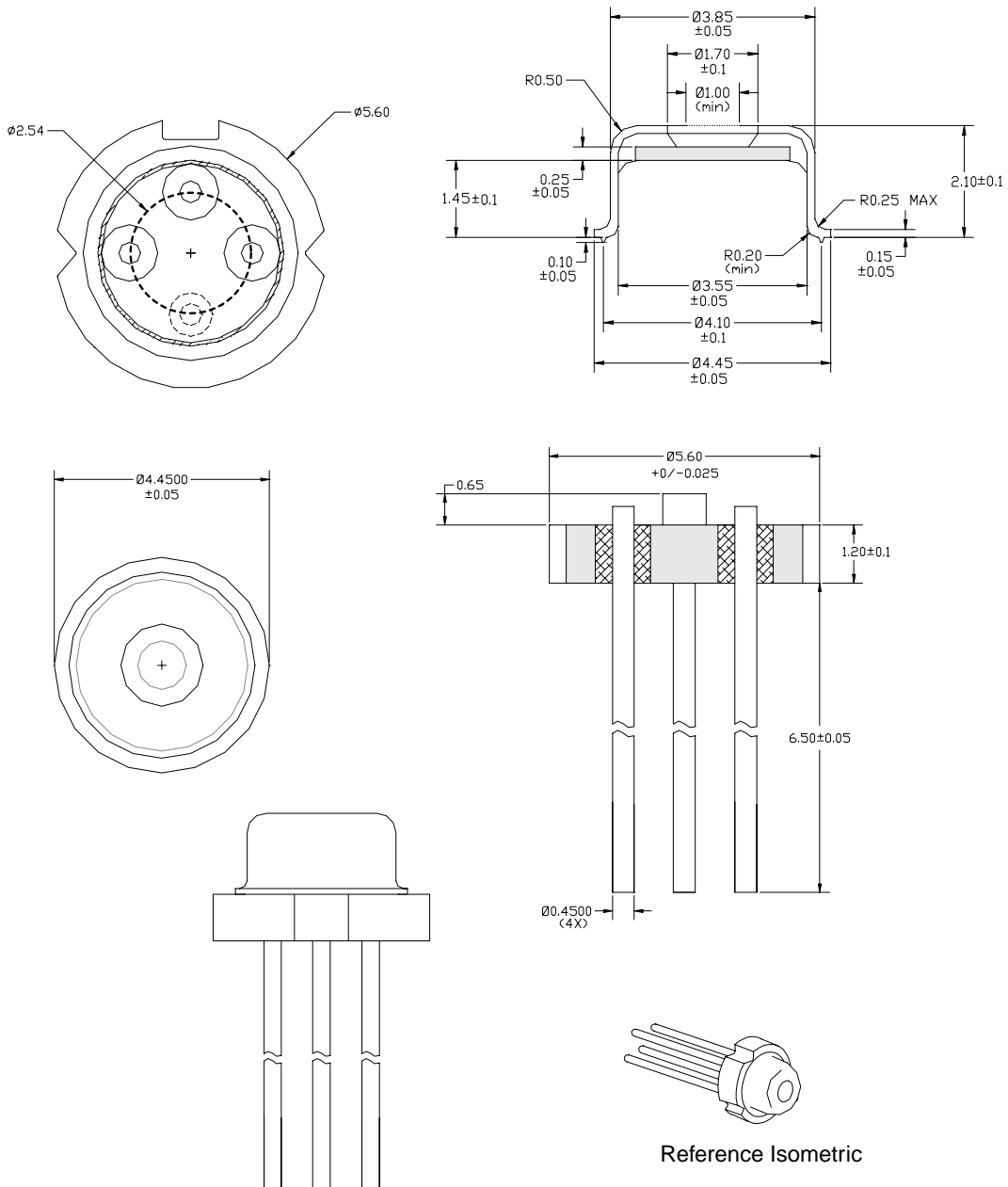
#### TO-46 Flat Window Package



Reference Isometric



**TO-56 Flat Window Package**

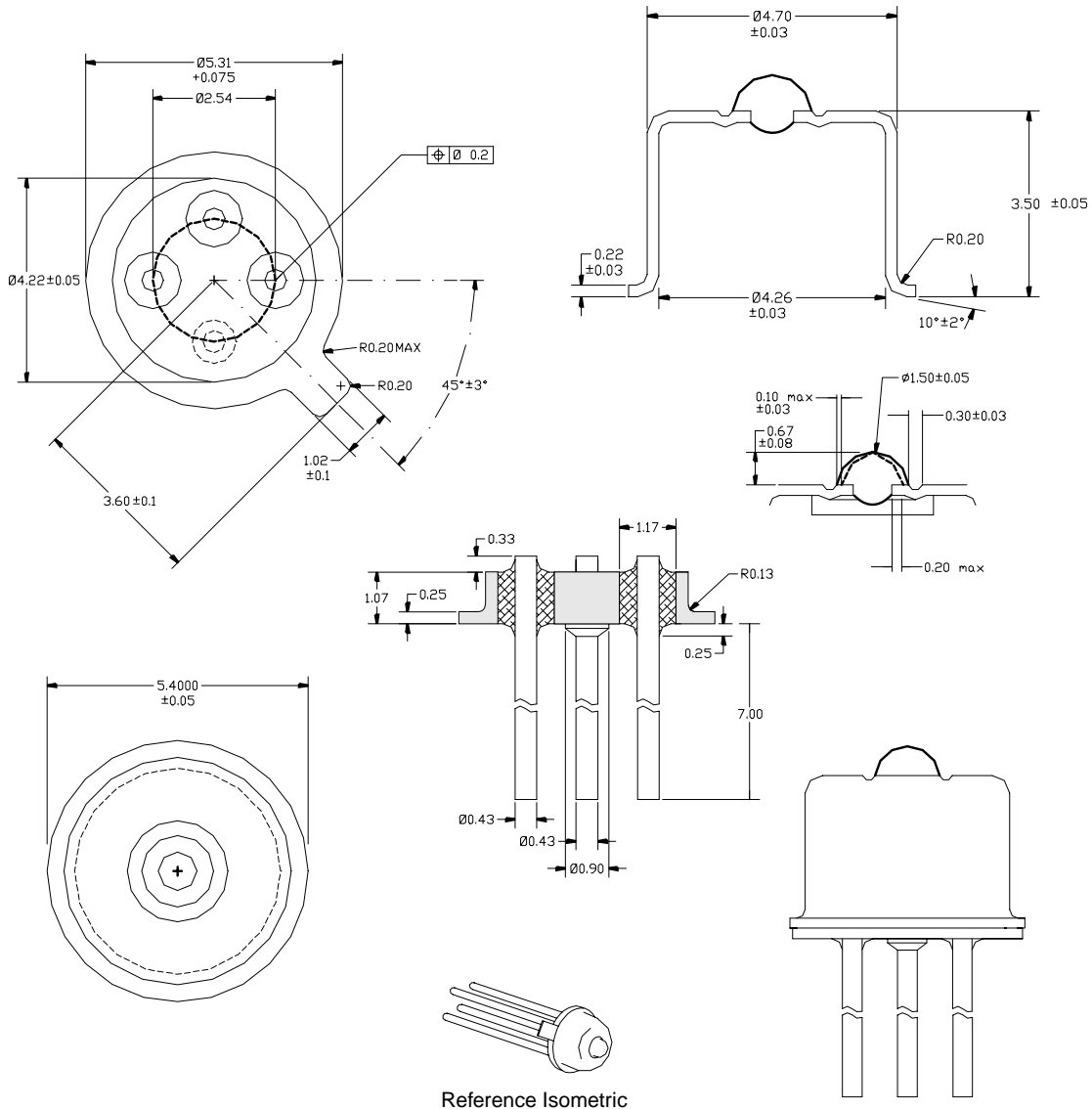


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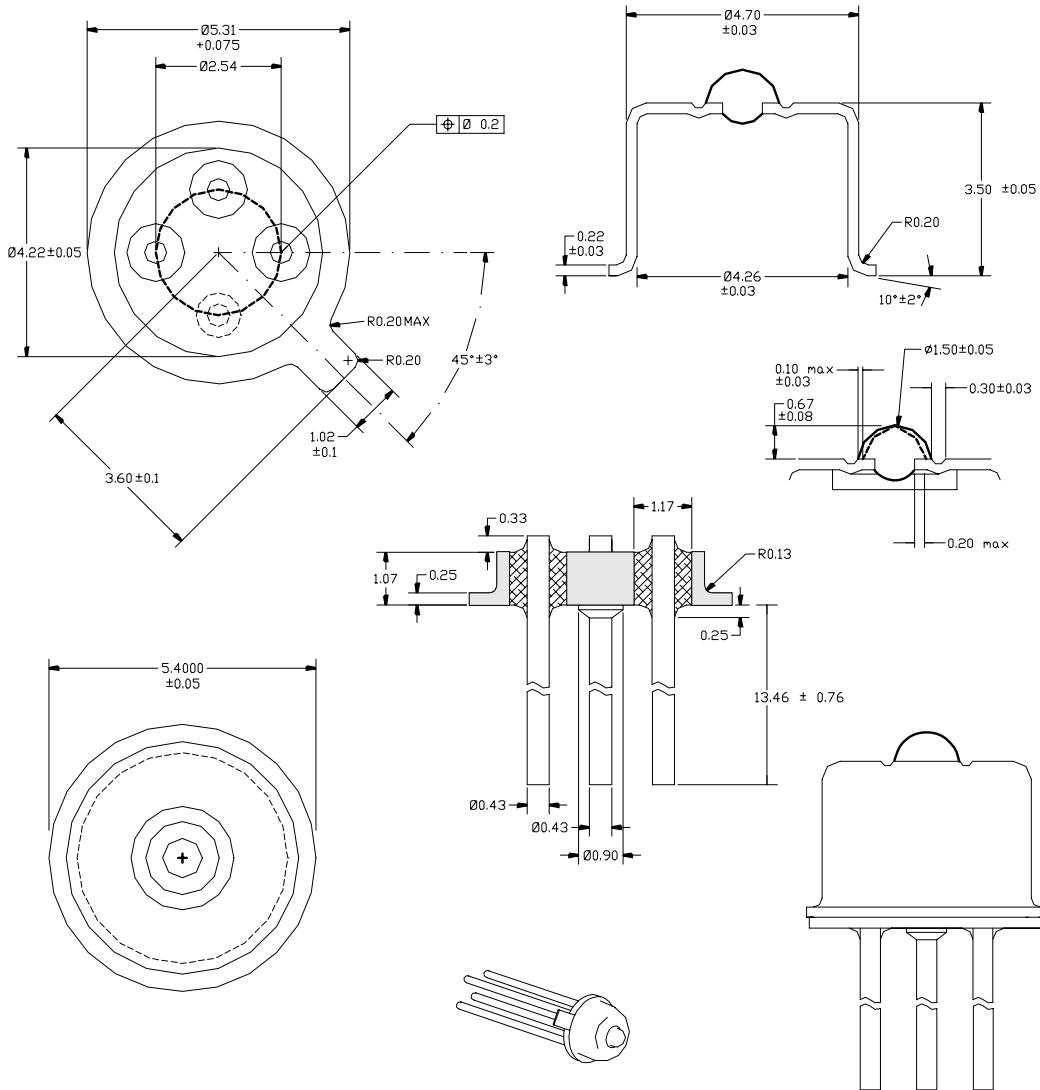
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#### TO-46 Ball Lens Package—7mm Lead Length



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



Reference Isometric



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### Ordering Information

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

**VSC7807 xx**

**Device Type**  
Photodetector/Transimpedance Amplifier  
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**Package**  
WA: TO-46 Flat Window  
WB: TO-56 Flat Window  
WC: TO-46 Ball Lens—7mm Lead Length  
WD: TO-46 Ball Lens—13mm Lead Length  
X: Bare Dice

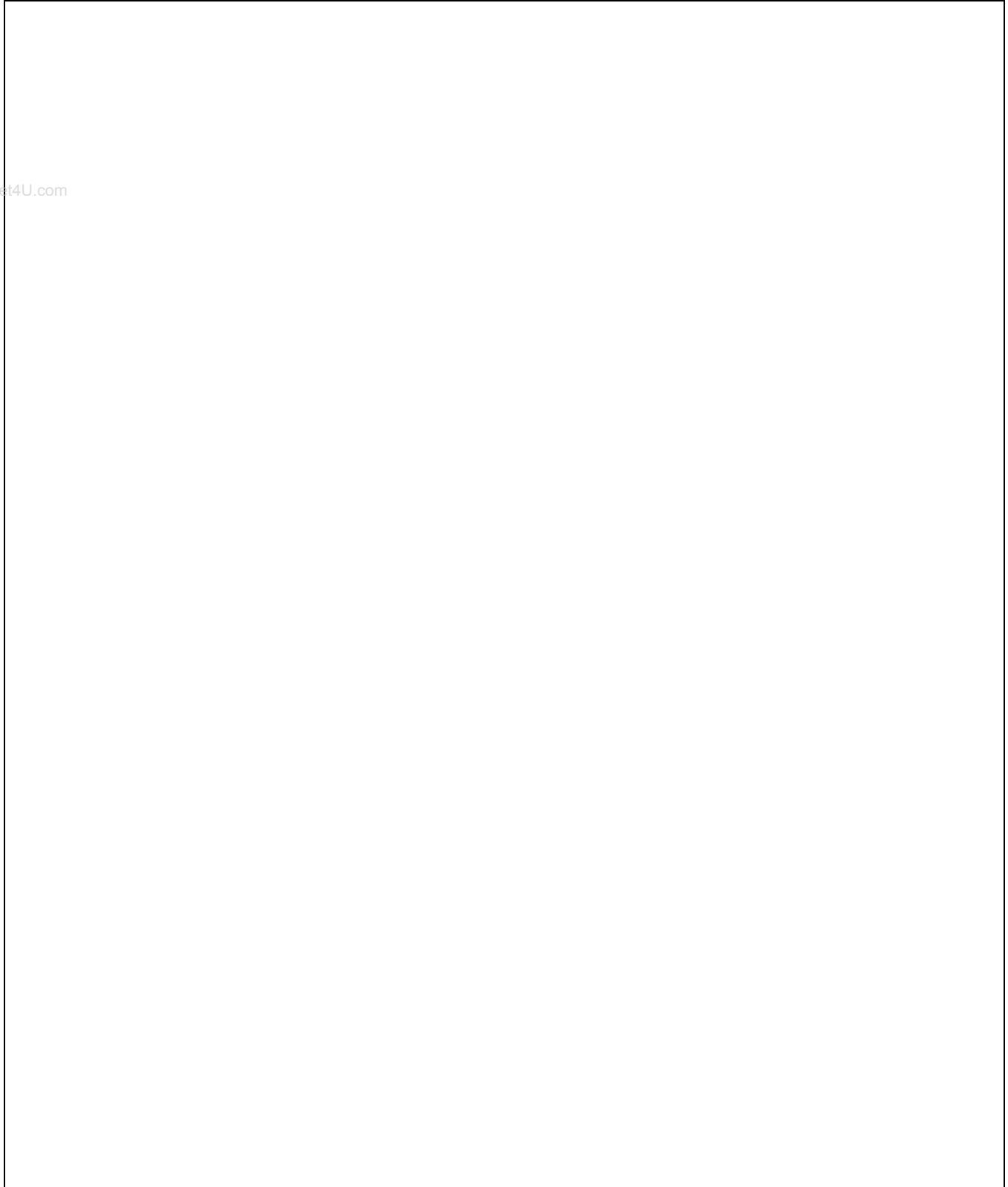
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