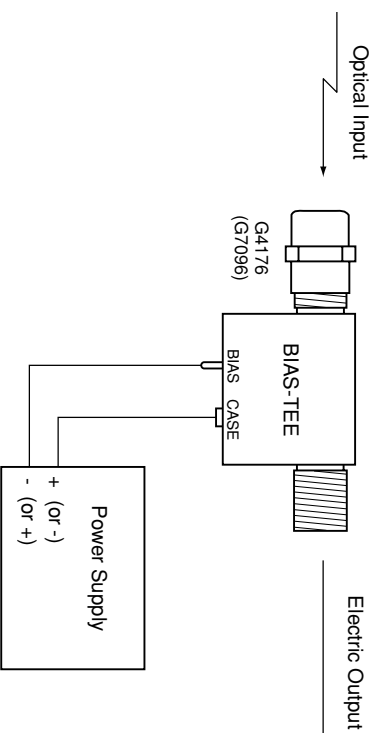


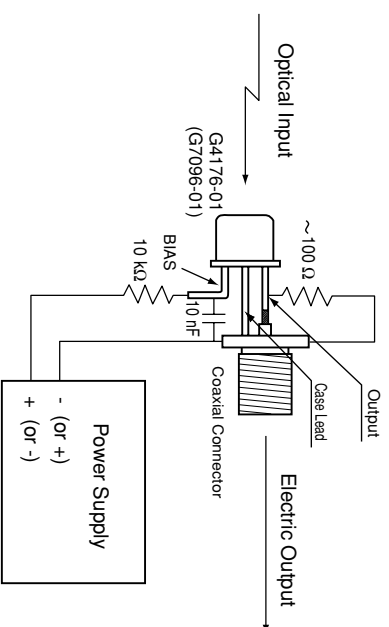
ULTRAFAST MSM PHOTODETECTORS G4176 SERIES (GaAs) , G7096 SERIES (InGaAs)

■ CONNECTION EXAMPLES

G4176
G7096

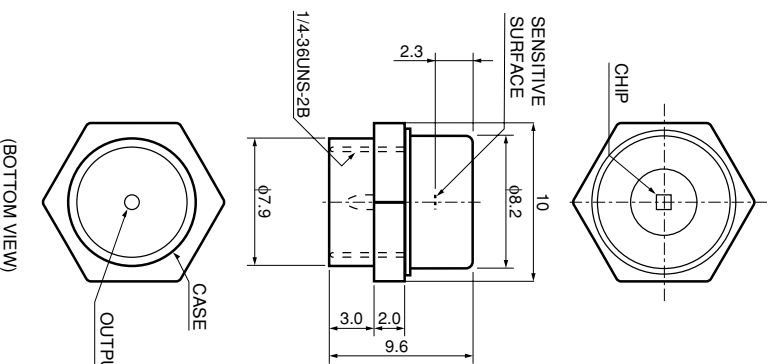


G4176-01
G7096-01

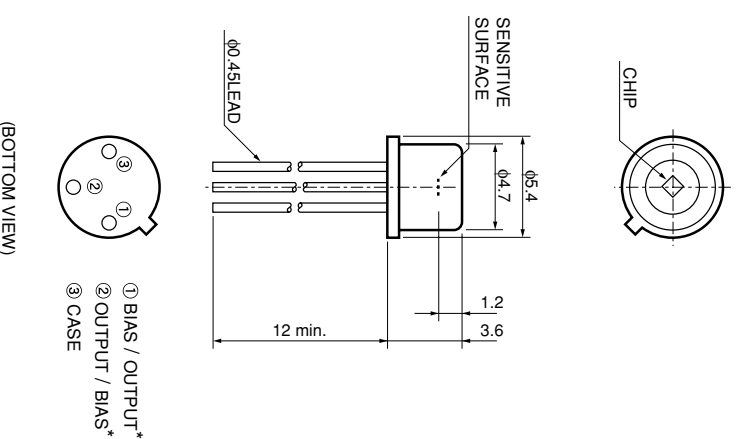


■ DIMENSIONAL OUTLINES (Unit : mm)

G4176
G7096



G4176-01
G7096-01



* Both polarities of the bias voltage are available.

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HAMAMATSU

PRELIMINARY DATA

ULTRAFAST MSM PHOTODETECTORS
G4176 SERIES (GaAs)
G7096 SERIES (InGaAs)

Ultrafast response of several tens picosecond

■ FEATURES

- Ultrafast response
G4176 : t_r , $t_f = 30$ ps (Typ.)
G7096 : $t_r = 40$ ps (Typ.)
- Low dark current
G4176 : 100 pA ($T_a=25^\circ\text{C}$)
- Large photosensitive area
200 μm^2

■ APPLICATIONS

- Optical high-speed waveform measurements
- Optical communications



■ DESCRIPTION

HAMAMATSU realized MSM (Metal-Semiconductor-Metal) Photodetectors having ultrafast responses. The GaAs MSM Photodetector G4176 features 30ps response time for both rise & fall while keeping a low dark current (100pA at $T_a=25^\circ\text{C}$). The rise time of the InGaAs MSM Photodetector G7096 is 40ps. Symmetrical and interdigital Schottky contacts are fabricated at the sensitive area, whose size can be larger than other kinds of fast response photodetectors. This makes easier to set up with optics. Therefore, MSM Photodetectors are suited for measurements of optical high-speed waveform and optical communications. There is no electrical polarity in MSM Photodetectors, that is, both polarities of a bias voltage are available, and the polarity of an output signal depends on its connection. Two kinds of packages are prepared for each MSM Photodetector. The package of G4176 & G7096 is a coaxial metal type (patent : Japan 2070802), which is easy to connect with an electrical SMA-connector. That of G4176-01 & G7096-01 is a TO-18, which is very common. An optical fiber or connector input types are available as a custom option. Contact your local representative for more information.

◆ G4176 SERIES ◆

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V _b		±10	V
Maximum Light Input	Φ	Pulse width ≤ 1ns	50	mW
Pulsed Light		Pulse width > 1ns	5	mW
CW to Pulsed Light				
Operating Temperature	T _{op(a)}		-40 to +85	°C
Storage Temperature	T _{stg}		-40 to +100	°C

■ GENERAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Spectral Response Range	λ	V _b = 7 V	450 to 870	nm
Peak Response Wavelength	λ _p	V _b = 7 V	850	nm
Effective Sensitive Area	A		0.2 × 0.2	mm ²
Chip Size			1 × 1	mm ²
Package			TO-5 (Unified with SMA connector)	
G4176			TO-5	
G4176-01			TO-18	

■ ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=7V)

Item	Symbol	Condition	Value	Unit			
Radiant sensitivity	S	λ = 850 nm	0.2	0.3	-	AWW	
Dark Current	I _d		-	100	300	pA	
NEP*						W/Hz ^{1/2}	
G4176		λ = 850 nm	0.2 × 10 ⁻¹⁵	3 × 10 ⁻¹⁵	-		
G4176-01			0.2 × 10 ⁻¹⁵	4 × 10 ⁻¹⁵	-		
Terminal Capacitance	C _t			0.3	0.4	pF	
G4176**				0.5	0.6		
G4176-01							
Rise Time	t _r			10 to 90 %	30	40	ps
G4176					50	80	
G4176-01							
Fall Time	t _f			90 to 10 %	30	40	ps
G4176					50	80	
G4176-01							

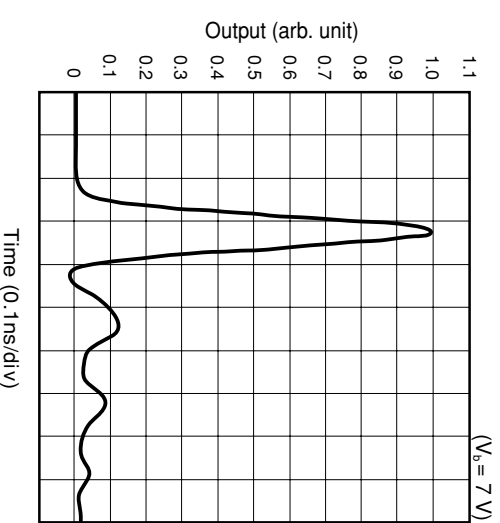
*Noise Equivalent Power

**Value on Chip

Figure 1: Optical Pulse Response

■ G4176

(Including time response of light source, bias-tee and oscilloscope)



■ G4176-01

(Including time response of light source, assembly circuit and oscilloscope)

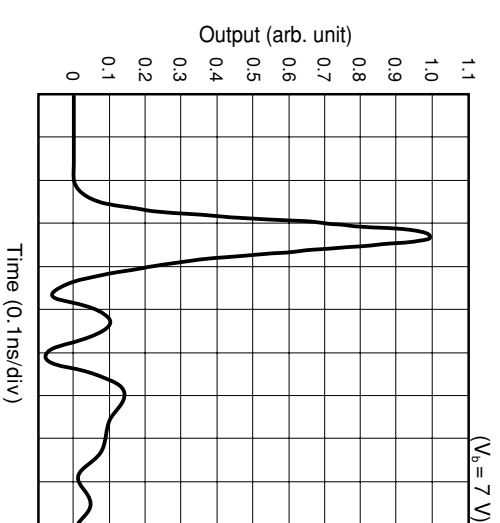
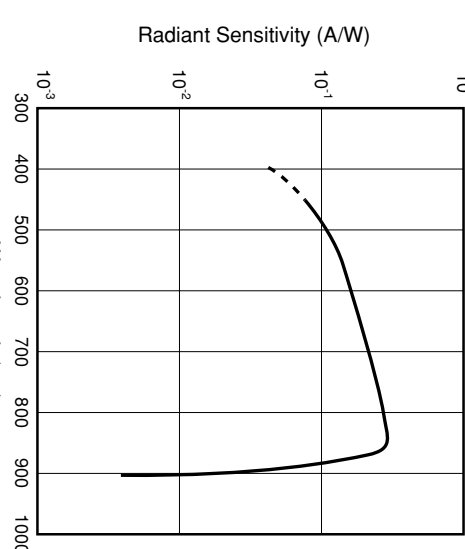


Figure 2: Spectral Response

(V_b = 7 V)



◆ G7096 SERIES ◆

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V _b		±15	V
Maximum Light Input	Φ	Pulse width ≤ 1ns	10	mW
Pulsed Light		Pulse width > 1ns	2	mW
CW to Pulsed Light				
Operating Temperature	T _{op(a)}		-40 to +85	°C
Storage Temperature	T _{stg}		-40 to +100	°C

■ GENERAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Spectral Response Range	λ	V _b = 10 V	850 to 1650	nm
Peak Response Wavelength	λ _p	V _b = 10 V	1500	nm
Effective Sensitive Area	A		0.2 × 0.2	mm ²
Chip Size			1 × 1	mm ²
Package			TO-5 (Unified with SMA connector)	
G7096			TO-5	
G7096-01			TO-18	

■ ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=10V)

Item	Symbol	Condition	Value	Unit			
Radiant sensitivity	S	λ = 1.3 μm	0.2	0.4	-	AWW	
Dark Current	I _d		-	5	20	μA	
NEP*						W/Hz ^{1/2}	
G7096		λ = 1.3 μm	0.2 × 10 ⁻¹⁰	2 × 10 ⁻¹⁰	-		
G7096-01			0.2 × 10 ⁻¹⁰	3 × 10 ⁻¹⁰	-		
Terminal Capacitance	C _t			0.7	0.8	pF	
G7096**				0.9	1.0		
G7096-01							
Rise Time	t _r			10 to 90 %	40	60	ps
G7096					80	100	
G7096-01							
Fall Time	t _f			90 to 10 %	120	160	ps
G7096					160	200	
G7096-01							

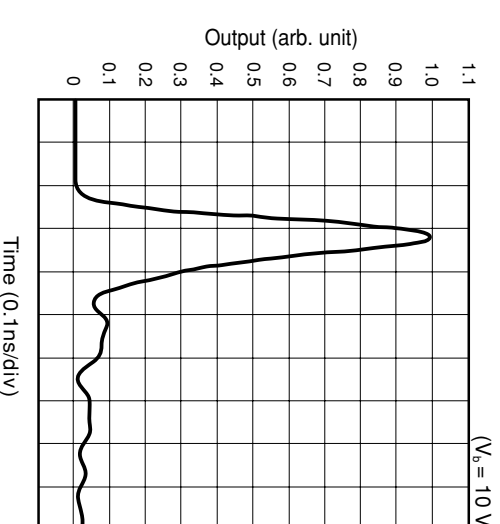
*Noise Equivalent Power

**Value on Chip

Figure 3: Optical Pulse Response

■ G7096

(Including time response of light source, bias-tee and oscilloscope)



■ G7096-01

(Including time response of light source, assembly circuit and oscilloscope)

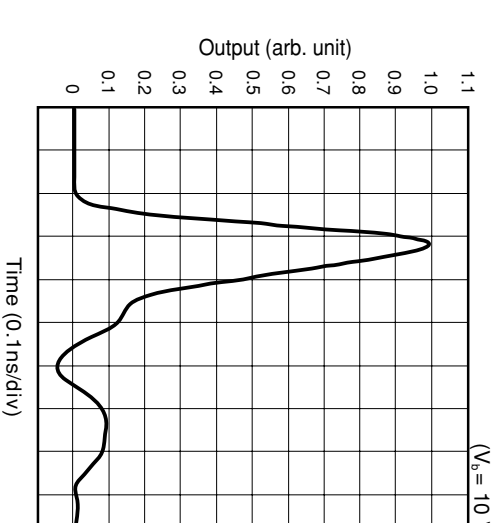
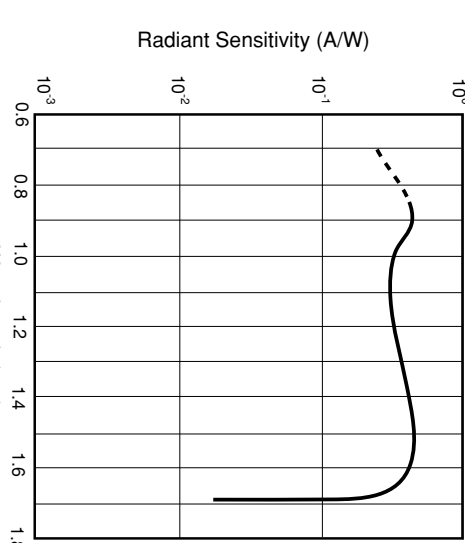


Figure 4: Spectral Response

(V_b = 10 V)



◆ G4176 SERIES ◆

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V _b		±10	V
Maximum Light Input	Φ	Pulse width ≤ 1ns	50	mW
Pulsed Light		Pulse width > 1ns	5	mW
CW to Pulsed Light				
Operating Temperature	T _{op(a)}		-40 to +85	°C
Storage Temperature	T _{stg}		-40 to +100	°C

■ GENERAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Spectral Response Range	λ	V _b = 7 V	450 to 870	nm
Peak Response Wavelength	λ _p	V _b = 7 V	850	nm
Effective Sensitive Area	A		0.2 × 0.2	mm ²
Chip Size			1 × 1	mm ²
Package			TO-5 (Unified with SMA connector)	
G4176			TO-5	
G4176-01			TO-18	

■ ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=7V)

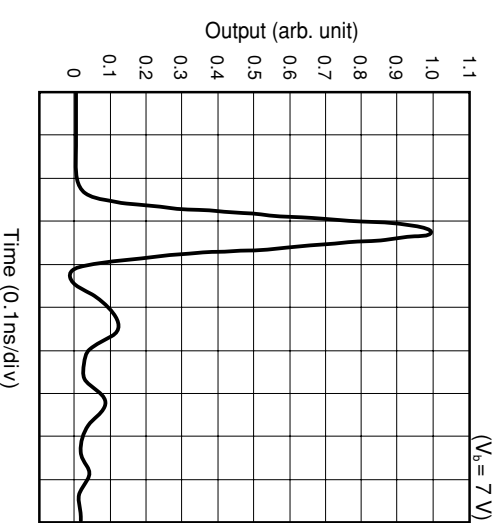
Item	Symbol	Condition	Value	Unit		
Radiant sensitivity	S	λ = 850 nm	0.2	0.3	-	AWW
Dark Current	I _d		-	100	300	pA
NEP*						W/Hz ^{1/2}
G4176		λ = 850 nm	0.2 × 10 ⁻¹⁵	3 × 10 ⁻¹⁵	-	
G4176-01			0.2 × 10 ⁻¹⁵	4 × 10 ⁻¹⁵	-	
Terminal Capacitance	C _t					pF
G4176**			-	0.3	0.4	
G4176-01			-	0.5	0.6	
Rise Time	t _r					ps
G4176		10 to 90 %	-	30	40	
G4176-01			-	50	80	
Fall Time	t _f					ps
G4176		90 to 10 %	-	30	40	
G4176-01			-	50	80	

*Noise Equivalent Power
**Value on Chip

Figure 1: Optical Pulse Response

■ G4176

(Including time response of light source, bias-tee and oscilloscope)



■ G4176-01

(Including time response of light source, assembly circuit and oscilloscope)

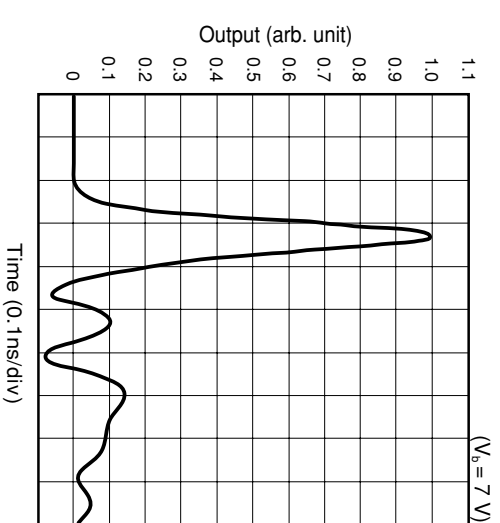
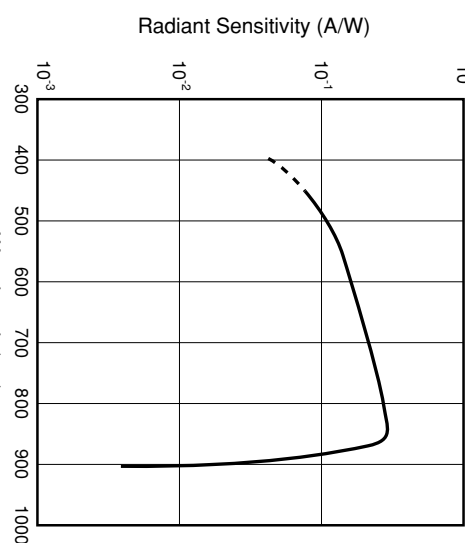


Figure 2: Spectral Response

(V_b = 7 V)



◆ G7096 SERIES ◆

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V _b		±15	V
Maximum Light Input	Φ	Pulse width ≤ 1ns	10	mW
Pulsed Light		Pulse width > 1ns	2	mW
CW to Pulsed Light				
Operating Temperature	T _{op(a)}		-40 to +85	°C
Storage Temperature	T _{stg}		-40 to +100	°C

■ GENERAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Spectral Response Range	λ	V _b = 10 V	850 to 1650	nm
Peak Response Wavelength	λ _p	V _b = 10 V	1500	nm
Effective Sensitive Area	A		0.2 × 0.2	mm ²
Chip Size			1 × 1	mm ²
Package			TO-5 (Unified with SMA connector)	
G7096			TO-5	
G7096-01			TO-18	

■ ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=10V)

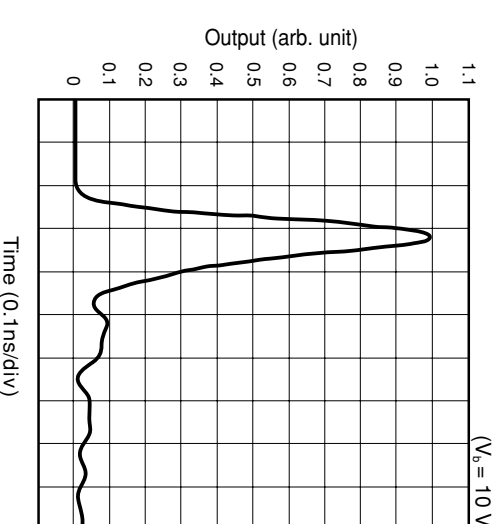
Item	Symbol	Condition	Value	Unit		
Radiant sensitivity	S	λ = 1.3 μm	0.2	0.4	-	AWW
Dark Current	I _d		-	5	20	μA
NEP*						W/Hz ^{1/2}
G7096		λ = 1.3 μm	0.2 × 10 ⁻¹⁰	2 × 10 ⁻¹⁰	-	
G7096-01			0.2 × 10 ⁻¹⁰	3 × 10 ⁻¹⁰	-	
Terminal Capacitance	C _t					pF
G7096**			-	0.7	0.8	
G7096-01			-	0.9	1.0	
Rise Time	t _r					ps
G7096		10 to 90 %	-	40	60	
G7096-01			-	80	100	
Fall Time	t _f					ps
G7096		90 to 10 %	-	120	160	
G7096-01			-	160	200	

*Noise Equivalent Power
**Value on Chip

Figure 3: Optical Pulse Response

■ G7096

(Including time response of light source, bias-tee and oscilloscope)



■ G7096-01

(Including time response of light source, assembly circuit and oscilloscope)

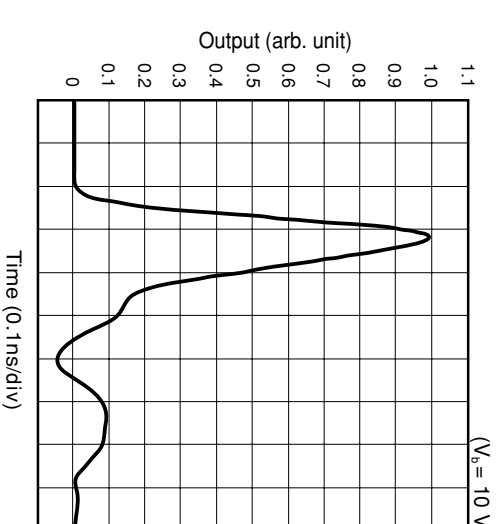
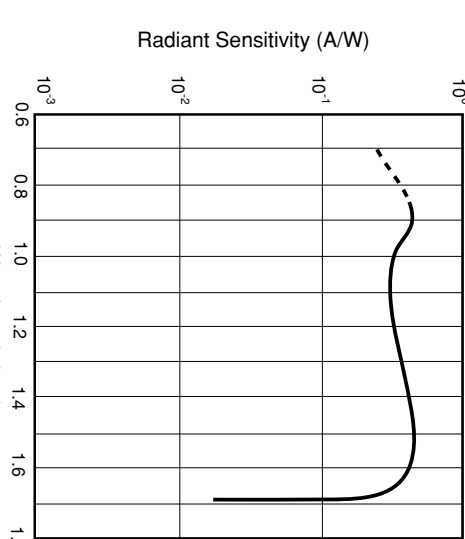


Figure 4: Spectral Response

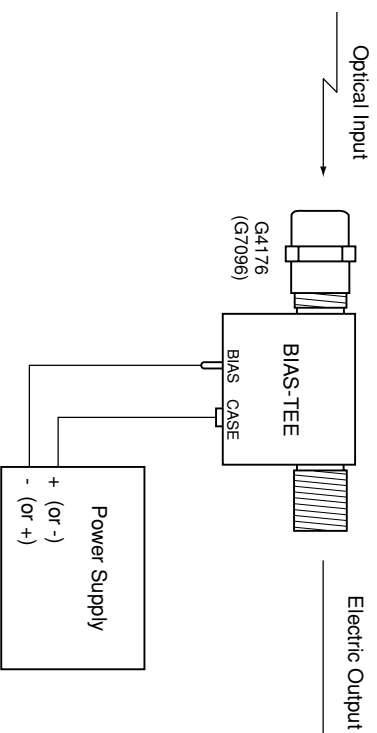
(V_b = 10 V)



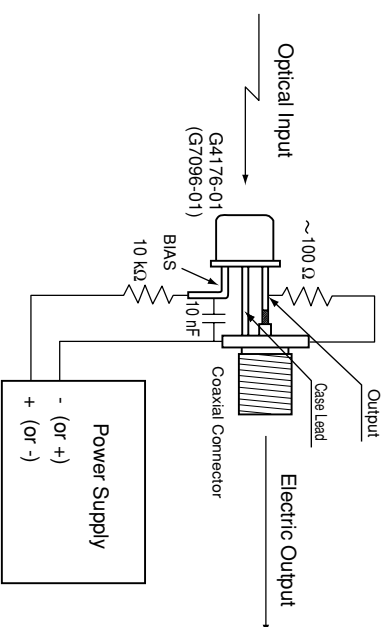
ULTRAFAST MSM PHOTODETECTORS G4176 SERIES (GaAs) , G7096 SERIES (InGaAs)

■ CONNECTION EXAMPLES

G4176
G7096

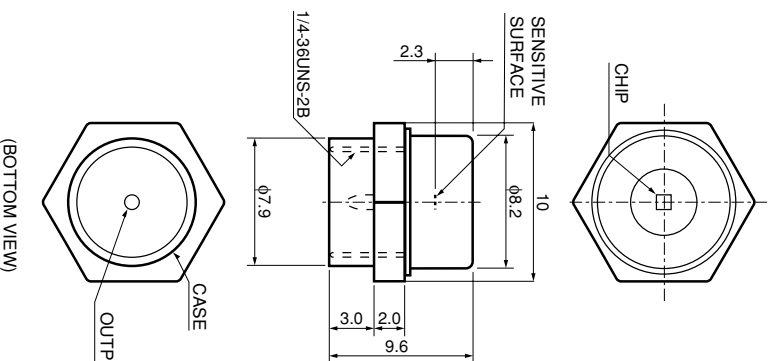


G4176-01
G7096-01

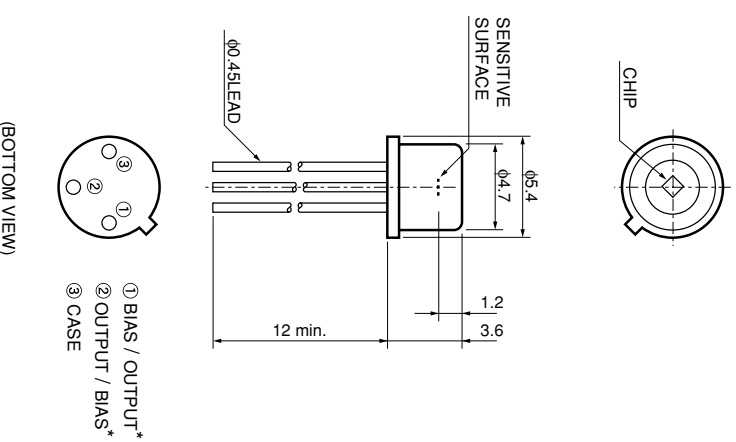


■ DIMENSIONAL OUTLINES (Unit : mm)

G4176
G7096



G4176-01
G7096-01



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United Kingdom: Hamamatsu Photonics UK Limited; 2 Howard Court, 10 Tramin Road, Welwyn, Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44)1707-294888, Fax: (44)1707-325777, E-mail: info@hamamatsu.uk
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HAMAMATSU

PRELIMINARY DATA

ULTRAFAST MSM PHOTODETECTORS G4176 SERIES (GaAs) G7096 SERIES (InGaAs)

Ultrafast response of several tens picosecond

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G7096 : $t_r = 40$ ps (Typ.)
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G4176 : 100 pA ($T_a=25^\circ\text{C}$)
- Large photosensitive area
200 μm^2

■ APPLICATIONS

- Optical high-speed waveform measurements
- Optical communications



■ DESCRIPTION

HAMAMATSU realized MSM (Metal-Semiconductor-Metal) Photodetectors having ultrafast responses.

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An optical fiber or connector input types are available as a custom option. Contact your local representative for more information.

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