HAMAMATSU

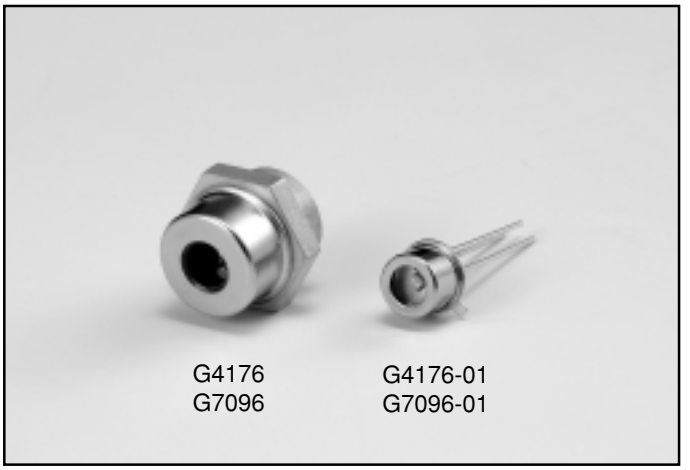
PRELIMINARY DATA

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 (Ta=25 °C)
- Large photosensitive area
  - 200 μm□



G4176 G4176-01
G7096 G7096-01

■ 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 Ta=25 °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.

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◆ G4176 SERIES ◆

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V_b		±10	V
Maximum Light Input	Φ			
Pulsed Light		Pulse width ≦1ns	50	mW
CW to Pulsed Light		Pulse width >1ns	5	mW
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	λp	V_b = 7 V	850	nm
Effective Sensitive Area	A		0.2 × 0.2	mm^2
Chip Size			1 × 1	mm^2
Package				
G4176			TO-5 (Unified with SMA connector)	
G4176-01			TO-18	

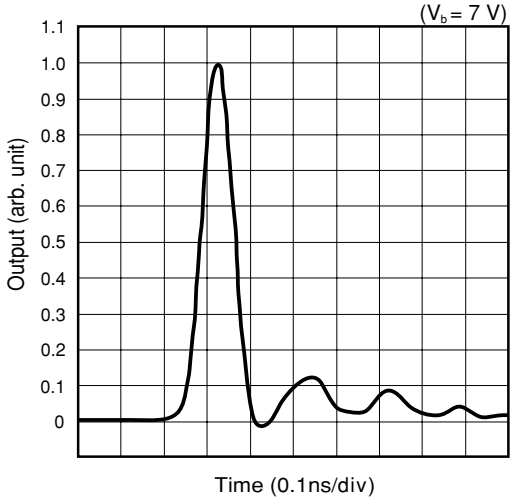
■ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=7V)

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Radiant sensitivity	S	λ = 850 nm	0.2	0.3	-	A/W
Dark Current	I_d		-	100	300	pA
NEP*						
G4176		λ = 850 nm	0.2×10^{-15}	3×10^{-15}	-	$W/Hz^{1/2}$
G4176-01			0.2×10^{-15}	4×10^{-15}	-	
Terminal Capacitance						
G4176**	C_t		-	0.3	0.4	pF
G4176-01			-	0.5	0.6	
Rise Time						
G4176	t_r	10 to 90 %	-	30	40	ps
G4176-01			-	50	80	
Fall Time						
G4176	t_f	90 to 10 %	-	30	40	ps
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)

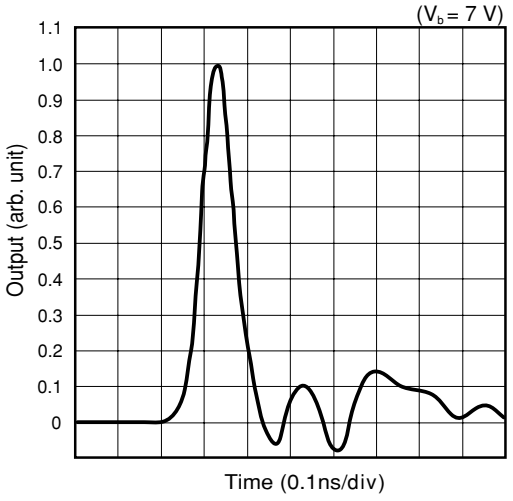
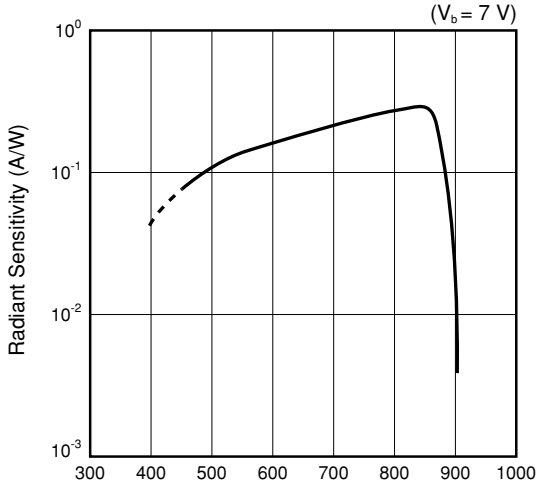


Figure 2: Spectral Response



◆ G7096 SERIES ◆

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Condition	Value	Unit
Maximum Bias Voltage	V_b		±15	V
Maximum Light Input	Φ			
Pulsed Light		Pulse width ≦1ns	10	mW
CW to Pulsed Light		Pulse width >1ns	2	mW
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				
G7096			TO-5 (Unified with SMA connector)	
G7096-01			TO-18	

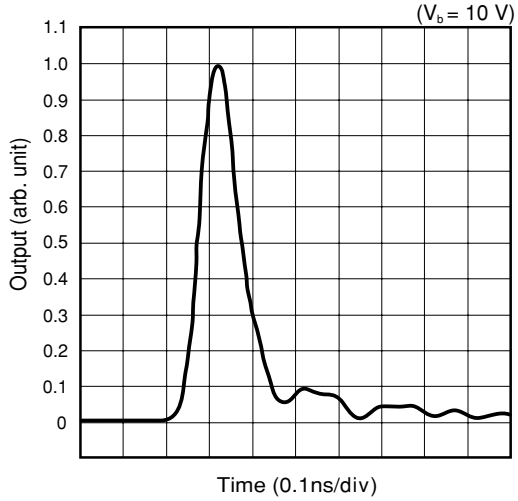
■ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25°C, V_b=10V)

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Radiant sensitivity	S	λ = 1.3 μm	0.2	0.4	-	A/W
Dark Current	I_d		-	5	20	μA
NEP*						
G7096		λ = 1.3 μm	0.2×10^{-10}	2×10^{-10}	-	$W/Hz^{1/2}$
G7096-01			0.2×10^{-10}	3×10^{-10}	-	
Terminal Capacitance						
G7096**	C_t		-	0.7	0.8	pF
G7096-01			-	0.9	1.0	
Rise Time						
G7096	t_r	10 to 90 %	-	40	60	ps
G7096-01			-	80	100	
Fall Time						
G7096	t_f	90 to 10 %	-	120	160	ps
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)

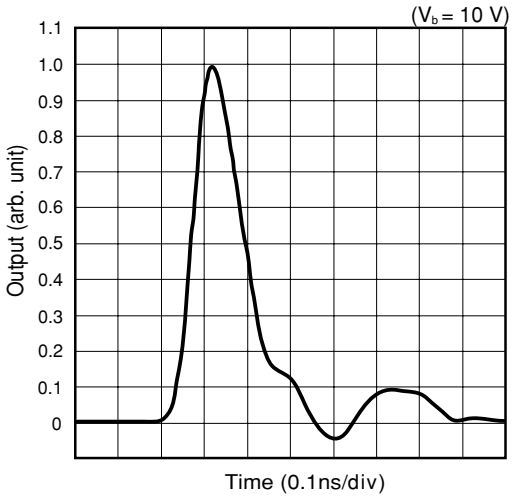
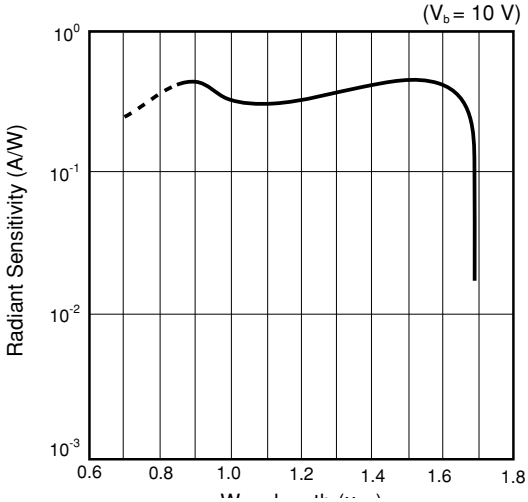
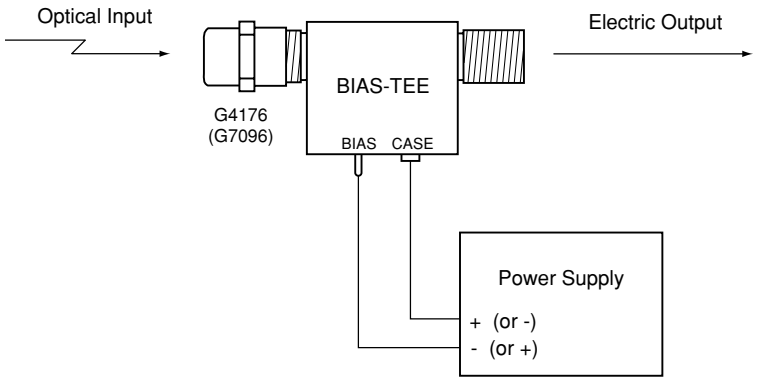


Figure 4: Spectral Response

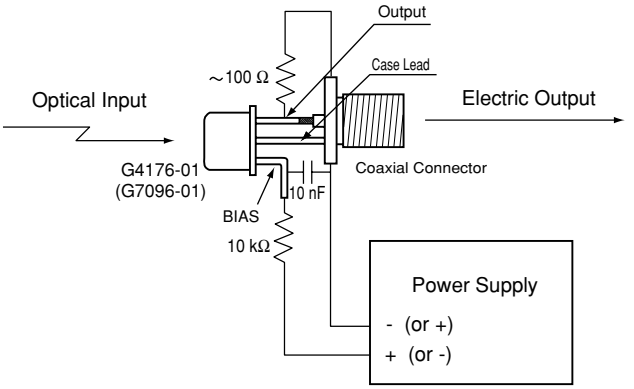


CONNECTION EXAMPLES

G4176
G7096

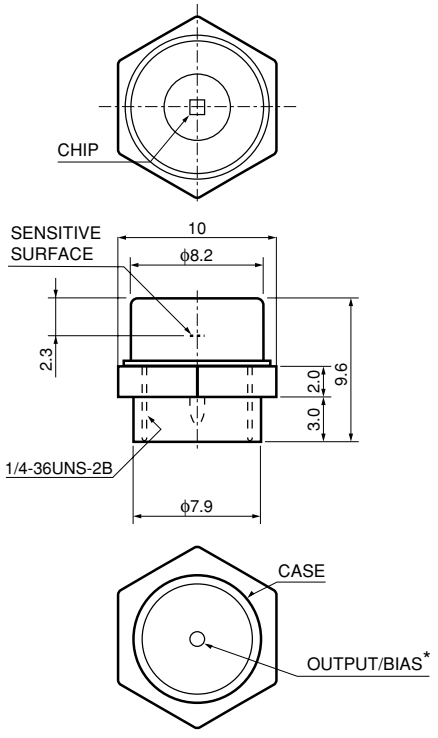


G4176-01
G7096-01



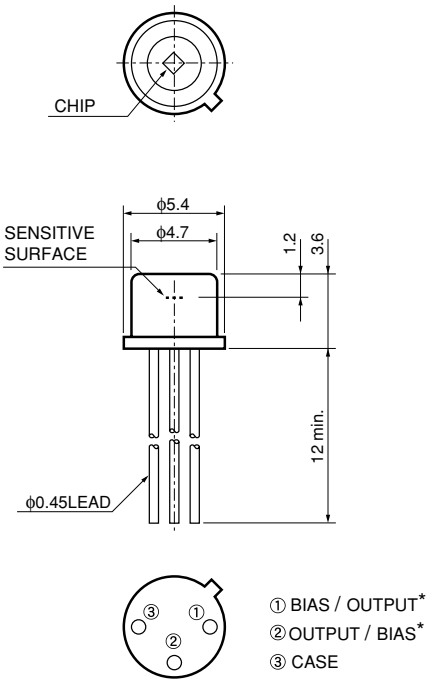
DIMENSIONAL OUTLINES (Unit : mm)

G4176
G7096



(BOTTOM VIEW)

G4176-01
G7096-01



(BOTTOM VIEW)

*Both polarities of the bias voltage are available.

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