

CONNECTION EXAMPLE

DFB-CW QCL

- ①DFB-CW QCL (L12004, L12005, L12006, L12007 series)
- ②TEC temperature controller C11330-01
- ③Forced air cooling HHL mount A11709-01 or water cooling HHL mount A11709-02
- ④Aspheric ZnSe lens A11331-02 and/or lens unit A11331-02H (*1)
- ⑤Cable A11134-04
- ⑥Laser power supply (Use DC power supply designed for CW semiconductor laser available in market.)
- ⑦Cable A11134-05
- ⑧Heatseeker A10767

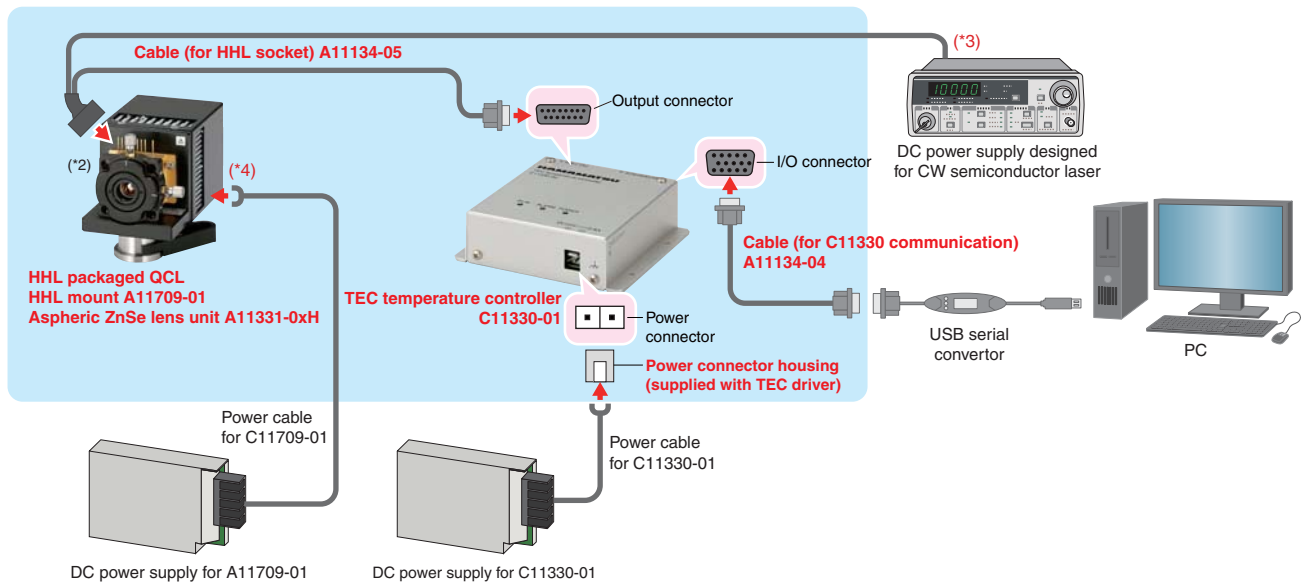
(*1) Select suitable lens based on the emission wavelength of the QCL to use.

DFB-CW QCL (built-in lens)

- ①DFB-CW QCL (L12004-2190H-E)
- ②TEC temperature controller C11330-01
- ③Forced air cooling HHL mount A11709-01 or water cooling HHL mount A11709-02
- ④Cable A11134-04
- ⑤Laser power supply (Use DC power supply designed for CW semiconductor laser available in market.)
- ⑥Cable A11134-05
- ⑦Heatseeker A10767

Connection example of DFB-CW QCL

.... Our products



(*2) The photo is HHL Mount C11709-01 mounting a HHL packaged QCL and a Aspheric ZnSe Lens Unit A11331-0xH.

(*3) One end of the cable for CW semiconductor laser that connects to the DC power supply is unterminated and so should be properly terminated by the user.

(*4) Connect to the cooling fan 2-pin red/black cord of the A11709-01.

· Products shown in photos are Hamamatsu products. Product names and part numbers are written in red.

· Prepare additional devices and cables separately.

CONNECTION EXAMPLE

DFB-Pulsed QCL (1)

- ① DFB-Pulsed QCL (L12014, L12015, L12016, L12017 series)
- ② TEC temperature controller C11330-02
- ③ TO-8 pulsed driver C11635 and/or C14277 series^{(*)1}
- ④ Aspheric ZnSe lens A11331-02 and/or lens unit A11331-02H^{(*)2}
- ⑤ Cable A11134-04
- ⑥ Heatseeker A10767^{(*)2}

DFB-Pulsed QCL (2)

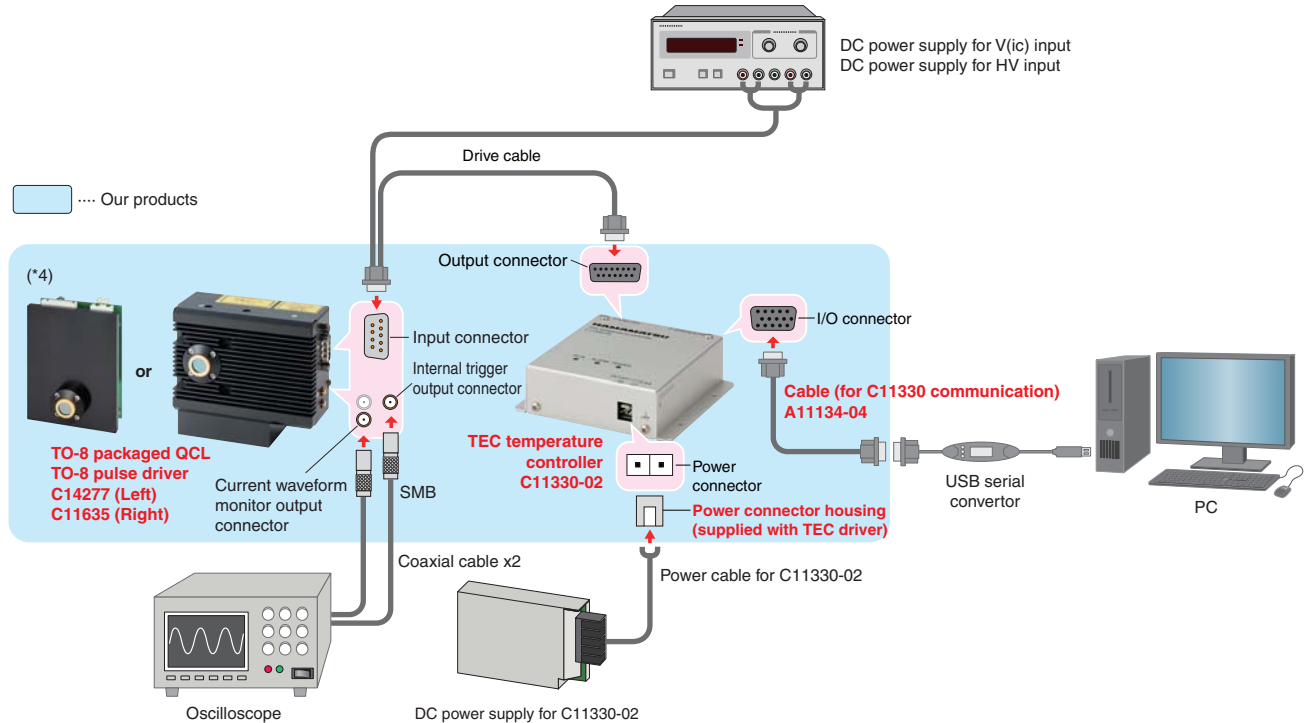
- ① DFB-Pulsed QCL (L12020 series)
- ② TEC temperature controller C11330-02
- ③ TO-8 pulsed driver C11635 and/or C14277 series
- ④ Aspheric ZnSe lens A11331-01 and/or lens unit A11331-01H^{(*)2}
- ⑤ Cable A11134-04
- ⑥ Heatseeker A10767^{(*)3}

(*)1 Aspheric ZnSe Lens Unit A11331-0xH is not adaptable to C14277 series.

(*)2 Select suitable lens based on the emission wavelength of the QCL to use.

(*)3 Might not be used depending on the drive conditions.

Connection example of DFB-Pulsed QCL



(*)4 The photo is TO-8 Pulse Driver C14277, C11635 mounted a TO-8 packaged QCL.

· Products shown in photos are Hamamatsu products. Product names and part numbers are written in red.

· Prepare other necessary devices and cables.

PERIPHERAL INSTRUMENTS AND ACCESSORIES

TEC temperature controller C11330 series



Peltier TEC (thermoelectric cooler) driver is used to control QCL temperature with high accuracy and high stability. Designed to be built into an instrument.

- Features**
- High accuracy, high stability
 - Temperature stability: 0.01 °C
 - TEC heatsink monitoring function
 - Bipolar output, digital PID control

Parameter		C11330-01	C11330-02	Unit
Applicable package		HHL	TO-8	—
TEC output ^{(*)1}	TEC control current	-8 to +8	-1.9 to +1.9	A
	Compliance voltage	24		V
Temperature sensor ^{(*)2}	Thermistor	NTC, 2 lines		—
	RTD sensor	3-line platinum temperature measurement resistance (Pt100)		—
Temperature control	Temperature control range (Thermistor/RTD)	-50 to +125 / -50 to +150		°C
	Setup resolution	0.01		°C
	Temperature stability	0.01 (Typ.)		°C
	Control frequency	0.1 to 100		s
		Control algorithm		Digital PID loop ^{(*)3}
Host interface		RS-232C, RS-422		—
Dimensions (W × H × D)		100 × 110 × 33		mm
Weight		0.3		kg

(*)1 Actual output depends on characteristics of the connected load (TEL module), input power supply voltage, and current.

(*)2 Thermistor and Pt100 cannot be used simultaneously; select one of them.

(*)3 Auto-tuning function can be set by the host interface.

* A power supply (DC 24V), power cable, output cable, communication cable (A11134-04), terminal for control are separately needed.

* This product can only be controlled via serial communication.

* When controlling through a PC which does not have any ports or terminal emulators for serial communication, use an USB serial converter of HPK's recommendation (Windows7 or later). Supplied with sample software. (Windows XP, 7 or later).

HHL Mount A11709 series



A11709-01 Forced air cooling



A11709-02 Water cooling

* Mounts shown in photos have HHL package QCL.

Cooling Unit for HHL packaged QCL. Two types of cooling, forced air and water, are available. An Aspheric ZnSe Lens Unit A11331-0xH can be mounted.

- Features**
- Two types of cooling (water, forced air) are available.
 - Easy to mount
 - Easily set on optical tables
 - Can be mounted to the lens unit A11331-0xH

Parameter	A11709-01	A11709-02	Unit
Cooling method	Forced air cooling	Water cooling	—
Maximum heat discharge power	Approx. 30 ^{(*)1}	Approx. 50 ^{(*)2}	W
Thermal resistance	Approx. 0.5 ^{(*)1}	Approx. 0.3 ^{(*)2}	°C/W
Applicable package	HHL		—
Operating temperature	0 to +40		°C
Dimensions (W × H × D)	68 × 82 × 117	60 × 103 × 50	mm
Weight	0.5	0.52	kg

(*)1 DC fan speed 7600 min⁻¹ at ambient temperature 25 °C

(*)2 Necessary flow rate and water temperature: 2000 cc/min. at 20 °C

TO-8 Pulse Driver C11635



* This photo is TO-8 Pulse Driver C11635 mounted a TO-8 packaged QCL.

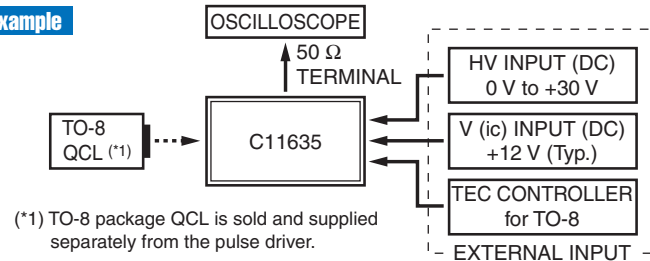
Pulsed QCL Driver for TO-8 packaged pulsed QCL. It outputs low noise pulsed current, and TO-8 packaged pulsed QCL can be mounted directly. An Aspheric ZnSe Lens Unit A11331-0xH can be mounted. Designed to be built into an instrument.

- Features**
- Mount TO-8 package QCL directly
 - Pulse width: 10 ns (Typ.)
 - Repetition frequency: <1 MHz
 - Low noise, high stability

Parameter		Symbol	Value	Unit
Output current	Pulsed current range	$I_{(pulse)}$	0 to 3	A
	Pulse width (Typ.)	P_w	10	ns
	Rise / fall time (Typ.)	T_r	5	ns
	Repetition frequency	—	Approx. 150 kHz to Approx. 1 MHz	—
	Duty ratio	DR	<5	%
Dimensions (W × H × D)		—	90 × 68 × 43	mm
Weight		—	0.3	kg

- * Can be mounted to aspheric lens unit A11331-0xH.
- * Repetition frequency up to 2 MHz
- * Pulse width down to 40 ns (repetition frequency < 500 kHz)
- * Pulse width up to 1000 ns (repetition frequency < 100 kHz)
- * External trigger operation by removing the oscillating board
- * External DC power supplies and a TEC temperature controller are user-supplied.
- * An oscilloscope is separately needed for observation of current output shape.
- * Bias source or TTL gate source should be separately prepared at the needs of usage.

Setup example



TO-8 Pulse Driver C14277 series



C14277-01



C14277-02

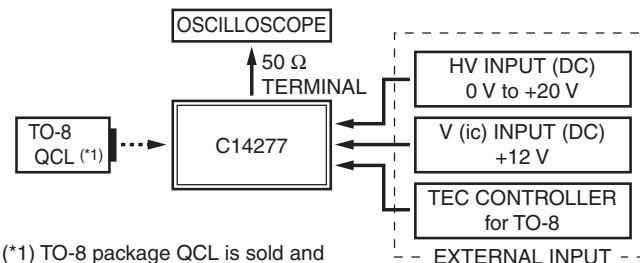
This TO-8 pulsed driver is exclusive use for pulsed QCL (TO-8 can package). This product is designed to be built into equipment and does not work solely. Two type of external and internal trigger are available.

Parameter		Symbol	C14277-01	C14277-02	Unit
Output current	Pulsed current range (*)	$I_{(pulse)}$	0 to 2.5 (*)	—	A
	Pulse width (*)	P_w	20 to 2000	—	ns
	Trigger mode	—	External trigger (*)	Internal trigger	—
	Repetition frequency (*)	f_r	10 to 1000	50 to 500	kHz
	Duty ratio (*)	DR	<5 (*)	—	%
Power supply voltage	V (ic) input	$V_{(ic)}$	DC12 (*)	—	V
	HV input	HV	DC0 to 20 (*)	—	V
Dimensions (W × H × D)		—	88 × 31.6 × 66	—	mm
Weight		—	0.13	—	kg

- (*) Pulsed output current needs to be controlled in the range which must not exceed the absolute maximum ratings of the pulsed QCL even momentarily.
- (*) The maximum amplitude of the pulsed output current depends on the electrical characteristics of pulsed QCL.
- (*) Rise edge. External trigger source is required.
- (*) Sufficient heat dissipation out of the driver circuit is required.
- (*) Operating voltage of driver circuit
- (*) Amplitude of the pulsed output current is controlled by HV input. The HV input needs to be controlled in the range which must not exceed the absolute maximum ratings of the pulsed QCL even momentarily.

* External DC power supplies and a TEC temperature controller are user-supplied.

Setup example



- * C14277-01 requires an external trigger.
- * Aspheric ZnSe Lens Unit A11331-0xH is not adaptable to C14277 series.

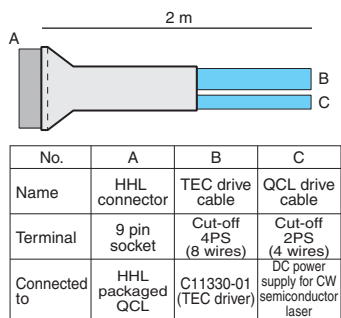


* The photo is TO-8 Pulse Driver C14277 mounted a TO-8 package QCL.

PERIPHERAL INSTRUMENTS AND ACCESSORIES

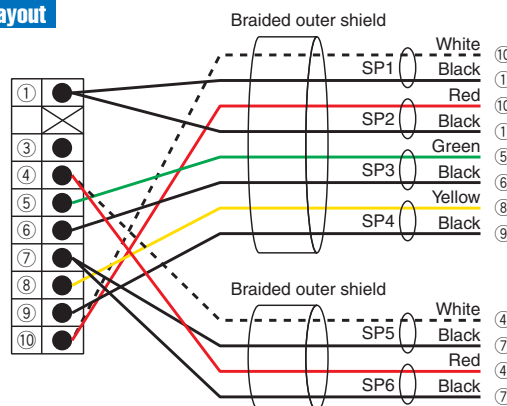
Cables

●Cable (for HHL socket) A11134-01



Terminals B and C are to be modified in accordance with the type of TEC and power supply.

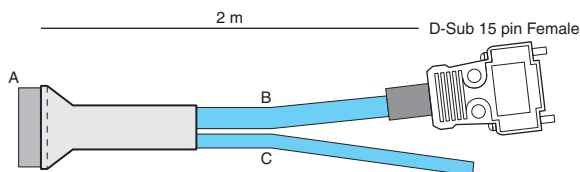
Pin layout



●Cable (for HHL socket) A11134-05

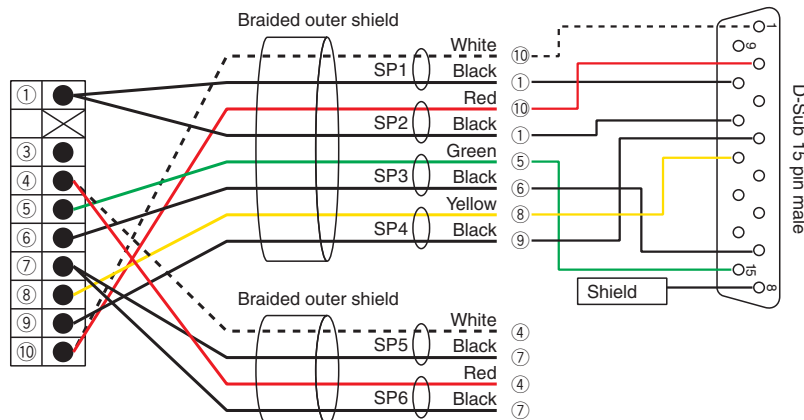


The B terminal connects to TEC Driver C11330-01. The C terminal is to be connected to Power Supply for laser.



No.	A	B	C
Name	HHL connector	TEC drive cable	QCL drive cable
Terminal	9 pin socket	D-sub 15 pin (male)	Cut-off 2PS (4 wires)
Connected to	HHL packaged QCL	C11330-01 (TEC driver)	DC power supply for CW semiconductor laser

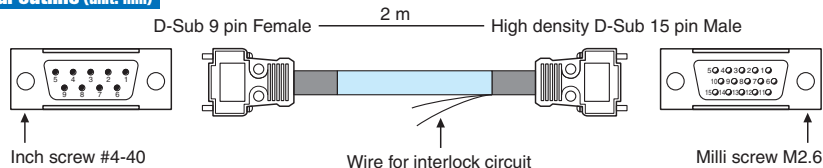
Dimensional outline (unit: mm)



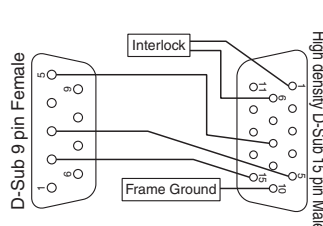
●Cable (for C11330 communication) A11134-04



Dimensional outline (unit: mm)



PC Side	
D-Sub 9 pin layout	
Pin No.	Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



C11330 Side	
High density D-Sub 15 pin layout	
Pin No.	Signal
1	INTERLOCK
2	ALARM
3	RS-422 Rx+
4	RS-422 Tx+
5	RS-232C Rx
6	GND
7	GND
8	GND
9	GND
10	Frame Ground
11	START
12	STABLE
13	RS-422 Rx-
14	RS-422 Tx-
15	RS-232C Tx

■ Lens / Lens Unit

Aspheric ZnSe lens designed for QCLs can be installed into Lens Unit A11331-0xH. The A11331-0xH series can be mounted onto HHL Mount A11709 series and TO-8 Pulsed Driver C11635. The A11331-0x series can also be used separately.

● Aspheric ZnSe Lens A11331-0x



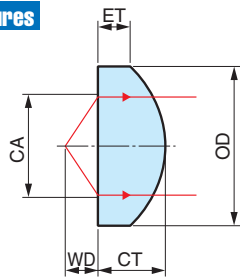
* When using the lens by itself, a lens holder is required.

Parameter	Symbol	A11331-01	A11331-02	Unit
Primary design wavelength	λ	8	5	μm
Numerical aperture (NA)	NA	0.78		—
Effective diameter	CA	10		mm
Actual focal distance	EFL	4.8		mm
Working distance	WD	3.0		mm
Periphery	OD	14.9 to 15.0		mm
Center thickness	CT	6.4 ± 0.2	6.3 ± 0.2	mm
Edge thickness	ET	3		mm
Material	—	ZnSe		—
Refractive index	n	2.417 at 8 μm		—
AR coating	—	BBAR, T (ave)>97 % ^(*)	BBAR, T (ave)>96 % ^(*)	—
Weight	—	5		g

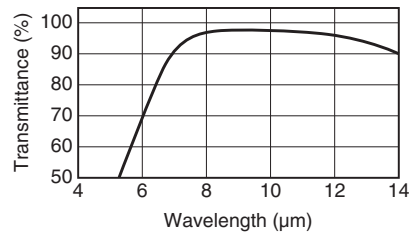
(*) T (ave): Average transmittance at 8 μm - 12 μm wavelengths

(*) T (ave): Average transmittance at 4 μm - 8 μm wavelengths

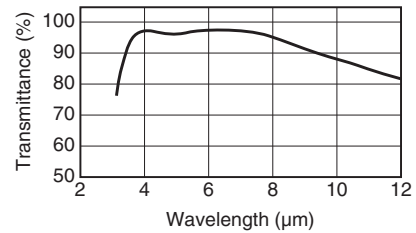
Features



A11331-01
BBAR / 8 μm to 12 μm



A11331-02
BBAR / 4 μm to 8 μm



● Aspheric ZnSe Lens Unit A11331-0xH



Parameter		Value
Lens mounting unit	Applicable lens	A11331-01 or A11331-02
XYZ translator	X/Y movable range	± 1 mm

x in the suffix of the part number indicates the type of embedded lens.

Usage example

A11331-0xH can be mounted on HHL Mount A11709 series and TO-8 Pulse Driver C11635.



Mounted on A11709-01

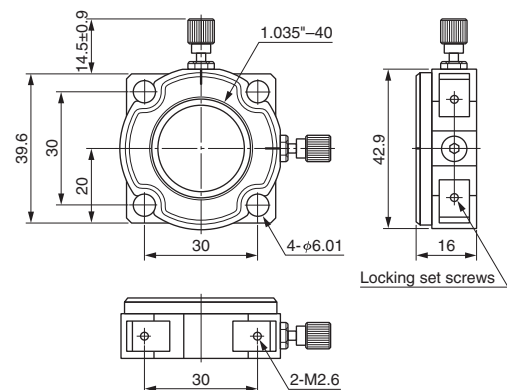
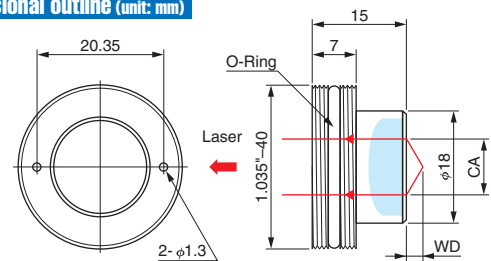


Mounted on A11709-02



Mounted on C11635

Dimensional outline (unit: mm)



PERIPHERAL INSTRUMENTS AND ACCESSORIES

■Heatseeker A10767



Heatseeker A10767 consists of 2 types of thermal viewing card and an alignment target. It can be used for visualization and alignment of the QCL laser beam.

Thermal Viewing Card

Thermal material provides visibility of the invisible IR laser beam and facilitates tracing of the beam. Two cards with different sensitivity ranges are provided.

Alignment Target

The light axis of the invisible IR laser beam can be easily aligned. Includes a cross target for checking the light axis. Thermal viewing card can be inserted.

Parameter	Description / value	Unit
Detectable temperature range	Thermal viewing card #01	18 to 32 °C
	Thermal viewing card #02	30 to 35 °C
Usable wavelength range	1.0 to 20	μm
Power required for visibility (*1)	>3	mW/mm ²
Damage threshold (Max. power density)	20	mW/mm ²
Maximum aperture	φ30	mm
Storage temperature	-5 to +60 (No condensation)	°C
Dimensions (W × H × D)	50 × 100 × φ12	mm

(*1) Average power density

Dimensional outline (unit: mm)

