

Hitachi Plastic Mini-DIL Application Note

HITACHI

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Hitachi

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Safety Considerations

Be sure to avoid direct exposure of human eyes to high power laser beams emitted from laser diodes. Even though barely visible and/or invisible to the human eye, they can be quite harmful. In particular, avoid looking directly into a laser diode or collimated beam along its optical axis when the diode is activated. One simple way to determine the optical path is to use a phosphor plate or infrared sensitive camera.

Hitachi certifies compliance with US Safety Regulations (21 CFR Subchapter J) on laser products, as stipulated by the U.S. Department of Health and Human Services. The Hitachi products shown here correspond to the category "CLASS IIb LASER PRODUCT" in this regulation.

 "VISIBLE AND/OR INVISIBLE LASER RADIATION - AVOID DIRECT EXPOSURE TO BEAM" PEAK POWER 60 mW WAVELENGTH 625 ~ 1600 nm "CLASS IIb LASER PRODUCT" This product conforms to FDA regulations 21 CFR Chapter 1, Subchapter J. AVOID EXPOSURE : Visible and/or invisible laser radiation is emitted from glass window, fiber pigtail end or laser chip mounted on top of header. Before use, consult appropriate catalogs or manuals. LASER SAFETY This laser device in operation produces visible and/or invisible laser radiation which may be harmful to the human eye. Avoid directly looking into the device or the collimated beam along its optical axis when the device is in operation. MANUFACTURED BY: Hitachi, Ltd. Semiconductor and I.C. Division Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, JAPAN Tel : +81-3-3270-2111 USER INSTRUCTIONS: Be sure to avoid direct exposure of human eyes to high power laser beams emitted from laser diodes. Even though barely visible and/or invisible to the human eye, they can be quite harmful. In particular, avoid looking directly into a laser diode or collimated beam along its optical axis when the diode is activated. One simple way to determine the optical path is to use a phosphor plate or infrared sensitive camera. These devices are components to be used in producing complete laser systems. They do not emit radiation unless combined by the end user with other components. Please consult the Opto Data Book for some of the possible uses of these devices. Because of the small size of the device, the required labels and these instructions are provided in this insert rather than printed on the device.
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Cautions

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1. The laser light is harmful to human body especially to eye no matter what directly or indirectly. The laser beam shall be observed or adjusted through infrared camera or equivalent.

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Section 1 Introduction

The non-hermetic plastic Mini-DIL was developed in collaboration with Nortel Networks. The pin connections conform to an agreement between Nortel, Lucent and Hitachi. The key technologies used are very accurate laser diode die bonding technology on the V-grooved Si substrate, very stable fiber attachment technology for the V-groove, and design technology that ensures high reliability of optical semiconductors in a humid environment. As the result of these combined technologies, the plastic Mini-DIL has achieved a level of reliability that meets the Bellcore 468 CORE standard even though it is non-hermetic. The first product in the plastic Mini-DIL family is the HL1328DJS, a 0.2 mW 1310 nm Fabry Perot type laser diode. A model with higher optical output, and receivers for 155 Mbps or 622 Mbps, will follow in the near future.

Section 2 HL1328DJS Description

The HL1328DJS is a 1310 nm InGaAsP Fabry Perot laser diode with a multi-quantum well (MQW) structure. It is suitable as a light source in 155 Mbps or 622 Mbps short haul fiberoptic communication systems and other types of optical equipment. The package is a non-hermetic plastic Mini-DIL type, attached the single-mode fiber terminated SC type connector. A built in photodiode provides an optical output monitor current. The major specifications are listed below. Details are given in the latest individual Datasheet and the Hitachi Optodevice Data Book (document numbers are ADE-208-673(Z) and ADE-408-001H respectively), available from, your nearest Hitachi sales channel (see Section 5).

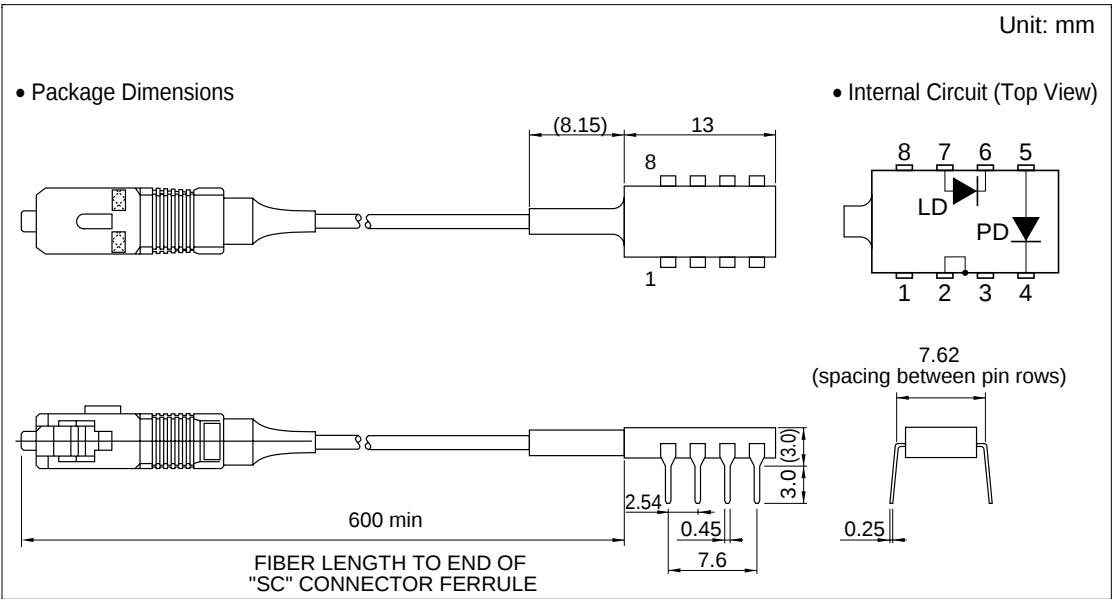
2.1 Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Value	Unit
LD forward current	$I_{F(LD)}$	$I_{th} + 60$	mA
PD reverse voltage	$V_{R(PD)}$	20	V
Operating temperature	Topr	−40 to +85	°C
Storage temperature	Tstg	−40 to +85	°C

2.2 Optical and Electrical Characteristics (Ta = −40°C to +85°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Threshold current	I_{th}	—	—	20	mA	Ta = 25°C
		—	—	40		Ta = 85°C
Optical output power	Pf	0.2	—	—	mW	Kink free
Slope efficiency	η_s	0.008	—	0.025	mW/mA	Ta = 25°C
		0.004	—	—		Ta = 85°C
Wavelength	λ_c	1260	—	1360	nm	Pf = 0.2 mW, RMS
Monitor current	I_s	200	—	—	mA	Pf = 0.2 mW, $V_{R(PD)} = 5$ V
PD dark current	I_{DARK}	—	—	200	nA	$V_{R(PD)} = 5$ V, Ta = 85°C

2.3 Package Outline



The products listed below will also be available soon. Please contact your nearest Hitachi sales office for details.

Part No.	Description
HL1336DJS	1.3 μ m FP-LD 1.4 mW for 155/622 Mbps
HR1155PAS	Single ended Pin-Amp. receiver for 1.3 μ m 155 Mbps
HR1156PAS	Single ended Pin-Amp. receiver for 1.3 μ m 622 Mbps
HR1157PAS	Differential ended Pin-Amp. receiver for 1.3 μ m 155 Mbps
HR1158PAS	Differential ended Pin-Amp. receiver for 1.3 μ m 622 Mbps

Section 3 HL1328DJS Reliability

The reliability of the HL1328DJS has been confirmed through extensive testing. Some of the results are given here to demonstrate the effectiveness of the key technologies mentioned in section 1.

3.1 Fiber Pulling Test

A 1 kg pulling force was applied 3 times, for 5 seconds each time, to 11 samples. The change in slope efficiency and monitor current was negligible small for all 11 samples.

3.2 Temperature Cycle Test

Rapid temperature cycle test results have shown good stability up to 2,000 cycles. Figure 1 below shows the results for 22 samples over the temperature range -40°C to $+85^{\circ}\text{C}$ (Mil STD 883D1010.7).

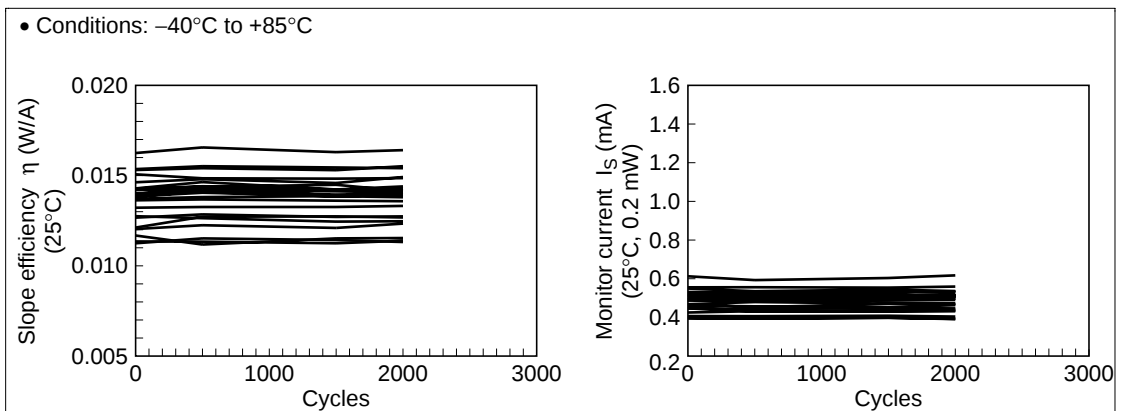


Figure 1 Temperature Cycle Test Result

3.3 Damp Heat Test

The damp heat test is a key item for confirming reliability in humid conditions. In this case the lower bias condition of the laser diode is more stringent than the normal operating bias condition. Moisture could reach the vicinity of the light emitting area since its local temperature in this condition is much lower than with the normal operating bias, from the stand point of power dissipation. A damp heat test was therefore conducted with subthreshold current biased operation under conditions of 85°C ambient temperature and 85% relative humidity. Figure 2 shows the results for 25 samples. The forward current, monitor current, and photodiode dark current are highly stable up to 2,000 h.

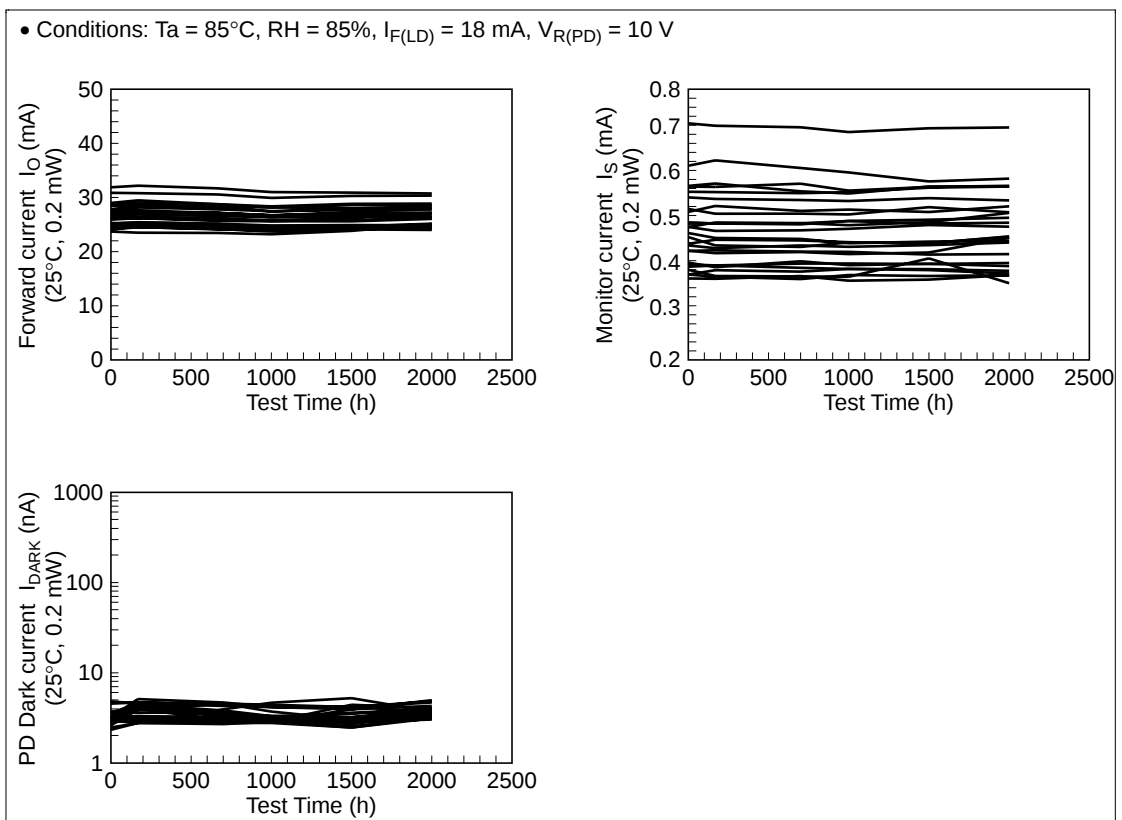


Figure 2 Damp Heat Test Result

3.4 Popcorn Test

To confirm the fiber fixing stability, a popcorn test was performed on 9 devices. Twenty rapid temperature cycles of -40°C to $+85^{\circ}\text{C}$ were followed by 72 hours of unbiased storage at 85°C and 85% RH. The devices were then dipped in 260°C solder for 10 seconds. Figure 3 shows the results of the popcorn test, confirming that the change in slope efficiency and monitor current was very small.

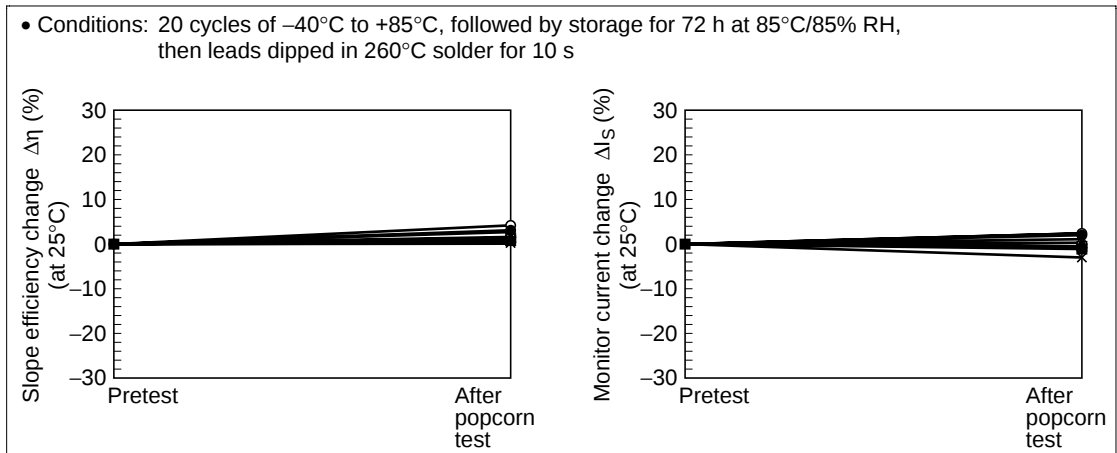


Figure 3 Popcorn Test Result

Our qualification test results, including those of other tests not described here, show that the HL1328DJS non-hermetic plastic Mini-DIL will meet requirements for use in uncontrolled and remote environments as defined in Bellcore 468-CORE.

Section 4 Surface-Mount DIL Socket Connector

The plastic Mini-DIL devices are fitted with a fiber pigtail. Therefore, the device is not suitable for SMT (surface-mount) processing. To allow mounting on a PCB, a surface mount DIL Socket Connector for Mini-DIL has been developed with Tyco Electronics. Figure 4 shows the Tyco Surface Mount DIL Socket Connector features. The contact lead frames are first attached to the PCB, either by machine or manually, and then reflow-soldered. Finally, the Mini-DIL is manually inserted into the socket. The socket is suitable for applications up to 622 Mbps. Details of the Tyco socket are available from the address below.

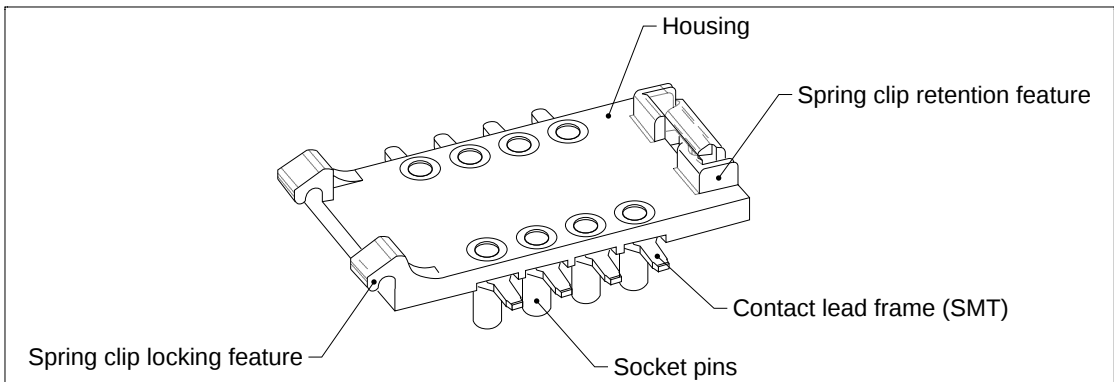


Figure 4 Tyco Surface Mount DIL Socket Connector

For more information of Tyco Surface Mount DIL Socket

- Reference Part Number : 699 722-1
- Product Code : 1530
- Application Specification Number : 114-3209
- Contact Address : Tyco Electronics UK Ltd,
Merrion Avenue, Stanmore
Middlesex, HA7 4RS UK
Phone (+44) 0208 954 2356
Fax (+44) 0208 954 6234

Section 5 Handling Precautions

1. Although the laser diode and photodiode in the HL1328DJS have been confirmed to have an ESD tolerance level of more than 500 V (100 pF, 1.5 k Ω), human bodies, work benches and equipment coming into contact with the device should be grounded. Transportation trays or jigs should be made of appropriate materials from the stand point of ESD potential.
2. Although the HL1328DJS has been confirmed to be tolerant of humid environments, it is recommended that the device be stored in a dry environment such as a dry nitrogen box.
3. Do not apply excessive stress between the package (body) and fiber, as this may cause fiber breakage or detachment and degradation of optical output power.
4. Do not bend the fiber with less than a 30 mm radius, as this may cause characteristic degradation.
5. Do not apply excessive stress by bending or pulling the pins, as this may cause mechanical damage to the package.
6. Do not process or deform the package.
7. Do not store the device in a chemical atmosphere such as Cl₂, H₂S or SO₂ gas, as this may cause lead frame deterioration.

Section 6 Hitachi Sales Offices

Please contact your nearest Hitachi sales office for more detail information.

- Japan : Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2 Ohte-machi,
Chiyoda-ku, Tokyo 100-0004 Japan
Tel: 81-3-3270-2111
- US and Canada : Hitachi Semiconductor (America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel : 1-408-433-1990
- Europe : Hitachi Europe GmbH
Electronic components Group
Dorhacher Straße 3
D-85622 Feldkirchen, Munich Germany
Tel: 49-89-180175
- Asia : Hitachi Asia Ltd.
16 Collyer Quay #20-00 Hitachi Tower
Singapore 049318
Tel : 65-535-2100

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