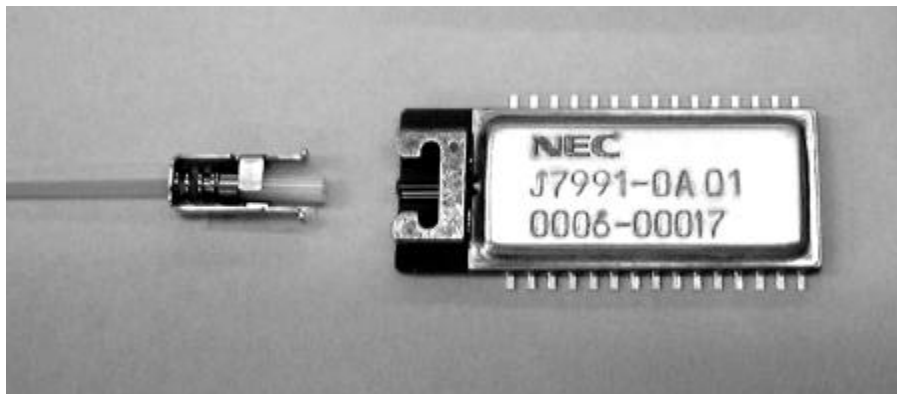


***OE HYBRID***  
***2.48832 Gbps Receiver***

**OD-J7991-HA01**  
**OC-48 LR-1, LR-2, LR-3**  
**STM-16 L-16. 1, L-16. 2, L-16.3**



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## 1. Product number

<b>Specifications</b>	<b>Product number</b>
SONET OC-48 LR-1, LR-2, LR-3 ITU-T G.957 L-16.1, L-16.2, L-16.3	OD-J7991-HA01

Pigtail fiber code is not included with the above product. Pigtail fiber code has to be separately ordered. The applicable pigtail fiber cords are listed below.

<b>Connector type</b>	<b>Fiber code length</b>	<b>Product number</b>
SC	51 to 55 cm	OD-S524-SCFPC-SM
FC		OD-S524-FCFPC-SM
MUJ		OD-S524-MUJFPC-SM

Refer to section 8.(6) of this manual for pigtail attachment to the receiver.

## 2. Specifications

### (1) Absolute Maximum Ratings

Parameters	Specifications		Notes
	Min.	Max.	
Power supply voltage (Vcc)	0 V	+4.0 V	
Storage temperature	- 40 deg. C	+ 85 deg. C	
Optical input power	-6 dBm (average)		

Stresses beyond these listed parameters may cause permanent damage to the device.

### (2) Environmental Conditions

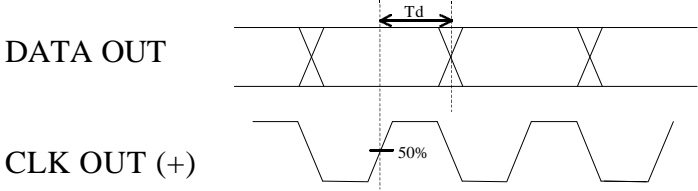
Items	Specifications	Notes
Bit rate	2488.32 Mbps	
Data format	Scrambled NRZ	
Transmission cable	Single mode fiber	
Operating temperature	-40 to + 85 deg. C.	Case temperature
Power supply voltage	+3.3V ±5%	
Power consumption	0.6 W typical	25 degree C., +3.3V
	0.9W maximum	85 degree C., +3.46V
Package size	10 mm x 26 mm x 3 mm	Refer to section 5.

### (3) Optical Signal Interface Specifications

Items	Specifications		Notes
	Min.	Max.	
Maximum sensitivity	---	-28 dBm	
Minimum over load	-8 dBm	---	
Bit Error Rate	$1 \times 10^{-10}$ , PRBS <sup>23</sup> -1		
Optical input wavelength	1310nm band 1550nm band		
Optical signal polarity	Positive logic		In case emission of light: Logic "1"

#### (4) Electrical Interface Specifications

##### 4.1 Data and clock signal

Items	Specifications		Notes
Output level	VOH	VCC – 1.085 V to VCC – 0.880 V	
	VOL	VCC – 1.830 V to VCC – 1.620 V	
Output waveform and phase	 <p>DATA OUT</p> <p>CLK OUT (+)</p> <p>tr, tf of DATA &lt; 200 ps tr, tf of CLK is &lt; 150 ps</p> <p>Phase shift between DATA and CLK (+): Td = 110 ps to 290 ps</p> <p>DATA duty: 100 % ±10% CLK duty: 50 % ±5%</p> <p>(Note: (+) means positive side signal)</p>		RL=50 Ohms, Output  tr, tf is specified for 20 to 80% of amplitude.

##### 4.2 Alarm output (LOS) without rapid LOS detection circuit\*

Items	Specifications		Notes
Output level	VOH	2.4 V to VCC	
	VOL	GND to 0.5 V	
Status	“H” while alarm detected “L” while alarm not detected		
Assert time	2.3 us to 2.0 ms		without rapid LOS detection circuit
Fan-out	IOH	10 uA	without rapid LOS detection circuit
	IOL	-10 uA	

\*Refer to section 6.

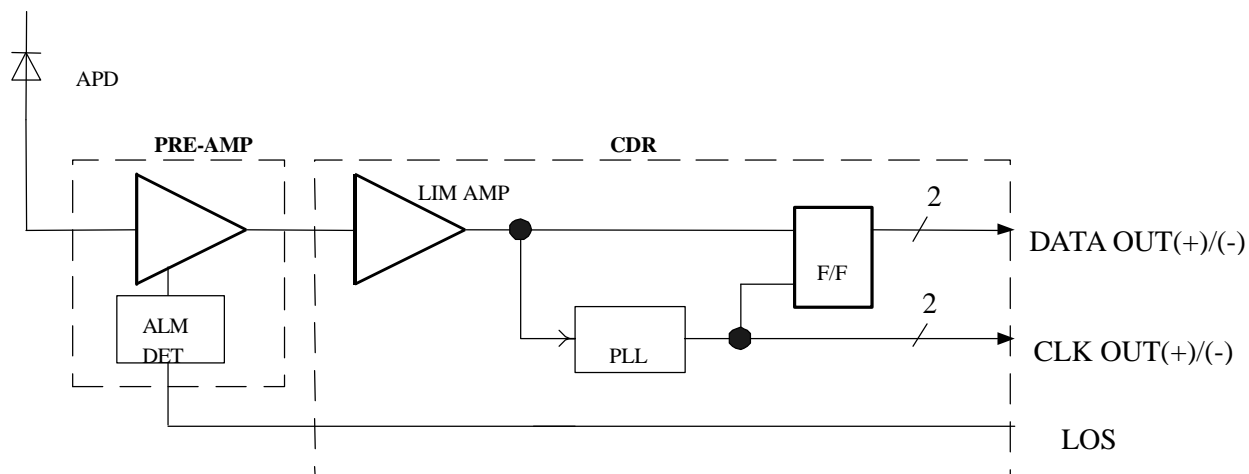
##### 4.3 Alarm output (LOS) with rapid LOS detection circuit \*

Items	Specifications		Notes
Output level	VOH	2.4 V to VCC	
	VOL	GND to 0.5 V	
Status	“H” while alarm detected “L” while alarm not detected		
Assert time	2.3 us to 100 us		with rapid LOS detection circuit
Fan-out	IOH	2.1 mA	with rapid LOS detection circuit
	IOL	-0.2 mA	

\*Refer to section 6.

## 3. Functional Block Diagram

### (1) Functional Block Diagram



APD: InGaAs APD  
 PRE-AMP: I / V converter  
 LIM AMP: Limiting Amplifier  
 PLL: Phase locked loop  
 F/F: Flip-flop  
 ALM DET: Alarm detector  
 CDR IC: Clock and data recovery IC

### (2) Alarm Control Signal Function

Symbol	Items	Function
LOS	Loss of optical input signal	Activated while optical input signal is lost.

#### 4. Reliability

(The reliability of J7991 was confirmed by means of the reliability test of the other product made by the same manufacturing process as this product.)

##### (1) FIT Number

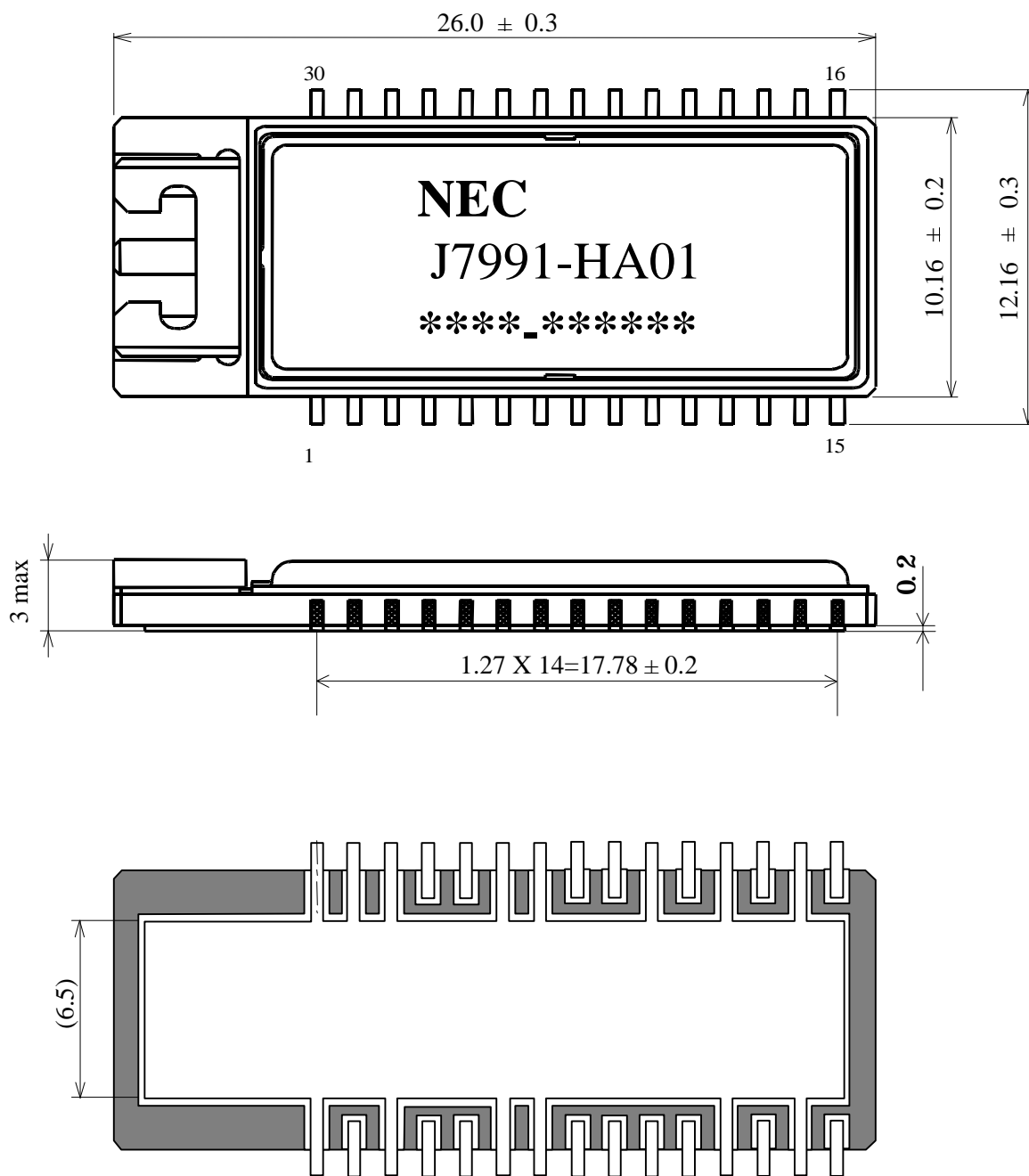
\*\*\* FIT at 45 degree C

##### (2) Reliability Test Items and Conditions

<b>Items</b>	<b>Conditions</b>
Accelerated aging	85 degree C., 3.465 V, 3000 hours
Temperature cycle	-40 to 85 degree C., 4 H/cycle, 500 cycles
Damp heat	85 degree C., 85%RH, 500 hours
Vibration	10 to 55 Hz, 1.5 mm, x, y, z each direction, an hour
Mechanical shock	50 G, 11 ms, x, y, z each direction, 3times
Thermal shock	0 and 100 degree C. in water, 5 min. each, 20 cycles
Low temperature storage	-40 degree C., 2000 hours

## 5. Package size, Pin Assignment

### (1) Outline diagram, Pin layout



(Unit in mm)

(Note) Product name description is given below:

NEC : Maker name

J7991-0A01: Product number

\*\*\*\*\_\*\*\*\*\*: Production year/month-serial no.

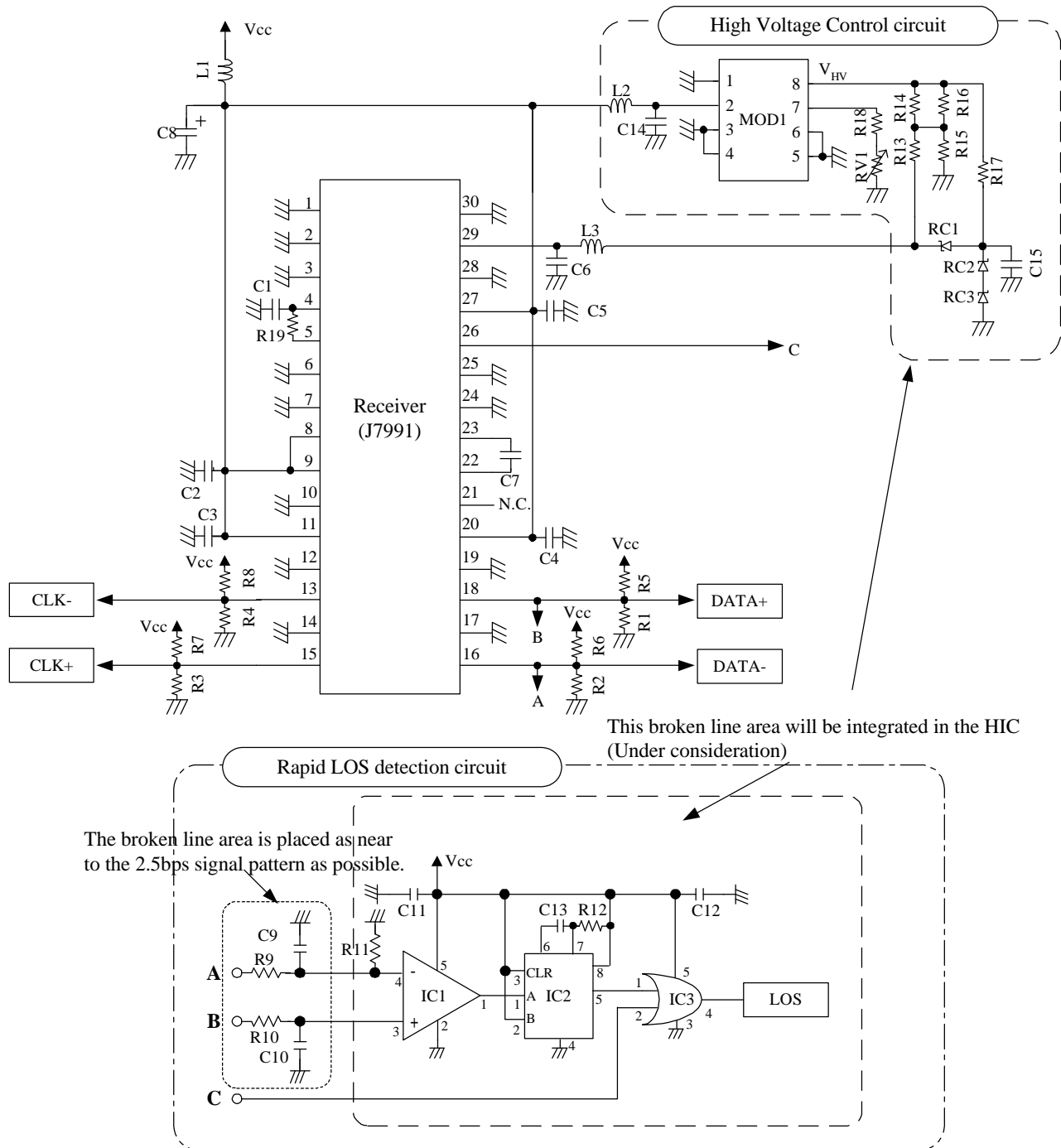


(2) Pin Assignment

Pin No.	Symbol	I/O	Notes
1	GND	I	Ground
2	GND	I	
3	GND	I	
4	EXTC	---	Connect a 0.1uF capacitor between EXTC and GND
5	N.C.	---	
6	GND	I	
7	GND	I	
8	VCC	I	+3.3 V
9	VCC	I	+3.3 V
10	GND	I	
11	VCC	I	+3.3 V
12	GND	I	
13	CLK(-)	O	Negative clock signal output.
14	GND	I	
15	CLK(+)	O	Positive clock signal output.
16	DATA(-)	O	Negative data signal output.
17	GND	I	
18	DATA(+)	O	Positive data signal output.
19	GND	I	
20	VCC	I	+3.3 V
21	N.C.	---	No connection. Leave open.
22	FIL(+)	---	Connect a 1.0uF capacitor between FIL(+) and FIL(-)
23	FIL(-)	---	
24	GND	I	
25	GND	I	
26	LOS	O	Loss of signal alarm output.
27	VCC	I	+3.3 V
28	GND	I	
29	Vpd	I	Power supply for APD.
30	GND	I	

I: input terminal, O: output terminal

## 6. Recommended peripheral circuit



Note: Termination resistors (R1-8) should be placed as near to the latter IC as possible.

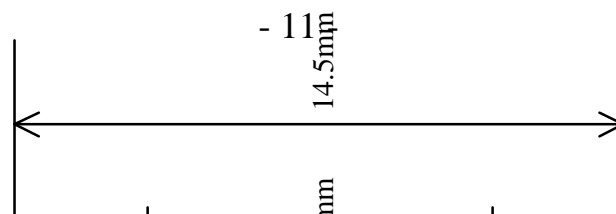
\* Please refer to the Peripheral circuit parts list on the next page, for detail.

## Peripheral circuit part list

Symbol	Description	Note
L1	10 $\mu$ H, Murata LQH4C100K04	
L2	10 $\mu$ H, NL252018T-100J etc.	
L3	68nH $\pm$ 2%, SUSUMU CO., LTD TFL0816-68N etc.	
C1-5	0.1 $\mu$ F + 80 % / - 20 % , 10V Ceramic capacitor	
C6	0.01 $\mu$ F $\pm$ 20 % , 200V Ceramic capacitor	
C7	1 $\mu$ F $\pm$ 20 % , 10V Ceramic capacitor	
C8	100 $\mu$ F $\pm$ 20 % , 10V Tantalum capacitor	
C9,10	1000pF $\pm$ 20 % , 10V Ceramic capacitor	
C11,12	0.1 $\mu$ F + 80 % / - 20 % , 10V Ceramic capacitor	
C13	0.01 $\mu$ F $\pm$ 20 % , 10V Ceramic capacitor	
C14	10 $\mu$ F $\pm$ 20 % , 10V Tantalum capacitor	
C15	0.01 $\mu$ F $\pm$ 20 % , 200V Ceramic capacitor	
R1-4	82 $\Omega$ $\pm$ 5 % , 1/10 W	
R5-8	130 $\Omega$ $\pm$ 5 % , 1/10W	
R9,10	10k $\Omega$ $\pm$ 5 % , 1/16W	
R11	47k $\Omega$ $\pm$ 5 % , 1/16W	
R12	300k $\Omega$ $\pm$ 5 % , 1/16W	
R13	300k $\Omega$ $\pm$ 5 % , 1/16W	
R14	100k $\Omega$ $\pm$ 5 % , 1/16W	
R15	200k $\Omega$ $\pm$ 5 % , 1/16W	
R16	THERMISTOR 100k $\Omega$ $\pm$ 3% , B=4100 $\pm$ 3% , 1/16W Tama Electric Co., Ltd. NTCC16Y104H410H etc.	
R17	33k $\Omega$ $\pm$ 5 % , 1/16W	
R18	51k $\Omega$ $\pm$ 5% , 1/16W	
R19	4.7k $\Omega$ $\pm$ 5 % , 1/16W	
RV1	Variable Resistor 1M $\Omega$ $\pm$ 5%	
RC1,2	33V Sneer Diode, NEC RD47S	
RC3	7.5V Zener Diode, NEC RD6.2S	
MOD1	HV module, TDK CE-0925	
IC1	MAX4250EUK-T, MAXIM	
IC2	TC7WH123FK, Toshiba	
IC3	SN74AHC1G32, TI	

About RV1 adjustment

- The RV1 adjustment data is attached to the product.



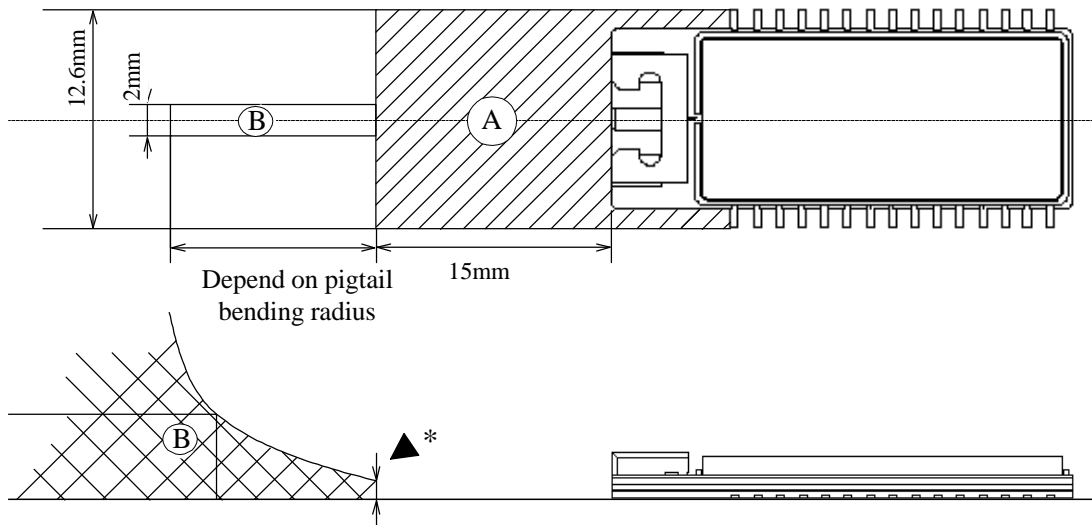
23<sup>rd</sup> March 2001  
Preliminary

7. Pad layout, pattern layout

Unit in [mm]

## 8. Recommended Mounting Conditions

### (1) Mount prohibit area

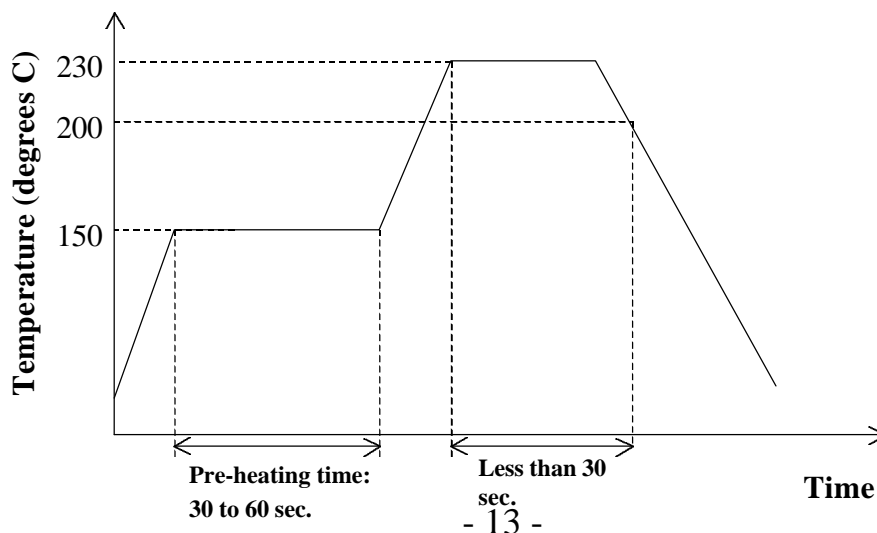


### Un-mountable Area

- 1) "A" is necessary space for the pigtail-connecting tool. Keep this area empty. (12.6mm x 15.0mm)
- 2) "B" is space for pigtail cord; keep the bending radius of pigtail cord more than 30mm.
- 3) Start bending pigtail cord after "\*" this point.

### (2) Re-flow Soldering Conditions

- 1) More than 200 deg. C – less than 30 sec., max. 230 deg. C
- 2) Pre-heating time at 150 deg. C is not specified particularly (depends on PCB). Typically 30 to 60 sec.
- 3) Temperature rise and fall should be 2 to 5 deg. C/ sec.



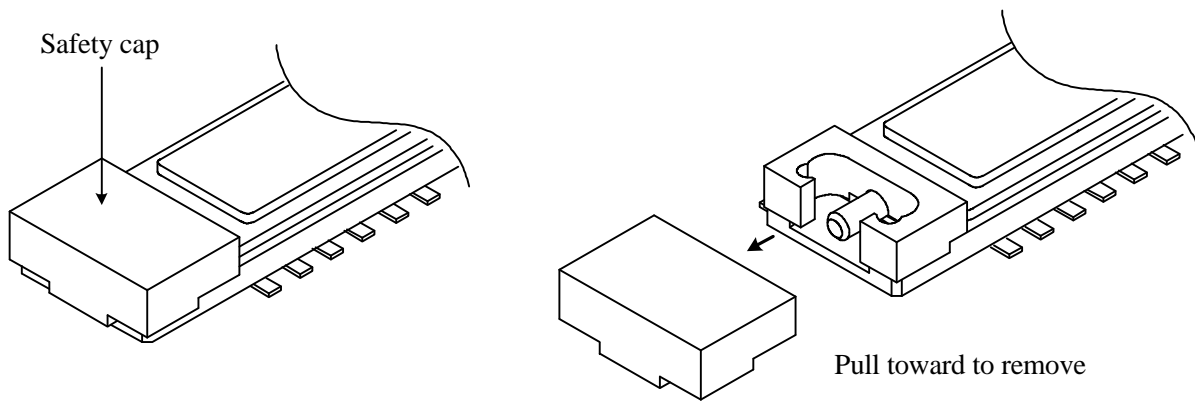
### (3) Solvent Cleaning

Solvent Cleaning is not recommended.

### (4) Mounting Precautions

Do not remove safety cap over the ferrule at the time of re-flow soldering.

Remove safety cap over the ferrule only after re-flow soldering.



Safety cap mounted position

Safety cap removed position

Do not reform or deform the product.

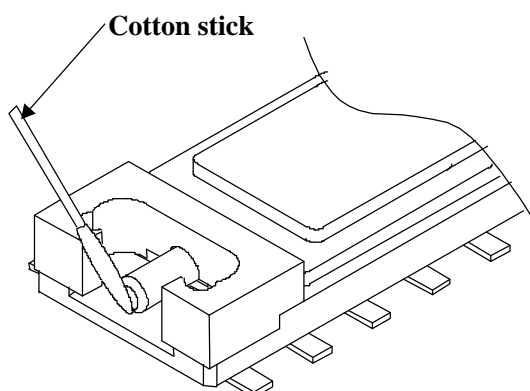
### (5) De-soldering from the Printed Board

The product performance is not guaranteed in case of de-soldering from a printed circuit board. But if it is necessary to de-solder, first detach pigtail. Pigtail can be re-used.

## (6) Pigtail Attachment

Pigtail can be attached after soldering the product on printed board.  
Pay attention to following points while attaching a pigtail:

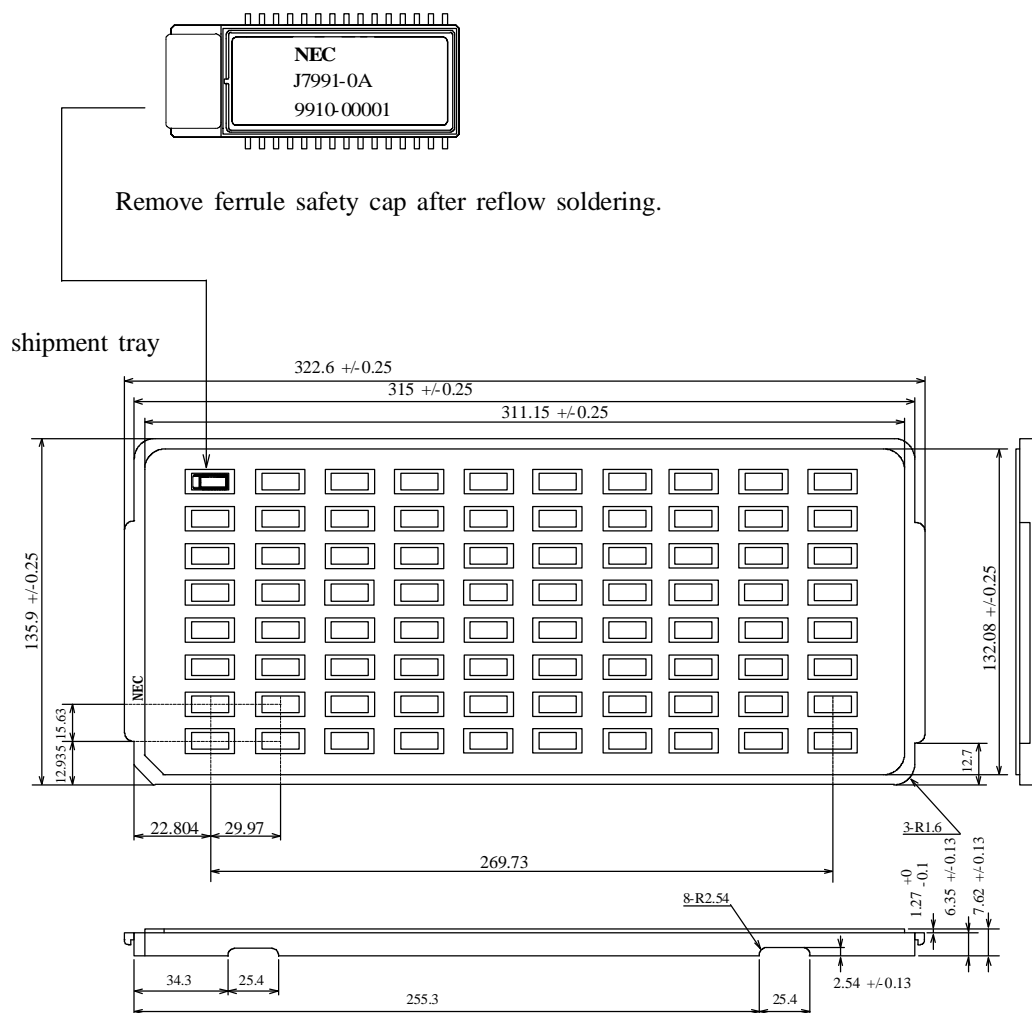
1. To attach pigtail use pigtail attach / detach tool specially designed for it.
2. Refer to instruction manual of pigtail attach / detach tool for details. (Supplied separately)
3. Clean the ferrule face by a cotton stick before attaching a pigtail. (Refer to the figure below)
4. Ferrule may be broken upon applying excess strength and its characteristics may be changed. Do not stretch or bend pigtail cord more than specified values. Recommended value for stretch is less than 200gf and bending radius should be more than 30 mm.



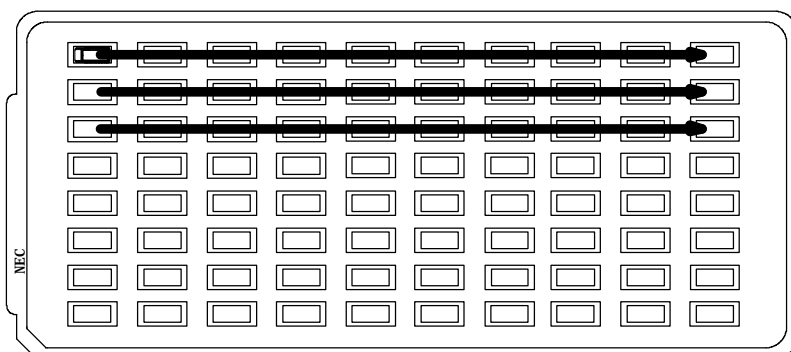
### Recommended cotton stick

Maker	NTT - ME
Product name	CLETOP stick type
Product Number	14100400

## (7) Shipment Packing



### Tray Packaging





## 9. Application Precautions

- (1) In this product, optical parts are mounted on a ceramic package. Mechanical shocks due to falling could lead permanent damage to the product.
- (2) The product's performance given in this manual is guaranteed for correct applications only. In case of incorrect usage product performance are not guaranteed.
- (3) Sudden heating and sudden cooling by dryer and cooling spray could lead permanent damage to the product. The product may not operate correctly while sudden heating and/or sudden cooling.
- (4) This product should be handled as a CMOS product.