Please read CAUTION and Notice in this catalog for safety. This catalog has only typical specifications. Therefore you are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.

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Chip Multilayer Delay Lines
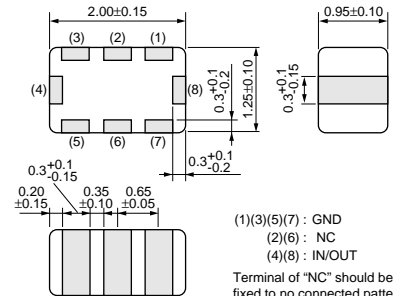
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Chip Multilayer Delay Lines

This Delay Line is developed by applying ceramic multilayering and via hole technology. It consists of copper line and low dielectric constant material and incorporates metal shields. LDH series are very small and match up uses at high frequency.

■ Features
1. High stability at high frequency (2GHz).
2. Small, thin and light, utilizing multilayer construction.
3. Metal shield is built inside chip.
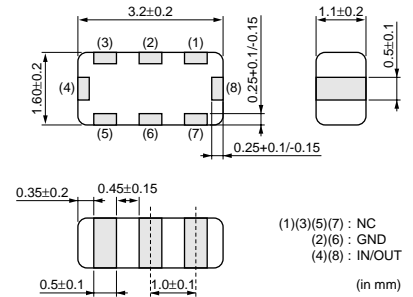4. Reflow solderable.
5. Supplied on tape.

LDH21 Series

(1)(3)(5)(7) : GND
(2)(6) : NC
(4)(8) : IN/OUT

Terminal of "NC" should be fixed to no connected pattern.

All the technical data and Information contained herein are subject to change without prior notice. (in mm)

LDH31 Series

(1)(3)(5)(7) : NC
(2)(6) : GND
(4)(8) : IN/OUT

(in mm)

Terminal of "NC" should not be fixed to any pattern.
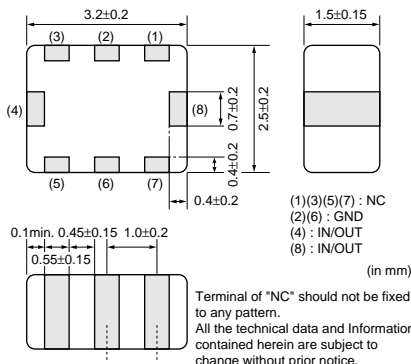
All the technical data and Information contained herein are subject to change without prior notice.

LDH32 Series

(1)(3)(5)(7) : NC
(2)(6) : GND
(4) : IN/OUT
(8) : IN/OUT

(in mm)

Terminal of "NC" should not be fixed to any pattern.
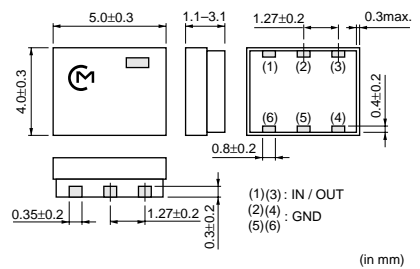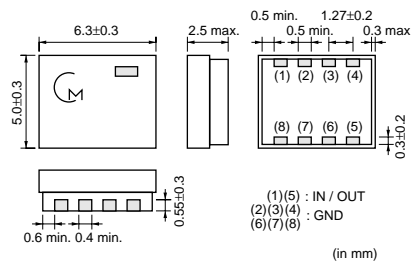All the technical data and Information contained herein are subject to change without prior notice.

LDH54 Series

(1)(3) : IN / OUT
(2)(4) : GND
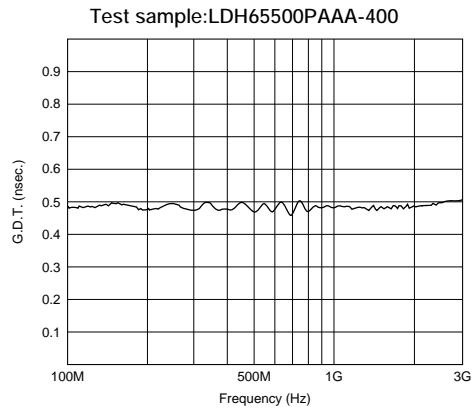(5)(6)

(in mm)

LDH65 Series

(1)(5) : IN / OUT
(2)(3)(4) : GND
(6)(7)(8)

(in mm)

LDHA2 Series

(1)(6) : IN / OUT
(2)(3)(4)
(5)(7)(8) : GND
(9)(10)

(in mm)

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Part Number	Delay Time (ns)	Impedance (ohm)	Rising Time (ns)	Insulation Resistance (M ohm)	Rated Current (mA)
LDH21600PLAC-820	0.60 ±0.09ns	50 (Nominal)	0.7 max.	100 min.	50
LDH21800PLAC-820	0.80 ±0.12ns	50 (Nominal)	0.75 max.	100 min.	50
LDH211N00LAC-820	1.00 ±0.15ns	50 (Nominal)	0.8 max.	100 min.	50
LDH211N20LAC-820	1.20 ±0.18ns	50 (Nominal)	0.85 max.	100 min.	50
LDH311N00LAC-810	0.1 ±15%	50 (Nominal)	0.8 max.	100 min.	50
LDH311N50LAC-810	1.5 ±15%	50 (Nominal)	1.0 max.	100 min.	50
LDH312N00LAC-810	2.0 ±15%	50 (Nominal)	1.5 max.	100 min.	50
LDH321N00LAC-800	1.0 ±15%	50 (Nominal)	0.8 max.	100 min.	50
LDH321N50LAC-800	1.5 ±15%	50 (Nominal)	1.0 max.	100 min.	50
LDH322N00LAC-800	2.0 ±15%	50 (Nominal)	1.5 max.	100 min.	50
LDH322N50LAC-800	2.5 ±15%	50 (Nominal)	1.8 max.	100 min.	50
LDH323N00LAC-800	3.0 ±15%	50 (Nominal)	2.0 max.	100 min.	50
LDH54100PAAA-600	0.1 ±0.05ns	50 ±7 (at 100MHz)	0.15 max.	100 min.	50
LDH54200PAAA-600	0.2 ±0.05ns	50 ±7 (at 100MHz)	0.15 max.	100 min.	50
LDH54300PAAA-600	0.3 ±0.05ns	50 ±7 (at 100MHz)	0.15 max.	100 min.	50
LDH54400PAAA-600	0.4 ±0.05ns	50 ±7 (at 100MHz)	0.15 max.	100 min.	50
LDH54500PAAA-600	0.5 ±0.05ns	50 ±7 (at 100MHz)	0.15 max.	100 min.	50
LDH54600PBAA-600	0.6 ±0.1ns	50 ±7 (at 100MHz)	0.3 max.	100 min.	50
LDH54700PBAA-600	0.7 ±0.1ns	50 ±7 (at 100MHz)	0.3 max.	100 min.	50
LDH54800PBAA-600	0.8 ±0.1ns	50 ±7 (at 100MHz)	0.3 max.	100 min.	50
LDH54900PBAA-600	0.9 ±0.1ns	50 ±7 (at 100MHz)	0.3 max.	100 min.	50
LDH541N00BAA-600	1.0 ±0.1ns	50 ±7 (at 100MHz)	0.3 max.	100 min.	50
LDH541N50BAA-600	1.5 ±0.1ns	50 ±7 (at 100MHz)	0.5 max.	100 min.	50
LDH542N00BAA-600	2.0 ±0.1ns	50 ±7 (at 100MHz)	0.5 max.	100 min.	50
LDH542N50BAA-600	2.5 ±0.1ns	50 ±7 (at 100MHz)	0.5 max.	100 min.	50
LDH543N00KAB-700	3.0 ±0.3ns	75 (Nominal)	2.0 max.	100 min.	50
LDH544N00KAB-700	4.0 ±0.4ns	75 (Nominal)	2.5 max.	100 min.	50
LDH545N00KAB-700	5.0 ±0.5ns	75 (Nominal)	2.5 max.	100 min.	50
LDH546N00KAB-700	6.0 ±0.6ns	75 (Nominal)	3.0 max.	100 min.	50
LDH547N00KAB-700	7.0 ±0.7ns	75 (Nominal)	3.5 max.	100 min.	50
LDH548N00KAB-700	8.0 ±0.8ns	75 (Nominal)	3.5 max.	100 min.	50
LDH549N00KAB-700	9.0 ±0.9ns	75 (Nominal)	4.0 max.	100 min.	50
LDH5410N0KAB-700	10.0 ±1.0ns	75 (Nominal)	4.5 max.	100 min.	50
LDH65100PAAA-400	0.1 ±0.05ns	50 ±5 (at 100MHz)	0.10 max.	100 min.	100
LDH65200PAAA-400	0.2 ±0.05ns	50 ±5 (at 100MHz)	0.10 max.	100 min.	100
LDH65300PAAA-400	0.3 ±0.05ns	50 ±5 (at 100MHz)	0.15 max.	100 min.	100
LDH65400PAAA-400	0.4 ±0.05ns	50 ±5 (at 100MHz)	0.15 max.	100 min.	100
LDH65500PAAA-400	0.5 ±0.05ns	50 ±5 (at 100MHz)	0.15 max.	100 min.	100
LDH65600PBAA-400	0.6 ±0.1ns	50 ±5 (at 100MHz)	0.15 max.	100 min.	100
LDH65700PBAA-400	0.7 ±0.1ns	50 ±5 (at 100MHz)	0.20 max.	100 min.	100
LDH65800PBAA-400	0.8 ±0.1ns	50 ±5 (at 100MHz)	0.20 max.	100 min.	100
LDH65900PBAA-400	0.9 ±0.1ns	50 ±5 (at 100MHz)	0.20 max.	100 min.	100
LDH651N00BAA-400	1.0 ±0.1ns	50 ±5 (at 100MHz)	0.20 max.	100 min.	100
LDHA2500PAAA-300	0.5 ±0.05ns	50 ±5 (at 100MHz)	0.15 max.	100 min.	100
LDHA21N00BAA-300	1.0 ±0.1ns	50 ±5 (at 100MHz)	0.20 max.	100 min.	100
LDHA21N50BAA-300	1.5 ±0.1ns	50 ±5 (at 100MHz)	0.30 max.	100 min.	100
LDHA22N00BAA-300	2.0 ±0.1ns	50 ±5 (at 100MHz)	0.40 max.	100 min.	100
LDHA22N50BAA-300	2.5 ±0.1ns	50 ±5 (at 100MHz)	0.40 max.	100 min.	100
LDHA23N00BAA-300	3.0 ±0.1ns	50 ±10 (at 100MHz)	0.75 max.	100 min.	100
LDHA24N00BAA-300	4.0 ±0.1ns	50 ±10 (at 100MHz)	1.00 max.	100 min.	100
LDHA25N00BAA-300	5.0 ±0.1ns	50 ±10 (at 100MHz)	1.25 max.	100 min.	100
LDHA26N00CAA-300	6.0 ±0.2ns	50 ±10 (at 100MHz)	1.50 max.	100 min.	100
LDHA27N00CAA-300	7.0 ±0.2ns	50 ±10 (at 100MHz)	1.75 max.	100 min.	100
LDHA28N00CAA-300	8.0 ±0.2ns	50 ±10 (at 100MHz)	2.00 max.	100 min.	100
LDHA29N00CAA-300	9.0 ±0.2ns	50 ±10 (at 100MHz)	2.25 max.	100 min.	100
LDHA210N0CAA-300	10.0 ±0.2ns	50 ±10 (at 100MHz)	2.50 max.	100 min.	100

Operating Temperature Range : -40°C to +85°C

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■ Group Delay Time

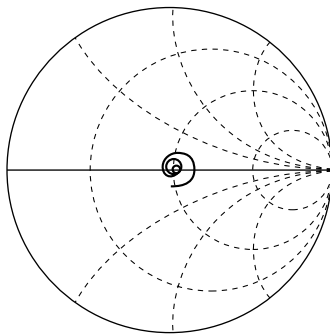Test sample:LDH65500PAAA-400
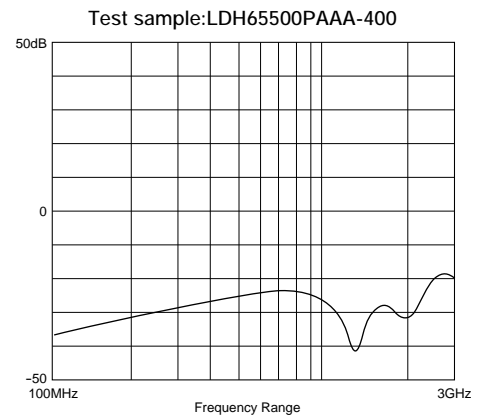
■ Pulse Response

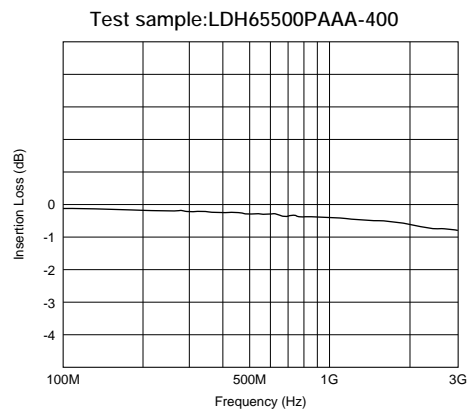Test sample:LDH65500PAAA-400
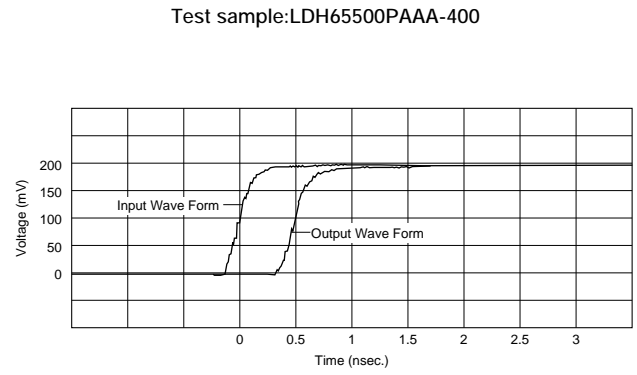
■ Impedance

Test sample:LDH65500PAAA-400

Frequency Range : 100MHz to 3GHz (Smith Chart)

■ Return Loss

Test sample:LDH65500PAAA-400

■ Insertion Loss

Test sample:LDH65500PAAA-400

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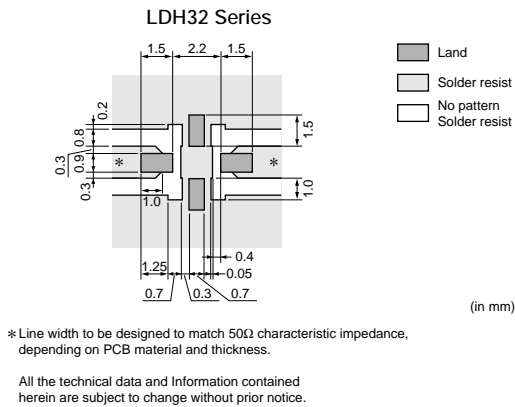
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Soldering and Mounting

■ Standard Land Dimensions

LDH21 Series

*Line width to be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.
•All the technical data and Information contained herein are subject to change without prior notice.

(in mm)

LDH31 Series

*Line width to be designd to match 50ohm characteristic impedance, depending on PCB material and thickness.

All the technical data and Information contained herein are subject to change without prior notice.   (in mm)

LDH32 Series

*Line width to be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

All the technical data and Information contained herein are subject to change without prior notice.

(in mm)

LDH54 Series

*Line width to be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.

(in mm)

LDH65 Series

* Line width to be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

(in mm)

LDHA2 Series

* Line width to be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

(in mm)

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Packaging

■ Minimum Quantity

Part Number	Dimensions (mm)			Minimum Quantity	
	L	W	T	Ø180mm Reel	Ø330mm Reel
LDH21	2.0	1.25	0.95	4000	
LDH31	3.2	1.6	1.1	3000	
LDH32	3.2	2.5	1.5	2000	
LDH54	5.0	4.0	1.1-3.1	1000 *	
LDH65	6.3	5.0	2.5	500	
LDHA2	10.0	6.3	3.7		500

* 500pcs. for LDH542N0 and LDH542N5.

■ Dimensions of Taping

LDH21 Series

● Plastic Tape

● Reel

(in mm)
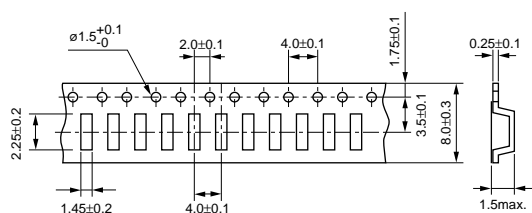
LDH31 Series

● Plastic Tape

● Reel

(in mm)
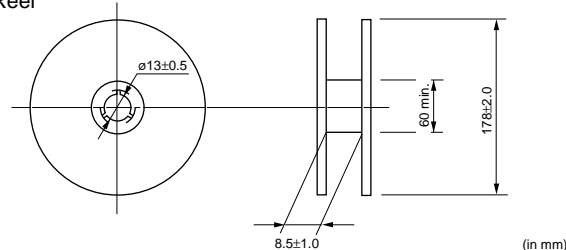
LDH32 Series

● Plastic Tape
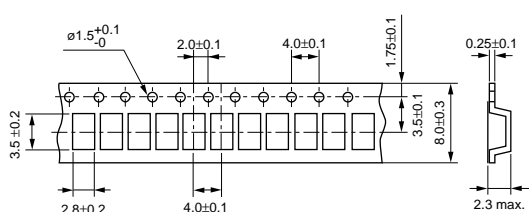
● Reel

(in mm)

LDH54 Series

● Plastic Tape
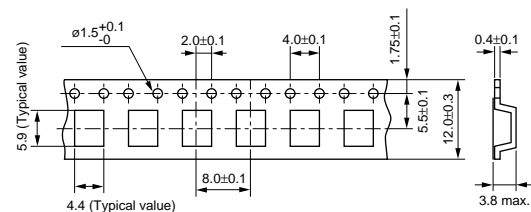
● Reel

(in mm)

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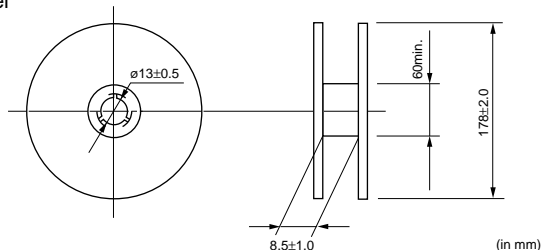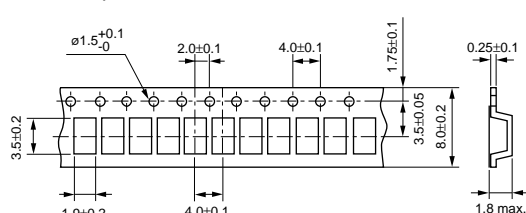
Packaging

■ Dimensions of Taping

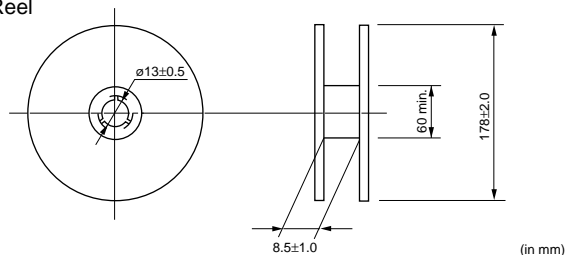### LDH65 Series

● Plastic Tape
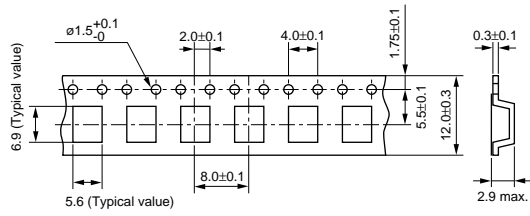
● Reel

LDHA2 Series

● Plastic Tape

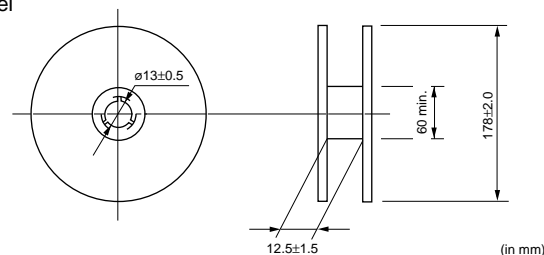● Reel

(in mm)

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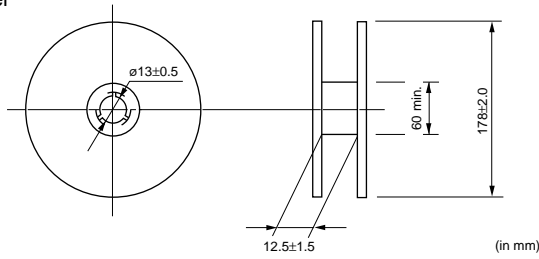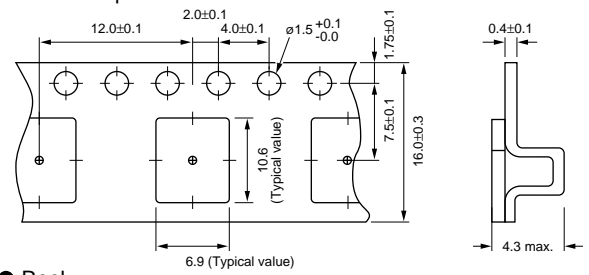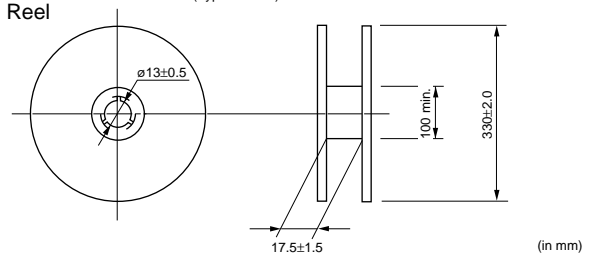
Notice

■ Notice (Storage and Operating Condition)
To avoid damaging the solderability of the external electrodes, be sure to observe the following points.

● Store products where the ambient temperature is 15 to 35D and humidity 45 to 75% RH.
(Packing materials, In particular, may be deformed at the temperature over 40D.).

● Bulk packed chip components should be used as soon as the seal is opened, thus preventing the solderability from deteriorating. The remaining unused components should be put in the original bag and sealed again or store in a desecrator containing a desiccating agent.

● Store products in non-corrosive gas (Cl_2, NH_3, SO_2, Nox, etc.).

● Stored products should be used within 6 months of receipt. Solderability should be verified if this period is exceeded.

■ Notice (Rating)
Products shall be used in the input power capacity as specified in this specifications.
Inform Murata beforehand, in case that the components are used beyond such input power capacity range.

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Notice

■ Notice (Soldering and Mounting)

1. Standard PCB Design (Land Pattern and Dimensions):

   All the ground terminals should be connected to the ground patterns. Please refer to the specifications for the standard land dimensions.

   The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Murata beforehand.

2. Soldering Conditions:

   Carefully perform preheating so that the temperature difference (ΔT) between the solder and products surface should be in the following range. When products are immersed in solvent after mounting, pay special attention to maintain the temperature difference within 100°C. Soldering must be carried out by the above mentioned conditions to prevent products from damage.

   Contact Murata before use if concerning other soldering conditions.

Soldering method	Temperature
Soldering iron method	ΔT≦130°C
Reflow method	

● Soldering iron method conditions are indicated below.

Item \ Kind of iron	Nichrome heater	Ceramics heater
Soldering iron wattage	≦30W	≦18W
Temperature of iron-tip	≦280°C	≦250°C

● Diameter of iron-tip : f3.0 mm max.

● Do not allow the iron-tip to directly touch the ceramic element.

Reflow soldering standard conditions (Example)
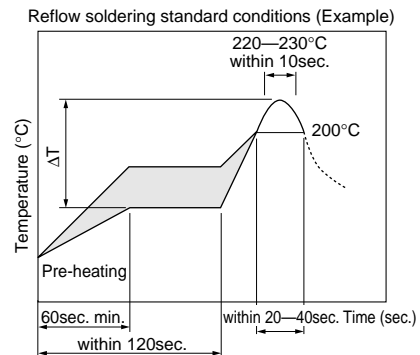
Use rosin type flux or weakly active flux with a chlorine content of 0.2 wt % or less.

Use eutectic crystal solder.

Amount of Solder Paste:

● Ensure that solder is applied smoothly to a minimum height of 0.2 to 0.5 mm at the end surface of the external electrodes. If too much or little solder is applied, there is high possibility that the mechanical strength will be insufficient, creating the variation of characteristics.

■ Notice (Handling)

1. Be careful in handling or transporting products because excessive stress or mechanical shock may break products due to the nature of ceramics structure.

2. Handle with care if products may have cracks or damages on their terminals, the characteristics of products maychange.

   Do not touch products with bear hands that may result in poor solderability.

3. Notice for Chip Placer

   When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle.

   To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used.

   For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

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Notice

■ Notice (Other)

1. Cleaning Conditions:

The total cleaning time of soaking, ultrasonic and steam methods should be within 5 minutes.

Consult with Murata concerning the cleaning solvent. In order to totally abolish ODC (Freon, Trichrolethan), Murata has carried out testing on non-cleaning and water cleaning (water- soluble flux, water-soluble cream solder, water-based cleaning solvent). Therefore, be sure to contact Murata beforehand for details when applying any of the above mentioned cleaning fluid.

The ultrasonic cleaning conditions are indicated below :

Power	20 W per liter max.
Frequency	50 - 60 kHz
Temperature	40 deg.C max.

If the ultrasonic output power is too high, the PCB may resonate and products mounted on the PCB may be damaged. The ultrasonic cleaning conditions may change depending on the size of the vessel and the size of the PCB. Contact Murata regarding conditions other than those stated above.

Be sure to completely dry up products immediately after cleaning.

2. Operational Environment Conditions:

Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur

- In an atmosphere containing corrosive gas (Cl_2, NH_3, SO_x, NO_x etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty place.
- Direct sunlight place.
- Water splashing place.
- Humid place where water condenses.
- Freezing place.

If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use. Be sure to completely dry up products immediately after cleaning.

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● Part Numbering (The structure of the "Global Part Numbers" that have been adopted since June 2001 and the meaning of each code are described herein. If you have any questions about details, inquire at your usual Murata sales office or distributor.)

Chip Multilayer Delay Lines

(Global Part Number) | LD | H | 65 | 100P | A | A | A | -400 |
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

❶Product ID

Product ID	
LD	Chip Multilayer Devices

❷Function

Code	Function
H	Delay Lines

❸Dimension (L×W)

Code	Dimension (L×W)	EIA
21	2.00×1.25mm	0805
31	3.20×1.60mm	1206
32	3.20×2.50mm	1210
54	5.00×4.00mm	–
65	6.30×5.00mm	–
A2	10.0×6.3mm	–

❹Delay Time

Three figures and a capital letter express the nominal value. If the unit is "nano-second", a decimal point is expressed by the capital letter "**N**". If the unit is "pico-second", the letter "**P**".

❺Delay Time Tolerance

Code	Delay Time Tolerance
A	±0.05ns
B	±0.1ns
C	±0.2ns
K	±10%
L	±15%

❻Individual Specification Code (1)

Code	Individual Specification Code (1)
A	Standard

❼Design

Code	Design
A	An alphabet expresses identification of design type for each function.

❽Individual Specification Code (2)

A hyphen (-), figures, alphabets, express the specifications or characteristics or others.

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⚠ **Note:**

1. Export Control
   〈For customers outside Japan〉
   Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.
   〈For customers in Japan〉
   For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than specified in this catalog.
   ① Aircraft equipment
   ② Aerospace equipment
   ③ Undersea equipment
   ④ Power plant equipment
   ⑤ Medical equipment
   ⑥ Transportation equipment (vehicles, trains, ships, etc.)
   ⑦ Traffic signal equipment
   ⑧ Disaster prevention / crime prevention equipment
   ⑨ Data-processing equipment
   ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above

3. Product specifications in this catalog are as of July 2001. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before your ordering. If there are any questions, please contact our sales representatives or product engineers.

4. Please read CAUTION and Notice in this catalog for safety. This catalog has only typical specifications. Therefore you are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.

5. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or third party's intellectual property rights and other related rights in consideration of your using our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.

6. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.

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