RN.2 Technologies

Datasheet

S1206N

Rev. 1.2

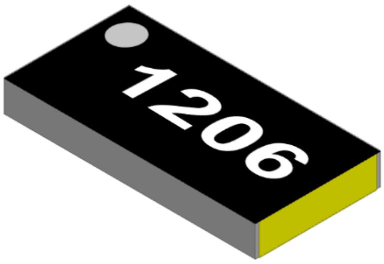
Revision History

Rev	Release Date	Description	Author
1.0	2019-09-16	• Initial release	G.H.Baek
1.1	2019-09-25	• Power Capacity Specification modify	Y.J. Ko
1.2	2019-11-01	• Packing design modified	G.H.Baek

Contents

12W, Termination
with High-Power Capacity and Stable Performance based on RN2 Resistor Technology

1. KEY FEATURES
- Frequency range DC – 6000 MHz
- Excellent high-power capacity up to average 12 watts
- Excellent stable performance at different temperatures
- Low insertion loss Max. 0.25dB, high conductivity metal conductor (Ag), and gold (Au) plating
- Small size (3.05 x 1.52 mm) SMD package
- RoHS compliance (Pb-Free)



2. APPLICATIONS
- Applications using mobile networks, broadcast
- High power amplifiers
- Isolator, Circulator
- Military

3. GENERAL DESCRIPTIONS
S1206N is a 12W termination with high-power capacity and stable performance in different temperatures. The AlN, high conductivity metal conductor (Ag), and gold (Au) plating enable S1206N to low return loss and improve durability for thermal stabilization and electricity.

S1206N is suited for applications using GSM, UMTS, and LTE and communications equipment, requiring high power.

S1206N supports up to average 12 watts. It is a SMD type product enabling Pb-Free solder and meets RoHS-6.

4. ELECTRICAL SPECIFICATIONS

Frequency (MHz)	DC Impedance (ohms)	Return Loss(S11) (dB, Min.)	Power Capacity Avg.(Watt)	Operating Temperature(℃)
DC – 6000	50 ± 2%	20.0	12	-55 - +125

NOTE: These electrical specifications are measured by using a RN2 Technologies test board.
Specifications subject to change without notice.
For reliability test data, please contact RN2 Technologies sales team.

5. PORT CONFIGURATIONS

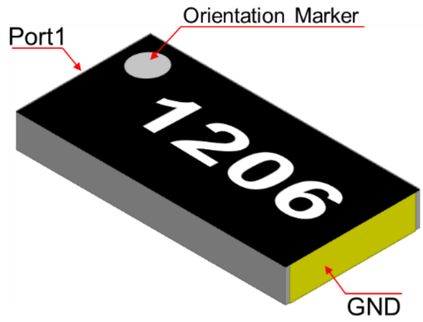
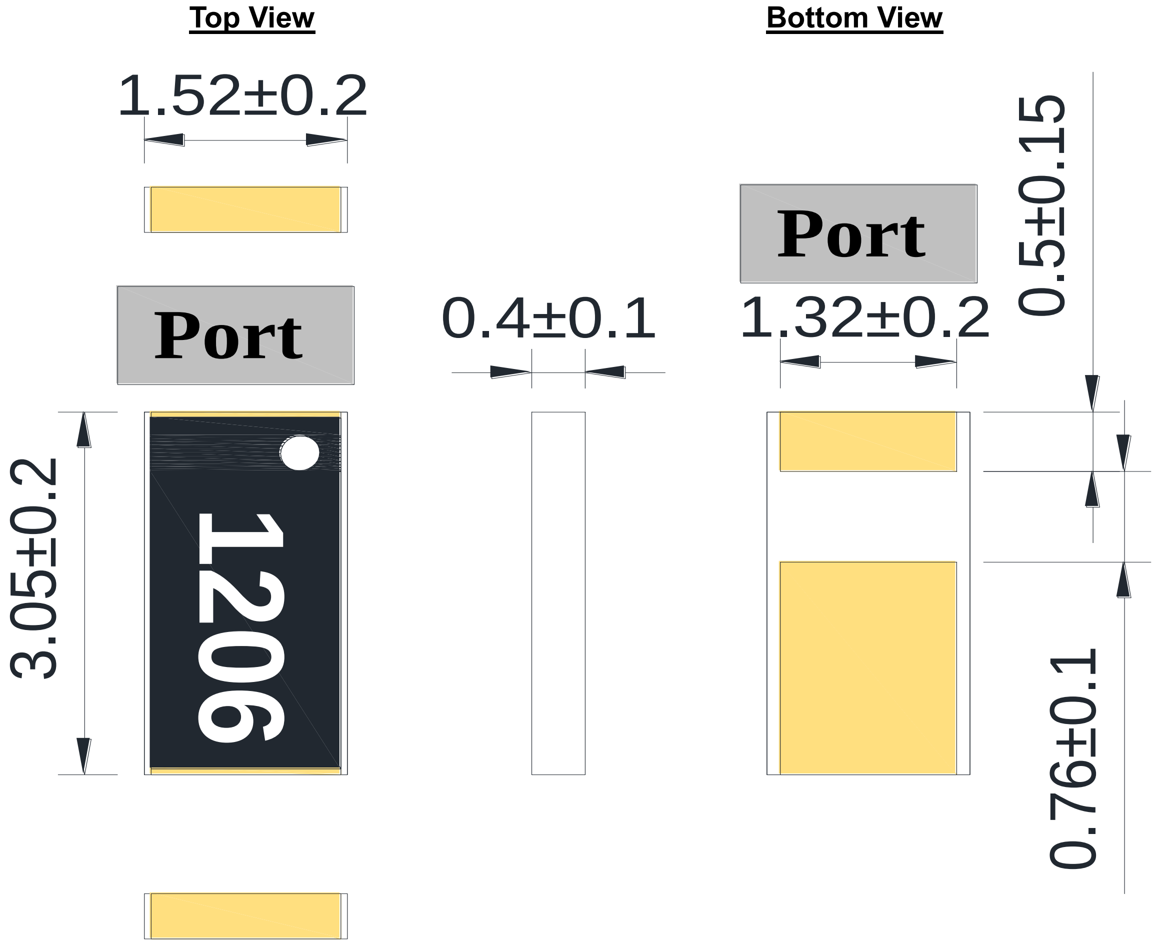


Figure 1. Top View

Figure 1 shows the locations of the S1206N ports. The orientation marker is included to represent input port.

6. OUT DIMENSION



- Unit: mm
- Weight: 0.03 grams
- Camber specifications: Less than ±0.08 mm

7. POWER DERATING CURVE

The maximum allowable average power (Maximum input power, CW) of the S1206N depending on base PCB temperature changes. The maximum allowable average power of the S1206N is limited by the following power derating curve.

The S1206N factors that determine the power derating curve are as follows:

- Internal circuit
- Thickness
- Thermal conductivity of materials
- Operating temperature
- Mounting interface temperature between the S1206N and the base PCB

The maximum operating temperature of the S1206N is 125 ºC. Therefore, when the base PCB temperature is over 125 ºC, the S1206N operates stably by decreasing its durable average input power. When the base PCB temperature reaches 200 ºC, the maximum allowable average power decreases to 0 watt.

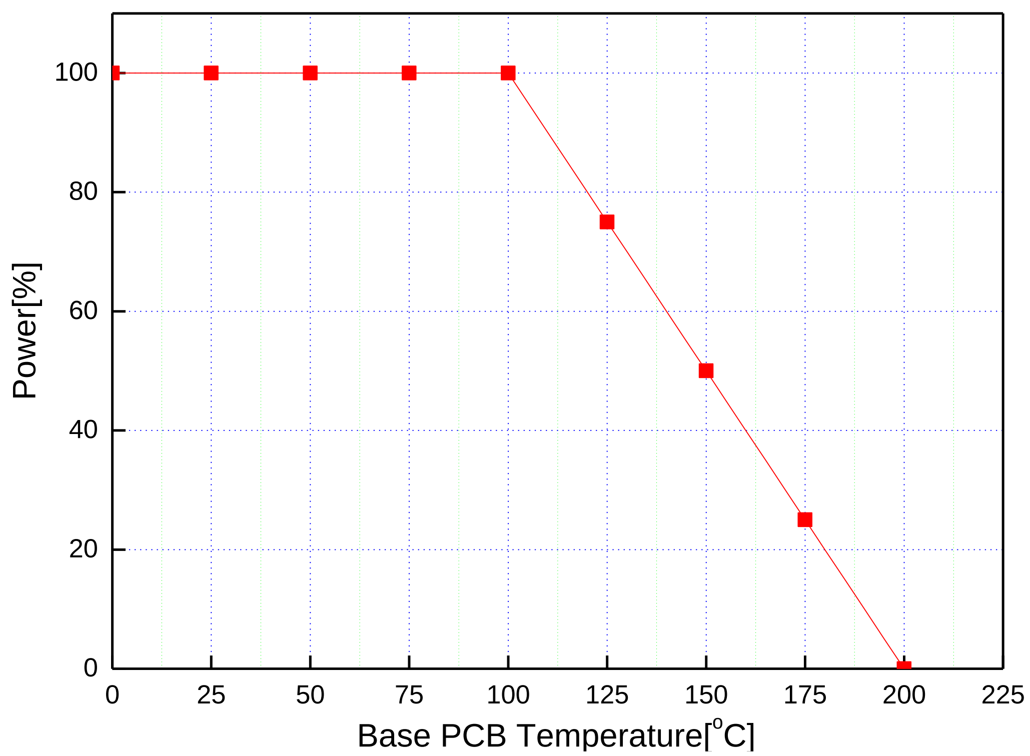


Figure 2. Power Derating Curve

8. RF Characteristics: Return Loss (at -55 ºC, 25 ºC, and 125 ºC)

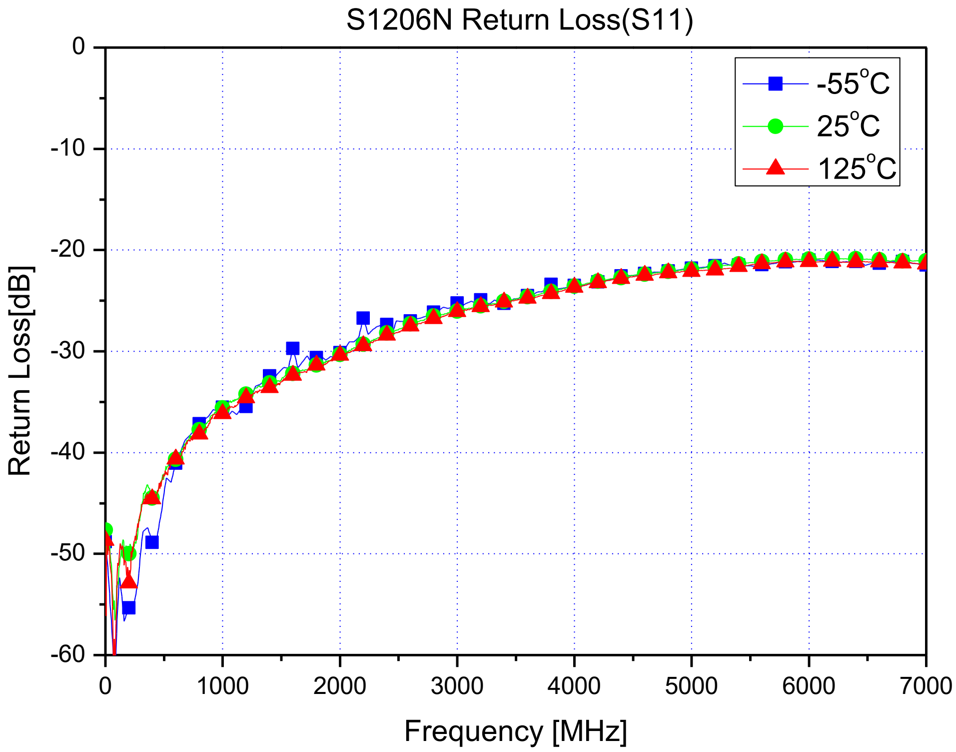


Figure 3. Test Plots of Return Loss (at -55 ºC, 25 ºC, and 125 ºC)

9. RF TEST METHODS

To ensure S-Parameters reliability, we follow our internal test procedures by using the RN2 Technologies bare test board, RN2 Technologies test board, and test fixture connected with VNA (Vector Network Analyzer). In addition, we use the Automatic Port Extensions (APE) function of the Vector network analyzer to obtain accurate s-parameters.

9.1 RF TEST PROCEDURES

To test the S1206N RF performance, we perform the following steps:

1. Preparing the Test Equipment
2. Performing the APE Function of the VNA
3. Measuring the S-Parameters (Coupling, Transmission Loss, Isolation, and Return Loss)
4. Obtaining the Characteristic Parameters (Amplitude Balance, Isolation, Insertion Loss, Return Loss, and Phase Balance)

STEP 1: Preparing the Test Equipment
The following test equipment is prepared to test the S1206N RF performance.

- RN2 Technologies bare test board
- RN2 Technologies test board
- Vector network analyzer
- Test fixture

NOTE: See *'RN2 Technologies TEST BOARD LAYOUT'* for the RN2 Technologies test board details.

STEP 2: Performing the Automatic Port Extensions (APE) Function of the Vector Network Analyzer
The APE function is used with the RN2 Technologies bare test board to correctly check the S1206N RF performance. This reduces or eliminates both electrical delay and insertion loss of the test fixture.

The detailed steps are as follows:

1. Place the RN2 Technologies bare test board on the text fixture.
2. Click the **Cal** button of the Vector network analyzer to calibrate it.
3. Connect the four ports of the test fixture into the fours ports of the Vector network analyzer.
4. Click the **Port Extensions** button of the Vector network analyzer to measure the data of the RN2 Technologies bare test board.

NOTE: See *'AUTOMATIC PORT EXTENSIONS FUNCTION'* for more details.

STEP 3: Measuring the S-Parameters (Coupling, Transmission Loss, Isolation, and Return Loss)

After performing the APE function, the S1206N S-Parameters are measured through the following steps:

1. Place the RN2 Technologies test board on the text fixture.
2. Apply pressure to the text fixture using a pneumatic piston.
3. Connect the four ports of the test fixture into the fours ports of the Vector network analyzer.
4. Set port1 as Case 1 configuration in *'Table 1. S1206N Port Configurations'*.
5. Calibrate the Vector network analyzer.
6. Measure the return loss value from port 1 to port 1(S11).

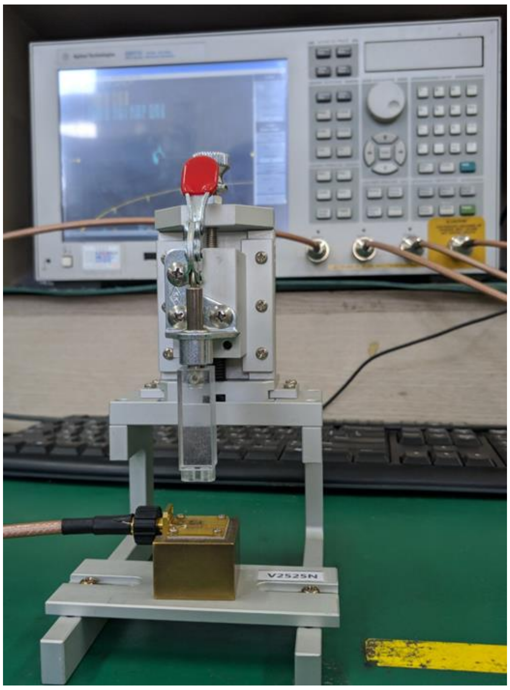


Figure 4. Test Setting to Measure the S1206N S-parameters

STEP 4: Obtaining the Characteristic Parameters (Return Loss)
The S-Parameters are calculated by using the formula in ***Table 2*** to obtain the characteristic parameters, such as return loss.

Table 1. Mathematical Formula for the S1206N Parameters

Parameter	S-Parameter	Power Method
Return Loss	S11 S22 S33 S44	$10 \cdot \log\left(\frac{P_{in}}{P_{back}}\right)$

NOTE
- P_{in}: Power of Input Port
- P_{back}: Return Power of Input Port

9.2 RN2 Technologies TEST BOARD LAYOUT

Figure 6 shows the RN2 Technologies test board layout used for testing the S1206N RF performance. The RN2 Technologies test board is based on the Taconic RF35 board with the dielectric constant of 3.5, board thickness of 0.8 mm, and copper of 1 Oz.

We recommend that you use the same material and design layout, as shown in ***Figure 6***, to meet the specifications in this datasheet. However, if you use different materials, you must follow the basic guidelines. See *'RECOMMENDED PCB LAYOUT AND SOLDER MASK PATTERN'* for more details.

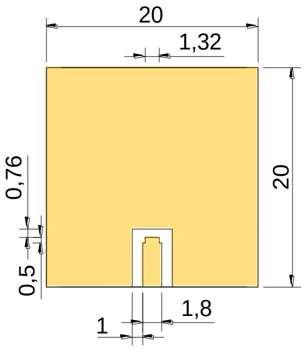


Figure 5. RN2 Technologies Test Board Layout

9.3 AUTOMATIC PORT EXTENSIONS (APE) FUNCTION

To accurately measure the S1206N s-parameters, we use the Automatic Port Extensions (APE) function of the Vector network analyzer. The APE function is used for reducing or eliminating both electrical delay and insertion loss of test fixtures. It provides a convenient, automated way to calculate the insertion loss and electrical delay terms by a simple measurement of an open or short circuit, which is easy to do in test fixtures.

We consider the transmission lines of the RN2 Technologies bare test board as extensions of the coaxial test cables that are between the Vector network analyzer and the S1206N. With the APE function, we extend the coaxial test ports so that our calibration plane is right at the terminals of the S1206N, and not at the connectors of the RN2 Technologies bare test board.

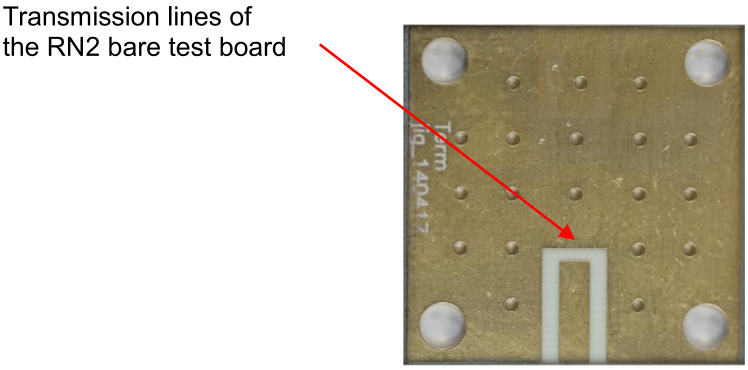


Figure 6. Performing the APE Function Test

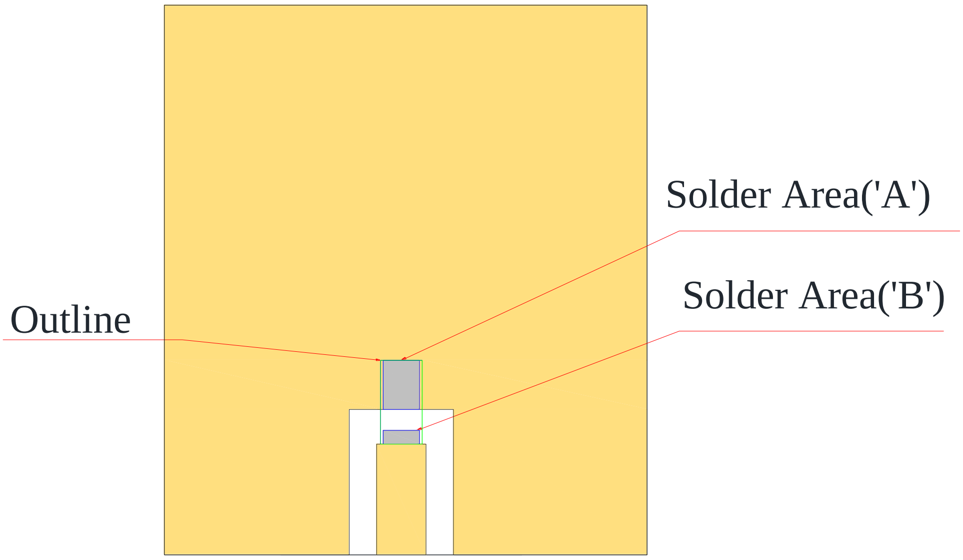
10. RECOMMENDED PCB LAND PATTERN

Figure 8 shows the recommended PCB layout and solder mask pattern to meet the specifications in this datasheet. When you use different materials other than the RN2 Technologies test board, you must follow the basic guidelines and calculate the 50 ohm impedance line width using a different PCB stack information.

Basic Guidelines

- Place GND more than 30% of the S1206N GND dimension regardless of a via size.
- Appropriately increase via sizes and numbers to allow low impedance ground connection and good thermal conductivity.
- Align the S1206N ground plane with the solder to have good connection to ground.
- Fill the via holes under the S1206N with the solder for thermal emission.

NOTE: Contact the RN2 Technologies sales team for more detailed PCB layout and solder mask pattern information.



NOTE

- Test Solder Cream: SAC-305 (Alpha Metal)
- Lead-Free Solder Alloy: Sn/Ag/Cu Ratio of 96.5/3.0/0.5
- Solder Area (‘A’) Dimension: 1.79 mm by 1.32 mm
- Solder Area (‘B’) Dimension: 1.32mm by 0.50mm

Figure 7. Recommended PCB Layout and Solder Mask Pattern

11. SOLDERING PROCESS

The S1206N soldering steps are as follows:

1. Cleaning the PCB
2. Applying solder paste to the PCB
3. Placing the S1206N on the PCB
4. Reflowing the S1206N to the PCB
5. Cleaning and inspecting the soldered PCB with the S1206N

STEP 1: Cleaning the PCB
Carefully clean the PCB surface where the S1206N is soldered.
Particles must not be placed on the PCB surface where the S1206N is soldered.

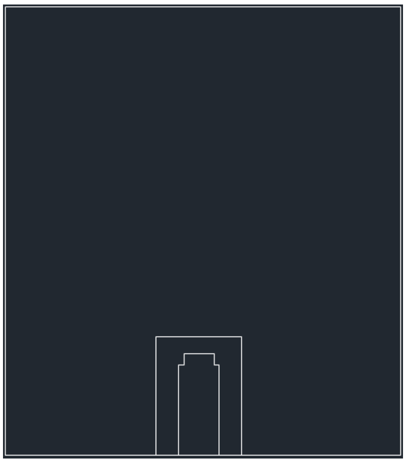


Figure 8. Cleaning the PCB Surface Where the S1206N is Soldered

STEP 2: Applying the Solder Paste to the PCB
Apply the solder paste to the 2 points on the PCB surface.
It enables good thermal conductivity because the S1206N is firmly attached to the PCB surface without air.

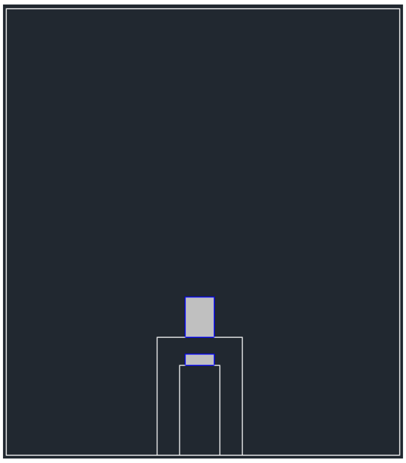


Figure 9. Applying the Solder Paste to the 2 Points on the PCB Surface

STEP 3: Placing the S1206N on the PCB
Correctly place the S1206N on the 2 points of the PCB surface.
Applying the solder paste to the 9 points helps you firmly attach the S1206N to the PCB surface.

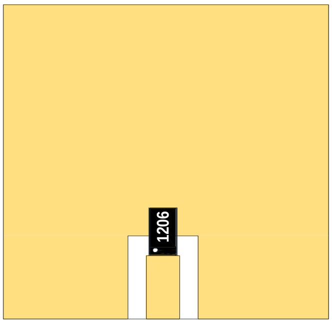


Figure 10. Placing the S1206N on the 2 Points of the PCB Surface

STEP 4: Reflowing the S1206N to the PCB
We recommend both manual soldering and PCB surface pre-heating methods when reflowing the S1206N to the PCB surface. Be careful NOT to touch the iron tip to the S1206N when you use the manual soldering method.
See *'REFLOW PROFILE'* for more details.

12. REFLOW PROFILE

Figure 12 shows the thermal reflow profile of the SAC-305 (Alpha metal), which is a test solder cream we used.

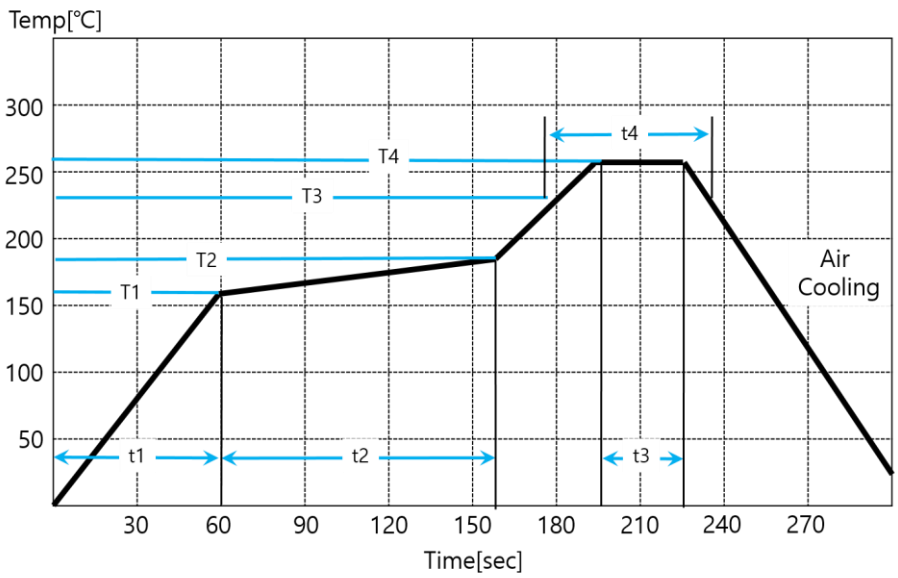
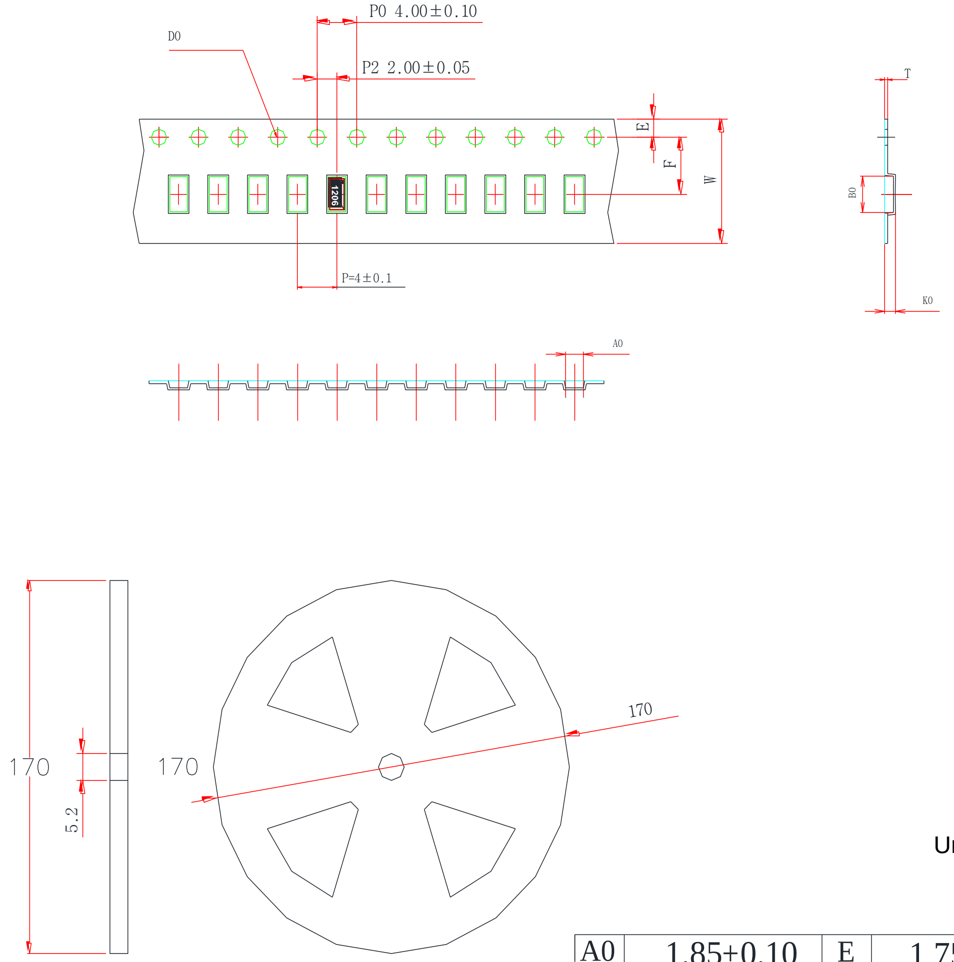


Figure 11. Thermal Reflow Profile

	Ramp Up	Pre-Heating	Peak	Soaking
Temperature(℃)	T1:160±5	T2:180±5	T4:260±5	T3:230±5
Time(sec)	t1:60±5	t2:100±15	t3:30±5	t4:60±10

13. PACKAGING AND ORDERING INFORMATION



Units : mm

Starndard Packaging Quantity : 3,000 PCS / Reel

A0	1.85±0.10	E	1.75±0.10
B0	3.40±0.10	F	5.50±0.05
D0	1.50±0.10	T	0.30±0.05
K0	0.65±0.10	W	12.00±0.30

14. HANDLING GUIDE

PLEASE READ THIS NOTICE BEFORE USING OUR LTCC COUPLERS.

I. Be careful when transporting

- Ensure proper transportation as excessive stress or shock may damage LTCC couplers due to the nature of ceramics structure.
- LTCC couplers cracked or damaged on terminals may have their property changed.

II. Be careful during storage

- Store LTCC couplers in the temperature of -55 ℃ to +125 ℃.
- Keep the humidity at 45 % to 75 % around LTCC couplers.
- Prevent corrosive gas (Cl_2, NH_3, SO_X, NO_X, etc.) from contacting LTCC couplers.
- It is recommended to use LTCC couplers within 6 months of receipt. If the period exceeds 6 months, solderability may need to be verified.

III. Be careful when soldering

- Solder all the ground terminals, IN and OUT pad of LTCC couplers on the ground plane of the PCB.
- LTCC couplers may be cracked or broken by uneven forces from a claw or suction device.
- Mechanical stress by any other devices may damage LTCC couplers when positioning them on PCB.
- Do not use dropped LTCC couplers.
- Ensure that any soldering is carried out by the condition of specification sheet.
- Do not re-use LTCC couplers which are de-soldered from PCB.

15. LEGAL INFORMATION

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