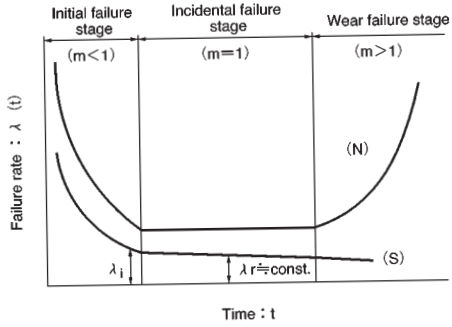
Quality assurance and reliability

We put quality first. No matter what it takes, or what kind of problems we run into, our goal is to provide a constant supply of high quality products to our customers both at home and abroad, in the quantities they need, and to make an ongoing contribution to the progress of culture and civilization.

In recent years, semiconductor products are being used in a greater variety of fields, and they have to be able to provide the necessary functions demanded by a broad spectrum of equipment and devices. Thus, as the equipment around us becomes more sophisticated, semiconductor products need to keep pace with or one step ahead of that level of sophistication.

Semiconductor quality is defined by the initial failure rate and the incidental failure rate. It is our goal to reduce both of these rates (occurrence rates) to negligible levels in order to obtain and maintain high reliability in our products.



In many cases, the initial failure rate is tied to problems in the manufacturing process, and this rate stabilizes over time, as problems are worked out. However, stabilizing quality after these initial failure products have already been allowed onto the market inevitably results in a high rate of complaints from customers. Thus, quality control and process control at the manufacturing stage are critical elements of reliability, and we make every effort to carry out debugging and catch problems to lower the initial failure level.

Incidental failures are determined by the design quality of the product, so we work to lower our incidental failure rate by designing products with higher component performance than is actually called for. In other words, we build derated redundancy into our designs to make sure that we achieve the necessary performance level. At Rohm, our goal is to make sure that we produce semiconductors that meet our customers' needs and provide satisfaction.

●Quality assurance activities

(1) Design Division

Circuit design is carried out based on circuit design standards. In the process of designing our circuits, designs are thoroughly evaluated by the Design, Manufacturing, Production Engineering, QC, and QA Divisions, and only those designs which pass rigid inspections are used. Those products which are rejected at the design stage, and those which are rejected at the trial manufacture stage (particularly in terms of reliability evaluation) are sent back for partial or total design revisions.

In trial manufacture evaluation, characteristics and reliability are confirmed, and we make sure the required quality and process capability levels have been achieved.

(2) Manufacturing Division

In the manufacturing process, we put products through prototype mass production based on all of the standards documentation, and check to make sure stable quality and productivity are obtained. In order to obtain stable quality, quality control and facilities control are carried out with careful attention paid to the finest details.

We also pay extremely careful attention to aspects that affect longterm reliability, such as control of temperature, humidity and dust in the manufacturing process.

As a result, we implement thorough dust prevention measures in processes calling for particularly high levels of cleanliness, such as dust rooms and anti-dust clothing. These measures are extremely effective in suppressing the harmful effects of dust.

(3) Testing Division

Recent market demands call for a defect rate on the order of several ppm. It goes without saying that all of our products are checked in terms of characteristics. We also conduct debugging based on fluctuations in voltage, current, and temperature, and any products which show evidence of instability are tested in-house and thoroughly screened to make sure they meet our quality standards before reaching the customer. Debugging is also an extremely effective means of improving our product reliability.

(4) Quality Assurance Division

Each product from the prorotype manufacture and prototype mass production processes is tested for reliability and evaluated to make sure it satisfies the required quality standards. We also evaluate our manufacturing process capability and circuit designs on an ongoing basis. In addition, we periodically sample random lots of mass produced products and inspect all of the products in the lot for reliability. This helps ensure process capability and ongoing process improvement.

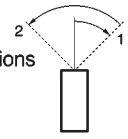
(5) Other measures

Control of all processes is initiated based on data, or statistical methods. This gives us a systematic way of overseeing product histories based on lot numbers. In the event that a problem occurs, the lot can be tracked down, allowing us to act immediately to find the cause of the problem and make sure it doesn't happen again. If customers report any kind of problem or failure of our products, that information can be fed back to the process immediately, to prevent recurrence of the problem.

●IC quality assurance system

1	1. Material intake inspection	Inspection of all materials based on intake inspection standards, and quality assurance of supplier based on purchase specifications
2	2. IC chip manufacturing process	Process control conditions, check, lot control, in-process inspection, and maintenance of equipment (in all processes)
3	3. IC chip selection	Full-lot selection of electrical characteristics of IC chip, regular calibration of measuring instruments
4	4. IC chip appearance check	
5	5. Scribing	
6	6. Appearance check	
7	7. Die bonding	Control of chip bonding strength
8	8. Die bonding test	
9	9. Wire bonding	Control of wire bonding strength
10	10. Wire bonding test	
11	11. Resin sealing	Control of temperature, pressure, time, and other factors
12	12. Heat aging	Stabilization of characteristics
13	13. Lead end plating	Control of soldering
14	14. Appearance check	Inspection of molds and lead end plating
15	15. Marking	
16	16. Marking check	
17	17. Lead end cutting and bending	
18	18. Lead appearance check	Inspection of shape dimensions of lead ends
19	19. Open circuit test	Full-lot selection based on tests for open, shorted, and leaking chips, and regular calibration of measuring instruments
20	20. Production process check	Random sampling for appearance, external dimensions, open, shorted, and leaking chips
21	21. Full test	Full-lot inspection of individual electrical characteristics, and regular calibration of measuring instruments
22	22. Packing	
23	23. Shipping inspection	Random inspection of electrical characteristics, appearance, and external dimensions
24	24. Regular reliability test	
25	25. Storing/shipping	Control of storage period and storage environment

●Quality assurance testing program

Test item	Test conditions	Test method
Outer appearance and dimensions	Outer dimensions and markings must meet specifications.	MIL - STD - 883 Method 2009
Resistance to vibration	Vibration frequency: 10 ～ 55 Hz Full amplitude: 1.5 mm Sweep time: 1 min. 2 hours in X, Y, Z directions; total time of 6 hours	MIL - STD - 202 Method 201A
Drop test	Dropped 10 times from a height of 1 m onto maple wood board	—
Resistance to soldering heat	Component is immersed in solder bath up to the stop point on the leads, at a temperature of 260±5℃, for 10±1 seconds. Mini-flat package components are immersed in solder bath up to the point where the lead is bent, at a temperature of 260±5℃, for 10±1 seconds.	MIL - STD - 202 Method 210
Characteristics to soldering heat	Component is immersed in solder bath at a temperature of 235±5℃, for 3±1 seconds. Use eutectic solder and a 7% rosin methanol solution for flux.	MIL - STD - 202 Conforms to Method 208
Terminal bending strength	Carried out twice under conditions stated below. 	MIL - STD - 202 Method 211 Condition B
Resistance to moisture	Perform 10 cycles without preprocessing.	MIL - STD - 883 Method 1004
Temperature cycling	Perform 100 cycles at specified intervals (30 min/10 min/30 min) for each temperature time.	MIL - STD - 883 Method 1010 Condition B
Thermal shock	Perform 15 cycles at specified intervals (5 min/10 sec/5 min) for each temperature solvent time.	MIL - STD - 883 Method 1011 Condition B
High-temperature storage (125)	Leave component for 1,000 hours at Ta = 125±3 C.	MIL - STD - 883 Method 1008 Condition B
Steady state life (load lifetime)	Leave component for 1,000 hours with continuous voltage (power) supplied, at Ta = 25±5℃.	MIL - STD - 883 Method 1005
High temperature and high humidity storage	Leave component for 1,000 hours at a room humidity of 90 ~ 95%, at Ta = 65±3℃.	—
Pressure cooker	Leave component for 100 hours at a barometric pressure of 2, at Ta = 119±2℃.	—