ASAHI KASEI MICRODEVICES
QUALITY ASSURANCE CENTER

AK4604VQ Quality Data

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* The marking and dimensional drawings of our product described in this document (hereinafter referred to as the "Product") are shown in the datasheet of the Product. For any other information regarding Product not shown in this document, please make inquiries the sales office of us or authorized distributors.

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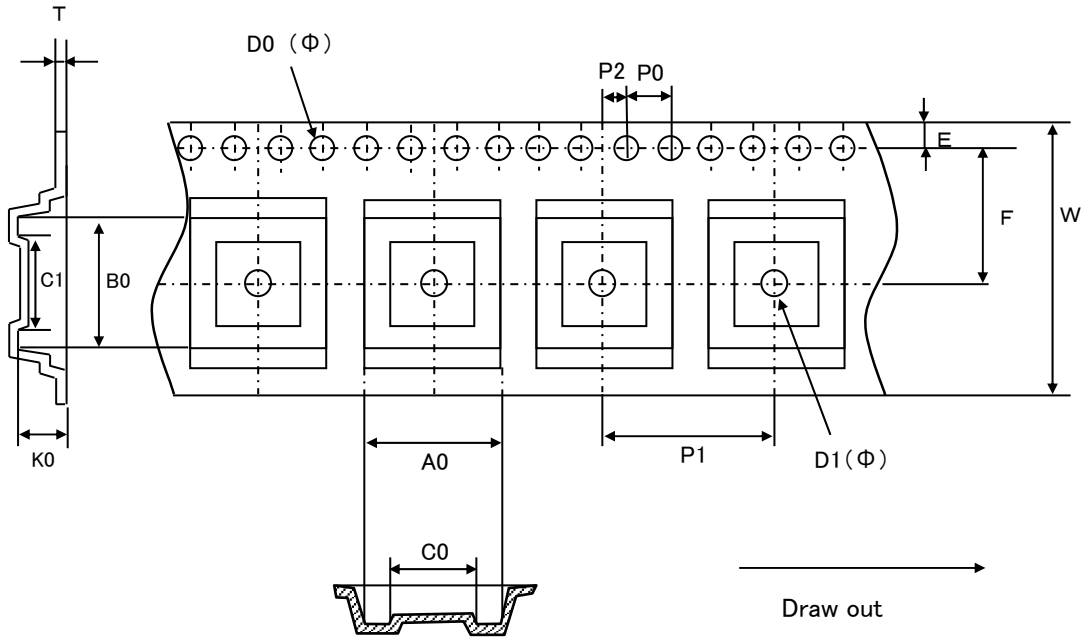
EMBOSS TAPING PACKAGING SPECIFICATIONS (LQFP010010-64)

1. Dimensions of Tape

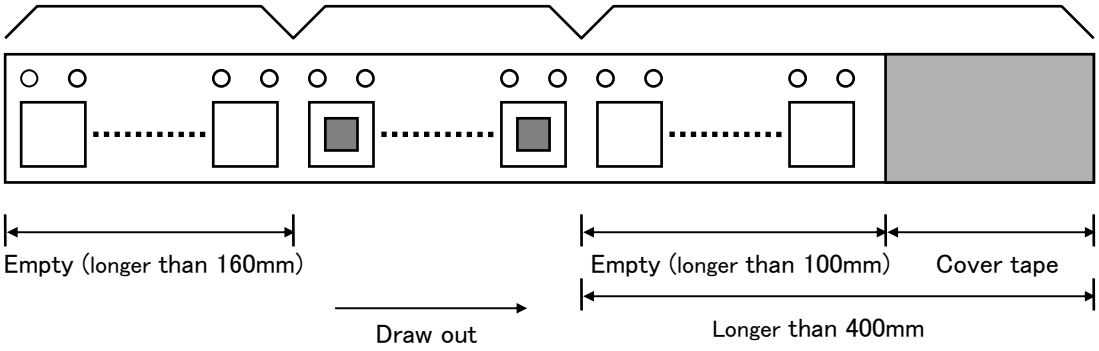


Unit: mm

A0	B0	C0	C1	W	E	F
12.50±0.1	12.50±0.1	9.00±0.2	9.00±0.2	24.00±0.3	1.75±0.1	11.50±0.1
P0*	P1	P2	D0	D1	T	K0
4.00±0.1	16.00±0.1	2.00±0.1	1.50+0.1/−0	2.00+0.1/−0	0.30±0.05	2.20±0.1

(*)Cumulative tolerance is 10 pitches at ± 0.1mm

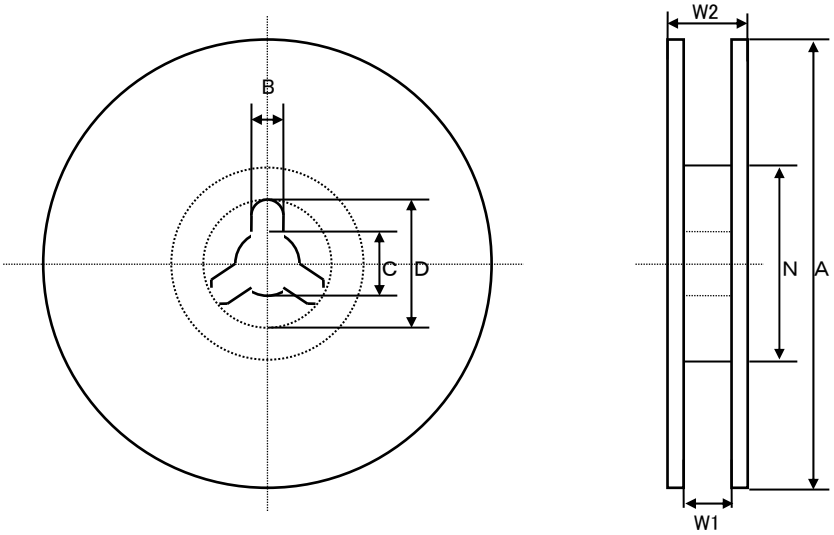
2. Tape at the leading and the ending portion



3. Tape at the joint

There's no jointing point at the cover tape and the carrier tape.

4. Specifications the Reel

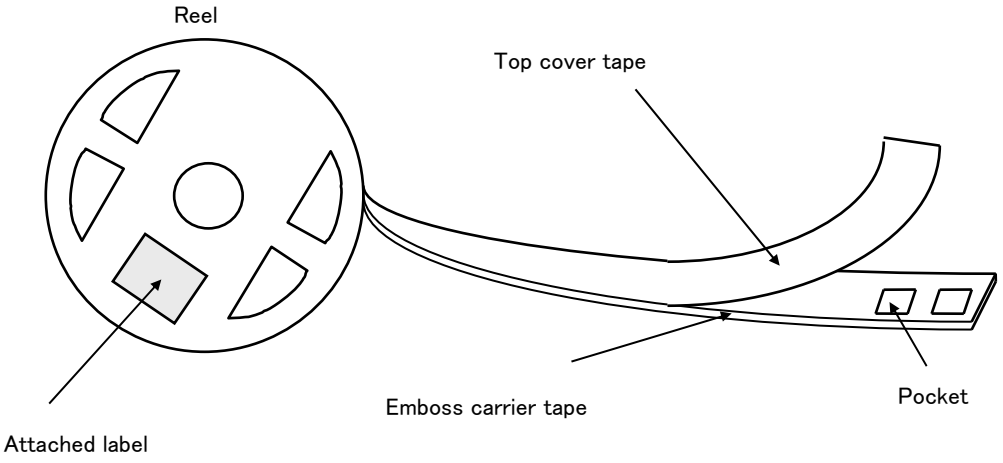


Unit: mm

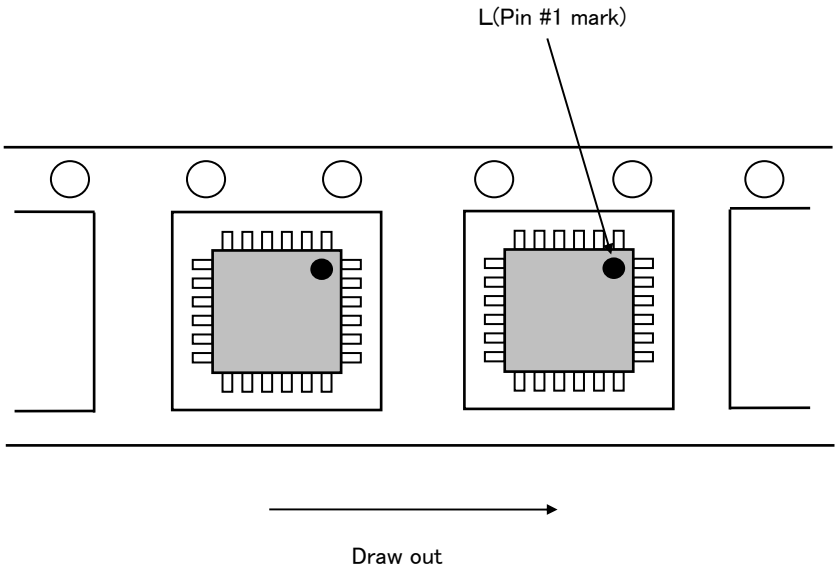
A	N	B	C	D	W1	W2
254±2	100±1	2±0.5	13±0.2	21±0.8	25.5±1.0	29.5±1.0

5. Taping

ICs are put in the pockets of an emboss carrier tape. Then, sealed with a cover tape and wound to a reel.



6. Taping direction

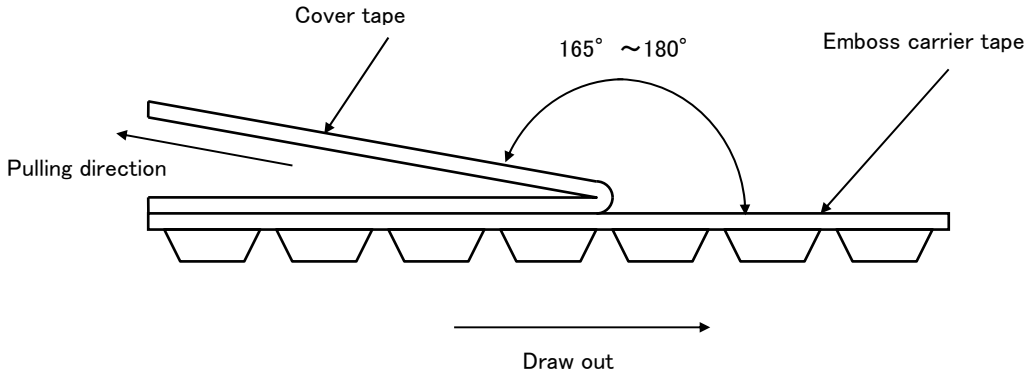


7. Exfoliation strength of cover tape

Exfoliation angle : 165～180 degree

Exfoliation speed : 300mm/min

Exfoliation strength : 0.1～1.3N



8. Number of lack ICs and mistaken taping

There must be no lack of products.

There must be no mistake in direction.

9. Caution for electro static discharge

Reel, Emboss carrier tape and top cover tape must be anti-static type.

10. Package and Indications

・Packaging is based on JEDEC J-STD-033.

・Quantity : 1,000pcs per reel

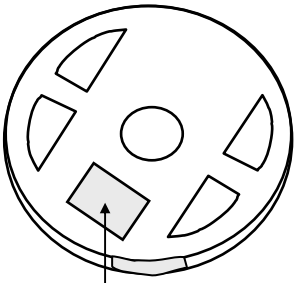
・The label which includes device type, quantity and lot# is attached on the reel and inner box.
（2 lots at maximum can be combined. The 2 lots must have different data code.）

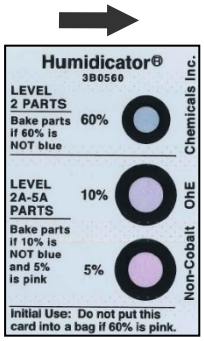
・Every reel must be sealed in anti-static shield bag with a desiccant and indicator card.

・Reel is put inside the inner box.

Example of package and Indications

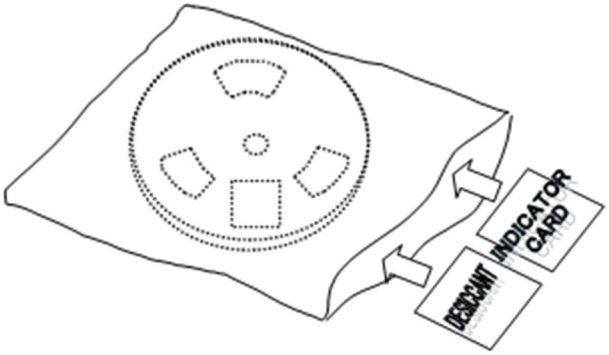
1,000pcs per reel





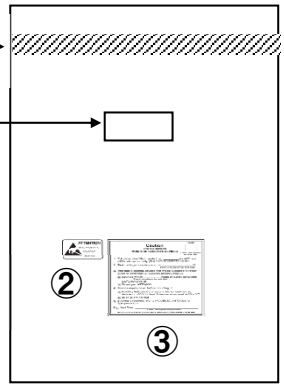
(INDICATOR CARD)

Reel must be sealed in anti-static shield bag with a desiccant and indicator card.



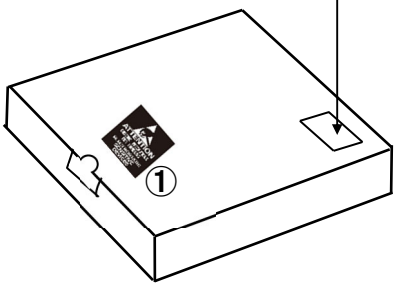
Attached label

Dry-pack, heat seal



Put in the inner box.

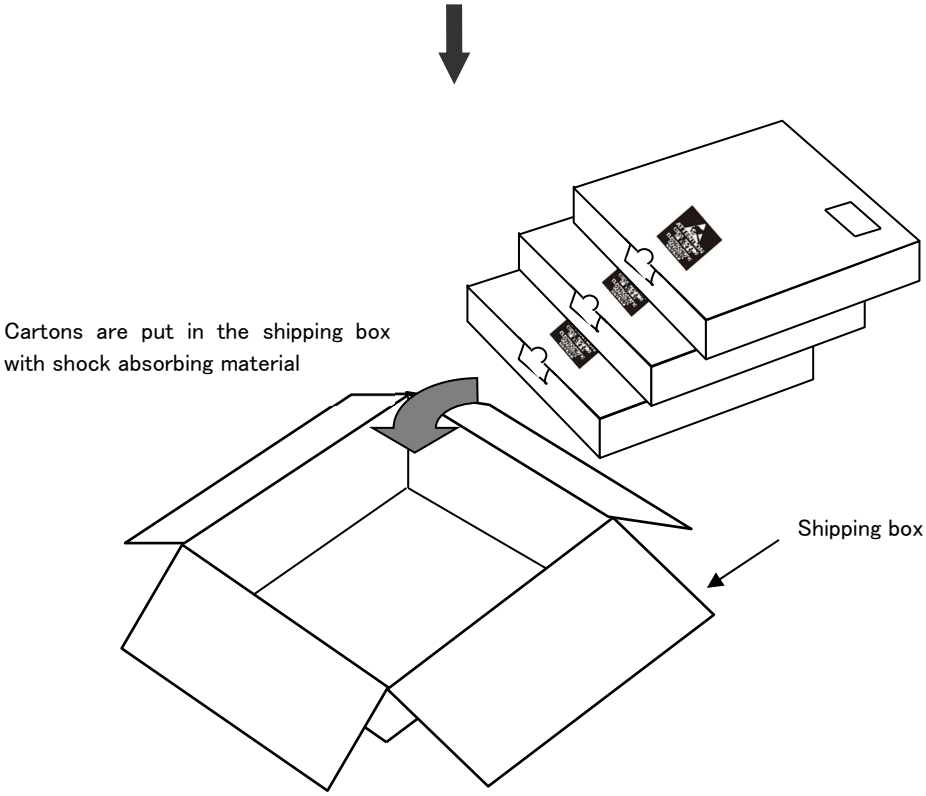
(1 reel per box)

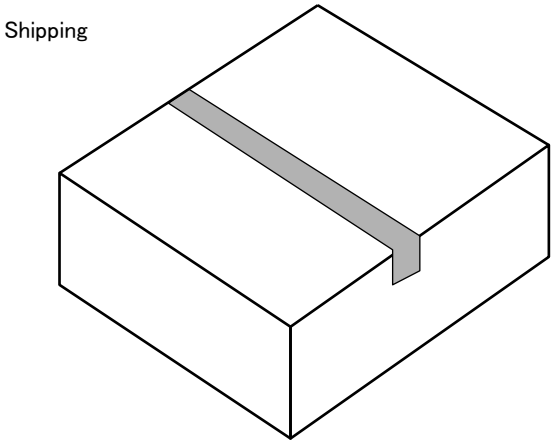


① ESDS mark print

② ESDS mark print

③ Caution label print


Cartons are put in the shipping box with shock absorbing material
Shipping box


Shipping

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AK4604VQ Reliability Test Data

WAFER PROCESS : CMOS
PACKAGE TYPE : LQFP64-10×10-0.50

	TEST	CONDITION	S.S.	TEST RESULT MEASUREMENT TIME POINT / FAILURES	PASS-FAIL RESULT
1	HIGH TEMP. OPERATING LIFE	Ta=143°C DYNAMIC Vopr=Voprmax	79	168: 0 / 500: 0 / 1000: 0 (h)	PASS
2	LOW TEMP. OPERATING LIFE	Ta=-40°C DYNAMIC Vopr=Voprmax	40	168: 0 / 500: 0 / 1000: 0 (h)	PASS
3	REFLOW1	BAKE: 125°C/24h SOAK×1+REFLOW×3 SOAK: 85°C/60%RH/168h REFLOW: 260°C Max	90	ALL PASS	PASS
4	HIGH TEMP. STORAGE	(AFTER REFLOW1 TEST) Ta=150°C	40	168: 0 / 500: 0 / 1000: 0 (h)	PASS
5	TEMP. HUMIDITY BIAS	(AFTER REFLOW1 TEST) Ta=85°C, RH=85% Vopr=Voprmax	50	168: 0 / 500: 0 / 1000: 0 (h)	PASS
6	REFLOW2	BAKE: 125°C/24h SOAK×1+REFLOW×3 SOAK: 85°C/60%RH/168h REFLOW: 260°C Max	129	ALL PASS	PASS
7	TEMP. CYCLING	(AFTER REFLOW2 TEST) Ta: -65~150°C SOAK: 30 min EACH	79	500: 0 (CYCLE)	PASS
8	AUTOCLAVE	(AFTER REFLOW2 TEST) Ta=121°C, RH=100%, P=0.21MPa	50	200: 0 (h)	PASS

Results by this product: No.6~No.8
Results by generic devices: No.1~No.5

AK4604VQ ESD/ LATCH UP Data

WAFER PROCESS : CMOS
PACKAGE TYPE : LQFP64-10×10-0.5

	TEST	CONDITION	S.S.	TEST RESULT	PASS-FAIL RESULT
1	ELECTRO STATIC DISCHARGE (HBM)	CON.: R=1.5kΩ, C=100pF COMMON/POLARITY: AVDD, LVDD, VDD33, TVDD1, TVDD2, AVDRV, AVSS, DVSS / ±(EXECUTED 16 MODES) SUPPLY: 3TIMES/PIN TEST PIN: ALL PINS Ta=25°C	3	CRITERIA: ±2000V ALL PINS PASS	PASS
2	LATCH UP (PULSE CURRENT APPLICATION)	CON.: DIRECT CURRENT INJECTION COMMON/POLARITY: VSS/± (EXECUTED 2 MODES) TEST PIN: ALL I/O PINS Ta=25°C Vopr=Voprmax	3	CRITERIA: ±200mA ALL PINS PASS	PASS

Results by this product: No.1~No.2
Results by generic devices: -

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Country of origin of the AK4604VQ

Origin: Korea

Soldering Methods (Solder Paste: Pb Free) and Handling Precautions

When plastic surface-mount-device product (hereinafter, “product”) which is including excessive amount of moisture is put in the soldering furnace, package cracks may possibly occur in it. The products shall be handled on the condition of reduced moisture absorption and soldered at temperature as low as possible in order to prevent a package crack.

AKM’s recommendations regarding soldering method are as below.

1. MSL

This product is worth MSL2. (JEDEC J-STD-020)

2. Storage Conditions

Store this product under the following conditions.

Shelf Life: 60 months from the bag seal date. (The seal date is indicated on the bar code label.)
In Packing Bag: 5~40°C, <90%RH (Recommended to use the product within 1 year after delivery.)
After Unpacking: 5~30°C, <60%RH (Floor life is within 1 year.)

3. Soldering Conditions

Please give your consideration on soldering conditions of the products. For reference, AKM presents soldering methods as below. And please check the results of solderability.

Soldering Methods : IR or Air Reflow (Flow Soldering is not recommended)
Reflow Times : up to 3 times
Reflow Profile : Refer to Fig.1

Preheat/Soak	T_{smin}	150°C
	T_{smax}	200°C
	T_{smin} to T_{smax}	60~120s
Liquidous Temperature	T_L	217°C
	t_L	60~150s
Ramp-up Rate	T_L to T_p	3°C/s max.
Peak Package Body Temperature	T_p	260°C max.
	t_p	30s max.
Ramp-down Rate	T_p to T_L	6°C/s max.
Time 25°C to Peak Temperature	25°C to T_p	8min max.

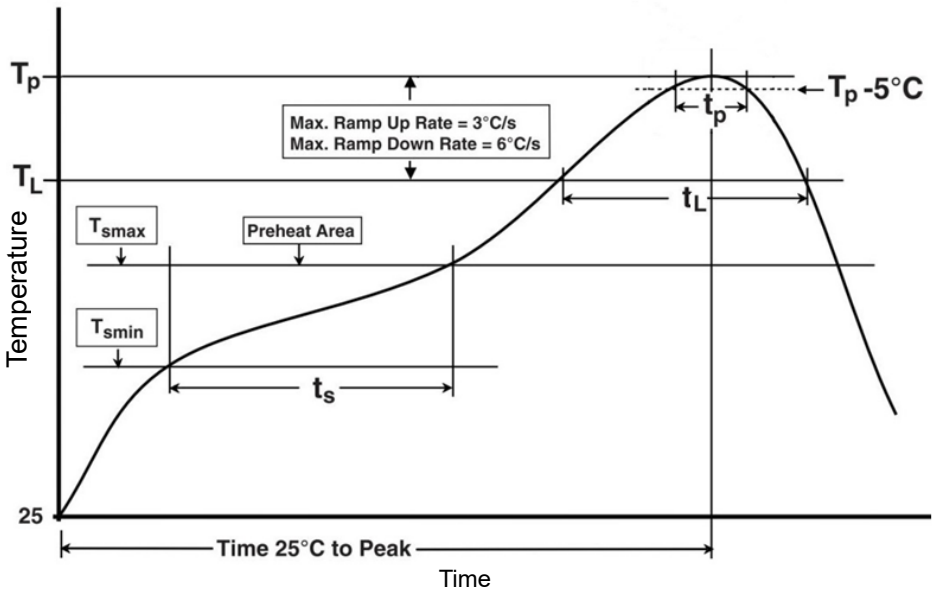


Fig.1 Temperature Profile (Pb Free Solder)

4. Bake (After the Moisture Absorption)

When the products have been stored over the recommended time limit or absorbed the moisture in a high humidity atmosphere, bake them before soldering. (refer to JEDEC J-STD-033)

1) Normal Temperature Baking

In case of moisture desorption of the products packed in taping, the treat condition is as below.

Ta=40°C, <5%RH, 13days

2) High Temperature Baking

In the case that the products are shipped in heat proof packing material, we recommend that they shall be baked in high temperature atmosphere of below condition. (N.B. It is necessary to take off the unity belt)

125°C, 8h (within 3 times)

3) Floor Life Reset and Pause

The products after unpacking can be reset or pause the floor life by storage in the following time in the dry cabinet (room temperature, <10%RH).

Floor Life Reset : exposure time <12h, by storage 5 times exposure time, floor life can be reset.

Floor Life Pause : exposure time <1year, floor life can be extended by adding the storage time.

4) Storage Conditions (After Baking)

Store the products in atmosphere on the condition within the following range. (after baking)

5~30°C, <60%RH. 1year max.

5. Handling Precautions

(1) Mounting and repair using a soldering iron

According to the general standard for the soldering heat resistance test of semiconductor devices, the temperature of the terminals should be 260°C for 10 seconds or 350°C for 3.5 seconds when heating the solder. If the soldering temperature is high and the time is long, the temperature of the device may rise excessively, which may cause deterioration or destruction.

Carry out sufficient evaluation and use appropriate conditions.

(2) Flux types and cleaning methods

Rosin-based flux (RMA: Mildly Activated Rosin base) is recommended for use during soldering. The flux should be selected with due consideration for the environment and safety.

We recommend the use of general cleaning agents such as quasi-waterborne, hydrocarbon-based, or alcohol-based agents.

We also recommend the use of alcohol-based cleaning agents, which are environmentally and safely safe.

(3) Underfill

We do not recommend the use of underfill.

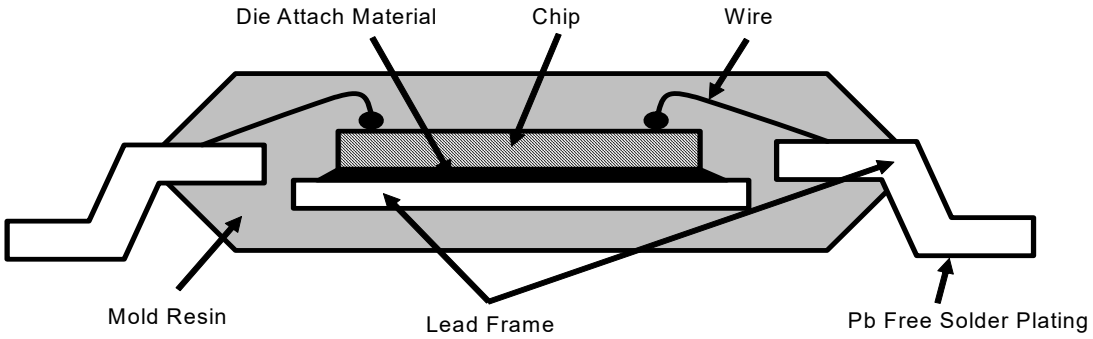
If underfill is to be used in BGA or WL-CSP packages, please evaluate it thoroughly by the customer.

(4) Static Electricity and Electrostatic Discharge

ESD (Electro-Static Discharge) destruction is different from EOS (Electrical Overstress) destruction that occurs during normal operation in that it can also occur before the device is mounted. For this reason, take care during the packing, storage and transportation of semiconductor devices.

Cross Section :AK4604VQ

Package Type :LQFP64-10×10-0.5



Process	Name	Material and its Specification
Wafer	Chip	Si
Die Bonding	Lead Frame	Cu Alloy
	Die Attach Material	Ag Paste
Wire Bonding	Wire	Au
Molding	Mold Resin	Epoxy Resin UL-94 V-0
Plating	Pb Free Solder Plating	Sn100%
Marking	Laser Marking	Laser Mark

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Failure Rate and MTTF Estimation for AK4604VQ

Failure Rate Estimation for AK4604VQ is as follows,

Assuming Arrhenius model for LSI failure mechanism, Temp. accelerating factor AF is described in formula (1).

$$AF = \exp[-Ea / KB \times (1/Tj1 - 1/Tj2)] \quad \cdots (1)$$

Activation energy (eV) :	Ea
Boltzmann constant :	K_B (8.617×10^{-5}eV/K)
Junction Temp. at stress condition (K) :	Tj1
Junction Temp. at using condition (K) :	Tj2

And junction Temp. Tj is described in formula (2)

$$Tj = Ta + Pd \times \theta ja \quad \cdots (2)$$

Ambient Temp. (K) :	Ta
Power dissipation (W) :	Pd
Package thermal resistance (K/W) :	θja

As AK4604VQ is CMOS product, power dissipation Pd is very small.

$$Tj = Ta \quad \cdots (3)$$

Assuming activation energy Ea=0.4 eV, Temp. accelerating factor AF is calculated from formula (1) and (3).

The results of High Temperature Op-Life test are as follows.

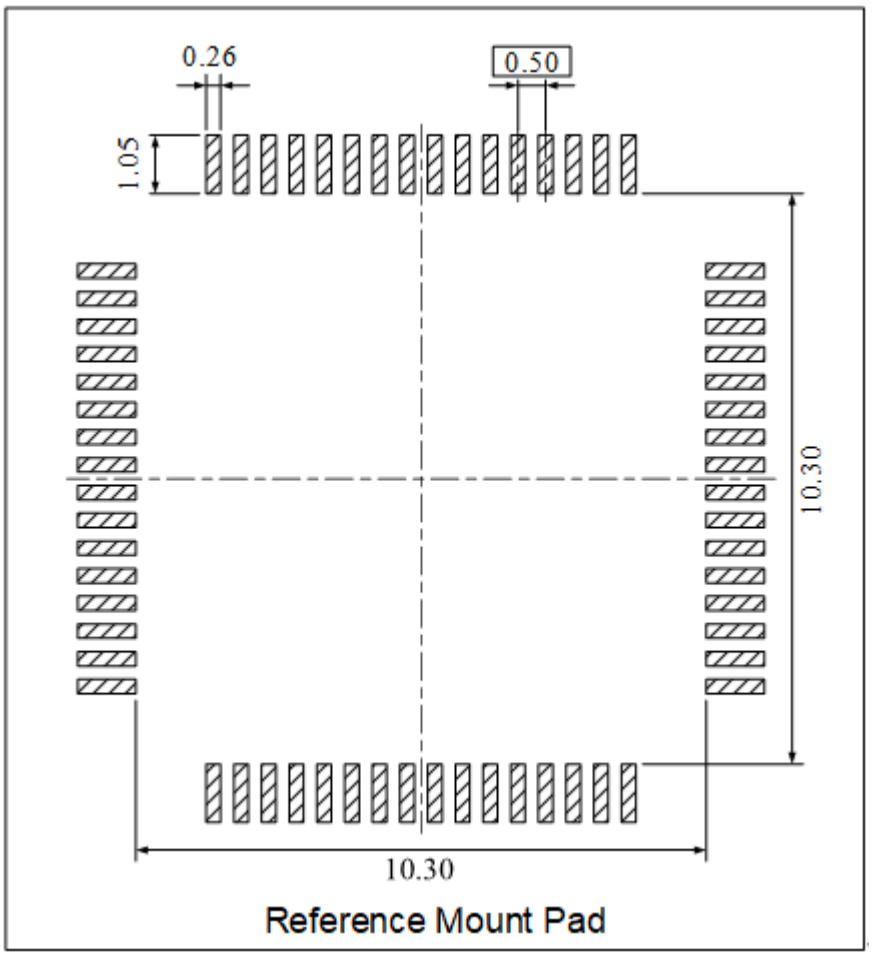
Ambient Temp. (°C):	125	
Test life (h) :	1000	
No. of samples :	1200	(total 1200 samples from 15 lots)
Failure counts :	0	

The calculated data , Failure Rate (λ) at 60% confidence level

Using Temp. (°C)	70	55	27
AF	6.5	12.0	45.0
Failure Rate λ (Fit)	118	63	17
MTTF (Years)	1000	1800	7000

AK4604VQ Land Pattern (for reference)

Package Type: LQFP64-10×10-0.5



【unit: mm】

※Our Land-pattern for reference is described above, however, please note that the most suitable dimension for mounting-pad will vary according to following conditions, :Materials of PCB, Kind of soldering paste, soldering method, accuracy of soldering machine, so on.
So, for your actual design for Land-pattern, we recommend you should optimize it to your actual condition.

AK4604VQ Mounting Related Test Data.

PACKAGE TYPE : LQFP64-10×10-0.5
External plating : Sn100%

	TEST	CONDITION	S.S.	TEST RESULT	PASS-FAIL RESULT
1	Solderability	JEITA ET-7404 Based on. Pretreatment condition: 105°C, 100%RH, 4h Used solder: Sn-3.0Ag-0.5Cu Solder bath temperature: 230±2°C Dipping time: 10s Dipping depth: 0.25mm Criteria: Zero-cross time is 3 seconds or less.	5	Zero-cross time: Less than 3 second	Pass
2	Whisker	Test1) Temperature cycle test Condition: -55+0/-10°C~85+10/-0°C, each 10min., 1500cyc Criteria: Whisker length within 45μm.	6	Whisker length within 45μm.	Pass
		Test2) Room temperature test Condition: 30±2°C, 60±3%RH, 4000h Criteria: Whisker length within 40μm.	6	Whisker length within 40μm.	Pass
		Test3) High-temperature and high-humidity storage test Condition: 55±3°C, 85±3%RH, 4000h Criteria: Whisker length within 40μm.	6	Whisker length within 40μm.	Pass

The data above are based on the test results of generic of AK4604VQ.