

APPLICATION NOTE

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SUBJECT: Reliability concept for SiRF Products

Conclusion: This application note shows the reliability concept and reliability level for SiRF products. We show the target quality level of SiRF products at Item 1. Next we show the our estimate operating time of walkie-talkie at Item2. Item 3 shows the our standard item of reliability test. For reference ,we show the conceivable failure mode at Item4.

1.Quality level

Application; Consumer use two way walkie-talkie for mobile.

Initial Failure Rate; 1000ppm

Failure in Time ; 1000FIT

2.Estimate of walkie-talkie operating time

Transmit :Receive : Wait Time= 1 : 4 : 5 minute/Cycle

Operating time 8.5hours/day

Life Time 5Years (93.075Cycle/Life)

3.Reliability test item and condition

Page 2-4 shows the example of reliability report.

We examine the reliability with these item and condition as standard.

4.Conceivable Failure Mode

Page 5 shows the conceivable failure mode.

Example

RELIABILITY REPORT

mitsubishi semiconductor device

TYPE ; RA30H series

DATE OF ISSUE: Oct. 2002

mitsubishi electric corporation

miyoshi electronics corporation

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RA30H series reliability results

The following summarizes reliability test on RA30H series (RA30H4452M)

Table 1 Results

Group	Test item	Test condition	QTY of sample	QTY of failure
1	High temperature Storage	125deg/C 1000hours	11	0
2	Temperature cycling	-40/125deg/C 210cycles	22	0
3	Humidity bias	85degC/85% Vdd=17V 1000hours	20	0
4	RF operation	f=480MHz Pin=50mW Vgg=5V Vdd=12.5V ON/OFF=1min/1min(DeltaTj=60deg/C) 20000cycles	7	0
5	Shock ↓ Vibration	1500G,0.5sec,X1 2/Y1 2/Z1 2 ↓ 20G,100-2000-100Hz,4min,X/Y/Z	8	0
6	Soldering thermostability ↓ Lead integrity	350deg/C 3sec ↓ Pull:0.5Kg,5sec	8	0
7	ESD	100pF 1.5kohm Test lead ;Pin-GND,Vgg-GND,Vdd-GND,Po-GND	Each lead 3	0

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Table 2 Failure criteria

Group	Test	Failure criteria
1	High temperature Storage	For Po and nT , More than the following amount
2	Temperature cycling	Delta Po= \pm 20% Delta nT= \pm 20%
3	Humidity bias	@ ferq=440,490MHz Pin=50mW Vgg=5V
4	RF operation	Vdd=12.5V
5	Shock ↓ Vibration	
6	Soldering thermostability ↓ Lead integrity	Broken lead
7	ESD	under 1000V

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SiRF Products conceivable failure mode and test method.

Mode	Detail	Formation Process	Principal Cause	Test Method
Substrate Crack (Only Module).	Line break on the substrate.	#Wrong assembly procedure. #Foreign object between module flange and chassis. #Expansion by thermal stress.	Excess stress to substrate.	Temperature Cycling
SMD Parts/Solder Crack (Only Module).	Line break on the substrate.	#Poor soldering #High Frequent on/off switching	Excess stress to solder/ SMD parts.	Temperature Cycling
Terminal pull off (Only Module).	Line break on the substrate.	#Poor soldering #High Frequent on/off switching	Excess stress to solder.	Temperature Cycling
Gate leak	Gate oxide burn out.	#Large RF input power #Load VSWR mismatch #Excess DC or RF voltage applied between drain and source.	Excess input power Excess reflection power Static electricity or surge. Misbiasing	- - ESD -
Drain to Source Breakdown	Termination between drain and source or drain and gate.	# Load VSWR mismatch #Excess DC or RF voltage applied between drain and source.	Excess reflection power Static electricity or surge. Misbiasing	- ESD -
Degradation of ohmic feature.	Migration of electrode.	#High current. #Exposed in higher ambient or heat concentration.	Excess high current Inadequate thermal dissipation.	RF continuation transmission test
Wire snapping	Open between chip and substrate.	#High frequent on/off switching	Excess stress to wire by expansion and reduction of coating resin.	Temperature Cycling