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EEE Part Qualification for Commercial Satellite

Chang-Ho Lee*, Dong-In Han**

Abstract

Traditionally, for space program whose operation environment is severe, high reliability parts, that is class s microcircuit, JANS level semiconductor, and ER passive parts, are reliable choices. But in some case, we must use 'Non-standard Part' which is not verified as high reliability standard part. To use 'Non-standard Part' in space application, the manufacturer should qualify the part and screen potential week part from the flight lot. In this technical memo, I introduce the flight part verification process for KOMPSAT 1 and KOMPSAT 2 program.

High-Reliability Part Discrete Semiconductor,	Class S ER(Established Reliability)	Microcircuit, JANS R High-Reliability Part	Passive
	가	Screening	
	1	2	
:	(flight part), (burn in),	(flight part), (standard part),	(EEE part screening), (non-standard part)

1.

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/ chlee@kari.re.kr

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/ dihan@kari.re.kr

Part) S (Class S)
 (Microcircuit), JANS
 (Discrete Semiconductor), ER (Established Reliability) R (Passive)
 2 NASA MIL-STD-975 GSFC PPL (Preferred Part List) 21 2 (Grade 2)

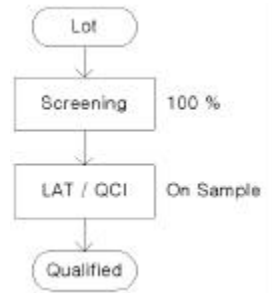
NASA GSFC
 PPL (Preferred Part List) 21

(COTS, Commercial Off The Shelf)

2.3 (Screening)

1 (Screening) QPL QML
 1 (Quality Level)
 (QCI, Quality Conformance Inspection)

2 IGG



1. Screening

2.1 (Standard Part)
 (Standard Part)

1 2
 NASA MIL-STD-975 PPL(Preferred Part List) 21 2 (Grade 2)
 (Non-standard Part)

Lot
 (COTS, Commercial Off The Shelf)
 (Nonstandard Part)

2.2 QML QPL

(Specification), 가

QML(Qualified Manufacturer List) QPL (Qualified Part List)

2.4
 2

MIL QPL,

ESA QPL, GSFC PPL 21

(PPL, Preferred

3. (Nonstandard Part)

Part List)

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QPL

QML

ESA

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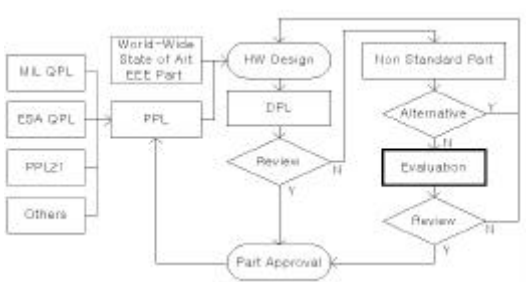
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Screening

(Pilot Test)

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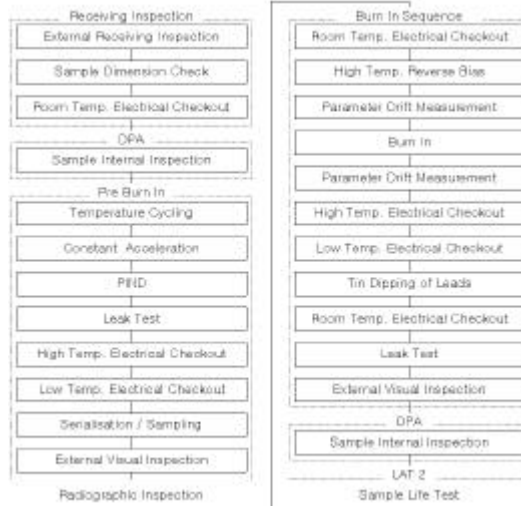
3



2.

1. (Screening)

	Screening
Generic Electric and Electronic Component	MIL-STD-202
Semiconductor Device	MIL-STD-750
Microcircuit	MIL-STD-883
Custom Electromagnetic Device	MIL-STD-981
Electrical Connector	MIL-STD-1344



3.

Screening

3.1 (Burn In)

(Failure Rate)
(Bathtub)

(Early Life Failure)

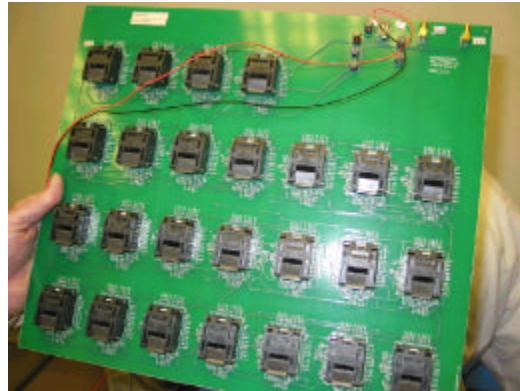
1 2

Failure Infant Mortality Failure . Infant Mortality Failure
0.05 1% . Freak Failure
2 10%

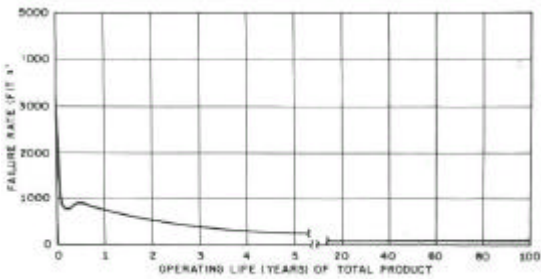
Steady State Reverse Bias, Steady
State Forward Bias, Parallel Excitation
(Burn In) 가
(Burn In)

4

5
Infant Mortality Freak

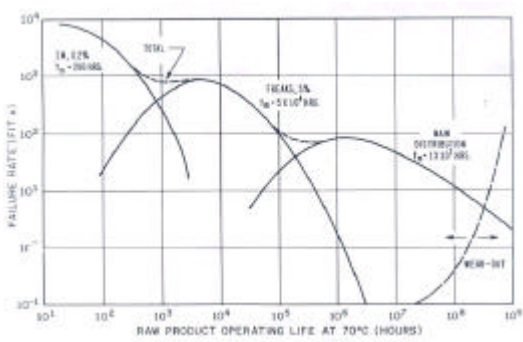


6. Burn In Socket (Bias
가 . IGG)

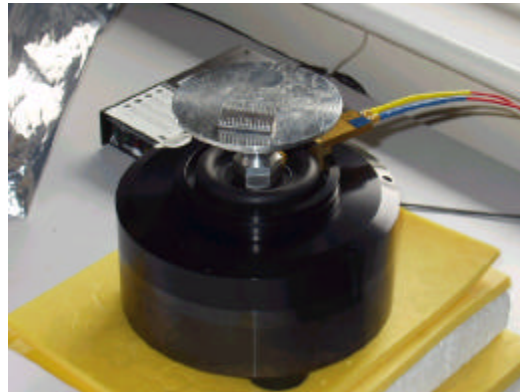


4.

3.2 PIND



5.



7. PIND Shaker (IGG)

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PIND(Particle Impact Noise Detect)
(Cavity) (Hermetic)

가

(Burn

In) . (Burn In)

(Bond Wire) (Die) (Short)
 Circuit) . PIND 가 가 가
 가 가 가
 PIND
 Vibration Shaker, Shaker Driver,
 PIND Transducer, Amplifier, Oscilloscope
 7 PIND

3.4 (Thermal Cycling)

가 가 가
 가
 (Thermal Cycling)
 가
 (Thermal Shock)

1

3.3 (Leak)

10

(Leak) (Seal)
 (Hermetic) (Cavity)
 (Gross Leak) (Sealing)
 (Fine Leak)

가 가
 가

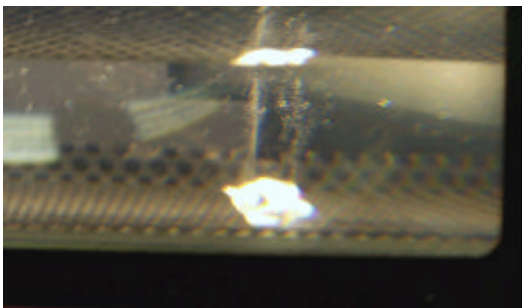


9. Leak Test 가 (IGG)

Krypton 85 Helium
 carbon Fluoro

3.5 (DPA, Destructive Physical Analysis)

(DPA, Destructive Physical Analysis)
 가



8. (Feed through) 가
 . IGG)

1. External Optical Inspection
2. Electrical Measurement
3. PIND
4. Hermetic Seal Test

5. Solderability / Terminal Strength Test

6. X-ray Inspection

7. De-Encapsulation

1. , " COTS 가
", KARI-SB-TM-2001-002, 2001

8. Internal Optical Inspection

9. SEM Inspection

2. , "
", 9 1 ,
2001, pp. 173-191

10. Wire Bond Strength Test

11. Die Shear Strength Test

3. 2 1
, 2000,

12. Microsection Inspection

De-Encapsulation (Die)

pp.321-327

Cavity 가

PIND

. Internal Optical Inspection

Layout Wire

Bond . SEM

Die Layout Metalization .

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4.

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1 TRW가

2
IGG가