

TOTAL DOSE RADIATION TEST REPORT

Part Type : LMH6702JF-QMLV

Package : DIL-08

**Description : Ultra Low Distortion, Current
Feedback Wideband, Operational Amplifier**

Manufacturer : National Semiconductor

Date Code: 0915

Alter Technology - TUV Nord S.A.U. Purchase Order N° 5504769 dated 01/03/2012

Alter Technology - TUV Nord S.A.U. Technical Responsible: Jose Maria Montero Castillo

Hirex reference:	HRX/TID/1029	Issue: 02	Date:	August 10 th , 2012
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Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
	LMH6702JF-QMLV	National Semiconductor	Issue:	02

TOTAL DOSE RADIATION TEST REPORT **on National Semiconductor** **LMH6702JF-QMLV**

Ultra Low Distortion, Current Feedback Wideband, Operational Amplifier

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1 Introduction

A total dose radiation verification test of the National Semiconductor LMH6702JF-QMLV, Ultra Low Distortion, Current Feedback Wideband, Operational Amplifier has been performed with an accumulated dose of about 106 Krad(Si) at a dose rate of 330 rad(Si)/hour, in response to Alter Technology - TUV Nord S.A.U. purchase order reference 5504769.

The purpose of this test was to evaluate total dose withstanding of this component, to investigate its suitability for being used in space applications. This test was conducted on samples provided by Alter Technology - TUV Nord S.A.U..

Test has been performed in accordance with Hirex Engineering proposal reference HRX/PRO/3688 Issue 02 dated 19/12/2011.

A complete set of electrical measurements together with graphical representation of measured parameters with respect to total dose received, are provided for all samples.

2 Applicable and Reference Documents

2.1 Applicable Documents

- Hirex Engineering proposal: HRX/PRO/3688 Issue 02 dated 19/12/2011
- Alter Technology - TUV Nord S.A.U. specification: ATGSP-RP-81 Issue 1.
- Hirex Engineering Detail Design Document: HRX/DDD/1543 Issue 01
- Hirex Engineering Test Conditions: HRX/TC/1203 Issue 01

2.2 Reference Documents

- Manufacturer Datasheet

3 Test Samples

11 samples of the LMH6702JF-QMLV device were tested (5 ON + 5 OFF + 1 control sample).

Samples were allocated into the bias conditions during exposures and annealing as provided in the following table.

Serial Number	Allocation
191	Control
192	Biased ON
193	Biased ON
194	Biased ON
195	Biased ON
196	Biased ON
197	Biased OFF
198	Biased OFF
199	Biased OFF
200	Biased OFF
201	Biased OFF

Identification of the LMH6702JF-QMLV is given below:

Part Type: LMH6702JF-QMLV
Part Number: 5962F0254601VPA
Top Marking: logo B4D0915A LMH6702JF QV Q 5962F 0254601VPA
Bottom Marking serial
Date Code: 0915

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4 Experimental Conditions

4.1 Radiation Source Dose Rate and Annealing

The dose exposures were performed at UCL in Louvain (Belgium). In this irradiation facility, a Cobalt 60 source is used with the possibility to vary the dose rate by simply adjusting the distance to the source.

During the dose exposures, devices under test have been irradiated in an ambient temperature of 24°C ±6°C.

The dose received by the devices has been controlled by the measurement of one Alanine pellet dosimeter placed onto the bias board.

Resulting test conditions are provided below.

Irradiation Steps Requested	Pellet dosimetry data	Dose rate	Annealing steps	Temperature
kRad	kRad	kRad/h	Hours	°C
0	0	-	-	Room
5	6.3	0.33	-	Room
10	13.5	0.33	-	Room
20	20.5	0.33	-	Room
35	29.4	0.33	-	Room
50	51.2	0.33	-	Room
100	106	0.33	-	Room
-	-	-	24	Room
-	-	-	168	100

4.2 Bias during Dose Exposures and Measurements conditions

4.2.1 Bias conditions

During exposures test board allowed to bias 5 samples in accordance with the electrical circuit provided in Figure 1.

5 other samples were biased OFF with all pins connected to ground.

During annealing steps the same stress conditions were applied at room and 100°C temperatures.

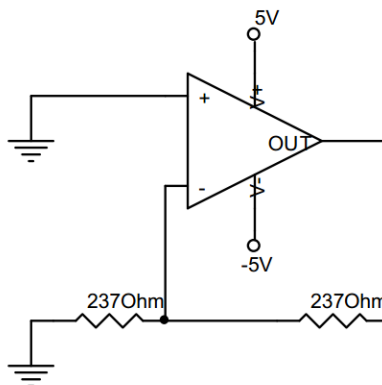


Figure 1 : Bias Conditions during Irradiation Exposures and Annealing

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4.2.2 Electrical Measurements

Electrical parameters test program principle for LMH6702JF-QMLV is provided in Figure 2.

One HP4142 DC tester was used to perform required measurements.

A dedicated test fixture was designed to ensure proper measurement conditions.

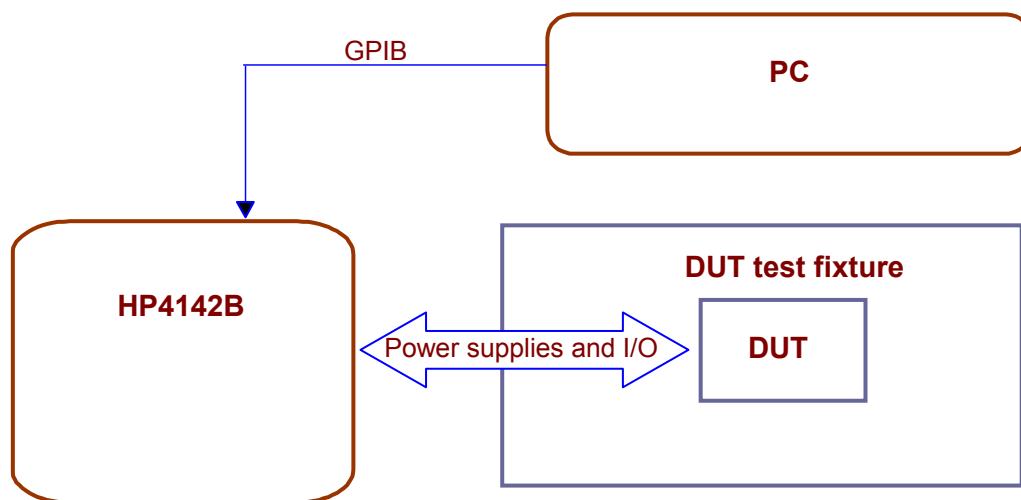


Figure 2 : LMH6702JF-QMLV test program principle

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Electrical parameters test conditions and limits used for performing this test are given in the following table.

PARAMETERS	SYMBOLS	TEST CONDITIONS Note1	MIN	MAX	UNITS
Input bias current. non inverting	IBN	-	-15.0	15.0	μA
Input bias current. inverting	IBI	-	-30.0	30.0	μA
Input offset voltage	VIO	-	-4.5	4.5	mV
Common Mode Rejection Ratio	CMRR	-	45.00	-	dB
Supply current. no load	ICC+	R1=∞	-	15.0	mA
Supply current. no load	ICC-	R1=∞	-15.0	-	mA
Power supply rejection ratio	PSRRP	Vcc = 4.5V to 5V	45.00	-	dB
Power supply rejection ratio	PSRRN	-Vcc=-4.5V to -5V	45.00	-	dB

Note 1: Unless otherwise specified: R1=100Ω, VCC=±5V, Av=+2, feedback resistor (Rf) = 250Ω, Gain resistor (Rg)=250Ω

Table 1 : Measured electrical parameters

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5 Conclusion

A Total Ionizing Dose verification test was carried out by Hirex Engineering under Alter Technology - TUV Nord S.A.U. contract on the National Semiconductor LMH6702JF-QMLV Ultra Low Distortion, Current Feedback Wideband, Operational Amplifier in DIL-08 package.

10 samples plus one control sample were used during testing. They were exposed to radiation using a dose rate of 330 rad(Si)/hour at room temperature.

All parameters remained within specification limits all along testing.

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6 Test Results

Test results including tables and graphics are provided in this section for each measured parameter.

Statistics are provided separately for Bias ON and Bias OFF samples.

Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
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Parameter : Input bias current. non inverting : IBN

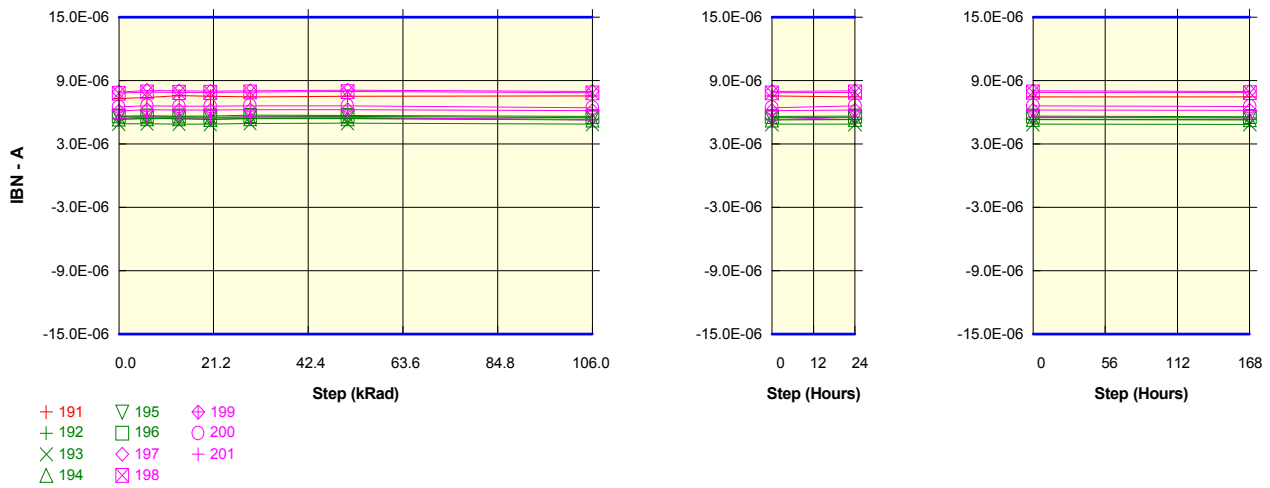
Test conditions :

Unit : A

Spec Limit Min : -15.0E-06

Spec Limit Max : 15.0E-06

Spec limits are represented in bold lines on the graphic.



Measurements

IBN	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	7.3E-06	7.4E-06	7.6E-06	7.5E-06	7.4E-06	7.5E-06	7.6E-06	7.4E-06	7.4E-06
ON samples									
192	5.4E-06	5.4E-06	5.4E-06	5.3E-06	5.4E-06	5.4E-06	5.3E-06	5.3E-06	5.3E-06
193	4.9E-06	4.9E-06	4.9E-06	4.9E-06	4.9E-06	5.0E-06	4.9E-06	4.9E-06	4.9E-06
194	5.4E-06	5.4E-06	5.4E-06	5.3E-06	5.4E-06	5.4E-06	5.3E-06	5.3E-06	5.3E-06
195	5.6E-06	5.6E-06	5.6E-06	5.5E-06	5.6E-06	5.6E-06	5.5E-06	5.5E-06	5.5E-06
196	5.7E-06	5.7E-06	5.7E-06	5.6E-06	5.7E-06	5.7E-06	5.6E-06	5.6E-06	5.6E-06
Statistics									
Min	4.9E-06	4.9E-06	4.9E-06	4.9E-06	4.9E-06	5.0E-06	4.9E-06	4.9E-06	4.9E-06
Max	5.7E-06	5.7E-06	5.7E-06	5.6E-06	5.7E-06	5.7E-06	5.6E-06	5.6E-06	5.6E-06
Average	5.4E-06	5.4E-06	5.4E-06	5.3E-06	5.4E-06	5.4E-06	5.3E-06	5.3E-06	5.3E-06
Sigma	260.2E-09	259.3E-09	259.3E-09	260.5E-09	257.5E-09	255.9E-09	246.4E-09	261.6E-09	252.0E-09

Measurements

IBN	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	7.3E-06	7.4E-06	7.6E-06	7.5E-06	7.4E-06	7.5E-06	7.6E-06	7.4E-06	7.4E-06
OFF samples									
197	7.9E-06	8.1E-06	8.0E-06	8.0E-06	8.0E-06	8.1E-06	8.0E-06	8.0E-06	8.0E-06
198	7.8E-06	7.9E-06	7.9E-06	7.9E-06	7.9E-06	8.0E-06	7.8E-06	7.9E-06	7.9E-06
199	6.1E-06	6.2E-06	6.2E-06	6.2E-06	6.2E-06	6.3E-06	6.2E-06	6.2E-06	6.2E-06
200	6.5E-06	6.6E-06	6.6E-06	6.6E-06	6.6E-06	6.6E-06	6.4E-06	6.6E-06	6.6E-06
201	5.4E-06	5.5E-06	5.5E-06	5.5E-06	5.5E-06	5.5E-06	5.3E-06	5.5E-06	5.5E-06
Statistics									
Min	5.4E-06	5.5E-06	5.5E-06	5.5E-06	5.5E-06	5.5E-06	5.3E-06	5.5E-06	5.5E-06
Max	7.9E-06	8.1E-06	8.0E-06	8.0E-06	8.0E-06	8.1E-06	8.0E-06	8.0E-06	8.0E-06
Average	6.8E-06	6.9E-06	6.8E-06	6.8E-06	6.9E-06	6.9E-06	6.7E-06	6.9E-06	6.8E-06
Sigma	964.2E-09	975.9E-09	973.0E-09	968.6E-09	970.6E-09	990.3E-09	1.0E-06	964.8E-09	968.3E-09

Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
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Parameter : Input bias current, inverting : IBI

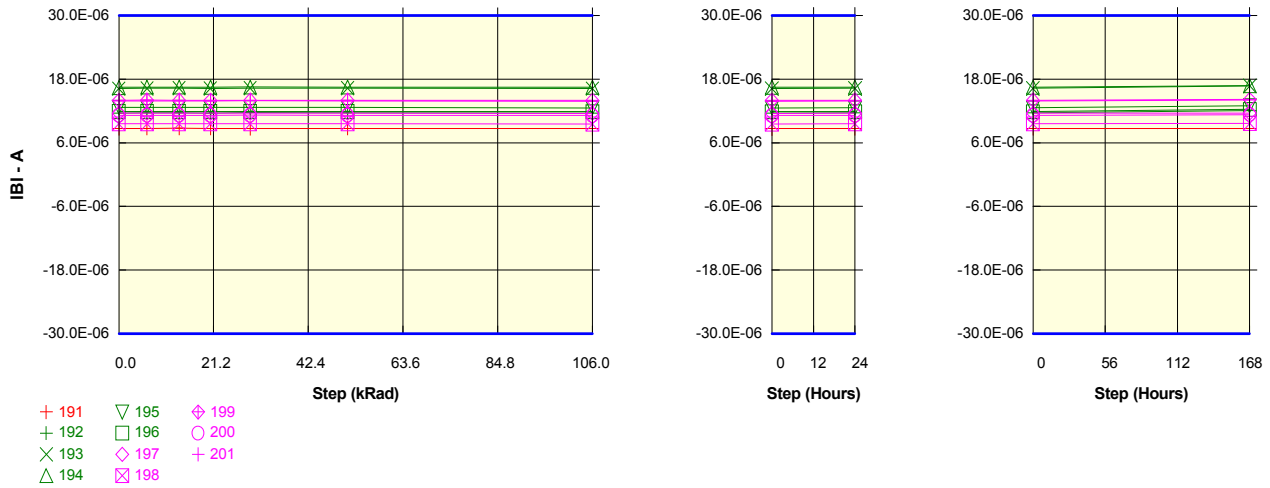
Test conditions :

Unit : A

Spec Limit Min : -30.0E-06

Spec Limit Max : 30.0E-06

Spec limits are represented in bold lines on the graphic.



Measurements

IBI	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06
ON samples									
192	11.6E-06	11.6E-06	11.7E-06	11.6E-06	11.7E-06	11.7E-06	11.6E-06	11.6E-06	12.0E-06
193	16.2E-06	16.3E-06	16.3E-06	16.2E-06	16.3E-06	16.3E-06	16.2E-06	16.2E-06	16.7E-06
194	16.4E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.8E-06
195	12.6E-06	12.7E-06	12.7E-06	12.6E-06	12.6E-06	12.7E-06	12.6E-06	12.6E-06	13.0E-06
196	11.9E-06	11.9E-06	11.9E-06	11.9E-06	11.9E-06	11.9E-06	11.8E-06	11.9E-06	12.3E-06
Statistics									
Min	11.6E-06	11.6E-06	11.7E-06	11.6E-06	11.7E-06	11.7E-06	11.6E-06	11.6E-06	12.0E-06
Max	16.4E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.5E-06	16.8E-06
Average	13.8E-06	13.8E-06	13.8E-06	13.8E-06	13.8E-06	13.8E-06	13.7E-06	13.8E-06	14.1E-06
Sigma	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.2E-06	2.1E-06	2.1E-06

Measurements

IBI	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06
OFF samples									
197	11.5E-06	11.6E-06	11.6E-06	11.5E-06	11.6E-06	11.6E-06	11.5E-06	11.6E-06	11.6E-06
198	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.5E-06	9.6E-06	9.6E-06
199	14.0E-06	14.1E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.1E-06
200	11.2E-06	11.2E-06	11.2E-06	11.1E-06	11.2E-06	11.2E-06	11.1E-06	11.2E-06	11.3E-06
201	13.9E-06	13.9E-06	13.9E-06	13.9E-06	13.9E-06	13.9E-06	13.8E-06	13.9E-06	14.0E-06
Statistics									
Min	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.6E-06	9.5E-06	9.6E-06	9.6E-06
Max	14.0E-06	14.1E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.0E-06	14.1E-06
Average	12.0E-06	12.1E-06	12.1E-06	12.0E-06	12.1E-06	12.0E-06	12.0E-06	12.0E-06	12.1E-06
Sigma	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06

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	LMH6702JF-QMLV	National Semiconductor	Issue:	02

Parameter : Input offset voltage : VIO

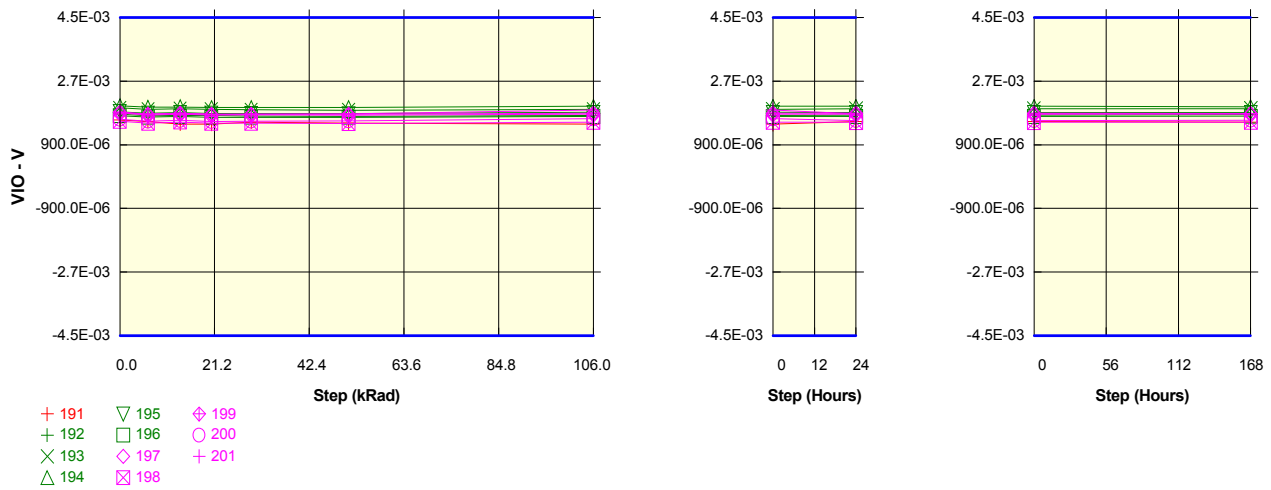
Test conditions :

Unit : V

Spec Limit Min : -4.5E-03

Spec Limit Max : 4.5E-03

Spec limits are represented in bold lines on the graphic.



Measurements

VIO	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	1.6E-03	1.6E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.6E-03	1.5E-03
ON samples									
192	1.8E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.8E-03
193	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03
194	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03
195	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03
196	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03
Statistics									
Min	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03
Max	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03	2.0E-03
Average	1.9E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03
Sigma	105.5E-06	104.5E-06	104.8E-06	103.0E-06	104.6E-06	105.1E-06	106.7E-06	107.0E-06	100.7E-06

Measurements

VIO	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	1.6E-03	1.6E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.6E-03	1.5E-03
OFF samples									
197	1.8E-03	1.7E-03	1.8E-03	1.7E-03	1.7E-03	1.7E-03	1.8E-03	1.8E-03	1.8E-03
198	1.6E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03
199	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03
200	1.6E-03	1.6E-03	1.6E-03	1.6E-03	1.6E-03	1.6E-03	1.6E-03	1.6E-03	1.6E-03
201	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.9E-03	1.8E-03	1.8E-03
Statistics									
Min	1.6E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03
Max	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.9E-03	1.8E-03	1.8E-03
Average	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03	1.7E-03
Sigma	109.8E-06	108.6E-06	107.1E-06	108.8E-06	109.0E-06	110.6E-06	122.5E-06	109.5E-06	106.3E-06

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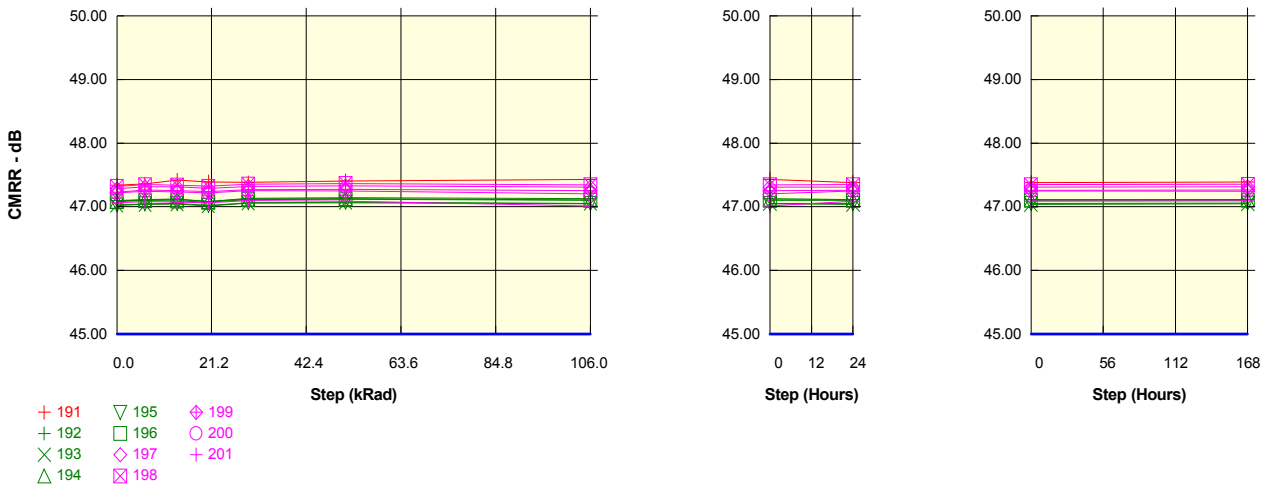
Parameter : Common Mode Rejection Ratio : CMRR

Test conditions :

Unit : dB

Spec Limit Min : 45.00

Spec limits are represented in bold lines on the graphic.



Measurements

CMRR	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	47.34	47.36	47.42	47.39	47.38	47.41	47.43	47.38	47.39
ON samples									
192	47.09	47.11	47.12	47.08	47.13	47.14	47.13	47.11	47.11
193	47.02	47.03	47.04	47.01	47.05	47.06	47.05	47.04	47.05
194	47.09	47.11	47.11	47.08	47.12	47.12	47.11	47.10	47.11
195	47.03	47.05	47.05	47.02	47.06	47.07	47.05	47.05	47.06
196	47.08	47.09	47.09	47.07	47.11	47.12	47.10	47.10	47.10
Statistics									
Min	47.02	47.03	47.04	47.01	47.05	47.06	47.05	47.04	47.05
Max	47.09	47.11	47.12	47.08	47.13	47.14	47.13	47.11	47.11
Average	47.06	47.08	47.08	47.05	47.10	47.10	47.09	47.08	47.09
Sigma	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Measurements

CMRR	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	47.34	47.36	47.42	47.39	47.38	47.41	47.43	47.38	47.39
OFF samples									
197	47.28	47.31	47.31	47.29	47.32	47.33	47.31	47.31	47.31
198	47.32	47.35	47.34	47.32	47.35	47.36	47.34	47.35	47.35
199	47.23	47.26	47.25	47.23	47.27	47.27	47.25	47.26	47.26
200	47.22	47.24	47.23	47.22	47.25	47.25	47.20	47.25	47.24
201	47.06	47.08	47.07	47.06	47.09	47.09	47.01	47.09	47.09
Statistics									
Min	47.06	47.08	47.07	47.06	47.09	47.09	47.01	47.09	47.09
Max	47.32	47.35	47.34	47.32	47.35	47.36	47.34	47.35	47.35
Average	47.22	47.25	47.24	47.22	47.26	47.26	47.22	47.25	47.25
Sigma	0.09	0.09	0.09	0.09	0.09	0.10	0.12	0.09	0.09

Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
	LMH6702JF-QMLV	National Semiconductor	Issue:	02

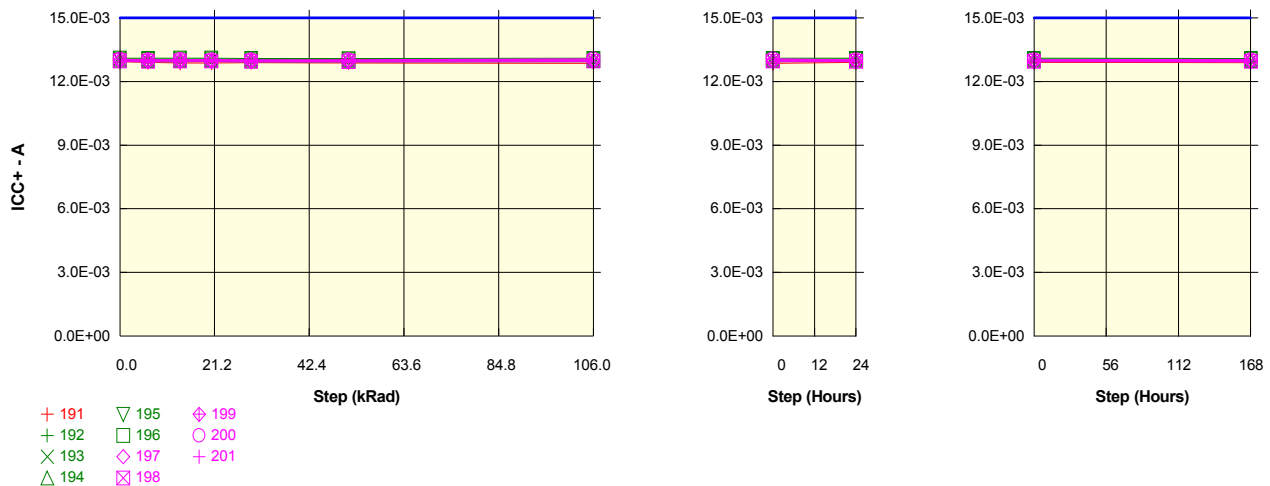
Parameter : Supply current. no load : ICC+

Test conditions : R1=8

Unit : A

Spec Limit Max : 15.0E-03

Spec limits are represented in bold lines on the graphic.



Measurements

ICC+	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
ON samples									
192	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
193	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
194	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
195	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03
196	13.1E-03	13.0E-03	13.1E-03	13.1E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
Statistics									
Min	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
Max	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03	13.1E-03
Average	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
Sigma	56.3E-06	55.8E-06	59.0E-06	54.6E-06	57.3E-06	57.0E-06	58.4E-06	53.5E-06	52.6E-06

Measurements

ICC+	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
OFF samples									
197	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
198	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	12.9E-03	13.0E-03	13.0E-03	13.0E-03
199	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
200	13.1E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.1E-03	13.0E-03	13.0E-03
201	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.1E-03	13.0E-03	13.0E-03
Statistics									
Min	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03	12.9E-03
Max	13.1E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.1E-03	13.0E-03	13.0E-03
Average	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03	13.0E-03
Sigma	38.1E-06	38.1E-06	37.4E-06	38.0E-06	37.7E-06	41.2E-06	54.8E-06	36.5E-06	38.1E-06

Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
	LMH6702JF-QMLV	National Semiconductor	Issue:	02

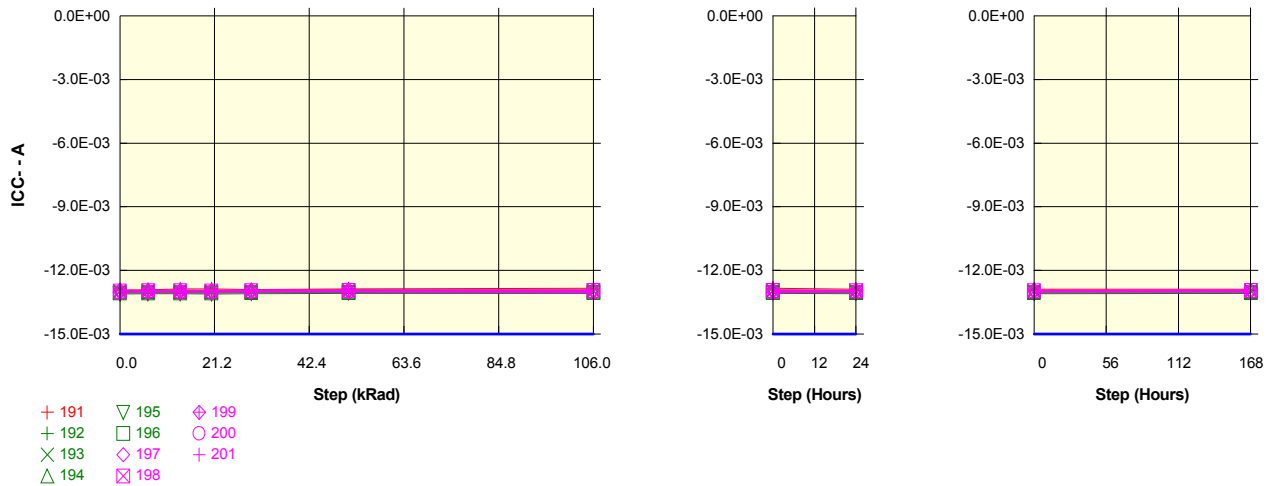
Parameter : Supply current. no load : ICC-

Test conditions : R1=8

Unit : A

Spec Limit Min : -15.0E-03

Spec limits are represented in bold lines on the graphic.



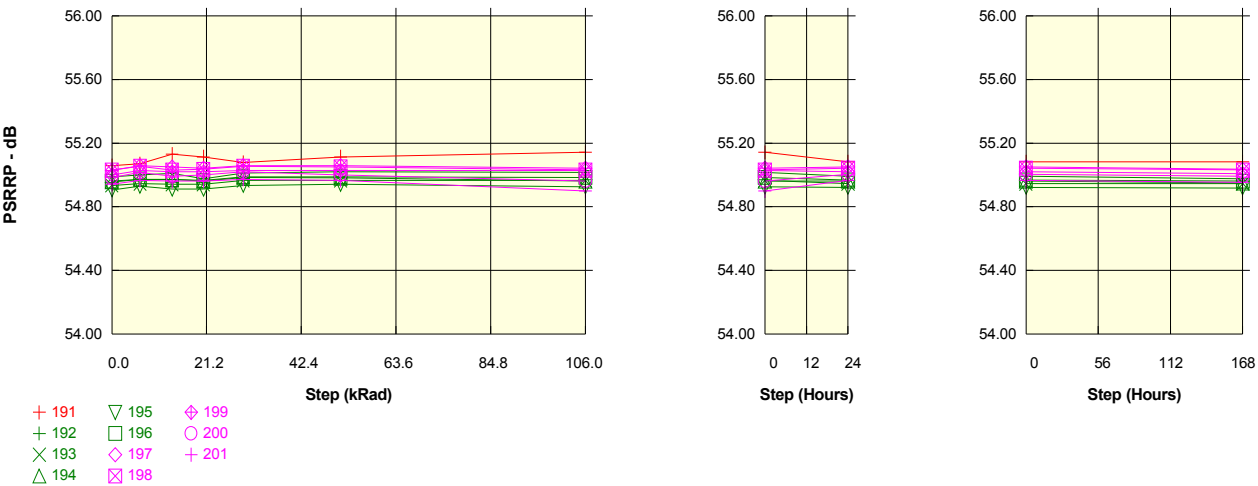
Measurements

ICC-	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.8E-03	-12.9E-03	-12.9E-03
ON samples									
192	-13.0E-03	-12.9E-03	-12.9E-03	-13.0E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03
193	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03
194	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03
195	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03
196	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.0E-03	-13.0E-03	-13.1E-03	-13.1E-03
Statistics									
Min	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03	-13.1E-03
Max	-13.0E-03	-12.9E-03	-12.9E-03	-13.0E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03
Average	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03
Sigma	55.7E-06	55.3E-06	58.1E-06	54.7E-06	56.3E-06	56.5E-06	56.9E-06	53.3E-06	52.5E-06

Measurements

ICC-	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.8E-03	-12.9E-03	-12.9E-03
OFF samples									
197	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03
198	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-12.9E-03	-13.0E-03	-13.0E-03	-13.0E-03
199	-13.0E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03
200	-13.1E-03	-13.0E-03	-13.1E-03	-13.1E-03	-13.0E-03	-13.0E-03	-13.1E-03	-13.0E-03	-13.0E-03
201	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.1E-03	-13.0E-03	-13.0E-03
Statistics									
Min	-13.1E-03	-13.0E-03	-13.1E-03	-13.1E-03	-13.0E-03	-13.0E-03	-13.1E-03	-13.0E-03	-13.0E-03
Max	-13.0E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03	-12.9E-03
Average	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03	-13.0E-03
Sigma	37.4E-06	37.6E-06	40.0E-06	38.0E-06	37.5E-06	41.3E-06	54.5E-06	36.3E-06	37.6E-06

Parameter : Power supply rejection ratio : PSRRP
 Test conditions : Vcc = 4.5V to 5V
 Unit : dB
 Spec Limit Min : 45.00
 Spec limits are represented in bold lines on the graphic.



Measurements									
PSRRP	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	55.06	55.07	55.13	55.11	55.08	55.11	55.14	55.08	55.08
ON samples									
192	54.99	55.00	55.01	54.98	55.01	55.02	55.02	54.99	54.98
193	54.93	54.94	54.94	54.94	54.96	54.96	54.96	54.94	54.94
194	54.96	54.97	54.97	54.96	54.98	54.98	54.96	54.96	54.95
195	54.91	54.93	54.91	54.91	54.93	54.94	54.93	54.92	54.92
196	54.96	54.97	54.97	54.96	54.99	54.99	54.98	54.97	54.96
Statistics									
Min	54.91	54.93	54.91	54.91	54.93	54.94	54.93	54.92	54.92
Max	54.99	55.00	55.01	54.98	55.01	55.02	55.02	54.99	54.98
Average	54.95	54.96	54.96	54.95	54.98	54.98	54.97	54.96	54.95
Sigma	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02

Measurements									
PSRRP	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	55.06	55.07	55.13	55.11	55.08	55.11	55.14	55.08	55.08
OFF samples									
197	55.00	55.03	55.02	55.02	55.03	55.03	55.03	55.02	55.01
198	55.03	55.05	55.03	55.03	55.05	55.05	55.03	55.04	55.03
199	55.03	55.06	55.05	55.04	55.06	55.06	55.04	55.05	55.03
200	54.98	55.02	54.99	55.00	55.02	55.00	54.96	55.00	54.99
201	54.94	54.96	54.96	54.96	54.97	54.96	54.90	54.96	54.95
Statistics									
Min	54.94	54.96	54.96	54.96	54.97	54.96	54.90	54.96	54.95
Max	55.03	55.06	55.05	55.04	55.06	55.06	55.04	55.05	55.03
Average	55.00	55.02	55.01	55.01	55.03	55.02	54.99	55.02	55.00
Sigma	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.03	0.03

Hirex Engineering	Total Dose Radiation Test Report		Ref.:	HRX/TID/1029
	LMH6702JF-QMLV	National Semiconductor	Issue:	02

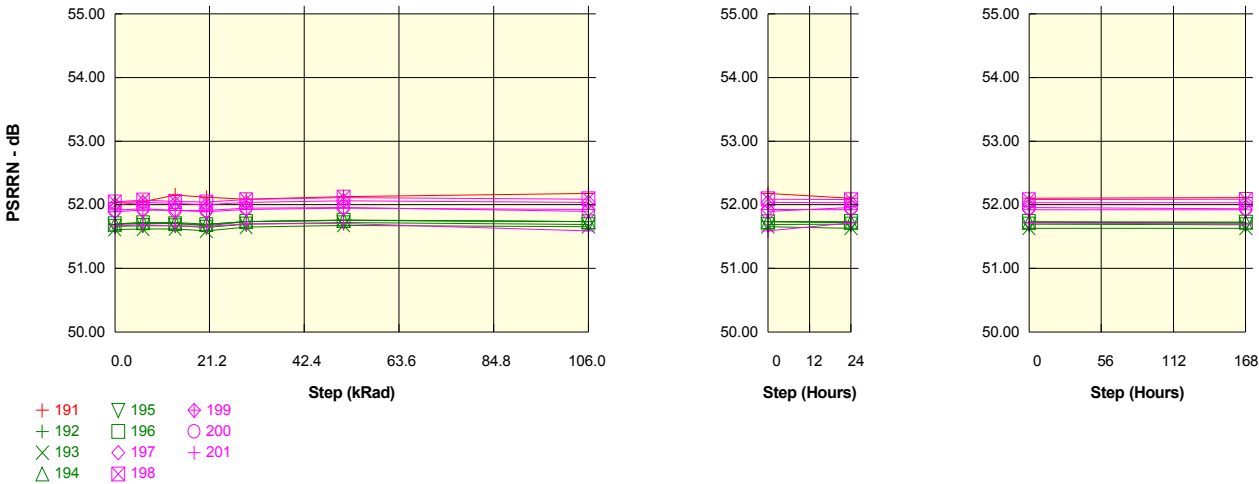
Parameter : Power supply rejection ratio : PSRRN

Test conditions : -Vcc=-4.5V to -5V

Unit : dB

Spec Limit Min : 45.00

Spec limits are represented in bold lines on the graphic.



Measurements

PSRRN	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	52.03	52.05	52.15	52.12	52.09	52.12	52.17	52.10	52.11
ON samples									
192	51.69	51.70	51.71	51.67	51.73	51.75	51.73	51.72	51.71
193	51.61	51.62	51.62	51.59	51.65	51.67	51.66	51.63	51.63
194	51.69	51.72	51.72	51.69	51.74	51.76	51.73	51.72	51.72
195	51.66	51.67	51.67	51.64	51.69	51.72	51.69	51.69	51.68
196	51.70	51.72	51.70	51.69	51.74	51.75	51.73	51.74	51.72
Statistics									
Min	51.61	51.62	51.62	51.59	51.65	51.67	51.66	51.63	51.63
Max	51.70	51.72	51.72	51.69	51.74	51.76	51.73	51.74	51.72
Average	51.67	51.69	51.68	51.65	51.71	51.73	51.71	51.70	51.69
Sigma	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.03

Measurements

PSRRN	0 kRad	6.3 kRad	13.5 kRad	20.5 kRad	29.4 kRad	51.2 kRad	106 kRad	24 Hours	168 Hours
191_REF	52.03	52.05	52.15	52.12	52.09	52.12	52.17	52.10	52.11
OFF samples									
197	52.00	52.04	52.02	52.00	52.03	52.06	52.04	52.03	52.03
198	52.04	52.07	52.05	52.04	52.08	52.11	52.09	52.08	52.08
199	51.89	51.91	51.91	51.89	51.93	51.94	51.93	51.92	51.92
200	51.91	51.93	51.91	51.91	51.94	51.96	51.89	51.95	51.93
201	51.67	51.68	51.67	51.66	51.70	51.70	51.59	51.71	51.70
Statistics									
Min	51.67	51.68	51.67	51.66	51.70	51.70	51.59	51.71	51.70
Max	52.04	52.07	52.05	52.04	52.08	52.11	52.09	52.08	52.08
Average	51.90	51.93	51.91	51.90	51.94	51.96	51.91	51.94	51.93
Sigma	0.13	0.14	0.13	0.13	0.13	0.14	0.18	0.13	0.13