RIR IN:- 69834

RIR OUT:- 69834

PARTS HISTORY LOG

Radiation Testing

PROGRAMME:- XMM

PART TYPE:- OP43GP

RADIATION REPORT:- RD 189

IGG TASK NUMBER:- 1500

Radiation Report Number:- RD 189

Project:- XMM

Part Type:- OP43GP

Date Code:- T9501

Manufacturer:- AD/U

IGG Task No:- 1500

Project Approval of Lot Traveller:-

Signed.....

Date.....

Position.....

Serial Number Range:-

01 through 06

I certify that the subject component has been tested in accordance with the following radiation specifications:-

Test Method - ESA/SCC22900 ISSUE- 4 DATE- Jan '95

Irradiation Test Plan- XM-PL-IGG-0036 ISSUE- 1 DATE- Apr '96

Closed/Approved NCR No:- N a/A

Approved Waiver No:- WAR N/A

Signed.....

Date.7TH MAY '96

Upscreening Engineer

Signed.....

Date.7/5/96..

Upscreening Manager

RADIATION REPORT NUMBER:- RD 189 DATE:- 3.5.96

PROJECT:- XMM RIR IN:- 69834

PART NUMBER:- OP43GP MANUFACTURER:- AD/U

PROCUREMENT LEVEL:- Commercial (Plastic) DATE CODE:- ~~9522~~ T9501

TEST METHOD:- ESA/SCC22900 ISSUE- 4 DATE- Jan '95

TEST PLAN:- XM-PL-IGG-0036 ISSUE- 1 DATE- Apr '96

START QUANTITY:- 6

No.	Test (Sample Size)	XM-PL-IGG-0036 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
1	Serialisation and Selection of Control Sample (100%)	Control Sample= SN 01	16/4/96	6	16/4/96	5 + CONTROL	P.O.R. IGG 16 CT
2	Initial Electrical Measurements (100% read and record)	Table A Testing at IGG	16/4/96	5	16/4/96	0 SEE NOTE	P.O.R. IGG 16 CT
3	Initial Electrical Measurements (100% read and record)	Table A Testing at ERA	17/4/96	5	17/4/96	0	P.O.R. IGG 16 CT
4	Set-up and apply Bias per Figure 1	Verify Bias Circuit and conditions (in-situ) for all 5 test samples	17/4/96	5	17/4/96	5	P.O.R. IGG 16 CT
5	Irradiation 1 (5 samples)	Dose= 10kRAD(Si) Rate= 10RAD(Si) per second Time=1000secs	17/4/96	5	17/4/96	5	P.O.R. IGG 16 CT
6	Interim 1 Electrical Measurements (100% read and record)	Table A. Bias to be maintained until testing is performed. Tdwell=10mins maximum	17/4/96	5	17/4/96	0	P.O.R. IGG 16 CT

Report No: RD 189	Part Type: OP43GP	Date: 3.5.96

No.	Test (Sample Size)	XM-PL-IGG-0036 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
7	Irradiation 2 (5 samples)	As Test 5	17/4/96	5	17/4/96	5	IGG 16 CT
8	Interim 2 Electrical Measurements (100% read and record)	As Test 6	17/4/96	5	17/4/96	0	IGG 16 CT
9	Irradiation 3 (5 samples)	As Test 5	17/4/96	5	17/4/96	5	IGG 16 CT
10	Interim 3 Electrical Measurements (100% read and record)	As Test 6	17/4/96	5	17/4/96	0	IGG 16 CT
11	Irradiation 4 (5 samples)	Dose= 20kRAD(Si) Rate= 10RAD(Si) per second Time=2000secs	17/4/96	5	17/4/96	5	IGG 16 CT
12	Interim 4 Electrical Measurements (100% read and record)	As Test 6	17/4/96	5	17/4/96	0	IGG 16 CT
13	Irradiation 5 (5 samples)	Dose= 25kRAD(Si) Rate= 10RAD(Si) per second Time=2500secs	17/4/96	5	17/4/96	5	IGG 16 CT
14	Interim 5 Electrical Measurements (100% read and record)	As Test 6	17/4/96	5	17/4/96	0	IGG 16 CT
15	Irradiation 6 (5 samples)	As Test 13	17/4/96	5	17/4/96	5	IGG 16 CT

Report No: RD 189	Part Type: OP43GP	Date: 3.5.96

No.	Test (Sample Size)	XM-PL-IGG-0036 Test Method and Conditions	Date in	Qty in	Date out	Qty out	SIGNED Op/QA
16	Final Electrical Measurements (100% read and record)	As Test 6 At ERA	17/4/96	5	17/4/96	0	IGG 16 CT
17	Final Electrical Measurements (100% read and record)	After 24 hours bias at Room Temperature perform Table A	18/4/96	5	18/4/96	0	IGG 16 CT
18	Annealing Electrical Measurements (100% read and record)	After 240 hours bias at +70°C Temperature perform Table A	30/4/96	5	30/4/96	0	IGG 16 CT
19	Test Report Collation				7/5/96		IGG 2 CT
20	Test Report Approval				7/5/96		IGG 2 CT
21	NOTES:- PARTS TESTED WERE COMMERCIAL SAMPLES (OP43GP). HOWEVER, THE LIMITS APPLIED WERE FOR THE OP43AJ.						

Report No: RD 189 Part Type: OP43GP Date: 3.5.96

FAILURE LIST AND APPLICABLE NCR

Test No.	Serial Number(s)	Failed Parameter and Failure Mode	Applicable NCR
2	1 2 3,4,5,6	FAILS I_{os} AND + I_s PARAMETERS. FAILS I_b, I_{os} AND + I_s PARAMETERS. FAIL I_b AND + I_s PARAMETERS. (NOTE: OP43AJ LIMITS APPLIED TO OP43GP COMMERCIAL SAMPLES	—
3	1,2,3,4,5 6	FAIL I_b, I_{os} AND + I_s PARAMETERS. FAILS V_{os}, I_b, I_{os} AND + I_s PARAMETERS.	—
6	AS PER TEST 3.	AS PER TEST 3.	—
8	1,2 3 4,5 6	FAIL I_b, I_{os} AND + I_s PARAMETERS. FAILS V_{os}, I_b AND + I_s PARAMETERS. FAIL I_b PARAMETER FAILS V_{os} AND I_b PARAMETERS	—
10	1,5,6 2,4 3	AS PER TEST 8. FAIL I_b AND I_{os} PARAMETERS. FAILS V_{os}, I_b AND I_{os} PARAMETERS.	—
12	2,3,4 1 5 6	AS PER TEST 10. FAILS I_{os} AND + I_s PARAMETERS. FAILS I_b AND I_{os} PARAMETERS. FAILS V_{os}, I_b AND I_{os} PARAMETERS.	—
14	1 2,3,4,5,6.	FAILS I_b, I_{os} AND + I_s PARAMETERS. AS PER TEST 12.	—
16	2,4,5 1 3 6	AS PER TEST 14. FAILS I_{os} AND + I_s PARAMETERS. FAILS V_{os}, I_b, I_{os} AND + I_s PARAMETERS FAILS V_{os} AND I_b PARAMETERS.	—
17	2,4,5 1 3 6	AS PER TEST 16. FAILS I_b, I_{os} AND + I_s PARAMETERS. FAILS V_{os} AND I_b PARAMETERS. FAILS V_{os}, I_b AND I_{os} PARAMETERS.	—
18	2 1 3,6 4,5	AS PER TEST 17. FAILS I_{os} AND + I_s PARAMETERS. FAIL V_{os} AND I_b PARAMETERS. FAIL I_b PARAMETER.	—

Report No: RD 189 Part Type: OP43GP Date: 3.5.96

TEST EQUIPMENT LIST

Item, Type Number and Serial Number	CT Inventory Number	Function	Calibration Due
Item: SZ Type No: M3000 Serial No: 884769	CT339	ATE	3 / 7 /1996
Item: THURLBY Type No: PL320 Serial No: 2GP0623	CT288	PSU	02 / 10 /1996
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199
Item: Type No: Serial No:			/ /199

RADIATION TEST SUMMARY

PART TYPE : OP43GP

DESCRIPTION : OP AMP

REPORT NO. : RD 189

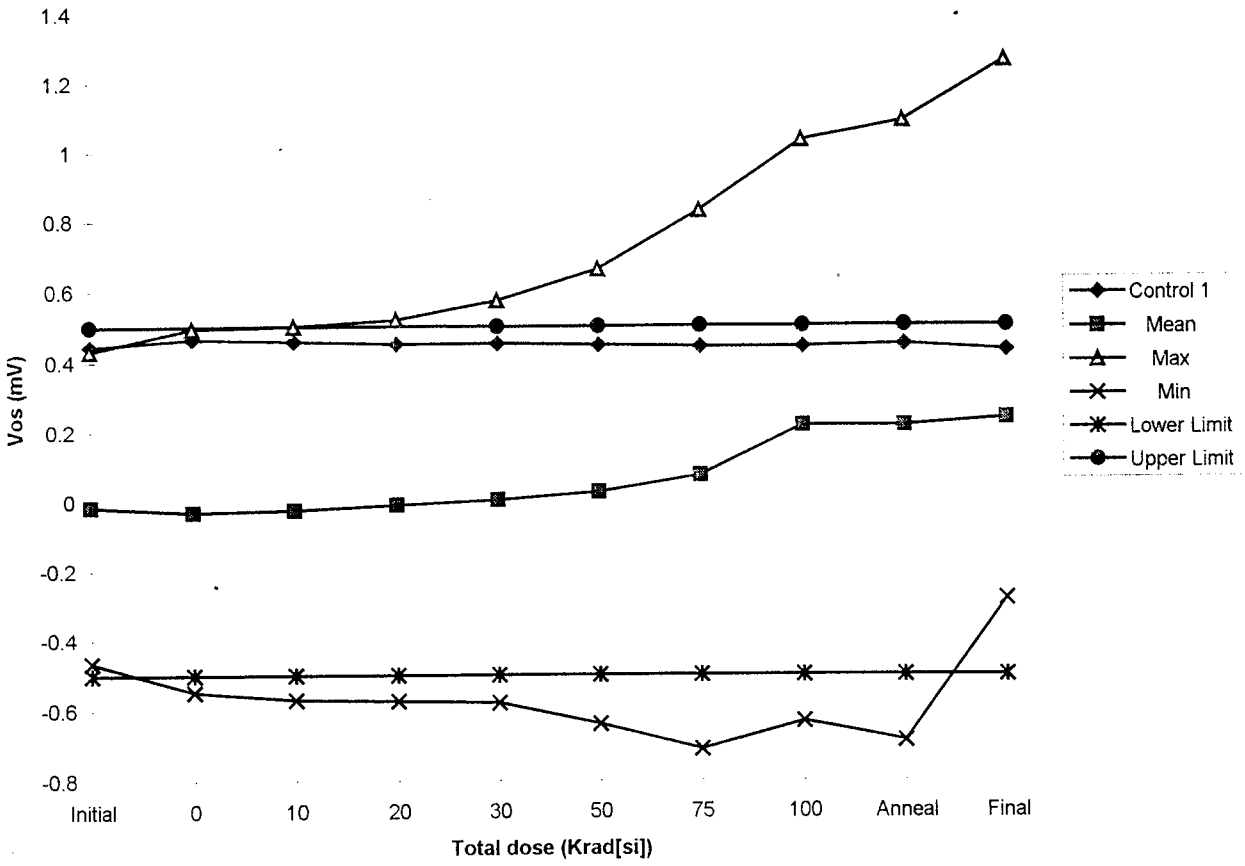
PARAMETERS PLOTTED :

Vos
Ib
AVO
Is+
Is-

Note :

All of the remaining parameters showed little change over the irradation sequence and hence were not plotted.

Vos results for OP43GP

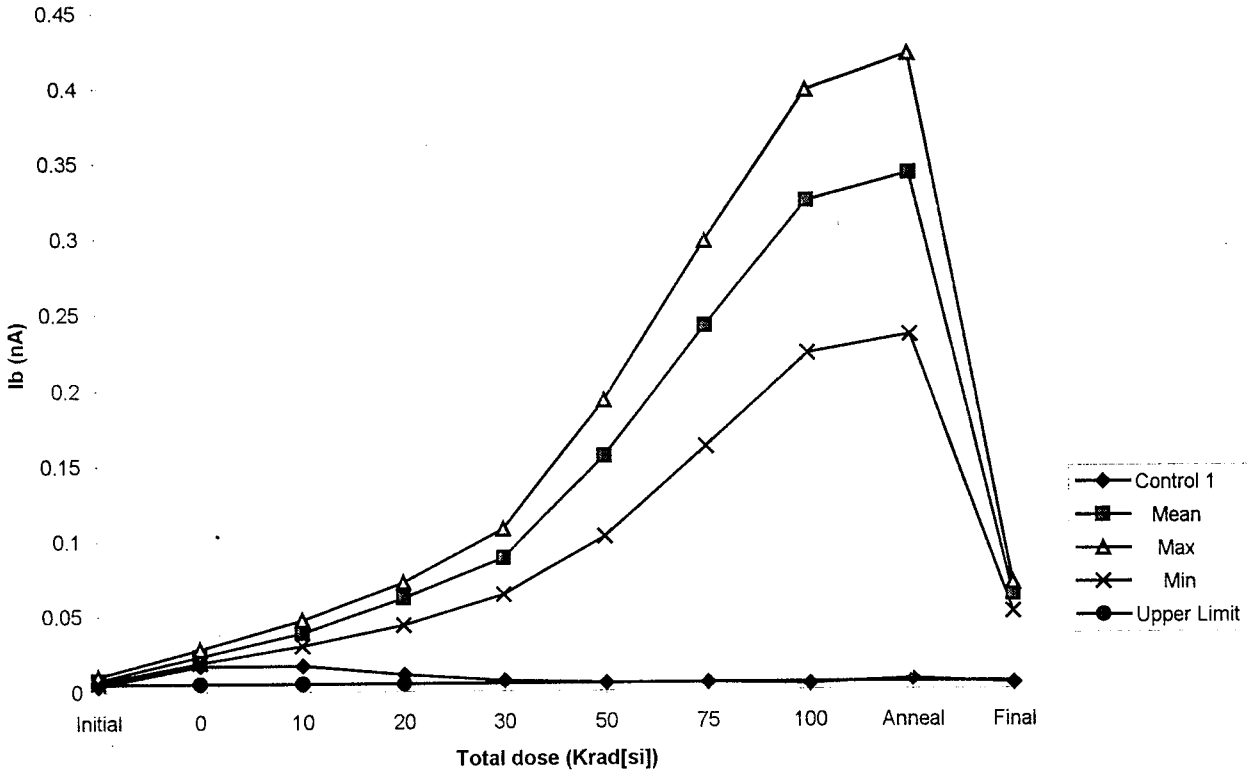


Dose (kRad)	Control 1	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mV)	(mV)	(mV)	(mV)	(mV)	(mV)	
Initial	0.444	-0.017	0.432	-0.465	-0.5	0.5	0.399
0	0.464	-0.034	0.493	-0.548	-0.5	0.5	0.445
10	0.457	-0.028	0.5	-0.571	-0.5	0.5	0.448
20	0.449	-0.013	0.517	-0.574	-0.5	0.5	0.451
30	0.449	-0.001	0.571	-0.580	-0.5	0.497	0.463
50	0.444	0.022	0.66	-0.641	-0.5	0.497	0.486
75	0.439	0.070	0.827	-0.711	-0.5	0.497	0.556
100	0.438	0.212	1.028	-0.632	-0.5	0.497	0.595
Anneal	0.446	0.212	1.084	-0.688	-0.5	0.5	0.627
Final	0.43	0.235	1.259	-0.283	-0.5	0.5	0.631

Lot size for statistics : 5 devices

RD 189 Date code T9501

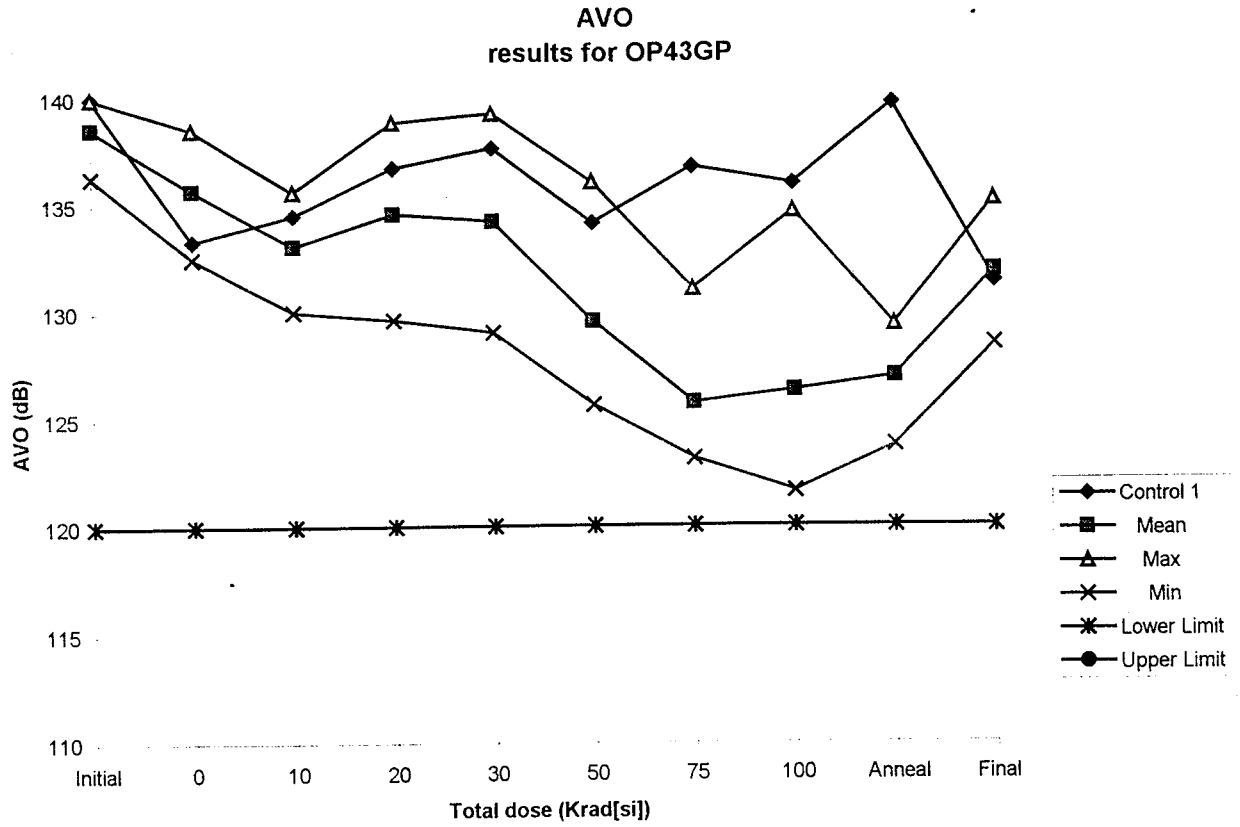
Ib results for OP43GP



Dose (kRad)	Control 1	Mean	Max	Min	Upper Limit		Std.Dev.
	(nA)	(nA)	(nA)	(nA)	(nA)		
Initial	0.004	0.008	0.01	0.006	0.005		0.001
0	0.017	0.024	0.028	0.019	0.005		0.004
10	0.017	0.039	0.047	0.030	0.005		0.006
20	0.011	0.062	0.072	0.044	0.005		0.011
30	0.007	0.088	0.107	0.064	0.005		0.016
50	0.005	0.155	0.192	0.102	0.005		0.034
75	0.005	0.240	0.296	0.161	0.005		0.051
100	0.004	0.322	0.396	0.222	0.005		0.066
Anneal	0.007	0.341	0.42	0.234	0.005		0.069
Final	0.004	0.063	0.07	0.051	0.005		0.007

Lot size for statistics : 5 devices

RD 189 Date code T9501

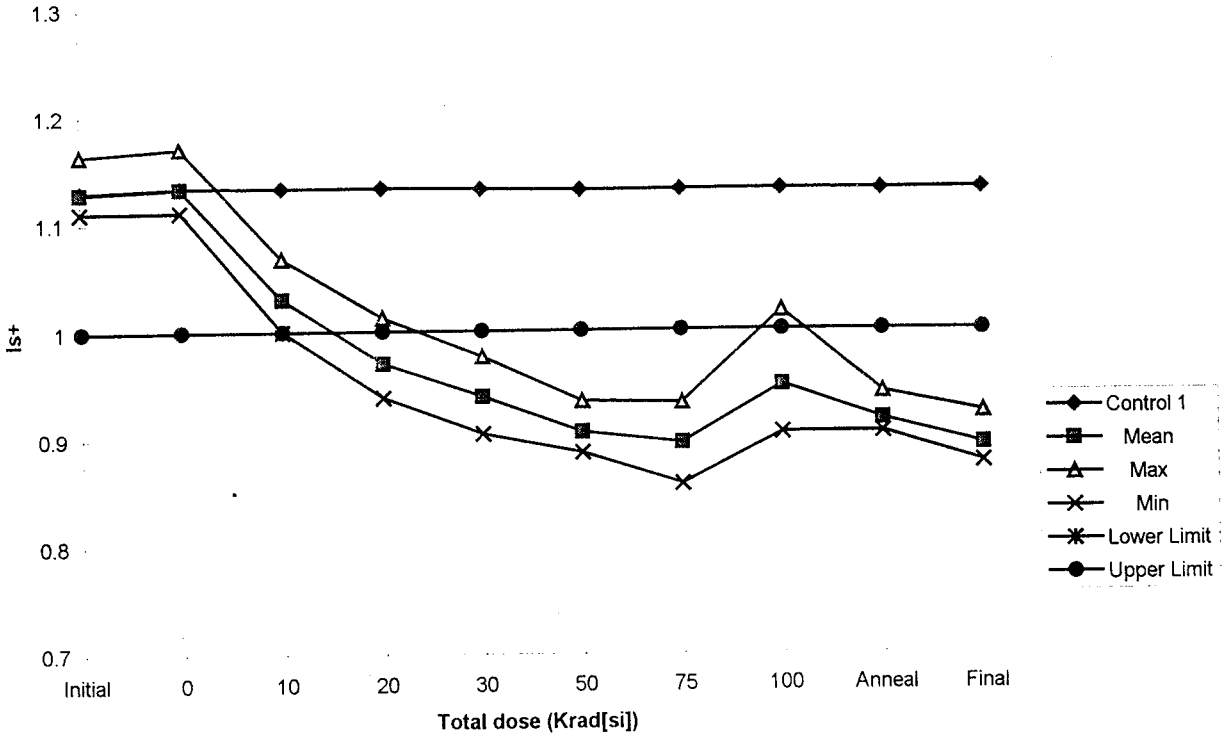


Dose (kRad)	Control 1	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	
Initial	140	138.560	140	136.300	120		1.973
0	133.3	135.680	138.5	132.500	120		2.456
10	134.5	133.060	135.6	130.000	120		2.197
20	136.7	134.540	138.8	129.600	120		4.103
30	137.6	134.200	139.2	129.000	120		4.342
50	134.1	129.500	136	125.600	120		3.883
75	136.7	125.700	131	123.100	120		3.076
100	135.9	126.260	134.6	121.600	120		5.024
Anneal	139.6	126.900	129.3	123.700	120		2.144
Final	131.3	131.800	135.1	128.400	120		2.580

Lot size for statistics : 5 devices

RD 189 Date code T9501

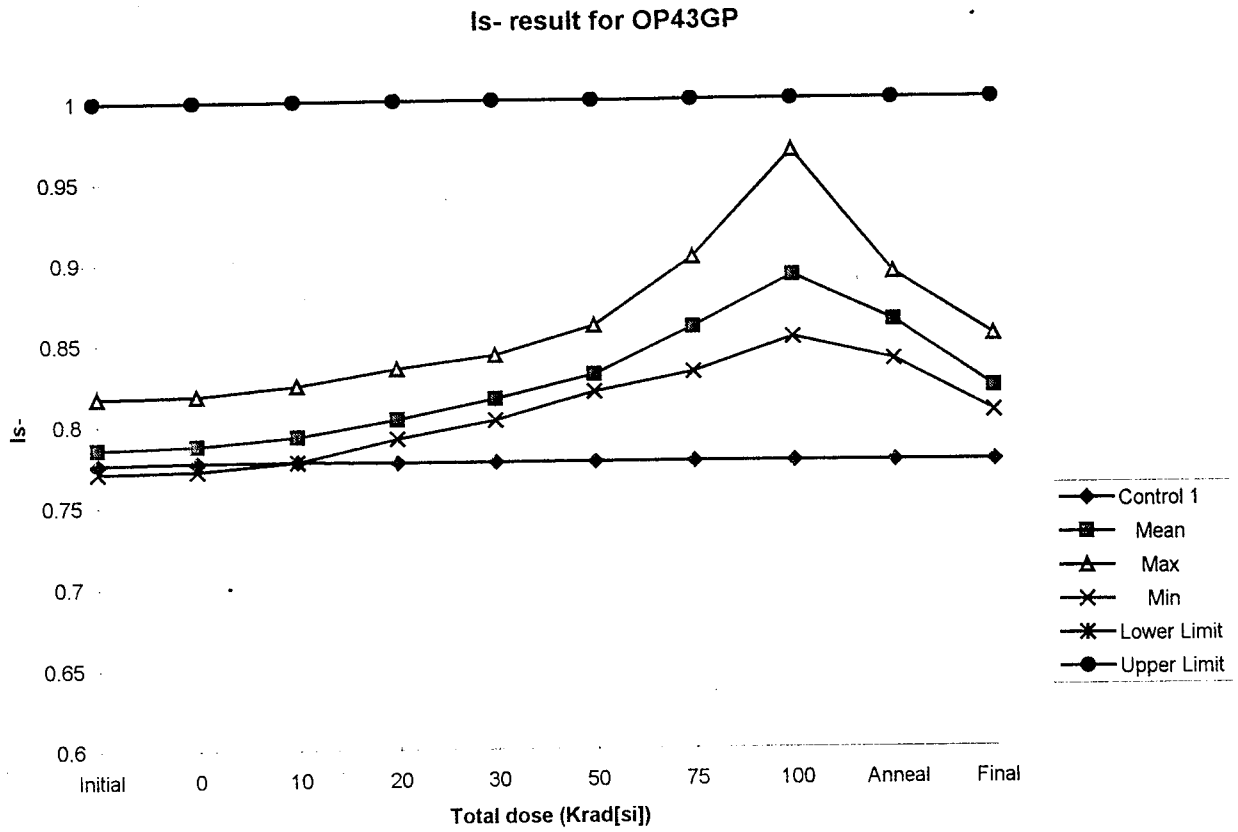
Is+ result for OP43GP



Dose (kRad)	Control 1	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mA)	(mA)	(mA)	(mA)	(mA)	(mA)	
Initial	1.129	1.128	1.163	1.110		1.000	0.020
0	1.133	1.132	1.17	1.111		1.000	0.023
10	1.132	1.029	1.067	1.000		1.000	0.032
20	1.132	0.970	1.012	0.938		1.000	0.036
30	1.131	0.939	0.976	0.904		1.000	0.038
50	1.13	0.905	0.934	0.886		1.000	0.025
75	1.13	0.895	0.932	0.857		1.000	0.027
100	1.13	0.948	1.017	0.904		1.000	0.048
Anneal	1.129	0.917	0.942	0.905		1.000	0.015
Final	1.13	0.893	0.923	0.877		1.000	0.021

Lot size for statistics : 5 devices

RD 189 Date code T9501



Dose (kRad)	Control 1	Mean	Max	Min	Lower Limit	Upper Limit	Std.Dev.
	(mA)	(mA)	(mA)	(mA)	(mA)	(mA)	
Initial	0.776	0.786	0.817	0.771		1.000	0.019
0	0.777	0.787	0.818	0.772		1.000	0.019
10	0.777	0.792	0.824	0.777		1.000	0.019
20	0.776	0.803	0.834	0.791		1.000	0.018
30	0.776	0.815	0.842	0.802		1.000	0.018
50	0.776	0.830	0.86	0.819		1.000	0.017
75	0.776	0.859	0.902	0.831		1.000	0.026
100	0.776	0.891	0.968	0.852		1.000	0.046
Anneal	0.776	0.862	0.892	0.838		1.000	0.022
Final	0.776	0.821	0.853	0.806		1.000	0.020

Lot size for statistics : 5 devices

RD 189 Date code T9501

XMM	IRRADIATION TEST PLAN NO. XM-PL-IGG-0036 (1)	Issue No. 1 Date: APRIL 1996 Page: 1/4 (2)	Rev. Date:

Component No. XMIG007401B (3)	Component Designation: IC BIPOLAR FAST J FET OP-AMP TYPE: OP43AJ (4)	Irradiation Spec No. N/A Iss. Rev. (5)

Specifications (6)	Acceptance (7)	Electrical Meas (8)	Project/Programme (9)
Generic SCC 9000 Iss.8E Detail XM-IS-IGG-0074 Iss. 1	Evaluation X Element ___ Diffusion ___ Lot ___	In-situ ___ Remote X	XMM

Manufacturer: Name: ANALOG DEVICES Address: 1500 SPACE PARK DRIVE PO BOX 58020 SANTA CLARA CA 95052-8020 (10)	Test Facility: Name: ERA Address: LEATHERHEAD SURREY (11)	Originator: IGG CT Name: M. A. PORTER Telephone: 01329 829311 (12)

Radiation Source (13)	Sample Size: 5 (14)	Exposure (15)	Annealing Test (16)	Radiation Level: (17)
COBALT 60	Control Devices: 1	Single ___ Multiple X	YES X NO ___	10 KRad(Si), 50 KRad(Si) 20 KRad(Si), 75 KRad(Si) 30 KRad(Si), 100 KRad(Si)

Single Exposure
Dose [Krad(Si)]
Dose Rate [rad(Si)/s]
NOT APPLICABLE
Exposure Time (18)

Multiple Exposure: (19)

Irradiation Steps	1	2	3	4	5	6
Dose [Krad(Si)]	10	10	10	20	25	25
Dose Rate [rad(Si)/s]	10	10	10	10	10	10
Exposure Time(s)	1000	1000	1000	2000	2500	2500

Bias Requirements: During Exposure (for in-situ elec. measure): N/A
During and after Exposure (for remote elec. measure): YES

Bias Conditions:
Test Circuits: The Electrical Bias circuit is given in Figure 1 herein.
Voltages: See Figure 1 Tolerance: See Figure 1

Shielding: Shielding is required to minimize dose enhancement effects caused by low energy, scattered radiation. The test specimens shall be enclosed in a Pb/Al container of Pb 1.5mm minimum, surrounding on inner shield of 0.7 to 1.0mm Al. (20)

Irradiation Test Sequence (21)

Test Step	Description	Requirements
1(A)	Serialisation Goods Receiving Inspection	If parts are not serialised, serialise them (permanently) sequentially from to inclusive. Goods Receiving Inspection shall consist of 100% Travel Visual, Visual Inspection and Electrical Measurements per XM-IS-IGG-0074 ISS 1.
1(B)	Initial Electrical Measurements (at IGG)	Per Table A herein - Read and Record - 6 parts minimum at IGG.
2	Initial Electrical Measurements	Per Table A herein - Read and Record - 6 parts minimum at ERA.
3	Set-up of Test	Verify Bias circuit and Voltages (In-situ) for all 5 test samples.
4	Irradiation Exposure	Verify Radiation dose rate and position in the chamber to achieve required dose. Verify and witness duration of exposure to achieve required dose.

Irradiation Test Sequence (Cont.) 21

Test Step	Description	Requirements
5	Intermediate Electrical Measurements	Bias to be maintained until test is performed. Test per Table A herein - Read and Record 6 parts. Test to be performed immediately upon removal from chamber (less than 10 mins interval). Upon completion of test devices to be replaced in bias circuit (10 parts) and returned to chamber. Maximum interval between two consecutive exposures to be (30 mins).
6 to 21	Repeat Set-up/Exposure/Test sequence up to Total Dose of 100 Krad(Si) as per Plan above	Repeat Step 3, 4, 5 for a total of 6 cycles up to the total dose of 100 KRad(Si) at accumulated dose of 10,20,30,50,75, and 100 KRad(Si)
22	Annealing	To be 24 hours at 25°C under Figure 1 Bias conditions.
23	Post Anneal Electrical Measurements	Per Table A herein - Read and Record - 6 parts.
24	Accelerated ageing under Bias	Bake at +70°C under Figure 1 Bias conditions for 240 hours.
25	Final Electrical Measurements	Per Table A herein - Read and Record - 6 parts.
26	Total Dose Irradiation Report	ESA/SCC 22900.

Remarks 22

1. Performed for the purposes of correlation.
2. The set-up/exposure/test sequence shall be stopped for any device that exhibits repeated functional failure.
3. Electrical testing shall be performed on the same test equipment from test step 1 to step 25.

TABLE A - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE T_{amb} +25 ±5°C BEFORE AT INTERMEDIATE POINTS, AND ON COMPLETION OF IRRADIATION

NO.	CHARACTERISTICS	SYMBOL	MIL-STD-883 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT	
					MIN.	MAX.		
1	Input Offset Voltage	V_{os}	4001	-	-	500	µV	✓
2	Input Offset Current	I_{os}	4001	- (Note 2)	-	1.0	pA	✓
3	Input Bias Current	I_B	4001	Either Input (Note 2)	-	±5.0	pA	✓
4	Input Voltage Range	IVR	4003	- (Note 3)	±11	-	V	✓
5	Common Mode Rejection	CMR	4003	V_{CM} = ±11V	100	-	dB	✓
6	Power Supply Rejection Ratio	PSRR	4003	V_S = ±10V to ±18V	-	25	µV/V	✓
7	Large Signal Voltage Gain	A_{VO}	4006	V_O = ±10V R_L = 2KΩ	1000	-	V/mV	✓
8	Supply Current	I_{SY}	-	No Load	-	1.0	mA	✓
9	Output Voltage Swing	V_O	4005	R_L = 2KΩ	±12.3	-	V	✓
10	Output Short-Circuit Current	I_{SC}	-	Short Circuit to Ground	±12	±36	mA	✓
11	Slew Rate	SR	4002	A_V = +1	5	-	V/µs	

NOTES:-

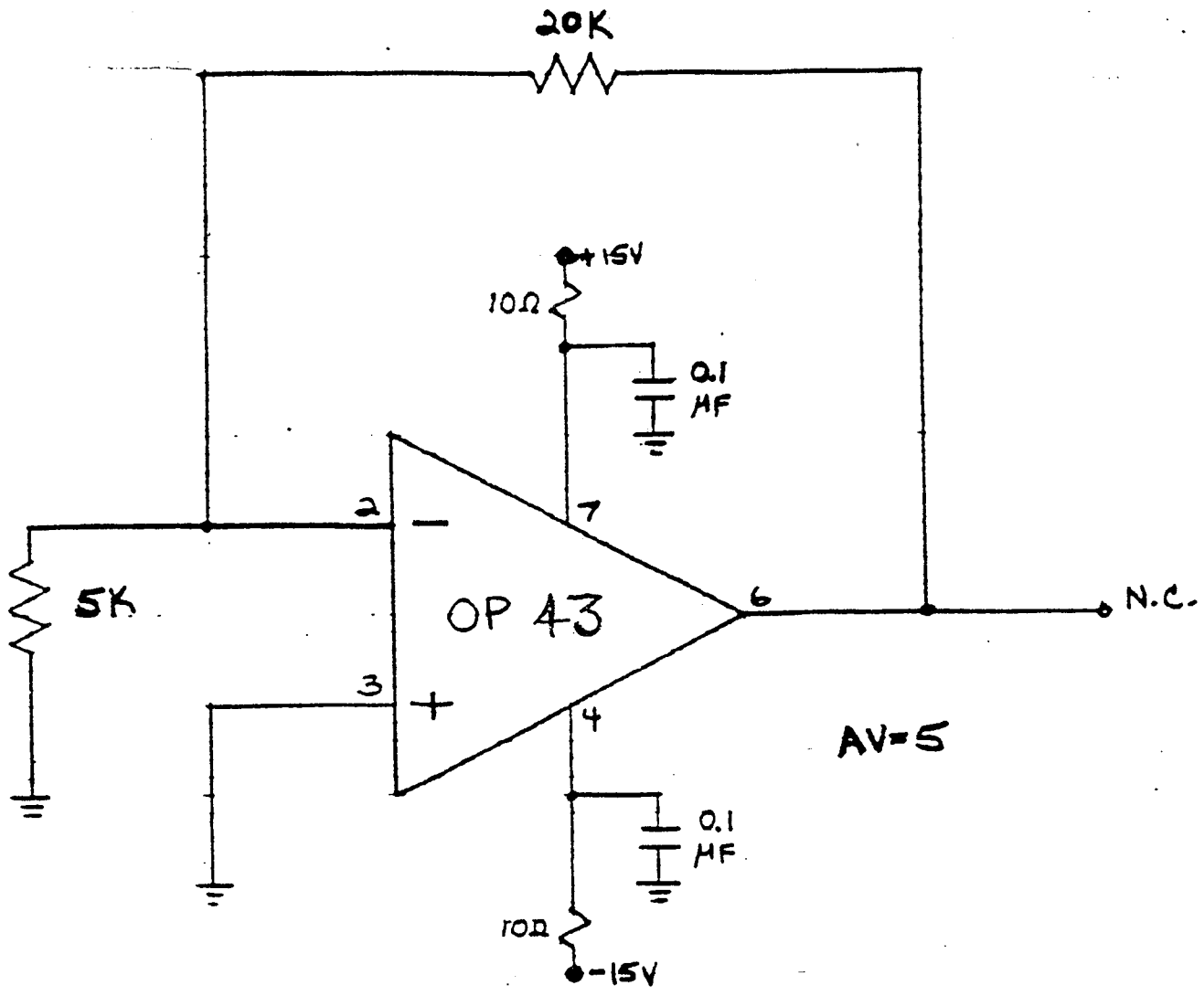
1. Unless otherwise specified, the following test conditions shall apply:-

   (a) V_{S+} = +15V
   (b) V_{S-} = -15V
   (c) V_{CM} = 0V
   (d) R_S = 50Ω

2. I_B and I_{OS} are tested at 25°C ambient with devices warmed up.

3. IVR is defined as the V_{CM} range used for the CMR test.

FIGURE 1 - ELECTRICAL BIAS CIRCUIT FOR IRRADIATION



Results file : RD189_OP43GP_INIT_EMS_@_IGG from: 16.04.96 / 10:04:45
Operator : PAUL RUSSELL
Part number : OP43GP
Lot number : RD189
Order number : D/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: INITIAL EMS @ IGG
: OP43AJ XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...		0.500	mV
2.	Ib	(	0.000	)...		0.005	nA
3.	Ios	(	0.000	)...		0.001	nA
4.	CMRR		100.00	...	(140.00	)	dB
5.	Avo		120.0	...	(130.0	)	dB
6.	+Vo		12.300	...	(15.000	)	V
7.	-Vo	(	-15.000	)...	-12.300		V
8.	SR+		5	...	(50	)	V/us
9.	SR-		5	...	(50	)	V/us
10.	PSRR+		92.00	...	(120.00	)	dB
11.	Isc		-36.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.444	-0.075	0.432	-0.327	0.349	-0.465
2.1 [nA]	0.004	0.006F	0.008F	0.007F	0.008F	0.010F
3.1 [nA]	0.006F	0.002F	0.001	0.000	0.001	0.001
4.1 [dB]	124.26	111.43	118.65	111.30	120.86	121.48
5.1 [dB]	140.0	140.0	140.0	136.5	140.0	136.3
6.1 [V]	12.857	12.905	12.879	12.840	12.874	12.856
7.1 [V]	-12.891	-12.884	-12.885	-12.895	-12.901	-12.902
8.1 [V/us]	9	10	10	10	9	9
9.1 [V/us]	8	8	8	8	8	8
10.1 [dB]	128.86	105.85	120.50	107.13	118.23	116.78
11.1 [mA]	-18.05	-17.81	-18.02	-18.19	-18.37	-18.25
12.1 [mA]	1.129F	1.125F	1.163F	1.125F	1.118F	1.110F
13.1 [mA]	0.776	0.790	0.817	0.771	0.776	0.774

SC-TESTSYSTEME Statistics 03 Vers. 2.15 for TA05
RD189_OP436P_INIT_EMS_@_ERA / V1.0 15/4/96 PAR

Results file : RD189_OP436P_INIT_EMS_@_ERA from: 16.04.96 / 16:23:29
Operator : PAUL RUSSELL
Part number : OP436P
Lot number : RD189
Order number : D/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: INITIAL EMS @ ERA
: OP43AJ XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...	0.500		mV
2.	Ib	(	0.000	)...	0.005		nA
3.	Ios	(	0.000	)...	0.001		nA
4.	CMRR		100.00	... (	140.00	)	dB
5.	Avo		120.0	... (	130.0	)	dB
6.	+Vo		12.300	... (	15.000	)	V
7.	-Vo	(	-15.000	)...	-12.300		V
8.	SR+		5	... (	50	)	V/us
9.	SR-		5	... (	50	)	V/us
10.	PSRR+		92.00	... (	128.00	)	dB
11.	Isc		-35.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.484	-0.095	0.493	-0.360	0.342	-0.548F
2.1 [nA]	0.017F	0.019F	0.028F	0.022F	0.023F	0.030F
3.1 [nA]	0.010F	0.008F	0.012F	0.004F	0.003F	0.004F
4.1 [dB]	109.09	111.20	119.82	110.88	120.29	123.63
5.1 [dB]	133.3	138.5	132.5	136.2	137.3	133.9
6.1 [V]	12.859	12.905	12.880	12.842	12.875	12.858
7.1 [V]	-12.875	-12.865	-12.866	-12.877	-12.883	-12.885
8.1 [V/us]	10	10	10	10	9	9
9.1 [V/us]	8	8	8	8	8	8
10.1 [dB]	129.49	106.12	120.90	107.56	117.98	117.10
11.1 [mA]	-18.55	-18.30	-18.56	-18.70	-18.88	-18.75
12.1 [mA]	1.133F	1.131F	1.170F	1.129F	1.119F	1.111F
13.1 [mA]	0.777	0.794	0.818	0.772.1	0.777	0.775

SZ-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP43GP_EMS_@_10_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP43GP_EMS_@_10_KRAD from: 16.04.96 / 16:36:14
Operator : PAUL RUSSELL
Part number : OP43GP
Lot number : RD189
Order number : D/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 10 KRAD
: OP43AJ XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...	0.500		mV
2.	Ib	(	0.000	)...	0.005		nA
3.	Ios	(	0.000	)...	0.001		nA
4.	CMRR		100.00	... (	140.00	)	dB
5.	Avo		120.0	... (	130.0	)	dB
6.	+Vo		12.300	... (	15.000	)	V
7.	-Vo	(	-15.000	)...	-12.300		V
8.	SR+		5	... (	50	)	V/us
9.	SR-		5	... (	50	)	V/us
10.	PSRR+		92.00	... (	120.00	)	dB
11.	Isc		-30.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.457	-0.079	0.500	-0.330	0.339	-0.571F
2.1 [nA]	0.017F	0.030F	0.036F	0.039F	0.047F	0.042F
3.1 [nA]	0.010F	0.009F	0.006F	0.001F	0.006F	0.001F
4.1 [dB]	124.57	111.15	118.16	110.72	121.66	122.34
5.1 [dB]	134.5	133.1	132.0	134.6	135.5	130.0
6.1 [V]	12.858	12.904	12.877	12.838	12.871	12.856
7.1 [V]	-12.879	-12.862	-12.858	-12.868	-12.874	-12.877
8.1 [V/us]	9	10	10	10	9	9
9.1 [V/us]	8	9	9	9	9	8
10.1 [dB]	130.37	106.48	117.81	107.70	116.66	119.76
11.1 [mA]	-18.40	-18.22	-18.48	-18.62	-18.80	-18.71
12.1 [mA]	1.132F	1.062F	1.067F	1.010F	1.000F	1.008F
13.1 [mA]	0.777	0.794	0.824	0.780	0.786	0.781

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP436P_EMS_@_20_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP436P_EMS_@_20_KRAD from: 16.04.96 / 17:15:40
Operator : PAUL RUSSELL
Part number : OP436P
Lot number : RD189
Order number : T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 20 KRAD
: OP43AJ XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos			-0.500	...	0.500		mV
2.	Ib		(	0.000	)...	0.005		nA
3.	Ios		(	0.000	)...	0.001		nA
4.	CMRR			100.00	... (	140.00	)	dB
5.	Avo			120.0	... (	130.0	)	dB
6.	+Vo			12.300	... (	15.000	)	V
7.	-Vo		(	-15.000	)...	-12.300		V
8.	SR+			5	... (	50	)	V/us
9.	SR-			5	... (	50	)	V/us
10.	PSRR+			82.00	... (	128.00	)	dB
11.	Isc			-36.00	...	-12.00		mA
12.	+Is			0.000	...	1.000		mA
13.	-Is			0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.449	-0.084	0.317F	-0.286	0.360	-0.574F
2.1 [nA]	0.011F	0.044F	0.060F	0.066F	0.072F	0.067F
3.1 [nA]	0.009F	0.005F	0.001	0.001	0.000	0.000
4.1 [dB]	129.17	111.51	119.72	110.92	119.74	123.02
5.1 [dB]	136.7	133.1	132.4	138.8	128.6	138.8
6.1 [V]	12.858	12.900	12.873	12.832	12.865	12.850
7.1 [V]	-12.880	-12.856	-12.847	-12.853	-12.859	-12.864
8.1 [V/us]	9	10	10	10	9	10
9.1 [V/us]	8	9	9	9	9	9
10.1 [dB]	129.74	106.66	113.86	107.65	114.32	125.82
11.1 [mA]	-18.36	-18.20	-18.49	-18.64	-18.80	-18.70
12.1 [mA]	1.132F	1.012F	1.006F	0.945	0.938	0.948
13.1 [mA]	0.776	0.800	0.834	0.791	0.798	0.791

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP436P_EMS_0_30_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP436P_EMS_0_30_KRAD from: 16.04.96 / 17:34:54
Operator : PAUL RUSSELL
Part number : OP436P
Lot number : RD189
Order number : D/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 30 KRAD
: OP436P XM-PL-I66-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...	0.500	mV
2.	Ib	(	0.000	)...	0.005	nA
3.	Ios	(	0.000	)...	0.001	nA
4.	CMRR		100.00	... (	140.00	)dB
5.	Avo		120.0	... (	130.0	)dB
6.	+Vo		12.300	... (	15.000	)V
7.	-Vo	(	-15.000	)...	-12.300	V
8.	SR+		5	... (	50	)V/us
9.	SR-		5	... (	50	)V/us
10.	PSRR+		92.00	... (	109.00	)dB
11.	Isc		-35.00	...	-12.00	mA
12.	+Is		0.000	...	1.000	mA
13.	-Is		0.000	...	1.000	mA

	1	2	3	4	5	6
1.1 [mV]	0.449	-0.066	0.571F	-0.271	0.342	-0.580F
2.1 [nA]	0.007F	0.064F	0.085F	0.095F	0.107F	0.090F
3.1 [nA]	0.005F	0.002F	0.004F	0.001F	0.001	0.000
4.1 [dB]	127.43	111.71	119.87	111.44	125.27	122.33
5.1 [dB]	137.6	132.8	129.0	135.3	139.2	131.3
6.1 [V]	12.857	12.897	12.867	12.825	12.859	12.844
7.1 [V]	-12.883	-12.847	-12.833	-12.836	-12.839	-12.849
8.1 [V/us]	9	10	10	10	9	10
9.1 [V/us]	8	9	10	9	9	9
10.1 [dB]	129.53	106.16	110.66	105.69	114.75	124.63
11.1 [mA]	-18.29	-18.16	-18.47	-18.63	-18.81	-18.70
12.1 [mA]	1.131F	0.976	0.967	0.908	0.904	0.912
13.1 [mA]	0.776	0.806	0.842	0.802	0.810	0.803

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP43GP_EMS_@_50_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP43GP_EMS_@_50_KRAD from: 16.04.96 / 18:00:36
Operator : PAUL RUSSELL
Part number : OP43GP
Lot number : RD189
Order number : D/C 9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 50 KRAD
: OP43GP XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...	0.500		mV
2.	Ib	(	0.000	)...	0.005		nA
3.	Ios	(	0.000	)...	0.001		nA
4.	CMRR		100.00	... (	140.00	)	dB
5.	Avo		120.0	... (	130.0	)	dB
6.	+Vo		12.300	... (	15.000	)	V
7.	-Vo	(	-15.000	)...	-12.300		V
8.	SR+		5	... (	50	)	V/us
9.	SR-		5	... (	50	)	V/us
10.	PSRR+		92.00	... (	128.00	)	dB
11.	Isc		-36.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.444	-0.024	0.660F	-0.159	0.273	-0.641F
2.1 [nA]	0.005	0.102F	0.148F	0.174F	0.192F	0.160F
3.1 [nA]	0.007F	0.008F	0.002F	0.002F	0.004F	0.002F
4.1 [dB]	135.67	111.29	117.87	110.25	127.88	121.30
5.1 [dB]	134.1	136.0	128.1	125.6	129.2	128.6
6.1 [V]	12.857	12.881	12.857	12.810	12.841	12.828
7.1 [V]	-12.885	-12.827	-12.799	-12.795	-12.801	-12.816
8.1 [V/us]	9	10	10	10	10	10
9.1 [V/us]	8	9	8	8	9	8
10.1 [dB]	130.34	105.09	106.57	104.81	111.88	140.00
11.1 [mA]	-18.22	-18.15	-18.46	-18.64	-18.87	-18.72
12.1 [mA]	1.130F	0.932	0.934	0.886	0.889	0.886
13.1 [mA]	0.776	0.819	0.860	0.827	0.819	0.824

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP436P_EMS_@_75_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP436P_EMS_@_75_KRAD from: 16.04.96 / 18:46:12
Operator : PAUL RUSSELL
Part number : OP436P
Lot number : RD189
Order number : D/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 75 KRAD
: OP43AJ XM-PL-I66-0036 RAD TEST / V1.0 15//4/96 PAR

Test steps

1.	Vos			-0.500	...	0.500		mV
2.	Ib	(	0.000	) ...		0.005		nA
3.	Ios	(	0.000	) ...		0.001		nA
4.	CMRR		100.00	...	(140.00		)	dB
5.	Avo		120.0	...	(130.0		)	dB
6.	+Vo		12.300	...	(15.000		)	V
7.	-Vo	(	-15.000	) ...		-12.300		V
8.	SR+		5	...	(50		)	V/us
9.	SR-		5	...	(50		)	V/us
10.	PSRR+		82.00	...	(128.00		)	dB
11.	Isc		-35.00	...		-12.00		mA
12.	+Is		0.000	...		1.000		mA
13.	-Is		0.000	...		1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.439	0.027	0.827F	-0.055	0.262	-0.711F
2.1 [nA]	0.005F	0.161F	0.228F	0.268F	0.296F	0.246F
3.1 [nA]	0.008F	0.003F	0.005F	0.002F	0.002F	0.005F
4.1 [dB]	125.33	111.54	118.96	110.76	119.33	119.38
5.1 [dB]	136.7	125.4	124.6	123.1	124.4	131.0
6.1 [V]	12.856	12.897	12.861	12.796	12.826	12.811
7.1 [V]	-12.887	-12.793	-12.738	-12.737	-12.751	-12.771
8.1 [V/us]	10	10	10	10	10	10
9.1 [V/us]	8	8	9	9	9	9
10.1 [dB]	131.35	104.37	106.37	104.63	111.96	123.68
11.1 [mA]	-18.18	-18.18	-18.51	-18.70	-19.00	-18.81
12.1 [mA]	1.130F	0.932	0.957	0.896	0.901	0.890
13.1 [mA]	0.776	0.857	0.902	0.855	0.831	0.848

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD189_OP43GP_EMS_@_100_KRAD / V1.0 15/4/96 PAR

Results file : RD189_OP43GP_EMS_@_100_KRAD from: 16.04.96 / 19:36:21
Operator : PAUL RUSSELL
Part number : OP43GP
Lot number : RD189
Order number : D/C T8501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: EMS @ 100 KRAD
: OP43GP XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos		-0.500	...	0.500		mV
2.	Ib	(	0.000	)...	0.005		nA
3.	Ios	(	0.000	)...	0.001		nA
4.	CMRR		100.00	... (	140.00	)	dB
5.	Avo		120.0	... (	130.0	)	dB
6.	+Vo		12.300	... (	15.000	)	V
7.	-Vo	(	-15.000	)...	-12.300		V
8.	SR+		5	... (	50	)	V/us
9.	SR-		5	... (	50	)	V/us
10.	PSRR+		92.00	... (	128.00	)	dB
11.	Isc		-36.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.438	0.199	1.028F	0.094	0.373	-0.632F
2.1 [nA]	0.004	0.222F	0.315F	0.366F	0.396F	0.313F
3.1 [nA]	0.006F	0.009F	0.005F	0.010F	0.001F	0.001
4.1 [dB]	128.51	112.09	118.48	111.02	123.61	127.74
5.1 [dB]	135.9	134.6	126.2	125.7	123.2	121.6
6.1 [V]	12.857	12.918	12.888	12.793	12.824	12.801
7.1 [V]	-12.888	-12.750	-12.536	-12.580	-12.693	-12.708
8.1 [V/us]	9	10	10	10	10	10
9.1 [V/us]	8	9	9	9	9	9
10.1 [dB]	133.17	104.34	106.54	105.34	119.52	121.35
11.1 [mA]	-18.14	-18.21	-18.53	-18.76	-19.12	-18.94
12.1 [mA]	1.130F	0.978	1.017F	0.918	0.925	0.904
13.1 [mA]	0.776	0.852	0.968	0.893	0.869	0.871

SZ-TESTSYSTEME Statistics 02 Vers. 2.15 for TA09
RD189_OP43GP_POST_ANNEAL_EMS / V1.0 15/4/96 PAR

Results file : RD189_OP43GP_POST_ANNEAL_EMS from: 17.04.96 / 01:24:57
Operator : PAUL RUSSELL
Part number : OP43GP
Lot number : RD189
Order number : O/C T9501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: POST ANNEAL EMS
: OP43AJ XM-PL-IG6-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos			-0.500	...	0.500		mV
2.	Ib		(	0.000	)...	0.005		nA
3.	Ios		(	0.000	)...	0.001		nA
4.	CMRR			100.00	... (	140.00	)	dB
5.	Avo			120.0	... (	130.0	)	dB
6.	+Vo			12.300	... (	15.000	)	V
7.	-Vo		(	-15.000	)...	-12.300		V
8.	SR+			5	... (	50	)	V/us
9.	SR-			5	... (	50	)	V/us
10.	PSRR+			92.00	... (	120.00	)	dB
11.	Isc			-36.00	...	-12.00		mA
12.	+Is			0.000	...	1.000		mA
13.	-Is			0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.446	0.218	1.084F	0.177	0.270	-0.686F
2.1 [nA]	0.007F	0.234F	0.321F	0.371F	0.420F	0.357F
3.1 [nA]	0.007F	0.002F	0.000	0.001F	0.002F	0.006F
4.1 [dB]	123.34	110.43	118.93	111.44	126.15	118.72
5.1 [dB]	139.6	126.0	129.3	127.5	123.7	128.0
6.1 [V]	12.859	12.870	12.815	12.756	12.780	12.779
7.1 [V]	-12.891	-12.767	-12.680	-12.682	-12.708	-12.727
8.1 [V/us]	9	10	10	10	9	10
9.1 [V/us]	8	9	10	10	9	10
10.1 [dB]	131.40	99.91	101.33	101.74	111.94	140.00
11.1 [mA]	-18.10	-18.09	-18.42	-18.58	-18.89	-18.68
12.1 [mA]	1.129F	0.905	0.942	0.912	0.916	0.909
13.1 [mA]	0.776	0.838	0.892	0.846.	0.859	0.877

SI-TESTSYSTEME Statistics 03 Vers. 2.15 for TA09
RD188_OP436P_POST_AGEING_EMS / V1.0 15/4/96 PAR

Results file : RD188_OP436P_POST_AGEING_EMS from: 30.04.96 / 14:42:26
Operator : PAUL RUSSELL
Part number : OP436P
Lot number : RD188
Order number : O/C T6501
Vendor : PMI
: CONTROL S/No 01 ; RAD SAMPLE S/NoS 02-06
: POST 'ACCELERATED AGEING UNDER BIAS' EMS
: OP43AJ XM-PL-IGG-0036 RAD TEST / V1.0 15/4/96 PAR

Test steps

1.	Vos			-0.500	...	0.500	mV
2.	Ib	(	0.000	) ...		0.005	nA
3.	Ios	(	0.000	) ...		0.001	nA
4.	CMRR		100.00	...	(140.00	)	dB
5.	Avo		120.0	...	(130.0	)	dB
6.	+Vo		12.300	...	(15.000	)	V
7.	-Vo	(	-15.000	) ...		-12.300	V
8.	SR+		5	...	(50	)	V/us
9.	SR-		5	...	(50	)	V/us
10.	PSRR+		92.00	...	(126.00	)	dB
11.	Isc		-36.00	...	-12.00		mA
12.	+Is		0.000	...	1.000		mA
13.	-Is		0.000	...	1.000		mA

	1	2	3	4	5	6
1.1 [mV]	0.430	0.418	1.253F	-0.263	-0.155	-0.665F
2.1 [mA]	0.004	0.051F	0.062F	0.066F	0.070F	0.065F
3.1 [mA]	0.005F	0.002F	0.000	0.000	0.001	0.001
4.1 [dB]	128.56	112.02	122.64	110.48	117.07	126.55
5.1 [dB]	131.3	131.0	136.1	128.4	133.5	131.0
6.1 [V]	12.856	12.891	12.863	12.821	12.856	12.836
7.1 [V]	-12.890	-12.834	-12.827	-12.836	-12.844	-12.849
8.1 [V/us]	10	10	10	10	10	10
9.1 [V/us]	8	9	10	9	9	9
10.1 [dB]	130.47	102.29	107.33	103.07	114.87	122.64
11.1 [mA]	-18.14	-18.00	-18.26	-18.35	-18.53	-18.43
12.1 [mA]	1.130F	0.908	0.823	0.877	0.878	0.880
13.1 [mA]	0.776	0.830	0.853	0.806	0.809	0.808