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# HIGH DOSE RADIATION TEST REPORT MAT02

September 1995  
Generic



Radiation Test Report	
Product:	MAT02
Gamma:	0,100k, 24Hr, 96Hr, 69Hr @100C
Gamma Source:	Co60/TM1019 Condition A
Dose Rate:	50 Rad/s
Facilities:	LSI Logic
Tested:	September 14th, 1995

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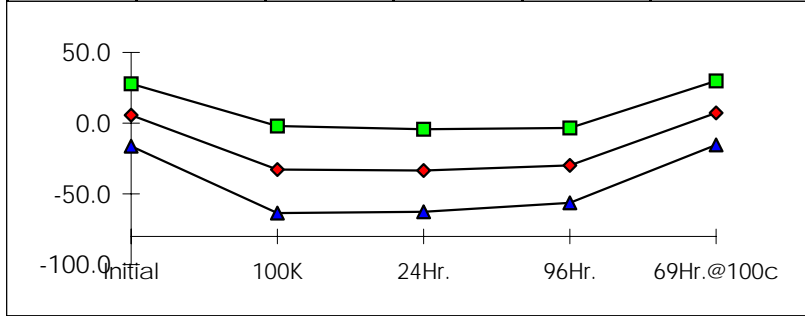
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**Test#3.0 VOS @IC=10uA ;VCB=0V uV**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	21.7	21.8	19.7	18.8	23.2
3	4.3	-38.9	-37.9	-36.7	4.7
4	16.3	-21.8	-20.3	-19.7	18.2
5	6.0	-36.0	-35.5	-33.9	7.5
6	-4.4	-44.9	-45.9	-38.0	-2.7
7	6.6	-22.6	-28.2	-21.1	8.8

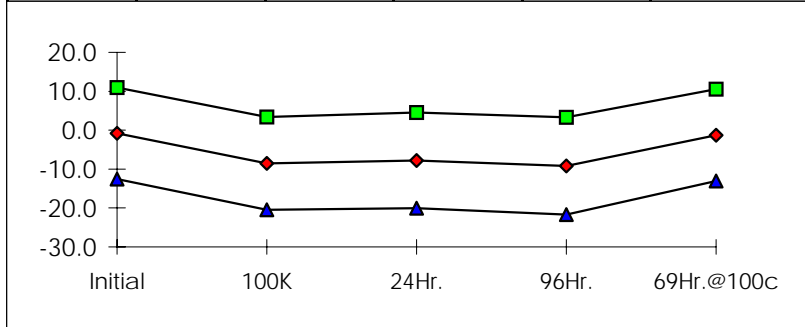
Min	-4.4	-44.9	-45.9	-38.0	-2.7
Max	16.3	-21.8	-20.3	-19.7	18.2
Stddev	7.4	10.2	9.7	8.8	7.5
Mean	5.8	-32.8	-33.6	-29.9	7.3
M+3S	27.9	-2.1	-4.3	-3.5	29.9
M-3S	-16.3	-63.5	-62.8	-56.3	-15.3



**Test#5.0 DVOS/DVCB @IC=10uA uV**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	-6.0	-6.4	-6.5	-7.7	-5.9
3	0.8	-7.8	-6.6	-8.1	0.2
4	1.1	-7.0	-5.9	-7.2	1.2
5	-7.5	-15.4	-14.9	-16.5	-7.9
6	2.4	-5.1	-4.5	-6.1	1.8
7	-0.9	-7.3	-6.9	-8.0	-1.6

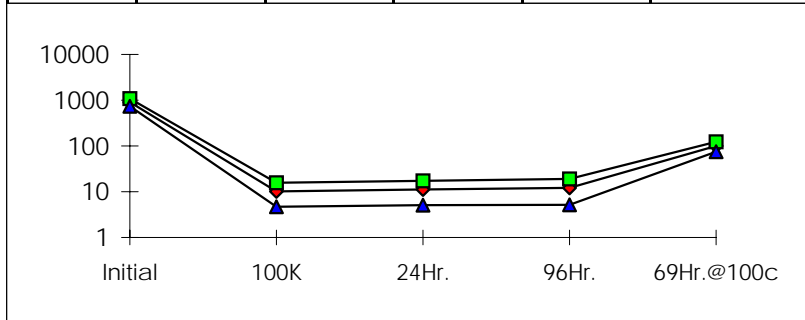
Min	-7.5	-15.4	-14.9	-16.5	-7.9
Max	2.4	-5.1	-4.5	-6.1	1.8
Stddev	3.9	4.0	4.1	4.2	3.9
Mean	-0.8	-8.5	-7.8	-9.2	-1.3
M+3S	10.9	3.4	4.5	3.3	10.5
M-3S	-12.6	-20.5	-20.1	-21.7	-13.0



**Test#11 Q1 HFE4, IC=1uA, VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	882	888	876	887	868
3	894	10	11	11	97
4	1004	9	10	11	100
5	848	9	9	10	90
6	901	10	12	12	97
7	901	13	14	16	113

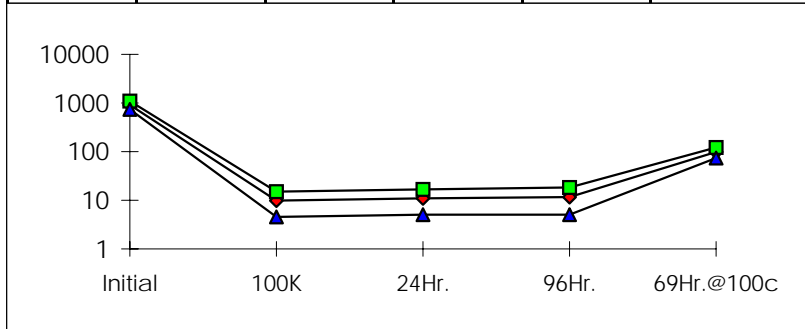
Min	848	9	9	10	90
Max	1004	13	14	16	113
Stddev	57	2	2	2	8
Mean	910	10	11	12	99
M+3S	1082	16	17	19	124
M-3S	738	5	5	5	75



**Test#11.1 Q2 HFE4, IC=1uA, VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	879	887	875	890	885
3	918	9	10	11	96
4	1010	9	10	11	99
5	857	8	9	10	89
6	895	10	11	12	96
7	896	13	14	15	111

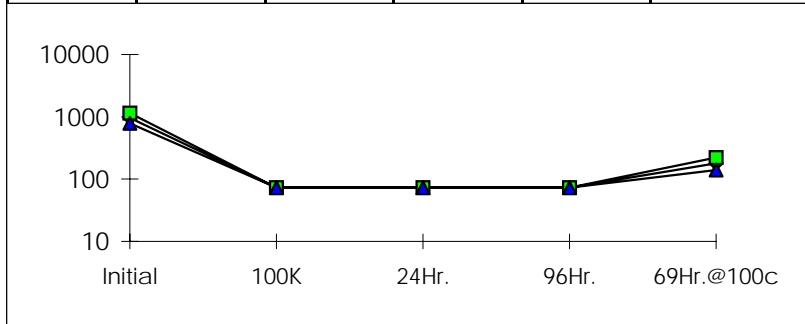
Min	857	8	9	10	89
Max	1010	13	14	15	111
Stddev	58	2	2	2	8
Mean	915	10	11	12	98
M+3S	1088	15	17	18	122
M-3S	743	5	5	5	74



**Test#13 Q1 HFE3, IC=10uA,VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	934	936	937	944	937
3	961	73	73	73	177
4	1067	73	73	73	183
5	902	73	73	73	164
6	953	73	73	73	177
7	950	73	73	73	201

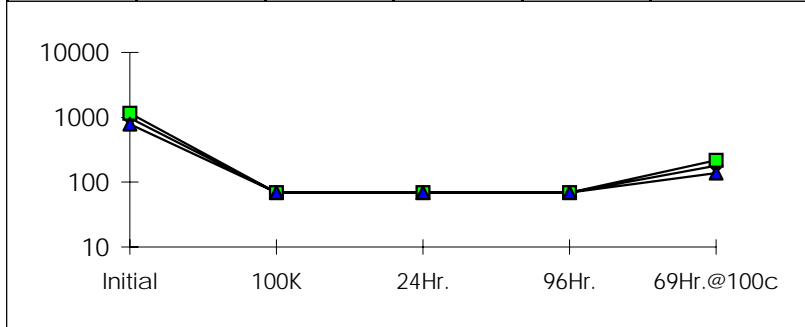
Min	902	73	73	73	164
Max	1067	73	73	73	201
Stddev	61	0	0	0	14
Mean	966	73	73	73	180
M+3S	1148	73	73	73	221
M-3S	784	73	73	73	140



**Test#13.1 Q2 HFE3, IC=10uA,VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	933	936	938	945	939
3	970	69	69	69	175
4	1072	69	69	69	182
5	907	69	69	69	162
6	952	69	69	69	175
7	950	69	69	69	199

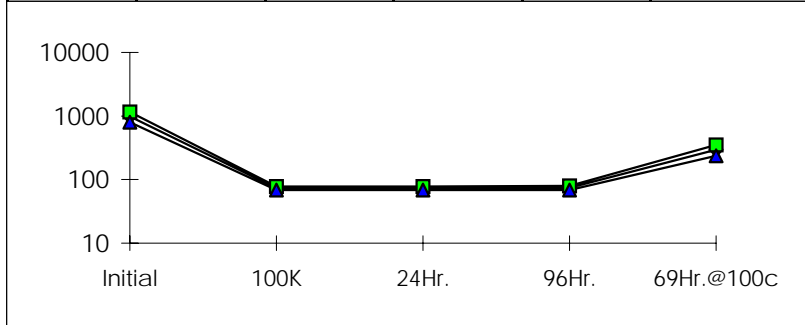
Min	907	69	69	69	162
Max	1072	69	69	69	199
Stddev	61	0	0	0	13
Mean	970	69	69	69	178
M+3S	1154	69	69	69	218
M-3S	786	69	69	69	139



**Test#15 Q1 HFE2, IC=100uA,VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	945	949	950	957	949
3	977	73	73	73	289
4	1082	73	73	73	303
5	917	73	73	73	268
6	966	73	73	76	288
7	963	76	76	76	319

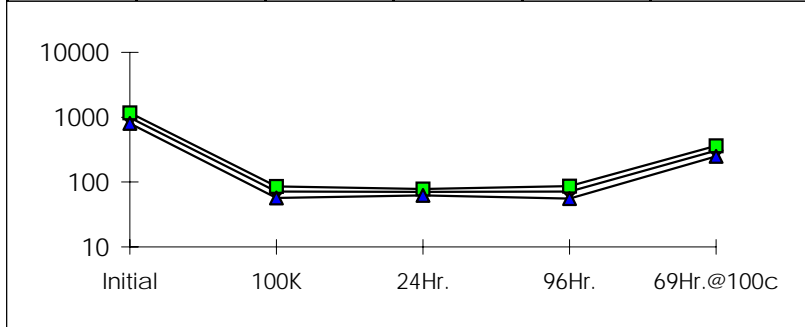
Min	917	73	73	73	268
Max	1082	76	76	76	319
Stddev	61	1	2	2	19
Mean	981	73	73	74	293
M+3S	1164	78	78	80	350
M-3S	798	69	69	68	236



**Test#15.1 Q2 HFE2, IC=100uA,VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	948	952	953	959	954
3	985	69	69	69	302
4	1086	69	69	69	317
5	921	69	69	69	280
6	968	69	69	69	301
7	964	80	75	81	331

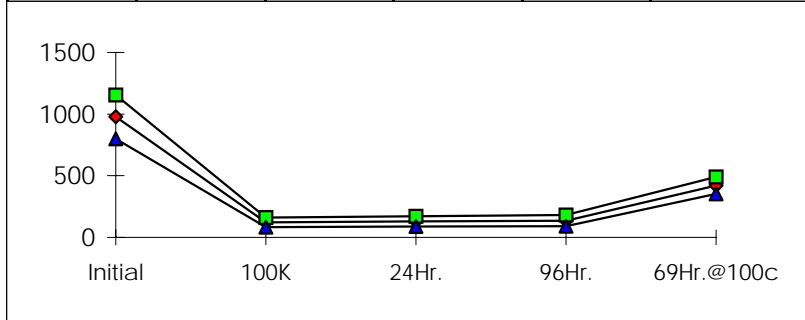
Min	921	69	69	69	280
Max	1086	80	75	81	331
Stddev	61	5	3	5	19
Mean	985	71	70	71	306
M+3S	1168	86	78	87	363
M-3S	801	57	62	56	249



**Test#17 Q1 HFE1, IC=1mA, VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	942	946	948	955	946
3	976	120	126	131	417
4	1076	118	125	131	442
5	916	108	114	119	388
6	963	123	133	137	414
7	960	144	152	160	445

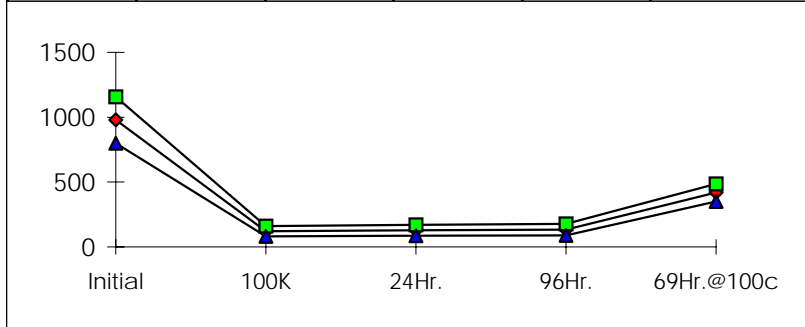
Min	916	108	114	119	388
Max	1076	144	152	160	445
Stddev	59	13	14	15	23
Mean	978	123	130	136	421
M+3S	1156	162	172	181	491
M-3S	800	83	88	90	352



**Test#17.1 Q2 HFE1, IC=1mA, VCB=40V**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	942	946	948	955	949
3	979	117	123	129	415
4	1077	116	123	129	439
5	916	107	112	117	386
6	963	121	131	135	412
7	960	142	149	158	442

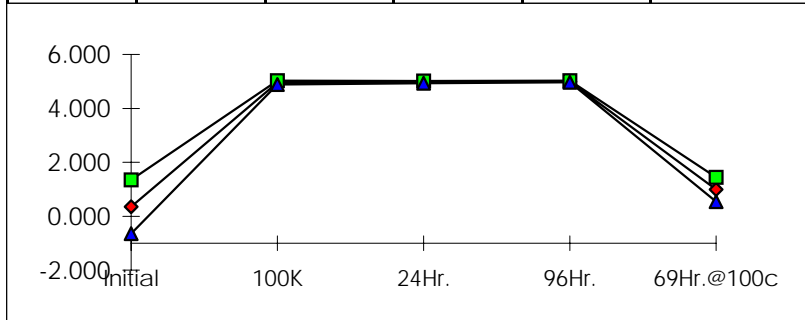
Min	916	107	112	117	386
Max	1077	142	149	158	442
Stddev	60	13	14	15	23
Mean	979	121	128	133	419
M+3S	1158	159	169	178	487
M-3S	800	82	86	89	351



**Test#18 DELTA HFE3, IC=10uA, VCB=0V %**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.070	0.040	0.060	0.120	0.220
3	0.850	4.920	4.950	4.980	0.900
4	0.360	4.940	4.970	5.000	0.940
5	0.450	4.970	4.980	5.000	0.830
6	0.050	4.970	4.980	5.000	1.110
7	0.050	4.980	4.990	5.000	1.190

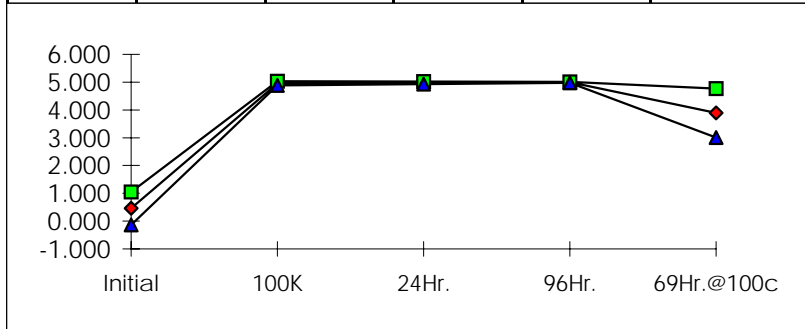
Min	0.050	4.920	4.950	4.980	0.830
Max	0.850	4.980	4.990	5.000	1.190
Stddev	0.332	0.025	0.015	0.009	0.150
Mean	0.352	4.956	4.974	4.996	0.994
M+3S	1.347	5.031	5.019	5.023	1.445
M-3S	-0.643	4.881	4.929	4.969	0.543



**Test#19 DELTA HFE2, IC=100uA, VCB=0V %**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.340	0.350	0.340	0.340	0.560
3	0.780	4.920	4.950	4.990	4.000
4	0.440	4.950	4.970	5.000	4.060
5	0.480	4.970	4.980	5.000	4.120
6	0.310	4.970	4.990	4.990	3.880
7	0.280	4.980	4.990	5.000	3.390

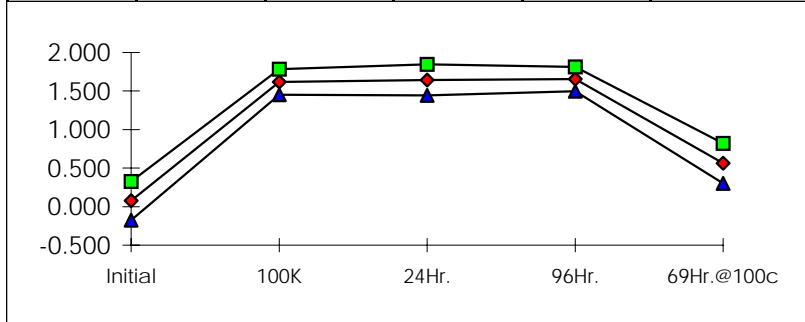
Min	0.280	4.920	4.950	4.990	3.390
Max	0.780	4.980	4.990	5.000	4.120
Stddev	0.199	0.024	0.017	0.005	0.293
Mean	0.458	4.958	4.976	4.996	3.890
M+3S	1.054	5.030	5.026	5.012	4.770
M-3S	-0.138	4.886	4.926	4.980	3.010



**Test#20 DELTA HFE1, IC=1mA,VCB=0V %**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.010	0.000	0.000	0.000	0.180
3	0.220	1.690	1.750	1.740	0.550
4	0.080	1.540	1.570	1.600	0.550
5	0.040	1.620	1.620	1.630	0.460
6	0.020	1.640	1.660	1.660	0.550
7	0.020	1.600	1.620	1.650	0.700

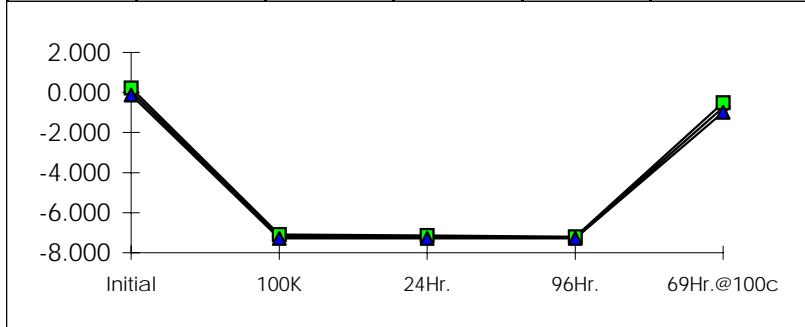
Min	0.020	1.540	1.570	1.600	0.460
Max	0.220	1.690	1.750	1.740	0.700
Stddev	0.084	0.055	0.067	0.052	0.086
Mean	0.076	1.618	1.644	1.656	0.562
M+3S	0.328	1.783	1.846	1.813	0.821
M-3S	-0.176	1.453	1.442	1.499	0.303



**Test#21 IOS @IC=10uA ;VCB=0V nA**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.012	0.007	0.010	0.019	0.036
3	0.136	-7.133	-7.174	-7.217	-0.699
4	0.053	-7.167	-7.208	-7.252	-0.719
5	0.074	-7.197	-7.225	-7.246	-0.677
6	-0.008	-7.206	-7.226	-7.249	-0.862
7	-0.008	-7.212	-7.235	-7.251	-0.814

Min	-0.008	-7.212	-7.235	-7.252	-0.862
Max	0.136	-7.133	-7.174	-7.217	-0.677
Stddev	0.061	0.033	0.024	0.015	0.080
Mean	0.049	-7.183	-7.214	-7.243	-0.754
M+3S	0.231	-7.084	-7.141	-7.199	-0.515
M-3S	-0.133	-7.282	-7.286	-7.287	-0.993

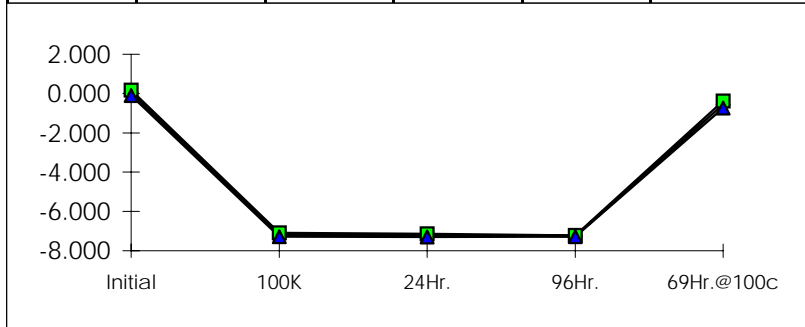




**Test#21.1 IOS @IC=10uA ;VCB=40V nA**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	-0.005	-0.002	0.004	0.015	0.022
3	0.102	-7.137	-7.175	-7.231	-0.511
4	0.045	-7.175	-7.212	-7.249	-0.522
5	0.065	-7.201	-7.227	-7.259	-0.519
6	-0.008	-7.210	-7.238	-7.254	-0.647
7	-0.007	-7.221	-7.238	-7.250	-0.585

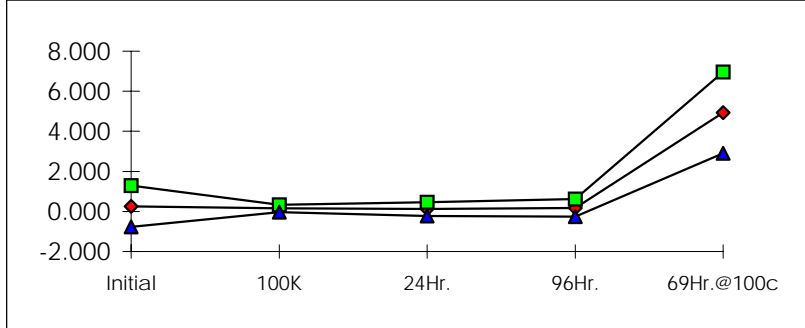
Min	-0.008	-7.221	-7.238	-7.259	-0.647
Max	0.102	-7.137	-7.175	-7.231	-0.511
Stddev	0.047	0.034	0.026	0.011	0.058
Mean	0.039	-7.189	-7.218	-7.249	-0.557
M+3S	0.182	-7.088	-7.139	-7.217	-0.381
M-3S	-0.103	-7.290	-7.297	-7.280	-0.732



**Test#22 DIOS/DVOS @IC=10uA pA/V**

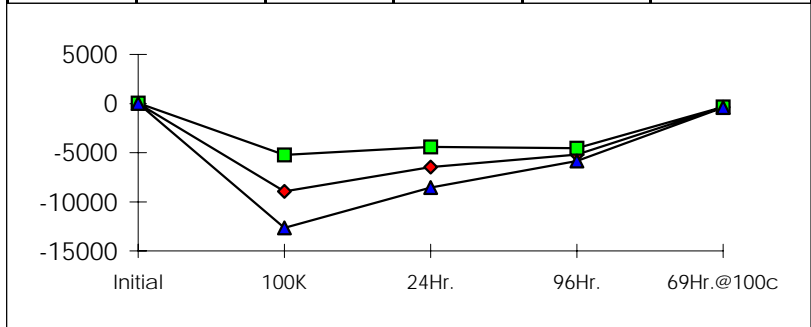
Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.420	0.230	0.150	0.090	0.350
3	0.850	0.110	0.040	0.350	4.690
4	0.200	0.190	0.120	0.070	4.920
5	0.230	0.110	0.030	0.320	3.960
6	0.000	0.100	0.310	0.120	5.370
7	0.020	0.240	0.090	0.040	5.730

Min	0.000	0.100	0.030	0.040	3.960
Max	0.850	0.240	0.310	0.350	5.730
Stddev	0.346	0.062	0.113	0.145	0.677
Mean	0.260	0.150	0.118	0.180	4.934
M+3S	1.297	0.336	0.458	0.614	6.964
M-3S	-0.777	-0.036	-0.222	-0.254	2.904



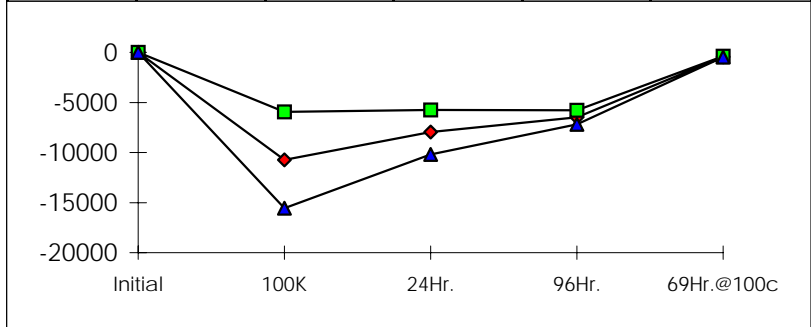
<b>Test#24</b>		<b>Q1 ICBO VCB=40V</b>				<b>pA</b>
Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c	
2	31	30	31	24	-3	
3	32	-7168	-6173	-5061	-378	
4	32	-9124	-6449	-5241	-387	
5	29	-10507	-6689	-5477	-401	
6	30	-9448	-7467	-5290	-376	
7	29	-8479	-5588	-4907	-367	

Min	29	-10507	-7467	-5477	-401
Max	32	-7168	-5588	-4907	-367
Stddev	1	1235	691	219	13
Mean	30	-8945	-6473	-5195	-382
M+3S	35	-5241	-4400	-4539	-343
M-3S	26	-12650	-8546	-5852	-420



<b>Test#24.1</b>		<b>Q2 ICBO VCB=40V</b>				<b>pA</b>
Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c	
2	-14	-8	-14	-9	-14	
3	-7	-8370	-7548	-6260	-431	
4	-8	-12193	-7969	-6547	-445	
5	-7	-12191	-8223	-6825	-459	
6	-7	-10895	-9026	-6509	-428	
7	-6	-10083	-7057	-6269	-424	

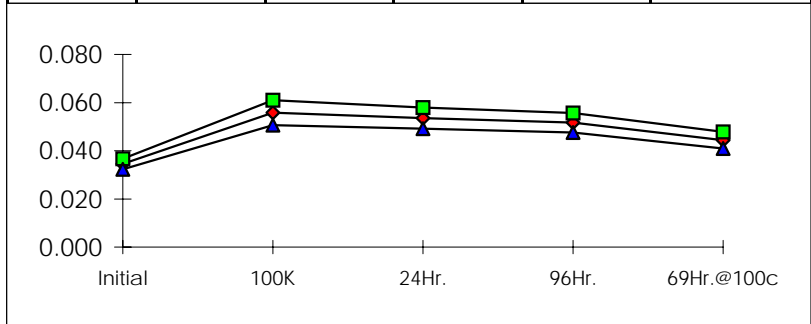
Min	-8	-12193	-9026	-6825	-459
Max	-6	-8370	-7057	-6260	-424
Stddev	1	1604	740	233	14
Mean	-7	-10746	-7964	-6482	-437
M+3S	-5	-5934	-5744	-5783	-394
M-3S	-9	-15558	-10185	-7181	-481



**Test#26 Q1 Vce(Sat) IC=1 mA, IB=100uA nA**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.035	0.035	0.036	0.035	0.036
3	0.034	0.055	0.054	0.052	0.044
4	0.033	0.054	0.052	0.050	0.043
5	0.035	0.059	0.056	0.054	0.046
6	0.035	0.056	0.054	0.052	0.045
7	0.035	0.055	0.053	0.051	0.045

Min	0.033	0.054	0.052	0.050	0.043
Max	0.035	0.059	0.056	0.054	0.046
Stddev	0.001	0.002	0.001	0.001	0.001
Mean	0.035	0.056	0.054	0.052	0.044
M+3S	0.037	0.061	0.058	0.056	0.048
M-3S	0.032	0.051	0.049	0.048	0.041



**Test#26.1 Q2 Vce(Sat) IC=1 mA, IB=100uA nA**

Device	Initial	100K	24Hr.	96Hr.	69Hr.@100c
2	0.035	0.035	0.036	0.035	0.035
3	0.034	0.055	0.054	0.052	0.044
4	0.033	0.054	0.052	0.050	0.043
5	0.035	0.059	0.056	0.054	0.046
6	0.035	0.056	0.054	0.052	0.044
7	0.035	0.055	0.053	0.051	0.044

Min	0.033	0.054	0.052	0.050	0.043
Max	0.035	0.059	0.056	0.054	0.046
Stddev	0.001	0.002	0.001	0.001	0.001
Mean	0.034	0.056	0.054	0.052	0.044
M+3S	0.037	0.061	0.058	0.056	0.047
M-3S	0.032	0.051	0.049	0.047	0.041

