

After the 30 krad irradiation, both S/N 3635 and S/N 3636 fell below the minimum specification limit for Vout Full Load, with readings of 0.40 V. Both parts also fell below the minimum specification limit for Efficiency, with readings of 67.00% and 24.81%, respectively. Both parts also exceeded the maximum specification limit for Load Reg., with readings of 4,606 mV and 4,602 mV, and, in addition, S/N 3636 continued to exceed the maximum specification limit for Line Reg., with a reading of 2,461 mV. These readings indicate increasing performance degradation for both parts under full load conditions.

At this point, both parts were retested under a half-load condition. Under this condition, both parts read within specification limits for Vout Full Load, Load Reg. and Line Reg. Both parts continued to fall marginally below the minimum specification limit for Efficiency, with readings of 73.96% and 73.88%; however, under the half-load condition, efficiency is normally lower.

After the 50 krad irradiation, both parts continued to exhibit increasing performance degradation under full load. No further half-load tests were made, therefore no half-load data are available at this radiation level. At this level, S/N 3636 recovered to within specification limits for Line Reg., with a reading of 12.86 mV, but S/N 3635 exceeded the maximum specification limit of 80 mVp-p for Output Ripple, with a reading of 154.54 mV.

After annealing for 168 hours at 25°C, S/N 3635 recovered to within specification limits for all electrical parameters except Line Reg., with a reading of 1,687 mV and S/N 3636 recovered to within specification limits for all electrical parameters except Efficiency, with a marginally failing reading of 74.998%.

After annealing for 168 hours at 100°C, no rebound effects were observed.

Table IVa and Table IVb provide the values for each parameter for MHF2812D and MHF2805S, respectively, after each irradiation exposure and annealing step.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

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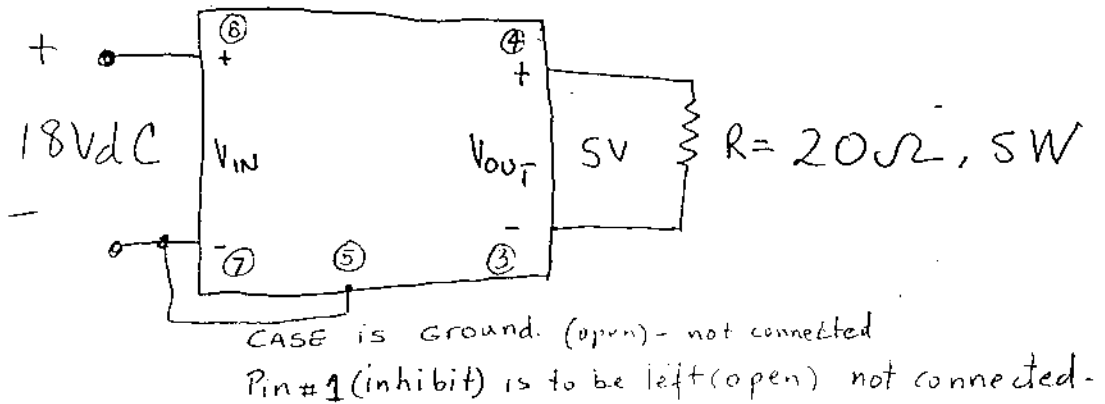
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Figure 1. Radiation Bias Circuit for MHF2812D and MHF2805S

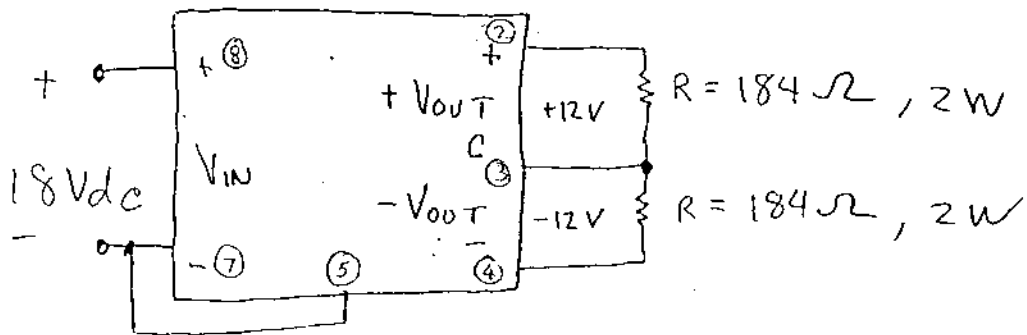
RADIATION Bias Circuit : DC-DC Converters
2 positions

5962-9213901HXX
(MHF-2805S)



Radiation Bias circuit. (2 positions)

(5962-9214401HXX)
MHF2812D



Case is ground (open) - not connected
Pin #1 (inhibit) not connected (left open)

TABLE I. Part Information

Generic Part Number:	MHF2812D and MIIF2805S*
CASSINI/CIRS Part Number	5962-9214401HXX and 5962-9213901HXXF
CASSINI/CIRS Control Number:	14857 and 14858
Charge Number:	EE61849
Manufacturer:	Interpoint
Lot Date Code (LDC):	9603
Quantity Tested:	6 (3 MIIF2812D and 3 MHF2805S)
Serial Number of Control Samples:	653 (MHF2812D), 3630 (MHF2805S)
Serial Numbers of Radiation Samples:	654, 655 (MHF2812D), 3635, 3636 (MHF2805S)
Part Function:	DC-DC Converter
Part Technology:	Hybrid
Package Style:	12 pin metal sealed
Test Equipment:	S-50
Engineer:	T. Mondy

* No radiation tolerance/hardness was guaranteed by the manufacturer for this part.

TABLE II. Radiation Schedule for MHF2812D and MHF2805S

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS.....	03/08/96
2) 2.5 KRAD IRRADIATION (0.15 KRADS/HOUR).....	03/11/96
POST-2.5 KRAD ELECTRICAL MEASUREMENT.....	03/12/96
3) 5 KRAD IRRADIATION (0.15 KRADS/HOUR).....	03/12/96
POST-5 KRAD ELECTRICAL MEASUREMENT.....	03/13/96
4) 7.5 KRAD IRRADIATION (0.15 KRADS/HOUR).....	03/13/96
POST-7.5 KRAD ELECTRICAL MEASUREMENT.....	03/14/96
5) 10 KRAD IRRADIATION (0.15 KRADS/HOUR).....	03/14/96
POST-10 KRAD ELECTRICAL MEASUREMENT.....	03/15/96
6) 15 KRAD IRRADIATION (0.08 KRADS/HOUR).....	03/15/96
POST-15 KRAD ELECTRICAL MEASUREMENT.....	03/18/96
7) 20 KRAD IRRADIATION (0.29 KRADS/HOUR).....	03/18/96
POST-20 KRAD ELECTRICAL MEASUREMENT.....	03/19/96
8) 30 KRAD IRRADIATION (0.59 KRADS/HOUR).....	03/19/96
POST-30 KRAD ELECTRICAL MEASUREMENT.....	03/20/96
9) 50 KRAD IRRADIATION (1.18 KRADS/HOUR).....	03/20/96
POST-50 KRAD ELECTRICAL MEASUREMENT.....	03/21/96
10) 168-HOUR ANNEALING @25°C.....	03/21/96
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	03/28/96
11) 168-HOUR ANNEALING @100°C.....	03/28/96
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	04/04/96

PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS; SEE FIGURE 1.

Table III. Electrical Characteristics of MHF2812D and MHF2805S

MHF2812D

Test #	Parameters	Units	Conditions	Min	Max
1	Pos. Vout Full load	V	Full Load	11.880	12.120
2	Neg. Vout Full load	V	Full Load	-12.180	11.820
3	Efficiency	%	Full Load	76	-
4	Iin No Load	mA	No Load	-	50
5	Pos. Load Reg	mV	No Load to Full	-	50
6	Neg. Load Reg	mV	No Load to Full	-	100
7	Pos. Line Reg	mV	Full Load	-	50
8	Neg. Line Reg	mV	Full Load	-	100
9	Pos. Output Ripple	mVp-p	Full Load	-	80
10	Neg. Output Ripple	mVp-p	Full Load	-	80
11	Clock Frequency	kHz	Full Load	500	600

MHF2805S

Test #	Parameters	Units	Conditions	Min	Max
1	Vout Full load	V	Full Load	4.95	5.05
2	Efficiency	%	Full Load	75	-
3	Iin No Load	mA	No Load	-	40
4	Load Reg	mV	No Load to Full	-	50
5	Line Reg	mV	Full Load	-	50
6	Output Ripple	mVp-p	Full Load	-	80
7	Switching Frequency	kHz	Full Load	500	600

TABLE IVa: Summary of Electrical Measurements after Total Dose Exposures and Annealing for MHF2812D

#	Electrical Parameters	Units	Spec. Lim./1 min max		Total Dose Exposure (krads) /2														Annealing			
					Initial		5		10		15		20		30		50		168 hrs. @ 25°C		168 hrs. @ 100°C	
					654	655	654	655	654	655	654	655	654	655	654	655	654	655	654	655	654	655
1	Pos. Vout Full Load	V	11.88	400	12.05	12.06	12.04	12.06	12.04	12.06	12.04	12.05	12.04	12.05	12.03	12.05	12.02	12.04	12.02	12.04	12.02	12.04
2	Neg. Vout Full Load	V	12.1	4.75	-12.10	-12.03	-12.09	-12.03	-12.09	-12.03	-12.09	-12.03	-12.09	-12.03	-12.08	-12.02	-12.07	-12.01	-12.07	-12.01	-12.07	-12.02
3	Efficiency	%	76	-	81.49	81.50	81.56	81.48	81.26	81.20	81.16	81.02	81.23	81.09	81.03	80.88	80.79	80.64	80.88	80.62	81.06	81.06
4	Iin No Load	mA	-	50	25.05	25.05	24.35	24.35	25.05	25.05	24.35	25.05	25.05	25.05	25.05	25.05	25.05	25.05	23.90	23.90	23.20	23.9
5	Pos. Load Reg.	mV	-	50	2.13	3.94	3.14	4.42	3.53	4.77	3.02	4.21	2.75	4.75	3.44	4.79	3.25	4.97	3.13	5.02	2.92	4.79
6	Neg. Load Reg.	mV	-	100	20.91	30.75	21.93	33.37	23.33	30.72	19.82	31.99	22.74	31.94	23.48	32.38	24.52	34.26	24.91	30.01	23.55	30.46
7	Pos. Line Reg.	mV	-	50	-5.50	-2.72	-5.16	-2.31	5.09	-2.22	-4.73	-2.15	-4.83	-2.35	-4.85	-2.34	-5.07	-2.46	-4.47	-2.01	-4.88	-2.17
8	Neg. Line Reg.	mV	-	100	6.56	14.50	6.20	14.33	6.45	14.10	6.28	13.37	6.76	14.08	6.50	14.00	6.98	14.24	5.43	14.24	5.61	14.79
9	Pos. Output Ripple	mVp-p	-	80	25.22	30.50	26.66	32.30	26.78	32.18	27.87	32.89	26.62	32.10	28.71	33.92	26.38	31.59	25.35	30.74	26.42	32.23
10	Neg. Output Ripple	mVp-p	-	80	20.37	23.45	21.98	25.58	20.96	24.05	22.40	25.45	21.12	24.52	23.60	26.99	21.15	24.12	20.29	23.19	21.32	24.37
11	Clock Frequency	kHz	500	600	/3	/3	562	555	579	572	560	551	558	550	553	548	552	547	554	549	560	555

Notes:

- 1/ These are manufacturer's pre-irradiation data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time these tests were performed.
- 2/ Data for 2.5 and 7.5 krads have been omitted for clarity. Data for these irradiation levels are available on request.
- 3/ No data available at this level.

TABLE IVb: Summary of Electrical Measurements after Total Dose Exposures and Annealing for MHF2805S

Electrical # Parameters	Units	Spec. Lim./1		Total Dose Exposure (krads) /2														Annealing				
				Initial		5		10		15		20		30 /4		50		168 hrs. @ 25°C		168 hrs. @ 100°C		
				3635	3636	3635	3636	3635	3636	3635	3636	3635	3636	3635	3636	3635	3636	3635	3636	3635	3636	
1	Vout Full Load	V	4.95	5.05	4.97	4.96	4.98	4.96	4.98	4.96	4.98	4.96	4.98	3.17	0.40	0.40	0.39	0.38	4.97	4.97	4.97	4.96
2	Efficiency	%	75	-	76.11	75.70	75.92	75.66	75.94	75.49	75.76	75.48	75.55	67.00	24.81	24.95	23.74	23.63	75.02	74.998	75.20	75.22
3	Iin No Load	mA	-	40	28.00	29.40	28.00	29.40	28.00	29.40	28.00	29.40	28.00	29.40	28.00	28.00	28.00	28.00	26.85	26.85	25.80	28.70
4	Load Reg.	mV	-	50	27.26	26.69	28.44	30.34	27.92	28.97	27.08	29.44	29.12	1825	4606	4602	4615	4614	28.08	28.52	28.50	30.63
5	Line Reg.	mV	-	50	2.74	4.19	2.65	3.98	2.47	3.68	2.45	3.67	2.43	4554	21.62	2461	11.03	12.86	1687	1.89	2.12	3.67
6	Output Ripple	mVp-p	-	80	54.94	55.17	59.08	57.30	58.88	58.23	59.70	59.27	60.48	59.92	69.92	71.19	154.54	62.15	63.18	63.41	59.40	57.03
7	Switching Frequency	kHz	500	600	/5	/5	550	603	547	543	546	543	545	542	543	540	543	540	544	541	550	546

Notes:

- 1/ These are manufacturer's pre-irradiation data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time these tests were performed.
- 2/ Data for 2.5 and 7.5 krads have been omitted for clarity. Data for these irradiation levels are available on request.
- 3/ No data available at this level.
- 4/ After the 30 krad irradiation, both parts were retested under half-load. Under this condition, both parts passed all tests except Efficiency.