

Unisys

DATE: April 10, 1998
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SUBJECT: Radiation Report on: **OM11725SMX (Omnirel) (LDC 9735)**
Project: MAP/Subsystem
Job #: C80782
Project part #: OM11725 (OM7646)

PPM-98-007

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A radiation evaluation was performed on **OM11725SMX Surface Mount Positive Adjustable 1.0Amp Voltage Regulator (Omnirel)** to determine the total dose tolerance of these parts. **This particular package is the hi-rel version of OM7646.** A brief summary of the test results is provided below. For detailed information, refer to Tables I through IV and Figure 1.

The total dose testing was performed using a Co⁶⁰ gamma ray source. During the radiation testing, four parts were irradiated under bias (see Figure 1 for bias configuration) and one part was used as a control sample. The total dose radiation levels were 10.0, 20.0, 30.0, 50.0, 75.0 and 100.0 kRads.* The dose rate was between 0.250 and 0.625 kRads/hour (0.069 to 0.174 Rads/s). After the 100.0 kRad irradiation, the parts were annealed for 168 hours at 25°C. See Table II for the radiation schedule and effective dose rate calculation. The effective dose rate over all testing was 0.083 Rads/sec. After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits** listed in Table III.

Initial electrical measurements were made on 5 samples. Four samples (SN's 19, 23, 31, and 37) were used as radiation samples while SN 39 was used as a control sample. All parts passed all tests during initial electrical measurements.

All parts passed all tests up to 30 kRads.

After the 50.0 kRad irradiation, all parts fell below the specification limit of -9.0mV for Vline_a with readings in the range of -14.1 to -25.4mV. **All parts passed all other tests.**

After the 75.0 kRad irradiation, SN's 23, 31 and 37 fell marginally below the specification limit of 1.200V for Vref with readings in the range of 1.18 to 1.19V. All parts fell below the specification limit for Vline_a and Vline_b with readings in the range of -55.4 to -74.0mV for Vline_a and readings in the range of -6.0 to -24.0mV for Vline_b. **All parts passed all other tests.**

After the 100.0 kRad irradiation, SN 19 fell below the specification limit of -5.0µA for delta_I with a reading of -14.6µA. All parts fell below the specification limit for Vref with readings in the range of 1.12 to 1.17V. All parts fell below the specification limit for Vline_a with readings in the range of -328 to -2579mV and also fell below the specification limit for Vline_b with readings in the range of -32 to -41mV. **All parts passed all other tests.**

After annealing the parts for 168 hours at 25°C, the parts showed modest recovery in Vref with three parts marginally exceeding the specification limit. Some recovery in Vline_a and Vline_b was noted with all parts

* The term Rads, as used in this document, means Rads (silicon). All radiation levels cited are cumulative.

** These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation limits at the time these tests were performed.

continuing to fall below the specification limits with readings in the range of -66 to -105mV and -6.8 to -31mV respectively. SN's 31 and 37 however, fell marginally below the specification limit of $-5.0\mu\text{A}$ for ΔI with readings of -13.2 and $-19.0\mu\text{A}$ respectively.

Table IV provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

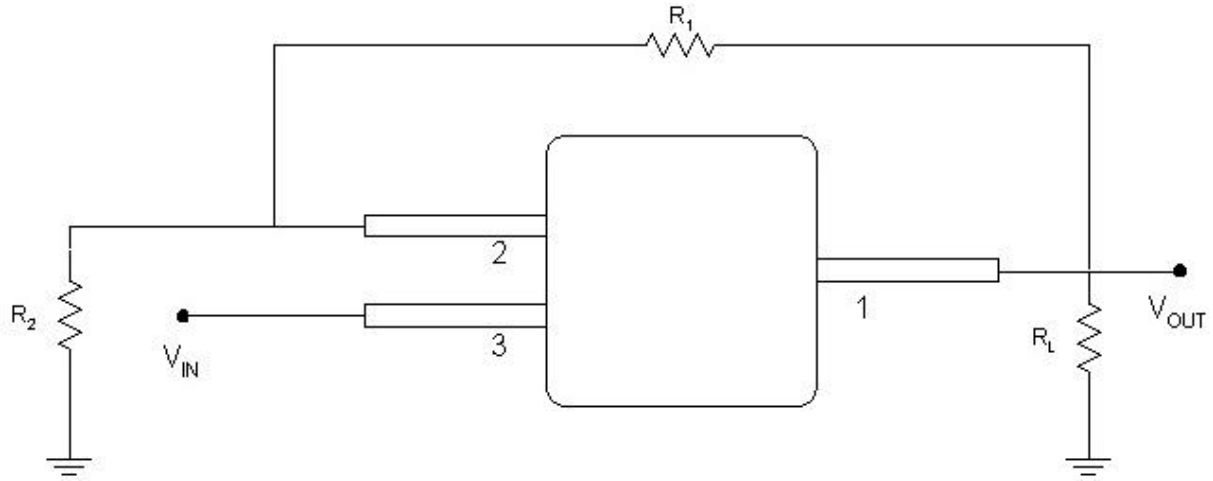
Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

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Figure 1. Radiation Bias Circuit for OM11725SMX



Notes:

1. Pin 1: V_{OUT} , Pin 2: Adjust, Pin 3: V_{IN} , Case: Isolated
2. $R_1 = 250\Omega \pm 5\% \frac{1}{4}W$.
3. $R_2 = 5k\Omega \pm 5\% \frac{1}{4}W$.
4. $R_L = 3k\Omega \pm 5\% \frac{1}{2}W$.
5. $V_{IN} = 35.0V \pm 0.5V$.
6. $V_{OUT} = 26.8V \pm 0.5V$.

TABLE I. Part Information

Generic Part Number:	OM11725SMX (OM7646)
MAP/Subsystem Part Number	OM11725SMX
Charge Number:	C80644
Manufacturer:	Omnirel
Lot Date Code (LDC):	9735
Quantity Tested:	15
Serial Number of Control Sample:	39
Serial Numbers of Radiation Samples:	19, 23, 31, and 37
Part Function:	Positive Adjustable 1.0Amp Voltage Regulator
Part Technology:	Bipolar
Package Style:	3 Pin Hermetic Isolated Surface Mount
Test Equipment:	A540
Test Engineer:	S. Archer-Davies

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

TABLE II. Radiation Schedule for OM11725SMX

EVENT.....	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	03/20/98
2) 10.0 KRAD IRRADIATION (0.250 KRADS/HOUR)	03/20/98
POST-10.0 KRAD ELECTRICAL MEASUREMENT	03/23/98
3) 20.0 KRAD IRRADIATION (0.250 KRADS/HOUR)	03/23/98
POST-20.0 KRAD ELECTRICAL MEASUREMENT	03/25/98
4) 30.0 KRAD IRRADIATION (0.250 KRADS/HOUR)	03/25/98
POST-30.0 KRAD ELECTRICAL MEASUREMENT	03/27/98
5) 50.0 KRAD IRRADIATION (0.500 KRADS/HOUR)	03/27/98
POST-50.0 KRAD ELECTRICAL MEASUREMENT	03/30/98
6) 75.0 KRAD IRRADIATION (0.625 KRADS/HOUR)	03/30/98
POST-75.0 KRAD ELECTRICAL MEASUREMENT	04/01/98
7) 100.0 KRAD IRRADIATION (0.625 KRADS/HOUR).....	04/01/98
POST-100.0 KRAD ELECTRICAL MEASUREMENT	04/03/98
8) 168 HOUR ANNEALING @25°C	04/03/98
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	04/10/98

Effective Dose Rate = 100,000 RADS/14 DAYS=297.6 RADS/HOUR=0.083 RADS/SEC

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

Table III. Electrical Characteristics of OM11725SMX /1

Test #	Parameter	Units	Test Conditions /2	Spec. min	Lim. max
1	iadj_1	mA	V _{DIFF} = 3.3V		100
2	iadj_2	mA	V _{DIFF} = 40V		100
3	iadj_3	mA	V _{DIFF} = 60V		100
4	delta_I	mA	V _{DIFF} = 3.0V, 10mA £I _L £195mA	-5.0	5.0
5	delta_I	mA	V _{DIFF} = 40V, 10mA £I _L £195mA	-5.0	5.0
6	vref	V	V _{DIFF} = 40V	1.200	1.300
7	vline_a	mV	3.0V £V _{DIFF} £40V, V _{OUT} = V _{REF}	-9.0	9.0
8	vline_b	mV	40V £V _{DIFF} £60V, V _{OUT} = V _{REF}	-5.0	5.0
9	vload	mV	V _{DIFF} = 40V, 10mA £I _L £195mA	-15.0	15.0
10	ilmin_3V	mA	V _{DIFF} = 3.0V, V _{OUT} = 1.4V (forced)	-5.0	5.0
11	ilmin_3.3V	mA	V _{DIFF} = 3.3V, V _{OUT} = 1.4V (forced)	-5.0	5.0
12	ilmin_40V	mA	V _{DIFF} = 40V, V _{OUT} = 1.4V (forced)	-5.0	5.0
13	ilmin_60V	mA	V _{DIFF} = 60V, V _{OUT} = 1.4V (forced)	-7.0	7.0

Notes:

1/ These limits are the manufacturer's non-irradiated data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed.

2/ I_L = 8mA unless otherwise specified.

TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for OM11725SMX /1

Test #	Parameters	Units	Spec. Lim. /2 min max		Total Dose Exposure (kRads)														Annealing	
					Initial		10.0		20.0		30.0		50.0		75.0		100		168 hours @25°C	
					mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	Iadj_1	mA		100	-38.7	0.3	-38.2	0.1	-38.5	0.4	-38.3	0.4	-36.3	0.3	-31.6	0.5	72	48	-30.0	1.8
2	Iadj_2	mA		100	-38.5	0.4	-38.4	0.4	-38.3	0.3	-37.4	0.2	-36.4	0.3	-34.5	0.9	-32.2	1.3	-35.2	1.0
3	Iadj_3	mA		100	-39.2	0.6	-38.9	0.1	-38.3	0.4	-37.5	0.4	-36.8	0.3	-36.4	0.3	-34.3	1.4	-36.6	0.6
4	delta_I	mA	-5.0	5.0	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.3	0.1	0.1	0.1	-0.1	0.2	0.1	0.2
5	delta_I	mA	-5.0	5.0	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	-3.8	6.2	-8.1	8.2
6	vref	V	1.20	1.30	1.25	0.04	1.25	0.04	1.24	0	1.24	0	1.22	0	1.19	0.01	1.14	0.02	1.19	0.01
7	vline_a	mV	-9.0	9.0	-0.6	0.05	-0.6	0	-0.8	0	-1.4	0.08	-21	4.5	-67	7.4	-1999	965	-87	14
8	vline_b	mV	-5.0	5.0	-0.9	0	-1.1	0.04	-1.6	0.08	-2.3	0.2	-4.3	0.5	-17	7.1	-38	3.7	-24	9.8
9	vload	mV	-15	15	2.0	0	2.2	0.1	2.7	0.1	2.9	0.1	4.1	0.3	6.6	1.7	3.4	0.2	7.8	3.9
10	ilmin_3V	mA	-5.0	5.0	-1.0	0.04	-1.0	0	-1.1	0.08	-1.1	0	-0.9	0.1	0	0	0	0	0	0
11	ilmin_3.3V	mA	-5.0	5.0	-1.0	0.04	-1.0	0	-1.1	0.08	-1.1	0	-0.9	0.1	0	0	0	0	0	0
12	ilmin_40V	mA	-5.0	5.0	-1.7	0.04	-1.7	0.04	-1.8	0.04	-1.9	0	-2.0	0	-2.0	0.1	-1.4	0.3	-1.9	0.2
13	ilmin_60V	mA	-7.0	7.0	-2.4	0.04	-2.4	0.04	-2.5	0.04	-2.6	0	-2.7	0.04	-2.7	0.04	-2.5	0.3	-2.8	0.1

Notes:

- 1/ The mean and standard deviation values were calculated over the four parts irradiated in this testing. The control samples remained constant throughout testing and are not included in this table.
- 2/ These are manufacturer's pre-irradiation data sheet specification limits. No post-irradiation limits were provided by the manufacturer at the time the tests were performed.

Radiation sensitive parameters: delta_I, vref, vline_a, vline_b.