

# Unisys

DATE: August 10, 1999  
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SUBJECT: Radiation Report on **OM20P10 (Omnirel) (LDC 9735)**  
PROJECT: HST/COS

PPM-99-025

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A radiation evaluation was performed on **OM20P10STV P-Channel MOSFET (Omnirel)** to determine the total dose tolerance of these parts. The total dose testing was performed using a  $\text{Co}^{60}$  gamma ray source. During the radiation testing, eight parts were irradiated under bias (see Figure 1 for bias configuration) and two parts were used as control samples. The total dose radiation levels were 2.5, 5.0, 10.0, and 20.0kRads.<sup>1</sup> The effective dose rate was 0.119kRads/hour (0.03 Rads/s). See Table II for the radiation schedule and effective dose rate calculation. After the 20.0kRad irradiation, the parts were annealed under bias at 25°C for 168 hours.<sup>2</sup> After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits<sup>3</sup> listed in Table III. An executive summary of the test results is provided below in bold, followed by a detailed summary of the test results after each radiation level and annealing step.

**All parts passed all tests up to 10kRads. After the 20kRad irradiation, all parts exceeded the specification limits for VGSth, VDS\_on and RDS\_on. After annealing the parts at 25°C for 168 hours, the parts showed no significant recovery in any radiation sensitive parameter. See Figures 2, 3 and 4 for more details.**

Initial electrical measurements were made on 10 samples. Eight samples (SN's 62, 63, 64, 65, 66, 67, 68, and 69) were used as radiation samples while SN's 60 and 61 were used as control samples. All parts passed all tests during initial electrical measurements.

All parts passed all tests up to 10.0kRads.

After the 20kRad irradiation, all parts exceeded the specification limit of 4.5V for VGSth with readings of greater than 41V. All parts exceeded the specification limit of 4.2V for VDS\_on with readings in the range of 5.8 to 7.9V. All parts exceed the specification limit of 0.2Ω for RDS\_on with readings in the range of 0.368 to 1.062Ω. **All parts passed all other tests.**

After annealing the parts for 168 hours at 25°C, the parts showed no significant recovery in any radiation sensitive parameter.

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 us at (301) 731-8954.

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<sup>1</sup> The term Rads, as used in this document, means Rads (silicon). All radiation levels cited are cumulative.

<sup>2</sup> The temperature 25°C as used in this document implies room temperature.

<sup>3</sup> These are manufacturer's pre-irradiation data specification limits. The manufacturer provided no post-irradiation limits at the time these tests were performed.

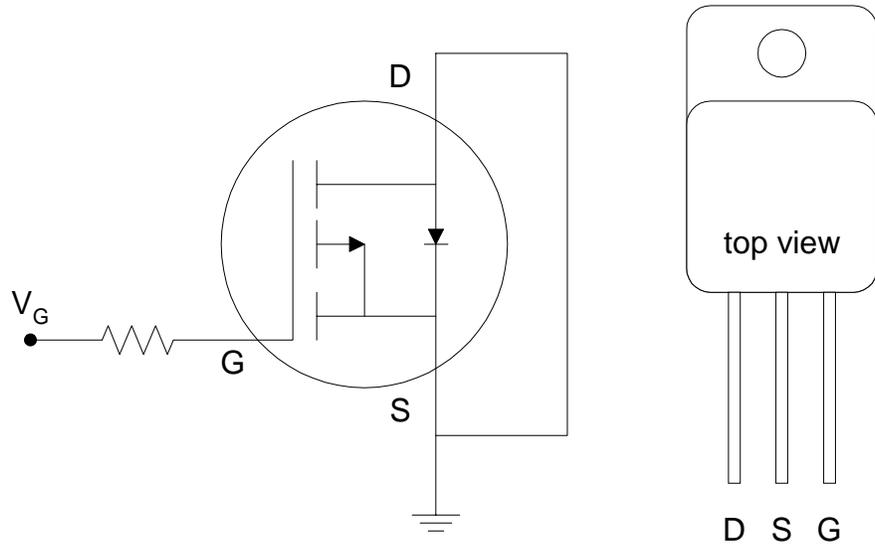
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Figure 1. Radiation Bias Circuit for OM20P10STV



Notes:

1.  $R = 10k\Omega \pm 5\%$ ,  $\frac{1}{4}W$ .
2.  $V_G = +16.0V \pm 0.5V$  DC.

TABLE I. Part Information

Generic Part Number:	OM20P10STV
HST/COS Part Number	OM20P10STV
HST/COS TID Requirement	10kRads (RDM = 5)
Charge Number:	M90429
Manufacturer:	Omnirel
Lot Date Code (LDC):	9735
Quantity Tested:	10
Serial Numbers of Control Samples:	60, 61
Serial Numbers of Radiation Samples:	62, 63, 64, 65, 66, 67, 68, 69
Part Function:	P-Channel MOSFET
Part Technology:	MOSFET
Package Style:	TO-254AA
Test Equipment:	Testronics
Test Engineer:	S. Norris

- The manufacturer for this part guaranteed no radiation tolerance/hardness.

TABLE II. Radiation Schedule for OM20P10STV

EVENT .....	DATE
1) INITIAL ELECTRICAL MEASUREMENTS .....	07/23/99
2) 2.5 KRAD IRRADIATION (0.147 KRADS/HOUR).....	07/26/99
POST-2.5 KRAD ELECTRICAL MEASUREMENT .....	07/27/99
3) 5.0 KRAD IRRADIATION (0.147 KRADS/HOUR).....	07/27/99
POST-5.0 KRAD ELECTRICAL MEASUREMENT .....	07/28/99
4) 10.0 KRAD IRRADIATION (0.294 KRADS/HOUR).....	07/28/99
POST-10.0 KRAD ELECTRICAL MEASUREMENT .....	07/30/99
5) 20.0 KRAD IRRADIATION (0.154 KRADS/HOUR).....	07/30/99
POST-20.0 KRAD ELECTRICAL MEASUREMENT .....	08/02/99
6) 168 HOUR ANNEALING @25°C.....	08/02/99
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	08/09/99

Effective Dose Rate = 20,000 RADS/7 DAYS=119.0 RADS/HOUR=0.033 RADS/SEC

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

Table III. Electrical Characteristics OM20P10STV (1)

Test #	Parameter	Units	Spec. Limit		Test Conditions
			min	max	
1	VBDSS	V	100		$V_{GS} = 0V, I_D = 250\mu A$
2	VGSt <sub>h</sub>	V	2.0	4.5	$V_{DS} = V_{GS}, I_D = 1.0mA$
3	IGSS	nA		100	$V_{GS} = \pm 20V$
4	IDSS	mA		0.01	$V_{DS} = \text{Max. Rating}, V_{GS} = 0V$
5	VDS on	V		4.2	$V_{GS} = 10V, I_D = 20A$
6	RDS on	$\Omega$		0.2	$V_{GS} = 10V, I_D = 10A$

Notes:

(1) These are the manufacturer's non-irradiated data sheet specification limits. The manufacturer provided no post-irradiation limits at the time the tests were performed.

**Figure 2: VGStH vs Total Ionizing Dose (kRads Si)**

