

Unisys

DATE: June 28, 1999 PPM-99-023
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SUBJECT: Radiation Report on **JANTXV2N7225 (Harris) (LDC 9827)**
PROJECT: HST/COS

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A radiation evaluation was performed on **JANTXV2N7225 N-Channel Transistor (Harris)** to determine the total dose tolerance of these parts. The total dose testing was performed using a Co⁶⁰ gamma ray source. During the radiation testing, five 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 2.5, 5.0, 10.0, 20.0, 30.0, and 50.0kRads.¹ The effective dose rate was 0.231kRads/hour (0.06 Rads/s). See Table II for the radiation schedule and effective dose rate calculation. After the 50.0kRad irradiation, the parts were annealed under bias at 25°C for 168 hours and 100°C for 168 hours.² After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits³ 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 20 to 50kRad irradiations, all parts showed significant degradation in VGStH. All parts passed all other tests. After annealing the parts at 25°C for 168 hours, the parts showed some recovery in VGStH, but remained below the specification limit. After annealing the parts at 100°C for 168 hours, the parts showed no rebound effects. See Figure 2 for more detail.

Initial electrical measurements were made on 6 samples. Five samples (SN's 5, 6, 7, 8, and 9) were used as radiation samples while SN 4 was used as a control sample. All parts passed all tests during initial electrical measurements.

All parts passed all tests up to 10.0kRads.

After the 20kRad irradiation, all parts fell below the specification limit of 2.000V for VGStH with readings in the range of 1.734 to 1.796V. **All parts passed all other tests.**

After the 30kRad irradiation, all parts fell below the specification limit of 2.000V for VGStH with readings in the range of 1.294 to 1.384V. **All parts passed all other tests.**

After the 50kRad irradiation, all parts fell below the specification limit of 2.000V for VGStH with readings in the range of 0.916 to 1.034V. **All parts passed all other tests.**

After annealing the parts for 168 hours at 25°C, the parts showed some recovery in VGStH.

After annealing the parts for 168 hours at 100°C, the parts showed no rebound effects.

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.

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

² The temperature 25°C as used in this document implies room temperature.

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

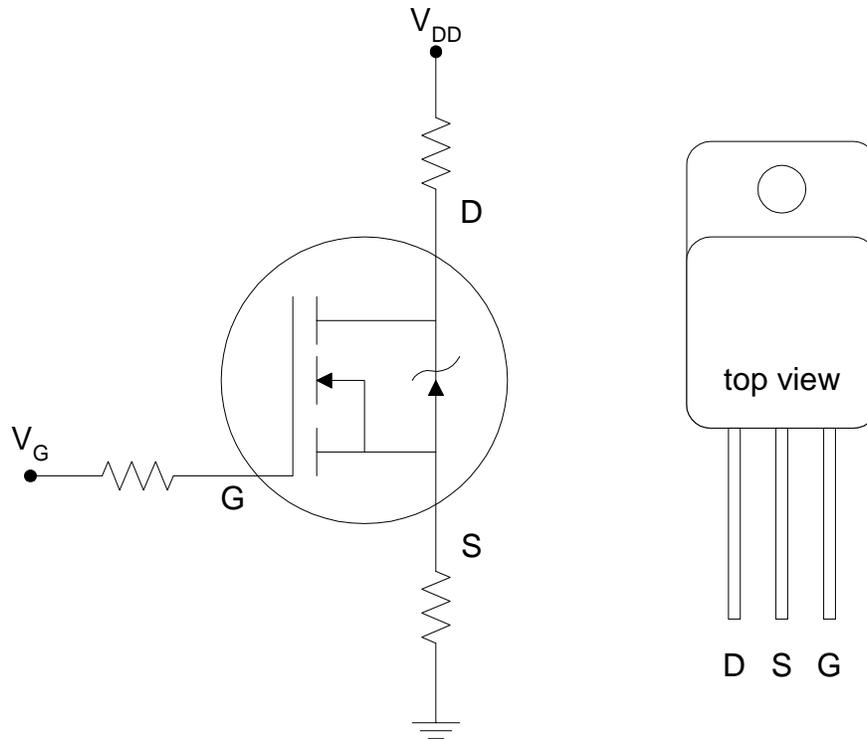
Any further details about this evaluation can be obtained upon request. If you have any questions, please call us at (301) 731-8954.

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Figure 1. Radiation Bias Circuit for JANTXV2N7225



Notes:

1. $R = 100\Omega \pm 5\%$, $\frac{1}{4}W$.
2. $V_{DD} = +20.0V \pm 0.5V$ DC.
3. $V_G = +10.0V \pm 0.5V$ DC.

TABLE I. Part Information

Generic Part Number:	JANTXV2N7225
HST/COS Part Number	JANTXV2N7225
HST/COS TID Requirement	10kRads (RDM \geq 2)
Charge Number:	M90420
Manufacturer:	Harris
Lot Date Code (LDC):	9827
Quantity Tested:	6
Serial Number of Control Samples:	4
Serial Numbers of Radiation Samples:	5, 6, 7, 8, 9
Part Function:	N-Channel Transistor
Part Technology:	MOSFET
Package Style:	TO-254AA
Test Equipment:	A540
Test Engineer:	S. Archer-Davies

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

TABLE II. Radiation Schedule for JANTXV2N7225

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	05/31/99
2) 2.5 KRAD IRRADIATION (0.147 KRADS/HOUR).....	06/01/99
POST-2.5 KRAD ELECTRICAL MEASUREMENT	06/02/99
3) 5.0 KRAD IRRADIATION (0.147 KRADS/HOUR).....	06/02/99
POST-5.0 KRAD ELECTRICAL MEASUREMENT	06/03/99
4) 10.0 KRAD IRRADIATION (0.294 KRADS/HOUR).....	06/03/99
POST-10.0 KRAD ELECTRICAL MEASUREMENT	06/04/99
5) 20.0 KRAD IRRADIATION (0.154 KRADS/HOUR).....	06/04/99
POST-20.0 KRAD ELECTRICAL MEASUREMENT	06/07/99
6) 30.0 KRAD IRRADIATION (0.588 KRADS/HOUR).....	06/07/99
POST-30.0 KRAD ELECTRICAL MEASUREMENT	06/08/99
7) 50.0 KRAD IRRADIATION (0.488 KRADS/HOUR).....	06/08/99
POST-50.0 KRAD ELECTRICAL MEASUREMENT	06/10/99
8) 168 HOUR ANNEALING @25°C.....	06/10/99
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	06/17/99
9) 168 HOUR ANNEALING @100°C.....	06/17/99
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT.....	06/24/99

Effective Dose Rate = 50,000 RADS/9 DAYS=231.5 RADS/HOUR=0.064 RADS/SEC

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

Table III. Electrical Characteristics JANTXV2N7225 (1)

Test #	Parameter	Units	Spec. Limit		Test Conditions
			min	max	
1	VBDSS	V	200		Pass/Fail, $V_{GS} = 0V$, $I_D = 1.0mA$
2	VGSt _h	V	2	4	$V_{DS} = V_{GS}$, $I_D = 250\mu A$
3	IGSS	nA		100	$V_{GS} = 20V$
4	IGSS _r	nA		100	$V_{GS} = -20V$
5	IDSS	μA		25	$V_{DS} = 0.8 \times \text{Max. Rating}$, $V_{GS} = 0V$

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)

