

Total Dose Test
Multiplexer ADG 506 AKN
Manufactured by Analog Devices

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1 Tested Devices

- 16-channel analog multiplexers, ADG 506 AKN from Analog Devices
- Temperature range: $-40^{\circ}\text{C} \dots +85^{\circ}\text{C}$
- Package: 28-lead plastic DIP (Suffix N)
- Package marks: ADG 506 AKN, 9613, 85744
- Analog Devices data sheet: Rev. C
- vH&S order 004489/COSIMA-We00, 21 February 2000

1.1 Device Marking

Six devices irradiated; two devices for reference.

Mark	Total Dose
0K/1	0 kRad H ₂ O (reference)
0K/2	0 kRad H ₂ O (reference)
5K/1	5 kRad H ₂ O
5K/2	5 kRad H ₂ O
10K/1	10 kRad H ₂ O
10K/2	10 kRad H ₂ O
22K/1	22 kRad H ₂ O
22K/2	22 kRad H ₂ O

2 Radiation Facility

Radiation Facility at ESTEC, Noordwijk, The Netherlands.

Date	2 March 2000	3 March 2000	2 March 2000
Total Dose	5 krad (H ₂ O)	10 krad (H ₂ O)	22 kRad (H ₂ O)
Log File	d:\data\vh-s5k.txt	d:\data\vh-s10k.txt	d:\data\vh-s15k.txt
Device	unbiased		
Project	vH&S		
Dosemeter	Farmer 2670		
Chamber	NE 0.6cc air ionisation type 2571 serial no. 2915		
Dose Rate	24 rad/min (H ₂ O)		
Test Eng.	Bob Nickson, QCA, ESTEC, Noordwijk		

All pins of all tested devices shorted during irradiation. No annealing was performed after irradiation.

3 Measured Device Parameters

- Currents I_{DD} and I_{SS} see section 4.
- R_{ON} at 0 V channel voltage see section 5.
- Threshold voltage $V_{INL} \leftrightarrow V_{INH}$ at EN input see section 6.
- Threshold voltage $V_{INL} \leftrightarrow V_{INH}$ at A0 input see section 7.

4 I_{DD}/I_{SS} Test

Measurements done at 8 March 2000, vH&S.

4.1 Test Setup

Pins 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28 connect to GND. Pin 1 (V_{DD}) connect through 1 k Ω current sense resistor to +15 V. Pin 27 (V_{SS}) connect through 100 k Ω current sense resistor to -15 V.

Voltage drop over current sense resistors measured with digital multimeter.

4.2 Test Results

Device	Total Dose	I_{DD}	I_{SS}
0K/1	0 kRad H ₂ O	0.575 mA	0.7 nA
0K/2	0 kRad H ₂ O	0.577 mA	0.5 nA
5K/1	5 kRad H ₂ O	0.577 mA	1.8 nA
5K/2	5 kRad H ₂ O	0.572 mA	1.8 nA
10K/1	10 kRad H ₂ O	0.578 mA	2.6 nA
10K/2	10 kRad H ₂ O	0.581 mA	1.0 nA
22K/1	22 kRad H ₂ O	0.572 mA	11.8 nA
22K/2	22 kRad H ₂ O	0.574 mA	11.2 nA

5 R_{ON} Test

Measurements done at 8 March 2000, vH&S.

5.1 Test Setup

Pins 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26 connect to GND. Pin 1 (V_{DD}) connect to +15 V. Pin 27 (V_{SS}) connect to -15 V. Pin 18 (EN) connect to +5 V.

Resistance R_{ON} between pin 28 (D) and pin 19 (S1, at GND) measured with digital multi-meter.

5.2 Test Results

Device	Total Dose	R_{ON}
0K/1	0 kRad H ₂ O	179.4 Ω
0K/2	0 kRad H ₂ O	180.7 Ω
5K/1	5 kRad H ₂ O	185.4 Ω
5K/2	5 kRad H ₂ O	186.2 Ω
10K/1	10 kRad H ₂ O	187.0 Ω
10K/2	10 kRad H ₂ O	188.2 Ω
22K/1	22 kRad H ₂ O	192.3 Ω
22K/2	22 kRad H ₂ O	191.3 Ω

6 V_{EN} Threshold Voltage Test

Measurements done at 13 March 2000, vH&S.

6.1 Test Setup

Pins 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26 connect to GND. Pin 1 (V_{DD}) connect to +15 V. Pin 27 (V_{SS}) connect to -15 V. Pin 18 (EN) connect to variable DC voltage source. Pin 28 (D) connect through 10 k Ω resistor to +15 V.

Pin 19 (S1) connect to base of NPN transistor, type BC 237. Base of transistor connect with 10 k Ω resistor to GND. Collector of transistor connect through 1 k Ω resistor and LED to +15 V.

LED shows conducting channel S1. Adjust variable DC voltage at EN pin to find LED on/off threshold. Measure voltage V_{EN} of source at EN pin.

6.2 Test Results

Device	Total Dose	V_{EN}
0K/1	0 kRad H ₂ O	1.43 V
0K/2	0 kRad H ₂ O	1.44 V
5K/1	5 kRad H ₂ O	1.23 V
5K/2	5 kRad H ₂ O	1.25 V
10K/1	10 kRad H ₂ O	1.07 V
10K/2	10 kRad H ₂ O	1.09 V
22K/1	22 kRad H ₂ O	0.87 V
22K/2	22 kRad H ₂ O	0.81 V

7 V_{A0} Threshold Voltage Test

Measurements done at 13 March 2000, vH&S.

7.1 Test Setup

Pins 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, 24, 25, 26 connect to GND. Pin 1 (V_{DD}) connect to +15 V. Pin 27 (V_{SS}) connect to -15 V. Pin 18 (EN) connect to +5 V. Pin 17 (A0) connect to variable DC voltage source. Pin 28 (D) connect through 10 k Ω resistor to +15 V. Two separate LED circuits:

- Pin 19 (S1) connect to base of first NPN transistor, type BC 237. Base of transistor connect with 10 k Ω resistor to GND. Collector of transistor connect through 1 k Ω resistor and first LED to +15 V.
- Pin 20 (S2) connect to base of second NPN transistor, type BC 237. Base of transistor connect with 10 k Ω resistor to GND. Collector of transistor connect through 1 k Ω resistor and second LED to +15 V.

LEDs show conducting channels S1 and S2. Adjust variable DC voltage at A0 pin to find takeover threshold. Measure voltage V_{A0} of source at A0 pin.

7.2 Test Results

Transition between channels S1 and S2 was always sharp.

Device	Total Dose	V_{A0}
0K/1	0 kRad H ₂ O	1.43 V
0K/2	0 kRad H ₂ O	1.43 V
5K/1	5 kRad H ₂ O	1.25 V
5K/2	5 kRad H ₂ O	1.25 V
10K/1	10 kRad H ₂ O	1.05 V
10K/2	10 kRad H ₂ O	1.08 V
22K/1	22 kRad H ₂ O	0.86 V
22K/2	22 kRad H ₂ O	0.81 V