Standard Products

MUX8531 16-Channel Analog Multiplexer Module
Radiation Tolerant & ESD Protected
Kelvin Measurement Configured

www.aeroflex.com/mux

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FEATURES

- ❑ 16 Kelvin measurement channels provided by two 16-channel multiplexers

- ❑ Radiation performance
  - Total dose: 150 krads(Si), Dose rate = 50 - 300 rads(Si)/s
  - SEU: Immune up to 90 MeV-cm^2/mg
  - SEL: Immune by process design

- ❑ Full military temperature range

- ❑ Low power consumption < 30mW

- ❑ One address bus (A0-3), and one enable line

- ❑ All channel inputs protected by ±20V nominal Transorbs

- ❑ Fast access time < 500ns typical

- ❑ Break-Before-Make switching

- ❑ High analog input impedance (power on or off)

- ❑ Designed for aerospace and high reliability space applications

- ❑ Packaging – Hermetic ceramic
  - 56 leads, 0.80"Sq x 0.20"Ht quad flat pack
 - Typical Weight 6 grams

GENERAL DESCRIPTION

Aeroflex's MUX8531 is a radiation tolerant, 16 Kelvin measurement channel multiplexer MCM (Multi Chip Module) with electrostatic discharge (ESD) protection on all channel inputs.

The MUX8531 has been specifically designed to meet exposure to radiation environments. It is available in a 56 lead High Temperature Co-Fired Ceramic (HTCC) Quad Flatpack (CQFP). It is guaranteed operational from -55°C to +125°C. Available screened in accordance with MIL-PRF-38534, the MUX8531 is ideal for demanding military and space applications.

ORGANIZATION AND APPLICATION

The MUX8531 consists of two 16 channel multiplexers arranged as shown in the block diagram, addressable by bus $A_0 \sim A_3$ including enable which connects the addressed channel to two separate outputs, "Output" and "Current". This technique enables selecting and reading a remote resistive sensor without the MUX resistance being part of the measurement. For grounded sensors, this is done by passing current to the sensor by means of the "Current" pin and reading the resultant voltage (proportional to the sensor resistance) at the "Output" pin.
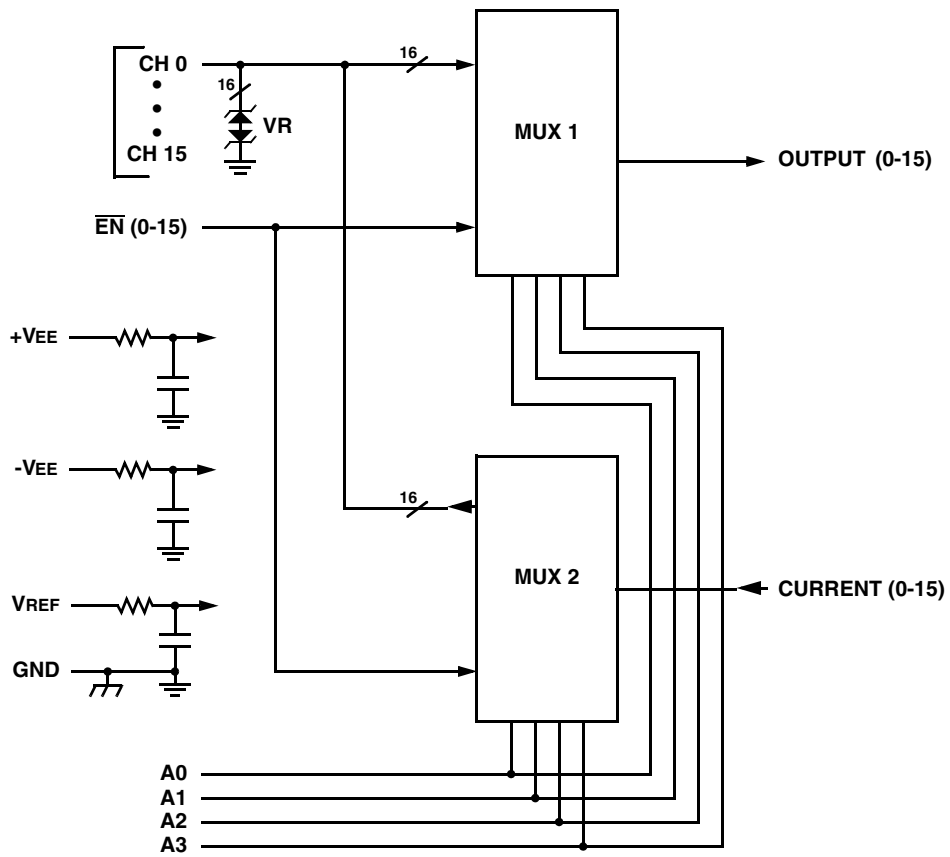
**MUX8531: 16 CHANNEL ANALOG MUX BLOCK DIAGRAM
KELVIN MEASUREMENT CONFIGURED**

ABSOLUTE MAXIMUM RATINGS 1/

Parameter	Range	Units
Case Operating Temperature Range	-55 to +125	°C
Storage Temperature Range	-65 to +150	°C
Supply Voltage +V$_{EE}$ (Pin 18) -V$_{EE}$ (Pin 46) V$_{REF}$ (Pin 39)	+20 -20 +7.5	V V V
Digital Input Overvoltage V$_{EN}$ (Pin 13), V$_A$ (Pins 14, 15, 16, 17)	< V$_{REF}$ +.5 > GND -.5	V V
Analog Input Over Voltage V$_{IN}$	±18V	V

Notes:
1/ All measurements are made with respect to ground.

NOTICE: Stresses above those listed under "Absolute Maximums Rating" may cause permanent damage to the device. These are stress rating only; functional operation beyond the "Operation Conditions" is not recommended and extended exposure beyond the "Operation Conditions" may affect device reliability.

RECOMMENDED OPERATING CONDITIONS 1/

Symbol	Parameter	Typical	Units
+V$_{EE}$	+15V Power Supply Voltage	+15.0	V
-V$_{EE}$	-15V Power Supply Voltage	-15.0	V
V$_{REF}$	Reference Voltage	+5.00	V
V$_{AL}$	Logic Low Level	+0.8	V
V$_{AH}$	Logic High Level	+4.0	V

1/ Power Supply turn-on sequence shall be as follows: -V$_{EE}$, V$_{REF}$, followed by +V$_{EE}$.

DC ELECTRICAL PERFORMANCE CHARACTERISTICS 1/
(T$_C$ = -55°C TO +125°C, -V$_{EE}$ = -15V, V$_{REF}$ = +5.0V, +V$_{EE}$ = +15V - UNLESS OTHERWISE SPECIFIED)

Parameter	Symbol	Conditions	Min	Max	Units
Supply Current	+I$_{EE}$	V$_{EN}$(0-15) = V$_A$(0-3) = 0	0	1	mA
	-I$_{EE}$	V$_{EN}$(0-15) = V$_A$(0-3) = 0	-1	0	mA
	+I$_{SBY}$	V$_{EN}$(0-15) = 4V, V$_A$(0-3) = 0 7/	0	1	mA
	-I$_{SBY}$	V$_{EN}$(0-15) = 4V, V$_A$(0-3) = 0 7/	-1	0	mA
Address Input Current	I$_{AL(0-3)A}$	V$_A$ = 0V	-2	2	μA
	I$_{AH(0-3)A}$	V$_A$ = 5V	-2	2	μA
Enable Input Current	I$_{ENL(0-15)}$	V$_{EN}$(0-15) = 0V	-2	2	μA
	I$_{ENH(0-15)}$	V$_{EN}$(0-15) = 5V	-2	2	μA

Parameter	Symbol	Conditions		Min	Max	Units
Positive Input Leakage Current (CH0-CH15)	+$I_{SOFFOUTPUT(ALL)}$	V_{IN} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 2/, 3/		-100	+1000	nA
Negative Input Leakage Current (CH0-CH15)	-$I_{SOFFOUTPUT(ALL)}$	V_{IN} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 2/, 3/		-100	+1000	nA
Positive Output Leakage Current OUTPUTS (pins 12,45)	+$I_{DOFFOUTPUT(ALL)}$	V_{OUT} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 3/, 4/		-100	+100	nA
Negative Output Leakage Current OUTPUTS (pins 12,45)	-$I_{DOFFOUTPUT(ALL)}$	V_{OUT} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 3/, 4/		-100	+100	nA
Input Clamped Voltage (CH0-CH15)	+V_{CLMP}	V_{EN} = 4V, all unused MUX inputs under test are open. 3/	+25°C +125°C -55°C	18.0 18.0 17.5	23.0 23.5 22.5	V V V
Input Clamped Voltage (CH0-CH15)	-V_{CLMP}		+25°C +125°C -55°C	-23.0 -23.5 -22.5	-18.0 -18.0 -17.5	V V V
Switch ON Resistance OUTPUTS (pins 12,45) 6/	$R_{DS(ON)(0-15)_A}$	V_{IN} = +15V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		200	1000	Ω
	$R_{DS(ON)(0-15)_B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/		200	1500	Ω
	$R_{DS(ON)(0-15)_C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/		200	2500	Ω

Notes:

1/ Measure inputs sequentially. Ground all unused inputs of the device under test. V_A is the applied input voltage to the address lines A(0-3).

2/ V_{IN} is the applied input voltage to the input channels (CH0-CH15).

3/ V_{EN} is the applied input voltage to the enable line EN (0-15).

4/ V_{OUT} is the applied input voltage to the output lines OUTPUT (0-15), CURRENT (0-15)

5/ Negative current is the current flowing out of each of the MUX pins. Positive current is the current flowing into each MUX pin.

6/ The MUX8531 cannot be operated with analog inputs from -15 to -5 volts.

7/ Not tested, guaranteed to the specified limits.
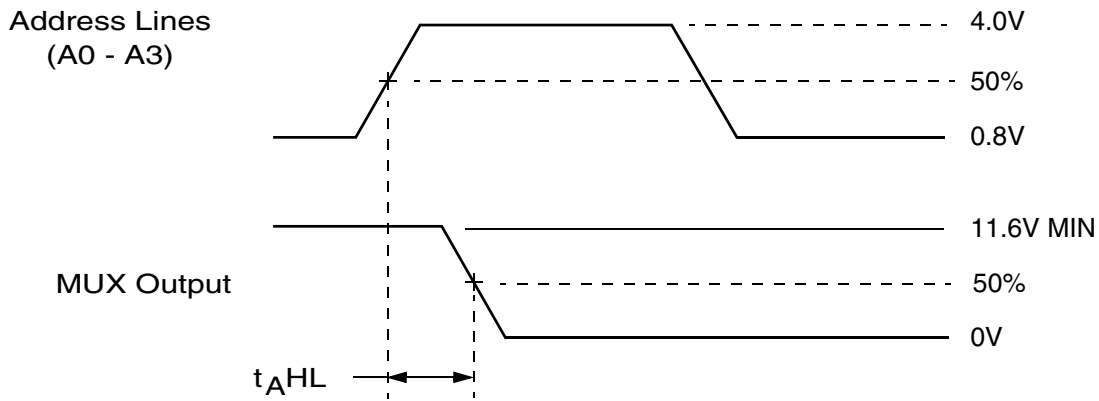
SWITCHING CHARACTERISTICS
(Tc = -55°C TO +125°C, -Vee = -15V, Vref = +5.0V, +Vee = +15V -- UNLESS OTHERWISE SPECIFIED)

Parameter	Symbol	Conditions	Min	Max	Units
Switching Test MUX	$t_A HL$	R_L = 10KΩ, C_L = 50pF	10	1000	ns
	$t_A LH$		10	1000	ns
	$t_{ON} EN$	R_L = 1KΩ, C_L = 50pF	10	1000	ns
	$t_{OFF} EN$		10	1000	ns

TRUTH TABLE (CH0–CH15)

A3	A2	A1	A0	$\overline{EN}$ (0-15)	"ON" CHANNEL 1/
X	X	X	X	H	NONE
L	L	L	L	L	CH0
L	L	L	H	L	CH1
L	L	H	L	L	CH2
L	L	H	H	L	CH3
L	H	L	L	L	CH4
L	H	L	H	L	CH5
L	H	H	L	L	CH6
L	H	H	H	L	CH7
H	L	L	L	L	CH8
H	L	L	H	L	CH9
H	L	H	L	L	CH10
H	L	H	H	L	CH11
H	H	L	L	L	CH12
H	H	L	H	L	CH13
H	H	H	L	L	CH14
H	H	H	H	L	CH15

1/ Between (CH0-CH15) and OUTPUT (0-15), CURRENT (0-15)

Address Lines
(A0 - A3)

4.0V

50%

0.8V

MUX Output

11.6V MIN

50%

0V

t_AHL

Definition of t_AHL

Address Lines
(A0 - A3)

4.0V

50%

0.8V

MUX Output

11.6V MIN

50%

0V

t_ALH

Definition of t_ALH

$\overline{EN}$ Lines

4.0V

50%

0.8V

MUX Output

~3V to 12.5V

50%

0V
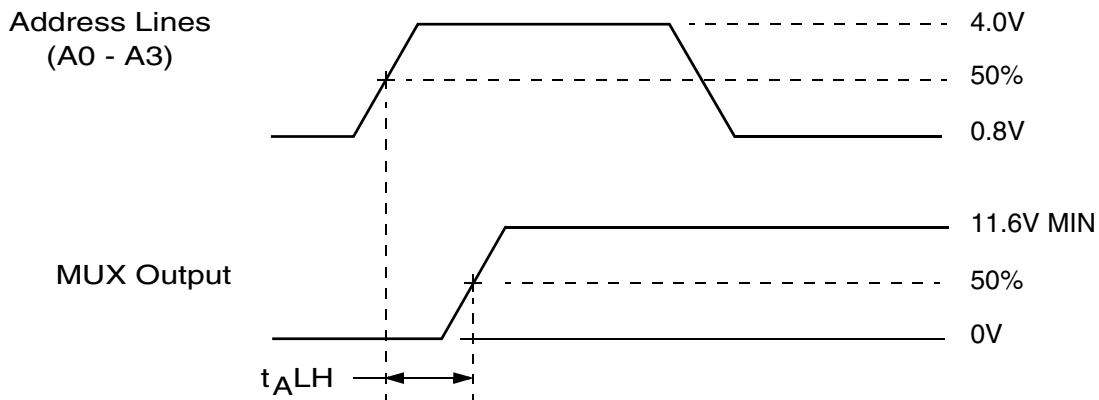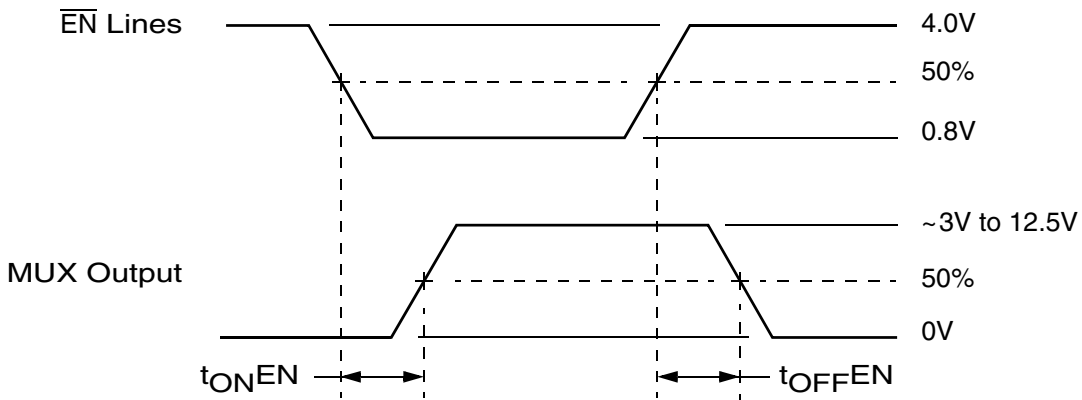
$t_{ON}EN$ $t_{OFF}EN$

Definition of $t_{ON}EN$ and $t_{OFF}EN$

NOTE: f = 10KHz, Duty cycle = 50%.

MUX8531 SWITCHING DIAGRAMS

PIN NUMBERS & FUNCTIONS

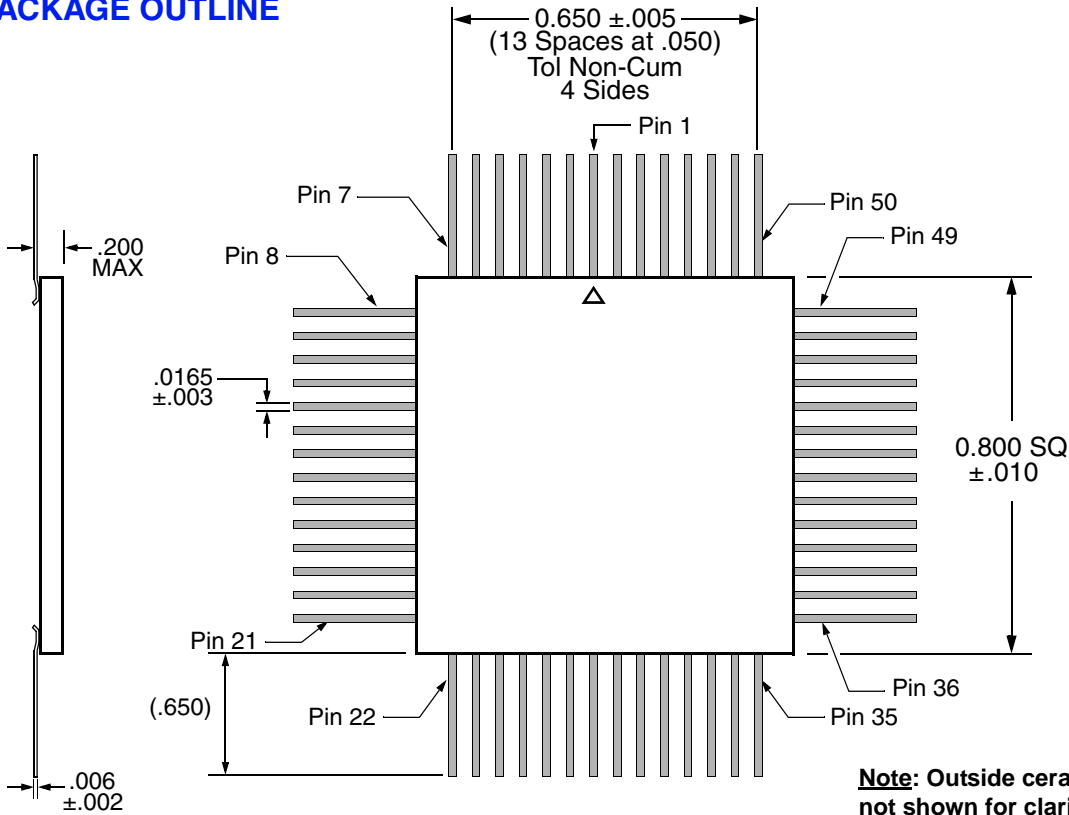| MUX8531 – 56 Leads Ceramic QUAD Flat Pack			
Pin #	Function	Pin #	Function
1	CH0	29	NC
2	CH1	30	NC
3	CH2	31	NC
4	CH3	32	NC
5	CH4	33	NC
6	CH5	34	NC
7	GND	35	GND
8	GND	36	GND
9	CH6	37	NC
10	CH7	38	NC
11	CASE GND	39	V_{REF}
12	OUTPUT (0-15)	40	NC
13	$\overline{EN}$ (0-15)	41	NC
14	A0	42	NC
15	A1	43	NC
16	A2	44	NC
17	A3	45	CURRENT (0-15)
18	$+V_{EE}$	46	$-V_{EE}$
19	CH15	47	NC
20	CH14	48	NC
21	GND	49	GND
22	GND	50	GND
23	CH13	51	NC
24	CH12	52	NC
25	CH11	53	NC
26	CH10	54	NC
27	CH9	55	NC
28	CH8	56	NC

Notes:
 1. It is recommended that all "NC" or "no connect pin", be grounded. This eliminates or minimizes any ESD or static buildup.
 2. Package lid is internally connected to circuit ground (Pins 7, 8, 11, 21, 22, 35, 36, 49, 50).

ORDERING INFORMATION

Model	DSCC SMD #	Screening	Package
MUX8531-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
MUX8531-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 fro Space Applications	
MUX8531-201-1S	5962-0923002KXC	In accordance with DSCC SMD	

PACKAGE OUTLINE

0.650 ±.005
(13 Spaces at .050)
Tol Non-Cum
4 Sides

Pin 1

Pin 7

Pin 50

Pin 49

Pin 8

.200 MAX

.0165 ±.003

0.800 SQ ±.010

Pin 21

Pin 36

(.650)

Pin 22

Pin 35

.006 ±.002

Note: Outside ceramic tie bars not shown for clarity. Contact factory for details.

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