MUX8522 Dual 16-Channel Analog Multiplexer Module Radiation Tolerant

www.aeroflex.com/mux

October 9, 2013

FEATURES

- ❑ 32-channels provided by two independent 16-channel multiplexers

- ❑ Radiation performance
    - Total dose: 300 krads(Si), Dose rate = 50 - 300 rads(Si)/s
    - SEU: Immune up to 120 MeV-cm^2/mg
    - SEL: Immune by process design

- ❑ Full military temperature range

- ❑ Low power consumption < 30mW

- ❑ Separate address (A$_0$~A$_3$ & B$_0$~B$_3$) and enable ($\overline{EN}$0-15 & $\overline{EN}$16-31) for CH0-15 and CH16-31

- ❑ Fast access time 1500ns 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

- ❑ **Aeroflex Plainview's Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.**

GENERAL DESCRIPTION

Aeroflex's MUX8522 is a radiation tolerant, dual 16 channel multiplexer MCM (Multi Chip Module).

The MUX8522 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 MUX8522 is ideal for demanding military and space applications.

ORGANIZATION AND APPLICATION

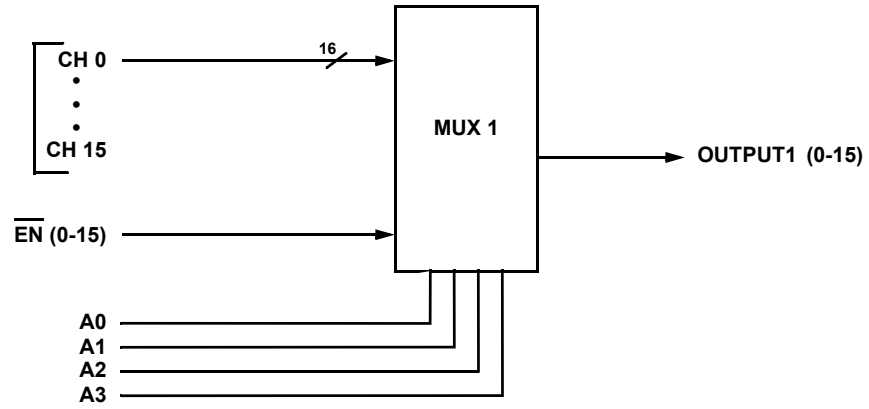The MUX8522 consists of two independent 16 channel multiplexers arranged as shown in the block diagram.

A Section

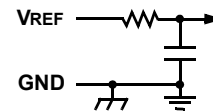Sixteen (16) channels addressable by bus A$_0$~A$_3$, enabled by $\overline{EN}$0-15 and outputted on Output1 (0-15).
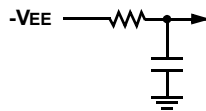
B Section

Sixteen (16) channels addressable by bus B$_0$~B$_3$, enabled by $\overline{EN}$16-31 and outputted on Output2 (16-31).
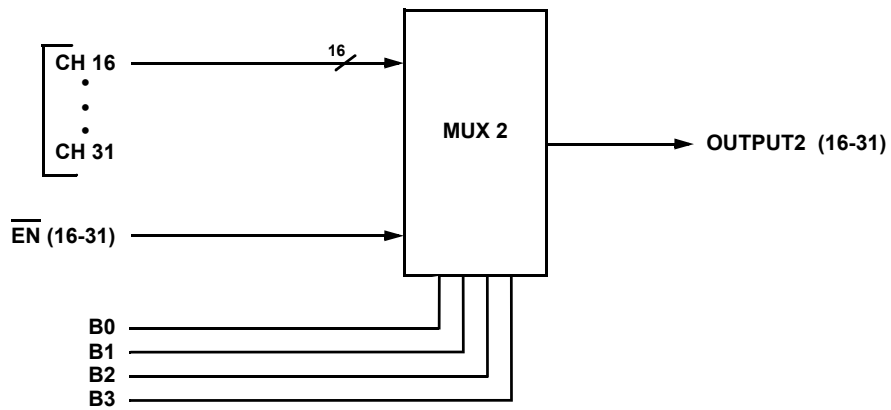
SECTION A

CH 0
•
•
•
CH 15

$\overline{EN}$ (0-15)

A0
A1
A2
A3

16

MUX 1

OUTPUT1 (0-15)

SECTION B

CH 16
•
•
•
CH 31

$\overline{EN}$ (16-31)

B0
B1
B2
B3

16

MUX 2

OUTPUT2 (16-31)

+V$_{EE}$

-V$_{EE}$

V$_{REF}$

GND
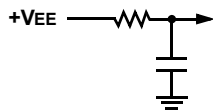
MUX8522: DUAL 16 CHANNEL ANALOG MUX BLOCK DIAGRAM

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)	+16.5 -16.5 +16.5	V V V
Digital Input Overvoltage V_{EN}0-15 (Pin 13), V_{EN}16-31 (Pin 44), V_A (Pins 14, 15, 16, 17), V_B (Pins 40, 41, 42, 43)	< V_{REF} +4 > GND -4	V V
Analog Input Over Voltage V_{IN}	±35V	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_{EE}, followed by V_{REF}.

DC ELECTRICAL PERFORMANCE CHARACTERISTICS [1]
(T_C = -55°C TO +125°C, +V_{EE} = +15V, -V_{EE} = -15V, V_{REF} = +5.0V - UNLESS OTHERWISE SPECIFIED)

Parameter	Symbol	Conditions	Min	Max	Units
Supply Current	+I_{EE}	V_{EN}(0-15) = V_{EN}(16-31) = V_A(0-3) = V_B(0-3) = 0	0.1	1	mA
	-I_{EE}	V_{EN}(0-15) = V_{EN}(16-31) = V_A(0-3) = V_B(0-3) = 0	-1	-0.1	mA
	+I_{SBY}	V_{EN}(0-15) = V_{EN}(16-31) = 4V, V_A(0-3) = V_B(0-3) = 0 [6]	0.1	1	mA
	-I_{SBY}	V_{EN}(0-15) = V_{EN}(16-31) = 4V, V_A(0-3) = V_B(0-3) = 0 [6]	-1	-0.1	mA
Address Input Current [7]	I_{AL}(0-3)A	V_A = 0V	-1	1	µA
	I_{AH}(0-3)A	V_A = 5V	-1	1	µA
	I_{AL}(0-3)B	V_B = 0V	-1	1	µA
	I_{AH}(0-3)B	V_B = 5V	-1	1	µA
Enable Input Current [7]	I_{ENL}(0-15)	V_{EN}(0-15) = 0V	-1	1	µA
	I_{ENH}(0-15)	V_{EN}(0-15) = 5V	-1	1	µA
	I_{ENL}(16-31)	V_{EN}(16-31) = 0V	-1	1	µA
	I_{ENH}(16-31)	V_{EN}(16-31) = 5V	-1	1	µA

DC ELECTRICAL PERFORMANCE CHARACTERISTICS 1/ (continued)

(Tc = -55°C TO +125°C, +VEE = +15V, -VEE = -15V, VREF = +5.0V - UNLESS OTHERWISE SPECIFIED)

Parameter	Symbol	Conditions	Min	Max	Units
Positive Input Leakage Current (CH0-CH31)	+$I_{SOFFOUTPUT(ALL)}$	V_{IN} = +10V, V_{EN} = 4V, output and all unused MUX inputs under test = -10V 2/, 3/, 7/	-100	+100	nA
Negative Input Leakage Current (CH0-CH31)	-$I_{SOFFOUTPUT(ALL)}$	V_{IN} = -10V, V_{EN} = 4V, output and all unused MUX inputs under test = +10V 2/, 3/, 7/	-100	+100	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/, 7/	-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/, 7/	-100	+100	nA
Switch ON Resistance OUTPUTS (pins 12,45)	$R_{DS(ON)(0-31)A}$	V_{IN} = +15V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/	500	3000	Ω
	$R_{DS(ON)(0-31)B}$	V_{IN} = +5V, V_{EN} = 0.8V, I_{OUT} = -1mA 2/, 3/, 5/	500	3000	Ω
	$R_{DS(ON)(0-31)C}$	V_{IN} = -5V, V_{EN} = 0.8V, I_{OUT} = +1mA 2/, 3/, 5/	500	3000	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). V_B is the applied input voltage to the address lines B(0-3).

2/ V_{IN} is the applied input voltage to the input channels (CH0-CH31).

3/ V_{EN} 0-15 is the applied input voltage to the enable line $\overline{EN}$ (0-15). V_{EN} 16-31 is the applied input voltage to the enable line $\overline{EN}$ (16-31)

4/ V_{OUT} is the applied input voltage to the output lines OUTPUT1 (0-15), OUTPUT2 (16-31)

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/ Not tested, guaranteed to the specified limits.

7/ These parameters for Tc = -55°C are guaranteed by design, characterization, or correlation to other test parameters.

SWITCHING CHARACTERISTICS

(Tc = -55°C TO +125°C, +VEE = +15V, -VEE = -15V, VREF = +5.0V -- UNLESS OTHERWISE SPECIFIED)

Parameter	Symbol	Conditions	Min	Max	Units
Switching Test MUX	$t_A HL$	R_L = 10KΩ, C_L = 50pF	10	1500	ns
	$t_A LH$	R_L = 10KΩ, C_L = 50pF Tc = +25°C, +125°C Tc = -55°C	10 10	2000 5000	ns ns
	$t_{ON}EN$	R_L = 1KΩ, C_L = 50pF	10	1500	ns
	$t_{OFF}EN$		10	1000	ns

TRUTH TABLE (CH0–CH15)

A3	A2	A1	A0	$\overline{EN}$ (0-15)	"ON" CHANNEL, 1/ (OUTPUT 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 OUTPUT1 (0-15)

TRUTH TABLE (CH16–CH31)

B3	B2	B1	B0	$\overline{EN}$ (16-31)	"ON" CHANNEL, 1/ (OUTPUT 2)
X	X	X	X	H	NONE
L	L	L	L	L	CH16
L	L	L	H	L	CH17
L	L	H	L	L	CH18
L	L	H	H	L	CH19
L	H	L	L	L	CH20
L	H	L	H	L	CH21
L	H	H	L	L	CH22
L	H	H	H	L	CH23
H	L	L	L	L	CH24
H	L	L	H	L	CH25
H	L	H	L	L	CH26
H	L	H	H	L	CH27
H	H	L	L	L	CH28
H	H	L	H	L	CH29
H	H	H	L	L	CH30
H	H	H	H	L	CH31

1/ Between (CH16-CH31) and OUTPUT2 (16-31)

Address Lines
(A0 - A3 / B0 - B3)

4.0V

50%

0.8V

11.6V MIN

MUX Output

50%

0V

$t_A HL$

Definition of $t_A HL$

Address Lines
(A0 - A3 / B0 - B3)

4.0V

50%

0.8V

11.6V MIN

MUX Output

50%

0V

$t_A LH$

Definition of $t_A LH$

$\overline{EN}$ Lines

4.0V

50%

0.8V

~3V to 10.0V

MUX Output

50%

0V

$t_{ON}EN$

$t_{OFF}EN$

Definition of $t_{ON}EN$ and $t_{OFF}EN$
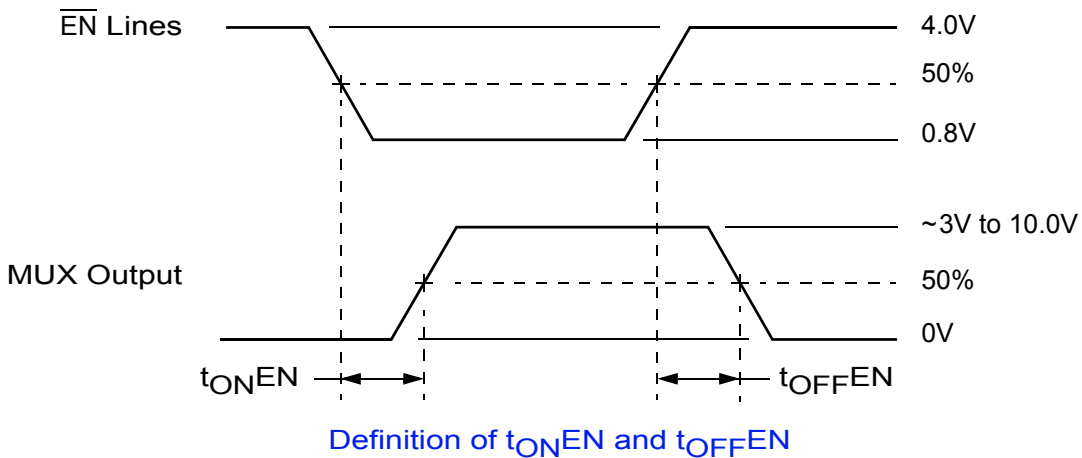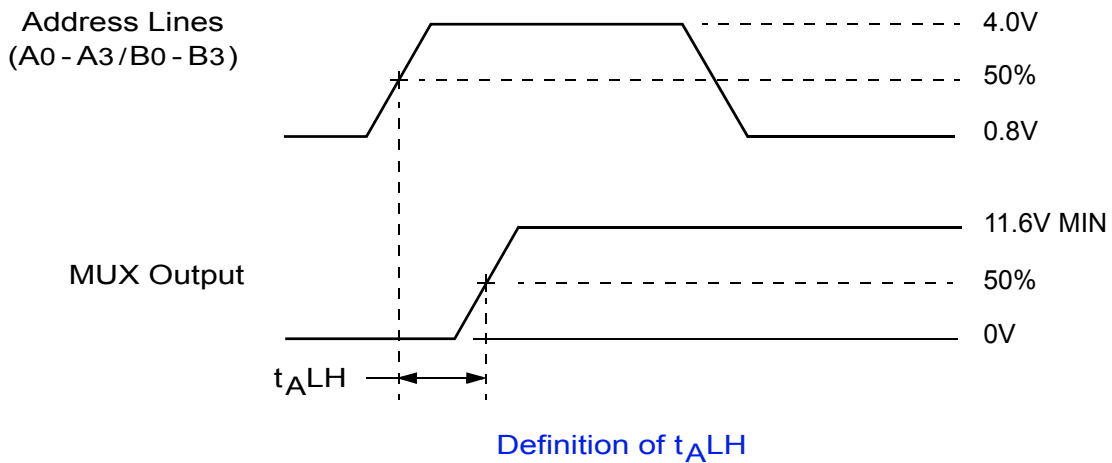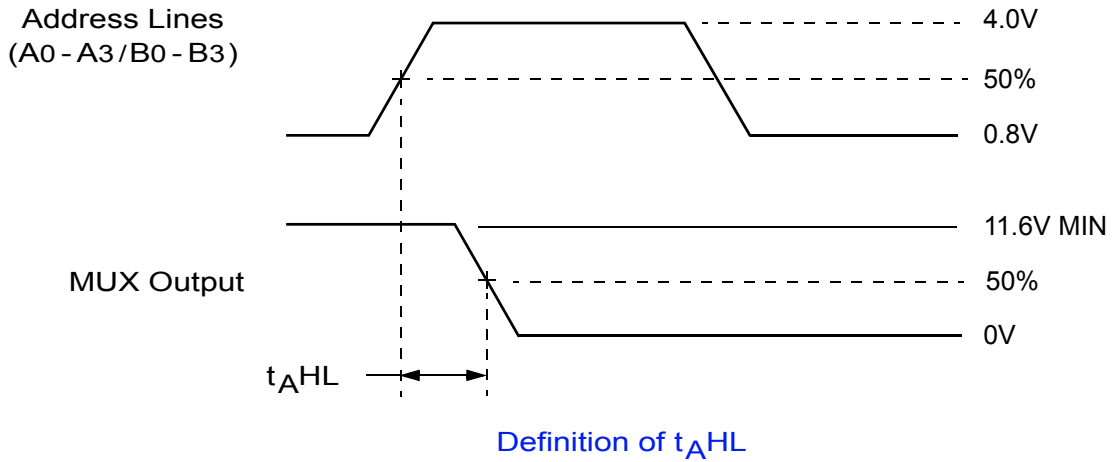
NOTE: f = 10KHz, Duty cycle = 50%.

MUX8522 SWITCHING DIAGRAMS

PIN NUMBERS & FUNCTIONS

MUX8522 – 56 Leads Ceramic QUAD Flat Pack			
Pin #	**Function**	**Pin #**	**Function**
1	CH0	29	CH31
2	CH1	30	CH30
3	CH2	31	CH29
4	CH3	32	CH28
5	CH4	33	CH27
6	CH5	34	CH26
7	GND	35	GND
8	GND	36	GND
9	CH6	37	CH25
10	CH7	38	CH24
11	CASE GND	39	V_{REF}
12	OUTPUT1 (0-15)	40	B3
13	$\overline{EN}$ (0-15)	41	B2
14	A0	42	B1
15	A1	43	B0
16	A2	44	$\overline{EN}$ (16-31)
17	A3	45	OUTPUT2 (16-31)
18	+V_{EE}	46	-V_{EE}
19	CH15	47	CH16
20	CH14	48	CH17
21	GND	49	GND
22	GND	50	GND
23	CH13	51	CH18
24	CH12	52	CH19
25	CH11	53	CH20
26	CH10	54	CH21
27	CH9	55	CH22
28	CH8	56	CH23

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	DLA SMD #	Screening	Package
MUX8522-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
MUX8522-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
MUX8522-201-1S	5962-0923101KXC	In accordance with DLA SMD	
MUX8522-901-1S	5962F0923101KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "F", 300krads(Si)	

PACKAGE OUTLINE

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

Pin 1

Pin 7

Pin 8

Pin 50

Pin 49

.200 MAX

.0165 ±.003

0.800 SQ ±.010

Pin 21

Pin 22

Pin 35

Pin 36

(.650)

.006 ±.002

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

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused