Standard Products *Preliminary*

RadHard-by-Design
RHD8543 48-Channel Analog Multiplexer

www.aeroflex.com/RHDseries

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FEATURES

- 48 Channels provided by three 16-channel multiplexers
- Single power supply operation at +3.3V to +5V
- Radiation performance
  - Total dose: >1Mrad(Si), Dose rate = 50 - 300 rads(Si)/s
  - ELDRS Immune
  - SEL Immune: >100 MeV-cm^2/mg
  - Neutron Displacement Damage: >10^{14} neutrons/cm^2
- Full military temperature range
- Low power consumption < 0.15mW
- CMOS analog switching allows rail to rail operation and low switch impedance
- Address Bus A(0-3), and three enable lines afford flexible organization
- Designed for aerospace and high reliability space applications
- Packaging – Hermetic ceramic
  - 96 Leads, 1.320"Sq x 0.200"Ht quad flat pack
  - Weight - 15 grams max
- **Aeroflex Plainview's Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.**

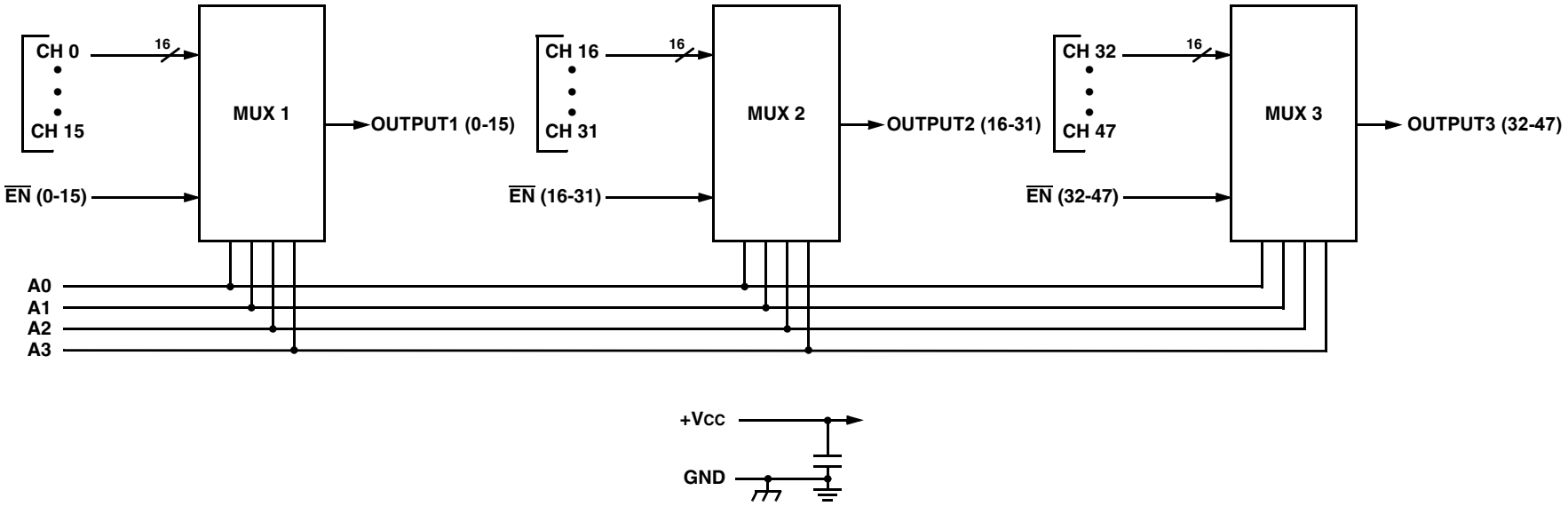
GENERAL DESCRIPTION

Aeroflex's RHD8543 is a radiation hardened, single supply, 48-Channel Multiplexer MCM (multi-chip module). The RHD8543 design uses specific circuit topology and layout methods to mitigate total ionization dose effects and single event latchup. These characteristics make the RHD8543 especially suited for the harsh environment encountered in Deep Space missions. It is available in a 96 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 Class K, the RHD8543 is ideal for demanding military and space applications.

ORGANIZATION AND APPLICATION

The RHD8543 consists of three, single supply, 16-Channel Multiplexers arranged as shown in the Block Diagram. The Address Bus and three Enable lines provide for 48 channels addressable by bus A(0-3), in three 16-channel blocks, each block enabled separately. Each block connects the addressed channel to one output. The RHD8543 design is inherently radiation tolerant.

The device will not latch with SEU events to above 100MeV-cm^2/mg. Total dose degradation is minimal to above 1Mrad(Si). Displacement damage environments to neutron fluence equivalents in the mid 10^{14} neutrons per cm^2 range are readily tolerated. There is no sensitivity to low-dose rate (ELDRS) effects. SEU effects are application dependant.



RHD8543 48 – CHANNEL ANALOG MUX BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS 1/

Parameter	Range	Units
Case Operating Temperature Range	-55 to +125	°C
Storage Temperature Range	-55 to +150	°C
Supply Voltage +VCC (Pin 44)	+3.0 to +6.0	V
Digital Input Overvoltage VEN (Pins 5, 91, 92), VA (Pins 1, 3, 93, 95)	< VCC +0.4 > GND -0.4	V V
Analog Input Over Voltage VIN (CH0-CH47)	< VCC +0.4 > GND -0.4	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 effect device reliability.

RECOMMENDED OPERATING CONDITIONS 1/

Symbol	Parameter	Typical	Units
+VCC	Power Supply Voltage	3.3 to 5.0	V
VEN, VAL	Logic Low Level	30% VCC	V
VEN, VAH	Logic High Level	70% VCC	V

DC ELECTRICAL PERFORMANCE CHARACTERISTICS 1/

(Tc = -55°C to +125°C, +VCC = +5V - Unless otherwise specified)

Parameter	Symbol	Conditions	Min	Max	Units
Supply Current +VCC	+ICC	$\overline{EN}$ = 30% VCC	0	30	µA
	+ISBY	$\overline{EN}$ = 70% VCC	0	30	µA
Address Input Current A(0-3)	IAL(0-3)	VA = 30% VCC	-150	150	nA
	IAH(0-3)	VA = 70% VCC	-150	150	nA
Enable Input Current $\overline{EN}$	IENL(0-15)	VEN(0-15) = 30% VCC	-50	50	nA
	IENH(0-15)	VEN(0-15) = 70% VCC	-50	50	nA
	IENL(16-31)	VEN(16-31) = 30% VCC	-50	50	nA
	IENH(16-31)	VEN(16-31) = 70% VCC	-50	50	nA
	IENL(32-47)	VEN(32-47) = 30% VCC	-50	50	nA
	IENH(32-47)	VEN(32-47) = 70% VCC	-50	50	nA

DC ELECTRICAL PERFORMANCE CHARACTERISTICS 1/ (con't)

(Tc = -55°C to +125°C, +VCC = +5V - Unless otherwise specified)

Parameter	Symbol	Conditions		Min	Max	Units
High Input Leakage Current (CH0-CH47)	I_{INLK_5}	V_{IN} = +5V, V_{EN} =70% V_{CC}, Output and all unused MUX inputs under test = 0V		-50	50	nA
Low Input Leakage Current (CH0-CH47)	I_{INLK_0}	V_{IN} = 0V, V_{EN} =70% V_{CC}, Output and all unused MUX inputs under test = +5V		-50	50	nA
Output Leakage Current V_{OUT} (pins 25, 68 & 70)	I_{OUTLK}	V_{OUT} = +5V, V_{EN} = 70% V_{CC}, All inputs grounded except channel being tested. 3/, 4/		-50	50	nA
Switch ON Resistance OUTPUTS (pins 25, 68 & 70) 6/	$R_{DS(ON)}$	V_{IN} = 0V, V_{IN} = +2.5V, V_{IN} = +5V V_{EN} = 30% V_{CC} I_{OUT} = -1mA 2/, 3/, 5/	-55°C	-	500	Ω
			+25°C	-	750	Ω
			+125°C	-	1000	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-CH47.

3/ V_{EN} is the applied input voltage to the enable lines $\overline{EN}$ (0-15), $\overline{EN}$ (16-31) and $\overline{EN}$ (32-47).

4/ V_{OUT} is the applied input voltage to the output lines OUTPUT1(0-15), OUTPUT2(16-31) and OUTPUT3(32-47).

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 RHD8543 cannot be operated with analog inputs below 0 volts.

7/ Not tested, guaranteed to the specified limits.

SWITCHING CHARACTERISTICS

(Tc = -55°C to +125°C, +VCC = +5V - Unless otherwise specified)

Parameter	Symbol	Conditions		Min	Max	Units
Address to Output Delay	t_AHL	V_{OUT} High to Low Transition	-55°C	10	150	ns
			+25°C	10	150	ns
			+125°C	10	200	ns
	t_ALH	V_{OUT} Low to High Transition	-55°C	10	150	ns
			+25°C	10	150	ns
			+125°C	10	200	ns
Enable to Output Delay	$t_{ON}EN$	V_{EN} = 30% V_{CC} (Enabled)	-55°C	10	150	ns
			+25°C	10	150	ns
			+125°C	10	200	ns
	$t_{OFF}EN$	V_{EN} = 70% V_{CC} (Disabled)	ALL	10	200	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 OUTPUT1 (0-15)

TRUTH TABLE (CH16 – CH31)

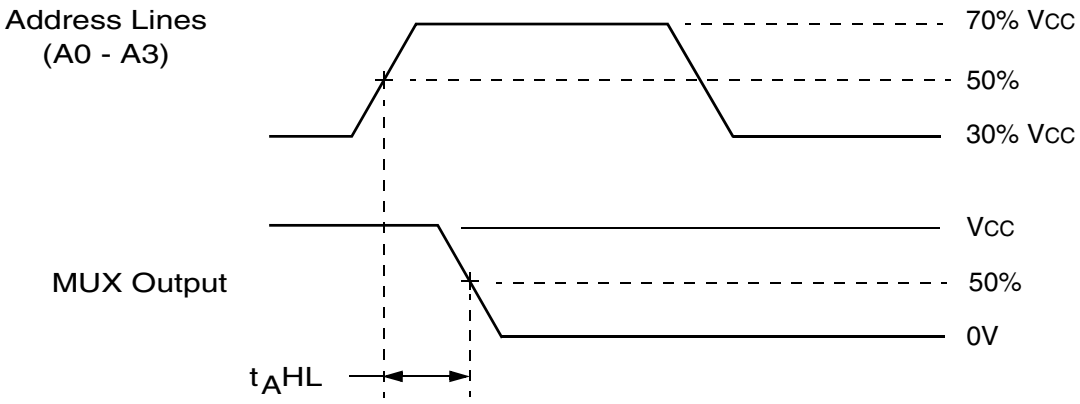
A3	A2	A1	A0	$\overline{EN}$(16-31)	"ON" CHANNEL 2/
X	X	X	X	H	NONE
L	L	L	L	L	CH16
L	L	L	H	L	CH17
L	L	H	L	L	CH18
L	L	H	H	L	CH19
L	H	L	L	L	CH20
L	H	L	H	L	CH21
L	H	H	L	L	CH22
L	H	H	H	L	CH23
H	L	L	L	L	CH24
H	L	L	H	L	CH25
H	L	H	L	L	CH26
H	L	H	H	L	CH27
H	H	L	L	L	CH28
H	H	L	H	L	CH29
H	H	H	L	L	CH30
H	H	H	H	L	CH31

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

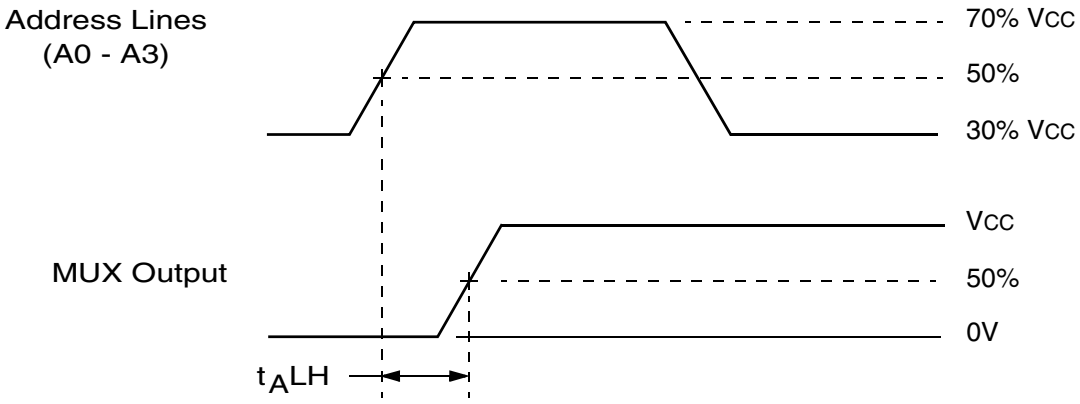
TRUTH TABLE (CH32 – CH47)

A3	A2	A1	A0	$\overline{EN}$(32-47)	"ON" CHANNEL 3/
X	X	X	X	H	NONE
L	L	L	L	L	CH32
L	L	L	H	L	CH33
L	L	H	L	L	CH34
L	L	H	H	L	CH35
L	H	L	L	L	CH36
L	H	L	H	L	CH37
L	H	H	L	L	CH38
L	H	H	H	L	CH39
H	L	L	L	L	CH40
H	L	L	H	L	CH41
H	L	H	L	L	CH42
H	L	H	H	L	CH43
H	H	L	L	L	CH44
H	H	L	H	L	CH45
H	H	H	L	L	CH46
H	H	H	H	L	CH47

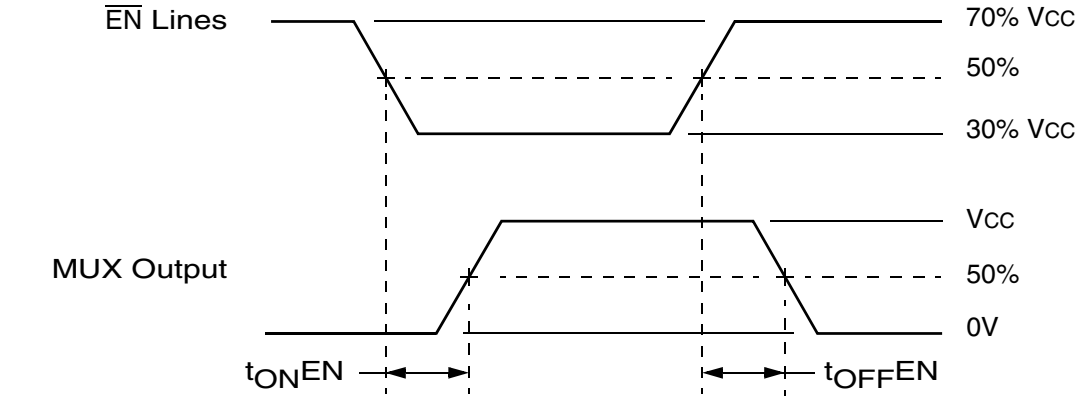
3/ Between (CH32-CH47) and OUTPUT3 (32-47)



Definition of t_AHL



Definition of t_ALH



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

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

RHD8543 SWITCHING DIAGRAMS

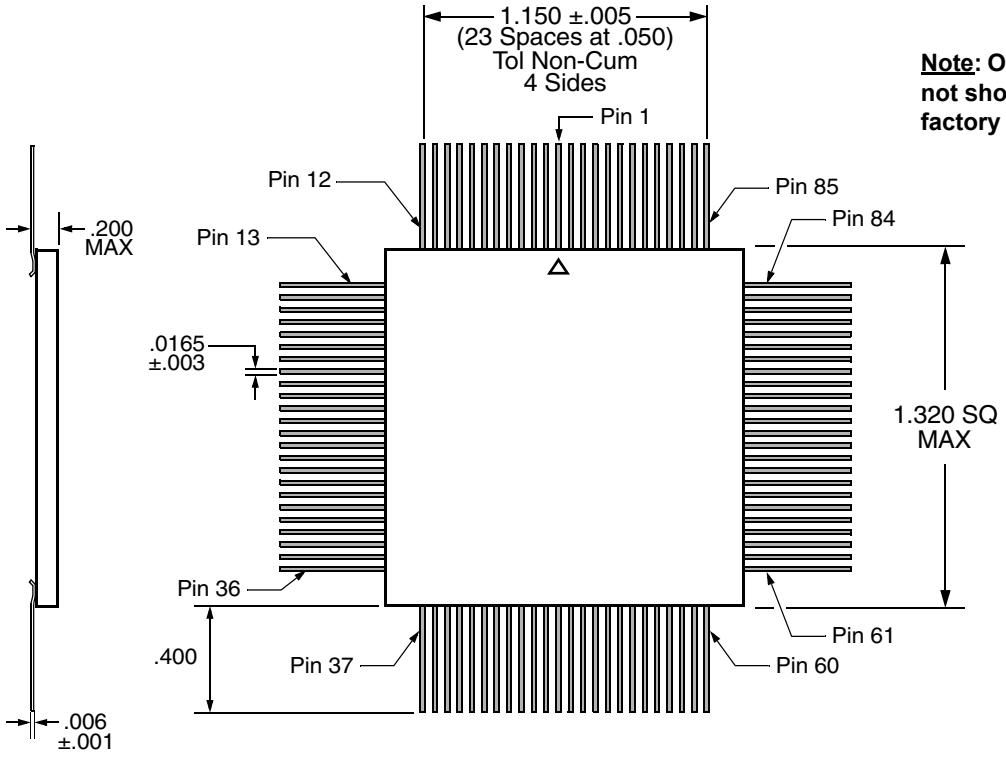
LEAD NUMBERS & FUNCTIONS

RHD8543 – 96 Leads Ceramic QUAD Flat Pack					
Pin #	**Function**	**Pin #**	**Function**	**Pin #**	**Function**
1	A2	33	CH11	65	CH33
2	NC	34	NC	66	CH32
3	A3	35	CH12	67	NC
4	NC	36	NC	68	Output3 (32-47)
5	$\overline{EN}$(0-15)	37	CH13	69	NC
6	NC	38	NC	70	Output2 (16-31)
7	CH0	39	CH14	71	GND
8	NC	40	NC	72	GND
9	CH1	41	CH15	73	CH31
10	NC	42	NC	74	CH30
11	CH2	43	NC	75	CH29
12	NC	44	+Vcc	76	CH28
13	CH3	45	NC	77	CH27
14	NC	46	NC	78	CH26
15	CH4	47	NC	79	CH25
16	NC	48	NC	80	CH24
17	CH5	49	NC	81	CH23
18	NC	50	CASE GND	82	CH22
19	CH6	51	CH47	83	CH21
20	NC	52	CH46	84	CH20
21	CH7	53	CH45	85	CH19
22	NC	54	CH44	86	CH18
23	GND	55	CH43	87	CH17
24	GND	56	CH42	88	CH16
25	Output1 (0-15)	57	CH41	89	GND
26	NC	58	CH40	90	GND
27	CH8	59	CH39	91	$\overline{EN}$(32-47)
28	NC	60	CH38	92	$\overline{EN}$(16-31)
29	CH9	61	CH37	93	A0
30	NC	62	CH36	94	NC
31	CH10	63	CH35	95	A1
32	NC	64	CH34	96	NC

NOTE: It is recommended that all "NC or "no connect pin" be grounded. This eliminates or minimizes any ESD or static buildup.

ORDERING INFORMATION

Model Number	DLA SMD #	Screening	Package
RHD8543-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
RHD8543-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
RHD8543-201-1S	5962-1221001KXC	DLA SMD Pending	
RHD8543-901-1S	5962H1221001KXC	DLA SMD and Radiation Certification Pending	



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

FLAT PACKAGE OUTLINE

EXPORT CONTROL:

This product is controlled for export under the International Traffic in Arms Regulations (ITAR). A license from the U.S. Department of State is required prior to the export of this product from the United States.

EXPORT WARNING:

Aeroflex's military and space products are controlled for export under the International Traffic in Arms Regulations (ITAR) and may not be sold or proposed or offered for sale to certain countries. (See ITAR 126.1 for complete information.)

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