

RadHard-by-Design**RHD8544 Dual 16-Channel Analog Multiplexer**

www.aeroflex.com/RHDseries

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**FEATURES**

- 32 Channels provided by two independent 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-cm²/mg
 - Neutron Displacement Damage: >10¹⁴ neutrons/cm²
- Full military temperature range
- Low power consumption < 0.10mW
- CMOS analog switching allows rail to rail operation and low switch impedance
- Separate address busses A(0-3) & B(0-3) and enable $\overline{EN}(0-15)$ & $\overline{EN}(16-31)$
- Designed for aerospace and high reliability space applications
- Packaging – Hermetic ceramic
 - 56 leads, 0.800" Sq x 0.200"Ht quad flat pack
 - Weight - 6 grams max
- Aeroflex Plainview's Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.

GENERAL DESCRIPTION

Aeroflex's RHD8544 is a radiation hardened, single supply, dual 16-Channel Multiplexer MCM (multi-chip module). The RHD8544 design uses specific circuit topology and layout methods to mitigate total ionization dose effects and single event latchup. These characteristics make the RHD8544 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 RHD8544 is ideal for demanding military and space applications.

ORGANIZATION AND APPLICATION

The RHD8544 consists of two independent 16-channel multiplexers arranged as shown in the block diagram.

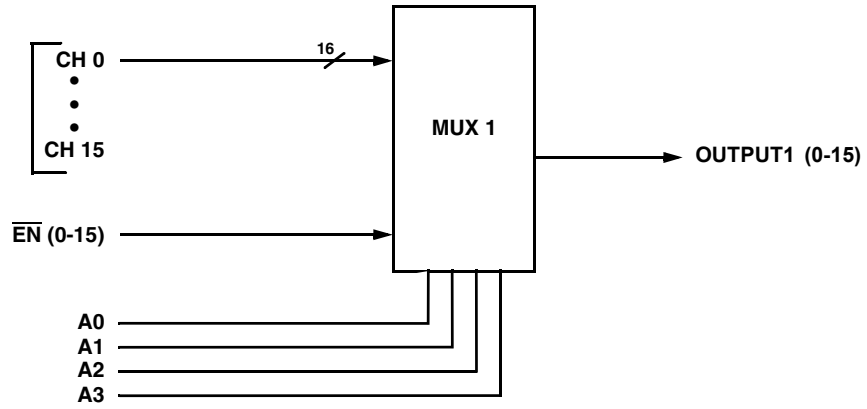
A Section

Sixteen (16) channels addressable by bus A(0-3), enabled by $\overline{EN}(0-15)$ and outputted on Output1 (0-15).

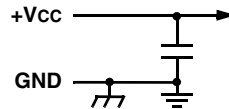
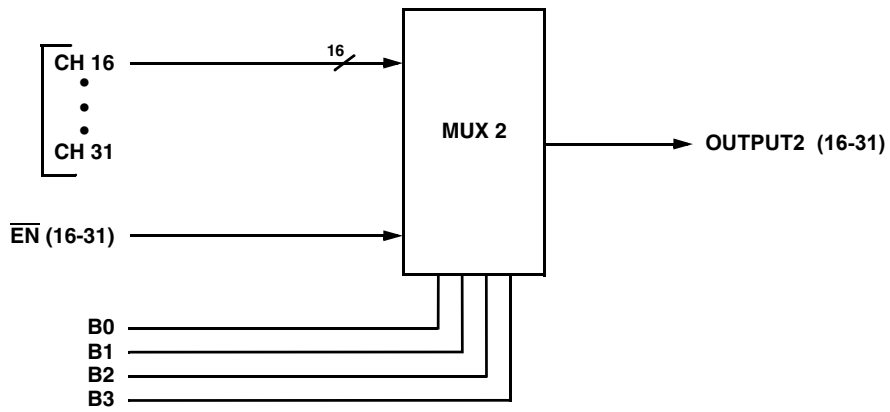
B Section

Sixteen (16) channels addressable by bus B(0-3), enabled by $\overline{EN}(16-31)$ and outputted on Output2 (16-31).

SECTION A



SECTION B



RHD8544: 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 +VCC (Pin 18)	+6.0	V
Digital Input Overvoltage VEN0-15 (Pin 13), VEN16-31 (Pin 44), VA (Pins 14, 15, 16, 17), VB (Pins 40, 41, 42, 43)	< VCC +0.4 > GND -0.4	V V
Analog Input Over Voltage VIN (CH0-CH31)	< 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 affect device reliability.

RECOMMENDED OPERATING CONDITIONS 1/

Symbol	Parameter	Typical	Units
+VCC	Power Supply Voltage	3.3 to 5.0	V
VENL, VAL	Logic Low Level	30% VCC	V
VENH, 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	$\overline{EN} = 30\% V_{CC}$	0	20	μA
	+ISBY	$\overline{EN} = 70\% V_{CC}$	0	20	μA
Address Input Current A(0-3), B(0-3)	I _{AL} (0-3)A	V _A = 30% VCC	-50	50	nA
	I _{AH} (0-3)A	V _A = 70% VCC	-50	50	nA
	I _{AL} (0-3)B	V _B = 30% VCC	-50	50	nA
	I _{AH} (0-3)B	V _B = 70% VCC	-50	50	nA
Enable Input Current \overline{EN}	I _{ENL} (0-15)	V _{EN} (0-15) = 30% VCC	-50	50	nA
	I _{ENH} (0-15)	V _{EN} (0-15) = 70% VCC	-50	50	nA
	I _{ENL} (16-31)	V _{EN} (16-31) = 30% VCC	-50	50	nA
	I _{ENH} (16-31)	V _{EN} (16-31) = 70% VCC	-50	50	nA

DC ELECTRICAL PERFORMANCE CHARACTERISTICS 1/ (continued)

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

Parameter	Symbol	Conditions	Min	Max	Units	
High Input Leakage Current (CH0-CH31)	IINLK 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-CH31)	IINLK 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 12 & 45)	IOUTLK	V _{OUT} = +5V, V _{EN} = 70% V _{CC} , All inputs grounded except channel being tested. <u>3/</u> , <u>4/</u>	-50	50	nA	
Switch ON Resistance OUTPUTS (pins 12 & 45) <u>6/</u>	RDS(ON)	V _{IN} = 0V, V _{IN} = +2.5V, V _{IN} = +5V V _{EN} = 30% V _{CC} I _{OUT} = -1mA <u>2/</u> , <u>3/</u> , <u>5/</u>	-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). 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.

SWITCHING CHARACTERISTICS

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

Parameter	Symbol	Conditions	Temp	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 _{ONEN}	V _{EN} = 30% V _{CC} (Enabled)	-55°C	10	150	ns
			+25°C	10	150	ns
			+125°C	10	200	ns
	t _{OFFEN}	V _{EN} = 70% V _{CC} (Disabled)	ALL	10	200	ns

TRUTH TABLE (CH0–CH15)

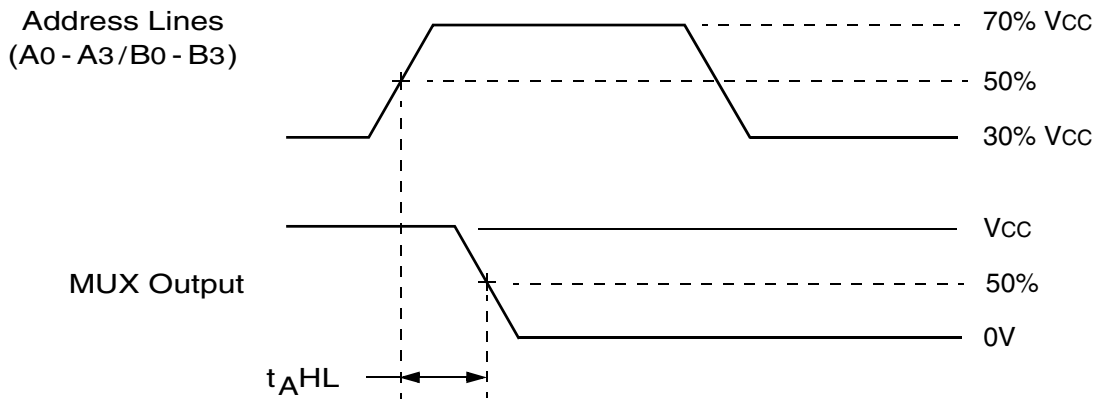
A3	A2	A1	A0	$\overline{\text{EN}}$ (0-15)	"ON" CHANNEL, 1/ (OUTPUT 1)
X	X	X	X	H	NONE
L	L	L	L	L	CH0
L	L	L	H	L	CH1
L	L	H	L	L	CH2
L	L	H	H	L	CH3
L	H	L	L	L	CH4
L	H	L	H	L	CH5
L	H	H	L	L	CH6
L	H	H	H	L	CH7
H	L	L	L	L	CH8
H	L	L	H	L	CH9
H	L	H	L	L	CH10
H	L	H	H	L	CH11
H	H	L	L	L	CH12
H	H	L	H	L	CH13
H	H	H	L	L	CH14
H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

1/ Between (CH0-CH15) and OUTPUT1 (0-15)

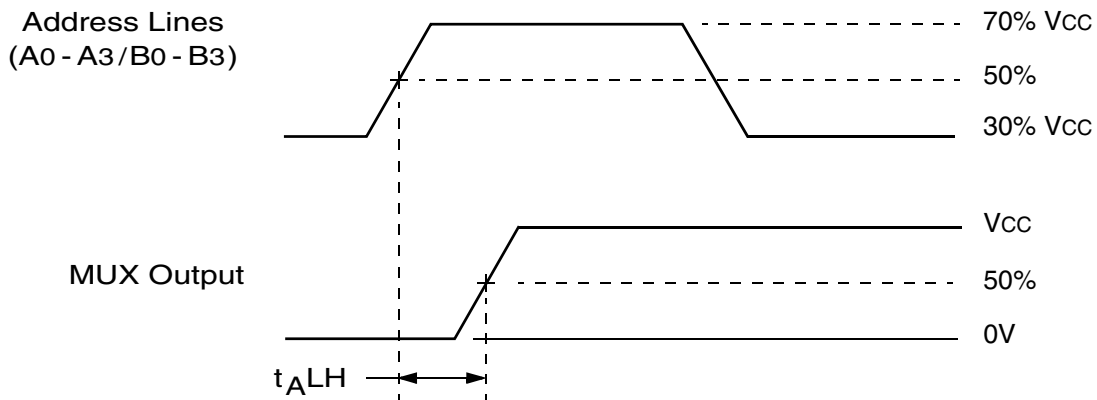
TRUTH TABLE (CH16–CH31)

B3	B2	B1	B0	$\overline{\text{EN}}$ (16-31)	"ON" CHANNEL, 2/ (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

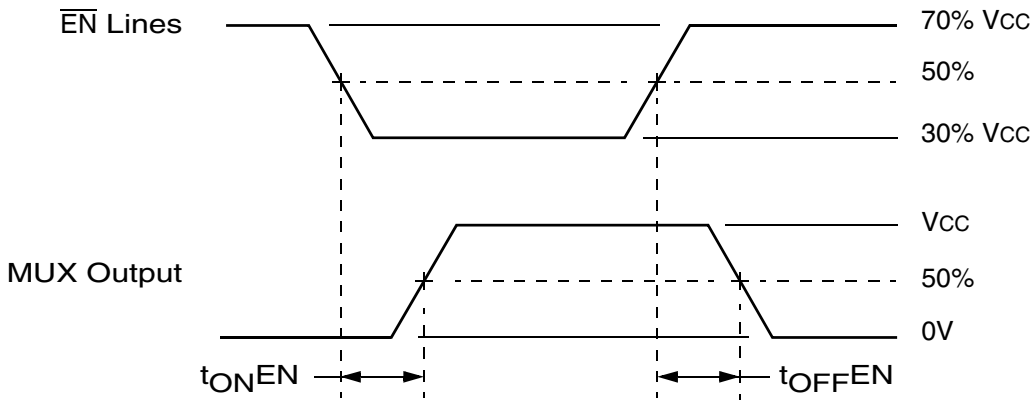
2/ Between (CH16-CH31) and OUTPUT2 (16-31)



Definition of t_{AHL}



Definition of t_{ALH}



Definition of t_{ONEN} and t_{OFFEN}

NOTE: $f = 10\text{KHz}$, Duty cycle = 50%.

RHD8544 SWITCHING DIAGRAMS

PIN NUMBERS & FUNCTIONS

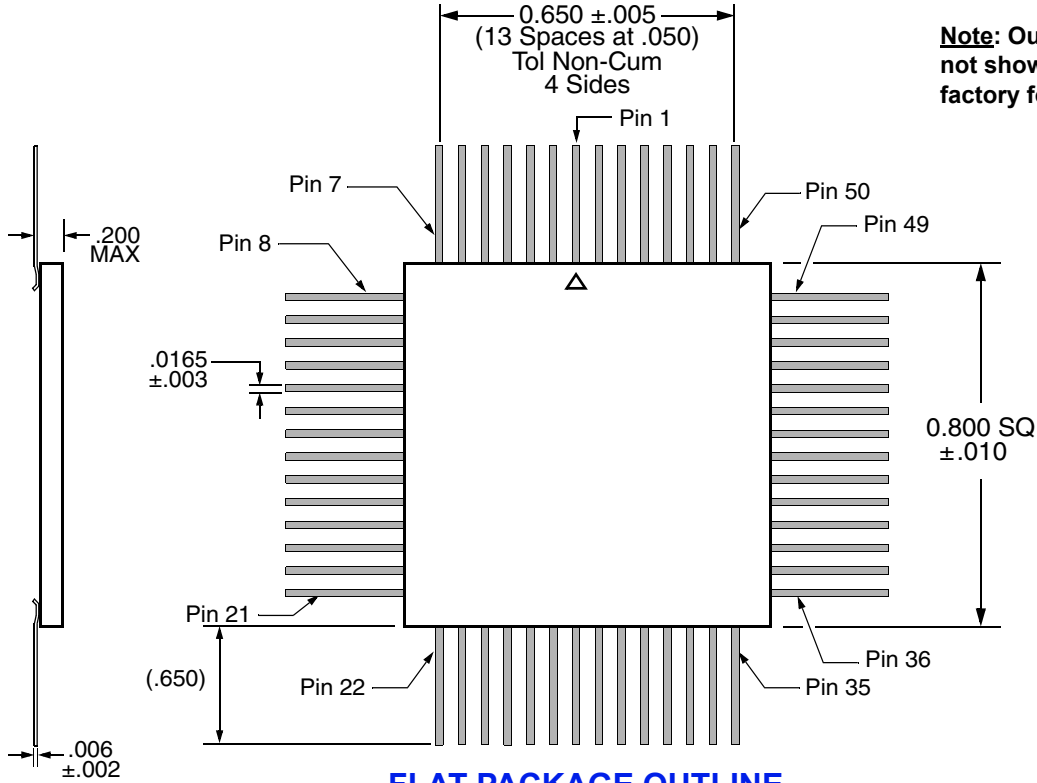
RHD8544 – 56 Leads Ceramic QUAD Flat Pack			
Pin #	Function	Pin #	Function
1	CH0	29	CH31
2	CH1	30	CH30
3	CH2	31	CH29
4	CH3	32	CH28
5	CH4	33	CH27
6	CH5	34	CH26
7	GND	35	GND
8	GND	36	GND
9	CH6	37	CH25
10	CH7	38	CH24
11	CASE GND	39	GND
12	OUTPUT1 (0-15)	40	B3
13	\overline{EN} (0-15)	41	B2
14	A0	42	B1
15	A1	43	B0
16	A2	44	\overline{EN} (16-31)
17	A3	45	OUTPUT2 (16-31)
18	+Vcc	46	GND
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, 39, 46, 49, 50).

ORDERING INFORMATION

Model	DLA SMD #	Screening	Package
RHD8544-7	-	Commercial Flow, +25°C testing only	QUAD Flat Pack
RHD8544-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
RHD8544-201-1S	5962-1220901KXC	DLA SMD Pending	
RHD8544-901-1S	5962H1220901KXC	DLA SMD and Radiation Certification Pending	



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.

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