DATASHEET

RELEASED 5/9/17

Dual 16-Channel Analog Multiplexer

RHD8544

Features

- 32 Channels provided by two independent 16-channel multiplexers
- Single power supply operation at +5V
- Radiation performance
  - Total Dose: >1 Mrad(Si), Dose rate = 50-300 rad(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 < 11.2mW
- CMOS analog switching allows rail to rail operation and low switch impedance
- Separate address buses 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
- **Radiation Hardness Assurance Plan: DLA Certified to MIL-PRF-38534, Appendix G**.

General Description

The 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 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 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

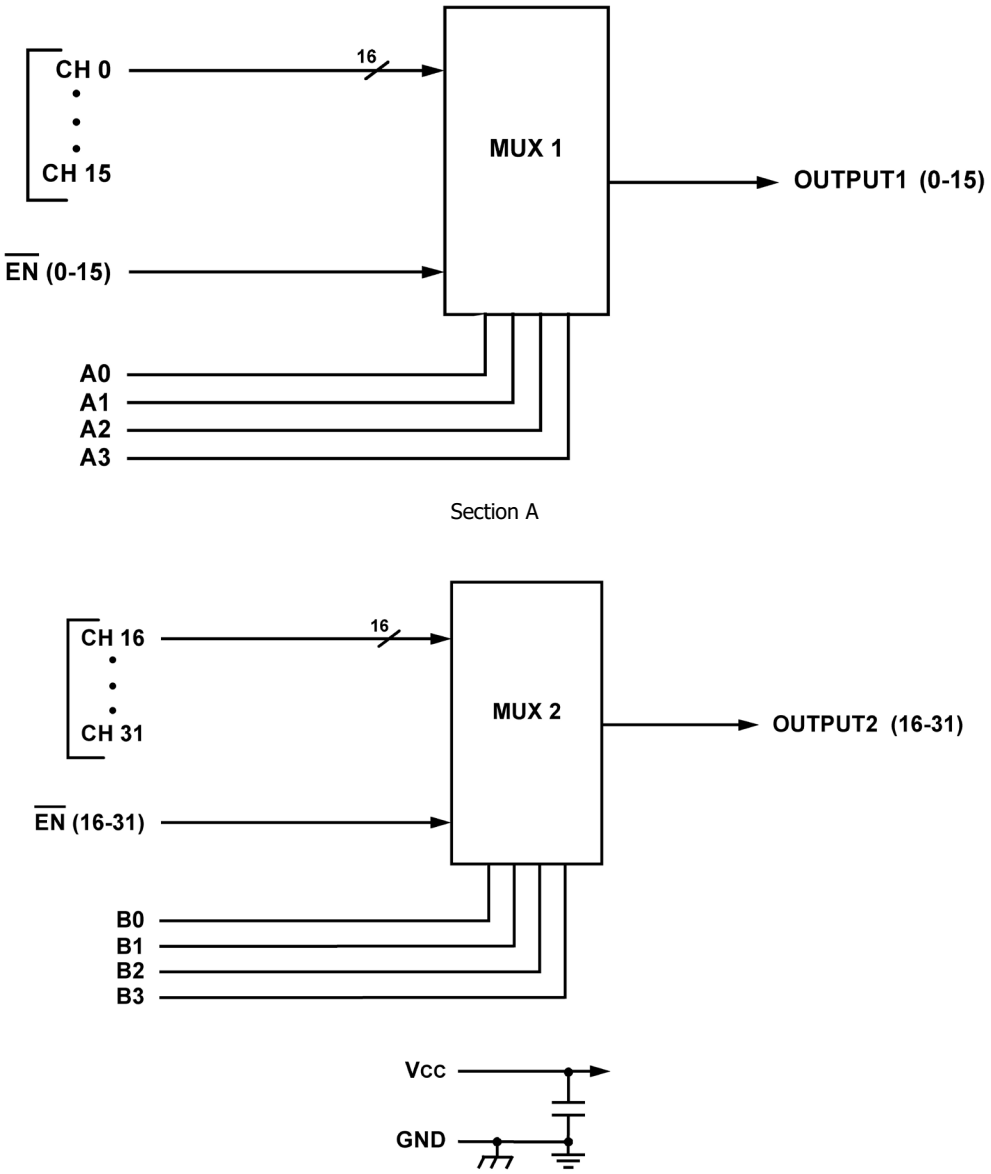
Sixteen (16) channels addressable by bus A(0-3), enabled by $\overline{EN}$(0-15) and outputted on Output1(0-15).

B Section

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

Dual 16-Channel Analog Multiplexer

RHD8544



RHD8544: Dual 16-Channel Analog Mux Block Diagram

Dual 16-Channel Analog Multiplexer

RHD8544

Absolute Maximum Ratings 1/

Parameter	Range	Units
Case Operating Temperature Range	-55 to +125	°C
Storage Temperature Range	-65 to +150	°C
Supply Voltage $+V_{CC}$ (Pin 18)	+7.0	V
Digital Input Over Voltage 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_{CC} +0.4 > GND -0.4	V V
Analog Input Over Voltage V_{IN} (CH0-CH31)	< V_{CC} +0.4 > GND -0.4	V
Input Current	±10	mA

Note:

1) All measurements are made with respect to ground.

Notice: Stresses above those listed under "Absolute Maximum Ratings" 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
$+V_{CC}$	Power Supply Voltage	+5.0	V
V_{IL}	Low Level Input Voltage	GND -to- 30% V_{CC}	V
V_{IH}	High Level Input Voltage	70% V_{CC} -to- V_{CC}	V

DC Electrical Performance Characteristics 1/

(T_C = -55°C to +125°C, $+V_{CC}$= +5V - Unless otherwise specified)

Parameter	Symbol	Conditions		MIN	MAX	Units
Supply Current $+V_{CC}$	$+I_{CC}$	$\overline{EN}$ = 30% V_{CC}		0	1.6	mA
	$+I_{SBY}$	$\overline{EN}$ = 70% V_{CC}		0	400	µA
Address Input Current A(0-3), B(0-3)	I_{AL}	V_A = 30% V_{CC}	+25°C	-5	5	nA
			+125°C	-50	50	nA
	I_{AH}	V_A = 70% V_{CC}	+25°C	-5	5	nA
			+125°C	-50	50	nA
Enable Input Current $\overline{EN}$ (0-15), $\overline{EN}$(16-31)	I_{ENL}	V_{EN} = 30% V_{CC}	+25°C	-5	5	nA
			+125°C	-50	50	nA
	I_{ENH}	V_{EN} = 70%V_{CC}	+25°C	-5	5	nA
			+125°C	-50	50	nA
High Input Leakage Current (CH0-CH31)	I_{INLK5}	V_{IN} = +5V, V_{EN} = 80% V_{CC}, Output and all unused MUX inputs under test = 0V	+25°C	-5	5	nA
			+125°C	-50	50	nA

DC Electrical Performance Characteristics 1/ (Continued)

(Tc = -55°C to +125°C, +V_{CC} = +5V - Unless otherwise specified)

Parameter	Symbol	Conditions		MIN	MAX	Units
Low Input Leakage Current (CH0-CH31)	I_{INLK_0}	V_{IN} = +0V, V_{EN} = 80% V_{CC}, Output and all unused MUX inputs under test = +5V	+25°C	-5	5	nA
			+125°C	-50	50	nA
Output Leakage Current V_{OUT} (pins 12 & 45)	I_{OUTLK}	V_{OUT} = +5V, V_{EN} = 80% V_{CC}, All inputs grounded except channel being tested 3/, 4/	+25°C	-5	5	nA
			+125°C	-50	50	nA
Switch ON Resistance OUTPUTS (pins 12 & 45)	R_{DSON}	V_{IN} = 0V, V_{EN} = 30% V_{CC} I_{OUT} = +1mA V_{IN} = +2.5V, V_{IN} = +5V, V_{EN} = 30% V_{CC} I_{OUT} = -1mA 2/, 3/, 5/, 6/	-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) The RHD8544 cannot be operated with analog inputs below 0 volts.

Switching Characteristics

(T_C = -55°C to +125°C, +V_{CC} = +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	$t_{ON}EN$	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)

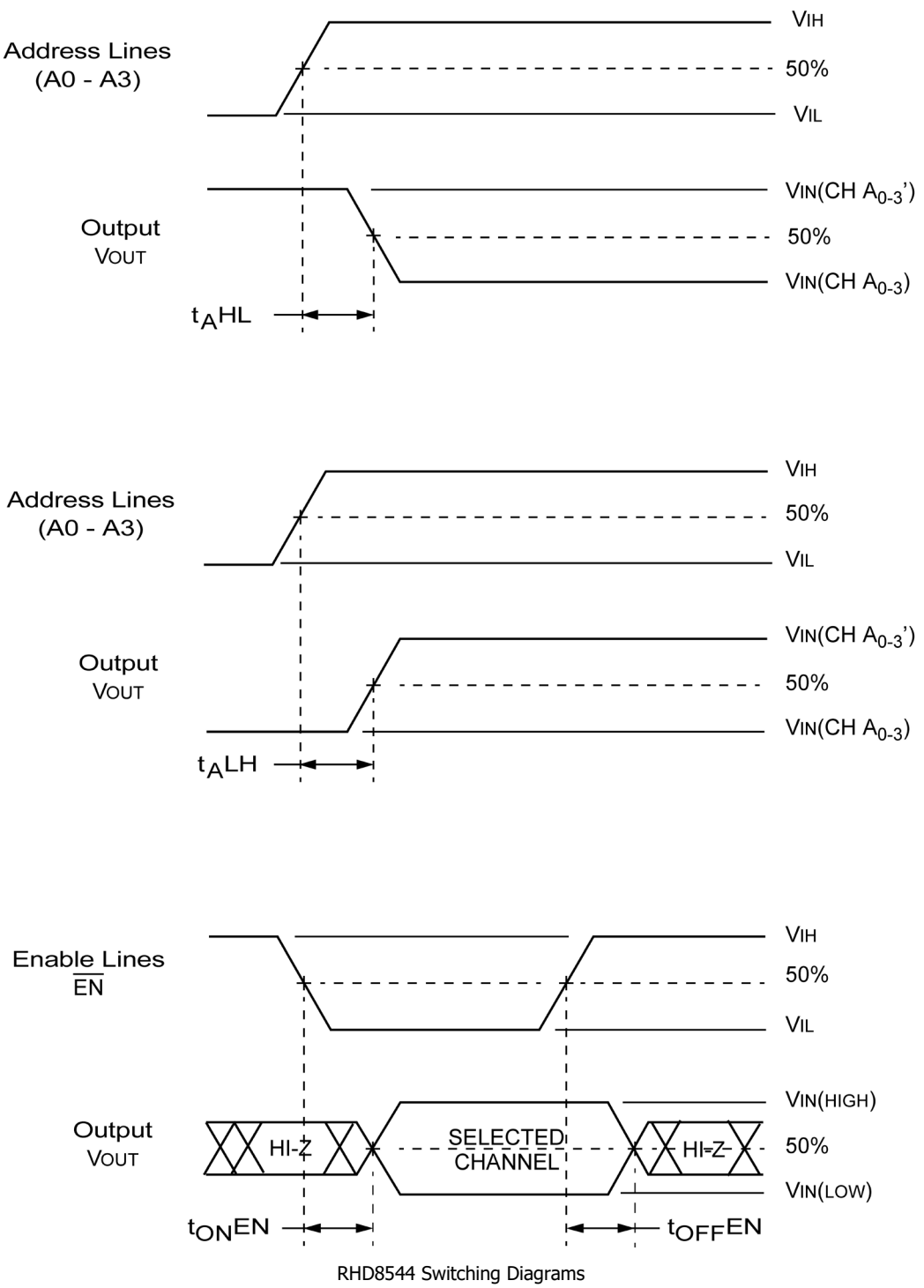
A3	A2	A1	A0	$\overline{EN}$(0-15)	"ON" Channel, 1/ (Output 1)
X	X	X	X	H	NONE
L	L	L	L	L	CH0
L	L	L	H	L	CH1
L	L	H	L	L	CH2
L	L	H	H	L	CH3
L	H	L	L	L	CH4
L	H	L	H	L	CH5
L	H	H	L	L	CH6
L	H	H	H	L	CH7
H	L	L	L	L	CH8
H	L	L	H	L	CH9
H	L	H	L	L	CH10
H	L	H	H	L	CH11
H	H	L	L	L	CH12
H	H	L	H	L	CH13
H	H	H	L	L	CH14
H	H	H	H	L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

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

Truth Table (CH16 – CH31)

B3	B2	B1	B0	$\overline{EN}$(16-31)	"ON" Channel, 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)



RHD8544 Switching Diagrams

Note:

1) f = 10KHz, Duty cycle = 50%.

Dual 16-Channel Analog Multiplexer

RHD8544

Pin Numbers & Functions

RHD8544 – 56 Leads Ceramic QUAD Flat Pack

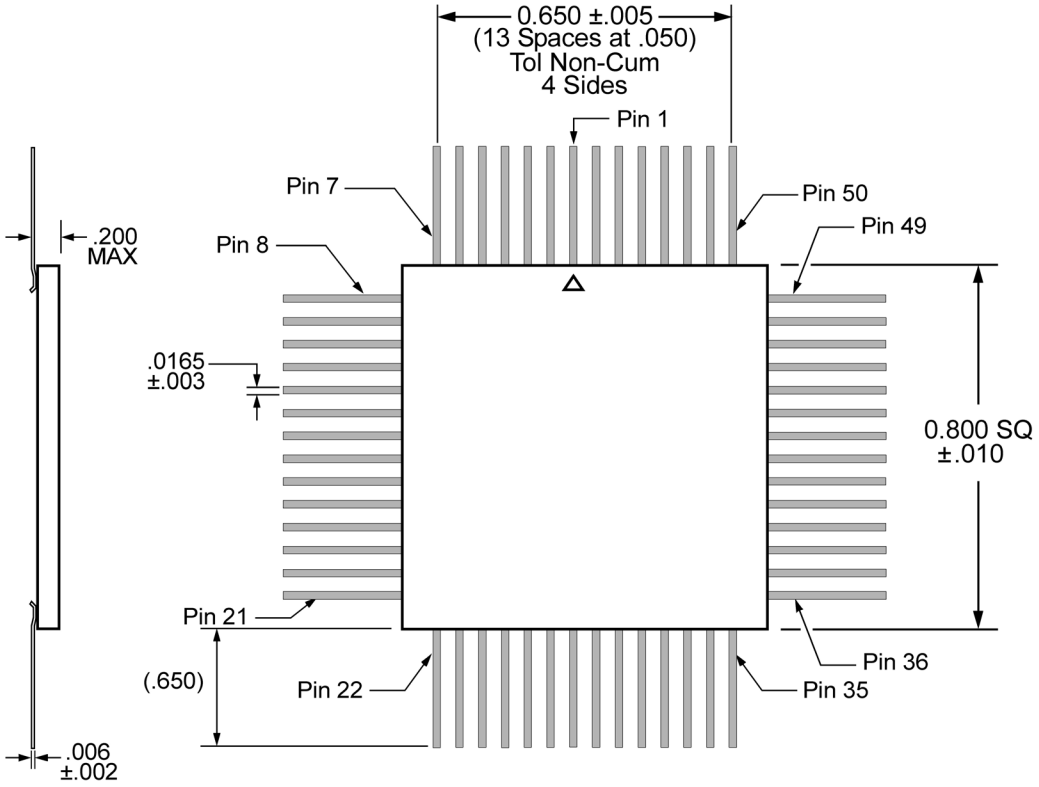
Pin #	Function	Pin #	Function
1	CH0	29	CH31
2	CH1	30	CH30
3	CH2	31	CH29
4	CH3	32	CH28
5	CH4	33	CH27
6	CH5	34	CH26
7	GND	35	GND
8	GND	36	GND
9	CH6	37	CH25
10	CH7	38	CH24
11	CASE GND	39	NC
12	OUTPUT1 (0-15)	40	B3
13	$\overline{EN}$ (0-15)	41	B2
14	A0	42	B1
15	A1	43	B0
16	A2	44	$\overline{EN}$ (16-31)
17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

Dual 16-Channel Analog Multiplexer

RHD8544



Flat Package Outline

Note:

1) Outside ceramic tie bars not shown for clarity. Contact factory for details.

DATASHEET

RELEASED 5/9/17

Dual 16-Channel Analog Multiplexer

RHD8544

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	In accordance with DLA SMD	
RHD8544-901-1S	5962H1220901KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "H", 1 Mrad(Si)	

Revision History

Date	Revision	Change Description
03/30/2016	D	Import into CAES format
5/9/2017	E	Change status to Datasheet, Remove 3.3V references, Remove the resistor in the V_{CC} line, Add Max Input Current, Typical ranges in Recommended table, Change Input and Output leakage current conditions to V_{EN} = 80% V_{CC}

DATASHEET

RELEASED 5/9/17

Dual 16-Channel Analog Multiplexer

RHD8544

Datasheet Definitions

	DEFINITION
Advanced Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the datasheet **is subject to change**. Specifications can be **TBD** and the part package and pinout are **not final**.
Preliminary Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

The following United States (U.S.) Department of Commerce statement shall be applicable if these commodities, technology, or software are exported from the U.S.: These commodities, technology, or software were exported from the United States in accordance with the Export Administration Regulations. Diversion contrary to U.S. law is prohibited.