

RadHard-by-Design RHD5910 Quad Comparator High Speed

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December 23, 2013



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FEATURES

- ❑ Single power supply operation at 3.3V or 5.0V
- ❑ Radiation performance
 - Total dose: > 1 Mrad(Si); Dose rate = 50 - 300 rads(Si)/s
 - ELDRS Immune
 - SEL Immune > 100 MeV-cm²/mg
 - Neutron Displacement Damage > 10¹⁴ neutrons/cm²
- ❑ Short Circuit Tolerant
- ❑ Full military temperature range
- ❑ Designed for aerospace and high reliability space applications
- ❑ Packaging – Hermetic ceramic SOIC
 - 16-pin, .417"L x .300"W x .105"Ht
 - Weight - 0.8 grams max
- ❑ Aeroflex Plainview's Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.

GENERAL DESCRIPTION

Aeroflex's RHD5910 is a radiation hardened, single supply, high speed, quad comparator in a 16-pin SOIC package. The RHD5910 design uses specific circuit topology and layout methods to mitigate total ionizing dose effects and single event latchup. These characteristics make the RHD5910 especially suited for the harsh environment encountered in Deep Space missions. It is guaranteed operational from -55°C to +125°C. Available screened in accordance with MIL-PRF-38534 Class K, the RHD5910 is ideal for demanding military and space applications.

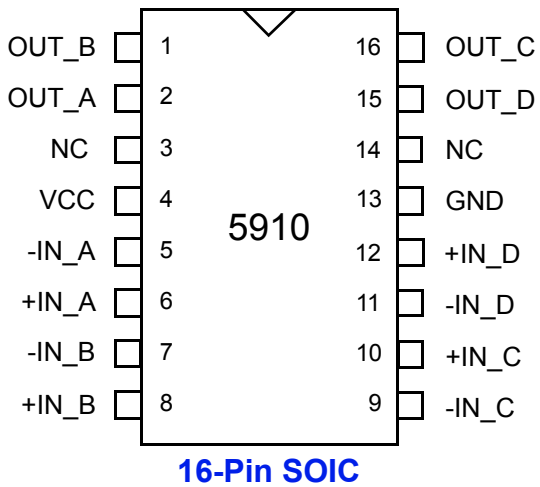
ORGANIZATION AND APPLICATION

The RHD5910 quad comparator is intended for operation with dynamic signals on either or both inputs. Comparison is 'continuous', that is, the circuit functions as high gain open loop amplifiers with a digital output. For slow input signals with small input differences the comparators can be expected to respond to small noise signals at the inputs. Feedback hysteresis is the responsibility of the user to avoid 'chattering' on system noise.

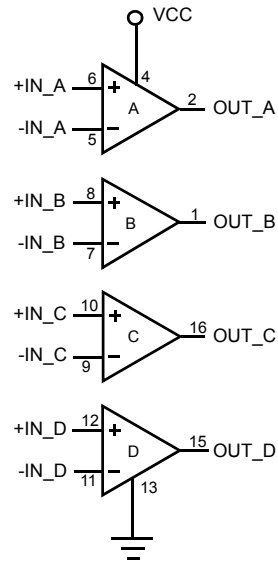
The comparator will accept signals anywhere in the included power supply range. The circuit delay is specified for a half-volt single ended or differential input step of either polarity ending in an input polarity reversal of 10mV. See Switching Diagrams.

CMOS device drive has a negative temperature coefficient and the devices are therefore inherently tolerant to momentary shorts, although on chip thermal shutdown is not provided. All inputs and outputs are diode protected.

The devices will not latch with SEU events above 100 Mev-cm²/mg. Total dose degradation is minimal to above 1 Mrad(Si). Displacement damage environments to neutron fluence equivalents in the mid 10¹⁴ neutrons per cm² range are readily tolerated. There is no sensitivity to low-dose rate (ELDRS) effects. SEU effects are application dependent.



PACKAGE PINOUTS



BLOCK DIAGRAM

Notes:

1. Package and lid are electrically isolated from signal pads.
2. It is recommended that NC or no connect pins (pins 3 and 14) and lid be grounded. This eliminates or minimizes any ESD or static buildup.

| Pin #s | Signal | Definitions |
|--------|--------|--|
| 1 | OUT_B | Output of Comparator B. |
| 2 | OUT_A | Output of Comparator A. |
| 3 | NC | It is recommended tying this pin to ground |
| 4 | VCC | DC Supply Voltage |
| 5 | -IN_A | Inverting Input to Comparator A |
| 6 | +IN_A | Non-Inverting Input to Comparator A |
| 7 | -IN_B | Inverting Input to Comparator B |
| 8 | +IN_B | Non-Inverting Input to Comparator B |
| 9 | -IN_C | Inverting Input to Comparator C |
| 10 | +IN_C | Non-Inverting Input to Comparator C |
| 11 | -IN_D | Inverting Input to Comparator D |
| 12 | +IN_D | Non-Inverting Input to Comparator D |
| 13 | GND | DC Supply Return |
| 14 | NC | It is recommended tying this pin to ground |
| 15 | OUT_D | Output of Comparator D. |
| 16 | OUT_C | Output of Comparator C. |

PIN DESCRIPTIONS

ABSOLUTE MAXIMUM RATINGS

| Parameter | Rating | Units |
|--|----------------------|--------|
| Case Operating Temperature Range | -55 to +125 | °C |
| Storage Temperature Range | -65 to +150 | °C |
| Junction Temperature | +150 | °C |
| Supply Voltage +VCC | +6.0 | V |
| Input Voltage | VCC +0.4 GND -0.4 | V V |
| Lead Temperature (soldering, 10 seconds) | 300 | °C |
| ESD (MIL-STD-883, Method 3015, Class 2) | 2,000 to 3,999 | V |
| Power @ 25°C | 250 | mW |

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

| Symbol | Parameter | Typical | Units |
|--------|-------------------------|------------|-------|
| +VCC | Power Supply Voltage | 3.3 to 5.0 | V |
| VCM | Input Common Mode Range | VCC to GND | V |

ELECTRICAL PERFORMANCE CHARACTERISTICS

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

| Parameter | Symbol | Conditions | Min | Max | Units |
|--|------------|--------------|------|------|-------|
| Quiescent Supply Current <u>1/</u> | ICCQ | No Load | | 15 | mA |
| Input Offset Voltage <u>1/</u> | VOS | | -60 | 60 | mV |
| Input Offset Current <u>1/</u> , <u>3/</u> | IOS | | -1 | 1 | nA |
| Input Bias Current <u>1/</u> , <u>3/</u> | IB | | -1 | 1 | nA |
| Common Mode Rejection Ratio <u>2/</u> | CMRR | | 50 | | dB |
| Power Supply Rejection Ratio <u>2/</u> | PSRR | | 50 | | dB |
| Output Voltage High <u>1/</u> | VOH | RLOAD = 2 KΩ | 4.9 | | V |
| Output Voltage Low <u>1/</u> | VOL | RLOAD = 2 KΩ | | 0.1 | V |
| Gain <u>2/</u> | A | No Load | 5 | | V/mV |
| Short Circuit Output Current <u>2/</u> | IO(SINK) | VOUT to VCC | -130 | -220 | mA |
| | IO(SOURCE) | VOUT to VEE | 130 | 200 | |

Notes:

- 1/ Specification derated to reflect Total Dose exposure to 1 Mrad(Si) @ 25°C.
- 2/ Not tested. Shall be guaranteed by design, characterization or correlation to other test parameters.
- 3/ Subgroup 3 for these parameters is guaranteed, but not production tested.

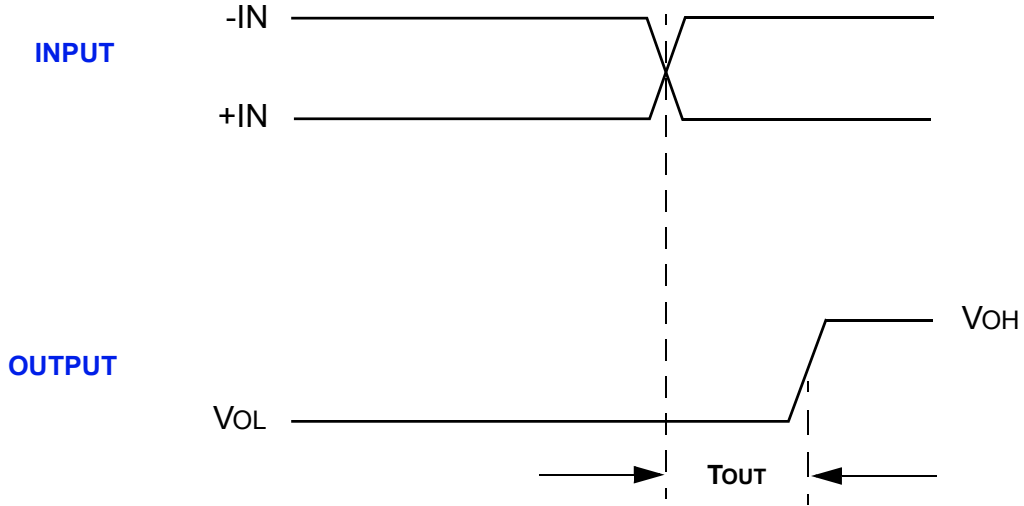
SWITCHING CHARACTERISTICS

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

| Parameter | Symbol | Conditions | Min | Max | Units |
|--------------|--------|----------------------------|-----|-----|-------|
| Output Delay | TOUT | RLOAD = 2 KΩ ^{1/} | | 200 | ns |

Note:

^{1/} The circuit delay is specified for a half-volt single ended or differential input step, of either polarity, ending in an input polarity reversal of 10mV.



SWITCHING DIAGRAM

APPLICATION NOTE 1

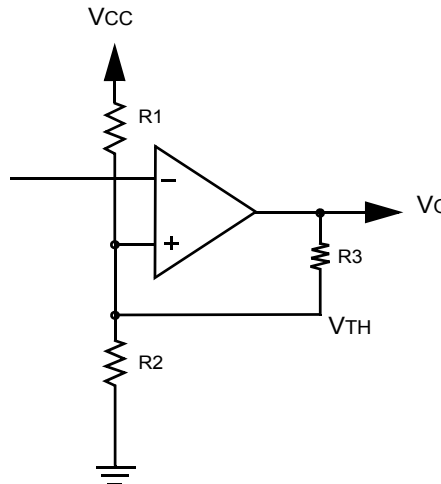
Comparator with Hysteresis

Threshold Voltage

$$V_{TH} = V_{CC} \frac{R2}{R1 + R2}$$

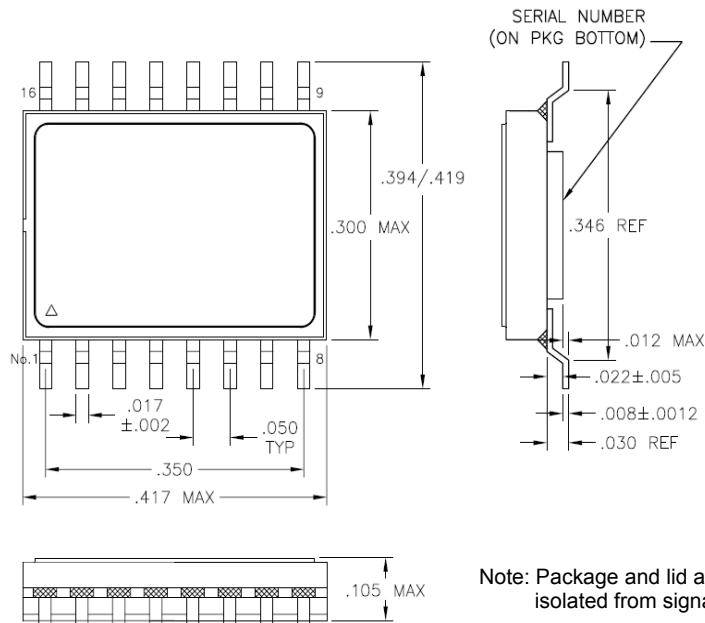
Hysteresis Calculation

$$HYS = V_O \frac{R2}{R2 + R3}$$



ORDERING INFORMATION

| Model | DLA SMD # | Screening | Package |
|----------------|-----------------|--|-------------|
| RHD5910-7 | - | Commercial Flow, +25°C testing only | 16-pin SOIC |
| RHD5910-S | - | Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications | |
| RHD5910-201-1S | 5962-1024201KXC | In accordance with DLA SMD | |
| RHD5910-201-2S | 5962-1024201KXA | | |
| RHD5910-901-1S | 5962H1024201KXC | In accordance with DLA Certified RHA Program Plan to RHA Level "H", 1Mrad(Si) | |
| RHD5910-901-2S | 5962H1024201KXA | | |



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:

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