

**HS-139RH, HS-139EH**

Radiation Hardened Quad Voltage Comparator

FN3573  
Rev 6.00  
August 8, 2013

The Radiation Hardened HS-139RH, HS-139EH consists of four independent single or dual supply voltage comparators on a single monolithic substrate. The common mode input voltage range includes ground, even when operated from a single supply and the low supply current makes these comparators suitable for low power applications. These types were designed to directly interface with TTL and CMOS.

The HS-139RH, HS-139EH are fabricated on our dielectrically isolated Rad Hard Silicon Gate (RSG) process, which provides an immunity to Single Event Latch-up and the capability of highly reliable performance in any radiation environment.

**Specifications for Rad Hard QML devices are controlled by the Defense Logistics Agency Land and Maritime (DLA). The SMD numbers listed below must be used when ordering.**

**Detailed Electrical Specifications for the HS-139RH, HS-139EH are contained in [SMD 5962-98613](#). A "hot-link" is provided on our homepage with instructions for downloading. [www.intersil.com/spacedefense/newsafclasst.asp](http://www.intersil.com/spacedefense/newsafclasst.asp)**

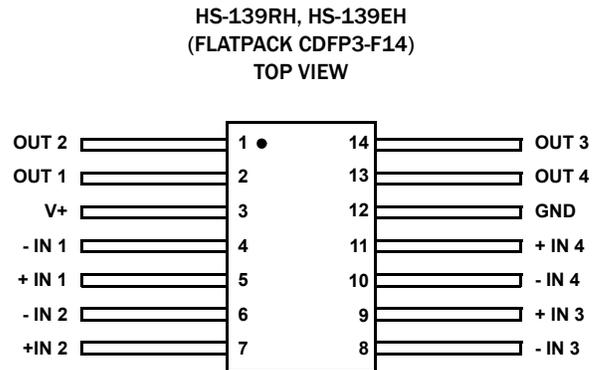
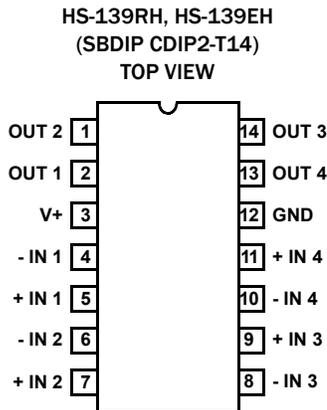
**Features**

- QML qualified per MIL-PRF-38535 requirements
- Radiation environment
  - Latch-up free under any conditions
  - Total dose (Max) . . . . .  $3 \times 10^5$  RAD(Si)
  - SEU LET threshold . . . . . 20MeV/cm<sup>2</sup>/mg
  - Low dose rate effects immunity
- 100V output voltage withstand capability
- ESD protection to >3000V
- Differential input voltage range equal to the supply voltage
- Input offset voltage (V<sub>IO</sub>) . . . . . 2mV (Max)
- Quiescent supply current . . . . . 2mA (Max)
- Pb-Free (RoHS Compliant)

**Applications**

- Pulse generators
- Timing circuitry
- Level shifting
- Analog-to-digital conversion

**Pin Configurations**



## Ordering Information

ORDERING SMD NUMBER (Note 1)	PART NUMBER (Note 2)	PART MARKING	TEMP. RANGE (°C)	PACKAGE (RoHS Compliant)	PKG. DWG. #
5962F9861303VCC	HS1-139EH-Q	Q 5962F98 61303VCC	-55 to +125	14 Ld SBDIP	D14.3
5962F9861301VCC	HS1-139RH-Q	Q 5962F98 61301VCC	-55 to +125	14 Ld SBDIP	D14.3
5962F9861301QCC	HS1-139RH-8	Q 5962F98 61301QCC	-55 to +125	14 Ld SBDIP	D14.3
HS1-139RH/PROTO	HS1-139RH/PROTO	HS1-139RH/PROTO	-55 to +125	14 Ld SBDIP	D14.3
5962F9861301VXC	HS9-139RH-Q	Q 5962F98 61301VXC	-55 to +125	14 Ld FLATPACK	K14.A
5962F9861301QXC	HS9-139RH-8	Q 5962F98 61301QXC	-55 to +125	14 Ld FLATPACK	K14.A
5962F9861303VXC	HS9-139EH-Q	Q 5962F98 61303VXC	-55 to +125	14 Ld FLATPACK	K14.A
HS9-139RH/PROTO	HS9-139RH/PROTO	HS9-139RH /PROTO	-55 to +125	14 Ld FLATPACK	K14.A
5962F9861303V9A	HS0-139EH-Q		-55 to +125	Die	
5962F9861301V9A	HS0-139RH-Q		-55 to +125	Die	
HS0-139RH/SAMPLE	HS0-139RH/SAMPLE		-55 to +125	Die	

## NOTES:

- Specifications for Rad Hard QML devices are controlled by the Defense Logistics Agency Land and Maritime (DLA). The SMD numbers listed in the "Ordering Information" table on page 2 must be used when ordering.
- These Intersil Pb-free Hermetic packaged products employ 100% Au plate - e4 termination finish, which is RoHS compliant and compatible with both SnPb and Pb-free soldering operations.

## Die Characteristics

### DIE DIMENSIONS:

3750 $\mu$ m x 2820 $\mu$ m (148 mils x 111 mils)  
483 $\mu$ m  $\pm$ 25.4 $\mu$ m (19 mils  $\pm$ 1 mil)

### INTERFACE MATERIALS:

#### Glassivation:

Type: Silox (SiO<sub>2</sub>)  
Thickness: 8.0kÅ  $\pm$ 1.0kÅ

#### Top Metallization:

Type: AlSiCu  
Thickness: 16.0kÅ  $\pm$ 2kÅ

### Substrate:

Radiation Hardened Silicon Gate, Dielectric Isolation

### Backside Finish:

Silicon

### ASSEMBLY RELATED INFORMATION:

#### Substrate Potential:

Unbiased (DI)

#### ADDITIONAL INFORMATION:

#### Worst Case Current Density:

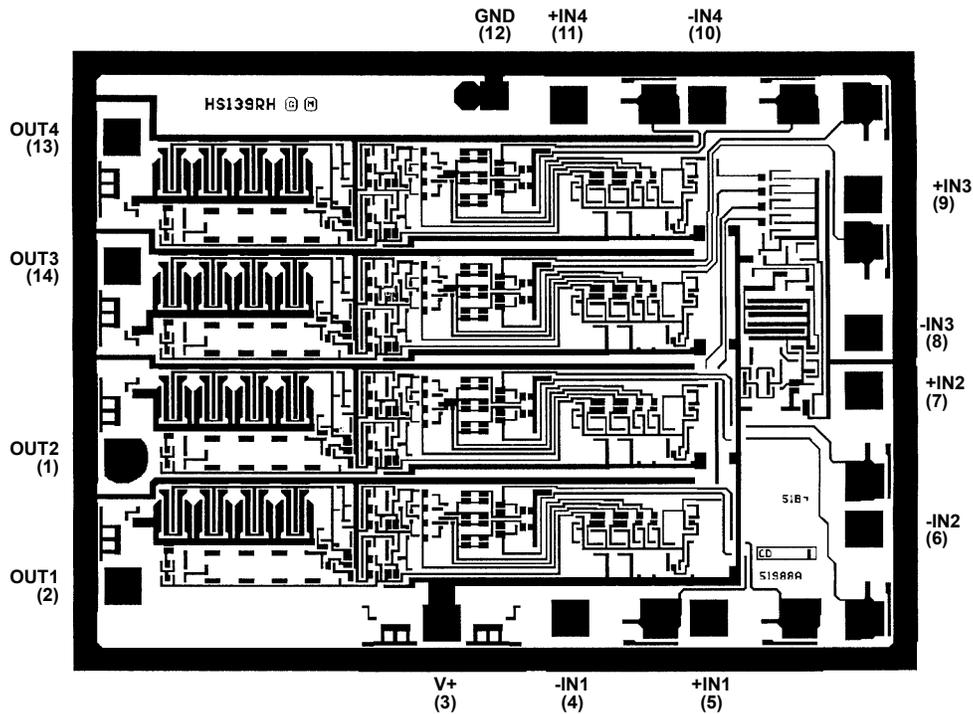
$<2.0 \times 10^5$  A/cm<sup>2</sup>

#### Transistor Count:

49

## Metallization Mask Layout

HS-139RH, HS-139EH



**TABLE 1. HS-139RH, HS-139EH PAD COORDINATES**

PIN NUMBER	PAD NAME	RELATIVE TO PIN 1	
		X COORDINATES	Y COORDINATES
1	OUT 2	0	0
2	OUT 1	0	-535
3	V+	1323	-688
4	-IN 1	1862	-670
5	+IN 1	2439	-670
6	-IN 2	3084	-299
7	+IN 2	3084	278
8	-IN 3	3084	518
9	+IN 3	3084	1095
10	-IN 4	2439	1466
11	+IN 4	1862	1466
12	GND	1550	1503
13	OUT 4	0	1331
14	OUT 3	0	796

NOTE: Dimensions in microns

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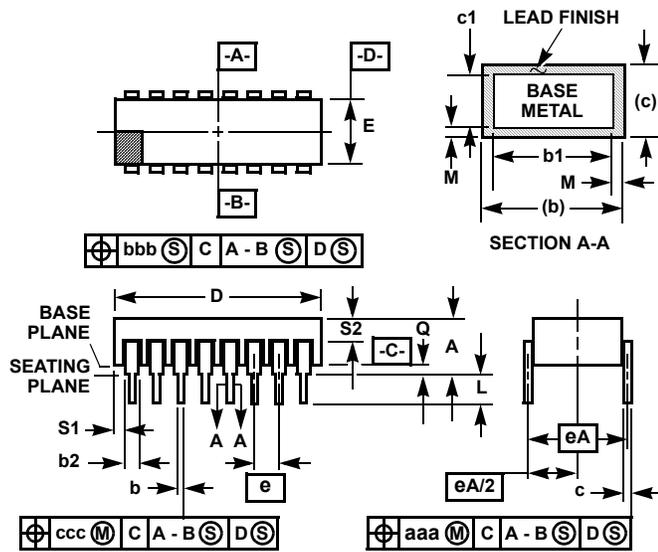
For additional products, see [www.intersil.com/en/products.html](http://www.intersil.com/en/products.html)

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**Ceramic Dual-In-Line Metal Seal Packages (SBDIP)**



**D14.3 MIL-STD-1835 CDIP2-T14 (D-1, CONFIGURATION C)  
14 LEAD CERAMIC DUAL-IN-LINE METAL SEAL PACKAGE**

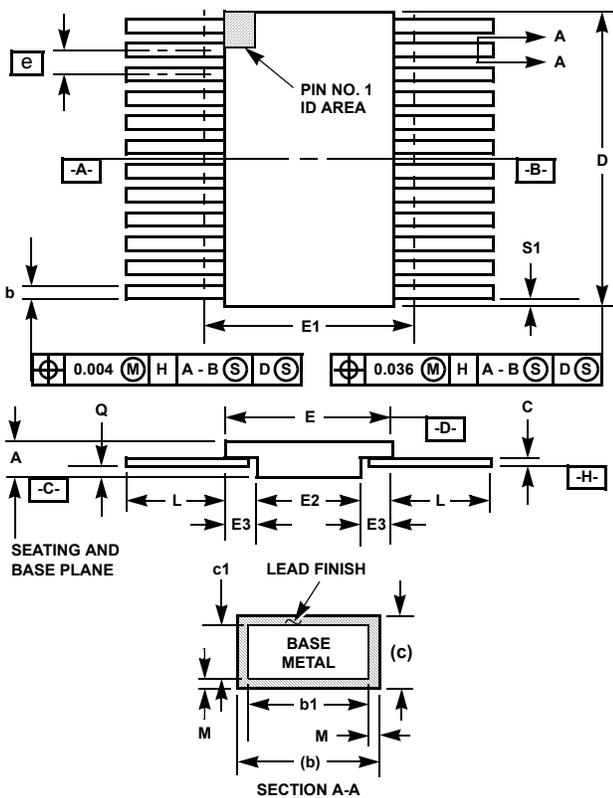
SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.200	-	5.08	-
b	0.014	0.026	0.36	0.66	2
b1	0.014	0.023	0.36	0.58	3
b2	0.045	0.065	1.14	1.65	-
b3	0.023	0.045	0.58	1.14	4
c	0.008	0.018	0.20	0.46	2
c1	0.008	0.015	0.20	0.38	3
D	-	0.785	-	19.94	-
E	0.220	0.310	5.59	7.87	-
e	0.100 BSC		2.54 BSC		-
eA	0.300 BSC		7.62 BSC		-
eA/2	0.150 BSC		3.81 BSC		-
L	0.125	0.200	3.18	5.08	-
Q	0.015	0.060	0.38	1.52	5
S1	0.005	-	0.13	-	6
S2	0.005	-	0.13	-	7
$\alpha$	90 <sup>0</sup>	105 <sup>0</sup>	90 <sup>0</sup>	105 <sup>0</sup>	-
aaa	-	0.015	-	0.38	-
bbb	-	0.030	-	0.76	-
ccc	-	0.010	-	0.25	-
M	-	0.0015	-	0.038	2
N	14		14		8

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**NOTES:**

- Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark.
- The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
- Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness.
- Corner leads (1, N, N/2, and N/2+1) may be configured with a partial lead paddle. For this configuration dimension b3 replaces dimension b2.
- Dimension Q shall be measured from the seating plane to the base plane.
- Measure dimension S1 at all four corners.
- Measure dimension S2 from the top of the ceramic body to the nearest metallization or lead.
- N is the maximum number of terminal positions.
- Braze fillets shall be concave.
- Dimensioning and tolerancing per ANSI Y14.5M - 1982.
- Controlling dimension: INCH.

**Ceramic Metal Seal Flatpack Packages (Flatpack)**



**K14.A MIL-STD-1835 CDFP3-F14 (F-2A, CONFIGURATION B)  
14 LEAD CERAMIC METAL SEAL FLATPACK PACKAGE**

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.045	0.115	1.14	2.92	-
b	0.015	0.022	0.38	0.56	-
b1	0.015	0.019	0.38	0.48	-
c	0.004	0.009	0.10	0.23	-
c1	0.004	0.006	0.10	0.15	-
D	-	0.390	-	9.91	3
E	0.235	0.260	5.97	6.60	-
E1	-	0.290	-	7.11	3
E2	0.125	-	3.18	-	-
E3	0.030	-	0.76	-	7
e	0.050 BSC		1.27 BSC		-
k	0.008	0.015	0.20	0.38	2
L	0.270	0.370	6.86	9.40	-
Q	0.026	0.045	0.66	1.14	8
S1	0.005	-	0.13	-	6
M	-	0.0015	-	0.04	-
N	14		14		-

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**NOTES:**

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark. Alternately, a tab (dimension k) may be used to identify pin one.
2. If a pin one identification mark is used in addition to a tab, the limits of dimension k do not apply.
3. This dimension allows for off-center lid, meniscus, and glass over-run.
4. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
5. N is the maximum number of terminal positions.
6. Measure dimension S1 at all four corners.
7. For bottom-brazed lead packages, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
8. Dimension Q shall be measured at the point of exit (beyond the meniscus) of the lead from the body. Dimension Q minimum shall be reduced by 0.0015 inch (0.038mm) maximum when solder dip lead finish is applied.
9. Dimensioning and tolerancing per ANSI Y14.5M - 1982.
10. Controlling dimension: INCH.