

## HS-3530ARH, HS-3530AEH

Radiation Hardened Programmable Low Power Op Amps

FN4653  
Rev 4.00  
Jun 18, 2018

The [HS-3530ARH](#) and [HS-3530AEH](#) are low power operational amplifiers, which are internally compensated monolithic devices offering a wide range of performance specifications. Parameters such as power dissipation, slew rate, bandwidth, noise, and input DC parameters are programmed by selecting an external resistor or current source. Supply voltages as low as  $\pm 3V$  may be used with little degradation of AC performance. Operation from  $-55^{\circ}C$  to  $+125^{\circ}C$  is ensured.

A major advantage of the HS-3530ARH, HS-3530AEH is that operating characteristics remain virtually constant over a wide supply range ( $\pm 3V$  to  $\pm 15V$ ), allowing the amplifiers to offer maximum performance in almost any system, including battery operated equipment. A primary application for these devices is in active filtering and conditioning for a wide variety of signals that differ in frequency and amplitude. By modulating the set current, they can be used for designs such as current controlled oscillators/modulators, sample and hold circuits, and variable active filters.

## Related Literature

For a full list of related documents, visit our website

- [HS-3530ARH](#), [HS-3530AEH](#) product pages

## Features

- Radiation performance
  - Single event latch-up . . . . . Immune (RSG DI Process)
  - High dose rate (50-300rad(Si)/s) . . . . . 300krad(Si)
  - Low dose rate (0.01rad(Si)/s) . . . . . 50krad(Si)
- Wide range AC programming
  - Slew rate . . . . . 0.025 to 0.1V/ $\mu$ s
  - Gain X bandwidth . . . . . 30kHz to 750kHz
- Wide range DC programming
  - Power supply range . . . . .  $\pm 3.0V$  to  $\pm 15V$
- Supply current . . . . . 15 $\mu$ A to 150 $\mu$ A
- Output current . . . . . 0.25mA to 2.5mA
- Quiescent power. . . . . 4.8mW (max)
- Dielectrically isolated device islands
- Short-circuit protection
- Full  $-55^{\circ}C$  to  $+125^{\circ}C$  military temperature range
- Electrically screened to SMD [5962-95687](#)

## Ordering Information

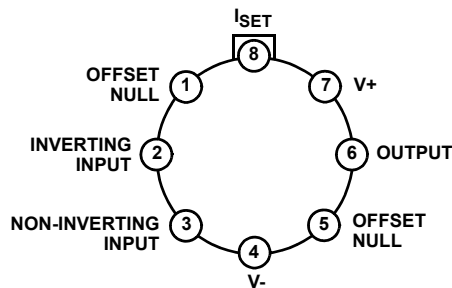
ORDERING NUMBER (Notes 1, 2)	PART NUMBER	Radiation Hardness		TEMP. RANGE (°C)	PACKAGE (RoHS COMPLIANT)	PKG. DWG. #
		HDR	LDR			
5962F9568701QGA	HS2-3530ARH-8	100krad(Si)	-	-55 to +125	8 LD METAL CAN	T8.C
5962F9568701VGA	HS2-3530ARH-Q	100krad(Si)	-	-55 to +125	8 LD METAL CAN	T8.C
5962F9568702VGA	HS2-3530AEH-Q	100krad(Si)	50krad(Si)	-55 to +125	8 LD METAL CAN	T8.C
5962F9568701VXC	HS9-3530ARH-Q	100krad(Si)	-	-55 to +125	10 LD FLATPACK, SOLDER SL	K10.A
5962F9568702VXC	HS9-3530AEH-Q	100krad(Si)	50krad(Si)	-55 to +125	10 LD FLATPACK, SOLDER SL	K10.A
5962F9568701V9A	HSO-3530ARH-Q	100krad(Si)	-	-55 to +125	DIE	-
5962F9568702V9A	HSO-3530AEH-Q	100krad(Si)	50krad(Si)	-55 to +125	DIE	-
HS2-3530ARH/PROTO (Note 3)	HS2-3530ARH/PROTO		-	-55 to +125	8 LD METAL CAN	T8.C
HS9-3530ARH/PROTO (Note 3)	HS9-3530ARH/PROTO		-	-55 to +125	10 LD FLATPACK, SOLDER SL	K10.A
HSO-3530ARH/SAMPLE (Note 3)	HSO-3530ARH/SAMPLE		-	-55 to +125	DIE	-

**NOTES:**

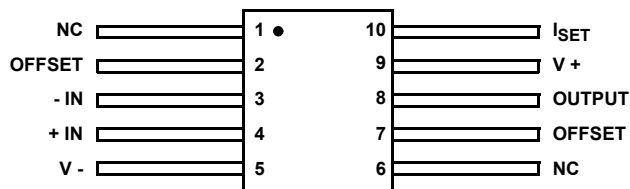
1. These Pb-free Hermetic packaged products employ 100% Au plate - e4 termination finish, which is RoHS compliant and compatible with both SnPb and Pb-free soldering operations.
2. Specifications for Rad Hard QML devices are controlled by the Defense Logistics Agency Land and Maritime (DLA). The SMD numbers listed must be used when ordering.
3. The /PROTO and /SAMPLE are not rated or certified for Total Ionizing Dose (TID) or Single Event Effect (SEE) immunity. These parts are intended for engineering evaluation purposes only. The /PROTO parts meet the electrical limits and conditions across the temperature range specified in the DLA SMD and are in the same form and fit as the qualified device. The /SAMPLE die is capable of meeting the electrical limits and conditions specified in the DLA SMD at +25°C only. The /SAMPLE is a die and does not receive 100% screening across the temperature range to the DLA SMD electrical limits. These part types do not come with a certificate of conformance because there is no radiation assurance testing and they are not DLA qualified devices.

## Pin Configurations

HS2-3530ARH, HS2-3530AEH (CAN), MACY1-X8  
TOP VIEW



HS9-3530ARH, HS9-3530AEH(FLATPACK), CDFP3-F10  
TOP VIEW



## Die Characteristics

### DIE DIMENSIONS:

1720µm x 1390µm x 483µm ±25.4µm  
(68 mils x 55 mils x 19 mils ±1 mil)

### INTERFACE MATERIALS

#### GLASSIVATION

Type: Silox (SiO<sub>2</sub>)  
Thickness: 8.0kÅ ±1.0kÅ

#### TOP METALLIZATION

Type: AlSiCu  
Thickness: 16.0kÅ ±2kÅ

#### SUBSTRATE:

Radiation Hardened Silicon Gate,  
Dielectric Isolation

#### BACKSIDE FINISH:

Silicon

## ASSEMBLY RELATED INFORMATION

### SUBSTRATE POTENTIAL:

Unbiased (DI)

### ADDITIONAL INFORMATION

### WORST CASE CURRENT DENSITY:

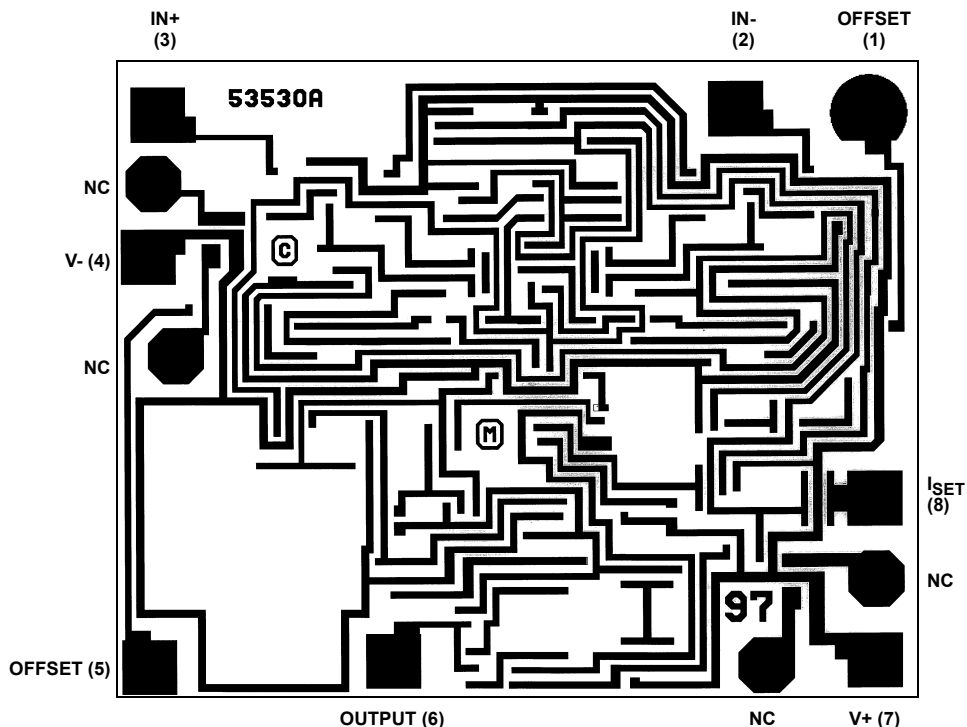
<2.0 x 10<sup>5</sup> A/cm<sup>2</sup>

### TRANSISTOR COUNT:

49

## Metallization Mask Layout Pin Numbers shown are for the Can Package

HS-3530ARH, HS-3530AEH



## Revision History

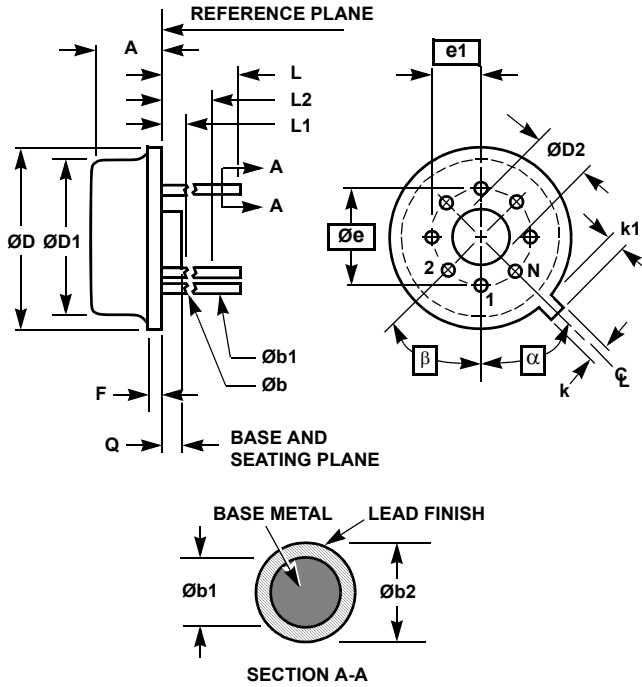
The revision history provided is for informational purposes only and is believed to be accurate, but not warranted. Please visit our website to make sure you have the latest revision.

DATE	REVISION	CHANGE
Jun 18, 2018	FN4653.4	Added Related Literature section. Moved information from Specifications section to Ordering Information on page 2. Added footnotes and packaging information to Ordering Information on page 2. Updated Die Dimensions on page 2. Removed About Intersil section and added new disclaimer.
Feb 9, 2015	FN4653.3	Added Rev History and About Intersil Verbiage. Updated datasheet by removing sentence that was not in compliance.

# Package Outline Drawing

For the most recent package outline drawing, see [T8.C](#).

## Metal Can Packages (Can)



**T8.C MIL-STD-1835 MACY1-X8 (A1)**  
**8 LEAD METAL CAN PACKAGE**

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.165	0.185	4.19	4.70	-
Øb	0.016	0.019	0.41	0.48	1
Øb1	0.016	0.021	0.41	0.53	1
Øb2	0.016	0.024	0.41	0.61	-
ØD	0.335	0.375	8.51	9.40	-
ØD1	0.305	0.335	7.75	8.51	-
ØD2	0.110	0.160	2.79	4.06	-
e	0.200 BSC		5.08 BSC		-
e1	0.100 BSC		2.54 BSC		-
F	-	0.040	-	1.02	-
k	0.027	0.034	0.69	0.86	-
k1	0.027	0.045	0.69	1.14	2
L	0.500	0.750	12.70	19.05	1
L1	-	0.050	-	1.27	1
L2	0.250	-	6.35	-	1
Q	0.010	0.045	0.25	1.14	-
α	45° BSC		45° BSC		3
β	45° BSC		45° BSC		3
N	8		8		4

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**NOTES:**

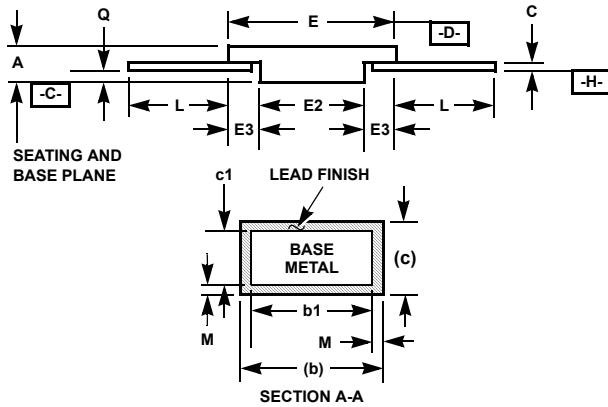
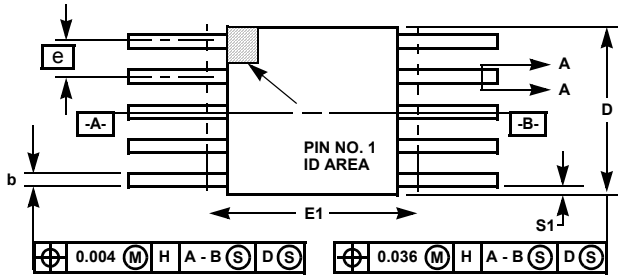
- (All leads) Øb applies between L1 and L2. Øb1 applies between L2 and 0.500 from the reference plane. Diameter is uncontrolled in L1 and beyond 0.500 from the reference plane.
- Measured from maximum diameter of the product.
- α is the basic spacing from the centerline of the tab to terminal 1 and β is the basic spacing of each lead or lead position (N - 1 places) from α, looking at the bottom of the package.
- N is the maximum number of terminal positions.
- Dimensioning and tolerancing per ANSI Y14.5M - 1982.
- Controlling dimension: INCH.

# Package Outline Drawing

For the most recent package outline drawing, see [K10.A](#).

## Ceramic Metal Seal Flatpack Packages (Flatpack)

**K10.A MIL-STD-1835 CDFP3-F10 (F-4A, CONFIGURATION B)  
10 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	-	0.290	-	7.37	3
E	0.240	0.260	6.10	6.60	-
E1	-	0.280	-	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	0.250	0.370	6.35	9.40	-
Q	0.026	0.045	0.66	1.14	8
S1	0.005	-	0.13	-	6
M	-	0.0015	-	0.04	-
N	10		10		-

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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 overrun.
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.

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