

OBSOLETE PRODUCT
NO RECOMMENDED REPLACEMENT
contact our Technical Support Center at
1-888-INTERSIL or www.intersil.com/tsc

ctober 11, 2004

FN3735.3

10nA (Typ)

# Uncompensated, High Slew Rate Operational Amplifier

The HA-2520/883 is a monolithic operational amplifier which delivers an unsurpassed combination of specifications for slew rate, bandwidth and settling time. This dielectrically isolated amplifier is designed for closed loop gains of 3 or greater without external compensation. In addition, this high performance component also provides low offset current and high input impedance.

The 100V/μs (min) slew rate and fast settling time of this amplifier make it ideal for pulse amplification and data acquisition designs. To insure compliance with slew rate and transient response specifications, the device is 100% tested for AC performance characteristics over full temperature. This device is a valuable component for RF and video circuitry requiring wideband operation. For accurate signal conditioning designs, the HA-2520/883's superior dynamic specifications are complemented by 25nA (max) offset current and offset voltage adjust capability.

#### Part Number Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
HA2-2520/883	-55°C to +125°C	8 Pin Can	T8.C

# **Applications**

- Data Acquisition Systems
- RF Amplifiers
- Video Amplifiers
- Signal Generators
- Pulse Amplification

#### **Features**

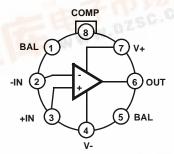
 This Circuit is Processed in Accordance to MIL-STD-883 and is Fully Conformant Under the Provisions of Paragraph 1.2.1.

•	High Slew Rate	100V/μs (Min)
		120V/us (Min)

- Wide Power Bandwidth . . . . . . . . . 1.5MHz (Min)
- High Input Impedance . . . . . . . . . . . . 50M $\Omega$  (Min)
- Fast Settling (0.1% of 10V Step) . . . . . . . . 200ns (Typ)
- Low Quiescent Supply Current . . . . . . . . 6mA (Max)

#### **Pinout**

HA-2520/883 (METAL CAN) TOP VIEW





#### HA-2520/883

#### **Absolute Maximum Ratings**

# Voltage Between V+ and V- Terminals .40V Differential Input Voltage .15V Voltage at Either Input Terminal V+ to V Peak Output Current .50mA Junction Temperature +175°C Storage Temperature Range -65°C to +150°C ESD Rating <2000V</td> Lead Temperature (Soldering 10s) +300°C

#### **Thermal Information**

Thermal Resistance	$\theta_{JA}$	$\theta$ JC
Thermal Resistance Metal Can Package	160°C/W	75°C/W
Package Power Dissipation Limit at +75°C fo	r T <sub>J</sub> ≤ +175 <sup>0</sup>	C C
Metal Can Package		625mW
Package Power Dissipation Derating Factor A	Above +75 <sup>0</sup> 0	)
Metal Can Package		6.3mW/ <sup>o</sup> C

# **Operating Conditions**

Operating Temperature Range	55 <sup>o</sup> C to +125 <sup>o</sup> C	$V_{INCM} \le 1/2 (V + - V -)$
Operating Supply Voltage	±15V	$R_L \ge 2k\Omega$

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

θ<sub>JA</sub> is measured with the component mounted on a low effective thermal conductivity test board in free air. See Tech Brief TB379 for details.

#### TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at:  $V_{SUPPLY} = \pm 15V$ ,  $R_{SOURCE} = 100\Omega$ ,  $R_{LOAD} = 500k\Omega$ ,  $V_{OUT} = 0V$ , Unless Otherwise Specified.

			GROUP A		HA-2520/883		
PARAMETERS	SYMBOL	CONDITIONS	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Input Offset	$V_{IO}$	V <sub>CM</sub> = 0V	1	+25 <sup>o</sup> C	-8	8	mV
Voltage			2, 3	+125°C, -55°C	-10	10	mV
Input Bias Current	+l <sub>B</sub>	$V_{CM} = 0V, +R_S = 100k\Omega, -R_S = 100\Omega$	1	+25 <sup>o</sup> C	-200	200	nA
			2, 3	+125°C, -55°C	-400	400	nA
	-I <sub>B</sub>	$V_{CM} = 0V, +R_S = 100\Omega, -R_S = 100k\Omega$	1	+25 <sup>o</sup> C	-200	200	nA
			2, 3	+125°C, -55°C	-400	400	nA
Input Offset	I <sub>IO</sub>	$V_{CM} = 0V, +R_S = 100k\Omega, -R_S = 100k\Omega$	1	+25 <sup>o</sup> C	-25	25	nA
Current			2, 3	+125°C, -55°C	-50	50	nA
Common Mode	+CMR	V+ = 5V, V- = -25V	1	+25°C	+10	-	V
Range			2, 3	+125°C, -55°C	+10	-	V
	-CMR	V+ = 25V, V- = -5V	1	+25 <sup>0</sup> C	-	-10	V
			2, 3	+125°C, -55°C	-	-10	V
Large Signal	+A <sub>VOL</sub>	$V_{OUT} = 0V$ and +10V, $R_L = 2k\Omega$	4	+25 <sup>o</sup> C	10	-	kV/V
Voltage Gain			5, 6	+125°C, -55°C	7.5	-	kV/V
	-A <sub>VOL</sub>	$V_{OUT} = 0V$ and -10V, $R_L = 2k\Omega$	4	+25°C	10	-	kV/V
			5, 6	+125°C, -55°C	7.5	-	kV/V
Common Mode	+CMRR	$\Delta V_{CM} = +10V$ , $V+ = +5V$ , $V- = -25V$ ,	1	+25°C	80	-	dB
Rejection Ratio		V <sub>OUT</sub> = -10V	2, 3	+125°C, -55°C	80	-	dB
	-CMRR	$\Delta V_{CM} = -10V$ , $V + = +25V$ , $V - = -5V$ ,	1	+25°C	80	-	dB
		V <sub>OUT</sub> = +10V	2, 3	+125°C, -55°C	80	-	dB
Output Voltage	+V <sub>OUT</sub>	$R_L = 2k\Omega$	4	+25°C	10	-	V
Swing			5, 6	+125°C, -55°C	10	-	V
	-V <sub>OUT</sub>	$R_L = 2k\Omega$	4	+25°C	-	-10	V
			5, 6	+125°C, -55°C	-	-10	V

-----

# HA-2520/883

#### TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at:  $V_{SUPPLY} = \pm 15V$ ,  $R_{SOURCE} = 100\Omega$ ,  $R_{LOAD} = 500k\Omega$ ,  $V_{OUT} = 0V$ , Unless Otherwise Specified.

			GROUP A		HA-2520/883		
PARAMETERS	SYMBOL	CONDITIONS	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Output Current	+l <sub>OUT</sub>	V <sub>OUT</sub> = -10V	4	+25°C	10	-	mA
			5, 6	+125°C, -55°C	7.5	-	mA
	-lout	V <sub>OUT</sub> = +10V	4	+25°C	-	-10	mA
			5, 6	+125°C, -55°C	-	-7.5	mA
Quiescent Power	+I <sub>CC</sub>	V <sub>OUT</sub> = 0V, I <sub>OUT</sub> = 0mA	1	+25°C	-	6	mA
Supply Current  -I <sub>CC</sub>			2, 3	+125°C, -55°C	-	6.5	mA
	-lcc	V <sub>OUT</sub> = 0V, I <sub>OUT</sub> = 0mA	1	+25°C	-6	-	mA
			2, 3	+125°C, -55°C	-6.5	-	mA
Power Supply	+PSRR	$\Delta V_{SUP} = 10V, V_{+} = +20V, V_{-} = -15V, V_{+}$	1	+25°C	80	-	dB
Rejection Ratio	ection Ratio = +10V, V- = -15V	= +10V, V- = -15V	2, 3	+125°C, -55°C	80	-	dB
	-PSRR	$\Delta V_{SUP} = 10V, V+ = +15V, V- = -20V, V+$	1	+25°C	80	-	dB
		= +15V, V- = -10V	2, 3	+125°C, -55°C	80	-	dB
Offset Voltage	+V <sub>IO</sub> Adj	Note 1	1	+25 <sup>o</sup> C	V <sub>IO</sub> -1	-	mV
Adjustment			2, 3	+125°C, -55°C	V <sub>IO</sub> -1	-	mV
	-V <sub>IO</sub> Adj	Note 1	1	+25°C	V <sub>IO</sub> +1	-	mV
			2, 3	+125°C, -55°C	V <sub>IO</sub> +1	-	mV

#### NOTE:

#### TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at:  $V_{SUPPLY} = \pm 15V$ ,  $R_{SOURCE} = 50\Omega$ ,  $R_{LOAD} = 2k\Omega$ ,  $C_{LOAD} = 50pF$ ,  $A_{VCL} = +3V/V$ , Unless Otherwise Specified.

		GROUP A		HA-2520/883			
PARAMETERS	SYMBOL	CONDITIONS	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Slew Rate	+SR	V <sub>OUT</sub> = -5V to +5V, 25% ≤ +SR ≤ 75%	7	+25 <sup>o</sup> C	100	-	V/μs
			8A, 8B	+125°C, -55°C	84	-	V/µs
	-SR	$V_{OUT} = +5V \text{ to } -5V, 75\% \ge -SR \ge 25\%$	7	+25 <sup>o</sup> C	100	-	V/μs
			8A, 8B	+125°C, -55°C	84	-	V/μs
Rise and Fall Time	T <sub>R</sub>	$V_{OUT} = 0 \text{ to } +200 \text{mV}, \ 10\% \le T_R \le 90\%$	7	+25°C	-	50	ns
			8A, 8B	+125°C, -55°C	-	55	ns
	T <sub>F</sub>	$V_{OUT} = 0$ to -200mV, $10\% \le T_F \le 90\%$	7	+25 <sup>o</sup> C	-	50	ns
			8A, 8B	+125°C, -55°C	-	55	ns
Overshoot	+OS	V <sub>OUT</sub> = 0 to +200mV	7	+25 <sup>o</sup> C	-	40	%
			8A, 8B	+125°C, -55°C	-	45	%
	-OS	V <sub>OUT</sub> = 0 to -200mV	7	+25°C	-	40	%
			8A, 8B	+125°C, -55°C	-	45	%

---

 $<sup>2. \ \</sup> Offset\ adjustment\ range\ is\ [V_{IO}(Measured)\pm 1mV]\ minimum\ referred\ to\ output.\ This\ test\ is\ for\ functionality\ only\ to\ assure\ adjustment\ through\ 0V.$ 

# HA-2520/883

#### **TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS**

Device Characterized at:  $V_{SUPPLY} = \pm 15V$ ,  $R_{LOAD} = 2k\Omega$ ,  $C_{LOAD} = 50pF$ ,  $A_V \ge 3$ ,  $C_{COMP} = 0pF$ , Unless Otherwise Specified.

					HA-2520/883			
PARAMETERS	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS	
Differential Input Resistance	R <sub>IN</sub>	V <sub>CM</sub> = 0V	1	+25 <sup>0</sup> C	50	-	ΜΩ	
Full Power	GBWP	$V_{O} = 200 \text{mV}, f_{O} = 10 \text{kHz}$	1	+25 <sup>o</sup> C	10	-	MHz	
Bandwidth		$V_O = 200$ mV, $f_O = 1$ MHz	1	+25°C	10	-	MHz	
Full Power Bandwidth	FPBW	V <sub>PEAK</sub> = 10V	1, 2	+25 <sup>o</sup> C	1.6	-	MHz	
Minimum Closed Loop Stable Gain	CLSG	$R_L = 2k\Omega$ , $C_L = 50pF$	1	-55°C to +125°C	+3	-	V/V	
Quiescent Power Consumption	PC	V <sub>OUT</sub> = 0V, I <sub>OUT</sub> = 0mA	1, 3	-55°C to +125°C	-	195	mW	

#### NOTES:

- 3. Parameters listed in Table 3 are controlled via design or process parameters and are not directly tested at final production. These parameters are lab characterized upon initial design release, or upon design changes. These parameters are guaranteed by characterization based upon data from multiple production runs which reflect lot to lot and within lot variation.
- 4. Full Power Bandwidth guarantee based on Slew Rate measurement using FPBW = Slew Rate/ $(2\pi V_{PEAK})$ .
- 5. Quiescent Power Consumption based upon Quiescent Supply Current test maximum. (No load on outputs.)

#### **TABLE 4. ELECTRICAL TEST REQUIREMENTS**

MIL-STD-883 TEST REQUIREMENTS	SUBGROUPS (SEE TABLES 1 AND 2)
Interim Electrical Parameters (Pre Burn-In)	1
Final Electrical Test Parameters	1 (Note 4), 2, 3, 4, 5, 6, 7, 8A, 8B
Group A Test Requirements	1, 2, 3, 4, 5, 6, 7, 8A, 8B
Groups C and D Endpoints	1

# NOTE:

6. PDA applies to Subgroup 1 only.

-----

# Die Characteristics

#### **DIE DIMENSIONS:**

67 x 57 x 19 mils  $\pm$  1 mils 1700 x 1440 x 483 $\mu$ m  $\pm$  25.4 $\mu$ m

#### **METALLIZATION:**

Type: Al, 1% Cu Thickness:  $16k\mathring{A} \pm 2k\mathring{A}$ 

#### **GLASSIVATION:**

Type: Nitride (Si3N4) over Silox (SiO2, 5% Phos.)

Silox Thickness:  $12k\text{\AA} \pm 2k\text{\AA}$ Nitride Thickness:  $3.5k\text{\AA} \pm 1.5k\text{\AA}$ 

#### **WORST CASE CURRENT DENSITY:**

 $0.26 \times 10^5 \text{ A/cm}^2$ 

# SUBSTRATE POTENTIAL (Powered Up):

Unbiased

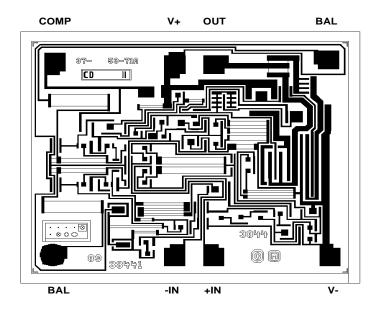
#### TRANSISTOR COUNT:

HA-2520/883: 40

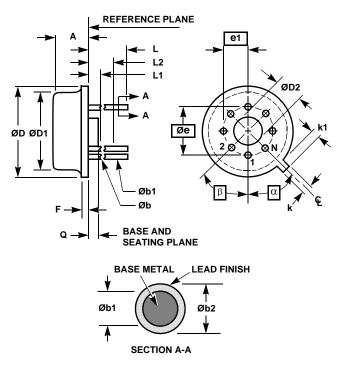
#### PROCESS:

Bipolar Dielectric Isolation

# Metallization Mask Layout



# Metal Can Packages (Can)



#### 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.
- 2. Measured from maximum diameter of the product.
- 3.  $\alpha$  is the basic spacing from the centerline of the tab to terminal 1 and  $\beta$  is the basic spacing of each lead or lead position (N -1 places) from  $\alpha$ , looking at the bottom of the package.
- 4. N is the maximum number of terminal positions.
- 5. Dimensioning and tolerancing per ANSI Y14.5M 1982.
- 6. Controlling dimension: INCH.

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

	INC	HES	MILLIN		
SYMBOL	MIN	MAX	MIN	MAX	NOTES
Α	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	-
е	0.200	BSC	5.08	-	
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 <sup>0</sup>	BSC	45 <sup>0</sup>	BSC	3
β	45 <sup>0</sup>	BSC	45 <sup>0</sup>	BSC	3
N	8	3		8	4

Rev. 0 5/18/94

All Intersil U.S. products are manufactured, assembled and tested utilizing ISO9000 quality systems. Intersil Corporation's quality certifications can be viewed at www.intersil.com/design/quality

Intersil products are sold by description only. Intersil Corporation reserves the right to make changes in circuit design, software and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Intersil is believed to be accurate and reliable. However, no responsibility is assumed by Intersil or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Intersil or its subsidiaries.

For information regarding Intersil Corporation and its products, see www.intersil.com

6 :--