250MHz Video Buffer

The HA-5033 is a unity gain monolithic IC designed for any application requiring a fast, wideband buffer. Featuring a bandwidth of 250MHz and outstanding differential phase/gain characteristics, this high performance voltage follower is an excellent choice for video circuit design. Other features, which include a minimum slew rate of 1000V/μs and high output drive capability, make the HA-5033 applicable for line driver and high speed data conversion circuits.

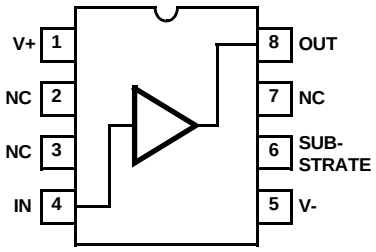
The high performance of this product is a result of the Intersil Dielectric Isolation process. A major feature of this process is that it produces both PNP and NPN high frequency transistors which makes wide bandwidth designs, such as the HA-5033, practical. Alternative process methods typically produce a lower AC performance.

Ordering Information

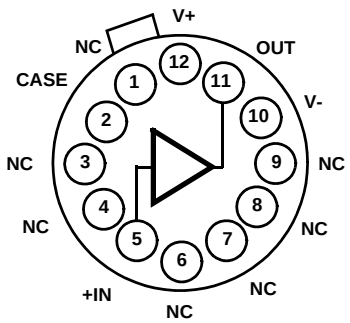
PART NUMBER	PART MARKING	TEMP. RANGE (°C)	PACKAGE	PKG. DWG. #
HA2-5033-2	HA2-5033-2	-55 to 125	12 Pin Metal Can	T12.C
HA3-5033-5	HA3-5033-5	0 to 75	8 Ld PDIP	E8.3

Pinouts

HA-5033 (PDIP)
TOP VIEW



HA-5033 (METAL CAN)
TOP VIEW



Features

- Differential Phase Error . . . . . 0.02 Degrees
- Differential Gain Error 0.03%
- High Slew Rate 1100V/μs
- Wide Bandwidth (Small Signal) 250MHz
- Wide Power Bandwidth . . . . . DC to 17.5MHz
- Fast Rise Time 3ns
- High Output Drive . . . . . ±10V With 100Ω Load
- Wide Power Supply Range . . . . . ±5V to ±16V
- Replace Costly Hybrids

Applications

- Video Buffer
- High Frequency Buffer
- Isolation Buffer
- High Speed Line Driver
- Impedance Matching
- Current Boosters
- High Speed A/D Input Buffers
- Related Literature
  - AN548, Designer's Guide for HA-5033

Absolute Maximum Ratings

Voltage Between V+ and V- Pins. 40V
DC Input Voltage . . . . . V+ to V-
Output Current (Peak) (50ms On/1 Second Off) . . . . . ±200mA
ESD Rating
Human Body Model (Per MIL-STD-883 Method 3015.7) 2000V

Operating Conditions

Temperature Ranges (Note 3)
HA-5033-2 . . . . . -55°C to 125°C
HA-5033-5 . . . . . 0°C to 75°C

Thermal Information

Thermal Resistance (Typical, Note 2)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
Metal Can Package	65	34
PDIP Package	120	N/A

Maximum Junction Temperature (Note 1) . . . . . 175°C
Maximum Junction Temperature (Plastic Packages) . . . . . 150°C
Maximum Storage Temperature Range . . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C

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.

NOTES:

1. Maximum power dissipation, including load conditions, must be designed to maintain the maximum junction temperature below 175°C for the metal can package, and below 150°C for the plastic packages (See Figure 5.).
2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.
3. The maximum operating temperature may have to be derated depending on the output load condition. See Figure 5 for more information.

Electrical Specifications

V_{SUPPLY} = ±12V, R_S = 50Ω, R_L = 100Ω, C_L = 10pF, Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	TEMP. (°C)	HA-5033-2			HA-5033-5			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
INPUT CHARACTERISTICS									
Offset Voltage		25	-	5	15	-	5	15	mV
		Full	-	6	25	-	6	25	mV
Average Offset Voltage Drift		Full	-	33	-	-	33	-	µV/°C
Bias Current		25	-	20	35	-	20	35	µA
		Full	-	30	50	-	30	50	µA
Input Resistance		25	-	3	-	-	3	-	MΩ
Input Capacitance		25	-	1.6	-	-	1.6	-	pF
Input Noise Voltage	10Hz to 100MHz	25	-	20	-	-	20	-	μV_{P-P}
TRANSFER CHARACTERISTICS									
Voltage Gain	R_L = 100Ω	25	0.93	-	-	0.93	-	-	V/V
	R_L = 1kΩ	25	0.93	0.99	-	0.93	0.99	-	V/V
	R_L = 100Ω	Full	0.92	-	-	0.92	-	-	V/V
-3dB Bandwidth		25	-	250	-	-	250	-	MHz
OUTPUT CHARACTERISTICS									
Output Voltage Swing	R_L = 100Ω	Full	±8	±10	-	±8	±10	-	V
	R_L = 1kΩ, V_S = ±15V	Full	±11	±12	-	±11	±12	-	V
Output Current		25	±80	±100	-	±80	±100	-	mA
Output Resistance		25	-	8	-	-	8	-	Ω
Full Power Bandwidth	V_{OUT} = $1V_{RMS}$, R_L = 1kΩ	25	-	146	-	-	146	-	MHz
Full Power Bandwidth (Note 4)		25	15.9	17.5	-	15.9	17.5	-	MHz
TRANSIENT RESPONSE									
Rise Time	V_{OUT} = 500mV	25	-	4.6	-	-	4.6	-	ns
Propagation Delay		25	-	1	-	-	1	-	ns

Electrical Specifications $V_{SUPPLY} = \pm12V$, $R_S = 50\Omega$, $R_L = 100\Omega$, $C_L = 10pF$, Unless Otherwise Specified **(Continued)**

PARAMETER	TEST CONDITIONS	TEMP. (°C)	HA-5033-2			HA-5033-5			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Overshoot		25	-	3	-	-	3	-	%
Slew Rate (Note 4)		25	1	1.1	-	1	1.1	-	V/ns
Settling Time to 0.1%		25	-	50	-	-	50	-	ns
Differential Phase Error (Note 5)		25	-	0.02	-	-	0.02	-	Degree
Differential Gain Error (Note 5)		25	-	0.03	-	-	0.03	-	%
POWER SUPPLY CHARACTERISTICS									
Supply Current		25	-	21	25	-	21	25	mA
		Full	-	21	30	-	21	30	mA
Power Supply Rejection Ratio		Full	54	-	-	54	-	-	dB
Harmonic Distortion	$V_{IN} = 1V_{RMS}$ at 100kHz	25	-	<0.1	-	-	<0.1	-	%

NOTES:

4. $V_{SUPPLY} = \pm15V$, $V_{OUT} = \pm10V$, $R_L = 1k\Omega$.
5. Differential gain and phase error are nonlinear signal distortions found in video systems and are defined as follows: Differential gain error is defined as the change in amplitude at the color subcarrier frequency as the picture signal is varied from blanking to white level. Differential phase error is defined as the change in the phase of the color subcarrier as the picture signal is varied from blanking to white level. $R_L = 300\Omega$.

Test Circuits and Waveforms

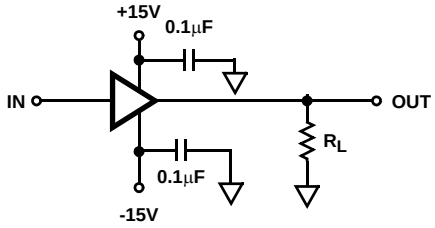


FIGURE 1. SLEW RATE AND SETTLING TIME

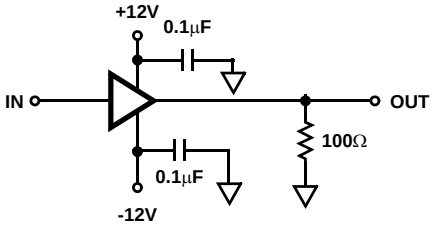


FIGURE 2. TRANSIENT RESPONSE

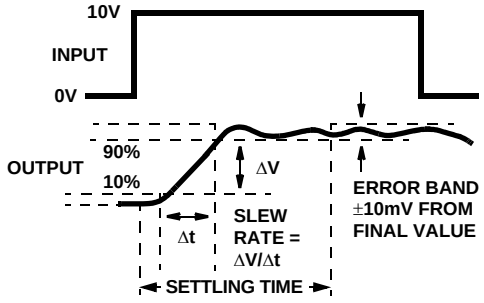


FIGURE 3. SETTLING TIME AND SLEW RATE

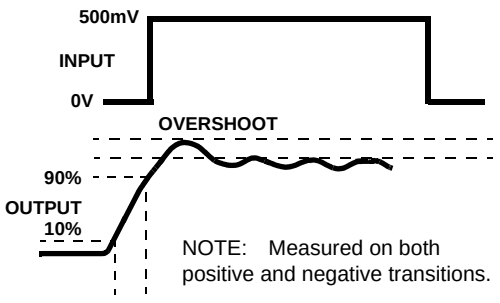
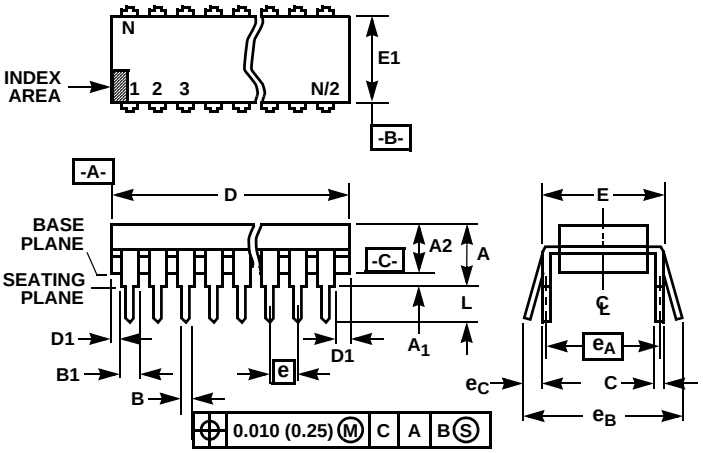


FIGURE 4. RISE TIME AND OVERSHOOT

Dual-In-Line Plastic Packages (PDIP)



NOTES:

1. Controlling Dimensions: INCH. In case of conflict between English and Metric dimensions, the inch dimensions control.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication No. 95.
4. Dimensions A, A1 and L are measured with the package seated in JEDEC seating plane gauge GS-3.
5. D, D1, and E1 dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch (0.25mm).
6. E and e_A are measured with the leads constrained to be perpendicular to datum -C-.
7. e_B and e_C are measured at the lead tips with the leads unconstrained. e_C must be zero or greater.
8. B1 maximum dimensions do not include dambar protrusions. Dambar protrusions shall not exceed 0.010 inch (0.25mm).
9. N is the maximum number of terminal positions.
10. Corner leads (1, N, N/2 and N/2 + 1) for E8.3, E16.3, E18.3, E28.3, E42.6 will have a B1 dimension of 0.030 - 0.045 inch (0.76 - 1.14mm).

E8.3 (JEDEC MS-001-BA ISSUE D)
8 LEAD DUAL-IN-LINE PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.210	-	5.33	4
A1	0.015	-	0.39	-	4
A2	0.115	0.195	2.93	4.95	-
B	0.014	0.022	0.356	0.558	-
B1	0.045	0.070	1.15	1.77	8, 10
C	0.008	0.014	0.204	0.355	-
D	0.355	0.400	9.01	10.16	5
D1	0.005	-	0.13	-	5
E	0.300	0.325	7.62	8.25	6
E1	0.240	0.280	6.10	7.11	5
e	0.100 BSC		2.54 BSC		-
e_A	0.300 BSC		7.62 BSC		6
e_B	-	0.430	-	10.92	7
L	0.115	0.150	2.93	3.81	4
N	8		8		9

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