# HA4344B

350MHz, 4x1 Video Crosspoint Switch with Synchronous Controls

FN3956
Rev 4.00
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The HA4344B is a very wide bandwidth 4x1 crosspoint switch ideal for professional video switching, HDTV, computer display routing, and other high performance applications. This circuit features very low power dissipation, excellent differential gain and phase, high off isolation, symmetric slew rates, fast switching, and latched control signals. When disabled, the output is switched to a high impedance state, making the HA4344B ideal for matrix routers.

The latched control signals allow for synchronized channel switching. When $\overline{CK1}$ is low, the master control latch loads the next switching address (A0, A1, $\overline{CS}$), while the closed (assuming $\overline{CK2}$ is the inverse of $\overline{CK1}$) slave control latch maintains the crosspoint in its current state. $\overline{CK2}$ switching low closes the master latch (with previous assumption), loads the now open slave latch, and switches the crosspoint to the newly selected channel. Channel selection is asynchronous (changes with any control signal change) if both $\overline{CK1}$ and $\overline{CK2}$ are low.

## Ordering Information

| PART NUMBER | PART MARKING | TEMP. RANGE (°C) | PACKAGE | PKG. DWG. # |
|---|---|---|---|---|
| HA4344BCB | HA4344BCB | 0 to 70 | 16 Ld SOIC | M16.15 |
| HA4344BCBZ (Note) | 4344BCBZ | 0 to 70 | 16 Ld SOIC (Pb-free) | M16.15 |
| HA4344BCBZ96 (Note) | 4344BCBZ | 0 to 70 | 16 Ld SOIC Tape & Reel (Pb-free) | M16.15 |

NOTE: Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

## Features

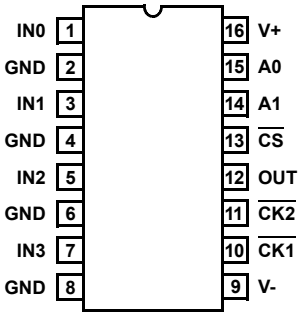
- Low Power Dissipation . . . . . 105mW
- Symmetrical Slew Rates . . . . . 1400V/µs
- 0.1dB Gain Flatness . . . . . 100MHz
- -3dB Bandwidth . . . . . 350MHz
- Off Isolation (100MHz) . . . . . 70dB
- Crosstalk Rejection (30MHz) . . . . . 80dB
- Differential Gain and Phase . . . . . 0.01%/0.01°
- High ESD Rating . . . . . >2000V
- TTL Compatible Control Signals
- Latched Control Lines for Synchronous Switching
- Pb-Free Plus Anneal Available (RoHS Compliant)

## Applications

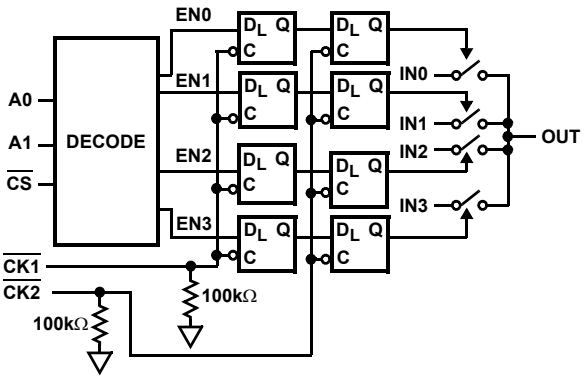
- Professional Video Switching and Routing
- RGB Video Distribution Systems
- Computer Graphics
- RF Switching and Routing

## Pinout

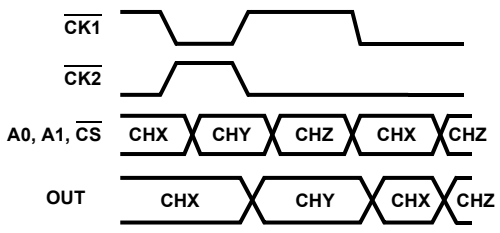
**HA4344B (SOIC)**
TOP VIEW




## Functional Diagram




## Timing Diagram



## Absolute Maximum Ratings

Voltage Between V+ and V- . . . . . 12V
Input Voltage . . . . . $V_{SUPPLY}$
Digital Input Current (Note 2) . . . . . ±25mA
Analog Input Current (Note 2) . . . . . ±5mA
Output Current . . . . . 20mA
ESD Rating
Human Body Model (Per MIL-STD-883 Method 3015.7) . . . 2000V

## Thermal Information

| Thermal Resistance (Typical, Note 1) | $\theta_{JA}$ (°C/W) |
|---|---|
| SOIC Package | 110 |

Maximum Junction Temperature (Die) . . . . . 175°C
Maximum Junction Temperature (Plastic Package) . . . . . 150°C
Maximum Storage Temperature Range . . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C
(SOIC - Lead Tips Only)

## Operating Conditions

Temperature Range . . . . . 0°C to 70°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. $\theta_{JA}$ is measured with the component mounted on a low effective thermal conductivity test board in free air. See Tech Brief 379 for details.
2. If an input signal is applied before the supplies are powered up, the input current must be limited to these maximum values.

## Electrical Specifications

$V_{SUPPLY}$ = ±5V, $R_L$ = 10kΩ, $V_{\overline{CS}}$ = 0.8V, Unless Otherwise Specified

| PARAMETER | TEST CONDITIONS | (NOTE 4) TEMP. (°C) | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **DC SUPPLY CHARACTERISTICS** | | | | | | |
| Supply Voltage | | Full | ±4.5 | ±5.0 | ±5.5 | V |
| Supply Current ($V_{OUT}$ = 0V) | $V_{\overline{CS}}$ = 0.8V | 25, 70 | - | 10.5 | 13 | mA |
| | $V_{\overline{CS}}$ = 0.8V | 0 | - | - | 15.5 | mA |
| | $V_{\overline{CS}}$ = 2.0V | 25, 70 | - | 400 | 450 | µA |
| | $V_{\overline{CS}}$ = 2.0V | 0 | - | 400 | 580 | µA |
| **ANALOG DC CHARACTERISTICS** | | | | | | |
| Output Voltage Swing Without Clipping | $V_{OUT} = V_{IN} \pm V_{IO} \pm 20mV$ | 25, 70 | ±2.7 | ±2.8 | - | V |
| | | 0 | ±2.4 | ±2.5 | - | V |
| Output Current | | Full | 15 | 20 | - | mA |
| Input Bias Current | | Full | - | 30 | 50 | µA |
| Output Offset Voltage | | Full | -10 | - | 10 | mV |
| Output Offset Voltage Drift (Note 3) | | Full | - | 25 | 50 | µV/°C |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-On Time | | 25 | - | 160 | - | ns |
| Turn-Off Time | | 25 | - | 320 | - | ns |
| Output Glitch During Switching | | 25 | - | ±10 | - | mV |
| **DIGITAL DC CHARACTERISTICS** | | | | | | |
| Input Logic High Voltage | | Full | 2 | - | - | V |
| Input Logic Low Voltage | | Full | - | - | 0.8 | V |
| $\overline{CLK1}$, $\overline{CLK2}$ Input Current | 0 to 4V | Full | - | 40 | 50 | µA |
| $\overline{CS}$, A0, A1 Input Current | 0 to 4V | Full | -2 | - | 2 | µA |
| **AC CHARACTERISTICS** | | | | | | |
| Insertion Loss | $1V_{P-P}$ | 25 | - | 0.055 | 0.063 | dB |
| | | Full | - | 0.07 | 0.08 | dB |
| Channel-to-Channel Insertion Loss Match | | Full | - | ±0.004 | ±0.006 | dB |

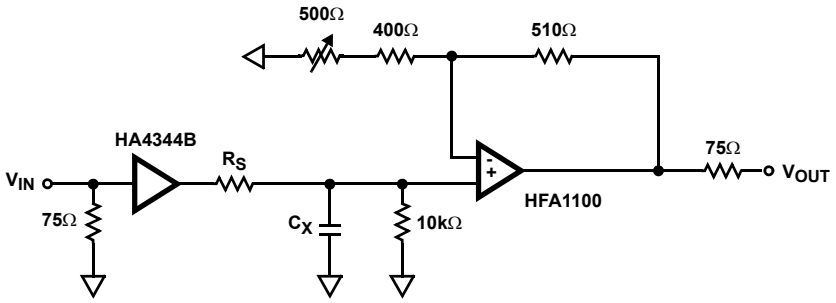
**Electrical Specifications** $V_{SUPPLY}$ = ±5V, $R_L$ = 10kΩ, $V_{\overline{CS}}$ = 0.8V, Unless Otherwise Specified **(Continued)**

| PARAMETER | TEST CONDITIONS | (NOTE 4) TEMP. (°C) | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| -3dB Bandwidth | $R_S$ = 47Ω, $C_L$ = 10pF | 25 | - | 350 | - | MHz |
| | $R_S$ = 29Ω, $C_L$ = 20pF | 25 | - | 300 | - | MHz |
| | $R_S$ = 16Ω, $C_L$ = 33pF | 25 | - | 220 | - | MHz |
| | $R_S$ = 9Ω, $C_L$ = 52pF | 25 | - | 160 | - | MHz |
| ±0.1dB Flat Bandwidth | $R_S$ = 47Ω, $C_L$ = 10pF | 25 | - | 150 | - | MHz |
| | $R_S$ = 29Ω, $C_L$ = 20pF | 25 | - | 110 | - | MHz |
| | $R_S$ = 16Ω, $C_L$ = 33pF | 25 | - | 100 | - | MHz |
| | $R_S$ = 9Ω, $C_L$ = 52pF | 25 | - | 70 | - | MHz |
| Input Resistance | | Full | 200 | 400 | - | kΩ |
| Input Capacitance | | Full | - | 1.5 | - | pF |
| Enabled Output Resistance | | Full | - | 15 | - | Ω |
| Disabled Output Capacitance | $V_{\overline{CS}}$ = 2.0V | Full | - | 2.5 | - | pF |
| Differential Gain | 4.43MHz (Note 3) | 25 | - | 0.01 | 0.02 | % |
| Differential Phase | 4.43MHz (Note 3) | 25 | - | 0.01 | 0.02 | ° |
| Off Isolation | $1V_{P-P}$, 100MHz, $V_{\overline{CS}}$ = 2.0V | Full | - | 70 | - | dB |
| Crosstalk Rejection | $1V_{P-P}$, 30MHz | Full | - | 80 | - | dB |
| Slew Rate ($1.5V_{P-P}$, +SR/-SR) | $R_S$ = 47Ω, $C_L$ = 10pF | 25 | - | 1400/1490 | - | V/µs |
| | $R_S$ = 29Ω, $C_L$ = 20pF | 25 | - | 1200/1260 | - | V/µs |
| | $R_S$ = 16Ω, $C_L$ = 33pF | 25 | - | 870/940 | - | V/µs |
| | $R_S$ = 9Ω, $C_L$ = 52pF | 25 | - | 750/710 | - | V/µs |
| Total Harmonic Distortion (Note 3) | | Full | - | 0.01 | 0.1 | % |
| Disabled Output Resistance | $V_{\overline{CS}}$ = 2.0V | Full | - | 12 | - | MΩ |

NOTES:

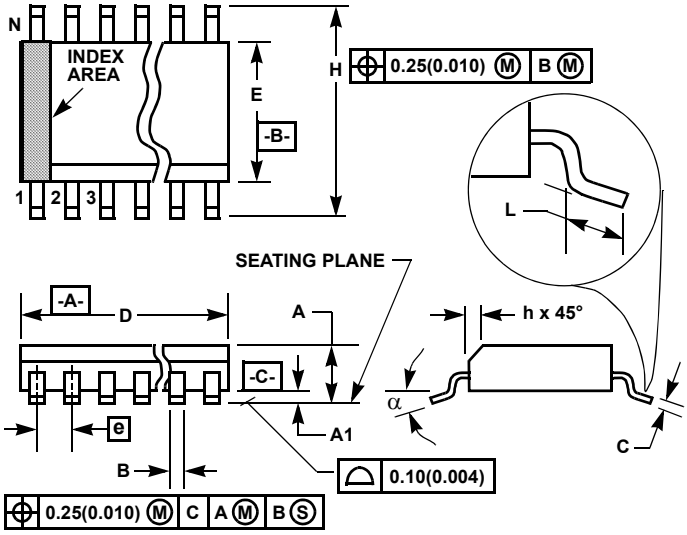
3. This parameter is not tested. The limits are guaranteed based on lab characterization, and reflect lot-to-lot variation.
4. Units are 100% tested at 25°C; guaranteed, but not tested at 0°C and 70°C.

## *AC Test Circuit*




NOTE: $C_L = C_X$ + Test Fixture Capacitance.

## *Small Outline Plastic Packages (SOIC)*




NOTES:

1. Symbols are defined in the “MO Series Symbol List” in Section 2.2 of Publication Number 95.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold flash, protrusion and gate burrs shall not exceed 0.15mm (0.006 inch) per side.
4. Dimension “E” does not include interlead flash or protrusions. Interlead flash and protrusions shall not exceed 0.25mm (0.010 inch) per side.
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
6. “L” is the length of terminal for soldering to a substrate.
7. “N” is the number of terminal positions.
8. Terminal numbers are shown for reference only.
9. The lead width “B”, as measured 0.36mm (0.014 inch) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.024 inch).
10. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

**M16.15 (JEDEC MS-012-AC ISSUE C)**
**16 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE**

| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | |
| A | 0.0532 | 0.0688 | 1.35 | 1.75 | - |
| A1 | 0.0040 | 0.0098 | 0.10 | 0.25 | - |
| B | 0.013 | 0.020 | 0.33 | 0.51 | 9 |
| C | 0.0075 | 0.0098 | 0.19 | 0.25 | - |
| D | 0.3859 | 0.3937 | 9.80 | 10.00 | 3 |
| E | 0.1497 | 0.1574 | 3.80 | 4.00 | 4 |
| e | 0.050 BSC | | 1.27 BSC | | - |
| H | 0.2284 | 0.2440 | 5.80 | 6.20 | - |
| h | 0.0099 | 0.0196 | 0.25 | 0.50 | 5 |
| L | 0.016 | 0.050 | 0.40 | 1.27 | 6 |
| N | 16 | | 16 | | 7 |
| α | 0° | 8° | 0° | 8° | - |

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