

HA4344B

350MHz, 4x1 Video Crosspoint Switch with Synchronous Controls

FN3956
Rev 4.00
June 1, 2006

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

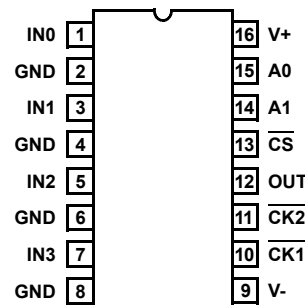
- Low Power Dissipation 105mW
- Symmetrical Slew Rates 1400V/μs
- 0.1dB Gain Flatness 100MHz
- -3dB Bandwidth 350MHz
- Off Isolation (100MHz) 70dB
- Crosstalk Rejection (30MHz) 80dB
- Differential Gain and Phase 0.01%/0.01°
- High ESD Rating >2000V
- TTL Compatible Control Signals
- Latched Control Lines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

Applications

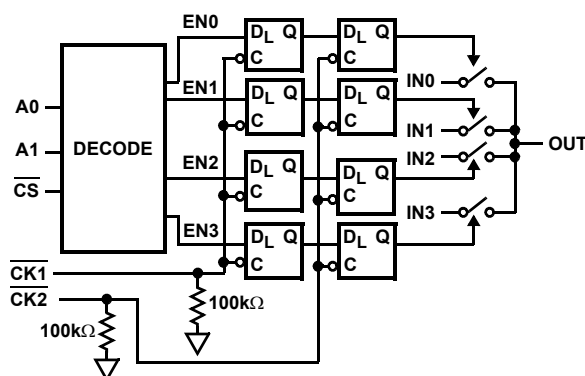
- Professional Video Switching and Routing
- RGB Video Distribution Systems
- Computer Graphics
- RF Switching and Routing

Pinout

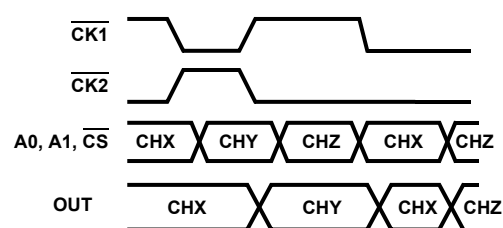
HA4344B (SOIC)
TOP VIEW



Functional Diagram



Timing Diagram



Absolute Maximum Ratings

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

Thermal Information

Thermal Resistance (Typical, Note 1)	θ_{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
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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. θ_{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 $V_{SUPPLY} = \pm 5\text{V}$, $R_L = 10\text{k}\Omega$, $V_{CS} = 0.8\text{V}$, Unless Otherwise Specified

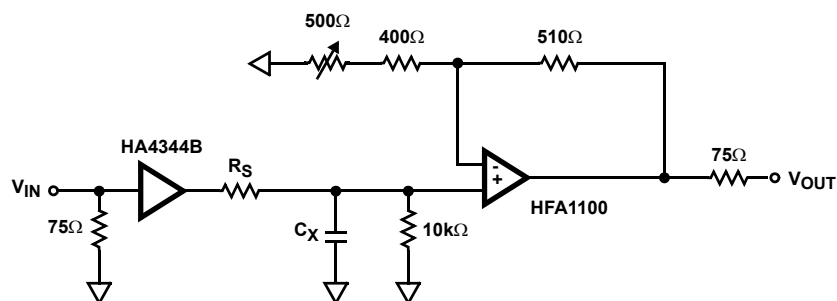
PARAMETER	TEST CONDITIONS	(NOTE 4) TEMP. (°C)	MIN	TYP	MAX	UNITS
DC SUPPLY CHARACTERISTICS						
Supply Voltage		Full	± 4.5	± 5.0	± 5.5	V
Supply Current ($V_{OUT} = 0\text{V}$)	$V_{CS} = 0.8\text{V}$	25, 70	-	10.5	13	mA
	$V_{CS} = 0.8\text{V}$	0	-	-	15.5	mA
	$V_{CS} = 2.0\text{V}$	25, 70	-	400	450	μA
	$V_{CS} = 2.0\text{V}$	0	-	400	580	μA
ANALOG DC CHARACTERISTICS						
Output Voltage Swing Without Clipping	$V_{OUT} = V_{IN} \pm V_{IO} \pm 20\text{mV}$	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	$\mu\text{V}/^\circ\text{C}$
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
$\overline{\text{CLK1}}$, $\overline{\text{CLK2}}$ Input Current	0 to 4V	Full	-	40	50	μA
$\overline{\text{CS}}$, 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 $V_{\text{SUPPLY}} = \pm 5\text{V}$, $R_L = 10\text{k}\Omega$, $\overline{V_{\text{CS}}} = 0.8\text{V}$, Unless Otherwise Specified **(Continued)**

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

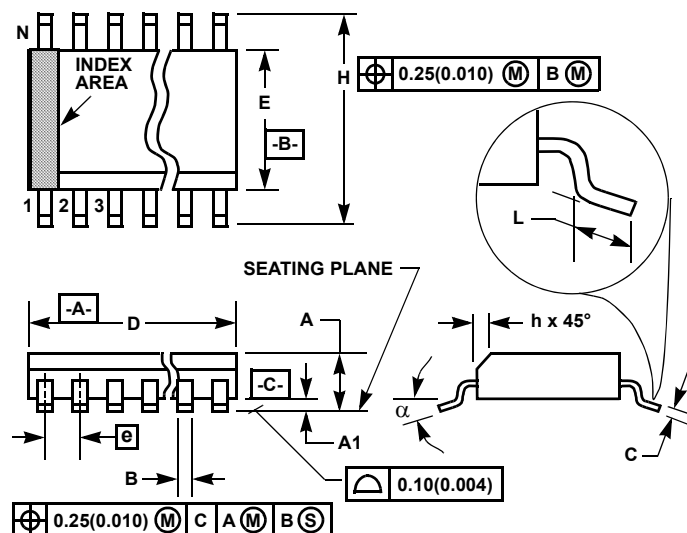
NOTES:

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

AC Test Circuit

NOTE: $C_L = C_X + \text{Test Fixture Capacitance}$.

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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