



# HA4404

## ADVANCE INFORMATION

February 1994

## Wideband, 4 x 1 Video Crosspoint Switch with Tally Outputs

### Features

- Low Power Dissipation .....80mW
- 0.1dB Gain Flatness..... 100MHz
- Off Isolation (100MHz)......70dB
- Slew Rate ..... 1000V/μs
- Crosstalk Rejection (30MHz)......80dB
- Differential Gain and Phase ..... 0.01%/0.01Deg.
- TTL Compatible Enable Input
- Open Collector Tally Output
- Improved Replacement for GX4404

### Applications

- Professional Video Switching and Routing
- HDTV
- Computer Graphics
- RF Switching and Routing
- PCM Data Routing

### Description

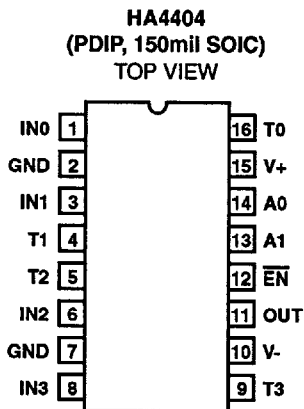
The HA4404 is a very wide bandwidth 4x1 crosspoint switch ideal for professional video switching, HDTV, computer monitor routing, and other high performance applications. The circuit features very low power dissipation (80mW Enabled, 2mW Disabled), excellent differential gain and phase, and very high off isolation. When disabled, the output is switched to a high impedance state, making the HA4404 ideal for routing matrix equipment.

The HA4404 requires no external current source, and features fast switching and symmetric slew rates. The tally outputs are open collector PNP transistors to V<sub>CC</sub> to provide an indication of crosspoint selection.

### Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HA4404CP	0°C to +70°C	16 Lead Plastic DIP
HA4404CB	0°C to +70°C	16 Lead Narrow Body SOIC

### Pinout



### Truth Table

$\overline{\text{EN}}$	A1	A0	OUT	ACTIVE TALLY OUTPUT
0	0	0	IN0	T0
0	0	1	IN1	T1
0	1	0	IN2	T2
0	1	1	IN3	T3
1	X	X	HIGH - Z	NONE, ALL HIGH - Z

## Specifications HA4404

### Absolute Maximum Ratings

Voltage Between V+ and V- .....	12V
Input Voltage .....	$V_{SUPPLY}$
Output Current .....	20mA
Junction Temperature .....	+175°C
Junction Temperature (Plastic Package) .....	+150°C
Lead Temperature (Soldering 10s) .....	+300°C

### Operating Conditions

Operating Temperature Range	HA4404C .....	$0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$
Storage Temperature .....		$-65^{\circ}\text{C} \leq T_A \leq +150^{\circ}\text{C}$
Thermal Package Characteristics ( $^{\circ}\text{C}/\text{W}$ )		$\theta_{JA}$
Plastic DIP Package .....		.88
SOIC Package .....		.96

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.

### Electrical Specifications $V_{SUPPLY} = \pm 5\text{V}$ , $R_L = 10\text{k}\Omega$ , $C_L = 30\text{pF}$ , $V_{EN} = 0.8\text{V}$ , Unless Otherwise Specified.

PARAMETER	TEMPERATURE	HA4404C			UNITS	
		MIN	TYP	MAX		
<b>DC SUPPLY CHARACTERISTICS</b>						
Supply Voltage	Full	$\pm 4.5$	$\pm 5.0$	$\pm 5.5$	V	
Supply Current ( $V_{OUT} = 0\text{V}$ )	Full	$I_{CC}, I_{EE}, V_{EN} = 0.8\text{V}$	-	8	9.5	mA
		$I_{CC}, I_{EE}, V_{EN} = 2.0\text{V}$	-	200	400	$\mu\text{A}$
<b>ANALOG DC CHARACTERISTICS</b>						
Output Voltage Swing without Clipping	Full	$\pm 3.1$	$\pm 3.5$	-	V	
Input Bias Current	Full	-	30	50	$\mu\text{A}$	
Output Offset Voltage	+25°C	-10	-	10	mV	
Output Offset Voltage Drift (Note 1)	Full	-	25	50	$\mu\text{V}/^{\circ}\text{C}$	
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Time	Full	-	90	-	ns	
Turn-Off Time	Full	-	140	-	ns	
Output Current	Full	15	20	-	mA	
<b>DIGITAL DC CHARACTERISTICS</b>						
Input Logic High Voltage	Full	2	-	-	V	
Input Logic Low Voltage	Full	-	-	0.8	V	
EN Input Current	Full	-2	-	2	$\mu\text{A}$	
Tally Output High Voltage ( $I_{OH} = 1\text{mA}$ )	Full	4.8	4.9	-	V	
<b>AC CHARACTERISTICS</b>						
Insertion Loss ( $1V_{P-P}$ , 100kHz, Note 1)	+25°C	-	0.03	0.05	dB	
0.1dB Flat Bandwidth	Full	-	100	-	MHz	
Input Resistance	Full	-	0.7	-	M $\Omega$	
Input Capacitance	Full	-	0.7	-	pF	
Enabled Output Resistance	Full	-	10	-	$\Omega$	
Disabled Output Capacitance ( $V_{EN} = 2.0\text{V}$ )	Full	-	1.2	-	pF	
Differential Gain (4.43MHz, Note 1)	Full	-	0.01	0.02	%	
Differential Phase (4.43MHz, Note 1)	Full	-	0.01	0.02	Degrees	
Off Isolation ( $1V_{P-P}$ , 100MHz, $V_{EN} = 2.0\text{V}$ )	Full	-	70	-	dB	
Crosstalk Rejection ( $1V_{P-P}$ , 30MHz, Note 1)	Full	80	-	-	dB	
Slew Rate ( $3V_{P-P}$ , $C_L = 10\text{pF}$ ) +SR, -SR	Full	-	1000	-	V/ $\mu\text{s}$	
Total Harmonic Distortion (Note 1)	Full	-	0.05	0.1	%	
Disabled Output Resistance ( $V_{EN} = 2.0\text{V}$ )	Full	-	12	-	M $\Omega$	

#### NOTES:

1. This parameter is not tested. The limits are guaranteed based on lab characterization, and reflect lot-to-lot variation.

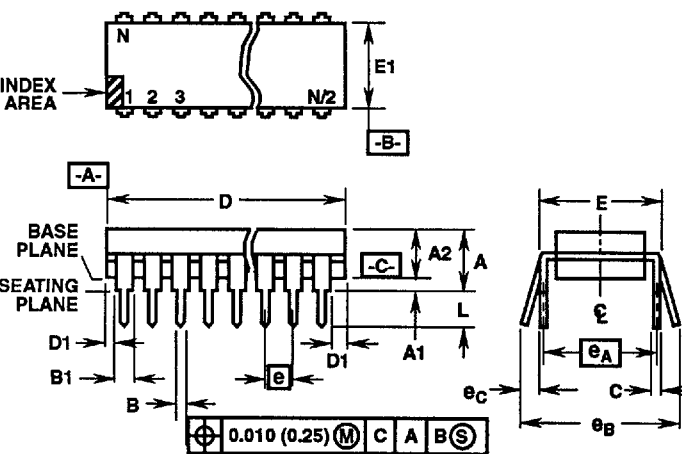
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Packaging

E16.3 (JEDEC MS-001-BB ISSUE D)  
16 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	0.735	0.775	18.66	19.68	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 <sub>A</sub>	0.300 BSC		7.62 BSC		6
e <sub>B</sub>	-	0.430	-	10.92	7
L	0.115	0.150	2.93	3.81	4
N	16		16		9

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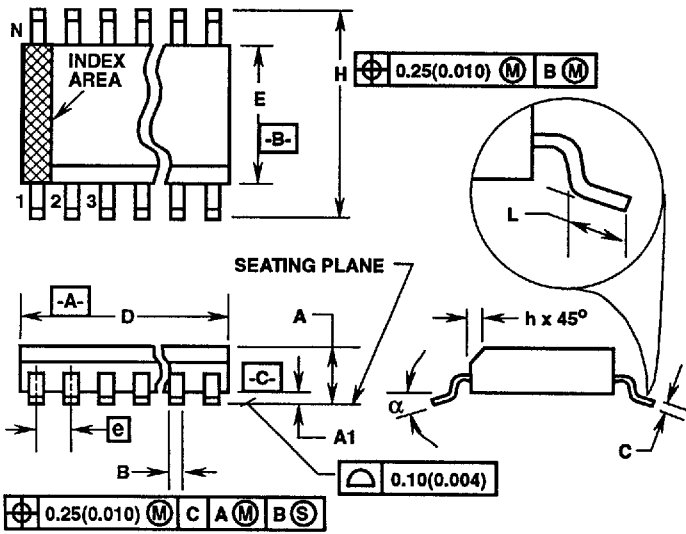


NOTES:

- Controlling Dimensions: INCH. In case of conflict between English and Metric dimensions, the inch dimensions control.
- Dimensioning and tolerancing per ANSI Y14.5M-1982.
- Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication No. 95.
- Dimensions A, A1 and L are measured with the package seated in JEDEC seating plane gauge GS-3.
- D, D1, and E1 dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch (0.25mm).
- E and e<sub>A</sub> are measured with the leads constrained to be perpendicular to datum -C-.
- e<sub>B</sub> and e<sub>C</sub> are measured at the lead tips with the leads unconstrained. e<sub>C</sub> must be zero or greater.
- B1 maximum dimensions do not include dambar protrusions. Dambar protrusions shall not exceed 0.010 inch (0.25mm).
- N is the maximum number of terminal positions.
- 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).

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Packaging (Continued)



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
alpha	0°	8°	0°	8°	-

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.

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