

### Features

- High Digital Data Rate ..... 500MHz
- Very Fast Slew Rate ..... 2500V/ $\mu$ s
- Very Fast Rise/Fall Times ..... 600ps
- Wide Output Range ..... +7V to -2V
- Precise 50 $\Omega$  Output Impedance
- High Impedance, Three-State Output Control

### Applications

- IC Tester Pin Electronics
- Pattern Generators
- Pulse Generators
- Built-In Test Equipment (BITE)
- Level Comparator/Translator

### Description

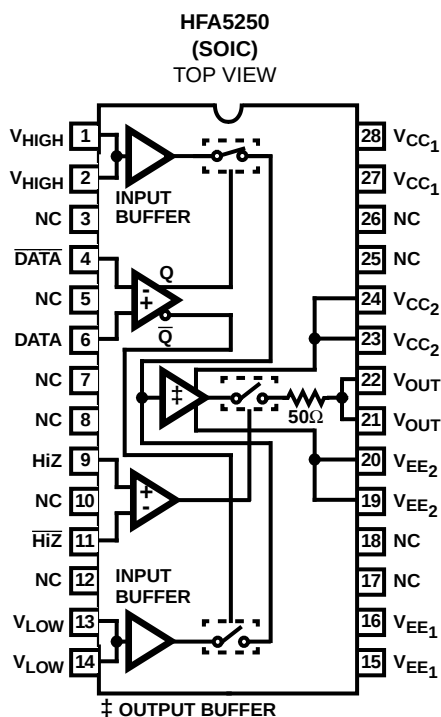
The HFA5250 is the ideal monolithic pin driver solution for high performance test systems. The device will switch at high data rates between two input voltage levels providing variable amplitude pulses. The output impedance is trimmed to achieve a precision 50 $\Omega$  source for impedance matching. Two differential ECL/TTL compatible inputs control the operation of the HFA5250, one controlling the  $V_{HIGH}/V_{LOW}$  switching and the other controlling the output's high-impedance state. The HFA5250's 500MHz data rate makes it compatible with today's high speed VLSI test systems and the +7V to -2V output swing allows testing of all common logic families.

The HFA5250 is manufactured in the Harris proprietary complementary bipolar process.

### Ordering Information

| PART NUMBER | TEMP. RANGE ( $^{\circ}$ C)   | PACKAGE    | PKG. NO. |
|-------------|-------------------------------|------------|----------|
| HFA5250CB   | 0 to 50 Without Air Flow      | 28 Ld SOIC | M28.3    |
|             | 0 to 70 With 400lfpm Air Flow |            |          |

### Pinout



NOTE: Switches Shown in the "1" State.

# HFA5250

## Absolute Maximum Ratings

Supply Voltage ..... 17V  
Differential Input Voltage..... 5V  
Continuous Output Current..... 160mA (Note 1)

## Operating Conditions

Temperature Range ..... 0°C to 70°C

## Thermal Information

Thermal Resistance (Typical, Note 2)  $\theta_{JA}$  (°C/W)  $\theta_{JC}$  (°C/W)  
SOIC Package ..... 70 55  
Maximum Package Power Dissipation  
SOIC Package with Still Air at 50°C ..... 1.43W  
SOIC Package with 400lfpm Air at 70°C ..... 1.45W  
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)

**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. Internal Power Dissipation may limit Output Current below 160mA.
2.  $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## Electrical Specifications $V_{CC} = +10V$ , $V_{EE} = -5.2V$ , Unless Otherwise Specified

| PARAMETER                                                                                                                                                    | TEST CONDITIONS                             | TEMP. (°C) | MIN          | TYP  | MAX          | UNITS             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------|--------------|------|--------------|-------------------|
| <b>INPUT CHARACTERISTICS</b> ( $V_{HIGH}$ , $V_{LOW}$ )                                                                                                      |                                             |            |              |      |              |                   |
| $V_{HIGH}$ Input Offset Voltage                                                                                                                              | $V_{HIGH} = 0$                              | 25         | -200         | -100 | 30           | mV                |
| $V_{LOW}$ Input Offset Voltage                                                                                                                               | $V_{LOW} = 0$                               | 25         | -200         | -100 | 30           | mV                |
| $V_{HIGH}$ Input Bias Current                                                                                                                                | $V_{HIGH} = 5V$                             | 25         | -150         | 50   | 250          | μA                |
| $V_{LOW}$ Input Bias Current                                                                                                                                 | $V_{LOW} = 0V$                              | 25         | -350         | -100 | 150          | μA                |
| $V_{HIGH}$ Voltage Range                                                                                                                                     | Note 6                                      | 25         | -2.6         | -    | 7.5          | V                 |
|                                                                                                                                                              |                                             | 25         | $V_{EE}+2.6$ | -    | $V_{CC}-2.5$ | V                 |
| $V_{LOW}$ Voltage Range                                                                                                                                      | Note 6                                      | 25         | -2.7         | -    | 7.4          | V                 |
|                                                                                                                                                              |                                             | 25         | $V_{EE}+2.5$ | -    | $V_{CC}-2.6$ | V                 |
| $V_{HIGH}$ to $V_{LOW}$ Differential Voltage Range                                                                                                           |                                             | 25         | 0.2          | -    | 10.2         | V                 |
| Input Resistance                                                                                                                                             | $V_{IN} = -2V$ to 7V                        | 25         | -            | 10   | -            | kΩ                |
| Input Capacitance                                                                                                                                            |                                             | 25         | -            | 5    | -            | pF                |
| Input Noise Voltage                                                                                                                                          | 10Hz to 1MHz                                | 25         | -            | 20   | -            | μV <sub>P-P</sub> |
| <b>LOGIC INPUT CHARACTERISTICS</b> (Data, $\overline{\text{Data}}$ , HiZ, $\overline{\text{HiZ}}$ )                                                          |                                             |            |              |      |              |                   |
| Input Offset Voltage                                                                                                                                         |                                             | 25         | -            | ±250 | -            | mV                |
| Input Voltage Range                                                                                                                                          | Note 6                                      | 25         | -2.0         | -    | 7.0          | V                 |
|                                                                                                                                                              |                                             | 25         | $V_{EE}+3.2$ | -    | $V_{CC}-3.0$ | V                 |
| Input High Current                                                                                                                                           | $V_{IH} = 0V$ , $V_{IL} = -2V$              | 25         | -25          | 50   | 200          | μA                |
| Input Low Current                                                                                                                                            | $V_{IH} = 0V$ , $V_{IL} = -2V$              | 25         | -400         | -150 | 25           | μA                |
| Common Mode Input Resistance                                                                                                                                 | $V_{CM} = -2V$ to 7V                        | 25         | -            | 1    | -            | MΩ                |
| Differential Input Resistance                                                                                                                                | $V_{DIFF} = 0V$ to 5V                       | 25         | -            | 100  | -            | kΩ                |
| Input Capacitance                                                                                                                                            |                                             | 25         | -            | 3    | -            | pF                |
| <b>TRANSFER CHARACTERISTICS</b>                                                                                                                              |                                             |            |              |      |              |                   |
| $V_{HIGH}/V_{LOW}$ Voltage Gain                                                                                                                              | $V_{HIGH}$ , $V_{LOW} = 0V$ to 5V           | 25         | 0.95         | 0.97 | 1.0          | V/V               |
| $V_{HIGH}/V_{LOW}$ Linearity Error                                                                                                                           | $V_{HIGH}$ , $V_{LOW} = 0V$ to 5V, FS = 5V  | 25         | -0.5         | ±0.2 | 0.5          | %                 |
| $V_{HIGH}/V_{LOW}$ Linearity Error                                                                                                                           | $V_{HIGH}$ , $V_{LOW} = -2V$ to 7V, FS = 9V | 25         | -1.2         | ±0.6 | 1.2          | %                 |
| $V_{HIGH}/V_{LOW}$ -3dB Bandwidth                                                                                                                            | 200mV <sub>P-P</sub>                        | 25         | -            | 500  | -            | MHz               |
| <b>SWITCHING CHARACTERISTICS</b> ( $Z_{LOAD} = 10$ Inches of RG-58, $V_{HIGH} = 3V$ , $V_{LOW} = 0V$ , $V_{DATA} = -1.8V$ to -1.0V, Measured 50% to 50% pts) |                                             |            |              |      |              |                   |
| Propagation Delay                                                                                                                                            | Note 3                                      | 25         | -            | 2    | -            | ns                |
| Propagation Delay Jitter, 1 Sigma                                                                                                                            |                                             | 25         | -            | 30   | -            | ps                |
| Propagation Delay Match (Rising vs Falling Edge)                                                                                                             | Note 3                                      | 25         | -            | 150  | -            | ps                |

## HFA5250

### Electrical Specifications $V_{CC} = +10V$ , $V_{EE} = -5.2V$ , Unless Otherwise Specified (Continued)

| PARAMETER                                                                        | TEST CONDITIONS                                   | TEMP. (°C) | MIN           | TYP  | MAX           | UNITS |
|----------------------------------------------------------------------------------|---------------------------------------------------|------------|---------------|------|---------------|-------|
| Propagation Delay vs Duty Cycle                                                  | 2.5% to 97.5%, 200ns Period                       | 25         | -             | ±100 | -             | ps    |
| Active to HiZ Delay                                                              | Measured 50% to 10% Points                        | 25         | -             | 3.0  | -             | ns    |
| HiZ to Active Delay                                                              | Measured 50% to 10% Points                        | 25         | -             | 3.5  | -             | ns    |
| Data Rate                                                                        | 1V <sub>P-P</sub> , 50% Duty Cycle, 90% Amplitude | 25         | -             | 500  | -             | MHz   |
| <b>TRANSIENT RESPONSE</b> ( $Z_{LOAD} = 16$ Inches of RG-58 Terminated with 5pF) |                                                   |            |               |      |               |       |
| Slew Rate                                                                        | -1V to +6V                                        | 25         | -             | 2500 | -             | V/μs  |
| Rise/Fall Time                                                                   | 1V <sub>P-P</sub> , 20%-80%                       | 25         | -             | 600  | -             | ps    |
| Rise/Fall Time                                                                   | 3V <sub>P-P</sub> , 10%-90%                       | 25         | -             | 1.2  | -             | ns    |
| Rise/Fall Time                                                                   | 5V <sub>P-P</sub> , 10%-90%                       | 25         | -             | 1.8  | 2.25          | ns    |
| Rise/Fall Time Match                                                             | Note 3                                            | 25         | -             | -    | 200           | ps    |
| Overshoot/Undershoot/Preshoot                                                    | 3V <sub>P-P</sub>                                 | 25         | -             | 5    | -             | %     |
| Data Settling Time 1%                                                            | Note 4                                            | 25         | -             | 7    | -             | ns    |
| V <sub>HIGH</sub> /V <sub>LOW</sub> Settling Time 1%                             | Note 4                                            | 25         | -             | 12   | -             | ns    |
| <b>OUTPUT CHARACTERISTICS</b>                                                    |                                                   |            |               |      |               |       |
| Output Voltage Swing, No Load                                                    | Note 6                                            | 25         | -2            | -    | 7             | V     |
|                                                                                  |                                                   | 25         | $V_{EE}+3.2$  | -    | $V_{CC}-3.0$  | V     |
| Output Voltage Swing                                                             | $R_L = 50\Omega$                                  | 25         | -1            | -    | 3.5           | V     |
| Output Resistance                                                                | Active (-2V to 7V)                                | 25         | 49            | 50   | 51            | Ω     |
| Output Resistance                                                                | HiZ (-2V to 7V)                                   | 25         | -             | 10   | -             | MΩ    |
| HiZ Output Voltage Compliance                                                    | Note 6                                            | 25         | -2            | -    | 7             | V     |
|                                                                                  |                                                   | 25         | $V_{CC}-12.0$ | -    | $V_{EE}+12.2$ | V     |
| Output Leakage                                                                   | HiZ (-2V to 7V)                                   | 25         | -1            | -    | 1             | μA    |
| Output Capacitance                                                               | HiZ                                               | 25         | -             | 5    | -             | pF    |
| <b>POWER SUPPLY CHARACTERISTICS</b>                                              |                                                   |            |               |      |               |       |
| V <sub>HIGH</sub> Power Supply Rejection Ratio (Note 5)                          |                                                   | 25         | 28            | -    | -             | dB    |
| V <sub>LOW</sub> Power Supply Rejection Ratio (Note 5)                           |                                                   | 25         | 28            | -    | -             | dB    |
| Data/HiZ Power Supply Rejection Ratio                                            |                                                   | 25         | -             | 22   | -             | dB    |
| Total Supply Current                                                             |                                                   | 25         | 85            | 90   | 95            | mA    |
| I <sub>CC1</sub> /I <sub>EE1</sub> Supply Current                                |                                                   | 25         | -             | 65   | -             | mA    |
| I <sub>CC2</sub> /I <sub>EE2</sub> Supply Current                                |                                                   | 25         | -             | 25   | -             | mA    |
| Supply Voltage Range                                                             | $V_{CC} - V_{EE}$                                 | 25         | 10            | -    | 15.2          | V     |
| Power Dissipation                                                                | $V_{CC} = 10V$ , $V_{EE} = -5.2V$ , No Load       | 25         | -             | -    | 1.44          | W     |

**NOTES:**

3. 3V Step, 50% duty cycle, 200ns period.
4. 3V Step, measured from 50% of input to ±1% of final value, final value is at 50ns.
5. V<sub>HIGH</sub> = 2.6V, V<sub>LOW</sub> = 2.4V, V<sub>CC</sub> = 9V to 10V, V<sub>EE</sub> = -4.2V to -5.2V.
6. Operation above total supply voltage of 15.2V is not recommended. See specification under Power Supply Characteristics.

## Die Characteristics

### DIE DIMENSIONS:

1990 $\mu$ m x 1530 $\mu$ m x 525 $\mu$ m

### PASSIVATION:

Nitride, 4k $\text{\AA}$   $\pm$  0.5k $\text{\AA}$

### METALLIZATION:

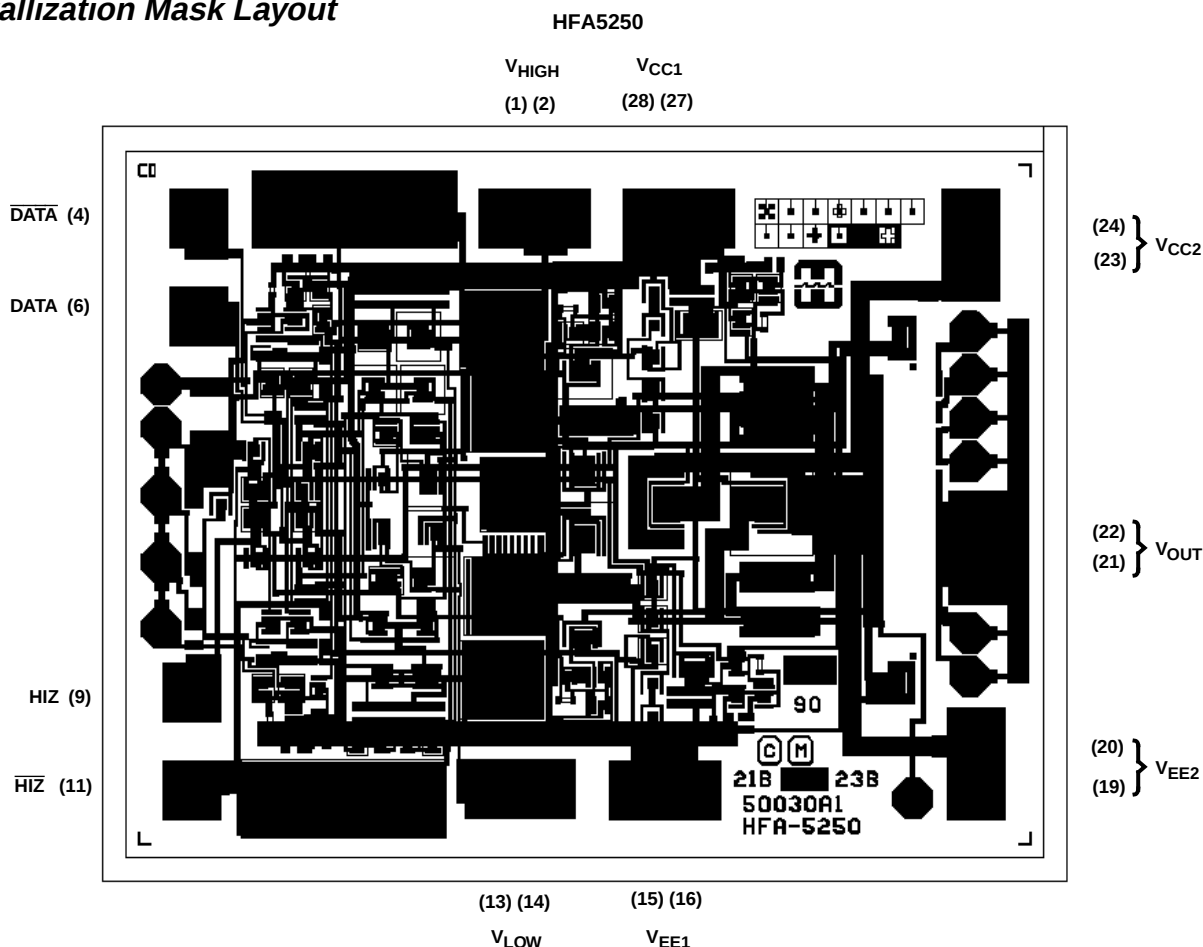
Type: Metal 1: AlCu(2%)/TiW

Thickness: Metal 1: 8k $\text{\AA}$   $\pm$  0.4k $\text{\AA}$

Type: Metal 2: AlCu(2%)

Thickness: Metal 2: 16k $\text{\AA}$   $\pm$  0.8k $\text{\AA}$

## Metallization Mask Layout



All Harris Semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

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## Sales Office Headquarters

For general information regarding Harris Semiconductor and its products, call **1-800-4-HARRIS**

### NORTH AMERICA

Harris Semiconductor  
P. O. Box 883, Mail Stop 53-210  
Melbourne, FL 32902  
TEL: 1-800-442-7747  
(407) 729-4984  
FAX: (407) 729-5321

### EUROPE

Harris Semiconductor  
Mercure Center  
100, Rue de la Fusee  
1130 Brussels, Belgium  
TEL: (32) 2.724.2111  
FAX: (32) 2.724.22.05

### ASIA

Harris Semiconductor PTE Ltd.  
No. 1 Tannery Road  
Cencon 1, #09-01  
Singapore 1334  
TEL: (65) 748-4200  
FAX: (65) 748-0400

