

## HX4424 3A Dual High-Speed Power MOSFET Driver

## General Description

The HX4423/4424/4425 series is a highly reliable BiCMOS/DMOS buffer/driver/MOSFET driver, providing higher output current versions of HX4426/4427/4428 with improved features. These families are pin compatible, and the HX4423/4424/4425 drivers are specifically designed for use in more demanding electrical environments, providing reliable service under any conditions within the rated power and voltage range. They are capable of withstanding noise spikes of up to 5V on the ground pin, regardless of polarity. Compared to other CMOS or bipolar drivers, the HX4423/4424/4425 drivers are easier to use, more flexible to operate, and more forgiving. Their BiCMOS/DMOS structures consume minimal power and provide stable voltage fluctuations.

The HX4423/4424/4425 driver is primarily designed to drive power MOSFETs, and it is ideal for driving other loads such as capacitors, resistors, or inductors that require low impedance, peak current, and fast switching times. It can be used with heavy-duty clock lines, coaxial cables, or piezoelectric transducers. The only limitation is that the total power dissipated in the driver must be kept within the maximum power dissipation limit of the package.

For high power and narrow pulse applications, see the HX4123/4124/4125 series.

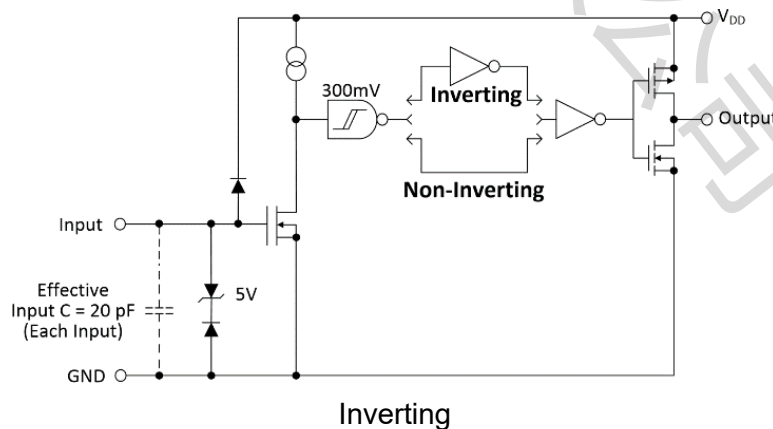
## Features

- High Peak Output Current: 3A
- Wide Input Supply Voltage Operating Range: - 4.5V to 18V
- High Capacitive Load Drive Capability: - 1800 pF in 25 ns
- Short Delay Times: <40 ns (typ)
- Matched Rise/Fall Times
- Low Supply Current
  - With Logic '1' Input – 3.5 mA (Max)
  - With Logic '0' Input – 350  $\mu$ A (Max)
- Low Output Impedance: 3.5 $\Omega$  (typ)0
- Latch-Up Protected: Will Withstand 1.5A Reverse Current
- Logic Input Will Withstand Negative Swing Up To 5V
- ESD Protected: 4 kV
- Available in Green SOP8, DIP8 and DFN8 Packages

## Applications

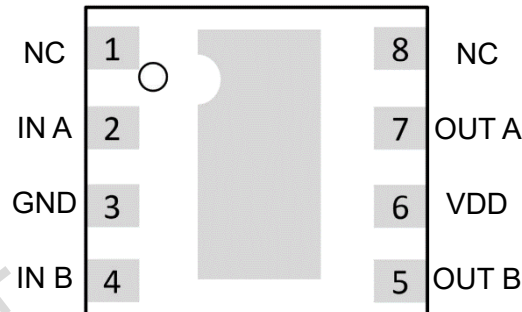
- Switch Mode Power Supplies
- Pulse Transformer Drive
- Line Drivers

## Pin Configuration and Functions



## Functional Block Diagram

SOP8/DIP8/DFN8



Outputs out of phase with input

Pin Diagram

| Function Tab |     |       |       |
|--------------|-----|-------|-------|
| INA          | INB | OUT A | OUT B |
| L            | L   | H     | H     |
| L            | H   | H     | L     |
| H            | L   | L     | H     |
| H            | H   | L     | L     |

| Pin Descriptio |       |                                  |
|----------------|-------|----------------------------------|
| Pin            | Name  | Description                      |
| 1              | NC    | No connection                    |
| 2              | IN A  | Input A                          |
| 3              | GND   | Ground                           |
| 4              | In B  | Input B                          |
| 5              | OUT B | Output of Channel B              |
| 6              | VDD   | Power Supply                     |
| 7              | OUT A | Output of Channel A              |
| 8              | NC    | No connection                    |
| -              | PAD   | Exposed Metal Pad of DFN package |

### Inputs A and B

MOSFET driver inputs A and B are high-impedance, TTL/CMOS compatible inputs. These inputs also have 300mV of hysteresis between the high and low thresholds that prevents output glitching even when the rise and fall time of the input signal is very slow.

### Ground (GND)

Ground is the device return pin. The Ground pin(s) should have a low-impedance connection to the bias supply source return. High peak current flows out the Ground pin(s) when the capacitive load is being discharged.

### Output A and B

MOSFET driver outputs A and B are low-impedance, CMOS push-pull style outputs. The pull-down and pullup devices are of equal strength, making the rise and fall times equivalent. Output A/B is held LOW if Input is unbiased or floating.

### Supply Input (VDD)

The VDD input is the bias supply for the MOSFET driver and is rated for 4.5V to 25V with respect to the Ground pin. The VDD input should be bypassed with local ceramic capacitors. The value of these capacitors should be chosen based on the capacitive load that is being driven. A value of 1.0  $\mu$ F is suggested.

### Exposed Metal Pad

The exposed metal pad of the DFN-S package is not internally connected to any potential. Therefore, this pad can be connected to a ground plane or other copper plane on a Printed Circuit Board (PCB), to aid in heat removal from the package.

## Product Specification

| Absolute Maximum Ratings <sup>(1)</sup> |       |         |      |
|-----------------------------------------|-------|---------|------|
| Parameter                               | Min   | Max     | Unit |
| DC supply voltage Vs                    |       | 26      | V    |
| Operating junction temperature          | -40   | +125    | °C   |
| Storage temperature                     | -55   | +150    | °C   |
| Maximum input voltage                   | GND-5 | VDD+0.3 | V    |

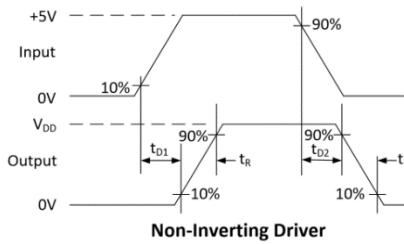
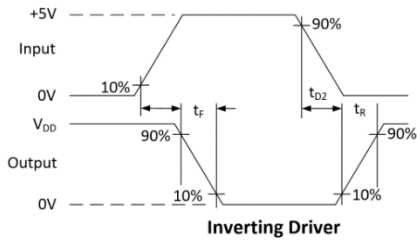
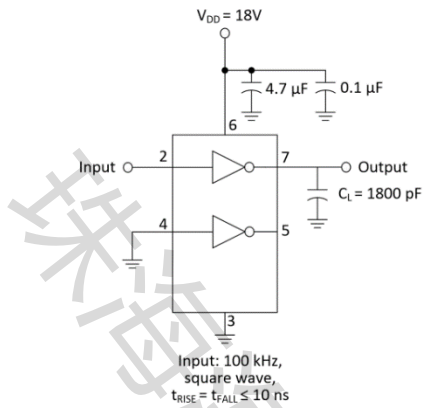
(1) Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Thermal Data               |                                         |      | Recommended Operating Conditions |             |      |
|----------------------------|-----------------------------------------|------|----------------------------------|-------------|------|
| Parameter                  | Rating                                  | Unit | Parameter                        | Rating      | Unit |
| Package Thermal Resistance | 155(SOP8)<br>125(DIP8)<br>118(FDN8,2x2) | °C/W | DC Supply Voltage                | 4.5V ~ 25V  | V    |
|                            |                                         |      | Operating ambient temperature    | -40 to +125 | °C   |

## Electrical Characteristics(Typical values are tested at TA=25 oC, VDD=18V)

| Parameter                   | Symbol | Conditions                   | Min.  | Typ. | Max.  | Unit |
|-----------------------------|--------|------------------------------|-------|------|-------|------|
| INPUT                       |        |                              |       |      |       |      |
| Input Signal High Threshold | VIH    |                              | 1.6   |      |       | V    |
| Input Signal Low Threshold  | VIL    |                              |       |      | 0.7   | V    |
| Input Signal Hysteresis     | VHYS   |                              |       | 0.3  |       | V    |
| Input Current               | IIN    | $0V \leq V_{IN} \leq V_{DD}$ |       |      | ±1    | μA   |
| OUTPUT                      |        |                              |       |      |       |      |
| High Output Voltage VOH     | VOH    | DC Test                      | VDD – |      |       | V    |
| Low Output Voltage VOL      | VOL    | DC Test                      |       |      | 0.025 | V    |
| Pull-Up Resistance          | ROH    | Source Current = 10mA        |       | 1.6  |       | Ω    |
| Pull-Down Resistance        | ROL    | Sink Current = -10mA         |       | 1.5  |       | Ω    |
| Peak Output Current         | IPK    | $10V \leq V_{DD} \leq 18V$   |       | 4.0  |       | A    |
| POWER SUPPLY                |        |                              |       |      |       |      |
| Power Supply Current        | ICC    | VINA=VINB=3V                 |       | 0.9  |       | mA   |
|                             |        | VINA=VINB=0V                 |       | 0.5  |       |      |
| Operating Voltage Range     | VDD    |                              | 4.5   |      | 25    | V    |
| Under-Voltage Lockout ON    |        |                              |       | 3.7  | 4.1   | V    |
| Under-Voltage Lockout       |        |                              |       | 0.5  |       | V    |
| SWITCHING CHARACTERISTICS   |        |                              |       |      |       |      |
| Rise Time                   | tR     | C <sub>L</sub> =1800pF,      |       | 12   |       | ns   |
| Fall Time                   | tF     | C <sub>L</sub> =1800pF,      |       | 12   |       | ns   |
| Turn-On Delay Time          | tD1    | Non-inverting Input          |       | 36   |       | ns   |
|                             |        | Inverting Input              |       | 35   |       | ns   |
| Turn-On Delay Time          | tD2    | Non-inverting Input          |       | 36   |       | ns   |
|                             |        | Inverting Input              |       | 35   |       | ns   |
| OVER-TEMPERATURE PROTECTION |        |                              |       |      |       |      |
| Thermal Shutdown Threshold  |        |                              |       | 150  |       | °C   |
| Thermal Shutdown Threshold  |        |                              |       | 25   |       | °C   |

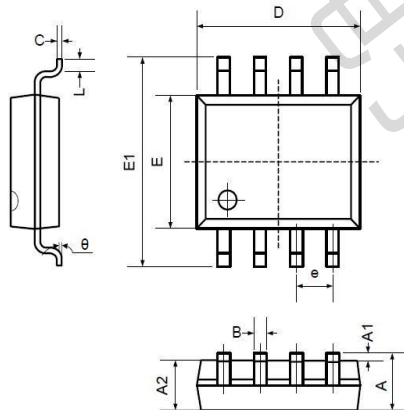
## Application Informa



## Switching Time Test Circuit

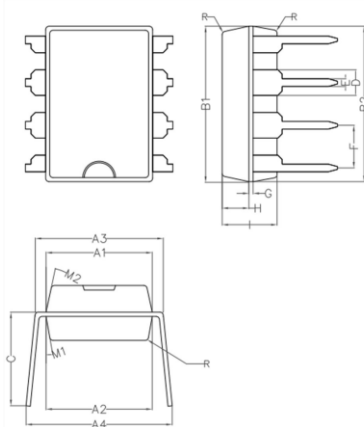
## Package Information

### SOP8 (Package Outline Dimensions)



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | Min                          | Max   | Min                     | Max   |
| A      | 1.350                        | 1.750 | 0.053                   | 0.069 |
| A1     | 0.100                        | 0.250 | 0.004                   | 0.010 |
| A2     | 1.350                        | 1.550 | 0.053                   | 0.061 |
| B      | 0.330                        | 0.510 | 0.013                   | 0.020 |
| C      | 0.190                        | 0.250 | 0.007                   | 0.010 |
| D      | 4.780                        | 5.000 | 0.188                   | 0.197 |
| E      | 3.800                        | 4.000 | 0.150                   | 0.157 |
| E1     | 5.800                        | 6.300 | 0.228                   | 0.248 |
| e      | 1.270TYP                     |       | 0.050TYP                |       |
| L      | 0.400                        | 1.270 | 0.016                   | 0.050 |
| θ      | 0°                           |       | 8°                      |       |

### DIP8 (Package Outline Dimensions)



| Symbol | Min  | Non  | Max  |
|--------|------|------|------|
| A1     | 6.28 | 6.33 | 6.38 |
| A2     | 6.33 | 6.38 | 6.43 |
| A3     | 7.52 | 7.62 | 7.72 |
| A4     | 7.80 | 8.40 | 9.00 |
| B1     | 9.15 | 9.20 | 9.25 |
| B2     | 9.20 | 9.25 | 9.30 |
| C      |      | 5.57 |      |
| D      |      | 1.52 |      |
| E      | 0.43 | 0.45 | 0.47 |
| F      |      | 2.54 |      |
| G      |      | 0.25 |      |
| H      | 1.54 | 1.59 | 1.64 |
| I      | 3.22 | 3.27 | 3.32 |
| R      |      | 0.20 |      |
| M1     | 9°   | 10°  | 11°  |
| M2     | 11°  | 12°  | 13°  |

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