

## Features

- 4A Peak Source/Sink Drive Current
- Wide Operating Voltage Range: 4.5V to 35V
- -55°C to +125°C Extended Operating Temperature Range
- Logic Input Withstands Negative Swing of up to 5V
- Matched Rise and Fall Times
- Low Propagation Delay Time: 19ns
- Low, 10 $\mu$ A Supply Current
- Low Output Impedance

## Applications

- Efficient Power MOSFET and IGBT Switching
- Switch Mode Power Supplies
- Motor Controls
- DC to DC Converters
- Class-D Switching Amplifiers
- Pulse Transformer Driver



## Description

The IXDD604/IXDF604/IXDI604/IXDN604 dual high-speed gate drivers are especially well suited for driving the latest IXYS MOSFETs and IGBTs. Each of the two outputs can source and sink 4A of peak current while producing voltage rise and fall times of less than 10ns. The input of each driver is TTL and CMOS compatible, and is virtually immune to latch up. Proprietary circuitry eliminates cross conduction and current “shoot-through.” Low propagation delay and fast, matched rise and fall times make the IXDD604/IXDF604/IXDI604/IXDN604 ideal for high-frequency and high-power applications.

The IXDD604 is configured as a dual non-inverting driver with an enable. The IXDN is configured as a dual non-inverting driver, the IXDI is configured as a dual inverting driver, and the IXDF is configured as a dual inverting + non-inverting driver.

The IXDD604/IXDF604/IXDI604/IXDN604 family is available in a standard 8-pin DIP (PI), 8-lead SOIC (SIA), 8-lead SOIC with an exposed grounded metal back (SI), and an 8-lead DFN (D2) package.

## Ordering Information

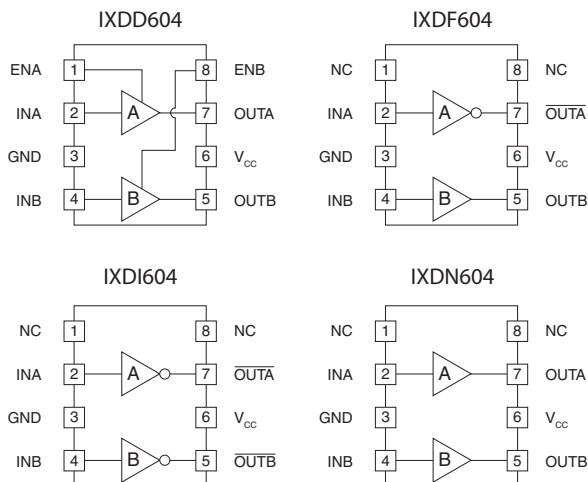
| Part Number   | Logic Configuration | Package Type                                  | Packing Method | Quantity |
|---------------|---------------------|---|----------------|----------|
| IXDD604D2T/R  |                     | 8-Lead DFN                                    | Tape & Reel    | 2500     |
| IXDD604PI     |                     | 8-Pin DIP                                     | Tube           | 50       |
| IXDD604SI     |                     | 8-Lead SOIC with Exposed, Grounded Metal Back | Tube           | 94       |
| IXDD604SIA    |                     | 8-Lead SOIC                                   | Tube           | 94       |
| IXDD604SIAT/R |                     | 8-Lead SOIC                                   | Tape & Reel    | 2500     |
| IXDF604PI     |                     | 8-Pin DIP                                     | Tube           | 50       |
| IXDF604SI     |                     | 8-Lead SOIC with Exposed, Grounded Metal Back | Tube           | 94       |
| IXDF604SIA    |                     | 8-Lead SOIC                                   | Tube           | 94       |
| IXDF604SIAT/R |                     | 8-Lead SOIC                                   | Tape & Reel    | 2500     |
| IXDI604PI     |                     | 8-Pin DIP                                     | Tube           | 50       |
| IXDI604SI     |                     | 8-Lead SOIC with Exposed, Grounded Metal Back | Tube           | 94       |
| IXDI604SIA    |                     | 8-Lead SOIC                                   | Tube           | 94       |
| IXDI604SIAT/R |                     | 8-Lead SOIC                                   | Tape & Reel    | 2500     |
| IXDN604PI     |                     | 8-Pin DIP                                     | Tube           | 50       |
| IXDN604SI     |                     | 8-Lead SOIC with Exposed, Grounded Metal Back | Tube           | 94       |
| IXDN604SIA    |                     | 8-Lead SOIC                                   | Tube           | 94       |
| IXDN604SIAT/R |                     | 8-Lead SOIC                                   | Tape & Reel    | 2500     |

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## 1 Specifications

### 1.1 Pin Configurations



### 1.2 Pin Definitions

| Pin Name            | Description  |
|---------------------|--|
| INA                 | Channel A Logic Input  |
| INB                 | Channel B Logic Input  |
| ENA                 | Channel A Enable Input - Drive pin low to disable Channel A and force Channel A Output to a high impedance state |
| ENB                 | Channel B Enable Input - Drive pin low to disable Channel A and force Channel A Output to a high impedance state |
| <u>OUTA</u><br>OUTA | Channel A Output -Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT                      |
| <u>OUTB</u><br>OUTB | Channel B Output -Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT                      |
| V <sub>CC</sub>     | Supply Voltage - Provides power to the device  |
| GND                 | Ground - Common ground reference for the device  |

### 1.3 Absolute Maximum Ratings

| Parameter            | Symbol           | Minimum | Maximum              | Units |
|----------------------|------------------|---------|----------------------|-------|
| Supply Voltage       | V <sub>CC</sub>  | -       | 40                   | V     |
| All Other Pins       | -                | -0.3    | V <sub>CC</sub> +0.3 | V     |
| Output Current       |                  | -       | ±4                   | A     |
| Junction Temperature | T <sub>J</sub>   | -55     | +150                 | °C    |
| Storage Temperature  | T <sub>STG</sub> | -65     | +150                 | °C    |

Absolute maximum electrical ratings are at 25°C

*Absolute maximum ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at conditions beyond those indicated in the operational sections of this data sheet is not implied.*

### 1.4 Recommended Operating Conditions

| Parameter                   | Symbol          | Minimum | Maximum | Units |
|-----------------------------|-----------------|---------|---------|-------|
| Supply Voltage              | V <sub>CC</sub> | 4.5     | 35      | V     |
| Operating Temperature Range | T <sub>A</sub>  | -40     | +125    | °C    |

### 1.5 Electrical Characteristics

Test Conditions:  $T_A=25^{\circ}\text{C}$ ,  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$ , one channel (unless otherwise noted).

| Parameter                                  | Conditions                                     | Symbol       | Minimum        | Typical | Maximum      | Units            |
|--|--|--------------|----------------|---------|--------------|------------------|
| Input Voltage, High                        | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IH}$     | 2.4            | -       | -            | V                |
| Input Voltage, Low                         | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IL}$     | -              | -       | 0.8          |                  |
| Input Voltage Range                        | -  | $V_{IN}$     | -5             | -       | $V_{CC}+0.3$ |                  |
| Input Current                              | $0\text{V} \leq V_{IN} \leq V_{CC}$            | $I_{IN}$     | -10            | -       | 10           | $\mu\text{A}$    |
| High EN Input Voltage                      | IXDD604 only                                   | $V_{ENH}$    | $2/3V_{CC}$    | -       | -            | V                |
| Low EN Input Voltage                       | IXDD604 only                                   | $V_{ENL}$    | -              | -       | $1/3V_{CC}$  |                  |
| Output Voltage, High                       | -  | $V_{OH}$     | $V_{CC}-0.025$ | -       | -            | V                |
| Output Voltage, Low                        | -  | $V_{OL}$     | -              | -       | 0.025        |                  |
| Output Resistance, High State              | $V_{CC}=18\text{V}$ , $I_{OUT}=-10\text{mA}$   | $R_{OH}$     | -              | 1.5     | 2.5          | $\Omega$         |
| Output Resistance, Low State               | $V_{CC}=18\text{V}$ , $I_{OUT}=10\text{mA}$    | $R_{OL}$     | -              | 1.2     | 2            |                  |
| Output Current, Continuous                 | Limited by package power dissipation           | $I_{DC}$     | -              | -       | $\pm 1$      | A                |
| Rise Time                                  | $C_{LOAD}=1000\text{pF}$ , $V_{CC}=18\text{V}$ | $t_R$        | -              | 9       | 16           | ns               |
| Fall Time                                  | $C_{LOAD}=1000\text{pF}$ , $V_{CC}=18\text{V}$ | $t_F$        | -              | 8       | 14           |                  |
| On-Time Propagation Delay                  | $C_{LOAD}=1000\text{pF}$ , $V_{CC}=18\text{V}$ | $t_{ONDLY}$  | -              | 19      | 40           |                  |
| Off-Time Propagation Delay                 | $C_{LOAD}=1000\text{pF}$ , $V_{CC}=18\text{V}$ | $t_{OFFDLY}$ | -              | 18      | 35           |                  |
| Enable to Output-High Delay Time           | IXDD604 only                                   | $t_{ENOH}$   | -              | 15      | 30           |                  |
| Disable to High Impedance State Delay Time | IXDD604 only                                   | $t_{DOLD}$   | -              | -       | 30           |                  |
| Enable Pull-Up Resistor                    | -  | $R_{EN}$     | -              | 200     | -            | $\text{k}\Omega$ |
| Power Supply Current                       | $V_{CC}=18\text{V}$ , $V_{IN}=3.5\text{V}$     | $I_{CC}$     | -              | 1       | 3            | $\text{mA}$      |
|  | $V_{CC}=18\text{V}$ , $V_{IN}=0\text{V}$       |              | -              | -       | 10           | $\mu\text{A}$    |
|  | $V_{CC}=18\text{V}$ , $V_{IN}=V_{CC}$          |              | -              | -       | 10           |                  |

**1.6 Electrical Characteristics**

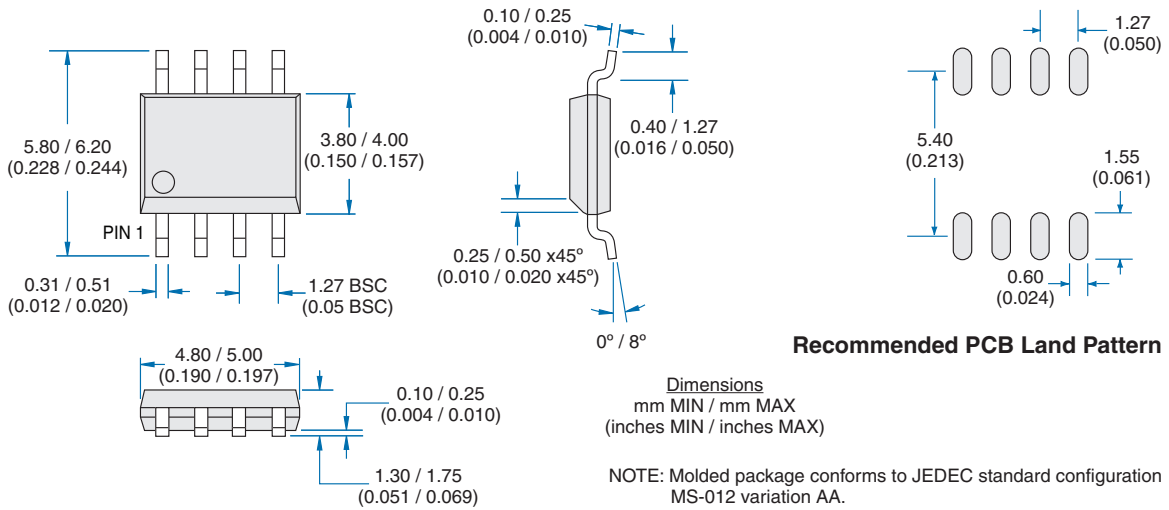
Test Conditions:  $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$ ,  $T_J < 150^{\circ}\text{C}$ , one channel (unless otherwise noted).

| Parameter                                  | Conditions                                  | Symbol       | Minimum        | Typical | Maximum      | Units         |
|--|---|--------------|----------------|---------|--------------|---------------|
| Input Voltage, High                        | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$   | $V_{IH}$     | 2.4            | -       | -            | V             |
| Input Voltage, Low                         | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$   | $V_{IL}$     | -              | -       | 0.8          |               |
| Input Voltage Range                        | -   | $V_{IN}$     | -5             | -       | $V_{CC}+0.3$ |               |
| Input Current                              | $0\text{V} \leq V_{IN} \leq V_{CC}$         | $I_{IN}$     | -10            | -       | 10           | $\mu\text{A}$ |
| Output Voltage, High                       | -   | $V_{OH}$     | $V_{CC}-0.025$ | -       | -            | V             |
| Output Voltage, Low                        | -   | $V_{OL}$     | -              | -       | 0.025        |               |
| Output Resistance, High State              | $V_{CC}=18\text{V}, I_{OUT}=-10\text{mA}$   | $R_{OH}$     | -              | -       | 3            | $\Omega$      |
| Output Resistance, Low State               | $V_{CC}=18\text{V}, I_{OUT}=10\text{mA}$    | $R_{OL}$     | -              | -       | 2            |               |
| Output Current, Continuous                 | Limited by package power dissipation        | $I_{DC}$     | -              | -       | $\pm 1$      | A             |
| Rise Time                                  | $C_{LOAD}=1000\text{pF}, V_{CC}=18\text{V}$ | $t_R$        | -              | -       | 10           | ns            |
| Fall Time                                  | $C_{LOAD}=1000\text{pF}, V_{CC}=18\text{V}$ | $t_F$        | -              | -       | 9            |               |
| On-Time Propagation Delay                  | $C_{LOAD}=1000\text{pF}, V_{CC}=18\text{V}$ | $t_{ONDLY}$  | -              | -       | 23           |               |
| Off-Time Propagation Delay                 | $C_{LOAD}=1000\text{pF}, V_{CC}=18\text{V}$ | $t_{OFFDLY}$ | -              | -       | 32           |               |
| Enable to Output-High Delay Time           | IXDD604 only                                | $t_{ENOH}$   | -              | -       | 60           |               |
| Disable to High Impedance State Delay Time | IXDD604 only                                | $t_{DOLD}$   | -              | -       | 59           |               |
| Power Supply Current                       | $V_{CC}=18\text{V}, V_{IN}=3.5\text{V}$     | $I_{CC}$     | -              | 1       | 3            | mA            |
|  | $V_{CC}=18\text{V}, V_{IN}=0\text{V}$       |              | -              | -       | 10           |               |
|  | $V_{CC}=18\text{V}, V_{IN}=V_{CC}$          |              | -              | -       | 10           | $\mu\text{A}$ |

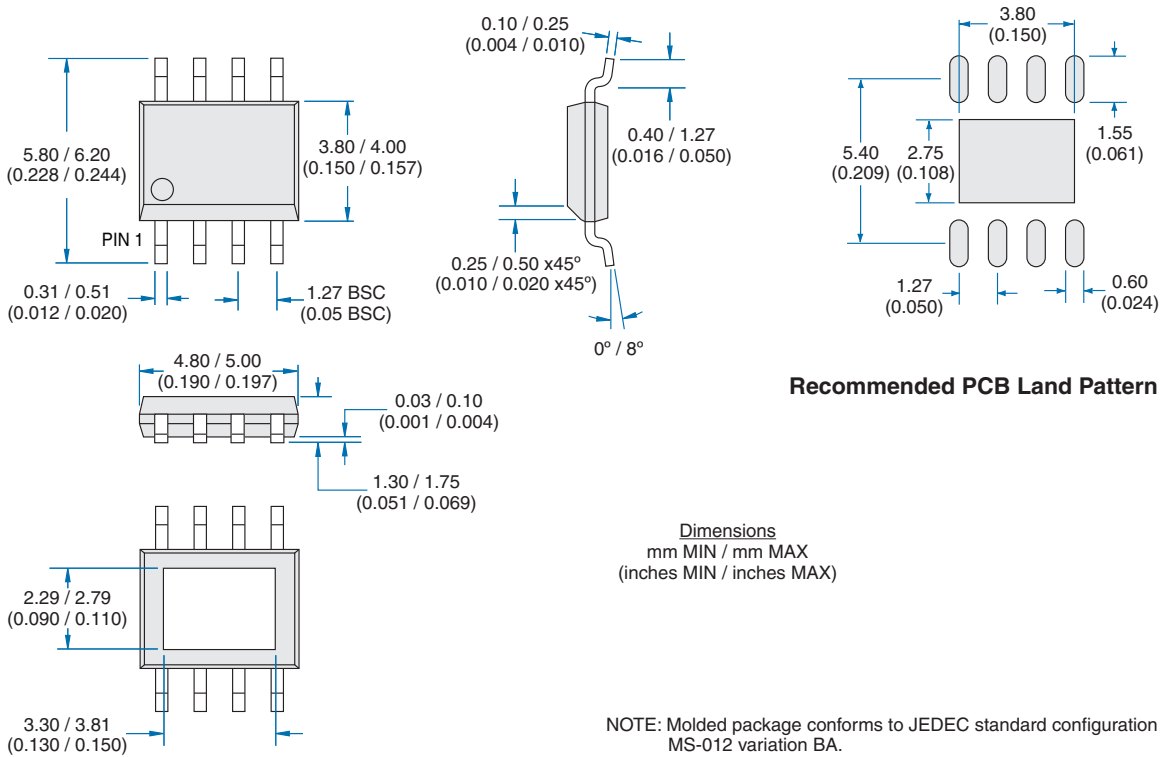
## 2 Manufacturing Information

### 2.1 Mechanical Dimensions

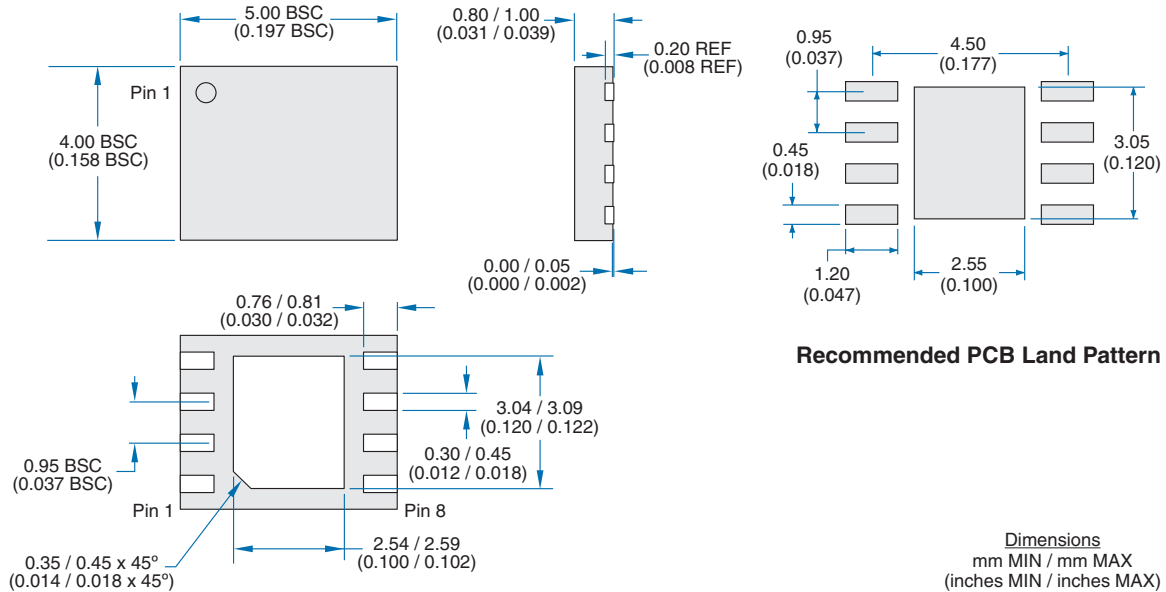
#### 2.1.1 8-Pin SOIC - SIA Package



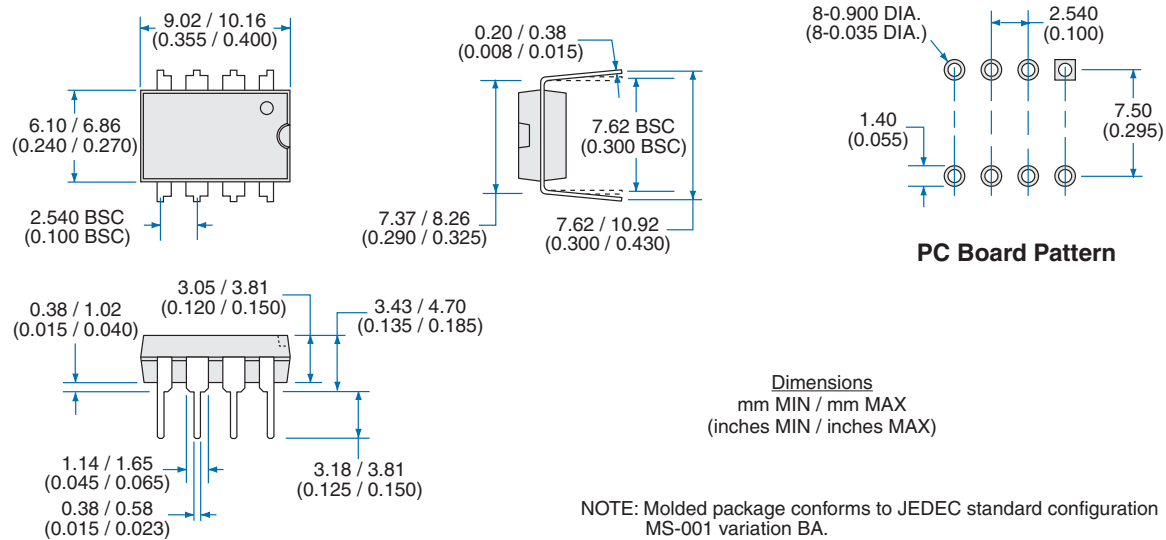
#### 2.1.2 8-Pin SOIC - SI Package



**2.1.3 8-Pin DFN - D2 Package**



**2.1.4 8-Pin DIP - PI Package**



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