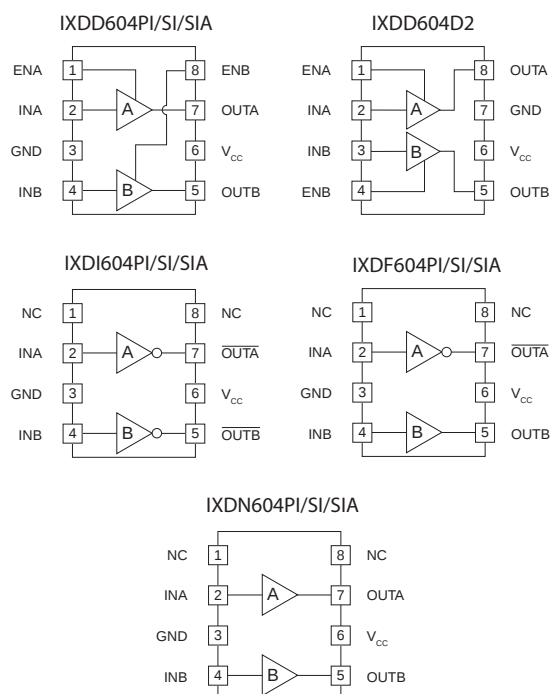


|                                                                                      |           |
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## 1 Specifications

### 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 |
| OUTA<br>OUTA    | Channel A Output - Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT                     |
| OUTB<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>                     | -0.3    | 40                   | V     |
| Input Voltage                 | V <sub>INx</sub> , V <sub>ENx</sub> | -5      | V <sub>CC</sub> +0.3 | V     |
| Output Current                | I <sub>OUT</sub>                    | -       | ±4                   | A     |
| Output Pulsed Current (0.5μs) | I <sub>out_pulsed</sub>             | -       | ±5                   | 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          | Range       | Units |
|-----------------------------|-----------------|-------------|-------|
| Supply Voltage              | V <sub>CC</sub> | 4.5 to 35   | V     |
| Operating Temperature Range | T <sub>A</sub>  | -40 to +125 | °C    |

### 1.5 Electrical Characteristics: $T_A = 25^\circ\text{C}$

Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$ , one channel (unless otherwise noted).

| Parameter                                  | Conditions                                     | Symbol       | Minimum        | Typical | Maximum     | Units         |
|--------------------------------------------|------------------------------------------------|--------------|----------------|---------|-------------|---------------|
| Input Voltage, High                        | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IH}$     | 3.0            | -       | -           | V             |
| Input Voltage, Low                         | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IL}$     | -              | -       | 0.8         |               |
| Input Current                              | $0\text{V} \leq V_{IN} \leq V_{CC}$            | $I_{IN}$     | -              | -       | $\pm 10$    | $\mu\text{A}$ |
| 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              | $V_{CC}=18\text{V}$ , $I_{OUT}=-10\text{mA}$   | $R_{OH}$     | -              | 1.3     | 2.5         | $\Omega$      |
| Output Resistance, Low State               | $V_{CC}=18\text{V}$ , $I_{OUT}=10\text{mA}$    | $R_{OL}$     | -              | 1.1     | 2           |               |
| Output Current, Continuous                 | Limited by package power dissipation           | $I_{DC}$     | -              | -       | $\pm 1$     | A             |
| Rise Time                                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_r$        | -              | 9       | 16          | ns            |
| Fall Time                                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_f$        | -              | 8       | 14          |               |
| On-Time Propagation Delay                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_{ondly}$  | -              | 29      | 50          |               |
| Off-Time Propagation Delay                 | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_{offdly}$ | -              | 35      | 50          |               |
| Enable to Output-High Delay Time           | IXDD604 only, $V_{CC}=18\text{V}$              | $t_{ENOH}$   | -              | 35      | 55          |               |
| Disable to High Impedance State Delay Time | IXDD604 only, $V_{CC}=18\text{V}$              | $t_{DOLD}$   | -              | 40      | 55          |               |
| Enable Pull-Up Resistor                    | -                                              | $R_{EN}$     | -              | 200     | -           | $k\Omega$     |
| Power Supply Current                       | $V_{CC}=18\text{V}$ , $V_{IN}=3.5\text{V}$     | $I_{CC}$     | -              | 1       | 3           | $\mu\text{A}$ |
|                                            | $V_{CC}=18\text{V}$ , $V_{IN}=0\text{V}$       |              | -              | <1      | 10          |               |
|                                            | $V_{CC}=18\text{V}$ , $V_{IN}=V_{CC}$          |              | -              | <1      | 10          |               |

### 1.6 Electrical Characteristics: $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$

Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$ , one channel (unless otherwise noted).

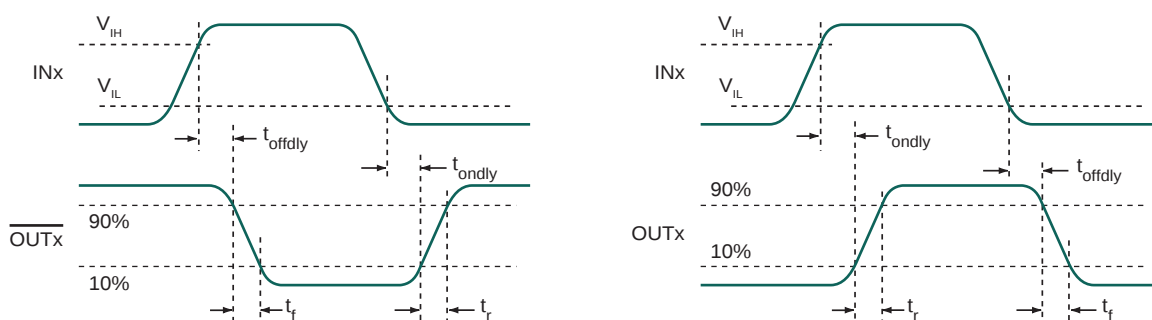
| Parameter                                  | Conditions                                     | Symbol       | Minimum        | Maximum | Units         |
|--------------------------------------------|------------------------------------------------|--------------|----------------|---------|---------------|
| Input Voltage, High                        | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IH}$     | 3.3            | -       | V             |
| Input Voltage, Low                         | $4.5\text{V} \leq V_{CC} \leq 18\text{V}$      | $V_{IL}$     | -              | 0.65    |               |
| 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               | $V_{CC}=18\text{V}$ , $I_{OUT}=10\text{mA}$    | $R_{OL}$     | -              | 2.5     |               |
| Output Current, Continuous                 | Limited by package power dissipation           | $I_{DC}$     | -              | $\pm 1$ | A             |
| Rise Time                                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_r$        | -              | 16      | ns            |
| Fall Time                                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_f$        | -              | 14      |               |
| On-Time Propagation Delay                  | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_{ondly}$  | -              | 65      |               |
| Off-Time Propagation Delay                 | $V_{CC}=18\text{V}$ , $C_{LOAD}=1000\text{pF}$ | $t_{offdly}$ | -              | 65      |               |
| Enable to Output-High Delay Time           | IXDD604 only, $V_{CC}=18\text{V}$              | $t_{ENOH}$   | -              | 65      |               |
| Disable to High Impedance State Delay Time | IXDD604 only, $V_{CC}=18\text{V}$              | $t_{DOLD}$   | -              | 65      |               |
| Power Supply Current                       | $V_{CC}=18\text{V}$ , $V_{IN}=3.5\text{V}$     | $I_{CC}$     | -              | 3.5     | $\mu\text{A}$ |
|                                            | $V_{CC}=18\text{V}$ , $V_{IN}=0\text{V}$       |              | -              | 150     |               |
|                                            | $V_{CC}=18\text{V}$ , $V_{IN}=V_{CC}$          |              | -              | 150     |               |

## 1.7 Thermal Characteristics

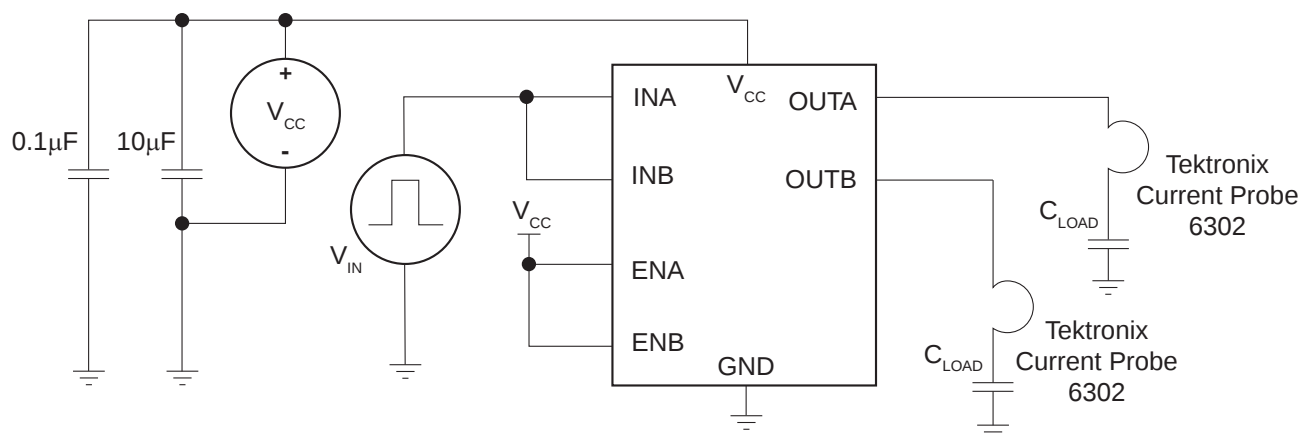
| Package               | Parameter                               | Symbol        | Rating | Units |
|-----------------------|-----------------------------------------|---------------|--------|-------|
| D2 (8-Pin DFN)        | Thermal Resistance, Junction-to-Ambient | $\theta_{JA}$ | 35     | °C/W  |
| PI (8-Pin DIP)        |                                         |               | 125    |       |
| SI (8-Pin Power SOIC) |                                         |               | 85     |       |
| SIA (8-Pin SOIC)      |                                         |               | 120    |       |
| SI (8-Pin Power SOIC) | Thermal Resistance, Junction-to-Case    | $\theta_{JC}$ | 10     | °C/W  |

## 2 IXD\_604 Performance

### 2.1 Timing Diagrams

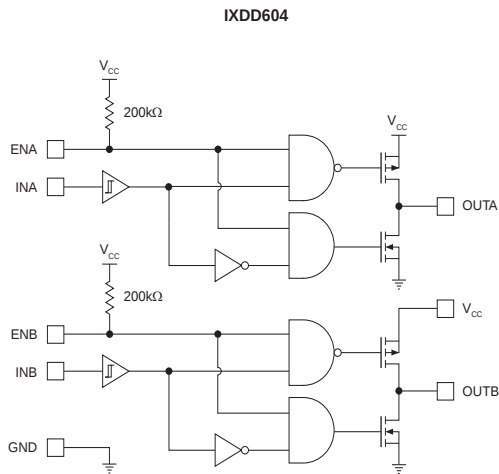


### 2.2 Characteristics Test Diagram



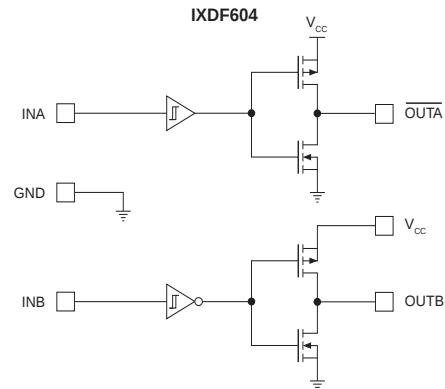
### 3 Block Diagrams & Truth Tables

#### 3.1 IXDD604



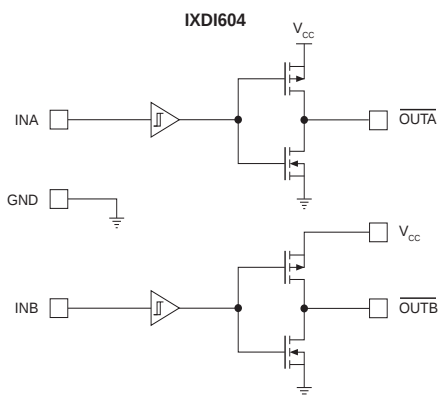
| IN <sub>x</sub> | EN <sub>x</sub> | OUT <sub>x</sub> |
|-----------------|-----------------|------------------|
| 0               | 1 or open       | 0                |
| 1               | 1 or open       | 1                |
| 0               | 0               | Z                |
| 1               | 0               | Z                |

#### 3.3 IXDF604



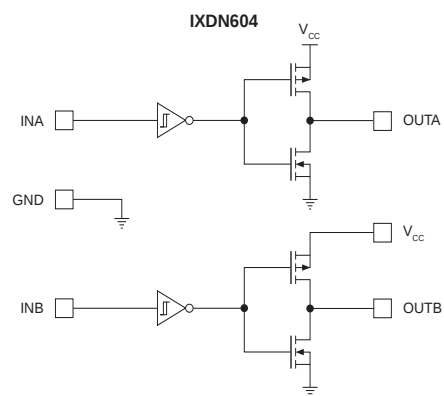
| INA | OUTA |
|-----|------|
| 0   | 1    |
| 1   | 0    |
| INB | OUTB |
| 0   | 0    |
| 1   | 1    |

#### 3.2 IXDI604



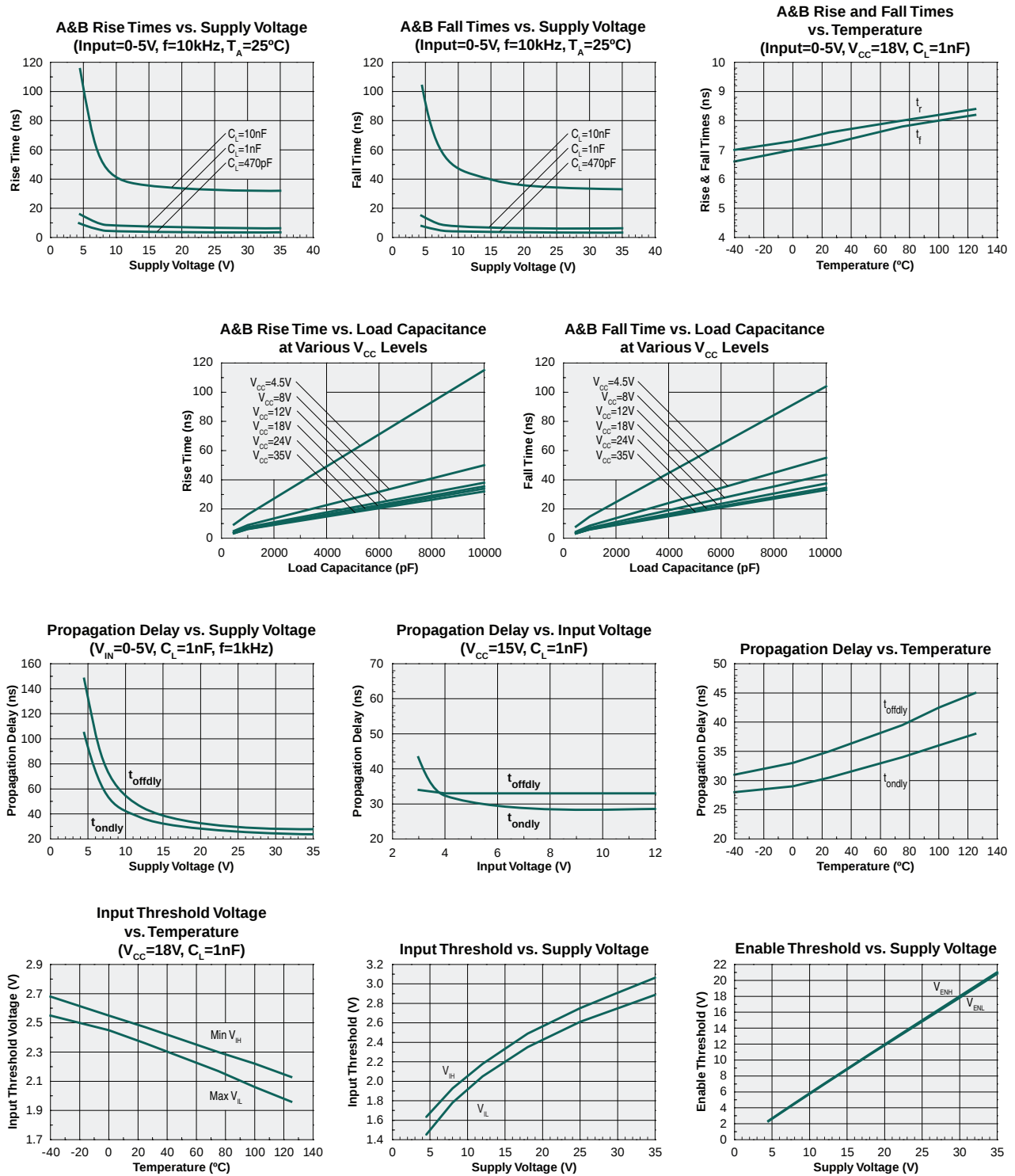
| IN <sub>x</sub> | OUT <sub>x</sub> |
|-----------------|------------------|
| 0               | 1                |
| 1               | 0                |

#### 3.4 IXDN604

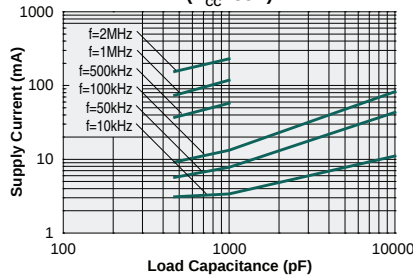


| IN <sub>x</sub> | OUT <sub>x</sub> |
|-----------------|------------------|
| 0               | 0                |
| 1               | 1                |

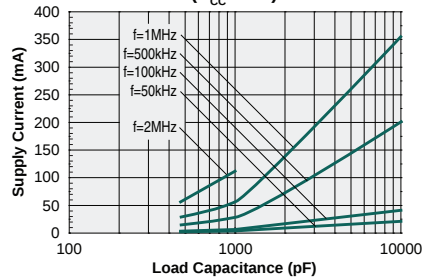
## 4 Typical Performance Characteristics



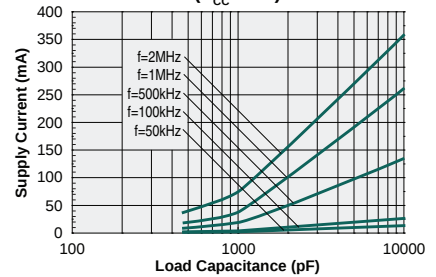
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=35V$ )**



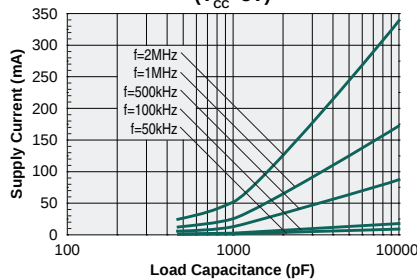
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=18V$ )**



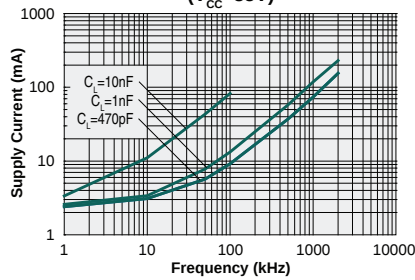
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=12V$ )**



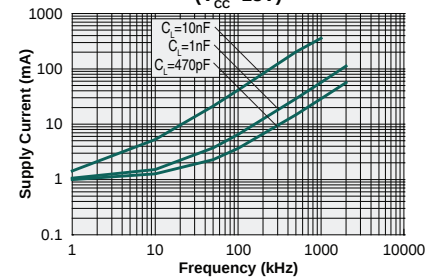
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=8V$ )**



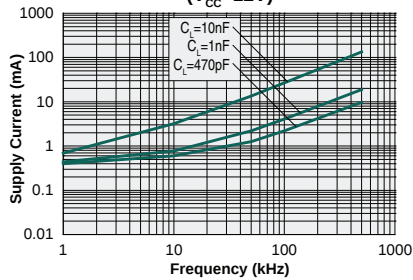
**Supply Current vs. Frequency  
Both Outputs Active  
( $V_{CC}=35V$ )**



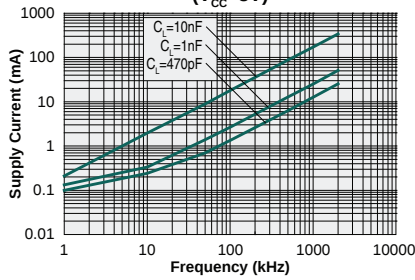
**Supply Current vs. Frequency  
Both Outputs Active  
( $V_{CC}=18V$ )**



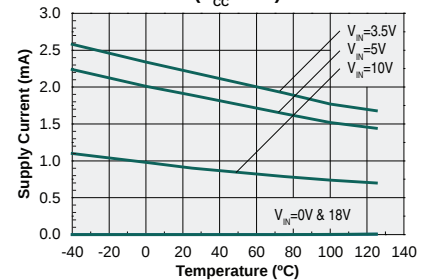
**Supply Current vs. Frequency  
Both Outputs Active  
( $V_{CC}=12V$ )**



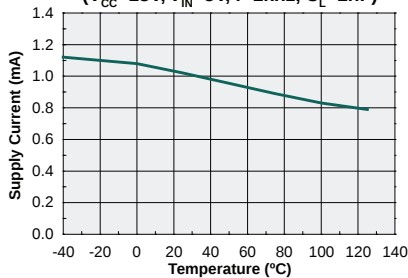
**Supply Current vs. Frequency  
Both Outputs Active  
( $V_{CC}=8V$ )**



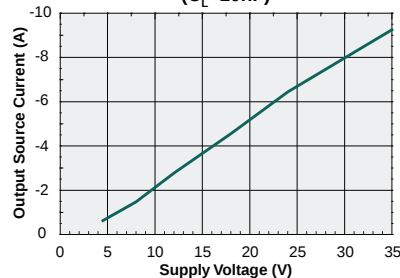
**Quiescent Supply Current  
vs. Temperature  
( $V_{CC}=18V$ )**



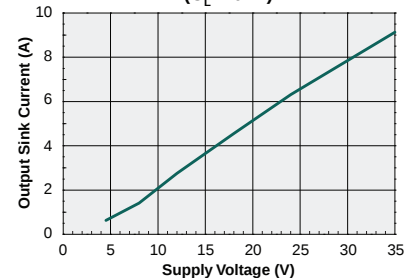
**Dynamic Supply Current  
vs. Temperature  
( $V_{CC}=18V$ ,  $V_{IN}=5V$ ,  $f=1kHz$ ,  $C_L=1nF$ )**

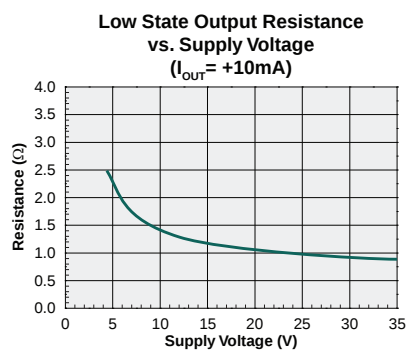
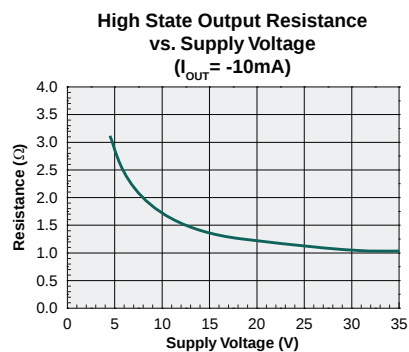
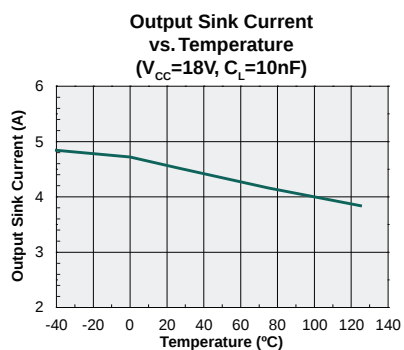
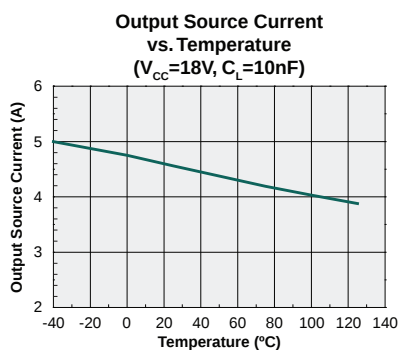


**Output Source Current  
vs. Supply Voltage  
( $C_L=10nF$ )**



**Output Sink Current  
vs. Supply Voltage  
( $C_L=10nF$ )**





## 5 Manufacturing Information

### 5.1 Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits Division classifies its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation.

We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a **Moisture Sensitivity Level (MSL)** classification as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

| Device               | Moisture Sensitivity Level (MSL) Classification |
|----------------------|-------------------------------------------------|
| IXD_604 All Versions | MSL 1                                           |

### 5.2 ESD Sensitivity



This product is **ESD Sensitive**, and should be handled according to the industry standard **JESD-625**.

### 5.3 Soldering Profile

Provided in the table below is the Classification Temperature ( $T_C$ ) of this product and the maximum dwell time the body temperature of this device may be ( $T_C - 5^\circ\text{C}$ ) or greater. The classification temperature sets the Maximum Body Temperature allowed for this device during lead-free reflow processes. For through-hole devices, and any other processes, the guidelines of J-STD-020 must be observed.

| Device                             | Classification Temperature ( $T_C$ ) | Dwell Time ( $t_p$ ) | Max Reflow Cycles |
|------------------------------------|--------------------------------------|----------------------|-------------------|
| IXD_604SI / IXD_604SIA / IXD_604D2 | 260°C                                | 30 seconds           | 3                 |
| IXD_604PI                          | 250°C                                | 30 seconds           | -                 |

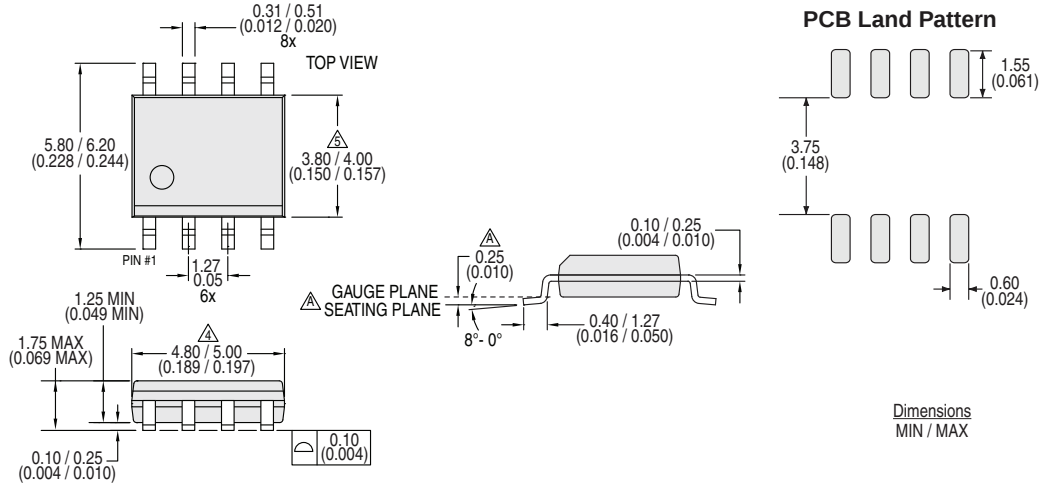
### 5.4 Board Wash

IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include but are not limited to: using a low pressure wash and providing a follow up bake cycle sufficient to remove any moisture trapped within the device due to the washing process. Due to the variability of the wash parameters used to clean the board, determination of the bake temperature and duration necessary to remove the moisture trapped within the package is the responsibility of the user (assembler). Cleaning or drying methods that employ ultrasonic energy may damage the device and should not be used. Additionally, the device must not be exposed to flux or solvents that are Chlorine- or Fluorine-based



## 5.5 Mechanical Dimensions

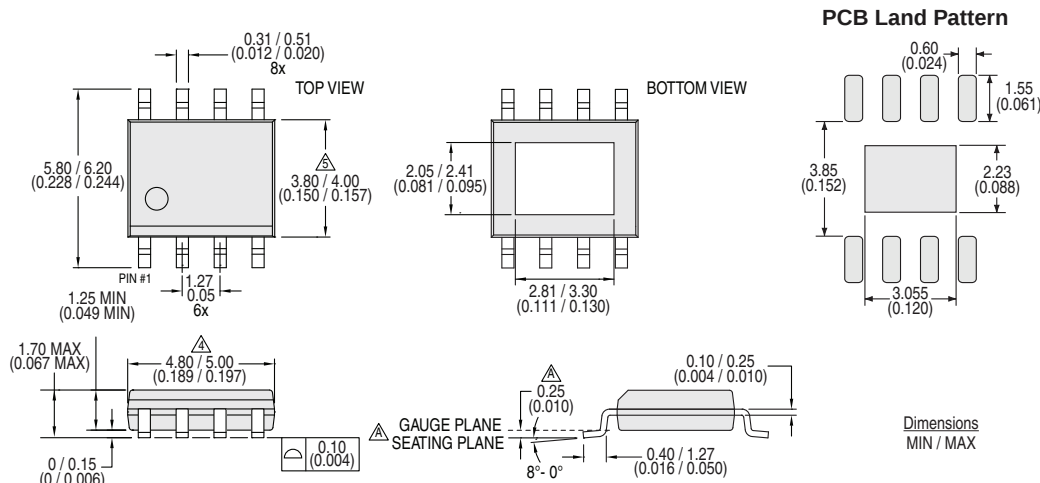
### 5.5.1 SIA (8-Pin SOIC)



#### Notes:

1. Controlling dimension: millimeters.
2. All dimensions are in mm (inches).
3. This package conforms to JEDEC Standard MS-012, variation AA, Rev. F.
4. Dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15mm per end.
5. Dimension does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25mm per side.
6. Lead thickness includes plating.

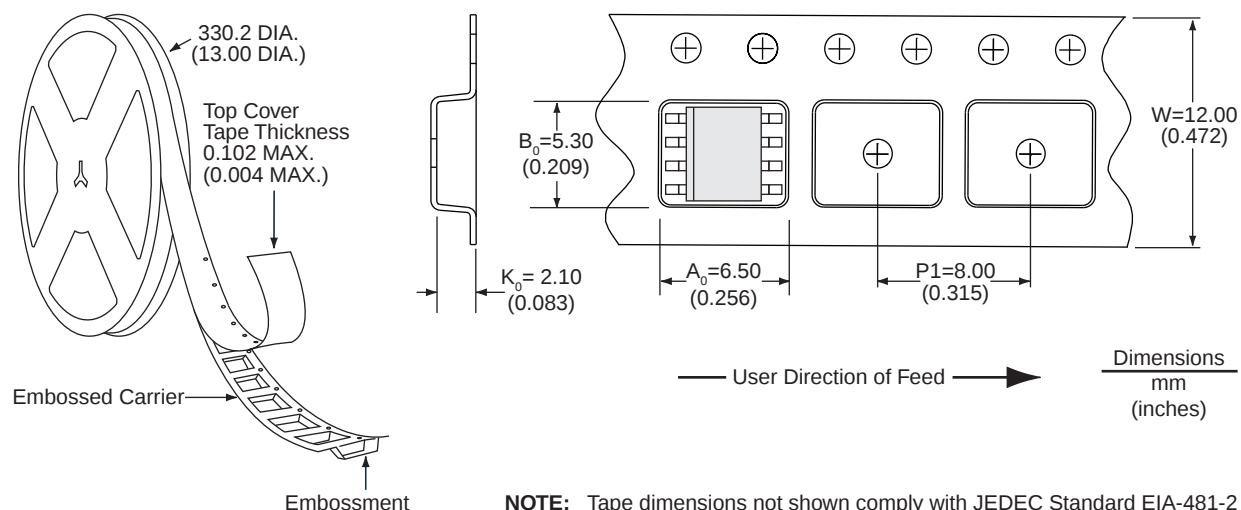
### 5.5.2 SI (8-Pin Power SOIC with Exposed Metal Back)



#### Notes:

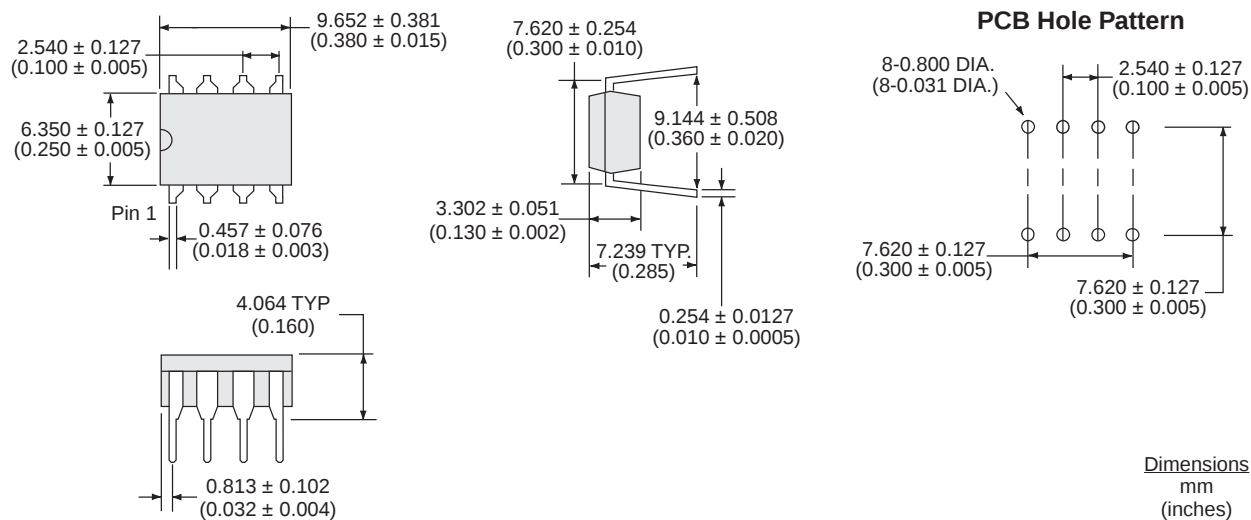
1. Controlling dimension: millimeters.
2. All dimensions are in mm (inches).
3. This package conforms to JEDEC Standard MS-012, variation BA, Rev. F.
4. Dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15mm per end.
5. Dimension does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25mm per side.
6. The exposed metal pad on the back of the package should be connected to GND. It is not suitable for carrying current.
7. Lead thickness includes plating.

### 5.5.3 Tape & Reel Information for SI and SIA Packages

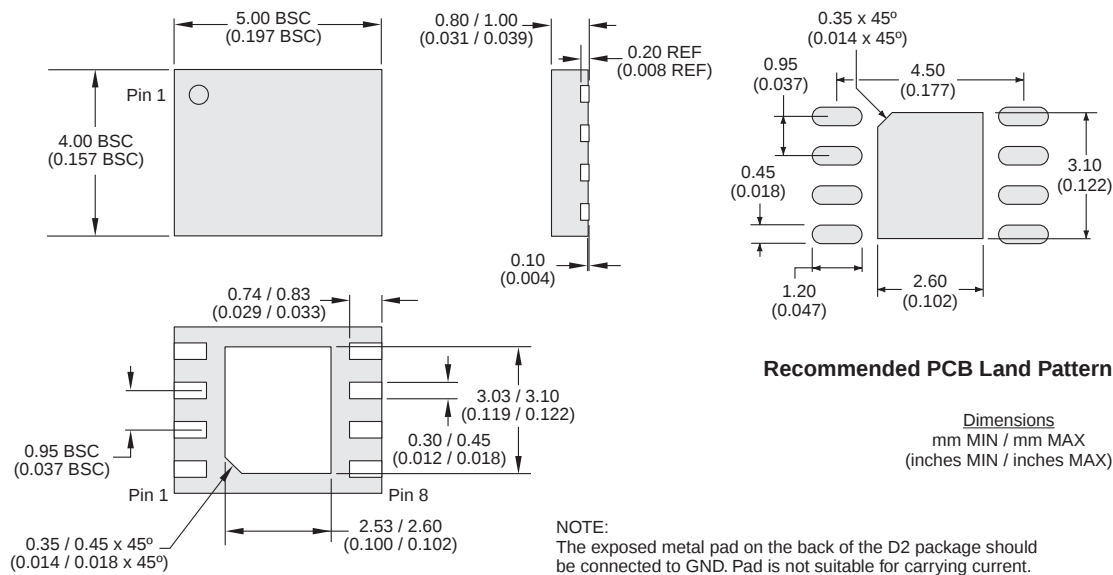


**NOTE:** Tape dimensions not shown comply with JEDEC Standard EIA-481-2

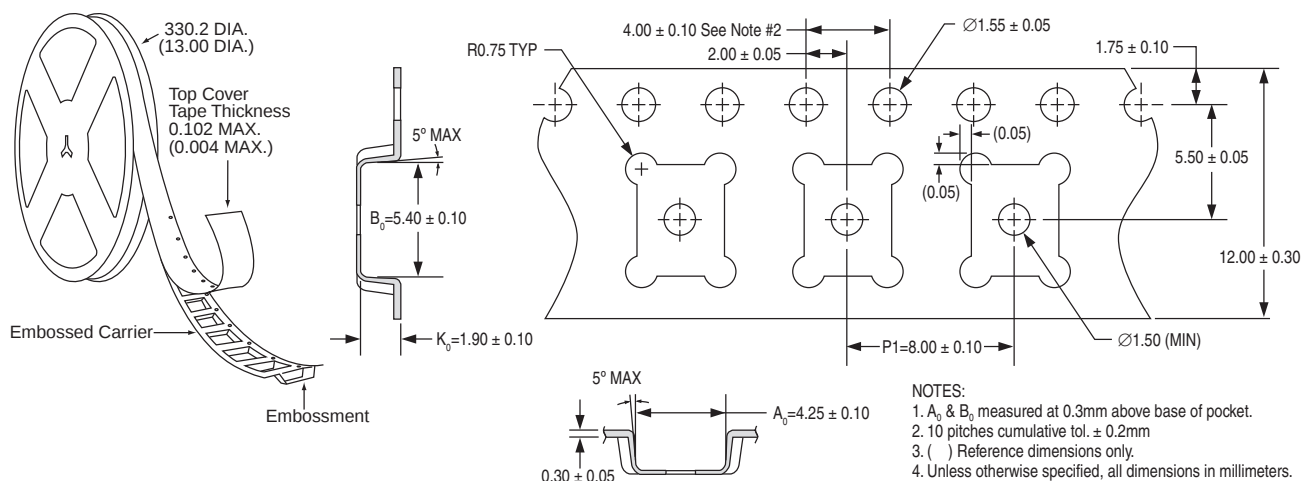
#### 5.5.4 PI (8-Pin DIP)



### 5.5.5 D2 (8-Pin DFN)



### 5.5.6 Tape & Reel Information for D2 Package



For additional information please visit our website at: [www.ixysic.com](http://www.ixysic.com)

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