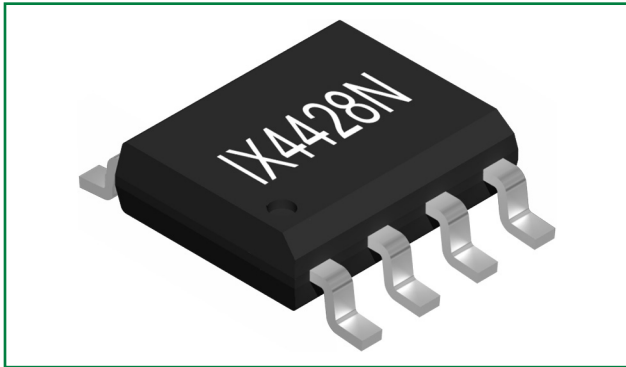


# IX4426 / IX4427 / IX4428

## 1.5A Dual Low-Side Ultrafast MOSFET Driver



### Description

IX4426, IX4427, and IX4428 are dual high-speed, low-side gate drivers. Each of the two outputs can source and sink 1.5A of peak current and they can switch a 1 nF gate load with rise and fall times of less than 10 ns.

The inputs of each driver are TTL and CMOS compatible, and are virtually immune to latch-up. Low propagation delay times and fast, matched rise and fall times make IX4426, IX4427, and IX4428 ideal for high-frequency and high-power applications.

IX4426 is configured as a dual inverting driver, IX4427 is configured as a dual non-inverting driver, and the IX4428 is configured with one inverting driver and one non-inverting driver.

All three devices are available in a standard 8-pin narrow SOIC package (N suffix), an 8-pin narrow SOIC with an exposed bottom side pad (NE suffix), and an 8-pin DFN package (M suffix).

### Features

- 1.5A Peak Output Current
- Wide Operating Voltage Range: 4.5V to 35V
- -40°C to +125°C Operating Temperature Range
- Latch-up Protected to 1.5A
- TTL and CMOS Compatible Inputs
- Ultrafast Rise and Fall Times
- Low Power Consumption

### Applications

- MOSFET Driver
- Switching Power Supplies
- Motor Controls
- DC to DC Converters
- Pulse Transformer Driver

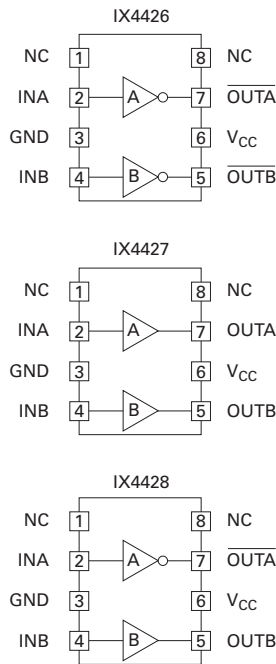
### Ordering Information

| Logic Configuration | Part Number | Package Type                                   | Packing Method | Quantity |
|---------------------|-------------|--|----------------|----------|
|                     | IX4426N     | 8-Pin Narrow SOIC                              | Tube           | 100      |
|                     | IX4426NTR   |  | Tape and Reel  | 2000     |
|                     | IX4426NE    | 8-Pin Narrow SOIC with exposed Bottom Side Pad | Tube           | 100      |
|                     | IX4426NETR  |  | Tape and Reel  | 2000     |
|                     | IX4426MTR   | 8-Pin DFN                                      | Tape and Reel  | 2000     |
|                     | IX4427N     | 8-Pin Narrow SOIC                              | Tube           | 100      |
|                     | IX4427NTR   |  | Tape and Reel  | 2000     |
|                     | IX4427NE    | 8-Pin Narrow SOIC with exposed Bottom Side Pad | Tube           | 100      |
|                     | IX4427NETR  |  | Tape and Reel  | 2000     |
|                     | IX4427MTR   | 8-Pin DFN                                      | Tape and Reel  | 2000     |
|                     | IX4428N     | 8-Pin Narrow SOIC                              | Tube           | 100      |
|                     | IX4428NTR   |  | Tape and Reel  | 2000     |
|                     | IX4428NE    | 8-Pin Narrow SOIC with exposed Bottom Side Pad | Tube           | 100      |
|                     | IX4428NETR  |  | Tape and Reel  | 2000     |
|                     | IX4428MTR   | 8-Pin DFN                                      | Tape and Reel  | 2000     |

|          |   |    |
|----------|---|----|
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## 1 Specifications

### 1.1 Pin Configurations



### 1.2 Pin Description

| Pin Name           | Description  |
|--------------------|--|
| INA                | Channel A Logic Input  |
| INB                | Channel B Logic Input  |
| OUTA<br>or<br>OUTA | Channel A Output - Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT |
| OUTB<br>or<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   |
| NC                 | No connection  |

### 1.3 Absolute Maximum Ratings

| Parameter            | Symbol           | Value   |                       | Units |
|----------------------|------------------|---------|-----------------------|-------|
|                      |                  | Minimum | Maximum               |       |
| Supply Voltage       | V <sub>CC</sub>  | -0.3    | 35                    | V     |
| Input Voltage        | V <sub>IN</sub>  | -5      | V <sub>CC</sub> + 0.3 |       |
| Output Current       | I <sub>OUT</sub> | —       | ±1.5                  | A     |
| Junction Temperature | T <sub>J</sub>   | -55     | +150                  | °C    |
| Storage Temperature  | T <sub>STG</sub> | -65     | +150                  |       |

Unless otherwise specified, 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          | Value   |         | Units |
|-----------------------------|-----------------|---------|---------|-------|
|                             |                 | Minimum | Maximum |       |
| Supply Voltage              | V <sub>CC</sub> | 4.5     | 30      | V     |
| Operating Temperature Range | T <sub>A</sub>  | -40     | +125    | °C    |

**1.5 Electrical Characteristics:  $T_A = 25^\circ\text{C}$** Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 18\text{V}$ 

| Parameter                     | Conditions                                     | Symbol    | Value            |         |         | Units         |
|-------------------------------|--|-----------|------------------|---------|---------|---------------|
|                               |  |           | Minimum          | Typical | Maximum |               |
| Input Voltage, High           | —  | $V_{IH}$  | 2.4              | —       | —       | V             |
| Input Voltage, Low            | —  | $V_{IL}$  | —                | —       | 0.8     |               |
| Input Current                 | $0\text{V} \leq V_{IN} \leq V_{CC}$            | $I_{IN}$  | —                | —       | $\pm 1$ | $\mu\text{A}$ |
| Output Voltage, High          | —  | $V_{OH}$  | $V_{CC} - 0.025$ | —       | —       | V             |
| Output Voltage, Low           | —  | $V_{OL}$  | —                | —       | 0.025   |               |
| Output Resistance, High State | $V_{CC} = 18\text{V}, I_{OUT} = -100\text{mA}$ | $R_{OH}$  | —                | 4       | 8       | $\Omega$      |
| Output Resistance, Low State  | $V_{CC} = 18\text{V}, I_{OUT} = 100\text{mA}$  | $R_{OL}$  | —                | 2       | 4       |               |
| Latch-Up Protection           | With Reverse Current                           | $I$       | $> 500$          | —       | —       | $\text{mA}$   |
| Rise Time                     | $V_{CC} = 18\text{V}, C_{LOAD} = 1\text{nF}$   | $t_r$     | —                | 10      | 20      | ns            |
| Fall Time                     |  | $t_f$     | —                | 8       | 20      |               |
| On-Time Propagation Delay     |  | $t_{on}$  | —                | 35      | 60      |               |
| Off-Time Propagation Delay    |  | $t_{off}$ | —                | 35      | 60      |               |
| Power Supply Current          | $V_{INA} = V_{INB} = 3\text{V}$                | $I_{CC}$  | —                | 2.5     | 4       | $\text{mA}$   |
|                               | $V_{INA} = V_{INB} = 0\text{V}$                |           | —                | 0.6     | 0.8     |               |

**1.6 Electrical Characteristics:  $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$** Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 18\text{V}$ 

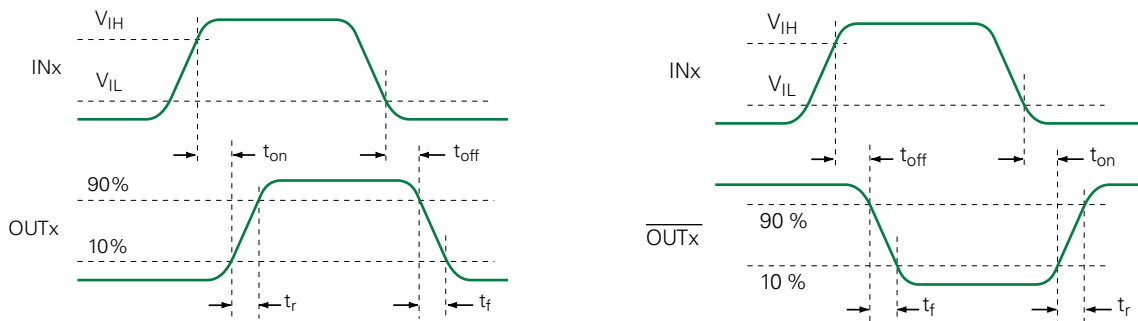
| Parameter                     | Conditions                                     | Symbol    | Value            |         | Units         |
|-------------------------------|--|-----------|------------------|---------|---------------|
|                               |  |           | Minimum          | Maximum |               |
| Input Voltage, High           | —  | $V_{IH}$  | 2.4              | —       | V             |
| Input Voltage, Low            | —  | $V_{IL}$  | —                | 0.8     |               |
| Input Current                 | $0\text{V} \leq V_{IN} \leq V_{CC}$            | $I_{IN}$  | —                | $\pm 1$ | $\mu\text{A}$ |
| Output Voltage, High          | —  | $V_{OH}$  | $V_{CC} - 0.025$ | —       | V             |
| Output Voltage, Low           | —  | $V_{OL}$  | —                | 0.025   |               |
| Output Resistance, High State | $V_{CC} = 18\text{V}, I_{OUT} = -100\text{mA}$ | $R_{OH}$  | —                | 12      | $\Omega$      |
| Output Resistance, Low State  | $V_{CC} = 18\text{V}, I_{OUT} = 100\text{mA}$  | $R_{OL}$  | —                | 8       |               |
| Latch-Up Protection           | With Reverse Current                           | $I$       | $> 500$          | —       | $\text{mA}$   |
| Rise Time                     | $V_{CC} = 18\text{V}, C_{LOAD} = 1\text{nF}$   | $t_r$     | —                | 30      | ns            |
| Fall Time                     |  | $t_f$     | —                | 30      |               |
| On-Time Propagation Delay     |  | $t_{on}$  | —                | 70      |               |
| Off-Time Propagation Delay    |  | $t_{off}$ | —                | 70      |               |
| Power Supply Current          | $V_{INA} = V_{INB} = 3\text{V}$                | $I_{CC}$  | —                | 6       | $\text{mA}$   |
|                               | $V_{INA} = V_{INB} = 0\text{V}$                |           | —                | 1       |               |

**1.7 Thermal Characteristics**

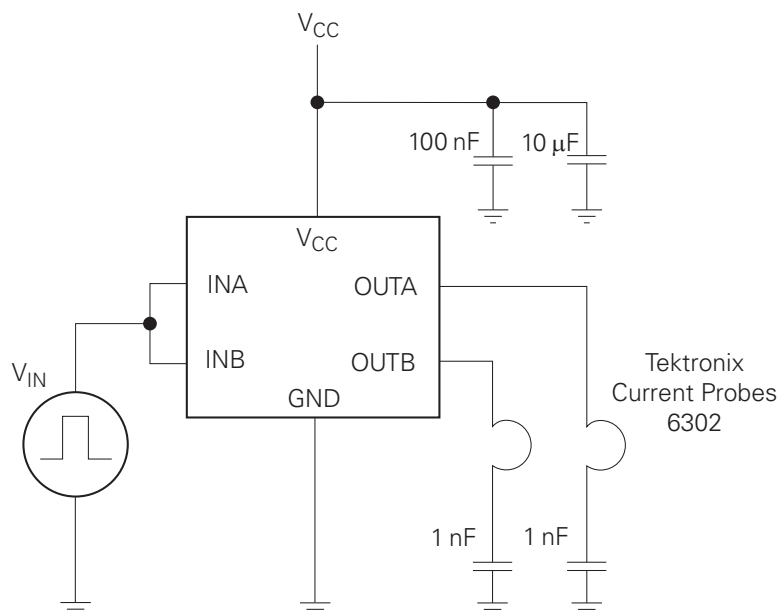
| Package                                 | Parameter                              | Symbol        | Rating | Units        |
|---|--|---------------|--------|--------------|
| 8-Pin SOIC with Exposed Bottom Side Pad | Thermal Impedance, Junction to Ambient | $\theta_{JA}$ | 58     | $\text{K/W}$ |
| 8-Pin SOIC                              | Thermal Impedance, Junction to Ambient | $\theta_{JA}$ | 120    |              |
| 8-Pin DFN                               | Thermal Impedance, Junction to Ambient | $\theta_{JA}$ | 68     |              |
| 8-Pin DFN                               | Thermal Impedance, Junction to Case    | $\theta_{JC}$ | 3.73   |              |

## 2 IX4426 / IX4427 / IX4428 Performance

### 2.1 Timing Diagram

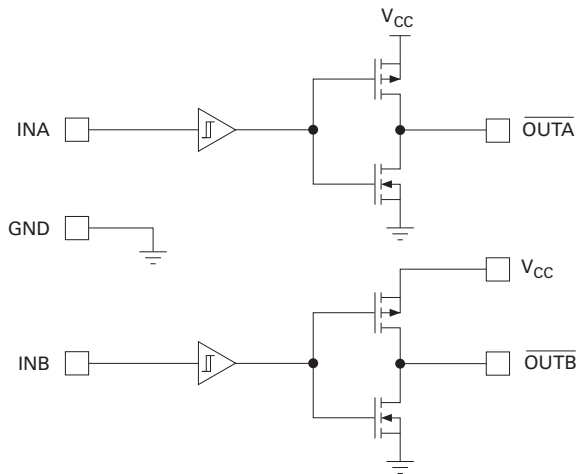


### 2.2 Characteristics Test Diagrams



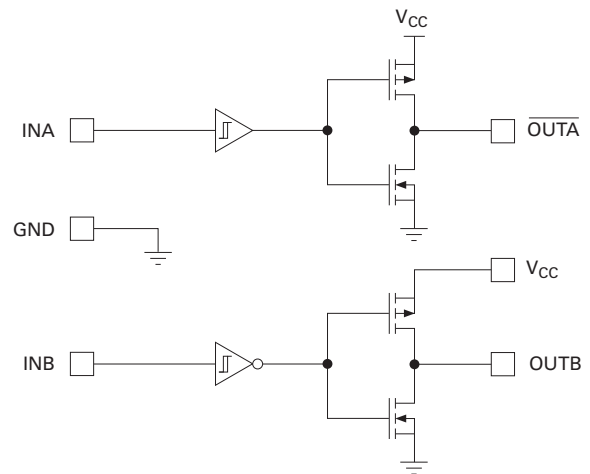
### 3 Block Diagrams and Truth Tables

#### 3.1 IX4426



| IN <sub>x</sub> | $\overline{\text{OUT}}_x$ |
|-----------------|---------------------------|
| 0               | 1                         |
| 1               | 0                         |

#### 3.3 IX4428

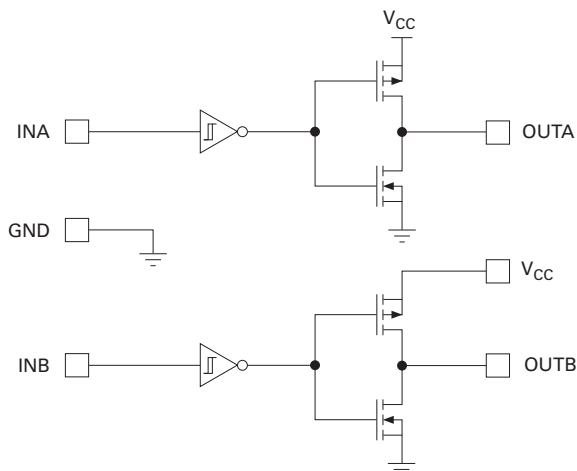


| INA | $\overline{\text{OUT}}_A$ |
|-----|---------------------------|
| 0   | 1                         |
| 1   | 0                         |

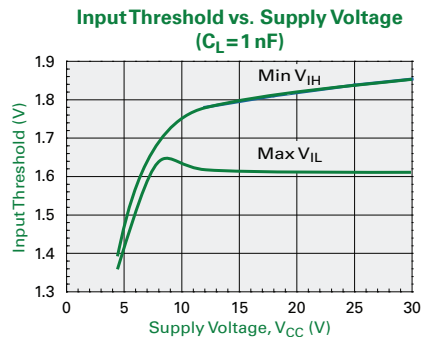
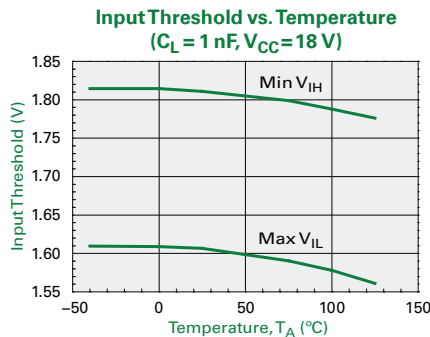
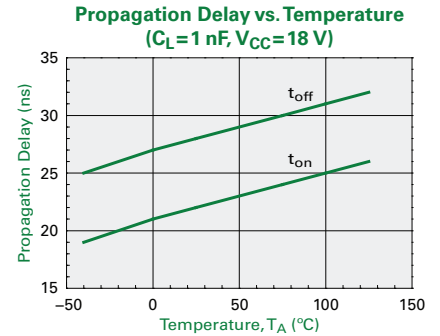
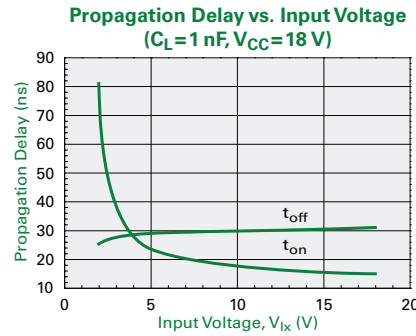
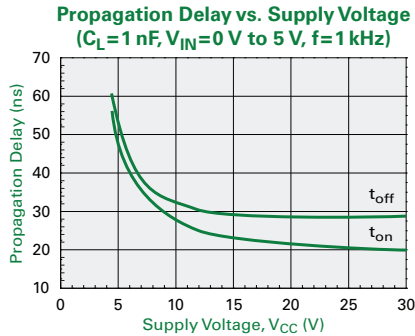
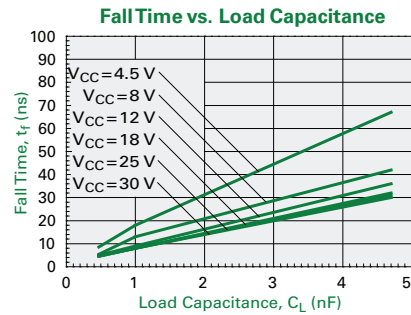
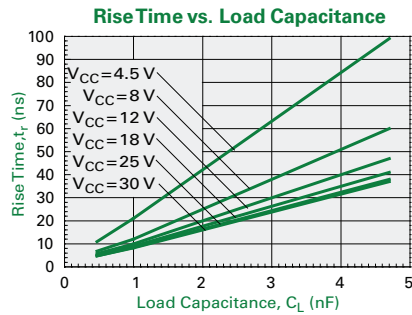
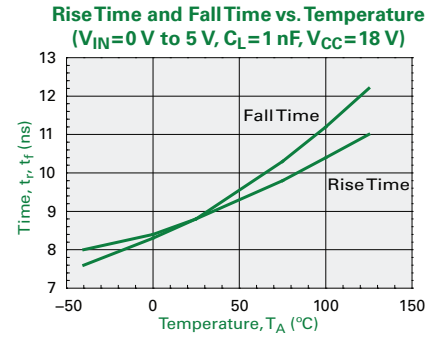
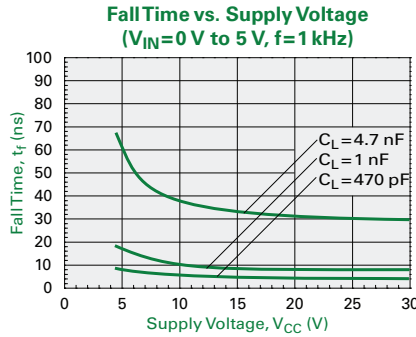
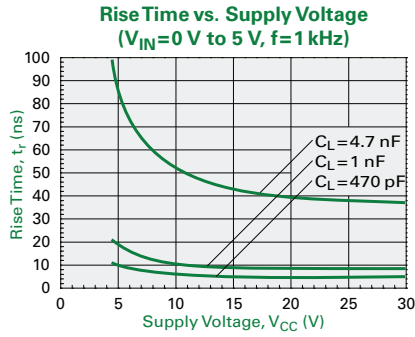
| INB | OUT <sub>B</sub> |
|-----|------------------|
| 0   | 0                |
| 1   | 1                |

#### 3.2 IX4427

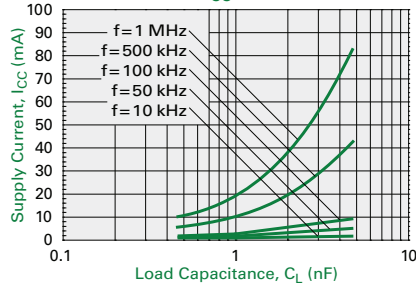


| IN <sub>x</sub> | $\overline{\text{OUT}}_x$ |
|-----------------|---------------------------|
| 0               | 0                         |
| 1               | 1                         |

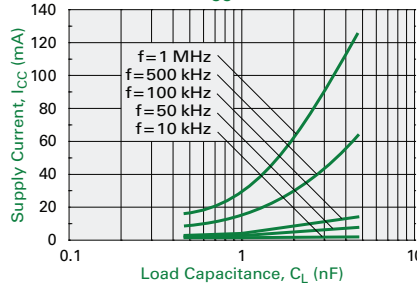
### 4 Performance Data



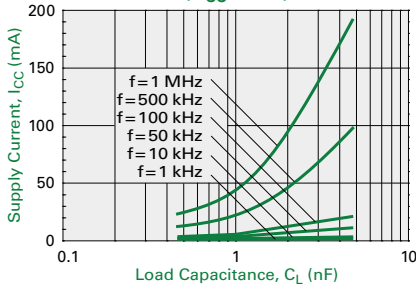
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=8\text{ V}$ )**



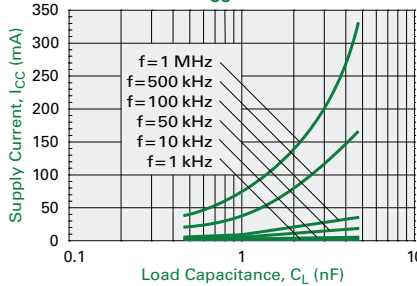
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=12\text{ V}$ )**



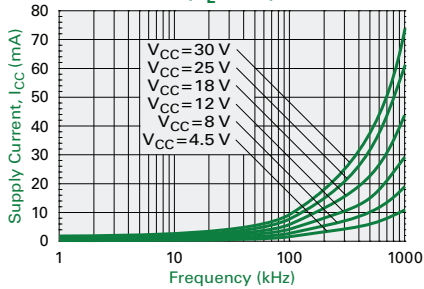
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=18\text{ V}$ )**



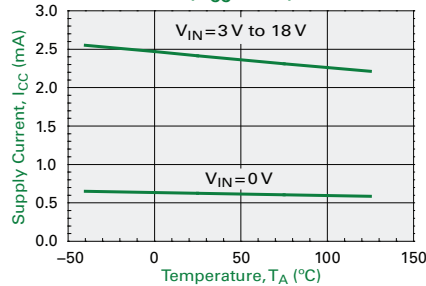
**Supply Current vs. Load Capacitance  
Both Outputs Active  
( $V_{CC}=30\text{ V}$ )**



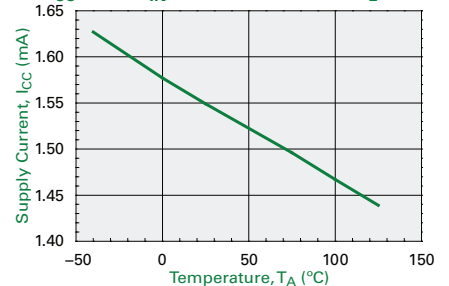
**Supply Current vs. Frequency  
Both Outputs Active  
( $C_L=1\text{ nF}$ )**



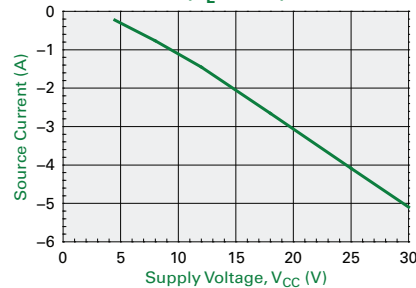
**Quiescent Supply Current  
vs. Temperature  
( $V_{CC}=18\text{ V}$ )**



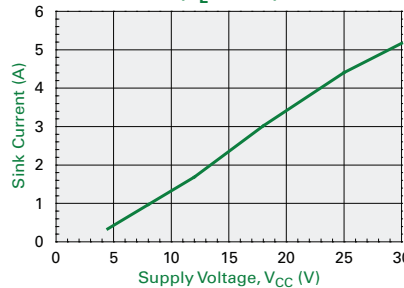
**Dynamic Supply Current vs. Temperature  
Both Outputs Active  
( $V_{CC}=18\text{ V}, V_{IN}=0\text{ V to }5\text{ V}, f=1\text{ kHz}, C_L=1\text{ nF}$ )**



**Output Source Current  
vs. Supply Voltage  
( $C_L=47\text{ nF}$ )**

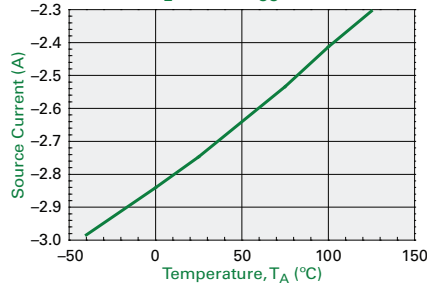


**Output Sink Current  
vs. Supply Voltage  
( $C_L=47\text{ nF}$ )**

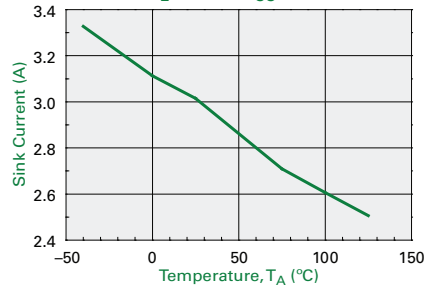




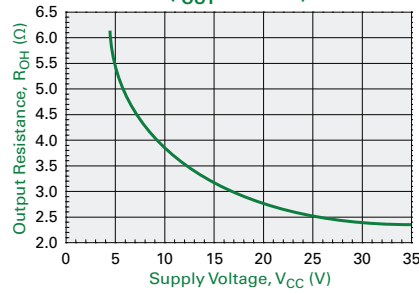
**Output Source Current vs. Temperature**  
( $C_L=47\text{ nF}$ ,  $V_{CC}=18\text{ V}$ )



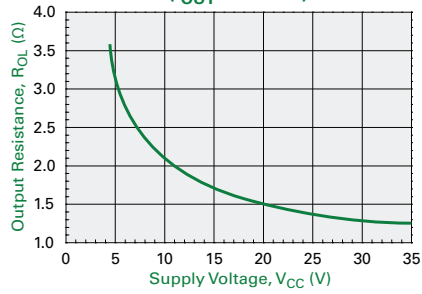
**Output Sink Current vs. Temperature**  
( $C_L=47\text{ nF}$ ,  $V_{CC}=18\text{ V}$ )



**High-State Output Resistance vs. Supply Voltage**  
( $I_{OUT}=-10\text{ mA}$ )



**Low-State Output Resistance vs. Supply Voltage**  
( $I_{OUT}=+10\text{ mA}$ )



## 5 Manufacturing Information

### 5.1 Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. Littelfuse classifies its plastic encapsulated devices for moisture sensitivity according to the latest revision 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 revision of the joint industry standard **IPC/JEDEC J-STD-033**.

| Device                                 | Moisture Sensitivity Level (MSL) Classification |
|--|---|
| IX4426 / IX4427 / IX4428, 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 **IPC/JEDEC J-STD-020** Classification Temperature ( $T_C$ ) and the maximum dwell time ( $T_C - 5^\circ\text{C}$ ). The Classification Temperature sets the Maximum Body Temperature allowed for these devices during reflow soldering processes.

| Device                                 | Classification Temperature ( $T_C$ ) | Dwell Time ( $t_p$ ) | Maximum Reflow Cycles |
|--|--------------------------------------|----------------------|-----------------------|
| IX4426 / IX4427 / IX4428, all versions | 260°C                                | 30 seconds           | 3                     |

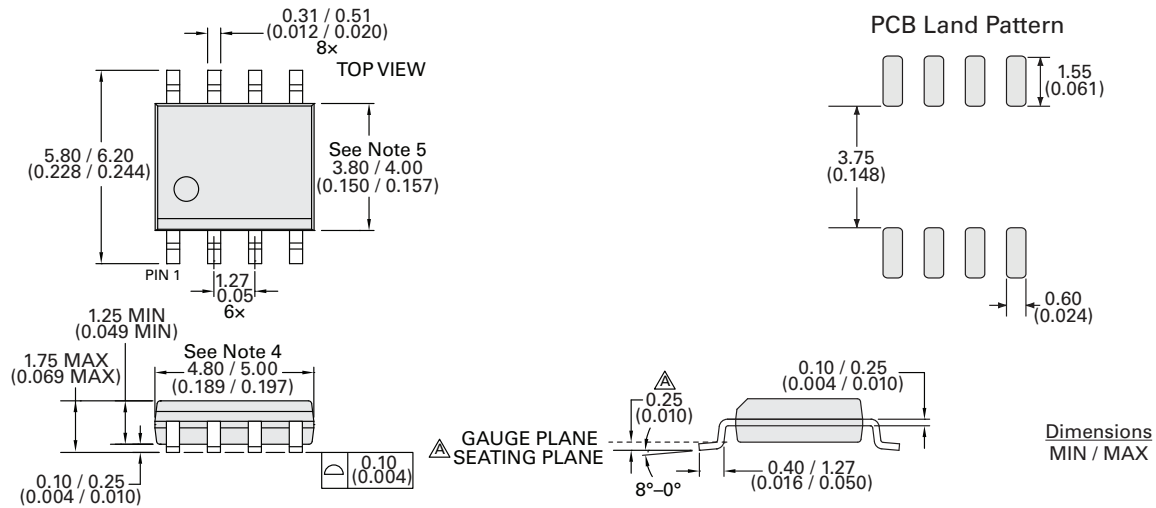
### 5.4 Board Wash

Littelfuse 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 halide flux or solvents.



## 5.5 Mechanical Dimensions

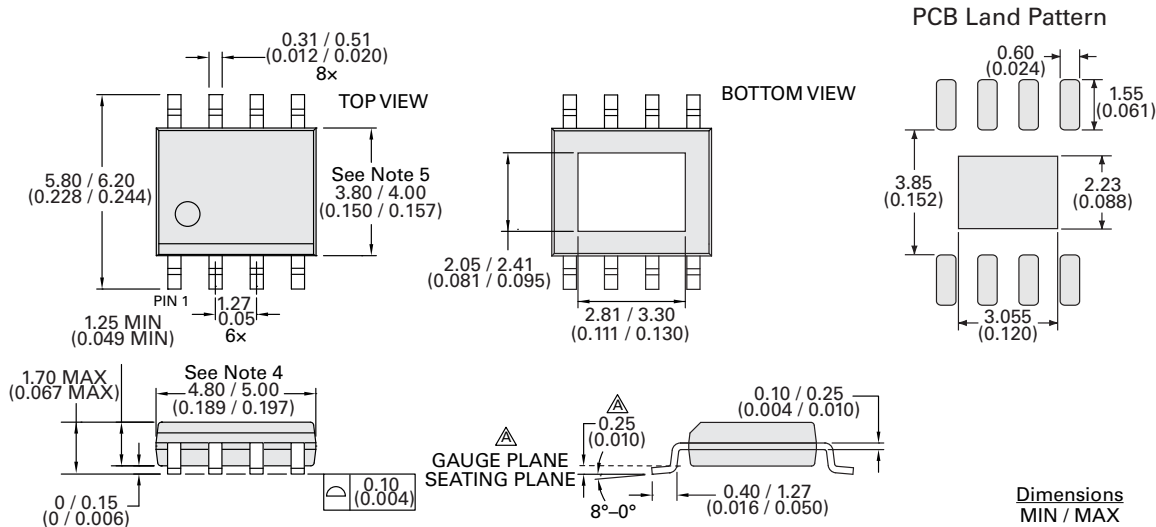
### 5.5.1 "N" Package (8-Pin Narrow SOIC)



#### 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 0.15 mm per end.
5. Dimension does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25 mm per side.
6. Lead thickness includes plating.

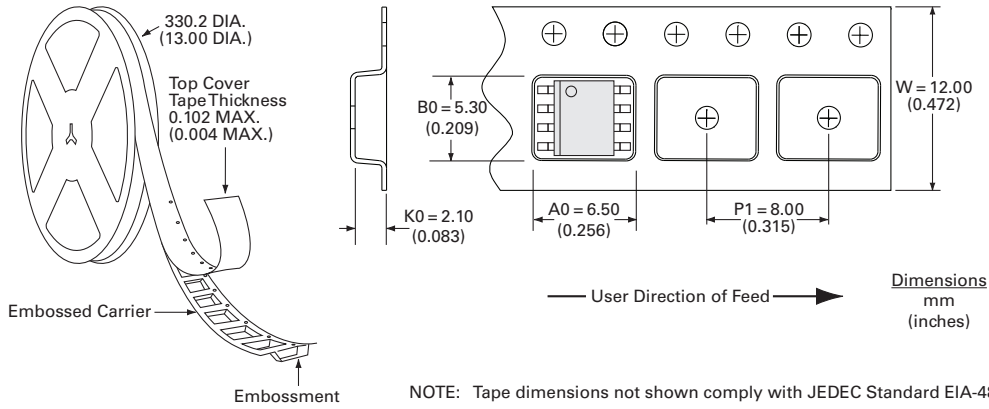
### 5.5.2 "NE" Package (8-Pin Narrow SOIC with Exposed Bottom-Side Pad)



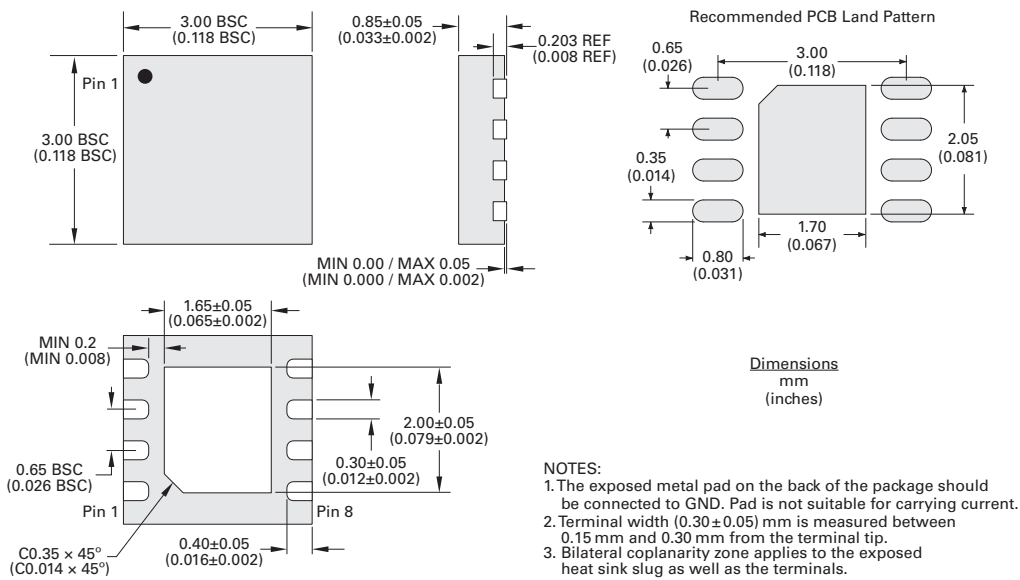
#### Notes:

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 0.15 mm per end.
5. Dimension does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25 mm 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.

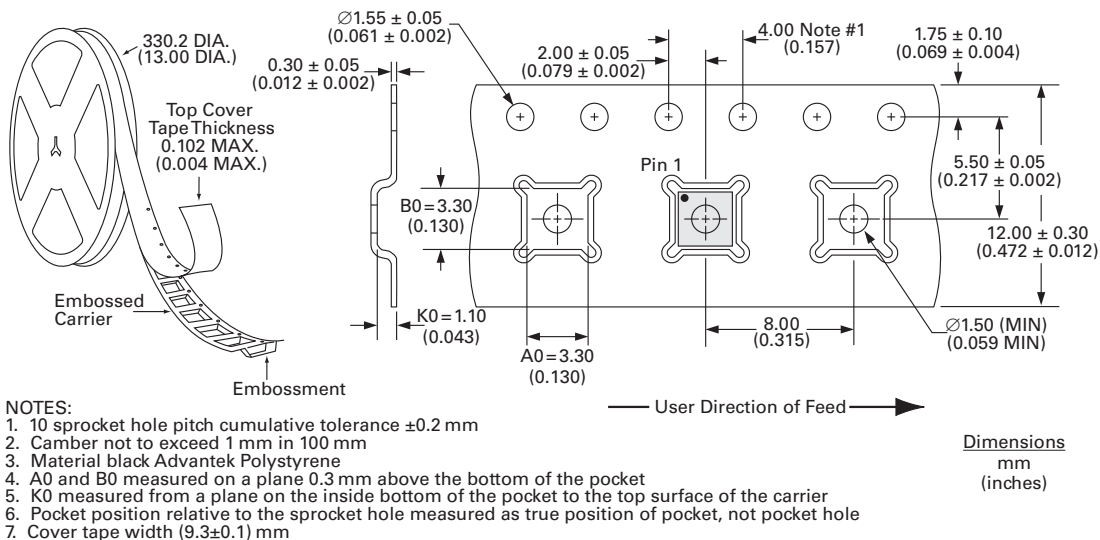
5.5.3 "N" and "NE" Package Tape and Reel



5.5.4 "M" Package (8-Pin DFN)



5.5.5 "M" Package Tape and Reel



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