

Features

- 2.5A Maximum Peak Output Current
- 20ns Typical Pulse Width Distortion
- 10kV/ μ s Minimum Common Mode Rejection (CMR) at 1500V_{CM}
- Wide Operating Voltage Range: 10V to 20V
- Under Voltage Lockout with Hysteresis
- 3750V_{rms} Input to Output Isolation
- Wide Temperature Range: -40°C to +100°C
- 200ns Maximum Propagation Delay Over Temperature Range

Applications

- Isolated Power MOSFET Gate Drive
- Switch Mode Power Supplies
- Industrial Inverters
- Motor Drivers

Description

The IX3180 is a high speed MOSFET gate drive optocoupler. It consists of an input infrared LED that is optically coupled to an integrated power gate driver that is capable of sourcing and sinking 2.5A of peak current. The IX3180 is ideally suited for high frequency driving of power MOSFETs used in high performance DC/DC converters, motor control inverter applications, and high performance switching power supplies.

The IX3180 is available in an 8-pin DIP package and an 8-pin surface mount package.

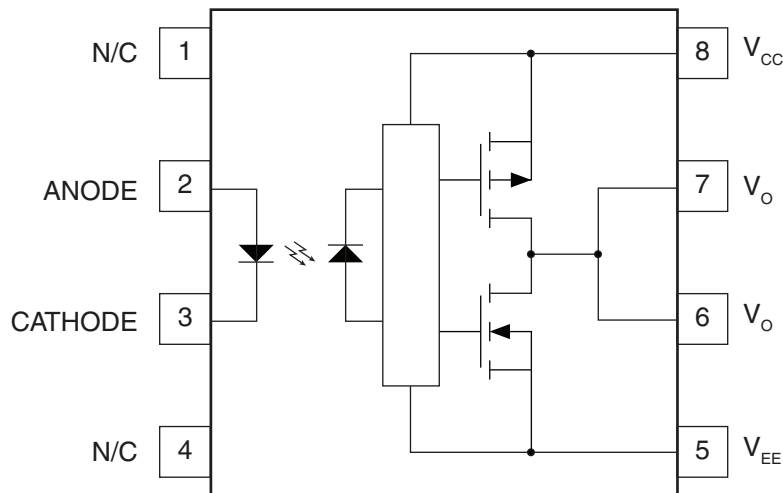
Approvals

- UL Recognized Component: File E76270

Ordering Information

| Part | Description |
|------------|---|
| IX3180G | 8-Pin DIP Package (50/Tube) |
| IX3180GS | 8-Pin Surface Mount (50/Tube) |
| IX3180GSTR | 8-Pin Surface Mount Tape & Reel (1000/Reel) |

Figure 1. IX3180 Block Diagram



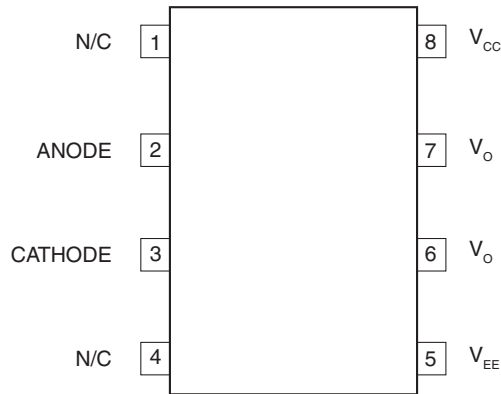
Note: A 0.1 μ F bypass capacitor must be connected between pins 5 & 8.



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|--|----------|
| 1. Specifications | 3 |
| 1.1 Package Pinout | 3 |
| 1.2 Pin Description | 3 |
| 1.3 Absolute Maximum Ratings @ 25°C | 3 |
| 1.4 Recommended Operating Conditions | 4 |
| 1.5 Electrical Specifications (DC) | 4 |
| 1.6 Switching Characteristics (AC) | 5 |
| 1.7 Package Characteristics | 5 |
| 2. Performance Data | 6 |
| 3. Test Circuits | 8 |
| 4. Manufacturing Information | 9 |
| 4.1 Moisture Sensitivity | 9 |
| 4.2 ESD Sensitivity | 9 |
| 4.3 Soldering Profile | 9 |
| 4.4 Board Wash | 9 |
| 4.5 Package Mechanical Dimensions | 10 |
| 4.5.1 IX3180G 8-Pin DIP | 10 |
| 4.5.2 IX3180GS 8-Pin Surface Mount | 10 |
| 4.5.3 IX3180GSTR Tape & Reel | 11 |

1. Specifications

1.1 Package Pinout



1.2 Pin Description

| Pin# | Name | Description |
|------|-----------------|-------------------------|
| 1 | N/C | No connection |
| 2 | ANODE | Anode of input LED |
| 3 | CATHODE | Cathode of input LED |
| 4 | N/C | No connection |
| 5 | V _{EE} | Negative Supply Voltage |
| 6 | V _O | Gate Drive Output |
| 7 | V _O | Gate Drive Output |
| 8 | V _{CC} | Positive Supply Voltage |

1.3 Absolute Maximum Ratings @ 25°C

| Parameter | Symbol | Limit | Units |
|---|-----------------------------------|----------------------|------------------|
| Supply Voltage | V _{CC} - V _{EE} | -0.5 to 25 | V |
| Output Voltage | V _{O(PEAK)} | 0 to V _{CC} | V |
| “High” Peak Output Current ¹ | I _{OH(PEAK)} | - 2.5 | A |
| “Low” Peak Output Current ¹ | I _{OL(PEAK)} | 2.5 | A |
| Reverse Input Voltage | V _R | 5 | V |
| Average Input Current | I _{F(AVG)} | 20 | mA |
| Peak Transient Input Current (<1μs pulse width, 300pps) | I _{F(TRAN)} | 1 | A |
| Input Power Dissipation ² | P _{IN} | 70 | mW |
| Total Power Dissipation ³ | P _T | 800 | mW |
| Isolation Voltage, Input to Output | V _{IO} | 3750 | V _{rms} |
| Operating Temperature | T _A | -40 to +100 | °C |
| Storage Temperature | T _{STG} | -55 to +125 | °C |

Notes:

¹ Maximum pulse width=10μs, maximum duty cycle=0.2%.

² Derate linearly 0.66mW/°C

³ Derate linearly 7.5mW/°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 | Min | Max | Units |
|-----------------------|-------------------|------|-----|-------|
| Power Supply Voltage | $V_{CC} - V_{EE}$ | 10 | 20 | V |
| Input Current (ON) | $I_{F(on)}$ | 10 | 16 | mA |
| Input Voltage (OFF) | $V_{F(off)}$ | -3.6 | 0.8 | V |
| Operating Temperature | T_A | -40 | 100 | °C |

1.5 Electrical Specifications (DC)

Over recommended operating conditions unless otherwise specified. Typical values are at $T_A=25^{\circ}\text{C}$.

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|--|---|-------------------------|------------|------|-----|-------|
| High Level Output Current | $V_O=(V_{CC}-4V)^1$ | I_{OH} | -0.5 | - | - | A |
| | $V_O=(V_{CC}-10V)^2$ | | -2 | - | - | |
| Low Level Output Current | $V_O=(V_{EE}+2.5V)^1$ | I_{OL} | 0.5 | - | - | A |
| | $V_O=(V_{EE}+10V)^2$ | | 2 | - | - | |
| High Level Output Voltage | $I_O=-100\text{mA}$ | V_{OH} | $V_{CC}-1$ | - | - | V |
| Low Level Output Voltage | $I_O=100\text{mA}$ | V_{OL} | - | - | 0.5 | V |
| High Level Supply Current | Output Open, $I_F=10$ to 16mA | I_{CCH} | - | 3 | 6 | mA |
| Low Level Supply Current | Output Open, $V_F=-3$ to $+0.8\text{V}$ | I_{CCL} | - | 3 | 6 | |
| Threshold Input Current, Low-to-High | $I_O=0\text{mA}$, $V_O>5\text{V}$ | I_{FLH} | - | - | 8 | mA |
| Threshold Input Voltage, High-to-Low | - | V_{FHL} | 0.8 | - | - | V |
| Input Forward Voltage | $I_F=10\text{mA}$ | V_F | 1 | 1.35 | 1.7 | V |
| Temperature Coefficient of Forward Voltage | $I_F=10\text{mA}$ | $\Delta V_F/\Delta T_A$ | - | -1.4 | - | mV/°C |
| Input Reverse Breakdown Voltage | $I_R=10\mu\text{A}$ | BV_R | 5 | - | - | V |
| Input Capacitance | $f=1\text{MHz}$, $V_F=0\text{V}$ | C_{IN} | - | 30 | - | pF |
| UVLO Threshold | $V_O>5\text{V}$, $I_F=10\text{mA}$ | V_{UVLO+} | - | 8.7 | - | V |
| | | V_{UVLO-} | - | 8.1 | - | |
| UVLO Hysteresis | $V_O>5\text{V}$, $I_F=10\text{mA}$ | $UVLO_{HYS}$ | - | 0.6 | - | V |

¹ Maximum pulse width = $50\mu\text{s}$, maximum duty cycle = 0.5%.

² Maximum pulse width = $10\mu\text{s}$, maximum duty cycle = 0.2%.

See “Test Circuits” on page 8 for more information.

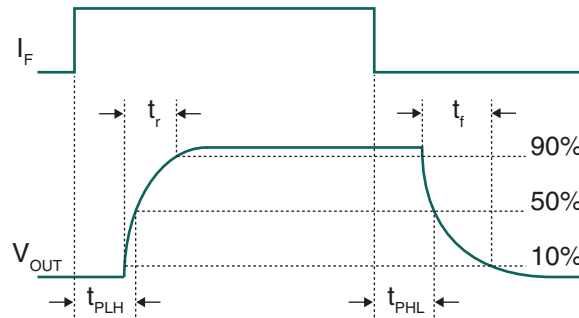
1.6 Switching Characteristics (AC)

Over recommended operating conditions, unless otherwise specified.

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|---|--|----------------------------|----------------|-----|-----|-------------|
| Propagation Delay Time to High Output Level | $R_G=10\Omega, C_G=10nF$ $f=250kHz, \text{Duty Cycle}=50\%$ | t_{PLH} | 50 | 85 | 200 | ns |
| Propagation Delay Time to Low Output Level | | t_{PHL} | 50 | 100 | 200 | |
| Pulse Width Distortion | | PWD $ t_{PHL}-t_{PLH} $ | - | 20 | 65 | |
| Propagation Delay Difference Between any Two Parts ¹ | | PDD $(t_{PHL}-t_{PLH})$ | -90 | - | 90 | |
| Rise Time | | t_r | - | 25 | - | |
| Fall Time | | t_f | - | 25 | - | |
| UVLO Turn-On Delay | | $V_O>5V, I_F=10mA$ | $t_{UVLO(on)}$ | - | 2 | |
| UVLO Turn-Off Delay | $V_O<5V, I_F=10mA$ | $t_{UVLO(off)}$ | - | 0.3 | - | |
| Output High Level Common Mode Transient Immunity | $I_F=10 \text{ to } 16mA, V_{CM}=1500V,$ $V_{CC}=20V, T_A=25^\circ C$ | $ CM_H $ | 10 | - | - | kV/ μs |
| Output Low Level Common Mode Transient Immunity | $V_F=0V, V_{CM}=1500V, V_{CC}=20V,$ $T_A=25^\circ C$ | $ CM_L $ | 10 | - | - | |

¹ The difference between t_{PHL} and t_{PLH} of any two IX3180 devices operating under the same conditions and temperature.

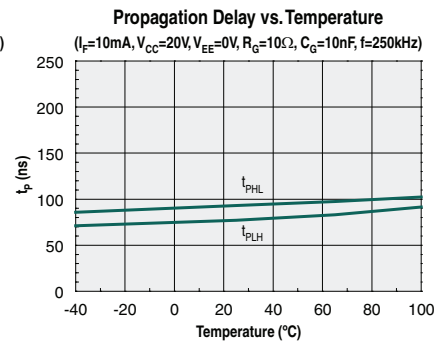
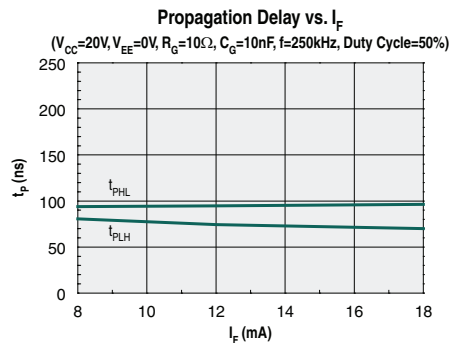
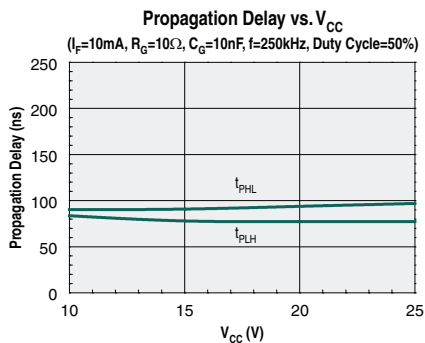
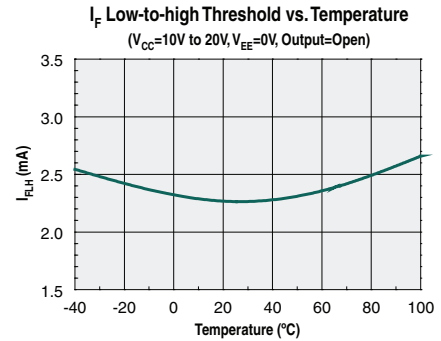
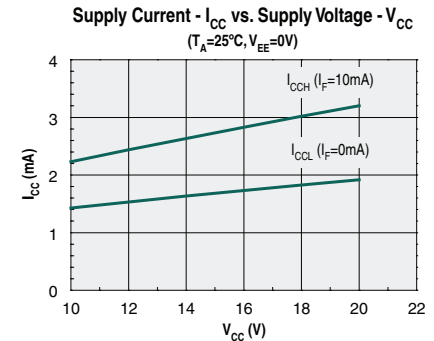
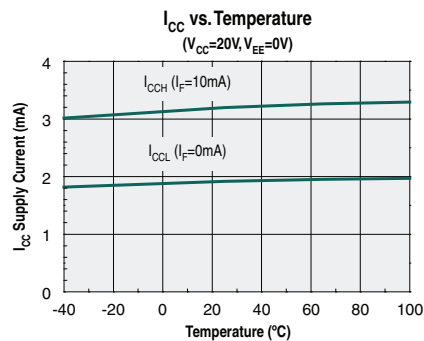
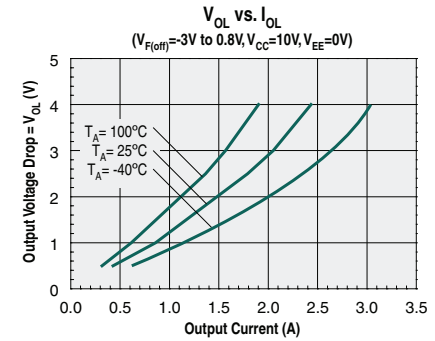
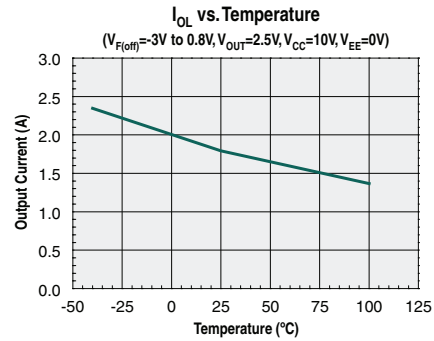
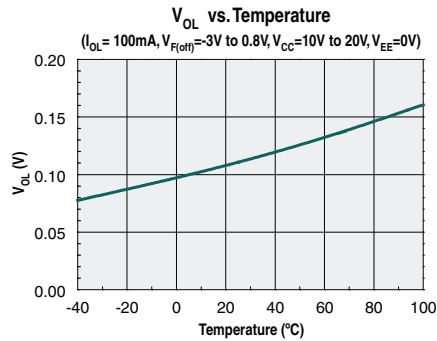
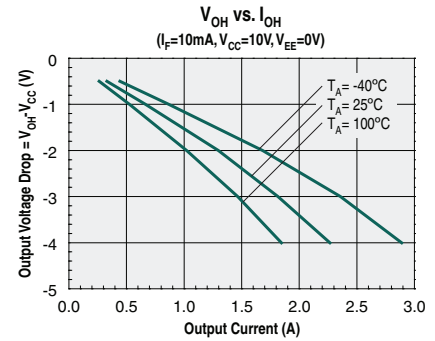
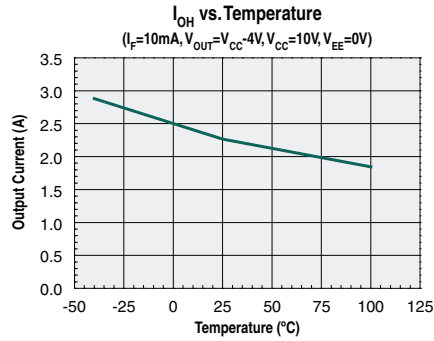
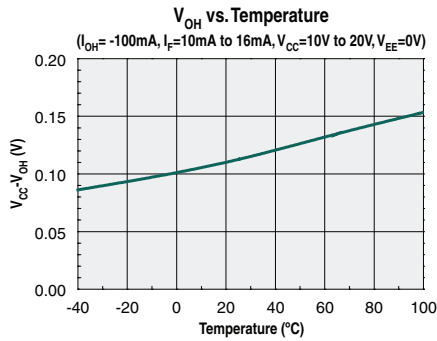
Figure 2. Timing Waveforms

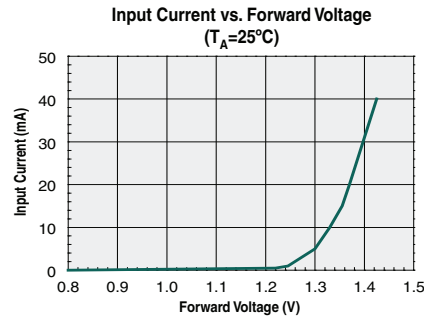
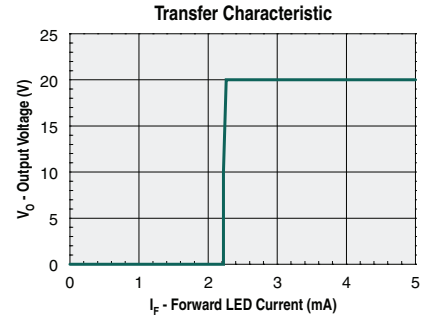
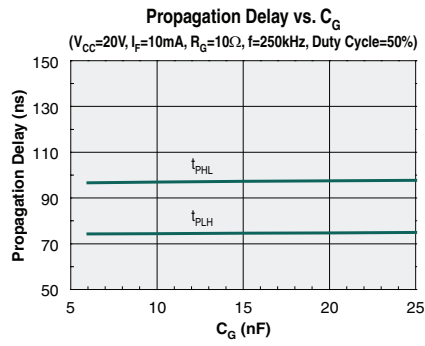
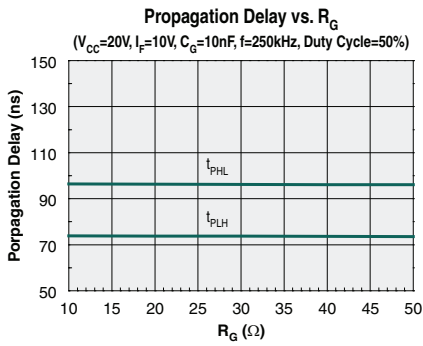


1.7 Package Characteristics

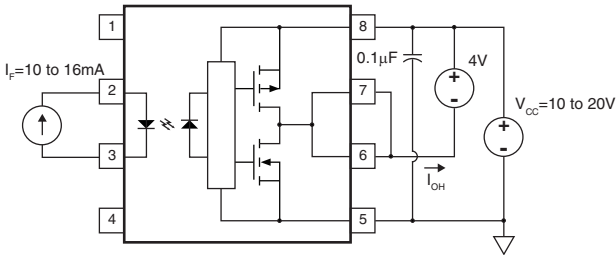
| Parameter | Conditions | Symbol | Rating | Units |
|--|---|-----------|-----------|-----------|
| Isolation Test Voltage | - | V_{ISO} | 3750 | V_{rms} |
| Input-Output Momentary Withstand Voltage | $RH < 50\%, t = 1 \text{ min},$ $T_A = 25^\circ C$ | V_{ISO} | 3750 | V_{rms} |
| Resistance (Input-Output), Typical | $V_{I-O} = 500V_{DC}$ | R_{I-O} | 10^{12} | Ω |
| Capacitance (Input-Output), Typical | $f = 1 \text{ MHz}$ | C_{I-O} | 0.6 | pF |

2. Performance Data

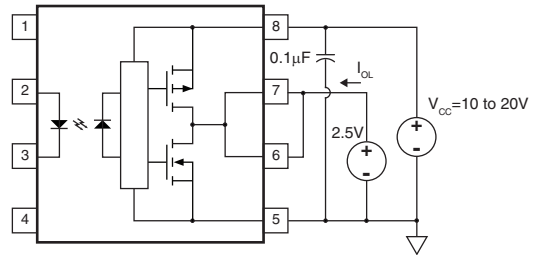




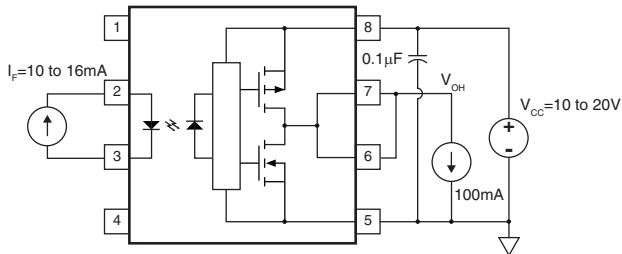
3. Test Circuits



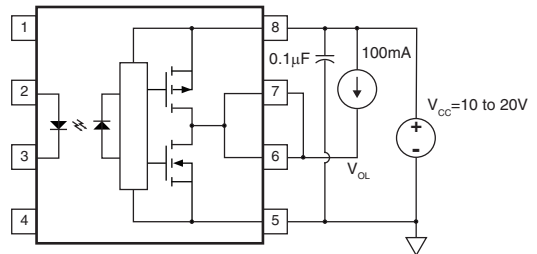
I_{OH} Test Circuit



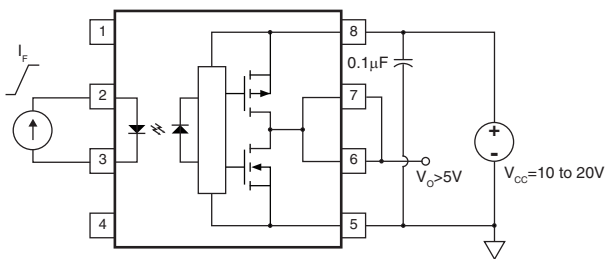
I_{OL} Test Circuit



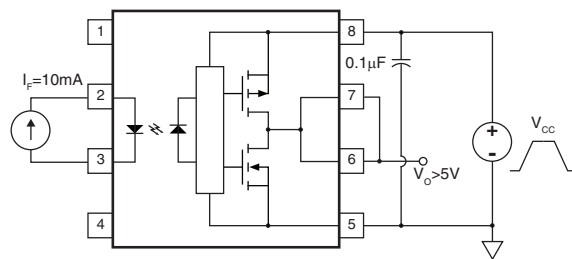
V_{OH} Test Circuit



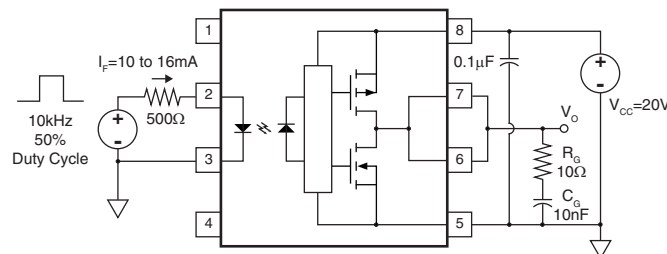
V_{OL} Test Circuit



I_{FLH} Test Circuit



UVLO Test Circuit



t_{PLH} , t_{PHL} , t_r , t_f Test Circuit

4. Manufacturing Information

4.1 Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits Division classified all of 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) rating** 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) Rating |
|--------------------|---|
| IX3180G / IX3180GS | MSL 1 |

4.2 ESD Sensitivity



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

4.3 Soldering Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

| Device | Maximum Temperature x Time | Maximum Reflow Cycles |
|--------------------|----------------------------|-----------------------|
| IX3180G / IX3180GS | 250°C for 30 seconds | 3 |

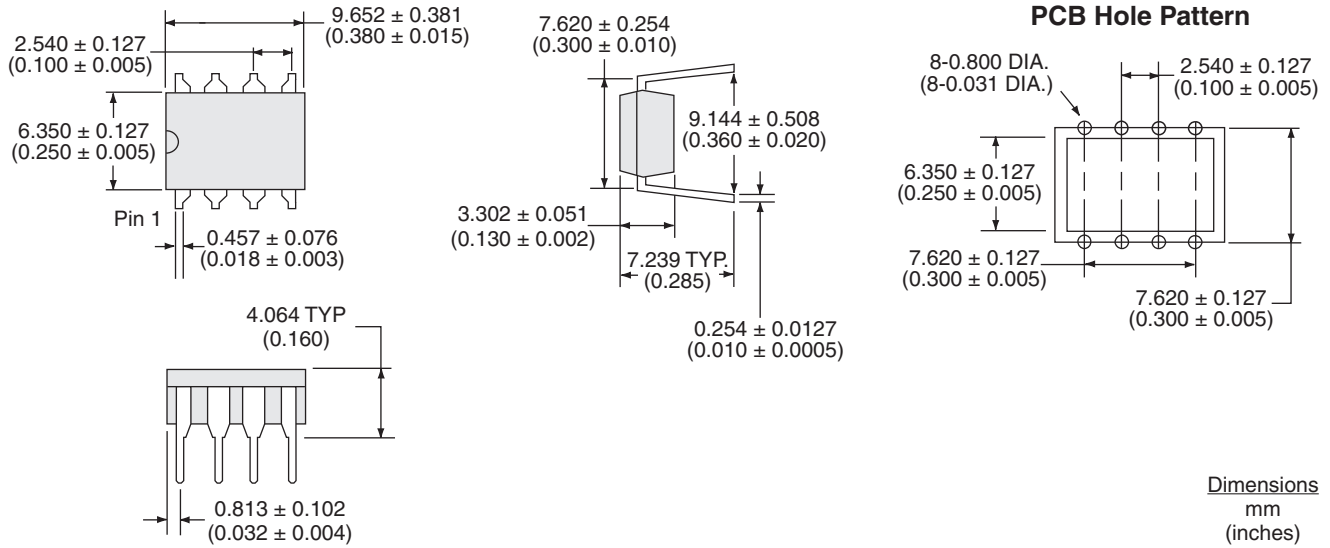
4.4 Board Wash

IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable. Since IXYS Integrated Circuits Division employs the use of silicone coating as an optical waveguide in many of its optically isolated products, the use of a short drying bake may be necessary if a wash is used after solder reflow processes. Chlorine-based or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

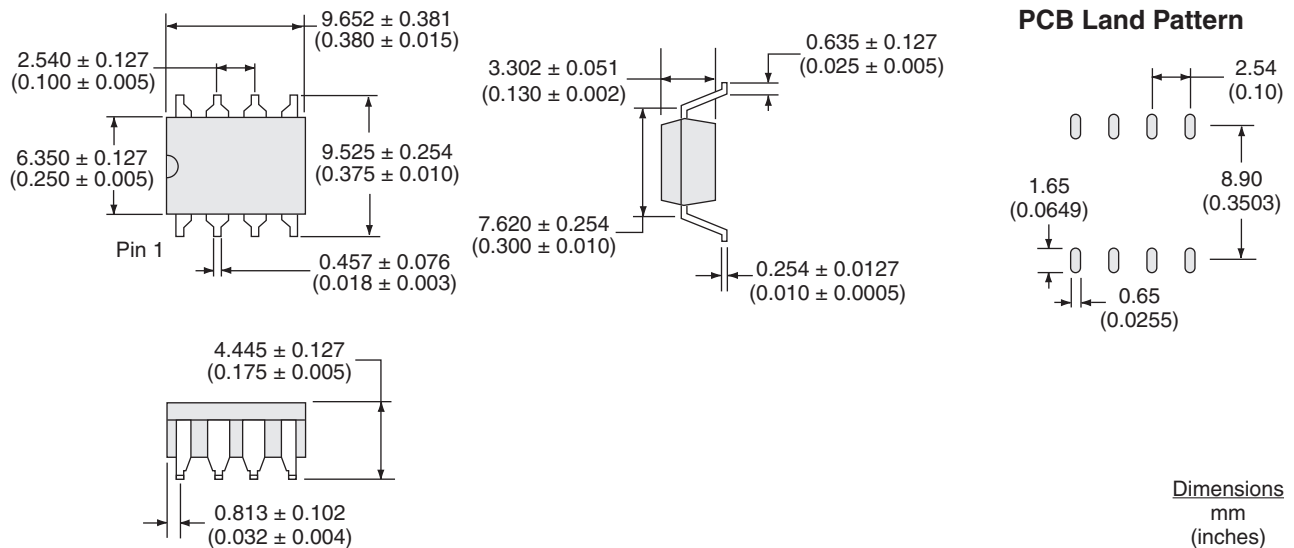


4.5 Package Mechanical Dimensions

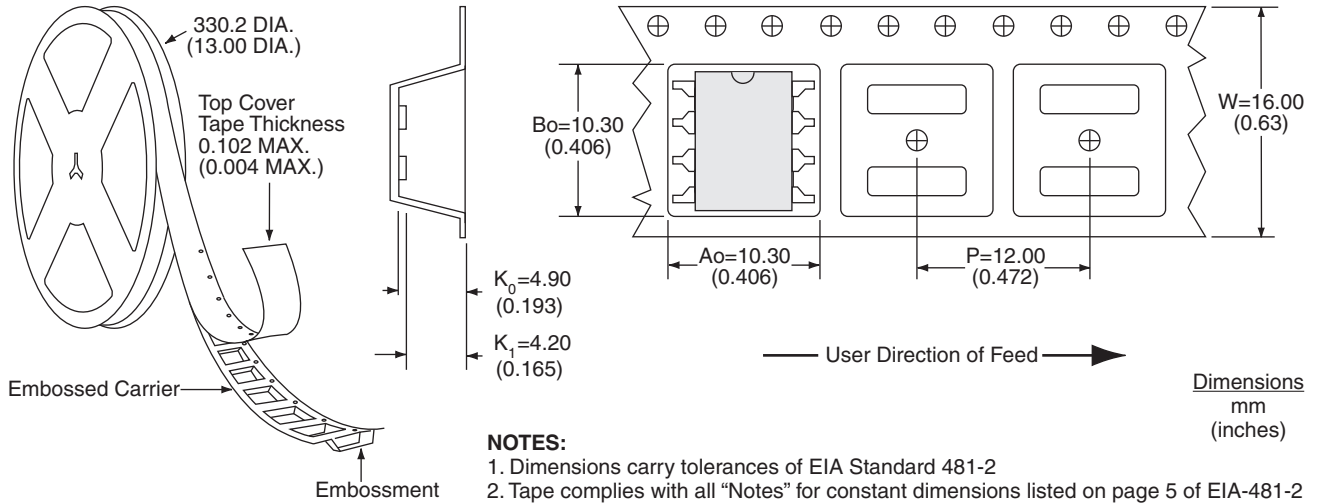
4.5.1 IX3180G 8-Pin DIP



4.5.2 IX3180GS 8-Pin Surface Mount



4.5.3 IX3180GSTR Tape & Reel



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