

# OPIA800—OPIA803, OPID804

## DIP Package



### Features:

- 2,500 or 5,000 Vrms electrical isolation
- Choice of a Single and Dual LED
- Choice of Phototransistor or Photologic® Sensor
- Low-cost plastic Dual-In-Line (DIP) package

### Agency Approvals:

- UL Certification No: E58730
- VDE NO: 40026713, 40026624



### Description:

The OPIA800 through OPID804 optocouplers are designed for applications that utilize a digital output (Photologic®) in a dual-in-line package. Isolation voltage from 2,500 to 5,000 Volts RMS product are designed for some of the most stringent power system isolation requirements.

Theory of operation: The LED transmitter is used to illuminate the Photosensor providing electrical isolation between two power systems while maintaining the ability to transmit information from one power system to the other. In many applications, analog or digital signals may be required to be transmitted between two power systems while maintaining isolation between the power systems up to 5,000 volts RMS. A variety of LED and photosensor configurations are available depending on the system requirements

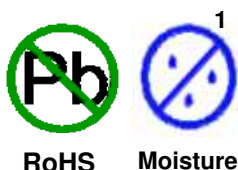
The ratio Current Transfer Ratio (CTR) is determined using the output current and input current for analog photosensors. CTR ratios can range from as low as 5 to over 9,000 depending on the device.

$$CTR = \frac{\text{Photosensor Current}}{\text{LED Current}} = \frac{20mA}{10mA} * 100 = 200$$

All DIP product is shipped in a shipping tube with "TU" identified on the end of the part number.  
Example: OPIA800DTU is a 8-Pin DIP shipped in a tube (TU).

### Applications:

- High voltage isolation
- PCBoard power system isolation
- Industrial equipment power isolation
- Medical equipment power isolation
- Office equipment



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# OPIA800—OPIA803, OPID804

## DIP Package



### Analog Output Devices Ordering Information

| Part Number | Isolation Voltage<br>Max. (Vrms) | CTR<br>Min/Typ/Max | Typ. Tplh / Tphl (ns)<br>[R <sub>L</sub> = ohms] | Package   | Configuration       |
|-------------|----------------------------------|--------------------|--------------------------------------------------|-----------|---------------------|
| OPIA800     | 2,500                            | 300 / 1,600 / -    | 7 / 2 [ 2.2 K]                                   | 8 Pin DIP | A K—K A B C E (Dar) |
| OPIA801     | 2,500                            | 500 / 1,600 / -    | 10 / 5 [ 4.7 K]                                  | 8 Pin DIP | A K—K A B C E (Dar) |
| OPIA802     | 2,500                            | 15 / 43 / -        | 0.3 / 0.3 [ 1.9 K]                               | 8 Pin DIP | A K—K A C E         |
| OPIA803     | 2,500                            | 5 / 43 / -         | 0.4 / 0.3 [ 4.1 K]                               | 8 Pin DIP | A K—K A C E         |

### Digital Output Devices Ordering Information

| Part Number | Isolation Voltage<br>Max. (Vrms) | Typ. Tr / Tf (ns)<br>[R <sub>L</sub> = 350 ohms] | Typ. Tplh / Tphl (ns)<br>[R <sub>L</sub> = ohms] | Package   | Configuration |
|-------------|----------------------------------|--------------------------------------------------|--------------------------------------------------|-----------|---------------|
| OPID804     | 5,000                            | 30 / 30                                          | 45 / 45 [ 350]                                   | 8 Pin DIP | A K—NAND      |

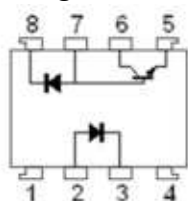
Configuration: Definition of Terms  
LED Identification—Sensor Identification

|        |             |                    |           |               |             |
|--------|-------------|--------------------|-----------|---------------|-------------|
| LED    | A = Anode   | K = Cathode        |           |               |             |
| Sensor | 10K Logic   | 10K Inverted Logic | NAND Gate | NAND Gate     |             |
|        | K = Cathode | A = Anode          | B = Base  | C = Collector | E = Emitter |

Packaging Part Number Suffix: **D** = DIP, **TU** = Ship in Tubes, **TR** = Ship on Tape and Reel Example: OPID606DTR

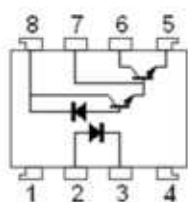
| Part Number | Pin # |   |   |   |     |        |        |     |
|-------------|-------|---|---|---|-----|--------|--------|-----|
|             | 1     | 2 | 3 | 4 | 5   | 6      | 7      | 8   |
| OPIA800     |       | A | K |   | E   | C      | C-B    | K-C |
| OPIA801     |       | A | K |   | E   | C      | C-B    | K-C |
| OPIA802     |       | A | K |   | E   | C      | A-B    | K   |
| OPIA803     |       | A | K |   | E   | C      | A-B    | K   |
| OPID804     |       | A | K |   | GND | Output | Enable | Vcc |

### Package Outline Dimensions and Schematics: Top-View

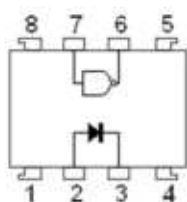


**OPIA802**  
**OPIA803**

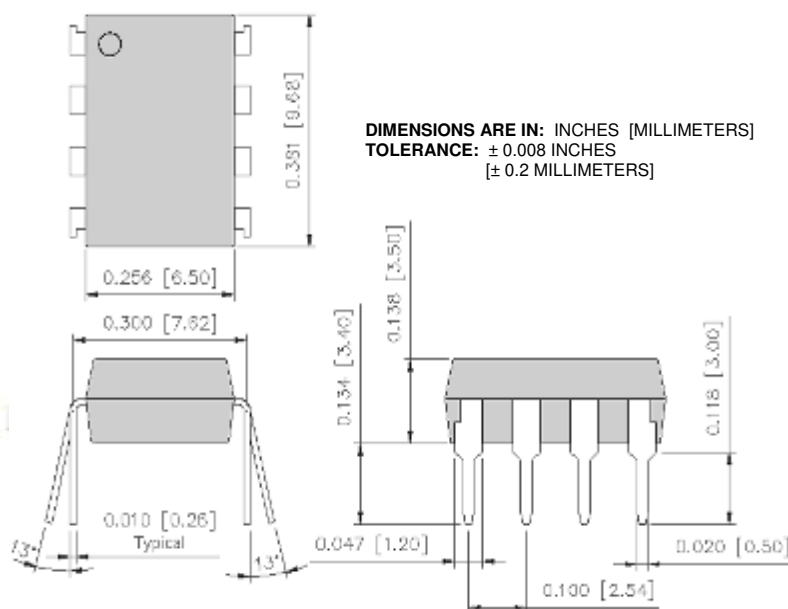
| Symbol | Definition |
|--------|------------|
| A      | Anode      |
| B      | Base       |
| C      | Collector  |
| E      | Emitter    |
| K      | Cathode    |



**OPIA800**  
**OPIA801**



**OPID804**



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# OPIA800—OPIA803, OPID804

## DIP Package



### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

|                                                                                         |                                                                                                  |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Storage Temperature                                                                     | -55° C to +125° C                                                                                |
| Operating Temperature<br>OPIA800<br>OPIA801<br>OPIA802<br>OPIA803<br>OPID804            | -40° C to +115° C<br>0° C to +125° C<br>-55° C to +115° C<br>-55° C to +100° C<br>0° C to +85° C |
| Isolation voltage (1 minute)<br>OPID804<br>OPIA800, OPIA801, OPIA802, OPIA803           | 5,000 Vrms<br>2,500 Vrms                                                                         |
| Lead Soldering Temperature (1/16" (1.6 mm) from case for 5 seconds with soldering iron) | 260° C                                                                                           |

### Input Diode

|                                                                                                              |                |
|--------------------------------------------------------------------------------------------------------------|----------------|
| Continuous Forward Current<br>OPIA802, OPIA803, OPID804<br>OPIA800 OPIA801                                   | 25 mA<br>20 mA |
| Peak Forward current (1 $\mu\text{s}$ pulse width, 300 pps)<br>OPIA800, OPIA801, OPIA802, OPIA803<br>OPID804 | 1 A<br>40 mA   |
| Reverse Voltage<br>OPIA800, OPIA801, OPIA802, OPIA803, OPID804                                               | 5 V            |
| Power Dissipation<br>OPIA802, OPIA803, OPID804<br>OPIA800, OPIA801                                           | 45 mW<br>35 mW |

### Absolute Maximum Ratings ( $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$ unless otherwise specified)

#### Output IC

|                                                                                      |                                                      |
|--------------------------------------------------------------------------------------|------------------------------------------------------|
| V <sub>CC</sub> —Collector-Emitter Voltage<br>OPIA800<br>OPIA801<br>OPIA802, OPIA803 | -0.5 V to +7 V<br>-0.5 V to +18 V<br>-0.5 V to +15 V |
| Collector Current<br>OPIA802, OPIA803<br>OPIA800, OPIA801                            | 8 mA<br>60 mA                                        |
| Power Dissipation<br>OPIA800, OPIA801, OPIA802, OPIA803                              | 100 mW                                               |

#### Output NAND Gate—OPID804

|                                    |       |
|------------------------------------|-------|
| V <sub>CC</sub> —Supply voltage    | 7 V   |
| Enable voltage                     | 5.5 V |
| High Level Output voltage          | 7 V   |
| Low Level Output current           | 50 mA |
| Output Collector Power Dissipation | 85 mW |

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# OPIA800—OPIA803, OPID804

## DIP Package



### Electrical Characteristics: OPIA800

| Parameter                                     | Symbol                    | Conditions                                                                | MIN. | TYP.      | MAX. | Unit                       |
|-----------------------------------------------|---------------------------|---------------------------------------------------------------------------|------|-----------|------|----------------------------|
| *6 Current transfer ratio                     | CTR                       | $I_F=1.6\text{mA}$ , $V_O=0.4\text{V}$ , $V_{CC}=4.5\text{V}$             | 300  | 1600      | -    | %                          |
| Logic (0) output voltage                      | $V_{OL}$                  | $I_F=1.6\text{mA}$<br>$I_O=4.8\text{mA}$ , $V_{CC}=4.5\text{V}$           | -    | 0.1       | 0.4  | V                          |
| Logic (1) output current                      | $I_{OH}$                  | $I_F=0$ , $V_O=V_{CC}=7\text{V}$                                          | -    | 0.1       | 250  | $\mu\text{A}$              |
| Logic (0) supply current                      | $I_{CCL}$                 | $I_F=1.6\text{mA}$ , $V_O=\text{open}$ , $V_{CC}=5\text{V}$               | -    | 0.5       | -    | mA                         |
| Logic (1) supply current                      | $I_{CCH}$                 | $I_F=0$ , $V_O=\text{open}$ , $V_{CC}=5\text{V}$                          | -    | 10        | -    | nA                         |
| Input forward voltage                         | $V_F$                     | $T_a=25^\circ\text{C}$ , $I_F=1.6\text{mA}$                               | -    | 1.5       | 1.7  | V                          |
| Input forward voltage temperature coefficient | $\Delta V_F / \Delta T_a$ | $I_F=1.6\text{mA}$                                                        | -    | -1.9      | -    | $\text{mV}/^\circ\text{C}$ |
| Input reverse voltage                         | $BVR$                     | $T_a=25^\circ\text{C}$ , $I_R=10\mu\text{A}$                              | 5.0  | -         | -    | V                          |
| Input capacitance                             | $C_{IN}$                  | $V_F=0$ , $f=1\text{MHz}$                                                 | -    | 60        | -    | pF                         |
| *7 Leak current(input-output)                 | $I_{I-O}$                 | $T_a=25^\circ\text{C}$ , 45% RH<br>$V_{I-O}=3\text{kVDC}$ , $t=5\text{s}$ | -    | -         | 1.0  | $\mu\text{A}$              |
| *7 Isolation resistance(input-output)         | $R_{I-O}$                 | $V_{I-O}=500\text{VDC}$                                                   | -    | $10^{12}$ | -    | $\Omega$                   |
| *7 Capacitance(input-output)                  | $C_{I-O}$                 | $f=1\text{MHz}$                                                           | -    | 0.6       | -    | pF                         |

\*6 Current transfer ratio is a ratio of input current and output current expressed in %.

\*7 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)

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## OPIA800—OPIA803, OPID804 DIP Package

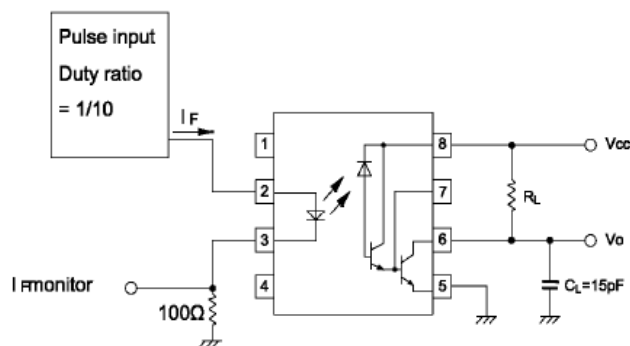
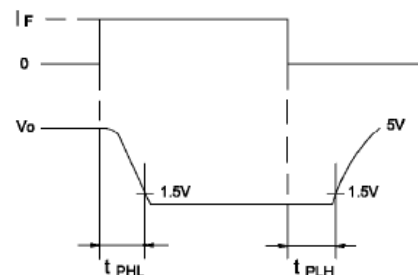
## Switching Characteristics: OPIA800

| Parameter                                                             | Symbol           | Conditions                                                          | MIN. | TYP. | MAX. | Unit |
|-----------------------------------------------------------------------|------------------|---------------------------------------------------------------------|------|------|------|------|
| *8 Propagation delay time<br>Output (1)-->(0)                         | t <sub>PHL</sub> | R <sub>L</sub> =2.2kΩ,I <sub>F</sub> =1.6mA                         | -    | 2    | 10   | uS   |
| *8 Propagation delay time<br>Output (0)-->(1)                         | t <sub>PLH</sub> | R <sub>L</sub> =2.2kΩ,I <sub>F</sub> =1.6mA                         | -    | 7    | 35   | uS   |
| *9 Instantaneous common<br>*10 mode rejection voltage<br>"Output (1)" | CMH              | I <sub>F</sub> =0,V <sub>CM</sub> =10Vp-p,R <sub>L</sub> =2.2kΩ     | -    | 500  | -    | V/uS |
| *9 Instantaneous common<br>*10 mode rejection voltage<br>"Output (0)" | CML              | I <sub>F</sub> =1.6mA,V <sub>CM</sub> =10Vp-p,R <sub>L</sub> =2.2kΩ | -    | -500 | -    | V/uS |

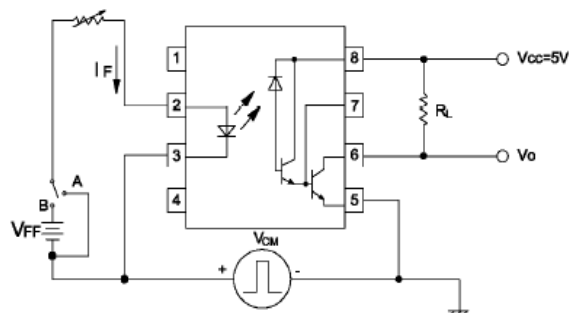
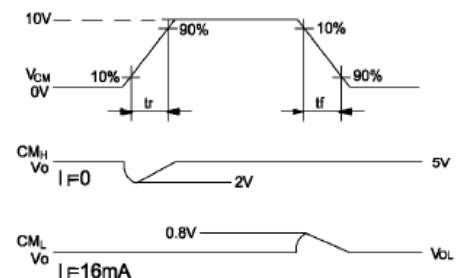
\*9 Instantaneous common mode rejection voltage “output(1)” represents a common voltage variation that can hold the output above (1) level ( $V_{O>2.0V}$ ).

\*10 Instantaneous common mode rejection voltage “output(1)” represents a common voltage variation that can hold the output above (0) level ( $V_o > 0.8V$ ).

\*8 Test Circuit Propagation Delay Time



\*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



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## OPIA800

### Characteristic Curves

Fig.1 LED Forward Current vs. Forward Voltage

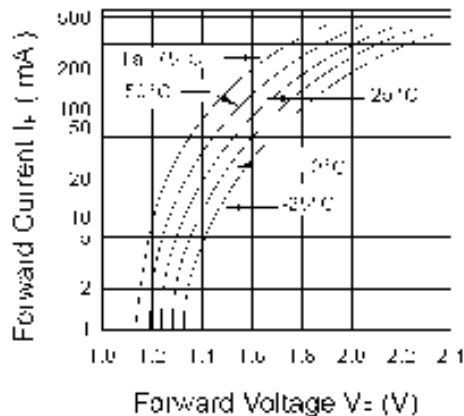


Fig.2 LED Forward Current vs. Ambient Temperature

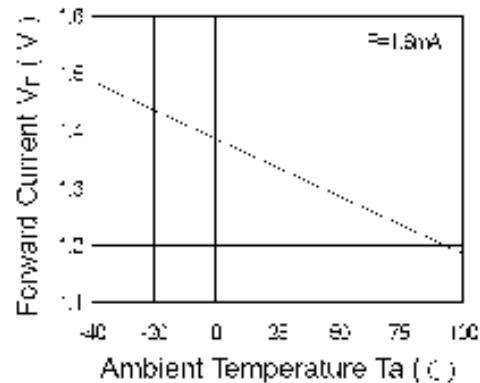


Fig.3 Response and Fall Time vs. Load Resistance

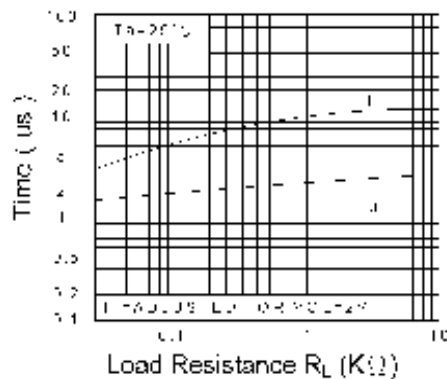


Fig.4 Current Transfer Ratio vs. Forward Current

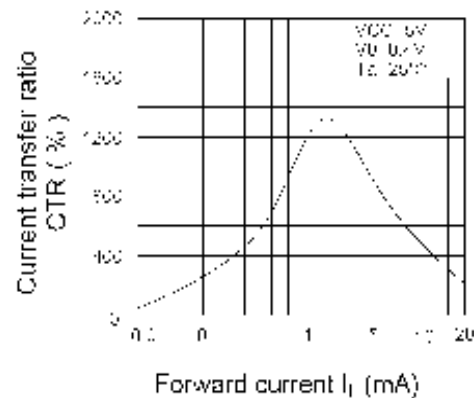


Fig.5 Current Transfer Ratio vs. Base-Emitter Resistance

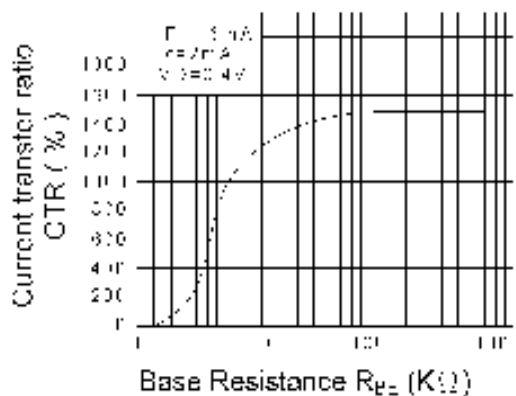
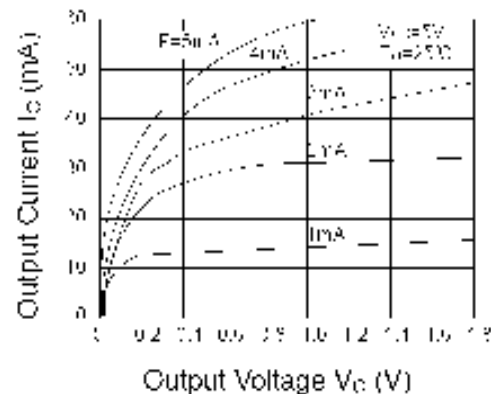


Fig.6 Output Current vs. Output Voltage



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OPIA800

Characteristic Curves

Fig.7 Output Current vs. Input Diode Forward Current

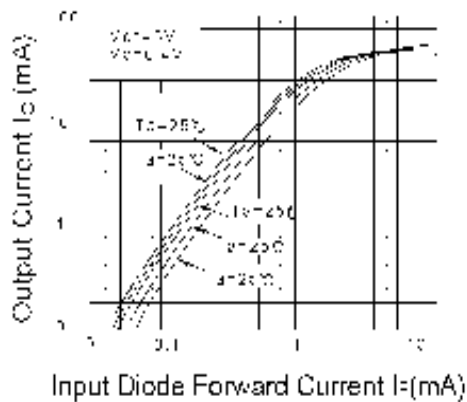


Fig.8 Logic Low Supply Current vs. Input Diode Forward Current

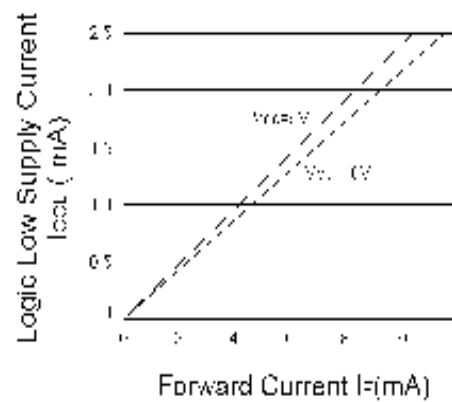


Fig.9 Propagation Delay vs. Input Diode Forward Current

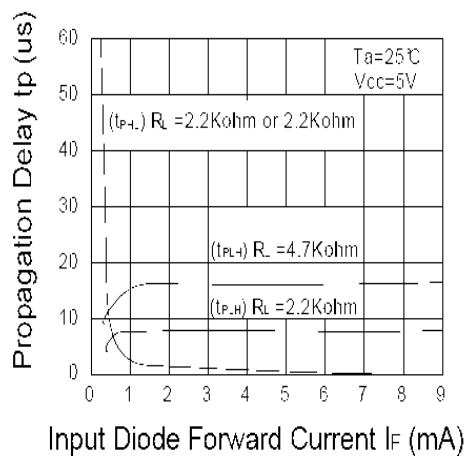
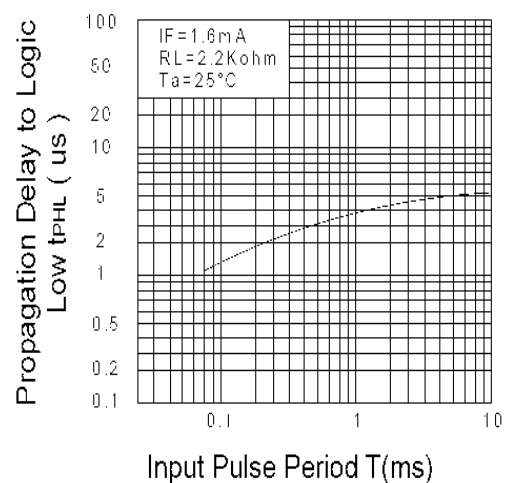


Fig.10 Propagation Delay to Logic Low vs. Pulse Period



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# OPIA800—OPIA803, OPID804

## DIP Package



### Electrical Characteristics: OPIA801

(T<sub>A</sub> = 25°C)

| Parameter                                     | Symbol                           | Conditions                                                          | MIN. | TYP.             | MAX. | Unit  |
|-----------------------------------------------|----------------------------------|---------------------------------------------------------------------|------|------------------|------|-------|
| *6 Current transfer ratio                     | CTR(1)                           | I <sub>F</sub> =0.5mA, V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V  | 400  | 1800             | -    | %     |
|                                               | CTR(2)                           | I <sub>F</sub> =1.6mA, V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V  | 500  | 1600             | -    | %     |
| Logic ( 0 ) output voltage                    | V <sub>OL</sub> (1)              | I <sub>F</sub> =6.4mA, I <sub>O</sub> =1.6mA, V <sub>CC</sub> =4.5V | -    | 0.1              | 0.4  | V     |
|                                               | V <sub>OL</sub> (2)              | I <sub>F</sub> =5mA, I <sub>O</sub> =15mA, V <sub>CC</sub> =4.5V    | -    | 0.1              | 0.4  | V     |
|                                               | V <sub>OL</sub> (3)              | I <sub>F</sub> =12mA, I <sub>O</sub> =24mA, V <sub>CC</sub> =4.5V   | -    | 0.1              | 0.4  | V     |
| Logic ( 1 ) output current                    | I <sub>OH</sub>                  | I <sub>F</sub> =0, V <sub>O</sub> =V <sub>CC</sub> =18V             | -    | 0.05             | 100  | uA    |
| Logic ( 0 ) supply current                    | I <sub>CC</sub> L                | I <sub>F</sub> =1.6mA, V <sub>O</sub> =open, V <sub>CC</sub> =5V    | -    | 0.5              | -    | mA    |
| Logic ( 1 ) supply current                    | I <sub>CC</sub> H                | I <sub>F</sub> =0, V <sub>F</sub> =open, V <sub>CC</sub> =5V        | -    | 10               | -    | nA    |
| Input forward voltage                         | V <sub>F</sub>                   | T <sub>a</sub> =25°C, I <sub>F</sub> =1.6mA                         | -    | 1.5              | 1.7  | V     |
| Input forward voltage temperature coefficient | ΔV <sub>F</sub> /ΔT <sub>a</sub> | I <sub>F</sub> =1.6mA                                               | -    | -1.9             | -    | mV/°C |
| Input reverse voltage                         | BV <sub>R</sub>                  | T <sub>a</sub> =25°C, I <sub>R</sub> =10uA                          | 5.0  | -                | -    | V     |
| Input capacitance                             | C <sub>IN</sub>                  | V <sub>F</sub> =0, f=1MHz                                           | -    | 60               | -    | pF    |
| *7 Leak current ( input-output )              | I <sub>I-O</sub>                 | T <sub>a</sub> =25°C, 45%RH<br>V <sub>I-O</sub> =3KVDC, t=5s        | -    | -                | 1.0  | uA    |
| *7 Isolation resistance ( input-output )      | R <sub>I-O</sub>                 | V <sub>I-O</sub> =500VDC                                            | -    | 10 <sup>12</sup> | -    | Ω     |
| *7 Capacitance ( input-output )               | C <sub>I-O</sub>                 | f=1MHz                                                              | -    | 0.6              | -    | pF    |

\*6 Current transfer ratio is a ratio of input current and output current expressed in %.

\*7 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)

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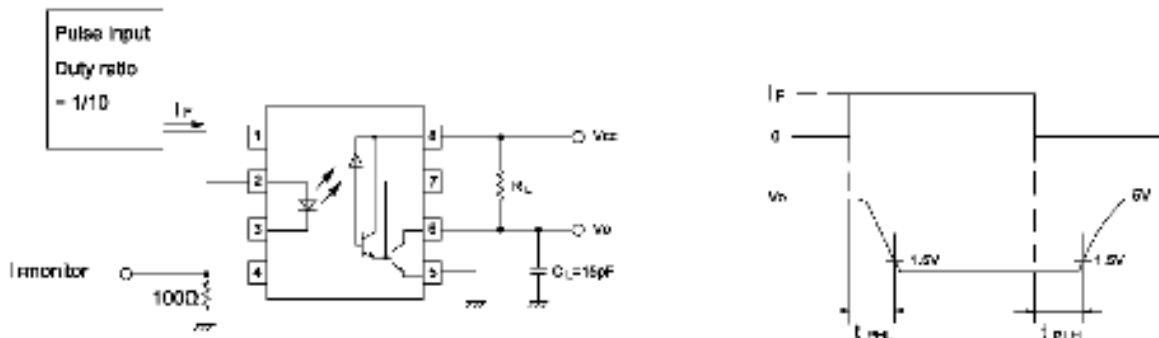
### Switching Characteristics: OPIA801

| Parameter                                                         | Symbol    | Conditions                                             | MIN. | TYP. | MAX. | Unit       |
|-------------------------------------------------------------------|-----------|--------------------------------------------------------|------|------|------|------------|
| *8 Propagation delay time<br>Output (1) → (0)                     | $t_{PHL}$ | $R_L=4.7K\Omega$ , $I_F=0.5mA$                         | -    | 5    | 25   | $\mu S$    |
|                                                                   |           | $R_L=270\Omega$ , $I_F=12mA$                           | -    | 0.3  | 1    | $\mu S$    |
| *8 Propagation delay time<br>Output (0) → (1)                     | $t_{PLH}$ | $R_L=4.7K\Omega$ , $I_F=0.5mA$                         | -    | 10   | 60   | $\mu S$    |
|                                                                   |           | $R_L=270\Omega$ , $I_F=12mA$                           | -    | 1.5  | 7    | $\mu S$    |
| *9 Instantaneous common<br>mode rejection voltage<br>"Output (1)" | $CM_H$    | $I_F=0$ , $V_{CM}=10V_{P-P}$ ,<br>$R_L=2.2K\Omega$     | -    | 500  | -    | V/ $\mu S$ |
| *9 Instantaneous common<br>mode rejection voltage<br>"Output (0)" | $CM_L$    | $I_F=1.6mA$ , $V_{CM}=10V_{P-P}$ ,<br>$R_L=2.2K\Omega$ | -    | -500 | -    | V/ $\mu S$ |

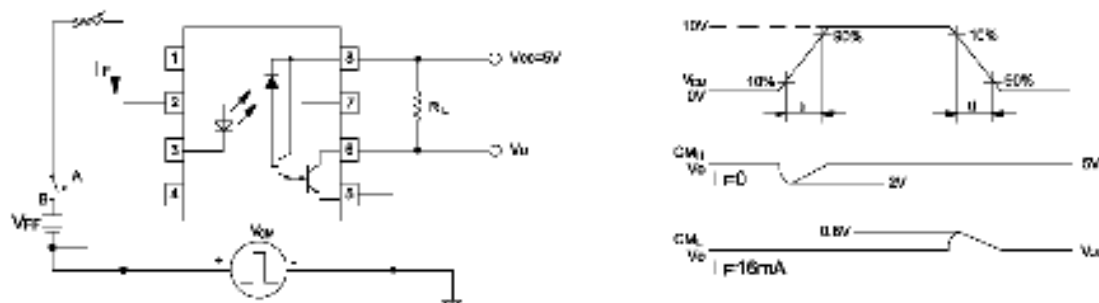
\*9 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (1) level ( $V_O > 2.0V$ ).

\*10 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (0) level ( $V_O > 0.8V$ ).

#### \*8 Test Circuit Propagation Delay Time



#### \*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



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# OPIA800—OPIA803, OPID804

## DIP Package



### Electrical Characteristics: OPIA802

(T<sub>A</sub> = 0 to +70°C unless otherwise specified)

| Parameter                                     | Symbol               | Conditions                                                                   | MIN. | TYP.             | MAX. | Unit  |
|-----------------------------------------------|----------------------|------------------------------------------------------------------------------|------|------------------|------|-------|
| *5 Current transfer ratio                     | CTR(1)               | Ta=25°C, I <sub>F</sub> =16mA<br>V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V | 19   | 40               | -    | %     |
|                                               | CTR(2)               | I <sub>F</sub> =16mA<br>V <sub>O</sub> =0.5V, V <sub>CC</sub> =4.5V          | 15   | 43               | -    | %     |
| Logic ( 0 ) output voltage                    | V <sub>OL</sub>      | *6 V <sub>CC</sub> =4.5V, I <sub>F</sub> =16mA                               | -    | 0.1              | 0.4  | V     |
| Logic ( 1 ) output current                    | I <sub>OH</sub> (1)  | Ta=25°C, I <sub>F</sub> =0<br>V <sub>O</sub> =V <sub>CC</sub> =5.5V          | -    | 3.0              | 500  | nA    |
|                                               | I <sub>OH</sub> (2)  | Ta=25°C, I <sub>F</sub> =0<br>V <sub>O</sub> =V <sub>CC</sub> =15V           | -    | 0.01             | 1.0  | uA    |
|                                               | I <sub>OH</sub> (3)  | V <sub>CC</sub> =V <sub>O</sub> =15V, I <sub>F</sub> =0                      | -    | -                | 50   | uA    |
| Logic ( 0 ) supply current                    | I <sub>CCL</sub>     | I <sub>F</sub> =16mA<br>V <sub>O</sub> =open, V <sub>CC</sub> =15V           | -    | 200              | -    | uA    |
| Logic ( 1 ) supply current                    | I <sub>CCH</sub> (1) | Ta=25°C, I <sub>O</sub> =0<br>V <sub>F</sub> =open, V <sub>CC</sub> =15V     | -    | 0.02             | 1.0  | uA    |
|                                               | I <sub>CCH</sub> (2) | I <sub>O</sub> =0<br>V <sub>O</sub> =open, V <sub>CC</sub> =15V              | -    | -                | 2.0  | uA    |
| Input forward voltage                         | V <sub>F</sub>       | Ta=25°C, I <sub>F</sub> =16mA                                                | -    | 1.7              | 1.95 | V     |
| Input forward voltage temperature coefficient | ΔV <sub>F</sub> /ΔTa | I <sub>F</sub> =16mA                                                         | -    | -1.9             | -    | mV/°C |
| Input reverse voltage                         | BV <sub>R</sub>      | Ta=25°C, I <sub>R</sub> =10uA                                                | 5.0  | -                | -    | V     |
| Input capacitance                             | C <sub>IN</sub>      | V <sub>F</sub> =0, f=1MHz                                                    | -    | 60               | -    | pF    |
| *7 Leak current ( input-output )              | I <sub>I-O</sub>     | Ta=25°C, 45%RH<br>V <sub>I-O</sub> =3KVDC, t=5s                              | -    | -                | 1.0  | uA    |
| *7 Isolation resistance ( input-output )      | R <sub>I-O</sub>     | V <sub>I-O</sub> =500VDC                                                     | -    | 10 <sup>12</sup> | -    | Ω     |
| *7 Capacitance ( input-output )               | C <sub>I-O</sub>     | f=1MHz                                                                       | -    | 0.6              | -    | pF    |
| Transistor current amplification factor       | h <sub>FE</sub>      | V <sub>O</sub> =5V, I <sub>O</sub> =3mA                                      | -    | 70               | -    |       |

\*5 Current transfer ratio is a ratio of input current and output current expressed in %.

\*6 I<sub>O</sub> = 2.4mA

\*7 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

### Switching Characteristics: OPIA802

( $T_A = 25^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $I_F=16\text{mA}$ )

| Parameter                                                          | Symbol    | Conditions                                   | MIN. | TYP.  | MAX. | Unit                   |
|--------------------------------------------------------------------|-----------|----------------------------------------------|------|-------|------|------------------------|
| *8 Propagation delay time<br>*9 Output (1) $\rightarrow$ (0)       | $t_{PHL}$ | $R_L=1.9\text{K}\Omega$                      | -    | 0.3   | 0.8  | $\mu\text{S}$          |
| *8 Propagation delay time<br>*9 Output (0) $\rightarrow$ (1)       | $t_{PLH}$ | $R_L=1.9\text{K}\Omega$                      | -    | 0.3   | 0.8  | $\mu\text{S}$          |
| *10 Instantaneous common<br>mode rejection voltage<br>"Output (1)" | $CM_H$    | $I_F=0$ , $V_{CM}=10\text{V}_{PP}$           | -    | 1000  | -    | $\text{V}/\mu\text{S}$ |
| *10 Instantaneous common<br>mode rejection voltage<br>"Output (0)" | $CM_L$    | $I_F=16\text{mA}$ , $V_{CM}=10\text{V}_{PP}$ | -    | -1000 | -    | $\text{V}/\mu\text{S}$ |
| *12 Bandwidth                                                      | BW        | $R_L=100\Omega$                              | -    | 2.0   | -    | $\text{MHz}$           |

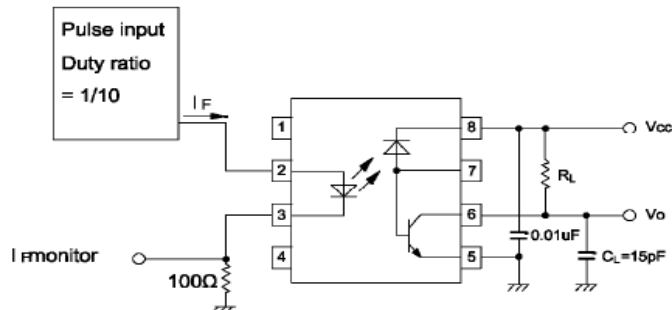
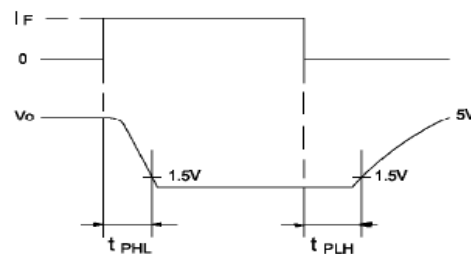
\*8  $R_L = 1.9\text{k ohms}$  is equivalent to on LSTTL and  $5.6\text{k ohm}$  pull-up resistor.

\*9 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (1) level ( $V_O > 2.0\text{V}$ ).

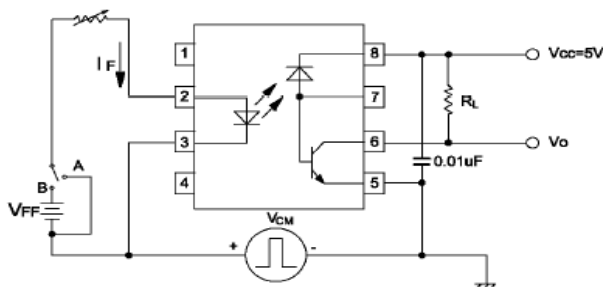
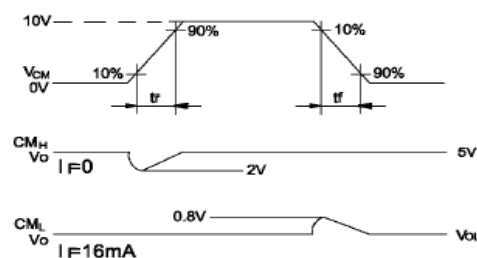
\*10 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (0) level ( $V_O > 0.8\text{V}$ ).

\*11 Bandwidth represents a point where AC input goes down by 3dB.

#### \*9 Test Circuit Propagation Delay Time



#### \*11 Test Circuit for Instantaneous Common Mode Rejection Voltage



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# OPIA800—OPIA803, OPID804

## DIP Package



### Electrical Characteristics: OPIA803

(T<sub>A</sub> = 0 to +70°C unless otherwise specified)

| Parameter                                     | Symbol                           | Conditions                                                                                | MIN. | TYP.             | MAX. | Unit  |
|-----------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------|------|------------------|------|-------|
| *5 Current transfer ratio                     | CTR(1)                           | T <sub>a</sub> =25°C, I <sub>F</sub> =16mA<br>V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V | 7    | 40               | -    | %     |
|                                               | CTR(2)                           | I <sub>F</sub> =16mA<br>V <sub>O</sub> =0.5V, V <sub>CC</sub> =4.5V                       | 5    | 43               | -    | %     |
| Logic ( 0 ) output voltage                    | V <sub>OL</sub>                  | *6 V <sub>CC</sub> =4.5V, I <sub>F</sub> =16mA                                            | -    | 0.1              | 0.4  | V     |
| Logic ( 1 ) output current                    | I <sub>OH</sub> (1)              | T <sub>a</sub> =25°C, I <sub>F</sub> =0<br>V <sub>O</sub> =V <sub>CC</sub> =5.5V          | -    | 3.0              | 500  | nA    |
|                                               | I <sub>OH</sub> (2)              | T <sub>a</sub> =25°C, I <sub>F</sub> =0<br>V <sub>O</sub> =V <sub>CC</sub> =15V           | -    | 0.01             | 1.0  | uA    |
|                                               | I <sub>OH</sub> (3)              | V <sub>CC</sub> =V <sub>O</sub> =15V, I <sub>F</sub> =0                                   | -    | -                | 50   | uA    |
| Logic ( 0 ) supply current                    | I <sub>CCL</sub>                 | I <sub>F</sub> =16mA<br>V <sub>O</sub> =open, V <sub>CC</sub> =15V                        | -    | 200              | -    | uA    |
| Logic ( 1 ) supply current                    | I <sub>CCH</sub> (1)             | T <sub>a</sub> =25°C, I <sub>O</sub> =0<br>V <sub>F</sub> =open, V <sub>CC</sub> =15V     | -    | 0.02             | 1.0  | uA    |
|                                               | I <sub>CCH</sub> (2)             | I <sub>O</sub> =0<br>V <sub>O</sub> =open, V <sub>CC</sub> =15V                           | -    | -                | 2.0  | uA    |
| Input forward voltage                         | V <sub>F</sub>                   | T <sub>a</sub> =25°C, I <sub>F</sub> =16mA                                                | -    | 1.7              | 1.95 | V     |
| Input forward voltage temperature coefficient | ΔV <sub>F</sub> /ΔT <sub>a</sub> | I <sub>F</sub> =16mA                                                                      | -    | -1.9             | -    | mV/°C |
| Input reverse voltage                         | BV <sub>R</sub>                  | T <sub>a</sub> =25°C, I <sub>R</sub> =10uA                                                | 5.0  | -                | -    | V     |
| Input capacitance                             | C <sub>IN</sub>                  | V <sub>F</sub> =0, f=1MHz                                                                 | -    | 60               | -    | pF    |
| *7 Leak current ( input-output )              | I <sub>I-O</sub>                 | T <sub>a</sub> =25°C, 45%RH<br>V <sub>I-O</sub> =3KVDC, t=5s                              | -    | -                | 1.0  | uA    |
| *7 Isolation resistance ( input-output )      | R <sub>I-O</sub>                 | V <sub>I-O</sub> =500VDC                                                                  | -    | 10 <sup>12</sup> | -    | Ω     |
| *7 Capacitance ( input-output )               | C <sub>I-O</sub>                 | f=1MHz                                                                                    | -    | 0.6              | -    | pF    |
| Transistor current amplification factor       | h <sub>FE</sub>                  | V <sub>O</sub> =5V, I <sub>O</sub> =3mA                                                   | -    | 70               | -    |       |

\*5 Current transfer ratio is a ratio of input current and output current expressed in %.

\*6 I<sub>O</sub> = 1.1mA

\*7 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)

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# OPIA800—OPIA803, OPID804

## DIP Package



### Switching Characteristics: OPIA803

( $T_A = 25^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $I_F=16\text{mA}$ )

| Parameter                                                          | Symbol    | Conditions                                    | MIN. | TYP.  | MAX. | Unit                   |
|--------------------------------------------------------------------|-----------|-----------------------------------------------|------|-------|------|------------------------|
| *8 Propagation delay time<br>*9 Output (1) $\rightarrow$ (0)       | $t_{PHL}$ | $R_L=4.1\text{K}\Omega$                       | -    | 0.3   | 1.5  | $\mu\text{S}$          |
| *8 Propagation delay time<br>*9 Output (0) $\rightarrow$ (1)       | $t_{PLH}$ | $R_L=4.1\text{K}\Omega$                       | -    | 0.4   | 1.5  | $\mu\text{S}$          |
| *10 Instantaneous common<br>mode rejection voltage<br>"Output (1)" | $CM_H$    | $I_F=0$ , $V_{CM}=10\text{V}_{P-P}$           | -    | 1000  | -    | $\text{V}/\mu\text{S}$ |
| *10 Instantaneous common<br>mode rejection voltage<br>"Output (0)" | $CM_L$    | $I_F=16\text{mA}$ , $V_{CM}=10\text{V}_{P-P}$ | -    | -1000 | -    | $\text{V}/\mu\text{S}$ |
| *12 Bandwidth                                                      | BW        | $R_L=100\Omega$                               | -    | 2.0   | -    | $\text{MHz}$           |

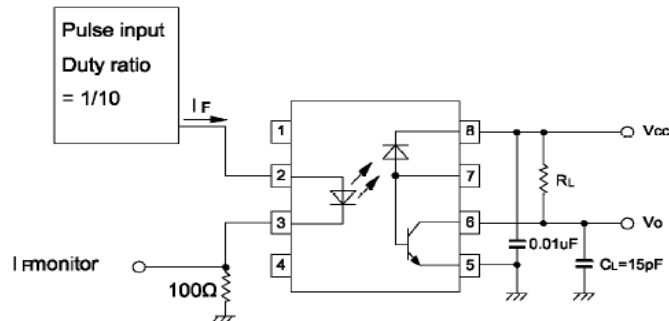
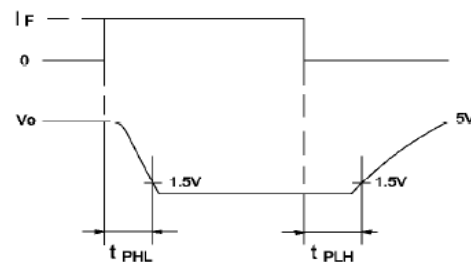
\*8  $R_L = 4.1\text{k ohms}$  is equivalent to on LSTTL and  $6.1\text{k ohm}$  pull-up resistor.

\*9 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (1) level ( $V_O > 2.0\text{V}$ ).

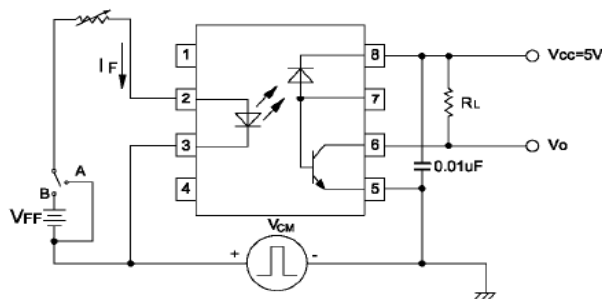
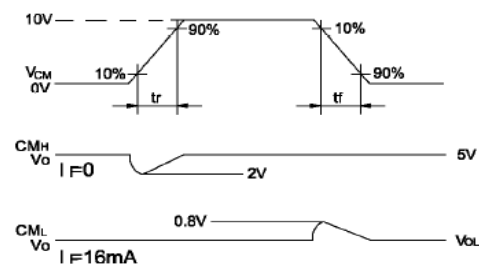
\*10 Instantaneous common mode rejection voltage "output(1)" represents a common voltage variation that can hold the output above (0) level ( $V_O > 0.8\text{V}$ ).

\*11 Bandwidth represents a point where AC input goes down by 3dB.

#### \*9 Test Circuit Propagation Delay Time



#### \*11 Test Circuit for Instantaneous Common Mode Rejection Voltage



OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

# OPIA800—OPIA803, OPID804

## DIP Package



### Electrical Characteristics: OPID804

(T<sub>A</sub> = 0 to +70°C unless otherwise specified)

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|--------|-----------|-----|-----|-----|-------|-----------------|
|--------|-----------|-----|-----|-----|-------|-----------------|

#### Input Diode

|                 |                           |   |     |     |    |                                                |
|-----------------|---------------------------|---|-----|-----|----|------------------------------------------------|
| V <sub>F</sub>  | Forward Voltage (*4)      | - | 1.6 | 1.8 | V  | I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25° C |
| BV <sub>R</sub> | Reverse Breakdown Voltage | 5 | -   | -   | V  | I <sub>R</sub> = 10 μA, T <sub>A</sub> = 25° C |
| C <sub>IN</sub> | Input Capacitance         | - | 60  | -   | pf | V <sub>F</sub> = 0.0 V, f = 1M Hz              |

#### Output Photologic

|                                     |                                                                |      |                  |     |       |                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------|------|------------------|-----|-------|------------------------------------------------------------------------------------------------------------------------------|
| V <sub>OL</sub>                     | Low Level Output Voltage                                       | -    | 0.4              | 0.6 | V     | I <sub>OL</sub> = 13 mA, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 5 mA, V <sub>EH</sub> =2V                                 |
| I <sub>OH</sub>                     | High Level Output Current                                      | -    | 2                | 250 | μA    | V <sub>CC</sub> =5.5 V, V <sub>O</sub> =5.5 V, V <sub>E</sub> =2.0 V, I <sub>F</sub> =250 μA                                 |
| I <sub>EH</sub>                     | High Level Enable Current                                      | -    | -0.8             | -   | mA    | V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 2.0 V                                                                              |
| I <sub>EL</sub>                     | Low Level Enable Current                                       | -2.0 | -1.2             | -   | mA    | V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 2.0 V                                                                              |
| I <sub>OCL</sub>                    | Low Level Output Current                                       | -    | 13               | 18  | mA    | V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 0.5 V, I <sub>F</sub> = 10 mA                                                      |
| I <sub>OCH</sub>                    | High Level Output Current                                      | -    | 7                | 15  | mA    | V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 0.5 V, I <sub>F</sub> = 0 mA                                                       |
| I <sub>I-O</sub>                    | Leakage Current                                                | -    | -                | 1.0 | mA    | V <sub>I-O</sub> = 3,000 V, T <sub>A</sub> = 25° C, t = 5 s, RH = 45%                                                        |
| t <sub>EHL</sub>                    | Enable Propagation delay "High to Low" (*8)                    | -    | 15               | -   | ns    | V <sub>EH</sub> = 3.0 V, V <sub>EL</sub> = 0.5 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, C <sub>LOAD</sub> = 15 pf |
| t <sub>ELH</sub>                    | Enable Propagation delay "Low to High" (*8)                    | -    | 40               | -   |       |                                                                                                                              |
| I <sub>FHL</sub> / I <sub>FLH</sub> | Hysteresis                                                     | -    | 0.8              | -   | Ratio | V <sub>CC</sub> = 5 V, R <sub>L</sub> = 280 Ω                                                                                |
| R <sub>I-O</sub>                    | Input-Output Isolation resistance (*5)                         | -    | 10 <sup>12</sup> | -   | ohm   | V <sub>I-O</sub> = 500 V, T <sub>A</sub> = 25° C                                                                             |
| C <sub>I-O</sub>                    | Input-Output Capacitance (*5)                                  | -    | 0.6              | -   | pf    | f = 1M Hz, T <sub>A</sub> = 25° C                                                                                            |
| t <sub>PHL</sub> & t <sub>PLH</sub> | Propagation delay "High to Low" and "Low to High" (*7)         | -    | 45               | 75  | ns    | V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, C <sub>LOAD</sub> = 15 pf, T <sub>A</sub> = 25° C    |
| t <sub>R</sub> & t <sub>F</sub>     | Rise and Fall Time                                             | -    | 30               | -   |       |                                                                                                                              |
| CM <sub>H</sub>                     | Instantaneous common mode rejection voltage "High Output" (*9) | -    | 500              | -   | V/us  | V <sub>CM</sub> = 10 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 0 mA, V <sub>O</sub> = 2.0 V                                |
| CM <sub>L</sub>                     | Instantaneous common mode rejection voltage "Low Output" (*9)  | -    | -500             | -   |       | V <sub>CM</sub> = 10 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 5 mA, V <sub>O</sub> = 0.8 V                                |

Notes: (Typical values are all at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

\*5 Measured as 2-Pin element. Connect pins 2 and 3, connect pins 5,6,7 and 8.

\*6 DC current transfer ratio is defined as the ratio of output collector current to forward bias input current.

\*7 Refer to Figure 1.

\*8 Refer to Figure 2.

\*9 CM<sub>H</sub> represents a common mode voltage ignorable rise time ratio that can hold logic (1) state in output.

CM<sub>L</sub> represents a common mode voltage ignorable fall time ratio that can hold logic (0) state in output.

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

**Recommended Operating Conditions: OPIA804**

| Parameter                 | Symbol    | Min | Max      | Unit        |
|---------------------------|-----------|-----|----------|-------------|
| Low level input current   | $I_{FL}$  | 0   | 250      | $\mu A$     |
| High level input current  | $I_{FH}$  | 7.0 | 15       | mA          |
| High level enable voltage | $V_{EH}$  | 2.0 | $V_{CC}$ | V           |
| Low level enable voltage  | $V_{EL}$  | 0   | 0.8      | V           |
| Supply voltage            | $V_{CC}$  | 4.5 | 5.5      | V           |
| Fanout (TTL load )        | N         | -   | 8        | -           |
| Operating temperature     | $T_{opr}$ | 0   | 70       | $^{\circ}C$ |

**Truth Table**

| Input | Enable | Ouput |
|-------|--------|-------|
| H     | H      | L     |
| L     | H      | H     |
| H     | L      | H     |
| L     | L      | H     |

**Circuit Block Diagram**

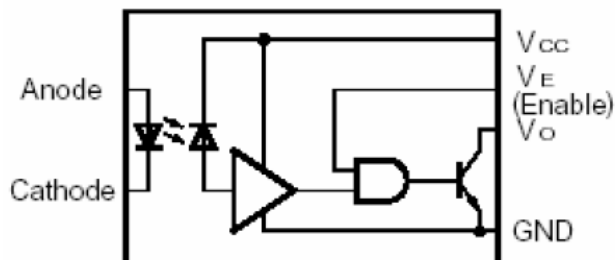
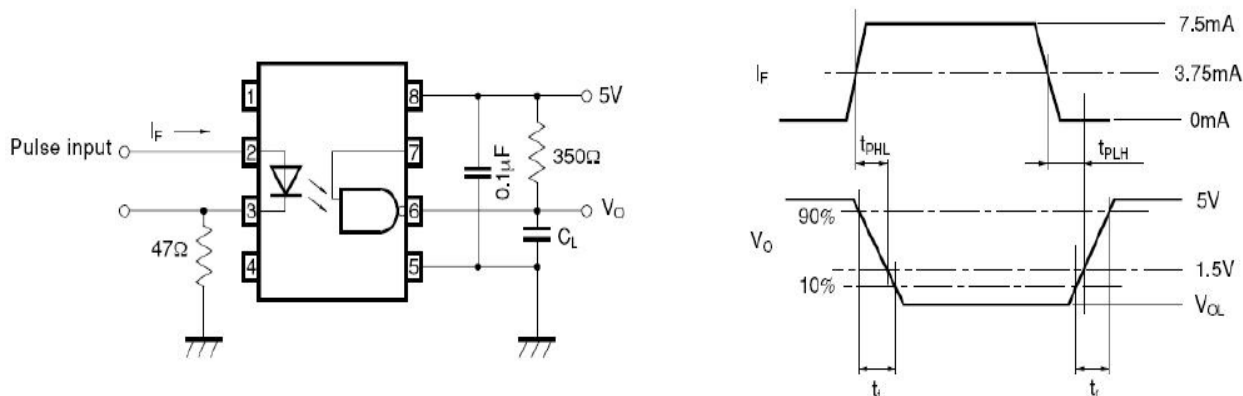


**Figure 1.**

**Test Circuit Propagation Delay Time**



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Recommended Operating Conditions (cont.): OPIA804

Test Circuit for Enable Propagation Delay Time

Figure 2.

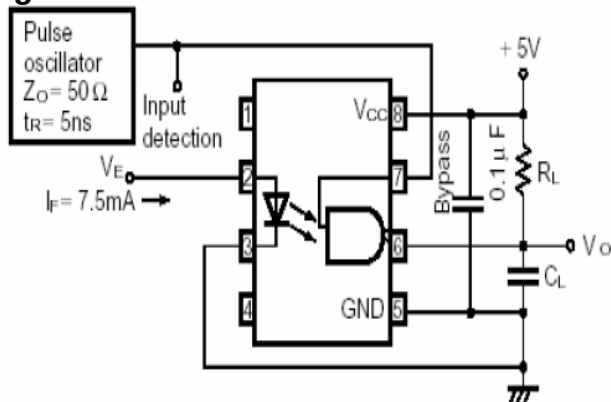
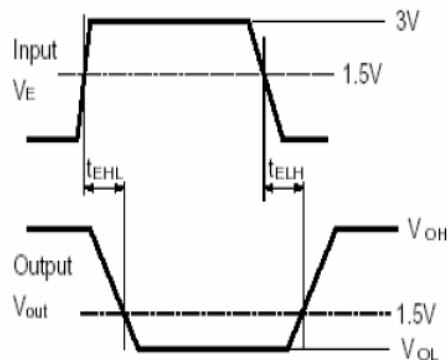
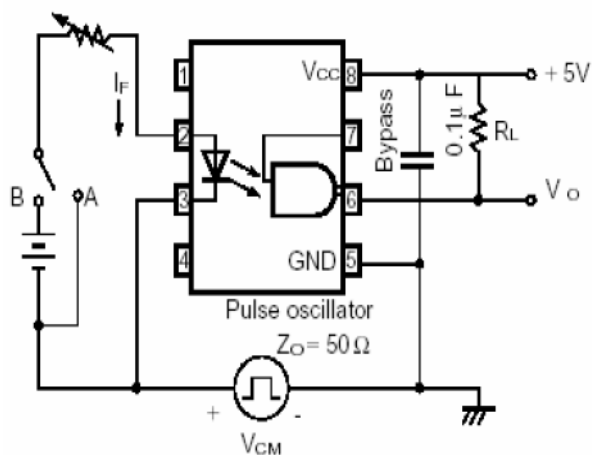
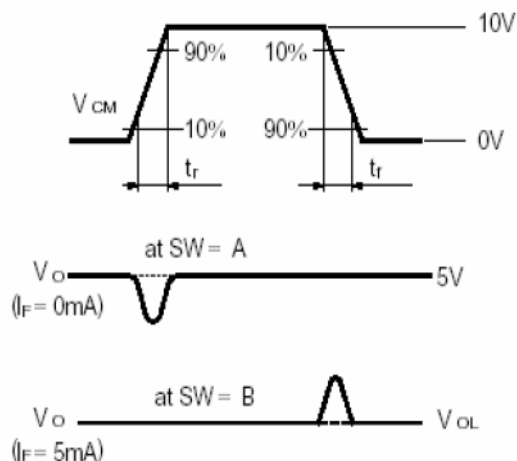


Figure 3.

Test Circuit for Instantaneous Common Mode Rejection Voltage



OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

## OPID804

### Characteristic Curves

Fig.1 Low Level Output Voltage vs. Ambient Temperature

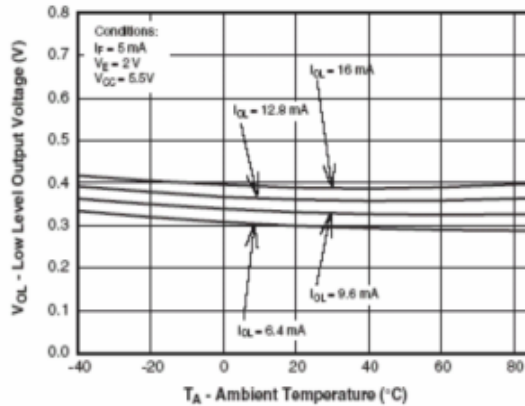


Fig.2 Input Diode Forward Voltage vs. Forward Current

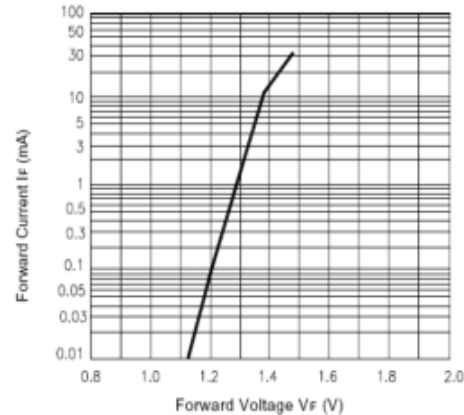


Fig.3 Switching Time vs. Forward Current

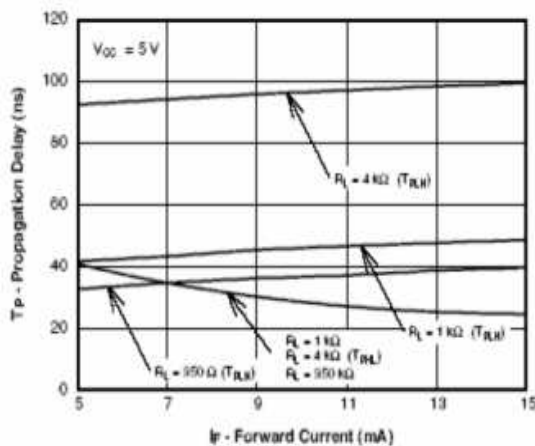


Fig.4 Low Level Output Current vs. Ambient Temperature

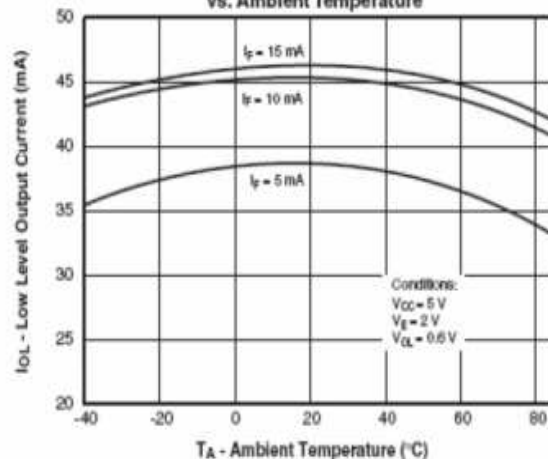


Fig.5 Input Threshold Current vs. Ambient Temperature

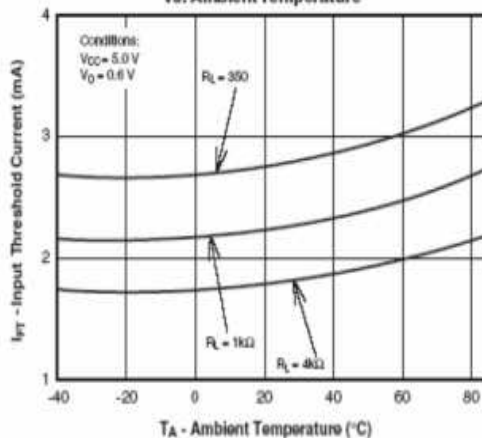
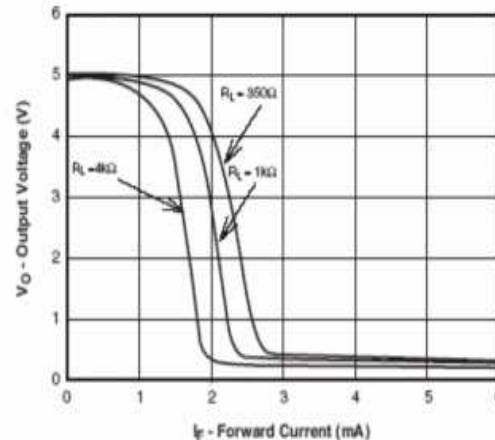


Fig.6 Output Voltage vs. Input Forward Current



OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

### OPID804

#### Characteristic Curves

Fig. 11 High Level Output Current vs. Temperature

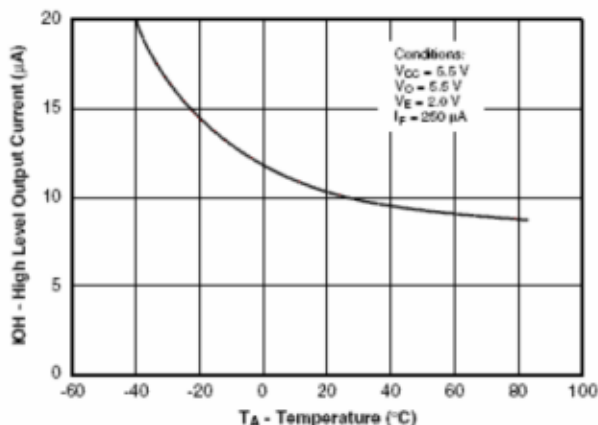


Fig. 9 Enable Propagation Delay vs. Temperature

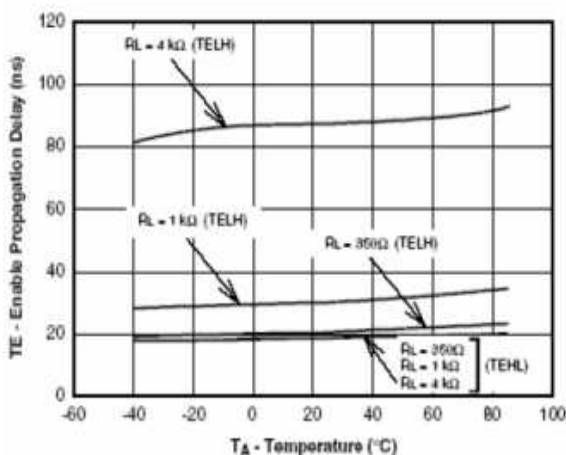


Fig. 10 Switching Time vs. Temperature

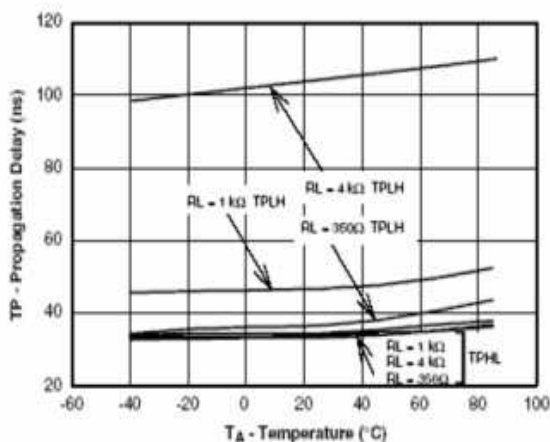


Fig. 7 Pulse Width Distortion vs. Temperature

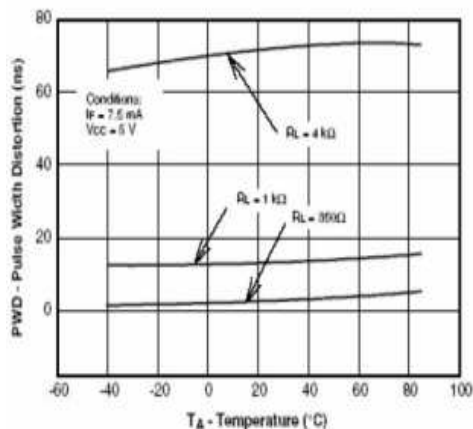
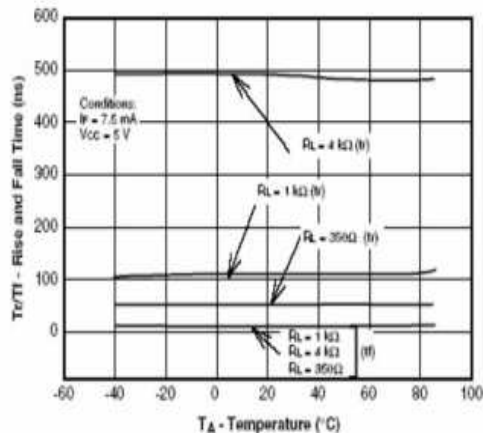


Fig. 8 Rise and Fall Time vs. Temperature



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# OPIA800—OPIA803, OPID804 DIP Package



## Quality / Reliability Requirements

| Parameter                  | Failure Criteria | Conditions                                                              |
|----------------------------|------------------|-------------------------------------------------------------------------|
| HTRB D I <sub>C(OFF)</sub> | ± 10%            | 11 samples after 500Hrs                                                 |
|                            | 0 Fail           | @ VCE = 5.0VDC, Ta = 70°C                                               |
| HTFB D I <sub>C(ON)</sub>  | ± 10%            | 50 samples after 96Hrs                                                  |
|                            | 0 Fail           | @ Max P <sub>D</sub> , Ta = 25°C                                        |
| MTTF @ 90% confidence      | 150,000 Min.     | @ 25°C, 25mADC                                                          |
| Moisture Sensitivity Level | MSL 1            | per JDEC std J-STD-020B                                                 |
| Lead Solderability         | 0 Fail           | per Method 208 of MIL-STD-202.                                          |
| Glass Transition of body   | 125°C Min.       | DSC test method                                                         |
| Temperature Humidity-Bias  | ± 20%            | 85°C, 85%RH, 500Hrs, 80% min I <sub>ceo</sub>                           |
| Temperature Cycle          | ± 20%            | per Method 1010.7 of MIL-STD-883E                                       |
| High Temperature Storage   | ± 20%            | 85°C, 500Hrs                                                            |
| Autoclave                  | 0 Fail           | T <sub>A</sub> = 121°C, Pressure = 15psi, Humidity = 100%, Time = 96Hrs |

**Note:** This is to be performed when a change occurs to form, fit or function.

## Government and Industry Standard Compliance Requirements

European Union's Reduction of Hazardous Substances (RoHS) Directive 2002/95/EC

## Label Identification

### DESCRIPTION:

Size: 3" (7.4 cm) X 2.2" (5.5 cm)  
Lettering shall be black on white background.  
Format shall be as:

#### Notes:

1. The DATE CODE is a 4-digit code for date of manufacture where YY is the last two digits of the year, and WW is week number of manufacture.
2. The LOT I.D. is the manufacturing location lot identification where Y is the year of manufacture, NNNN is a sequential lot identifier, and DDD is the day of the year of manufacture. – or use equivalent label format.

|                                           |  |
|-------------------------------------------|--|
| <br>Carrollton, TX, USA<br>MADE IN TAIWAN |  |
| OPTEK P/N <u>OPIA800D-TU</u>              |  |
|                                           |  |
| QTY. <u>N/A</u>                           |  |
|                                           |  |
| DATE CODE <u>(YYWW)</u>                   |  |
|                                           |  |
| LOT I.D. <u>(Y-NNNNDDD)</u>               |  |
|                                           |  |

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

# OPIA800—OPIA803, OPID804 DIP Package



## Packaging Information:

| Optek's Optocoupler<br>Part Numbers |                                                               | Packaging<br>Quantities | Tube |        | Inner              |        | Small Carton        |        |                 | Medium Carton         |        |                 | Large Carton        |        |                 |
|-------------------------------------|---------------------------------------------------------------|-------------------------|------|--------|--------------------|--------|---------------------|--------|-----------------|-----------------------|--------|-----------------|---------------------|--------|-----------------|
|                                     |                                                               |                         | Qty  | Weight | 52 x 7 x 7.5<br>cm |        | 53.5 x 16 x 17.5 cm |        |                 | 53.5 x 30.7 x 17.5 cm |        |                 | 53.5 x 30.7 x 25 cm |        |                 |
|                                     |                                                               |                         |      |        | Qty                | Weight | Qty                 | Weight | Gross<br>Weight | Qty                   | Weight | Gross<br>Weight | Qty                 | Weight | Gross<br>Weight |
| P/H<br>and<br>SMD                   | 4-PIN<br>OPIA400D/A, OPIA410D/A -<br>OPIA413D/A               | 100                     | 44   | 3,000  | 1.40               | 12,000 | 6.0                 | 6.5    | 24,000          | 12.0                  | 12.5   | 36,000          | 18.0                | 18.5   |                 |
|                                     | 6-PIN<br>OPIA6XXD/A Series                                    | 65                      | 44   | 1,950  | 1.50               | 7,800  | 6.5                 | 7.0    | 15,600          | 12.0                  | 12.5   | 23,400          | 18.5                | 19.0   |                 |
|                                     | 8-PIN<br>OPIA8XXD Series and OPID804D                         | 48                      | 44   | 1,440  | 1.44               | 5,760  | 6.0                 | 6.5    | 11,520          | 12.0                  | 12.5   | 17,290          | 18.0                | 18.5   |                 |
| M/F<br>SOP                          | 4-PIN and 5-PIN<br>OPIA401B - OPIA404B, OPIA414B,<br>OPIA500B | 100                     | 24   | 6,000  | 1.60               | 24,000 | 6.5                 | 7.0    | 48,000          | 13.0                  | 13.5   | 72,000          | 19.5                | 20.0   |                 |
| SSOP                                | 4-PIN<br>OPIA405C - OPIA409C                                  | 170                     | --   | 10,200 | --                 |        |                     |        |                 |                       |        |                 |                     |        |                 |

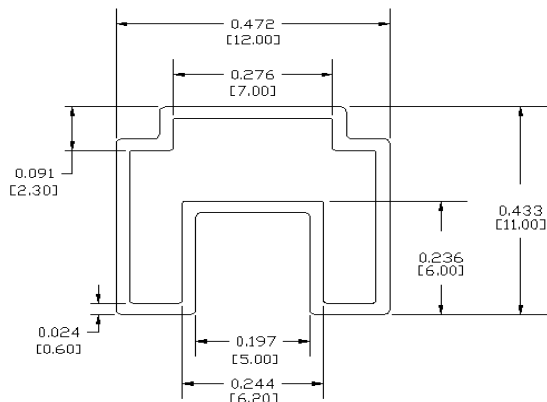
**P/H** = Pin-Hole Packages (Referred as D = Dual-In-Line Package)

**SMD** = Standard Surface Mount Packages (Referred as A = 6.5mil SMD)

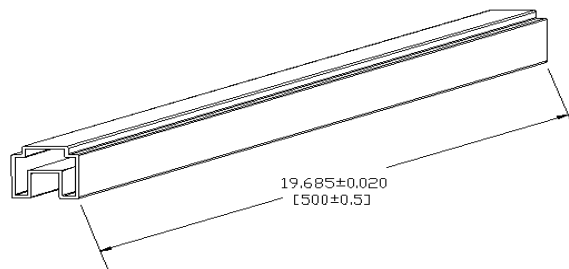
**M/F or SOP** = Mini-Flat Packages or Small Outside Packages (Referred as B = 4.40mil SMD w/ 2.54mil Lead-Spacing)

**SSOP** = Shrink SOP Packages (Referred as C = 3.60mil SMD with 1.27mil Lead-Spacing)

## Tube Packaging Specifications (TU):



**DIMENSIONS ARE IN: INCHES [MILLIMETERS]**  
**TOLERANCE: ± 0.008 INCHES**  
**[± 0.2 MILLIMETERS]**



**Quantity: 8-pin: 48pcs/tube**

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