

# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages

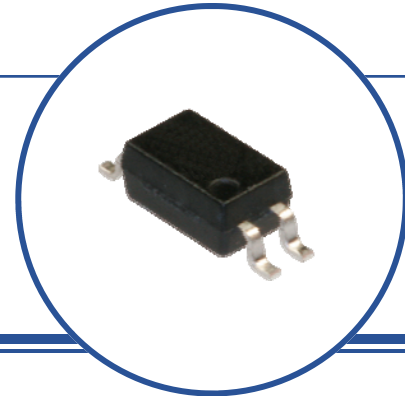


## Features:

- 2,500 or 3,750 Vrms electrical isolation
- Choice of a Single and Dual LED
- Phototransistor or Photo Darlington Sensor
- Low-cost plastic Dual-In-Line (DIP) package

## Agency Approvals:

- UL Certification No: E58730
- VDE No: 40026577(OPIA401-404), 40026553(OPIA405-409)



## Description:

The OPIA series optocouplers are designed for applications that use an analog output (Phototransistor or Photodarlington) in a surface mount package. A wide selection of configurations are available. With typical isolation voltage of 2,500 or 3,750 Volts(RMS), these products meet typical power system isolation requirements.

Theory of operation: The LED transmitter is used to illuminate the Photo sensor 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 signal levels may be required to be transmitted between two power systems while maintaining isolation between the power systems up to 3,750 Volts(RMS). A variety of LED and photo sensor configurations are available depending on the system requirements.

The Current Transfer Ratio (CTR) is determined using the output current and input current for analog photo sensors. 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 SMD products are shipped in a shipping tube with "TR" identified on the end of the part number.

Example: OPI401ATRE is a 4-Pin SMD shipped in tape and reel (TR)

## Applications:

- High voltage isolation: 2,500 or 3,750 Volts(RMS)
- PCBoard power system isolation
- Industrial equipment power isolation
- Medical equipment power isolation
- Office equipment



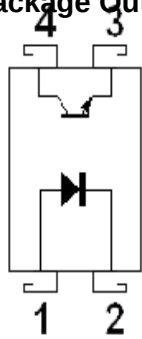
RoHS

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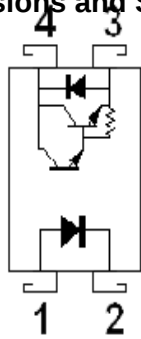
# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages



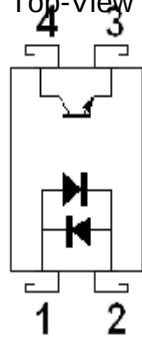
## Package Outline Dimensions and Schematics: Top-View



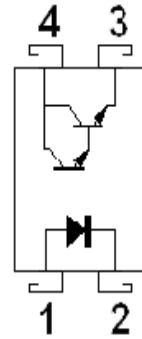
**OPIA404**  
**OPIA405**  
**OPIA414**



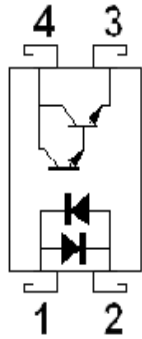
**OPIA401**  
**OPIA409**



**OPIA402**  
**OPIA407**



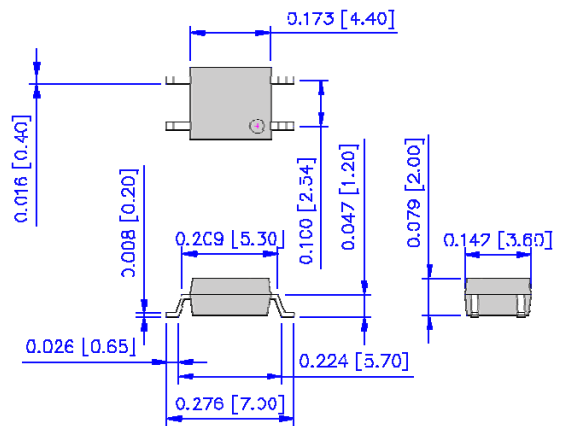
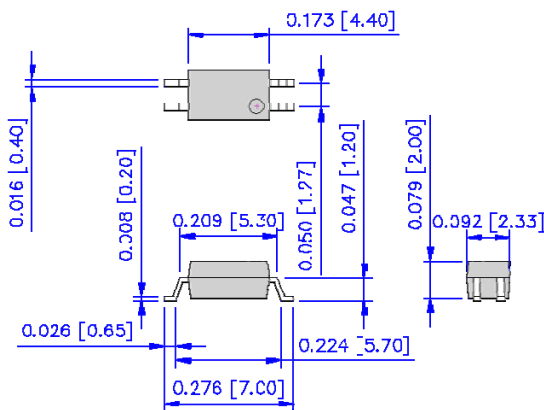
**OPIA403**  
**OPIA406**



**OPIA408**

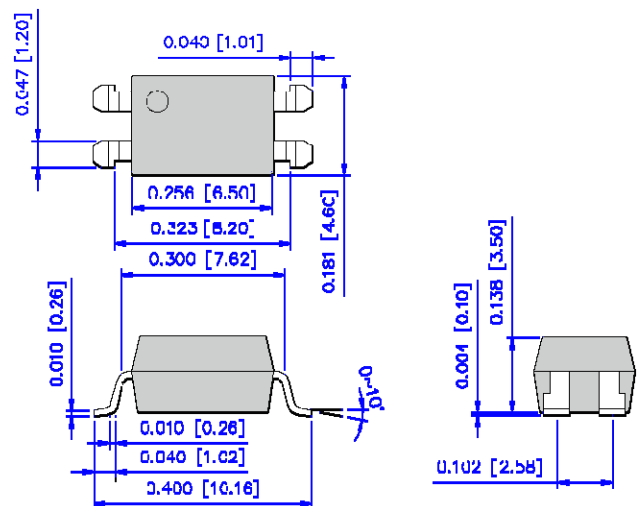
**Package Style C**  
(SSOP)

**Package Style B**  
(SOP)



| Part Number | Pin # |     |   |   |
|-------------|-------|-----|---|---|
|             | 1     | 2   | 3 | 4 |
| OPIA401B    | A     | K   | E | C |
| OPIA402B    | A-K   | K-A | E | C |
| OPIA403B    | A     | K   | E | C |
| OPIA404B    | A     | K   | E | C |
| OPIA405C    | A     |     | E | C |
| OPIA406C    | A     | K   | E | C |
| OPIA407C    | A-K   | K-A | E | C |
| OPIA408C    | A     | K   | E | C |
| OPIA409C    | A     | K   | E | C |
| OPIA414B    | A     | K   | E | C |

**Package Style A**  
(SMD)



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# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages



## Analog Output Devices Ordering Information

| Part Number                                                                    | Isolation Voltage<br>Max. (Vrms)                                     | CTR<br>Min/Typ/Max  | Typ. Tr / Tf (μs)<br>R <sub>L</sub> = 100 ohms | Package     | Configuration           |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------|------------------------------------------------|-------------|-------------------------|
| OPIA401B                                                                       | 3,750                                                                | 1,000 / - / -       | 100 / 20                                       | 4-Pin SOP   | A K—C E (Dar)           |
| OPIA402B                                                                       | 3,750                                                                | 20 / - 400          | 4 / 3                                          | 4-Pin SOP   | A K, K A—C E            |
| OPIA403B                                                                       | 3,750                                                                | 600 / 1,600 / 7,500 | 60 / 53                                        | 4-Pin SOP   | A K—C E (Dar)           |
| OPIA404B                                                                       | 3,750                                                                | 50 / - / 600        | 5 / 4                                          | 4-Pin SOP   | A K—C E                 |
| OPIA405CxxA                                                                    | 2,500                                                                | 80 / - / 160        | 3 / 5                                          | 4-Pin SSOP  | A K—C E                 |
| OPIA405CxxB                                                                    | 2,500                                                                | 130 / - / 260       | 3 / 5                                          | 4-Pin SSOP  | A K—C E                 |
| OPIA405CxxC                                                                    | 2,500                                                                | 200 / - / 400       | 3 / 5                                          | 4-Pin SSOP  | A K—C E                 |
| OPIA405CxxD                                                                    | 2,500                                                                | 300 / - / 600       | 3 / 5                                          | 4-Pin SSOP  | A K—C E                 |
| OPIA405CxxE                                                                    | 2,500                                                                | 50 / - / 600        | 3 / 5                                          | 4-Pin SSOP  | AK—CE                   |
| OPIA406C                                                                       | 2,500                                                                | 200 / 2,000 / -     | 200 / 200                                      | 4-Pin SSOP  | A K—C E (Dar)           |
| OPIA407CxxE                                                                    | 2,500                                                                | 80 / - / 600        | 3 / 5                                          | 4-Pin SSOP  | A K, K A—C E            |
| OPIA408C                                                                       | 2,500                                                                | 200 / 2,000 / -     | 200 / 200                                      | 4-Pin SSOP  | A K—C E (Dar)           |
| OPIA409C                                                                       | 2,500                                                                | 400 / 2,000 -       | 40 / 10                                        | 4-Pin SSOP  | A K—C E (Dar)           |
| OPIA414B                                                                       | 3,750                                                                | 100 / - / 600       | 4 / 3                                          | 4-Pin SOP   | A K—C E                 |
| Configuration: Definition of Terms<br>LED Identification—Sensor Identification |                                                                      |                     |                                                |             |                         |
| Configuration<br>Information                                                   | LED                                                                  | A = Anode           | K = Cathode                                    |             |                         |
|                                                                                | Sensor                                                               | B = Base            | C = Collector                                  | E = Emitter | (Dar) = Photodarlington |
|                                                                                |                                                                      |                     |                                                |             |                         |
| Packaging                                                                      | Part Number Suffix: <b>TU</b> = Shipped in Tubes<br>TR = Tape & Reel |                     |                                                |             | Example: OPIA405CTUE    |

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# OPIA401 through OPIA409, OPIA414

## SMD, SOP and SSOP Packages



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

|                                                                                                                                       |                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Storage Temperature<br>OPIA404, OPIA414<br>OPIA401, OPIA402, OPIA403<br>OPIA405, OPIA406, OPIA407, OPIA408, OPIA409                   | -55° C to +125° C<br>-40° C to +125° C<br>-55° C to +150° C |
| Operating Temperature<br>All except the part numbers noted below<br>OPIA404<br>OPIA414                                                | -30° C to +100° C<br>-55° C to +115° C<br>-30° C to +115° C |
| Isolation voltage (1 minute)<br>OPIA400<br>OPIA401, OPIA402, OPIA403, OPIA404, OPIA414<br>OPIA405, OPIA406, OPIA407, OPIA408, OPIA409 | 5,000 Vrms<br>3,750 Vrms<br>2,500 Vrms                      |
| Total Package Power Dissipation<br>OPIA401, OPIA402, OPIA403, OPIA404, OPIA414<br>OPIA405<br>OPIA406, OPIA407, OPIA408, OPIA409       | 170 mW<br>160 mW<br>-                                       |
| Lead Soldering Temperature (1/16" (1.6 mm) from case for 5 seconds with soldering iron)                                               | 260° C                                                      |

### Input Diode

|                                                                                                                                          |                         |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Continuous Forward Current<br>All except the part number noted below<br>OPIA414                                                          | 50 mA<br>10 mA          |
| Peak Forward current (1 $\mu\text{s}$ pulse width, 300 pps)<br>All except the part number noted below<br>OPIA414                         | 1 A<br>200 mA           |
| Reverse Voltage<br>OPIA401, OPIA403, OPIA404, OPIA405, OPIA406, OPIA409, OPIA414<br>OPIA402, OPIA407, OPIA408, OPIA409, OPIA410, OPIA412 | 6 V<br>-                |
| Power Dissipation<br>OPIA401, OPIA402, OPIA403, OPIA404<br>OPIA405, OPIA406, OPIA407, OPIA408, OPIA409<br>OPIA414                        | 70 mW<br>60 mW<br>15 mW |

### Output Phototransistor

|                                                                                                                               |                                       |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Collector-Emitter Voltage<br>OPIA402, OPIA404<br>OPIA401, OPIA409<br>OPIA403<br>OPIA406, OPIA408<br>OPIA405, OPIA407, OPIA414 | 60 V<br>300 V<br>35 V<br>40 V<br>80 V |
| Emitter-Collector Voltage<br>OPIA405, OPIA406, OPIA407, OPIA408<br>OPIA401<br>OPIA402, OPIA403, OPIA404<br>OPIA409<br>OPIA414 | 6 V<br>0.1 V<br>5 V<br>0.3 V<br>7 V   |
| Collector Current<br>OPIA402, OPIA404, OPIA405, OPIA407, OPIA414<br>OPIA401, OPIA403<br>OPIA406, OPIA408<br>OPIA409           | 50 mA<br>150 mA<br>90 mA<br>60 mA     |
| Power Dissipation<br>All except the part numbers noted below<br>OPIA405, OPIA406, OPIA407, OPIA408, OPIA409                   | 150 mW<br>120 mW                      |

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# OPIA401 through OPIA409, OPIA414

## SMD, SOP and SSOP Packages



### Electrical Characteristics

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

#### Input Diode

|          |                                                                                                                               |                  |                          |                           |               |                                                                                                                                        |
|----------|-------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------|---------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| $V_F$    | Forward Voltage<br>All except those noted below<br>OPIA404<br>OPIA405, OPIA406, OPIA407, OPIA408<br>OPIA401, OPIA409, OPIA414 | -<br>-<br>-<br>- | 1.2<br>1.6<br>1.1<br>1.2 | 1.4<br>1.75<br>1.4<br>1.4 | V             | $I_F = 20 \text{ mA}$<br>$I_F = 10 \text{ mA}$<br>$I_F = 5 \text{ mA}$<br>$I_F = 10 \text{ mA}$<br>$I$                                 |
| $V_{FM}$ | Peak Forward Voltage<br>OPIA403<br>OPIA405<br>OPIA401, OPIA404, OPIA414, OPIA406,<br>OPIA407, OPIA408, OPIA409                | -<br>-<br>-      | -<br>-<br>-              | 3.5<br>3.0<br>-           | V             | $I_{FM} = 500 \text{ mA}$                                                                                                              |
| $I_R$    | Reverse Current<br>All except those noted below<br>OPIA404, OPIA407, OPIA408, OPIA414<br>OPIA405, OPIA406, OPIA409            | -<br>-<br>-      | -<br>-<br>-              | 10<br>-<br>5              | $\mu\text{A}$ | $V_R = 4 \text{ V}$<br>-<br>$V_R = 5 \text{ V}$                                                                                        |
| $C_t$    | Terminal Capacitance<br>All except those noted below<br>OPIA402, OPIA404, OPIA414<br>OPIA408, OPIA409                         | -<br>-<br>-      | 30<br>30<br>60           | -<br>250<br>-             | pf            | $V = 0.0 \text{ V}$ , $f = 1 \text{ K Hz}$<br>$V = 0.0 \text{ V}$ , $f = 1 \text{ K Hz}$<br>$V = 0.0 \text{ V}$ , $f = 1 \text{ M Hz}$ |

#### Output Phototransistor

|               |                                                                                                  |             |                   |                   |               |                                                                                                                                                                                                                |
|---------------|--------------------------------------------------------------------------------------------------|-------------|-------------------|-------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{CEO}$     | Collector dark Current<br>OPIA400, OPIA402, OPIA404<br>OPIA405, OPIA407<br>OPIA414               | -<br>-<br>- | -<br>-<br>-       | 100<br>100<br>100 | nA            | $I_F = 0 \text{ mA}$ , $V_{CE} = 20 \text{ V}$<br>$I_F = 0 \text{ mA}$ , $V_{CE} = 80 \text{ V}$<br>$I_F = 0 \text{ mA}$ , $V_{CE} = 50 \text{ V}$                                                             |
| $V_{CE(SAT)}$ | Collector-emitter Saturation Voltage<br>OPIA405, OPIA407<br>OPIA402, OPIA404, OPIA410<br>OPIA414 | -<br>-<br>- | 0.1<br>0.1<br>0.1 | 0.3<br>0.3<br>0.2 | V             | $I_F = 10 \text{ mA}$ , $I_C = 2 \text{ mA}$<br>$I_F = 20 \text{ mA}$ , $I_C = 1 \text{ mA}$<br>$I_F = 10 \text{ mA}$ , $I_C = 1 \text{ mA}$                                                                   |
| $f_c$         | Cutt-Off frequency<br>All except those noted below                                               | -           | -                 | -                 | K Hz          | $V_{CC} = 5 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$                                                                                                                                             |
| $t_R$         | Rise Time<br>OPIA402, OPIA414<br>OPIA405, OPIA407<br>OPIA404                                     | -<br>-<br>- | 4<br>3<br>5       | 18<br>18<br>20    | $\mu\text{s}$ | $V_{CC} = 2 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$<br>$V_{CC} = 2 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$ |
| $t_F$         | Fall Time<br>OPIA402, OPIA414<br>OPIA405, OPIA407<br>OPIA404                                     | -<br>-<br>- | 3<br>5<br>4       | 18<br>18<br>20    | $\mu\text{s}$ | $V_{CC} = 2 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$<br>$V_{CC} = 2 \text{ V}$ , $I_C = 2 \text{ mA}$ , $R_L = 100 \Omega$ |

Continued on Next Page

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# OPIA401 through OPIA409, OPIA414

## SMD, SOP and SSOP Packages



### Electrical Characteristics (OPIA400 Series) - Continued from Previous Page

| SYMBOL                        | PARAMETER                                                                               | MIN              | TYP                    | MAX                      | UNITS   | TEST CONDITIONS                                                                                                                                                                                                                                                |
|-------------------------------|-----------------------------------------------------------------------------------------|------------------|------------------------|--------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Output PhotoDarlington</b> |                                                                                         |                  |                        |                          |         |                                                                                                                                                                                                                                                                |
| $I_{CEO}$                     | Collector dark Current<br>OPIA401<br>OPIA403<br>OPIA406, OPIA408<br>OPIA409             | -<br>-<br>-<br>- | -<br>-<br>-<br>-       | 1.0<br>1.0<br>0.4<br>0.4 | $\mu A$ | $I_F = 0 \text{ mA}, V_{CE} = 200 \text{ V}$<br>$I_F = 0 \text{ mA}, V_{CE} = 10 \text{ V}$<br>$I_F = 0 \text{ mA}, V_{CE} = 40 \text{ V}$<br>$I_F = 0 \text{ mA}, V_{CE} = 300 \text{ V}$                                                                     |
| $V_{CE(SAT)}$                 | Collector-emitter Saturation Voltage<br>OPIA403<br>OPIA406, OPIA408, OPIA409<br>OPIA401 | -<br>-<br>-      | -<br>-<br>0.8          | 1.0<br>1.0<br>1.5        | V       | $I_F = 20 \text{ mA}, I_C = 1 \text{ mA}$<br>$I_F = 1 \text{ mA}, I_C = 2 \text{ mA}$<br>$I_F = 20 \text{ mA}, I_C = 100 \text{ mA}$                                                                                                                           |
| $f_C$                         | Cut-Off frequency<br>OPIA401, OPIA406, OPIA408, OPIA409<br>OPIA403                      | -<br>1.0         | -<br>7.0               | -<br>-                   | K Hz    | -<br>$V_{CC} = 5 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$                                                                                                                                                                                              |
| $t_R$                         | Rise Time<br>OPIA401<br>OPIA403<br>OPIA406, OPIA408<br>OPIA409                          | -<br>-<br>-<br>- | 100<br>60<br>200<br>40 | 300<br>300<br>-<br>-     | $\mu s$ | $V_{CC} = 2 \text{ V}, I_C = 20 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 2 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}, I_C = 10 \text{ mA}, R_L = 100 \Omega$ |
| $t_F$                         | Fall Time<br>OPIA401<br>OPIA403<br>OPIA406, OPIA408<br>OPIA409                          | -<br>-<br>-<br>- | 20<br>53<br>200<br>10  | 100<br>250<br>-<br>-     | $\mu s$ | $V_{CC} = 2 \text{ V}, I_C = 20 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 2 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega$<br>$V_{CC} = 5 \text{ V}, I_C = 10 \text{ mA}, R_L = 100 \Omega$ |

### Coupled Characteristics

|           |                                                                                                                                                       |                                                           |                                                     |                                                         |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CTR       | Current Transfer Ratio<br>OPIA404<br>OPIA401<br>OPIA402<br>OPIA403<br>OPIA405(See Table, page 3)<br>OPIA406, OPIA408<br>OPIA407<br>OPIA409<br>OPIA414 | 50<br>1,000<br>20<br>600<br>50<br>20<br>0.3<br>400<br>100 | -<br>-<br>-<br>-<br>-<br>2,000<br>1.0<br>2,000<br>- | 600<br>-<br>400<br>7,500<br>600<br>-<br>3.0<br>-<br>600 | %   | $I_F = 5.00 \text{ mA}, V_{CE} = 5.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 2.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 5.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 2.0 \text{ V}$<br>$I_F = 5.00 \text{ mA}, V_{CE} = 5.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 2.0 \text{ V}$<br>$I_F = 5.00 \text{ mA}, V_{CE} = 5.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 2.0 \text{ V}$<br>$I_F = 1.00 \text{ mA}, V_{CE} = 5.0 \text{ V}$ |
| $C_i$     | Floating Capacitance<br>OPIA405, OPIA406, OPIA407,<br>OPIA408, OPIA409                                                                                | -<br>-                                                    | 0.6<br>0.4                                          | 1.0<br>-                                                | pF  | $V = 0.0 \text{ V}, f = 1 \text{ M Hz}$                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| $R_{ISO}$ | Isolation resistance                                                                                                                                  | $5 \times 10^{10}$                                        | $10^{11}$                                           | -                                                       | ohm | C500V, 40% to 60%RH                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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## OPIA401

Fig.1 Forward Current vs. Ambient Temperature

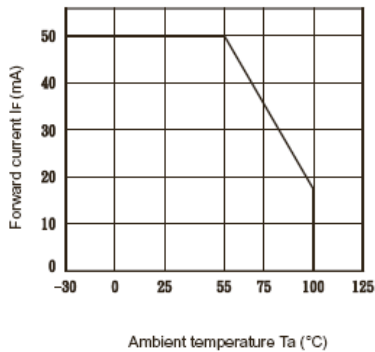


Fig.2 Collector Power Dissipation vs. Ambient Temperature

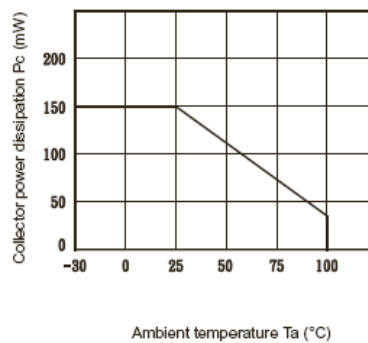


Fig.3 Peak Forward Current vs. Duty Ratio

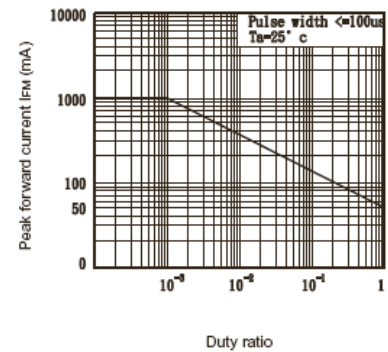


Fig.4 Forward Current vs. Forward Voltage

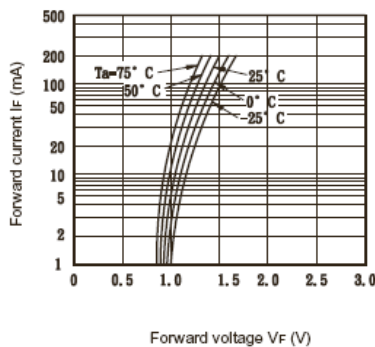


Fig.5 Current Transfer Ratio vs. Forward Current

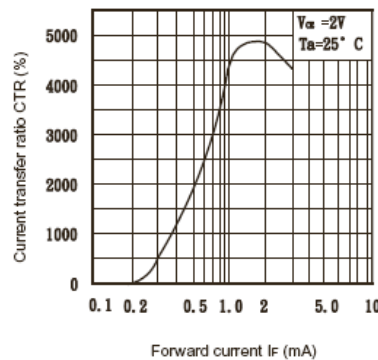


Fig.6 Collector Current vs. Collector-emitter Voltage

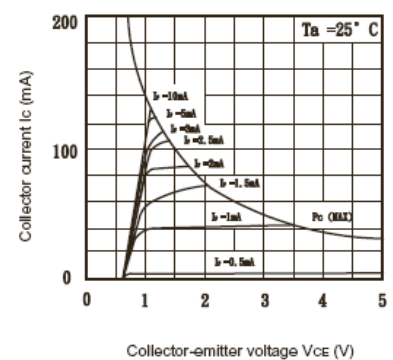


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

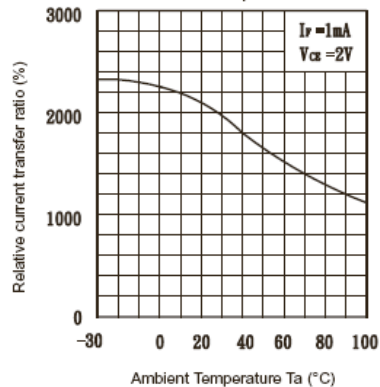


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

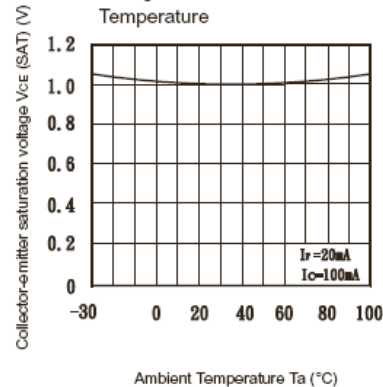
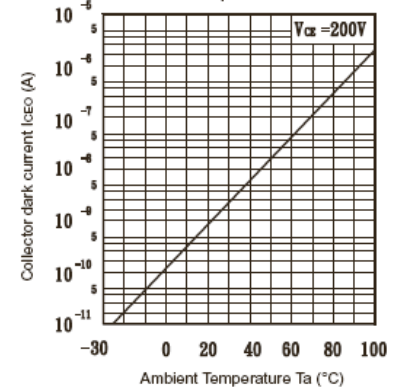


Fig.9 Collector Dark Current vs. Ambient Temperature



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## OPIA401

Fig.10 Response Time vs. Load Resistance

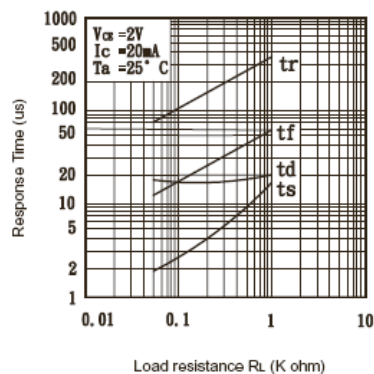


Fig.11 Frequency Response

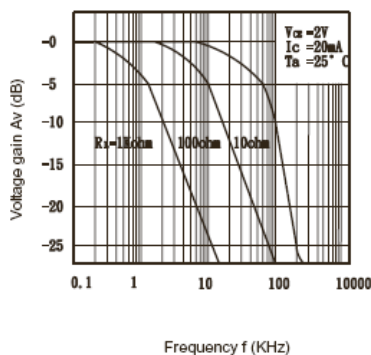
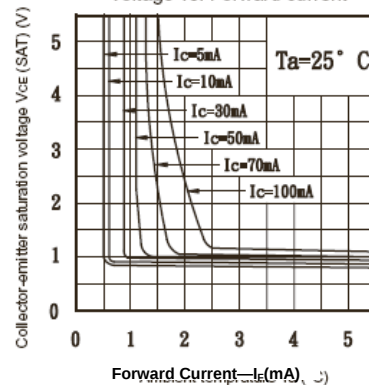


Fig.12 Collector-emitter Saturation Voltage vs. Forward current



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

OPIA402

Fig.1 Forward Current vs. Ambient Temperature

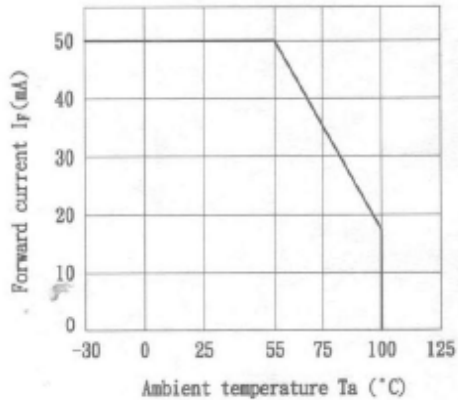


Fig.2 Diode Power Dissipation vs. Ambient Temperature

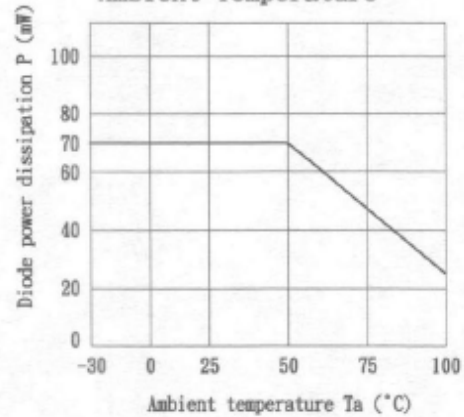


Fig.3 Collector Power Dissipation vs. Ambient Temperature

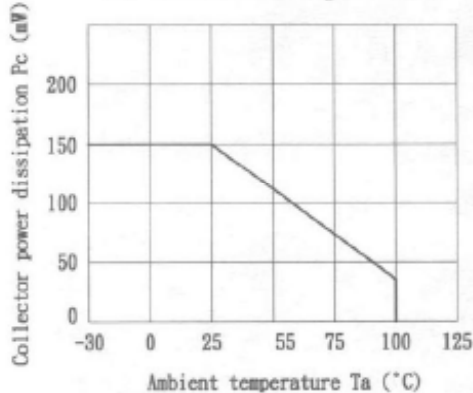


Fig.4 Total Power Dissipation vs. Ambient Temperature

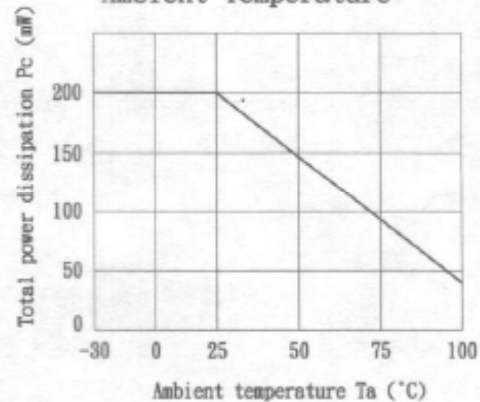


Fig.5 Peak Forward Current vs. Duty Ratio

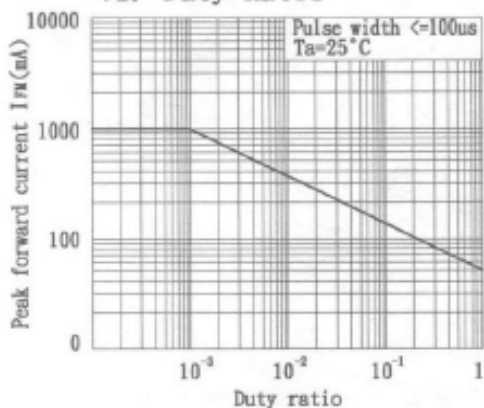
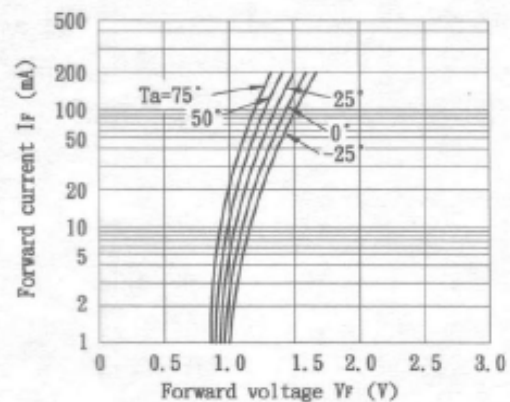


Fig.6 Forward Current vs. Forward Voltage



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

## OPIA402

Fig. 7 Current Transfer Ratio vs. Forward Current

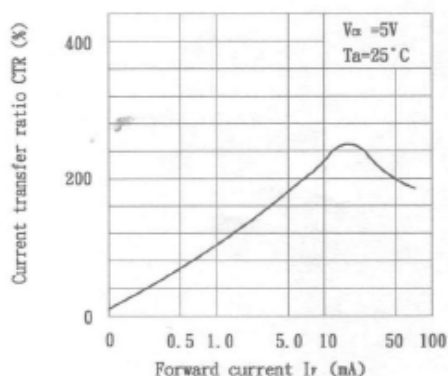


Fig. 8 Collector Current vs. Collector-emitter Voltage

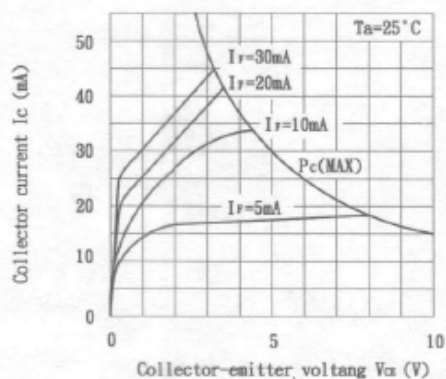


Fig. 9 Relative Current Transfer Ratio vs. Ambient Temperature

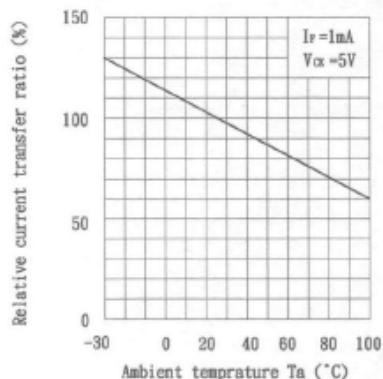


Fig. 10 Collector-emitter Saturation Voltage vs. Ambient Temperature

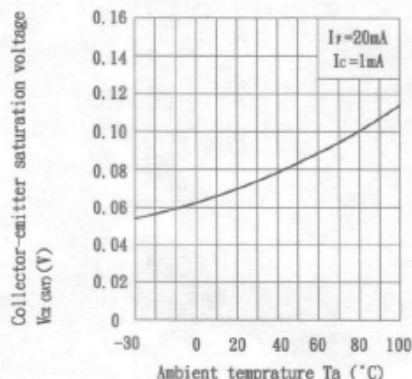


Fig. 11 Collector Dark Current vs. Ambient Temperature

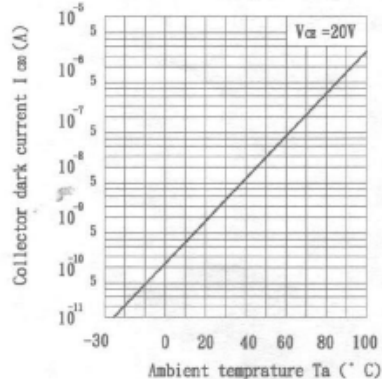
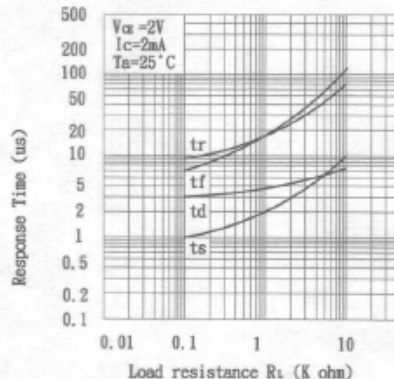


Fig. 12 Response Time vs. Load Resistance



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

## OPIA403

Fig.1 Forward Current vs.  
Ambient Temperature

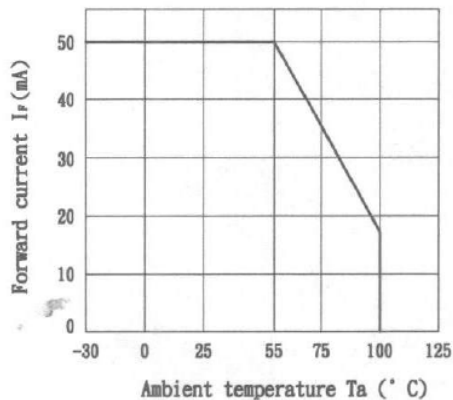


Fig.2 Collector Power Dissipation  
vs. Ambient Temperature

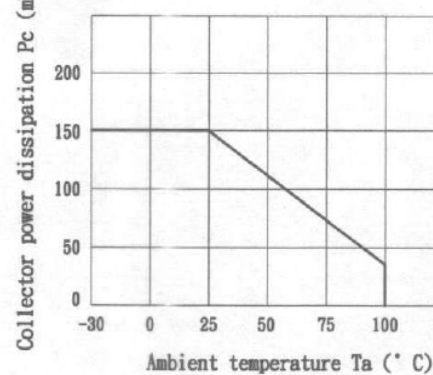


Fig.3 Peak Forward Current  
vs. Duty Ratio

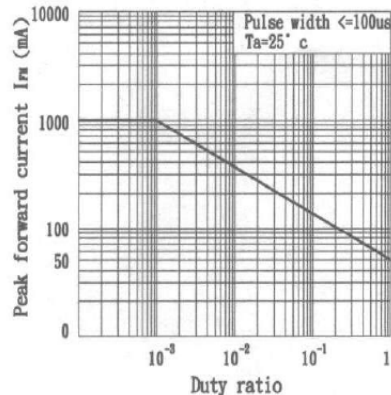


Fig.4 Forward Current vs.  
Forward Voltage

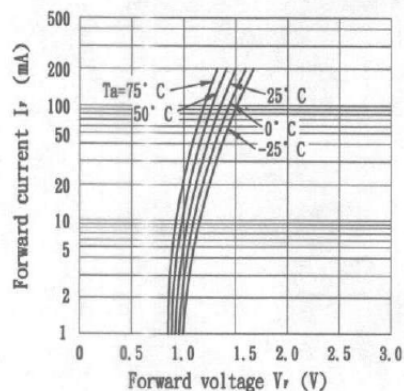


Fig.5 Current Transfer Ratio vs.  
Forward Current

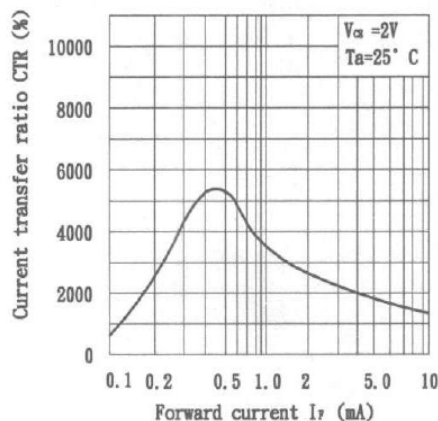
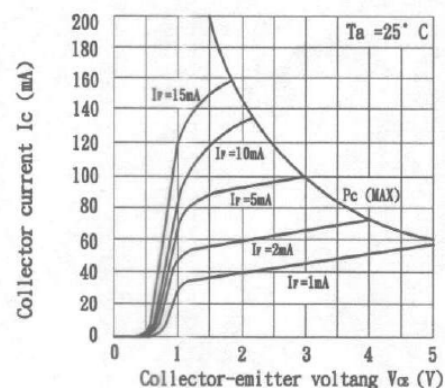


Fig.6 Collector Current vs.  
Collector-emitter Voltage



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

## OPIA403

Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

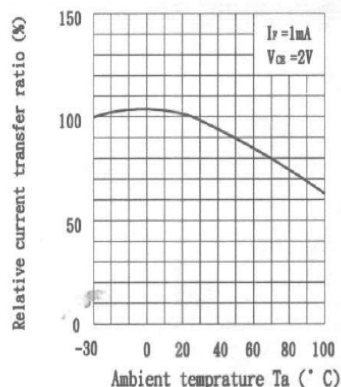


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

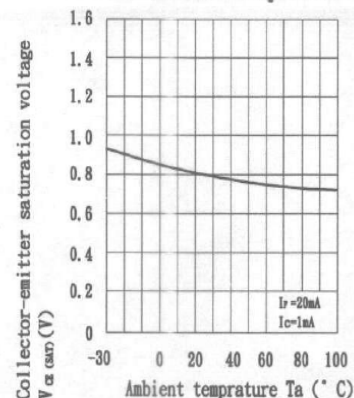


Fig.9 Collector Dark Current vs. Ambient Temperature

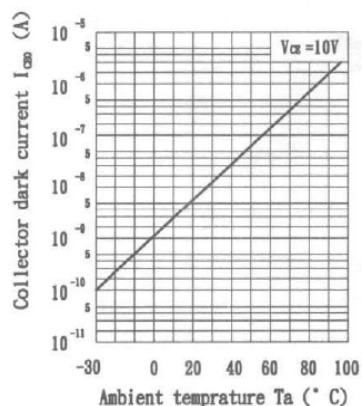


Fig.10 Response Time vs. Load Resistance

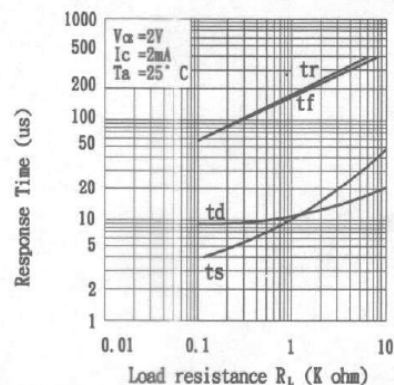
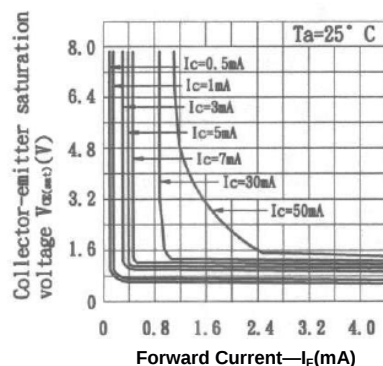


Fig.11 Collector-emitter Saturation Voltage vs. Forward current



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

## OPIA404

Fig.1 Forward Current vs.  
Ambient Temperature

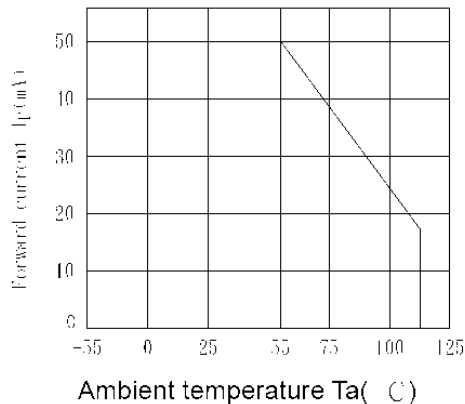


Fig.2 Diode Power Dissipation  
vs. Ambient Temperature

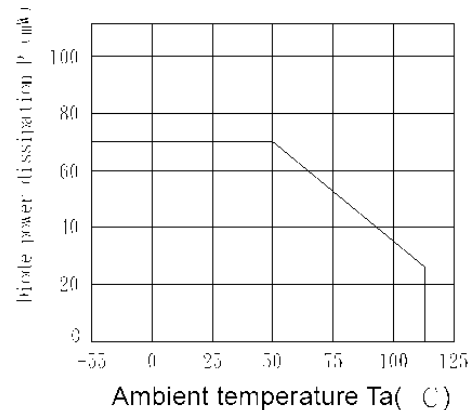


Fig.3 Collector Power Dissipation  
vs. Ambient Temperature

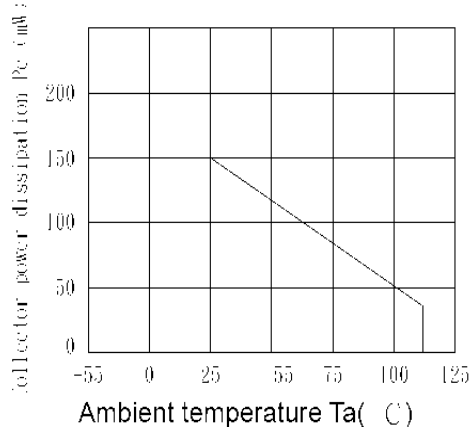


Fig.4 Total Power Dissipation  
vs. Ambient Temperature

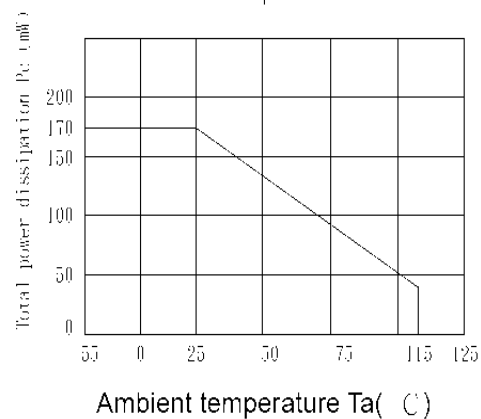


Fig.5 Peak Forward Current  
vs. Duty Ratio

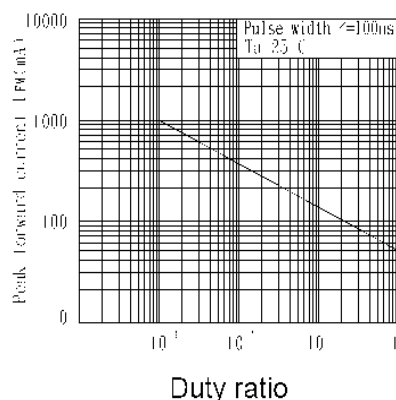
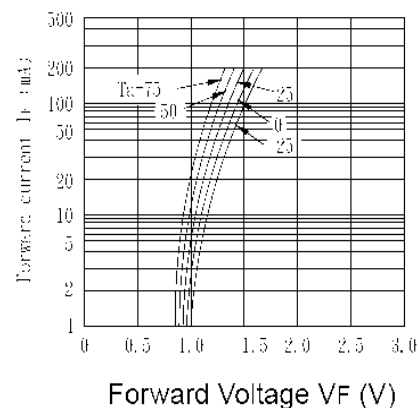


Fig.6 Forward Current vs.  
Forward Voltage



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

## OPIA404

Fig.9 Collector Current vs.  
Collector-Emitter Voltage

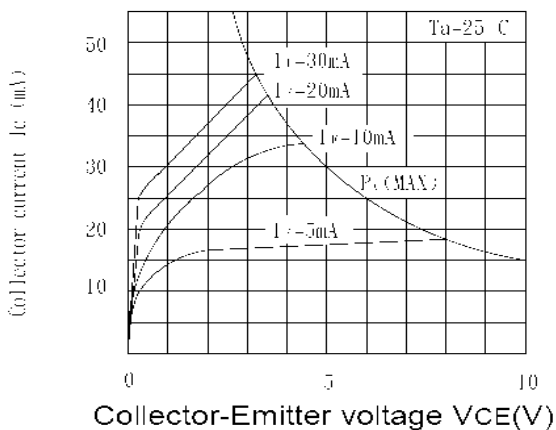


Fig.10 Relative Current Transfer Ratio  
vs. Ambient Temperature

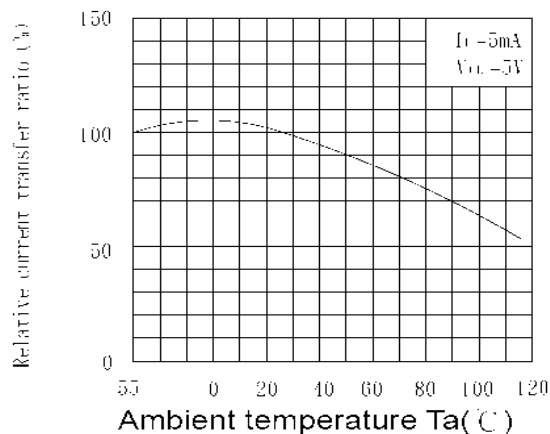


Fig.7 Forward Current vs.  
Forward Voltage

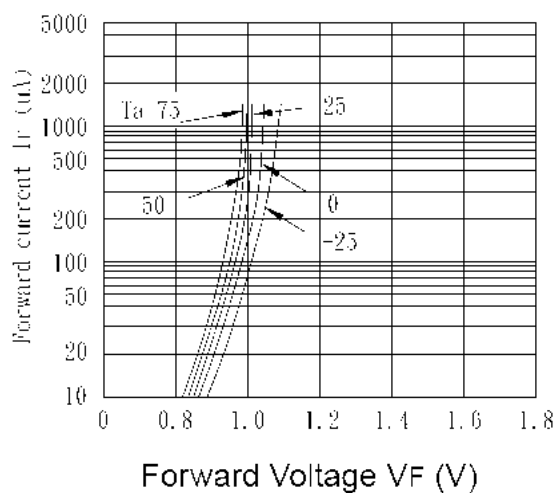
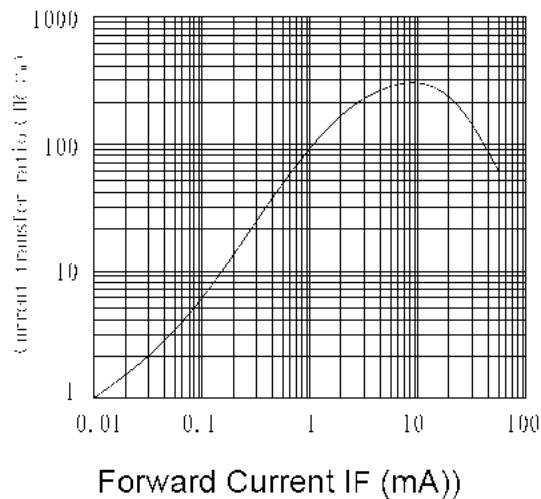


Fig.8 Current Transfer Ratio vs.  
Forward Current



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## OPIA405

Fig. 1 Current Transfer Ratio vs. Forward Current

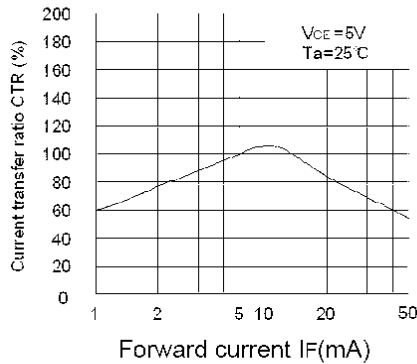


Fig.2 Collector Power Dissipation vs. Ambient Temperature

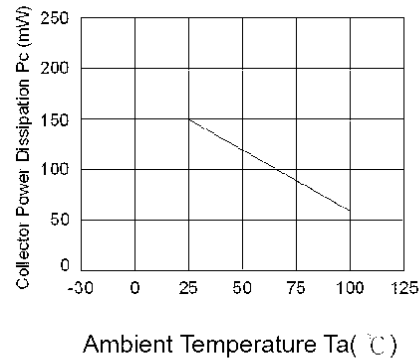


Fig.3 Collector Dark Current vs. Ambient Temperature

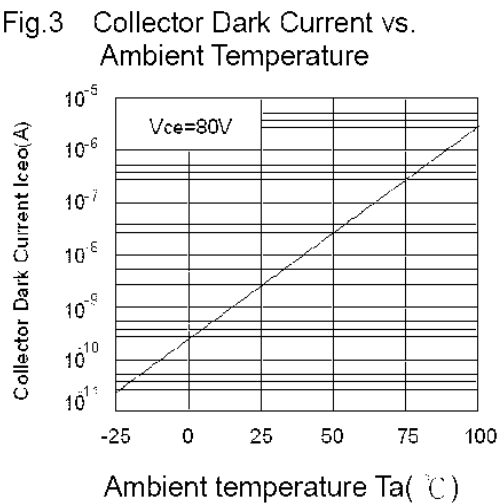


Fig.4 Forward Current vs. Ambient Temperature

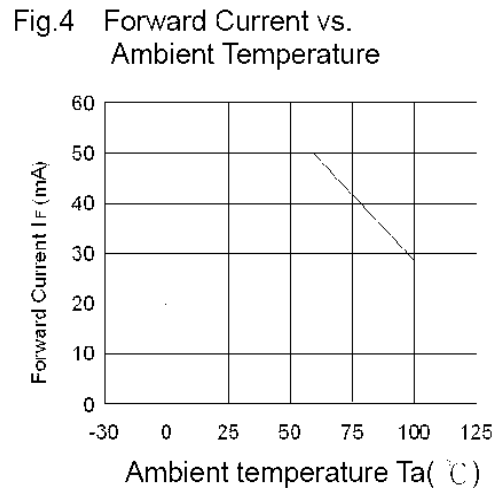


Fig.5 Forward Current vs. Forward Voltage

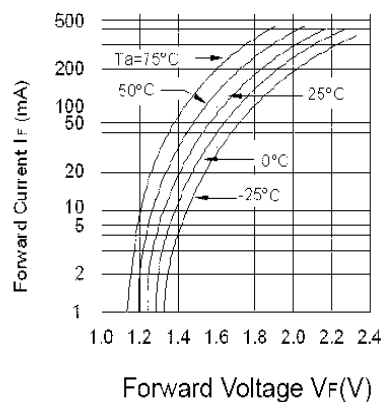
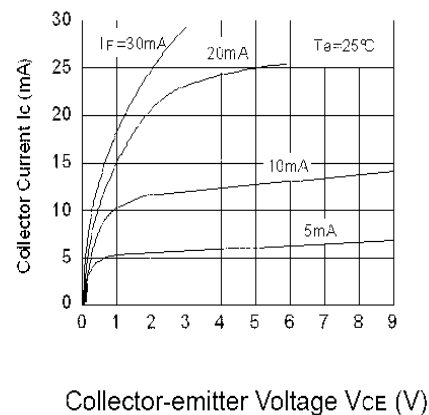


Fig.6 Collector Current vs. Collector-emitter Voltage



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

## OPIA405

Fig.7 Collector-emitter Saturation Voltage vs. Ambient Temperature

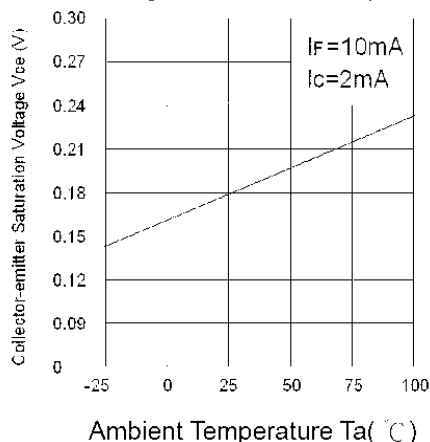


Fig.8 Collector-emitter Saturation Voltage vs. Forward Current

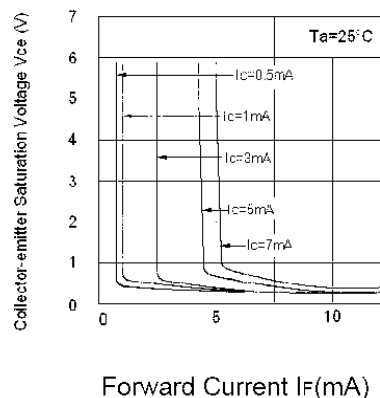


Fig.9 Response Time vs. Load Resistance Fig.10 Response Time vs. Load Resistance

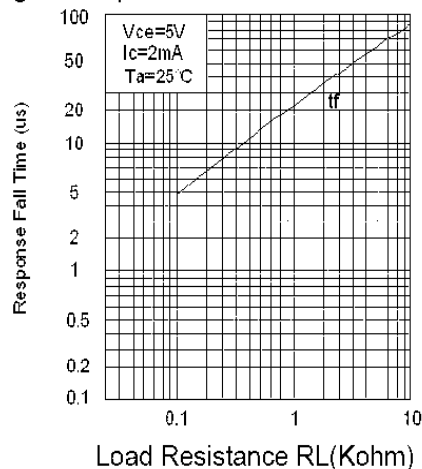
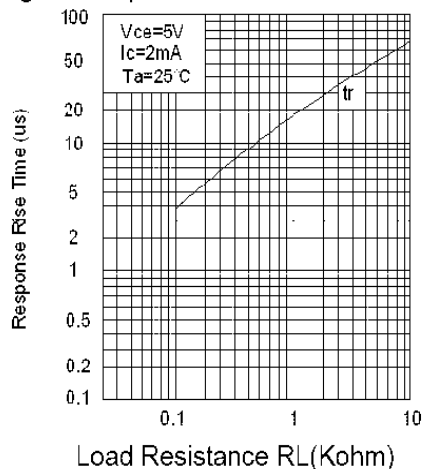
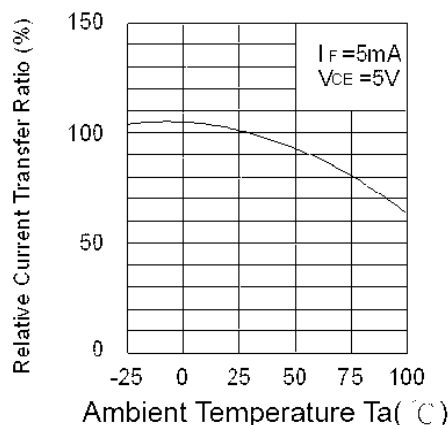


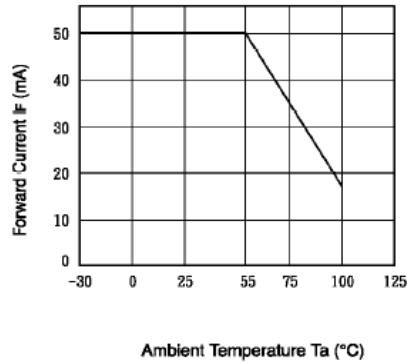
Fig.11 Relative Current Transfer Ratio vs. Ambient Temperature



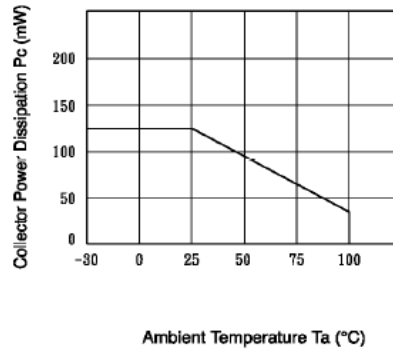
OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

OPIA406

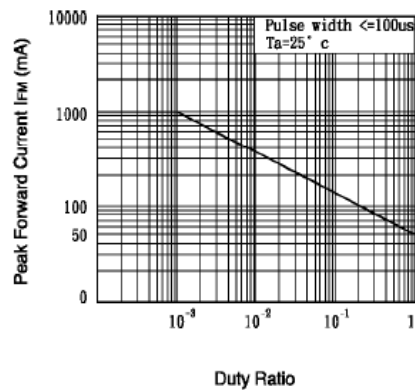
**Fig.1 Forward Current vs. Ambient Temperature**



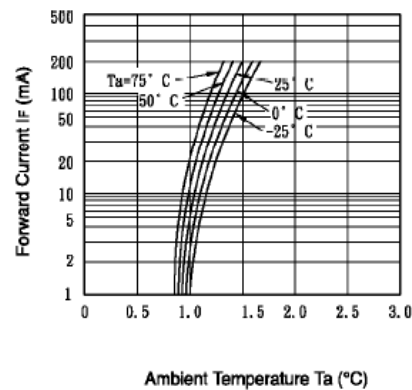
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



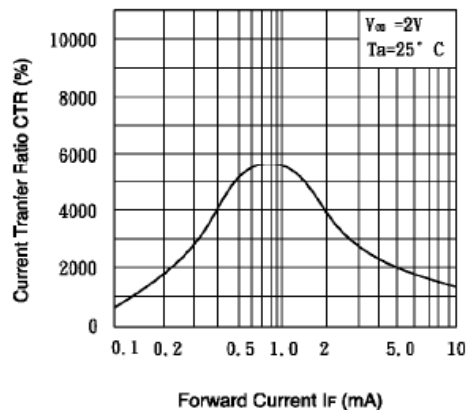
**Fig.3 Peak Forward Current vs. Duty Ratio**



**Fig.4 Forward Current vs. Ambient Temperature**



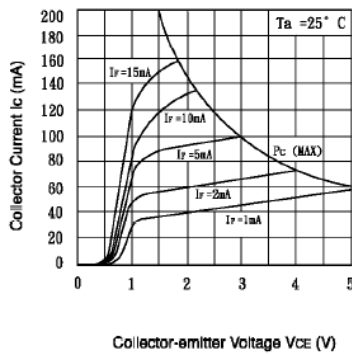
**Fig.5 Current Transfer Ratio vs. Forward Current**



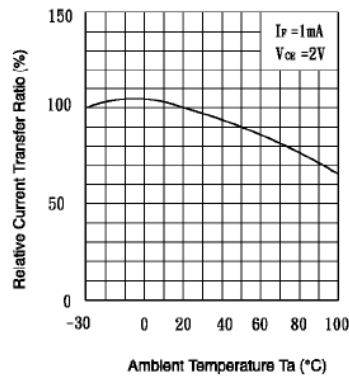
OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

OPIA406

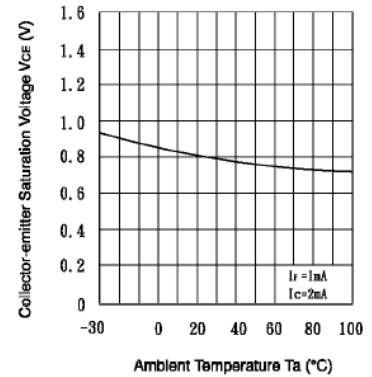
**Fig.6** Collector Current vs.  
Collector-emitter Voltage



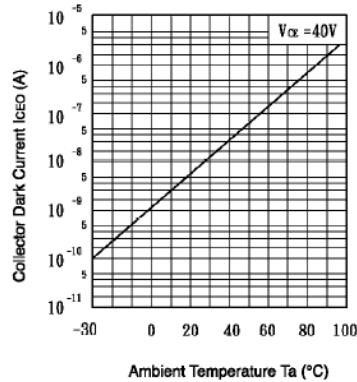
**Fig.7** Relative Current Transfer Ratio  
vs. Ambient Temperature



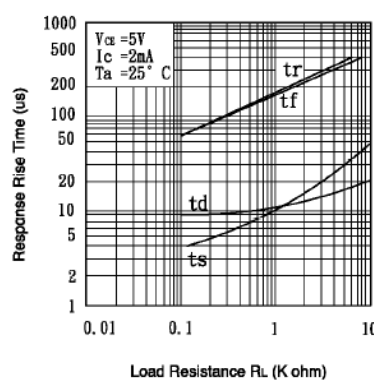
**Fig.8** Collector-emitter Saturation  
Voltage vs. Ambient Temperature



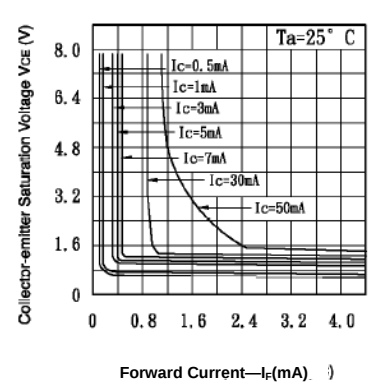
**Fig.9** Collector Dark Current vs.  
Ambient Temperature



**Fig.10** Response Time vs.  
Load Resistance



**Fig.11** Collector-emitter Saturation  
Voltage vs. Forward Current



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

## OPIA407

Fig.1 Current Transfer Ratio vs. Forward Current

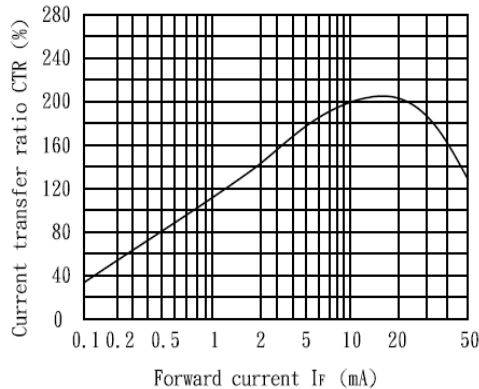


Fig.2 Collector Power Dissipation vs. Ambient Temperature

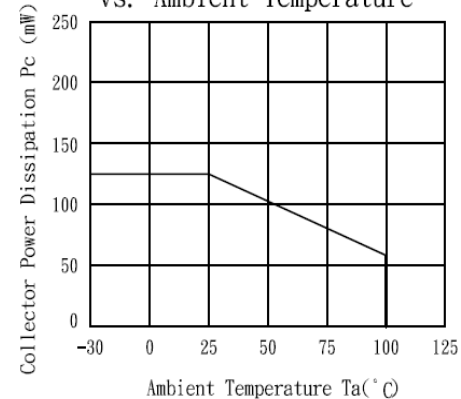


Fig.3 Collector Dark Current vs. Ambient Temperature

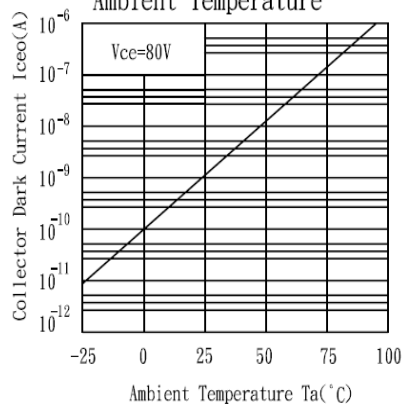


Fig.4 Forward Current vs. Ambient Temperature

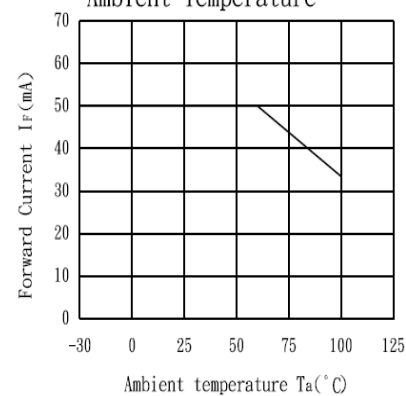


Fig.5 Forward Current vs. Forward Voltage

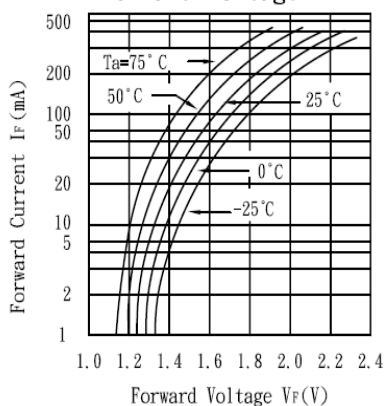
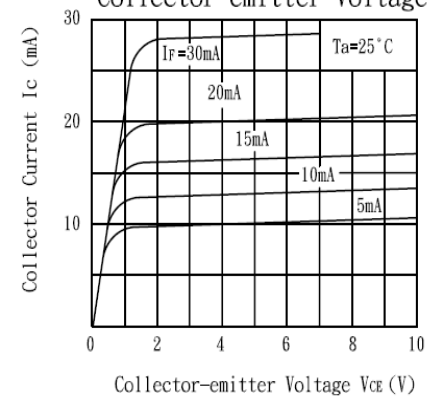


Fig.6 Collector Current vs. Collector-emitter Voltage



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

## OPIA407

Fig. 7 Collector-emitter Saturation Voltage vs. Ambient Temperature

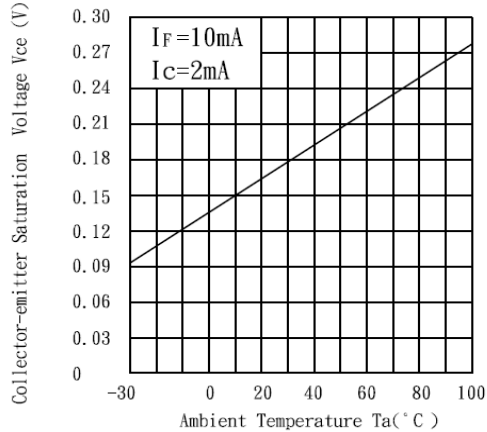


Fig. 8 Collector-emitter Saturation Voltage vs. Forward Current

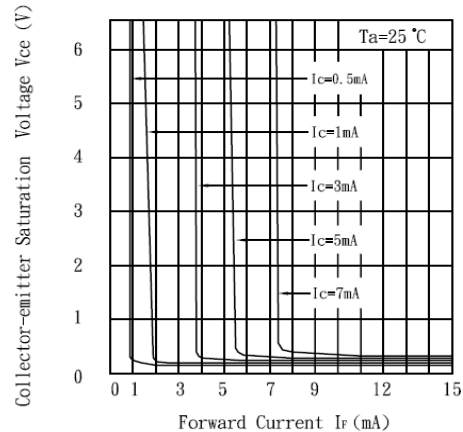


Fig. 9 Response Time vs. Load Resistance

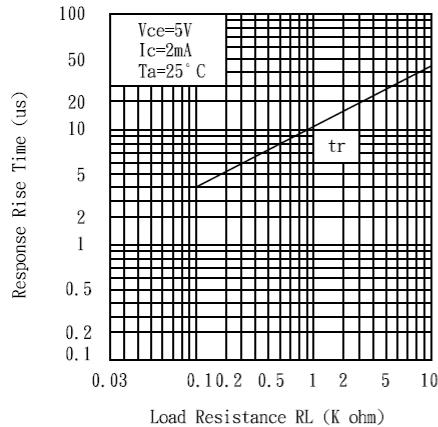


Fig. 10 Response Time vs. Load Resistance

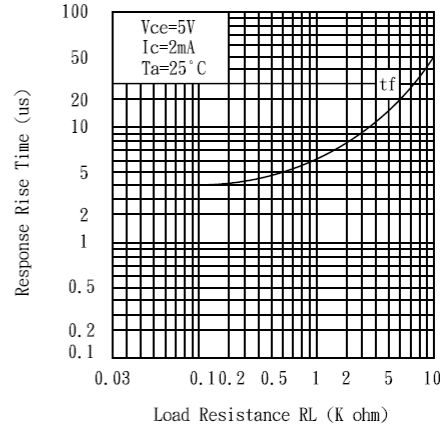
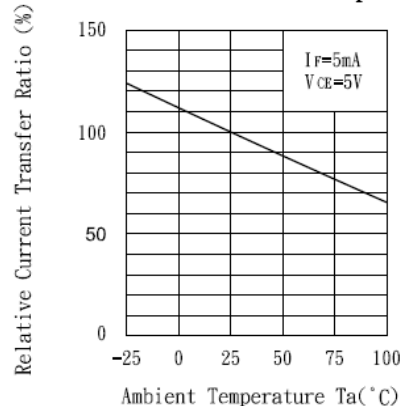
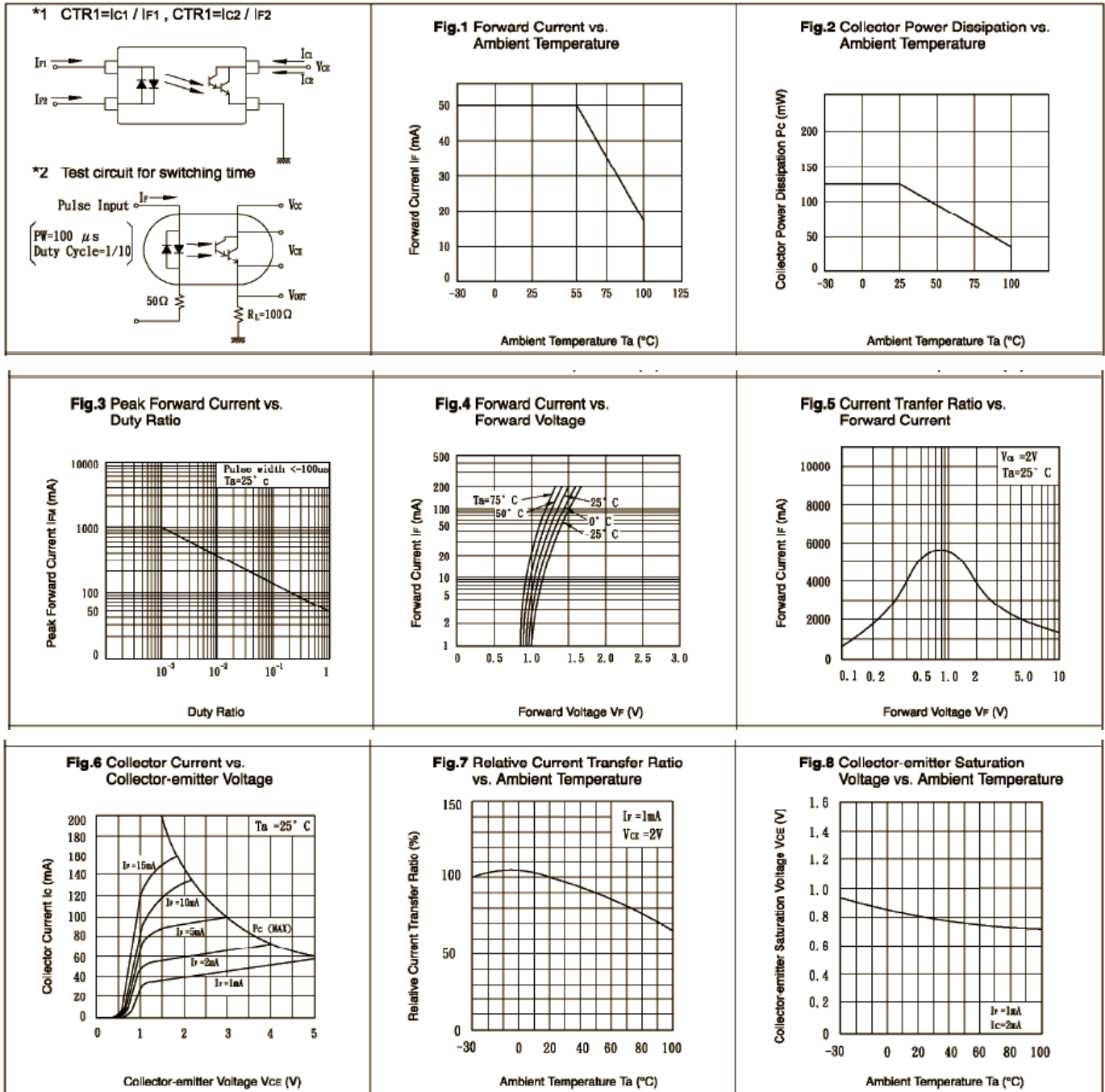


Fig. 11 Relative Current Transfer Ratio vs. Ambient Temperature



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

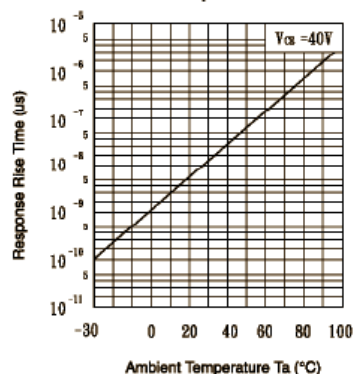
## OPIA408



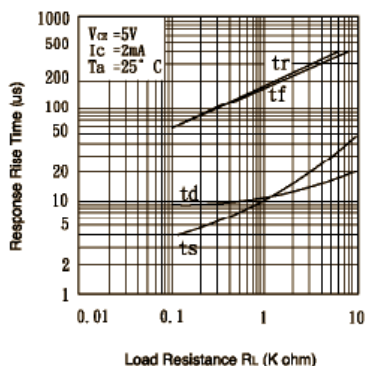
OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

## OPIA408

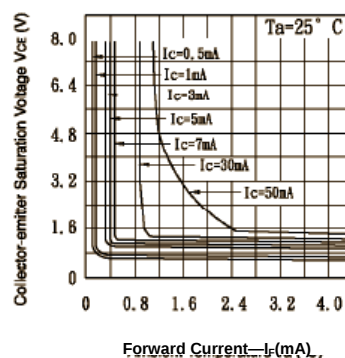
**Fig.9** Collector Dark Current vs. Ambient Temperature



**Fig.10** Response Time vs. Load Resistance



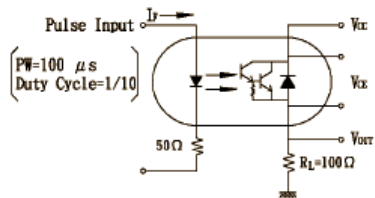
**Fig.11** Collector-emitter Saturation Voltage vs. Forward Current



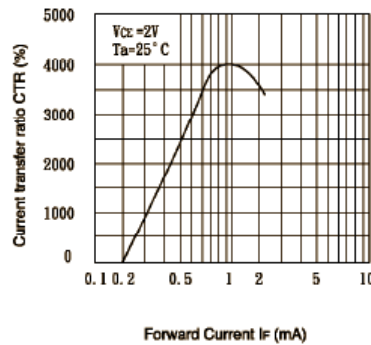
OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

## OPIA409

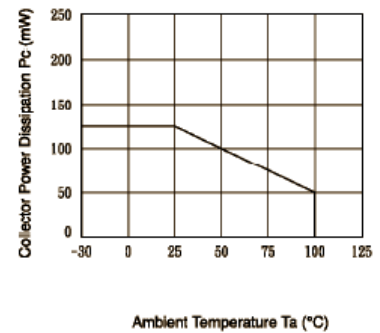
\*1 Test circuit for switching time



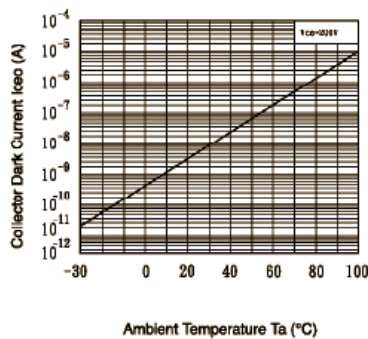
**Fig.1** Current Transfer Ratio vs. Forward Current



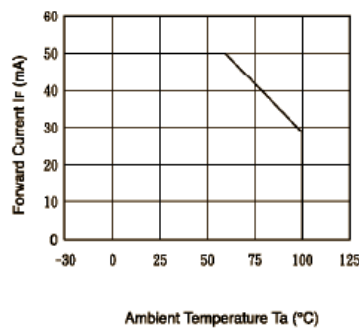
**Fig.2** Collector Power Dissipation vs. Ambient Temperature



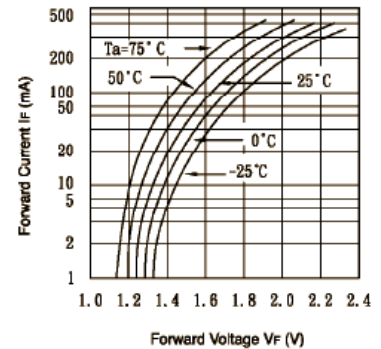
**Fig.3** Collector Dark Current vs. Ambient Temperature



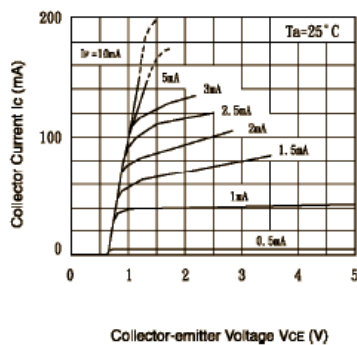
**Fig.4** Forward Current vs. Ambient Temperature



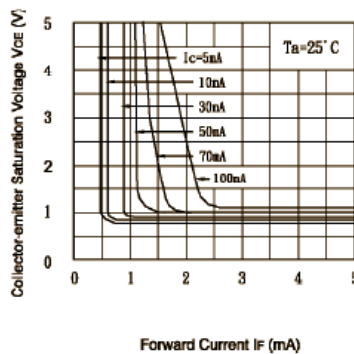
**Fig.5** Forward Current vs. Forward Voltage



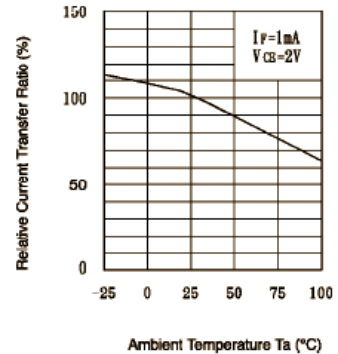
**Fig.6** Collector Current vs. Collector-emitter Voltage



**Fig.7** Collector-emitter Saturation Voltage vs. Forward Current

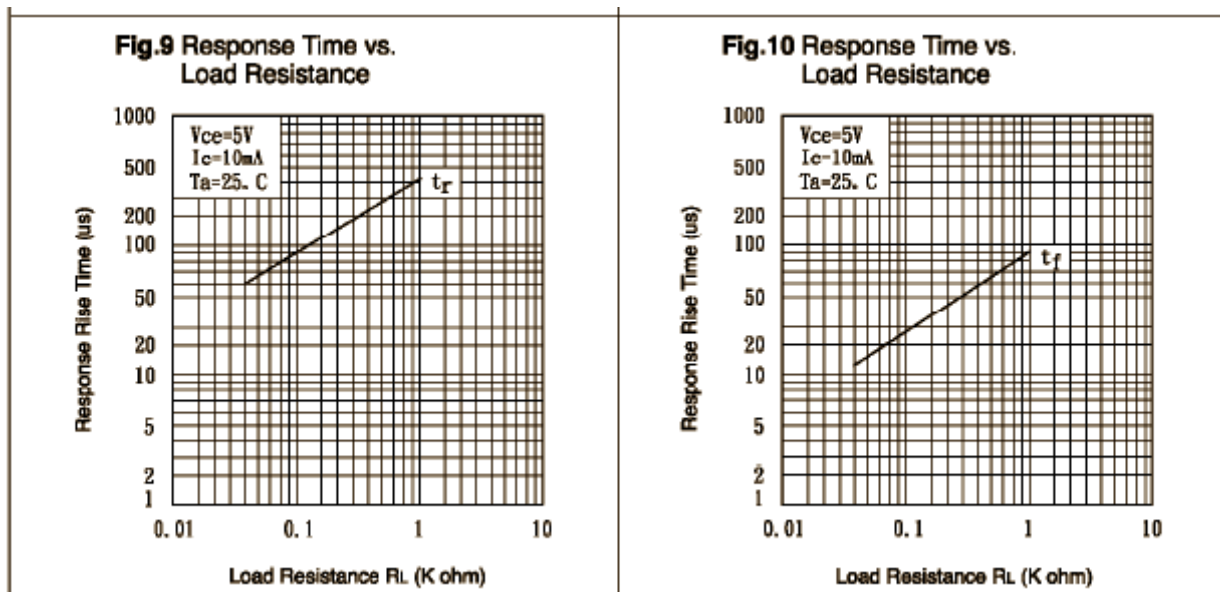


**Fig.8** Relative Current Transfer Ratio vs. Ambient Temperature



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OPIA409



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## OPIA414

Fig.1 Current Transfer Ratio  
vs. Forward Current

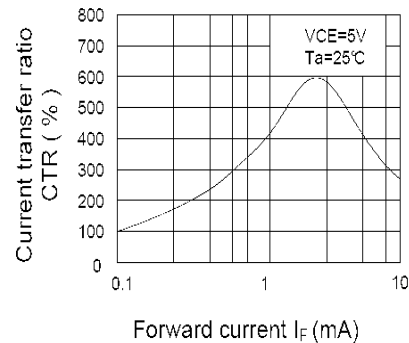


Fig.2 Collector Power Dissipation  
vs. Ambient Temperature

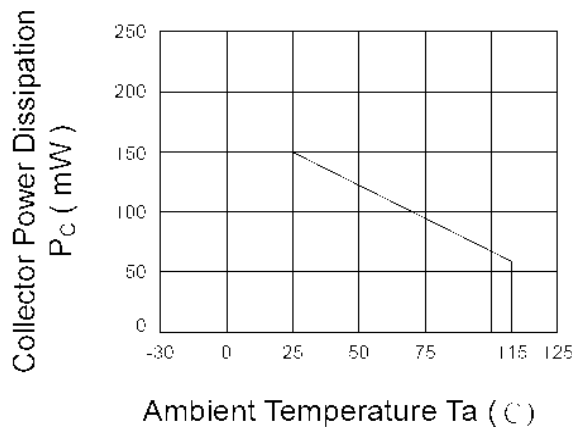


Fig.3 Collector Dark Current  
vs. Ambient Temperature

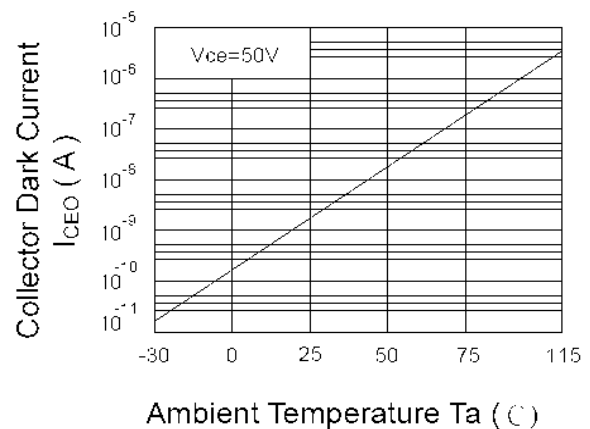


Fig.4 Forward Current vs.  
Ambient Temperature

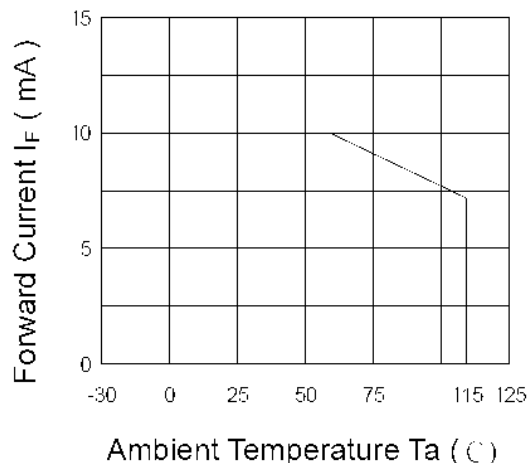
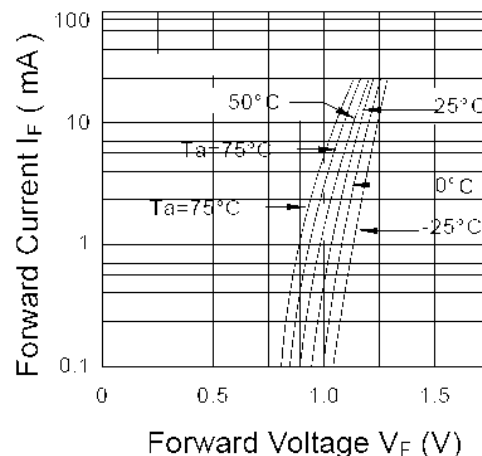


Fig.5 Forward Current vs.  
Forward Voltage



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OPIA414

Fig.6 Collector Current vs. Collector-Emitter Voltage

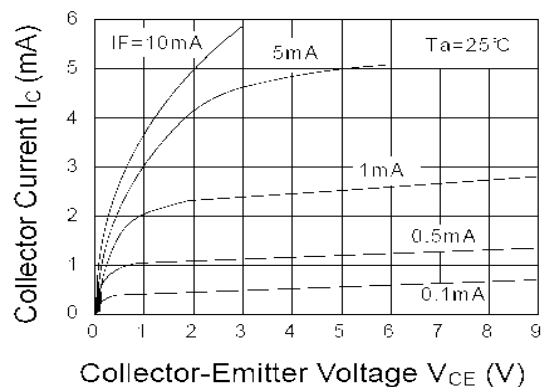


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

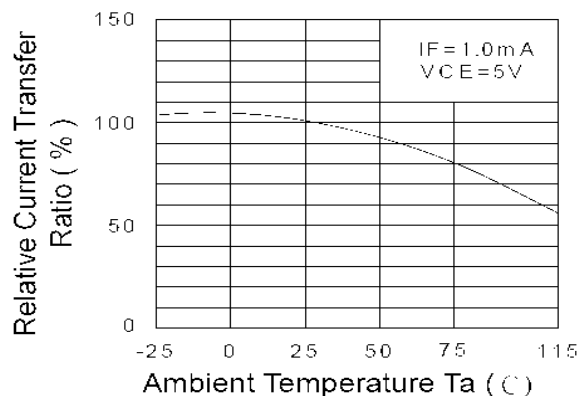


Fig.8 Collector-Emitter Saturation Voltage vs. Ambient Temperature

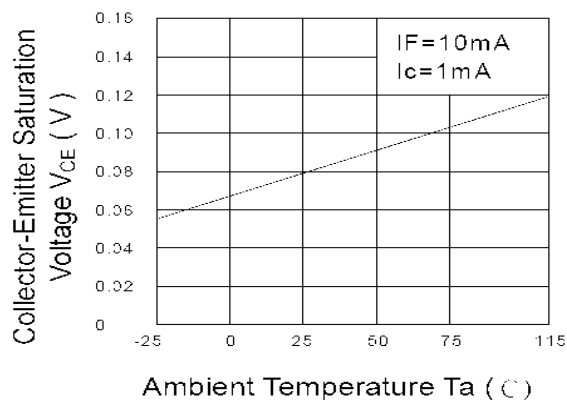


Fig.9 Collector-Emitter Saturation Voltage vs. Forward Current

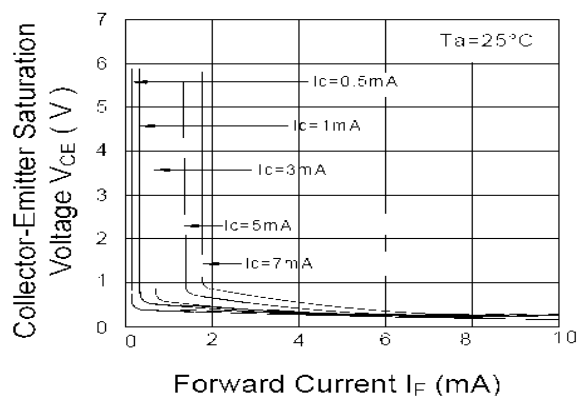


Fig.10 Response Time vs. Load Resistance

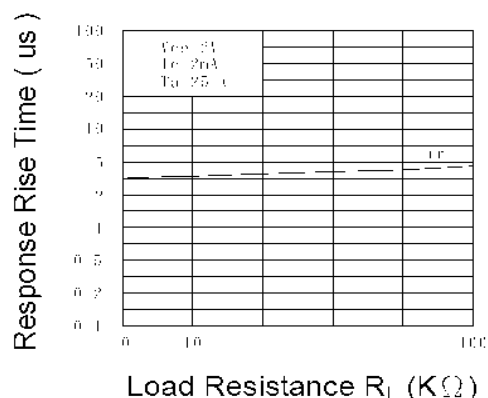
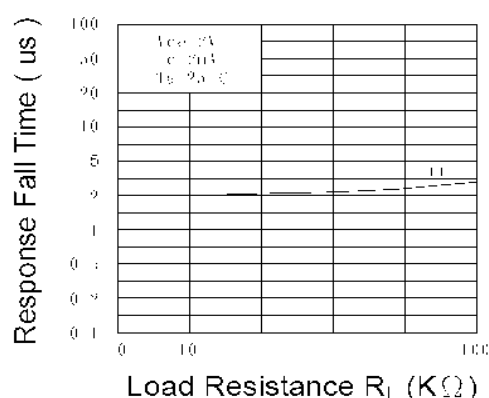


Fig.11 Response Time vs. Load Resistance



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## 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<br> |
| OPTEK P/N <u>OPIA407C-TR</u><br>                                                                                                                                                                                        |
| QTY. <u>N/A</u><br>                                                                                                                                                                                                     |
| DATE CODE <u>(YYWW)</u><br>                                                                                                                                                                                             |
| LOT I.D. <u>(Y-NNNNDDD)</u><br>                                                                                                                                                                                         |

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# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages



## Tube 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<br>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 |
| <b>P/H<br/>and<br/>SMD</b>          | <b>4-PIN</b><br>OPIA400D/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                |        |                 |
|                                     | <b>6-PIN</b><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                |        |                 |
|                                     | <b>8-PIN</b><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                |        |                 |
| <b>M/F<br/>SOP</b>                  | <b>4-PIN and 5-PIN</b><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                |        |                 |
| <b>SSOP</b>                         | <b>4-PIN</b><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)

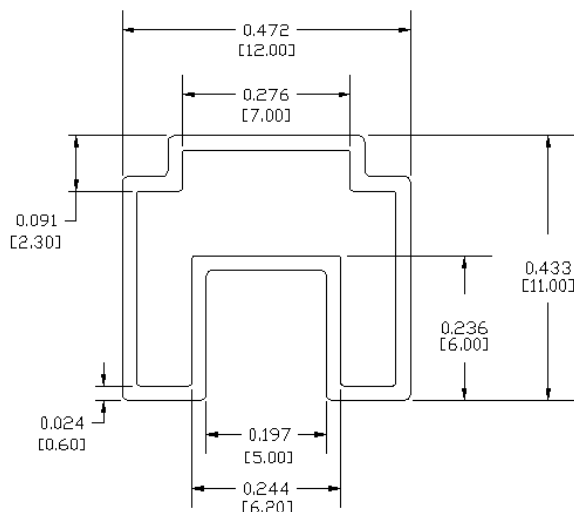
**SSOP** = Shrink SOP Packages (Referred as C = 3.60mil SMD with 1.27mil Lead-Spacing)

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# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages

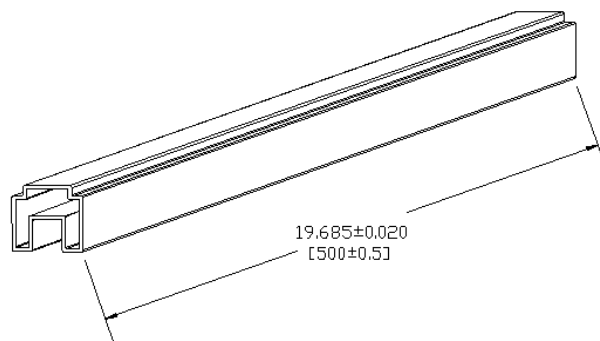


## Tube Packaging Specifications—SMD— (TU):



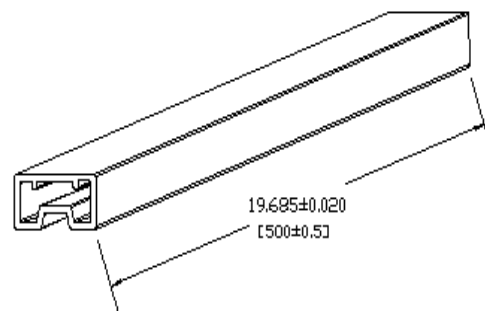
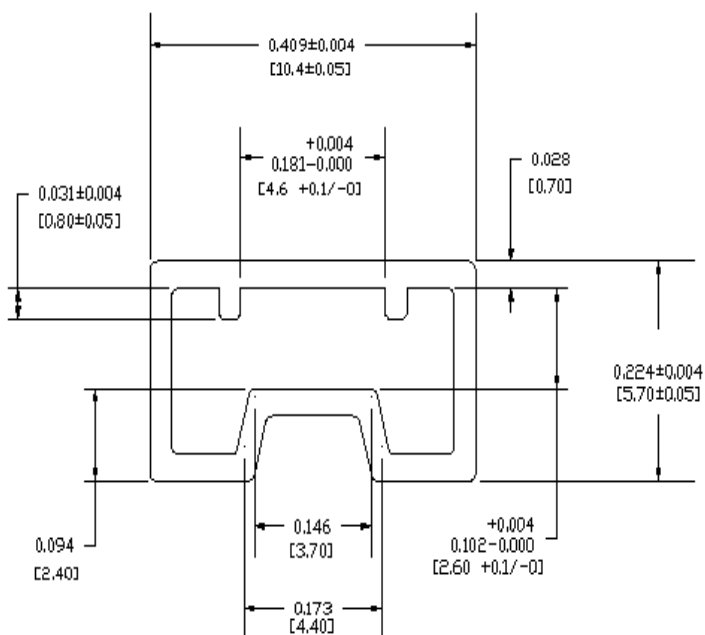
DIMENSIONS ARE IN: INCHES [MILLIMETERS]

TOLERANCE:  $\pm 0.008$  INCHES  
[ $\pm 0.2$  MILLIMETERS]



Quantity: 4-pin (SMD): 100pcs/tube

## Tube Packaging Specifications— SOP (Mini-flats) and SSOP— (TU):



Quantity: 4-pin (SOP): 100pcs/tube  
4-pin (SSOP): 170pcs/tube

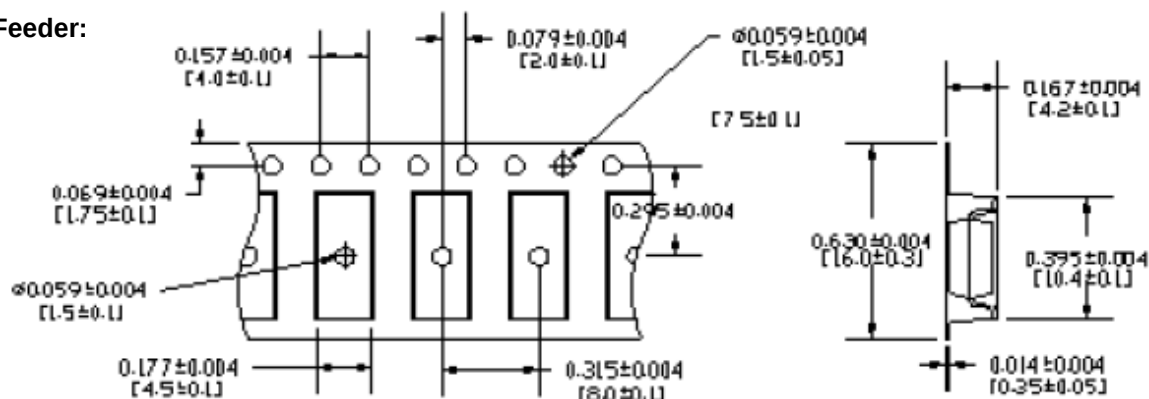
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# OPIA401 through OPIA409, OPIA414 SMD, SOP and SSOP Packages

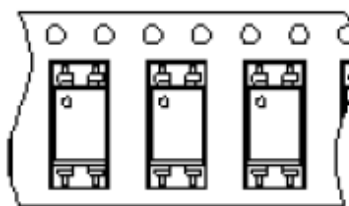


## Tape and Reel Packaging Specifications— SMD and SOP—(TR):

### Tape Feeder:



### Direction:

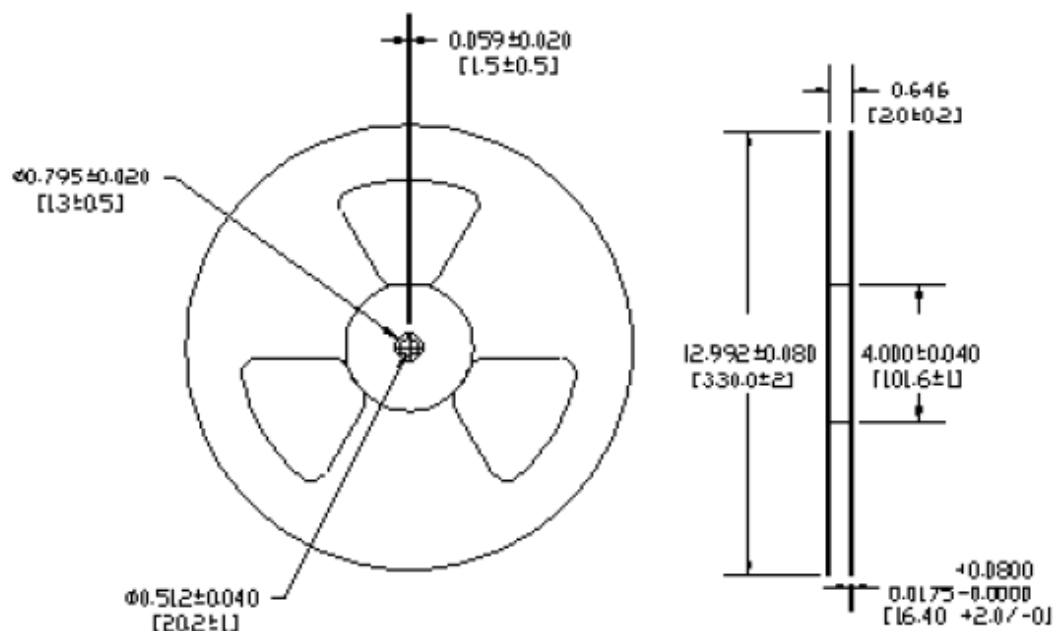


**Quantity:** 4-pin (SMD): 1000pcs/Reel  
4-pin (SOP): 1000pcs/Reel  
4-pin (SSOP): 3000pcs/Reel

DIMENSIONS ARE IN: INCHES [MILLIMETERS]

TOLERANCE: ± 0.008 INCHES  
[± 0.2 MILLIMETERS]

### Reel:



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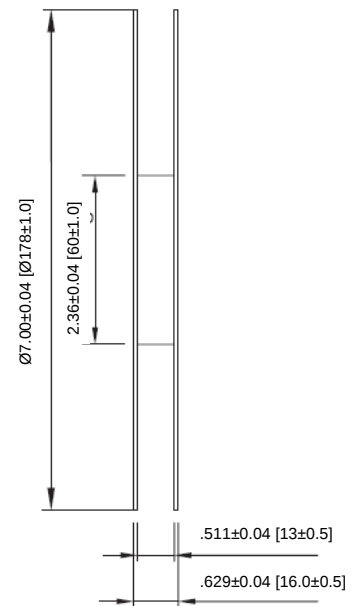


A schematic diagram of a three-phase motor. It shows three vertical rectangular blocks representing windings, each containing a circle with a dot. These windings are connected to four terminals at the top, represented by circles. The terminals are connected in a star configuration, with the fourth terminal being the common neutral point.

**TOLERANCE:** ± 0.008 INCHES  
[± 0.2 MILLIMETERS]

Technical drawing of a wheel rim cross-section. The drawing shows a central hub with five spokes. Dimensions are indicated as follows:

- Hub diameter:  $\varnothing 531 \pm 0.02$  [ $\varnothing 13.5 \pm 0.5$ ]
- Spoke width:  $\varnothing 098 \pm 0.02$  [ $2.5 \pm 0.5$ ]
- Hub bore diameter:  $\varnothing 826 \pm 0.04$  [ $\varnothing 21 \pm 1.0$ ]



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