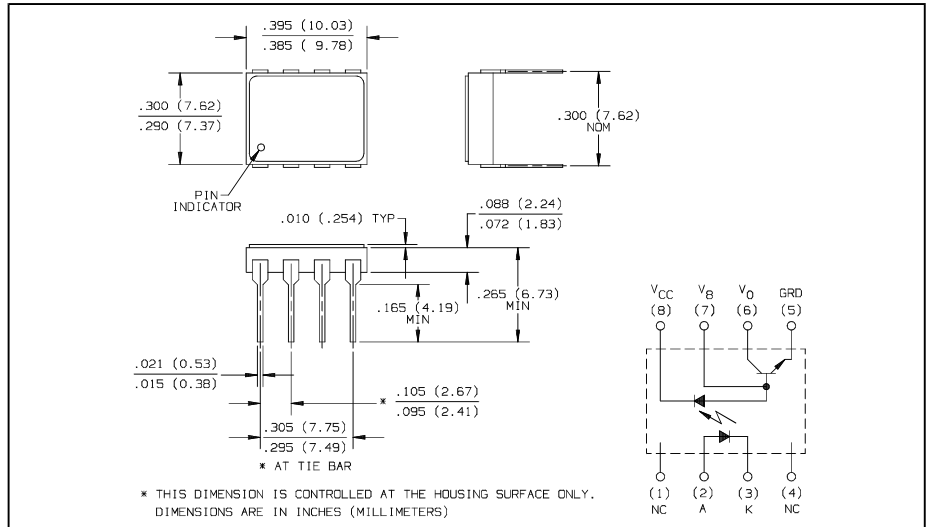
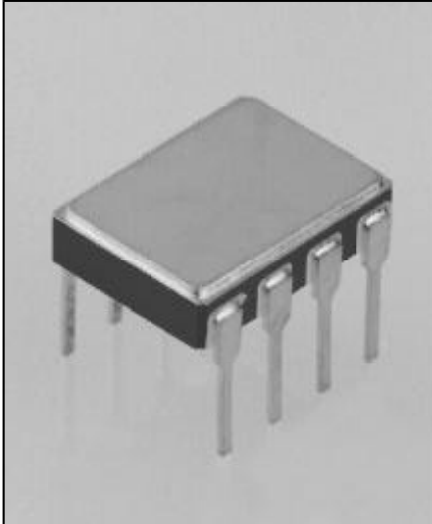


# High Speed Optocouplers

## Types HDC135, HDC136, HDC135B, HDC136B



### Features

- High speed
- TTL compatible
- High common mode transient immunity
- Wide bandwidth
- Open collector output

### Description

Optek's HDC135 and HDC136 are high speed optocouplers, consisting of IR emitters and integrated photodetectors in hermetic side brazed dual-in-line 8 pin packages. Electrical characteristics are similar to the 6N135 and 6N136 optocouplers but with full military temperature range operation.

The HDC135B and HDC136B are high reliability optocouplers with 100% processing and Group Testing patterned after MIL-STD-883 Method 5004 and 5005 for class B.

Typical screening and lot acceptance tests are provided on page 13-4.

Minimum orders will apply to processed devices.

### Absolute Maximum Ratings (No derating required up to 70° C)

|   |                       |
|---|-----------------------|
| Storage Temperature Range   | -55° C to +150° C     |
| Operating Temperature Range   | -55° C to +125° C     |
| Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 10 seconds]    | 260° C                |
| Average Input Current - $I_F$   | 25 mA <sup>(1)</sup>  |
| Peak Output Current - $I_F$ (50% duty cycle, 1 ms pulse width)              | 50 mA <sup>(2)</sup>  |
| Peak Transient Input Current - $I_F$ ( $\leq 1 \mu s$ pulse width, 300 pps) | 1.0 A                 |
| Reverse Input Voltage - $V_R$   | 5.0 V                 |
| Input Power Dissipation   | 45 mW <sup>(3)</sup>  |
| Average Output Current - $I_O$  | 8.0 mA                |
| Peak Output Current   | 16.0 mA               |
| Emitter-Base Reverse Voltage  | 5.0 V                 |
| Supply and Output Voltage - $V_{CC}, V_O$                                   | -0.5 V to 15 V        |
| Base Current - $I_B$  | 5.0 mA                |
| Output Power Dissipation  | 100 mW <sup>(4)</sup> |

**Caution:** This component is susceptible to damage from electrostatic discharge. Normal static prevention procedures should be used in handling.

#### Notes:

- (1) Derate linearly above 70° C free-air temperature at a rate of 0.45 mA/° C.
- (2) Derate linearly above 70° C free-air temperature at a rate of 0.9 mA/° C.
- (3) Derate linearly above 70° C free-air temperature at a rate of 0.8 mW/° C.
- (4) Derate linearly above 70° C free-air temperature at a rate of 1.8 mW/° C.
- (5)  $CM_H$  is the maximum allowable dV/dt on the leading edge of a common mode pulse to assure that the output will not switch from high to low.
- (6)  $CM_L$  is the maximum negative dV/dt allowable on the trailing edge of a common mode pulse to assure that the output will not switch from low to high.
- (7) Test conditions represents 1 TTL unit load with 5.6 k $\Omega$  pull-up resistor.
- (8) Test conditions represents 1 LSTTL unit load with a 6.1 k $\Omega$  pull-up resistor.
- (9) Device considered a two-terminal device: pins 2 and 3 shorted together and pins 5, 6, 7 and 8 shorted together.

# Types HDC135, HDC136, HDC135B, HDC136B

Electrical Characteristics (Over recommended temperature  $T_A = -55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , unless otherwise noted)

| SYMBOL   | PARAMETER   | MIN    | TYP*      | MAX   | UNITS   | TEST CONDITIONS   |
|--|---|--------|-----------|-------|---|---|
| CTR  | Current Transfer Ratio                                    | HDC135 | 7.0       | 19.0  |   | %<br>$I_F = 16\text{ mA}, V_O = 0.40\text{ V}, V_{CC} = 4.5\text{ V}, T_A = 25^{\circ}\text{C}$ |
|  |   | HDC136 | 19.0      | 25.0  |   | %   |
| VOL  | Logic Low Output Voltage                                  | HDC135 | 5.0       | 15.0  |   | %<br>$I_F = 16\text{ mA}, V_O = 0.50\text{ V}, V_{CC} = 4.5\text{ V}$                           |
|  |   | HDC136 | 15.0      | 23.0  |   | %   |
| VOH  | Logic High Output Voltage                                 | HDC135 |           | 0.100 | 0.40  | V<br>$I_F = 16\text{ mA}, I_O = 1.10\text{ mA}, V_{CC} = 4.5\text{ V}$                          |
|  |   | HDC136 |           | 0.100 | 0.40  | V<br>$I_F = 16\text{ mA}, I_O = 2.4\text{ mA}, V_{CC} = 4.5\text{ V}$                           |
| IOH  | Logic High Output Current                                 |        |           | 3.0   | 500   | nA<br>$I_F = 0\text{ mA}, V_O = V_{CC} = 5.5\text{ V}, T_A = 25^{\circ}\text{C}$                |
|  |   |        |           | 0.010 | 1.00  | $\mu\text{A}$<br>$I_F = 0\text{ mA}, V_O = V_{CC} = 15\text{ V}, T_A = 25^{\circ}\text{C}$      |
|  |   |        |           |       | 50  | $\mu\text{A}$<br>$I_F = 0\text{ mA}, V_O = V_{CC} = 15\text{ V}$                                |
| ICCL   | Logic Low Supply Current                                  |        | 40        |       | $\mu\text{A}$<br>$I_F = 16\text{ mA}, V_O = \text{open}, V_{CC} = 15\text{ V}$  |   |
| ICCH   | Logic High Supply Current                                 |        | 0.020     | 1.00  | $\mu\text{A}$<br>$I_F = 0\text{ mA}, V_O = \text{open}, V_{CC} = 15\text{ V}, T_A = 25^{\circ}\text{C}$                 |   |
|  |   |        |           | 2.0   | $\mu\text{A}$<br>$I_F = 0\text{ mA}, V_O = \text{open}, V_{CC} = 15\text{ V}$   |   |
| VF   | Input Forward Voltage                                     |        | 1.50      | 1.70  | V<br>$I_F = 16\text{ mA}, T_A = 25^{\circ}\text{C}$   |   |
| $\frac{\Delta V_F}{\Delta T_A}$  | Temperature Coefficient of Forward Voltage                |        | -1.80     |       | $\text{mV}/^{\circ}\text{C}$<br>$I_F = 16\text{ mA}$  |   |
| BVR  | Input Reverse Breakdown Voltage                           | 5.0    |           |       | V<br>$I_R = 10\text{ }\mu\text{A}, T_A = 25^{\circ}\text{C}$  |   |
| CIN  | Input Capacitance   |        | 42        |       | pF<br>$f = 1\text{ MHz}, V_F = 0$   |   |
| IIO  | Input-Output Insulation Leakage Current                   |        |           | 1.00  | $\mu\text{A}$<br>45% Relative Humidity, $t = 5\text{ sec}, V_{IO} = 1000\text{ Vdc}, T_A = 25^{\circ}\text{C}$ (Note 9) |   |
| RIO  | Input-Output Resistance                                   |        | $10^{12}$ |       | $\Omega$<br>$V_{IO} = 500\text{ Vdc}$ (Note 9)  |   |
| CIO  | Input-Output Capacitance                                  |        | 0.50      |       | pF<br>$f = 1\text{ MHz}$ (Note 9)   |   |
| hFE  | Transistor DC Current Gain                                |        | 150       |       | —<br>$V_O = 5\text{ V}, I_O = 3\text{ mA}$  |   |
| <b>Switching Specification (<math>T_A = 25^{\circ}\text{C}</math>) <math>V_{CC} = 5.0\text{ V}, I_F = 16.0\text{ mA}</math> unless otherwise noted</b> |   |        |           |       |   |   |
| tPHL   | Propagation Delay Time to Logic Low at Output             | HDC135 | 0.50      | 1.50  | $\mu\text{s}$   | $R_L = 4.1\text{ k}\Omega$ (Note 8)   |
|  |   | HDC136 | 0.60      | 1.00  | $\mu\text{s}$   | $R_L = 1.90\text{ k}\Omega$ (Note 7)  |
| tPLH   | Propagation Delay Time to Logic High at Output            | HDC135 | 0.40      | 1.50  | $\mu\text{s}$   | $R_L = 4.1\text{ k}\Omega$ (Note 8)   |
|  |   | HDC136 | 0.80      | 1.00  | $\mu\text{s}$   | $R_L = 1.90\text{ k}\Omega$ (Note 7)  |
| CMH  | Common Mode Transient Immunity at Logic High Level Output | HDC135 | 1000      |       | V/ $\mu\text{s}$  | $I_F = 0\text{ mA}, V_{CM} = 10\text{ Vp-p}, R_L = 4.1\text{ k}\Omega$ (Notes 6,8)              |
|  |   | HDC136 | 1000      |       | V/ $\mu\text{s}$  | $I_F = 0\text{ mA}, V_{CM} = 10\text{ Vp-p}, R_L = 1.90\text{ k}\Omega$ (Notes 6,7)             |
| CML  | Common Mode Transient Immunity at Logic Low Level Output  | HDC135 | -1000     |       | V/ $\mu\text{s}$  | $V_{CM} = 10\text{ Vp-p}, R_L = 4.1\text{ k}\Omega$ , (Notes 5,8)                               |
|  |   | HDC136 | -1000     |       | V/ $\mu\text{s}$  | $V_{CM} = 10\text{ Vp-p}, R_L = 1.90\text{ k}\Omega$ (Notes 5,7)                                |

\* All typicals at  $T_A = 25^{\circ}\text{C}$  and  $V_{CC} = 5\text{ V}$ , unless otherwise noted

HI-RELOPTO  
COMPONENTS

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

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