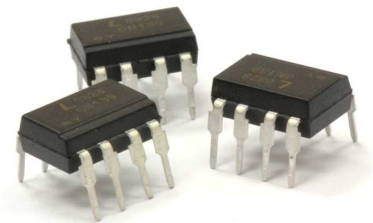


## 6N135, 6N136 Single Channel, High Speed Optocouplers



Jan.2009



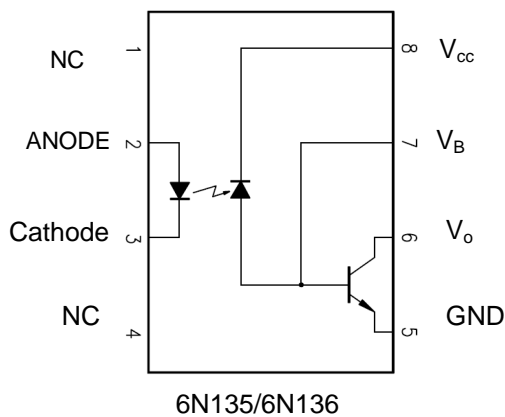
### Description

The 6N135/6 consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. Connection for the bias of the photodiode improves the speed that of a conventional phototransistor coupler by reducing the base-collector capacitances. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 1KV/  $\mu$  sec.

### Features

- High speed – 1MBd typical
- Available in Dual-in-line, Wide lead spacing, Surface mounting package.
- Storable output.
- UL, CSA approval

### Functional Diagram



Truth Table (Positive Logic)

| LED | OUT |
|-----|-----|
| ON  | L   |
| OFF | H   |

A 0.1 $\mu$ F bypass Capacitor must be connected between Pin8 and Pin5

### Application

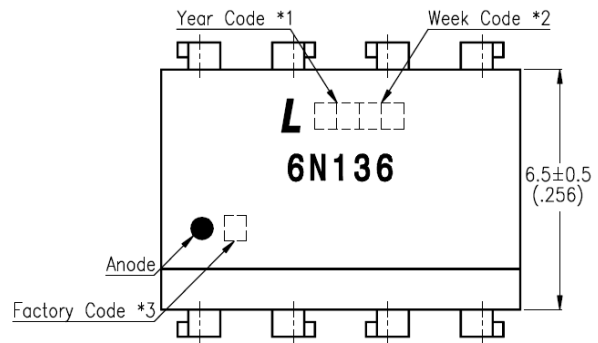
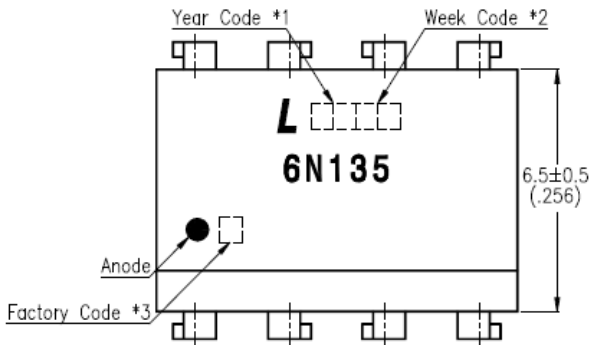
- High Voltage Isolation
- Isolation in line receivers
- Feedback element in switching mode power supplier
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their peripheral
- Replace pulse transformers.
- Replace slower optocoupler isolators.

## Ordering Information

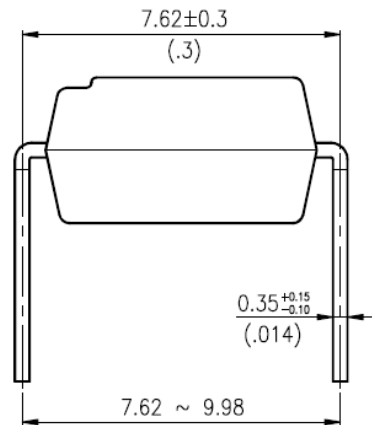
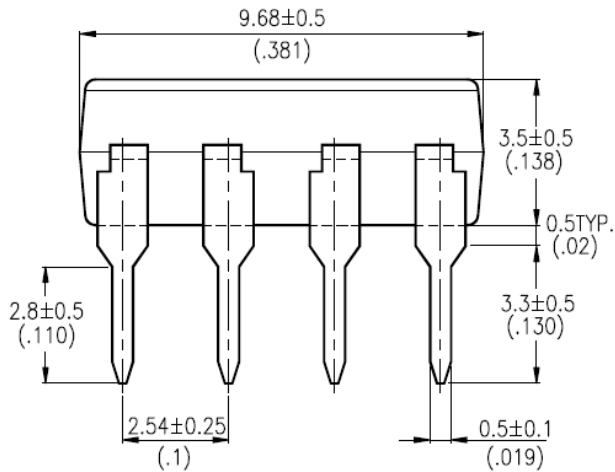
| Part  | Option | Minimum CMR           |                        | CTR | Remarks                           |
|-------|--------|-----------------------|------------------------|-----|-----------------------------------|
|       |        | dV/dt<br>(V/ $\mu$ s) | V <sub>CM</sub><br>(V) |     |                                   |
| 6N135 | M      | 1000                  | 10                     | 7   | Single Channel, DIP-8             |
|       | S      |                       |                        |     | Single Channel, Wide Lead Spacing |
| 6N136 | M      | 1000                  | 10                     | 19  | Single Channel, SMD-8             |
|       | S      |                       |                        |     | Single Channel, DIP-8             |
|       |        |                       |                        |     | Single Channel, Wide Lead Spacing |
|       |        |                       |                        |     | Single Channel, SMD-8             |

## Package Dimensions

### 8-pin DIP Package (6N135 / 6N136)

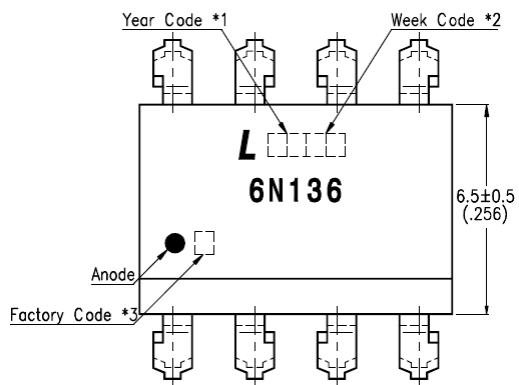
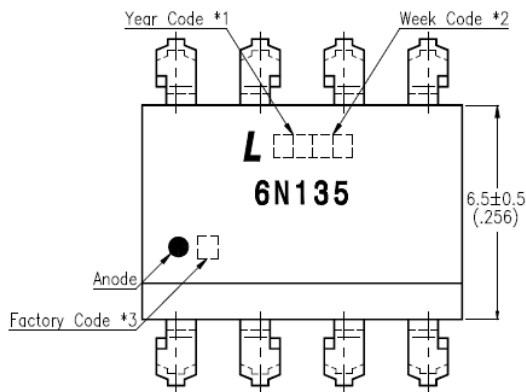


- \*1. Year date code.
  - \*2. 2-digit work week.
  - \*3. Factory identification mark  
(Z : Taiwan, Y : Thailand).
- Dimensions are in Millimeters and (Inches).



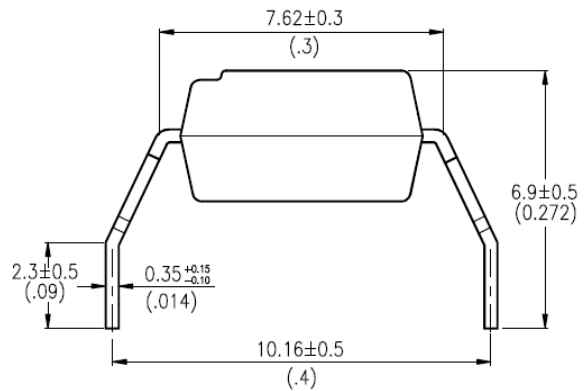
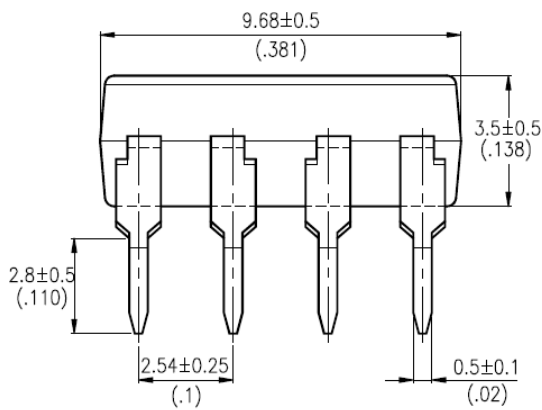
## Package Dimensions

### 8-pin DIP Wide Lead Spacing Package (6N135M / 6N136M)



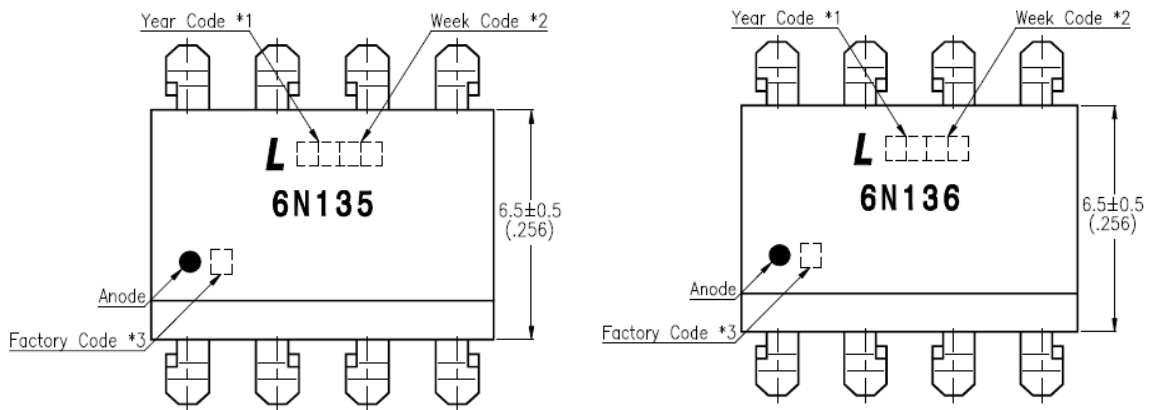
- \*1. Year date code.
- \*2. 2-digit work week.
- \*3. Factory identification mark  
(Z : Taiwan, Y : Thailand).

Dimensions are in Millimeters and (Inches).

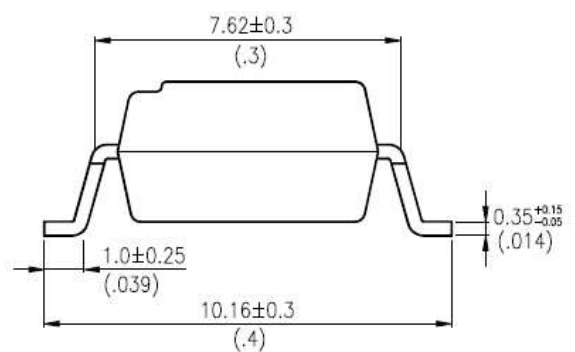
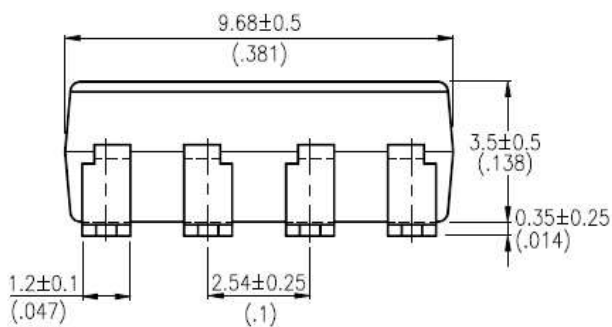


## Package Dimensions

### 8-pin DIP Surface Mount Package (6N135S / 6N136S)



- \*1. Year date code.
  - \*2. 2-digit work week.
  - \*3. Factory identification mark  
(Z : Taiwan, Y : Thailand).
- Dimensions are in Millimeters and (Inches).

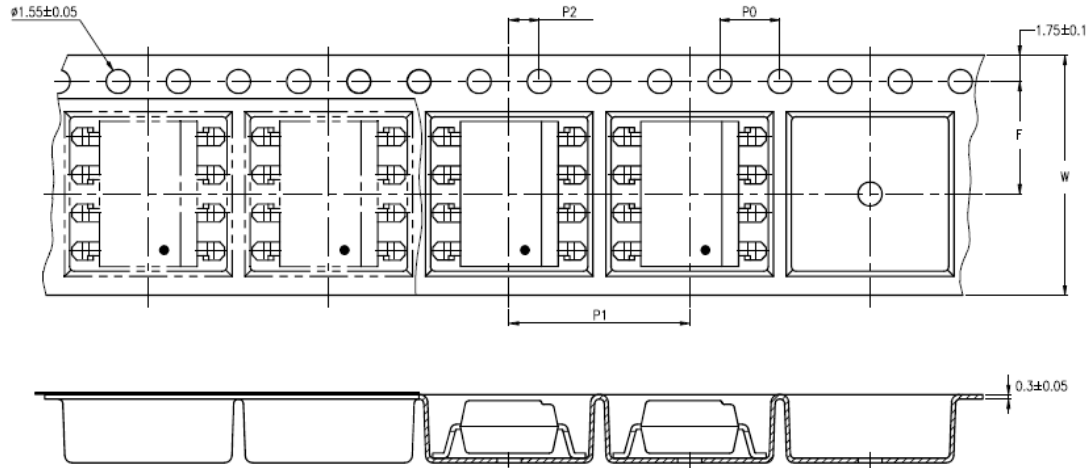


# LITEON LITE-ON TECHNOLOGY CORPORATION

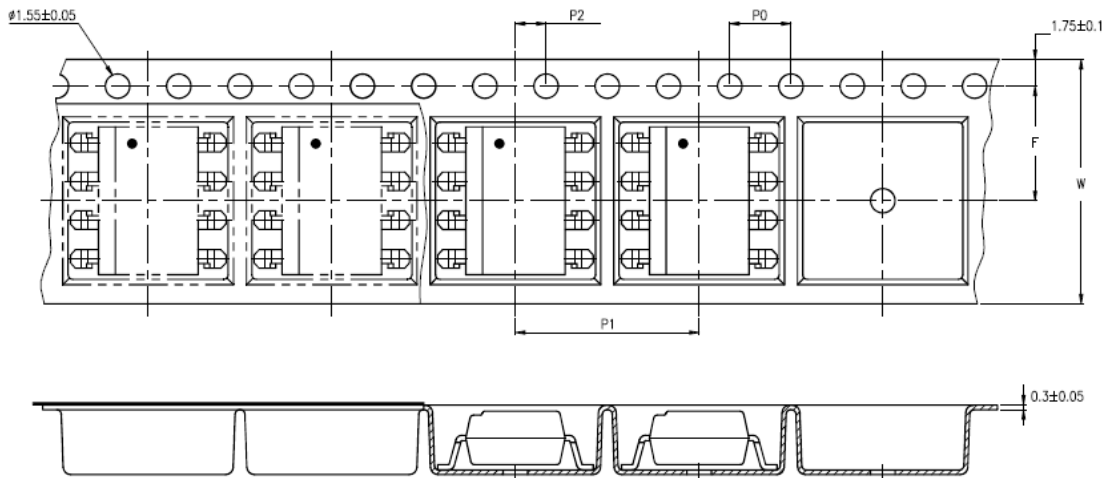
Property of Lite-on Only

## Taping Dimensions

### 6N135S/136S-TA

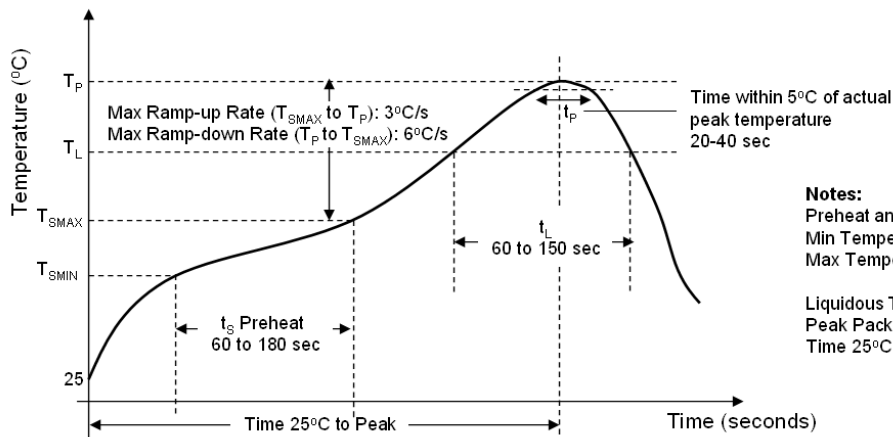


### 6N135S/136S-TA1



| Description                            | Symbol | Dimensions in millimeters ( inches ) |
|--|--------|--------------------------------------|
| Tape wide                              | W      | $16 \pm 0.3$ ( .63 )                 |
| Pitch of sprocket holes                | P0     | $4 \pm 0.1$ ( .15 )                  |
| Distance of compartment                | F      | $7.5 \pm 0.1$ ( .295 )               |
| Distance of compartment to compartment | P1     | $2 \pm 0.1$ ( .079 )                 |
| Distance of compartment to compartment | P1     | $12 \pm 0.1$ ( .472 )                |

## Recommended Lead Free Reflow Profile



## Absolute Maximum Ratings\*1

| Parameter                          | Symbol    | Min  | Max | Units     | Note |
|------------------------------------|-----------|------|-----|-----------|------|
| Storage Temperature                | $T_{ST}$  | -55  | 125 | °C        |      |
| Operating Temperature              | $T_A$     | -40  | 85  | °C        |      |
| Isolation Voltage                  | $V_{ISO}$ | 5000 |     | $V_{RMS}$ |      |
| Supply Voltage                     | $V_{CC}$  |      | 15  | V         |      |
| Lead Solder Temperature * 2        |           |      | 260 | °C        | 2    |
| <b>Input</b>                       |           |      |     |           |      |
| Average Forward Input Current      | $I_F$     |      | 25  | mA        |      |
| Reverse Input Voltage              | $V_R$     |      | 5   | V         |      |
| Input Power Dissipation            | $P_I$     |      | 45  | mW        |      |
| <b>Output</b>                      |           |      |     |           |      |
| Output Collector Current           | $I_O$     |      | 8   | mA        |      |
| Output Collector Voltage           | $V_O$     | -0.5 | 20  | V         |      |
| Output Collector Power Dissipation | $P_O$     |      | 100 | mW        |      |

1. Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

2. 260°C for 10 seconds. Refer to Lead Free Reflow Profile.



### Electrical Specifications

| Parameters                                 | Test Condition  | Symbol    | Device         | Min | Typ  | Max | Units         |
|--|---|-----------|----------------|-----|------|-----|---------------|
| <b>Input</b>                               |   |           |                |     |      |     |               |
| Input Forward Voltage                      | $I_F=16\text{mA}$ , $T_A=25^\circ\text{C}$  | $V_F$     | 6N135          |     | 1.4  | 1.7 | V             |
| Input Reverse Voltage                      | $I_R=10\mu\text{A}$   | $BV_R$    | 6N136          | 5   |      |     | V             |
| <b>Detector</b>                            |   |           |                |     |      |     |               |
| Current transfer ratio                     | $I_F=16\text{mA}$ ; $V_{CC}=4.5\text{V}$ ;<br>$T_A=25^\circ\text{C}$ ; $V_o=0.4\text{V}$  | CTR       | 6N135          | 7   | 18   | 50  | %             |
|  |   |           | 6N136          | 19  | 24   | 50  |               |
| Logic low output voltage<br>output voltage | $I_F=16\text{mA}$ ; $V_{CC}=4.5\text{V}$ ;<br>$I_o=1.1\text{mA}$ ; $T_A=25^\circ\text{C}$ | $V_{OL}$  | 6N135          |     | 0.18 | 0.4 | V             |
|  | $I_F=16\text{mA}$ ; $V_{CC}=4.5\text{V}$ ;<br>$I_o=3\text{mA}$ ; $T_A=25^\circ\text{C}$   |           | 6N136          |     | 0.25 | 0.4 |               |
| Logic high output current                  | $I_F=0\text{mA}$ , $V_o=V_{CC}=5.5\text{V}$<br>$T_A=25^\circ\text{C}$                     | $I_{OH}$  | 6N135          |     |      | 0.5 | $\mu\text{A}$ |
|  | $I_F=0\text{mA}$ , $V_o=V_{CC}=15\text{V}$<br>$T_A=25^\circ\text{C}$                      |           | 6N136          |     |      | 1   |               |
| Logic low supply current                   | $I_F=16\text{mA}$ , $V_o=\text{open}$<br>( $V_{CC}=15\text{V}$ )                          | $I_{CCL}$ | 6N135<br>6N136 |     | 400  |     | $\mu\text{A}$ |
| Logic high supply current                  | $I_F=0\text{mA}$ , $V_o=\text{open}$ ;<br>$T_A=25^\circ\text{C}$ ( $V_{CC}=15\text{V}$ )  | $I_{CCH}$ | 6N135<br>6N136 |     |      | 1   | $\mu\text{A}$ |

\*All Typical at  $T_A=25^\circ\text{C}$

## Property of Lite-on Only

### Switching Specifications

$T_A=0\sim 70^{\circ}\text{C}$ ,  $V_{CC}=5\text{V}$ , unless otherwise specified.

| Parameter                                   | Test Condition  | Symbol    | Device | Min | Typ  | Max | Units                   |
|---|---|-----------|--------|-----|------|-----|-------------------------|
| Propagation Delay Time to Low Output Level  | $T_A=25^{\circ}\text{C}$<br>( $R_L=4.1\text{K}\Omega$ , $I_F=16\text{mA}$ )               | $t_{PHL}$ | 6N135  |     | 0.09 | 1.5 | $\mu\text{s}$           |
|   | $T_A=25^{\circ}\text{C}$<br>( $R_L=1.9\text{K}\Omega$ , $I_F=16\text{mA}$ )               |           | 6N136  |     | 0.1  | 0.8 | $\mu\text{s}$           |
| Propagation Delay Time to High Output Level | $T_A=25^{\circ}\text{C}$<br>( $R_L=4.1\text{K}\Omega$ , $I_F=16\text{mA}$ )               | $t_{PLH}$ | 6N135  |     | 0.8  | 1.5 | $\mu\text{s}$           |
|   | $T_A=25^{\circ}\text{C}$<br>( $R_L=1.9\text{K}\Omega$ , $I_F=16\text{mA}$ )               |           | 6N136  |     | 0.4  | 0.8 | $\mu\text{s}$           |
| Logic High Common Mode Transient Immunity   | $I_F=0\text{mA}$ ; $V_{CM}=10\text{Vp-p}$ ;<br>$R_L=4.1\text{K}\Omega$ ; $T_A=25\text{C}$ | $ CM_H $  | 6N135  | 1   |      |     | $\text{KV}/\mu\text{s}$ |
|   | $I_F=0\text{mA}$ ; $V_{CM}=10\text{Vp-p}$ ;<br>$R_L=1.9\text{K}\Omega$ ; $T_A=25\text{C}$ |           | 6N136  | 1   |      |     | $\text{KV}/\mu\text{s}$ |
| Logic Low Common Mode Transient Immunity    | $I_F=0\text{mA}$ ; $V_{CM}=10\text{Vp-p}$ ;<br>$R_L=4.1\text{K}\Omega$ ; $T_A=25\text{C}$ | $ CM_L $  | 6N135  | 1   |      |     | $\text{KV}/\mu\text{s}$ |
|   | $I_F=0\text{mA}$ ; $V_{CM}=10\text{Vp-p}$ ;<br>$R_L=1.9\text{K}\Omega$ ; $T_A=25\text{C}$ |           | 6N136  | 1   |      |     | $\text{KV}/\mu\text{s}$ |

\*All Typical at  $T_A=25^{\circ}\text{C}$

## Isolation Characteristics

| Parameter                               | Test Condition   | Symbol    | Min  | Typ       | Max | Units     |
|---|--|-----------|------|-----------|-----|-----------|
| Input-Output Insulation Leakage Current | 45% RH, t = 5s,<br>$V_{I-O} = 3kV$ DC, $T_A = 25^{\circ}C$ | $I_{I-O}$ |      |           | 1.0 | $\mu A$   |
| Withstand Insulation Test Voltage       | $RH \leq 50\%$ , t = 1min,<br>$T_A = 25^{\circ}C$          | $V_{ISO}$ | 5000 |           |     | $V_{RMS}$ |
| Input-Output Resistance                 | $V_{I-O} = 500V$ DC  | $R_{I-O}$ |      | $10^{12}$ |     | $\Omega$  |

\*All Typical at  $T_A = 25^{\circ}C$

### Notes

1. A  $0.1\mu F$  or bigger bypass capacitor for  $V_{CC}$  is needed as shown in Fig.1
2. Current Transfer Ratio is defined as the ratio of output collector current  $I_o$ , to the forward LED input current  $I_F$ , times 100.
3. The  $1.9K\Omega$  load represents 1TTL unit load of 1.6mA and the  $5.6K\Omega$  pull-up resistor.
4. The  $4.1K\Omega$  load represents 1LSTTL unit load of 0.36mA and the  $6.1K\Omega$  pull-up resistor.

## Switching Time Test Circuit

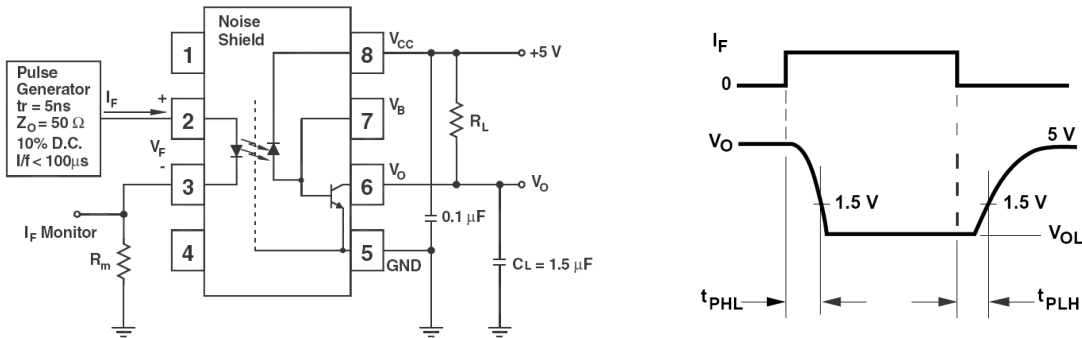


Figure 1: Single Channel Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

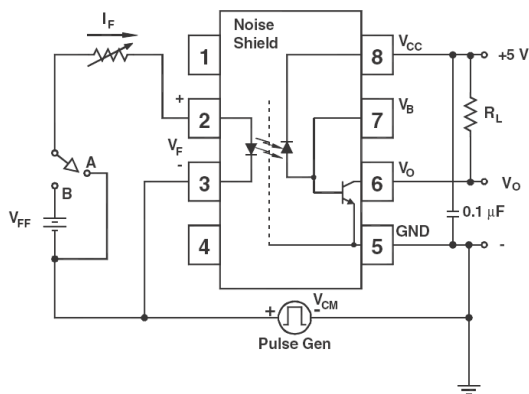


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

## Characteristics Curves

Figure 3: DC and pulsed transfer characteristics

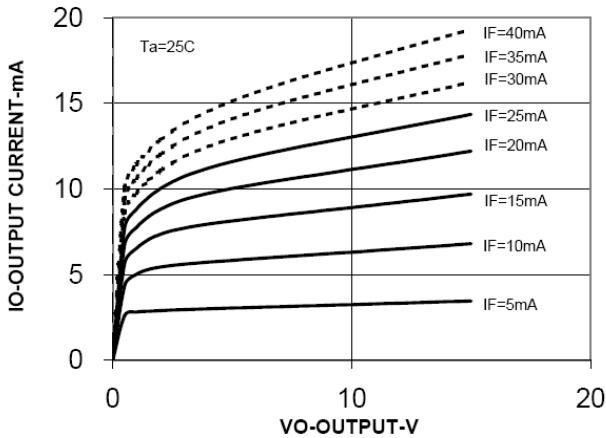


Figure 6: Current transfer ratio vs. input

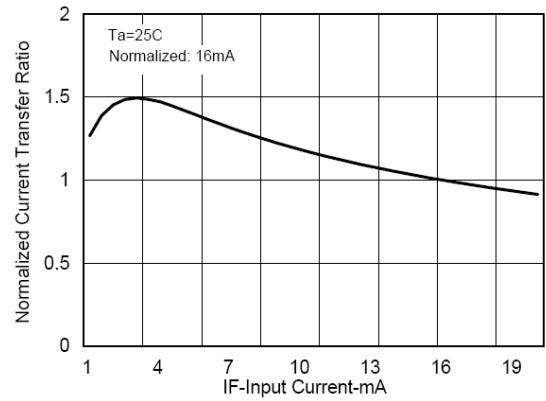


Figure 4: Input current vs. forward voltage

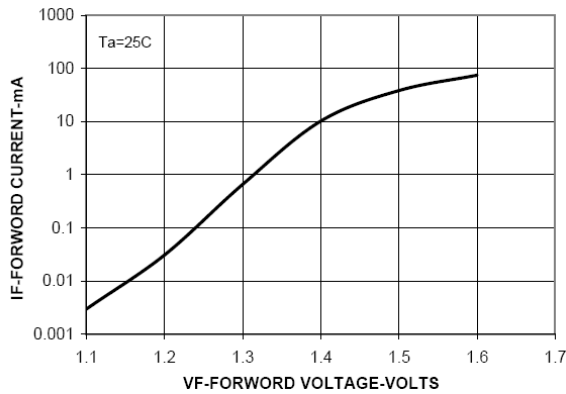


Figure 7: Current transfer ratio vs. temperature

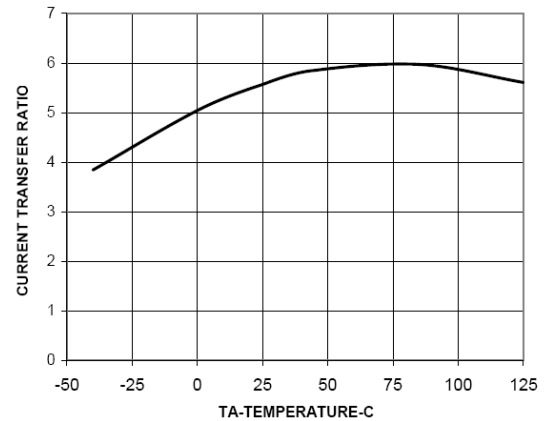


Figure 5: Logic high output current vs. temperature

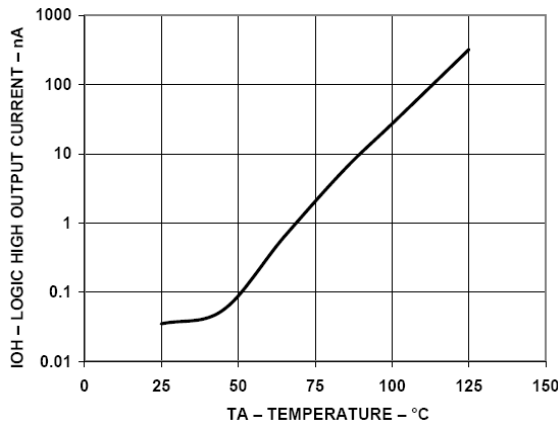
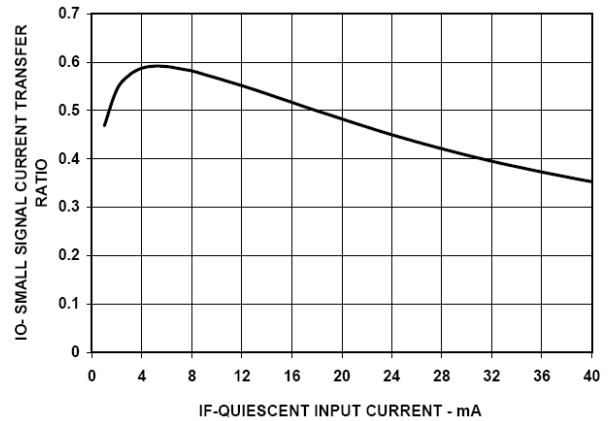


Figure 8: Small-signal current transfer ratio vs. quiescent current



## Property of Lite-on Only

### Characteristics Curves

Figure 9: Propagation delay time vs. temperature

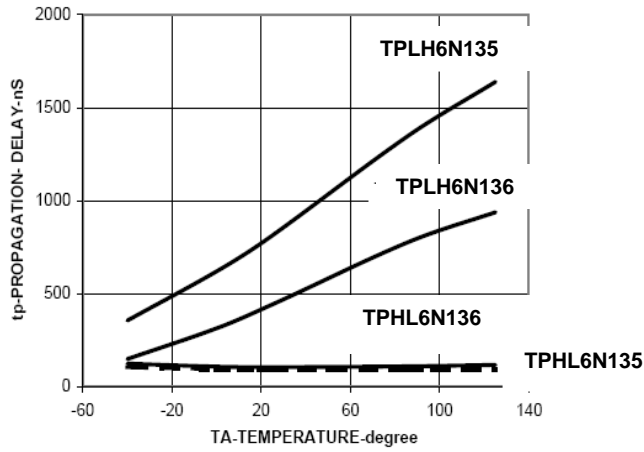
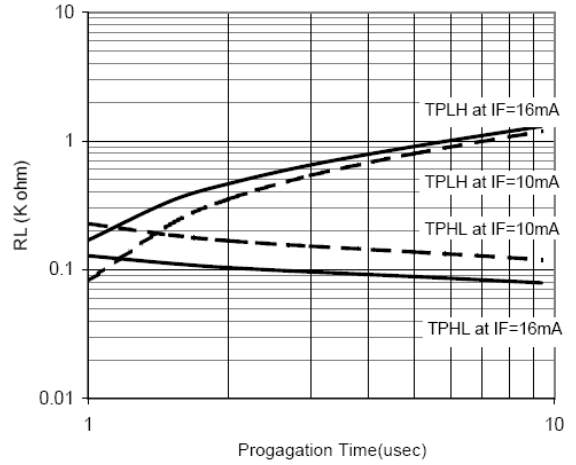


Figure 10: Propagation delay time vs. load resistance



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