

# 8-Pin DIP High Speed Transistor Optocouplers

## Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

### Description

The 6N135M, 6N136M, HCPL4503M, HCPL2530M, and HCPL2531M optocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector transistor for each channel.

A separate connection for the bias of the photodiode improves the speed by several orders of magnitude over conventional phototransistor optocouplers by reducing the base-collector capacitance of the input transistor.

The HCPL4503M has no internal connection to the phototransistor base for improved noise immunity. An internal noise shield provides superior common mode rejection of up to 50,000 V/ $\mu$ s.

### Features

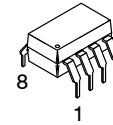
- High Speed – 1 MBit/s
- Dual-Channel: HCPL2530M, HCPL2531M
- CTR Guaranteed 0°C to 70°C
- No Base Connection for Improved Noise Immunity (HCPL4503M)
- Superior CMR of 15,000 V/ $\mu$ s Minimum (HCPL4503M)
- Safety and Regulatory Approvals
  - ◆ UL1577, 5,000 VAC<sub>RMS</sub> for 1 Minute
  - ◆ DIN EN/IEC60747-5-5
- These are Pb-Free Devices

### Applications

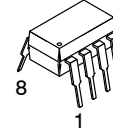
- Line Receivers
- Pulse Transformer Replacement
- Output Interface to CMOS-LSTTL-TTL
- Wide-Bandwidth Analog Coupling

### Related Resources

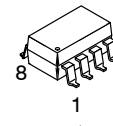
- <https://www.onsemi.com/products/interfaces/high-performance-optocouplers>
- <https://www.onsemi.com/products/interfaces/high-performance-optocouplers/high-performance-transistor-optocouplers/hcpl0500>
- <https://www.onsemi.com/products/interfaces/high-performance-optocouplers/high-performance-transistor-optocouplers/fodm452>
- <https://www.onsemi.com/products/interfaces/high-performance-optocouplers/low-voltage-high-performance-optocouplers/fod0501>



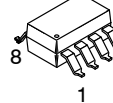
PDIP8 6.6x3.81, 2.54P  
CASE 646BW



PDIP8 9.655x6.61, 2.54P  
CASE 646CQ

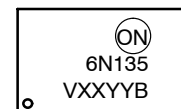


PDIP8 GW  
CASE 709AC



PDIP8 GW  
CASE 709AD

### MARKING DIAGRAM



6N135 = Device Number

V = DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)

XX = Two Digit Year Code, e.g., '15'

YY = Two Digit Work Week Ranging from '01' to '53'

B = Assembly Package Code

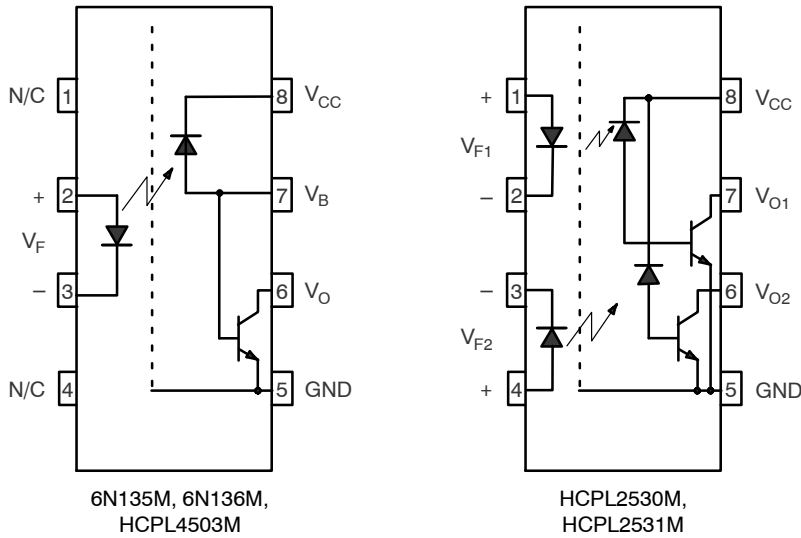
### ORDERING INFORMATION

See detailed ordering and shipping information on page 11 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 11.

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## SCHEMATICS



Pin 7 is not connected in  
the HCPL4503M

**Figure 1. Schematics**

**SAFETY AND INSULATION RATINGS** (As per DIN EN/IEC 60747-5-5, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.)

| Parameter                                                                           |                       | Characteristics |
|-------------------------------------------------------------------------------------|-----------------------|-----------------|
| Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage | <150 V <sub>RMS</sub> | I-IV            |
|                                                                                     | <300 V <sub>RMS</sub> | I-IV            |
|                                                                                     | <450 V <sub>RMS</sub> | I-III           |
|                                                                                     | <600 V <sub>RMS</sub> | I-III           |
| Climatic Classification                                                             |                       | 40/100/21       |
| Pollution Degree (DIN VDE 0110/1.89)                                                |                       | 2               |
| Comparative Tracking Index                                                          |                       | 175             |

| Symbol                | Parameter                                                                                                                                                      | Value            | Unit              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------|
| V <sub>PR</sub>       | Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC  | 1,335            | V <sub>peak</sub> |
|                       | Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC | 1,669            | V <sub>peak</sub> |
| V <sub>IORM</sub>     | Maximum Working Insulation Voltage                                                                                                                             | 890              | V <sub>peak</sub> |
| V <sub>IOTM</sub>     | Highest Allowable Over-Voltage                                                                                                                                 | 6,000            | V <sub>peak</sub> |
|                       | External Creepage                                                                                                                                              | ≥8.0             | mm                |
|                       | External Clearance                                                                                                                                             | ≥7.4             | mm                |
|                       | External Clearance (for Option TV, 0.4" Lead Spacing)                                                                                                          | ≥10.16           | mm                |
| DTI                   | Distance Through Insulation (Insulation Thickness)                                                                                                             | ≥0.5             | mm                |
| T <sub>S</sub>        | Case Temperature (Note 1)                                                                                                                                      | 150              | °C                |
| I <sub>S,INPUT</sub>  | Input Current (Note 1)                                                                                                                                         | 200              | mA                |
| P <sub>S,OUTPUT</sub> | Output Power (Duty Factor ≤ 2.7%) (Note 1)                                                                                                                     | 300              | mW                |
| R <sub>IO</sub>       | Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)                                                                                     | >10 <sup>9</sup> | Ω                 |

1. Safety limit value – maximum values allowed in the event of a failure.

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

| Symbol           | Parameter               | Test Conditions | Value        | Unit |
|------------------|-------------------------|-----------------|--------------|------|
| T <sub>STG</sub> | Storage Temperature     |                 | -40 to +125  | °C   |
| T <sub>OPR</sub> | Operating Temperature   |                 | -40 to +100  | °C   |
| T <sub>J</sub>   | Junction Temperature    |                 | -40 to +125  | °C   |
| T <sub>SOL</sub> | Lead Solder Temperature |                 | 260 for 10 s | °C   |

## EMITTER

|                        |                                                        |                           |     |    |
|------------------------|--------------------------------------------------------|---------------------------|-----|----|
| I <sub>F</sub> (avg)   | DC/Average Forward Input Current Each Channel (Note 2) |                           | 25  | mA |
| I <sub>F</sub> (pk)    | Peak Forward Input Current Each Channel (Note 3)       | 50% Duty Cycle, 1 ms P.W. | 50  | mA |
| I <sub>F</sub> (trans) | Peak Transient Input Current Each Channel              | ≤1 μs P.W., 300 pps       | 1.0 | A  |
| V <sub>R</sub>         | Reverse Input Voltage Each Channel                     |                           | 5   | V  |
| P <sub>D</sub>         | Input Power Dissipation Each Channel (Note 4)          |                           | 45  | mW |

## DETECTOR

|                      |                                                |                   |            |    |
|----------------------|------------------------------------------------|-------------------|------------|----|
| I <sub>O</sub> (avg) | Average Output Current Each Channel            |                   | 8          | mA |
| I <sub>O</sub> (pk)  | Peak Output Current Each Channel               |                   | 16         | mA |
| V <sub>EBR</sub>     | Emitter-Base Reverse Voltage                   | 6N135M and 6N136M | 5          | V  |
| V <sub>CC</sub>      | Supply Voltage                                 |                   | -0.5 to 30 | V  |
| V <sub>O</sub>       | Output Voltage                                 |                   | -0.5 to 20 | V  |
| I <sub>B</sub>       | Base Current                                   | 6N135M and 6N136M | 5          | mA |
| P <sub>D</sub>       | Output Power Dissipation Each Channel (Note 5) |                   | 100        | mW |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Derate linearly above 70°C free-air temperature at a rate of 0.8 mA/°C.
- Derate linearly above 70°C free-air temperature at a rate of 1.6 mA/°C.
- Derate linearly above 70°C free-air temperature at a rate of 0.9 mW/°C.
- Derate linearly above 70°C free-air temperature at a rate of 2.0 mW/°C.

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                          | Min | Max  | Unit |
|-----------------|------------------------------------|-----|------|------|
| V <sub>CC</sub> | Supply Voltage                     | 4.5 | 20.0 | V    |
| T <sub>A</sub>  | Ambient Operating Temperature      | 0   | 70   | °C   |
| I <sub>FL</sub> | Input Current, Low Level           | 0   | 250  | μA   |
| I <sub>FH</sub> | Input Current, High Level (Note 6) | 6.3 | 20.0 | mA   |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

- 6.3 mA is a guard banded value which allows for at least 20% CTR degradation. Initial input current threshold value is 5.0 mA or less.

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Device | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|--------|-----------------|-----|-----|-----|------|
|--------|-----------|--------|-----------------|-----|-----|-----|------|

**INDIVIDUAL COMPONENT CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$  unless otherwise specified.)

| EMITTER                 |                                            |                           |                                                                                 |   |        |      |                      |
|-------------------------|--------------------------------------------|---------------------------|---------------------------------------------------------------------------------|---|--------|------|----------------------|
| $V_F$                   | Input Forward Voltage                      | All                       | $I_F = 16\text{ mA}$ , $T_A = 25^\circ\text{C}$                                 | – | 1.45   | 1.70 | V                    |
|                         |                                            | All                       | $I_F = 16\text{ mA}$                                                            | – | –      | 1.80 |                      |
| $B_{VR}$                | Input Reverse Breakdown Voltage            | All                       | $I_R = 10\text{ }\mu\text{A}$                                                   | 5 | 21     | –    | V                    |
| $\Delta V_F/\Delta T_A$ | Temperature Coefficient of Forward Voltage | All                       | $I_F = 16\text{ mA}$                                                            | – | –1.7   | –    | mV/ $^\circ\text{C}$ |
| DETECTOR                |                                            |                           |                                                                                 |   |        |      |                      |
| $I_{OH}$                | Logic High Output Current                  | All                       | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 5.5\text{ V}$ , $T_A = 25^\circ\text{C}$  | – | 0.0007 | 0.5  | $\mu\text{A}$        |
|                         |                                            | 6N135M, 6N136M, HCPL4503M | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 15\text{ V}$ , $T_A = 25^\circ\text{C}$   | – | 0.0019 | 1    |                      |
|                         |                                            | All                       | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 15\text{ V}$                              | – | –      | 50   |                      |
| $I_{OCL}$               | Logic Low Supply Current                   | 6N135M, 6N136M, HCPL4503M | $I_F = 16\text{ mA}$ , $V_O = \text{Open}$ , $V_{CC} = 15\text{ V}$             | – | 163    | 200  | $\mu\text{A}$        |
|                         |                                            | HCPL2530M, HCPL2531M      | $I_{F1} = I_{F2} = 16\text{ mA}$ , $V_O = \text{Open}$ , $V_{CC} = 15\text{ V}$ | – | –      | 400  |                      |
| $I_{OCH}$               | Logic High Supply Current                  | 6N135M, 6N136M, HCPL4503M | $I_F = 0\text{ mA}$ , $V_O = \text{Open}$ , $V_{CC} = 15\text{ V}$              | – | 0.0004 | 2    | $\mu\text{A}$        |
|                         |                                            | HCPL2530M, HCPL2531M      | $I_F = 0\text{ mA}$ , $V_O = \text{Open}$ , $V_{CC} = 15\text{ V}$              | – | –      | 4    |                      |

**TRANSFER CHARACTERISTICS** ( $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$  unless otherwise specified.)

| COUPLED  |                                    |                                    |                                                                                                      |                         |    |      |     |   |
|----------|------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------|----|------|-----|---|
| CTR      | Current Transfer Ratio<br>(Note 7) | 6N135M,<br>HCPL2530M               | $I_F = 16\text{ mA}$ , $V_O = 0.4\text{ V}$ , $V_{CC} = 4.5\text{ V}$ ,<br>$T_A = 25^\circ\text{C}$  |                         | 7  | 38   | 50  | % |
|          |                                    | 6N136M,<br>HCPL4503M,<br>HCPL2531M |                                                                                                      |                         | 19 | 38   | 50  | % |
|          |                                    | 6N135M                             | $I_F = 16\text{ mA}$ , $V_{CC} = 4.5\text{ V}$                                                       | $V_{OL} = 0.4\text{ V}$ | 5  | –    | –   | % |
|          |                                    | HCPL2530M                          |                                                                                                      | $V_{OL} = 0.5\text{ V}$ |    |      |     |   |
|          |                                    | 6N136M,<br>HCPL4503M               |                                                                                                      | $V_{OL} = 0.4\text{ V}$ | 15 | –    | –   | % |
|          |                                    | HCPL2531M                          |                                                                                                      | $V_{OL} = 0.5\text{ V}$ |    |      |     |   |
| $V_{OL}$ | Logic LOW Output<br>Voltage        | 6N135M                             | $I_F = 16\text{ mA}$ , $I_O = 1.1\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ ,<br>$T_A = 25^\circ\text{C}$ |                         | –  | 0.12 | 0.4 | V |
|          |                                    | HCPL2530M                          |                                                                                                      |                         |    |      | 0.5 |   |
|          |                                    | 6N136M,<br>HCPL4503M               | $I_F = 16\text{ mA}$ , $I_O = 3\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ ,<br>$T_A = 25^\circ\text{C}$   |                         | –  | 0.20 | 0.4 |   |
|          |                                    | HCPL2531M                          |                                                                                                      |                         |    |      | 0.5 |   |
|          |                                    | 6N135M,<br>HCPL2530M               | $I_F = 16\text{ mA}$ , $I_O = 0.8\text{ mA}$ , $V_{CC} = 4.5\text{ V}$                               |                         | –  | 0.11 | 0.5 |   |
|          |                                    | HCPL4503M,<br>HCPL2531M            | $I_F = 16\text{ mA}$ , $I_O = 2.4\text{ mA}$ , $V_{CC} = 4.5\text{ V}$                               |                         | –  | 0.18 | 0.5 |   |

**Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M,  
HCPL2531M**

**ELECTRICAL CHARACTERISTICS** (continued)

| Symbol                                                                                                        | Parameter                                    | Device                       | Test Conditions                                                                                                                      | Min    | Typ    | Max | Unit                   |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------|--------|-----|------------------------|
| <b>SWITCHING CHARACTERISTICS</b> ( $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$ unless otherwise specified.) |                                              |                              |                                                                                                                                      |        |        |     |                        |
| $t_{\text{PHL}}$                                                                                              | Propagation Delay Time to Logic LOW          | 6N135M                       | $T_A = 25^\circ\text{C}$ , $R_L = 4.1\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 8) (Figure 14)                                    | –      | 0.23   | 1.5 | $\mu\text{s}$          |
|                                                                                                               |                                              | HCPL2530M                    |                                                                                                                                      |        | 0.25   |     |                        |
|                                                                                                               |                                              | 6N136M, HCPL4503M            | $T_A = 25^\circ\text{C}$ , $R_L = 1.9\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 9) (Figure 14)                                    | –      | 0.25   | 0.8 | $\mu\text{s}$          |
|                                                                                                               |                                              | HCPL2531M                    |                                                                                                                                      |        | 0.28   |     |                        |
|                                                                                                               |                                              | 6N135M, HCPL2530M            | $R_L = 4.1\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 8) (Figure 14)                                                               | –      | –      | 2.0 | $\mu\text{s}$          |
|                                                                                                               |                                              | 6N136M, HCPL4503M, HCPL2531M | $R_L = 1.9\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 9) (Figure 14)                                                               | –      | –      | 1.0 | $\mu\text{s}$          |
| $t_{\text{PLH}}$                                                                                              | Propagation Delay Time to Logic HIGH         | 6N135M                       | $T_A = 25^\circ\text{C}$ , $R_L = 4.1\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 8) (Figure 14)                                    | –      | 0.45   | 1.5 | $\mu\text{s}$          |
|                                                                                                               |                                              | HCPL2530M                    |                                                                                                                                      |        | 0.29   |     |                        |
|                                                                                                               |                                              | 6N136M, HCPL4503M            | $T_A = 25^\circ\text{C}$ , $R_L = 1.9\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 9) (Figure 14)                                    | –      | 0.26   | 0.8 | $\mu\text{s}$          |
|                                                                                                               |                                              | HCPL2531M                    |                                                                                                                                      |        | 0.18   |     |                        |
|                                                                                                               |                                              | 6N135M, HCPL2530M            | $R_L = 4.1\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 8) (Figure 14)                                                               | –      | –      | 2.0 | $\mu\text{s}$          |
|                                                                                                               |                                              | 6N136M, HCPL4503M, HCPL2531M | $R_L = 1.9\text{ k}\Omega$ , $I_F = 16\text{ mA}$ (Note 9) (Figure 14)                                                               | –      | –      | 1.0 | $\mu\text{s}$          |
| $ CM_H $                                                                                                      | Common Mode Transient Immunity at Logic High | 6N135M, HCPL2530M            | $I_F = 0\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$ , $R_L = 4.1\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ (Note 10) (Figure 15)     | –      | 10,000 | –   | $\text{V}/\mu\text{s}$ |
|                                                                                                               |                                              | 6N136M, HCPL2531M            | $I_F = 0\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$ , $R_L = 1.9\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ (Note 10) (Figure 15)     | –      | 10,000 | –   |                        |
|                                                                                                               |                                              | HCPL4503M                    | $I_F = 0\text{ mA}$ , $V_{CM} = 1,500\text{ V}_{P-P}$ , $R_L = 4.1\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ (Note 10) (Figure 15)  | 15,000 | 50,000 | –   |                        |
| $ CM_L $                                                                                                      | Common Mode Transient Immunity at Logic Low  | 6N135M, HCPL2530M            | $I_F = 16\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$ , $R_L = 4.1\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ (Note 10) (Figure 16)    | –      | 10,000 | –   | $\text{V}/\mu\text{s}$ |
|                                                                                                               |                                              | 6N136M, HCPL2531M            | $I_F = 16\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$ , $R_L = 1.9\text{ k}\Omega$ (Note 10) (Figure 15)                               | –      | 10,000 | –   |                        |
|                                                                                                               |                                              | HCPL4503M                    | $I_F = 16\text{ mA}$ , $V_{CM} = 1,500\text{ V}_{P-P}$ , $R_L = 4.1\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ (Note 10) (Figure 15) | 15,000 | 50,000 | –   |                        |

**Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M,  
HCPL2531M**

**ELECTRICAL CHARACTERISTICS** (continued)

| Symbol                                                                                 | Parameter                              | Device                  | Test Conditions                                                                                                       | Min   | Typ       | Max | Unit           |
|----------------------------------------------------------------------------------------|----------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------|-------|-----------|-----|----------------|
| <b>ISOLATION CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ , unless otherwise noted.) |                                        |                         |                                                                                                                       |       |           |     |                |
| $V_{ISO}$                                                                              | Withstand Isolation Test Voltage       | All                     | $RH \leq 50\%$ , $I_{I-O} \leq 10 \mu\text{A}$<br>$t = 1 \text{ minute}$ ,<br>$f = 50 \text{ Hz}$ (Note 11) (Note 13) | 5,000 | –         | –   | $V_{AC_{RMS}}$ |
| $R_{I-O}$                                                                              | Resistance (Input to Output)           | All                     | $V_{I-O} = 500 V_{DC}$ (Note 11)                                                                                      | –     | $10^{11}$ | –   | $\Omega$       |
| $C_{I-O}$                                                                              | Capacitance (Input to Output)          | All                     | $f = 1 \text{ MHz}$ , $V_{I-O} = 0 V_{DC}$ (Note 11)                                                                  | –     | 1         | –   | pF             |
| $I_{I-I}$                                                                              | Input-Input Insulation Leakage Current | HCPL2530M,<br>HCPL2531M | $RH \leq 45\%$ , $V_{I-I} = 500 V_{DC}$ , $t = 5 \text{ s}$<br>(Note 12)                                              | –     | $<1$      | –   | nA             |
| $R_{I-I}$                                                                              | Input-Input Resistance                 | HCPL2530M,<br>HCPL2531M | $V_{I-I} = 500 V_{DC}$ (Note 12)                                                                                      | –     | $10^{12}$ | –   | $\Omega$       |
| $C_{I-I}$                                                                              | Input-Input Capacitance                | HCPL2530M,<br>HCPL2531M | $f = 1 \text{ MHz}$ (Note 12)                                                                                         | –     | 0.2       | –   | pF             |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

7. Current Transfer Ratio is defined as a ratio of output collector current,  $I_O$ , to the forward LED input current,  $I_F$ , times 100%.

8. The  $4.1 \text{ k}\Omega$  load represents 1 LSTTL unit load of 0.36 mA and  $6.1 \text{ k}\Omega$  pull-up resistor.

9. The  $1.9 \text{ k}\Omega$  load represents 1 TTL unit load of 1.6 mA and  $5.6 \text{ k}\Omega$  pull-up resistor.

10. Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{CM}/dt$  on the leading edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic high state (i.e.,  $V_O > 2.0 \text{ V}$ ).

Common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{CM}/dt$  on the trailing edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic low state (i.e.,  $V_O < 0.8 \text{ V}$ ).

11. Device is considered a two terminal device: pins 1, 2, 3 and 4 are shorted together and pins 5, 6, 7 and 8 are shorted together.

12. Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

13.  $5000 V_{RMS}$  for 1 minute duration is equivalent to  $6000 V_{RMS}$  for 1 second duration.

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## TYPICAL PERFORMANCE CURVES

(For single-channel devices; 6N135M, 6N136M, and HCPL4503M.)

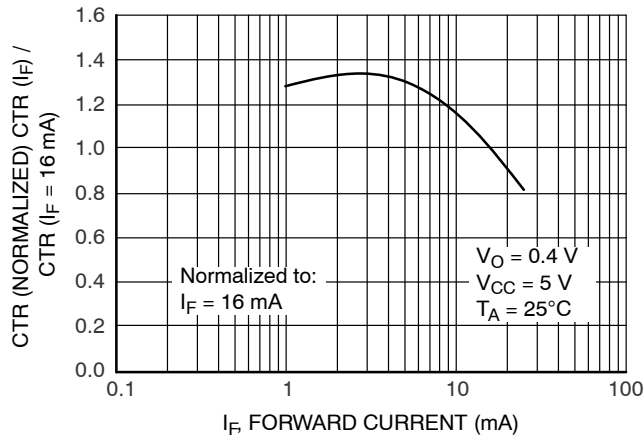


Figure 2. Normalized CTR vs. Forward Current

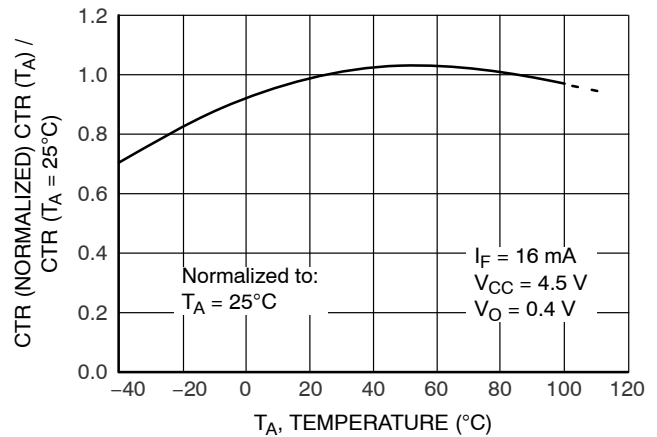


Figure 3. Normalized CTR vs. Temperature

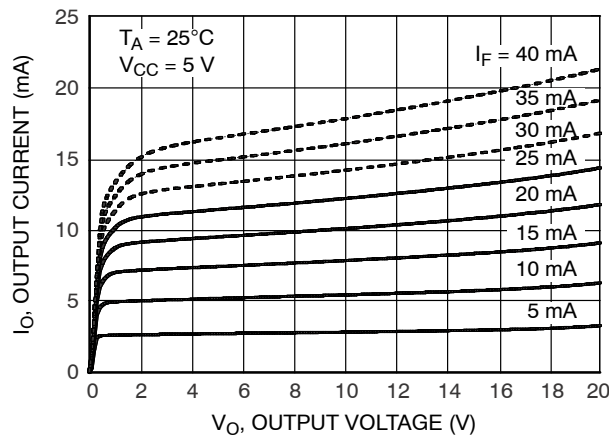


Figure 4. Output Current vs. Output Voltage

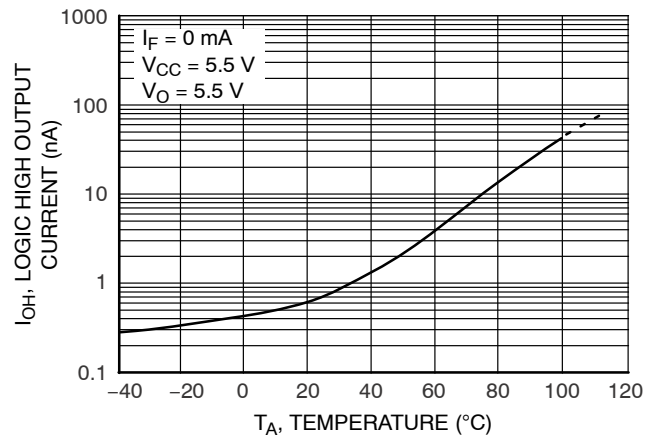


Figure 5. Logic High Output Current vs. Temperature

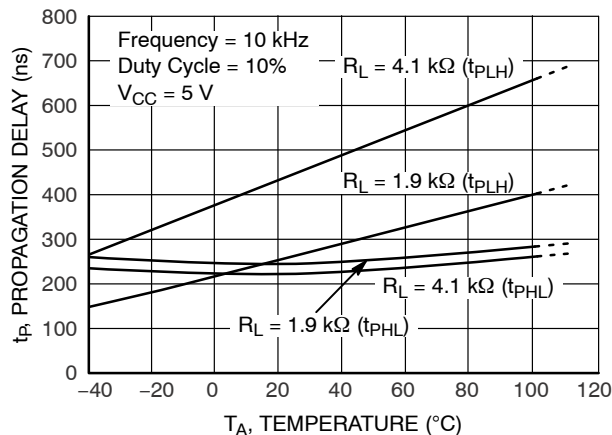


Figure 6. Propagation Delay vs. Temperature

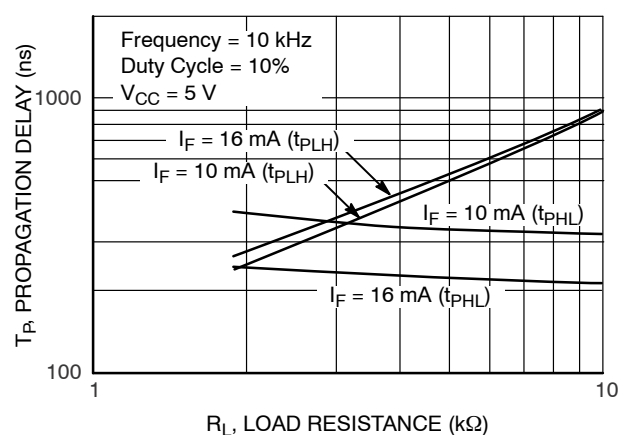


Figure 7. Propagation Delay vs. Load Resistance

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## TYPICAL PERFORMANCE CURVES

(For dual-channel devices; HCPL2530M and HCPL2531M.)

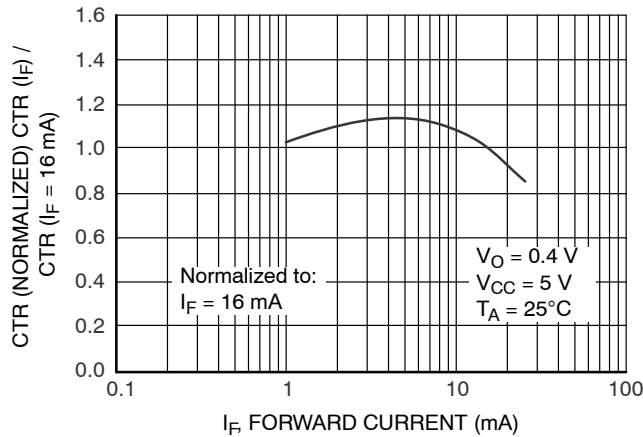


Figure 8. Normalized CTR vs. Forward Current

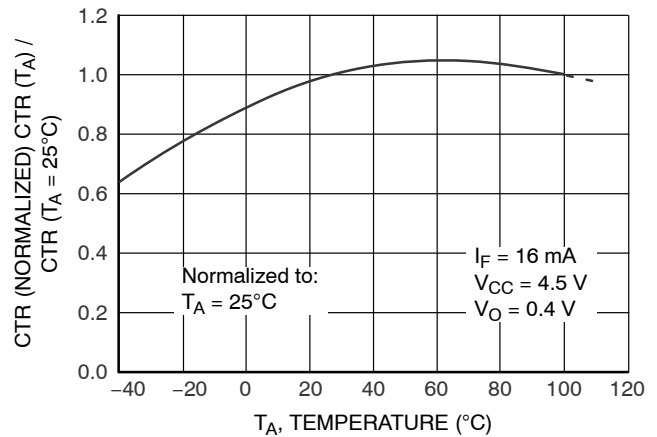


Figure 9. Normalized CTR vs. Temperature

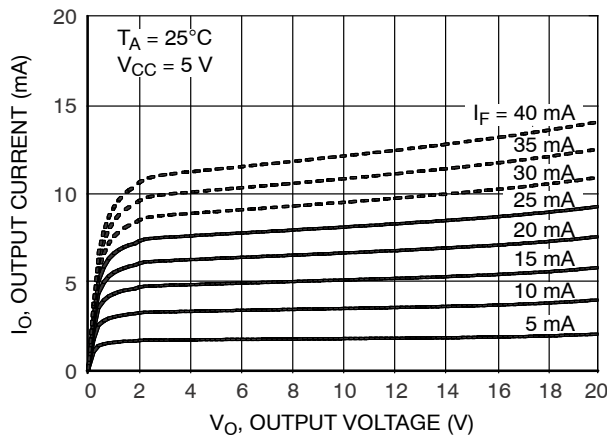


Figure 10. Output Current vs. Output Voltage

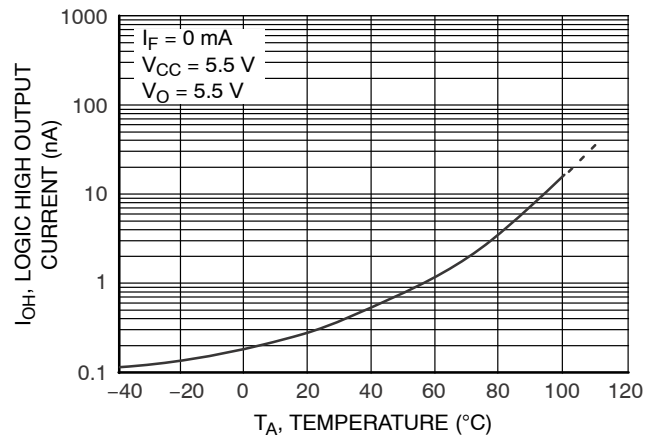


Figure 11. Logic High Output Current vs. Temperature

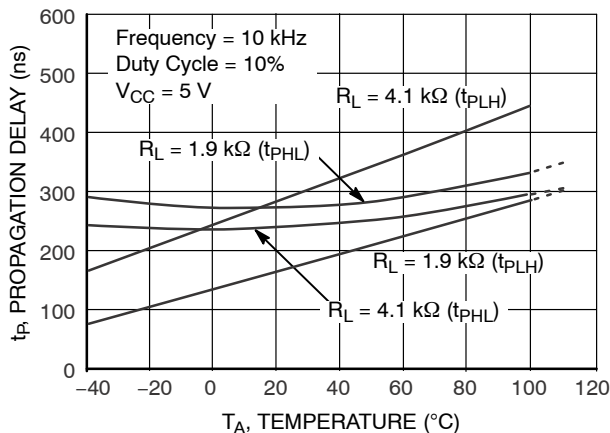


Figure 12. Propagation Delay vs. Temperature

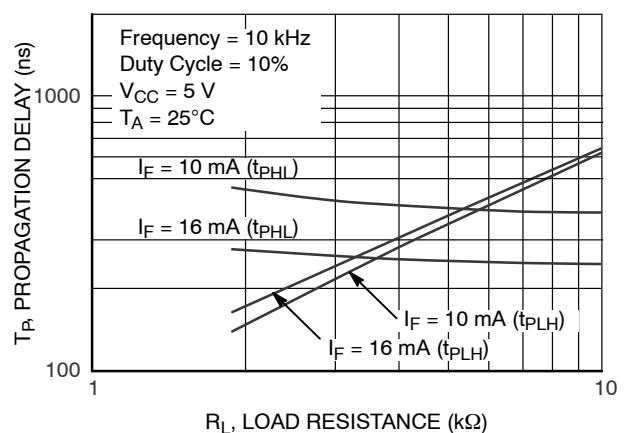
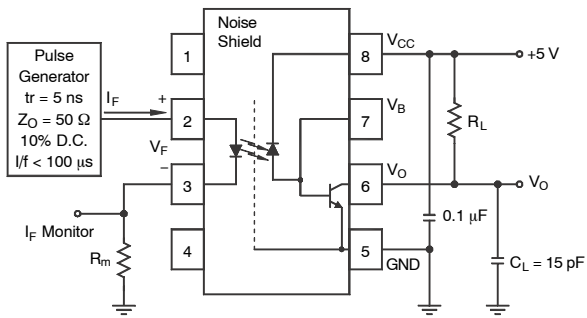


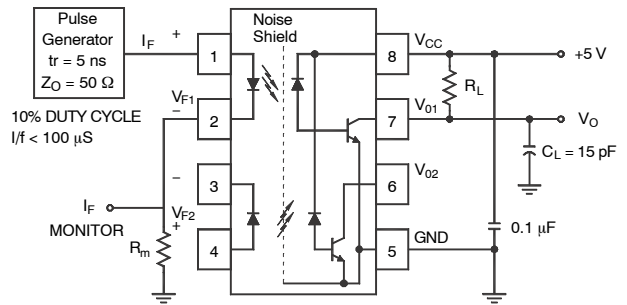
Figure 13. Propagation Delay vs. Load Resistance

# Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M

## TEST CIRCUIT



Test Circuit for 6N135M, 6N136M, and HCPL4503M



Test Circuit for HCPL2530M and HCPL2531M

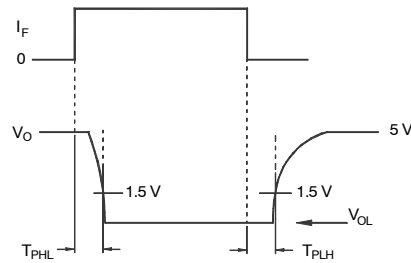
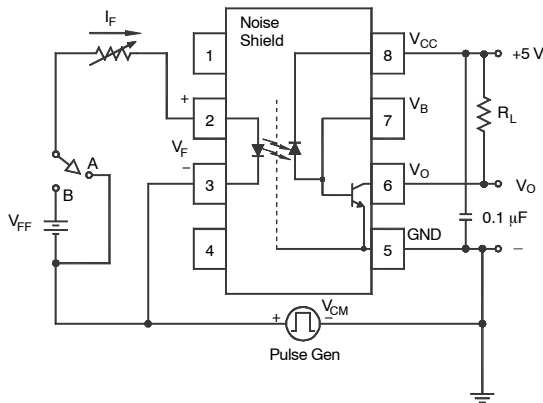
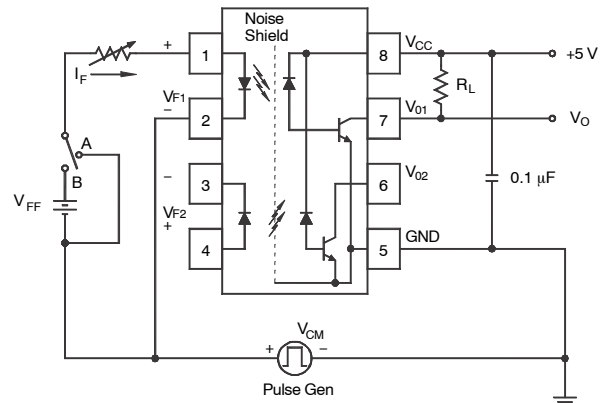


Figure 14. Switching Time Test Circuit



Test Circuit for 6N135M, 6N136M, and HCPL4503M



Test Circuit for HCPL2530M and HCPL2531M

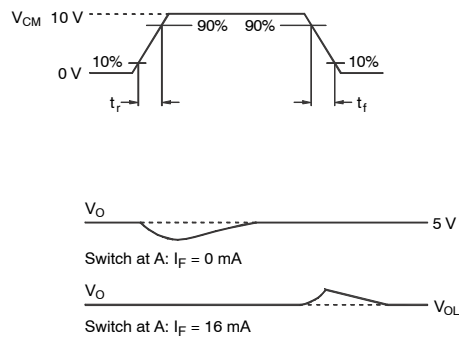
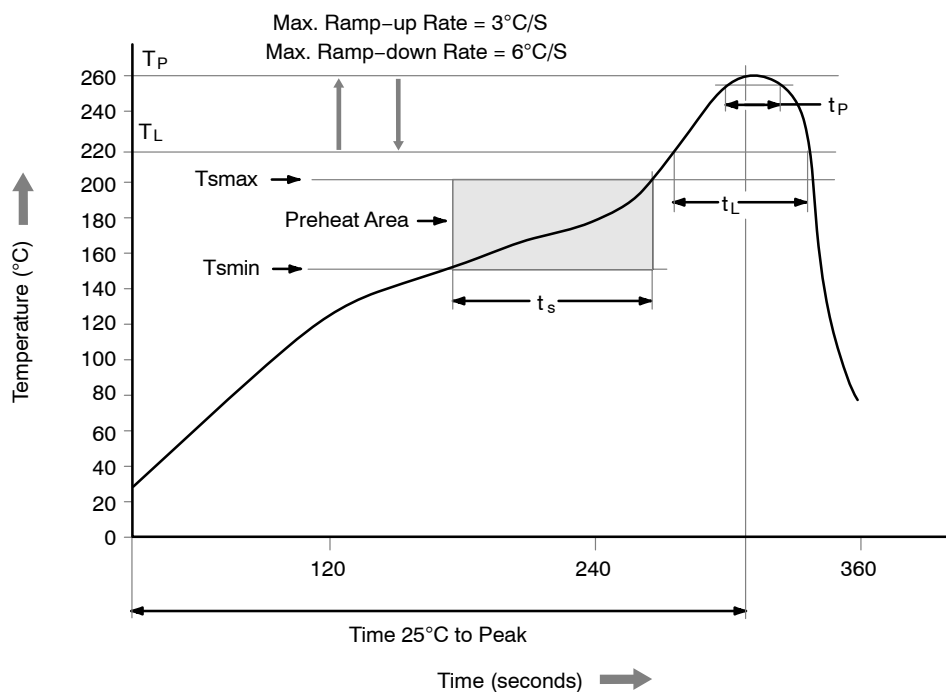


Figure 15. Common Mode Immunity Test Circuit

**Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M**

**REFLOW PROFILE**



| Profile Feature                                | Pb-Free Assembly Profile |
|------------------------------------------------|--------------------------|
| Temperature Min. ( $T_{smin}$ )                | 150°C                    |
| Temperature Max. ( $T_{sm}$ )                  | 200°C                    |
| Time ( $t_s$ ) from ( $T_{smin}$ to $T_{sm}$ ) | 60 to 120 s              |
| Ramp-up Rate ( $t_L$ to $t_P$ )                | 3°C/second maximum       |
| Liquidous Temperature ( $T_L$ )                | 217°C                    |
| Time ( $t_L$ ) Maintained Above ( $T_L$ )      | 60 to 150 s              |
| Peak Body Package Temperature                  | 260°C +0°C / -5°C        |
| Time ( $t_P$ ) within 5°C of 260°C             | 30 s                     |
| Ramp-down Rate ( $T_P$ to $T_L$ )              | 6°C/s maximum            |
| Time 25°C to Peak Temperature                  | 8 minutes maximum        |

**Figure 16. Reflow Profile**

**Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M,  
HCPL2531M**

**ORDERING INFORMATION**

| Part Number | Package                                                               | Shipping <sup>†</sup> |
|-------------|-----------------------------------------------------------------------|-----------------------|
| 6N135M      | PDIP8 9.655x6.61, 2.54P<br>DIP 8-Pin                                  | 50 Units / Tube       |
| 6N135SM     | PDIP8 GW<br>SMT 8-Pin (Lead Bend)                                     | 50 Units / Tube       |
| 6N135SDM    | PDIP8 GW<br>SMT 8-Pin (Lead Bend)                                     | 1,000 / Tape and Reel |
| 6N135VM     | PDIP8 9.655x6.61, 2.54P<br>DIP 8-Pin, DIN IEC60747-5-5 Option         | 50 Units / Tube       |
| 6N135SVM    | PDIP8 GW<br>SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-5 Option        | 50 Units / Tube       |
| 6N135SDVM   | PDIP8 GW<br>SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-5 Option        | 1,000 / Tape and Reel |
| 6N135TSVM   | PDIP8 GW<br>SMT 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-5 Option | 50 Units / Tube       |
| 6N135TSR2VM | PDIP8 GW<br>SMT 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-2 Option | 1,000 / Tape and Reel |

**DISCONTINUED** (Note 14)

|          |                                                                                    |                 |
|----------|------------------------------------------------------------------------------------|-----------------|
| 6N135TVM | PDIP8 6.6x3.81, 2.54P<br>DIP 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-5 Option | 50 Units / Tube |
|----------|------------------------------------------------------------------------------------|-----------------|

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NOTE: The product orderable part number system listed in this table also applies to the 6N136M, HCPL4503M, HCPL2530M and HCPL2531M product families.

14. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

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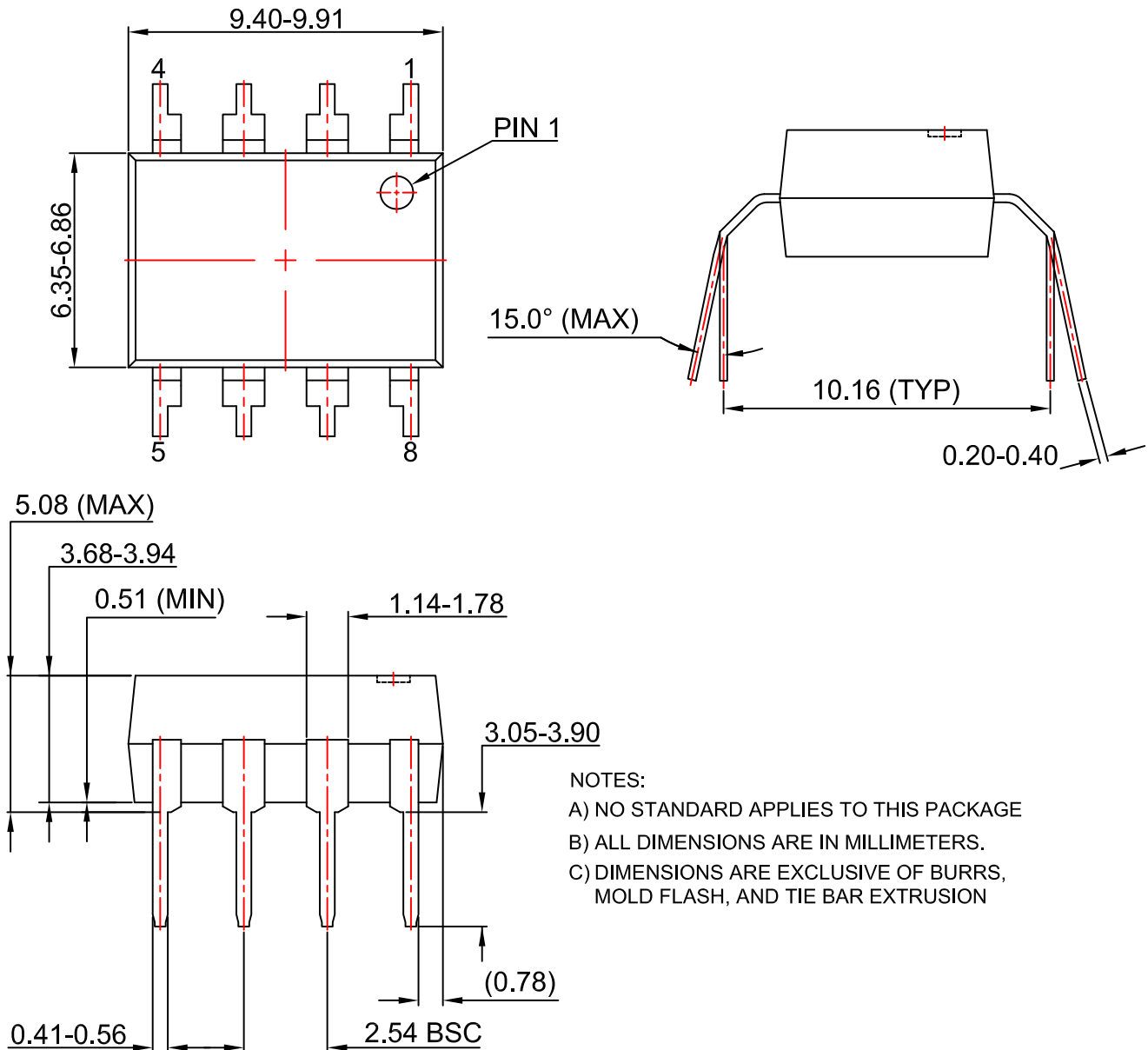
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PDIP8 6.6x3.81, 2.54P  
CASE 646BW  
ISSUE O

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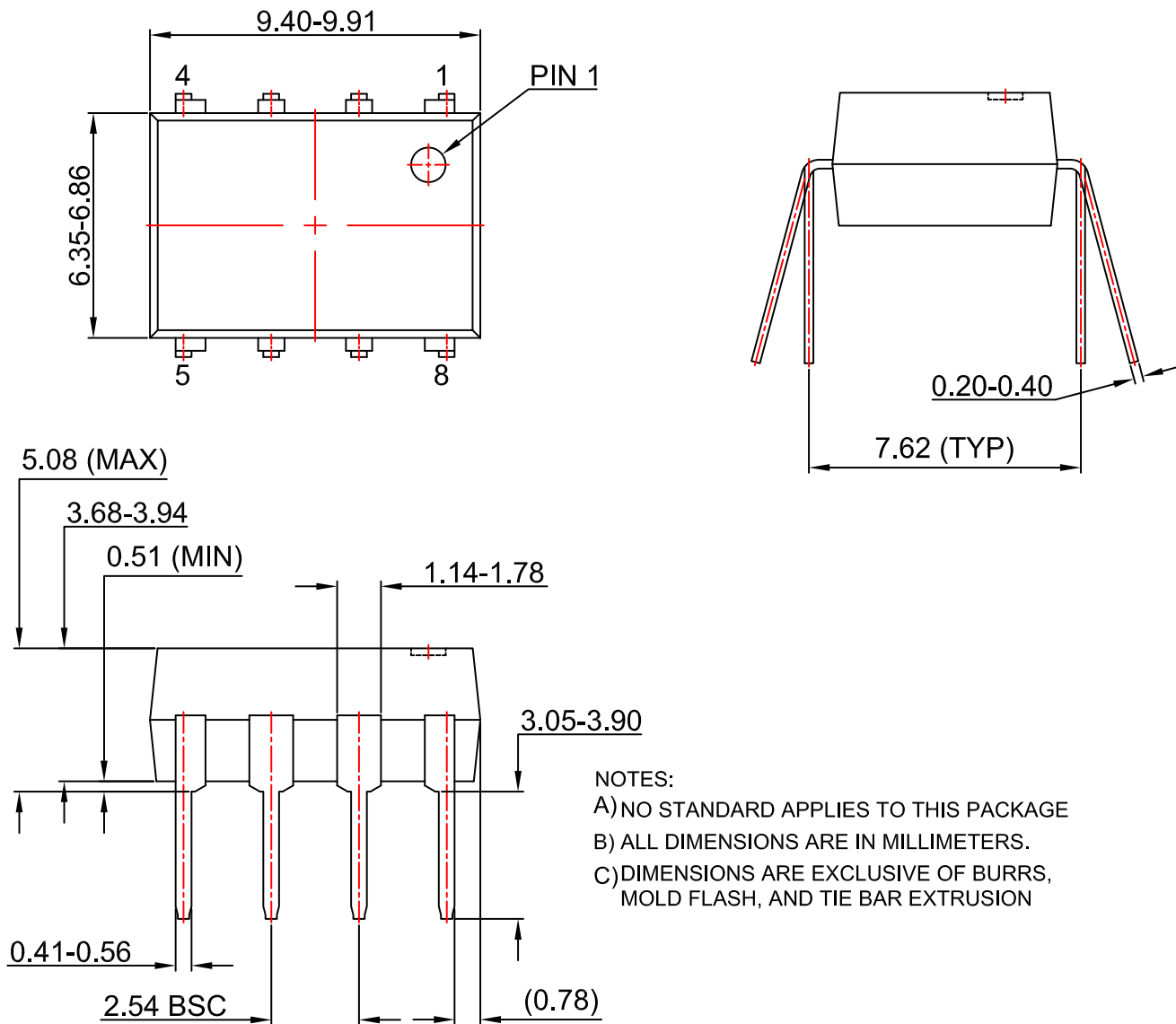
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CASE 646CQ  
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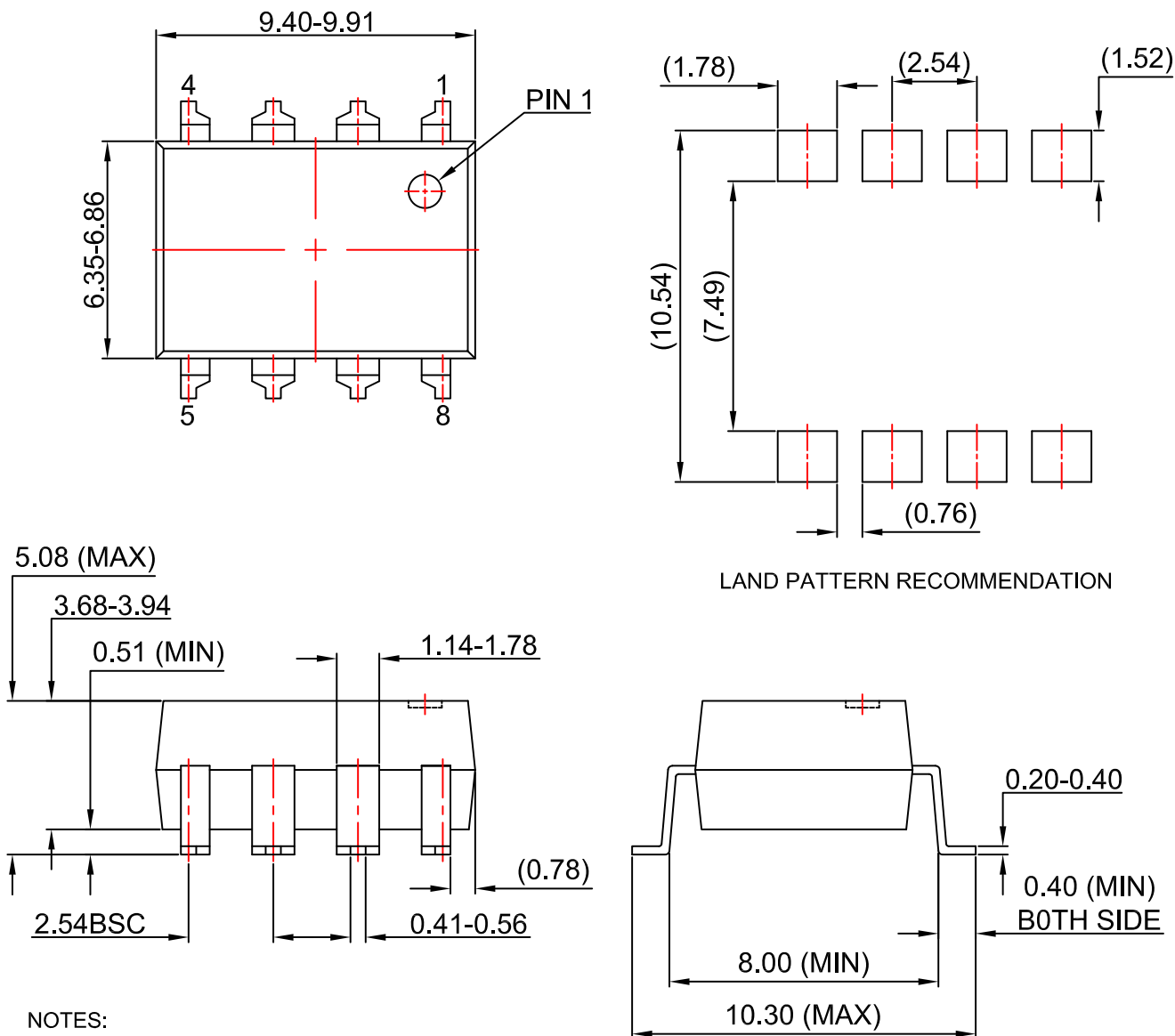


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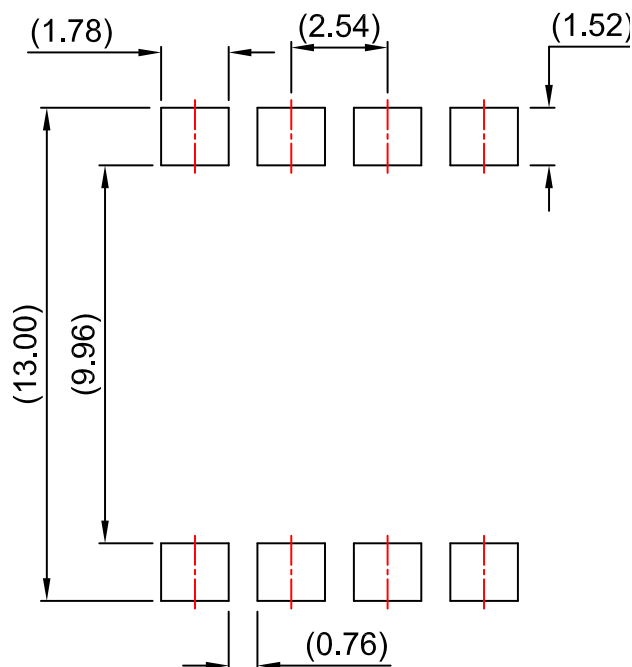
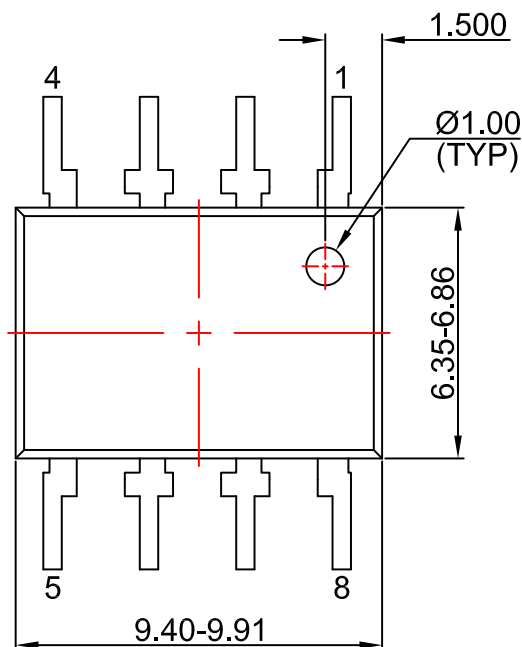
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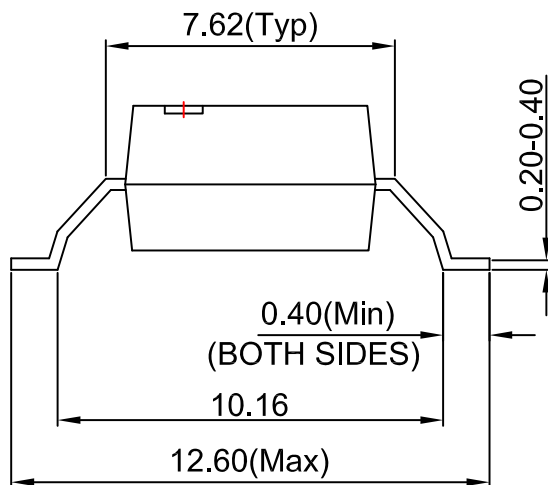
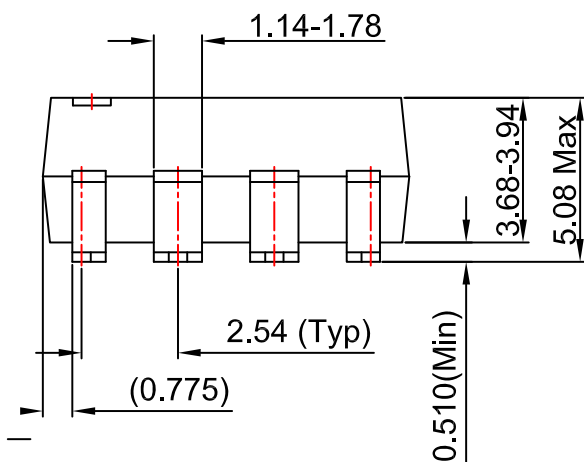


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