

# 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/μs.

### Features

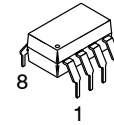
- High Speed – 1 MBit/s
- Dual-Channel: HCPL2530M, HCPL2531M
- CTR Guaranteed 0°C to 70°C
- No Base Connection for Improved Noise Immunity (HCPL4503M)
- Superior CMR of 15,000 V/μs Minimum (HCPL4503M)
- Safety and Regulatory Approvals
  - ◆ UL1577, 5,000 VAC<sub>RMS</sub> for 1 Minute
  - ◆ DIN EN/IEC60747-5-5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

### Applications

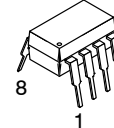
- Line Receivers
- Pulse Transformer Replacement
- Output Interface to CMOS-LSTTL-TTL
- Wide-Bandwidth Analog Coupling

### Related Resources

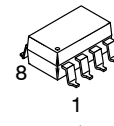
- <https://www.onsemi.com/products/interfaces/high-performance-opto-couplers>
- <https://www.onsemi.com/products/interfaces/high-performance-opto-couplers/high-performance-transistor-optocouplers/hcpl0500>
- <https://www.onsemi.com/products/interfaces/high-performance-opto-couplers/high-performance-transistor-optocouplers/fodm452>
- [https://www.onsemi.com/products/interfaces/high-performance-optocouplers/low-voltage-high-performance-optocouplers/fod0501](https://www.onsemi.com/products/interfaces/high-performance-opto-couplers/low-voltage-high-performance-optocouplers/fod0501)



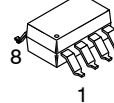
PDIP8 6.6x3.81, 2.54P  
CASE 646BW



PDIP8 9.655x6.61, 2.54P  
CASE 646CQ

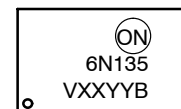


PDIP8 GW  
CASE 709AC



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'

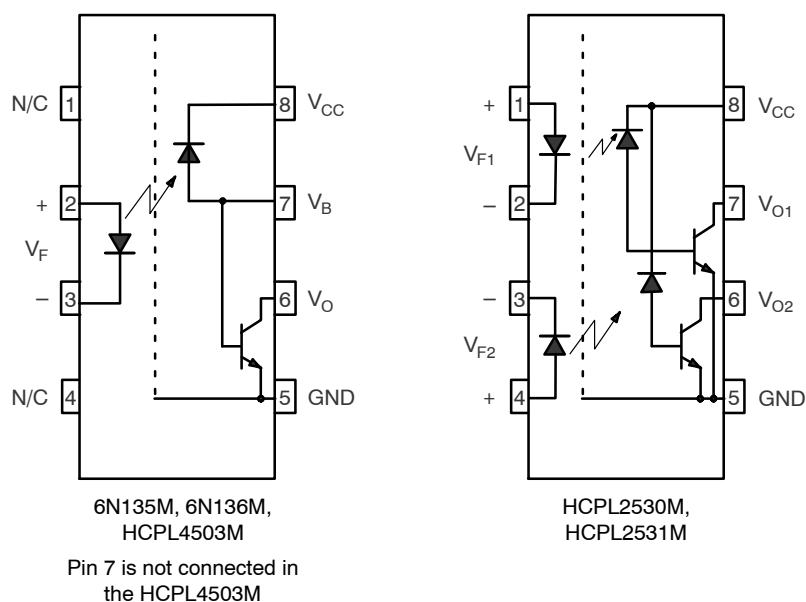
B = Assembly Package Code

### 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**



**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** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Symbol    | Parameter               | Test Conditions | Value        | Unit             |
|-----------|-------------------------|-----------------|--------------|------------------|
| $T_{STG}$ | Storage Temperature     |                 | -40 to +125  | $^\circ\text{C}$ |
| $T_{OPR}$ | Operating Temperature   |                 | -40 to +100  | $^\circ\text{C}$ |
| $T_J$     | Junction Temperature    |                 | -40 to +125  | $^\circ\text{C}$ |
| $T_{SOL}$ | Lead Solder Temperature |                 | 260 for 10 s | $^\circ\text{C}$ |

**EMITTER**

|               |                                                        |                                    |     |    |
|---------------|--------------------------------------------------------|------------------------------------|-----|----|
| $I_F$ (avg)   | DC/Average Forward Input Current Each Channel (Note 2) |                                    | 25  | mA |
| $I_F$ (pk)    | Peak Forward Input Current Each Channel (Note 3)       | 50% Duty Cycle, 1 ms P.W.          | 50  | mA |
| $I_F$ (trans) | Peak Transient Input Current Each Channel              | $\leq 1 \mu\text{s}$ P.W., 300 pps | 1.0 | A  |
| $V_R$         | Reverse Input Voltage Each Channel                     |                                    | 5   | V  |
| $P_D$         | Input Power Dissipation Each Channel (Note 4)          |                                    | 45  | mW |

**DETECTOR**

|             |                                                |                   |            |    |
|-------------|------------------------------------------------|-------------------|------------|----|
| $I_O$ (avg) | Average Output Current Each Channel            |                   | 8          | mA |
| $I_O$ (pk)  | Peak Output Current Each Channel               |                   | 16         | mA |
| $V_{EBR}$   | Emitter-Base Reverse Voltage                   | 6N135M and 6N136M | 5          | V  |
| $V_{CC}$    | Supply Voltage                                 |                   | -0.5 to 30 | V  |
| $V_O$       | Output Voltage                                 |                   | -0.5 to 20 | V  |
| $I_B$       | Base Current                                   | 6N135M and 6N136M | 5          | mA |
| $P_D$       | 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.

2. Derate linearly above  $70^\circ\text{C}$  free-air temperature at a rate of  $0.8 \text{ mA}/^\circ\text{C}$ .
3. Derate linearly above  $70^\circ\text{C}$  free-air temperature at a rate of  $1.6 \text{ mA}/^\circ\text{C}$ .
4. Derate linearly above  $70^\circ\text{C}$  free-air temperature at a rate of  $0.9 \text{ mW}/^\circ\text{C}$ .
5. Derate linearly above  $70^\circ\text{C}$  free-air temperature at a rate of  $2.0 \text{ mW}/^\circ\text{C}$ .

**RECOMMENDED OPERATING CONDITIONS**

| Symbol   | Parameter                          | Min | Max  | Unit             |
|----------|------------------------------------|-----|------|------------------|
| $V_{CC}$ | Supply Voltage                     | 4.5 | 20.0 | V                |
| $T_A$    | Ambient Operating Temperature      | 0   | 70   | $^\circ\text{C}$ |
| $I_{FL}$ | Input Current, Low Level           | 0   | 250  | $\mu\text{A}$    |
| $I_{FH}$ | 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. 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.)

| <b>EMITTER</b>          |                                            |                           |                                                                                 |   |        |      |                      |
|-------------------------|--------------------------------------------|---------------------------|---------------------------------------------------------------------------------|---|--------|------|----------------------|
| $V_F$                   | 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/ $^\circ\text{C}$ |
| <b>DETECTOR</b>         |                                            |                           |                                                                                 |   |        |      |                      |
| $I_{OH}$                | 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.)

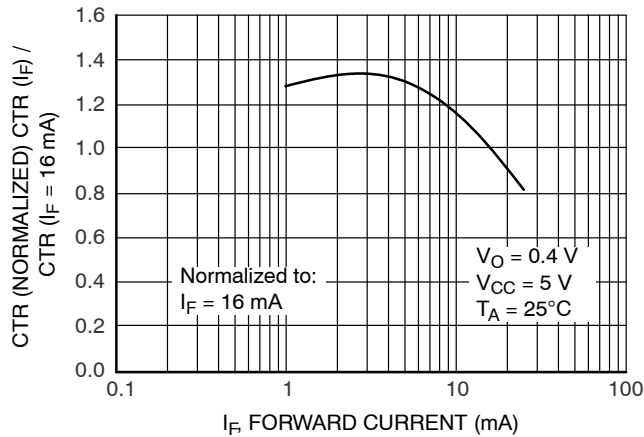


Figure 2. Normalized CTR vs. Forward Current

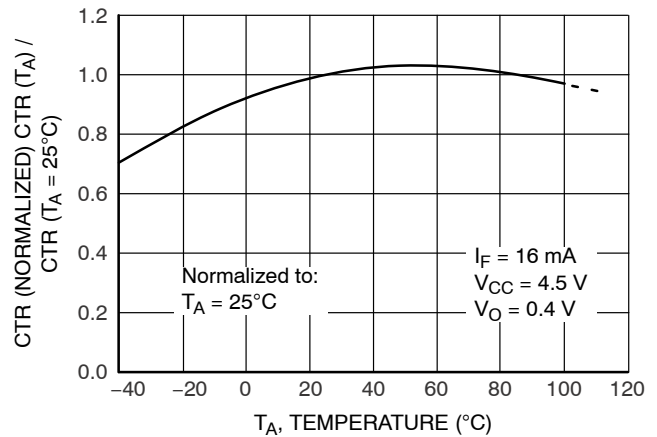


Figure 3. Normalized CTR vs. Temperature

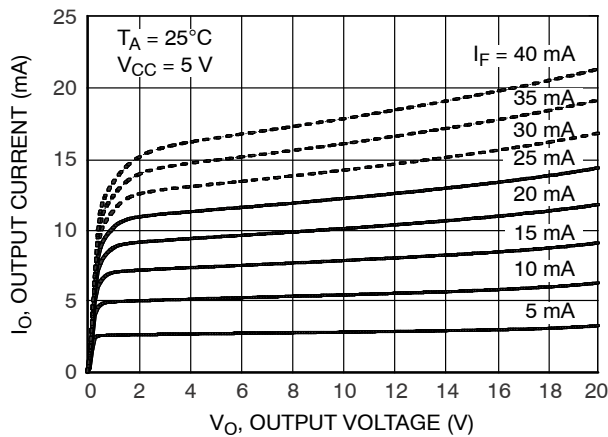


Figure 4. Output Current vs. Output Voltage

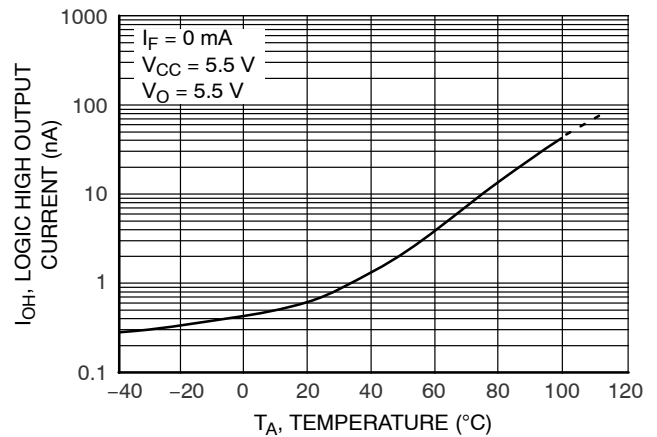


Figure 5. Logic High Output Current vs. Temperature

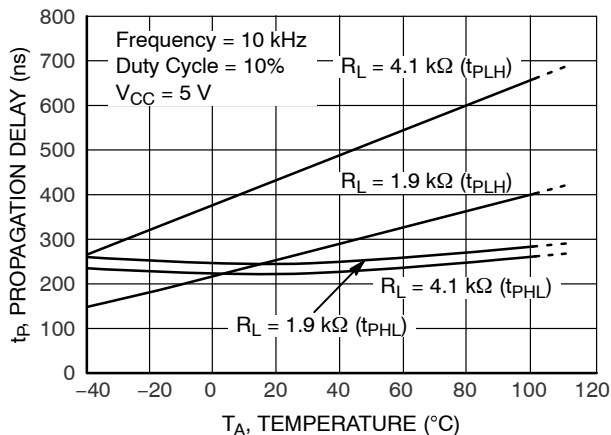


Figure 6. Propagation Delay vs. Temperature

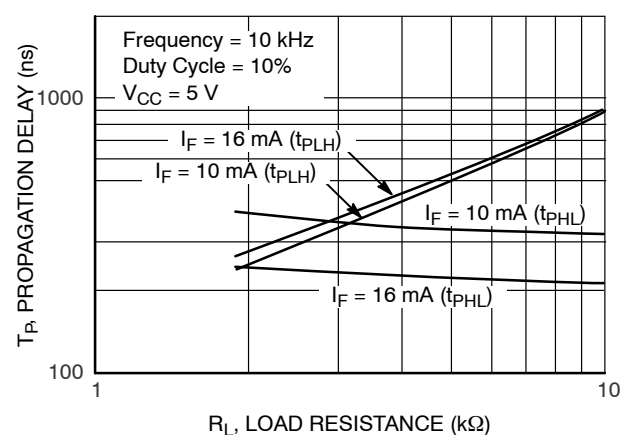


Figure 7. Propagation Delay vs. Load Resistance

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

## TYPICAL PERFORMANCE CURVES

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

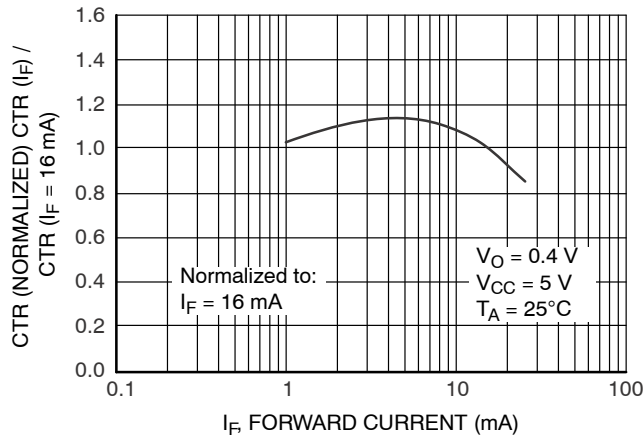


Figure 8. Normalized CTR vs. Forward Current

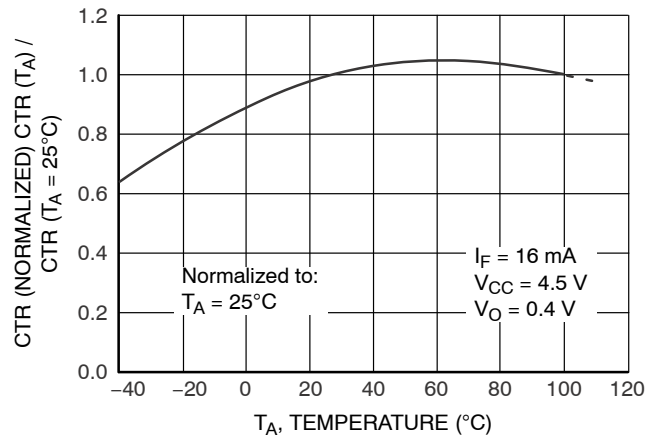


Figure 9. Normalized CTR vs. Temperature

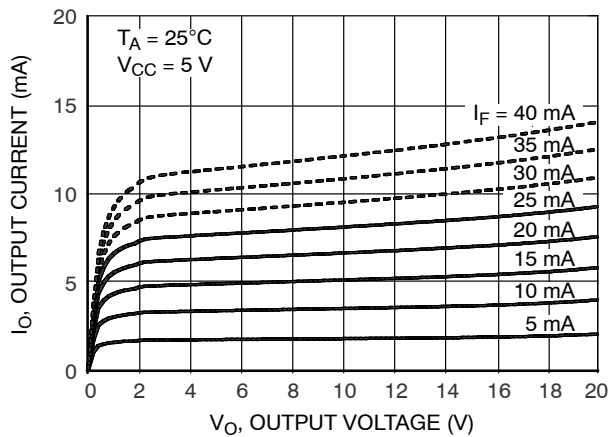


Figure 10. Output Current vs. Output Voltage

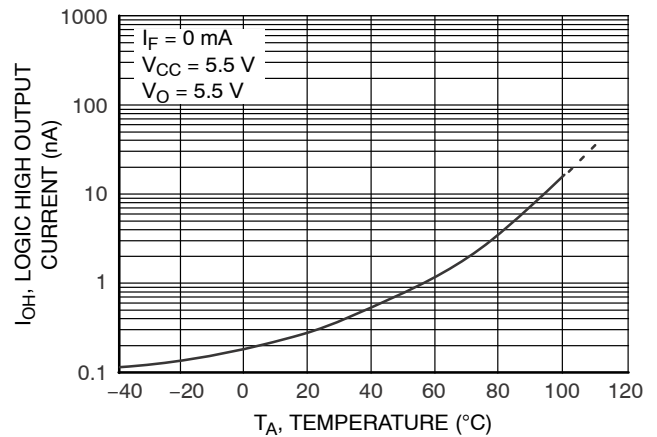


Figure 11. Logic High Output Current vs. Temperature

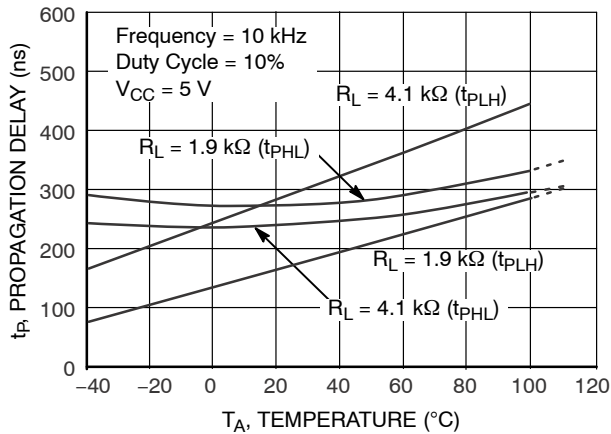


Figure 12. Propagation Delay vs. Temperature

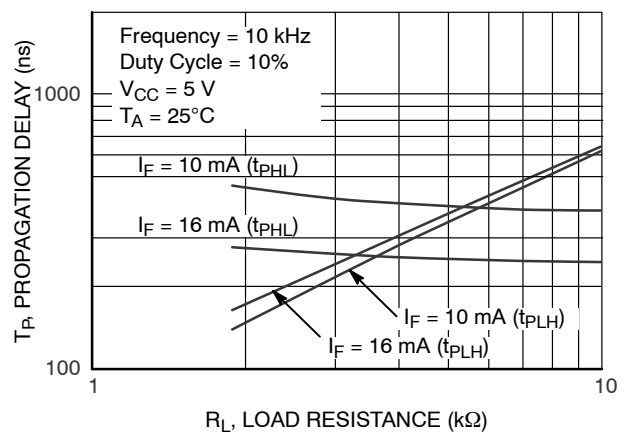
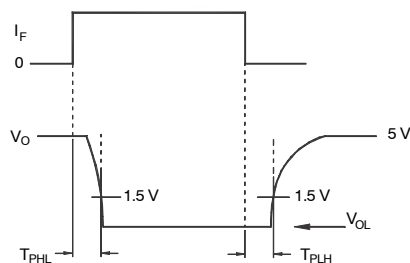
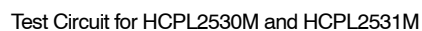
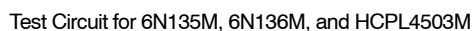
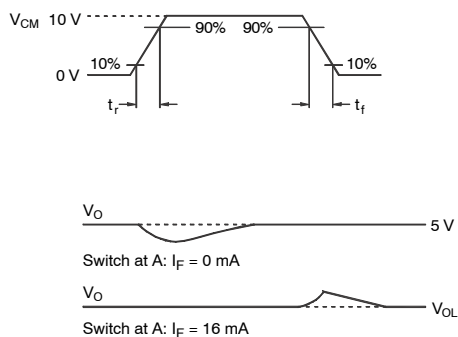
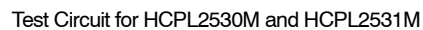
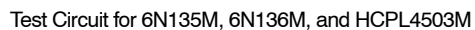


Figure 13. Propagation Delay vs. Load Resistance

## TEST CIRCUIT



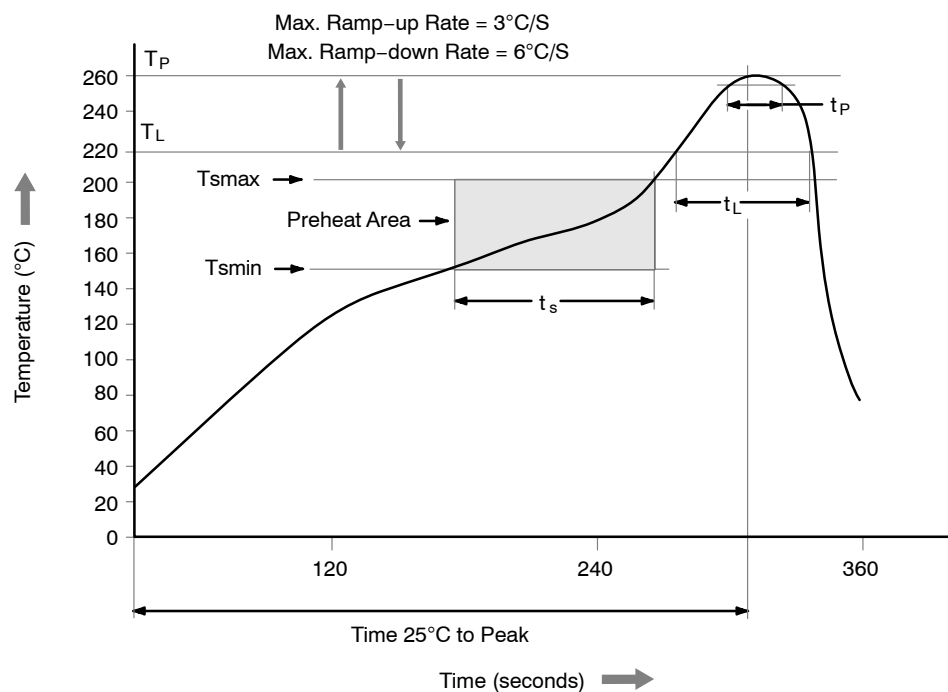
### Figure 14. Switching Time Test Circuit



**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. (Tsmmin)         | 150°C                    |
| Temperature Max. (Tsmmax)         | 200°C                    |
| Time (ts) from (Tsmmin to Tsmmax) | 60 to 120 s              |
| Ramp-up Rate (tL to tp)           | 3°C/second maximum       |
| Liquidous Temperature (TL)        | 217°C                    |
| Time (tL) Maintained Above (TL)   | 60 to 150 s              |
| Peak Body Package Temperature     | 260°C +0°C / -5°C        |
| Time (tp) within 5°C of 260°C     | 30 s                     |
| Ramp-down Rate (TP to TL)         | 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).

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

DATE 31 JUL 2016



|                         |                              |                                                                                                                                                                                     |
|-------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON13445G</b>           | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>PDIP8 6.6X3.81, 2.54P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**PDIP8 9.655x6.6, 2.54P**  
CASE 646CQ  
ISSUE O

DATE 18 SEP 2017



|                         |                               |                                                                                                                                                                                     |
|-------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON13446G</b>            | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>PDIP8 9.655X6.6, 2.54P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**PDIP8 GW**  
CASE 709AC  
ISSUE O

DATE 31 JUL 2016



**NOTES:**

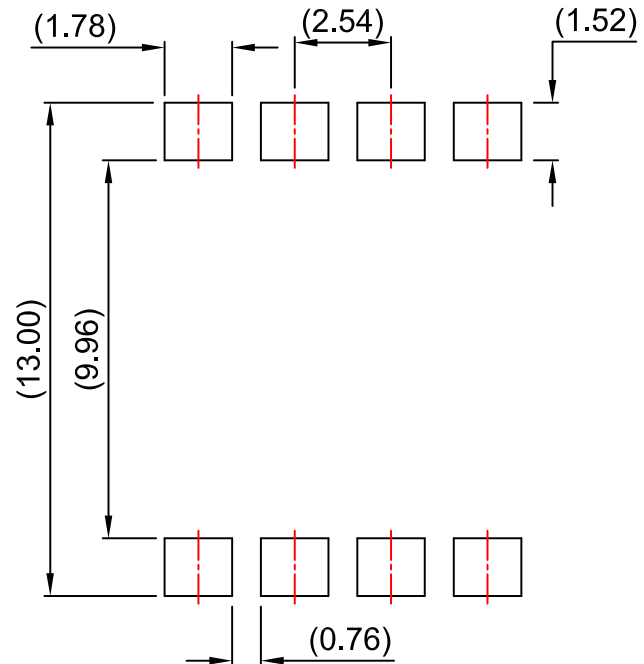
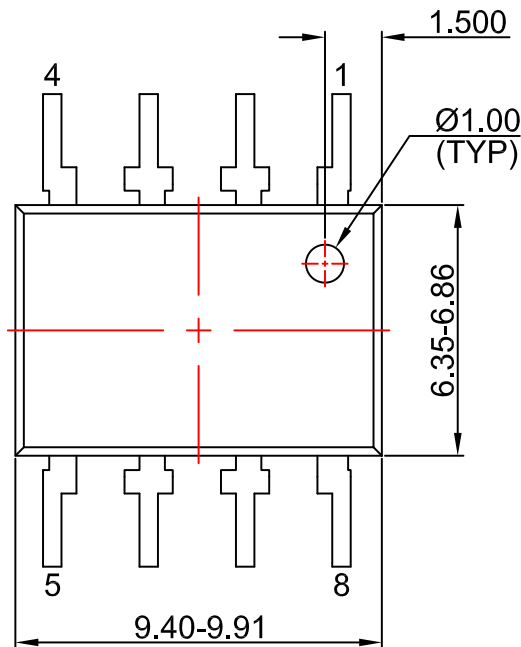
- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

|                         |                    |                                                                                                                                                                                     |
|-------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON13447G</b> | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>PDIP8 GW</b>    | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

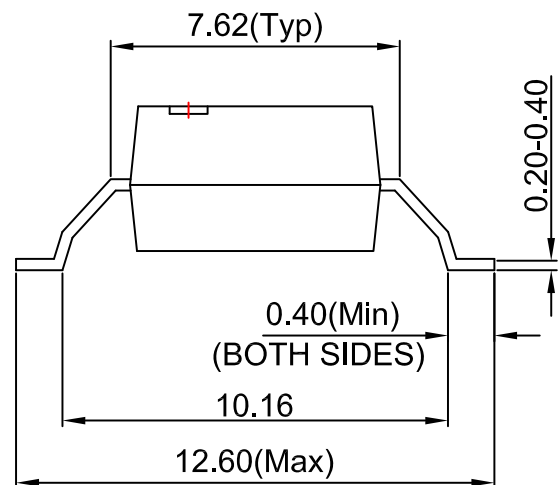
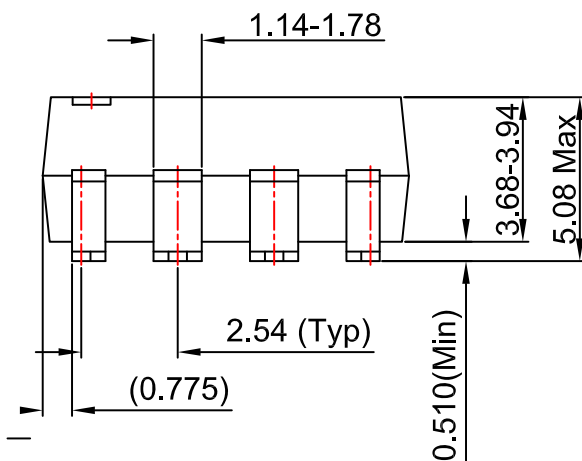
onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**PDIP8 GW**  
CASE 709AD  
ISSUE O

DATE 31 JUL 2016



LAND PATTERN RECOMMENDATION



NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

|                         |                    |                                                                                                                                                                                     |
|-------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON13448G</b> | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>PDIP8 GW</b>    | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)