

# Single-Channel: 6N137M, HCPL2601M, HCPL2611M Dual-Channel: HCPL2630M, HCPL2631M High-Speed 10 MBit/s Logic Gate Optocouplers

## Features

- Very High Speed – 10 MBit/s
- Superior CMR – 10 kV/μs
- Fan-out of 8 Over -40°C to +85°C
- Logic Gate Output
- Strobable Output
- Wired OR-open Collector
- U.L. Recognized (File # E90700, Vol. 2)

## Applications

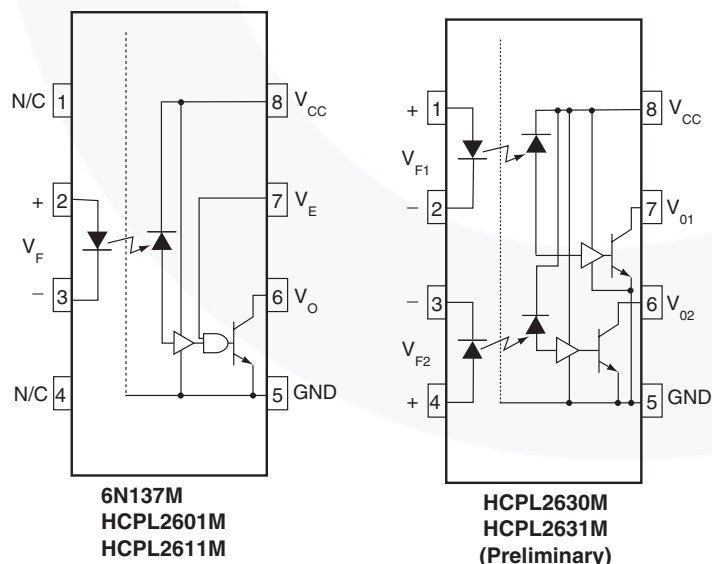
- Ground Loop Elimination
- LSTTL to TTL, LSTTL or 5 V CMOS
- Line Receiver, Data Transmission
- Data Multiplexing
- Switching Power Supplies
- Pulse Transformer Replacement
- Computer-peripheral Interface

## Description

The 6N137M, HCPL2601M, HCPL2611M single-channel and HCPL2630M, HCPL2631M dual-channel optocouplers consist of a 850 nm AlGaAs LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. This output features an open collector, thereby permitting wired OR outputs. The switching parameters are guaranteed over the temperature range of -40°C to +85°C. A maximum input signal of 5 mA will provide a minimum output sink current of 13 mA (fan out of 8).

An internal noise shield provides superior common mode rejection of typically 10 kV/μs. The HCPL2601M and HCPL2631M has a minimum CMR of 5 kV/μs. The HCPL2611M has a minimum CMR of 10 kV/μs.

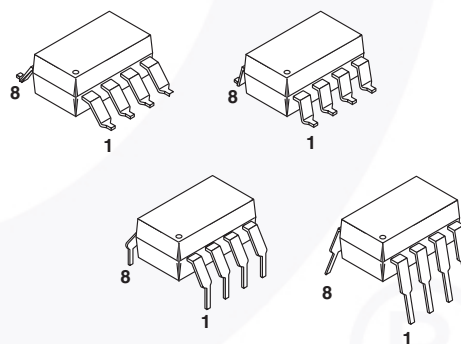
## Schematics



A 0.1μF bypass capacitor must be connected between pins 8 and 5<sup>(1)</sup>.

**Figure 1. Schematics**

## Package Outlines



**Figure 2. Package Options**

## Truth Table (Positive Logic)

| Input | Enable | Output |
|-------|--------|--------|
| H     | H      | L      |
| L     | H      | H      |
| H     | L      | H      |
| L     | L      | H      |
| H     | NC     | L      |
| L     | NC     | H      |

## Safety and Insulation Ratings for 8-Pin DIP White

As per DIN\_EN/IEC 60747-5-2. 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.

| Symbol                | Parameter                                                                                                                                                      | Min.            | Typ.      | Max. | Unit              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|------|-------------------|
|                       | Installation Classifications per DIN VDE 0110/1.89 Table 1                                                                                                     |                 |           |      |                   |
|                       | For Rated Mains Voltage < 150 V <sub>RMS</sub>                                                                                                                 |                 | I–IV      |      |                   |
|                       | For Rated Mains Voltage < 300 V <sub>RMS</sub>                                                                                                                 |                 | I–IV      |      |                   |
|                       | For Rated Mains Voltage < 450 V <sub>RMS</sub>                                                                                                                 |                 | I–III     |      |                   |
|                       | For Rated Mains Voltage < 600 V <sub>RMS</sub>                                                                                                                 |                 | I–III     |      |                   |
|                       | Climatic Classification                                                                                                                                        |                 | 40/100/21 |      |                   |
|                       | Pollution Degree (DIN VDE 0110/1.89)                                                                                                                           |                 | 2         |      |                   |
| CTI                   | Comparative Tracking Index                                                                                                                                     | 175             |           |      |                   |
| V <sub>PR</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           |           |      |                   |
|                       | Input to Output Test Voltage, Method a, V <sub>IORM</sub> × 1.5 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 60 s, Partial Discharge < 5 pC  | 1,335           |           |      |                   |
| V <sub>IORM</sub>     | Max 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 T, 0.4" Lead Spacing)                                                                                                           | 10.16           |           |      | mm                |
|                       | Insulation Thickness                                                                                                                                           | 0.5             |           |      | mm                |
| T <sub>S</sub>        | Safety Limit Values, Maximum Values Allowed in the Event of a Failure                                                                                          |                 |           |      |                   |
|                       | Case Temperature                                                                                                                                               | 150             |           |      | °C                |
| I <sub>S,INPUT</sub>  | Input Current                                                                                                                                                  | 200             |           |      | mA                |
| P <sub>S,OUTPUT</sub> | Output Power (Duty Factor ≤ 2.7%)                                                                                                                              | 300             |           |      | mW                |
| R <sub>IO</sub>       | Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V                                                                                              | 10 <sup>9</sup> |           |      | Ω                 |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.  $T_A = 25^\circ\text{C}$  unless otherwise specified.

| Symbol                            | Parameter                                                              |                             | Value        | Units |
|-----------------------------------|------------------------------------------------------------------------|-----------------------------|--------------|-------|
| T <sub>STG</sub>                  | Storage Temperature                                                    |                             | -40 to +125  | °C    |
| T <sub>OPR</sub>                  | Operating Temperature                                                  |                             | -40 to +100  | °C    |
| T <sub>SOL</sub>                  | Lead Solder Temperature                                                |                             | 260 for 10 s | °C    |
| Emitter                           |                                                                        |                             |              |       |
| I <sub>F</sub>                    | DC/Average Forward                                                     | Single Channel              | 50           | mA    |
|                                   | Input Current                                                          | Dual Channel (Each Channel) | 30           |       |
| V <sub>E</sub>                    | Enable Input Voltage Not to Exceed V <sub>CC</sub> by more than 500 mV | Single Channel              | 5.5          | V     |
| V <sub>R</sub>                    | Reverse Input Voltage                                                  | Each Channel                | 5.0          | V     |
| P <sub>I</sub>                    | Power Dissipation                                                      | Single Channel              | 100          | mW    |
|                                   |                                                                        | Dual Channel (Each Channel) | 45           |       |
| Detector                          |                                                                        |                             |              |       |
| V <sub>CC</sub><br>(1 minute max) | Supply Voltage                                                         |                             | 7.0          | V     |
| I <sub>O</sub>                    | Output Current                                                         | Single Channel              | 50           | mA    |
|                                   |                                                                        | Dual Channel (Each Channel) | 50           |       |
| V <sub>O</sub>                    | Output Voltage                                                         | Each Channel                | 7.0          | V     |
| P <sub>O</sub>                    | Collector Output                                                       | Single Channel              | 85           | mW    |
|                                   | Power Dissipation                                                      | Dual Channel (Each Channel) | 60           |       |

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

| Symbol   | Parameter                     | Min. | Max.     | Units            |
|----------|-------------------------------|------|----------|------------------|
| $I_{FL}$ | Input Current, Low Level      | 0    | 250      | $\mu\text{A}$    |
| $I_{FH}$ | Input Current, High Level     | *6.3 | 15       | mA               |
| $V_{CC}$ | Supply Voltage, Output        | 4.5  | 5.5      | V                |
| $V_{EL}$ | Enable Voltage, Low Level     | 0    | 0.8      | V                |
| $V_{EH}$ | Enable Voltage, High Level    | 2.0  | $V_{CC}$ | V                |
| $T_A$    | Ambient Operating Temperature | -40  | +85      | $^\circ\text{C}$ |
| N        | Fan Out (TTL load)            |      | 8        |                  |

\*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.

## Electrical Characteristics ( $T_A = 0$ to $70^\circ\text{C}$ unless otherwise specified)

### Individual Component Characteristics

| Symbol                    | Parameter                           | Test Conditions                                                         | Min.                                                                      | Typ.*   | Max.        | Unit                 |
|---------------------------|-------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------|---------|-------------|----------------------|
| <b>EMITTER</b>            |                                     |                                                                         |                                                                           |         |             |                      |
| $V_F$                     | Input Forward Voltage               | $I_F = 10\text{ mA}$<br>$T_A = 25^\circ\text{C}$                        |                                                                           |         | 1.8<br>1.75 | V                    |
| $B_{VR}$                  | Input Reverse Breakdown Voltage     | $I_R = 10\text{ }\mu\text{A}$                                           | 5.0                                                                       |         |             | V                    |
| $C_{IN}$                  | Input Capacitance                   | $V_F = 0$ , $f = 1\text{ MHz}$                                          |                                                                           | 60      |             | pF                   |
| $\Delta V_F / \Delta T_A$ | Input Diode Temperature Coefficient | $I_F = 10\text{ mA}$                                                    |                                                                           | -1.4    |             | mV/ $^\circ\text{C}$ |
| <b>DETECTOR</b>           |                                     |                                                                         |                                                                           |         |             |                      |
| $I_{CCH}$                 | High Level Supply Current           | $V_{CC} = 5.5\text{ V}$ , $I_F = 0\text{ mA}$ ,<br>$V_E = 0.5\text{ V}$ | Single Channel<br>Dual Channel                                            | 6<br>10 | 10<br>15    | mA                   |
| $I_{CCL}$                 | Low Level Supply Current            | Single Channel<br>Dual Channel                                          | $V_{CC} = 5.5\text{ V}$ ,<br>$I_F = 10\text{ mA}$<br>$V_E = 0.5\text{ V}$ | 8<br>14 | 13<br>21    | mA                   |
| $I_{EL}$                  | Low Level Enable Current            | $V_{CC} = 5.5\text{ V}$ , $V_E = 0.5\text{ V}$                          |                                                                           | -0.7    | -1.6        | mA                   |
| $I_{EH}$                  | High Level Enable Current           | $V_{CC} = 5.5\text{ V}$ , $V_E = 2.0\text{ V}$                          |                                                                           | -0.5    | -1.6        | mA                   |
| $V_{EH}$                  | High Level Enable Voltage           | $V_{CC} = 5.5\text{ V}$ , $I_F = 10\text{ mA}$                          | 2.0                                                                       |         |             | V                    |
| $V_{EL}$                  | Low Level Enable Voltage            | $V_{CC} = 5.5\text{ V}$ , $I_F = 10\text{ mA}^{(3)}$                    |                                                                           |         | 0.8         | V                    |

### Switching Characteristics ( $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ , $V_{CC} = 5\text{ V}$ , $I_F = 7.5\text{ mA}$ unless otherwise specified)

| Symbol                | AC Characteristics                                    | Test Conditions                                                                                                                                                        | Min.                                         | Typ.*          | Max.      | Unit             |
|-----------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|-----------|------------------|
| $T_{PLH}$             | Propagation Delay Time to Output HIGH Level           | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}^{(4)}$ (Fig. 14)<br>$T_A = 25^\circ\text{C}$                                                                           | 20                                           | 40             | 75<br>100 | ns               |
| $T_{PHL}$             | Propagation Delay Time to Output LOW Level            | $T_A = 25^\circ\text{C}^{(5)}$<br>$R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$ (Fig. 14)                                                                           | 25                                           | 40             | 75<br>100 | ns               |
| $ T_{PHL} - T_{PLH} $ | Pulse Width Distortion                                | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$ (Fig. 14)                                                                                                             |                                              | 1              | 35        | ns               |
| $t_r$                 | Output Rise Time (10% to 90%)                         | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}^{(6)}$ (Fig. 14)                                                                                                       |                                              | 30             |           | ns               |
| $t_f$                 | Output Rise Time (90% to 10%)                         | $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}^{(7)}$ (Fig. 14)                                                                                                       |                                              | 10             |           | ns               |
| $t_{ELH}$             | Enable Propagation Delay Time to Output HIGH Level    | $I_F = 7.5\text{ mA}$ , $V_{EH} = 3.5\text{ V}$ , $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}^{(8)}$ (Fig. 15)                                                     |                                              | 15             |           | ns               |
| $t_{EHL}$             | Enable Propagation Delay Time to Output LOW Level     | $I_F = 7.5\text{ mA}$ , $V_{EH} = 3.5\text{ V}$ , $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}^{(9)}$ (Fig. 15)                                                     |                                              | 15             |           | ns               |
| $ ICM_H $             | Common Mode Transient Immunity (at Output HIGH Level) | $T_A = 25^\circ\text{C}$ , $ IV_{CM}  = 50\text{ V}$ (Peak), $I_F = 0\text{ mA}$ ,<br>$V_{OH}$ (Min.) = $2.0\text{ V}$ ,<br>$R_L = 350\text{ }\Omega^{(10)}$ (Fig. 16) | 6N137M, HCPL2630M<br>HCPL2601M,<br>HCPL2631M | 10,000<br>5000 | 10,000    | V/ $\mu\text{s}$ |
|                       |                                                       | $ IV_{CM}  = 400\text{ V}$                                                                                                                                             | HCPL2611M                                    | 10,000         | 15,000    | V/ $\mu\text{s}$ |
| $ ICM_L $             | Common Mode Transient Immunity (at Output LOW Level)  | $R_L = 350\text{ }\Omega$ , $I_F = 7.5\text{ mA}$ ,<br>$V_{OL}$ (Max.) = $0.8\text{ V}$ ,<br>$T_A = 25^\circ\text{C}^{(11)}$ (Fig. 16)                                 | 6N137M, HCPL2630M<br>HCPL2601M,<br>HCPL2631M | 10,000<br>5000 | 10,000    | V/ $\mu\text{s}$ |
|                       |                                                       | $ IV_{CM}  = 400\text{ V}$                                                                                                                                             | HCPL2611M                                    | 10,000         | 15,000    | V/ $\mu\text{s}$ |

## Electrical Characteristics (Continued)

### Transfer Characteristics ( $T_A = -40$ to $+85^\circ\text{C}$ unless otherwise specified)

| Symbol   | DC Characteristics        | Test Conditions                                                                                                 | Min. | Typ.* | Max. | Unit          |
|----------|---------------------------|-----------------------------------------------------------------------------------------------------------------|------|-------|------|---------------|
| $I_{OH}$ | HIGH Level Output Current | $V_{CC} = 5.5\text{ V}$ , $V_O = 5.5\text{ V}$ ,<br>$I_F = 250\text{ }\mu\text{A}$ , $V_E = 2.0\text{ V}^{(2)}$ |      |       | 100  | $\mu\text{A}$ |
| $V_{OL}$ | LOW Level Output Current  | $V_{CC} = 5.5\text{ V}$ , $I_F = 5\text{ mA}$ , $V_E = 2.0\text{ V}$ ,<br>$I_{CL} = 13\text{ mA}^{(2)}$         |      | 0.4   | 0.6  | V             |
| $I_{FT}$ | Input Threshold Current   | $V_{CC} = 5.5\text{ V}$ , $V_O = 0.6\text{ V}$ , $V_E = 2.0\text{ V}$ ,<br>$I_{OL} = 13\text{ mA}$              |      | 3     | 5    | mA            |

### Isolation Characteristics ( $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise specified.)

| Symbol    | Characteristics                         | Test Conditions                                                                                                 | Min. | Typ.*     | Max. | Unit          |
|-----------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------|------|-----------|------|---------------|
| $I_{I-O}$ | Input-Output Insulation Leakage Current | Relative humidity = 45%,<br>$T_A = 25^\circ\text{C}$ , $t = 5\text{ s}$ ,<br>$V_{I-O} = 3000\text{ VDC}^{(12)}$ |      |           | 1.0* | $\mu\text{A}$ |
| $V_{ISO}$ | Withstand Insulation Test Voltage       | $RH < 50\%$ , $T_A = 25^\circ\text{C}$ ,<br>$I_{I-O} \leq 10\text{ }\mu\text{A}$ , $t = 1\text{ min.}^{(12)}$   | 5000 |           |      | $V_{RMS}$     |
| $R_{I-O}$ | Resistance (Input to Output)            | $V_{I-O} = 500\text{ V}^{(12)}$                                                                                 |      | $10^{11}$ |      | $\Omega$      |
| $C_{I-O}$ | Capacitance (Input to Output)           | $f = 1\text{ MHz}^{(12)}$                                                                                       |      | 1         |      | pF            |

\*All Typicals at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

#### Notes:

1. The  $V_{CC}$  supply to each optoisolator must be bypassed by a  $0.1\text{ }\mu\text{F}$  capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package  $V_{CC}$  and GND pins of each device.
2. Each channel.
3. Enable Input – No pull up resistor required as the device has an internal pull up resistor.
4.  $t_{PLH}$  – Propagation delay is measured from the  $3.75\text{ mA}$  level on the HIGH to LOW transition of the input current pulse to the  $1.5\text{ V}$  level on the LOW to HIGH transition of the output voltage pulse.
5.  $t_{PHL}$  – Propagation delay is measured from the  $3.75\text{ mA}$  level on the LOW to HIGH transition of the input current pulse to the  $1.5\text{ V}$  level on the HIGH to LOW transition of the output voltage pulse.
6.  $t_r$  – Rise time is measured from the 90% to the 10% levels on the LOW to HIGH transition of the output pulse.
7.  $t_f$  – Fall time is measured from the 10% to the 90% levels on the HIGH to LOW transition of the output pulse.
8.  $t_{ELH}$  – Enable input propagation delay is measured from the  $1.5\text{ V}$  level on the HIGH to LOW transition of the input voltage pulse to the  $1.5\text{ V}$  level on the LOW to HIGH transition of the output voltage pulse.
9.  $t_{EHL}$  – Enable input propagation delay is measured from the  $1.5\text{ V}$  level on the LOW to HIGH transition of the input voltage pulse to the  $1.5\text{ V}$  level on the HIGH to LOW transition of the output voltage pulse.
10.  $CM_H$  – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e.,  $V_{OUT} > 2.0\text{ V}$ ). Measured in volts per microsecond ( $\text{V}/\mu\text{s}$ ).
11.  $CM_L$  – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the LOW output state (i.e.,  $V_{OUT} < 0.8\text{ V}$ ). Measured in volts per microsecond ( $\text{V}/\mu\text{s}$ ).
12. Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shorted together.

## Typical Performance Curves

For Single-Channel Devices: 6N137M, HCPL2601M, and HCPL2611M

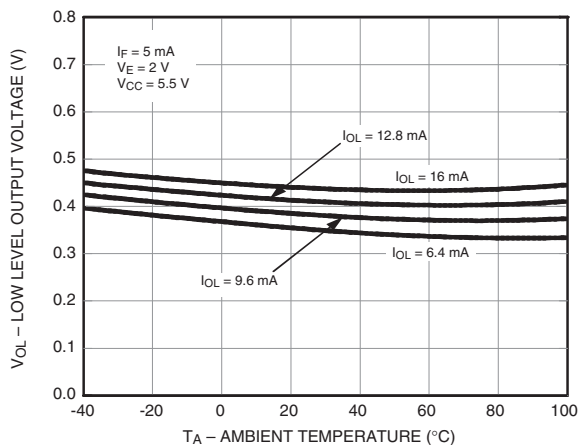


Figure 3. Low Level Output Voltage vs. Ambient Temperature

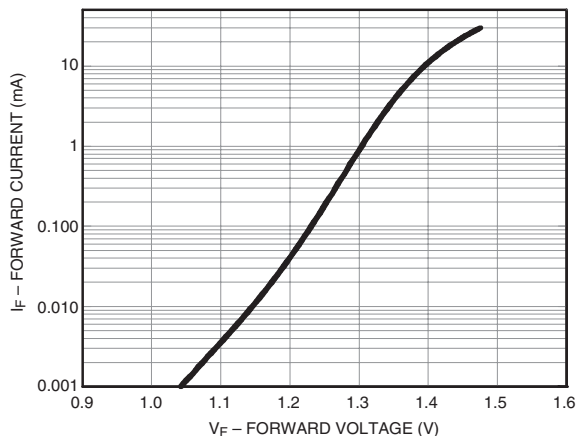


Figure 4. Input Diode Forward Voltage vs. Forward Current

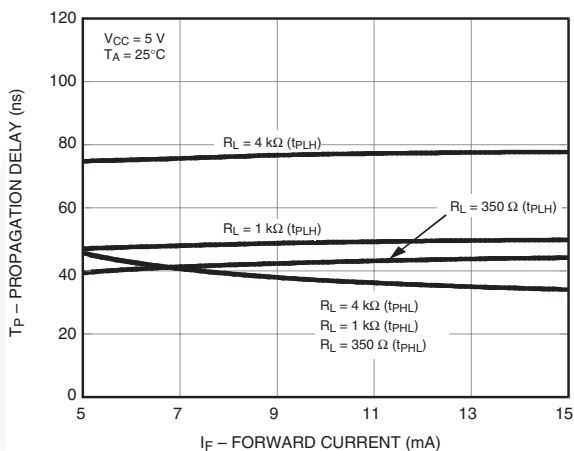


Figure 5. Switching Time vs. Forward Current

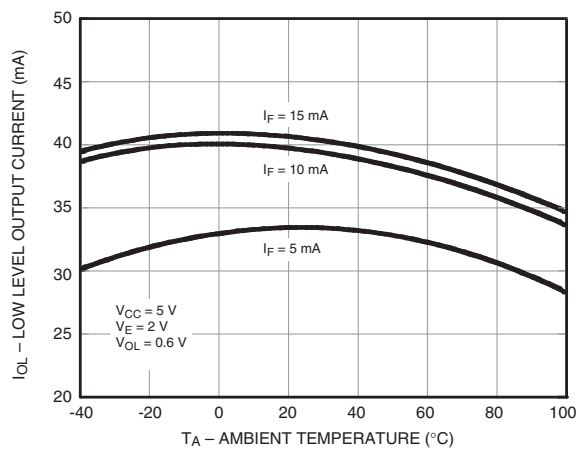


Figure 6. Low Level Output vs. Ambient Temperature

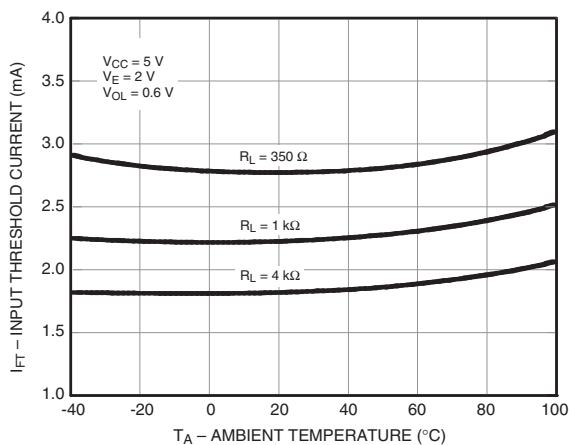


Figure 7. Input Threshold Current vs. Ambient Temperature

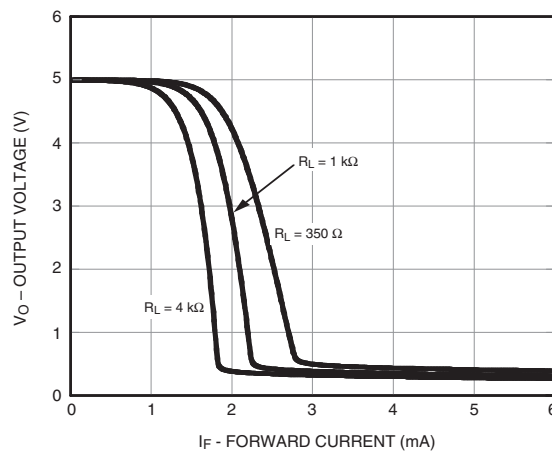


Figure 8. Output Voltage vs. Input Forward Current

## Typical Performance Curves (Continued)

(For Single-Channel Devices: 6N137M, HCPL2601M, HCPL2611M)

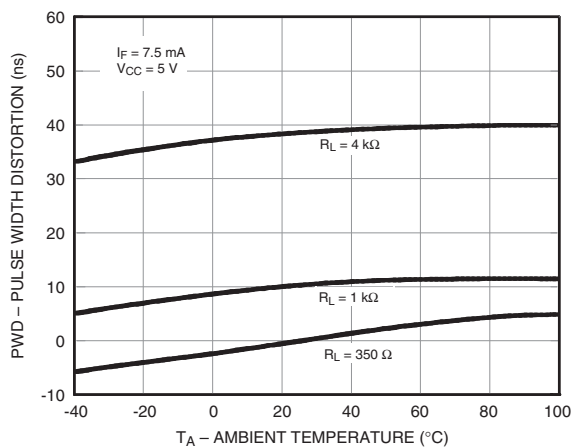


Figure 9. Pulse Width Distortion vs. Temperature

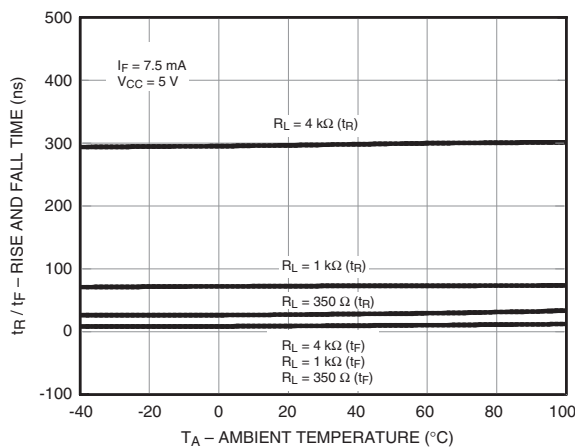


Figure 10. Rise and Fall Time vs. Temperature

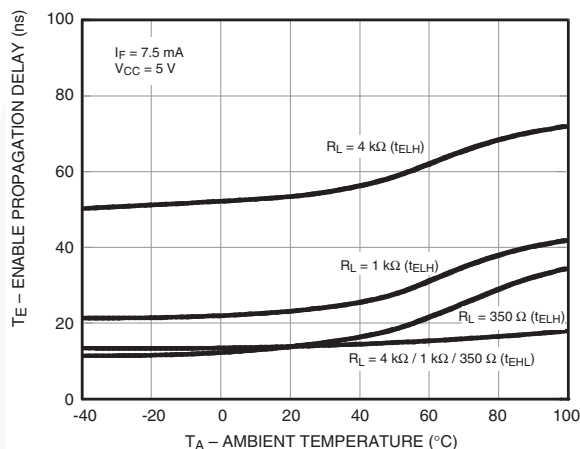


Figure 11. Enable Propagation Delay vs. Temperature

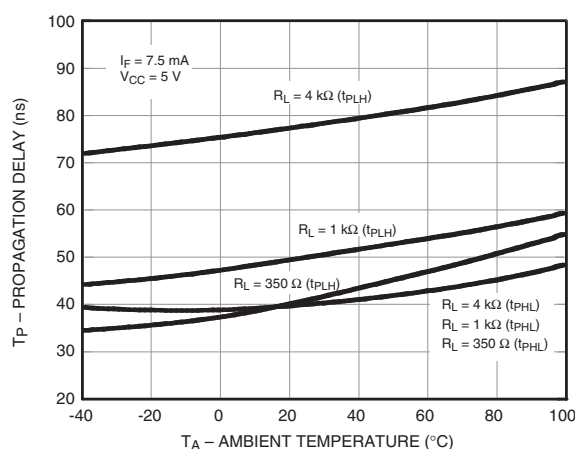


Figure 12. Switching Time vs. Temperature

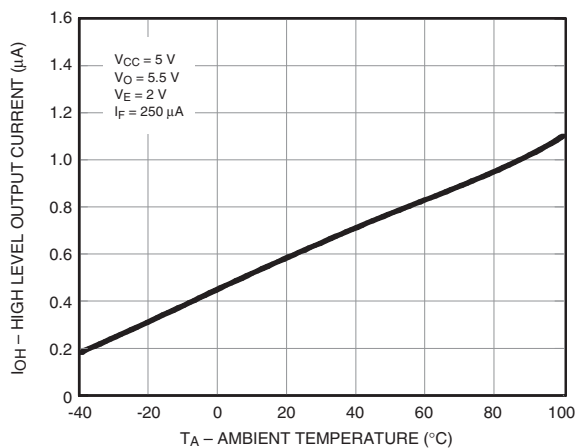


Figure 13. High Level Output Current vs. Temperature

## Typical Performance Curves (Continued)

For Dual-Channel Devices: HCPL2630M and HCPL2631M

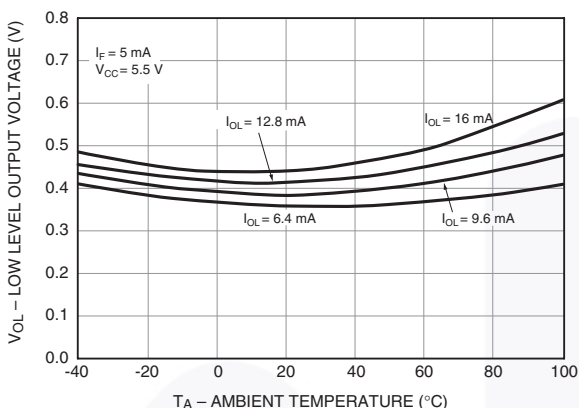


Figure 14. Low Level Output Voltage vs. Ambient Temperature

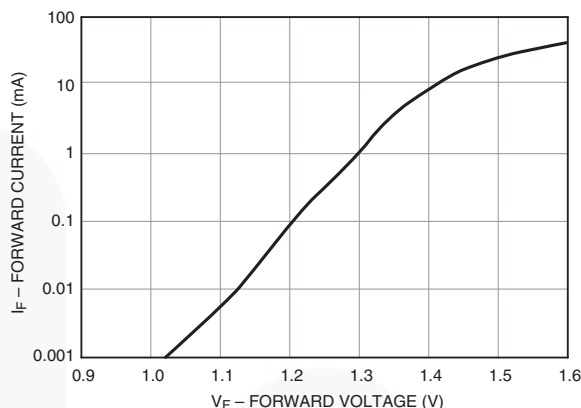


Figure 15. Input Diode Forward Voltage vs. Forward Current

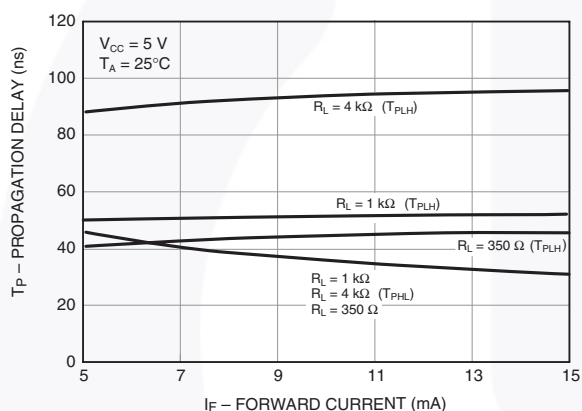


Figure 16. Switching Time vs. Forward Current

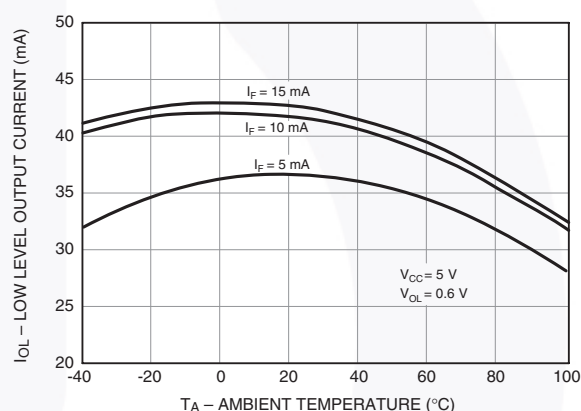


Figure 17. Low Level Output Current vs. Ambient Temperature

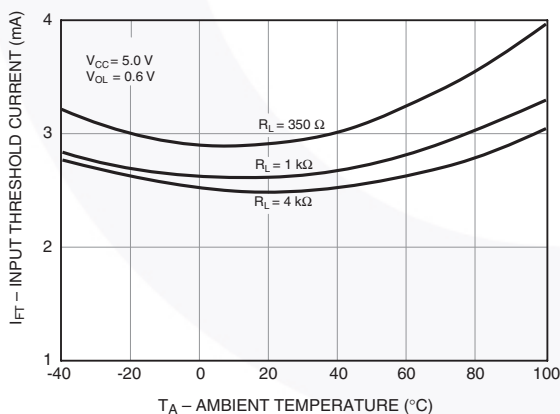


Figure 18. Input Threshold Current vs. Ambient Temperature

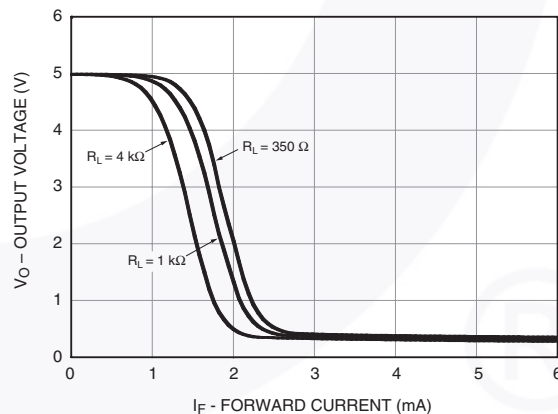


Figure 19. Output Voltage vs. Input Forward Current

## Typical Performance Curves (Continued)

For Dual-Channel Devices: HCPL2630M and HCPL2631M

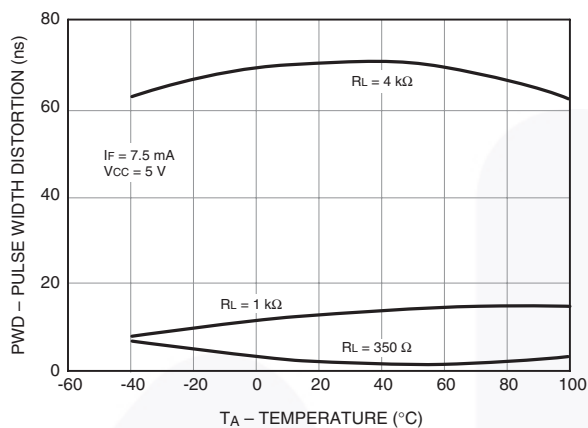


Figure 20. Pulse Width Distortion vs. Temperature

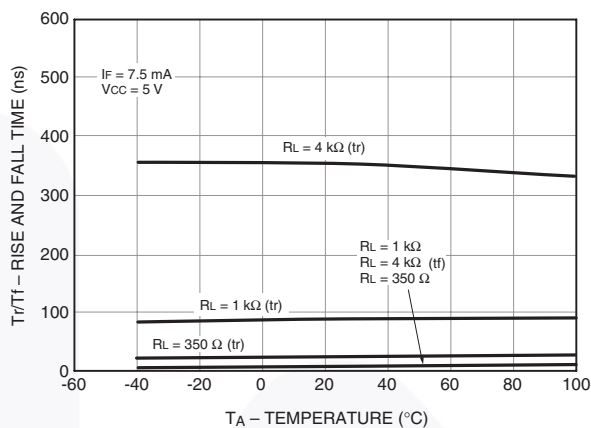


Figure 21. Rise and Fall Time vs. Temperature

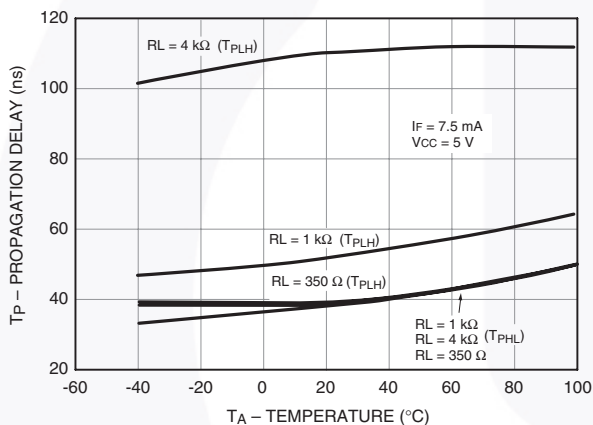


Figure 22. Switching Time vs. Temperature

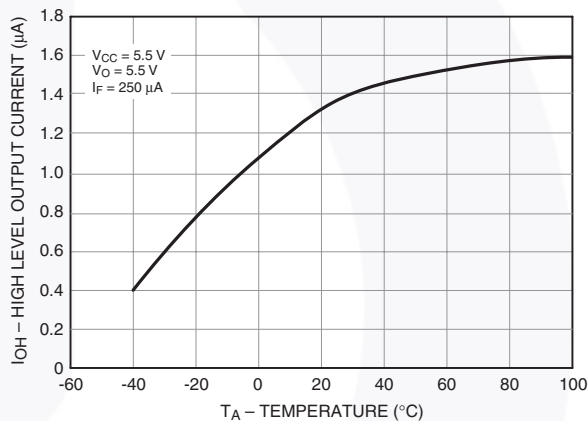


Figure 23. High Level Output Current vs. Temperature

## Test Circuits

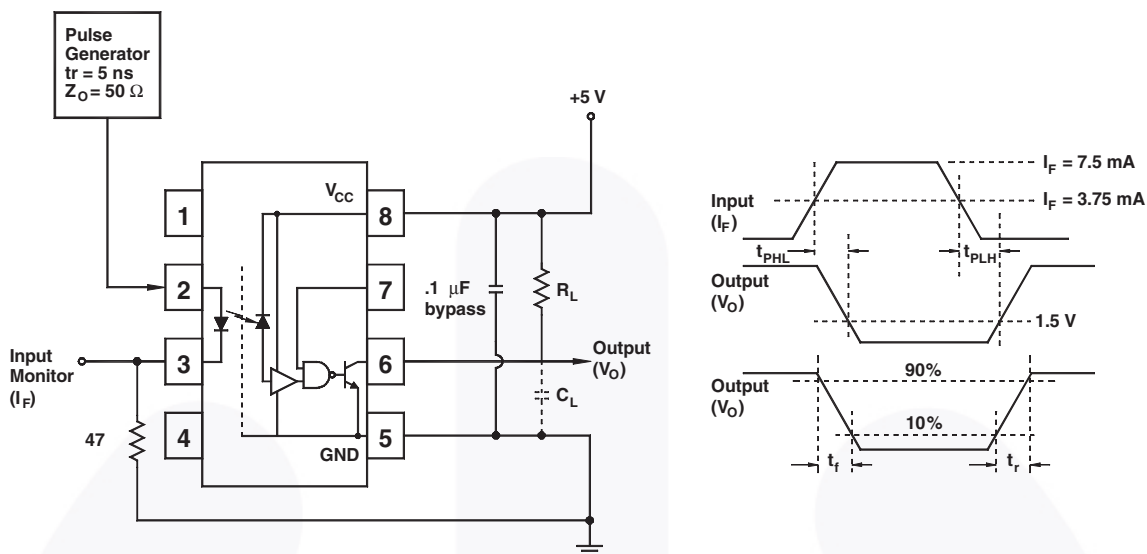


Figure 24. Test Circuit and Waveforms for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_r$  and  $t_f$

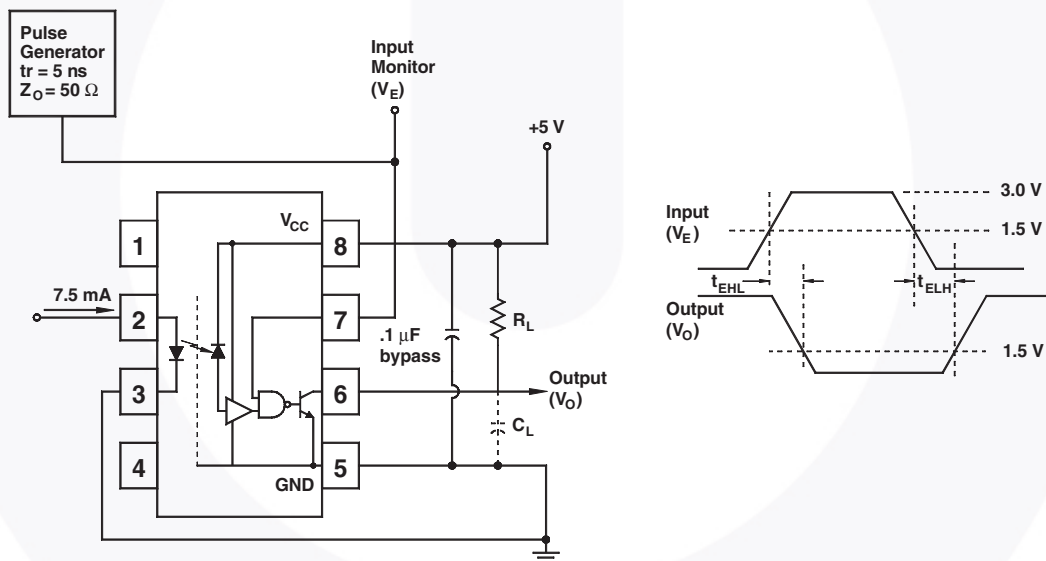


Figure 25. Test Circuit  $t_{EHL}$  and  $t_{ELH}$

## Test Circuits (Continued)

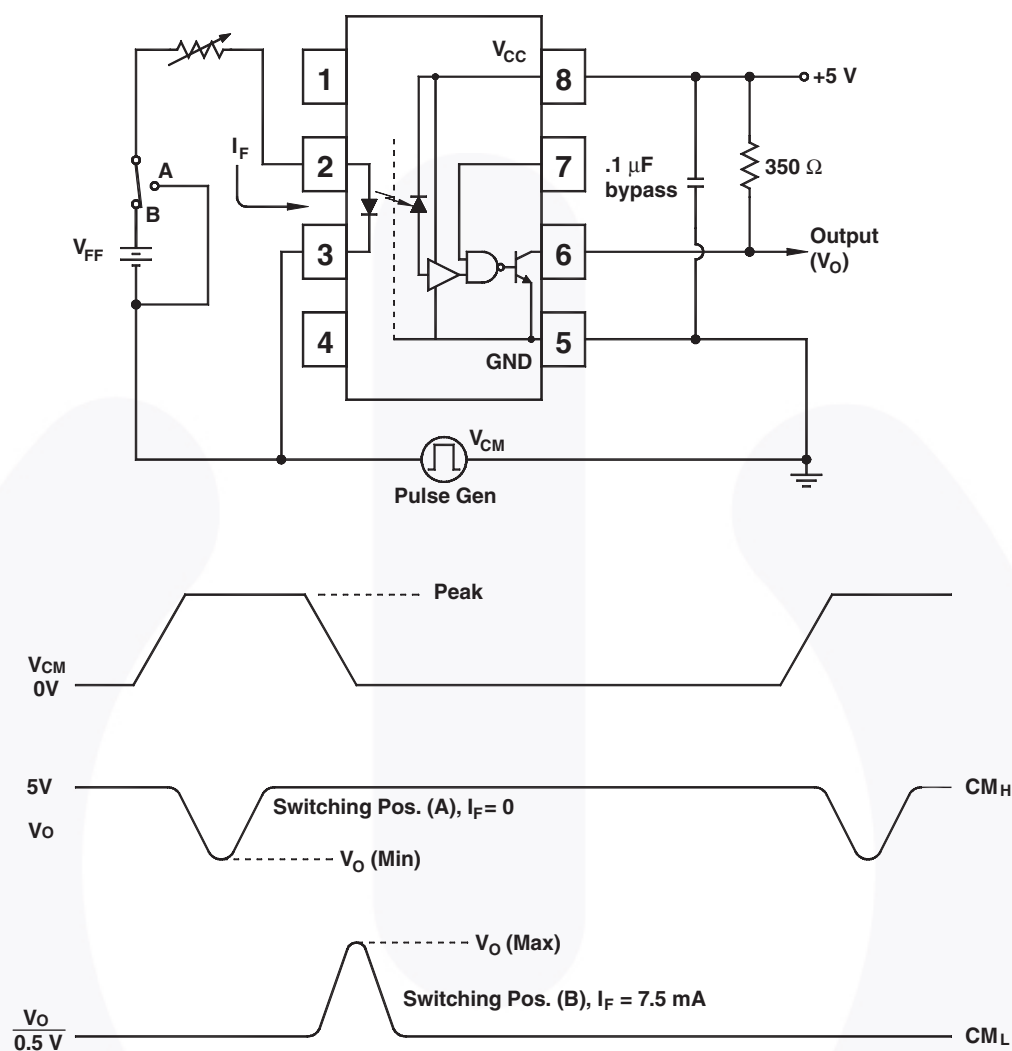
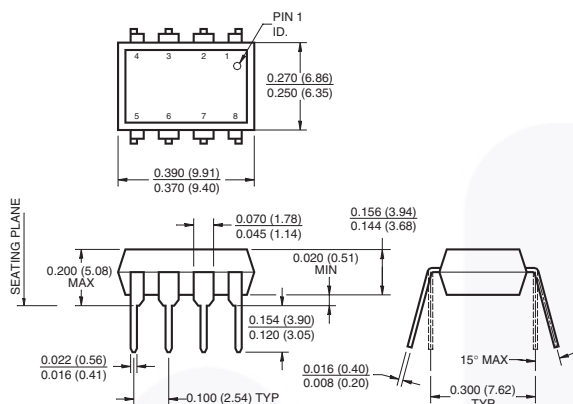


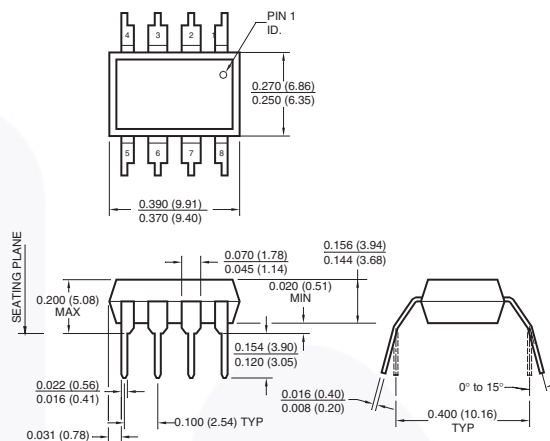
Figure 26. Test Circuit Common Mode Transient Immunity

## Package Dimensions

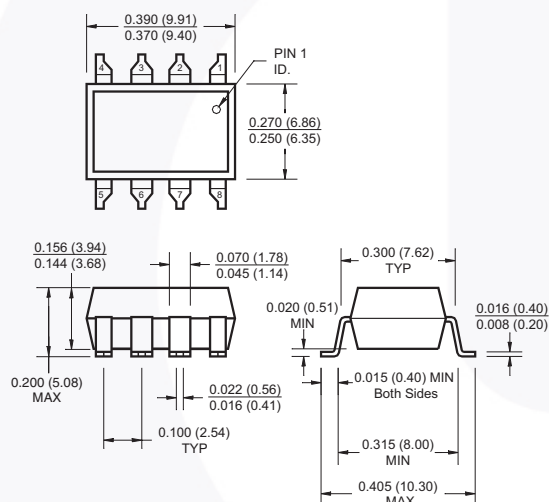
### Through Hole



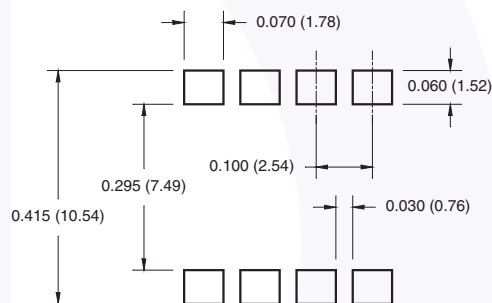
### 0.4" Lead Spacing (Option TV) (Pending)



### Surface Mount – 0.3" Lead Spacing (Option S)



### 8-Pin Surface Mount DIP – Land Pattern (Option S)



#### Note:

All dimensions are in inches (millimeters)

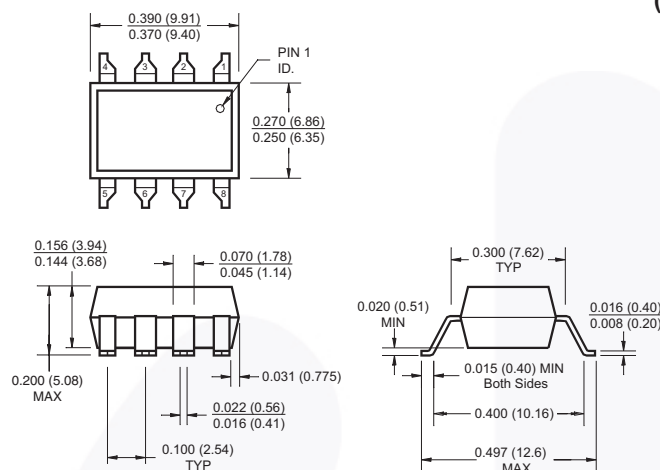
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

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## Package Dimensions (Continued)

### Surface Mount – 0.4" Lead Spacing (Option TS)



#### Note:

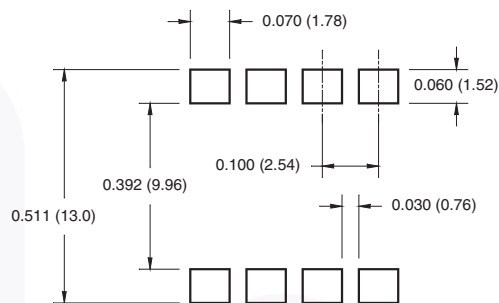
All dimensions are in inches (millimeters)

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

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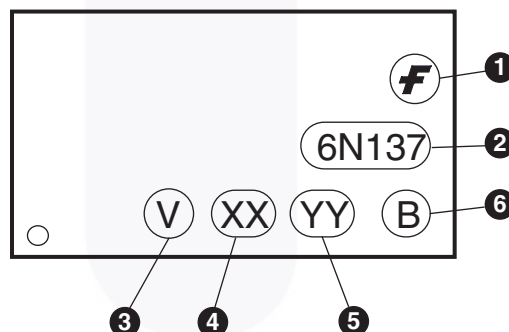
### 8-Pin Surface Mount DIP – Land Pattern (Option TS)



## Ordering Information

| Option    | Example Part Number | Description                                                                          |
|-----------|---------------------|--------------------------------------------------------------------------------------|
| No Suffix | 6N137M              | Standard Through Hole Device, 50 pcs per tube                                        |
| S         | 6N137SM             | Surface Mount Lead Bend                                                              |
| SD        | 6N137SDM            | Surface Mount; Tape and Reel                                                         |
| V         | 6N137VM             | DIN_EN/IEC60747-5-2 (VDE)                                                            |
| TV        | 6N137TVM            | DIN_EN/IEC60747-5-2 (VDE), 0.4" lead spacing                                         |
| SV        | 6N137SVM            | DIN_EN/IEC60747-5-2 (VDE), surface mount                                             |
| SDV       | 6N137SDVM           | DIN_EN/IEC60747-5-2 (VDE), surface mount, tape and reel                              |
| TS        | 6N137TSM            | Surface Mount, 0.4" lead spacing                                                     |
| TSV       | 6N137TSVM           | Surface Mount, 0.4" lead spacing, IEC60747-5-2 approval pending (VDE)                |
| TSR2      | 6N137TSR2M          | Surface Mount, Tape and Reel, 0.4" lead spacing                                      |
| TSR2V     | 6N137TSR2VM         | Surface Mount, Tape and Reel, 0.4" lead spacing, IEC60747-5-2 approval pending (VDE) |

## Marking Information



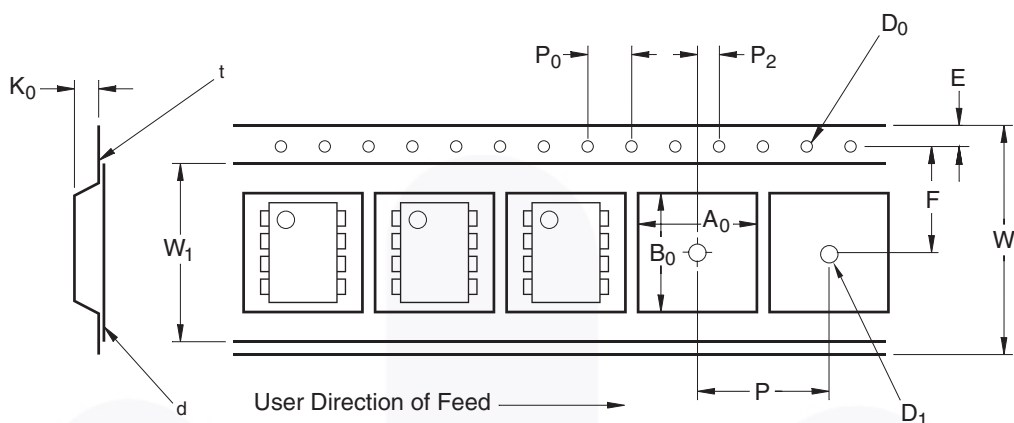
| Definitions |                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------|
| 1           | Fairchild logo                                                                                               |
| 2           | Device number                                                                                                |
| 3           | DIN_EN/IEC60747-5-2 (VDE) mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4           | Two digit year code, e.g., '13'                                                                              |
| 5           | Two digit work week ranging from '01' to '53'                                                                |
| 6           | Assembly package code                                                                                        |

### Note:

'HCPL' devices are marked only with the numerical characters (for example, HCPL2630 is marked as '2630').

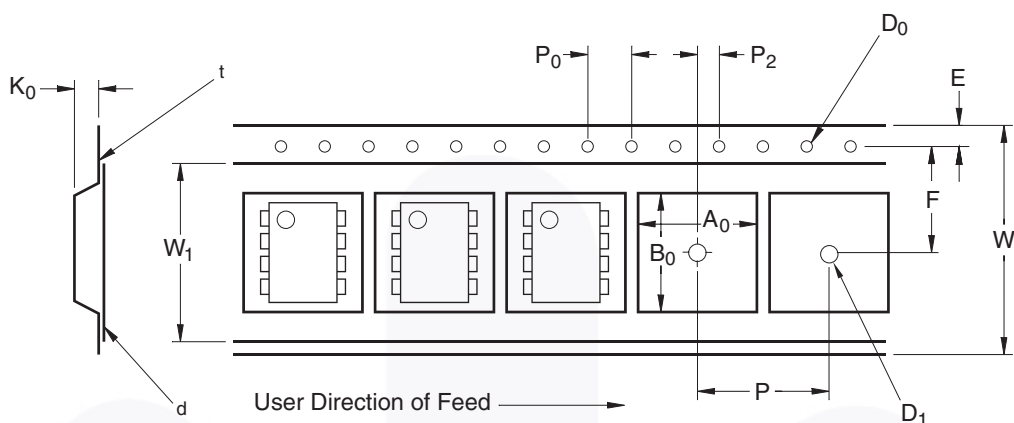
The 'M' suffix on the part number is an order identifier only. It is used to identify orders for the white package version. The 'M' does not appear on the device's top mark.

## Carrier Tape Specifications (Option SD)



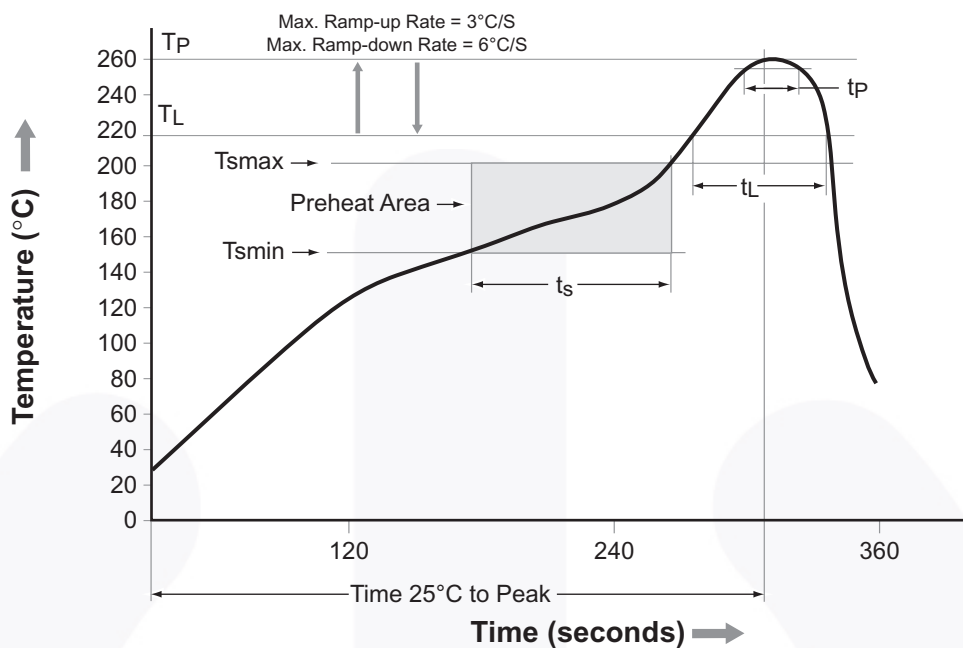
| Symbol | Description                     | Dimension in mm  |
|--------|---------------------------------|------------------|
| W      | Tape Width                      | $16.0 \pm 0.3$   |
| t      | Tape Thickness                  | $0.30 \pm 0.05$  |
| $P_0$  | Sprocket Hole Pitch             | $4.0 \pm 0.1$    |
| $D_0$  | Sprocket Hole Diameter          | $1.55 \pm 0.05$  |
| E      | Sprocket Hole Location          | $1.75 \pm 0.10$  |
| F      | Pocket Location                 | $7.5 \pm 0.1$    |
| $P_2$  |                                 | $2.0 \pm 0.1$    |
| P      | Pocket Pitch                    | $12.0 \pm 0.1$   |
| $A_0$  | Pocket Dimensions               | $10.30 \pm 0.20$ |
| $B_0$  |                                 | $10.30 \pm 0.20$ |
| $K_0$  |                                 | $4.90 \pm 0.20$  |
| $W_1$  | Cover Tape Width                | $13.2 \pm 0.2$   |
| d      | Cover Tape Thickness            | 0.1 maximum      |
|        | Max. Component Rotation or Tilt | $10^\circ$       |
| R      | Min. Bending Radius             | 30               |

## Carrier Tape Specifications (Option TSR2)



| Symbol         | Description                     | Dimension in mm |
|----------------|---------------------------------|-----------------|
| W              | Tape Width                      | 24.0 ± 0.3      |
| t              | Tape Thickness                  | 0.40 ± 0.1      |
| P <sub>0</sub> | Sprocket Hole Pitch             | 4.0 ± 0.1       |
| D <sub>0</sub> | Sprocket Hole Diameter          | 1.55 ± 0.05     |
| E              | Sprocket Hole Location          | 1.75 ± 0.10     |
| F              | Pocket Location                 | 11.5 ± 0.1      |
| P <sub>2</sub> |                                 | 2.0 ± 0.1       |
| P              | Pocket Pitch                    | 16.0 ± 0.1      |
| A <sub>0</sub> | Pocket Dimensions               | 12.80 ± 0.1     |
| B <sub>0</sub> |                                 | 10.35 ± 0.1     |
| K <sub>0</sub> |                                 | 5.7 ± 0.1       |
| W <sub>1</sub> | Cover Tape Width                | 21.0 ± 0.1      |
| d              | Cover Tape Thickness            | 0.1 max         |
|                | Max. Component Rotation or Tilt | 10°             |
| R              | Min. Bending Radius             | 30              |

## Reflow Profile



| Profile Feature                                  | Pb-Free Assembly Profile |
|--------------------------------------------------|--------------------------|
| Temperature Minimum ( $T_{smin}$ )               | 150°C                    |
| Temperature Maximum ( $T_{smax}$ )               | 200°C                    |
| Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ ) | 60 to 120 seconds        |
| 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 seconds        |
| Peak Body Package Temperature                    | 260°C +0°C / -5°C        |
| Time ( $t_p$ ) within 5°C of 260°C               | 30 seconds               |
| Ramp-down Rate ( $T_P$ to $T_L$ )                | 6°C/second maximum       |
| Time 25°C to Peak Temperature                    | 8 minutes maximum        |



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|  | MicroPak™                                      | STEALTH™                                                                          | UHC®                                                                                |
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| Fairchild Semiconductor®                                                          | MillerDrive™                                   | SuperSOT™-3                                                                       | UniFET™                                                                             |
| FACT Quiet Series™                                                                | MotionMax™                                     | SuperSOT™-6                                                                       | VCX™                                                                                |
| FACT®                                                                             | mVSaver™                                       | SuperSOT™-8                                                                       | VisualMax™                                                                          |
| FAST®                                                                             | OptoHiT™                                       | SupreMOS®                                                                         | VoltagePlus™                                                                        |
| FastvCore™                                                                        | OPTOLOGIC®                                     | SyncFET™                                                                          | XS™                                                                                 |
| FETBench™                                                                         | OPTOPLANAR®                                    |                                                                                   |                                                                                     |

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