



February 2016

# FOD3120

## High Noise Immunity, 2.5 A Output Current, Gate Drive Optocoupler

### Features

- High Noise Immunity Characterized by 35 kV/ $\mu$ s Minimum Common Mode Rejection
- 2.5 A Peak Output Current Driving Capability for Most 1200 V/20 A IGBT
- Use of P-channel MOSFETs at Output Stage Enables Output Voltage Swing Close to The Supply Rail
- Wide Supply Voltage Range from 15 V to 30 V
- Fast Switching Speed
  - 400 ns max. Propagation Delay
  - 100 ns max. Pulse Width Distortion
- Under Voltage LockOut (UVLO) with Hysteresis
- Extended Industrial Temperature Range, -40°C to 100°C Temperature Range
- Safety and Regulatory Approved
  - UL1577, 5000 V<sub>RMS</sub> for 1 min.
  - DIN EN/IEC60747-5-5
- R<sub>DS(ON)</sub> of 1  $\Omega$  (typ.) Offers Lower Power Dissipation
- >8.0 mm Clearance and Creepage Distance (Option 'T' or 'TS')
- 1,414 V Peak Working Insulation Voltage (V<sub>IORM</sub>)

### Applications

- Industrial Inverter
- Uninterruptible Power Supply
- Induction Heating
- Isolated IGBT/Power MOSFET Gate Drive

### Description

The FOD3120 is a 2.5 A Output Current Gate Drive Optocoupler, capable of driving most medium power IGBT/MOSFET. It is ideally suited for fast switching driving of power IGBT and MOSFETs used in motor control inverter applications, and high performance power system.

It utilizes Fairchild's coplanar packaging technology, Optoplanar<sup>®</sup>, and optimized IC design to achieve high noise immunity, characterized by high common mode rejection.

It consists of a gallium aluminum arsenide (AlGaAs) light emitting diode optically coupled to an integrated circuit with a high-speed driver for push-pull MOSFET output stage.

### Related Resources

- FOD3150, 1 A Output Current, Gate Drive Optocoupler Datasheet
- [www.fairchildsemi.com/products/optoelectronics/](http://www.fairchildsemi.com/products/optoelectronics/)

### Functional Block Diagram

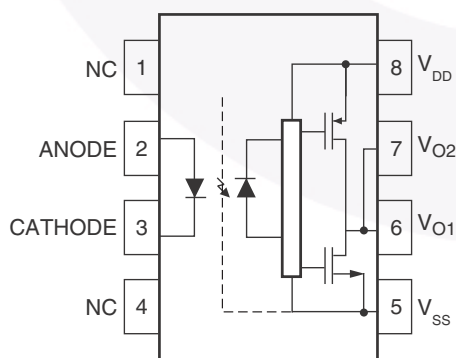


Figure 1. Functional Block Diagram<sup>(1)</sup>

#### Note:

1. 0.1  $\mu$ F bypass capacitor must be connected between pins 5 and 8.

### Package Outlines

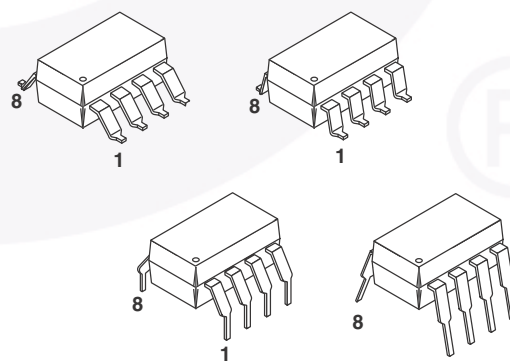


Figure 2. Package Outlines

**Truth Table**

| LED | $V_{DD} - V_{SS}$ "Positive Going"<br>(Turn-on) | $V_{DD} - V_{SS}$ "Negative Going"<br>(Turn-off) | $V_o$      |
|-----|---|--|------------|
| Off | 0 V to 30 V                                     | 0 V to 30 V                                      | Low        |
| On  | 0 V to 11.5 V                                   | 0 V to 10 V                                      | Low        |
| On  | 11.5 V to 13.5 V                                | 10 V to 12 V                                     | Transition |
| On  | 13.5 V to 30 V                                  | 12 V to 30 V                                     | High       |

**Pin Definitions**

| Pin # | Name     | Description  |
|-------|----------|--|
| 1     | NC       | Not Connected  |
| 2     | Anode    | LED Anode  |
| 3     | Cathode  | LED Cathode  |
| 4     | NC       | Not Connected  |
| 5     | $V_{SS}$ | Negative Supply Voltage                              |
| 6     | $V_{O2}$ | Output Voltage 2 (internally connected to $V_{O1}$ ) |
| 7     | $V_{O1}$ | Output Voltage 1                                     |
| 8     | $V_{DD}$ | Positive Supply Voltage                              |

## 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 |
|   | < 1000 V <sub>RMS</sub> (Option T, TS) | 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  | 2,262             | 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 | 2,651             | V <sub>peak</sub> |
| V <sub>IORM</sub>     | Maximum Working Insulation Voltage   | 1,414             | 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 or TS, 0.4" Lead Spacing)   | ≥ 10.16           | mm                |
| DTI                   | Distance Through Insulation (Insulation Thickness)   | ≥ 0.5             | mm                |
| T <sub>S</sub>        | Case Temperature <sup>(2)</sup>  | 175               | °C                |
| I <sub>S,INPUT</sub>  | Input Current <sup>(2)</sup>   | 400               | mA                |
| P <sub>S,OUTPUT</sub> | Output Power (Duty Factor ≤ 2.7%) <sup>(2)</sup>   | 700               | mW                |
| R <sub>IO</sub>       | Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V <sup>(2)</sup>   | > 10 <sup>9</sup> | Ω                 |

**Note:**

2. Safety limit value - maximum values allowed in the event of a failure.

**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

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.

| Symbol                 | Parameter  | Value                       | Unit             |
|------------------------|--|-----------------------------|------------------|
| $T_{STG}$              | Storage Temperature  | -55 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 Wave Solder Temperature<br>(refer to page 21 for reflow solder profile) | 260 for 10sec               | $^\circ\text{C}$ |
| $I_{F(AVG)}$           | Average Input Current  | 25                          | mA               |
| $I_{F(PEAK)}$          | Peak Transient Forward Current <sup>(3)</sup>                                | 1                           | A                |
| f                      | Operating Frequency <sup>(4)</sup>   | 50                          | kHz              |
| $V_R$                  | Reverse Input Voltage  | 5                           | V                |
| $I_{O(PEAK)}$          | Peak Output Current <sup>(5)</sup>   | 3.0                         | A                |
| $V_{DD} - V_{SS}$      | Supply Voltage   | $T_A \leq 90^\circ\text{C}$ | 0 to 35          |
|                        |  | $T_A \geq 90^\circ\text{C}$ | 0 to 30          |
| $V_{O(PEAK)}$          | Peak Output Voltage  | 0 to $V_{DD}$               | V                |
| $t_{R(IN)}, t_{F(IN)}$ | Input Signal Rise and Fall Time  | 500                         | ns               |
| $PD_I$                 | Input Power Dissipation <sup>(6)(8)</sup>                                    | 45                          | mW               |
| $PD_O$                 | Output Power Dissipation <sup>(7)(8)</sup>                                   | 250                         | mW               |

**Notes:**

- Pulse Width,  $P_W \leq 1 \mu\text{s}$ , 300 pps
- Exponential Waveform,  $I_{O(PEAK)} \leq |2.5 \text{ A}| (\leq 0.3 \mu\text{s})$
- Maximum pulse width = 10  $\mu\text{s}$ , maximum duty cycle = 1.1%
- Derate linearly above 87 $^\circ\text{C}$ , free air temperature at a rate of 0.77 mW/ $^\circ\text{C}$
- No derating required across temperature range.
- Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

**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                     | Value       | Unit             |
|-------------------|-------------------------------|-------------|------------------|
| $T_A$             | Ambient Operating Temperature | -40 to +100 | $^\circ\text{C}$ |
| $V_{DD} - V_{SS}$ | Power Supply                  | 15 to 30    | V                |
| $I_{F(ON)}$       | Input Current (ON)            | 7 to 16     | mA               |
| $V_{F(OFF)}$      | Input Voltage (OFF)           | 0 to 0.8    | V                |

## Isolation Characteristics

Apply over all recommended conditions, typical value is measured at  $T_A = 25^\circ\text{C}$

| Symbol    | Parameter                      | Conditions  | Min.  | Typ.      | Max. | Unit      |
|-----------|--------------------------------|---|-------|-----------|------|-----------|
| $V_{ISO}$ | Input-Output Isolation Voltage | $T_A = 25^\circ\text{C}$ , R.H. < 50%, $t = 1.0\text{min}$ , $I_{I-O} \leq 10 \mu\text{A}$ , 50 Hz <sup>(9)(10)</sup> | 5,000 |           |      | $V_{RMS}$ |
| $R_{ISO}$ | Isolation Resistance           | $V_{I-O} = 500 \text{V}^{(9)}$  |       | $10^{11}$ |      | $\Omega$  |
| $C_{ISO}$ | Isolation Capacitance          | $V_{I-O} = 0 \text{V}$ , Freq = 1.0 MHz <sup>(9)</sup>  |       | 1         |      | pF        |

### Notes:

9. Device is considered a two terminal device: Pins 2 and 3 are shorted together and Pins 5, 6, 7 and 8 are shorted together.

10. 5,000  $V_{RMS}$  for 1 minute duration is equivalent to 6,000  $V_{ACRMS}$  for 1 second duration.

## Electrical Characteristics

Apply over all recommended conditions, typical value is measured at  $V_{DD} = 30 \text{V}$ ,  $V_{SS} = \text{Ground}$ ,  $T_A = 25^\circ\text{C}$  unless otherwise specified.

| Symbol              | Parameter                                  | Conditions  | Min.                     | Typ.                    | Max.                     | Unit                 |
|---------------------|--|---|--------------------------|-------------------------|--------------------------|----------------------|
| $V_F$               | Input Forward Voltage                      | $I_F = 10 \text{mA}$  | 1.2                      | 1.5                     | 1.8                      | V                    |
| $\Delta(V_F / T_A)$ | Temperature Coefficient of Forward Voltage |   |                          | -1.8                    |                          | mV/ $^\circ\text{C}$ |
| $BV_R$              | Input Reverse Breakdown Voltage            | $I_R = 10 \mu\text{A}$                                      | 5                        |                         |                          | V                    |
| $C_{IN}$            | Input Capacitance                          | $f = 1 \text{MHz}$ , $V_F = 0\text{V}$                      |                          | 60                      |                          | pF                   |
| $I_{OH}$            | High Level Output Current <sup>(4)</sup>   | $V_O = V_{DD} - 3 \text{V}$                                 | -1.0                     | -2.0                    | -2.5                     | A                    |
|                     |  | $V_O = V_{DD} - 6 \text{V}$                                 | -2.0                     |                         | -2.5                     |                      |
| $I_{OL}$            | Low Level Output Current <sup>(4)</sup>    | $V_O = V_{SS} + 3 \text{V}$                                 | 1.0                      | 2.0                     | 2.5                      | A                    |
|                     |  | $V_O = V_{SS} + 6 \text{V}$                                 | 2.0                      |                         | 2.5                      |                      |
| $V_{OH}$            | High Level Output Voltage                  | $I_F = 10 \text{mA}$ , $I_O = -2.5 \text{A}$                | $V_{DD} - 6.25 \text{V}$ | $V_{DD} - 2.5 \text{V}$ |                          | V                    |
|                     |  | $I_F = 10 \text{mA}$ , $I_O = -100 \text{mA}$               | $V_{DD} - 0.25 \text{V}$ | $V_{DD} - 0.1 \text{V}$ |                          |                      |
| $V_{OL}$            | Low Level Output Voltage                   | $I_F = 0 \text{mA}$ , $I_O = 2.5 \text{A}$                  |                          | $V_{SS} + 2.5 \text{V}$ | $V_{SS} + 6.25 \text{V}$ | V                    |
|                     |  | $I_F = 0 \text{mA}$ , $I_O = 100 \text{mA}$                 |                          | $V_{SS} + 0.1 \text{V}$ | $V_{SS} + 0.25 \text{V}$ |                      |
| $I_{DDH}$           | High Level Supply Current                  | $V_O = \text{Open}$ ,<br>$I_F = 7 \text{ to } 16 \text{mA}$ |                          | 2.8                     | 3.8                      | mA                   |
| $I_{DDL}$           | Low Level Supply Current                   | $V_O = \text{Open}$ ,<br>$V_F = 0 \text{ to } 0.8 \text{V}$ |                          | 2.8                     | 3.8                      | mA                   |
| $I_{FLH}$           | Threshold Input Current Low to High        | $I_O = 0 \text{mA}$ , $V_O > 5 \text{V}$                    |                          | 2.3                     | 5.0                      | mA                   |
| $V_{FHL}$           | Threshold Input Voltage High to Low        | $I_O = 0 \text{mA}$ , $V_O < 5 \text{V}$                    | 0.8                      |                         |                          | V                    |
| $V_{UVLO+}$         | Under Voltage Lockout Threshold            | $I_F = 10 \text{mA}$ , $V_O > 5 \text{V}$                   | 11.5                     | 12.7                    | 13.5                     | V                    |
| $V_{UVLO-}$         |  | $I_F = 10 \text{mA}$ , $V_O < 5 \text{V}$                   | 10.0                     | 11.2                    | 12.0                     | V                    |
| $UVLO_{HYS}$        | Under Voltage Lockout Threshold Hysteresis |   |                          | 1.5                     |                          | V                    |

## Switching Characteristics

Apply over all recommended conditions, typical value is measured at  $V_{DD} = 30\text{ V}$ ,  $V_{SS} = \text{Ground}$ ,  $T_A = 25^\circ\text{C}$  unless otherwise specified.

| Symbol          | Parameter  | Conditions   | Min.                                      | Typ. | Max.          | Unit                    |
|-----------------|--|--|---|------|---------------|-------------------------|
| $t_{PHL}$       | Propagation Delay Time to Logic Low Output   | $I_F = 7\text{ mA to }16\text{ mA}$ ,<br>$R_g = 10\ \Omega$ , $C_g = 10\text{ nF}$ ,<br>$f = 10\text{ kHz}$ , Duty Cycle = 50% | 150                                       | 275  | 400           | ns                      |
| $t_{PLH}$       | Propagation Delay Time to Logic High Output  |  | 150                                       | 255  | 400           | ns                      |
| PWD             | Pulse Width Distortion,<br>$ t_{PHL} - t_{PLH} $   |  | 20  | 100  | ns            |                         |
| PDD (Skew)      | Propagation Delay Difference Between Any Two Parts or Channels, $(t_{PHL} - t_{PLH})^{(11)}$ |  | -250                                      | 250  | ns            |                         |
| $t_R$           | Output Rise Time (10% – 90%)   |  | 60  | ns   |               |                         |
| $t_F$           | Output Fall Time (90% – 10%)   |  | 60  | ns   |               |                         |
| $t_{UVLO\ ON}$  | UVLO Turn On Delay   |  | $I_F = 10\text{ mA}$ , $V_O > 5\text{ V}$ |      | 1.6           | $\mu\text{s}$           |
| $t_{UVLO\ OFF}$ | UVLO Turn Off Delay  | $I_F = 10\text{ mA}$ , $V_O < 5\text{ V}$  |   | 0.4  | $\mu\text{s}$ |                         |
| $ CM_H $        | Common Mode Transient Immunity at Output High  | $T_A = 25^\circ\text{C}$ , $V_{DD} = 30\text{ V}$ ,<br>$I_F = 7\text{ to }16\text{ mA}$ ,<br>$V_{CM} = 2000\text{ V}^{(12)}$   | 35  | 50   |               | $\text{kV}/\mu\text{s}$ |
| $ CM_L $        | Common Mode Transient Immunity at Output Low   | $T_A = 25^\circ\text{C}$ , $V_{DD} = 30\text{ V}$ , $V_F = 0\text{ V}$ ,<br>$V_{CM} = 2000\text{ V}^{(13)}$                    | 35  | 50   |               | $\text{kV}/\mu\text{s}$ |

### Notes:

- The difference between  $t_{PHL}$  and  $t_{PLH}$  between any two FOD3120 parts under same test conditions.
- Common mode transient immunity at output high is the maximum tolerable negative  $dV_{cm}/dt$  on the trailing edge of the common mode impulse signal,  $V_{cm}$ , to assure that the output will remain high (i.e.  $V_O > 15.0\text{ V}$ ).
- Common mode transient immunity at output low is the maximum tolerable positive  $dV_{cm}/dt$  on the leading edge of the common pulse signal,  $V_{cm}$ , to assure that the output will remain low (i.e.  $V_O < 1.0\text{ V}$ ).

## Typical Performance Characteristics

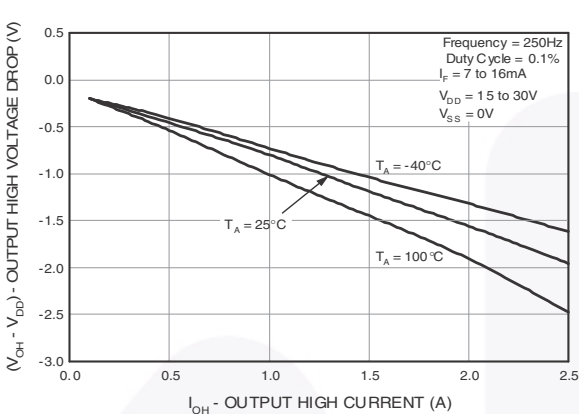


Fig. 3 Output High Voltage Drop vs. Output High Current

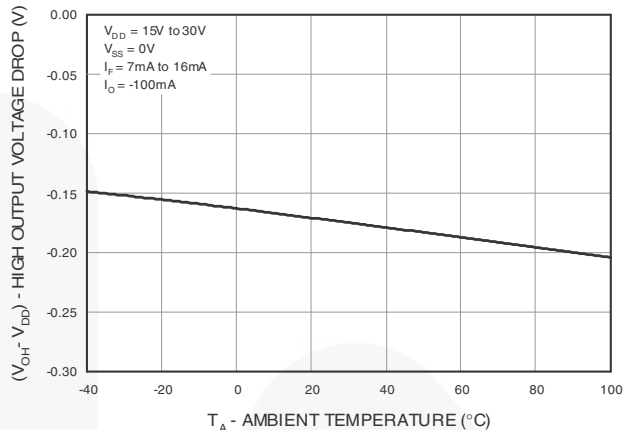


Fig. 4 Output High Voltage Drop vs. Ambient Temperature

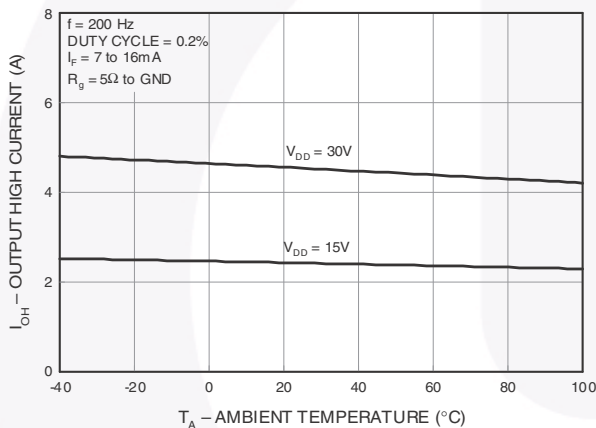


Fig. 5 Output High Current vs. Ambient Temperature

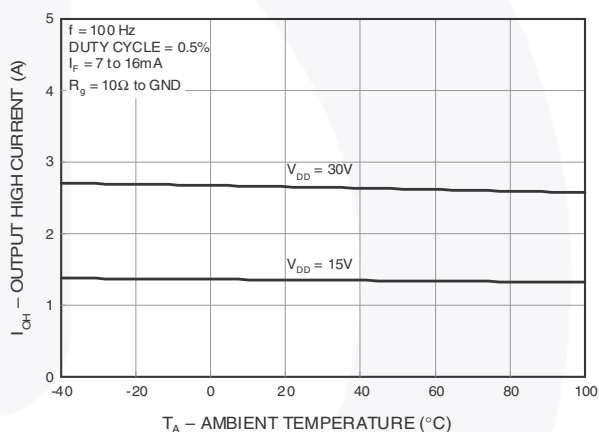


Fig. 6 Output High Current vs. Ambient Temperature

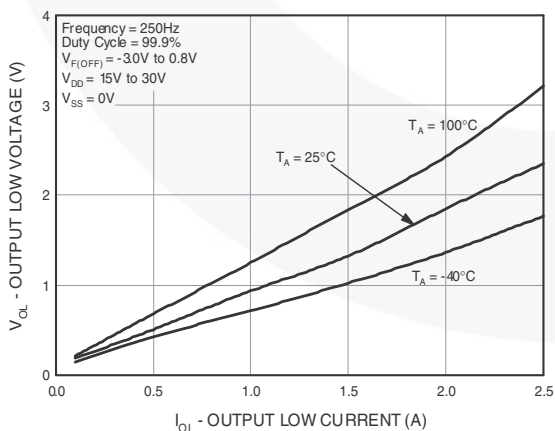


Fig. 7 Output Low Voltage vs. Output Low Current

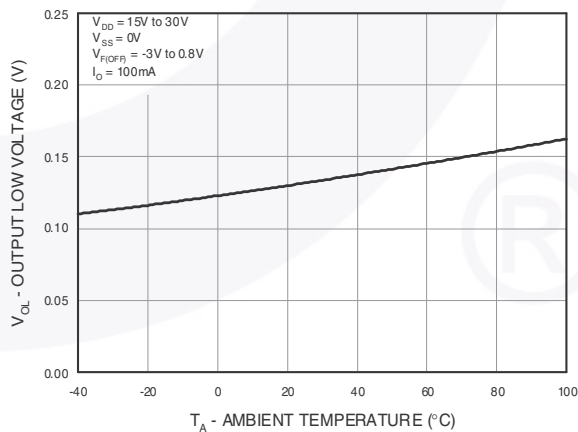
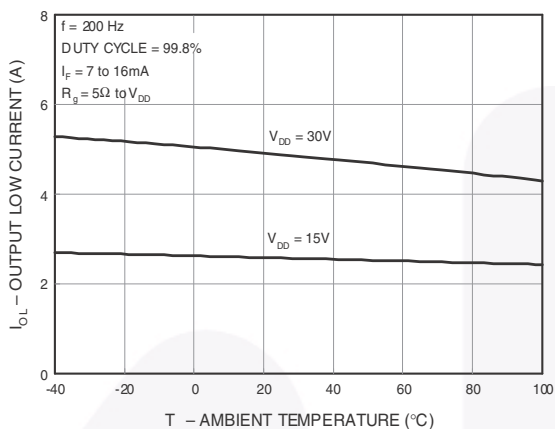
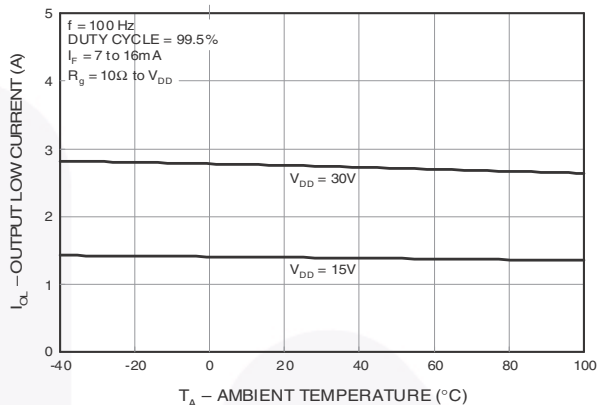


Fig. 8 Output Low Voltage vs. Ambient Temperature

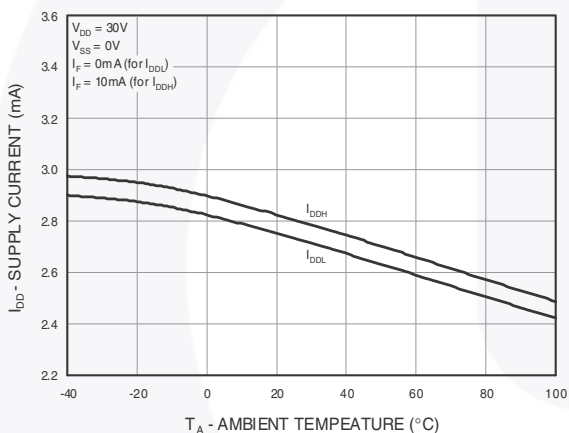
### Typical Performance Characteristics (Continued)



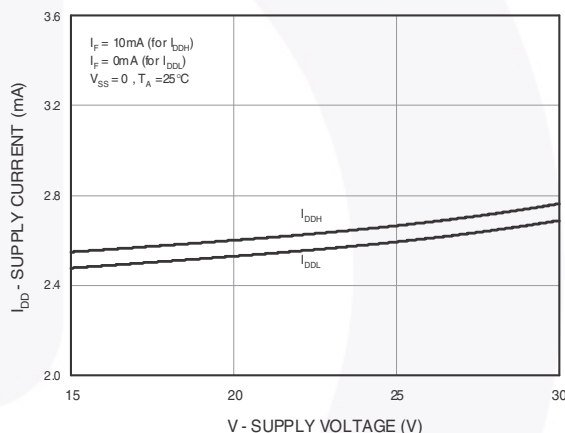
**Fig. 9 Output Low Current vs. Ambient Temperature**



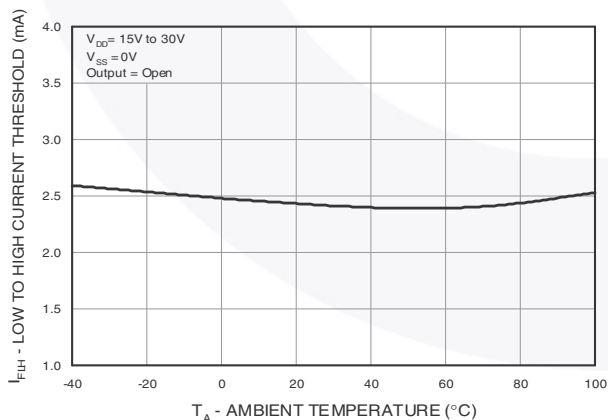
**Fig. 10 Output Low Current vs. Ambient Temperature**



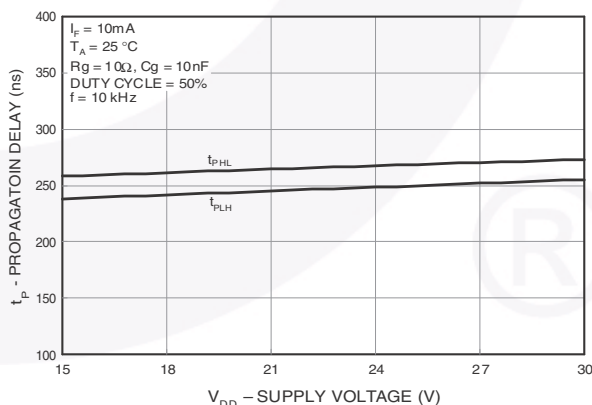
**Fig. 11 Supply Current vs. Ambient Temperature**



**Fig. 12 Supply Current vs. Supply Voltage**



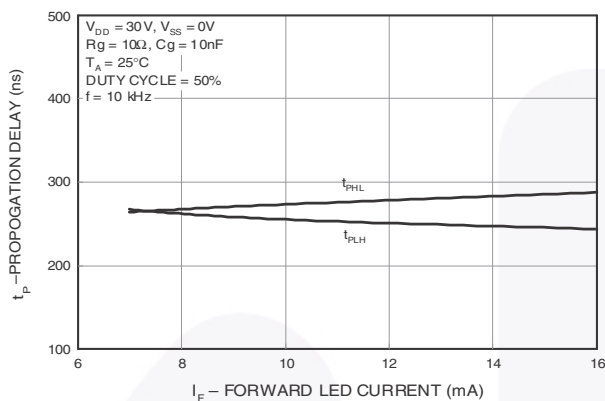
**Fig. 13 Low to High Input Current Threshold vs. Ambient Temperature**



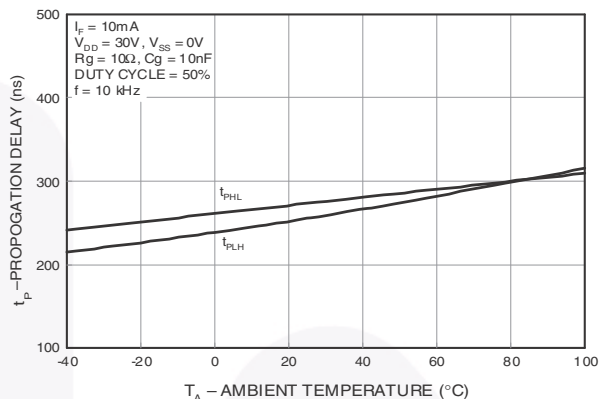
**Fig. 14 Propagation Delay vs. Supply Voltage**



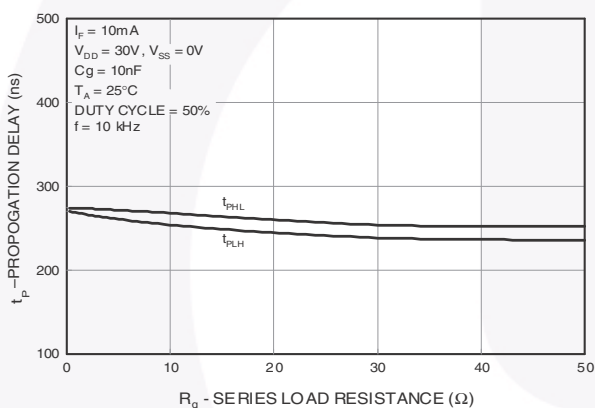
## Typical Performance Characteristics (Continued)



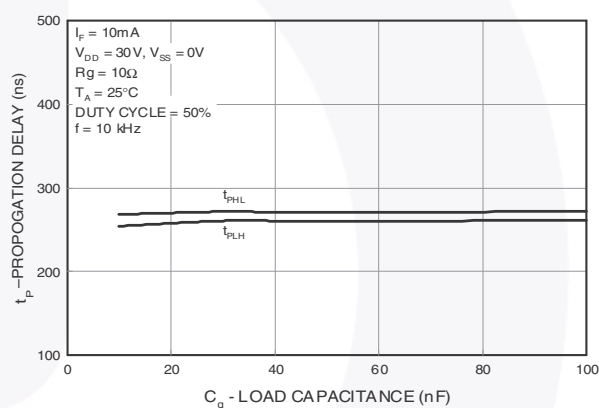
**Fig. 15 Propagation Delay vs. LED Forward Current**



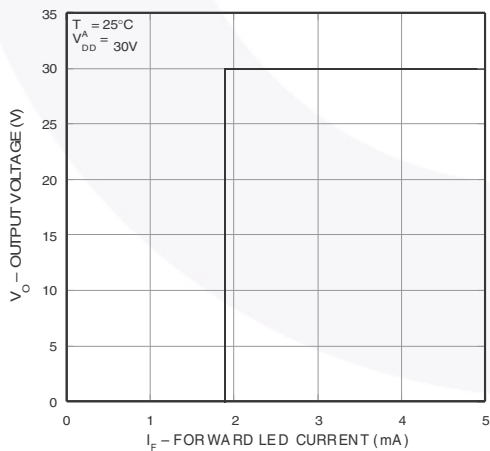
**Fig. 16 Propagation Delay vs. Ambient Temperature**



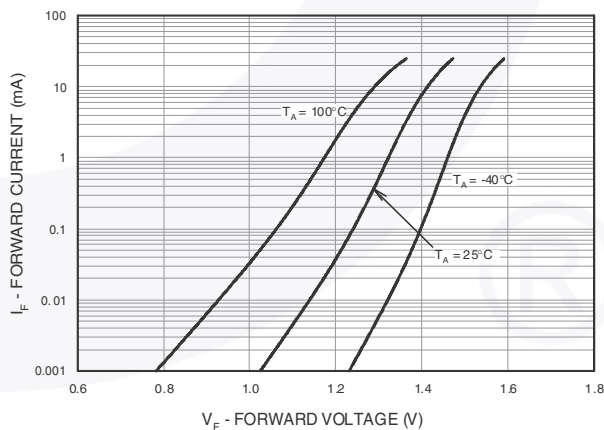
**Fig. 17 Propagation Delay vs. Series Load Resistance**



**Fig. 18 Propagation Delay vs. Load Capacitance**



**Fig. 19 Transfer Characteristics**



**Fig. 20 Input Forward Current vs. Forward Voltage**

### Typical Performance Characteristics (Continued)

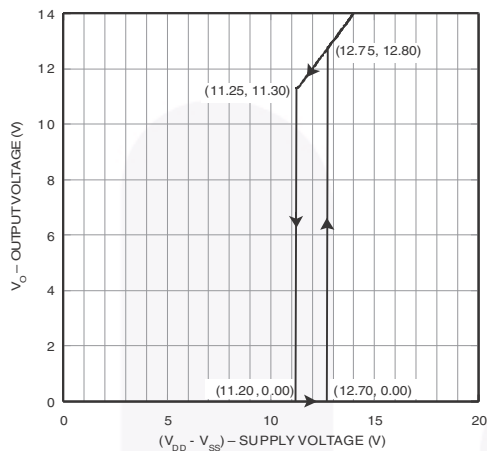


Fig. 21 Under Voltage Lockout



### Test Circuit

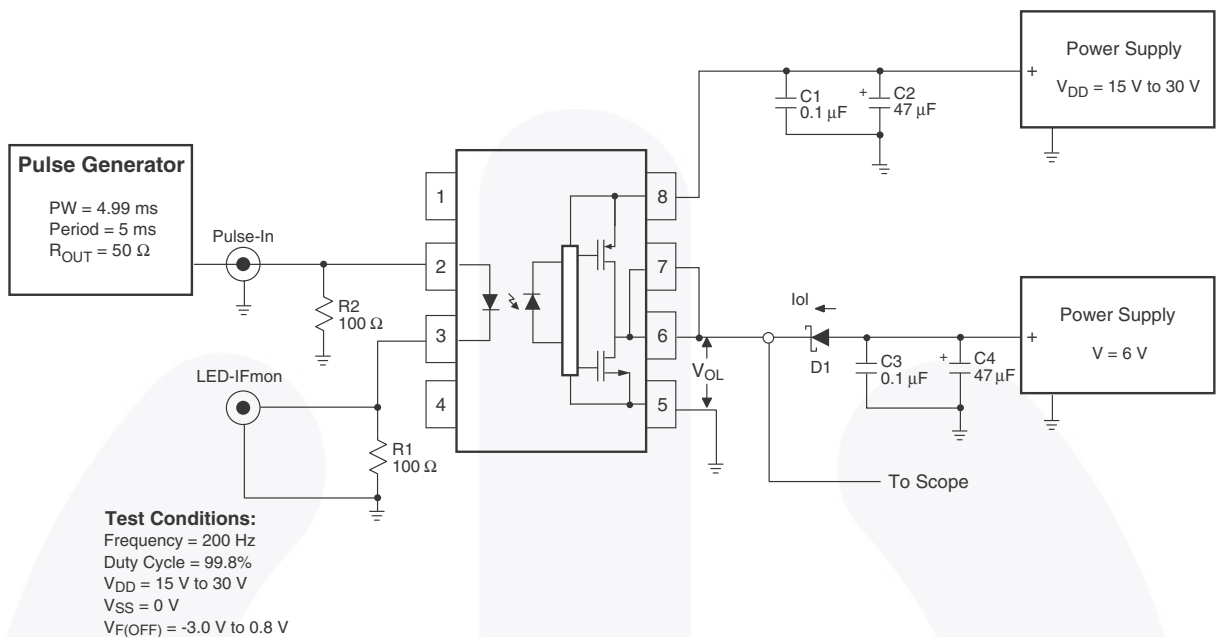


Figure 22.  $I_{OL}$  Test Circuit

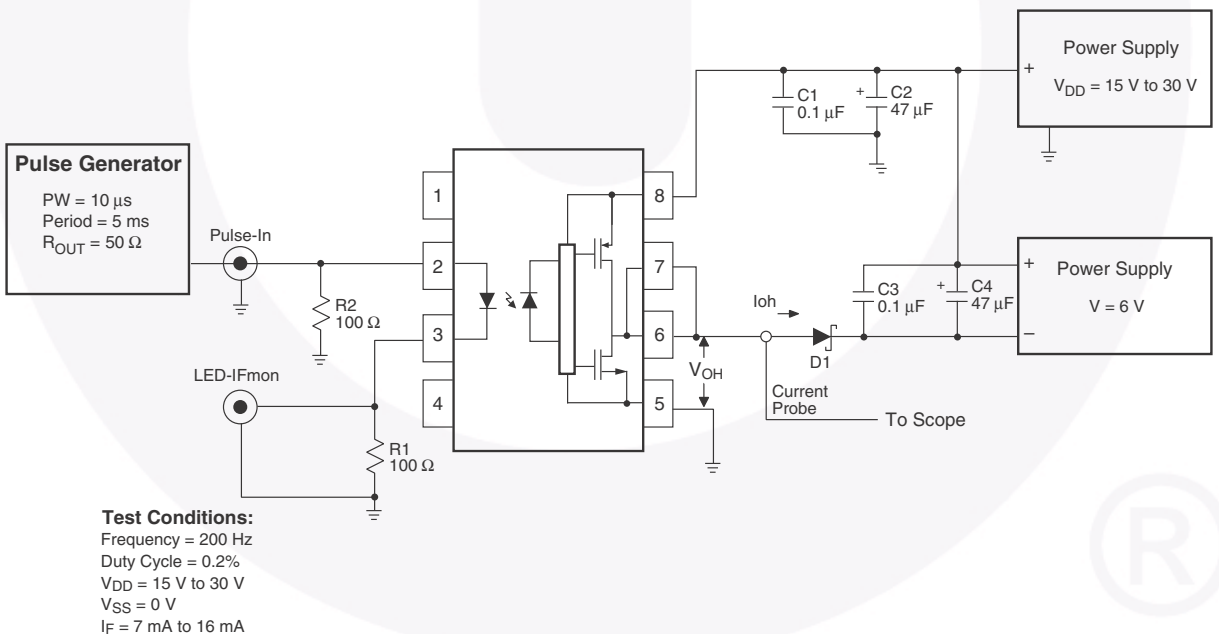
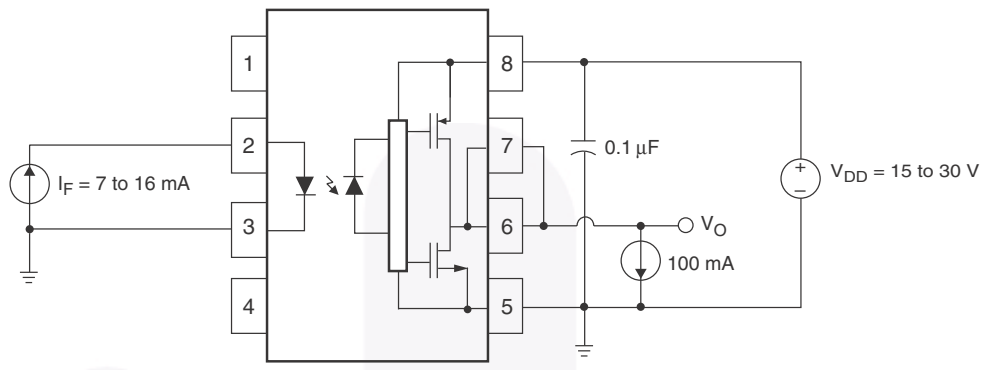
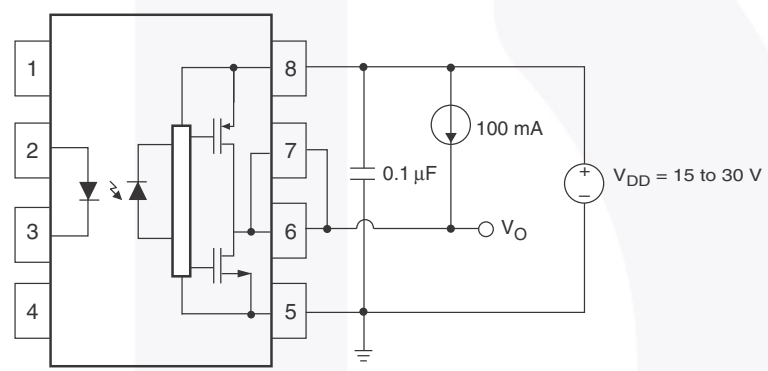


Figure 23.  $I_{OH}$  Test Circuit

**Test Circuit** (Continued)



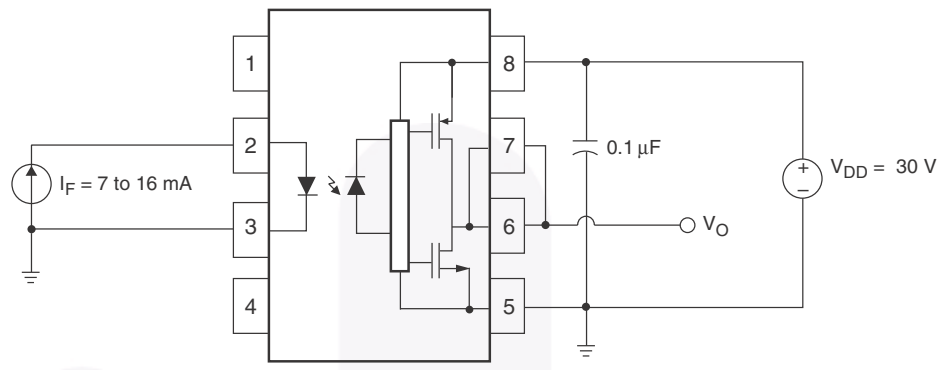
**Figure 24.  $V_{OH}$  Test Circuit**



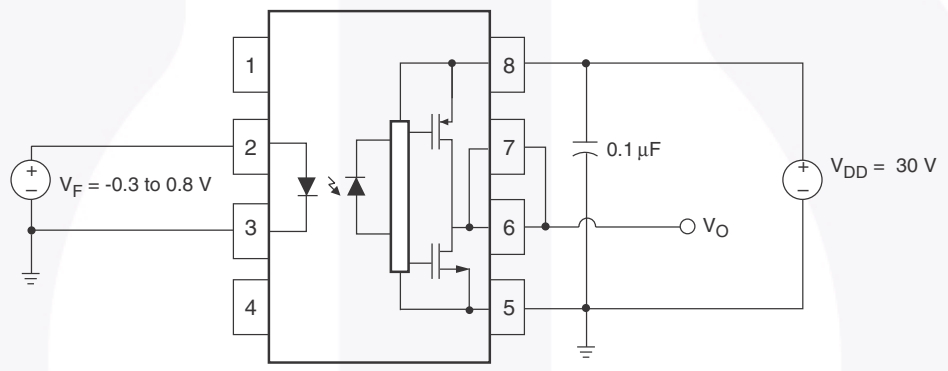
**Figure 25.  $V_{OL}$  Test Circuit**



**Test Circuit** (Continued)



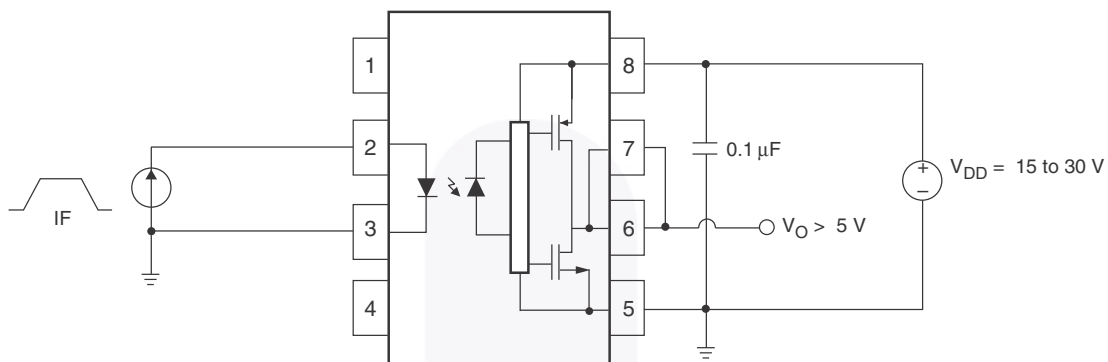
**Figure 26.  $I_{DDH}$  Test Circuit**



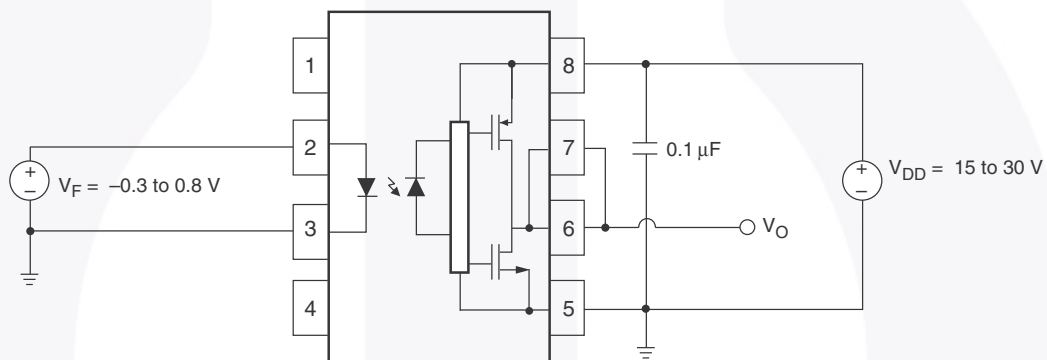
**Figure 27.  $I_{DDL}$  Test Circuit**



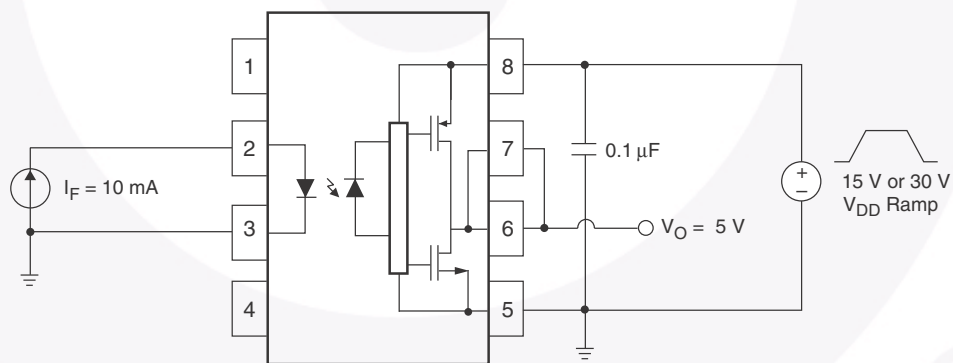
**Test Circuit** (Continued)



**Figure 28.  $I_{FLH}$  Test Circuit**

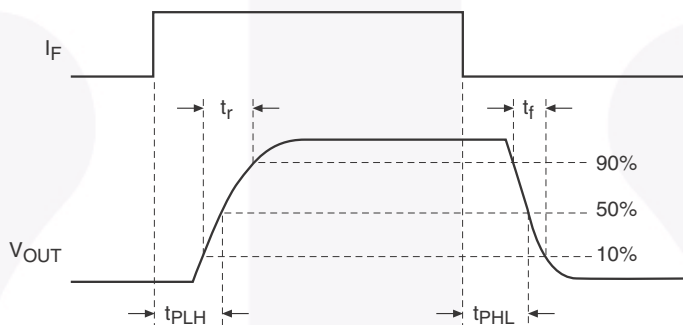
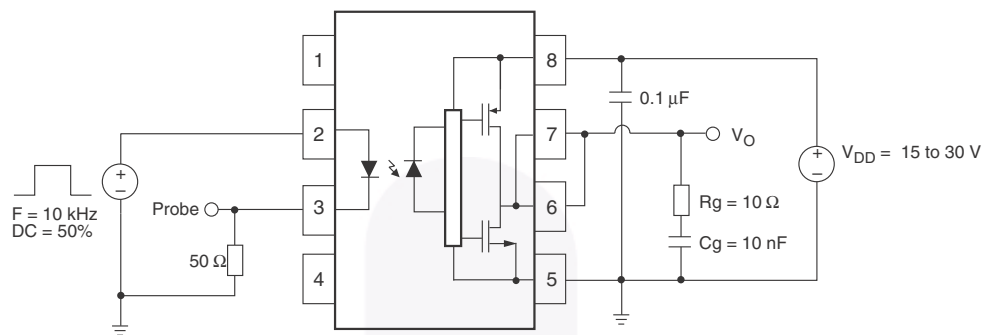


**Figure 29.  $V_{FHL}$  Test Circuit**

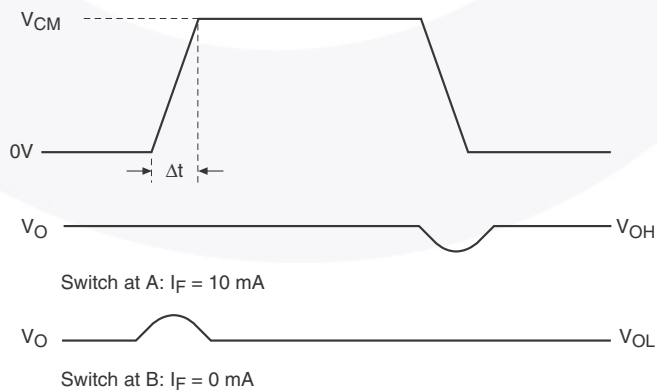
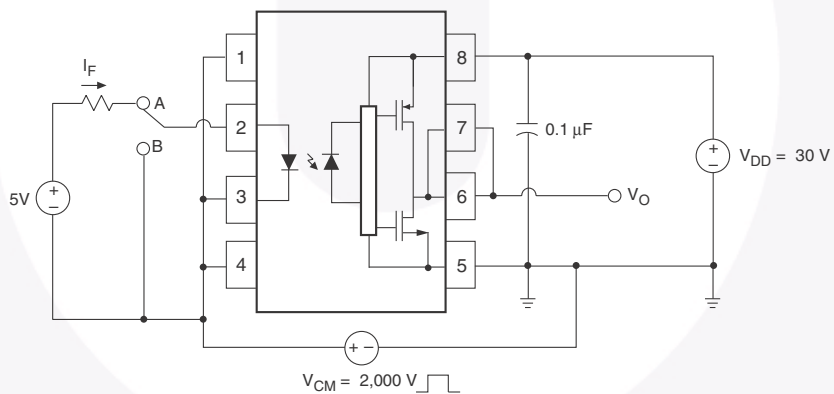


**Figure 30. UVLO Test Circuit**

**Test Circuit (Continued)**

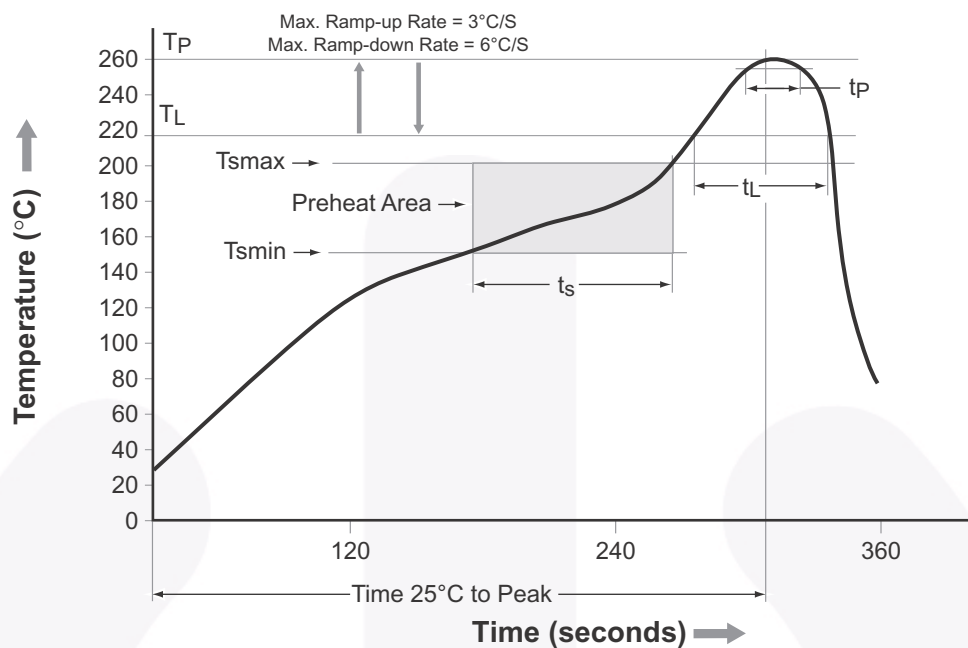


**Figure 31.  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_R$  and  $t_F$  Test Circuit and Waveforms**



**Figure 32. CMR Test Circuit and Waveforms**

## Reflow Profile



| Profile Feature   | Pb-Free Assembly Profile |
|---|--------------------------|
| Temperature Min. (T <sub>smin</sub> )                                 | 150°C                    |
| Temperature Max. (T <sub>smax</sub> )                                 | 200°C                    |
| Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> ) | 60–120 seconds           |
| Ramp-up Rate (t <sub>L</sub> to t <sub>p</sub> )                      | 3°C/second max.          |
| Liquidous Temperature (T <sub>L</sub> )                               | 217°C                    |
| Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )             | 60–150 seconds           |
| Peak Body Package Temperature   | 260°C +0°C / -5°C        |
| Time (t <sub>p</sub> ) within 5°C of 260°C                            | 30 seconds               |
| Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )                    | 6°C/second max.          |
| Time 25°C to Peak Temperature   | 8 minutes max.           |



## Ordering Information

| Part Number  | Package  | Packing Method                       |
|--------------|--|--------------------------------------|
| FOD3120      | DIP 8-Pin  | Tube (50 units per tube)             |
| FOD3120S     | SMT 8-Pin (Lead Bend)                                    | Tube (50 units per tube)             |
| FOD3120SD    | SMT 8-Pin (Lead Bend)                                    | Tape and Reel (1,000 units per reel) |
| FOD3120V     | DIP 8-Pin, DIN_EN/IEC60747-5-5 option                    | Tube (50 units per tube)             |
| FOD3120SV    | SMT 8-Pin (Lead Bend), DIN_EN/IEC60747-5-5 option        | Tube (50 units per tube)             |
| FOD3120SDV   | SMT 8-Pin (Lead Bend), DIN_EN/IEC60747-5-5 option        | Tape and Reel (1,000 units per reel) |
| FOD3120TV    | DIP 8-Pin, 0.4" Lead Spacing, DIN_EN/IEC60747-5-5 option | Tube (50 units per tube)             |
| FOD3120TSV   | SMT 8-Pin, 0.4" Lead Spacing, DIN_EN/IEC60747-5-5 option | Tube (50 units per tube)             |
| FOD3120TSR2V | SMT 8-Pin, 0.4" Lead Spacing, DIN_EN/IEC60747-5-5 option | Tape and Reel (700 units per reel)   |

## Marking Information

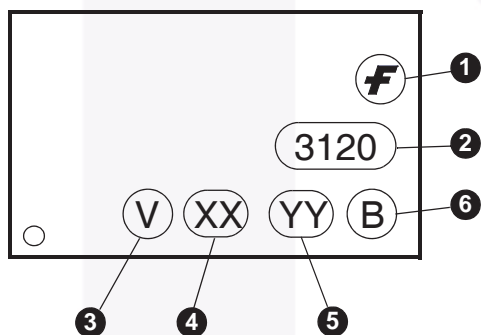
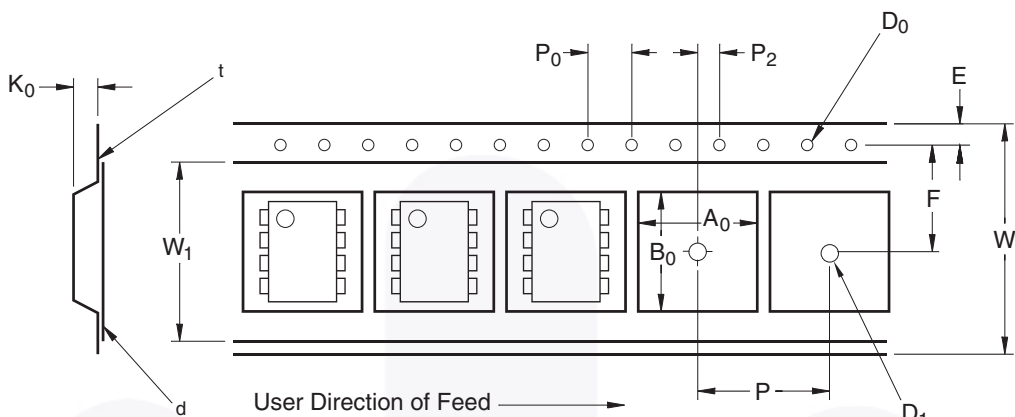


Figure 33. Top Mark

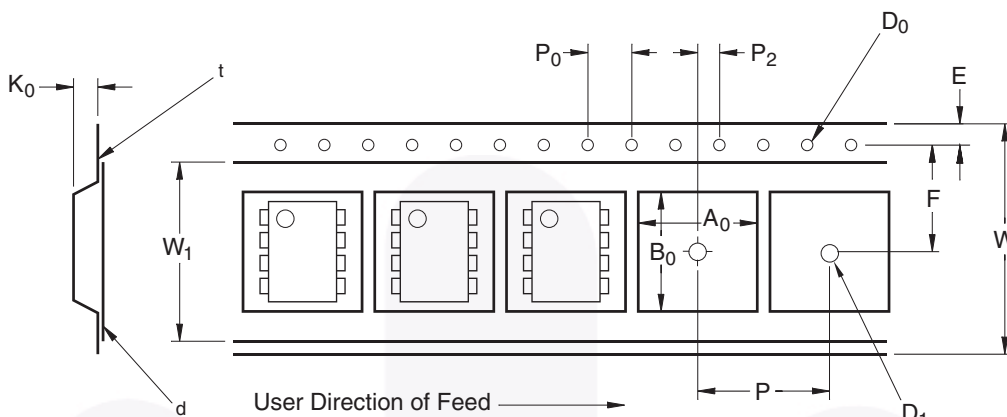
| Definitions |   |
|-------------|---|
| 1           | Fairchild logo  |
| 2           | Device number   |
| 3           | DIN_EN/IEC60747-5-5 Option (only appears on component ordered with this option) |
| 4           | Two digit year code, e.g., '16'   |
| 5           | Two digit work week ranging from '01' to '53'                                   |
| 6           | Assembly package code   |

### Carrier Tape Specifications (Option SD)

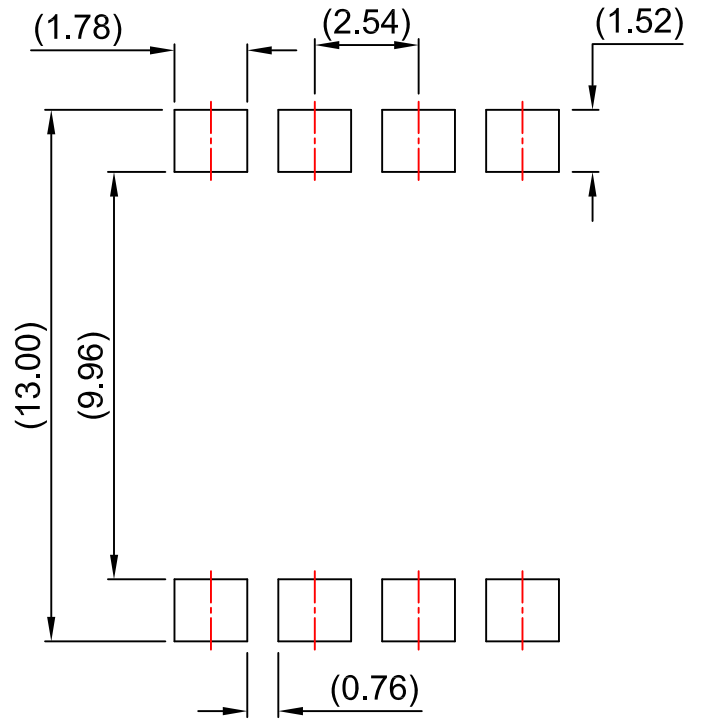
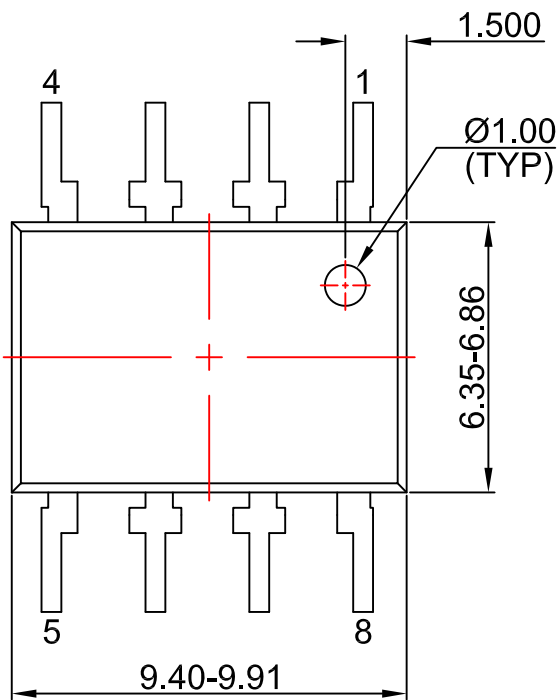


| Symbol         | Description                     | Dimension in mm |
|----------------|---------------------------------|-----------------|
| W              | Tape Width                      | 16.0 ± 0.3      |
| t              | Tape Thickness                  | 0.30 ± 0.05     |
| P <sub>0</sub> | 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                 | 7.5 ± 0.1       |
| P <sub>2</sub> |                                 | 2.0 ± 0.1       |
| P              | Pocket Pitch                    | 12.0 ± 0.1      |
| A <sub>0</sub> | Pocket Dimensions               | 10.30 ± 0.20    |
| B <sub>0</sub> |                                 | 10.30 ± 0.20    |
| K <sub>0</sub> |                                 | 4.90 ± 0.20     |
| W <sub>1</sub> | Cover Tape Width                | 13.2 ± 0.2      |
| d              | Cover Tape Thickness            | 0.1 max         |
|                | Max. Component Rotation or Tilt | 10°             |
| R              | Min. Bending Radius             | 30              |

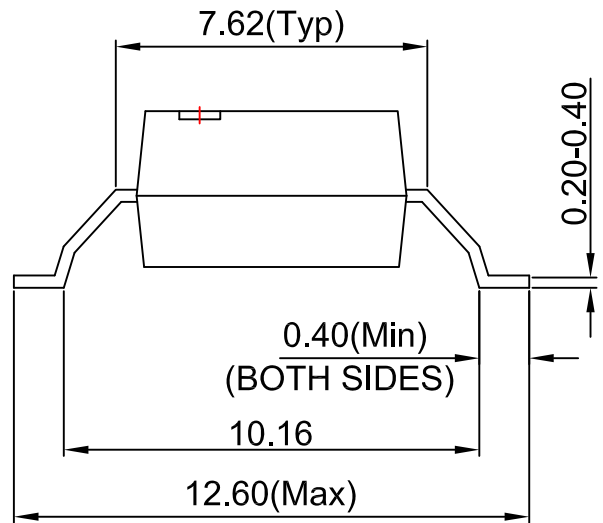
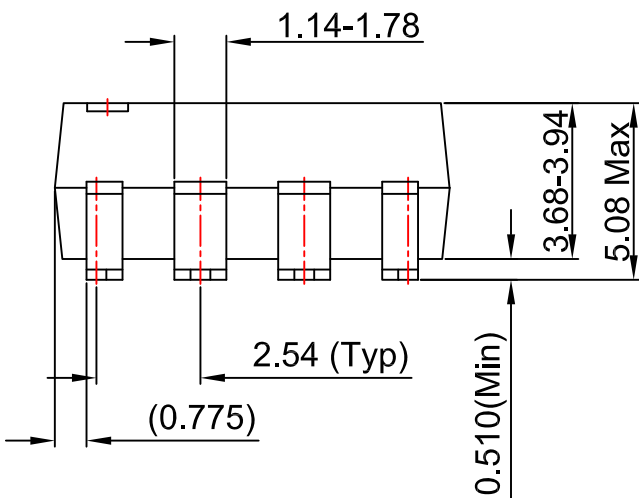
### Carrier Tape Specifications (Option TSR2)



| 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              |



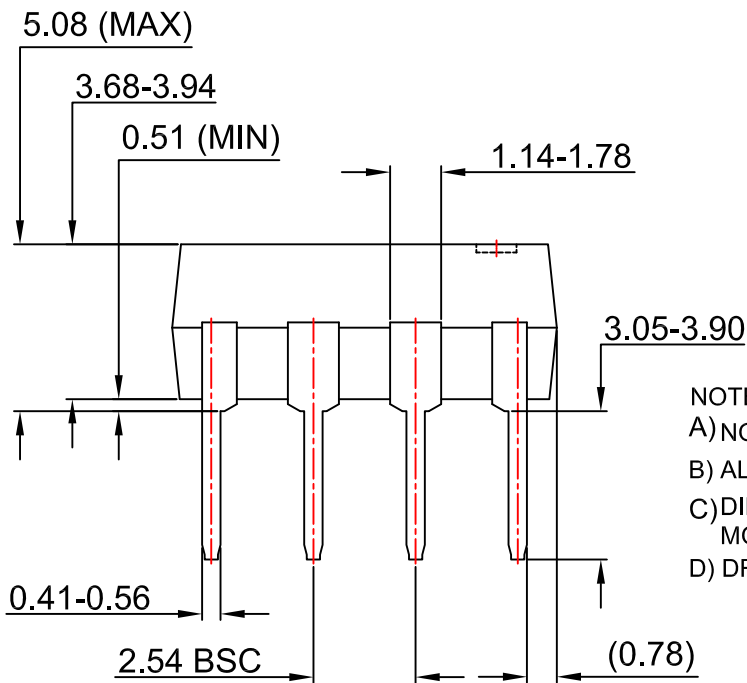
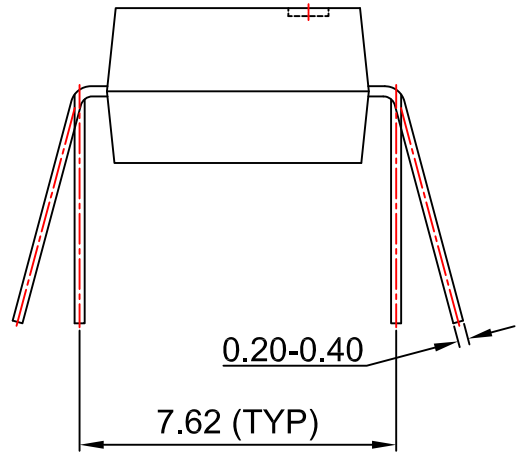
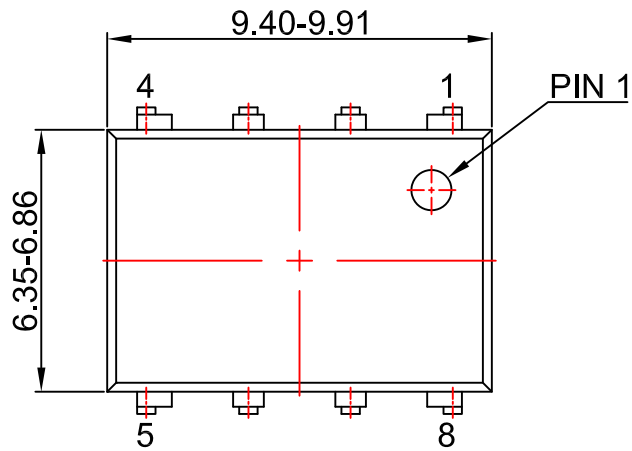
LAND PATTERN RECOMMENDATION



NOTES:

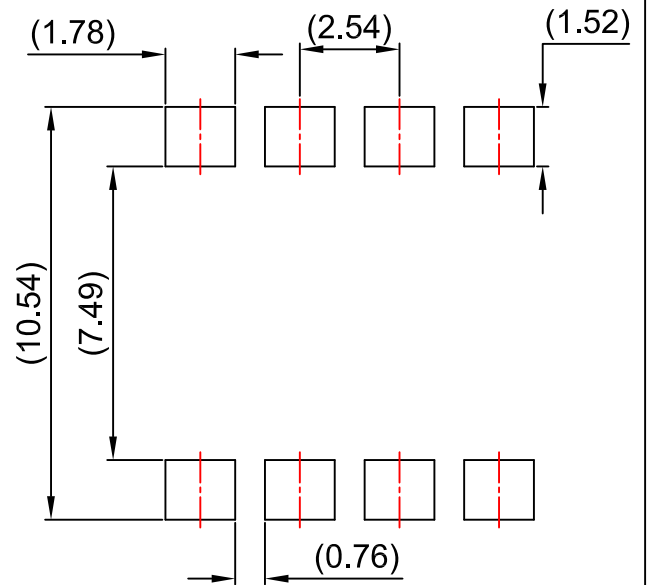
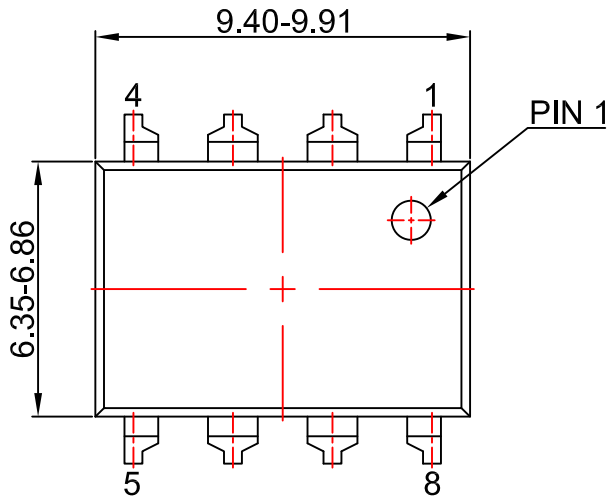
- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DWG FILENAME AND REVISION: MKT-N08Lrev2.



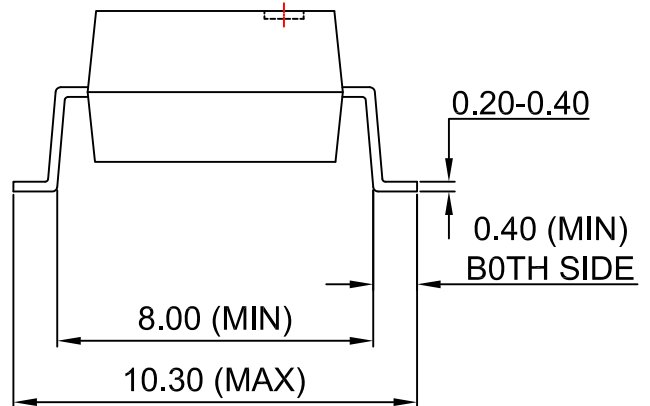
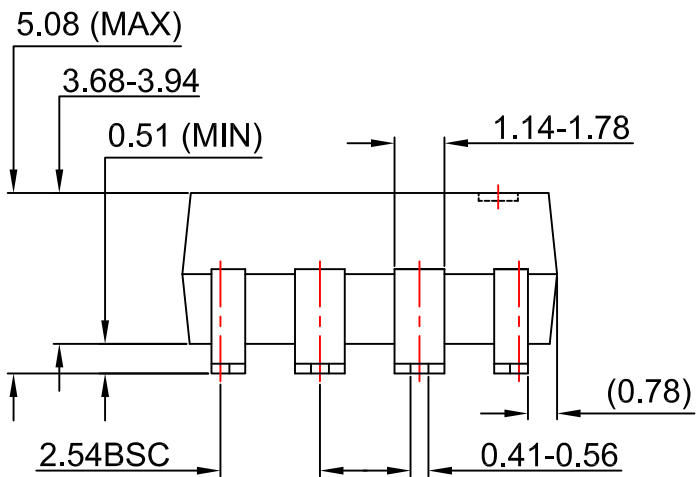


- NOTES:  
 A) NO STANDARD APPLIES TO THIS PACKAGE  
 B) ALL DIMENSIONS ARE IN MILLIMETERS.  
 C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION  
 D) DRAWING FILENAME AND REVISION: MKT-N08GREV7





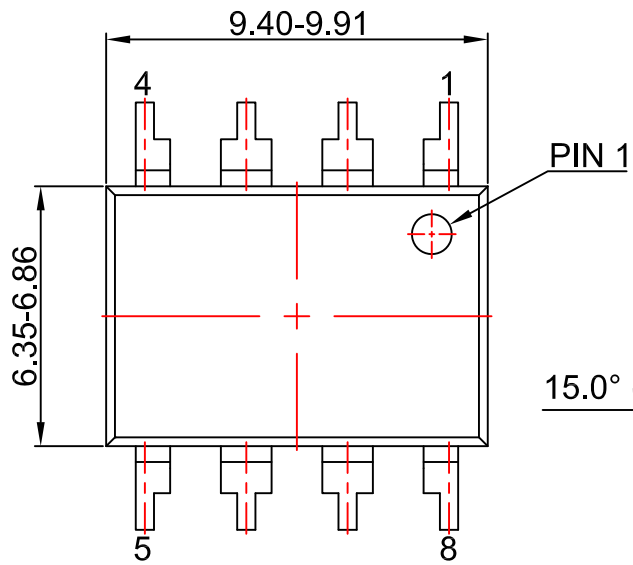
LAND PATTERN RECOMMENDATION



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
- D) DRAWING FILENAME AND REVISION: MKT-N08Hrev7.



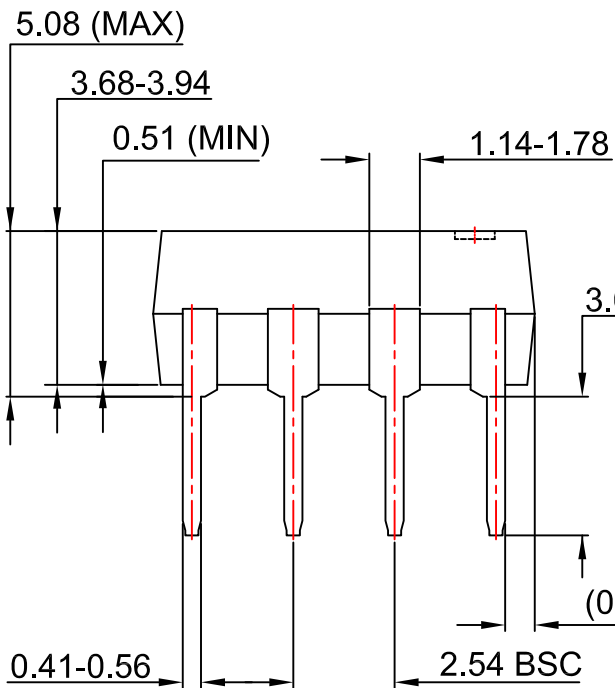


PIN 1

15.0° (MAX)

10.16 (TYP)

0.20-0.40



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
- D) DRAWING FILENAME AND REVISION: MKT-N08REV7





**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |                          |  |                                       |                  |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™               | F-PFS™   | OPTOPLANAR®                           | SYSTEM GENERAL®  |
| AttitudeEngine™          | FRFET®   | Power Supply WebDesigner™             | TinyBoost®       |
| Awinda®                  | Global Power Resource <sup>SM</sup>            | PowerTrench®                          | TinyBuck®        |
| AX-CAP®*                 | GreenBridge™                                   | PowerXS™                              | TinyCalc™        |
| BitSiC™                  | Green FPS™                                     | Programmable Active Droop™            | TinyLogic®       |
| Build it Now™            | Green FPS™ e-Series™                           | QFET®                                 | TINYOPTO™        |
| CorePLUS™                | Gmax™  | QS™                                   | TinyPower™       |
| CorePOWER™               | GTO™   | Quiet Series™                         | TinyPWM™         |
| CROSSVOL™                | IntelliMAX™                                    | RapidConfigure™                       | TinyWire™        |
| CTL™                     | ISOPLANAR™                                     | Saving our world, 1mW/W/kW at a time™ | TranSiC™         |
| Current Transfer Logic™  | Making Small Speakers Sound Louder and Better™ | SignalWise™                           | TriFault Detect™ |
| DEUXPEED®                | MegaBuck™                                      | SmartMax™                             | TRUECURRENT®*    |
| Dual Cool™               | MICROCOUPLER™                                  | SMART START™                          | μSerDes™         |
| EcoSPARK®                | MicroFET™                                      | Solutions for Your Success™           | UHC®             |
| EfficientMax™            | MicroPak™                                      | SPM®                                  | Ultra FRFET™     |
| ESBC™                    | MicroPak2™                                     | STEALTH™                              | UniFET™          |
| F <sup>®</sup>           | MillerDrive™                                   | SuperFET®                             | VCX™             |
| Fairchild®               | MotionMax™                                     | SuperSOT™-3                           | VisualMax™       |
| Fairchild Semiconductor® | MotionGrid®                                    | SuperSOT™-6                           | VoltagePlus™     |
| FACT Quiet Series™       | MTi®   | SuperSOT™-8                           | XST™             |
| FACT®                    | MTx®   | SupreMOS®                             | Xsens™           |
| FastvCore™               | MVN®   | SyncFET™                              | 仙童®              |
| FETBench™                | mWSaver®                                       | Sync-Lock™                            |                  |
| FPS™                     | OptoHiT™                                       |                                       |                  |
|                          | OPTOLOGIC®                                     |                                       |                  |

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**AUTHORIZED USE**

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

| Datasheet Identification | Product Status        | Definition  |
|--------------------------|-----------------------|---|
| Advance Information      | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.   |
| Preliminary              | First Production      | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production       | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.   |
| Obsolete                 | Not In Production     | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.  |