

# FAN7382

## High- and Low-Side Gate Driver

### Features

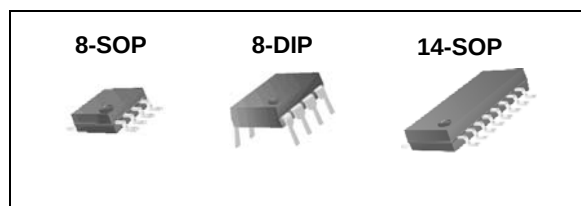
- Floating Channels Designed for Bootstrap Operation to +600V
- Typically 350mA/650mA Sourcing/Sinking Current Driving Capability for Both Channels
- Common-Mode dv/dt Noise Canceling Circuit
- Extended Allowable Negative  $V_S$  Swing to -9.8V for Signal Propagation at  $V_{CC}=V_{BS}=15V$
- $V_{CC}$  &  $V_{BS}$  Supply Range from 10V to 20V
- UVLO Functions for Both Channels
- TTL Compatible Input Logic Threshold Levels
- Matched Propagation Delay Below 50nsec
- Output In-phase with Input Signal

### Applications

- PDP Scan Driver
- Fluorescent Lamp Ballast
- SMPS
- Motor Driver

### Description

The FAN7382, a monolithic high and low side gate-drive IC, can drive MOSFETs and IGBTs that operate up to +600V. Fairchild's high-voltage process and common-mode noise canceling technique provides stable operation of the high-side driver under high-dv/dt noise circumstances. An advanced level-shift circuit allows high-side gate driver operation up to  $V_S=-9.8V$  (typical) for  $V_{BS}=15V$ . The input logic level is compatible with standard TTL-series logic gates. UVLO circuits for both channels prevent malfunction when  $V_{CC}$  or  $V_{BS}$  is lower than the specified threshold voltage. Output drivers typically source/sink 350mA/650mA, respectively, which is suitable for fluorescent lamp ballasts, PDP scan drivers, motor controls, etc.



### Ordering Information

| Part Number               | Package | Pb-Free | Operating Temperature Range | Packing Method |
|---------------------------|---------|---------|-----------------------------|----------------|
| FAN7382N                  | 8-DIP   | Yes     | -40°C ~ 125°C               | Tube           |
| FAN7382M <sup>(1)</sup>   | 8-SOP   |         |                             | Tube           |
| FAN7382MX <sup>(1)</sup>  |         |         |                             | Tape & Reel    |
| FAN7382M1 <sup>(1)</sup>  | 14-SOP  |         |                             | Tube           |
| FAN7382M1X <sup>(1)</sup> |         |         |                             | Tape & Reel    |

#### Note:

1. These devices passed wave soldering test by JESD22A-111.

## Typical Application Circuit

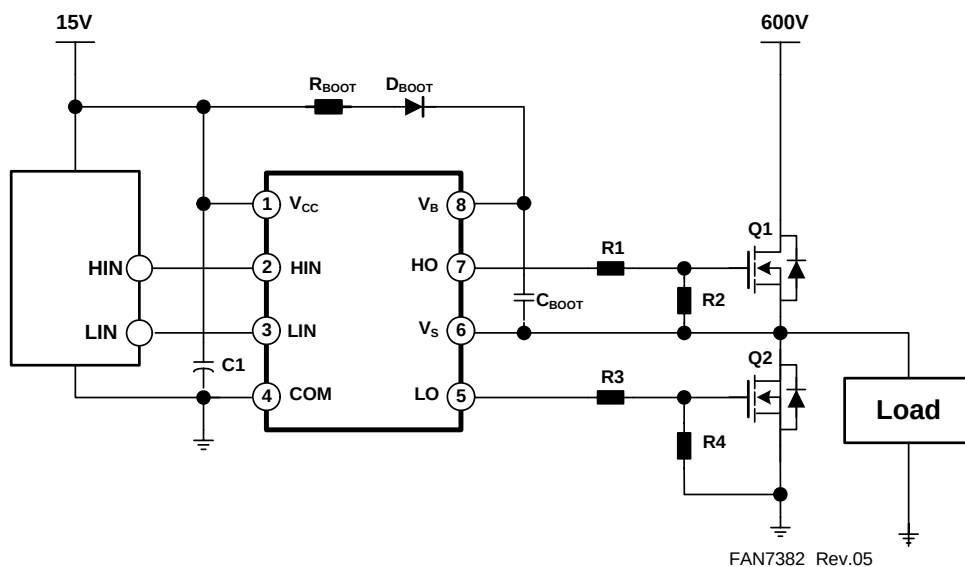


Figure 1. Application Circuit for Half-Bridge

## Internal Block Diagram

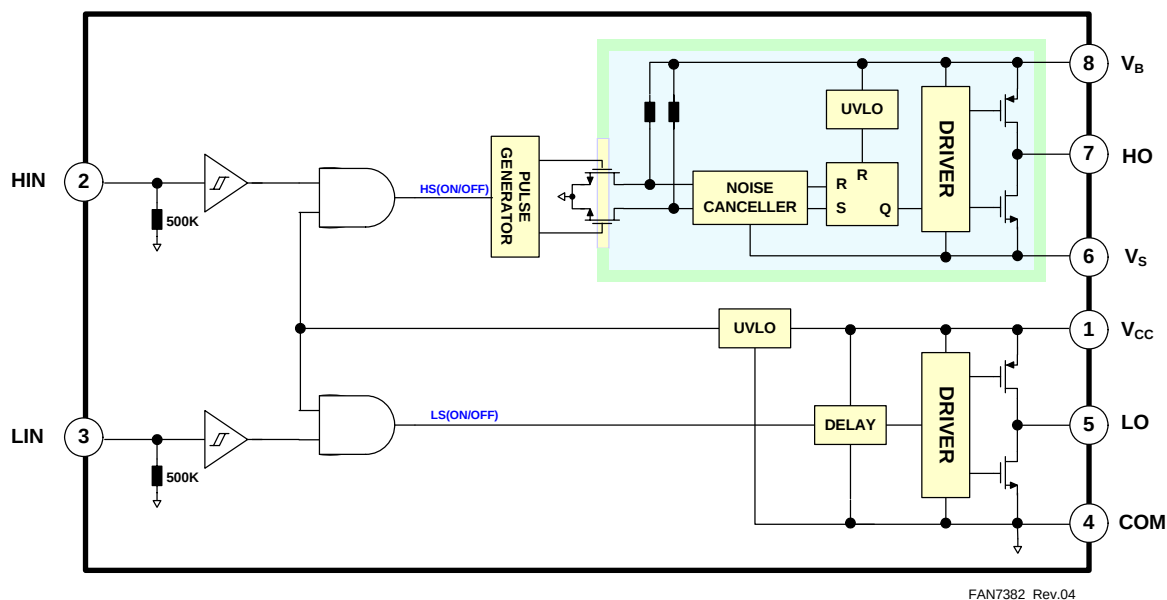


Figure 2. Functional Block Diagram

## Pin Assignments

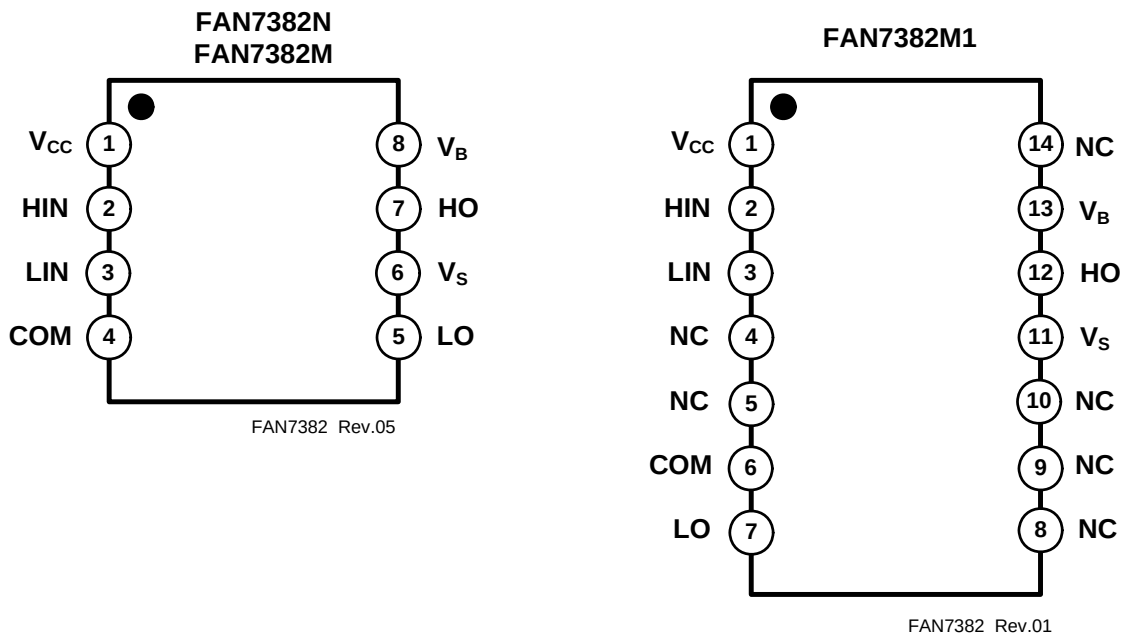


Figure 3. Pin Configuration (Top View)

## Pin Definitions

| Name     | Description                                  |
|----------|----------------------------------------------|
| $V_{CC}$ | Low-Side Supply Voltage                      |
| HIN      | Logic Input for High-Side Gate Driver Output |
| LIN      | Logic Input for Low-Side Gate Driver Output  |
| COM      | Logic Ground and Low-Side Driver Return      |
| LO       | Low-Side Driver Output                       |
| $V_S$    | High-Voltage Floating Supply Return          |
| HO       | High-Side Driver Output                      |
| $V_B$    | High-Side Floating Supply                    |

## 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.

| Symbol            | Characteristics                         | Min.        | Max.         | Unit |
|-------------------|-----------------------------------------|-------------|--------------|------|
| $V_S$             | High-side offset voltage                | $V_B-25$    | $V_B+0.3$    | V    |
| $V_B$             | High-side floating supply voltage       | -0.3        | 625          |      |
| $V_{HO}$          | High-side floating output voltage HO    | $V_S-0.3$   | $V_B+0.3$    |      |
| $V_{CC}$          | Low-side and logic fixed supply voltage | -0.3        | 25           |      |
| $V_{LO}$          | Low-side output voltage LO              | -0.3        | $V_{CC}+0.3$ |      |
| $V_{IN}$          | Logic input voltage (HIN, LIN)          | -0.3        | $V_{CC}+0.3$ |      |
| COM               | Logic ground                            | $V_{CC}-25$ | $V_{CC}+0.3$ |      |
| $dV_S/dt$         | Allowable offset voltage slew rate      |             | 50           | V/ns |
| $P_D^{(2)(3)(4)}$ | Power dissipation                       | 8-SOP       | 0.625        | W    |
|                   |                                         | 14-SOP      | 1.0          |      |
|                   |                                         | 8-DIP       | 1.2          |      |
| $\theta_{JA}$     | Thermal resistance, junction-to-ambient | 8-SOP       | 200          | °C/W |
|                   |                                         | 14-SOP      | 110          |      |
|                   |                                         | 8-DIP       | 100          |      |
| $T_J$             | Junction temperature                    |             | 150          | °C   |
| $T_{STG}$         | Storage temperature                     |             | 150          | °C   |

### Notes:

- Mounted on 76.2 x 114.3 x 1.6mm PCB (FR-4 glass epoxy material).
- Refer to the following standards:  
 JESD51-2: Integral circuits thermal test method environmental conditions - natural convection  
 JESD51-3: Low effective thermal conductivity test board for leaded surface mount packages
- Do not exceed  $P_D$  under any circumstances.

## Recommended Operating Ratings

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.     | Unit |
|----------|------------------------------------------|------------|----------|------|
| $V_B$    | High-side floating supply voltage        | $V_S+10$   | $V_S+20$ | V    |
| $V_S$    | High-side floating supply offset voltage | $6-V_{CC}$ | 600      |      |
| $V_{HO}$ | High-side (HO) output voltage            | $V_S$      | $V_B$    |      |
| $V_{LO}$ | Low-side (LO) output voltage             | COM        | $V_{CC}$ |      |
| $V_{IN}$ | Logic input voltage (HIN, LIN)           | COM        | $V_{CC}$ |      |
| $V_{CC}$ | Low-side supply voltage                  | 10         | 20       |      |
| $T_A$    | Ambient temperature                      | -40        | 125      | °C   |

## Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ )=15.0V,  $T_A$  = 25°C, unless otherwise specified. The  $V_{IN}$  and  $I_{IN}$  parameters are referenced to COM. The  $V_O$  and  $I_O$  parameters are referenced to  $V_S$  and COM and are applicable to the respective outputs HO and LO.

| Symbol                     | Characteristics                                                       | Test Condition                                  | Min. | Typ. | Max. | Unit    |
|----------------------------|-----------------------------------------------------------------------|-------------------------------------------------|------|------|------|---------|
| $V_{CCUV+}$<br>$V_{BSUV+}$ | $V_{CC}$ and $V_{BS}$ supply under-voltage positive going threshold   |                                                 | 8.2  | 9.2  | 10.0 | V       |
| $V_{CCUV-}$<br>$V_{BSUV-}$ | $V_{CC}$ and $V_{BS}$ supply under-voltage negative going threshold   |                                                 | 7.6  | 8.7  | 9.6  |         |
| $V_{CCUVH}$<br>$V_{BSUVH}$ | $V_{CC}$ supply under-voltage lockout hysteresis                      |                                                 |      | 0.6  |      |         |
| $I_{LK}$                   | Offset supply leakage current                                         | $V_B = V_S = 600V$                              |      |      | 50   | $\mu A$ |
| $I_{QBS}$                  | Quiescent $V_{BS}$ supply current                                     | $V_{IN} = 0V$ or 5V                             |      | 45   | 120  |         |
| $I_{QCC}$                  | Quiescent $V_{CC}$ supply current                                     | $V_{IN} = 0V$ or 5V                             |      | 70   | 180  |         |
| $I_{PBS}$                  | Operating $V_{BS}$ supply current                                     | $f_{IN} = 20kHz$ , rms value                    |      |      | 600  | $\mu A$ |
| $I_{PCC}$                  | Operating $V_{CC}$ supply current                                     | $f_{IN} = 20kHz$ , rms value                    |      |      | 600  |         |
| $V_{IH}$                   | Logic "1" input voltage                                               |                                                 | 2.9  |      |      | V       |
| $V_{IL}$                   | Logic "0" input voltage                                               |                                                 |      |      | 0.8  |         |
| $V_{OH}$                   | High-level output voltage, $V_{BIAS} - V_O$                           | $I_O = 20mA$                                    |      |      | 1.0  |         |
| $V_{OL}$                   | Low-level output voltage, $V_O$                                       |                                                 |      |      | 0.6  |         |
| $I_{IN+}$                  | Logic "1" input bias current                                          | $V_{IN} = 5V$                                   |      | 10   | 20   | $\mu A$ |
| $I_{IN-}$                  | Logic "0" input bias current                                          | $V_{IN} = 0V$                                   |      | 1.0  | 2.0  |         |
| $I_{O+}$                   | Output high short-circuit pulsed current                              | $V_O = 0V$ , $V_{IN} = 5V$ with $PW < 10\mu s$  | 250  | 350  |      | mA      |
| $I_{O-}$                   | Output low short-circuit pulsed current                               | $V_O = 15V$ , $V_{IN} = 0V$ with $PW < 10\mu s$ | 500  | 650  |      |         |
| $V_S$                      | Allowable negative $V_S$ pin voltage for HIN signal propagation to HO |                                                 |      | -9.8 | -7.0 | V       |

## Dynamic Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ )=15.0V,  $V_S$ =COM,  $C_L$ =1000pF and,  $T_A$  = 25°C, unless otherwise specified.

| Symbol    | Characteristics                     | Test Condition                    | Min. | Typ. | Max. | Unit |
|-----------|-------------------------------------|-----------------------------------|------|------|------|------|
| $t_{on}$  | Turn-on propagation delay           | $V_S = 0V$                        | 100  | 170  | 300  | ns   |
| $t_{off}$ | Turn-off propagation delay          | $V_S = 0V$ or 600V <sup>(5)</sup> | 100  | 200  | 300  |      |
| $t_r$     | Turn-on rise time                   |                                   | 20   | 60   | 140  |      |
| $t_f$     | Turn-off fall time                  |                                   |      | 30   | 80   |      |
| MT        | Delay matching, HS & LS turn-on/off |                                   |      |      | 50   |      |

### Note:

5. This parameter guaranteed by design.

## Typical Characteristics

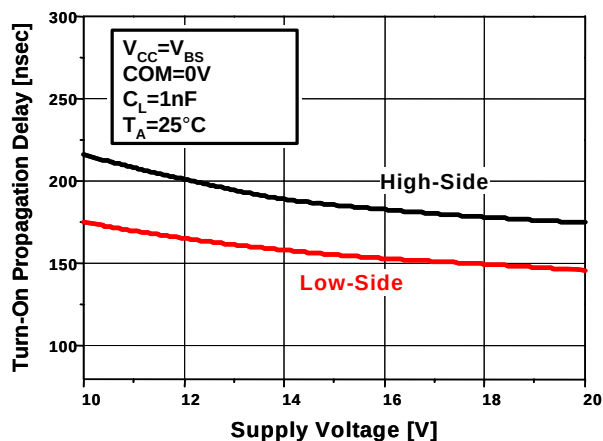


Figure 4. Turn-On Propagation Delay vs. Supply Voltage

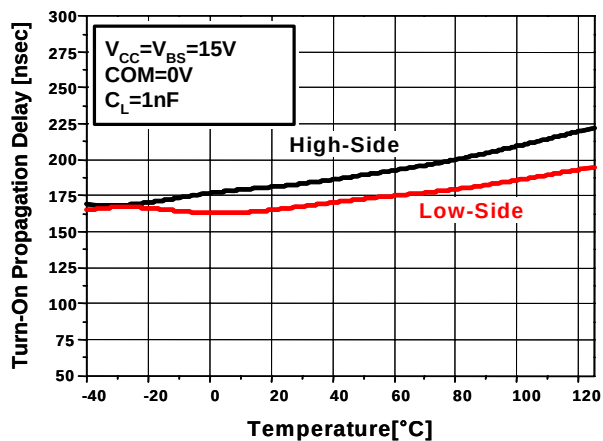


Figure 5. Turn-On Propagation Delay vs. Temp.

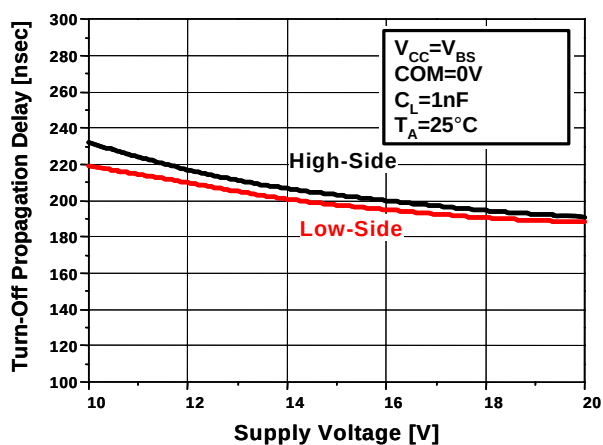


Figure 6. Turn-Off Propagation Delay vs. Supply Voltage

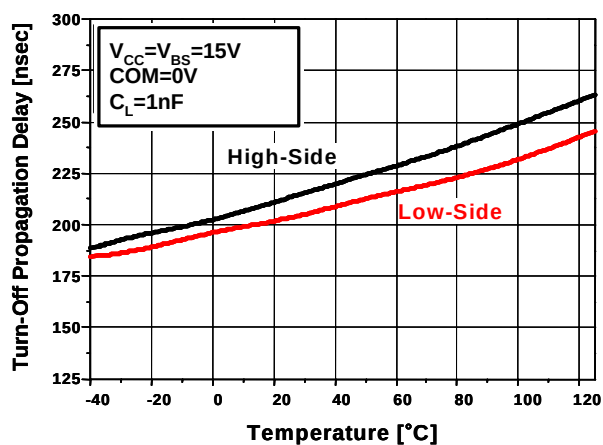


Figure 7. Turn-Off Propagation Delay vs. Temp.

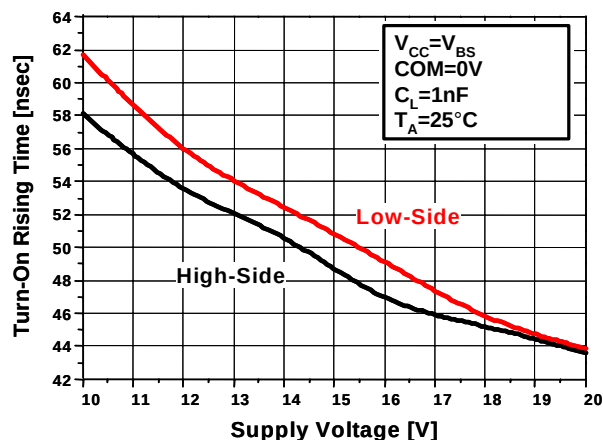


Figure 8. Turn-On Rising Time vs. Supply Voltage

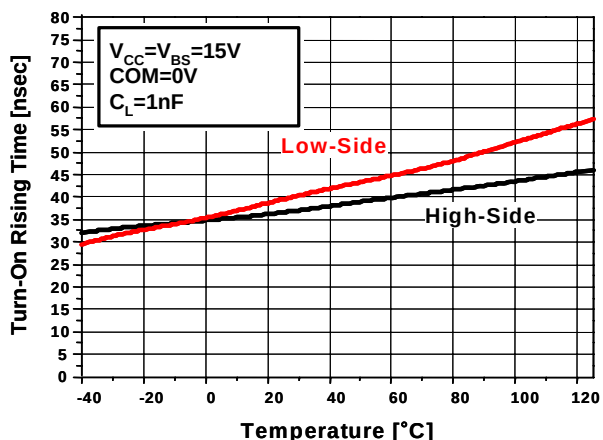


Figure 9. Turn-On Rising Time vs. Temp.

## Typical Characteristics (Continued)

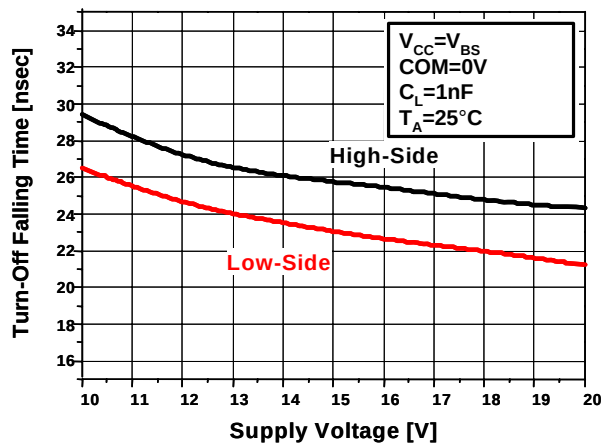


Figure 10. Turn-Off Falling Time vs. Supply Voltage

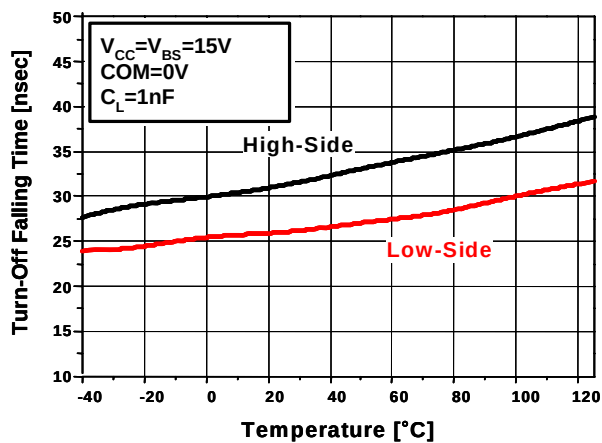


Figure 11. Turn-Off Falling Time vs. Temp.

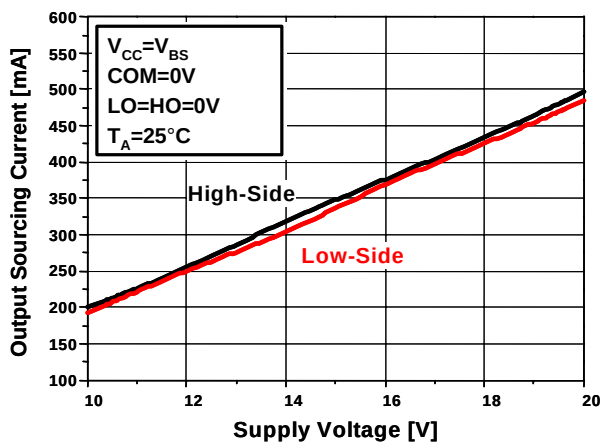


Figure 12. Output Sourcing Current vs. Supply Voltage

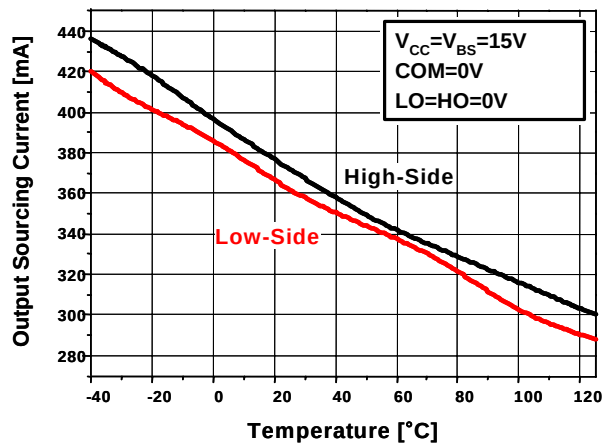


Figure 13. Output Sourcing Current vs. Temp

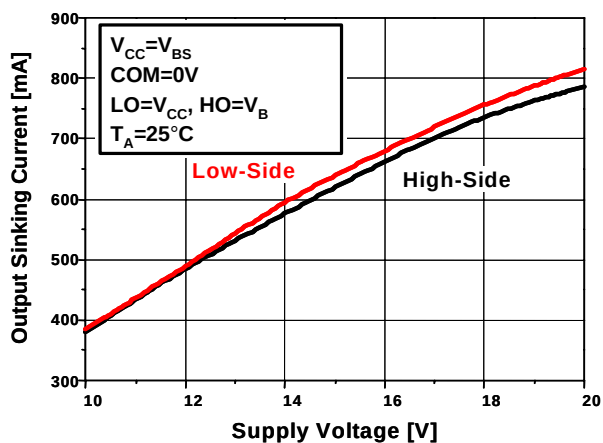


Figure 14. Output Sinking Current vs. Supply Voltage

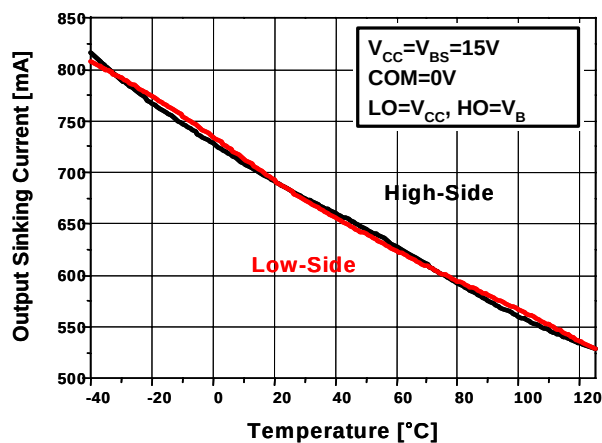
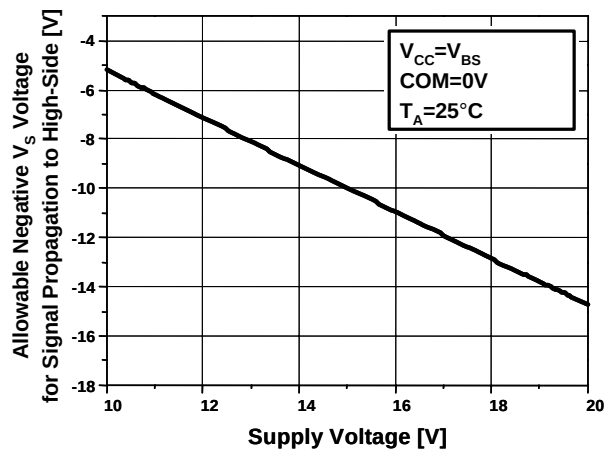
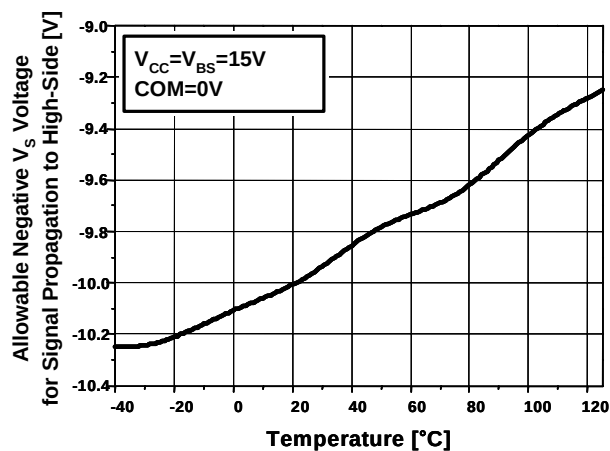
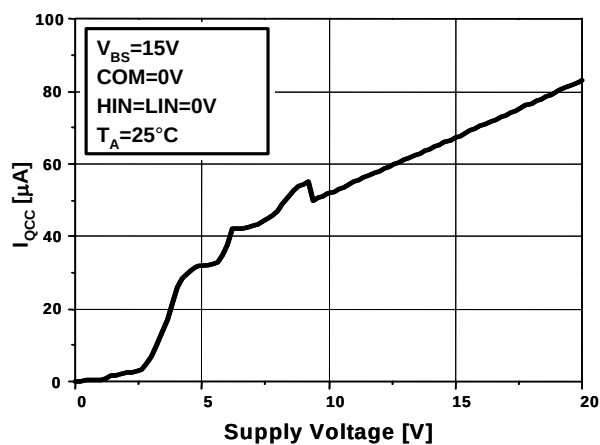
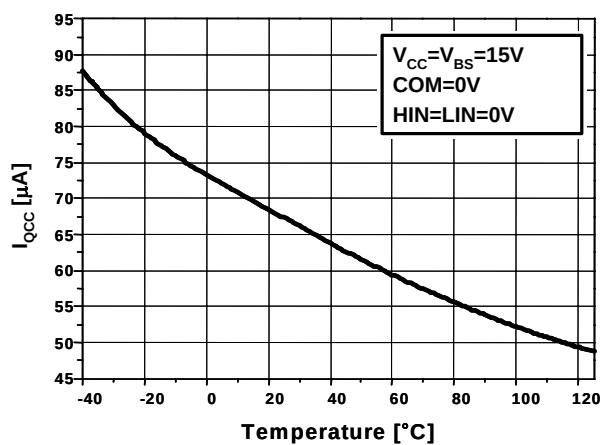
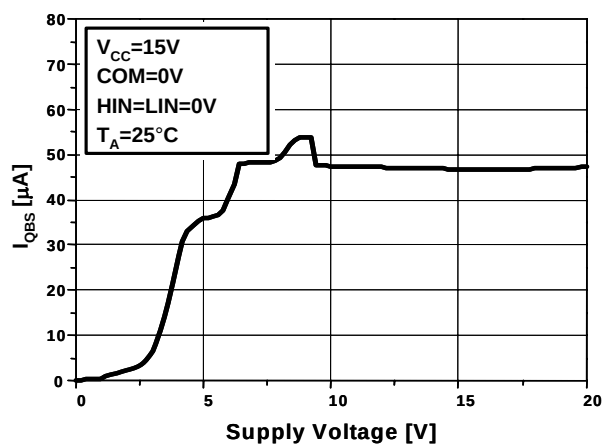
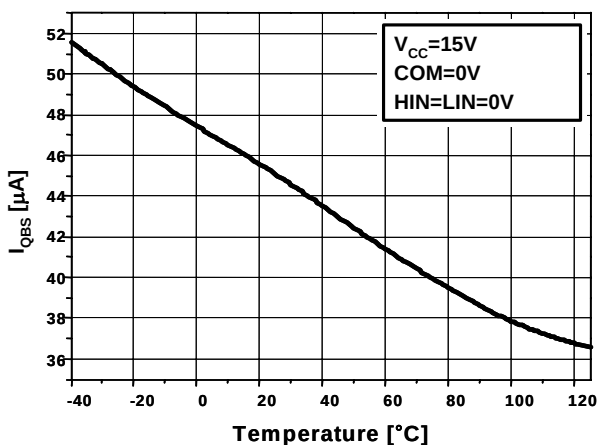


Figure 15. Output Sinking Current vs. Temp.

## Typical Characteristics (Continued)

Figure 16. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Supply VoltageFigure 17. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Temp.Figure 18.  $I_{QCC}$  vs. Supply VoltageFigure 19.  $I_{QCC}$  vs. Temp.Figure 20.  $I_{QBS}$  vs. Supply VoltageFigure 21.  $I_{QBS}$  vs. Temp.



## Typical Characteristics (Continued)

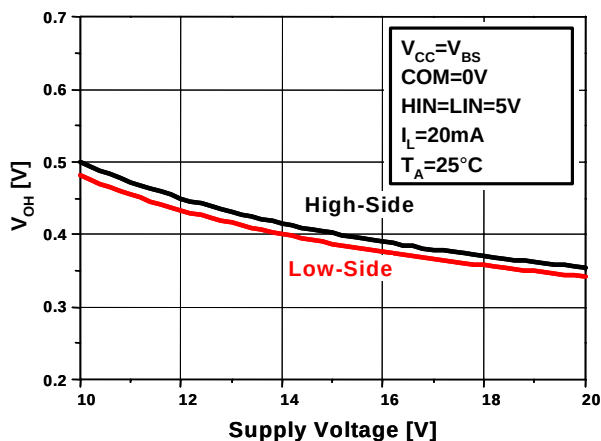


Figure 22. High-Level Output Voltage vs. Supply Voltage

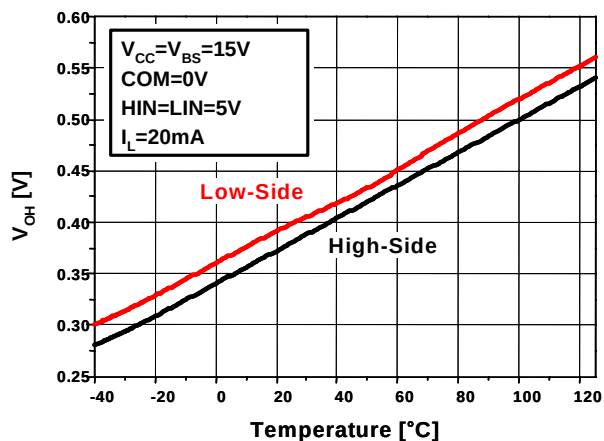


Figure 23. High-Level Output Voltage vs. Temp.

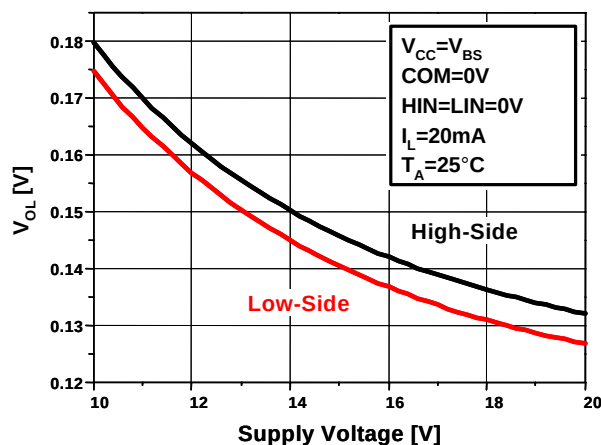


Figure 24. Low-Level Output Voltage vs. Supply Voltage

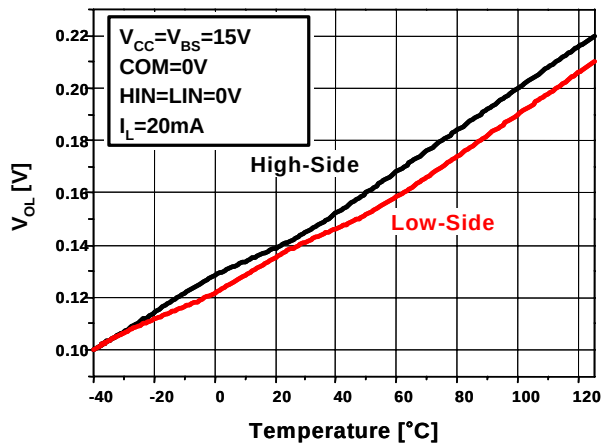


Figure 25. Low-Level Output Voltage vs. Temp.

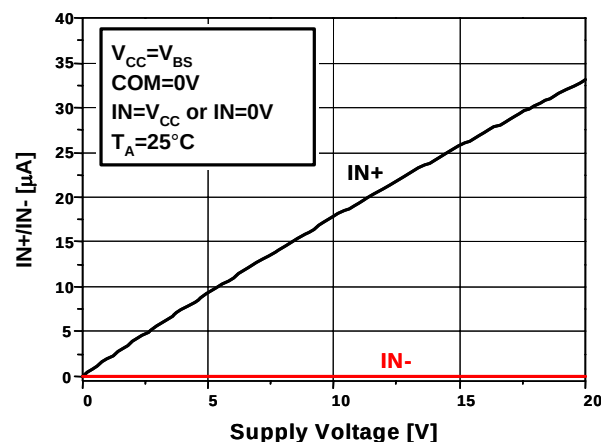


Figure 26. Input Bias Current vs. Supply Voltage

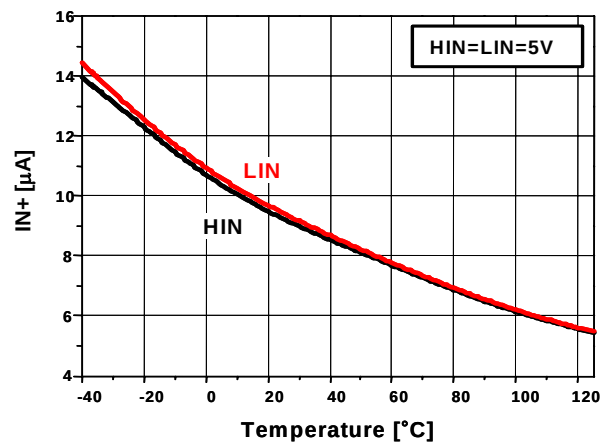


Figure 27. Input Bias Current vs. Temp.

## Typical Characteristics (Continued)

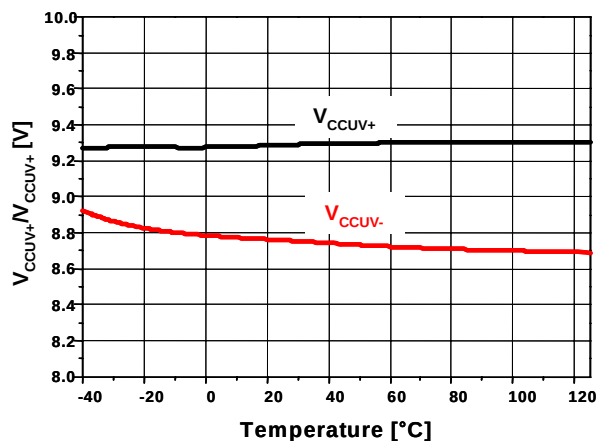
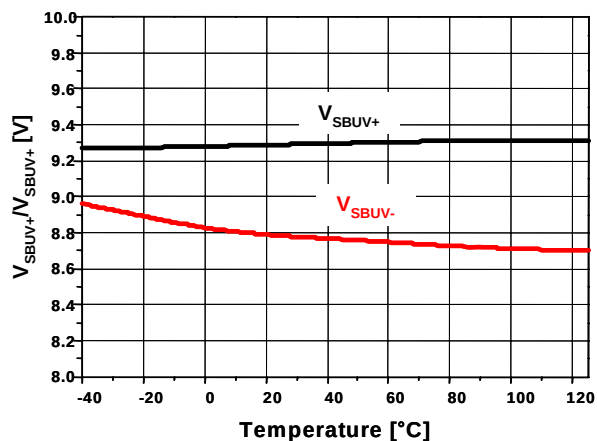
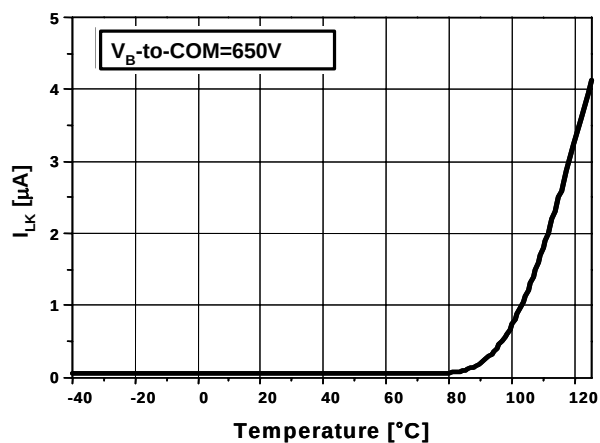
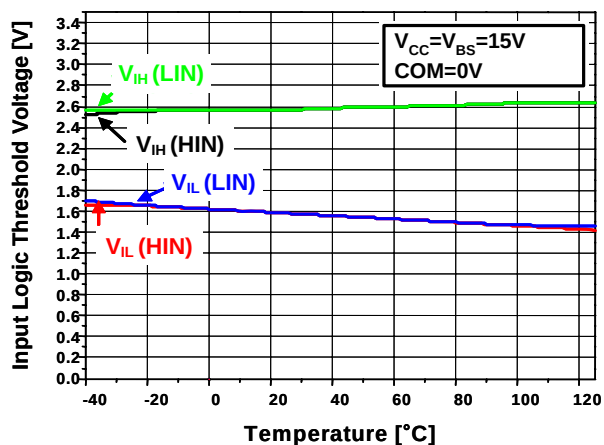
Figure 28.  $V_{CC}$  UVLO Threshold Voltage vs. Temp.Figure 29.  $V_{BS}$  UVLO Threshold Voltage vs. Temp.Figure 30.  $V_B$  to COM Leakage Current vs. Temp.

Figure 31. Input Logic Threshold Voltage vs. Temp.

## Typical Characteristics (Continued)

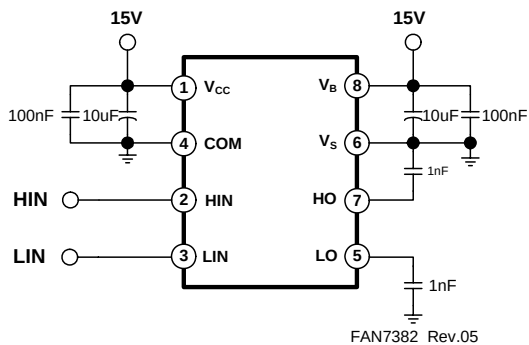


Figure 32. Switching Time Test Circuit

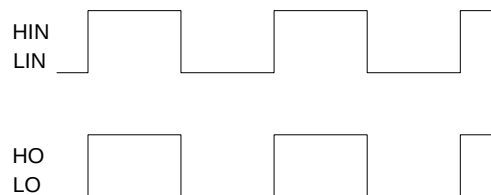


Figure 33. Input / Output Timing Diagram

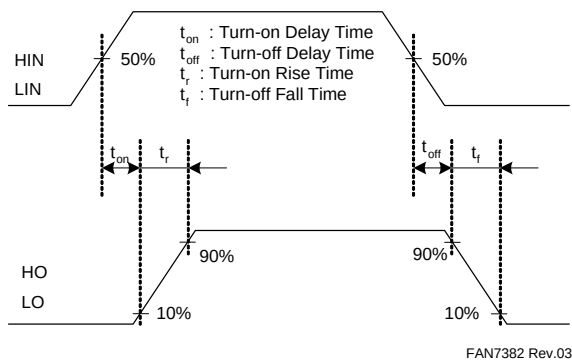


Figure 34. Switching Time Waveform Definition

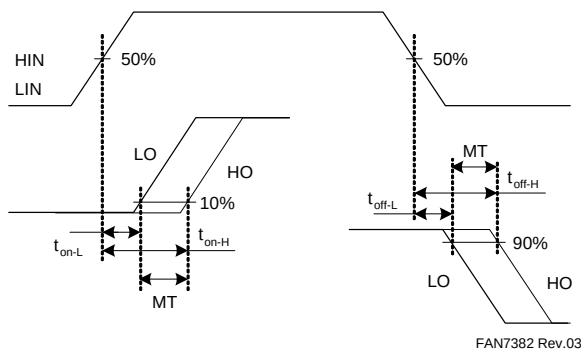
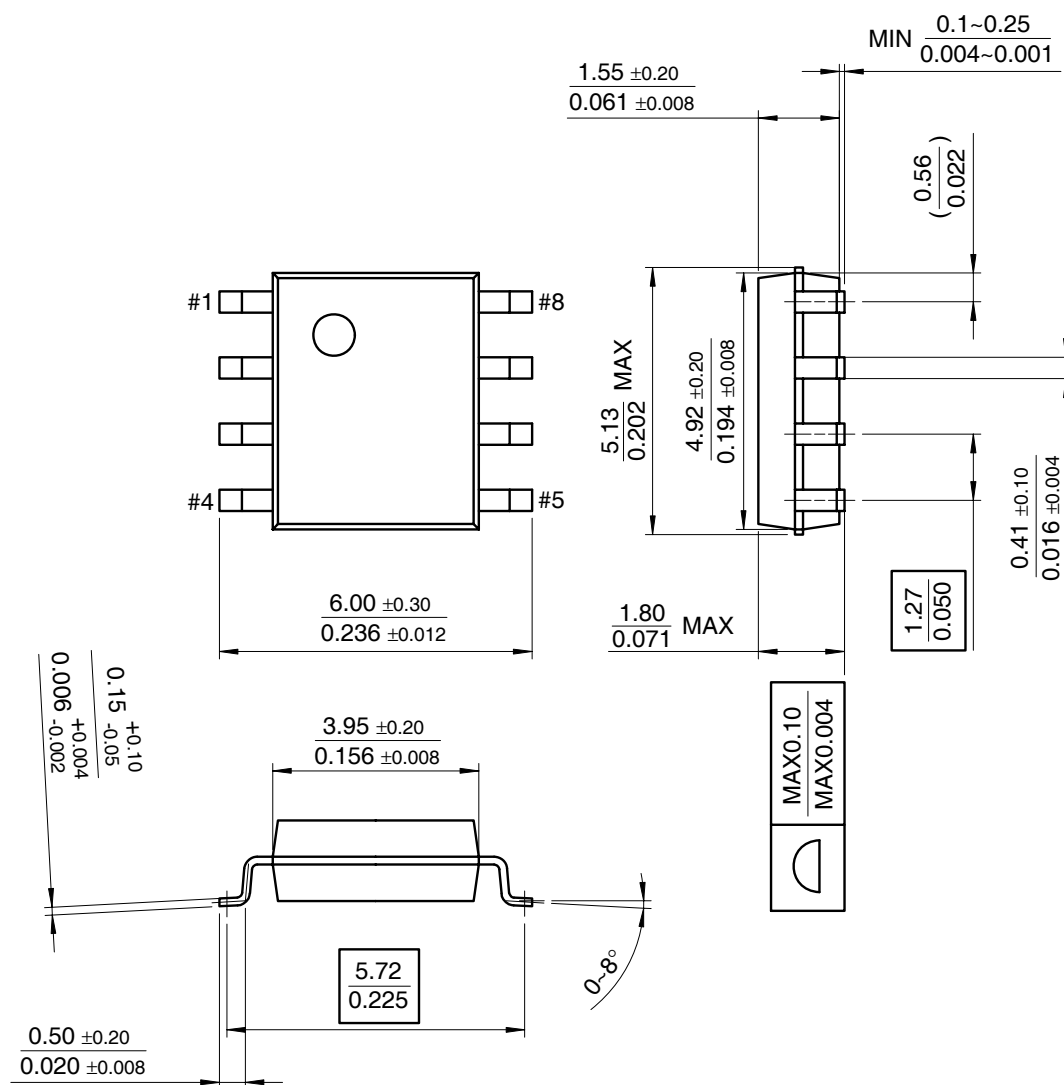


Figure 35. Delay Matching Waveform Definition

## Mechanical Dimensions

### 8-SOP

Dimensions are in millimeters (inches) unless otherwise noted.



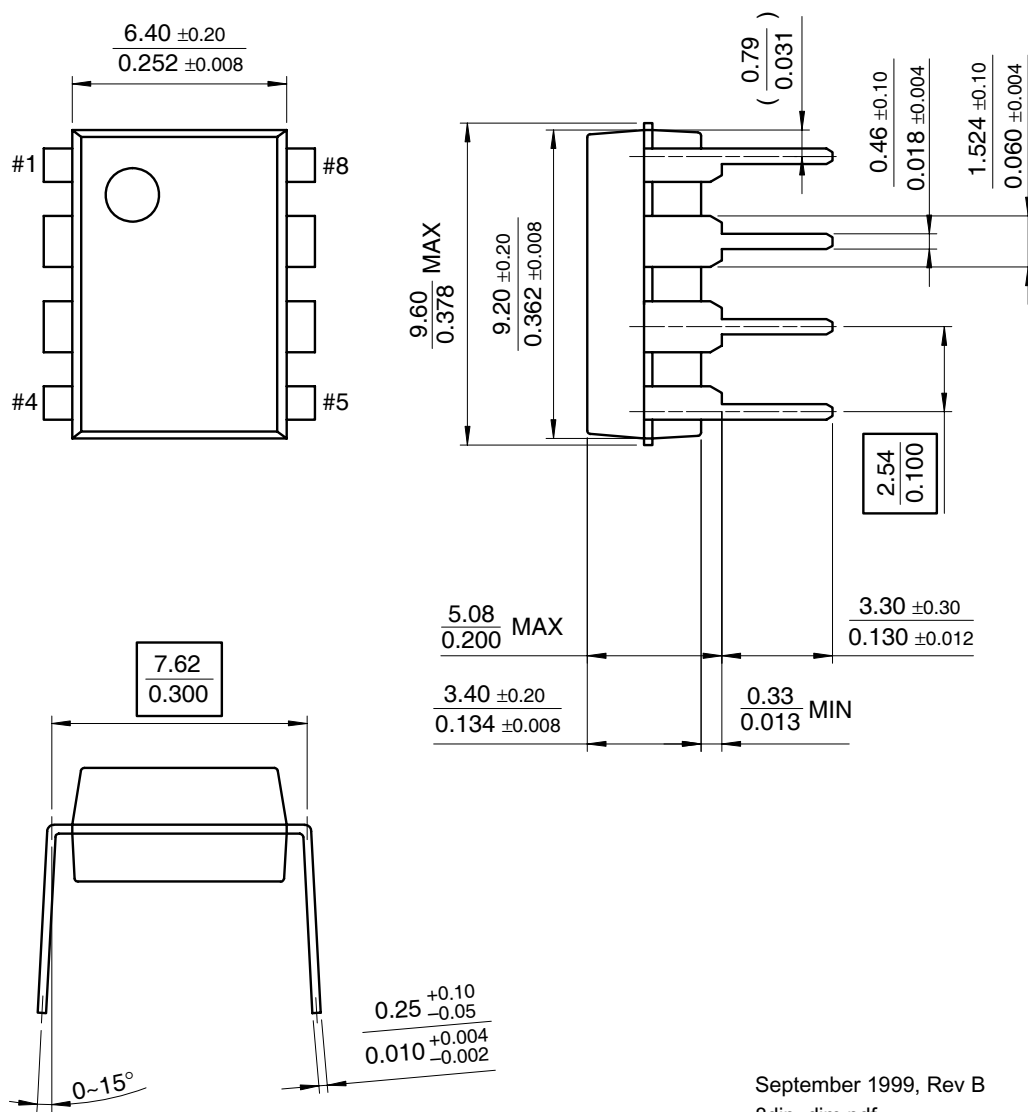
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Figure 36. 8-Lead Small Outline Package

## Mechanical Dimensions (Continued)

### 8-DIP

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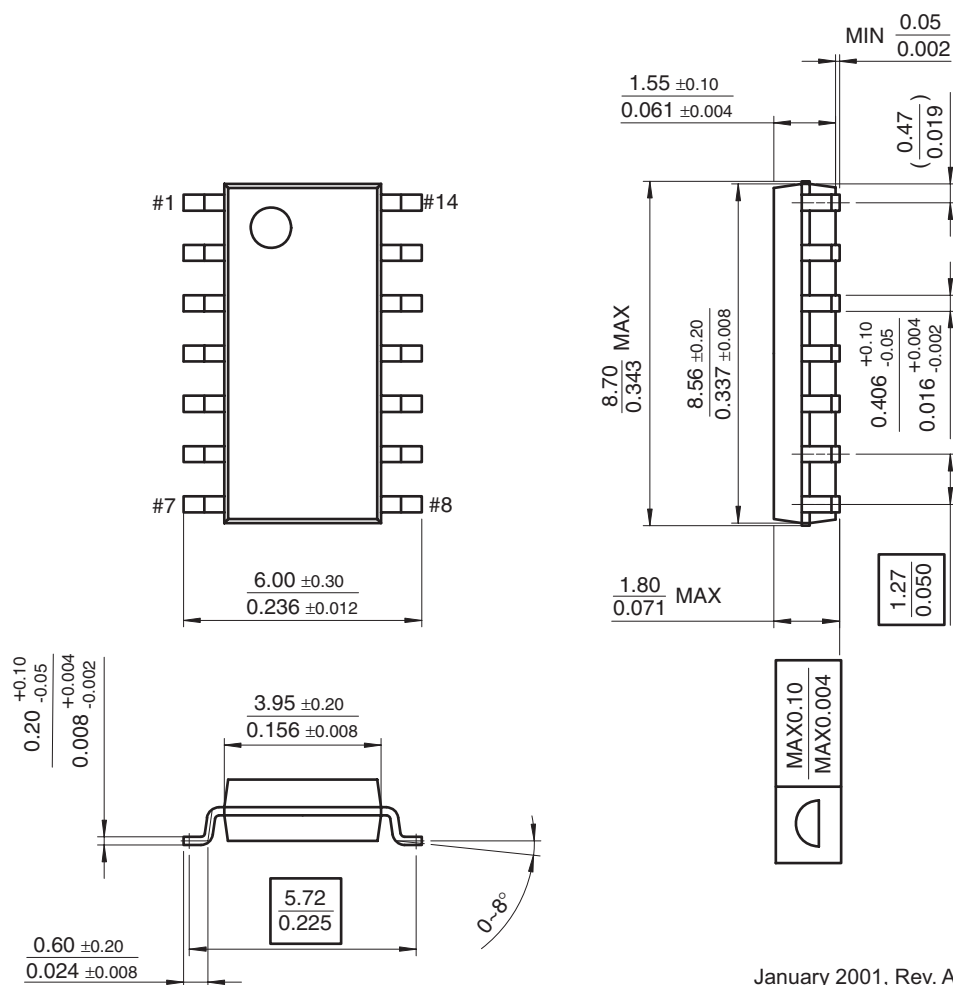


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Figure 37. 8-Lead Dual In-Line Package

**Mechanical Dimensions** (Continued)**14-SOP**

Dimensions are in millimeters (inches) unless otherwise noted.



January 2001, Rev. A  
14sop225b\_dim.pdf

**Figure 38. 14-Lead Small Outline Package**



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| ActiveArray <sup>™</sup>                         | ImpliedDisconnect <sup>™</sup> | QFET <sup>®</sup>                                                                   | TinyPower <sup>™</sup>      |
| Bottomless <sup>™</sup>                          | IntelliMAX <sup>™</sup>        | QS <sup>™</sup>                                                                     | TinyWire <sup>™</sup>       |
| Build it Now <sup>™</sup>                        | ISOPLANAR <sup>™</sup>         | QT Optoelectronics <sup>™</sup>                                                     | TruTranslation <sup>™</sup> |
| CoolFET <sup>™</sup>                             | MICROCOUPLER <sup>™</sup>      | Quiet Series <sup>™</sup>                                                           | μSerDes <sup>™</sup>        |
| CROSSVOLT <sup>™</sup>                           | MicroPak <sup>™</sup>          | RapidConfigure <sup>™</sup>                                                         | UHC <sup>®</sup>            |
| CTL <sup>™</sup>                                 | MICROWIRE <sup>™</sup>         | RapidConnect <sup>™</sup>                                                           | UniFET <sup>™</sup>         |
| Current Transfer Logic <sup>™</sup>              | MSX <sup>™</sup>               | ScalarPump <sup>™</sup>                                                             | VCX <sup>™</sup>            |
| DOME <sup>™</sup>                                | MSXPro <sup>™</sup>            | SMART START <sup>™</sup>                                                            | Wire <sup>™</sup>           |
| E <sup>2</sup> C <sup>™</sup>                    | OCX <sup>™</sup>               | SPM <sup>®</sup>                                                                    |                             |
| EcoSPARK <sup>®</sup>                            | OCXPro <sup>™</sup>            | SuperFET <sup>™</sup>                                                               |                             |
| EnSigna <sup>™</sup>                             | OPTOLOGIC <sup>®</sup>         | SuperSOT <sup>™</sup> -3                                                            |                             |
| FACT Quiet Series <sup>™</sup>                   | OPTOPLANAR <sup>®</sup>        | SuperSOT <sup>™</sup> -6                                                            |                             |
| FACT <sup>®</sup>                                | PACMAN <sup>™</sup>            | SuperSOT <sup>™</sup> -8                                                            |                             |
| FAST <sup>®</sup>                                | POP <sup>™</sup>               | TCM <sup>™</sup>                                                                    |                             |
| FASTr <sup>™</sup>                               | Power220 <sup>®</sup>          | The Power Franchise <sup>®</sup>                                                    |                             |
| FPS <sup>™</sup>                                 | Power247 <sup>®</sup>          |  ™ |                             |
| FRFET <sup>®</sup>                               | PowerEdge <sup>™</sup>         | TinyBoost <sup>™</sup>                                                              |                             |
| GlobalOptoisolator <sup>™</sup>                  | PowerSaver <sup>™</sup>        | TinyBuck <sup>™</sup>                                                               |                             |
| GTO <sup>™</sup>                                 |                                |                                                                                     |                             |

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As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status         | Definition                                                                                                                                                                                               |
|--------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information      | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.                                                                       |
| Preliminary              | First Production       | This 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. |
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