

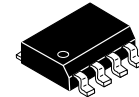
# High-Side and Low-Side Gate Driver

## FAN7382

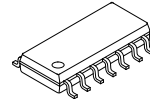
The FAN7382, a monolithic high and low side gate-drive IC, can drive MOSFETs and IGBTs that operate up to +600 V. onsemi's high-voltage process and commonmode noise canceling technique provides stable operation of the high-side driver under high-dv/dt noise circumstances. An advanced level-shift circuit allows high-side gate driver operation up to  $V_S = -9.8$  V (typical) for  $V_{BS} = 15$  V. 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 350 mA/650 mA, respectively, which is suitable for fluorescent lamp ballasts, PDP scan drivers, motor controls, etc.

### Features

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



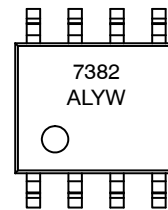
SOIC8  
CASE 751EG



SOIC14 N  
CASE 751ER

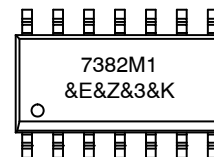
### MARKING DIAGRAMS

#### SOIC8



7382 = Device Code  
A = Assembly Site  
L = Wafer Lot Number  
YW = Assembly Start Week

#### SOIC14 N



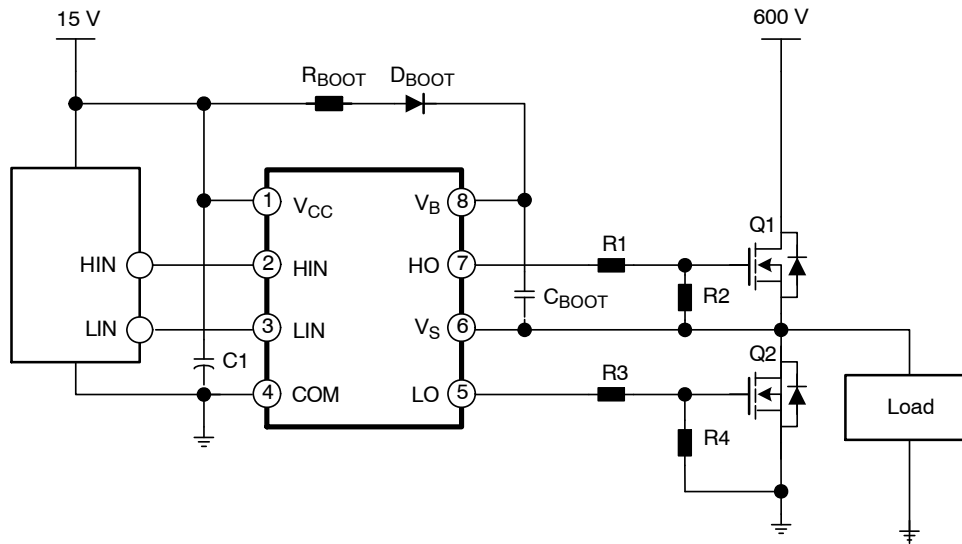
7382M1 = Device Code  
&E = Designates Space  
&Z = Assembly Location  
&3 = 3-Digit Date Code  
&K = 2-Digits Lot Run Traceability Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 12 of this data sheet.

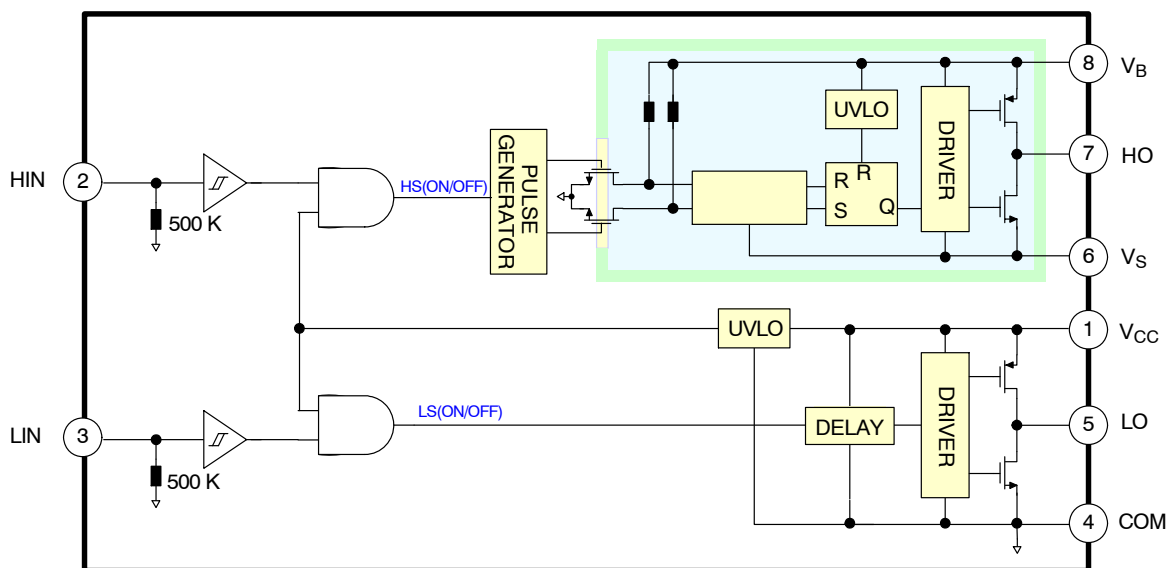
**FAN7382**

### Typical Application Circuit



**Figure 1. Application Circuit for Half-Bridge**

### Internal Block Diagram



**Figure 2. Functional Block Diagram**

# FAN7382

## Pin Assignments

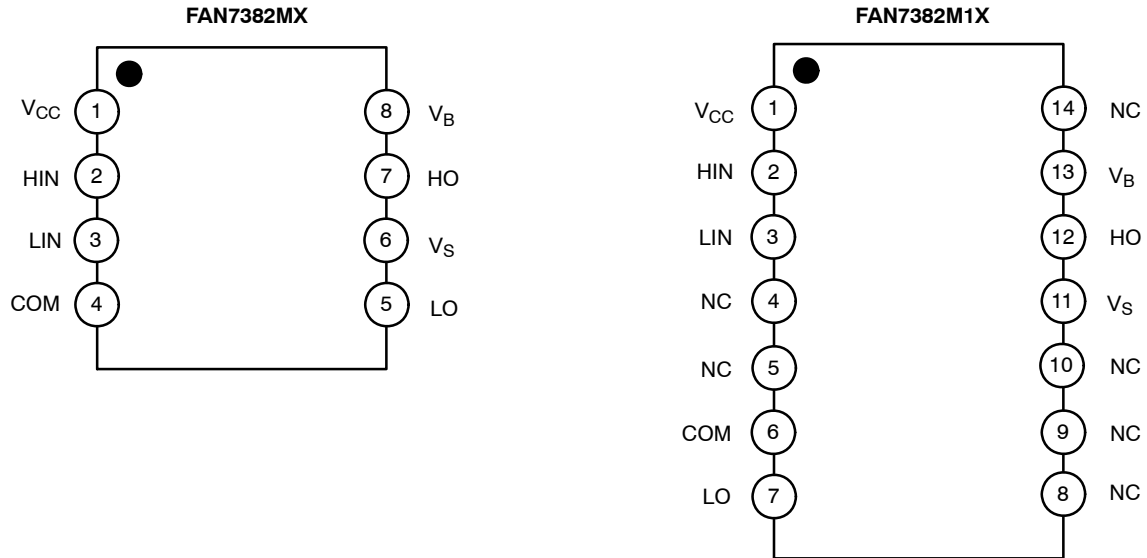


Figure 3. Pin Configuration (Top View)

## 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**

| Parameter                               | Symbol                   | Min           | Max            | Unit |
|-----------------------------------------|--------------------------|---------------|----------------|------|
| High-Side Offset Voltage                | $V_S$                    | $V_B - 25$    | $V_B + 0.3$    | V    |
| High-Side Floating Supply Voltage       | $V_B$                    | -0.3          | 625            |      |
| High-Side Floating Output Voltage HO    | $V_{HO}$                 | $V_S - 0.3$   | $V_B + 0.3$    |      |
| Low-Side and Logic Fixed Supply Voltage | $V_{CC}$                 | -0.3          | 25             |      |
| Low-Side Output Voltage LO              | $V_{LO}$                 | -0.3          | $V_{CC} + 0.3$ |      |
| Logic Input Voltage (HIN, LIN)          | $V_{IN}$                 | -0.3          | $V_{CC} + 0.3$ |      |
| Logic Ground                            | COM                      | $V_{CC} - 25$ | $V_{CC} + 0.3$ |      |
| Allowable Offset Voltage Slew Rate      | $dV_S/dt$                |               | 50             | V/ns |
| Power Dissipation                       | $P_D$<br>(Notes 1, 2, 3) | SOIC8         | 0.625          | W    |
|                                         |                          | SOIC14 N      | 1.0            |      |
| Junction temperature                    | $T_J$                    |               | 150            | °C   |
| Storage Temperature                     | $T_{STG}$                |               | 150            | °C   |

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

1. Mounted on 76.2 x 114.3 x 1.6 mm PCB (FR-4 glass epoxy material).
2. 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
3. Do not exceed  $P_D$  under any circumstances.

**THERMAL CHARACTERISTICS**

| Parameter                               | Symbol        | Min      | Max | Unit |
|-----------------------------------------|---------------|----------|-----|------|
| Thermal Resistance, Junction-to-Ambient | $\theta_{JA}$ | SOIC8    | 200 | °C/W |
|                                         |               | SOIC14 N | 110 |      |

**RECOMMENDED OPERATING CONDITIONS**

| Parameter                                | Symbol   | Min          | Max        | Unit |
|------------------------------------------|----------|--------------|------------|------|
| High-Side Floating Supply Voltage        | $V_B$    | $V_S + 10$   | $V_S + 20$ | V    |
| High-Side Floating Supply Offset Voltage | $V_S$    | $6 - V_{CC}$ | 600        | V    |
| High-Side (HO) Output Voltage            | $V_{HO}$ | $V_S$        | $V_B$      | V    |
| Low-Side (LO) Output Voltage             | $V_{LO}$ | COM          | $V_{CC}$   | V    |
| Logic Input Voltage (HIN, LIN)           | $V_{IN}$ | COM          | $V_{CC}$   | V    |
| Low-Side Supply Voltage                  | $V_{CC}$ | 10           | 20         | V    |
| Ambient Temperature                      | $T_A$    | -40          | 125        | °C   |

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

**ELECTRICAL CHARACTERISTICS**

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15.0 V,  $T_A$  = 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.

| Parameter                                                             | Test Condition                                         | Symbol                     | Min | Typ  | Max  | Unit    |
|-----------------------------------------------------------------------|--------------------------------------------------------|----------------------------|-----|------|------|---------|
| $V_{CC}$ and $V_{BS}$ Supply Under-Voltage Positive Going Threshold   |                                                        | $V_{CCUV+}$<br>$V_{BSUV+}$ | 8.2 | 9.2  | 10.0 | V       |
| $V_{CC}$ and $V_{BS}$ Supply Under-Voltage Negative Going Threshold   |                                                        | $V_{CCUV-}$<br>$V_{BSUV-}$ | 7.6 | 8.7  | 9.6  | V       |
| $V_{CC}$ Supply Under-Voltage Lockout Hysteresis                      |                                                        | $V_{CCUVH}$<br>$V_{BSUVH}$ |     | 0.6  |      | V       |
| Offset Supply Leakage Current                                         | $V_B = V_S = 600$ V                                    | $I_{LK}$                   |     |      | 50   | $\mu$ A |
| Quiescent $V_{BS}$ Supply Current                                     | $V_{IN} = 0$ V or 5 V                                  | $I_{QBS}$                  |     | 45   | 120  | $\mu$ A |
| Quiescent $V_{CC}$ Supply Current                                     | $V_{IN} = 0$ V or 5 V                                  | $I_{QCC}$                  |     | 70   | 180  | $\mu$ A |
| Operating $V_{BS}$ Supply Current                                     | $f_{IN} = 20$ kHz, rms value                           | $I_{PBS}$                  |     |      | 600  | $\mu$ A |
| Operating $V_{CC}$ Supply Current                                     | $f_{IN} = 20$ kHz, rms value                           | $I_{PCC}$                  |     |      | 600  | $\mu$ A |
| Logic "1" Input Voltage                                               |                                                        | $V_{IH}$                   | 2.9 |      |      | V       |
| Logic "0" input voltage                                               |                                                        | $V_{IL}$                   |     |      | 0.8  | V       |
| High-Level Output Voltage, $V_{BIAS} - V_O$                           | $I_O = 20$ mA                                          | $V_{OH}$                   |     |      | 1.0  | V       |
| Low-Level Output Voltage, $V_O$                                       |                                                        | $V_{OL}$                   |     |      | 0.6  | V       |
| Logic "1" Input Bias Current                                          | $V_{IN} = 5$ V                                         | $I_{IN+}$                  |     | 10   | 20   | $\mu$ A |
| Logic "0" Input Bias Current                                          | $V_{IN} = 0$ V                                         | $I_{IN-}$                  |     | 1.0  | 2.0  | $\mu$ A |
| Output High Short-Circuit Pulsed Current                              | $V_O = 0$ V, $V_{IN} = 5$ V<br>with $PW < 10$ $\mu$ s  | $I_{O+}$                   | 250 | 350  |      | mA      |
| Output Low Short-Circuit Pulsed Current                               | $V_O = 15$ V, $V_{IN} = 0$ V<br>with $PW < 10$ $\mu$ s | $I_{O-}$                   | 500 | 650  |      | mA      |
| Allowable Negative $V_S$ Pin Voltage for HIN Signal Propagation to HO |                                                        | $V_S$                      |     | -9.8 | -7.0 | V       |

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

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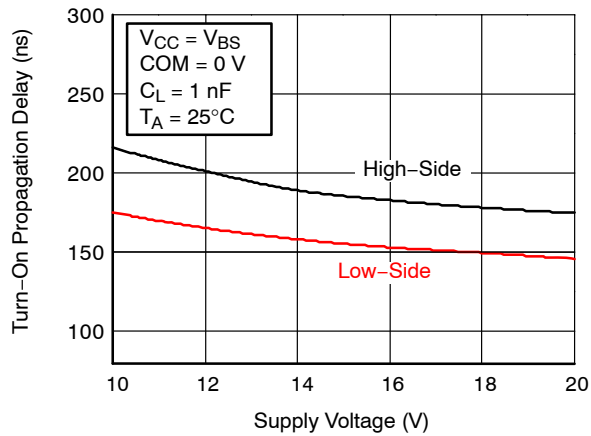
**DYNAMIC ELECTRICAL CHARACTERISTICS**

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

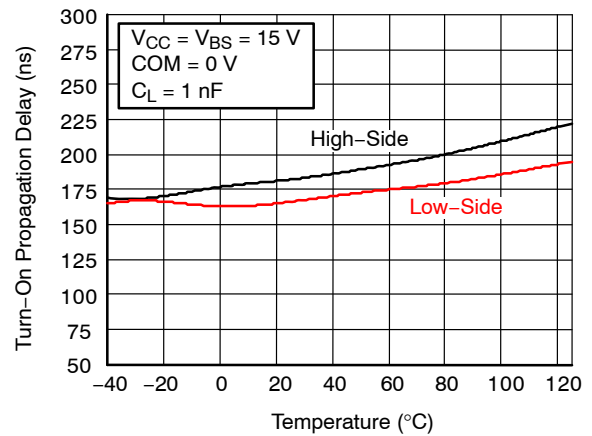
| Parameter                           | Test Condition                   | Symbol    | Min | Typ | Max | Unit |
|-------------------------------------|----------------------------------|-----------|-----|-----|-----|------|
| Turn-On Propagation Delay           | $V_S = 0$ V                      | $t_{on}$  | 100 | 170 | 300 | ns   |
| Turn-Off Propagation Delay          | $V_S = 0$ V or 600 V<br>(Note 4) | $t_{off}$ | 100 | 200 | 300 | ns   |
| Turn-On Rise Time                   |                                  | $t_r$     | 20  | 60  | 140 | ns   |
| Turn-Off Fall Time                  |                                  | $t_f$     |     | 30  | 80  | ns   |
| Delay Matching, HS & LS Turn-On/Off |                                  | MT        |     |     | 50  | ns   |

4. This parameter guaranteed by design.

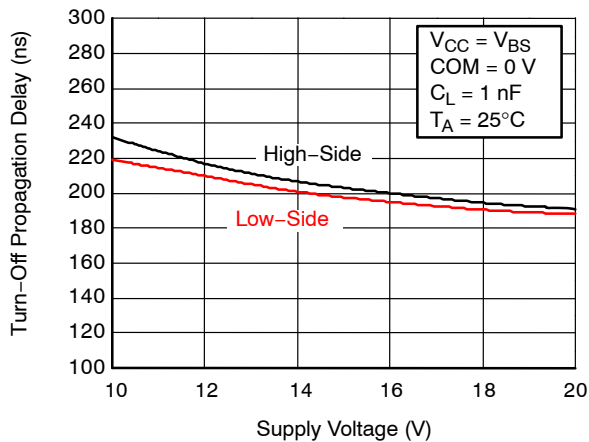
## TYPICAL CHARACTERISTICS



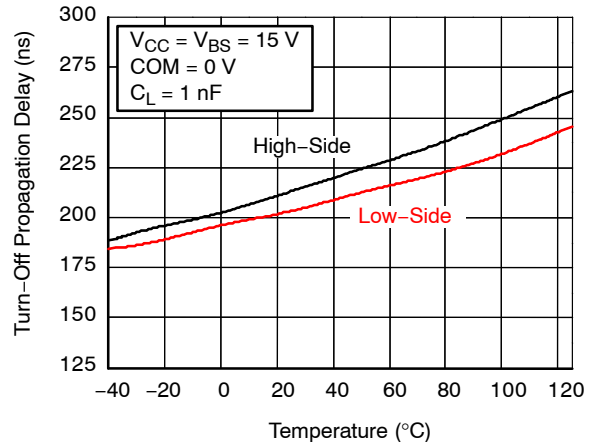
**Figure 4. Turn-On Propagation Delay vs. Supply Voltage**



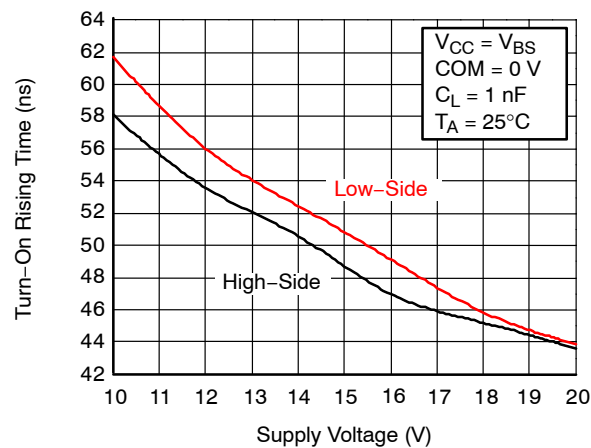
**Figure 5. Turn-On Propagation Delay vs. Temperature**



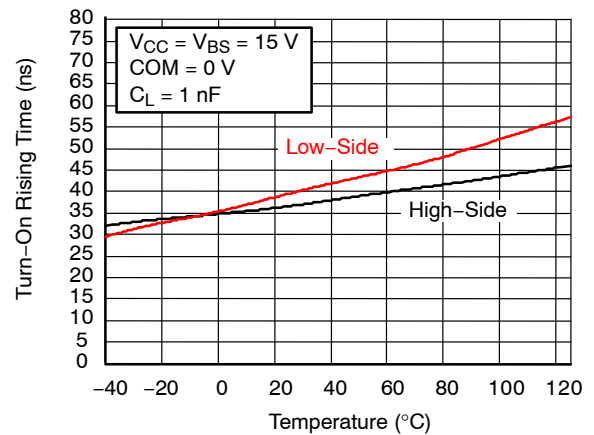
**Figure 6. Turn-Off Propagation Delay vs. Supply Voltage**



**Figure 7. Turn-Off Propagation Delay vs. Temperature**



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



**Figure 9. Turn-On Rising Time vs. Temperature**

TYPICAL CHARACTERISTICS (continued)

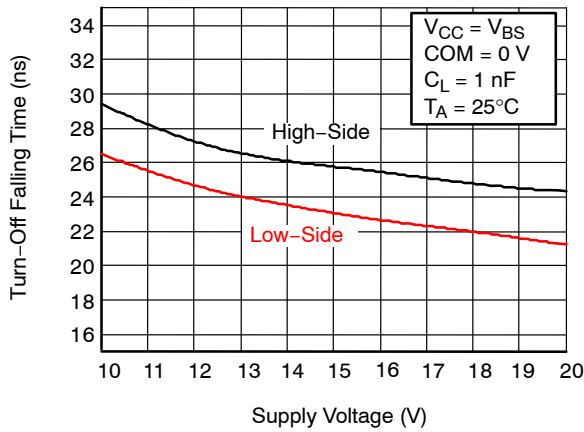


Figure 10. Turn-Off Falling Time vs. Supply Voltage

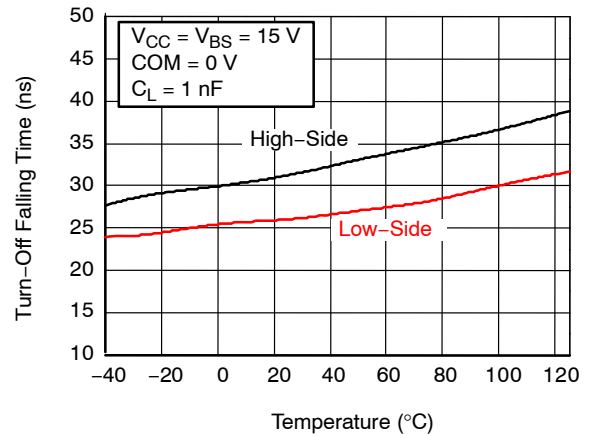


Figure 11. Turn-Off Falling Time vs. Temperature

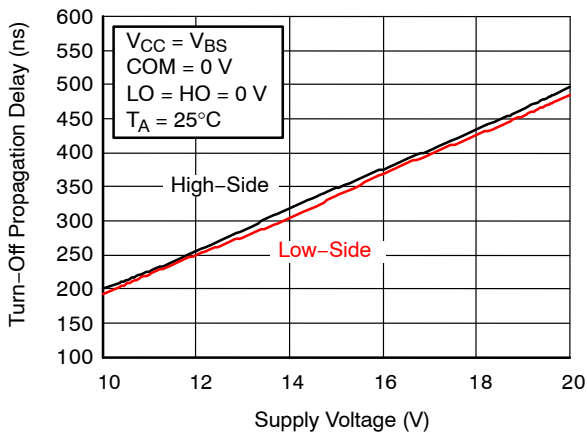


Figure 12. Output Sourcing Current vs. Supply Voltage

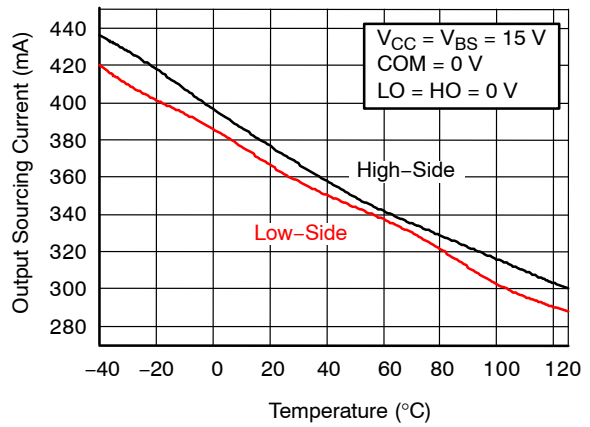


Figure 13. Output Sourcing Current vs. Temperature

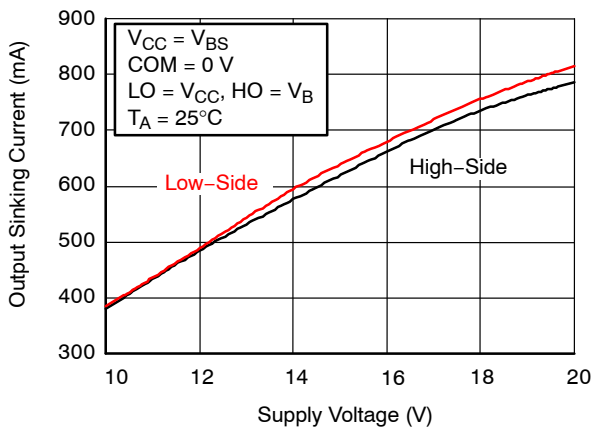


Figure 14. Output Sinking Current vs. Supply Voltage

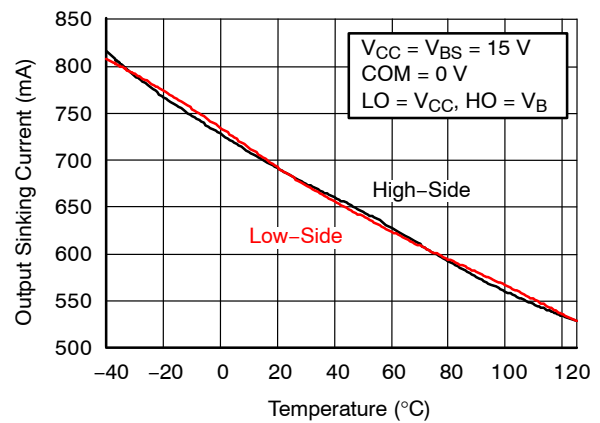
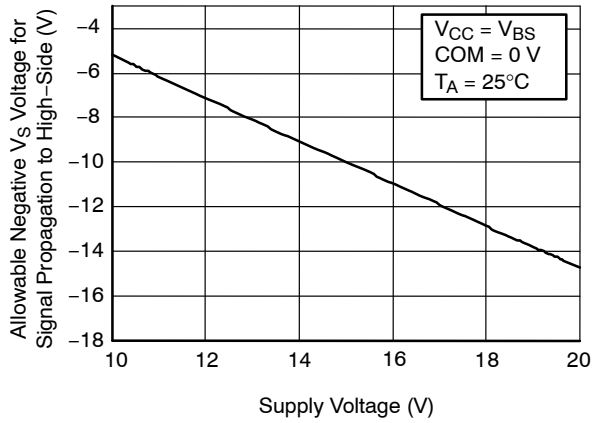
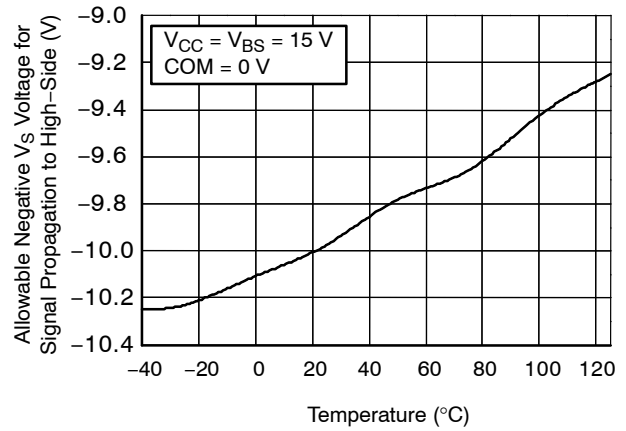


Figure 15. Output Sinking Current vs. Temperature

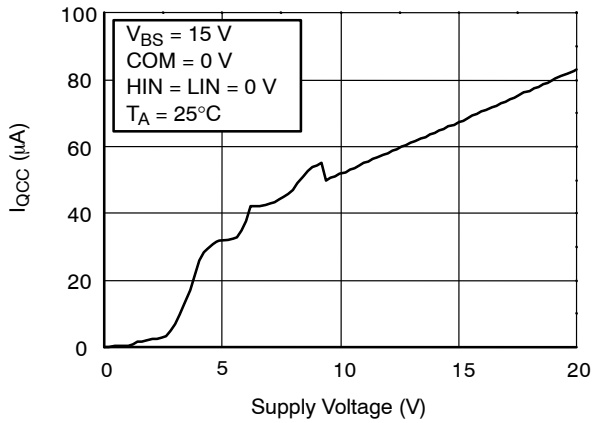
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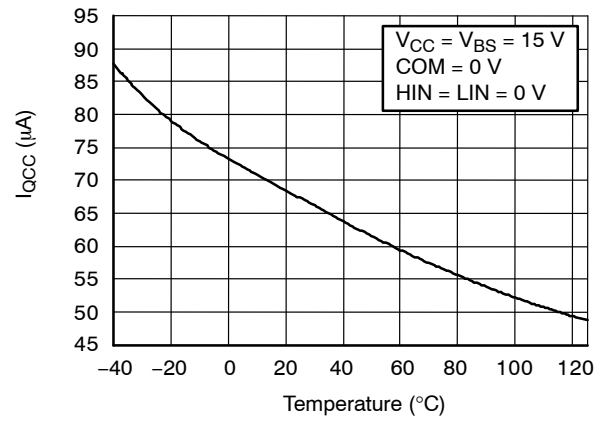
**Figure 16. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Supply Voltage**



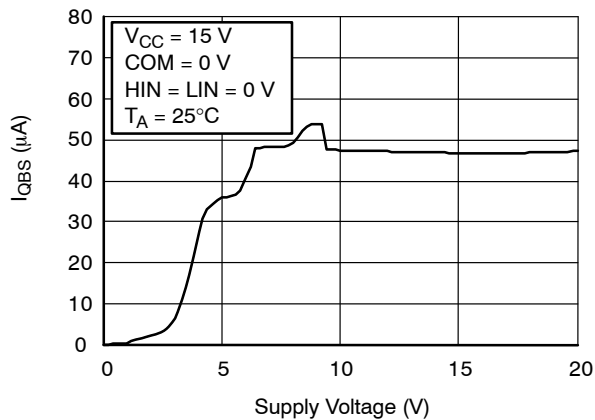
**Figure 17. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Temperature**



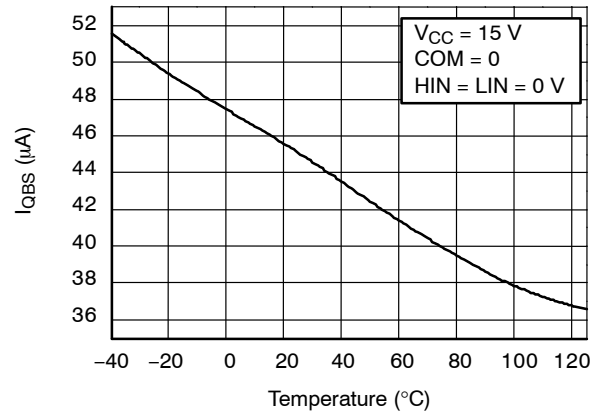
**Figure 18.  $I_{QCC}$  vs. Supply Voltage**



**Figure 19.  $I_{QCC}$  vs. Temperature**



**Figure 20.  $I_{QBS}$  vs. Supply Voltage**



**Figure 21.  $I_{QBS}$  vs. Temperature**



## TYPICAL CHARACTERISTICS (continued)

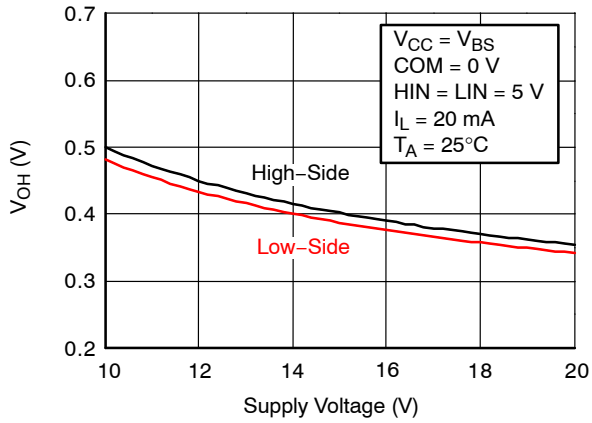


Figure 22. High-Level Output Voltage vs. Supply Voltage

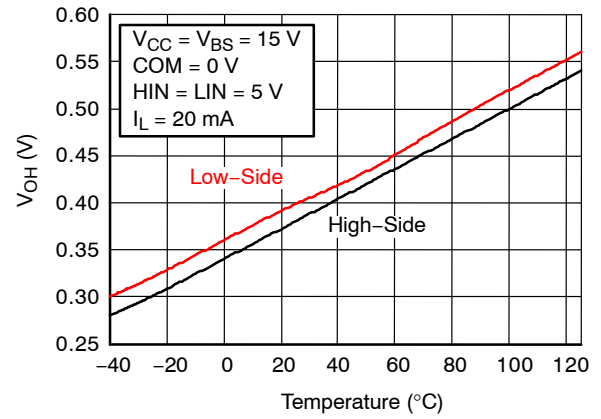


Figure 23. High-Level Output Voltage vs. Temperature

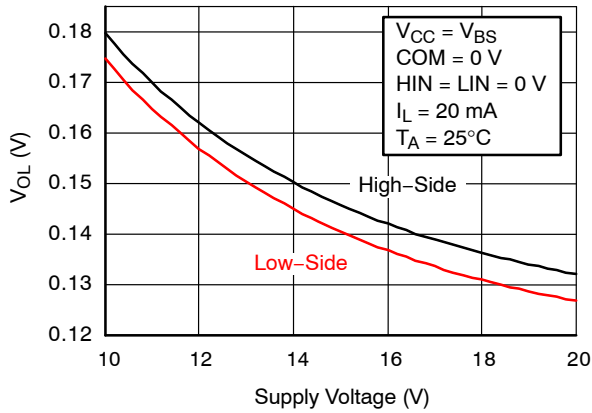


Figure 24. Low-Level Output Voltage vs. Supply Voltage

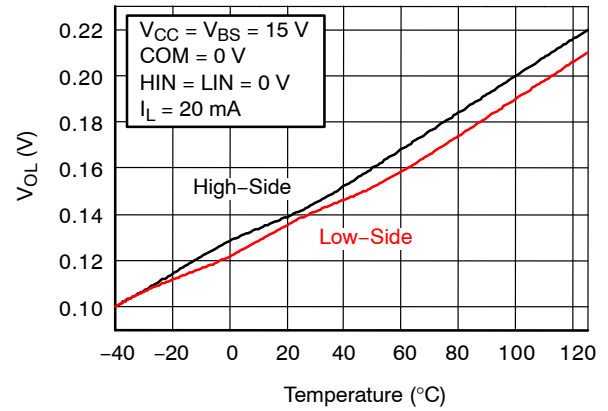


Figure 25. Low-Level Output Voltage vs. Temperature

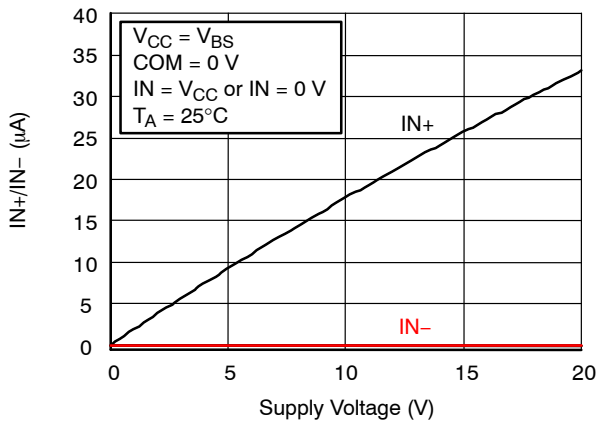


Figure 26. Input Bias Current vs. Supply Voltage

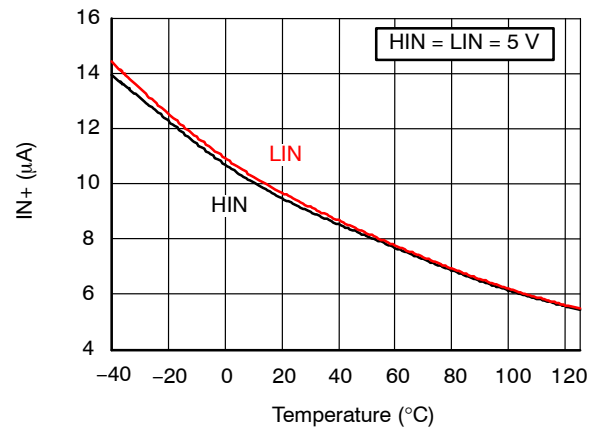


Figure 27. Input Bias Current vs. Temperature

## TYPICAL CHARACTERISTICS (continued)

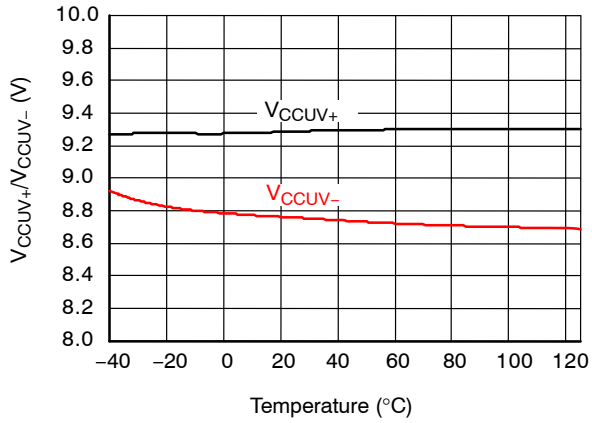


Figure 28. V<sub>CC</sub> UVLO Threshold Voltage vs. Temperature

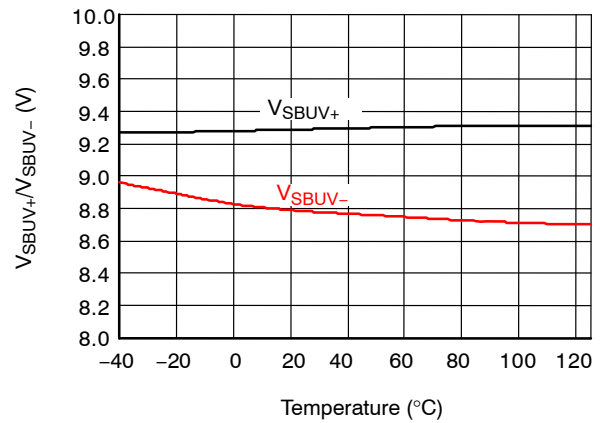


Figure 29. V<sub>BS</sub> UVLO Threshold Voltage vs. Temperature

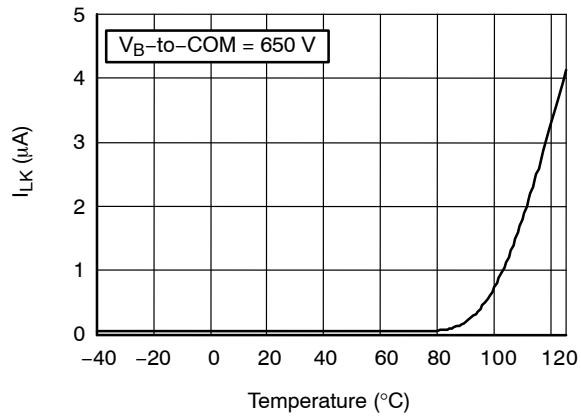


Figure 30. V<sub>B</sub> to COM Leakage Current vs. Temperature

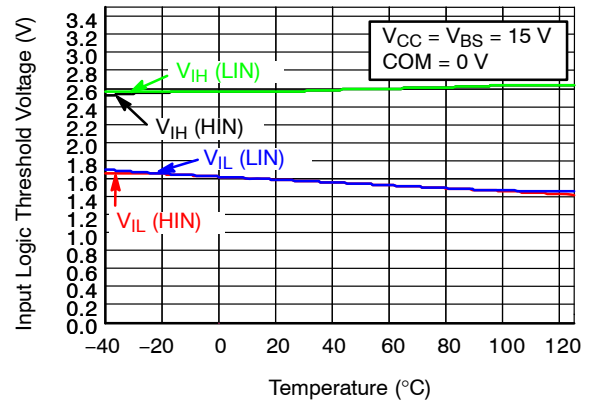


Figure 31. Input Logic Threshold Voltage vs. Temperature

TYPICAL CHARACTERISTICS (continued)

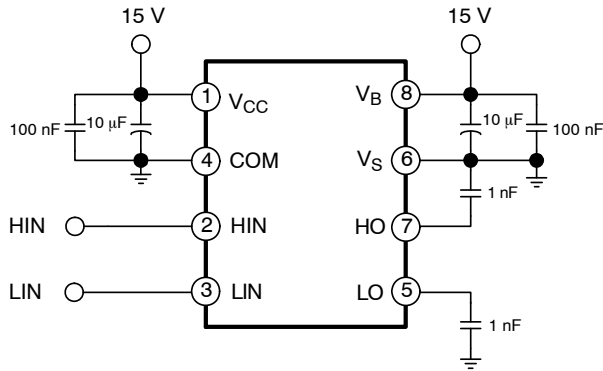


Figure 32. Switching Time Test Circuit

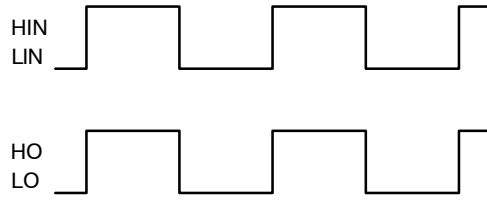


Figure 33. Input / Output Timing Diagram

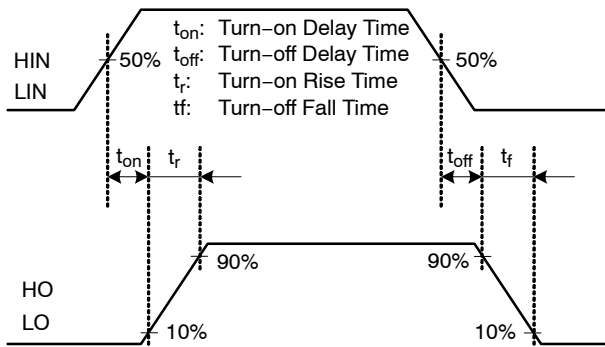


Figure 34. Switching Time Waveform Definition

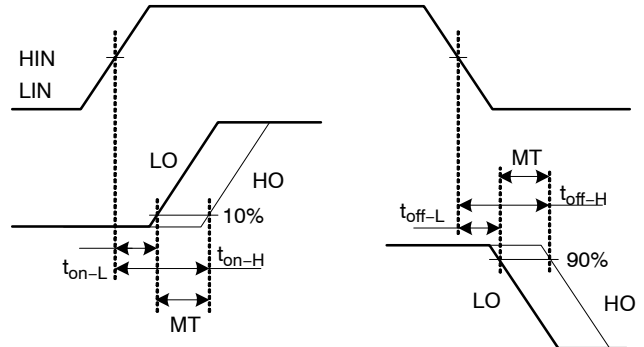


Figure 35. Delay Matching Waveform Definition

## FAN7382

### ORDERING INFORMATION

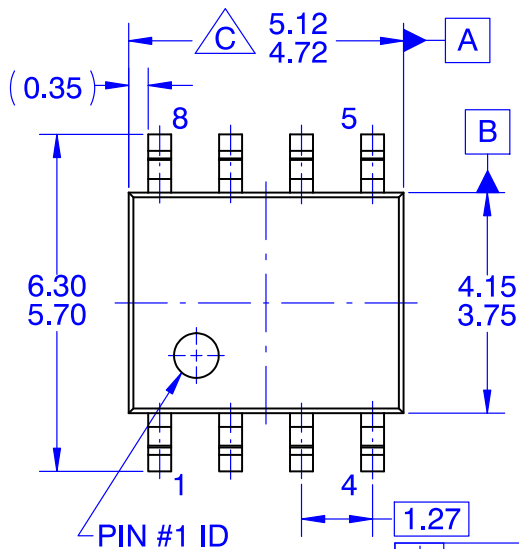
| Part Number         | Operating Temperature Range | Package               | Shipping <sup>†</sup> |
|---------------------|-----------------------------|-----------------------|-----------------------|
| FAN7382MX (Note 5)  | -40°C ~125°C                | SOIC8<br>(Pb-Free)    | 3000 / Tape & Reel    |
| FAN7382M1X (Note 5) |                             | SOIC14 N<br>(Pb-Free) | 3000 / Tape & Reel    |

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

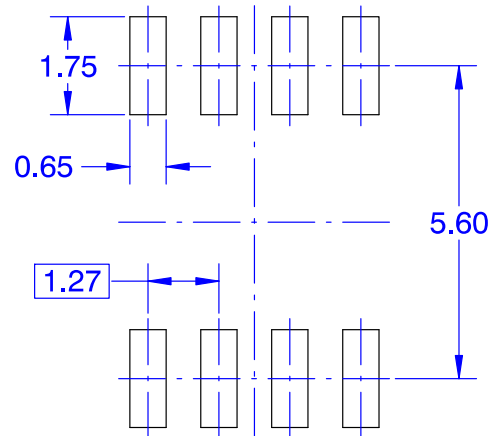
5. These devices passed wave soldering test by JESD22A-111.

**SOIC8**  
**CASE 751EG**  
**ISSUE O**

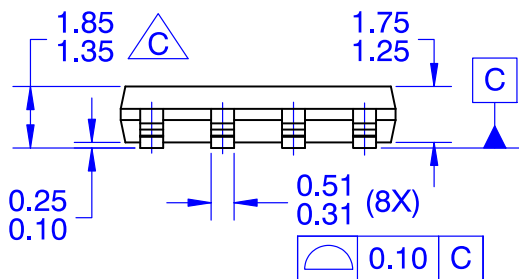
DATE 30 SEP 2016



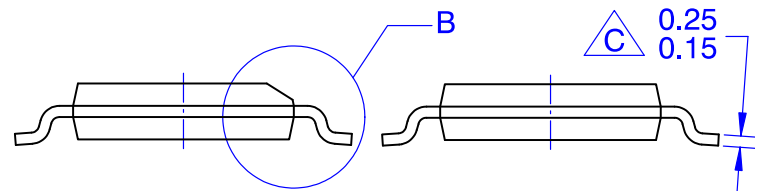
TOP VIEW



LAND PATTERN RECOMMENDATION



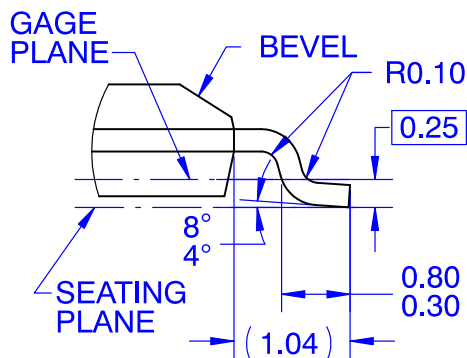
FRONT VIEW



OPTION A  
BEVEL EDGE

OPTION B  
NON-BEVEL EDGE

SIDE VIEW



DETAIL "B"  
SCALE 2:1

**NOTES: UNLESS OTHERWISE SPECIFIED**

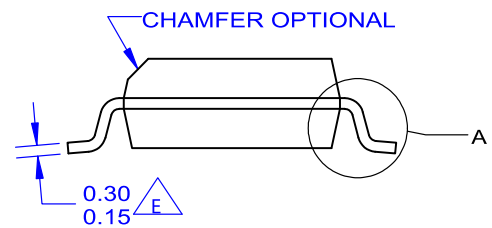
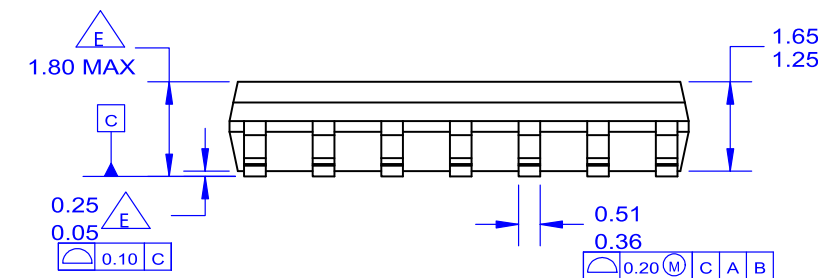
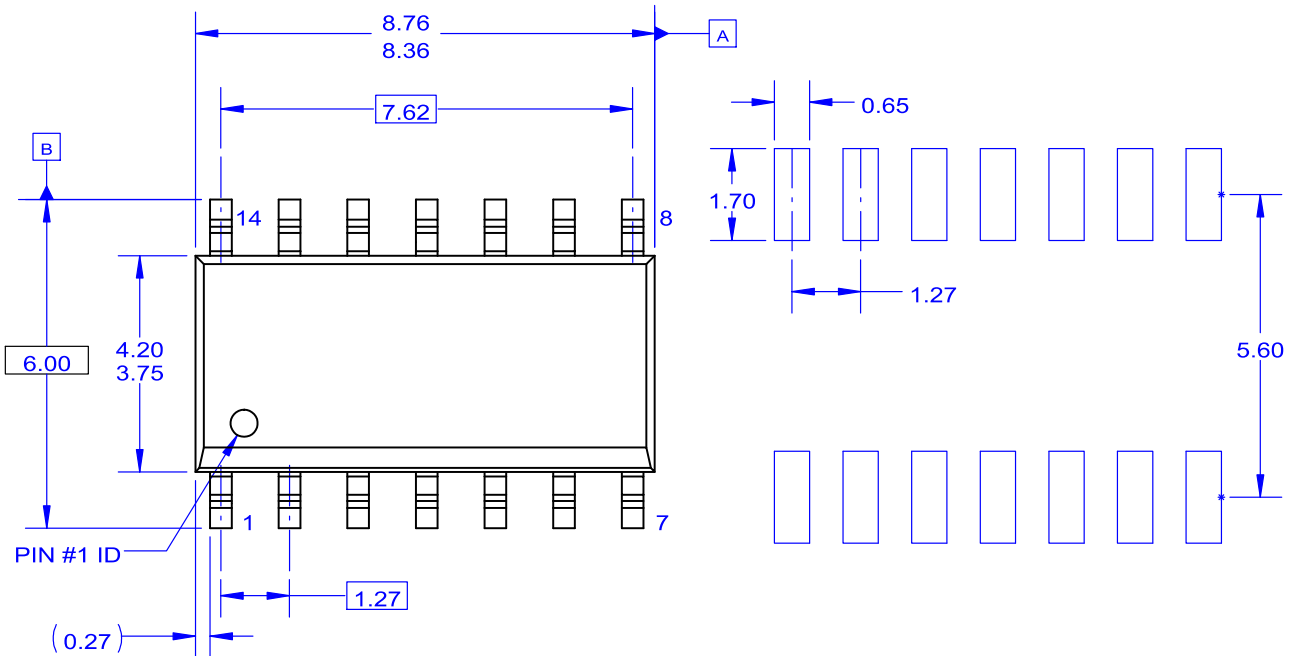
- A. THIS PACKAGE CONFORMS TO JEDEC MS-012 VARIATION A EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. OUT OF JEDEC STANDARD VALUE
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- E. LAND PATTERN AS PER IPC SOIC127P600X175-8M

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**SOIC14 N**  
**CASE 751ER**  
**ISSUE O**

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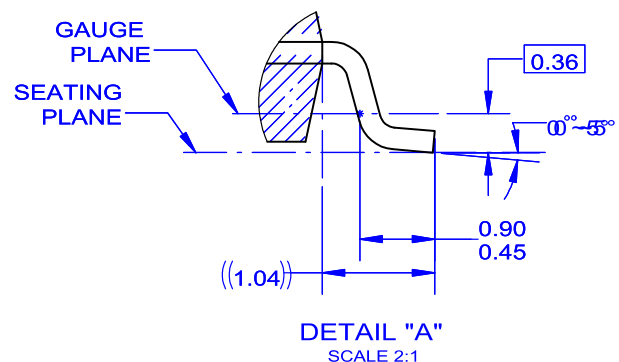
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