# FAN7361

## High-Side Gate Driver

### Features

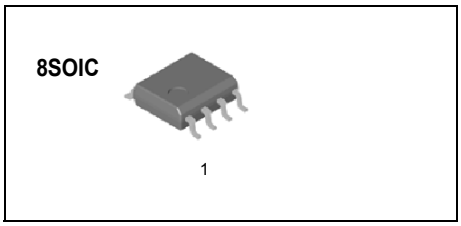
- Floating Channel Designed For Bootstrap Operation To +600V.
- Typically 250mA/500mA Sourcing/Sinking Current Driving Capability
- Common-Mode dv/dt Noise Canceling Circuit
- VCC & VBS Supply Range From 10V To 20V
- UVLO Function
- Output In-phase With Input

### Typical Applications

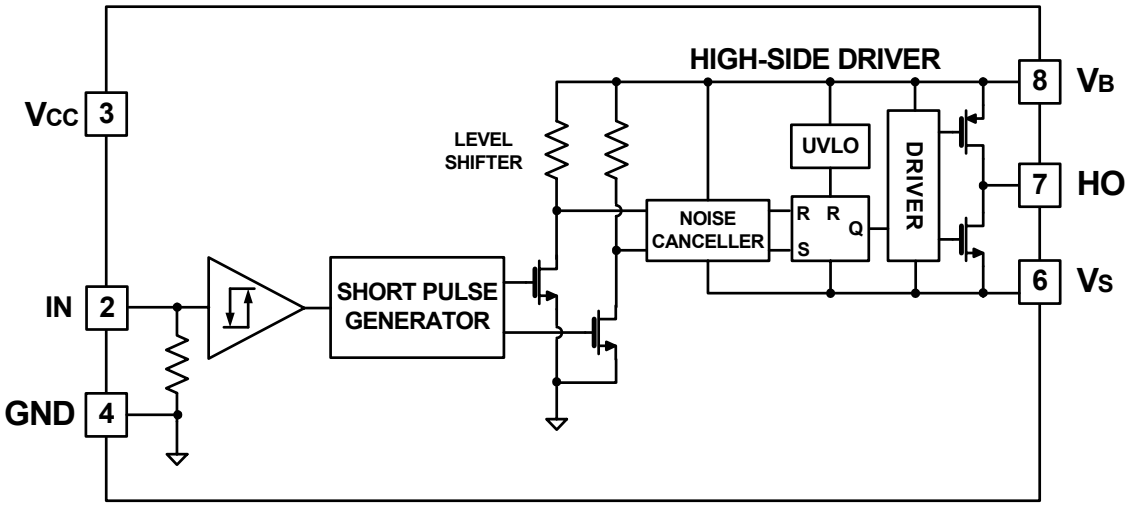
- Fluorescent Lamp Ballast
- PDP Scan Driver
- Motor Control

### Description

The FAN7361 is a monolithic high-side gate driver IC for driving MOSFETs and IGBTs, which operate up to +600V. Fairchild's high voltage process and common-mode noise canceling technique give stable operation of high-side driver under high dv/dt noise circumstances. The UVLO circuit prevents malfunction when VBS is lower than the specified threshold voltage. Output drivers typically source/sink 250mA/500mA, respectively, which is suitable for the applications such as fluorescent lamp ballast, PDP scan driver, motor control, etc.

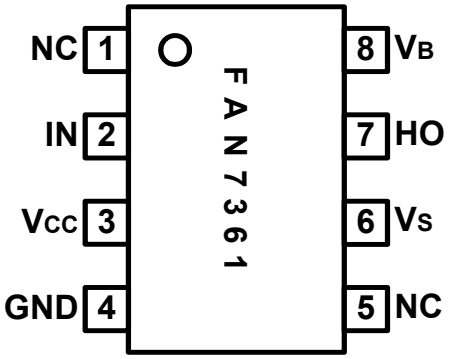



### Internal Block Diagram




Rev. 1.0.1

## Pin Assignments




## Pin Descriptions

| Pin No | Symbol | I/O | Description |
|---|---|---|---|
| 1 | NC | | No Connection |
| 2 | IN | | Logic Input for High Side Gate Driver Output |
| 3 | Vcc | | Supply Voltage |
| 4 | GND | | Logic Ground |
| 5 | NC | | No Connection |
| 6 | VS | | High Voltage Floating Supply Return |
| 7 | HO | | High Side Driver Output |
| 8 | VB | | High Side Floating Supply |

## Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | 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 | |
| Logic fixed supply voltage | $V_{CC}$ | -0.3 | | 25 | |
| Logic input voltage(IN) | $V_{IN}$ | -0.3 | | Vcc+0.3 | |
| Allowable offset voltage SLEW RATE | dVs/dt | | | ± 50 | V/ns |
| Power Dissipation | $P_D$ | | | 0.625 | W |
| Thermal resistance, junction to ambient | Rthja | | | 200 | °C/W |
| Junction Temperature | $T_J$ | | | 150 | °C |
| Storage Temperature | $T_S$ | | | 150 | °C |

Note : Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltage referenced to GND, all currents are defined positive into any lead.

## Recommended Operating Ratings

| Parameter | Symbol | Min. | Typ. | 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-Vcc | | 600 | |
| High side(HO) output voltage | $V_{HO}$ | $V_S$ | | $V_B$ | |
| Logic input voltage(IN) | $V_{IN}$ | GND | | Vcc | |
| Logic supply voltage | $V_{CC}$ | 10 | | 20 | |
| Ambient Temperature | $T_A$ | -40 | | 125 | °C |

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## ESD Level

| Parameter | Pins | Conditions | Level | Unit |
|---|---|---|---|---|
| Human Body Model(HBM) | IN, VCC, COM, VB, HO | R=1.5kΩ, C=100pF | ±1500 | V |
| | VS | | ±1000 | |
| Machine Model(MM) | All Pins | C=200pF | ±300 | |
| Charged Device Model(CDM) | All Pins | | ±500 | |

## Static 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 GND. The $V_O$ and $I_O$ parameters are referenced to $V_S$.

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| VBS supply under voltage positive going threshold | $V_{BSUV+}$ | $V_{IN}$=0V | 8.2 | 9.2 | 10.2 | V |
| VBS supply under voltage negative going threshold | $V_{BSUV-}$ | $V_{IN}$=0V | 7.4 | 8.6 | 9.2 | |
| VBS supply under voltage lockout hysteresis | $V_{BSHYS}$ | $V_{IN}$=0V | - | 0.6 | - | |
| Offset supply leakage current | $I_{LK}$ | $V_B$=$V_S$=HO=600V | - | - | 10 | μA |
| Quiescent VBS supply current | $I_{QBS}$ | $V_{IN}$=0V or 5V | - | 50 | 90 | |
| Quiescent VCC supply current | $I_{QCC}$ | $V_{IN}$=0V | - | 30 | 80 | |
| Operating VBS supply current | $I_{PBS}$ | $C_L$=1nF, f=20kHz | - | 420 | 550 | |
| Logic "1" input voltage | $V_{IH}$ | | 3.6 | - | - | V |
| Logic "0" input voltage | $V_{IL}$ | | - | - | 1.0 | |
| High Level Output Voltage, VB-$V_{HO}$ | $V_{OH}$ | No load | - | - | 0.1 | |
| Low Level Output Voltage, $V_{HO}$ | $V_{OL}$ | No load | - | - | 0.1 | |
| Logic "1" input bias current | $I_{IN+}$ | $V_{IN}$=5V | - | 50 | 90 | μA |
| Logic "0" input bias current | $I_{IN-}$ | $V_{IN}$=0V | - | 1.0 | 2.0 | |
| Output high short circuit pulse current | $I_{O+}$ | $V_{HO}$=0V, $V_{IN}$=5V, PW ≤ 10us | 200 | 250 | - | mA |
| Output low short circuit pulsed current | $I_{O-}$ | $V_{HO}$=15V, $V_{IN}$=0V, PW ≤ 10us | 400 | 500 | - | |
| Allowable negative VS pin voltage for IN signal propagation to HO | VS | | - | -9.8 | -7 | V |

## Dynamic Electrical Characteristics

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

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Turn-on propagation delay | $t_{on}$ | $V_S$=0V | - | 120 | 200 | ns |
| Turn-off propagation delay | $t_{off}$ | $V_S$=0V or 600V | - | 90 | 180 | |
| Turn-on rise time | $t_r$ | | - | 70 | 160 | |
| Turn-off fall time | $t_f$ | | - | 30 | 100 | |

# Typical Characteristics

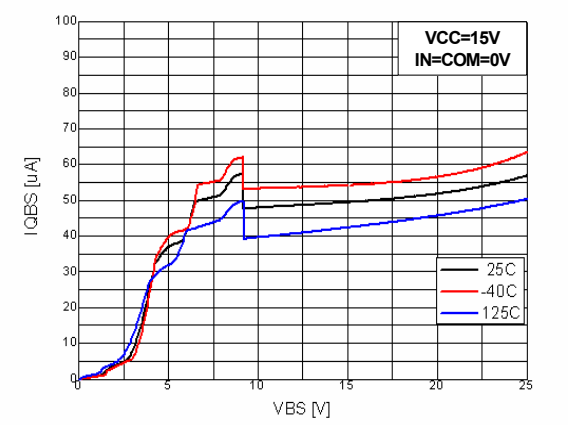



**Fig. 1 $I_{QBS}$ vs. Supply Voltage**

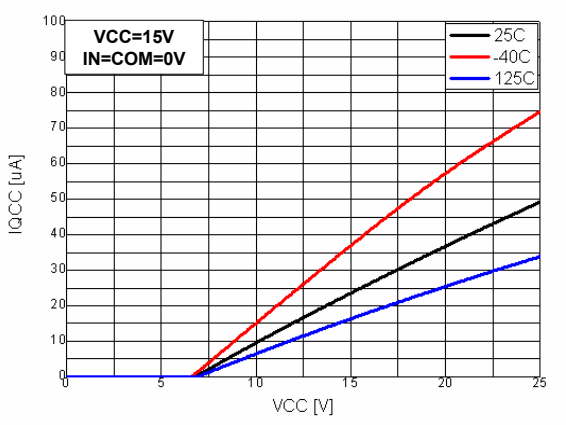



**Fig. 2 $I_{QCC}$ vs. Supply Voltage**

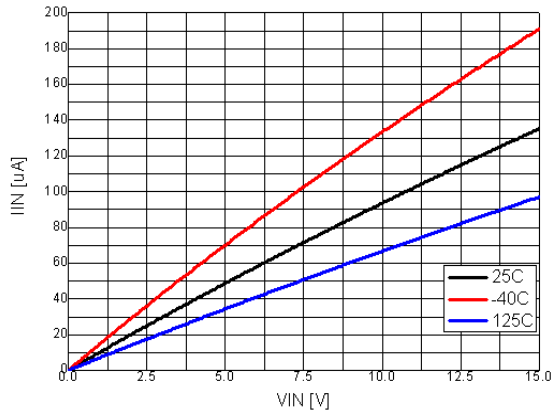



**Fig. 3 Input Bias Current vs. Supply Voltage**

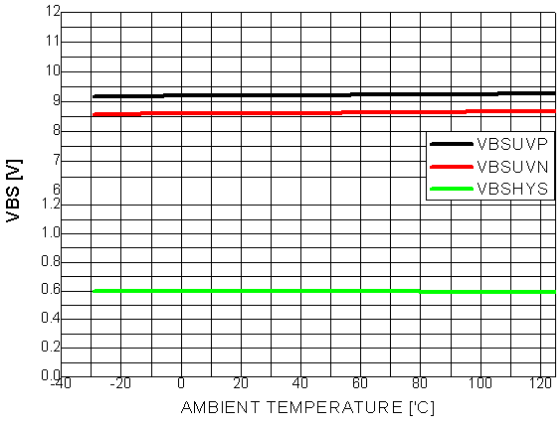



**Fig. 4 $V_{BS}$ UVLO vs. Temperature**

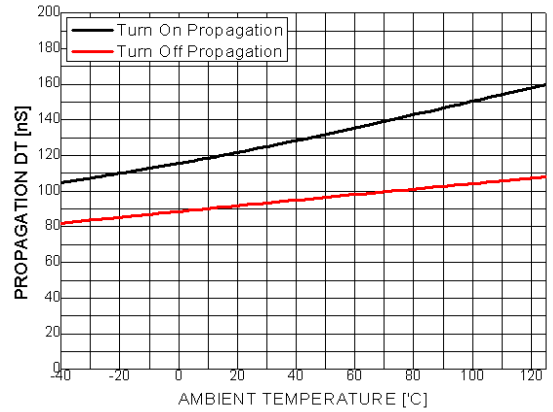



**Fig. 5 Turn On/Off Propagation Time vs. Temperature**

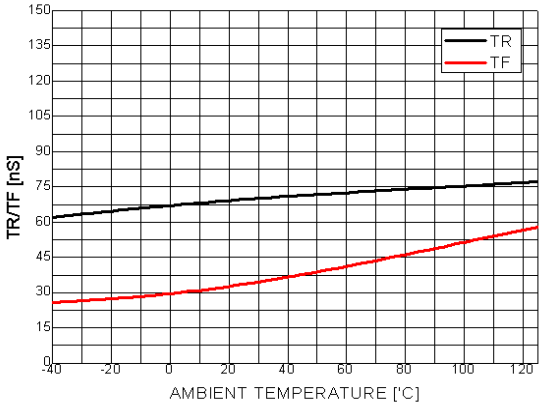



**Fig. 6 Rising/Falling Time vs. Temperature**

# Typical Characteristics

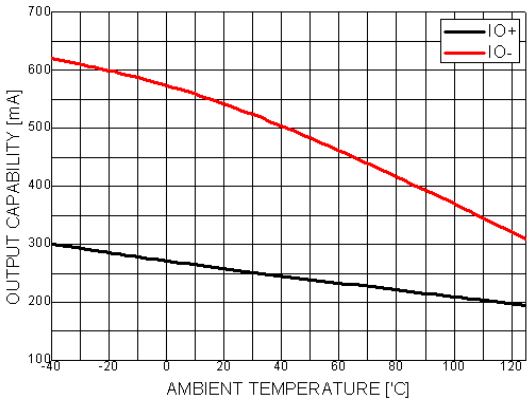



**Fig. 7 Output Sinking/Sourcing Current vs. Temperature**

## Switching Time Definitions

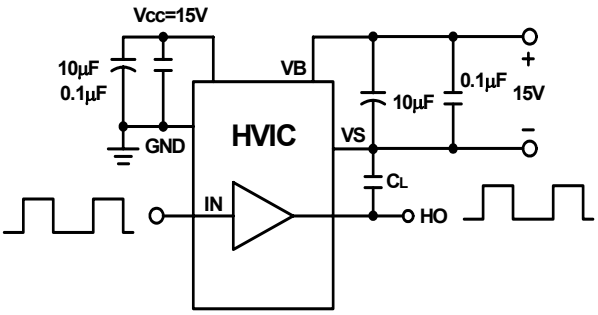



Fig. 8 Switching Time Test Circuit

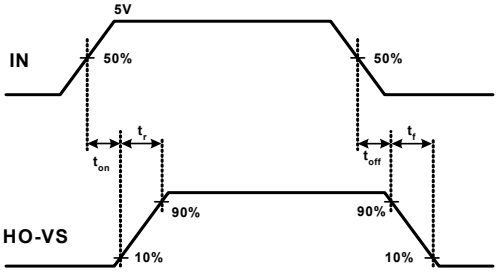
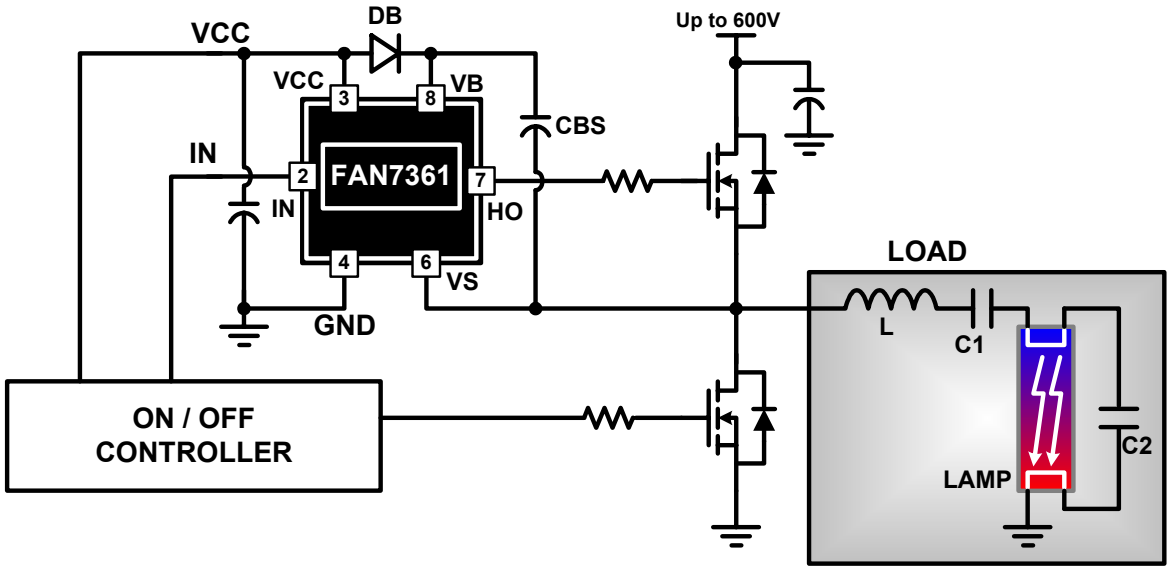



Fig. 9 Input/Output Timing Diagram

## Typical Application Circuits



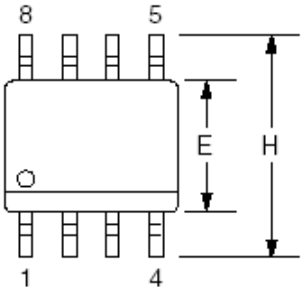
## Mechanical Dimensions

### Package

**Dimensions in millimeters**

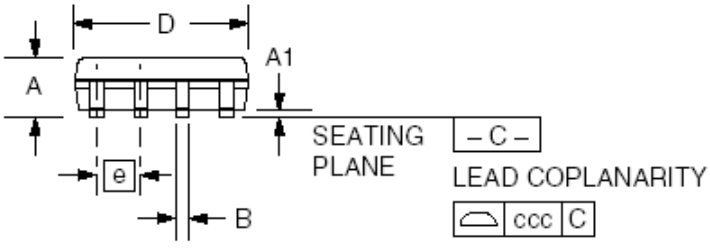
# 8-SOP

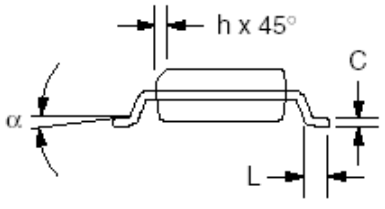
| Symbol | Inches | | Millimeters | | Notes |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| A | .053 | .069 | 1.35 | 1.75 | |
| A1 | .004 | .010 | 0.10 | 0.25 | |
| B | .013 | .020 | 0.33 | 0.51 | |
| C | .0075 | .010 | 0.20 | 0.25 | 5 |
| D | .189 | .197 | 4.80 | 5.00 | 2 |
| E | .150 | .158 | 3.81 | 4.01 | 2 |
| e | .050 BSC | | 1.27 BSC | | |
| H | .228 | .244 | 5.79 | 6.20 | |
| h | .010 | .020 | 0.25 | 0.50 | |
| L | .016 | .050 | 0.40 | 1.27 | 3 |
| N | 8 | | 8 | | 6 |
| α | 0° | 8° | 0° | 8° | |
| ccc | — | .004 | — | 0.10 | |




**Notes:**

1. Dimensioning and tolerancing per ANSI Y14.5M-1982.
2. "D" and "E" do not include mold flash. Mold flash or protrusions shall not exceed .010 inch (0.25mm).
3. "L" is the length of terminal for soldering to a substrate.
4. Terminal numbers are shown for reference only.
5. "C" dimension does not include solder finish thickness.
6. Symbol "N" is the maximum number of terminals.



## Ordering Information

| Device | Package | Operating Temperature | Packing |
|---|---|---|---|
| FAN7361M | 8SOIC | -40°C ~ +125°C | Tube |
| FAN7361MX | | | Tape & Reel |

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| CoolFET™ | FRFET™ | MICROCOUPLER™ | PowerSaver™ | SuperSOT™-3 |
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