

Low Voltage Comparator

FAN156



SIP6 1.45x1.0
CASE 127EB

Description

The FAN156 is a low-power single comparator that typically consumes less than 10 μA of supply current. It is guaranteed to operate at a low voltage of 1.6 V and is fully operational up to 5.5 V, making it convenient for use in 1.8, 3.0 V, and 5.0 V systems.

The FAN156 has a complementary push-pull P- and N-channel output stage capable of driving a rail-to-rail output swing with a load ranging up to 5.0 mA.

Features

- Low Supply Current: I_{DD} 6 μA (Typical)
- Single Power Supply Operation
- Wide Common-Mode Input Voltage Range
- Push-Pull Output Circuit
- Low Input Bias Current
- Internal Hysteresis
- Packaged in MicroPak™ 6
- This is a Pb-Free Device

Applications

- Mobile Phones
- Alarm and Security Systems
- Personal Digital Assistants

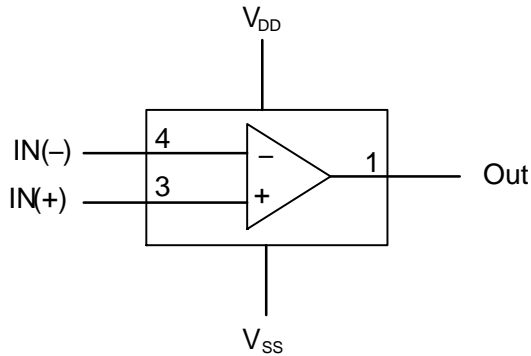
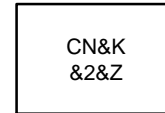


Figure 1. Functional Diagram

MARKING DIAGRAM



CN = Specific Device Code
&K = 2-Digits Lot Run Traceability Code
&2 = 2-Digit Date Code
&Z = Assembly Plant Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

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PIN CONFIGURATION

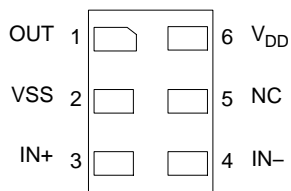


Figure 2. Pin Configuration (Top-Through View)

PIN DEFINITIONS

| Pin # | Name | Description |
|-------|----------|-------------------------|
| 1 | OUT | Comparator Output |
| 2 | V_{SS} | Negative Supply Voltage |
| 3 | IN+ | Non-Inverting Input |
| 4 | IN- | Inverting Input |
| 5 | NC | No Connect |
| 6 | V_{DD} | Positive Supply Voltage |

FUNCTION TABLE

| Inputs | Outputs |
|-----------------|-------------|
| $IN(-) > IN(+)$ | Output LOW |
| $IN(+ > IN(-)$ | Output HIGH |

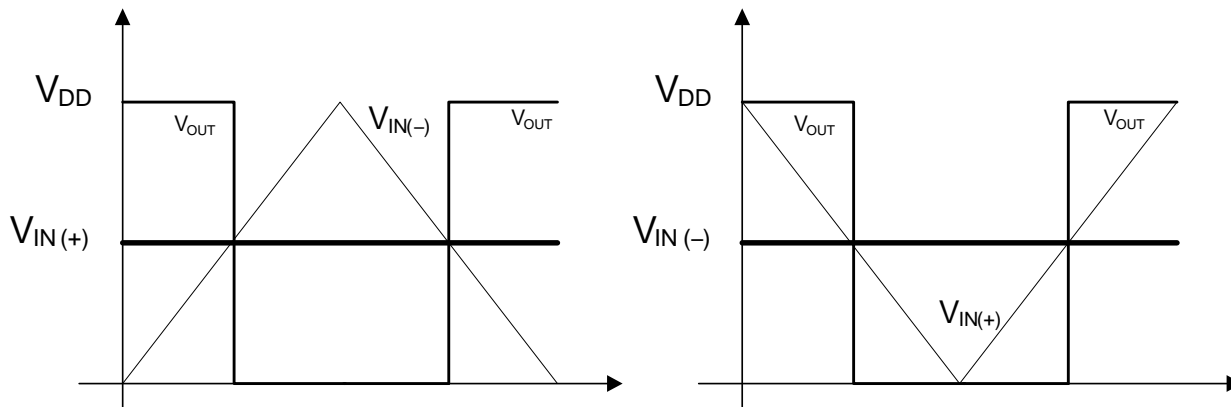


Figure 3. V_{IN} vs. V_{OUT}

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ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Condition | Min. | Max. | Unit |
|------------------------------------|---|--|------|------------------------------------|------|
| V _{DD} to V _{SS} | Supply Voltage | | -3.0 | +3.0 | V |
| | | | 0 | 6.0 | |
| DV _{IN} | Differential Input Voltage | | | ±6 | |
| V _{IN} | Input Voltage | | | V _{SS} to V _{DD} | V |
| t _s | Output Short Circuit Duration (Note 1) | | | Indefinite | s |
| T _J | Junction Temperature | | | +150 | °C |
| T _{STG} | Storage Temperature Range | | -65 | +150 | °C |
| P _D | Power Dissipation | | | 194 | mW |
| θ _{JA} | Thermal Resistance | | | 335 | °C/W |
| ESD | IEC 61000-4-2 System ESD | Air Gap | | 15 | kV |
| | | Contact | | 8 | |
| | JEDEC JESD22-A114, Human Body Model | All Pins | | 8 | |
| | | Pin to Pin: IN(-), IN(+) to V _{DD} or V _{SS} | | 12 | |
| | JEDEC JESD22-C101, Charged Device Model | All Pins | | 2 | |

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. The maximum total power dissipation must not be exceeded.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Condition | Min. | Max. | Unit |
|------------------------------------|---------------------------------|-----------------------|-------|------------------------------------|------|
| V _{DD} to V _{SS} | Power Supply | | -2.75 | +2.75 | V |
| | | | 0 | 5.50 | |
| V _{DD} | Power Supply | V _{SS} 0 V | 1.6 | 5.5 | V |
| V _{IN} | Input Voltage | | | V _{SS} to V _{DD} | V |
| I _{OH} /I _{OL} | Output Sink/Source Current | V _{DD} 5.0 V | | 5 | mA |
| | | V _{DD} 3.0 V | | 3 | |
| | | V _{DD} 1.6 V | | 1 | |
| T _A | Operating Temperature, Free Air | | -40 | +85 | °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.

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ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|--|--|--|-----------------|------|-----------------|------|
| V_{DD} = 5.5 V, V_{SS} = GND, and T_A = +25°C | | | | | | |
| V _{HYS} | Input Hysteresis | V _{CM} = 0.5 V _{DD} | | 4 | | mV |
| V _{IO} | Input Offset Voltage (Note 2) | V _{CM} = 0.5 V _{DD} | -15 | ±1 | +15 | mV |
| I _{IO} | Input Offset Current | | | 10 | | µA |
| I _I | Input Bias Current | | | 10 | | µA |
| V _{CM} | Common Mode Input Voltage | | V _{SS} | | V _{DD} | V |
| CMRR | Common Mode Rejection Ratio (Note 3) | V _{CM} = V _{DD} | | 68 | | dB |
| I _{DD} | Supply Current | | | 6 | 17 | µA |
| PSRR | Power Supply Rejection Ratio (Note 3) | ΔV _{DD} = 0.5 V | 45 | 80 | | dB |
| I _{OS} | Output Short Circuit Current | V _O = V _{DD} | | 60 | | mA |
| | | V _O = V _{SS} | | 90 | | |
| V _{OL} | Low-Level Output Voltage | I _{SINK} = 5.0 mA | | 0.1 | 0.3 | V |
| V _{OH} | High-Level Output Voltage | I _{SOURCE} = 5.0 mA | 5.2 | 5.4 | | V |
| t _{PLH} | Propagation Delay (Turn-On) | Overdrive 20 mV, C _L = 15 pF | | 0.40 | | µs |
| t _{PHL} | Propagation Delay (Turn-Off) | Overdrive = 20 mV, C _L = 15 pF | | 0.42 | | µs |
| t _{TLH} | Response Time, Output Rise/Fall (Note 4) | C _L = 50 pF | | 4.0 | | ns |
| t _{THL} | | | | 5.4 | | |

V_{DD} = 3 V, V_{SS} = GND, and T_A = +25°C

| | | | | | | |
|------------------|--|--|-----------------|------|-----------------|----|
| V _{HYS} | Input Hysteresis | V _{CM} = 0.5 V _{DD} | | 4 | | mV |
| V _{IO} | Input Offset Voltage (Note 2) | V _{CM} = 0.5 V _{DD} | -15 | ±1 | +15 | mV |
| I _{IO} | Input Offset Current | | | 10 | | µA |
| I _I | Input Bias Current | | | 10 | | µA |
| V _{CM} | Common Mode Input Voltage | | V _{SS} | | V _{DD} | V |
| CMRR | Common Mode Rejection Ratio (Note 3) | V _{CM} = V _{DD} | | 60 | | dB |
| I _{DD} | Supply Current | | | 5.5 | 15.0 | µA |
| PSRR | Power Supply Rejection Ratio (Note 3) | ΔV _{DD} = 0.5 V | 45 | 80 | | dB |
| I _{OS} | Output Short Circuit Current | V _O = V _{DD} | | 27 | | mA |
| | | V _O = V _{SS} | | 35 | | |
| V _{OL} | Low-Level Output Voltage | I _{SINK} = 3.0 mA | | 0.15 | 0.35 | V |
| V _{OH} | High-Level Output Voltage | I _{SOURCE} = 3.0 mA | 2.65 | 2.85 | | V |
| t _{PLH} | Propagation Delay (Turn-On) | Overdrive = 20 mV, C _L = 15 pF | | 0.45 | | µs |
| t _{PHL} | Propagation Delay (Turn-Off) | Overdrive = 20 mV, C _L = 15 pF | | 0.47 | | µs |
| t _{TLH} | Response Time, Output Rise/Fall (Note 4) | C _L = 50 pF | | 6.1 | | ns |
| t _{THL} | | | | 6.2 | | |

V_{DD} = 1.6 V, V_{SS} = GND, and T_A = +25°C

| | | | | | | |
|------------------|--------------------------------------|---------------------------------------|-----------------|-----|-----------------|----|
| V _{HYS} | Input Hysteresis | V _{CM} = 0.5 V _{DD} | | 3.5 | | mV |
| V _{IO} | Input Offset Voltage (Note 2) | V _{CM} = 0.5 V _{DD} | -15 | ±1 | +15 | mV |
| I _{IO} | Input Offset Current | | | 10 | | µA |
| I _I | Input Bias Current | | | 10 | | µA |
| V _{CM} | Common Mode Input Voltage | | V _{SS} | | V _{DD} | V |
| CMRR | Common Mode Rejection Ratio (Note 3) | V _{CM} = V _{DD} | | 56 | | dB |

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ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|--|------|------|------|---------------|
| $V_{DD} = 1.6\text{ V}$, $V_{SS} = \text{GND}$, and $T_A = +25^\circ\text{C}$ | | | | | | |
| I_{DD} | Supply Current | | | 5 | 15 | μA |
| PSRR | Power Supply Rejection Ratio (Note 3) | $\Delta V_{DD} = 0.5\text{ V}$ | 45 | 80 | | dB |
| I_{OS} | Output Short Circuit Current | $V_O = V_{DD}$ | | 5.5 | | mA |
| | | $V_O = V_{SS}$ | | 7.5 | | |
| V_{OL} | Low-Level Output Voltage | $I_{SINK} = 5.0\text{ mA}$ | | 0.10 | 0.25 | V |
| V_{OH} | High-Level Output Voltage | $I_{SOURCE} = 5.0\text{ mA}$ | 1.35 | 1.50 | | V |
| t_{PLH} | Propagation Delay (Turn-On) | Overdrive 20 mV, $C_L = 15\text{ pF}$ | | 0.52 | | μs |
| t_{PHL} | Propagation Delay (Turn-Off) | Overdrive = 20 mV, $C_L = 15\text{ pF}$ | | 0.54 | | μs |
| t_{TLH} | Response Time, Output Rise/Fall (Note 4) | $C_L = 50\text{ pF}$ | | 16.5 | | ns |
| t_{THL} | | | | 13.0 | | |

2. Differential input switching level is guaranteed at the minimum or maximum offset voltage, minus or plus half the maximum hysteresis voltage.

3. Guaranteed by design and characterization data.

4. Input signal: 1 kHz, square-wave signal with 10 ns edge rate.

TYPICAL PERFORMANCE CHARACTERISTICS

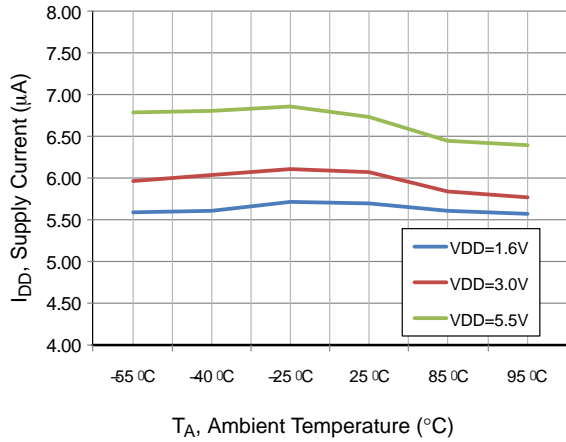


Figure 4. Supply Current vs. Temperature

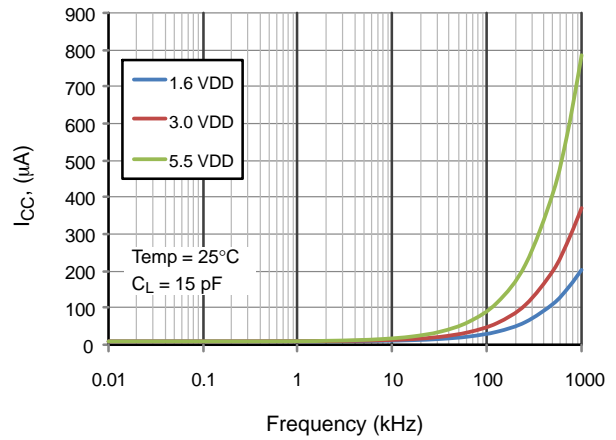


Figure 5. Supply Current vs. Output Transition Frequency

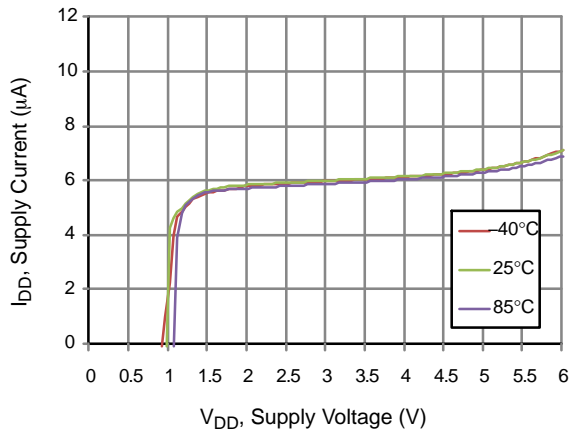


Figure 6. Supply Current vs. Supply Voltage

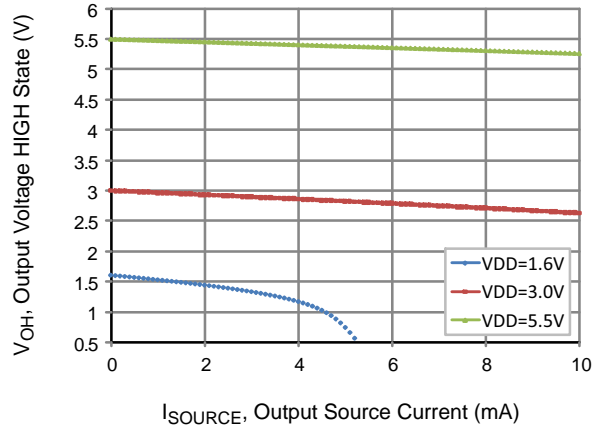


Figure 7. Output HIGH vs. Output Drive Current

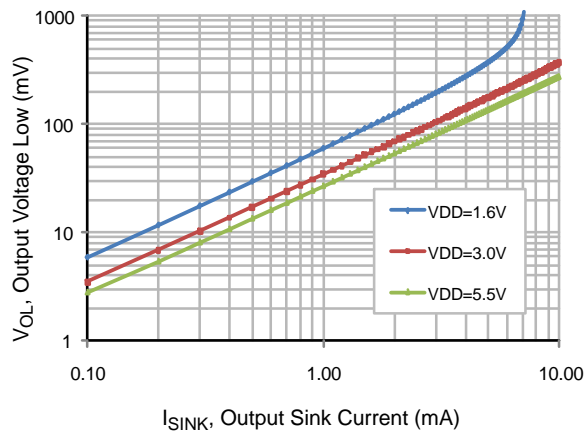


Figure 8. Output LOW vs. Output Drive Current

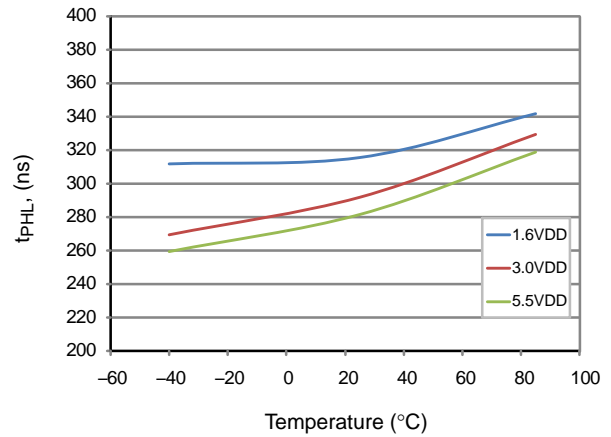


Figure 9. Propagation Delay t_{PHL} vs. Temperature

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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

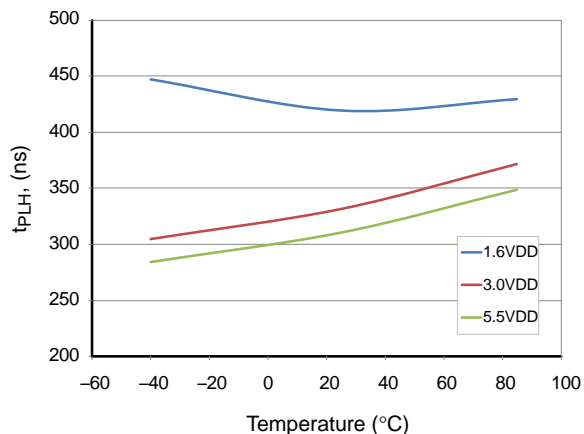


Figure 10. Propagation Delay $t_{(PLH)}$ vs. Temperature

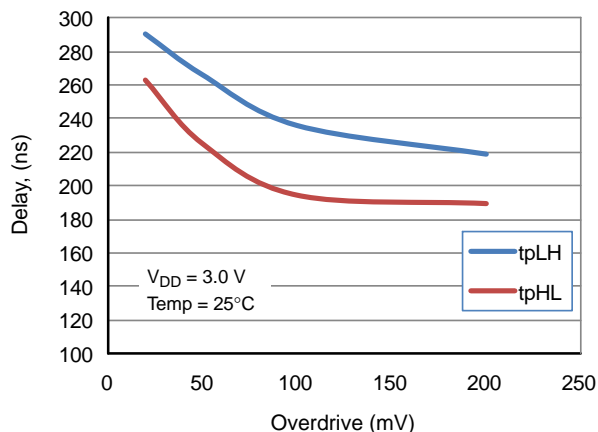


Figure 11. Propagation Delay vs. Input Overdrive

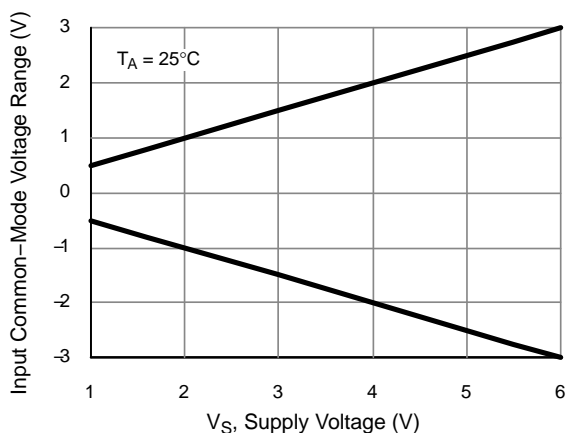


Figure 12. Input Common-Mode Voltage Range vs. Supply Voltage

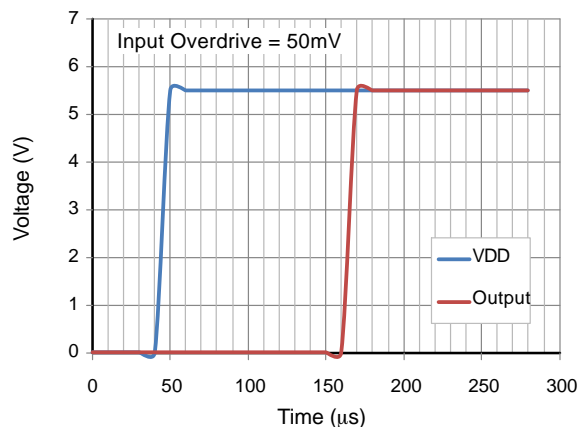


Figure 13. Power-Up Delay

ORDERING INFORMATION

| Device | Operating Temperature Range | Top Mark | Package | Shipping† |
|-----------|-----------------------------|----------|---|--------------------|
| FAN156L6X | -40°C to +85°C | CN | 6-Lead, SIP6 1.45x1.0 (MicroPak™) (Pb-Free) | 5000 / Tape & Reel |

†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.

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SIP6 1.45X1.0
CASE 127EB
ISSUE O

DATE 31 AUG 2016



NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

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