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FAIRCHILD SEMICONDUCTOR®

December 2012

FAN156
Low Voltage Comparator

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

Applications

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

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.

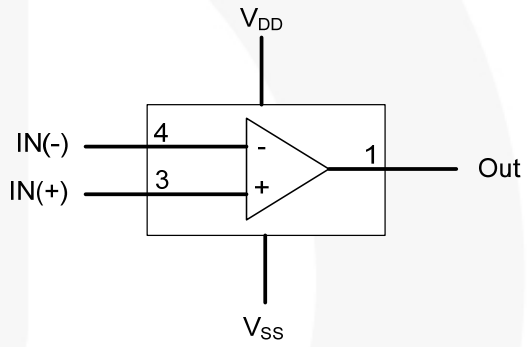


Figure 1. Functional Diagram

Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package	Packing Method
FAN156L6X	CN	-40 to 85°C	6-Lead, MicroPak™, 1 x 1.45 mm Wide	5000 Units on Tape and Reel

Pin Configuration

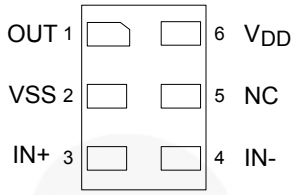


Figure 2. Pin Configuration (Top-Through View)

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

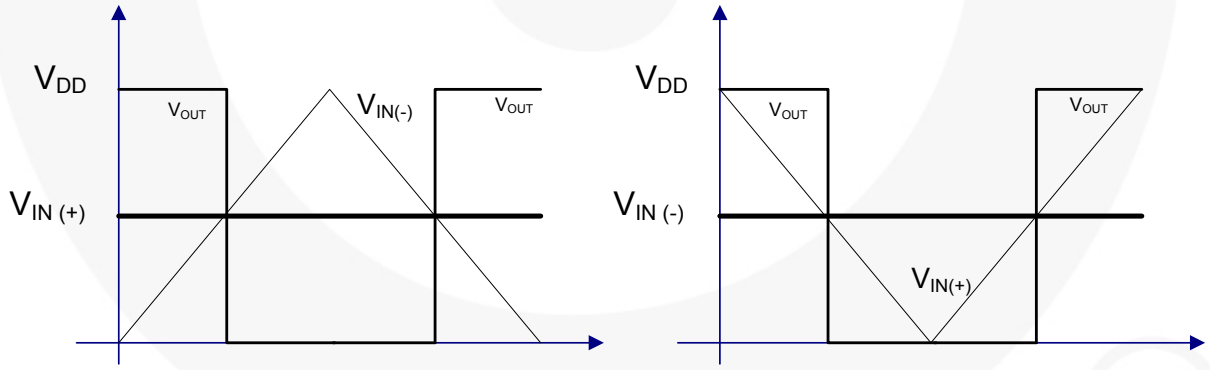


Figure 3. V_{IN} vs. V_{OUT}

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	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(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 VSS		12	
	JEDEC JESD22-C101, Charged Device Model	All Pins		2	

Note:
1. The maximum total power dissipation must not be exceeded.

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	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

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD}=5.5V, 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[2]	V_{CM}=0.5 V_{DD}	-15	±1	+15	mV
I_{IO}	Input Offset Current			10		pA
I_I	Input Bias Current			10		pA
V_{CM}	Common Mode Input Voltage		V_{SS}		V_{DD}	V
CMRR	Common Mode Rejection Ratio[3]	V_{CM}=V_{DD}		68		dB
I_{DD}	Supply Current			6	17	µA
PSRR	Power Supply Rejection Ratio[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[4]	C_L=50 pF		4.0		ns
t_{THL}				5.4		
V_{DD}=3V, 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[2]	V_{CM}=0.5 V_{DD}	-15	±1	+15	mV
I_{IO}	Input Offset Current			10		pA
I_I	Input Bias Current			10		pA
V_{CM}	Common Mode Input Voltage		V_{SS}		V_{DD}	V
CMRR	Common Mode Rejection Ratio[3]	V_{CM}=V_{DD}		60		dB
I_{DD}	Supply Current			5.5	15.0	µA
PSRR	Power Supply Rejection Ratio[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[4]	C_L=50pF		6.1		ns
t_{THL}				6.2		

Continued on the following page…

Electrical Characteristics (Continued)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD} 1.6V, 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[2]	V_{CM}=0.5 V_{DD}	-15	±1	+15	mV
I_{IO}	Input Offset Current			10		pA
I_I	Input Bias Current			10		pA
V_{CM}	Common Mode Input Voltage		V_{SS}		V_{DD}	V
CMRR	Common Mode Rejection Ratio[3]	V_{CM}=V_{DD}		56		dB
I_{DD}	Supply Current			5	15	µA
PSRR	Power Supply Rejection Ratio[3]	ΔV_{DD}=0.5 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}=1.0 mA		0.10	0.25	V
V_{OH}	High-Level Output Voltage	I_{SOURCE}=1.0 mA	1.35	1.50		V
t_{PLH}	Propagation Delay (Turn-On)	Overdrive=20 Mv, C_L=15pF		0.52		µs
t_{PHL}	Propagation Delay (Turn-Off)	Overdrive=20 Mv, C_L=15 pF		0.54		µs
t_{TLH}	Response Time, Output Rise/Fall[4]	C_L=50 pF		16.5		ns
t_{THL}				13.0		

Notes:

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

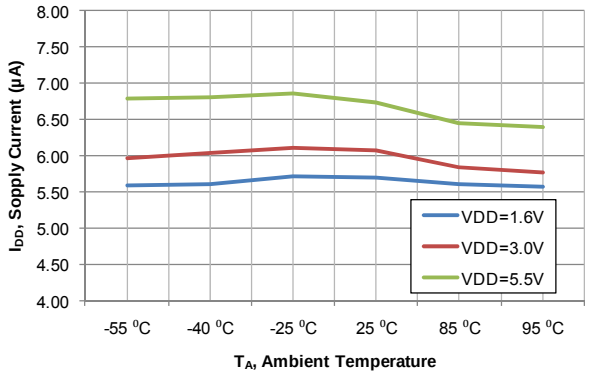


Figure 4. Supply Current vs. Temperature

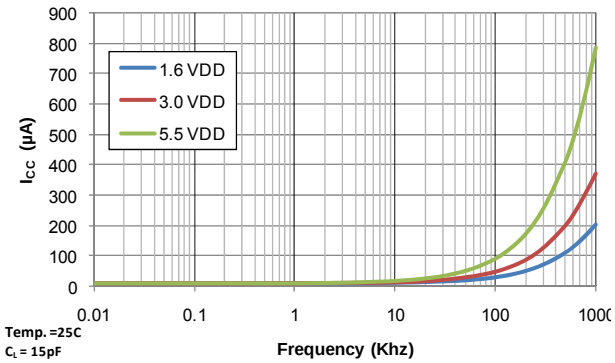


Figure 5. Supply Current vs. Output Transition Frequency

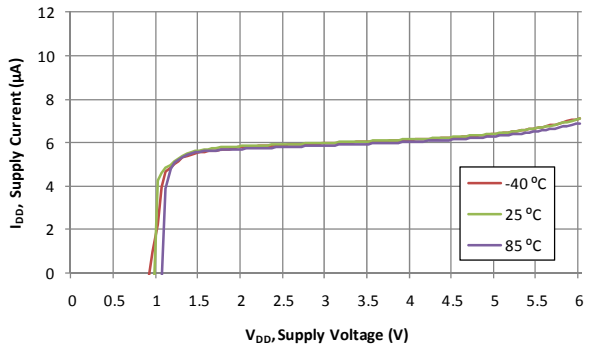


Figure 6. Supply Current vs. Supply Voltage

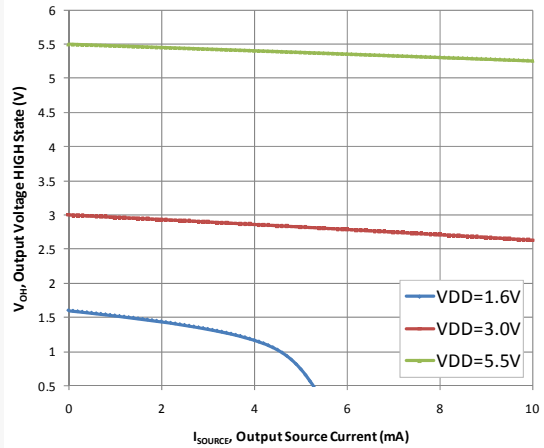


Figure 7. Output HIGH vs. Output Drive Current

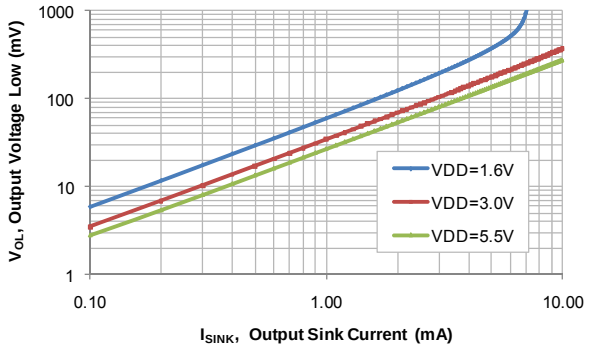


Figure 8. Output LOW vs. Output Drive Current

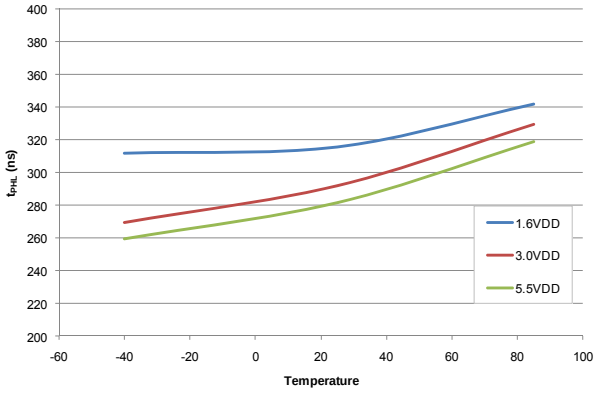


Figure 9. Propagation Delay (t_{PHL}) vs. Temperature

Typical Performance Characteristics (Continued)

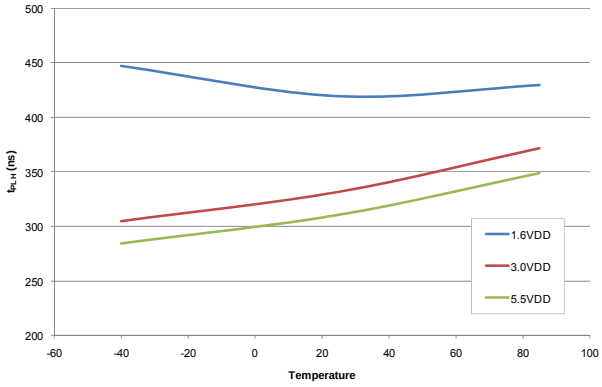


Figure 10. Propagation Delay (t_{PLH}) vs. Temperature

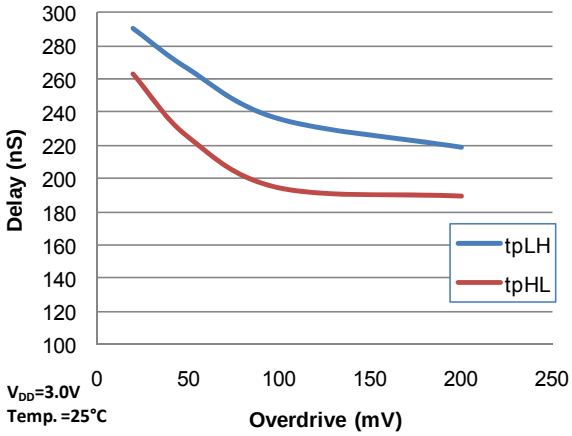


Figure 11. Propagation Delay vs. Input Overdrive

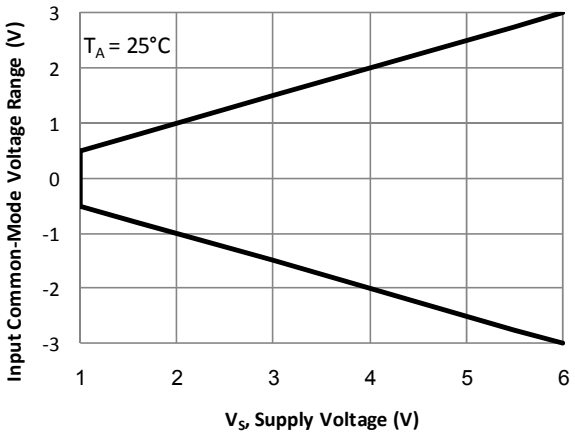


Figure 12. Input Common-Mode Voltage Range vs. Supply Voltage

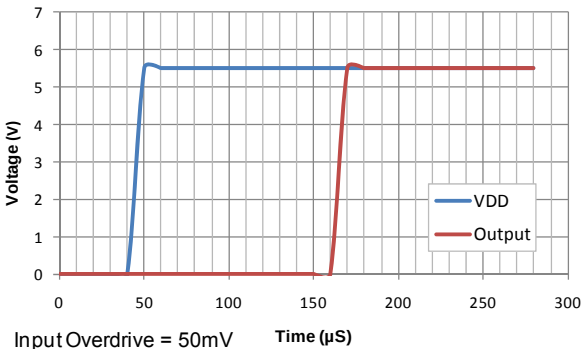
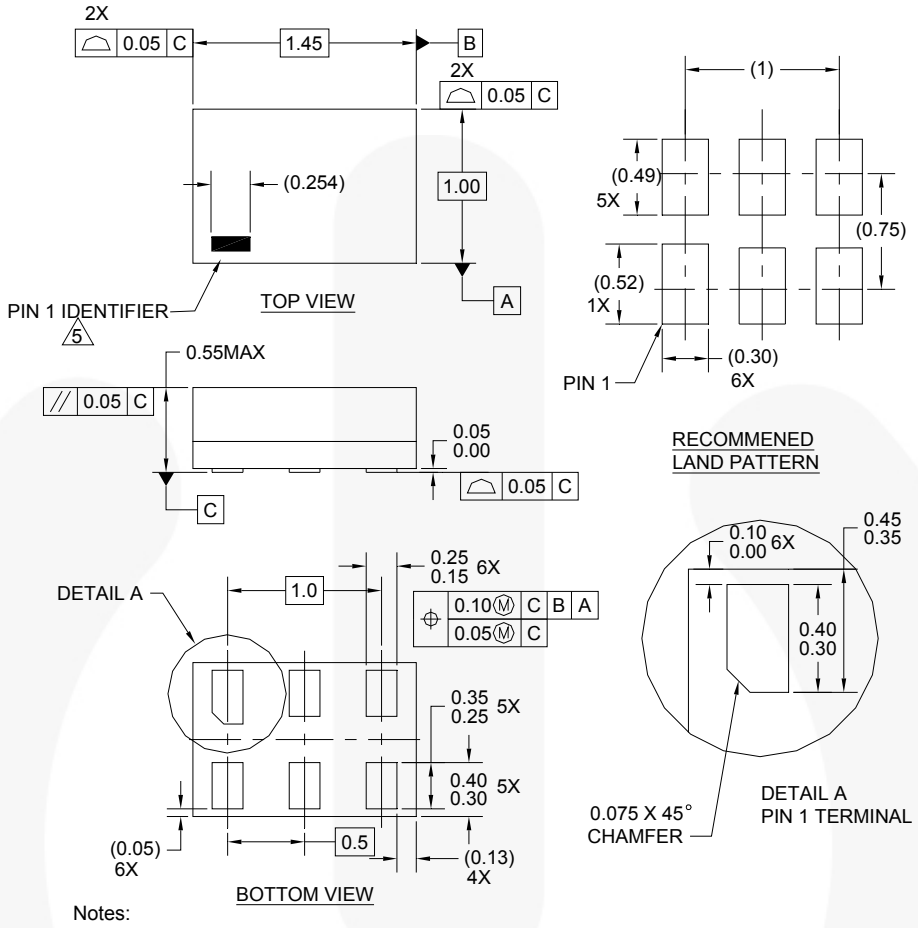


Figure 13. Power-Up Delay

Physical Dimensions



Notes:

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994
4. FILENAME AND REVISION: MAC06AREV4
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

Figure 14. 6-Lead, MicroPak™, 1 x 1.45 mm Wide

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http://www.fairchildsemi.com/packaging/.

Tape and Reel Specifications

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications:
http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf.

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
L6X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

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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.

Rev. I63

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