



T-73-53

Voltage Comparator

AD96685/AD96687

1.1 Scope.

This specification covers the requirements for an ultrafast voltage comparator. The AD96685 is a single comparator with a 2.5 ns propagation delay, and the AD96687 is an equally fast dual comparator.

1.2 Part Number.

The complete part number per Table 1 this specification is as follows:

Device	Part Number
-1	AD96685T(X)/883B
-2	AD96687T(Y)/883B

1.2.3 Case Outline.

See Appendix 1 of General Specification ADI-M-1000: package outline:

(X)	(Y)	Package	Description
E	E	E-20A	20-Contact LCC
Q	Q	Q-16	16-Pin Ceramic DIP
H		H-10A	10-Pin TO-100 Can

1.3 Absolute Maximum Ratings. ($T_A = +25^\circ\text{C}$ unless otherwise noted)

Supply Voltage	$\pm 6.5\text{ V}$
Power Dissipation	AD96685 = 500 mW; AD96687 = 600 mW
Input Voltage Range	$\pm 5\text{ V}$
Differential Input Voltage	5.5 V
Output Current	30 mA
Latch Enable Voltage	$-V_S$ to 0 V
Junction Temperature	$+175^\circ\text{C}$
Operating Temperature Range (Case)	-55°C to $+125^\circ\text{C}$
Storage Temperature Range (Case)	-65°C to $+150^\circ\text{C}$
Lead Temperature (Soldering 10 sec)	$+300^\circ\text{C}$

1.5 Thermal Characteristics.

Thermal Resistance

- $\theta_{JC} = 31^\circ\text{C/W}$ for E-20A (AD96687)
- $\theta_{JA} = 82^\circ\text{C/W}$ for E-20A (AD96687)
- $\theta_{JC} = 65^\circ\text{C/W}$ for E-20A (AD96685)
- $\theta_{JA} = 172^\circ\text{C/W}$ for E-20A (AD96685)
- $\theta_{JC} = 52^\circ\text{C/W}$ for H-10A
- $\theta_{JA} = 172^\circ\text{C/W}$ for H-10A
- $\theta_{JC} = 57^\circ\text{C/W}$ for Q-16
- $\theta_{JA} = 115^\circ\text{C/W}$ for Q-16

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Test	Symbol	Device	Design Limit @+25°C	Sub Group 1	Sub Group ² 2, 3	Sub Group 4	Sub Group ^{2, 3, 4, 5} 5, 6	Sub Group 9	Test Condition ¹	Units
Input Offset Current	I _{IO}	-1	±1	±1	±1.6				V _{CM} = +0.5 V	μA max
		-2	±1	±1	±1.2				V _{CM} = 0 V; +0.5 V -V _{CM} = -0.5 V	
Input Offset Voltage	V _{OS}	-1	±2	±2.0	±3.0				R _S = 100 Ω	mV max
		-2	±2	±2.0	±3.0				V _{CM} = 0 V	
Input Offset Voltage Tempco	ΔV _{OS} /ΔT	-1	±20	±20	±20				R _S = 100 Ω V _{CM} = 0 V	μV/°C max
		-2	±20	±20	±20					
Input Bias Current	I _{IB}	-1	10	10	16				+V _{CM} = +0.5 V -V _{CM} = -0.5 V	μA max
		-2	10	10	16				R _S = 100 Ω V _{CM} = 0 V; ±0.5 V	
Input Voltage Range	V _{CM}	-1, 2	-2.5	-2.5	-2.5					V min
			+5.0	+5.0	+5.0					V max
Common Mode Rejection Ratio	CMRR	-1, 2	90			80	80		-2.5 V ≤ V _{CM} ≤ +5.0 V	dB min
Power Supply Rejection Ratio	PSRR	-1	70			60	60		R _S = 100 Ω ΔV _S = ±5%	dB min
		-2				60	60			
High Level Output Voltage	V _{OH}	-1, 2		-1.10	-1.10					V min
Low Level Output Voltage	V _{OL}	-1, 2		-1.50	-1.50					V max
Positive Supply Current	+I _{CC}	-1	9	9	9					mA max
		-2	18	18	18					
Negative Supply Current	-I _{CC}	-1	18	18	18					mA max
		-2	36	36	36					
Propagation Delay Time	t _{PD±}	-1	2.5					9	See Note 6	ns max
		-2	2.5					1.5		ns min
								3.5		ns max
Propagation Delay Time Latch Enable to Output	t _{PD±(E)}	-1	2.5					3.5		ns max
		-2	2.5					3.5		

NOTES

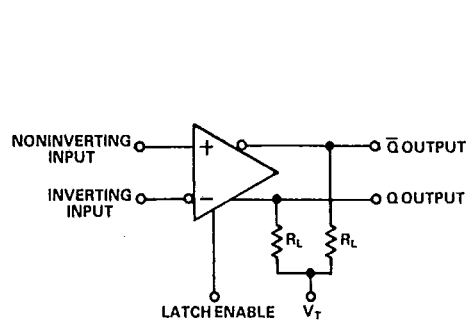
¹Unless otherwise specified, T_A = +25°C; +V_S = +5.0 V; V_S = -5.2 V.²-55°C ≤ T_A ≤ +125°C.³+V_S = +5.0 V; V_S = -5.2 V; V_T = -2.0 V; R_L = 50 Ω.⁴Devices require a thermal equilibrium to be established with a transverse airflow of >500 LFPM.⁵Production pulse test devices at correlated temperatures of -35°C and +145°C to compensate for high power steadystate operation.⁶This parameter measured with 100 mV pulse (10 mV overdrive), to 50% of the transition output point.

Table 1.

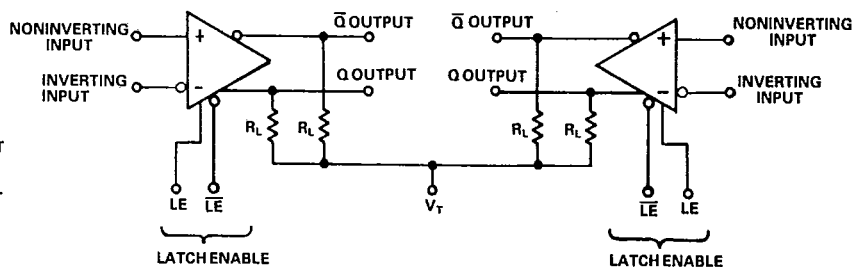
AD96685/AD96687

3.2.1 Functional Block Diagram and Terminal Assignments.

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AD96685

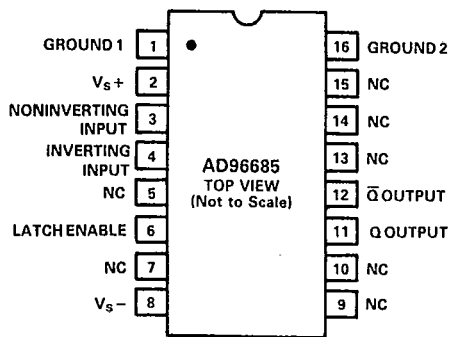


AD96687

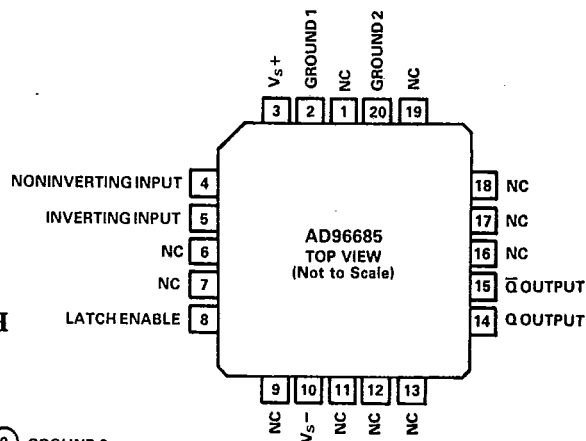
THE OUTPUTS ARE OPEN EMITTERS, REQUIRING EXTERNAL PULL-DOWN RESISTORS. THESE RESISTORS MAY BE IN THE RANGE OF 50Ω - 200Ω CONNECTED TO -2.0V, OR 200Ω - 2000Ω

Pin Assignments

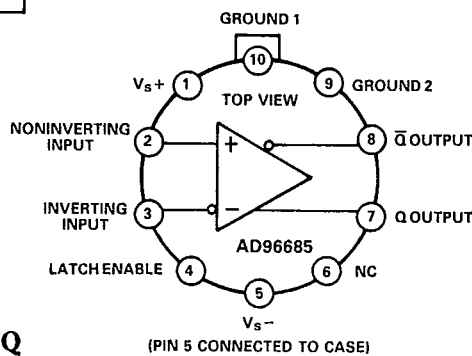
AD96685TQ



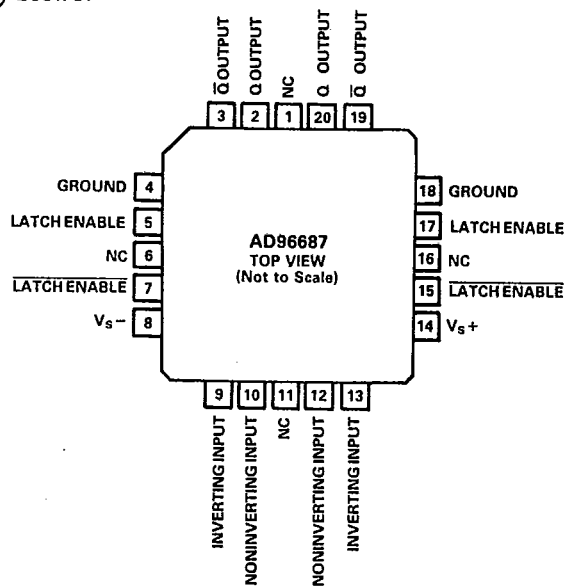
AD96685TE



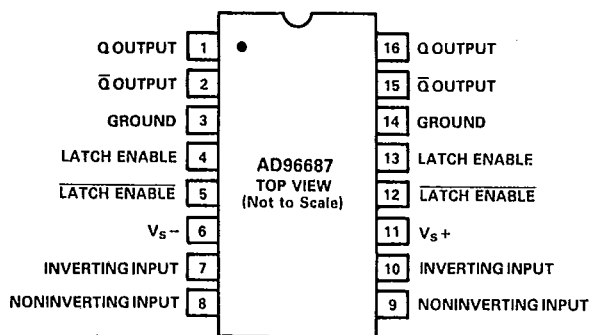
AD96685TH



AD96687TE



AD96687TQ



AD96685/AD96687

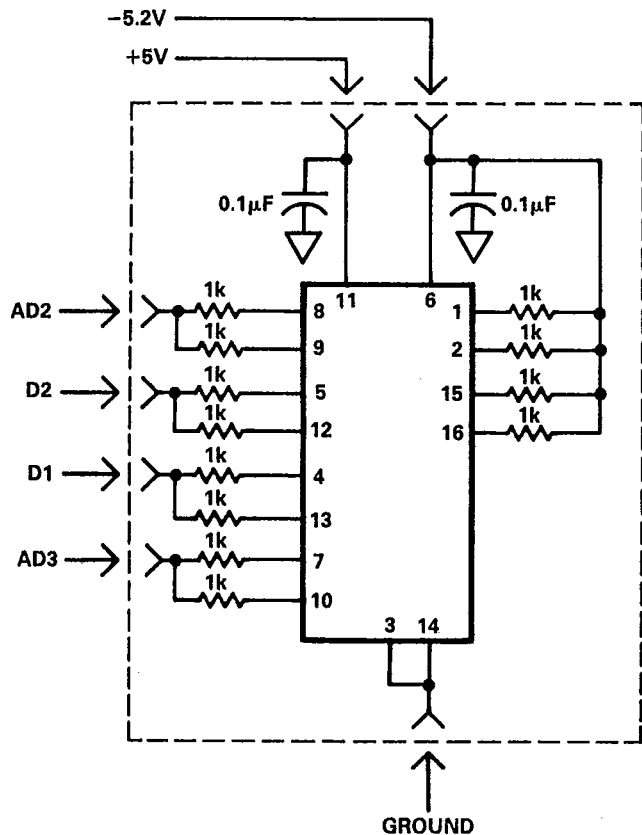
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3.2.4 Microcircuit Technology Group.

This microcircuit is covered by technology group (D-50).

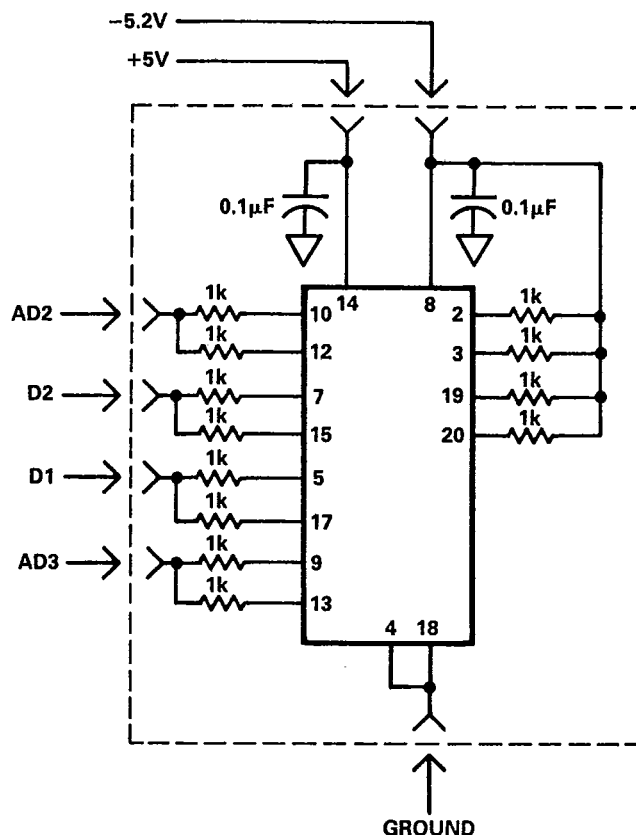
4.2.1 Life Test/Burn-In Circuit.

Steady state life test is per MIL-STD-883 Method 1005. Burn-in is per MIL-STD-883 Method 1015 test condition (B).



ALL RESISTORS $\pm 5\%$
 $+V_S = +5.0V \pm 5\%$
 $-V_S = -5.2V \pm 5\%$

AD96687 (16-Pin DIP)

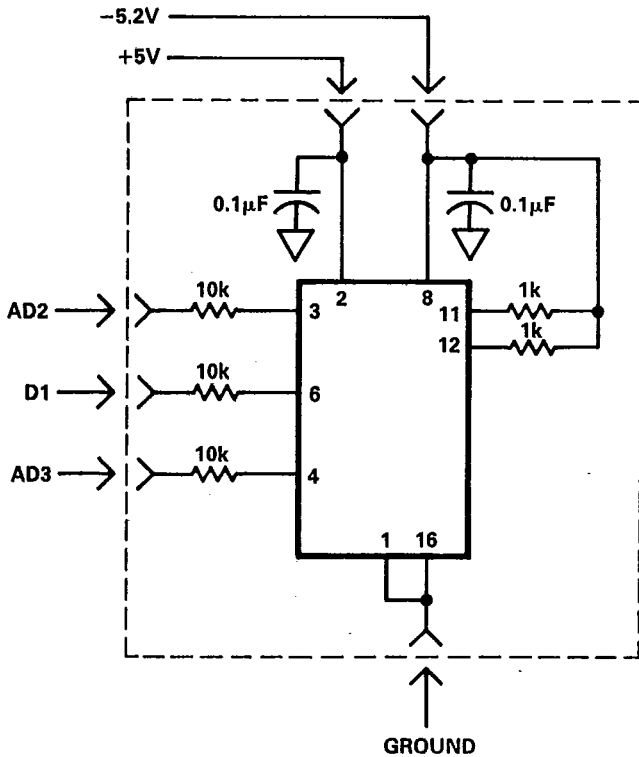


ALL RESISTORS $\pm 5\%$
 $+V_S = +5.0V \pm 5\%$
 $-V_S = -5.2V \pm 5\%$

AD96687 (20-Pin LCC)

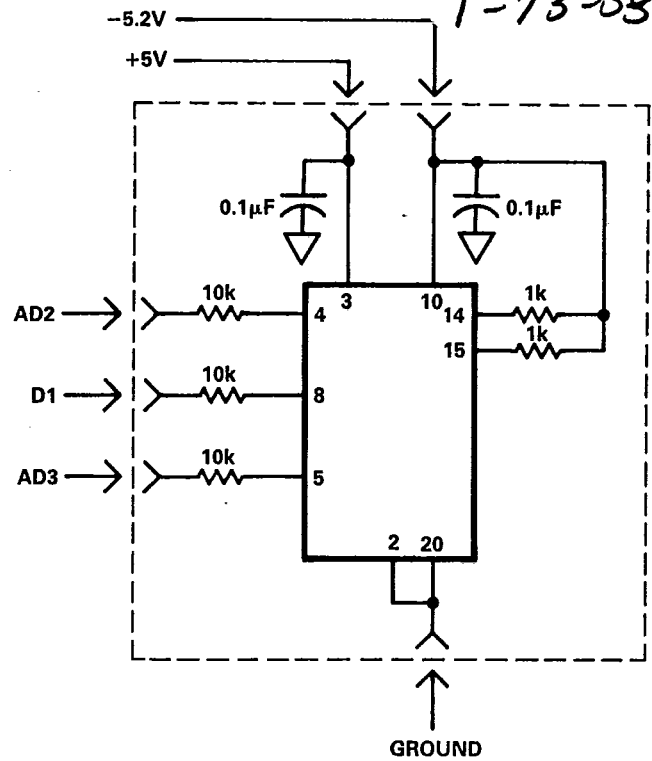
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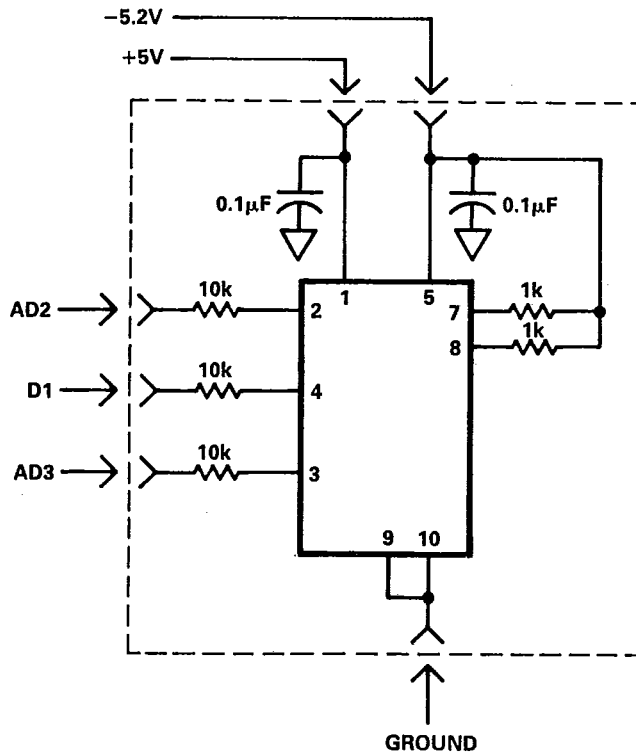
ALL RESISTORS ±5%
 +V_S = +5.0V ±5%
 -V_S = -5.2V ±5%

AD96685 (16-Pin DIP)



ALL RESISTORS ±5%
 +V_S = +5.0V ±5%
 -V_S = -5.2V ±5%

AD96685 (20-Pin LCC)



ALL RESISTORS ±5%
 +V_S = +5.0V ±5%
 -V_S = -5.2V ±5%

AD96685 (TO-100)