



# Am687/Am687A

## Dual Voltage Comparators

### DISTINCTIVE CHARACTERISTICS

- 8.0 ns Maximum Propagation Delay at 5 mV Overdrive
- Complementary ECL Outputs
- 50-Ω Driving Capability

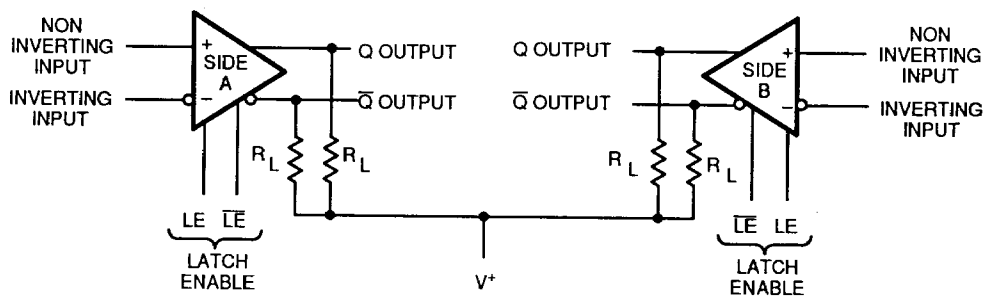
### GENERAL DESCRIPTION

The Am687 and Am687A are fast dual voltage comparators constructed on a single silicon chip with an advanced high-frequency process. The circuits feature very short propagation delays as well as excellent matching characteristics. Each comparator has differential analog inputs and complementary logic outputs, compatible with most forms of ECL. The output-current capability is adequate for driving terminated 50-Ω transmission lines. The low input offsets and short delays make these comparators especially suitable for high-speed precision analog-to-digital processing.

The comparators are similar to the Am685 high-speed comparator but have been designed to operate from a

5-V positive supply (instead of 6 V), dissipating less power than two Am685s. Separate latch functions are provided so that each comparator can be independently used in a sample-and-hold mode. The Latch Enable inputs are intended to be driven from the complementary outputs of a standard ECL gate. If LE is HIGH and  $\overline{LE}$  is LOW, the comparator functions normally. When LE is driven LOW and  $\overline{LE}$  is driven HIGH, the comparator outputs are locked in their existing logic states. If the latch function is not used, LE must be connected to ground.

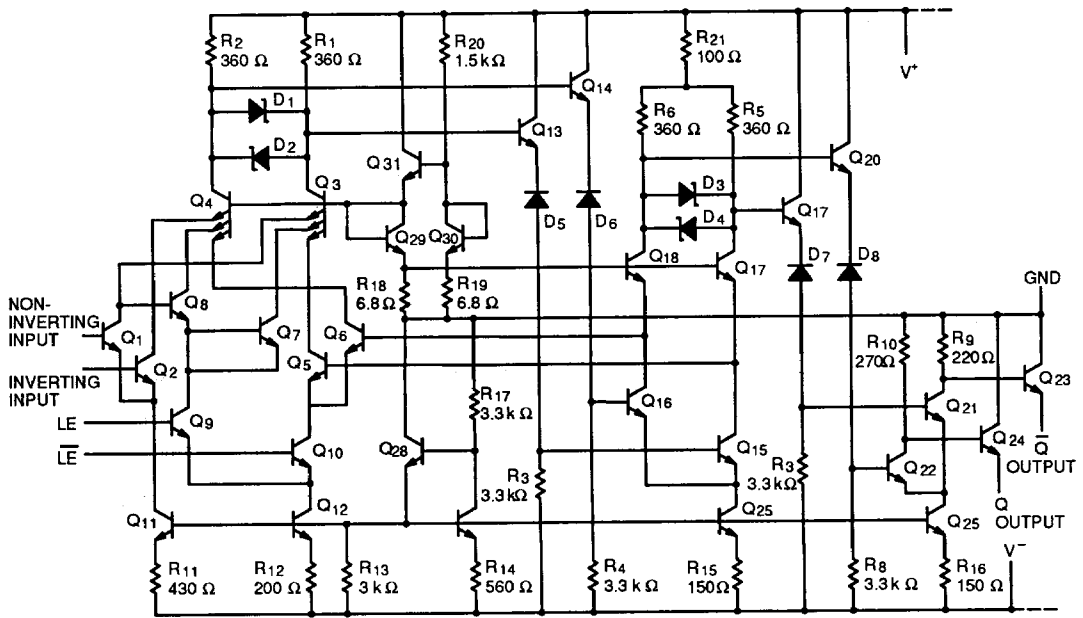
### BLOCK DIAGRAM



03939-001C

The outputs are open emitters, therefore external pull-down resistors are required. These resistors may be in the range of 50–200 Ω connected to –2.0 V, or 200–2000 Ω connected to –5.2 V.

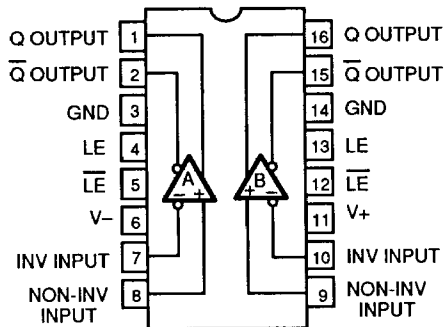
Circuit Diagram (each comparator)



03939-002C

## CONNECTION DIAGRAM Top Views

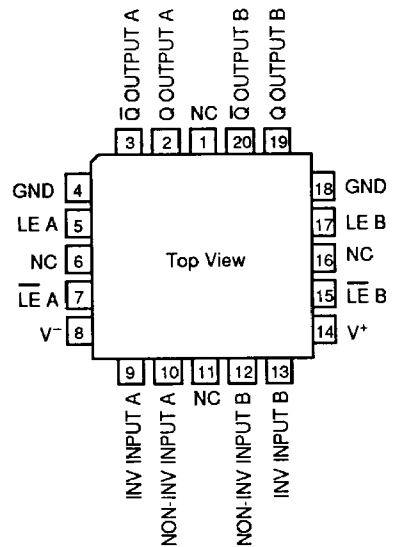
D-16-1



Note: Pin 1 is marked for orientation

03939-003C

L-20-1



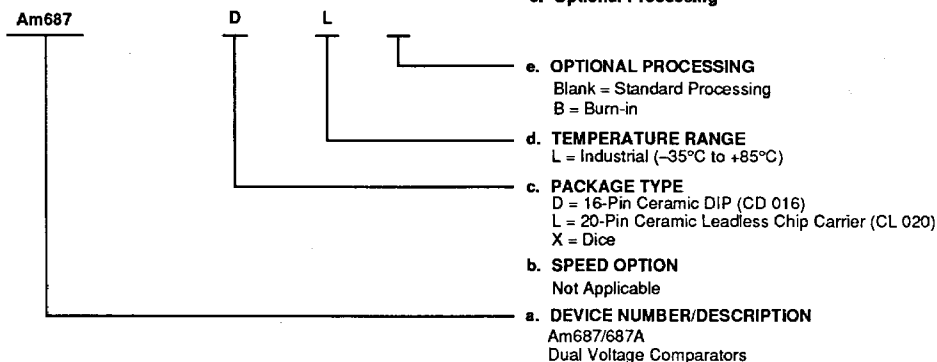
03939-005C

## ORDERING INFORMATION

### Standard Products

AMD standard products are available in several packages and operating ranges. The ordering number (Valid Combination) is formed by a combination of:

- a. Device Number
- b. Speed Option (if applicable)
- c. Package Type
- d. Temperature Range
- e. Optional Processing



Valid Combinations	
Am687	DL, DLB,
Am687A	LMB, XC

#### Valid Combinations

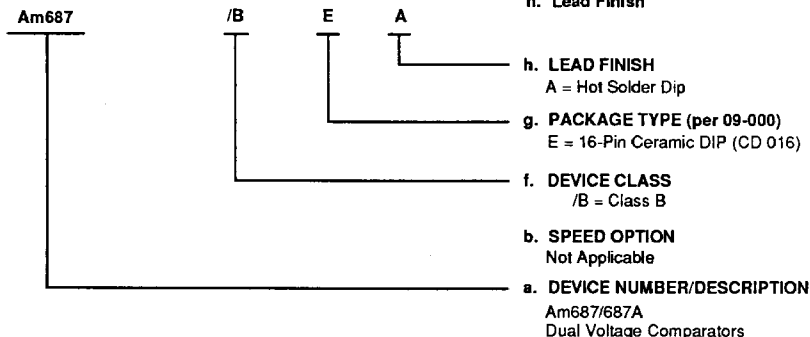
Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, to check on newly released combinations, and to obtain additional data on AMD's standard military grade products.

## MILITARY ORDERING INFORMATION

### APL Products

AMD products for Aerospace and Military applications are available in several packages and operating ranges. APL (Approved Products List) products are fully compliant with MIL-M-38510 and MIL-STD-883C requirements. The ordering number (Valid Combination) is formed by a combination of:

- a. Device Number
- b. Speed Option (if applicable)
- f. Device Class
- g. Package Type
- h. Lead Finish



Valid Combinations	
Am687	/BEA
AM687A	

#### Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, to check on newly released combinations.

#### Group A Tests

Group A tests consist of subgroups 1, 2, 3, 4, 5, 6, 9.

## MAXIMUM RATINGS

Positive Supply Voltage	+7 V
Negative Supply Voltage	-7 V
Input Voltage	±4 V
Differential Input Voltage	±6 V
Output Current	30 mA
Power Dissipation (Note 1)	600 mW
Storage Temperature Range	-65 to +150°C
Lead Temperature (Soldering, 60 sec)	300°C
Minimum Operating Voltage (V+ to V-)	9.7 V

Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

## OPERATING RANGES

Am687-L, Am687A-L*	-30 to +85°C
Am687-M, Am687A-M*	-55 to +125°C
Die Size	.056 x .056 in.

Operating ranges define those limits between which the functionality of the device is guaranteed.

\*To duplicate high power steady-state operation, parts are pulse tested at these correlated temperatures:

687L = -5°C to +110°C, 687M = -35°C to +150°C.

## DC CHARACTERISTICS over operating ranges (Unless otherwise specified)

Included in Group A, Subgroups 1,2,3,4,5,6 unless noted.

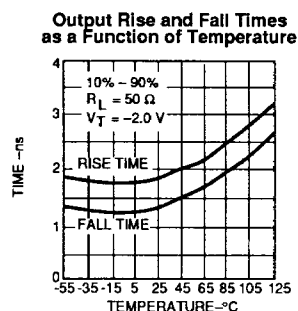
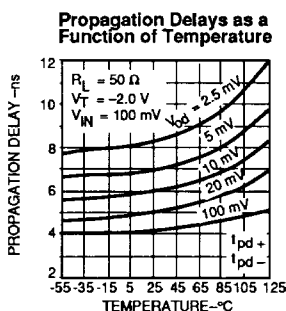
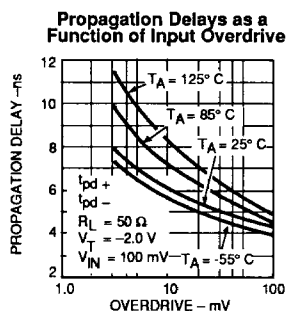
Parameter	Description	Test Conditions	Am687A-L Am687-L		Am687A-M Am687-M		Unit
			Min.	Max.	Min.	Max.	
V <sub>OS</sub>	Input Offset Voltage	R <sub>S</sub> = 100 Ω, T <sub>A</sub> = 25°C R <sub>S</sub> = 100 Ω	-3.0 -3.5	+3.0 +3.5	-2.0 -3.0	+2.0 +3.0	mV mV
ΔV <sub>OS</sub> /ΔT	Average Temperature Coefficient of Input Offset Voltage	R <sub>S</sub> = 100 Ω (Note 4)	-10	+10	-10	+10	μV/°C
I <sub>OS</sub>	Input Offset Current	25°C < T <sub>A</sub> < T <sub>A</sub> (Max) T <sub>A</sub> = T <sub>A</sub> (min)	-1.0 -1.3	+1.0 +1.3	-1.0 -1.6	+1.0 +1.6	μA μA
I <sub>B</sub>	Input Bias Current	25°C < T <sub>A</sub> < T <sub>A</sub> (Max) T <sub>A</sub> = T <sub>A</sub> (min)	— —	10 13	— —	10 16	μA μA
V <sub>CM</sub>	Input Voltage Range		-3.3	+2.7	-3.3	+2.7	V
CMMR	Common Mode Rejection Ratio	R <sub>S</sub> = 100 Ω, -3.3 < V <sub>CM</sub> < +2.7 V	80	—	80	—	dB
SVRR	Supply Voltage Rejection Ratio	R <sub>S</sub> = 100 Ω, ΔV <sub>S</sub> = ±5%	60	—	60	—	dB
V <sub>OH</sub>	Output HIGH Voltage	T <sub>A</sub> = 25°C T <sub>A</sub> = T <sub>A</sub> (min) T <sub>A</sub> = T <sub>A</sub> (max)	-0.960 -1.060 -0.890	-0.810 -0.890 -0.700	-0.960 -1.100 -0.850	-0.810 -0.929 -0.620	V V V
V <sub>OL</sub>	Output LOW Voltage	T <sub>A</sub> = 25°C T <sub>A</sub> = T <sub>A</sub> (min) T <sub>A</sub> = T <sub>A</sub> (max)	-1.850 -1.890 -1.825	-1.650 -1.675 -1.625	-1.850 -1.910 -1.810	-1.650 -1.690 -1.575	V V V
I <sub>+</sub>	Positive Supply Current		—	35	—	32	mA
I <sub>-</sub>	Negative Supply Current		—	48	—	44	mA
P <sub>DISS</sub>	Power Dissipation		—	485	—	450	mW

**SWITCHING CHARACTERISTICS** ( $V_{in} = 100 \text{ mV}$ ,  $V_{od} = 5 \text{ mV}$ ) Included in Group A, Subgroup 9 unless noted.

Symbol	Descriptions	Test Conditions	Am687A-L Am687-L		Am687A-M Am687-M		Unit
			Min.	Max.	Min.	Max.	
$t_{pd+}$ , $t_{pd-}$	Propagation Delay, Am687A	$T_{A(min)} \leq T_A \leq 25^\circ\text{C}$ $T_A = T_{A(max)}$ (Note 4)		8.0 10		8.0 12.5	ns ns
$t_{pd+}$ , $t_{pd-}$	Propagation Delay, Am687	$T_{A(min)} \leq T_A \leq 25^\circ\text{C}$ $T_A = T_{A(max)}$ (Note 4)		10 14		10 20	ns ns
$t_s$	Minimum Latch Setup Time	$T_A = 25^\circ\text{C}$ (Note 3)		4.0		4.0	ns

**Notes:**

- Derate at 9 mW/°C for operation at ambient temperatures above +115°C.
- Unless otherwise specified  $V_+ = +5.0 \text{ V}$ ,  $V_- = -5.2 \text{ V}$ ,  $V_T = -2.0 \text{ V}$ , and  $R_L = 50 \Omega$ ; all switching characteristics are for a 100 mV input step with 5 mV overdrive. The specifications given for  $V_{OS}$ ,  $I_{OS}$ ,  $I_B$ , CMMR, SVRR,  $t_{pd+}$ , and  $t_{pd-}$  apply over the full V range and for  $\pm 5\%$  supply voltages. The Am687 and Am687A are designed to meet the specifications given in the table after thermal equilibrium has been established with a transverse air flow of 500 LFPM or greater.
- Owing to the difficult and critical nature of switching measurements involving the latch, these parameters cannot be tested in production. Engineering data indicates that at least 95% of the units will meet specifications given.
- Not 100 tested. Group A only.

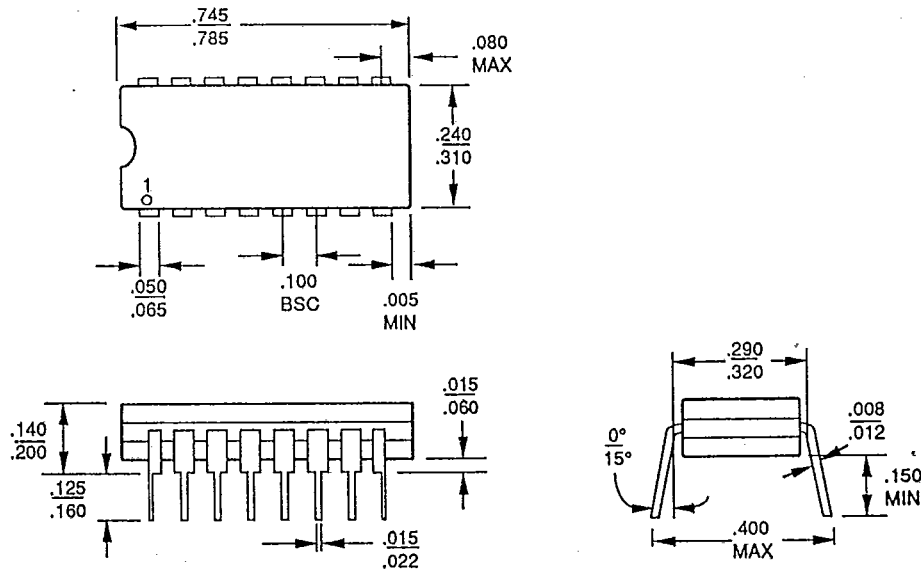


**Performance Curves**

03939-006C

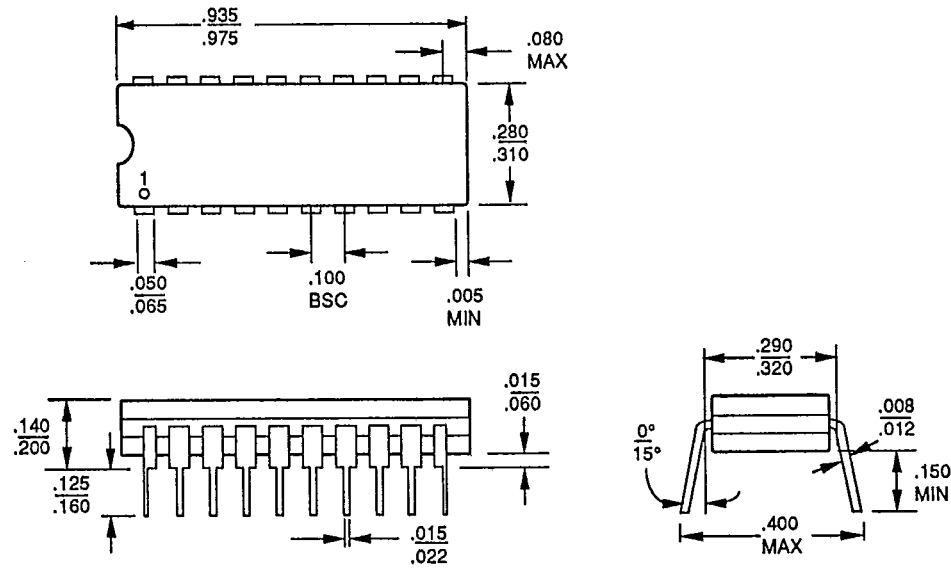
PHYSICAL DIMENSIONS  
CD 016

T-90-20



07319B

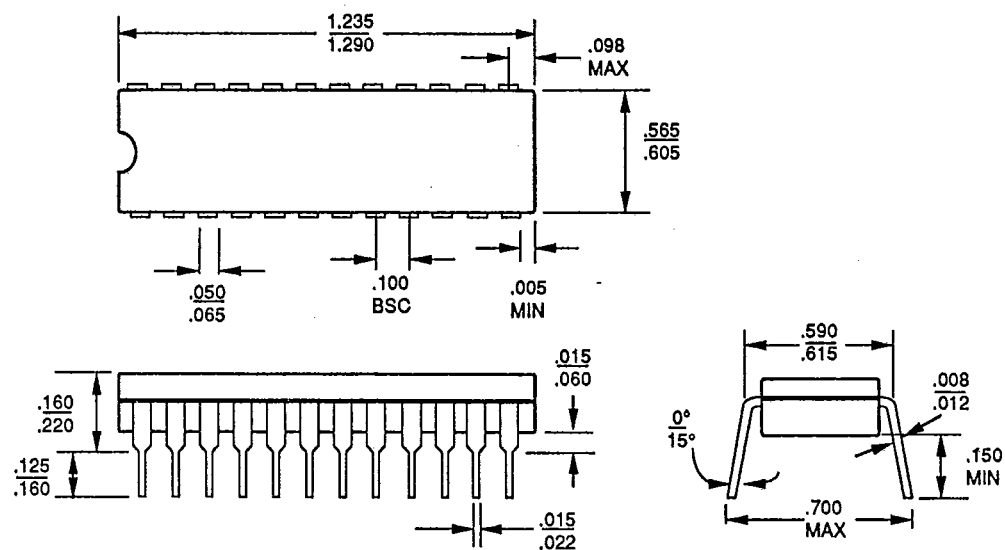
CD 020



03941-004C

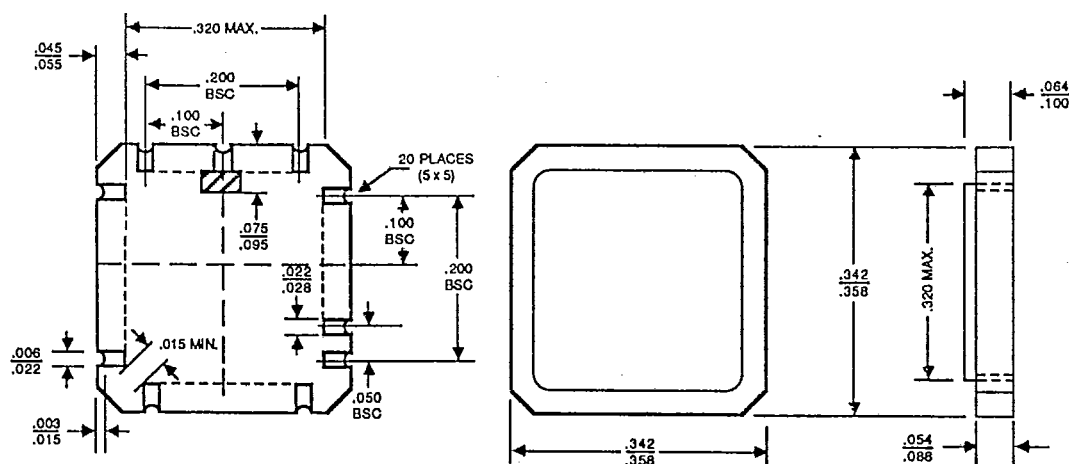
PHYSICAL DIMENSIONS (continued)  
CD 024

T-90-20



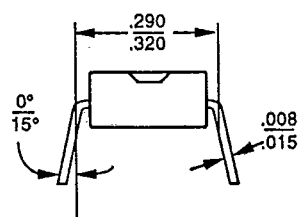
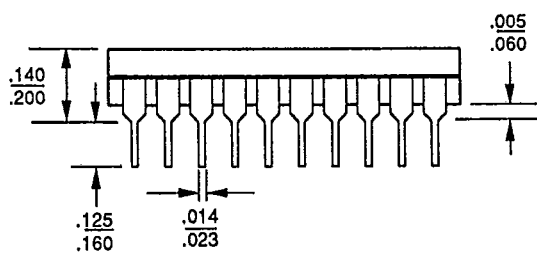
03067-008A

## CL 020



PID #07318C

**PHYSICAL DIMENSIONS (continued)**  
**MC 010**



03941-005C