REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Change to approved source. Table I changes; burn-in and life test condition changes.	1984 AUG 27	M. A. Frye
B	Page 4 change test condition R_S, V_{CC}, and V_{IN} for CMR test. Page 5 delete footnote 4 for t_{PLH}, t_{PHL}. Page 5 add special subgroup 12 for t_s. Page 5 footnote 5 change $\leq$ 500 LFPM to $\geq$ 500 LFPM. Editorial changes throughout.	1985 JUL 12	M. A. Frye
C	Pages 4 and 5, table I: change test conditions for V_{IO}, I_{IO}, I_{IB}, CMR and PSRR. Add footnote for $\frac{\Delta V_{IO}}{\Delta T}$. Page 8, table II: change subgroups for final electrical, groups A, C, and D tests. Guarantee subgroups 10 and 11. Add subgroup 12. Page 9, 6.8: change similar vendor type. Editorial changes throughout.	1986 MAY 15	M. A. Frye
D	Change to standardized military drawing format. Change CAGE code to 67268. Add device types 02 and 03. Add vendor CAGE 34031. Delete latch setup time test. Change test conditions for I_{IO} and I_{IB}. Add maximum and minimum temperature testing to CMRR and PSRR. Change footnote 2/ for 1.3. Add footnotes 3/ and 4/ to 1.4. Add case outline 2. Add footnotes 4/, 5/, and 6/ to table I. Add latch enable voltage to the recommended operating conditions. Add latch enable propagation delay to table I to be tested. Editorial changes throughout.	1989 MAY 09	M. A. Frye

CURRENT CAGE CODE 67268

REV																									
SHEET																									
REV																									
SHEET																									
REV STATUS OF SHEETS	REV	D	D	D	D	D	D	D	D	D	D														
	SHEET	1	2	3	4	5	6	7	8	9	10														

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY: Joseph A. Kerby

CHECKED BY: Ray Monnin

APPROVED BY: M. A. Frye

DRAWING APPROVAL DATE: 25 JANUARY 1979

REVISION LEVEL: D

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, LINEAR, DUAL VOLTAGE COMPARATOR, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	14933	78019

SHEET 1 OF 10

DESC FORM 193-1
SEP 87

* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60912

5962-E1109

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

78019	01	E	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device types. The device types shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	AM687	Dual voltage comparator
02	AM6687	Dual voltage comparator
03	AD96687	Dual voltage comparator

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
E	D-2 (16-lead, .840" x .310" x .200"), dual-in-line package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range (V_{CC}):	
Device types 01 and 02	-7 V dc to +7 V dc
Device type 03	-6.5 V dc to +6.5 V dc
Input voltage range (V_I):	
Device types 01 and 02	-4 V dc to +4 V dc
Device type 03	-5 V dc to +5 V dc 2/
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D):	
Device types 01 and 02	450 mW
Device type 03	500 mW
Output current (I_O)	30 mA
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction to case (θ_{JC})	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175°C
Differential input voltage (V_{ID}):	
Device types 01 and 02	-6 V dc to +6 V dc
Device type 03	-5.5 V dc to +5.5 V dc
Thermal resistance, junction to ambient (θ_{JA}):	
Case E	93°C/W
Case 2	82°C/W

1/ The device performance shall not be impaired when subjected to maximum rating conditions.
2/ $V_I \leq V_{CC}$.

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1.4 Recommended operating conditions.

Supply voltage (V_{CC})	$+V_{CC}$ = +5.0 V dc, $-V_{CC}$ = -5.2 V dc
Minimum operating voltage ($+V_{CC}$ to $-V_{CC}$) 3/	9.7 V dc
Ambient operating temperature range (T_A) 4/	-55°C to +125°C
Latch enable voltage:	
V_{IH}	-1.1 V
V_{IL}	-1.5 V

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full ambient operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

3/ The information is provided under the recommended operating conditions for design references only. Device is guaranteed to function at 9.7 V dc. However, this parameter is not tested.
4/ Devices require a thermal equilibrium to be established with a transverse airflow of $\geq$ 500 LFPM.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified 1/ 2/ 3/	Device types	Group A subgroups	Limits Min	Limits Max	Unit
Input offset voltage	V_{IO}	R_S = 100Ω, V_{CM} = 0 V dc	All	1		±2.0	mV
				2, 3		±3.0	
Input offset voltage temperature coefficient 4/	$\frac{\Delta V_{IO}}{\Delta T}$		01	1, 2, 3		±10	
			02			±15.0	
			03			±20	
Input offset current	I_{IO}	R_S = 100Ω, V_{CM} = 0 V dc; V_{CM} = 2.7 V dc; V_{CM} = -3.3 V dc T_A = +25°C, +125°C	01	1, 2		±1.0	μA
			02			±1.5	
		R_S = 100Ω, V_{CM} = 0 V dc, V_{CM} = ±0.5 V dc, T_A = +25°C	03	1		±1.0	
		R_S = 100Ω, V_{CM} = 0 V dc; V_{CM} = 2.7 V dc; V_{CM} = -3.3 V dc T_A = -55°C	01	3		±1.6	
			02			±3.0	
		R_S = 100Ω, V_{CM} = 0 V dc, V_{CM} = ±0.5 V dc, T_A = -55°C, +125°C	03	2, 3		±1.2	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified 1/ 2/ 3/	Device types	Group A subgroups	Limits Min	Limits Max	Unit
Input bias current	I_{IB}	$R_S = 100\Omega$, $V_{CM} = 0$ V dc; $V_{CM} = 2.7$ V dc; $V_{CM} = -3.3$ V dc $T_A = +25°C$, $+125°C$	01	1, 2		10	µA
			02			15	
		$R_S = 100\Omega$, $V_{CM} = 0$ V dc, $V_{CM} = \pm 0.5$ V dc, $T_A = +25°C$	03	1		10	
		$R_S = 100\Omega$, $V_{CM} = 0$ V dc; $V_{CM} = 2.7$ V dc; $V_{CM} = -3.3$ V dc $T_A = -55°C$	01	3		16	
			02			30	
		$R_S = 100\Omega$, $V_{CM} = 0$ V dc, $V_{CM} = \pm 0.5$ V dc, $T_A = -55°C$, $+125°C$	03	2, 3		16	
Input voltage range	V_{CM}		01, 02	1, 2, 3	-3.3	2.7	V
			03		-2.5	+5.0	
Input voltage common mode rejection ratio	CMRR	$R_S = 100\Omega$, -3.3 V $\le V_{CM} \le 2.7$ V	01, 02	4, 5, 6	80		dB
		$R_S = 100\Omega$, $-2.5 \le V_{CM} \le +5.0$ V	03				
Power supply rejection ratio	PSRR	$R_S = 100\Omega$, $\Delta V_S = \pm 5\%$	All	4, 5, 6	60		dB
High level output voltage	V_{OH}	$T_A = +25°C$	01, 02	1	-.960	-.810	V
		$T_A = +125°C$		2	-.850	-.620	
		$T_A = -55°C$		3	-1.10	-.920	
			03	1, 2, 3	-1.10		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C < T_A < +125°C$ unless otherwise specified 1/ 2/ 3/	Device types	Group A subgroups	Limits Min	Limits Max	Unit
Low level output voltage	V_{OL}	T_A = +25°C	01, 02	1	-1.85	-1.65	V
		T_A = +125°C		2	-1.81	-1.57	
		T_A = -55°C		3	-1.91	-1.69	
			03	1, 2, 3		-1.50	
Positive supply current	$+I_{CC}$		01, 02	1, 2, 3		32	mA
			03			18	
Negative supply current	$-I_{CC}$		01, 02	1, 2, 3		44	mA
			03			36	
Propagation delay time	t_{PD}±	T_A = +25°C and -55°C 5/	01	9, 11		10	ns
		T_A = +125°C 5/		10		20	
		T_A = +25°C and -55°C 6/	02	9, 11		4.0	
		T_A = +125°C 6/		10	1.5	6.0	
		T_A = +25°C and -55°C 6/	03	9, 11	1.5	3.5	
		T_A = +125°C 6/		10	1.5	6.0	
Propagation delay time, latch enable to output	t_{PD}± (E)	T_A = +25°C and -55°C	01,02	9, 11		8	ns
		T_A = +125°C		10		12.5	
		T_A = +25°C	03	9		3.5	
		T_A = +125°C, T_A = -55°C		10, 11		7	

See footnotes on next page.

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1/ Unless otherwise specified, $+V_{CC}$ = +5.0 V; $-V_{CC}$ = -5.2 V; V_T = -2.0 V dc; and R_L = 50Ω.

2/ Devices require a thermal equilibrium to be established with transverse airflow of 500 LFPM.

3/ Production pulse tests devices at correlated temperatures of -35°C and +150°C to compensate for high power steady-state operation for device type 01.

4/ Guaranteed, if not tested.

5/ 100 mV step input with 5 mV overdrive, t_{PD}^+ on output Q, t_{PD}^- on output of $\overline{Q}$.

6/ 100 mV step input with 10 mV overdrive, t_{PD}^+ on output Q, t_{PD}^- on output of $\overline{Q}$.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125°C, minimum.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 7 and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

Device types	01, 02, 03	03
Case outlines	E	2
Terminal number	Terminal symbol	
1	OUTPUT A	NC
2	OUTPUT $\overline{A}$	OUTPUT A
3	GROUND	OUTPUT $\overline{A}$
4	LATCH ENABLE A	GROUND
5	LATCH ENABLE $\overline{A}$	LATCH ENABLE A
6	$-V_{CC}$	NC
7	INVERTING INPUT A	LATCH ENABLE $\overline{A}$
8	NONINVERTING INPUT A	$-V_{CC}$
9	NONINVERTING INPUT B	INVERTING INPUT A
10	INVERTING INPUT B	NONINVERTING INPUT A
11	$+V_{CC}$	NC
12	LATCH ENABLE $\overline{B}$	NONINVERTING INPUT B
13	LATCH ENABLE B	INVERTING INPUT B
14	GROUND	$+V_{CC}$
15	OUTPUT $\overline{B}$	LATCH ENABLE $\overline{B}$
16	OUTPUT B	NC
17		LATCH ENABLE B
18		GROUND
19		OUTPUT $\overline{B}$
20		OUTPUT B

NC = no connection

FIGURE 1. Terminal connections.

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4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions; method 1005 of MIL-STD-883:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 4
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 9, 10**, 11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.
** Subgroups 10 and 11, if not tested, shall be guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
7801901EX	34335	AM687/BEA
7801902EX	34335	AM6687/BEA
7801903EX	34031	AD96687TQ/883B
78019032X	34031	AD96687TE/883B

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
34335	Advanced Micro Devices, Incorporated 901 Thompson Place Sunnyvale, CA 94086
34031	Analog Devices, Incorporated Computer Labs Division 7910 Triad Center Drive Greensboro, NC 27409