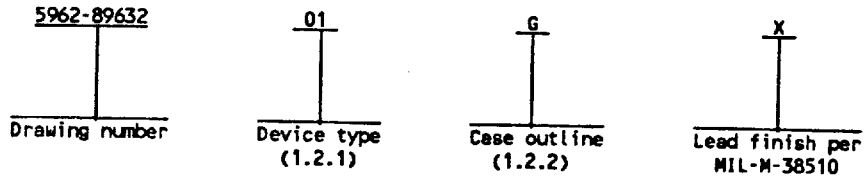


1. SCOPE

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 or Identifying Number (PIN). The complete PIN shall be as shown in the following example:



1.2.1 Device type(s). The device type(s) shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	HA-5112	Dual, low-noise, uncompensated operational amplifier

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

<u>Outline letter</u>	<u>Case outline</u>
G	A-1 (8-lead, .370" x .185"), can package
P	D-4 (8-lead, .405" x .310" x .200"), dual-in-line package
Z	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Voltage between V+ and V- terminals	40 V dc
Differential input voltage (V _{IP})	7.0 V dc
Voltage at either input terminal	V+ to V-
Input current	25 mA
Peak output current	Indefinite ^{1/}
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P _D):	
Case G	1.0 W ^{2/}
Case P	820 mW ^{2/}
Case Z	1.18 W ^{2/}
Lead temperature (soldering, 10 seconds)	+275°C
Thermal resistance, junction-to-case (θ _{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (θ _{JA}):	
Case G	101°C/W
Case P	121°C/W
Case Z	85°C/W
Junction temperature (T _J)	+175°C

^{1/} One amplifier shorted to ground.

^{2/} Derate linearly above T_A = +75°C, case G = 10 mW/°C, case P = 8.2 mW/°C, and case Z = 11.8 mW/°C.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-89632
	REVISION LEVEL	SHEET 2

DESC FORM 193A
SEP 87

U.S. GOVERNMENT PRINTING OFFICE: 1986-550-547

1.4 Recommended operating conditions.

Positive supply voltage range (V ₊)	- - - - -	+5 V dc to +15 V dc
Negative supply voltage range (V ₋)	- - - - -	-5 V dc to -15 V dc
Common mode input voltage (V _{CM})	- - - - -	≤ (V ₊ - (V ₋))/2
Load resistance (R _L)	- - - - -	2.0 kΩ
Ambient operating temperature range (T _A)	- - - - -	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin 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.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin 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 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

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

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

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-89632
	REVISION LEVEL	SHEET 3

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ 1/ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	$V_{CM} = 0.0 \text{ V}$	1	All	-2.0	+2.0	mV
			2, 3		-2.5	+2.5	
Input bias current	$+I_B$	$V_{CM} = 0.0 \text{ V}, +R_S = 100 \text{ k}\Omega,$ $-R_S = 100\Omega$	1	All	-200	+200	nA
			2, 3		-325	+325	
	$-I_B$	$V_{CM} = 0.0 \text{ V}, +R_S = 100\Omega,$ $-R_S = 100 \text{ k}\Omega$	1		-200	+200	
			2, 3		-325	+325	
Input offset current	I_{IO}	$V_{CM} = 0.0 \text{ V}, +R_S = 10 \text{ k}\Omega,$ $-R_S = 10 \text{ k}\Omega$	1	All	-75	75	nA
			2, 3		-125	125	
Common mode voltage range	$+V_{CM}$	$V_+ = 3.0 \text{ V}, V_- = -27 \text{ V}$	1, 2, 3	All	12		V
	$-V_{CM}$	$V_+ = 27 \text{ V}, V_- = -3.0 \text{ V}$				-12	
Common mode rejection ratio	$+CMRR$	$\Delta V_{CM} = 5 \text{ V},$ $V_- = -20 \text{ V}, V_{OUT} = -5 \text{ V},$ $V_+ = +10 \text{ V}$	1, 2, 3	All	86		dB
	$-CMRR$	$\Delta V_{CM} = -5.0 \text{ V},$ $V_- = -10 \text{ V}, V_{OUT} = +5 \text{ V},$ $V_+ = +20 \text{ V}$			86		
Output current	$+I_{OUT}$	$V_{OUT} = -5.0 \text{ V}$	1,2,3	All	10		mA
	$-I_{OUT}$	$V_{OUT} = +5.0 \text{ V}$				-10	
Quiescent power supply	$+I_{CC}$	$V_{OUT} = 0 \text{ V}, I_{OUT} = 0 \text{ mA}$	1	All		5.0	mA
			2, 3			6.0	
	$-I_{CC}$		1			-5.0	
			2, 3			-6.0	

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-89632
	REVISION LEVEL	SHEET 4

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C ^{1/} unless otherwise specified	Group A subgroups	Device type	Limits		Unit	
					Min	Max		
Output voltage swing	+V _{OUT}	R _L = 2.0 kΩ	1	All	10		V	
		R _L = 10 kΩ	2, 3		12			
	-V _{OUT}	R _L = 2.0 kΩ	1			-10		
		R _L = 10 kΩ	2, 3			-12		
Power supply rejection ratio	+PSRR	V ₊ = 10 V and 20 V, V ₋ = -15 V	1, 2, 3	All	86		dB	
	-PSRR	V ₋ = -10 V and -20 V, V ₊ = 15 V			86			
Quiescent power consumption ^{2/ 3/}	P _C	V _{OUT} = 0 V, I _{OUT} = 0 mA	1, 2, 3	All		180	mW	
Differential input resistance ^{2/}	R _{IN}	V _{CM} = 0.0 V, T _A = +25°C	4	All	250		kΩ	
Input noise voltage density ^{2/}	E _N	R _S = 10Ω, f _O = 1.0 kHz, T _A = +25°C	4	All		9.0	nV/ √Hz	
Input noise current ^{2/}	I _N	R _S = 1.0 MΩ, f _O = 1.0 kHz, T _A = +25°C	4	All		3.0	pA/ √Hz	
Slew rate	+SR	V _{OUT} = -5.0 V to +5.0 V, measured at -2.5 V to +2.5 V, T _A = +25°C, R _L = 2 kΩ	4	All	12		V/μs	
	-SR	V _{OUT} = +5.0 V to -5.0 V, measured at -2.5 V to +2.5 V, T _A = +25°C, R _L = 2 kΩ			12			
Output resistance ^{2/}	R _{OUT}	Open loop, T _A = +25°C	4	All		375	Ω	

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89632
		REVISION LEVEL	SHEET 5

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1986-550-547

9004708 0005906 714

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Gain bandwidth product ^{2/}	GBWP	V _{OUT} = 200 mV, T _A ± 25°C	f = 50 kHz	4	All	33		MHz
			f = 1.0 MHz			39		
Full power ^{2/ 4/} bandwidth	FPBW	V _{PEAK} = 10 V, T _A ± 25°C		4	All	191		MHz
Large signal voltage gain	+A _{VOL}	V _{OUT} = 0.0 V and 10 V, R _L = 2.0 kΩ		4, 5, 6	All	100		V/mV
	-A _{VOL}	V _{OUT} = 0.0 V and -10 V, R _L = 2.0 kΩ				100		
Closed loop stable gain ^{2/}	CLSG	R _L = 2.0 kΩ, C _L = 50 pF		4, 5, 6	All	10		V/V
Rise time ^{2/ 5/}	t _r	V _{OUT} = 0.0 V to +200 mV, T _A ± 25°C		9	All		100	ns
Fall time ^{2/ 5/}	t _f	V _{OUT} = 0.0 V to -200 mV, T _A ± 25°C		9	All		100	ns
Overshoot ^{2/}	+OS	V _{OUT} = 0.0 V to +200 mV, T _A ± 25°C		9	All		50	%
	-OS	V _{OUT} = 0.0 V to -200 mV, T _A ± 25°C					50	

^{1/} Unless otherwise specified, V₊ = +15 V, V₋ = -15 V, R_S = 100Ω, R_L = 500 kΩ, C_L = 50 pF, V_{OUT} = 0.0 V, and A_V = 10 V/V.

^{2/} If not tested, shall be guaranteed to the limits specified in table I herein.

^{3/} Quiescent power consumption based on quiescent supply current test maximum (no load on outputs).

^{4/} Full power bandwidth = $\frac{SR}{2\pi V_{PEAK}}$.

^{5/} Rise and fall times measured between 10 percent and 90 percent point.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-89632
	REVISION LEVEL	SHEET 6

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE: 1988-550-547

Device type	01	
Case outlines	G and P	2
Terminal number	Terminal symbol	
1	OUTPUT 1	NC
2	INPUT- 1	OUTPUT 1
3	INPUT+ 1	NC
4	V-	NC
5	INPUT+ 2	INPUT- 1
6	INPUT- 2	NC
7	OUTPUT 2	INPUT+ 1
8	V+	NC
9	- - -	NC
10	- - -	V-
11	- - -	NC
12	- - -	INPUT+ 2
13	- - -	NC
14	- - -	NC
15	- - -	INPUT- 2
16	- - -	NC
17	- - -	OUTPUT 2
18	- - -	NC
19	- - -	NC
20	- - -	V+

NC = No connection.

FIGURE 1. Terminal connections.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89632
		REVISION LEVEL	SHEET 7

DESC FORM 193A
SEP 87

© U. S. GOVERNMENT PRINTING OFFICE 1968-850-547

■ 9004708 0005908 597 ■

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

3.6 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 MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 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.

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

3.9 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 3.6 herein).

(2) $T_A = +125^{\circ}\text{C}$, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

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, 8, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89632
		REVISION LEVEL	SHEET 8

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

TABLE II. Electrical test requirements.

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

* PDA applies to subgroup 1.

** Subgroup 9, if not tested, shall be guaranteed to the limits specified in table I.

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 3.6 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-89632
	REVISION LEVEL	SHEET 9

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

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

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

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89632
		REVISION LEVEL	SHEET 10

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1968-650-547