

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:

5962-89502	01	G	X
└─┘	└─┘	└─┘	└─┘
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

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

Device type	Generic number	Circuit function
01	HA-2544	Video 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:

Outline letter	Case outline
G	A-1 (8-lead, .370" x .185"), can package
P	D-4 (8-lead, .405" 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.

Voltage between +V and -V terminals	33 V dc
Differential input voltage	+6.0 V dc
Voltage at either input terminal	+V to -V
Peak output current	40 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P _D) 1/:	
Case G	860 mW
Case P	780 mW
Case 2	1.1 W
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	116°C/W
Case P	129°C/W
Case 2	92°C/W
Junction temperature (T _J)	+175°C

1.4 Recommended operating conditions.

Positive supply voltage range (+V)	+12 V dc to +15 V dc
Negative supply voltage range (-V)	-12 V dc to -15 V dc
Common mode input voltage (V _{CM})	< (+V - -V)/2
Load resistance (R _L)	> 1.0 kΩ
Ambient temperature range (T _A)	-55°C to +125°C

1/ Derate linearly above T_A = +75°C as follows:

Case G	= 8.6 mW/°C
Case P	= 7.8 mW/°C
Case 2	= 11 mW/°C

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89502
		REVISION LEVEL	SHEET 2

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

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 part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89502
		REVISION LEVEL	SHEET 3

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} < T_A < +125^{\circ}\text{C}$ 1/ $+V = +15\text{ V}$, $-V = -15\text{ V}$, $C_L \leq 10\text{ pF}$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Input offset voltage	V_{IO}	$V_{CM} = 0\text{ V}$	1		± 15	mV
			2, 3		± 20	
Input bias current	$+I_B$	$V_{CM} = 0\text{ V}$, $+R_S = 1.0\text{ k}\Omega$, $-R_S = 10\Omega$	1		± 15	μA
			2, 3		± 20	
	$-I_B$	$V_{CM} = 0\text{ V}$, $+R_S = 10\Omega$, $-R_S = 1.0\text{ k}\Omega$	1		± 15	μA
			2, 3		± 20	
Input offset current	I_{IO}	$V_{CM} = 0\text{ V}$, $+R_S = 1.0\text{ k}\Omega$, $-R_S = 1.0\text{ k}\Omega$	1		± 2.0	μA
			2, 3		± 3.0	
Common mode voltage range	$+V_{CM}$	$+V = +5.0\text{ V}$, $-V = -25\text{ V}$	1, 2, 3	10		V
	$-V_{CM}$	$+V = +25\text{ V}$, $-V = -5.0\text{ V}$	1, 2, 3	-10		V
Large signal voltage gain	$+A_{VOL}$	$V_{OUT} = 0\text{ V}$ and $+10\text{ V}$, $R_L = 1\text{ k}\Omega$	4	3.5		kV/V
			5, 6	2.5		
	$-A_{VOL}$	$V_{OUT} = 0\text{ V}$ and -10 V , $R_L = 1\text{ k}\Omega$	4	3.5		kV/V
			5, 6	2.5		
Common mode rejection ratio	$+CMRR$	$\Delta V_{CM} = +10\text{ V}$, $+V = +5.0\text{ V}$, $-V = -25\text{ V}$, $V_{OUT} = -10\text{ V}$	1, 2, 3	75		dB
	$-CMRR$	$\Delta V_{CM} = -10\text{ V}$, $+V = +25\text{ V}$, $-V = -5.0\text{ V}$, $V_{OUT} = +10\text{ V}$	1, 2, 3	75		dB
Output current	$+I_{OUT}$	$V_{OUT} = +10\text{ V}$, $T_A = +25^{\circ}\text{C}$	4	25		mA
	$-I_{OUT}$	$V_{OUT} = -10\text{ V}$, $T_A = +25^{\circ}\text{C}$	4	-25		mA
Output voltage swing	$+V_{OUT}$	$R_L = 1\text{ k}\Omega$	4, 5, 6	+10.0		V
	$-V_{OUT}$	$R_L = 1\text{ k}\Omega$	4, 5, 6	-10.0		V

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A			5962-89502
		REVISION LEVEL	SHEET 4	

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} < T_A < +125^{\circ}\text{C}$ 1/ $+V = +15\text{ V}$, $-V = -15\text{ V}$, $C_L < 10\text{ pF}$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Quiescent power supply current	$+I_{CC}$	$V_{OUT} = 0\text{ V}$, $I_{OUT} = 0\text{ mA}$	1, 2, 3		12	mA
	$-I_{CC}$	$V_{OUT} = 0\text{ V}$, $I_{OUT} = 0\text{ mA}$	1, 2, 3		-12	mA
Power supply rejection ratio	$+PSRR$	$+V = +10\text{ V}$ and $+20\text{ V}$, $-V = -15\text{ V}$	1, 2, 3	70		dB
	$-PSRR$	$-V = -10\text{ V}$ and -20 V , $+V = +15\text{ V}$	1, 2, 3	70		dB
Offset voltage adjustment	$+V_{IO}$ (ADJ)	$T_A = +25^{\circ}\text{C}$ 2/	1	V_{IO} -1.0		mV
	$-V_{IO}$ (ADJ)	$T_A = +25^{\circ}\text{C}$ 2/	1	V_{IO} +1.0		mV
Slew rate	$+SR$	$V_{OUT} = -3.0\text{ V}$ to $+3.0\text{ V}$ $R_S = 100\Omega$, $R_L = 1\text{ k}\Omega$, $A_V = 1\text{ V/V}$	7	100		$\text{V}/\mu\text{s}$
			8	70		
	$-SR$	$V_{OUT} = +3.0\text{ V}$ to -3.0 V $R_S = 100\Omega$, $R_L = 1\text{ k}\Omega$, $A_V = 1\text{ V/V}$	7	100		$\text{V}/\mu\text{s}$
			8	70		
Differential gain 7/	dA_V	$R_S = 50\Omega$, $R_L = 1.0\text{ k}\Omega$, $f_O = 3.58\text{ MHz}$ and 4.43 MHz $T_A = +25^{\circ}\text{C}$	4		.04	dB
Differential phase 7/	$d\phi$		4		.11	degrees
Unity gain bandwidth	UGBW	$V_{OUT} = 200\text{ mV}$, f at -3.0 dB , $T_A = +25^{\circ}\text{C}$	4	45		MHz
Gain tolerance 7/	ΔA_V	$f_O = 5.0\text{ MHz}$, $T_A = +25^{\circ}\text{C}$	4		$\pm .15$	dB
		$f_O = 10\text{ MHz}$, $T_A = +25^{\circ}\text{C}$	4		$\pm .35$	dB
Full power bandwidth 4/	FPBW	$V_{PK} = 1.0\text{ V}$, $R_L = 1\text{ k}\Omega$, $T_A = +25^{\circ}\text{C}$	4	15.9		MHz
		$V_{PK} = 5.0\text{ V}$, $R_L = 1\text{ k}\Omega$, $T_A = +25^{\circ}\text{C}$	4	3.2		MHz

See footnotes at end of table.

**STANDARDIZED
MILITARY DRAWING**

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

SIZE
A

5962-89502

REVISION LEVEL

SHEET

5

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _A < +125°C 1/ +V = +15 V, -V = -15 V, C _L ≤ 10 pF unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Closed loop stable gain 3/	CLSG	R _L = 1.0 kΩ, C _L ≤ 1.0 pF	4, 5, 6	+1.0		V/V
Rise time 5/	t _r	V _{OUT} = 0 V to +200 mV	9 10, 11 ^{3/}		15	ns
Fall time 5/	t _f	V _{OUT} = 0 V to -200 mV	9 10, 11 ^{3/}		15	ns
Overshoot	+OS	V _{OUT} = 0 V to +200 mV	9		20	%
			10, 11 ^{3/}		30	
	-OS	V _{OUT} = 0 V to -200 mV	9		20	%
			10, 11 ^{3/}		30	
Output resistance 3/	R _{OUT}	T _A = +25°C	4		40	Ω
Quiescent power consumption 6/	P _C	V _{OUT} = 0 V, I _{OUT} = 0 mA	1, 2, 3		360	mW

1/ For DC tests (subgroups 1, 2, and 3): R_S = 10Ω, R_L = 500 kΩ, V_{OUT} = 0 V unless otherwise specified. For AC tests (subgroups 4, 5, 6, 7, 8, 9, 10, 11): A_V = +1.0 V/V, R_L = 1 kΩ, unless otherwise specified.

2/ Offset adjustment range is V_{I0} (measured) ±1.0 mV minimum referred to output. This test is for functionality only to assure adjustment through 0 V.

3/ If not tested, shall be guaranteed to the limits specified in table I.

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

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

6/ Quiescent power consumption based on quiescent supply current test maximum (no load on outputs).

7/ Sample tested on every lot to a LTPD = 5.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89502
		REVISION LEVEL	SHEET 6

Device type	01	
Case outlines	G and P	2
Terminal number	Terminal symbol	
1	Balance	No connection
2	-IN	Balance
3	+IN	No connection
4	-V	No connection
5	Balance	-IN
6	Output	No connection
7	+V	+IN
8	No connection	No connection
9	---	No connection
10	---	-V
11	---	No connection
12	---	Balance
13	---	No connection
14	---	No connection
15	---	Output
16	---	No connection
17	---	+V
18	---	No connection
19	---	No connection
20	---	No connection

FIGURE 1. Terminal connections.

**STANDARDIZED
MILITARY DRAWING**

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

SIZE
A

5962-89502

REVISION LEVEL

SHEET

7

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. Tests shall be as specified in table II herein.

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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89502
		REVISION LEVEL	SHEET 8

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*,2,3,4,5,6,7
Group A test requirements (method 5005)	1,2,3,4,5,6,7, 8**,9,10**,11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

** Subgroups 8, 10, and 11 guaranteed if not tested.

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 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. Additional sources will be added to MIL-BUL-103 as they become available. The vendor 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		5962-89502
		REVISION LEVEL	SHEET 9

STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 91-03-22

Approved sources of supply for SMD 5962-89502 are listed below for immediate acquisition only and shall be added to MIL-BUL-103 during the next revision. MIL-BUL-103 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-ECS. This bulletin is superseded by the next dated revision of MIL-BUL-103.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN <u>1/</u>
5962-8950201GX	34371	HA2-2544/883
5962-8950201PX	34371	HA7-2544/883
5962-89502012X	34371	HA4-2544/883

1/ 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

34371

Vendor name
and address

Harris Semiconductor
P.O. Box 883
Melbourne, FL 32901

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