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5962-E335

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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:

5962-89643	01	X	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-2542	High slew rate, high output current, wideband 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
X	See figure 1 (12-lead, .610" x .185"), can package

1.3 Absolute maximum ratings.

Voltage between +V and -V terminals	35 V dc
Differential input voltage	6.0 V dc
Voltage at either input terminal	+V to -V
Peak output current (< 10% duty cycle)	125 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D)	2.1 W ^{1/}
Lead temperature (soldering, 10 seconds)	+275°C
Thermal resistance, junction-to-case (Θ_{JC})	82°C/W
Thermal resistance, junction-to-ambient (Θ_{JA})	47°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)	$\geq 100\Omega$
Ambient operating temperature range (T_A)	-55°C to +125°C

^{1/} Derate linearly above $T_A = +75^\circ\text{C}$ at 21.4 mW/°C.

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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 2.

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.

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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A sub- groups	2/ Limits		Unit
				Min	Max	
Input offset voltage	V_{IO}	$V_{CM} = 0\text{ V}$	1		± 10	mV
			2, 3		± 20	
Input bias current	$+I_B$	$V_{CM} = 0\text{ V}, +R_S = 1.1\text{ k}\Omega,$ $-R_S = 100\Omega$	1		± 35	μA
			2, 3		± 50	
	$-I_B$	$V_{CM} = 0\text{ V}, +R_S = 100\Omega,$ $-R_S = 1.1\text{ k}\Omega$	1		± 35	μA
			2, 3		± 50	
Input offset current	I_{IO}	$V_{CM} = 0\text{ V}, +R_S = 1.1\text{ k}\Omega,$ $-R_S = 1.1\text{ k}\Omega$	1		± 7.0	μA
			2, 3		± 9.0	
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	$+A_{VOL}$	$V_{OUT} = 0\text{ V and } 10\text{ V},$ $R_L = 1.0\text{ k}\Omega$	4	10		kV/V
			5, 6	5.0		
	$-A_{VOL}$	$V_{OUT} = 0\text{ V and } -10\text{ V},$ $R_L = 1.0\text{ k}\Omega$	4	10		kV/V
			5, 6	5.0		
Common mode rejection	$+CMRR$	$\Delta V_{CM} = 10\text{ V}, +V = 5.0\text{ V},$ $-V_{CM} = -25\text{ V}, V_{OUT} = -10\text{ V}$	1, 2, 3	70		dB
	$-CMRR$	$\Delta V_{CM} = -10\text{ V}, +V = 25\text{ V},$ $-V_{CM} = -5.0\text{ V}, V_{OUT} = 10\text{ V}$	1, 2, 3	70		dB

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A sub- groups	2/ Limits		Unit
				Min	Max	
Output current	$+I_{\text{OUT}}$	$V_{\text{OUT}} = -5.0 \text{ V}$	1, 2, 3	100		mA
	$-I_{\text{OUT}}$	$V_{\text{OUT}} = 5.0 \text{ V}$	1, 2, 3	-100		mA
Output voltage swing	$+V_{\text{OUT}}$	$R_L = 1.0 \text{ k}\Omega$	1, 2, 3	10		V
	$-V_{\text{OUT}}$	$R_L = 1.0 \text{ k}\Omega$	1, 2, 3	-10		V
Quiescent power supply current	$+I_{\text{CC}}$	$V_{\text{OUT}} = 0 \text{ V}, I_{\text{OUT}} = 0 \text{ mA}$	1, 2, 3		34.5	mA
	$-I_{\text{CC}}$	$V_{\text{OUT}} = 0 \text{ V}, I_{\text{OUT}} = 0 \text{ mA}$	1, 2, 3		-34.5	mA
Power supply rejection ratio	+PSRR	$+V = 5.0 \text{ V}$ and $15 \text{ V},$ $-V = -15 \text{ V}$	1, 2, 3	70		dB
	-PSRR	$-V = -5.0 \text{ V}$ and $-15 \text{ V},$ $+V = +15 \text{ V}$	1, 2, 3	70		dB
Offset voltage adjustment	$+V_{\text{IO}}(\text{adj})$	$T_A = +25^{\circ}\text{C}$ 3/	1	$V_{\text{IO}} - 1.0$		mV
	$-V_{\text{IO}}(\text{adj})$	$T_A = +25^{\circ}\text{C}$ 3/	1	$V_{\text{IO}} + 1.0$		mV
Differential input resistance 4/	R_{IN}	$V_{\text{CM}} = 0 \text{ V}, T_A = +25^{\circ}\text{C}$	4	40		$\text{k}\Omega$
Slew rate 4/	+SR	$V_{\text{OUT}} = -5.0 \text{ V}$ to $+5.0 \text{ V},$ $R_L = 1 \text{ k}\Omega, A_V = 2 \text{ V/V}$ measured at -4 V to $+4 \text{ V}$	7,8	250		$\text{V}/\mu\text{s}$
	-SR	$V_{\text{OUT}} = +5.0 \text{ V}$ to $-5.0 \text{ V},$ $R_L = 1 \text{ k}\Omega, A_V = 2 \text{ V/V}$ measured at -4 V to $+4 \text{ V}$	7,8	250		$\text{V}/\mu\text{s}$

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	2/ Limits		Unit
				Min	Max	
Gain bandwidth product 4/	GBWP	$V_{\text{OUT}} = \pm 100 \text{ mV}$, $f = .1 \text{ MHz}$, $T_A = +25^{\circ}\text{C}$, $R_L = 9 \text{ k}\Omega$	4	40		MHz
		$V_{\text{OUT}} = \pm 100 \text{ mV}$, $f = 1.0 \text{ MHz}$, $T_A = +25^{\circ}\text{C}$, $R_L = 9 \text{ k}\Omega$	4	50		MHz
Full power bandwidth 4/ 5/	FPBW	$V_{\text{PEAK}} = 10 \text{ V}$, $R_L = 1 \text{ k}\Omega$	4, 5, 6	4.0		MHz
closed loop stable gain 4/	CLSG	$R_L = 1.0 \text{ k}\Omega$, $C_L \leq 10 \text{ pF}$	4, 5, 6	2.0		V/V
Rise time 4/ 6/	t_r	$V_{\text{OUT}} = 0 \text{ V to } +200 \text{ mV}$, $T_A = +25^{\circ}\text{C}$	9		10	ns
Fall time 4/ 6/	t_f	$V_{\text{OUT}} = 0 \text{ V to } -200 \text{ mV}$, $T_A = +25^{\circ}\text{C}$	9		10	ns
Overshoot 4/	+OS	$V_{\text{OUT}} = 0 \text{ V to } +200 \text{ mV}$, $T_A = +25^{\circ}\text{C}$	9		55	%
	-OS	$V_{\text{OUT}} = 0 \text{ V to } -200 \text{ mV}$, $T_A = +25^{\circ}\text{C}$	9		55	%
Output resistance 4/	R_{OUT}	$V_{\text{OUT}} = 0 \text{ V}$, $T_A = +25^{\circ}\text{C}$	4		25	Ω
Quiescent power consumption 7/	PC	$V_{\text{OUT}} = 0 \text{ V}$, $I_{\text{OUT}} = 0 \text{ mA}$	1, 2, 3		1.035	W

1/ Unless otherwise specified, $+V = +15 \text{ V}$, $-V = -15 \text{ V}$, and $C_L \leq 10 \text{ pF}$. For dc tests, $R_S = 100\Omega$, $R_L = 100 \text{ k}\Omega$, and $V_{\text{OUT}} = 0 \text{ V}$. For ac tests, $A_V = +2 \text{ V/V}$.

2/ The limiting terms "min" (minimum) and "max" (maximum) shall be considered to apply to magnitudes only. Negative current shall be defined as conventional current flow out of a device terminal.

3/ Offset adjustment range is V_{10} (measured) $\pm 1.0 \text{ mV}$ minimum referred to output. This test is for functionality only to assure adjustment through 0 V .

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

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

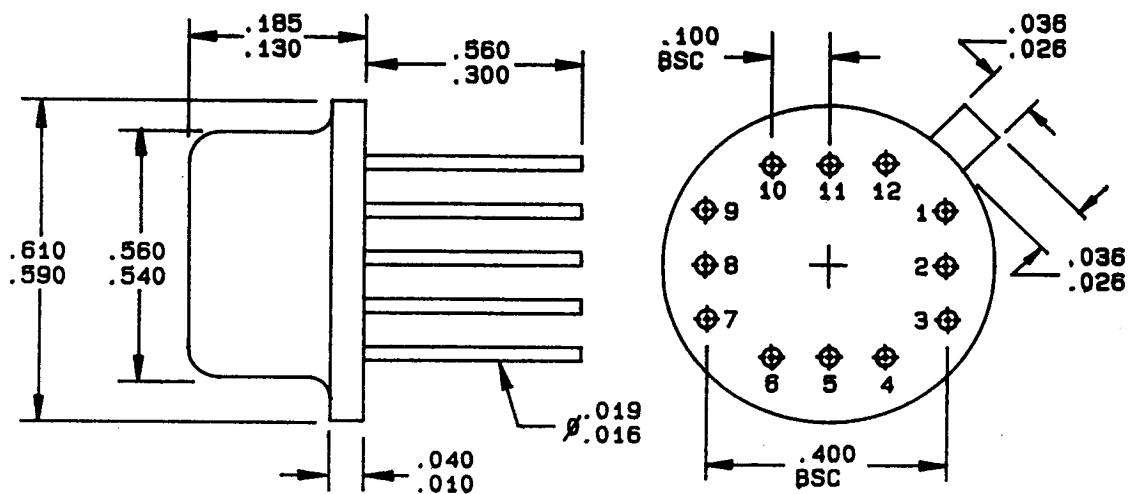
7/ Rise and fall times measured between 10 percent and 90 percent point.

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

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Inches	mm
.016	0.41
.010	0.25
.019	0.48
.024	0.61
.026	0.66
.036	0.91
.040	1.02
.100	2.54
.130	3.30
.185	4.70
.300	7.62
.400	10.16
.540	13.72
.560	14.22
.590	14.99
.610	15.49

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Pin numbers are for reference only and do not appear on package.
4. All leads: Increase maximum limit by .003 (0.08 mm) when lead finish A or B is applied.

FIGURE 1. Case outline X.

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Device type	01
Case outline	X
Terminal number	Terminal symbol
1	NC
2	COMP
3	BAL
4	BAL
5	-IN
6	+IN
7	NC
8	NC
9	NC
10	-V
11	OUTPUT
12	+V

FIGURE 2. Terminal connections.

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

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.

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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, 7**, 8**, 9**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

** Subgroups 7, 8, and 9 shall be 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. 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.

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