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REV STATUS OF SHEETS	REV SHEET		1	2	3	4	5	6	7	8	9	10	11							

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 <i>Joseph A. Hensley</i> CHECKED BY <i>Ray Monnin</i> APPROVED BY <i>[Signature]</i> DRAWING APPROVAL DATE 9 MARCH 1989 REVISION LEVEL	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 MICROCIRCUITS, LINEAR LOW-POWER OPERATIONAL AMPLIFIERS, MONOLITHIC SILICON <table style="width: 100%;"> <tr> <td style="width: 10%;">SIZE A</td> <td style="width: 20%;">CAGE CODE 67268</td> <td style="width: 70%;">5962-88559</td> </tr> <tr> <td colspan="3" style="text-align: center;">SHEET 1 OF 11</td> </tr> </table>	SIZE A	CAGE CODE 67268	5962-88559	SHEET 1 OF 11		
SIZE A	CAGE CODE 67268	5962-88559						
SHEET 1 OF 11								

DESC FORM 193
SEP 87

• U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911
5962-E796

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

5962-88559	01	C	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	OP421B	Quad low-power operational amplifier
02	OP421C	Quad low-power operational amplifier

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

Outline letter	Case outline
C	D-1 (14-lead, .785" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

Supply voltage:	
V ₊ - - - - -	+18 V
V ₋ - - - - -	-18 V
Differential input voltage - - - - -	+30 V or -30 V
Input voltage (V _{IN}) - - - - -	Supply voltage
Internal power dissipation (P _D) 1/- - - - -	500 mW
Storage temperature range - - - - -	-65°C to +150°C
Lead temperature (soldering, 60 seconds) - - -	+300°C
Junction temperature (T _J) - - - - -	+150°C
Thermal resistance, junction-to-case (θ _{JC}) - - - -	See MIL-M-38510, appendix C

1.4 Recommended operating conditions.

Ambient operating temperature range (T _A) - - - - -	-55°C to +125°C
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1/ Derate above +100°C, 10 mW/°C.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-88559	
		REVISION LEVEL	SHEET 2

DESC FORM 193A
SEP 87

* U. S. GOVERNMENT PRINTING OFFICE: 1988-550-547

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 outline. The case outline 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.

3.5 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).

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88559
		REVISION LEVEL	SHEET 3

DESC FORM 193A
SEP 87

* U. S. GOVERNMENT PRINTING OFFICE: 1988-549-904

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C < T _A < +125°C V ⁺ = 15 V, V ⁻ = -15 V unless otherwise specified	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Input offset voltage	V _{IO}	V ⁺ = +2.5 V to +15 V V ⁻ = -2.5 V to -15V	01	1		±2.5	mV
				2,3		±3.5	
			02	1		±4.0	
				2,3		±5.5	
Input offset current	I _{IO}	V ⁺ = +2.5 V to +15 V V ⁻ = -2.5 V to -15 V	01	1		±5.0	nA
				2,3		±8.0	
			02	1		±10.0	
				2,3		±15.0	
Input bias current	I _B	V ⁺ = +2.5 V to +15 V V ⁻ = -2.5 V to -15 V	01	1		±50	nA
				2,3		±70	
			02	1		±80	
				2,3		±125	
Input voltage range 1/	IVR	V ⁺ = 5 V, V ⁻ = 0 V	ALL	1	0.0	+3.5	V
				2,3	0.0	+3.2	
		V ⁺ = 15 V V ⁻ = -15 V		1	-15.0	+13.5	
				2,3	-15.0	+13.2	

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88559
		REVISION LEVEL	SHEET 4

DESC FORM 193A
SEP 87

* U. S. GOVERNMENT PRINTING OFFICE: 1968-550-547

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _A < +125°C V ₊ = 15 V, V ₋ = -15 V unless otherwise specified	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Common-mode rejection ratio	CMRR	V ₊ = +5 V, V ₋ = 0 V, 0 V ≤ V _{CM} ≤ +3.5 V	01	4	83		dB
		V ₊ = +5 V, V ₋ = 0 V, 0 V ≤ V _{CM} ≤ +3.2 V		5,6	78		
		V ₊ = +5 V, V ₋ = 0 V, 0 V ≤ V _{CM} ≤ +3.5 V	02	4	80		
		V ₊ = +5 V, V ₋ = 0 V, 0 V ≤ V _{CM} ≤ +3.2 V		5,6	74		
		-15 V ≤ V _{CM} ≤ +13.5 V, V ₊ = 15 V V ₋ = -15 V	01	4	83		
				5,6	78		
			02	4	80		
				5,6	74		
Power supply rejection ratio	PSRR	V ₊ = 2.5 V V ₋ = -2.5 V, V ₊ = 15 V V ₋ = -15 V, V ₊ = 5 V V ₋ = 0 V, V ₋ to V ₊ = 5 V to 30 V	01	4		30	μV/V
				5,6		50	
			02	4		50	
				5,6		80	

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-88559	
		REVISION LEVEL	SHEET 5

DESC FORM 193A
SEP 87

★ U. S. GOVERNMENT PRINTING OFFICE: 1986-549-904

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} < T_A < +125^{\circ}\text{C}$ $V^+ = 15\text{ V}, V^- = -15\text{ V}$ unless otherwise specified	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Supply current (four amplifiers)	I _{SY}	$V^+ = 2.5\text{ V}$ $V^- = -2.5\text{ V}$, no load	01	1		1.0	mA
				2,3		1.5	
			02	1		1.5	
				2,3		2.0	
		$V^+ = 15\text{ V}$ $V^- = -15\text{ V}$, no load	01	1		1.8	
				2,3		2.5	
			02	1		2.3	
				2,3		3.2	
Large-signal voltage gain	A _{VO}	$V_O = \pm 10\text{ V}$, $R_L = 10\text{ k}\Omega$	01	4	200		V/mV
		$V_O = \pm 10\text{ V}$, $R_L = 20\text{ k}\Omega$		5,6	100		
		$V_O = \pm 10\text{ V}$, $R_L = 10\text{ k}\Omega$	02	4	100		
		$V_O = \pm 10\text{ V}$, $R_L = 20\text{ k}\Omega$		5,6	50		

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88559
		REVISION LEVEL	SHEET 6

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 V ⁺ = 15 V, V ⁻ = -15 V unless otherwise specified		Device types	Group A subgroups	Limits		Unit
						Min	Max	
Output voltage swing	V _O	V ⁺ = 5 V V ⁻ = 0 V	R _L = 5 kΩ	01	4	0.7	+4.0	V
				02	4	0.8	+3.9	
			R _L = 10 kΩ	01	5,6	0.8	+3.9	
				02	5,6	0.9	+3.8	
		V ⁺ = 15V V ⁻ = -15V	R _L = 10 kΩ	01	4	-14	+14	
				02	4	-13.9	+13.9	
			R _L = 20 kΩ	01	5,6	-13.8	+13.8	
				02	5,6	-13.7	+13.7	
Slew rate <u>2/</u>	SR	T _A = +25°C		A11	7	0.25	V/μs	
Channel separation <u>2/</u>	CS	T _A = +25°C		A11	7	100	dB	
Input noise voltage <u>2/</u> density	E _n	f ₀ = 10 Hz, T _A = +25°C		A11	7	40	nV/√Hz	
		f ₀ = 100 Hz, T _A = +25°C				30		
Input noise current density <u>2/</u>	I _n	f ₀ = 10 Hz T _A = +25°C		A11	7	.6	pA/√Hz	
		f ₀ = 100 Hz T _A = +25°C				.4		
Average input offset voltage drift	TCV ₁₀			01	2,3	-10	10	μV/°C
				02		-15	15	

1/ IVR is guaranteed by CMRR test.

2/ Guaranteed if not tested.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88559
		REVISION LEVEL	SHEET 7

DESC FORM 193A
SEP 87

* U. S. GOVERNMENT PRINTING OFFICE: 1988-550-547

Device types	01 and 02
Case	C
Terminal number	Terminal symbol
1	OUT 1
2	-IN 1
3	+IN 1
4	V+
5	+IN 2
6	-IN 2
7	OUT 2
8	OUT 3
9	-IN 3
10	+IN 3
11	V -
12	+IN 4
13	-IN 4
14	OUT 4

FIGURE 1. Terminal connections.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-88559	
		REVISION LEVEL	SHEET 8

DESC FORM 193A
SEP 87

* U. S. GOVERNMENT PRINTING OFFICE: 1985-549-904

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) $T_A = +125^{\circ}\text{C}$, 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 8, 9, 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 3.5 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		5962-88559
		REVISION LEVEL	SHEET 9

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)	1,4
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
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88559
		REVISION LEVEL	SHEET 10

DESC FORM 193A
SEP 87

★ U. S. GOVERNMENT PRINTING OFFICE: 1986-580-547

6.4 Approved source of supply. An approved source of supply is listed herein. Additional sources will be added as they become available. The vendor listed herein has 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 <u>1/</u>
5962-8855901CX	06665	OP421BY
5962-8855902CX	06665	OP421CY

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

06665

Vendor name
and address

Precision Monolithics Incorporated
1500 Space Park Drive
P.O. Box 58020
Santa Clara, CA 95050-8020

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A	5962-88559	
		REVISION LEVEL	SHEET 11

DESC FORM 193A
SEP 87

U. S. GOVERNMENT PRINTING OFFICE: 1988-549-904