

REVISIONS																								
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED																					

REV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

REV STATUS OF SHEETS	REV SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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PMIC N/A  <b>STANDARDIZED MILITARY DRAWING</b>  THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE  AMSC N/A	PREPARED BY <i>Ruth C. Offner</i> CHECKED BY <i>Charles E. Besore</i> APPROVED BY <i>Yonnes L. Poelking</i> DRAWING APPROVAL DATE 23 MARCH 1990 REVISION LEVEL	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444  MICROCIRCUIT, LINEAR, CMOS, 12-BIT, MULTIPLYING D/A CONVERTER, MONOLITHIC SILICON  <table style="width: 100%;"> <tr> <td style="width: 15%;">SIZE <b>A</b></td> <td style="width: 35%;">CAGE CODE <b>67268</b></td> <td style="width: 50%;">5962-89481</td> </tr> <tr> <td colspan="3">SHEET <span style="float: right;">1</span></td> </tr> </table>	SIZE <b>A</b>	CAGE CODE <b>67268</b>	5962-89481	SHEET <span style="float: right;">1</span>		
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SHEET <span style="float: right;">1</span>								

DESC FORM 193  
SEP 87

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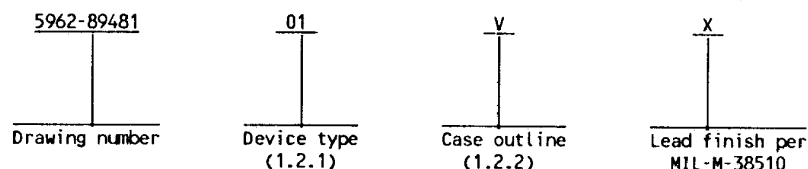
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5962-E1584

# 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:



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

Device type	Generic number	Circuit function
01	AD7541AS	12 bit multiplying DAC
02	AD7541AT	12 bit multiplying DAC
03	PM7541AB	12 bit multiplying DAC
04	PM7541AA	12 bit multiplying DAC

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
V	D-6 (18-lead, .960" 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.

Supply voltage ( $V_{DD}$ )	- - - - -	+17 V dc
Reference input voltage ( $V_{REF}$ )	- - - - -	$\pm 25$ V dc
$V_{RFB}$ to GND	- - - - -	$\pm 25$ V dc
Digital input voltage ( $V_{IN}$ ):		
devices 01, 02	- - - - -	-0.3 V dc to $V_{DD}$
devices 03, 04	- - - - -	GND, $V_{DD}$
Voltage at OUT1, OUT2 pins	- - - - -	-0.3 $V_{DD}$ to $V_{DD}$
Power dissipation	- - - - -	450 mW <sup>1/</sup>
Storage temperature range	- - - - -	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	- - - - -	+300°C
Junction temperature ( $T_J$ )	- - - - -	+175°C
Thermal resistance, junction-to-case ( $\theta_{JC}$ )	- - - - -	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient ( $\theta_{JA}$ ):		
cases V and 2	- - - - -	120 °C/W

## 1.4 Recommended operating conditions.

Positive supply voltage ( $V_{DD}$ )	- - - - -	+15 V dc
Ambient operating temperature range ( $T_A$ )	- - - - -	-55°C to +125°C
Reference input voltage range	- - - - -	-10 V dc to +10 V dc

<sup>1/</sup> Derate 6 mW/°C above  $T_A = +75^\circ\text{C}$

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE <b>A</b>		5962-89481
		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 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 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).

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.

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	<b>SIZE</b> <b>A</b>		5962-89481
		<b>REVISION LEVEL</b>	<b>SHEET</b> 3.

DESC FORM 193A  
SEP 87

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Relative accuracy	RA		01	1,2,3		$\pm 1$	LSB
			02	1		$\pm 1$	
				2,3,12		$\pm 0.5$	
			03, 04	1,2,3		$\pm 0.5$	
Differential nonlinearity	DNL		01, 03	1,2,3		$\pm 1$	LSB
			02	1		$\pm 1$	
				2,3,12		$\pm 0.5$	
			04	1,2,3		$\pm 0.5$	
Gain error <u>2/</u>	AE		01	1		$\pm 6$	LSB
				2,3		$\pm 8$	
			02	1		$\pm 6$	
				2,3		$\pm 5$	
				12		$\pm 3$	
			03	1		$\pm 2$	
				2,3		$\pm 3$	
			04	1		$\pm 1$	
Power supply rejection ratio <u>3/</u>	PSRR	$\Delta V_{DD} = +5\% \text{ or } -5\%$	01,02	1		$\pm .01$	%per%
				2,3		$\pm .02$	
			03,04	1		$\pm .001$	
				2,3		$\pm .002$	
Output leakage current <u>4/</u>	$I_{OUT}$	$I_{OUT1}$ and $I_{OUT2}$ pins Digital input = 0 V, $V_{DD}$	01,02	1		$\pm 5$	nA
				2,3		$\pm 200$	
			03,04	1		$\pm 5$	
				2,3		$\pm 100$	

See footnotes at end of table.

**STANDARDIZED  
MILITARY DRAWING**  
DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO 45444

SIZE  
**A**

5962-89481

REVISION LEVEL

SHEET 4

TABLE 1. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Reference input resistance	$R_{IN}$		01,02	1,2,3	7	18	$k\Omega$
			03,04		7	15	
Digital input high voltage	$V_{IH}$		All	1,2,3	2.4		V
Digital input low voltage	$V_{IL}$		All	1,2,3		0.8	V
Digital input leakage current	$I_{IN}$	$V_{IN} = 0\text{ V or }V_{DD}$	All	1,2,3		$\pm 1$	$\mu\text{A}$
Supply current	$I_{DD}$	Digital inputs = $V_{IH}$ or $V_{IL}$	All	1,2,3		2	mA
				1		100	$\mu\text{A}$
		Digital inputs = 0 V or $V_{DD}$		2,3		500	$\mu\text{A}$
Digital input capacitance	$C_{IN}$	See 4.3.1c, $T_A = +25^{\circ}\text{C}$	All	4		8	pF
Output capacitance $I_{OUT1}$ pin $I_{OUT2}$ pin	$C_{OUT1}$ $C_{OUT2}$	Digital inputs = $V_{IH}$ See 4.3.1c	All	4		200 70	pF
	$C_{OUT1}$ $C_{OUT2}$	Digital inputs = $V_{IL}$ See 4.3.1c				70 200	

1/  $V_{DD} = +15\text{ V}$ ,  $V_{OUT1} = V_{OUT2} = 0\text{ V}$ ,  $V_{REF} = 10\text{ V}$  unless otherwise specified.

2/ Measured using internal feedback resistor.

3/  $\Delta V_{DD} = \pm 5\%$ .

4/ DAC loaded with 0000 0000 0000 for  $I_{OUT1}$  and digital inputs =  $V_{IL}$ . Digital inputs =  $V_{IH}$  for  $I_{OUT2}$ .

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.

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE <b>A</b>		5962-89481
		REVISION LEVEL	SHEET 5

Device types	01, 02, 03, and 04	
Case outlines	V	2
Terminal number	Terminal symbol	
1	I <sub>OUT1</sub>	NC
2	I <sub>OUT2</sub>	I <sub>OUT1</sub>
3	GND	I <sub>OUT2</sub>
4	BIT 1 (MSB)	GND
5	BIT 2	BIT 1 (MSB)
6	BIT 3	BIT 2
7	BIT 4	BIT 3
8	BIT 5	BIT 4
9	BIT 6	BIT 5
10	BIT 7	BIT 6
11	BIT 8	NC
12	BIT 9	BIT 7
13	BIT 10	BIT 8
14	BIT 11	BIT 9
15	BIT 12 (LSB)	BIT 10
16	V <sub>DD</sub>	BIT 11
17	V <sub>REF</sub>	BIT 12 (LSB)
18	R <sub>FB</sub>	V <sub>DD</sub>
19	---	V <sub>REF</sub>
20	---	R <sub>FB</sub>

NC = No connection

FIGURE 1. Terminal connections.

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE <b>A</b>		5962-89481
		REVISION LEVEL	SHEET 6

#### 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 B 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.
- c. Subgroup 12 test is used for grading in part selection at  $T_A = +25^{\circ}\text{C}$  and is not included in PDA calculations.

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, 12
Group A test requirements (method 5005)	1, 2, 3, 4, 12
Groups C and D end-point electrical parameters (method 5005)	1

\*PDA applies to subgroup 1.

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 5, 6, 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 ( $C_{IN}$  and  $C_{OUT}$  measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Sample size is 15 devices, all input and output terminals tested, and no failures.
- d. Subgroup 12 test is used for grading in part selection at  $T_A = +25^{\circ}\text{C}$ .

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	<b>SIZE A</b>		5962-89481
		<b>REVISION LEVEL</b>	<b>SHEET 7</b>

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 B 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.

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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89481
		REVISION LEVEL	SHEET 8



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 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. The approved sources of supply listed below are for information purposes only and are current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8948101VX	1ES66	AD7541ASQ/883B
	24355	AD7541ASQ/883B
5962-89481012X	1ES66	AD7541ASE/883B
	24355	AD7541ASE/883B
5962-8948102VX	1ES66	AD7541ATQ/883B
	24355	AD7541ATQ/883B
5962-89481022X	1ES66	AD7541ATE/883B
	24355	AD7541ATE/883B
5962-8948103VX	06665	PM7541ABX/883
5962-89481032X	06665	PM7541ABRC/883
5962-8948104VX	06665	PM7541AAX/883

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

06665

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

1ES66

Maxim Integrated Products  
120 San Gabriel Drive  
Sunnyvale, CA 94086

24355

Analog Devices  
Route 1 Industrial Park  
P.O. Box 9106  
Norwood, MA 02062  
Point of contact: 181 Ballardvale Street  
Wilmington, MA 01887

<b>STANDARDIZED MILITARY DRAWING</b> DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE <b>A</b>	5962-89481	
		REVISION LEVEL	SHEET 9