

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case outline 3. Add vendor CAGE 1ES66. Made changes to tables I and II, and figures 1 and 2.	91-09-17	M. A. Frye

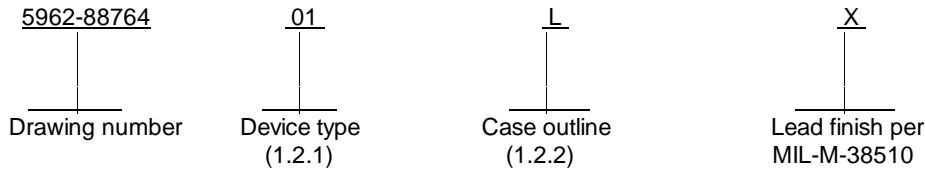
REV																				
SHEET																				
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REV STATUS OF SHEETS	REV	A	A	A	A	A	A	A	A	A	A	A	A	A						
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12							

<p align="center">STANDARDIZED MILITARY DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	PMIC N/A	PREPARED BY Rick C. Officer	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON OHIO 45444		
		CHECKED BY Charles E. Besore			
		APPROVED BY Michael A. Frye	SIZE A	CAGE CODE 67268	5962-88764
		DRAWING APPROVAL DATE 7 August 1989	SHEET 1 OF 12		
		REVISION LEVEL A			

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>	<u>Total unadjusted error</u>
01	7824T	4-channel 8-bit ADC	±1.0 LSB
02	7824U	4-channel 8-bit ADC	±0.5 LSB
03	7828T	8-channel 8-bit ADC	±1.0 LSB
04	7828U	8-channel 8-bit ADC	±0.5 LSB

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>
L	D-9 (24-lead, 1.280" x .310" x .200"), dual-in-line package
X	D-10 (28-lead, 1.490" x .610" x .232"), dual-in-line package
3	C-4 (28-terminal, .460" x .460" x .100"), leadless chip carrier package

1.3 Absolute maximum ratings.

V_{DD} to ground range	0 V dc to +7 V dc
Digital input voltage to ground	(RD, CS, A0, A1 and <u>A2</u>)-0.3 V dc to V_{DD}
Digital output voltage to ground (DB0, DB7, RDY and INT)	-0.3 V dc to V_{DD}
$V_{REF(+)}$ to ground	$V_{REF(-)}$ to V_{DD}
$V_{REF(-)}$ to ground	0 V dc to $V_{REF(+)}$
Analog input, any channel	-0.3 V dc to V_{DD}
Storage temperature range	-65° C to +150° C
Lead temperature (soldering, 10 seconds)	+300° C
Power dissipation (P_D)	450 mW ^{1/}
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (Θ_{JA}) (all cases)	120° C/W
Junction temperature (T_J)	+175° C

1.4 Recommended operating conditions.

Supply voltage range (V_{DD})	+4.75 V dc to +5.25 V dc
Positive reference voltage (V_{REF+})	+5.0 V dc
Negative reference voltage (V_{REF-})	0 V dc
Ground potential (GND)	0 V dc
Ambient operating temperature range (T_A)	-55° C to +125° C

^{1/} Derate above $T_A = +75° C$ at 6.0 mW/° C for case outlines L, X, and 3.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		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 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.

3.2.3 Truth table. The truth table 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.

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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 3

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Resolution	RES	Guaranteed minimum resolution for which no codes are missing	1, 2, 3	All	8.0		Bits
Total unadjusted error <u>3/</u>	TUE		1, 2, 3	01, 03		±1.0	LSB
			1	02, 04		±1.0	LSB
			2, 3, 12			±0.5	
Analog input leakage current	I _{IN}	Any channel	1, 2, 3	All		±3.0	μA
Reference input resistance <u>4/</u>	R _{IN}		1, 2, 3	All	1.0	4.0	kΩ
Digital input high voltage	V _{IH}	A0, A1, A2, <u>5/</u> , $\overline{\text{RD}}$, $\overline{\text{CS}}$	1, 2, 3	All	2.4		V
Digital input low voltage	V _{IL}	A0, A1, A2, <u>5/</u> , $\overline{\text{RD}}$, $\overline{\text{CS}}$	1, 2, 3	All		0.8	V
Digital input high current	I _{IH}	$\overline{\text{CS}}$, $\overline{\text{RD}}$, A0, A1, A2, <u>5/</u>	1, 2, 3	All		1.0	μA
Digital input low current	I _{IL}	$\overline{\text{CS}}$, $\overline{\text{RD}}$, A0, A1, A2, <u>5/</u>	1, 2, 3	All		-1.0	μA
Digital output high voltage	V _{OH}	DB ₀ - DB ₇ , $\overline{\text{INT}}$, I _{SOURCE} = 360 μA	1, 2, 3	All	4.0		V
Digital output low voltage	V _{OL}	DB ₀ - DB ₇ , $\overline{\text{INT}}$, I _{SINK} = 1.6 mA <u>6/</u>	1, 2, 3	All		0.4	V
		RDY, I _{SINK} = 2.6 mA <u>6/</u>	1, 2, 3	All		0.4	V
Floating state leakage current	I _{OUT}	DB ₀ - DB ₇ only	1, 2, 3	All		3.0	μA
Supply current from V _{DD}	I _{DD}	$\overline{\text{CS}}$ = $\overline{\text{RD}}$ = 2.4 V	1, 2, 3	All		20	mA

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 4

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Power supply sensitivity	PSS	V _{DD} = +5.0 V ±5.0%	1, 2, 3	All	0	±0.25	LSB
Analog input capacitance <u>4/</u>	C _{IN1}	0 V to 5.0 V, T _A = +25°C	4	All		45	pF
Digital input capacitance <u>4/</u>	C _{IN2}	T _A = +25°C, CS, RD, A0, A1, A2, <u>5/</u>	4	All		8.0	pF
Digital output capacitance <u>4/</u>	C _{OUT}	T _A = +25°C	4	All		8.0	pF
Slew rate tracking <u>4/</u>	SR	T _A = +25°C	4	All		0.157	V/μs
Functional tests		See 4.3.1d and figure 2	7, 8	All			
CS to RD setup time	t _{CSS}	See figure 3	9, 10, 11	All	0		ns
CS to RD hold time	t _{CSH}	See figure 3	9, 10, 11	All	0		ns
CS to RDY delay	t _{RDY}	C _L = 50 pF, pull-up resistor = 5.0 kΩ, See figure 3	9 10, 11	All		40 60	ns
Conversion time, mode 0	t _{CRD}	See figure 3	9 10, 11	All		2.0 2.8	μs
Data access time after RD, mode 1	t _{ACC1}	See figure 3 <u>7/ 8/</u>	9 10, 11	All		85 120	ns
RD to INT delay	t _{INTH}	C _L = 50 pF	9 10, 11	All		75 100	ns

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 5

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Data hold time	t _{DH}	See figure 3 and 4 <u>9/</u>	9	All		60	ns
			10, 11			70	
Delay time between conversions	t _p	See figure 3	9	All	500		ns
			10, 11		600		
Read pulse width, mode 1	t _{RD}	See figure 3	9	All	60	600	ns
			10, 11		80	400	
Data access time after INT	t _{ACC2}	See figure 3 <u>7/ 8/</u>	9	All		50	ns
			10, 11			70	
Multiplexer address setup time	t _{AS}	See figure 3	9, 10, 11	All	0		ns
Multiplexer address hold time	t _{AH}	See figure 3	9	All	30		ns
			10, 11		40		

- 1/ V_{DD} = +5.0 V, V_{REF(+)} = +5.0 V, and V_{REF(-)} = GND = 0 V unless otherwise specified. Specifications apply for mode 0. All input control signals are specified with t_r = t_f = 20 ns (10% to 90% of +5.0 V) and timed from a voltage level of +1.6 V.
- 2/ Subgroups 10 and 11, if not tested, shall be guaranteed to the limits specified in table I.
- 3/ Total unadjusted error includes offset, full scale, and linearity errors.
- 4/ The (C_{IN1}, C_{IN2}, R_{IN}, C_{OUT}, and SR measurements) are measured initially and after any process or design changes which may affect these tests.
- 5/ A2 applies to device types 03 and 04 only.
- 6/ RDY is an open drain output.
- 7/ Measured with load circuits of figure 5 and defined as the time required for an output to cross 0.8 V or 2.4 V.
- 8/ If not tested, shall be guaranteed to the limits specified in table I herein.
- 9/ Defined as the time required for the data lines to change 0.5 V when loaded with the circuits of figure 4 and is measured only for the initial test and after process or design changes which may affect t_{DH}.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 6

Device types	01 and 02	03 and 04
Case outlines	L	X and 3
Terminal number	Terminal symbol	Terminal symbol
1	AIN 4	AIN 6
2	AIN 3	AIN 5
3	AIN 2	AIN 4
4	AIN 1	AIN 3
5	NC	AIN 2
6	DB0	AIN 1
7	DB1	NC
8	DB2	DB0
9	<u>DB3</u>	DB1
10	<u>RD</u>	DB2
11	INT	<u>DB3</u>
12	GND	<u>RD</u>
13	V _{REF(-)}	INT
14	V _{REF(+)}	GND
15	<u>RDY</u>	V _{REF(-)}
16	CS	V _{REF(+)}
17	DB4	<u>RDY</u>
18	DB5	CS
19	DB6	DB4
20	DB7	DB5
21	A1	DB6
22	A0	DB7
23	NC	A2
24	V _{DD}	A1
25	----	A0
26	----	V _{DD}
27	----	AIN 8
28	----	AIN 7

NC = No connection

FIGURE 1. Terminal connections.

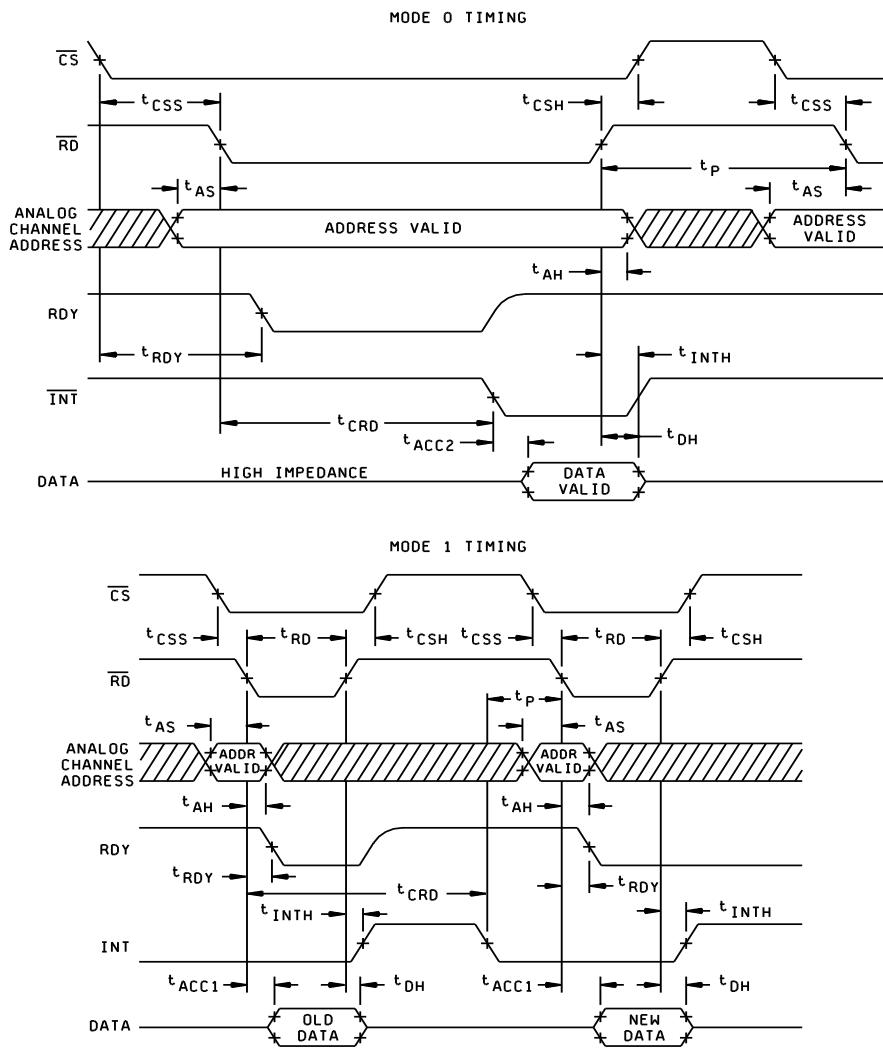
STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 7

Device types 01 and 02		Device types 03 and 04			Channel
A1	A0	A2	A1	A0	
0	0	0	0	0	AIN 1
0	1	0	0	1	AIN 2
1	0	0	1	0	AIN 3
1	1	0	1	1	AIN 4
		1	0	0	AIN 5
		1	0	1	AIN 6
		1	1	0	AIN 7
		1	1	1	AIN 8

0 = logic low state
1 = Logic high state

FIGURE 2. Truth table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 8



NOTES:

1. All input signal rise and fall times are measured from 10% to 90% of +5.0 V, $t = t = 20$ ns.
2. Timing measurements reference level is $(V_{IN} + V_{IL})/2$.

FIGURE 3. Timing diagram.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-88764
		REVISION LEVEL	SHEET 9

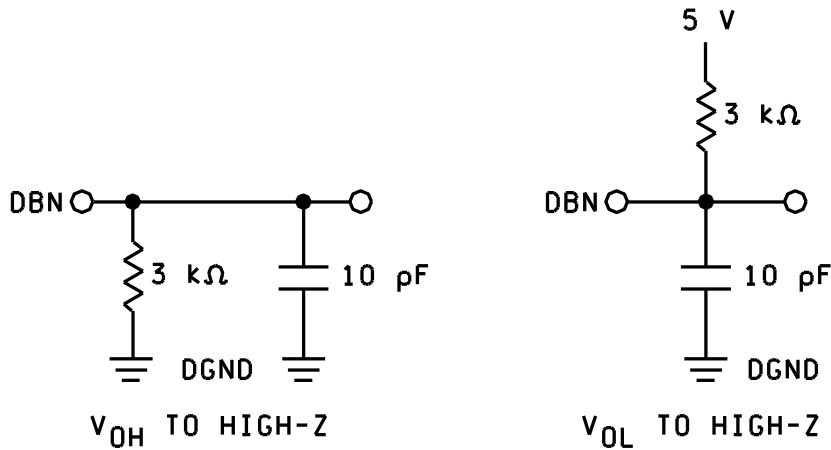


FIGURE 4. Load circuits for data.

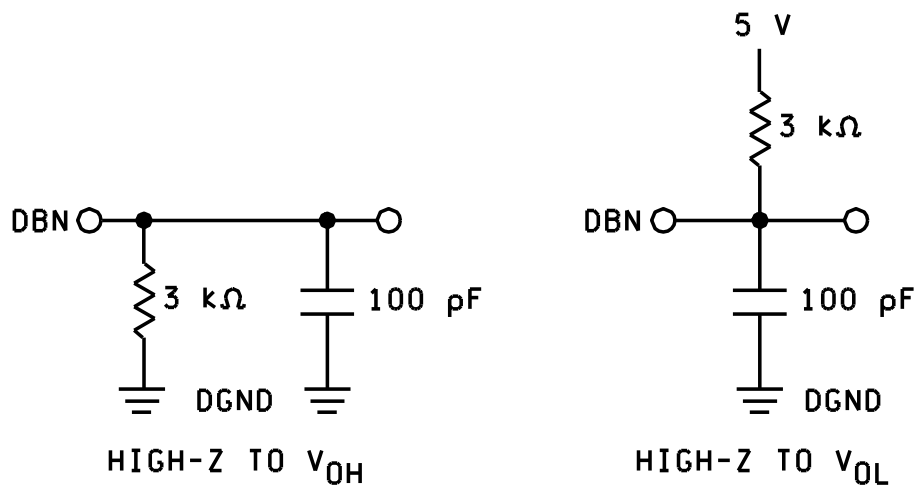


FIGURE 5. Load circuits for data access time.

STANDARDIZED
MILITARY DRAWING
DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

SIZE
A

5962-88764

REVISION LEVEL

SHEET

10

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 5 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (C_{IN1} , C_{IN2} , R_{IN} , C_{OUT} , and SR measurements) shall be measured only for the initial test and after process or design changes which may affect input capacitance.
- d. Subgroups 7 and 8 tests shall include verification of the truth table.
- e. Subgroup 12 test is used for grading and part selection at $T_A = +25^\circ\text{C}$, and is not included in PDA calculations.

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		5962-88764
		REVISION LEVEL	SHEET 11

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, 7, 12
Group A test requirements (method 5005)	1, 2, 3, 4**, 7, 8, 9, 10***, 11***, 12****
Groups C and D end-point electrical parameters (methgod 5005)	1

* PDA applies to subgroup 1.

** See 4.3.1c.

*** Subgroups 10 and 11, if not tested, shall be guaranteed to the limits specified in table I.

**** See 4.3.1e.

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) 296-6021.

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		5962-88764
		REVISION LEVEL	SHEET 12

STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 91-09-17

Approved sources of supply for SMD 5962-88764 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>
5962-8876401LX	1ES66 24355	MX7824TQ/883B AD7824TQ/883B
5962-8876402LX	1ES66 24355	MX7824UQ/883B AD7824UQ/883B
5962-8876403XX	1ES66 24355	MX7828TQ/883B AD7828TQ/883B
5962-8876404XX	1ES66 24355	MX7828UQ/883B AD7828UQ/883B
5962-88764043X	24355	AD7828UE/883B

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

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 01887-1024

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