

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add generic part number HA-2841 as device type 03. Add case outline C to device type 01. Make changes to 1.2.1, 1.3, TABLE I, and FIGURE 2.	94-05-16	M. A. FRYE
B	Drawing updated to reflect current requirements. - ro	00-05-24	R. MONNIN

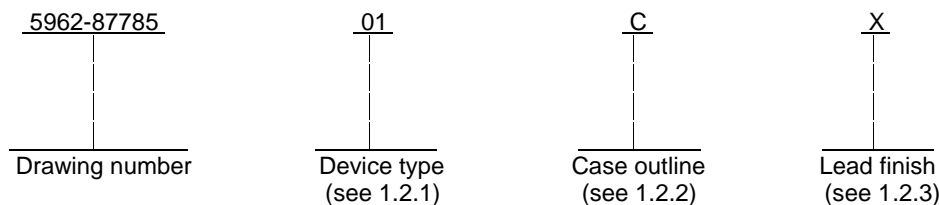
THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																		
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REV STATUS	REV	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14			
PMIC N/A	PREPARED BY RICK C. OFFICER	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216																
STANDARD MICROCIRCUIT DRAWING	CHECKED BY RAJESH R. PITHADIA																	
THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE	APPROVED BY MICHAEL A. FRYE	MICROCIRCUIT, LINEAR, WIDEBAND, FAST SETTLING, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON																
	DRAWING APPROVAL DATE 90-06-28																	
	AMSC N/A	REVISION LEVEL B	SIZE A	CAGE CODE 67268	5962-87785													
			SHEET 1 OF 14															

1. SCOPE

1.1 Scope. This drawing describes device requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	HA-2541	Fast settling, unity gain stable, wideband operational amplifier
02	EL-2041	Fast settling, unity gain stable, wideband operational amplifier
03	HA-2841	Fast settling, unity gain stable, video operational amplifier

1.2.2 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line package
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line package
X	See figure 1	12	Can
2	CQCC1-N20	20	Square leadless chip carrier

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

1.3 Absolute maximum ratings.

- Voltage between +V and -V terminals35 V dc
- Differential input voltage (V_{IN})±6.0 V dc
- Voltage at either input terminalV+ to V-
- Peak output current (< 10% duty cycle)50 mA
- Maximum power dissipation (P_D)2.0 W ^{1/}
- Storage temperature range-65°C to +150°C
- Lead temperature (soldering, 10 seconds) :
 - Device types 01 and 02+275°C
 - Device type 03+300°C
- Junction temperature (T_J)+175°C
- Thermal resistance, junction-to-case (θ_{JC}) :
 - Cases C, P, and 2See MIL-STD-1835
 - Case X82°C/W
- Thermal resistance, junction-to-ambient (θ_{JA}):50°C/W

^{1/} Derate linearly above T_A = +75°C at 20 mW/°C.

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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 operating temperature range (T_A)-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
 MIL-STD-973 - Configuration Management.
 MIL-STD-1835 - Interface Standard For Microcircuit Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 - List of Standard Microcircuit Drawings (SMD's).
 MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-PRF-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-PRF-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-PRF-38535 is required to identify when the QML flow option is used.

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3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535, appendix A and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and figure 1.

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-PRF-38535, appendix A. 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-HDBK-103 (see 6.6 herein). For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device.

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-HDBK-103 (see 6.6 herein). The certificate of compliance submitted to DSCC-VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38535, appendix A and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DSCC-VA shall be required in accordance with MIL-PRF-38535, appendix A.

3.9 Verification and review. DSCC, DSCC'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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1</u> / -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V _{IO}	V _{CM} = 0 V	1	01,02	-2.0	+2.0	mV
				03	-4.0	+4.0	
			2,3	01	-6.0	+6.0	
				02	-10.0	+10.0	
				03	-8.0	+8.0	
Input bias current	+I _B	V _{CM} = 0 V, +R _S = 1.1 kΩ, -R _S = 100 Ω	1	01	-35	+35	μA
					2,3	-50	
			1	02		-15	
					2,3	-20	
			1	03		-10	
					2,3	-20	
	-I _B	V _{CM} = 0 V, +R _S = 100 Ω, -R _S = 1.1 kΩ	1	01		-35	
					2,3	-50	
			1	02		-15	
					2,3	-20	
			1	03		-10	
					2,3	-20	
Input offset current	I _{IO}	V _{CM} = 0 V, +R _S = 1.1 kΩ, -R _S = 1.1 kΩ	1	01		-7.0	+7.0
					2,3	-9.0	+9.0
			1	02		-4.0	+4.0
					2,3	-6.0	+6.0
			1	03		-1.0	+1.0
					2,3	-2.0	+2.0

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1</u> / -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Common mode input range	+V _{CM}	+V = 5.0 V, -V = -25 V	1,2,3	01,03	10		V
				02	8		
	-V _{CM}	+V = 25 V, -V = -5.0 V		01,03	-10		
				02	-8		
Large signal voltage range	+AVOL	V _{OUT} = 0 V and 10 V, R _L = 1.0 kΩ	4	01,03	10		kV/V
				02	7		
			5,6	All	5		
	-AVOL	V _{OUT} = 0 V and -10 V, R _L = 1.0 kΩ	4	01,03	10		
				02	7		
			5,6	All	5		
Common mode rejection ratio	+CMRR	ΔV _{CM} = 10 V, -V = -25 V, +V = 5.0 V, V _{OUT} = -10 V	1,2,3	01,02	70		dB
				1	03	86	
			2,3		80		
	-CMRR	ΔV _{CM} = -10 V, +V = 25 V, -V = -5.0 V, V _{OUT} = 10 V	1,2,3	01,02	70		
				1	03	86	
			2,3		80		
Output current	+I _{OUT}	V _{OUT} = -10 V	1	01	10		mA
				02	25		
		V _{OUT} = -5 V <u>2</u>		03	25		
				2,3	15		
	-I _{OUT}	V _{OUT} = 10 V	1	01	-10		
				02	-25		
		V _{OUT} = +5 V <u>2</u>		03	-25		
				2,3	-15		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1</u> / -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage swing	+V _{OUT}	R _L = 1.0 kΩ	1,2,3	01,03	10		V
				02	11		
	-V _{OUT}	R _L = 1.0 kΩ	1,2,3	01,03	-10		
				02	-11		
Quiescent power supply current	+I _{CC}	V _{OUT} = 0 V, I _{OUT} = 0 mA	1,2,3	01		39	mA
				02		17	
				03		11	
	-I _{CC}	V _{OUT} = 0 V, I _{OUT} = 0 mA	1,2,3	01		-39	
				02		-17	
				03		-11	
Power supply rejection ratio	+PSRR	+V = 5.0 and 15 V, -V = -15 V	1,2,3	01	70		dB
				02	60		
		+V = 10 and 20 V, -V = -15 V		03	70		
	-PSRR	-V = -5.0 V and -15 V, +V = +15 V	1,2,3	01	70		
				02	60		
		-V = -10 and -20 V, +V = +15 V		03	70		
Offset voltage adjustment	+V _{IO} (adj)	T _A = +25°C <u>3</u> /	1	All	V _{IO} -1.0		mV
	-V _{IO} (adj)	T _A = +25°C <u>3</u> /	1	All	V _{IO} +1.0		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Differential input <u>4/</u> resistance	R _{IN}	V _{CM} = 0 V, T _A = +25°C	4	01,02	40		kΩ
Slew rate <u>4/</u>	+SR	V _{OUT} = -3.0 V to 3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	01	200		V/μs
			8		150		
	-SR	V _{OUT} = 3.0 V to -3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	01	200		
			8		150		
	+SR	V _{OUT} = -3.0 V to 3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	02	180		
			8		130		
	-SR	V _{OUT} = 3.0 V to -3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	02	180		
			8		130		
	+SR	V _{OUT} = -3.0 V to 3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	03	200		
			8		187		
	-SR	V _{OUT} = 3.0 V to -3.0 V, R _L = 1 kΩ, A _V = 1 V/V	7	03	200		
			8		187		
Gain bandwidth <u>4/</u> product	GBWP	V _{OUT} = ±100 mV, R _L = 1 kΩ, f ₁ = 100 kHz, f ₂ = 10 MHz, T _A = +25°C	4	All	38		MHz
		V _{OUT} = ±200 mV, R _L = 1 kΩ, f _O = 100 kHz, T _A = +25°C		03	42		
		V _{OUT} = ±200 mV, R _L = 1 kΩ, f _O = 10 MHz, T _A = +25°C			44		
Full power bandwidth <u>4/ 5/</u>	FPBW	V _{PK} = 10 V, R _L = 1 kΩ	4	01	3.0		MHz
			5,6		2.4		
			4	02	2.8		
			5,6		2.0		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit	
					Min	Max		
Full power bandwidth <u>4/ 5/</u>	FPBW	V _{PK} = 10 V, R _L = 1 kΩ	4	03	3.1		MHz	
			5,6		3.0			
Closed loop stable <u>4/</u> gain	CLSG	R _L = 1 kΩ, C _L ≤ 10 pF	4,5,6	All	1.0		V/V	
Rise time <u>4/ 6/</u>	t _r	V _{OUT} = 0 V to +200 mV	9,10,11	01,02		10	ns	
				03		6		
Fall time <u>4/ 6/</u>	t _f	V _{OUT} = 0 V to -200 mV	9,10,11	01,02		10	ns	
				9	03			5
				10,11				6
Settling time <u>4/</u>	t _s	A _V = -1 V/V, 10 V step to 0.1 %, T _A = +25°C	9	01		150	ns	
		A _V = -1 V/V, 10 V step to 0.01 %, T _A = +25°C				300		
		A _V = -1 V/V, 10 V step to 0.05 %, T _A = +25°C	9	02		350		
Overshoot <u>4/</u>	+OS	V _{OUT} = 0 V to +200 mV	9,10,11	01,02		40	%	
			9	03		60		
			10,11			65		
	-OS	V _{OUT} = 0 V to -200 mV	9,10,11	01,02		40		
			9	03		60		
			10,11			70		
Output resistance <u>4/</u>	R _{OUT}	Open loop, T _A = +25°C	4	01,02		25	Ω	
Quiescent power <u>7/</u> consumption	P _C	V _{OUT} = 0 V, I _{OUT} = 0 mA	1,2,3	01		1.17	W	
				02		.51		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

- 1/ Unless otherwise specified, for dc tests, $R_S = 100 \Omega$, $R_L = 100 \text{ k}\Omega$, $V_{OUT} = 0 \text{ V}$. Unless otherwise specified, for ac tests, $A_V = \pm 1 \text{ V/V}$ and $R_L = 1 \text{ k}\Omega$.
- 2/ Device type 03 is designed to handle $I_{OUT} = 10 \text{ mA}$ at a 50 % duty cycle for $T_J = +175^\circ\text{C}$. For $I_{OUT} = 15 \text{ mA}$ and $T_J = +175^\circ\text{C}$, a duty cycle of less than or equal to 33 % is required.
- 3/ Offset adjustment range is V_{IO} (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 herein.
- 5/ Full power bandwidth = $SR / (2 \times \pi \times V_{PK})$.
- 6/ Rise and fall times measured between 10 percent and 90 percent point.
- 7/ Quiescent power consumption is based on quiescent supply current test maximum (no load outputs).

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(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.

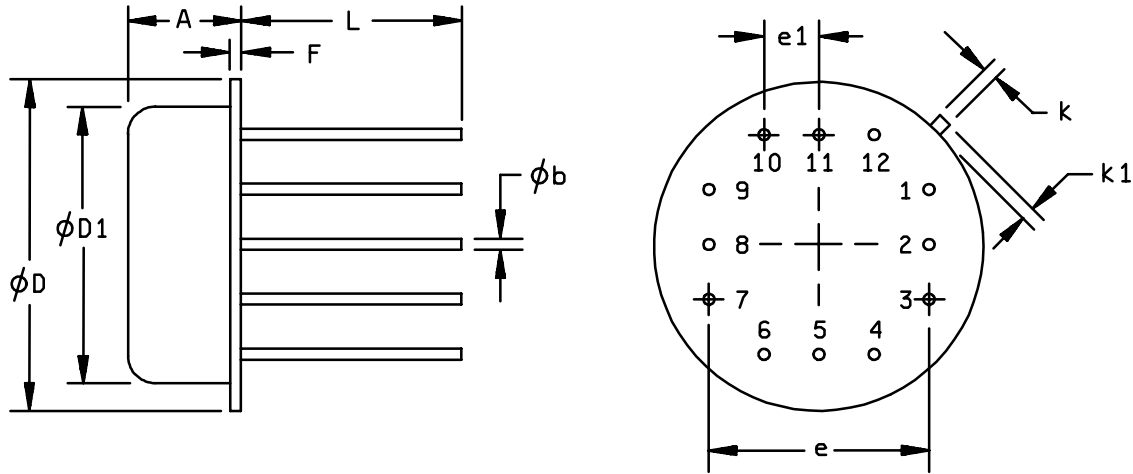
4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

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Case X



Letter	Inches		Millimeters	
	Min	Max	Min	Max
A	.130	.150	3.30	3.81
ϕb	.016	.021	0.41	0.53
ϕD	.585	.615	14.86	15.62
$\phi D1$.545	.555	13.84	14.10
e	.400 BSC		10.16 BSC	
e1	.100 BSC		2.54 BSC	
F	.020	.040	0.51	1.02
k	.027	.034	0.69	0.86
k1	.027	.045	0.69	1.14
L	.505	.562	12.83	14.27

- NOTES: 1. The US government preferred system of measurement is the metric SI system. However, since this item was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
 2. Pin numbers are for reference only and do not appear on package.

FIGURE 1. Case outline.

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Device types	01 and 02	01, 02, and 03	02	03
Case outlines	X	C	2	P
Terminal number	Terminal symbol			
1	NC	NC	NC	BAL
2	NC	NC	BAL	-IN
3	BAL	BAL	NC	+IN
4	BAL	-IN	NC	-V
5	-IN	+IN	-IN	NC
6	+IN	-V	NC	OUT
7	NC	NC	+IN	+V
8	NC	NC	NC	BAL
9	NC	NC	NC	---
10	-V	OUTPUT	-V	---
11	OUTPUT	+V	NC	---
12	+V	BAL	NC	---
13	---	NC	NC	---
14	---	NC	NC	---
15	---	---	OUT	---
16	---	---	NC	---
17	---	---	+V	---
18	---	---	NC	---
19	---	---	NC	---
20	---	---	BAL	---

NC = No connection

FIGURE 1. Terminal connections.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with MIL-STD-883, 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**10**,11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

** Subgroups 7, 8, 9, 10, and 11, if not tested, shall be guaranteed to the limits specified in table I 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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.
 - (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-PRF-38535, appendix A.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

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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-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC 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 DSCC-VA, telephone (614) 692-0525.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0674.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DSCC-VA.

<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216-5000</p>	<p align="center">SIZE A</p>		<p align="center">5962-87785</p>
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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 00-05-24

Approved sources of supply for SMD 5962-87785 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 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 DSCC-VA. This bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962-8778501CA	34371	HA1-2541/883
5962-8778501XA	<u>3/</u>	HA2-2541/883
5962-8778501XC	34371	HA2-2541/883
5962-8778502CA	<u>3/</u>	EL2041J/883B
5962-8778502XA	<u>3/</u>	EL2041G/883B
5962-87785022A	<u>3/</u>	EL2041L/883B
5962-8778503CA	34371	HA1-2841/883
5962-8778503PA	<u>3/</u>	HA7-2841/883

- 1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.
- 2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- 3/ Not available from approved source of supply.

Vendor CAGE number

34371

Vendor name and address

Intersil Corporation
P.O. Box 883
Melbourne, FL 32902-0883

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.