

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Table I, correct V_{CC} from 30 V to 20 V for V_{OM2} , V_{OM4} , f_{OM2} , and PSRR.	03-11-07	Raymond Monnin

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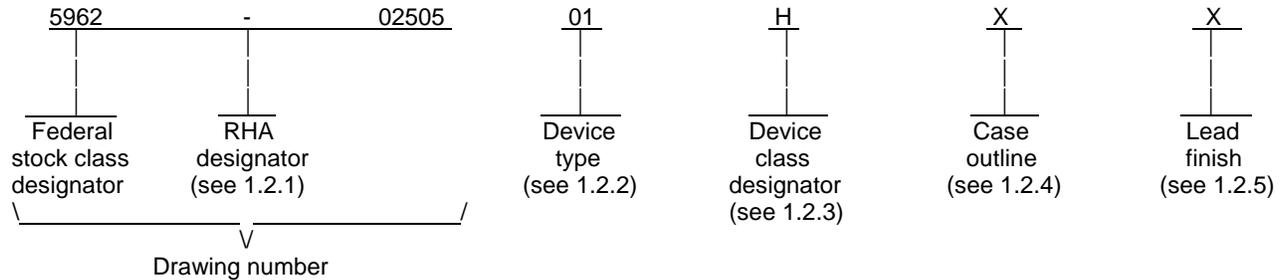
REV STATUS	REV	A	A	A	A	A	A	A	A	A	A	A	A	A						
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11								

PMIC N/A	PREPARED BY Gary Zahn	<p align="center">DEFENSE SUPPLY CENTER COLUMBUS POST OFFICE BOX 3990 COLUMBUS, OHIO 43216-5000 http://www.dsc.dla.mil</p>																	
<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p align="center">THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	CHECKED BY Michael C. Jones																		
	APPROVED BY Raymond Monnin	<p align="center">MICROCIRCUIT, LINEAR, HIGH SPEED PULSE WIDTH MODULATOR CONTROLLER, MONOLITHIC SILICON</p>																	
	DRAWING APPROVAL DATE 02-01-31																		
	REVISION LEVEL A		SIZE A	CAGE CODE 67268	5962-02505														
		SHEET	1 OF 11																

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

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

<u>Device type</u> ^{1/}	<u>Generic number</u>	<u>Circuit function</u>
02	52445	High speed PWM controller
03	52446	High speed PWM controller

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

<u>Device class</u>	<u>Device performance documentation</u>
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

^{1/} Device types may be similar to the device types on Standard Microcircuit Drawing (SMD) 5962-87681.

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1.2.4 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>
X	CQCC1-N28B	28	Square leadless chip carrier with thermal pads

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. ^{1/}

Supply voltage (V _{CC}).....	22 V dc
DC output current, source or sink.....	0.5 A
Pulse output current, source or sink (0.5 μs).....	2.0 A
Analog input voltage:	
NONINVERTING, INVERTING, and RAMP pins	-0.3 V dc to 7.0 V dc
SOFT START and CURRENT LIMIT / SD pins	-0.3 V dc to 6.0 V dc
Clock output current	-5.0 mA
Error amplifier output current.....	5.0 mA
Soft start sink current	20 mA
Oscillator charging current	-5.0 mA
Power dissipation (P _D)	1.0 W ^{2/} ^{3/}
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds).....	+300°C
Junction temperature (T _J).....	+150°C
Thermal resistance, junction-to-case (θ _{JC})	See MIL-STD-1835

1.4 Recommended operating conditions.

Supply voltage range (V _{CC}).....	12 V dc to 22 V dc
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-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

- ^{1/} Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
^{2/} For case outline X, derate linearly above T_A = 40°C at 9 mW/°C.
^{3/} Must withstand the added P_D due to short circuit test, e.g., I_{SC}.

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HANDBOOKS

DEPARTMENT OF DEFENSE

- MIL-HDBK-103 - List of Standard Microcircuit Drawings.
- 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 performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 shall include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.3 Block diagram(s). The block diagram(s) 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 specified 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 defined in table I.

3.5 Marking of device(s). Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

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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	
Reference section							
Output voltage	V _{REF}	T _J = +25°C, I _O = 1.0 mA	1	All	5.05	5.15	V
Line regulation	V _{RLINE}	12 V < V _{CC} < 20 V	1,2,3	All		±15	mV
Load regulation	V _{RLOAD}	1.0 mA < I _O < 10 mA	1,2,3	All		±20	mV
Long term stability <u>2/</u>	ΔV _{REF} / Δt	T _J = +125°C, t = 1000 hrs.	2	All		±25	mV
Total output variation	V _{OM1}	I _O = -1.0 mA, V _{CC} = 10 V	1,2,3	All	5.00	5.20	V
	V _{OM2}	I _O = -1.0 mA, V _{CC} = 20 V					
	V _{OM3}	I _O = -10 mA, V _{CC} = 10 V					
	V _{OM4}	I _O = -10 mA, V _{CC} = 20 V					
Short-circuit current	I _{SC}	V _{REF} = 0 V	1,2,3	All	30	90	mA
Oscillator section							
Initial accuracy	f _o	T _J = +25°C	4	All	375	425	kHz
Voltage stability	Δf _o / ΔV	12 V < V _{CC} < 20 V	4,5,6	All		±1.0	%
Total variation	f _{OM1}	V _{CC} = 10 V	4,5,6	All	340	460	kHz
	f _{OM2}	V _{CC} = 20 V					
Clock out high	V _{CLK(H)}		1,2,3	All	3.7		V
Clock out low	V _{CLK(L)}		1,2,3	All		0.2	V
Ramp voltage, peak <u>2/</u>	V _{im}		1,2,3	All	2.6	3.0	V
Ramp voltage, valley <u>2/</u>	V _{iv}		1,2,3	All	0.6	1.25	V
Ramp voltage, valley <u>2/</u> to peak	V _{ivp}		1,2,3	All	1.6	2.1	V
Functional tests							
Functional tests		See 4.3.1b	7,8	All			Pass/ Fail

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	
Error amplifier section							
Input offset voltage	V _{OS}	V _{CM} = 3.0 V, V _O = 3.0 V	1,2,3	All	-15	15	mV
Input bias current	I _{IB}	V _{CM} = 3.0 V, V _O = 3.0 V	1,2,3	All		3.0	μA
Input offset current	I _{OS}	V _{CM} = 3.0 V, V _O = 3.0 V	1,2,3	All		±1.0	μA
Open loop gain	A _{VOL}	1.0 V < V _O < 4.0 V	4,5,6	All	60		dB
Common-mode rejection ratio	CMRR	1.5 V < V _{CM} < 5.5 V V _{OUT} = 3.0 V	4,5,6	All	75		dB
Power supply rejection ration	PSRR	10 V < V _{CC} < 20 V V _{OUT} = 3.0 V	4,5,6	All	85		dB
Output sink current	I _{O(SINK)}	E/A OUT voltage = 1.0 V	1,2,3	All	1.0		mA
Output source current	I _{O(SOURCE)}	E/A OUT voltage = 4.0 V	1,2,3	All	-0.5		mA
Output high voltage	V _{OH1}	E/A OUT current = -0.5 V	1,2,3	All	4.0	5.0	V
Output low voltage	V _{OL1}	E/A OUT current = 1.0 mA	1,2,3	All	0	1.0	V
Gain bandwidth <u>2/</u> product	GBWP	F = 200 kHz	4,5,6	All	6.0		MHz
Slew rate <u>2/</u>	SR		4,5,6	All	6.0		V/μs
PWM comparator section.							
RAMP bias current	I _{BRAMP}	RAMP voltage = 0 V	1,2,3	All		-8.0	μA
Duty cycle range	DC(range)		1,2,3	All	0	80	%
E/A OUT zero dc threshold voltage	V _{TH}	RAMP voltage = 0 V	1,2,3	All	1.1		V
Delay to output <u>2/</u>	t _{D1}		9,10,11	All		80	ns
Soft-start/duty cycle clamp section							
Charge current	I _{CHG}	SOFT START voltage = 2.5 V	1,2,3	All	8.0	20	μA
Discharge current	I _{DCHG}	SOFT START voltage = 2.5 V	1,2,3	All	0.10	0.35	mA

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Current limit / start sequence / fault section							
Restart threshold	V _{RS}		1,2,3	All		0.5	V
I LIM bias current	I _{BLIM}	0 V < V I LIM < 2 V	1,2,3	All		15	μA
Current limit threshold	V _{LIMIT}		1,2,3	All	0.95	1.05	V
Over current threshold	V _{OVER}		1,2,3	All	1.14	1.26	V
I LIM delay to output	t _{D3}		1,2,3	All		80	ns
Output section.							
Output low level	V _{OL2}	I _{OUT} = 20 mA	1,2,3	All		0.4	V
		I _{OUT} = 200 mA				2.2	
Output high level	V _{OH2}	I _{OUT} = -20 mA	1,2,3	All	13.0		V
		I _{OUT} = -200 mA			12.0		
UVLO output low saturation	V _{OLS}	I _O = 20 mA	1,2,3	All		1.2	V
Rise / fall time ^{2/}	t _r	C _L = 1.0 nF	9,10,11	All		45	ns
Under-voltage lockout section							
Start threshold	V _{START}		1,2,3	02	8.4	9.6	V
				03		17.0	
Stop threshold	V _{STOP}		1,2,3	03	9		V
UVLO hysteresis	V _{HYS}		1,2,3	02	0.4	1.2	V
				03	5.0	7.0	
Supply current							
Start up current	I _{START}	V _C = V _{CC} = V _{TH} (start) – 0.5 V	1,2,3	All		0.3	mA
Supply current	I _{CC}	voltage = 0 V, NONINVERTING INPUT voltage = 1.0 V	1,2,3	All		36	mA

^{1/} Unless otherwise specified, characteristics apply at R_T = 3.65 kΩ, C_T = 1.0 nF. V_{CC} = 12 V.

^{2/} Guaranteed, if not tested, to the specified limits.

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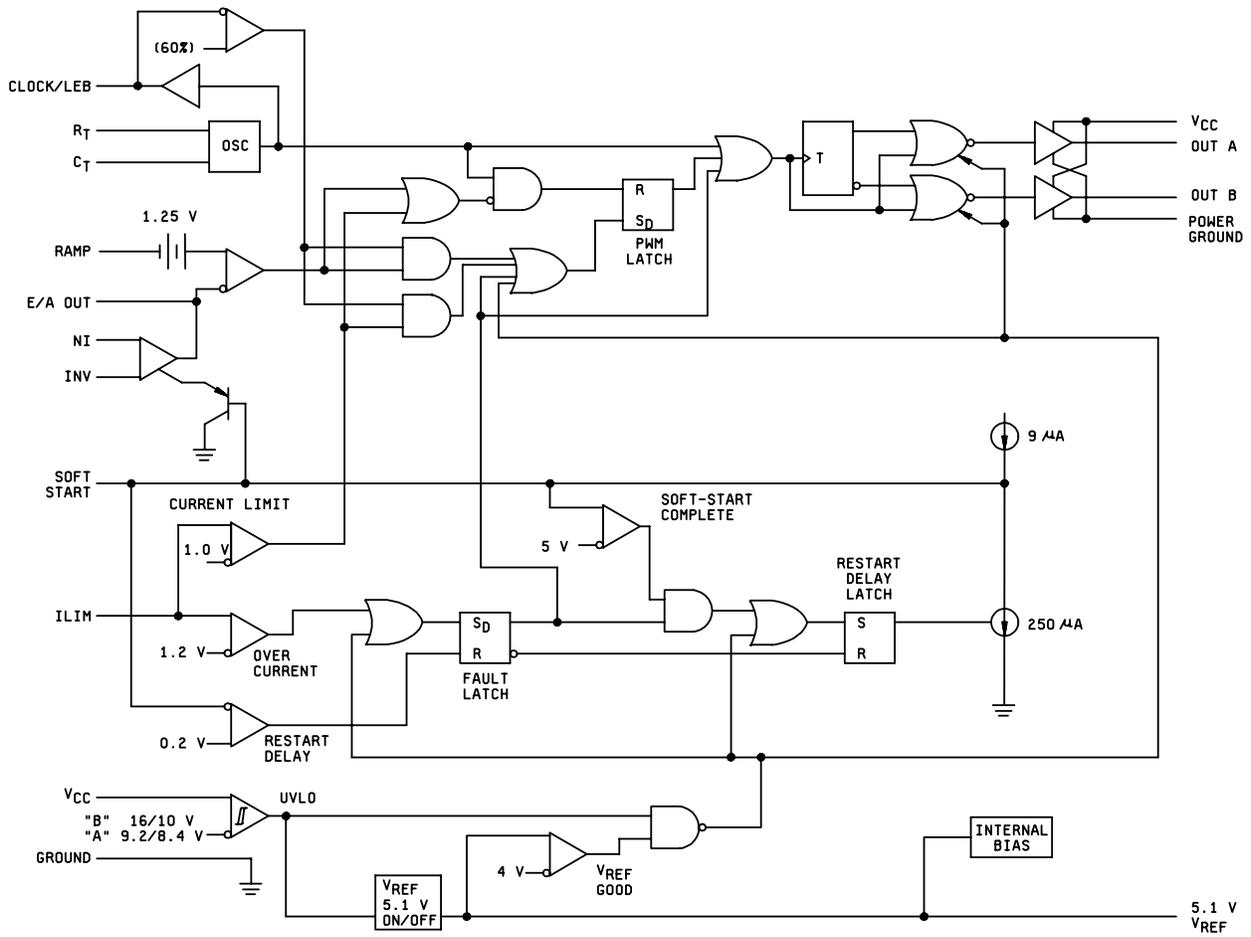
Device types	02 and 03
Case outline	X
Terminal number	Terminal symbol
1	NC
2	INVERTING INPUT
3	NONINVERTING INPUT
4	NC
5	NC
6	E / A OUT
7	CLK / LEB
8	NC
9	R _T
10	C _T
11	NC
12	NC
13	RAMP
14	SOFT START
15	NC
16	CURRENT LIMIT / SD
17	GROUND
18	NC
19	NC
20	OUT A
21	POWER GROUND
22	NC
23	V _C
24	OUT B
25	NC
26	NC
27	V _{CC}
28	V _{REF}

NC = No connection

FIGURE 1. Terminal connections.

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Device types 02 and 03.



NOTE:

- "A" is for device type 02. "B" is for device type 03.

FIGURE 2. Block diagram(s).

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TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	1
Final electrical parameters	1*,2,3,4
Group A test requirements	1,2,3,4,5,6,7,8,9**,10**,11**
Group C end-point electrical parameters	1,2,3
Group D end-point electrical parameters	1,2,3
End-point electrical parameters for radiation hardness assurance (RHA) devices	Not applicable

* PDA applies to subgroup 1.

** Subgroups 9, 10, and 11 are guaranteed if not tested.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534 and conducted on all devices prior to Conformance inspection (CI). 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 either DSCC-VA or the acquiring activity upon request. Also, 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 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

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- 4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:
- a. Sample size shall be 116(0) for all tests.
 - b. Tests shall be as specified in table II herein.
 - c. Subgroups 7 and 8 shall consist of verifying the functionality of the device. It forms a part of the vendors test tape and shall be maintained and available from the approved source of supply.
- 4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534 and as follows:
- a. Sample size for bond strength is 22(0), resistance to solvents and die sheer is 3(0) for each test.
- 4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:
- a. End-point electrical parameters shall be as specified in table II herein.
 - b. Steady-state life test, method 1005 of MIL-STD-883. Sample size is 45(0).
 - (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 either DSCC-VA or the acquiring activity upon request. Also, 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.
 - c. Subgroup 1 shall consist of the following:
 - (1) Temperature cycle and thermal shock.
 - (2) Mechanical shock, constant acceleration, and PIND.
 - (3) Physical dimensions 15(0).
- 4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534. Sample size is 15(0)
- 4.3.5 Radiation Hardness Assurance (RHA) inspection. RHA inspection is not currently applicable to this drawing.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

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.

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-PRF-38534.

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 microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Post Office Box 3990, Columbus, Ohio 43216-5000, or telephone (614) 692-0536.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 03-11-07

Approved sources of supply for SMD 5962-02505 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 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 revisions of MIL-HDBK-103 and QML-38534.

Standard microcircuit drawing PIN <u>1/</u> <u>2/</u>	Vendor CAGE number	Vendor similar PIN <u>3/</u>
5962-0250502HXA	31757	52445
5962-0250502HXC	31757	52445
5962-0250503HXA	31757	52446
5962-0250503HXC	31757	52446

- 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/ Device types may be similar to the device types on Standard Microcircuit Drawing (SMD) 5962-87681.
- 3/ 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

31757

Vendor name
and address

Micropac Industries, Incorporated
905 E. Walnut Street
Garland, TX 75040

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