REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Change t_{PLH3} max limit for subgroup 9 in table I. Editorial changes throughout – jak.	99-07-13	Monica L. Poelking
B	Update the boilerplate paragraphs to current requirement as specified in MIL-PRF-38535. - MAA	09-01-26	Charles F. Saffle
C	Update drawing cage code information. Update boilerplate paragraphs to the current requirements as specified in MIL-PRF-38535. - MAA	15-09-23	Thomas M. Hess
D	Update boilerplate paragraphs and drawing to current MIL-PRF-38535 requirements. –RDC	21-07-23	Muhammad A. Akbar

REV																				
SHEET																				
REV																				
SHEET																				

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

PMIC N/A

PREPARED BY
Marcia B. Kelleher

DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990
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STANDARD MICROCIRCUIT DRAWING

CHECKED BY
Thomas J. Ricciuti

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

APPROVED BY
Michael A Frye

MICROCIRCUIT, DIGITAL, HIGH SPEED CMOS, DUAL 4-STAGE BINARY COUNTER, TTL COMPATIBLE INPUTS, MONOLITHIC SILICON

DRAWING APPROVAL DATE
90-10-11

AMSC N/A

REVISION LEVEL
D

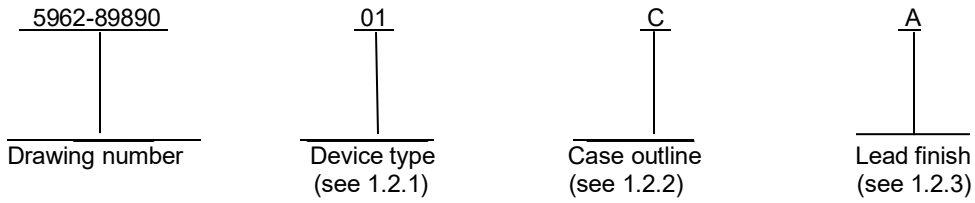
SIZE	CAGE CODE	
A	**67268**	**5962-89890**

SHEET 1 OF 11

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:

Device type	Generic number	Circuit function
01	54HCT393	Dual 4-stage binary counter, TTL compatible inputs

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

Outline letter	Descriptive designator	Terminals	Package style
C	GDFP1-T14	14	Dual-in-line package

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

1.3 Absolute maximum ratings. 1/

Supply voltage range (V_{CC})	-0.5 V dc to +7.0 V dc
DC input voltage range (V_{IN})	-0.5 V dc to V_{CC} +0.5 V dc
DC output voltage range (V_{OUT})	-0.5 V dc to V_{CC} +0.5 V dc
DC input diode current (I_{IK})	±20 mA
DC output diode current (I_{OK}) (per pin)	±20 mA
DC drain current (per pin)	±25 mA
DC V_{CC} or GND current	±50 mA
Storage temperature range (T_{STG})	-65°C to +150°C
Maximum power dissipation (P_D):	500 mW 2/
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Junction temperature (T_J)	+175°C

1/ Unless otherwise specified, all voltages are referenced to ground.

2/ For T_C = +100°C to +125°C, derate linearly at 8 mW/°C.

1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	+4.5 V dc to +5.5 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Input rise or fall time t_r, t_f) (V_{CC} = 4.5 V)	0 to 500 ns
Maximum input clock pulse frequency (f_{MAX}):	
T_C = +25°C, V_{CC} = 4.5 V	27 MHz
T_C = -55°C to +125°C, V_{CC} = 4.5 V	18 MHz
Minimum clock pulse width (t_{w1}):	
T_C = +25°C, V_{CC} = 4.5 V	19 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V	29 ns
Minimum reset clock pulse width (t_{w2}):	
T_C = +25°C, V_{CC} = 4.5 V	16 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V	24 ns
Minimum reset recovery time (t_{rec}):	
T_C = +25°C, V_{CC} = 4.5 V	5 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V	5 ns

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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARDS

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

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at https://quicksearch.dla.mil/).

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.

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

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Logic diagram(s). The logic diagram(s) shall be as specified on figure 3.

3.2.4 Switching waveforms and test circuit. The switching waveforms and test circuit shall be as specified in figure 4.

3.2.5 Case outline. The case outline 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 (case) 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. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. 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. For RHA product using this option, the RHA designator shall still be marked. Marking for device classes Q and V shall be in accordance with MIL-PRF-38535. Marking for device class M shall be in accordance with MIL-PRF-38535, appendix A.

3.5.1 Certification/compliance mark. The certification mark for device classes Q and V shall be a "QML" or "Q" as required in MIL-PRF-38535. The compliance mark for device class M shall be a "C" as required in MIL-PRF-38535, appendix A.

3.6 Certificate of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). For device class M, 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 6.6.2 herein). The certificate of compliance submitted to DLA Land and Maritime-VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and herein or for device class M, the requirements of MIL-PRF-38535, appendix A and herein.

3.7 Certificate of conformance. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 or for device class M in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change for device class M. For device class M, notification to DLA Land and Maritime-VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change that affects this drawing.

3.9 Verification and review for device class M. For device class M, DLA Land and Maritime, DLA Land and Maritime'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.

3.10 Microcircuit group assignment for device class M. Device class M devices covered by this drawing shall be in microcircuit group number 36 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Test conditions 1/ $-55°C \le T_C \le +125°C$ $+4.5\ V \le V_{CC} \le +5.5\ V$ unless otherwise specified		Device Type	Group A subgroups	Limits		Unit
						Min	Max	
High level output voltage	V_{OH}	V_{CC} = 4.5 V $V_{IN} = V_{IH}$ = 2.0 V or V_{IL} = 0.8 V	I_{OH} = -20 µA	01	1, 2, 3	4.4		V
			I_{OH} = -4.0 mA			3.7		
Low level output voltage	V_{OL}	V_{CC} = 4.5 V $V_{IN} = V_{IH}$ = 2.0 V or V_{IL} = 0.8 V	I_{OL} = +20 µA	01	1, 2, 3		0.1	V
			I_{OL} = +4.0 mA				0.4	
High level input voltage	V_{IH} 2/	V_{CC} = 4.5 V		01	1, 2, 3	2.0		V
Low level input voltage	V_{IL} 2/	V_{CC} = 4.5 V		01	1, 2, 3		0.8	V
Input capacitance	C_{IN}	T_A = +25°C See 4.3.1c		01	4		10.0	pF
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND I_{OUT} = 0.0 A		01	1, 2, 3		160	µA
Input leakage current	I_{IN}	V_{CC} = 5.5 V, $V_{IN} = V_{CC}$ or GND		01	1, 2, 3		±1.0	V
Quiescent supply current delta, TTL input levels	ΔI_{CC}	Any one input: V_{IN} = 2.4 V Other inputs: $V_{IN} = V_{CC}$ or GND I_{OUT} = 0.0 A, V_{CC} = 5.5 V		01	1, 2, 3		3.0	mA
Functional test		See 4.3.1d		01	7, 8	L	H	
Propagation delay time, CPn to Q0n	t_{PLH1} t_{PHL1}	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4		01	9		32	ns
				01	10, 11		48	
Propagation delay time, Qn to Qn + 1	t_{PLH2} t_{PHL2} 3/	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4		01	9		12	ns
				01	10, 11		18	
Propagation delay time, CPn to Q1n	t_{PLH3} t_{PHL3} 3/	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4		01	9		44	ns
				01	10, 11		66	

See footnotes at end of table.

TABLE I. Electrical performance characteristics-Continued.

Test	Symbol	Test conditions 1/ $-55°C \le T_C \le +125°C$ $+4.5\ V \le V_{CC} \le +5.5\ V$ unless otherwise specified	Device Type	Group A subgroups	Limits		Unit
					Min	Max	
Propagation delay time, CPn to Q2n	t_{PLH4} t_{PHL4} 3/	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4	01	9		50	ns
			01	10, 11		75	
Propagation delay time, CPn to Q3n	t_{PLH5} t_{PHL5}	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4	01	9		62	ns
			01	10, 11		93	
Propagation delay time, CPn to Q4n	t_{PLH6} t_{PHL6}	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4	01	9		32	ns
			01	10, 11		48	
Output transition time	t_{TLH} t_{THL}	V_{CC} = 4.5 V C_L = 50 pF minimum See figure 4	01	9		15	ns
			01	10, 11		22	

1/ For a power supply of 5 V ±10%, the worst case output voltages (V_{OH} and V_{OL}) occur for HCT at 4.5 V. Thus, the 4.5 V values should be used when designing with this supply. Worst cases V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V respectively.

2/ The V_{IH} and V_{IL} tests are not required, and shall be applied as forcing functions for the V_{OH} or V_{OL} tests.

3/ Guaranteed, if not tested, to the specified limits.

4/ Transition time (t_{TLH}, t_{THL}), if not tested, shall be guaranteed to the specified limits.

Device type	01
Case outline	C
Terminal number	Terminal symbol
1	$\overline{CP1}$
2	MR1
3	Q01
4	Q11
5	Q21
6	Q31
7	GND
8	Q32
9	Q22
10	Q12
11	Q02
12	MR2
13	$\overline{CP2}$
14	V_{CC}

FIGURE 1. Terminal connections.

Inputs		Output state
$\overline{CPn}$	MRn	Qn
↗	L	No change
↘	L	Count
X	H	L

$\overline{CPn}$ Count	Outputs			
	Q0n	Q1n	Q2n	Q3n
0	L	L	L	L
1	H	L	L	L
2	L	H	L	L
3	H	H	L	L
4	L	L	H	L
5	H	L	H	L
6	L	H	H	L
7	H	H	H	L
8	L	L	L	H
9	H	L	L	H
10	L	H	L	H
11	H	H	L	H
12	L	L	H	H
13	H	L	H	H
14	L	H	H	H
15	H	H	H	H

H = High voltage level.
L = Low voltage level.
X = Irrelevant.
↗ = Low-to-high clock transition.
↘ = High-to-low clock transition.

FIGURE 2. Truth table.

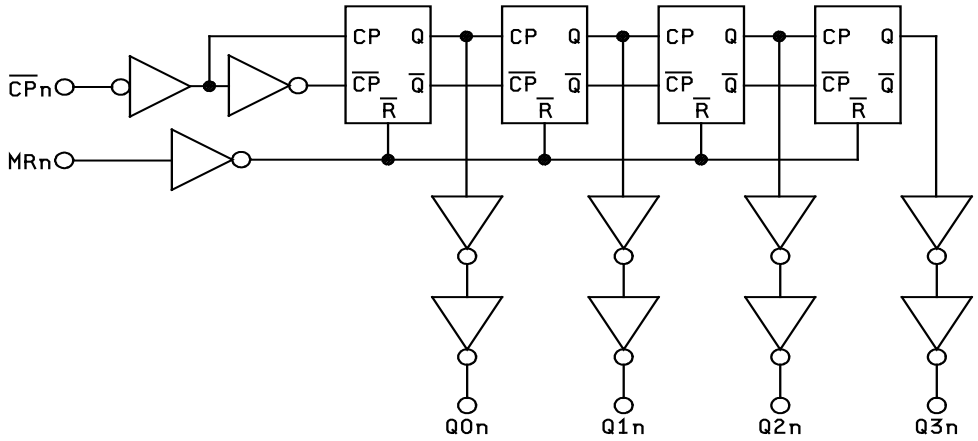
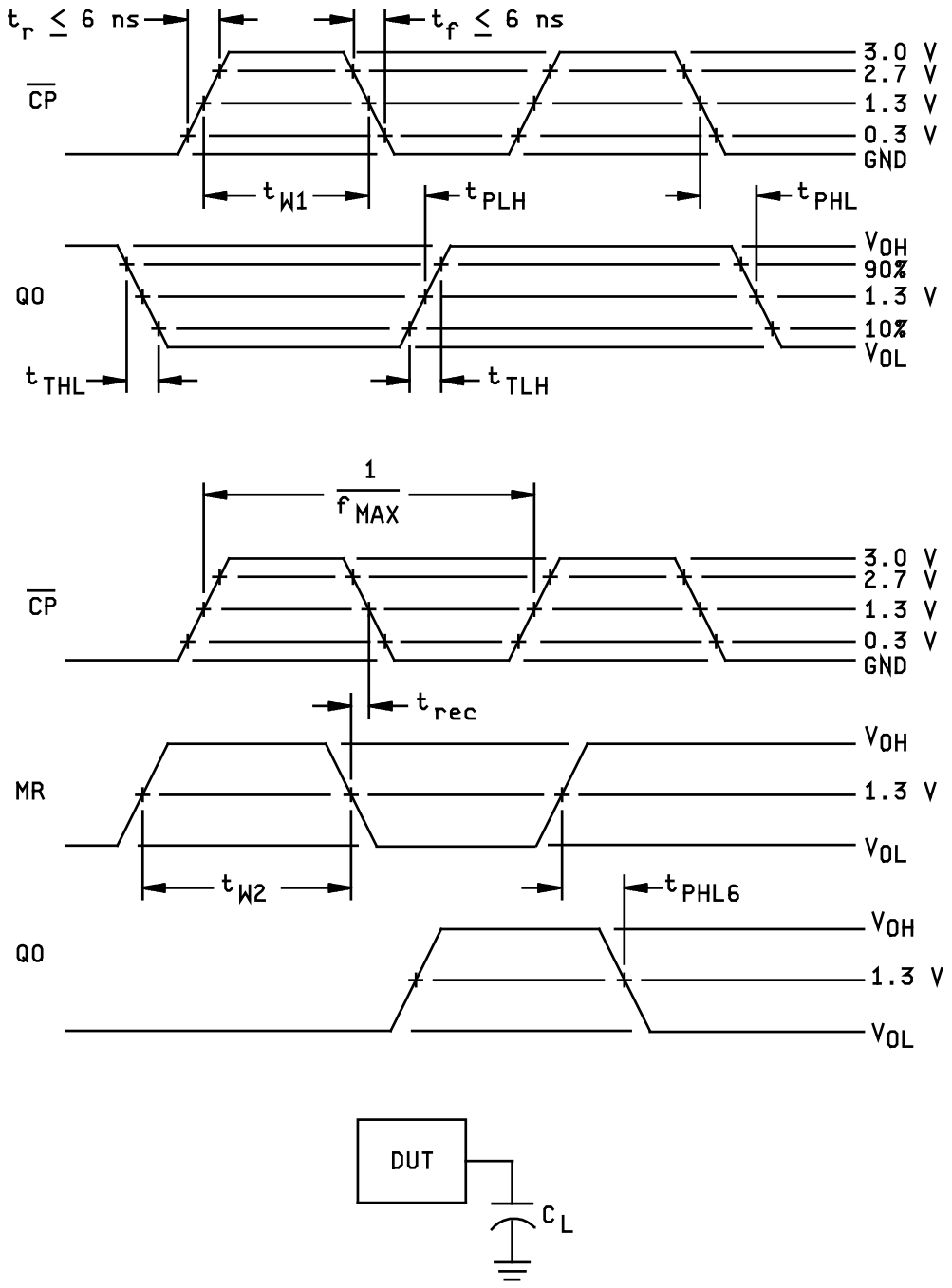


FIGURE 3. Logic diagram.



NOTES:
1. C_L = 50 pF minimum or equivalent (includes jig and probe capacitance).

FIGURE 4. Switching waveforms and test circuit.

4. VERIFICATION

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 method 1015 of MIL-STD-883.

(2) T_A = +125°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_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance. Capacitance shall be measured between the designated terminal and GND at a frequency of 1 MHz. Test all applicable pins on five devices with zero failures.

d. Subgroups 7 and 8 tests shall include verify the truth table as specified on figure 2.

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°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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

1/ PDA applies to subgroup 1.

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.

6.3 Record of users. Military and industrial users should inform DLA Land and Maritime when a system application requires configuration control and which SMD's are applicable to that system. DLA Land and Maritime 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 DLA Land and Maritime-VA, telephone (614) 692-8108.

6.4 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0540.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

6.6 Sources of supply.

6.6.1 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA, and have agreed to this drawing.

6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M 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 DLA Land and Maritime-VA.

STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN

DATE: 21-07-23

Approved sources of supply for SMD 5962-89890 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 DLA Land and Maritime-VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at https://landandmaritimeapps.dla.mil/programs/smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-8989001CA	01295	CD54HCT393F3A

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.

Vendor CAGE number	Vendor name and address
01295	Texas Instruments Incorporated 13500 N. Central Expressway P.O. Box 655303 Dallas, TX 75265