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

REV																									
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SHEET																									
REV STATUS OF SHEETS	REV																								
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13											

PMIC N/A

STANDARDIZED MILITARY DRAWING

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

AMSC N/A

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DRAWING APPROVAL DATE
29 NOVEMBER 1988

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, DIGITAL, ADVANCED CMOS, HEX D TYPE, FLIP-FLOP, MONOLITHIC SILICON

SIZE	CAGE CODE	5962-87757
A	67268	

SHEET 1 OF 13

DESC FORM 193
SEP 87

* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911
5962-E751

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:

5962-87757	01	E	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

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

Device type	Generic number	Circuit function
01	54ACT174	Hex D-type, flip-flop with master reset and TTL compatible inputs

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
E	D-2 (16-lead, .840" x .310" x .200"), dual-in-line package
F	F-5 (16-lead, .440" x .285" x .085"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Supply voltage range 1/	-0.5 V dc to +6.0 V dc
DC input voltage 1/	-0.5 V dc to V_{CC} + 0.5 V dc
DC output voltage 1/	-0.5 V dc to V_{CC} + 0.5 V dc
Clamp diode current	±20 mA
DC output current (per pin)	±50 mA
DC V_{CC} or GND current (per pin)	±100 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D)	500 mW
Lead temperature (soldering, 10 seconds)	+245°C
Thermal resistance, junction-to-case (θ_{JC}): Cases E, F, and 2	See MIL-M-38510, appendix C
Junction temperature (T_J) 2/	+175°C

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	+4.5 V dc to +5.5 V dc
Input voltage	0.0 V dc to V_{CC}
Output voltage	0.0 V dc to V_{CC}
Case operating temperature range (T_C)	-55°C to +125°C
Input rise or fall times: V_{CC} = 3.6 V to 5.5 V	0 to 8 ns/V

1/ Unless otherwise specified, all voltages are referenced to GND.
2/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening conditions in accordance with method 5004 of MIL-STD-883.

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Minimum setup time, Dn to CP (t_s):
T_C = +25°C, V_{CC} = 4.5 V - - - - - - - - - - - - - - 3.0 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 3.0 ns

Minimum hold time, Dn to CP (t_h):
T_C = +25°C, V_{CC} = 4.5 V - - - - - - - - - - - - - - 2.0 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 2.5 ns

Minimum pulse width CP (t_w):
T_C = +25°C, V_{CC} = 4.5 V- - - - - - - - - - - - - - 5.0 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 6.2 ns

Maximum frequency (f_{max}):
T_C = +25°C, V_{CC} = 4.5 V- - - - - - - - - - - - - - 95 MHz
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 80 MHz

Minimum pulse width $\overline{MR}$ (t_w):
T_C = +25°C, V_{CC} = 4.5 V- - - - - - - - - - - - - - 5.0 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 5.0 ns

Minimum recovery time, $\overline{MR}$ to CP (t_{rem}):
T_C = +25°C, V_{CC} = 4.5 V- - - - - - - - - - - - - - 1.5 ns
T_C = -55°C to +125°C, V_{CC} = 4.5 V - - - - - - - - 1.5 ns

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, 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.

(Copies of the specification and standard 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 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 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 6.4 herein.

3.5 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 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 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.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 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, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C < T_C < +125°C$ unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High level output 1/ voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -50\ \mu A$	$V_{CC} = 4.5$ V	1, 2, 3	4.4		V
			$V_{CC} = 5.5$ V		5.4		
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -24$ mA	$V_{CC} = 4.5$ V		3.7		
			$V_{CC} = 5.5$ V		4.7		
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -50$ mA	$V_{CC} = 5.5$ V		3.85		
Low level output 1/ voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 50\ \mu A$	$V_{CC} = 4.5$ V	1, 2, 3		0.1	V
			$V_{CC} = 5.5$ V			0.1	
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = 24$ mA	$V_{CC} = 4.5$ V			0.5	
			$V_{CC} = 5.5$ V			0.5	
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = 50$ mA	$V_{CC} = 5.5$ V			1.65	
High level input voltage	V_{IH}	2/	$V_{CC} = 4.5$ V	1, 2, 3	2.0		V
			$V_{CC} = 5.5$ V		2.0		
Low level input voltage	V_{IL}	2/	$V_{CC} = 4.5$ V	1, 2, 3		0.8	
			$V_{CC} = 5.5$ V			0.8	
Input leakage current	I_{IL}	$V_{IN} = 0.0$ V	$V_{CC} = 5.5$ V	1, 2, 3		-1.0	µA
	I_{IH}	$V_{IN} = 5.5$ V				1.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified		Group A subgroups	Limits Min	Limits Max	Unit
Input capacitance	C_{IN}	See 4.3.1c		4		10	pF
Power dissipation capacitance 3/	C_{PD}	See 4.3.1c		4		60	
Functional tests		Tested at V_{CC} = 3.0 V and repeated at V_{CC} = 5.5 V, see 4.3.1d		7, 8			
Quiescent current	I_{CC}	V_{CC} = 5.5 V; V_{IN} = V_{CC} or GND		1, 2, 3		160	µA
Maximum I_{CC}/TTL 4/ inputs high	ΔI_{CC}	V_{IN} = V_{CC} - 2.1 V, V_{IL} = 0.0 V, V_{CC} = 5.5 V		1, 2, 3		1.6	mA
Propagation delay time High to low 5/ Low to high CP to QN	t_{PHL}, t_{PLH}	C_L = 50 pF, R_L = 500Ω, See figure 3	V_{CC} = 4.5 V	9	1.0	10.5	ns
			V_{CC} = 4.5 V	10, 11	1.0	14.0	
Propagation delay time High to low 5/ Low to high $\overline{MR}$ to QN	t_{PHL}, t_{PLH}	C_L = 50 pF, R_L = 500Ω, See figure 3	V_{CC} = 4.5 V	9	1.0	11.5	ns
			V_{CC} = 4.5 V	10, 11	1.0	15.5	

1/ V_{OH} and V_{OL} tests will be tested at V_{CC} = 4.5 V. V_{OH} and V_{OL} are guaranteed, if not tested, for other values of V_{CC}. Limits shown apply to operation at V_{CC} = 5.0 V ± 0.5 V. Transmission driving tests are performed at V_{CC} = 5.5 V with a 2 ms duration maximum.

2/ V_{IH} and V_{IL} tests are guaranteed by the V_{OH} and V_{OL} tests.

3/ Power dissipation capacitance (C_{PD}), determines the dynamic power consumption, $P_D = (C_{PD} + C_L)V_{CC}^2 f + I_{CC}(V_{CC})$, and the dynamic current consumption (I_S) is $I_S = (C_{PD} + C_L)V_{CC} f + I_{CC}$.

4/ ΔI_{CC}(max)/pin $\le$ 1.6 mA (preferred method), or ΔI_{CC}/package $\le$ 1.6 mA x number of input pins/package where ΔI_{CC}(max)/data pin $\le$ 1.6 mA and ΔI_{CC}(max)/control pin $\le$ 3.0 mA (alternate method).

5/ AC limits at 5.5 V V_{CC} are equal to limits at 4.5 V V_{CC} and guaranteed by testing at 4.5 V V_{CC}. Minimum ac guaranteed for 5.5 V V_{CC} by guardbanding 4.5 V V_{CC} limits to 1.5 ns minimum.

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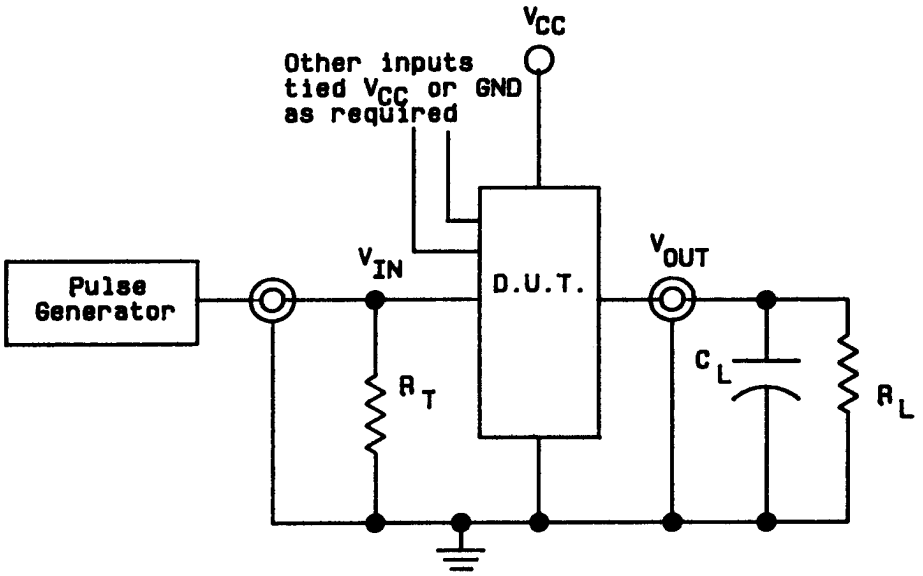
Device type	01	
Case outlines	E, F	2
Terminal number	Terminal symbol	
1	$\overline{MR}$	NC
2	Q0	$\overline{MR}$
3	D0	Q0
4	D1	D0
5	Q1	D1
6	D2	NC
7	Q2	Q1
8	GND	D2
9	CP	Q2
10	Q3	GND
11	D3	NC
12	Q4	CP
13	D4	Q3
14	D5	D3
15	Q5	Q4
16	V_{CC}	NC
17	---	D4
18	---	D5
19	---	Q5
20	---	V_{CC}

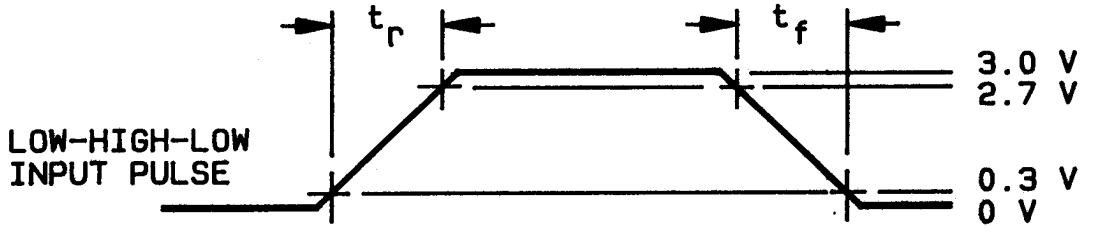
FIGURE 1. Terminal connections.

Inputs			Output
$\overline{MR}$	CP	D_n	Q_n
L	X	X	L
H	⌐	H	H
H	⌐	L	L
H	L	X	Q_i

FIGURE 2. Truth table.



C_L = 50 pF, R_L = 500Ω, R_T = 50Ω or equivalent



NOTES:
1. t_r and t_f shall be as fast as required for f_{max} and pulse width being measured.
2. Outputs must be switching from 10% V_{CC} to 90% V_{CC} in accordance with device truth table. For f_{max}, input duty cycle = 50%.

FIGURE 3. Switching waveforms and test circuit.

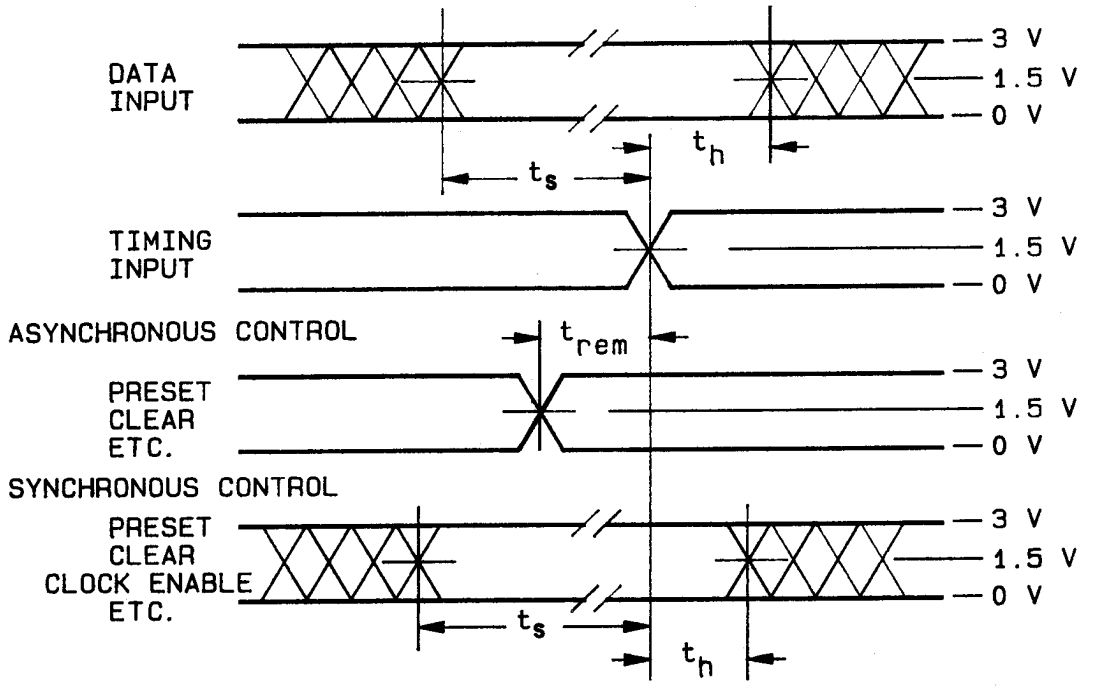


FIGURE 3. Switching waveforms and test circuit - Continued.

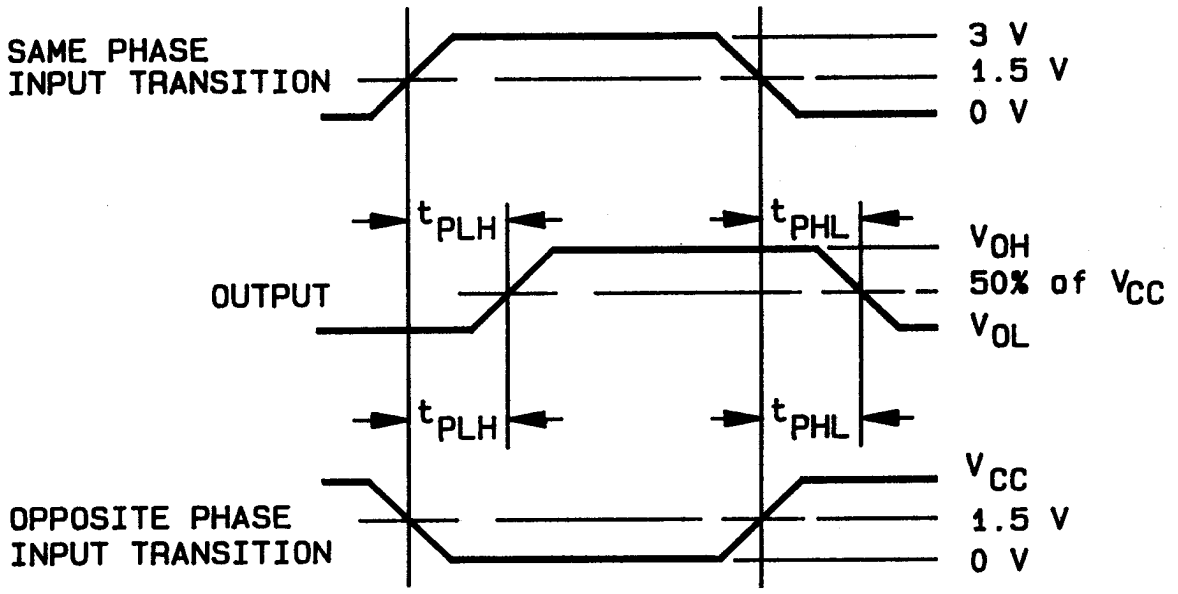


FIGURE 3. Switching waveforms and test circuit - Continued.

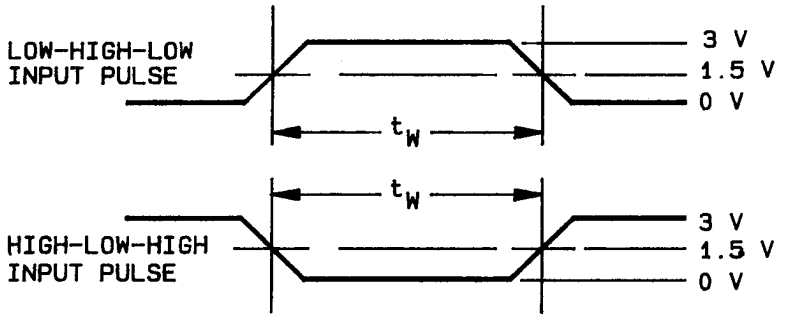


FIGURE 3. Switching waveforms and test circuit - Continued.

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} and C_{PD} measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Test all applicable pins on 5 devices with zero failures.

d. Subgroups 7 and 8 shall verify the truth table as specified on figure 2 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 using the circuit submitted with the certificate of compliance (see 3.5 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 (per method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3, 7, 8, 9
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

* PDA applies to subgroup 1.

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 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor 1/ similar part number	Replacement military specification
5962-8775701EX	27014 18714	54ACT174/DMQB CD54ACT174/3A	M38510/75653BRX
5962-8775701FX	27014	54ACT174/FMQB	M38510/75653BSX
5962-87757012X	27014	54ACT174/LMQB	M38510/75653B2X

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
27014	National Semiconductor 333 Western Avenue South Portland, ME 04106
18714	GE/RCA Solid State Route 202 Somerville, NJ 08876-0591

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