

LTR	DESCRIPTION	DATE	APPROVED
A	Change output current, Io. Complete document update. <i>DEP</i>	6 March 1985	<i>MacKhauch</i>
B	Case E inactive for new design. Remove Vendor FSCM 04713. Editorial changes throughout.	25 July 1985	<i>MacKhauch</i>

Selected item drawing

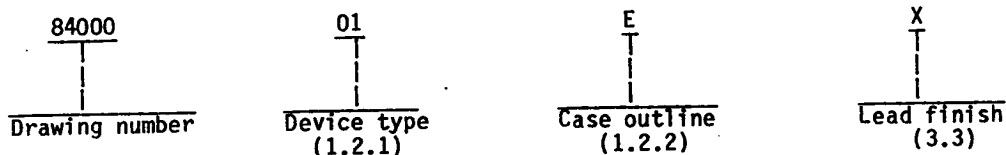
DESC FORM 144  
MAR 76

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

# 1. SCOPE

1.1 Scope. This drawing describes the requirements for monolithic silicon, advanced low power Schottky, TTL, J-K flip-flops microcircuits. This drawing provides for a level of microcircuit quality and reliability assurance for acquisition of microcircuits in accordance with MIL-M-38510.

1.2 Part number. The complete part number shall be as shown in the following example:



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

Device type	Generic number	Circuit
01	54ALS109	Dual J-K flip-flop with clear and preset (active high)
02	54ALS112A	Dual J-K flip-flop with clear and preset (active low)

1.2.2 Case outline. The case outline shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
E	D-2 (16-lead, 1/4" x 7/8"), dual-in-line package
F	F-5 (16-lead, 1/4" x 3/8"), flat package
2	C-2 (20-terminal, .350" x .350"), square chip carrier package

## 1.3 Absolute maximum ratings.

Supply voltage range - - - - -	-0.5 V to +7.0 V
Input voltage range- - - - -	-1.5 V at -18 mA to +7.0 V
Storage temperature- - - - -	-65°C to +150°C
Maximum power dissipation (P <sub>D</sub> ) per flip-flop 1/:	
Device type 01 - - - - -	11 mW
Device type 02 - - - - -	13 mW
Lead temperature (soldering, 10 seconds) - - -	+300°C
Thermal resistance, junction-to-case (θ <sub>JC</sub> ):	
Case E, F - - - - -	See MIL-M-38510, appendix C
Case 2- - - - -	80°C/W 2/
Junction temperature (T <sub>J</sub> ) - - - - -	+175°C

1/ Must withstand the added P<sub>D</sub> due to short circuit test (e.g., I<sub>0</sub>).

2/ When a thermal resistance for this case is published in MIL-M-38510, appendix C, that value shall supersede the value indicated herein.

<b>DEFENSE ELECTRONICS SUPPLY CENTER</b> <b>DAYTON, OHIO</b>	SIZE <b>A</b>	CODE IDENT. NO. <b>14933</b>	DWG NO. 84000
	REV B		PAGE 2

#### 1.4 Recommended operating conditions.

Supply voltage ( $V_{CC}$ )	4.5 V minimum to 5.5 V maximum
Minimum high level input voltage ( $V_{IH}$ )	2.0 V
Maximum low level input voltage ( $V_{IL}$ )	0.8 V
Case operating temperature range ( $T_C$ )	-55°C to +125°C
Minimum width of CLOCK pulse ( $t_p$ CLOCK):	
Device type 01	16.5 ns
Device type 02	20 ns
Minimum width of CLEAR pulse ( $t_p$ CLEAR):	
Device types 01 and 02	15 ns
Minimum width of PRESET pulse ( $t_p$ PRESET):	
Device types 01 and 02	15 ns
Minimum data setup time:	
Device type 01	15 ns
Device type 02	25 ns
Minimum CLR or PR inactive state setup time:	
Device type 01	10 ns
Device type 02	20 ns
Minimum data hold time ( $t_p$ HOLD):	
Device types 01 and 02	0 ns

#### 2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, 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 specification 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 specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

#### 3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein. The country of manufacture requirement of MIL-M-38510 does not apply.

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 Design documentation. The design documentation shall be in accordance with MIL-M-38510 and, unless otherwise specified in the contract or purchase order, shall be retained by the manufacturer but be available for review by the acquiring activity or contractor upon request.

3.2.2 Terminal connections and logic diagrams. The terminal connections and logic diagrams shall be as specified on figures 1 and 2, respectively.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. 14933	DWG NO. 84000
		REV B	PAGE 3

3.2.3 Truth table. The truth table shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines shall be in accordance with 1.2.2.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510.

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

3.5 Marking. Marking shall be in accordance with MIL-M-38510 except the part number shall be in accordance with 1.2 herein. The Vendor Similar Part Number may also be marked in accordance with 6.8 herein. Both part numbers, when used, shall be printed on the same surface. The "M38510/XXX" part number and the "JAN" or "J" mark shall not be used. Lead finish letter "X" is used only as specified in MIL-M-38510 and shall not be marked on the microcircuit or its packaging. The country of origin shall be marked on the microcircuit.

3.6 Quality assurance requirements. Microcircuits furnished under this drawing shall have been subjected to, and passed all the requirements, tests, and inspections detailed herein including screening and quality conformance inspections.

3.6.1 Screening. Screening shall be in accordance with method 5004, class B of MIL-STD-883, and 4.2 herein.

3.6.2 Qualification. Qualification inspection for the device types specified herein shall not be required.

3.6.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and 4.4 herein.

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this drawing, a manufacturer shall have manufacturer certification in accordance with MIL-M-38510 for at least one line and have part I listing on Qualified Products List QPL-38510 for at least one device type (not necessarily the one for which the acquisition of this drawing is to apply).

3.8 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply (see 6.7 and 6.8).

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. <b>14933</b>	DWG NO. 84000
		REV B	PAGE 4

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C, unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
High level output voltage	V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, V <sub>IH</sub> = 2.0 V, I <sub>OH</sub> = -400 μA, V <sub>IL</sub> = 0.8 V	A11	1,2,3	2.5		V
Low level output voltage	V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V, V <sub>IH</sub> = 2.0 V, I <sub>OL</sub> = 4 mA, V <sub>IL</sub> = 0.8 V	A11	1,2,3		0.4	V
Input clamp voltage	V <sub>IC</sub>	V <sub>CC</sub> = 4.5 V, I <sub>IN</sub> = -18 mA, T <sub>C</sub> = 25°C	A11	1		-1.5	V
Low level input current at J or K	I <sub>IL1</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0.4 V	A11	1,2,3		-200	μA
Low level input current PRE, CLR, or CLK	I <sub>IL2</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0.4 V	A11	1,2,3		-400	μA
High level input current at J or K	I <sub>IH1</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 2.7 V	A11	1,2,3		20	μA
High level input current at PRE or CLR	I <sub>IH2</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 2.7 V	A11	1,2,3		40	μA
High level input current at CLK	I <sub>IH3</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 2.7 V	A11	1,2,3		80	μA
Output current 1/	I <sub>O</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	A11	1,2,3	-30	-112	mA
Supply current 2/	I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V	01	1,2,3		4	mA
			02	1,2,3		4.5	
High level input current J or K	I <sub>IH4</sub>	V <sub>CC</sub> = 5.5 V V <sub>IN</sub> = 7 V	A11	1,2,3		100	μA
High level input current PRE or CLR	I <sub>IH5</sub>	V <sub>CC</sub> = 5.5 V V <sub>IN</sub> = 7 V	A11	1,2,3		200	μA

See footnotes at end of table.

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE  
A

CODE IDENT. NO.  
14933

DWG NO.

84000

REV A

PAGE 5

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C, unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
High level input current at CLK	I <sub>IH6</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 7 V	A11	1,2,3		400	μA
Propagation delay time CLR or PRE to output	t <sub>PLH1</sub>	V <sub>CC</sub> = 5.0 V, C <sub>L</sub> = 50 pF ±10% R <sub>L</sub> = 500Ω	01	9,10,11	3	18	ns
			02	9,10,11	3	26	
	t <sub>PHL1</sub>		01	9,10,11	5	17	ns
			02	9,10,11	4	23	
Propagation delay time CLK to output	t <sub>PLH2</sub>		01	9,10,11	5	21	ns
			02	9,10,11	3	23	
	t <sub>PHL2</sub>		01	9,10,11	7	20	ns
			02	9,10,11	5	24	
Maximum clock frequency	f <sub>max</sub>	01	9,10,11	30		MHz	
		02	9,10,11	25			

1/ The output conditions have been chosen to produce a current that closely approximates one half of the true short circuit output current, I<sub>OS</sub>.

2/ I<sub>CC</sub> is measured with outputs open with J, K, CLK and  $\overline{\text{PRE}}$  grounded; then with J, K, CLK, and  $\overline{\text{CLR}}$  grounded.

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE  
A

CODE IDENT. NO.  
**14933**

DWG NO.

84000

REV B

PAGE 6

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Initial electrical parameters (pre burn-in) (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 7, 9
Groups C and D end point electrical parameters (method 5005)	1, 2, 3
Additional electrical subgroups for group C periodic inspections	10, 11**

\* PDA applies to subgroup 1 (see 4.2c).

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

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and method 5005 of MIL-STD-883, except as modified 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.

(2)  $T_A = +125^{\circ}\text{C}$ , minimum.

b. Initial and final electrical test parameters shall be as specified in table II herein, except initial electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

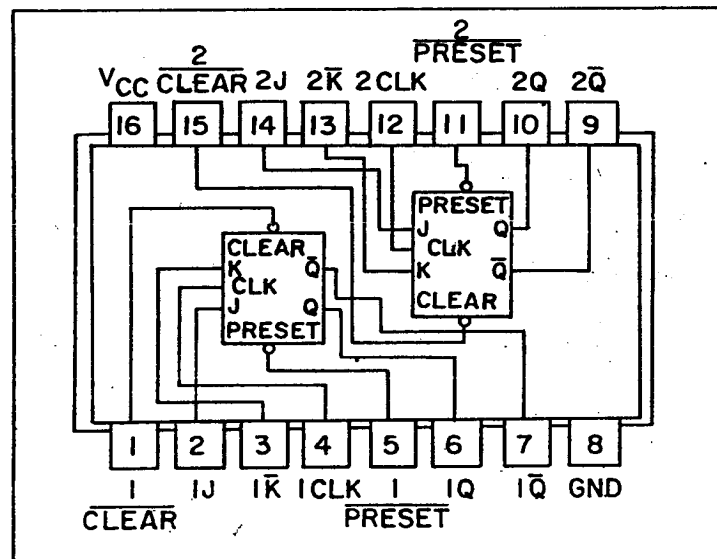
c. The percent defective allowable (PDA) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection for the device types specified herein shall not be required.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and method 5005 of MIL-STD-883. Groups A and B inspections shall be performed on each inspection lot or as specified in method 5005, of MIL-STD-883. Groups C and D shall be performed on a periodic basis in accordance with MIL-M-38510. Generic test data (see 6.5) may be used to satisfy the requirements for groups C and D inspections. Manufacturers shall keep lot records for 5 years (minimum), monitor for compliance to the prescribed procedures, and observe that satisfactory manufacturing conditions and records on lots are maintained for these devices. The records, including as a minimum an attributes summary of all screening and quality conformance inspections conducted on each lot, shall be available for review by customers at all times.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. 14933	DWG NO. 84000
		REV B	PAGE 7

Device type 01  
Cases E and F



Device type 01  
Case 2

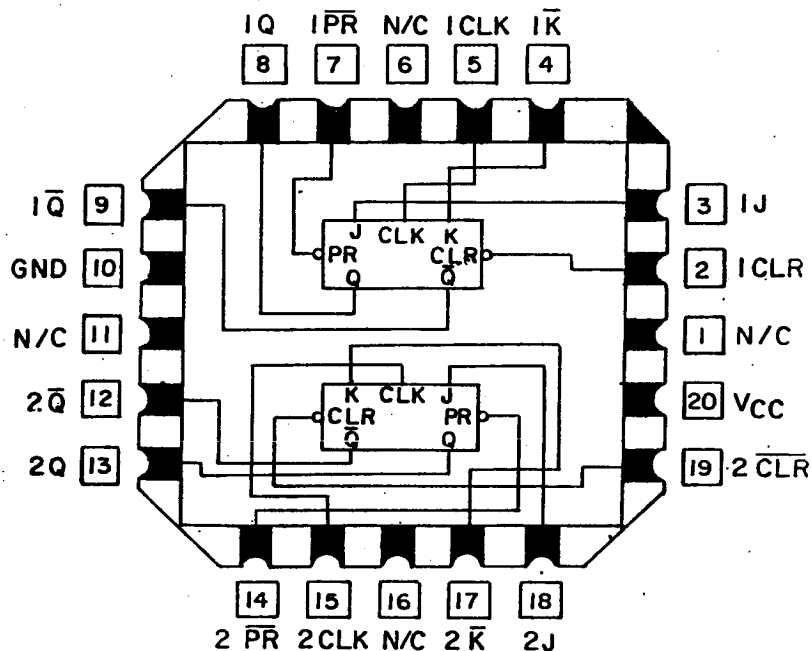


FIGURE 1. Terminal connections (top view).

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE  
A

CODE IDENT. NO.  
14933

DWG NO.

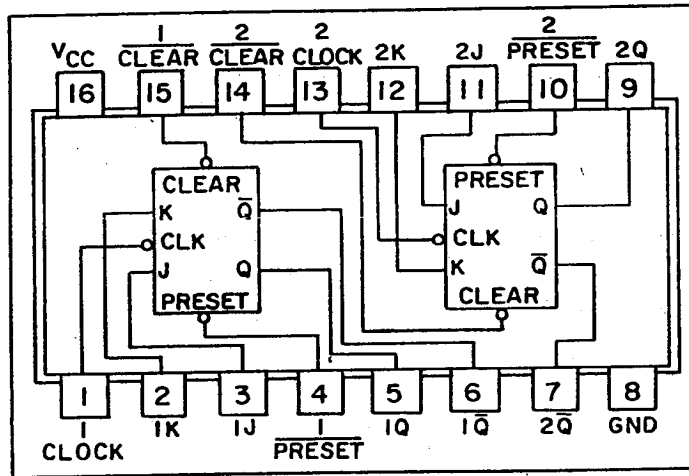
84000

REV B

PAGE 8



Device type 02  
Cases E and F



Device type 02  
Case 2

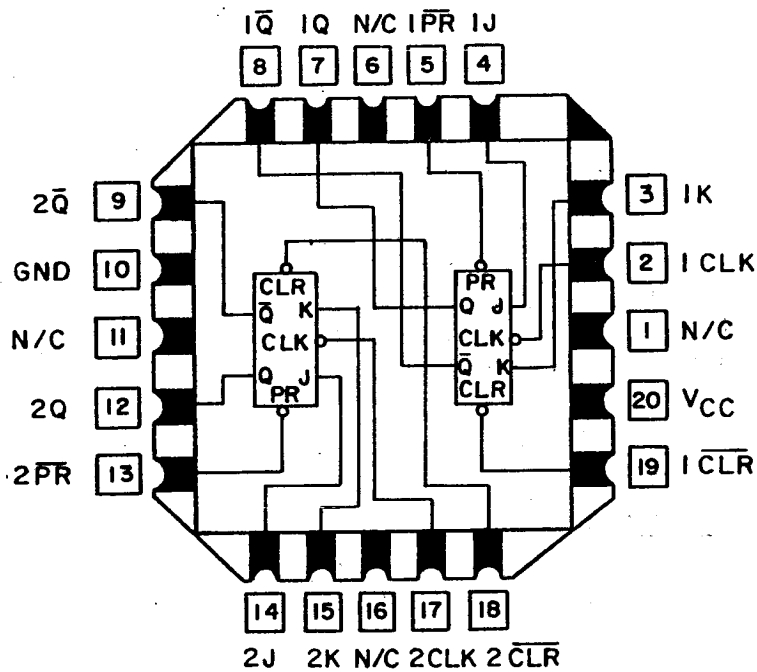


FIGURE 1. Terminal connections (top view) - Continued.

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE  
A

CODE IDENT. NO.  
**14933**

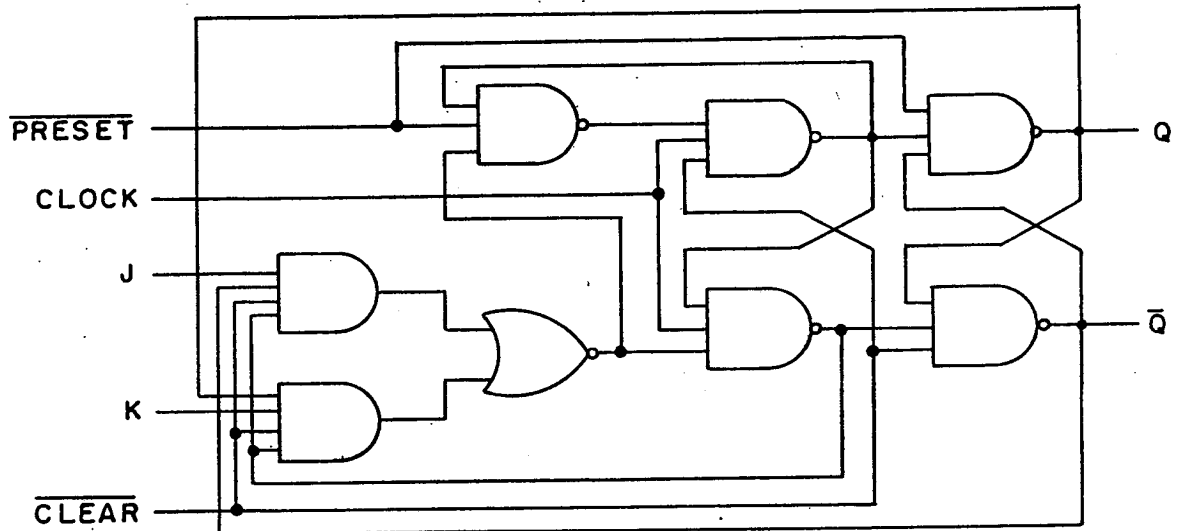
DWG NO.

84000

REV B

PAGE 9

Device type 01



Device type 02

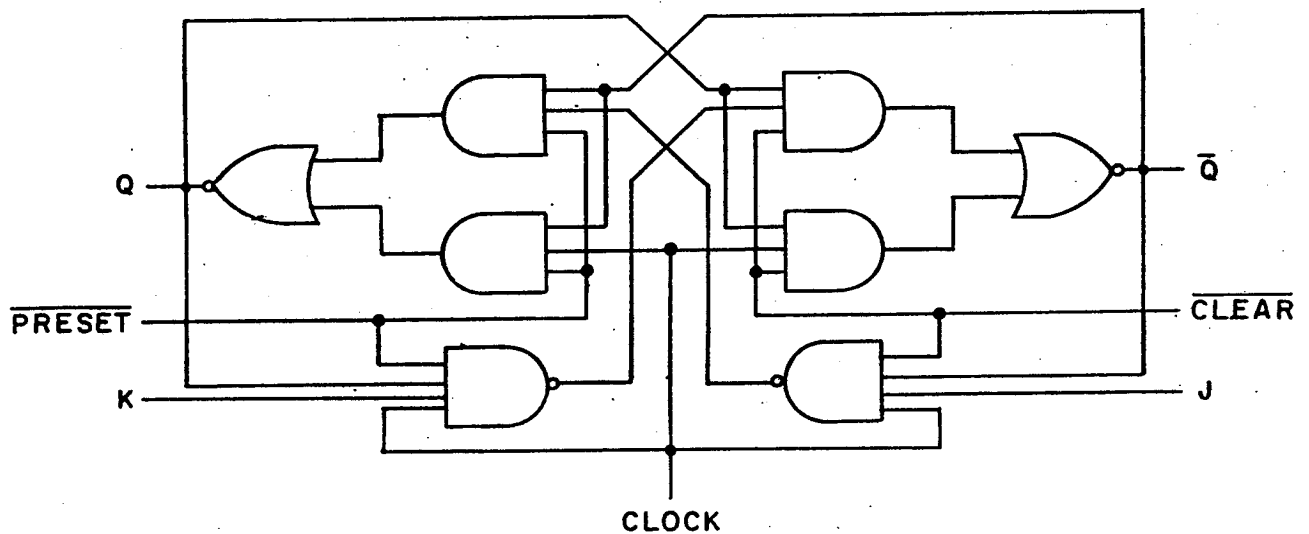


FIGURE 2. Logic diagrams.

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE  
A

CODE IDENT. NO.  
**14933**

DWG NO.

84000

REV

PAGE 10

Device type 01

INPUTS					OUTPUTS	
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	+	L	L	L	H
H	H	+	H	L	TOGGLE	
H	H	+	L	H	$Q_0$	$\bar{Q}_0$
H	H	+	H	H	$Q_0$	$\bar{Q}_0$
H	H	L	X	X	$Q_0$	$\bar{Q}_0$

H = High level (steady state)

L = Low level (steady state)

X = Irrelevant

+

$Q_0$  = The level of Q before the indicated steady state input conditions were established.

TOGGLE: Each output changes to the complement of its previous level on each + clock transition.

- \* This configuration is nonstable; that is it will not persist when preset and clear inputs return to their inactive (high) level.

Device type 02

INPUTS					OUTPUTS	
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	+	L	L	$Q_0$	$\bar{Q}_0$
H	H	+	L	H	L	H
H	H	+	L	H	L	H
H	H	+	H	H	TOGGLE	
H	H	H	X	X	$Q_0$	$\bar{Q}_0$

H = High level (steady state)

L = Low level (steady state)

X = Irrelevant

+

$Q_0$  = The level of Q before the indicated steady state input conditions were established.

TOGGLE: Each output changes to the complement of its previous level on each + clock transition.

- \* This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

FIGURE 3. Truth tables.

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO

SIZE

A

CODE IDENT. NO.

14933

DWG NO.

84000

REV

PAGE 11

4.4.1 Group A inspection. Group A inspection shall consist of the test subgroups and LTPD values shown in table I of method 5005 of MIL-STD-883, class B, and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5, 6, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 ( $C_{IN}$  measurement) shall be measured only initially and after design or process changes which may affect input capacitance.
- d. Subgroup 7 tests sufficiently to verify the truth table.

4.4.2 Group B inspection. Group B inspection shall consist of the test subgroups and LTPD values shown in table IIb of method 5005 of MIL-STD-883, class B.

4.4.3 Groups C and D inspections. Groups C and D inspections shall consist of the test subgroups and LTPD values shown in tables III and IV of method 5005 of MIL-STD-883, class B, 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) conditions:
  - (1) Test condition A, B, C, or D.
  - (2)  $T_A = +125^{\circ}\text{C}$ , minimum.
  - (3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

## 6. NOTES

6.1 Notes. Only the note "Reevaluation of lot quality" of the notes specified in MIL-M-38510 shall apply to this drawing.

6.2 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. This drawing is intended exclusively to prevent the proliferation of unnecessary duplicate specifications, drawings, and stock catalog listings. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, this drawing will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. 14933	DWG NO. 84000
		REV A	PAGE 12

6.3 Ordering data. The acquisition document should specify the following:

- a. Complete part number (see 1.2).
- b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- c. Requirements for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to the acquiring activity, if applicable.
- e. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements will not apply to direct shipment to the Government.

6.4 Replaceability. Replaceability is determined as follows:

- a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/3710XB--.

6.5 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Group C generic test data shall be on date codes no more than one year old and on a die in the same microcircuit group (see appendix E of MIL-M-38510) with the same material, design and process and from the same plant as the die represented. Group D generic data shall be on date codes no more than one year old and on the same package type (see terms, definitions, and symbols of MIL-M-38510) and from the same plant as the package represented. The vendor is required to retain the generic data for a period of not less than 5 years from the date of shipment.

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

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. <b>14933</b>	DWG NO. 84000
		REV A	PAGE 13

6.7 Submission of certificate of compliance. The certificate of compliance submitted to DESC-ECS, prior to listing as an approved source of supply in 6.8, shall state that the manufacturer's product meets the requirements herein.

6.8 Approved sources of supply. An approved source of supply is listed herein. Additional sources will be added as they become available. The vendor listed herein has agreed to this drawing and a certificate of compliance (see 3.8) has been submitted to DESC-ECS.

DESC drawing part number	Vendor FSCM number	Vendor similar part number	Replacement military specification part number
8400001EX <u>1/</u>	01295	SNJ54ALS109AJ	M38510/37102BEX
8400001FX	01295	SNJ54ALS109AW	M38510/37102BFX
84000012X	01295	SNJ54ALS109AFK	M38510/37102B2X
8400002EX <u>1/</u>	01295	SNJ54ALS112AJ	M38510/37103BEX
8400002FX	01295	SNJ54ALS112AW	M38510/37103BFX
84000022X	01295	SNJ54ALS112AFK	M38510/37103B2X

1/ Inactive for new design. Use QPL-38510 product.

Vendor FSCM number

01295

Vendor name and address

Texas Instruments, Inc.  
P. O. Box 6448  
Midland, TX 79701

★ U.S. GOVERNMENT PRINTING OFFICE: 359-075/20080

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO	SIZE A	CODE IDENT. NO. <b>14933</b>	DWG NO. 84000
		REV B	PAGE 14