



# 1. SCOPE

1.1 Scope. This drawing describes the requirements for monolithic silicon, low-power Schottky TTL, 4 X 4 register file 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:

77042	01	E	X
-----	-----	-----	-----
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish (3.3)

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

Device type	Generic number	Circuit
01	54LS670	4 X 4 register file with 3-state outputs

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, 1/4" X 7/8"), dual-in-line package
F	F-5 (16-lead, 1/4" X 3/8"), flat package

## 1.3 Absolute maximum ratings.

Supply voltage range - - - - -	-0.5 V dc to 7.0 V dc
Input voltage range- - - - -	-1.5 V dc at -18 mA to 5.5 V dc
Storage temperature range- - - - -	-65°C to +150°C
Maximum power dissipation, (P <sub>D</sub> ) 1/ - - - - -	275 mW
Lead temperature (soldering, 10 seconds) - - - - -	+300°C
Thermal resistance, junction-to-case (θ <sub>JC</sub> ) - - - - -	See MIL-M-38510, appendix C
Junction temperature (T <sub>J</sub> ) - - - - -	+175°C

## 1.4 Recommended operating conditions.

Supply voltage (V <sub>CC</sub> ) - - - - -	4.5 V dc minimum to 5.5 V dc maximum
Minimum high level input voltage (V <sub>IH</sub> ) - - - - -	2.0 V dc
Maximum low level input voltage (V <sub>IL</sub> ) - - - - -	0.7 V dc
Case operating temperature range (T <sub>C</sub> ) - - - - -	-55°C to +125°C

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

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## 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.)

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

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

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/XXXXY" 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C < T <sub>C</sub> < +125°C unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High-level output voltage	V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V; V <sub>IN</sub> = 0.7 V or 2.0 V I <sub>OH</sub> = -1 mA		1, 2, 3	2.4	---	V
Low-level output voltage	V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V; V <sub>IN</sub> = 0.7 V or 2.0 V I <sub>OL</sub> = 4 mA		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		1	---	-1.5	V
High-level input current	I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V V <sub>IH</sub> = 2.7 V	Any D, R, or W	1, 2, 3	---	20	μA
			Write enable	1, 2, 3	---	40	
			Read enable	1, 2, 3	---	60	
Low-level input current	I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V V <sub>IL</sub> = 0.4 V	Any D, R, or W	1, 2, 3	---	-0.4	mA
			Write enable	1, 2, 3	---	-0.8	
			Read enable	1, 2, 3	---	-1.2	
Short-circuit output current	I <sub>OS</sub>	V <sub>CC</sub> = 5.5 V 1/		1, 2, 3	-15	-130	mA
Supply current	I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V		1, 2, 3	---	50	mA
Functional tests		See 4.4.1c		7			
Propagation delay time, from read select to any Q 2/	t <sub>PLH1</sub>	V <sub>CC</sub> = 5.0 V R <sub>L</sub> = 2 kΩ ±5%	C <sub>L</sub> = 15 pF ±10%	9		40	ns
				10, 11		56	ns
			C <sub>L</sub> = 50 pF ±10%	9		45	ns
				10, 11		63	ns
	t <sub>PHL1</sub>	V <sub>CC</sub> = 5.0 V R <sub>L</sub> = 2 kΩ ±5%	C <sub>L</sub> = 15 pF ±10%	9		45	ns
				10, 11		63	ns
			C <sub>L</sub> = 50 pF ±10%	9		50	ns
				10, 11		70	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T <sub>C</sub> < +125°C unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Propagation delay time, from write enable to any Q <u>2/</u>	t <sub>PLH2</sub>	V <sub>CC</sub> = 5.0 V R <sub>L</sub> = 2 kΩ ±5%	C <sub>L</sub> = 15 pF ±10%	9		45	ns
				10, 11		63	ns
			C <sub>L</sub> = 50 pF ±10%	9		50	ns
				10, 11		70	ns
	t <sub>PHL2</sub>		C <sub>L</sub> = 15 pF ±10%	9		50	ns
				10, 11		70	ns
			C <sub>L</sub> = 50 pF ±10%	9		55	ns
				10, 11		77	ns
Propagation delay time, from data to any Q <u>2/</u>	t <sub>PLH3</sub>	C <sub>L</sub> = 15 pF ±10%		9		45	ns
				10, 11		63	ns
			C <sub>L</sub> = 50 pF ±10%	9		50	ns
				10, 11		70	ns
	t <sub>PHL3</sub>		C <sub>L</sub> = 15 pF ±10%	9		40	ns
				10, 11		56	ns
			C <sub>L</sub> = 50 pF ±10%	9		45	ns
				10, 11		63	ns

1/ Not more than one output should be shorted at a time and the duration of the short circuit condition should not exceed 1 second.

2/ Propagation delay time testing may be performed using either C<sub>L</sub> = 15 pF or C<sub>L</sub> = 50 pF. However, the manufacturer must certify and guarantee that the microcircuits meet the switching test limits specified for a 50 pF load.

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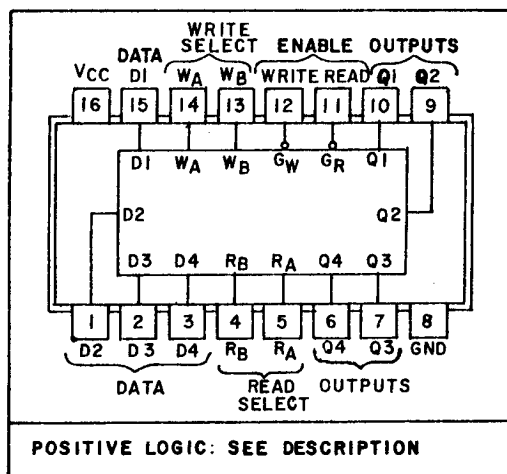
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logic: Low input to load sets  $Q_A = A$ ,  
 $Q_B = B$ ,  $Q_C = C$ , and  $Q_D = D$ .

FIGURE 1. Terminal connections (top view).

WRITE FUNCTION TABLE  
 (SEE NOTES 1, 2, AND 3)

WRITE INPUTS			WORD			
$W_B$	$W_A$	$G_W$	0	1	2	3
L	L	L	$Q = D$	$Q_0$	$Q_0$	$Q_0$
L	H	L	$Q_0$	$Q = D$	$Q_0$	$Q_0$
H	L	L	$Q_0$	$Q_0$	$Q = D$	$Q_0$
H	H	L	$Q_0$	$Q_0$	$Q_0$	$Q = D$
X	X	H	$Q_0$	$Q_0$	$Q_0$	$Q_0$

READ FUNCTION TABLE  
 (SEE NOTES 1 AND 4)

READ INPUTS			OUTPUTS			
$R_B$	$R_A$	$G_R$	Q1	Q2	Q3	Q4
L	L	L	W0B1	W0B2	W0B3	W0B4
L	H	L	W1B1	W1B2	W1B3	W1B4
H	L	L	W2B1	W2B2	W2B3	W2B4
H	H	L	W3B1	W3B2	W3B3	W3B4
X	X	H	Z	Z	Z	Z

NOTES:

1. H = high level, L = low level, X = irrelevant, Z = high impedance (off).
2. ( $Q = D$ ) = The four selected internal flip-flop outputs will assume the states applied to the four external data inputs.
3.  $Q_0$  = The level of Q before the indicated input conditions were established.
4. W0B1 = The first bit of word 0, ect.

FIGURE 2. Truth table.

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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 type 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.

3.6.4 Burn-in test circuit documentation. The burn-in test circuit documentation shall be made available to the acquiring activity on request.

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).

#### 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. 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.

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

4.3 Qualification inspection. Qualification inspection for the device type 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 an attributes summary of all screening and quality conformance inspections conducted on each lot shall be available for review by customers at all times.

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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, 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.

4.4.1 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:

- Tests shall be as specified in table II herein.
- Subgroups 4, 5, 6, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.
- Subgroup 7 tests shall 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, method 5005 of MIL-STD-883, class B, and as follows:

- End-point electrical parameters shall be as specified in table II herein.
- Steady-state life test (method 1005 of MIL-STD-883) conditions:
  - Test condition A, B, C, or D.
  - $T_A = +125^{\circ}\text{C}$ , minimum.
  - Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

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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.

6.3 Ordering data. The contract or purchase order 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 contracting 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 M38510/31901B--.

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 1 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 1 year old and on the same package type (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.

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.

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6.8 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 3.8) has been submitted to DESC-ECS.

DESC drawing part number	Vendor FSCM number	Vendor similar part number <u>1/</u>	Replacement military specification part number
7704201EX <u>2/</u>	07263 04713 27014 01295	54LS670DMQB 54LS670BEXJC DM54LS670J/883B SNJ54LS670J	M38510/31901BEX
7704201FX <u>2/</u>	07263 04713 27014 01295	54LS670FMQB 54LS670BFXJC DM54LS670W/883B SNJ54LS670W	M38510/31901BFX

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

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

<u>Vendor FSCM number</u>	<u>Vendor name and address</u>
07263	Fairchild Semiconductor 333 Western Avenue S. Portland, ME 04106
04713	Motorola, Incorporated 7402 S. Price Road Tempe, AZ 85283
27014	National Semiconductor Corporation 2900 Semiconductor Drive Santa Clara, CA 95051
01295	Texas Instruments, Incorporated P. O. Box 6448 Midland, TX 79071

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