

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
D	Delete vendors, CAGE 18324 and CAGE 27014. Table I, add footnote 2. Change t _{p1} , t _{p2} , and t _{p4} . Add footnote to truth table. Editorial changes throughout. Change to military drawing. Change drawing CAGE to 67268.	7 DEC 1987	<i>M. L. G.</i>

CURRENT DATE											
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REV STATUS	REV	D	D	D	D	D	D	D	D	D	D
OF PAGES	PAGES	1	2	3	4	5	6	7	8	9	10
Defense Electronics Supply Center Dayton, Ohio		PREPARED BY <i>Monica L. Goresel</i>				MILITARY DRAWING This drawing is available for use by all Departments and Agencies of the Department of Defense					
Original date of drawing: 24 November 1976		CHECKED BY <i>Da Di Enzo</i>				TITLE: MICROCIRCUITS, DIGITAL, LOW POWER SCHOTTKY TTL, MULTIVIBRATOR, MONOLITHIC SILICON					
AMSC N/A		APPROVED BY <i>Mike M. Lyle</i>				TITLE: MICROCIRCUITS, DIGITAL, LOW POWER SCHOTTKY TTL, MULTIVIBRATOR, MONOLITHIC SILICON					
		SIZE	CODE IDENT. NO.				DWG NO.				
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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:

76042	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	54LS221	Dual monostable multivibrator with schmitt-trigger inputs and clear

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 _D) 1/ - - - - -	149 mW
Lead temperature (soldering, 10 seconds) - - - - -	+300°C
Thermal resistance, junction to case (θ _{JC}) - - - - -	
Cases E and F - - - - -	See MIL-M-38510, appendix C
Junction temperature (T _J)- - - - -	+175°C

1.4 Recommended operating conditions.

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

1/ Must withstand the added P_D due to short circuit test (e.g., I_{OS}).

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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 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 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 Logic diagram and terminal connections. The logic diagram and 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.

3.3 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.

3.4 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.

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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 voltage	V _{OH}	V _{CC} = 4.5 V; V _{IH} = 2.0 V I _{OH} = -400 µA; V _{IL} = 0.7 V	1, 2, 3	2.5		V
Low-level output voltage	V _{OL}	V _{CC} = 4.5 V; V _{IH} = 2.0 V I _{OL} = 4 mA; V _{IL} = 0.7 V	1, 2, 3		0.4	V
Input clamp voltage	V _{IC}	V _{CC} = 4.5 V; I _{IN} = -18 mA; T _C = +25°C	1		-1.5	V
High-level input current	I _{IH1}	V _{CC} = 5.5 V; V _{IH} = 2.7 V	1, 2, 3		20	µA
	I _{IH2}	V _{CC} = 5.5 V; V _{IH} = 5.5 V	1, 2, 3		100	µA
Low-level input current at A	I _{IL1}	V _{CC} = 5.5 V; V _{IL} = 0.4 V	1, 2, 3		-0.4	mA
Low-level input current at B or clear	I _{IL2}	V _{CC} = 5.5 V; V _{IL} = 0.4 V	1, 2, 3		-0.8	mA
Short-circuit output current	I _{OS}	V _{CC} = 5.5 V; V _{OUT} = 0.0 V <u>1/</u>	1, 2, 3	-15	-150	mA
Supply current (quiescent)	I _{CC1}	V _{CC} = 5.5 V	1, 2, 3		11	mA
Supply current (triggered)	I _{CC2}	V _{CC} = 5.5 V <u>2/</u>	1, 2, 3		27	mA
Functional tests		See 4.3.1c	7			
Propagation delay time, A to Q	t _{PHL1}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 2 kΩ C _{ext} = 80 pF <u>3/</u>	C _L = 15 pF ±10%	9	80	ns
				10, 11	112	ns
			C _L = 50 pF ±10%	9	85	ns
				10, 11	128	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _C < +125°C unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Propagation delay time, A to Q	t _{PLH1}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 2 kΩ C _{ext} = 80 pF 3/	C _L = 15 pF ±10%	9	70	ns
				10, 11	98	ns
			C _L = 50 pF ±10%	9	75	ns
				10, 11	113	ns
Propagation delay time, B to Q	t _{PHL2}		C _L = 15 pF ±10%	9	65	ns
				10, 11	91	ns
			C _L = 50 pF ±10%	9	70	ns
				10, 11	105	ns
Propagation delay time, B to Q	t _{PLH2}	C _L = 15 pF ±10%	9	55	ns	
			10, 11	77	ns	
		C _L = 50 pF ±10%	9	60	ns	
			10, 11	90	ns	
Propagation delay time, clear to Q	t _{PHL3}	C _L = 15 pF ±10%	9	55	ns	
			10, 11	77	ns	
		C _L = 50 pF ±10%	9	60	ns	
			10, 11	90	ns	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _C < +125°C unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Propagation delay time, clear to Q	t _{PLH3}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 2 kΩ C _{ext} = 80 pF 3/	9		65	ns
				10, 11	91	ns
			9		70	ns
				10, 11	105	ns
Width of Q output pulse A or B to Q or Q	t _{p1}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 2 kΩ C _{ext} = 0 2/ 3/	9		150	ns
				10, 11	210	ns
			9		160	ns
				10, 11	214	ns
Width of Q output pulse A or B to Q or Q	t _{p2}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 2 kΩ C _{ext} = 0 2/ 3/	9		70	ns
				10, 11	98	ns
			9		75	ns
				10, 11	102	ns
Width of Q output pulse A or B to Q or Q	t _{p3}	V _{CC} = 5.0 V R _L = 2 kΩ ±5% R _{ext} = 10 kΩ C _{ext} = 100 pF 3/	9		750	ns
				10, 11	915	ns
			9		850	ns
				10, 11	975	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _C < +125°C unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Width of Q output pulse A or B to Q or \bar{Q}	t _{p4}	V _{CC} = 5.0 V R _L = 2 kΩ ±5 R _{ext} = 10 kΩ C _{ext} = 1 μF 2/ 3/	9		7.5	ms
				10, 11	8.7	ms
			9		8.5	ms
			10, 11		9.0	ms

- 1/ Not more than one output should be shorted at a time, and the duration of the short circuit condition should not exceed one second.
- 2/ This test is guaranteed if not tested to the specified limits.
- 3/ Propagation delay time testing and pulse width testing may be performed using either C_L = 15 pF or C_L = 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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CASES E AND F

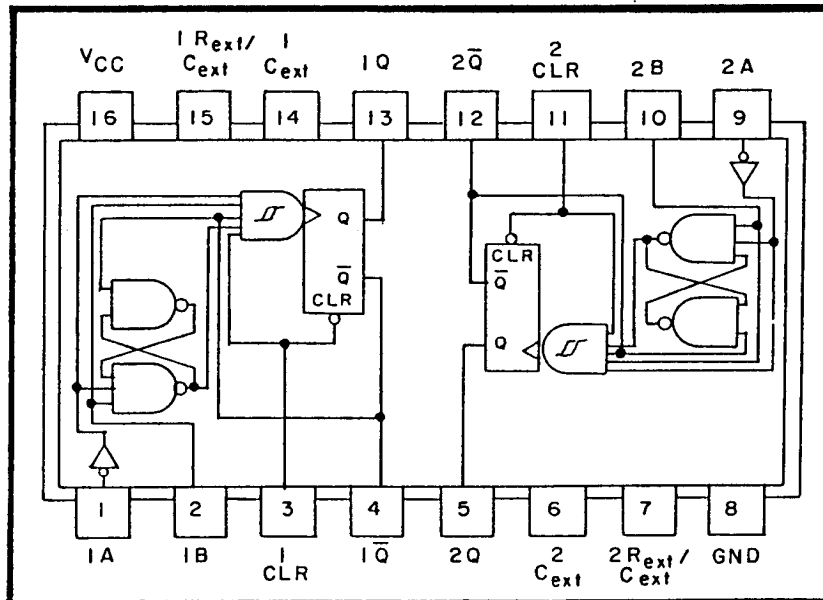


FIGURE 1. Logic diagram and terminal connections (top view).

Inputs			Outputs	
Clear	A	B	Q	Q̄
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⌊	⌋
H	↓	H	⌊	⌋
↑*	L	H	⌊	⌋

H = high level (steady state)

L = low level (steady state)

↑ = transition from low to high level

↓ = transition from high to low level

⌊ = one high-level pulse

⌋ = one low-level pulse

X = irrelevant

*This latch is conditioned by taking either A high or B low while CLR is in the inactive state.

FIGURE 2. Truth table.

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

(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 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 4, 5, 6 and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Suogroup 7 tests shall verify the truth table.

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 (method 1005 of MIL-STD-883) conditions:

(1) Test condition A, B, C or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

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

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table 1)
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 10, 11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.

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

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. Replaceability is determined as follows:

- Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/31402B--.

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

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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 part number
7604201EX <u>2/</u>	04713 01295	54LS221/BEAJC SNJ54LS221J	M38510/31402BEX
7604201FX <u>2/</u>	04713 01295	54LS221/BFAJC SNJ54LS221W	M38510/31402BFX

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.

Vendor CAGE number

Vendor name and address

04713

Motorola, Inc.
7402 S. Price Road
Tempe, AZ 85283

01295

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

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