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

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

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: 9 AUGUST 1989

REVISION LEVEL:

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, DIGITAL, ADVANCED SCHOTTKY, OCTAL D FLIP-FLOP WITH THREE-STATE OUTPUTS, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-89724

SHEET 1

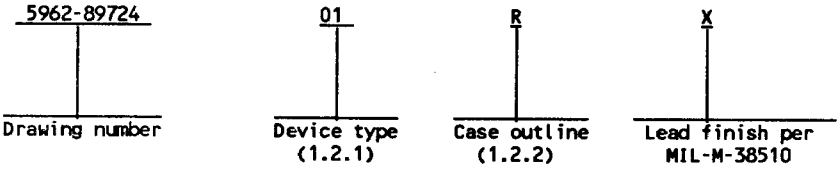
DESC FORM 193
SEP 87

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

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:



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

Device type	Generic number	Circuit function
01	54F574	Octal D flip-flop with three-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
R	D-8 (20-lead, 1.060" x .310" x .200"), dual-in-line package
S	F-9 (20-lead, .540" x .300" x .100"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Supply voltage range (V_{CC})	-0.5 V dc minimum to +7.0 V dc maximum
Input voltage range	-0.5 V dc minimum to +7.0 V dc maximum
Input current range	-30 mA to +5.0 mA
Voltage applied to output in the high state	-0.5 V to +V_{CC}
Current applied to output in the low state	40 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D) 1/	495 mW
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175°C

1/ Power dissipation is defined as V_{CC} x I_{CC}, and must withsand the added P_D due to short circuit output test; e.g., I_{OS}.

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1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	+4.5 V dc minimum to +5.5 V dc maximum
High level input voltage (V_{IH})	2.0 V dc
Low level input voltage (V_{IL})	0.8 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Minimum setup time, Dn to CP (t_s):	
T_C = +25°C	2.0 ns
T_C = -55°C, +125°C	2.5 ns
Minimum Hold time, Dn to CP (t_h):	
T_C = +25°C	1.5 ns
T_C = -55°C, +125°C	2.0 ns
Minimum CP pulse width, high (t_w(H)):	
T_C = +25°C	3.0 ns
T_C = -55°C, +125°C	3.0 ns
Minimum CP pulse width, low (t_w(L)):	
T_C = +25°C	4.5 ns
T_C = -55°C, +125°C	4.5 ns

2. APPLICABLE DOCUMENTS

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

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin 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 Test circuit and switching waveforms. The test circuit and switching waveforms shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines 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 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. 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 MIL-BUL-103 (see 6.6 herein).

3.6 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 MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 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.

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

3.9 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).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ unless otherwise specified		Group A subgroups	Limits Min	Limits Max	Unit
High level output voltage	V_{OH}	V_{CC} = 4.5 V, V_{IL} = 0.8 V, V_{IH} = 2.0 V	I_{OH} = -1.0 mA	1,2,3	2.5		V
			I_{OH} = -3.0 mA		2.4		
Low level output voltage	V_{OL}	V_{CC} = 4.5 V, V_{IL} = 0.8 V, V_{IH} = 2.0 V, I_{OL} = 20 mA		1,2,3		0.50	V
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V, I_{IN} = -18 mA		1,2,3		-1.2	V
High level input current	I_{IH1}	V_{CC} = 5.5 V, V_{IN} = 2.7 V		1,2,3		20	µA
	I_{IH2}	V_{CC} = 5.5 V, V_{IN} = 7.0 V		1,2,3		100	
Low level input current	I_{IL}	V_{CC} = 5.5 V, V_{IN} = 0.5 V		1,2,3		-0.6	mA
Off-state output current	I_{OZH}	V_{CC} = 5.5 V, V_{OUT} = 2.7 V		1,2,3		50	µA
	I_{OZL}	V_{CC} = 5.5 V, V_{OUT} = 0.5 V		1,2,3		-50	
Short circuit output current	I_{OS}	V_{CC} = 5.5 V, V_{OUT} = 0.0 V 1/		1,2,3	-60	-150	µA
Supply current	I_{CCH}	V_{CC} = 5.5 V		1,2,3		65	mA
	I_{CCL}					70	
	I_{CCZ}					90	
Maximum clock frequency	f_{MAX}	2/		9 10,11	110 100		MHz
Functional tests		See 4.3.1c		7,8			

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ unless otherwise specified		Group A subgroups	Limits Min	Limits Max	Unit
Propagation delay, CP to Qn	t_{PLH}	C_L = 50 pF, R_L = 500Ω, see figure 3	V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10,11	4.0 3.0	8.5 9.5	ns
	t_{PHL}		V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10, 11	4.0 3.0	8.5 9.5	
Output enable time, OE to high, low	t_{PZH}		V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10,11	2.5 2.0	8.0 9.0	ns
	t_{PZL}		V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10, 11	3.0 3.0	8.5 9.5	
Output disable time, OE to high, low	t_{PHZ}		V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10,11	1.0 1.0	6.0 7.0	ns
	t_{PLZ}		V_{CC} = 5.0 V V_{CC} = 4.5 V to 5.5 V	9 10, 11	1.0 1.0	5.5 6.0	

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

2/ This parameter is guaranteed but not tested to the limits in table I.

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 3.6 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.

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.

Device type	01
Case outlines	R, S, and 2
Terminal number	Terminal symbol
1	$\overline{OE}$
2	D0
3	D1
4	D2
5	D3
6	D4
7	D5
8	D6
9	D7
10	GND
11	CP
12	Q7
13	Q6
14	Q5
15	Q4
16	Q3
17	Q2
18	Q1
19	Q0
20	V_{CC}

FIGURE 1. Terminal connections.

Inputs			Internal register	Outputs	Operating mode
$\overline{OE}$	CP	Dn		Q0-Q7	
L	↑	l	L	L	Load and read register
L	↑	h	H	H	Load and read register
L	↑	X	NC	NC	Hold
H	↑	Dn	Dn	Z	Disable outputs
H	X	X	X	Z	Disable outputs

H = High voltage level
h = High voltage level one set-up time prior to the low-to-high clock transition
L = Low voltage level
l = Low voltage level one set-up time prior to the Low-to-High clock transition
NC = No change
X = Irrelevant
Z = High impedance "off" state
↑ = Low-to-High clock transition

FIGURE 2. Truth table.

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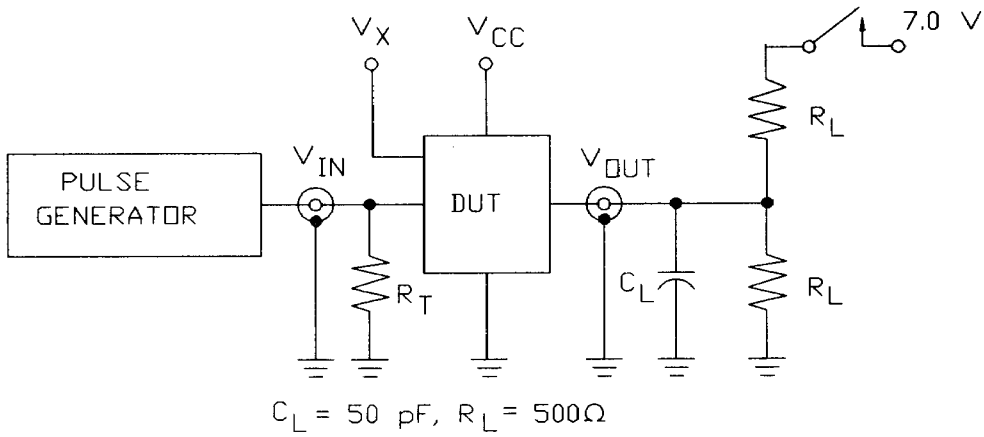


C_L = 50 pF, R_L = 500Ω

Switch position

Test	Switch
t_{PLZ}	Closed
t_{PZL}	Closed
All others	Open

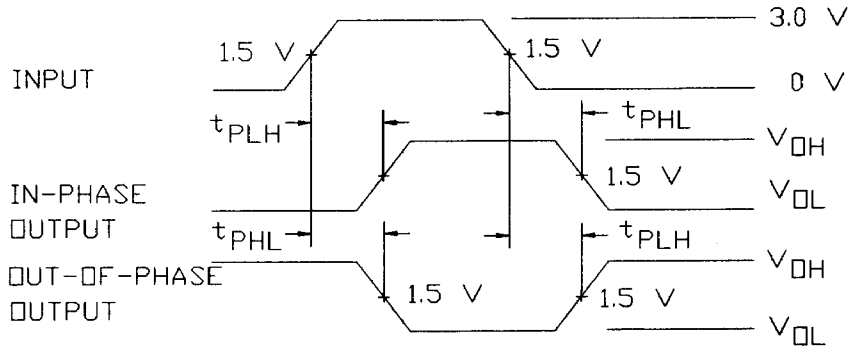
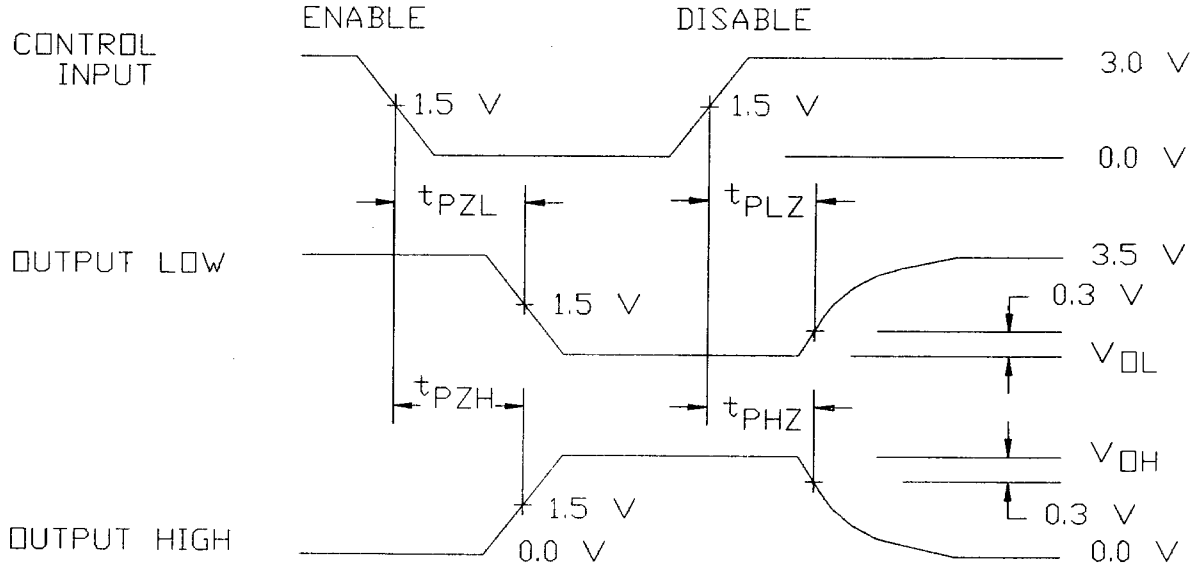


FIGURE 3. Test circuit and switching waveforms.



NOTES:

1. C_L includes probe and jig capacitance.
2. R_T = Termination resistance should be equal to Z_{OUT} of pulse generator.
3. V_X = Unclocked pins must be held at ≤ 0.8 V, ≥ 2.7 V or open.
4. All input pulses have the following characteristics: PRR = 1 MHz, $t_r = t_f$ = 2.5 ns, duty cycle = 50 percent.
5. When measuring propagation delay times of three-state outputs, switch 1 is open.
6. The outputs are measured one at a time with one input transition per measurement.

FIGURE 3. Test circuit and switching waveforms - Continued.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

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

c. Subgroups 7 and 8 shall verify the truth table as specified on figure 2 herein.

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

*PDA applies to subgroup 1.

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 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 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:

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 M38510/341.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordiation and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECC, telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECC, Dayton, Ohio 45444, or telephone 513-296-8525.

6.6 Approved source of supply. An approved source of supply is listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. The vendor listed in MIL-BUL-103 has agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to DESC-ECC. The approved source of supply listed below is for information purposes only and is current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/	Replacement military specification part number
5962-8972401RX	18324	54F574/BRA	M38510/34110BRX
5962-8972401SX	18324	54F574/BSA	M38510/34110BSX
5962-89724012X	18324	54F574/B2A	M38510/34110B2X

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
18324	Signetics Company 4130 South Market Court Sacramento, CA 95834