

REVISIONS																			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED																
A	Removed vendor CAGE 61772 as source of supply for case outline letter Z, the F-11A package. Added case outline letters U and T, F-11 and D-15, to the drawing. Editorial changes throughout.	1990 OCT 04	<i>M.O. Lye</i>																

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REV STATUS OF SHEETS	REV	A	A	A				A								A	A	A		
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

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	PREPARED BY <i>Kenneth Rice</i> CHECKED BY <i>Ray Monnin</i> APPROVED BY <i>William M. Lye</i> DRAWING APPROVAL DATE 23 MAY 1988 REVISION LEVEL A	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 MICROCIRCUITS, MEMORY, DIGITAL, CMOS PARALLEL 512 X 9 FIFO, MONOLITHIC SILICON <table style="width: 100%;"> <tr> <td style="width: 10%;">SIZE A</td> <td style="width: 40%;">CAGE CODE 67268</td> <td style="width: 50%;">5962-87531</td> </tr> <tr> <td colspan="2">SHEET</td> <td style="text-align: center;">1</td> </tr> </table>	SIZE A	CAGE CODE 67268	5962-87531	SHEET		1
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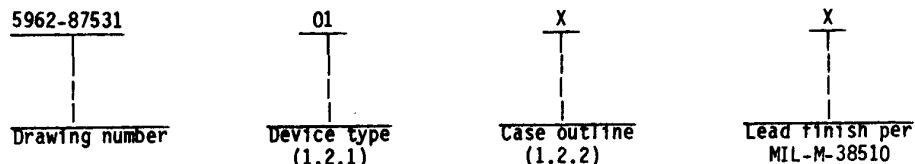
5962-E036

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

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 or identifying number (PIN). The complete PIN shall be as shown in the following example:



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

Device type	Generic number	Circuit function	Access time
01	See 6.6	512 x 9-bit parallel FIFO	30 ns
02	See 6.6	512 x 9-bit parallel FIFO	50 ns
03	See 6.6	512 x 9-bit parallel FIFO	80 ns

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

Outline letter	Case outline
X	D-10 (28-lead, 1.490" x .610" x .232"), dual-in-line package
Y	C-12 (32-terminal, .560" x .458" x .120"), rectangular chip carrier
Z	F-11A (28-lead, .740" x .520" x .115"), flat package
U	F-11 (28-lead, .740" x .308" x .090"), flat package
T	D-15 (28-lead, 1.485" x .310" x .230") dual-in-line package

1.3 Absolute maximum ratings. 1/

Supply voltage range (V_{CC})	-0.5 V dc to +7.0 V dc
DC output current (I_{OUT})	50 mA
Ambient storage temperature	-65°C to +150°C
Temperature under bias	-55°C to +125°C
Thermal resistance, junction-to-case (θ_{JC}):	
Case outlines X, Y, Z, U and T	See MIL-M-38510, appendix C
Power dissipation (P_D)	1.0 W

1.4 Recommended operating conditions. 1/

Supply voltage range (V_{CC})	+4.5 V dc to +5.5 V dc
Ground voltage (V_{SS})	0 V dc
Minimum input high voltage (V_{IH})	2.2 V dc
Maximum input low voltage (V_{IL})	0.8 V dc
Operating case temperature range (T_C)	-55°C to +125°C
Rise time	5 ns
Fall time	5 ns

1/ All voltages referenced to V_{SS} .

Z/ 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, 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 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

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

3.2.4 Die overcoat. Polyimide and silicone coatings are allowable as an overcoat on the die for alpha particle protection provided that each coated microcircuit inspection lot (see MIL-M-38510, 3.1.3.8) shall be subjected to and pass the Internal Water-Vapor Content test (test method 1018 of MIL-STD-883). The frequency of the internal water vapor testing may not be decreased unless approved by the preparing activity.

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

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C < T _C < +125°C V _{SS} = 0 V, 4.5 V < V _{CC} < 5.5 V unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Input leakage current	I _{LI}	0.4 V ≤ V _{IN} ≤ V _{CC}	1,2,3	A11	-10	10	μA
Output leakage current	I _{LO}	0.4 V ≤ V _{OUT} ≤ V _{CC} R ≥ V _{IH}	1,2,3	A11	-10	10	μA
Output low voltage	V _{OL}	V _{CC} = 4.5 V, I _{OL} = 8 mA V _{IL} = 0.8 V; V _{IH} = 2.2 V	1,2,3	A11		.4	V
Output low voltage	V _{OH}	V _{CC} = 4.5 V, I _{OH} = -2 mA V _{IL} = 0.8 V; V _{IH} = 2.2 V	1,2,3	A11	2.4		V
Operating supply current	I _{CC1}	f = maximum, outputs open, V _{CC} = maximum	1,2,3	A11		100	mA
Standby power supply current	I _{CC2}	R = W = RS = FL/RT = V _{IH} , outputs open	1,2,3	A11		15	mA
Power down current	I _{CC3}	All inputs = V _{CC} - 0.2 V, outputs open	1,2,3	A11		900	μA
Input capacitance	C _I 1/	V _I = 5.0 V or GND f = 1 MHz, T _C = +25°C See 4.3.1c	4	A11		5	pF
Output capacitance	C _O 1/	V _O = 5.0 V or GND f = 1 MHz, T _C = +25°C See 4.3.1c	4	A11		7	pF

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 2/ 3/ -55°C < T _C < +125°C V _{SS} = 0 V, 4.5 V < V _{CC} < 5.5 V unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Read cycle time	t _{RC}		9,10,11	01 02 03	40 65 100		ns
Access time	t _A		9,10,11	01 02 03		30 50 80	ns
Read recovery time	t _{RR}		9,10,11	01 02 03	10 15 20		ns
Read pulse width	t _{RPW}		9,10,11	01 02 03	30 50 80		ns
Read pulse low to data bus at low Z	t _{RLZ} 4/		9,10,11	A11	5		ns
Write pulse high to data bus at low Z	t _{WLZ} 4/		9,10,11	A11	5		ns
Data valid from read pulse high	t _{DV}		9,10,11	A11	5		ns
Read pulse high to data bus at high Z	t _{RHZ} 4/		9,10,11	A11	30		ns
Write cycle time	t _{WC}		9,10,11	01 02 03	40 65 100		ns
Write pulse width	t _{WPW}		9,10,11	01 02 03	30 50 80		ns
Write recovery time	t _{WR}		9,10,11	01 02 03	10 15 20		ns
Data setup time	t _{DS}		9,10,11	01 02 03	18 30 40		ns
Data hold time	t _{DH}		9,10,11	01 02 03	0 5 10		ns
Reset cycle time	t _{RSC}		9,10,11	01 02 03	40 65 100		ns
Reset pulse width	t _{RS}		9,10,11	01 02 03	30 50 80		ns
Reset recovery time	t _{RSR}		9,10,11	01 02 03	10 15 20		ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 2/ 3/ -55°C < T _C < +125°C V _{SS} = 0 V, 4.5 V < V _{CC} < 5.5 V unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Reset setup time	t _{RSS}		9,10,11	01 02 03	30 50 80		ns
Retransmit cycle time	t _{RTC}		9,10,11	01 02 03	40 65 80		ns
Retransmit pulse width	t _{RT}		9,10,11	01 02 03	30 50 80		ns
Retransmit recovery time	t _{RTR}		9,10,11	01 02 03	10 15 20		ns
Reset to empty flag low	t _{EFL}		9,10,11	01 02 03		40 65 100	ns
Read low to empty flag low	t _{REF}		9,10,11	01 02 03		30 45 60	ns
Read high to full flag high	t _{RFF}		9,10,11	01 02 03		30 45 60	ns
Write high to empty flag high	t _{WEF}		9,10,11	01 02 03		30 45 60	ns
Write low to full flag low	t _{WFF}		9,10,11	01 02 03		30 45 60	ns
Reset to half full and full flag high	t _{HFH} t _{FFH}		9,10,11	01 02 03		40 65 100	ns
Read/write to X0 low	t _{XOL}		9,10,11	01 02 03		30 50 80	ns
Read/write to X0 high	t _{XOH}		9,10,11	01 02 03		30 50 80	ns
XI pulse width	t _{XI}		9,10,11	01 02 03	30 50 80		ns
XI recovery time	t _{XIR}		9,10,11	A11	10		ns
XI setup time	t _{XIS}		9,10,11	A11	15		ns

1/ This parameter tested initially and after any design or process change which could affect this parameter, and is therefore guaranteed to the limits specified in table I.

2/ For output load circuit and ac test conditions, see figure 3.

3/ For timing waveforms, see figure 4.

4/ May not be tested, but shall be guaranteed to the limits specified in table I.

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Device types	01-03	
Cases	X, Z, U, T	Y
Terminal number	Terminal symbol	
1	W	NC
2	D ₈	W
3	D ₃	D ₈
4	D ₂	D ₃
5	D ₁	D ₂
6	D ₀	D ₁
7	XT	D ₀
8	FF	XT
9	Q ₀	FF
10	Q ₁	Q ₀
11	Q ₂	Q ₁
12	Q ₃	NC
13	Q ₈	Q ₂
14	GND	Q ₃
15	R	Q ₈
16	Q ₄	GND
17	Q ₅	NC
18	Q ₆	R
19	Q ₇	Q ₄
20	XO/HF	Q ₅
21	EF	Q ₆
22	RS	Q ₇
23	FL/RT	XO/HF
24	D ₇	EF
25	D ₆	RS
26	D ₅	FL/RT
27	D ₄	NC
28	V _{CC}	D ₇
29	---	D ₆
30	---	D ₅
31	---	D ₄
32	---	V _{CC}

FIGURE 1. Terminal connections.

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Reset and retransmit
Single device configuration/width expansion mode

Mode	Inputs			Internal status		Outputs		
	RS	RT	XI	Read pointer	Write pointer	EF	FF	HF
Reset	0	X	0	Location zero	Location zero	0	1	1
Retransmit	1	0	0	Location zero	Unchanged	X	X	X
Read/Write	1	1	0	Increment	Increment 1/	X	X	X

1/ Pointer will increment if flag is high.

Reset and first load truth table
Depth expansion/compound expansion mode

Mode	Inputs			Internal status		Outputs	
	RS	FL	XI	Read pointer	Write pointer	EF	FF
Reset	0	0	1/	Location zero	Location zero	0	1
Retransmit	0	1	1/	Location zero	Location zero	0	1
Read/Write	1	X	1/	X	X	X	X

1/ $\overline{XI}$ is connected to $\overline{X0}$ of previous device.

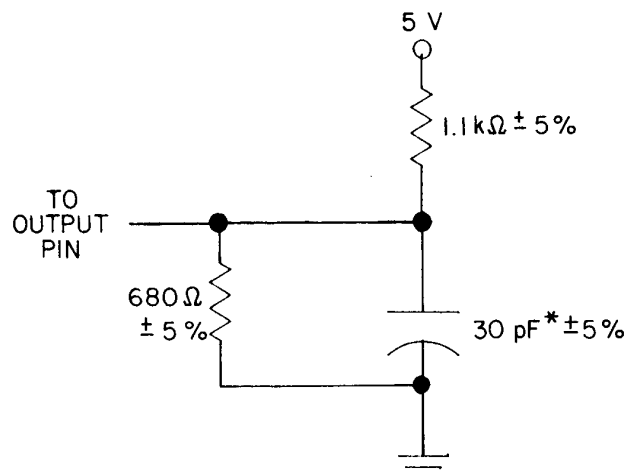
NOTE: $\overline{RS}$ = Reset input, $\overline{FL}/\overline{RT}$ = First load/retransmit,
 $\overline{EF}$ = Empty flag output, $\overline{FF}$ = Full flag output, $\overline{XI}$ = Expansion input,
and $\overline{HF}$ = Half-full flag output

FIGURE 2. Truth tables.

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*Includes jig and scope capacitance (minimum).

AC test conditions

Input pulse levels	GND to 3.0 V
Input rise and fall times	5 ns
Input timing reference levels	1.5 V
Output reference levels	1.5 V

FIGURE 3. Output load circuit and ac test conditions.

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SIZE
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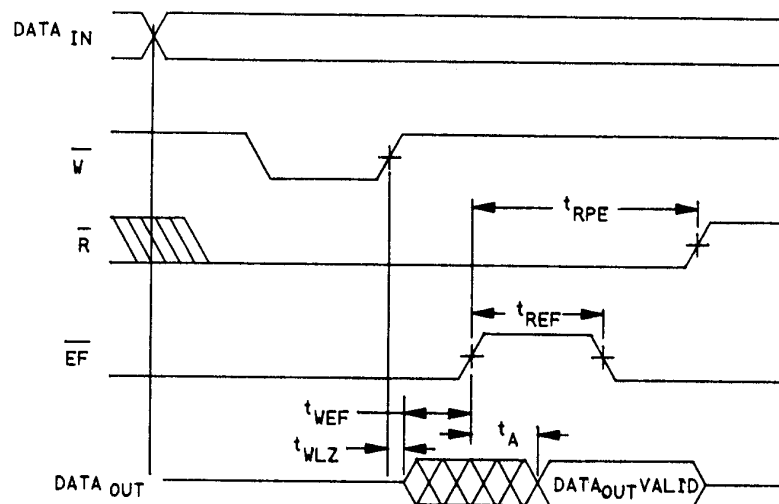
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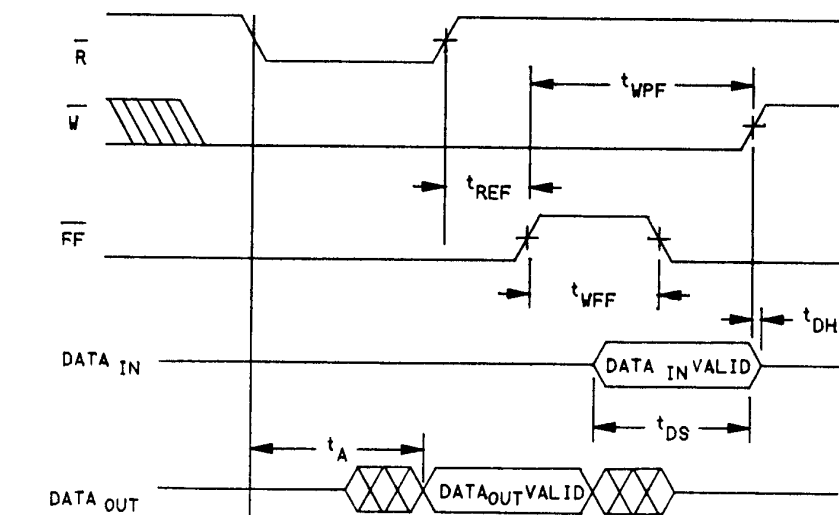
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READ DATA FLOW-THROUGH MODE



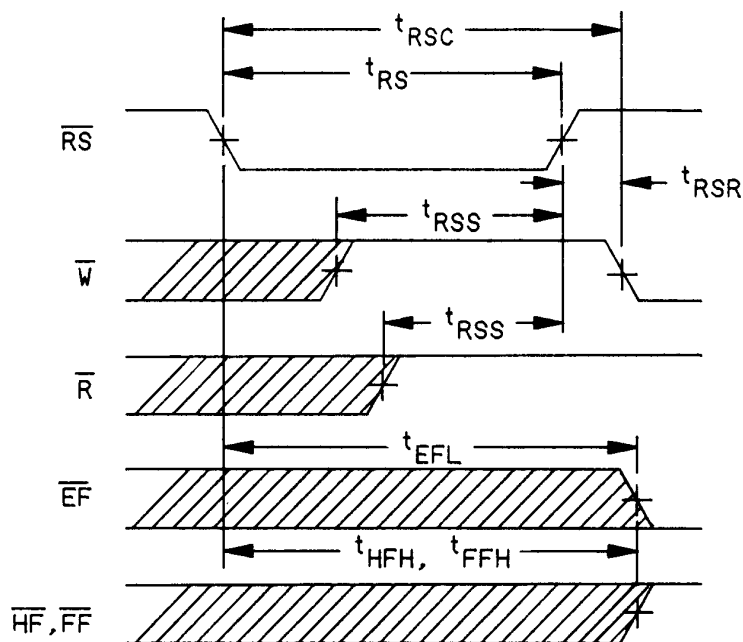
WRITE DATA FLOW-THROUGH MODE

FIGURE 4. Timing waveforms.

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NOTES:

1. EF, FF, and HF may change status during RESET, but flags will be valid at t_{RSC} .
2. $\overline{W}$ and $\overline{R} = V_{IH}$ around the rising edge of RS.

RESET

FIGURE 4. Timing waveforms - Continued.

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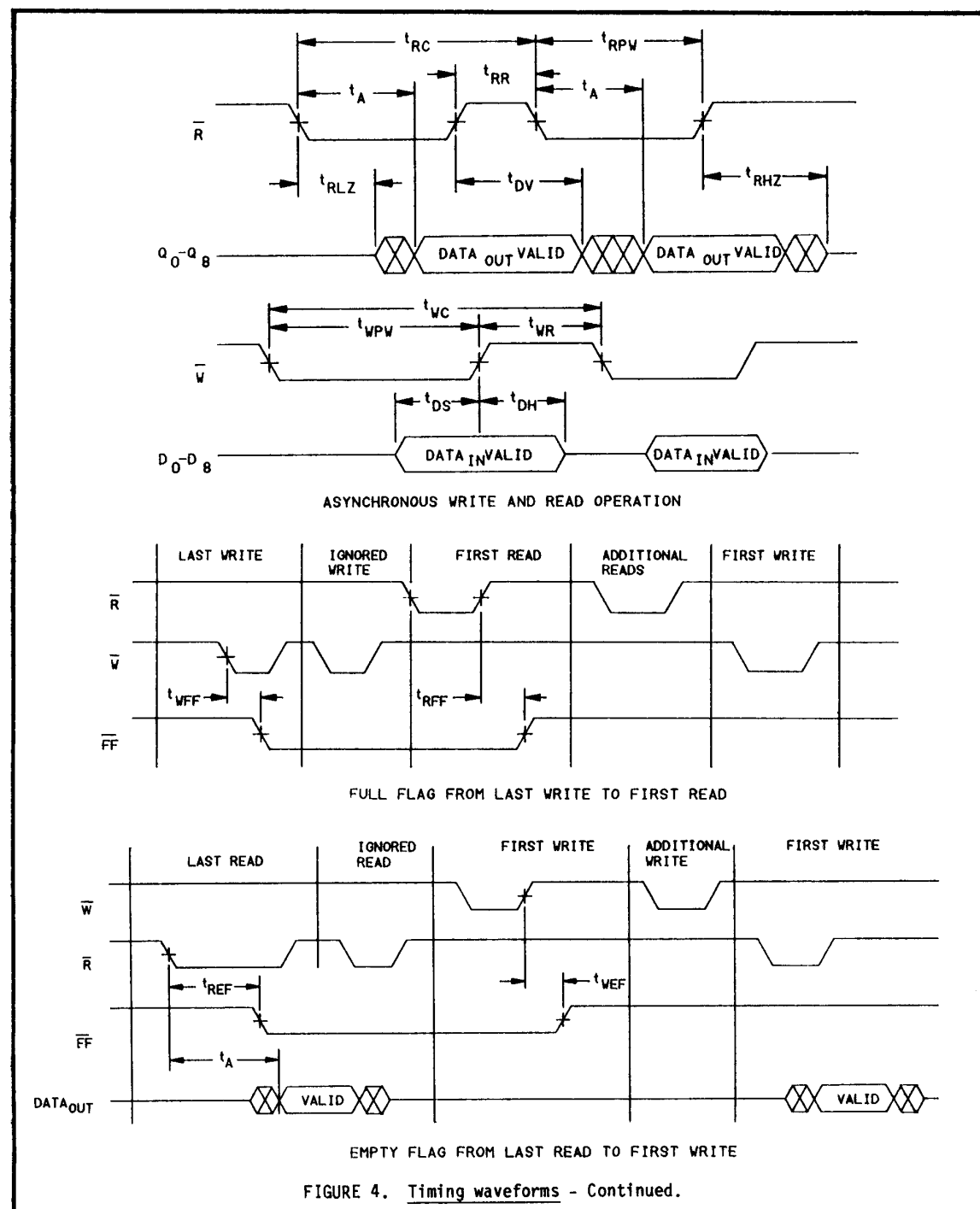
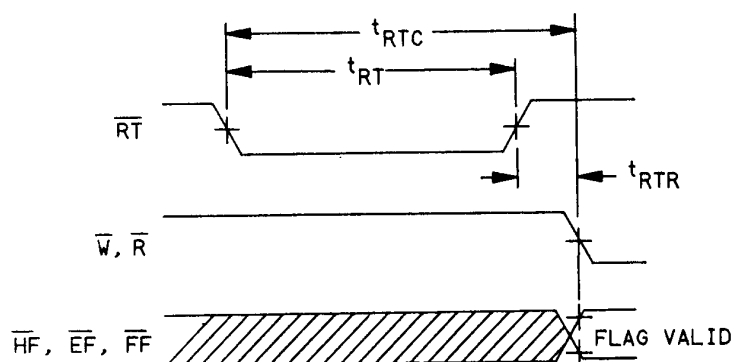


FIGURE 4. Timing waveforms - Continued.

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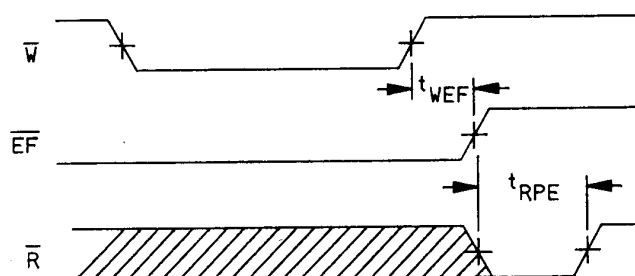
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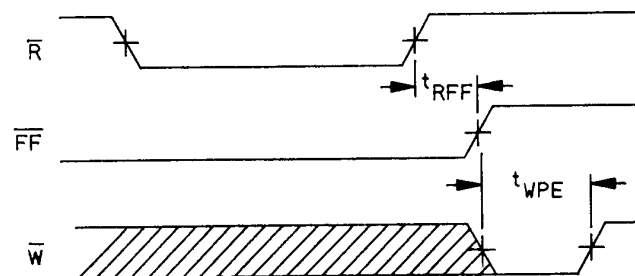


NOTE:
1. $\overline{EF}$, $\overline{FF}$, and $\overline{HF}$ may change status during RETRANSMIT, but flags will be valid to t_{RTC} .

RETRANSMIT



EMPTY FLAG TIMING



FULL FLAG TIMING

FIGURE 4. Timing waveforms - Continued.

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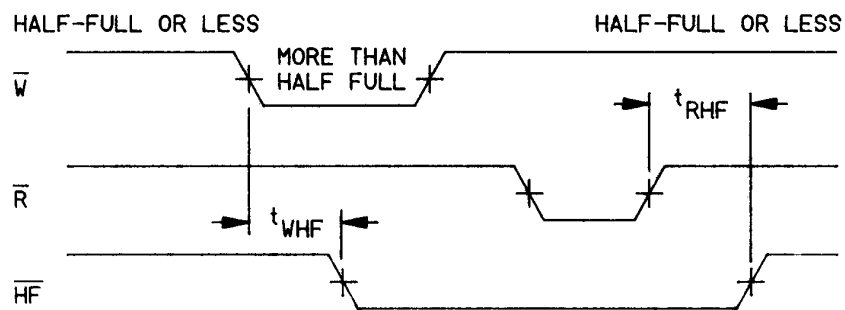
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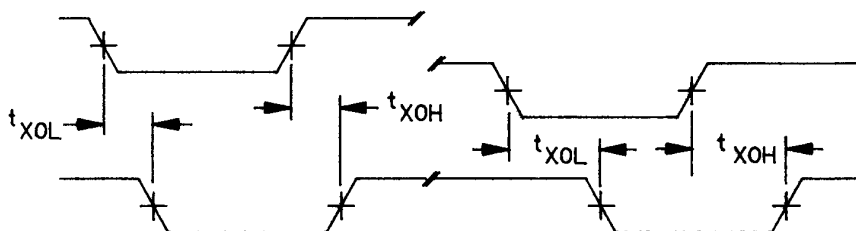
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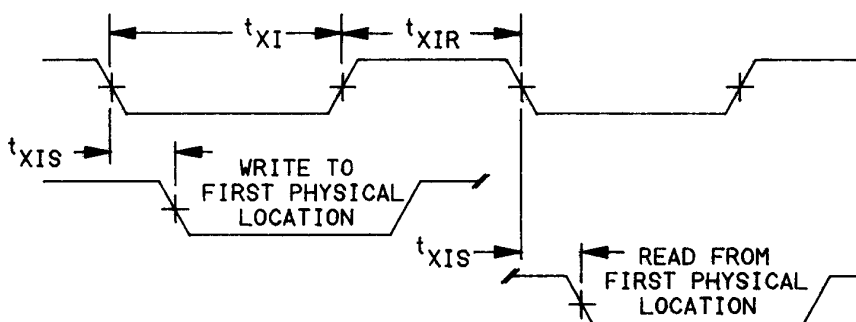
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HALF-FULL FLAG TIMING



EXPANSION OUT



EXPANSION IN

FIGURE 4. Timing waveforms - Continued.

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3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical test 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 PIN listed in 1.2 herein. In addition, the manufacturer's PIN 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-ECS 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-ECS 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).

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 C or D using the circuit submitted with the certificate of compliance (see 3.6 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 5 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} and C_{OUT} measurement) shall be measured only for the initial test and after any process or design changes which may affect capacitance. Sample size is 15 devices with no failures, and all inout and output terminals tested.

d. Subgroup 7 and 8 tests shall include verification of the truth table.

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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 C or D using the circuit submitted with the certificate of compliance (see 3.6 herein).
 - (2) $T_A = +125^{\circ}\text{C}$, 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)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 7*, 8, 9, 10, 11
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)	2, 3, 7, 8a, 8b

* PDA applies to subgroups 1 and 7

** See 4.3.1c.

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.

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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 the Defense Electronics Supply Center when a system application requires control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

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

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-87531
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