

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case outlines F and 2. Delete vendor CAGE 04713. Add output noise voltage test to table I, reference section. Change minimum limit for $V_{TH(SYNC)}$ test in table I, oscillator section. Editorial changes throughout.	94-02-28	M. A. FRYE

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

PMIC N/A	PREPARED BY D. H. JOHNSON	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444		
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY MICHAEL A. FRYE	MICROCIRCUIT, LINEAR, REGULATING, PULSE WIDTH MODULATOR, MONOLITHIC SILICON		
	APPROVED BY MICHAEL A. FRYE			
	DRAWING APPROVAL DATE 89-04-27	SIZE A	CAGE CODE 67268	5962-89511
	REVISION LEVEL A	SHEET 1 OF 13		

DESC FORM 193
JUL 91

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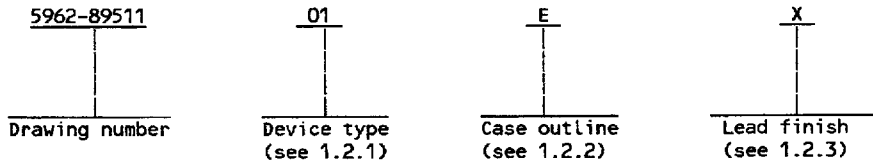
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1. SCOPE

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 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:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	1525A	Regulating pulse width modulator
02	1527A	Regulating pulse width modulator
03	UC1525A	Regulating pulse width modulator
04	UC1527A	Regulating pulse width modulator

1.2.2 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
E	GDIP1-T16 or CDIP2-T16	16	Dual-in-line
F	GDFP2-F16 or CDFP3-F16	16	Flat pack
2	CQCC1-N20	20	Square Leadless chip carrier

1.2.3 Lead finish. The lead finish shall be as specified in MIL-STD-883 (see 3.1 herein). Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specification when finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Input voltage ($+V_{IN}$)	+40 V dc
Collector voltage (V_C)	+40 V dc
Logic inputs range	-0.3 V dc to +5.5 V dc
Analog inputs range	-0.3 V dc to $+V_{IN}$
Output current, source or sink	500 mA
Reference output current	50 mA
Oscillator charging current	5 mA
Maximum power dissipation (P_D) ^{1/}	1,000 mW
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+150°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA}):	
Cases E and F	100°C/W
Case 2	70°C/W

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

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 2

DESC FORM 193A
JUL 91

74E ■ 9004708 0000167 211 ■

1.4 Recommended operating conditions.

Input voltage (+V _{IN})	+8 V dc to +35 V dc
Collector voltage (V _C)	+4.5 V dc to +35 V dc
Sink/source load current (steady-state)	0 mA to 100 mA
Sink/source load current (peak)	0 mA to 400 mA
Reference load current range	0 mA to 20 mA
Oscillator frequency range	100 Hz to 350 kHz
Oscillator timing resistor (R _T)	2 kΩ to 200 kΩ
Oscillator timing capacitor range (C _T)	470 pF to 0.1 μF
Ambient operating temperature range (T _A)	-55°C to +125°C

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-I-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
 MIL-STD-1835 - Microcircuit Case Outline

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. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-I-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-I-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-I-38535 is required to identify when the QML flow option is used.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 3

DESC FORM 193A
 JUL 91

74E ■ 9004708 0000168 158 ■

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-STD-883 (see 3.1 herein) 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 Logic diagram. The logic diagrams shall be as specified on figure 2.

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 ambient 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 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-EC 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-EC 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.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 4

DESC FORM 193A
JUL 91

74E ■ 9004708 0000169 094 ■

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C unless otherwise specified 1/	Device types	Group A subgroups	Limits 2/		Unit
					Min	Max	
Reference section							
Reference voltage out	V _{REF}		ALL	1	5.05	5.15	V
				2,3	5.0	5.2	
Line regulation	V _{RLINE}	V _{IN} = 8 V to 35 V	ALL	1,2,3	-30	30	mV
Load regulation	V _{LOAD}	I _L = 0 mA to 20 mA	ALL	1,2,3	-50	50	mV
Short-circuit current	I _{OS}	V _{REF} = 0 V, t < 25 ms, T _A = +25°C	ALL	1	-100		mA
Output noise voltage	N _O	10 Hz ≤ f ≤ 10 kHz, 3/ T _A = +25°C	ALL	7		200	μVrms
Oscillator section							
Initial accuracy	F _{OSC}	T _A = +25°C	ALL	4	37.5	42.5	kHz
Oscillator accuracy over temperature	F _{OSC} (OT)	T _A = -55°C and +125°C	ALL	5, 6	35.2	44.8	kHz
Voltage stability	V _{STAB}	V _{IN} = 8 V to 35 V	ALL	4,5,6		±1	%
Clock pulse amplitude	V _{OSC}	3/	ALL	4,5,6	3		V
Clock pulse width	t _{PW}	T _A = +25°C 3/	ALL	9	0.3	1.0	μs
Max oscillator frequency	F _{MAX}	R _T = 2 kΩ, C _T = .001 μF	01,02	4,5,6	300		kHz
		R _T = 2 kΩ, C _T = 470 μF	03,04		350		
Min oscillator frequency	F _{MIN}	R _T = 150 kΩ, C _T = 0.1 μF	01,02	4,5,6		150	Hz
		R _T = 200 kΩ, C _T = 0.1 μF	03,04			120	

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 5

DESC FORM 193A
JUL 91

74E ■ 9004708 0000170 806 ■

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55°C ≤ T _A ≤ +125°C unless otherwise specified	Device types	Group A subgroups	Limits 2/		Unit
					Min	Max	
Oscillator section - Continued.							
Threshold SYNC voltage	V _{TH} (SYNC)		ALL	1,2,3	1.2	2.8	V
SYNC input current	I _I (SYNC)	SYNC voltage = 3.5 V	ALL	1,2,3		2.5	mA
Pulse width modulator comparator section							
Min duty cycle	t _{ON(min)} t _{OSC}	V _{COMP} = 0.6 V	ALL	9,10,11		.001	%
Max duty cycle	t _{ON(max)} t _{OSC}	V _{COMP} = 3.6 V	ALL	9,10,11	45		%
Error amplifier section, V _{CM} = 5.1 V (unless otherwise specified)							
Input offset voltage	V _{IO}	R _S ≤ 2 kΩ	ALL	1,2,3	-5	5	mV
Input bias current	I _{IB}		ALL	1,2,3		10	μA
Input offset current	I _{IO}		ALL	1,2,3	-1	1	μA
DC open loop gain	A _{VOL}	T _A = +25°C, V _{CM} = 5.1 V, R _L ≥ 10 MΩ	ALL	4	60		dB
Output low level	V _{OL}		ALL	1,2,3		0.5	V
Output high level	V _{OH}		ALL	1,2,3	3.8		V
Common mode rejection ratio	CMRR	V _{CM} = 1.5 V to 5.2 V	ALL	1,2,3	60		dB
Power supply rejection ratio	PSRR	V _{IN} = 8 V to 35 V	ALL	4,5,6	50		dB

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 6

DESC FORM 193A
JUL 91

74E ■ 9004708 0000171 742 ■

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55°C ≤ T _A ≤ +125°C unless otherwise specified	Device types	Group A subgroups	Limits 2/		Unit
					Min	Max	

Error amplifier section, V_{CM} = 5.1 V (unless otherwise specified) - Continued.

Unity gain bandwidth	GBW	A _V = 0 dB, T _A = +25°C 3/	ALL	7	1		MHz
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Soft start section

Soft start current	I _{SS}	V _{SD} = 0 V	ALL	1,2,3	25	80	μA
Soft start voltage	V _{SS}	V _{SD} = 2.5 V	ALL	1,2,3		0.7	V
Shutdown input current	I _{SD}	V _{SD} = 2.5 V	ALL	1,2,3		1.0	mA
Shutdown threshold voltage	V _{TH}	To outputs, V _{SS} = 5.1 V, T _A = +25°C	03,04	4	0.6		V

Output section (each output), V_C = +20 V (unless otherwise specified)

Output low level	V _{OL}	I _{SINK} = 20 mA	ALL	1,2,3		0.4	V
		I _{SINK} = 100 mA				2.2	
Output high level	V _{OH}	I _{SOURCE} = -20 mA	ALL	1,2,3		18	V
		I _{SOURCE} = -100 mA				17	
Under voltage lockout	V _{UL}	V _{COMP} and V _{SS} = high	ALL	1,2,3	6	8	V
Shutdown delay	t _{SD}	V _{SD} = 3 V, T _A = +25°C 3/	01,02	9		500	ns
		V _{SD} = 2.5 V, T _A = +25°C 3/	03,04			500	
Rise time	t _r	C _L = 1 nF, T _A = +25°C 3/	ALL	9		600	ns

See footnotes at end of table.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 7

DESC FORM 193A
JUL 91

74E ■ 9004708 0000172 689 ■

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions ^{1/} -55°C ≤ T _A ≤ +125°C Unless otherwise specified	Device types	Group A subgroups	Limits ^{2/}		Unit
					Min	Max	
Output section (each output), V _C = +20 V (unless otherwise specified) - Continued.							
Collector fall time	t _f	C _L = 1 nF, T _A = +25°C ^{3/}	ALL	9		300	ns
V _C off current	I _{VC} (off)	V _C = 35 V	01,03	1,2,3		200	μA
Total standby current section							
Supply current	I _S	V _{IN} = 35 V	ALL	1,2,3		20	mA

^{1/} Unless otherwise specified, +V_{IN} = 20 V, R_T = 3.6 kΩ, C_T = 0.01 μF, and R_D = ∞Ω.

^{2/} The algebraic convention, whereby the most negative value is a minimum and the most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.

^{3/} If not tested, shall be guaranteed to the limits specified in table I herein.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE ▲		5962-89511
		REVISION LEVEL A	SHEET 8

DESC FORM 193A
JUL 91

74E ■ 9004708 0000173 515 ■

Device types	01, 02, 03, and 04	
Case outlines	E and F	2
Terminal number	Terminal symbol	
1	INVERTING INPUT	NC
2	NONINVERTING INPUT	INVERTING INPUT
3	SYNC	NONINVERTING INPUT
4	OSCILLATOR OUTPUT	SYNC
5	C_T	OSCILLATOR OUTPUT
6	R_T	NC
7	DISCHARGE	C_T
8	SOFT-START	R_T
9	COMPENSATION	DISCHARGE
10	SHUTDOWN	SOFT-START
11	OUTPUT A	NC
12	GROUND	COMPENSATION
13	V_C	SHUTDOWN
14	OUTPUT B	OUTPUT A
15	$+V_{IN}$	GROUND
16	V_{REF}	NC
17	---	V_C
18	---	OUTPUT B
19	---	$+V_{IN}$
20	---	V_{REF}

NC = No connection

FIGURE 1. Terminal connections.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 9

DESC FORM 193A
 JUL 91

74E ■ 9004708 0000174 451 ■

Device types 01 and 02

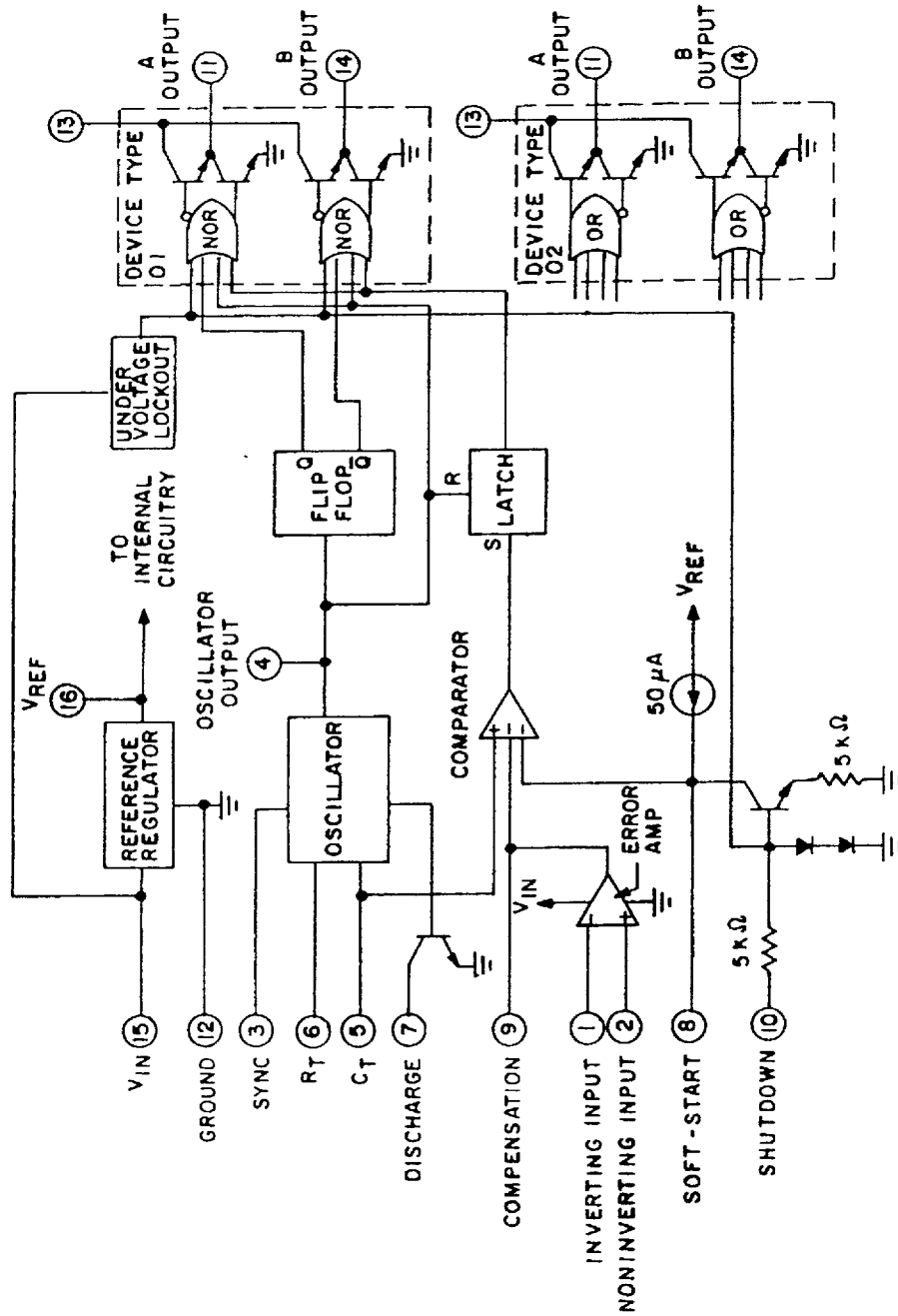


FIGURE 2. Logic diagram.

STANDARDIZED
MILITARY DRAWING
DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

SIZE
A

5962-89511

REVISION LEVEL
A

SHEET
10

DESC FORM 193A
JUL 91

74E ■ 9004708 0000175 398 ■

Device types 03 and 04

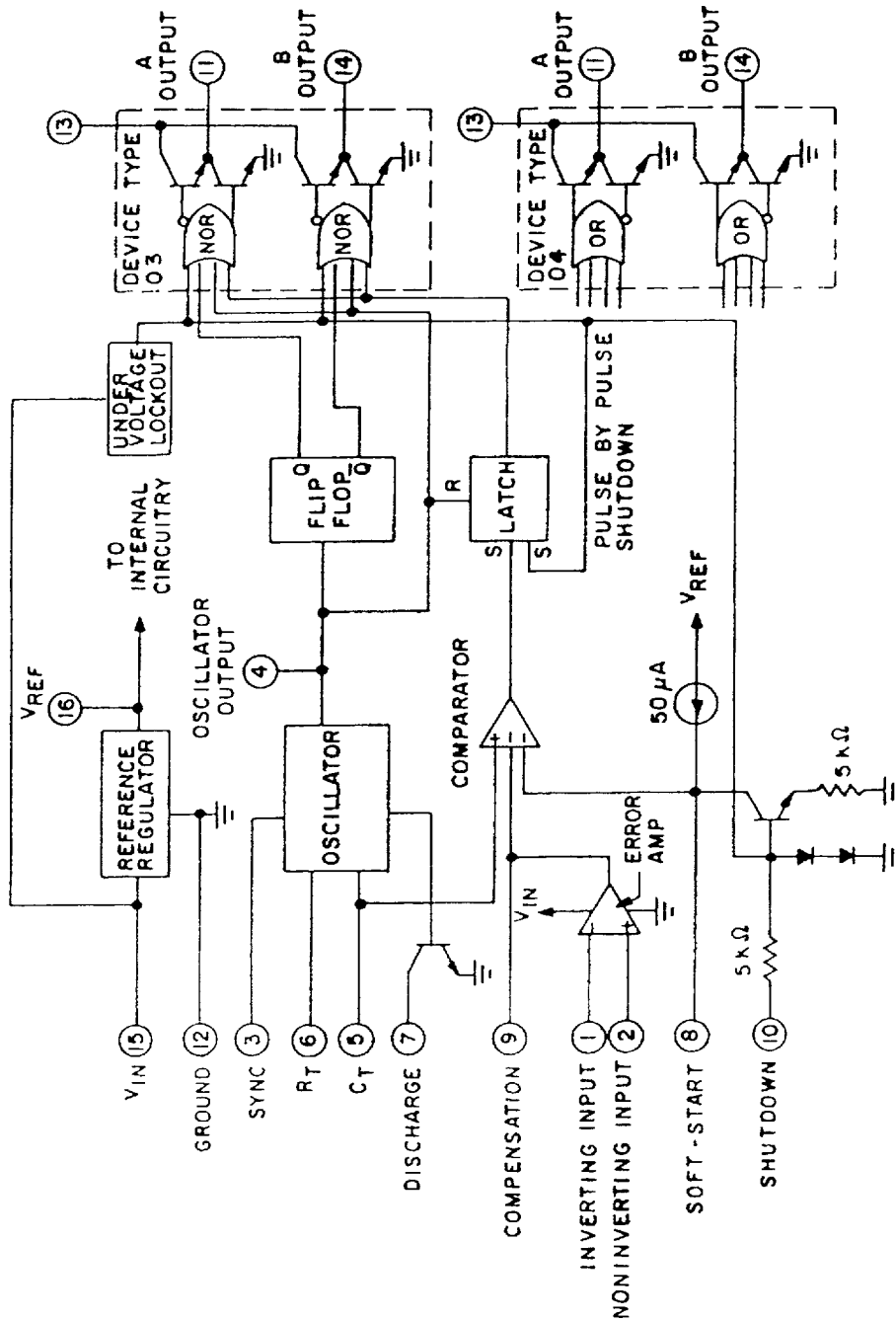


FIGURE 2. Logic diagram - Continued.

STANDARDIZED
MILITARY DRAWING
DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

SIZE
A

5962-89511

REVISION LEVEL
A

SHEET
11

DESC FORM 193A
JUL 91

74E ■ 9004708 0000176 224 ■

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, output, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(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. Subgroup 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, output, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

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

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

5. PACKAGING

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

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 12

DESC FORM 193A
JUL 91

74E ■ 9004708 0000177 160 ■

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3, 4, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 7, 9, 10, 11
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

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 original equipment manufacturer 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.

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 coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5377.

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-EC.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89511
		REVISION LEVEL A	SHEET 13

DESC FORM 193A
 JUL 91

74E ■ 9004708 0000178 0T7 ■