MIL-M-38510/119A
7 August 1987
SUPERSEDING
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11 January 1980

MILITARY SPECIFICATION

MICROCIRCUITS, LINEAR, LOW POWER, LOW NOISE, BI-FET OPERATIONAL AMPLIFIERS, MONOLITHIC SILICON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, BI-FET operational amplifiers. Two product assurance classes and a choice of case outline and lead finish are provided for each type and are reflected in the complete part number.

1.2 Part number. The part number shall be in accordance with MIL-M-38510.

1.2.1 Device type. The BI-FET operational amplifiers shall be internally compensated and shall be distinguished by the following circuit characteristics:

Device type	Circuit
01	Single operational amplifier, BI-FET, low power
02	Dual operational amplifier, BI-FET, low power
03	Quad operational amplifier, BI-FET, low power
04	Single operational amplifier, BI-FET
05	Dual operational amplifier, BI-FET
06	Quad operational amplifier, BI-FET

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outline. The case outline shall be designated as follows:

Outline letter	MIL-M-38510, appendix C, case outline
C	D-1 (14-lead, 1/4" X 3/4"), dual-in-line package
D	F-2 (14-lead, 1/4" X 3/8"), flat package
G	A-1 (8-lead can)
H	F-4 (10-lead, 1/4" x 1/4"), flat package
P	D-4 (8-lead, 1/4" X 3/8"), dual-in-line package

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Air Development Center, RADC(RBE-2), Griffiss AFB, NY 13441, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5962

1.3 Absolute maximum ratings.

Supply voltage range	±18 V
Input voltage range 1/	±15 V
Differential input voltage range	±30 V
Storage temperature range	-65°C to +150°C
Output short-circuit duration	Unlimited 2/
Lead temperature (soldering, 60 seconds)	+300°C
Junction temperature (T_J)	+175°C 3/

1.4 Recommended operating conditions.

Supply voltage range	±5 to ±15 V dc
Ambient temperature range (T_A)	-55°C to +125°C

1.5 Power and thermal characteristics.

Package	Case outline	Maximum allowable power dissipation	Maximum θ_{JC}	Maximum θ_{JA}
14-lead dual-in-line	C	400 mW at T_A = +125°C	35°C/W	120°C/W
14-lead flat package	D	350 mW at T_A = +125°C	60°C/W	140°C/W
8-lead can	G	330 mW at T_A = +125°C	40°C/W	150°C/W
10-lead flat package	H	290 mW at T_A = +125°C	70°C/W	170°C/W
8-lead dual-in-line	P	400 mW at T_A = +125°C	35°C/W	120°C/W

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specification and standard. The following specification and standard form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

1/ The absolute maximum negative input voltage is equal to the negative power supply voltage.
2/ Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.
3/ For short term test (in the specific burn-in and steady-state life test configuration when required and up to 168 hours maximum), T_J = +275°C.

3. REQUIREMENTS

3.1 Detail specifications. The individual item requirements shall be in accordance with MIL-M-38510, 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 1.2.3 herein.

3.2.1 Terminal connections. Terminal connections shall be as specified on figure 1.

3.2.2 Typical schematic circuit. The typical schematic circuits shall be as specified on figure 2.

3.2.3 Schematic circuits. The schematic circuits shall be submitted to the preparing activity prior to inclusion of manufacturer's device in this specification and shall be submitted to the qualifying activity and agent activity (DESC-ECS) as a prerequisite for qualification. All qualified manufacturer's schematics shall be maintained by the agent activity and will be available upon request.

3.3 Lead material and finish. Lead material and finish shall be in accordance with MIL-M-38510.

3.4 Electrical performance characteristics. The electrical performance characteristics shall be as specified in table I and, unless otherwise specified, apply over the full operating ambient temperature range for supply voltages from ±5 to ±15 V dc. Unless otherwise specified, source resistance (R_S) shall be 50 ohms for all tests. For dual and quad packages, the idle devices shall be connected as grounded followers.

3.4.1 Offset null circuits. The nulling inputs shall be capable of being nulled 1 mV beyond the specified offset voltage limits for $-55°C \leq T_A \leq 125°C$ using the circuit of figure 3.

3.4.2 Instability oscillations. The devices shall be free of oscillations when operated in the test circuits of this specification.

3.5 Electrical test requirements. The electrical test requirements for each device class shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III.

3.6 Marking. Marking shall be in accordance with MIL-M-38510 and 1.2 herein.

3.6.1 Serialization. All class S devices shall be serialized in accordance with MIL-M-38510.

3.6.2 Correctness of indexing and markings. All devices shall be subjected to the final electrical tests specified in table II after part marking to verify that they are correctly indexed and identified by part number. Optionally, an approved electrical test may be devised especially for this requirement.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 85 (see MIL-M-38510, appendix E).

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007, as applicable, 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 qualification and quality conformance inspection. The following additional criteria shall apply:

a. Burn-in (method 1015 of MIL-STD-883).

(1) For class S devices: Test condition D using the circuit shown on figure 4.

(2) For class B devices: Test condition D using the circuit shown on figure 4, or test condition C using the circuit shown on figure 5, or test condition F using the circuit shown on figure 6.

b. Reverse bias burn-in (method 1015 of MIL-STD-883). This screen test shall apply to class S devices only using the circuit shown on figure 5.

c. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameters test prior to burn-in is optional at the discretion of the manufacturer.

d. Percent defective allowable (PDA) for class S and class B devices shall be as specified in MIL-M-38510, based on failures from group A, subgroup 1 test after cooldown as final electrical test in accordance with method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroup 1 after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent defective for that lot, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

If accelerated high-temperature test conditions are used, the device manufacturer shall ensure that at least 85 percent of the applied voltage is dropped across the device at temperature. The device is not considered functional under accelerated test conditions.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

a. Subgroups 9, 10, and 11 shall be omitted.

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

c. Subgroup 12 shall be added to group A inspection as shown in table III herein. The LTPD for subgroup 12 shall be 5 for all classes.

TABLE I. Electrical performance characteristics.

Characteristics	Symbol	Conditions $\pm V_{CC}$ = ±15 V (see 3.4 and figure 7, unless otherwise specified)		Device types	Limits Min	Limits Max	Unit
Input offset voltage	V_{IO}	$\pm V_{CC}$ = ±5 V at V_{CM} = 0 V, and $\pm V_{CC}$ = ±15 V at V_{CM} = ±11 V, 0 V	T_A = +25°C	All	-5	5	mV
			-55°C ≤ T_A ≤ +125°C	All	-7	7	mV
Input offset voltage temperature sensitivity	$\frac{\Delta V_{IO}}{\Delta T}$	V_{CM} = 0 V		All	-30	30	µV/°C
Input offset current	I_{IO} 1/	V_{CM} = 0 V; t ≤ 25 ms	T_J = +25°C	All	-100	100	pA
			T_J = +125°C	All	-20	20	nA
Input bias current	$+I_{IB}$	V_{CM} = +11 V; t ≤ 25 ms	T_J = +25°C	All	-200	1,200	pA
			T_J = +125°C	All	-10	70	nA
	$-I_{IB}$ 2/	$\pm V_{CC}$ = ±15 V; V_{CM} = 0 V; t ≤ 25 ms	T_J = +25°C	All	-200	200	pA
			T_J = +125°C	All	-10	50	nA
	3/	V_{CM} = -11 V; t ≤ 25 ms	T_J = +25°C	All	-400	200	pA
			T_J = +125°C	All	-10	50	nA
Power supply rejection ratio	+PSRR	$+V_{CC}$ = 20 V, 10 V; $-V_{CC}$ = -15 V		All	80		dB
	-PSRR	$+V_{CC}$ = 15 V; $-V_{CC}$ = -20 V, -10 V		All	80		dB
Input voltage common mode rejection 4/	CMR	-11 V ≤ V_{CM} ≤ 11 V		All	80		dB
Adjustment for input offset voltage 5/	V_{IO} ADJ(+)	V_{CM} = 0 V		01,02, 04,05	+8		mV
	V_{IO} ADJ(-)	V_{CM} = 0 V		01,02, 04,05		-8	mV
Output short circuit current (for positive output) 6/	$I_{OS}(+)$	t ≤ 25 ms (short circuit to ground)		01,02, 03	-40		mA
				04,05, 06	-80		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Characteristics	Symbol	Conditions $\pm V_{CC}$ = ±15 V (see 3.4 and figure 7, unless otherwise specified)		Device types	Limits Min	Limits Max	Unit
Output short circuit current (for negative output) 6/	$I_{OS}(-)$	t ≤ 25 ms (short circuit to ground)		01,02, 03		40	mA
				04,05, 06		80	
Supply current (per amplifier)	I_{CC}		T_A = -55°C	01,02, 03		0.3	mA
				04,05, 06		4.0	
			+25°C ≤ T_A ≤ +125°C	01,02, 03		0.3	
				04,05, 06		3.5	
Output voltage swing (maximum)	$+V_{OP}$, $-V_{OP}$	R_L = 10 kΩ		All	±12		V
		R_L = 2 kΩ		04,05, 06	±10		
Open loop voltage gain (single ended) 7/	$A_{VS}(+)$	V_{OUT} 0 to 10 V 01-03, R_L = 10 kΩ	T_A = +25°C	01,02, 03	5		V/mV
				04,05, 06	50		
	$A_{VS}(-)$	V_{OUT} = -10 to 0 V 04-06, R_L = 2 kΩ	-55°C ≤ T_A ≤ +125°C	01,02, 03	4		
				04,05, 06	25		
Open loop voltage gain (single ended) 7/	A_{VS}	$\pm V_{CC}$ = ±5 V; R_L = 10 kΩ V_{OUT} = ±2 V		01,02, 03	3		V/mV
				04,05, 06	20		
Transient response rise time	TR(tr)	A_V = 1 V_{IN} = 50 mV; C_L = 100 pF (see figure 8)	R_L = 10 kΩ	01,02, 03		400	ns
			R_L = 2 kΩ	04,05, 06		200	
Transient response overshoot	TR(os)		R_L = 10 kΩ	01,02, 03		20	%
			R_L = 2 kΩ	04,05, 06		40	
Slew rate	SR(+) and SR(-)	V_{IN} = ±5 V; A_V = 1 (see figure 8)	T_A = +25°C	01,02, 03	.8		V/µs
				04,05, 06	7		
			T_A = -55°C, +125°C	01,02, 03	.7		
				04,05, 06	5		

See footnotes at end of table.

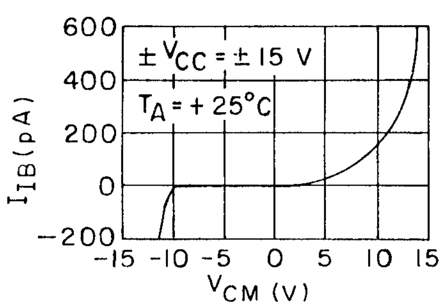
TABLE I. Electrical performance characteristics - Continued.

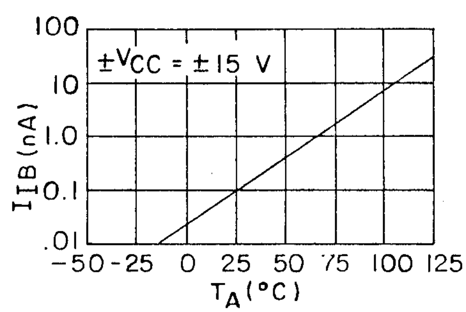
Characteristics	Symbol	Conditions $\pm V_{CC} = \pm 15$ V (see 3.4 and figure 7, unless otherwise specified)		Device types	Limits Min	Limits Max	Unit
Settling time	ts(+) and ts(-)	$T_A = +25°C$ (0.1 percent error) $A_V = 1$ (see figure 9)		01,02, 03		6,000	ns
				04,05, 06		1,500	
Noise (referred to input) broadband	N_I(BB)	Bandwidth = 10 kHz (see figure 10)	$T_A = +25°C$	All		15	µV rms
Noise (referred to input) popcorn	N_I(PC)		$T_A = +25°C$	All		80	µV pk
Channel separation 8/	CS	See figure 11	$T_A = +25°C$	02,03, 05,06	80		dB

1/ I_{IO} is calculated as the difference between $+I_{IB}$ and $-I_{IB}$.

2/ Bias current is actually junction leakage current which double (approximately) for each 10°C increase in junction temperature (T_J). To minimize thermal transient due to warm-up, measurements for bias current must be made within 25 ms after power is first applied to the device for test.

3/ Bias current is sensitive to power supply voltage, common mode voltage, and temperature as shown by the following typical curves:





4/ CMR is calculated from V_{IO} measurements at V_{CM} = +11 and -11 V.

5/ Offset adjustment pins do not exist for 8-pin dual and 14-pin quad packages.

6/ Continuous limits shall be considerably lower. Protection for shorts to either supply exists providing that $T_J(max) \leq 175°C$.

7/ Because of thermal feedback effects from output to input, open loop gain is not guaranteed to be linear or positive over the operating range. These requirements, if needed, should be specified by the user in additional acquisition documents.

8/ Channel separation is applicable only for the dual and quad devices.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirement	Subgroups (see table III) Class S devices	Class B devices
Interim electrical parameters (method 5004)	1	1
Final electrical test parameters (method 5004) 1/	1, 2, 3, 4	1, 2, 3, 4
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 7, 8, 12	1, 2, 3, 4 5, 6, 7, 8, 12
Group C end-point and group B, class S electrical parameters (method 5005)	1, 2, 3 and table IV delta limits	1 and table IV delta limits
Additional electrical sub-groups for group C periodic inspections	N/A	---
Group D end-point electrical parameters (method 5005)	1, 2, 3	1

1/ PDA applies to subgroup 1 (see 4.2d).

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883 and as follows:

a. End-point electrical parameters shall be as specified in table II herein. For class S devices, delta limits shall apply only to subgroup 5 of group B inspection.

b. Steady-state life test for class S devices shall be in accordance with table IIa of method 5005 of MIL-STD-883, using the circuit shown on figure 5. If the alternate burn-in conditions are used, the circuit shown on figure 4 shall be used.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 and as follows:

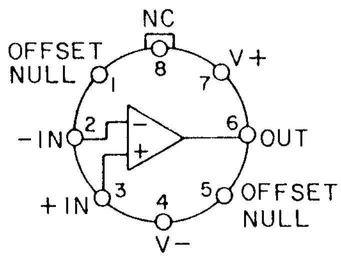
a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test for class B devices (method 1005 of MIL-STD-883). Test condition D using the circuit shown on figure 4 or test condition C using the circuit shown on figure 5, or test condition F using the circuit shown on figure 6.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

Device types 01 and 04

Case G

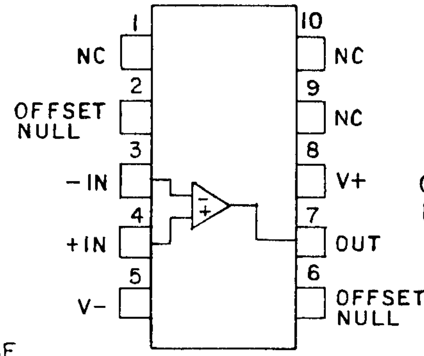


NOTE: PIN 4 CONNECTED TO CASE

8-PIN METAL CAN
(TOP VIEW)

Device types 01 and 04

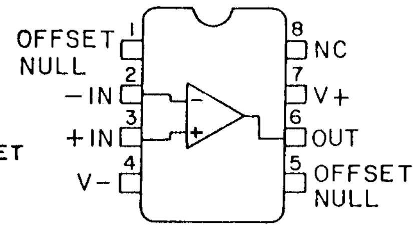
Case H



10-PIN FLAT PACK
(TOP VIEW)

Device types 01 and 04

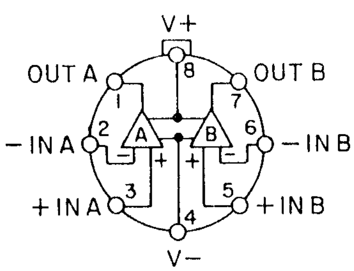
Case P



8-PIN MINI DIP
(TOP VIEW)

Device types 02 and 05

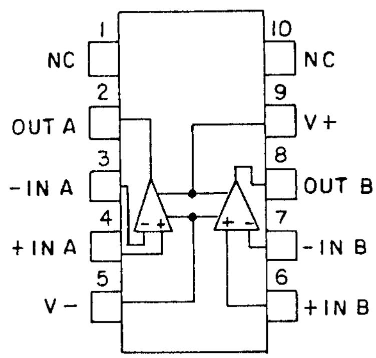
Case G



8-PIN METAL CAN
(Top view)

Device types 02 and 05

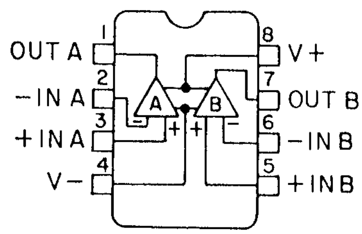
Case H



10-PIN FLAT PACK
(TOP VIEW)

Device types 02 and 05

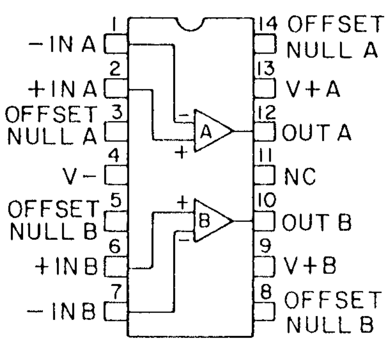
Case P



8-PIN MINI DIP
(Top view)

Device types 02 and 05

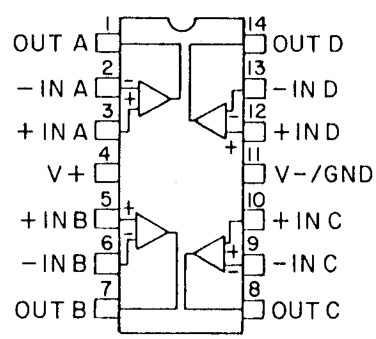
Case C



14-PIN DIP
(TOP VIEW)

Device types 03 and 06

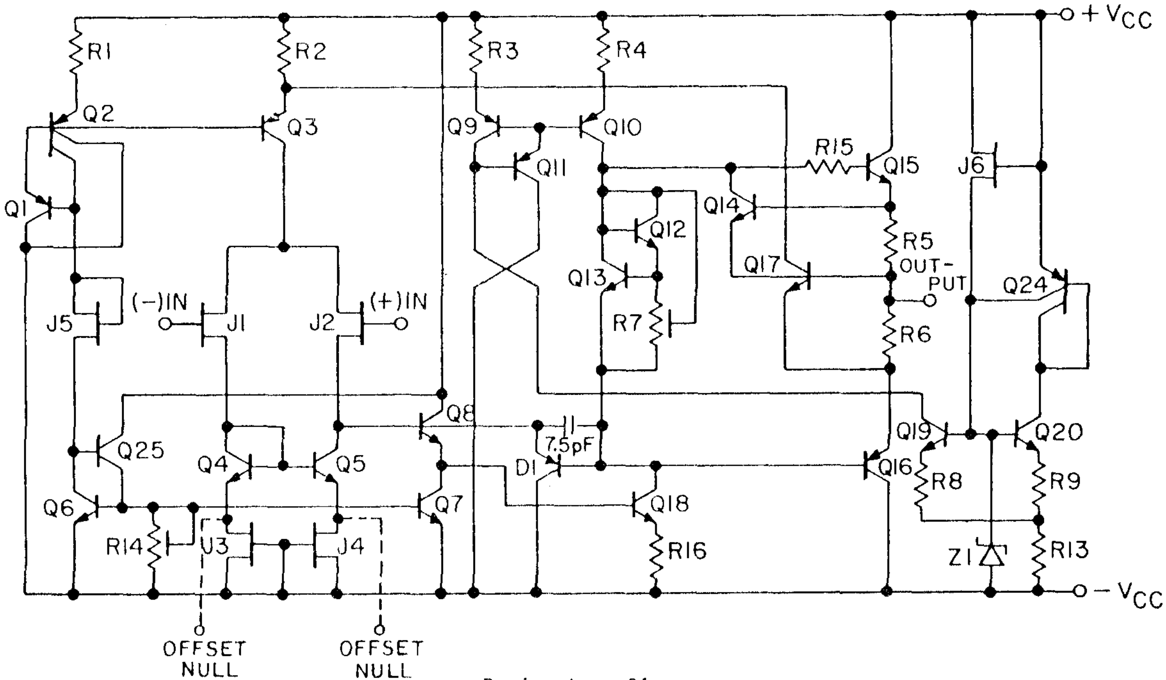
Cases C and D



14-PIN DIP OR
FLAT PACK
(TOP VIEW)

FIGURE 1. Terminal connections.

Device types 01, 02, and 03



Device type 04

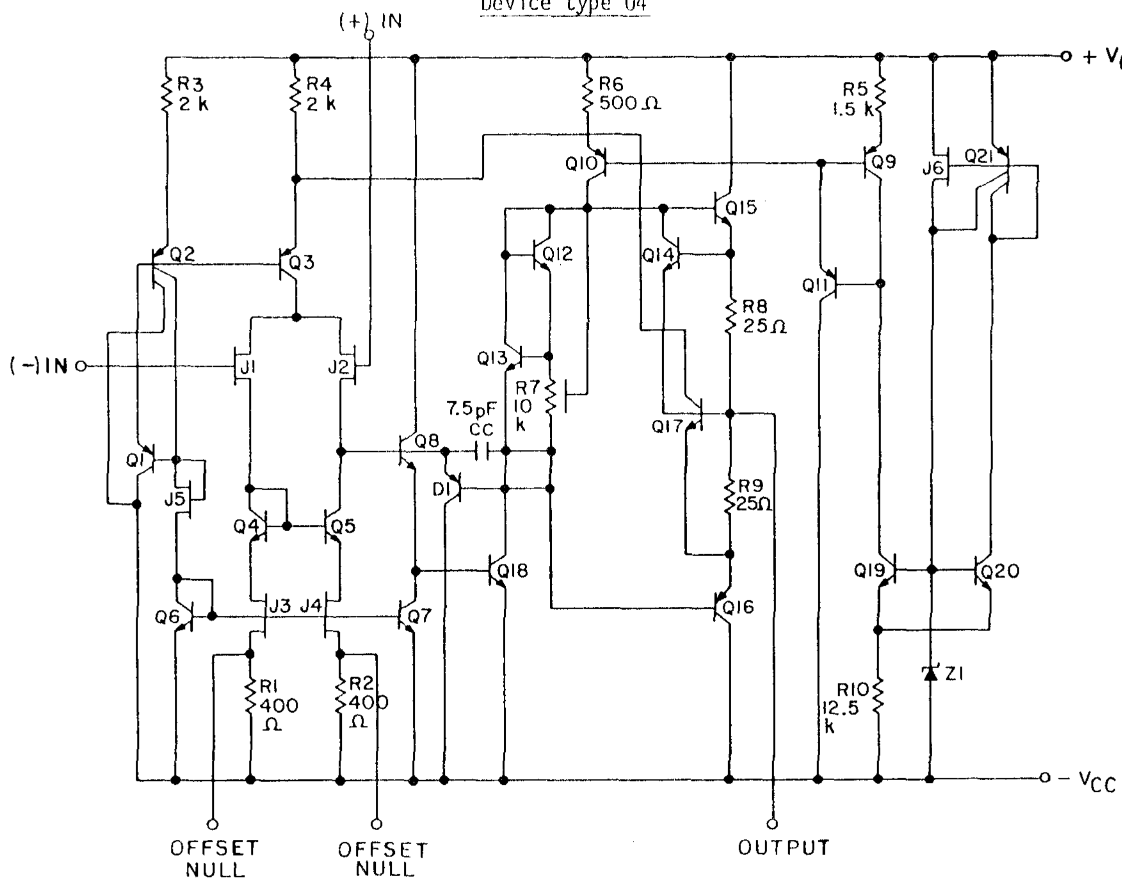
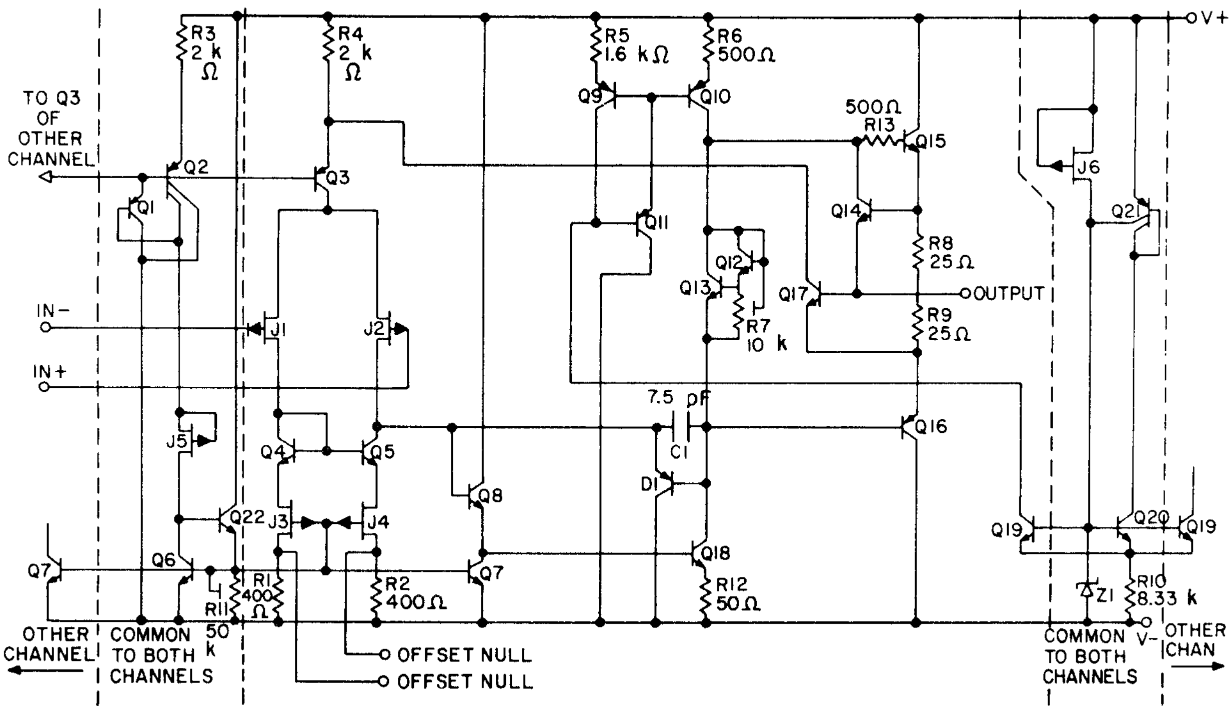


FIGURE 2. Typical schematic circuits.

Device type 05



Device type 06

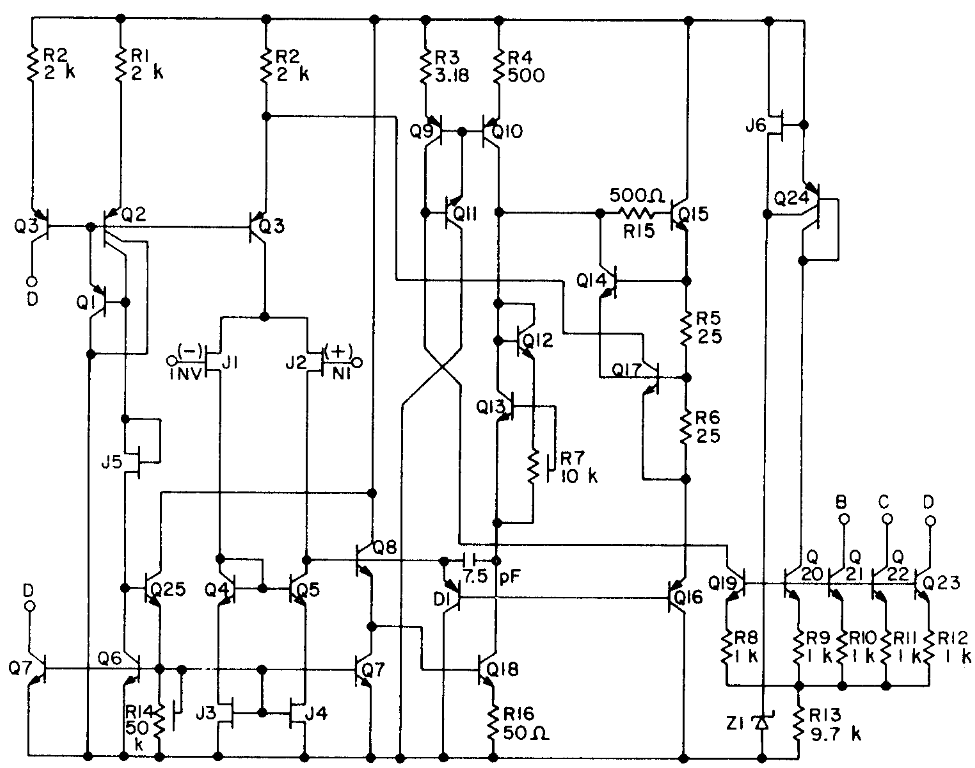
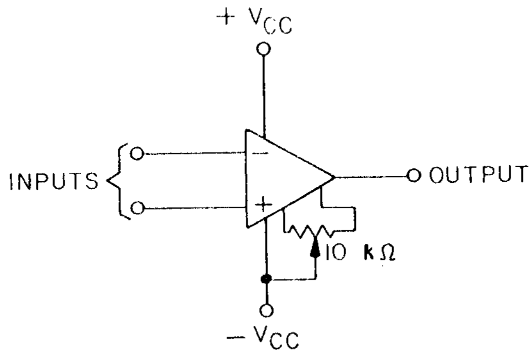
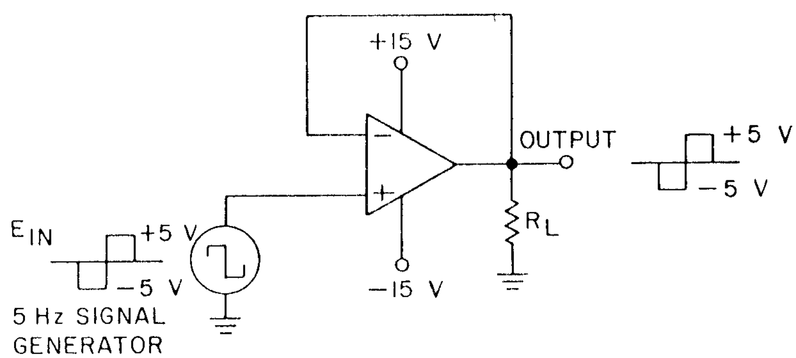


FIGURE 2. Typical schematic circuits - Continued.



NOTE: Available on device types 01 and 04.
Available on device types 02 and 05 in case outline C package only.

FIGURE 3. Offset null circuit.

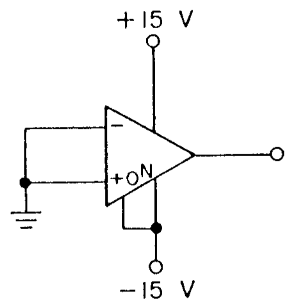


Conditions @ T_A = +125°C	
Device type	R_L
01, 02, 03	10 kΩ
04, 05, 06	2 kΩ

NOTES:
1. The actual measured value of the resistor selected shall not exceed a ±5 percent tolerance of its specified value due to use, heat, or age.
2. Each amplifier of the dual and quad devices shall be exercised simultaneously in the same manner.

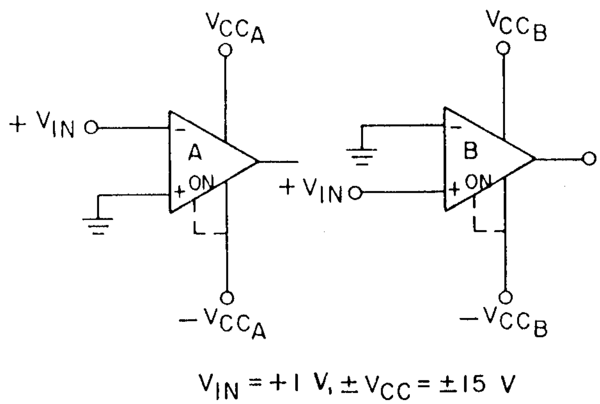
FIGURE 4. Test circuit for burn-in and steady state life tests.

Device types 01 and 04



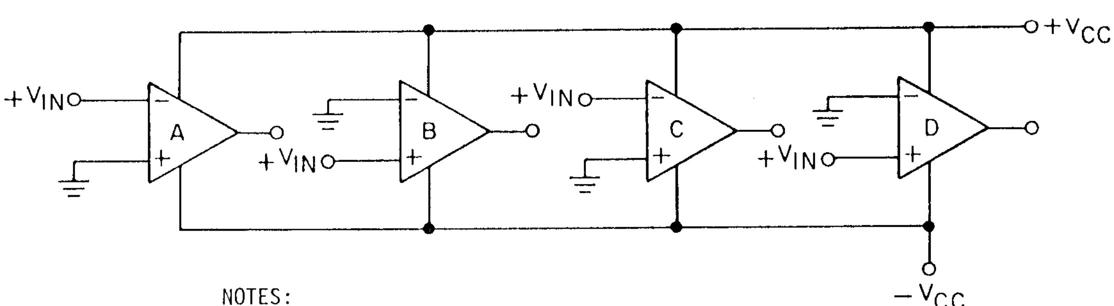
NOTES:
1. Either offset null pin shall be connected to $-V_{CC}$, if offset null pins are available.
2. Device shall not oscillate in test circuit.

Device types 02 and 05



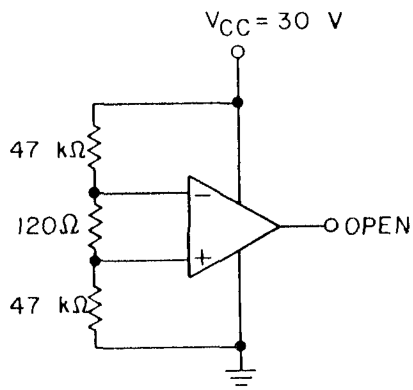
NOTES:
1. Either offset null pin shall be connected to $-V_{CC}$, if offset null pins are available.
2. Device shall not oscillate in test circuit.

Device types 03 and 06



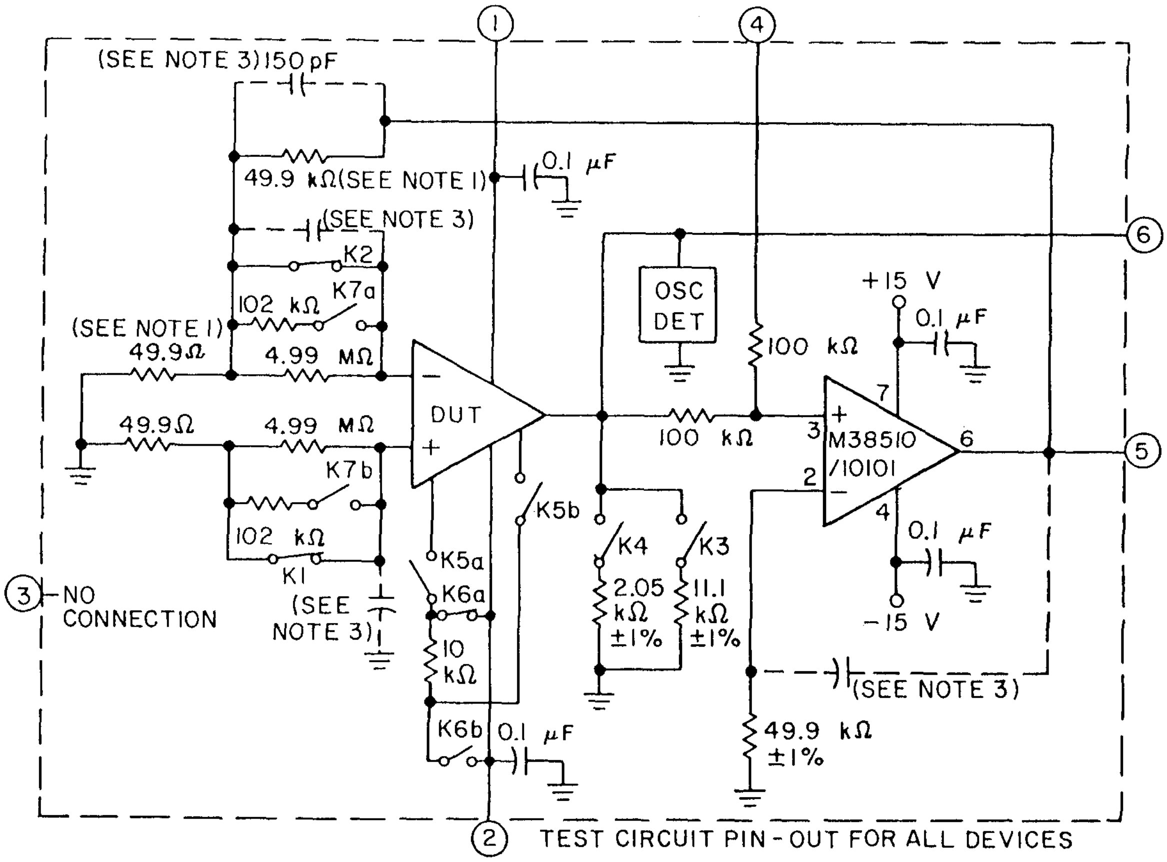
NOTES:
1. $V_{IN} = +1$ V; $\pm V_{CC} = \pm 15$ V.
2. Device shall not oscillate in test circuit.

FIGURE 5. Test circuit, burn-in (steady state power and reverse bias) and steady state life test.



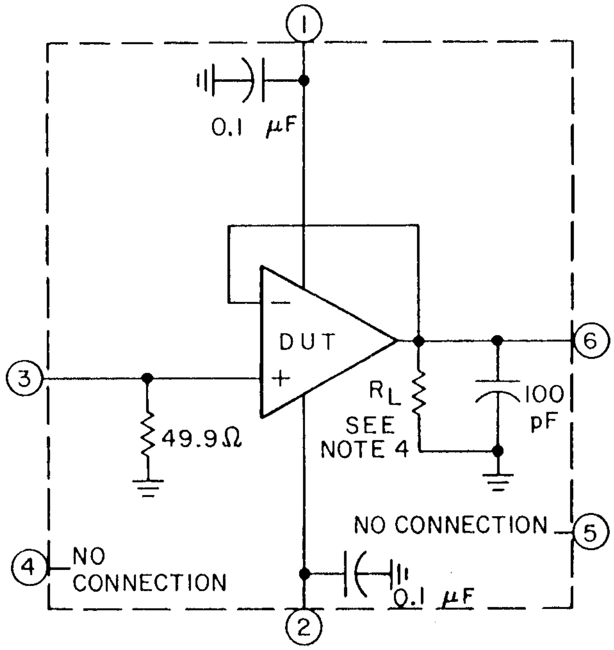
NOTES:
1. The actual measured value of the resistor selected shall not exceed a ±20 percent tolerance of its specified value due to use, heat, or age.
2. Each amplifier of the dual and quad devices shall be exercised simultaneously in the same manner.

FIGURE 6. Accelerated burn-in and life test circuit.



NOTES:
1. All resistors are ±0.1 percent tolerance and all capacitors are ±10 percent tolerance unless otherwise specified.
2. Precautions shall be taken to prevent damage to the DUT during insertion into socket and change of state of relays (i.e., disable voltage supplies, current limit $\pm V_{CC}$, etc.).
3. Compensation capacitors should be added as required for test circuit stability. Two general methods for stability compensation exist. One method is with a capacitor for nulling amplifier feedback. The other method is with a capacitor in parallel with the 49.9 kΩ closed loop feedback resistor. Both methods should not be used simultaneously. Proper wiring procedures shall be followed to prevent unwanted coupling and oscillations, etc. Loop response and settling time shall be consistent with the test rate such that any value has settled for at least 5 loop time constants before the value is measured.
4. Adequate settling time should be allowed such that each parameter has settled to within 5 percent of its final value.
5. All relays are shown in the normal deenergized state.
6. The nulling amplifier shall be a M38510/10101XXX. Saturation of the nulling amplifier is not allowed on tests where the E (pin 5) value is measured.
7. The load resistors 2050 Ω and 11.1 kΩ yield effective load resistances of 2 kΩ and 10 kΩ respectively.
8. Any oscillation greater than 300 mV in amplitude (peak-to-peak) shall be cause for device failure.
9. Selection relays for the dual and quad devices are not shown.

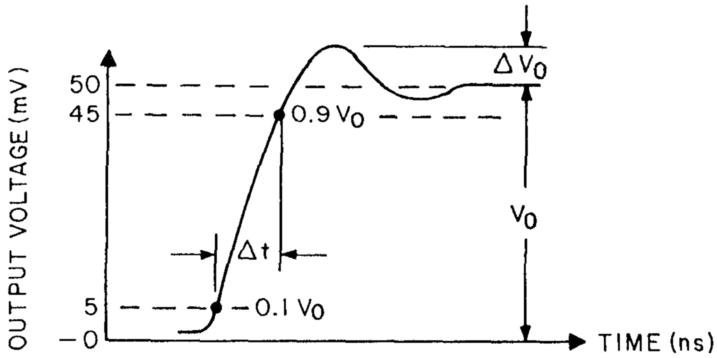
FIGURE 7. Test circuit for static tests.



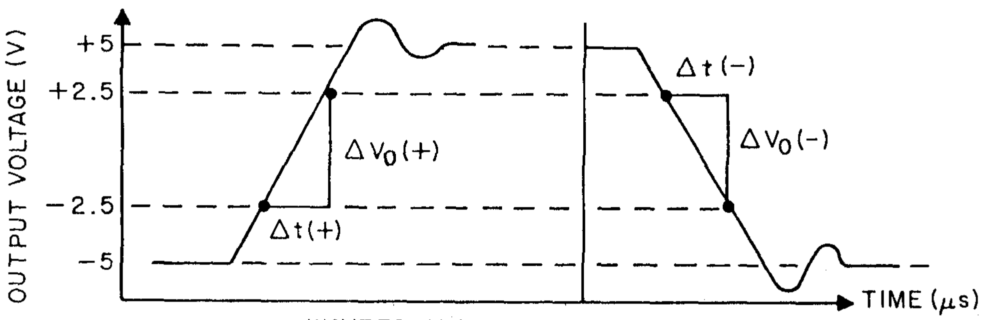
NOTES:

1. Resistors are ±1.0 percent tolerance and capacitors are ±10 percent tolerance.
2. Precautions shall be taken to prevent damage to the DUT during insertion into socket and in applying power.
3. Pulse input and output characteristics are shown on the next page.
4. For device types 01-03, R_L = 10 kΩ, for device types 04-06, R_L = 2 kΩ.
5. Selection circuitry for dual and quad devices is not shown.

FIGURE 8. Test circuit for transient response and slew rate.



WAVEFORM 1
(TRANSIENT RESPONSE)

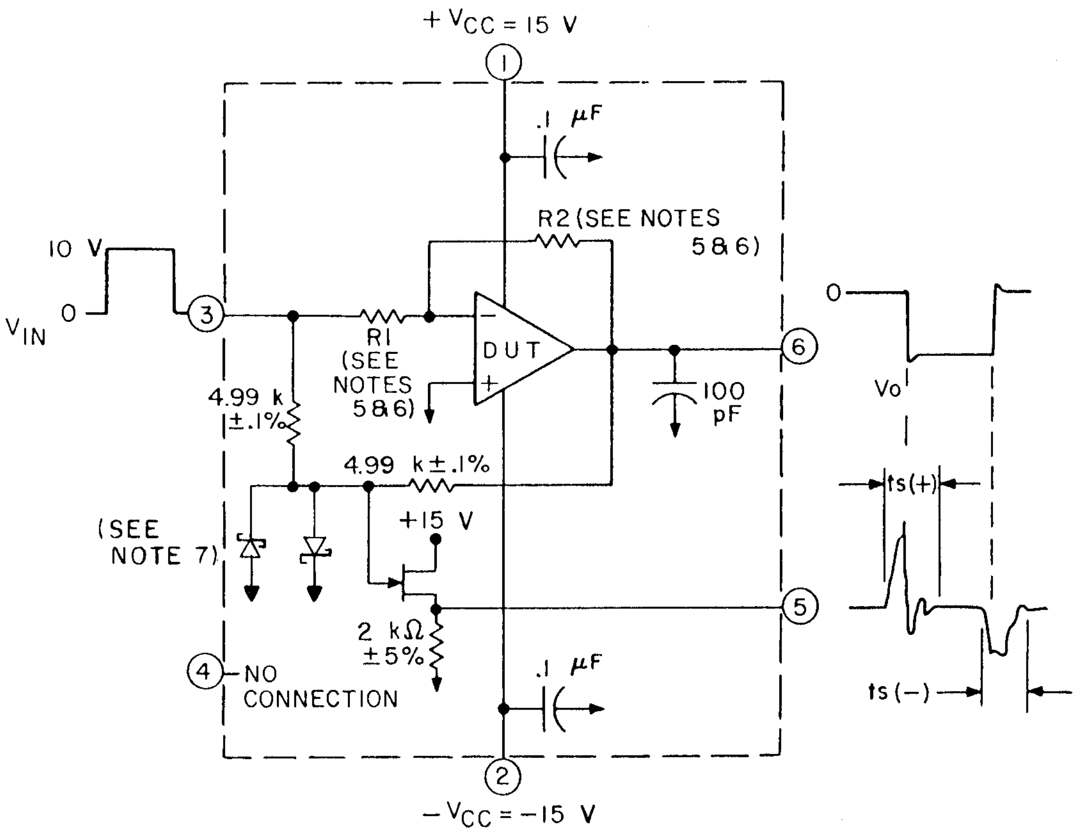


WAVEFORM 2
(POSITIVE SLEW RATE)

WAVEFORM 3
(NEGATIVE SLEW RATE)

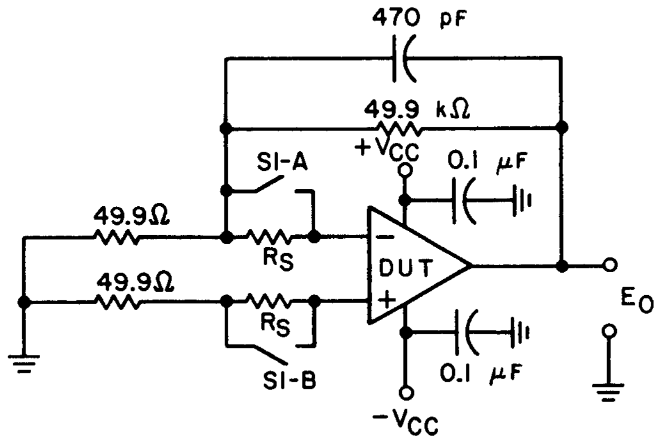
Parameter symbol	Input pulse signal at $t_r \leq$ 50 ns	Output pulse signal	Equation
TR (tr)	+50 mV	Waveform 1	TR (tr) = Δt
TR (os)	+50 mV	Waveform 1	TR (os) = 100 ($\Delta V_O / V_O$)%
SR (+)	-5 V to +5 V step	Waveform 2	SR (+) = $\Delta V_O(+) / \Delta t(+)$
SR (-)	+5 V to -5 V step	Waveform 3	SR (-) = $\Delta V_O(-) / \Delta t(-)$

FIGURE 8. Test circuit for transient response and slew rate - Continued.



NOTES:
1. Resistors are ±0.1 percent and capacitors are ±10 percent unless otherwise specified.
2. Precaution shall be taken to prevent damage to the DUT during insertion into socket and in applying power.
3. Selection circuitry for dual and quad devices is not shown.
4. Settling time t_s, measured on pin 5, is the interval during which the summing made is not nulled to within ±5 mV.
5. For device types 01, 02, and 03, R1 = R2 = 10 kΩ.
6. For device types 04, 05, and 06, R1 = R2 = 2 kΩ.
7. 1N5711 Schottky diodes. Add as needed to limit oscilloscope overdrive caused by the instantaneous transition of V_{IN}.

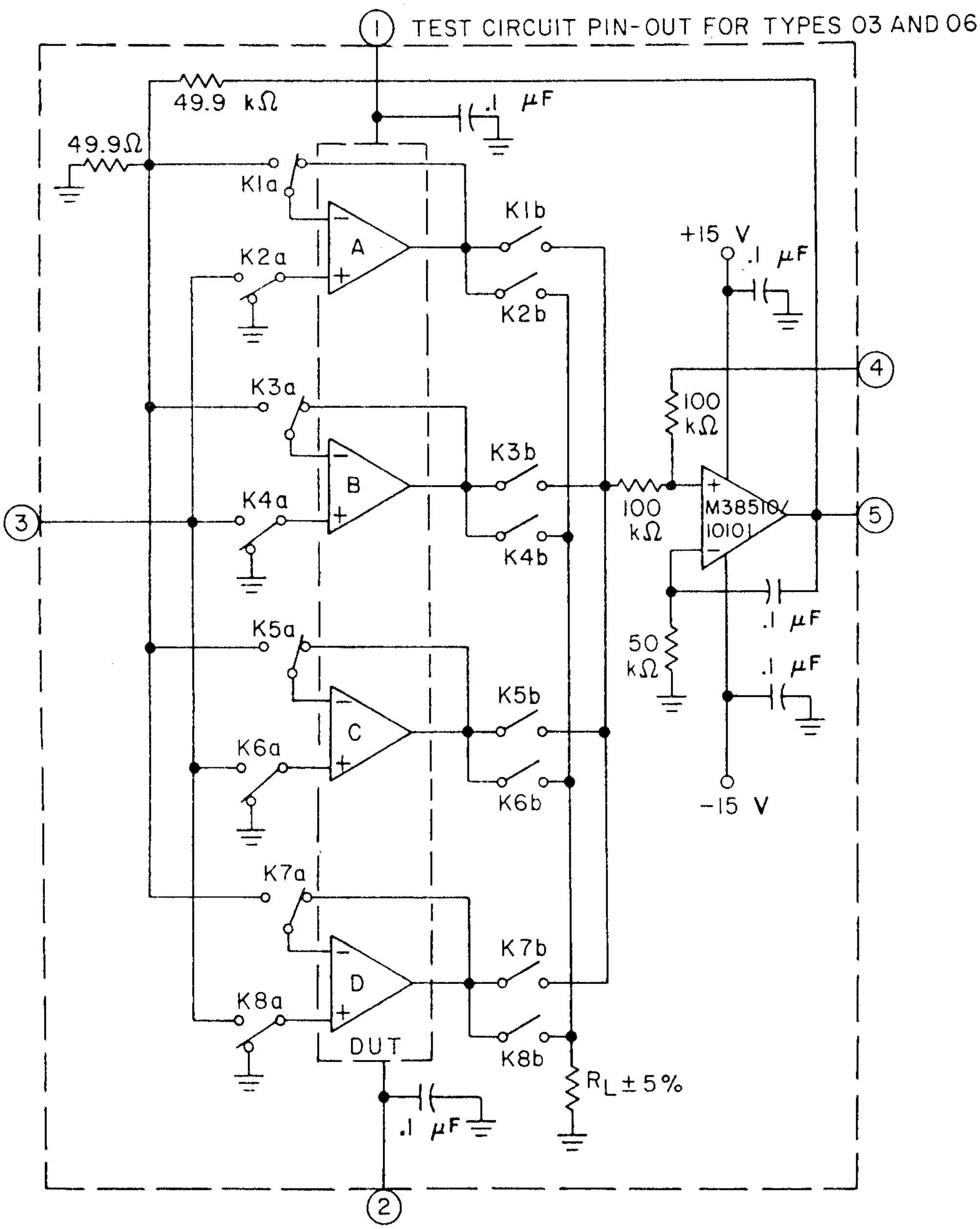
FIGURE 9. Test circuit for settling time.



Noise (Referred to input)	Symbol	S1	Measure Value	Measure Units	Measured equation	Parameter units
Broadband	$N_{1(BB)}$	Closed	E_0	mV rms	$E_0/1000$	μV rms
Popcorn	$N_{1(PC)}$	Open	E_0	mV pk	$E_0/1000$	μV pk

NOTES:
1. RS = 100 kΩ.
2. E_0 shall be measured with a true rms voltmeter with a bandwidth of 10 Hz to 15 kHz (minimum).
3. The 470 pF capacitor and 49.9 kΩ resistor yield a circuit noise bandwidth of 10 kHz.

FIGURE 10. Noise test circuit.



NOTES:
1. Resistors are ±0.1 percent and capacitors are ±10 percent tolerance, unless otherwise specified.
2. All relay contacts are shown in the normal deenergized state.
3. R_L = 10 kΩ for device types 01, 02, and 03, R_L = 2 kΩ for device types 04, 05, and 06.

FIGURE 11. Test circuit for channel separation.

TABLE III. Group A inspection for device types.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Notes	Adapter pin numbers 1	2	3	4	Energized relays	Measured pin No.	Value	Unit	Equation 1/	Device types	Limits Min	Max	Unit
1 (T_A = +25°C)	V_{IO}	4001	1	2/	26 V	-4 V	Open	-11 V	None	5	E1	V	V_{IO} = E1	All	-5	5	mV
			2	"	4 V	-26 V	"	11 V	"	"	E2	"	V_{IO} = E2	"	"	"	"
			3	"	15 V	-15 V	"	0 V	"	"	E3	"	V_{IO} = E3	"	"	"	"
			4	"	5 V	-5 V	"	0 V	"	"	E4	"	V_{IO} = E4	"	"	"	"
	$+I_{IB}$		5	"	26 V	-4 V	"	-11 V	K1	"	E5	"	$+I_{IB}$ = 200 (E1-E5)	"	-400	200	pA
			6	"	15 V	-15 V	"	0 V	"	"	E6	"	$+I_{IB}$ = 200 (E3-E6)	"	-200	200	"
			7	"	4 V	-26 V	"	11 V	"	"	E7	"	$+I_{IB}$ = 200 (E2-E7)	"	-200	1,200	"
	$-I_{IB}$		8	"	26 V	-4 V	"	-11 V	K2	"	E8	"	$-I_{IB}$ = 200 (E8-E1)	"	-400	200	"
			9	"	15 V	-15 V	"	0 V	"	"	E9	"	$-I_{IB}$ = 200 (E9-E3)	"	-200	200	"
			10	"	4 V	-26 V	"	11 V	"	"	E10	"	$-I_{IB}$ = 200 (E10-E2)	"	-200	1,200	"
	I_{IO}		11	"	Calculate value using data from tests 3, 6, and 9 3/								I_{IO} = 200 (2E3-E6-E9)	"	-100	100	"
	+PSRR	4003	12		20 V 10 V	-15 V -15 V	Open "	0 V "	None "	5 "	E11 E12	V "	+PSRR = 20 log|10⁴/(E11-E12)|	"	80		dB
	-PSRR		13		15 V 15 V	-20 V -10 V	" "	" "	" "	" "	E13 E14	" "	-PSRR = 20 log|10⁴/(E13-E14)|	"	"		"
	CMR		14	4/	Calculate value using data from tests 1 and 2								CMR = 20 log|22000/(E1-E2)|	"	"		"
	V_{IO} ADJ(+)		15	5/	15 V	-15 V	Open	0 V	K5	5	E15	V	V_{IO} ADJ(+) = (E3-E15)	01, 02, 04, 05	8		mV
	V_{IO} ADJ(-)		16	5/	"	"	"	0 V	K5, K6	5	E16	V	V_{IO} ADJ(-) = (E3-E16)	01, 02, 04, 05		-8	mV
	$I_{OS(+)}$	3011	17	6/	"	"	"	-10 V	None	6	I1	mA	$I_{OS(+)}$ = I1	01,02,03 04,05,06	-40 -80		mA "
	$I_{OS(-)}$	3011	18	6/	"	"	"	10 V	"	6	I2	"	$I_{OS(-)}$ = I2	01,02,03 04,05,06		40 80	" "
	I_{CC}	3005	19		"	"	"	0 V	"	2	I3	"	I_{CC} = I3 7/	01,02,03 04,05,06		0.3 3.5	" "
2 (T_A = +125°C)	V_{IO}	4001	20	2/	26 V	-4 V	"	-11 V	"	5	E15	V	V_{IO} = E15	All	-7	7	mV
			21	"	4 V	-26 V	"	11 V	"	"	E16	"	V_{IO} = E16	"	"	"	"
			22	"	15 V	-15 V	"	0 V	"	"	E17	"	V_{IO} = E17	"	"	"	"
			23	"	5 V	-5 V	"	0 V	"	"	E18	"	V_{IO} = E18	"	"	"	"
	$\Delta V_{IO}/\Delta T$		24	8/	$\Delta V_{IO}/\Delta T = \left[V_{IO}(\text{test } 22) - V_{IO}(\text{test } 3) \right] / 100°C$									"	-30	30	µV/°C
	$+I_{IB}$		25	2/	26 V	-4 V	Open	-11 V	K1, K7	5	E19	V	$+I_{IB}$ = 10 (E15-E19)	"	-10	50	nA
			26	"	15 V	-15 V	"	0 V	"	"	E20	"	$+I_{IB}$ = 10 (E17-E20)	"	"	50	"
			27	"	4 V	-26 V	"	11 V	"	"	E21	"	$+I_{IB}$ = 10 (E16-E21)	"	"	70	"
	$-I_{IB}$		28	"	26 V	-4 V	"	-11 V	K1, K7	"	E22	"	$-I_{IB}$ = 10 (E22-E15)	"	"	50	"
			29	"	15 V	-15 V	"	0 V	"	"	E23	"	$-I_{IB}$ = 10 (E23-E17)	"	"	50	"
			30	"	4 V	-26 V	"	11 V	"	"	E24	"	$-I_{IB}$ = 10 (E24-E16)	"	"	70	"
	I_{IO}		31	"	Calculate value using data from tests 22, 26, and 29 3/								I_{IO} = 10 (2E17-E20-E23)	"	-20	20	"

See footnotes at end of table.

TABLE III. Group A inspection for device types - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Notes	Adapter pin numbers 1	2	3	4	Energized relays	Measured pin No.	Value	Unit	Equation 1/	Device types	Limits Min	Max	Unit
2 (T_A = +125°C)	+PSRR	4003	32		20 V 10 V	-15 V -15 V	Open "	0 V "	None "	5 "	E25 E26	V "	+PSRR = 20 log|10⁴/(E25-E26)|	All	80		dB
	-PSRR		33		15 V 15 V	-20 V -10 V	" "	" "	" "	" "	E27 E28	" "	-PSRR = 20 log|10⁴/(E27-E28)|	"	"		"
	CMR		34	4/	Calculate value using data from tests 20 and 21								CMR = 20 log|22000/E15-E16)|	"	"		"
	V_{IO} ADJ(+)		35	5/	15 V	-15 V	Open	0 V	K5	5	E29	V	V_{IO} ADJ(+) = (E17-E29)	01, 02, 04, 05	8		mV
	V_{IO} ADJ(-)		36	5/	"	"	"	0 V	K5, K6	5	E30	[illegible]	V_{IO} ADJ(-) = (E17-E30)	01, 02, 04, 05		-8	mV
	I_{OS} (+)	3011	37	6/	"	"	"	-10 V	None	6	I4	mA	I_{OS}(+) = I4	01,02,03 04,05,06	-40 -80		mA "
	I_{OS} (-)	3011	38	6/	"	"	"	10 V	"	6	I5	"	I_{OS}(-) = I5	01,02,03 04,05,06		40 80	" "
	I_{CC}	3005	39		"	"	"	0 V	"	2	I6	"	I_{CC} = I6 7/	01,02,03 04,05,06		0.3 3.5	" "
3 (T_A = -55°C)	V_{IO}	4001	40 41 42 43	2/ " " "	26 V 4 V 15 V 5 V	-4 V -26 V -15 V -5 V	" " " "	-11 V 11 V 0 V 0 V	" " " "	5 " " "	E31 E32 E33 E34	V " " "	V_{IO} = E31 V_{IO} = E32 V_{IO} = E33 V_{IO} = E34	All " " "	-7 " " "	7 " " "	mV " " "
	$\Delta V_{IO}/\Delta T$		44	8/	$\Delta V_{IO}/\Delta T = \left[V_{IO}(\text{test } 42) - V_{IO}(\text{test } 3)\right]/80°C$									"	-30	30	µV/°C
	+PSRR	4003	45		20 V 10 V	-15 V -15 V	Open "	0 V "	None "	5 "	E35 E36	V "	+PSRR = 20 log|10⁴/(E35-E36)|	"	80		dB
	-PSRR		46		15 V 15 V	-20 V -10 V	" "	" "	" "	" "	E37 E38	" "	-PSRR = 20 log|10⁴/(E37-E38)|	"	"		"
	CMR		47	4/	Calculate value using data from tests 40 and 41								CMR = 20 log|22000/(E31-E32)|	"	"		"
	V_{IO} ADJ(+)		48	5/	15 V	-15 V	Open	0 V	K5	5	E39	V	V_{IO} ADJ(+) = (E33-E39)	01, 02, 04, 05	8		mV
	V_{IO} ADJ(-)		49	5/	"	"	"	"	K5, K6	5	E40	V	V_{IO} ADJ(-) = (E33-E40)	01, 02, 04, 05		-8	mV
	I_{OS} (+)	3011	50	6/	"	"	"	-10 V	None	6	I7	mA	I_{OS}(+) = I7	01,02,03 04,05,06	-40 -80		mA "
	I_{OS} (-)	3011	51	6/	"	"	"	10 V	"	6	I8	"	I_{OS}(-) = I8	01,02,03 04,05,06		40 80	" "
	I_{CC}	3005	52		"	"	"	0 V	"	2	I9	"	I_{CC} = I9 7/	01,02,03 04,05,06		0.3 4.0	" "

See footnotes at end of table.

TABLE III. Group A inspection for device types - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Notes	Adapter pin numbers 1	2	3	4	Energized relays	Measured pin No.	Value	Unit	Equation 1/	Device types	Limits Min	Max	Unit
4 (T_A = +25°C)	$+V_{OP}$ $-V_{OP}$	4004	53 54		15 V "	-15 V "	Open "	-15 V 15 V	K3 K3	6 "	(EO)1 (EO)2	V "	$+V_{OP}$ = (EO)1 $-V_{OP}$ = (EO)2	All All	12 	 -12	V "
	$+V_{OP}$ $-V_{OP}$		55 56		" "	" "	" "	-15 V 15 V	K4 K4	" "	(EO)3 (EO)4	" "	$+V_{OP}$ = (EO)3 $-V_{OP}$ = (EO)4	04,05,06 04,05,06	10 	 -10	" "
	A_{VS} (+)		57	9/	"	"	"	-10 V	K3 K4	5	E41	"	$A_{VS(+)}$ = 10/(E3-E41)	01,02,03 04,05,06	5.0 50		V/mV "
	A_{VS} (-)		58	9/	"	"	"	10 V	K3 K4	"	E42	"	$A_{VS(-)}$ = 10/(E42-E3)	01,02,03 04,05,06	5.0 50		" "
	A_{VS}		59		5 V "	-5 V "	" "	-2 V 2 V	K3 K3	" "	E43 E44	" "	A_{VS} = 4/(E44-E43)	01,02,03 04,05,06	3 20		" "
5 (T_A = +125°C)	$+V_{OP}$ $-V_{OP}$	4004	60 61		15 V "	-15 V "	" "	-15 V 15 V	K3 K3	6 "	(EO)5 (EO)6	" "	$+V_{OP}$ = (EO)5 $-V_{OP}$ = (EO)6	All All	12 	 -12	V "
	$+V_{OP}$ $-V_{OP}$		62 63		" "	" "	" "	-15 V 15 V	K4 K4	" "	(EO)7 (EO)8	" "	$+V_{OP}$ = (EO)7 $-V_{OP}$ = (EO)8	04,05,06 04,05,06	10 	 -10	" "
	A_{VS} (+)		64	9/	"	"	"	-10 V	K3 K4	5	E45	"	$A_{VS(+)}$ = 10/(E17-E45)	01,02,03 04,05,06	4 25		V/mV "
	A_{VS} (-)		65	9/	"	"	"	10 V	K3 K4	"	E46	"	$A_{VS(-)}$ = 10/(E46-E17)	01,02,03 04,05,06	4 25		" "
	A_{VS}		66		5 V "	-5 V "	" "	-2 V 2 V	K3 K3	" "	E47 E48	" "	A_{VS} = 4/(E48-E47)	01,02,03 04,05,06	3 20		" "
6 (T_A = -55°C)	$+V_{OP}$ $-V_{OP}$	4004	67 68		15 V "	-15 V "	" "	-15 V 15 V	K3 K3	6 "	(EO)9 (EO)10	" "	$+V_{OP}$ = (EO)9 $-V_{OP}$ = (EO)10	All All	12 	 -12	V "
	+VOP -VOP		69 70		" "	" "	" "	-15 V 15 V	K4 K4	" "	(EO)11 (EO)12	" "	$+V_{OP}$ = (EO)11 $-V_{OP}$ = (EO)12	04,05,06 04,05,06	10 	 -10	" "
	A_{VS} (+)		71	9/	"	"	"	-10 V	K3 K4	5	E49	"	$A_{VS(+)}$ = 10/(E33-E49)	01,02,03 04,05,06	4 25		V/mV "
	A_{VS} (-)		72	9/	"	"	"	10 V	K3 K4	"	E50	"	$A_{VS(-)}$ = 10/(E50-E33)	01,02,03 04,05,06	4 25		" "
	A_{VS}		73		5 V "	-5 V "	" "	-2 V 2 V	K3 K3	" "	E51 E52	" "	A_{VS} = 4/ (E52-E51)	01,02,03 04,05,06	3 20		" "
7 T_A = +25°C)	$TR_{(tr)}$		74	Fig 8	15 V	-15 V	50 mV	Open	None	6	Δt1	ns	$TR_{(tr)}$ = Δt1	01,02,03 04,05,06		400 200	ns "
	$TR_{(os)}$		75	"	"	"	"	"	"	"	V_{O1} ΔV_{O1}	mV	$TR_{(os)}$ = 100 (ΔV_{O1}/V_{O1})	01,02,03 04,05,06		20 40	% "

See footnotes at end of table.

TABLE III. Group A inspection for device types - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Notes	Adapter pin numbers 1	2	3	4	Energized relays	Measured pin No.	Value	Unit	Equation 1/	Device type	Limits Min	Max	Unit
7 (T_A = +25°C)	SR(+)	4002	76	Fig 8	15 V	-15 V	8/	Open	None	6	ΔV_{O1} (+)	V	$SR(+) = \Delta V_{O1}(+) / \Delta t1(+)$	01,02,03	.8		V/µs
											$\Delta t1$ (+)	µs		04,05,06	7		"
	SR(-)		77	"	"	"	"	"	"	"	ΔV_{O1} (-)	V	$SR(-) = \Delta V_{O1}(-) / \Delta t1(-)$	01,02,03	.8		"
											$\Delta t1$ (-)	µs		04,05,06	7		"
	N_I (BB)		78	Fig 10 10/	15 V	-15 V	Open	0 V	None	6	(EO) 13	mV rms	NI(BB) = (EO)13/1000	All		15	µV rms
	N_I (PC)		79		"	"	Open	"	K1, K2	"	(EO) 14	mV pk	N_I(PC) = (EO)14/1000	"		80	µV pk
	CS		80	Fig 11 11/	"	"	10 V	"	K2, K3	5	E53	V	CS = 20 log| 20000 / (E53-E54) |	02, 03, 05, 06	80		dB
					"	"	-10 V	"	K2, K3	"	E54	"					
			81	"	"	"	10 V	"	K2, K5	"	E55	"	CS = 20 log| 20000 / (E55-E56) |	"	"		"
				"	"	"	-10 V	"	K2, K5		E56	"					
			82	"	"	"	10 V	"	K2, K7	"	E57	"	CS = 20 log| 20000 / (E57-E58) |	"	"		"
				"	"	"	-10 V	"	K2, K7	"	E58	"					
			83	"	"	"	10 V	"	K4, K1	"	E59	"	CS = 20 log| 20000 / (E59-E60) |	"	"		"
					"	"	-10 V	"	K4, K1	"	E60	"					
			84	"	"	"	10 V	"	K4, K5	"	E61	"	CS = 20 log| 20000 / (E61-E62) |	"	"		"
				"	"	"	-10 V	"	K4, K5	"	E62	"					
			85	"	"	"	10 V	"	K4, K7	"	E63	"	CS = 20 log| 20000 / (E63-E64) |	"	"		"
				"	"	"	-10 V	"	K4, K7	"	E64	"					
			86	"	"	"	10 V	"	K6, K1	"	E65	"	CS = 20 log| 20000 / (E65-E66) |	"	"		"
				"	"	"	-10 V	"	K6, K1	"	E66	"					
			87	"	"	"	10 V	"	K6, K3	"	E67	"	CS = 20 log| 20000 / (E67-E68) |	"	"		"
				"	"	"	-10 V	"	K6, K3	"	E68	"					
			88	"	"	"	10 V	"	K6, K7	"	E69	"	CS = 20 log| 20000 / (E69-E70) |	"	"		"
				"	"	"	-10 V	"	K6, K7	"	E70	"					
			89	"	"	"	10 V	"	K8, K1	"	E71	"	CS = 20 log| 20000 / (E71-E72) |	"	"		"
				"	"	"	-10 V	"	K8, K1	"	E72	"					
			90	"	"	"	10 V	"	K8, K3	"	E73	"	CS = 20 log| 20000 / (E73-E74) |	"	"		"
				"	"	"	-10 V	"	K8, K3	"	E74	"					
			91	"	"	"	10 V	"	K8, K5	"	E75	"	CS = 20 log| 20000 / (E75-E76) |	"	"		"
				"	"	"	-10 V	"	K8, K5	"	E76	"					

See footnotes at end of table.

TABLE III. Group A inspection for device types - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Notes	Adapter pin numbers 1	2	3	4	Energized relays	Measured pin No.	Value	Unit	Equation 1/	Device types	Limits Min	Max	Unit
8 (T_A = +125°C)	TR(tr)		92	Fig 8	15 V	-15 V	50 mV	Open	None	6	Δt2	ns	$TR(tr) = \Delta t2$	01,02,03		400	ns
														04,05,06		200	"
	TR(os)		93	"	"	"	"	"	"	"	V_{02}, ΔV_{02}	mV	$TR(os) = 100\ (\Delta V_{02}/V_{02})$	01,02,03		20	%
				"	"	"	"	"	"	"				04,05,06		40	"
	SR(+)	4002	94	"	"	"	12/	"	"	"	ΔV_{02} (+)	V	$SR(+) = \Delta V_{02}(+)/\Delta t2(+)$	01,02,03	.7		V/µs
				"	"	"	"	"	"	"	Δt2 (+)	µs		04,05,06	5		"
	SR(-)		95	"	"	"	"	"	"	"	ΔV_{02} (-)	V	$SR(-) = \Delta V_{02}(-)/\Delta t2(-)$	01,02,03	.7		"
				"	"	"	"	"	"	"	Δt2 (-)	Δs		04,05,06	5		"
8 (T_A = -55°C)	TR(tr)		96	"	"	"	50 mV	"	"	"	Δt3	ns	$TR(tr) = \Delta t3$	01,02,03		400	ns
														04,05,06		200	
	TR(os)		97	"	"	"	"	"	"	"	V_{03}, ΔV_{03}	mV	$TR(os) = 100\ (\Delta V_{03}/V_{03})$	01,02,03		20	%
				"	"	"	"	"	"	"				04,05,06		40	
	SR(+)	4002	98	"	"	"	12/	"	"	"	ΔV_{03} (+)	V	$SR(+) = \Delta V_{03}(+)/\Delta t3(+)$	01,02,03	.7		V/µs
				"	"	"	"	"	"	"	Δt3 (+)	µs		04,05,06	5		"
	SR(-)		99	"	"	"	"	"	"	"	ΔV_{03} (-)	V	$SR(-) = \Delta V_{03}(-)/\Delta t3(-)$	01,02,03	.7		"
				"	"	"	"	"	"	"	Δt3 (-)	µs		04,05,06	5		"
12 (T_A = +25°C)	ts(+)		100	Fig 9	"	"	10 V	"	"	5	ts(+)	ns	See figure 9	01,02,03		6,000	ns
	ts(-)		101	Fig 9	"	"	-10 V	"	"	5	ts(-)	ns	See figure 9	04,05,06		1,500	ns

See footnotes at end of table.

1/ The equations take into account both the closed loop gain of 1,000 and the scale factor multiplier so that the calculated value is in table I units. The measured value units should, therefore, be used in the equation. (For example: If E1 = 2 V and V_{IO} = E1, then V_{IO} = 2 mV.)

2/ Each device shall be tested over the common mode range as specified in table III. V_{cm} *conditions are achieved by grounding the inputs and* algebraically subtracting V_{cm} from each supply. (For example: If V_{cm} = -11 V, then +V_{CC} = +15 V - (-11) = +26 V and -V_{CC} = -15 V - (-11) = -4 V.)

3/ Input offset current, I_{IO}, may be measured directly. To do so, both K1 and K2 shall be energized. The difference in E values, with and without the relays energized, is multiplied by the proper coefficient to yield the I_{IO} value.

4/ Common mode rejection is calculated using the offset voltage values measured at the common mode range end points.

5/ V_{IO} ADJ(±) is only tested on device types 01 and 04 and certain duals in a 14-pin dual-in-line package.

6/ The output shall be shorted to ground for 25 ms, or less.

7/ For device type 05, maximum limit shown is for 1 operating ampere only, this value is double for the dual device (i.e., 2 x 3.5 = 7 mA at 25°C and 125°C; 2 x 4.0 = 8 mA at -55°C).

8/ Tests 24 and 44 which require a read and record measurement plus a calculation may be omitted except when subgroups 2 and 3 *are being accomplished for group* A sampling inspection and groups C and D end-point measurements.

9/ To minimize thermal drift, the reference voltage for the gain measurement (E3, E17, and E33) shall be taken immediately prior to or after the reading corresponding to device gain (E41, E42, E45, E46, E49, and E50).

10/ Broadband *noise* NI(BB) shall be *measured* using *an* RMS voltmeter with a bandwidth of 10 Hz to 15 kHz. "Popcorn" noise NI(PC) shall be measured for 15 seconds.

11/ Quad devices 03 and 06 shall be tested for all combinations of channel separation (i.e., tests 80 through 91). Dual devices are tested for two combinations of channel separation (i.e., tests 80 and 83).

12/ All device types are tested with a -5 to +5 V step input as shown on figure 8. The circuit gain is 1 V/V.

TABLE IV. Group C end-point electrical parameters. 1/

Table III tests		Limits Min	Limits Max	Units
V_{IO}	Limit Delta	-5 -1	5 1	mV
$+I_{IB}$	Limit Delta	-200 -100	200 100	pA
$-I_{IB}$	Limit Delta	-200 -100	200 100	pA

1/ $T_A = +25^\circ C$, $\pm V_{CC} = \pm 15$ V for all device types.

4.5 Methods of inspection. Methods of inspections shall be as specified in the appropriate tables. Electrical test circuits are prescribed herein or in the referenced test methods of MIL-STD-883 shall be acceptable. Other test circuits shall require the approval of the qualifying activity.

4.5.1 Voltage and current. All voltage values given are referenced to the ground terminal of the device under test (DUT). Current values given are for conventional current and are positive when flowing into the referenced terminal.

4.5.2 Life test and burn-in cooldown procedure. When devices are measured at +25°C following application of the steady-state life or burn-in test condition, they shall be cooled to within +10°C of their power stable condition at room temperature prior to removal of the bias.

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 specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Ordering data. The acquisition document 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 to the contracting activity in addition to notification to the qualifying activity, if applicable.

e. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.

f. Requirements for product assurance provisions.

g. Requirements for special lead lengths or lead forming, if applicable. These requirements shall not affect the part number.

h. Requirement for JAN marking.

6.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein are defined in MIL-M-38510 and MIL-STD-1331.

6.4 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2), lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.5 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information shall not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-M-38510.

Military-device type	Generic-industry type
01	061
02	062
03	064
04	071, 771, LF151, LF411
05	072, 772, LF153, LF412
06	074, 774, LF147

6.6 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - ER
Navy - EC
Air Force - 17
NASA - NA

Review activities:
Army - AR, MI
Navy - OS, SH, TD
Air Force - 11, 19, 85, 99
DLA - ES

User activities:
Army - SM
Navy - AS, CG, MC

Preparing activity:
Air Force - 17

Agent:
DLA - ES

(Project 5962-0931)

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-M-38510/119A	Microcircuits, Linear, Low Power, Low Noise, Bi-Fet Operational Amplifiers, Monolithic Silicon

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- [ ] VENDOR
- [ ] USER
- [ ] MANUFACTURER
- [ ] OTHER (Specify): ______

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional

b. WORK TELEPHONE NUMBER (Include Area Code) – Optional

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