INCH-POUND
MIL-M-38510/122C
26 May 2004
SUPERSEDING
MIL-M-38510/122B
17 September 2003

MILITARY SPECIFICATION

MICROCIRCUITS, LINEAR, HIGH SLEW RATE OPERATIONAL AMPLIFIERS, MONOLITHIC SILICON

Reactivated for new design as of 17 September 2003. May be used for either new or existing design acquisition.

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

The requirement for acquiring the product herein shall consist of this specification sheet and MIL-PRF-38535.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, operational amplifier microcircuit. Two product assurance classes and a choice of case outlines and lead finishes are provided and are reflected in the complete part number. For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.3)

1.2 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-38535, and as specified herein.

1.2.1 Device types. The device types are as follows:

Device type	Circuit
01	Single operational amplifier, internally compensated, low power, high performance
02	Single operational amplifier, internally compensated, high impedance, wide band
03	Single operational amplifier, externally compensated, high impedance, wide band
04	Single operational amplifier, internally compensated, precision, high slew rate
05	Single operational amplifier, internally compensated, high slew rate
06	Single operational amplifier, externally compensated, high slew rate
07	Single operational amplifier, internally compensated, high speed, precision
08	Single operational amplifier, internally compensated, high speed, fast-settling, precision

1.2.2 Device class. The device class is the product assurance level as defined in MIL-PRF-38535.

1.2.3 Case outline. The case outlines are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
G	MACY1-X8	8	Can
H	GDFP1-F10 or CDFP2-F10	10	Flat pack
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line
2	CQCC1-N20	20	Square leadless chip carrier

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAS, 3990 East Broad St., Columbus, OH 43216-5000, or emailed to linear@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

AMSC N/A FSC 5962

1.3 Absolute maximum ratings.

Supply voltage range .... ±20 V dc 1/
Input voltage range .... ±15 V dc 2/ 3/
Differential input voltage range: 2/ 3/
Device type 01 .... ±18 V dc
Device types 02 and 03 .... ±12 V dc
Device types 04, 05, and 06 .... ±15 V dc
Device types 07 and 08 .... ±20 V dc
Storage temperature range .... -65°C to +150°C
Lead temperature (soldering, 10 seconds) .... +300°C.
Junction temperature (T_J) .... +175°C

1.4 Recommended operating conditions.

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

1.5 Power and thermal characteristics.

Case outlines	Maximum allowable power dissipation	Maximum θ_{JC}	Maximum θ_{JA}
G	300 mW at T_A = +125°C	40°C/W	150°C/W
H	300 mW at T_A = +125°C	45°C/W	150°C/W
P	500 mW at T_A = +125°C	26°C/W	119°C/W
2	500 mW at T_A = +125°C	30°C/W	120°C/W

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those, cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard for Microelectronics.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

1/ Voltages in excess of these may be applied for short term tests if voltage difference does not exceed 40 volts.
2/ For supply voltages less than ±15 V dc, the absolute maximum input voltage is equal to the supply voltage (minus 3 volts for device types 01, 02, and 03).
3/ For supply voltages less than ±20 V dc, the absolute maximum input voltage is equal to the supply voltage for device types 07 and 08.

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Microcircuits furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.3 and 6.4).

3.2 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535 and as specified herein or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein.

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

3.3.2 Schematic circuits. The schematic circuits shall be maintained by the manufacturer and made available to the qualifying activity and the preparing activity upon request.

3.3.3 Case outlines. The case outlines shall be as specified in 1.2.3.

3.4 Lead material and finish. The lead material and finish shall be in accordance with MIL-PRF-38535 (see 6.6).

3.5 Electrical performance characteristics. The electrical performance characteristics are as specified in table I, and apply over the full recommended ambient operating temperature range –55°C to +125°C and for supply voltages of ±15 V dc, unless otherwise specified (see table I).

3.5.1 Offset null circuits. Each amplifier having nulling inputs shall be capable of being nulled 1 mV beyond 0.0 volt at $-55°C \leq T_A \leq 125°C$ using the circuit of figure 2.

3.5.2 Frequency compensation. Device types 01, 02, 04, 05, and 08 shall be free of oscillation when operated in a unity gain noninverting mode with no external compensation and a source resistance of ≤ 10 kΩ, and when operated in any test condition specified herein. Device type 03 shall be free of oscillation when operated in a closed loop gain of 5 or greater with no external compensation. Device type 07 shall be free of oscillation when operated in a closed loop gain of 3 or greater with no external compensation.

3.5.3 Output short circuit current test. Output short circuit current test (I_{OS}) shall not be performed on any device types. Current density requirements of MIL-PRF-38535, junction temperature (T_J) or both are exceeded under output short circuit conditions.

3.6 Electrical test requirements. Electrical test requirements for each device class shall be the subgroups specified in table II. The subgroups of table II which constitute the minimum electrical test requirements for screening, qualification, and quality conformance by device class are specified in table II.

3.7 Marking. Marking shall be in accordance with MIL-PRF-38535.

Special marking for device classes B and S. The date code may be reduced to 3 digits (for example, 026 where 0 is the last digit of the year and 26 is the seal week) for device classes B and S.

3.7.1 Serialization. All class S devices shall be serialized in accordance with MIL-PRF-38535.

3.7.2 Correctness of indexing and marking. 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 PIN. Optionally, an approved electrical test may be devised especially for this requirement.

3.8 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 49 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type 1/	Limits Min	Limits Max	Unit
Input offset voltage 2/	V_{IO}	$R_S = 100\ \Omega$	1	01	-3.0	3.0	mV
				02,03	-4.0	4.0	
				04	-5.0	5.0	
				05,06	-8.0	8.0	
				07,08	-1.0	1.0	
			2,3	01	-5.0	5.0	
				02,03	-6.0	6.0	
				04	-8.0	8.0	
				05,06	-10.0	10.0	
				07,08	-2.0	2.0	
Input offset voltage	V_{IO}	$T_A = +25°C$, 3/ (end point limits)	1	07,08	-1.5	1.5	mV
Input offset voltage temperature sensitivity	ΔV_{IO} / ΔT	ΔT_A from –55°C to +25°C	13	01,02, 03	-15.0	15.0	µV/°C
				04,05, 06	-30.0	30.0	
				07,08	-10	10	
		ΔT_A from +25°C to +125°C	13	01,02, 03	-15.0	15.0	
				04,05, 06	-30.0	30.0	
				07,08	-10	10	
Input offset current 2/ 4/	I_{IO}		1	01	-10.0	10.0	nA
				02,03	-15.0	15.0	
				04,05, 06	-25.0	25.0	
				07,08	-0.4	+0.4	
			2,3	01,02, 03	-30.0	30.0	
				04,05, 06	-50.0	50.0	
				07,08	-1.0	+1.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \leq T_A \leq +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset current 5/ temperature sensitivity	$\Delta I_{IO} / \Delta T$	T_A = -55°C	13	01	-200	200	pA/°C
				02,03	-100	100	
				04,05, 06	-400	400	
				07,08	-20	20	
		T_A = +125°C	13	01,02, 03	-100	100	
				04,05, 06	-400	400	
				07,08	-20	20	
Input bias current 2/ 4/	$+I_{IB}$		1	01	-20.0	20.0	nA
				02	-10.0	10.0	
				03	-15.0	15.0	
				04,05, 06	1.0	200.0	
		$+V_{CM}$ = -10 V, 0 V		07,08	-0.2	0.2	
		$+V_{CM}$ = +10 V			-1.0	1.0	
			2,3	01	-50.0	50.0	
				02,03	-30.0	30.0	
				04,05, 06	1.0	400.0	
				07,08	-20.0	20.0	
Input bias current 2/ 4/	$-I_{IB}$		1	01	-20.0	20.0	nA
				02	-10.0	10.0	
				03	-15.0	15.0	
				04,05, 06	1.0	200.0	
		$+V_{CM}$ = -10 V, 0 V		07,08	-0.2	0.2	
		$+V_{CM}$ = +10 V			-1.0	1.0	
			2,3	01	-50.0	50.0	
				02,03	-30.0	30.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \leq T_A \leq +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input bias current 2/ 4/	$-I_{IB}$		2,3	04,05, 06	1.0	400.0	nA
				07,08	-20.0	20.0	
Input bias current	$\pm I_{IB}$	$T_A = +25°C$, 3/ (end point limits)	1	07,08	-1.0	1.0	nA
Power supply rejection ratio	+PSRR	$+V_{CC}$ = 10 V, 20 V	4,5,6	01	86		dB
				02,03, 04,05, 06	80		
				07,08	84		
	-PSRR	$-V_{CC}$ = -10 V, -20 V		01	86		
				02,03, 04,05, 06	80		
				07,08	84		
Input voltage common mode rejection ratio	CMRR	$+V_{CC}$ = 5 V, 25 V, $-V_{CC}$ = -25 V, -5 V	4,5,6	01	86		dB
				02,03, 04,05, 06,08	80		
				07	84		
Input offset voltage adjustment 6/ 7/	$+V_{IO}$ (ADJ)		1	01	4.0		mV
				02,03	5.0		
				04	6.0		
				05,06	9.0		
				07	2.5		
			2,3	01	6.0		
				02,03	7.0		
				04	9.0		
				05,06	11.0		
				07	3.0		

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \leq T_A \leq +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits Min	Limits Max	Unit
Input offset voltage 6/ 7/ adjustment	$-V_{IO}$ (ADJ)		1	01		-4.0	mV
				02,03		-5.0	
				04		-6.0	
				05,06		-9.0	
				07		-2.5	
			2,3	01		-6.0	
				02,03		-7.0	
				04		-9.0	
				05,06		-11.0	
				07		-3.0	
Supply current 2/	I_{CC}	$\pm V_{CC} = \pm 15.0$ V	1	01		0.15	mA
				02,03		3.7	
				04,05, 06,08		6.0	
				07		7.5	
			2,3	01		0.20	
				02,03		4.0	
				04,05, 06		6.5	
				07		7.5	
				08		6.0	
Output voltage at minimum rated output current	$+V_{OUT}$	V_{OUT} at –10 mA	1	All	10.0		V
		V_{OUT} at –5 mA	2,3	01,04, 05,06, 07,08	10.0		
		V_{OUT} at –10 mA		02,03	10.0		

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage at minimum rated output current	$-V_{OUT}$	V_{OUT} at 10 mA	1	All		-10.0	V
		V_{OUT} at 5 mA	2,3	01,04, 05,06, 07,08		-10.0	
		V_{OUT} at 10 mA		02,03		-10.0	
Output voltage swing	$+V_{OP}$	$R_L = 2\ k\Omega$	1	01	12.0		V
				02,03, 04,05, 06	10.0		
				07,08	11.5		
			2,3	01,07, 08	11.0		
				02,03, 04,05, 06	10.0		
	$-V_{OP}$	$R_L = 2\ k\Omega$	1	01		-12.0	
				02,03, 04,05, 06		-10.0	
				07,08		-11.5	
			2,3	01,07, 08		-11.0	
				02,03, 04,05, 06		-10.0	
Open loop voltage gain 6/	$+A_{VS}$ and $-A_{VS}$	$V_{OUT} = \pm 10$ V, 0 V; $R_L = 2\ k\Omega$	4	01	200.0		V/mV
				02,03, 07,08	100.0		
				04	20.0		
				05,06	10.0		

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \leq T_A \leq +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits Min	Limits Max	Unit
Open loop voltage gain 6/	$+A_{VS}$ and $-A_{VS}$	$V_{OUT} = \pm 10$ V, 0 V; $R_L = 2$ kΩ	5,6	01	100.0		V/mV
				02,03, 07,08	70.0		
				04	15.0		
				05,06	7.50		
Slew rate	+SR and +SR	$A_V = 5$, see figure 3	7	01	10.0		V/µs
		$A_V = 1$, see figure 3		02	4.0		
		$A_V = 5$, see figure 3		03	25.0		
		$A_V = 1$, see figure 3		04	25.0		
		$A_V = 1$, see figure 3		05	50.0		
		$A_V = 3$, see figure 3		06,07	100.0		
		$A_V = 1$, see figure 3		08	45.0		
		$A_V = 5$, see figure 3	8	01	8.0		
		$A_V = 1$, see figure 3		02	3.0		
		$A_V = 5$, see figure 3		03	20.0		
		$A_V = 1$, see figure 3		04	20.0		
		$A_V = 1$, see figure 3		05	45.0		
		$A_V = 3$, see figure 3		06	84.0		
		$A_V = 3$, see figure 3		07	80.0		
		$A_V = 1$, see figure 3		08	40.0		
Transient response: (Rise time and fall time)	$TR_{(tr)}$ and $TR_{(tf)}$	$A_V = 1$, see figure 3	7	02		60.0	ns
		$A_V = 5$, see figure 3		03		45.0	
		$A_V = 1$, see figure 3		04,05		50.0	
		$A_V = 3$, see figure 3		06,07		50.0	
		$A_V = 1$, see figure 3		08		50.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified see 3.5 and figure 3	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Transient response: Rise time and fall time	$TR_{(tr)}$	A_V = 1, see figure 3	8	02		70.0	ns
	and	A_V = 5, see figure 3		03		60.0	
	$TR_{(tf)}$	A_V = 1, see figure 3		04,05		60.0	
		A_V = 3, see figure 3		06,07		55.0	
		A_V = 1, see figure 3		08		60.0	
Transient response: Overshoot	$TR_{(+OS)}$	A_V = 1, see figure 3	7	02,08		40.0	%
	and	A_V = 5, see figure 3		03		70.0	
	$TR_{(-OS)}$	A_V = 1, see figure 3		04,05		40.0	
		A_V = 3, see figure 3		06,07		40.0	
		A_V = 1, see figure 3	8	02,08		50.0	
		A_V = 5, see figure 3		03		70.0	
		A_V = 1, see figure 3		04,05		50.0	
		A_V = 3, see figure 3		06,07		45.0	
Settling time	$+t_S$	A_V = 1, see figure 4	12			4.0	µs
	and	A_V = 5, see figure 4				3.0	
	$-t_S$	A_V = 1, see figure 4				1.2	
		A_V = 1, see figure 4				1.0	
		A_V = 3, see figure 4				1.1	
		A_V = 1, see figure 4				1.1	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

1/ Device type 06 shall be free of oscillation when operated at gains of 3 or greater with no external compensation.

2/ Tests at common mode $V_{CM} = 0$, $V_{CM} = -10$ V, and $V_{CM} = +10$ V.

3/ See table IV for end-point test conditions.

4/ Device type 07 is not tested at $T_A = -55°C$

5/ Input offset current temperature sensitivity is guaranteed by I_{IO} end-point limits at $T_A = -55°C$ and +125°C.

6/ Note that gain is not specified at V_{IO}(ADJ) extremes. Some gain reduction is usually seen at V_{IO}(ADJ) extremes. For closed loop application (closed loop gain less than 1,000), the open loop tests (A_{VS}) prescribed herein should guarantee a positive, reasonable linear, transfer characteristic. They do not, however, guarantee that the open loop is linear, or even positive, over the operating range. If either of these requirements exist (positive open loop gain or open loop gain linearity), they should be specified in the contract or purchase order as additional requirements (see 6.2).

7/ The limits specified are for devices with offset voltages equal to the maximum limit. For devices with offset voltages less than the limit, offset adjust capability will be tested to guarantee adjustability to 1 mV beyond zero.

TABLE II. Electrical test requirements.

MIL-PRF-38535 test requirements	Subgroups (see table III)	
	Class S devices	Class B devices
Interim electrical parameters	1	1
Final electrical test parameters	1*, 2, 3, 4	1*, 2, 3, 4
Group A test requirements	1, 2, 3, 4, 5, 6, 7, 8, 12, 13	1, 2, 3, 4, 5, 6, 7, 8, 12, 13
Group B electrical test parameters when Using the method 5005 QCI option	1, 2, 3 and table IV delta limits	N/A
Group C end-point electrical parameters	1, 2, 3 and table IV delta limits	1 and table IV delta limits
Group D end-point electrical parameters	1, 2, 3	1

*PDA applies to subgroup 1.

4. VERIFICATION.

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer’s Quality Management (QM) plan. The modification in the QM plan shall not effect the form, fit, or function as function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38535, and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

a. The burn-in test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

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

c. Additional screening for space level product shall be as specified in MIL-PRF-38535.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-38535.

4.4 Technology Conformance inspection (TCI). Technology conformance inspection shall be in accordance with MIL-PRF-38535 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 III of MIL-PRF-38535 and as follows:

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

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

c. Subgroup 12 shall be added to group A inspection for as specified in table III herein. Subgroup 12 shall be performed for initial qualification and after major process or design changes using a sample of 15 devices with no failure allowed.

d. The acceptable sample number for subgroup 13 should be 32 devices with 0 failures. If the input offset voltage and current temperature sensitivities (computed from group A, subgroups 1, 2, and 3 data) indicate a failure (one device) out of an acceptable sample number of 32 devices for subgroup 13, the lot should be 100 percent electrically retested for the parameters in subgroup 13, and all temperature sensitive rejects should be removed. No re-sampling of the lot is required if the original sample passed the other group A tests.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of MIL-PRF-38535.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table IV of MIL-PRF-38535 and as follows:

a. End point electrical parameters shall be as specified in table II herein. Delta limits shall apply for class S devices.

b. The steady-state life test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table V of MIL-PRF-38535. End point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be specified in the appropriate tables. Electrical test circuits as 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, except the input offset voltage (or differential voltage) are referenced to the external zero reference level of the supply voltage. Currents given are conventional current and positive when flowing into the referenced terminal.

4.5.2 Life test 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.

4.6 Inspection of packaging. Inspection of packaging shall be in accordance with MIL-PRF-38535.

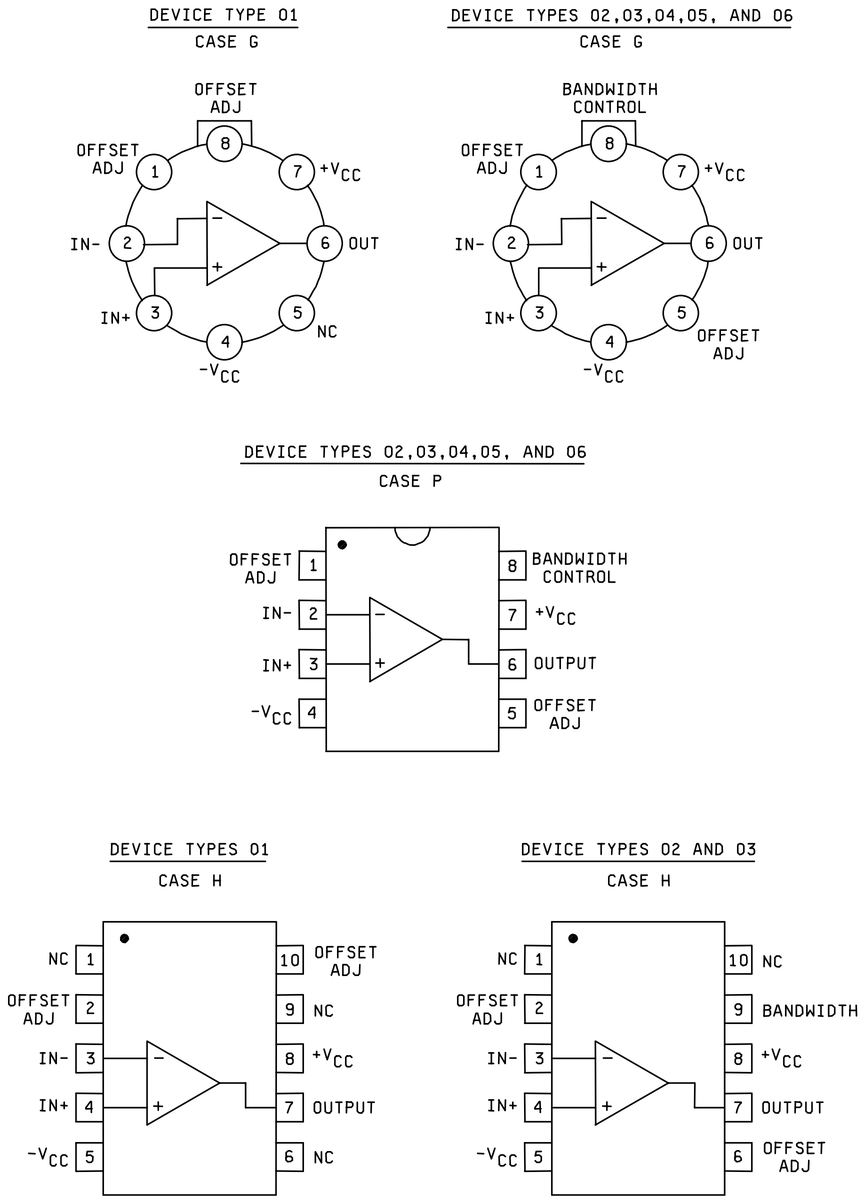
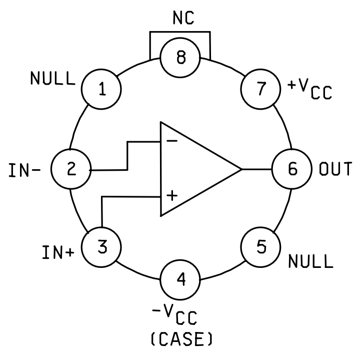
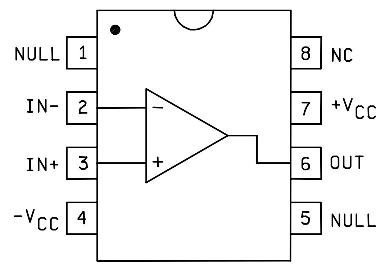


Figure 1. Terminal connections.

DEVICE TYPES 07 AND 08
CASE G



DEVICE TYPES 07 AND 08
CASE P



DEVICE TYPES 07 AND 08
CASE 2

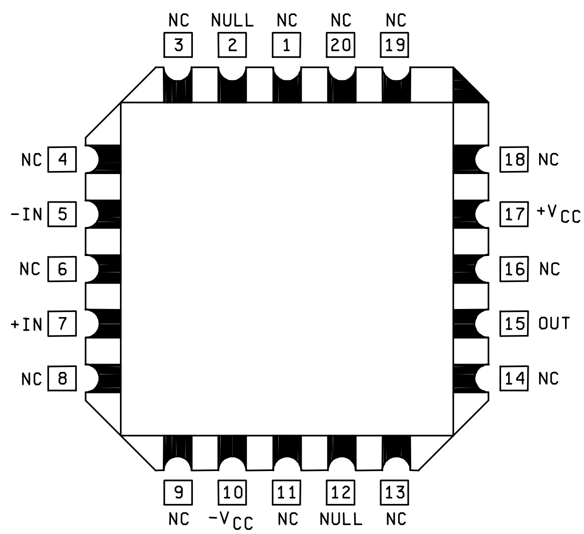
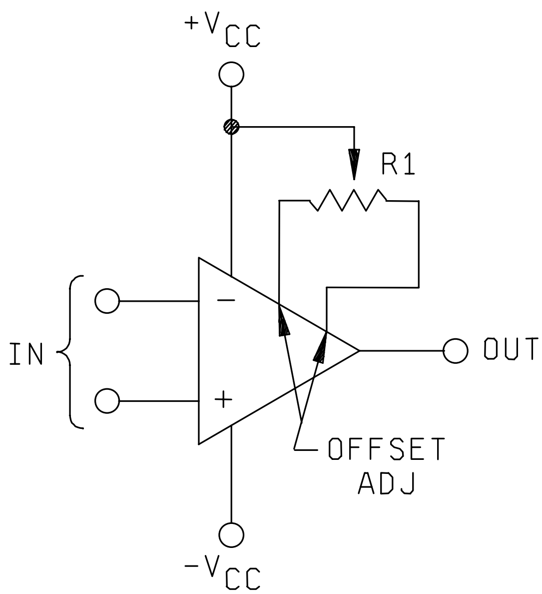


Figure 1. <u>Terminal connections</u> – Continued.

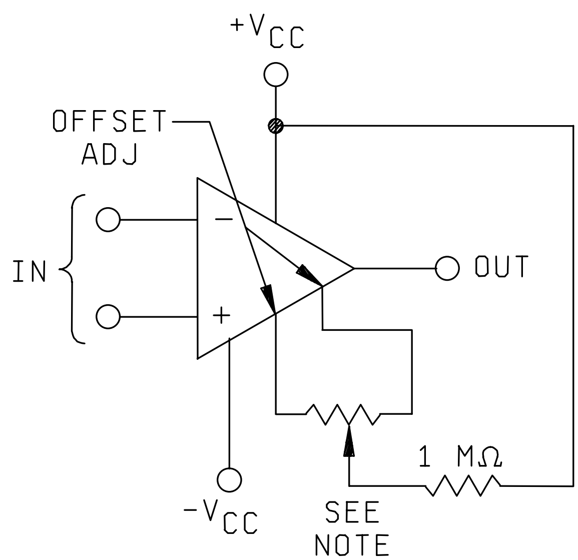
Device types 01 through 06



Device types	Value
01	R1 = 1 MΩ
02, 03	R1 = 100 kΩ
04, 05, 06	R1 = 20 kΩ

FIGURE 2. Offset null circuit.

DEVICE TYPES 07 AND 08



NOTE: Potentiometer, 10 kΩ to 100 kΩ.

FIGURE 2. Offset null circuit – Continued.

DEVICE TYPE 01

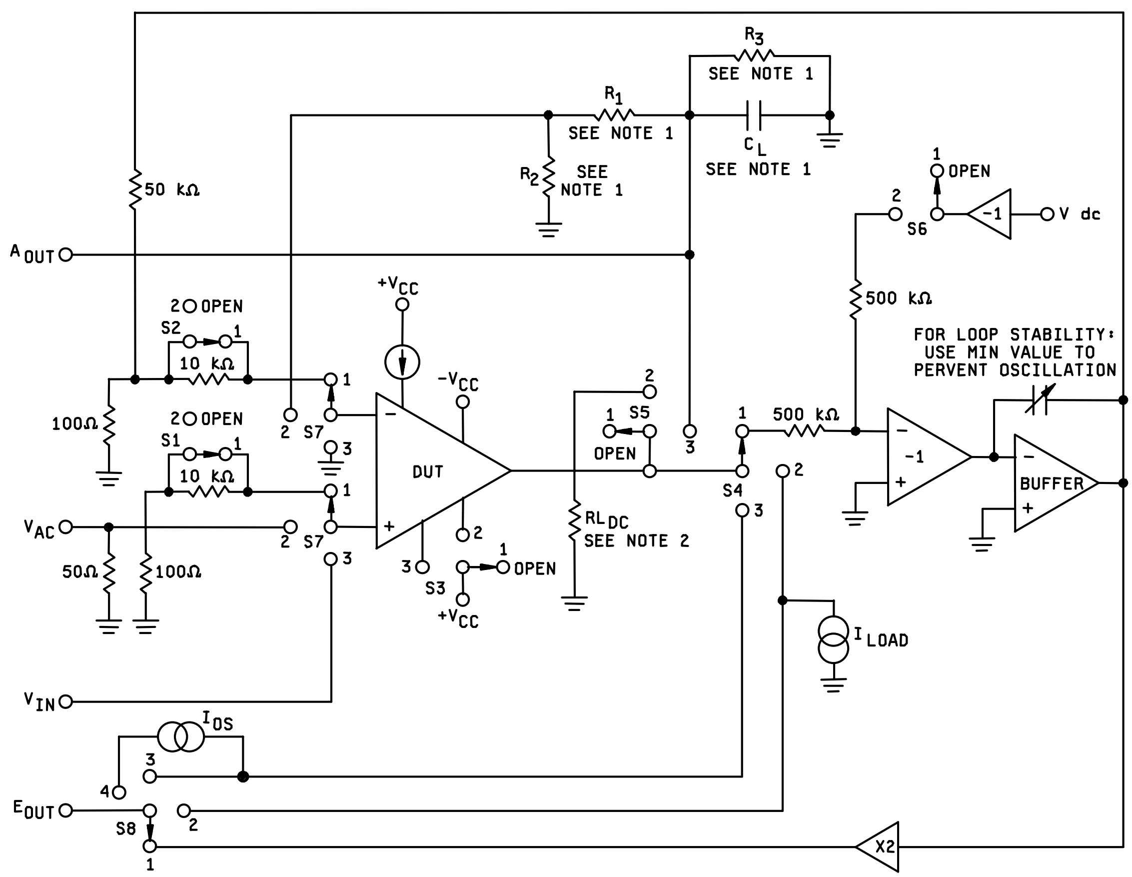
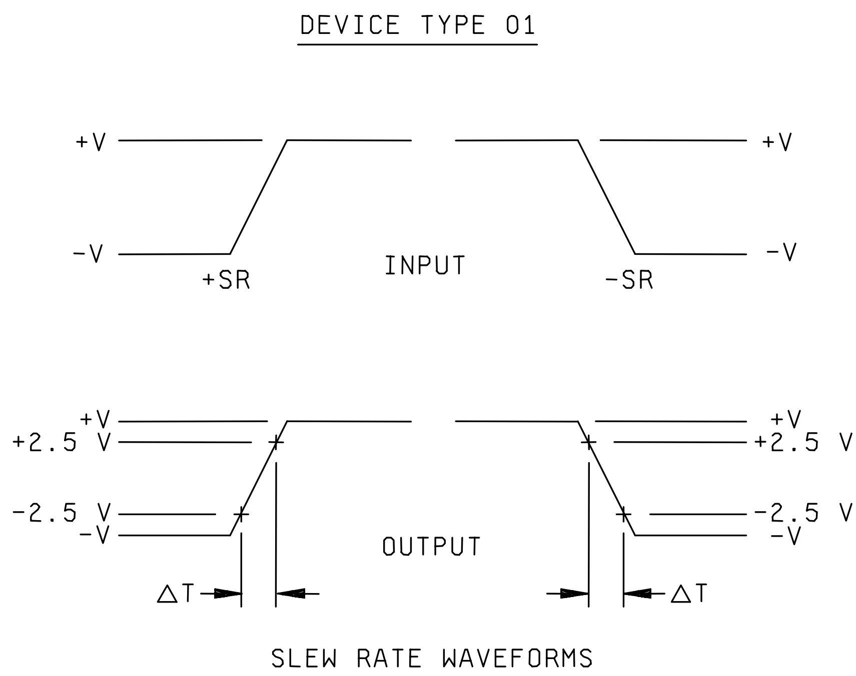


FIGURE 3. Test circuit for static and dynamic tests.

Device type 01

Parameter	Apply (in volts)					Switch positions								Measure		Measured parameter	
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	Value	Unit	Equation	Unit
V_{IO}	15 25 5	-15 -5 -25	0 10 -10			1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10			2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1 – E4) x 100, (E2 – E5) x 100, (E3 – E6) x 100	nA
$+I_{IB}$	15 25 5	-15 -5 -25	0 10 -10			2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E7 E8 E9		$+I_{IB}$ = (E1 – E7) x 100, (E2 – E8) x 100, (E3 – E9) x 100	nA
$-I_{IB}$	15 25 5	-15 -5 -25	0 10 -10			1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1 – E10) x 100, (E2 – E11) x 100, (E3 – E12) x 100	nA
I_{CC}	15	-15	0			1	1	1	1	1	2	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E13 E14	V	+PSRR = 20 log 10 (10^4/E13 – E14)	dB
-PSRR	15 15	-10 -20	0 0			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E15 E16	V	-PSRR = 20 log 10 (10^4/E15 – E16)	dB
CMRR	5 25	-25 -5	-10 10			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E17 E18		CMRR = 20 log 10 (2 x 10^4/E17 – E18)	dB
$+V_{IO(ADJ)}$ see notes 1 and 3	15	-15				1	1	2	3	3	1	2	3	E19	V	$+V_{IO(ADJ)}$ = (E19 – E1)	mV
$-V_{IO(ADJ)}$ see notes 1 and 3	15	-15				1	1	3	3	3	1	2	3	E20		$-V_{IO(ADJ)}$ = (E1 – E20)	mV
$+V_{OUT}$ see note 4	15	-15			0.5	1	1	1	2	1	1	3	2	E21	V		V
$-V_{OUT}$ see note 5	15	-15			-0.5	1	1	1	2	1	1	3	2	E22	V		V
$+V_{OP}$ see note 2	15	-15			0.5	1	1	1	3	2	1	3	3	E23	V		V
$-V_{OP}$ see note 2	15	-15			-0.5	1	1	1	3	2	1	3	3	E24	V		V
$+A_{VS}$ see note 2	15 15	-15 -15	0 10			1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	E25 E26	V	$+A_{VS}$ = 10 / (E26 – E25)	V/mV
$-A_{VS}$ see note 2	15 15	-15 -15	0 -10			1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	E27 E28	V	$-A_{VS}$ = 10 / (E27 – E28)	V/mV
+SR	15	-15		See note 6		1	1	1	3	3	1	2	1	A1	See notes	+SR = $\Delta V / \Delta T$	V /µs
-SR	15	-15		See note 7		1	1	1	3	3	1	2	1	A2	See notes	-SR = $\Delta V / \Delta T$	V /µs

FIGURE 3. Test circuit for static and dynamic tests – Continued.



NOTES:

1. R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 = 3.4 kΩ, C_L = 100 pF.
2. RL_{DC} = 2.0 kΩ.
3. $+V_{IO(ADJ)}$ if E1 < 0; $-V_{IO(ADJ)}$ if E1 > 0.
4. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
5. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
6. V_{AC} = -1 V to +1 V, R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 = 3.4 kΩ, C_L = 100 pF.
7. V_{AC} = +1 V to -1 V, R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 = 3.4 kΩ, C_L = 100 pF.

FIGURE 3. Test circuit for static and dynamic tests – Continued.

DEVICE TYPES 02 AND 03

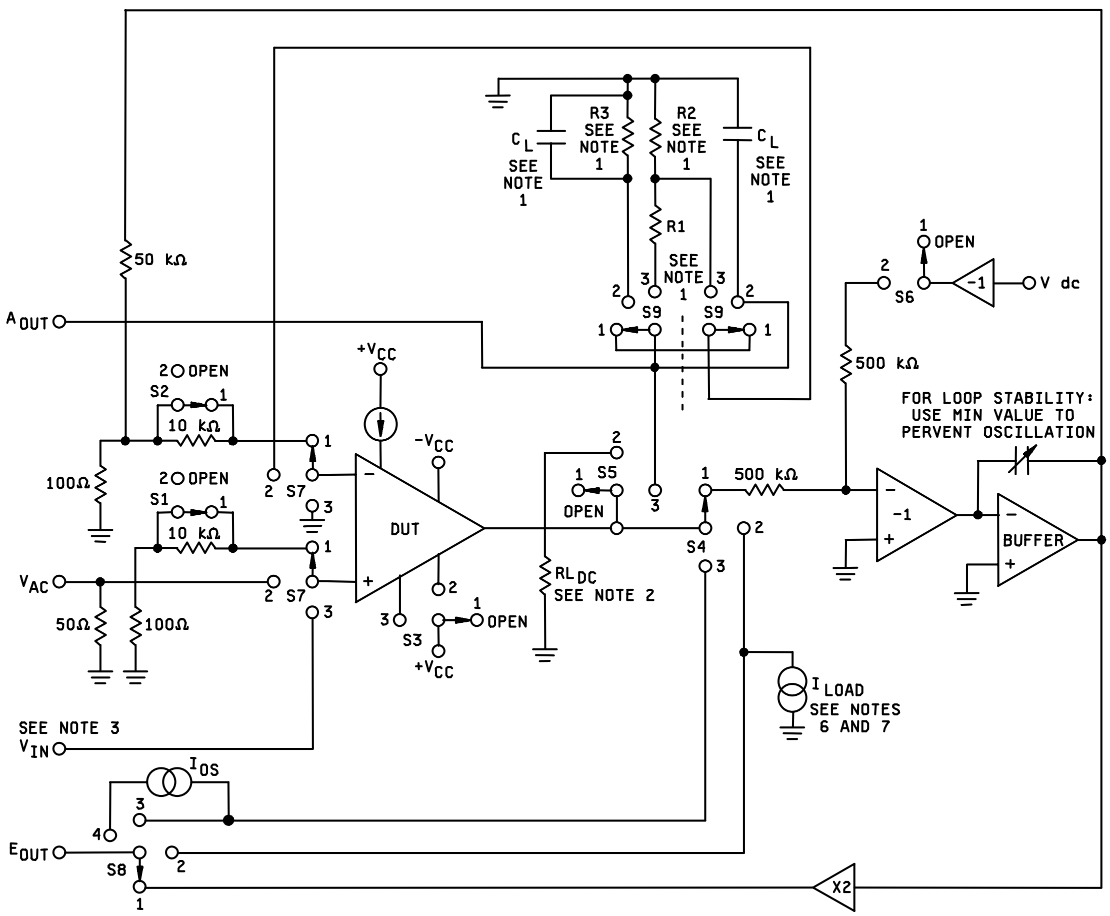


FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device types 02 and 03

Parameter	Apply (in volts)						Switch positions										Measure		Measured parameter	
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 3	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 4	Value	Unit	Equation	Unit
V_{IO}	15 25 5	-15 -5 -25	0 10 -10				1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10				2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1 – E4) x 100, (E2 – E5) x 100, (E3 – E6) x 100	nA
$+I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E7 E8 E9	V	$+I_{IB}$ = (E1 – E7) x 100, (E2 – E8) x 100, (E3 – E9) x 100	nA
$-I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1 – E10) x 100, (E2 – E11) x 100, (E3 – E12) x 100	nA
I_{CC}	15	-15	0				1	1	1	1	1	2	1	1	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E13 E14	V	+PSRR = 20 log 10 (10^4/E13 – E14)	dB
-PSRR	15 15	-10 -20	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E15 E16	V	-PSRR = 20 log 10 (10^4/E15 – E16)	dB
CMRR	5 25	-25 -5	-10 10				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E17 E18		CMRR = 20 log 10 (2 x 10^4/E17 – E18)	dB
$+V_{IO(ADJ)}$ see notes 1 and 5	15	-15					1	1	2	3	3	1	2	3	1	3	E19	V	$+V_{IO(ADJ)}$ = (E19 – E1)	mV
$-V_{IO(ADJ)}$ see notes 1 and 5	15	-15					1	1	3	3	3	1	2	3	1	3	E20	V	$-V_{IO(ADJ)}$ = (E1 – E20)	mV
$+V_{OUT}$ see note 6	15	-15				0.5	1	1	1	2	1	1	3	2	1	1	E21	V		V
$-V_{OUT}$ see note 7	15	-15				-0.5	1	1	1	2	1	1	3	2	1	1	E22	V		V
$+V_{OP}$ see note 2	15	-15				0.5	1	1	1	3	2	1	3	3	1	1	E23	V		V
$-V_{OP}$ see note 2	15	-15				-0.5	1	1	1	3	2	1	3	3	1	1	E24	V		V
$+A_{VS}$ see note 2	15 15	-15 -15	0 10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E25 E26	V	$+A_{VS}$ = 10 / (E26 – E25)	V/mV
$-A_{VS}$ see note 2	15 15	-15 -15	0 -10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E27 E28	V	$-A_{VS}$ = 10 / (E27 – E28)	V/mV

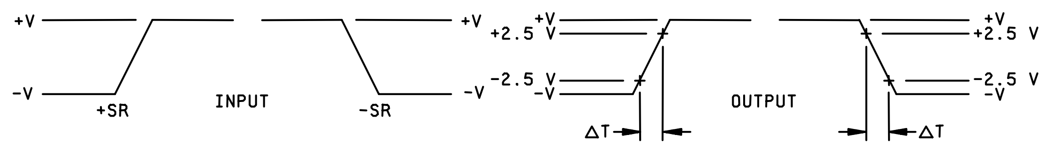
FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device types 02 and 03

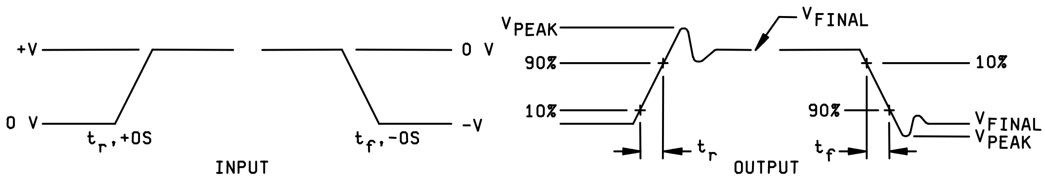
Parameter	Apply (in volts)						Switch positions										Measure		Measured parameter	
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 3	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 4	Value	Unit	Equation	Unit
$TR_{(tr)}$ see note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A1	See notes	TR(tr) = 10% - 90%	ns
$TR_{(tf)}$	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A2		TR(tf) = 90% - 10%	
+OS see note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A3	See notes	$OS = (V_{peak} - V_{final}) \times 100 / V_{final}$	%
-OS	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A4			%
+SR see note 1	15	-15		See note 12	See note 13		1	1	1	3	3	1	2	1	2	3	A5	See notes	$SR = \Delta V / \Delta T$	V/µs
-SR	15	-15		See note 14	See note 15		1	1	1	3	3	1	2	1	2	3	A6			V/µs

FIGURE 3. Test circuit for static and dynamic tests – Continued.

DEVICE TYPES 02 AND 03



SLEW RATE WAVEFORMS



OVERSHOOT, RISE AND FALL TIME WAVEFORMS

NOTES:

1. R1 = 1.6 kΩ, R2 = 400 Ω, R3 = 2 kΩ, C_L = 50 pF, see above figure.
2. RL_{DC} = 2 kΩ.
3. V_{AC} input for device type 03 only.
4. S9 switch positions for device type 03 only.
5. $+V_{IO(ADJ)}$ if E1 $<$ 0; $-V_{IO(ADJ)}$ if E1 $>$ 0.
6. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
7. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
8. Input = 0 V to 200 mV, see above figure.
9. Input = 0 V to 40 mV, see above figure.
10. Input = 0 V to -200 mV, see above figure.
11. Input = 0 V to -40 mV, see above figure.
12. Input = -5 V to +5 V, see above figure.
13. Input = -1 V to +1 V, see above figure.
14. Input = +5 V to -5 V, see above figure.
15. Input = +1 V to -1 V, see above figure.

FIGURE 3. Test circuit for static and dynamic tests – Continued.

DEVICE TYPES 04,05,AND 06

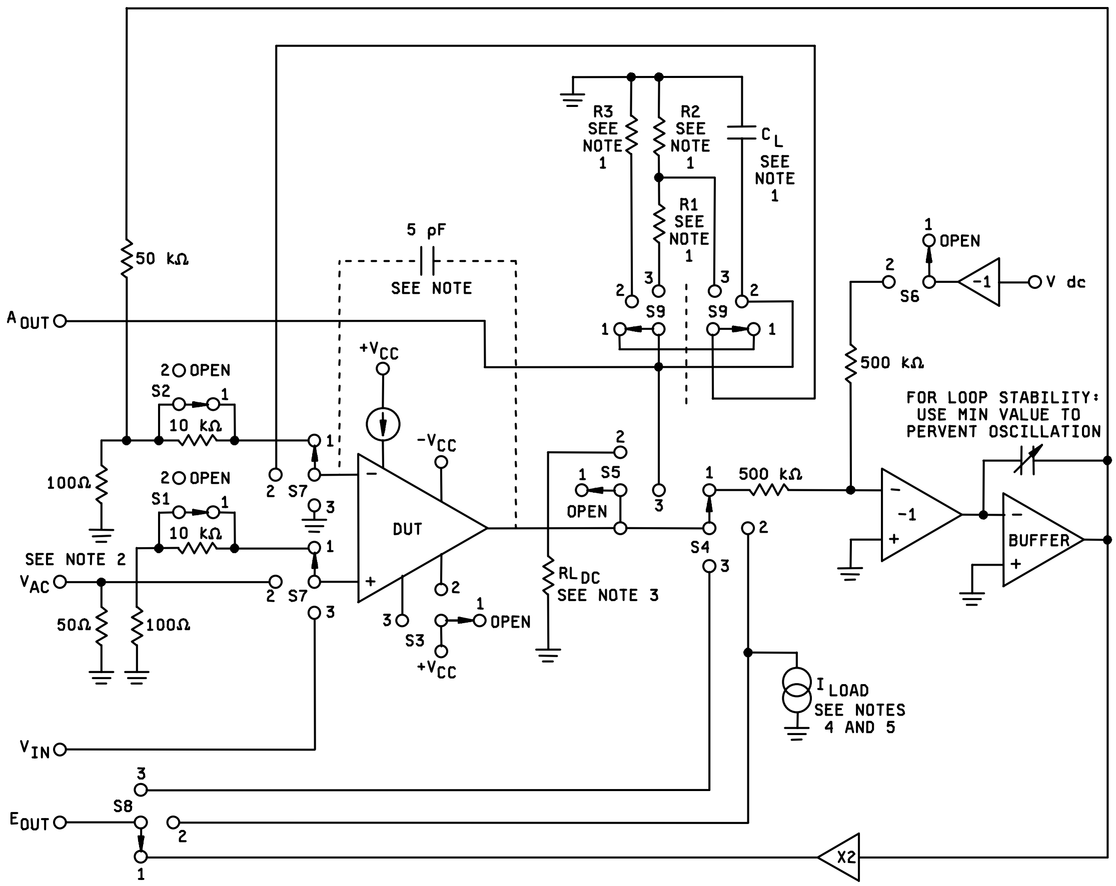


FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device types 04, 05, and 06

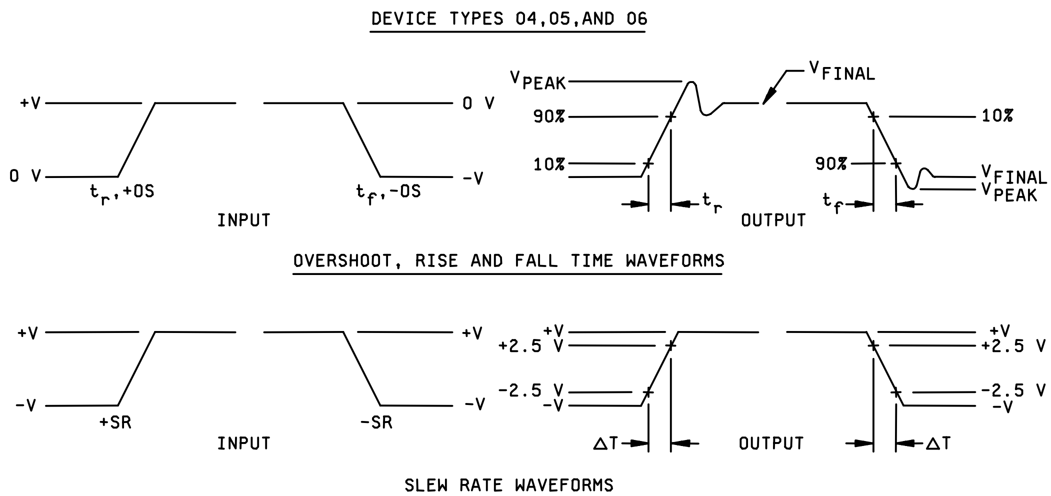
Parameter	Apply (in volts)						Switch positions										Measure		Measured parameter	
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 2	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 6	Value	Unit	Equation	Unit
V_{IO}	15 25 5	-15 -5 -25	0 10 -10				1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10				2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1 – E4) x 100, (E2 – E5) x 100, (E3 – E6) x 100	nA
$+I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E7 E8 E9	V	$+I_{IB}$ = (E1 – E7) x 100, (E2 – E8) x 100, (E3 – E9) x 100	nA
$-I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1 – E10) x 100, (E2 – E11) x 100, (E3 – E12) x 100	nA
I_{CC}	15	-15	0				1	1	1	1	1	2	1	1	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E13 E14	V	+PSRR = 20 log 10 (10^4/E13 – E14)	dB
-PSRR	15 15	-10 -20	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E15 E16	V	-PSRR = 20 log 10 (10^4/E15 – E16)	dB
CMRR	5 25	-25 -5	-10 10				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E17 E18		CMRR = 20 log 10 (2 x 10^4/E17 – E18)	dB
$+V_{IO(ADJ)}$ see notes 1 and 7	15	-15					1	1	2	3	3	1	2	3	1	3	E19	V	$+V_{IO(ADJ)}$ = (E19 – E1)	mV
$-V_{IO(ADJ)}$ see notes 1 and 7	15	-15					1	1	3	3	3	1	2	3	1	3	E20	V	$-V_{IO(ADJ)}$ = (E1 – E20)	mV
$+V_{OUT}$ see note 4	15	-15				0.5	1	1	1	2	1	1	3	2	1	1	E21	V		V
$-V_{OUT}$ see note 5	15	-15				-0.5	1	1	1	2	1	1	3	2	1	1	E22	V		V
$+V_{OP}$ see note 3	15	-15				0.5	1	1	1	3	2	1	3	3	1	1	E23	V		V
$-V_{OP}$ see note 3	15	-15				-0.5	1	1	1	3	2	1	3	3	1	1	E24	V		V
$+A_{VS}$ see note 3	15 15	-15 -15	0 10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E25 E26	V	$+A_{VS}$ = 10 / (E26 – E25)	V/mV
$-A_{VS}$ see note 3	15 15	-15 -15	0 10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E27 E28	V	$-A_{VS}$ = 10 / (E27 – E28)	V/mV

FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device types 04, 05, and 06

Parameter	Apply (in volts)						Switch position										Measure		Measured parameter	
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 2	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 6	Value	Unit	Equation	Unit
$TR_{(tr)}$ see note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A1	See notes	TR(tr) = 10% - 90%	ns
$TR_{(tf)}$	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A2		TR(tf) = 90% - 10%	
+OS see note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A3	See notes	$OS = (V_{peak} - V_{final})$ x 100 / V_{final}	%
-OS	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A4			%
+SR see note 1	15	-15		See note 12	See note 13		1	1	1	3	3	1	2	1	2	3	A5	See notes	$SR = \Delta V / \Delta T$	V/µs
-SR	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A6			V/µs

FIGURE 3. Test circuit for static and dynamic tests – Continued.



NOTES:

1. R1 = 1.33 kΩ, R2 = 667 Ω, R3 = 2 kΩ, C_L = 50 pF, see above figure.
2. V_{AC} input for device type 06 only.
3. RL_{DC} = 2 kΩ.
4. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
5. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
6. S9 switch positions for device type 06 only.
7. $+V_{IO(ADJ)}$ if $E1 < 0$; $-V_{IO(ADJ)}$ if $E1 > 0$.
8. Input = 0 V to 200 mV, see above figure.
9. Input = 0 V to +66.7 mV, see above figure.
10. Input = 0 V to -200 mV, see above figure.
11. Input = 0 V to –66.7 mV, see above figure.
12. Input = -5 V to +5 V, see above figure.
13. Input = -1.67 V to +1.67 V, see above figure.
14. Input = +5 V to -5 V, see above figure.
15. Input = +1.67 V to –1.67 V, see above figure.

FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device type 07

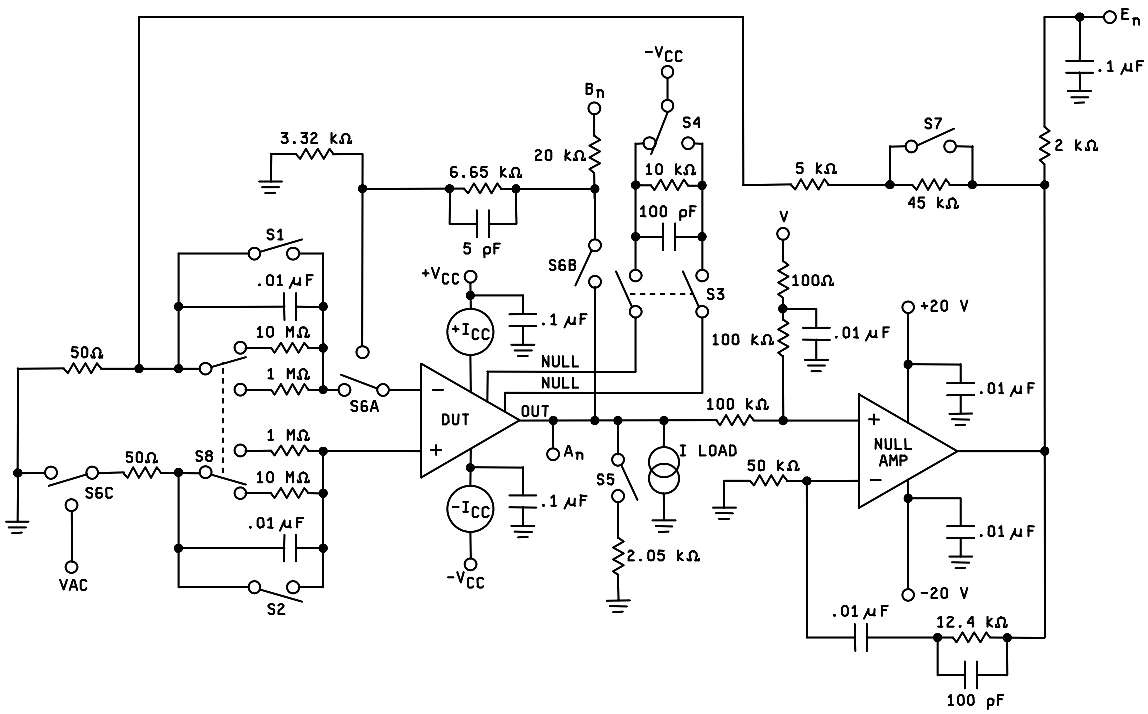


FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device type 08

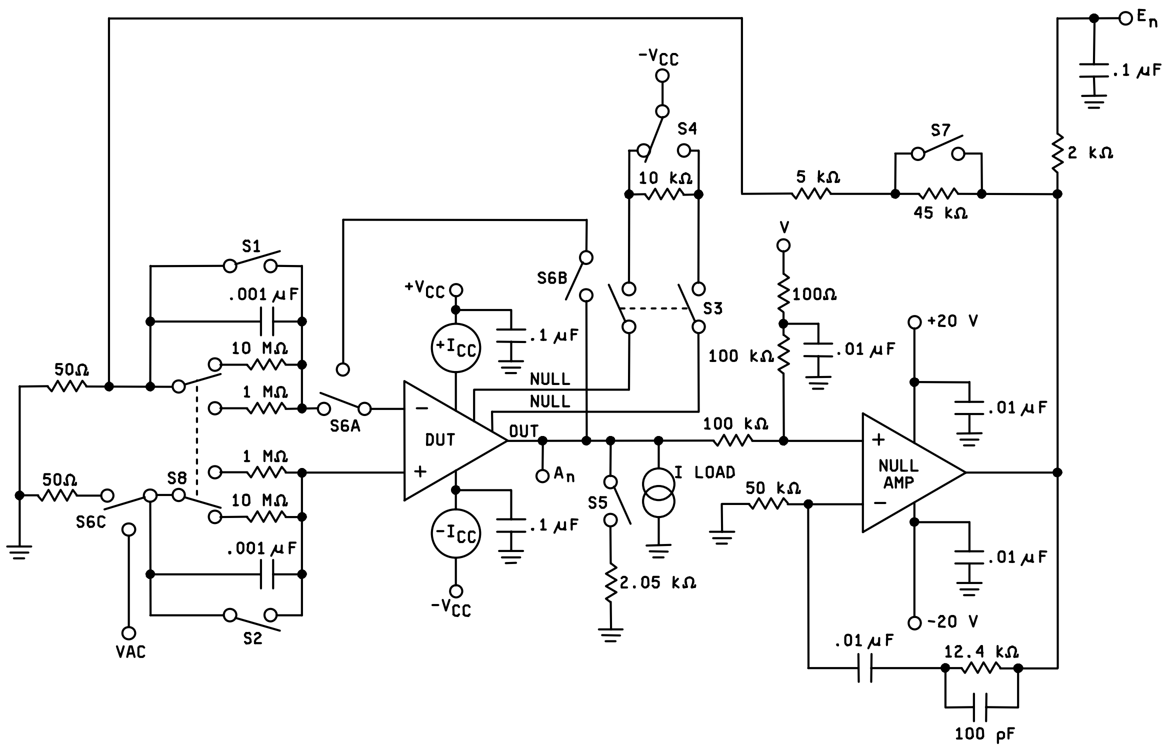


FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device type 07 and 08

Parameter	Apply (in volts)			Switch positions O = Open C = Closed								Measure		Measured parameter	Unit
	$+V_{CC}$	$-V_{CC}$	V	S1	S2	S3	S4	S5	S6	S7	S8	Value	Unit	Equation	
V_{IO}	15	-15	0	C	C	0	0	0	0	0	0	E1	V	V_{IO} = E1 / 1000	mV
	25	-5	10	C	C	0	0	0	0	0	0	E2		V_{IO} = E2 / 1000	
	5	-25	-10	C	C	0	0	0	0	0	0	E3		V_{IO} = E3 / 1000	
I_{IO} see note 1	15	-15	0	0	0	0	0	0	0	0	C	E4	V	I_{IO} = (E4 – E1) / 1000 / 10 MΩ	pA
	25	-5	10	0	0	0	0	0	0	0	C	E5		I_{IO} = (E5 – E2) / 1000 / 10 MΩ	
	5	-25	-10	0	0	0	0	0	0	0	C	E6		I_{IO} = (E6 – E3) / 1000 / 10 MΩ	
$+I_{IB}$ see note 1	15	-15	0	C	0	0	0	0	0	0	C	E7	V	$+I_{IB}$ = (E7 – E1) / 1000 / 10 MΩ	pA
	25	-5	-10	C	0	0	0	0	0	0	C	E8		$+I_{IB}$ = (E8 – E2) / 1000 / 10 MΩ	
	5	-25	10	C	0	0	0	0	0	0	C	E9		$+I_{IB}$ = (E9 – E3) / 1000 / 10 MΩ	
$-I_{IB}$ see note 1	15	-15	0	0	C	0	0	0	0	0	C			$-I_{IB}$ = (E4 + E7) / 1000 / 10 MΩ	pA
	25	-5	-10	0	C	0	0	0	0	0	C			$-I_{IB}$ = (E5 + E8) / 1000 / 10 MΩ	
	5	-25	10	0	C	0	0	0	0	0	C			$-I_{IB}$ = (E6 + E9) / 1000 / 10 MΩ	
+PSRR	10 20	-15 -15	0 0	C C	C C	0 0	0 0	0 0	0 0	0 0	0 0	E13 E14	V	+PSRR = 20 log 10 (1000 / (E14 – E13))	dB
-PSRR	15 15	-10 -20	0 0	C C	C C	0 0	0 0	0 0	0 0	0 0	0 0	E15 E16	V	-PSRR = 20 log 10 (1000 / (E16 – E15))	dB
CMRR														CMRR = 20 log (20 / (E3 – E2) / 1000))	dB
$+V_{IO(ADJ)}$	15	-15	0	C	C	C	C	0	0	0	0	E17	V	$+V_{IO(ADJ)}$ = E17 / 1000	mV
$-V_{IO(ADJ)}$	15	-15	0	C	C	C	C	0	0	0	0	E18	V	$-V_{IO(ADJ)}$ = E18 / 1000	mV
$+I_{CC}$	15	-15	0	C	C	0	0	0	0	0	0	$+I_{CC}$	mA	$+I_{CC}$ = $+I_{CC}$	mA
$-I_{CC}$	15	-15	0	C	C	0	0	0	0	0	0	$-I_{CC}$	mA	$-I_{CC}$ = $-I_{CC}$	mA
$+V_{OP}$	15	-15	-20	C	C	0	0	C	0	0	0	A1	V	$+V_{OP}$ = A1	V
$-V_{OP}$	15	-15	+20	C	C	0	0	C	0	0	0	A2	V	$-V_{OP}$ = A2	V
$+A_{VS}$	15 15	-15 -15	0 -10	C C	C C	0 0	0 0	C C	0 0	0 0	0 0	E19 E20	V V	$+A_{VS}$ = 10 / ((E20 – E19) / 1000)	V/mV
$-A_{VS}$	15	-15	+10	C	C	0	0	C	0	0	0	E21	V	$-A_{VS}$ = 10 / ((E21 – E19) / 1000)	V/mV

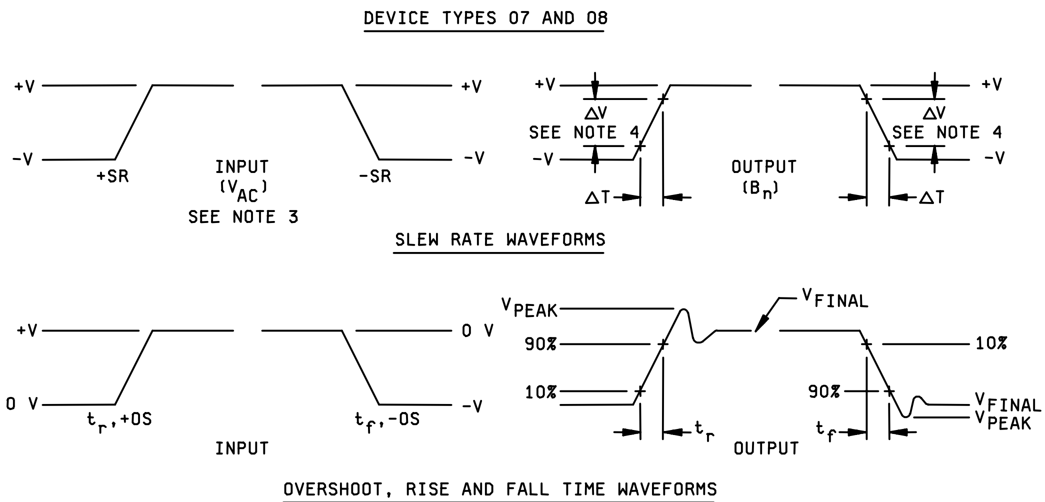
FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device type 07 and 08

Parameter	Apply (in volts)			Switch positions								Measure		Measured parameter	Unit
				O = Open				C = Closed							
	$+V_{CC}$	$-V_{CC}$	V	S1	S2	S3	S4	S5	S6	S7	S8	Value	Unit	Equation	
$+V_{OUT}$ see note 2	15	-15	0	C	C	0	0	0	0	0	0	A3	V	$+V_{OUT} = A3$	V
$-V_{OUT}$ see note 2	15	-15	0	C	C	0	0	0	0	0	0	A4	V	$-V_{OUT} = A4$	V
+SR see note 3	15	-15	0	C	C	0	0	0	C	0	0	B1	See notes	$+SR = \Delta V / \Delta T$	V/µs
-SR see note 4	15	-15	0	C	C	0	0	0	C	0	0	B2		$-SR = \Delta V / \Delta T$	V/µs
$TR_{(tr)}$	15	-15	0	C	C	0	0	0	C	0	0	A5	See notes	TR(tr) = t10% - t90%	ns
$TR_{(tf)}$	15	-15	0	C	C	0	0	0	C	0	0	A6		TR(tf) = t90% - t10%	
$TR_{(+OS)}$	15	-15	0	C	C	0	0	0	C	0	0	A7	See notes	$TR_{(+OS)} = ((V_{peak} - V_{final}) / V_{final}) \times 100$	%
$TR_{(-OS)}$	15	-15	0	C	C	0	0	0	C	0	0	A8		$TR_{(-OS)} = ((V_{peak} - V_{final}) / V_{final}) \times 100$	

FIGURE 3. Test circuit for static and dynamic tests – Continued.

Device type 07 and 08

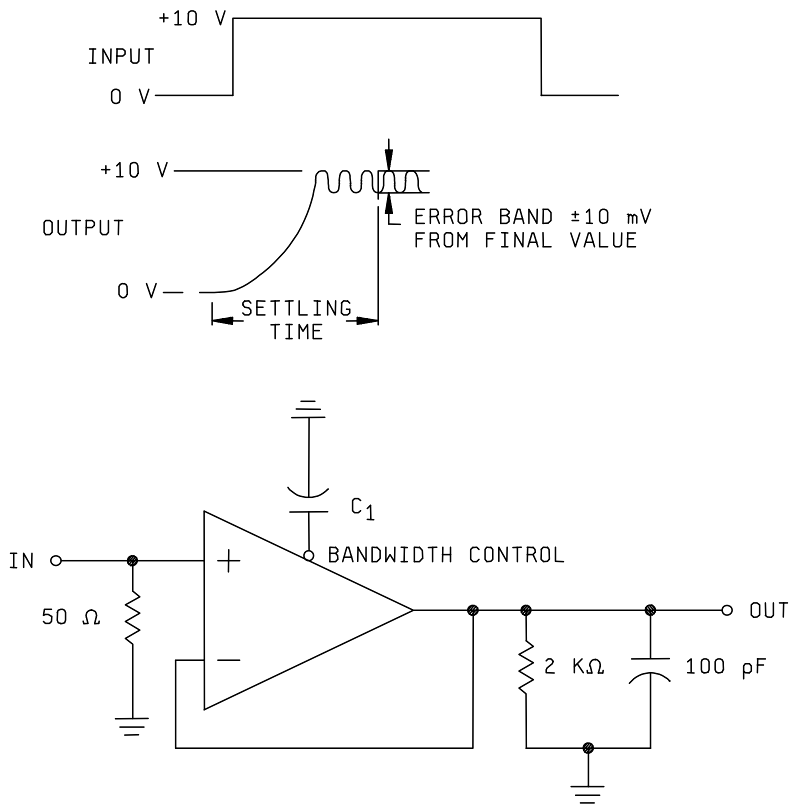


NOTES:

1. At T_A = +125°C, S7 and S8 shall be closed and the factor of 1000 shall be replaced with a factor of 100 in all equations for I_{IO}, $+I_{IB}$, and $–I_{IB}$ and the factor of 10 MΩ shall be replaced with a factor of 1 MΩ in all equations for I_{IO}, $+I_{IB}$, and $–I_{IB}$. Also, the units shall be nA.
2. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
3. V_{AC} = -1.0 V to +1.0 V for device type 07, V_{AC} = -10.0 V to +10.0 V for device type 08.
4. ΔV = -3.3 V to +3.3 V for device type 07, ΔV = -5.0 V to +5.0 V for device type 08.
5. Any oscillation of 300 mV_{PP} or greater shall be cause for device failure.
6. All resistors are ±1% tolerance and all capacitors are ±10% tolerance, unless otherwise indicated.
7. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.

FIGURE 3. Test circuit for static and dynamic tests – Continued.

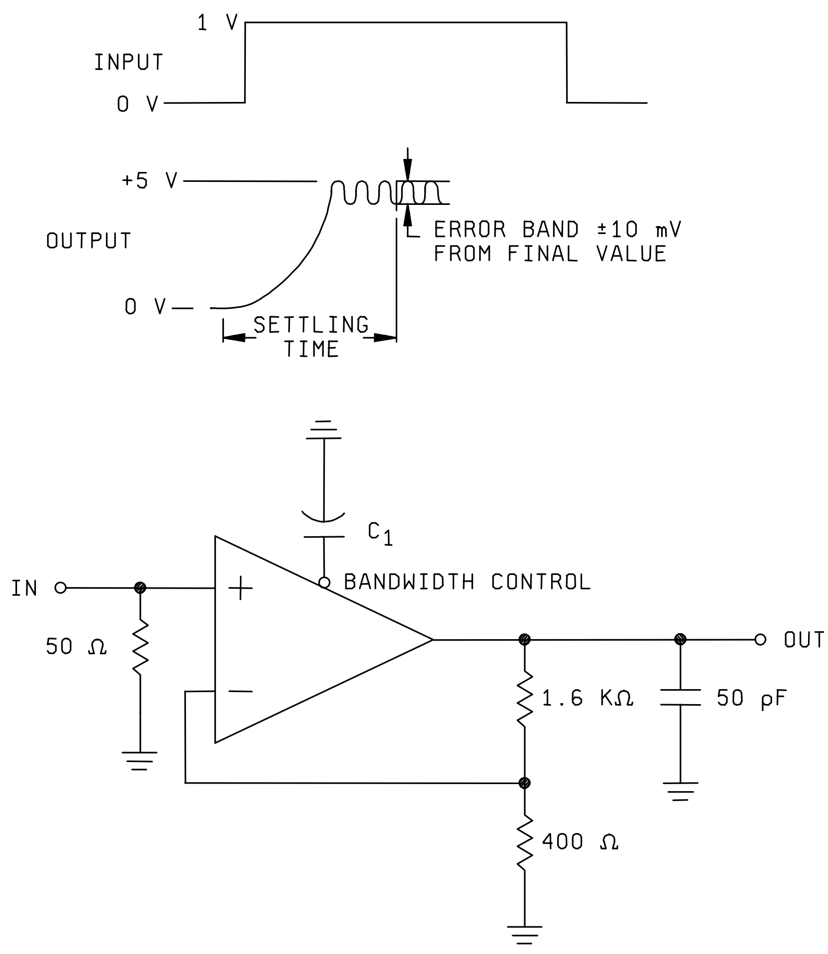
Device type 02



NOTE: C1 is test fixture capacitance and shall be 1.5 pF ±1.0 pF.

FIGURE 4. Settling time circuits .

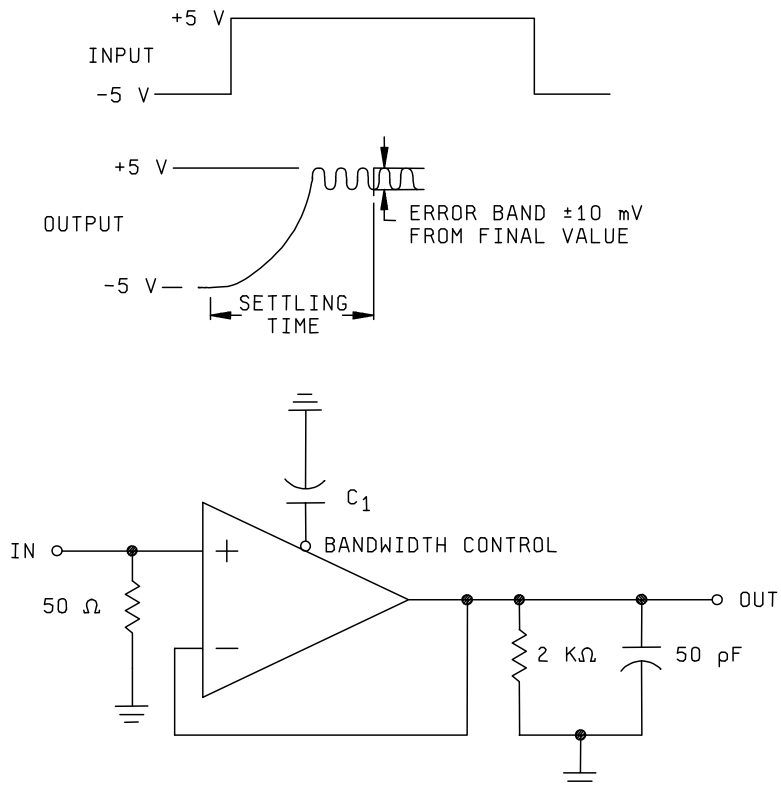
Device type 03



NOTE: C1 is test fixture capacitance and shall be less than 1.0 pF.

FIGURE 4. Settling time circuits – Continued.

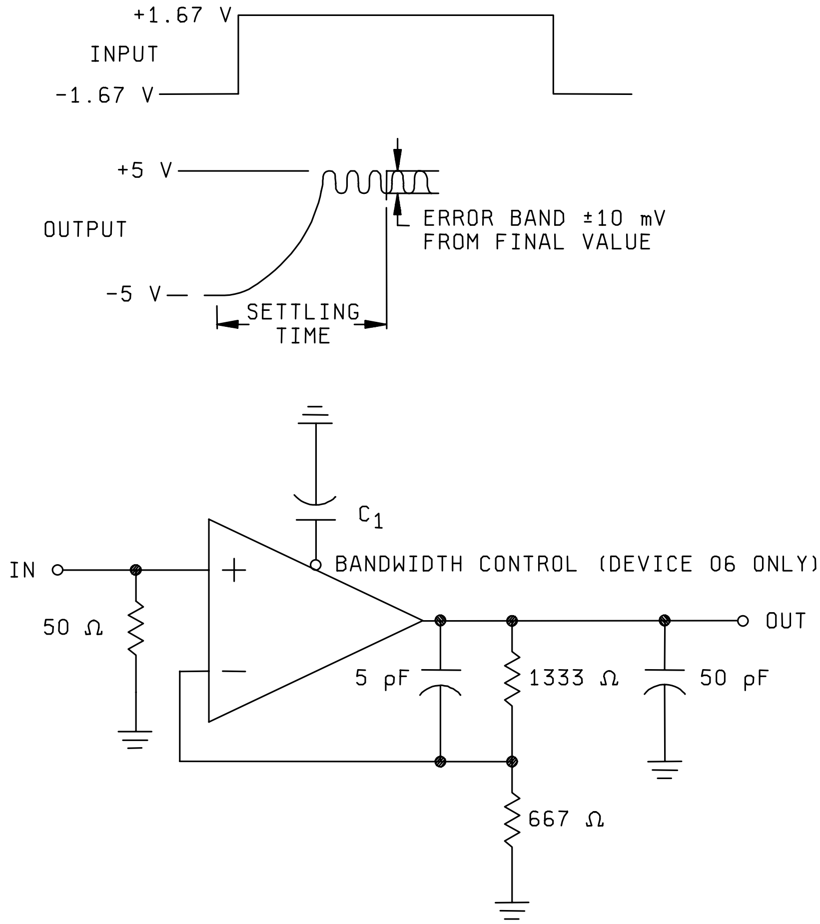
Device types 04 and 05



NOTE: C1 is test fixture capacitance and shall be less than 1.0 pF.

FIGURE 4. Settling time circuits – Continued.

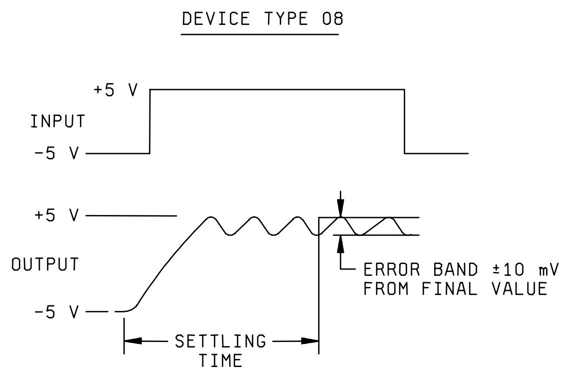
Device types 06 and 07

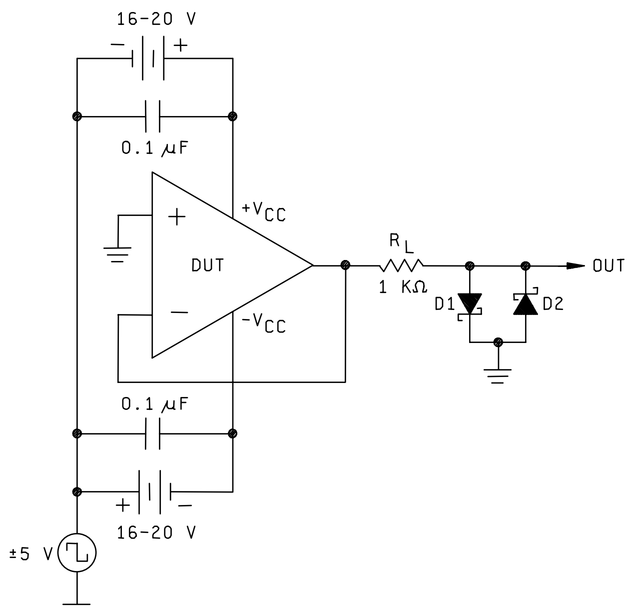


NOTE: C1 is test fixture capacitance and shall be 2.5 pF ±1.0 pF.

FIGURE 4. Settling time circuits – Continued.

Device type 08





Schottky diodes D1 – D2 are Hewlett-Packard HP5082-2835 or equivalent.

FIGURE 4. Settling time circuits – Continued.

TABLE III. Group A inspection.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions ±V_{CC} = ±15 V, see figure 3, unless otherwise specified	Device type 01 limits		Device type 02 limits		Device type 03 limits		Device type 04 limits		Device types 05 and 06 limits		Device types 07 and 08 limits		Unit
					Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
1	V_{IO}	4001	1	V_{CM} = 0 V	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
	"	"	2	V_{CM} = -10 V 1/	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
T_A = +25°C	"	"	3	V_{CM} = 10 V 1/	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
	I_{IO}	"	4	V_{CM} = 0 V	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-0.4	+0.4	nA
	"		5	V_{CM} = -10 V 1/	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-0.4	+0.4	nA
	"	"	6	V_{CM} = 10 V 1/	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-0.4	+0.4	nA
	$+I_{IB}$	"	7	V_{CM} = 0 V	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-0.2	+0.2	nA
	"	"	8	V_{CM} = -10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-0.2	+0.2	nA
	"	"	9	V_{CM} = 10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-1.0	+1.0	nA
	$-I_{IB}$	"	10	V_{CM} = 0 V	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-0.2	+0.2	nA
	"	"	11	V_{CM} = -10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-0.2	+0.2	nA
	"	"	12	V_{CM} = 10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-1.0	+1.0	nA
	+PSRR	4003	13	$+V_{CC}$ = 10.0 V, 20.0 V	86		80		80		80		80		84		dB
	-PSRR	"	14	$-V_{CC}$ = -10.0 V, -20.0 V	86		80		80		80		80		84		dB
	CMRR	"	15	$+V_{CC}$ = 5.0 V, 25.0 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V. –10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		16	2/ 3/	4.0		5.0		5.0		6.0		9.0		2.5		mV
	$-V_{IO(ADJ)}$		17	2/ 3/		-4.0		-5.0		-5.0		-6.0		-9.0		-2.5	mV
	I_{CC}	4005	18			0.15		3.7		3.7		6.0		6.0		7.5 (07 only) 6.0 (08 only)	mA
2	V_{IO}	4001	19	V_{CM} = 0 V	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
	"	"	20	V_{CM} = -10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
T_A = +125°C	"	"	21	V_{CM} = 10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
	I_{IO}	"	22	V_{CM} = 0 V	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	"	"	23	V_{CM} = -10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	"	"	24	V_{CM} = 10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	$+I_{IB}$	"	25	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	"	"	26	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	"	"	27	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-1.0	+1.0	nA
	$-I_{IB}$	"	28	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	"	"	29	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	"	"	30	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-1.0	+1.0	nA
	+PSRR	4003	31	$+V_{CC}$ = 10.0 V, 20.0 V	86		80		80		80		80		84		dB
	-PSRR	"	32	$-V_{CC}$ = -10.0 V, -20.0 V	86		80		80		80		80		84		dB

TABLE III. Group A inspection – Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC} = \pm 15$ V, see figure 3, unless otherwise specified	Device type 01 limits		Device type 02 limits		Device type 03 limits		Device type 04 limits		Device types 05 and 06 limits		Device types 07 and 08 limits		Unit
					Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
2 T_A = +125°C	CMRR	4003	33	$+V_{CC}$ = 5.0 V, 25.0 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V. –10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		34	2/ 3/	6.0		7.0		7.0		9.0		11.0		3.0		mV
	$-V_{IO(ADJ)}$		35	2/ 3/		-6.0		-7.0		-7.0		-9.0		-11.0		-3.0	mV
	I_{CC}	4005	36			0.20		4.0		4.0		6.5		6.5		7.5 (07 only) 6.0 (08 only)	mA
3 T_A = -55°C	V_{IO}	4001	37	V_{CM} = 0 V	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
	"	"	38	V_{CM} = -10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
	"	"	39	V_{CM} = 10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	2.0	mV
	I_{IO}	"	40	V_{CM} = 0 V	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	"	"	41	V_{CM} = -10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	"	"	42	V_{CM} = 10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	$+I_{IB}$ 4/	"	43	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	20.0	nA
	"	"	44	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	20.0	nA
	"	"	45	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-1.0	+1.0	nA
	$-I_{IB}$ 4/	"	46	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	20.0	nA
	"	"	47	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	20.0	nA
	"	"	48	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-1.0	+1.0	nA
	+PSRR	4003	49	$+V_{CC}$ = 10.0 V, 20.0 V	86		80		80		80		80		84		dB
	-PSRR	"	50	$-V_{CC}$ = -10.0 V, -20.0 V	86		80		80		80		80		84		dB
	CMRR	"	51	$+V_{CC}$ = 5.0 V, 25.0 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V. –10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		52	2/ 3/	6.0		7.0		7.0		9.0		11.0		3.0		mV
	$-V_{IO(ADJ)}$		53	2/ 3/		-60		-7.0		-7.0		-9.0		-11.0		-3.0	mV
	I_{CC}	4005	54			0.20		4.0		4.0		6.5		6.5		7.5 (07 only) 6.0 (08 only)	mA
4 T_A = +25°C	$+V_{OP}$	4004	55	R_L = 2 kΩ	12.0		10.0		10.0		10.0		10.0		11.5		V
	$-V_{OP}$	"	56	R_L = 2 kΩ		-12.0		-10.0		-10.0		-10.0		-10.0		-11.5	V
	$+A_{VS}$	"	57	R_L = 2 kΩ, V_{OUT} = 0 V, 10 V	200.0		100.0		100.0		20.0		10.0		100.0		V/mV
	$-A_{VS}$	"	58	R_L = 2 kΩ, V_{OUT} = 0 V, -10 V	200.0		100.0		100.0		20.0		10.0		100.0		V/mV
	$+V_{OUT}$		59	V_{OUT} at –10 mA	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		60	V_{OUT} at 10 mA		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V

TABLE III. Group A inspection – Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC}$ = ±15 V, see figure 3, unless otherwise specified	Device type 01 limits		Device type 02 limits		Device type 03 limits		Device type 04 limits		Device types 05 and 06 limits		Device types 07 and 08 limits		Unit
					Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
5 T_A = +125°C	$+V_{OP}$	4004	61	R_L = 2 kΩ	11.0		10.0		10.0		10.0		10.0		11.0		V
	$-V_{OP}$	"	62	R_L = 2 kΩ		-11.0		-10.0		-10.0		-10.0		-10.0		-11.0	V
	$+A_{VS}$	"	63	R_L = 2 kΩ, V_{OUT} = 0 V, 10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$-A_{VS}$	"	64	R_L = 2 kΩ, V_{OUT} = 0 V, -10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$+V_{OUT}$		65	V_{OUT} at –10 mA, -5 mA 5/	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		66	V_{OUT} at 10 mA , 5 mA 5/		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V
6 T_A = -55°C	$+V_{OP}$	4004	67	R_L = 2 kΩ	11.0		10.0		10.0		10.0		10.0		11.0		V
	$-V_{OP}$	"	68	R_L = 2 kΩ		-11.0		-10.0		-10.0		-10.0		-10.0		-11.0	V
	$+A_{VS}$	"	69	R_L = 2 kΩ, V_{OUT} = 0 V, 10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$-A_{VS}$	"	70	R_L = 2 kΩ, V_{OUT} = 0 V, -10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$+V_{OUT}$		71	V_{OUT} at –10 mA, -5 mA 5/	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		72	V_{OUT} at 10 mA , 5 mA 5/		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V
7 T_A = +25°C	TR(tr)	4002	73	6/				60.0		45.0		50.0		50.0		50.0	ns
	TR(tf)	"	74	6/				60.0		45.0		50.0		50.0		50.0	ns
	TR(-os)	"	75	6/				40.0		70.0		40.0		40.0		40.0	%
	TR(+os)	"	76	6/				40.0		70.0		40.0		40.0		40.0	%
	+SR	"	77	6/ 7/	10.0		4.0		25.0		25.0		50.0 (05 only) 100.0 (06 only)		100.0 (07 only) 45.0 (08 only)		V/µs
	-SR	"	78	6/ 7/	10.0		4.0		25.0		25.0		50.0 (05 only) 100.0 (06 only)		100.0 (07 only) 45.0 (08 only)		V/µs
8 T_A = +125°C	TR(tr)	"	79	6/ 8/				70.0		60.0		60.0		60.0 (05 only) 55.0 (06 only)		55.0 (07 only) 60.0 (08 only)	ns
	TR(tf)	"	80	6/ 8/				70.0		60.0		60.0		60.0 (05 only) 55.0 (06 only)		55.0 (07 only) 60.0 (08 only)	ns
	TR(+os)	"	81	6/ 9/				50.0		70.0		50.0		50.0 (05 only) 45.0 (06 only)		45.0 (07 only) 50.0 (08 only)	%
	TR(-os)	"	82	6/ 9/				50.0		70.0		50.0		50.0 (05 only) 45.0 (06 only)		45.0 (07 only) 50.0 (08 only)	%

TABLE III. Group A inspection – Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC}$ = ±15 V, see figure 3, unless otherwise specified	Device type 01 limits Min	Device type 01 limits Max	Device type 02 limits Min	Device type 02 limits Max	Device type 03 limits Min	Device type 03 limits Max	Device type 04 limits Min	Device type 04 limits Max	Device types 05 and 06 limits Min	Device types 05 and 06 limits Max	Device types 07 and 08 limits Min	Device types 07 and 08 limits Max	Unit
8 T_A = +125°C	+SR	4002	83	6/ 10/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		80.0 (07 only) 40.0 (08 only)		V/µs
	-SR	"	84	6/ 10/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		80.0 (07 only) 40.0 (08 only)		V/µs
8 T_A = -55°C	TR(tr)	"	85	6/ 11/				70.0		60.0		60.0		55.0		55.0 (07 only) 60.0 (08 only)	V/µs
	TR(tf)	"	86	6/ 11/				70.0		60.0		60.0		55.0		55.0 (07 only) 60.0 (08 only)	V/µs
	TR(+os)	"	87	12/				50.0		70.0		50.0		45.0		45.0 (07 only) 50.0 (08 only)	V/µs
	TR(-os)	"	88	12/				50.0		70.0		50.0		45.0		45.0 (07 only) 50.0 (08 only)	V/µs
	+SR	"	89	6/ 13/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		84.0 (07 only) 40.0 (08 only)		V/µs
	-SR	"	90	6/ 13/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		84.0 (07 only) 40.0 (08 only)		V/µs
12 T_A =-55°C	$+t_S$		91	See figure 4 14/				4.0		3.0		1.2		15/		15/	µs
	$-t_S$		92	See figure 4 14/				4.0		3.0		1.2		15/		15/	µs
13 T_A = +125°C	$\Delta V_{IO}/\Delta T$		93	$\Delta V_{IO}/\Delta T = V_{IO}$ (test 19) - V_{IO} (test 1) x 10 16/	-15.0	15.0	-15.0	15.0	-15.0	15.0	-30.0	30.0	-30.0	30.0	-10	10	µV/°C
	$\Delta I_{IO}/\Delta T$		94	$\Delta I_{IO}/\Delta T = V_{IO}$ (test 22) - I_{IO} (test 4) x 10 16/	-100.0	100.0	-100.0	100.0	-100.0	100.0	-400.0	400.0	-400.0	400.0	-20	20	pA/°C
13 T_A =-55°C	$\Delta V_{IO}/\Delta T$		95	$\Delta V_{IO}/\Delta T = V_{IO}$ (test 37) - V_{IO} (test 1) x 12.5 16/	-15.0	15.0	-15.0	15.0	-15.0	15.0	-30.0	30.0	-30.0	30.0	-10	10	µV/°C
	$\Delta I_{IO}/\Delta T$		96	$\Delta I_{IO}/\Delta T = V_{IO}$ (test 40) - I_{IO} (test 4) x 12.5 16/	-200.0	200.0	-100.0	100.0	-100.0	100.0	-400.0	400.0	-400.0	400.0	-20	+20	pA/°C

TABLE III. Group A inspection – Continued.

1/ V_{CM} is achieved by algebraically subtracting the common mode voltage (V_{CM}) from each supply and algebraically adding the common mode voltage to V (For example: for V_{CM} = -10 V, then $+V_{CC}$ = +25 V, $-V_{CC}$ = -5 V, V = 10 V).

2/ Using the ac test circuit, the $+V_{IO(ADJ)}$ will force the output voltage to a voltage greater than +1 mV. The $-V_{IO(ADJ)}$ will force the output voltage to voltage less than – 1 mV.

3/ The $V_{IO(ADJ)}$ test will be performed as follows: The tester will measure V_{IO} and make a determination as to whether V_{IO} is positive or negative. If V_{IO} is positive, the tester will check for $V_{IO(ADJ)}$ to 1 mV more negative than zero volts. If V_{IO} is negative, the tester will check for $V_{IO(ADJ)}$ to 1 mV more positive than zero volts. The limits specified in this table indicate the minimum adjustability required for a device having V_{IO} equal to the maximum limit.

4/ $\pm I_{IB}$ (test numbers 43 through 48), device type 07 is not tested.

5/ Device types 01, 04, 05, 06, 07, and 08: I_{OUT} = ±5 mA. Device types 02 and 03: I_{OUT} = ±10 mA.

6/ Device types 01 and 03: A_V = 5; device types 02, 04, and 05: A_V = 1; device types 06 and 07: A_V = 3.

7/ At +25°C, tests 77 and 78, +SR and –SR, device type 05: 50 V/µs minimum.

8/ At +125°C, test 79 and 80, $TR_{(tr)}$ and $TR_{(tf)}$, device type 05: 60 ns maximum.

9/ At +125°C, tests 81 and 82, $TR_{(+OS)}$ and $TR_{(-OS)}$, device type 05: +50.0% maximum.

10/ At +125C, tests 83 and 84, +SR and –SR, device type 05: +45V/µs minimum.

11/ At –55°C, tests 85 and 86, $TR_{(tr)}$ and $TR_{(tf)}$, device type 05: +60.0 ns maximum.

12/ At –55°C, tests 87 and 88, $TR_{(+OS)}$ and $TR_{(-OS)}$, device type 05: +50% maximum.

13/ At –55°C, tests 89 and 90, +SR and –SR, device type 05: +45.0 V/µs minimum.

14/ For device types 02, 03, 04, 05 and 06, which have a bandwidth control pin, no additional external compensation capacitance shall be used.

15/ At +25°C, tests 91 and 92, $+t_S$ and $-t_S$, device type 05: 1.0 µs maximum, device types 06, 07, and 08: 1.1 µs maximum.

16/ Tests 93 through 96, which require a read and record measurement plus a calculation, may be omitted except when subgroup 13 is being accomplished for group A sampling inspection and group B (class S) inspection.

5. PACKAGING

5.1 Packaging requirements. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department of Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

TABLE IV. Group C end point electrical parameters. 1/ 2/ 3/

(T_A = 25°C, $\pm V_{CC}$ = ±15 V V_{CM} = 0 V)

Device type	V_{IO} (test no. 1, table III) (mV)				$+I_{IB}$ (test no. 7, table III) (nA)				$-I_{IB}$ (test no. 10, table III) (nA)			
	Limit		Delta		Limit		Delta		Limit		Delta	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
01	-3.0	+3.0	-0.5	+0.5	-20.0	+20.0	-10.0	+10.0	-20.0	+20.0	-10.0	+10.0
02	-4.0	+4.0	-0.5	+0.5	-10.0	+10.0	-8.0	+8.0	-10.0	+10.0	-8.0	+8.0
03	-4.0	+4.0	-0.5	+0.5	-15.0	+15.0	-10.0	+10.0	-15.0	+15.0	-10.0	+10.0
04	-5.0	+5.0	-1.5	+1.5	+1.0	+200.0	-20.0	+20.0	+1.0	+200.0	-20.0	+20.0
05, 06	-8.0	+8.0	-1.5	+1.5	+1.0	+200.0	-20.0	+20.0	+1.0	+200.0	-20.0	+20.0
07, 08	-1.5	+1.5	-0.5	+0.5	-1.0	+1.0	-0.5	+0.5	-1.0	+1.0	-0.5	+0.5

1/ Delta limits apply to the measured value (see delta limit definition in MIL-PRF-38535). For device types 07 and 08, delta limits apply to the measured value of test 1, 7, and 10.
2/ Each of the parameters shall be recorded before and after the required burn-in or life tests to determine deltas (Δ).
3/ For device types 07 and 08, limits apply for tests 1, 2, 3, 7, 8, 9, 10, 11, and 12.

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 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.

b. PIN and compliance identifier, if applicable (see 1.2).

c. Requirements for delivery of one copy of the conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.

d. Requirements for certificate of compliance, if applicable.

e. Requirements for notification of change of product or process to acquiring activity in addition to notification of the qualifying activity, if applicable.

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

g. Requirements for product assurance options.

h. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements should not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.

i. Requirements for "JAN" marking.

j. Packaging requirements (see 5.1).

6.3 Superseding information. The requirements of MIL-M-38510 have been superseded to take advantage of the available Qualified Manufacturer Listing (QML) system provided by MIL-PRF-38535. Previous references to MIL-M-38510 in this document have been replaced by appropriate references to MIL-PRF-38535. All technical requirements now consist of this specification and MIL-PRF-38535. The MIL-M-38510 specification sheet number and PIN have been retained to avoid adversely impacting existing government logistics systems and contractor's parts lists.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List QML-38535 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DSCC-VQ, 3990 E. Broad Street, Columbus, Ohio 43123-1199.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-STD-1331.

6.6 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 A (see 3.4). Longer length leads and lead forming should not affect the part number.

6.7 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 should 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-PRF-38535.

Military device type	Generic-industry type
01	2700
02	2600
03	2620
04	2500
05	2510
06	2520
07	OP44
08	OP42

6.8 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 – CR
Navy - EC
Air Force - 11
NASA - NA
DLA – CC

Review activities:
Army - MI, SM
Navy - AS, CG, MC, SH, TD
Air Force – 03, 19, 99

Preparing activity:
DLA - CC

Project 5962-2051

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.