

MILITARY SPECIFICATION
MICROCIRCUITS, LINEAR, ADJUSTABLE, NEGATIVE, VOLTAGE REGULATORS, MONOLITHIC SILICON

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

Reactivated for new design as of 05 November 2003. May be used for either new or existing design acquisition.

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 three and four terminal monolithic silicon, adjustable, negative, voltage regulators. Two product assurance classes and a choice of case outlines and lead finish are provided for each type 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 For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.4).

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 shown in the following:

<u>Device type</u>	<u>Circuit</u>	<u>Case outline letter</u>
01	4-terminal voltage regulator, -30 volts $\leq V_O \leq$ -5 volts at 0.5 A	X
02	4-terminal voltage regulator, -30 volts $\leq V_O \leq$ -5 volts at 1.0 A	Y
03	3-terminal voltage regulator, -37 volts $\leq V_O \leq$ -1.25 volts at 0.5 A	X
04	3-terminal voltage regulator, -37 volts $\leq V_O \leq$ -1.25 volts at 1.5 A	Y

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

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

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Device type</u>	<u>Package style</u>
X	See figure 1	4	01	Can
Y	See figure 2	4	02	Flange mount
X	See figure 3	3	03	Can
Y	See figure 4	2	04	Flange mount

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 43218-3990, or emailed to linear@dsccl.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

1.3 Absolute maximum ratings.

Input voltage (device types 01 and 02)	-40 V
Input-output differential voltage (device types 03 and 04)	-40 V
Lead temperature (soldering, 60 seconds)	+300°C
Junction temperature (T_J)	+150°C <u>1/</u>
Storage temperature range	-65°C to +150°C

1.4 Recommended operating conditions.

Input voltage range:	
Device types 01 and 02	-8 V dc to -38 V dc
Device types 03 and 04	-4.25 V dc to -41.25 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

1.5 Power and thermal characteristics.

$T_A = T_S$	Case	Max θ_{JA}	Maximum P_D with heat sink	Max θ_{JC}	Maximum P_D with heat sink	Max θ_{C-S} <u>2/</u>
125°C <u>3/</u>	X	140°C/W	0.18 W	40°C/W	0.5 W	10°C/W
	Y	35°C/W	0.71 W	4°C/W	5.6 W	0.5°C/W
25°C	X	140°C/W	0.89 W	40°C/W	2.50 W	10°C/W
	Y	35°C/W	3.60 W	4°C/W	28.00 W	0.5°C/W
-55°C	X	140°C/W	1.50 W	40°C/W	4.00 W	10°C/W
	Y	35°C/W	5.80 W	4°C/W	45.00 W	0.5°C/W

1/ The device is protected by a thermal shutdown circuit which is designed to turn off the output transistor whenever the device junction temperature is in excess of 150°C.

2/ This value represents the maximum allowable thermal impedance of a heat sink to remain within the thermal ratings.

3/ Based on $T_J = 150^\circ\text{C}$ and specified values of θ_{JA} and θ_{JC} .

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 <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 6.3).

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 Block diagram and terminal connections. The block diagrams and terminal connections shall be as specified on figures 5 through 8.

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 (DSCC-VA) upon request.

3.3.3 Case outlines. The case outlines shall be as specified in 1.2.3 and on figures 1, 2, 3, and 4.

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

3.4.1 Lead material. The lead material shall be in accordance with MIL-PRF-38535, or as follows:

Type X

Nickel	50-53 percent
Manganese	0.60 percent, maximum
Silicon	0.30 percent, maximum
Carbon	0.10 percent, maximum
Chromium	0.25 percent, maximum
Cobalt	0.50 percent, maximum
Phosphorous	0.025 percent, maximum
Sulfur	0.025 percent, maximum
Aluminum	0.10 percent maximum
Iron	Remainder

Type Y

Copper core	24.75 percent, maximum
Clad with Alloy 52	75.25 percent maximum

3.5 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full operating ambient temperature range of -55°C to $+125^{\circ}\text{C}$.

3.5.1 Stability. If the device is located an appreciable distance from the power supply filter, a solid tantalum bypass capacitor should be connected as close to the device V_{CC} input as possible to suppress oscillation. A solid tantalum bypass capacitor is recommended on the device output. Output current oscillations may occur in the current limit operating mode. Since load currents of less than 5 milliamperes may result in a loss of voltage regulation, regulators should be preloaded with 5 milliamperes of load current in lightly loaded applications.

3.5.2 Test limit. The test limits specified in tables I and III apply only for the stated test conditions (example, 2 percent duty cycle), which essentially keep the junction temperature constant. In most applications the junction temperature will greatly exceed the 25°C ambient or sink temperature; thus devices may not perform within the 25°C specified limits.

3.6 Electrical test requirements. 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.

3.7 Marking. Marking shall be in accordance with MIL-PRF-38535. At the option of the manufacturer, marking of the country of origin may be omitted from the body of the microcircuit, but shall be retained on the initial container.

3.8 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 52 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output voltage	V _{OUT}	V _{IN} = -8 V	I _L = 5 mA, 500 mA	01	-5.25	-4.75	V
		V _{IN} = -30 V	I _L = 5 mA, 50 mA		-5.25	-4.75	
		V _{IN} = -38 V	I _L = 500 mA		-31.5	-28.5	
		V _{IN} = -10 V, T _A = 150°C	I _L = 5 mA		-5.25	-4.75	
Line regulation	V _{RLINE}	-30 V ≤ V _{IN} ≤ -8 V	I _L = 50 mA	01	-150	150	mV
		-25 V ≤ V _{IN} ≤ -8 V	I _L = 350 mA		-50	50	
Load regulation	V _{RLOAD}	V _{IN} = -10 V	5 mA ≤ I _L ≤ 500 mA	01	-100	100	mV
		V _{IN} = -30 V	5 mA ≤ I _L ≤ 50 mA		-150	150	
Thermal regulation	V _{RTH}	V _{IN} = -15 V, T _A = 25°C	I _L = 500 mA	01	-50	50	mV
Standby current drain	I _{SCD}	V _{IN} = -10 V	I _L = 5 mA	01	0.1	3.0	mA
		V _{IN} = -30 V	I _L = 5 mA		0.1	4.0	
Standby current drain change versus line voltage	ΔI _{SCD} (LINE)	-30 V ≤ V _{IN} ≤ -8 V	I _L = 5 mA	01	-1.0	1.0	mA
Standby current drain change versus load current	ΔI _{SCD} (LOAD)	V _{IN} = -10 V	5 mA ≤ I _L ≤ 500 mA	01	-0.5	0.5	mA
Control pin current	I _{CTL}	V _{IN} = -10 V, T _A = 25°C	I _L = 350 mA	01	0.001	2.00	μA
		V _{IN} = -10 V, -55°C ≤ T _A ≤ 125°C	I _L = 350 mA		0.001	3.00	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output short circuit current	I _{OS1}	V _{IN} = -10 V		01	0.002	2.0	A
	I _{OS2}	V _{IN} = -30 V			0.002	1.0	
Output voltage recovery after output short circuit current	V _{OUT} (RECOV)	V _{IN} = -10 V, <u>3/</u> after I _{OS1}	R _L = 10 Ω, C _L = 20 μF	01	-5.25	-4.75	V
		V _{IN} = -30 V, <u>3/</u> after I _{OS2}	R _L = 5 kΩ		-5.25	-4.75	
Voltage start-up	V _{START}	V _{IN} = -20 V	R _L = 10 Ω, C _L = 20 μF	01	-5.25	-4.75	V
Ripple rejection	ΔV _{IN} / ΔV _{OUT}	V _{IN} = -10 V, <u>4/</u> e _i = 1 V _{rms} , at f = 2400 Hz	I _L = 125 mA, T _A = 25°C, see figure 10	01	45		dB
Output noise voltage	V _{NO}	V _{IN} = -10 V, <u>4/</u> see figure 11	I _L = 50 mA, T _A = 25°C	01		250	μV _{rms}
Line transient response	ΔV _{OUT} / ΔV _{IN}	V _{IN} = -10 V, <u>5/</u> V _{pulse} = -3.0 V, see figure 12	I _L = 5 mA, T _A = 25°C	01		30	mV/V
Load transient response	ΔV _{OUT} / ΔI _L	V _{IN} = -10 V, <u>5/</u> see figure 13	I _L = 50 mA, ΔI _L = 200 mA T _A = 25°C	01		2.5	mV/mA

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output voltage	V _{OUT}	V _{IN} = -8 V	I _L = 5 mA, 1 A	02	-5.25	-4.75	V
		V _{IN} = -30 V	I _L = 5 mA, 100 mA		-5.25	-4.75	
		V _{IN} = -38 V	I _L = 1 A		-31.5	-28.5	
		V _{IN} = -10 V, T _A = 150°C	I _L = 5 mA		-5.25	-4.75	
Line regulation	V _{RLINE}	-30 V ≤ V _{IN} ≤ -8 V	I _L = 100 mA	02	-150	150	mV
		-25 V ≤ V _{IN} ≤ -8 V	I _L = 500 mA		-75	75	
Load regulation	V _{RLOAD}	V _{IN} = -10 V	5 mA ≤ I _L ≤ 1 A	02	-100	100	mV
		V _{IN} = -30 V	5 mA ≤ I _L ≤ 100 mA		-150	150	
Thermal regulation	V _{RTH}	V _{IN} = -15 V, T _A = 25°C	I _L = 1 A	02	-50	50	mV
Standby current drain	I _{SCD}	V _{IN} = -10 V	I _L = 5 mA	02	0.1	3.0	mA
		V _{IN} = -30 V	I _L = 5 mA		0.1	4.0	
Standby current drain change versus line voltage	ΔI _{SCD} (LINE)	-30 V ≤ V _{IN} ≤ -8 V	I _L = 5 mA	02	-1.0	1.0	mA
Standby current drain change versus load current	ΔI _{SCD} (LOAD)	V _{IN} = -10 V	5 mA ≤ I _L ≤ 1 A	02	-0.5	0.5	mA
Control pin current	I _{CTL}	V _{IN} = -10 V, T _A = 25°C	I _L = 500 mA	02	0.01	2.00	μA
		V _{IN} = -10 V, -55°C ≤ T _A ≤ 125°C	I _L = 500 mA		0.001	3.00	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output short circuit current	I _{OS1}	V _{IN} = -10 V		02	0.002	4.5	A
	I _{OS2}	V _{IN} = -30 V			0.002	2.0	
Output voltage recovery after output short circuit current	V _{OUT} (RECOV)	V _{IN} = -10 V, <u>3/</u> after I _{OS1}	R _L = 5 Ω, C _L = 20 μF	02	-5.25	-4.75	V
		V _{IN} = -30 V, <u>3/</u> after I _{OS2}	R _L = 5 kΩ		-5.25	-4.75	
Voltage start-up	V _{START}	V _{IN} = -20 V	R _L = 5 Ω, C _L = 20 μF	02	-5.25	-4.75	V
Ripple rejection	ΔV _{IN} / ΔV _{OUT}	V _{IN} = -10 V, <u>4/</u> e _i = 1 V _{rms} , at f = 2400 Hz	I _L = 350 mA, T _A = 25°C, see figure 10	02	45		dB
Output noise voltage	V _{NO}	V _{IN} = -10 V, <u>4/</u> see figure 11	I _L = 100 mA, T _A = 25°C	02		250	μV _{rms}
Line transient response	ΔV _{OUT} / ΔV _{IN}	V _{IN} = -10 V, <u>5/</u> V _{pulse} = -3.0 V, see figure 12	I _L = 5 mA, T _A = 25°C	02		30	mV/V
Load transient response	ΔV _{OUT} / ΔI _L	V _{IN} = -10 V, <u>5/</u> see figure 13	I _L = 100 mA, ΔI _L = 400 mA T _A = 25°C	02		2.5	mV/mA

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output voltage	V _{OUT}	V _{IN} = -4.25 V, T _A = 25°C	I _L = 5 mA, 500 mA	03	-1.275	-1.225	V
		V _{IN} = -4.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA, 500 mA		-1.30	-1.20	
		V _{IN} = -41.25 V, T _A = 25°C	I _L = 5 mA, 50 mA		-1.275	-1.225	
		V _{IN} = -41.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA, 50 mA		-1.30	-1.20	
		V _{IN} = -6.25 V, T _A = 150°C	I _L = 5 mA		-1.30	-1.20	
Line regulation	V _{RLINE}	-41.25 V ≤ V _{IN} ≤ -4.25 V, T _A = 25°C	I _L = 5 mA	03	-9	9	mV
		-41.25 V ≤ V _{IN} ≤ -4.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA		-23	23	
Load regulation	V _{RLOAD}	V _{IN} = -6.25 V, T _A = 25°C	5 mA ≤ I _L ≤ 200 mA	03	-6	6	mV
		V _{IN} = -6.25 V, -55°C ≤ T _A ≤ 125°C	5 mA ≤ I _L ≤ 200 mA		-12	12	
		V _{IN} = -6.25 V, T _A = 25°C	5 mA ≤ I _L ≤ 500 mA		-12	12	
		V _{IN} = -6.25 V, -55°C ≤ T _A ≤ 125°C	5 mA ≤ I _L ≤ 500 mA		-24	24	
		V _{IN} = -41.25 V, T _A = 25°C	5 mA ≤ I _L ≤ 50 mA		-6	6	
		V _{IN} = -41.25 V, -55°C ≤ T _A ≤ 125°C	5 mA ≤ I _L ≤ 50 mA		-12	12	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage			Load current		
Thermal regulation	V _{RTH}	V _{IN} = -14.6 V, T _A = 25°C	I _L = 500 mA	03	-5	5	mV
Adjust pin current	I _{ADJ}	V _{IN} = -4.25 V	I _L = 5 mA	03	25	100	μA
		V _{IN} = -41.25 V	I _L = 5 mA		25	100	
Adjust pin current change versus line voltage	ΔI _{ADJ}	V _{IN} = -41.25 V	I _L = 5 mA	03	25	100	μA
	(LINE)	-41.25 V ≤ V _{IN} ≤ -4.25 V	I _L = 5 mA		-5	5	
Adjust pin current change versus load current	ΔI _{ADJ} (LOAD)	V _{IN} = -6.25 V	5 mA ≤ I _L ≤ 500 mA	03	-5	5	μA
Minimum load current	I _Q	-14.25 V ≤ V _{IN} ≤ -4.25 V, forced V _{OUT} = -1.4 V		03	0.20	3.00	mA
		V _{IN} = -41.25 V forced V _{OUT} = -1.4 V			1.00	5.00	
Output short circuit current	I _{OS1}	V _{IN} = -4.25 V		03	0.5	1.8	A
	I _{OS2}	V _{IN} = -40 V			0.05	0.5	
Output voltage recovery after output short circuit current	V _{OUT} (RECOV)	V _{IN} = -4.25 V, <u>3/</u> after I _{OS1}	R _L = 2.5 Ω, C _L = 10 μF	03	-1.30	-1.20	V
		V _{IN} = -40 V, <u>3/</u> after I _{OS2}	R _L = 250 Ω		-1.30	-1.20	
Voltage start-up	V _{START}	V _{IN} = -4.25 V	R _L = 2.5 Ω, C _L = 10 μF	03	-1.30	-1.20	V
Ripple rejection	ΔV _{IN} / ΔV _{OUT}	V _{IN} = -6.25 V, <u>6/</u> e _i = 1 V _{rms} , at f _o = 2400 Hz	I _L = 125 mA, T _A = 25°C, see figure 10	03	48		dB

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output noise voltage	V _{NO}	V _{IN} = -6.25 V, <u>4/</u> see figure 11	I _L = 50 mA, T _A = 25°C	03		120	μVrms
Line transient response	ΔV _{OUT} / ΔV _{IN}	V _{IN} = -6.25 V, <u>5/</u> ΔV _{IN} = -1.0 V, see figure 12	I _L = 50 mA, T _A = 25°C	03		80	mV/V
Load transient response	ΔV _{OUT} / ΔI _L	V _{IN} = -6.25 V, <u>5/</u> see figure 13	I _L = 50 mA, ΔI _L = 200 mA T _A = 25°C	03		0.30	mV/mA
Output voltage	V _{OUT}	V _{IN} = -4.25 V, T _A = 25°C	I _L = 5 mA, 1.5 A	04	-1.275	-1.225	V
		V _{IN} = -4.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA, 1.5 A		-1.30	-1.20	
		V _{IN} = -41.25 V, T _A = 25°C	I _L = 5 mA, 200 mA		-1.275	-1.225	
		V _{IN} = -41.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA, 200 mA		-1.30	-1.20	
		V _{IN} = -6.25 V, T _A = 150°C	I _L = 5 mA		-1.30	-1.20	
Line regulation	V _{RLINE}	-41.25 V ≤ V _{IN} ≤ -4.25 V, T _A = 25°C	I _L = 5 mA	04	-9	9	mV
		-41.25 V ≤ V _{IN} ≤ -4.25 V, -55°C ≤ T _A ≤ 125°C	I _L = 5 mA		-23	23	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Load regulation	V _{RLOAD}	V _{IN} = -6.25 V, T _A = 25°C	5 mA ≤ I _L ≤ 1.5 A	04	-6	6	mV
		V _{IN} = -6.25 V, -55°C ≤ T _A ≤ 125°C	5 mA ≤ I _L ≤ 1.5 A		-12	12	
		V _{IN} = -41.25 V, T _A = 25°C	5 mA ≤ I _L ≤ 150 mA		-6	6	
		V _{IN} = -41.25 V, -55°C ≤ T _A ≤ 125°C	5 mA ≤ I _L ≤ 150 mA		-12	12	
Thermal regulation	V _{RTH}	V _{IN} = -14.6 V, T _A = 25°C	I _L = 1.5 A	04	-5	5	mV
Adjust pin current	I _{ADJ}	V _{IN} = -4.25 V	I _L = 5 mA	04	25	100	μA
		V _{IN} = -41.25 V	I _L = 5 mA		25	100	
Adjust pin current change versus line voltage	ΔI _{ADJ} (LINE)	-41.25 V ≤ V _{IN} ≤ -4.25 V	I _L = 5 mA	04	-5	5	μA
Adjust pin current change versus load current	ΔI _{ADJ} (LOAD)	V _{IN} = -6.25 V	5 mA ≤ I _L ≤ 1.5 A	04	-5	5	μA
Minimum load current	I _Q	-14.25 V ≤ V _{IN} ≤ -4.25 V, forced V _{OUT} = -1.4 V		04	0.20	3.00	mA
		V _{IN} = -41.25 V forced V _{OUT} = -1.4 V			1.00	5.00	
Output short circuit current	I _{OS1}	V _{IN} = -4.25 V		04	1.5	3.5	A
	I _{OS2}	V _{IN} = -40 V			0.2	1.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ T _A ≤ +125°C see figure 9 and 3.5 unless otherwise specified		Device type	Limits		Unit
					Min	Max	
		Input voltage	Load current				
Output voltage recovery after output short circuit current	V _{OUT} (RECOV)	V _{IN} = -4.25 V, <u>3/</u> after I _{OS1}	R _L = 0.833 Ω, C _L = 10 μF	04	-1.30	-1.20	V
		V _{IN} = -40 V, <u>3/</u> after I _{OS2}	R _L = 250 Ω		-1.30	-1.20	
Voltage start-up	V _{START}	V _{IN} = -4.25 V	R _L = 0.833 Ω, C _L = 10 μF	04	-1.30	-1.20	V
Ripple rejection	ΔV _{IN} / ΔV _{OUT}	V _{IN} = -6.25 V, <u>6/</u> e _i = 1 V _{rms} , at f _o = 2400 Hz	I _L = 500 mA, T _A = 25°C, see figure 10	04	50		dB
Output noise voltage	V _{NO}	V _{IN} = -6.25 V, <u>4/</u> see figure 11	I _L = 100 mA, T _A = 25°C	04		120	μV _{rms}
Line transient response	ΔV _{OUT} / ΔV _{IN}	V _{IN} = -6.25 V, <u>5/</u> ΔV _{IN} = -1.0 V, see figure 12	I _L = 100 mA, T _A = 25°C	04		80	mV/V
Load transient response	ΔV _{OUT} / ΔI _L	V _{IN} = -6.25 V, <u>5/</u> see figure 13	I _L = 100 mA, ΔI _L = 400 mA T _A = 25°C	04		0.15	mV/mA

1/ All tests performed at T_A = 125°C may at the manufacturer's option, be performed at T_A = 150°C.
Specifications for T_A = 125°C shall then apply at T_A = 150°C.

2/ Static tests with load currents greater than 5 mA are performed under pulsed conditions defined on figure 9.

3/ Output voltage recovery test shall be performed, with the designated load conditions, immediately after removal of each I_{OS} test forced output voltage condition.

4/ The meter for e_i and e_o shall have a minimum bandwidth from 10 Hz to 10 kHz and shall measure true rms voltages.

5/ The oscilloscope shall have a bandwidth between 5 and 15 MHz.

6/ The meter for e_i and e_o shall have a minimum bandwidth from 300 Hz to 10 kHz and shall measure true rms voltage.

4. VERIFICATION.

4.1 Sampling and inspection. Sampling and inspection procedures should 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 affect the form, fit, or 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. For class S and B devices, an additional burn-in screen shall be performed to test the operation of the thermal shutdown circuit. This screen shall be performed after serialization (3.1.8 of method 5004 of MIL-STD-883) and before interim electrical parameters (pre burn-in, 3.1.9 of method 5004 of MIL-STD-883). The requirements of 3.2.3 of method 1015 of MIL-STD-883 shall apply to this screen except the devices need not be tested in an oven.
- b. 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.
- c. 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.
- d. Additional screening for space level product shall be as specified in MIL-PRF-38535.
- e. Constant acceleration (method 2001 of MIL-STD-883); test condition B shall be used for case Y.

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 5, 6, 8, 9, 10, and 11 shall be omitted.

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

- a. End point electrical parameters shall be as specified in table II herein.
- b. When using the method 5005 option, constant acceleration for class S (method 2001 of MIL-STD-883); test condition B shall be used for case Y.

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 IV herein. Delta limits shall apply to subgroup 1 of group C inspection for class B 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.

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 <u>1/</u>	1,2,3,4	1,2,3,4
Group A test requirements	1,2,3,4,7	1,2,3,4,7
Group B electrical test parameters when using the method 5005 QCI option	1,2,3, and table IV delta limits	N/A
Group C electrical parameters	1,2,3, and table IV delta limits	1 and table IV delta limits
Additional electrical subgroups for group C periodic inspections	Not applicable	None
Group D end point electrical parameters	1,2,3	1

1/ PDA applies to subgroup 1.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table V of MIL-PRF-38535 and as follows:

- a. End point electrical parameters shall be as specified in table II herein.
- b. Constant acceleration (method 2001 of MIL-STD-883); test condition B shall be used for case Y.

4.5 Methods of inspection. Methods of inspection shall be as specified and as follows.

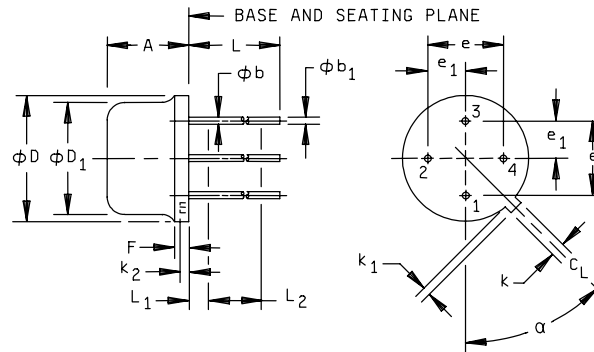
4.5.1 Voltage and current. All voltage values given are referenced to the designated return sense line. Currents given are conventional current and positive when flowing into the referenced terminal.

4.5.2 Life test and burn-in cool down procedure. When devices are measured at +25°C following application of the operating life or burn-in condition, they shall be cooled to room temperature prior to removal of the bias.

4.5.3 Inspection of packaging. The sampling and inspection of the preservation – packaging, packing, and container marking shall be in accordance with the requirements of MIL-PRF-38535.

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 packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military's service 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.



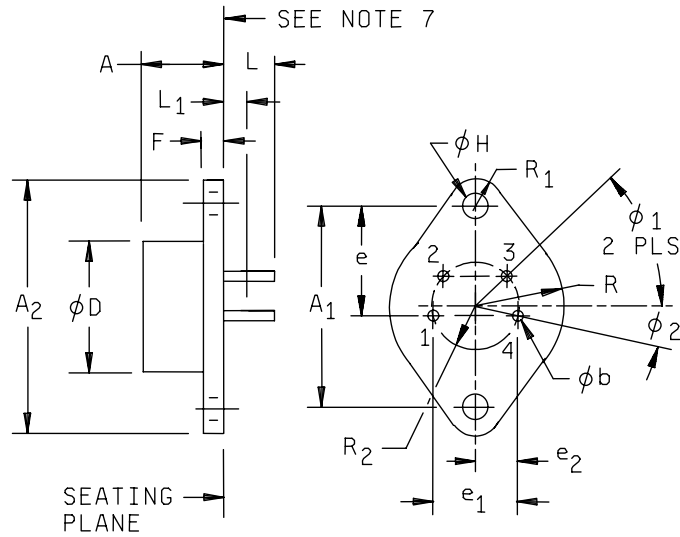
Dimensions					
Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.240	.260	6.10	6.60	
ϕb	.016	.019	.41	.48	3
ϕb_1	.016	.021	.41	.53	3
ϕD	.335	.370	8.51	9.40	
ϕD_1	.305	.335	7.79	8.51	
e	.200	T.P.	5.08	T.P.	5
e_1	.100	T.P.	2.54	T.P.	5
F	---	.050	---	1.27	
k	.028	.034	.71	.86	
k_1	.029	.045	.74	1.14	4
k_2	.009	.041	.23	1.04	
L	.500	---	12.70	---	
L_1	---	.050	---	1.27	
L_2	.250	---	6.35	---	
α	45°	T.P.	45°	T.P.	5

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. (Four leads) ϕb applies between L_1 and L_2 . ϕb_1 applies between L_2 and .500 (12.70 mm) from the reference plane. Diameter is uncontrolled in L_1 and beyond .500 (12.70 mm) from the reference plane.
4. Four leads.
5. Measured from the maximum diameter of the product.
6. Leads having a maximum diameter .019 (.48 mm) measured in gaging plane .054 (1.37 mm) + .001 (.03 mm) - .000 (.00 mm) below the base plane of the product shall be within .007 (.18 mm) of their true position relative to a maximum width tab.
7. The product may be measured by direct methods or by gage.

FIGURE 1. Case outline X (device type 01).

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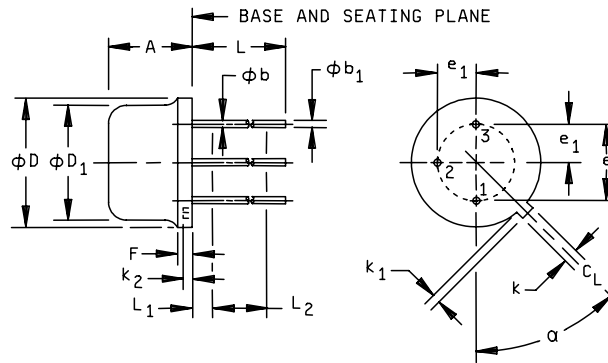
Dimensions					
Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.250	.450	6.35	11.43	
A ₁	1.177	1.197	29.90	30.40	
A ₂	1.480	1.500	37.59	38.10	
ϕb	.038	.043	.97	1.09	3,7
ϕD	---	.875	---	22.22	
e	.655	.675	16.64	17.14	
e ₁	.420	.440	10.67	11.18	
e ₂	.205	.225	5.21	5.72	
F	.060	.135	1.52	3.43	
ϕH	.151	.161	3.84	4.09	5,6
L	.312	.500	7.92	12.70	4
L ₁	---	.050	---	1.27	3,4
R	.495	.525	12.57	13.34	
R ₁	.131	.188	3.33	4.78	
R ₂	.470	T.P.	11.94	T.P.	
θ ₁	54°	T.P.	54°	T.P.	
θ ₂	18°	T.P.	18°	T.P.	

FIGURE 2. Case outline Y (device type 02).

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. (Four leads) ϕb applies between L_1 and .500 (12.70 mm) from the seating plane.
Diameter is uncontrolled in L_1 and beyond .500 (12.70 mm) from the seating plane.
4. Four leads.
5. Two holes.
6. Two holes located at true position within diameter .010 (.25 mm).
7. Leads having a maximum diameter .043 (1.09 mm) measured in gaging plane .054 (1.37 mm) + .001 (.03 mm) - .000 (.00 mm) below the seating plane shall be located at true position within diameter .014 (.36mm).
8. The mounting surface of the header shall be flat to convex within .003 (.08 mm) inside a .930 (23.62 mm) diameter circle on the center of the header and flat to convex within .006 (.15 mm) overall.

FIGURE 2. Case outline Y (device type 02) – Continued.

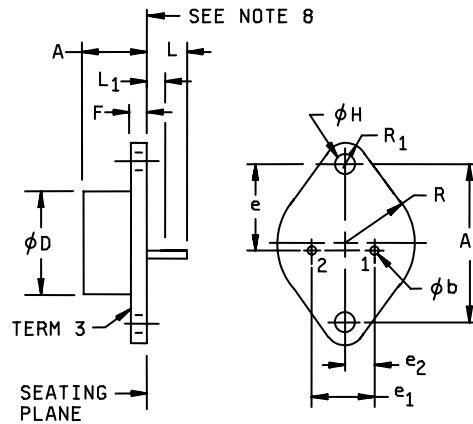


Dimensions					
Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.165	.185	4.19	4.70	
ϕb	.016	.019	.41	.48	3
ϕb_1	.016	.021	.41	.53	3
ϕD	.335	.370	8.51	9.40	
ϕD_1	.305	.335	7.75	8.51	
e	.200	T.P.	5.08	T.P.	5
e_1	.100	T.P.	2.54	T.P.	5
F	---	.050	---	1.27	
k	.028	.034	.71	.86	
k_1	.029	.045	.74	1.14	4
k_2	.009	.041	.23	1.04	
L	.500	---	12.70	---	
L_1	---	.050	---	1.27	
L_2	.250	---	6.35	---	
α	45°	T.P.	45°	T.P.	5

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. (Three leads) ϕb applies between L_1 and L_2 . ϕb_1 applies between L_2 and .500 (12.70 mm) from the reference plane.
Diameter is uncontrolled in L_1 and beyond .500 (12.70 mm) from the reference plane.
4. Three leads.
5. Measured from the maximum diameter of the product.
6. Leads having a maximum diameter .019 (.48 mm) measured in gaging plane .054 (1.37 mm) + .001 (.03 mm) - .000 (.00 mm) below the base plane of the product shall be within .007 (.18 mm) of their true position relative to a maximum width tab.
7. The product may be measured by direct methods or by gage.

FIGURE 3. Case outline X (device type 03).

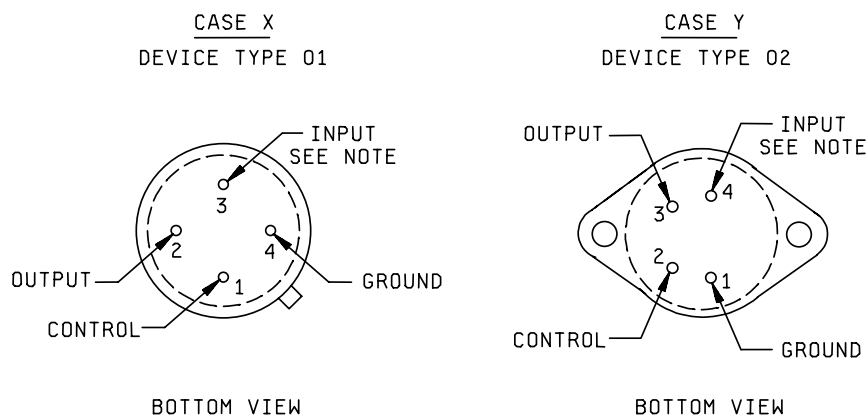


Dimensions					
Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.250	.352	6.35	8.94	
A ₁	1.177	1.197	29.90	30.40	
φb	.038	.043	.97	1.09	3,7
φD	---	.875	---	22.22	
e	.655	.675	16.64	17.14	
e ₁	.420	.440	10.67	11.18	
e ₂	.205	.225	5.21	5.72	
F	.060	.135	1.52	3.43	
φH	.151	.161	3.84	4.09	5,6
L	.312	.500	7.92	12.70	4
L ₁	---	.050	---	1.27	3,4
R	.495	.525	12.57	13.34	
R ₁	.131	.188	3.33	4.78	

NOTES:

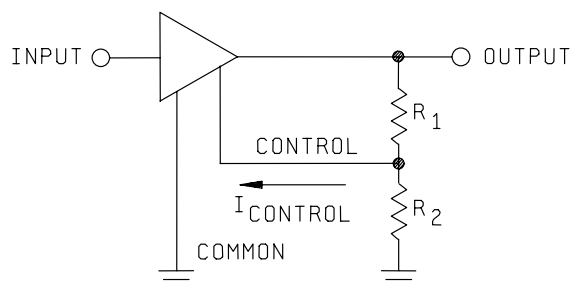
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. (Two leads) φb applies between L₁ and .500 (12.70 mm) from the seating plane.
Diameter is uncontrolled in L₁ and beyond .500 (12.70 mm) from the seating plane.
4. Two leads.
5. Two holes.
6. Two holes located at true position within diameter .010 (.25 mm).
7. Leads having a maximum diameter .043 (1.09 mm) measured in gaging plane .054 (1.37 mm) + .001 (.03 mm) - .000 (.00 mm) below the seating plane shall be located at true position within diameter .014 (.36 mm).
8. The mounting surface of the header shall be flat to convex within .003 (.08 mm) inside a .930 (23.62 mm) diameter circle on the center of the header and flat to convex within .006 (.15 mm) overall.

FIGURE 4. Case outline Y (device type 04).



NOTE: Case is connected to input.

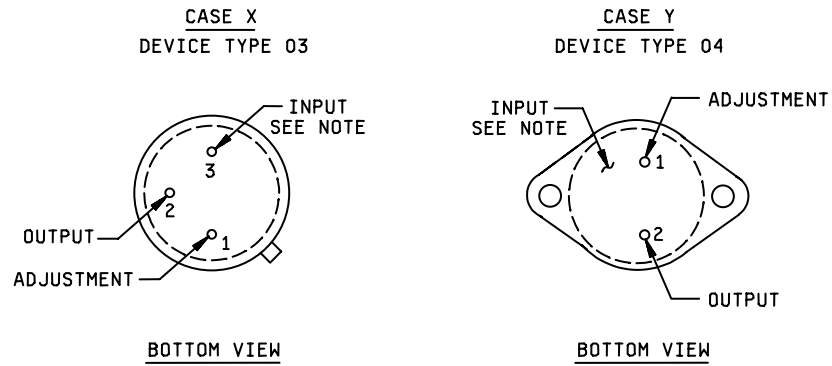
FIGURE 5. Terminal connections for device types 01 and 02.



NOTES:

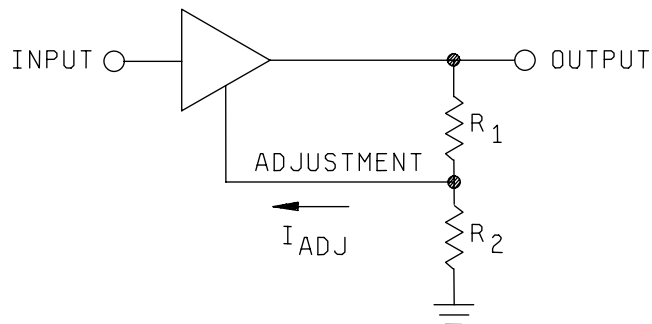
1. $V_{\text{OUT}} = [((R_1 + R_2) / R_2) \times (V_{\text{CONTROL}}) + |I_{\text{CONTROL}}| \times R_2]$ volts.
2. $V_{\text{CONTROL}} = -2.23 \text{ V}$ (nominal).
3. $R_2 = 446 \, \Omega$ provides a minimum of $|5 \text{ mA}|$ load to the regulator at any V_{OUT} .

FIGURE 6. Block diagram for device types 01 and 02.



NOTE: Case is connected to input.

FIGURE 7. Terminal connections for 03 and 04.

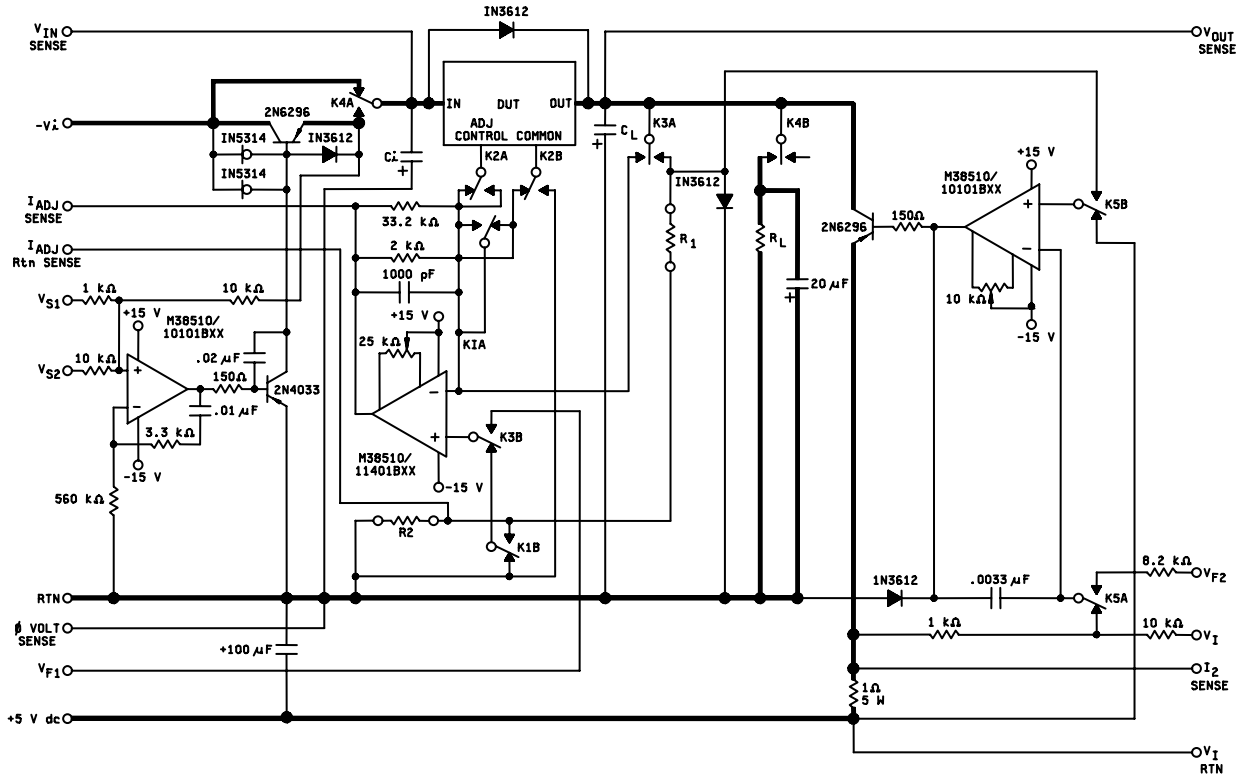


NOTES:

1. $V_{OUT} = [(R_1 + R_2) / R_1] \times (-1.25) + |I_{ADJ}| \times R_2$ volts.
2. $R_1 = 250 \, \Omega$.

FIGURE 8. Block diagram for device types 03 and 04.

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Device table				
Device type	01	02	03	04
R ₁	549 Ω	549 Ω	249 Ω	249 Ω
R ₂	442 Ω	442 Ω	0 Ω	0 Ω
R _L	10 Ω	5 Ω	2.5 Ω	0.833 Ω
C _i , C _L	2.0 μF	2.0 μF	10.0 μF	10.0 μF

FIGURE 9. Test circuit for static tests.

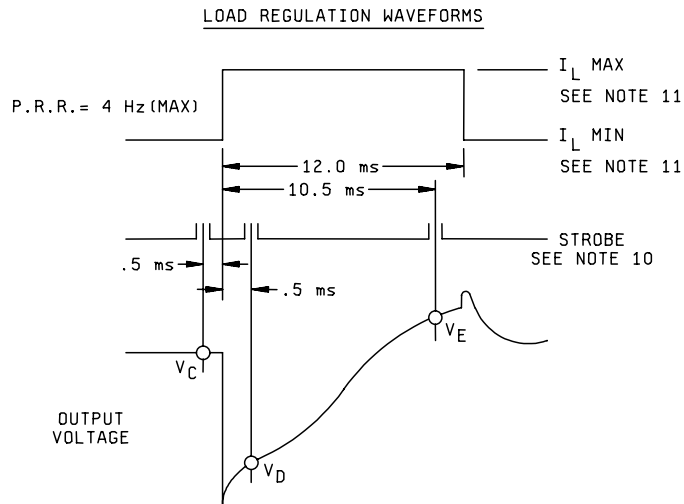
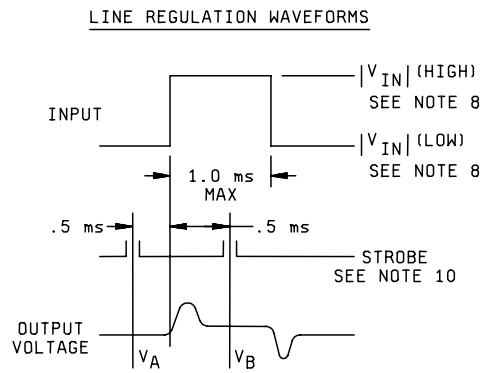


FIGURE 9. Test circuit for static tests – Continued.

WAVEFORMS FOR VOLTAGE START-UP, OUTPUT SHORT CIRCUIT CURRENT,
AND OUTPUT VOLTAGE RECOVERY

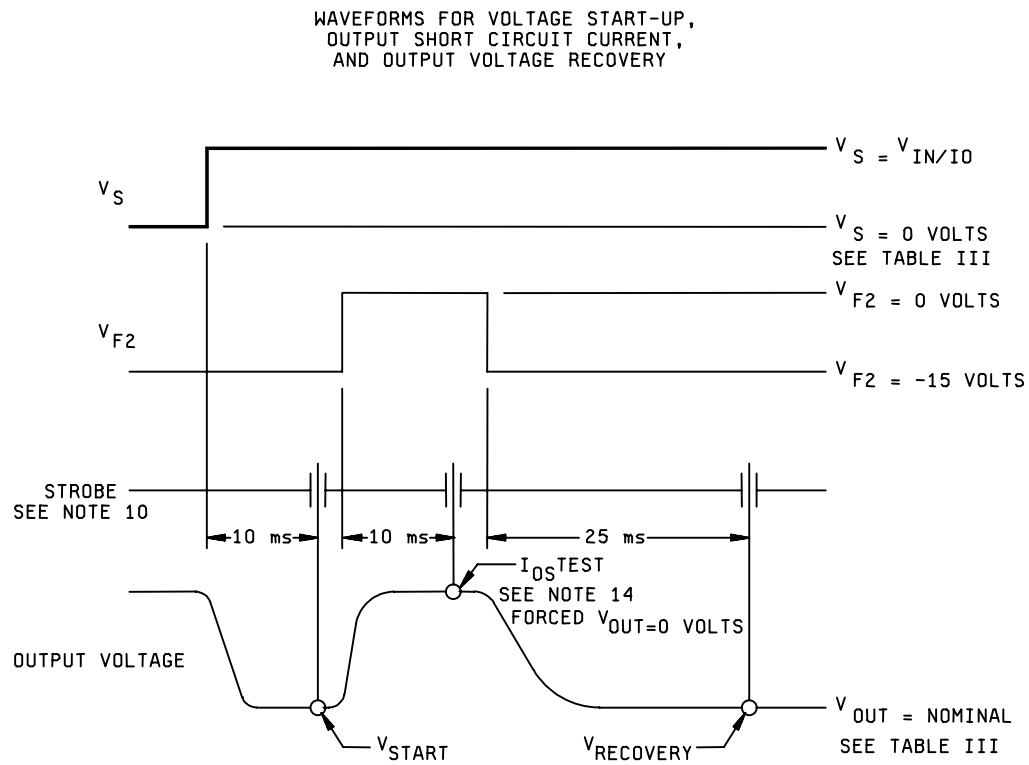
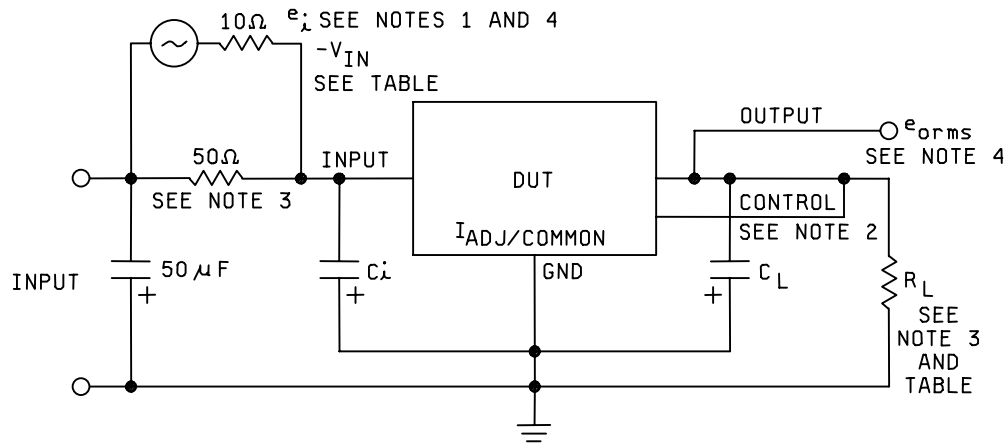


FIGURE 9. Test circuit for static tests – Continued.

NOTES:

1. Heavy current paths ($I \geq 1.0$ A) are indicated by bold lines.
2. Kelvin connections must be used for all output current and voltage measurements.
For device types 03 and 04, output voltage measurements shall be made 1/8 inch below the case.
3. The output offset voltage shall be adjusted to zero with the device under test (DUT) removed.
The operational amplifier stabilization networks may vary with test adapter construction.
Alternate drive circuits for the 2N6296 may be used to develop the proper load current and input voltage pulses. These circuits shall require the approval of the qualifying activity.
4. Relay switch positions are defined in table III.
5. Load currents of 5 mA may be established via the load resistors R_1 and R_2 . All other load currents shall be established via the pulse load circuit. Resistors R_1 and R_2 shall have a tolerance ≤ 0.1 % for device types 01 and 02.
6. The pulse generator for the pulse load circuit shall have the following characteristics:
 - a. Pulse amplitude = $-10 (|I_L| - V_O / (R_1 + R_2))$ volts.
 - b. Pulse width = 1.0 ms (unless otherwise stated).
 - c. Duty cycle = 2% (maximum).
7. Load currents shall be determined by the voltage measured across the 1 Ω resistor.
Measurements shall be made 0.5 ms after the start of the pulse.
8. $|V_{IN}|$ (LOW) and $|V_{IN}|$ (HIGH) per table III herein.
9. $V_{RLINE} = V_B - V_A$.
10. The output voltage is sampled at specified intervals. Strobe pulse width is 100 μ s maximum.
11. I_L (minimum) and I_L (maximum) per table III herein.
12. $V_{RLOAD} = V_D - V_C$.
13. $V_{RTH} = V_D - V_E$.
14. $I_{OS} = (I_L)$ amps.

FIGURE 9. Test circuit for static tests – Continued.

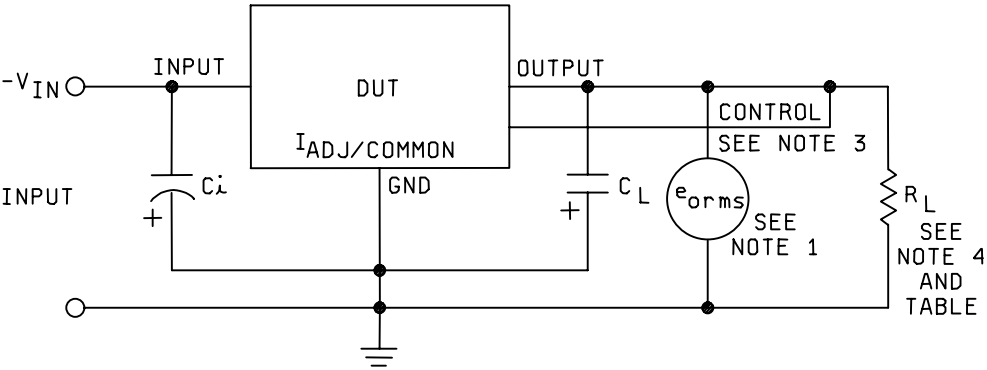


Device table				
Device type	01	02	03	04
V_{IN}	-10 V	-10 V	-6.25 V	-6.25 V
R_L	40.2Ω	14.3Ω	10Ω	2.5Ω
C_i, C_L	$2.0\mu F$	$2.0\mu F$	$1.0\mu F$	$1.0\mu F$

NOTES:

- $e_i = 1\text{ Vrms}$ at $f = 2400\text{ Hz}$ (measured at the input terminals of the DUT).
Ripple rejection = $20 \log (e_{i\text{rms}} / e_{o\text{rms}})$.
- The control pin connection is required for device types 01 and 02 only.
- The input 50Ω resistor and R_L shall be type RER 70 or equivalent.
- The meter for e_i and e_o shall have a minimum bandwidth from 10 Hz to 10 kHz and shall measure true rms voltages.

FIGURE 10. Ripple rejection test circuit.

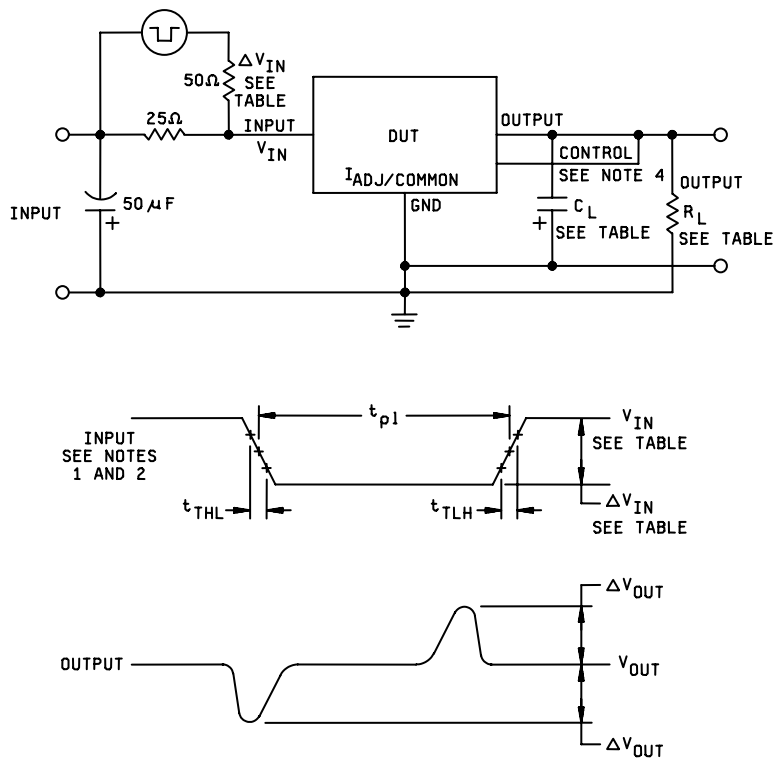


Device table				
Device type	01	02	03	04
V_{IN}	10 V	10 V	6.25 V	6.25 V
R_L	100 Ω	50 Ω	25 Ω	12.5 Ω
C_i, C_L	2.0 μF	2.0 μF	1.0 μF	1.0 μF

NOTES:

1. The meter for measuring e_{rms} and shall have a minimum bandwidth from 10 Hz to 10 kHz and shall measure true rms voltages.
2. $N_O = e_{rms}$
3. The control pin connection is required for device types 01 and 02 only.
4. R_L shall be type RER 70 or equivalent.

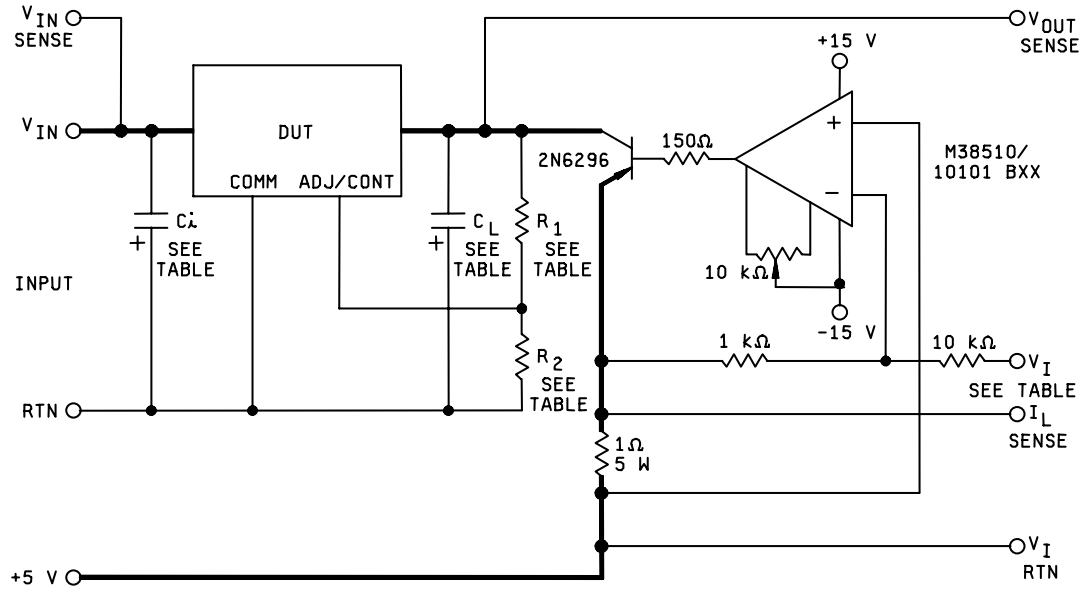
FIGURE 11. Noise test circuit.



Device table					
Device type	01	02	03	04	Notes
V_{IN}	-10 V	-10 V	-6.25 V	-6.25 V	1
ΔV_{IN}	-3.0 V	-3.0 V	-1.0 V	-1.0 V	1
R_L	1.25 kΩ	1.25 kΩ	25 Ω	12 Ω	
$t_{THL} = t_{TLH}$	5.0 μs	5.0 μs	5.0 μs	5.0 μs	1
C_i, C_L	2.0 μF	2.0 μF	1.0 μF	1.0 μF	

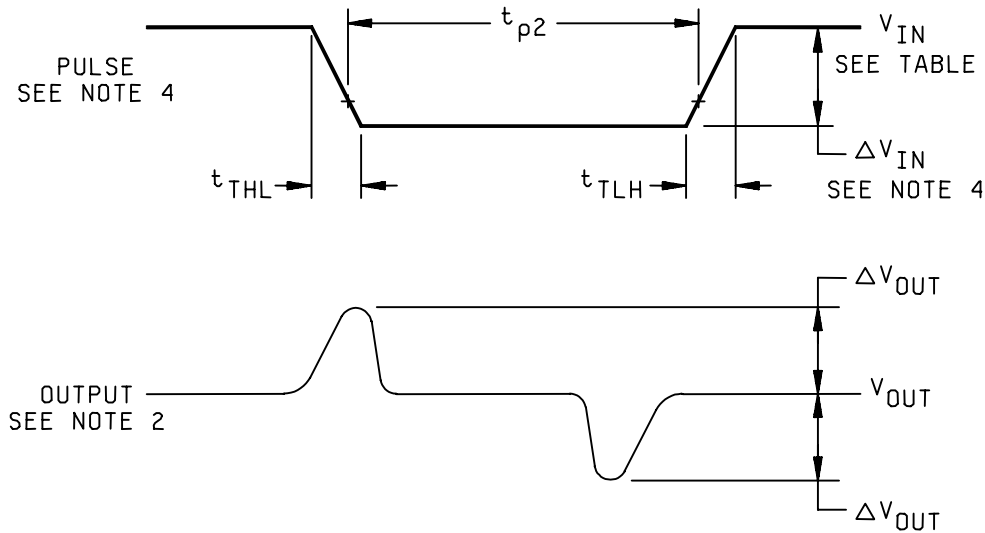
- NOTES:
1. Measured at device input.
 2. Pulse width $t_{p1} = 25 \mu s$; duty cycle = 3% (maximum).
 3. Oscilloscope bandwidth = 5 MHz to 15 MHz.
 4. The control pin connection is required for device types 01 and 02 only..

FIGURE 12. Line transient test circuit.



Device table				
Device type	01	02	03	04
R_1	0	0	249 Ω	249 Ω
R_2	5.0 k Ω	5.0 k Ω	0	0
I_L	50 mA	100 mA	50 mA	100 mA
ΔI_L	200 mA	400 mA	200 mA	400 mA
V_I	0.49 V	0.99 V	0.45 V	0.95 V
ΔV_I	2.0 V	4.0 V	2.0 V	4.0 V
C_i, C_L	2.0 μ F	2.0 μ F	1.0 μ F	1.0 μ F

FIGURE 13. Load transient response test circuit.



NOTES:

1. Heavy current paths ($I \geq 1.0$ A) are indicated by bold lines.
2. Kelvin connections must be used for all output current and voltage measurements.
3. The operational amplifier stabilization networks may vary with test adapter construction. Alternate drive circuits for the 2N6296 may be used to develop the proper load current and input voltage pulses. These circuits shall require the approval of the qualifying activity.
4. The pulse generator for the pulse load circuit shall have the following characteristics. (See device table.)
 - a. Voltage level (V_I) = $10 (|I_L| - (V_{OUT} / (R_1 + R_2)))$ volts.
 - b. Pulse width (t_{p2}) = 25 μ s.
 - c. Duty cycle = 3% (maximum).
 - d. $t_{THL} = t_{TLH} = 1.0$ μ s for device types 01 and 02.
 - e. $t_{THL} = t_{TLH} = 5.0$ μ s for device types 03 and 04.
 - f. Difference voltage level (ΔV_I) = 10 (I_L) volts.
5.
 - a. $\Delta V_{OUT} = 500$ mV maximum for device type 01.
 - b. $\Delta V_{OUT} = 1,000$ mV maximum for device type 02.
 - c. $\Delta V_{OUT} = 60$ mV maximum for device types 03 and 04.
 (These values guarantee the specified limits for load transient response.)
6. The oscilloscope shall have a bandwidth between 5 and 15 MHz.

FIGURE 13. Load transient response test circuit – Continued.

TABLE III. Group A inspection for all device type 01.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit	
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max		
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2										
1 T _A = +25°C	V _{OUT1}	1	-8	5	-8	---	---	---	---	None	9-11	E ₁	V	V _{OUT1} = E ₁		-5.25	-4.75	V	
	V _{OUT2}	2	-8	500	-8	4.95	---	---	---	"	"	E ₂	"	V _{OUT2} = E ₂		"	"	"	
	V _{OUT3}	3	-30	5	-30	---	---	---	---	"	"	E ₃	"	V _{OUT3} = E ₃		"	"	"	
	V _{OUT4}	4	-30	50	-30	0.45	---	---	---	"	"	E ₄	"	V _{OUT4} = E ₄		"	"	"	
	V _{RLINE1}	5	-8	50	-8	0.45	---	---	---	"	"	E ₅	"	V _{RLINE1} = E ₅ – E ₄	See figure 9 waveforms	-150	150	mV	
	V _{RLINE2}	6	-8	350	-8	3.45	---	---	---	"	"	E ₆	"	---		---	---	"	
	V _{RLINE2}	7	-25	350	-25	3.45	---	---	---	"	"	E ₇	"	V _{RLINE2} = E ₆ – E ₇		-50	50	"	
	V _{RLOAD1}	8	-10	5	-10	---	---	---	---	"	"	E ₈	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	9	-10	500	-10	4.95	---	---	---	"	"	E ₉	"	V _{RLOAD1} = E ₈ – E ₉		-100	100	"	
	V _{RLOAD2}	10	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₃ – E ₄		-150	150	"	
	V _{RTH}	11	-15	500	-15	4.95	---	---	---	"	9-11	E ₁₀	"	V _{RTH} = E ₁₀	See figure 9 waveforms	-50	50	"	
	I _{SCD1}	12	-10	5	-10	---	---	---	---	"	12-13	E ₁₁	"	I _{SCD1} = E ₁₁ / 2000		0.1	3.0	mA	
	I _{SCD2}	13	-30	5	-30	---	---	---	---	"	"	E ₁₂	"	I _{SCD2} = E ₁₂ / 2000		4.0	"	"	
	ΔI _{SCD} (LINE)	14	-8	5	-8	---	---	---	---	"	"	E ₁₃	"	ΔI _{SCD} = E ₁₃ – E ₁₂ / 2000 (LINE)			1.0	"	
	ΔI _{SCD} (LOAD)	15	-10	500	-10	4.95	---	---	---	"	"	E ₁₄	"	ΔI _{SCD} = E ₁₁ – E ₁₄ / 2000 (LOAD)	0.1 -1.0		0.5	"	
	I _{OS1}	16	-10	---	-15	---	---	---	-1.0	0	K4,K5	10-5	E ₁₅	"	I _{OS1} = E ₁₅	See figure 9 waveforms	0.002	2.0	A
	V _{OUT5} (RECOV)	17	-10	---	-15	---	---	---	-1.0	0	K4,K5	9-11	E ₁₆	"	V _{OUT5} = E ₁₆		-5.25	-4.75	V
	I _{OS2}	18	-30	---	-40	---	---	---	-3.5	0	K5	10-5	E ₁₇	"	I _{OS2} = E ₁₇			1.0	A
	V _{OUT6} (RECOV)	19	-30	---	-40	---	---	---	-3.5	0	K5	9-11	E ₁₈	"	V _{OUT6} = E ₁₈		-4.75	"	V
I _{CTL}	20	-10	350	-10	3.45	---	---	---	K1,K2	12-13	E ₁₉	"	I _{CTL} = E ₁₉ / 33200	0.002 -5.25		2	μA		
V _{START}	21	-8	500	-15	---	---	---	-0.8	---	K4	9-11	E ₂₀	"	V _{OUT} = E ₂₀	See figure 9 waveforms	-5.25	-4.75	V	
V _{OUT7}	22	-38	500	-38	4.95	---	---	---	None	"	E ₂₁	"	V _{OUT} = E ₂₁	R1 = 54942 ±0.1%	-31.5	-28.5	V		
2 T _A = +125°C	V _{OUT1}	23	-8	5	-8	---	---	---	---	None	9-11	E ₂₂	V	V _{OUT1} = E ₂₂		-5.25	-4.75	V	
	V _{OUT2}	24	-8	500	-8	4.95	---	---	---	"	"	E ₂₃	"	V _{OUT2} = E ₂₃		"	"	"	
	V _{OUT3}	25	-30	5	-30	---	---	---	---	"	"	E ₂₄	"	V _{OUT3} = E ₂₄		"	"	"	
	V _{OUT4}	26	-30	50	-30	0.45	---	---	---	"	"	E ₂₅	"	V _{OUT4} = E ₂₅		"	"	"	
	V _{RLINE1}	27	-8	50	-8	0.45	---	---	---	"	"	E ₂₆	"	V _{RLINE1} = E ₂₆ – E ₂₅	See figure 9 waveforms	-150	150	mV	
	V _{RLINE2}	28	-8	350	-8	3.45	---	---	---	"	"	E ₂₇	"	---		---	---	"	
	V _{RLINE2}	29	-25	350	-25	3.45	---	---	---	"	"	E ₂₈	"	V _{RLINE2} = E ₂₇ – E ₂₈		-50	50	"	
	V _{RLOAD1}	30	-10	5	-10	---	---	---	---	---	"	"	E ₂₉	"	---	See figure 9 waveforms	---	---	"
	V _{RLOAD1}	31	-10	500	-10	4.95	---	---	---	"	"	E ₃₀	"	V _{RLOAD1} = E ₂₉ – E ₃₀	-100		100	"	
	V _{RLOAD2}	32	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₂₄ – E ₂₅	-150		150	"	
	I _{SCD1}	33	-10	5	-10	---	---	---	---	---	"	12-13	E ₃₁	"	I _{SCD1} = E ₃₁ / 2000		0.1	3.0	mA
	I _{SCD2}	34	-30	5	-30	---	---	---	---	"	"	E ₃₂	"	I _{SCD2} = E ₃₂ / 2000	4.0		"	"	

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TABLE III. Group A inspection for all device type 01 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit							
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max								
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2																
2	ΔI _{SCD} (LINE)	35	-8	5	-8	---	---	---	---	None	12-13	E ₃₃	V	ΔI _{SCD} = E ₃₃ – E ₃₂ / 2000 (LINE)			1.0	mA							
	ΔI _{SCD} (LOAD)	36	-10	500	-10	4.95	---	---	---	"	"	E ₃₄	"	ΔI _{SCD} = E ₃₁ – E ₃₄ / 2000 (LOAD)	-1.0		0.5	"							
	I _{OS1} V _{OUT5}	37	-10	---	-15	---	---	-1.0	0	K4,K5	10-5	E ₃₅	"	I _{OS1} = E ₃₅ V _{OUT5} = E ₃₆	See figure 9 waveforms	0.002	2.0	A							
		38	-10	---	-15	---	---	-1.0	0	K4,K5	9-11	E ₃₆							-4.75	V					
	I _{OS2} V _{OUT6}	39	-30	---	-40	---	---	-3.5	0	K5	10-5	E ₃₇	"	I _{OS2} = E ₃₇ V _{OUT6} = E ₃₈			1.0	A							
		40	-30	---	-40	---	---	-3.5	0	K5	9-11	E ₃₈							-4.75	V					
	(RECOV)	I _{CTL}	41	-10	350	-10	3.45	---	---	---	K1,K2	12-13	E ₃₉	"	I _{CTL} = E ₃₉ / 33200	0.002		3	μA						
		V _{START}	42	-8	500	-15	---	---	-0.8	---	K4	9-11	E ₄₀	"	V _{OUT} = E ₄₀	See figure 9 waveforms	-5.25	-4.75	V						
(RECOV)	V _{OUT7}	43	-38	500	-38	4.95	---	---	---	None	"	E ₄₁	"	V _{OUT7} = E ₄₁	R1 = 5000 ±0.1%	-31.5	-28.5	V							
T _A = +150°C	V _{OUT8}	44	-10	5	-10	---	---	---	---	"	"	E ₄₂	"	V _{OUT8} = E ₄₂		-5.30	-4.70	"							
3	T _A = -55°C	V _{OUT1}	45	-8	5	-8	---	---	---	---	None	9-11	E ₄₃	V	V _{OUT1} = E ₄₃		-5.25	-4.75	V						
		V _{OUT2}	46	-8	500	-8	4.95	---	---	---	"	"	E ₄₄	"	V _{OUT2} = E ₄₄			"	"						
		V _{OUT3}	47	-30	5	-30	---	---	---	---	"	"	E ₄₅	"	V _{OUT3} = E ₄₅			"	"						
		V _{OUT4}	48	-30	50	-30	0.45	---	---	---	"	"	E ₄₆	"	V _{OUT4} = E ₄₆			"	"						
		V _{RLINE1}	49	-8	50	-8	0.45	---	---	---	"	"	E ₄₇	"	V _{RLINE1} = E ₄₇ – E ₄₆	See figure 9 waveforms	-150	150	mV						
		V _{RLINE2}	50	-8	350	-8	3.45	---	---	---	"	"	E ₄₈	"	---		---	---	"						
		V _{RLINE2}	51	-25	350	-25	3.45	---	---	---	"	"	E ₄₉	"	V _{RLINE2} = E ₄₈ – E ₄₉		-50	50	"						
		V _{RLOAD1}	52	-10	5	-10	---	---	---	---	"	"	E ₅₀	"	---		---	---	"						
		V _{RLOAD1}	53	-10	500	-10	4.95	---	---	---	"	"	E ₅₁	"	V _{RLOAD1} = E ₅₀ – E ₅₁	See figure 9 waveforms	-100	100	"						
		V _{RLOAD2}	54	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₄₅ – E ₄₆		-150	150	"						
		I _{SCD1} I _{SCD2}	55	-10	5	-10	---	---	---	---	"	12-13	E ₅₂	"	I _{SCD1} = E ₅₂ / 2000 I _{SCD2} = E ₅₃ / 2000			0.1	3.0	mA					
			56	-30	5	-30	---	---	---	---	"	"	E ₅₃								4.0				
		ΔI _{SCD} (LINE)	57	-8	5	-8	---	---	---	---	None	12-13	E ₅₄	V	ΔI _{SCD} = E ₅₄ – E ₅₃ / 2000 (LINE)			1.0	mA						
		ΔI _{SCD} (LOAD)	58	-10	500	-10	4.95	---	---	---	"	"	E ₅₅	"	ΔI _{SCD} = E ₅₂ – E ₅₅ / 2000 (LOAD)	0.1		0.5	"						
	(RECOV)	I _{OS1} V _{OUT5}	59	-10	---	-15	---	---	-1.0	0	K4,K5	10-5	E ₅₆	"	I _{OS1} = E ₅₆ V _{OUT5} = E ₅₇	See figure 9 waveforms	0.002	2.0	A						
			60	-10	---	-15	---	---	-1.0	0	K4,K5	9-11	E ₅₇							-4.75	V				
		I _{OS2} V _{OUT6}	61	-30	---	-40	---	---	-3.5	0	K5	10-5	E ₅₈							"	I _{OS2} = E ₅₈ V _{OUT6} = E ₅₉			1.0	A
			62	-30	---	-40	---	---	-3.5	0	K5	9-11	E ₅₉												
	(RECOV)	I _{CTL}	63	-10	350	-10	3.45	---	---	---	K1,K2	12-13	E ₆₀	"	I _{CTL} = E ₆₀ / 33200	0.002		3	μA						
		V _{START}	64	-8	500	-15	---	---	-0.8	---	K4	9-11	E ₆₁	"	V _{OUT} = E ₆₁	See figure 9 waveforms	-5.25	-4.75	V						
		V _{OUT7}	65	-38	500	-38	4.95	---	---	---	None	"	E ₆₂	"	V _{OUT} = E ₆₂	R1 = 5000 ±0.1%	-31.5	-28.5	V						

TABLE III. Group A inspection for all device type 01 – Continued.

Subgroup	Symbol	Test no.	Test conditions		Measurement sense lines			Equation	Notes	Limits		Unit
			Input voltage	Load current	Symbol	Value	Units			Min	Max	
4 $T_A = +25^{\circ}\text{C}$	$\Delta V_{IN} / \Delta V_{OUT}$	66	$V_{IN} = -10\text{ V}$ $e_i = 1.0\text{ Vrms}$ at 2400 Hz	$I_L = 125\text{ mA}$	e_{orms} E	63	Vrms	$\Delta V_{IN} / \Delta V_{OUT} = -20 \log E_{63}$	See figure 10	45	---	dB
7 $T_A = +25^{\circ}\text{C}$	V_{NO}	67	$V_{IN} = -10\text{ V}$	$I_L = 50\text{ mA}$	e_{orms}	64	Vrms	$V_{NO} = E_{64}$	See figure 11	---	250	μVrms
	$\Delta V_{OUT} / \Delta V_{IN}$	68	$V_{IN} = -10\text{ V}$ $V_{\text{pulse}} = -3.0\text{ V}$	$I_L = 5\text{ mA}$	V_{OUT} E	E65	V	$\Delta V_{OUT} / \Delta V_{IN} = E_{65} / 3$	See figure 12	---	30	mV/V
	$\Delta V_{OUT} / \Delta I_L$	69	$V_{IN} = -10\text{ V}$	$I_L = 50\text{ mA}$ $\Delta I_L = 200\text{ mA}$	V_{OUT}	E66	V	$\Delta V_{OUT} / \Delta I_L = E_{66} / 200$	See figure 13	---	2.5	mV/mA

TABLE III. Group A inspection for all device type 02.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit	
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max		
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2										
1 T _A = +25°C	V _{OUT1}	1	-8	5	-8	---	---	---	---	None	9-11	E ₁	V	V _{OUT1} = E ₁		-5.25	-4.75	V	
	V _{OUT2}	2	-8	1000	-8	9.95	---	---	---	"	"	E ₂	"	V _{OUT2} = E ₂		"	"	"	
	V _{OUT3}	3	-30	5	-30	---	---	---	---	"	"	E ₃	"	V _{OUT3} = E ₃		"	"	"	
	V _{OUT4}	4	-30	100	-30	0.95	---	---	---	"	"	E ₄	"	V _{OUT4} = E ₄		"	"	"	
	V _{RLINE1}	5	-8	100	-8	0.95	---	---	---	"	"	E ₅	"	V _{RLINE1} = E ₅ – E ₄	See figure 9 waveforms	-150	150	mV	
	V _{RLINE2}	6	-8	500	-8	4.95	---	---	---	"	"	E ₆	"	---		---	"	"	
	V _{RLINE2}	7	-25	500	-25	4.95	---	---	---	"	"	E ₇	"	V _{RLINE2} = E ₆ – E ₇		-50	50	"	
	V _{RLOAD1}	8	-10	5	-10	---	---	---	---	"	"	E ₈	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	9	-10	1000	-10	9.95	---	---	---	"	"	E ₉	"	V _{RLOAD1} = E ₈ – E ₉		-100	100	"	
	V _{RLOAD2}	10	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₃ – E ₄		-150	150	"	
	V _{RTH}	11	-15	1000	-15	9.95	---	---	---	"	9-11	E ₁₀	"	V _{RTH} = E ₁₀	See figure 9 waveforms	-50	50	"	
	I _{SCD1}	12	-10	5	-10	---	---	---	---	"	12-13	E ₁₁	"	I _{SCD1} = E ₁₁ / 2000		0.1	3.0	mA	
	I _{SCD2}	13	-30	5	-30	---	---	---	---	"	"	E ₁₂	"	I _{SCD2} = E ₁₂ / 2000		4.0	"	"	
	ΔI _{SCD} (LINE)	14	-8	5	-8	---	---	---	---	"	"	E ₁₃	"	ΔI _{SCD} = E ₁₃ – E ₁₂ / 2000 (LINE)			1.0	"	
	ΔI _{SCD} (LOAD)	15	-10	1000	-10	9.95	---	---	---	"	"	E ₁₄	"	ΔI _{SCD} = E ₁₁ – E ₁₄ / 2000 (LOAD)	0.1 -1.0		0.5	"	
I _{OS1}	16	-10	---	-15	---	---	---	-1.0	0	K4,K5	10-5	E ₁₅	"	I _{OS1} = E ₁₅	See figure 9 waveforms	0.002	4.5	A	
V _{OUT5} (RECOV)	17	-10	---	-15	---	---	---	-1.0	0	K4,K5	9-11	E ₁₆	"	V _{OUT5} = E ₁₆		-5.25	-4.75	V	
I _{OS2}	18	-30	---	-40	---	---	---	-3.5	0	K5	10-5	E ₁₇	"	I _{OS2} = E ₁₇			2.0	A	
V _{OUT6} (RECOV)	19	-30	---	-40	---	---	---	-3.5	0	K5	9-11	E ₁₈	"	V _{OUT6} = E ₁₈		-4.75		V	
I _{CTL}	20	-10	500	-10	4.95	---	---	---	---	K1,K2	12-13	E ₁₉	"	I _{CTL} = E ₁₉ / 33200	0.002 -5.25		2	μA	
V _{START}	21	-8	1000	-15	---	---	---	-0.8	---	K4	9-11	E ₂₀	"	V _{OUT} = E ₂₀	See figure 9 waveforms	-5.25	-4.75	V	
V _{OUT7}	22	-38	1000	-38	---	---	---	---	---	None	"	E ₂₁	"	V _{OUT7} = E ₂₁	R1 = 500kΩ ±0.1%	-31.5	-28.5	V	
2 T _A = +125°C	V _{OUT1}	23	-8	5	-8	---	---	---	---	None	9-11	E ₂₂	V	V _{OUT1} = E ₂₂		-5.25	-4.75	V	
	V _{OUT2}	24	-8	1000	-8	9.95	---	---	---	"	"	E ₂₃	"	V _{OUT2} = E ₂₃		"	"	"	
	V _{OUT3}	25	-30	5	-30	---	---	---	---	"	"	E ₂₄	"	V _{OUT3} = E ₂₄		"	"	"	
	V _{OUT4}	26	-30	100	-30	0.95	---	---	---	"	"	E ₂₅	"	V _{OUT4} = E ₂₅		"	"	"	
	V _{RLINE1}	27	-8	100	-8	0.95	---	---	---	"	"	E ₂₆	"	V _{RLINE1} = E ₂₆ – E ₂₅	See figure 9 waveforms	-150	150	mV	
	V _{RLINE2}	28	-8	500	-8	4.95	---	---	---	"	"	E ₂₇	"	---		---	"	"	
	V _{RLINE2}	29	-25	500	-25	4.95	---	---	---	"	"	E ₂₈	"	V _{RLINE2} = E ₂₇ – E ₂₈		-50	50	"	
	V _{RLOAD1}	30	-10	5	-10	---	---	---	---	---	"	"	E ₂₉	"	---	See figure 9 waveforms	---	---	"
	V _{RLOAD1}	31	-10	1000	-10	9.95	---	---	---	"	"	E ₃₀	"	V _{RLOAD1} = E ₂₉ – E ₃₀	-100		100	"	
	V _{RLOAD2}	32	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₂₄ – E ₂₅	-150		150	"	
	I _{SCD1}	33	-10	5	-10	---	---	---	---	---	"	12-13	E ₃₁	"	I _{SCD1} = E ₃₁ / 2000		0.1	3.0	mA
	I _{SCD2}	34	-30	5	-30	---	---	---	---	---	"	"	E ₃₂	"	I _{SCD2} = E ₃₂ / 2000			4.0	"

TABLE III. Group A inspection for all device type 02 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit							
			Test conditions		Applied test voltages (volts) (Hi - Lo pin potential)						Pins	Value	Units			Min	Max								
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2																
2 T _A = +125°C	ΔI _{SCD} (LINE)	35	-8	5	-8	---	---	---	---	None	12-13	E ₃₃	V	ΔI _{SCD} = E ₃₃ – E ₃₂ / 2000 (LINE)			1.0	mA							
	ΔI _{SCD} (LOAD)	36	-10	1000	-10	9.95	---	---	---	"	"	E ₃₄	"	ΔI _{SCD} = E ₃₁ – E ₃₄ / 2000 (LOAD)	-1.0		0.5	"							
	(RECOV)	I _{OS1}	37	-10	---	-15	---	---	-1.0	0	K4,K5	10-5	E ₃₅	"	I _{OS1} = E ₃₅ V _{OUT5} = E ₃₆	See figure 9 waveforms	0.002	4.5	A						
		V _{OUT5}	38	-10	---	-15	---	---	-1.0	0	K4,K5	9-11	E ₃₆	"						-5.25	-4.75	V			
		I _{OS2}	39	-30	---	-40	---	---	-3.5	0	K5	10-5	E ₃₇	"									I _{OS2} = E ₃₇ V _{OUT6} = E ₃₈	2.0	A
		V _{OUT6}	40	-30	---	-40	---	---	-3.5	0	K5	9-11	E ₃₈	"											
	(RECOV)	I _{CTL}	41	-10	500	-10	4.95	---	---	---	K1,K2	12-13	E ₃₉	"	I _{CTL} = E ₃₉ / 33200	0.002		3	μA						
		V _{START}	42	-8	1000	-15	---	---	-0.8	---	K4	9-11	E ₄₀	"	V _{OUT} = E ₄₀	See figure 9 waveforms	-5.25	-4.75	V						
V _{OUT7}		43	-38	1000	-38	---	---	---	---	None	"	E ₄₁	"	V _{OUT7} = E ₄₁	R1 = 5000Ω ±0.1%	-31.5	-28.5	V							
T _A = +150°C	V _{OUT8}	44	-10	5	-10	---	---	---	---	"	"	E ₄₂	"	V _{OUT8} = E ₄₂		-5.30	-4.70	"							
3 T _A = -55°C	V _{OUT1}	45	-8	5	-8	---	---	---	---	None	9-11	E ₄₃	V	V _{OUT1} = E ₄₃		-5.25	-4.75	V							
	V _{OUT2}	46	-8	1000	-8	9.95	---	---	---	"	"	E ₄₄	"	V _{OUT2} = E ₄₄			"	"							
	V _{OUT3}	47	-30	5	-30	---	---	---	---	"	"	E ₄₅	"	V _{OUT3} = E ₄₅			"	"							
	V _{OUT4}	48	-30	100	-30	0.95	---	---	---	"	"	E ₄₆	"	V _{OUT4} = E ₄₆			"	"							
	V _{RLINE1}	49	-8	100	-8	0.95	---	---	---	"	"	E ₄₇	"	V _{RLINE1} = E ₄₇ – E ₄₆	See figure 9 waveforms	-150	150	mV							
	V _{RLINE2}	50	-8	500	-8	4.95	---	---	---	"	"	E ₄₈	"	---		---	---	"							
	V _{RLINE2}	51	-25	500	-25	4.95	---	---	---	"	"	E ₄₉	"	V _{RLINE2} = E ₄₈ – E ₄₉		-50	50	"							
	V _{RLOAD1}	52	-10	5	-10	---	---	---	---	"	"	E ₅₀	"	---	See figure 9 waveforms	---	---	"							
	V _{RLOAD1}	53	-10	1000	-10	9.95	---	---	---	"	"	E ₅₁	"	V _{RLOAD1} = E ₅₀ – E ₅₁		-100	100	"							
	V _{RLOAD2}	54	---	---	---	---	---	---	---	"	---	---	"	V _{RLOAD2} = E ₄₅ – E ₄₆		-150	150	"							
	I _{SCD1}	55	-10	5	-10	---	---	---	---	"	12-13	E ₅₂	"	I _{SCD1} = E ₅₂ / 2000		0.1	3.0	mA							
	I _{SCD2}	56	-30	5	-30	---	---	---	---	"	"	E ₅₃	"	I _{SCD2} = E ₅₃ / 2000			4.0	"							
	ΔI _{SCD} (LINE)	57	-8	5	-8	---	---	---	---	None	12-13	E ₅₄	V	ΔI _{SCD} = E ₅₄ – E ₅₃ / 2000 (LINE)			1.0	mA							
	ΔI _{SCD} (LOAD)	58	-10	1000	-10	9.95	---	---	---	"	"	E ₅₅	"	ΔI _{SCD} = E ₅₂ – E ₅₅ / 2000 (LOAD)	0.1		0.5	"							
	(RECOV)	I _{OS1}	59	-10	---	-15	---	---	-1.0	0	K4,K5	10-5	E ₅₆	"	I _{OS1} = E ₅₆ V _{OUT5} = E ₅₇	See figure 9 waveforms	0.002	4.5	A						
		V _{OUT5}	60	-10	---	-15	---	---	-1.0	0	K4,K5	9-11	E ₅₇	"						-5.25	-4.75	V			
		I _{OS2}	61	-30	---	-40	---	---	-3.5	0	K5	10-5	E ₅₈	"									I _{OS2} = E ₅₈ V _{OUT6} = E ₅₉	2.0	A
		V _{OUT6}	62	-30	---	-40	---	---	-3.5	0	K5	9-11	E ₅₉	"											
	(RECOV)	I _{CTL}	63	-10	500	-10	4.95	---	---	---	K1,K2	12-13	E ₆₀	"	I _{CTL} = E ₆₀ / 33200	0.002		3	μA						
		V _{START}	64	-8	1000	-15	---	---	-0.8	---	K4	9-11	E ₆₁	"	V _{OUT} = E ₆₁	See figure 9 waveforms	-5.25	-4.75	V						
		V _{OUT7}	65	-38	1000	-38	---	---	---	---	None	"	E ₆₂	"	V _{OUT7} = E ₆₂	R1 = 5000Ω ±0.1%	-31.5	-28.5	V						

TABLE III. Group A inspection for all device type 02 – Continued.

Subgroup	Symbol	Test no.	Test conditions		Measurement sense lines			Equation	Notes	Limits		Unit
			Input voltage	Load current	Symbol	Value	Units			Min	Max	
4 $T_A = +25^{\circ}\text{C}$	$\Delta V_{IN} / \Delta V_{OUT}$	66	$V_{IN} = -10\text{ V}$ $e_i = 1.0\text{ Vrms}$ at 2400 Hz	$I_L = 350\text{ mA}$	e_{orms} E	63	Vrms	$\Delta V_{IN} / \Delta V_{OUT} = -20 \log E_{63}$	See figure 10	45	---	dB
7 $T_A = +25^{\circ}\text{C}$	V_{NO}	67	$V_{IN} = -10\text{ V}$	$I_L = 100\text{ mA}$	e_{orms}	64	Vrms	$V_{NO} = E_{64}$	See figure 11	---	250	μVrms
	$\Delta V_{OUT} / \Delta V_{IN}$	68	$V_{IN} = -10\text{ V}$ $V_{\text{pulse}} = -3.0\text{ V}$	$I_L = 5\text{ mA}$	V_{OUT} E	E65	V	$\Delta V_{OUT} / \Delta V_{IN} = E_{65} / 3$	See figure 12	---	30	mV/V
	$\Delta V_{OUT} / \Delta I_L$	69	$V_{IN} = -10\text{ V}$	$I_L = 100\text{ mA}$ $\Delta I_L = 400\text{ mA}$	V_{OUT}	E66	V	$\Delta V_{OUT} / \Delta I_L = E_{66} / 400$	See figure 13	---	2.5	mV/mA

TABLE III. Group A inspection for all device type 03.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Lines		Unit	
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max		
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2										
1 T _A = +25°C	V _{OUT1}	1	-4.25	5	-4.25	---	---	---	---	None	9-11	E ₁	V	V _{OUT1} = E ₁		-1.275	-1.225	V	
	V _{OUT2}	2	-4.25	500	-4.25	4.95	---	---	---	"	"	E ₂	"	V _{OUT2} = E ₂		"	"	"	
	V _{OUT3}	3	-41.25	5	-41.25	---	---	---	---	"	"	E ₃	"	V _{OUT3} = E ₃		"	"	"	
	V _{OUT4}	4	-41.25	50	-41.25	0.45	---	---	---	"	"	E ₄	"	V _{OUT4} = E ₄		"	"	"	
	V _{RLINE1}	5	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₁ – E ₃	See figure 9 waveforms	-9	9	mV	
	V _{RLOAD1}	6	-6.25	5	-6.25	0	---	---	---	"	"	E ₅	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	7	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₆	"	V _{RLOAD1} = E ₅ – E ₆		-12	12	"	
	V _{RLOAD2}	8	---	---	---	---	---	---	---	"	"	---	"	V _{RLOAD2} = E ₃ – E ₄		-6	6	"	
	V _{RLOAD3}	9	-6.25	200	-6.25	1.95	---	---	---	"	"	E ₇	"	V _{RLOAD3} = E ₅ – E ₇		6	6	"	
	V _{RTH}	10	-14.6	500	-14.6	7.45	---	---	---	"	"	E ₈	"	V _{RTH} = E ₈	See figure 9 waveforms	-5	5	"	
	I _{ADJ}	11	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₉	mV	I _{ADJ} = E ₉ / 2000			100	μA	
	I _{ADJ}	12	-41.25	5	-41.25	0	---	---	---	"	"	E ₁₀	"	I _{ADJ} = E ₁₀ / 2000	-6		100	"	
	ΔI _{ADJ} (LINE)	13	---	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₉ – E ₁₀) / 2000 (LINE)	25		5	"	
	ΔI _{ADJ}	14	-6.25	5	-6.25	0	---	---	---	"	"	E ₁₁	"	ΔI _{ADJ} = (E ₁₁ – E ₁₂) / 2000 (LINE)	25		5	"	
	ΔI _{ADJ}	15	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₁₂	"		-5			"	
	(LOAD)	I _{OS1}	16	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₁₃	V	I _{OS1} = E ₁₃	See figure 9 waveforms	0.05	1.8	A
	(LOAD)	V _{OUT5}	17	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₁₄	"	V _{OUT5} = E ₁₄ (RECOV)		-1.275	-1.225	V
	(RECOV)	I _{OS2}	18	-40	---	-40	---	---	---	0	K5	10-5	E ₁₅	"	I _{OS2} = E ₁₅			0.5	A
	(RECOV)	V _{OUT6}	19	-40	---	-40	---	---	---	0	K5	9-11	E ₁₆	"	V _{OUT6} = E ₁₆ (RECOV)			-1.225	V
	(RECOV)	I _{Q1}	20	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₁₇	"	I _{Q1} = E ₁₇ / 2000	0.05		3.0	mA
		I _{Q2}	21	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₁₈	"	I _{Q2} = E ₁₈ / 2000	-1.275		3.0	"
		I _{Q3}	22	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₁₉	"	I _{Q3} = E ₁₉ / 2000			5.0	"
		V _{START}	23	-4.25	500	-10	0	---	-0.425	---	K4	9-11	E ₂₀	"	V _{START} = E ₂₀	See figure 9 waveforms	-1.275	-1.225	V
2 T _A = +125°C	V _{OUT1}	24	-4.25	5	-4.25	---	---	---	---	None	9-11	E ₂₁	V	V _{OUT1} = E ₂₁	1.0	-1.30	-1.20	V	
	V _{OUT2}	25	-4.25	500	-4.25	4.95	---	---	---	"	"	E ₂₂	"	V _{OUT2} = E ₂₂			"	"	
	V _{OUT3}	26	-41.25	5	-41.25	---	---	---	---	"	"	E ₂₃	"	V _{OUT3} = E ₂₃			"	"	
	V _{OUT4}	27	-41.25	50	-41.25	0.45	---	---	---	"	"	E ₂₄	"	V _{OUT4} = E ₂₄			"	"	
	V _{RLINE1}	28	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₂₁ – E ₂₃	See figure 9 waveforms	-23	23	mV	
	V _{RLOAD1}	29	-6.25	5	-6.25	0	---	---	---	"	"	E ₂₅	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	30	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₂₆	"	V _{RLOAD1} = E ₂₅ – E ₂₆		-24	24	"	
	V _{RLOAD2}	31	---	---	---	---	---	---	---	"	"	---	"	V _{RLOAD2} = E ₂₃ – E ₂₄		-12	12	"	
	V _{RLOAD3}	32	-6.25	200	-6.25	1.95	---	---	---	"	"	E ₂₇	"	V _{RLOAD3} = E ₂₅ – E ₂₇			12	"	

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TABLE III. Group A inspection for all device type 03 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit		
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max			
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2											
2	I _{ADJ}	33	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₂₈	mV	I _{ADJ} = E ₂₈ / 2000			100	μA		
	I _{ADJ}	34	-41.25	5	-41.25	0	---	---	---	"	"	E ₂₉	"	I _{ADJ} = E ₂₉ / 2000			100	"		
	T _A = +125°C	ΔI _{ADJ} (LINE)	35	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₂₈ – E ₂₉) / 2000 (LINE)	25		5	"		
		ΔI _{ADJ}	36	-6.25	5	-6.25	0	---	---	---	"	"	E ₃₀	"		25			"	
	(LOAD)	ΔI _{ADJ}	37	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₃₁	"	ΔI _{ADJ} = (E ₃₀ – E ₃₁) / 2000 (LINE)	-5		5	"	
	(LOAD)	I _{OS1}	38	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₃₂	V	I _{OS1} = E ₃₂	See figure 9 waveforms	0.5	1.8	A	
		V _{OUT5}	39	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₃₃	"	V _{OUT5} = E ₃₃ (RECOV)		-1.30	-1.20	V	
	(RECOV)	I _{OS2}	40	-40	---	-40	---	---	---	0	K5	10-5	E ₃₄	"	I _{OS2} = E ₃₄			0.5	A	
		V _{OUT6}	41	-40	---	-40	---	---	---	0	K5	9-11	E ₃₅	"	V _{OUT6} = E ₃₅ (RECOV)			-1.20	V	
	(RECOV)	I _{Q1}	42	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₃₆	"	I _{Q1} = E ₃₆ / 2000	0.05		3.0	mA	
		I _{Q2}	43	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₃₇	"	I _{Q2} = E ₃₇ / 2000	-1.30		3.0	"	
		I _{Q3}	44	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₃₈	"	I _{Q3} = E ₃₈ / 2000			5.0	"	
	V _{START}	45	-4.25	500	-10	0	---	-0.425	---	K4	9-11	E ₃₉	"	V _{START} = E ₃₉	See figure 9 waveforms	-1.30	-1.20	V		
T _A = +150°C	V _{OUT7}	46	-6.25	5	-6.25	0	---	---	---	None	"	E ₄₀	"	V _{OUT7} = E ₄₀	1.0	-1.30	-1.20	V		
3	T _A = -55°C	V _{OUT1}	47	-4.25	5	-4.25	0	---	---	---	None	9-11	E ₄₁	V	V _{OUT1} = E ₄₁		-1.30	-1.20	V	
		V _{OUT2}	48	-4.25	500	-4.25	4.95	---	---	---	"	"	E ₄₂	"	V _{OUT2} = E ₄₂			"	"	
		V _{OUT3}	49	-41.25	5	-41.25	0	---	---	---	"	"	E ₄₃	"	V _{OUT3} = E ₄₃			"	"	
		V _{OUT4}	50	-41.25	50	-41.25	0.45	---	---	---	"	"	E ₄₄	"	V _{OUT4} = E ₄₄			"	"	
		V _{RLINE1}	51	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₄₁ – E ₄₃	See figure 9 waveforms	-23	23	mV	
	VR _{LOAD1}	52	-6.25	5	-6.25	0	---	---	---	---	"	"	E ₄₅	"	---	See figure 9 waveforms	---	---	"	"
		VR _{LOAD1}	53	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₄₆	"	VR _{LOAD1} = E ₄₅ – E ₄₆		-24	24	"	"
		VR _{LOAD2}	54	---	---	---	---	---	---	---	"	"	E ₄₇	"	VR _{LOAD2} = E ₄₃ – E ₄₄		-12	12	"	"
		VR _{LOAD2}	55	-6.25	200	-6.25	1.95	---	---	---	"	"	E ₄₈	"	VR _{LOAD3} = E ₄₅ – E ₄₈			12	"	"
		VR _{LOAD3}																		
	(LOAD)	I _{ADJ}	56	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₄₉	mV	I _{ADJ} = E ₄₉ / 2000			100	μA	
		I _{ADJ}	57	-41.25	5	-41.25	0	---	---	---	"	"	E ₅₀	"	I _{ADJ} = E ₅₀ / 2000			100	"	
		ΔI _{ADJ} (LINE)	58	---	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₄₉ – E ₅₀) / 2000 (LINE)	-12 25		5	"	
		ΔI _{ADJ}	59	-6.25	5	-6.25	0	---	---	---	"	"	E ₅₁	"		25			"	
		ΔI _{ADJ}	60	-6.25	500	-6.25	4.95	---	---	---	"	"	E ₅₂	"	ΔI _{ADJ} = (E ₅₁ – E ₅₂) / 2000 (LINE)	-5		5	"	

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TABLE III. Group A inspection for all device type 03 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max	
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2									
3 T _A = -55°C (RECOV)	I _{OS1}	61	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₅₃	V	I _{OS1} = E ₅₃	See figure 9 waveforms	0.5	1.8	A
	V _{OUT5} (RECOV)	62	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₅₄	"	V _{OUT5} = E ₅₄ (RECOV)		-1.30	-1.20	V
	I _{OS2}	63	-40	---	-40	---	---	---	0	K5	10-5	E ₅₅	"	I _{OS2} = E ₅₅			0.5	A
	V _{OUT6}	64	-40	---	-40	---	---	---	0	K5	9-11	E ₅₆	"	V _{OUT6} = E ₅₆ (RECOV)			-1.20	V
	I _{Q1}	65	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₅₇	"	I _{Q1} = E ₅₇ / 2000	0.05		3.0	mA
	I _{Q2}	66	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₅₈	"	I _{Q2} = E ₅₈ / 2000	-1.30		3.0	"
	I _{Q3}	67	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₅₉	"	I _{Q3} = E ₅₉ / 2000			5.0	"
	V _{START}	68	-4.25	500	-10	0	---	-0.425	---	K4	9-11	E ₆₀	"	V _{START} = E ₆₀	0.2	-1.30	-1.20	V
														See figure 9.2 waveforms	0.05			
Subgroup	Symbol	Test no.	Test conditions							Measurement sense lines			Equation	Notes	Limits		Unit	
			Input voltage			Load current				Symbol	Value	Units			Min	Max		
4 T _A = +25°C	ΔV _{IN} / ΔV _{OUT}	69	V _{IN} = -6.25 V e _i = 1.0 Vrms at 2400 Hz				I _L = 125 mA			e _{orms}	61	Vrms	ΔV _{IN} / ΔV _{OUT} = -20 log E ₆₁	See figure 10	48	---	dB	
7 T _A = +25°C	V _{NO}	70	V _{IN} = -6.25 V				I _L = 50 mA			e _{orms}	62	Vrms	V _{NO} = E ₆₂	See figure 11	---	120	μVrms	
	ΔV _{OUT} / ΔV _{IN}	71	V _{IN} = -6.25 V V _{pulse} = -1.0 V				I _L = 50 mA			V _{OUT}	63	V	ΔV _{OUT} / ΔV _{IN} = E ₅₉ / 1	See figure 12	---	80	mV/V	
	ΔV _{OUT} / ΔI _L	72	V _{IN} = -6.25 V				I _L = 50 mA ΔI _L = 200 mA			V _{OUT}	64	V	ΔV _{OUT} / ΔI _L = E ₆₄ / 200	See figure 13	---	0.30	mV/mA	

TABLE III. Group A inspection for all device type 04.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit	
			Test conditions		Applied test voltages (volts) (Hi – LO pin potential)						Pins	Value	Units			Min	Max		
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2										
1 T _A = +25°C	V _{OUT1}	1	-4.25	5	-4.25	---	---	---	---	None	9-11	E ₁	V	V _{OUT1} = E ₁		-1.275	-1.225	V	
	V _{OUT2}	2	-4.25	1500	-4.25	14.95	---	---	---	"	"	E ₂	"	V _{OUT2} = E ₂		"	"	"	
	V _{OUT3}	3	-41.25	5	-41.25	---	---	---	---	"	"	E ₃	"	V _{OUT3} = E ₃		"	"	"	
	V _{OUT4}	4	-41.25	200	-41.25	1.95	---	---	---	"	"	E ₄	"	V _{OUT4} = E ₄		"	"	"	
	V _{RLINE1}	5	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₁ – E ₃	See figure 9 waveforms	-9	9	mV	
	V _{RLOAD1}	6	-6.25	5	-6.25	0	---	---	---	"	"	E ₅	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	7	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₆	"	V _{RLOAD1} = E ₅ – E ₆		-6	6	"	
	V _{RLOAD2}	8	---	---	---	---	---	---	---	"	"	---	"	V _{RLOAD2} = E ₃ – E ₄		-6	6	"	
	V _{RTH}	9	-14.6	1500	-14.6	14.95	---	---	---	"	"	E ₇	"	V _{RTH} = E ₇	See figure 9 waveforms	-5	5	"	
	I _{ADJ}	10	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₈	mV	I _{ADJ} = E ₈ / 2000			100	μA	
	I _{ADJ}	11	-41.25	5	-41.25	0	---	---	---	"	"	E ₉	"	I _{ADJ} = E ₉ / 2000			100	"	
	ΔI _{ADJ} (LINE)	12	---	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₈ – E ₉) / 2000 (LINE)			5	"	
	ΔI _{ADJ}	13	-6.25	5	-6.25	0	---	---	---	"	"	E ₁₀	"		25			"	
	ΔI _{ADJ}	14	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₁₁	"	ΔI _{ADJ} = (E ₁₀ – E ₁₁) / 2000 (LINE)	-5		5	"	
	(LOAD)	I _{OS1}	15	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₁₂	V	I _{OS1} = E ₁₂	See figure 9 waveforms	1.5	3.5	A
	(LOAD)	V _{OUT5}	16	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₁₃	"	V _{OUT5} = E ₁₃ (RECOV)		-1.275	-1.225	V
	(RECOV)	I _{OS2}	17	-40	---	-40	---	---	---	0	K5	10-5	E ₁₄	"	I _{OS2} = E ₁₄			1.0	A
	(RECOV)	V _{OUT6}	18	-40	---	-40	---	---	---	0	K5	9-11	E ₁₅	"	V _{OUT6} = E ₁₅ (RECOV)			-1.225	V
	(RECOV)	I _{Q1}	19	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₁₆	"	I _{Q1} = E ₁₆ / 2000	0.2		3.0	mA
		I _{Q2}	20	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₁₇	"	I _{Q2} = E ₁₇ / 2000	-1.275		3.0	"
		I _{Q3}	21	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₁₈	"	I _{Q3} = E ₁₈ / 2000			5.0	"
		V _{START}	22	-4.25	1500	-10	0	---	-0.425	---	K4	9-11	E ₁₉	"	V _{START} = E ₁₉	See figure 9 waveforms	-1.275	-1.225	V
2 T _A = +125°C	V _{OUT1}	23	-4.25	5	-4.25	0	---	---	---	None	9-11	E ₂₀	V	V _{OUT1} = E ₂₀	1.0	-1.30	-1.20	V	
	V _{OUT2}	24	-4.25	1500	-4.25	14.95	---	---	---	"	"	E ₂₁	"	V _{OUT2} = E ₂₁			"	"	
	V _{OUT3}	25	-41.25	5	-41.25	0	---	---	---	"	"	E ₂₂	"	V _{OUT3} = E ₂₂			"	"	
	V _{OUT4}	26	-41.25	200	-41.25	1.95	---	---	---	"	"	E ₂₃	"	V _{OUT4} = E ₂₃			"	"	
	V _{RLINE1}	27	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₂₀ – E ₂₂	See figure 9 waveforms	-23	23	mV	
	V _{RLOAD1}	28	-6.25	5	-6.25	0	---	---	---	"	"	E ₂₄	"	---	See figure 9 waveforms	---	---	"	
	V _{RLOAD1}	29	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₂₅	"	V _{RLOAD1} = E ₂₄ – E ₂₅		-12	12	"	
	V _{RLOAD2}	30	---	---	---	---	---	---	---	"	"	---	"	V _{RLOAD2} = E ₂₂ – E ₂₃		-12	12	"	

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TABLE III. Group A inspection for all device type 04 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max	
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2									
2	I _{ADJ}	31	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₂₆	mV	I _{ADJ} = E ₂₆ / 2000			100	μA
	I _{ADJ}	32	-41.25	5	-41.25	0	---	---	---	"	"	E ₂₇	"	I _{ADJ} = E ₂₇ / 2000			100	"
	ΔI _{ADJ} (LINE)	33	---	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₂₆ – E ₂₇) / 2000 (LINE)	25		5	"
	ΔI _{ADJ}	34	-6.25	5	-6.25	0	---	---	---	"	"	E ₂₈	"	ΔI _{ADJ} = (E ₂₈ – E ₂₉) / 2000 (LINE)	25		5	"
	ΔI _{ADJ}	35	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₂₉	"		-5		5	"
	(LOAD) I _{OS1}	36	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₃₀	V	I _{OS1} = E ₃₀ V _{OUT5} = E ₃₁ (RECOV) I _{OS2} = E ₃₂ V _{OUT6} = E ₃₃ (RECOV)	See figure 9 waveforms	1.5	3.5	A
	(LOAD) V _{OUT5}	37	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₃₁	"			-1.30	-1.20	V
	(RECOV) I _{OS2}	38	-40	---	-40	---	---	---	0	K5	10-5	E ₃₂	"			1.0		A
	(RECOV) V _{OUT6}	39	-40	---	-40	---	---	---	0	K5	9-11	E ₃₃	"	-1.20		V		
	(RECOV) I _{Q1}	40	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₃₄	"	I _{Q1} = E ₃₄ / 2000 I _{Q2} = E ₃₅ / 2000 I _{Q3} = E ₃₆ / 2000	0.2 -1.30		3.0	mA
	(RECOV) I _{Q2}	41	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₃₅	"			3.0		"
	(RECOV) I _{Q3}	42	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₃₆	"			5.0		"
		V _{START}	43	-4.25	1500	-10	0	---	-0.425	---	K4	9-11	E ₃₇	"	V _{START} = E ₃₇	See figure 9 waveforms	-1.30	-1.20
T _A = +150°C	V _{OUT7}	44	-6.25	5	-6.25	0	---	---	---	None	"	E ₃₈	"	V _{OUT7} = E ₃₈	0.2 1.0	-1.30	-1.20	V
3	V _{OUT1}	45	-4.25	5	-4.25	0	---	---	---	None	9-11	E ₃₉	V	V _{OUT1} = E ₃₉		-1.30	-1.20	V
	V _{OUT2}	46	-4.25	1500	-4.25	14.95	---	---	---	"	"	E ₄₀	"	V _{OUT2} = E ₄₀			"	"
	V _{OUT3}	47	-41.25	5	-41.25	0	---	---	---	"	"	E ₄₁	"	V _{OUT3} = E ₄₁			"	"
	V _{OUT4}	48	-41.25	200	-41.25	1.95	---	---	---	"	"	E ₄₂	"	V _{OUT4} = E ₄₂			"	"
	V _{RLINE1}	49	---	---	---	---	---	---	---	"	"	---	"	V _{RLINE} = E ₃₉ – E ₄₁	See figure 9 waveforms	-23	23	mV
	V _{RLOAD1}	50	-6.25	5	-6.25	0	---	---	---	"	"	E ₄₃	"	---	See figure 9 waveforms	---	---	"
	V _{RLOAD1}	51	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₄₄	"	V _{RLOAD1} = E ₄₃ – E ₄₄		-12	12	"
	V _{RLOAD2}	52	---	---	---	---	---	---	---	"	"	---	"	V _{RLOAD2} = E ₄₁ – E ₄₂		-12	12	"
	I _{ADJ}	53	-4.25	5	-4.25	0	---	---	---	K2	12-13	E ₄₅	mV	I _{ADJ} = E ₄₅ / 2000			100	μA
	I _{ADJ}	54	-41.25	5	-41.25	0	---	---	---	"	"	E ₄₆	"	I _{ADJ} = E ₄₆ / 2000			100	"
	ΔI _{ADJ} (LINE)	55	---	---	---	---	---	---	---	"	"	---	"	ΔI _{ADJ} = (E ₄₅ – E ₄₆) / 2000 (LINE)	25		5	"
	ΔI _{ADJ}	56	-6.25	5	-6.25	0	---	---	---	"	"	E ₄₇	"	ΔI _{ADJ} = (E ₄₇ – E ₄₈) / 2000 (LOAD)	25		5	"
	ΔI _{ADJ}	57	-6.25	1500	-6.25	14.95	---	---	---	"	"	E ₄₈	"		-5		5	"

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TABLE III. Group A inspection for all device type 04 – Continued.

Subgroup	Symbol	Test no.	See figure 9							Relays energized	Measurement sense lines			Equation	Notes	Limits		Unit
			Test conditions		Applied test voltages (volts) (Hi – Lo pin potential)						Pins	Value	Units			Min	Max	
			V _{IN} (volts)	I _L (mA)	1-2	4-5	6-11	7-2	8-2									
3 T _A = -55°C	I _{OS1}	58	-4.25	---	-10	---	---	-0.425	0	K4,K5	10-5	E ₄₉	V	I _{OS1} = E ₄₉ V _{OUT5} = E ₅₀ (RECOV) I _{OS2} = E ₅₁ V _{OUT6} = E ₅₂ (RECOV)	See figure 9 waveforms	1.5 -1.30	3.5 -1.20	A V
	V _{OUT5} (RECOV)	59	-4.25	---	-10	---	---	-0.425	0	K4,K5	9-11	E ₅₀	"					
	I _{OS2}	60	-40	---	-40	---	---	---	0	K5	10-5	E ₅₁	"					
	V _{OUT6} (RECOV)	61	-40	---	-40	---	---	---	0	K5	9-11	E ₅₂	"					
	I _{Q1}	62	-4.25	---	-4.25	0	-1.4	---	---	K3	12-13	E ₅₃	"	I _{Q1} = E ₅₃ / 2000 I _{Q2} = E ₅₄ / 2000 I _{Q3} = E ₅₅ / 2000	0.2 -1.30	3.0 3.0 5.0	mA " "	
	I _{Q2}	63	-14.25	---	-14.25	0	-1.4	---	---	K3	12-13	E ₅₄	"					
	I _{Q3}	64	-41.25	---	-41.25	0	-1.4	---	---	K3	12-13	E ₅₅	"					
V _{START}	65	-4.25	1500	-10	0	---	-0.425	---	K4	9-11	E ₅₆	"	V _{START} = E ₅₆	See figure 9 waveforms	-1.30	-1.20	V	
1.0																		
Subgroup	Symbol	Test no.	Test conditions							Measurement sense lines			Equation	Notes	Limits		Unit	
			Input voltage				Load current			Symbol	Value	Units			Min	Max		
4 T _A = +25°C	ΔV _{IN} / ΔV _{OUT}	66	V _{IN} = -6.25 V e _i = 1.0 Vrms at 2400 Hz				I _L = 500 mA			e _{orms}	57	Vrms	ΔV _{IN} / ΔV _{OUT} = -20 log E ₅₇	See figure 10	50	---	dB	
7 T _A = +25°C	V _{NO}	67	V _{IN} = -6.25 V				I _L = 100 mA			e _{orms}	58	Vrms	V _{NO} = E ₅₈	See figure 11	---	120	μVrms	
	ΔV _{OUT} / ΔV _{IN}	68	V _{IN} = -6.25 V V _{pulse} = -1.0 V				I _L = 100 mA			V _{OUT}	59	V	ΔV _{OUT} / ΔV _{IN} = E ₅₉ / 1	See figure 12	---	80	mV/V	
	ΔV _{OUT} / ΔI _L	69	V _{IN} = -6.25 V				I _L = 100 mA ΔI _L = 400 mA			V _{OUT}	60	V	ΔV _{OUT} / ΔI _L = E ₆₀ / 200	See figure 13	---	0.15	mV/mA	

TABLE IV. Group C end point electrical parameters. ($T_A = +25^\circ\text{C}$)

Device type	Characteristic	Symbol	Delta limits <u>1/</u>	Limits		Units
				Min	Max	
01, 02	Output voltage	V_{OUT}	± 50 mV	-5.25	-4.75	V
	Standby current drain	I_{SCD}	± 20 %	0.5	4.0	mA
03, 04	Output voltage	V_{OUT}	± 10 mV	-1.275	-1.225	V
	Adjust pin current	I_{ADJ}	± 10 μA	25	100	μA
	Line regulation	V_{RLINE}	± 4 mV	-9	9	mV

1/ Delta limits apply to the measured value (see delta limit definition in MIL-PRF-38535).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but it is not mandatory.)

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 quality 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 contracting activity in addition to notification to the qualifying activity, if applicable.
- f. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), 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 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 43128-3990.

6.4 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.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535, MIL-HDBK-1331, and as follows:

6.5.1 Line regulation. The change in output voltage for a specified change in input voltage (V_{RLINE}).

6.5.2 Load regulation. The change in output voltage for a specified change in load current (V_{RLOAD}).

6.5.3 Ripple rejection. The ratio of the peak to peak input ripple voltage to the peak to peak output ripple voltage ($\Delta V_{OUT} / \Delta V_{IN}$).

6.5.4 Output noise voltage. The rms output noise voltage with constant load and no input ripple (V_{NO}).

6.5.5 Standby current drain. The supply current drawn by the regulator with no output load or with a 1 kilohm output load.

6.5.6 Minimum load current. The minimum load current is that current required to maintain regulation.

6.5.7 Input voltage range. The range of supply voltage over which the regulator will operate.

6.5.8 Output voltage range. The range of output voltage over which the regulator will operate.

6.5.9 Transient response. The closed-loop step function response of the regulator under small-signal conditions.

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.

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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.

<u>Military device type</u>	<u>Generic-industry type</u>
01	79MG
02	79G
03	LM137H
04	LM137K

6.8 Changes from previous issue. Marginal notations 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

Preparing activity:

DLA - CC

Project 5962-2005-016

Review activities:

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

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 <http://assist.daps.dla.mil>.