National Semiconductor

MICROCIRCUIT DATA SHEET

MDLM143-X REV 0A0

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HIGH VOLTAGE OPERATIONAL AMPLIFIER

General Description

The LM143 is a general purpose high voltage operational amplifier featuring operation to ±40V, complete input overvoltage protection up to ±40V and input currents comparable to those of other super-B op amps. Increased slew rate, together with higher common-mode and supply rejection, insure improved performance at high supply voltages. Operating characteristics, in particular supply current, slew rate and gain, are virtually independent of supply voltage and temperature. Furthermore, gain is unaffected by output loading at high supply voltages due to thermal symmetry on the die. The LM143 is pin compatible with general purpose op amps and has offset null capability.

Application areas include those of general purpose op amps, but can be extended to higher voltages and higher output power when externally boosted. For example, when used in audio power applications, the LM143 provides a power bandwidth that covers the entire audio spectrum. In addition, the LM143 can be reliably operated in environments with large overvoltage spikes on the power supplies, where other internally-compensated op amps would suffer catastrophic failures.

Industry Part Number

LM143

NS Part Numbers

LM143H-SMD *

Prime Die

LM143

Controlling Document

DESC.# 7800303XA*

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Wide supply voltage range. ±4.0V to ±40V
- Large output voltge swing. ±37V
- Wide input common-mode range. ±38V
- Input overvoltage protection. Full ±40V
- Supply current is virtually independent of supply voltage and temperature.

(Absolute Maximum Ratings)
(Note 1)

Supply Voltage		±40V
Power Dissipation (Note 2)		680mW
Differential Input Voltage (Note 3)		80V
Input Voltage (Note 3)		±40V
Operating Temperature Range		-55 C to +125 C
Thermal Resistance		
ThetaJA		
Metal Can Pkg	(Still Air @ 0.5W)	153 C/W
	(500LF/Min Air flow @ 0.5W)	82 C/W
ThetaJC		
Metal Can Pkg		44 C/W
Storage Temperature Range		-65 C to +150 C
Maximum Junction Temperature		150 C
Output Short Circuit Duration		5 seconds
Lead Temperature (Soldering, 10 seconds)		300 C
ESD Rating (Note 4)		1500V

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by Tjmax (maximum junction temperature), ThetaJA (package junction to ambient thermal resistance), and TA (ambient temperature). The maximum allowable power dissipation at any temperature is Pdmax - (Tjmax - TA)/ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: For supply voltage less than ±40V, the absolute maximum input voltage is equal to the supply voltage.

Note 4: Human body model, 1.5K Ohms in series with 100pF.

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vs = ±28V, Rs = 50 Ohms, Vcm = 0V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage	Vs = ±28V, Rl = 5K Ohms				5	mV	1
		Vs = ±28V, Rl = 5K Ohms				7	mV	2, 3
		Vcm = -24V, Rl = 5K Ohms			-5	5	mV	1
					-7	7	mV	2, 3
		Vcm = 24V, Rl = 5K Ohms			-5	5	mV	1
					-7	7	mV	2, 3
		Rl = 5K Ohms			-5	5	mV	1
					-7	7	mV	2, 3
		Vcm = -24V, Rl = 5K Ohms, Rs=50K Ohms			-5	5	mV	1
					-7	7	mV	2, 3
		Vcm = 24V, Rl = 5K Ohms, Rs = 50K Ohms			-5	5	mV	1
					-7	7	mV	2, 3
Iio	Input Offset Current	Vs = ±28V, Rl = 5K Ohms				3	nA	1
		Vs = ±28V, Rl = 5K Ohms				7	nA	2, 3
		Vcm = -24V, Rl = 5K Ohms			-3	3	nA	1
					-7	7	nA	2, 3
		Vcm = 24V, Rl = 5K Ohms			-3	3	nA	1
					-7	7	nA	2, 3
					-3	3	nA	1
					-7	7	nA	2, 3
Iib	Input Bias Current	Vs = ±28V, Rl = 5K Ohms				20	nA	1
		Vs = ±28V, Rl = 5K Ohms				35	nA	2, 3
		Vcm = -24V, Rl = 5K Ohms			0.1	20	nA	1
					0.1	35	nA	2, 3
		Vcm = 24V, Rl = 5K Ohms			0.1	20	nA	1
					0.1	35	nA	2, 3
					0.1	20	nA	1
					0.1	35	nA	2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vs = ±28V, Rs = 50 Ohms, Vcm = 0V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Icc	Supply Current	Vs = ±28V, Rl = 5K Ohms				4	mA	1
		Vs = ±28V, Rl = 5K Ohms				4.5	mA	2, 3
		Rl = 5K Ohms				4	mA	1
+Vo	Output Voltage Swing	Rl = 5K Ohms			22		V	1, 2, 3
-Vo	Output Voltage Swing	Rl = 5K Ohms				-22	V	1, 2, 3
Vo	Output Voltage Swing	Vs = ±28V, Rl = 5K Ohms			±22		V	1, 2, 3
Ios+	Output Short Circuit Current					-12	mA	1
Ios-	Output Short Circuit Current				12		mA	1
Ios	Output Short Circuit Current		2		±12		mA	1
Vir	Input Voltage Range	Vs = ±28V, Rl = 5K Ohms	1		-24	24	V	1, 2, 3
		Rl = 5K Ohms	1		-24	24	V	1, 2, 3

Electrical Characteristics

DC/AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vs = ±28V, Rs = 50 Ohms, Vcm = 0V
AC: Vs = ±28V, Rs = 50 Ohms, Vcm = 0V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
SVRR	Supply Voltage Rejection Ratio	Vs = ±15V to ±28V	3		80		dB	4, 5, 6
CMRR	Common Mode Rejection Ratio	Vs = ±28V, Rl = 5K Ohms			80		dB	4, 5, 6
		Vcm = -24V to +24V, Rl = 5K Ohms			80		db	4, 5, 6
-Avol	Large Signal Voltage Gain	Vo = -10V, Rl = 2K Ohms			100		V/mV	4
					50		V/mV	5, 6
+Avol	Large Signal Voltage Gain	Vo = +10V, Rl = 2K Ohms			100		V/mV	4
					50		V/mV	5, 6
Avol	Large Signal Voltage Gain	Vs = ±28V, Vo = ±10V, Rl = 2K Ohms	4		100		V/mV	4
		Vs = ±28V, Vo = ±10V, Rl = 2K Ohms	4		50		V/mV	5, 6
Sr+	Slew Rate	Av = 1, Vin = -10V to +10V			1.4		V/uS	4
Sr-	Slew Rate	Av = 1, Vin = +10V to -10V			1.4		V/uS	4
Sr	Slew Rate	Av = 1	2		1.4		V/uS	4

Note 1: Parameter tested go-no-go only.
Note 2: Tested on LTX system.
Note 3: 80dB is equivalent to 100uV/V.
Note 4: Datalog reading in K = V/mV.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
H08CRE	(blank)
P000019A	8LD .200 DIA P.C. TO-99 METAL CAN (H)(PIN OUT)

See attached graphics following this page.