National Semiconductor

MICROCIRCUIT DATA SHEET

MNLM105-X REV 0C0

Original Creation Date: 06/23/95
Last Update Date: 04/08/02
Last Major Revision Date: 06/23/95

VOLTAGE REGULATOR

General Description

The LM105 positive voltage regulator is similar to the LM100, except that an extra gain stage has been added for improved regulation. A redesign of the biasing circuitry removes any minimum load current requirement and at the same time reduces standby current drain, permitting higher voltage operation. It is a direct, plug-in replacement for the LM100 in both linear and switching regulator circuits with output voltages greater than 4.5V. Important characteristics of the circuit is:

- Output voltage adjustable from 4.5V to 40V
- Output currents in excess of 10A possible by adding external transistors
- Load regulation better than 0.1%, full load with current limiting
- DC line regulation guaranteed at 0.30%/V
- Ripple rejection on 0.01%/V

As with the LM100, it also features fast response to both load and line transients, freedom from oscillations with varying resistive and reactive loads and the ability to start reliably on any load within rating. The circuit is built on a single silicon chip.

The LM105 is specified for operation for -55 C $\leq$ TA $\leq$ +125 C.

Industry Part Number

LM105

NS Part Numbers

LH105H-MLS
LM105H/883

Prime Die

LM105

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{O}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

(Absolute Maximum Ratings)

(Note 1)

Input Voltage	50V
Input-Output Differential	40V
Power Dissipation	800 mW
Operating Temperature Range	-55 C ≤ Ta ≤ +125 C
Storage Temperature Range	-65 C ≤ Ta ≤ +150 C
Lead Temperature (Soldering, 10 seconds)	300 C
Maximum Junction Temperature	150 C
Thermal Resistance	
ThetaJA	
(Still Air)	165 C/W
(500LF/Min Air flow)	96 C/W
ThetaJC	43 C/W
ESD Tolerance	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.

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vout = 4.5V, Rsc = 0 Ohms.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
R23	Pin 2 to Pin 3 Resistance	V23 = 0.25V			0.2	1.2	KOhms	1
					0.14	2.5	KOhms	2, 3
Iq	Quiescent Current	Vin = 50V			-0.1	-2	mA	1, 2
					-0.1	-3	mA	3
Vref	Reference Voltage	Vin = 8.4V (Feedback Sense Voltage)			1.63	1.81	V	1, 2, 3
Vrload	Load Regulation	Vin = 8.4V, 0.7mA ≤ Il ≤ 13mA				0.05	%	1
						0.1	%	2, 3
		Vin = 50V, 0.7mA ≤ Il ≤ 13mA, Vout = 40.5V				0.05	%	1
						0.1	%	2, 3
		Vin = 43V, 13mA ≥ Il ≥ 0.7mA, Vout = 40.5V				0.05	%	1
						0.1	%	2, 3
Vrline	Line Regulation	Il = 13mA, 8.4V ≤ Vin ≤ 44.5V	3			1	%	1, 2, 3
		Il = 0.7mA, 8.4V ≤ Vin ≤ 44.5V	3			1	%	1, 2, 3
		Il = 0.7mA, 43V ≤ Vin ≤ 50V, Vout = 40.5V	4			0.2	%	1, 2, 3
		Il = 13mA, 50V ≤ Vin ≤ 43V, Vout = 40.5V	4			0.2	%	1, 2, 3
Ibias	Input Bias Current	Vin = 50V				6	uA	1, 2
						10.5	uA	3
Vsense	Current Limit Sense Voltage	Vin = 20V, Vout = Gnd, Rsc = 10 Ohms			225	375	mV	1
					70	305	mV	2
					195	510	mV	3
Vin	Input Voltage Range		1		8.5	50	V	1, 2, 3
Vout	Output Voltage Range		1		4.5	40	V	1, 2, 3
Vdiff	Output-Input Voltage Differential		1		3	30	V	1, 2, 3
	Ripple Rejection	Vin = 25V, Cref = 10uF, Vout = 20V, f = 120Hz, Vin = 0.707Vrms	2			1.4	mVrms	1

Electrical Characteristics

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vout = 4.5V, Rsc = 0 Ohms. "Deltas not required on B-Level product. Deltas required for S-Level product as specified on Internal Processing Instructions (IPI)."

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iq	Quiescent Current	Vin = 50V			-0.2	0.2	mA	1
Vref	Reference Voltage	Vin = 8.4V (Feedback Sense Voltage)			-0.02	0.02	V	1
Ibias	Input Bias Current	Vin = 50V			-1	1	uA	1

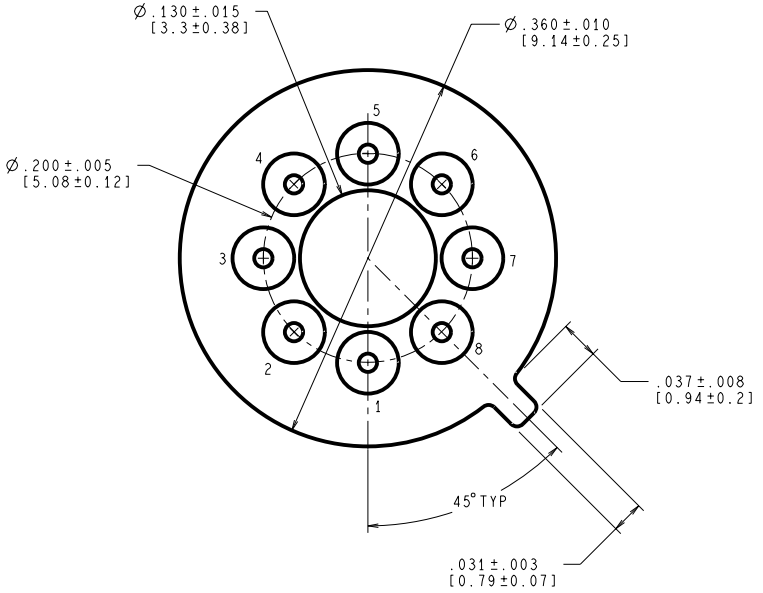
Note 1: Parameter guaranteed by line regulation.
Note 2: Ripple Rejection test may be done on LTX or bench use (SG)RPI-3-369.
Note 3: 1% = 0.03%/V.
Note 4: 0.2% = 0.03%/V.

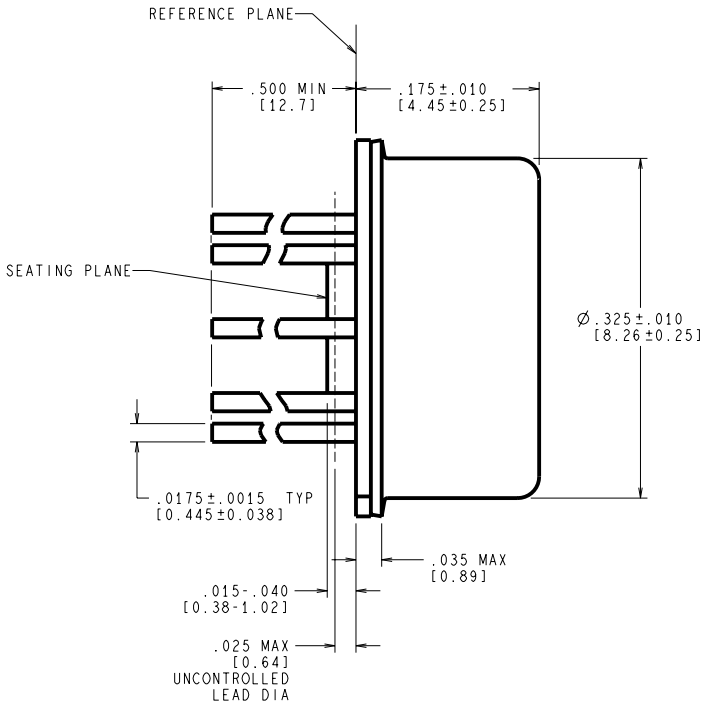
Graphics and Diagrams

GRAPHICS#	DESCRIPTION
9797HRB	8LD .200 DIA P.C. TO-99 METAL CAN(H) (B/I CKT)
H08CRF	METAL CAN (H), TO-99, 8LD, .200 DIA P.C. (P/P DWG)

See attached graphics following this page.

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
F	REVISE & REDRAW PER CURRENT STANDARD; UPDATE MIL/AERO STAMP & TITLE.	11002	06/22/95	MS/





CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

MIL-I-38535
CONFIGURATION CONTROL

NOTES: UNLESS OTHERWISE SPECIFIED

1. LEADS TO BE LOCATED WITHIN .007 IN/ 0.18 mm OF THEIR TRUE POSITIONS RELATIVE TO A MAXIMUM WIDTH TAB.
2. STANDARD METAL CAN TYPE: SOLID BASE WITH CERAMIC STANDOFF.
3. APPLIES TO MIL-AERO AND LINEAR PRODUCTS.
4. REFERENCE JEDEC REGISTRATION TO-99, JEDEC PUBLICATION No.95.

APPROVALS	DATE
DRAWN: MARTA SUCHY	06/22/95
DFTG. CHK.	
ENGR. CHK.	

National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

METAL CAN, TO-99, 8 LEAD, .200 DIA P.C.

PROJECTION — INCH [MM]

SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-H08C	F

DO NOT SCALE DRAWING — SHEET 1 of 1

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0C0	M0003999	04/08/02	Rose Malone	Update MDS: MNLM105-X, Rev. 0B0 to MNLM105-X, Rev. 0C0. Added LM105H-MLS to Main Table under NS Part Numbers Section and Updated Absolute Maximum Ratings Section adding Thermal Resistance limits.