National Semiconductor

MICROCIRCUIT DATA SHEET

MJLM140-15-H REV 0B0

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VOLTAGE REGULATOR, +15 VOLTS AT 0.5A

General Description

The LM140 monolithic 3-terminal positive voltage regulators employ internal current limiting, thermal shutdown and safe-area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 0.5A output current. They are intended as fixed voltage regulators in a wide range of applications including local (on-card) regulation for elimination of noise and distribution problems associated with single-point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents.

Considerable effort was expended to make the entire series of regulators easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response. Input bypassing is needed only if the regulator is located far from the filter capacitor of the power supply.

Industry Part Number

LM140

NS Part Numbers

JL140-15BXA

Prime Die

LM141

Controlling Document

38510/10704(CIRCUIT A) REV C

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

Features

- Output current in excess of 0.5A
- No external components
- Internal thermal overload protection
- Internal short circuit current-limiting
- Output transistor safe-area compensation

(Absolute Maximum Ratings)
(Note 1)

DC Input Voltage	35V
Internal Power Dissipation (Note 2)	Internally Limited
Maximum Junction Temperature	150 C
Storage Temperature Range	-65 C to +150 C
Lead Temperature	
Soldering, (10 seconds)	300 C
Thermal Resistance	
ThetaJA	
(Still Air)	232 C/W
(500 LF/Min Air Flow)	77 C/W
ThetaJC	15 C/W
ESD Susceptibility (Note 3)	2KV

Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specification might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.
Note 2: The Maximum allowable power dissipation at any ambient temperature is a function of the maximum junction temperature for operation (TjMAX = 150 C), the junction-to-ambient thermal resistance (ThetaJA), and the ambient temperature (TA). PDMAX = (TjMAX - TA)/ThetaJA. If this dissipation is exceeded, the die temperature will rise above TjMAX and the electrical specifications do not apply. If the die temperature rises above 150 C, the device will go into thermal shutdown.
Note 3: Human body model, 100pF discharged through 1.5K Ohms

Recommended Operating Conditions
(Note 1)

Temperature Range (TA) (Note 2)	-55 C to +125 C

Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specification might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.
Note 2: The Maximum allowable power dissipation at any ambient temperature is a function of the maximum junction temperature for operation (TjMAX = 150 C), the junction-to-ambient thermal resistance (ThetaJA), and the ambient temperature (TA). PDMAX = (TjMAX - TA)/ThetaJA. If this dissipation is exceeded, the die temperature will rise above TjMAX and the electrical specifications do not apply. If the die temperature rises above 150 C, the device will go into thermal shutdown.

Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout (1)	Output Voltage	Vin = 18.5V, Il = -5mA			14.25	15.75	V	1, 2, 3
		Vin = 18.5V, Il = -500mA			14.25	15.75	V	1, 2, 3
		Vin = 30V, Il = -5mA			14.25	15.75	V	1, 2, 3
		Vin = 30V, Il = -500mA			14.25	15.75	V	1, 2, 3
		Vin = 35V, Il = -5mA			14.25	15.75	V	1, 2, 3
		Vin = 35V, Il = -50mA			14.25	15.75	V	1, 2, 3
VRLINE	Line Regulation	18.5V ≤ Vin ≤ 35V, Il = -350mA			-150	150	mV	1, 2, 3
VRLOAD	Load Regulation	-500mA ≤ Il ≤ -5mA, Vin = 20V			-300	300	mV	1, 2, 3
		-50mA ≤ Il ≤ -5mA, Vin = 35V			-450	450	mV	1, 2, 3
ISCD	Stand by Current Drain	Vin = 20V, Il = -5mA			-7	-0.5	mA	1, 2, 3
		Vin = 35V, Il = -5mA			-8	-0.5	mA	1, 2, 3
Delta ISCD (LINE)	Stand by Current Drain vs. Line Voltage	18.5V ≤ Vin ≤ 35V, Il = -5mA			-1	1	mA	1, 2, 3
Delta ISCD (LOAD)	Stand by Current Drain vs. Load Current	-500mA ≤ Il ≤ -5mA, Vin = 20V			-0.5	0.5	mA	1, 2, 3
Iol	Overload Current	FORCED Delta/Vout = -1.43V, Vin = 18.5V			-2	-0.5	A	1, 2, 3
Ios	Output Short Circuit Current	Vin = 20V			-1.75	-0.01	A	1, 2, 3
		Vin = 35V			-1	-0.01	A	1, 2, 3
Vout (2)	Output Voltage	Vin = 20V, Il = -5mA	1		14.1	15.9	V	2
Vout (3)	Output Voltage	Vin = 20V, Il = -5mA	2		14.25	15.75	V	7, 8A, 8B
Delta Vout/ Delta T	Average Temperature Coefficient Output Voltage	25 C ≤ TA ≤ +125 C, Vin = 20V, Il = -5mA	3		-3.75	3.75	mV/C	8A
		-55 C ≤ TA ≤ 25 C, Vin = 20V, Il = -5mA	3		-3.75	3.75	mV/C	8B

Electrical Characteristics

AC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
NO	Output Noise Voltage	Vin = 20V, Il = -50mA				300	uVrms	7
Delta Vout/ Delta Il	Transient Load Response	Delta Il = -200mA, Vin = 20V, Il = -50mA				2.5	mV/mA	7
Delta Vout/Delta Vin	Transient Line Response	Vin = 20V, VPulse = 3V, Il = -5mA				30	mV/V	7
Delta Vin/Delta Vout	Ripple Rejection	Vin = 20V, Il = -125mA, ei = 1Vrms at f = 2400Hz			53		dB	4

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: "Delta calculation performed on JAN S and QMLV devices at group B, subgroup 5 only".

Vout	Output Voltage	Vin = 18.5V, Il = -5mA			-0.075	0.075	V	1
		Vin = 18.5V, Il = -500mA			-0.075	0.075	V	1
		Vin = 30V, Il = -5mA			-0.075	0.075	V	1
		Vin = 30V, Il = -500mA			-0.075	0.075	V	1
		Vin = 35V, Il = -5mA			-0.075	0.075	V	1
		Vin = 35V, Il = -50mA			-0.075	0.075	V	1
ISCD	Stand by Current Drain	Vin = 20V, Il = -5mA			-20	20	%	1

Note 1: Tested at TA = 125 C, correlated to TA = +150 C.
Note 2: Tested at extremes as a set up for Delta Vout/Delta T.
Note 3: Calculated parameter. For calculations use Vout test at Vin = 17V, Il = -5mA (See NOTE 2).

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
H03ARC	(blank)

See attached graphics following this page.