National Semiconductor

MICROCIRCUIT DATA SHEET

MJLM140-05-K REV 0B0

Original Creation Date: 05/10/95
Last Update Date: 02/17/97
Last Major Revision Date: 05/10/95

VOLTAGE REGULATOR, +5 VOLTS AT 1.0A

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 1.0A 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

JL140-5BYA
JL140-5SYA

Prime Die

LM140

Controlling Document

38510/10706 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

- Complete specifications at 1A load
- Internal thermal overload protection
- Internal short-circuit current limit
- Output transistor safe area protection

(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
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. The junction-to-ambient thermal resistance (ThetaJA) is 39 C/W. When using a heatsink, ThetaJA is the sum of the 4 C/W junction-to-case thermal resistance (ThetaJC) and the case-to-ambient thermal resistance (ThetaCA) of the heatsink.

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. The junction-to-ambient thermal resistance (ThetaJA) is 39 C/W. When using a heatsink, ThetaJA is the sum of the 4 C/W junction-to-case thermal resistance (ThetaJC) and the case-to-ambient thermal resistance (ThetaCA) of the heatsink.

Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout (1)	Output Voltage	Vin = 8V, Il = -5mA			4.75	5.25	V	1, 2, 3
		Vin = 8V, Il = -1A			4.75	5.25	V	1, 2, 3
		Vin = 20V, Il = -5mA			4.75	5.25	V	1, 2, 3
		Vin = 20V, Il = -1A			4.75	5.25	V	1, 2, 3
		Vin = 35V, Il = -5mA			4.75	5.25	V	1, 2, 3
		Vin = 35V, Il = -0.1A			4.75	5.25	V	1, 2, 3
VRLINE	Line Regulation	8V ≤ Vin ≤ 35V, Il = -0.1A			-150	150	mV	1, 2, 3
		8V ≤ Vin ≤ 25V, Il = -0.5A			-50	50	mV	1, 2, 3
VRLOAD	Load Regulation	Vin = 10V, -1A ≤ Il ≤ -5mA			-100	100	mV	1, 2, 3
		Vin = 35V, -0.1A ≤ Il ≤ -5mA			-150	150	mV	1, 2, 3
ISCD	Stand by Current Drain	Vin = 10V, 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	8V ≤ Vin ≤ 35V, Il = -5mA			-1	1	mA	1, 2, 3
DELTA ISCD (LOAD)	Stand by Current Drain vs. Load Current	Vin = 10V, -1A ≤ Il ≤ -5mA			-0.5	0.5	mA	1, 2, 3
IOL	Overload Current	Vin = 8V, FORCED DELTA Vout = -0.48V			-4	-1	A	1, 2, 3
IOS	Output Short Circuit Current	Vin = 10V			-4	-0.02	A	1, 2, 3
		Vin = 25V			-3	-0.02	A	1, 2, 3
		Vin = 35V			-2	-0.02	A	1, 2, 3
Vout (2)	Output Voltage	Vin = 10V, Il = -5mA	2		4.7	5.3	V	2
Vout (3)	Output Voltage	Vin = 10V, Il = -5mA	3		4.75	5.25	V	7, 8A, 8B

Electrical Characteristics

DC PARAMETERS(Continued)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
DELTA Vout/ DELTA T	Average Temperature Coefficient Output Voltage	Vin = 10V, Il = -5mA	4		-2	2	mV/ C	8A, 8B

AC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
NO	Output Noise Voltage	Vin = 10V, Il = -0.1A				125	uVrms	7
DELTA Vout/Vin	Transient Line Response	Vin = 10V, VPulse = 3V, Il = -5mA	1			30	mV/V	7
DELTA Vout/Il	Transient Load Response	Vin=10V, DELTA/Il = -400mA, Il = -100mA	1			2.5	mV/mA	7
DELTA Vin/Vout	Ripple Rejection	Vin = 10V, ei = 1Vrms at f = 2400Hz, Il = -350mA			60		dB	4

DC PARAMETERS: DRIFT VALUES

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

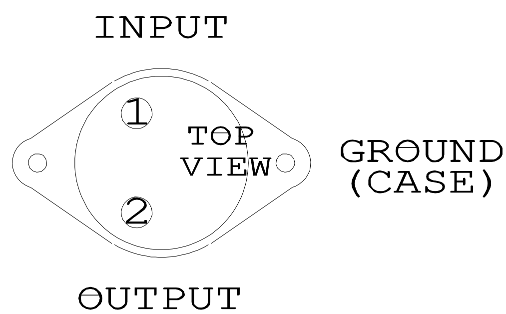
SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout	Output Voltage	Vin = 8V, Il = -5mA			-0.025	0.025	V	1
		Vin = 8V, Il = -1A			-0.025	0.025	V	1
		Vin = 20V, Il = -5mA			-0.025	0.025	V	1
		Vin = 20V, Il = -1A			-0.025	0.025	V	1
		Vin = 35V, Il = -5mA			-0.025	0.025	V	1
		Vin = 35V, Il = -0.1A			-0.025	0.025	V	1
ISCD	Stand by Current Drain	Vin = 10V, Il = -5mA			-20	20	%	1

Note 1: Bench test
Note 2: Tested at TA = +125 C, correlated to TA = +150 C.
Note 3: Tested at extremes as a set up for DELTA Vout/DELTA T tests.
Note 4: Calculated parameter

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
9482HRA1	METAL CAN(KA),TO-3,2LD,LOW PROFILE (B/I CKT)
K02CRC	METAL CAN(KA),TO-3,2LD,LOW PROFILE (P/P DWG)
P000031A	METAL CAN(KA),TO-3,2LD,LOW PROFILE(PIN OUT)

See attached graphics following this page.



LM140K
CONNECTION DIAGRAM
2 - LEAD TO3
(TOP VIEW)
P000031A