National Semiconductor

MILITARY DATA SHEET

MNLM140-12-K REV 0B0

Original Creation Date: 05/10/95
Last Update Date: 12/10/96
Last Major Revision Date: 05/10/95

THREE TERMINAL POSITIVE REGULATORS

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 chapacitor of the power supply.

Industry Part Number

LM140

NS Part Numbers

LM140K-12/883

Prime Die

LM140

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	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 do 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/AC PARAMETERS: PRE-BURN-IN STRESS TEST PER (SG) RPI-3-371

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin = 19V, Il = 5mA
AC: Vin = 19V, Il = 5mA

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iq	Quiescent Current	Il = 1A				6	mA	1
						7	mA	2, 3
Delta Iq	Quiescent Current Change	Il = 1A, 15.5V <= Vin <= 27V			-0.8	0.8	mA	1
		Il = 500mA 15V <= Vin <= 30V			-0.8	0.8	mA	1, 2, 3
		5mA <= Il <= 1A			-0.5	0.5	mA	1, 2, 3
Vout	Output Voltage				11.5	12.5	V	1
		Vin = 15.5V			11.4	12.6	V	1, 2, 3
		Vin = 15.5V, Il = 1A			11.4	12.6	V	1, 2, 3
		Vin = 27V			11.4	12.6	V	1, 2, 3
		Vin = 27V, Il = 1A			11.4	12.6	V	1, 2, 3
Rline	Line Regulation	Il = 500mA, 14.5V <= Vin <= 25V			-120	120	mV	1, 2, 3
		Il = 1A, 14.6V <= Vin <= 27V			-120	120	mV	1
		Il = 1A, 15.0V <= Vin <= 27V			-120	120	mV	2, 3
		Il = 1A, 16V <= Vin <= 22V			-60	60	mV	1, 2, 3
Rload	Load Regulation	5mA <= Il <= 1.5A			-120	120	mV	1
		5mA <= Il <= 1.0A			-120	120	mV	2, 3
		250mA <= Il <= 750mA			-60	60	mV	1
Ios	Current Limit	Vin = 17V			-3.5	-0.02	A	1
		Vin = 35V			-2.0	-0.02	A	1
ThetaJC	Thermal Resistance	Junction to Case	1			4	C/W	1
ThetaCA	Thermal Resistance	Case to Ambient	1			35	C/W	1
Rr	Ripple Rejection	f = 120Hz, Il = 350mA, ein = 1V RMS			61		dB	4

Electrical Characteristics

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin = 19V, Il = 5mA. "Deltas not required on B-Level product. Deltas required for S-Level product ONLY as specified on Internal Processing Instructions (IPI)."

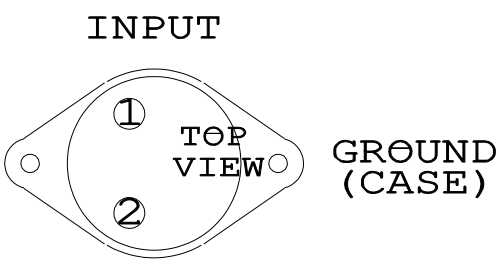
SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iq	Quiescent Current	Il = 1A			-1.2	1.2	mA	1
Vout	Output Voltage				-0.060	0.060	V	1

Note 1: Guaranteed parameter not tested.

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