

MJLM140-05-K REV 0B0

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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 (°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 ($T_{jMAX} = 150\text{ C}$), the junction-to-ambient thermal resistance (Θ_{JA}), and the ambient temperature (T_A). $P_{DMAX} = (T_{jMAX} - T_A)/\Theta_{JA}$. If this dissipation is exceeded, the die temperature will rise above T_{jMAX} 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 (Θ_{JA}) is 39 C/W. When using a heatsink, Θ_{JA} is the sum of the 4 C/W junction-to-case thermal resistance (Θ_{JC}) and the case-to-ambient thermal resistance (Θ_{CA}) of the heatsink.

Note 3: Human body model, 100pF discharged through 1.5K Ohms

Recommended Operating Conditions

(Note 1)

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

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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 | $8V \leq V_{in} \leq 35V$, Il = -0.1A | | | -150 | 150 | mV | 1, 2, 3 |
| | | $8V \leq V_{in} \leq 25V$, Il = -0.5A | | | -50 | 50 | mV | 1, 2, 3 |
| VRLOAD | Load Regulation | Vin = 10V, $-1A \leq I_l \leq -5mA$ | | | -100 | 100 | mV | 1, 2, 3 |
| | | Vin = 35V, $-0.1A \leq I_l \leq -5mA$ | | | -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 | $8V \leq V_{in} \leq 35V$, Il = -5mA | | | -1 | 1 | mA | 1, 2, 3 |
| DELTA ISCD (LOAD) | Stand by Current Drain vs. Load Current | Vin = 10V, $-1A \leq I_l \leq -5mA$ | | | -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, I _L = -5mA | 4 | | -2 | 2 | mV/°C | 8A, 8B |

AC PARAMETERS

| | | | | | | | | |
|------------------------------|----------------------------|--|---|--|----|-----|-------|---|
| NO | Output Noise Voltage | Vin = 10V, I _L = -0.1A | | | | 125 | uVrms | 7 |
| DELTA Vout/Vin | Transient Line Response | Vin = 10V, VPulse = 3V, I _L = -5mA | 1 | | | 30 | mV/V | 7 |
| DELTA Vout/I _L | Transient Load Response | Vin=10V, DELTA/I _L = -400mA, I _L = -100mA | 1 | | | 2.5 | mV/mA | 7 |
| DELTA Vin/Vout | Ripple Rejection | Vin = 10V, ei = 1Vrms at f = 2400Hz, I _L = -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".

| | | | | | | | | |
|------|---------------------------|-----------------------------------|--|--|--------|-------|---|---|
| Vout | Output Voltage | Vin = 8V, I _L = -5mA | | | -0.025 | 0.025 | V | 1 |
| | | Vin = 8V, I _L = -1A | | | -0.025 | 0.025 | V | 1 |
| | | Vin = 20V, I _L = -5mA | | | -0.025 | 0.025 | V | 1 |
| | | Vin = 20V, I _L = -1A | | | -0.025 | 0.025 | V | 1 |
| | | Vin = 35V, I _L = -5mA | | | -0.025 | 0.025 | V | 1 |
| | | Vin = 35V, I _L = -0.1A | | | -0.025 | 0.025 | V | 1 |
| ISCD | Stand by Current Drain | Vin = 10V, I _L = -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.

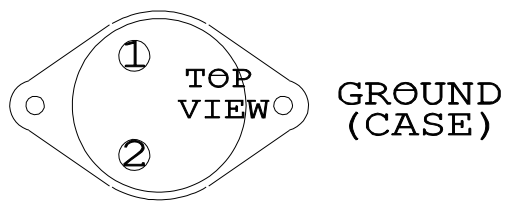
Note 4: Calculated parameter

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.

INPUT



OUTPUT

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