



LINEAR
INTEGRATED
CIRCUITS
VOLTAGE
REGULATORS

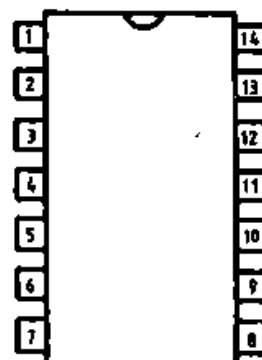
β A 723C
 β 723
VOLTAGE REGULATORS

The β A 723C, β 723 are voltage regulators designed primarily for series regulator applications. By itself, it will supply output currents up to 150 mA, but external transistors can be added to provide any desired load current. All can be used as a shunt regulator, a switching regulator, a current regulator or a temperature controller.

Features

- Operating temperature	0 ... +70 °C
- Storage temperature	-25 ... +125 °C
- Power dissipation	max. 500 mW
- Input voltage	β A 723C ... max. 40 V
	β 723 ... max. 30 V
- Input-output voltage differential	β A 723C ... max. 40 V
	β 723 ... max. 30 V
- Amplifier input voltage (differential)	max. 5 V
- Line regulation ($V_I = 12 \dots 15$ V)	max. 0.1 %/V _{OUT}
- Load regulation	max. 0.2 %/V _{OUT}
- Temperature coefficient of output voltage	max. 0.015 %/°C
- Standby current drain	max. 4 mA
- Reference voltage	6.8 ... 7.6 V
- Output voltage range	β A 723C ... 2 ... 37 V
	β 723 ... 2 ... 27 V

- 1. NC
- 2. Current limit
- 3. Current sense
- 4. Input -
- 5. Input +
- 6. V_{REF}
- 7. V₋
- 8. NC
- 9. V_Z
- 10. V_D
- 11. V_C
- 12. V₊
- 13. Frequency compensation
- 14. NC



PACKAGE TO-116 / TOP VIEW

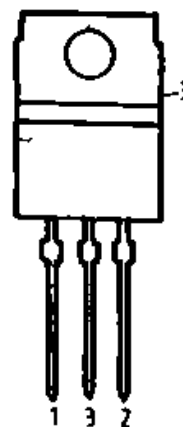
CONFIDENTIAL

The BA 7800 series is available with several fixed output voltages making them useful in a wide range of applications including, on-card regulation used in logic systems, instrumentation and other solid state electronic equipments.

These regulators employ internal current limiting, thermal shutdown and safe area compensation. If adequate heat sinking is provided, they can deliver over 1 A output current.

In addition to use as fixed regulators, these devices can be used with external components to obtain adjustable output voltages and currents and also as the power pass element in precision regulators.

- Storage temperature	-25 ...	+125 °C
- Operating junction temperature range	max.	+125 °C
- Thermal resistance of the TO-220 package (without a heat sink) : junction to case ... max. 4 °C/W junction to ambient max. 50 °C/W		
- Output voltages : 5; 6; 8; 9; 12; 15; 18 and 24		V
- Input voltage (5 ... 18 V)	max.	35 V
(24 V)	max.	40 V
- Output current in excess of 1 A		
- Internal thermal overload protection		



PACKAGE TO-220 / FRONT VIEW

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LINEAR INTEGRATED CIRCUITS VOLTAGE REGULATORS

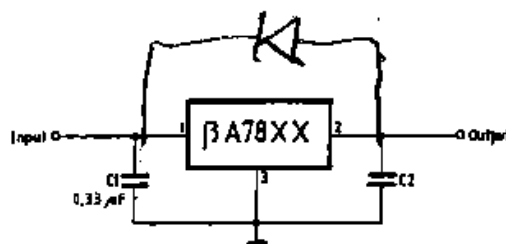
BA 7800 series (cont.)

Typical applications

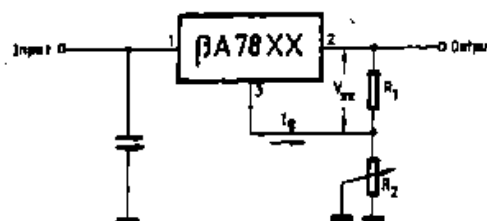
NOTES : to specify an output voltage, substitute voltage value for XX

C2 : although no output capacitor is needed for stability, it does improve transient response.

C1 : required if regulator is located an appreciable distance from power supply filter.



FIXED OUTPUT REGULATOR



$$V_O = V_{XX}(1 + R_2/R_1) + I_g R_2$$

ADJUSTABLE OUTPUT REGULATOR



$$I_O = V_O/R_1 + I_g$$

CURRENT REGULATOR

LINEAR INTEGRATED CIRCUITS - VOLTAGE - REGULATORS -



* μ M 317H
* μ M 317AH

3-TERMINAL ADJUSTABLE POSITIVE VOLTAGE REGULATORS

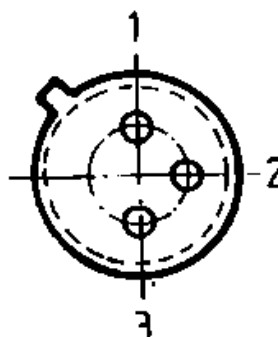
The μ M 317H is an adjustable 3-terminal positive regulator capable of supplying in excess of 0.5 A over a 1.2 V to 37 V output range. It requires only two external resistors to set the output voltage. The circuit offers full overload protection including current limit, thermal protection and safe area protection. Rated power dissipation is about 2 W.

The μ M 317 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. It also makes a simple adjustable switching regulator. Since the regulator is "floating", supplies of voltages higher than 37 V are possible as long as the maximum input to output differential voltage is not exceeded.

Features

- Operating junction temperature range	0 ...	+125 °C
- Thermal resistance of the TO-39 package (without a heat sink) : junction to case ...	max.	15 °C/W
- Line regulation	typ.	0.01 %/V
- Load regulation	typ.	0.1 %
- Input-output voltage differential μ M 317H	max.	40 V
μ M 317AH ...	max.	25 V

1. Input
2. Adjustment
3. Output



Note : Case is output

PACKAGE TO-39 / BOTTOM VIEW

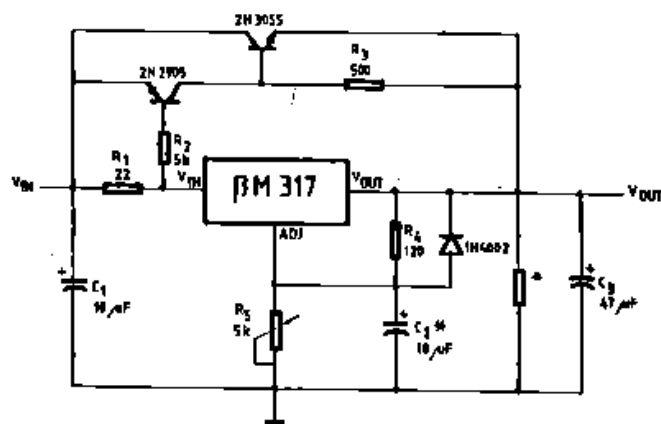
* Preliminary data

LINEAR INTEGRATED CIRCUITS VOLTAGE REGULATORS

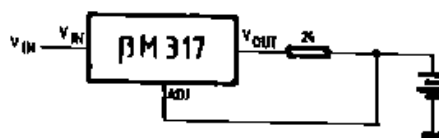
BM 317H ; BM 317AH (cont.)

Typical applications

- + = Solid tantalum
- * = Minimum load current 30 mA
- # = Optional—improves ripple rejection



HIGH CURRENT ADJUSTABLE REGULATOR



50 mA CONSTANT CURRENT BATTERY CHARGER

LINEAR INTEGRATED CIRCUITS - VOLTAGE - REGULATORS -



* **PM 317K**
* **PM 317AK**
3-TERMINAL ADJUSTABLE POSITIVE VOLTAGE REGULATORS

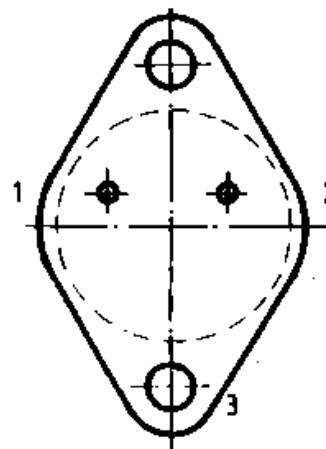
The PM 317K is an adjustable 3-terminal positive regulator capable of supplying in excess of 1.5 A over a 1.2 V to 37 V output range. It requires only two external resistors to set the output voltage. The circuit offers full overload protection including current limit, thermal protection and safe area protection. Rated power dissipation is about 20 W.

The PM 317 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. It also makes a simple adjustable switching regulator. Since the regulator is "floating", supplies of voltages higher than 37 V are possible as long as the maximum input to output differential voltage is not exceeded.

Features

- Operating junction temperature range	0 ... +125 °C
- Thermal resistance of the TO-3 package (without a heat sink) : junction to case ...	max. 3 °C/W
- Line regulation	typ. 0.01 %/V
- Load regulation	typ. 0.1 %
- Input-output voltage differential PM 317K	max. 40 V
PM 317AK ...	max. 25 V

1. Adjustement
2. Input
3. Output



Note : Case is output

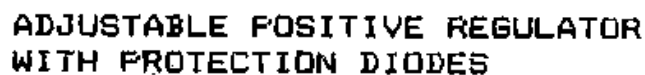
PACKAGE TO-3 / BOTTOM VIEW

* Preliminary data

Typical applications



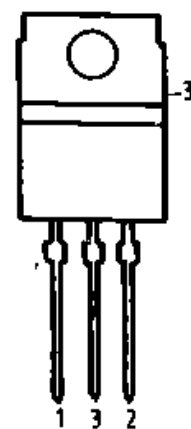
- + = When C1 is larger than 20 μ F, D1 protects the μ M 317 in case that the input supply is shorted.
- * = When C2 is larger than 10 μ F and VOUT is larger than 25 V, D2 protects the μ M 317 in case that the output is shorted.



3-TERMINAL ADJUSTABLE POSITIVE VOLTAGE REGULATORS

The β M 317 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. Also it makes a simple adjustable switching regulator. Since the regulator is "floating", supplies of voltages higher than 37 V are possible as long as the maximum input to output differential voltage is not exceeded.

- Operating junction temperature range	0 ...	+125 °C
- Thermal resistance of the TO-220 package (without a heat sink) : junction to case ...	max.	4 °C/W
- Line regulation	typ.	0.01 %/V
- Load regulation	typ.	0.1 %
- Input-output voltage differential μ M 317T	max.	40 V
μ M 317AT ...	max.	25 V



PACKAGE TO-220 / FRONT VIEW

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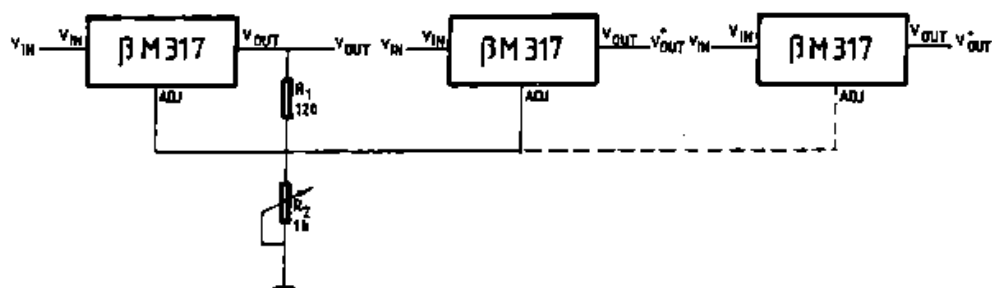
LINEAR
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VOLTAGE
REGULATORS

β M 317T ; β M 317AT (cont.)

Typical applications

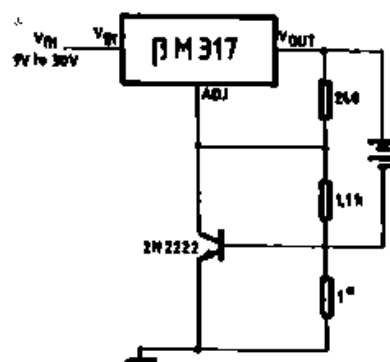
* = All outputs within ± 100 mV

+ = Minimum load 10 mA



ADJUSTING MULTIPLE ON-CARD REGULATORS
WITH SINGLE CONTROL *

* = Sets peak current
(0.6 A for 1 ohm).



CURRENT LIMITED 6 V CHARGER

LINEAR INTEGRATED CIRCUITS - VOLTAGE - REGULATORS -



PM 323

PM 323J

3-TERMINAL 5 V / 3 A POSITIVE VOLTAGE REGULATORS

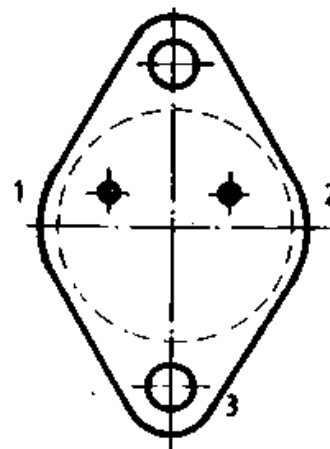
The PM 323 series is a 3-terminal positive voltage regulator with preset 5 V output and a load driving capability of 3 A. Current limiting, power limiting, thermal shutdown and hermetic TO-3 package provide high reliability.

No external components are required for standard operation of the PM 323 series.

Features

- Storage temperature	-55 ... +125 °C
- Operating junction temperature	0 ... +125 °C
- Junction to case thermal resistance	max. 2 °C/W
- Input voltage	max. 20 V
- Power dissipation (internally limited)	min. 30 W
- Output voltage (7.5 V < V _I < 15 V ; I _O < 3 A)	
PM 323 ...	4.75 ... 5.25 V
PM 323J ...	4.60 ... 5.40 V
- Line regulation (7.5 V < V _I < 15 V)	
PM 323 ...	max. 25 mV
PM 323J ...	max. 40 mV
- Load regulation (0 < I _O < 3 A)	
PM 323 ...	max. 100 mV
PM 323J ...	max. 150 mV
- Quiescent current	
PM 323 ...	max. 20 mA
PM 323J ...	max. 30 mA

1. Input
2. Output
3. GND



PACKAGE TO-3 / BOTTOM VIEW

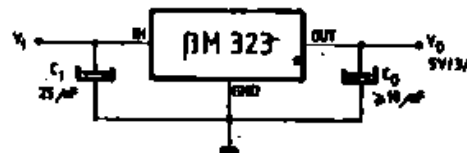
**LINEAR
INTEGRATED
CIRCUITS
VOLTAGE
REGULATORS**

LM 323J ; LM 323 (cont.)

Typical applications

CI = Required if LM 323 is more than 2 inches from filter capacitor.

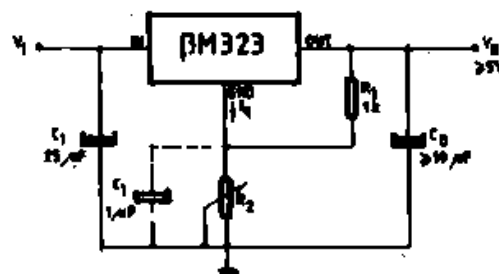
CO = Improves transient response



BASIC 3 A REGULATOR

$V_O(V) = 5(1+R_2/R_1) + I_Q R_2$
R2 in kohms

$I_Q = 10 \text{ mA}$



ADJUSTABLE REGULATOR

LINEAR INTEGRATED CIRCUITS - VOLTAGE - REGULATORS -



\$ **µM 337H**
\$ **µM 337AH**
3-TERMINAL ADJUSTABLE NEGATIVE VOLTAGE REGULATORS

The µM 337H is an adjustable 3-terminal negative regulator capable of supplying in excess of -1.5 A over a -1.2 V to -37 V output range. It requires only two external resistors to set the output voltage and one output capacitor for frequency compensation. The circuit features full overload protection including current limit, thermal protection and safe operating area protection. Rated power dissipation is about 2 W.

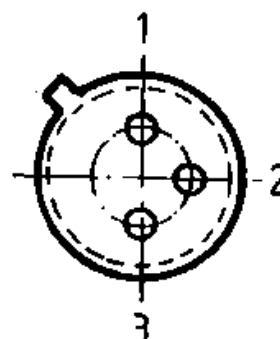
The µM 337 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation.

The µM 337 series is ideal complement to the µM 317 series adjustable positive regulator.

Features

- Operating junction temperature range 0 ... +125 °C
- Thermal resistance of the TO-39 package
(without a heat sink) : junction to case ... max. 15 °C/W
- Line regulation typ. 0.01 %/V
- Load regulation typ. 0.3 %
- Input-output voltage differential µM 337H ... max. -40 V
µM 337AH ... max. -25 V

1. Adjustment
2. Output
3. Input



Note : Case is input

PACKAGE TO-39 / BOTTOM VIEW

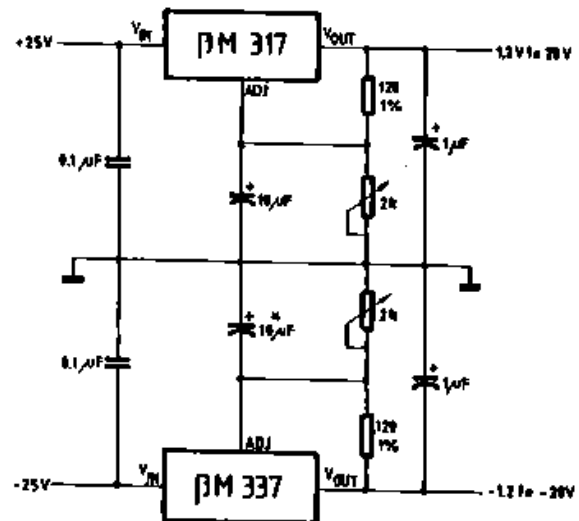
\$ Preliminary data

LINEAR INTEGRATED CIRCUITS VOLTAGE = REGULATORS

PM 337H ; PM 337AH (cont.)

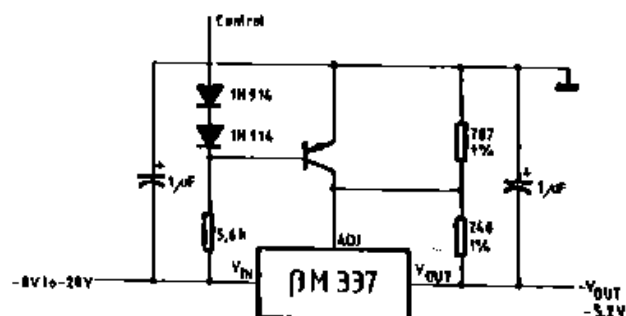
Typical applications

* = The 10 uF capacitors are optional to improve ripple rejection.



ADJUSTABLE LAB VOLTAGE REGULATOR

* = Minimum output = -1.3 V when control input is low.



-5.2 V REGULATOR WITH
ELECTRONIC SHUTDOWN *

LINEAR INTEGRATED CIRCUITS = VOLTAGE = REGULATORS =



\$ **BM 337K**
\$ **BM 337AK**
3-TERMINAL ADJUSTABLE NEGATIVE VOLTAGE REGULATORS

The BM 337K is an adjustable 3-terminal negative regulator capable of supplying in excess of -1.5 A over a -1.2 V to -37 V output range. It requires only two external resistors to set the output voltage and one output capacitor for frequency compensation. The circuit features full overload protection including current limit, thermal protection and safe operating area protection. Rated power dissipation is about 20 W.

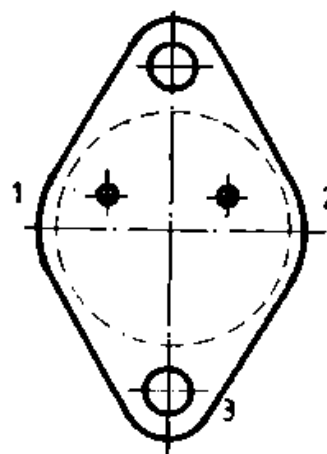
The BM 337 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation.

The BM 337 series is ideal complement to the BM 317 series adjustable positive regulator.

Features

- Operating junction temperature range 0 ... +125 °C
- Thermal resistance of the TO-3 package
(without a heat sink) : junction to case ... max. 3 °C/W
- Line regulation typ. 0.01 %/V
- Load regulation typ. 0.1 %
- Input-output voltage differential BM 337K ... max. -40 V
BM 337AK ... max. -25 V

1. Adjustment
2. Output
3. Input



Note : Case is input

PACKAGE TO-3 / BOTTOM VIEW

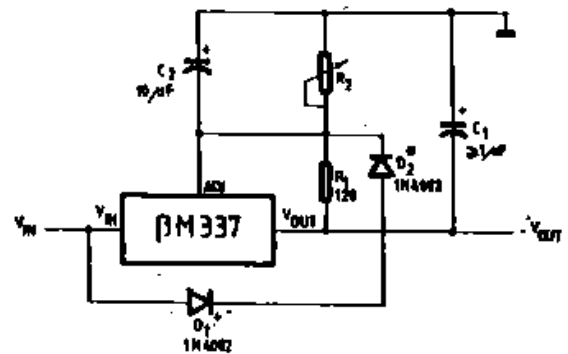
\$ Preliminary data

LINEAR INTEGRATED CIRCUITS VOLTAGE REGULATORS

LM 337K ; LM 337AK (cont.)

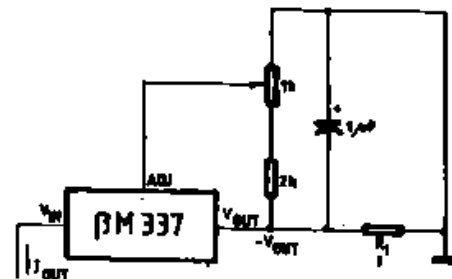
Typical applications

- + = When C1 is larger than 20 uF, D1 protects the LM 337 in case that the input supply is shorted.
 - * = When C2 is larger than 10 uF and -VOUT is larger than -25 V, D2 protects the LM 317 in case that the output is shorted.
- $-V_{OUT} = -1.25V(1+R2/R1) - R2I_{adj}$
(I_{adj} typ. 65 uA)



ADJUSTABLE NEGATIVE REGULATOR
WITH PROTECTION DIODES

$$I_{OUT} = 1.5V/R1 \text{ +/-15\% adjustable}$$



ADJUSTABLE CURRENT REGULATOR

LINEAR INTEGRATED CIRCUITS

VOLTAGE REGULATORS



- * **PM 337T**
- * **PM 337AT**
- 3-TERMINAL ADJUSTABLE NEGATIVE VOLTAGE REGULATORS**

The PM 337H is an adjustable 3-terminal negative regulator capable of supplying in excess of -1.5 A over a -1.2 V to -37 V output range. It requires only two external resistors to set the output voltage and one output capacitor for frequency compensation. The circuit features full overload protection including current limit, thermal protection and safe area protection. Rated power dissipation is at about 15 W.

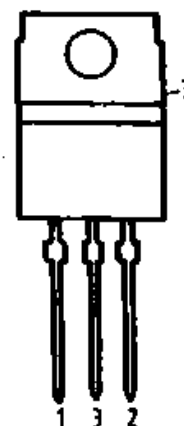
The PM 337 series is useful in applications including local on-card regulation, programmable-output voltage regulation or precision current regulation.

The PM 337 series is ideal complement to the PM 317 series adjustable positive regulator.

Features

- Operating junction temperature range 0 ... +125 °C
- Thermal resistance of the TO-220 package
(without a heat sink) : junction to case ... max. 4 °C/W
- Line regulation typ. 0.01 %/V
- Load regulation typ. 0.3 %
- Input-output voltage differential PM 337T ... max. -40 V
PM 337AT ... max. -25 V

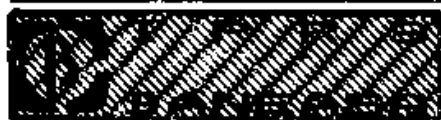
1. Adjustement
2. Output
3. Input



Note : Case is input

PACKAGE TO-220 / FRONT VIEW

* Preliminary data



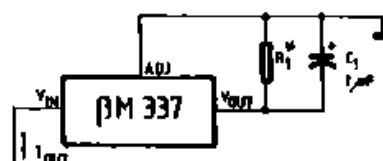
LINEAR
INTEGRATED
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REGULATORS

PM 337T, PM 337AT (cont.)

Typical applications

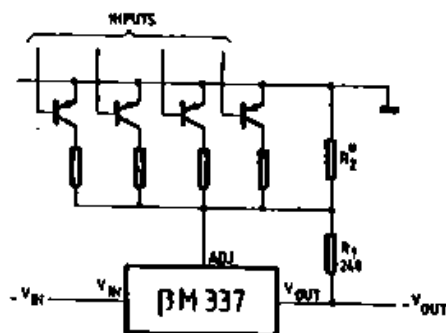
$$I_{OUT} = 1.25V/R_1$$

$$* = 0.8 \text{ ohms} < R_1 < 120 \text{ ohms}$$



CURRENT REGULATOR

* = Sets minimum $-V_{OUT}$



DIGITALLY SELECTED OUTPUTS