

M5237L,ML

3-TERMINAL ADJUSTABLE REGULATOR

DESCRIPTION

The M5237 is a semiconductor integrated circuit which is designed for variable output voltage regulator and is low power dissipation type with input-output voltage difference are quite low.

Housed in its 3-pin package are Reference voltage generator circuit, Differential amplifier and Drive circuit.

FEATURES

- Wide operating supply voltage range.
 $V_{IN} = 3.5V \sim 36V$. $V_O = 1.5V \sim 33V$
- The input-output voltage differences can be small moved by the external PNP transistors.
 $(T_R: V_{CE(sat)} \text{ state})$
 $V_{I-O(min)} \cong 0.2V$
- The output voltage can be freely adjusted by the external resistors.
- Built in Over-current protection circuit (Drooping fold-back unit), ASO protection circuit and Thermal protection circuit.
- Its possible Taping (Automatic insert) and Lead forming.

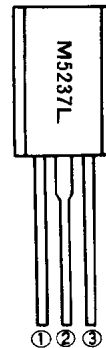
APPLICATION

Car stereos, radio cassettes, portable stereos, and other general usage electronic power supplies

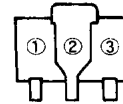
RECOMMENDED OPERATING CONDITIONS

Supply voltage range $V_{IN} = 3.5V \sim 30V$
 Output voltage range $V_O = 1.5V \sim 25V$

PIN CONFIGURATION



Outline SOT-89(ML)

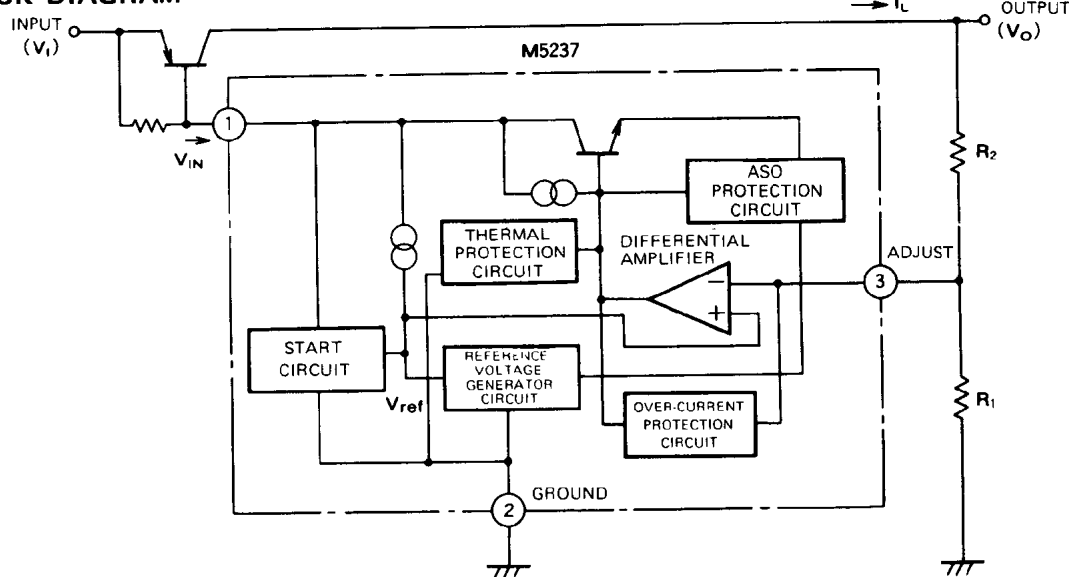


Outline TO-92L(L)

ELECTRODE CONNECTIONS

- ① INPUT
- ② GROUND
- ③ OUTPUT

BLOCK DIAGRAM



3-TERMINAL ADJUSTABLE REGULATOR

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{IN}	Input voltage	36	V
I_D	Drive current	30	mA
$V_I - V_O$	Input/output voltage difference	30	V
P_d	Internal power dissipation	900(L)/500(ML)	mW
T_{opr}	Operating ambient temperature	$-20 \sim +75$	$^\circ\text{C}$
T_{stg}	Storage temperature	$-55 \sim +150$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS

(measurement circuit (a) is used with $T_a = 25^\circ\text{C}$, $V_I = 15\text{V}$, $V_O = 12\text{V}$, $I_L = 200\text{mA}$, $C_{REF} = 1\mu\text{F}$, $R_1 = 4.3\text{k}\Omega$)

Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
V_{IN}	Input voltage	(between Pin 1 and Pin 2)	3.5		36	V
V_O	Output voltage	$R_2 \approx 0.82\text{k}\Omega \sim 108\text{k}\Omega$	1.5		33	V
$V_I - V_O$	Minimum input/output voltage difference			0.2		V
V_{REF}	Reference voltage	(between Pin 2 and Pin 3)	1.20	1.26	1.32	V
Reg-in	Input voltage regulation	$V_I = 15 \sim 20\text{V}$		0.02	0.1	%/V
Reg-L	Loading voltage regulation	$I_L = 10 \sim 200\text{mA}$		0.02	0.1	%
I_B	Bias current	$I_L = 0$ (disregarding the current in resistors R_1 , R_2)		1.7	3.0	mA
TC_{VO}	Output voltage thermal coefficient	$T_a = 0 \sim 75^\circ\text{C}$		0.02		%/ $^\circ\text{C}$
RR	Ripple rejection	$f = 120\text{Hz}$ (measured with circuit (b))		68		dB
V_{NO}	Output noise voltage	$f = 20\text{Hz} \sim 100\text{kHz}$		25		μVrms

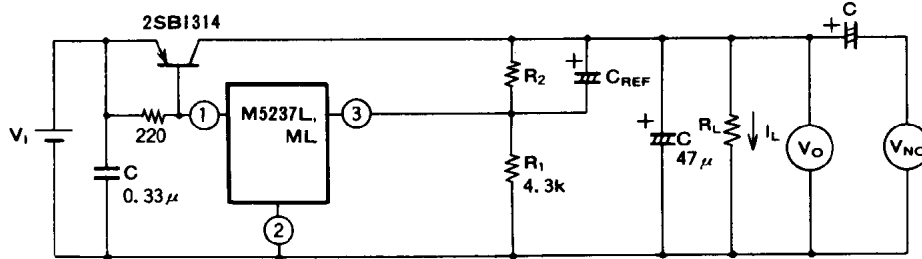
TEST CIRCUIT

(a) Standard test circuit

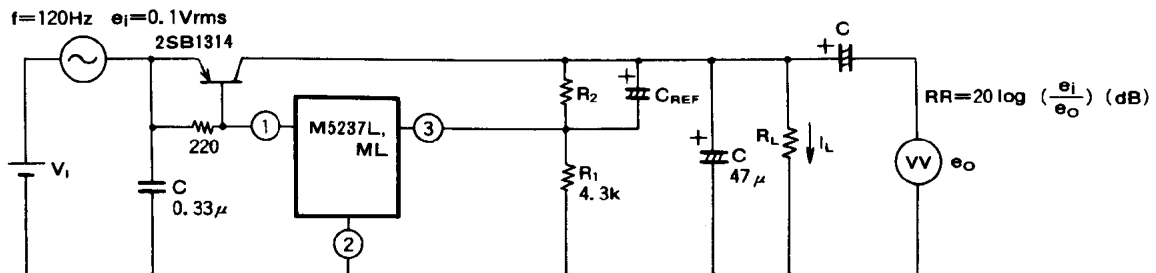
$$V_O = V_{REF} \left(1 + \frac{R_2}{R_1}\right) \approx 1.26 \times \left(1 + \frac{R_2}{4.3}\right) \text{ (V)}$$

$$R_2 = R_1 \left(\frac{V_O}{V_{REF}} - 1\right) \approx 4.3 \times \left(\frac{V_O}{1.26} - 1\right) \text{ (k}\Omega\text{)}$$

$$(R_1 = 4.3\text{k}\Omega, V_{REF} \approx 1.26\text{V})$$

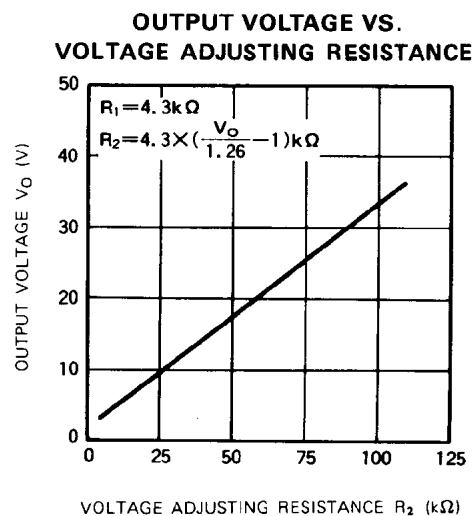
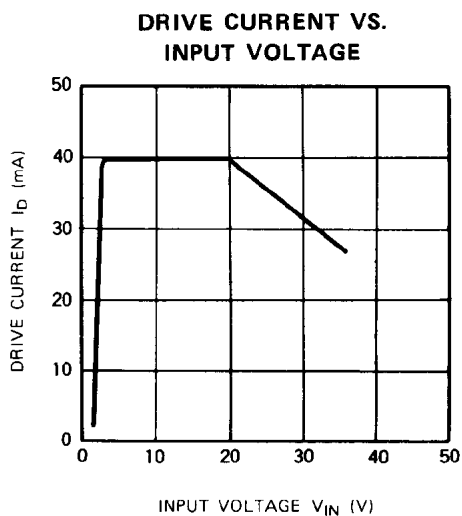
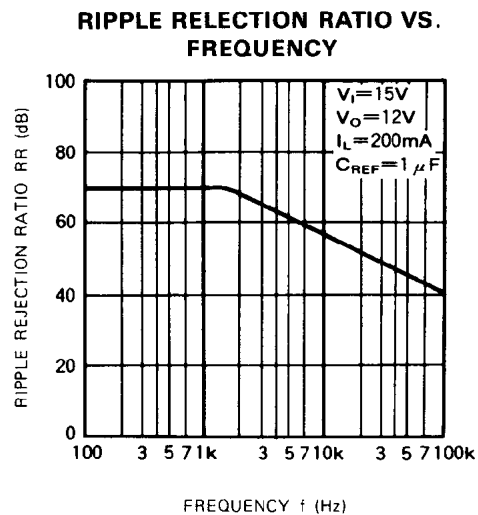
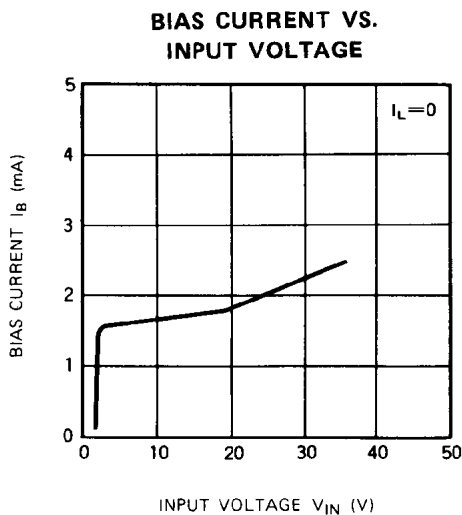
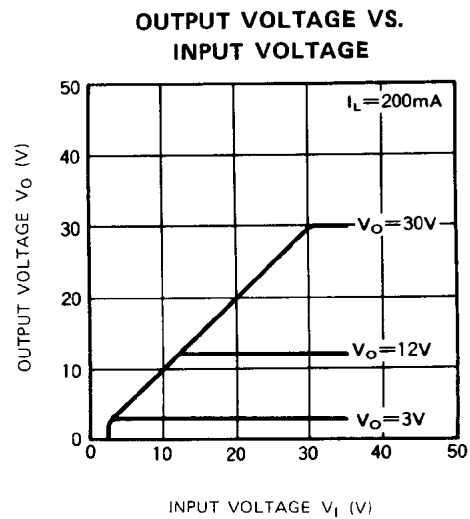
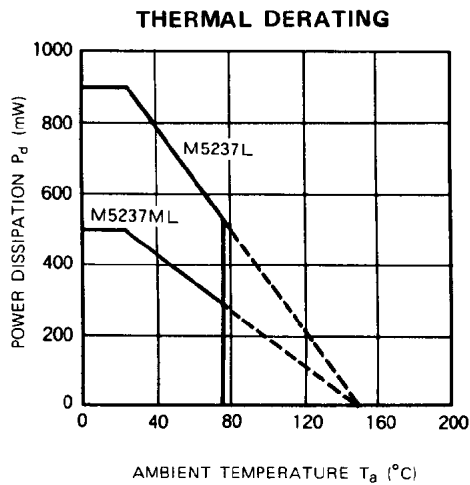


(b) Ripple rejection test circuit



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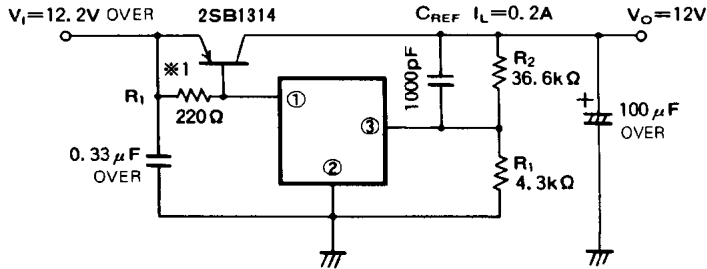
TYPICAL CHARACTERISTICS



3-TERMINAL ADJUSTABLE REGULATOR

APPLICATION CIRCUIT

1. Standard application circuit



$$V_O = V_{REF} \times \left(1 + \frac{R_2}{R_1}\right) V$$

$$V_{REF} = 1.26V$$

$$\ast 1. R_1 = 180 \sim 220 \Omega$$

Note: Please use the capacitor not to depend on the ambient temperature.

2. Maximum drive current controller application circuit

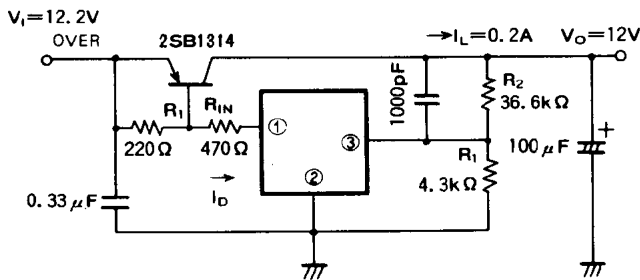


Fig. 1 MAXIMUM DRIVE CURRENT

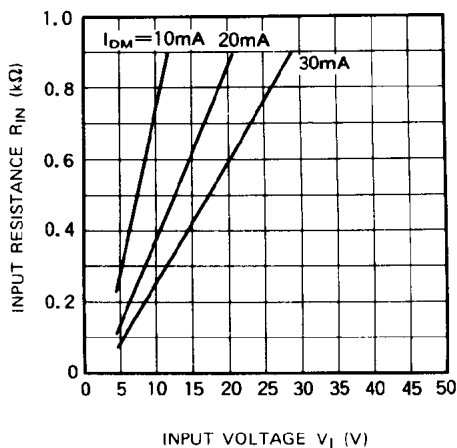
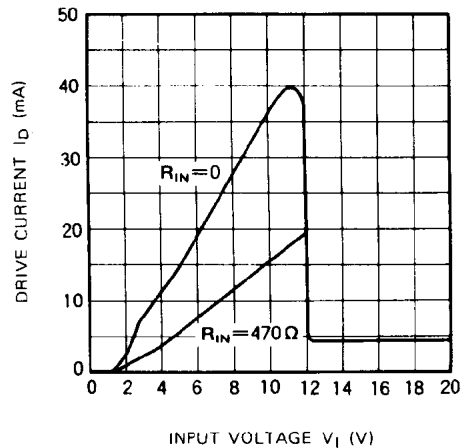
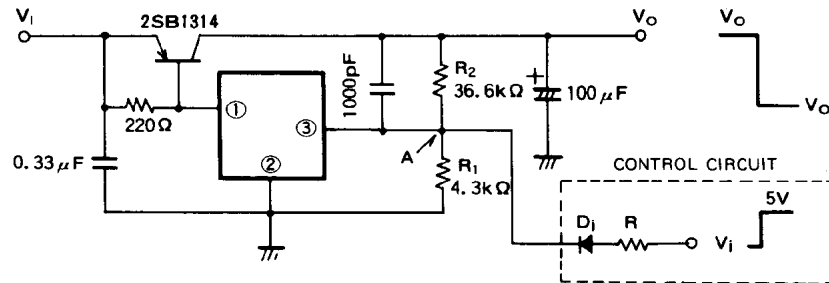


Fig. 2 DRIVE CURRENT VS. INPUT VOLTAGE

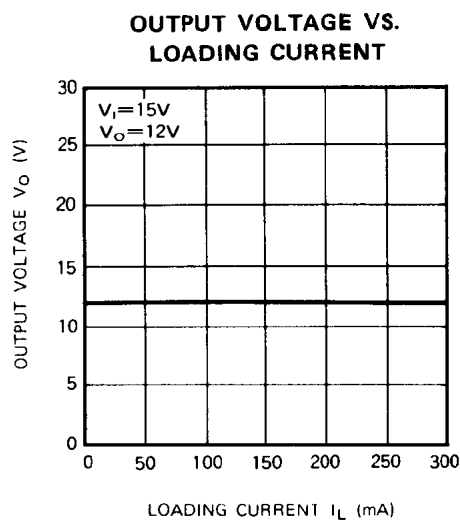
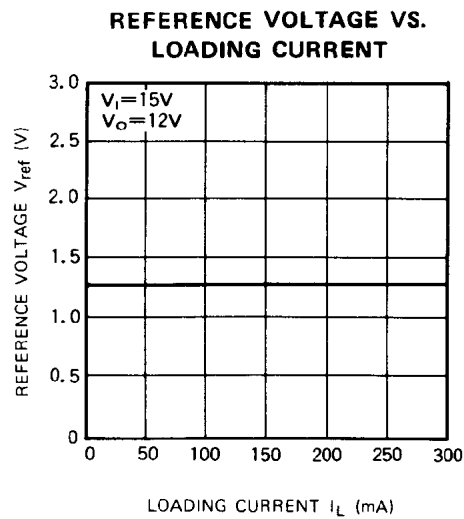
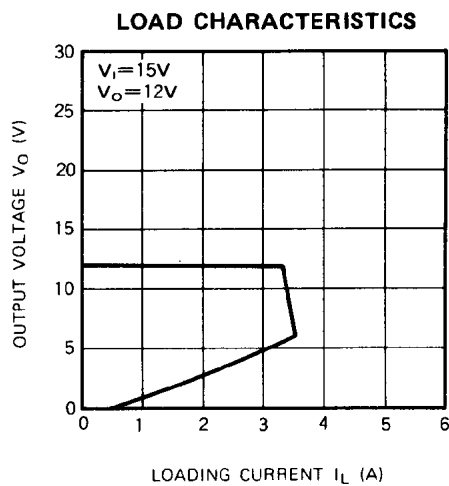


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3. Output voltage ON/OFF controller

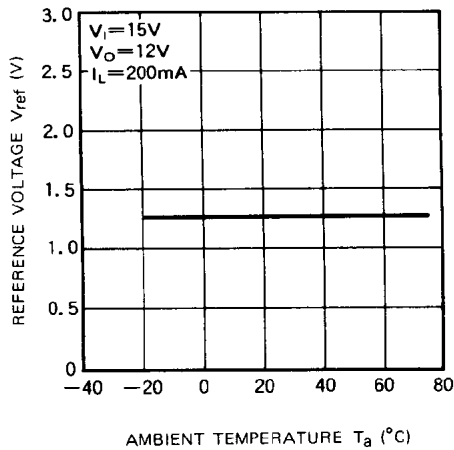


Set control circuit resistor R so that voltage of point A is more than 1.5V and less than 5V.

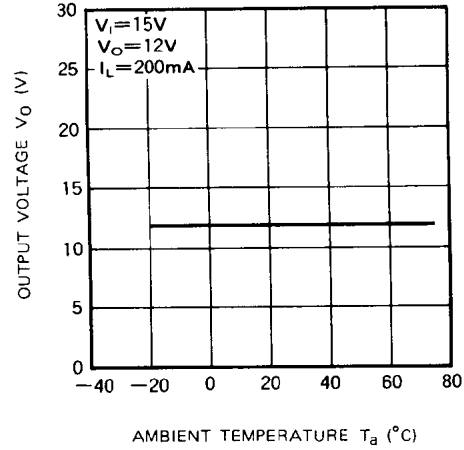


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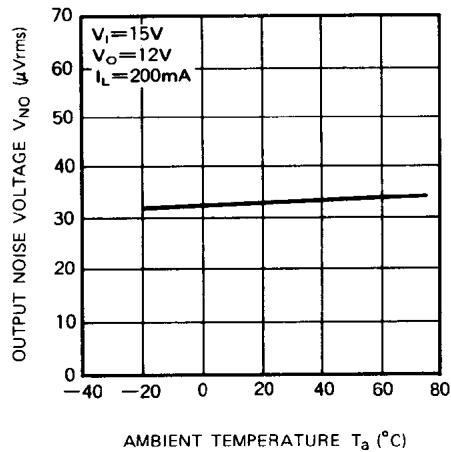
**REFERENCE VOLTAGE VS.
AMBIENT TEMPERATURE**



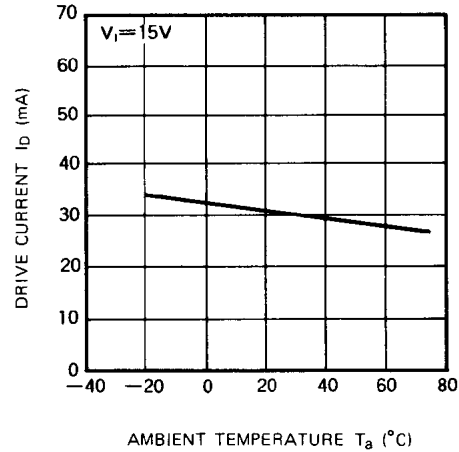
**OUTPUT VOLTAGE VS.
AMBIENT TEMPERATURE**



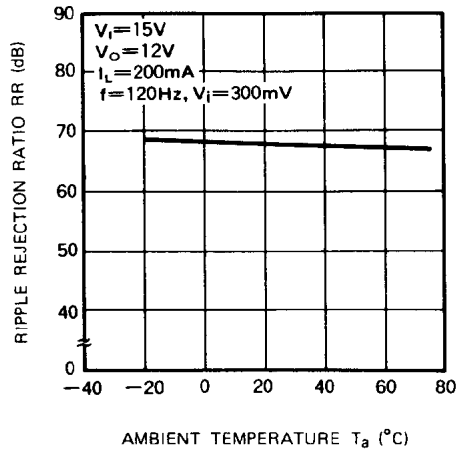
**OUTPUT NOISE VOLTAGE VS.
AMBIENT TEMPERATURE**



**DRIVE CURRENT VS.
AMBIENT TEMPERATURE**



**RIPPLE REJECTION RATIO VS.
AMBIENT TEMPERATURE**



**BIAS CURRENT VS.
AMBIENT TEMPERATURE**

