

ADJUSTABLE 3-TERMINAL POSITIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

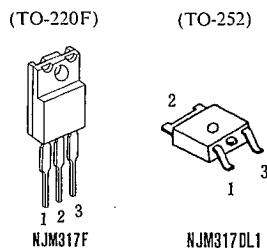
The NJM317 is adjustable 3-terminal positive voltage regulator IC. It is capable of adjustment from typical 1.25V to 37V output voltage range with two resistors. It is capable of supplying in excess of 1.5A with heat sink.

The NJM317 is suitable for the power supply of VCR, CD player and others.

■ FEATURES

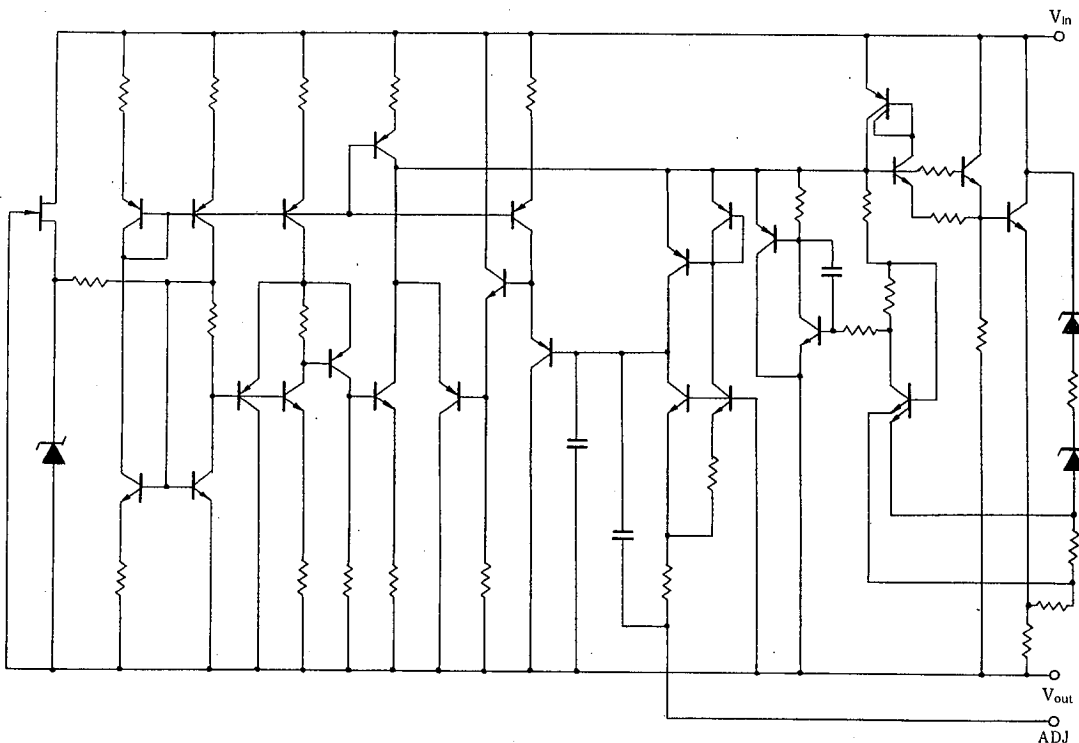
- Operating Voltage (+4.25V~+40V)
- Adjustable Output Down to 1.2V
- Guarantee'd 1.5A Output Current
- Line Regulation typically (0.01%/V)
- Load Regulation typically (0.1%)
- 80dB Ripple Rejection
- Package Outline TO-220F
- Bipolar Technology

■ PACKAGE OUTLINE



1. Adjustment
2. Output
3. Input

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(T_a=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input-Output Differential Voltage	V _{IN} -V _O	40(T _a =25°C)	V
Power Dissipation	P _D	TO-220F 16(T _C ≤70°C) TO-252 10(T _C ≤25°C) 1(T _a ≤25°C)	W
Operating Temperature Range(Junction) (Ambient)	T _{opr(j)} T _{opr(a)}	-40~+150 -40~+85	°C
Storage Temperature Range	T _{stg}	-50~+150	°C

■ THERMAL CHARACTERISTICS

		TO-220F	TO-252	°C/W
Thermal Resistance	Junction-To-Ambient	60	125	
	Junction-To-Case	5	12.5	

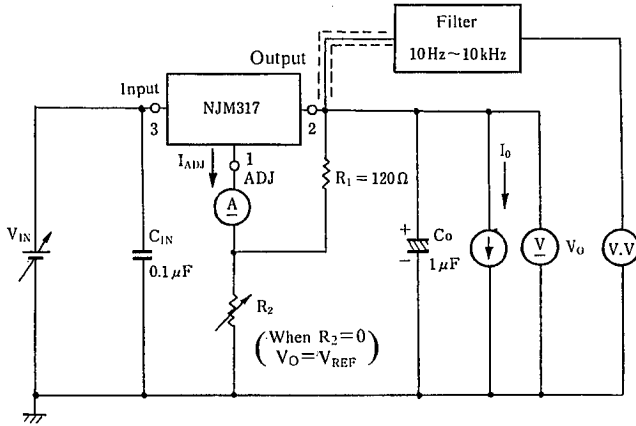
■ ELECTRICAL CHARACTERISTICS (V_{IN}-V_O=5V, I_O=500mA, C_{IN}=0.1μF, C_O=1μF, T_J=25°C)

Measurement is to be conducted in pulse testing.

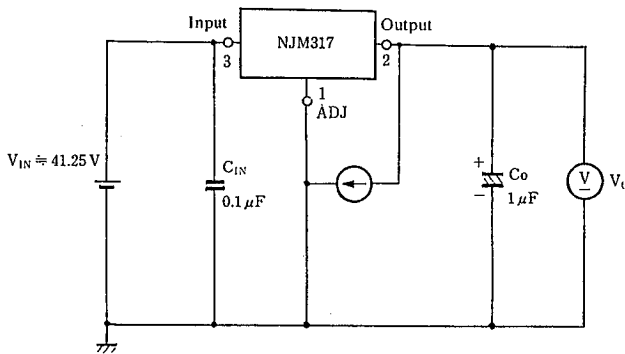
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V _{REF}		1.2	1.25	1.3	V
	V _{REF} -V _{IN}	3V≤(V _{IN} -V _O)≤40V, I _O =100mA	1.2	1.25	1.3	
	V _{REF} -I _O	10mA≤I _O ≤1.5A(TO-220F) 10mA≤I _O ≤500mA(TO-252)	1.2	1.25	1.3	
Reference Voltage Thermal Change	ΔV _{REF} -T	0≤T _J ≤125°C	-	5	-	mV
Adjustment Pin Current	I _{ADJ}		-	50	100	μA
Adjustment Pin Current Change	ΔI _{ADJ} -V _{IN}	3V≤(V _{IN} -V _O)≤40V, I _O =100mA	-	0.2	5	μA
	ΔI _{ADJ} -I _O	10mA≤I _O ≤1.5A(TO-220F) 10mA≤I _O ≤500mA(TO-252)	-	0.2	5	
			-	0.2	5	
Line Regulation	ΔV _O -V _{IN}	3V≤(V _{IN} -V _O)≤40V, I _O =100mA	-	0.01	0.04	%/V
Load Regulation	ΔV _O -I _O	10mA≤I _O ≤1.5A(TO-220F)	-	-	-	mV %
		10mA≤I _O ≤500mA(TO-252)	-	-	-	
		V _O ≤5V	-	5	25	
		V _O >5V	-	0.1	0.5	
Minimum Load Current	I _{O(MIN)}	(V _{IN} -V _O)=40V	-	3.5	10	mA
Peak Output Current	I _{O(PEAK)}	5V≤(V _{IN} -V _O)≤15V	1.5	2.2	-	A
		(V _{IN} -V _O)=40V	0.15	0.4	-	
RMS Output Noise Voltage	V _{NO}	10Hz≤f≤10kHz(RMS)	-	0.001	-	%/V _O
Ripple Rejection Ratio	RR	V _O =10V, f=120Hz, ΔV _{IN} =1V _{rms}	-	65	-	dB
		C _{ADJ} =0	-	66	-	
		C _{ADJ} =10μF	66	80	-	

■ TEST CIRCUIT

- 1) (Reference Voltage Thermal Change), (Adjustment Pin Current Change), (Line Regulation), (Load Regulation), (Peak Output Current), (RMS Output Noise Current)

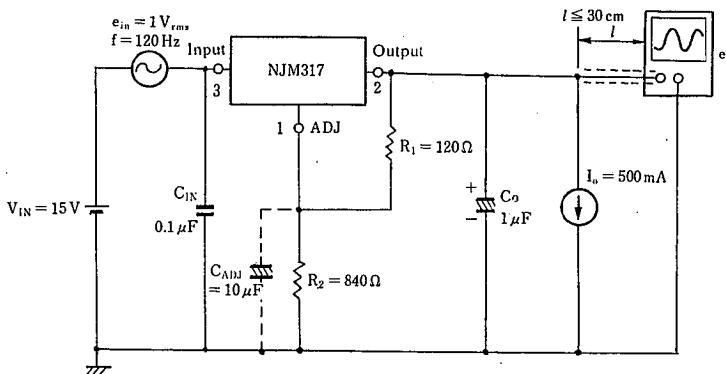


- 2) Minimum Load Current



I_{OMIN} : Minimum I_O for
 $V_O = V_{REF}$ (Typical 1.25V)
 $(V_{IN} = 40 + V_{REF})$

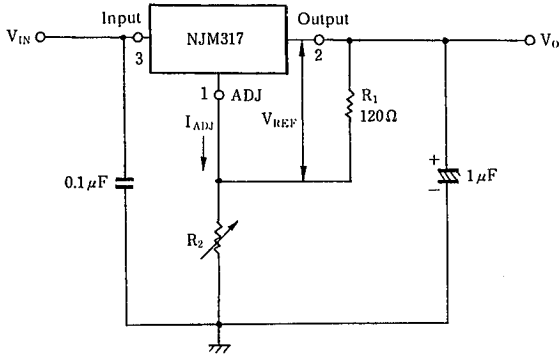
- 3) Ripple Rejection



$$\text{Ripple Rejection} = 20 \log_{10} \left(\frac{e_{IN}}{e_O} \right) \text{ [dB]}$$

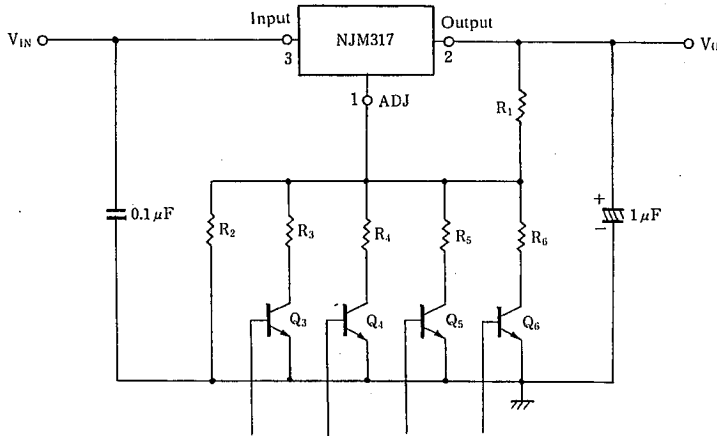
■ TYPICAL APPLICATIONS

1). $V_O = 1.25V \sim 37V$ Adjustable Voltage Regulator



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

2) Selected Output Voltage



The transistors Q_3 are switched by selective signal inputs and the output voltage V_O is controlled by the transistor on or off.

(Example)

When all transistor is off,

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

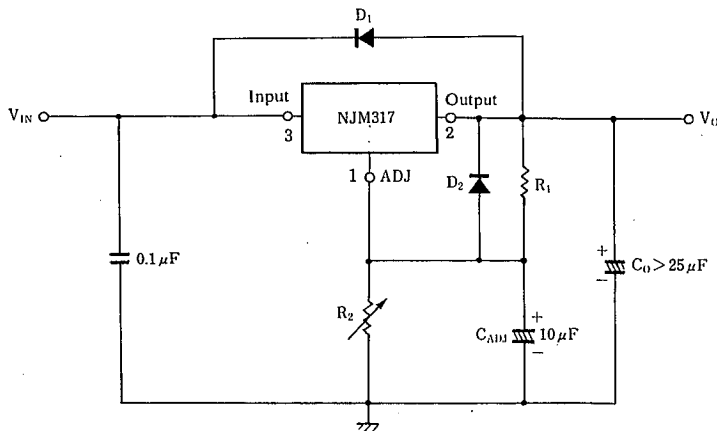
When the transistor Q_3 is on, and others are off.

$$V_O \approx V_{REF} \times \left\{1 + \frac{R_2 \times R_3}{(R_2 + R_3) \times R_1}\right\}$$

※ I_{ADJ} ignore.

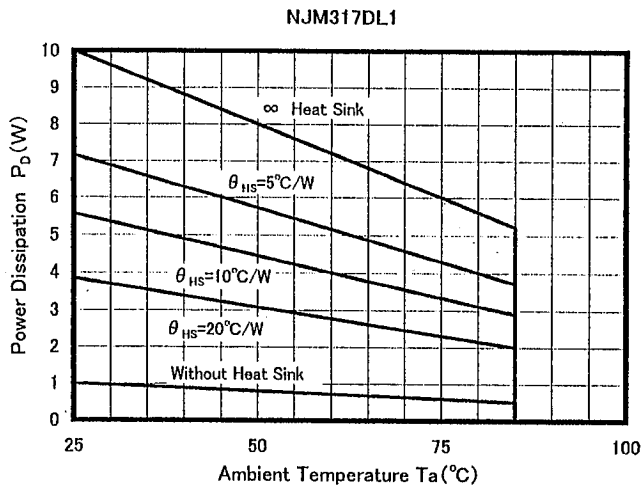
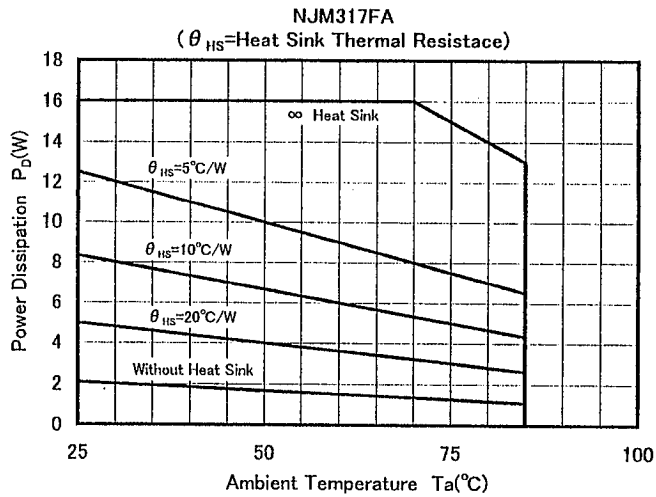
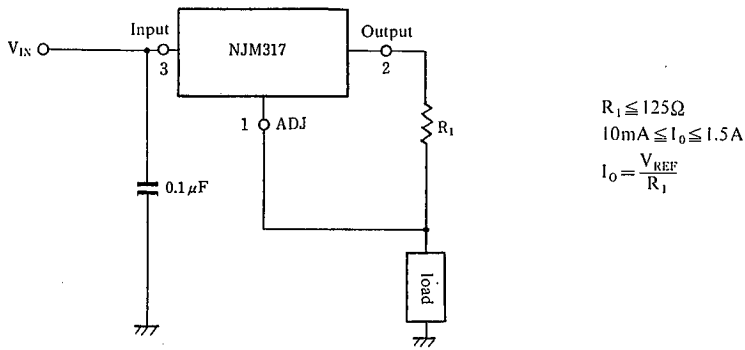
Selective Signal Inputs

3). Regulator with Protection Diodes



D_1 protects about C_O
 D_2 protects about C_{ADJ}

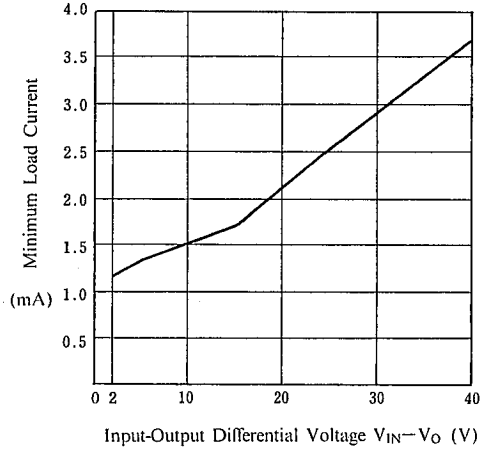
4) Constant Current Regulator



TYPICAL CHARACTERISTICS

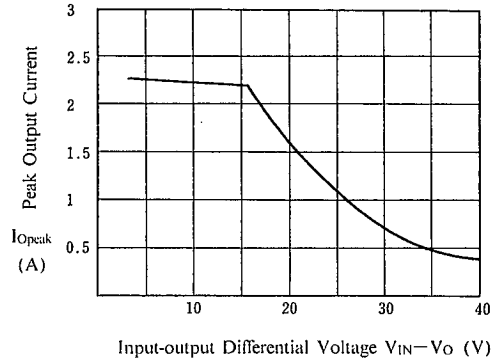
Minimum Load Current

($T_a=25^\circ\text{C}$, $V_{\text{OUT}}=1.25(V_{\text{REF}})$)



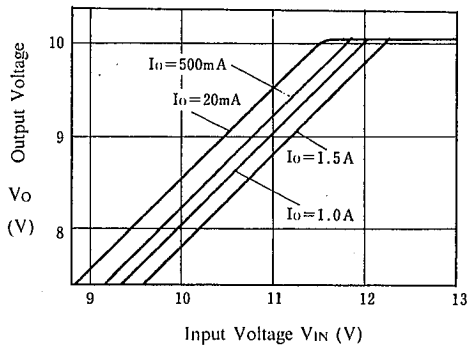
Peak Output Current vs. Input-Output Differential Voltage

($T_a=25^\circ\text{C}$)



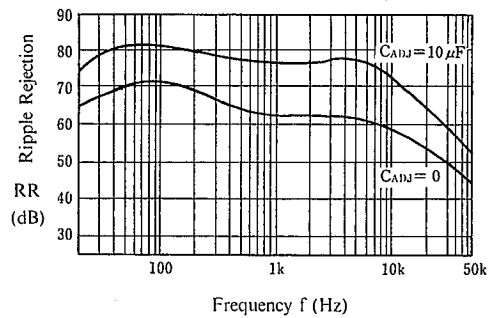
Output Voltage vs. Input Voltage

($T_a=25^\circ\text{C}$)



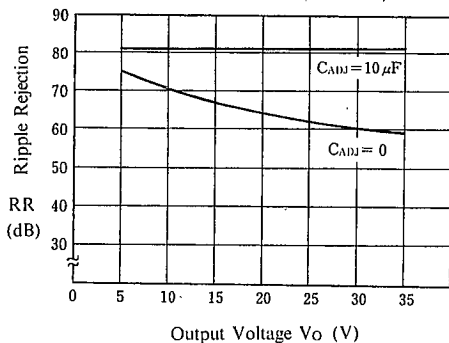
Ripple Rejection vs. Frequency

($V_{\text{IN}}=15\text{V}$, $V_{\text{O}}=10\text{V}$, $e_{\text{in}}=1\text{V}_{\text{rms}}$, $I_{\text{O}}=500\text{mA}$, $T_a=25^\circ\text{C}$)



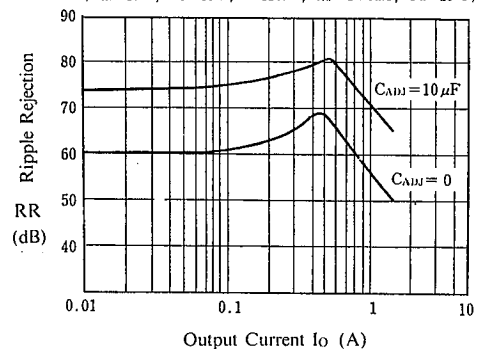
Ripple Rejection vs. Output Voltage

($V_{\text{IN}} - V_{\text{O}}=5\text{V}$, $e_{\text{in}}=1\text{V}_{\text{rms}}$, $f=120\text{Hz}$, $I_{\text{O}}=500\text{mA}$, $T_a=25^\circ\text{C}$)



Ripple Rejection vs. Output Current

($V_{\text{IN}}=15\text{V}$, $V_{\text{O}}=10\text{V}$, $f=120\text{Hz}$, $e_{\text{in}}=1\text{V}_{\text{rms}}$, $T_a=25^\circ\text{C}$)

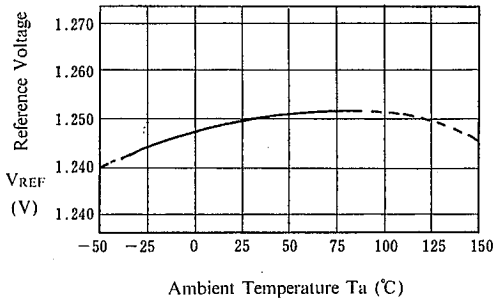


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■ TYPICAL CHARACTERISTICS

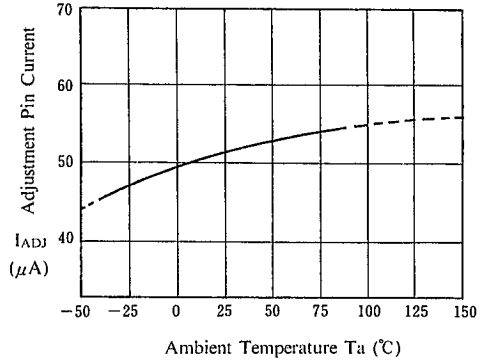
Reference Voltage vs. Temperature

($V_{IN} - V_O = 5V, I_0 = 500nA, \text{Pulse Test}$)



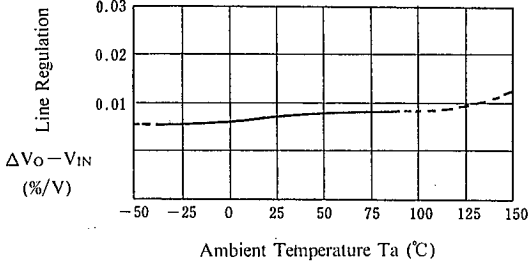
Adjustment Pin Current vs. Temperature

($V_{IN} - V_O = 5V, I_0 = 500mA$)



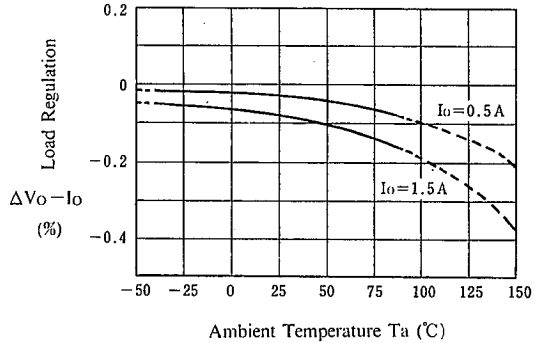
Line Regulation vs. Temperature

($V_{IN} = 8V \sim 45V, V_O = 5V, I_0 = 100mA, \text{Pulse Test}$)



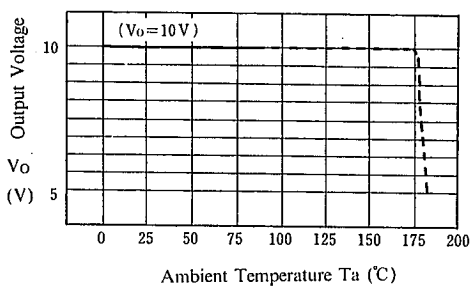
Load Regulation vs. Temperature

($V_{IN} = 15V, V_O = 10V, \text{Pulse Test}$)



Thermal Shutdown

($V_{IN} = 15V, V_O = 10V, I_0 = 0mA$)



MEMO

[CAUTION]

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