

TL317 3-TERMINAL ADJUSTABLE REGULATOR

SLVS004D – APRIL 1979 – REVISED JANUARY 2002

- Output Voltage Range Adjustable From 1.2 V to 32 V When Used With an External Resistor Divider
- Output Current Capability of 100 mA
- Input Regulation Typically 0.01% Per Input-Voltage Change
- Output Regulation Typically 0.5%
- Ripple Rejection Typically 80 dB

description

The TL317 is an adjustable three-terminal positive-voltage regulator capable of supplying 100 mA over an output-voltage range of 1.2 V to 32 V. It is exceptionally easy to use and requires only two external resistors to set the output voltage.

In addition to higher performance than fixed regulators, this regulator offers full overload protection available only in integrated circuits. Included on the chip are current-limiting and thermal-overload protection. All overload-protection circuitry remains fully functional, even when ADJUSTMENT is disconnected. Normally, no capacitors are needed unless the device is situated far from the input filter capacitors, in which case an input bypass is needed. An optional output capacitor can be added to improve transient response. ADJUSTMENT can be bypassed to achieve very high ripple rejection, which is difficult to achieve with standard three-terminal regulators.

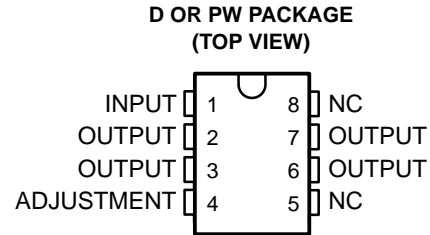
In addition to replacing fixed regulators, the TL317 regulator is useful in a wide variety of other applications. Since the regulator is floating and sees only the input-to-output differential voltage, supplies of several hundred volts can be regulated as long as the maximum input-to-output differential is not exceeded. Its primary application is that of a programmable output regulator, but by connecting a fixed resistor between ADJUSTMENT and OUTPUT, this device can be used as a precision current regulator. Supplies with electronic shutdown can be achieved by clamping ADJUSTMENT to ground, programming the output to 1.2 V, where most loads draw little current.

The TL317C is characterized for operation over the virtual junction temperature range of 0°C to 125°C.

AVAILABLE OPTIONS

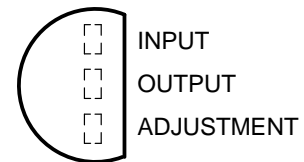
T _J	PACKAGED DEVICES		
	SMALL OUTLINE (D)	PLASTIC (LP)	PLASTIC THIN SHRINK SMALL OUTLINE (PW)
0°C to 125°C	TL317CD	TL317CLP	TL317CPW

The D and LP packages are available taped and reeled. Add the suffix R to device type (e.g., TL317CDR). The PW package is only available taped and reeled.



NC – No internal connection
OUTPUT terminals are all internally connected.

LP PACKAGE (TOP VIEW)



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

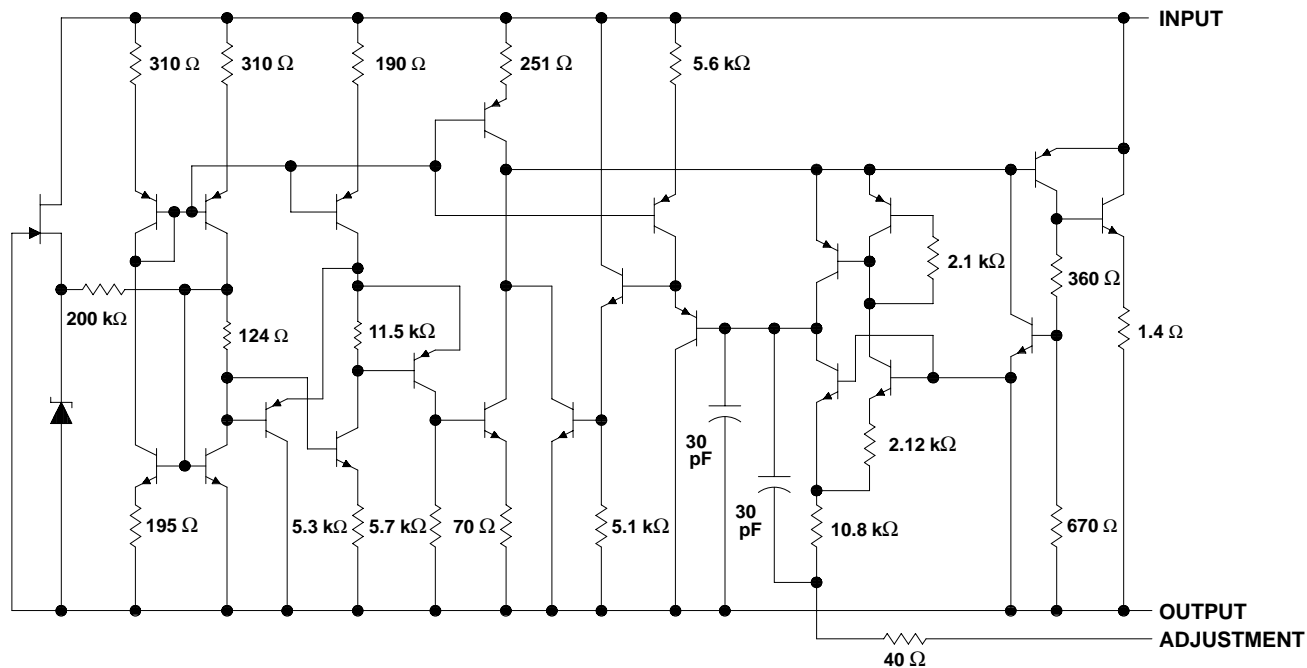
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2002, Texas Instruments Incorporated

TL317 3-TERMINAL ADJUSTABLE REGULATOR

SLVS004D – APRIL 1979 – REVISED JANUARY 2002

schematic



NOTE A: All component values shown are nominal.

absolute maximum ratings over operating temperature range (unless otherwise noted)†

Input-to-output differential voltage, $V_I - V_O$	35 V
Package thermal impedance, θ_{JA} (see Notes 1 and 2): D package	97°C/W
LP package	156°C/W
PW package	149°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

		MIN	MAX	UNIT	
$V_I - V_O$	Input-to-output voltage differential		35	V	
I_O	Output current	2.5	100	mA	
T_J	Operating virtual-junction temperature				
		TL317C	0	125	°C



TL317

3-TERMINAL ADJUSTABLE REGULATOR

SLVS004D – APRIL 1979 – REVISED JANUARY 2002

electrical characteristics over recommended operating virtual-junction temperature range (unless otherwise noted)

PARAMETER	TEST CONDITION [†]		TL317C			UNIT
			MIN	TYP	MAX	
Input voltage regulation (see Note 3)	$V_I - V_O = 5\text{ V to }35\text{ V}$	$T_J = 25^\circ\text{C}$	0.01	0.02		%V
		$I_O = 2.5\text{ mA to }100\text{ mA}$	0.02	0.05		
Ripple regulation	$V_O = 10\text{ V},$	$f = 120\text{ Hz}$	65			dB
	$V_O = 10\text{ V},$ 10- μF capacitor between ADJUSTMENT and ground		66	80		
Output voltage regulation	$V_I = 5\text{ V to }35\text{ V},$ $I_O = 2.5\text{ mA to }100\text{ mA},$ $T_J = 25^\circ\text{C}$	$V_O \leq 5\text{ V}$	25			mV
		$V_O \geq 5\text{ V}$	5			mV/V
	$V_I = 5\text{ V to }35\text{ V},$ $I_O = 2.5\text{ mA to }100\text{ mA}$	$V_O \leq 5\text{ V}$	50			mV
		$V_O \geq 5\text{ V}$	10			mV/V
Output voltage change with temperature	$T_J = 0^\circ\text{C to }125^\circ\text{C}$		10			mV/V
Output voltage long-term drift	After 1000 hours at $T_J = 125^\circ\text{C}$ and $V_I - V_O = 35\text{ V}$		3	10		mV/V
Output noise voltage	$f = 10\text{ Hz to }10\text{ kHz},$	$T_J = 25^\circ\text{C}$	30			$\mu\text{V/V}$
Minimum output current to maintain regulation	$V_I - V_O = 35\text{ V}$		1.5	2.5		mA
Peak output current	$V_I - V_O \leq 35\text{ V}$		100	200		mA
ADJUSTMENT current			50	100		μA
Change in ADJUSTMENT current	$V_I - V_O = 2.5\text{ V to }35\text{ V},$	$I_O = 2.5\text{ mA to }100\text{ mA}$	0.2	5		μA
Reference voltage (output to ADJUSTMENT)	$V_I - V_O = 5\text{ V to }35\text{ V},$ $P \leq \text{rated dissipation}$	$I_O = 2.5\text{ mA to }100\text{ mA},$	1.2	1.25	1.3	V

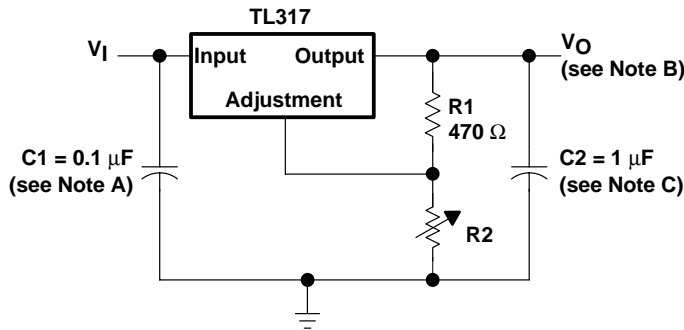
[†] Unless otherwise noted, these specifications apply for the following test conditions: $V_I - V_O = 5\text{ V}$ and $I_O = 40\text{ mA}$. Pulse-testing techniques must be used that maintain the junction temperature as close to the ambient temperature as possible. All characteristics are measured with a 0.1- μF capacitor across the input and a 1- μF capacitor across the output.

NOTE 3: Input voltage regulation is expressed here as the percentage change in output voltage per 1-V change at the input.

TL317 3-TERMINAL ADJUSTABLE REGULATOR

SLVS004D – APRIL 1979 – REVISED JANUARY 2002

APPLICATION INFORMATION



NOTES: A. Use of an input bypass capacitor is recommended if regulator is far from the filter capacitors.

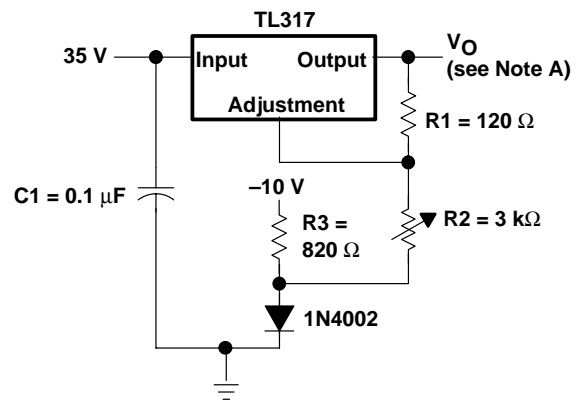
B. Output voltage is calculated from the equation:

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

where: V_{ref} equals the difference between OUTPUT and ADJUSTMENT voltages (≈ 1.25 V).

C. Use of an output capacitor improves transient response but is optional.

Figure 1. Adjustable Voltage Regulator

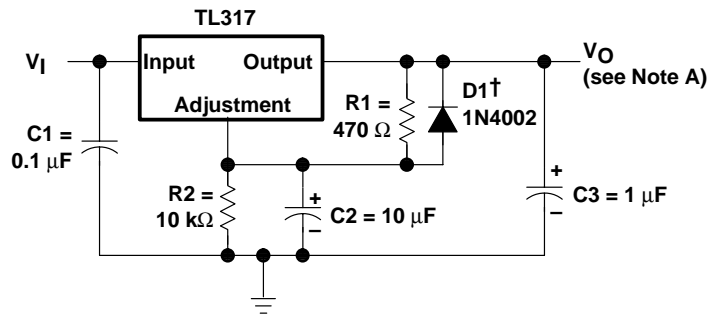


NOTE A: Output voltage is calculated from the equation:

$$V_O = V_{ref} \left(1 + \frac{R_2 + R_3}{R_1} \right) - 10 \text{ V}$$

where: V_{ref} equals the difference between OUTPUT and ADJUSTMENT voltages (≈ 1.25 V).

Figure 2. 0-V to 30-V Regulator Circuit



† D1 discharges C2 if output is shorted to ground.

NOTE A: Use of an output capacitor improves transient response but is optional.

Figure 3. Regulator Circuit With Improved Ripple Rejection

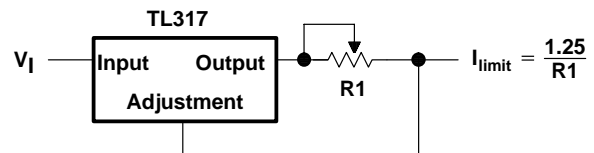


Figure 4. Precision Current-Limiter Circuit

APPLICATION INFORMATION

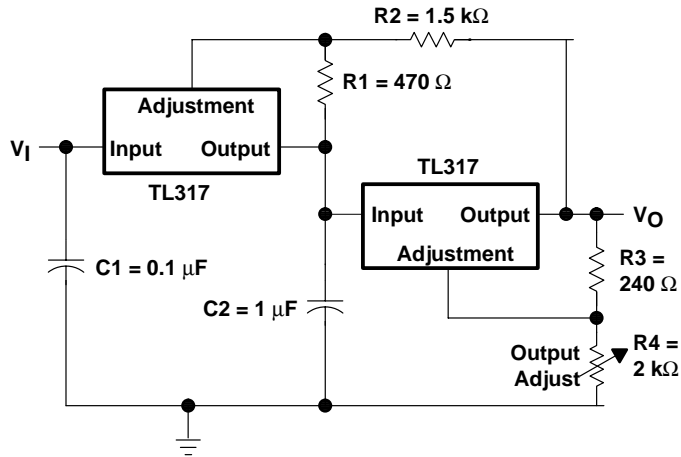


Figure 5. Tracking Preregulator Circuit

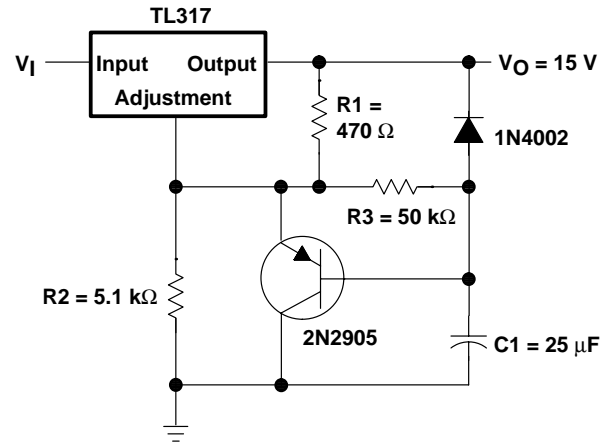


Figure 6. Slow Turnon 15-V Regulator Circuit

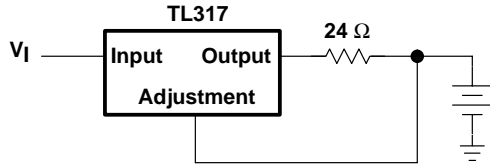


Figure 7. 50-mA Constant-Current Battery-Charger Circuit

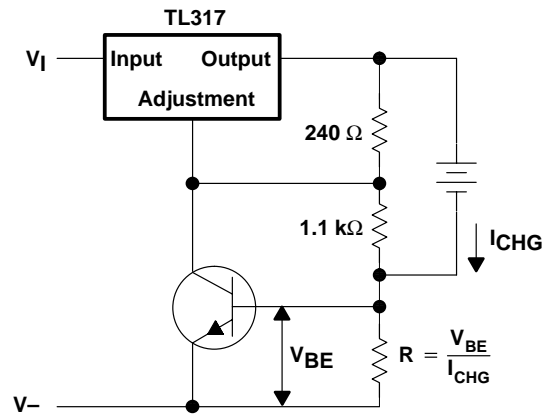
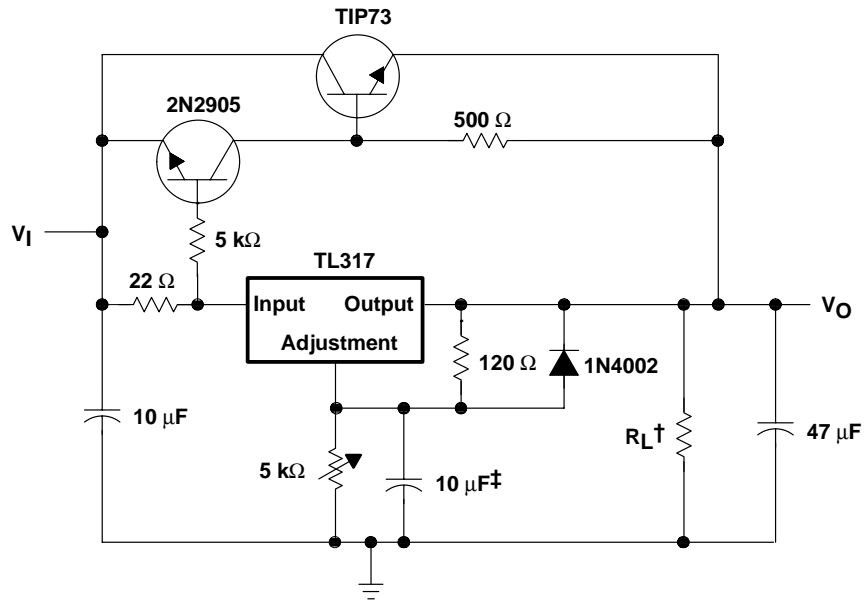


Figure 8. Current-Limited 6-V Charger

TL317 3-TERMINAL ADJUSTABLE REGULATOR

SLVS004D – APRIL 1979 – REVISED JANUARY 2002

APPLICATION INFORMATION



† Minimum load current is 30 mA.

‡ Optional capacitor improves ripple rejection.

Figure 9. High-Current Adjustable Regulator

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.