XL317 SOP8

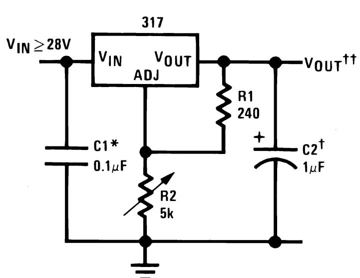
1 Features

- Adjustable Output Down to 1.2 V
- 100-mA Output Current
- Capable of Handling up to 40V V_{IN}
- Line Regulation Typically 0.01% /V
- Load Regulation Typically 0.1% /A
- No Output Capacitor Required (†)
- Current Limit Constant With Temperature
- Eliminates the Need to Stock Many Voltages
- Standard 3-Lead Transistor Package
- 80-dB Ripple Rejection
- Available in 3-Pin TO-92, 8-Pin SOIC, or 6-pin DSBGA Packages
- Output is Short-Circuit Protected
- See AN-1112 (SNVA009) for DSBGA Considerations

2 Applications

- Automotive LED Lighting
- Battery Chargers
- Post Regulation for Switching Supplies
- Constant-Current Regulators
- Microprocessor Supplies

Schematic Diagram



Full output current not available at high input-output voltages
†Optional—improves transient response
*Needed if device is more than 6 inches from filter capacitors

$$^{††}V_{OUT} = 1.25V\left(1 + \frac{R2}{R1}\right) + I_{ADJ}(R_2)$$

3 Description

The XL317 is an adjustable positive voltage regulator capable of supplying 100 mA over a 1.2-V to 37-V output range. The XL317 is easy to use and requires only two external resistors to set the output voltage. Both line and load regulation are better than standard fixed regulators. The XL317 is available packaged in a standard, easy-to-use TO-92 transistor package.

The XL317 offers full overload protection. Included on the chip are current limit, thermal overload protection, and safe area protection. Normally, no capacitors are required unless the device is situated more than 6 inches from the input filter capacitors, in which case an input bypass is required.

The XL317 uses *floating* topology and sees only the input-to-output differential voltage, therefore supplies of several hundred volts can be regulated, provided the maximum input-to-output differential is not exceeded. The device makes a simple adjustable switching regulator, a programmable output regulator, or by connecting a fixed resistor between the adjustment and output, the XL317 can be used as a precision current regulator.

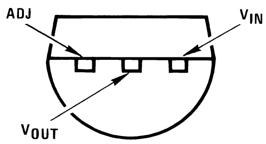
The XL317 is available in a standard 3-pin TO-92 transistor package, the 8-pin SOIC package, and 6-pin DSBGA package. The XL317 is rated for operation over a −40°C to 125°C range.

4 Device Information(1)

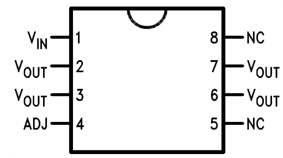
PART NUMBER	PACKAGE	BODY SIZE (NOM)
317	TO-92 (3)	4.30 mm × 4.30 mm
	SOIC (8)	3.91 mm × 4.90 mm
	DSBGA (6)	1.68 mm × 1.019 mm

5 Pin Configuration and Functions

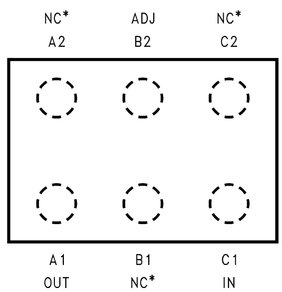
LP Plastic Package
3-Pin TO-92
Bottom View



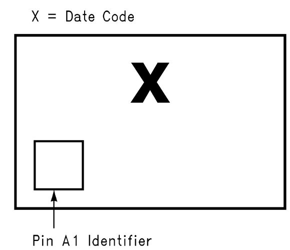
D Package
8-Pin SOIC
Top View



YPB Package
6-Pin DSBGA
Top View



YPB Package
6-Pin DSBGA
Laser Mark



Pin Functions

PIN				I/O	DESCRIPTION
NAME	**TO-92**	**SOIC**	**DSBGA**		
VIN	3	1	C1	I	Supply input pin
VOUT	2	2, 3, 6, 7	A1	O	Voltage output pin
ADJ	1	4	B2	I	Output voltage adjustment pin. Connect to a resistor divider to set V_O.
NC	—	5, 8	B1, A2, C2	—	No connection

6 Specifications

6.1 Absolute Maximum Rating [1][2]

	MIN	MAX	UNIT
Power dissipation	Internally Limited		
Input-output voltage differential		40	V
Operating junction temperature	−40	125	°C
Lead temperature (soldering, 4 seconds)		260	°C
Storage temperature, T_{stg}	−55	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) If Military/Aerospace specified devices are required, contact the Texas Instruments Sales Office/Distributors for availability and specifications.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 [1]	±2000	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Pins listed as ±2000 V may actually have higher performance.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

	MIN	MAX	UNIT
Operating temperature	−40	125	°C

6.4 Thermal Information

THERMAL METRIC [1]		XL317				UNIT
		TO-92		SOIC	DSBGA	
		3 PINS		8 PINS	6 PINS	
		0.4-in Leads	0.125-in Leads			
$R_{\theta JA}$	Junction-to-ambient thermal resistance	180	160	165	290	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	—	80.6	—	—	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	—	—	—	—	°C/W
ψ_{JT}	Junction-to-top characterization parameter	—	24.7	—	—	°C/W
ψ_{JB}	Junction-to-board characterization parameter	—	135.8	—	—	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	—	—	—	—	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report, SPRA953.

6.5 Electrical Characteristics [1]

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Line regulation	T_J = 25°C, 3 V ≤ (V_{IN} − V_{OUT}) ≤ 40 V, I_L ≤ 20 mA [2]		0.01	0.04	%/V
Load regulation	T_J = 25°C, 5 mA ≤ I_{OUT} ≤ I_{MAX} [2]		0.1%	0.5%	
Thermal regulation	T_J = 25°C, 10-ms Pulse		0.04	0.2	%/W
Adjustment pin current			50	100	μA
Adjustment pin current change	5 mA ≤ I_L ≤ 100 mA 3 V ≤ (V_{IN} − V_{OUT}) ≤ 40 V, P ≤ 625 mW		0.2	5	μA
Reference voltage	3 V ≤ (V_{IN} − V_{OUT}) ≤ 40 V [3] 5 mA ≤ I_{OUT} ≤ 100 mA, P ≤ 625 mW	1.2	1.25	1.3	V
Line regulation	3 V ≤ (V_{IN} − V_{OUT}) ≤ 40 V, I_L ≤ 20 mA [2]		0.02	0.07	%/V
Load regulation	5 mA ≤ I_{OUT} ≤ 100 mA [2]		0.3%	1.5%	
Temperature stability	T_{MIN} ≤ T_J ≤ T_{MAX}		0.65%		
Minimum load current	(V_{IN} − V_{OUT}) ≤ 40 V		3.5	5	mA
	3 V ≤ (V_{IN} − V_{OUT}) ≤ 15 V		1.5	2.5	
Current limit	3 V ≤ (V_{IN} − V_{OUT}) ≤ 13 V	100	200	300	mA
	(V_{IN} − V_{OUT}) = 40 V	25	50	150	
RMS output noise, % of V_{OUT}	T_J = 25°C, 10 Hz ≤ f ≤ 10 kHz		0.003%		
Ripple rejection ratio	V_{OUT} = 10 V, f = 120 Hz, C_{ADJ} = 0		65		dB
	C_{ADJ} = 10 μF	66	80		
Long-term stability	T_J = 125°C, 1000 Hours		0.3%	1%	

(1) Unless otherwise noted, these specifications apply: −25°C ≤ T_j ≤ 125°C for the XL317; V_{IN} − V_{OUT} = 5 V and I_{OUT} = 40 mA. Although power dissipation is internally limited, these specifications are applicable for power dissipations up to 625 mW. I_{MAX} is 100 mA.
(2) Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.
(3) Thermal resistance of the TO-92 package is 180°C/W junction to ambient with 0.4-inch leads from a PCB and 160°C/W junction to ambient with 0.125-inch lead length to PCB.

6.6 Typical Characteristics

(Output capacitor = 0 μF unless otherwise noted.)

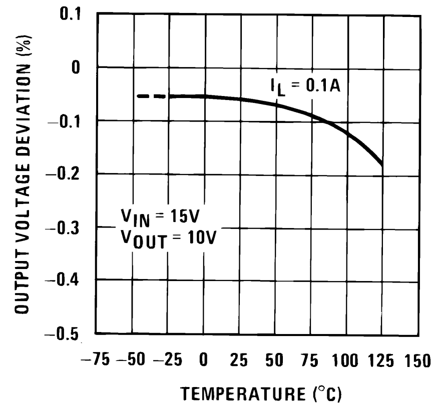


Figure 1. Load Regulation

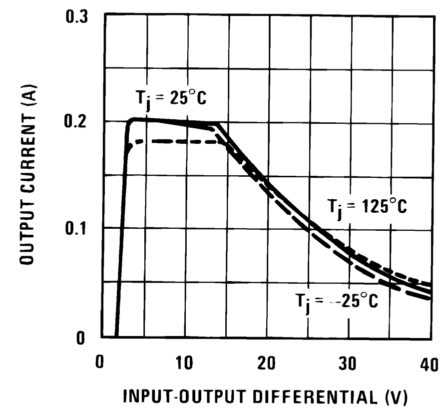


Figure 2. Current Limit

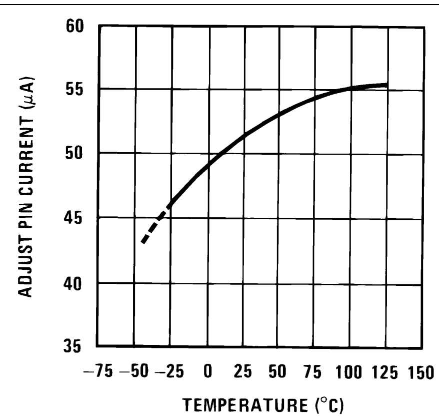


Figure 3. Adjustment Current

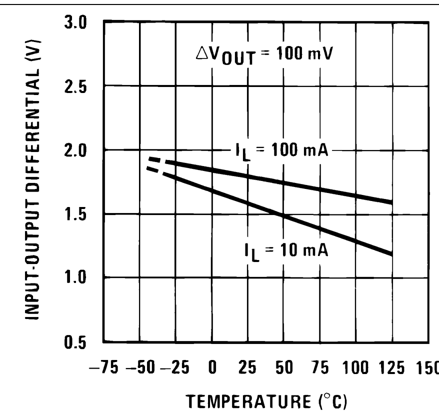


Figure 4. Dropout Voltage

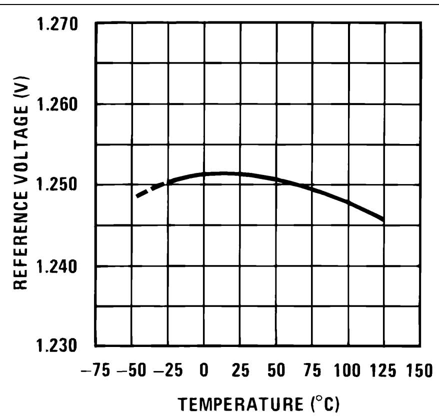


Figure 5. Reference Voltage Temperature Stability

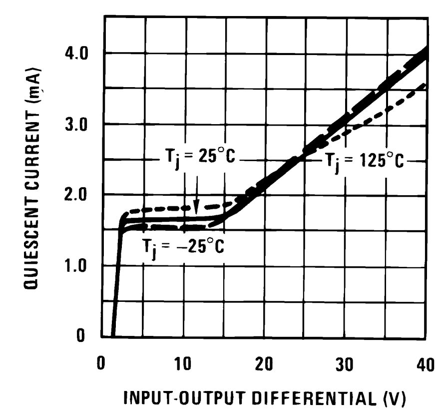


Figure 6. Minimum Operating Current

Typical Characteristics (continued)

(Output capacitor = 0 μF unless otherwise noted.)

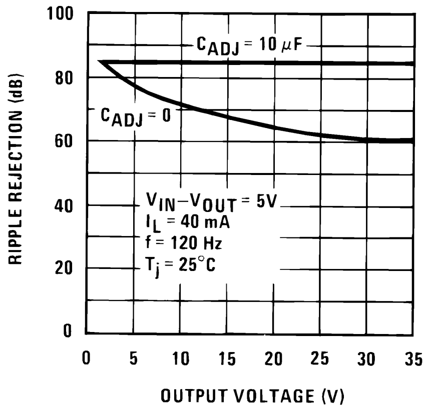


Figure 7. Ripple Rejection

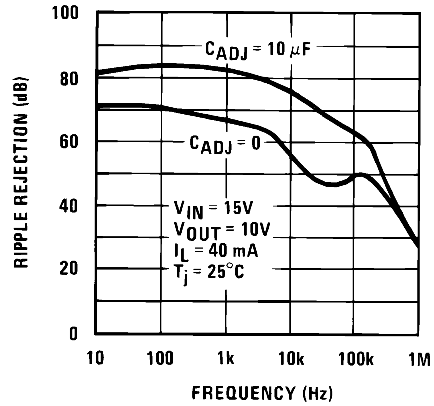


Figure 8. Ripple Rejection

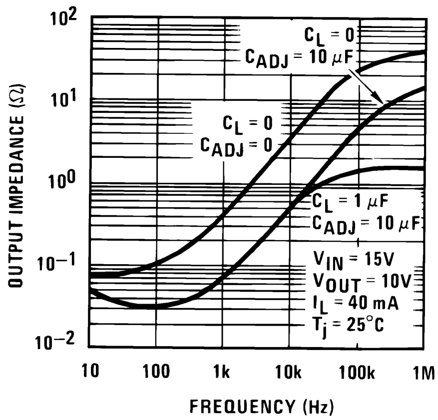


Figure 9. Output Impedance

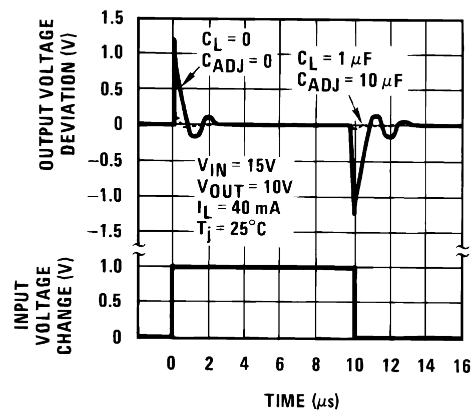


Figure 10. Line Transient Response

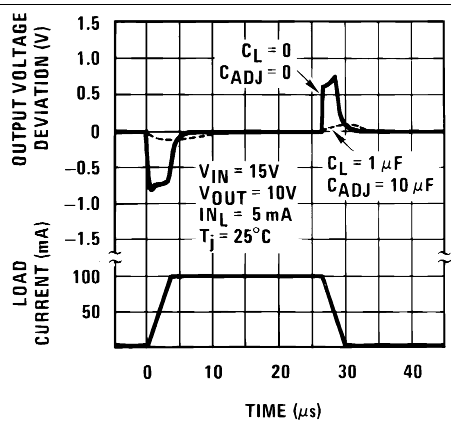


Figure 11. Load Transient Response

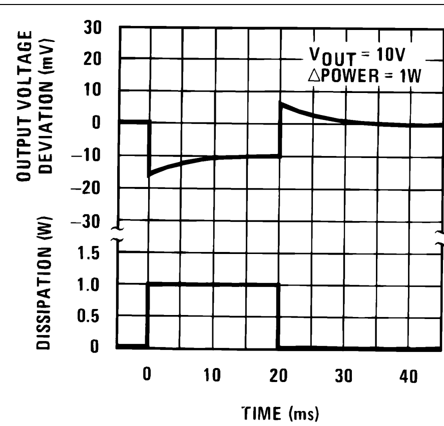


Figure 12. Thermal Regulation

7 Detailed Description

7.1 Overview

In operation, the XL317 develops a nominal 1.25-V reference voltage, V_{REF}, between the output and adjustment terminal. The reference voltage is impressed across program resistor R1 and, because the voltage is constant, a constant current I_1 then flows through the output set resistor R2, giving an output voltage of:

$$V_{OUT} = V_{REF}\left(1 + \frac{R2}{R1}\right) + I_{ADJ}(R2) \tag{1}$$

Because the 100-µA current from the adjustment terminal represents an error term, the XL317 was designed to minimize I_{ADJ} and make it very constant with line and load changes. To do this, all quiescent operating current is returned to the output establishing a minimum load current requirement. If there is insufficient load on the output, the output will rise.

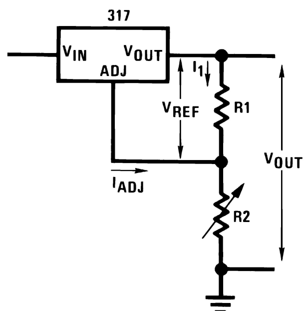
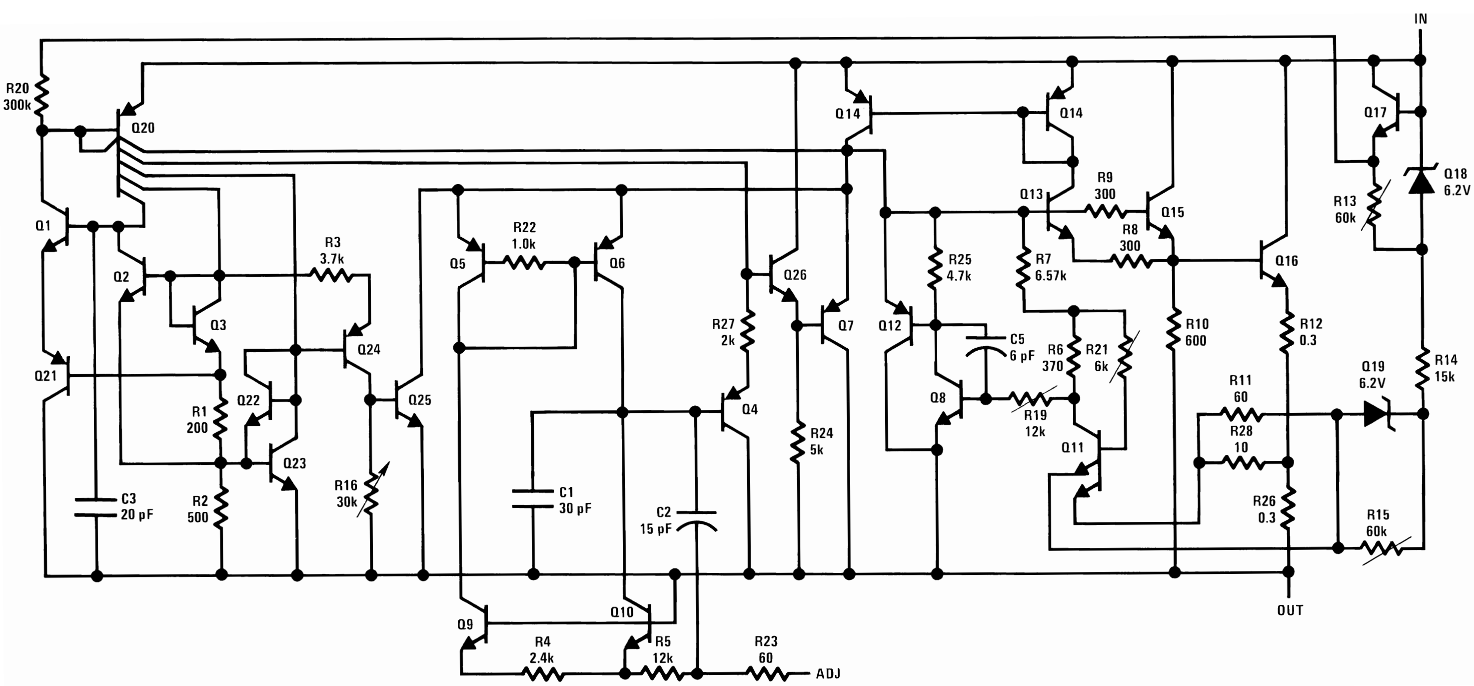


Figure 13. Typical Application Circuit for Adjustable Regulator

7.2 Functional Block Diagram



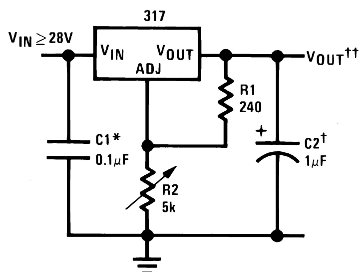
8 Application and Implementation

8.1 Application Information

The XL317 is a versatile, high-performance, linear regulator with 1% output-voltage accuracy. An output capacitor can be added to further improve transient response, and the ADJ pin can be bypassed to achieve very high ripple-rejection ratios. Its functionality can be used in many different applications that require high performance regulation, such as battery chargers, constant-current regulators, and microprocessor supplies.

8.2 Typical Applications

8.2.1 1.25-V to 25-V Adjustable Regulator



Full output current not available at high input-output voltages
†Optional—improves transient response
*Needed if device is more than 6 inches from filter capacitors
$$††V_{OUT} = 1.25V \left(1 + \frac{R2}{R1}\right) + I_{ADJ}(R_2)$$

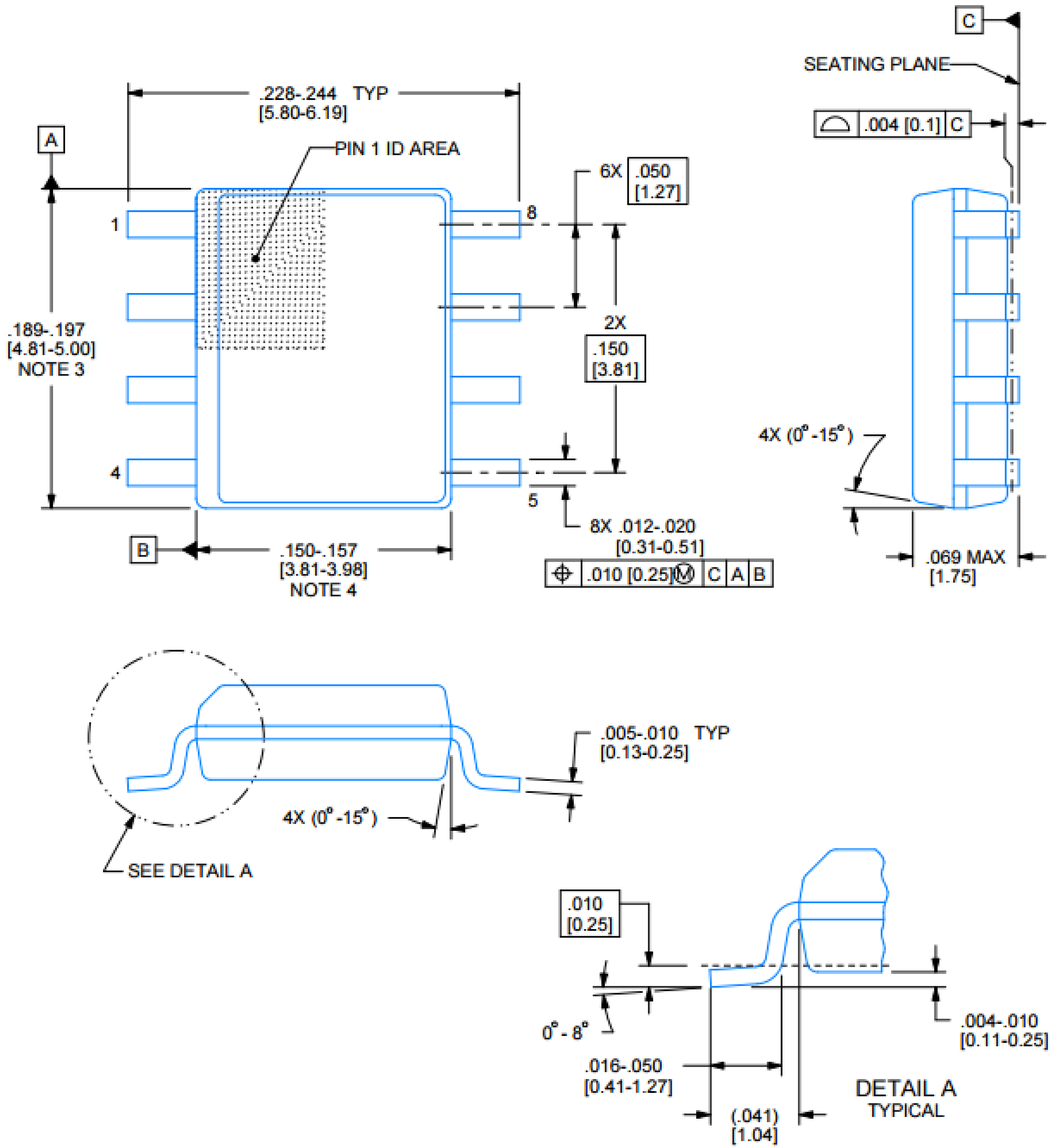
Figure 16. 1.25-V to 25-V Adjustable Regulator

8.2.1.1 Design Requirements

The device component count is very minimal, employing two resistors as part of a voltage-divider circuit and an output capacitor for load regulation. An input capacitor is needed if the device is more than 6 inches from filter capacitors. An optional bypass capacitor across R2 can also be used to improve PSRR.

8.2.1.2 Detailed Design Procedure

The output voltage is set based on the selection of the two resistors, R1 and R2, as shown in Figure 16. For details on capacitor selection, see *External Capacitors*.



以上信息仅供参考.如需帮助联系客服人员。谢谢 XINLUDA