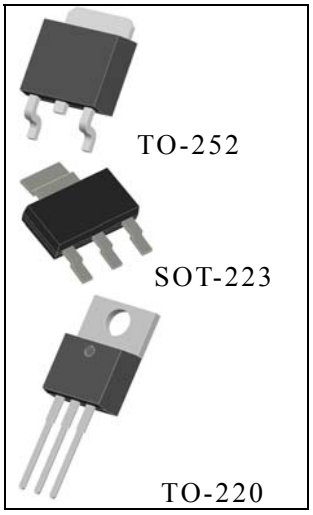
3-Terminal Adjustable Negative Regulator
D337

DESCRIPTIONS:

The D337 are adjustable 3-terminal negative voltage regulators capable of supplying in excess of −1.5A over an output voltage range of −1.2V to −37V. These regulators are exceptionally easy to apply, requiring only 2 external resistors to set the output voltage and 1 output capacitor for frequency compensation. The circuit design has been optimized for excellent regulation and low thermal transients.

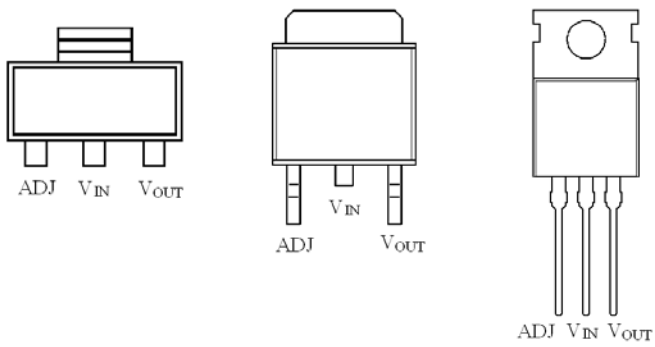
The D337 serve a wide variety of applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. The D337 is ideal complements to the D337 adjustable positive regulators.



FEATURES

- Output voltage adjustable from −1.2V to −37V
- 1.5A output current guaranteed, −55°C to +150°C
- Line regulation typically 0.01%/V
- Excellent thermal regulation, 0.002%/W
- Excellent rejection of thermal transients
- Temperature-independent current limit
- Internal thermal overload protection
- 77 dB ripple rejection
- 50 ppm/°C temperature coefficient
- Load regulation typically 0.3%
- P+ Product Enhancement tested
- Output is short circuit protected

PI N CONFIGURATION



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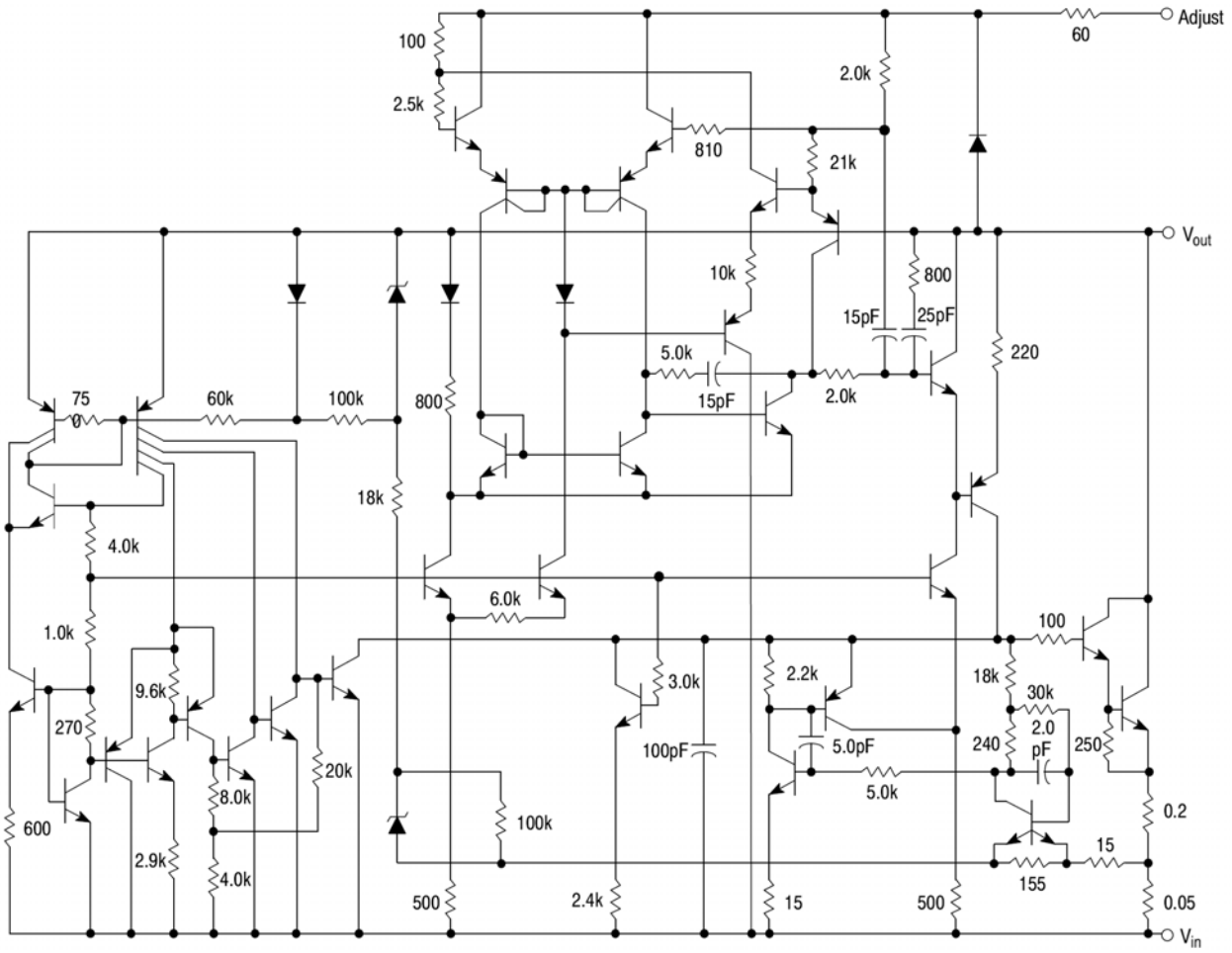
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS *1

Characteristic	Value	Unit
Power dissipation	Internally limited	
Input-output voltage differential	40	V
Operating junction temperature range	0～+125	°C
Storage temperature	-65～+150	°C
Lead temperature (soldering, 10 sec.)	300	°C
Plastic package (soldering, 4 sec.)	260	°C
ESD rating	2k	Volts

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ELECTRICAL CHARACTERISTICS *1

Characteristics	Test conditions	Min	Typ	Max	Unit
Line regulation	Tj=25°C,3V≤ | V_{IN}-V_{OUT} | ≤40V *2 IL=10mA		0.01	0.04	%/V
Load regulation	Tj=25°C, 10mA≤I_{OUT}≤I_{MAX}		0.3	1.0	%
Thermal regulation	Tj=25°C, 10ms pulse		0.003	0.04	%/W
Adjustment pin current			65	100	μA
Adjustment pin current charge	10mA≤I_L≤I_{MAX},T_A=25°C 3V≤ | V_{IN}-V_{OUT} | ≤40V		2	5	μA
Reference voltage	Tj=25°C *3 3V≤ | V_{IN}-V_{OUT} | ≤40V *3 10mA≤I_{OUT}≤I_{MAX}, P≤P_{MAX}	-1.213 -1.200	-1.250 -1.250	-1.287 -1.300	V
Line regulation	3V≤ | V_{IN}-V_{OUT} | ≤40V *2		0.02	0.07	%/V
Load regulation	10mA≤I_{OUT}≤I_{MAX} *2		0.3	1.5	%
Temperature stability	T_{MIN}≤Tj≤T_{MAX}		0.6		%
Minimum load current	| V_{IN}-V_{OUT} | ≤40V | V_{IN}-V_{OUT} | ≤10V		2.5 1.5	10 6	mA
Current limit	| V_{IN}-V_{OUT} | ≤15V | V_{IN}-V_{OUT} | =40V, Tj=25°C	1.5 0.15	2.2 0.4	3.7	A
RMS output noise,% of V_{OUT}	Tj=25°C, 10Hz≤f≤10kHz		0.003		%
Ripple rejection ratio	V_{OUT}=-10V, f=120Hz C_{ADJ}=10μF	66	60 77		dB
Long-term stability	Tj=125°C, 1000 Hours		0.3	1	%
Thermal resistance, junction to case	SOT223 TO-220 TO-252		2.3 12 4	3 15	°C/W
Thermal resistance, junction to ambient (no heat sink)	SOT223 TO-220 TO-252		35 140 50		°C/W

*1: Unless otherwise specified, these specifications apply 0°C ≤ Tj ≤ +125°C for the D337; V_{IN} − V_{OUT} = 5V; and I_{OUT} = 0.5A for the TO-252, SOT-223 and TO-220 packages. Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2W for the SOT-223 (see Application Hints), and 20W for the TO-252, and TO-220. I_{MAX} is 1.5A for the TO-252, SOT-223 and TO-220 packages.

*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. Load regulation is measured on the output pin at a point 1⁄8" below the base of the TO-252 packages.

*3: Selected devices with tightened tolerance reference voltage available.

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Continues:

APPLICATION SUMMARY

When a value for $\theta_{(H-A)}$ is found using the equation shown, a heatsink must be selected that has a value that is less than or equal to this number.

Heatsinking SOT-223 Package Parts

The SOT-223 packages use a copper plane on the PCB and the PCB itself as a heatsink. To optimize the heat sinking ability of the plane and PCB, solder the tab of the package to the plane.

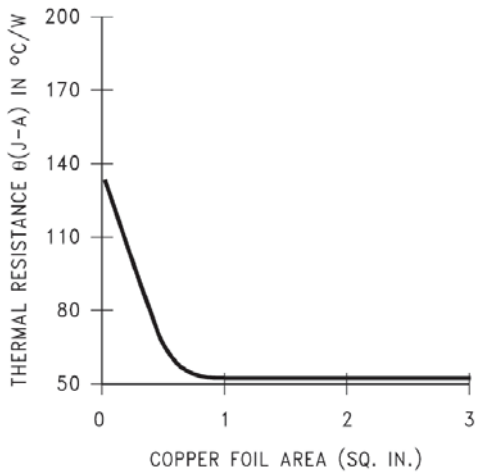


Fig. θ(J−A) vs Copper (2 ounce) Area for the SOT-223 Package

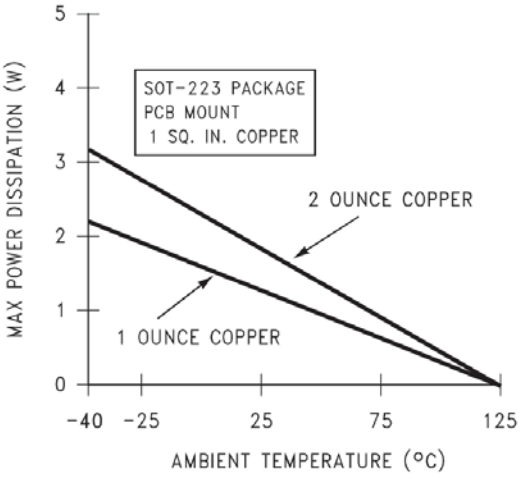
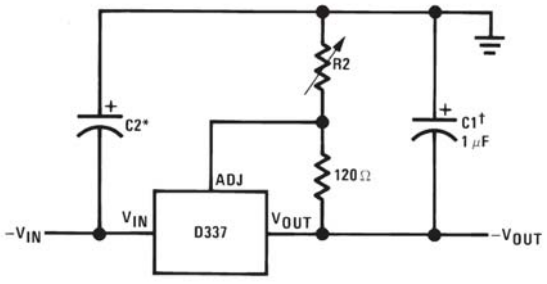


Fig. Maximum Power Dissipation vs. T_{AMB} for the SOT-223 Package

TYPICAL APPLICATION

Adjustable Negative Voltage Regulator



Full output current not available at high input-output voltages

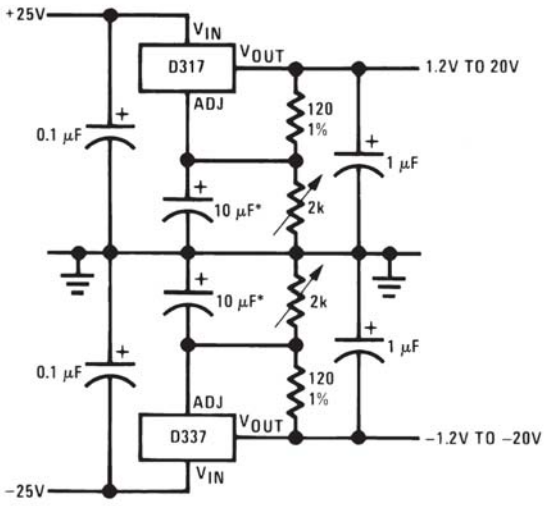
$$-V_{OUT} = -1.25V\left(1 + \frac{R2}{120}\right) + \left(-I_{ADJ} \times R2\right)$$

†C1 = 1 µF solid tantalum or 10 µF aluminum electrolytic required for stability

*C2 = 1 µF solid tantalum is required only if regulator is more than 4" from power-supply filter capacitor

Output capacitors in the range of 1 µF to 1000 µF of aluminum or tantalum electrolytic are commonly used to provide improved output impedance and rejection of transients

Adjustable Lab Voltage Regulator



Full output current not available at high input-output voltages

*The 10 µF capacitors are optional to improve ripple rejection

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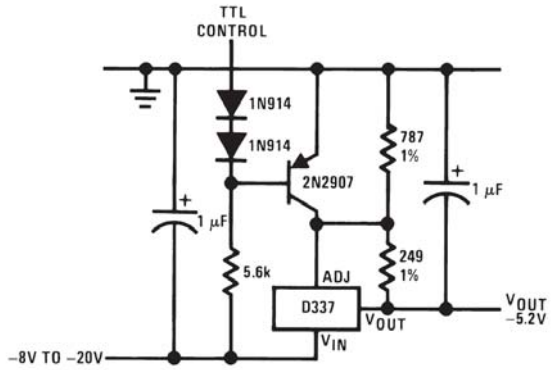
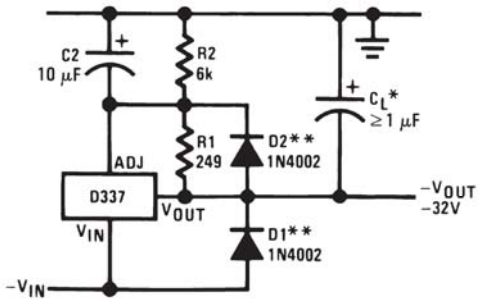
–5.2V Regulator with Electronic Shutdown*



*Minimum output ≃ –1.3V when control input is low

Negative Regulator with Protection Diodes

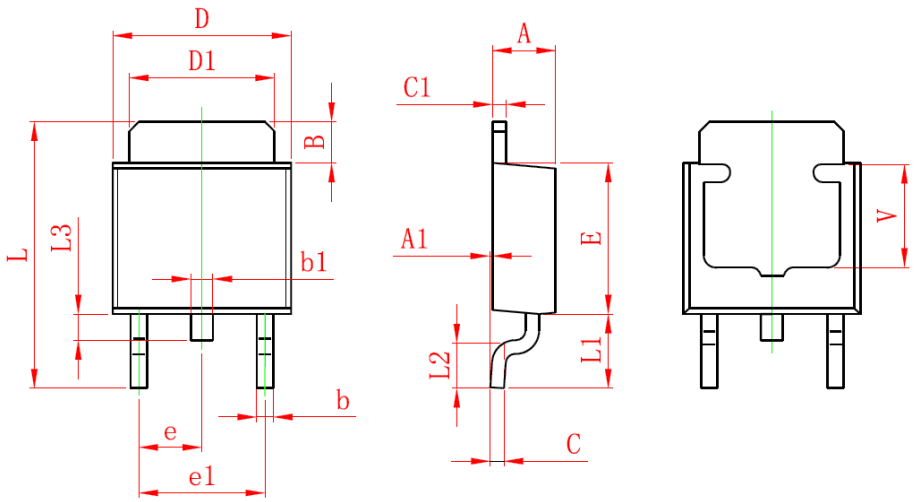


*When C_L is larger than 20 µF, D1 protects the LM137 in case the input supply is shorted

**When C2 is larger than 10 µF and $-V_{OUT}$ is larger than –25V, D2 protects the LM137 in case the output is shorted

OUTLINE DRAWING

TO-252 Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	

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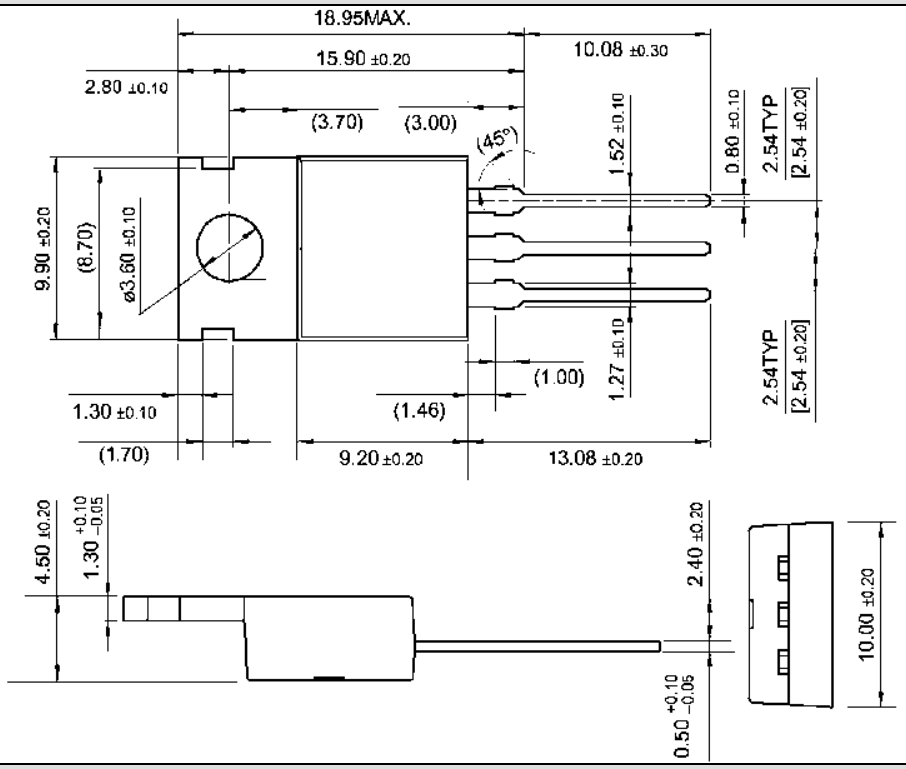
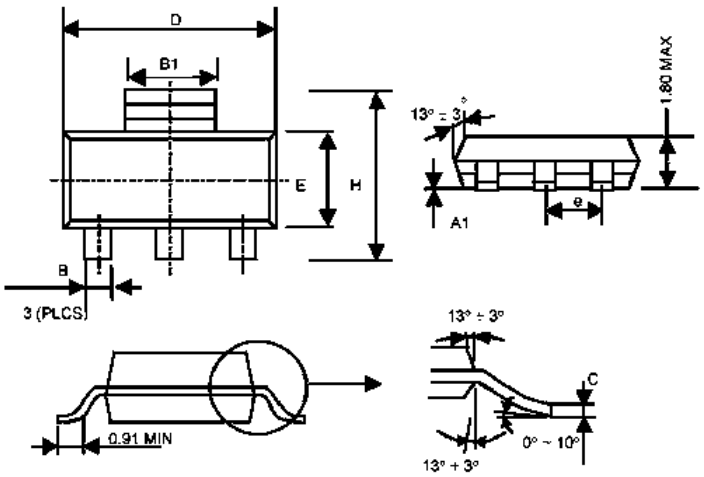
TO-220 Unit:mm



SOT-223 Unit:mm

- **SOT-223**



SYMBOL	MIN	MAX
A1	0.02	0.12
B	0.60	0.80
B1	2.90	3.15
C	0.24	0.35
D	6.30	6.80
E	3.30	3.70
e	2.30 (TYP.)	
H	6.70	7.30

Datasheet Versions:

Name	Time	Versions
D337	2013.06.06	V1.0

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