

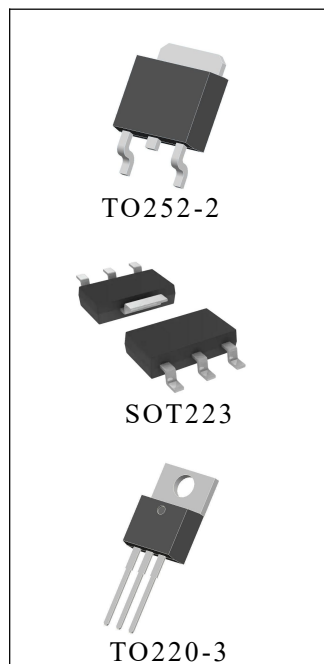
D337

3-Terminal Adjustable Negative Regulator

General Description

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
- 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

Package Information

Part NO.	Order NO.	Package Description	Package Marking	Package Option
D337	D337D	TO252-2	CHMC D337 SXXXX	70/Tube 2500/Reel
D337	D337B	SOT223	D337 SXXXX	2500/Reel
D337	D337T	TO220-3	CHMC D337 SXXXX	50/Tube

CHMC:Trademark

D337:Part NO.

SXXXX:Lot NO.

Absolute Maximum Ratings *1

Characteristic	Value	Unit
Power dissipation	Internally limited	
Input-output voltage differential	40	V
Operating junction temperature range	-20 ~ +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

Electrical Characteristics *1

Characteristics	Test conditions	Min	Typ	Max	Unit
Line regulation	$T_j=25^{\circ}\text{C}, 3\text{V} \leq V_{\text{IN}}-V_{\text{OUT}} \leq 40\text{V}$ *2 $I_L=10\text{mA}$		0.01	0.04	%/V
Load regulation	$T_j=25^{\circ}\text{C}, 10\text{mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}$		0.3	1.0	%
Thermal regulation	$T_j=25^{\circ}\text{C}, 10\text{ms pulse}$		0.003	0.04	%/W
Adjustment pin current			65	100	μA
Adjustment pin current charge	$10\text{mA} \leq I_L \leq I_{\text{MAX}}, T_A=25^{\circ}\text{C}$ $3\text{V} \leq V_{\text{IN}}-V_{\text{OUT}} \leq 40\text{V}$		2	5	μA
Reference voltage	$T_j=25^{\circ}\text{C}$ *3 $3\text{V} \leq V_{\text{IN}}-V_{\text{OUT}} \leq 40\text{V}$ *3 $10\text{mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}, P \leq P_{\text{MAX}}$	-1.213 -1.200	-1.250 -1.250	-1.287 -1.300	V
Line regulation	$3\text{V} \leq V_{\text{IN}}-V_{\text{OUT}} \leq 40\text{V}$ *2		0.02	0.07	%/V
Load regulation	$10\text{mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}$ *2		0.3	1.5	%
Temperature stability	$T_{\text{MIN}} \leq T_j \leq T_{\text{MAX}}$		0.6		%
Minimum load current	$ V_{\text{IN}}-V_{\text{OUT}} \leq 40\text{V}$ $ V_{\text{IN}}-V_{\text{OUT}} \leq 10\text{V}$		2.5 1.5	10 6	mA
Current limit	$ V_{\text{IN}}-V_{\text{OUT}} \leq 15\text{V}$ $ V_{\text{IN}}-V_{\text{OUT}} = 40\text{V}, T_j=25^{\circ}\text{C}$	1.5 0.15	2.2 0.4	3.7	A
RMS output noise,% of V_{OUT}	$T_j=25^{\circ}\text{C}, 10\text{Hz} \leq f \leq 10\text{kHz}$		0.003		%
Ripple rejection ratio	$V_{\text{OUT}}=-10\text{V}, f=120\text{Hz}$ $C_{\text{ADJ}}=10\mu\text{F}$	66	60 77		dB
Long-term stability	$T_j=125^{\circ}\text{C}, 1000 \text{ Hours}$		0.3	1	%
Thermal resistance, junction to case	SOT223 TO220 TO252		2.3 12 4	3 15	°C/W
Thermal resistance, junction to ambient (no heat sink)	SOT223 TO220 TO252		35 140 50		°C/W

*1: Unless otherwise specified, these specifications apply $-20^{\circ}\text{C} \leq T_j \leq +125^{\circ}\text{C}$ for the D337; $V_{\text{IN}} - V_{\text{OUT}} = 5\text{V}$; and $I_{\text{OUT}} = 0.5\text{A}$ for the TO252, SOT223 and TO220 packages. Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2W for the SOT223 (see Application Hints), and 20W for the TO252, and TO220. I_{MAX} is 1.5A for the TO252, SOT223 and TO220 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 TO252 packages.

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

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 SOT223 Package Parts

The SOT223 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.

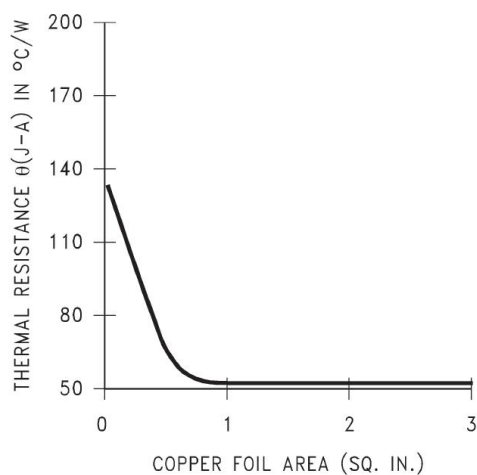


Fig. $\theta_{(J-A)}$ vs Copper (2 ounce) Area for the SOT223 Package

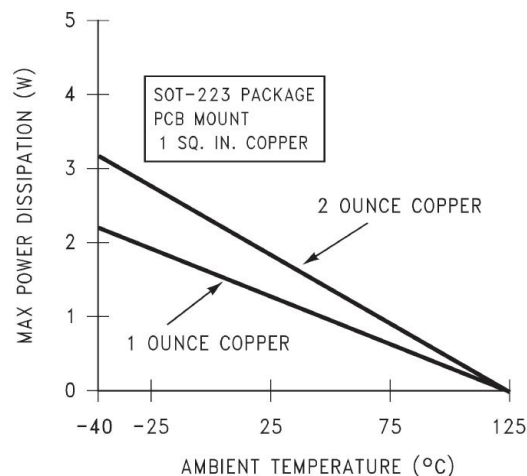
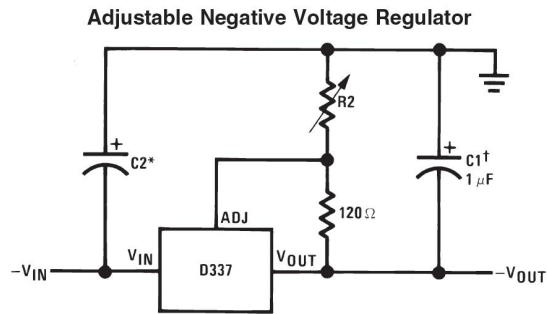


Fig. Maximum Power Dissipation vs. T_{AMB} for the SOT223 Package

Typical Application



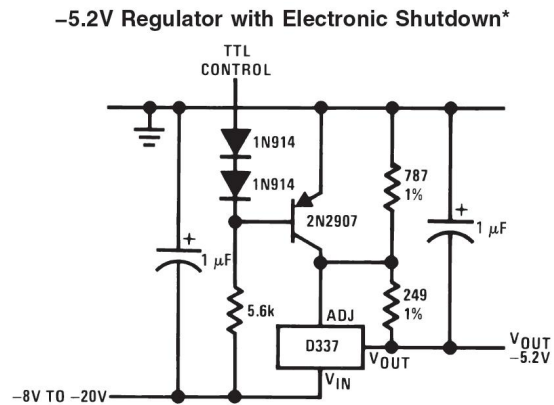
Full output current not available at high input-output voltages

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

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

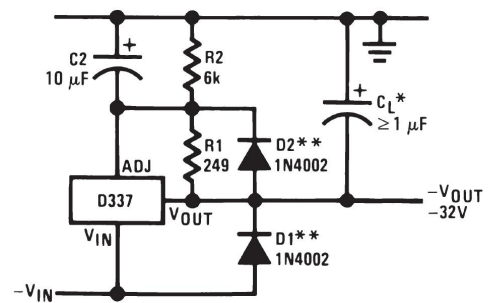
*C2 = 1 μF solid tantalum is required only if regulator is more than 4" from power-supply filter capacitor

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



*Minimum output ≈ -1.3V when control input is low

Negative Regulator with Protection Diodes



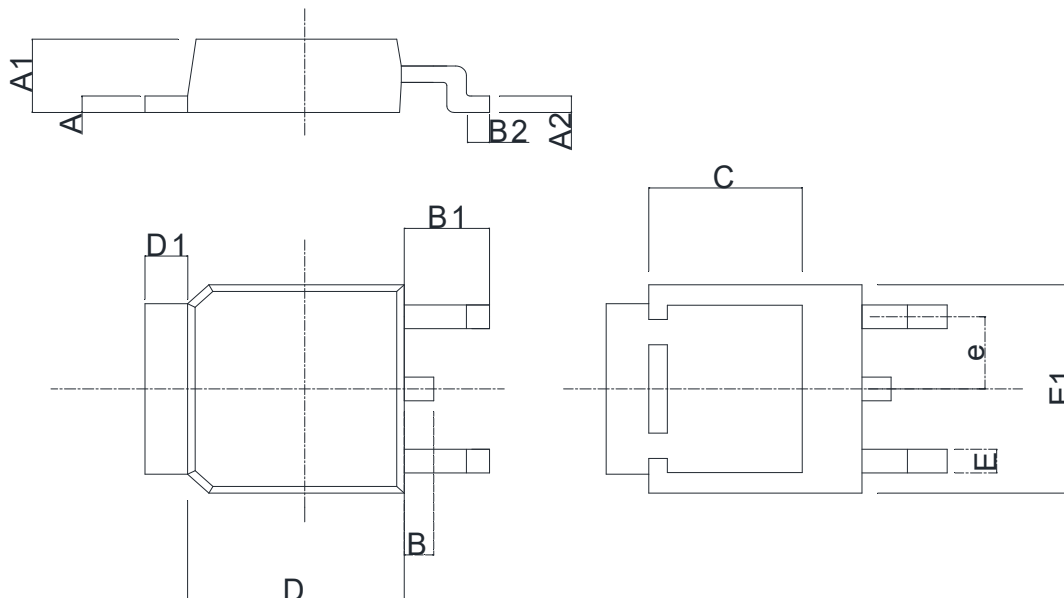
*When C_L is larger than 20 μF, D1 protects the LM137 in case the input supply is shorted

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

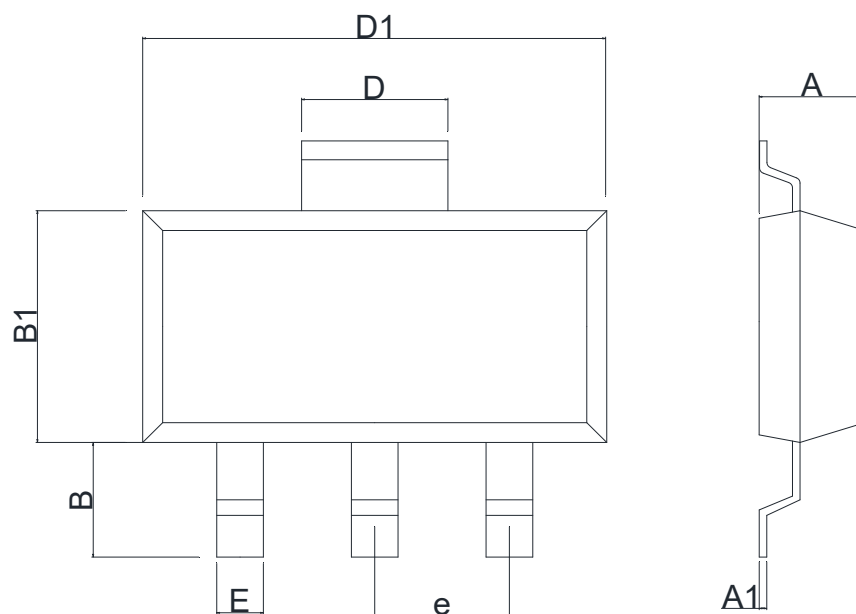
Outline Dimensions

TO252-2

Unit:mm



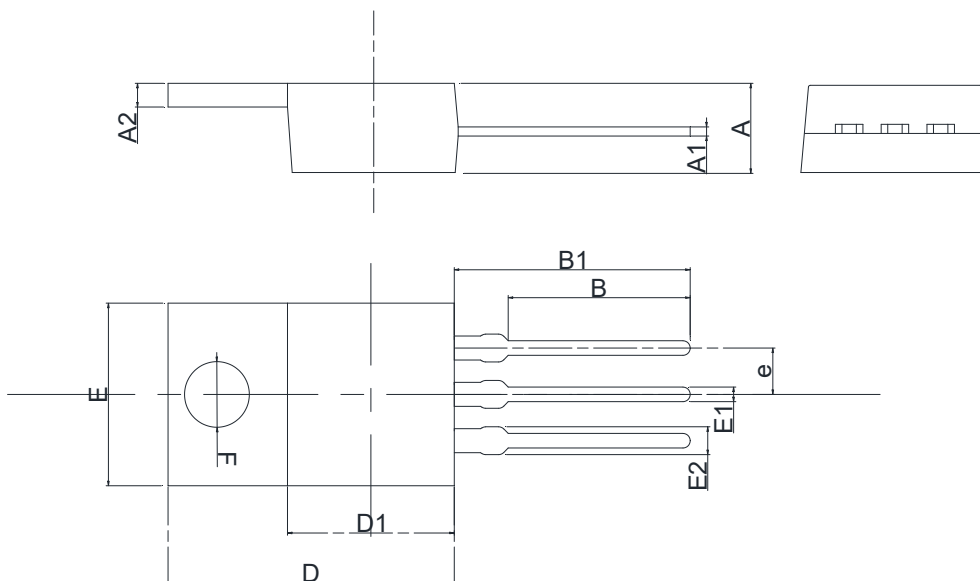
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.470	0.570	0.018	0.023
A1	2.220	2.380	0.087	0.094
A2	0.470	0.570	0.018	0.023
B	0.820	0.840	0.032	0.033
B1	2.380	2.480	0.093	0.098
B2	0.500	0.520	0.019	0.021
C	4.250	4.450	0.167	0.176
D	6.000	6.200	0.236	0.245
D1	1.150	1.250	0.045	0.050
E	0.650	0.850	0.025	0.034
E1	6.450	6.750	0.253	0.266
e	2.285 (BSC)		0.090 (BSC)	



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.550	1.650	0.061	0.064
A1	0.280	0.320	0.011	0.012
B	1.750	1.950	0.068	0.076
B1	3.350	3.550	0.131	0.140
E	0.660	0.760	0.025	0.030
D1	6.450	6.550	0.253	0.257
D	2.900	3.000	0.114	0.118
e	2.300 (BSC)		0.090 (BSC)	

TO220-3

Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.300	4.800	0.169	0.189
A1	0.340	0.600	0.013	0.023
A2	1.220	1.400	0.047	0.055
B	9.460	10.380	0.372	0.408
B1	12.880	13.760	0.507	0.541
D	14.410	15.900	0.567	0.626
D1	8.000	9.000	0.314	0.354
E	9.700	10.400	0.381	0.409
E1	0.700	0.900	0.027	0.036
E2	1.220	1.400	0.048	0.055
e	2.540 (BSC)		0.984 (BSC)	
F	Φ 3.800	Φ 3.900	Φ 0.149	Φ 0.153

Statements

- Silicore Technology reserves the right to make changes without further notice to any products or specifications herein. Before customers place an order, customers need to confirm whether datasheet obtained is the latest version, and to verify the integrity of the relevant information.

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