



钲地半导体
Tudi Semiconductor

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Product Specification

TUDI-LM285

Micropower Voltage Reference Diode

网址 www.sztdbdt.com Q

用芯智造 · 卓越品质

semiconductor device
manufacturer

- Design
- research and development
- production
- and sales



Features

- $\pm 3\%$ Initial Tolerance
- Operating Current of 100 μ A to 20mA
- 0.8 Ω Dynamic Impedance
- Low Temperature Coefficient
- Low Voltage Reference—1.235V
- 2.5V Device Also Available

Description

The LM285 is a micro-power-bandgap reference voltage source fabricated using bipolar process technology. It delivers stable voltage reference across an operating current range of 100 μ A to 20mA, featuring low dynamic resistance and excellent temperature stability. The integrated reference adjustment mechanism ensures minimal output voltage tolerance. With its bandgap reference architecture consisting solely of transistors and resistors, the circuit exhibits low noise levels and superior long-term stability.

The LM285 design has been meticulously engineered to address potential challenges under diverse load conditions, ensuring exceptional adaptability to external loads and reliable performance across most reference voltage source applications. Its wide dynamic operating range enables the chip to maintain outstanding adjustment capabilities even when power supply fluctuations occur significantly.

The LM285 delivers precise reference voltage with minimal load current, making it ideal for low-power circuits as a reference voltage source in battery-powered portable devices, regulated power supplies, and general analog circuits.

The LM285 series products are available in two fixed voltage specifications: 1.2V (LM285-1.2) and 2.5V (LM285-2.5). Standard package types for the LM285 include TO-92, SOT-23 and SOP-8.

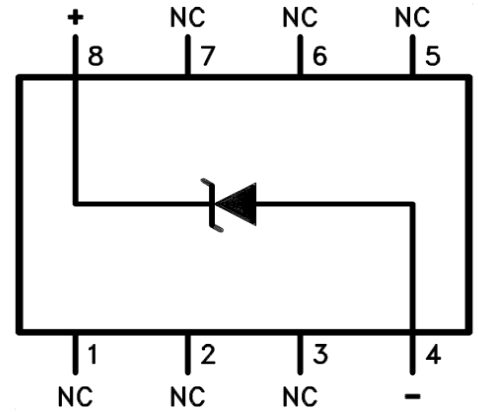


Figure 1. SOP8 Pin Diagram

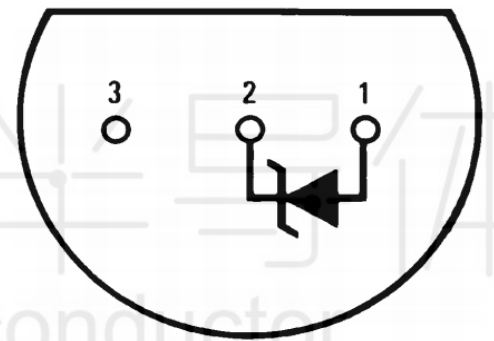


Figure 2. TO92 Pin Diagram

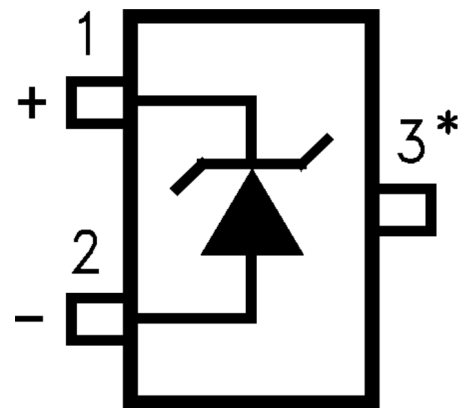


Figure 3. SOT23 Pin Diagram



Pin Description

Pin number			Name	Function
TO92	SOT23	SOP8		
2	1	8	Anode	Positive pole
1	2	4	Cathode	Negative pole
3	3	1,2,3,5,6,7	NC	No internal connections

Absolute Rating

Project	Parameter values	Unit
Back current	30	mA
Forward current	10	mA
Operating temperature range	-40~85	°C
Storage temperature	-55~150	°C
Welding temperature (spot welding, 10 seconds)	260	°C

Note: Limit parameters refer to the maximum values that must not be exceeded under any conditions. Exceeding these limits may cause physical damage such as product degradation. Additionally, normal chip operation cannot be guaranteed when approaching limit parameters.



Electrical parameters (1) LM285-1.2V (Ta=25 , unless otherwise specified)

Parameter	Test condition	Representative value	LM285B-1.2		LM285-1.2		Unit
			Least	Crest	Least	Crest	
Breakdown reverse voltage	Ta=25°C, 100μA ≤ IR ≤ 20mA	1.235	1.223	1.247	1.205	1.260	V
Minimum working current		100		120		120	μA
Rate of change of reverse breakdown voltage with current	100μA ≤ IR ≤ 1mA			1.5		1.5	mV
	1mA ≤ IR ≤ 20mA			25		25	
Reverse dynamic impedance	IR=100μA, f=20Hz	1					Ω
Multi-frequency noise(rms)	IR=100μA, 10 Hz ≤ f ≤ 10kHz	60					μV
Long term stability	IR=100μA, T=1000Hr, TA=25°C ± 0.1°C	20					ppm
Mean temperature coefficient	IR=100 μA	80		150		150	ppm/°C

Electrical parameters (2) LM285-2.5V (Ta=25 , unless otherwise specified)

Parameter	Test condition	Representative value	LM285A-2.5		LM285B-2.5		LM285-2.5		Unit
			Least	Crest	Least	Crest	Least	Crest	
Breakdown reverse voltage	Ta=25°C, 100μA ≤ IR ≤ 20mA	2.5	2.480	2.520	2.462	2.538	2.425	2.575	V
Minimum working current		100		120		130		130	μA
Rate of change of reverse breakdown voltage with current	100μA ≤ IR ≤ 1mA			1.5		2.5		2.5	mV
	1mA ≤ IR ≤ 20mA			20		25		25	
Reverse dynamic impedance	IR=100μA, f=20Hz	1							Ω
Multi-frequency noise(rms)	IR=100μA, 10Hz ≤ f ≤ 10kHz	120							μV
Long term stability	IR=100μA, T=1000Hr, TA=25°C ± 0.1°C	20							ppm
Mean temperature coefficient	IR=100 μA	80		150		150		150	ppm/°C



Application circuit diagram and working principle explanation for wide

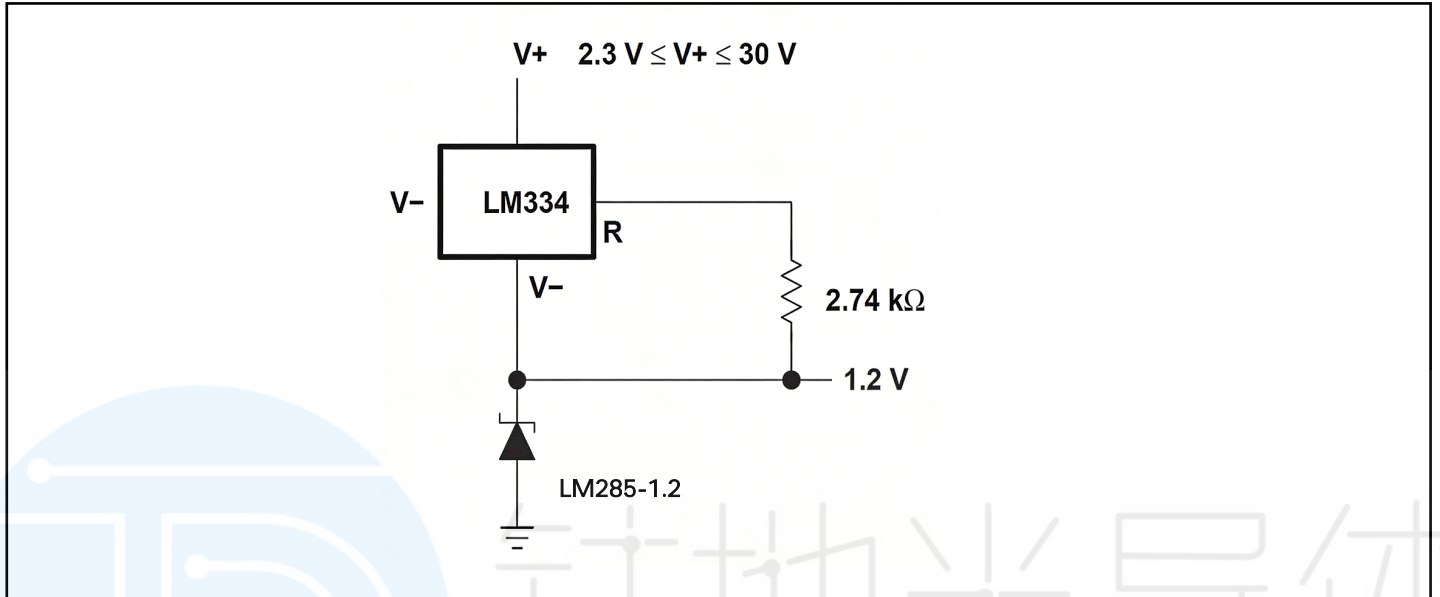


Figure 4 Input range reference

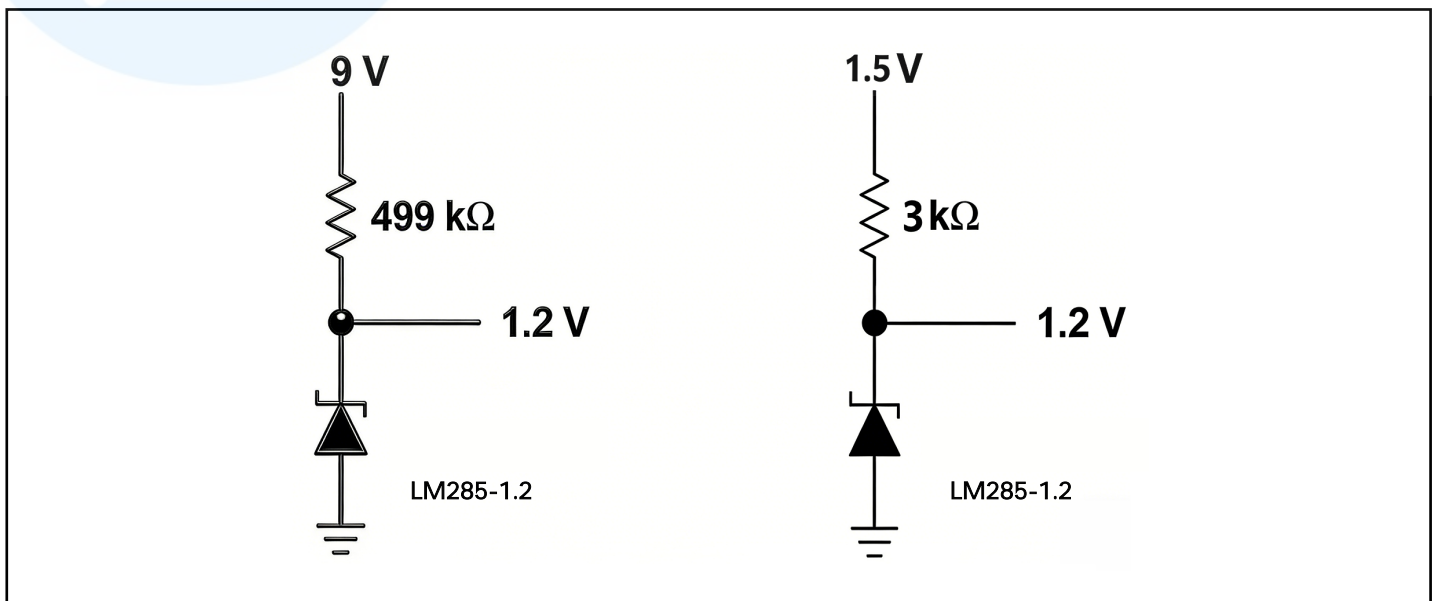


Figure 5 Micro Power Supply Reference (9V and 1.5V)

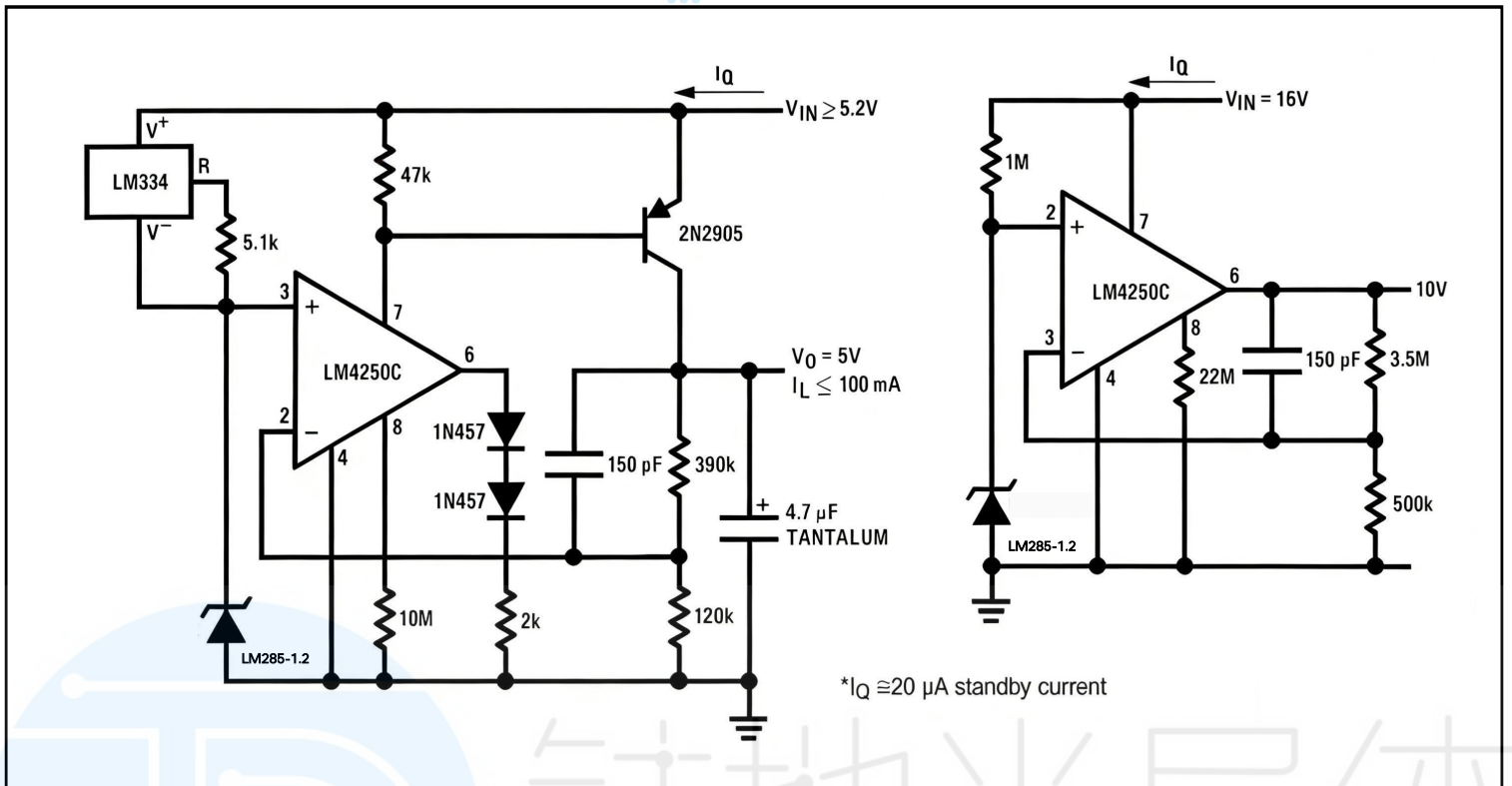


Figure 6 5V Regulator and 10V Reference Voltage Source

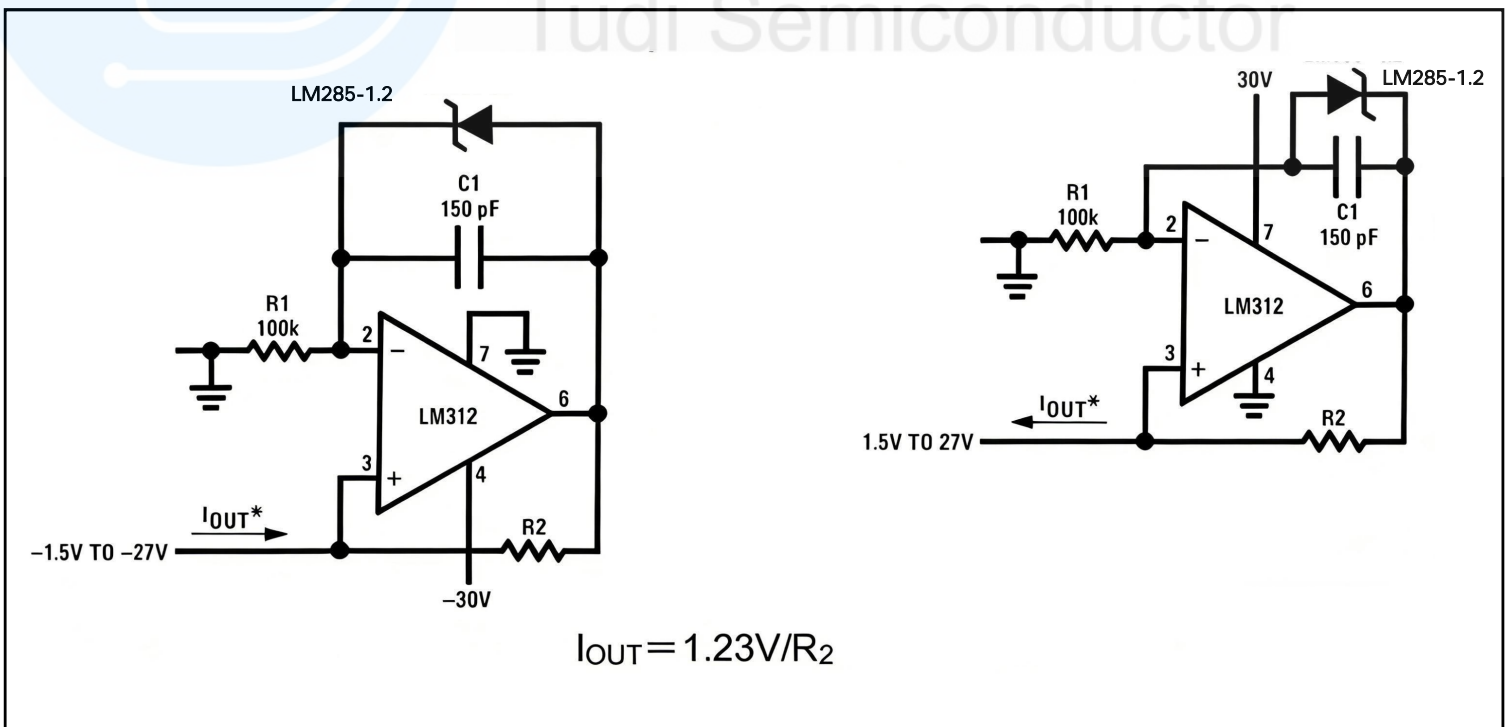


Figure 7 1μA to 1mA Precision Current Source

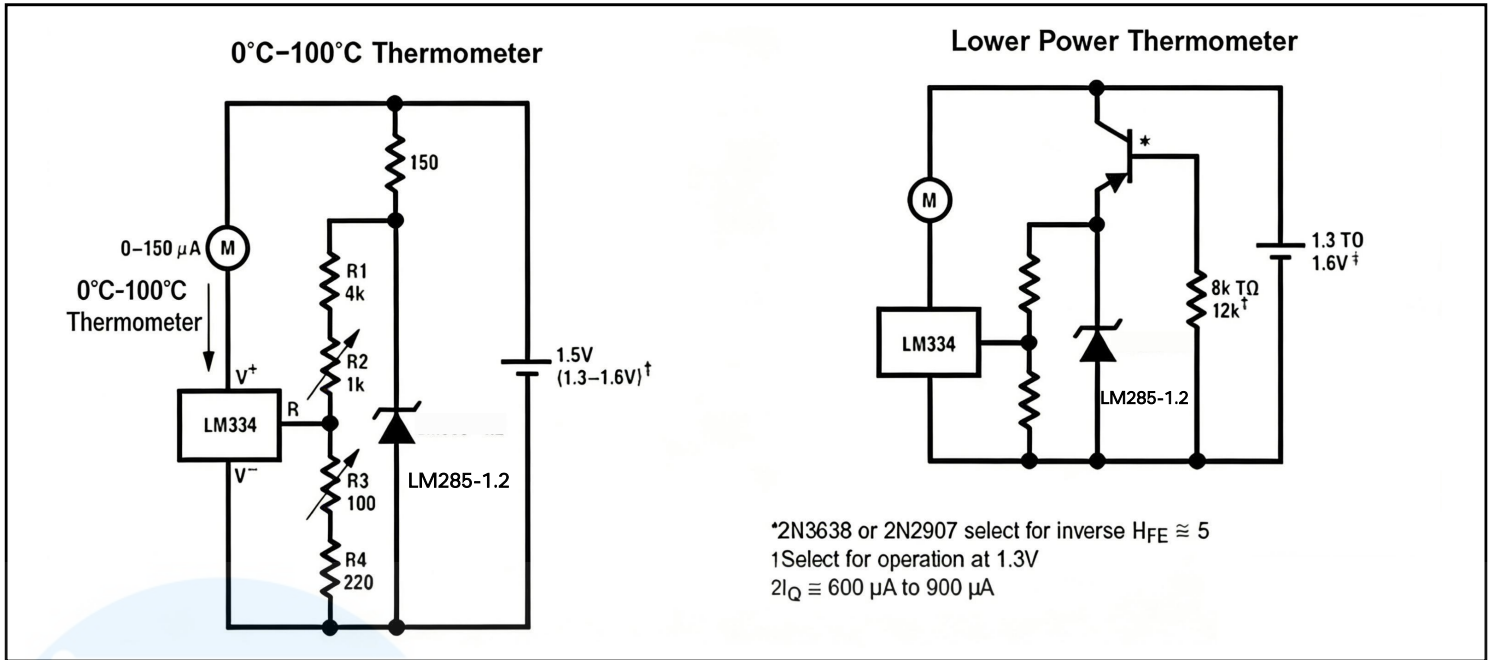


Figure 8 Thermometer

Reverse HFE = 5, select device as 2N3638 or 2N2907.

Select to operate at 1.3V; \uparrow I_Q=600 μA ~900 μA

Short-circuit LM285, adjust R3 to make I_{OU}=temp@1 $\mu\text{A}/^\circ\text{K}$; remove short-circuit, adjust R2, read out appropriate percentage temperature value: I_Q at 1.3V@500 μA ; I_Q at 1.6V@2.4 mA

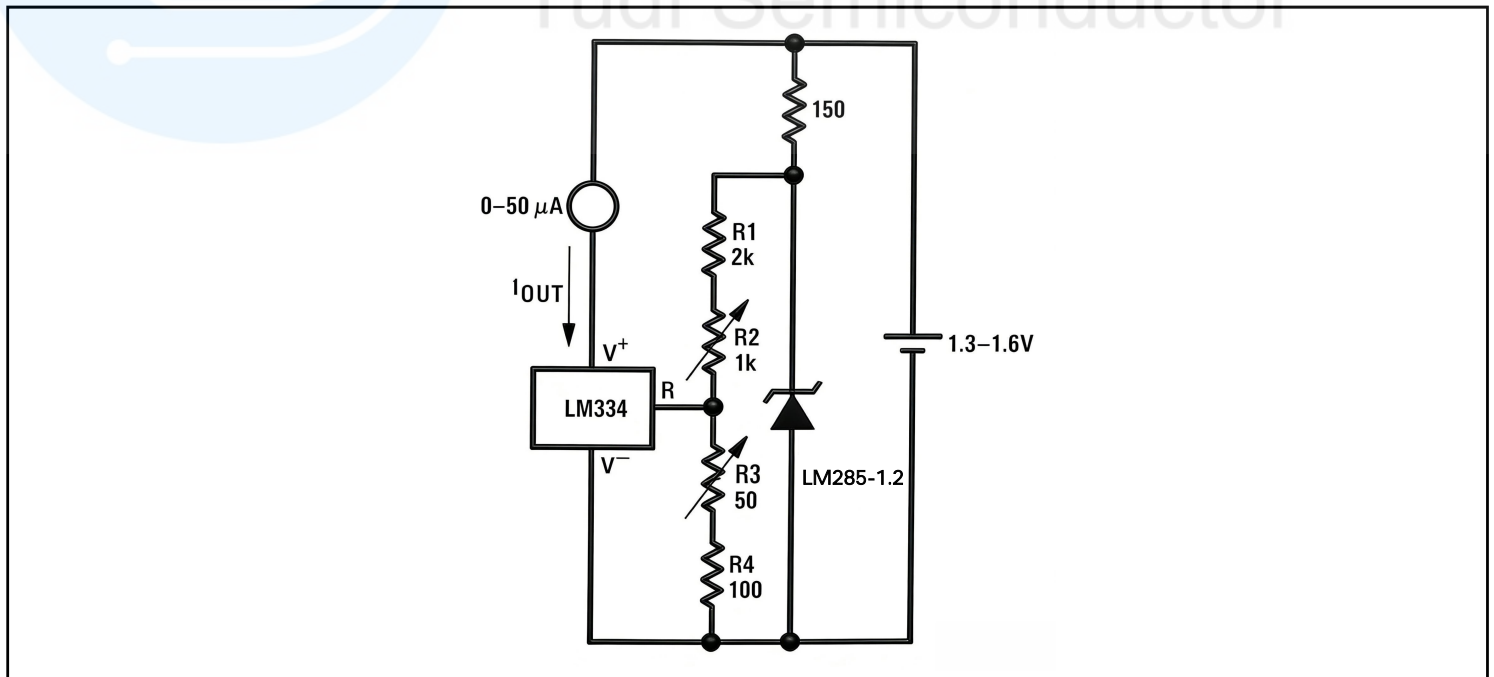


Figure 9 0-50°C Thermometer

Short-Circuit the LM285 and Adjust R3 to Set I_{OUT}=temp@ 1.8 $\mu\text{A}/^\circ\text{K}$; Remove the Short Circuit, Adjust R2, and Read the Correct Value in Units of T.

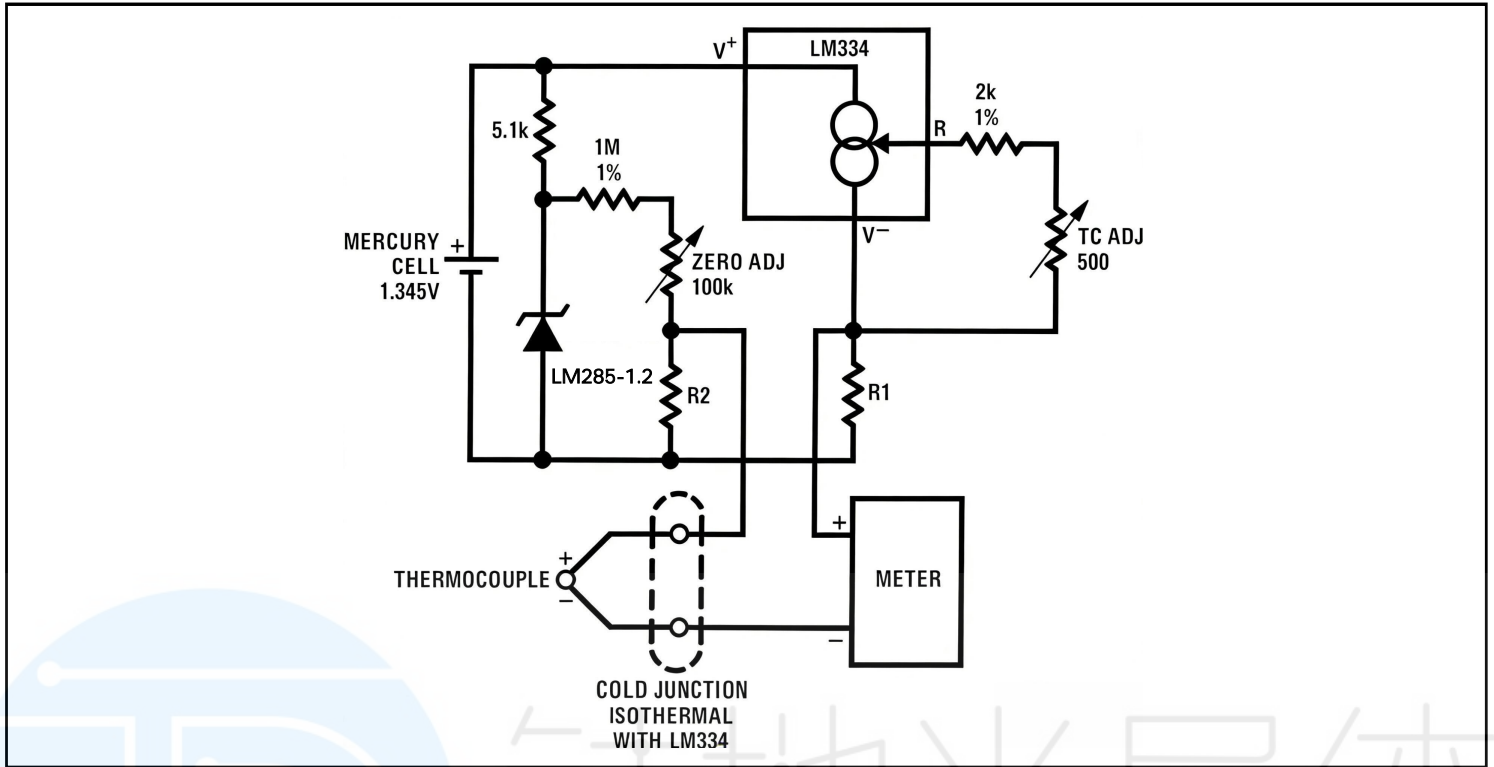


Figure 10 Low-Power Thermal Corner Room Temperature Connection Compensator

- Adjust TC ADJ until the voltage across R1 and the thermoelectric figure of merit corresponding to absolute temperature are in proportional relationship.
- Adjust ZERO ADJ until the voltage across R2 becomes proportional to the thermoelectric figure of merit corresponding to the relative temperature (273.2K).

Thermoelectric corner type	Proportionality coefficient ($\mu\text{V}/1^\circ\text{C}$)	R1 (Ω)	R2 (Ω)	Voltage across the R1 terminals@25°C	Voltage across the R2 terminals@25°C
J	52.3	523	1.24K	15.60	14.32
T	42.8	432	1K	12.77	11.78
K	40.8	412	953	12.17	11.17
S	6.4	63.4	150	1.908	1.766

The typical power supply current is 50 μA .

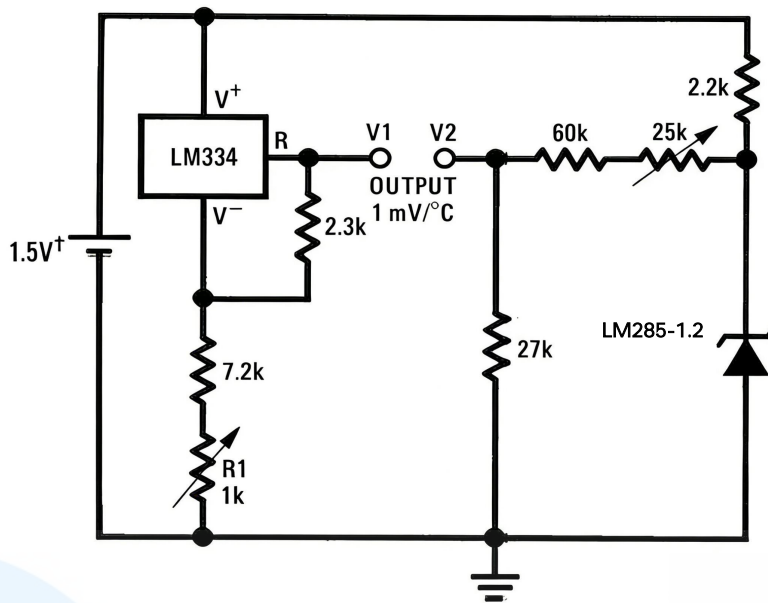


Figure 11 Percentage Thermometer

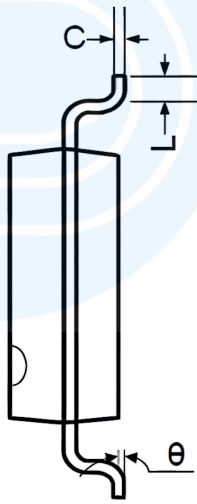
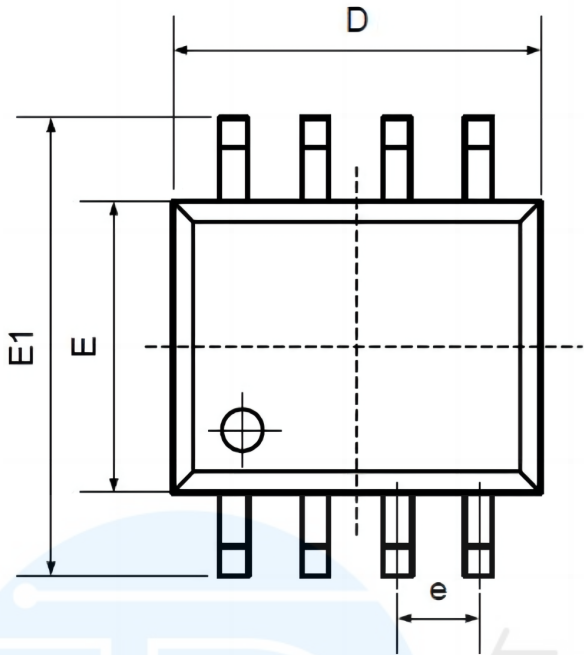
Adjust R1 to set $V1 = \text{temp} @ 1\text{mV}/^\circ\text{K}$; adjust V2 to 273.2mV. IQ ranges from 1.3V to 1.6V power supply voltage; age = 50~150 μA

Order information

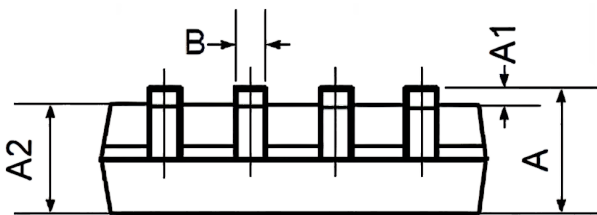
Order Number	Package	Package Quantity	Marking On The park	Temperature	Data Rate
LM285DR-1-2-TUDI	SOP8	Tape,Reel,2500	285-12	-40°C to 85°C	1.235V
LM285BDR-1-2-TUDI	SOP8	Tape,Reel,2500	285B12		
LM285LPR-1-2-TUDI	TO92-3	A box of 1800	285-12		
LM285DR-2-5-TUDI	SOP8	Tape,Reel,2500	285-25	-40°C to 85°C	2.5V
LM285BDR-2-5-TUDI	SOP8	Tape,Reel,2500	285B25		
LM285LPR-2-5-TUDI	TO92-3	A box of 1800	285-25		



Package SOP8

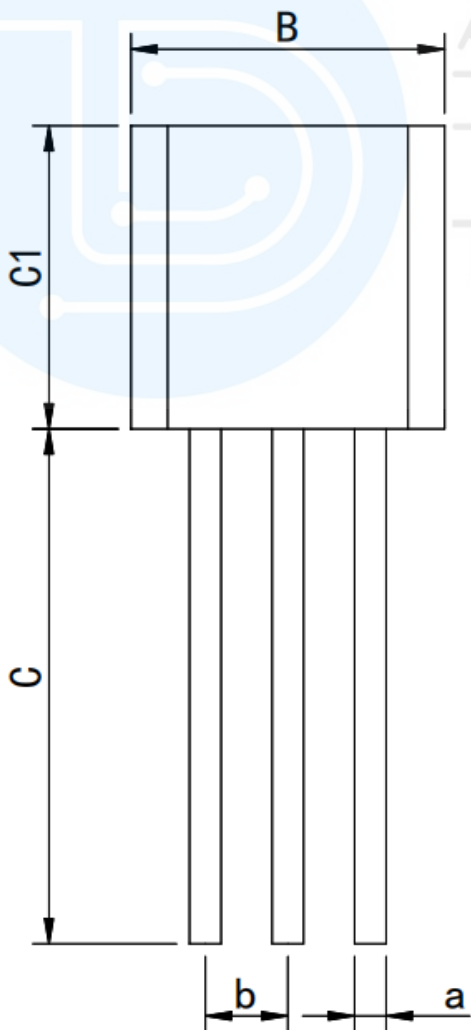
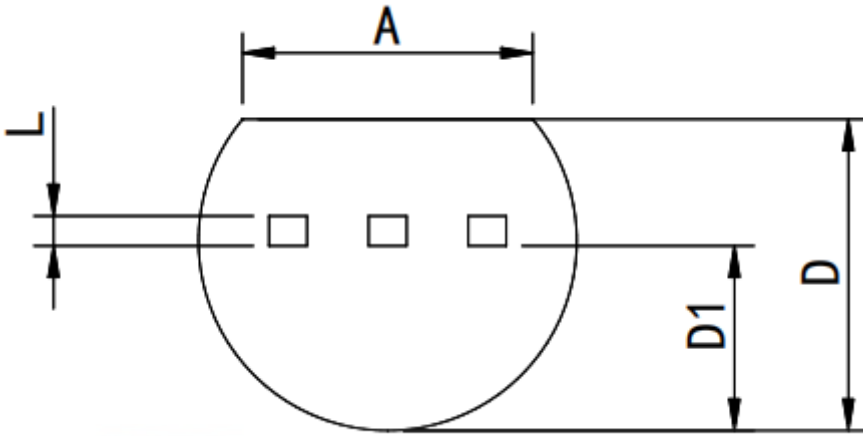


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°





Package TO92



Symbol	Min	Max
A	3.43	4.13
B	4.44	5.21
C	13.5	15.3
C1	4.32	5.34
D	3.17	4.19
D1	2.03	2.67
L	0.33	0.42
a	0.40	0.52
b	1.27BSC	



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