LM385-1.2 Micropower Voltage Reference Diode

1. General Description

1.1 Description

The LM385-1.2 is a micropower 2-terminal band-gap voltage references regulator diode. Operating over a 10-uA to 20-mA current range, it features exceptionally low dynamic impedance and good temperature stability. On-chip trimming provides tight voltage tolerance. Since the band-gap reference uses only transistors and resistors, low noise and long-term stability result.

The careful design makes the device exceptionally tolerant of capacitive loading, making it easy to use in most reference applications. The wide dynamic operating range allows its use with widely varying supplies with excellent regulation.

The extremely low power drain of the LM385-1.2 makes it useful for micropower circuitry. This voltage reference can be used to make portable meters,regulators or general purpose analog circuitry with battery life approaching shelf life.

The wide operating current range allows it to replace older references with tighter tolerance part.

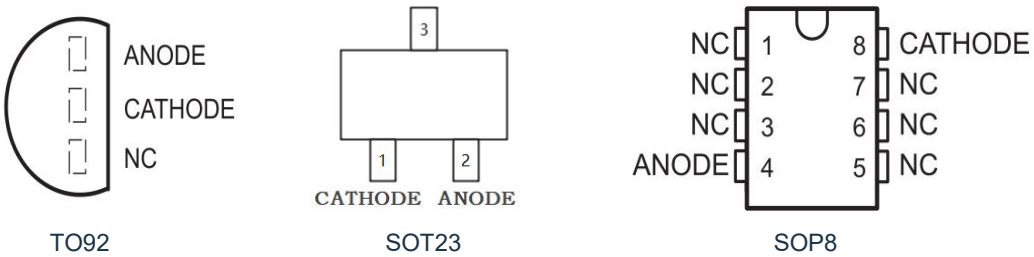
1.2 Features

- Operating Current Range：10 μ A to 20 mA
- ±1% Initial Voltage Tolerance
- Reference Impedance：0.6Ω(Typ) at 25° C
- Very Low Power Consumption
- Low Voltage Reference: 1.235V

1.3 Device Information

PART NUMBER	PACKAGE
LM385	TO92
	SOT23
	SOP8

2. Connection Diagrams and Pin Description

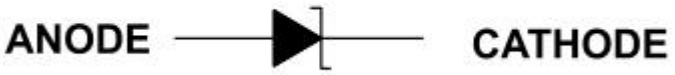


TO92 SOT23 SOP8

Figure 2.1 Top View

PIN				FUNCTION
NAME	No.			
	TO92	SOT23	SOP8	
CATHODE	2	1	8	Shunt Current/Voltage input
ANODE	3	2	4	Common pin, normally connected to ground
NC	1	3	1 ,2,3,5,6, 7	Not connect

2.1 Simplified Schematic



3. System Diagram

3.1 Function Block Diagram

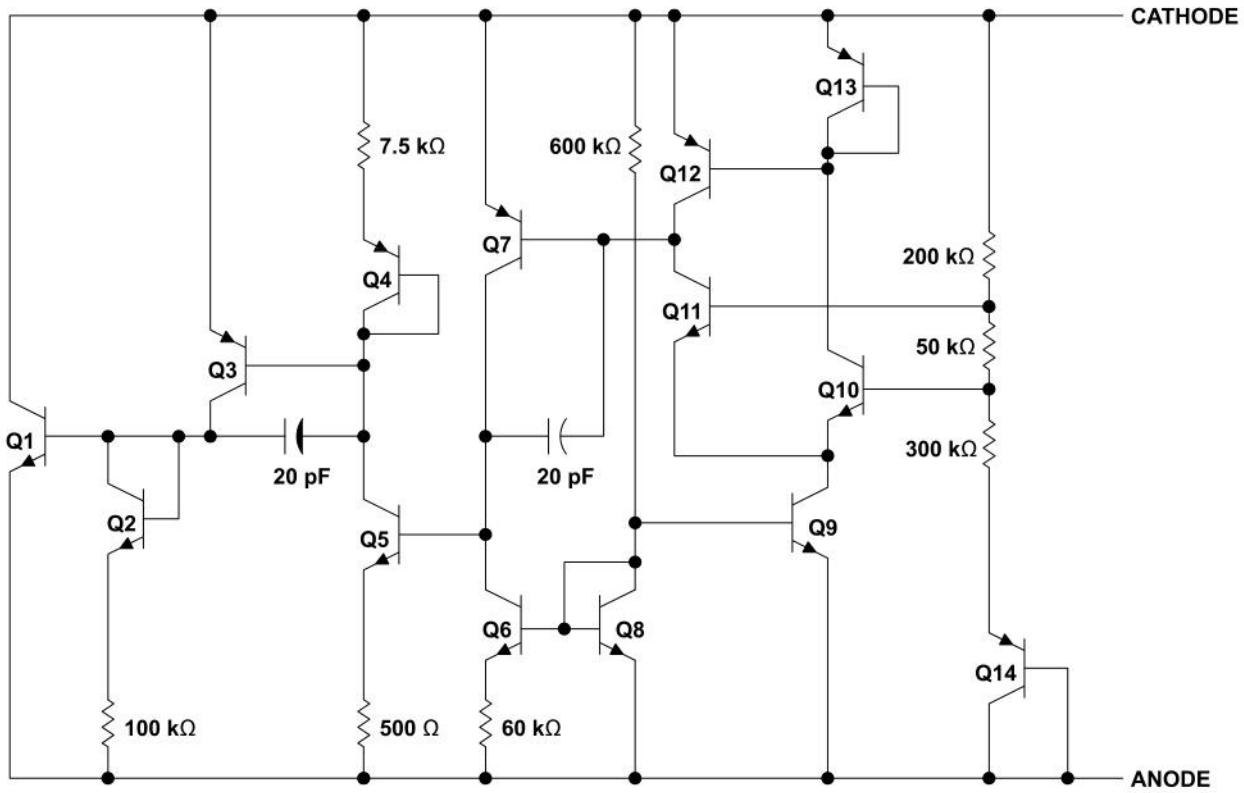


Figure 3.1：LM385 Function Block Diagram

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
IR	Reverse Current	-	30	mA
IF	Forward Current		10	mA
Tstg	Storage temperature	-65	150	℃
TJ	Operating Junction Temperature		150	℃
TA	Operating free-air temperature	-40	85	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

4.2 Recommended Operating Conditions

(T_a=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Symbol	Parameter	MIN	MAX	Unit
IZZ	Reference current	0.01	20	mA

4.3 Electrical Characteristics

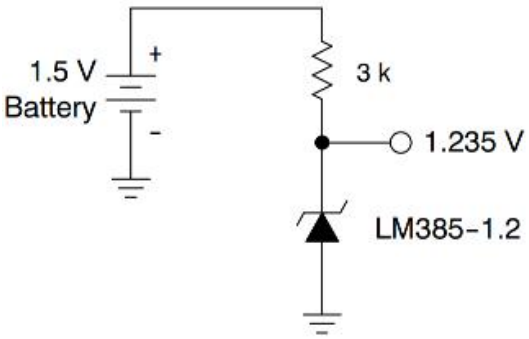
4.3.1 DC Specifications

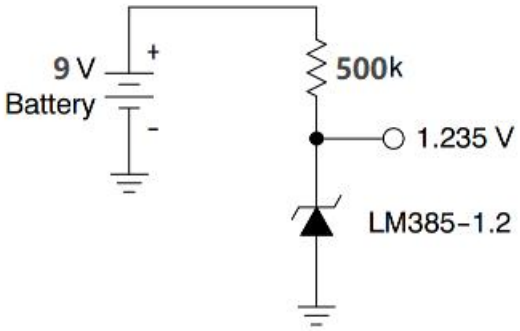
(T_a=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_Z	Reference voltage	I_Z= 1 mA	1.223	1.235	1.247	V
I_Z(min)	Minimum reference current		-	7	15	μA
ΔV_Z	Reverse Breakdown Voltage Change with Current	I_Z= 10uA to 1mA	-	-	1.5	mV
		I_Z= 1mA to 20mA	-	-	25	mV
Z_Z	Reverse Dynamic Impedance	I_Z= 100 μA, f = 20 Hz	-	0.6	-	Ω
Vn	Wideband Noise (rms)	I_Z= 100 μA, f = 10 Hz to 10 kHz	-	60	-	μV
$\Delta V_Z/\Delta t$	Long-term change in reference voltage	I_Z= 100 μA, T=1000Hr	-	20	-	ppm

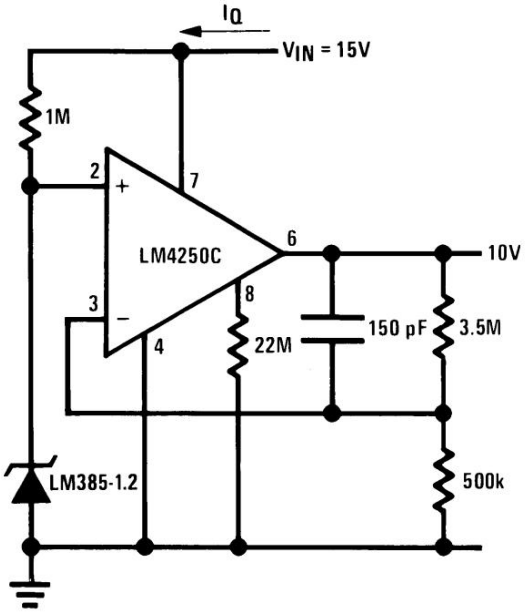
5. Typical Application

5.1 Reference from 1.5V / 9V Battery





5.2 Micropower 10V Reference



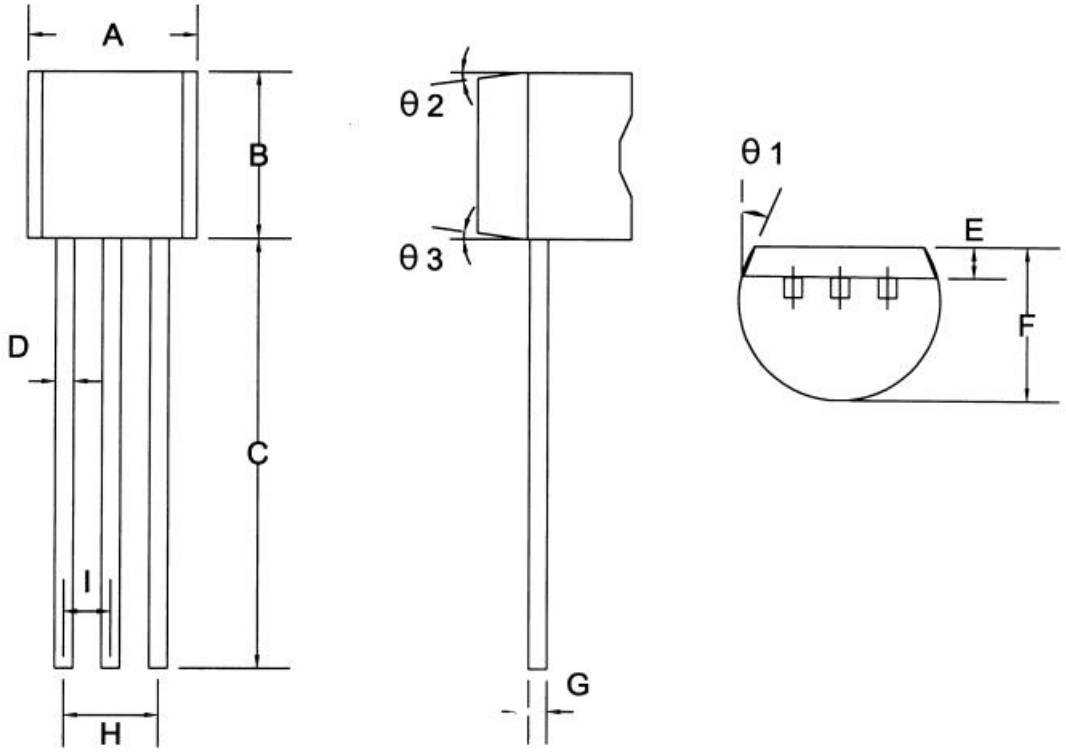
*I_Q= 20uA standby current

6. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
LM385-1.2KW03ABAQ	TO92	3	Bag	1000
LM385-1.2ST03ARCQ	SOT23	3	Tape & Reel	3000
LM385-1.2NS08ARBE	SOP8	8	Tape & Reel	2500

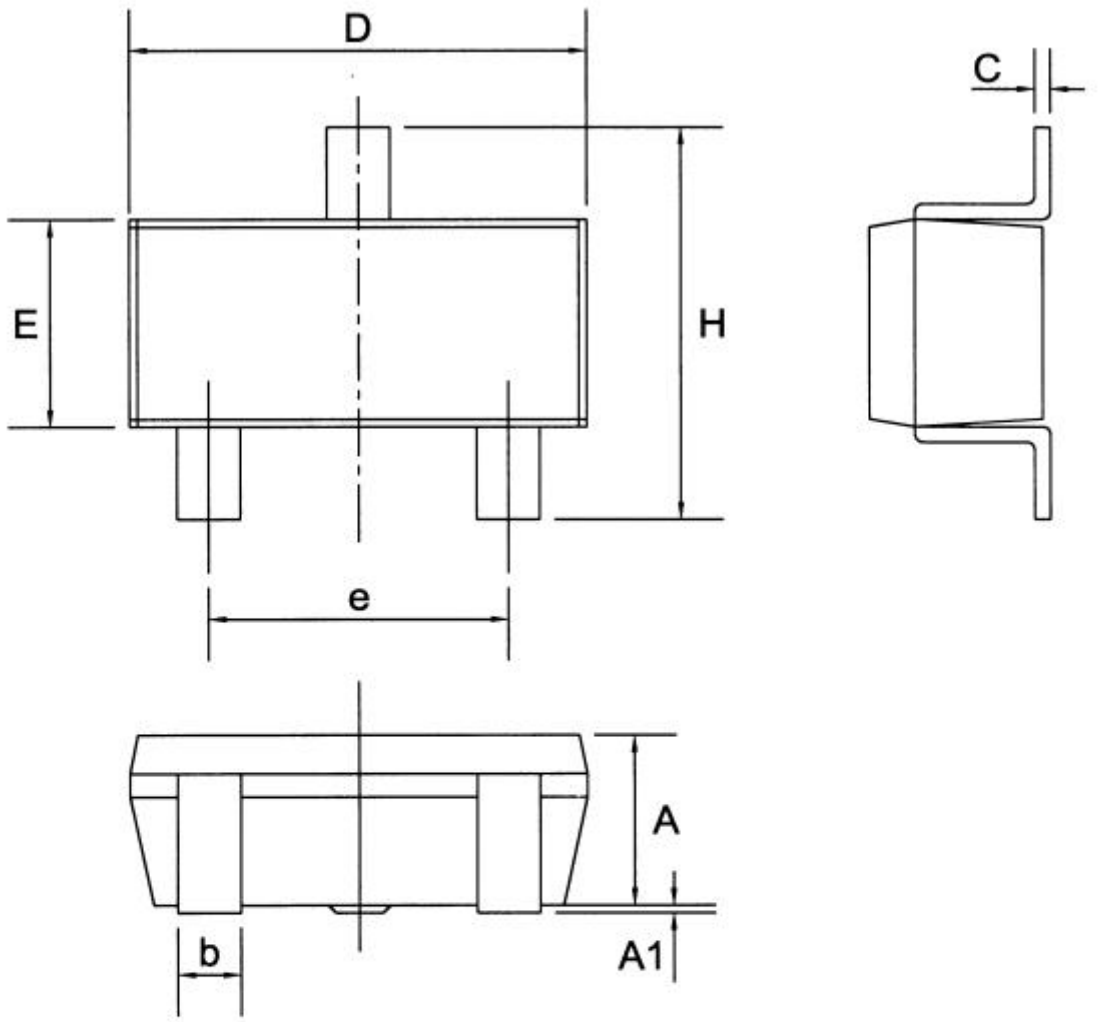
7. Package Information

7.1 TO92



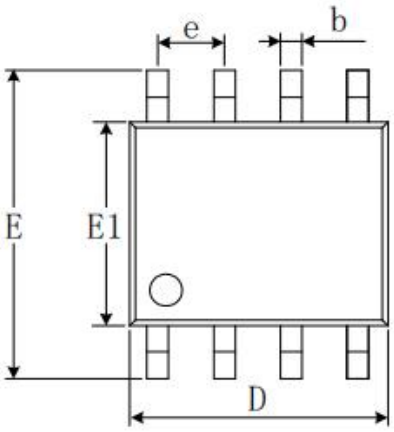
Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.33	4.58	4.83	0.170	0.180	0.190
B	4.33	4.58	4.83	0.170	0.180	0.190
C	14.07	14.47	14.87	0.554	0.570	0.585
D	0.34	0.44	0.54	0.013	0.017	0.021
E	0.92	1.02	1.12	0.036	0.040	0.044
F	3.36	3.56	3.76	0.132	0.140	0.148
G	0.34	0.44	0.54	0.013	0.017	0.021
H	2.42	2.54	2.66	0.095	0.100	0.105
I	1.15	1.27	1.39	0.045	0.050	0.055
θ1	—	5°	—	—	5°	—
θ2	—	2°	—	—	2°	—
θ3	—	2°	—	—	2°	—

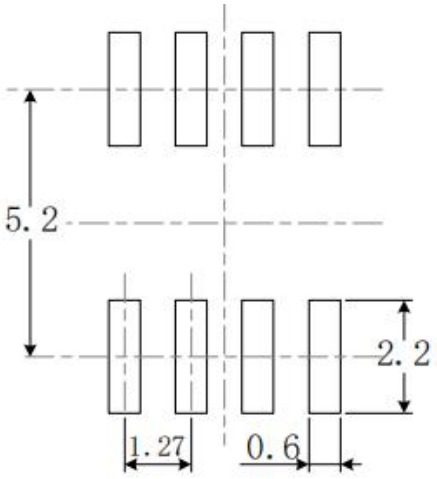
7.2 SOT23



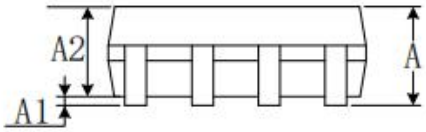
Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.05	1.15	1.35	0.041	0.045	0.053
A1	—	0.05	0.10	—	0.002	0.004
b	0.35	0.40	0.55	0.014	0.016	0.022
C	0.08	0.10	0.20	0.003	0.004	0.008
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.20	1.35	1.50	0.047	0.053	0.059
e	1.70	1.90	2.10	0.067	0.075	0.083
H	2.35	2.55	2.75	0.093	0.100	0.108

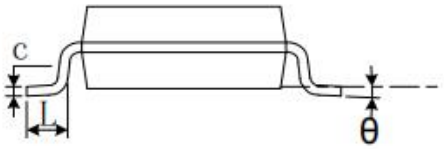
7.3 SOP8





RECOMMENDED LAND PATTERN (Unit: mm)





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	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°