

## FEATURES

- Operating Current of 15 $\mu$ A to 20mA for 1.2V
- Operating Current of 20 $\mu$ A to 20mA for 2.5V
- Operating Current of 13 $\mu$ A to 20mA for ADJ
- 1% and 2% Initial Tolerance
- 1 $\Omega$  Dynamic Impedance
- Low Temperature Coefficient
- Adjustable from 1.24V to 5.3V for ADJ
- Available in TO-92 and SOP-8 Packages

## APPLICATIONS

- Portable Meter References
- Portable Test Instruments
- Battery-Operated Systems
- Current-Loop Instrumentation
- Panel Meters

## DESCRIPTION

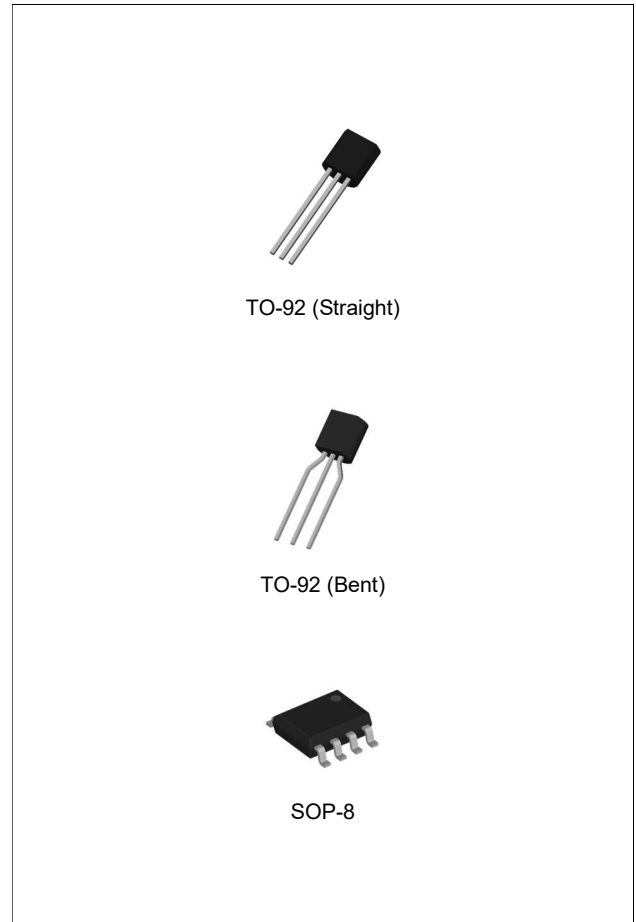
The LM385 series are micropower bandgap voltage reference diodes.

LM385-1.2/ 2.5 are 2-terminal bandgap voltage reference diodes operate over a 15 $\mu$ A to 20mA current range. LM385-ADJ is 3-terminal adjustable bandgap voltage reference diode operates from 1.24V to 5.3V and over 13 $\mu$ A to 20mA current range. They feature exceptionally low dynamic impedance and good temperature stability. On-chip trimming is used to provide tight voltage tolerance. The LM385 bandgap reference has low noise and good long-term stability.

Careful design of the LM385 has made the device tolerant of capacitive loading, making it easy to use in almost any reference application. The wide dynamic operating range allows its use with widely varying supplies with excellent regulation.

The extremely low power drain of the LM385 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. Further, the wide operating current allows them to replace older references with tighter tolerance parts.

The LM385 is rated for operation over a -40°C to 85°C temperature range. The LM385 is available in a TO-92 and SOP-8 packages.



## ORDERING INFORMATION

Device	Package
LM385x-1.2	TO-92 (Bulk, Straight)
LM385xTA-1.2	TO-92 (Tape, Bent)
LM385xD-1.2	SOP-8
LM385x-2.5	TO-92 (Bulk, Straight)
LM385xTA-2.5	TO-92 (Tape, Bent)
LM385xD-2.5	SOP-8
LM385x-ADJ	TO-92 (Bulk, Straight)
LM385xTA-ADJ	TO-92 (Tape, Bent)
LM385xD-ADJ	SOP-8

## ABSOLUTE MAXIMUM RATINGS (Note 1)

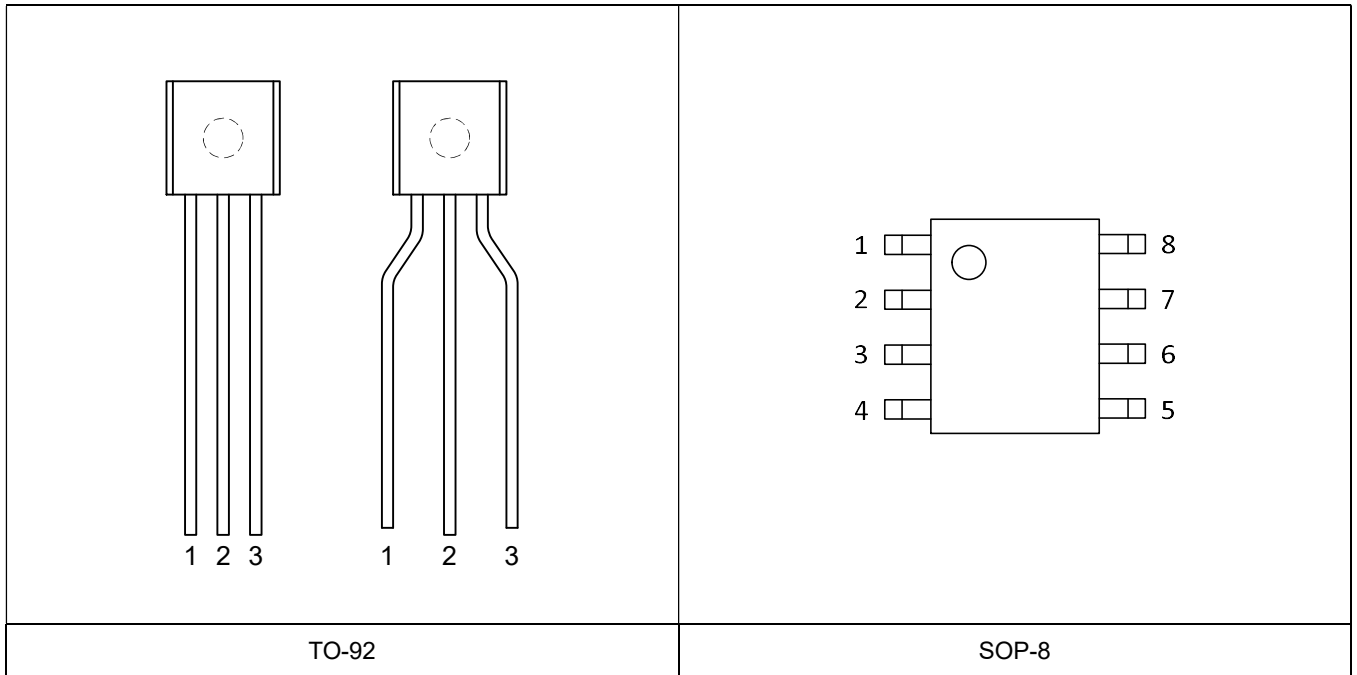
CHARACTERISTIC	SYMBOL	MIN	MAX	UNIT
Reverse Current	$I_R$	-	30	mA
Forward Current	$I_F$	-	10	mA
Operating Ambient Temperature Range	$T_{OPR}$	-40	85	°C
Junction Temperature	$T_J$	-	100	°C
Storage Temperature Range	$T_{STG}$	-65	150	°C

Note 1. Stresses listed as the absolute maximum ratings may cause permanent damage to the device.

## ORDERING INFORMATION

VOUT	Package	Order No.	Description	Supplied As	Status
1.2	TO-92	LM385-1.2	2.0%, Straight Lead	Bulk	Active
	TO-92	LM385B-1.2	1.0%, Straight Lead	Bulk	Active
	TO-92	LM385TA-1.2	2.0%, Bent Lead	Tape & Ammo Pack	Active
	TO-92	LM385BTA-1.2	1.0%, Bent Lead	Tape & Ammo Pack	Active
	SOP-8	LM385D-1.2	2.0%	Tape & Reel	Contact Us
	SOP-8	LM385BD-1.2	1.0%	Tape & Reel	Contact Us
2.5V	TO-92	LM385-2.5	3.0%, Straight Lead	Bulk	Active
	TO-92	LM385B-2.5	1.5%, Straight Lead	Bulk	Active
	TO-92	LM385TA-2.5	3.0%, Bent Lead	Tape & Ammo Pack	Active
	TO-92	LM385BTA-2.5	1.5%, Bent Lead	Tape & Ammo Pack	Active
	SOP-8	LM385D-2.5	3.0%	Tape & Reel	Contact Us
	SOP-8	LM385BD-2.5	1.5%	Tape & Reel	Contact Us
ADJ	TO-92	LM385-ADJ	2.0%, Straight Lead	Bulk	Active
	TO-92	LM385B-ADJ	1.0%, Straight Lead	Bulk	Active
	TO-92	LM385TA-ADJ	2.0%, Bent Lead	Tape & Ammo Pack	Active
	TO-92	LM385BTA-ADJ	1.0%, Bent Lead	Tape & Ammo Pack	Active
	SOP-8	LM385D-ADJ	2.0%	Tape & Reel	Contact Us
	SOP-8	LM385BD-ADJ	1.0%	Tape & Reel	Contact Us

**PIN CONFIGURATION**



**PIN DESCRIPTION**

**1.2V/ 2.5V Output Version**

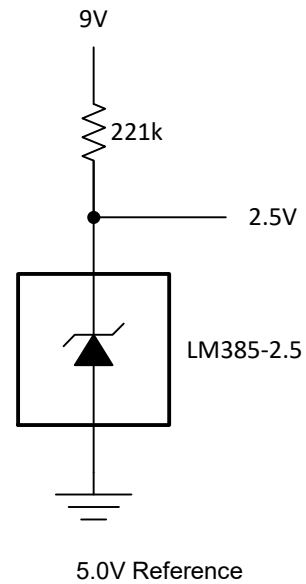
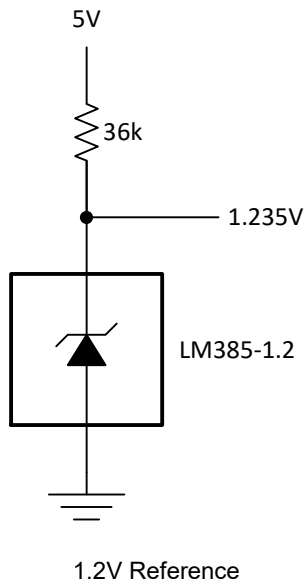
Pin No.		Pin Name	Pin Function
TO-92	SOP-8		
1	1, 2, 3, 5, 6, 7	NC	No Connection
2	8	CATHODE	Cathode
3	4	ANODE	Anode

**ADJ Output Version**

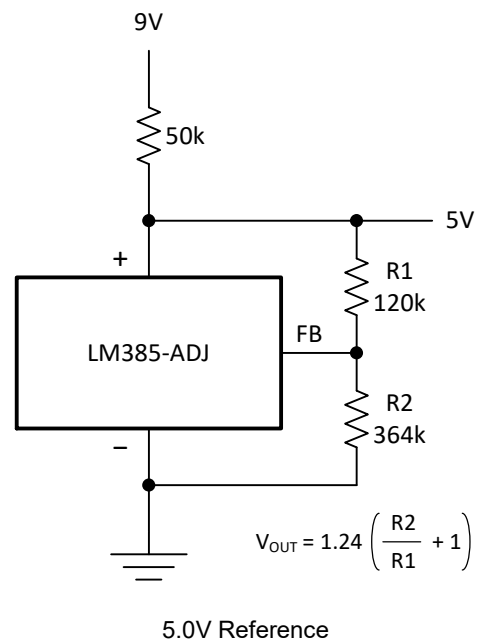
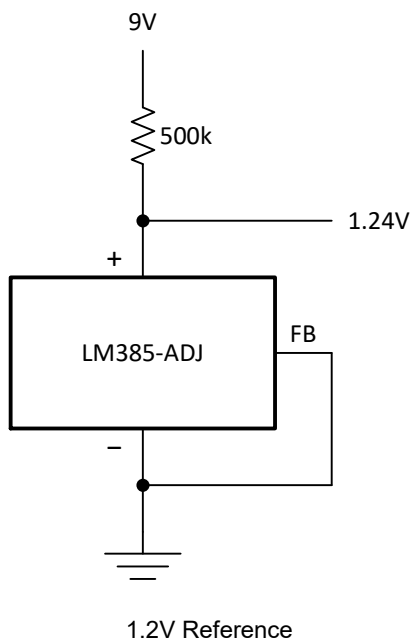
Pin No.		Pin Name	Pin Function
TO-92	SOP-8		
1	5	FB	Adjustable
2	8	+	Positive
3	4	-	Negative
-	1, 2, 3, 6, 7	NC	No Connection

## TYPICAL APPLICATIONS

### 1.2V/ 2.5V OUTPUT VERSION



### ADJ OUTPUT VERSION



## ELECTRICAL CHARACTERISTICS

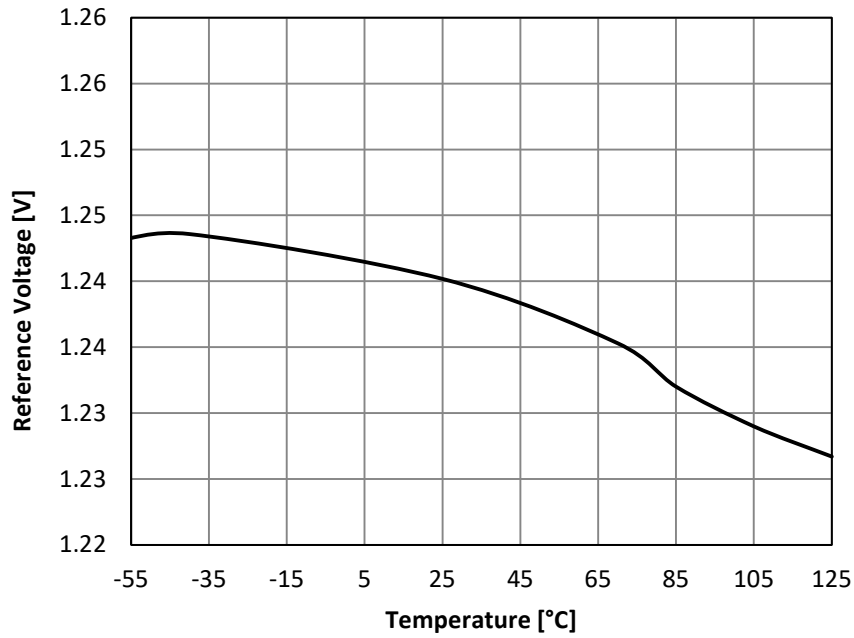
T<sub>A</sub> = 25°C unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>1.2 V REFERENCE</b>							
Reference Voltage	V <sub>R</sub>	I <sub>R</sub> = 1.0 mA	LM385	1.210	1.235	1.260	V
			LM385B	1.223	1.235	1.247	V
Reference Voltage Change with Current	ΔV <sub>R</sub> /ΔI <sub>R</sub>	I <sub>MIN</sub> < I <sub>R</sub> < 1.0 mA	-	-	1.0	mV	
		1.0 mA < I <sub>R</sub> < 20 mA	-	-	20	mV	
Minimum Operating Current	I <sub>Rmin</sub>		-	-	15	μA	
Average Temperature Coefficient (Note 2)	αV <sub>R</sub>	I <sub>R</sub> = 100 μA	-	50	-	ppm/°C	
<b>2.5 V REFERENCE</b>							
Reference Voltage	V <sub>R</sub>	I <sub>R</sub> = 1.0 mA	LM385	2.425	2.500	2.575	V
			LM385B	2.462	2.500	2.538	V
Reference Voltage Change with Current	ΔV <sub>R</sub> /ΔI <sub>R</sub>	I <sub>MIN</sub> < I <sub>R</sub> < 1.0 mA	-	-	2.0	mV	
		1.0 mA < I <sub>R</sub> < 20 mA	-	-	20	mV	
Minimum Operating Current	I <sub>Rmin</sub>		-	-	20	μA	
Average Temperature Coefficient (Note 2)	αV <sub>R</sub>	I <sub>R</sub> = 100 μA	-	50	-	ppm/°C	
<b>ADJ REFERENCE</b>							
Reference Voltage	V <sub>R</sub>	I <sub>R</sub> = 1.0 mA	LM385	1.215	1.240	1.265	V
			LM385B	1.228	1.240	1.252	V
Reference Voltage Change with Current	ΔV <sub>R</sub> /ΔI <sub>R</sub>	I <sub>MIN</sub> < I <sub>R</sub> < 1.0 mA	-	-	1.0	mV	
		1.0 mA < I <sub>R</sub> < 20 mA	-	-	15	mV	
Minimum Operating Current	I <sub>Rmin</sub>	V <sub>OUT</sub> = V <sub>REF</sub>	-	7.0	13	μA	
		V <sub>OUT</sub> = 5.0 V	-	35	60	μA	
Average Temperature Coefficient (Note 2)	αV <sub>R</sub>	I <sub>R</sub> = 100 μA	-	50	-	ppm/°C	

Note 2. The average temperature coefficient is defined as the maximum deviation of reference voltage at all measured temperatures from T<sub>MIN</sub> to T<sub>MAX</sub>, divided by T<sub>MAX</sub> - T<sub>MIN</sub>. It is not production tested.

TYPICAL OPERATING CHARACTERISTICS

ADJ OUTPUT VERSION



Temperature Drift

## REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

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