



Precision Micropower Bandgap Shunt Reference

CLM4040

FEATURES

- Trimmed Bandgap Design 0.2%
- Wide Operating Current Range 60 μ A to 20mA
- Low Dynamic Impedance 0.25 Ω
- Available in SOT-23, TO-92 and SO-8

APPLICATIONS

- Cellular Phones
- Portable Computers
- Instrumentation
- Automotive

DESCRIPTION

The CLM4040 is a two terminal precision voltage reference with thermal stability guaranteed over temperature, a typical dynamic impedance of 0.25 Ω and very sharp turn-on characteristics. The device has a fixed output of 2.5V for input currents between 60 μ A to 20mA and is an excellent choice for battery operated applications. Available in three tolerances, 0.5%, 1.0% and 2.0% and in three package outlines, SOT-23, SO-8 and TO-92.

ORDERING INFORMATION

Part	Package	Tolerance	Temp. Range
CLM4040CS	SOT-23	0.5%	-40°C to +85°C
CLM4040DS	SOT-23	1.0%	-40°C to +85°C
CLM4040ES	SOT-23	2.0%	-40°C to +85°C
CLM4040CY	SO-8	0.5%	-40°C to +85°C
CLM4040DY	SO-8	1.0%	-40°C to +85°C
CLM4040EY	SO-8	2.0%	-40°C to +85°C
CLM4040CN	TO-92	0.5%	-40°C to +85°C
CLM4040DN	TO-92	1.0%	-40°C to +85°C
CLM4040EN	TO-92	2.0%	-40°C to +85°C

SYMBOL DIAGRAM AND PIN CONFIGURATIONS

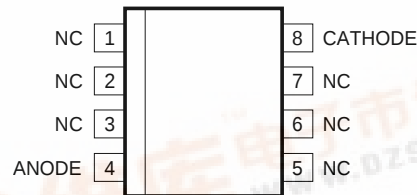
CATHODE



ANODE

1T-15

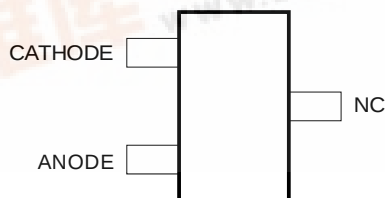
SO-8 LEAD



TOP VIEW

1T-13

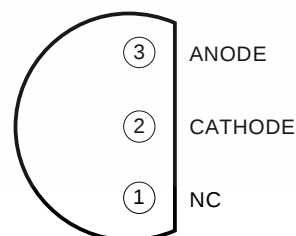
SOT-23-3 LEAD



TOP VIEW

1T-12

TO-92



TOP VIEW

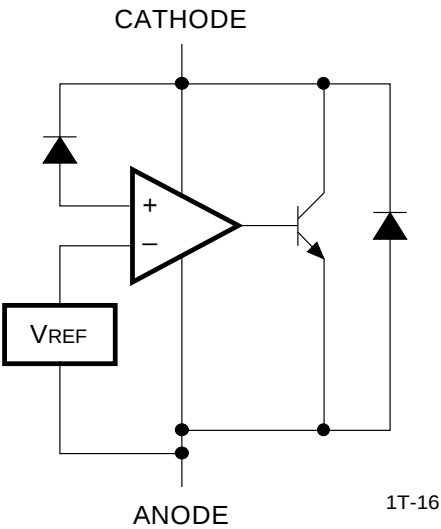
1T-14



ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	MAXIMUM	UNITS
	Reverse Current	20	mA
T _A	Operating Temperature Range	-40 to +85	°C
T _J	Operating Junction Temperature Range	-40 to +150	
T _{STG}	Storage Temperature Range	-65 to +150	
T _{LEAD}	Lead Temperature (Soldering) 10 Seconds	260	
ESD	ESD Rating	2	kV

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CLM4040C (0.5%)			CLM4040D (1.0%)			UNITS	CONDITIONS	
		MIN	TYP	MAX	MIN	TYP	MAX			
V_Z	Reverse Breakdown Voltage	2.488	2.500	2.512	2.475	2.500	2.525	V	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$
		2.471	2.500	2.529	2.451	2.500	2.549			$T_A = -40 \text{ to } +85^\circ\text{C}$
$I_{Z(\text{MIN})}$	Minimum Breakdown Current		60	80		60	80	μA		
$\frac{\Delta V_Z}{\Delta T}$	Reverse Breakdown Voltage Temperature Coefficient			± 100			± 150	$\text{ppm}/^\circ\text{C}$	$I_Z = 10\text{mA}$ $I_Z = 1\text{mA}$ $I_Z = 100\mu\text{A}$	$T_A = -40 \text{ to } +85^\circ\text{C}$
$\frac{\Delta V_Z}{\Delta T_Z}$	Ratio of Change in V_Z to Change in I_Z			0.8			1.0	mV	$I_{Z(\text{MIN})} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$
				1.0			1.2			$T_A = -40 \text{ to } +85^\circ\text{C}$
				6.0			8.0		$1\text{mA} \leq I_Z \leq 12\text{mA}$	$T_A = 25^\circ\text{C}$
				8.0			10.0			$T_A = -40 \text{ to } +85^\circ\text{C}$
Z_R	Reverse Dynamic Impedance		0.25	0.9		0.25	1.1	Ω	$I_Z = 1\text{mA}$, $f = 120\text{Hz}$, $I_{AC} = 0.1 I_Z$	
e_N	Wideband Noise (RMS)		20			35		μA	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$ ΔV_Z	
ΔV_Z	Long Term Stability of Reverse Breakdown Voltage		120			120		ppm	$t = 1000 \text{ Hours}$ $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$	

ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CLM4040E (2.0%)			UNITS	CONDITIONS	
		MIN	TYP	MAX			
V_Z	Reverse Breakdown Voltage	2.450	2.500	2.500	V	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$
		2.426	2.500	2.500			$T_A = -40 \text{ to } +85^\circ\text{C}$
$I_{Z(\text{MIN})}$	Minimum Breakdown Current		60	80	μA		
$\frac{\Delta V_Z}{\Delta T}$	Reverse Breakdown Voltage Temperature Coefficient			± 150	$\text{ppm}/^\circ\text{C}$	$I_Z = 10\text{mA}$ $I_Z = 1\text{mA}$ $I_Z = 100\mu\text{A}$	$T_A = -40 \text{ to } +85^\circ\text{C}$
$\frac{\Delta V_Z}{\Delta T_Z}$	Ratio of Change in V_Z to Change in I_Z			1.0	mV	$I_{Z(\text{MIN})} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$
				1.2			$T_A = -40 \text{ to } +85^\circ\text{C}$
				6.0		$1\text{mA} \leq I_Z \leq 12\text{mA}$	$T_A = 25^\circ\text{C}$
				10.0			$T_A = -40 \text{ to } +85^\circ\text{C}$
Z_R	Reverse Dynamic Impedance		0.25	1.1	Ω	$I_Z = 1\text{mA}$, $f = 120\text{Hz}$, $I_{AC} = 0.1 I_Z$	
e_N	Wideband Noise (RMS)		20		μA	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$ ΔV_Z	
ΔV_Z	Long Term Stability of Reverse Breakdown Voltage		120		ppm	$t = 1000 \text{ Hours}$ $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$	