calogic
CORPORATION

Precision Micropower Bandgap Shunt Reference

CLM4040

FEATURES

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

APLICATIONS

- **Cellular Phunes**
- **Portable Computers**
- **Instrumentation**
- **Automotive**

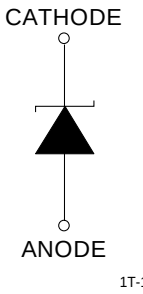
DESCRIPTION

The CLM4040 is a two terminal precision voltage reference with thermal stability guaranteed over temperature, a typical dynamic impedance of 0.25Ω and very sharp turn-on characteristics. The device has a fixed output of 2.5V for input currents between 60μA 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

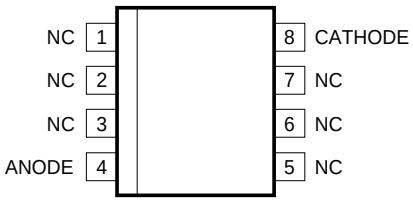
Part	Package	Tolerance	Temp. Range
CLM4040CS	SOT-23	0.5%	-40°C to +85°C
CLM4040DS	SOT-23	1.0%	-40°C to +85°C
CLM4040ES	SOT-23	2.0%	-40°C to +85°C
CLM4040CY	SO-8	0.5%	-40°C to +85°C
CLM4040DY	SO-8	1.0%	-40°C to +85°C
CLM4040EY	SO-8	2.0%	-40°C to +85°C
CLM4040CN	TO-92	0.5%	-40°C to +85°C
CLM4040DN	TO-92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

SYMBOL DIAGRAM AND PIN CONFIGURATIONS



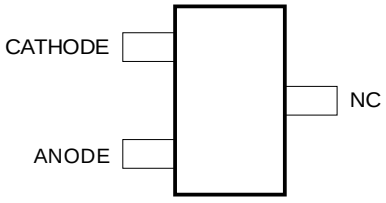
1T-15

SO-8 LEAD



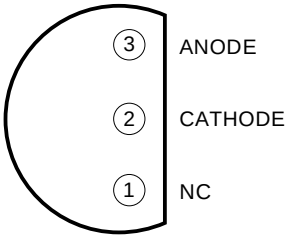
TOP VIEW 1T-13

SOT-23-3 LEAD



TOP VIEW IT-12

TO-92



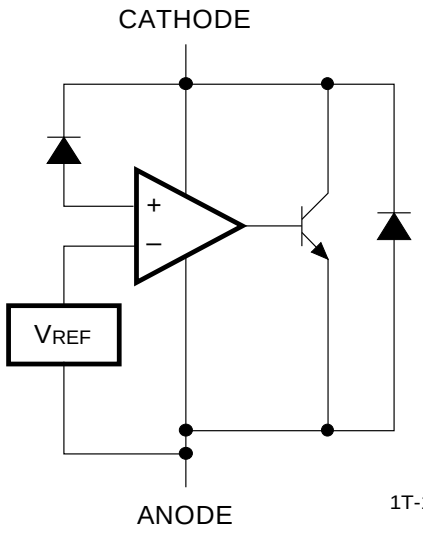
TOP VIEW 1T-14

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ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	MAXIMUM	UNITS
	Reverse Current	20	mA
T_A	Operating Temperature Range	-40 to +85	^oC
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



1T-16

ELECTRICAL CHARACTERISTICS $T_A = 25^oC$ 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 = 100µA	$T_A = 25^oC$
		2.471	2.500	2.529	2.451	2.500	2.549			T_A = -40 to +85^{o}C
$I_{Z(MIN)}$	Minimum Breakdown Current		60	80		60	80	µA		
$\frac{\Delta V_Z}{\Delta T}$	Reverse Breakdoen Voltage Temperature Coefficient			±100			±150	ppm/^{o}C	I_Z = 10mA I_Z = 1mA I_Z = 100µA	T_A = -40 to +85^{o}C
$\frac{\Delta V_Z}{\Delta T_Z}$	Ratio of Change in V_Z to Change in I_Z			0.8			1.0	mV	$I_{Z(MIN)} \le I_Z \le$ 1mA	$T_A = 25^oC$
				1.0			1.2			T_A = -40 to +85^{o}C
				6.0			8.0		ImA $\le I_Z \le$ 12mA	$T_A = 25^oC$
				8.0			10.0			T_A = -40 to +85^{o}C
Z_R	Reverse Dynamic Impedance		0.25	0.9		0.25	1.1	Ω	I_Z = 1mA, f = 120Hz, I_{AC} = 0.1 I_Z	
e_N	Wideband Noise (RMS)		20			35		µA	I_Z = 100µA 10Hz $\le$ f $\le$ 10kHz ΔV_Z	
ΔV_Z	Long Term Stability of Reverse Breakdown Voltage		120			120		ppm	t = 1000 Hours T = 25^{o}C ± 0.1^{o}C I_Z = 100µA	

ELECTRICAL CHARACTERISTICS $T_A = 25^oC$ 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 = 100µA	$T_A = 25^oC$
		2.426	2.500	2.500			T_A = -40 to +85^{o}C
$I_{Z(MIN)}$	Minimum Breakdown Current		60	80	µA		
$\frac{\Delta V_Z}{\Delta T}$	Reverse Breakdoen Voltage Temperature Coefficient			±150	ppm/^{o}C	I_Z = 10mA I_Z = 1mA I_Z = 100µA	T_A = -40 to +85^{o}C
$\frac{\Delta V_Z}{\Delta T_Z}$	Ratio of Change in V_Z to Change in I_Z			1.0	mV	$I_{Z(MIN)} \le I_Z \le$ 1mA	$T_A = 25^oC$
				1.2			T_A = -40 to +85^{o}C
				6.0		ImA $\le I_Z \le$ 12mA	$T_A = 25^oC$
				10.0			T_A = -40 to +85^{o}C
Z_R	Reverse Dynamic Impedance		0.25	1.1	Ω	I_Z = 1mA, f = 120Hz, I_{AC} = 0.1 I_Z	
e_N	Wideband Noise (RMS)		20		µA	I_Z = 100µA 10Hz $\le$ f $\le$ 10kHz ΔV_Z	
ΔV_Z	Long Term Stability of Reverse Breakdown Voltage		120		ppm	t = 1000 Hours T = 25^{o}C ± 0.1^{o}C I_Z = 100µA	