

芯伯乐®
X I N B O L E

Product Specification

XBLW LM4040A25FTA LM4040B25FTA
XBLW LM4040C25FTA LM4040D25FTA

Precision Low-Power Shunt Voltage Reference

WEB | www.xinboleic.com



Descriptions

The LM4040 is a family of bandgap circuits designed to achieve precision micro-power voltage references of 2.5V. The devices are available in 0.1% A-grade, 0.2% B-grade, 0.5% C-grade, and 1% D-grade initial tolerances. They are available in small outline SOT23-3L surface mount packages, which are ideal for applications where space is at a premium.

Excellent performance is maintained over the 20 μ A to 15mA operating current range with a typical temperature coefficient of only 20ppm/ $^{\circ}$ C. The device is designed to be highly tolerant of capacitive loads, which maintains excellent stability.

This device offers a pin for pin compatible alternative to the LM4040 voltage reference.

Features

- Small Package: SOT23-3L
 - No Output Capacitor Required
- Output Voltage Tolerance
 - LM4040A: \pm 0.1% at +25 $^{\circ}$ C
 - LM4040B: \pm 0.2% at +25 $^{\circ}$ C
 - LM4040C : \pm 0.5% at +25 $^{\circ}$ C
 - LM4040D: \pm 1% at +25 $^{\circ}$ C
- Low Output Noise
 - (10Hz to 10kHz) 45 μ VRMS
- Wide Operating Current Range 60 μ A to 15mA
- Extended Temperature Range -40 $^{\circ}$ C to +125 $^{\circ}$ C
- Low Temperature Coefficient 100 ppm/ $^{\circ}$ C (max)



SOT-23-3L

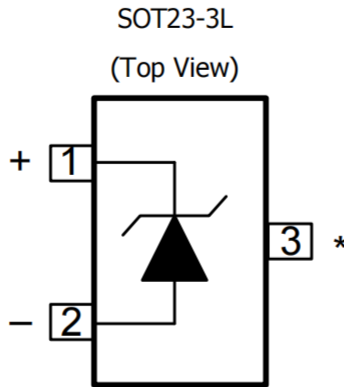
Applications

- Battery Powered Equipment
- Precision Power Supplies
- Portable Instrumentation
- Portable Communications Devices
- Notebook and Palmtop Computers
- Data Acquisition Systems

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW LM4040A25FTA	SOT-23-3L	R2A	Tape	3000Pcs/Reel
XBLW LM4040B25FTA	SOT-23-3L	R2B	Tape	3000Pcs/Reel
XBLW LM4040C25FTA	SOT-23-3L	R2C	Tape	3000Pcs/Reel
XBLW LM4040D25FTA	SOT-23-3L	R2D	Tape	3000Pcs/Reel

Pin Assignments



* Pin 3 must be left floating or connected to pin 2

Absolute Maximum Ratings (Voltages to Anode Unless Otherwise Stated)

Parameter	Rating	Unit
Continuous Reverse Current	20	mA
Continuous Forward Current	10	mA
Operating Junction Temperature	-40 to +150	°C
Storage Temperature	-55 to +150	°C
Human Body Model	4	KV
Machine Model	0.4	KV

Caution: Stresses greater than the *Absolute Maximum Ratings* specified above, may cause permanent damage to the device. These are stress ratings only; functional operation of the device at conditions between maximum recommended operating conditions and absolute maximum ratings is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

(Semiconductor devices are ESD sensitive and may be damaged by exposure to ESD events. Suitable ESD precautions should be taken when handling and transporting these devices.)

Unless otherwise stated voltages specified are relative to the Anode pin.

Recommended Operating Conditions

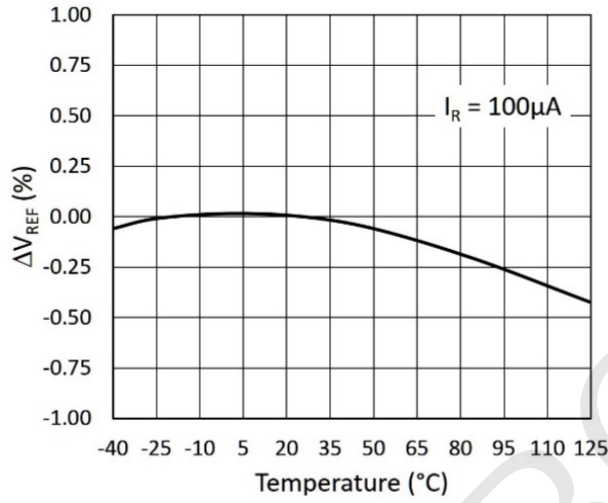
Parameter	Min	Max	Unit
Reverse Current	0.06	15	mA
Operating Ambient Temperature Range	-40	+125	°C

Electrical Characteristics (continued) (Test conditions: TA = +25°C, unless otherwise specified.)

LM4040-25

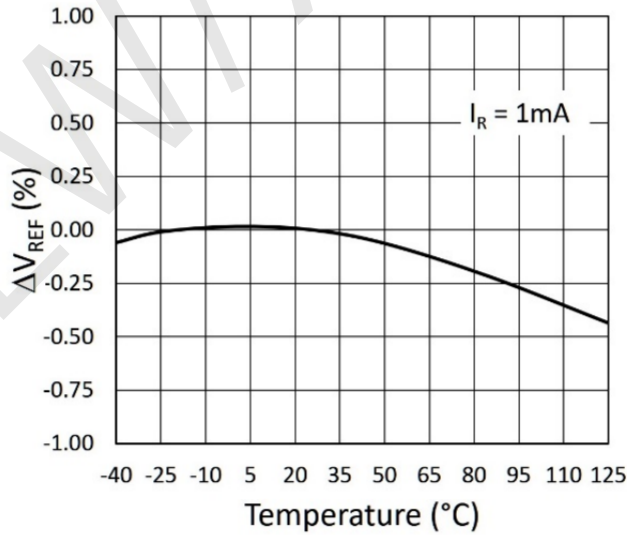
Symbol	Parameter	Conditions		Typ	LM4040				Unit
		—	TA		A Limits	B Limits	C Limits	D Limits	
V _{REF}	Reverse Breakdown Voltage	I _R = 100μA	+25°C	2.5	—	—	—	—	V
	Reverse Breakdown Voltage Tolerance	I _R = 100μA	+25°C	—	±2.5	±5	±12	±25	mV
			-40 to +85°C		±19	±21	±29	±49	
-40 to +125°C	±28	±30	±38		±63				
I _{RMIN}	Minimum Operating Current	—	+25°C	45	60	60	60	65	μA
			-40 to +85°C	—	65	65	65	70	
			-40 to +125°C	—	68	68	68	73	
ΔV _R /ΔT	Average Reverse Breakdown Voltage Temperature Coefficient	I _R = 10mA	-40 to +125°C	±20	±100	±100	±100	±150	ppm/°C
		I _R = 1mA		±15					
		I _R = 100μA		±15					
ΔV _R /ΔI _R	Reverse Breakdown Change with Current	I _{RMIN} ≤ I _R ≤ 1mA	+25°C	0.3	0.8	0.8	0.8	1.0	mV
			-40 to +85°C	—	1.0	1.0	1.0	1.2	
			-40 to +125°C	—	1.0	1.0	1.0	1.2	
		1mA ≤ I _R ≤ 15mA	+25°C	2.5	6.0	6.0	6.0	8.0	
			-40 to +85°C	—	8.0	8.0	8.0	10.0	
			-40 to +125°C	—	8.0	8.0	8.0	10.0	
Z _R	Dynamic Output Impedance	I _R = 1mA, f = 120Hz I _{AC} = 0.1I _R		0.3	0.8	0.9	0.9	1.1	Ω
e _n	Noise Voltage	I _R = 100μA 10Hz < f < 10kHz		35	—	—	—	—	μV _{RMS}
V _R	Long Term Stability (Non-Cumulative)	t = 1000Hrs, I _R = 100μA		120	—	—	—	—	ppm
V _{HYST}	Thermal Hysteresis	ΔT = -40°C to +125°C		0.08	—	—	—	—	%

Typical Characteristics – Reference Voltage Temperature Coefficient at 100µA



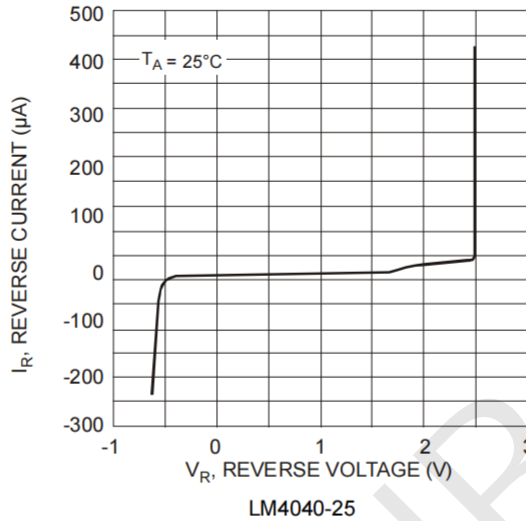
LM4040-25

Typical Characteristics – Reference Voltage Temperature Coefficient at 1mA



LM4040-25

Typical Characteristics – Reverse Characteristics



Application Information

In a conventional shunt regulator application (Figure 1), an external series resistor (R_S) is connected between the supply voltage, V_S , and the LM4040.

R_S determines the current that flows through the load (I_L) and the LM4040 (I_R). Because load current and supply voltage can vary, R_S should be small enough to supply at least the minimum acceptable I_R to the LM4040 even when the supply voltage is at its minimum and the load current is at its maximum value. When the supply voltage is at its maximum and I_L is at its minimum, R_S should be large enough so that the current flowing through the LM4040 is less than 15mA.

R_S is determined by the supply voltage, (V_S), the load and operating current, (I_L and I_R), and the LM4040's reverse breakdown voltage, V_R .

$$R_S = \frac{V_S - V_R}{I_L + I_R}$$

Printed Circuit Board Layout Considerations

The LM4040 device in the SOT23 package has the die attached to pin 3, which results in an electrical contact between pin 2 and pin 3. Therefore, pin 3 of the SOT23 package must be left floating or connected to pin 2.

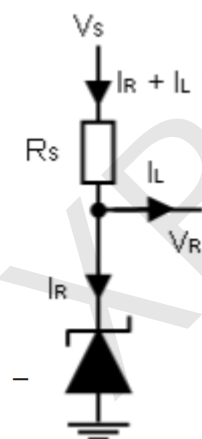
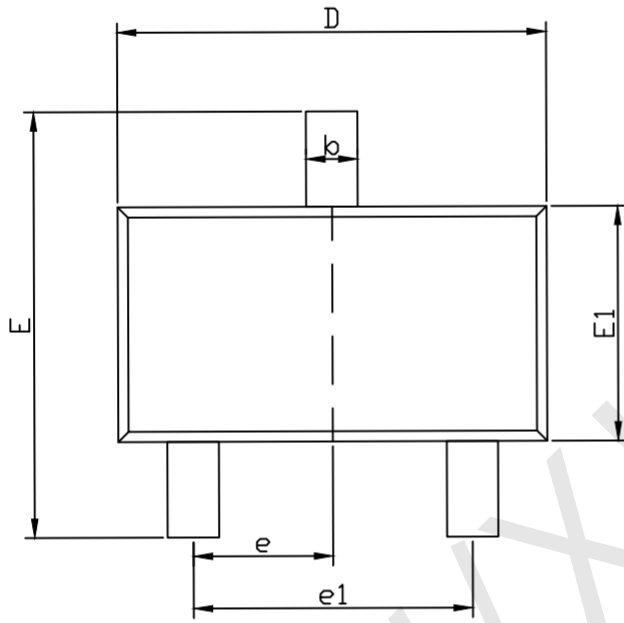


Figure 1

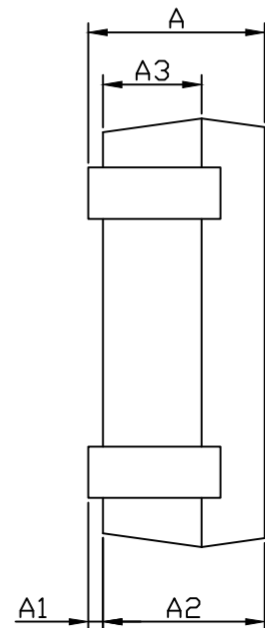
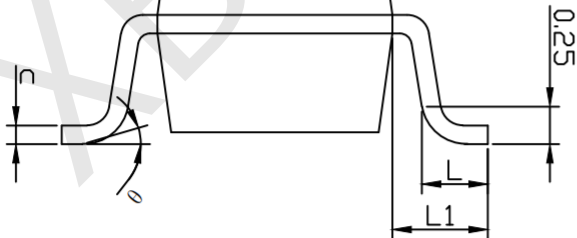
Package Information

- SOT23-3L



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	-	-	1.25
*A1	0.01	-	0.08
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	-	0.41
c	0.11	-	0.20
D	2.82	2.92	3.02
*E	2.60	2.80	3.00
*E1	1.50	1.60	1.70
*e	0.90	0.95	1.00
e1	1.90BSC		
L	0.30	-	0.60
*L1	0.55	0.60	0.75
θ	0°	-	8°



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