5V Bandgap Reference

FEATURES

- 0.2% Output Tolerance
- 0.6Ω Shunt Impedance
- 700μA to 10mA Operating Current
- Pin Compatible with LM136-5
- 20ppm/°C Max Drift
- Output Voltage Trim does not Affect Drift
- Can be Used as Positive or Negative Reference

APPLICATIONS

- A-to-D and D-to-A Converters
- Precision Regulators
- Precision Current Sources
- V to F and F to V Converters

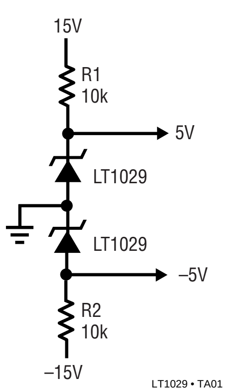
DESCRIPTION

The LT®1029 is a 5V bandgap reference intended for use in the shunt or "Zener" mode, allowing it to be used as either a positive or negative reference. The output is pretrimmed to ±0.2% accuracy with 20ppm/°C maximum temperature drift. A trim pin allows additional output adjustment for even more precise output voltage.

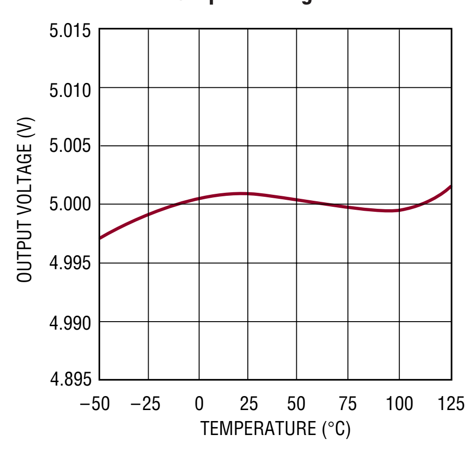
Operating current range for the LT1029 is 700μA to 10mA. Extremely low dynamic impedance allows excellent output regulation even with fluctuating operating current.

The LT1029 will replace an LM136-5 or LM336-5 and simplify circuits using the "minimum temperature coefficient" trim network. The LT1029 does not require this special network to meet its temperature drift specification; these application network components are simply removed. If output trimming is required for initial accuracy, the diodes in the trim network should be replaced with jumpers.

TYPICAL APPLICATION



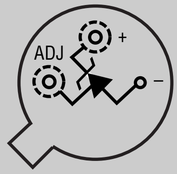
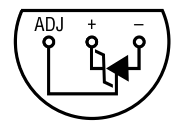
Output Voltage Drift



ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Current 15mA
Forward Current 10mA
Operating Temperature Range
  LT1029C/LT1029AC .... 0°C to 70°C
  LT1029M/LT1029AM **(OBSOLETE)** ....–55°C to 125°C
Storage Temperature .... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) .... 300°C

PACKAGE/ORDER INFORMATION

	ORDER PART NUMBER		ORDER PART NUMBER
BOTTOM VIEW  H PACKAGE TO-46 METAL CAN T_{JMAX} = 150°C, θ_{JA} = 440°C/W, θ_{JC} = 80°C/W	LT1029AMH LT1029MH LT1029ACH LT1029CH	BOTTOM VIEW  Z PACKAGE TO-92 PLASTIC T_{JMAX} = 100°C, θ_{JA} = 160°C/W	LT1029ACZ LT1029CZ
OBSOLETE PACKAGE Consider the Z Package as an Alternate Source			

Consult LTC Marketing for parts specified with wider operating temperature ranges.

ELECTRICAL CHARACTERISTICS

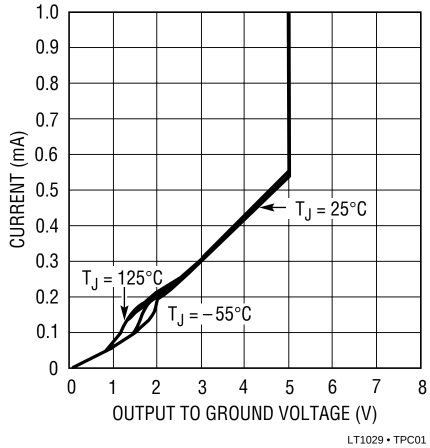
The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are T_A = 25°C.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	I_R = 1mA LT1029AM/LT1029AC		4.99	5.00	5.01	V
	LT1029M/LT1029C		4.95	5.00	5.05	V
Reverse Breakdown Change with Current	700µA ≤ I_R ≤ 10mA			2	5	mV
		●		3	8	mV
Reverse Dynamic Impedance	I_R = 1mA			0.2	0.6	Ω
		●		0.3	1.0	Ω
Temperature Stability	I_R = 1mA LT1029AC	●		3	7	mV
	LT1029C	●		5	12	mV
	LT1029AM	●		7	18	mV
	LT1029M	●		10	36	mV
Equivalent Temperature Drift	LT1029AM/LT1029AC	●		8	20	ppm/°C
	LT1029C	●		12	34	ppm/°C
	LT1029M	●		15	40	ppm/°C
Long Term Stability				20		ppm/kHr
Trim Range			±3	+5, –13		%

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

TYPICAL PERFORMANCE CHARACTERISTICS

Reverse Characteristics



APPLICATIONS INFORMATION

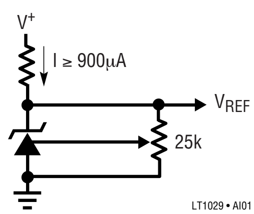
Output Trimming

Output voltage trimming on the LT1029 is nominally accomplished with a potentiometer connected from output to ground with the wiper tied to the trim pin. The LT1029 was made compatible with existing references, so the trim range is large; 5%, – 13%. This large trim range makes precision trimming rather difficult. One solution is to insert resistors in series with both ends of the potentiometer. This has the disadvantage of potentially poor tracking between the fixed resistors and the potentiometer. A second method of reducing trim range is to insert a resistor in series with the wiper of the potentiometer. This works well only for a very small trim range because of the mismatch in TCs between the series resistor and the internal thin film resistors. These film resistors can have a TC as high as 500ppm/°C. That same TC is then transferred to the change in output voltage; a 1% shift in output voltage causes a (500ppm) (1%) = 5ppm/°C change in output voltage drift. The worst case error in initial output voltage for the LT1029A is 0.2% and the LT1029 is 1%, so a series resistor is satisfactory if the output is simply trimmed to nominal value. 1ppm/°C TC shift would be the maximum expected for the LT1029A and 5ppm/°C for the LT1029.

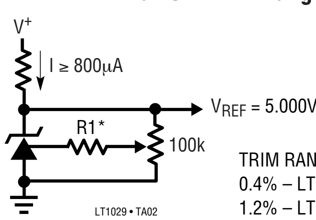
Shunt Capacitance

The LT1029 is stable with all values of shunt capacitance, but values between 300pF and 0.01μF are not recommended because they cause longer settling following a transient in operating current. A 1μF solid tantalum capacitor is suggested for most situations where bypassing is desirable.

Wide Trim Range (5%, – 13%)

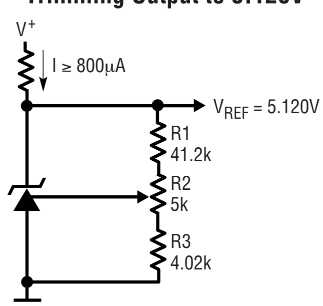


Narrow Trim Range



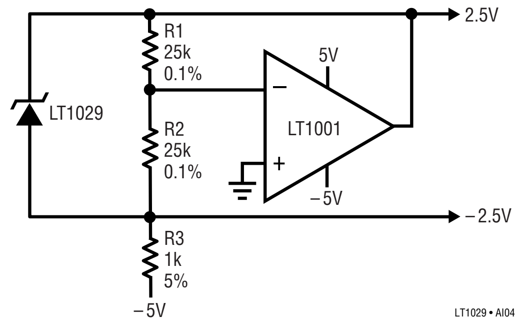
TRIM RANGE
0.4% – LT1029A, R1 = 750k
1.2% – LT1029, R1 = 250k

Trimming Output to 5.120V



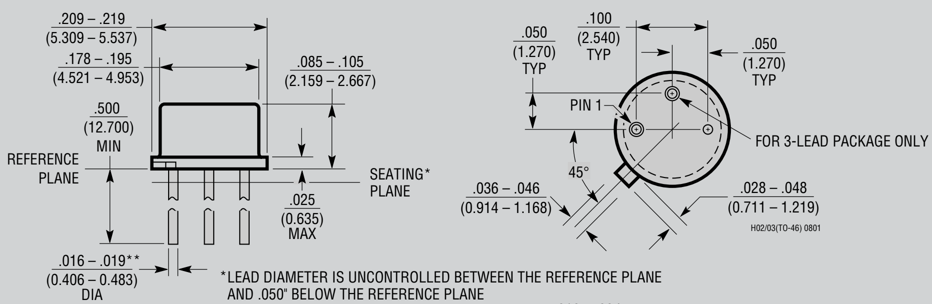
APPLICATIONS INFORMATION

Split ±2.5V References



PACKAGE DESCRIPTION

H Package
2-Lead and 3-Lead TO-46 Metal Can
(Reference LTC DWG # 05-08-1340)

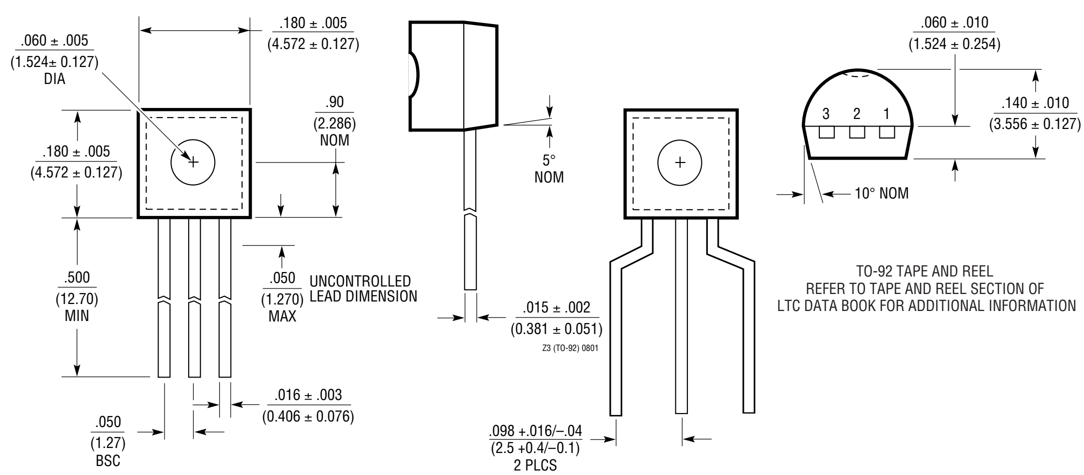


*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND .050" BELOW THE REFERENCE PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS .016 – .024 (0.406 – 0.610)

OBSOLETE PACKAGE

Z Package
3-Lead Plastic TO-92 (Similar to TO-226)
(Reference LTC DWG # 05-08-1330)



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