5.0V LOW POWER PRECISION REFERENCE SOURCE

ZRT050

ISSUE 1 - OCTOBER 1995

DEVICE DESCRIPTION

The ZRT050 is a monolithic integrated circuit providing a precise stable reference voltage of 4.9V at 500µA.

The circuit features a knee current of 150µA and operation over a wide range of temperatures and currents.

The ZRT050 is available in a 3-pin metal can package for through hole applications as well as SOT223 and SO8 packages for surface mount applications. Each package option offers a trim facility whereby the output voltage can be adjusted as shown in Fig.1. This facility is used when compensating for system errors or setting the reference output to a particular value. When the trim facility is not used, the pin should be left open circuit.

FEATURES

- Trimmable output
- Excellent temperature stability
- Low output noise figure
- Available in two temperature ranges
- 1 and 2% initial voltage tolerance versions available
- No external stabilising capacitor required in most cases
- Low slope resistance
- TO18 package
- SOT223 and SO8 small outline packages

SCHEMATIC DIAGRAM

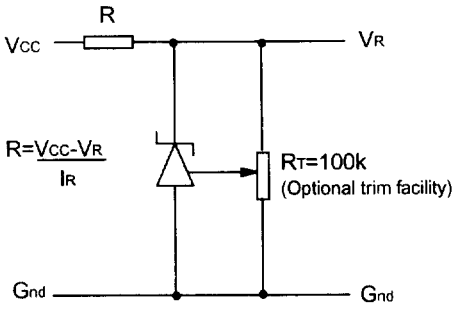


Figure 1:
This circuit will allow the reference to be trimmed over a wide range. The device is specified over a ±5% trim range.

CONNECTION TABLE

Pin	SO8	SOT223	TO18
1	Trim	Trim	V_R
2	N/C	G_{nd}	Trim
3	N/C	V_R	G_{nd}
4	G_{nd}	-	–
5	N/C	–	–
6	N/C	–	–
7	N/C	–	–
8	V_R	–	–
Pack	N8	G	–

see Diagrams Page 1 - 8

ZRT050

ABSOLUTE MAXIMUM RATING

Reverse Current 60mA ø

Operating Temperature
- A grade -55°C to 125°C
- C grade 0°C to 70°C

Storage Temperature
- TO18 -55 °C to 175 °C
- SO8, SOT223 -55 °C to 125 °C

Power Dissipation (T_{amb}=25°C)

TO18	300mW
SO8	625mW
SOT223	2W

ø Above 25°C this figure should be linearly derated to 12mA at 125°C

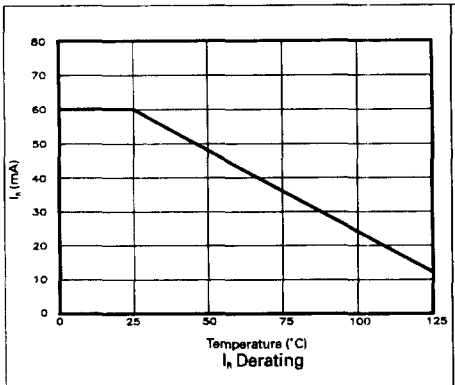
TEMPERATURE DEPENDENT ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	INITIAL VOLTAGE TOLERANCE %	GRADE A -55°C TO 125°C		GRADE C 0°C TO 70°C		UNITS
			TYP	MAX	TYP	MAX	
ΔV_R	Output voltage change over relevant temperature range (See note (a))	1 & 2	13.5	45.0	5.4	17.2	mV
$T_C V_R$	Output voltage temperature coefficient (See note (b))	1 & 2	15.0	50.0	15.0	50.0	ppm/°C

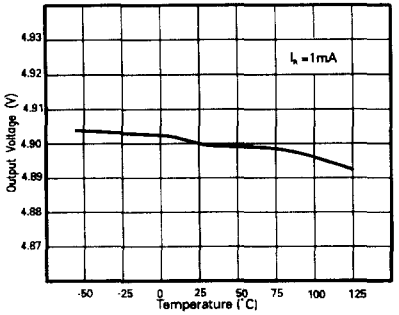
ELECTRICAL CHARACTERISTICS
(at T_{amb}=25°C and Pin 2 o/c unless otherwise stated)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS	COMMENTS
V_R	Output voltage 1% tolerance (A1,C1) 2% tolerance (C2)	 4.85 4.80	 4.90 4.90	 4.95 5.00	V	I_R=500µA
ΔV_{TRIM}	Output voltage adjustment range		±5		%	R_T=100kΩ
$T_C \Delta V_{TRIM}$	Change in TCV_R with output adjustment		2.5		ppm/°C/%	
I_R	Operating current range	0.15		60	mA	See note (c)
t_{on} t_{off}	Turn-on time Turn-off time		100 0.3		µs	R_L=1kΩ
e_{np-p}	Output voltage noise (over the range 0.1 to 10Hz)		50		µV	Peak to peak measurement
R_S	Slope resistance		1.25	2.0	Ω	I_R 0.5mA to 5mA See note (d)

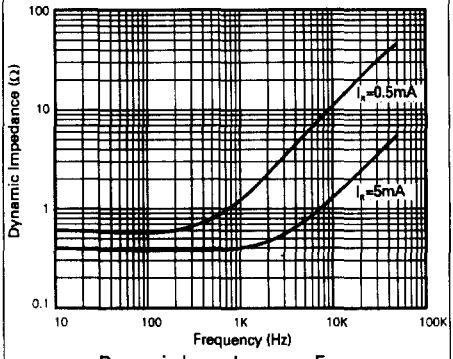
TYPICAL CHARACTERISTICS



I_k Derating



Temperature Drift



Dynamic Impedance vs. Frequency

NOTES

(a) Output change with temperature (V_R)

The absolute maximum difference between the maximum output voltage and the minimum output voltage over the specified temperature range

$$\Delta V_R = V_{max} - V_{min}$$

(b) Output temperature coefficient (T_CV_R)

The ratio of the output change with temperature to the specified temperature range expressed in ppm/°C

$$T_cV_R = \frac{\Delta V_R \times 10^6}{V_R \times \Delta T} \ ppm/°C$$

ΔT= Full temperature range

(c) Operating current (I_R)

Maximum operating current must be derated as indicated in maximum ratings.

(d) Slope resistance (R_S)

The slope resistance is defined as :

$$R_S = \frac{change\ in\ V_R}{specified\ current\ range}$$

ΔI = 5 - 0.5 = 4.5mA (typically)

(e) Line regulation

The ratio of change in output voltage to the change in input voltage producing it.

$$\frac{R_S \times 100}{V_R \times R_{source}} \ \%/V$$