

ADVANCE PRODUCT INFORMATION

5 Volt Low Power Precision Reference Source

Datasheet.

FEATURES

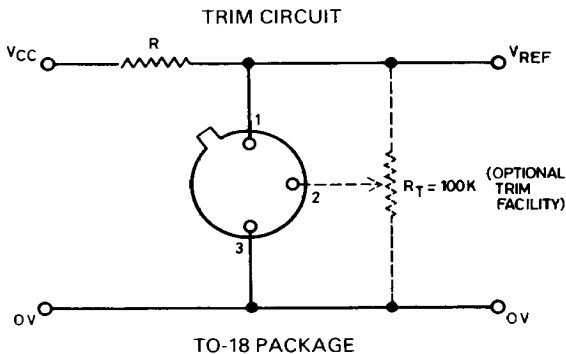
- Trimmable output
- Excellent Temperature Stability
- Low output noise figure
- Low Dynamic Impedance
- Available in three temperature ranges
- 1%, 2% and 3% initial voltage tolerance versions available
- No external stabilising capacitor required

DESCRIPTION

The ZNREF050 is a monolithic integrated circuit providing a precise, stable reference source of 5 volts in a three pin TO-18 metal can transistor package.

The ZNREF050 is unconditionally stable under all load conditions without the need for an external shaping capacitor.

The use of the third pin is optional and enables V_{REF} to be trimmed by $\pm 5\%$. This is useful for taking out system errors or setting V_{REF} to specific values, e.g. 5.000 volts for a standard calibration source or 5.12 volts for binary systems.



ZNREF050

ABSOLUTE MAXIMUM RATINGS

Reference Current	60mA*
Power Dissipation	300mW
Operating Temperature Range	See below
Storage Temperature Range	- 55 to + 175°C
Soldering temperature for a maximum time of 10s	
within 1/16" of the seating plane	300°C
within 1/32" of the seating plane	265°C

*Above 25°C this figure should be linearly derated to 20mA at + 125°C

TEMPERATURE DEPENDENT ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Initial Voltage Tolerance %	Grade A - 55 to 125°C		Grade B - 20 to 85°C		Grade C 0 to 70°C		Units
			Typ.	Max.	Typ.	Max.	Typ.	Max.	
Output voltage change over relevant temperature range (see Note (a))	ΔV_{OT}	1 & 2	32	45	10	15	5.4	8.8	mV
		3	51	72	14	21	6.4	10.5	mV
Output voltage temperature coefficient (See Note (b))	TCV_o	1 & 2	35	50	20	30	15	25	ppm/°C
		3	57	80	27	40	18	30	ppm/°C

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^\circ\text{C}$ and Pin 2 o/c unless otherwise noted).

Parameter	Symbol	Min.	Typ.	Max.	Units	Comments	
Output voltage 1% Tolerance (A1 B1 C1) 2% Tolerance (A2 B2 C2) 3% Tolerance (A3 B3 C3)	V_o or V_{REF}	4.93 4.88 4.83	4.98 4.98 4.98	5.03 5.08 5.13	V V V	} $I_{REF} = 150\mu\text{A}$	
Output voltage adjustment range	V_{OR}	—	± 5	—	%		$R_T = 100\text{k}\Omega$
Change in TCV_o with output adjustment	TCV_{OR}	—	0.8	—	ppm/°C/%		
Turn-on or "knee" current	I_{ON}	—	120	150	μA	Over full temperature range	
Operating current range	I_{REF}	0.15	—	60	mA	See Note (c)	
Turn-on settling time to within 0.1% of V_o	t_{on}	—	5	—	μsec	Overshoot typically less than 1%	
Output voltage noise (over the range 0.1Hz to 10Hz)	e_{np-p}	—	50	—	μV	Peak to peak measurement	
Dynamic impedance	R_D	—	1.5	2	Ω	$I_{REF} 0.5\text{mA}$ to 5mA See Note (d)	

NOTES

(a) **OUTPUT CHANGE WITH TEMPERATURE (ΔV_{OT})** the absolute difference between the maximum output voltage and the minimum output voltage over the specified temperature range

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

(b) **OUTPUT TEMPERATURE COEFFICIENT (TCV_o)**

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

$$TCV_o = \frac{\Delta V_{OT} \times 10^6}{V_o \times \Delta T} \text{ ppm/}^\circ\text{C}$$

ΔT = Full temperature change.

(c) **OPERATING CURRENT (I_{REF})**

Maximum operating current must be derated as indicated in Maximum Ratings.

(d) **DYNAMIC IMPEDANCE (R_D)**

The dynamic impedance is defined as

$$R_D = \frac{\text{CHANGE IN } V_o \text{ OVER SPECIFIED CURRENT RANGE}}{\Delta I_{REF}}$$

$$\Delta I_{REF} = 5 - 0.5 = 4.5 \text{ mA (typically)}$$

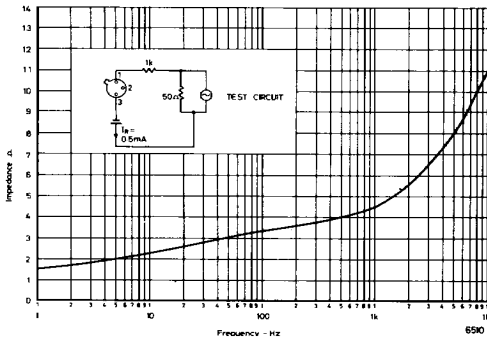
(e) **LINE REGULATION (ΔV_{OL})**

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

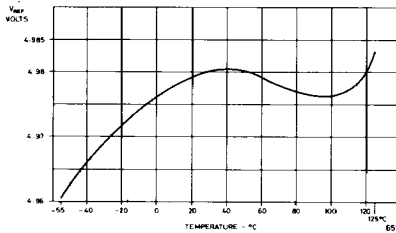
$$\Delta V_{OL} = \frac{R_D \times 100}{V_o \times R_S} \% / V$$

R_S = Source resistance

DYNAMIC IMPEDANCE (TYPICAL)



TYPICAL TEMPERATURE CHARACTERISTIC



ZNREF050

ORDERING INFORMATION

DEVICE	TOLERANCE (%)	T.C. (Max) – ppm/°C	Temperature Range
ZNREF050 A1	1	50	– 55°C to + 125°C
ZNREF050 A2	2		
ZNREF050 A3	3		
ZNREF050 B1	1	30	– 20°C to + 85°C
ZNREF050 B2	2		
ZNREF050 B3	3		
ZNREF050 C1	1	25	0°C to + 70°C
ZNREF050 C2	2		
ZNREF050 C3	3		

PACKAGE OUTLINE
(TO-18) Dimensions in millimetres

