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GEC PLESSEY
SEMICONDUCTORS

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JUNE 1993

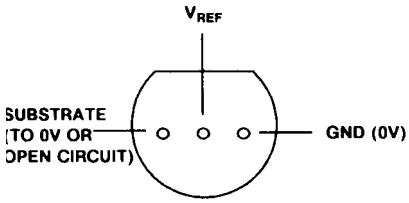
DS2427 - 1.0

REF50Z/REF50D

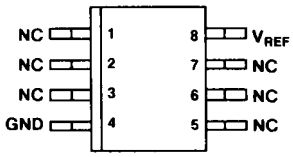
5V MICROPOWER PRECISION REFERENCE

The REF50Z and REF50D are integrated circuits using the bandgap principle to provide a precise stable reference voltage of 5V. There are two package options available: REF50Z in a plastic 3-pin TO-92 and REF50D in a miniature surface mount package (MP8).

These references feature a recommended operating current of 60µA to 5mA which make them ideal for all low power and battery applications.



REF50Z (TO-92) - BOTTOM VIEW



REF50D (MP8) - TOP VIEW

Fig.1 Pin connection

FEATURES

- Low Knee Current - typically 40 microamps
- Ideal for Battery Operation - 300 microwatts
- Internally Shaped
- REF50Z - 3 lead TO-92 Plastic Package
- REF50D - Miniature Plastic Surface Mount Package (MP8)
- Tight Initial V_{REF} Tolerance ±1.5%
- Low Temperature Coefficient
- Low Slope Resistance
- Operation over Industrial Temperature Range

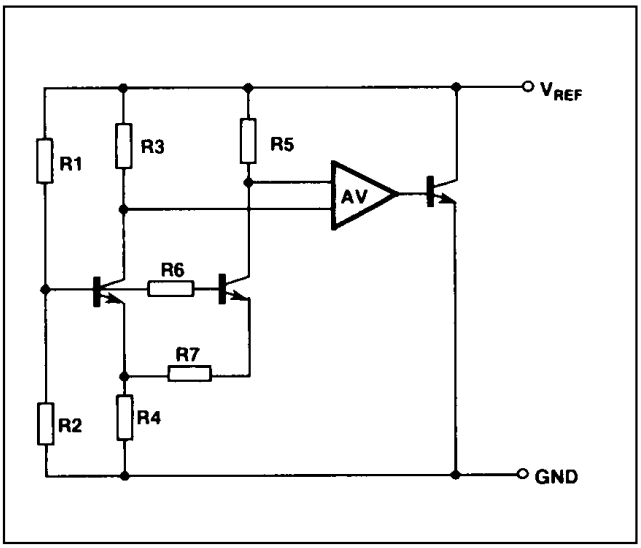


Fig.2 Internal connections

ORDERING INFORMATION

Device Type	Operating Temperature	Package
REF50Z	-40°C to +85°C	TO-92
REF50D	-40°C to +85°C	MP8

ABSOLUTE MAXIMUM RATINGS

Reference current	5mA
Operating temperature range:	
REF50Z	-40 to +85°C
REF50D	-40 to +85°C
Storage temperature	-55 to +125°C
Storage temperature for a max. time of 10ns:	
within 1.59mm of seating plane	300°C
within 0.80mm of seating plane	265°C

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated)

T_{amb} = 25°C, I_{REF} = 150µA

Characteristics	Symbol	Value			Units	Conditions
		Min.	Typ.	Max.		
Output voltage	V_{REF}	4.925	5.00	5.075	V	
Slope resistance (Note 1)	R_{REF}		3.0	3.5	Ω	REF 50Z; I_{REF} = 150µA to 5mA
			3.0	3.5	Ω	REF50D; I_{REF} = 150µA to 5mA
Turn-on (knee) current	I_{ON}		40		µA	
Recommended operating current range	I_{REF}	0.06		5.0	µA	
Temperature coefficient (Note 2)	TC V_{REF}		35	110	ppm/°C	REF25Z; Note 2
			35	80	ppm/°C	REF25D; Note 2
RMS noise voltage	E_N		13		µV	1kHz tp 10kHz
Turn-on time	T_{ON}		80		µs	
Turn-off time	T_{OFF}		7		µs	
Turn-on time	T_{ON}		65		µs	I_{REF} = 500µA
Turn-off time	T_{OFF}		2		µs	I_{REF} = 500µA

NOTES

1. Slope resistance (R_{REF})

Slope resistance is defined as

$$R_{REF} = \frac{\text{Change in } V_{REF} \text{ over a specified current range}}{\text{The change in reference current}}$$

2. Reference voltage temperature coefficient (TC VREF)

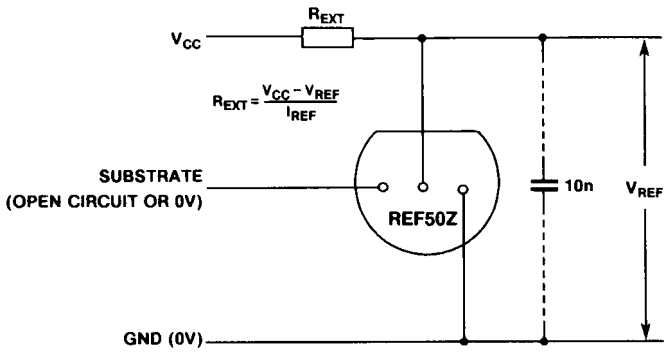
This is the normalised reference voltage change over temperature, divided by the change in temperature.

It is expressed in ppm/°C

$$TC\ V_{REF} = \frac{\Delta V_{REF} \times 10^6}{V_{REF} \times \Delta T} \text{ ppm/°C}$$

ΔT = temperature change in °C

ΔV_{REF} = change in reference voltage over temperature change ΔT



NOTE: In some instances, in order to achieve optimum operation, a 10nF capacitor should be connected between V_{REF} and 0V as shown.

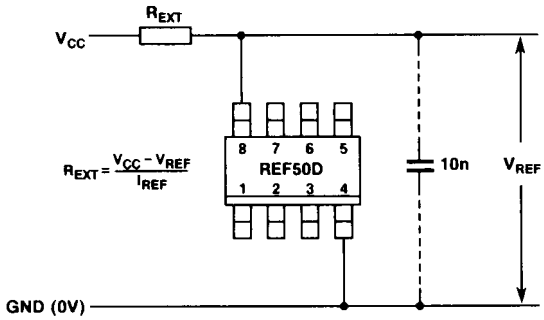


Fig.3 Connections diagram

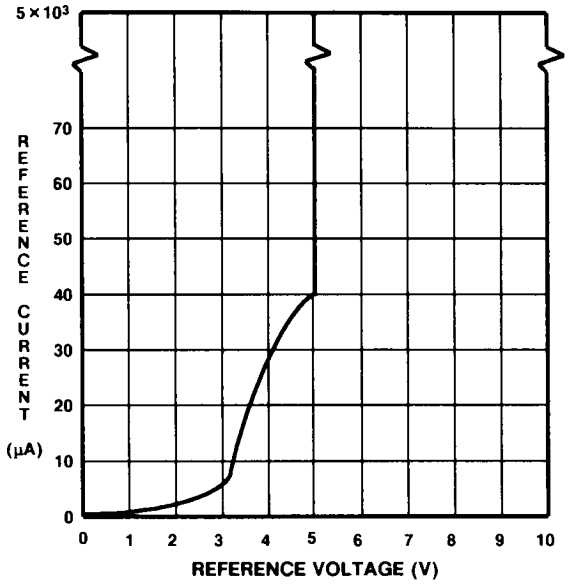


Fig.4 Typical reference characterics

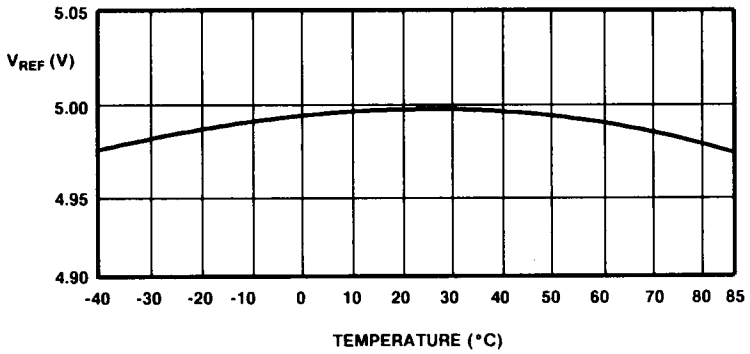


Fig.5 Typical temperature at I_{REF} = 150μA

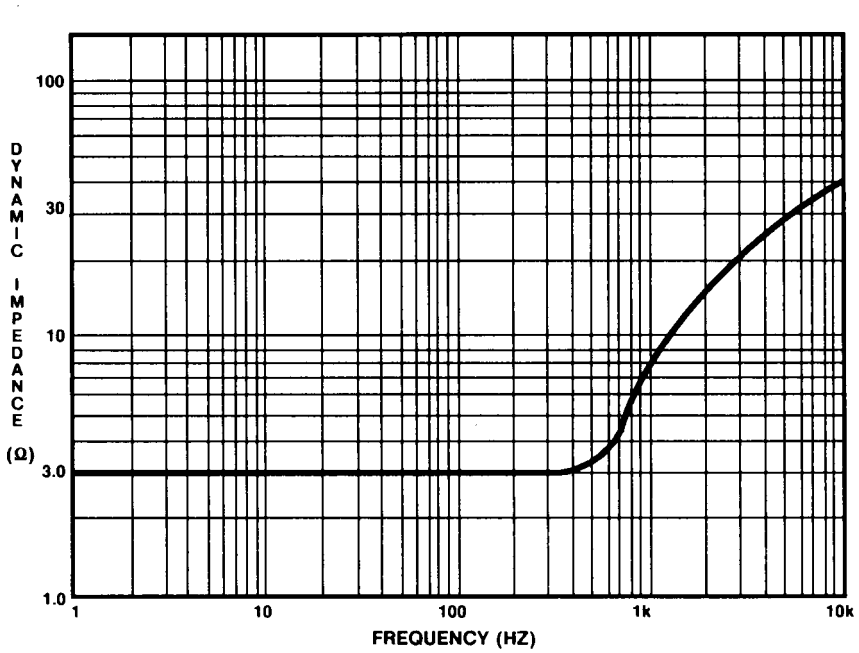


Fig.6 Typical dynamic impedance at I_{REF} = 5mA

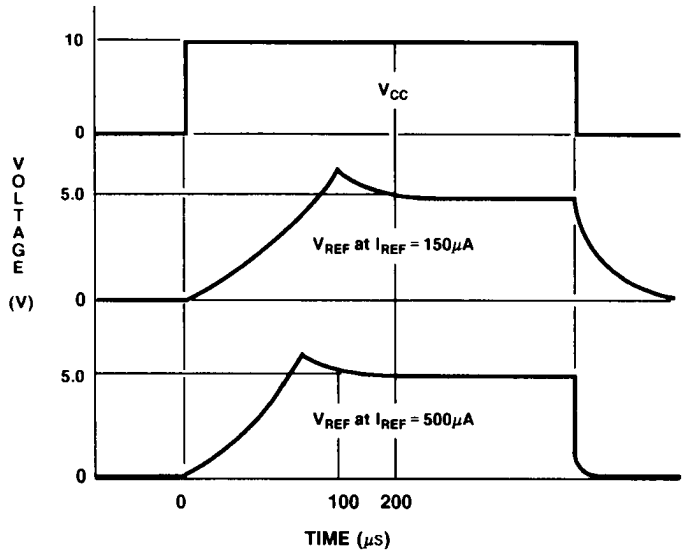


Fig.7 Typical response time (not to scale)

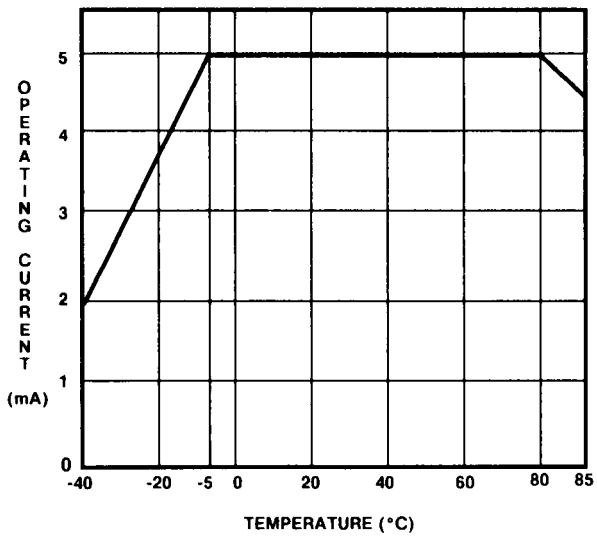
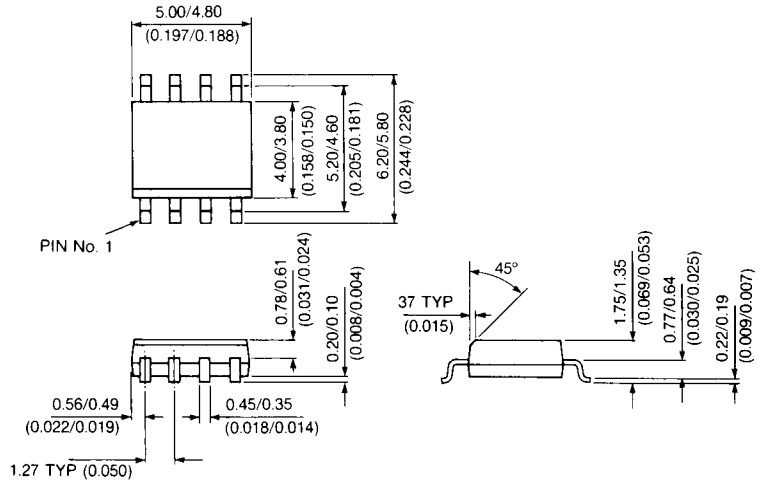
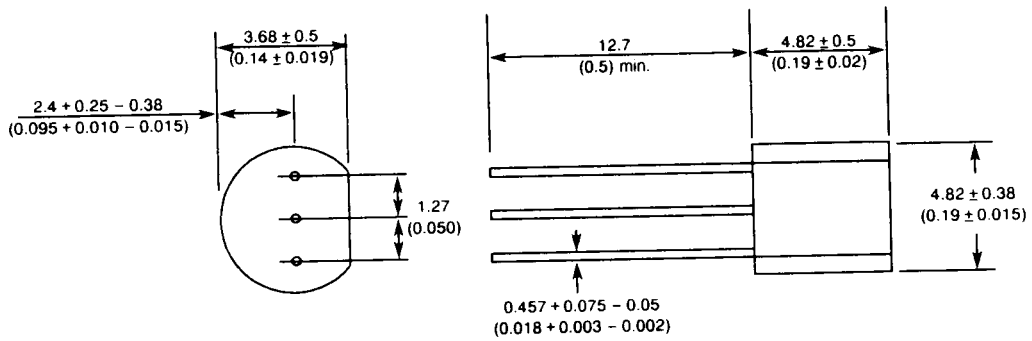


Fig.7 Typical response time (not to scale)



8-LEAD MINIATURE PLASTIC DIL - MP8



3-LEAD PLASTIC-TO-92

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