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# REF25Z/REF25D

## 2.5V MICROPOWER PRECISION REFERENCE

The REF25Z and REF25D are integrated circuits using the bandgap principle to provide a precise stable reference voltage of 2.5V without the need for an external shaping capacitor. There are two package options available: REF25Z in a plastic 3-pin TO-92 and REF25D in a miniature surface mount package (MP8).

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

### FEATURES

- Low Knee Current - typically 40 microamps
- Ideal for Battery Operation - 150 microwatts
- Internally Shaped
- REF25Z - 3 lead TO-92 Plastic Package
- REF25D - Miniature Plastic Surface Mount Package (MP8)
- Tight Initial $V_{REF}$ Tolerance ±1%
- Low Temperature Coefficient
- Low Slope Resistance
- Low Cost
- Operation over Industrial Temperature Range

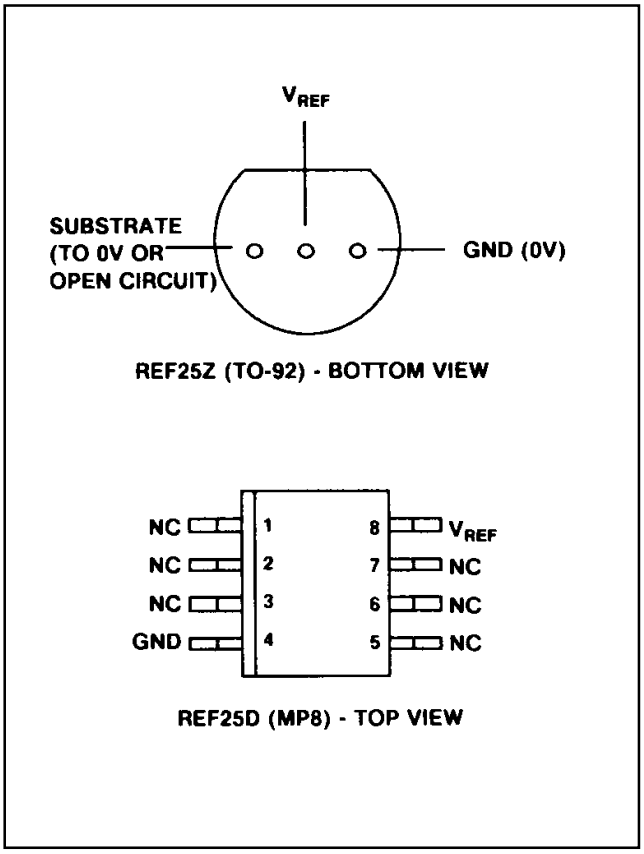


*Fig.1 Pin connection*

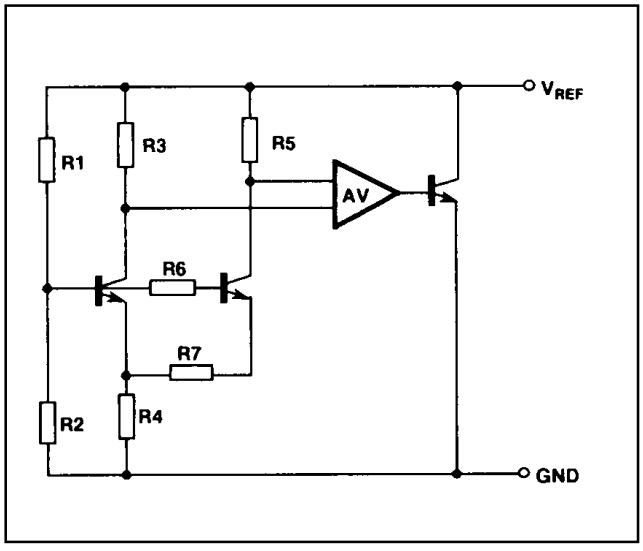


*Fig.2 Internal connections*

### ORDERING INFORMATION

| Device Type | Operating Temperature | Package |
|---|---|---|
| REF25Z | -40°C to +85°C | TO-92 |
| REF25D | -40°C to +85°C | MP8 |

### ABSOLUTE MAXIMUM RATINGS

| | |
|---|---|
| Reference current | 5mA |
| Operating temperature range: | |
| REF25Z | -40 to +85°C |
| REF25D | -40 to +85°C |
| Storage temperature | -55 to +125°C |
| Storage temperature for a max. time of 10ns: | |
| within 1.59mm of the seating plane | 300°C |
| within 0.80mm of the seating plane | 265°C |

## ELECTRICAL CHARACTERISTICS

**These characteristics are guaranteed over the following conditions (unless otherwise stated)**

$T_{amb}$ = 25°C, $I_{REF}$ = 150µA

| Characteristic | Symbol | Value | | | Units | Conditions |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Output voltage | $V_{REF}$ | 2.475 | 2.500 | 2.525 | V | |
| Slope resistance (Note 1) | $R_{REF}$ | | 1.2 | 2.0 | Ω | REF25Z } $I_{REF}$ = 150µA to 5mA |
| | | | 1.2 | 2.0 | Ω | REF25D } |
| Turn-on (knee) current | $I_{ON}$ | | 40 | | µA | |
| Recommended operating current range | $I_{REF}$ | 0.06 | | 5.0 | mA | |
| Temperature coefficient (Note 2) | TC $V_{REF}$ | | 35 | 110 | ppm/°C | REF25Z } Note 2 |
| | | | 35 | 80 | ppm/°C | REF25D } |
| RMS noise voltage | $E_N$ | | 13 | | µV | 1kHz to 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 | } |

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 $V_{REF}$)

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

   It is expressed in ppm/°C

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

   $\Delta T$ = temperature change in °C

   $\Delta V_{REF}$ = change in reference voltage over temperature change $\Delta T$

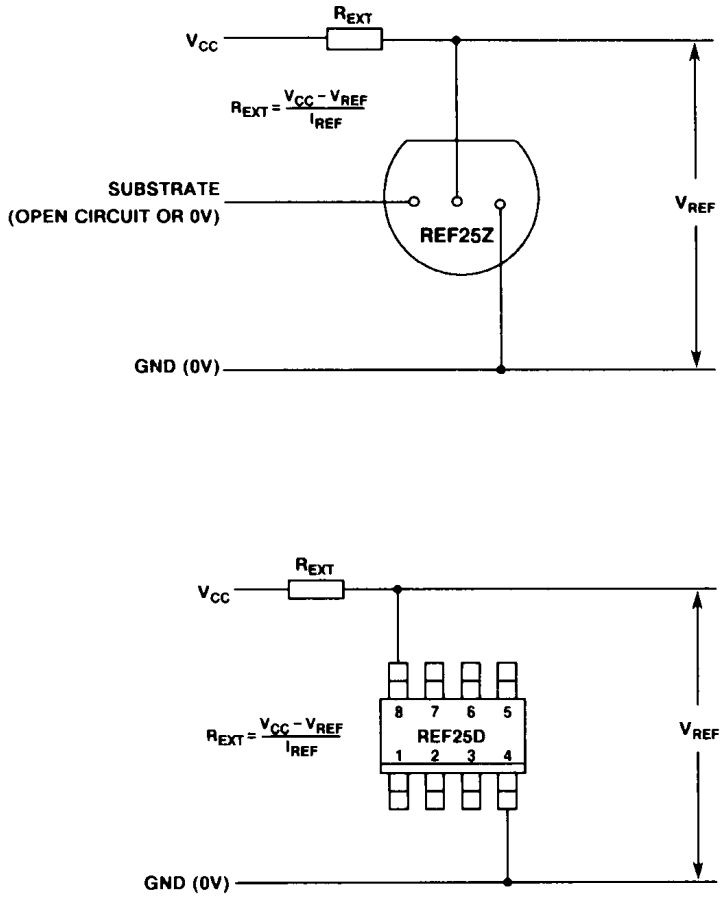


*Fig.3 Connection diagram*

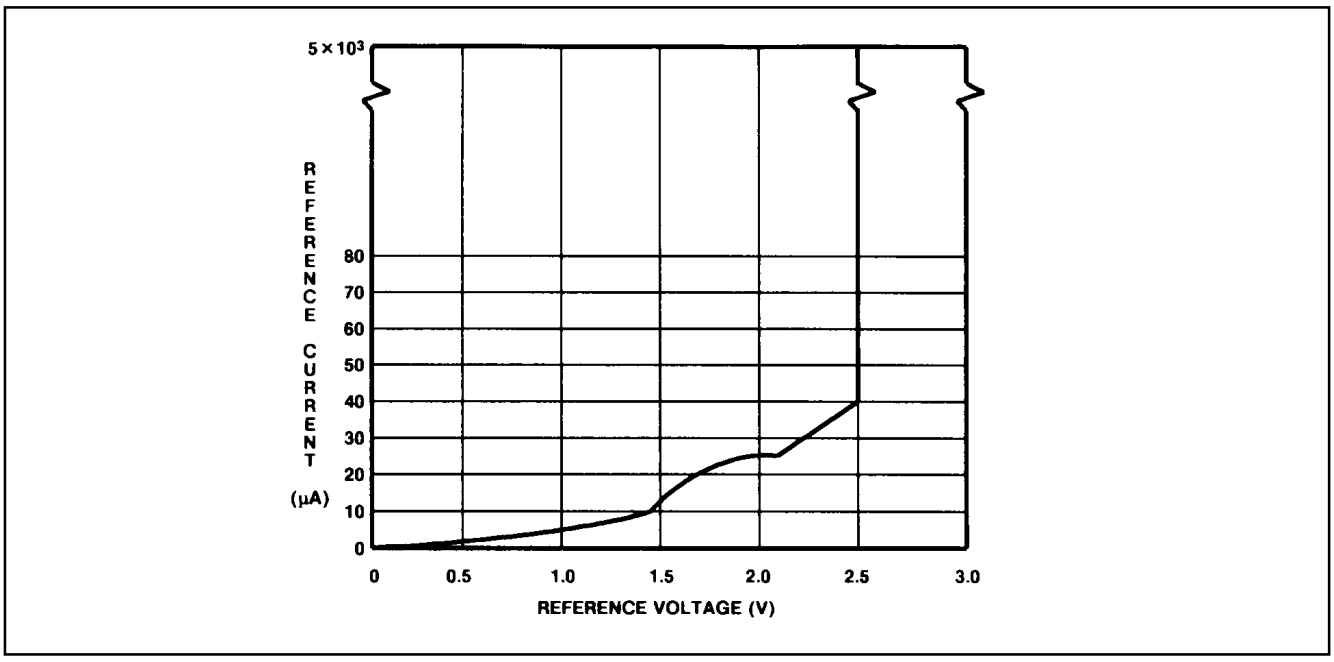


*Fig.4 Typical reference characteristic*

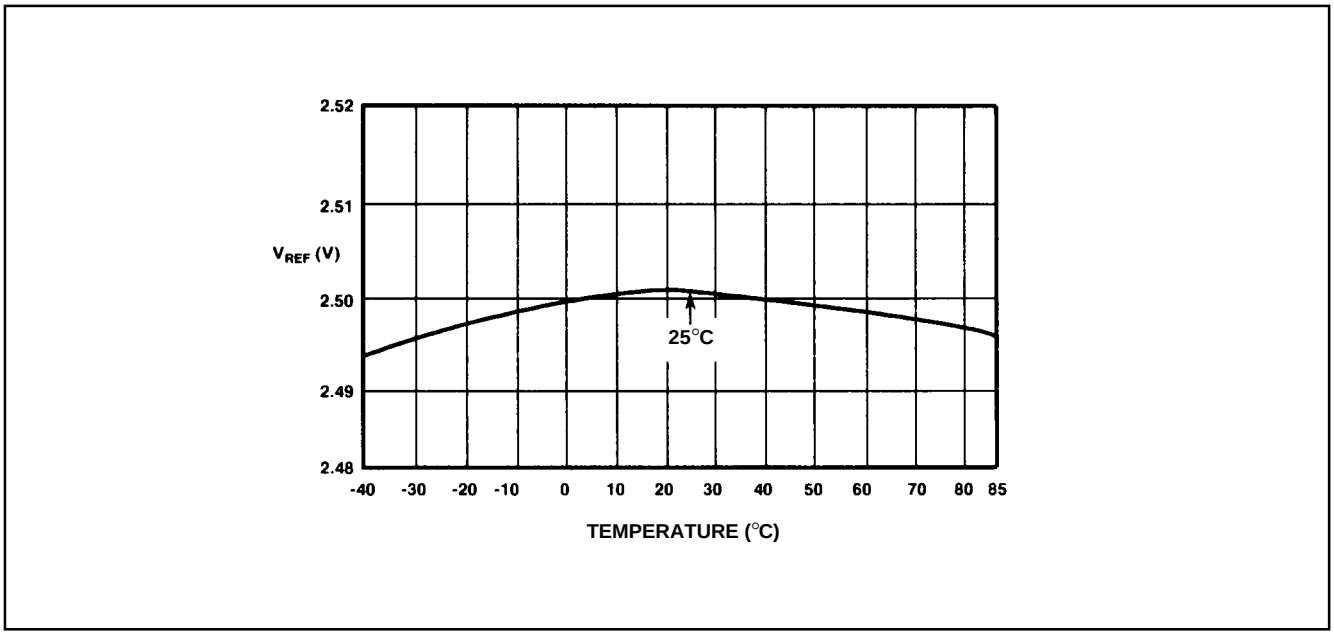


*Fig.5 Typical temperature characteristics at $I_{REF}$ = 150μA*

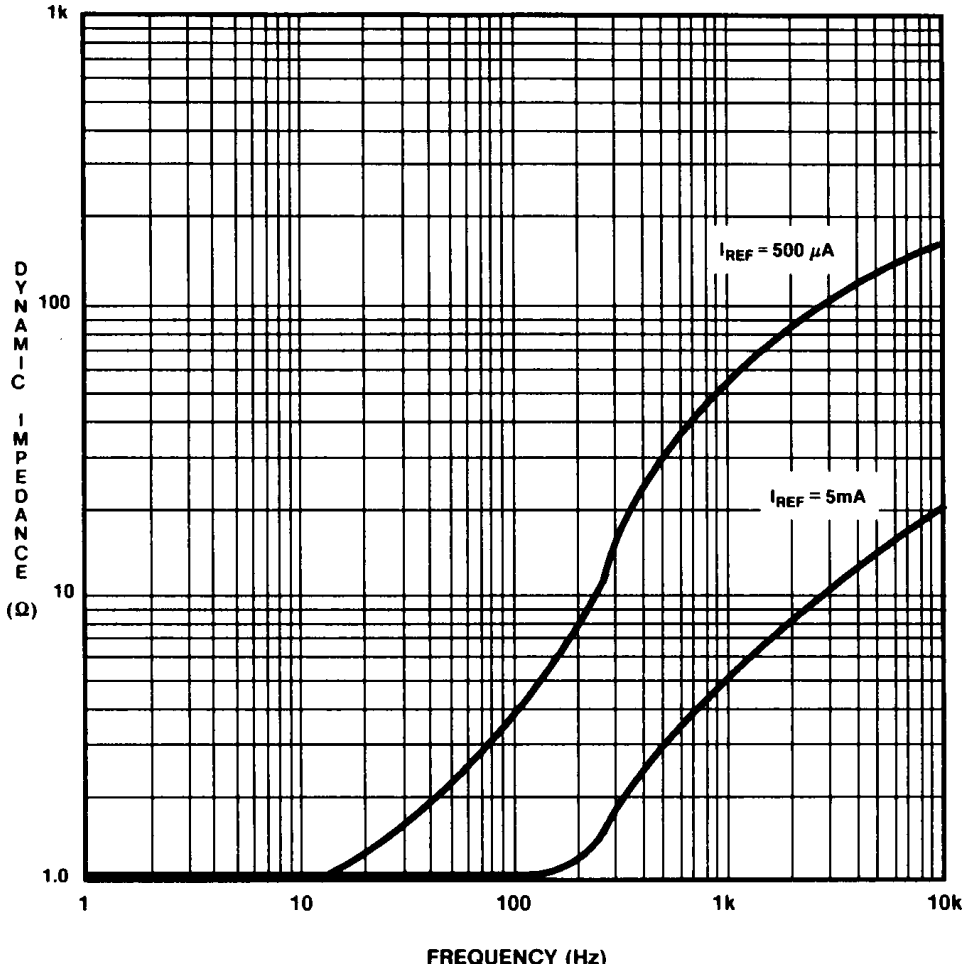


*Fig.6 Typical dynamic impedance*

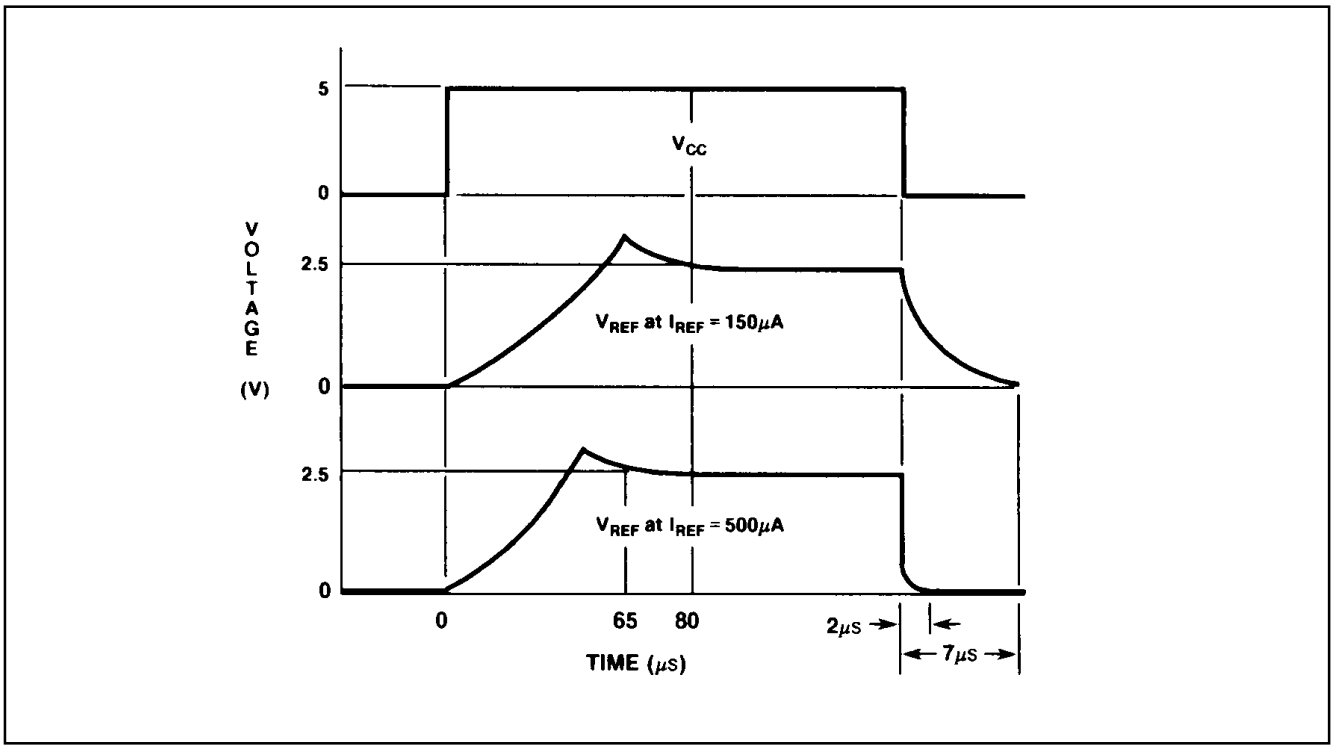


*Fig.7 Typical response time*

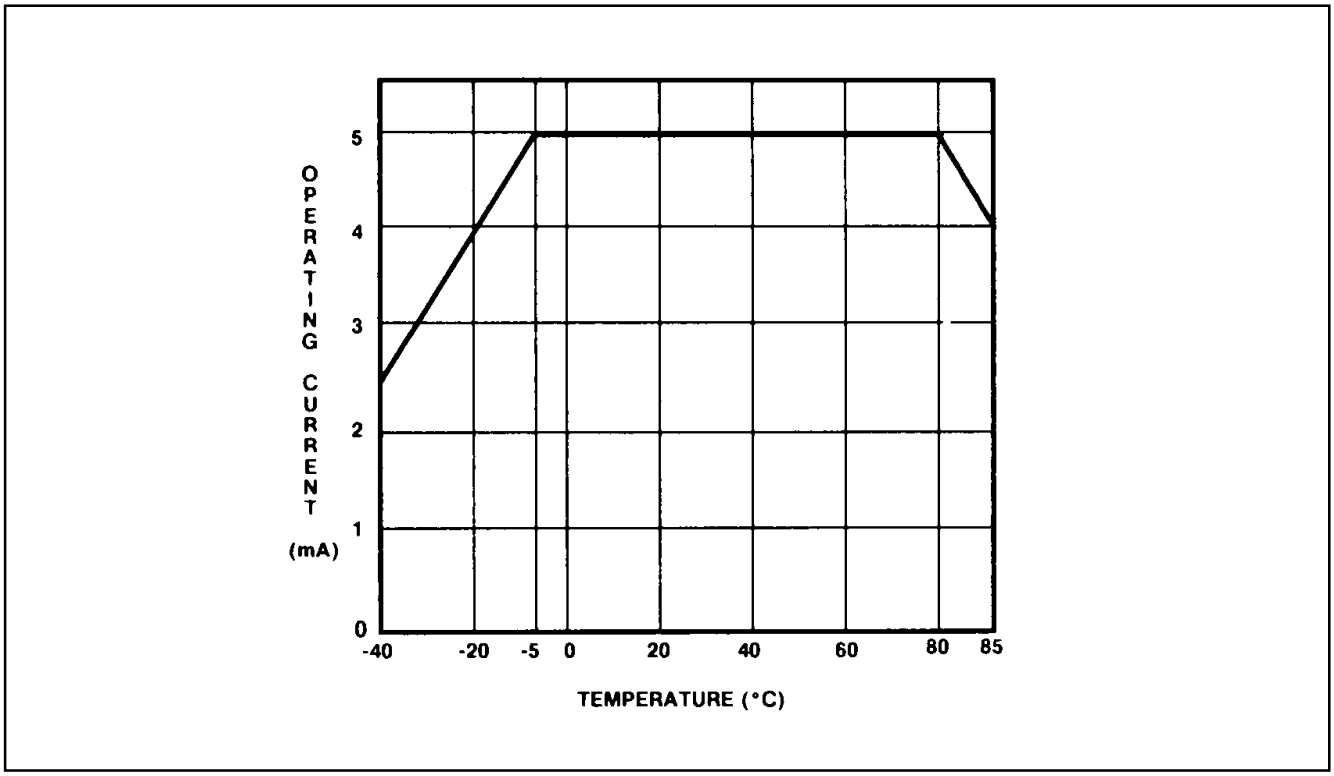


*Fig.8 Derating curve REF25Z/25D*


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