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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  $\pm 1\%$
- Low Temperature Coefficient
- Low Slope Resistance
- Low Cost
- Operation over Industrial Temperature Range

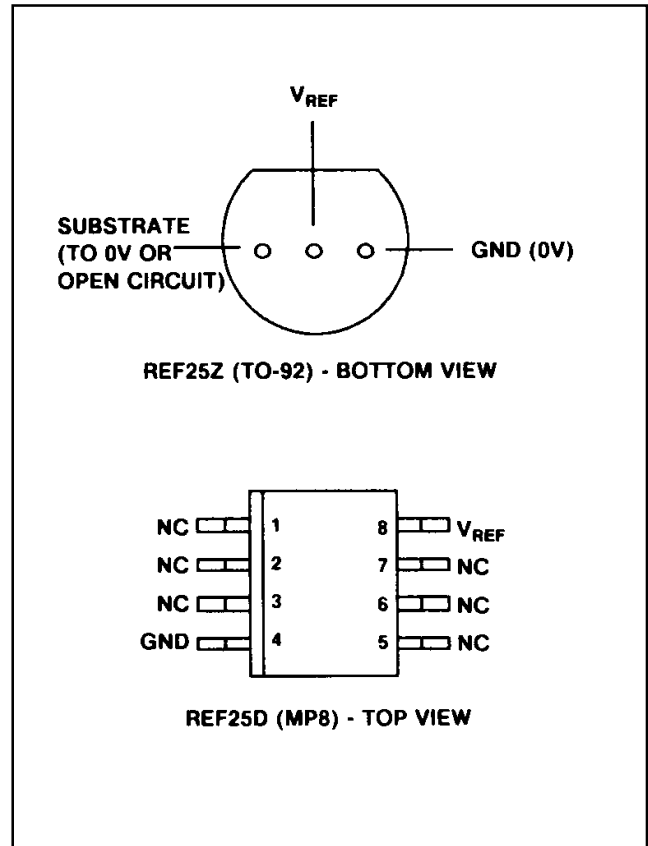


Fig.1 Pin connection

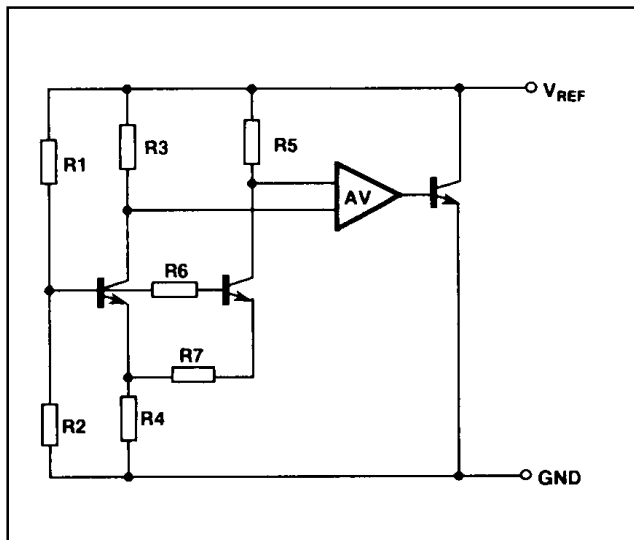


Fig.2 Internal connections

### 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

# REF25Z/25D

## ELECTRICAL CHARACTERISTICS

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

$$T_{amb} = 25^{\circ}\text{C}, I_{REF} = 150\mu\text{A}$$

Characteristic	Symbol	Value			Units	Conditions
		Min.	Typ.	Max.		
Output voltage	$V_{REF}$	2.475	2.500	2.525	V	REF25Z } $I_{REF} = 150\mu\text{A}$ REF25D } to 5mA
Slope resistance (Note 1)	$R_{REF}$		1.2	2.0	$\Omega$	
			1.2	2.0	$\Omega$	
Turn-on (knee) current	$I_{ON}$		40		$\mu\text{A}$	
Recommended operating current range	$I_{REF}$	0.06		5.0	mA	
Temperature coefficient (Note 2)	TC $V_{REF}$		35	110	ppm/ $^{\circ}\text{C}$	REF25Z } Note 2 REF25D }
			35	80	ppm/ $^{\circ}\text{C}$	
RMS noise voltage	$E_N$		13		$\mu\text{V}$	1kHz to 10kHz
Turn-on time	$T_{ON}$		80		$\mu\text{s}$	} $I_{REF} = 500\mu\text{A}$
Turn-off time	$T_{OFF}$		7		$\mu\text{s}$	
Turn-on time	$T_{ON}$		65		$\mu\text{s}$	
Turn-off time	$T_{OFF}$		2		$\mu\text{s}$	

### 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/ $^{\circ}\text{C}$

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

$\Delta T$  = temperature change in  $^{\circ}\text{C}$

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

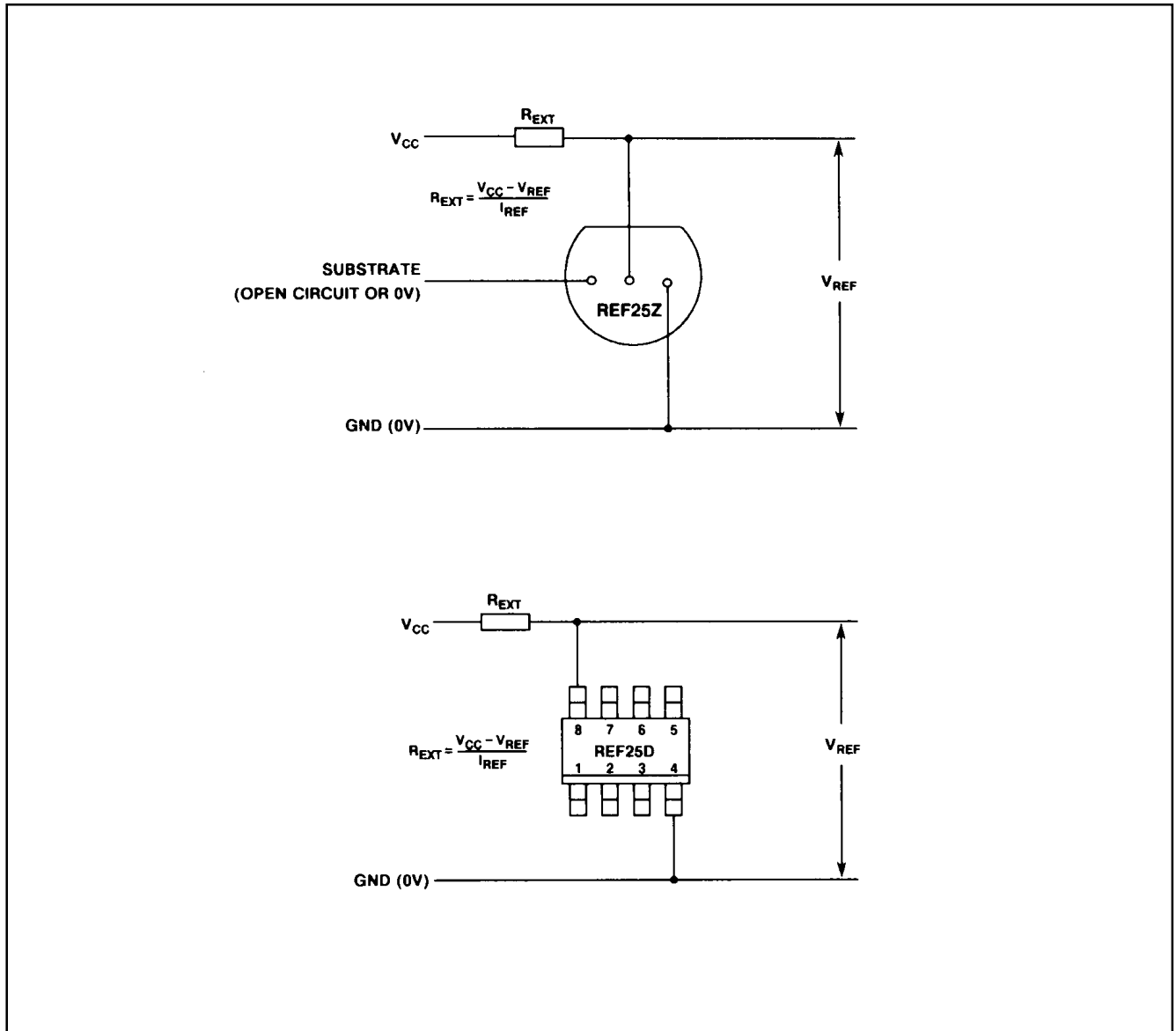


Fig.3 Connection diagram

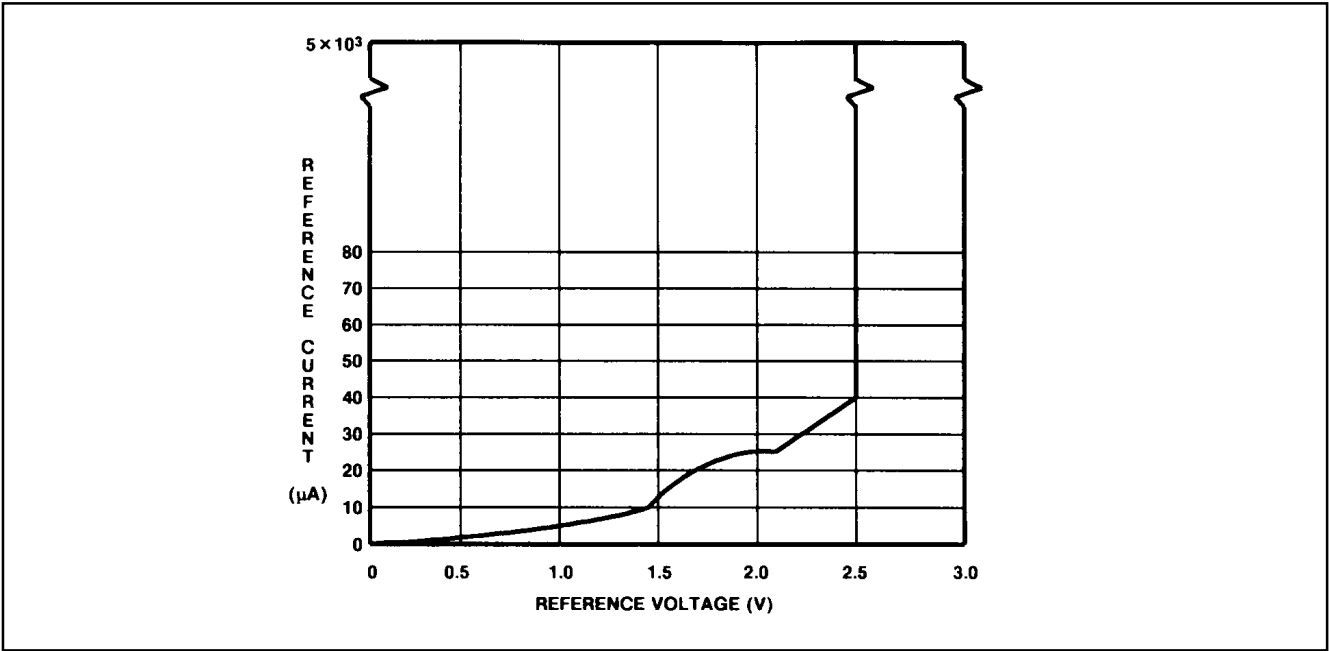


Fig.4 Typical reference characteristic

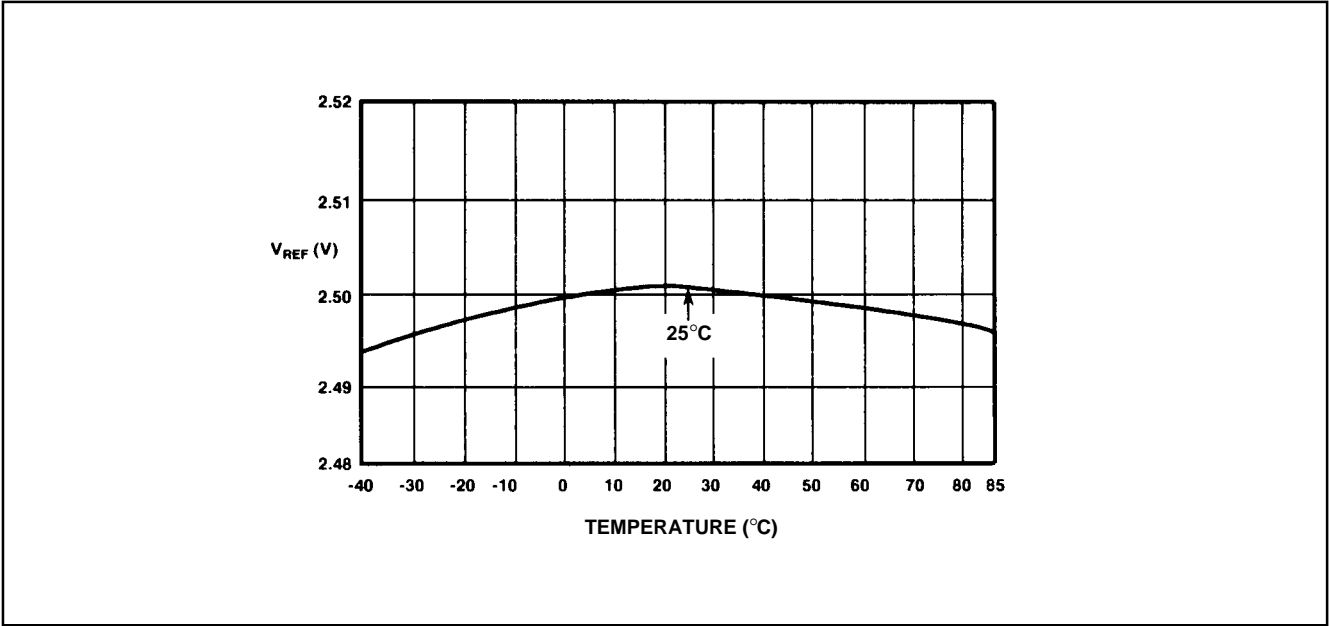


Fig.5 Typical temperature characteristics at  $I_{REF} = 150\mu A$

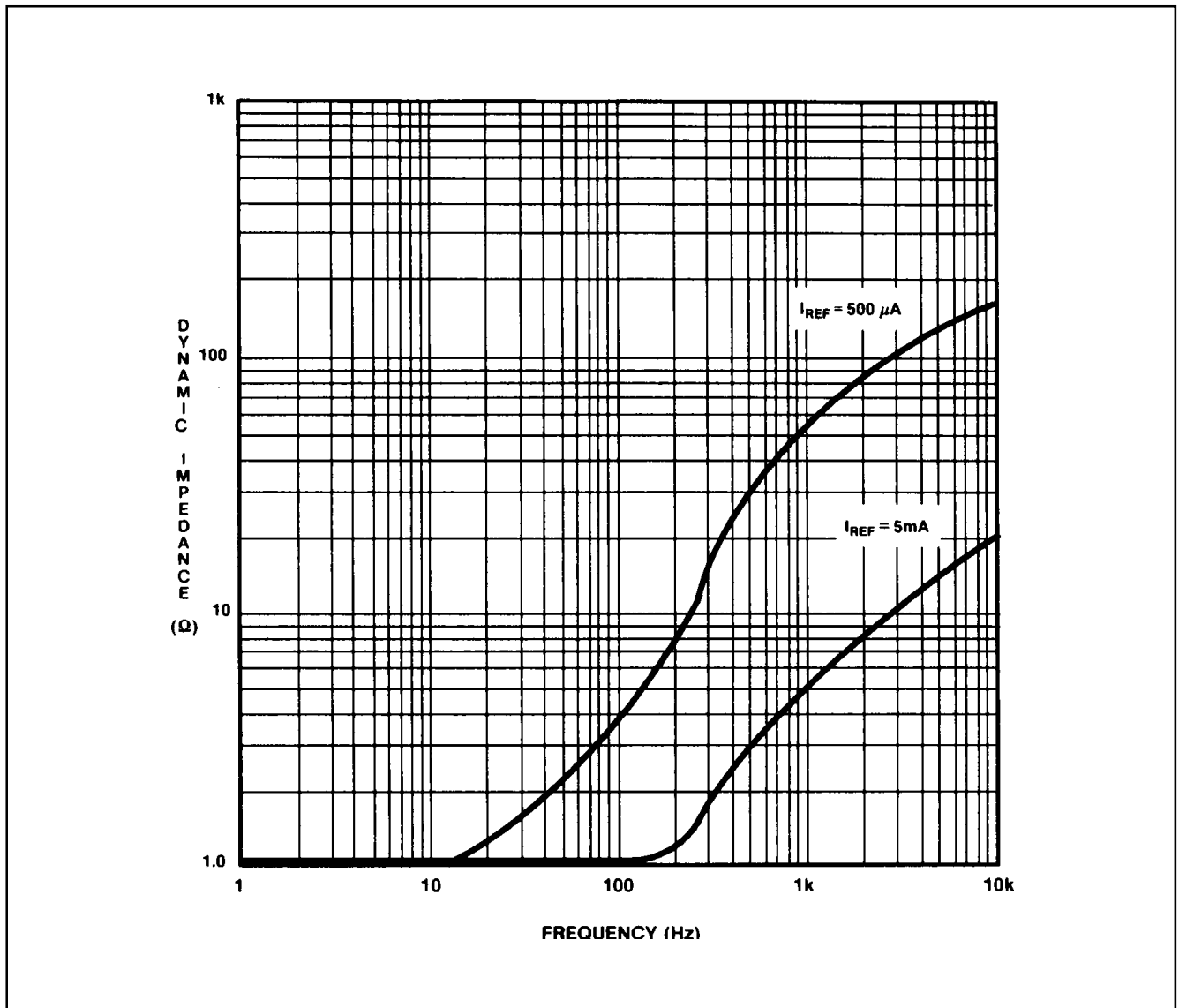


Fig.6 Typical dynamic impedance

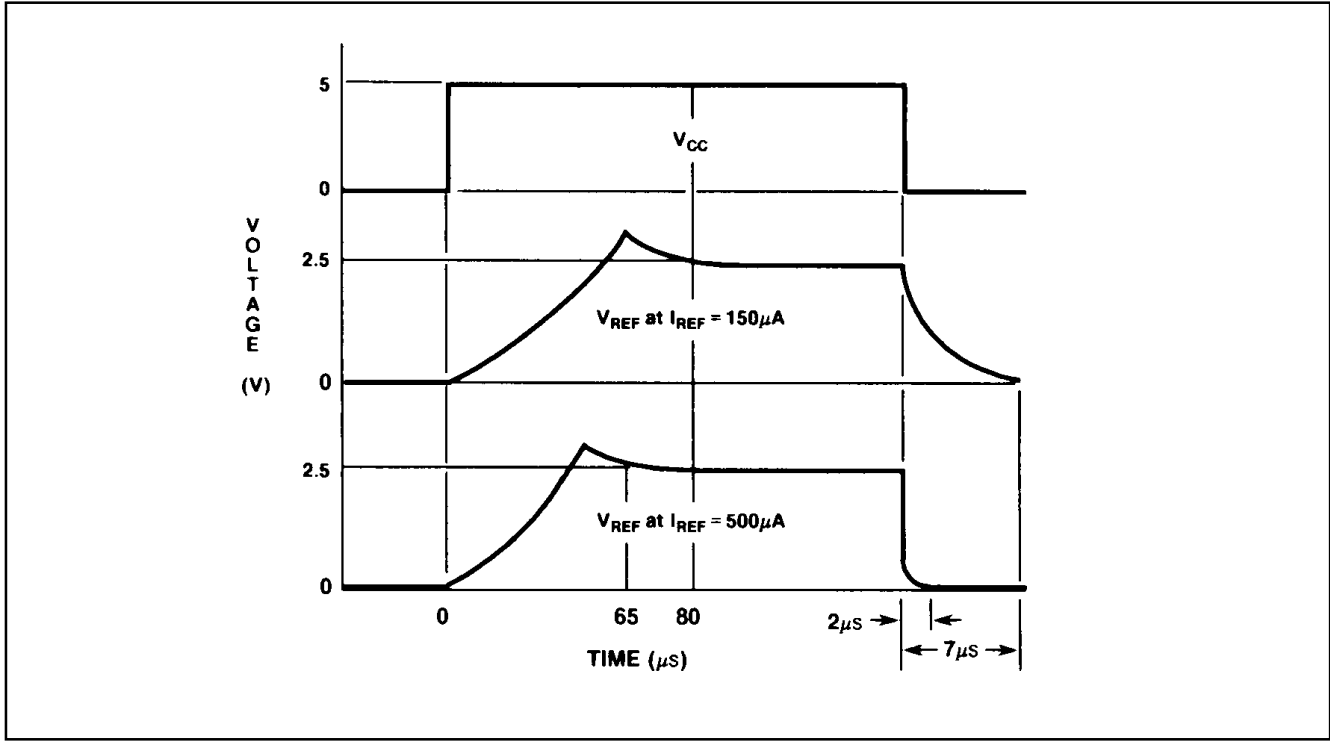


Fig.7 Typical response time

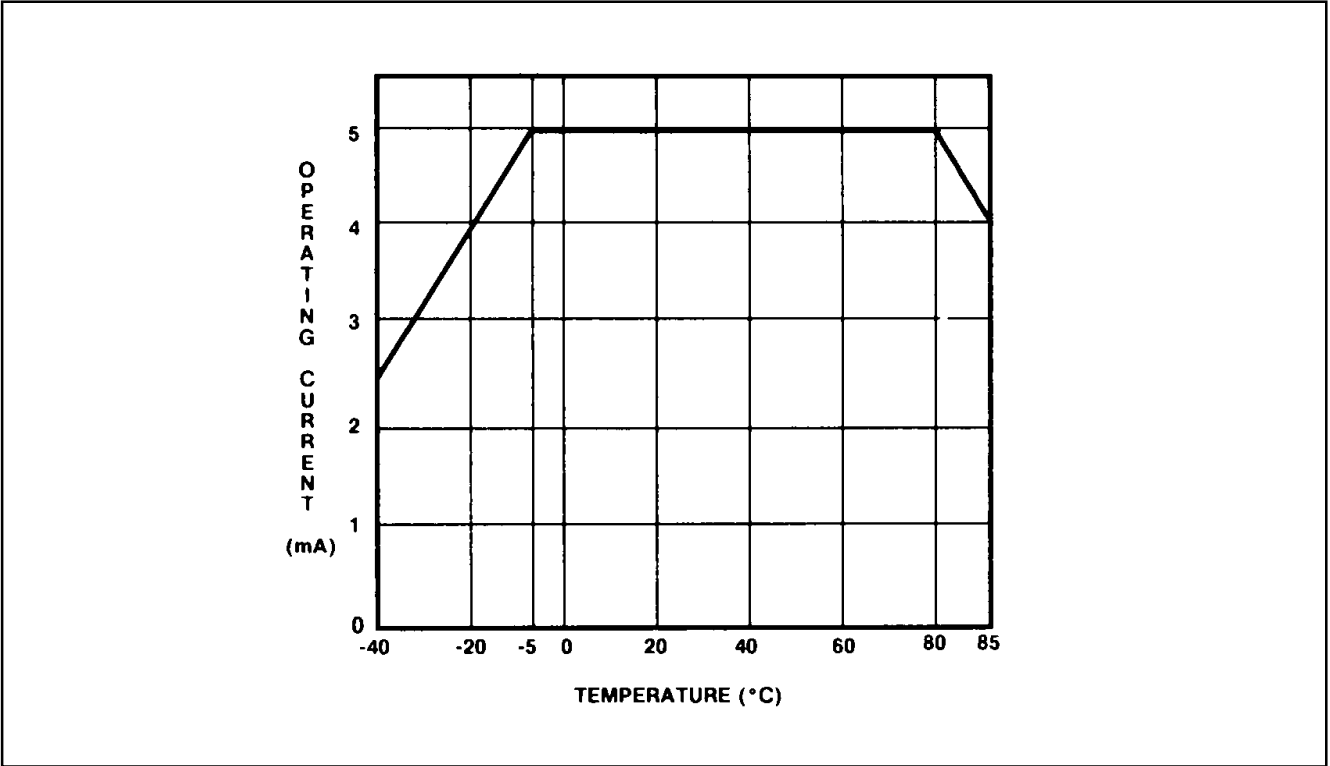


Fig.8 Derating curve REF25Z/25D







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