

## Precision Micropower Shunt Voltage Reference

### ■GENERAL DESCRIPTION

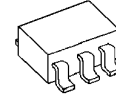
**NJM2825** is a precision and low quiescent current shunt voltage reference.

Reference voltage form bandgap circuit has guaranteed the high accuracy of the  $\pm 0.5\%$  with trimming. In addition the temperature drift of  $10\text{ppm}/^\circ\text{C}$  typ. was actualized by the temperature compensating circuit. The reference voltage circuit operates by consumed low quiescent current of the  $0.7\mu\text{A}$  for low power technology.

The Output capacitor is unnecessary by the phase compensating circuit which is built in. Tolerates capacitive loads, it is easy to use for application.

It is suitable for data converters, instrumentation, and other applications where precision reference is required.

### ■PACKAGE OUTLINE

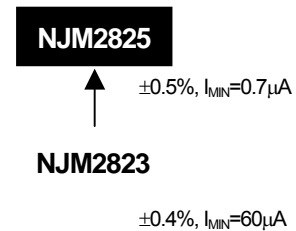


**NJM2825F**

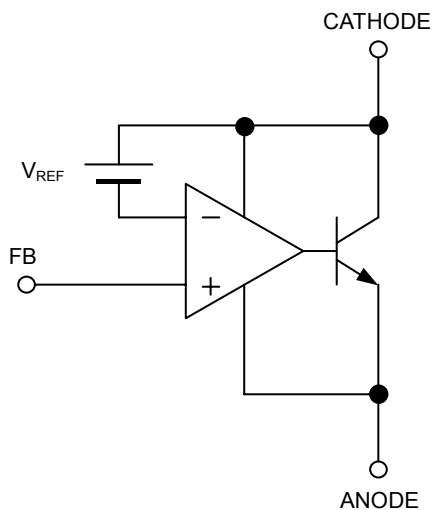
### ■FEATURES

- Precision Reference Voltage       $1,200\text{mV}\pm 0.5\%$
- Low temperature coefficient       $10\text{ppm}/^\circ\text{C}$  typ.
- Low Quiescent Current             $0.7\mu\text{A}$  max.
- No Output Capacitor Required
- Tolerates Capacitive Loads
- Bipolar Technology
- Package Outline                    NJM2825F : SOT-23-5 (MTP5)

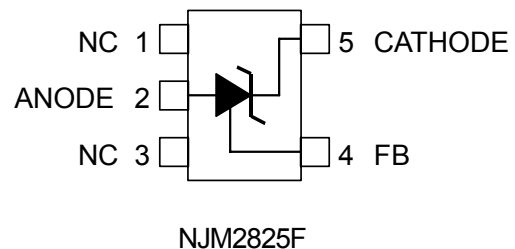
### ■PRODUCT VARIATION



### ■BLOCK DIAGRAM



### ■PIN CONFIGURATION



# NJM2825

## ■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Cathode Voltage	$V_{KA}$	14	V
Cathode Current	$I_K$	20	mA
Cathode-Anode Reverse Current	$-I_K$	10	mA
Power Dissipation	$P_D$	200	mW
Operating Temperature Range	$T_{OPR}$	-40 ~ +85	°C
Storage Temperature Range	$T_{STG}$	-40 ~ +125	°C

## ■RECOMMENDED OPERATING CONDITIONS (Ta=25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	$V_{KA}$	$V_{REF}$	-	13	V
Cathode Current	$I_K$	0.7μ	-	12	mA

## ■ELECTRICAL CHARACTERISTICS ( $I_K=0.8\mu A, T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage	$V_{REF}$	$V_{FB}=V_A$ (*1)	1194.0	1200.0	1206.0	mV
Load Regulation	$\frac{\Delta V_{REF}}{\Delta I_K}$	$V_{FB}=V_A, I_{MIN} \leq I_K \leq 200\mu A$ (*1)	-	0.2	0.7	mV
		$V_{FB}=V_A, 200\mu A \leq I_K \leq 2mA$ (*1)	-	0.7	2	mV
		$V_{FB}=V_A, 2mA \leq I_K \leq 12mA$ (*1)	-	3.4	10	mV
Reference Voltage Change vs. Cathode Voltage Change	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$ V_{REF}  \leq V_{KA} \leq 13V, I_K=2\mu A$ $R1=120k\Omega, R2=val$ (Note 1) (*2)	-	-1	-2	mV/V
Minimum Operating Current	$I_{MIN}$	$V_{REF} \leq V_{KA} \leq 5V$ (*2)	-	0.3	0.7	μA
		$5V \leq V_{KA} \leq 13V$ (*2)	-	1	2	μA
Feedback Current	$I_{FB}$	$R1=\infty, R2=120k\Omega$ (*2)	-	0.3	1	nA
Dynamic Impedance	$ Z_{KA} $	$V_{FB}=V_A, I_K=0.7\mu A \sim 12mA$ (*1)	-	0.4	1.1	Ω

## ■TEMPERATURE CHARACTERISTICS ( $I_K=0.8\mu A, T_a=-40^\circ C \sim 85^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage Change (Note 2)	$\Delta V_{REF\_T}$	$V_{FB}=V_A$ (*1)	-	0.8 10	2.3 30	mV ppm/°C
Reference Voltage (Note 2)	$V_{REF\_T}$	$V_{FB}=V_A$ (*1)	1191.7	1200.0	1208.3	mV
Feedback Current Change	$I_{FB\_T}$	$R1=\infty, R2=120k\Omega$ (*2)	-	0.4	-	nA

Note 1:  $|V_{REF}|$ ...Reference voltage includes error.

Note 2: Reference Voltage Change is defined as

$$\Delta V_{REF\_T} [mV] = \pm < \text{Reference Voltage Change [ppm/°C]} > \times < -40^\circ C \sim 25^\circ C > \times V_{REF}$$

The maximum value of "Reference Voltage Change" is determined based on sampling evaluation from the 5 initial production lots, and thus not tested in the production test. Therefore, these values are for the reference design purpose only.

(\*1): Test Circuit (Fig.1)

(\*2): Test Circuit (Fig.2)

## TEST CIRCUIT

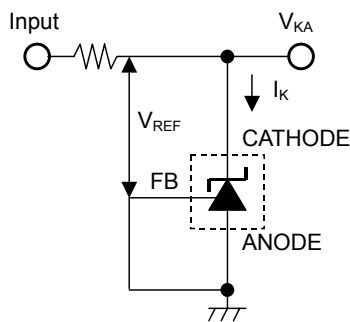


Fig.1  $V_{KA}=V_{REF}$  to test circuit

$$V_{FB}=V_A$$

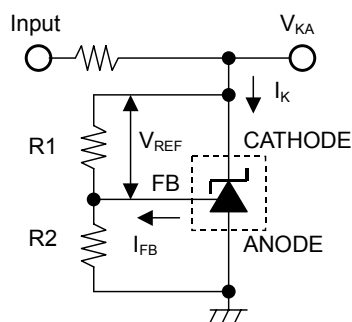
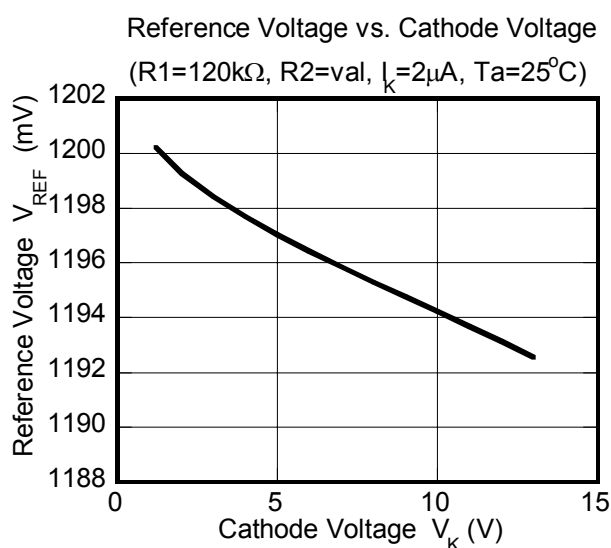
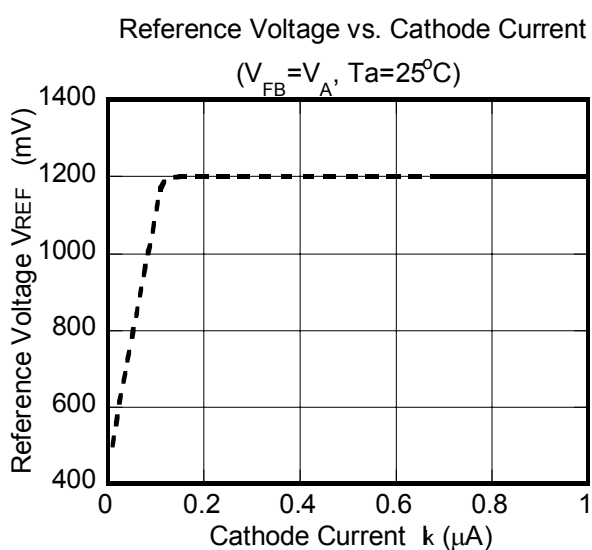
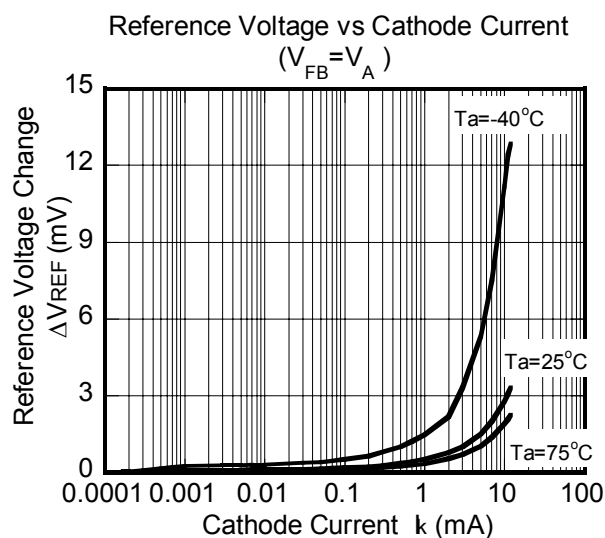
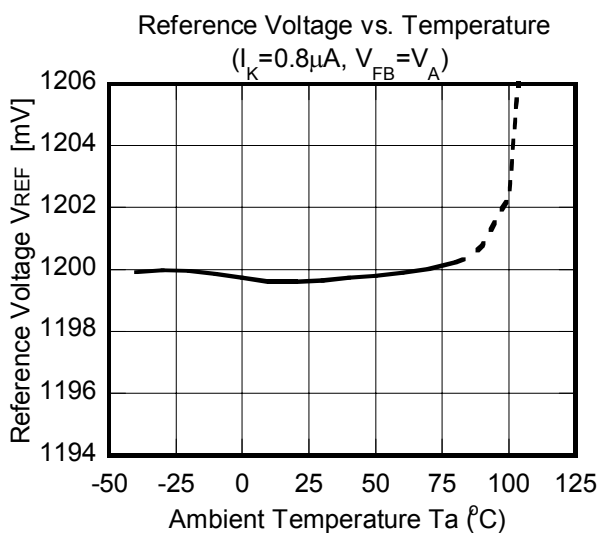


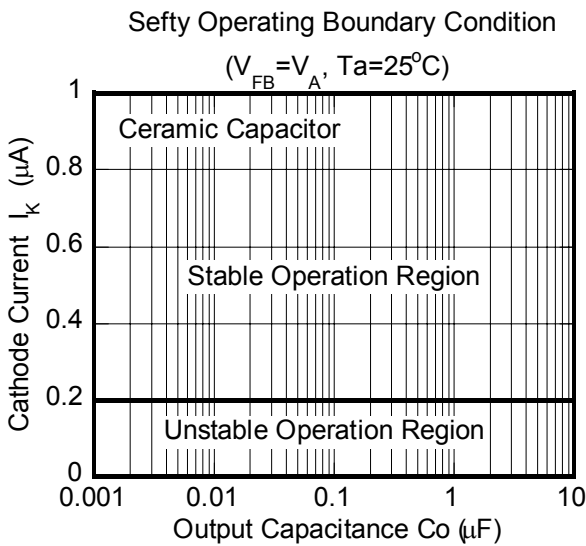
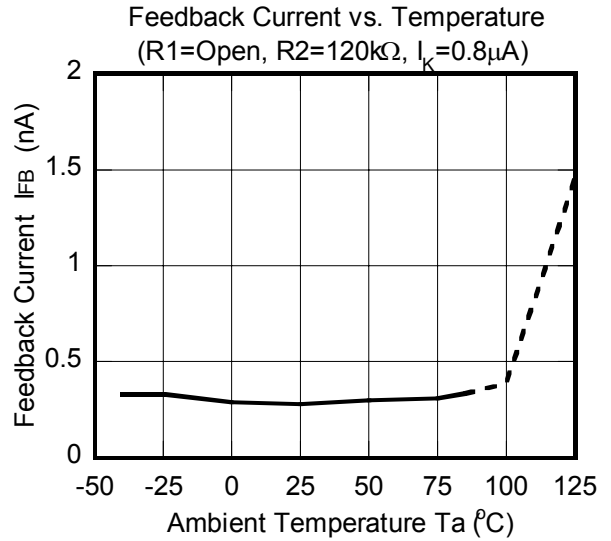
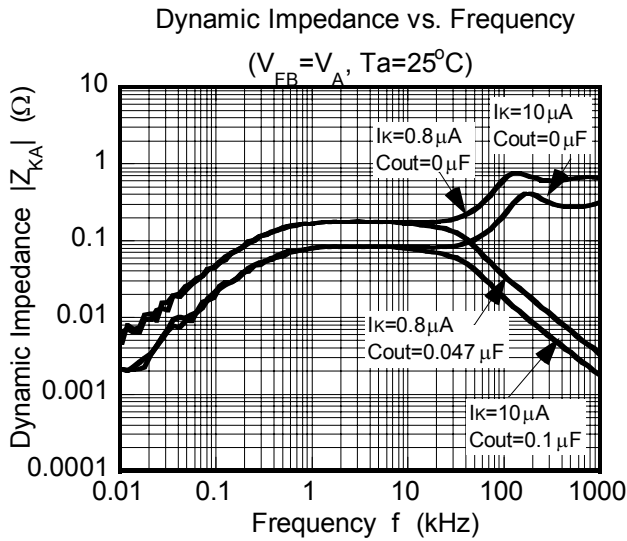
Fig.2  $V_{KA}>V_{REF}$  to test circuit

$$V_{KA} = V_{REF} \left( 1 + \frac{R2}{R1} \right) + I_{FB} \times R2$$

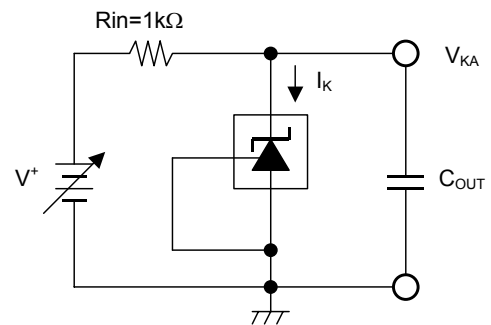
## TYPICAL CHARACTERISTICS



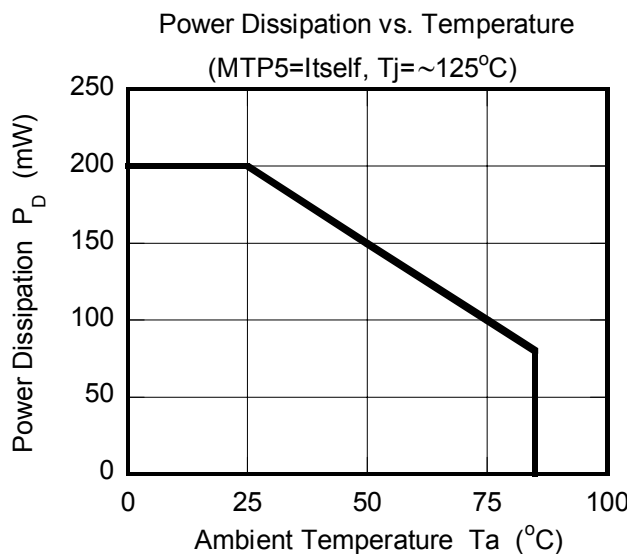
## TYPICAL CHARACTERISTICS



Safety Operating Boundary Condition  
Test Circuit



Note) Oscillation might occur while operating within the range of safety curve. So that, it is necessary to make ample margins by taking considerations of fluctuation of the device.



## MEMO

**[CAUTION]**

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