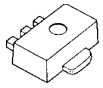
ADJUSTABLE HIGH PRECISION SHUNT REGULATOR

■GENERAL DESCRIPTION

NJM2373 / NJM2373A / NJM2376 is an adjustable high precision shunt regulator.

The output voltage can be adjusted to any value between reference voltage and 14V by two extend resistors.

■PACKAGE OUTLINE

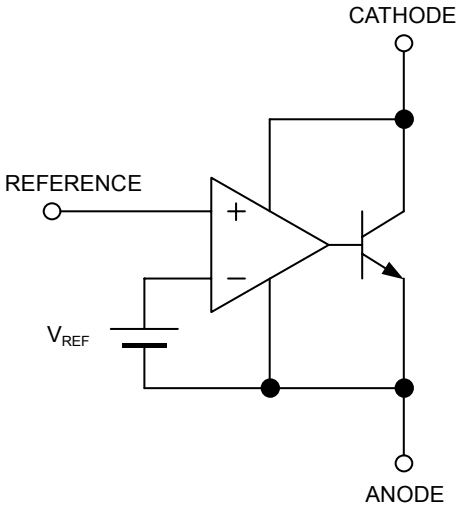


NJM2373F/AF **NJM2373AU**
NJM2376F **NJM2376U**

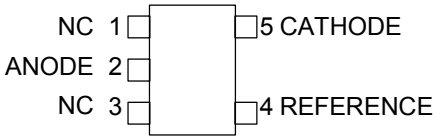
■FEATURES

- Operating Voltage V_{REF} to 13V
- High Precision Voltage Reference NJM2373 1.25V±2%
  NJM2373A/76 1.25V±1%
- Minimum Input Current 80μA typ.
- Adjustable Output Voltage
- Bipolar Technology
- Package Outline SOT-89 (3pin), MTP5

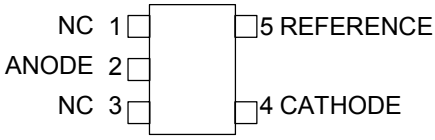
■BLOCK DIAGRAM



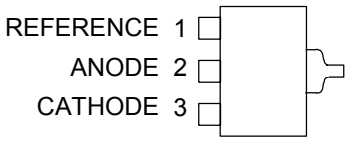
■PIN CONFIGURATION



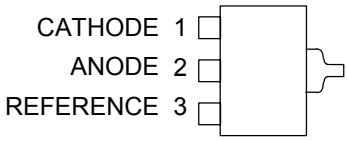
NJM2373F/73AF



NJM2376F



NJM2373AU



NJM2376U

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Cathode Voltage	V_{KA}	+14	V
Continuous Cathode Current	I_K	-30 ~ 50	mA
Reference Input Current	I_{REF}	-10 ~ 0.05	mA
Power Dissipation	P_D	(SOT-89) 350 (MTP5) 200	mW
Operating Temperature Range	T_{OPR}	-40 ~ +85	°C
Storage Temperature Range	T_{STG}	-40 ~ +150	°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	0.5	–	30	mA

■ELECTRICAL CHARACTERISTICS (I_K=1mA, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Reference Voltage	V_{REF}	$V_{KA}=V_{REF}$ NJM2373A	(*1)	1225	1250	1275	mV
		$V_{KA}=V_{REF}$ NJM2373A/ NJM2376	(*1)	1237	1250	1263	
Reference Voltage Change vs. Cathode Voltage Change	$\Delta V_{REF}/\Delta V_{KA}$	$\lvert V_{REF} \rvert \leq V_{KA} \leq 5V$	(*2)	–	–	±2.7	mV/V
		$5V \leq V_{KA} \leq 13V$	(*2)	–	–	±2.0	mV/V
Reference Input Current	I_{REF}	$V_{KA}=V_{REF}$ R1=10kΩ, R2=∞	(*2)	–	2.0	4.0	μA
Minimum Input Current	I_{MIN}	$V_{KA}=V_{REF}$, ΔV_{REF}=±1%	(*1)	–	80	500	μA
Cathode Current (Off Cond.)	I_{OFF}	V_{KA}=13V, V_{REF}=0V	(*3)	–	0.01	1.0	μA
Dynamic Impedance	$\lvert Z_{KA} \rvert$	$V_{KA}=V_{REF}$, f≤1kHz 0.5mA ≤ I_K ≤ 30mA	(*1)	–	0.12	–	Ω

■TEMPERATURE CHARACTERISTICS (I_K=1mA, Ta= -40°C ~ 85°C)

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Reference Voltage Change	ΔV_{REF}	$V_{KA}=V_{REF}$	(*1)	–	±10	–	mV
Reference Input Current Change	ΔI_{REF}	$V_{KA}=V_{REF}$ R1=10kΩ, R2=∞	(*2)	–	0.5	–	μA

$\lvert V_{REF} \rvert$ ···Reference voltage includes error.

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

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

(*3): Test Circuit (Fig.3)

■TEST CIRCUIT

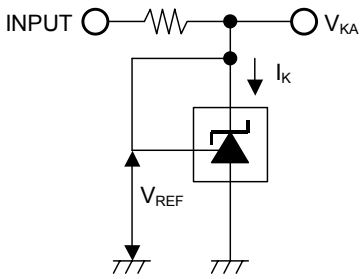


Fig.1 $V_{KA}=V_{REF}$ to test circuit

$V_O=V_{KA}=V_{REF}$

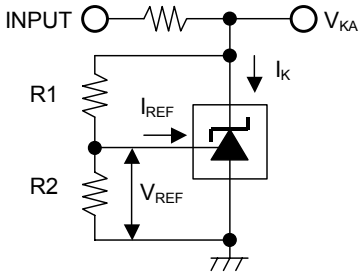


Fig.2 $V_{KA}>V_{REF}$ to test circuit

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

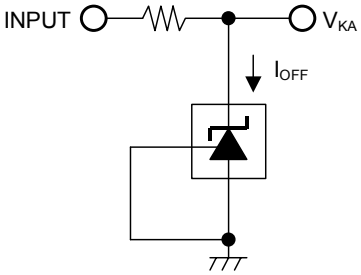


Fig.3 I_{OFF} to test circuit

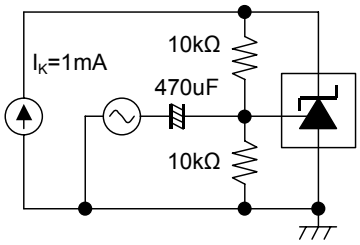
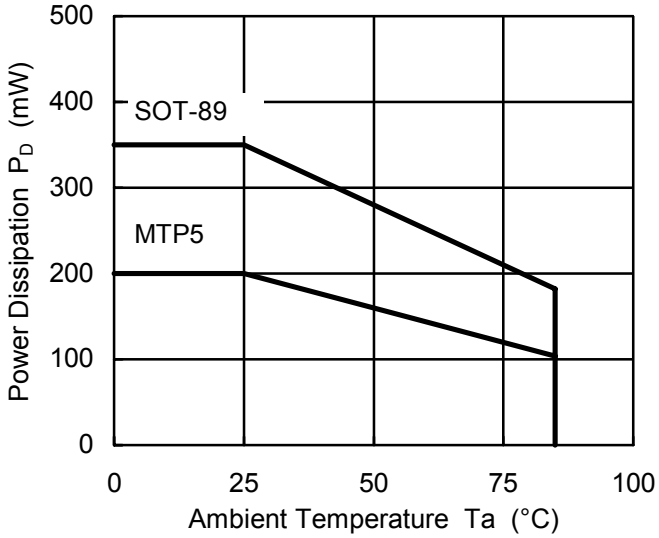


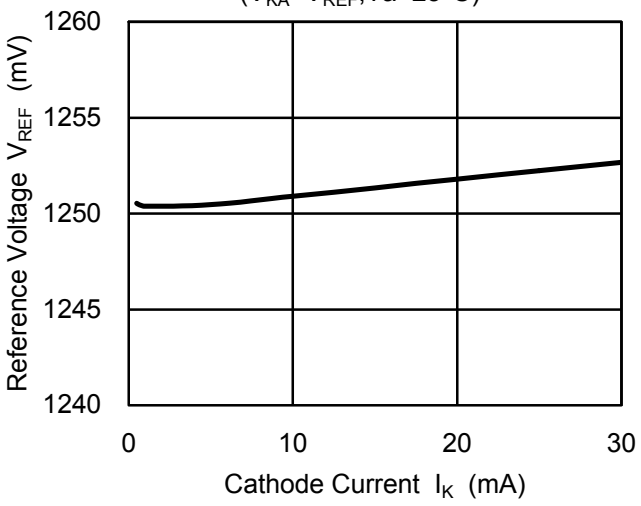
Fig.4 Gain and Phase to test circuit

■POWER DISSIPATION VS. AMBIENT TEMPERATURE

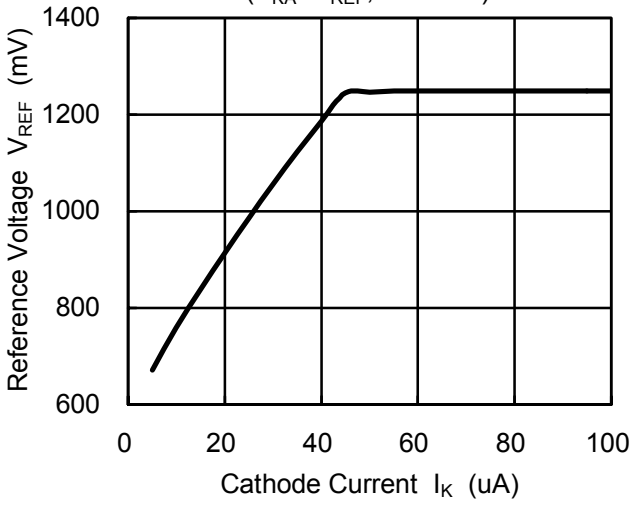


■TYPICAL CHARACTERISTICS

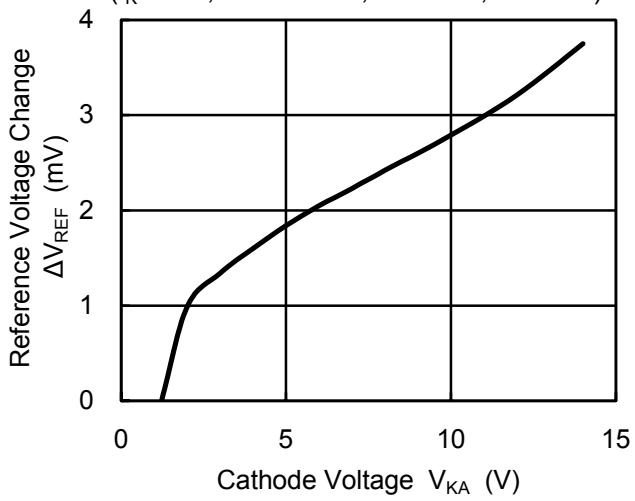
Reference Voltage vs. Cathode Current
(V_{KA}=V_{REF},Ta=25°C)



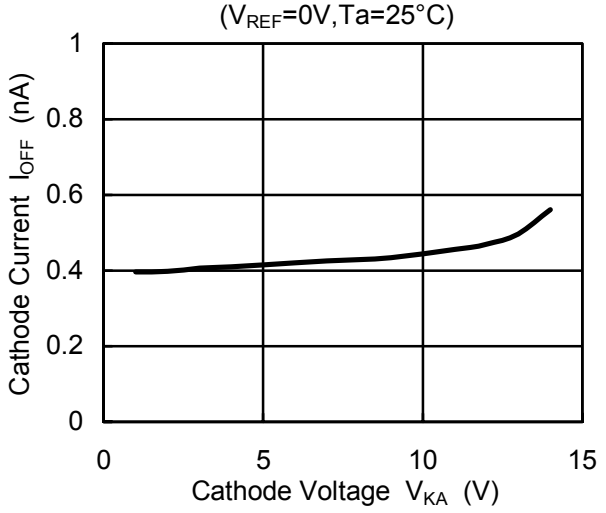
Reference Voltage vs. Cathode Current
(V_{KA}=V_{REF},Ta=25°C)



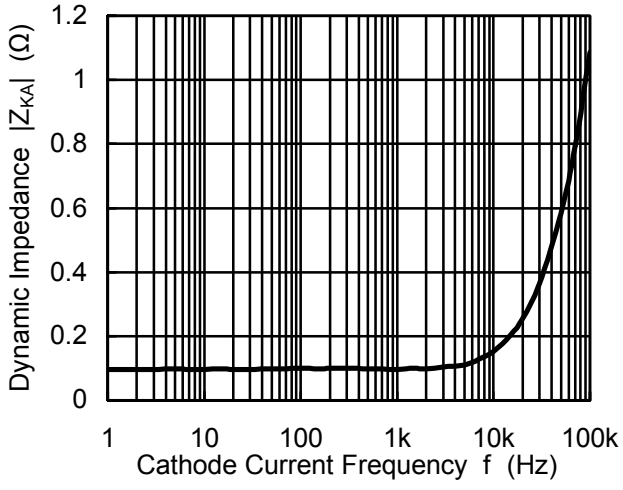
Reference Voltage Change vs. Cathode Voltage
(I_K=1mA,R1=Variable,R2=10kΩ,Ta=25°C)



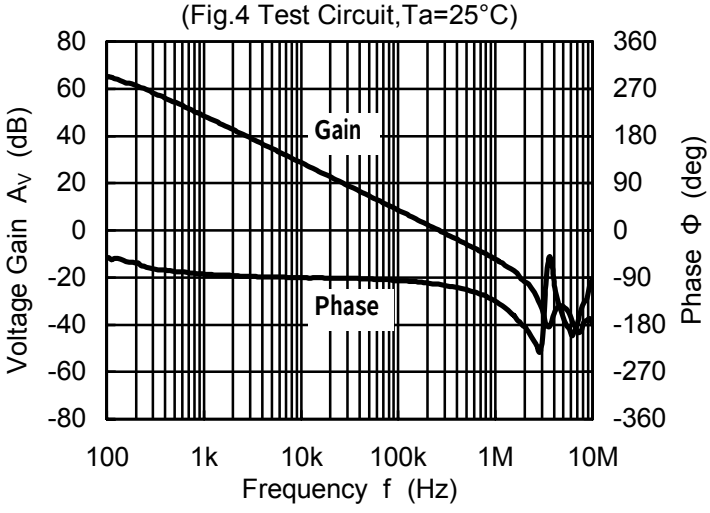
Cathode Current (Off Cond.) vs. Cathode Voltage
(V_{REF}=0V,Ta=25°C)



Dynamic Impedance
(I_K=0.5~30mA,V_{KA}=V_{REF},Ta=25°C)



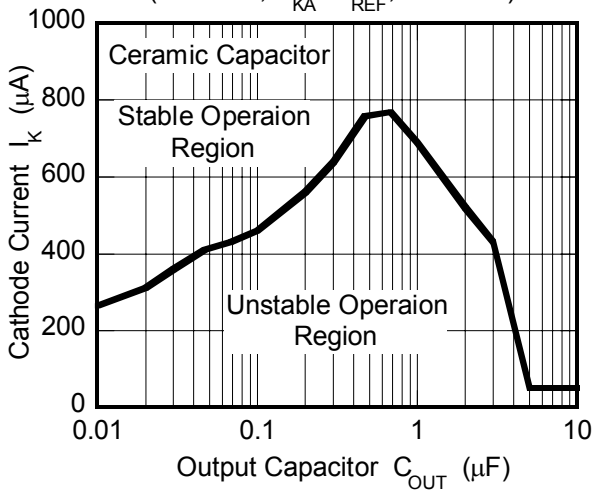
Voltage Gain · Phase vs. Frequency
(Fig.4 Test Circuit,Ta=25°C)



■TYPICAL CHARACTERISTICS

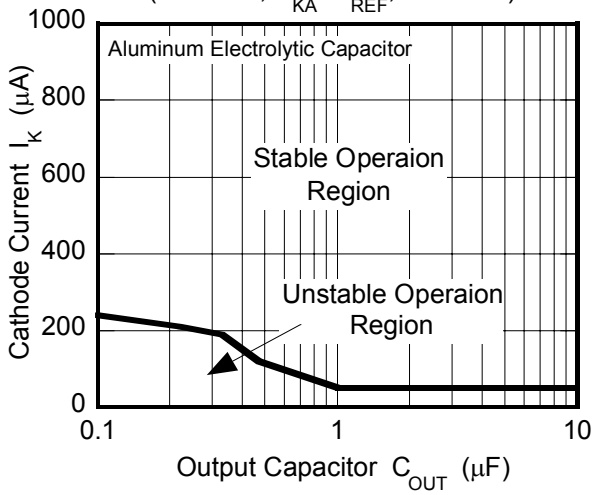
Safety Operating Boundary Condition

(Rin=1kΩ, V_{KA}=V_{REF}, Ta=25°C)



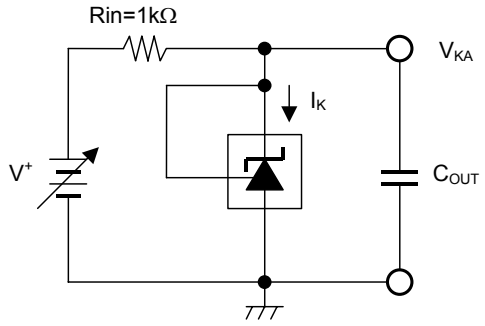
Safety Operating Boundary Condition

(Rin=1kΩ, V_{KA}=V_{REF}, Ta=25°C)



Safety Operating Boundary Condition

Test Circuit

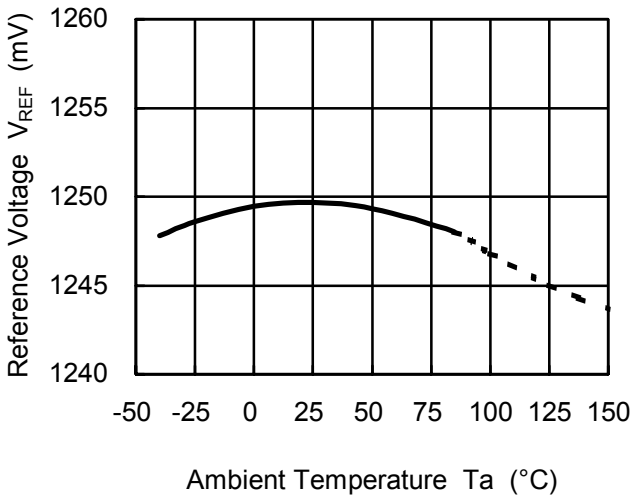


Note) Oscillation might occur while operating within the range of safety curve.

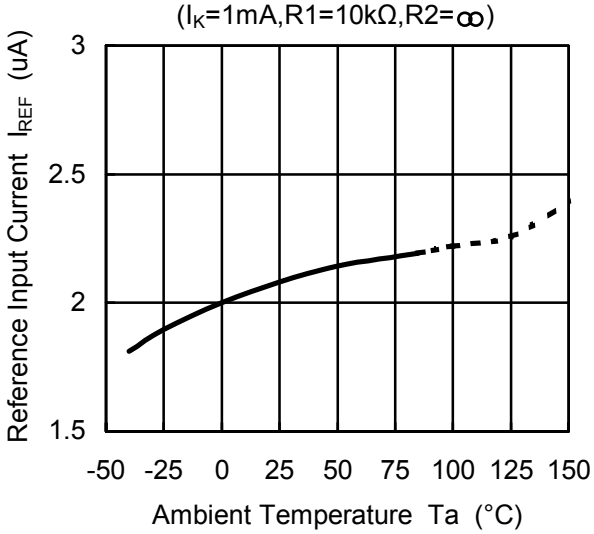
So that, it is necessary to make ample margins by taking considerations of fluctuation of the device.

■TYPICAL CHARACTERISTICS

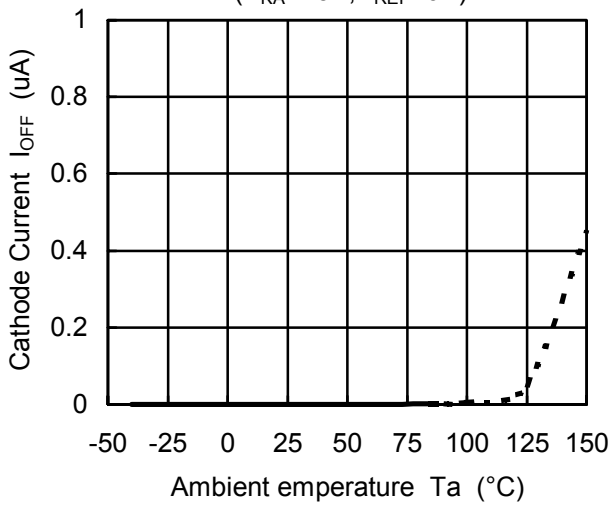
Reference Voltage vs. Temperature
(I_K=1mA,V_{KA}=V_{REF})



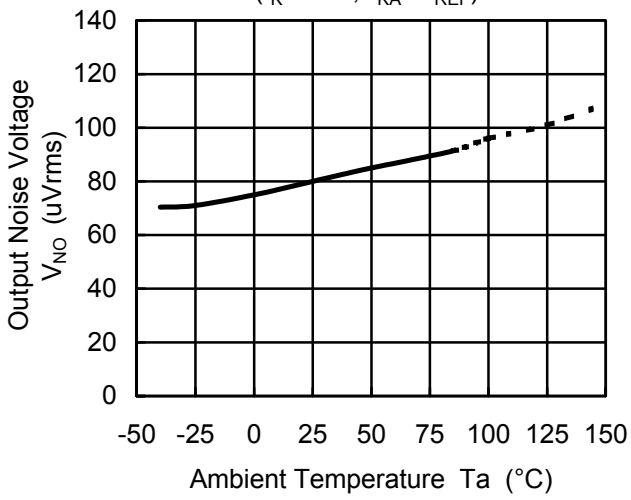
Reference Input Current vs. Temperature
(I_K=1mA,R1=10kΩ,R2=∞)



Cathode Current (Off Cond.) vs. Temperature
(V_{KA}=13V,V_{REF}=0V)



Output Noise Voltage vs. Temperature
(I_K=1mA,V_{KA}=V_{REF})



MEMO