ADJUSTABLE HIGH PRECISION SHUNT REGULATOR
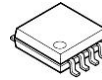
■ GENERAL DESCRIPTION

The **NJM2380/A and NJM2390/A** are adjustable high precision shunt regulators.

They are adapted for downsizing power supply module, battery charger and others, because an ultra mini package SOT23-5 is included in the package line-up.
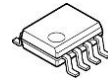
■ FEATURES

- Operating Voltage V_{REF} to 18V
- High Precision Voltage Reference   2.465V±2%
         2.465V±1% : A Version
- Mounted in Ultra Mini Package   SOT23-5
- Minimum External Parts
- Bipolar Technology
- Package Outline   DMP8, SOP8 JEDEC 150mil
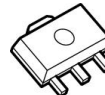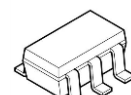   SOT89-3, SOT23-5

■ PACKAGE OUTLINE

NJM2380M/AM
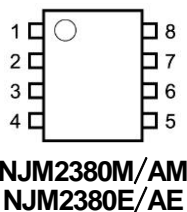**(DMP8)**

NJM2380E/AE
(SOP8)

NJM2380U/AU
NJM2390U/AU
(SOT89-3)

NJM2380F/AF
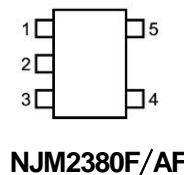**(SOT23-5)**

■ PIN CONFIGURATION

NJM2380M/AM
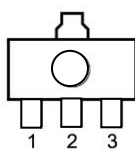**NJM2380E/AE**

PIN FUNCTION
1. CATHODE
2. NC
3. NC
4. NC
5. NC
6. ANODE
7. NC
8. REFERENCE

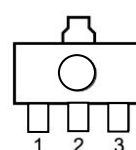**NJM2380F/AF**

PIN FUNCTION
1. NC
2. ANODE
3. NC
4. CATHODE
5. REFERENCE

NJM2380U/AU

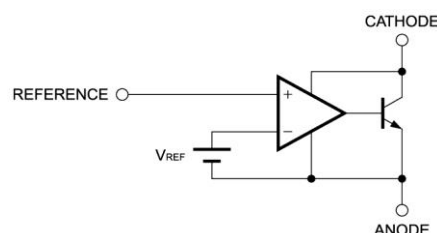PIN FUNCTION
1. REFERENCE
2. ANODE
3. CATHODE

NJM2390U/AU

PIN FUNCTION
1. CATHODE
2. ANODE
3. REFERENCE

■ BLOCK DIAGRAM

NJM2380/A, NJM2390/A

■ ABSOLUTE MAXIMUM RATINGS   (T$_a$=25°C)

PARAMETER	SYMBOL	RATINGS		UNIT
Cathode Voltage	V$_{KA}$	+20		V
Continuous Cathode Current	I$_{KA}$	-100 to 150		mA
Reference Input Current	I$_{REF}$	-0.05 to 10		mA
Power Dissipation	P$_D$	(DMP8)	300	mW
		(SOP8)	300	
		(SOT89)	350	
		(SOT23)	200	
Operating Temperature Range	T$_{OPR}$	-40 to +85		°C
Storage Temperature Range	T$_{STG}$	-50 to +150		°C

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	V$_{KA}$	V$_{REF}$	-	18	V
Cathode Current	I$_K$	1		100	mA

■ ELECTRICAL CHARACTERISTICS   (I$_K$=10mA, T$_a$=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V$_{REF}$	V$_{KA}$=V$_{REF}$(*1)	2415	2465	2515	mV
		V$_{KA}$=V$_{REF}$(*1), A Version	2440	2465	2490	
Reference Voltage Change vs. Cathode Voltage Change	V$_{REF}$/V$_{KA}$	│V$_{REF}$│≤V$_{KA}$≤10V(*2)	-	±1.4	±2.7	mV/V
		10≤V$_{KA}$≤18V(*2)	-	±1	±2	mV/V
Reference Input Current	I$_{REF}$	R=10kΩ, R2=∞(*2)	-	2	4	µA
Minimum Input Current	I$_{MIN}$	V$_{KA}$=V$_{REF}$(*1)	-	0.4	1.0	mA
Cathode Current (Off Cond.)	I$_{OFF}$	V$_{KA}$=18V, V$_{REF}$=0V(*3)	-	0.1	1.0	µA
Dynamic Impedance	│Z$_{KA}$│	V$_{KA}$=V$_{REF}$, f≤1kHz 1mA≤I$_K$≤100mA(*1)	-	0.2	-	Ω

■ TEMPERATURE   CHARACTERISTICS   (I$_K$=10mA, T$_a$=-20 to +85°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage Change	ΔV$_{REF}$	V$_{KA}$=V$_{REF}$(*1)	-	8	17	mV
Reference Input Current Change	ΔI$_{REF}$	R1=10kΩ, R2=∞(*2)	-	0.4	1.2	µA

The "Reference Voltage Change" and "Reference Input Current Change" is tested to using some samples of the first five lots. These "TEMPERATURE CHARACTERISTICS" are not guaranteed.
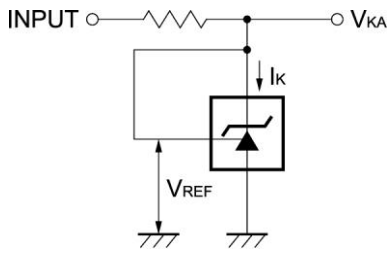
│V$_{REF}$│…Reference voltage includes error.

(*1) : TEST CIRCUIT 1 (Fig.1)

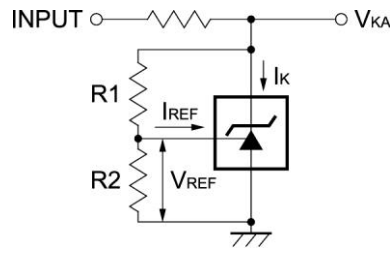(*2) : TEST CIRCUIT 2 (Fig.2)

(*3) : TEST CIRCUIT 3 (Fig.3)

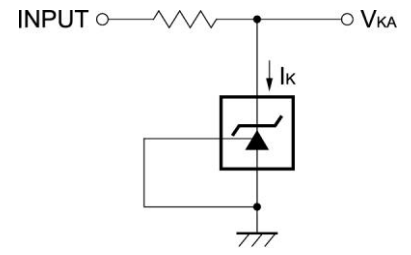■ **TEST CIRCUIT**

1, $V_{KA}=V_{REF}$

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

(Fig.1)

2, $V_{KA}>V_{REF}$

$V_O=V_{KA}=V_{REF}\bullet\left(1+\dfrac{R1}{R2}\right)+I_{REF}\bullet R1$
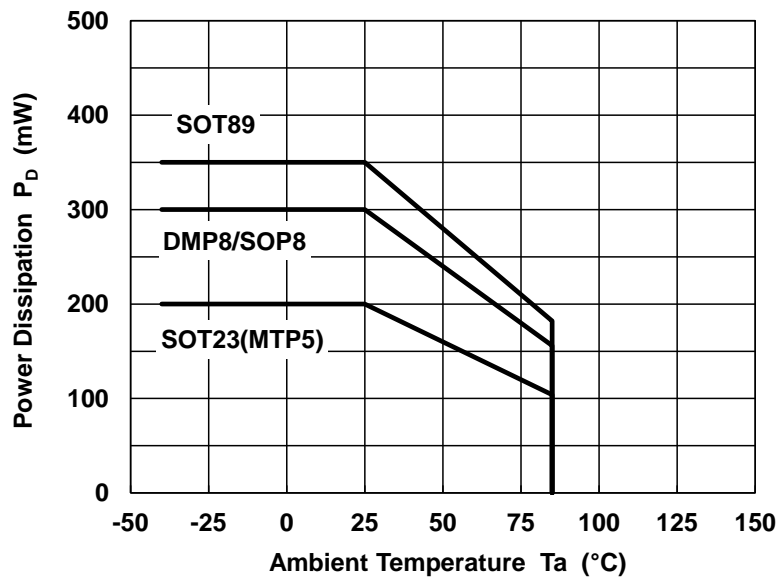
(Fig.2)

3, I_{OFF}

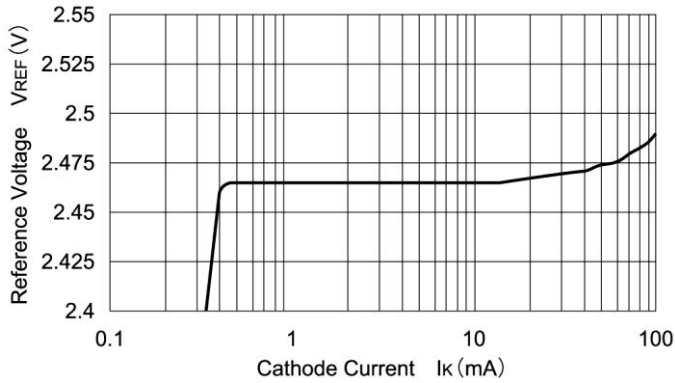**(Fig.3)**

■ **POWER DISSIPATION VS. AMBIENT TEMPERATURE**

NJM2380/A, NJM2390/A

■ **TYPICAL CHARACTERISTICS**

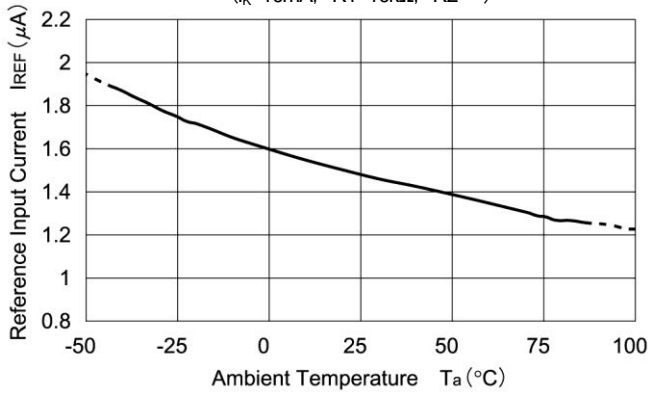### Reference Voltage
($V_{KA}=V_{REF}$, $T_a=25°C$)

Reference Voltage
($I_K=10mA$, R1=Variable, R2=2.5kΩ, $T_a=25°C$)
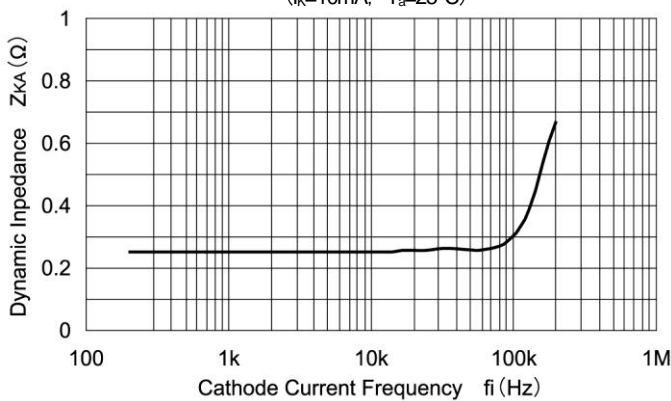
Reference Input Current
($I_K=10mA$, R1=10kΩ, R2=∞)

Reference Voltage
($V_{KA}=V_{REF}$, $I_K=10mA$)

Dynamic Inpedance
($I_K=10mA$, $T_a=25°C$)
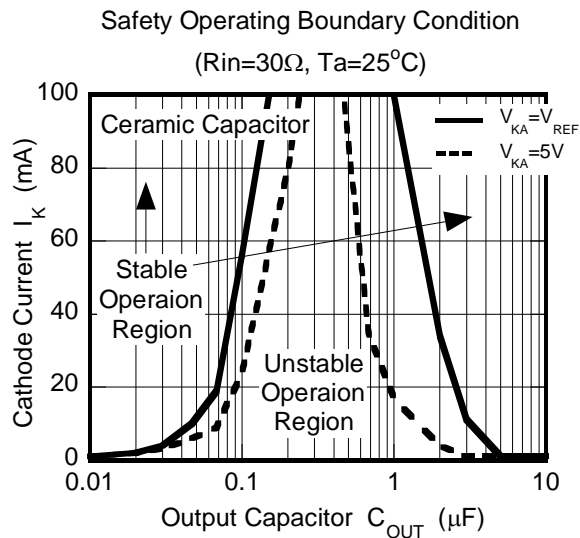
■ TYPICAL CHARACTERISTICS

Safety Operating Boundary Condition
(Rin=30Ω, Ta=25°C)

Aluminum Electrolytic Capacitor
$V_{KA}=V_{REF}$, 5V

Stable Operaion Region

Unstable Operaion Region

Cathode Current I_K (mA)

Output Capacitor C_{OUT} (µF)

Safety Operating Boundary Condition
Test Circuit

Rin=30Ω

V_{KA}

I_K

V^+

C_{OUT}

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.

Safety Operating Boundary Condition
(Rin=30Ω, Ta=25°C)

Ceramic Capacitor

$V_{KA}=V_{REF}$
$V_{KA}=5V$

Stable Operaion Region

Unstable Operaion Region

Cathode Current I_K (mA)

Output Capacitor C_{OUT} (µF)

New Japan Radio Co.,Ltd.