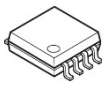
ADJUSTABLE HIGH PRECISION SHUNT REGULATOR

■ GENERAL DESCRIPTION

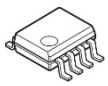
The **NJM2380/A and NJM2390/A** are adjustable high precision shunt regulators.

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.

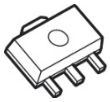
■ PACKAGE OUTLINE



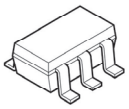
NJM2380M/AM
(DMP8)



NJM2380E/AE
(SOP8)



NJM2380U/AU
NJM2390U/AU
(SOT89-3)

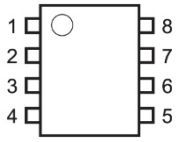


NJM2380F/AF
(SOT23-5)

■ FEATURES

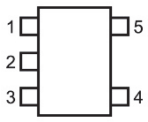
- Operating Voltage — V_{REF} to 18V
- High Precision Voltage Reference — 2.465V±2%
  2.465V±1% : A Version
- Mounted in Ultra Mini Package — SOT23-5
- Minimum External Parts
- Bipolar Technology
- Package Outline — DMP8, SOP8 JEDEC 150mil
  SOT89-3, SOT23-5

■ PIN CONFIGURATION



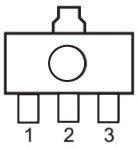
NJM2380M/AM
NJM2380E/AE

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



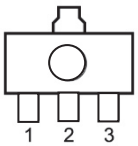
NJM2380F/AF

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



NJM2380U/AU

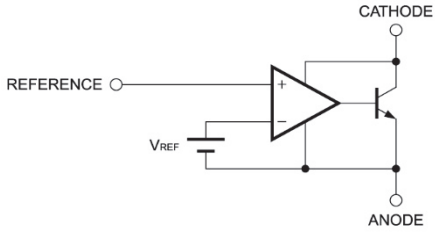
PIN FUNCTION
1. **REFERENCE**
2. **ANODE**
3. **CATHODE**



NJM2390U/AU

PIN FUNCTION
1. **CATHODE**
2. **ANODE**
3. **REFERENCE**

■ BLOCK DIAGRAM



■ 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}	$\lvert V_{REF} \rvert \leq V_{KA} \leq 10V$(*2)	-	±1.4	±2.7	mV/V
		$10 \leq V_{KA} \leq 18V$(*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	$\lvert Z_{KA} \rvert$	$V_{KA}=V_{REF}$, 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.

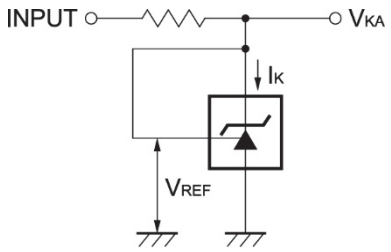
$\lvert V_{REF} \rvert$ …Reference voltage includes error.

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

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

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

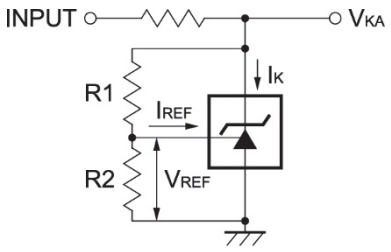
■ TEST CIRCUIT



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

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

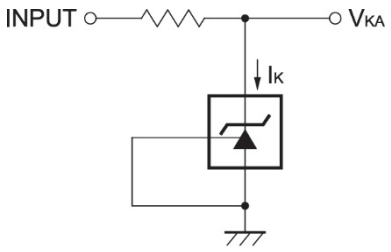
(Fig.1)



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

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

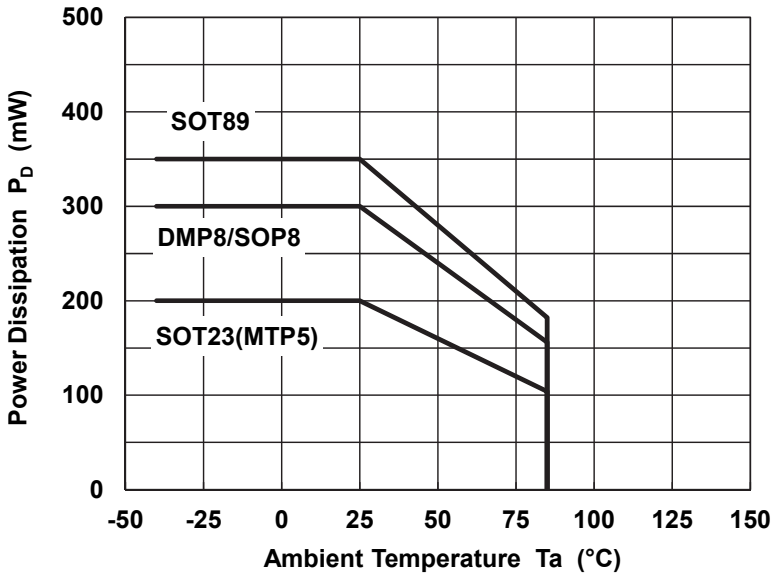
(Fig.2)



3, I_{OFF}

(Fig.3)

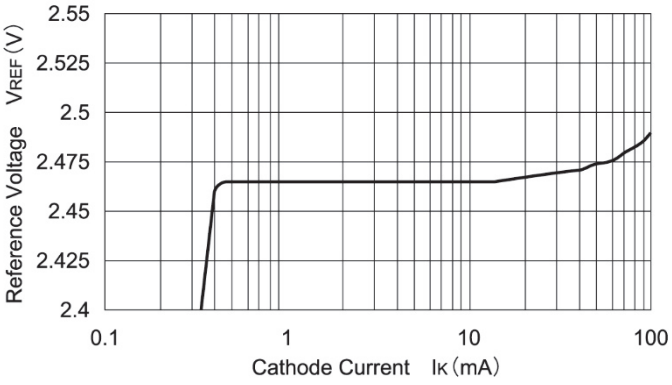
■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



■ TYPICAL CHARACTERISTICS

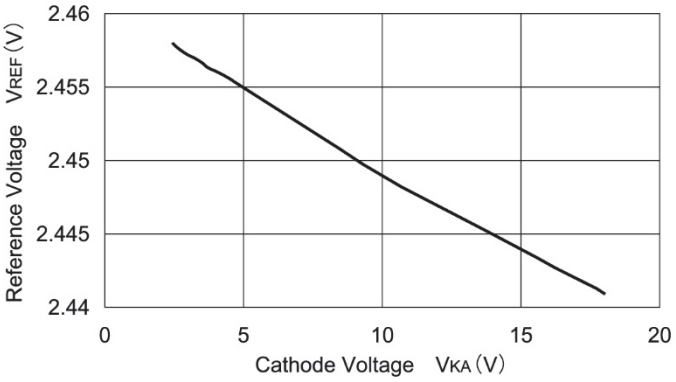
Reference Voltage

($V_{KA}=V_{REF}$, $T_a=25°C$)



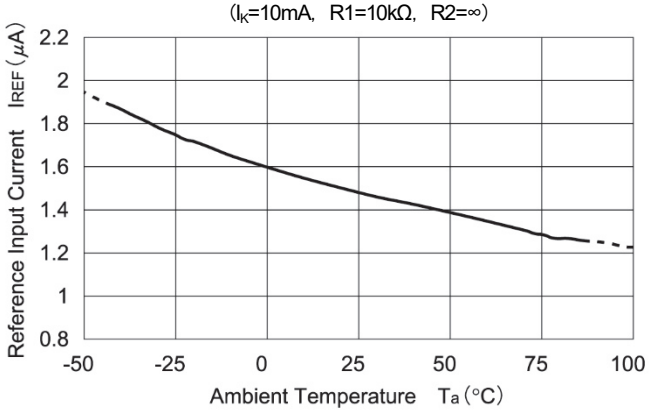
Reference Voltage

(I_K=10mA, R1=Variable, R2=2.5kΩ, $T_a=25°C$)



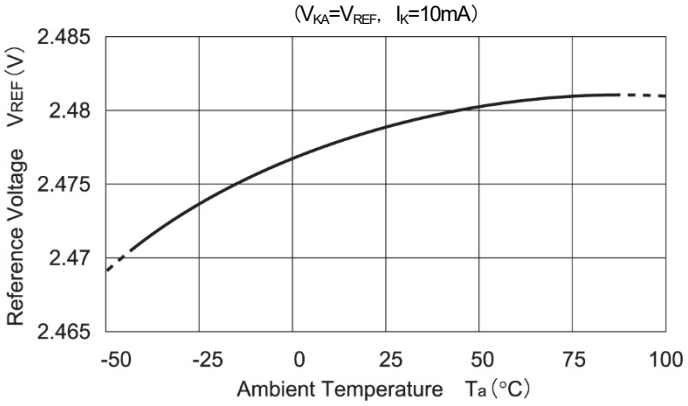
Reference Input Current

(I_K=10mA, R1=10kΩ, R2=∞)



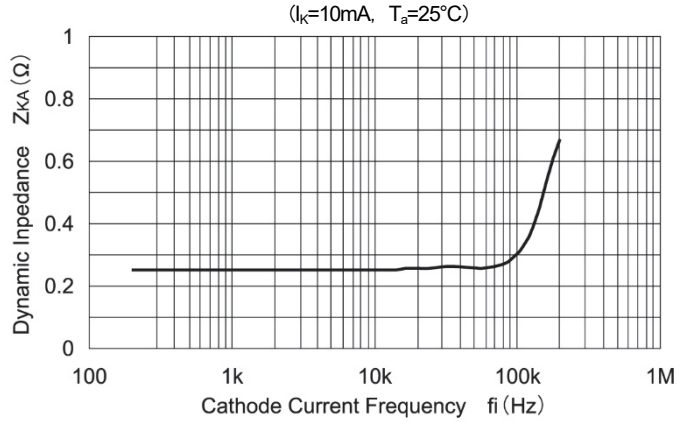
Reference Voltage

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



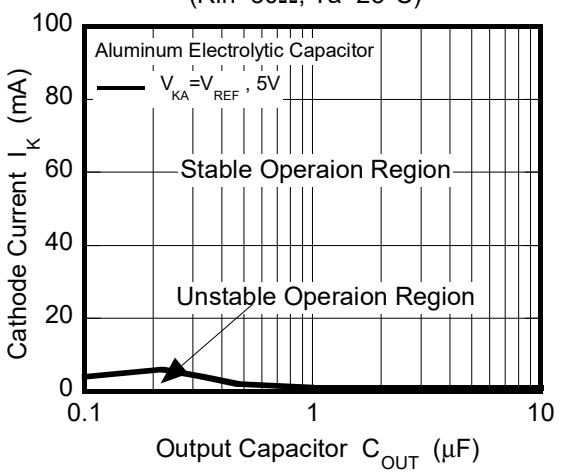
Dynamic Inpedance

(I_K=10mA, $T_a=25°C$)

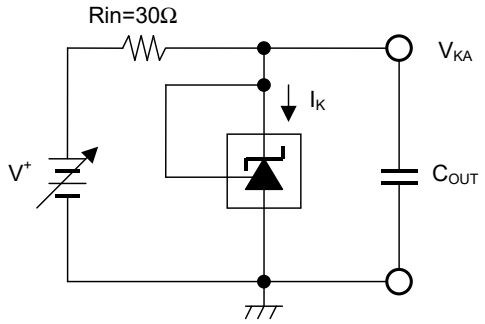


■ TYPICAL CHARACTERISTICS

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

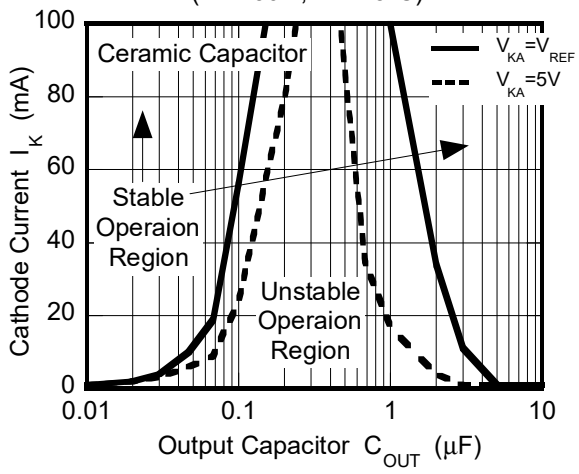


Safety Operating Boundary Condition
Test Circuit



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.

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



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