

ADJUSTABLE HIGH PRECISION SHUNT REGULATOR

■ GENERAL DESCRIPTION

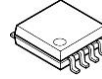
The NJM2380/A and NJM2390/A are adjustable high precision shunt regulators.

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 $2.465V \pm 2\%$
 $2.465V \pm 1\%$: A Version
- Mounted in Ultra Mini Package SOT23-5
- Minimum External Parts
- Bipolar Technology
- Package Outline DMP8, SOP8 JEDEC 150mil
SOT89-3, SOT23-5

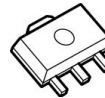
■ PACKAGE OUTLINE



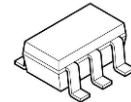
NJM2380M/AM
(DMP8)



NJM2380E/AE
(SOP8)

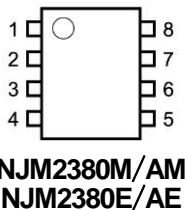


NJM2380U/AU
NJM2390U/AU
(SOT89-3)



NJM2380F/AF
(SOT23-5)

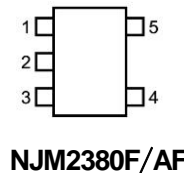
■ PIN CONFIGURATION



NJM2380M/AM
NJM2380E/AE

PIN FUNCTION

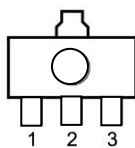
1. CATHODE
2. NC
3. NC
4. NC
5. NC
6. ANODE
7. NC
8. REFERENCE



NJM2380F/AF

PIN FUNCTION

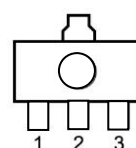
1. NC
2. ANODE
3. NC
4. CATHODE
5. REFERENCE



NJM2380U/AU

PIN FUNCTION

1. REFERENCE
2. ANODE
3. CATHODE

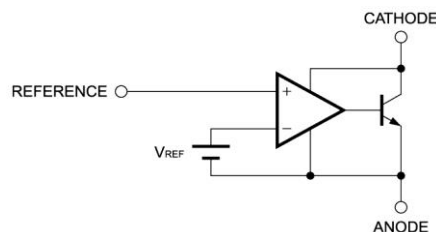


NJM2390U/AU

PIN FUNCTION

1. CATHODE
2. ANODE
3. REFERENCE

■ BLOCK DIAGRAM



NJM2380/A, NJM2390/A

■ ABSOLUTE MAXIMUM RATINGS

($T_a=25^\circ\text{C}$)

| 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 (SOP8) 300 (SOT89) 350 (SOT23) 200 | mW |
| Operating Temperature Range | T_{OPR} | -40 to +85 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -50 to +150 | $^\circ\text{C}$ |

■ 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

($I_K=10\text{mA}$, $T_a=25^\circ\text{C}$)

| 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} \leq V_{KA} \leq 10\text{V}(*2)$ | - | ± 1.4 | ± 2.7 | mV/V |
| | | $10 \leq V_{KA} \leq 18\text{V}(*2)$ | - | ± 1 | ± 2 | mV/V |
| Reference Input Current | I_{REF} | $R=10\text{k}\Omega$, $R2=\infty(*2)$ | - | 2 | 4 | μA |
| Minimum Input Current | I_{MIN} | $V_{KA}=V_{REF}(*1)$ | - | 0.4 | 1.0 | mA |
| Cathode Current (Off Cond.) | I_{OFF} | $V_{KA}=18\text{V}$, $V_{REF}=0\text{V}(*3)$ | - | 0.1 | 1.0 | μA |
| Dynamic Impedance | $ Z_{KA} $ | $V_{KA}=V_{REF}$, $f \leq 1\text{kHz}$ $1\text{mA} \leq I_K \leq 100\text{mA}(*1)$ | - | 0.2 | - | Ω |

■ TEMPERATURE CHARACTERISTICS

($I_K=10\text{mA}$, $T_a=-20$ to $+85^\circ\text{C}$)

| 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} | $R1=10\text{k}\Omega$, $R2=\infty(*2)$ | - | 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.

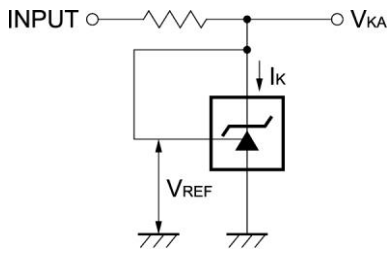
$|V_{REF}|$...Reference voltage includes error.

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

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

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

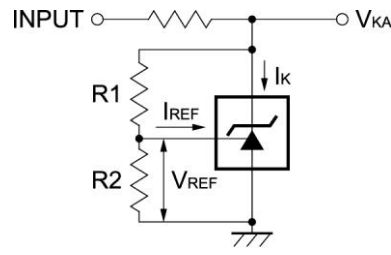
■ TEST CIRCUIT



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

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

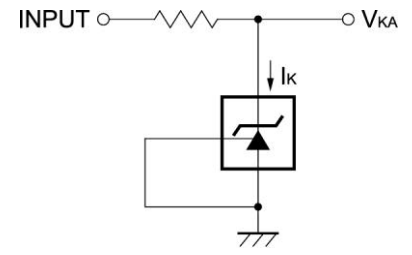
(Fig.1)



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

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

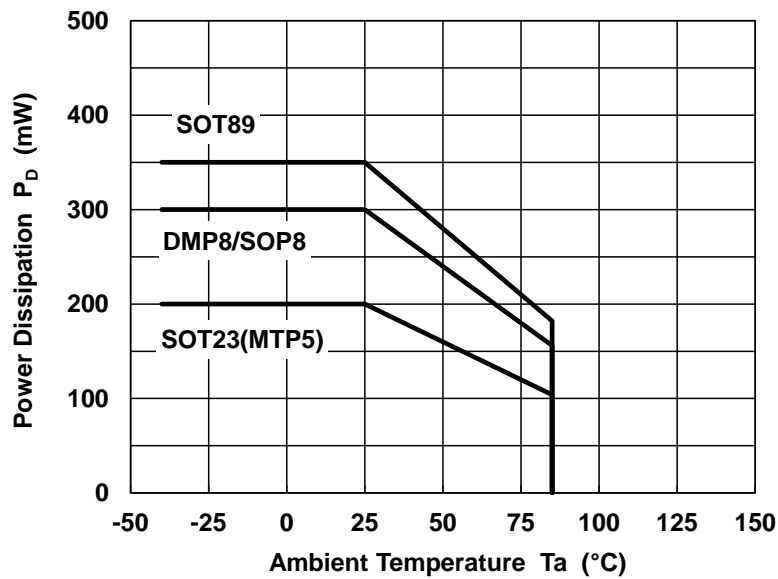
(Fig.2)



3, I_{OFF}

(Fig.3)

■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

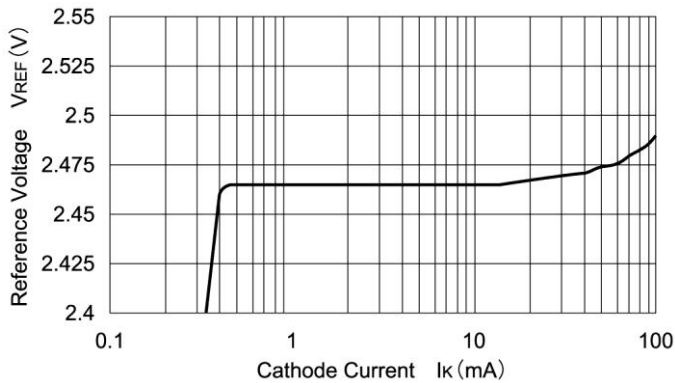


NJM2380/A, NJM2390/A

■ TYPICAL CHARACTERISTICS

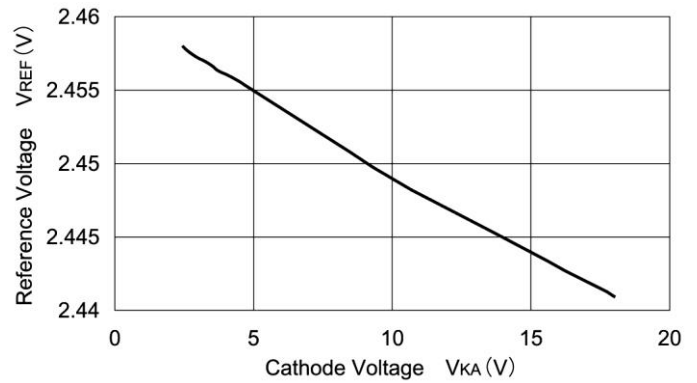
Reference Voltage

($V_{KA}=V_{REF}$, $T_a=25^\circ\text{C}$)



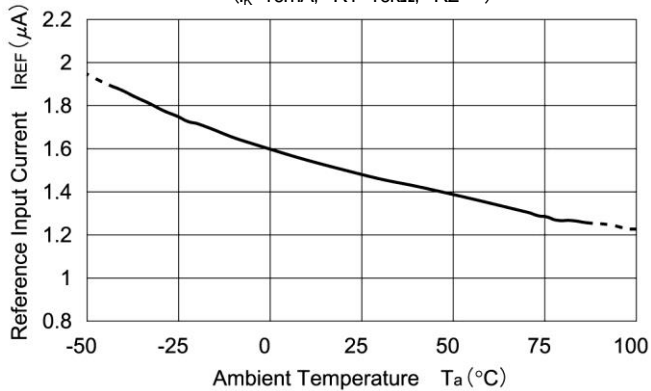
Reference Voltage

($I_k=10\text{mA}$, $R_1=\text{Variable}$, $R_2=2.5\text{k}\Omega$, $T_a=25^\circ\text{C}$)



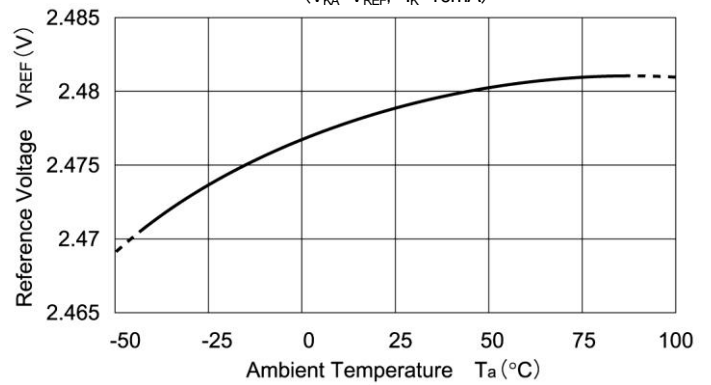
Reference Input Current

($I_k=10\text{mA}$, $R_1=10\text{k}\Omega$, $R_2=\infty$)



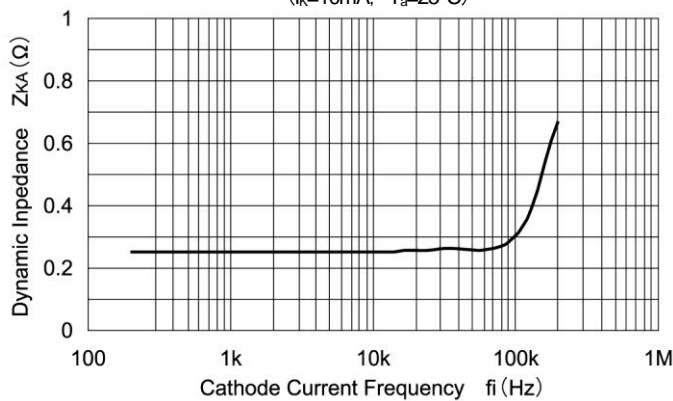
Reference Voltage

($V_{KA}=V_{REF}$, $I_k=10\text{mA}$)

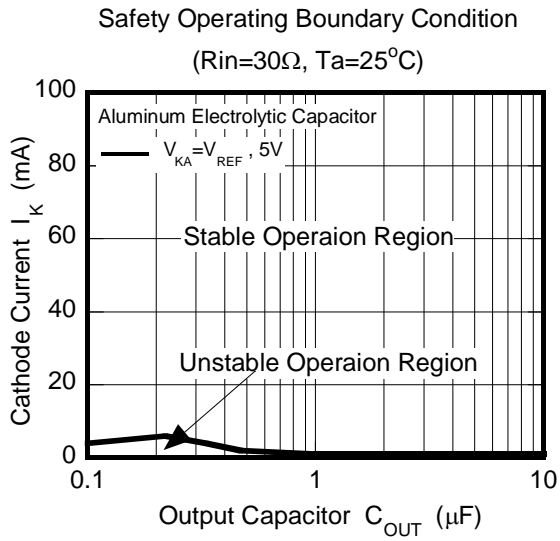


Dynamic Impedance

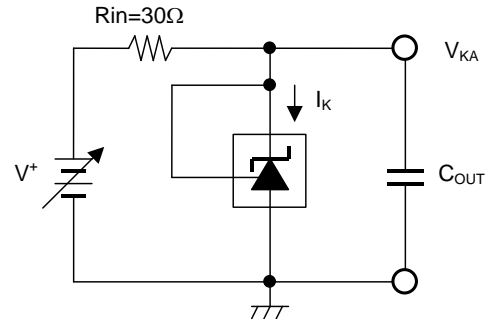
($I_k=10\text{mA}$, $T_a=25^\circ\text{C}$)



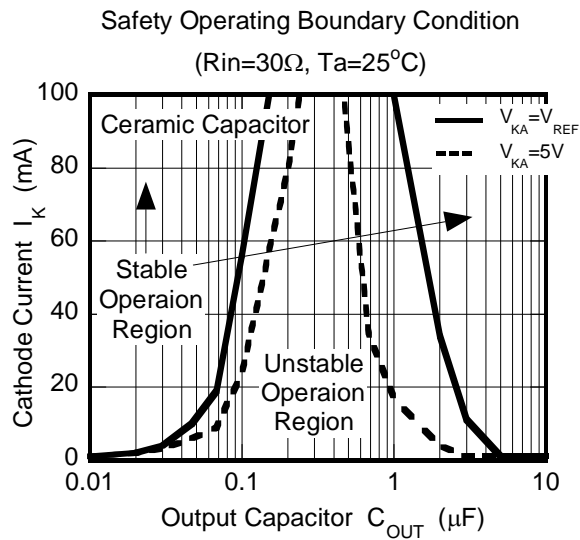
■ TYPICAL CHARACTERISTICS



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.



[CAUTION]

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