# VOLTAGE DETECTOR

## ■ GENERAL DESCRIPTION

NJM2405 is a dual comparator, including the high precision reference voltage circuit. Both channels have hystersis pins, so it could provide the hysteretic function for systems.

It has the wide range of operating voltage and works with less current consumption, so that it is suitable for detecting abnormal conditions, to change over to back up memories when the voltage drops off in operation.

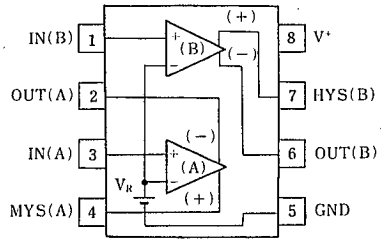
## ■ PACKAGE OUTLINE

NJM2405M

## ■ FEATURES

- Operating Voltage (2.5V~20V)
- Low Operating Current
- Internal Low Reference Voltage
- Adjustable Hystersis Voltage
- Package Outline DMP8
- Bipolar Technology

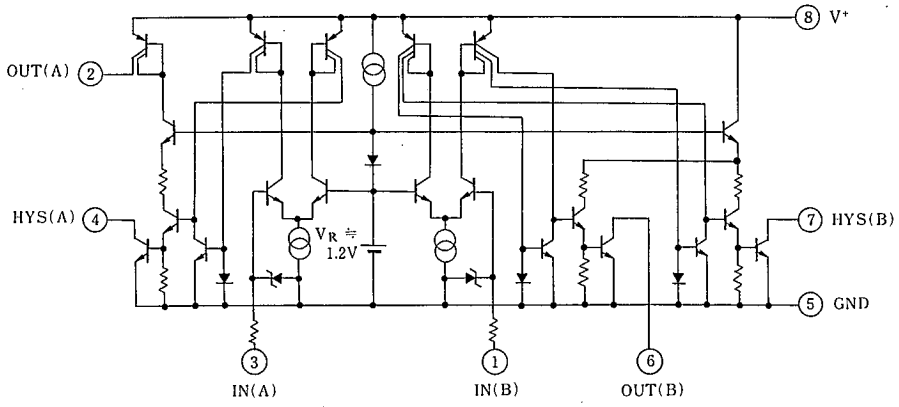
## ■ PIN CONFIGURATION




$V_R = 1.2V$

NJM2405M

## ■ EQUIVALENT CIRCUIT




6

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

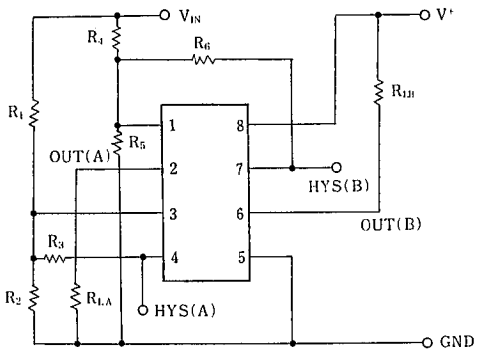
| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+$ | 21 | V |
| Output Voltage | $V_O$ | 21 | V |
| Output Current | $I_O$ | 50 | mA |
| Input Voltage | $V_{IN}$ | −0.3～+6.5 | Vdc |
| Power Dissipation | $P_D$ | 300 | mW |
| Operating Temperature Range | $T_{opr}$ | −20～+75 | ℃ |
| Storage Temperature Range | $T_{stg}$ | −40～+125 | ℃ |

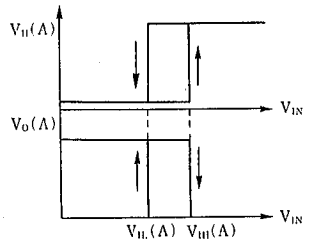
## ■ ELECTRICAL CHARACTERISTICS

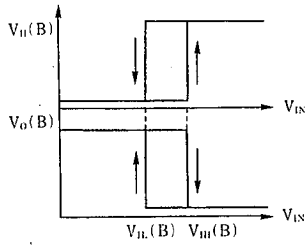
($V^+$=5V, Ta=25℃)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Operating Current | $I_{CCH}$ | $V^+$ =20V, $V_{IH}$=1.5V | — | 250 | 400 | μA |
| | $I_{CCL}$ | $V^+$ =20V, $V_{IL}$=1.0V | — | 400 | 600 | μA |
| Threshold Voltage | $V_{TH}$ | $I_O$=2mA, $V_O$=1V | 1.1. | 1.20 | 1.25 | V |
| Threshold Voltage Deviation vs Supply Voltage | $\Delta V_{TH1}$ | 2.5V≦$V^+$≦5.5V | — | 3 | 12 | mV |
| | $\Delta V_{TH2}$ | 4.5V≦$V^+$≦40V | — | 10 | 40 | mV |
| Offset Voltage between Normal Output and Hysteresis Output | | $I_O$(A)=20μA, $V_O$(A)=3V<br>$I_H$(A)=4.5mA, $V_H$(A)=2V | — | 2.0 | — | mV |
| | | $I_O$(B)=3mA, $V_O$(B)=2V<br>$I_H$(B)=3mA, $V_H$(B)=2V | — | 2.0 | — | mV |
| Threshold Voltage Temperature Coefficient | | −20℃≦$T_a$ ≦70℃ | — | ±0.05 | — | mV/℃ |
| Threshold Voltage Difference Between Channels | | | −10 | — | 10 | mV |
| Input Current | $I_{IL}$ | $I_{IL}$=1.0V | — | 5 | — | nA |
| | $I_{IH}$ | $V_{IH}$=1.5V | — | 100 | 500 | nA |
| Output Leak Current | $I_{OH}$(A) | $V^+$=20V, $V_O$(A)=0V, $V_{IH}$=1.5V | — | — | 0.1 | μA |
| | $I_{OH}$(B) | $V_O$(B)=20V, $V_{IL}$=1.0V | — | — | 1 | μA |
| Hysteresis Output leak Current | $I_{HH}$(A) | $V_H$(A)=20V, $V_{IH}$=1.5V | — | — | 1 | μA |
| | $I_{HH}$(B) | $V_H$(B)=20V, $V_{IH}$=1.5V | — | — | 1 | μA |
| Output Source Current | $I_{OL}$(A) | $V_O$(A)=0V, $V_{IL}$=1.0V | 40 | 80 | — | μA |
| Output Sink Current | $I_{OL}$(B) | $V_O$(B)=1.0V, $V_{IH}$=1.5V | 4 | 10 | — | mA |
| Hysteresis Current | $I_{HL}$(A) | $V_H$(A)=1.0V, $V_{IL}$=1.0V | 6 | 12 | — | mA |
| | $I_{HL}$(B) | $V_H$(B)=1.0V, $V_{IL}$=1.0V | 4 | 10 | — | mA |
| Output Saturation Voltage | $V_{OL}$(A) | $I_O$(A)=20μA, $V_{IL}$=1.0V | — | 50 | 200 | mV |
| | $V_{OL}$(B) | $I_O$(B)=3.0mA, $V_{IH}$=1.5V | — | 120 | 400 | mV |
| Hysteresis Output Saturation Voltage | $V_{HL}$(A) | $I_H$(A)=4.5mA. $V_{IL}$=1.0V | — | 120 | 400 | mV |
| | $V_{HL}$(B) | $I_H$(B)=3.0mA, $V_{IL}$=1.0V | — | 120 | 400 | mV |
| Delay Time | $t_{PHL}$ | RL=5kΩ | — | 2 | — | μs |
| | $t_{PLH}$ | RL=5kΩ | — | 3 | — | μs |

## ■ GENERAL OPERATING INFORMATION (Operation Principle)




Relational Function (Attention)

$$V_{IH}(A)=\left(1+\frac{R_1}{R_2 /\!/ R_3}\right)V_R$$

$$V_{IL}(A)=\left(1+\frac{R_1}{R_2}\right)V_R$$

$$V_{IH}(B)=\left(1+\frac{R_4}{R_5 /\!/ R_6}\right)V_R$$

$$V_{IL}(B)=\left(1+\frac{R_4}{R_5}\right)V_R$$

(note) $V_R \fallingdotseq V_{TH}(\fallingdotseq 1.20V)$

$$R_2 /\!/ R_3=\frac{R_2R_3}{R_2+R_3}$$

$$R_5 /\!/ R_6=\frac{R_5R_6}{R_5+R_6}$$

6

MEMO