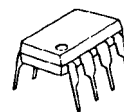


## VOLTAGE AND CURRENT CONTROL IC

### ■ GENERAL DESCRIPTION

The **NJM2146B** is a voltage and current control IC which contains single-supply low offset voltage OP-AMP (2mV max.), low operating OP-AMP, and precision voltage reference. It is suitable for battery charger, second controller of switching regulator systems, and other battery systems.

### ■ PACKAGE OUTLINE



NJM2146BD



NJM2146BM

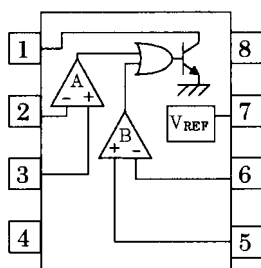


NJM2146BR

### ■ FEATURES

- Operating Voltage (2.5V to 18V)
- Internal Precision Voltage Reference (1.5V±1%)
- PC Terminal Current (60mA max.)
- Operating Current (3mA max.)
- Bipolar Technology
- Package Outline DIP8, DMP8, VSP8

### ■ PIN CONFIGURATION



#### PIN FUNCTION

1. PC
2. A-INPUT
3. A+INPUT
4. GND
5. B+INPUT
6. B-INPUT
7. V<sub>REF</sub>
8. V<sup>+</sup>

### ■ ABSOLUTE MAXIMUM RATINGS

(T<sub>a</sub>=25°C)

| PARAMETER                   | SYMBOL           | RATINGS                                        | UNIT |
|-----------------------------|------------------|------------------------------------------------|------|
| Supply Voltage              | V <sup>+</sup>   | 20                                             | V    |
| Differential Input Voltage  | V <sub>ID</sub>  | (A <sub>ch</sub> ) 20<br>(B <sub>ch</sub> ) ±4 | V    |
| Power Dissipation           | P <sub>D</sub>   | (DIP8) 500<br>(DMP8) 300<br>(VSP8) 320         | mW   |
| PC Terminal Current         | I <sub>PC</sub>  | 60                                             | mA   |
| Operating Temperature Range | T <sub>opr</sub> | -40 to 85                                      | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -50 to 150                                     | °C   |

(note) When the supply voltage is less than 20V, the absolute maximum input voltage is equal to the supply voltage.

### ■ RECOMMENDED OPERATING CONDITIONS

(T<sub>a</sub>=25°C)

| PARAMETER         | SYMBOL           | RATINGS   | UNIT |
|-------------------|------------------|-----------|------|
| Operating Voltage | V <sub>opr</sub> | 2.5 to 18 | V    |

# NJM2146B

## ■ ELECTRICAL CHARACTERISTICS

( $V^+=5V$ ,  $T_a=25^\circ C$ )

| PARAMETER                         | SYMBOL                          | CONDITIONS         | MIN. | TYP. | MAX. | UNIT    |
|-----------------------------------|---------------------------------|--------------------|------|------|------|---------|
| Operating Current                 | $I_{CC}$                        | $I_{PC}=off$       | -    | 1    | 3    | mA      |
| Leakage Current                   | $I_{PCLEAK}$                    | $V^+=V_{PC}=20V$   | -    | -    | 100  | $\mu A$ |
| Saturation Voltage                | $V_{PC(SAT)}$                   | $I_{PC}=50mA$      | -    | 0.5  | 0.7  | V       |
| Reference Voltage                 | $V_{REF}$                       | $I_{REF}=0mA$      | 1485 | 1500 | 1515 | mV      |
| Reference Voltage Load Regulation | $\Delta V_{REF}/\Delta I_{REF}$ | $I_{REF}=0$ to 5mA | -    | -    | 30   | mV      |

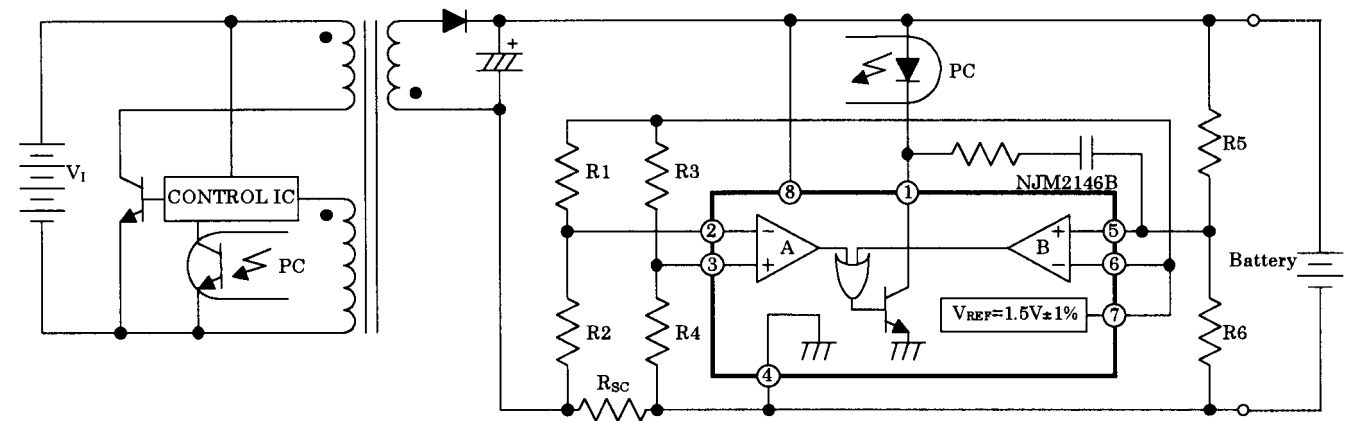
[Ach]

| PARAMETER                       | SYMBOL    | CONDITIONS | MIN.   | TYP. | MAX. | UNIT        |
|---------------------------------|-----------|------------|--------|------|------|-------------|
| Input Offset Voltage            | $V_{IO}$  |            | -      | 0.5  | 2    | mV          |
| Input Offset Current            | $I_{IO}$  |            | -      | 5    | 50   | nA          |
| Input Bias Current              | $I_B$     |            | -      | 80   | 250  | nA          |
| Large Signal Voltage Gain       | $A_V$     |            | -      | 80   | -    | dB          |
| Input Common Mode Voltage Range | $V_{ICM}$ |            | 0 to 3 | -    | -    | V           |
| Common Mode Rejection Ratio     | CMR       |            | -      | 90   | -    | dB          |
| Supply Voltage Rejection Ratio  | SVR       |            | -      | 80   | -    | dB          |
| Slew Rate                       | SR        |            | -      | 0.8  | -    | V / $\mu s$ |
| Gain Bandwidth Product          | GB        | $f=10kHz$  | -      | 2    | -    | MHz         |

[Bch]

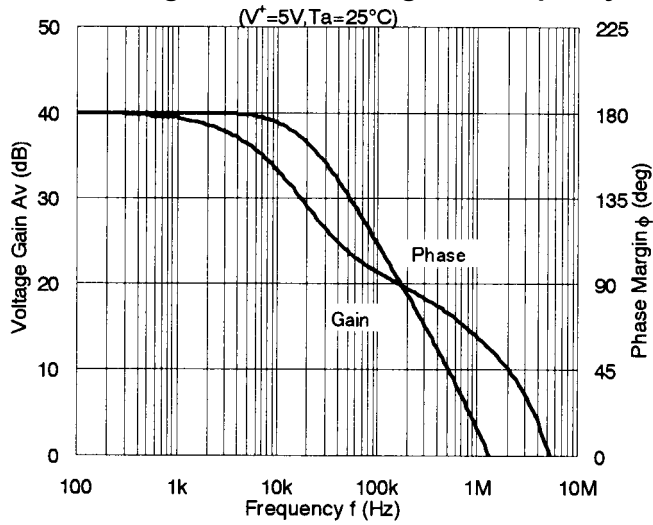
| PARAMETER                       | SYMBOL    | CONDITIONS                    | MIN.       | TYP. | MAX. | UNIT        |
|---------------------------------|-----------|-------------------------------|------------|------|------|-------------|
| Input Offset Voltage            | $V_{IO}$  |                               | -          | 1    | 6    | mV          |
| Input Offset Current            | $I_{IO}$  |                               | -          | 10   | 50   | nA          |
| Input Bias Current              | $I_B$     |                               | -          | 100  | 300  | nA          |
| Large Signal Voltage Gain       | $A_V$     |                               | -          | 80   | -    | dB          |
| Input Common Mode Voltage Range | $V_{ICM}$ |                               | 1.0 to 4.4 | -    | -    | V           |
| Common Mode Rejection Ratio     | CMR       |                               | -          | 90   | -    | dB          |
| Supply Voltage Rejection Ratio  | SVR       |                               | -          | 80   | -    | dB          |
| Slew Rate                       | SR        | $A_V=1$ , $V_{IN}=2.5V\pm 1V$ | -          | 0.5  | -    | V / $\mu s$ |
| Gain Bandwidth Product          | GB        | $f=10kHz$                     | -          | 1    | -    | MHz         |

## ■ TYPICAL APPLICATION

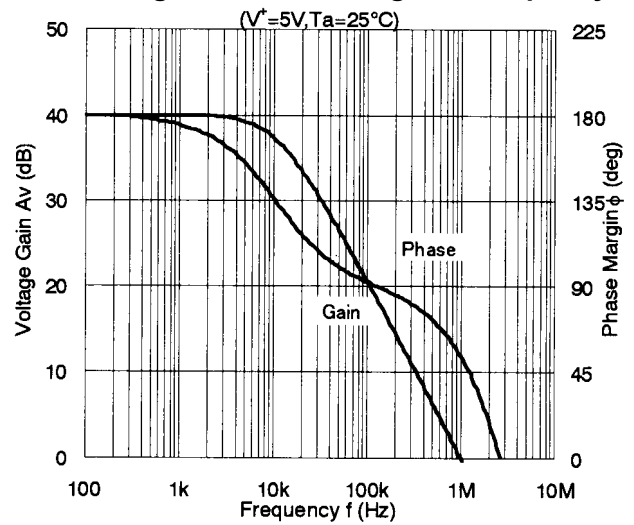


## ■ TYPICAL CHARACTERISTICS

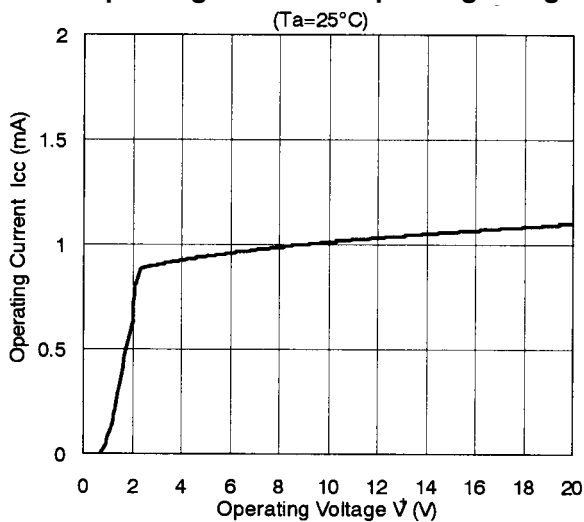
**Ach Voltage Gain, Phase Margin vs. Frequency**



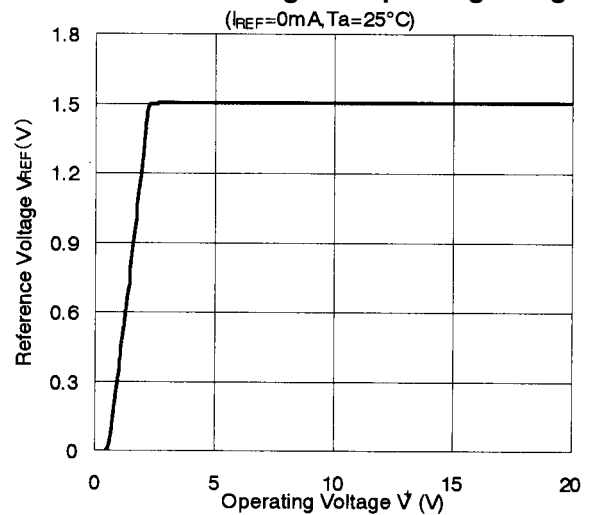
**Bch Voltage Gain, Phase Margin vs. Frequency**



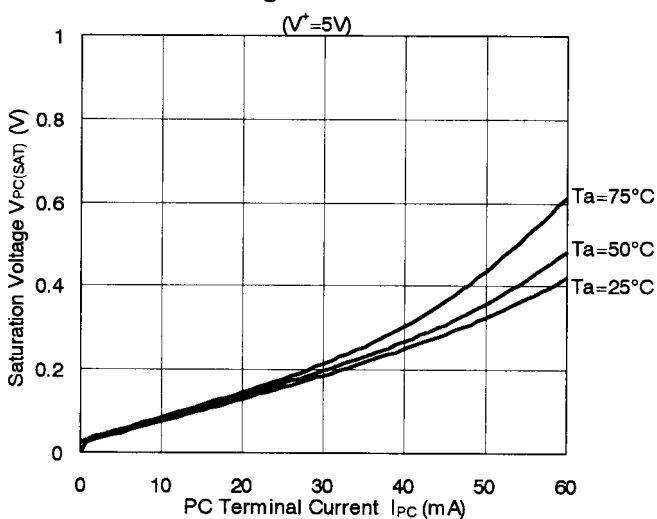
**Operating Current vs. Operating Voltage**



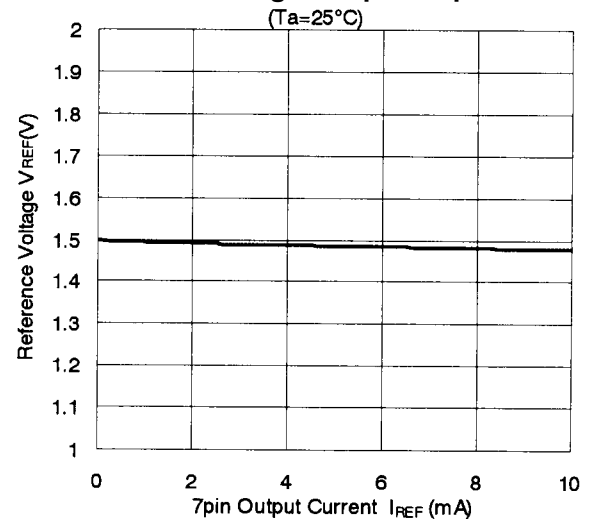
**Reference Voltage vs. Operating Voltage**



**Saturation Voltage vs. PC Terminal Current**



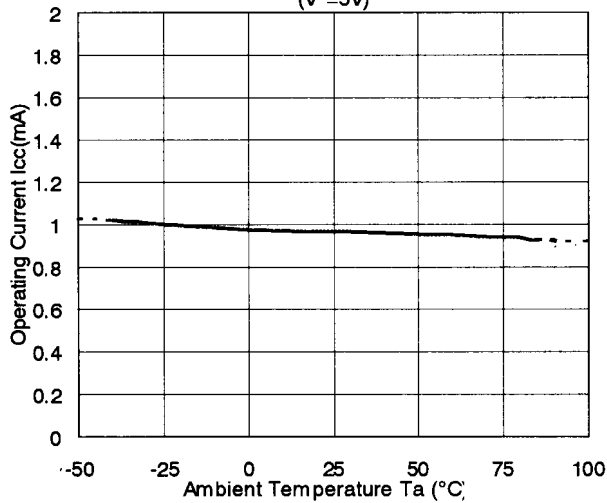
**Reference Voltage vs. 7pin Output Current**



## ■ TYPICAL CHARACTERISTICS

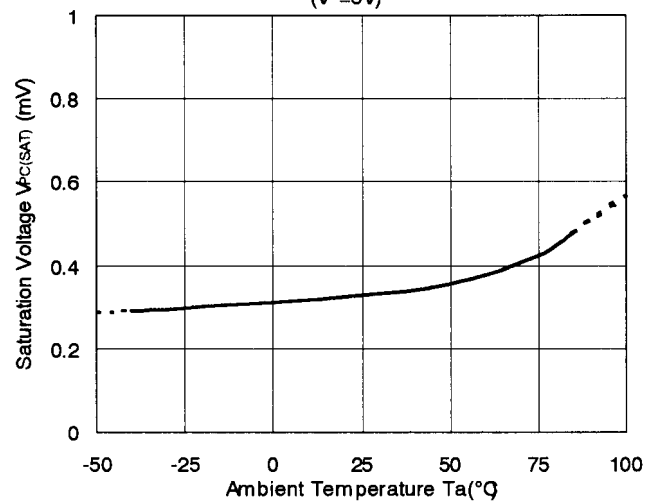
Operating Current vs. Temperature

( $V^+ = 5V$ )



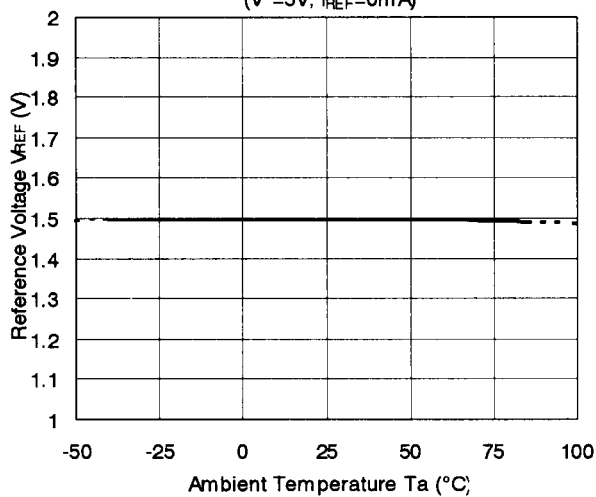
Saturation Voltage vs. Temperature

( $V^+ = 5V$ )



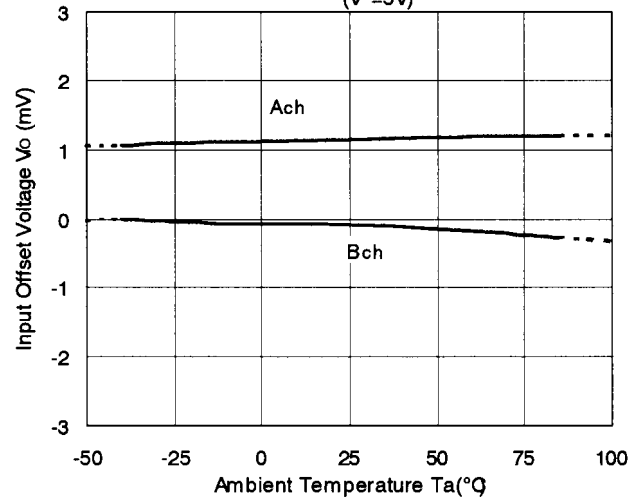
Reference Voltage vs. Temperature

( $V^+ = 5V, I_{REF} = 0mA$ )



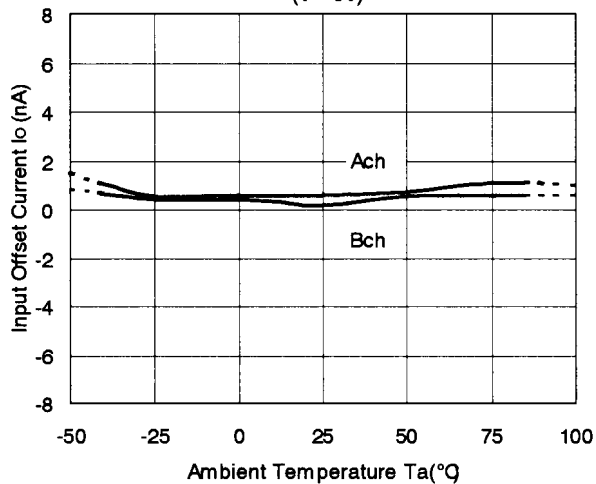
Input Offset Voltage vs. Temperature

( $V^+ = 5V$ )



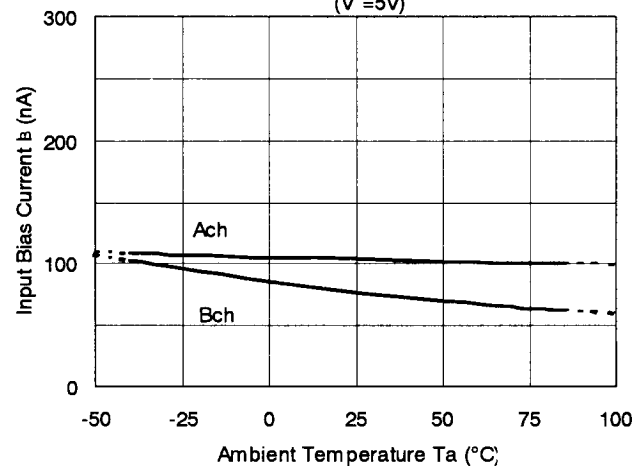
Input Offset Current vs. Temperature

( $V^+ = 5V$ )



Input Bias Current vs. Temperature

( $V^+ = 5V$ )



**[CAUTION]**

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