

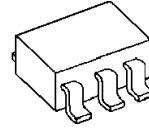
## Battery Charger IC

### ■ GENERAL DESCRIPTION

The NJM2336 is a voltage and current control IC which contains precision voltage reference.

It is suitable for battery charger, second controller of switching regulator systems, and other battery systems.

### ■ PACKAGE OUTLINE

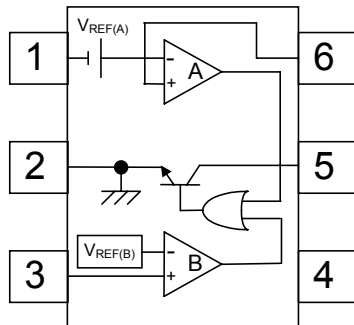


NJM2336AF/BF/CF

### ■ FEATURES

- Operating Voltage 2.2V to 13V
- Internal Precision Voltage Reference 1.24V±1%
- Photo Coupler ( PC ) Drive Current 20mA max.
- Operating Current 350μA max.
- Bipolar Technology
- Package Outline MTP6

### ■ PIN CONFIGURATION



- 1 : A -INPUT
- 2 : GND
- 3 : B +INPUT
- 4 : V<sup>+</sup>
- 5 : PC
- 6 : A +INPUT

# NJM2336

## ■ ABUSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER                   | SYMBOL          | RATINGS                  | UNIT |
|-----------------------------|-----------------|--------------------------|------|
| Supply Voltage              | V <sup>+</sup>  | +14                      | V    |
| Differential Input Voltage  | V <sub>ID</sub> | ( Ach ) 14<br>( Bch ) 14 | V    |
| Power Dissipation           | P <sub>D</sub>  | 200                      | mW   |
| PC Terminal Current         | I <sub>PC</sub> | 20                       | mA   |
| Operating Temperature Range | Topr            | -40 to +85               | °C   |
| Storage Temperature Range   | Tstg            | -50 to +150              | °C   |

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER         | SYMBOL | RATINGS   | UNIT |
|-------------------|--------|-----------|------|
| Operating Voltage | Vopr   | 2.2 to 13 | V    |

## ■ ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>=5V, Ta=25°C)

| PARAMETER          | SYMBOL               | CONDITIONS                           | MIN. | TYP. | MAX. | UNIT |
|--------------------|----------------------|--------------------------------------|------|------|------|------|
| Operating Current  | I <sub>CC</sub>      | I <sub>PC</sub> =off                 | -    | 220  | 350  | μA   |
| Leakage Current    | I <sub>PCLEAK</sub>  | V <sup>+</sup> =V <sub>PC</sub> =13V | -    | -    | 10   | μA   |
| Saturation Voltage | V <sub>PC(SAT)</sub> | I <sub>PC</sub> =20mA                | -    | 0.5  | 0.7  | V    |

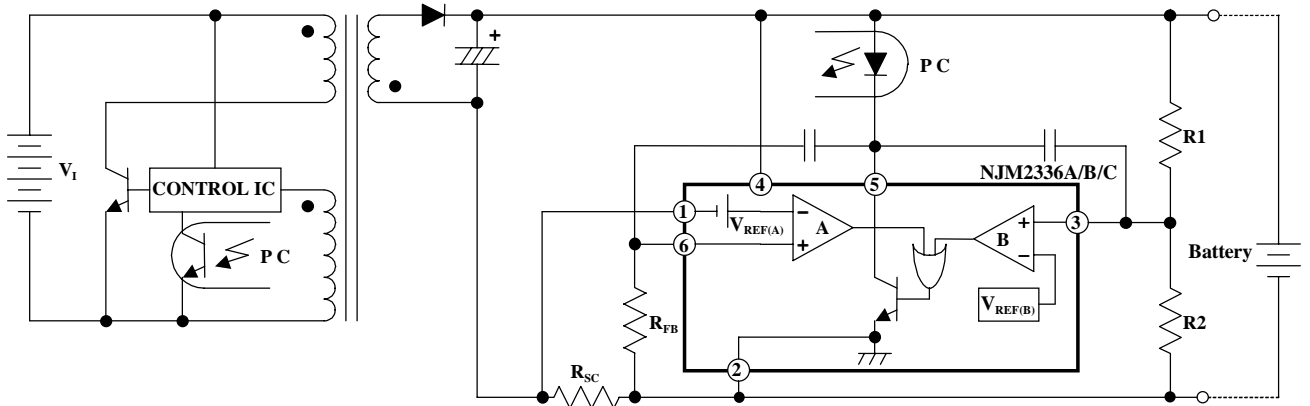
[Ach]

| PARAMETER                       | SYMBOL              | CONDITIONS | MIN. | TYP.        | MAX. | UNIT |
|---------------------------------|---------------------|------------|------|-------------|------|------|
| Reference Voltage               | V <sub>REF(A)</sub> | A version  | 69   | 72          | 75   | mV   |
|                                 |                     | B version  | 105  | 109         | 113  | mV   |
|                                 |                     | C version  | 145  | 151         | 157  | mV   |
| Input Bias Current              | I <sub>B</sub>      |            | -    | 80          | 250  | nA   |
| Large Signal Voltage Gain       | A <sub>V</sub>      |            | -    | 80          | -    | dB   |
| Input Common Mode Voltage Range | V <sub>ICM</sub>    |            | -    | -0.2 to 3.0 | -    | V    |
| Common Mode Rejection Ratio     | CMR                 |            | -    | 70          | -    | dB   |
| Supply Voltage Rejection Ratio  | SVR                 |            | -    | 80          | -    | dB   |
| Slew Rate                       | SR                  |            | -    | 0.5         | -    | V/μs |
| Gain Bandwidth Product          | GB                  | f=10kHz    | -    | 0.8         | -    | MHz  |

[Bch]

| PARAMETER                       | SYMBOL              | CONDITIONS | MIN. | TYP.       | MAX. | UNIT |
|---------------------------------|---------------------|------------|------|------------|------|------|
| Reference Voltage               | V <sub>REF(B)</sub> |            | 1227 | 1240       | 1253 | mV   |
| Input Bias Current              | I <sub>B</sub>      |            | -    | 80         | 250  | nA   |
| Large Signal Voltage Gain       | A <sub>V</sub>      |            | -    | 80         | -    | dB   |
| Input Common Mode Voltage Range | V <sub>ICM</sub>    |            | -    | 0.5 to 4.0 | -    | V    |
| Common Mode Rejection Ratio     | CMR                 |            | -    | 70         | -    | dB   |
| Supply Voltage Rejection Ratio  | SVR                 |            | -    | 80         | -    | dB   |
| Slew Rate                       | SR                  |            | -    | 0.5        | -    | V/μs |
| Gain Bandwidth Product          | GB                  | f=10kHz    | -    | 0.8        | -    | MHz  |

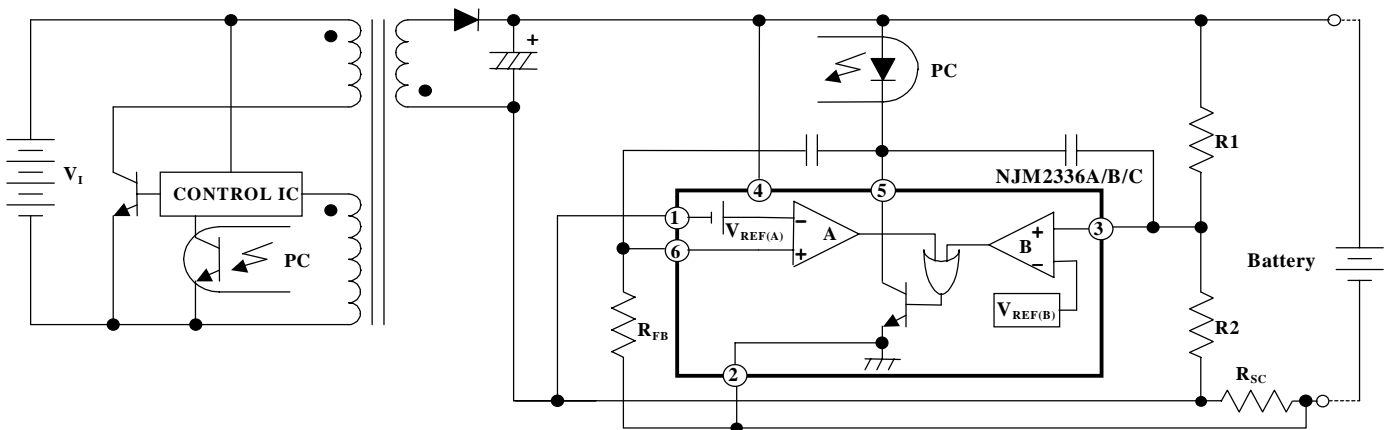
## APPLICATION 1



$$\text{OUTPUT} = V_{\text{REF (B)}} \times \frac{R_1 + R_2}{R_2} \text{ ( V )}$$

$$\text{CURRENT LIMIT} = \frac{V_{\text{REF(A)}}}{R_{\text{sc}}} \text{ ( A )}$$

## APPLICATION 2

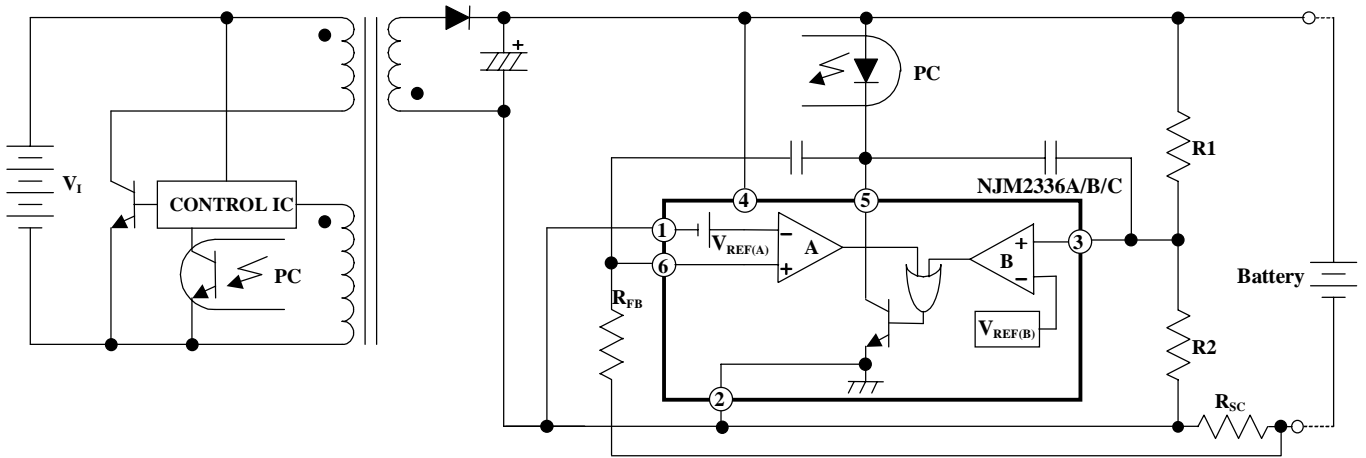


$$\text{OUTPUT} = \{ V_{\text{REF (B)}} + ( I_L \times R_{\text{sc}} ) \} \times \frac{R_1 + R_2}{R_2} - ( I_L \times R_{\text{sc}} ) \text{ ( V )}$$

$$\text{CURRENT LIMIT} = \frac{V_{\text{REF}}}{R_{\text{sc}}} \text{ ( A )}$$

# NJM2336

## APPLICATION 3

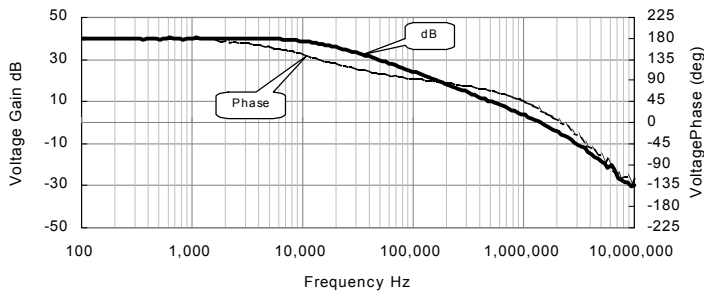


$$\text{OUTPUT} = V_{\text{REF (B)}} \frac{R1+R2}{R2} \times - (I_L \times R_{\text{sc}}) \text{ (V)}$$

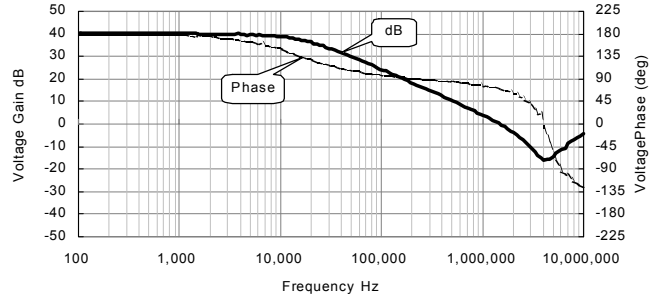
$$\text{CURRENT LIMIT} = \frac{V_{\text{REF (A)}}}{R_{\text{sc}}} \text{ (A)}$$

## TYPICAL CHARACTERISTICS

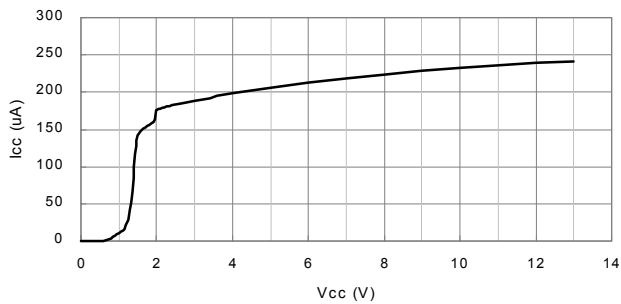
Ach Voltage Gain , Phase vs. Frequency  
Characteristic  
( V+=5V , Ta=25°C )



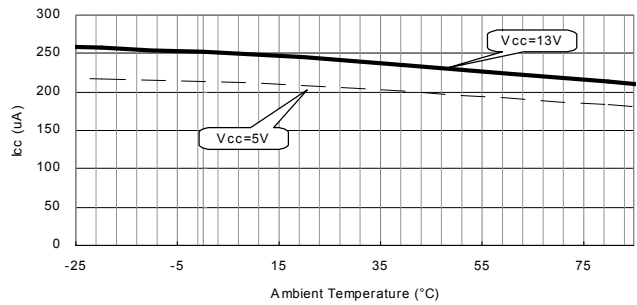
Bch Voltage Gain , Phase vs. Frequency Characteristic  
( V+=5V , Ta=25°C )



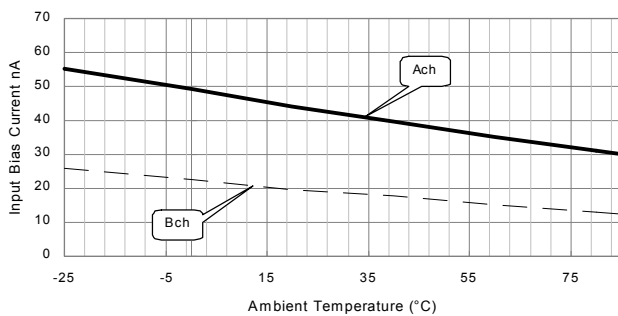
Supply Current(Icc) vs. Supply Voltage(Vcc)



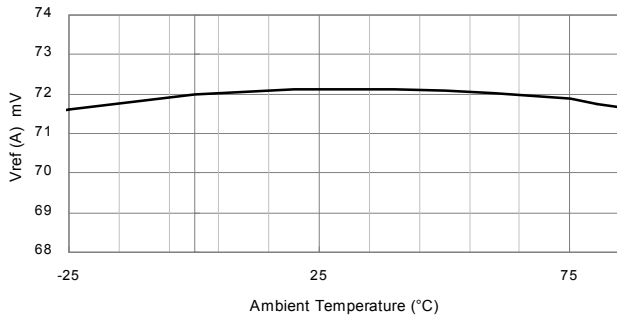
Supply Current(Icc) vs. Temperature



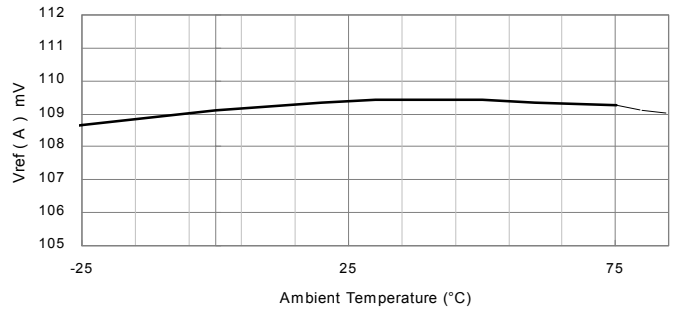
INPUT BIAS CURRENT



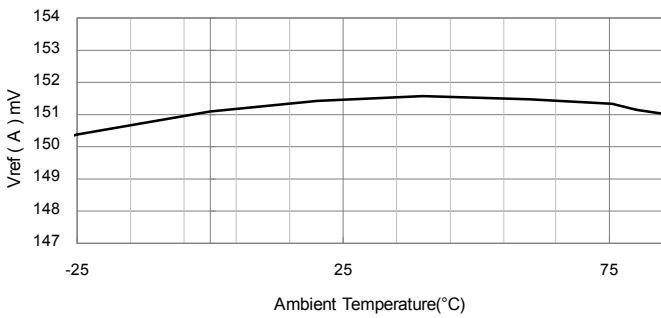
VOLTAGE REFERENCE  
(A Version)



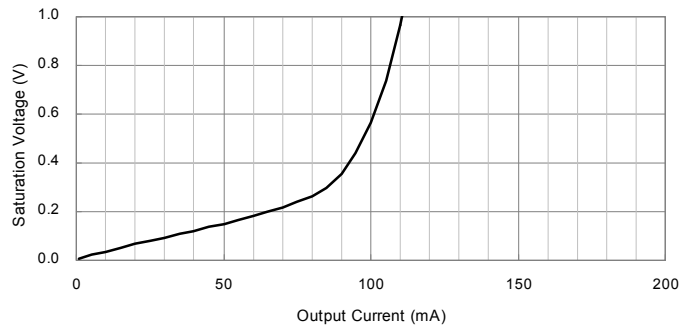
VOLTAGE REFERENCE  
(B Version)



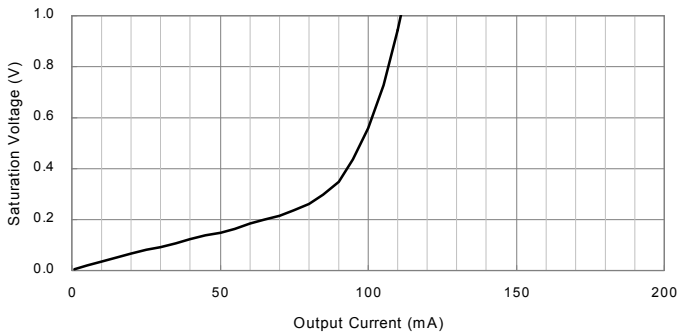
VOLTAGE REFERENCE  
(C Version)



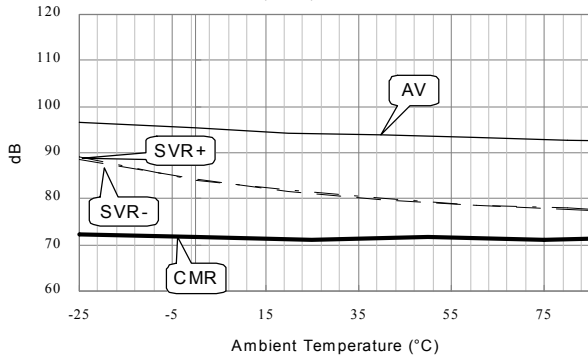
SATURATION VOLTAGE vs. OUTPUT CURRENT  
(Ach.)



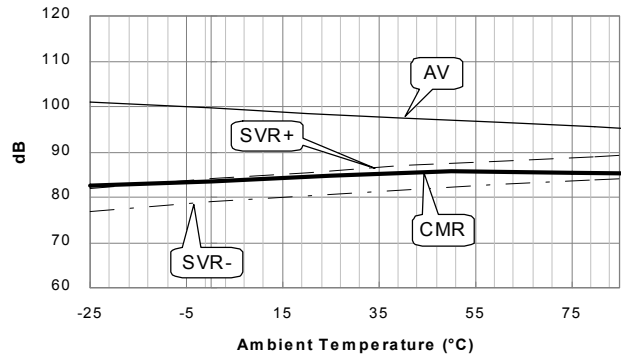
SATURATION VOLTAGE vs. OUTPUT CURRENT  
(Bch)



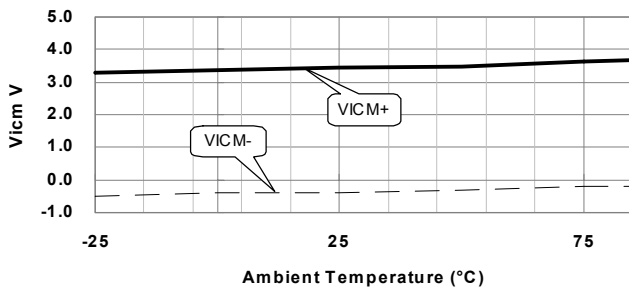
**Amp.Gain vs. Ambient Temperature**  
(Ach)



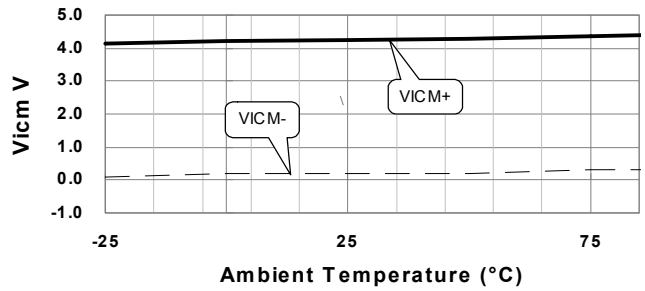
**Amp.Gain vs. Ambient Temperature**  
(Bch)



**Input Common Mode Voltage Range vs. Ambient Temperature (Ach)**  
Vcc=5V



**Input Common Mode Voltage Range vs. Ambient Temperature (Bch)**  
Vcc=5V



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