优尚

YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

企业微信二维码　　企业QQ二维码

## Description

The NK-AP2132B series are positive voltage regulator ICs fabricated by CMOS process. The ICs consist of a voltage reference, an error amplifier, a power transistor, a resistor network for setting output voltage, a current limit circuit for current protection, and a chip enable circuit.

The NK-AP2132B series have features of large current, low dropout voltage, high output voltage accuracy, low input voltage. The NK-AP2132B provides a power good (PG) signal to indicate if the voltage level of $V_{OUT}$ reaches 92% of its rating value. And it operates with $V_{IN}$ as low as 1.4V and $V_{CTRL}$ voltage 5V with output voltage programmable as low as 0.8V.

The NK-AP2132B are available in 1.2V, 1.5V, 1.8V, 2.5V fixed output voltage versions and adjustable output voltage version. The fixed versions integrate the adjust resistors. It is also available in an adjustable version, which can set the output voltage with external resistor. If the pin of adjustable output voltage is to ground, it will switch to fixed output voltage.

NK-AP2132B series are available in PSOP-8 package.

## Features

- Adjustable Output: 0.8V to 3.0V
- Low Dropout Voltage: 300mV@ $I_{OUT}$ = 2A, $V_{OUT}$ = 1.2V
- Over Current and Over Temperature Protection
- Enable Pin
- PSOP-8 Package with Thermal Pad
- Maximum Output Current: 2A
- High Output Voltage Accuracy: 2%
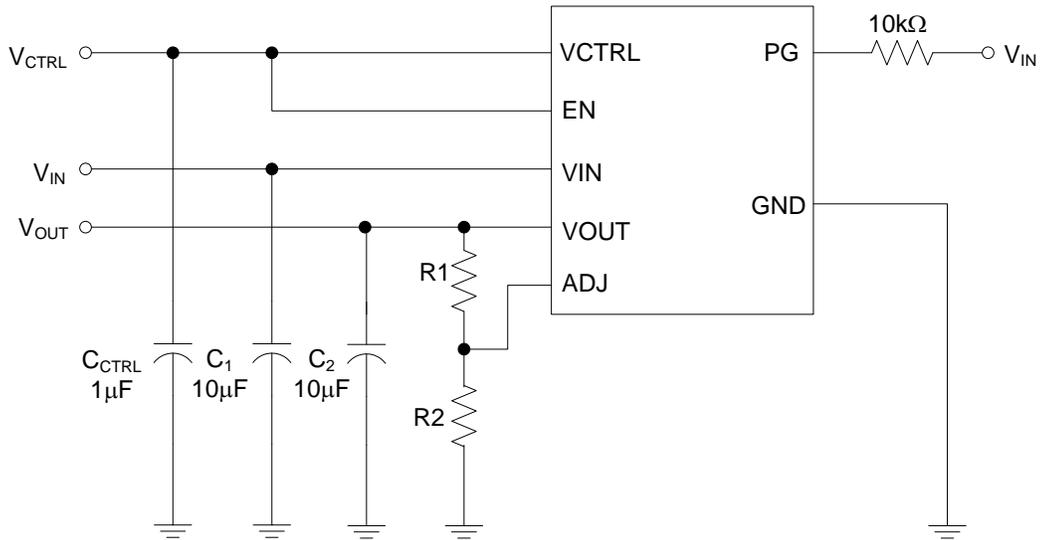- $V_{OUT}$ Power Good Signal
- Excellent Line/Load Regulation

## Pin Assignments

**(Top View)**

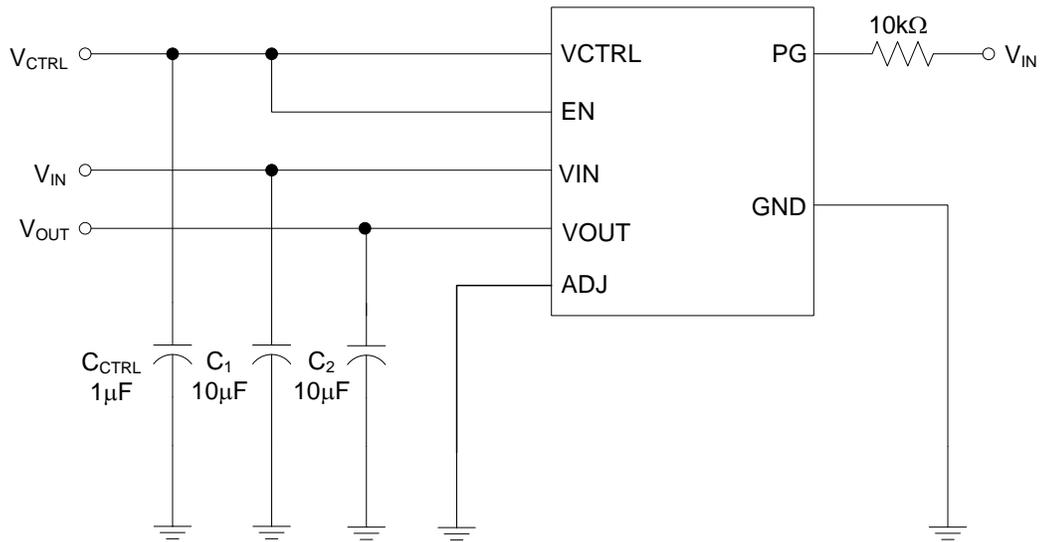| PG | 1 | | 8 | GND |
| EN | 2 | | 7 | ADJ |
| VIN | 3 | | 6 | VOUT |
| VCTRL | 4 | | 5 | NC |

**PSOP-8**
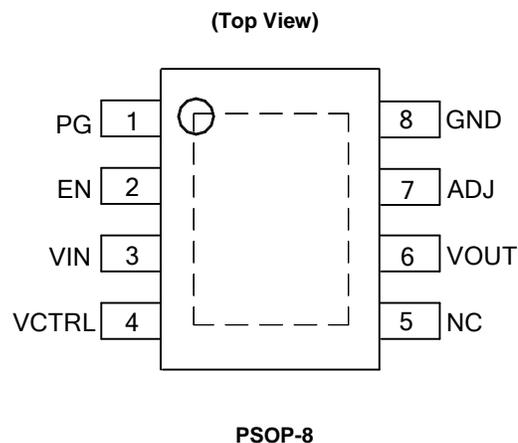
## Applications

- Notebook

## Typical Applications Circuit



$$V_{OUT} = \frac{0.8\ (R1+R2)}{R2}$$

For Adjustable Version



For Fixed Version

## Pin Descriptions

| Pin Number | Pin Name | Function |
|---|---|---|
| 1 | PG | Assert high once $V_{OUT}$ reaches 92% of its rating voltage |
| 2 | EN | Enable input |
| 3 | VIN | Input voltage |
| 4 | VCTRL | Input voltage for controlling circuit |
| 5 | NC | Not connected |
| 6 | VOUT | Regulated output voltage |
| 7 | ADJ | Adjust output: when connected to ground, the output voltage is set by internal resistors; when external feedback resistors are connected, the output voltage will be $V_{OUT} = 0.8(R1+R2)/R2$. |
| 8 | GND | Ground |

## Functional Block Diagram
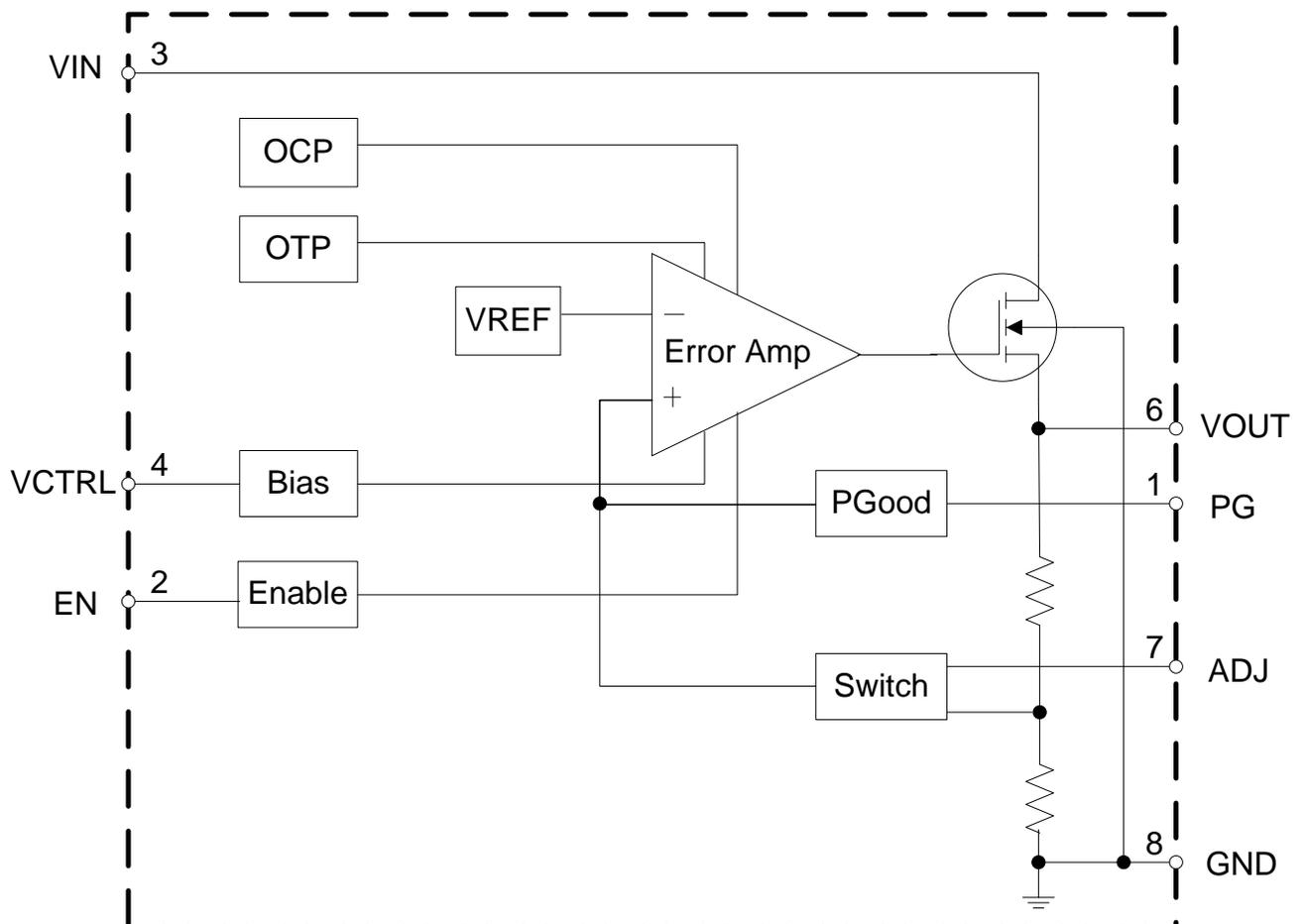
## Absolute Maximum Ratings (Note 1)

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_{IN}$<br>$V_{CTRL}$ | Input Voltage<br>Input Voltage for Controlling Circuit | 6.0 | V |
| $V_{EN}$ | Enable Input Voltage | -0.3 to 6.0 | V |
| $I_{OUT}$ | Output Current | 2.5 | A |
| $\theta_{JA}$ | Thermal Resistance (Note 2) | 53 | °C/W |
| $T_J$ | Operating Junction Temperature | +150 | °C |
| $T_{STG}$ | Storage Temperature Range | -65 to +150 | °C |
| $T_{LEAD}$ | Lead Temperature (Soldering, 10sec) | +260 | °C |
| — | ESD (Machine Model) | 200 | V |
| — | ESD (Human Body Model) | 2000 | V |

Notes:  1. Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

2. $\theta_{JA}$ is measured with the component mounted on 2-Layer FR-4 PCB board with 1.0cm*1.0cm thermal sink pad in free air.

## Recommended Operating Conditions

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| $V_{IN}$ | Input Voltage | 1.4 | 5.5 | V |
| $V_{CTRL}$ | Input Voltage for Controlling Circuit | 4.5 | 5.5 | V |
| $T_A$ | Operating Ambient Temperature Range | -40 | +85 | °C |

## Electrical Characteristics (@$V_{IN}$ = $V_{OUT}$+0.5V, $V_{CTRL}$ = $V_{EN}$ = 5V, $T_A$ = +25°C, $C_{IN}$ = $C_{OUT}$ = 10µF, $C_{CTRL}$ = 1µF, $I_{OUT}$ = 10mA, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | $V_{IN}$ = $V_{OUT}$+0.5V, $I_{OUT}$ = 10mA | $V_{OUT}$ × 98% | — | $V_{OUT}$ × 102% | V |
| $V_{IN}$ | Input Voltage | — | 1.4 | — | 5.5 | V |
| $I_{LIMIT}$ | Current Limit | $V_{IN}$–$V_{OUT}$ = 1V | 3 | — | — | A |
| $V_{RLOAD}$ | Load Regulation | $V_{IN}$ = $V_{OUT}$+0.5V, 10mA ≤ $I_{OUT}$ ≤ 2A | — | 10 | — | mV |
| $V_{RLINE}$ | Line Regulation | $V_{OUT}$+0.5V ≤ $V_{IN}$ ≤ 5V, $I_{OUT}$ = 10mA | — | 2 | — | mV |
| $V_{DROP}$ | Dropout Voltage | $I_{OUT}$ = 500mA | — | 80 | 120 | mV |
| | | $I_{OUT}$ = 1A | — | 150 | 200 | mV |
| | | $I_{OUT}$ = 2A | — | 300 | 450 | mV |
| $I_{SUPPLY}$ | Supply Current | $V_{IN}$ = $V_{OUT}$+0.5V, $I_{OUT}$ = 0mA | — | 300 | — | µA |
| $I_{CTRLH}$ | $V_{CTRL}$ Current | $V_{IN}$ = $V_{OUT}$+0.5V, $V_{CTRL}$ = $V_{EN}$ = 5V | — | 250 | 500 | µA |
| $I_{CTRLL}$ | | $V_{IN}$ = $V_{OUT}$+0.5V, $V_{CTRL}$ = 5V, $V_{EN}$ = 0V | — | 0.1 | 1.0 | µA |
| PSRR | Power Supply Rejection Ratio | Ripple 0.5Vp-p, $V_{IN}$ = $V_{OUT}$+1V, f = 100Hz | — | 60 | — | dB |
| | | f = 1kHz | — | 60 | — | dB |
| $\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta T}$ | Output Voltage Temperature Coefficient | $I_{OUT}$ = 10mA, -40°C ≤ $T_A$ ≤ +85°C | — | ±100 | — | ppm/°C |
| $I_{SHORT}$ | Short Circuit Current | — | — | 0.3 | 0.5 | A |
| $V_{REF}$ | Reference Voltage | Adjust Short to $V_{OUT}$ | 0.784 | 0.8 | 0.816 | V |
| — | Enable "High" Voltage | Enable Input Voltage "High" | 1.2 | — | — | V |
| — | Enable "Low" Voltage | Enable Input Voltage "Low" | — | — | 0.4 | V |
| OTSD | Thermal Shutdown | — | — | +165 | — | °C |
| — | Thermal Shutdown Hysteresis | — | — | +20 | — | °C |
| $V_{THPG}$ | $V_{OUT}$ Power Good Voltage | — | — | 92 | — | % |
| — | $V_{PG}$ Hysteresis | — | — | 7 | — | % |
| — | Adjust Pin Threshold | — | — | 200 | — | mV |
| $\theta_{JC}$ | Thermal Resistance (Junction to Case) | PSOP-8 | — | 29 | — | °C/W |

**YOUSHANG SEMICONDUCTOR**
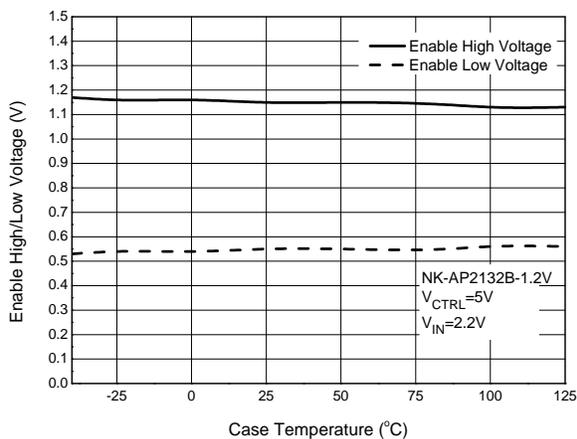
## Performance Characteristics

### Supply Current vs. Output Current
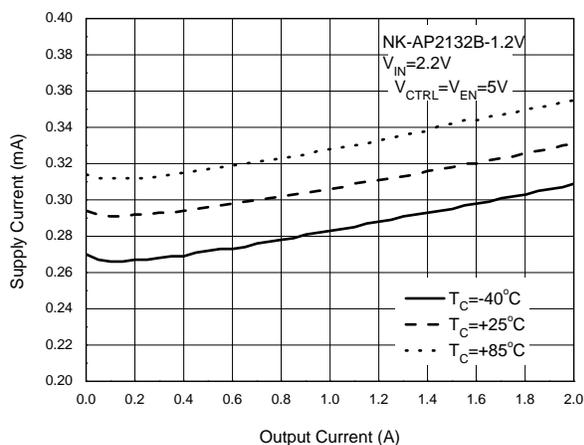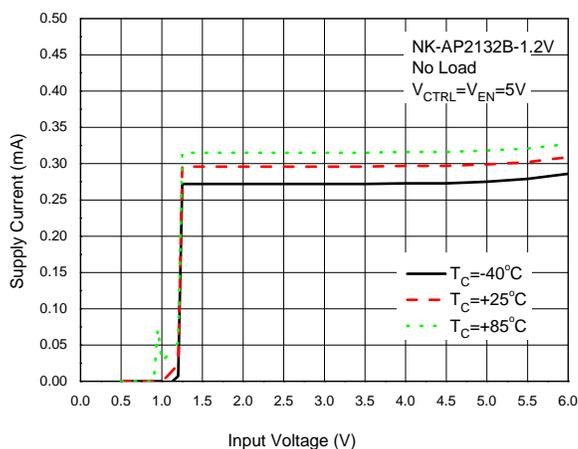


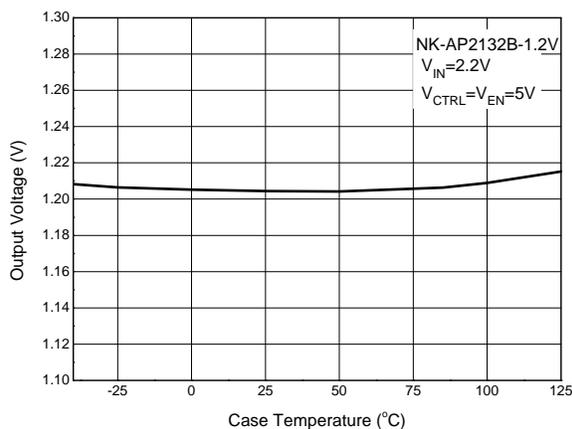### Supply Current vs. Case Temperature
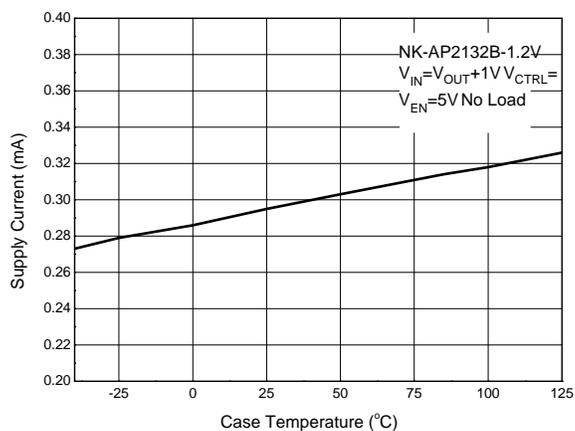


### Enable High/Low Voltage vs. Case Temperature
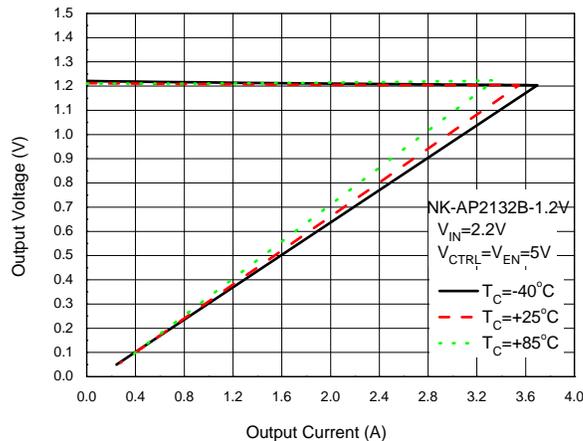


### Supply Current vs. Input Voltage
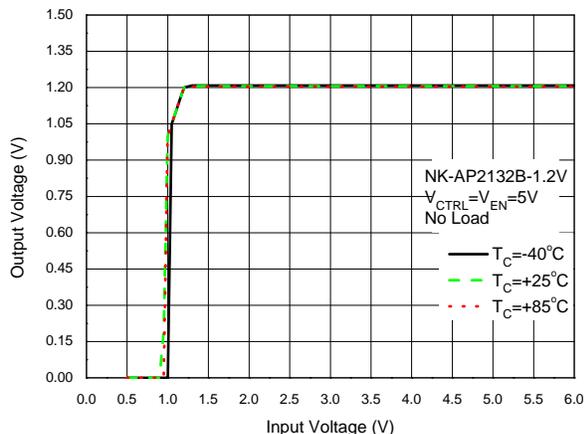


### Output Voltage vs. Case Temperature



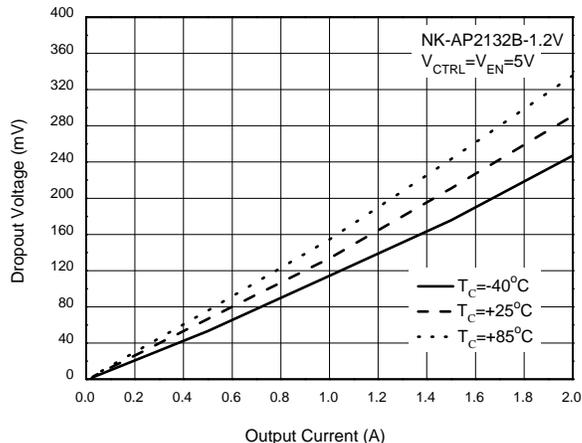### Output Voltage vs. Output Current

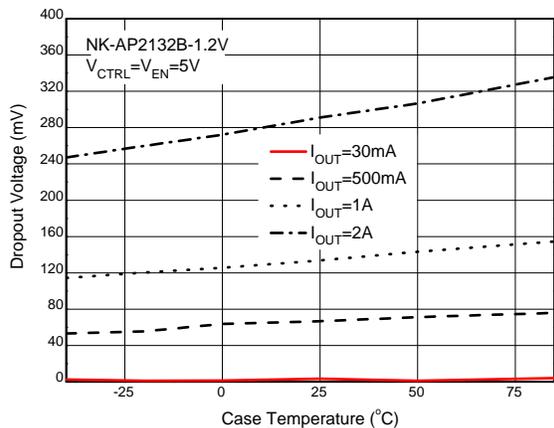## Performance Characteristics (Cont.)

### Output Voltage vs. Input Voltage



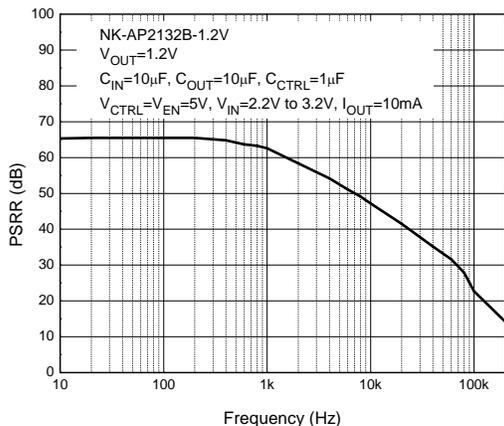### Dropout Voltage vs. Output Current



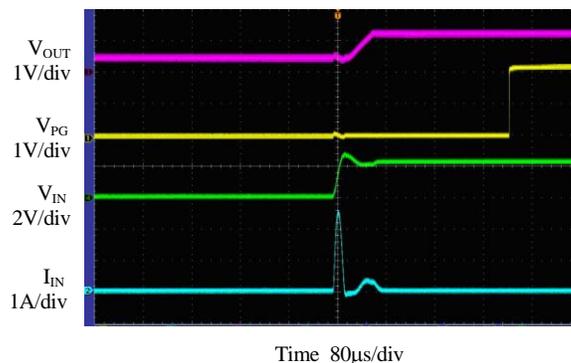### Dropout Voltage vs. Case Temperature



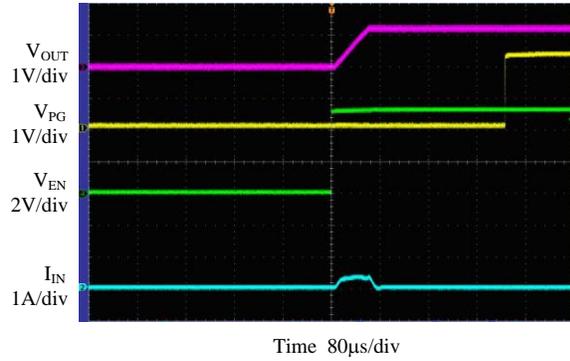### Short Current vs. Case Temperature
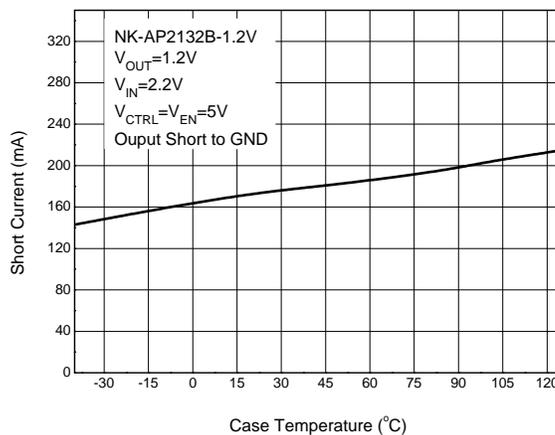


### PSRR vs. Frequency



### $V_{IN}$ Start up Waveform
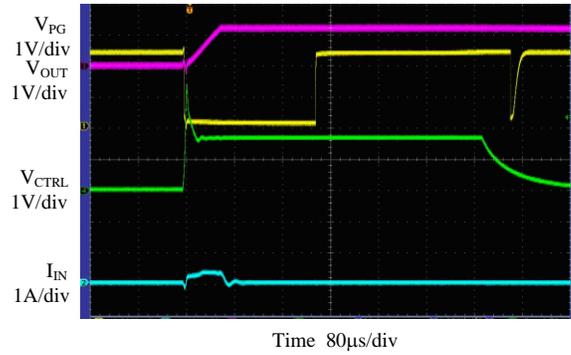### ($V_{CTRL}=V_{EN}=5V$, $V_{IN}=0$ to 2.2V, No Load)



Time 80μs/div

## Performance Characteristics (Cont.)

**$V_{EN}$ Start up Waveform**
**($V_{CTRL}$=5V, $V_{EN}$=0 to 5V, $V_{IN}$=2.2V, No Load)**

$V_{OUT}$
1V/div

$V_{PG}$
1V/div

$V_{EN}$
2V/div

$I_{IN}$
1A/div

Time 80μs/div

**$V_{CTRL}$ Start up and Shut down Waveform**
**($V_{CTRL}$=0 to 5V, $V_{EN}$=5V, $V_{IN}$=2.2V, No Load)**

$V_{PG}$
1V/div
$V_{OUT}$
1V/div

$V_{CTRL}$
1V/div

$I_{IN}$
1A/div

Time 80μs/div

**Load Transient**
**($V_{CTRL}$=$V_{EN}$=5V, $V_{IN}$=2.2V, $I_{OUT}$=0 to 2A)**

$V_{OUT}$
50mV/div

$V_{PG}$
500mV/div

$I_{OUT}$
1A/div

Time 80μs/div
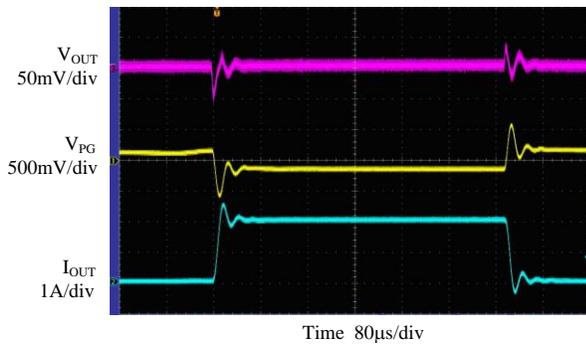
**Line Transient**
**($V_{CTRL}$=$V_{EN}$=5V, $C_{IN}$=$C_{CTRL}$=1μF, $C_{OUT}$=10μF,**
**$V_{IN}$=2.2V to 3.2V, $I_{OUT}$=10mA)**

$V_{IN}$
1V/div

$V_{OUT}$
50mV/div

Time 80μs/div
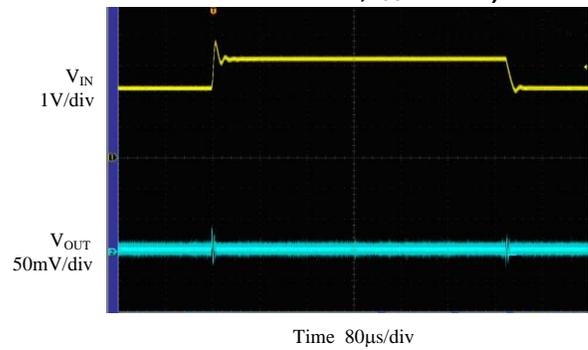
## Package Outline Dimensions (All dimensions in mm(inch).)

**(1)   Package Type: PSOP-8**
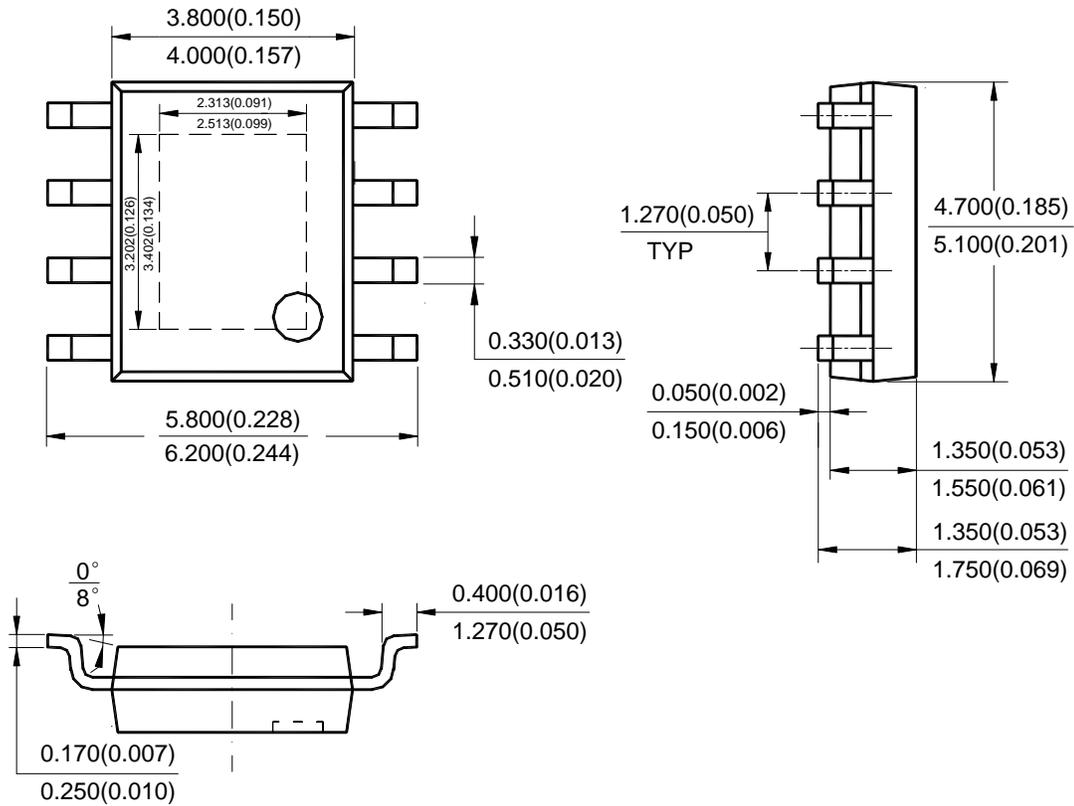


Note: Eject hole, oriented hole and mold mark is optional.