# AN80LxxRMS Series

## Positive output, low dropout voltage regulator (150 mA type)

### ■ Overview

The AN80LxxRMS series is a 0.15 A, low dropout, positive voltage regulator with reset function. 20 classifications of output voltages, 1.8 V, 1.9 V, 2.0 V, 2.1 V, 2.2 V, 2.5 V, 2.8 V, 2.9 V, 3.0 V, 3.1 V, 3.2 V, 3.3 V, 3.4 V, 3.5 V, 3.6 V, 4.8 V, 4.9 V, 5.0 V, 5.1 V and 5.2 V are available. In addition, it is adopting the surface mounting type package, so that it is most suited for miniaturization and weight reduction of set equipment.

### ■ Features

- Minimum input and output voltage difference: 0.4 V max.
- High accuracy output voltage: (allowance: ±3%)
- Built-in reset function terminal (high: active)
- Built-in overcurrent limit circuit
- Built-in rush current prevention circuit at input voltage rise
- Output voltage: 1.8 V to 5.2 V

### ■ Applications

- Cellular phone, PHS, analog cordless phone, other small sized portable equipment

Unit: mm

MINI-5D
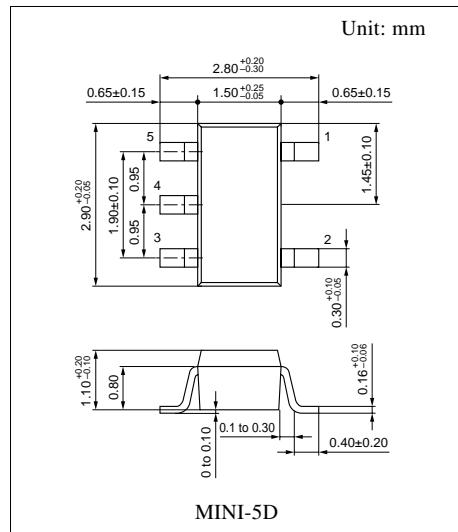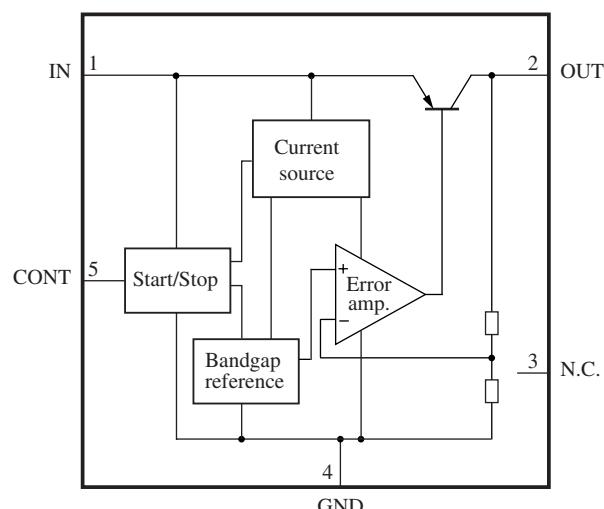
On marking, see page 2

### ■ Block Diagram

■ Output Voltage Characteristics at $I_{OUT}$ = 50 mA, $T_a$ = 25°C

| Type No. | Output V | Conditions | Min | Type | Max | Unit | Marking |
|---|---|---|---|---|---|---|---|
| AN80L18RMS | 1.8 | $V_{IN}$ = 2.8 V | 1.746 | 1.8 | 1.854 | V | BA |
| AN80L19RMS | 1.9 | 2.9 | 1.843 | 1.9 | 1.957 | V | BB |
| AN80L20RMS | 2.0 | 3.0 | 1.940 | 2.0 | 2.060 | V | BC |
| AN80L21RMS | 2.1 | 3.1 | 2.037 | 2.1 | 2.163 | V | BD |
| AN80L22RMS | 2.2 | 3.2 | 2.134 | 2.2 | 2.266 | V | BE |
| AN80L25RMS | 2.5 | 3.5 | 2.425 | 2.5 | 2.575 | V | BW |
| AN80L28RMS | 2.8 | 3.8 | 2.716 | 2.8 | 2.884 | V | BF |
| AN80L29RMS | 2.9 | 3.9 | 2.813 | 2.9 | 2.987 | V | BG |
| AN80L30RMS | 3.0 | 4.0 | 2.910 | 3.0 | 3.090 | V | BH |
| AN80L31RMS | 3.1 | 4.1 | 3.007 | 3.1 | 3.193 | V | BJ |
| AN80L32RMS | 3.2 | 4.2 | 3.104 | 3.2 | 3.296 | V | BK |
| AN80L33RMS | 3.3 | 4.3 | 3.201 | 3.3 | 3.399 | V | BL |
| AN80L34RMS | 3.4 | 4.4 | 3.298 | 3.4 | 3.502 | V | BM |
| AN80L35RMS | 3.5 | 4.5 | 3.395 | 3.5 | 3.605 | V | BN |
| AN80L36RMS | 3.6 | 4.6 | 3.492 | 3.6 | 3.708 | V | BP |
| AN80L48RMS | 4.8 | 5.8 | 4.656 | 4.8 | 4.944 | V | BQ |
| AN80L49RMS | 4.9 | 5.9 | 4.753 | 4.9 | 5.047 | V | BR |
| AN80L50RMS | 5.0 | 6.0 | 4.850 | 5.0 | 5.150 | V | BS |
| AN80L51RMS | 5.1 | 6.1 | 4.947 | 5.1 | 5.253 | V | BT |
| AN80L52RMS | 5.2 | 6.2 | 5.044 | 5.2 | 5.356 | V | BU |

BA
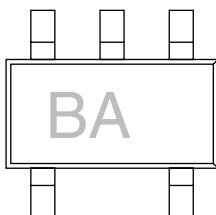
(Marking example: AN80L18RMS)

■ Pin Descriptions

| Pin No. | Description |
|---|---|
| 1 | Input voltage pin |
| 2 | Output voltage pin |
| 3 | N.C. pin |
| 4 | Grounding pin |
| 5 | Control pin<br>(High → operation, Low → stop) |

■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage [*1] | $V_{CC}$ | 14.6 | V |
| Supply current | $I_{CC}$ | 300 | mA |
| Power dissipation [*3] | $P_D$ | 78 | mW |
| Operating ambient temperature [*2] | $T_{opr}$ | −30 to +85 | °C |
| Storage temperature [*2] | $T_{stg}$ | −55 to +150 | °C |

Note) *1: There may be a case of the device destruction when the output ($V_{OUT}$) and the grounding (GND), or the output ($V_{OUT}$) and input ($V_{IN}$) are short-circuited.

*2: Except for the operating ambient temperature and storage temperature, all ratings are for $T_a = 25°C$.

*3: $T_{opr}$ = Power dissipation for IC alone without heat sink at +85°C.

■ Recommended Operating Conditions

| Part No. | Output voltage | Operating supply voltage range ($V_{CC}$) | Unit |
|---|---|---|---|
| AN80L18RMS | 1.8 | 2.2 to 14.5 | V |
| AN80L19RMS | 1.9 | 2.3 to 14.5 | V |
| AN80L20RMS | 2.0 | 2.4 to 14.5 | V |
| AN80L21RMS | 2.1 | 2.5 to 14.5 | V |
| AN80L22RMS | 2.2 | 2.6 to 14.5 | V |
| AN80L25RMS | 2.5 | 2.9 to 14.5 | V |
| AN80L28RMS | 2.8 | 3.2 to 14.5 | V |
| AN80L29RMS | 2.9 | 3.3 to 14.5 | V |
| AN80L30RMS | 3.0 | 3.4 to 14.5 | V |
| AN80L31RMS | 3.1 | 3.5 to 14.5 | V |
| AN80L32RMS | 3.2 | 3.6 to 14.5 | V |
| AN80L33RMS | 3.3 | 3.7 to 14.5 | V |
| AN80L34RMS | 3.4 | 3.8 to 14.5 | V |
| AN80L35RMS | 3.5 | 3.9 to 14.5 | V |
| AN80L36RMS | 3.6 | 4.0 to 14.5 | V |
| AN80L48RMS | 4.8 | 5.2 to 14.5 | V |
| AN80L49RMS | 4.9 | 5.3 to 14.5 | V |
| AN80L50RMS | 5.0 | 5.4 to 14.5 | V |
| AN80L51RMS | 5.1 | 5.5 to 14.5 | V |
| AN80L52RMS | 5.2 | 5.6 to 14.5 | V |

■ Electrical Characteristics at $T_a = 25°C$

● AN80L18RMS (1.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \, \mu F$, $C_{OUT} = 10 \, \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 50 \, mA$ | 1.746 | 1.8 | 1.854 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 2.8 \, V \rightarrow 14.5 \, V$, $I_{OUT} = 50 \, mA$ | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 2.8 \, V \rightarrow 9 \, V$, $I_{OUT} = 50 \, mA$ | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 0 \, mA \rightarrow 150 \, mA$ | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 2.8 \, V$, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50 \, mA$. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 0 \, mA$ | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 0 \, mA \rightarrow 150 \, mA$ | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10 \, V$, $V_{CONT} = 0 \, V$ | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 1.5 \, V$, $I_{OUT} = 0 \, mA$ | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10 \, mA$ | 62 | 70 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 1.5 \, V$, $I_{OUT} = 0 \, mA$ | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 2.1 \, V$, $I_{OUT} = 150 \, mA$ | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 50 \, mA$ | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 50 \, mA$ | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 50 \, mA$ $V_{CONT} = 1.8 \, V$ | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

● Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10 \, mA$ | — | 38 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 0 \, mA$ $-30°C \le T_a \le +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 2.8 \, V$, $I_{OUT} = 50 \, mA$ $V_{CONT} = 0 \, V \rightarrow 1.8 \, V$, $C_{IN} = 0.1 \, \mu F$ $C_{OUT} = 10 \, \mu F$, $V_{OUT} = 90\%$ | — | 0.10 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

• AN80L19RMS (1.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \ \mu F$, $C_{OUT} = 10 \ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 50$ mA | 1.843 | 1.9 | 1.957 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 2.9$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 2.9$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 2.9$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 1.6$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 62 | 70 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 1.6$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 2.2$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) *1: 1.0 Ω

   *2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 40 | — | μV |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 0$ mA $-30°C ≤ T_a ≤ +85°C$ | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1 \ \mu F$ $C_{OUT} = 10 \ \mu F$, $V_{OUT} = 90\%$ | — | 0.10 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a = 25°C$ (continued)

• AN80L20RMS (2.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \mu F$, $C_{OUT} = 10 \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 50$ mA | 1.940 | 2.0 | 2.060 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 3.0$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 3.0$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation *1 | $REG_{LOA}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current *2 | $I_{PEAK}$ | $V_{IN} = 3.0$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA | — | — | 350 | µA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | µA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 1.7$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 62 | 70 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 1.7$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 2.3$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | µA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 42 | — | µV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1 \mu F$ $C_{OUT} = 10 \mu F$, $V_{OUT} = 90\%$ | — | 0.10 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

- AN80L21RMS (2.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1$ μF, $C_{OUT} = 10$ μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 50$ mA | 2.037 | 2.1 | 2.163 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 3.1$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 3.1$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 3.1$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 1.8$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 61 | 69 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 1.8$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 2.4$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

- Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 44 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 3.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1$ μF $C_{OUT} = 10$ μF, $V_{OUT} = 90\%$ | — | 0.10 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a$ = 25°C (continued)

### • AN80L22RMS (2.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 50 mA | 2.134 | 2.2 | 2.266 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 3.2 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 3.2 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN}$ = 3.2 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 1.9 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 61 | 69 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 1.9 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 2.4 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 46 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 0 mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN}$ = 3.2 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.10 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a$ = 25°C (continued)

● AN80L25RMS (2.5 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 50 mA | 2.425 | 2.5 | 2.575 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 3.5 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 3.5 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN}$ = 3.5 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 2.2 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 60 | 68 | — | dB |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 2.2 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 2.6 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

● Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 58 | — | μV |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 0 mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN}$ = 3.15 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.10 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L28RMS (2.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 10\ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 50$ mA | 2.716 | 2.8 | 2.884 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 3.8$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 3.8$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 3.8$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 0$ mA | — | — | 350 | $\mu A$ |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | $\mu A$ |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 2.5$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 60 | 68 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 2.5$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 2.9$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | $\mu A$ |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz $\leq$ f $\leq$ 100 kHz, $I_{OUT} = 10$ mA | — | 58 | — | $\mu V$ |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 3.8$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1\ \mu F$ $C_{OUT} = 10\ \mu F$, $V_{OUT} = 90\%$ | — | 0.10 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L29RMS (2.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \mu F$, $C_{OUT} = 10 \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 50$ mA | 2.813 | 2.9 | 2.987 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 3.9$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 3.9$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 3.9$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 0$ mA | — | — | 350 | $\mu A$ |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | $\mu A$ |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 2.6$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 60 | 68 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 2.6$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | $\mu A$ |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 60 | — | $\mu V$ |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 0$ mA $-30°C ≤ T_a ≤ +85°C$ | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN} = 3.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1 \mu F$ $C_{OUT} = 10 \mu F$, $V_{OUT} = 90\%$ | — | 0.12 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a$ = 25°C (continued)

• AN80L30RMS (3.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 50 mA | 2.910 | 3.0 | 3.090 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 4.0 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 4.0 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN}$ = 4.0 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 2.7 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 60 | 68 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 2.7 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 3.1 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 62 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 0 mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN}$ = 4.0 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.12 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L31RMS (3.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \, \mu F$, $C_{OUT} = 10 \, \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 50$ mA | 3.007 | 3.1 | 3.193 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 4.1$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 4.1$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 4.1$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 0$ mA | — | — | 350 | $\mu A$ |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | $\mu A$ |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 2.8$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 59 | 67 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 2.8$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 3.2$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | $\mu A$ |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz $\leq$ f $\leq$ 100 kHz, $I_{OUT} = 10$ mA | — | 64 | — | $\mu V$ |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 4.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1 \, \mu F$ $C_{OUT} = 10 \, \mu F$, $V_{OUT} = 90\%$ | — | 0.12 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a$ = 25°C (continued)

### ● AN80L32RMS (3.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 50 mA | 3.104 | 3.2 | 3.296 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 4.2 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 4.2 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN}$ = 4.2 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 2.9 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 59 | 67 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 2.9 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 3.3 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### ● Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 66 | — | μV |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 0 mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN}$ = 4.2 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.12 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L33RMS (3.3 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 10\ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 50$ mA | 3.201 | 3.3 | 3.399 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 4.3$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 4.3$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 4.3$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 59 | 67 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 3.0$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 3.4$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 68 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 0$ mA $-30°C ≤ T_a ≤ +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 4.3$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1\ \mu F$ $C_{OUT} = 10\ \mu F$, $V_{OUT} = 90\%$ | — | 0.12 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a$ = 25°C (continued)

### ● AN80L34RMS (3.4 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 50 mA | 3.298 | 3.4 | 3.502 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 4.4 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 4.4 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN}$ = 4.4 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 3.1 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 58 | 66 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 3.1 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 3.5 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) *1: 1.0 Ω

　　　*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### ● Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 70 | — | μV |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 0 mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN}$ = 4.4 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.12 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a = 25°C$ (continued)

• AN80L35RMS (3.5 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \ \mu F$, $C_{OUT} = 10 \ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 50$ mA | 3.395 | 3.5 | 3.605 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 4.5$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 4.5$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 4.5$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 3.2$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 58 | 66 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 3.2$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 3.6$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 72 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1 \ \mu F$ $C_{OUT} = 10 \ \mu F$, $V_{OUT} = 90\%$ | — | 0.12 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a$ = 25°C (continued)

### • AN80L36RMS (3.6 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN}$ = 0.1 μF, $C_{OUT}$ = 10 μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 50 mA | 3.492 | 3.6 | 3.708 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN}$ = 4.6 V → 14.5 V, $I_{OUT}$ = 50 mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN}$ = 4.6 V → 9 V, $I_{OUT}$ = 50 mA | — | 5 | 20 | mV |
| Load regulation [1] | $REG_{LOA}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 0 mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [2] | $I_{PEAK}$ | $V_{IN}$ = 4.6 V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT}$ = 50 mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 0 mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 0 mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN}$ = 10 V, $V_{CONT}$ = 0 V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN}$ = 3.3 V, $I_{OUT}$ = 0 mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT}$ = 10 mA | 58 | 66 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN}$ = 3.3 V, $I_{OUT}$ = 0 mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN}$ = 3.7 V, $I_{OUT}$ = 150 mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 50 mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 50 mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 1.8 V | — | — | 30 | μA |

Note) [1]: 1.0 Ω

[2]: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT}$ = 10 mA | — | 74 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 0 mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN}$ = 4.6 V, $I_{OUT}$ = 50 mA $V_{CONT}$ = 0 V → 1.8 V, $C_{IN}$ = 0.1 μF $C_{OUT}$ = 10 μF, $V_{OUT}$ = 90% | — | 0.12 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L48RMS (4.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1$ μF, $C_{OUT} = 10$ μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 50$ mA | 4.656 | 4.8 | 4.944 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 5.8$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 5.8$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 5.8$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 57 | 65 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 4.5$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 4.9$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 100 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN} = 5.8$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1$ μF $C_{OUT} = 10$ μF, $V_{OUT} = 90\%$ | — | 0.20 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### ● AN80L49RMS (4.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1$ μF, $C_{OUT} = 10$ μF

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 50$ mA | 4.753 | 4.9 | 5.047 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 5.9$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 5.9$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [1] | $REG_{LOA}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [2] | $I_{PEAK}$ | $V_{IN} = 5.9$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 4.6$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 57 | 65 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 4.6$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 5.0$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) *1: 1.0 Ω

*2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### ● Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 102 | — | μV |
| Output voltage temperature coefficient | $\dfrac{1}{V_{OUT}} \cdot \dfrac{dV_{OUT}}{dT}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 0$ mA −30°C ≤ $T_a$ ≤ +85°C | — | 90 | — | ppm/°C |
| Output rise time * | $t_{ON}$ | $V_{IN} = 5.9$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1$ μF $C_{OUT} = 10$ μF, $V_{OUT} = 90\%$ | — | 0.20 | — | ms |

Note) *: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a = 25°C$ (continued)

• AN80L50RMS (5.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 10\ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 50$ mA | 4.850 | 5.0 | 5.150 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 6.0$ V → 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 6.0$ V → 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 0$ mA → 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 6.0$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 0$ mA → 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 4.7$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 56 | 64 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 4.7$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 5.1$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 104 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 0$ mA $-30°C ≤ T_a ≤ +85°C$ | — | 90 | — | ppm/°C |
| Output rise time ∗ | $t_{ON}$ | $V_{IN} = 6.0$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V → 1.8 V, $C_{IN} = 0.1\ \mu F$ $C_{OUT} = 10\ \mu F$, $V_{OUT} = 90\%$ | — | 0.20 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

## ■ Electrical Characteristics at $T_a = 25°C$ (continued)

### • AN80L51RMS (5.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 10\ \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 50$ mA | 4.947 | 5.1 | 5.253 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 6.1$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 6.1$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 6.1$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 0$ mA | — | — | 350 | μA |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | μA |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 4.8$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 56 | 64 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 4.8$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 5.2$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | μA |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

### • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz $\leq$ f $\leq$ 100 kHz, $I_{OUT} = 10$ mA | — | 106 | — | μV |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 0$ mA $-30°C \leq T_a \leq +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 6.1$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1\ \mu F$ $C_{OUT} = 10\ \mu F$, $V_{OUT} = 90\%$ | — | 0.20 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Electrical Characteristics at $T_a = 25°C$ (continued)

• AN80L52RMS (5.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected. $C_{IN} = 0.1 \mu F$, $C_{OUT} = 10 \mu F$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_{OUT}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 50$ mA | 5.044 | 5.2 | 5.356 | V |
| Line regulation 1 | $REG_{IN1}$ | $V_{IN} = 6.2$ V $\rightarrow$ 14.5 V, $I_{OUT} = 50$ mA | — | 10 | 50 | mV |
| Line regulation 2 | $REG_{IN2}$ | $V_{IN} = 6.2$ V $\rightarrow$ 9 V, $I_{OUT} = 50$ mA | — | 5 | 20 | mV |
| Load regulation [*1] | $REG_{LOA}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | 50 | 150 | mV |
| Peak output current [*2] | $I_{PEAK}$ | $V_{IN} = 6.2$ V, The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 50$ mA. | 180 | 240 | — | mA |
| Bias current under no load | $I_{BIAS}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 0$ mA | — | — | 350 | $\mu A$ |
| Bias current fluctuation to load | $\Delta I_{BIAS}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 0$ mA $\rightarrow$ 150 mA | — | — | 5 | mA |
| Standby consumption current | $I_{STB}$ | $V_{IN} = 10$ V, $V_{CONT} = 0$ V | — | — | 0.1 | $\mu A$ |
| Bias current before starting regulation | $I_{RUSH}$ | $V_{IN} = 4.9$ V, $I_{OUT} = 0$ mA | — | 1.5 | 5 | mA |
| Ripple rejection ratio | RR | 1 V[rms], f = 120 Hz, $I_{OUT} = 10$ mA | 56 | 64 | — | dB |
| Minimum input/ output voltage difference 1 | $V_{DIF(min)1}$ | $V_{IN} = 4.9$ V, $I_{OUT} = 0$ mA | — | 0.1 | 0.2 | V |
| Minimum input/ output voltage difference 2 | $V_{DIF(min)2}$ | $V_{IN} = 5.3$ V, $I_{OUT} = 150$ mA | — | — | 0.4 | V |
| Control terminal threshold high voltage | $V_{CONTH}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 50$ mA | — | — | 1.50 | V |
| Control terminal threshold low voltage | $V_{CONTL}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 50$ mA | 0.30 | — | — | V |
| Control terminal current | $I_{CONT}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 50$ mA $V_{CONT} = 1.8$ V | — | — | 30 | $\mu A$ |

Note) ∗1: 1.0 Ω

∗2: Peak output current: The output current when the output voltage has been decreased by 5% from the value at the time when the output current is 50 mA due to the overcurrent protection.

• Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Output noise voltage | $V_{NO}$ | 10 Hz ≤ f ≤ 100 kHz, $I_{OUT} = 10$ mA | — | 108 | — | $\mu V$ |
| Output voltage temperature coefficient | $\frac{1}{V_{OUT}} \cdot \frac{dV_{OUT}}{dT}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 0$ mA $-30°C ≤ T_a ≤ +85°C$ | — | 90 | — | ppm/°C |
| Output rise time [*] | $t_{ON}$ | $V_{IN} = 6.2$ V, $I_{OUT} = 50$ mA $V_{CONT} = 0$ V $\rightarrow$ 1.8 V, $C_{IN} = 0.1 \mu F$ $C_{OUT} = 10 \mu F$, $V_{OUT} = 90\%$ | — | 0.20 | — | ms |

Note) ∗: Refer to "■ Application Notes 3. Output rise-time characteristics".

■ Application Notes

1. $P_D$ — $T_a$ curves of MINI-5D package

$$P_D — T_a$$

Power dissipation $P_D$ (W)

Mounted on standard board
(glass epoxy: 50 mm × 50 mm × t1.6 mm)
$R_{th(j-a)} = 416.6$ °C/W

Independent IC
without a heat sink
$R_{th(j-a)} = 833.3$ °C/W

Ambient temperature $T_a$ (°C)

2. ESR characteristics

ESR ($\Omega$)

Oscillation

Stable

$C_{OUT}$ ($\mu$F)

• Test circuit

IN    OUT

CONT    GND

N.C.

Load
resistance
(0 mA to
150 mA)

ESR

$C_{OUT}$

0 V to 14.5 V
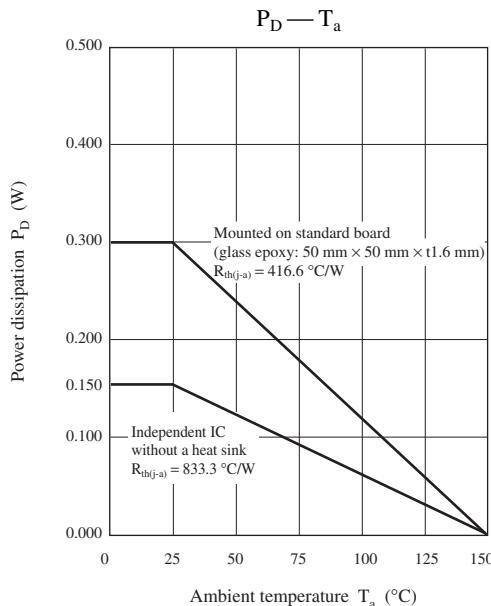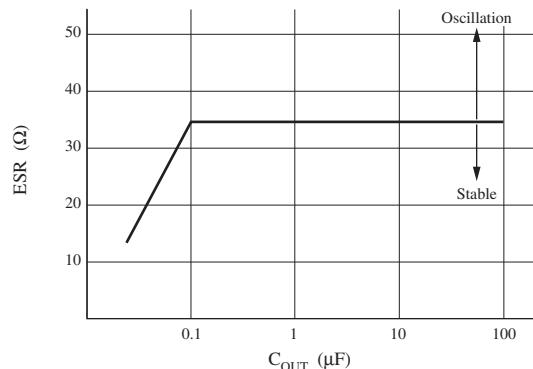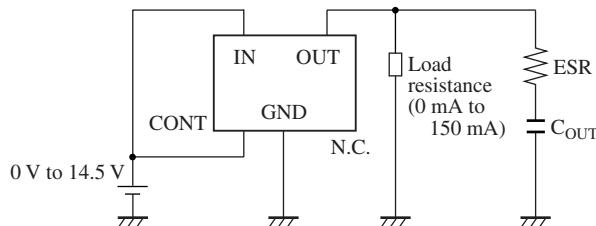
Note) 1. Not guaranteed values.

2. The capacitance value used for $C_{OUT}$ must be 0.22 $\mu$F or more and 100 $\mu$F or less. The recommended value is 10 $\mu$F.

3. Use a capacitor having ESR (equivalent series resistance of capacitor) of 35 $\Omega$ or less (at $T_a = -30$°C to +85°C).

■ Application Notes (continued)

3. Output rise-time characteristics
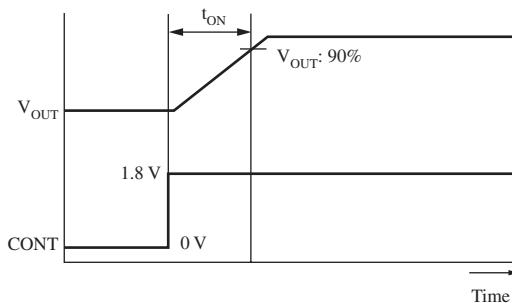


4. Main characteristics

• AN80L18RMS

$V_{OUT} — T_a$



$V_{OUT} — T_a$



• AN80L20RMS

$V_{OUT} — T_a$



$V_{OUT} — T_a$
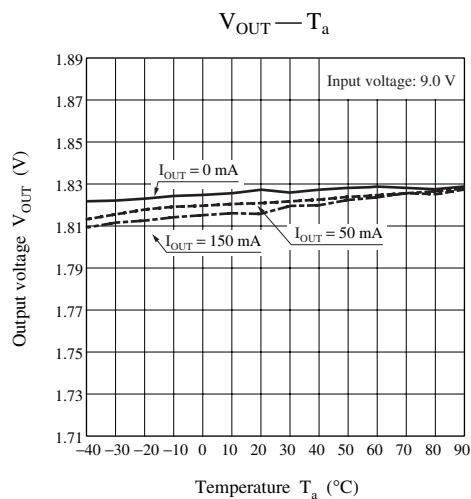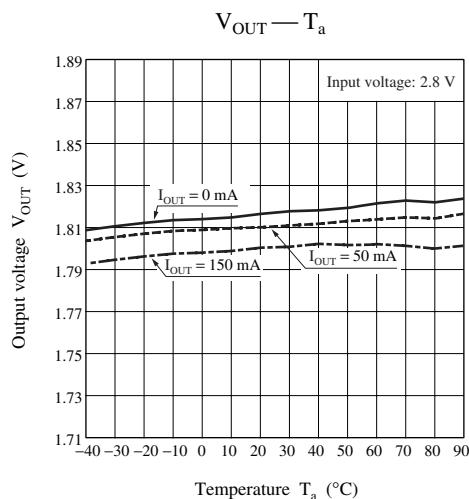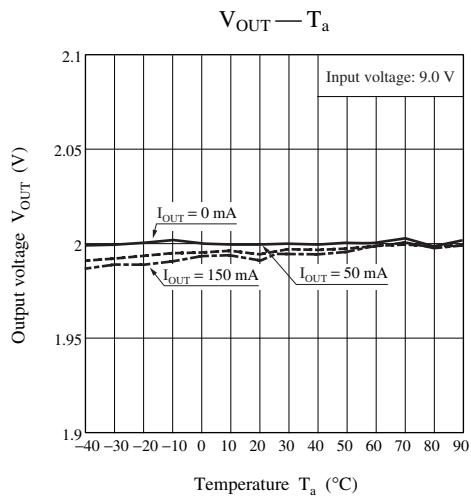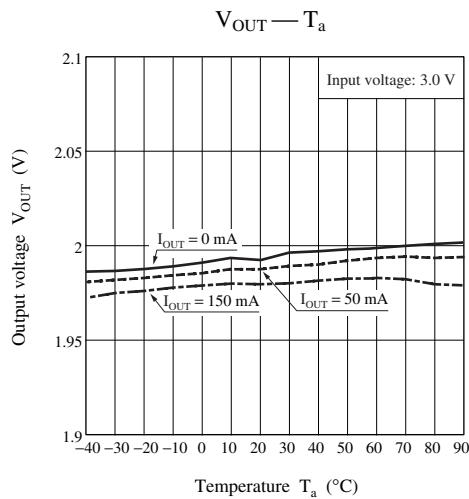
## ■ Application Notes (continued)

4. Main characteristics (continued)

• AN80L33RMS

$$V_{OUT} — T_a$$

Input voltage: 4.3 V

Output voltage $V_{OUT}$ (V)

$I_{OUT} = 0$ mA

$I_{OUT} = 150$ mA    $I_{OUT} = 50$ mA

Temperature $T_a$ (°C)

$$V_{OUT} — T_a$$

Input voltage: 9.0 V

Output voltage $V_{OUT}$ (V)

$I_{OUT} = 0$ mA

$I_{OUT} = 150$ mA    $I_{OUT} = 50$ mA

Temperature $T_a$ (°C)

• AN80L36RMS

$$V_{OUT} — I_{OUT}$$

Output voltage $V_{OUT}$ (V)

$V_{IN} = 14.5$ V

$V_{IN} = 9.0$ V

$V_{IN} = 4.6$ V

Output current $I_{OUT}$ (mA)
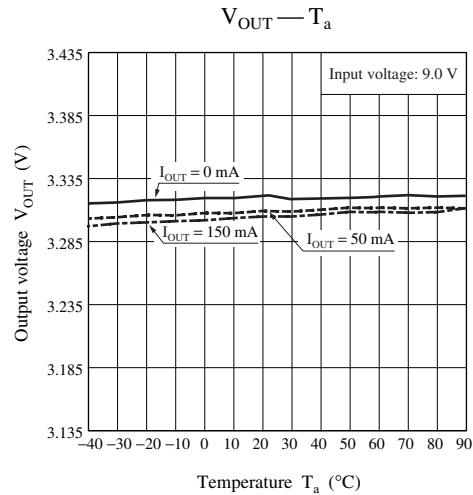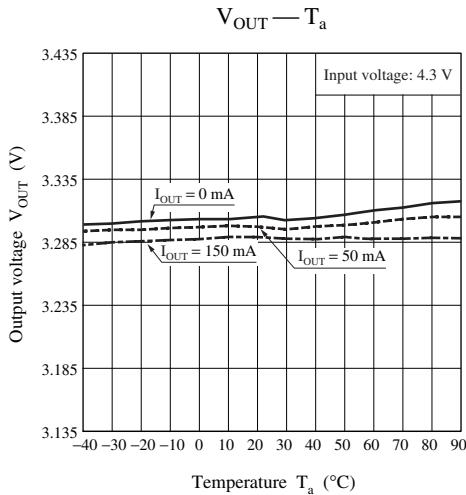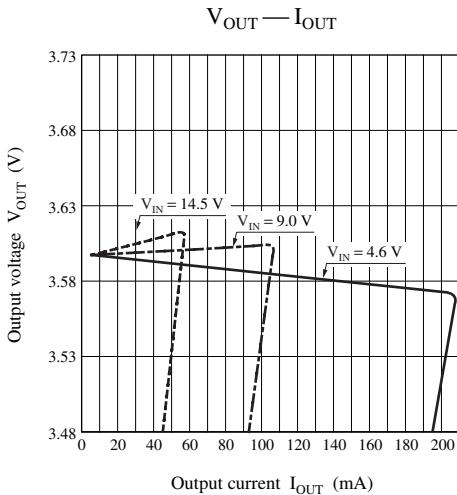
## ■ Application Circuit Example

IN

10 µF

SW

Output off at Low
Output on at High

1

5    Start/Stop

Current
source

Bandgap
reference

Error
amp.

2    OUT

10 µF

3    N.C.

4