Panasonic

AN80xx/AN80xxM Series

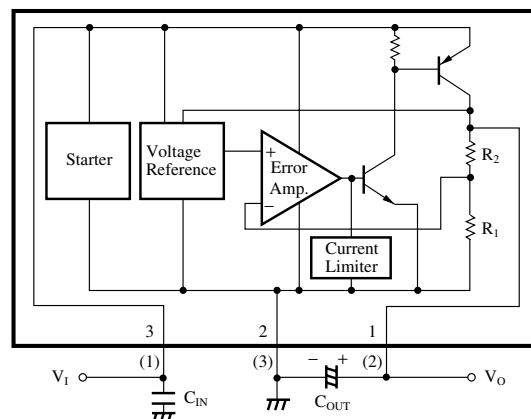## 3-pin, positive output, low dropout voltage regulator (50 mA type)

■ Overview

The AN80xx series and the AN80xxM series are 3-pin, low dropout, fixed positive output type monolithic voltage regulators. Since their power consumption can be minimized, they are suitable for battery-used power supply and reference voltage. 13 types of output voltage are available; 2V, 2.5V, 3V, 3.5V (SSIP003-P-0000 only), 4V, 4.5V, 5V, 6V, 7V, 8V, 8.5V, 9V, and 10V.

■ Features

- Input/output voltage difference: 0.3V max.
- Output current of up to 50mA
- Low bias current: 0.6mA typ.
- Output voltage: 2V, 2.5V, 3V, 3.5V (SSIP003-P-0000 only), 4V, 4.5V, 5V, 6V, 7V, 8V, 8.5V, 9V, and 10V
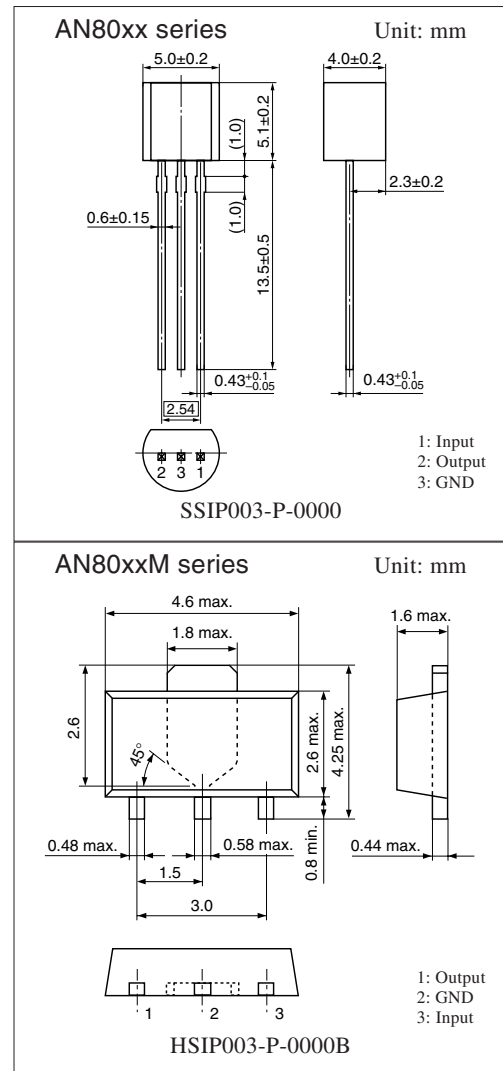- Built-in overcurrent protection circuit

AN80xx series — Unit: mm

5.0±0.2
(1.0)
5.1±0.2
4.0±0.2
2.3±0.2
0.6±0.15
(1.0)
13.5±0.5
0.43$^{+0.1}_{-0.05}$
0.43$^{+0.1}_{-0.05}$
2.54

1: Input
2: Output
3: GND

SSIP003-P-0000

AN80xxM series — Unit: mm

4.6 max.
1.8 max.
1.6 max.
2.6
2.6 max.
4.25 max.
45°
0.48 max.
0.58 max.
0.8 min.
0.44 max.
1.5
3.0

1: Output
2: GND
3: Input

HSIP003-P-0000B

■ Block Diagram (AN80xxM series)

Starter | Voltage Reference | Error Amp. | Current Limiter | R_2 | R_1

3 | 2 | 1
(1) | (3) | (2)
V_I | C_{IN} | C_{OUT} | V_O

$R_1 = 5k\Omega$
$C_{IN} = 0.33\mu F$
$C_{OUT} = 10\mu F$

Note) The number in ( ) shows the pin number for the AN80xx series.

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■ Absolute Maximum Ratings at $T_a = 25°C$

Parameter		Symbol	Rating	Unit
Supply voltage		V_I	20	V
Supply current		I_{CC}	100	mA
Power dissipation		P_D	650 *	mW
Operating ambient temperature		T_{opr}	−30 to +80	°C
Storage temperature	AN80xx series	T_{stg}	−55 to +150	°C
	AN80xxM series		−55 to +125	

* AN80xxM series is mounted on standard board (glass epoxy: 20mm × 20mm × t1.7mm with Cu foil of 1cm^2 or more).

■ Electrical Characteristics at $T_a = 25°C$

• AN8002, AN8002M (2V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	1.92	2	2.08	V
Line regulation	REG_{IN}	$V_I = 2.5$ to 8V, $T_j = 25°C$	——	2	40	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	7	20	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	10	25	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 1.9V$, $I_O = 20mA$, $T_j = 25°C$	——	0.06	0.2	V
		$V_I = 1.9V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.6	1	mA
Ripple rejection ratio	RR	$V_I = 3$ to 5V, $f = 120Hz$	62	74	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	60	——	μV
Output voltage temperature coefficient	$\Delta V_O / T_a$	$T_j = −30$ to +125°C	——	0.1	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 3V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8025, AN8025M (2.5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	2.4	2.5	2.6	V
Line regulation	REG_{IN}	$V_I = 3$ to 8.5V, $T_j = 25°C$	——	2.5	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	8	20	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	12.5	25	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 2.4V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 2.4V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.6	1	mA
Ripple rejection ratio	RR	$V_I = 3.5$ to 5.5V, $f = 120Hz$	60	72	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	65	——	μV
Output voltage temperature coefficient	$\Delta V_O / T_a$	$T_j = −30$ to +125°C	——	0.13	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 3.5V$, $I_O = 20mA$ and $C_O = 10μF$.

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

• AN8003, AN8003M (3V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	2.88	3	3.12	V
Line regulation	REG_{IN}	$V_I = 3.5$ to 9V, $T_j = 25°C$	——	3	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	9	25	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	15	30	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 2.9V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 2.9V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.6	1	mA
Ripple rejection ratio	RR	$V_I = 4$ to 6V, $f = 120Hz$	58	70	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	70	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.15	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 4V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8035(3.5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	3.36	3.5	3.64	V
Line regulation	REG_{IN}	$V_I = 4$ to 9.5V, $T_j = 25°C$	——	3.5	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	10	30	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	20	40	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 3.4V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 3.4V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.6	1	mA
Ripple rejection ratio	RR	$V_I = 4.5$ to 6.5V, $f = 120Hz$	57	69	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	75	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.2	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 4.5V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8004, AN8004M (4V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	3.84	4	4.16	V
Line regulation	REG_{IN}	$V_I = 4.5$ to 10V, $T_j = 25°C$	——	3.5	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	10	30	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	20	40	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 3.8V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 3.8V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.6	1	mA
Ripple rejection ratio	RR	$V_I = 5$ to 7V, $f = 120Hz$	56	67	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	80	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.2	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 5V$, $I_O = 20mA$ and $C_O = 10μF$.

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

• AN8045, AN8045M (4.5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	4.32	4.5	4.68	V
Line regulation	REG_{IN}	$V_I = 5$ to 10.5V, $T_j = 25°C$	——	4	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	11	35	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	23	45	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 4.3V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 4.3V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.7	1	mA
Ripple rejection ratio	RR	$V_I = 5.5$ to 7.5V, $f = 120Hz$	54	66	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	85	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to +125°C	——	0.23	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 5.5V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8005, AN8005M (5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	4.8	5	5.2	V
Line regulation	REG_{IN}	$V_I = 5.5$ to 11V, $T_j = 25°C$	——	4.5	50	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	12	40	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	25	50	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 4.8V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 4.8V$, $I_O = 50mA$, $T_j = 25°C$	——	0.12	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.7	1	mA
Ripple rejection ratio	RR	$V_I = 6$ to 8V, $f = 120Hz$	52	64	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	95	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to +125°C	——	0.25	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 6V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8006, AN8006M (6V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	5.76	6	6.24	V
Line regulation	REG_{IN}	$V_I = 6.5$ to 12V, $T_j = 25°C$	——	5.5	60	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	13	45	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	28	55	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 5.8V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 5.8V$, $I_O = 50mA$, $T_j = 25°C$	——	0.13	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.7	1.2	mA
Ripple rejection ratio	RR	$V_I = 7$ to 9V, $f = 120Hz$	51	63	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	105	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to +125°C	——	0.3	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 7V$, $I_O = 20mA$ and $C_O = 10μF$.

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

• AN8007, AN8007M (7V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	6.72	7	7.28	V
Line regulation	REG_{IN}	$V_I = 7.5$ to 13V, $T_j = 25°C$	——	6.5	70	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	14	50	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	31	60	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 6.8V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 6.8V$, $I_O = 50mA$, $T_j = 25°C$	——	0.13	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.7	1.3	mA
Ripple rejection ratio	RR	$V_I = 8$ to 10V, $f = 120Hz$	50	62	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	120	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.35	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 8V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8008, AN8008M (8V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	7.68	8	8.32	V
Line regulation	REG_{IN}	$V_I = 8.5$ to 14V, $T_j = 25°C$	——	7.5	80	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	15	55	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	34	65	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 7.8V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 7.8V$, $I_O = 50mA$, $T_j = 25°C$	——	0.14	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.7	1.3	mA
Ripple rejection ratio	RR	$V_I = 9$ to 11V, $f = 120Hz$	49	61	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	135	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.4	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 9V$, $I_O = 20mA$ and $C_O = 10μF$.

• AN8085, AN8085M (8.5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	8.16	8.50	8.84	V
Line regulation	REG_{IN}	$V_I = 9$ to 14.5V, $T_j = 25°C$	——	8.3	90	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	16	60	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	36	70	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 8.3V$, $I_O = 20mA$, $T_j = 25°C$	——	0.07	0.2	V
		$V_I = 8.3V$, $I_O = 50mA$, $T_j = 25°C$	——	0.14	0.3	V
Bias current	I_{Bias}	$I_O = 0mA$, $T_j = 25°C$	——	0.8	1.4	mA
Ripple rejection ratio	RR	$V_I = 9.5$ to 11.5V, $f = 120Hz$	48	60	——	dB
Output noise voltage	V_{no}	$f = 10Hz$ to 100kHz	——	140	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to $+125°C$	——	0.43	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 9.5V$, $I_O = 20mA$ and $C_O = 10μF$.

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

• AN8009, AN8009M (9V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	8.64	9	9.36	V
Line regulation	REG_{IN}	$V_I = 9.5$ to 15V, $T_j = 25°C$	——	9	100	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	17	70	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	37	75	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 8.8V, I_O = 20mA, T_j = 25°C$	——	0.07	0.2	V
		$V_I = 8.8V, I_O = 50mA, T_j = 25°C$	——	0.14	0.3	V
Bias current	I_{Bias}	$I_O = 0mA, T_j = 25°C$	——	0.8	1.4	mA
Ripple rejection ratio	RR	$V_I = 10$ to 12V, f = 120Hz	47	59	——	dB
Output noise voltage	V_{no}	f = 10Hz to 100kHz	——	150	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to +125°C	——	0.45	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, $V_I = 10V, I_O = 20mA$ and $C_O = 10μF$.

• AN8010, AN8010M (10V type)

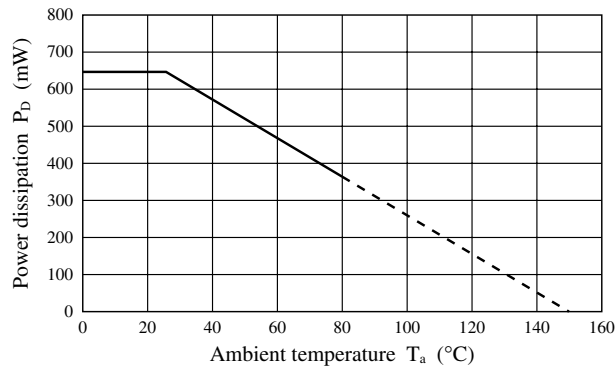| Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	9.6	10	10.4	V
Line regulation	REG_{IN}	$V_I = 10.5$ to 16V, $T_j = 25°C$	——	10	100	mV
Load regulation	REG_L	$I_O = 1$ to 40mA, $T_j = 25°C$	——	18	75	mV
		$I_O = 1$ to 50mA, $T_j = 25°C$	——	40	85	mV
Minimum input/output voltage difference	$V_{DIF(min)}$	$V_I = 9.8V, I_O = 20mA, T_j = 25°C$	——	0.07	0.2	V
		$V_I = 9.8V, I_O = 50mA, T_j = 25°C$	——	0.14	0.3	V
Bias current	I_{Bias}	$I_O = 0mA, T_j = 25°C$	——	0.8	1.4	mA
Ripple rejection ratio	RR	$V_I = 11$ to 13V, f = 120Hz	46	58	——	dB
Output noise voltage	V_{no}	f = 10Hz to 100kHz	——	165	——	μV
Output voltage temperature coefficient	$\Delta V_O/T_a$	$T_j = -30$ to +125°C	——	0.5	——	mV/°C

Note 1) The specified condition $T_j = 25°C$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
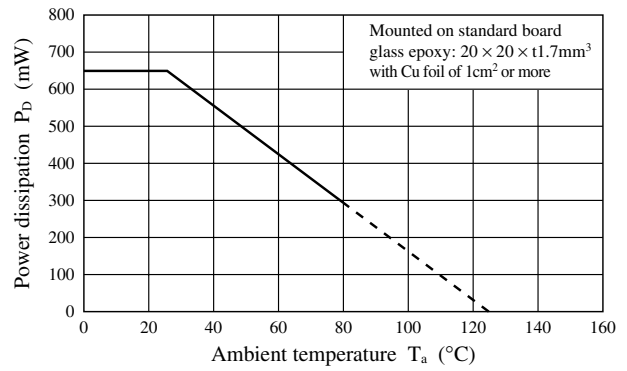Note 2) Unless otherwise specified, $V_I = 11V, I_O = 20mA$ and $C_O = 10μF$.

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■ Main Characteristics

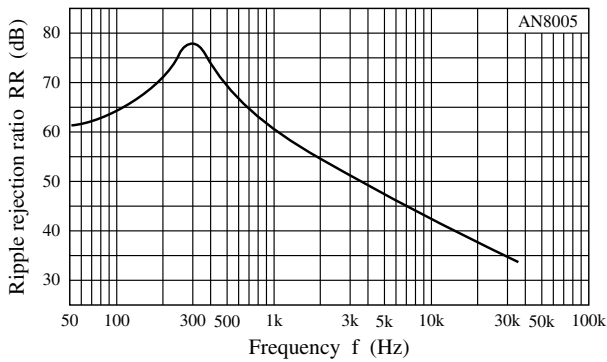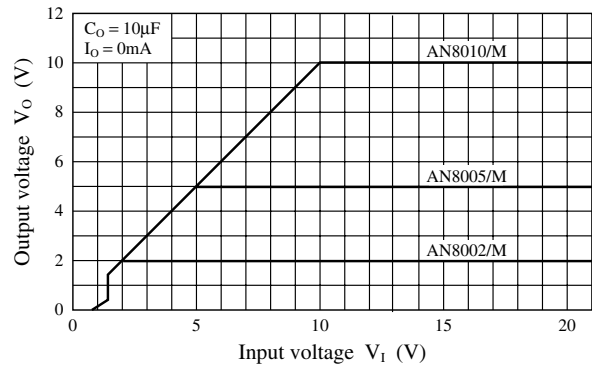P_D — T_a (AN80xx series)

P_D — T_a (AN80xxM series)

Mounted on standard board
glass epoxy: $20 \times 20 \times t1.7mm^3$
with Cu foil of $1cm^2$ or more

RR — f

AN8005

V_O — V_I

$C_O = 10\mu F$
$I_O = 0mA$

AN8010/M

AN8005/M

AN8002/M

V_O — I_O

AN8005
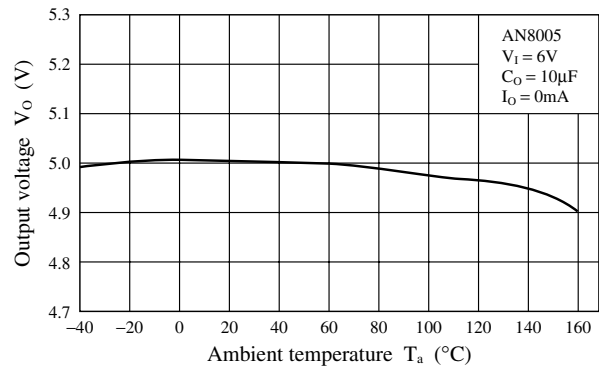$V_I = 6V$
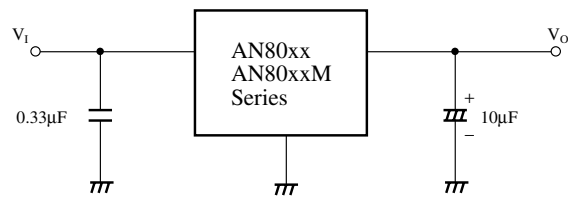$C_O = 10\mu F$

V_O — T_a

AN8005
$V_I = 6V$
$C_O = 10\mu F$
$I_O = 0mA$

■ Application Circuit Example

- AN80xx and AN80xxM series have their internal gain increased in order to improve performance. When the power line on the output side is long, use a capacitor of 10μF.
  Also, the capacitor on the output side should be attached as close to the IC as possible.
- When using at a low temperature, it is recommended to use the capacitors with low internal impedance (for example, tantalum capacitor) for output capacitors.

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