AN80xx/AN80xxM Series

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

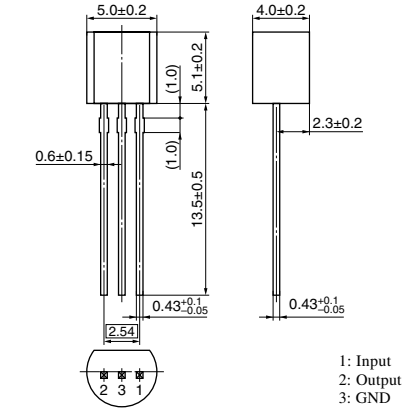
■ Overview

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

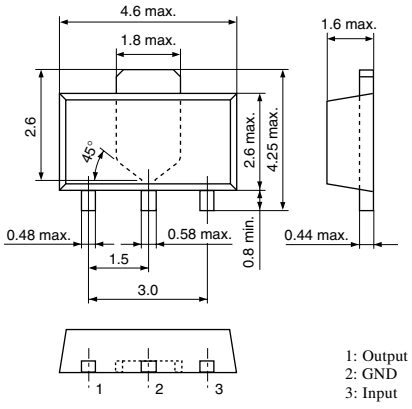
- Input/output voltage difference: 0.3V max.
- Output current of up to 50mA
- Low bias current: 0.6mA typ.
- Output voltage: 2V, 2.5V, 3V, 3.5V (SSIP003-P-0000 only), 4V, 4.5V, 5V, 6V, 7V, 8V, 8.5V, 9V, and 10V
- Built-in overcurrent protection circuit

AN80xx series Unit: mm



SSIP003-P-0000

AN80xxM series Unit: mm



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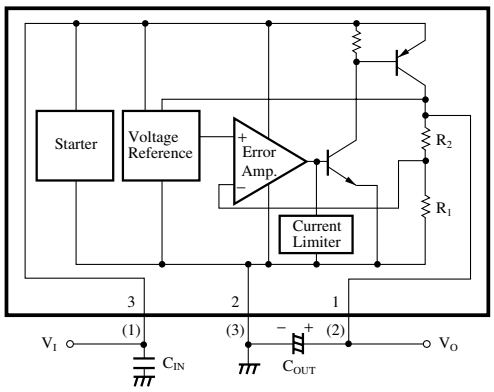
■ Block Diagram (AN80xxM series)



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

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

■ 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 1cm² 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.

■ 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.

■ 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.

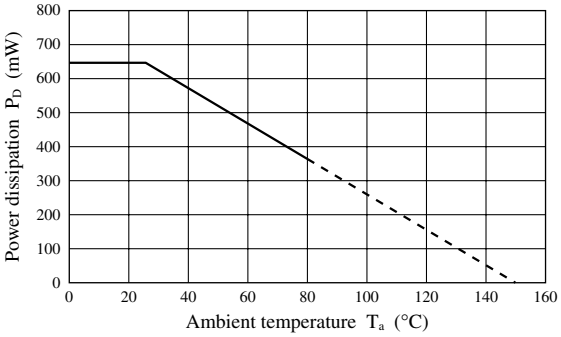
• AN8010, AN8010M (10V type)

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

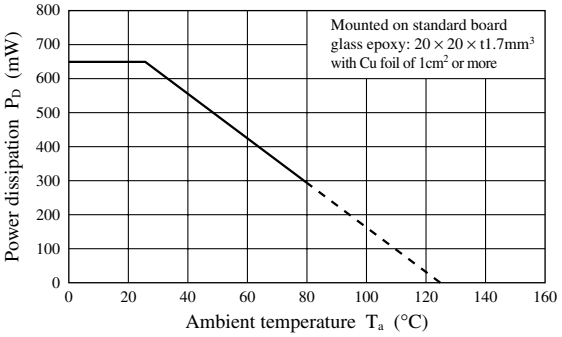
Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = 11V, I_O = 20mA and C_O = 10μF.

■ Main Characteristics

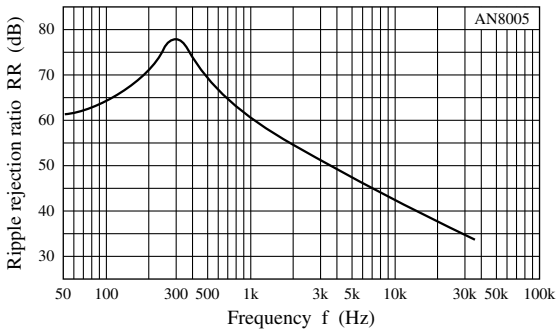
P_D — T_a (AN80xx series)



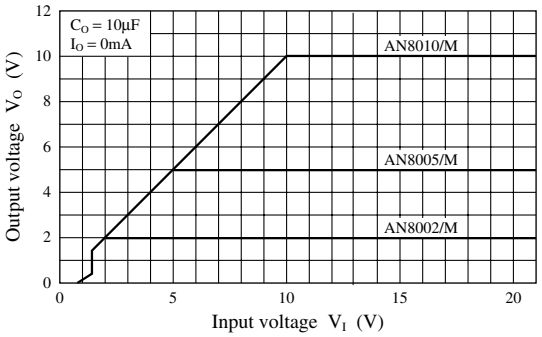
P_D — T_a (AN80xxM series)



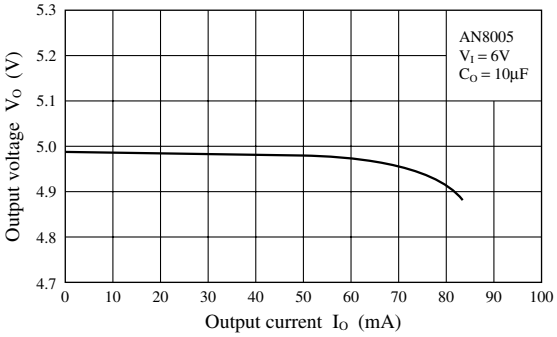
RR — f



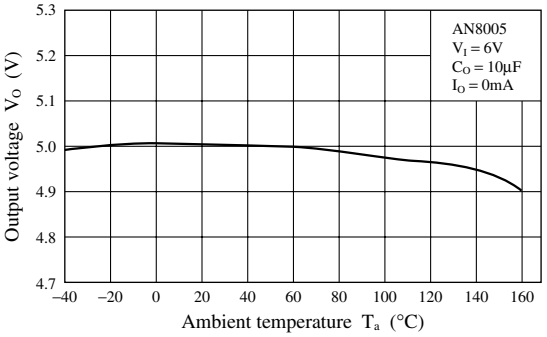
V_O — V_I



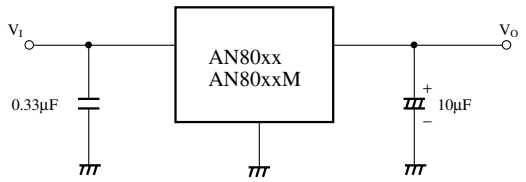
V_O — I_O



V_O — T_a



■ 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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