AN78xx/AN78xxF Series

3-pin positive output voltage regulator (1 A type)

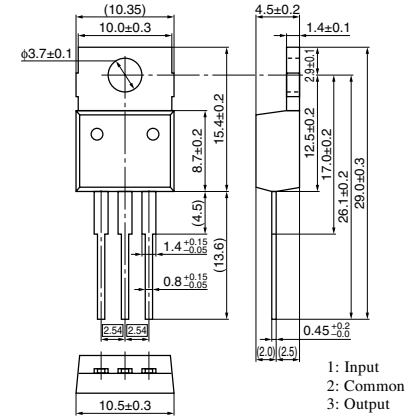
■ Overview

The AN78xx series and the AN78xxF series are 3-pin, fixed positive output type monolithic voltage regulators. Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components. 11 types of fixed output voltage are available; 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, and 24V. They can be used widely in power circuits with current capacity of up to 1A.

■ Features

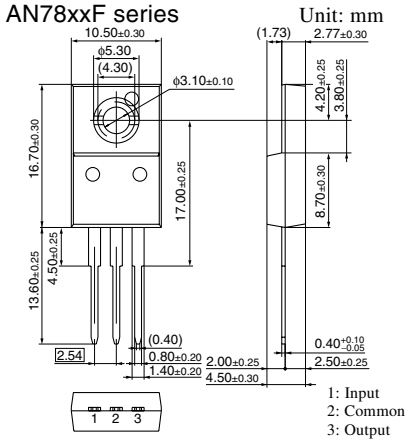
- No external components
- Output voltage: 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V
- Built-in overcurrent limit circuit
- Built-in thermal overload protection circuit
- Built-in ASO (area of safe operation) protection circuit

AN78xx series Unit: mm



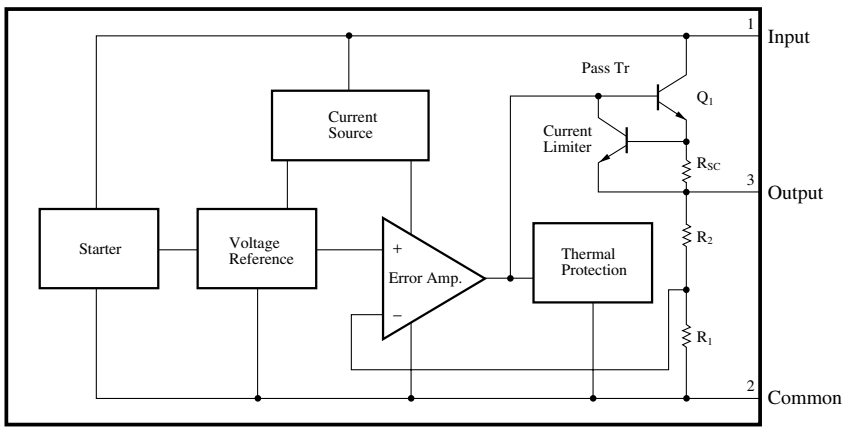
HSIP003-P-0000

AN78xxF series Unit: mm



HSIP003-P-0000A

■ Block Diagram



■ Absolute Maximum Ratings at T_a = 25°C

Parameter		Symbol	Rating	Unit
Input voltage		V_I	35 *1	V
			40 *2	V
Power dissipation	AN78xx series	P_D	15 *3	W
	AN78xxF series		10.25 *3	
Operating ambient temperature		T_{opr}	−30 to +80	°C
Storage temperature		T_{stg}	−55 to +150	°C

*1 AN7805/F, AN7806/F, AN7807/F, AN7808/F, AN7809/F, AN7810/F, AN7812/F, AN7815/F, AN7818/F
*2 AN7820/F, AN7824/F
*3 Follow the derating curve. When T_j exceeds 150°C, the internal circuit cuts off the output.

■ Electrical Characteristics at T_a = 25°C

• AN7805, AN7805F (5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	4.8	5	5.2	V
Output voltage tolerance	V_O	V_I = 8 to 20V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	4.75	—	5.25	V
Line regulation	REG_{IN}	V_I = 7.5 to 25 V, T_j = 25°C	—	3	100	mV
		V_I = 8 to 12V, T_j = 25°C	—	1	50	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	15	100	mV
		I_O = 250 to 750mA, T_j = 25°C	—	5	50	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 7.5 to 25V, T_j = 25°C	—	—	1.3	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	40	—	μV
Ripple rejection ratio	RR	V_I = 8 to 18V, I_O = 100mA, f = 120Hz	62	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	17	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 25V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 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 = 10V, I_O = 500mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78xx series: 15W, AN78xxF series: 10.25W

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

• AN7806, 7806F (6V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	5.75	6	6.25	V
Output voltage tolerance	V_O	V_I = 9 to 21V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	5.7	—	6.3	V
Line regulation	REG_{IN}	V_I = 8.5 to 25V, T_j = 25°C	—	5	120	mV
		V_I = 9 to 13V, T_j = 25°C	—	1.5	60	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	14	120	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	60	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 8.5 to 25V, T_j = 25°C	—	—	1.3	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	40	—	μV
Ripple rejection ratio	RR	V_I = 9 to 19V, I_O = 100mA, f = 120Hz	59	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	17	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 25V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 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 = 11V, I_O = 500mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78xx series: 15W, AN78xxF series: 10.25W

• AN7807, 7807F (7V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	6.7	7	7.3	V
Output voltage tolerance	V_O	V_I = 10 to 22V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	6.6	—	7.4	V
Line regulation	REG_{IN}	V_I = 9.5 to 25V, T_j = 25°C	—	5	140	mV
		V_I = 10 to 15V, T_j = 25°C	—	1.5	70	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	14	140	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	70	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 9.5 to 25V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	46	—	μV
Ripple rejection ratio	RR	V_I = 10 to 20V, I_O = 100mA, f = 120Hz	57	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	16	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 25V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 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 = 12V, I_O = 500mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78xx series: 15W, AN78xxF series: 10.25W

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

• AN7808, 7808F (8V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	7.7	8	8.3	V
Output voltage tolerance	V_O	V_I = 11 to 23V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	7.6	—	8.4	V
Line regulation	REG_{IN}	V_I = 10.5 to 25V, T_j = 25°C	—	6	160	mV
		V_I = 11 to 17V, T_j = 25°C	—	2	80	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	160	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	80	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 10.5 to 25V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	52	—	µV
Ripple rejection ratio	RR	V_I = 11.5 to 21.5V, I_O = 100mA, f = 120Hz	56	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	16	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 25V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 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 = 14V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

• AN7809, 7809F (9V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	8.65	9	9.35	V
Output voltage tolerance	V_O	V_I = 12 to 24V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	8.55	—	9.45	V
Line regulation	REG_{IN}	V_I = 11.5 to 26V, T_j = 25°C	—	7	180	mV
		V_I = 12 to 18V, T_j = 25°C	—	2	90	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	180	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	90	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 11.5 to 26V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	57	—	µV
Ripple rejection ratio	RR	V_I = 12 to 22V, I_O = 100mA, f = 120Hz	56	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	16	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 26V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 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 = 15V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

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

• AN7810, 7810F (10V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	9.6	10	10.4	V
Output voltage tolerance	V_O	V_I = 13 to 25V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	9.5	—	10.5	V
Line regulation	REG_{IN}	V_I = 12.5 to 27V, T_j = 25°C	—	8	200	mV
		V_I = 13 to 19V, T_j = 25°C	—	2.5	100	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	200	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	100	mV
Bias current	I_{Bias}	T_j = 25°C	—	3.9	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 12.5 to 27V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	63	—	µV
Ripple rejection ratio	RR	V_I = 13 to 23V, I_O = 100mA, f = 120Hz	56	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	16	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 27V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	– 0.6	—	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 = 16V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

• AN7812, 7812F (12V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	11.5	12	12.5	V
Output voltage tolerance	V_O	V_I = 15 to 27V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	11.4	—	12.6	V
Line regulation	REG_{IN}	V_I = 14.5 to 30V, T_j = 25°C	—	10	240	mV
		V_I = 16 to 22V, T_j = 25°C	—	3	120	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	240	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	120	mV
Bias current	I_{Bias}	T_j = 25°C	—	4	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 14.5 to 30V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	75	—	µV
Ripple rejection ratio	RR	V_I = 15 to 25V, I_O = 100mA, f = 120Hz	55	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	18	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 30V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	– 0.8	—	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 = 19V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

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

• AN7815, 7815F (15V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	14.4	15	15.6	V
Output voltage tolerance	V_O	V_I = 18 to 30V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	14.25	—	15.75	V
Line regulation	REG_{IN}	V_I = 17.5 to 30V, T_j = 25°C	—	11	300	mV
		V_I = 20 to 26V, T_j = 25°C	—	3	150	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	300	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	150	mV
Bias current	I_{Bias}	T_j = 25°C	—	4	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 17.5 to 30V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	90	—	µV
Ripple rejection ratio	RR	V_I = 18.5 to 28.5V, f = 120Hz	54	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	19	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 30V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−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 = 23V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

• AN7818, 7818F (18V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	17.3	18	18.7	V
Output voltage tolerance	V_O	V_I = 21 to 33V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	17.1	—	18.9	V
Line regulation	REG_{IN}	V_I = 21 to 33V, T_j = 25°C	—	14	360	mV
		V_I = 24 to 30V, T_j = 25°C	—	4	180	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	360	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	180	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 21 to 33V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	110	—	µV
Ripple rejection ratio	RR	V_I = 22 to 32V, I_O = 100mA, f = 120Hz	53	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	16	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−1.1	—	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 = 27V, I_O = 500mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78xx series: 15W, AN78xxF series: 10.25W

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

• AN7820, 7820F (20V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	19.2	20	20.8	V
Output voltage tolerance	V_O	V_I = 24 to 35V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	19	—	21	V
Line regulation	REG_{IN}	V_I = 23 to 35V, T_j = 25°C	—	15	400	mV
		V_I = 26 to 32V, T_j = 25°C	—	5	200	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	400	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	200	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 23 to 35V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	110	—	μV
Ripple rejection ratio	RR	V_I = 24 to 34V, I_O = 100mA, f = 120Hz	53	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	22	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−1.2	—	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 = 29V, I_O = 500mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78xx series: 15W, AN78xxF series: 10.25W

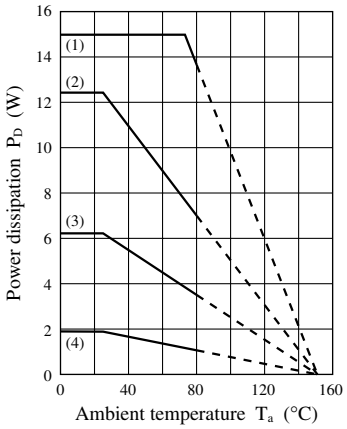
• AN7824, 7824F (24V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	23	24	25	V
Output voltage tolerance	V_O	V_I = 28 to 38V, I_O = 5mA to 1A, T_j = 0 to 125°C, $P_D \leq$ *	22.8	—	25.2	V
Line regulation	REG_{IN}	V_I = 27 to 38V, T_j = 25°C	—	18	480	mV
		V_I = 30 to 36V, T_j = 25°C	—	6	240	mV
Load regulation	REG_L	I_O = 5mA to 1.5A, T_j = 25°C	—	12	480	mV
		I_O = 250 to 750mA, T_j = 25°C	—	4	240	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	8	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 27 to 38V, T_j = 25°C	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5mA to 1A, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	170	—	μV
Ripple rejection ratio	RR	V_I = 28 to 38V, I_O = 100mA, f = 120Hz	50	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 1A, T_j = 25°C	—	2	—	V
Output impedance	Z_O	f = 1kHz	—	28	—	mΩ
Output short-circuit current	$I_{O(Short)}$	V_I = 38V, T_j = 25°C	—	700	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	2	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−1.4	—	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 = 33V, I_O = 500mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78xx series: 15W, AN78xxF series: 10.25W

■ Main Characteristic Curve

P_D — T_a (AN78xx series)

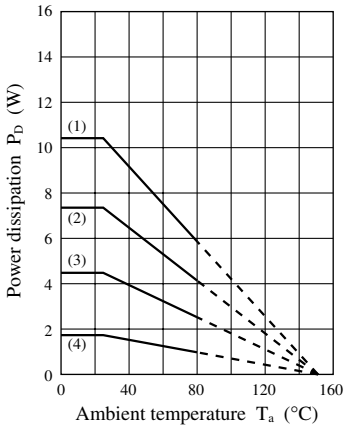


Thermal resistance value:
$R_{th(j-c)}$ = 5°C/W (max.)
$R_{th(j-a)}$ = 65°C/W (max.)

Installation condition to heat sink
Tightening torque 6kg·cm
Heat radiation compound used

(1) Infinite heat sink: 15.0W
(2) 5°C/W heat sink: 12.5W
(3) 15°C/W heat sink: 6.3W
(4) Without heat sink: 1.923W

P_D — T_a (AN78xxF series)

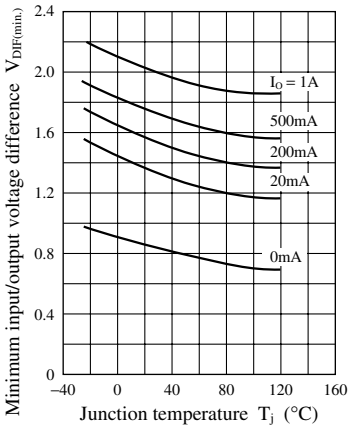


Thermal resistance value:
$R_{th(j-c)}$ = 12.2°C/W (max.)
$R_{th(j-a)}$ = 65°C/W (max.)

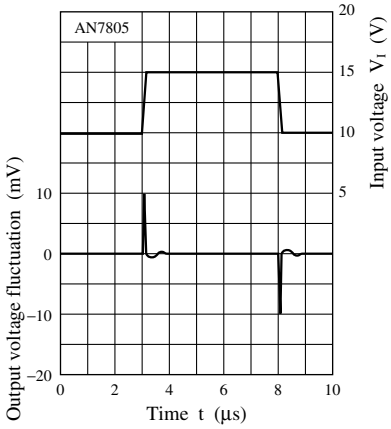
Installation condition to heat sink
Tightening torque 6kg·cm
Heat radiation compound used

(1) Infinite heat sink: 10.25W
(2) 5°C/W heat sink: 7.3W
(3) 15°C/W heat sink: 4.5W
(4) Without heat sink: 1.923W

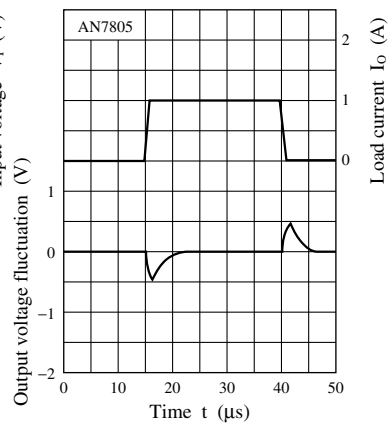
$V_{DIF(min.)}$ — T_j



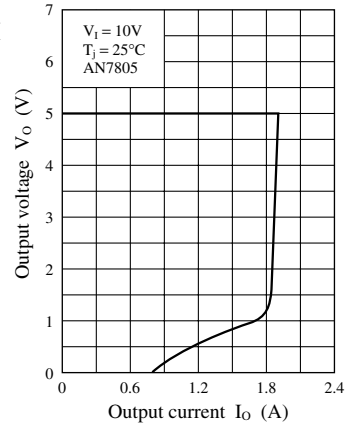
Input transient response



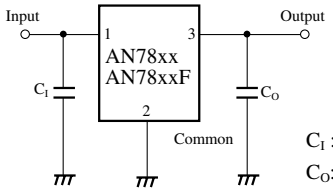
Load transient response



Current limiting characteristic



■ Basic Regulator Circuit



C_I : C_I is necessary when the input line is long.
C_O: C_O improves the transient response.

■ Usage Notes

1. Cautions for a basic circuit

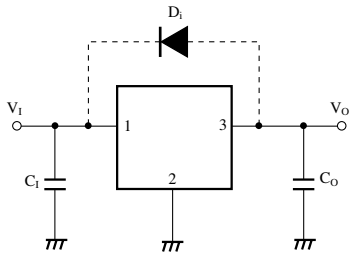


Figure 1

C_I: When a wiring from a smoothing circuit to a three-pin regulator is long, it is likely to oscillate in output. A capacitor of 0.1µF to 0.47µF should be connected near an input pin.

C_O: When any sudden change of load current is likely to occur, connect an electrolytic capacitor of 10µF to 100µF to improve a transitional response of output voltage.

D_i: Normally unnecessary. But add it in the case that there is a residual voltage at the output capacitor Co even after switching off the supply power because a current is likely to flow into an output pin of the IC and damage the IC.

2. Other caution items

1) Short-circuit between the input pin and GND pin

If the input pin is short-circuitted to GND or is cut off when a large capacitance capacitor has been connected to the IC's load, a voltage of a capacitor connected to an output pin is applied between input/output of the IC and this likely results in damage of the IC. It is necessary, therefore, to connect a diode, as shown in figure 2, to counter the reverse bias between input/output pins.

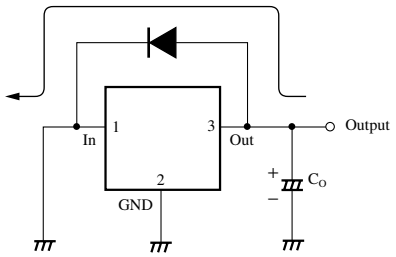


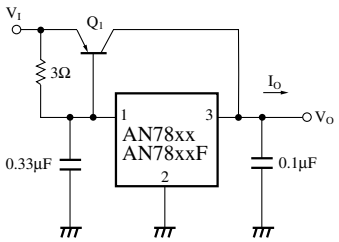
Figure 2

2) Floating of GND pin

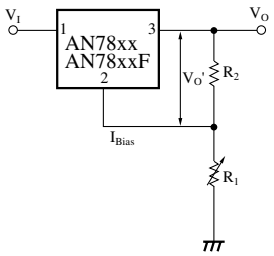
If a GND pin is made floating in an operating mode, an unstabilized input voltage is outputted. In this case, a thermal protection circuit inside the IC does not normally operate. In this state, if the load is short-circuited or overloaded, it is likely to damage the IC.

■ Application Circuit Examples

1. Current bootstrap circuit



2. Adjustable output regulator



$$V_O = V_O' + \left(I_{Bias} + \frac{V_O'}{R_2}\right) R_1$$

Note) V_O varies due to sample to sample variation of I_{Bias}.
Never fail to adjust individually with R_1.

Request for your special attention and precautions in using the technical information and semiconductors described in this material

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.

(3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.

(6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.

(7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.

B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.

C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.

2001 MAR