AN78Mxx/AN78MxxF Series

3-pin positive output voltage regulator (500 mA type)

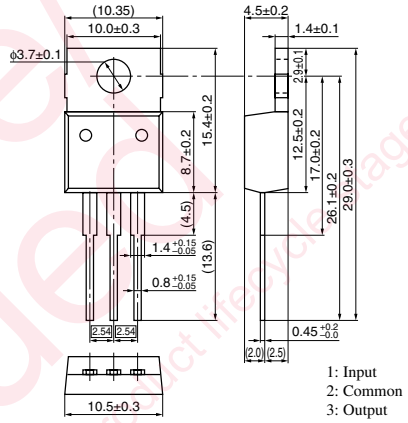
■ Overview

The AN78Mxx series and the AN78MxxF 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 up to 500mA.

■ 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

AN78Mxx series Unit: mm



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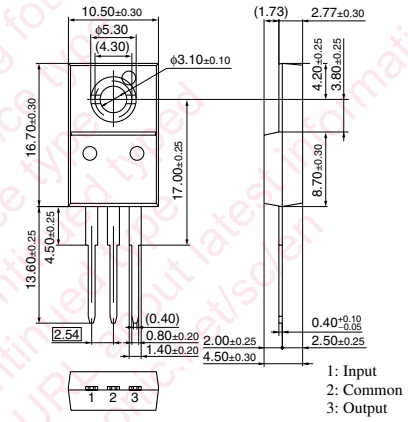
AN78MxxF series Unit: mm



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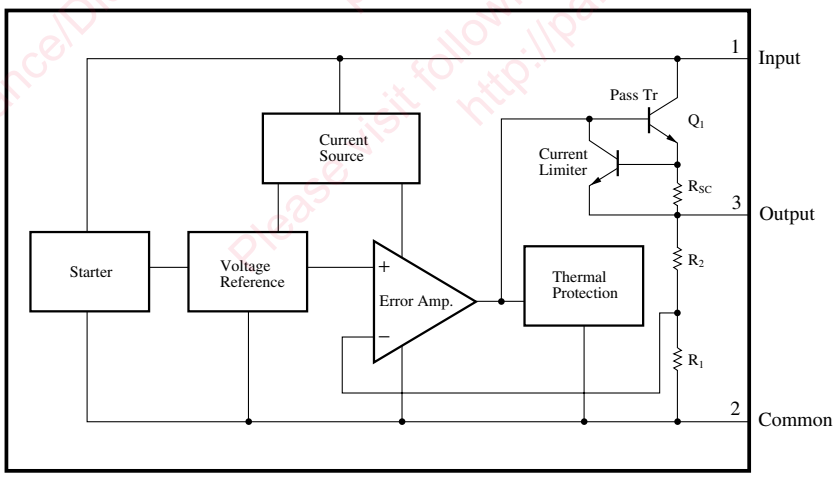
■ Block Diagram



■ 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}	−20 to +80	°C
Storage temperature		T_{stg}	−55 to +150	°C

*1 AN78M05/F, AN78M06/F, AN78M07/F, AN78M08/F, AN78M09/F, AN78M10/F, AN78M12/F, AN78M15/F, AN78M18/F
*2 AN78M20/F, AN78M24/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

• AN78M05, AN78M05F (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 = 7.5 to 20V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	4.75	—	5.25	V
Line regulation	REG_{IN}	V_I = 7.5 to 25V, T_j = 25°C	—	3	100	mV
		V_I = 8 to 25V, T_j = 25°C	—	1	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	20	100	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	50	mV
Bias current	I_{Bias}	T_j = 25°C	—	4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 8 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 10V, I_O = 350mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

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

• AN78M06, AN78M06F (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 = 8.5 to 21V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	5.7	—	6.3	V
Line regulation	REG_{IN}	V_I = 8.5 to 25V, T_j = 25°C	—	5	100	mV
		V_I = 9 to 25V, T_j = 25°C	—	1.5	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	20	120	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	60	mV
Bias current	I_{Bias}	T_j = 25°C	—	4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 9 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	45	—	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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 11V, I_O = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

• AN78M07, AN78M07F (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 = 9.5 to 22V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	6.65	—	7.35	V
Line regulation	REG_{IN}	V_I = 9.5 to 25V, T_j = 25°C	—	6	100	mV
		V_I = 10 to 25V, T_j = 25°C	—	2	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	20	140	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	70	mV
Bias current	I_{Bias}	T_j = 25°C	—	4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 10 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	48	—	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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

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

• AN78M08, AN78M08F (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 = 10.5 to 23V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	7.6	—	8.4	V
Line regulation	REG_{IN}	V_I = 10.5 to 25V, T_j = 25°C	—	6	100	mV
		V_I = 11 to 25V, T_j = 25°C	—	2	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	25	160	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	80	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 10.5 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

• AN78M09, AN78M09F (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 = 11.5 to 24V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	8.55	—	9.45	V
Line regulation	REG_{IN}	V_I = 11.5 to 25V, T_j = 25°C	—	7	100	mV
		V_I = 12 to 25V, T_j = 25°C	—	2	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	25	180	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	90	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 12 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	60	—	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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

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

• AN78M10, AN78M10F (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 = 12.5 to 25V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	9.5	—	10.5	V
Line regulation	REG_{IN}	V_I = 12.5 to 30V, T_j = 25°C	—	7	100	mV
		V_I = 13 to 25V, T_j = 25°C	—	2	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	25	200	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	100	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.1	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 13 to 25V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	65	—	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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 16V, I_O = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

• AN78M12, AN78M12F (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 = 14.5 to 27V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	11.4	—	12.6	V
Line regulation	REG_{IN}	V_I = 14.5 to 30V, T_j = 25°C	—	8	100	mV
		V_I = 16 to 30V, T_j = 25°C	—	2	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	25	240	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	120	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.3	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 14.5 to 30V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

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

• AN78M15, AN78M15F (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 = 17.5 to 30V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	14.25	—	15.75	V
Line regulation	REG_{IN}	V_I = 17.5 to 30V, T_j = 25°C	—	10	100	mV
		V_I = 20 to 30V, T_j = 25°C	—	3	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	25	300	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	150	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.3	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 17.5 to 30V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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, I_O = 100mA, f = 120Hz	54	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	I_O = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 350mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

• AN78M18, AN78M18F (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 = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	17.1	—	18.9	V
Line regulation	REG_{IN}	V_I = 21 to 33V, T_j = 25°C	—	10	100	mV
		V_I = 22 to 33V, T_j = 25°C	—	5	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	30	360	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	180	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 21 to 33V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, T_j = 25°C	—	—	0.5	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz	—	100	—	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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−1.0	—	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 = 350mA, C_I = 0.33μF and C_O = 0.1μF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

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

• AN78M20, AN78M20F (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 = 23 to 35V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	19	—	21	V
Line regulation	REG_{IN}	V_I = 23 to 35V, T_j = 25°C	—	10	100	mV
		V_I = 24 to 35V, T_j = 25°C	—	5	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	30	400	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	200	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 23 to 35V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	−1.0	—	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 = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

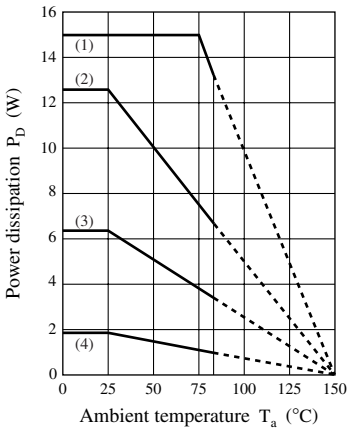
• AN78M24, AN78M24F (24V type)

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 = 27 to 38V, I_O = 5 to 350mA, T_j = 25°C, $P_D \leq$ *	22.8	—	25.2	V
Line regulation	REG_{IN}	V_I = 27 to 38V, T_j = 25°C	—	10	100	mV
		V_I = 28 to 38V, T_j = 25°C	—	5	50	mV
Load regulation	REG_L	I_O = 5 to 500mA, T_j = 25°C	—	30	480	mV
		I_O = 5 to 200mA, T_j = 25°C	—	10	240	mV
Bias current	I_{Bias}	T_j = 25°C	—	4.5	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = 27 to 38V, T_j = 25°C	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 5 to 350mA, 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 = 500mA, T_j = 25°C	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = 35V, T_j = 25°C	—	300	—	mA
Peak output current	$I_{O(Peak)}$	T_j = 25°C	—	700	—	mA
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 = 33V, I_O = 350mA, C_I = 0.33µF and C_O = 0.1µF.
* AN78Mxx series: 15W, AN78MxxF series: 10.25W

■ Main Characteristics

P_D — T_a (AN78Mxx series)

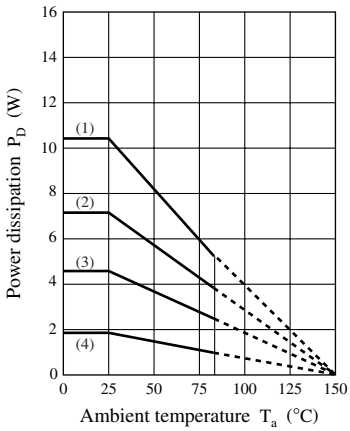


Thermal resistance value:
$R_{th(j-c)}$ = 5°C/W (max.)
$R_{th(j-a)}$ = 65°C/W (max.)

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 (AN78MxxF series)

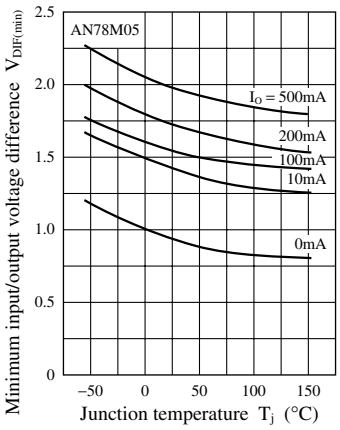


Thermal resistance value:
$R_{th(j-c)}$ = 12.2°C/W (max.)
$R_{th(j-a)}$ = 65°C/W (max.)

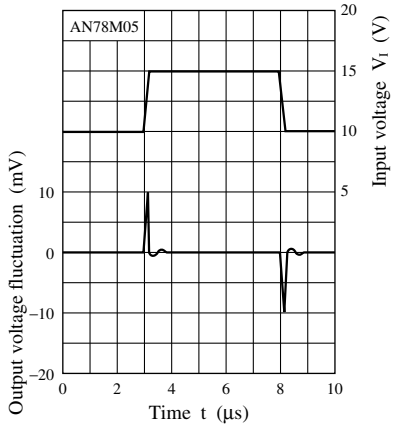
Installation condition to heat sink
Tightening torque 6kg·cm
Heat radiation compound used

(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

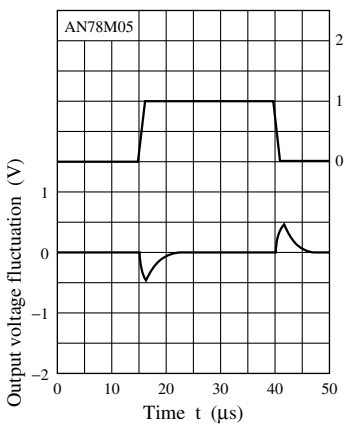
$V_{DIF(min)}$ — T_j



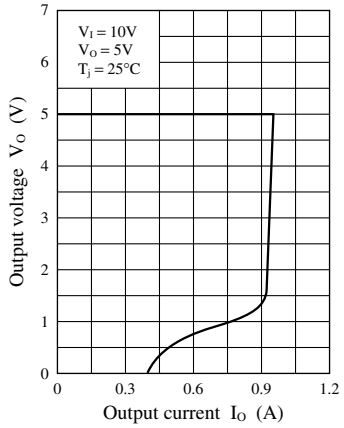
Input transient response



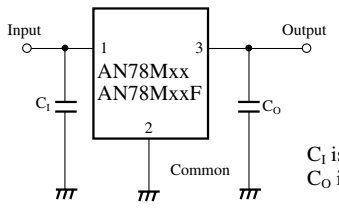
Load transient response



Current limiting



■ Basic Regulator Circuit



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

■ Usage Notes

1. Cautions for a basic circuit

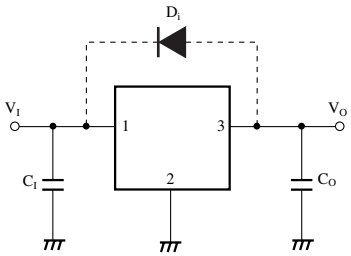


Figure 1

C_I: When a wiring from a smoothing circuit to a three-pin regulator is long, it is likely to oscillate at 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.

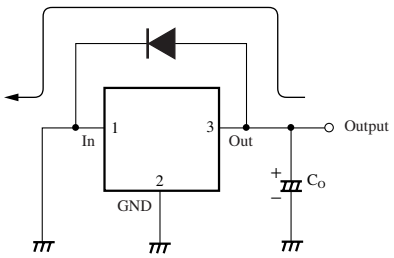
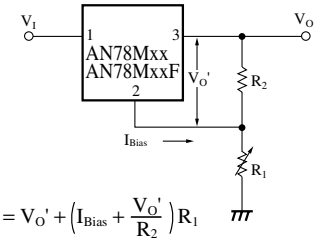


Figure 2

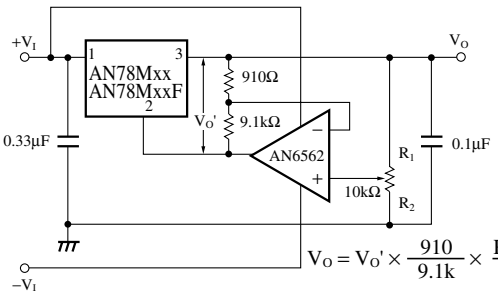
2) Floating of GND pin

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

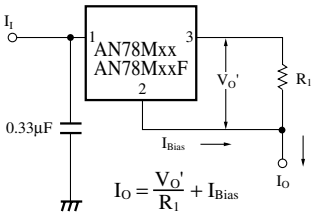


$$V_O = V_O' + \left(I_{Bias} + \frac{V_O'}{R_2}\right) R_1$$

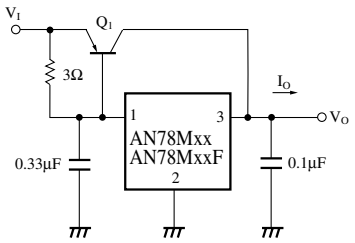


$$V_O = V_O' \times \frac{910}{9.1k} \times \frac{R_1 + R_2}{R_1}$$

V_O varies with the value of the input voltage V_I .
(In case of $R_1 + R_2 = 10k\Omega$)



$$I_O = \frac{V_O'}{R_1} + I_{Bias}$$



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