

AN79xxT/AN79xxF Series

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

Overview

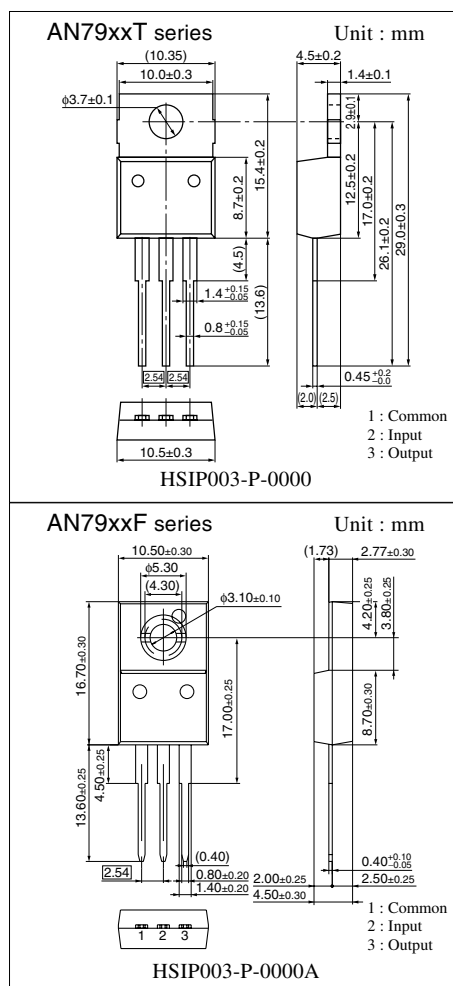
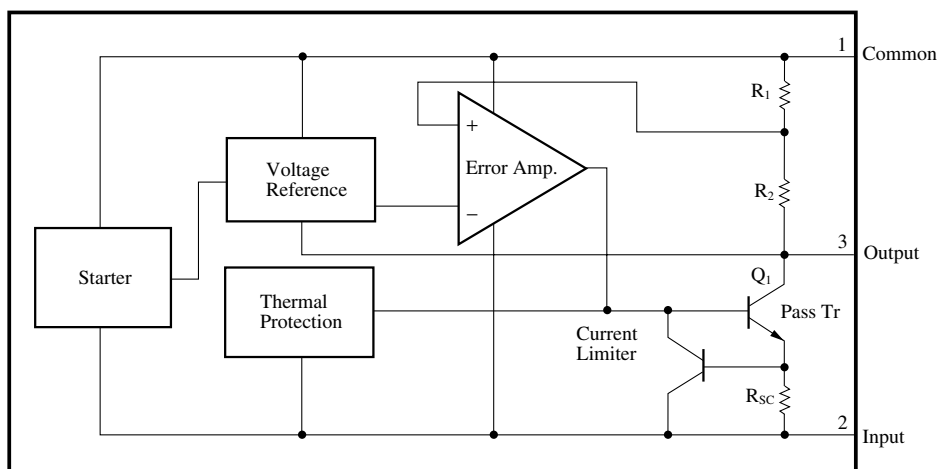
The AN79xxT series and the AN79xxF series are 3-pin, fixed negative output type monolithic voltage regulators.

A stabilized fixed negative output voltage is obtained from an unstable DC input voltage without using any external parts. Eleven types of fixed output voltage are available: $-5V$, $-6V$, $-7V$, $-8V$, $-9V$, $-10V$, $-12V$, $-15V$, $-18V$, $-20V$ and $-24V$. They can be used widely as power circuits with a 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

Block Diagram



■ Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter		Symbol	Rating	Unit
Input voltage		V_i	-35^{*1}	V
			-40^{*2}	V
Power dissipation	AN79xxT series	P_D	15^{*3}	W
	AN79xxF series		10.25^{*3}	
Operating ambient temperature		T_{opr}	-30 to $+80$	$^\circ\text{C}$
Storage temperature		T_{stg}	-55 to $+150$	$^\circ\text{C}$

*1 AN7905T/F, AN7906T/F, AN7907T/F, AN7908T/F, AN7909T/F, AN7910T/F, AN7912T/F, AN7915T/F, AN7918T/F

*2 AN7920T/F, AN7924T/F

*3 Follow the derating curve. When T_j exceeds 150°C , the internal circuit cuts off the output.

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$

• AN7905T, AN7905F (–5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	-4.8	-5	-5.2	V
Output voltage tolerance	V_O	$V_i = -7$ to -20V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	-4.75	—	-5.25	V
Line regulation	REG_{IN}	$V_i = -7$ to -25V , $T_j = 25^\circ\text{C}$	—	3	100	mV
		$V_i = -8$ to -12V , $T_j = 25^\circ\text{C}$	—	1	50	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	10	100	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	3	50	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2	4	mA
Bias current fluctuation to input	$\Delta I_{bias(IN)}$	$V_i = -7$ to -25V , $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Bias current fluctuation to load	$\Delta I_{bias(L)}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	40	—	μV
Ripple rejection ratio	RR	$V_i = -8$ to -18V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	62	74	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{O(Peak)}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	-0.4	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_i = -10\text{V}$, $I_O = 500\text{mA}$, $C_i = 2\mu\text{F}$, $C_o = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• AN7906T, AN7906F (–6V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–5.75	–6	–6.25	V
Output voltage tolerance	V_O	$V_I = -8$ to -21V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–5.7	—	–6.3	V
Line regulation	REG_{IN}	$V_I = -8$ to -25V , $T_j = 25^\circ\text{C}$	—	4	120	mV
		$V_I = -9$ to -13V , $T_j = 25^\circ\text{C}$	—	1.5	60	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	10	120	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	3	60	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2	4	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -8$ to -25V , $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	44	—	μV
Ripple rejection ratio	RR	$V_I = -9$ to -19V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	60	73	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.5	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -11\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

• AN7907T, AN7907F (–7V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–6.7	–7	–7.3	V
Output voltage tolerance	V_O	$V_I = -9$ to -22V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–6.65	—	–7.35	V
Line regulation	REG_{IN}	$V_I = -9$ to -25V , $T_j = 25^\circ\text{C}$	—	5	140	mV
		$V_I = -10$ to -14V , $T_j = 25^\circ\text{C}$	—	1.5	70	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	140	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	70	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2	4	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -9$ to -25V , $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	48	—	μV
Ripple rejection ratio	RR	$V_I = -10$ to -20V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	58	72	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.5	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -12\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• AN7908T, AN7908F (–8V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–7.7	–8	–8.3	V
Output voltage tolerance	V_O	$V_I = -10$ to -23V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–7.6	—	–8.4	V
Line regulation	REG_{IN}	$V_I = -10.5$ to -25V , $T_j = 25^\circ\text{C}$	—	6	160	mV
		$V_I = -11$ to -17V , $T_j = 25^\circ\text{C}$	—	2	80	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	160	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	80	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.2	4.5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -10.5$ to -25V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	52	—	μV
Ripple rejection ratio	RR	$V_I = -11$ to -21V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	56	71	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.6	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -14\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

• AN7909T, AN7909F (–9V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–8.65	–9	–9.35	V
Output voltage tolerance	V_O	$V_I = -11.5$ to -24V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–8.55	—	–9.45	V
Line regulation	REG_{IN}	$V_I = -11.5$ to -26V , $T_j = 25^\circ\text{C}$	—	7	180	mV
		$V_I = -12$ to -18V , $T_j = 25^\circ\text{C}$	—	2	90	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	180	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	90	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.2	4.5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -11.5$ to -26V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	58	—	μV
Ripple rejection ratio	RR	$V_I = -12$ to -22V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	56	71	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.6	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -15\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• AN7910T, AN7910F (–10V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–9.6	–10	–10.4	V
Output voltage tolerance	V_O	$V_I = -12.5$ to -25V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–9.5	—	–10.5	V
Line regulation	REG_{IN}	$V_I = -12.5$ to -27V , $T_j = 25^\circ\text{C}$	—	8	200	mV
		$V_I = -13$ to -19V , $T_j = 25^\circ\text{C}$	—	2.5	100	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	200	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	100	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.5	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -12.5$ to -27V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	64	—	μV
Ripple rejection ratio	RR	$V_I = -13$ to -23V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	56	71	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.7	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -16\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

• AN7912T, AN7912F (–12V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–11.5	–12	–12.5	V
Output voltage tolerance	V_O	$V_I = -14.5$ to -27V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–11.4	—	–12.6	V
Line regulation	REG_{IN}	$V_I = -14.5$ to -30V , $T_j = 25^\circ\text{C}$	—	10	240	mV
		$V_I = -16$ to -22V , $T_j = 25^\circ\text{C}$	—	3	120	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	240	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	120	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.5	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -14.5$ to -30V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	75	—	μV
Ripple rejection ratio	RR	$V_I = -15$ to -25V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	55	70	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.8	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -19\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• AN7915T, AN7915F (–15V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–14.4	–15	–15.6	V
Output voltage tolerance	V_O	$V_I = -17.5$ to -30V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–14.25	—	–15.75	V
Line regulation	REG_{IN}	$V_I = -17.5$ to -30V , $T_j = 25^\circ\text{C}$	—	11	300	mV
		$V_I = -20$ to -26V , $T_j = 25^\circ\text{C}$	—	3	150	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	300	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	150	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.5	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -17.5$ to -30V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	90	—	μV
Ripple rejection ratio	RR	$V_I = -18.5$ to -28.5V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	54	69	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–0.9	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -23\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

• AN7918T, AN7918F (–18V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–17.3	–18	–18.7	V
Output voltage tolerance	V_O	$V_I = -21$ to -33V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–17.1	—	–18.9	V
Line regulation	REG_{IN}	$V_I = -21$ to -33V , $T_j = 25^\circ\text{C}$	—	15	360	mV
		$V_I = -24$ to -30V , $T_j = 25^\circ\text{C}$	—	5	180	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	360	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	180	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	2.5	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -21$ to -33V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	110	—	μV
Ripple rejection ratio	RR	$V_I = -22$ to -32V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	53	68	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–1	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -27\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• AN7920T, AN7920F (–20V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–19.2	–20	–20.8	V
Output voltage tolerance	V_O	$V_I = -23$ to -35V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–19	—	–21	V
Line regulation	REG_{IN}	$V_I = -23$ to -35V , $T_j = 25^\circ\text{C}$	—	16	400	mV
		$V_I = -26$ to -32V , $T_j = 25^\circ\text{C}$	—	5.5	200	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	400	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	200	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -23$ to -35V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	135	—	μV
Ripple rejection ratio	RR	$V_I = -24$ to -34V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	52	67	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–1	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -29\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

• AN7924T, AN7924F (–24V type)

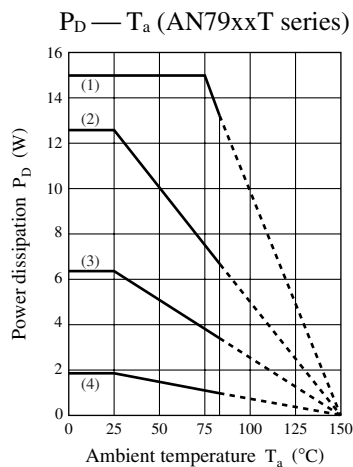
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–23	–24	–25	V
Output voltage tolerance	V_O	$V_I = -27$ to -38V , $I_O = 5\text{mA}$ to 1A , $P_D \leq *$	–22.8	—	–25.2	V
Line regulation	REG_{IN}	$V_I = -27$ to -38V , $T_j = 25^\circ\text{C}$	—	18	480	mV
		$V_I = -30$ to -36V , $T_j = 25^\circ\text{C}$	—	6	240	mV
Load regulation	REG_L	$I_O = 5\text{mA}$ to 1.5A , $T_j = 25^\circ\text{C}$	—	12	480	mV
		$I_O = 250$ to 750mA , $T_j = 25^\circ\text{C}$	—	4	240	mV
Bias current	I_{bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{bias(IN)}}$	$V_I = -27$ to -38V , $T_j = 25^\circ\text{C}$	—	—	1	mA
Bias current fluctuation to load	$\Delta I_{\text{bias(L)}}$	$I_O = 5\text{mA}$ to 1A , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	170	—	μV
Ripple rejection ratio	RR	$V_I = -28$ to -38V , $I_O = 100\text{mA}$, $f = 120\text{Hz}$	50	65	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 1\text{A}$, $T_j = 25^\circ\text{C}$	—	1.1	—	V
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	2.1	—	A
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ to 125°C	—	–1	—	$\text{mV}/^\circ\text{C}$

Note 1) The specified condition $T_j = 25^\circ\text{C}$ 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, $V_I = -33\text{V}$, $I_O = 500\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$ and $T_j = 0$ to 125°C

* AN79xxT series: 15W, AN79xxF series: 10.25W

■ Main Characteristics



Thermal resistance value:

$$R_{th(j-c)} = 5^\circ\text{C/W (max.)}$$

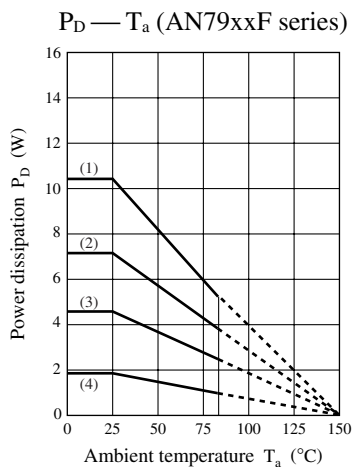
$$R_{th(j-a)} = 65^\circ\text{C/W (max.)}$$

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



Thermal resistance value:

$$R_{th(j-c)} = 12.2^\circ\text{C/W (max.)}$$

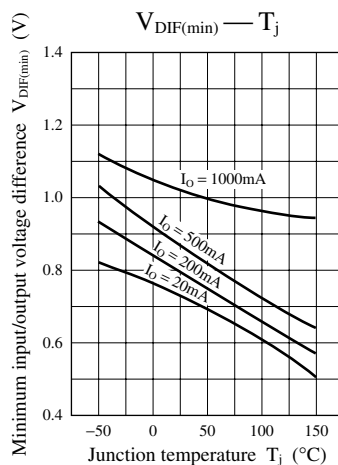
$$R_{th(j-a)} = 65^\circ\text{C/W (max.)}$$

Installation condition to heat sink

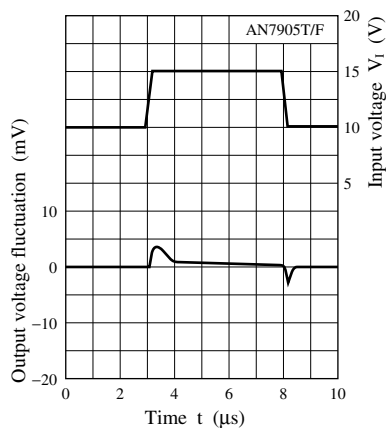
Tightening torque 6kg·cm

Heat radiation compound used

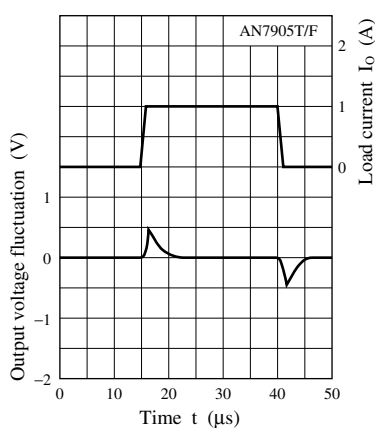
- (1) Infinite heat sink: 10.25W
- (2) 5°C/W heat sink: 7.3W
- (3) 15°C/W heat sink: 4.5W
- (4) Without heat sink: 1.923W



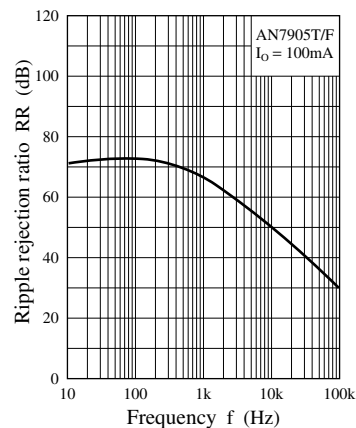
Input transient response



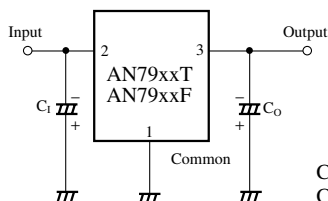
Load transient response



RR — f



■ 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

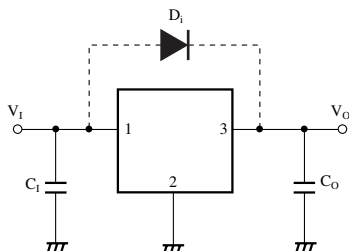


Figure 1

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 $0.1\mu\text{F}$ to $0.47\mu\text{F}$ should be connected near an input pin.

C_O : Deadly needed to prevent from oscillation ($0.33\mu\text{F}$ to $1.0\mu\text{F}$). It is recommended to use a capacitor of a small internal impedance (ex. tantalum capacitor) when using it under a low temperature.

When any sudden change of load current is likely to occur, connect an electrolytic capacitor of $10\mu\text{F}$ to $100\mu\text{F}$ 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 C_O 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-circuited 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.

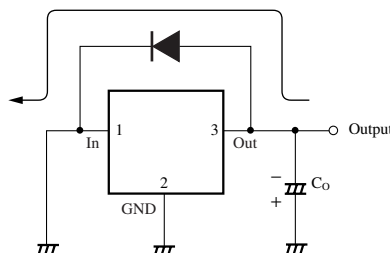


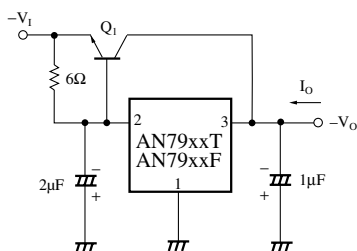
Figure 2

2) Floating of GND pin

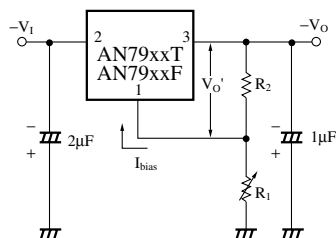
If a GND pin is made floating in an operating mode, an unstabilized input voltage is outputted. In this case, a thermal protection circuit inside the IC does not normally operate. In this state, if the load is short-circuited or overloaded, it is likely to damage the IC.

■ Application Circuit Examples

1. Current bootstrap circuit



2. Adjustable output regulator



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

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