AN7900/AN7900F Series

3-Terminal Negative Output Voltage Regulators (1A Type)

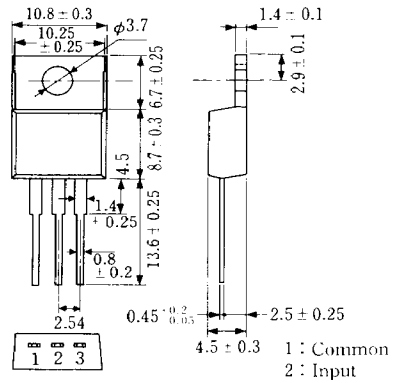
■ Outline

The AN7900 and the AN7900F series are 3-terminal fixed negative output voltage regulator. Stabilized fixed negative 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 1A.

■ Features

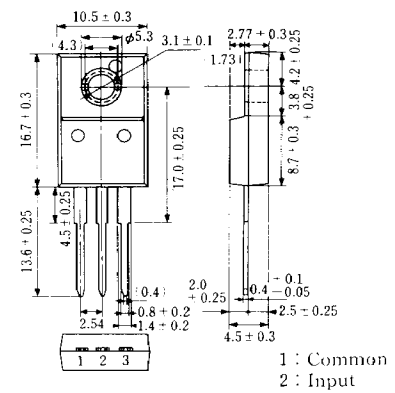
- No external components
- Output current in excess of 1A
- Output voltage : −5V, −6V, −7V, −8V, −9V, −10V, −12V, −15V, −18V, −20V, −24V
- Short-circuit current limiting built in
- Thermal overload protection built in
- Output transistor safe area compensation

AN7900 Series Unit : mm



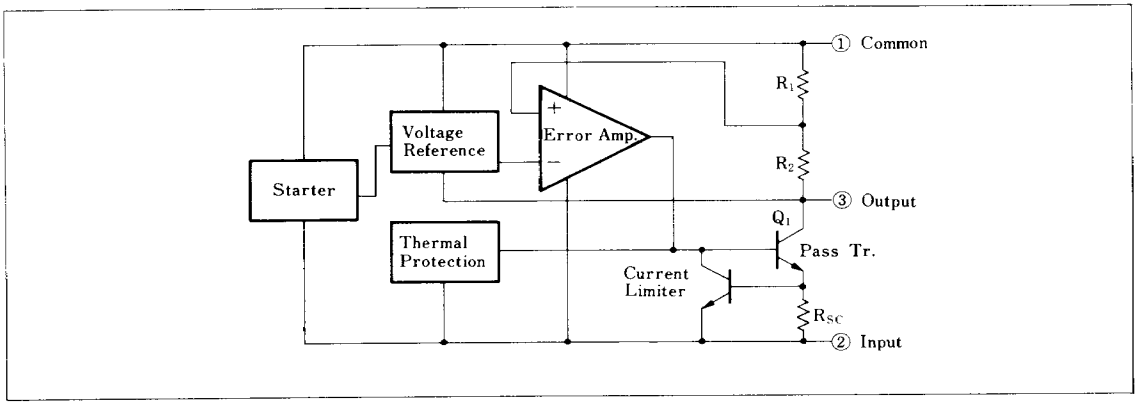
JEDEC : TO-220AB

AN7900F Series Unit : mm



TO-220 Full Pack Package

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Rating	Unit
Input Voltage	V_I	−35*1	V
		−40*2	V
Power Dissipation	P_D	15*3	W
Operating Ambient Temperature	T_{opr}	−30～+80	℃
Storage Temperature	T_{stg}	−55～+150	℃

*1 AN7905/F, AN7906/F, AN7907/F, AN7908/F, AN7909/F, AN7910/F, AN7912/F, AN7915/F, AN7918/F *2 AN7920/F, AN7924/F
*3 Follow the derating curve. When T_j exceeds 150℃, the internal circuit cuts off the output.

■ Electrical Characteristics (Ta=25℃)

● AN7905/F (−5V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−4.8	−5	−5.2	V
Output Voltage Tolerance	V_O	1	V_I=−7～−20V, I_O=5mA～1A, P_D≦15W	−4.75		−5.25	V
Line Regulation	REG_{IN}	1	V_I=−7～−25V, T_j=25℃		3	100	mV
			V_I=−8～−12V, T_j=25℃		1	50	mV
Load Regulation	REG_L	1	I_O=5mA～1.5A, T_j=25℃		10	100	mV
			I_O=250mA～750mA, T_j=25℃		3	50	mV
Bias Current	I_{Bias}	2	T_j=25℃		2	4	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−7～−25V, T_j=25℃			1.3	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA～1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz～100kHz, T_a=25℃		40		μV
Ripple Rejection Ratio	RR	3	V_I=−8～−18V, I_O=100mA, f=120Hz	62	74		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0～125℃		−0.4		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−10V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0～125℃

● AN7906/F (−6V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−5.75	−6	−6.25	V
Output Voltage Tolerance	V_O	1	V_I=−8～−21V, I_O=5mA～1A, T_j=0～125℃, P_D≦15W	−5.7		−6.3	V
Line Regulation	REG_{IN}	1	V_I=−8～−25V, T_j=25℃		4	120	mV
			V_I=−9～−13V, T_j=25℃		1.5	60	mV
Load Regulation	REG_L	1	I_O=5mA～1.5A, T_j=25℃		10	120	mV
			I_O=250～750mA, T_j=25℃		3	60	mV
Bias Current	I_{Bias}	2	T_j=25℃		2	4	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−8～−25V, T_j=25℃			1.3	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA～1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz～100kHz		44		μV
Ripple Rejection Ratio	RR	3	V_I=−9～−19V, I_O=100mA, f=120Hz	60	73		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0～125℃		−0.5		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−11V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0～125℃

■ Electrical Characteristics (Ta=25℃)

● AN7907/F (−7V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−6.7	−7	−7.3	V
Output Voltage Tolerance	V_O	1	V_I=−9~−22V, I_O=5mA~1A, P_D≦15W	−6.65		−7.35	V
Line Regulation	REG_{IN}	1	V_I=−9~−25V, T_j=25℃		5	140	mV
			V_I=−10~−14V, T_j=25℃		1.5	70	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	140	mV
			I_O=250mA~750mA, T_j=25℃		4	70	mV
Bias Current	I_{Bias}	2	T_j=25℃		2	4	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−9V~−25V, T_j=25℃			1.3	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		48		μV
Ripple Rejection Ratio	RR	3	V_I=−10~−20V, I_O=100mA, f=120Hz	58	72		dB
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−0.5		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−12V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

● AN7908/F (−8V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−7.7	−8	−8.3	V
Output Voltage Tolerance	V_O	1	V_I=−10.5~−23V, I_O=5mA~1A, P_D≦15W	−7.6		−8.4	V
Line Regulation	REG_{IN}	1	V_I=−10.5~−25V, T_j=25℃		6	160	mV
			V_I=−11~−17V, T_j=25℃		2	80	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	160	mV
			I_O=250mA~750mA, T_j=25℃		4	80	mV
Bias Current	I_{Bias}	2	T_j=25℃		2.2	4.5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−10.5~−25V, T_j=25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		52		μV
Ripple Rejection Ratio	RR	3	V_I=−11~−21V, I_O=100mA, f=120Hz	56	71		dB
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		2		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−0.6		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−14V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

■ Electrical Characteristics (Ta=25℃)

● AN7909/F (−9V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−8.65	−9	−9.35	V
Output Voltage Tolerance	V_O	1	V_I=−11.5~−24V, I_O=5mA~1A, P_D≦15W	−8.55		−9.45	V
Line Regulation	REG_{IN}	1	V_I=−11.5~−26V, T_j=25℃		7	180	mV
			V_I=−12~−18V, T_j=25℃		2	90	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	180	mV
			I_O=250mA~750mA, T_j=25℃		4	90	mV
Bias Current	I_{Bias}	2	T_j=25℃		2.2	4.5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−11.5V~−26V, T_j=25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		58		μV
Ripple Rejection Ratio	RR	3	V_I=−12~−22V, I_O=100mA, f=120Hz	56	71		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−0.6		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−15V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

● AN7910/F (−10V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−9.6	−10	−10.4	V
Output Voltage Tolerance	V_O	1	V_I=−12.5~−25V, I_O=5mA~1A, P_D≦15W	−9.5		−10.5	V
Line Regulation	REG_{IN}	1	V_I=−12.5~−27V, T_j=25℃		8	200	mV
			V_I=−13~−19V, T_j=25℃		2.5	100	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	200	mV
			I_O=250mA~750mA, T_j=25℃		4	100	mV
Bias Current	I_{Bias}	2	T_j=25℃		2.5	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−12.5~−27V, T_j=25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		64		μV
Ripple Rejection Ratio	RR	3	V_I=−13~−23V, I_O=100mA, f=120Hz	56	71		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−0.7		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−16V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

■ Electrical Characteristics (Ta = 25℃)

● AN7912/F (−12V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j = 25℃	−11.5	−12	−12.5	V
Output Voltage Tolerance	V_O	1	V_I = −14.5 ~ −27V, I_O = 5mA ~ 1A, $P_D \leqq$ 15W	−11.4		−12.6	V
Line Regulation	REG_{IN}	1	V_I = −14.5 ~ −30V, T_j = 25℃		10	240	mV
			V_I = −16 ~ −22V, T_j = 25℃		3	120	mV
Load Regulation	REG_L	1	I_O = 5mA ~ 1.5A, T_j = 25℃		12	240	mV
			I_O = 250mA ~ 750mA, T_j = 25℃		4	120	mV
Bias Current	I_{Bias}	2	T_j = 25℃		2.5	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I = −14.5V ~ −30V, T_j = 25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O = 5mA ~ 1A, T_j = 25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f = 10Hz ~ 100kHz, T_a = 25℃		75		μV
Ripple Rejection Ratio	RR	3	V_I = −15 ~ −25V, I_O = 100mA, f = 120Hz	55	70		dB
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$		I_O = 1A, T_j = 25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j = 25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O = 5mA, T_j = 0 ~ 125℃		−0.8		mV/℃

Note 1: The specified condition T_j = 25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2: When not specified, V_I = −19V, I_O = 500mA, C_I = 2μF, C_O = 1μF and T_j = 0 ~ 125℃

● AN7915/F (−15V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j = 25℃	−14.4	−15	−15.6	V
Output Voltage Tolerance	V_O	1	V_I = −17.5 ~ −30V, I_O = 5mA ~ 1A, $P_D \leqq$ 15W	−14.25		−15.75	V
Line Regulation	REG_{IN}	1	V_I = −17.5 ~ −30V, T_j = 25℃		11	300	mV
			V_I = −20 ~ −26V, T_j = 25℃		3	150	mV
Load Regulation	REG_L	1	I_O = 5mA ~ 1.5A, T_j = 25℃		12	300	mV
			I_O = 250mA ~ 750mA, T_j = 25℃		4	150	mV
Bias Current	I_{Bias}	2	T_j = 25℃		2.5	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I = −17.5V ~ −30V, T_j = 25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O = 5mA ~ 1A, T_j = 25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f = 10Hz ~ 100kHz, T_a = 25℃		90		μV
Ripple Rejection Ratio	RR	3	V_I = −18.5 ~ −28.5V, I_O = 100mA, f = 120Hz	54	69		dB
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$		I_O = 1A, T_j = 25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j = 25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O = 5mA, T_j = 0 ~ 125℃		−0.9		mV/℃

Note 1: The specified condition T_j = 25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2: When not specified, V_I = −23V, I_O = 500mA, C_I = 2μF, C_O = 1μF and T_j = 0 ~ 125℃

■ Electrical Characteristics (Ta=25℃)

● AN7918/F (−18V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−17.3	−18	−18.7	V
Output Voltage Tolerance	V_O	1	V_I=−21~−33V, I_O=5mA~1A, P_D≦15W	−17.1		−18.9	V
Line Regulation	REG_{IN}	1	V_I=−21~−33V, T_j=25℃		15	360	mV
			V_I=−24~−30V, T_j=25℃		5	180	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	360	mV
			I_O=250~750mA, T_j=25℃		4	180	mV
Bias Current	I_{Bias}	2	T_j=25℃		2.5	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−21V~−33V, T_j=25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		110		μV
Ripple Rejection Ratio	RR	3	V_I=−22~−32V, I_O=100mA, f=120Hz	53	68		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−1		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−27V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

● AN7920/F (−20V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−19.2	−20	−20.8	V
Output Voltage Tolerance	V_O	1	V_I=−23~−35V, I_O=5mA~1A, P_D≦15W	−19		−21	V
Line Regulation	REG_{IN}	1	V_I=−23~−35V, T_j=25℃		16	400	mV
			V_I=−26~−32V, T_j=25℃		5.5	200	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	400	mV
			I_O=250~750mA, T_j=25℃		4	200	mV
Bias Current	I_{Bias}	2	T_j=25℃		3	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−23V~−35V, T_j=25℃			1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		135		μV
Ripple Rejection Ratio	RR	3	V_I=−24~−34V, I_O=100mA, f=120Hz	52	67		dB
Minimum Input/Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−1		mV/℃

Note 1) The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2) When not specified, V_I=−29V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

■ Electrical Characteristics (Ta=25℃)

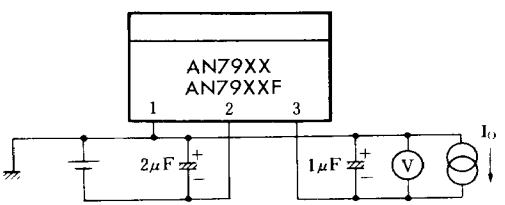
● AN7924/F (−24V Type)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Output Voltage	V_O	1	T_j=25℃	−23	−24	−25	V
Output Voltage Tolerance	V_O	1	V_I=−27~−38V, I_O=5mA~1A, P_D≦15W	−22.8		−25.2	V
Line Regulation	REG_{IN}	1	V_I=−27~−38V, T_j=25℃		18	480	mV
			V_I=−30~−36V, T_j=25℃		6	240	mV
Load Regulation	REG_L	1	I_O=5mA~1.5A, T_j=25℃		12	480	mV
			I_O=250mA~750mA, T_j=25℃		4	240	mV
Bias Current	I_{Bias}	2	T_j=25℃		3	5	mA
Input Bias Current Fluctuation	$\Delta I_{Bias(IN)}$	2	V_I=−27V~−38V, T_j=25℃			.1	mA
Load Bias Current Fluctuation	$\Delta I_{Bias(L)}$	2	I_O=5mA~1A, T_j=25℃			0.5	mA
Output Noise Voltage	V_{no}	1	f=10Hz~100kHz, T_a=25℃		170		μV
Ripple Rejection Ratio	RR	3	V_I=−28~−38V, I_O=100mA, f=120Hz	50	65		dB
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$		I_O=1A, T_j=25℃		1.1		V
Peak Output Current	$I_{O(Peak)}$	1	T_j=25℃		2.1		A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	I_O=5mA, T_j=0~125℃		−1		mV/℃

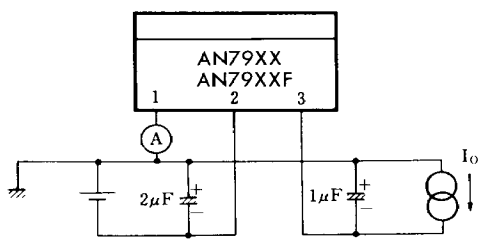
Note 1: The specified condition T_j=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2: When not specified, V_I=−33V, I_O=500mA, C_I=2μF, C_O=1μF and T_j=0~125℃

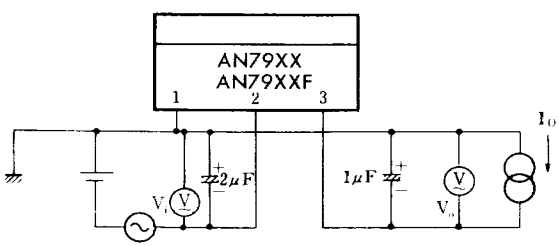
Test Circuit 1 (V_O, REG_{IN}, REG_L, V_{no}, $I_{O(peak)}$, $\Delta V_O/Ta$)



Test Circuit 2 (I_{Bias}, $\Delta I_{Bias(IN)}$, $\Delta I_{Bias(L)}$)

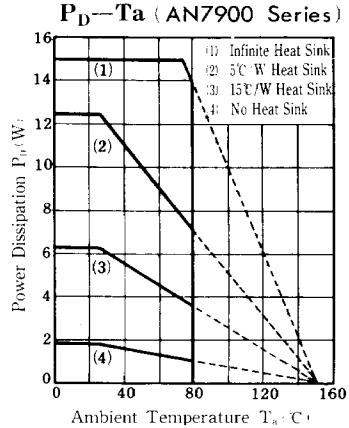


Test Circuit 3 (RR)

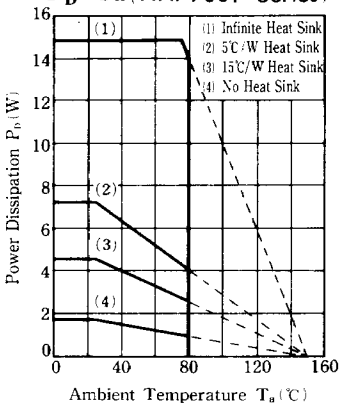


$$RR = 20\log\left(\frac{|V_I|}{|V_O|}\right)$$

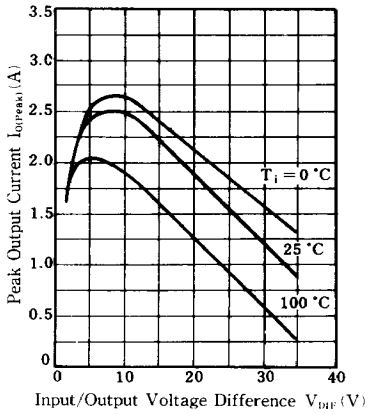
P_D—Ta (AN7900 Series)



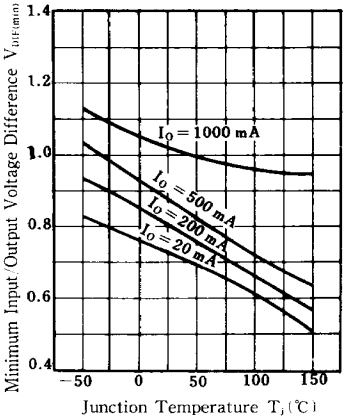
$P_D - Ta$ (AN7900F Series)



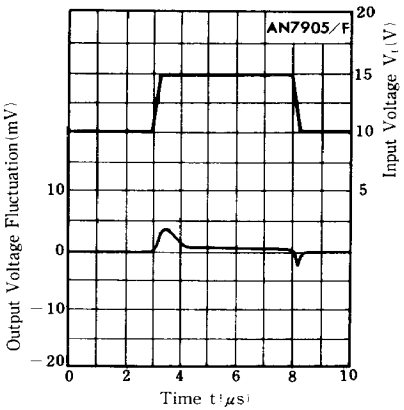
$I_{O(Peak)} - V_{DIF}$



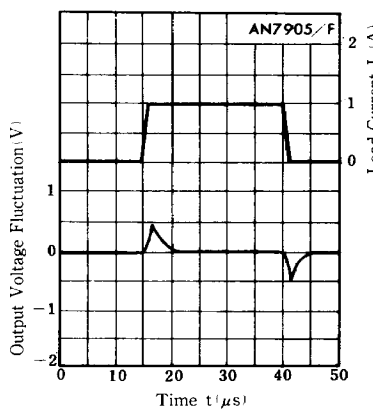
$V_{DIF(min.)} - T_j$



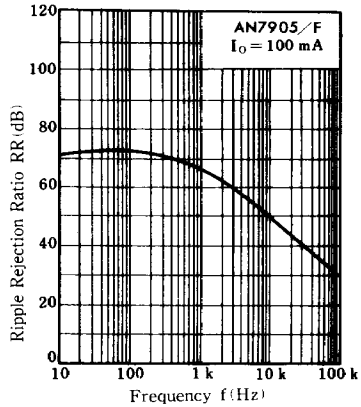
Input Response Characteristic



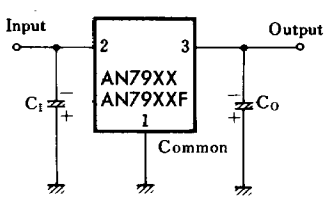
Load Response Characteristic



RR – f



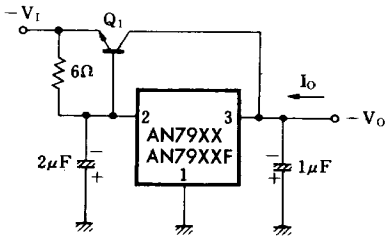
■ Basic Regulator Circuit



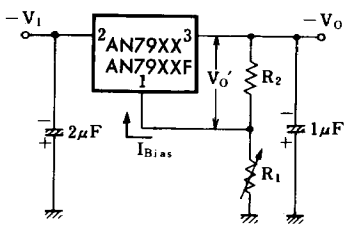
C_I is set when the input line is long.
C_O improves the transient response.

■ Application Circuits

1) Current Boost Circuit



2) Adjustable Output Regulator



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