

# AN79L00/AN79L00M Series

## 3-pin Negative Output Voltage Regulator (100mA Type)

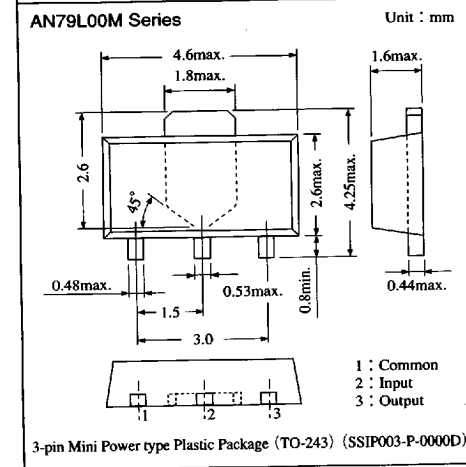
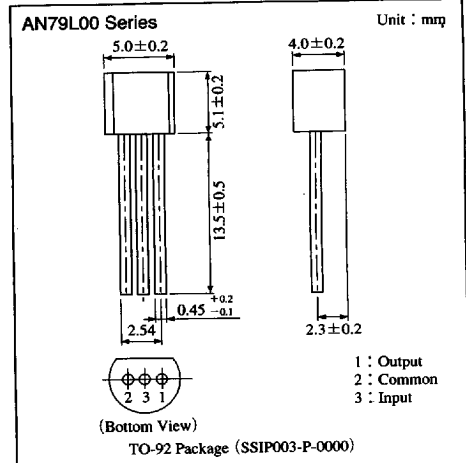
### Overview

The AN79L00 series is 3-pin fixed negative output voltage regulator.

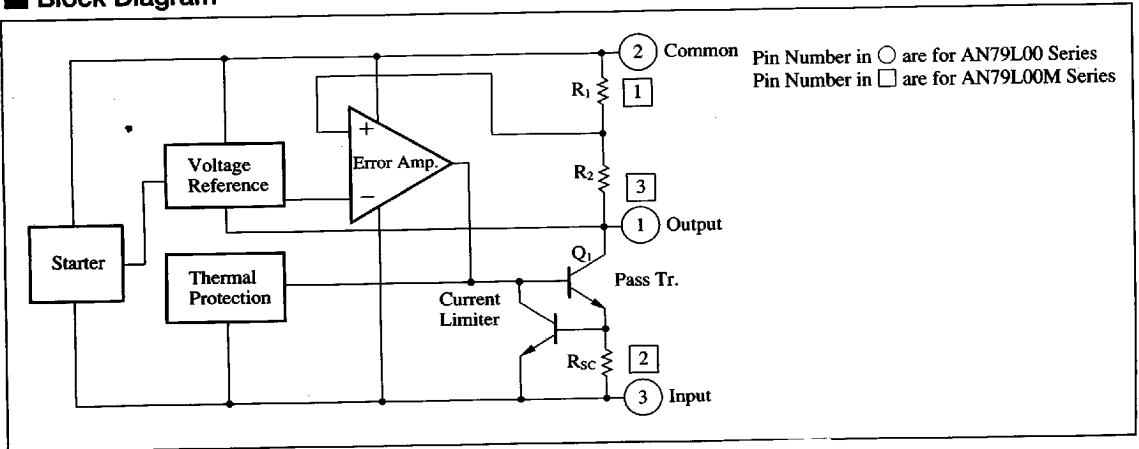
Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components. 12 types of output voltage are available; -4V, -5V, -6V, -7V, -8V, -9V, -10V, -12V, -15V, -18V, -20V and -24V. They can be used widely in power circuits with current capacitance up to 100mA.

### Features

- No external components
- Output voltage : -4V, -5V, -6V, -7V, -8V, -9V, -10V, -12V, -15V, -18V, -20V, -24V
- Short-circuit current limiting built-in
- Thermal overload protection built-in



### Block Diagram



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### Absolute Maximum Ratings ( $T_a=25^\circ\text{C}$ )

Parameter	Symbol	Rating	Unit
Input voltage	$V_I$	-35 *1	V
		-40 *2	V
Power dissipation	$P_D$	650 *3	mW
Operating ambient temperature	$T_{opr}$	-20 to +80	$^\circ\text{C}$
Storage temperature	AN79L00 Series	-55 to +150	$^\circ\text{C}$
	AN79L00M Series	-55 to +125	

\*1 AN79L04/M, AN79L05/M, AN79L06/M, AN79L07/M, AN79L08/M, AN79L09/M, AN79L10/M, AN79L12/M, AN79L15/M, AN79L18/M

\*2 AN79L20/M, AN79L24/M

\*3 Follow the derating curve. When  $T_j$  exceeds  $150^\circ\text{C}$ , the internal circuit cuts off the output. Mounting onto the PCB ( $20 \times 20 \times 1.7$  mm glass epoxy copper foil  $1 \text{ cm}^2$  or more), for AN79L00M Series.

### Electrical Characteristics ( $T_a=25^\circ\text{C}$ )

#### AN79L04/AN79L04M (-4V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	$V_O$	$T_j=25^\circ\text{C}$	-3.84	-4	-4.16	V
Output voltage tolerance	$V_O$	$V_I=-7$ to $-19\text{V}$ , $I_O=1$ to $70\text{mA}$	-3.8	—	-4.2	V
Line regulation	$\text{REG}_{IN}$	$V_I=-6$ to $-20\text{V}$ , $T_j=25^\circ\text{C}$	—	—	80	mV
		$V_I=-7$ to $-17\text{V}$ , $T_j=25^\circ\text{C}$	—	—	40	mV
Load regulation	$\text{REG}_L$	$I_O=1$ to $100\text{mA}$ , $T_j=25^\circ\text{C}$	—	10	60	mV
		$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	4.5	30	mV
Bias current	$I_{Bias}$	$T_j=25^\circ\text{C}$	—	3	5	mA
Input bias current fluctuation	$\Delta I_{Bias(IN)}$	$V_I=-7$ to $-19\text{V}$ , $T_j=25^\circ\text{C}$	—	—	0.5	mA
Load bias current fluctuation	$\Delta I_{Bias(L)}$	$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	$V_{no}$	$f=10\text{Hz}$ to $100\text{kHz}$ , $T_a=25^\circ\text{C}$	—	38	—	$\mu\text{V}$
Ripple rejection ratio	RR	$V_I=-7$ to $-17\text{V}$ , $f=120\text{Hz}$ , $T_a=25^\circ\text{C}$	55	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min.)}$	$T_j=25^\circ\text{C}$	—	0.8	—	V
Output short circuit current	$I_{O(Short)}$	$V_I=-35\text{V}$ , $T_j=25^\circ\text{C}$	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O=5\text{mA}$	—	-0.4	—	mV/ $^\circ\text{C}$

Note1) The specified condition  $T_j=25^\circ\text{C}$  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.

Note2) When not specified,  $V_I=-9\text{V}$ ,  $I_O=40\text{mA}$ ,  $C_I=2\mu\text{F}$ ,  $C_O=1\mu\text{F}$ ,  $T_j=0$  to  $125^\circ\text{C}$  (AN79L04) and  $T_j=0$  to  $100^\circ\text{C}$  (AN79L04M)

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### ■ Electrical Characteristics (Ta=25°C)

#### ● AN79L05/AN79L05M (-5V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-4.8	-5	-5.2	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-8 to -20V, I <sub>O</sub> =1 to 70mA	-4.75	—	-5.25	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-7 to -21V, T <sub>J</sub> =25°C	—	—	100	mV
		V <sub>I</sub> =-8 to -18V, T <sub>J</sub> =25°C	—	—	50	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	11	60	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	5	30	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-8 to -20V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	40	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-8 to -18V, f=120Hz, Ta=25°C	55	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-0.4	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2μF, C<sub>O</sub>=1μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

#### ● AN79L06/AN79L06M (-6V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-5.76	-6	-6.24	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-9 to -21V, I <sub>O</sub> =1 to 70mA	-5.7	—	-6.3	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-8 to -22V, T <sub>J</sub> =25°C	—	—	120	mV
		V <sub>I</sub> =-9 to -19V, T <sub>J</sub> =25°C	—	—	60	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	12	60	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	5.5	30	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-9 to -21V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	44	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-9 to -19V, f=120Hz, Ta=25°C	55	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> = to 35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-0.4	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2μF, C<sub>O</sub>=1μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

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### ■ Electrical Characteristics (Ta=25°C)

#### ● AN79L07/AN79L07M (-7V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	$V_O$	$T_j=25^\circ\text{C}$	-6.72	-7	-7.28	V
Output voltage tolerance	$V_O$	$V_I=-10$ to $-22\text{V}$ , $I_O=1$ to $70\text{mA}$	-6.65	—	-7.35	V
Line regulation	$\text{REG}_{\text{LN}}$	$V_I=-9$ to $-23\text{V}$ , $T_j=25^\circ\text{C}$	—	—	140	mV
		$V_I=-10$ to $-20\text{V}$ , $T_j=25^\circ\text{C}$	—	—	70	mV
Load regulation	$\text{REG}_{\text{L}}$	$I_O=1$ to $100\text{mA}$ , $T_j=25^\circ\text{C}$	—	13	70	mV
		$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	6	40	mV
Bias current	$I_{\text{Bias}}$	$T_j=25^\circ\text{C}$	—	3	5	mA
Input bias current fluctuation	$\Delta I_{\text{Bias(IN)}}$	$V_I=-10$ to $-22\text{V}$ , $T_j=25^\circ\text{C}$	—	—	0.5	mA
Load bias current fluctuation	$\Delta I_{\text{Bias(L)}}$	$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	$V_{\text{no}}$	$f=10\text{Hz}$ to $100\text{kHz}$ , $T_a=25^\circ\text{C}$	—	48	—	$\mu\text{V}$
Ripple rejection ratio	RR	$V_I=-10$ to $-20\text{V}$ , $f=120\text{Hz}$ , $T_a=25^\circ\text{C}$	54	—	—	dB
Minimum input/output voltage difference	$V_{\text{DIP(min.)}}$	$T_j=25^\circ\text{C}$	—	0.8	—	V
Output short circuit current	$I_{\text{O(Short)}}$	$V_I=-35\text{V}$ , $T_j=25^\circ\text{C}$	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O=5\text{mA}$	—	-0.5	—	mV/°C

Note1) The specified condition  $T_j=25^\circ\text{C}$  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.

Note2) When not specified,  $V_I=-9\text{V}$ ,  $I_O=40\text{mA}$ ,  $C_I=2\mu\text{F}$ ,  $C_O=1\mu\text{F}$ ,  $T_j=0$  to  $125^\circ\text{C}$  (AN79L04) and  $T_j=0$  to  $100^\circ\text{C}$  (AN79L04M)

#### ● AN79L08/AN79L08M (-8V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	$V_O$	$T_j=25^\circ\text{C}$	-7.68	-8	-8.32	V
Output voltage tolerance	$V_O$	$V_I=-11$ to $-23\text{V}$ , $I_O=1$ to $70\text{mA}$	-7.6	—	-8.4	V
Line regulation	$\text{REG}_{\text{LN}}$	$V_I=-10$ to $-24\text{V}$ , $T_j=25^\circ\text{C}$	—	—	160	mV
		$V_I=-11$ to $-21\text{V}$ , $T_j=25^\circ\text{C}$	—	—	80	mV
Load regulation	$\text{REG}_{\text{L}}$	$I_O=1$ to $100\text{mA}$ , $T_j=25^\circ\text{C}$	—	15	80	mV
		$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	7	40	mV
Bias current	$I_{\text{Bias}}$	$T_j=25^\circ\text{C}$	—	3	5	mA
Input bias current fluctuation	$\Delta I_{\text{Bias(IN)}}$	$V_I=-11$ to $-23\text{V}$ , $T_j=25^\circ\text{C}$	—	—	0.5	mA
Load bias current fluctuation	$\Delta I_{\text{Bias(L)}}$	$I_O=1$ to $40\text{mA}$ , $T_j=25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	$V_{\text{no}}$	$f=10\text{Hz}$ to $100\text{kHz}$ , $T_a=25^\circ\text{C}$	—	52	—	$\mu\text{V}$
Ripple rejection ratio	RR	$V_I=-11$ to $-21\text{V}$ , $f=120\text{Hz}$ , $T_a=25^\circ\text{C}$	54	—	—	dB
Minimum input/output voltage difference	$V_{\text{DIP(min.)}}$	$T_j=25^\circ\text{C}$	—	0.8	—	V
Output short circuit current	$I_{\text{O(Short)}}$	$V_I=-35\text{V}$ , $T_j=25^\circ\text{C}$	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O=5\text{mA}$ , $T_j=0$ to $125^\circ\text{C}$	—	-0.6	—	mV/°C

Note1) The specified condition  $T_j=25^\circ\text{C}$  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.

Note2) When not specified,  $V_I=-9\text{V}$ ,  $I_O=40\text{mA}$ ,  $C_I=2\mu\text{F}$ ,  $C_O=1\mu\text{F}$ ,  $T_j=0$  to  $125^\circ\text{C}$  (AN79L04) and  $T_j=0$  to  $100^\circ\text{C}$  (AN79L04M)

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### ■ Electrical Characteristics (Ta=25°C)

#### ● AN79L09/AN79L09M (-9V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-8.64	-9	-9.36	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-12 to -24V, I <sub>O</sub> =1 to 70mA	-8.55	—	-9.45	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-11 to -25V, T <sub>J</sub> =25°C	—	—	160	mV
		V <sub>I</sub> =-12 to -22V, T <sub>J</sub> =25°C	—	—	80	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	16	90	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	8	50	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-12 to -24V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	58	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-12 to -22V, f=120Hz, Ta=25°C	53	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA, T <sub>J</sub> =0 to 125°C	—	-0.6	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2 μF, C<sub>O</sub>=1 μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

#### ● AN79L10/AN79L10M (-10V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-9.6	-10	-10.4	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-13 to -25V, I <sub>O</sub> =1 to 70mA	-9.5	—	-10.5	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-12 to -26V, T <sub>J</sub> =25°C	—	—	160	mV
		V <sub>I</sub> =-13 to -23V, T <sub>J</sub> =25°C	—	—	80	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	17	100	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	9	50	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-13 to -25V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	65	—	μV
Ripple rejection	RR	V <sub>I</sub> =-13 to -23V, f=120Hz, Ta=25°C	53	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-0.7	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2 μF, C<sub>O</sub>=1 μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

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### ■ Electrical Characteristics (Ta=25°C)

#### ● AN79L12/AN79L12M (-12V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-11.5	-12	-12.5	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-15 to -27V, I <sub>O</sub> =1 to 70mA	-11.4	—	-12.6	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-14.5 to -30V, T <sub>J</sub> =25°C	—	—	200	mV
		V <sub>I</sub> =-15 to -25V, T <sub>J</sub> =25°C	—	—	100	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	20	100	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	10	50	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-15 to -27V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	75	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-15 to -25V, f=120Hz, Ta=25°C	52	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-0.8	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2μF, C<sub>O</sub>=1μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

#### ● AN79L15/AN79L15M (-15V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-14.4	-15	-15.6	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =18 to -28V, I <sub>O</sub> =1 to 70mA	-14.25	—	-15.75	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-17.5 to -33V, T <sub>J</sub> =25°C	—	—	200	mV
		V <sub>I</sub> =-18 to -28V, T <sub>J</sub> =25°C	—	—	100	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	25	130	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	12	60	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-18 to -30V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	90	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-18 to -28V, f=120Hz, Ta=25°C	51	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-0.9	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2μF, C<sub>O</sub>=1μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

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### ■ Electrical Characteristics (Ta=25°C)

#### ● AN79L18/AN79L18M (-18V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-17.3	-18	-18.7	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-21 to -33V, I <sub>O</sub> =1 to 70mA	-17.1	—	-18.9	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-21 to -33V, T <sub>J</sub> =25°C	—	—	200	mV
		V <sub>I</sub> =-21 to -32V, T <sub>J</sub> =25°C	—	—	100	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	30	160	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	15	80	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-21 to -33V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	110	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-22 to -32V, f=120Hz, Ta=25°C	50	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-1	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2 μF, C<sub>O</sub>=1 μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

#### ● AN79L20/AN79L20M (-20V Type)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V <sub>O</sub>	T <sub>J</sub> =25°C	-19.2	-20	-20.8	V
Output voltage tolerance	V <sub>O</sub>	V <sub>I</sub> =-23 to -35V, I <sub>O</sub> =1 to 70mA	-19	—	-21	V
Line regulation	REG <sub>IN</sub>	V <sub>I</sub> =-23 to -35V, T <sub>J</sub> =25°C	—	—	200	mV
		V <sub>I</sub> =-24 to -34V, T <sub>J</sub> =25°C	—	—	100	mV
Load regulation	REG <sub>L</sub>	I <sub>O</sub> =1 to 100mA, T <sub>J</sub> =25°C	—	35	180	mV
		I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	17	90	mV
Bias current	I <sub>Bias</sub>	T <sub>J</sub> =25°C	—	3	5	mA
Input bias current fluctuation	ΔI <sub>Bias(IN)</sub>	V <sub>I</sub> =-23 to -35V, T <sub>J</sub> =25°C	—	—	0.5	mA
Load bias current fluctuation	ΔI <sub>Bias(L)</sub>	I <sub>O</sub> =1 to 40mA, T <sub>J</sub> =25°C	—	—	0.1	mA
Output noise voltage	V <sub>no</sub>	f=10Hz to 100kHz, Ta=25°C	—	135	—	μV
Ripple rejection ratio	RR	V <sub>I</sub> =-24 to -34V, f=120Hz, Ta=25°C	49	—	—	dB
Minimum input/output voltage difference	V <sub>DIF(min.)</sub>	T <sub>J</sub> =25°C	—	0.8	—	V
Output short circuit current	I <sub>O(Short)</sub>	V <sub>I</sub> =-35V, T <sub>J</sub> =25°C	—	200	—	mA
Output voltage temperature coefficient	ΔV <sub>O</sub> /Ta	I <sub>O</sub> =5mA	—	-1	—	mV/°C

Note1) The specified condition T<sub>J</sub>=25°C 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.

Note2) When not specified, V<sub>I</sub>=-9V, I<sub>O</sub>=40mA, C<sub>I</sub>=2 μF, C<sub>O</sub>=1 μF, T<sub>J</sub>=0 to 125°C (AN79L04) and T<sub>J</sub>=0 to 100°C (AN79L04M)

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

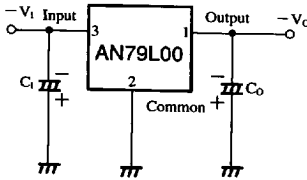
#### ● AN79L24/AN79L24M (-24V Type)

Parameter	Symbol	Condition	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 $-38\text{V}$ , $I_O = 1$ to $70\text{mA}$	-22.8	—	-25.2	V
Line regulation	$\text{REG}_{\text{IN}}$	$V_I = -27$ to $-38\text{V}$ , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -27$ to $-37\text{V}$ , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	$\text{REG}_{\text{L}}$	$I_O = 1$ to $100\text{mA}$ , $T_j = 25^\circ\text{C}$	—	40	200	mV
		$I_O = 1$ to $40\text{mA}$ , $T_j = 25^\circ\text{C}$	—	20	100	mV
Bias current	$I_{\text{Bias}}$	$T_j = 25^\circ\text{C}$	—	3	5	mA
Input bias current fluctuation	$\Delta I_{\text{Bias(IN)}}$	$V_I = -27$ to $-38\text{V}$ , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Load bias current fluctuation	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to $40\text{mA}$ , $T_j = 25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	$V_{\text{no}}$	$f = 10\text{Hz}$ to $100\text{kHz}$ , $T_a = 25^\circ\text{C}$	—	170	—	$\mu\text{V}$
Ripple rejection ratio	RR	$V_I = -28$ to $-38\text{V}$ , $f = 120\text{Hz}$ , $T_a = 25^\circ\text{C}$	49	—	—	dB
Minimum input/output voltage difference	$V_{\text{DIF(min.)}}$	$T_j = 25^\circ\text{C}$	—	0.8	—	V
Output short circuit current	$I_{\text{O(Short)}}$	$V_I = -35\text{V}$ , $T_j = 25^\circ\text{C}$	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	-1	—	$\text{mV}/^\circ\text{C}$

Note1) The specified condition  $T_j = 25^\circ\text{C}$  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.

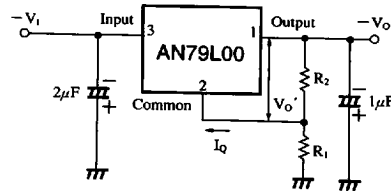
Note2) When not specified,  $V_I = -9\text{V}$ ,  $I_O = 40\text{mA}$ ,  $C_I = 2\mu\text{F}$ ,  $C_O = 1\mu\text{F}$ ,  $T_j = 0$  to  $125^\circ\text{C}$  (AN79L04) and  $T_j = 0$  to  $100^\circ\text{C}$  (AN79L04M)

### ■ Basic Regulator Circuit



$C_I$  is connected when the input line is long.  $2\mu\text{F}$   
 $C_O$  improves the transient Response.  $1\mu\text{F}$

### ■ Application Circuit



$$|V_O| = V_O \left( 1 + \frac{R_1}{R_2} \right) + I_Q R_1$$

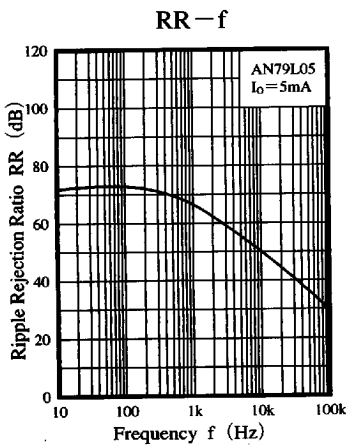
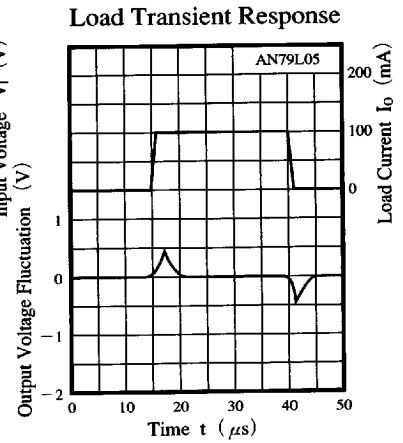
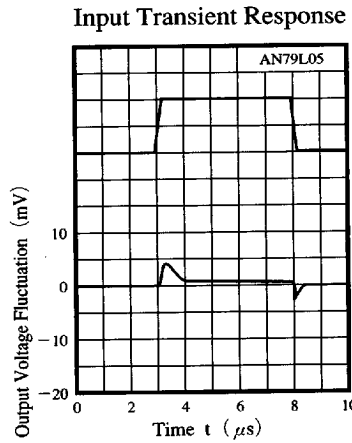
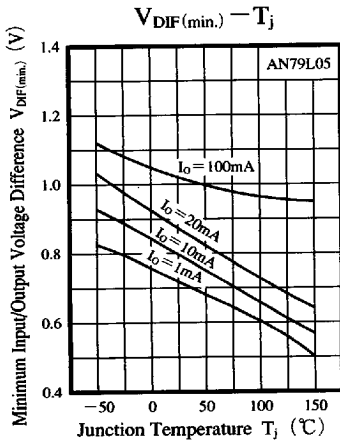
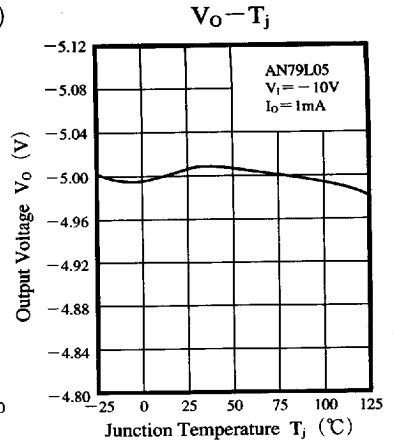
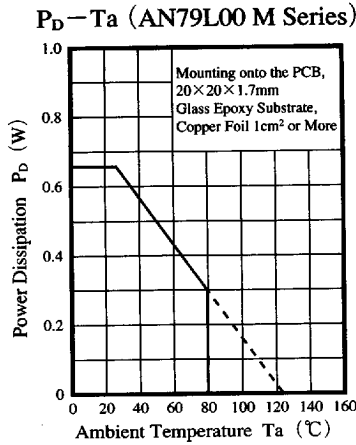
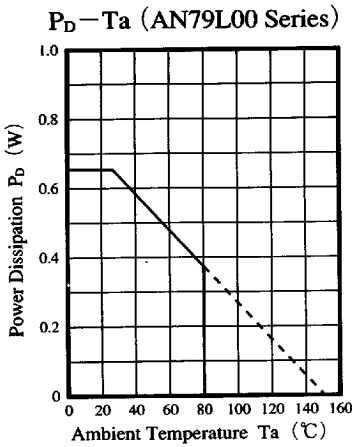
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■ Characteristics Curve



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