

AN79Lxx/AN79LxxM Series

3-pin negative output voltage regulator (100 mA type)

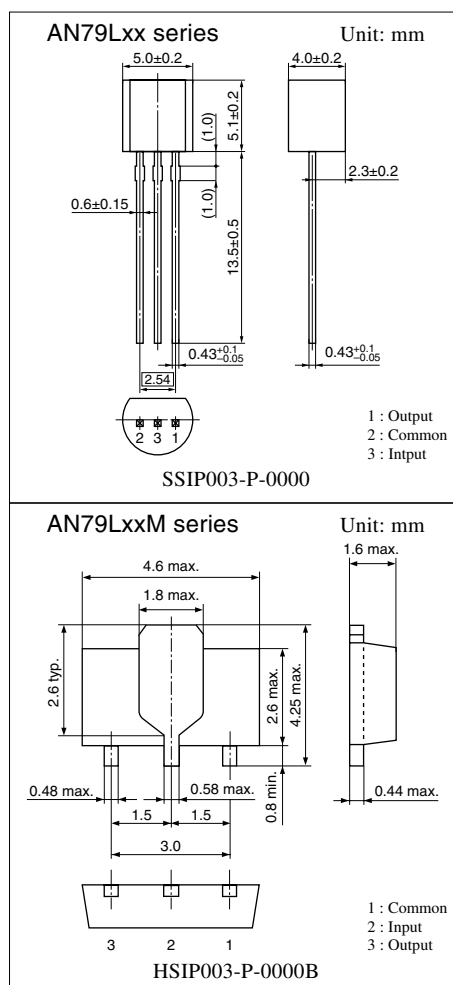
Overview

The AN79Lxx series and the AN79LxxM series are 3-pin, fixed negative output type monolithic voltage regulators.

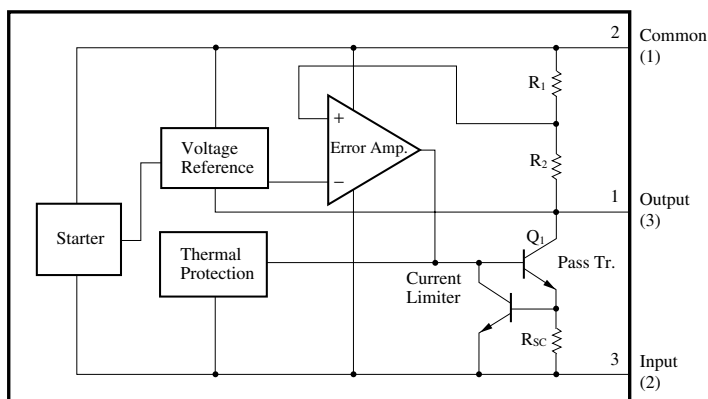
Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components. 12 types of output voltage are available: -4V , -5V , -6V , -7V , -8V , -9V , -10V , -12V , -15V , -18V , -20V and -24V . They can be used widely in power circuits with current capacity of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

Features

- No external components
- Output voltage: -4V , -5V , -6V , -7V , -8V , -9V , -10V , -12V , -15V , -18V , -20V , -24V
- Built-in overcurrent limit circuit
- Built-in thermal overload protection circuit



Block Diagram (AN79Lxx series)



Note) The packages (SSIP003-P-0000 and HSIP003-P-0000B) of this product will be changed to lead-free type (SSIP003-P-0000S and HSIP003-P-0000Q). See the new package dimensions section later of this datasheet.

Note) The number in () shows the pin number for the AN79LxxM series.

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		P _D	650 *3	mW
Operating ambient temperature		T _{opr}	−20 to +80	°C
Storage temperature	AN79Lxx series	T _{stg}	−55 to +150	°C
	AN79LxxM series		−55 to +125	

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

*2 AN79L20, AN79L24

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

AN79LxxM series is mounted on a standard board (glass epoxy: $20\text{mm} \times 20\text{mm} \times t1.7\text{mm}$ with Cu foil of 1cm^2 or more).

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

• AN79L04 (-4V type)

Parameter	Symbol	Conditions	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 -19V , $I_O = 1$ to 70mA	-3.8	—	-4.2	V
Line regulation	REG_{IN}	$V_I = -6$ to -20V , $T_j = 25^\circ\text{C}$	—	—	80	mV
		$V_I = -7$ to -17V , $T_j = 25^\circ\text{C}$	—	—	40	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	10	60	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	4.5	30	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	$V_I = -7$ to -19V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	38	—	μV
Ripple rejection ratio	RR	$V_I = -7$ to -17V , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	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	—	$\text{mV}/^\circ\text{C}$

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, $V_I = -9\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

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

• AN79L05, AN79L05M (–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	$V_I = -8$ to -20V , $I_O = 1$ to 70mA	–4.75	—	–5.25	V
Line regulation	REG_{IN}	$V_I = -7$ to -21V , $T_j = 25^\circ\text{C}$	—	—	100	mV
		$V_I = -8$ to -18V , $T_j = 25^\circ\text{C}$	—	—	50	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	11	60	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	5	30	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -8$ to -20V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	55	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	–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, $V_I = -10\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C (AN79L05) and $T_j = 0$ to 100°C (AN79L05M)

• AN79L06 (–6V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	–5.76	–6	–6.24	V
Output voltage tolerance	V_O	$V_I = -9$ to -21V , $I_O = 1$ to 70mA	–5.7	—	–6.3	V
Line regulation	REG_{IN}	$V_I = -8$ to -22V , $T_j = 25^\circ\text{C}$	—	—	120	mV
		$V_I = -9$ to -19V , $T_j = 25^\circ\text{C}$	—	—	60	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	12	60	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	5.5	30	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -9$ to -21V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	55	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	–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, $V_I = -11\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

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

• AN79L07 (–7V type)

Parameter	Symbol	Conditions	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 -22V , $I_O = 1$ to 70mA	–6.65	—	–7.35	V
Line regulation	REG_{IN}	$V_I = -9$ to -23V , $T_j = 25^\circ\text{C}$	—	—	140	mV
		$V_I = -10$ to -20V , $T_j = 25^\circ\text{C}$	—	—	70	mV
Load regulation	REG_{L}	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	13	70	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	6	40	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -10$ to -22V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	54	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	–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, $V_I = -12\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

• AN79L08, AN79L08M (–8V type)

Parameter	Symbol	Conditions	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 -23V , $I_O = 1$ to 70mA	–7.6	—	–8.4	V
Line regulation	REG_{IN}	$V_I = -10$ to -24V , $T_j = 25^\circ\text{C}$	—	—	160	mV
		$V_I = -11$ to -21V , $T_j = 25^\circ\text{C}$	—	—	80	mV
Load regulation	REG_{L}	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	15	80	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	7	40	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -11$ to -23V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	54	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ 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, $V_I = -14\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C (AN79L08) and $T_j = 0$ to 100°C (AN79L08M)

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

• AN79L09, AN79L09M (−9V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25^\circ\text{C}$	−8.64	−9	−9.36	V
Output voltage tolerance	V_O	$V_I = -12$ to -24V , $I_O = 1$ to 70mA	−8.55	—	−9.45	V
Line regulation	REG_{IN}	$V_I = -11$ to -25V , $T_j = 25^\circ\text{C}$	—	—	160	mV
		$V_I = -12$ to -22V , $T_j = 25^\circ\text{C}$	—	—	80	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	16	90	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	8	50	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -12$ to -24V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	53	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$, $T_j = 0$ 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, $V_I = -15\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C (AN79L09) and $T_j = 0$ to 100°C (AN79L09M)

• AN79L10 (−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	$V_I = -13$ to -25V , $I_O = 1$ to 70mA	−9.5	—	−10.5	V
Line regulation	REG_{IN}	$V_I = -12$ to -26V , $T_j = 25^\circ\text{C}$	—	—	160	mV
		$V_I = -13$ to -23V , $T_j = 25^\circ\text{C}$	—	—	80	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	17	100	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	9	50	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -13$ to -25V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	65	—	μV
Ripple rejection ratio	RR	$V_I = -13$ to -23V , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	53	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	−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, $V_I = -16\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

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

• AN79L12, AN79L12M (–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	$V_I = -15$ to -27V , $I_O = 1$ to 70mA	–11.4	—	–12.6	V
Line regulation	REG_{IN}	$V_I = -14.5$ to -30V , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -15$ to -25V , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	20	100	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	10	50	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -15$ to -27V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	52	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	–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, $V_I = -19\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C (AN79L12) and $T_j = 0$ to 100°C (AN79L12M)

• AN79L15, AN79L15M (–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	$V_I = -18$ to -28V , $I_O = 1$ to 70mA	–14.25	—	–15.75	V
Line regulation	REG_{IN}	$V_I = -17.5$ to -33V , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -18$ to -28V , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	25	130	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	12	60	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -18$ to -30V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	mA
Output noise voltage	V_{no}	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$	—	90	—	μV
Ripple rejection ratio	RR	$V_I = -18$ to -28V , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	51	—	—	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	$\Delta V_O/T_a$	$I_O = 5\text{mA}$	—	–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, $V_I = -23\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C (AN79L15) and $T_j = 0$ to 100°C (AN79L15M)

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

• AN79L18 (–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 , $I_O = 1$ to 70mA	–17.1	—	–18.9	V
Line regulation	REG_{IN}	$V_I = -21$ to -33V , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -21$ to -32V , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	30	160	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	15	80	mV
Bias current	I_{Bias}	$T_j = 25^\circ\text{C}$	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = -21$ to -33V , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	50	—	—	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	—	$\text{mV}/^\circ\text{C}$

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, $V_I = -27\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

• AN79L20 (–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 , $I_O = 1$ to 70mA	–19	—	–21	V
Line regulation	REG_{IN}	$V_I = -23$ to -35V , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -24$ to -34V , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	35	180	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	17	90	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 , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	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	—	$\text{mV}/^\circ\text{C}$

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, $V_I = -29\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

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

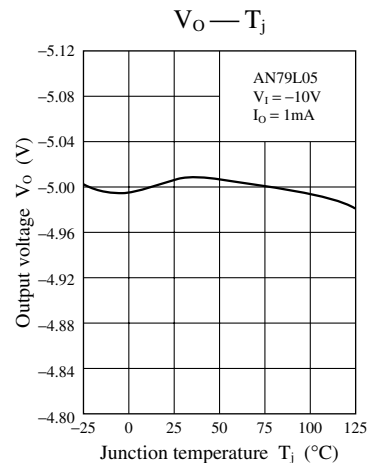
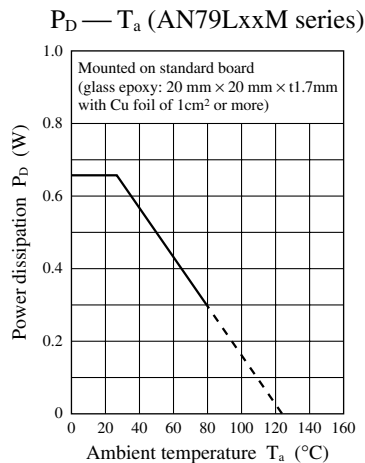
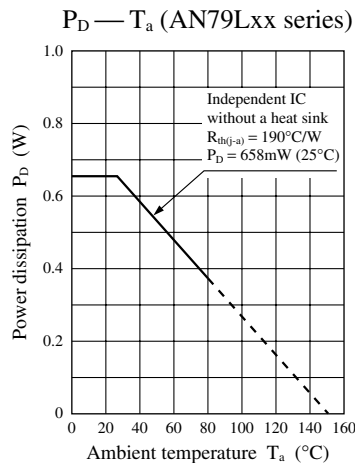
• AN79L24 (–24V type)

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 , $I_O = 1$ to 70mA	–22.8	—	–25.2	V
Line regulation	REG_{IN}	$V_I = -27$ to -38V , $T_j = 25^\circ\text{C}$	—	—	200	mV
		$V_I = -27$ to -37V , $T_j = 25^\circ\text{C}$	—	—	100	mV
Load regulation	REG_L	$I_O = 1$ to 100mA , $T_j = 25^\circ\text{C}$	—	40	200	mV
		$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	20	100	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 , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 1$ to 40mA , $T_j = 25^\circ\text{C}$	—	—	0.1	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 , $f = 120\text{Hz}$, $T_a = 25^\circ\text{C}$	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	—	$\text{mV}/^\circ\text{C}$

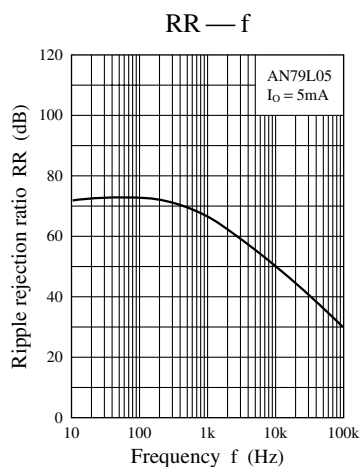
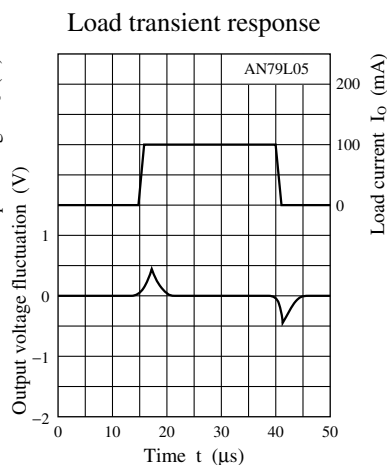
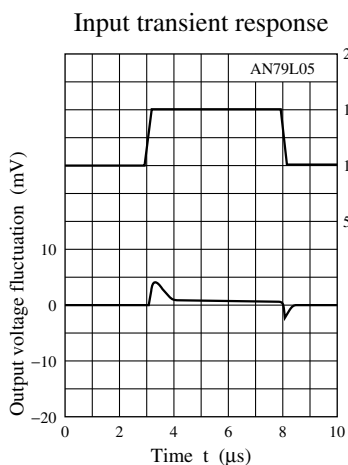
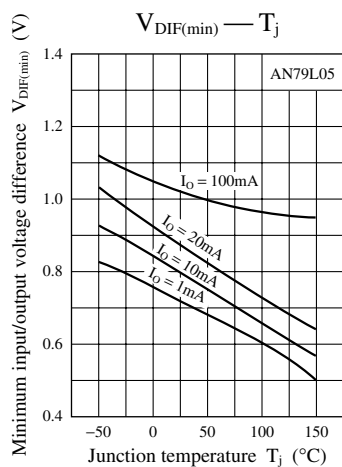
Note 1) The specified condition $T_j = 25^\circ\text{C}$ means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.

Note 2) Unless otherwise specified, $V_I = -33\text{V}$, $I_O = 40\text{mA}$, $C_I = 2\mu\text{F}$, $C_O = 1\mu\text{F}$, $T_j = 0$ to 125°C

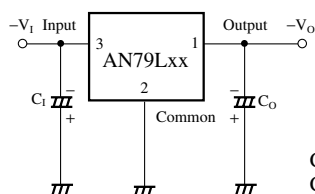
■ Main Characteristics



Main Characteristics (continued)



Basic Regulator Circuit



Connect C_I of $2\mu F$ when the input line is long.
 C_O improves the transient response. $1\mu F$

■ Usage Notes

1. Cautions for a basic circuit

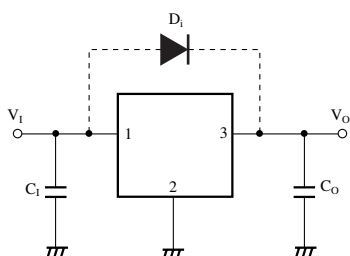


Figure 1

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.

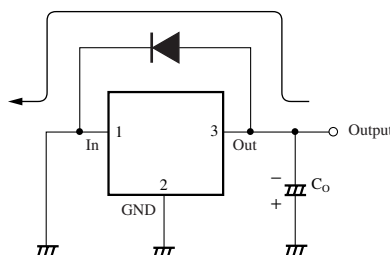
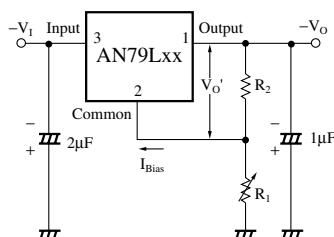


Figure 2

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 Example

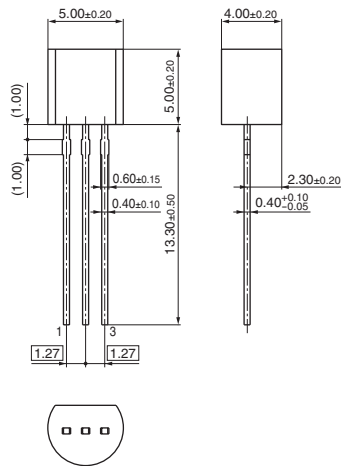


$$|V_O| = V_O' \left(1 + \frac{R_1}{R_2} \right) + I_Q R_1$$

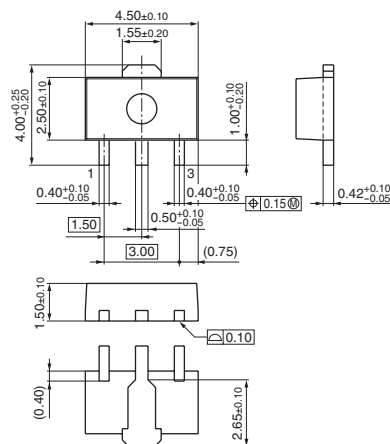
Note) V_O varies due to sample to sample variation of I_{Bias} .
Never fail to adjust individually with R_1 .

■ New Package Dimensions (Unit: mm)

- SSIP003-P-0000S (Lead-free package)



- HSIP003-P-0000Q (Lead-free package)



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