AN79Lxx/AN79LxxM Series

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

■ Overview

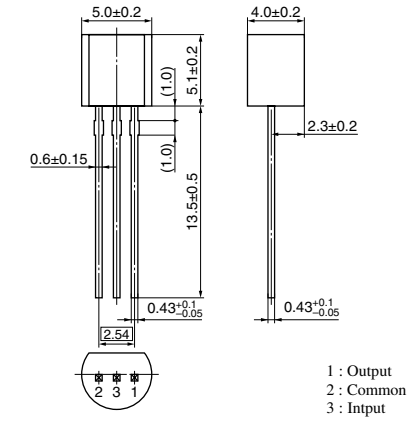
The AN79Lxx series and the AN79LxxM series are 3-pin, fixed negative output type monolithic voltage regulators.

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

AN79Lxx series Unit : mm



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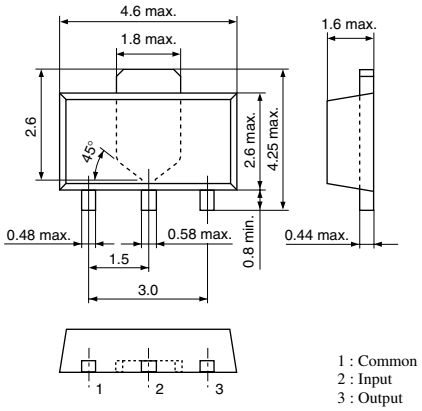
AN79LxxM series Unit : mm



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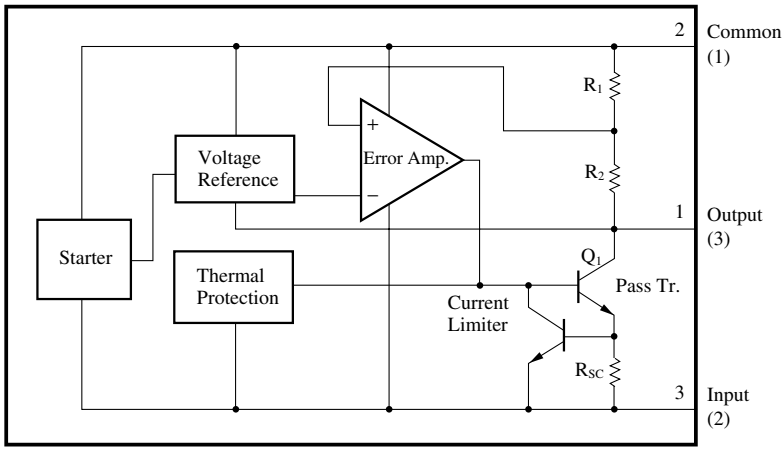
■ Block Diagram (AN79Lxx series)



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

■ Absolute Maximum Ratings at T_a = 25°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/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°C, the internal circuit cuts off the output.
AN79LxxM series is mounted on a standard board (glass epoxy: 20mm × 20mm × t1.7mm with Cu foil of 1cm² or more).

■ Electrical Characteristics at T_a = 25°C

• AN79L04, AN79L04M (–4V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°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°C	—	—	80	mV
		V_I = –7 to –17V, T_j = 25°C	—	—	40	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	10	60	mV
		I_O = 1 to 40mA, T_j = 25°C	—	4.5	30	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –7 to –19V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	38	—	µV
Ripple rejection ratio	RR	V_I = –7 to –17V, f = 120Hz, T_a = 25°C	55	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.4	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –9V, I_O = 40mA, C_I = 2µF, C_O = 1µF, T_j = 0 to 125°C (AN79L04) and T_j = 0 to 100°C (AN79L04M)

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

• AN79L05, AN79L05M (–5V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–4.8	–5	–5.2	V
Output voltage tolerance	V_O	V_I = –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°C	—	—	100	mV
		V_I = –8 to –18V, T_j = 25°C	—	—	50	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	11	60	mV
		I_O = 1 to 40mA, T_j = 25°C	—	5	30	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –8 to –20V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	40	—	μV
Ripple rejection ratio	RR	V_I = –8 to –18V, f = 120Hz, T_a = 25°C	55	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.4	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –10V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L05) and T_j = 0 to 100°C (AN79L05M)

• AN79L06, AN79L06M (–6V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°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°C	—	—	120	mV
		V_I = –9 to –19V, T_j = 25°C	—	—	60	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	12	60	mV
		I_O = 1 to 40mA, T_j = 25°C	—	5.5	30	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –9 to –21V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	44	—	μV
Ripple rejection ratio	RR	V_I = –9 to –19V, f = 120Hz, T_a = 25°C	55	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.4	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –11V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L06) and T_j = 0 to 100°C (AN79L06M)

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

• AN79L07, AN79L07M (–7V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°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°C	—	—	140	mV
		V_I = –10 to –20V, T_j = 25°C	—	—	70	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	13	70	mV
		I_O = 1 to 40mA, T_j = 25°C	—	6	40	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –10 to –22V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	48	—	μV
Ripple rejection ratio	RR	V_I = –10 to –20V, f = 120Hz, T_a = 25°C	54	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.5	—	mV/°C

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

Note 2) Unless otherwise specified, V_I = –12V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L07) and T_j = 0 to 100°C (AN79L07M)

• AN79L08, AN79L08M (–8V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°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°C	—	—	160	mV
		V_I = –11 to –21V, T_j = 25°C	—	—	80	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	15	80	mV
		I_O = 1 to 40mA, T_j = 25°C	—	7	40	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –11 to –23V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	52	—	μV
Ripple rejection ratio	RR	V_I = –11 to –21V, f = 120Hz, T_a = 25°C	54	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	– 0.6	—	mV/°C

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

Note 2) Unless otherwise specified, V_I = –14V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L08) and T_j = 0 to 100°C (AN79L08M)

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

• AN79L09, AN79L09M (–9V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°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°C	—	—	160	mV
		V_I = –12 to –22V, T_j = 25°C	—	—	80	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	16	90	mV
		I_O = 1 to 40mA, T_j = 25°C	—	8	50	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –12 to –24V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	58	—	μV
Ripple rejection ratio	RR	V_I = –12 to –22V, f = 120Hz, T_a = 25°C	53	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA, T_j = 0 to 125°C	—	– 0.6	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –15V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L09) and T_j = 0 to 100°C (AN79L09M)

• AN79L10, AN79L10M (–10V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–9.6	–10	–10.4	V
Output voltage tolerance	V_O	V_I = –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°C	—	—	160	mV
		V_I = –13 to –23V, T_j = 25°C	—	—	80	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	17	100	mV
		I_O = 1 to 40mA, T_j = 25°C	—	9	50	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –13 to –25V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	65	—	μV
Ripple rejection ratio	RR	V_I = –13 to –23V, f = 120Hz, T_a = 25°C	53	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.7	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –16V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L10) and T_j = 0 to 100°C (AN79L10M)

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

• AN79L12, AN79L12M (–12V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–11.5	–12	–12.5	V
Output voltage tolerance	V_O	V_I = –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°C	—	—	200	mV
		V_I = –15 to –25V, T_j = 25°C	—	—	100	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	20	100	mV
		I_O = 1 to 40mA, T_j = 25°C	—	10	50	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –15 to –27V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	75	—	µV
Ripple rejection ratio	RR	V_I = –15 to –25V, f = 120Hz, T_a = 25°C	52	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.8	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –19V, I_O = 40mA, C_I = 2µF, C_O = 1µF, 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°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°C	—	—	200	mV
		V_I = –18 to –28V, T_j = 25°C	—	—	100	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	25	130	mV
		I_O = 1 to 40mA, T_j = 25°C	—	12	60	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –18 to –30V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	90	—	µV
Ripple rejection ratio	RR	V_I = –18 to –28V, f = 120Hz, T_a = 25°C	51	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	– 0.9	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –23V, I_O = 40mA, C_I = 2µF, C_O = 1µF, T_j = 0 to 125°C (AN79L15) and T_j = 0 to 100°C (AN79L15M)

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

• AN79L18, AN79L18M (–18V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–17.3	–18	–18.7	V
Output voltage tolerance	V_O	V_I = –21 to –33V, I_O = 1 to 70mA	–17.1	—	–18.9	V
Line regulation	REG_{IN}	V_I = –21 to –33V, T_j = 25°C	—	—	200	mV
		V_I = –21 to –32V, T_j = 25°C	—	—	100	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	30	160	mV
		I_O = 1 to 40mA, T_j = 25°C	—	15	80	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –21 to –33V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	110	—	μV
Ripple rejection ratio	RR	V_I = –22 to –32V, f = 120Hz, T_a = 25°C	50	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	–1	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –27V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L18) and T_j = 0 to 100°C (AN79L18M)

• AN79L20, AN79L20M (–20V type)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–19.2	–20	–20.8	V
Output voltage tolerance	V_O	V_I = –23 to –35V, I_O = 1 to 70mA	–19	—	–21	V
Line regulation	REG_{IN}	V_I = –23 to –35V, T_j = 25°C	—	—	200	mV
		V_I = –24 to –34V, T_j = 25°C	—	—	100	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	35	180	mV
		I_O = 1 to 40mA, T_j = 25°C	—	17	90	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –23 to –35V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	135	—	μV
Ripple rejection ratio	RR	V_I = –24 to –34V, f = 120Hz, T_a = 25°C	49	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	–1	—	mV/°C

Note 1) The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.
Note 2) Unless otherwise specified, V_I = –29V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L20) and T_j = 0 to 100°C (AN79L20M)

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

• AN79L24, AN79L24M (–24V type)

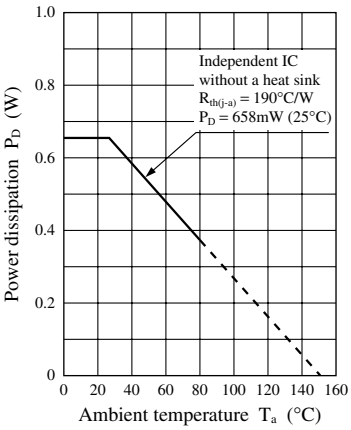
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	T_j = 25°C	–23	–24	–25	V
Output voltage tolerance	V_O	V_I = –27 to –38V, I_O = 1 to 70mA	–22.8	—	–25.2	V
Line regulation	REG_{IN}	V_I = –27 to –38V, T_j = 25°C	—	—	200	mV
		V_I = –27 to –37V, T_j = 25°C	—	—	100	mV
Load regulation	REG_L	I_O = 1 to 100mA, T_j = 25°C	—	40	200	mV
		I_O = 1 to 40mA, T_j = 25°C	—	20	100	mV
Bias current	I_{Bias}	T_j = 25°C	—	3	5	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_I = –27 to –38V, T_j = 25°C	—	—	0.5	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_O = 1 to 40mA, T_j = 25°C	—	—	0.1	mA
Output noise voltage	V_{no}	f = 10Hz to 100kHz, T_a = 25°C	—	170	—	μV
Ripple rejection ratio	RR	V_I = –28 to –38V, f = 120Hz, T_a = 25°C	49	—	—	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	0.8	—	V
Output short-circuit current	$I_{O(Short)}$	V_I = –35V, T_j = 25°C	—	200	—	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	I_O = 5mA	—	–1	—	mV/°C

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

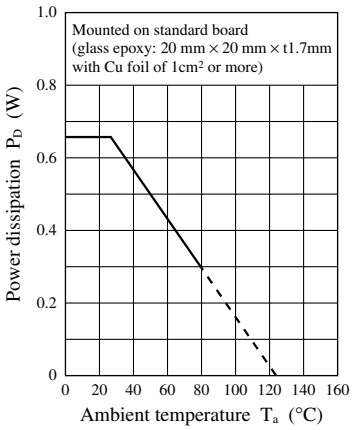
Note 2) Unless otherwise specified, V_I = –33V, I_O = 40mA, C_I = 2μF, C_O = 1μF, T_j = 0 to 125°C (AN79L24) and T_j = 0 to 100°C (AN79L24M)

■ Main Characteristics

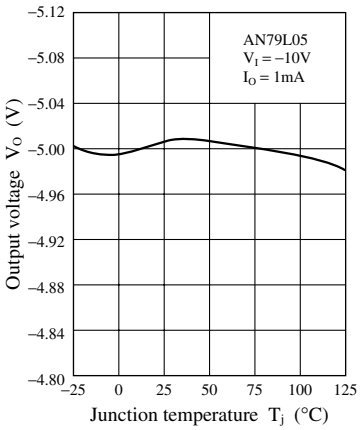
P_D — T_a (AN79Lxx series)



P_D — T_a (AN79LxxM series)

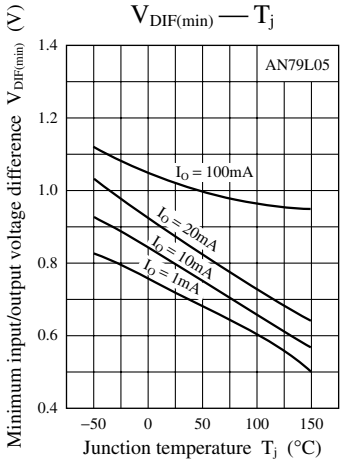


V_O — T_j

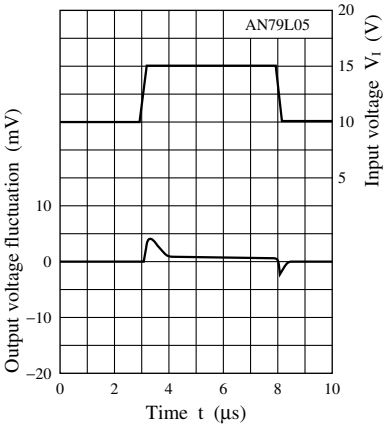


■ Main Characteristics (continued)

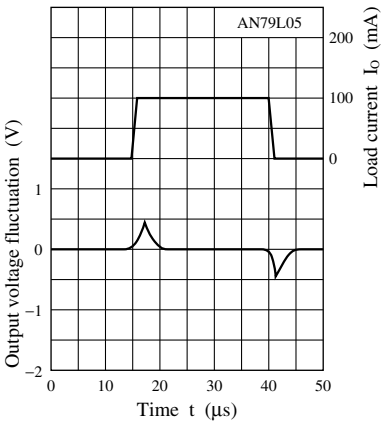
$V_{DIF(min)}$ — T_j



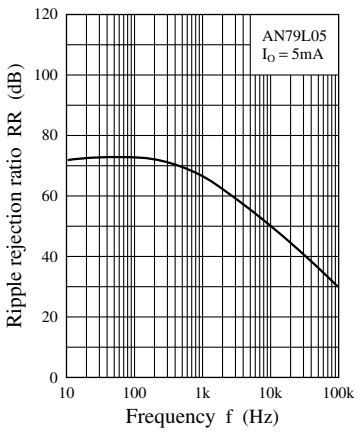
Input transient response



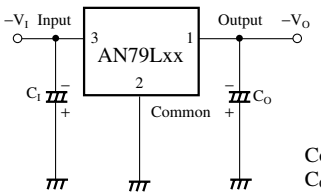
Load transient response



RR — f



■ Basic Regulator Circuit



Connect C_I of 2µF when the input line is long.
C_O improves the transient response. 1µF

■ Usage Notes

1. Cautions for a basic circuit

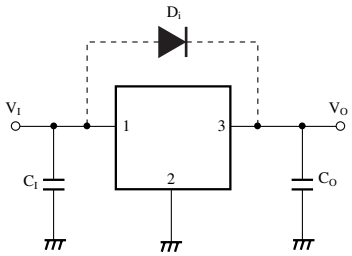


Figure 1

C_I: When a wiring from a smoothing circuit to a three-pin regulator is long, it is likely to oscillate at output. A capacitor of 0.1µF to 0.47µF should be connected near an input pin.

C_O: Deadly needed to prevent from oscillation (0.33µF to 1.0µF). 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 10µF to 100µF to improve a transitional response of output voltage.

D_i: Normally unnecessary. But add it in the case that there is a residual voltage at the output capacitor Co even after switching off the supply power because a current is likely to flow into an output pin of the IC and damage the IC.

2. Other caution items

1) Short-circuit between the input pin and GND pin

If the input pin is short-circuitted to GND or is cut off when a large capacitance capacitor has been connected to the IC's load, a voltage of a capacitor connected to an output pin is applied between input/output of the IC and this likely results in damage of the IC. It is necessary, therefore, to connect a diode, as shown in figure 2, to counter the reverse bias between input/output pins.

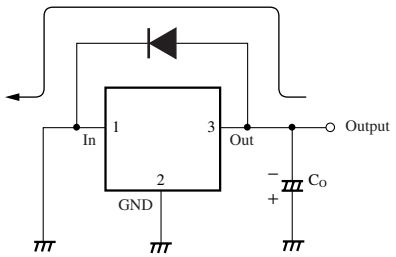
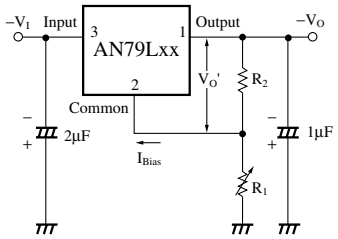


Figure 2

2) Floating of GND pin

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

■ Application Circuit 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 .

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