Panasonic

AN79Lxx/AN79LxxM Series

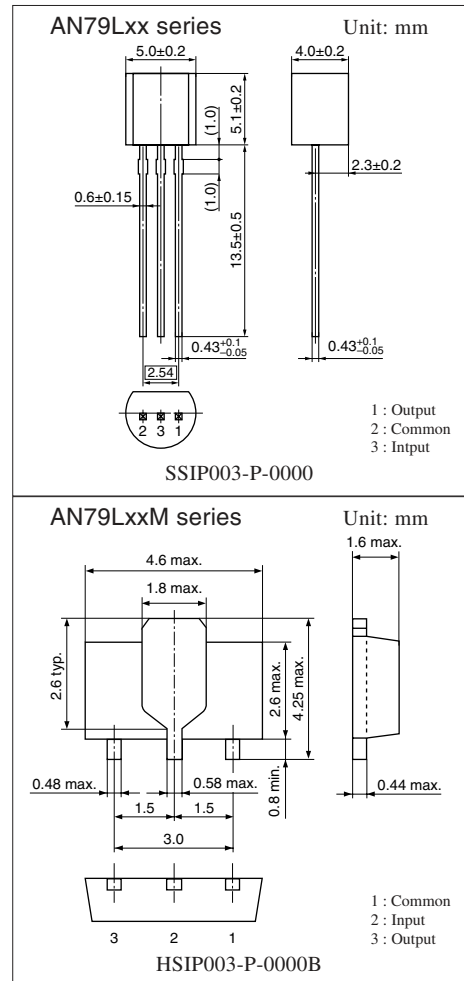## 3-pin negative output voltage regulator (100 mA type)

■ Overview

The AN79Lxx series and the AN79LxxM series are 3-pin, fixed negative output type monolithic voltage regulators.
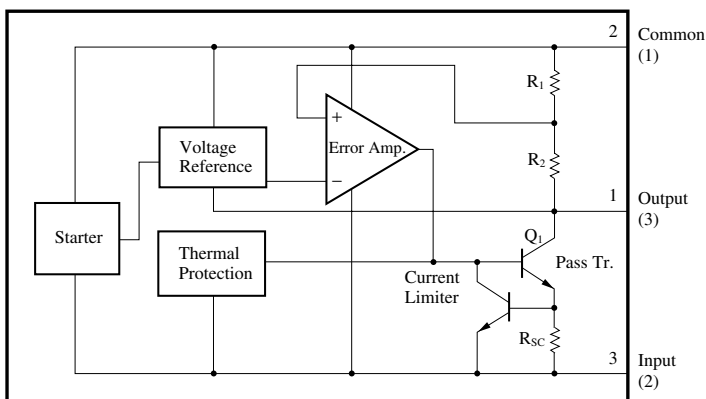
Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components. 12 types of output voltage are available: −4V, −5V, −6V, −7V, −8V, −9V, −10V, −12V, −15V, −18V, −20V and −24V. They can be used widely in power circuits with current capacity of up to 100mA.

■ 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

5.0±0.2   4.0±0.2   (1.0)   5.1±0.2   2.3±0.2   0.6±0.15   (1.0)   13.5±0.5   0.43$^{+0.1}_{-0.05}$ 0.43$^{+0.1}_{-0.05}$ 2.54

2 3 1

1 : Output
2 : Common
3 : Intput

SSIP003-P-0000

AN79LxxM series   Unit: mm

4.6 max.   1.6 max.   1.8 max.   2.6 typ.   2.6 max.   4.25 max.   0.48 max.   0.58 max.   0.8 min.   0.44 max.   1.5   1.5   3.0

3   2   1

1 : Common
2 : Input
3 : Output

HSIP003-P-0000B

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.

■ Block Diagram (AN79Lxx series)

2 Common (1)

R_1

R_2

Error Amp.

Voltage Reference

Starter

Thermal Protection

Current Limiter

Q_1 Pass Tr.

R_{SC}

1 Output (3)

3 Input (2)

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, AN79L05/M, AN79L06, AN79L07/M, AN79L08/M, AN79L09/M, AN79L10/M, 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: 20mm × 20mm × t1.7mm with Cu foil of $1cm^2$ or more).

■ Electrical Characteristics at $T_a = 25°C$

• AN79L04 (-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}	$f = 10$Hz to 100kHz, $T_a = 25°C$	——	38	——	μV
Ripple rejection ratio	RR	$V_I = -7$ to -17V, $f = 120$Hz, $T_a = 25°C$	55	——	——	dB
Minimum input/output voltage difference	$V_{DIF(min)}$	$T_j = 25°C$	——	0.8	——	V
Output short-circuit current	$I_{O(Short)}$	$V_I = -35$V, $T_j = 25°C$	——	200	——	mA
Output voltage temperature coefficient	$\Delta V_O/T_a$	$I_O = 5$mA	——	-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, $V_I = -9$V, $I_O = 40$mA, $C_I = 2$μF, $C_O = 1$μF, $T_j = 0$ to 125°C

■ 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 (−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

■ 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, $V_I = -15V$, $I_O = 40mA$, $C_I = 2\mu F$, $C_O = 1\mu F$, $T_j = 0$ 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, $V_I = -16V$, $I_O = 40mA$, $C_I = 2\mu F$, $C_O = 1\mu F$, $T_j = 0$ 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 (−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

• AN79L20 (−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

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

• AN79L24 (−24V type)

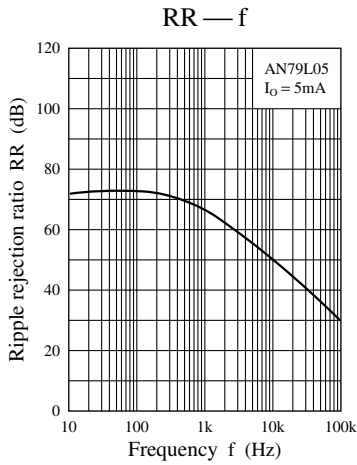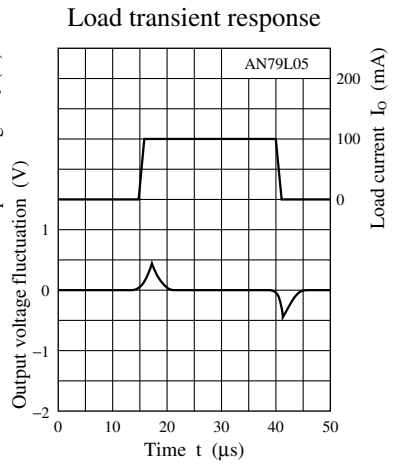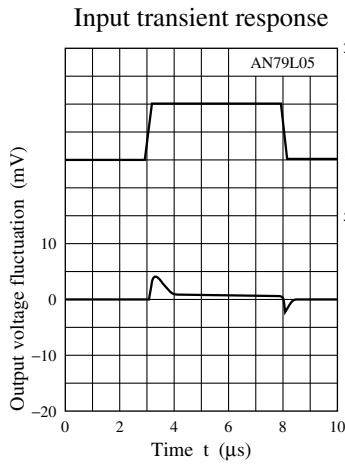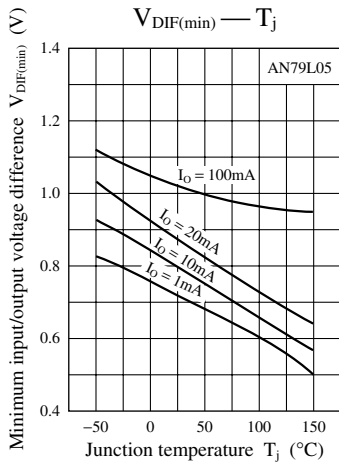| Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	V_O	$T_j = 25°C$	−23	−24	−25	V
Output voltage tolerance	V_O	$V_I = -27$ to $-38V$, $I_O = 1$ to 70mA	−22.8	——	−25.2	V
Line regulation	REG_{IN}	$V_I = -27$ to $-38V$, $T_j = 25°C$	——	——	200	mV
		$V_I = -27$ to $-37V$, $T_j = 25°C$	——	——	100	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

■ Main Characteristics

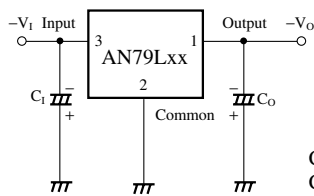P_D — T_a (AN79Lxx series)

P_D — T_a (AN79LxxM series)

V_O — T_j
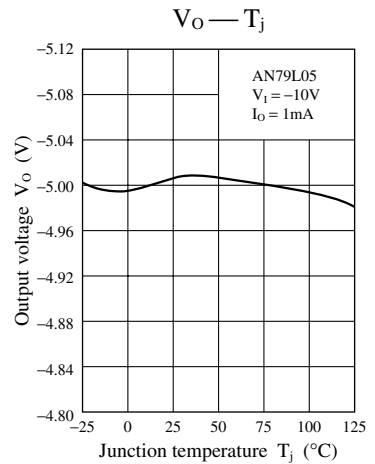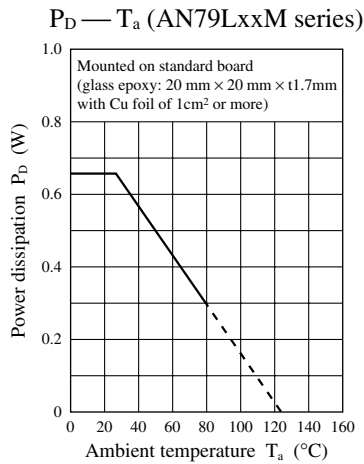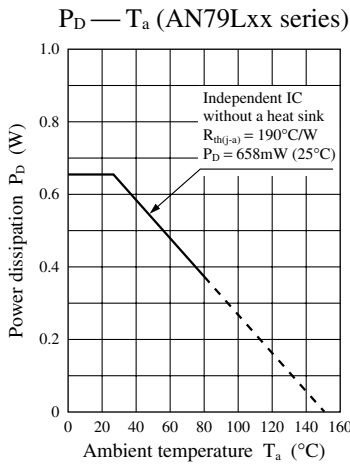
■ Main Characteristics (continued)

$V_{DIF(min)}$ — T_j

Minimum input/output voltage difference $V_{DIF(min)}$ (V)

AN79L05

$I_O = 100mA$
$I_O = 20mA$
$I_O = 10mA$
$I_O = 1mA$

Junction temperature T_j (°C)

Input transient response

AN79L05

Output voltage fluctuation (mV)

Input voltage V_I (V)

Time t (μs)

Load transient response

AN79L05

Output voltage fluctuation (V)

Load current I_O (mA)

Time t (μs)

RR — f

Ripple rejection ratio RR (dB)

AN79L05
$I_O = 5mA$

Frequency f (Hz)

■ Basic Regulator Circuit

$-V_I$ Input   Output $-V_O$

3   AN79Lxx   1

2

C_I Common C_O

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

■ Usage Notes
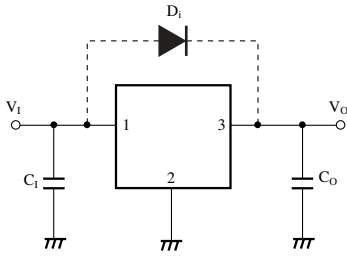
1. Cautions for a basic circuit

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.
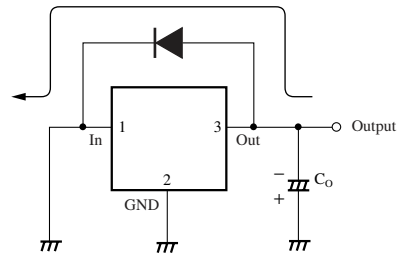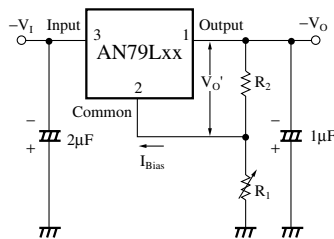

Figure 2

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.
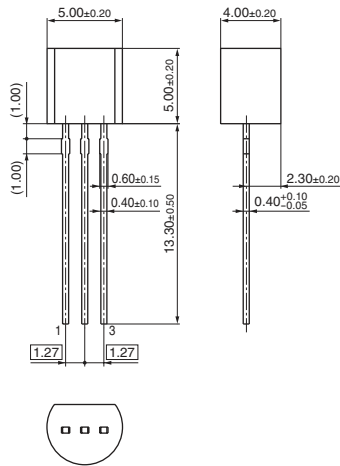
■ Application Circuit Example

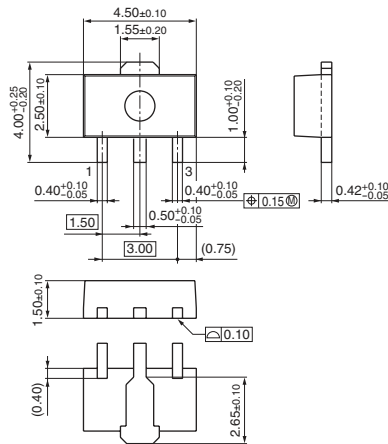$$|V_O| = V_O' \left(1 + \frac{R_1}{R_2}\right) + I_Q R_1$$

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

■ New Package Dimensions (Unit: mm)

• SSIP003-P-0000S (Lead-free package)

• HSIP003-P-0000Q (Lead-free package)

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