3-TERMINAL POSITIVE VOLTAGE REGULATOR

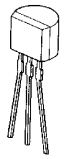
■ GENERAL DESCLIPTION

NJM78L00 is 3-terminal positive voltage regulator.

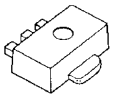
NJM78L00 series is mounted in EMP8 package of the surface mount package.

The EMP8 package possible flow soldering.

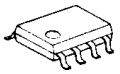
■ PACKAGE OUTLINE



NJM78L00A



NJM78L00UA

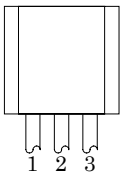


NJM78L00EA
(5V,9V,12V)

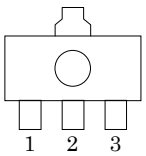
■ FEATURES

- ●Internal Short Circuit Current Limit
- ●Internal Thermal Overload Protection
- ●Excellent Ripple Rejection
- ●Guaranteed 100mA Output Current
- ●Bipolar Technology
- ●Package Outline T0-92,SOT-89,EMP8

■ PIN CONFIGURATION

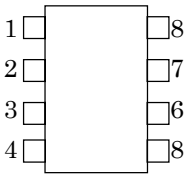


NJM78L00A



NJM78L00UA

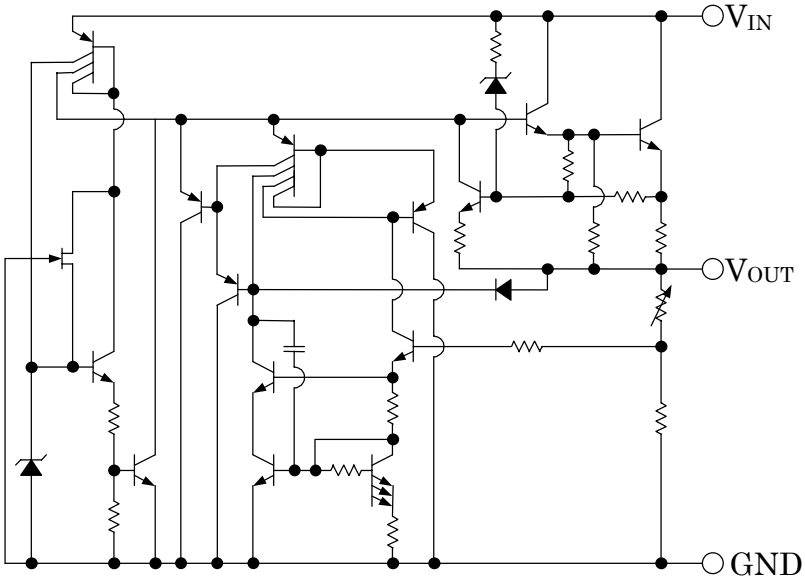
PIN FUNCTION
1.OUT
2.GND
3.IN



NJM78L00EA
(5V,9V,12V)

PIN FUNCTION
1.OUT
2.GND
3.GND
4.NC
5.NC
6.GND
7.GND
8.IN

■ EQUIAVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Input Voltage	V_{IN}	(78L02A ~ 78L09A) 30 (78L12A ~ 78L15A) 35 (78L18A ~ 78L24A) 40	V
Power Dissipation	P_D	(TO-92) 500 (EMP8) 350 (SOT-89) 300	mW
Operating Temperature Range	Topr	–40 ~ +85	°C
Storage Temperature Range	Tstg	–40 ~ +150	°C

■ ELECTRICAL CHARACTERISTICS(C_{IN}=0.33µF,Co=0.1µF,Tj=25°C)

Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM78L02A						
Output Voltage	Vo	V_{IN}=9V, Io=40mA	2.47	2.6	2.73	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=4.75V ~ 20V, Io=40mA	–	–	125	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=5V ~ 20V, Io=40mA	–	–	100	mV
Load Regulation1	ΔVo–Io1	V_{IN}=9V, Io=1 ~ 40mA	–	–	25	mV
Load Regulation2	ΔVo–Io2	V_{IN}=9V, Io=1 ~ 100mA	–	–	50	mV
Quiescent Current	I_Q	V_{IN}=9V, Io=0mA	–	2.0	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=9V, Io=1mA	–	0.2	–	mV/°C
Ripple Rejection	RR	6V < V_{IN} < 16V, Io=40mA ein=1Vp-p, f=120Hz	43	73	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=9V,BW=10Hz ~ 100kHz Io=40mA	–	35	–	µV
NJM78L03A(*1)						
Output Voltage	Vo	V_{IN}=9V, Io=40mA	2.85	3.0	3.15	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=5V ~ 20V, Io=40mA	–	–	125	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=6V ~ 20V, Io=40mA	–	–	100	mV
Load Regulation1	ΔVo–Io1	V_{IN}=9V, Io=1 ~ 40mA	–	–	25	mV
Load Regulation2	ΔVo–Io2	V_{IN}=9V, Io=1 ~ 100mA	–	–	50	mV
Quiescent Current	I_Q	V_{IN}=9V, Io=0mA	–	2.0	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=9V, Io=1mA	–	0.2	–	mV/°C
Ripple Rejection	RR	6V < V_{IN} < 16V, Io=40mA ein=1Vp-p, f=120Hz	43	72	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=9V,BW=10Hz ~ 100kHz, Io=40mA	–	40	–	µV
NJM78L05A(*3)						
Output Voltage	Vo	V_{IN}=10V, Io=40mA	4.75	5.0	5.25	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=7V ~ 20V, Io=40mA	–	–	200	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=8V ~ 20V, Io=40mA	–	–	150	mV
Load Regulation1	ΔVo–Io1	V_{IN}=10V, Io=1 ~ 40mA	–	–	30	mV
Load Regulation2	ΔVo–Io2	V_{IN}=10V, Io=1 ~ 100mA	–	–	60	mV
Quiescent Current	I_Q	V_{IN}=10V, Io=0mA	–	2.0	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=10V, Io=1mA	–	0.4	–	mV/°C
Ripple Rejection	RR	8V < V_{IN} < 18V, Io=40mA ein=1Vp-p, f=120Hz	40	69	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=10V,BW=10Hz ~ 100kHz Io=40mA	–	70	–	µV

(*1):SOT-89 package only.
(*2):TO-92 package only.
(*3):SOT-89,TO-92, EMP8

■ ELECTRICAL CHARACTERISTICS(C_{IN}=0.33μF,Co=0.1μF,Tj=25°C)
Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM78L06A						
Output Voltage	Vo	V_{IN}=12V, Io=40mA	5.7	6.0	6.3	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=8.5V ~ 20V, Io=40mA	–	–	200	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=9V ~ 20V, Io=40mA	–	–	150	mV
Load Regulation1	ΔVo–Io1	V_{IN}=12V, Io=1 ~ 40mA	–	–	40	mV
Load Regulation2	ΔVo–Io2	V_{IN}=12V, Io=1 ~ 100mA	–	–	80	mV
Quiescent Current	I_Q	V_{IN}=12V, Io=0mA	–	2.0	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=12V, Io=1mA	–	0.5	–	mV/°C
Ripple Rejection	RR	9V < V_{IN} < 20V, Io=40mA ein=1Vp-p, f=120Hz	40	67	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=12V,BW=10Hz ~ 100kHz Io=40mA	–	80	–	μV
NJM78L62A(*2)						
Output Voltage	Vo	V_{IN}=12.2V, Io=40mA	5.89	6.2	6.51	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=8.7V ~ 20.2V, Io=40mA	–	–	200	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=9.2V ~ 20.2V, Io=40mA	–	–	150	mV
Load Regulation1	ΔVo–Io1	V_{IN}=12.2V, Io=1 ~ 40mA	–	–	40	mV
Load Regulation2	ΔVo–Io2	V_{IN}=12.2V, Io=1 ~ 100mA	–	–	85	mV
Quiescent Current	I_Q	V_{IN}=12.2V, Io=0mA	–	2.0	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=12.2V, Io=1mA	–	0.5	–	mV/°C
Ripple Rejection	RR	9.2V < V_{IN} < 20.2V, Io=40mA ein=1Vp-p, f=120Hz	40	67	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=12.2V,BW=10Hz ~ 100kHz Io=40mA	–	85	–	μV
NJM78L07A						
Output Voltage	Vo	V_{IN}=13V, Io=40mA	6.65	7.0	7.35	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=9.5V ~ 22V, Io=40mA	–	–	210	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=10V ~ 22V, Io=40mA	–	–	160	mV
Load Regulation1	ΔVo–Io1	V_{IN}=13V, Io=1 ~ 40mA	–	–	45	mV
Load Regulation2	ΔVo–Io2	V_{IN}=13V, Io=1 ~ 100mA	–	–	90	mV
Quiescent Current	I_Q	V_{IN}=13V, Io=0mA	–	2.1	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=13V, Io=1mA	–	0.55	–	mV/°C
Ripple Rejection	RR	10V < V_{IN} < 20V, Io=40mA ein=1Vp-p, f=120Hz	39	66	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=13V,BW=10Hz ~ 100kHz Io=40mA	–	100	–	μV
NJM78L08A						
Output Voltage	Vo	V_{IN}=14V, Io=40mA	7.6	8.0	8.4	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=10.5V ~ 23V, Io=40mA	–	–	225	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=11V ~ 23V, Io=40mA	–	–	175	mV
Load Regulation1	ΔVo–Io1	V_{IN}=14V, Io=1 ~ 40mA	–	–	50	mV
Load Regulation2	ΔVo–Io2	V_{IN}=14V, Io=1 ~ 100mA	–	–	100	mV
Quiescent Current	I_Q	V_{IN}=14V, Io=0mA	–	2.1	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=14V, Io=1mA	–	0.6	–	mV/°C
Ripple Rejection	RR	11V < V_{IN} < 20V, Io=40mA ein=1Vp-p, f=120Hz	39	66	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=14V,BW=10Hz ~ 100kHz Io=40mA	–	115	–	μV

(*1):SOT-89 package only.
(*2):TO-92 package only.
(*3):SOT-89,TO-92, EMP8

■ ELECTRICAL CHARACTERISTICS(C_{IN}=0.33μF,Co=0.1μF,Tj=25°C)
Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM78L09A(*3)						
Output Voltage	Vo	V_{IN}=15V, Io=40mA	8.55	9.0	9.45	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=11.5V ~ 23V, Io=40mA	–	–	250	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=12V ~ 23V, Io=40mA	–	–	200	mV
Load Regulation1	ΔVo–Io1	V_{IN}=15V, Io=1 ~ 40mA	–	–	50	mV
Load Regulation2	ΔVo–Io2	V_{IN}=15V, Io=1 ~ 100mA	–	–	100	mV
Quiescent Current	I_Q	V_{IN}=15V, Io=0mA	–	2.1	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=15V, Io=1mA	–	0.65	–	mV/°C
Ripple Rejection	RR	12V < V_{IN} < 21V, Io=40mA ein=1Vp-p, f=120Hz	38	65	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=15V,BW=10Hz ~ 100kHz Io=40mA	–	125	–	μV
NJM78L10A						
Output Voltage	Vo	V_{IN}=16V, Io=40mA	9.5	10.0	10.5	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=13V ~ 25V, Io=40mA	–	–	250	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=14V ~ 25V, Io=40mA	–	–	200	mV
Load Regulation1	ΔVo–Io1	V_{IN}=16V, Io=1 ~ 40mA	–	–	50	mV
Load Regulation2	ΔVo–Io2	V_{IN}=16V, Io=1 ~ 100mA	–	–	100	mV
Quiescent Current	I_Q	V_{IN}=16V, Io=0mA	–	2.1	6	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=16V, Io=1mA	–	0.7	–	mV/°C
Ripple Rejection	RR	13V < V_{IN} < 22V, Io=40mA ein=1Vp-p, f=120Hz	37	64	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=16V,BW=10Hz ~ 100kHz Io=40mA	–	135	–	μV
NJM78L12A(*3)						
Output Voltage	Vo	V_{IN}=19V, Io=40mA	11.4	12.0	12.6	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=14.5V ~ 27V, Io=40mA	–	–	250	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=16V ~ 27V, Io=40mA	–	–	200	mV
Load Regulation1	ΔVo–Io1	V_{IN}=19V, Io=1 ~ 40mA	–	–	50	mV
Load Regulation2	ΔVo–Io2	V_{IN}=19V, Io=1 ~ 100mA	–	–	100	mV
Quiescent Current	I_Q	V_{IN}=19V, Io=0mA	–	2.1	6.5	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=19V, Io=1mA	–	0.9	–	mV/°C
Ripple Rejection	RR	15V < V_{IN} < 25V, Io=40mA ein=1Vp-p, f=120Hz	37	62	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=19V,BW=10Hz ~ 100kHz Io=40mA	–	160	–	μV
NJM78L15A						
Output Voltage	Vo	V_{IN}=23V, Io=40mA	14.3	15.0	15.7	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=17.5V ~ 30V, Io=40mA	–	–	300	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=20V ~ 30V, Io=40mA	–	–	250	mV
Load Regulation1	ΔVo–Io1	V_{IN}=23V, Io=1 ~ 40mA	–	–	75	mV
Load Regulation2	ΔVo–Io2	V_{IN}=23V, Io=1 ~ 100mA	–	–	150	mV
Quiescent Current	I_Q	V_{IN}=23V, Io=0mA	–	2.2	6.5	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=23V, Io=1mA	–	1.0	–	mV/°C
Ripple Rejection	RR	18.5V < V_{IN} < 28.5V, Io=40mA ein=1Vp-p, f=120Hz	34	60	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=23V,BW=10Hz ~ 100kHz Io=40mA	–	190	–	μV

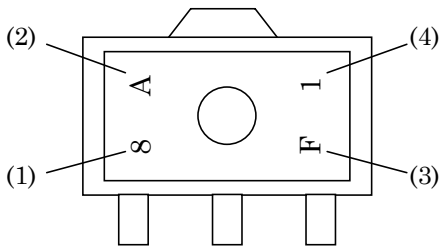
(*1):SOT-89 package only.
(*2):TO-92 package only.
(*3):SOT-89,TO-92, EMP8

■ ELECTRICAL CHARACTERISTICS(C_{IN}=0.33μF,Co=0.1μF,Tj=25°C)
Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM78L18A						
Output Voltage	Vo	V_{IN}=27V, Io=40mA	17.1	18.0	18.9	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=22V ~ 33V, Io=40mA	–	–	320	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=23V ~ 33V, Io=40mA	–	–	270	mV
Load Regulation1	ΔVo–Io1	V_{IN}=27V, Io=1 ~ 40mA	–	–	80	mV
Load Regulation2	ΔVo–Io2	V_{IN}=27V, Io=1 ~ 100mA	–	–	160	mV
Quiescent Current	I_Q	V_{IN}=27V, Io=0mA	–	2.2	6.5	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=27V, Io=1mA	–	1.1	–	mV/°C
Ripple Rejection	RR	23V < V_{IN} < 33V, Io=40mA ein=1Vp-p, f=120Hz	33	59	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=27V,BW=10Hz ~ 100kHz Io=40mA	–	230	–	μV
NJM78L20A						
Output Voltage	Vo	V_{IN}=29V, Io=40mA	19.0	20.0	21.0	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=23V ~ 34V, Io=40mA	–	–	330	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=24V ~ 34V, Io=40mA	–	–	280	mV
Load Regulation1	ΔVo–Io1	V_{IN}=29V, Io=1 ~ 40mA	–	–	90	mV
Load Regulation2	ΔVo–Io2	V_{IN}=29V, Io=1 ~ 100mA	–	–	180	mV
Quiescent Current	I_Q	V_{IN}=29V, Io=0mA	–	2.3	7	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=29V, Io=1mA	–	1.2	–	mV/°C
Ripple Rejection	RR	24V < V_{IN} < 34V, Io=40mA ein=1Vp-p, f=120Hz	32	58	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=29V,BW=10Hz ~ 100kHz Io=40mA	–	250	–	μV
NJM78L24A						
Output Voltage	Vo	V_{IN}=33V, Io=40mA	22.8	24	25.2	V
Line Regulation1	ΔVo–V_{IN}1	V_{IN}=27V ~ 38V, Io=40mA	–	–	350	mV
Line Regulation2	ΔVo–V_{IN}2	V_{IN}=28V ~ 38V, Io=40mA	–	–	300	mV
Load Regulation1	ΔVo–Io1	V_{IN}=33V, Io=1 ~ 40mA	–	–	100	mV
Load Regulation2	ΔVo–Io2	V_{IN}=33V, Io=1 ~ 100mA	–	–	200	mV
Quiescent Current	I_Q	V_{IN}=33V, Io=0mA	–	2.3	7	mA
Average Temperature Coefficient of Output Voltage	ΔVo/ΔT	V_{IN}=33V, Io=1mA	–	1.4	–	mV/°C
Ripple Rejection	RR	27.5V < V_{IN} < 37.5V, Io=40mA ein=1Vp-p, f=120Hz	32	57	–	dB
Output Noise Voltage	V_{NO}	V_{IN}=33V,BW=10Hz ~ 100kHz Io=40mA	–	280	–	μV

(*1):SOT-89 package only.
(*2):TO-92 package only.
(*3):SOT-89,TO-92, EMP8

■ SOT-89 MARK

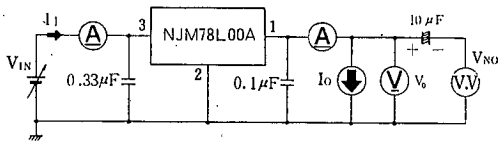


(1) 8 : Positive Output
(2) Vo Rank
(3) The end of A.D.
(4) Production Mouth
Oct. ··· X
Nov. ··· Y
Dec. ··· Z

NJM78L02A	8	A
NJM78L03A	8	B
NJM78L05A	8	C
NJM78L06A	8	E
NJM78L62A	8	Z
NJM78L07A	8	F
NJM78L08A	8	G
NJM78L09A	8	H
NJM78L10A	8	J
NJM78L12A	8	K
NJM78L15A	8	L
NJM78L18A	8	M
NJM78L20A	8	N
NJM78L24A	8	P

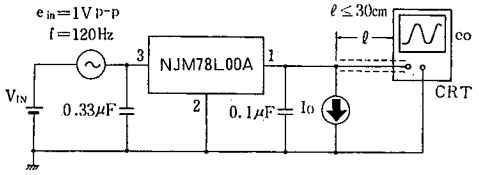
■ TEST CIRCUIT

1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage, Peak Output/Short-Circuit Current



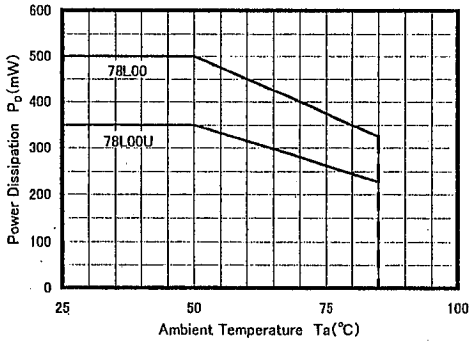
○ Measurement is to be conducted in pulse testing.
○ $I_Q = I_I - I_O$

2. Ripple Rejection



$$RR = 20\log_{10}\left(\frac{e_{in}}{e_o}\right) \quad (dB)$$

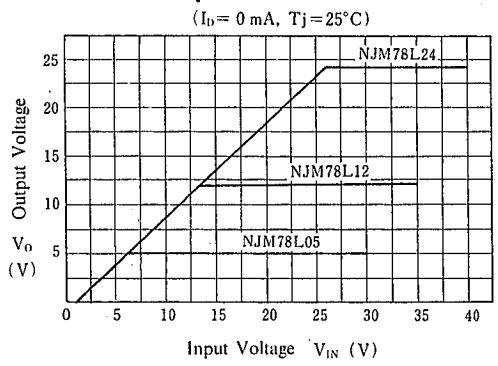
■ AMBIENT TEMPERATURE VS. POWER DISSIPATION



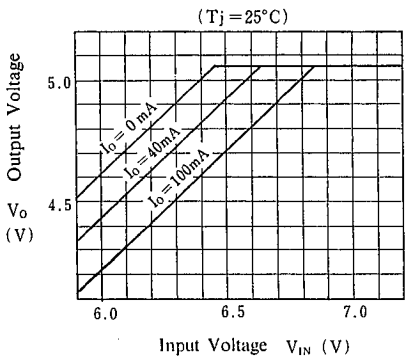
6

■ TYPICAL CHARACTERISTICS

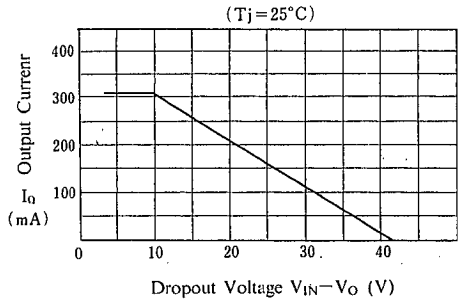
NJM78L05/L12/L24
Output Characteristics



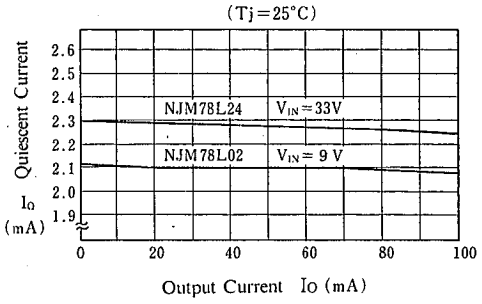
NJM78L05 Dropout Characteristics



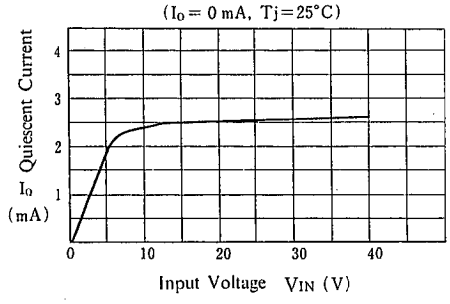
NJM78L00 Series Short Circuit Output Current



NJM78L02/L24 Quiescent Current vs. Output Current

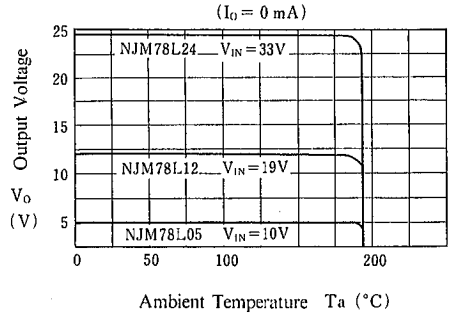


NJM78L05 Quiescent Current vs. Input Voltage

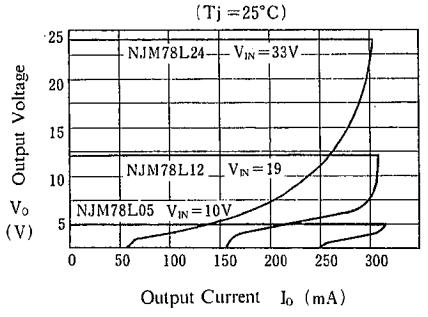


■ TYPICAL CHARACTERISTICS

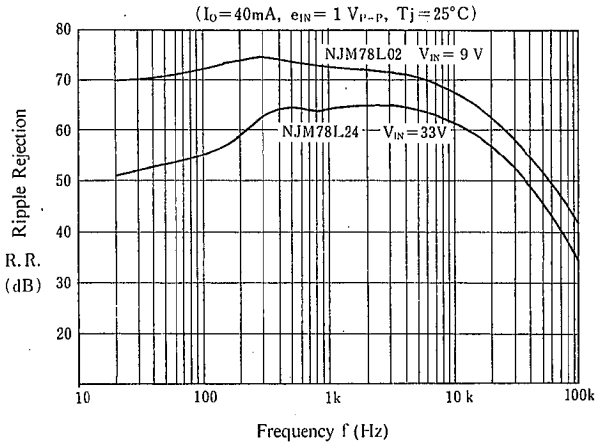
NJM78L05/L12/L24
Thermal Shutdown Characteristics



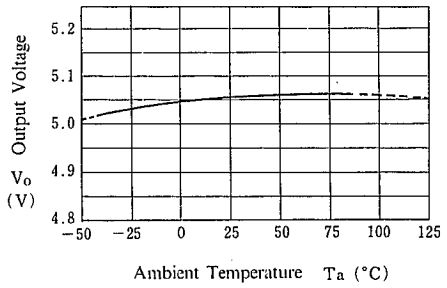
NJM78L05/L12/L24
Load Characteristics



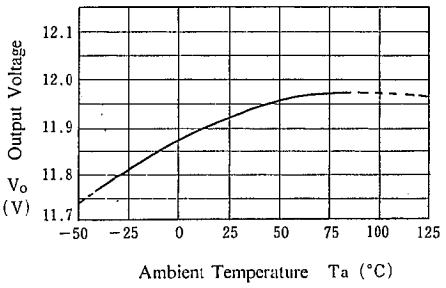
NJM78L02/L24 Ripple Rejection



NJM78L05 Output Voltage vs. Temperature



NJM78L12 Output Voltage vs. Temperature



MEMO

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