3-TERMINAL NEGATIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

The NJM79M00 series of 3-Terminal Negative Voltage Regulators are constructed using the New JRC Planar epitaxial process. These regulators employ internal current limiting, thermal shutdown and safe-area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver up to 500mA output current. They are intended as fixed voltage regulators in a wide range of applications including local (on-card) regulation for elimination of noise and distribution problems associated with single point regulation. In addition to use a fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents.
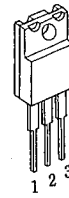
■ FEATURES

- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Excellent Ripple Rejection
- Guarantee'd 500mA Output Current
- Package Outline   TO-220F, TO-252
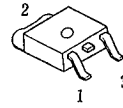- Bipolar Technology

■ PACKAGE OUTLINE

(TO-220F)

(TO-252)   (TO-252)
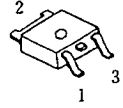
NJM79M00FA	NJM79M00DLA	NJM79M00DL1A
1. COMMON	1.COMMON	1.COMMON
2. IN	2.IN	2.IN
3. OUT	3.OUT	3.OUT

(note) The radiation fin is connected to Pin 2.

■ EQUIVALENT CIRCUIT

NJM79M00
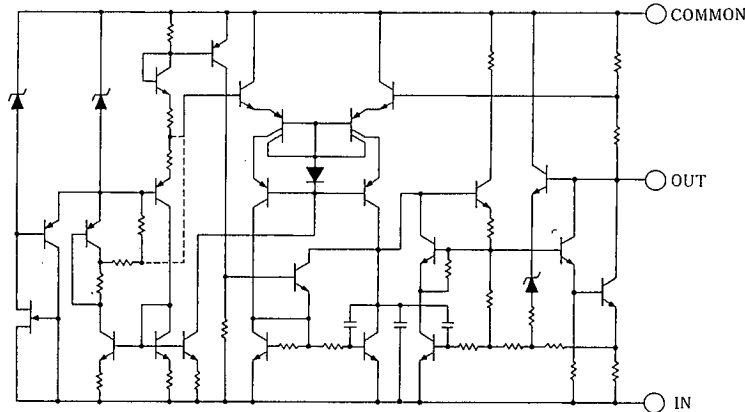
■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT
Input Voltage	V_{IN}	79M05~79M09	−35	V
		79M12~79M15	−35	
		79M18~79M24	−40	
Storge Temperature Range	T_{stg}	TO-220F −40~+150		°C
		TO-252 −40~+150		
Operating Temperature Range		Operating Junction Temperature	Tj	TO-220F −30~+150	°C
				TO-252 −30~+150	
		Operating Junction Temperature	Topr	−40~+85	
Power Dissipation	P_D	7.5($T_C \leqq 75$°C)		W

■ THERMAL CHARACTERISTICS

			TO220F	TO252	
Thermal Resistance	Junction-to-Ambient Temperature	θ ja	60	125	°C/W
	Junction-to-Case	θ jc	7	12.5	

■ ELECTRICAL CHARACTERISTICS (T_j=25°C. C_{IN}=2.2 μF, Co=1.0 μF.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM79M05A						
Output Voltage	V_O	V_{IN}=−10V, I_O=0.35A	−4.8	−5.0	−5.2	V
Quiescent Current	I_Q	V_{IN}=−10V, I_O=0mA	—	2.2	5.0	mA
Load Regulation	$\Delta V_O \cdot I_O$	V_{IN}=−10V, I_O=0.005~0.5A	—	35	50	mV
Line Regulation	$\Delta V_O \cdot V_{IN}$	V_{IN}=−7~−25V, I_O=0.35A	—	5	50	mV
Ripple Rejection	RR	V_{IN}=−10V,I_O=0.35A,e_{in}=2V_{P-P},f=120Hz	50	58	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−10V,I_O=0.35A,BW=10Hz~100kHz	—	100	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−10V, I_O=5mA	—	−0.4	—	mV/°C

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■ ELECTRICAL CHARACTERISTICS (Tj=25℃. CIN=2.2 μF, Co=1.0 μF)   Measurement is to be conducted in pulse testing..

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM79M06A						
Output Voltage	V_O	$V_{IN}=-11V$, $I_O=0.35A$	−5.75	−6.0	−6.25	V
Quiescent Current	I_Q	$V_{IN}=-11V$, $I_O=0mA$	—	2.2	5.0	mA
Load Regulation	$\Delta V_O\text{-}I_O$	$V_{IN}=-11V$, $I_O=0.005\sim0.5A$	—	35	60	mV
Line Regulation	$\Delta V_O\text{-}V_{IN}$	$V_{IN}=-8\sim-25V$,$Io=0.35A$	—	5	60	mV
Ripple Rejection	RR	$V_{IN}=-11V$,$I_O=0.35A$,$e_{in}=2V_{P-P}$,$f=120Hz$	50	57	—	dB
Output Noise Voltage	V_{NO}	$V_{IN}=-11V$,$I_O=0.35A$,$BW=10Hz\sim100kHz$	—	110	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=-11V$, $I_O=5mA$	—	−0.5	—	mV/℃
NJM79M08A						
Output Voltage	V_O	$V_{IN}=-14V$, $I_O=0.35A$	−7.7	−8.0	−8.3	V
Quiescent Current	I_Q	$V_{IN}=-14V$, $I_O=0mA$	—	2.2	5.0	mA
Load Regulation	$\Delta V_O\text{-}I_O$	$V_{IN}=-14V$, $I_O=0.005\sim0.5A$	—	40	80	mV
Line Regulation	$\Delta V_O\text{-}V_{IN}$	$V_{IN}=-10.5\sim-25V$, $Io=0.35A$	—	8	80	mV
Ripple Rejection	RR	$V_{IN}=-14V$,$I_O=0.35A$,$e_{in}=2V_{P-P}$,$f=120Hz$	50	55	—	dB
Output Noise Voltage	V_{NO}	$V_{IN}=-14V$,$I_O=0.35A$,$BW=10Hz\sim100kHz$	—	130	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=-14V$, $I_O=5mA$	—	−0.7	—	mV/℃
NJM79M09A						
Output Voltage	V_O	$V_{IN}=-15V$, $I_O=0.35A$	−8.65	−9.0	−9.35	V
Quiescent Current	I_Q	$V_{IN}=-15V$, $I_O=0mA$	—	2.2	5.0	mA
Load Regulation	$\Delta V_O\text{-}I_O$	$V_{IN}=-15V$, $I_O=0.005\sim0.5A$	—	40	90	mV
Line Regulation	$\Delta V_O\text{-}V_{IN}$	$V_{IN}=-11.5\sim-25V$, $Io=0.35A$	—	8	80	mV
Ripple Rejection	RR	$V_{IN}=-15V$,$I_O=0.35A$,$e_{in}=2V_{P-P}$,$f=120Hz$	50	54	—	dB
Output Noise Voltage	V_{NO}	$V_{IN}=-15V$,$I_O=0.35A$,$BW=10Hz\sim100kHz$	—	150	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=-15V$, $I_O=5mA$	—	−0.8	—	mV/℃
NJM79M12A						
Output Voltage	V_O	$V_{IN}=-19V$, $I_O=0.35A$	−11.5	−12.0	−12.5	V
Quiescent Current	I_Q	$V_{IN}=-19V$, $I_O=0mA$	—	2.7	6.0	mA
Load Regulation	$\Delta V_O\text{-}I_O$	$V_{IN}=-19V$, $I_O=0.005\sim0.5A$	—	30	120	mV
Line Regulation	$\Delta V_O\text{-}V_{IN}$	$V_{IN}=-14.5\sim-30V$, $Io=0.35A$	—	3	80	mV
Ripple Rejection	RR	$V_{IN}=-19V$,$I_O=0.35A$,$e_{in}=2V_{P-P}$,$f=120Hz$	54	71	—	dB
Output Noise Voltage	V_{NO}	$V_{IN}=-19V$,$I_O=0.35A$,$BW=10Hz\sim100kHz$	—	150	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=-19V$, $I_O=5mA$	—	−0.4	—	mV/℃

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■ **ELECTRICAL CHARACTERISTICS** (T$_j$=25℃. C$_{IN}$=2.2 μF, Co=1.0 μF)   Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM79M15A						
Output Voltage	V$_O$	V$_{IN}$=−23V, I$_O$=0.35A	−14.4	−15.0	−15.6	V
Quiescent Current	I$_Q$	V$_{IN}$=−23V, I$_O$=0mA	—	2.7	6.0	mA
Load Regulation	ΔV$_O$-I$_O$	V$_{IN}$=−23V, I$_O$=0.005~0.5A	—	30	150	mV
Line Regulation	ΔV$_O$-V$_{IN}$	V$_{IN}$=−17.5~−30V, I$_O$=0.35A	—	3	80	mV
Ripple Rejection	RR	V$_{IN}$=−23V, I$_O$=0.35A, e$_{in}$=2V$_{P-P}$, f=120Hz	54	70	—	dB
Output Noise Voltage	V$_{NO}$	V$_{IN}$=−23V, I$_O$=0.35A, BW=10Hz~100kHz	—	170	—	μV
Average Temperature Coefficient of Output Voltage	ΔV$_O$/ΔT	V$_{IN}$=−23V, I$_O$=5mA	—	−0.5	—	mV/℃
NJM79M18A						
Output Voltage	V$_O$	V$_{IN}$=−27V, I$_O$=0.35A	−17.3	−18.0	−18.7	V
Quiescent Current	I$_Q$	V$_{IN}$=−27V, I$_O$=0mA	—	2.7	6.0	mA
Load Regulation	ΔV$_O$-I$_O$	V$_{IN}$=−27V, I$_O$=0.005~0.5A	—	35	180	mV
Line Regulation	ΔV$_O$-V$_{IN}$	V$_{IN}$=−21~−33V, I$_O$=0.35A	—	4	80	mV
Ripple Rejection	RR	V$_{IN}$=−27V, I$_O$=0.35A, e$_{in}$=2V$_{P-P}$, f=120Hz	54	69	—	dB
Output Noise Voltage	V$_{NO}$	V$_{IN}$=−27V, I$_O$=0.35A, BW=10Hz~100kHz	—	200	—	μV
Average Temperature Coefficient of Output Voltage	ΔV$_O$/ΔT	V$_{IN}$=−27V, I$_O$=5mA	—	−0.6	—	mV/℃
NJM79M24A						
Output Voltage	V$_O$	V$_{IN}$=−33V, I$_O$=0.35A	−23.0	−24.0	−25.0	V
Quiescent Current	I$_Q$	V$_{IN}$=−33V, I$_O$=0mA	—	2.7	6.0	mA
Load Regulation	ΔV$_O$-I$_O$	V$_{IN}$=−33V, I$_O$=0.005~0.5A	—	40	240	mV
Line Regulation	ΔV$_O$-V$_{IN}$	V$_{IN}$=−27~−38V, I$_O$=0.35A	—	5	80	mV
Ripple Rejection	RR	V$_{IN}$=−33V, I$_O$=0.35A, e$_{in}$=2V$_{P-P}$, f=120Hz	54	66	—	dB
Output Noise Voltage	V$_{NO}$	V$_{IN}$=−33V, I$_O$=0.35A, BW=10Hz~100kHz	—	300	—	μV
Average Temperature Coefficient of Output Voltage	ΔV$_O$/ΔT	V$_{IN}$=−33V, I$_O$=5mA	—	−0.8	—	mV/℃

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■ TEST CIRCUIT

1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage

2. Ripple Rejection

$$I_Q = I_{IN} - I_0$$

$$e_{in} = 2V_{P-P}$$
$$f = 120Hz$$

$$RR = 20 \log_{10} \left(\frac{e_{in}}{e_0} \right) \text{ (dB)}$$
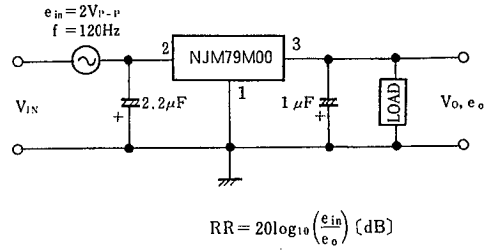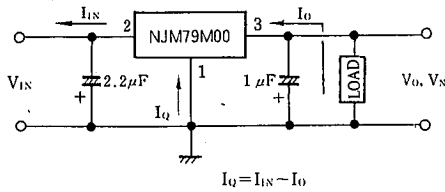
■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

NJM79M00FA
(θ_{HS}=Heat Sink Thermal Resistace)

NJM79M00DLA/DL1A
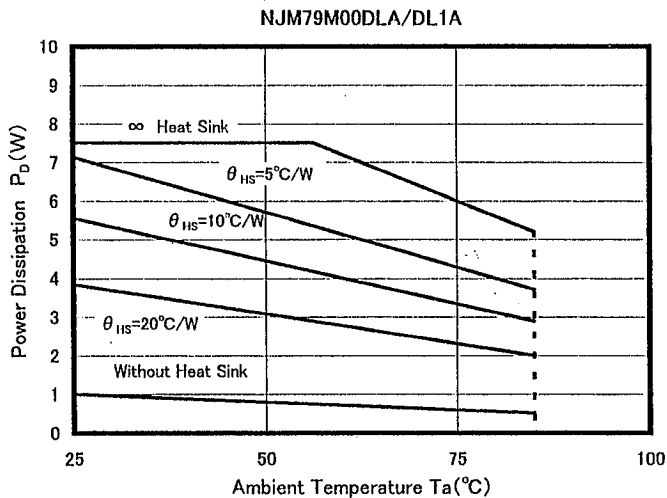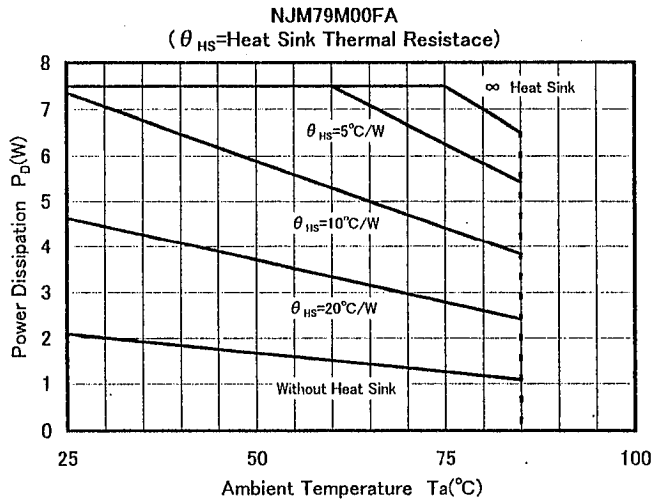
■ TYPICAL CHARACTERISTICS

NJM79M00 Output Characteristics
(Tj=25°C, I₀=0.35A)

Output Voltage V₀ (V) vs. Input Voltage V$_{IN}$ (V)

NJM79M24
NJM79M15
NJM79M09
NJM79M05
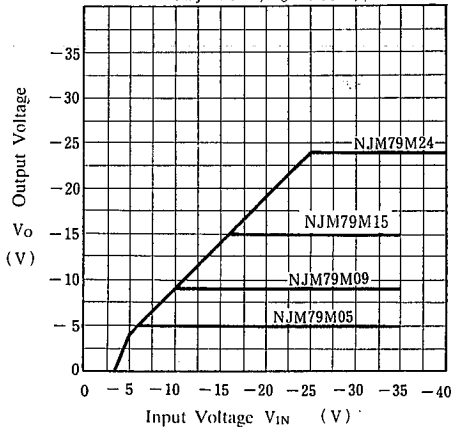
NJM79M12 Output Voltage vs. Low Input Voltage
(Tj=25°C)

Output Voltage V₀ (V) vs. Input Voltage V$_{IN}$ (V)

I₀=1mA
I₀=350mA
I₀=500mA
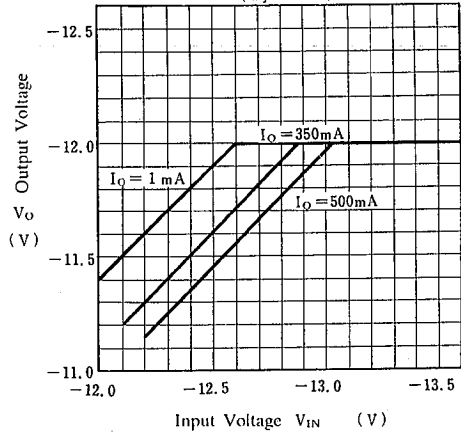
NJM79M05/15/24 Load Characteristics
(Tj=25°C)

Output Voltage V₀ (V) vs. Output Current I₀ (A)

NJM79M24 — V$_{IN}$=−33V
NJM79M15   V$_{IN}$=−23V
NJM79M05   V$_{IN}$=−10V
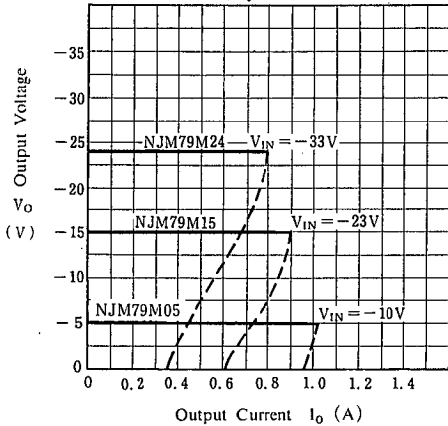
NJM79M00 Series Short Circuit Output Current
(Tj=25°C)

Output Current I₀ (A) vs. Dropout Voltage V₀−V$_I$ (V)
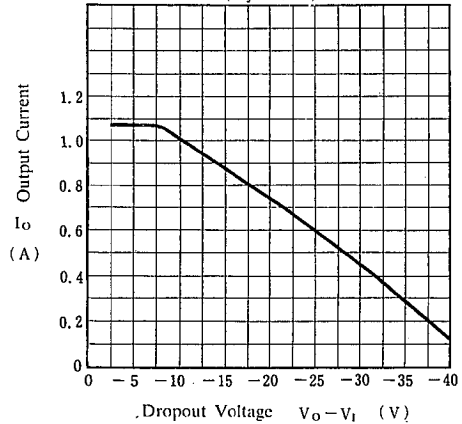
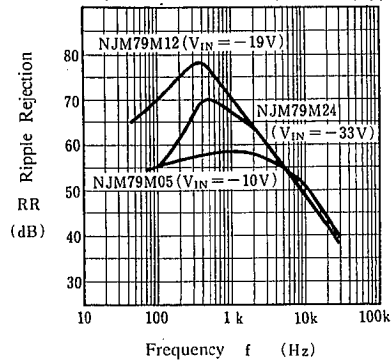## NJM79M05/12/24 Output Voltage vs. Junction Temperature

Output Voltage V₀ (V) vs. Junction Temperature Tj (°C)
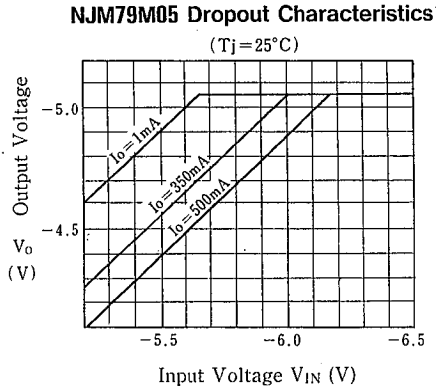
NJM79M24   V$_{IN}$=−33V
NJM79M12   V$_{IN}$=−19V
NJM79M05   V$_{IN}$=−10V
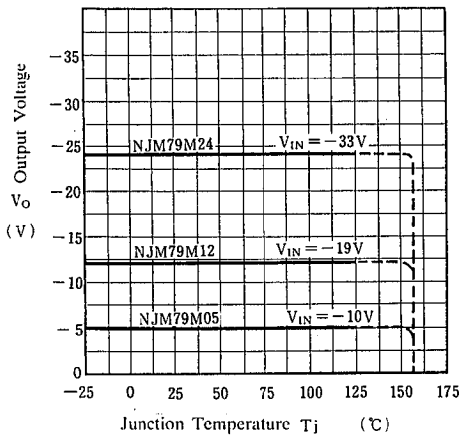
NJM79M05/15/24 Ripple Rejection vs. Frequency
(Tj=25°C, I₀=350mA, e$_{in}$=2V$_{p-p}$)

Ripple Rejection RR (dB) vs. Frequency f (Hz)

NJM79M12(V$_{IN}$=−19V)
NJM79M24 (V$_{IN}$=−33V)
NJM79M05(V$_{IN}$=−10V)

■ **TYPICAL CHARACTERISTICS**

NJM79M05 Dropout Characteristics
(Tj = 25°C)

Output Voltage Vo (V) vs. Input Voltage VIN (V)

NJM79M05 Output Voltage vs. Temperature

Output Voltage Vo (V) vs. Ambient Temperature Ta (°C)

Quiescent Current vs. Input Voltage
(Io = 0 mA, Tj = 25°C)

Quiescent Current IQ (mA) vs. Input Voltage VIN(V)

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MEMO