3-TERMINAL NEGATIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

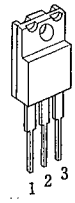
The NJM7900 series of Monolithic 3-Terminal Negative Regulators is constructed using the New JRC Planar epitaxial process. These negative regulators are intended as complements to the popular NJM7800 series of positive voltage regulators, and they are available in the same voltage options from −5 to −24V. The 7900 series employ internal current-limiting, safe-area protection, and thermal shutdown, making the virtually indestructible.

■ FEATURES

- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Excellent Ripple Rejection
- Guarantee'd 1.5A Output Current
- Package Outline TO-220F
- Bipolar Technology

■ PACKAGE OUTLINE

(TO-220F)

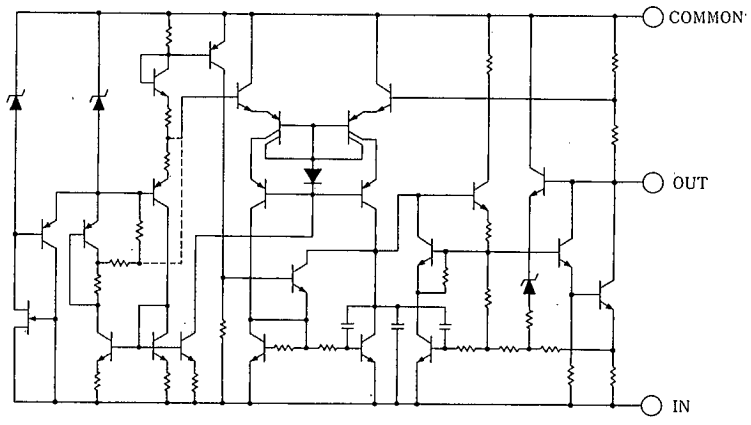


1. COMMON
2. IN
3. OUT

NJM7900FA

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

■ EQUIVALENT CIRCUIT



6

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

PARAMETER	SYMBOL	MAXIMUM RATINGS			UNIT
Input Voltage	V_{IN}	7905～7909		−35	V
		7912～7915		−35	
		7918～7924		−40	
Storge Temperature Range	T_{stg}	−40～+150			℃
Operating Temperature Range	Operating Junction Temperature		Tj	−30～+150	℃
	Operating Junction Temperature		Topr	−40～+85	
Power Dissipation	P_D	16(Tc≦45℃)			W

■ THERMAL CHARACTERISTICS

Thermal Resistance	Junction-to-Ambient Temperature	θja	60	°C/W
	Junction-to-Case	θjc	5	

■ ELECTRICAL CHARACTERISTICS (T_j=25℃, C_{IN}=2.2 μF, Co=1.0 μF.) Measurement is to be conducted in pulse testing.

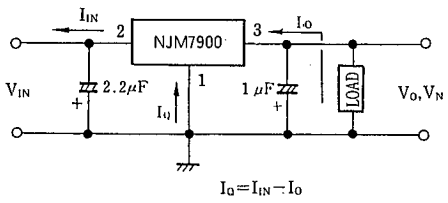
PARAMETER	SYMBOL	TEST CONDITION	Min.	TYP.	MAX.	UNIT
NJM7905FA						
Output Voltage	V_O	V_{IN}=−10V, I_O=0.5A	−4.8	−5.0	−5.2	V
Quiescent Current	I_O	V_{IN}=−10V, I_O=0mA	—	2.2	5.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−10V, I_O=0.005~1.5A	—	50	80	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−7~−25V, I_O=0.5A	—	5	50	mV
Ripple Rejection	RR	V_{IN}=−10V, I_O=0.5A, e_m=2$V_{p\text{-}p}$, f=120Hz	54	60	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−10V, I_O=0.5A, 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/℃
NJM7906FA						
Output Voltage	V_O	V_{IN}=−11V, I_O=0.5A	−5.75	−6.0	−6.25	V
Quiescent Current	I_O	V_{IN}=−11V, I_O=0mA	—	2.2	5.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−11V, I_O=0.005~1.5A	—	50	90	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−8~−25V, I_O=0.5A	—	5	60	mV
Ripple Rejection	RR	V_{IN}=−11V, I_O=0.5A, e_m=2$V_{p\text{-}p}$, f=120Hz	54	60	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−11V, I_O=0.5A, BW=10Hz~100kHz	—	110	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−11V, I_O=5mA	—	−0.5	—	mV/℃
NJM7908FA						
Output Voltage	V_O	V_{IN}=−14V, I_O=0.5A	−7.7	−8.0	−8.3	V
Quiescent Current	I_O	V_{IN}=−14V, I_O=0mA	—	2.2	5.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−14V, I_O=0.005~1.5A	—	60	110	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−10.5~−25V, I_O=0.5A	—	8	80	mV
Ripple Rejection	RR	V_{IN}=−14V, I_O=0.5A, e_m=2$V_{p\text{-}p}$, f=120Hz	54	60	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−14V, I_O=0.5A, BW=10Hz~100kHz	—	130	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−14V, I_O=5mA	—	−0.7	—	mV/℃
NJM7909FA						
Output Voltage	V_O	V_{IN}=−15V, I_O=0.5A	−8.65	−9.0	−9.35	V
Quiescent Current	I_O	V_{IN}=−15V, I_O=0mA	—	2.2	5.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−15V, I_O=0.005~1.5A	—	60	120	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−11.5~−25V, I_O=0.5A	—	8	90	mV
Ripple Rejection	RR	V_{IN}=−15V, I_O=0.5A, e_m=2$V_{p\text{-}p}$, f=120Hz	54	59	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−15V, I_O=0.5A, BW=10Hz~100kHz	—	150	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−15V, I_O=5mA	—	−0.8	—	mV/℃
NJM7912FA						
Output Voltage	V_O	V_{IN}=−19V, I_O=0.5A	−11.5	−12.0	−12.5	V
Quiescent Current	I_O	V_{IN}=−19V, I_O=0mA	—	2.7	6.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−19V, I_O=0.005~1.5A	—	60	150	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−14.5~−30V, I_O=0.5A	—	3	120	mV
Ripple Rejection	RR	V_{IN}=−19V, I_O=0.5A, e_m=2$V_{p\text{-}p}$, f=120Hz	54	68	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−19V, I_O=0.5A, BW=10Hz~100kHz	—	150	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−19V, I_O=5mA	—	−0.4	—	mV/℃

■ ELECTRICAL CHARACTERISTICS (T_j=25℃. C_{IN}=2.2 μF, C_O=1.0 μF)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM7915FA						
Output Voltage	V_O	V_{IN}=−23V, I_O=0.5A	−14.4	−15.0	−15.6	V
Quiescent Current	I_O	V_{IN}=−23V, I_O=0mA	—	2.7	6.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−23V, I_O=0.005~ 1.5A	—	60	180	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−17.5~−30V, I_O=0.5A	—	3	150	mV
Ripple Rejection	RR	V_{IN}=−23V, I_O=0.5A, e_m=$2V_{p\text{-}p}$, f=120Hz	54	67	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−23V, I_O=0.5A, BW=10Hz~100kHz	—	170	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−23V, I_O=5mA	—	−0.5	—	mV/℃
NJM7918FA						
Output Voltage	V_O	V_{IN}=−27V, I_O=0.5A	−17.3	−18.0	−18.7	V
Quiescent Current	I_O	V_{IN}=−27V, I_O=0mA	—	2.7	6.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−27V, I_O=0.005~ 1.5A	—	60	210	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−21~−33V, I_O=0.5A	—	4	180	mV
Ripple Rejection	RR	V_{IN}=−27V, I_O=0.5A, e_m=$2V_{p\text{-}p}$, f=120Hz	54	66	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−27V, I_O=0.5A, BW=10Hz~100kHz	—	200	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−27V, I_O=5mA	—	−0.6	—	mV/℃
NJM7924FA						
Output Voltage	V_O	V_{IN}=−33V, I_O=0.5A	−23.0	−24.0	−25.0	V
Quiescent Current	I_O	V_{IN}=−33V, I_O=0mA	—	2.7	6.0	mA
Load Regulation	ΔV_O-I_O	V_{IN}=−33V, I_O=0.005~ 1.5A	—	60	270	mV
Line Regulation	ΔV_O-V_{IN}	V_{IN}=−27~−38V, I_O=0.5A	—	5	240	mV
Ripple Rejection	RR	V_{IN}=−33V, I_O=0.5A, e_m=$2V_{p\text{-}p}$, f=120Hz	54	64	—	dB
Output Noise Voltage	V_{NO}	V_{IN}=−33V, I_O=0.5A, BW=10Hz~100kHz	—	300	—	μV
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	V_{IN}=−33V, I_O=5mA	—	−0.8	—	mV/℃

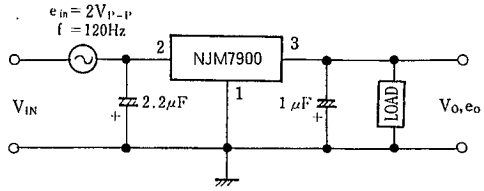
■ TEST CIRCUIT

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



$I_Q = I_{IN} - I_O$

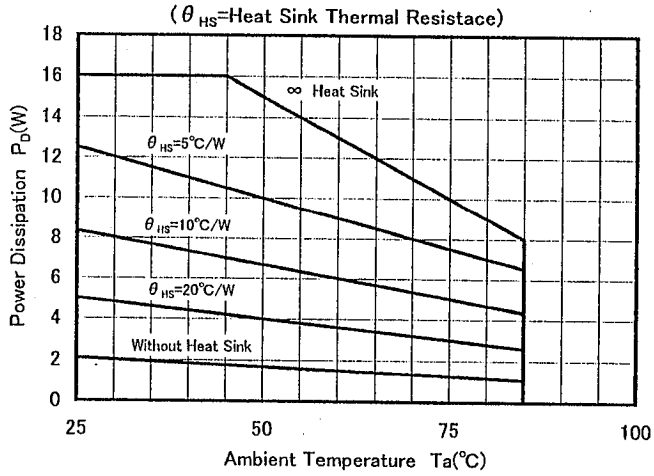
2. Ripple Rejection



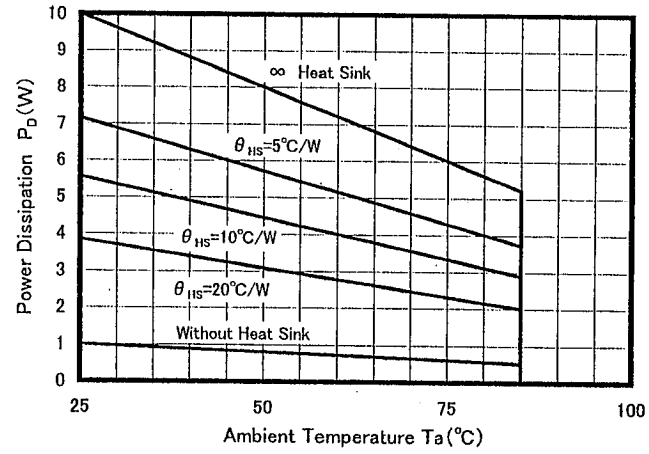
$$RR = 20\log_{10}\left(\frac{e_{in}}{e_o}\right) \text{ (dB)}$$

■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

NJM7900FA
(θ_{HS}=Heat Sink Thermal Resistace)



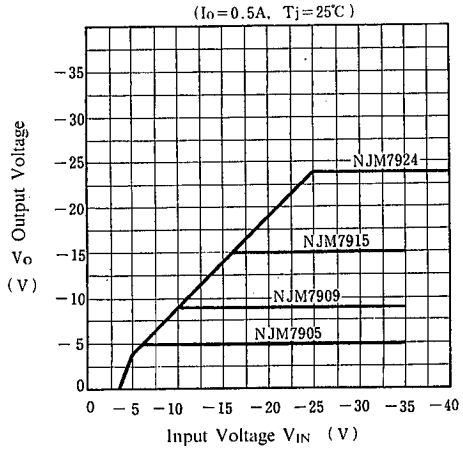
NJM7800DLA/DL1A



■ TYPICAL CHARACTERISTICS

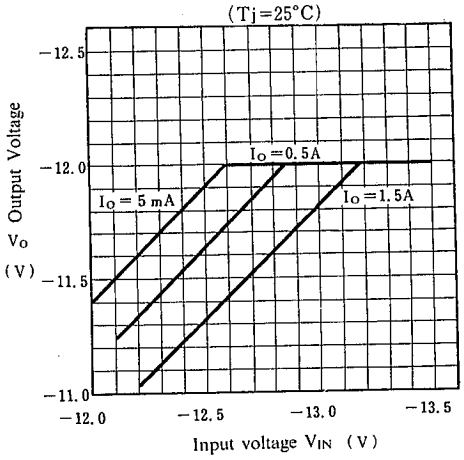
NJM7900 Output Characteristics

(Io=0.5A, Tj=25°C)



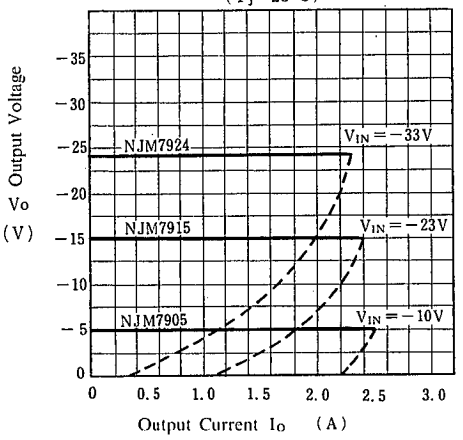
NJM7912 Output Voltage vs. Low Input Voltage

(Tj=25°C)



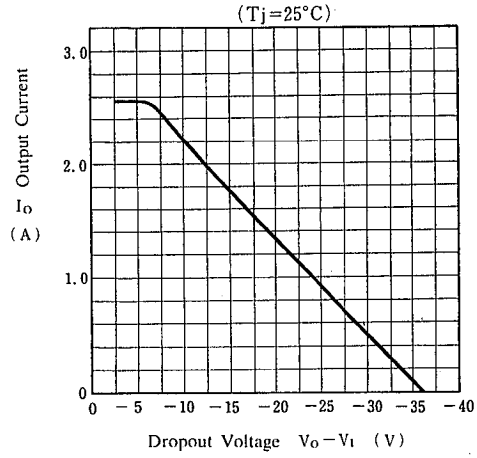
NJM7905/15/24 Load Characteristics

(Tj=25°C)

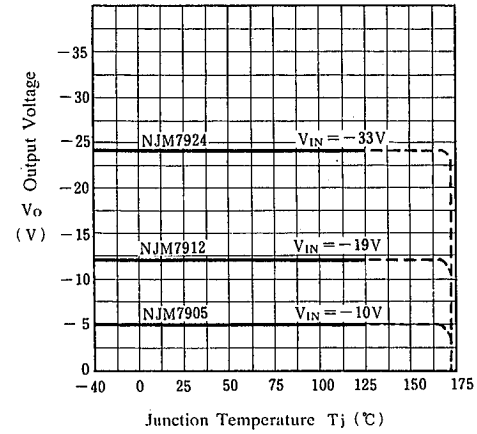


NJM7900 Series Short Circuit Output Current

(Tj=25°C)

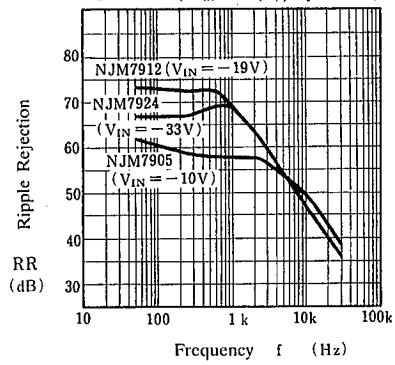


NJM7905/12/24 Output Voltage vs. Junction Temperature



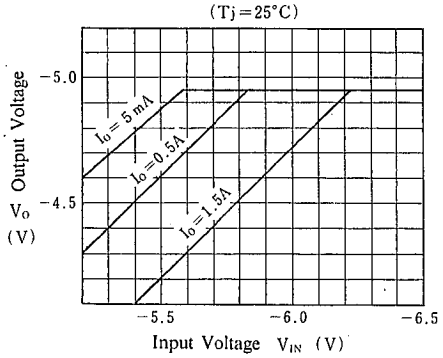
NJM7905/15/24 Ripple Rejection vs. Frequency

(Io=500mA, e_{in}=2V_{p-p}, Tj=25°C)

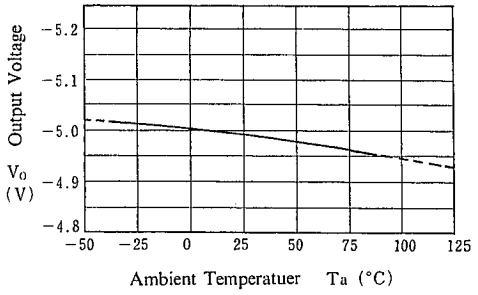


■ TYPICAL CHARACTERISTICS

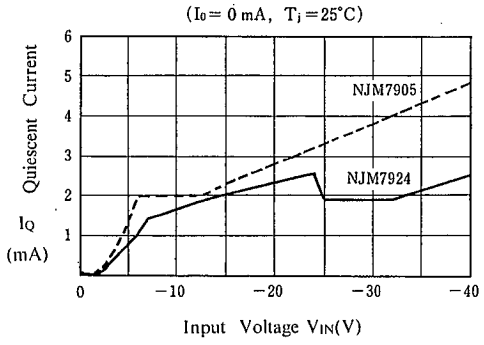
NJM7905 Dropout Characteristics



NJM7905 Output Voltage vs. Temperature



Quiescent Current vs. Input Voltage



6

MEMO