

3-TERMINAL NEGATIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

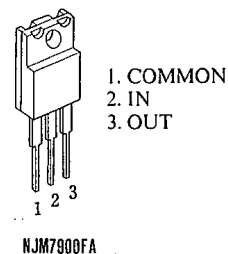
The NJM7900 series of Monolithic 3-Terminal Negative Regulators is constructed using the New JRC Planar epitaxial process. These negative regulators are intended as complements to the popular NJM7800 series of positive voltage regulators, and they are available in the same voltage options from -5 to -24 V. 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

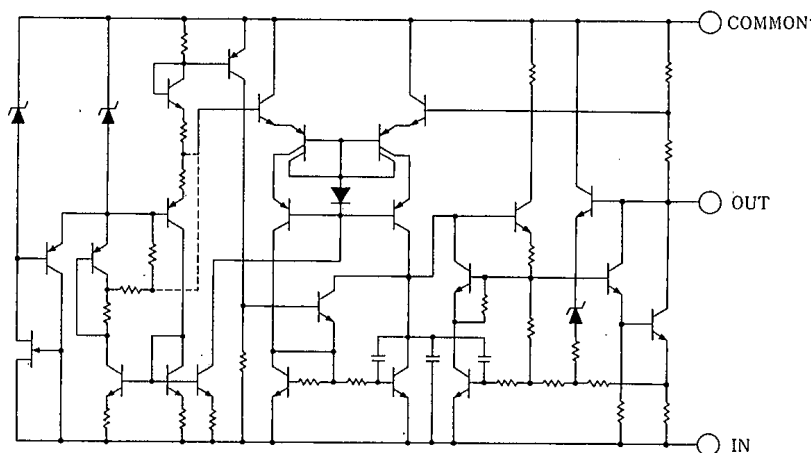
■ PACKAGE OUTLINE

(TO-220F)



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

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT
Input Voltage	V _{IN}	7905~7909	-35	V
		7912~7915	-35	
		7918~7924	-40	
Storage Temperature Range	T _{stg}	-40 ~ +150		°C
Operating Temperature Range	Operating Junction Temperature	T _j	-30 ~ +150	°C
	Operating Junction Temperature	T _{opr}	-40 ~ +85	
Power Dissipation	P _D	16(T _c ≤45°C)		W

■ THERMAL CHARACTERISTICS

Thermal Resistance	Junction-to-Ambient Temperature	θ_{ja}	60	°C/W
	Junction-to-Case	θ_{jc}	5	

■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, $C_{IN}=2.2\ \mu\text{F}$, $C_O=1.0\ \mu\text{F}$) Measurement is to be conducted in pulse testing.

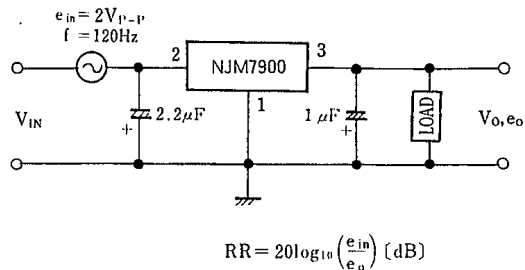
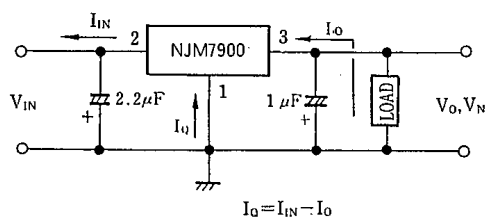
PARAMETER	SYMBOL	TEST CONDITION	Min.	TYP.	MAX.	UNIT
NJM7905FA						
Output Voltage	V_O	$V_{IN}=-10\text{V}$, $I_O=0.5\text{A}$	-4.8	-5.0	-5.2	V
Quiescent Current	I_O	$V_{IN}=-10\text{V}$, $I_O=0\text{mA}$	—	2.2	5.0	mA
Load Regulation	$\Delta V_O - I_O$	$V_{IN}=-10\text{V}$, $I_O=0.005\sim 1.5\text{A}$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

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

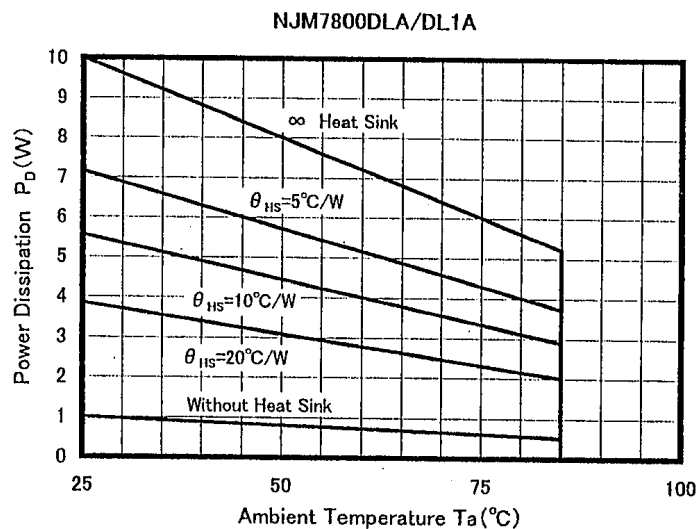
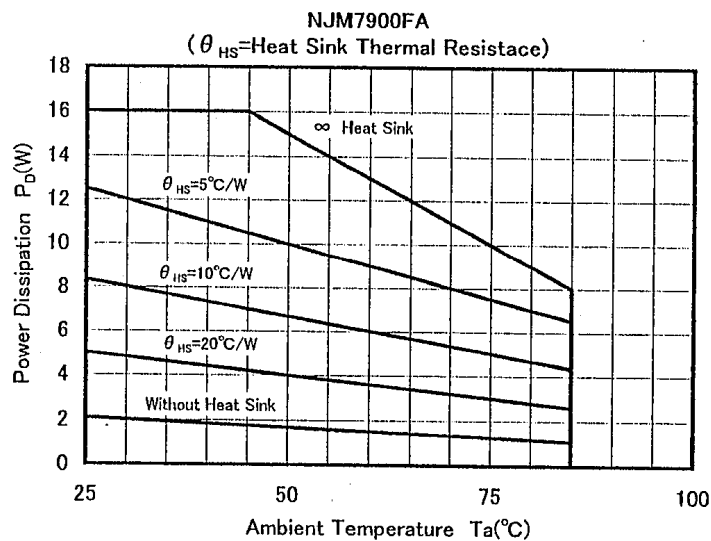
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
NJM7915FA						
Output Voltage	V _O	V _{IN} =-23V, I _O =0.5A	-14.4	-15.0	-15.6	V
Quiescent Current	I _O	V _{IN} =-23V, I _O =0mA	—	2.7	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =-23V, I _O =0.005~1.5A	—	60	180	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =-17.5~-30V, I _O =0.5A	—	3	150	mV
Ripple Rejection	RR	V _{IN} =-23V, I _O =0.5A, e _m =2V _{p-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	ΔV _O /ΔT	V _{IN} =-23V, I _O =5mA	—	-0.5	—	mV/°C
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-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	ΔV _O /ΔT	V _{IN} =-27V, I _O =5mA	—	-0.6	—	mV/°C
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-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	ΔV _O /ΔT	V _{IN} =-33V, I _O =5mA	—	-0.8	—	mV/°C

■ TEST CIRCUIT

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



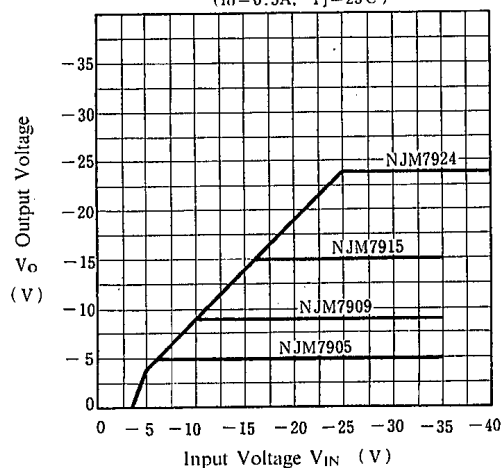
■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



TYPICAL CHARACTERISTICS

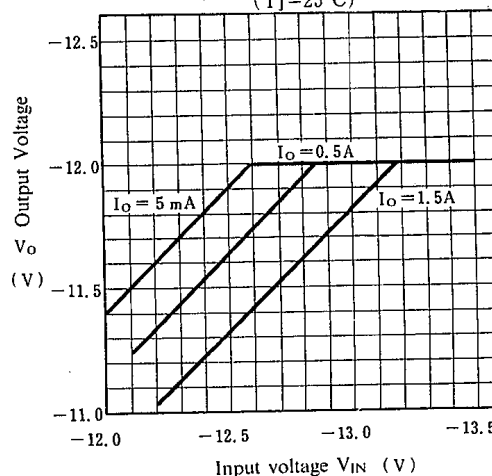
NJM7900 Output Characteristics

($I_O = 0.5A$, $T_j = 25^\circ C$)



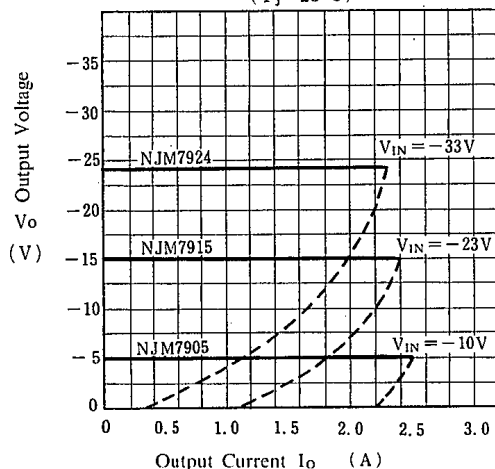
NJM7912 Output Voltage vs. Low Input Voltage

($T_j = 25^\circ C$)



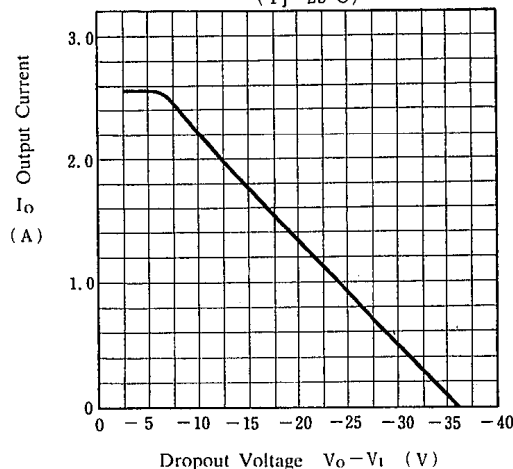
NJM7905/15/24 Load Characteristics

($T_j = 25^\circ C$)

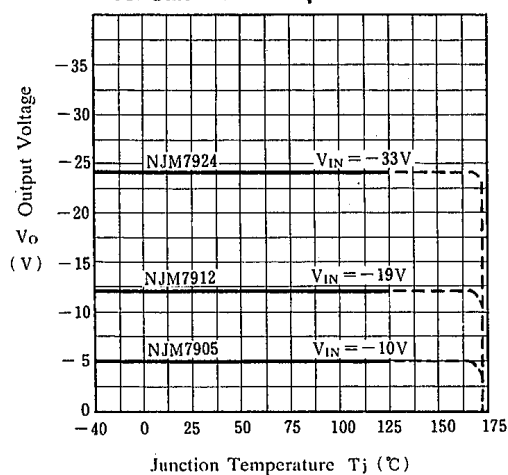


NJM7900 Series Short Circuit Output Current

($T_j = 25^\circ C$)

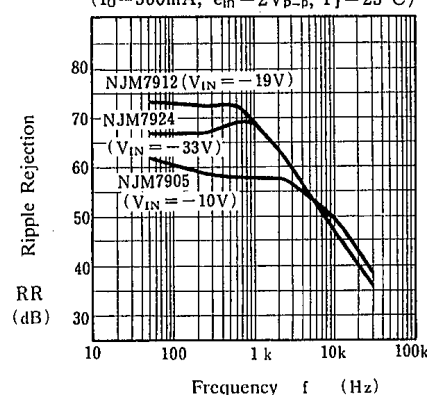


NJM7905/12/24 Output Voltage vs. Junction Temperature



NJM7905/15/24 Ripple Rejection vs. Frequency

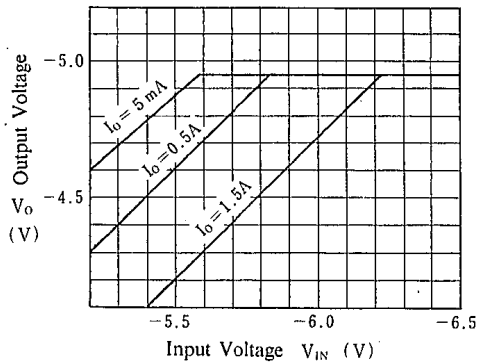
($I_O = 500mA$, $e_{in} = 2V_{p-p}$, $T_j = 25^\circ C$)



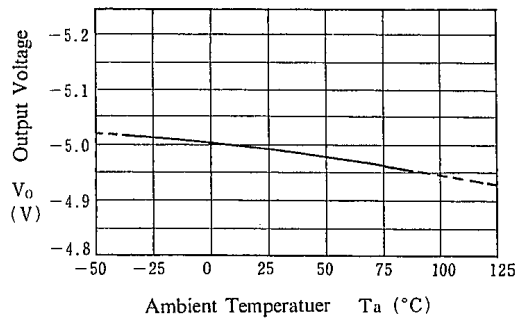
■ TYPICAL CHARACTERISTICS

NJM7905 Dropout Characteristics

($T_j = 25^\circ\text{C}$)

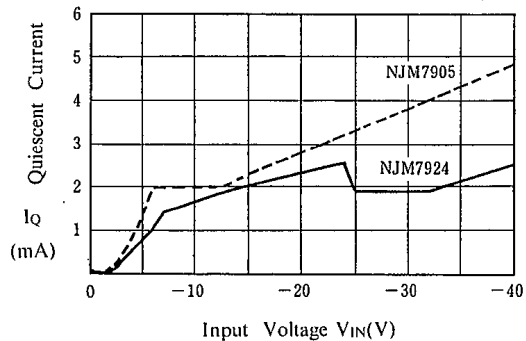


NJM7905 Output Voltage vs. Temperature



Quiescent Current vs. Input Voltage

($I_O = 0\text{ mA}$, $T_j = 25^\circ\text{C}$)



MEMO

[CAUTION]
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