

## 3-TERMINAL NEGATIVE VOLTAGE REGULATOR

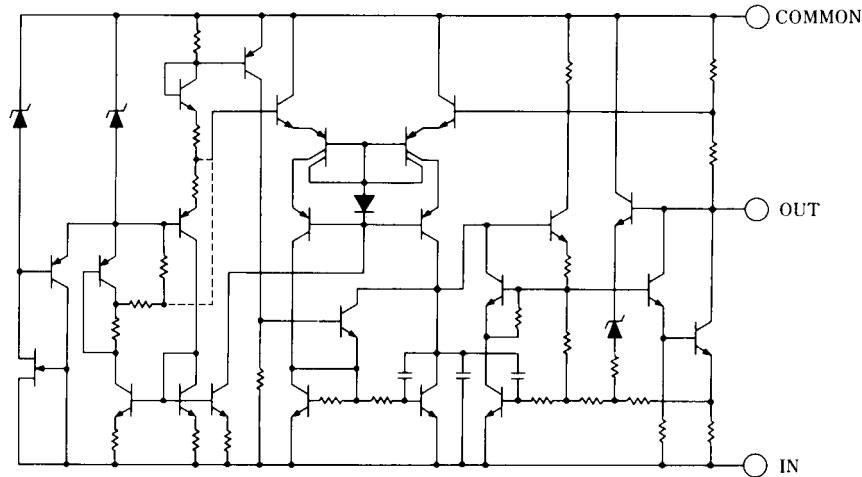
### ■ GENERAL DESCRIPTION

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 NJM 7800 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

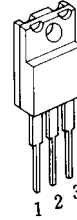
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Excellent Ripple Rejection
- Guarantee'd 1.5A Output Current
- Package Outline TO-220F
- Bipolar Technology

### ■ EQUIVALENT CIRCUIT



### ■ PACKAGE OUTLINE

(TO-220F)



1. COMMON
2. IN
3. OUT

**NJM7900FA**

(note) The radiation fin is connected Pin 2.

# NJM7900

## ■ ABSOLUTE MAXIMUM RATINGS

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

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT	
Input Voltage	$V_{IN}$	7905 to 7909 7912 to 7915 7918 to 7924	-35 -35 -40	V	
Storage Temperature Range	$T_{stg}$	-40 to +150		$^\circ\text{C}$	
Operating Temperature Range	Operating Junction Temperature		$T_j$	-40 to +150	$^\circ\text{C}$
	Operating Junction Temperature		$T_{opr}$	-40 to +85	
Power Dissipation	$P_D$	16 ( $T_C \leq 45^\circ\text{C}$ )		W	

## ■ THERMAL CHARACTERISTICS

Thermal Resistance	Junction-to-Ambient Temperature	$\theta_{ja}$	60	$^\circ\text{C/W}$
	Junction-to-Case	$\theta_{jc}$	5	

## ■ ELECTRICAL CHARACTERISTICS (T<sub>j</sub>=25°C, C<sub>IN</sub>=2.2μF, C<sub>O</sub>=1.0μF)

Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>NJM7905FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-10V, I <sub>O</sub> =0.5A	-4.8	-5.0	-5.2	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-10V, I <sub>O</sub> =0mA	-	2.2	5.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-10V, I <sub>O</sub> =0.005 to 1.5A	-	50	80	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-7 to -25V, I <sub>O</sub> =0.5A	-	5	50	mV
Ripple Rejection	RR	V <sub>IN</sub> =-10V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	54	60	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-10V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	100	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-10V, I <sub>O</sub> =5mA	-	-0.4	-	mV/°C
<b>NJM7906FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-11V, I <sub>O</sub> =0.5A	-5.75	-6.0	-6.25	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-11V, I <sub>O</sub> =0mA	-	2.2	5.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-11V, I <sub>O</sub> =0.005 to 1.5A	-	50	90	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-8 to -25V, I <sub>O</sub> =0.5A	-	5	60	mV
Ripple Rejection	RR	V <sub>IN</sub> =-11V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	54	60	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-11V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	110	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-11V, I <sub>O</sub> =5mA	-	-0.5	-	mV/°C
<b>NJM7908FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-14V, I <sub>O</sub> =0.5A	-7.7	-8.0	-8.3	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-14V, I <sub>O</sub> =0mA	-	2.2	5.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-14V, I <sub>O</sub> =0.005 to 1.5A	-	60	110	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-10.5 to -25V, I <sub>O</sub> =0.5A	-54	8	80	mV
Ripple Rejection	RR	V <sub>IN</sub> =-14V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	-	60	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-14V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	130	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-14V, I <sub>O</sub> =5mA	-	-0.7	-	mV/°C
<b>NJM7909FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-15V, I <sub>O</sub> =0.5A	-8.65	-9.0	-9.35	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-15V, I <sub>O</sub> =0mA	-	2.2	5.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-15V, I <sub>O</sub> =0.005 to 1.5A	-	60	120	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-11.5 to -25V, I <sub>O</sub> =0.5A	-	8	90	mV
Ripple Rejection	RR	V <sub>IN</sub> =-15V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	54	59	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-15V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	150	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-15V, I <sub>O</sub> =5mA	-	-0.8	-	mV/°C
<b>NJM7912FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-19V, I <sub>O</sub> =0.5A	-11.5	-12.0	-12.5	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-19V, I <sub>O</sub> =0mA	-	2.7	6.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-19V, I <sub>O</sub> =0.005 to 1.5A	-	60	150	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-14.5 to -30V, I <sub>O</sub> =0.5A	-	3	120	mV
Ripple Rejection	RR	V <sub>IN</sub> =-19V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	54	68	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-19V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	150	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-19V, I <sub>O</sub> =5mA	-	-0.4	-	mV/°C

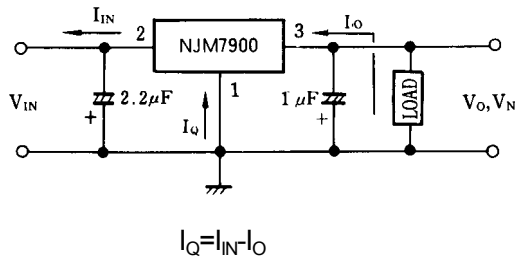
# NJM7900

## ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, C<sub>IN</sub>=2.2μF, C<sub>O</sub>=1.0μF)

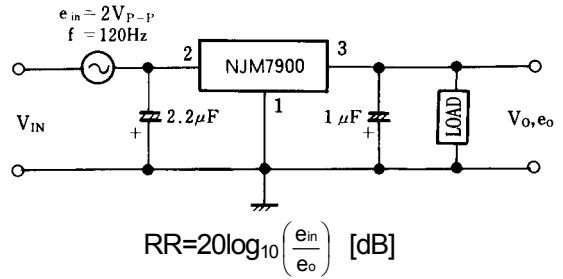
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>NJM7915FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-23V, I <sub>O</sub> =0.5A	-14.4	-15.0	-15.6	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-23V, I <sub>O</sub> =0mA	-	2.7	6.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-23V, I <sub>O</sub> =0.005 to 1.5A	-	60	180	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-17.5 to -30V, I <sub>O</sub> =0.5A	-	3	150	mV
Ripple Rejection	RR	V <sub>IN</sub> =-23V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P.P.</sub> , f=120Hz	54	67	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-23V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	170	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-23V, I <sub>O</sub> =5mA	-	-0.5	-	mV/°C
<b>NJM7918FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-27V, I <sub>O</sub> =0.5A	-17.3	-18.0	-18.7	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-27V, I <sub>O</sub> =0mA	-	2.7	6.8	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-27V, I <sub>O</sub> =0.005 to 1.5A	-	60	210	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-21 to -33V, I <sub>O</sub> =0.5A	-	4	180	mV
Ripple Rejection	RR	V <sub>IN</sub> =-27V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P.P.</sub> , f=120Hz	54	66	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-27V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	200	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-27V, I <sub>O</sub> =5mA	-	-0.6	-	mV/°C
<b>NJM7924FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =-33V, I <sub>O</sub> =0.5A	-23.0	-24.0	-25.0	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =-33V, I <sub>O</sub> =0mA	-	2.7	6.0	mA
Load Regulation	ΔV <sub>O</sub> - I <sub>O</sub>	V <sub>IN</sub> =-33V, I <sub>O</sub> =0.005 to 1.5A	-	60	270	mV
Line Regulation	ΔV <sub>O</sub> - V <sub>IN</sub>	V <sub>IN</sub> =-27 to -38V, I <sub>O</sub> =0.5A	54	5	240	mV
Ripple Rejection	RR	V <sub>IN</sub> =-33V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P.P.</sub> , f=120Hz	-	64	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =-33V, I <sub>O</sub> =0.5A, BW=10Hz to 100kHz	-	300	-	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =-33V, I <sub>O</sub> =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



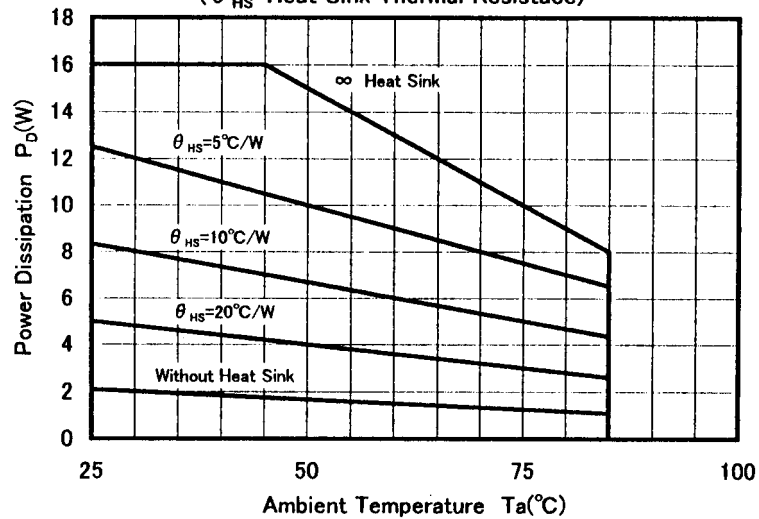
2. Ripple Rejection



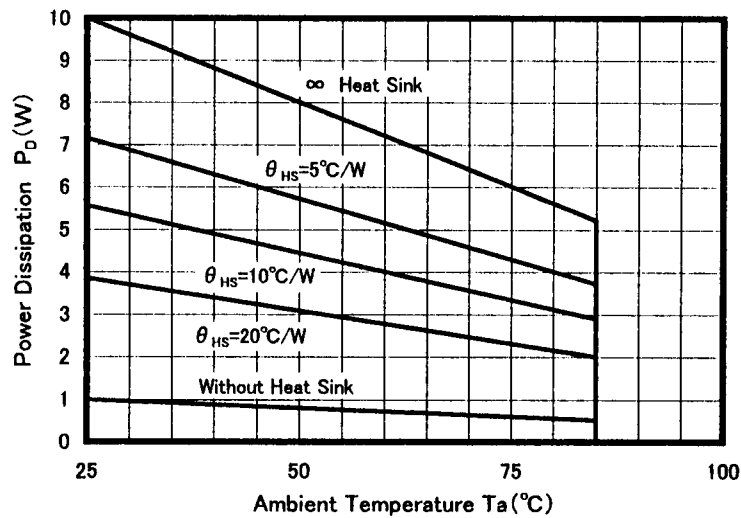
## ■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

### NJM7900FA

( $\theta_{HS}$  = Heat Sink Thermal Resistance)



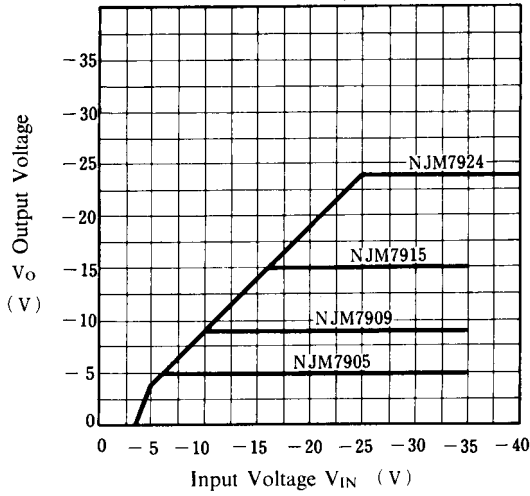
### NJM7800LA/DL1A



## ■ TYPICAL CHARACTERISTICS

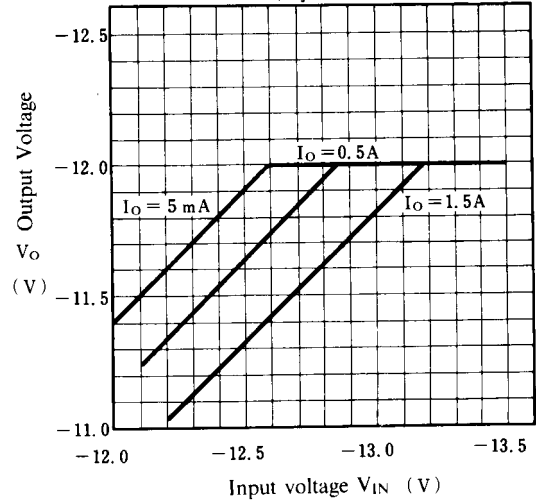
### NJM7900 Output Characteristics

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



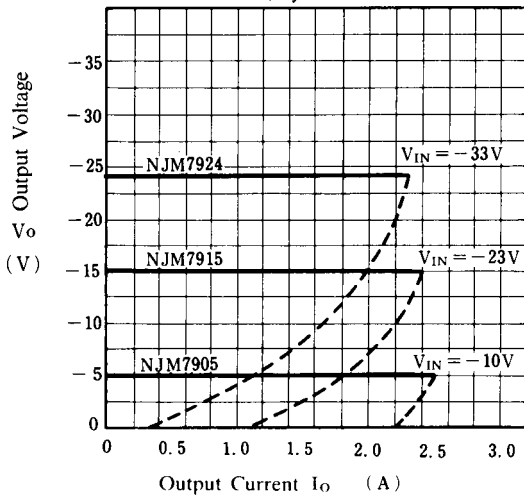
### NJM7912 Output Voltage vs. Low Input Voltage

( $T_j = 25^\circ C$ )



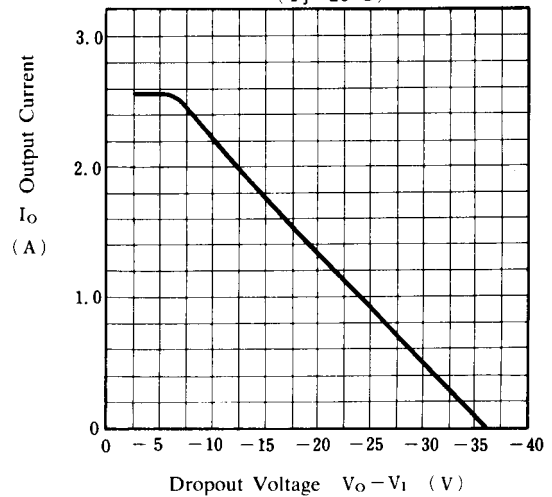
### NJM7905/15/24 Load Characteristics

( $T_j = 25^\circ C$ )

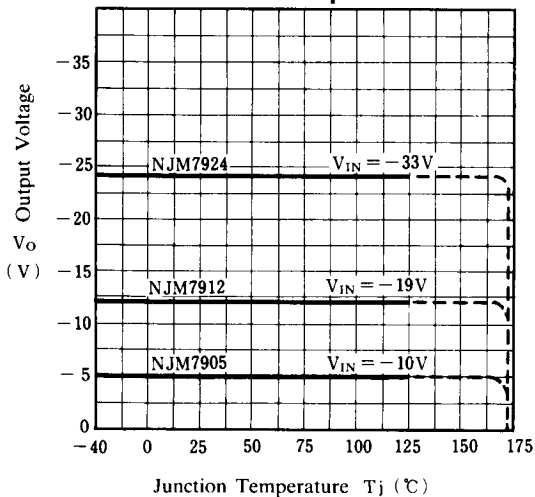


### NJM7900 Series Short Circuit Output Current

( $T_j = 25^\circ C$ )

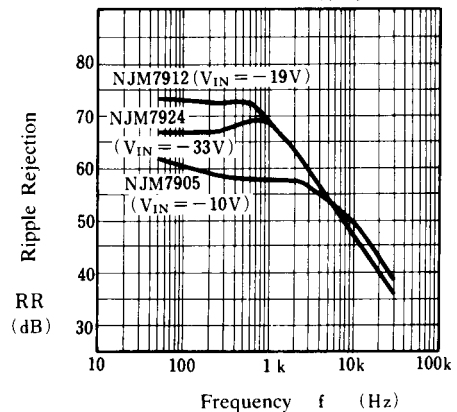


### NJM7905/12/24 Output Voltage vs. Junction Temperature



### NJM7905/15/24 Ripple Rejection vs. Frequency

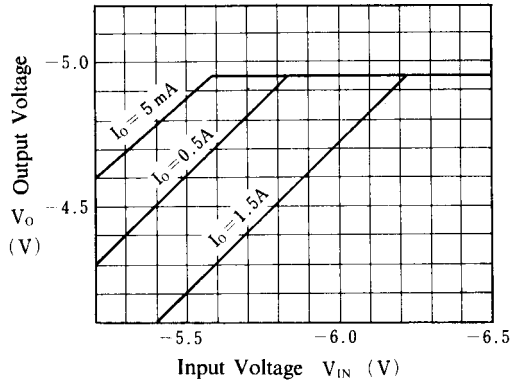
( $I_O = 500mA$ ,  $e_{in} = 2V_{p-p}$ ,  $T_j = 25^\circ C$ )



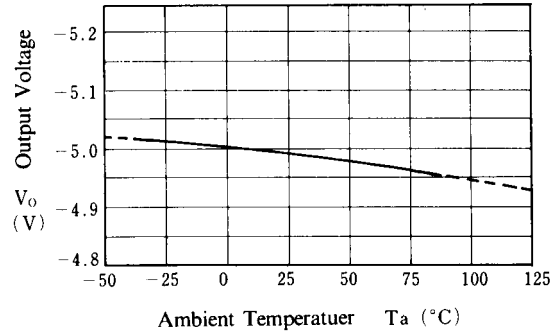
## ■ TYPICAL CHARACTERISTICS

### NJM7905 Dropout Characteristics

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

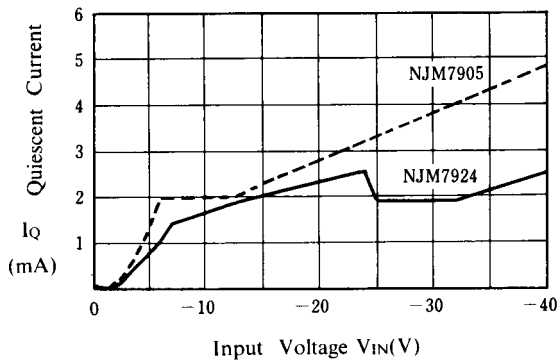


### NJM7905 Output Voltage vs. Temperature



### Quiescent Current vs. Input Voltage

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



#### [CAUTION]

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