



### 3-TERMINAL POSITIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

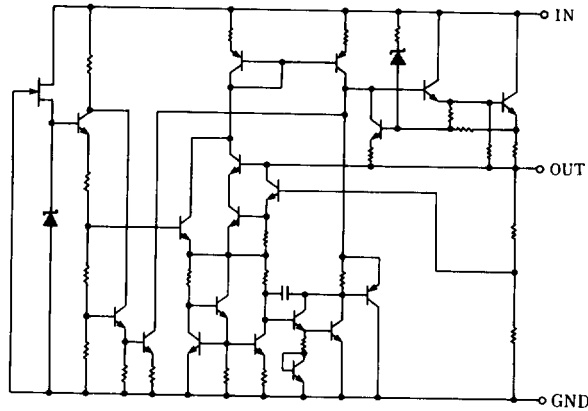
The NJM7800 series of monolithic 3-Terminal Positive Voltage Regulators is constructed using the New JRC Planar epitaxial process. These regulators employ internal current-limiting, thermal-shutdown and safe-area compensation making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. They are intended as fixed voltage regulators in a wide range of applications including local (on card) regulation for elimination of distribution problems associated with single point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents.

■ FEATURES

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

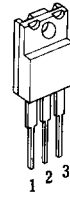
TO-220F, TO-252

■ EQUIVALENT CIRCUIT



■ PACKAGE OUTLINE

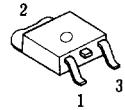
(TO-220F)



NJM7800FA

- 1. IN
- 2. GND
- 3. OUT

(TO-252)



NJM7800DLA

- 1. IN
- 2. GND
- 3. OUT

(note) The radiation fin is connected pin2.



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT
Input Voltage	V <sub>IN</sub>	7805~7809	35	V
		7812~7815	35	
		7818~7824	40	
Storage Temperature Range	T <sub>stg</sub>	-40 ~ +150		°C
Operating Temperature Range	Operating Junction Temperature	T <sub>j</sub>	-30~+150	°C
		T <sub>opr</sub>	-30~+75	
Power Dissipation	P <sub>D</sub>	TO220F	16 (T <sub>c</sub> ≤70°C)	W
		TO252	10 (T <sub>c</sub> =25°C)	
			1 (T <sub>a</sub> ≤25°C)	

■ THERMAL CHARACTERISTICS

Thermal Resistance	Junction-to-Ambient Temperature	θ <sub>ja</sub>	TO220F	TO252	°C/W
			60	125	
	Junction-to-Case	θ <sub>jc</sub>	5	12.5	

■ ELECTRICAL CHARACTERISTICS (C<sub>1</sub>=0.33 μF, C<sub>0</sub>=0.1 μF, T<sub>j</sub>=25°C) Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
<b>NJM7805A</b>									
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =0.5A	4.8	5.0	5.2	4.8	5.0	5.2	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =0mA	—	4.2	6.0	—	4.2	6.0	mA
Load Regulation	ΔV <sub>O</sub> -I <sub>O</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =0.005~1.5A	—	15	50	—	15	100	mV
Line Regulation	ΔV <sub>O</sub> -V <sub>IN</sub>	V <sub>IN</sub> =7~25V, I <sub>O</sub> =0.5A	—	3	50	—	3	100	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	68	78	—	68	78	—	dB
Output Noise Voltage	V <sub>No</sub>	V <sub>IN</sub> =10V, BW=10Hz~100kHz, I <sub>O</sub> =0.5A	—	45	—	—	45	—	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =10V, I <sub>O</sub> 5mA	—	-0.5	—	—	-0.5	—	mV/°C

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■ **ELECTRICAL CHARACTERISTICS** ( $C_1=0.33\ \mu\text{F}$ ,  $C_0=0.1\ \mu\text{F}$ ,  $T_j=25^\circ\text{C}$ ) Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
<b>NJM7806A</b>									
Output Voltage	$V_O$	$V_{IN}=11\text{V}$ , $I_O=0.5\text{A}$	5.75	6.0	6.25	5.75	6.0	6.25	V
Quiescent Current	$I_Q$	$V_{IN}=11\text{V}$ , $I_O=0\text{mA}$	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	$\Delta V_{O-I_O}$	$V_{IN}=11\text{V}$ , $I_O=0.005\sim 1.5\text{A}$	—	15	60	—	15	120	mV
Line Regulation	$\Delta V_{O-V_{IN}}$	$V_{IN}=8\sim 25\text{V}$ , $I_O=0.5\text{A}$	—	5	60	—	5	120	mV
Ripple Rejection	RR	$V_{IN}=11\text{V}$ , $I_O=0.5\text{A}$ , $e_{in}=2\text{V}_{P-P}$ , $f=120\text{Hz}$	65	75	—	65	75	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=11\text{V}$ , $BW=10\text{Hz}\sim 100\text{kHz}$ , $I_O=0.5\text{A}$	—	45	—	—	45	—	$\mu\text{V}$
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=11\text{V}$ , $I_O\ 5\text{mA}$	—	-0.6	—	—	-0.6	—	mV/°C
<b>NJM7808A</b>									
Output Voltage	$V_O$	$V_{IN}=14\text{V}$ , $I_O=0.5\text{A}$	7.7	8.0	8.3	7.7	8.0	8.3	V
Quiescent Current	$I_Q$	$V_{IN}=14\text{V}$ , $I_O=0\text{mA}$	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	$\Delta V_{O-I_O}$	$V_{IN}=14\text{V}$ , $I_O=0.005\sim 1.5\text{A}$	—	15	80	—	15	160	mV
Line Regulation	$\Delta V_{O-V_{IN}}$	$V_{IN}=10.5\sim 25\text{V}$ , $I_O=0.5\text{A}$	—	6	80	—	6	160	mV
Ripple Rejection	RR	$V_{IN}=14\text{V}$ , $I_O=0.5\text{A}$ , $e_{in}=2\text{V}_{P-P}$ , $f=120\text{Hz}$	62	72	—	62	72	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=14\text{V}$ , $BW=10\text{Hz}\sim 100\text{kHz}$ , $I_O=0.5\text{A}$	—	55	—	—	55	—	$\mu\text{V}$
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=14\text{V}$ , $I_O\ 5\text{mA}$	—	-0.8	—	—	-0.8	—	mV/°C
<b>NJM7809A</b>									
Output Voltage	$V_O$	$V_{IN}=15\text{V}$ , $I_O=0.5\text{A}$	8.65	9.0	9.35	8.65	9.0	9.35	V
Quiescent Current	$I_Q$	$V_{IN}=15\text{V}$ , $I_O=0\text{mA}$	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	$\Delta V_{O-I_O}$	$V_{IN}=15\text{V}$ , $I_O=0.005\sim 1.5\text{A}$	—	15	90	—	15	180	mV
Line Regulation	$\Delta V_{O-V_{IN}}$	$V_{IN}=11.5\sim 25\text{V}$ , $I_O=0.5\text{A}$	—	7	90	—	7	180	mV
Ripple Rejection	RR	$V_{IN}=15\text{V}$ , $I_O=0.5\text{A}$ , $e_{in}=2\text{V}_{P-P}$ , $f=120\text{Hz}$	62	72	—	62	72	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=15\text{V}$ , $BW=10\text{Hz}\sim 100\text{kHz}$ , $I_O=0.5\text{A}$	—	60	—	—	60	—	$\mu\text{V}$
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=15\text{V}$ , $I_O\ 5\text{mA}$	—	-0.9	—	—	-0.9	—	mV/°C
<b>NJM7812A</b>									
Output Voltage	$V_O$	$V_{IN}=19\text{V}$ , $I_O=0.5\text{A}$	11.5	12.0	12.5	11.5	12.0	12.5	V
Quiescent Current	$I_Q$	$V_{IN}=19\text{V}$ , $I_O=0\text{mA}$	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	$\Delta V_{O-I_O}$	$V_{IN}=19\text{V}$ , $I_O=0.005\sim 1.5\text{A}$	—	25	120	—	25	240	mV
Line Regulation	$\Delta V_{O-V_{IN}}$	$V_{IN}=14.5\sim 30\text{V}$ , $I_O=0.5\text{A}$	—	10	120	—	10	240	mV
Ripple Rejection	RR	$V_{IN}=19\text{V}$ , $I_O=0.5\text{A}$ , $e_{in}=2\text{V}_{P-P}$ , $f=120\text{Hz}$	61	71	—	61	71	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=19\text{V}$ , $BW=10\text{Hz}\sim 100\text{kHz}$ , $I_O=0.5\text{A}$	—	75	—	—	75	—	$\mu\text{V}$
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=19\text{V}$ , $I_O\ 5\text{mA}$	—	-1.2	—	—	-1.2	—	mV/°C



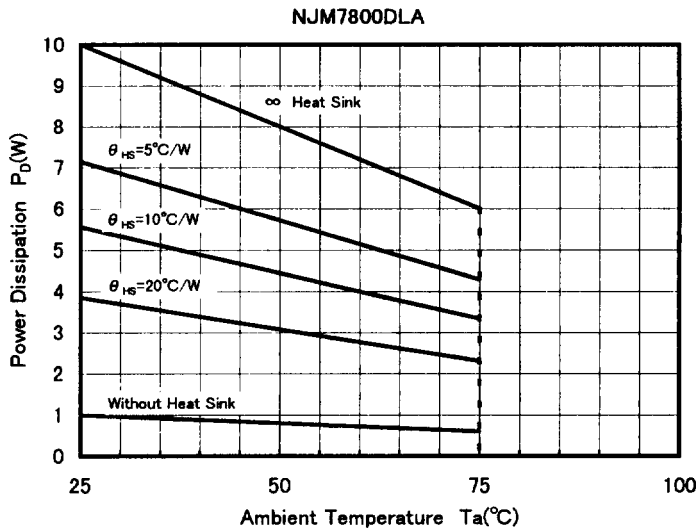
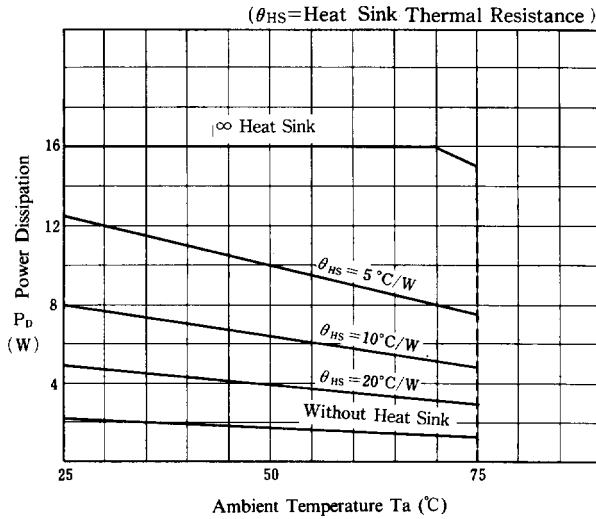
■ ELECTRICAL CHARACTERISTICS (C<sub>1</sub>=0.33 μF, C<sub>0</sub>=0.1 μF, T<sub>j</sub>=25°C) Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
<b>NJM7815A</b>									
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =23V, I <sub>O</sub> =0.5A	14.4	15.0	15.6	14.4	15.0	15.6	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =23V, I <sub>O</sub> =0mA	—	4.4	6.0	—	4.4	6.0	mA
Load Regulation	ΔV <sub>O</sub> -I <sub>O</sub>	V <sub>IN</sub> =23V, I <sub>O</sub> =0.005~1.5A	—	35	150	—	35	300	mV
Line Regulation	ΔV <sub>O</sub> -V <sub>IN</sub>	V <sub>IN</sub> =17.5~30V, I <sub>O</sub> =0.5A	—	11	150	—	11	300	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	60	70	—	60	70	—	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =23V, BW=10Hz~100kHz, I <sub>O</sub> =0.5A	—	90	—	—	90	—	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =23V, I <sub>O</sub> 5mA	—	-1.5	—	—	-1.5	—	mV/°C
<b>NJM7818A</b>									
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =27V, I <sub>O</sub> =0.5A	17.3	18.0	18.7	17.3	18.0	18.7	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =27V, I <sub>O</sub> =0mA	—	4.5	6.0	—	4.5	6.0	mA
Load Regulation	ΔV <sub>O</sub> -I <sub>O</sub>	V <sub>IN</sub> =27V, I <sub>O</sub> =0.005~1.5A	—	55	180	—	55	360	mV
Line Regulation	ΔV <sub>O</sub> -V <sub>IN</sub>	V <sub>IN</sub> =21~33V, I <sub>O</sub> =0.5A	—	15	180	—	15	360	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	59	69	—	59	69	—	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =27V, BW=10Hz~100kHz, I <sub>O</sub> =0.5A	—	100	—	—	100	—	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =27V, I <sub>O</sub> 5mA	—	-1.8	—	—	-1.8	—	mV/°C
<b>NJM7820A</b>									
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =29V, I <sub>O</sub> =0.5A	19.2	20.0	20.8	19.2	20.0	20.8	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =29V, I <sub>O</sub> =0mA	—	4.5	6.0	—	4.5	6.0	mA
Load Regulation	ΔV <sub>O</sub> -I <sub>O</sub>	V <sub>IN</sub> =29V, I <sub>O</sub> =0.005~1.5A	—	61	200	—	61	400	mV
Line Regulation	ΔV <sub>O</sub> -V <sub>IN</sub>	V <sub>IN</sub> =23~35V, I <sub>O</sub> =0.5A	—	16	200	—	16	400	mV
Ripple Rejection	RR	V <sub>IN</sub> =29V, I <sub>O</sub> =0.5A, e <sub>in</sub> =2V <sub>P-P</sub> , f=120Hz	58	68	—	58	68	—	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =29V, BW=10Hz~100kHz, I <sub>O</sub> =0.5A	—	120	—	—	120	—	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =29V, I <sub>O</sub> 5mA	—	-2.0	—	—	-2.0	—	mV/°C
<b>NJM7824A</b>									
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =33V, I <sub>O</sub> =0.5A	23.0	24.0	25.0	23.0	24.0	25.0	V
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =33V, I <sub>O</sub> =0mA	—	4.6	6.0	—	4.6	6.0	mA
Load Regulation	ΔV <sub>O</sub> -I <sub>O</sub>	V <sub>IN</sub> =33V, I <sub>O</sub> =0.005~1.5A	—	65	240	—	65	480	mV
Line Regulation	ΔV <sub>O</sub> -V <sub>IN</sub>	V <sub>IN</sub> =27~38V, I <sub>O</sub> =0.5A	—	18	240	—	18	480	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	56	66	—	56	66	—	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =33V, BW=10Hz~100kHz, I <sub>O</sub> =0.5A	—	120	—	—	120	—	μV
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =33V, I <sub>O</sub> 5mA	—	-2.4	—	—	-2.4	—	mV/°C

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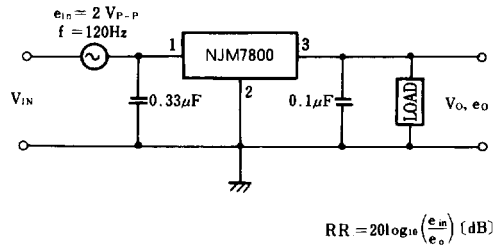
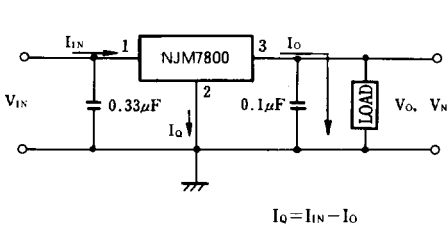
## POWER DISSIPATION VS. AMBIENT TEMPERATURE



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## TEST CIRCUIT

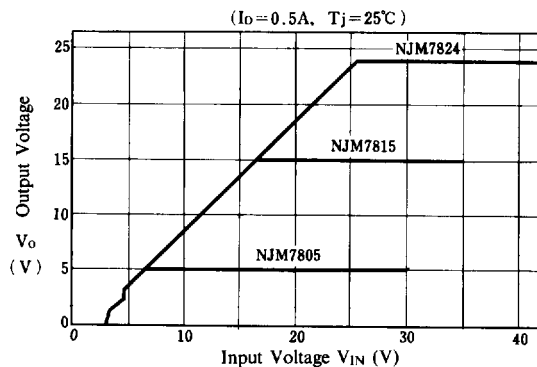
1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage
2. Ripple Rejection



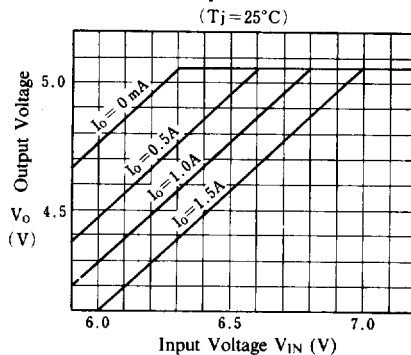


■ TYPICAL CHARACTERISTICS

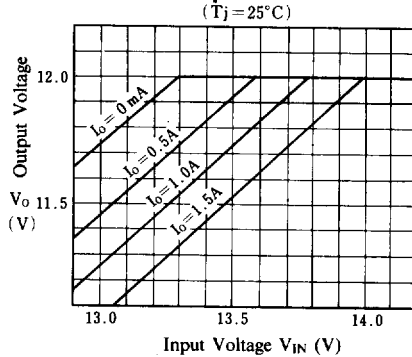
**NJM7805/15/24 Output Characteristics**



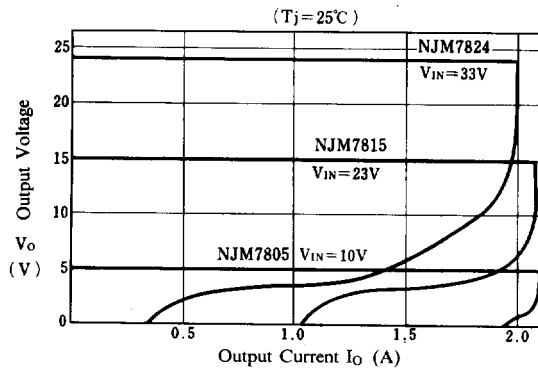
**NJM7805 Dropout Characteristics**



**NJM7812 Dropout Characteristics**



**NJM7805/15/24 Load Characteristics**

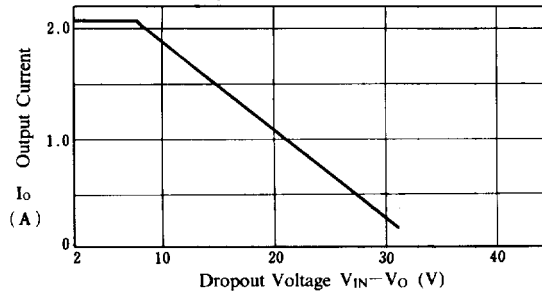




## ■ TYPICAL CHARACTERISTICS

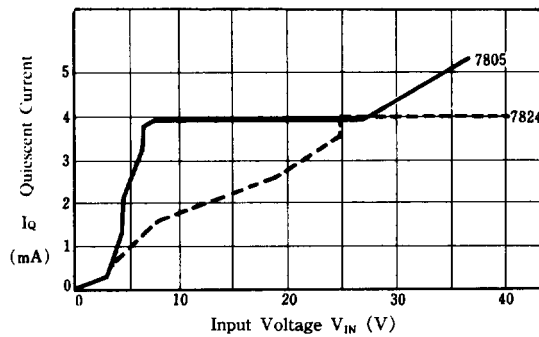
### NJM7800 Series Short Circuit Output Current

( $T_j = 25^\circ\text{C}$ ,  $\infty$  Heat Sink)

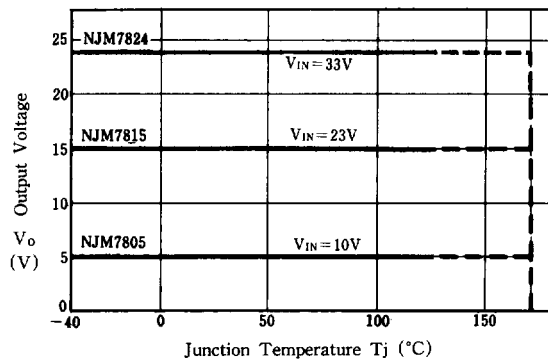


### NJM7805/24 Quiescent Current vs. Input Voltage

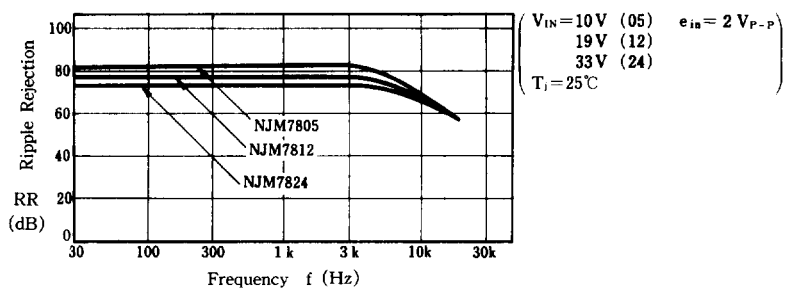
( $T_j = 25^\circ\text{C}$ )



### NJM7805/15/24 Output Voltage vs. Junction Temperature



### NJM7805/12/24 Ripple Rejection vs. Frequency

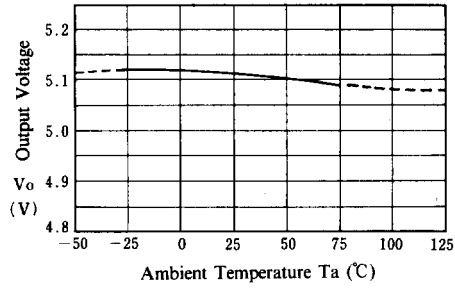


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■ TYPICAL CHARACTERISTICS

**NJM7805 Output Voltage vs. Temperature**



**NJM7808 Output Voltage vs. Temperature**

