

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.

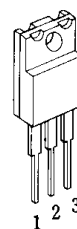
■ FEATURES

- 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

■ PACKAGE OUTLINE

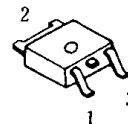
(TO-220F)



NJM7800FA

1. IN
2. GND
3. OUT

(TO-252)

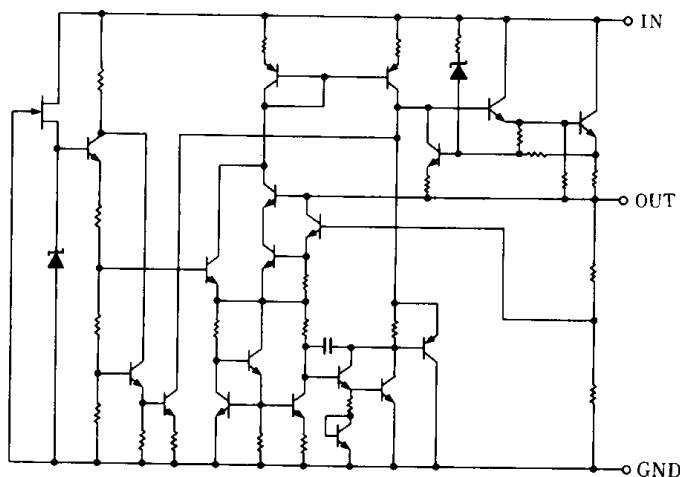


NJM7800DL1A

1. IN
2. GND
3. OUT

(note) The radiation fin is connected pin2.

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT	
Input Voltage	V _{IN}	7805~7809	35	V	
		7812~7815	35		
		7818~7824	40		
Storge Temperature Range	T _{stg}	-40 ~ +150		℃	
Operating Temperature Range	Operating Junction Temperature		T _j	-30~+150	℃
	Operating Junction Temperature		Topr	-40~+85	
Power Dissipation	P _D	TO220F	16 (Tc≤70℃)		W
		TO252	10 (Tc=25℃)		
			1 (Ta≤25℃)		

■ THERMAL CHARACTERISTICS

Thermal Resistance			TO220F	TO252	°C/W
		Junction-to-Ambient Temperature	θ _{ja}	60	
		Junction-to-Case	θ _{jc}	5	

■ ELECTRICAL CHARACTERISTICS (C₁=0.33 μF, C₀=0.1 μF, T_j=25°C) Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL1 TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
NJM7805 FA/DL1A									
Output Voltage	V _O	V _{IN} =10V, I _O =0.5A	4.8	5.0	5.2	4.8	5.0	5.2	V
Quiescent Current	I _Q	V _{IN} =10V, I _O =0mA	—	4.2	6.0	—	4.2	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =10V, I _O =0.005~1.5A	—	15	50	—	15	100	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =7~25V, I _O =0.5A	—	3	50	—	3	100	mV
Ripple Rejection	RR	V _{IN} =10V, I _O =0.5A, e _{in} =2V _{p.p.} , f=120Hz	68	78	—	68	78	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =10V, BW=10Hz~100kHz, I _O =0.5A	—	45	—	—	45	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =10V, I _O 5mA	—	−0.5	—	—	−0.5	—	mV/°C

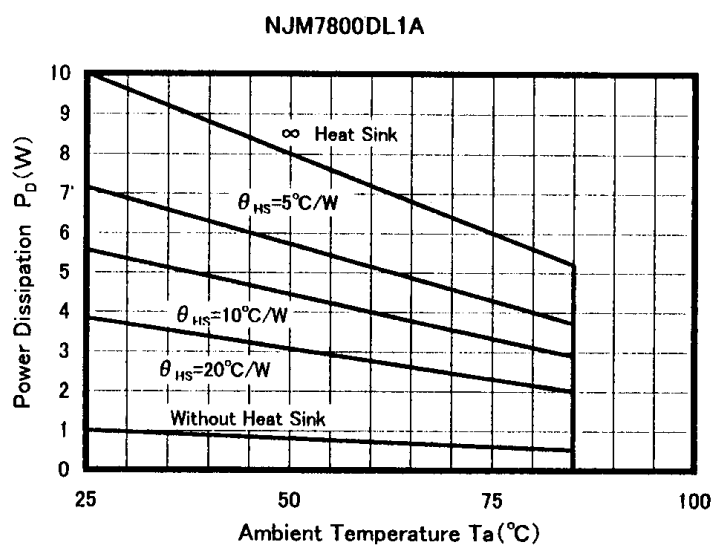
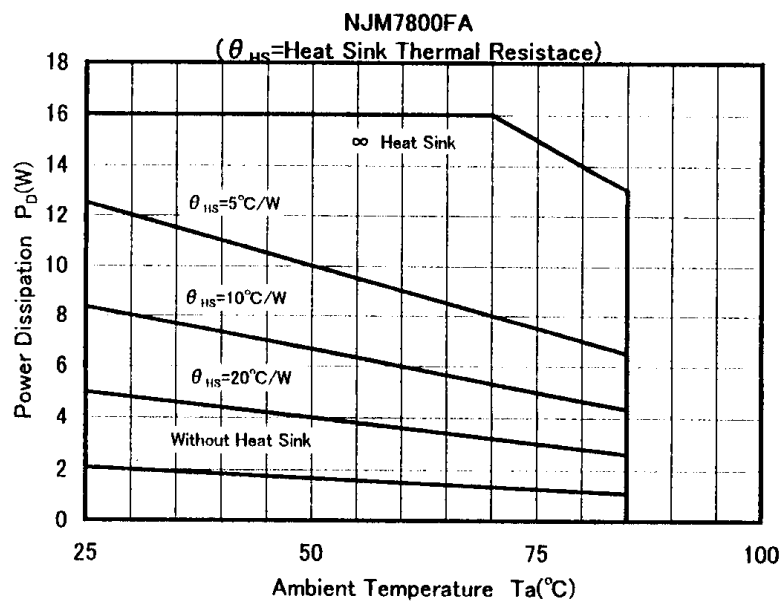
■ ELECTRICAL CHARACTERISTICS ($C_1=0.33\ \mu\text{F}$, $C_0=0.1\ \mu\text{F}$, $T_j=25^\circ\text{C}$) Measurement is to be conducted in pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL1 TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
NJM7806 FA/DL1									
Output Voltage	V _O	V _{IN} =11V, I _O =0.5A	5.75	6.0	6.25	5.75	6.0	6.25	V
Quiescent Current	I _Q	V _{IN} =11V, I _O =0mA	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =11V, I _O =0.005~1.5A	—	15	60	—	15	120	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =8~25V, I _O =0.5A	—	5	60	—	5	120	mV
Ripple Rejection	RR	V _{IN} =11V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	65	75	—	65	75	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =11V, BW=10Hz~100kHz, I _O =0.5A	—	45	—	—	45	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =11V, I _O 5mA	—	-0.6	—	—	-0.6	—	mV/℃
NJM7808 FA/DL1									
Output Voltage	V _O	V _{IN} =14V, I _O =0.5A	7.7	8.0	8.3	7.7	8.0	8.3	V
Quiescent Current	I _Q	V _{IN} =14V, I _O =0mA	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =14V, I _O =0.005~1.5A	—	15	80	—	15	160	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =10.5~25V, I _O =0.5A	—	6	80	—	6	160	mV
Ripple Rejection	RR	V _{IN} =14V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	62	72	—	62	72	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =14V, BW=10Hz~100kHz, I _O =0.5A	—	55	—	—	55	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =14V, I _O 5mA	—	-0.8	—	—	-0.8	—	mV/℃
NJM7809 FA/DL1									
Output Voltage	V _O	V _{IN} =15V, I _O =0.5A	8.65	9.0	9.35	8.65	9.0	9.35	V
Quiescent Current	I _Q	V _{IN} =15V, I _O =0mA	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =15V, I _O =0.005~1.5A	—	15	90	—	15	180	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =11.5~25V, I _O =0.5A	—	7	90	—	7	180	mV
Ripple Rejection	RR	V _{IN} =15V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	62	72	—	62	72	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =15V, BW=10Hz~100kHz, I _O =0.5A	—	60	—	—	60	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =15V, I _O 5mA	—	-0.9	—	—	-0.9	—	mV/℃
NJM7812 FA/DL1									
Output Voltage	V _O	V _{IN} =19V, I _O =0.5A	11.5	12.0	12.5	11.5	12.0	12.5	V
Quiescent Current	I _Q	V _{IN} =19V, I _O =0mA	—	4.3	6.0	—	4.3	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =19V, I _O =0.005~1.5A	—	25	120	—	25	240	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =14.5~30V, I _O =0.5A	—	10	120	—	10	240	mV
Ripple Rejection	RR	V _{IN} =19V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	61	71	—	61	71	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =19V, BW=10Hz~100kHz, I _O =0.5A	—	75	—	—	75	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =19V, I _O 5mA	—	-1.2	—	—	-1.2	—	mV/℃

■ ELECTRICAL CHARACTERISTICS (C₁=0.33 μF, C₀=0.1 μF, T_j=25°C) Measurement is to be conducted in pulse testing.

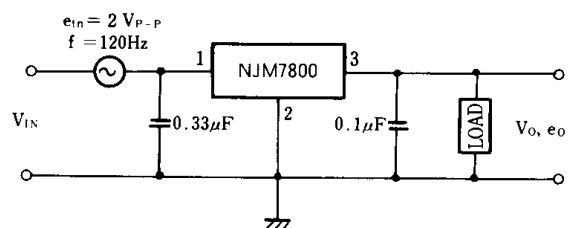
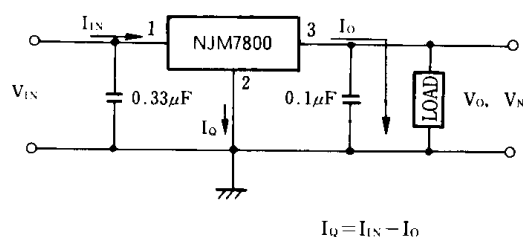
PARAMETER	SYMBOL	TEST CONDITIONS	F TYP.			DL1 TYP.			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
NJM7815 FA/DL1									
Output Voltage	V _O	V _{IN} =23V, I _O =0.5A	14.4	15.0	15.6	14.4	15.0	15.6	V
Quiescent Current	I _Q	V _{IN} =23V, I _O =0mA	—	4.4	6.0	—	4.4	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =23V, I _O =0.005 ~ 1.5A	—	35	150	—	35	300	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =17.5 ~ 30V, I _O =0.5A	—	11	150	—	11	300	mV
Ripple Rejection	RR	V _{IN} =23V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	60	70	—	60	70	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =23V, BW=10Hz ~ 100kHz, I _O =0.5A	—	90	—	—	90	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =23V, I _O 5mA	—	—1.5	—	—	—1.5	—	mV/°C
NJM7818 FA/DL1									
Output Voltage	V _O	V _{IN} =27V, I _O =0.5A	17.3	18.0	18.7	17.3	18.0	18.7	V
Quiescent Current	I _Q	V _{IN} =27V, I _O =0mA	—	4.5	6.0	—	4.5	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =27V, I _O =0.005 ~ 1.5A	—	55	180	—	55	360	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =21 ~ 33V, I _O =0.5A	—	15	180	—	15	360	mV
Ripple Rejection	RR	V _{IN} =27V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	59	69	—	59	69	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =27V, BW=10Hz ~ 100kHz, I _O =0.5A	—	100	—	—	100	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =27V, I _O 5mA	—	—1.8	—	—	—1.8	—	mV/°C
NJM7820 FA/DL1									
Output Voltage	V _O	V _{IN} =29V, I _O =0.5A	19.2	20.0	20.8	19.2	20.0	20.8	V
Quiescent Current	I _Q	V _{IN} =29V, I _O =0mA	—	4.5	6.0	—	4.5	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =29V, I _O =0.005 ~ 1.5A	—	61	200	—	61	400	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =23 ~ 35V, I _O =0.5A	—	16	200	—	16	400	mV
Ripple Rejection	RR	V _{IN} =29V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	58	68	—	58	68	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =29V, BW=10Hz ~ 100kHz, I _O =0.5A	—	120	—	—	120	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =29V, I _O 5mA	—	—2.0	—	—	—2.0	—	mV/°C
NJM7824 FA/DL1									
Output Voltage	V _O	V _{IN} =33V, I _O =0.5A	23.0	24.0	25.0	23.0	24.0	25.0	V
Quiescent Current	I _Q	V _{IN} =33V, I _O =0mA	—	4.6	6.0	—	4.6	6.0	mA
Load Regulation	ΔV _O -I _O	V _{IN} =33V, I _O =0.005 ~ 1.5A	—	65	240	—	65	480	mV
Line Regulation	ΔV _O -V _{IN}	V _{IN} =27 ~ 38V, I _O =0.5A	—	18	240	—	18	480	mV
Ripple Rejection	RR	V _{IN} =33V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz	56	66	—	56	66	—	dB
Output Noise Voltage	V _{NO}	V _{IN} =33V, BW=10Hz ~ 100kHz, I _O =0.5A	—	120	—	—	120	—	μV
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	V _{IN} =33V, I _O 5mA	—	—2.4	—	—	—2.4	—	mV/°C

■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



■ TEST CIRCUIT

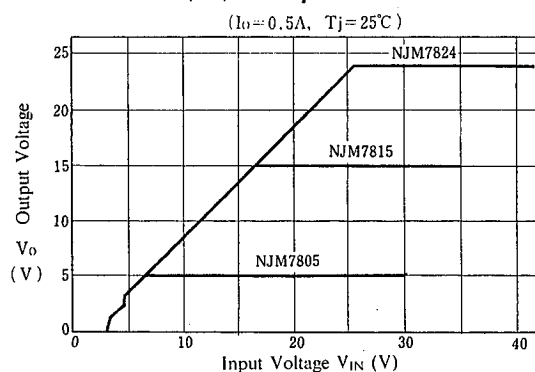
1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage
2. Ripple Rejection



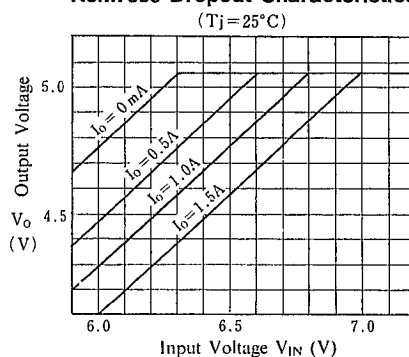
$$RR = 20 \log_{10} \left(\frac{e_{in}}{e_o} \right) \text{ [dB]}$$

■ TYPICAL CHARACTERISTICS

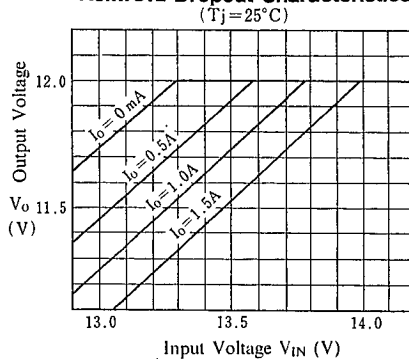
NJM7805/15/24 Output Characteristics



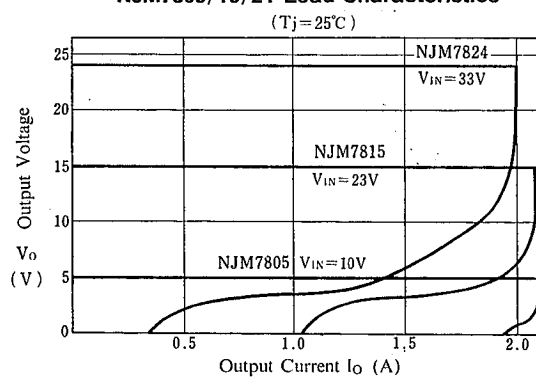
NJM7805 Dropout Characteristics



NJM7812 Dropout Characteristics



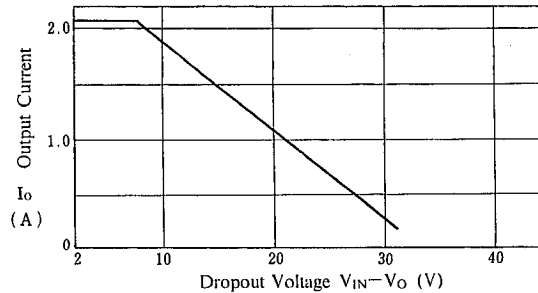
NJM7805/15/24 Load Characteristics



■ TYPICAL CHARACTERISTICS

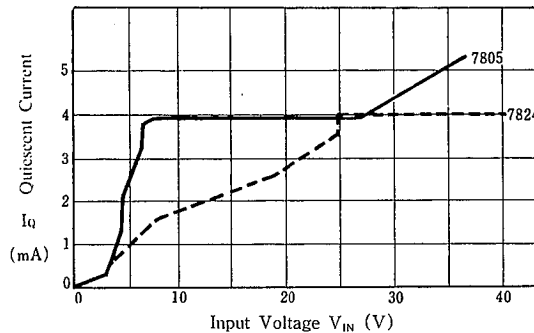
NJM7800 Series Short Circuit Output Current

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

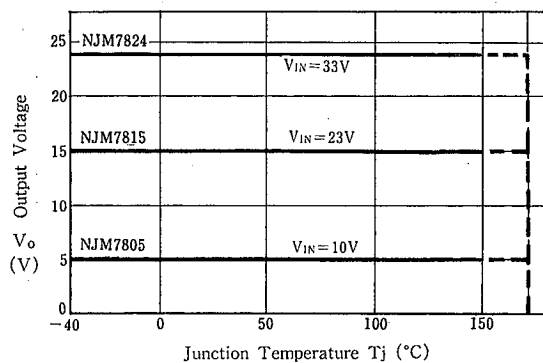


NJM7805/24 Quiescent Current vs. Input Voltage

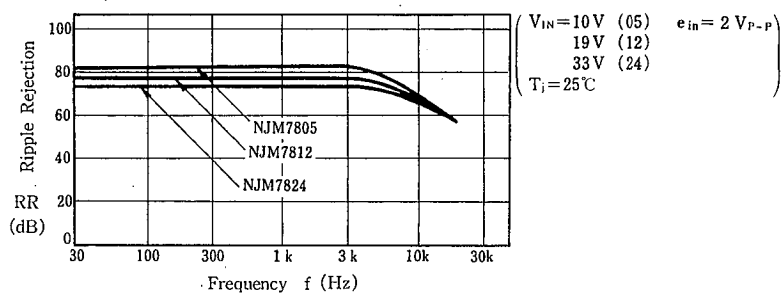
($T_j = 25^\circ\text{C}$)



NJM7805/15/24 Output Voltage vs. Junction Temperature

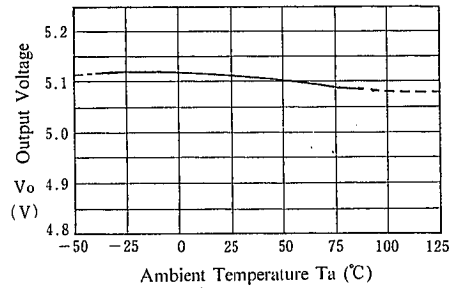


NJM7805/12/24 Ripple Rejection vs. Frequency

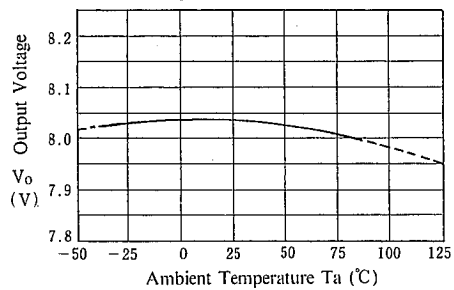


■ TYPICAL CHARACTERISTICS

NJM7805 Output Voltage vs. Temperature



NJM7808 Output Voltage vs. Temperature



MEMO

[CAUTION]

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