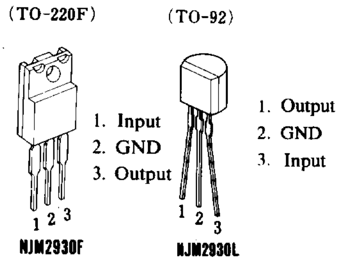
LOW DROP OUT VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

The NJM2930 3-terminal positive voltage regulator features an ability to source 150mA of output current (100mA: L-Type) with an input-output differential of 0.6V or less. Efficient use of low input voltages obtained, for example, from an automotive battery during cold crank conditions, allows 5V circuitry to be properly powered with supply voltages as low as 5.6V.

Familiar regulator features such as current limit and thermal overload protection are also provided.

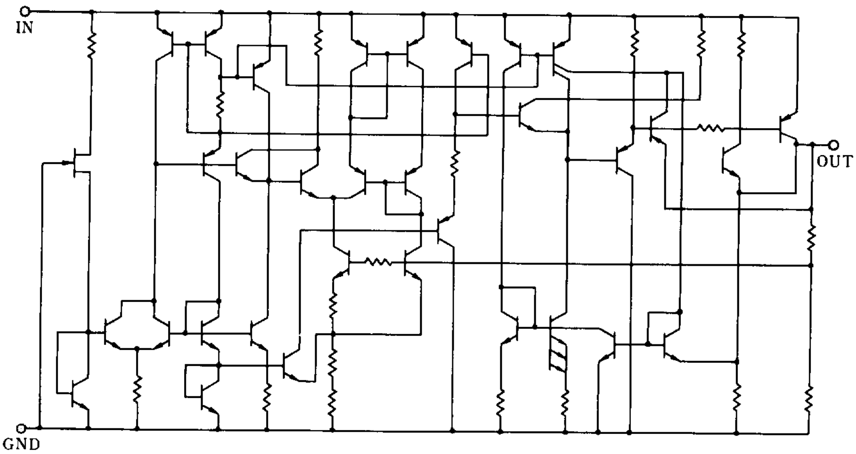
■ PACKAGE OUTLINE



■ FEATURES

- Operating Voltage
- Imput-Output diffetential less 0.6V
- Output Current in Excess of 150mA
- 40V Load Dump Protection
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Package Outline TO-220F, TO-92
- Bipolar Technology

■ EQUIVALENT CIRCUIT



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■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Operating Input Voltage Range	V_{IN}	26	V
Input Overvoltage Protection	V_{PR}	40	V
Input Reverse Voltage	V_{INR1}(100ms)	−12	V
Input Reverse Voltage	V_{INR2}(DC)	−6	V
Maximum Output Current	I_{OM}	(TO-92) 100	mA
		(TO-220F) 150	mA
Power Dissipation	P_D	(TO-92) 500	mW
		(TO-220F) 7.5(Note)	W
Operating Temperature Range	T_{opr}	−30~75	℃
Storage Temperature Range	T_{stg}	−40~125	℃

(note) Case Temperature : $T_{case} \leq 75$℃, Thermal Resistance: θ_{jc}=5℃/W TYP.

■ ELECTRICAL CHARACTERISTICS

(All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques.)

NJM2930F05 (V_{IN}=14V, C_2=10μF, T_j =25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	6V≦V_{IN}≦26V, 5mA≦I_O≦100mA	4.5	5	5.5	V
Line Regulation	ΔV_O-V_I	9V≦V_{IN}≦16V, I_O=5mA	—	7	25	mV
	ΔV_O-V_I	6V≦V_{IN}≦26V, I_O=5mA	—	30	80	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦150mA	—	14	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=150mA	—	30	40	mA
Dropout Voltage	ΔV_{I-O}	I_O=150mA	—	0.3	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=150mA	—	100	—	μV
Ripple Rejection	RR	f=120Hz, I_O=150mA	—	60	—	dB

NJM2930L 05 (V_{IN}=14V, C_2=10μF, T_j =25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	6V≦V_{IN}≦26V, 5mA≦I_O≦100mA	4.5	5	5.5	V
Line Regulation	ΔV_O-V_I	9V≦V_{IN}≦16V, I_O=5mA	—	7	25	mV
	ΔV_O-V_I	6V≦V_{IN}≦26V, I_O=5mA	—	30	80	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦100mA	—	14	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=100mA	—	25	40	mA
Dropout Voltage	ΔV_{I-O}	I_O=100mA	—	0.25	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=40mA, V_{IN}=10V	—	100	—	μV
Ripple Rejection	RR	f=120Hz, I_O=40mA, V_{IN}	—	60	—	dB

NJM2930F08 (V_{IN}=14V, C_2=10μF, T_j =25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	9.4V≦V_{IN}≦26V, 5mA≦I_O≦150mA	7.2	8	8.8	V
Line Regulation	ΔV_O-V_I	9.4V≦V_{IN}≦16V, I_O=5mA	—	12	50	mV
	ΔV_O-V_I	9.4V≦V_{IN}≦26V, I_O=5mA	—	50	100	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦150mA	—	25	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=150mA	—	30	40	mA
Dropout Voltage	ΔV_{I-O}	I_O=150mA	—	0.3	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=150mA	—	140	—	μV
Ripple Rejection	RR	f=120Hz, I_O=150mA	—	57	—	dB

NJM2930L 08 (V_{IN}=14V, C_2=10μF, T_j =25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	9.4V≦V_{IN}≦26V, 5mA≦I_O≦100mA	7.2	8	8.8	V
Line Regulation	ΔV_O-V_I	9.4V≦V_{IN}≦16V, I_O=5mA	—	12	50	mV
	ΔV_O-V_I	9.4V≦V_{IN}≦26V, I_O=5mA	—	50	100	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦100mA	—	25	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=100mA	—	25	40	mA
Dropout Voltage	ΔV_{I-O}	I_O= 100mA	—	0.25	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=40mA	—	140	—	μV
Ripple Rejection	RR	f=120Hz, I_O=40mA	—	57	—	dB

NJM2930F85 (V_{IN}=14V, C_2=10μF, T_j =25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	9.95V≦V_{IN}≦26V, 5mA≦I_O≦150mA	7.65	8.5	9.35	V
Line Regulation	ΔV_O-V_I	9.95V≦V_{IN}≦16V,I_O 5mA	—	12	50	mV
	ΔV_O-V_I	9.95V≦V_{IN}≦26V, I_O=5mA	—	50	100	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦150mA	—	25	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=150mA	—	30	40	mA
Dropout Voltage	ΔV_{I-O}	I_O=150mA	—	0.3	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=150mA	—	150	—	μV
Ripple Rejection	RR	f=120Hz, I_O=150mA	—	56	—	dB

NJM2930L 85 (V_{IN}=14V, C_2=10μF, T_j =25℃)

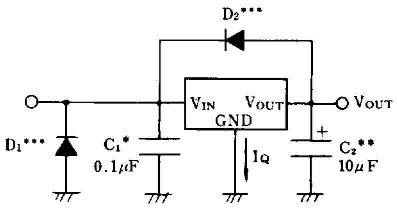
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O	9.95V≦V_{IN}≦26V, 5mA≦I_O≦100mA	7.65	8.5	9.35	V
Line Regulation	ΔV_O-V_I	9.95V≦V_{IN}≦16V, I_O=5mA	—	12	50	mV
	ΔV_O-V_I	9.4V≦V_{IN}≦26V, I_O=5mA	—	50	100	mV
Load Regulation	ΔV_O-I_O	5mA≦I_O≦100mA	—	25	50	mV
Quiescent Current	I_{Q1}	I_O=10mA	—	4	7	mA
	I_{Q2}	I_O=100mA	—	25	40	mA
Dropout Voltage	ΔV_{I-O}	I_O=100mA	—	0.25	0.6	V
Output Noise Voltage	V_{NO}	10Hz~100kHz, I_O=40mA	—	150	—	μV
Ripple Rejection	RR	f=120Hz, I_O=40mA	—	56	—	dB

■ STANDARD APPLICATION EXAMPLES

* This NJM2930 is required when the mounting position is separated from the power filter.

** Use an aluminum electrolytic capacitor or a tantalum capacitor as C_2. The temperature guarantee range of capacitors should be down to −30°C. A capacity value of 10μF is a minimum requirement for improving the stability and transient response. Mount it at a position as close to the leads as possible.

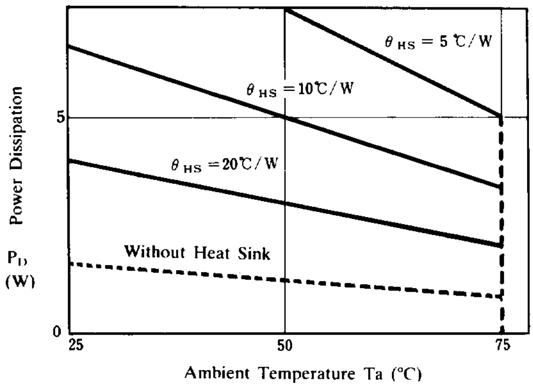
*** When application on automobile car operation, the minus pulse might be input on IC. In this case, however, the pulse might trigger to latch up. If it were that, this kind of latching up might be continued, the IC would burn up into defective in many cases. It is advisable to apply D1,D2 as described in the drawing, in order to prevent from making any troubles. It is important to make devices D1, D2 against V_{IN} to be able to stand for brake down voltage, current volume, and then less volume for Vf.



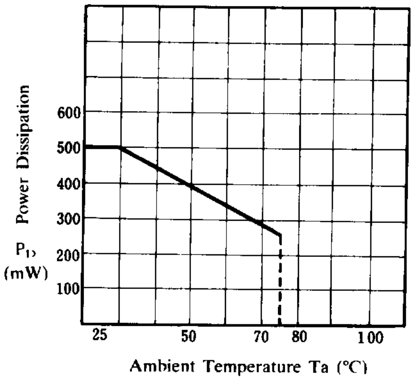
■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

NJM2930 (TO-220F)

@θHS = Heat Sink Thermal Resistance ∞ Heat Sink



NJM2930L (TO-92)



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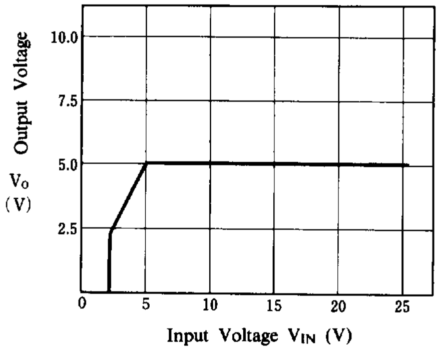
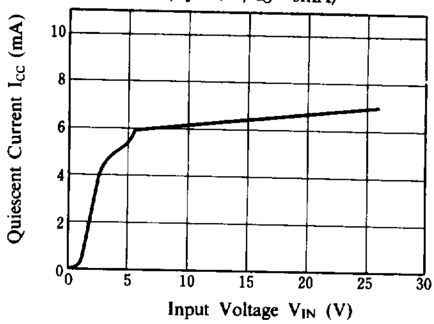
■ TYPICAL CHARACTERISTICS

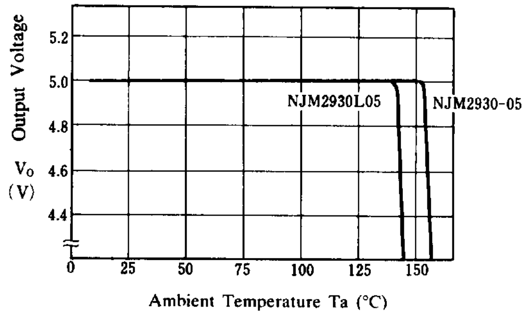
NJM2930F05/L05 Output Voltage
(Tj=25℃, I_O=0mA)



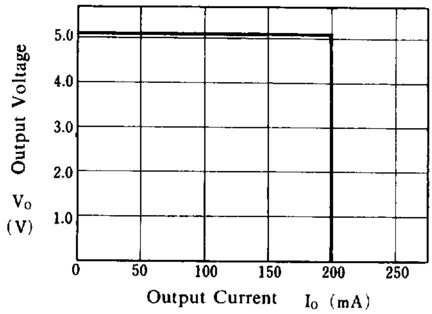
NJM2930F05/L05 I_{CC}-V_{IN}
(Tj=25℃, I_O=0mA)



NJM2939F05/L05 Thermal Shutdown
(V_{IN}=14V, I_O=50mA)



NJM2930F05/L05 Load Characteristics
(V_{IN}14V, Tj=25℃)



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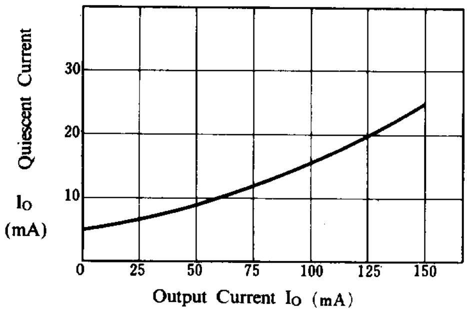
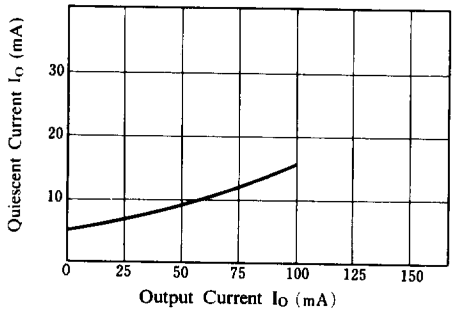
NJM2930L05 Output Current vs. Quiescent Current
(V_{IN}=14V, Tj=25°C)



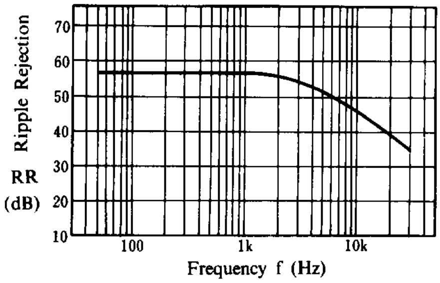
NJM2930F05 Output Current vs. Quiescent Current
(V_{IN}=14V, Tj=25°C)



■ **TYPICAL CHARACTERISTICS**

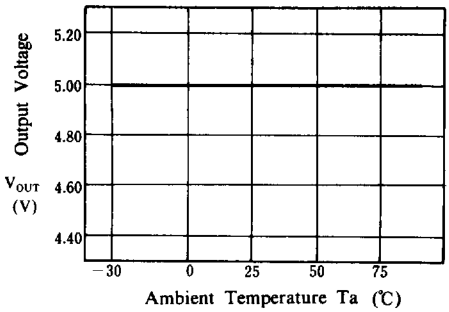
NJM2930F05/L05 Ripple Rejection vs. Frequency

(Ta=25°C, V_{IN}=14V, I_O=40mA, e_{in}=2V_{P-P})



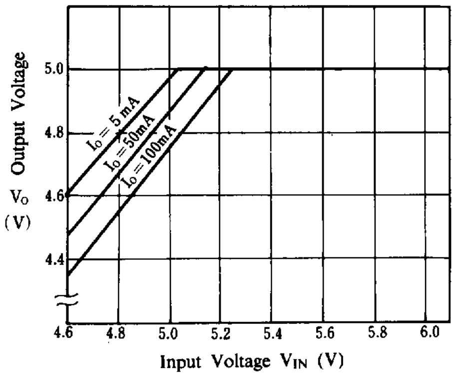
NJM2930F05/L05 Output Voltage

(V_{IN}=14V, I_O=1mA)



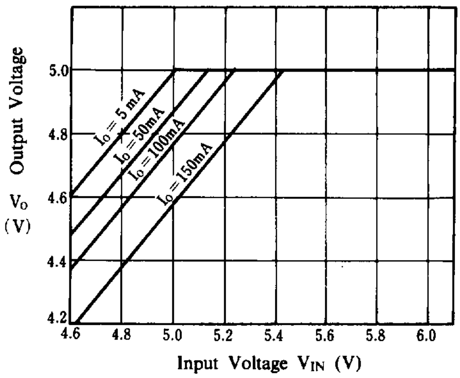
NJM2930L05 Dropout Voltage

(Tj=25°C)



NJM2930F05 Dropout Voltage

(Tj=25°C)



NJM2930F05 Dropout Voltage vs. Output Current

(Tj=25°C)