

## 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.

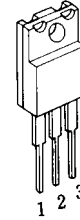
Familiar regulator features such as current limit and thermal overload protection are also provided.

### ■ FEATURES

- Operating Voltage
- Input-Output differential 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
- Bipolar Technology

### ■ PACKAGE OUTLINE

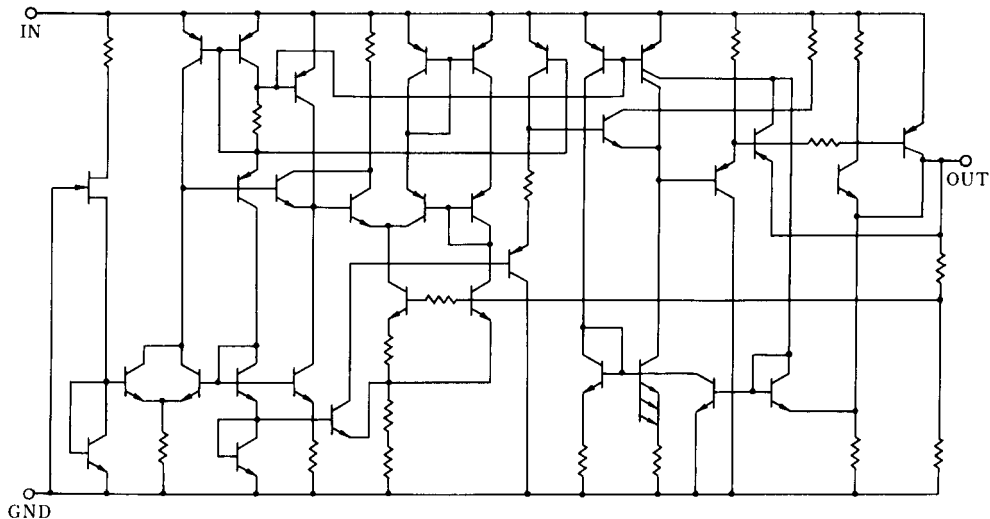
(TO-220F)



1. Input
2. GND
3. Output

**NJM2930F**

### ■ EQUIVALENT CIRCUIT



# NJM2930

## ■ ABSOLUTE MAXIMUM RATINGS

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

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

(note) Case Temperature :  $T_{case} \leq 75^\circ\text{C}$ , Thermal Resistance :  $\theta_{jc} = 5^\circ\text{C/W}$  TYP.

## ■ ELECTRICAL CHARACTERISTICS

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

### NJM2930F05 ( $V_{IN} = 14\text{V}$ , $C_2 = 10\mu\text{F}$ , $T_j = 25^\circ\text{C}$ )

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

### NJM2930F08 ( $V_{IN} = 14\text{V}$ , $C_2 = 10\mu\text{F}$ , $T_j = 25^\circ\text{C}$ )

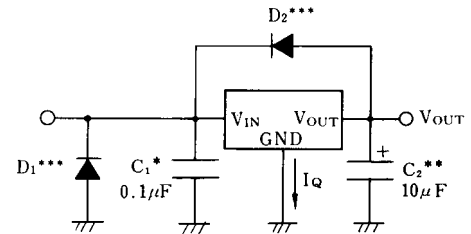
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	$9.4\text{V} \leq V_{IN} \leq 26\text{V}$ , $5\text{mA} \leq I_O \leq 150\text{mA}$	7.2	8	8.8	V
Line Regulation	$\Delta V_O - V_I$	$9.4\text{V} \leq V_{IN} \leq 16\text{V}$ , $I_O = 5\text{mA}$	-	12	50	mV
	$\Delta V_O - V_I$	$9.4\text{V}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

### NJM2930F85 ( $V_{IN} = 14\text{V}$ , $C_2 = 10\mu\text{F}$ , $T_j = 25^\circ\text{C}$ )

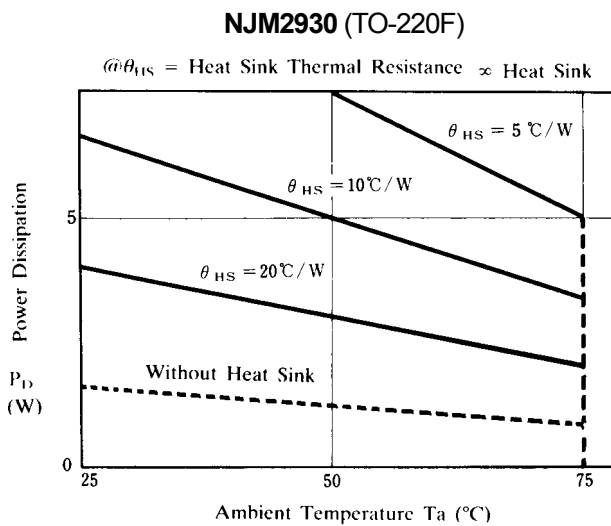
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_O$	$9.95\text{V} \leq V_{IN} \leq 26\text{V}$ , $5\text{mA} \leq I_O \leq 150\text{mA}$	7.65	8.5	9.35	V
Line Regulation	$\Delta V_O - V_I$	$9.95\text{V} \leq V_{IN} \leq 16\text{V}$ , $I_O = 5\text{mA}$	-	12	50	mV
	$\Delta V_O - V_I$	$9.95\text{V} \leq V_{IN} \leq 26\text{V}$ , $I_O = 5\text{mA}$	-	50	100	mV
Load Regulation	$\Delta V_O - I_O$	$5\text{mA} \leq I_O \leq 150\text{mA}$	-	25	50	mV
Quiescent Current	$I_{Q1}$	$I_O = 10\text{mA}$	-	4	7	mA
	$I_{Q2}$	$I_O = 150\text{mA}$	-	30	40	mA
Dropout Voltage	$\Delta V_I - I_O$	$I_O = 150\text{mA}$	-	0.3	0.6	V
Output Noise Voltage	$V_{NO}$	10Hz to 100kHz, $I_O = 150\text{mA}$	-	150	-	$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 150\text{mA}$	-	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  $-30^{\circ}\text{C}$ . A capacity value of  $10\mu\text{F}$  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  $D_1, D_2$  as described in the drawing, in order to prevent from making any troubles. It is important to make devices  $D_1, D_2$  against  $V_{\text{IN}}$  to be able to stand for brake down voltage, current volume, and then less volume for  $V_{\text{f}}$ .



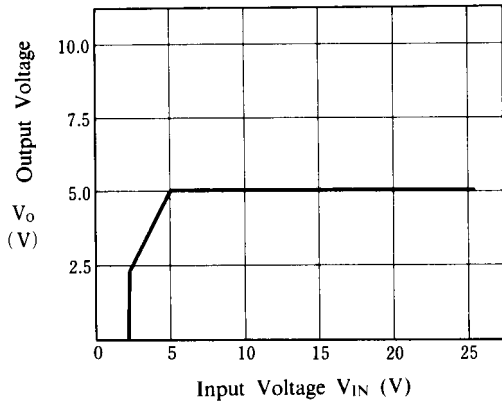
## ■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



## ■ TYPICAL CHARACTERISTICS

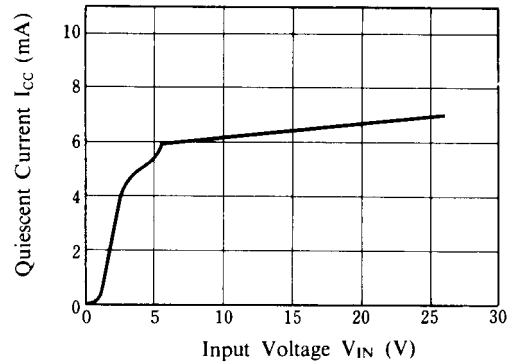
**NJM2930F05 Output Voltage**

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



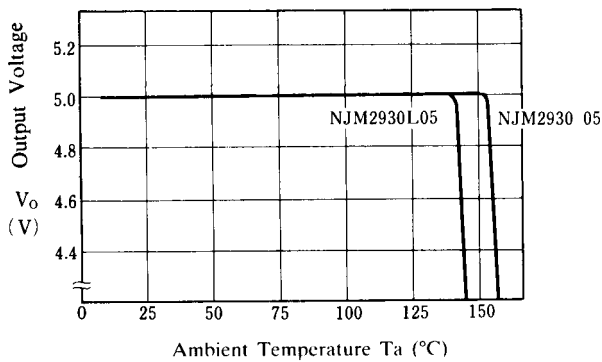
**NJM2930F05  $I_{cc}-V_{IN}$**

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



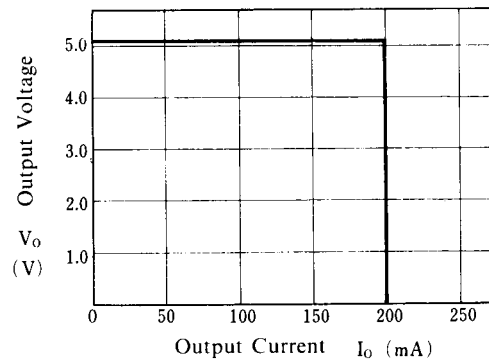
**NJM2939F05 Thermal Shutdown**

( $V_{IN}=14\text{V}$ ,  $I_o=50\text{mA}$ )



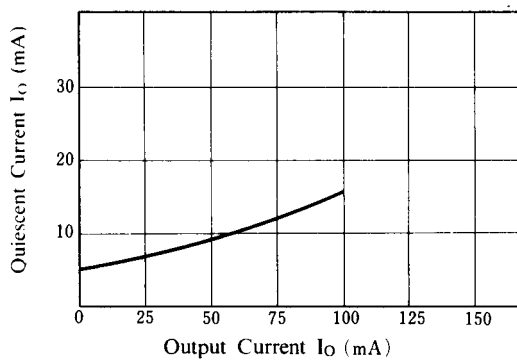
**NJM2930F05 Load Characteristics**

( $V_{IN}=14\text{V}$ ,  $T_j=25^\circ\text{C}$ )



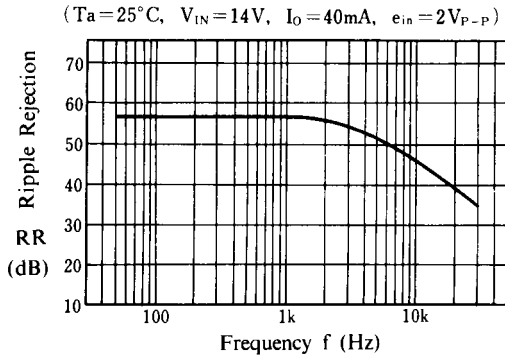
**NJM2930F05 Output Current vs. Quiescent Current**

( $V_{IN}=14\text{V}$ ,  $T_j=25^\circ\text{C}$ )

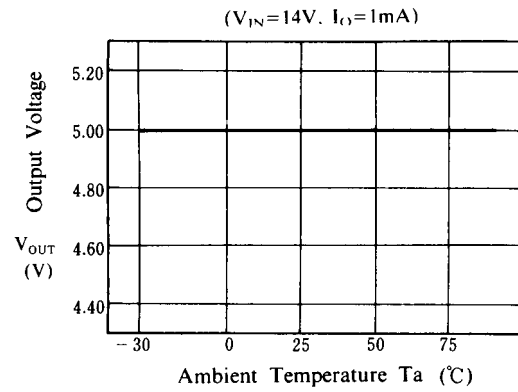


## ■ TYPICAL CHARACTERISTICS

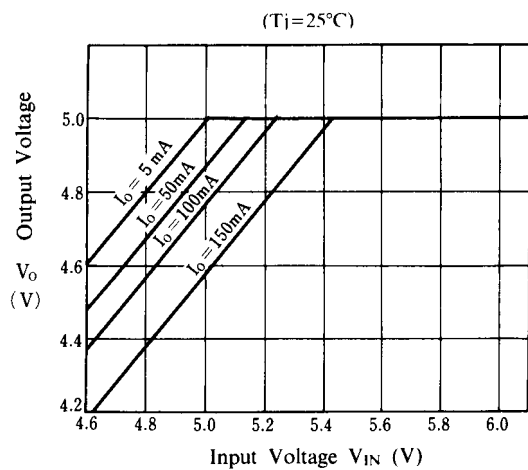
### NJM2930F05 Ripple Rejection vs. Frequency



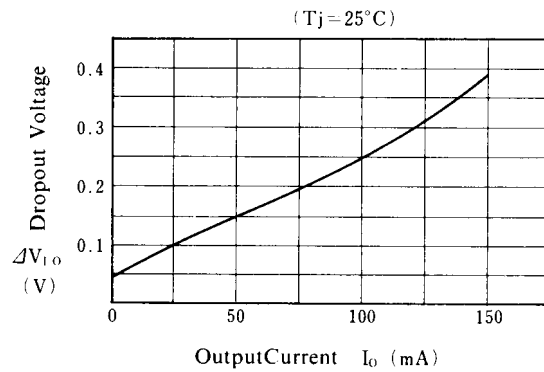
### NJM2930F05 Output Voltage



### NJM2930F05 Dropout Voltage



### NJM2930F05 Dropout Voltage vs. Output Current



**[CAUTION]**

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