Input/Output Full-Swing High Output Current Single C-MOS Operational Amplifier

■GENERAL DESCRIPTION

The NJU7040 is a C-MOS operational amplifier permitting a full-swing input and output in full-swing under high load.

Based on C-MOS technology, there are excellent features such as high output current, low current consumption, low operating voltage, and very high input impedance.

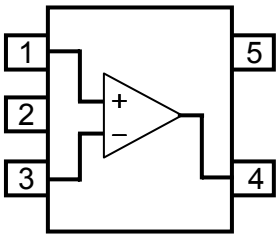
■PACKAGE OUTLINE

NJU7040F

■ FEATURES

- ●Operating Voltage: 2.2V to 5.5V
- ●Input/Output Full-Swing
- ●High Output Current: 40mA at V_O=0V
- ●Input Offset Voltage: V_{IO}=10mV max.
- ●Wide Input Common Mode Voltage Range: V_{SS} to V_{DD}
- ●Operating Current: I_{DD}=350μA typ. (at V_{DD}=3V)
- ●High Input Impedance: 1TΩ Typ.
- ●Low Input Bias Current: I_{IB}=1pA typ.
- ●Ground Sensing
- ●Tiny Package: MTP5

■ PIN CONFIGURATION



NJU7040F
(Top View)

PIN FUNCTION
1. +INPUT
2. V_{SS}
3. -INPUT
4. OUTPUT
5. V_{DD}

■ ABSOLUTE MAXIMUM RATINGS

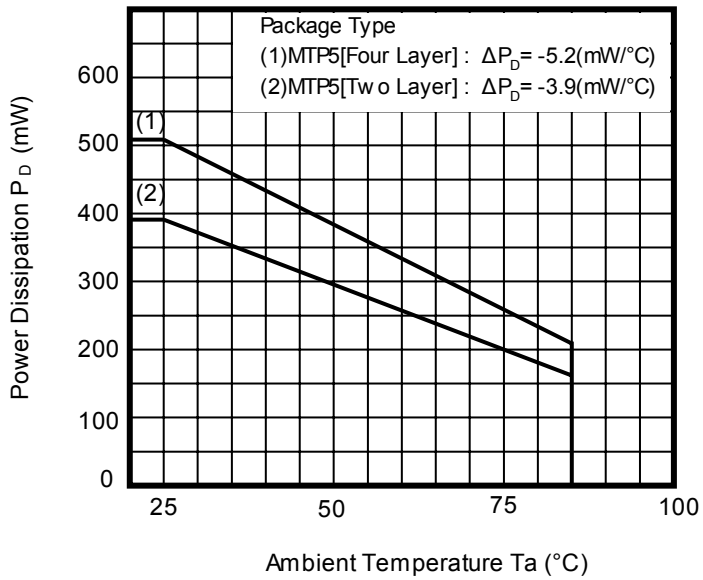
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	7	V
Common Mode Input Voltage Range	V_{ICM}	0 to 7 (Note 1)	V
Differential Input Voltage Range	V_{ID}	±7	V
Power Dissipation	P_D	200 [MTP5] 390 [MTP5] (Note 2) 520 [MTP5] (Note 3)	mW
Output Current	I_O	±75 [MTP5]	mA
Operating Temperature Range	T_{opr}	-40 to +85	˚C
Storage Temperature Range	T_{stg}	-55 to +125	˚C

(Note 1) For supply voltage less than 7V, the absolute maximum input voltage is equal to the supply voltage.

(Note 2) On the PCB " EIA/JEDEC (76.2x11.43x1.6mm, two layers, FR-4) "

(Note 3) On the PCB " EIA/JEDEC (76.2x11.43x1.6mm, four layers, FR-4) "

Power Dissipation vs. Ambient Temperature



(Note 4)

Please do not exceed "Power Dissipation (PD)" the power dissipation in IC is absolutely indicated to be in the maximum rating.

See the figure "Power Dissipation vs. Ambient Temperature" for information on temperature derating of this device.

■ OPERATING VOLTAGE (Ta=25˚C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	2.2 to 5.5	V

■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS (V_{DD}=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{DD}	No Signal Apply	-	450	700	μA
Input Offset Voltage	V_{IO}		-	-	10	mV
Input Bias Current	I_B		-	1	-	pA
Input Offset Current	I_{IO}		-	1	-	pA
Large Signal Voltage Gain	A_V	R_L=10kΩ to 2.5V, Vo=2.5V±2.4V	70	90	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 2.5V ≤ V_{CM} ≤ 5V CMR-: 0V ≤ V_{CM} ≤ 2.5V (Note 5)	44	60	-	dB
Supply Voltage Rejection Ratio	SVR	4.0V ≤ V_{DD} ≤ 5.5V, V_{CM}=V_{DD}/2	55	85	-	dB
Output Voltage1	V_{OH}1	R_L=10kΩ to 2.5V	4.95	-	-	V
	V_{OL}1	R_L=10kΩ to 2.5V	-	-	0.05	V
Output Voltage2	V_{OH}2	R_L=600Ω to 2.5V	4.9	-	-	V
	V_{OL}2	R_L=600Ω to 2.5V	-	-	0.1	V
Output Source Current	I_{SOURCE}	V_O=2.5V	70	-	-	mA
Output Sink Current	I_{SINK}	V_O=2.5V	70	-	-	mA
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 44dB	0	-	5	V

(Note 5) CMR is represented by either CMR+ or CMR- has lower value.

●AC CHARACTERISTICS (V_{DD}=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=10kΩ to 2.5V	-	0.8	-	MHz
Total Harmonic Distortion	THD	f=1kHz, V_{IN}=1Vpp, A_V=0dB	-	0.05	-	%
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	40	-	nV/√Hz

●TRANSIENT CHARACTERISTICS (V_{DD}=5V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=10kΩ to 2.5V	-	0.85	-	V/μs

■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS (V_{DD}=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{DD}	No Signal Apply	-	350	600	μA
Input Offset Voltage	V_{IO}		-	-	10	mV
Input Bias Current	I_B		-	1	-	pA
Input Offset Current	I_{IO}		-	1	-	pA
Large Signal Voltage Gain	A_V	R_L=10kΩ to 1.5V, Vo=1.5V±1.4V	70	90	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 1.5V ≤ V_{CM} ≤ 3V CMR-: 0V ≤ V_{CM} ≤ 1.5V (Note 6)	42	60	-	dB
Supply Voltage Rejection Ratio	SVR	2.7V ≤ V_{DD} ≤ 4.0V, V_{CM}=V_{DD}/2	50	80	-	dB
Output Voltage1	V_{OH}1	R_L=10kΩ to 1.5V	2.95	-	-	V
	V_{OL}1	R_L=10kΩ to 1.5V	-	-	0.05	V
Output Voltage2	V_{OH}2	R_L=600Ω to 1.5V	2.9	-	-	V
	V_{OL}2	R_L=600Ω to 1.5V	-	-	0.1	V
Output Source Current	I_{SOURCE}	V_O=1.5V	30	40	-	mA
Output Sink Current	I_{SINK}	V_O=1.5V	30	40	-	mA
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 42dB	0	-	3	V

(Note 6) CMR is represented by either CMR+ or CMR- has lower value.

●AC CHARACTERISTICS (V_{DD}=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=10kΩ to 1.5V	-	0.8	-	MHz
Total Harmonic Distortion	THD	f=1kHz, V_{IN}=1Vpp, A_V=0dB	-	0.05	-	%
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	40	-	nV/√Hz

●TRANSIENT CHARACTERISTICS (V_{DD}=3V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=10kΩ to 1.5V	-	0.7	-	V/μs

●DC CHARACTERISTICS (V_{DD}=2.2V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{DD}	No Signal Apply	-	300	500	μA
Input Offset Voltage	V_{IO}		-	-	10	mV
Input Bias Current	I_B		-	1	-	pA
Input Offset Current	I_{IO}		-	1	-	pA
Large Signal Voltage Gain	A_V	R_L=10kΩ to 1.1V, Vo=1.1V±1.0V	70	90	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 1.1V ≤ V_{CM} ≤ 2.2V CMR-: 0V ≤ V_{CM} ≤ 1.1V (Note 7)	30	60	-	dB
Supply Voltage Rejection Ratio	SVR	2.2V ≤ V_{DD} ≤ 2.7V, V_{CM}=V_{DD}/2	45	70	-	dB
Output Voltage1	V_{OH}1	R_L=10kΩ to 1.1V	2.15	-	-	V
	V_{OL}1	R_L=10kΩ to 1.1V	-	-	0.05	V
Output Voltage2	V_{OH}2	R_L=600Ω to 1.1V	2.1	-	-	V
	V_{OL}2	R_L=600Ω to 1.1V	-	-	0.1	V
Output Source Current	I_{SOURCE}	V_O=1.1V	10	15	-	mA
Output Sink Current	I_{SINK}	V_O=1.1V	10	15	-	mA
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 30dB	0	-	2.2	V

(Note 7) CMR is represented by either CMR+ or CMR- has lower value.

●AC CHARACTERISTICS (V_{DD}=2.2V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R_L=10kΩ to 1.1V	-	0.8	-	MHz
Total Harmonic Distortion	THD	f=1kHz, V_{IN}=1Vpp, A_V=0dB	-	0.05	-	%
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	40	-	nV/√Hz

●TRANSIENT CHARACTERISTICS (V_{DD}=2.2V, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L=10kΩ to 1.1V	-	0.6	-	V/μs