NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4074

LOW NOISE J-FET INPUT QUAD OPERATIONAL AMPLIFIER

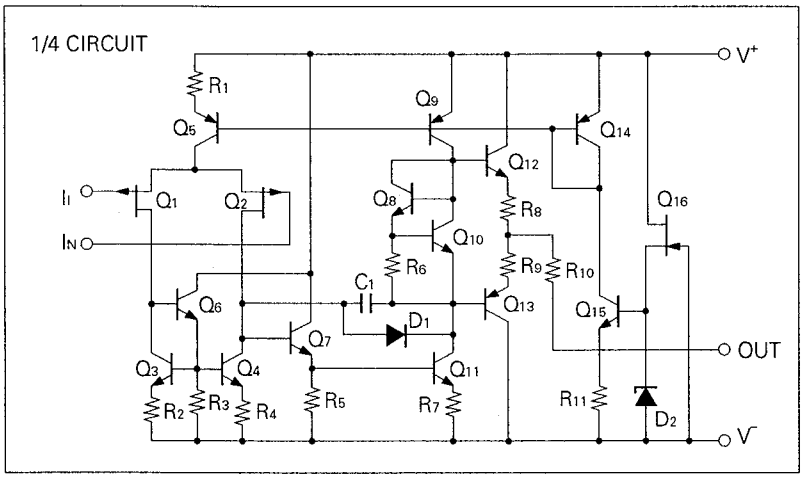
DESCRIPTION

The J-FET input operational amplifier of the μPC4074 is designed as low noise version of the μPC4084. The features of the μPC4074 are more improved intput equivalent noise voltage, input offset voltage and input bias current than those of μPC4084. By these features, the μPC4074 is excellent choice for wide variety of applications including audio preamplifier and active filter.

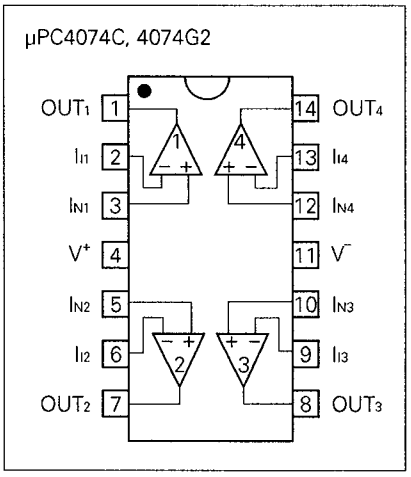
FEATURES

- Low noise: e_n = 18 nV/$\sqrt{Hz}$ (TYP.)
- Very low input bias and offset currents
- Output short circuit protection
- High input impedance...J-FET Input stage
- Internal frequency compensation
- High slew rate...13 V/μs (TYP.)

EQUIVALENT CIRCUIT



CONNECTION DIAGRAM (Top View)



ORDERING INFORMATION

PART NUMBER	PACKAGE	QUALITY GRADE
μPC4074C	14 PIN PLASTIC DIP (300 mil)	Standard
μPC4074G2	14 PIN PLASTIC SOP (225 mil)	Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

PARAMETER		SYMBOL	μPC4074	UNIT
Voltage between V^+ and V^- (Note1)		$V^+ - V^-$	−0.3 to +36	V
Differential Input Voltage		V_{ID}	±30	V
Input Voltage (Note 2)		V_I	V^- −0.3 to V^+ +0.3	V
Output Voltage (Note 3)		V_O	V^- −0.3 to V^+ +0.3	V
Power Dissipitation	C Package (Note 4)	P_T	570	mW
	G2 Package (Note 5)		550	mW
Output Short Circuit Duration (Note 6)			Indefinite	sec
Operating Temperature Range		T_{opt}	−20 to + 80	°C
Storage Temperature Range		T_{stg}	−55 to + 125	°C

Note 1. Reverse connection of supply voltage can cause destruction.

Note 2. The input voltage should be allowed to input without damage destruction. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The normal operation will establish when the both inputs are within the Common Mode Input Voltage Range of electrical characteristics.

Note 3. This specification is the voltage which should be allowed to supply to the output terminal from external without damage or destructive. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The output voltage of normal operation will be the Output Voltage Swing of electrical characteristics.

Note 4. Thermal derating factor is −7.6 mV/°C when ambient temperature is higher than 50 °C.

Note 5. Thermal derating factor is −5.5 mV/°C when ambient temperature is higher than 25 °C.

Note 6. Pay careful atttention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V^±$	± 5		± 16	V
Output Current	I_O			± 10	mA
Capacitive Load (A_V = +1)	C_L			100	pF

ELECTRICAL CHARACTERISTICS (T_a = 25 °C, $V^{\pm}$ = ±15 V)

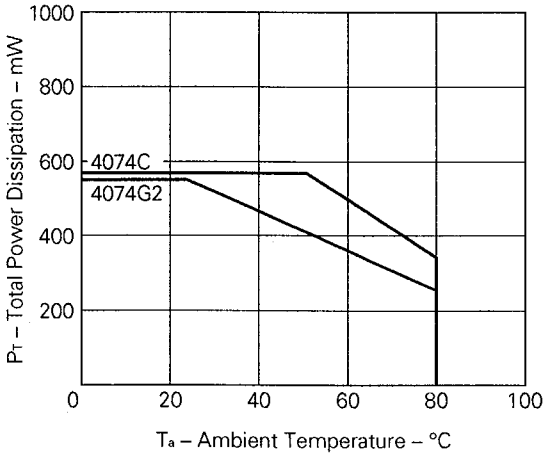
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Input Offset Voltage	V_{IO}		±3	±10.0	mV	$R_S \leqq 50\ \Omega$
Input Offset Current (Note7)	I_{IO}		±5	±50	pA	
Input Bias Current (Note7)	I_B		30	200	pA	
Large Signal Voltage Gain	A_V	25	200		V/mV	$R_L \geqq 2$ kΩ, V_O = ±10 V
Supply Current	I_{CC}		8	10	mA	I_O = 0 A, All Amplifiers
Common Mode Rejection Ratio	CMR	70	86		dB	
Supply Voltage Rejection Ratio	SVR	70	86		dB	
Output Voltage Swing	V_{om}	±12	+13.5		V	$R_L \geqq 10$ kΩ
Output Voltage Swing	V_{om}	±10	±12		V	$R_L \geqq 2$ kΩ
Common Mode Input Voltage Range	V_{ICM}	±10			V	
Slew Rate	SR		13		V/μs	A_V = 1
Unity Gain Frequency	f_{unity}		3		MHz	
Input Equivalent Noise Voltage Density	e_n		18		$nV/\sqrt{Hz}$	R_S = 100 Ω, f = 1 kHz
Input Equivalent Noise Voltage	V_n		4		$\mu V_{r.m.s}$	R_S = 10 Ω, f = 10 Hz to 10 kHz
Channel Separation			120		dB	
Input Offset Voltage	V_{IO}			±13	mV	$R_S \leqq 50\ \Omega$, T_a = −20 to +70 °C
Average V_{IO} Temperature Drift	$\Delta V_{IO}/\Delta T$		±10		μV/°C	T_a = −20 to +70 °C
Input Offset Current (Note7)	I_{IO}			±2	nA	T_a = −20 to +70 °C
Input Bias Current (Note7)	I_B			7	nA	T_a = −20 to +70 °C

Note 7. Input bias currents flow into IC. Because each currents are gate leak current of P-channel J-FET on input stage.

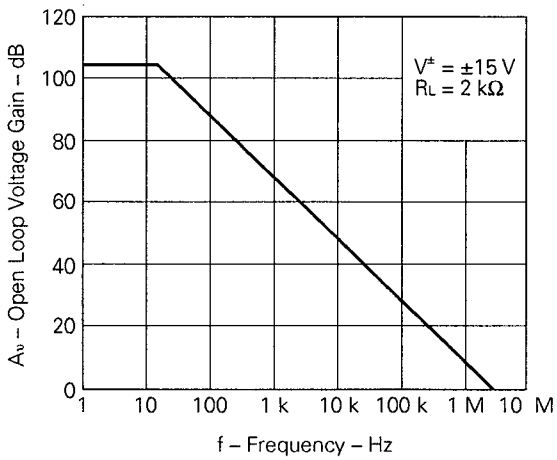
And that are temperature sensitive. Short time measuring method is recommendable to maintain the junction temperature close to the ambient temperature.

TYPICAL PERFORMANCE CHARACTERISTICS (T_a = 25 °C, TYP.)

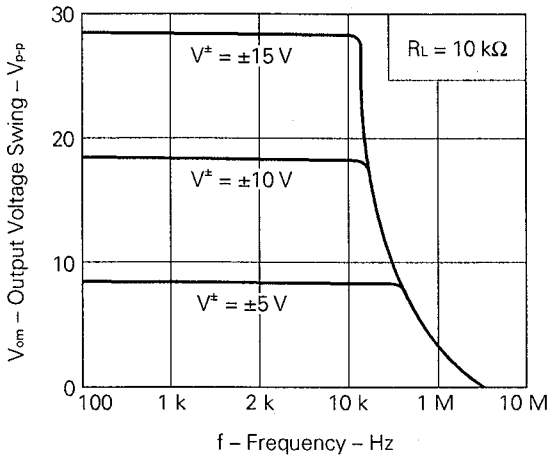
POWER DISSIPATION



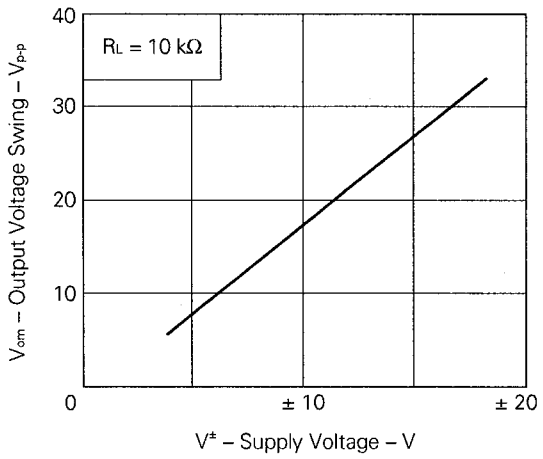
OPEN LOOP FREQUENCY RESPONSE



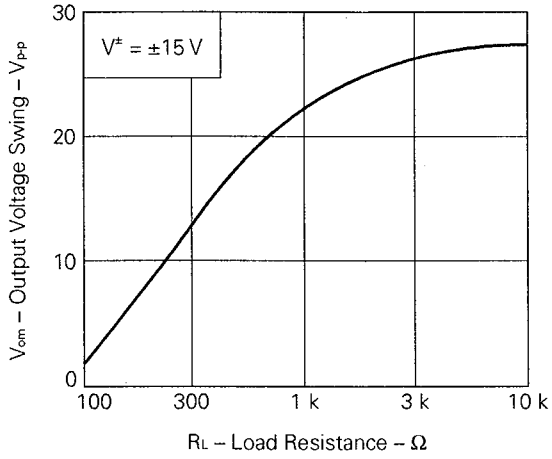
LARGE SIGNAL FREQUENCY RESPONSE



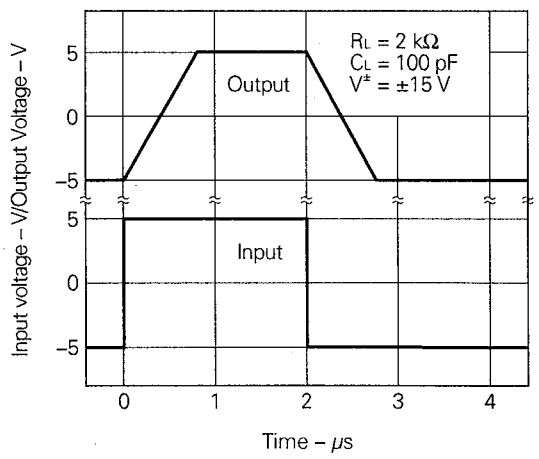
OUTPUT VOLTAGE SWING



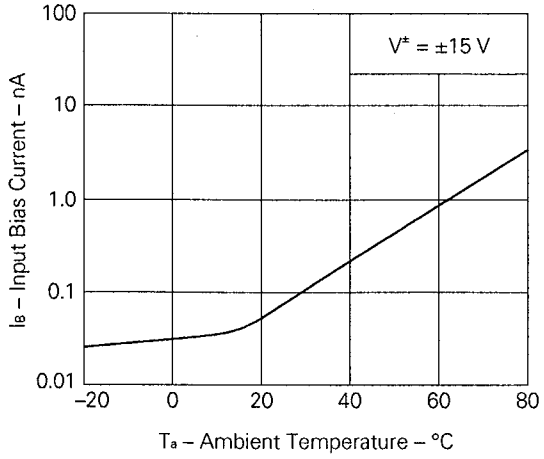
OUTPUT VOLTAGE SWING



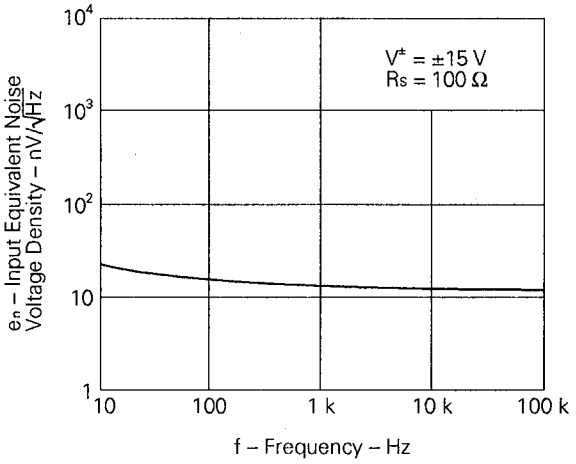
VOLTAGE FOLLOWER PULSE RESPONSE



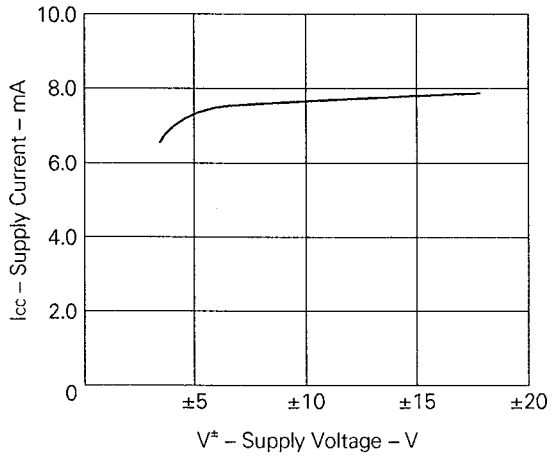
INPUT BIAS CURRENT



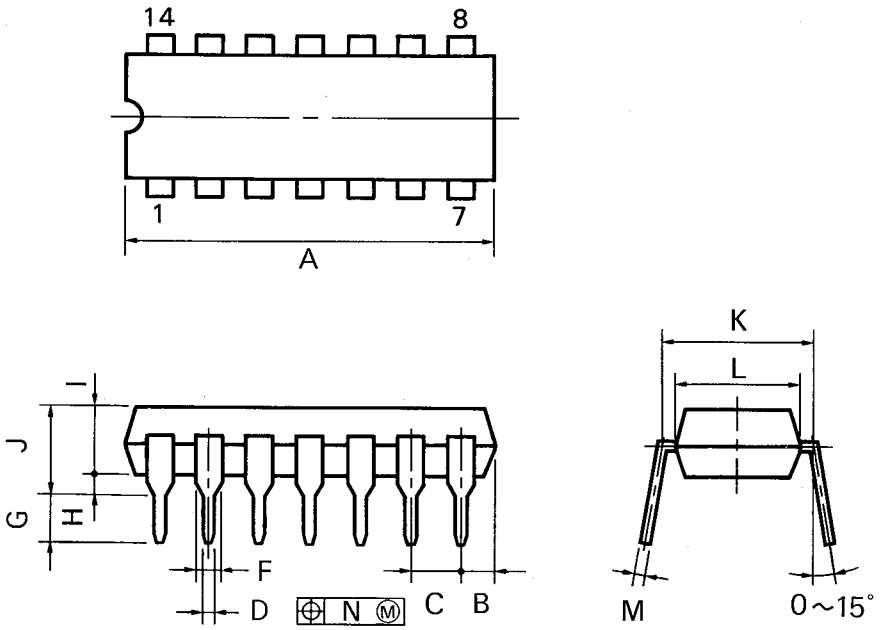
INPUT EQUIVALENT NOISE VOLTAGE DENSITY



SUPPLY CURRENT



14PIN PLASTIC DIP (300 mil)



P14C-100-300B1

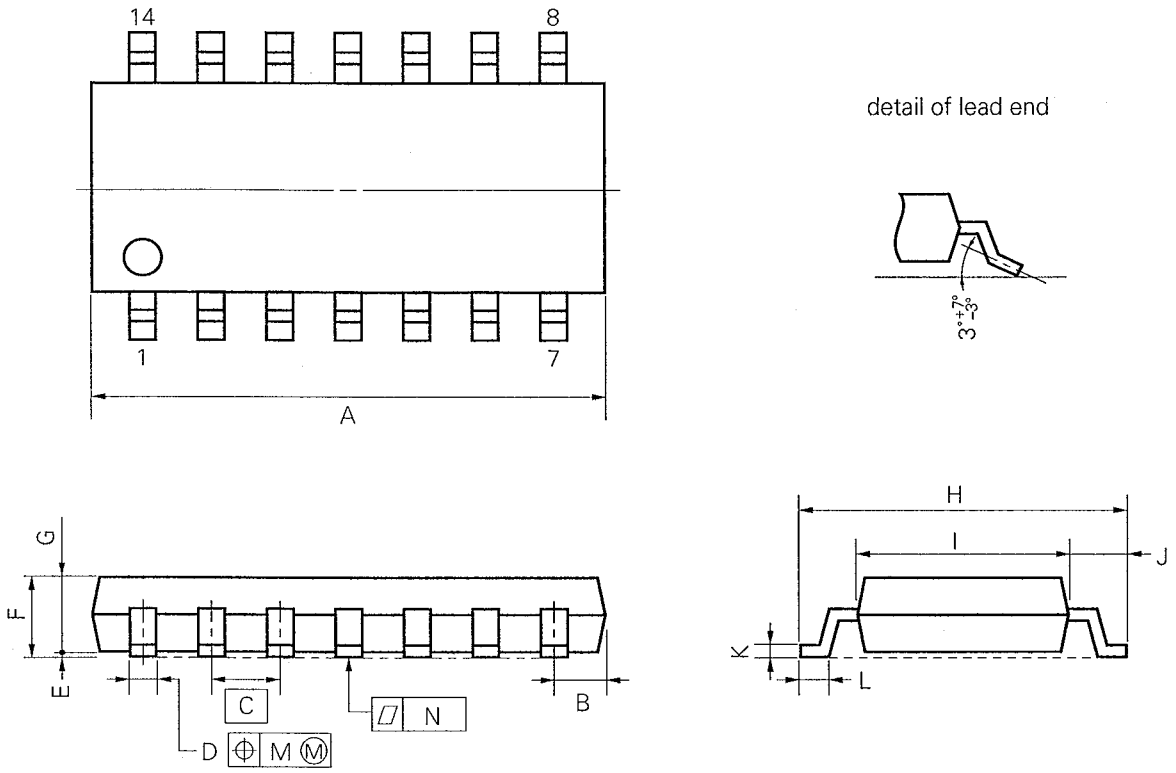
NOTES

1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	2.54 MAX.	0.100 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	$0.50^{\pm 0.10}$	$0.020^{+0.004}_{-0.005}$
F	1.2 MIN.	0.047 MIN.
G	$3.6^{\pm 0.3}$	$0.142^{\pm 0.012}$
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.25	0.01

14 PIN PLASTIC SOP (225 mil)



S14GM-50-225B, C-2

NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.46 MAX.	0.412 MAX.
B	1.42 MAX.	0.056 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071MAX.
G	1.49	0.059
H	6.5±0.3	0.256±0.012
I	4.4	0.173
J	1.1	0.043
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.15	0.006

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.
Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI–1207).

[μPC4074G2]

Soldering method	Soldering conditions	Recommended condition symbol
Infrared ray reflow	Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None	IR30–00–1
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None	VP15–00–1
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of flow process: 1, Exposure limit*: None	WS15–00–1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 10 seconds or below, Exposure limit*: None	

*: Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Note: Do not apply more than a single process at once, except for "Partial heating method."

TYPES OF THROUGH HOLE DEVICE

[μPC4074C]

Soldering method	Soldering conditions	Recommended condition symbol
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below	

[MEMO]

[MEMO]

M4 92.6