DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC3403

HIGH PERFORMANCE QUAD OPERATIONAL AMPLIFIER

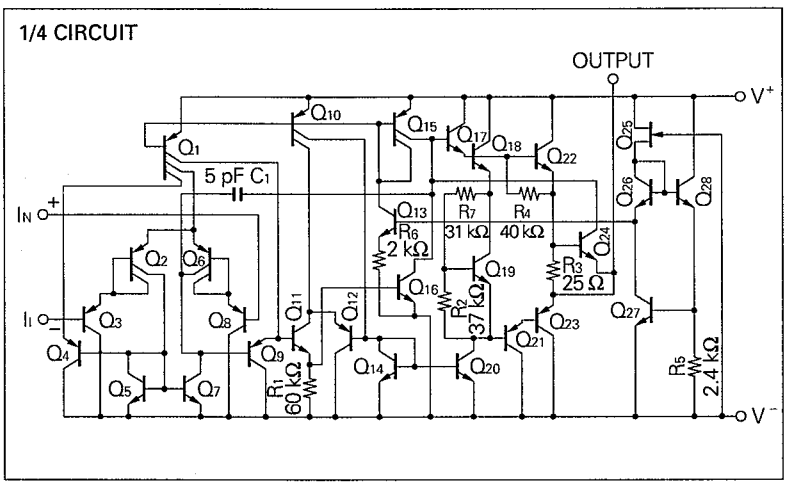
DESCRIPTION

The μPC3403 is monolithic Quad Operational Amplifier consists of four independent high-gain, internally frequency-compensated operational amplifiers, designed to operate from a single power supply or split power supplies over a wide range of voltages. The common mode input range includes the negative supply thereby eliminating the necessity for external biasing components in many applications.

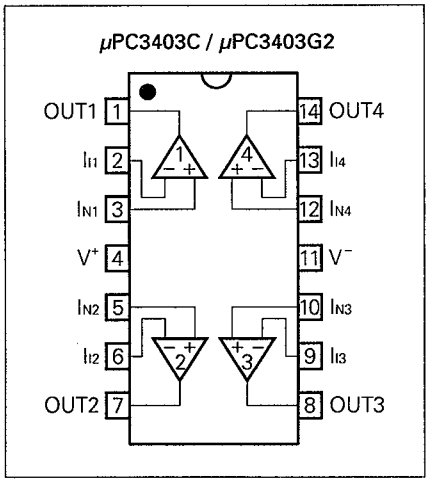
FEATURES

- Internal frequency compensation
- Common mode input voltage range includes V⁻
- Wide supply voltage range
  - 3 V to 32 V (Single)
  - ±1.5 V to 16 V (Split)
- Class AB Output Stage for Minimal Crossover Distortion
- Output short circuit protection

EQUIVALENT CIRCUIT



CONNECTION DIAGRAM (Top View)



ORDERING INFORMATION

PART NUMBER	PACKAGE	QUALITY GRADE
μPC3403C	14 PIN PLASTIC DIP (300 mil)	Standard
μPC3403G2	14 PIN PLASTIC SOP (225 mil)	Standard

Please refer to "Quality grade on NEC Semiconductor Device" (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	μPC3403	UNIT
Voltage between V^+ and V^- (Note 1)		$V^+ - V^-$	−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 Dissipation	C Package (Note 4)	P_T	570	mW
	G2 Package (Note 5)		550	mW
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 or 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 mW / °C when ambient temperature is higher than 50 °C.

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

Note 6. Pay careful attention 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 (Split)	$V^{\pm}$	± 1.5		± 16	V
Supply Voltage (V^- = GND)	V^+	+ 3		+ 32	V

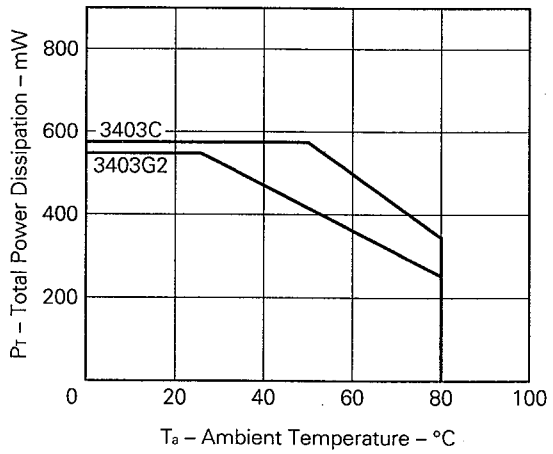
ELECTRICAL CHARACTERISTICS (T_a = 25 °C, $V^{\pm}$ = ±15 V)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Input Offset Voltage	V_{IO}		±2.0	±7.0	mV	
			±2.0	±7.0		V^+ = +5 V, V^- = GND
Input Offset Current	I_{IO}		±5	±50	nA	
			±5	±50		V^+ = +5 V, V^- = GND
Input Bias Current (Note 7)	I_B		45	250	nA	
			45	250		V^+ = +5 V, V^- = GND
Large Signal Voltage Gain	A_v	86	98		dB	V_O = ±10 V, R_L = 2 kΩ
		86	98			V^+ = +5 V, V^- = GND, R_L = 2 kΩ
Supply Current	I_{CC}		2.8	7.0	mA	V_O = 0, R_L = ∞, I_O = 0 A, All Amplifiers
			2.5	7.0		V^+ = +5 V, V^- = GND, I_O = 0 A, All Amplifiers
Common Mode Rejection Ratio	CMR	70	90		dB	
Supply Voltage Rejection Ratio	SVR		30	150	μV/V	
				150		V^+ = +5 V, V^- = GND
Output Voltage Swing	V_{om}	±12	±13.5		V	R_L = 10 kΩ
		±10	±13			R_L = 2.0 kΩ
		V^+–1.7 0	V^+–1.5 0			R_L = 10 kΩ (Connect to GND), 5 V ≦ V^+ ≦ 30 V, V^- = GND
Common Mode Input Voltage Range	V_{ICM}	+13 –15	+13.5 –15		V	
Output Short Circuit Current	$I_{O\ SHORT}$	±10	±20	±45	mA	
Channel Separation			120		dB	f = 1 kHz to 20 kHz

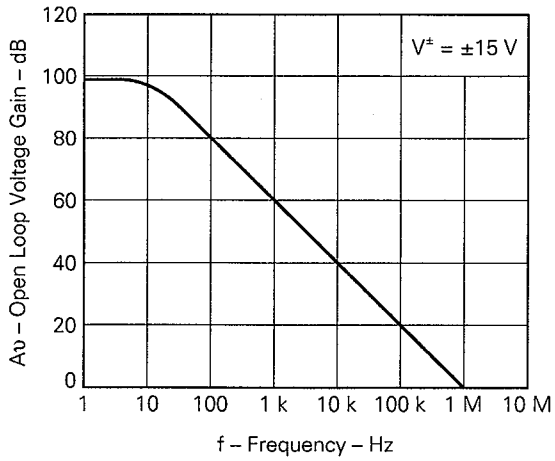
Note 7. Input bias currents flow out from IC. Because each currents are base current of PNP-transistor on input stage.

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

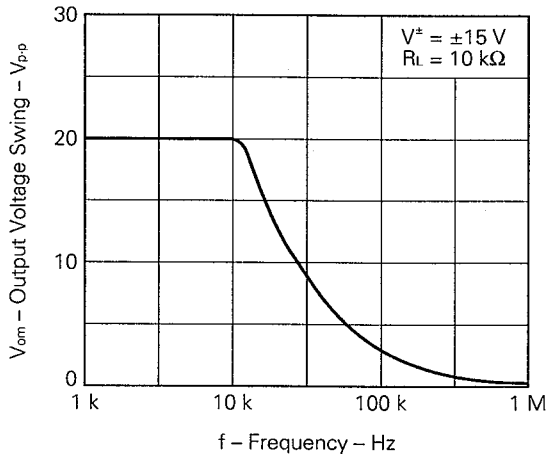
POWER DISSIPATION



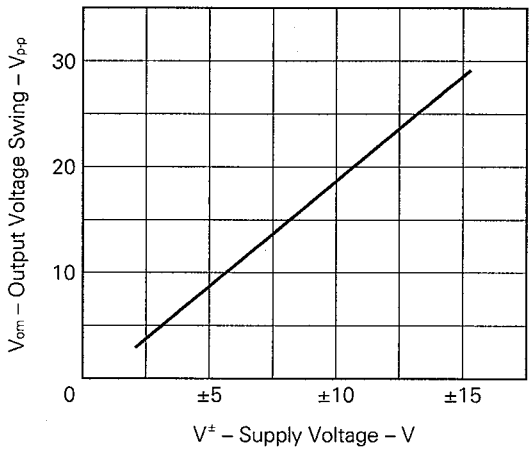
OPEN LOOP FREQUENCY RESPONSE



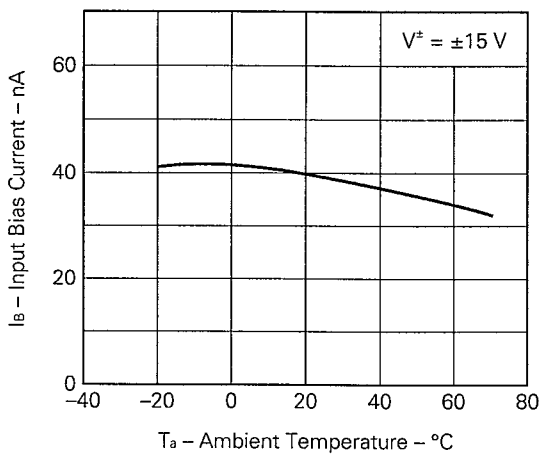
LARGE SIGNAL FREQUENCY RESPONSE



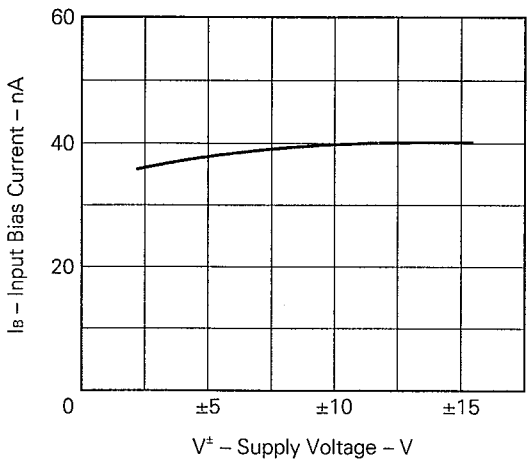
OUTPUT VOLTAGE SWING



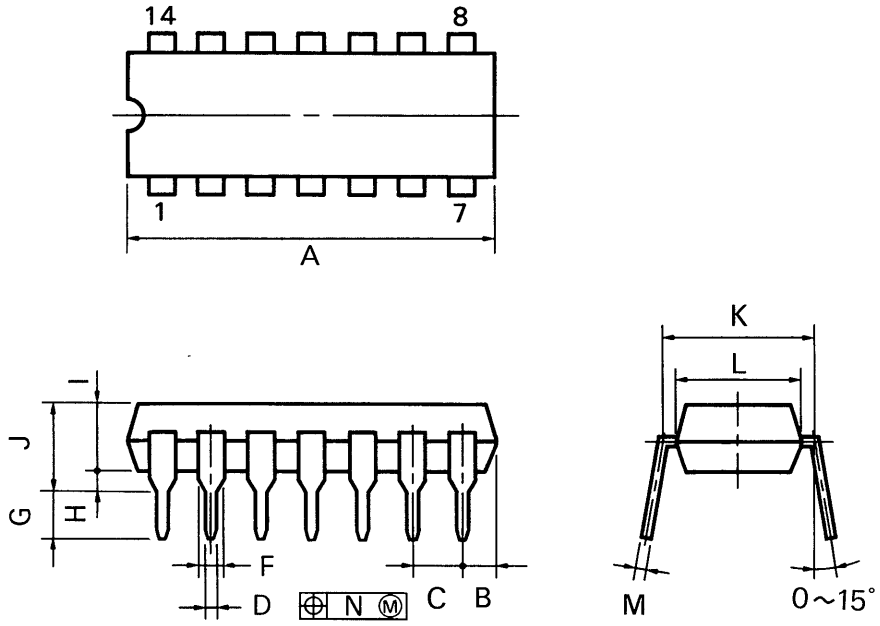
INPUT BIAS CURRENT



INPUT BIAS CURRENT



14PIN PLASTIC DIP (300 mil)



P14C-100-300B1

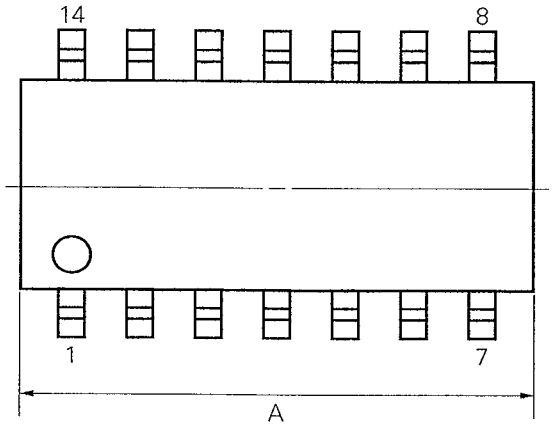
NOTES

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

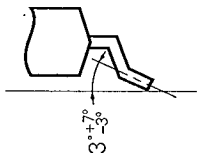
2) Item "K" to center of leads when formed parallel.

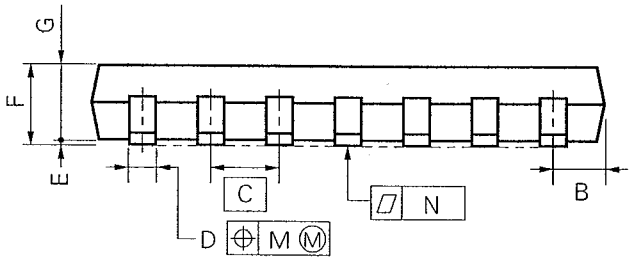
ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	2.54 MAX.	0.100 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	$0.50^{\pm 0.10}$	$0.020^{+0.004}_{-0.005}$
F	1.2 MIN.	0.047 MIN.
G	$3.6^{\pm 0.3}$	$0.142^{\pm 0.012}$
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L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

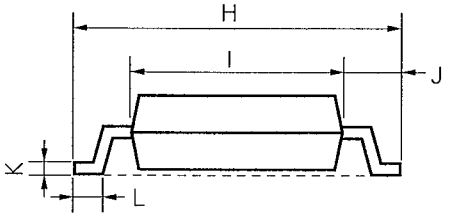
14 PIN PLASTIC SOP (225 mil)



detail of lead end







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).
[μPC3403G2]

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

[μPC3403C]

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

[MEMO]

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Application examples recommended by NEC Corporation.

Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.

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