

J-FET INPUT LOW-POWER QUAD OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4064 is a low power J-FET input quad operational amplifier that will operate at voltage levels as low as ± 2 V. Input current is typically less than 1mA. With input bias and offset currents as low as a few pA, the μPC4064 is an excellent choice for hand-held measurement equipment.

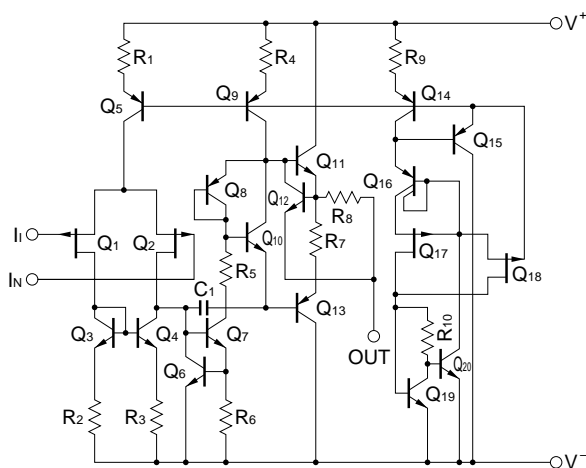
FEATURES

- Low supply current: 800 μ A (TYP.)
- Very low input bias and offset currents
- High input impedance...J-FET Input Stage
- Low supply voltage operation
- Output short circuit protection
- Internal frequency compensation

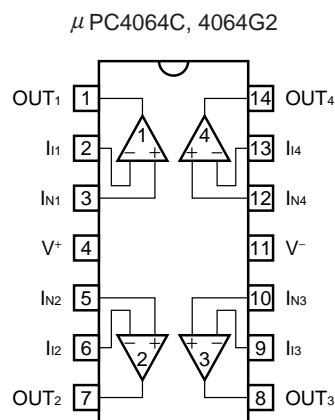
ORDERING INFORMATION

| Part Number | Package |
|-------------|------------------------------------|
| μPC4064C | 14-pin plastic DIP (7.62 mm (300)) |
| μPC4064G2 | 14-pin plastic SOP (5.72 mm (225)) |

EQUIVALENT CIRCUIT (1/4 Circuit)



PIN CONFIGURATION (Top View)



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ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

| Parameter | | Symbol | Ratings | 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 |
| Output Short Circuit Duration ^{Note 6} | | | Indefinite | sec |
| Operating Ambient Temperature | | T _A | -20 to +80 | °C |
| Storage Temperature | | T _{stg} | -55 to +125 | °C |

- Notes**
- Reverse connection of supply voltage can cause destruction.
 - 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.
 - 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.
 - Thermal derating factor is -7.6 mV/°C when operating ambient temperature is higher than 50°C.
 - Thermal derating factor is -5.5 mV/°C when operating ambient temperature is higher than 25°C.
 - Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|------|------|------|------|
| Supply Voltage | V [±] | ±2 | | ±16 | V |
| Output Source Current | I _{O SOURCE} | | | 5 | mA |
| Output Sink Current | I _{O SINK} | | | 3.5 | mA |
| Capacitive Load (A _v = +1, R _I = 0 Ω) | C _L | | | 100 | pF |

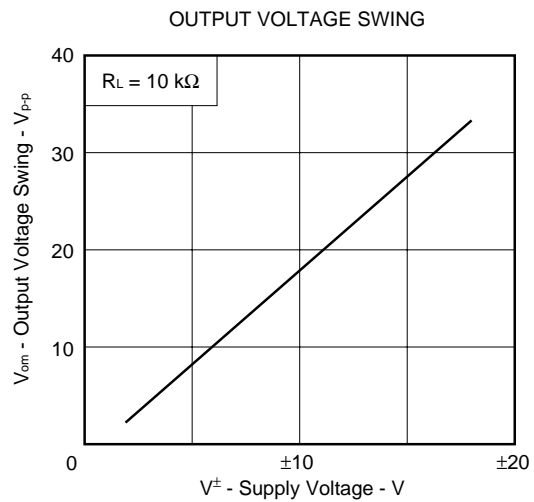
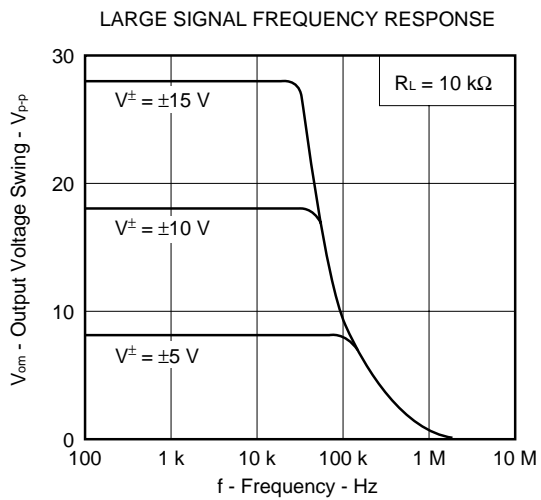
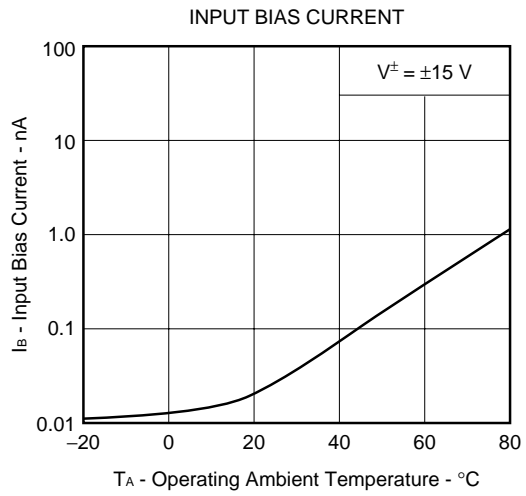
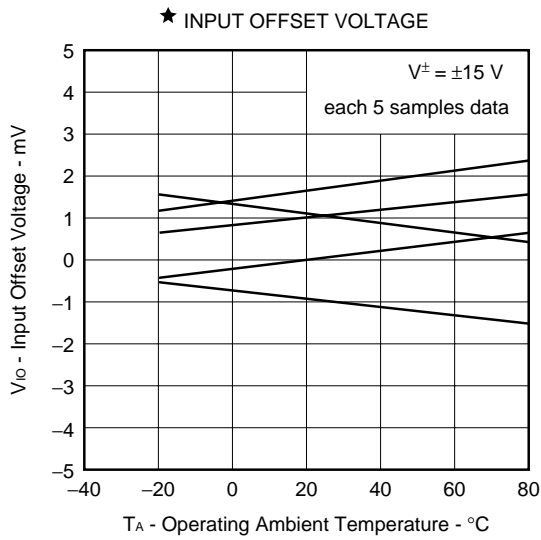
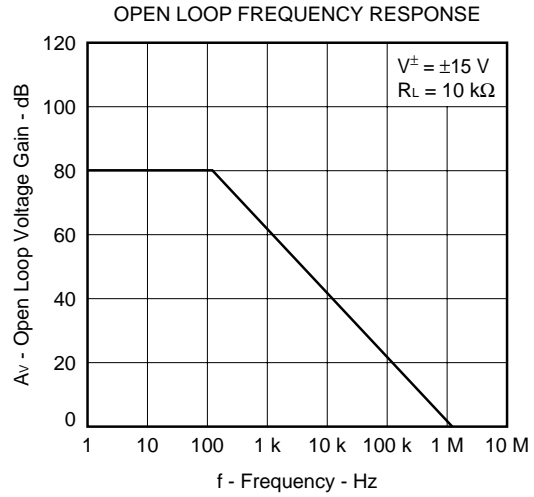
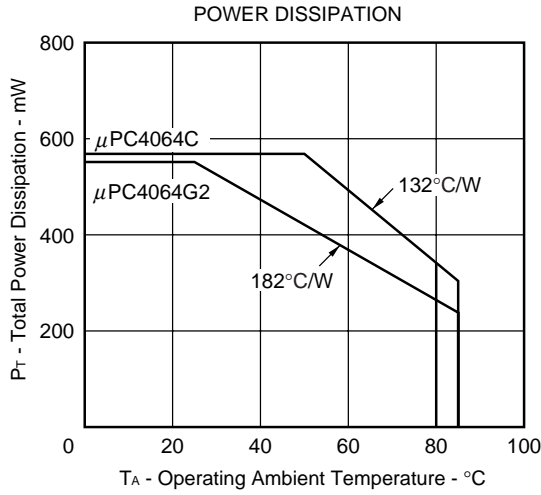
ELECTRICAL CHARACTERISTICS (T_A = 25°C, V[±] = ±15 V)

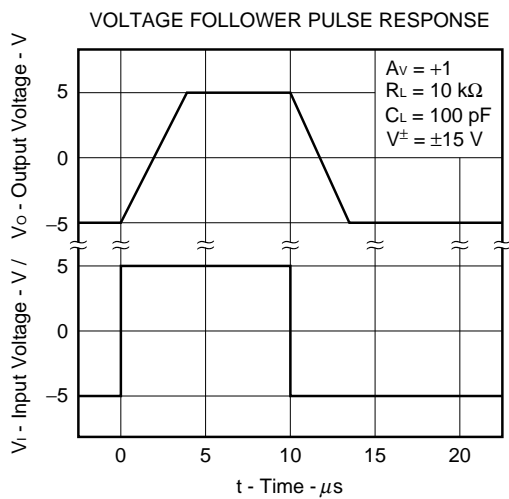
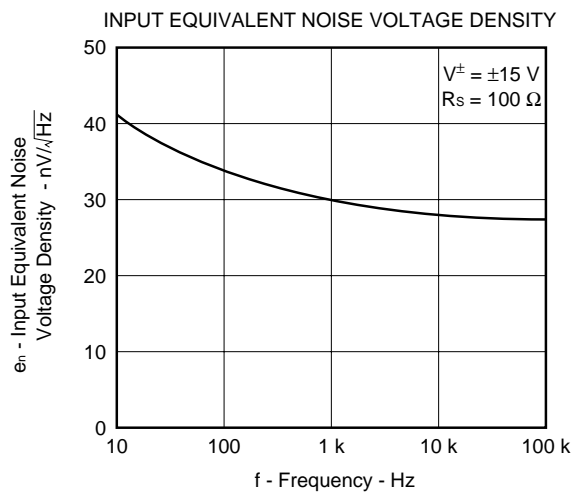
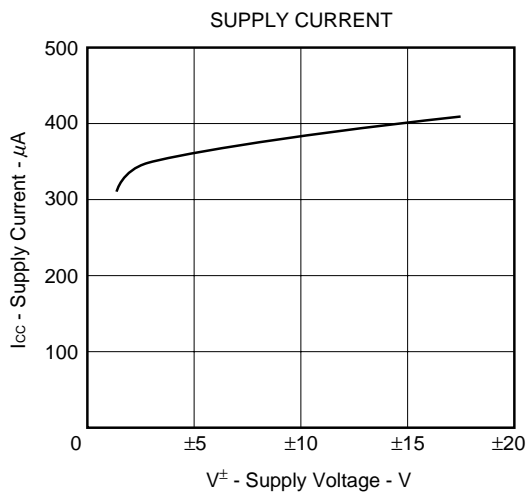
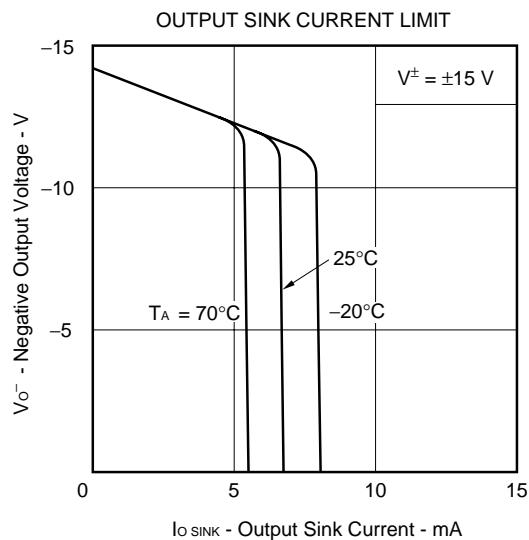
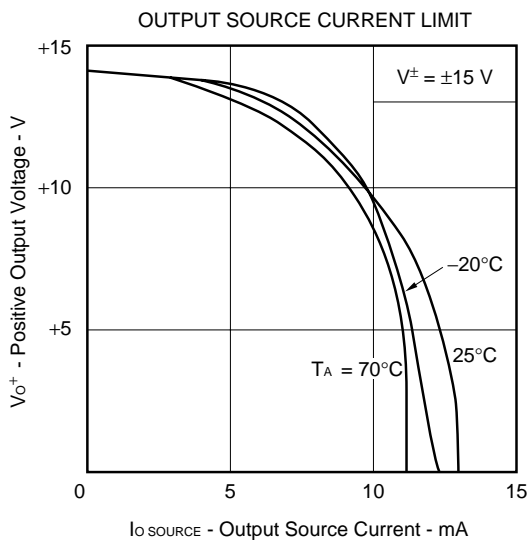
| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|----------------------|--|------|----------------|------|--------|
| Input Offset Voltage | V _{IO} | R _S ≤ 50 Ω | | ±2 | ±10 | mV |
| Input Offset Current ^{Note 7} | I _{IO} | | | ±5 | ±50 | pA |
| Input Bias Current ^{Note 7} | I _B | | | 10 | 100 | pA |
| Large Signal Voltage Gain | A _V | R _L ≥ 10 kΩ, V _O = ±10 V | 3000 | 9000 | | |
| ★ Supply Current ^{Note 8} | I _{CC} | I _O = 0 A | | 800 | 1000 | μA |
| Common Mode Rejection Ratio | CMR | | 70 | 90 | | dB |
| Supply Voltage Rejection Ratio | SVR | | 70 | 90 | | dB |
| Output Voltage Swing | V _{om} | R _L ≥ 10 kΩ | ±12 | +14.0 -13.6 | | V |
| Common Model Input Voltage Range | V _{ICM} | | ±12 | +15 -13 | | V |
| Slew Rate | SR | A _V = 1 | | 3 | | V/μs |
| Unity Gain Frequency | f _{unity} | | | 1 | | MHz |
| Input Equivalent Noise Voltage Density | e _n | R _S = 100 Ω, f = 1 kHz | | 30 | | nV/√Hz |
| Channel Separation | | | | 120 | | dB |
| Input Offset Voltage | V _{IO} | R _S ≤ 50 Ω, T _A = -20 to +70°C | | | ±15 | mV |
| Average V _{IO} Temperature Drift | ΔV _{IO} /ΔT | T _A = -20 to +70°C | | ±10 | | μV/°C |
| Input Offset Current ^{Note 7} | I _{IO} | T _A = -20 to +70°C | | | ±2 | nA |
| Input Bias Current ^{Note 7} | I _B | T _A = -20 to +70°C | | | 3.5 | nA |

Notes 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 operating ambient temperature.

★ **8.** This current flows irrespective of the existence of use.

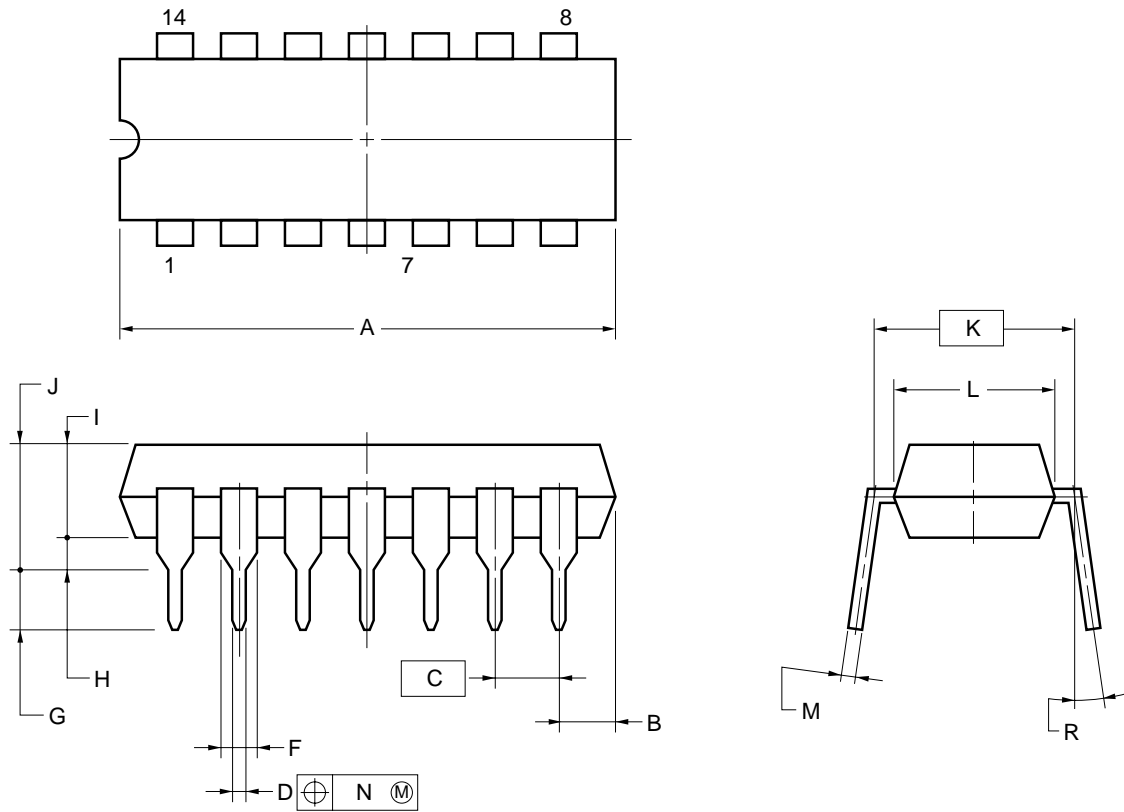
TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$, TYP.)





PACKAGE DRAWINGS (Unit : mm)

14-PIN PLASTIC DIP (7.62 mm (300))



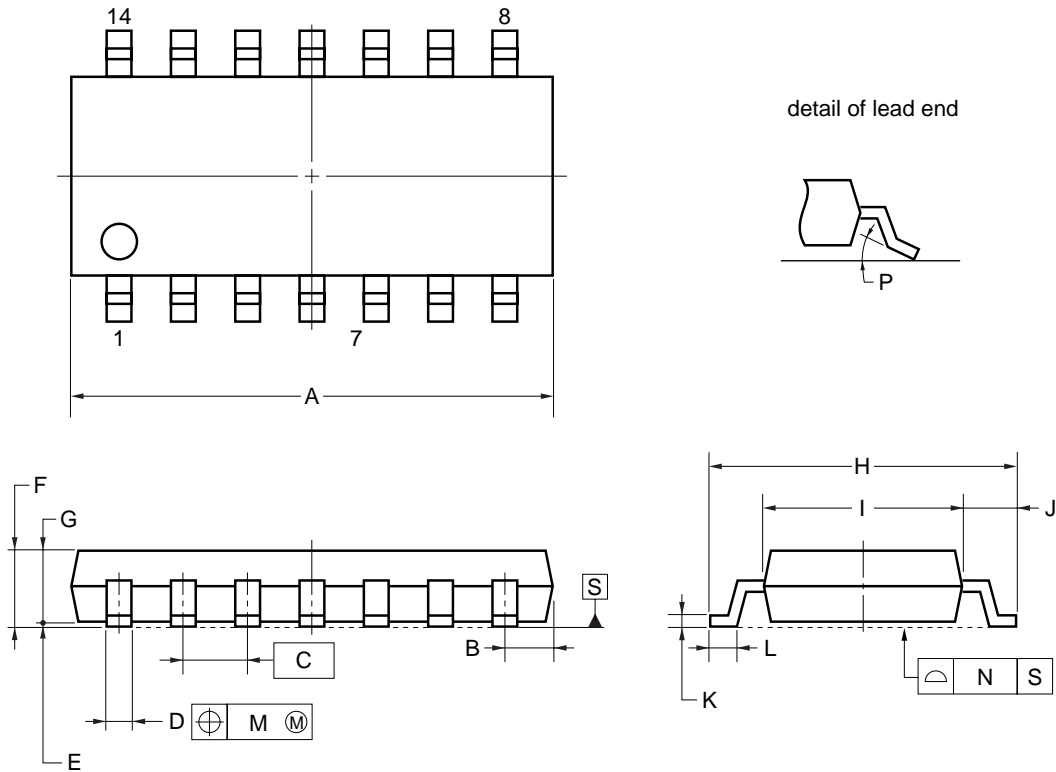
NOTES

1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.
2. Item "K" to center of leads when formed parallel.

| ITEM | MILLIMETERS |
|------|--|
| A | 19.22±0.2 |
| B | 2.14 MAX. |
| C | 2.54 (T.P.) |
| D | 0.50±0.10 |
| F | 1.32±0.12 |
| G | 3.6±0.3 |
| H | 0.51 MIN. |
| I | 3.55 |
| J | 4.3±0.2 |
| K | 7.62 (T.P.) |
| L | 6.4±0.2 |
| M | 0.25 ^{+0.10} _{-0.05} |
| N | 0.25 |
| R | 0~15° |

P14C-100-300B1-3

14-PIN PLASTIC SOP (5.72 mm (225))



NOTE

Each lead centerline is located within 0.1 mm of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS |
|------|--|
| A | 10.2±0.26 |
| B | 1.42 MAX. |
| C | 1.27 (T.P.) |
| D | 0.42 ^{+0.08} _{-0.07} |
| E | 0.1±0.1 |
| F | 1.59 ^{+0.21} _{-0.2} |
| G | 1.49 |
| H | 6.5±0.2 |
| I | 4.4±0.1 |
| J | 1.1±0.16 |
| K | 0.17 ^{+0.08} _{-0.07} |
| L | 0.6±0.2 |
| M | 0.1 |
| N | 0.10 |
| P | 3° ^{+7°} _{-3°} |

S14GM-50-225B, C-6

★ **RECOMMENDED SOLDERING CONDITIONS**

The μPC4064 should be soldered and mounted under the following recommended conditions.

For soldering methods and conditions other than those recommended below, contact an NEC Electronics sales representative.

For technical information, see the following website.

Semiconductor Device Mount Manual (<http://www.necel.com/pkg/en/mount/index.html>)

Type of Surface Mount Device

μPC4064G2: 14-pin plastic SOP (5.72 mm (225))

| Process | Conditions | Symbol |
|------------------------|---|-----------|
| Infrared Ray Reflow | Peak temperature: 230°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 1 time. | IR30-00-1 |
| Vapor Phase Soldering | Peak temperature: 215°C or below (Package surface temperature), Reflow time: 40 seconds or less (at 200°C or higher), Maximum number of reflow processes: 1 time. | VP15-00-1 |
| Wave Soldering | Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature). | WS60-00-1 |
| Partial Heating Method | Pin temperature: 300°C or below, Heat time: 3 seconds or less (Per each side of the device). | — |

Caution Apply only one kind of soldering condition to a device, except for "partial heating method", or the device will be damaged by heat stress.

Type of Through-hole Device

μPC4064C: 14-pin plastic DIP (7.62 mm (300))

| Process | Conditions |
|-----------------------------------|---|
| Wave Soldering (only to leads) | Solder temperature: 260°C or below, Flow time: 10 seconds or less. |
| Partial Heating Method | Pin temperature: 300°C or below, Heat time: 3 seconds or less (per each lead). |

Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.

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