

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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The Renesas logo, featuring the word "RENESAS" in a bold, sans-serif font with a stylized square icon to the left.

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QUAD ULTRA LOW-NOISE, WIDEBAND, OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4574 is an ultra low noise, high slew rate quad operational amplifier specifically designed for audio, instrumentation, and communication circuits. The low noise and high frequency capabilities make it ideal for preamps and active filters for instrumentation and professional audio.

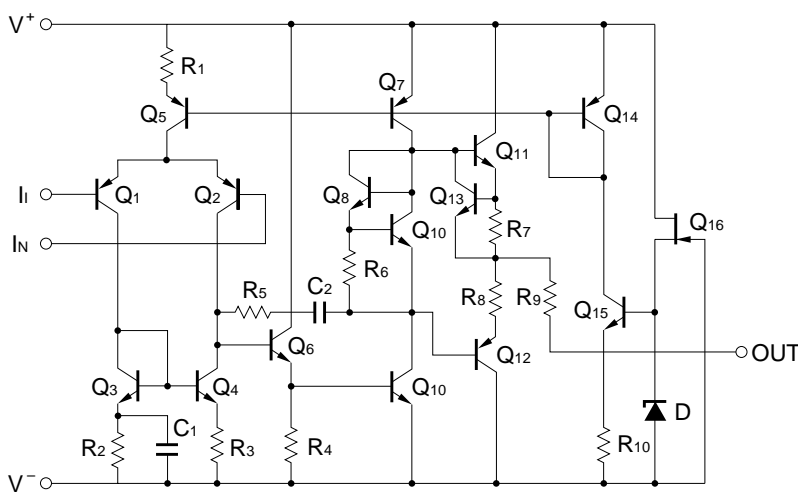
FEATURES

- Ultra low noise
- High slew rate
- Wide bandwidth
- Internal frequency compensation

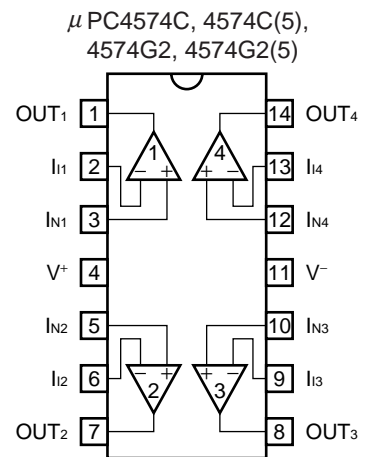
ORDERING INFORMATION

| Part Number | Package |
|--------------|------------------------------------|
| μPC4574C | 14-pin plastic DIP (7.62 mm (300)) |
| μPC4574C(5) | 14-pin plastic DIP (7.62 mm (300)) |
| μPC4574G2 | 14-pin plastic SOP (5.72 mm (225)) |
| μPC4574G2(5) | 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 ⁻ ^{Note1} | | V ⁺ - V ⁻ | -0.3 to +36 | V |
| Differential Input Voltage | | V _{ID} | ±30 | V |
| Input Voltage ^{Note2} | | V _I | V ⁻ -0.3 to V ⁺ +0.3 | V |
| Output Voltage ^{Note3} | | V _O | V ⁻ -0.3 to V ⁺ +0.3 | V |
| Power Dissipation | C Package ^{Note4} | P _T | 570 | mW |
| | G2 Package ^{Note5} | | 550 | mW |
| Output Short Circuit Duration ^{Note6} | | | 10 | 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 mW/°C when ambient temperature is higher than 50°C.
 - Thermal derating factor is -5.5 mW/°C when 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 [±] | ±4 | | ±16 | V |
| Output Current | I _o | | | ±10 | mA |
| Source Resistance | R _s | | | 50 | kΩ |
| Capacitive Load (A _v = +1) | C _L | | | 100 | pF |

μPC4574C, μPC4574G2

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 | | ±0.3 | ±5 | mV |
| Input Offset Current ^{Note 7} | I _{IO} | | | ±10 | ±200 | nA |
| Input Bias Current ^{Note 7} | I _B | | | 500 | 1000 | nA |
| Large Signal Voltage Gain | A _V | R _L ≥ 2 kΩ, V _O = ±10 V | 30000 | 300000 | | |
| ★ Supply Current ^{Note 8} | I _{CC} | I _O = 0 A | | 8.5 | 12 | mA |
| Common Mode Rejection Ratio | CMR | | 80 | 100 | | dB |
| Supply Voltage Rejection Ratio | SVR | | 80 | 100 | | dB |
| Output Voltage Swing | V _{om} | R _L ≥ 10 kΩ | ±12 | ±13.4 | | V |
| | | R _L ≥ 2 kΩ | ±10 | +12.8 -12.4 | | |
| Common Mode Input Voltage Range | V _{ICM} | | ±12 | ±14 | | V |
| Slew Rate | SR | R _L ≥ 2 kΩ | 4 | 6 | | V/ μs |
| Gain Band Width Product | GBW | f _o = 100 kHz | 10 | 14 | | MHz |
| Unity Gain Frequency | f _{unity} | open loop | | 7 | | MHz |
| Phase Margin | φ _{unity} | open loop | | 50 | | degree |
| Total Harmonic Distortion | THD | V _O = 3 V _{r.m.s.} , f = 20 Hz to 20 kHz (Fig.1) | | 0.002 | | % |
| Input Equivalent Noise Voltage | V _n | RIAA (Fig.2) | | 1.2 | | μV _{r.m.s.} |
| | | FLAT+JIS A, R _S = 100 Ω (Fig.3) | | 0.53 | 0.65 | |
| Input Equivalent Noise Voltage Density | e _n | f _o = 10 Hz, R _S = 100 Ω | | 5.5 | | nV/√Hz |
| | | f _o = 1 kHz, R _S = 100 Ω | | 5.0 | | |
| Input Equivalent Noise Current Density | i _n | f _o = 1 kHz | | 0.7 | | pA/√Hz |
| Channel Separation | | f = 20 Hz to 20 kHz | | 120 | | dB |

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

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

μPC4574C(5), μPC4574G2(5)

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

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|--|--------------------|--|-------|----------------|------|----------------------|
| Input Offset Voltage | V _{IO} | R _S ≤ 50 Ω | | ±0.3 | ±1 | mV |
| Input Offset Current ^{Note 7} | I _{IO} | | | ±10 | ±60 | nA |
| Input Bias Current ^{Note 7} | I _B | | | 500 | 650 | nA |
| Large Signal Voltage Gain | A _V | R _L ≥ 2 kΩ, V _O = ±10 V | 50000 | 300000 | | |
| ★ Supply Current ^{Note 8} | I _{CC} | I _O = 0 A | | 8.5 | 11 | mA |
| Common Mode Rejection Ratio | CMR | | 85 | 100 | | dB |
| Supply Voltage Rejection Ratio | SVR | | 85 | 100 | | dB |
| Output Voltage Swing | V _{OM} | R _L ≥ 10 kΩ | ±13 | ±13.4 | | V |
| | | R _L ≥ 2 kΩ | ±11.5 | +12.8 -12.4 | | |
| Common Mode Input Voltage Range | V _{ICM} | | ±13 | ±14 | | V |
| Slew Rate | SR | R _L ≥ 2 kΩ | 4 | 6 | | V/μs |
| Gain Band Width Product | GBW | f _O = 100 kHz | 10 | 14 | | MHz |
| Unity Gain Frequency | f _{UNITY} | open loop | | 7 | | MHz |
| Phase Margin | φ _{UNITY} | open loop | | 50 | | degree |
| Total Harmonic Distortion | THD | V _O = 3 V _{r.m.s.} , f = 20 Hz to 20 kHz (Fig.1) | | 0.002 | | % |
| Input Equivalent Noise Voltage | V _N | RIAA (Fig.2) | | 1.2 | | μV _{r.m.s.} |
| | | FLAT+JIS A, R _S = 100 Ω (Fig.3) | | 0.53 | 0.65 | |
| Input Equivalent Noise Voltage Density | e _N | f _O = 10 Hz, R _S = 100 Ω | | 5.5 | | nV/√Hz |
| | | f _O = 1 kHz, R _S = 100 Ω | | 5.0 | | |
| Input Equivalent Noise Current Density | i _N | f _O = 1 kHz | | 0.7 | | pA/√Hz |
| Channel Separation | | f = 20 Hz to 20 kHz | | 120 | | dB |

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

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

MEASUREMENT CIRCUIT

Fig.1 Total Harmonic Distortion Measurement Circuit

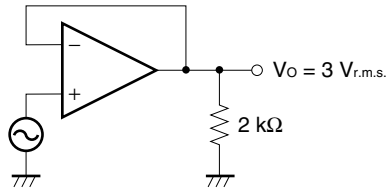


Fig.2 Noise Measurement Circuit (RIAA)

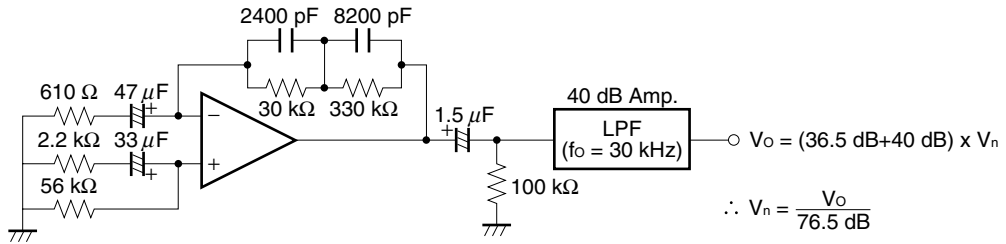
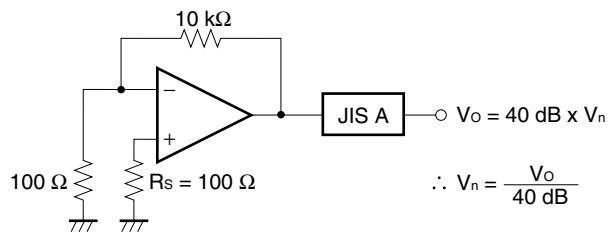
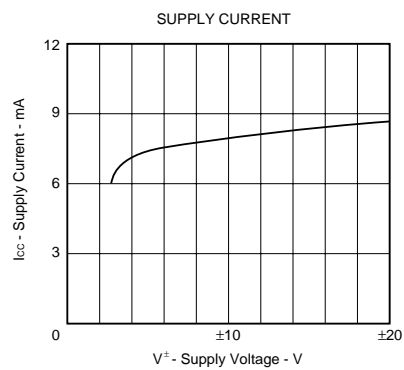
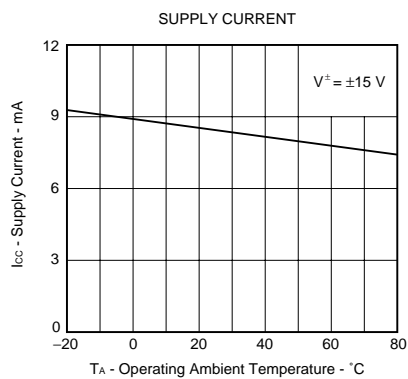
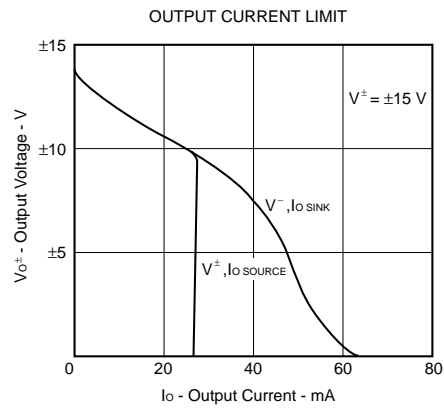
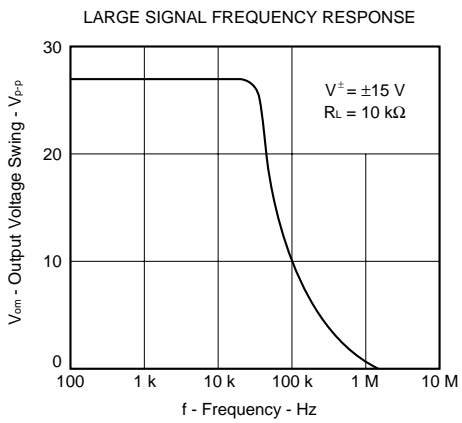
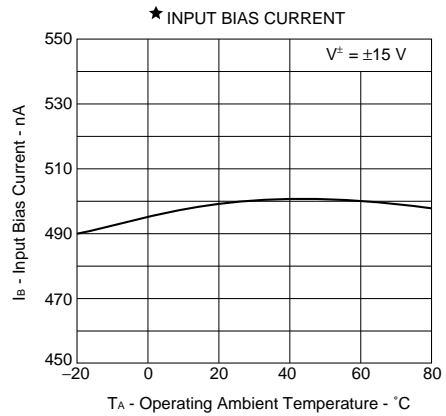
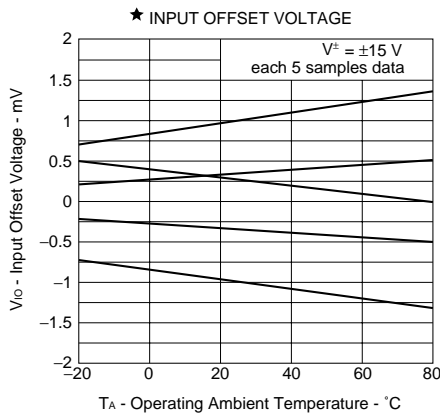
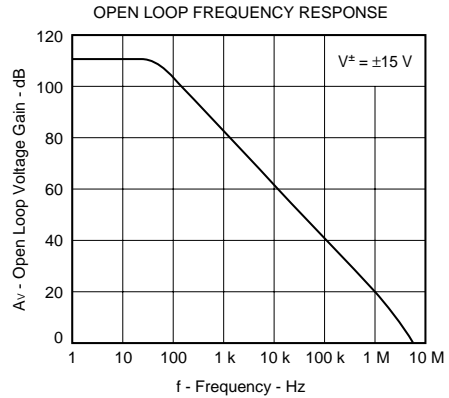
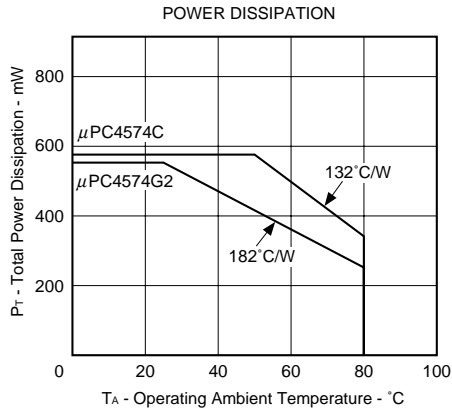
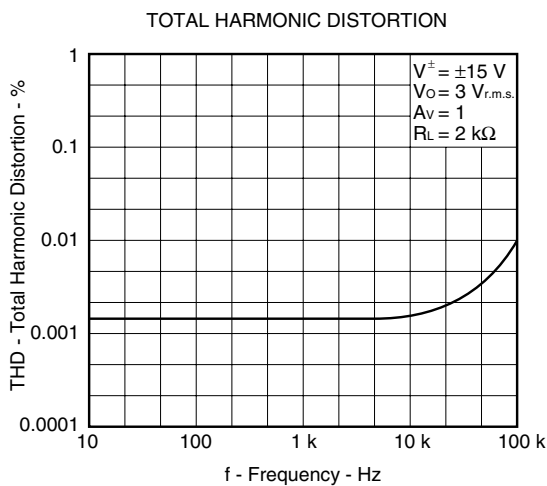
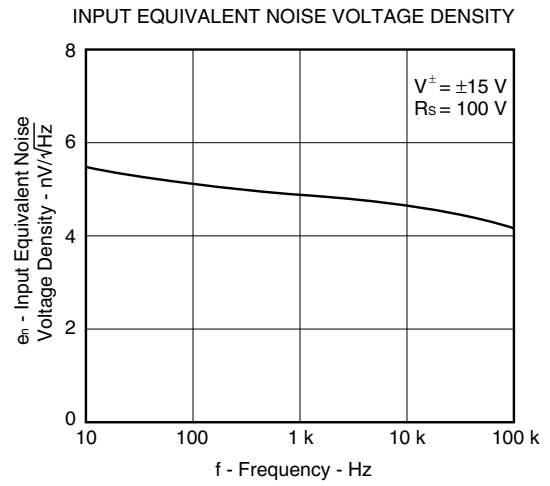
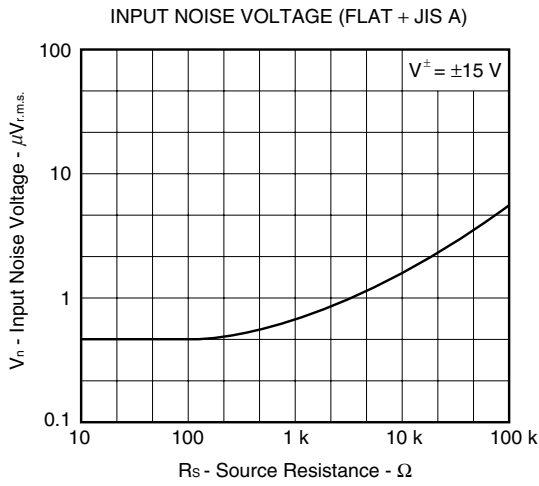
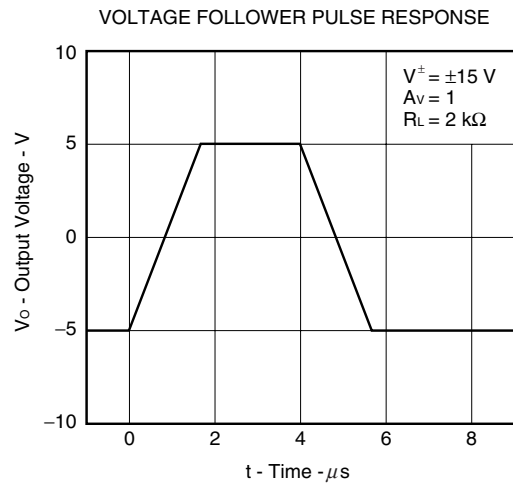
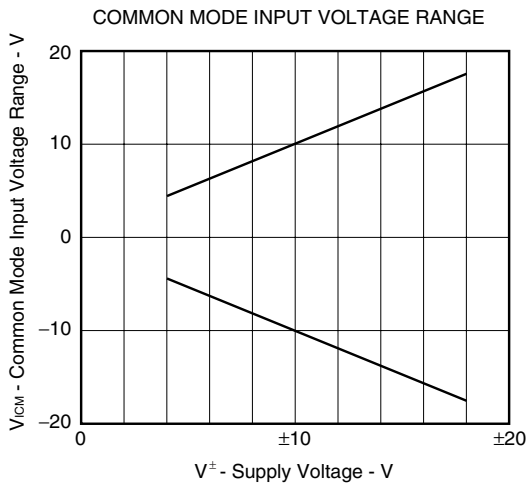


Fig.3 Flat Noise Measurement Circuit (FLAT+JIS A)



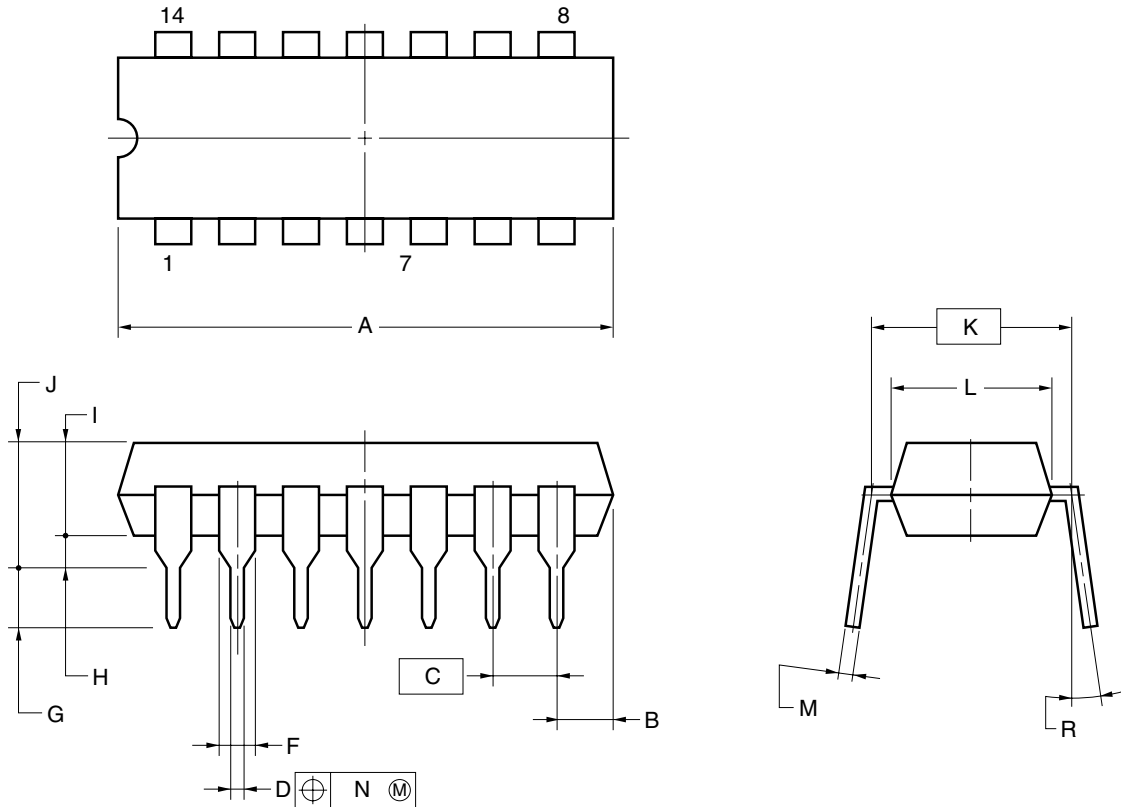
TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C, TYP.)





PACKAGE DRAWINGS (Unit: mm)

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



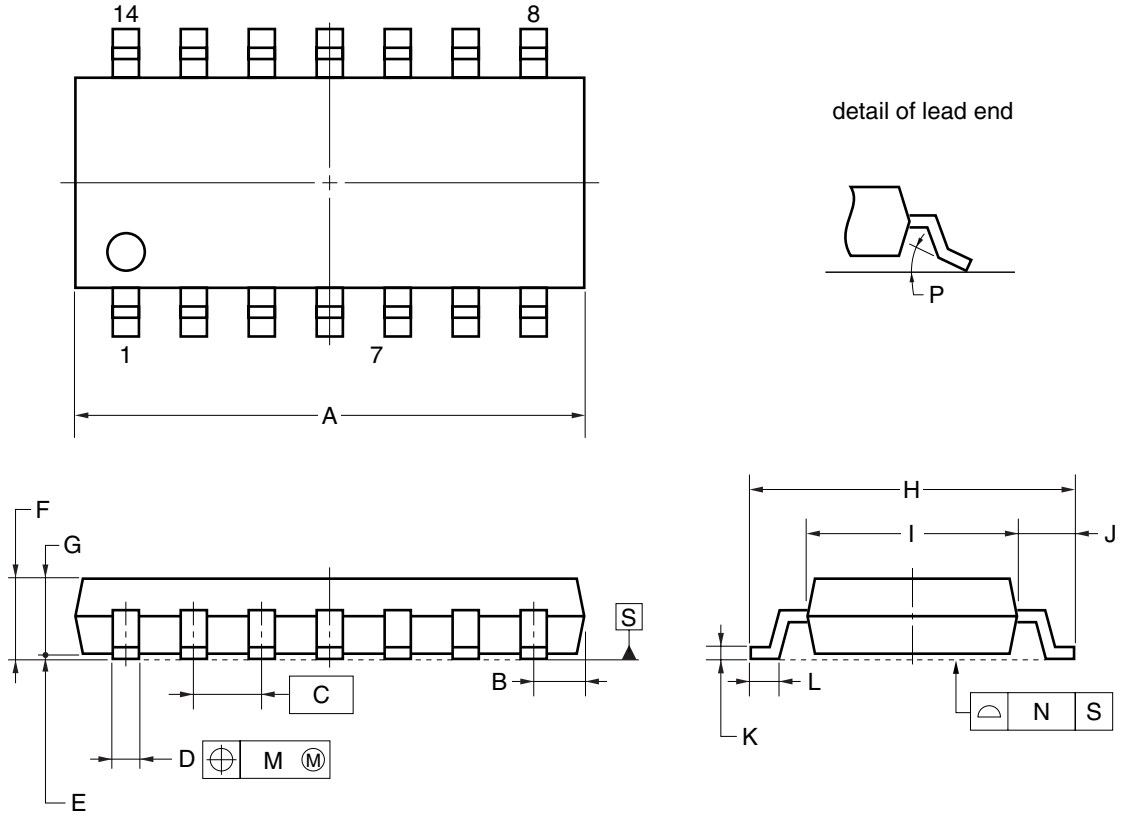
NOTES

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 μPC4574 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

μPC4574G2, 4574G2(5): 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

μPC4574C, 4574C(5): 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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