

### 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.

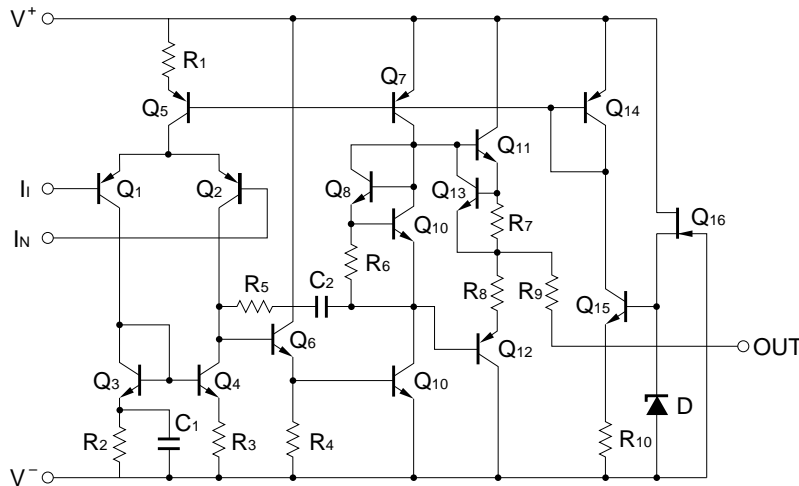
#### FEATURES

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

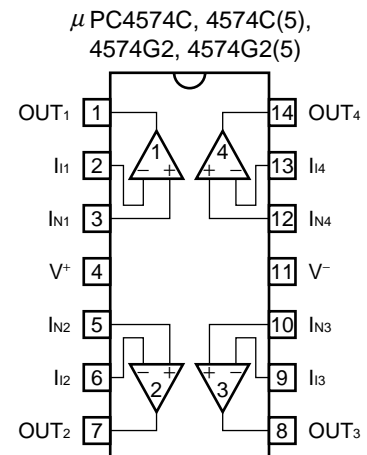
#### ★ ORDERING INFORMATION

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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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)**

Parameter		Symbol	Ratings	Unit
Voltage between V <sup>+</sup> and V <sup>-</sup> <sup>Note1</sup>		V <sup>+</sup> - V <sup>-</sup>	-0.3 to +36	V
Differential Input Voltage		V <sub>ID</sub>	±30	V
Input Voltage <sup>Note2</sup>		V <sub>I</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Output Voltage <sup>Note3</sup>		V <sub>O</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Power Dissipation	C Package <sup>Note4</sup>	P <sub>T</sub>	570	mW
	G2 Package <sup>Note5</sup>		550	mW
Output Short Circuit Duration <sup>Note6</sup>			10	sec
Operating Ambient Temperature		T <sub>A</sub>	-20 to +80	°C
Storage Temperature		T <sub>stg</sub>	-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 <sup>±</sup>	±4		±16	V
Output Current	I <sub>o</sub>			±10	mA
Source Resistance	R <sub>s</sub>			50	kΩ
Capacitive Load (A <sub>v</sub> = +1)	C <sub>L</sub>			100	pF

μPC4574C, μPC4574G2

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sup>±</sup> = ±15 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V <sub>io</sub>	R <sub>s</sub> ≤ 50 Ω		±0.3	±5	mV
Input Offset Current <sup>Note</sup>	I <sub>io</sub>			±10	±200	nA
Input Bias Current <sup>Note</sup>	I <sub>B</sub>			500	1000	nA
Large Signal Voltage Gain	A <sub>v</sub>	R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V	30000	300000		
Supply Current	I <sub>cc</sub>	I <sub>o</sub> = 0 A, All Amplifiers		8.5	12	mA
Common Mode Rejection Ratio	CMR		80	100		dB
Supply Voltage Rejection Ratio	SVR		80	100		dB
Output Voltage Swing	V <sub>om</sub>	R <sub>L</sub> ≥ 10 kΩ	±12	±13.4		V
		R <sub>L</sub> ≥ 2 kΩ	±10	+12.8 -12.4		
Common Mode Input Voltage Range	V <sub>icm</sub>		±12	±14		V
Slew Rate	SR	R <sub>L</sub> ≥ 2 kΩ	4	6		V/μs
Gain Band Width Product	GBW	f <sub>o</sub> = 100 kHz	10	14		MHz
Unity Gain Frequency	f <sub>unity</sub>	open loop		7		MHz
Phase Margin	φ <sub>unity</sub>	open loop		50		degree
Total Harmonic Distortion	THD	V <sub>O</sub> = 3 V <sub>r.m.s.</sub> , f = 20 Hz to 20 kHz (Fig.1)		0.002		%
Input Equivalent Noise Voltage	V <sub>n</sub>	RIAA (Fig.2)		1.2		μV <sub>r.m.s.</sub>
		FLAT+JIS A, R <sub>s</sub> = 100 Ω (Fig.3)		0.53	0.65	
Input Equivalent Noise Voltage Density	e <sub>n</sub>	f <sub>o</sub> = 10 Hz, R <sub>s</sub> = 100 Ω		5.5		nV/√Hz
		f <sub>o</sub> = 1 kHz, R <sub>s</sub> = 100 Ω		5.0		
Input Equivalent Noise Current Density	i <sub>n</sub>	f <sub>o</sub> = 1 kHz		0.7		pA/√Hz
Channel Separation		f = 20 Hz to 20 kHz		120		dB

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

★ μPC4574C(5), μPC4574G2(5)

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sup>±</sup> = ±15V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V <sub>io</sub>	R <sub>s</sub> ≤ 50 Ω		±0.3	±1	mV
Input Offset Current <sup>Note</sup>	I <sub>io</sub>			±10	±60	nA
Input Bias Current <sup>Note</sup>	I <sub>B</sub>			500	650	nA
Large Signal Voltage Gain	A <sub>v</sub>	R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V	50000	300000		
Supply Current	I <sub>cc</sub>	I <sub>o</sub> = 0 A, All Amplifiers		8.5	11	mA
Common Mode Rejection Ratio	CMR		85	100		dB
Supply Voltage Rejection Ratio	SVR		85	100		dB
Output Voltage Swing	V <sub>om</sub>	R <sub>L</sub> ≥ 10 kΩ	±13	±13.4		V
		R <sub>L</sub> ≥ 2 kΩ	±11.5	+12.8 -12.4		
Common Mode Input Voltage Range	V <sub>icm</sub>		±13	±14		V
Slew Rate	SR	R <sub>L</sub> ≥ 2 kΩ	4	6		V/μs
Gain Band Width Product	GBW	f <sub>o</sub> = 100 kHz	10	14		MHz
Unity Gain Frequency	f <sub>unity</sub>	open loop		7		MHz
Phase Margin	φ <sub>unity</sub>	open loop		50		degree
Total Harmonic Distortion	THD	V <sub>O</sub> = 3 V <sub>r.m.s.</sub> , f = 20 Hz to 20 kHz (Fig.1)		0.002		%
Input Equivalent Noise Voltage	V <sub>n</sub>	RIAA (Fig.2)		1.2		μV <sub>r.m.s.</sub>
		FLAT+JIS A, R <sub>s</sub> = 100 Ω (Fig.3)		0.53	0.65	
Input Equivalent Noise Voltage Density	e <sub>n</sub>	f <sub>o</sub> = 10 Hz, R <sub>s</sub> = 100 Ω		5.5		nV/√Hz
		f <sub>o</sub> = 1 kHz, R <sub>s</sub> = 100 Ω		5.0		
Input Equivalent Noise Current Density	i <sub>n</sub>	f <sub>o</sub> = 1 kHz		0.7		pA/√Hz
Channel Separation		f = 20 Hz to 20 kHz		120		dB

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

MEASUREMENT CIRCUIT

Fig.1 Total Harmonic Distortion Measurement Circuit

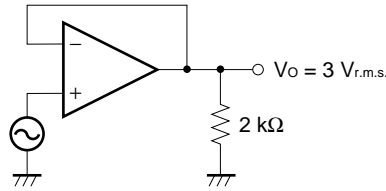


Fig.2 Noise Measurement Circuit (RIAA)

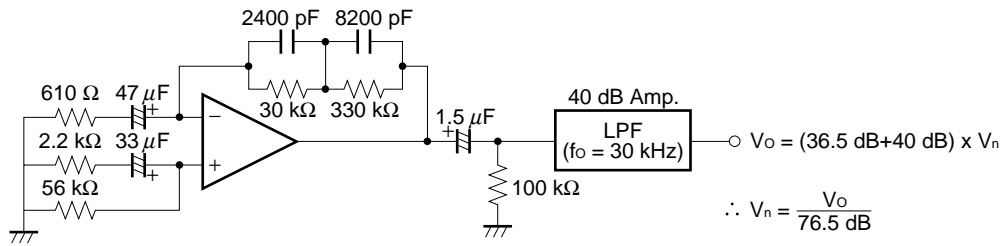
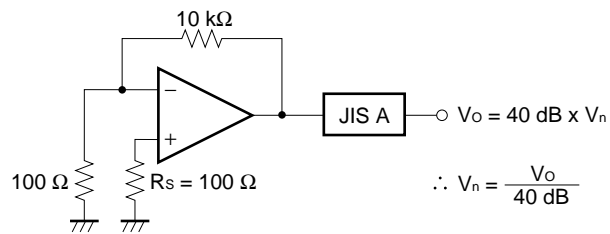
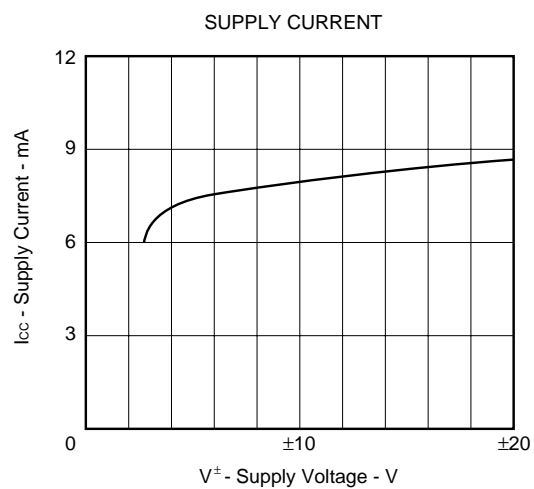
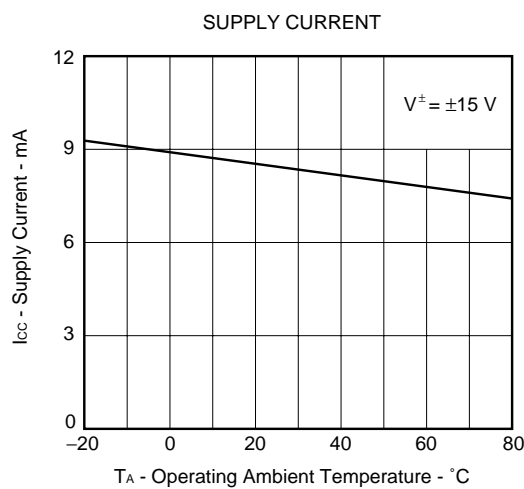
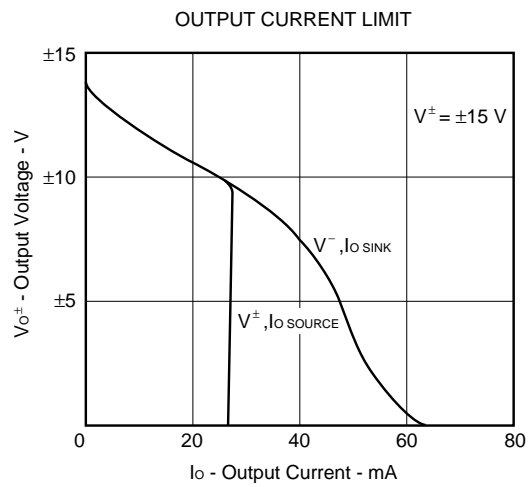
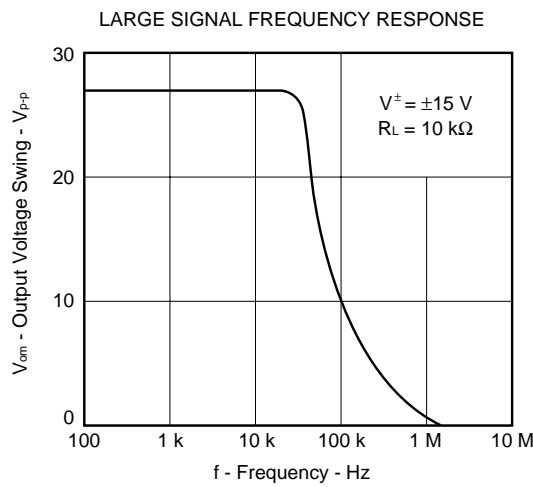
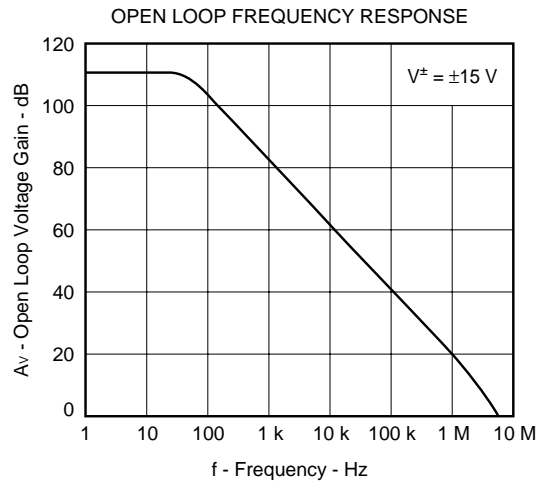
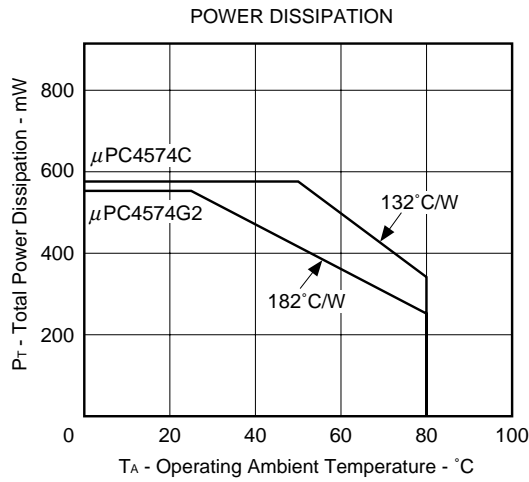
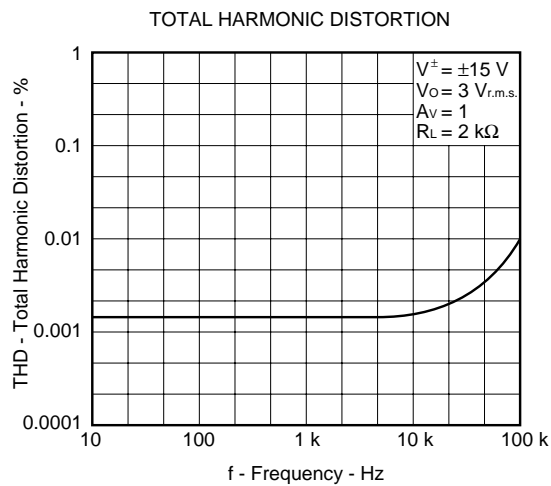
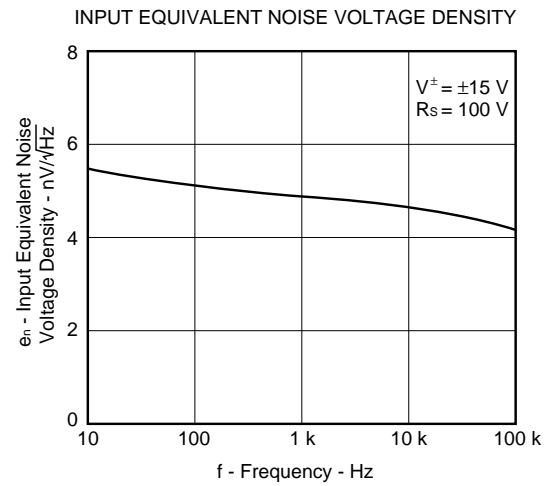
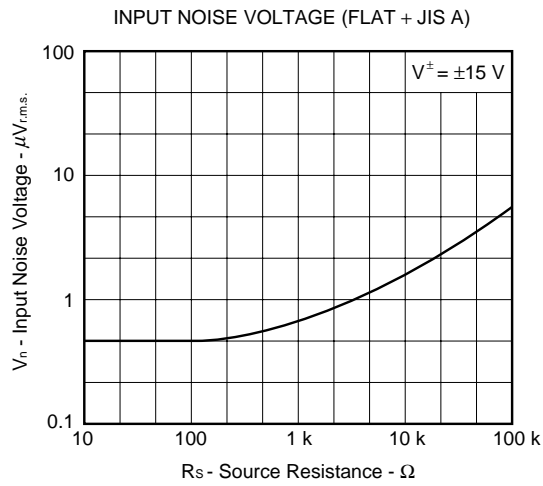
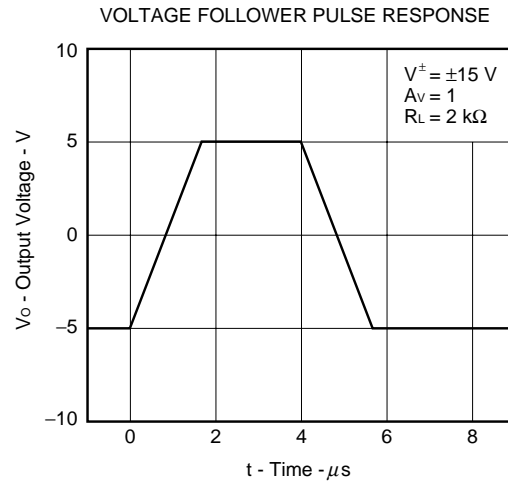
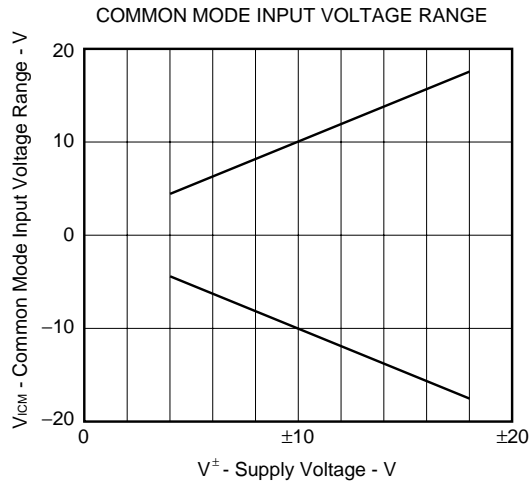


Fig.3 Flat Noise Measurement Circuit (FLAT+JIS A)



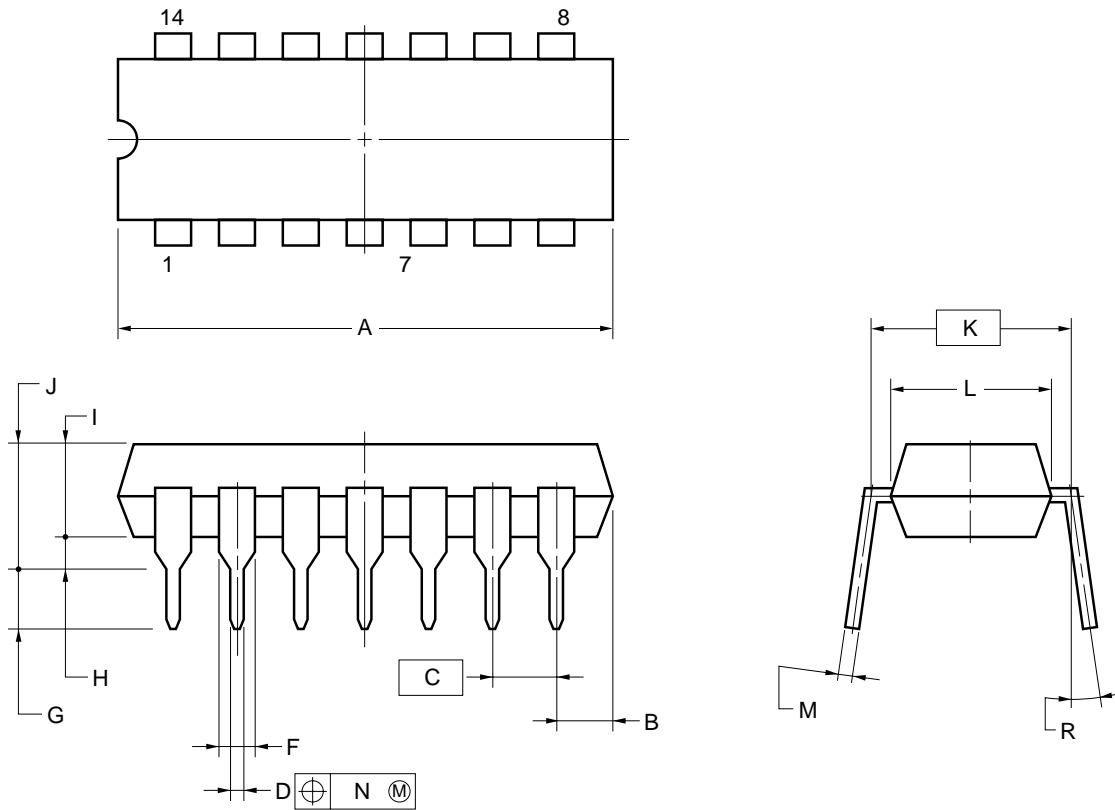
TYPICAL PERFORMANCE CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , TYP.)





★ PACKAGE DRAWINGS (Unit: mm)

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



NOTES

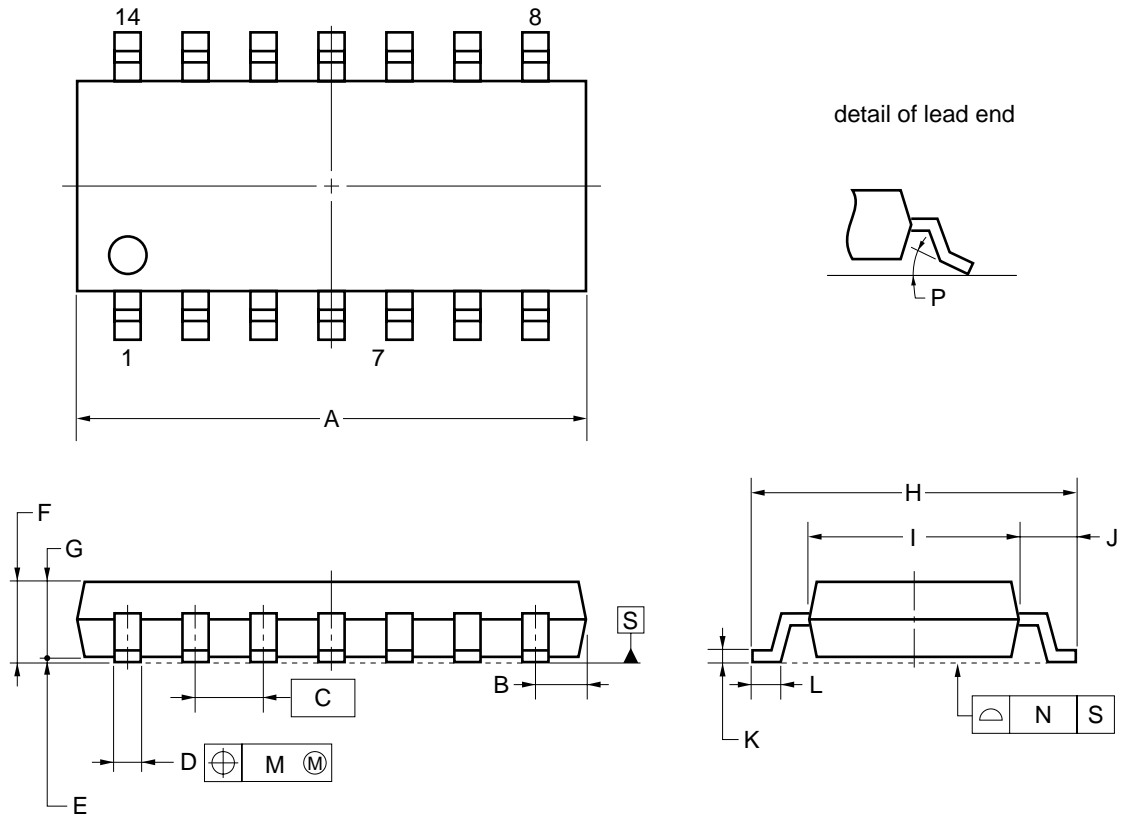
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.
2. Item "K" to center of leads when formed parallel.

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 <sup>+0.10</sup> <sub>-0.05</sub>
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 <sup>+0.08</sup> <sub>-0.07</sub>
E	0.1±0.1
F	1.59 <sup>+0.21</sup> <sub>-0.2</sub>
G	1.49
H	6.5±0.2
I	4.4±0.1
J	1.1±0.16
K	0.17 <sup>+0.08</sup> <sub>-0.07</sub>
L	0.6±0.2
M	0.1
N	0.10
P	3° <sup>+7°</sup> <sub>-3°</sub>

S14GM-50-225B, C-6

★ **RECOMMENDED SOLDERING CONDITIONS**

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to below our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL"(C10535E).

**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.

[MEMO]

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"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)  
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