

ULTRA LOW-NOISE, WIDEBAND, DUAL OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4570 is an ultra low-noise, wideband high slew-rate, dual operational amplifier. Input equivalent noise is three times better than the conventional 4558 type op-amps. The gain bandwidth products and the slew-rate are seven times better than 4558. In spite of fast AC performance, the μPC4570 is extremely stable under voltage-follower circuit conditions. Supply current is also improved compared with conventional wideband op-amps. The μPC4570 is an excellent choice for pre-amplifiers and active filters in audio, instrumentation, and communication circuits.

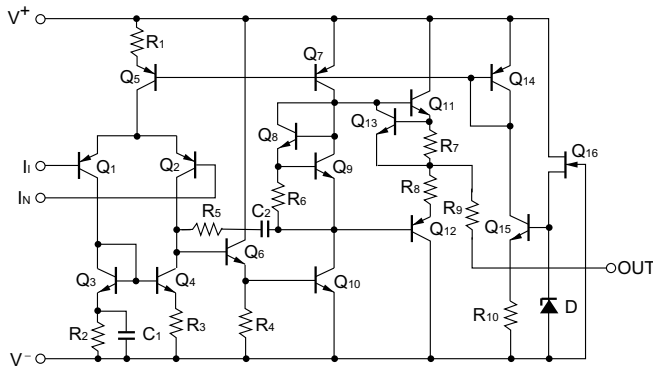
FEATURES

- Ultra low noise : $e_n = 4.5 \text{ nV}/\sqrt{\text{Hz}}$
- High slew rate : $7 \text{ V}/\mu\text{s}$
- High gain bandwidth product : $\text{GBW} = 15 \text{ MHz}$ at 100 kHz
- Internal frequency compensation

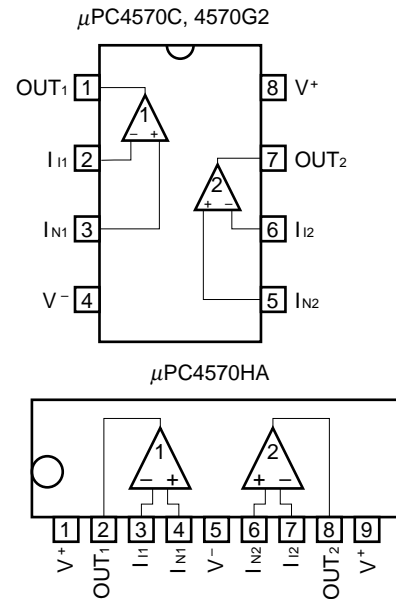
ORDERING INFORMATION

Part Number	Package
μPC4570C	8-pin plastic DIP (7.62 mm (300))
μPC4570G2	8-pin plastic SOP (5.72 mm (225))
μPC4570HA	9-pin plastic slim SIP

EQUIVALENT CIRCUIT (1/2 Circuit)



PIN CONFIGURATION (Top View)



The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version. Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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	350	mW
	G2 Package ^{Note 5}		440	mW
	HA Package ^{Note 4}		350	mW
Output Short Circuit Duration ^{Note 6}			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 destruction. 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 -5.0 mW/°C when operating ambient temperature is higher than 55°C.
 - Thermal derating factor is -4.4 mW/°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 [±]	±4		±16	V
Output Current	I _o			±10	mA
Source Resistance	R _s			50	kΩ
Capacitive Load (A _v = +1)	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		±0.3	±5	mV
Input Offset Current ^{Note}	I _{IO}			±10	±100	nA
Input Bias Current ^{Note}	I _B			100	400	nA
Large Signal Voltage Gain	A _V	R _L ≥ 2 kΩ, V _O = ±10 V	30,000	300,000		
Supply Current	I _{CC}	I _O = 0 A, Both Amplifiers		5	8	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		V
Common Mode Input Voltage Range	V _{ICM}		±12	±14		V
Slew Rate	SR	R _L ≥ 2 kΩ	5	7		V/μs
Gain Bandwidth Product	GBW	f _O = 100 kHz	10	15		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 (Figure1)		0.002		%
Input Equivalent Noise Voltage	V _n	RIAA (Figure2)		0.9		μV _{r.m.s.}
		FLAT+JIS A, R _S = 100 Ω (Figure3)		0.53	0.65	μV _{r.m.s.}
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		4.5		nV/√Hz
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

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

MEASUREMENT CIRCUIT

Figure1 Total Harmonic Distortion Measurement Circuit

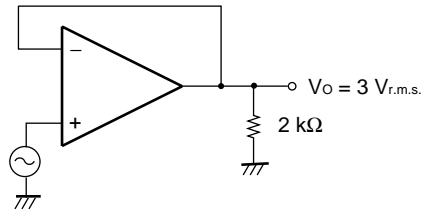


Figure2 Noise Measurement Circuit (RIAA)

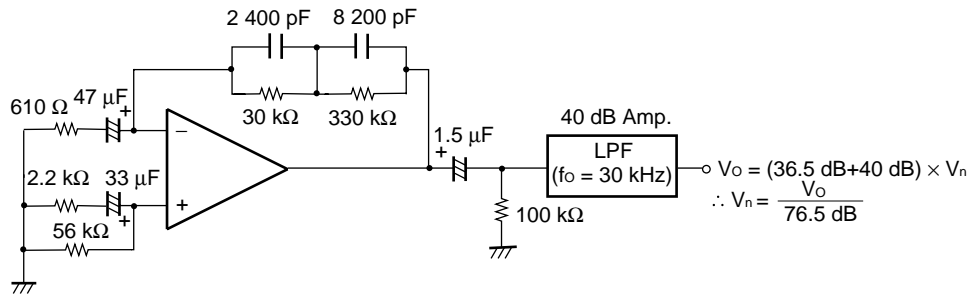
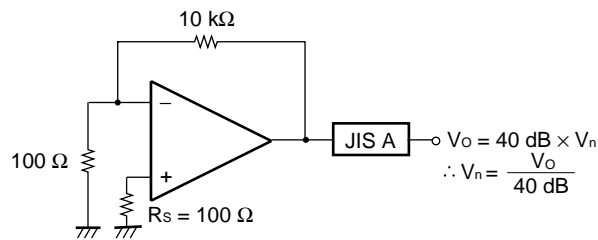
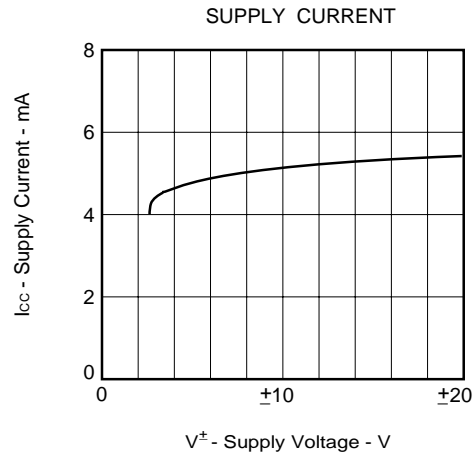
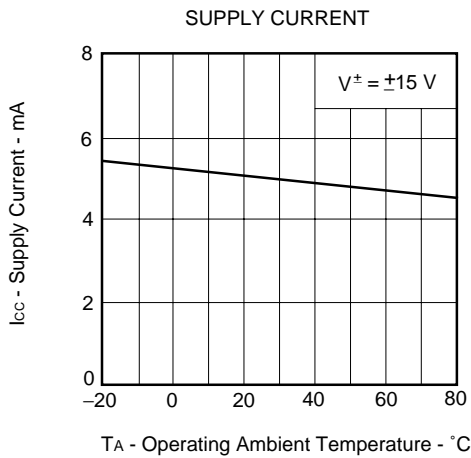
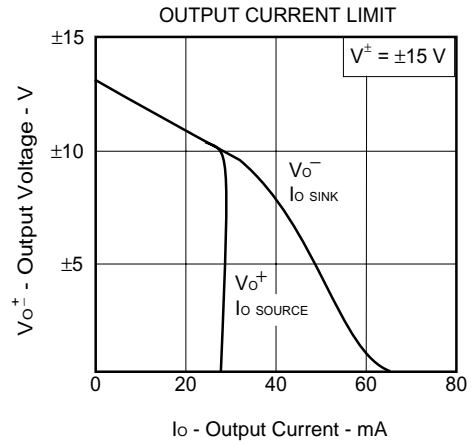
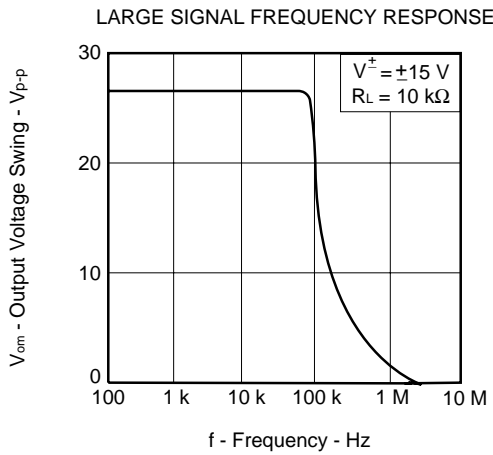
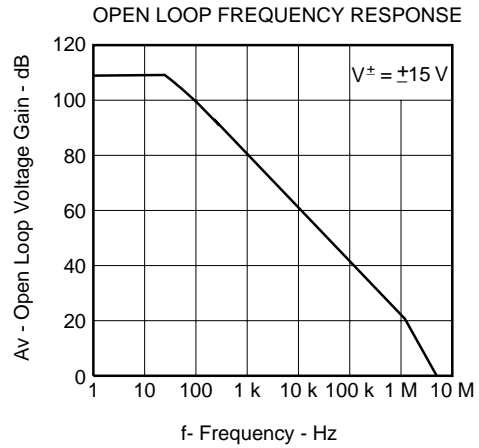
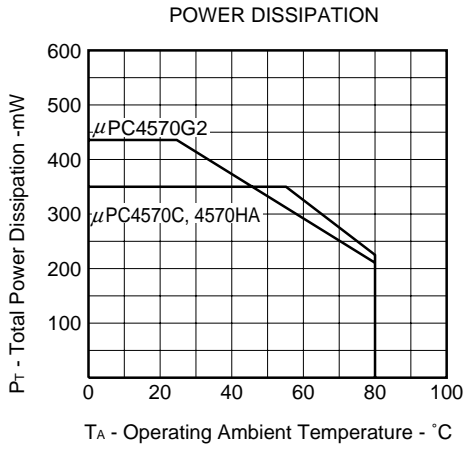
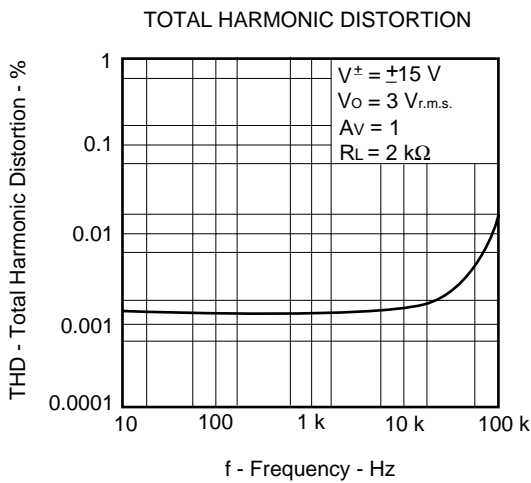
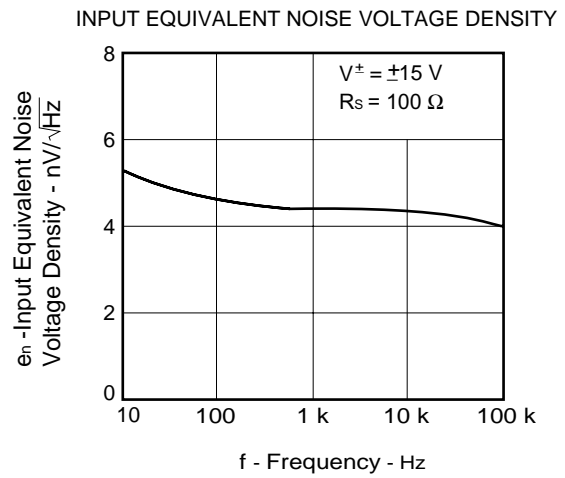
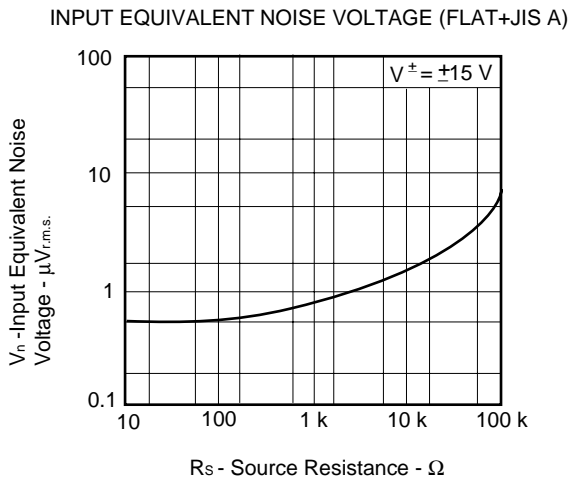
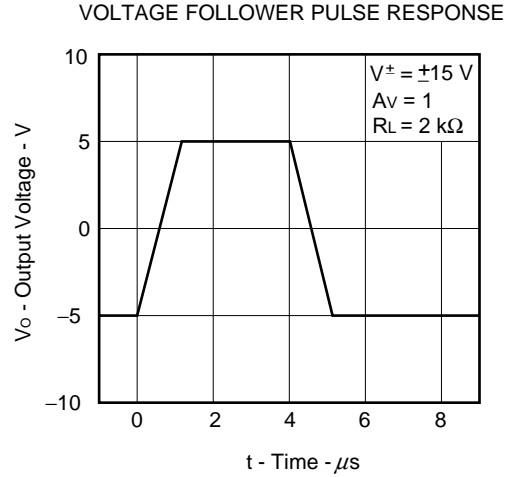
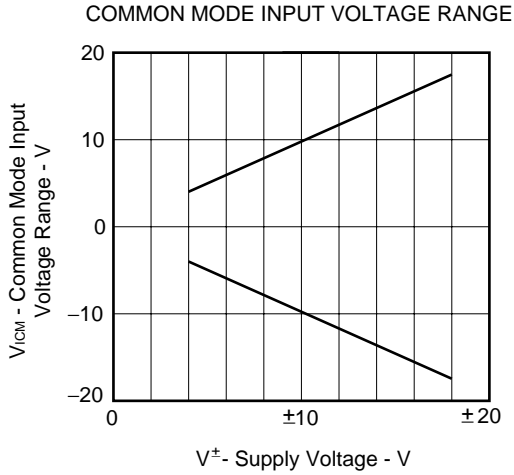


Figure3 Noise Measurement Circuit (FLAT+JIS A)



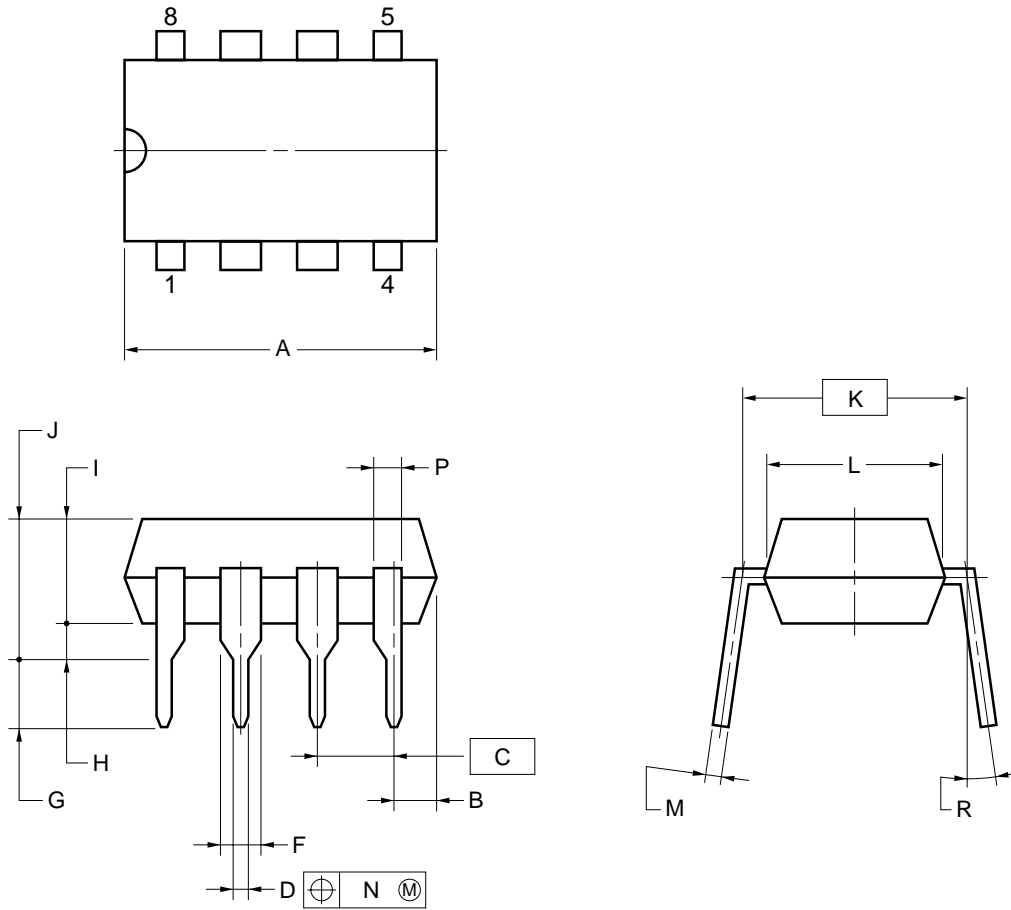
TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$, TYP.)





★ PACKAGE DRAWINGS (Unit: mm)

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



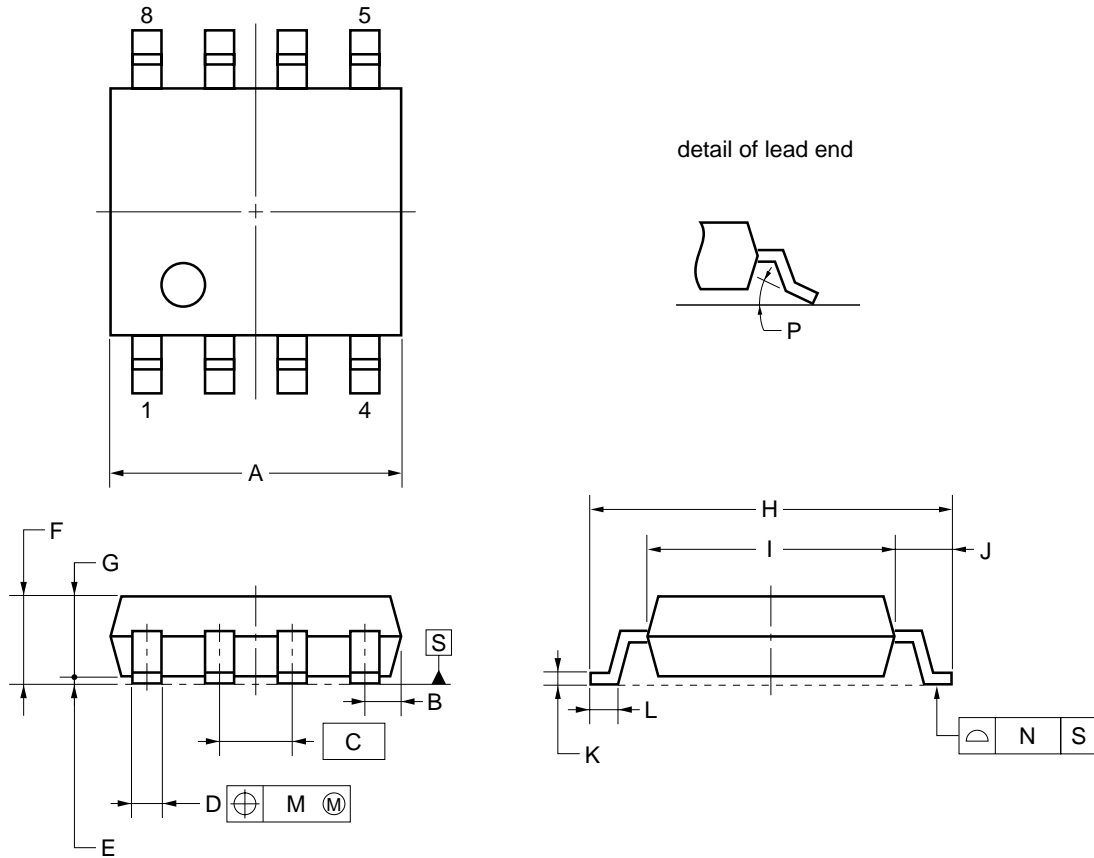
NOTES

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	10.16 MAX.
B	1.27 MAX.
C	2.54 (T.P.)
D	0.50±0.10
F	1.4 MIN.
G	3.2±0.3
H	0.51 MIN.
I	4.31 MAX.
J	5.08 MAX.
K	7.62 (T.P.)
L	6.4
M	0.25 ^{+0.10} _{-0.05}
N	0.25
P	0.9 MIN.
R	0-15°

P8C-100-300B,C-2

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



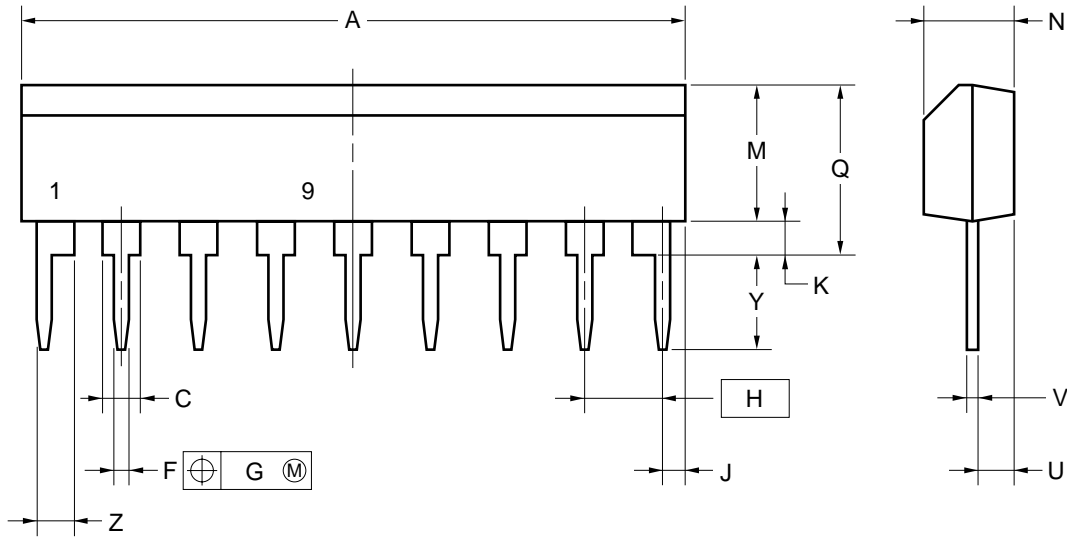
NOTE

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

ITEM	MILLIMETERS
A	5.2 ^{+0.17} / _{-0.20}
B	0.78 MAX.
C	1.27 (T.P.)
D	0.42 ^{+0.08} / _{-0.07}
E	0.1±0.1
F	1.59±0.21
G	1.49
H	6.5±0.3
I	4.4±0.15
J	1.1±0.2
K	0.17 ^{+0.08} / _{-0.07}
L	0.6±0.2
M	0.12
N	0.10
P	3° ^{+7°} / _{-3°}

S8GM-50-225B-6

9-PIN PLASTIC SLIM SIP



NOTE

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

ITEM	MILLIMETERS
A	22.86 MAX.
C	1.1 MIN.
F	0.5±0.1
G	0.25
H	2.54
J	1.27 MAX.
K	0.51 MIN.
M	5.08 MAX.
N	2.8±0.2
Q	5.75 MAX.
U	1.5 MAX.
V	0.25 ^{+0.10} _{-0.05}
Y	3.2±0.5
Z	1.1 MIN.

P9HA-254B-2

★ **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 our document "**SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL**"• (C10535E).

Type of Surface Mount Device

μPC4570G2: 8-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

μPC4570C: 8-pin plastic DIP (7.62 mm (300)) , μPC4570HA: 9-pin plastic slim SIP

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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