DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4072

J-FET INPUT LOW-NOISE DUAL OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4072 is a J-FET input operational amplifier. This product is designed as low noise version of the μPC4082. The features of the μPC4072 are more improved input equivalent noise voltage, input offset voltage and input bias current than those of μPC4082. By these features, the μPC4072 is excellent choice for wide variety of applications including audio preamplifier and active filter.

FEATURES

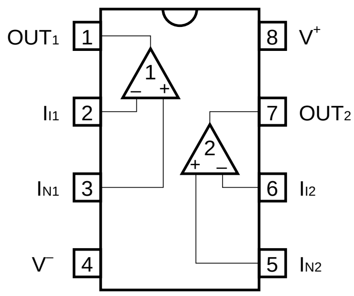
- Low noise: $e_n = 17\ nV/\sqrt{Hz}$ (TYP.)
- Very low input bias and offset currents
- Output short circuit protection
- High input impedance...J-FET Input stage
- Internal frequency compensation
- High slew rate...13 V/μs (TYP.)

ORDERING INFORMATION

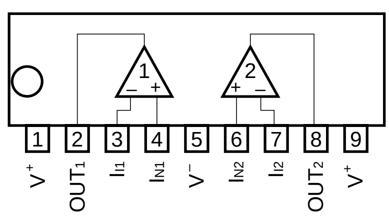
Part Number	Package
μPC4072C	8-pin plastic DIP (7.62 mm (300))
μPC4072G2	8-pin plastic SOP (5.72 mm (225))
μPC4072HA	9-pin plastic slim SIP

PIN CONFIGURATION (Top View)

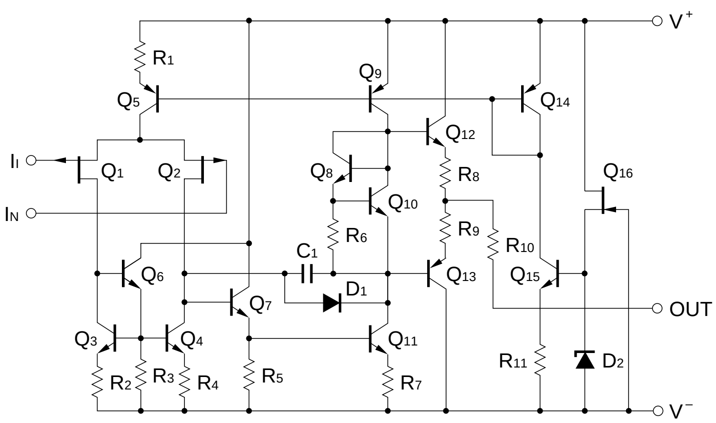
μPC4072C, 4072G2



μPC4072HA



EQUIVALENT CIRCUIT (1/2 Circuit)



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

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Printed in Japan

The mark ★ shows major revised points.

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			Indefinite	sec
Operating Ambient Temperature		T_A	–20 to +80	°C
Storage Temperature		T_{stg}	–55 to +125	°C

Notes 1. Reverse connection of supply voltage can cause destruction.

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.

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.

4. Thermal derating factor is –5.0 mV/°C when operating ambient temperature is higher than 55°C.

5. Thermal derating factor is –4.4 mV/°C when operating ambient temperature is higher than 25°C.

6. 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	$V^{\pm}$	±5		±16	V
Output Current	I_O			±10	mA
Capacitive Load (A_V = +1, R_f = 0 Ω)	C_L			100	pF

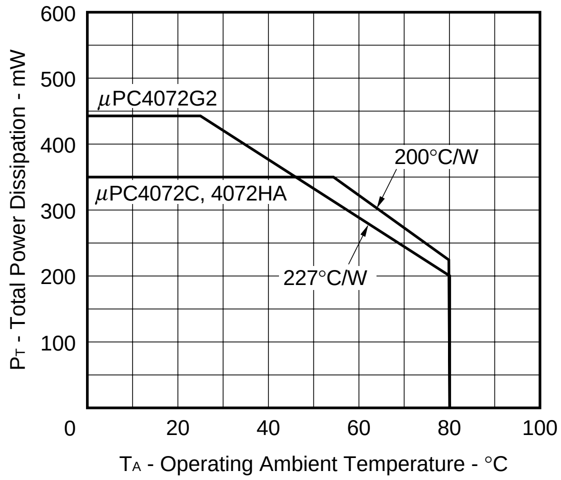
ELECTRICAL CHARACTERISTICS (T_A = 25°C, $V^{\pm}$ = ±15 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V_{IO}	$R_S \leq 50\ \Omega$		±3	±10	mV
Input Offset Current Note 7	I_{IO}			±5	±50	pA
Input Bias Current Note 7	I_B			30	200	pA
Large Signal Voltage Gain	A_V	$R_L \geq 2$ kΩ , V_O = ±10 V	25000	200000		
Supply Current	I_{CC}	I_O = 0 A, Both Amplifiers		4	5	mA
Common Mode Rejection Ratio	CMR		70	86		dB
Supply Voltage Rejection Ratio	SVR		70	86		dB
Output Voltage Swing	V_{om}	$R_L \geq 10$ kΩ	±12	±13.5		V
		$R_L \geq 2$ kΩ	±10	±12		V
Common Model Input Voltage Range	V_{ICM}		±10			V
Slew Rate	SR	A_V = 1		13		V/μs
Unity Gain Frequency	f_{unity}			3		MHz
Input Equivalent Noise Voltage	V_n	R_S = 100 Ω, f = 10 Hz to 10 kHz		4		$\mu V_{r.m.s.}$
Input Equivalent Noise Voltage Density	e_n	R_S = 100 Ω, f = 1 kHz		17		$nV/\sqrt{Hz}$
Channel Separation				120		dB
Input Offset Voltage	V_{IO}	$R_S \leq 50\ \Omega$, T_A = –20 to +70°C			±13	mV
Average V_{IO} Temperature Drift	$\Delta V_{IO}/\Delta T$	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			7	nA

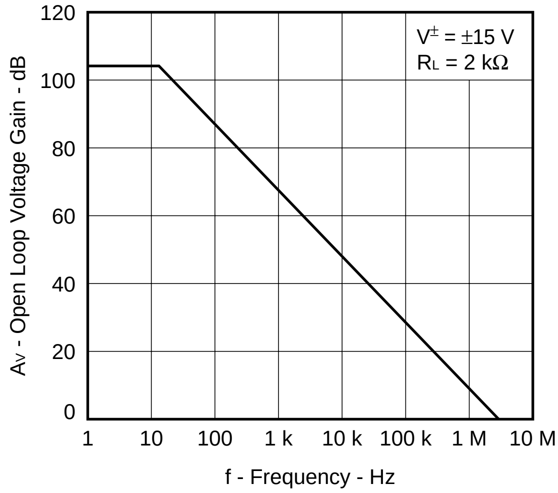
Notes 7. Input bias currents flow into IC. Because each currents are gate leak current of P-channel J-FET on input stage. And that are temperature sensitive. Short time measuring method is recommendable to maintain the junction temperature close to the operating ambient temperature.

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

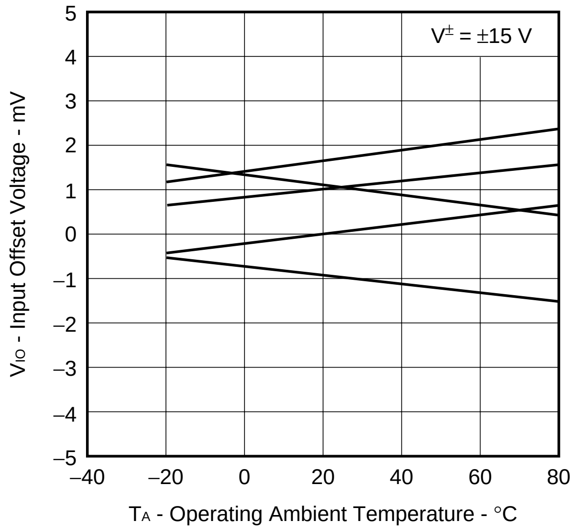
POWER DISSIPATION



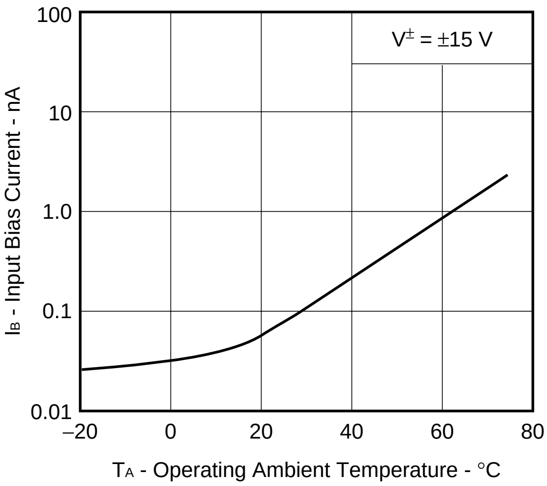
OPEN LOOP FREQUENCY RESPONSE



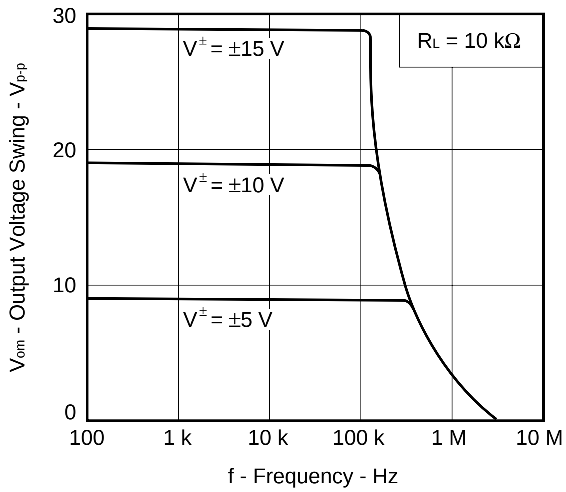
INPUT OFFSET VOLTAGE



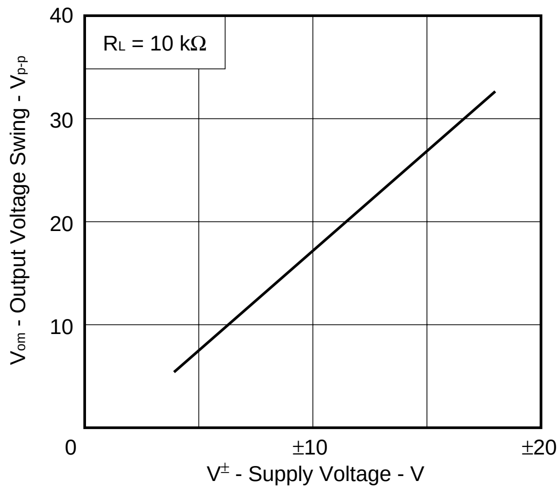
INPUT BIAS CURRENT

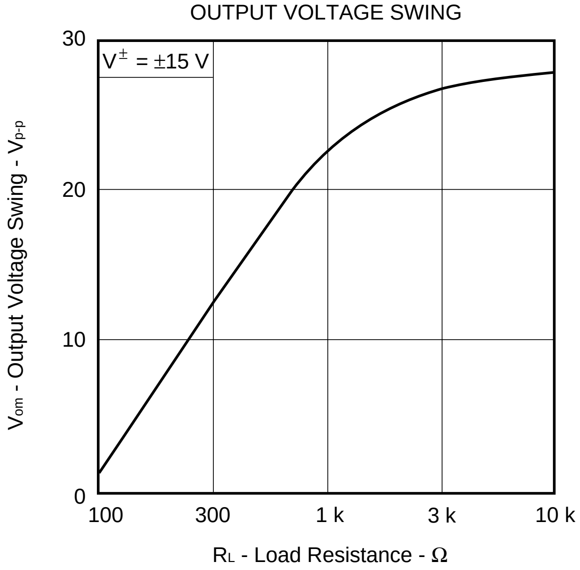


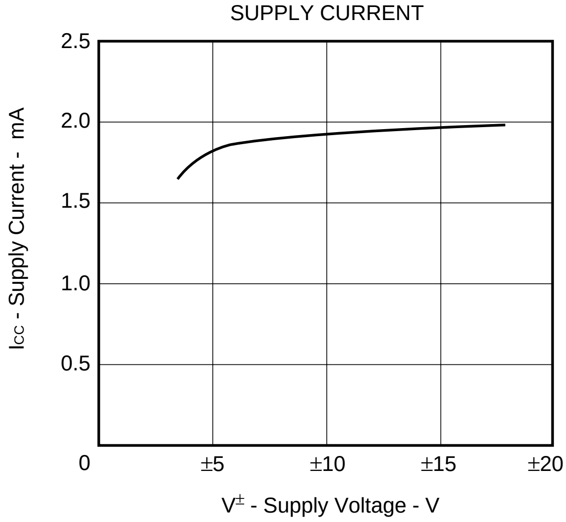
LARGE SIGNAL FREQUENCY RESPONSE

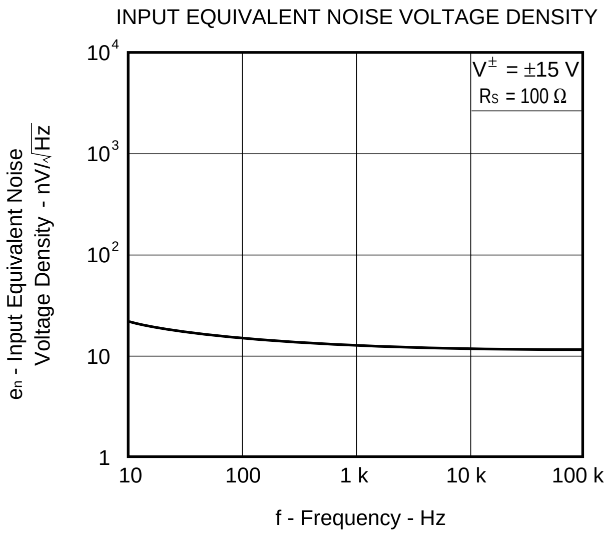


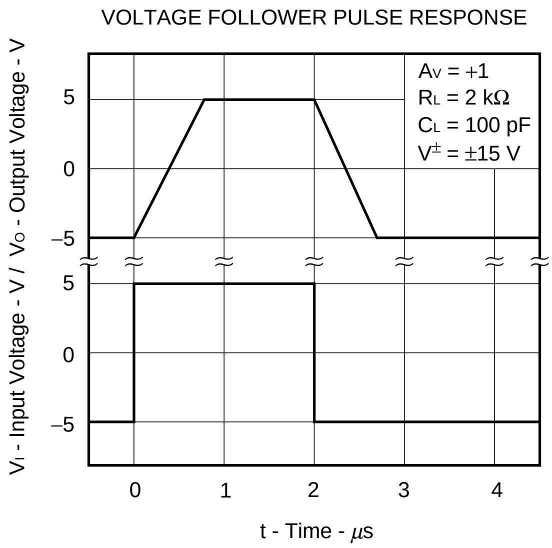
OUTPUT VOLTAGE SWING




OUTPUT VOLTAGE SWING
V± = ±15 V
Vom - Output Voltage Swing - Vp-p
30
20
10
0
100
300
1 k
3 k
10 k
RL - Load Resistance - Ω

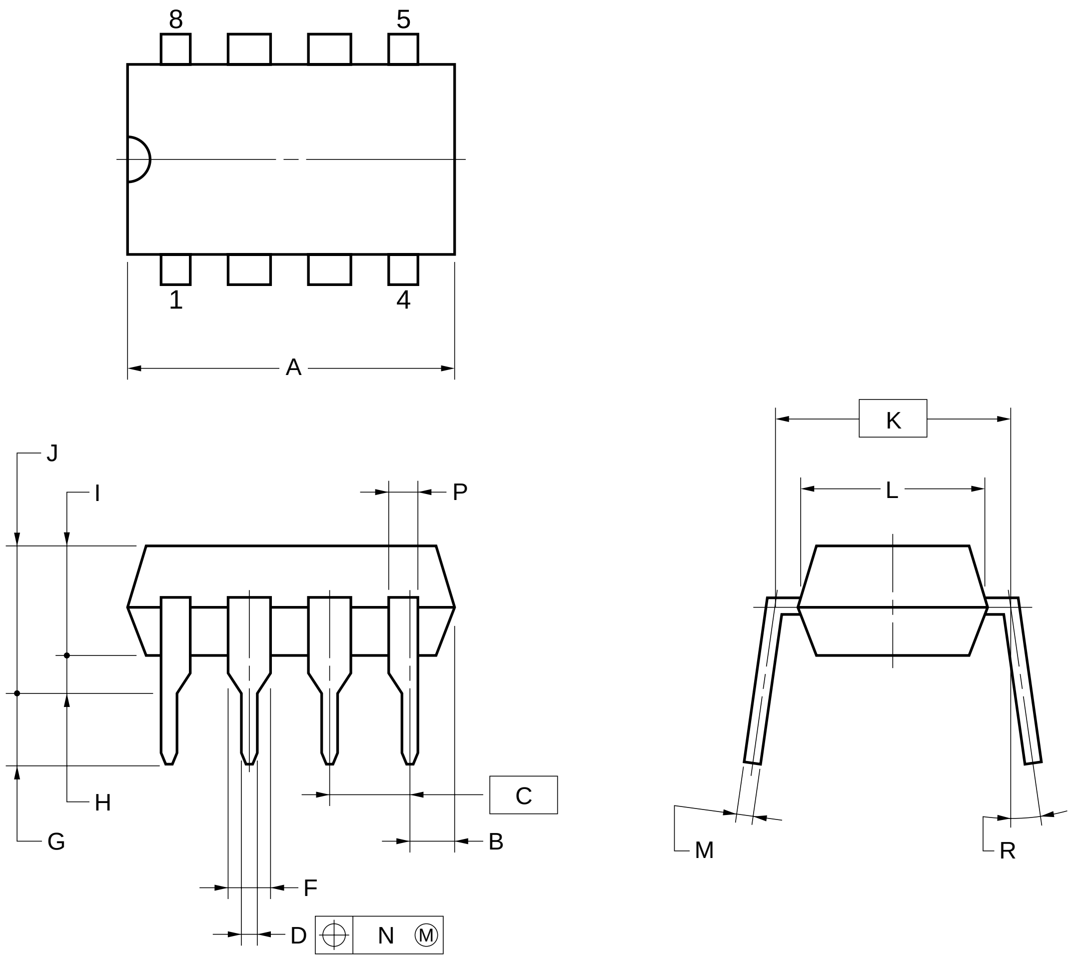

SUPPLY CURRENT
ICC - Supply Current - mA
2.5
2.0
1.5
1.0
0.5
0
±5
±10
±15
±20
V± - Supply Voltage - V


INPUT EQUIVALENT NOISE VOLTAGE DENSITY
V± = ±15 V
RS = 100 Ω
en - Input Equivalent Noise Voltage Density - nV/√Hz
10^4
10^3
10^2
10
1
10
100
1 k
10 k
100 k
f - Frequency - Hz


VOLTAGE FOLLOWER PULSE RESPONSE
AV = +1
RL = 2 kΩ
CL = 100 pF
V± = ±15 V
VI - Input Voltage - V / VO - Output Voltage - V
5
0
–5
5
0
–5
0
1
2
3
4
t - Time - μs

★ **PACKAGE DRAWINGS (Unit : mm)**

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



NOTES

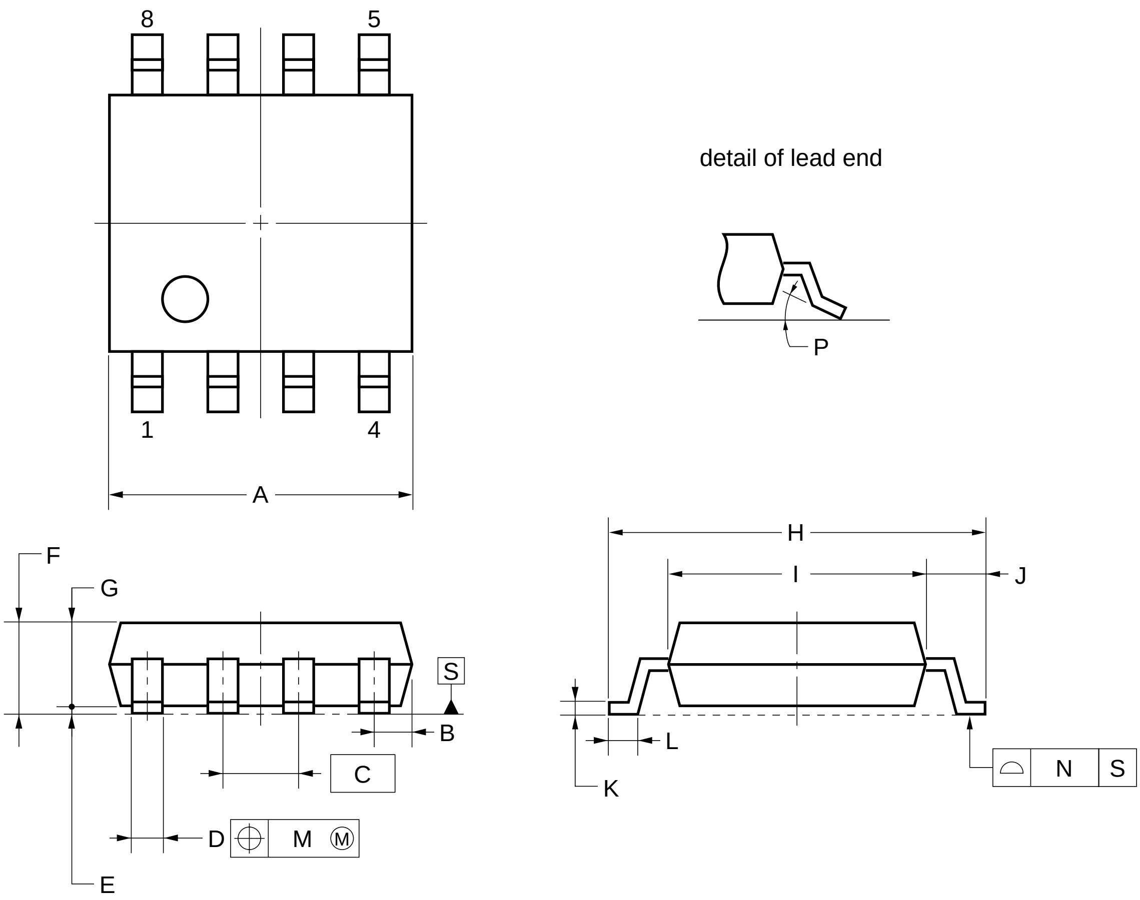
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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))



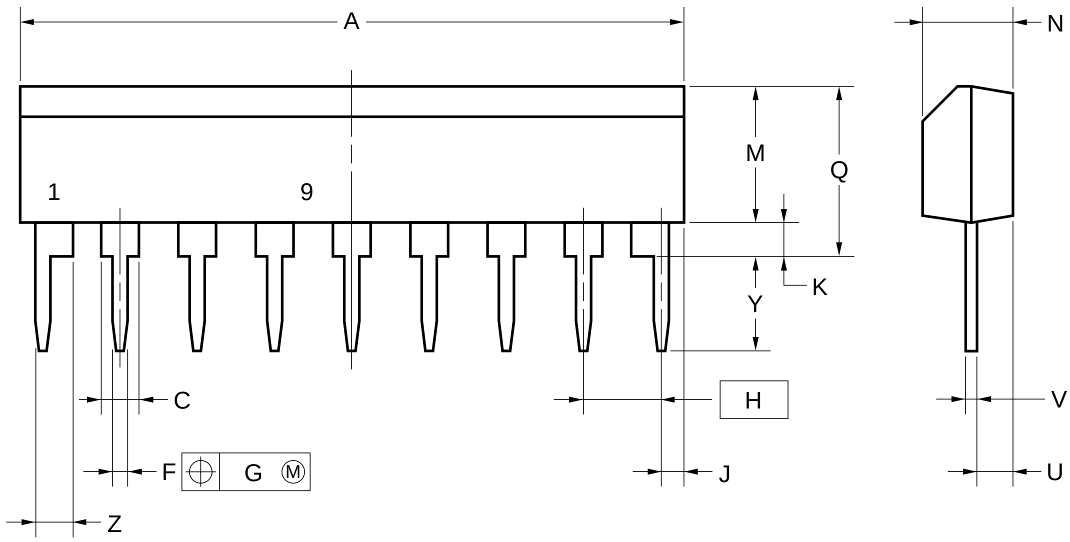
NOTE

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

μPC4072G2: 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

μPC4072C: 8-pin plastic DIP (7.62 mm (300))
μPC4072HA: 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]

[MEMO]