

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC4081

## J-FET INPUT OPERATIONAL AMPLIFIER

### DESCRIPTION

The  $\mu$ PC4081 is a single operational amplifier incorporating well matched ion implant P-channel J-FET on the same chip with standard bipolar transistors. The key features of this op amp is very low input bias current and high slew rate ten times faster than conventional general purpose op amps. By these features  $\mu$ PC4081 is excellent choice for wide variety of applications including integrator, active filter, pulse amp etc.

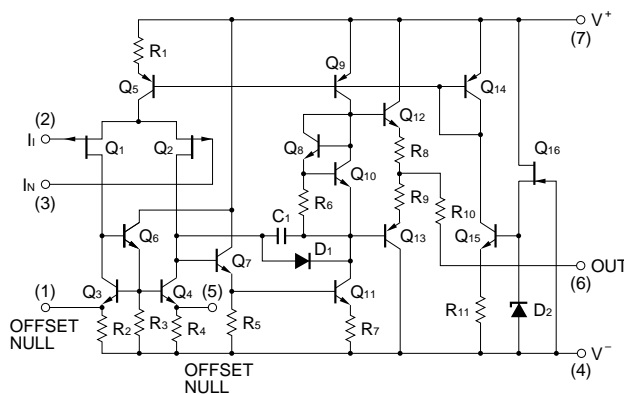
### FEATURES

- Low noise:  $e_n = 25 \text{ nV}/\sqrt{\text{Hz}}$  (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/ $\mu$ s (TYP.)

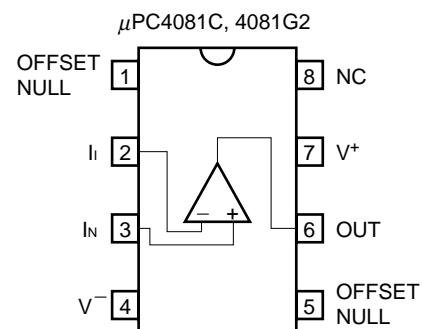
### ORDERING INFORMATION

Part Number	Package
$\mu$ PC4081C	8-pin plastic DIP (7.62 mm (300))
$\mu$ PC4081G2	8-pin plastic SOP (5.72 mm (225))

### EQUIVALENT CIRCUIT



### PIN CONFIGURATION (Top View)



Remark NC : No Connection

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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)**

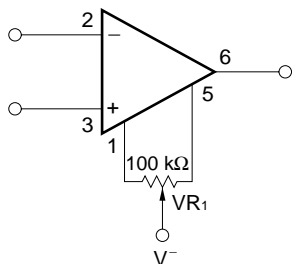
Parameter	Symbol	Ratings	Unit
Voltage between V <sup>+</sup> and V <sup>-</sup> <sup>Note 1</sup>	V <sup>+</sup> - V <sup>-</sup>	-0.3 to +36	V
Differential Input Voltage	V <sub>ID</sub>	±30	V
Input Voltage <sup>Note 2</sup>	V <sub>I</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Output Voltage <sup>Note 3</sup>	V <sub>O</sub>	V <sup>-</sup> -0.3 to V <sup>+</sup> +0.3	V
Power Dissipation	C Package <sup>Note 4</sup>	P <sub>T</sub>	350
	G2 Package <sup>Note 5</sup>		440
Output Short Circuit Duration <sup>Note 6</sup>		Indefinite	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 -5.0 mV/°C when operating ambient temperature is higher than 55°C.
  - Thermal derating factor is -4.4 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 <sup>±</sup>	±5		±16	V
★ Output Current	I <sub>o</sub>			±10	mA
★ Capacitive Load (A <sub>v</sub> = +1, R <sub>f</sub> = 0 Ω)	C <sub>L</sub>			100	pF

**OFFSET VOLTAGE NULL CIRCUIT**



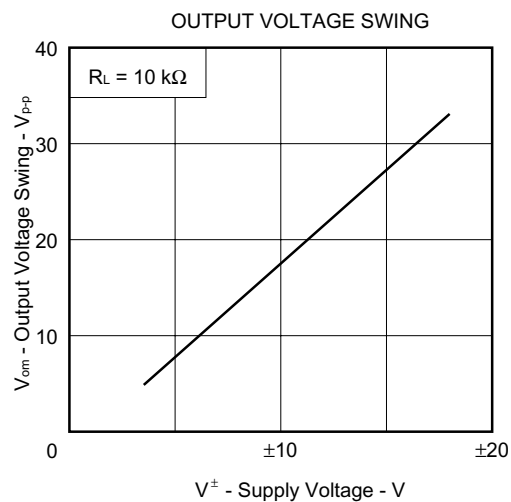
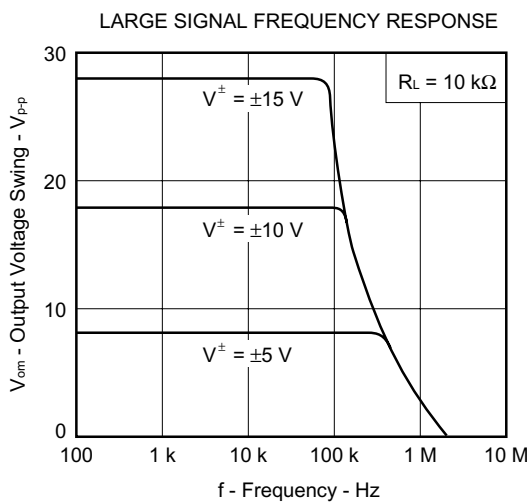
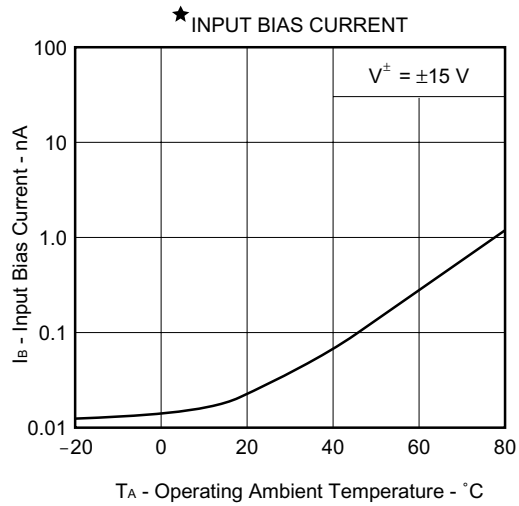
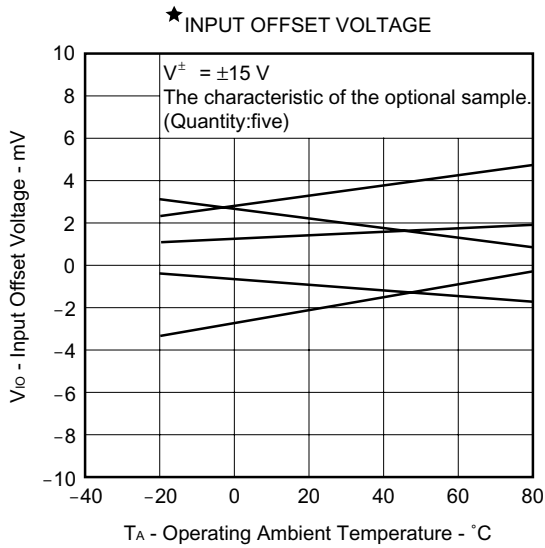
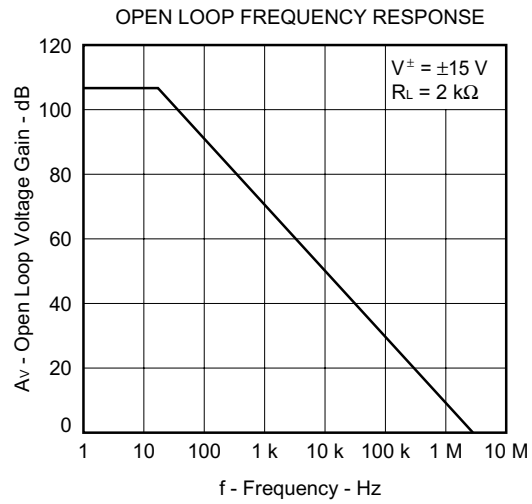
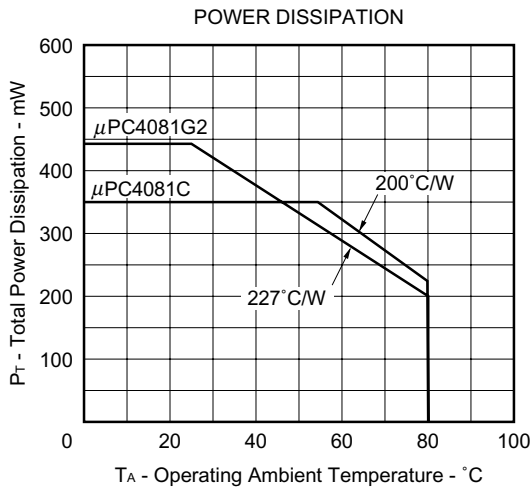
★ **Remark** The OFFSET NULL pins should be left open or connected to V<sup>-</sup> via a resistor as shown in the left figure. Don't connect to any lines other than V<sup>-</sup>, otherwise malfunction, degradation, or failure may occur.

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

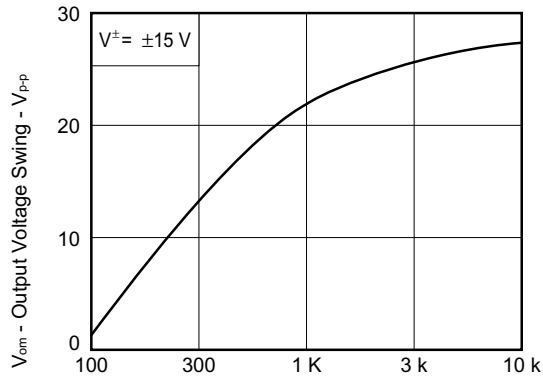
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤ 50 Ω		±5	±15	mV
Input Offset Current <sup>Note 7</sup>	I <sub>IO</sub>			±5	±200	pA
Input Bias Current <sup>Note 7</sup>	I <sub>B</sub>			30	400	pA
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V	25000	200000		
Supply Current	I <sub>CC</sub>	I <sub>O</sub> = 0 A		2.0	2.8	mA
Common Mode Rejection Ratio	CMR		70	76		dB
Supply Voltage Rejection Ratio	SVR		70	76		dB
Output Voltage Swing	V <sub>om</sub>	R <sub>L</sub> ≥ 10 kΩ	±12	±13.5		V
		R <sub>L</sub> ≥ 2 kΩ	±10	±12		V
Common Mode Input Voltage Range	V <sub>ICM</sub>		±10	+15 -12.7		V
Slew Rate	SR	A <sub>V</sub> = 1		13		V/μs
Unity Gain Frequency	f <sub>unity</sub>			3		MHz
Input Equivalent Noise Voltage Density	e <sub>n</sub>	R <sub>S</sub> = 100 Ω, f = 1 kHz		25		nV/√Hz
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤ 50 Ω, T <sub>A</sub> = -20 to +70°C			±20	mV
Average V <sub>IO</sub> Temperature Drift	ΔV <sub>IO</sub> /ΔT	T <sub>A</sub> = -20 to +70°C		±10		μV/°C
Input Offset Current <sup>Note 7</sup>	I <sub>IO</sub>	T <sub>A</sub> = -20 to +70°C			±5	nA
Input Bias Current <sup>Note 7</sup>	I <sub>B</sub>	T <sub>A</sub> = -20 to +70°C			10	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 ( $T_A = 25^\circ\text{C}$ , TYP.)

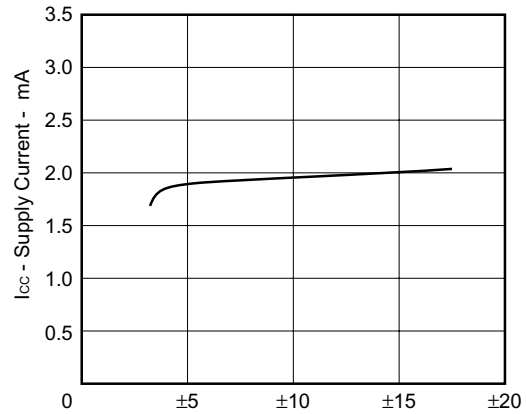


OUTPUT VOLTAGE SWING



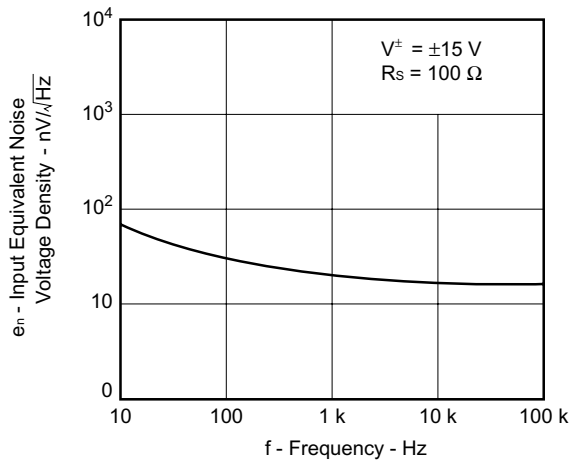
R<sub>L</sub> - Load Resistance - Ω

★ SUPPLY CURRENT



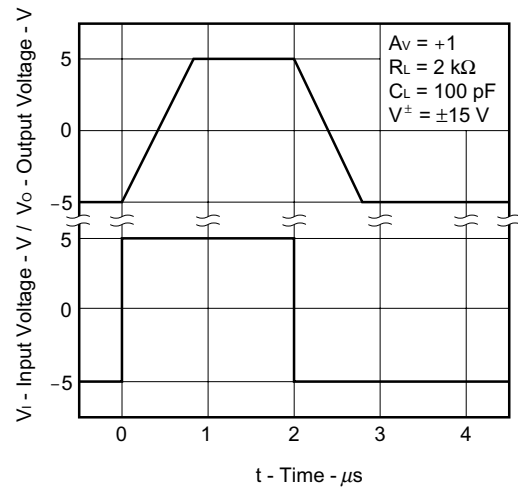
V<sup>±</sup> - Supply Voltage - V

★ INPUT EQUIVALENT NOISE VOLTAGE DENSITY



f - Frequency - Hz

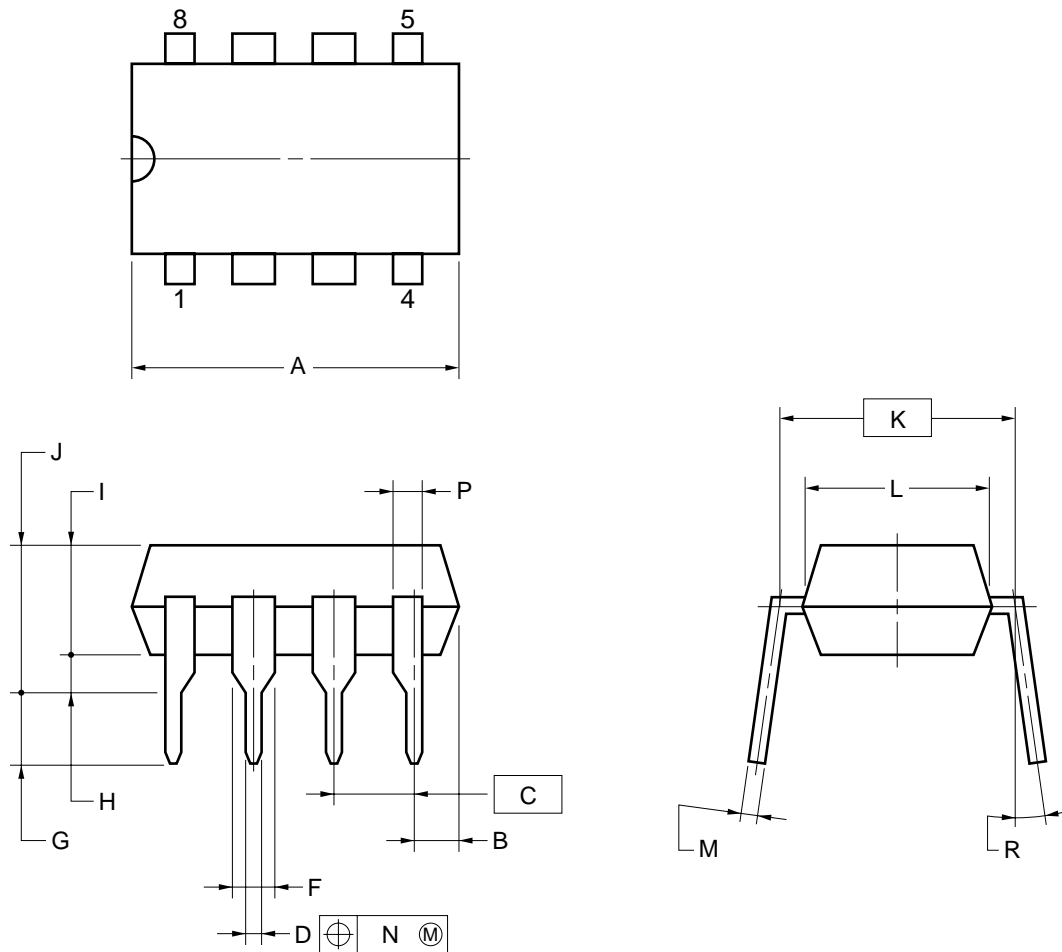
VOLTAGE FOLLOWER PULSE RESPONSE



t - Time - μs

★ PACKAGE DRAWINGS (Unit : mm)

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



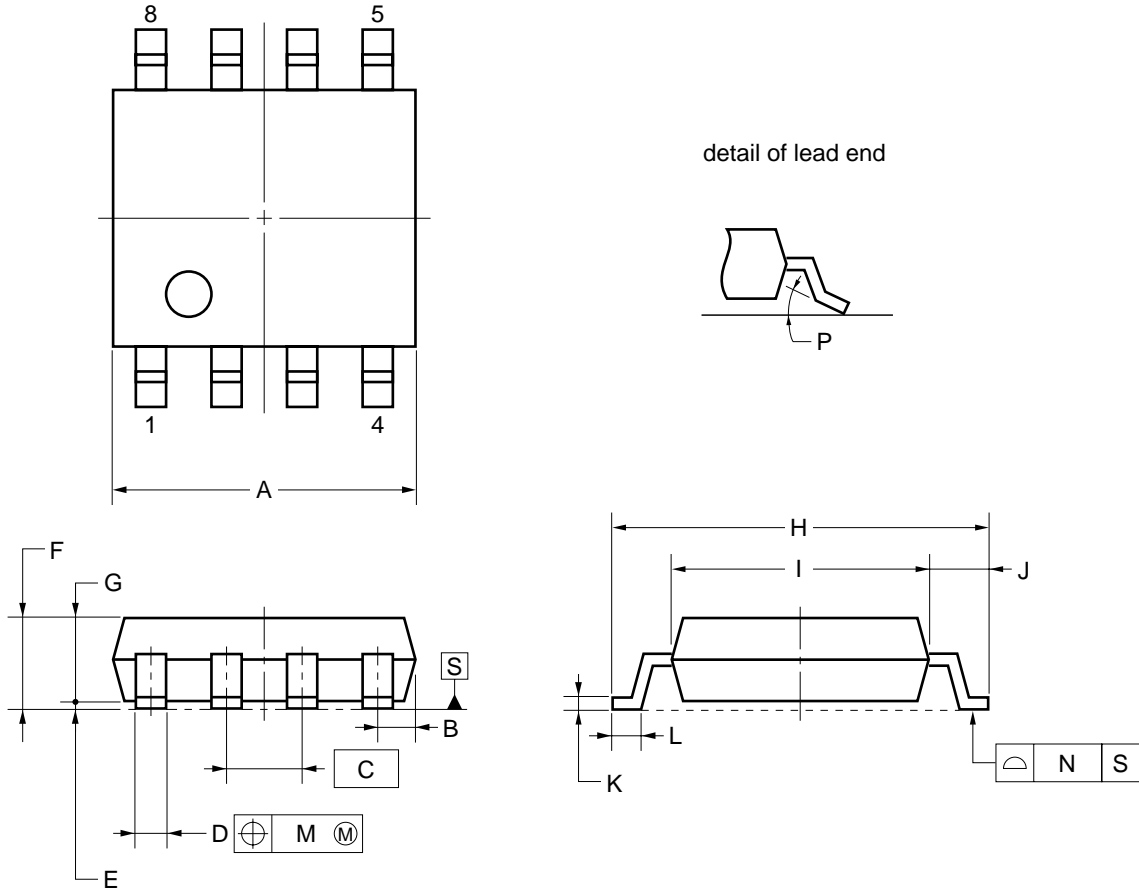
NOTES

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 <sup>+0.10</sup> <sub>-0.05</sub>
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 <sup>+0.17</sup> / <sub>-0.20</sub>
B	0.78 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±0.21
G	1.49
H	6.5±0.3
I	4.4±0.15
J	1.1±0.2
K	0.17 <sup>+0.08</sup> / <sub>-0.07</sub>
L	0.6±0.2
M	0.12
N	0.10
P	3° <sup>+7°</sup> / <sub>-3°</sub>

S8GM-50-225B-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 our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL"(C10535E).

**Type of Surface Mount Device**

**μPC4081G2: 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**

**μPC4081C: 8-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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