NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC4250

PROGRAMMABLE OPERATIONAL AMPLIFIER

DESCRIPTION

The μPC4250 is a highly versatile monolithic operational amplifier. The quiescent power dissipation, input offset and bias current, slew rate and gain-bandwidth products are determined by a single external programming resistor. Since the μPC4250 is in effect different op amps for each externally programmed set current, it is possible to use a single stock item for a variety of circuit function in a system.

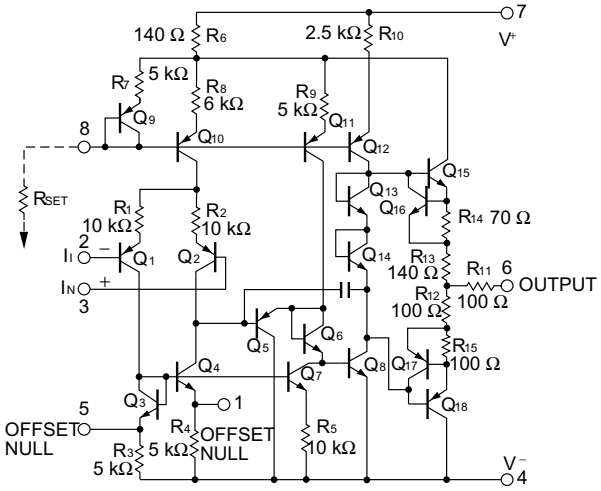
FEATURES

- Wide supply voltage range: ±1 V to ±18 V
- Programmable electrical characteristics
  Power consumption, slew rate, etc.
- Internal frequency compensation
- Offset voltage null capability
- Output short circuit protection

★ ORDERING INFORMATION

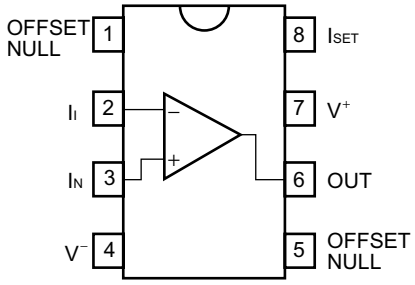
Part Number	Package
μPC4250C	8-pin plastic DIP (7.62 mm (300))
μPC4250G2	8-pin plastic SOP (5.72 mm (225))

EQUIVALENT CIRCUIT



PIN CONFIGURATION (Top View)

μPC4250C,4250G2



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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
I_{SET} Current		I_{SET}	150	μA
Power Dissipation	C Package Note 4	P_T	350	mW
	G2 Package Note 5		440	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 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.

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.

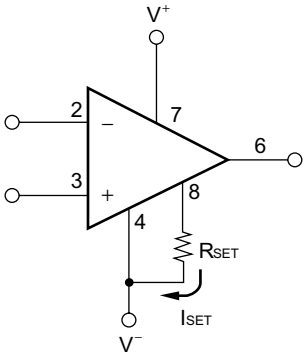
6. Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

RECOMMENDED OPERATING CONDITIONS

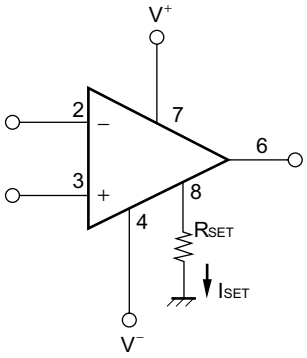
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	$V^{\pm}$	±1		±16	V
I_{SET} Current	I_{SET}	0.1		50	μA

TYPICAL CONNECTIONS

I_{SET}

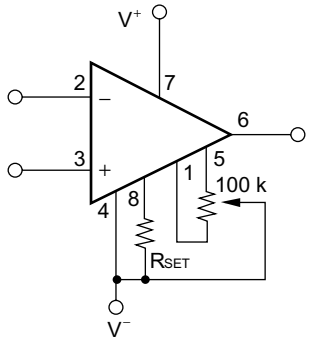


$$I_{SET} \fallingdotseq \frac{V^+ - V^- - 0.5}{R_{SET}}$$



$$I_{SET} \fallingdotseq \frac{V^+ - 0.5}{R_{SET}}$$

OFFSET VOLTAGE NULL CIRCUIT



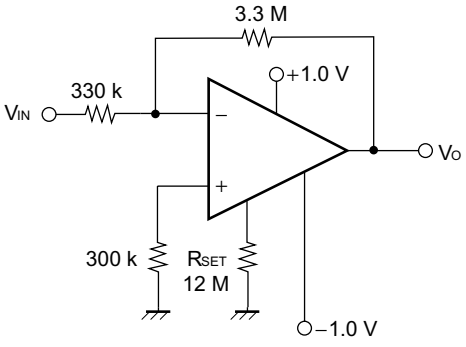
Remark I_{SET} is indispensable to operate.

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

Parameter	Symbol	Conditions	I_{SET} = 1 μA		I_{SET} = 10 μA		Unit
			MIN.	MAX.	MIN.	MAX.	
Input Offset Voltage	V_{IO}	$R_S \leq 100$ kΩ		±5		±6	mV
		$V^{\pm}$ = ±1.5 V, $R_S \leq 100$ kΩ		±5		±6	
Input Offset Current Note 7	I_{IO}			±6		±20	nA
Input Bias Current Note 7	I_B			10		75	nA
		$V^{\pm}$ = ±1.5 V		10		75	
Large Signal Voltage Gain	A_V	V_O = ±10 V, R_L = 100 kΩ	60000				
		V_O = ±10 V, R_L = 10 kΩ			60000		
Supply Current	I_{CC}	I_O = 0 A		11		100	μA
		$V^{\pm}$ = ±1.5 V, I_O = 0 A		8		90	
Power Dissipation	P_d	I_O = 0 A		330		3000	μW
		$V^{\pm}$ = ±1.5 V, I_O = 0 A		24		270	
Common Mode Rejection Ratio	CMR	$R_S \leq 10$ kΩ	70		70		dB
Supply Voltage Rejection Ratio	SVR	$R_S \leq 10$ kΩ	74		74		dB
Output Voltage Swing	V_{om}	R_L = 100 kΩ	±12				V
		$V^{\pm}$ = ±1.5 V, R_L = 100 kΩ	±0.6				
Output Voltage Swing	V_{om}	R_L = 10 kΩ			±12		V
		$V^{\pm}$ = ±1.5 V, R_L = 10 kΩ			±0.6		
Common Mode Input Voltage Range	V_{ICM}		±13.5		±13.5		V
		$V^{\pm}$ = ±1.5 V	±0.6		±0.6		

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

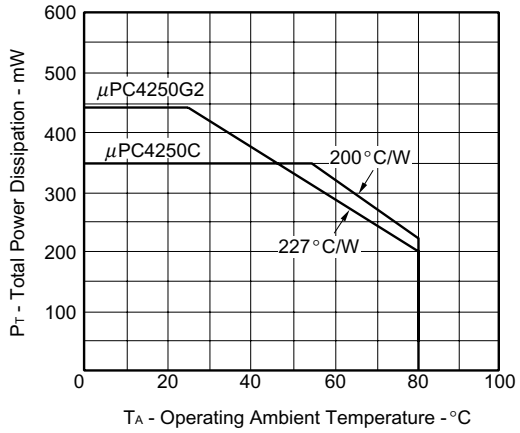
TYPICAL APPLICATION



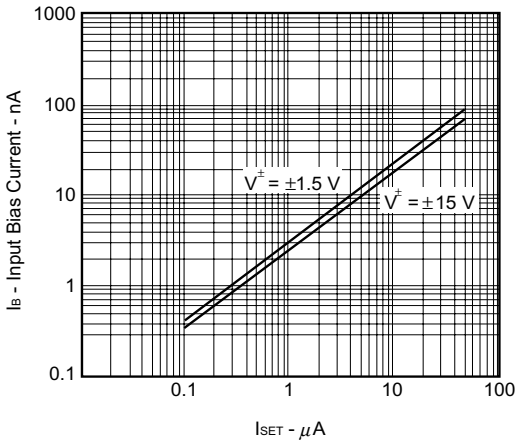
x10 Amplifier (500 nW)

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

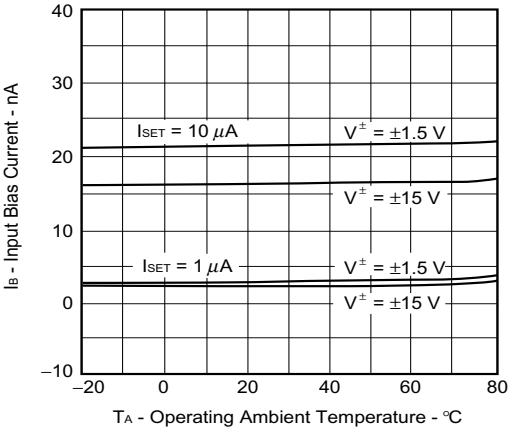
★ POWER DISSIPATION



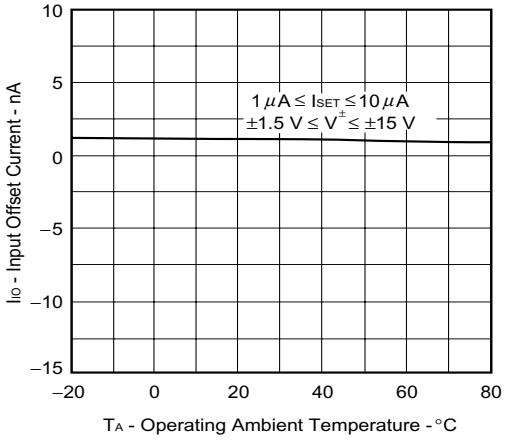
INPUT BIAS CURRENT



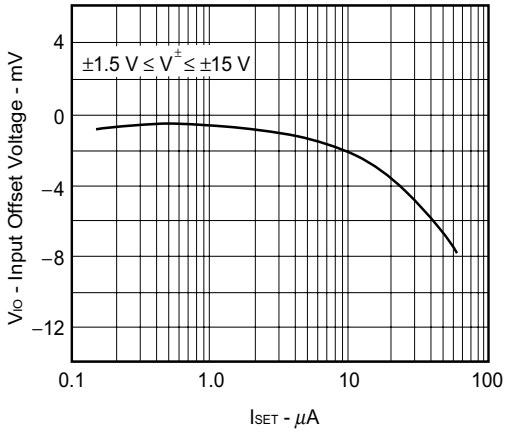
INPUT BIAS CURRENT



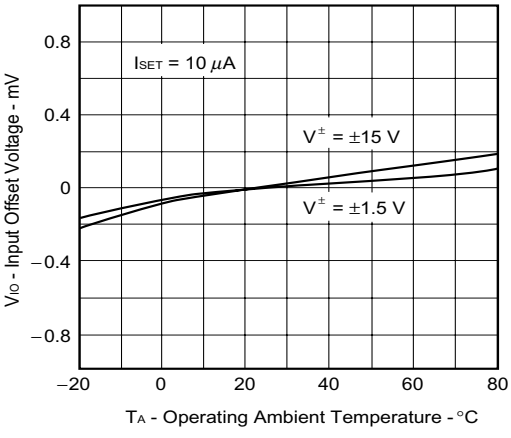
INPUT OFFSET CURRENT



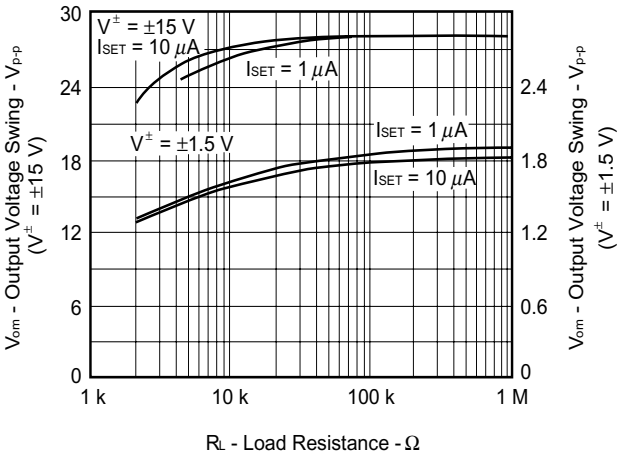
INPUT OFFSET VOLTAGE (unnull)



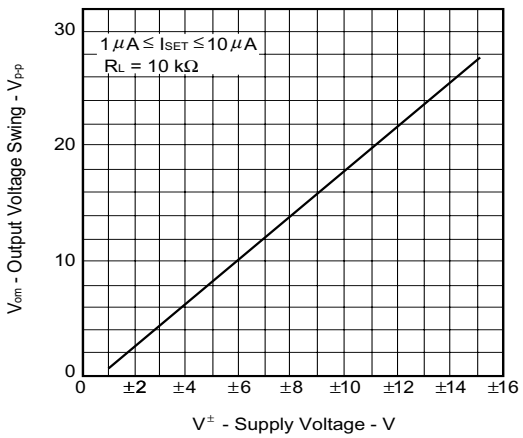
INPUT OFFSET VOLTAGE (unnull)



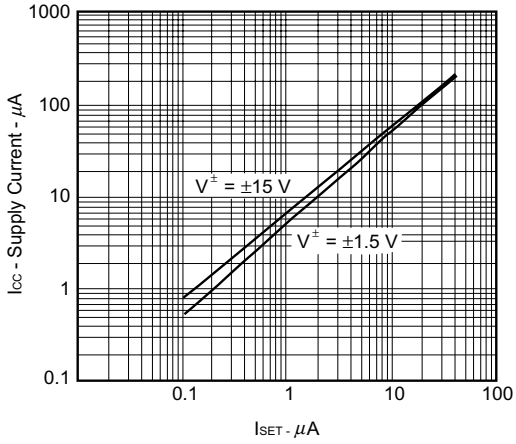
OUTPUT VOLTAGE SWING



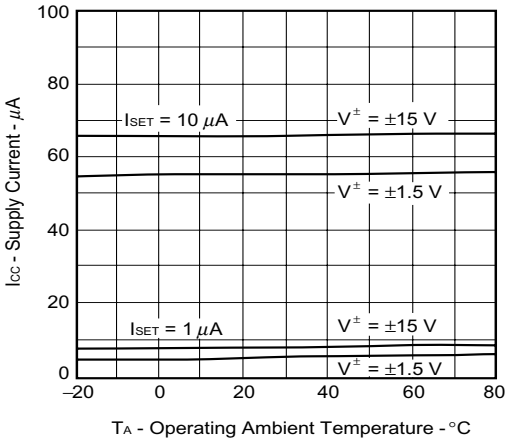
OUTPUT VOLTAGE SWING



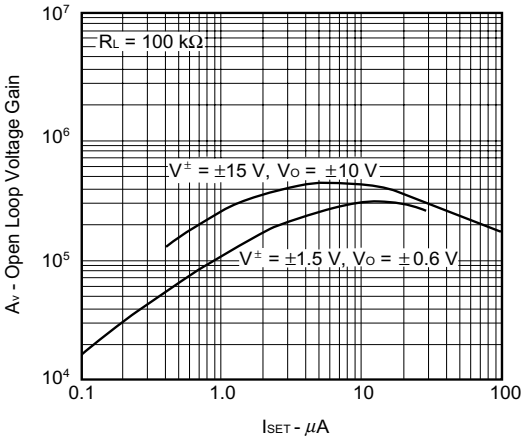
SUPPLY CURRENT



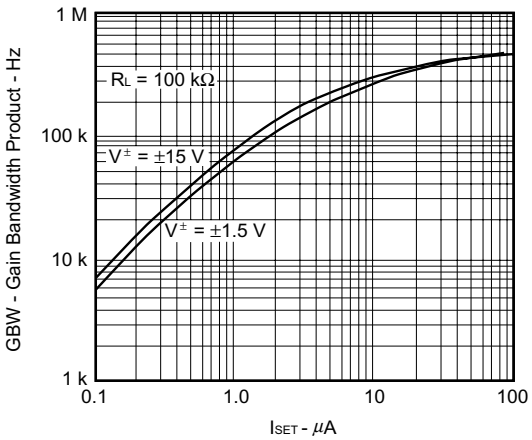
SUPPLY CURRENT



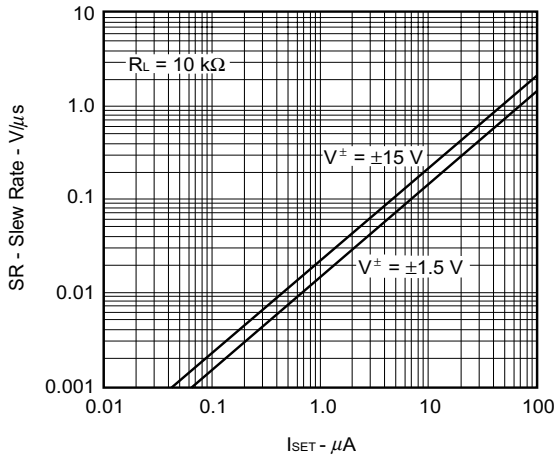
OPEN LOOP VOLTAGE GAIN



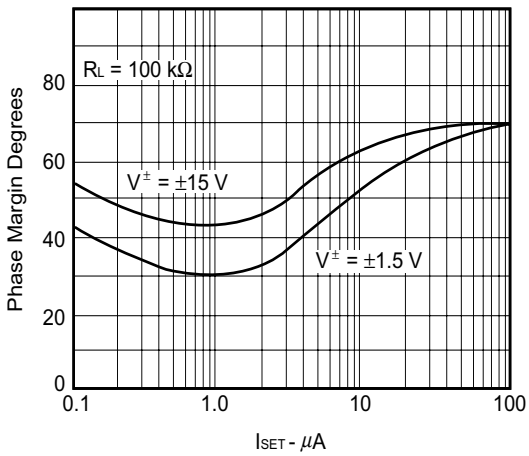
GAIN BANDWIDTH PRODUCT



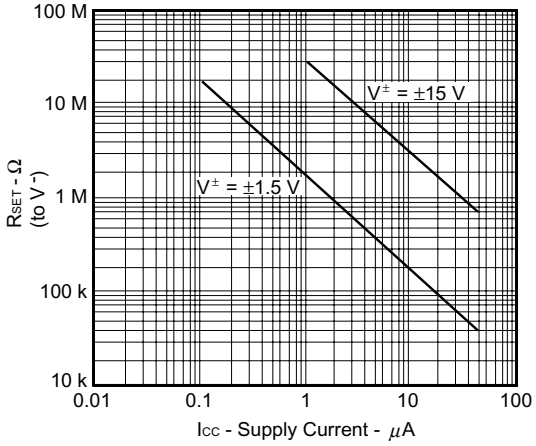
SLEW RATE



PHASE MARGIN

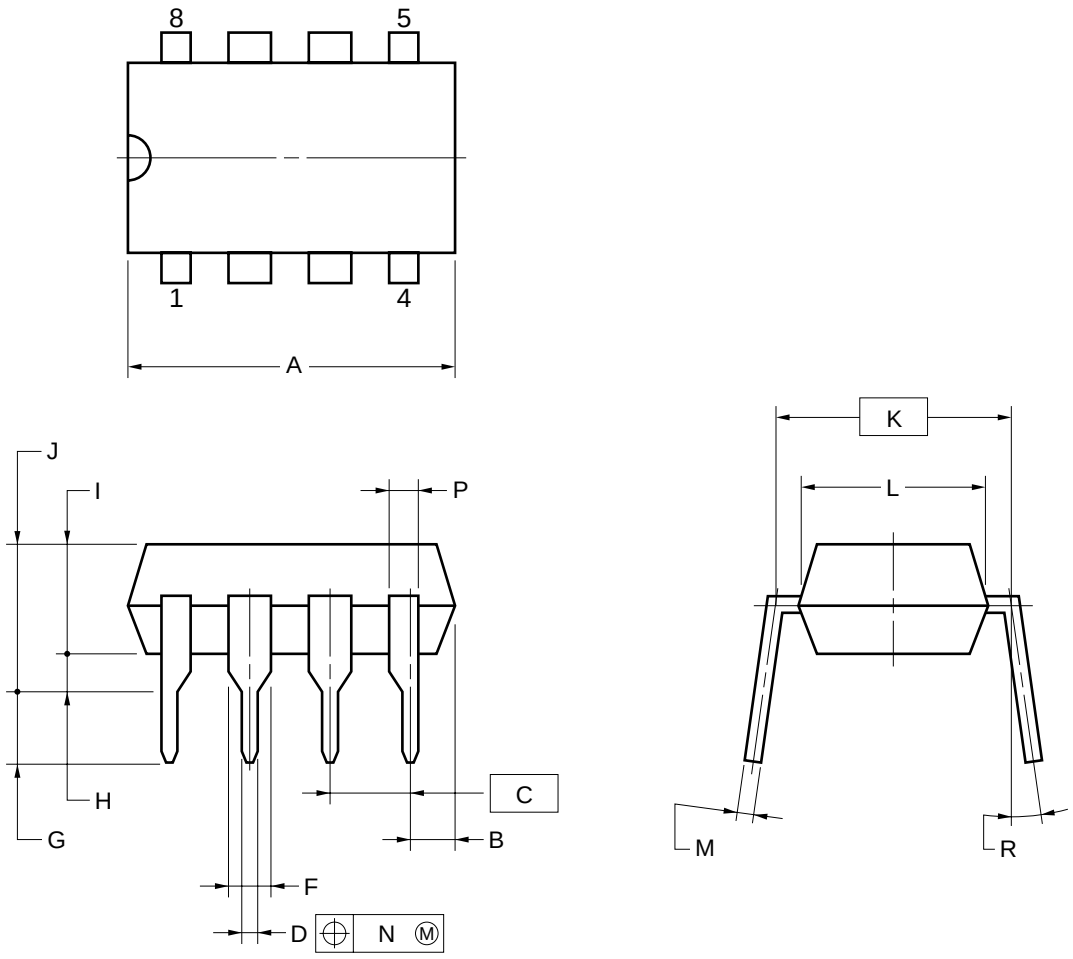


RSET



★ **PACKAGE DRAWINGS (Unit : mm)**

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



NOTES

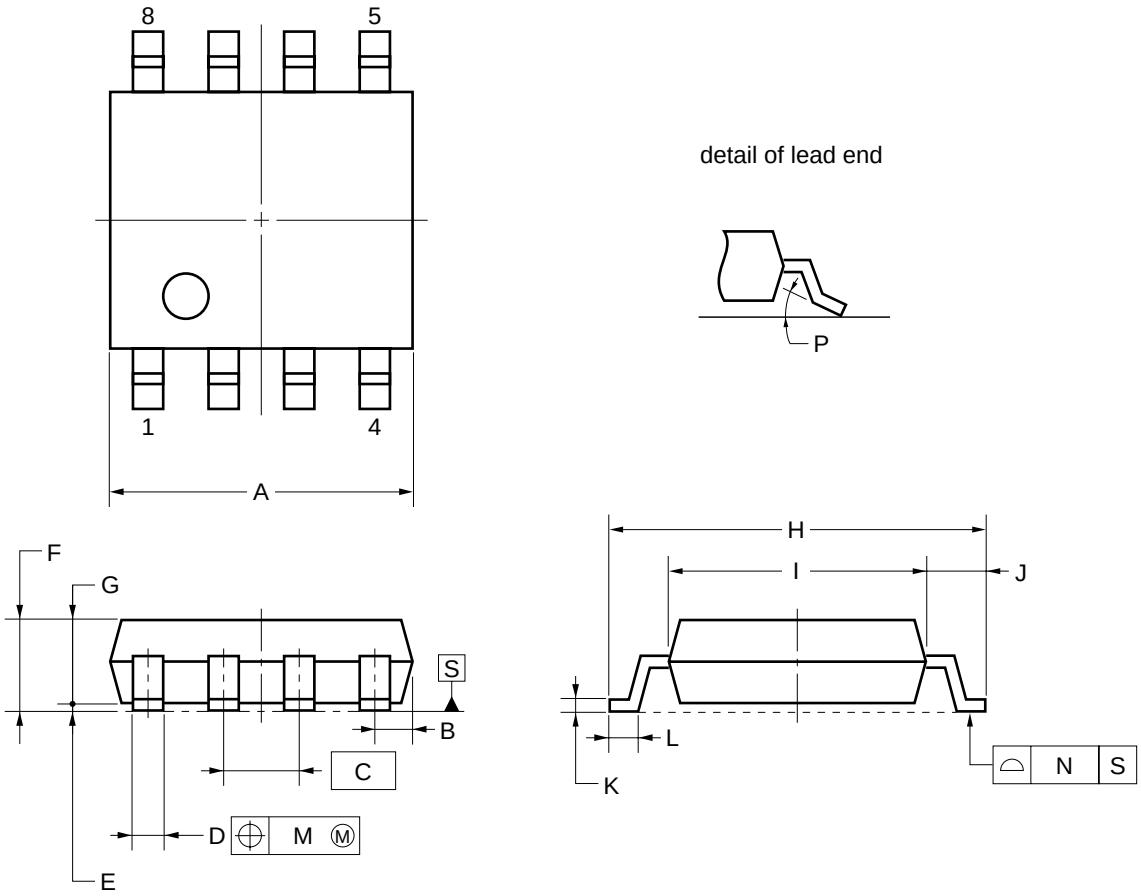
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

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

μPC4250G2: 8-pin plastic SOP (5.72 mm (225))

Process	Conditions	Symbol
Infrared Ray Reflow	Peak temperature: 235°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 3 time.	IR35-00-3
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: 3 time.	VP15-00-3
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

μPC4250C: 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.

[MEMO]

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