DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2723T

5 V, VARIABLE GAIN AMPLIFIER SILICON MMIC

DESCRIPTION

The μPC2723T is a silicon monolithic integrated circuit designed for miniature AGC amplifier. This amplifier realizes Auto gain control with external control circuit. This IC operates up to 1.1 GHz and therefore is suitable for DBS tuner, mobile telephone and other applications.

The μPC2723T is manufactured using NEC's 20 GHz f_T NESAT™ III silicon bipolar process. This process uses silicon nitride passivation film and gold metallization wirings. These materials can protect the chips from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

★ FEATURES

- Supply voltage : V_{CC} = 4.5 to 5.5 V
- Current consumption : I_{CC} = 15 mA TYP. @ V_{CC} = 5.0 V
- Maximum power gain : G_{PMAX} = 13 dB TYP. @ f = 0.5 GHz
- Saturated output power : $P_{O(sat)}$ = –2.0 dBm TYP. @ f = 0.5 GHz G_{PMAX}
- Upper limit operating frequency : f_u = 1.1 GHz TYP. @ –3 dB G_{PMAX}
- AGC Dynamic range : GCR = 38 dB TYP. @ f = 0.5 GHz

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPC2723T-E3	6-pin minimold	C1M	• 8 mm wide embossed taping • Pin 1, 2, 3 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, consult your NEC sales representative.
Part number for sample order: μPC2723T

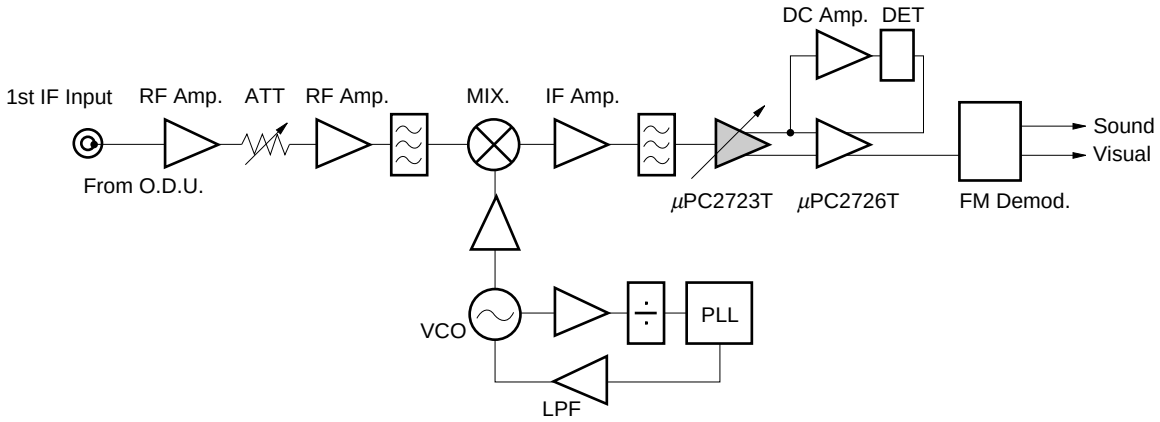
Caution Electro-static sensitive devices

Document No. P10922EJ3V0DS00 (3rd edition)
Date Published September 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

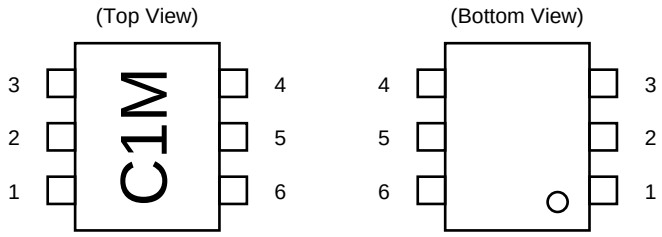
SYSTEM APPLICATION EXAMPLE

DBS Tuner Block Diagram



Caution The insertion point is different due to the specifications of conjunct devices.

PIN CONNECTIONS



Pin No.	Pin Name
1	$\overline{\text{INPUT}}$
2	GND
3	OUTPUT
4	V_{CC}
5	V_{AGC}
6	INPUT

★ PIN DESCRIPTIONS

Pin No.	Pin Name	Functions and Explanation
1	$\overline{\text{INPUT}}$	Input bypass pin. Must be connected bypass capacitor (example: 1 500 pF) to minimize ground impedance.
2	GND	Ground pin. Must be connected to the system ground with minimum inductance. Ground pattern on the board should be formed as wide as possible. (Track length should be kept as short as possible)
3	OUTPUT	Output pin. Must be coupled with capacitor (example: 1 500 pF) for DC cut.
4	V_{CC}	Power supply pin. Supply voltage 5.0±0.5 V for operation. Must be connected bypass capacitor (example: 1 500 pF) to minimize ground impedance.
5	V_{AGC}	AGC control pin. Can be used for auto gain control. The control can be governed by supply voltage to this pin. AGC performance can be adjustable by R_{AGC} value. (example: 15 Ω)
6	INPUT	Input pin. Input frequency from an external VCO output. Must be coupled with capacitor. (example: 1 500 pF)

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	6.0	V
AGC Control Voltage	V_{AGC}	T_A = +25°C	6.0	V
Total Power Dissipation	P_D	T_A = +85°C **Note**	280	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C
Input Power	P_{in}	T_A = +25°C	0	dBm

Note Mounted on double sided copper 50 × 50 × 1.6 mm epoxy glass PWB

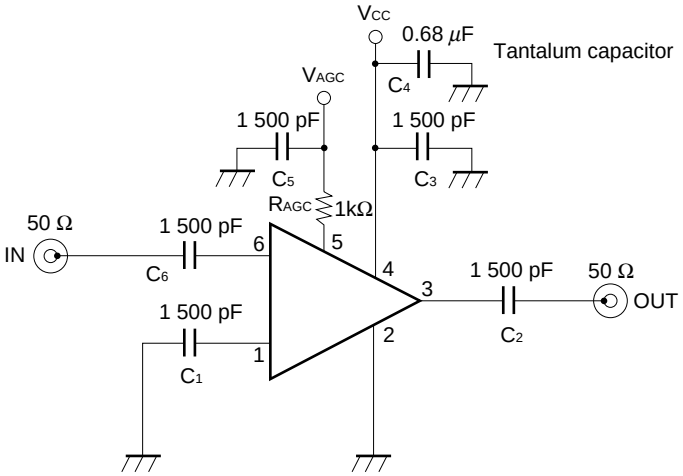
RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C, V_{CC} = 5.0 V, Z_S = Z_L = 50 Ω)

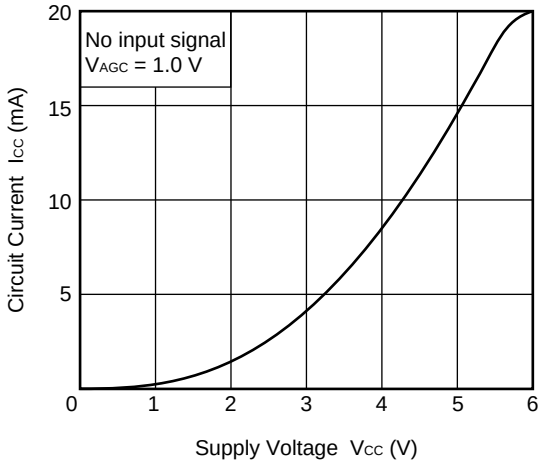
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No signal	11	15	19	mA
Maximum Power Gain	G_{PMAX}	f = 0.5 GHz	9.5	13.0	14.5	dB
Noise Figure	NF	f = 0.5 GHz, at G_{PMAX}	–	11.0	13.5	dB
Upper Limit Operating Frequency	f_u	3 dB down below flat gain f = 0.1 GHz at G_{PMAX}	0.8	1.1	–	GHz
AGC Dynamic Range	GCR	f = 0.5 GHz, V_{AGC} = 0 to 5.0 V	33	38	–	dB
Isolation	ISL	f = 0.5 GHz, at G_{PMAX}	32	37	–	dB
Input Return Loss	RL_{in}	f = 0.5 GHz, at G_{PMAX}	9	12	–	dB
Output Return Loss	RL_{out}	f = 0.5 GHz, at G_{PMAX}	2	4	–	dB
Saturated Output Power	$P_{O(sat)}$	f = 0.5 GHz, P_{in} = –5 dBm at G_{PMAX}	–5.0	–2.0	–	dBm

TEST CIRCUIT

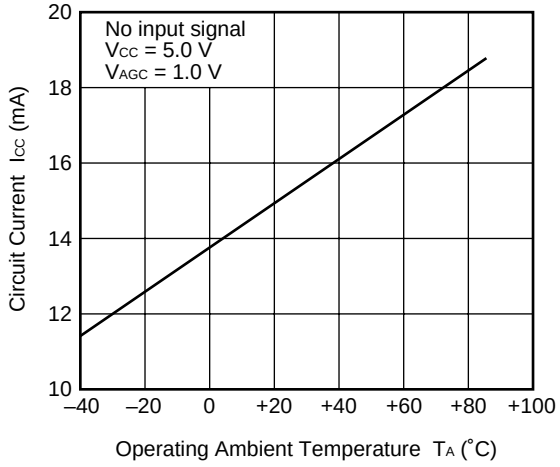


★ TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

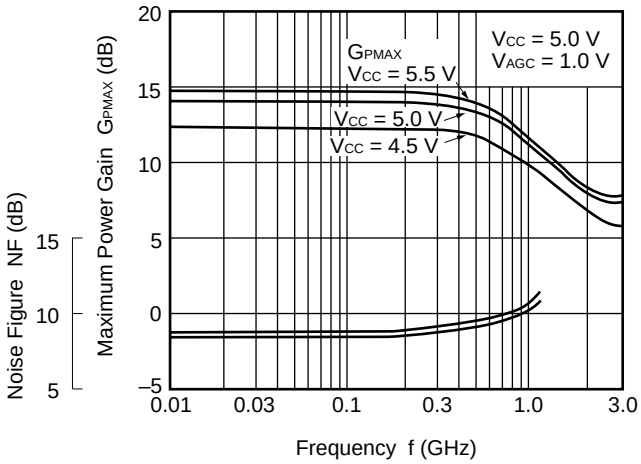
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



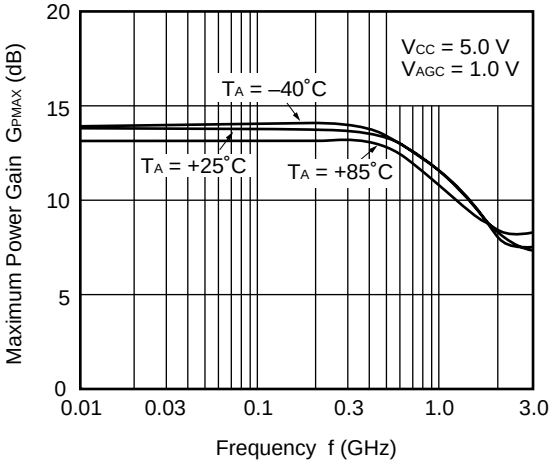
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



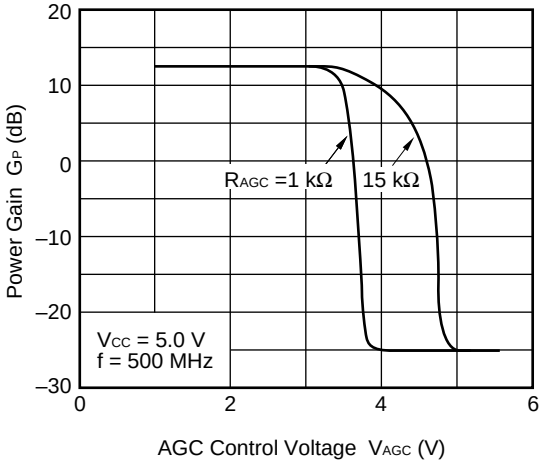
NOISE FIGURE, MAXIMUM POWER GAIN vs. FREQUENCY



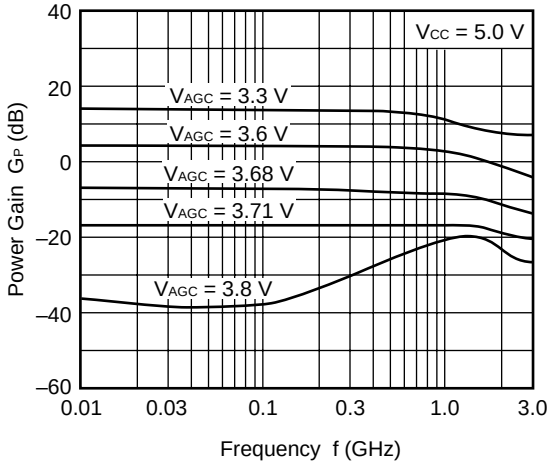
MAXIMUM POWER GAIN vs. FREQUENCY



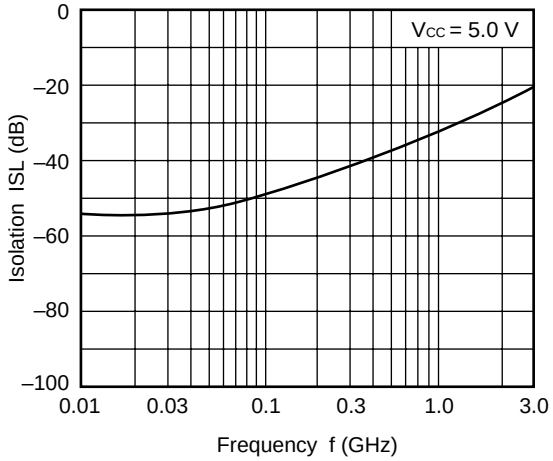
POWER GAIN vs. AGC CONTROL VOLTAGE



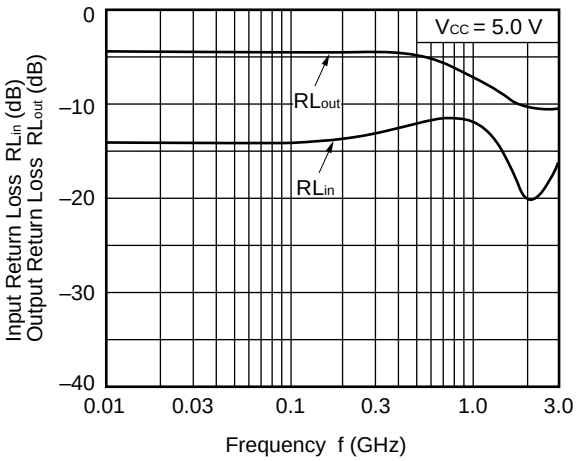
POWER GAIN vs. FREQUENCY



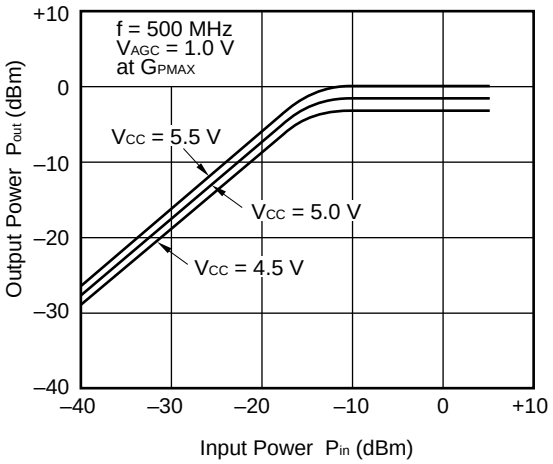
ISOLATION vs. FREQUENCY



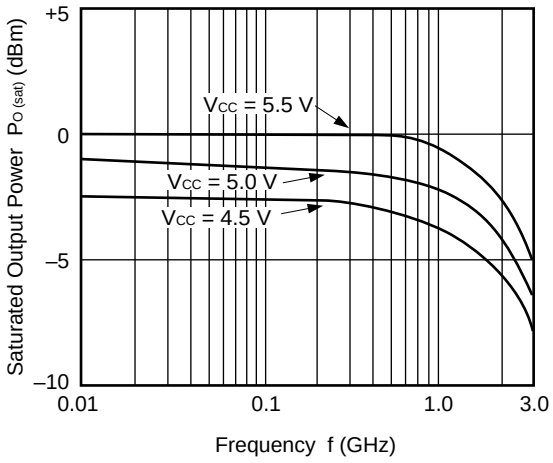
INPUT RETURN LOSS, OUTPUT RETURN LOSS vs. FREQUENCY



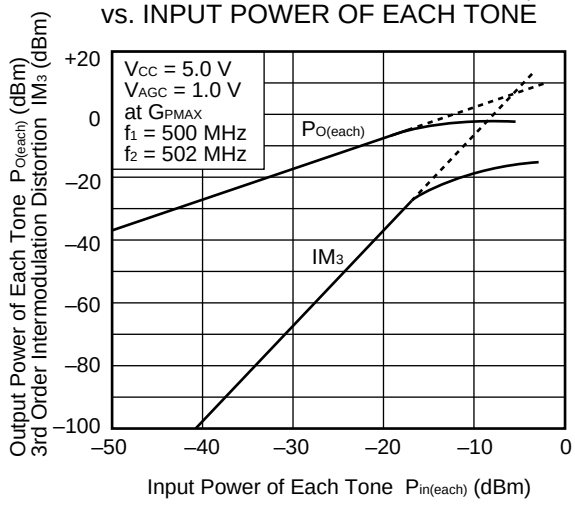
OUTPUT POWER vs. INPUT POWER



SATURATED OUTPUT POWER vs. FREQUENCY



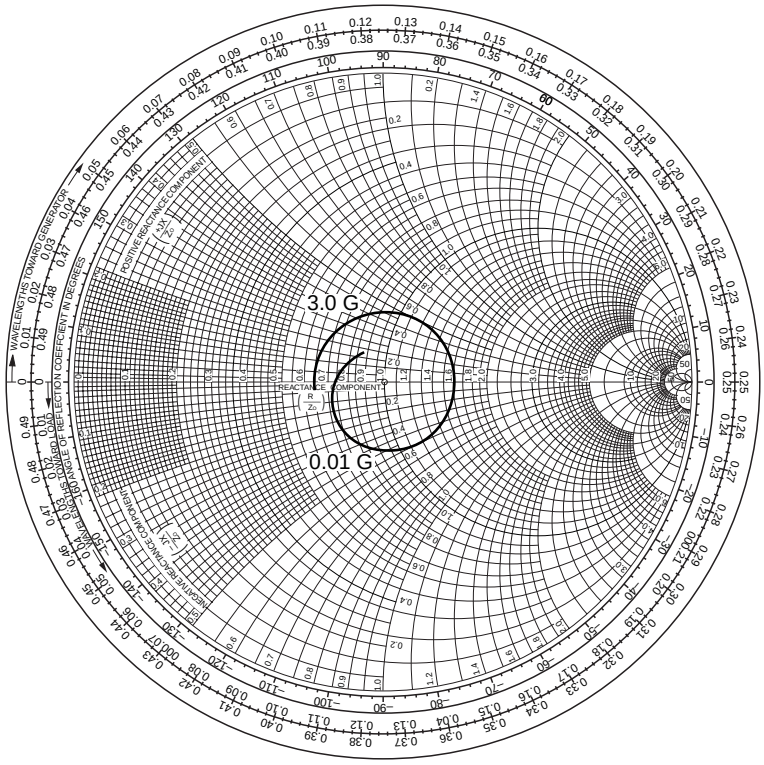
OUTPUT POWER OF EACH TONE, IM3 vs. INPUT POWER OF EACH TONE



Remark The graphs indicate nominal characteristics.

S-PARAMETERS (T_A = +25°C, V_{CC} = 5.0 V)

S_{11}-FREQUENCY



S_{22}-FREQUENCY

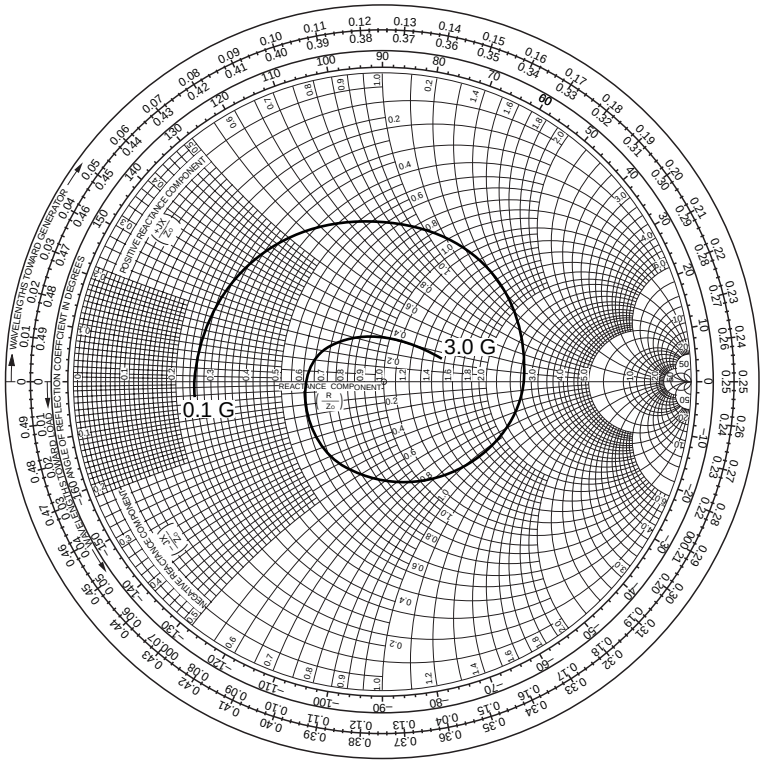
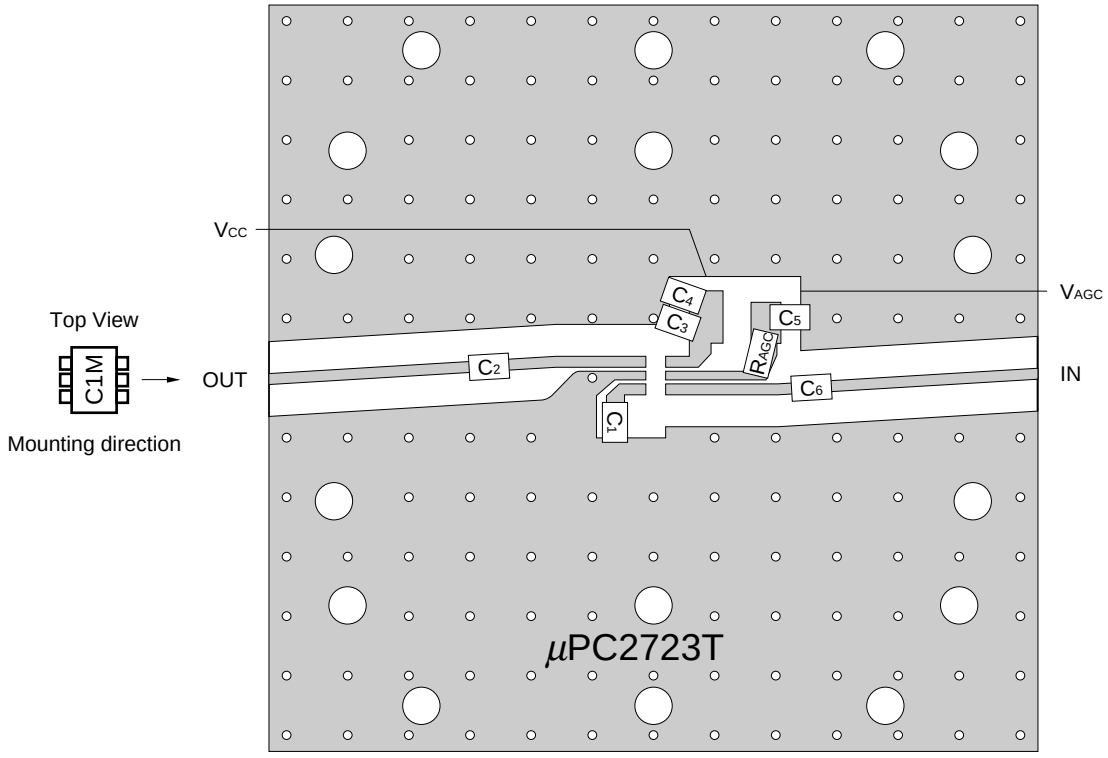


ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

	Value
C_1 to C_3	1 500 pF
C_4	0.68 μF
C_5, C_6	1 500 pF
R_{AGC}	1 kΩ

Remarks 1. 50 × 50 × 0.4 mm double copper clad polyimide board

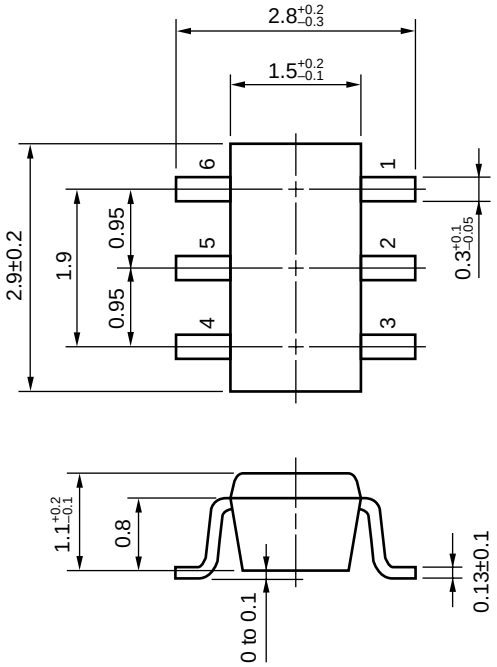
2. Back side: GND pattern

3. Solder plated on pattern

4. o ○: Through holes

★ **PACKAGE DIMENSIONS**

6-PIN MINIMOLD (UNIT: mm)



★ NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.

(2) Form a ground pattern as wide as possible to minimize ground impedance (to prevent abnormal oscillation).

(3) Connect a bypass capacitor (example: 1 000 pF) to the V_{CC} pin.

(4) Couple the signal source and I/O pins using a DC cut capacitor.

★ RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

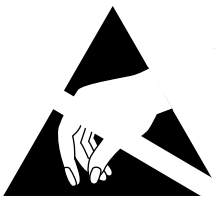
Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below, Time: 30 seconds or less (at 210°C or higher), Count: 3 times or less, Exposure limit: None Note	IR35-00-3
VPS	Package peak temperature: 215°C or below, Time: 40 seconds or less (at 200°C or higher), Count: 3 times or less, Exposure limit: None Note	VP15-00-3
Wave Soldering	Soldering bath temperature: 260°C or below, Time: 10 seconds or less, Count: 1 time, Exposure limit: None Note	WS60-00-1
Partial Heating	Pin temperature: 300°C or below, Time: 3 seconds or less (per side of device), Exposure limit: None Note	–

Note After opening the dry pack, store it at 25°C or less and 65% RH or less for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For the details of the recommended soldering conditions, refer to the document **SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (IEI-1207)**.

[MEMO]



ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

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