NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2723T

1.1 GHz AGC AMPLIFIER FOR DBS TUNER AND MOBILE TELEPHONE

FEATURES

- Wide frequency response – f_u = 1.1 GHz TYP @ – 3 dB $G_{PMAX.}$
- Maximum power gain – $G_{PMAX.}$ = 13 dB TYP
- Single supply voltage: 5 V, 15 mA TYP.
- AGC Dynamic range: GCR = 38 dB TYP. @ f = 500 MHz
- Packaged in 6 pins mini mold suitable for high-density surface mounting.

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.

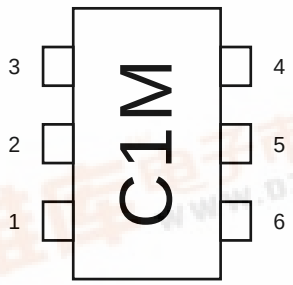
ORDER INFORMATION

ORDER NUMBER	PACKAGE	SUPPLYING FORM	MARKING
μPC2723T–E3	6pin mini mold	Embossed tape 8mm wide. 3kp/reel. Pin1, 2, 3 face to perforation side of the tape.	C1M

Remarks To order evaluation samples, please contact your local NEC sales office. (Order number: μPC2723T)

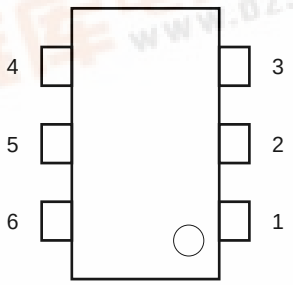
PIN CONNECTIONS

(Top View)



1. $\overline{\text{INPUT}}$
2. GND
3. OUTPUT
4. V_{CC}
5. V_{AGC}
6. INPUT

(Bottom View)



Caution: Electro-static sensitive device

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	CONDITION
Supply Voltage	V_{CC}	6.0	V	T_A = +25 °C
AGC Control Voltage	V_{AGC}	6.0	mA	T_A = +25 °C
Total Power Dissipation	P_D	280	mW	Mounted on double sided copper 50 × 50 × 1.6 mm epoxy glass PWB (T_A = +85 °C)
Operating Temperature	T_{opt}	–40 to +85	°C	
Storage Temperature	T_{stg}	–55 to +150	°C	
Input Power	P_{in}	0	dBm	T_A = +25 °C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	4.5	5	5.5	V
Operating Temperature	T_{opt}	–40	+25	+85	°C

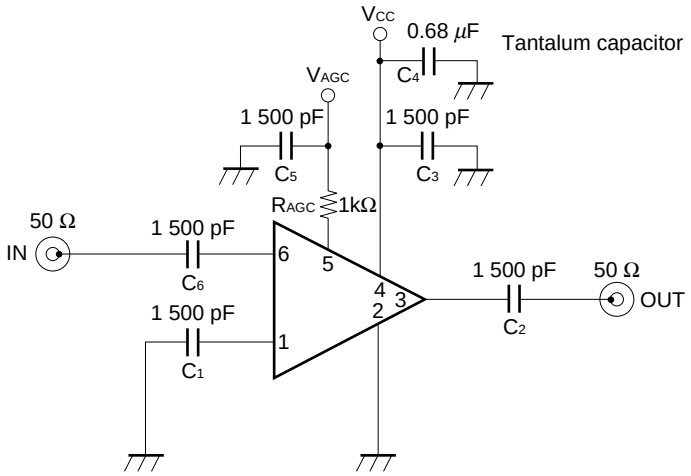
ELECTRICAL CHARACTERISTICS (T_A = 25 °C, V_{CC} = 5 V, Z_S = Z_L = 50 Ω)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Circuit Current	I_{CC}	11	15	19	mA	No signal
Maximum Power Gain	$G_{PMAX.}$	9.5	13	14.5	dB	f = 500 MHz
Noise Figure	NF	–	11	13.5	dB	f = 500 MHz, at $G_{PMAX.}$
Upper Limit Operating Frequency	f_u	0.8	1.1	–	GHz	3 dB down below flat gain f = 0.1 GHz at $G_{PMAX.}$
AGC Dynamic Range	GCR	33	38	–	dB	f = 500 MHz, V_{AGC} = 0 to 5.0 V
Isolation	ISL	32	37	–	dB	f = 500 MHz, at $G_{PMAX.}$
Input Return Loss	RL_{in}	9	12	–	dB	f = 500 MHz, at $G_{PMAX.}$
Output Return Loss	RL_{out}	2	4	–	dB	f = 500 MHz, at $G_{PMAX.}$
Maximum Output	$P_{O(sat)}$	–5	–2	–	dBm	f = 500 MHz, P_{in} = –5 dBm at $G_{PMAX.}$

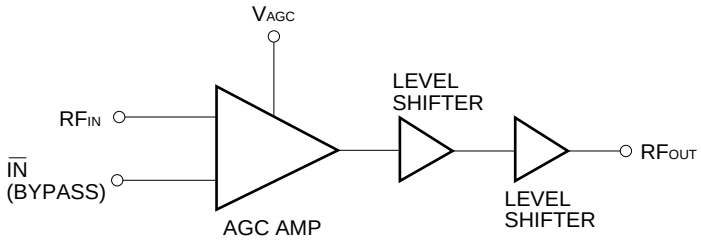
PIN DESCRIPTIONS

Pin No.	Symbol	Assignment	Functions and Explanation
1	$\overline{IN}$	Input bypass pin	Must be connected bypass capacitor (e.g. 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	OUT	Output pin	Must be coupled with capacitor (e.g. 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 (e.g. 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. (e.g. 15 Ω).
6	IN	Input pin	Input frequency from an external VCO output. Must be coupled with capacitor (e.g. 1 500 pF).

TEST CIRCUIT

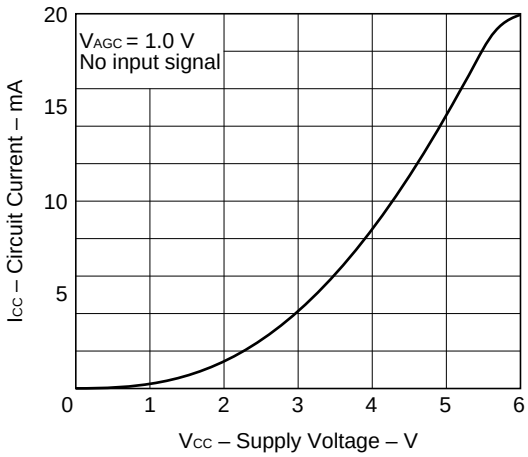


INTERNAL BLOCK DIAGRAM

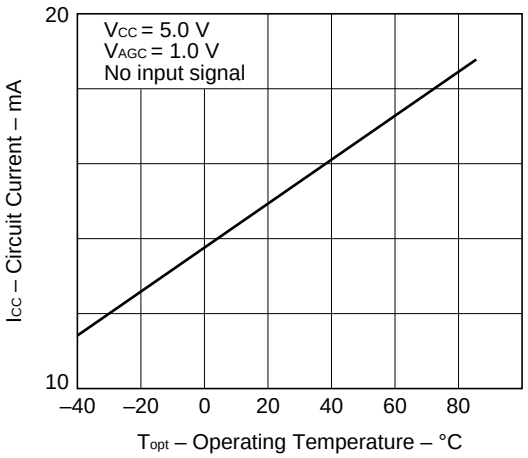


TYPICAL CHARACTERISTICS (T_A = +25 °C)

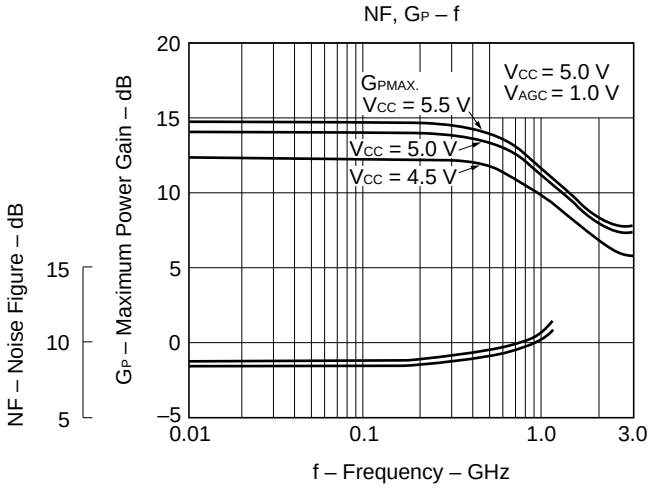
I_{CC} – V_{CC}



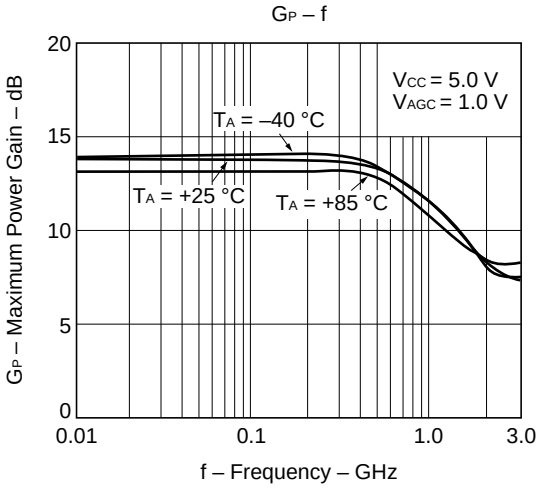
I_{CC} – T_{opt}



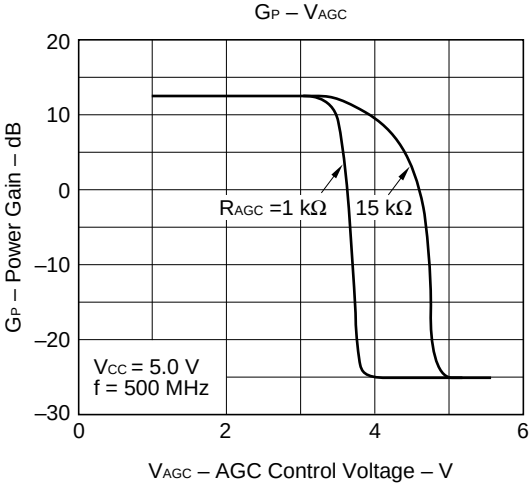
NF, G_P – f



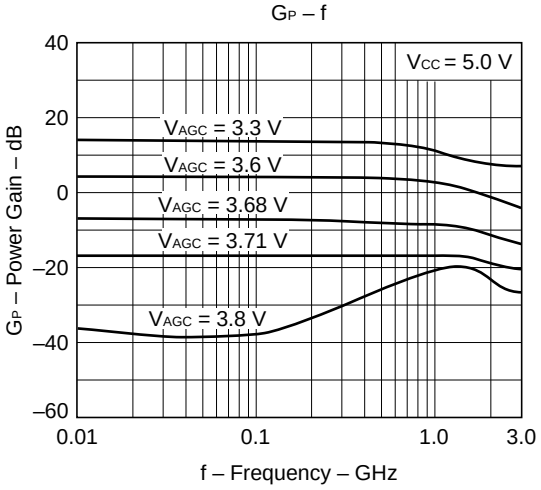
G_P – f



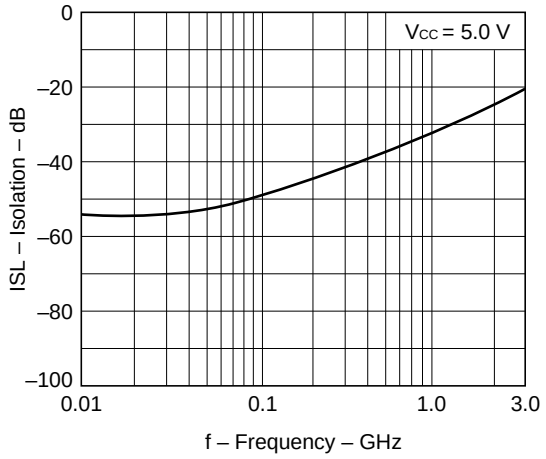
G_P – V_{AGC}



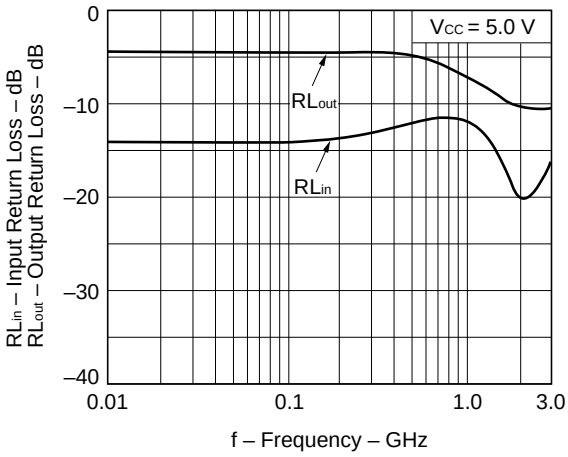
G_P – f



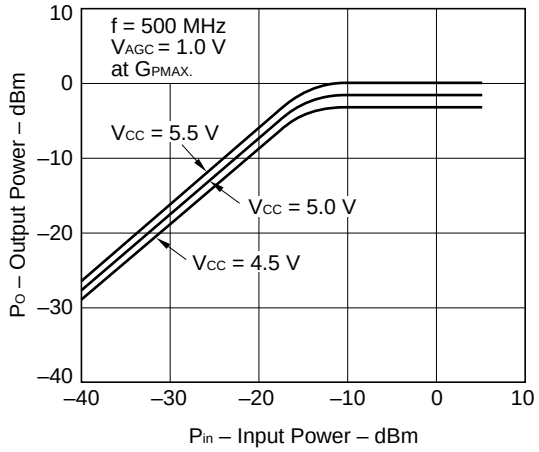
ISL – f



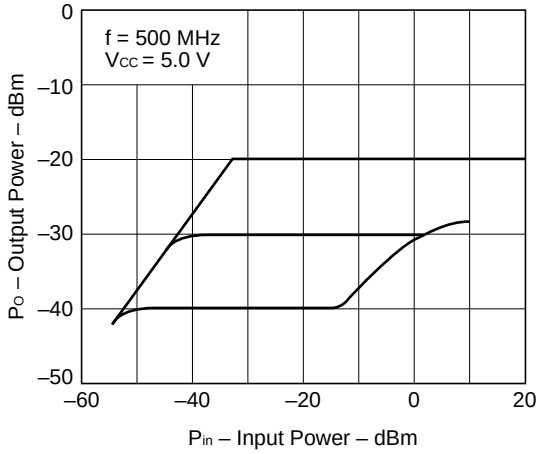
RLin, RLout – f



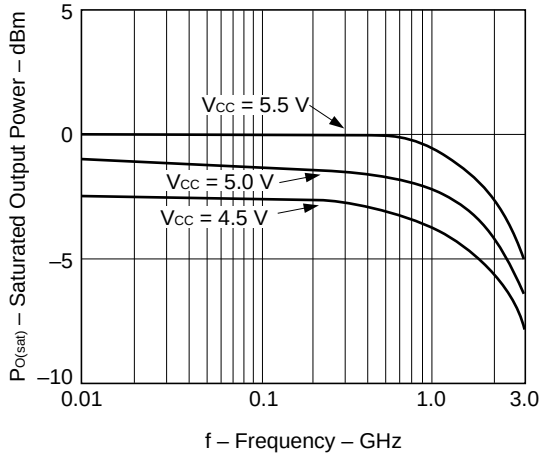
PO – Pin Manual Gain Control



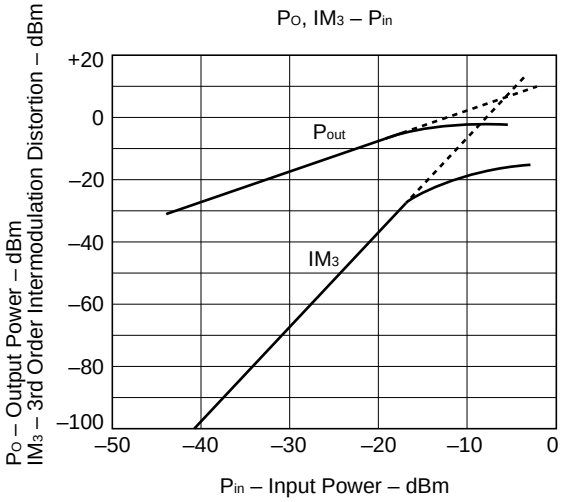
PO – Pin AGC Operation



PO(sat) – f

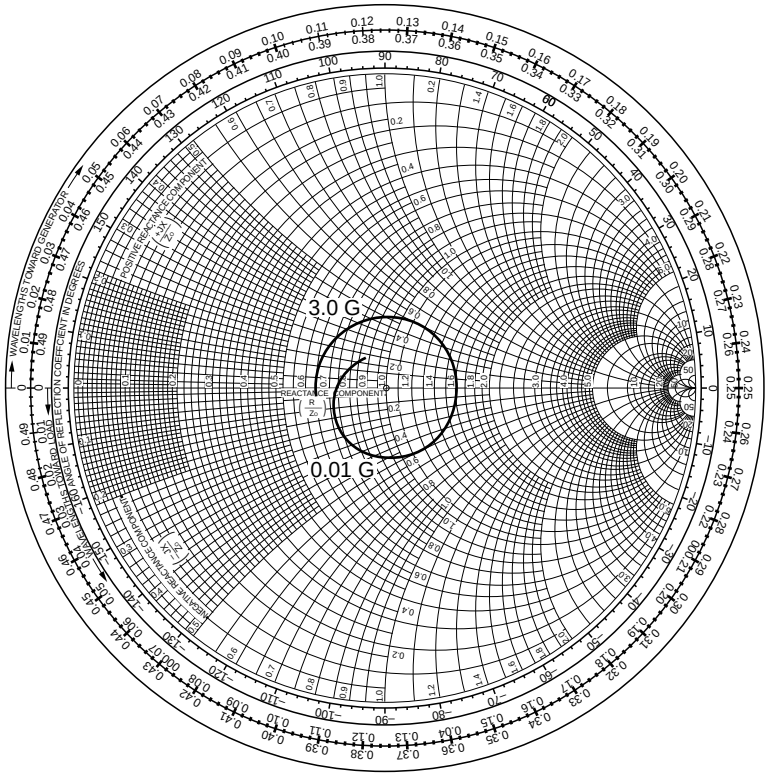


PO, IM3 – Pin



S PARAMETER (V_{CC} = 5.0 V)

S_{11} – FREQUENCY



S_{22} – FREQUENCY

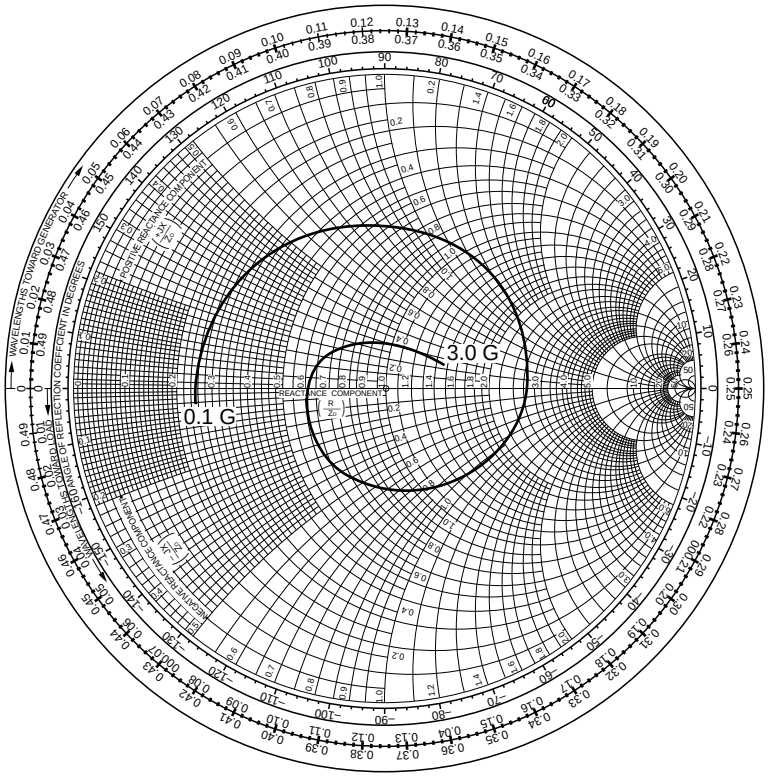
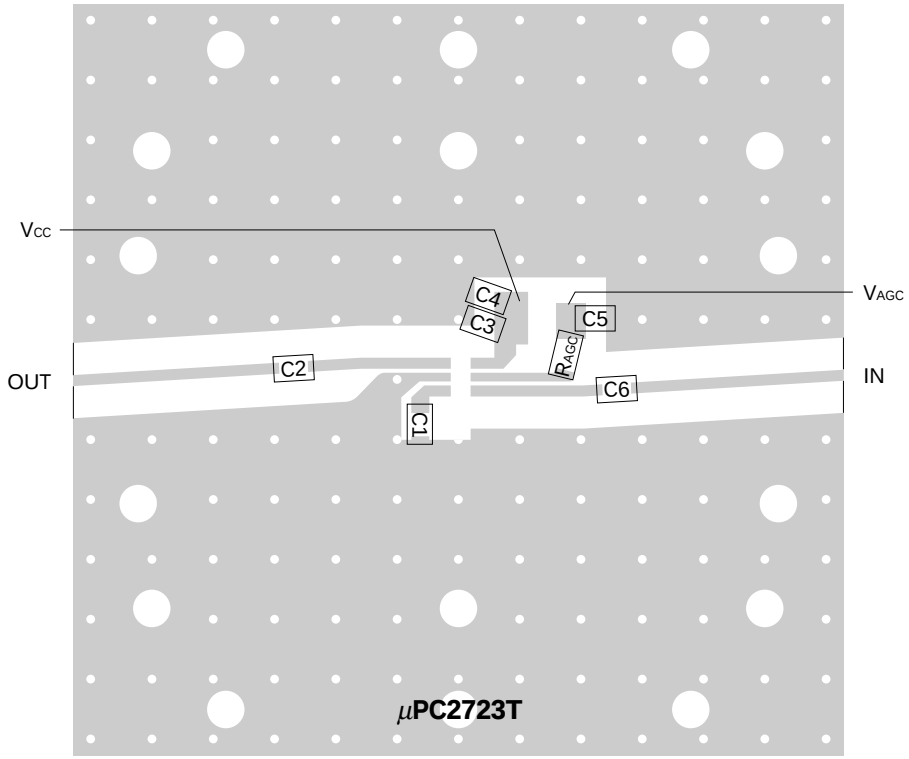


ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



Component List

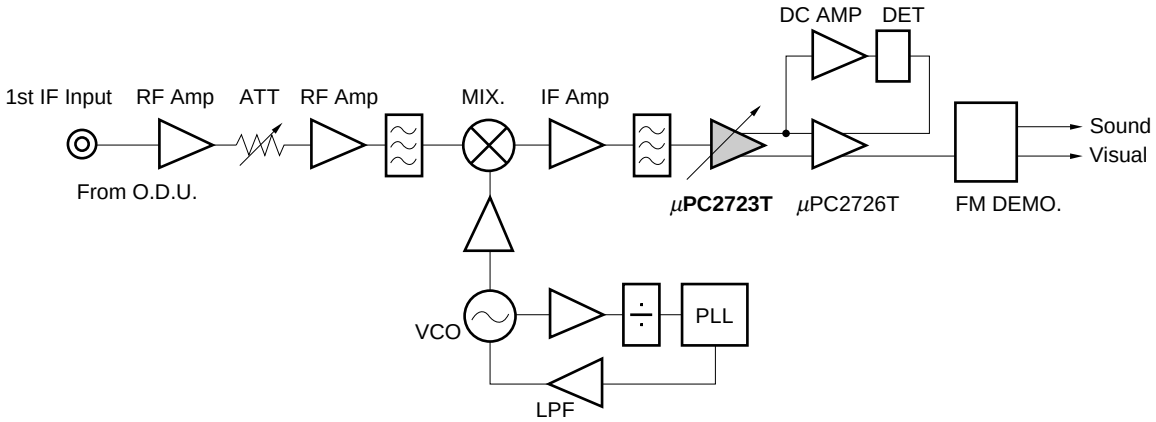
No.	Value
$C_{1 \text{ to } 3}$	1 500 pF
C_4	0.68 pF
$C_{5 \text{ to } 6}$	1 500 pF
R_{AGC}	1 kΩ

Note

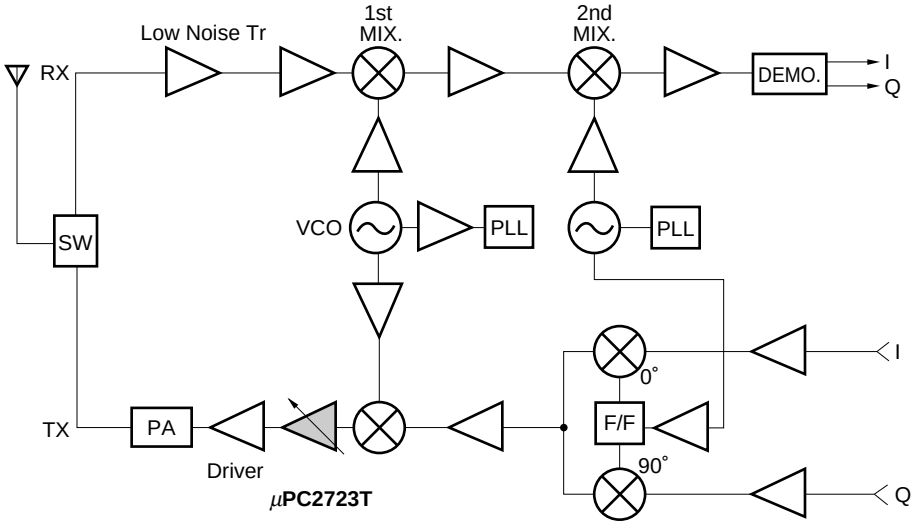
(1) 50×50×0.4 mm double copper clad polyimide board.
(2) Back side: GND pattern
(3) Solder plated on pattern
(4) ○○: Through holes

TYPICAL SYSTEM APPLICATION

DBS Tuner Block Diagram

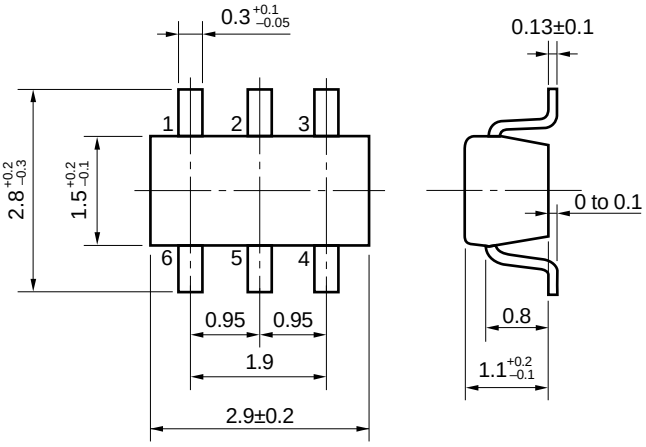


900 MHz Band Digital Cellular Block Diagram (5 V System)



The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

6 PINS MINI MOLD PACKAGE DIMENSIONS (Unit : mm)



NOTE 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 undesired oscillation).
(3) Keep the wiring length of the ground pins as short as possible.
(4) Connect a bypass capacitor (e.g. 1 000 pF) to the V_{CC} pin.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered in the following recommended conditions. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

μPC2723T

Soldering method	Soldering conditions	Recommended condition symbol
Infrared ray reflow	Package peak temperature: 235 °C, Hour: within 30 s. (more than 210 °C), Time: 2 times, Limited days: no.*	IR35–00-2
VPS	Package peak temperature: 215 °C, Hour: within 40 s. (more than 200 °C), Time: 2 times, Limited days: no.*	VP15–00-2
Wave soldering	Soldering tub temperature: less than 260 °C, Hour: within 10 s. Time: 1 time, Limited days: no.	WS60–00-1
Pin part heating	Pin area temperature: less than 300 °C, Hour: within 3 s/pin. Limited days: no.*	

***:** It is the storage days after opening a dry pack, the storage conditions are 25 °C, less than 65 % RH.

Note 1. The combined use of soldering method is to be avoided (However, except the pin area heating method).

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (IEI-1207).

ATTENTION

OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

M4 94.11