

LOW DISTORTION DOWN-CONVERTER

DESCRIPTION

The μPC3220GR is silicon monolithic IC designed for use as IF down-converter for digital CATV. This IC consists of AGC amplifier, mixer and video amplifier.

The package is 16-pin SSOP (Shrink Small Outline Package) suitable for surface mount.

This IC is manufactured using our 10 GHz fr NESAT II AL silicon bipolar process.

This process uses silicon nitride passivation film. This material can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformly and reliability.

FEATURES

- Low distortion IIP₃ = 0 dBm TYP.
- Wide AGC dynamic range GCR_{total} = 47 dB TYP.
- On chip video amplifier
- Supply voltage : 5 V
- Packaged in 16-pin SSOP suitable for high-density surface mounting

APPLICATION

- Digital CATV receivers

ORDERING INFORMATION

Part Number	Package	Supplying Form
μPC3220GR-E1	16-pin plastic SSOP (5.72 mm (225))	<ul style="list-style-type: none"> • Embossed tape 12 mm wide • Pin 1 indicates pull-out direction of tape • Qty 2.5 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.

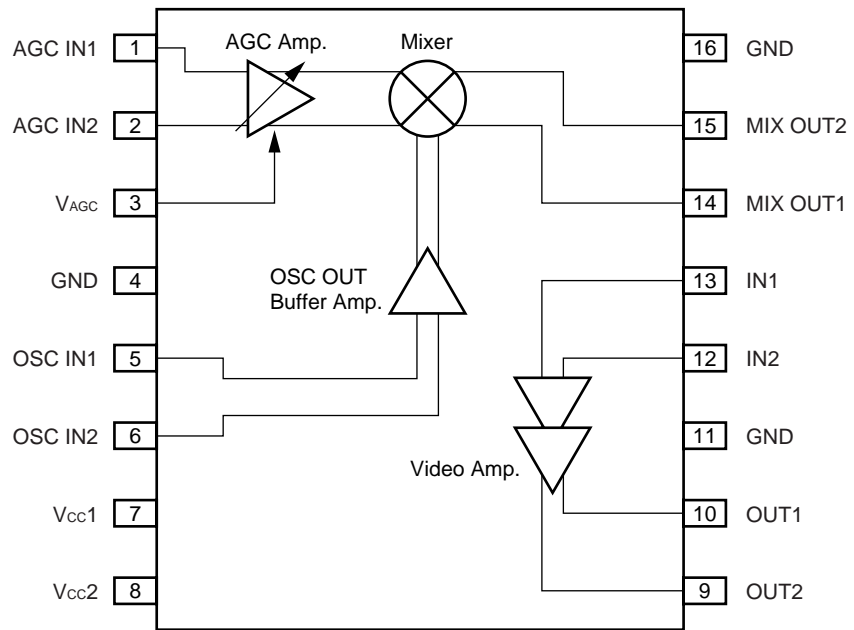
Part number for sample order: μPC3220GR

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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

INTERNAL BLOCK DIAGRAM AND PIN CONFIGURATION

(Top View)



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V _{CC}	T _A = +25°C	6.0	V
Power Dissipation	P _D	T _A = +85°C Note	433	mW
Operating Ambient Temperature	T _A		-40 to +85	°C
Storage Temperature	T _{stg}		-55 to +150	°C

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

RECOMMENDED OPERATING RANGE

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{CC}		4.5	5.0	5.5	V
Operating Ambient Temperature	T _A	V _{CC} = 4.5 to 5.5 V	-40	+25	+85	°C
Input Power	V _{AGC}		0	-	V _{CC}	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 5 V)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Circuit Current 1	I _{CC1}	No input signal, V _{CC1} = V _{CC2} = 5 V Note 1	30.5	40.0	50.5	mA
Circuit Current 2	I _{CC2}	No input signal, V _{CC1} = 5 V Note 1	12.5	18.0	23.0	mA
Circuit Current 3	I _{CC3}	No input signal, V _{CC2} = 5 V Note 1	18.0	22.0	27.5	mA
AGC Voltage High Level	V _{AGC(H)}	@ Maximum gain Note 1	3.0	–	V _{CC}	V
AGC Voltage Low Level	V _{AGC(L)}	@ Minimum gain Note 1	0	–	0.5	V
RF Characteristics (AGC Amplifier Block: f _{RF} = 100 MHz, f _{LO} = 136 MHz, P _{LO} = –15 dBm, f _{IF} = 36 MHz, Z _S = 50 Ω, Z _L = 1 kΩ)						
RF Input Frequency Range	f _{RF}	Note 1	30	–	250	MHz
IF Output Frequency Range	f _{IF}	Note 1	0.1	–	150	MHz
AGC Dynamic Range	GCR _{AGC}	V _{AGC} = 0.5 to 3.0 V Note 1	35	47	–	dB
RF Characteristics (Total Block: f _{RF} = 100 MHz, f _{LO} = 136 MHz, P _{LO} = –15 dBm, f _{IF} = 36 MHz, Z _S = 50 Ω, Z _L = 1 kΩ)						
Maximum Conversion Gain	CG _{MAX}	V _{AGC} = 3.0 V, P _{in} = –70 dBm Note 2	64.5	71	73.5	dB
Minimum Conversion Gain	CG _{MIN}	V _{AGC} = 0.5 V, P _{in} = –40 dBm Note 2	18	24	29.5	dB
Total Dynamic Range	GCR _{total}	V _{AGC} = 0.5 to 3.0 V Note 2	35	47	–	dB
Maximum Output Voltage	V _{oclip}	V _{AGC} = 3.0 V, P _{in} = –45 dBm Note 2	3.2	4.0	–	V _{p-p}
Noise Figure	NF _{total}	DSB, V _{AGC} = 3.0 V (@ Maximum gain) Note 3	–	7.0	8.5	dB

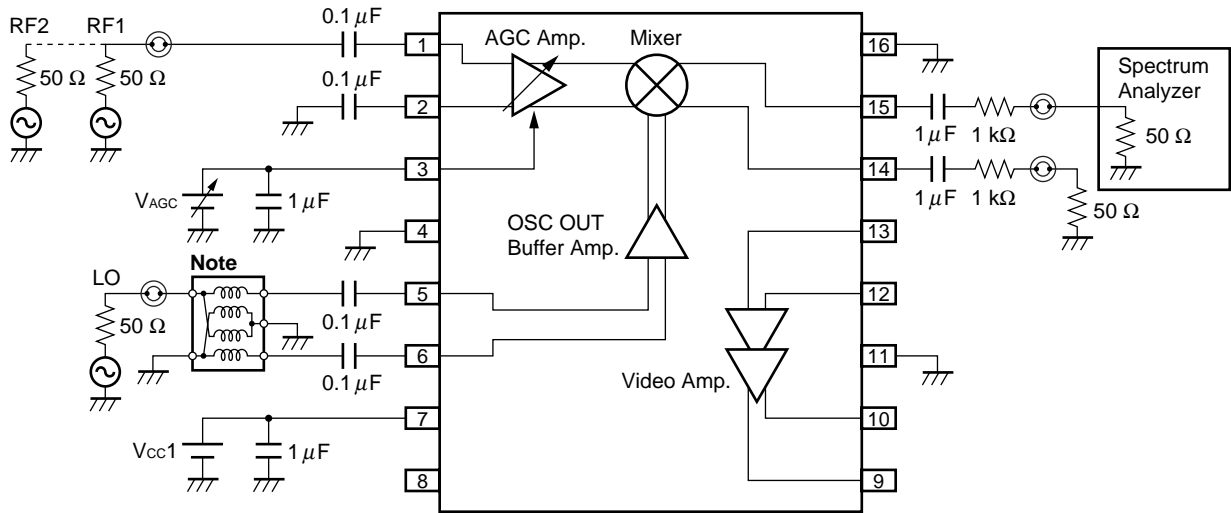
- Notes 1.** By measurement circuit 1
- 2.** By measurement circuit 6
- 3.** By measurement circuit 7

STANDARD CHARACTERISTICS (T_A = +25°C, V_{cc1} = 5 V, Z_s = 50 Ω)

Parameter	Symbol	Test Conditions	Reference Value	Unit
AGC Amplifier Block (f _{RF} = 100 MHz, f _{LO} = 136 MHz, P _{LO} = -15 dBm, f _{IF} = 36 MHz, Z _S = 50 Ω, Z _L = 1 kΩ)				
Maximum Conversion Gain	CG _{MAX}	V _{AGC} = 3.0 V, P _{in} = -50 dBm Note 1	33.5	dB
Minimum Conversion Gain	CG _{MIN}	V _{AGC} = 0.5 V, P _{in} = -30 dBm Note 1	-13.5	dB
Noise Figure	NF	DSB, V _{AGC} = 3.0 V (@ Maximum gain) Note 2	7.0	dB
Input 3rd Order Distortion Intercept Point	IIP ₃	V _{AGC} = 0.5 V (@ Minimum gain) Note 1	0	dBm
Maximum Output Voltage	V _{oclip}	V _{AGC} = 3.0 V Note 1	0.67	V _{p-p}
RF Input Impedance	Z _{RF}	V _{AGC} = 3.0 V, f = 100 MHz Note 3	0.39 - j0.95	kΩ
LO Input Impedance	Z _{LO}	V _{AGC} = 3.0 V, f = 136 MHz Note 3	0.24 - j0.86	kΩ
IF Output Impedance	Z _{IF}	V _{AGC} = 3.0 V, f = 36 MHz Note 3	30 + j2.5	Ω
Video Amplifier Block (f = 36 MHz, Z _S = 50 Ω, Z _L = 1 kΩ)				
Frequency Range	f _{BW}	P _{in} = -55 dBm, 1 dB down Note 4	45	MHz
Differential Gain	G _{diff}	P _{in} = -55 dBm Note 4	55	dB
Input Impedance	Z _{in}	f = 36 MHz Note 5	0.35 - j0.3	kΩ
Output Impedance	Z _{out}	f = 36 MHz Note 5	15 + j14	Ω
Total Block (f _{RF} = 100 MHz, f _{LO} = 136 MHz, P _{LO} = -15 dBm, f _{IF} = 36 MHz, Z _S = 50 Ω, Z _L = 1 kΩ)				
Input 3rd Order Distortion Intercept Point	IIP _{3total}	V _{AGC} = 0.5 V (@ Minimum gain) Note 6	0	dBm
3rd Order Intermodulation Distortion	IM _{3total}	V _{out} = 0.7 V _{p-p} × 2 tone, P _{in} -50 dBm/tone Note 6	56	dBc

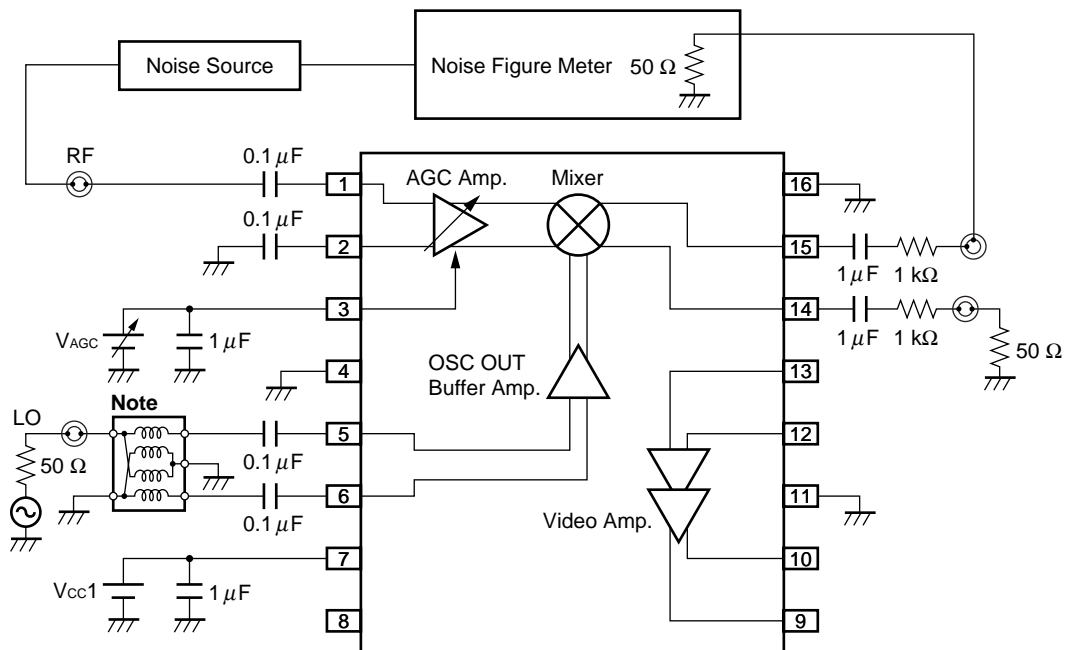
- Notes**
1. By measurement circuit 1
 2. By measurement circuit 2
 3. By measurement circuit 3
 4. By measurement circuit 4
 5. By measurement circuit 5
 6. By measurement circuit 6

MEASUREMENT CIRCUIT 1



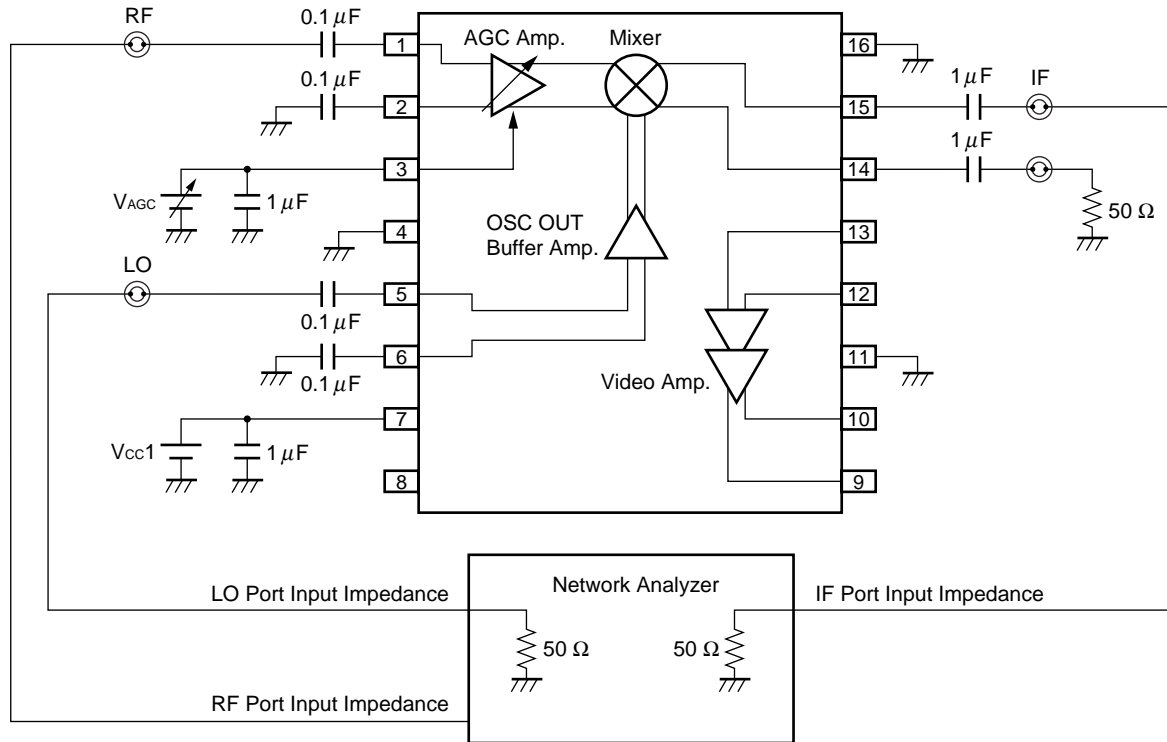
Note Balun Transformer : TOKO 617DB-1010 B4F (Double balanced type)

MEASUREMENT CIRCUIT 2

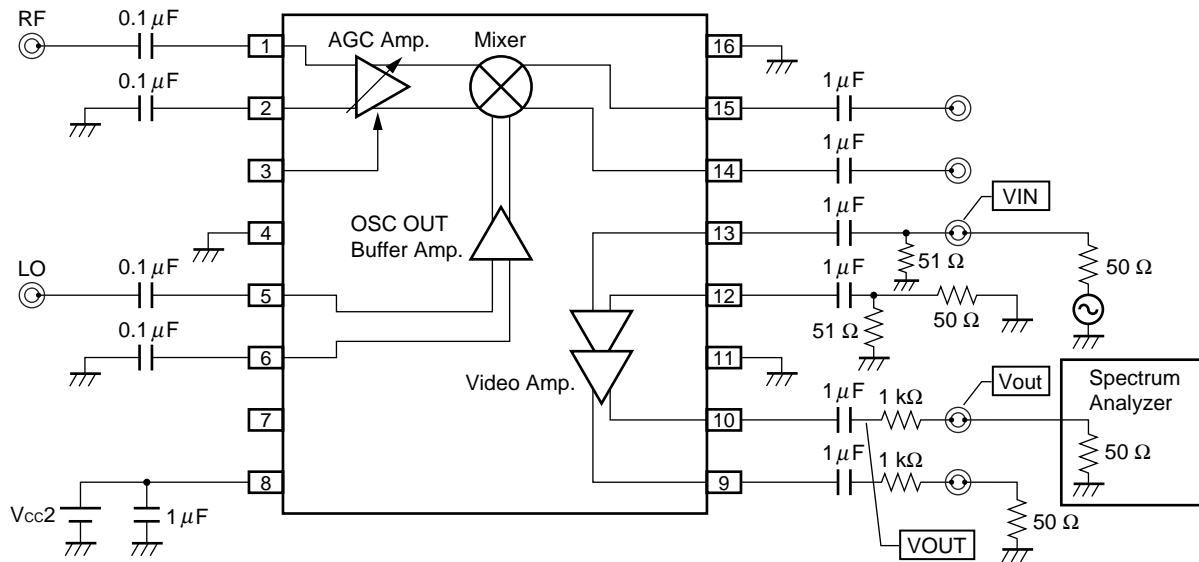


Note Balun Transformer : TOKO 617DB-1010 B4F (Double balanced type)

MEASUREMENT CIRCUIT 3

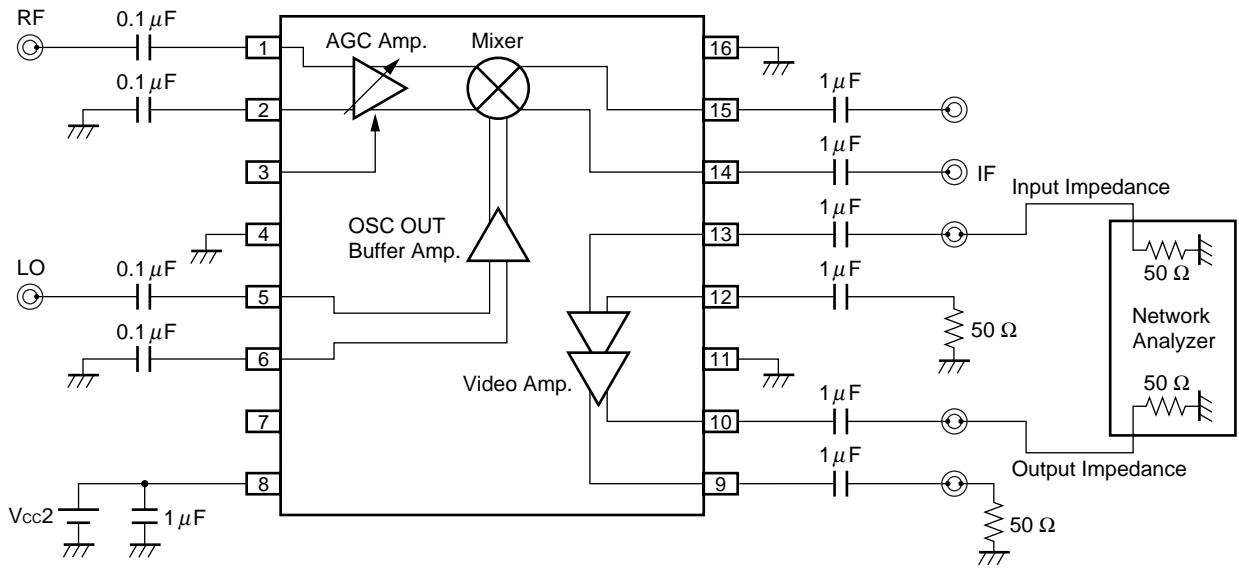


MEASUREMENT CIRCUIT 4

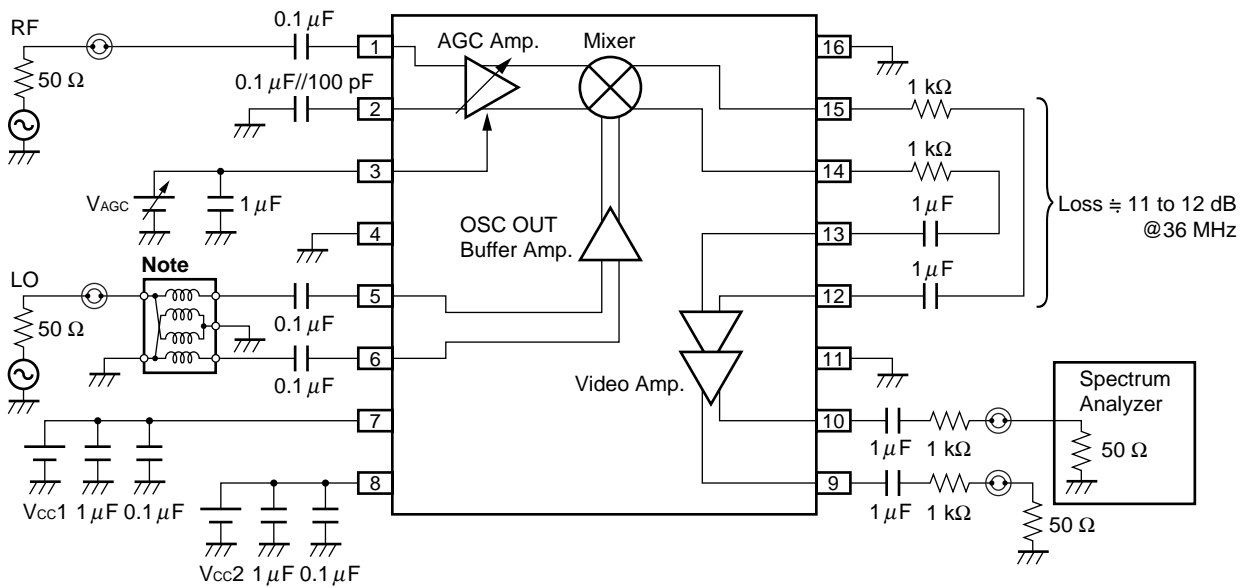


- Remarks 1.** Voltage Gain (Single Ended) = 20 log (V_{OUT}/V_{IN}) (dB)
2. Differential Gain (Differential-out) = 20 log (2 × V_{OUT}/V_{IN}) (dB)
3. V_{OUT} = V_{out} (Measured Value) × (1 050/50)

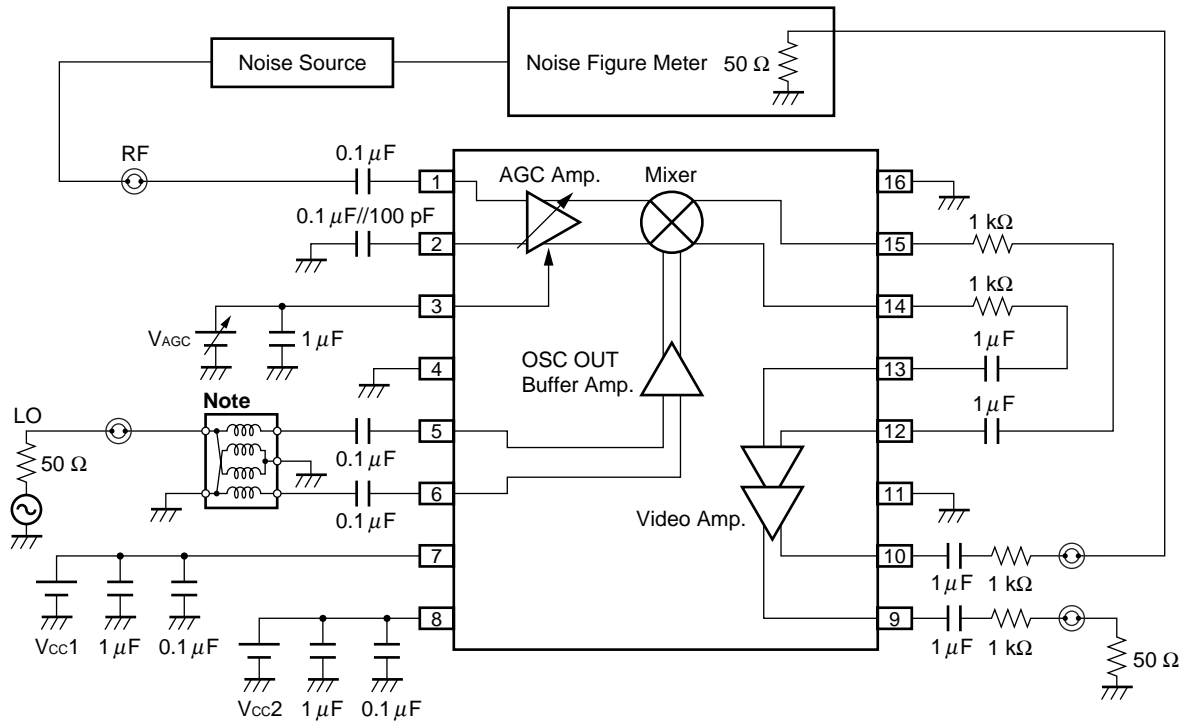
MEASUREMENT CIRCUIT 5



MEASUREMENT CIRCUIT 6



MEASUREMENT CIRCUIT 7

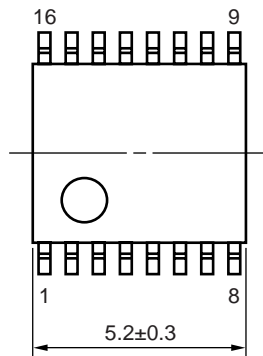


Note Balun Transformer : TOKO 617DB-1010 B4F (Double balanced type)

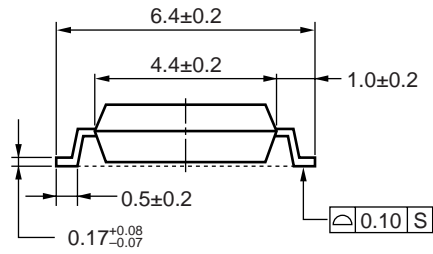
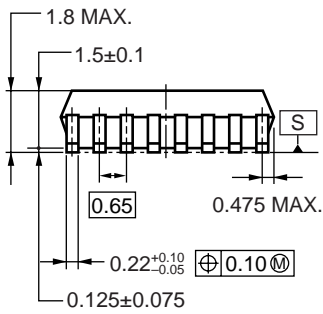
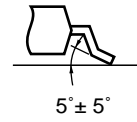
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

PACKAGE DIMENSIONS

16-PIN PLASTIC SSOP (5.72 mm (225)) (UNIT: mm)



detail of lead end



NOTES ON CORRECT USE

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).
All the ground pins must be connected together with wide ground pattern to decrease impedance difference.
- (3) The bypass capacitor should be attached to Vcc line.

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 nearby sales office.

Soldering Method	Soldering Conditions	Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) : 260°C or below Time at peak temperature : 10 seconds or less Time at temperature of 220°C or higher : 60 seconds or less Preheating time at 120 to 180°C : 120±30 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	IR260
VPS	Peak temperature (package surface temperature) : 215°C or below Time at temperature of 200°C or higher : 25 to 40 seconds Preheating time at 120 to 150°C : 30 to 60 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below Time at peak temperature : 10 seconds or less Preheating temperature (package surface temperature) : 120°C or below Maximum number of flow processes : 1 time Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350

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

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► **Business issue**

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► **Technical issue**

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