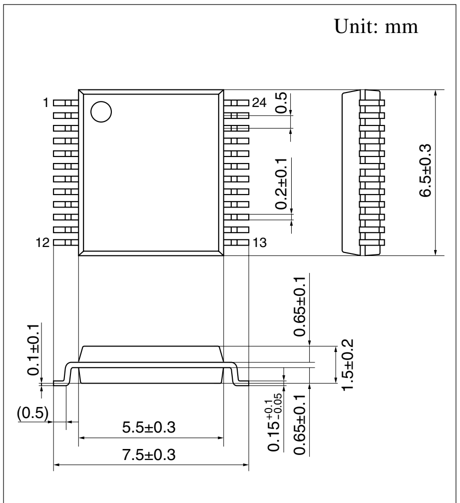
AN6095SH

Reception IF + transmission quadrature modulation IC for PHS and cellular telephone



SSOP024-P-0300A

Note) The package of this product will be changed to lead-free type (SSOP024-P-0300D). See the new package dimensions section later of this datasheet.

■ Overview

The AN6095SH is a single chip IC for PHS reception IF block and transmission block.

Reception IF block is incorporating a 2nd down-mixer and a limiter/RSSI circuit which can operate for up to 300 MHz of input frequency. Transmission block is incorporating a quadrature modulator, a phase shifter, an up-mixer for 1.9 GHz and output level control functions.

It contributes to realization of small package and small size of equipment.

■ Features

- Operating supply voltage range: 2.7 V to 4.0 V
- Current consumption
  - Transmission block: 28 mA
  - Reception block: 5.3 mA
  - Sleep mode: 10 µA or less

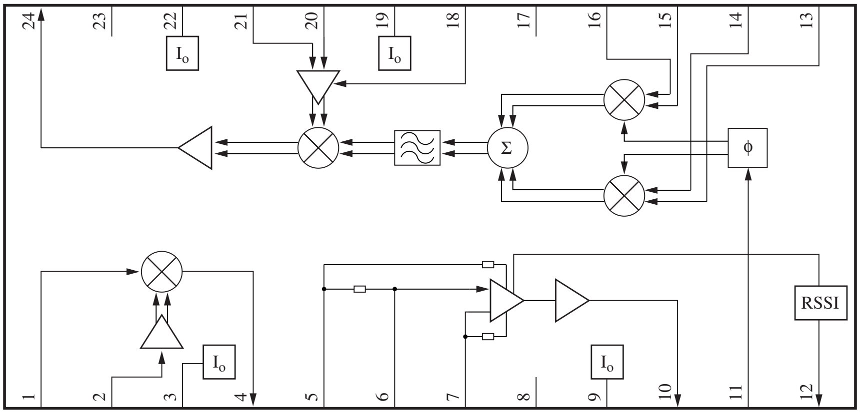
(Transmission block)
- Output level: −8 dBm
- Output frequency: up to 2 GHz
- Transmission IF frequency: 100 MHz to 300 MHz

(Reception block)
- RSSI input D range: 80 dB
- Mixer conversion gain: 16 dB
- Limiter voltage gain: 70 dB
- 2nd down-mixer NF: 6 dB

■ Applications

- PHS

■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	RXMXIN	RX-mixer-in	13	Q-IN	Q-input
2	RXLOIN	RX-local-in	14	$\overline{Q}$-IN	$\overline{Q}$-input
3	VCCM	V_{CC}-mixer	15	I-IN	I-input
4	MXO	Mixer-out	16	$\overline{I}$-IN	$\overline{I}$-input
5	LMDEC1	Limiter-decouple 1	17	GNDM	GND-TX-modulator
6	LMIN	Limiter-in	18	APC/BS	APC/BS
7	LMDEC2	Limiter-decouple 2	19	VCCM	V_{CC} -TX-modulator
8	GNDR	GND-RX	20	TXLO2R	TX-local 2-REF
9	VCCL	V_{CC} -limiter	21	TXLO2	TX-local 2
10	LMO	Limiter-out	22	VCCO	V_{CC} -TX-out
11	TXLO1	TX-local 1-in	23	GNDO	GND-TX-out
12	RSO	RSSI-out	24	TXO	TX-output

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.2	V
Supply current	I_{CC}	60	mA
Power dissipation	P_D	252	mW
Operating ambient temperature *	T_{opr}	–20 to +60	°C
Storage temperature *	T_{stg}	–55 to +125	°C

Note) 1. *: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.
2. For the main characteristics, refer to "■ Technical Data".

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	2.7 to 4.0	V

■ Electrical Characteristics at $T_a = 25°C$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Current consumption (reception)	I_{CCRX}	No signal	—	5.3	6.8	mA
Mixer conversion gain	G_{MX}	V_{MI} = 70 dBμ Except for filter loss, SW1 = a	13	16	19	dB
Mixer maximum output level	V_{MX}	V_{MI} = 105 dBμ Except for filter loss, SW1 = a	105	110	—	dBμ
Limiter voltage gain	G_{LM}	V_{LI} = 20 dBμ, SW1 = b	63	68	73	dB
Limiter maximum output amplitude	V_{LM}	V_{LI} = 80 dBμ, SW1 = b	300	360	—	mV[p-p]
RSSI output voltage 1	$V_{S(1)}$	No signal, SW1 = b	0	0.2	0.5	V
RSSI output voltage 2	$V_{S(2)}$	V_{LI} = 115 dBμ, SW1 = b	1.60	1.80	—	V
RSSI output slope	D_S	$V_S (V_{IS}) = V_{S(1)} + 0.15$ V $D_{S(1)} = V_S (V_{IS} + 65\ dB\mu) - V_S (V_{IS})$ SW1 = b	1.0	1.25	1.5	V
RSSI output slope variation	$\Delta D_{S(n)}$	$\Delta D_{S(n)} = 5\ \{V_S (V_{IS} + n13\ dB\mu) -$ $V_S (V_{IS} + (n-1)\ 13\ dB\mu)\}\ /D_{S(1)}$ n = 1 to 5, SW1 = b	0.75	1.0	1.25	—
Current consumption (transmission)	I_{CCTX}	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V	—	28	37	mA
Sleep current at transmission	I_{SL}	No signal, V_{APC} = 0 V	—	0	10	μA
Transmission output level 1	P_{O1}	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 660 MHz, −10 dBm V_{APC} = 2.75 V	−12	−8	—	dBm
Transmission output level 2	P_{O2}	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 685 MHz, −10 dBm V_{APC} = 2.75 V	−12	−8	—	dBm

Note) 1. Refer to the "• Test circuit" for the SW1.

2. Unless otherwise specified :

At reception, V_{CC2} = 3.0 V, V_{LO3} = −10 dBm: f = 233.15 MHz, V_{MI}: f = 243.95 MHz, SW1 = a

V_{LI}: f = 10.8 MHz (Input level of pin 6 except for attenuation of the matching circuit and filter.)

V_{MO} and V_{LO} are in high impedance measurement. (V_{LM} is measured with probe load of 27 pF and 1 MΩ.)

V_{IS} is an input level V_{LI} at which RSSI output voltage becomes $V_{S(1)}$ + 0.15 V.

At transmission, V_{CC1} = 3.0 V, IQ signal amplitude: 0.4 V (both phases), DC bias: 1.5 V, SW1 = a

I_{CCTX}: π/4 QPSK-modulated, P_{O1} and P_{O2}: PN9 stages modulated wave

Output frequency of P_{O1}: 1 893.174 MHz

Output frequency of P_{O2}: 1 918.174 MHz

■ Electrical Characteristics at T_a = 25°C (continued)

• Design reference data

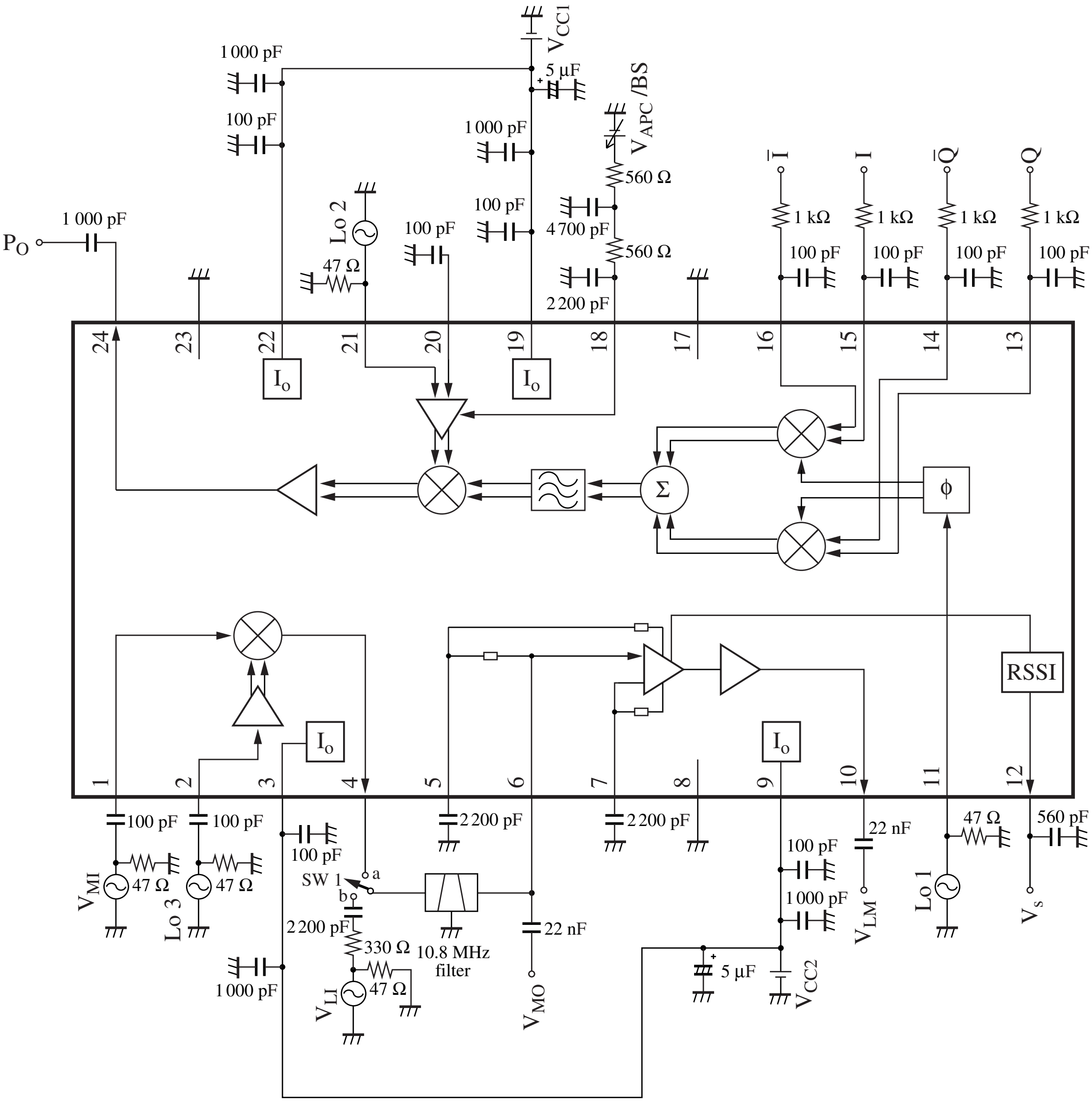
Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
1st local leak suppression amount	CL1	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V	—	−25	—	dBc
2nd local leak suppression amount	CL2	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V	—	−15	—	dBc
In-band output level deviation	ΔP	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 660 to 1 685 MHz, −10 dBm V_{APC} = 2.75 V	—	±1.6	—	dB
Adjacent channel leak power suppression (600 kHz detuning)	BL1	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V	—	−65	−60	dBc
Modulation precision	EVM	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V	—	3	5	%[rms]
Minimum output level	P_{min}	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 1.0 V	—	−45	−40	dBm
Image leak suppression	IL1	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V IQ: Level is of no adjustment	—	−35	—	dBc
$f_{LO1} + f_{LO2}$ local leak suppression amount	CL	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm V_{APC} = 2.75 V IQ: DC offset is of no adjustment	—	−35	—	dBc
Proximity spurious suppression	DU	Lo1 = 233.15 MHz, −10 dBm Lo2 = 1 672.5 MHz, −10 dBm Adjust V_{APC} so as to get P_O = −12 dBm	—	−55	−51	dBc

Note) Unless otherwise specified:
At transmission, V_{CC1} = 3.0 V, SW1 = a
IQ signal: 0.4 V[p-p] (both phases), DC bias: 1.5 V
CL1, CL2, ΔP, BL1, EVM, P_{min} , DU: PN9 stages modulated wave
IL1, CL: π/4 QPSK-modulated

■ Electrical Characteristics (continued)

• Test circuit

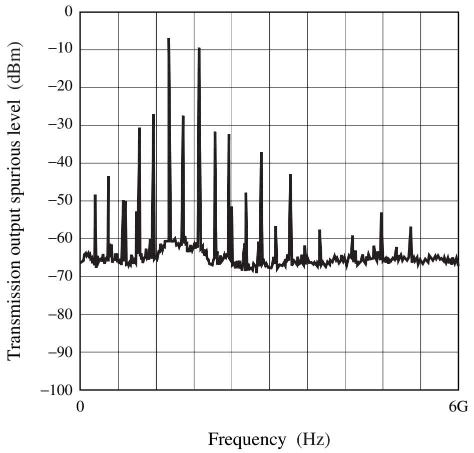


■ Technical Data

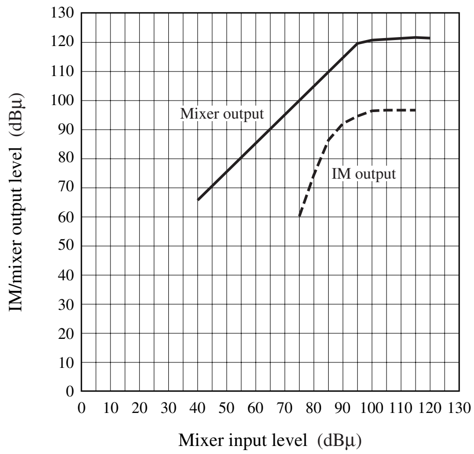
Unless otherwise specified, the test condition is the same as "■ Electrical Characteristics".
Characteristics are the theoretical values and not guaranteed ones.

• Main characteristics (application circuit)

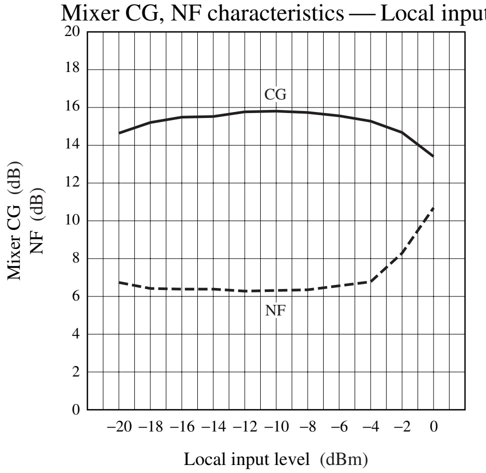
Wide band spurious characteristic



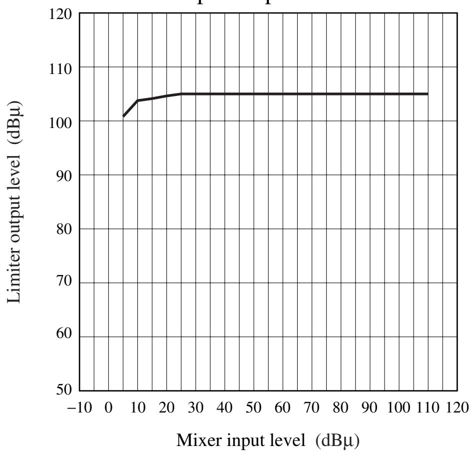
IM/mixer output — Mixer input



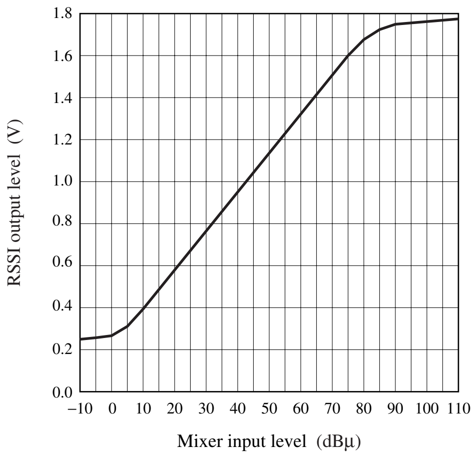
Mixer CG, NF characteristics — Local input



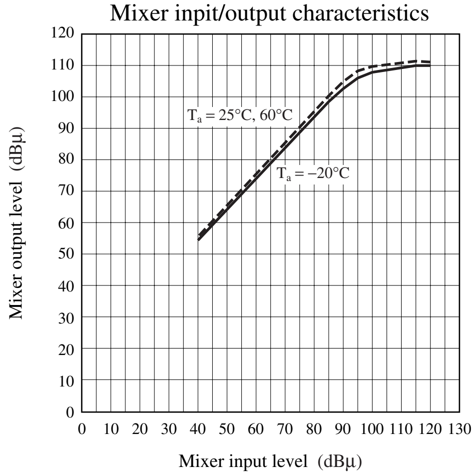
Limiter input/output characteristic



RSSI characteristic



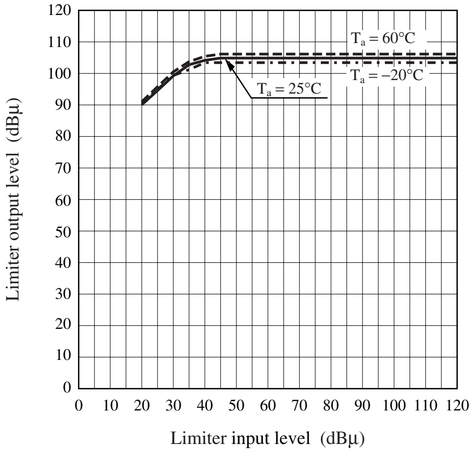
Mixer inpit/output characteristics



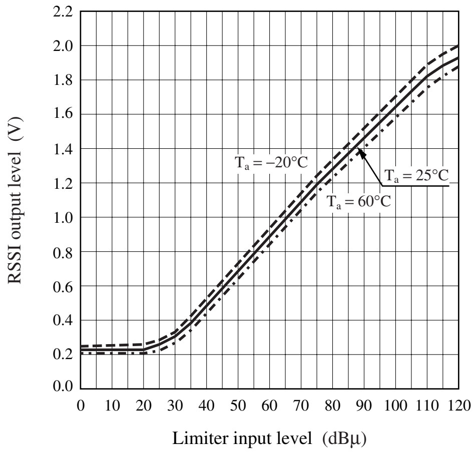
■ Technical Data (continued)

• Main characteristics (application circuit) (continued)

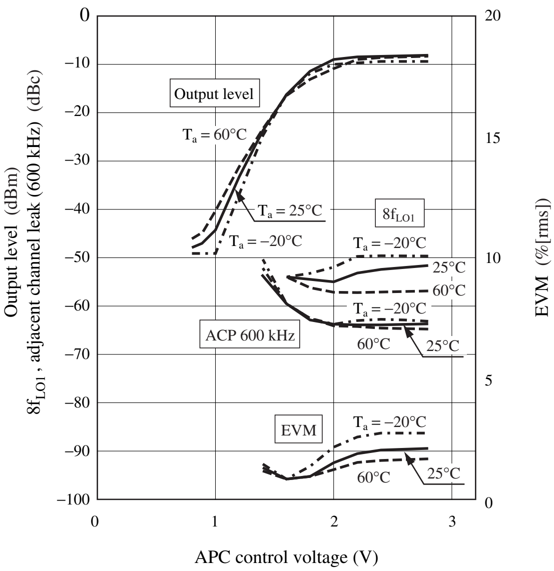
Limiter characteristics



RSSI characteristics



APC control voltage characteristics



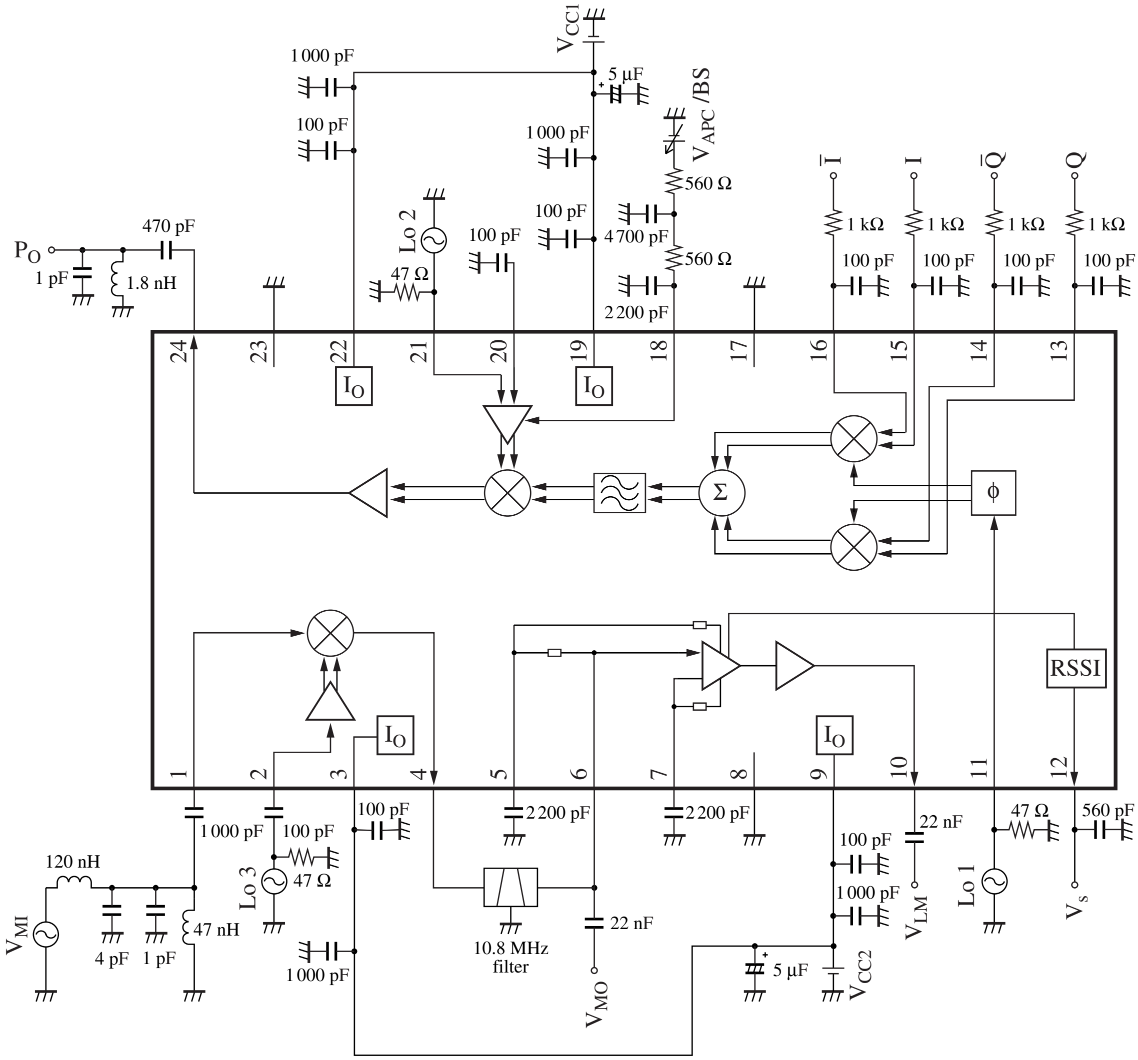
V_{CC} = 3.0 V

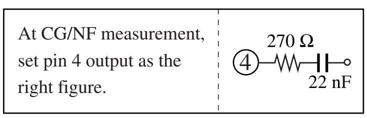
Lo1: 233.15 MHz, −10 dBm

Lo2: 1 672.5 MHz, −10 dBm

IQ: 0.4 V[p-p] (double phase), 1.5 V_{DC} , using PN9 stages continuous wave

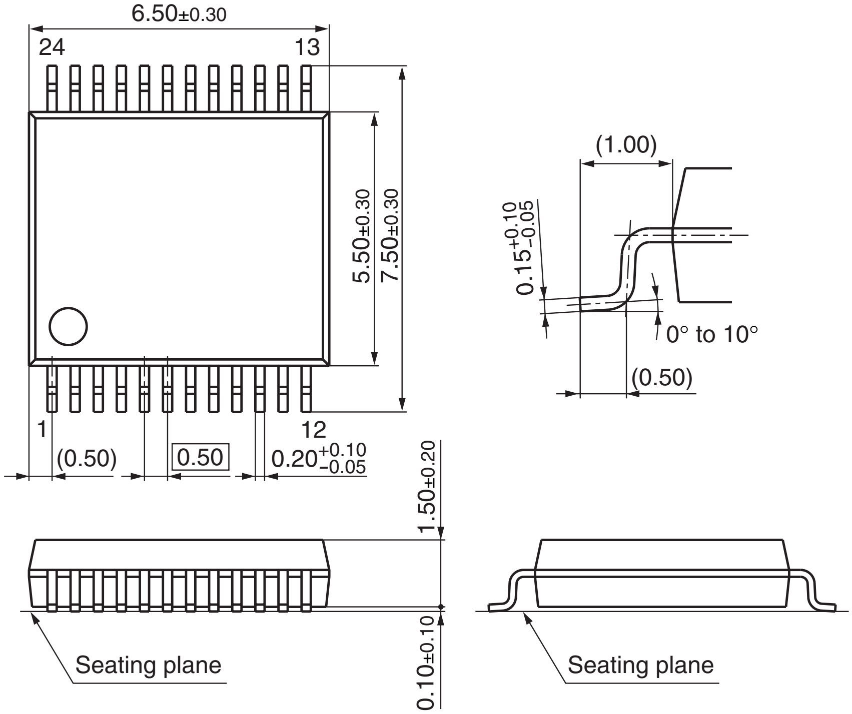
■ Application Circuit Example





■ New Package Dimensions (Unit: mm)

- SSOP024-P-0300D (Lead-free package)



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