AN6091SA

Quadrature modulation IC for mobile communications

■ Overview

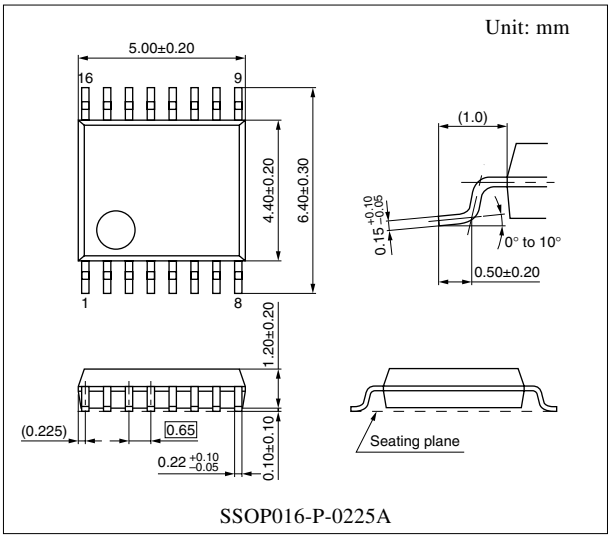
The AN6091SA is a quadrature modulation IC for 1.5 GHz band digital cellular telephone, and incorporates a phase shifter, up-mixer and APC function as well as a quadrature modulator.

■ Features

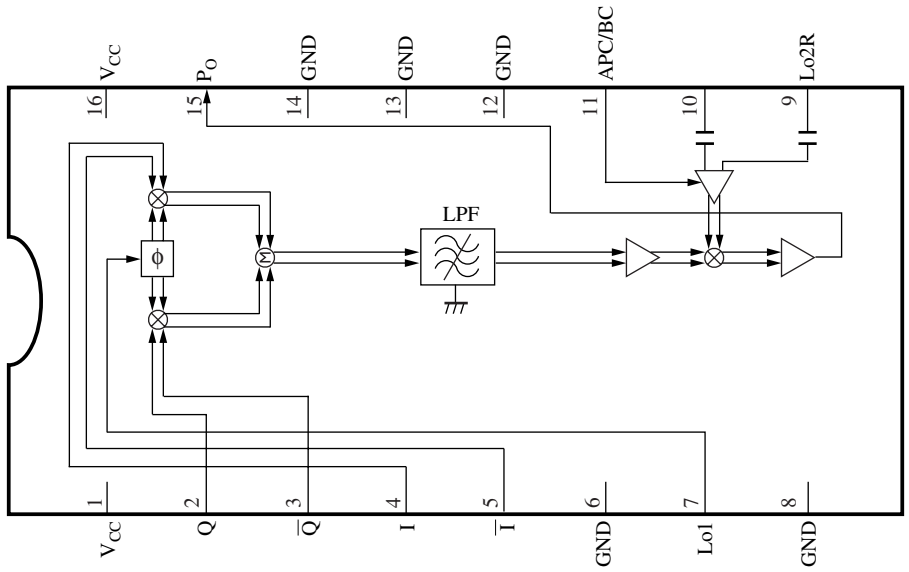
- Low current consumption: 27 mA at V_{CC} = 3 V
- APC built-in
- Excellent modulation precision characteristic

■ Applications

- Cellular telephone



■ Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	V_{CC} (MOD)	9	Lo2R
2	Q input	10	Lo2
3	$\overline{Q}$ input	11	APC/BS
4	I input	12	GND
5	$\overline{I}$ input	13	GND
6	GND	14	GND
7	Lo1	15	RF ouput
8	GND	16	V_{CC} (up-mixer)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.2	V
Supply current	I_{CC}	60	mA
Power dissipation *2	P_D	252	mW
Operating ambient temperature *1	T_{opr}	−30 to +80	°C
Storage temperature *1	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: T_a = 80°C.

■ 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
Outout level 1	P_{O1}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 607 MHz, −20 dBm V_{APC} = 2.3 V	−16	−13	−10	dBm
Outout level 2	P_{O2}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 631 MHz, −20 dBm V_{APC} = 2.3 V	−16	−13	−10	dBm
Current consumption	I_{CC}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 2.3 V	—	27	35	mA
Sleep current	I_{SL}	No signal V_{APC} = 0 V	—	0	10	µA

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Minimum output level	P_{MIN}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 1.0 V	—	−50	−43	dBm

Note) V_{CC} = 3.0 V
IQ signal amplitude: 0.5 V[p-p] (single phase), DC bias: 1.7 V, π/4 QPSK-modulated
P_{O1} output frequency: 1 429.0025 MHz
P_{O2} output frequency: 1 453.0025 MHz
P_{MIN} output frequency: 1 441.0025 MHz

• Design reference data

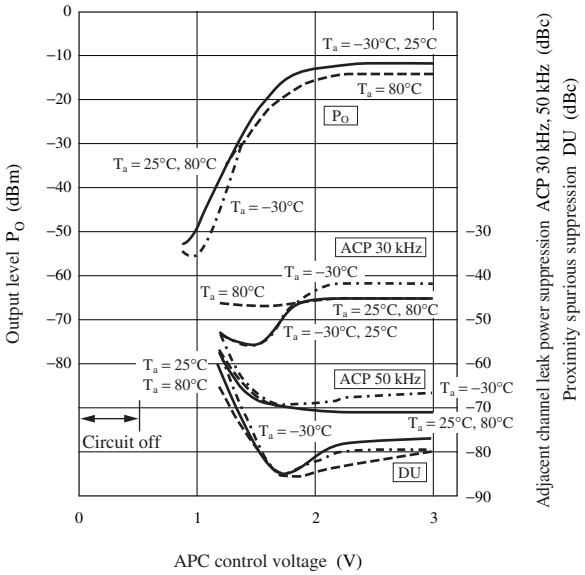
Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Carrier leak suppression ($f_{LO2} - f_{LO1}$)	CL	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 2.3 V, IQ: DC offset adjustment	—	−35	—	dBc
Image leak suppression	IL	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 2.3 V, IQ: Level adjustment	—	−40	—	dBc
Proximity spurious suppression	DU	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 2.3 V	—	−70	−65	dBc
Base band distortion suppression	BD	ditto	—	−40	—	dBc
Adjacent channel leak power suppression (30 kHz detuning)	BL1	ditto	—	−45	−38	dBc
Adjacent channel leak power suppression (50 kHz detuning)	BL2	ditto	—	−70	−60	dBc
Adjacent channel leak power suppression (100 kHz detuning)	BL3	ditto	—	—	−65	dBc
APC variable width	L_{APC}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 1.0 V to 2.3 V	30	37	—	dB
APC output level control sensitivity	S_{APC}	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 1.0 V/1.6 V	—	46	—	dB/0.1 V
In-band output level deviation	ΔP	Lo1 = 178 MHz, −15 dBm Lo2 = 1 607 MHz to 1 631 MHz, −20 dBm V_{APC} = 2.3 V	−1.5	—	+1.5	dB
Modulation precision	EVM	Lo1 = 178 MHz, −15 dBm Lo2 = 1 619 MHz, −20 dBm V_{APC} = 2.3 V	—	2.0	—	%[rms]

Note) Unless otherwise specified, V_{CC} = 3.0 V
IQ signal: 0.5 V[p-p] (single phase), DC bias: 1.7 V
BL1, BL2, BL3, EVM: π/4 QPSK-modulated
CL, IL, DU, BD, L_{APC} , S_{APC} , ΔP: PN9 stages

■ Technical Data

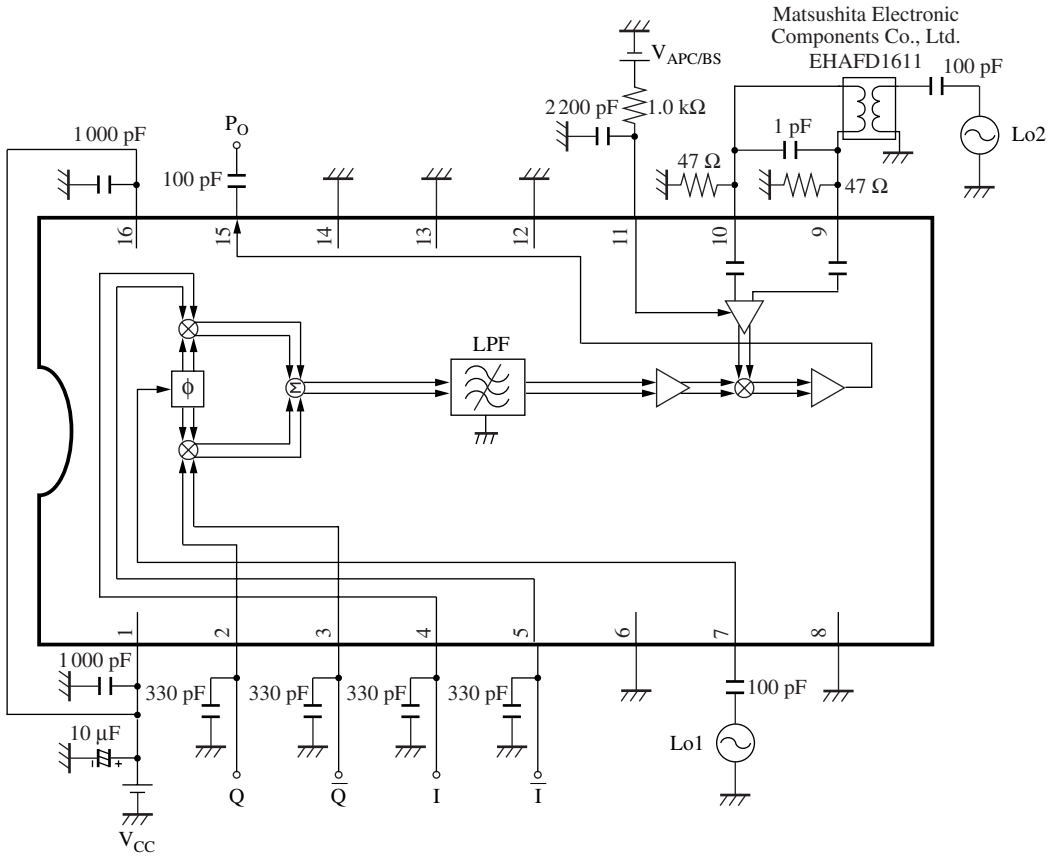
APC control voltage characteristics



Test circuit: "■ Application Circuit Example"
V_{CC} = 3.0 V
T_a = −30°C, 25°C, 80°C
Lo1: 178 MHz, −15 dBm
Lo2: 1619 MHz, −20 dBm
IQ: 0.5 V[p-p] (single phase), 1.7 V_{DC}
π/4, using PN9 stage continuous wave

Note) 1. Unless otherwise specified, the test conditions are same as the electrical characteristics.
2. The above characteristics are theoretical values based on the IC design and are not guaranteed.

■ Application Circuit Example



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