

# AN6091SA

## Quadrature modulation IC for mobile communications

### ■ Overview

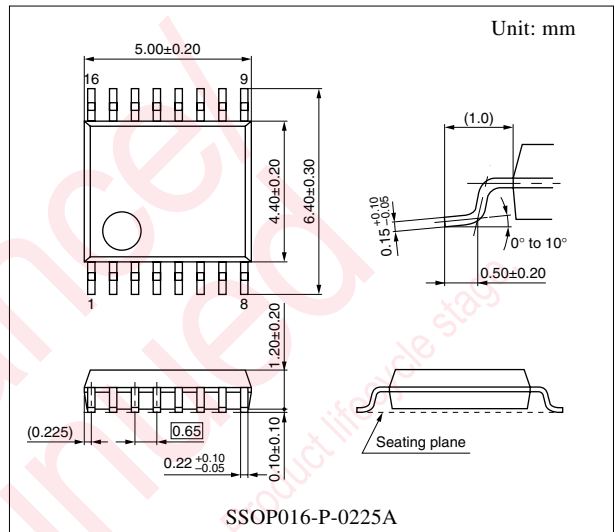
The AN6091SA is a quadrature modulation IC for 1.5 GHz band digital cellular telephone, and incorporates a phase shifter, up-mixer and APC function as well as a quadrature modulator.

### ■ Features

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

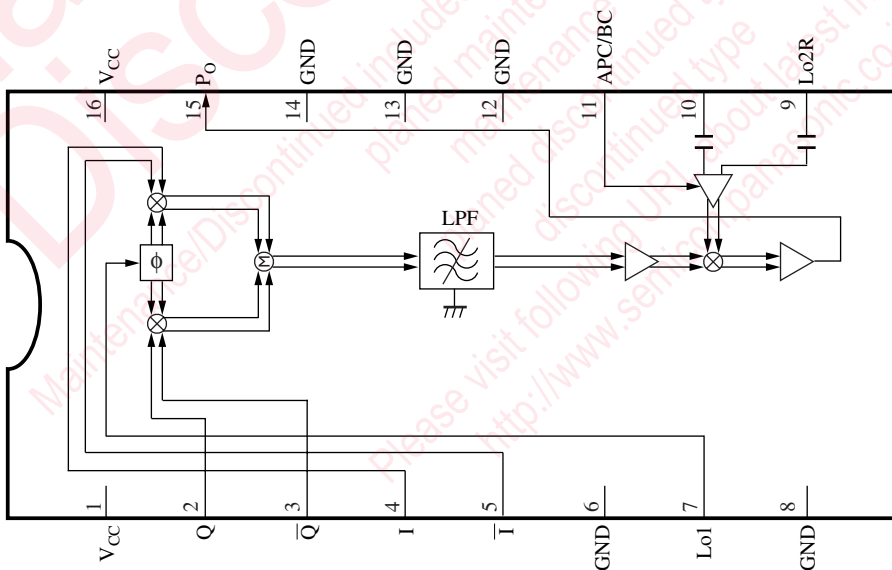
### ■ Applications

- Cellular telephone



Note) The package of this product will be changed to lead-free type (SSOP16-P-0225E). See the new package dimensions section later of this datasheet.

### ■ Block Diagram



### ■ Pin Descriptions

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

### ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	4.2	V
Supply current	I <sub>CC</sub>	60	mA
Power dissipation *2	P <sub>D</sub>	252	mW
Operating ambient temperature *1	T <sub>opr</sub>	-30 to +80	°C
Storage temperature *1	T <sub>stg</sub>	-55 to +125	°C

Note) \*1: Except for the operating ambient temperature and storage temperature, all ratings are for T<sub>a</sub> = 25°C.

\*2: T<sub>a</sub> = 80°C.

### ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V <sub>CC</sub>	2.7 to 4.0	V

### ■ Electrical Characteristics at T<sub>a</sub> = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Outout level 1	P <sub>O1</sub>	Lo1 = 178 MHz, -15 dBm Lo2 = 1607 MHz, -20 dBm V <sub>APC</sub> = 2.3 V	-16	-13	-10	dBm
Outout level 2	P <sub>O2</sub>	Lo1 = 178 MHz, -15 dBm Lo2 = 1631 MHz, -20 dBm V <sub>APC</sub> = 2.3 V	-16	-13	-10	dBm
Current consumption	I <sub>CC</sub>	Lo1 = 178 MHz, -15 dBm Lo2 = 1619 MHz, -20 dBm V <sub>APC</sub> = 2.3 V	—	27	35	mA
Sleep current	I <sub>SL</sub>	No signal V <sub>APC</sub> = 0 V	—	0	10	μA

### ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Minimum output level	$P_{\text{MIN}}$	Lo1 = 178 MHz, -15 dBm Lo2 = 1619 MHz, -20 dBm $V_{\text{APC}} = 1.0 \text{ V}$	—	-50	-43	dBm

Note)  $V_{\text{CC}} = 3.0 \text{ V}$

IQ signal amplitude: 0.5 V[p-p] (single phase), DC bias: 1.7 V,  $\pi/4$  QPSK-modulated

$P_{\text{O1}}$  output frequency: 1 429.0025 MHz

$P_{\text{O2}}$  output frequency: 1 453.0025 MHz

$P_{\text{MIN}}$  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 ( $f_{\text{LO2}} - f_{\text{LO1}}$ )	CL	Lo1 = 178 MHz, -15 dBm Lo2 = 1 619 MHz, -20 dBm $V_{\text{APC}} = 2.3 \text{ V}$ , IQ: DC offset adjustment	—	-35	—	dBc
Image leak suppression	IL	Lo1 = 178 MHz, -15 dBm Lo2 = 1 619 MHz, -20 dBm $V_{\text{APC}} = 2.3 \text{ V}$ , IQ: Level adjustment	—	-40	—	dBc
Proximity spurious suppression	DU	Lo1 = 178 MHz, -15 dBm Lo2 = 1 619 MHz, -20 dBm $V_{\text{APC}} = 2.3 \text{ V}$	—	-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	$L_{\text{APC}}$	Lo1 = 178 MHz, -15 dBm Lo2 = 1619 MHz, -20 dBm $V_{\text{APC}} = 1.0 \text{ V to } 2.3 \text{ V}$	30	37	—	dB
APC output level control sensitivity	$S_{\text{APC}}$	Lo1 = 178 MHz, -15 dBm Lo2 = 1 619 MHz, -20 dBm $V_{\text{APC}} = 1.0 \text{ V}/1.6 \text{ V}$	—	46	—	dB/0.1 V
In-band output level deviation	$\Delta\text{P}$	Lo1 = 178 MHz, -15 dBm Lo2 = 1607 MHz to 1 631 MHz, -20 dBm $V_{\text{APC}} = 2.3 \text{ V}$	-1.5	—	+1.5	dB
Modulation precision	EVM	Lo1 = 178 MHz, -15 dBm Lo2 = 1 619 MHz, -20 dBm $V_{\text{APC}} = 2.3 \text{ V}$	—	2.0	—	%[rms]

Note) Unless otherwise specified,  $V_{\text{CC}} = 3.0 \text{ V}$

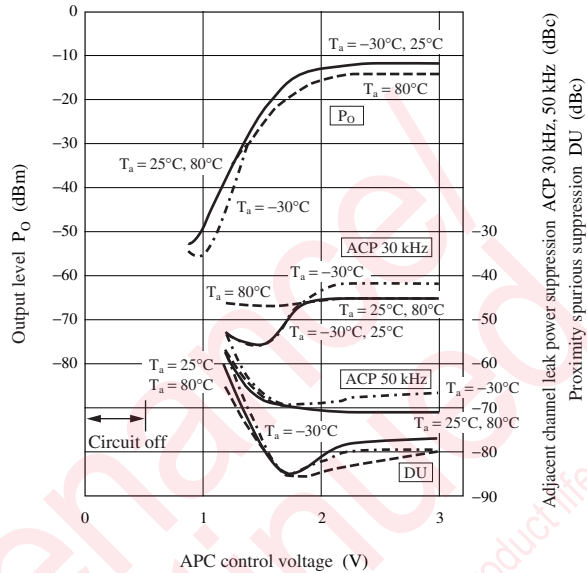
IQ signal: 0.5 V[p-p] (single phase), DC bias: 1.7 V

BL1, BL2, BL3, EVM:  $\pi/4$  QPSK-modulated

CL, IL, DU, BD,  $L_{\text{APC}}$ ,  $S_{\text{APC}}$ ,  $\Delta\text{P}$ : PN9 stages

■ Technical Data

APC control voltage characteristics



Test circuit: "■ Application Circuit Example"

V<sub>CC</sub> = 3.0 V

T<sub>a</sub> = -30°C, 25°C, 80°C

Lo1: 178 MHz, -15 dBm

Lo2: 1 619 MHz, -20 dBm

IQ: 0.5 V[p-p] (single phase), 1.7 V<sub>DC</sub>

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.



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