

Cellular Phone Power Amplifier Module with Built-in High/Low Output Switching for Japanese Market CDMA2000 1×WIN Products

CXG1207K

In today's advanced information society, the cellular phone is not merely a device just for voice communication, but is evolving to become a leading-edge tool that handles video and music content as well. To get the maximum performance possible from cellular phones, Sony has now developed the CXG1207K high/low output switching power amplifier module that takes full advantage of the features of Sony's original device technologies.

This power amplifier supports CDMA2000 1×WIN products and obviates the need for the output control DC/DC converter, which was previously used in terminal sets. We hope that you will take advantage of this device in developing miniature high-performance mobile terminals.

- Obviates the need for a DC/DC converter
- Miniature form factor, high efficiency, low distortion
- Low Rx band noise
- Miniature module
- Built-in temperature compensation circuit

■ Power Amplifier Module that Obviates the Need for a DC/DC Converter

The CDMA method requires that the output power be controlled during transmission. Therefore, in addition to the high output power mode, it is also desired that a low output power mode be provided in the CDMA portable terminal power amplifier. In conventional power amplifiers, a DC/DC converter is provided separately

and power consumption is minimized in low-power mode by switching the power amplifier supply voltage. In contrast, the CXG1207K provides a low output power mode path that minimizes power consumption, and controls power consumption in low-power output mode by switching the path with an internal switching circuit. This allows the DC/DC converter that has been included in these products up to now to be removed from the design. This mode switching is controlled by applying a high or low-level voltage to the power amplifier CTL pin. The current consumption in low-power mode is on the order of a few tens of μA . Furthermore, this structure consisting of power amplifier and switching circuit is integrated on the same chip, making this a product that takes advantage of the features of Sony's JPHEMT* device technology.

■ Miniature Package, High Efficiency, and Low Distortion

Sony developed miniature JPHEMT devices with even lower gm and on-resistance characteristics to achieve even further miniaturization and higher performance in this IC. This allowed Sony to achieve an operating voltage of 3.5 V, an output power of 28 dBm, and ACPR1 of -50 dBc, and an efficiency of 39.5% in high-power mode in this device. This performance is equal to or better than that of earlier power amplifiers that used an external DC/DC converter. Furthermore, even in low-power mode, this device achieves an operating voltage of 3.5 V, an output power of 13.6 dBm, and ACPR1 of -60 dBc, and an efficiency of 17%, and

when the output power is 18.5 dBm, it achieves an ACPR1 of -55 dBc and low distortion. The module matching circuit is based on Sony's low-loss matching circuit technology developed up to now, but achieves even further improvements in integration by adopting 0402 components and by reducing the number of components used. As a result, this device achieves a mounting area of 4.5 mm square, which corresponds to a reduction of about 50% from earlier high/low output switching power amplifier modules.

■ Low Rx Band Noise

Due to the excellent low noise characteristics of JPHEMT, the CXG1207K achieves the -140 dBm/Hz Rx band noise of the industry's top level.

■ Miniature Module

The CXG1207K is a miniature module with a volume of only 0.03 cc (4.5 mm \times 4.5 mm \times 1.35 mm).

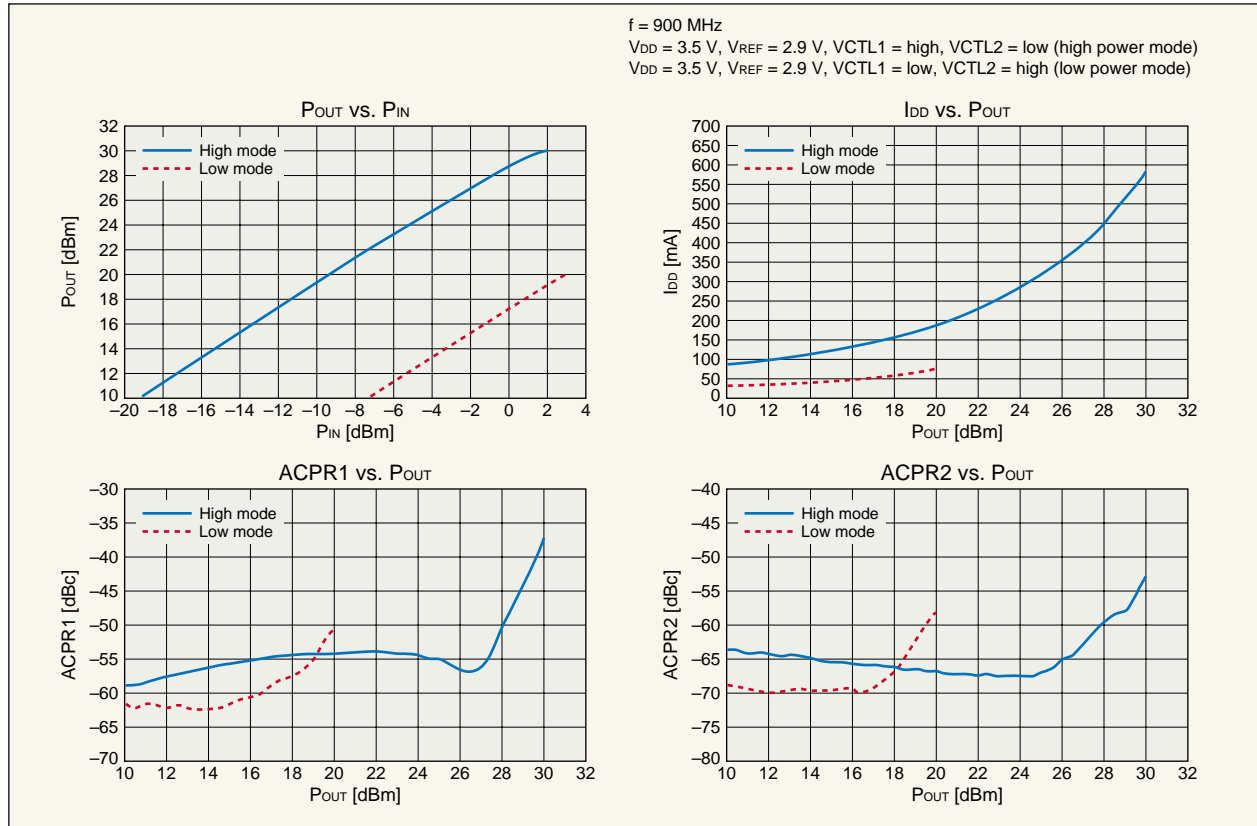
■ Built-in Temperature Compensation Circuit

The power amplifier bias current varies widely with changes in temperature, and that can result in a corresponding degradation of device characteristics. The CXG1207K includes a built-in temperature compensation circuit that controls the bias current to the optimal for the temperature as the temperature changes. This minimizes the degradation in device characteristics at both high and low temperatures.

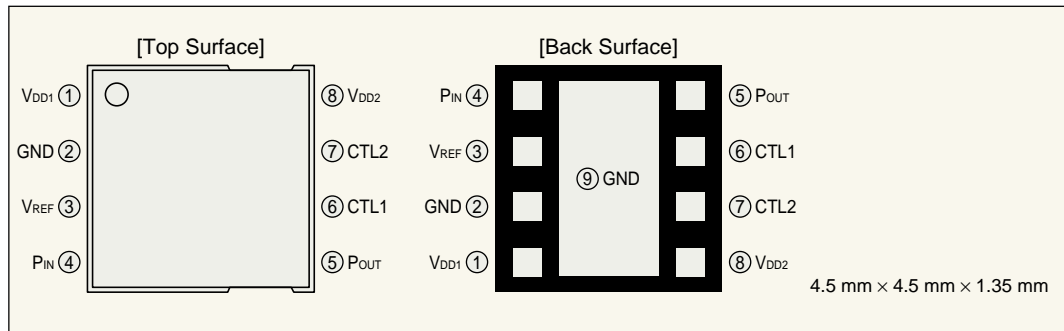
* JPHEMT: Junction Pseudomorphic High Electron Mobility Transistor

V O I C E

To distinguish this new power amplifier with built-in high/low output switching function from conventional power amplifiers, we developed it based on the concept of high added value. While we had previously developed the CXG1170K 6.2 mm square switchable power amplifier, the new CXG1207K features even further miniaturization. Although we faced many difficulties in developing this sensitive power amplifier with a built-in switching function, I am sure that this new product will contribute both to further miniaturization and lower costs in cellular phone products, and can fully satisfy our customers' needs. We are committed to developing even more high value added products that will be easy to use for our customers in the future. Keep your eye on Sony for cellular phone devices.



■ Figure 1 I/O Characteristics



■ Figure 2 Package Dimensions

■ Table 1 Main Characteristics

At Maximum Output Power (High Power Mode)	
Output power	P _{OUT} = 28.0 dBm
Operating voltage	V _{DD} = 3.5 V, V _{REF} = 2.9 V, V _{CTL1} = High, V _{CTL2} = Low
Current consumption	455 mA (PAE = 39.5%)
Gain	28.8 dB
ACPR1*1	-50 dBc
ACPR2*2	-60 dBc
Rx band noise	-140 dBm/Hz

At Low Output Power (Low Power Mode)	
Operating voltage	V _{DD} = 3.5 V, V _{REF} = 2.9 V, V _{CTL1} = Low, V _{CTL2} = High
Current consumption	37 mA (PAE = 17%) @ P _{OUT} = 13.6 dBm
Gain	17 dB @ P _{OUT} = 18.5 dBm
ACPR1*1	-55 dBc @ P _{OUT} = 18.5 dBm
ACPR2*2	-65 dBc @ P _{OUT} = 18.5 dBm

CTL Pin Voltages		
	High	Low
V _{CTL1}	2.45 to 2.7V	0 V
V _{CTL2}	2.45 to 2.7V	0 V

f = 887 to 925 MHz, T_a = 25°C

*1: Conditions: ±900 kHz offset, 30 kHz bandwidth

*2: Conditions: ±1.98 MHz offset, 30 kHz bandwidth