

Product Information
March 1996 (1 of 2)

2.4 to 2.5 GHz 1 Watt Amplifier Chip Set

Features

- ☐ High Gain ≈ 30 dB
- ☐ +30 dBm Output Power @ 5 Volts
- ☐ 33% Efficient
- ☐ Small Size

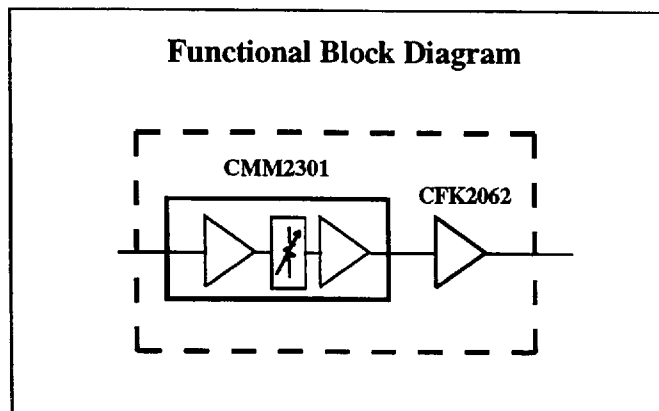
Applications

- ☐ ISM Band Base Stations
- ☐ Industrial Data Communication Networks
- ☐ Wireless LAN Hubs

Description

The Celeritek CCS2930 is a two-chip set designed to provide a compact, 1 Watt, RF power amplifier for wireless datacom base stations, wireless LAN hubs, campus networks, and industrial applications operating in the 2.4 to 2.5 GHz band. The chip set consists of a integrated driver amplifier (CMM2301) and a matched power stage (CFK2062) that operates from a 5 Volt positive supply.

When used with external heat sinking, the chip set implements a very small, high performance, and cost-effective transmit power amplifier that can be operated with high efficiency or backed off for linear operation through adjustment of the input drive level. Off chip matching is limited to just three capacitors and one resistor which further contributes to the compact nature of the product. The driver amplifier includes an



analog level adjustment capability that allows fine tuning of the output power level over a 10 dB range.

The use of the CCS2930 allows the designer to achieve close to the FCC-specified +30 dBm out of the antenna, after making allowances for filter and antenna coupling losses. When used with a Celeritek CSW2102 SPDT switch, transmit/receive switching can be implemented. The use of a second Celeritek CSW2102 SPDT switch in the circuit allows for the implementation of antenna diversity switching.

Evaluation Board

The Celeritek PB-CCS2930 evaluation board is available to assist the designer in the testing of this chip set and is useful as an application example. The test data and typical performance shown were taken on this evaluation board.

Electrical Characteristics

The following typical specifications are measured at +25°C with $V_{D1} = V_{D2} = 5$ V. The CMM2301 is biased for $I_D = 150$ mA and the CFK2062 is biased for $I_D = 600$ mA, with no RF applied. Refer to individual device Data Sheets for biasing details.

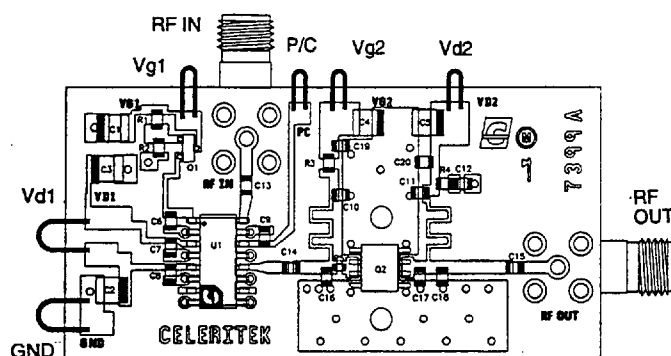
| Parameter | Condition | 2.40 GHz | 2.45 GHz | 2.50 GHz | Units |
|--------------|-----------------------------|----------|----------|----------|-------|
| Power Output | 1 dB Gain Compression Point | 30 | 30 | 30 | dBm |
| Gain | $P_{IN} = -15$ dBm | 31 | 30 | 29 | dB |

Ordering Information

The CCS2930 Amplifier is available as a two-chip set. Both devices can be purchased individually or as a set. Both devices are available in tape and reel. The PB-CCS2930 Evaluation board may also be purchased separately. Ordering part numbers are listed.

| Part Number for Ordering | Function | Package |
|--------------------------|----------------------------|---------------------------------------------------|
| CCS2930 | Amplifier Chip Set | CMM2301-AM, CFK2062-P5 |
| PB-CCS2930 | Amplifier Evaluation Board | Assembled FR4 PC board with SMA connectors |
| CMM2301-AM | Driver Amplifier | SOIC-16 surface mount narrow body plastic package |
| CFK2062-P5 | Power Stage | SOIC-8 surface mount power package |

PB-CCS2930 Evaluation Board



Evaluation Board Parts List

| Part Type | Reference Designator | Description | Manufacturer | Part Number |
|-------------|----------------------|--------------------------------|--------------|-----------------|
| Capacitor | C6-C9, C19, C20 | SMD 0805, 0.01 μ F | AVX | 08051C103KAT050 |
| Capacitor | C10-C15 | SMD 0805, 100 pF | AVX | 08051A101JAT050 |
| Capacitor | C1-C5 | SMD tantalum, 2.2 μ F | Matsuo | 267M2002225M |
| Capacitor | C16 | SMD 0805, 2.2 pF | AVX | 08055A2R2DAT050 |
| Capacitor | C17, C18 | SMD 0805, 1.2 pF | AVX | 08055A1R2DAT050 |
| Resistor | R2 | SMD 0805, 18k | ROHM | MCR10JW183 |
| Resistor | R1 | SMD 0805, 22k | ROHM | MCR10JW223 |
| Resistor | R3, R4 | SMD 0805, 51k | ROHM | MCR10JW510 |
| Resistor | R5 | SMD 0603, 2.4 Ω | ROHM | MCR03JW024 |
| Transistor | Q1 | SMD transistor | Motorola | MMBT5087 |
| Connector | J1, J2 | Right angle SMA PC board mount | EF Johnson | 142-0701-301 |
| MMIC | U1 | Driver amplifier | Celeritek | CMM2301-AM |
| Power Stage | Q2 | Power MESFET | Celeritek | CFK2062-P5 |

Evaluation Board Operating Instructions

Handle and test the board in an ESD protected environment. With all power OFF, connect the RF and DC connections. Monitor the drain currents of the CMM2301 and the CFK2062. To experiment with different bias conditions, use four (4) power supplies; one for each bias voltage.

Connect DC ground to any of the ground plane areas of the board. Connect a -5 V supply to Vg1. Connect a -5 V supply to Vg2. Connect a +5 V supply to Vd1. Monitor the Vd1 current and adjust Vg1 until the current (Id1) is 150 mA with no RF power applied. Connect 5.0 V to Vd2. Monitor the Vd2 current and adjust Vg2 until the current (Id2) is 600 mA. In this configuration the CMM2301 will be operating at 5.0 V and 150 mA. The CFK2062 will be operating at 5 V and 600 mA. For maximum output power connect P/C to ground. See the CMM2301 Data Sheet for specifications on the power control (P/C) function. Connect a +3 dBm signal to RF IN and measure the output power at RF OUT.

NOTE: Power Supply Sequencing The negative voltages (Vg1, Vg2) must be applied first at all times to prevent damage to the CMM2301 and the CFK2062. When turning the chip set off, the positive supply voltages must be turned off before the negative supplies. If this sequencing is not followed the devices will be damaged.

Thermal Considerations During evaluation it is suggested that a heat sink (recommended: EG&G Wakefield Engineering, part number: 290-2AB) be mounted on the backside of the board using the two screw holes provided. Refer to the Celeritek CFK2062 device data sheet for further information.

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