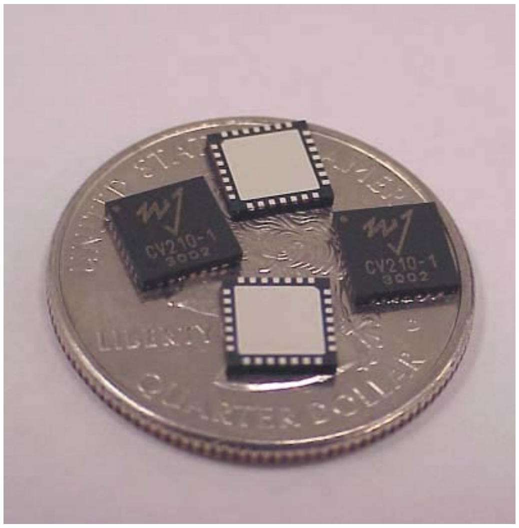
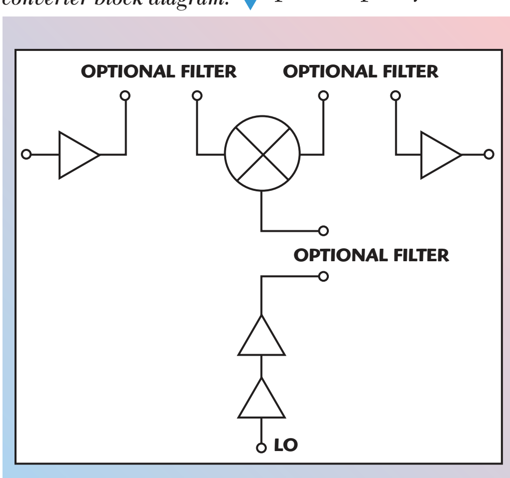


SINGLE- AND DUAL-BRANCH DOWNCONVERTER ICs FOR WIRELESS BASE STATION APPLICATIONS

A new family of single- and dual-branch converter integrated circuits has been introduced for use in mobile infrastructure base stations. The new CV series converters are all priced below $10 in volume and are available in a 6 × 6 mm QFN package, as shown above. Their small size makes them ideal for base station upgrades required to expand capacity. In addition, the performance of these converters is well suited for the newer 2.5/3 G protocols.

The functionality of these converters includes high linearity RF amplification, frequency conversion, IF amplification and LO driver amplification. Functional block diagrams for the single- and dual-branch converters are shown in ***Figures 1*** and ***2***, respectively. The dual-branch converters are ideal for base station transceivers requiring both primary and diversity channels with a common local oscillator. The single-

Fig. 1 Single-branch converter block diagram.



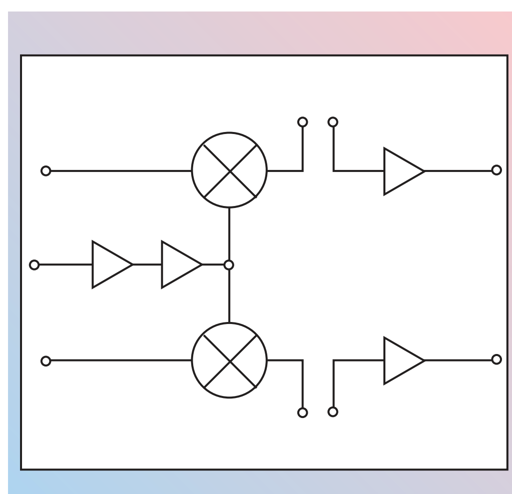


Fig. 2 Dual-branch converter block diagram.

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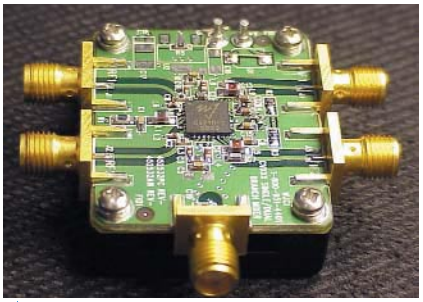
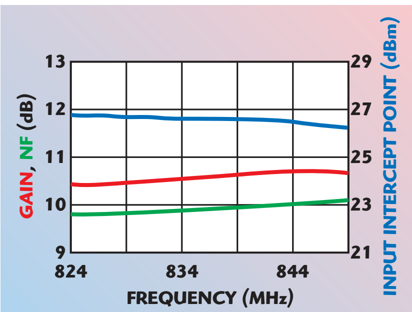
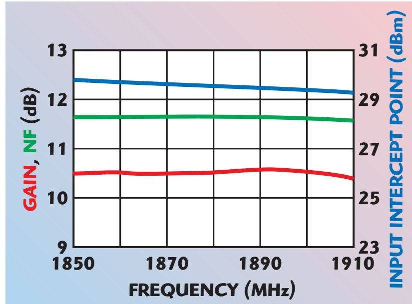


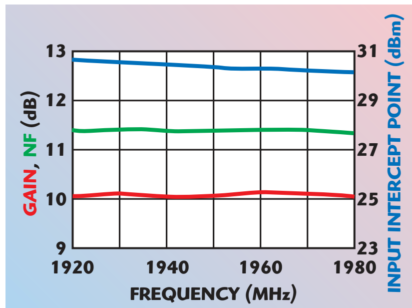
▲ *Fig. 3 A CV series converter IC mounted on an evaluation board.*



▲ *Fig. 4 CV210-1 dual-branch converter (IF = 70 MHz) performance.*



▲ *Fig. 5 CV211-1 PCS dual-branch converter (IF = 250 MHz) performance.*



▲ *Fig. 6 CV211-2 UMTS dual-branch converter (IF = 250 MHz) performance.*

branch converters find application in power amplifier error correction circuits as well as for microcells and repeaters that only require a single converter.

The small size of these converters significantly reduces the size of the circuit board required for this function. A discrete implementation of the functionality in one of the single-branch converters would typically require four square inches of circuit board space, while only one square inch is required with a CV series converter integrated circuit, as shown in ***Figure 3***. The CV series also provides a significant cost advantage compared to discrete implementations. The cost of the equivalent discrete parts found in one of the dual-branch converters, for example, is approximately $20, while the cost of the CV integrated circuit is less than $10 in volume.

The CV product family incorporates reliable GaAs MESFET and InGaP HBT semiconductor technologies. The frequency conversion function is passive which realizes a low noise characteristic.

Nine different CV models are being offered, including four single-branch and five dual-branch versions. Models for both the single- and dual-branch converters are available to cover the cellular, Personal Communications Service (PCS) and Universal Mobile Telecommunications System (UMTS) frequency ranges. In addition, performance has been optimized for low or high IF frequencies. Typical performance specifications for the various CV series models are included in ***Appendices A*** and ***B***. With an LO input level of 0 dBm the dual-branch converters typically provide a gain of 10 dB and an input third-order intercept point of 27 dBm, while the single-branch converters typically have a gain of 22 dB and an output third-order intercept point of 35 dBm. The typical noise figure for the single-branch converters is less than 5.5 dB, while the dual-branch converter's typical noise figure is less than 12.5 dB. ***Figures 4***, ***5*** and ***6*** show typical performance data for three of the dual-branch converters, one for each of the cellular, PCS and UMTS bands, respectively.

The CV series is available in a 28-pin, 6 × 6 mm QFN package and provides ports to add external filters to optimize performance in particular bands. Operating at 5 V these multi-chip modules require less than 2.5 W input power and are rated to operate over the full –40° to +85°C temperature range. Fully assembled evaluation boards and loose samples are available upon request.

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APPENDIX A

SINGLE-BRANCH CONVERTERS

Model No.	Frequency Range (MHz) RF	IF	LO Power (dBm)	Conversion Gain (dB)	Output IP3 (dBm)	Input P1dB (dBm)	NF (dB)	Current (mA)	Bias (V)
CV110-1	806–915	70–120	0	22	35	18	5.5	430	5
CV111-1	1710–1910	70–250	0	22	35	18	5.5	430	5
CV111-2	1900–2200	150–300	0	22	35	18	5.5	430	5
CV111-3	1900–2200	65–200	0	22	35	18	5.5	430	5

APPENDIX B

DUAL-BRANCH CONVERTERS

Model No.	Frequency Range (MHz) RF	IF	LO Power (dBm)	Conversion (dB)	Input IP3 (dBm)	Input P1dB (dBm)	NF (dB)	Current (mA)	Bias (V)
CV210-1	806–915	70–120	0	10	26	11	11.5	430	5
CV210-3	800–925	200–350	0	10	27	11	11.5	430	5
CV211-1	1710–1910	70–250	0	10	27	11	11.5	430	5
CV211-2	1900–2200	150–300	0	10	27	11	11.5	430	5
CV211-3	1900–2200	65–200	0	10	27	11	11.5	430	5