*Application Report*
*SLUA246 - September 2000*

# *A Comparison Between the BiCMOS UCC3895 Phase Shift Controller and the UC3875*

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**ABSTRACT**

This application report will compare the BiCMOS UCC3895 to its bipolar predecessors, the UC3875/6/7/8 family and the UC3879 controller. All of these integrated circuits provide the control and drive signals needed to implement a full-bridge converter utilizing phase-shifted control. The UCC3895 represents the latest offering in Texas Instrument's line of phase-shift controllers, incorporating a feature set with increased functionality along with more robust logic and protection functions.

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## 1 Comparing ICs

Notable improvements over the earlier controllers include an adaptive delay set feature, greatly reduced supply-current demand, and an internal-discharge transistor on the RAMP pin. The internal logic of the IC is redesigned to allow complete shutdown of the power stage using a comparator to detect the error-amplifier output going below 0.5 V. In addition, the IC pinout is improved to provide the maximum separation possible between the control and driver outputs. Note that the UCC3895 is not a drop-in replacement for either of the bipolar parts.

The UCC3895 retains many popular features of the bipolar parts. First, the ability to program the delay between switch commands in the A–B leg is independent of the delay between switch commands in the C–D leg. The chip can still operate with voltage- or current-mode control, with user selection of peak- or average-current-mode control. Basic features such as 150-µA startup current, UVLO lockout, 5-V reference, and soft-start functions are also included.

The high-current gate-drive capability of the UC3875 family was not incorporated into the UC3879 nor the UCC3895. Instead, a high-speed logic-level drive section is incorporated with output source/sink capability of 100-mA (peak). This approach was chosen to keep the low-level-analog phase-shift circuitry away from high-power switching thus allowing an optimum system ground configuration. Additionally, full-bridge systems may use either semiconductor or magnetic drive solutions, so the choice of external driver is left to the designer.

## 2 Part Family Comparison Summary

**Table 1. Part Family Comparison**

| Feature | UC3875/6/7/8 | UC3879 | UCC3895 | Units |
|---|---|---|---|---|
| UVLO start threshold | 10.75 or 15.25 | 10.75 or 15.25 | 11 | V |
| UVLO hysteresis | 1.25 or 6.0 | 1.75 or 6.0 | 2 | V |
| Supply current start | 150 | 150 | 150 | µA |
| Supply current run | 30 | 23 | 5 | mA |
| Error amplifier slew rate | 11 | 11 | 2.2 | V/µsec |
| Error amplifier unity gain | 11 | 10 | 6.5 | MHz |
| Ramp to OUT delay | 65 | 115 | 70 | ns |
| Oscillator line/load variation | 20 | 20 | 2.5 | % |
| Ramp valley | 0 | 0.2 | 0.2 | V |
| Ramp peak | 3.8 | 2.9 | 2.35 | V |
| Current limit level pulse-by-pulse | no | 2 | 2 | V |
| Current fault sense level | 2.5 | 2.5 | 2.5 | V |
| Current sense delay to output | 85 | 160 | 75 | ns |
| OUT drive current | 200 | 100 | 100 | mA |
| Delay time variation | 150–400 | 300–600 | 450–600 | ns |
| No load on/off comparator | no | no | yes | |

## 3 References


1. L. Balogh, “The Current–Doubler Rectifier: An Alternative Rectification Technique for Push–Pull and Bridge Converters”, Texas Instruments, Literature No. SLUA121.
2. W. Andreycak, “Phase Shifted, Zero Voltage Transition Design Considerations”, Texas Instruments, Literature No. SLUA107.
3. L. Balogh, “The New UC3879 Phase Shifted PWM Controller Simplifies the Design of Zero Voltage Transition Full–Bridge Converters”, Texas Instruments, Literature No. SLUA122.

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