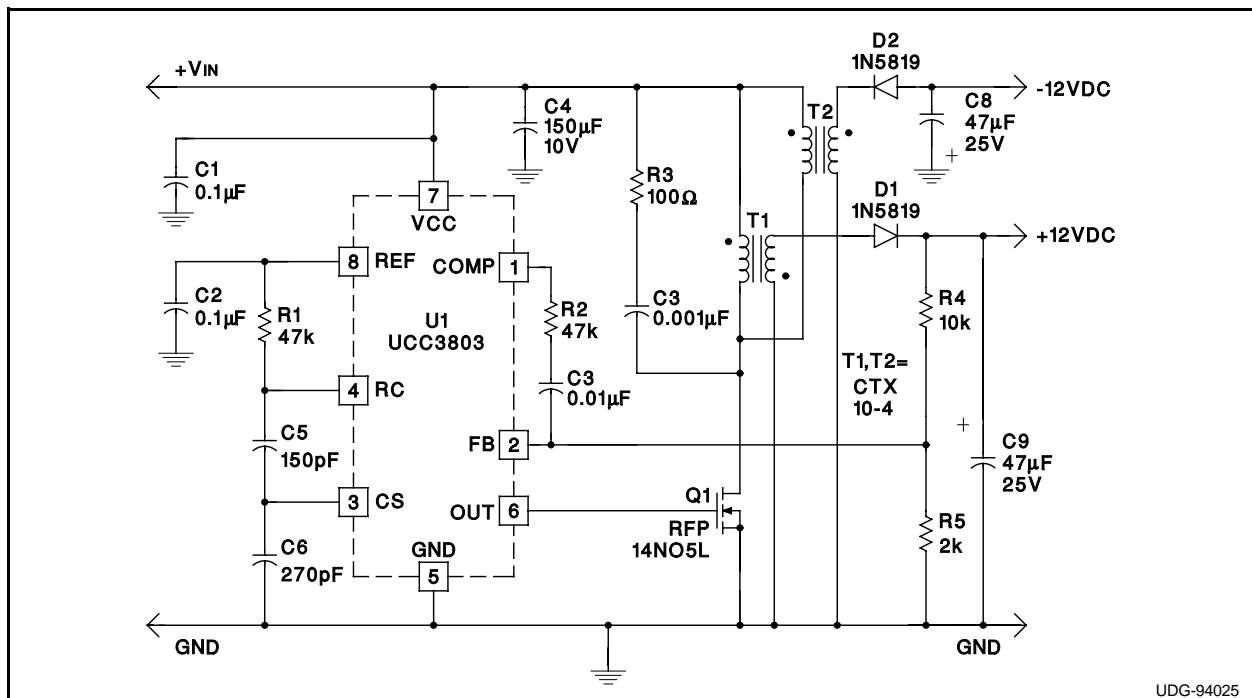


**Single Switch Flyback Circuit Converts +5 VDC to +/- 12 VDC  
for RS-232 and RS-422 Applications**

by Bill Andreycak

Developing bipolar 12 volt supplies from a single +5 volt input can be accomplished using a number of conventional approaches. A boost converter is the most logical for the +12 volt output, however it cannot be used in some Interface circuit applications. One significant drawback of the boost topology is that even while off, the output voltage approaches the in-

put voltage and does not go to zero. This can cause problems with many Interface line driver and receiver ICs which are functional from a five volt supply. A simple Flyback converter is a better choice for these applications which will allow the output voltage to go to zero when the control IC is turned off.



**Figure 1. +5 to ±12V/80mA Converter**

The negative supply also can be generated from the same Flyback transformer used for plus twelve volt output if an additional winding is provided. The result is a three winding transformer, and often cross regulation problems between the outputs. One way to avoid this is by incorporating two separate, but identical transformers, one per output. Each of these requires only two windings (primary and secondary) and may be a lower cost solution to a single three winding Flyback transformer. In many applications,

even Local Area Networking (LAN) data line isolation transformers, or common mode EMI chokes can be used. The Appendix section of this Design Note lists several potential vendors, products and phone numbers.

In many Interface circuit power supply applications the load currents drawn from the bipolar supplies are fairly similar. When this applies, the positive output voltage will vary proportionately with the negative supply. To simplify voltage regulation, the positive

voltage alone can be measured and used for feedback to the PWM control IC. The negative output voltage will track along reasonably well, and is adequate for many applications. This adaptation significantly reduces the complexity of regulating both outputs simultaneously, which would otherwise require two separate converters and control ICs.

The circuit shown in Figure 1. develops a plus and minus 12 volt output at 80 milliamps each from a +5V input supply. Excellent regulation is obtained with identical loading on both outputs, and degrades only slightly with differential loading. A small amount of preloading can be added to improve cross-regulation for more demanding conditions. Note that both transformer primaries are electrically in a parallel configuration, and energy is stored and released from both simultaneously. This is advantageous during differential loading, as energy stored in one core can be delivered to the other transformer's secondary. The result is a significant improvement in overall and cross regulation if they have low leakage induc-

tances. Magnetic modelling [1,2] can be used to further gain familiarity with this application.

#### REFERENCES

1. DIXON, Lloyd : " Coupled Inductor Design ", UNITRODE Power Supply Design Seminar Manual SEM-900, Topic 8
2. DIXON, Lloyd : " How to Put Leakage and Wiring Inductances in the High Frequency Circuit Model ", reprinted in the Reference section of UNITRODE Power Supply Design Seminar Manual SEM-900, Topic M4

**APPENDIX** - List of some Transformer Manufacturers and Products

COILCRAFT : DLF, LAX, P104, TTDLF, TRF, and WB Series', phone # 1-800-322-2645 (U.S.A.)

COILTRONIX : CTX series of two winding coupled inductors, also the VERSAPACK series of multiple winding transformers is applicable, phone # 1-561-241-7876 (U.S.A.)