

A Control IC for an Optocoupler-less DC-DC Converter with a Current Mirror Detection Circuit

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A conventional flyback DC-DC converter consists of a transformer, a filter, a control circuit, a main switch, a detection circuit, and an optocoupler. However the integration of the optocoupler into the monolithic IC is difficult.

Figure 1 shows applications of DC-DC converter used for telecommunications. In this case, the loads are telephones, facsimiles and personal computers. In addition, high impedance resistors connect a terminal, V_+ or V_- , with ground. In such applications, high impedance between the terminal V_+ or V_- and ground is required, but high voltage isolation is not necessary. Therefore, the optocoupler can be replaced by a high impedance current mirror circuit.

As shown in Fig. 2, in our flyback DC-DC converter, the optocoupler is replaced with a detection circuit and a level-shift circuit using current mirror technology. The output voltage and current of the converter are detected by current mirror circuits, and the standard level of output voltage V_o is changed to that of input voltage V_i by the level-shift circuit. The current mirror detection circuit, the level-shift circuit, the control circuit, the auxiliary power supply and the driver circuit are integrated on one chip, thereby reducing the mounting area of the converter.

Figure 3 shows a photograph of the control IC we developed for a DC-DC converter. It was manufactured using high-voltage bipolar process technology.

The DC-DC converter using this control IC generally exhibited good constant-voltage characteristics. The efficiency of this converter was a little higher than that of a conventional one. The mounting area was reduced 30 %.

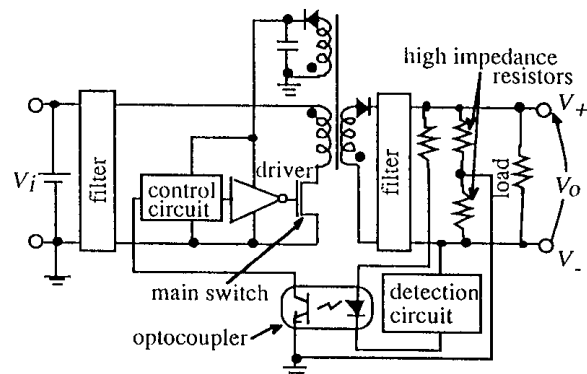


Fig.1. An applications of DC-DC converter used for telecommunications.

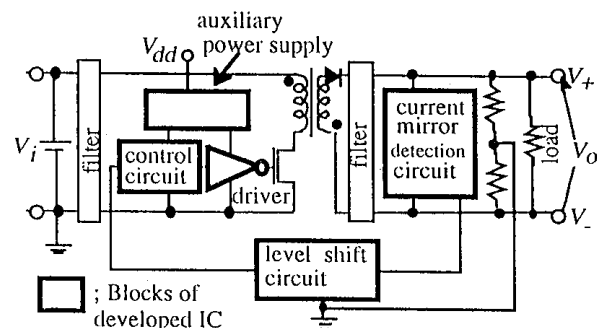


Fig.2. Schematic diagram of a new DC-DC converter.

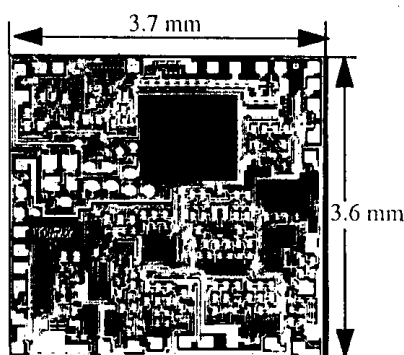


Fig.3. Photograph of the control IC for DC-DC converter.