MOTOROLA
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APPLICATION NOTE

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A Speakerphone With Receive Idle Mode

By
Dennis Welty and Dennis Morgan
Bipolar Analog IC Division

INTRODUCTION

The MC34018 speakerphone system operates on the principle of comparing the transmit and receive signals to determine which is stronger, and then switching the circuit into that mode. Under conditions where noise from the telephone line (in the receive path) exceeds the background noise in the transmit path, the speakerphone will switch easily, or even lock, into the receive mode. Under these conditions the conversation will sound "dead" to the party at the far-end. It will also be more difficult for the near-end party to activate the transmit channel since the transmit detection is at the output of the transmit attenuator, which will be at maximum attenuation during this time. The addition of a receive idle mode can alleviate this problem by ensuring that the transmit and receive gains will be approximately equal when no voice signals are present. This allows the far-end party to hear ambient noises, and also increases the sensitivity to transmit signals.

CIRCUIT DESCRIPTION

The additional circuitry is shown in Figure 1. The receive signal normally applied to RXI also drives XDI through a 2.7 kΩ resistor and a 0.1 μF capacitor. XDC is connected to VLC through the NPN and PNP emitter followers. When voice signals in the receive channel exceed the background noise by 4.6 dB, XDC switches high and turns off the PNP transistor (the 4.6 dB threshold is built into the MC34018). The voltage at VLC is then determined by the volume control potentiometer. When voice signals are no longer present, XDC decays to 0.5 VB and turns on the emitter followers. The voltage at VLC is now determined by the voltage at XDC. By decreasing the VLC voltage with the emitter followers the transmit and receive gains are adjusted to produce a receive-idle mode.

A peak detector using an external voltage comparator and diode is required to hold the receive attenuator fully on (out of the idle mode) when constant level signals, such as dial tone, are intentionally presented to the re-

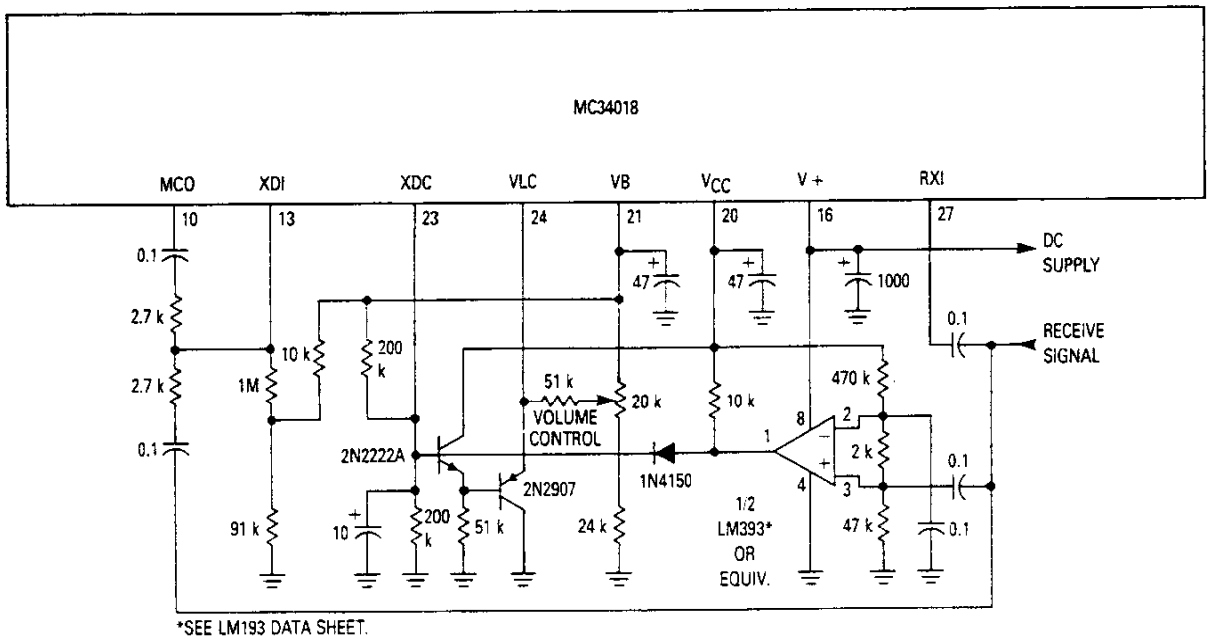

Figure 1. Receive-Idle Circuit

ceive channel. When the receive signal at the receive input exceeds the threshold on the comparator (typically 20 mV) the peak detector charges the capacitor at XDC which prevents the speakerphone from relaxing to the idle mode. The PNP transistor is turned off and the voltage at VLC is then determined by the volume control potentiometer. Under these conditions the speakerphone will be in the receive mode.

The sensitivity threshold of the voice detector circuitry can be changed by applying a dc current to XDI. The threshold current (nominally 250 nA) also prevents XDC from switching sporadically in quiet signal conditions. The threshold current is determined by the 1 Megohm resistor between XDI and the 10 kΩ/91 kΩ divider referenced to VB. Whenever receive signal currents exceed the threshold current by 4.6 dB, the voice detector will respond and allow XDC to switch high.

CONCLUSION

The receive-idle mode is simple to implement, and improves the performance of the speakerphone system by allowing noise rejection in both the receive and transmit channels. The voice-switching function operates only on valid speech, and ignores background noises.

REFERENCES

MC34018 data sheet, Motorola, 1985
LM193 data sheet, Motorola

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USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.
EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.
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