

Introduction

This application note lists a number of application circuits for Intersil's digitally-controlled (XDCP) potentiometers. The application circuits illustrate the wide variety of possible functions which can be implemented using the variability of the potentiometer in conjunction with standard active devices like operational amplifiers and comparators. The types of circuits include control circuits, converters, filters, signal processing circuits, regulators, wave shapers, analog computing circuits and signal sources. The circuits are shown in basic form and do not include supply decoupling or proper grounding techniques. The user must account for these in the final design.

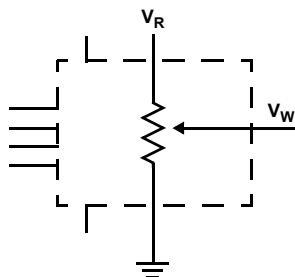
Intersil's potentiometers are controlled through the 2-wire, I²C, 3-wire, or SPI computer serial-interfaces or buses. For front panel, push button type applications, Intersil's push pots are recommended.

Electronic digitally-controlled (XDCP) potentiometers provide three powerful application advantages:

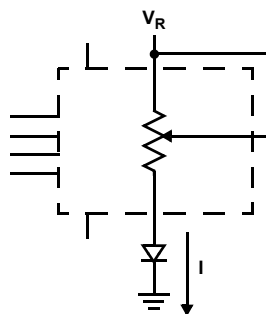
1. The variability and reliability of a solid-state potentiometer.
2. The flexibility of computer-based digital controls.
3. The retentivity of nonvolatile memory used for the storage of multiple potentiometer settings or data.

In addition, the packages of the potentiometers are completely compatible with other electronic components and hence reduce manufacturing assembly costs.

Applications



THREE TERMINAL POTENTIOMETER;
VARIABLE VOLTAGE DIVIDER



TWO TERMINAL VARIABLE RESISTOR;
VARIABLE CURRENT

FIGURE 1. BASIC CONFIGURATIONS OF ELECTRONIC POTENTIOMETERS

Application Circuits

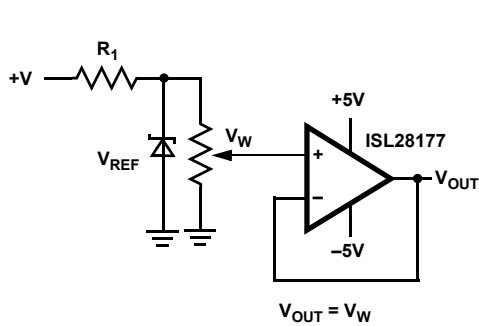


FIGURE 2. BUFFERED REFERENCE VOLTAGE

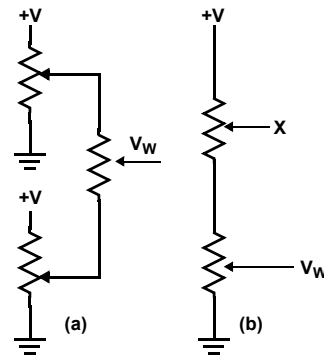


FIGURE 3. CASCADING TECHNIQUES

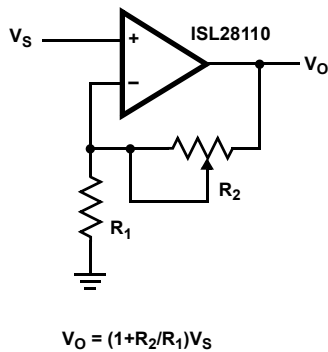


FIGURE 4. NONINVERTING AMPLIFIER

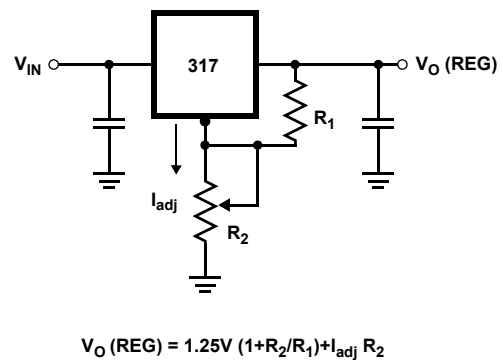


FIGURE 5. VOLTAGE REGULATOR

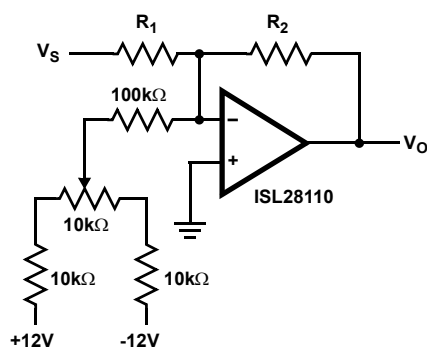


FIGURE 6. OFFSET VOLTAGE ADJUSTMENT

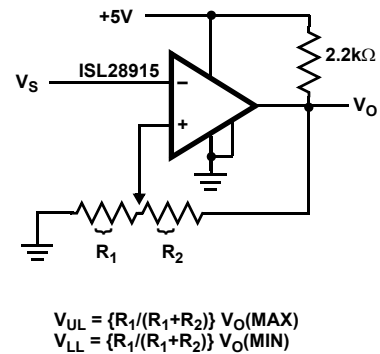


FIGURE 7. COMPARATOR WITH HYSTERESIS

Application Circuits (Continued)

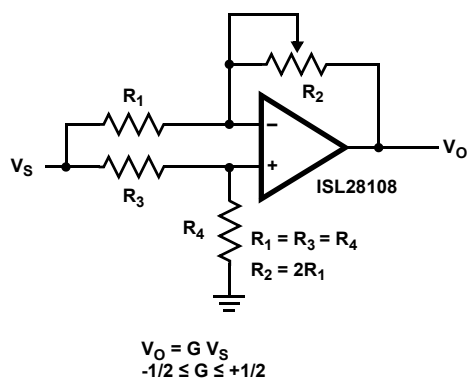


FIGURE 8. ATTENUATOR

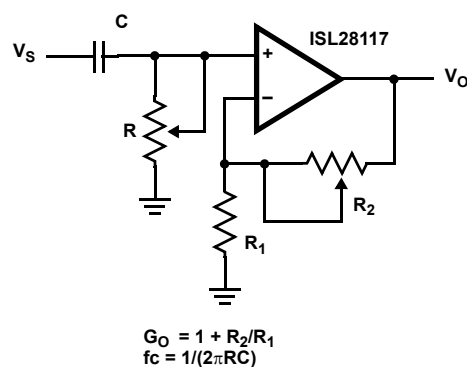


FIGURE 9. FILTER

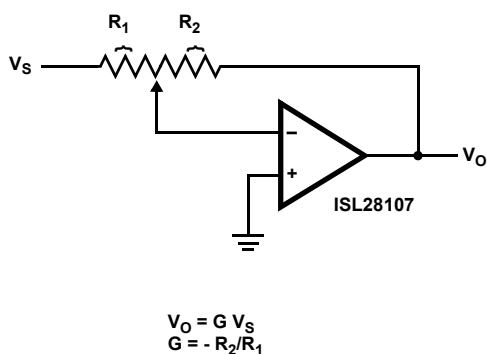


FIGURE 10. INVERTING AMPLIFIER

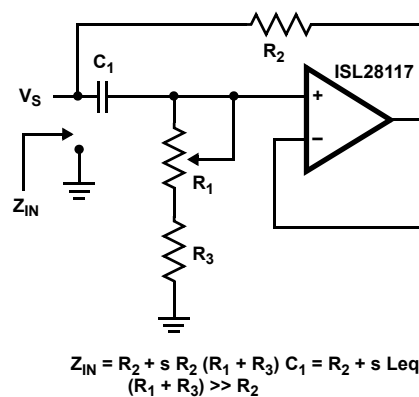


FIGURE 11. EQUIVALENT L-R CIRCUIT

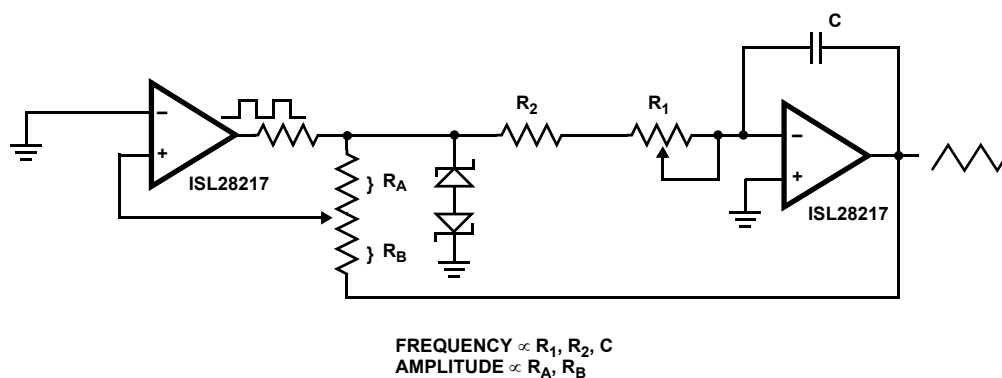
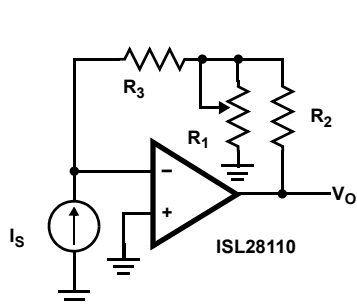


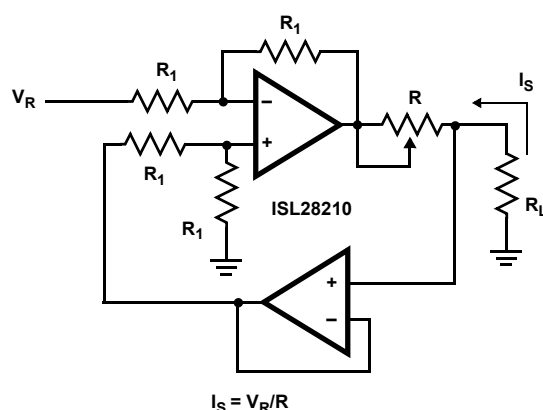
FIGURE 12. FUNCTION GENERATOR

Application Circuits (Continued)



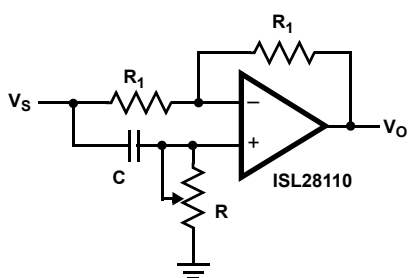
$$V_O / I_S = -R_3(1 + R_2/R_1) + R_2$$

FIGURE 13. I TO V CONVERTER



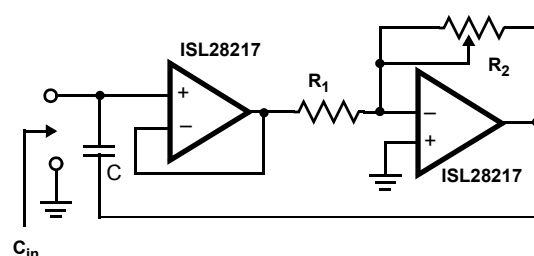
$$I_S = V_R/R$$

FIGURE 14. CURRENT SOURCE



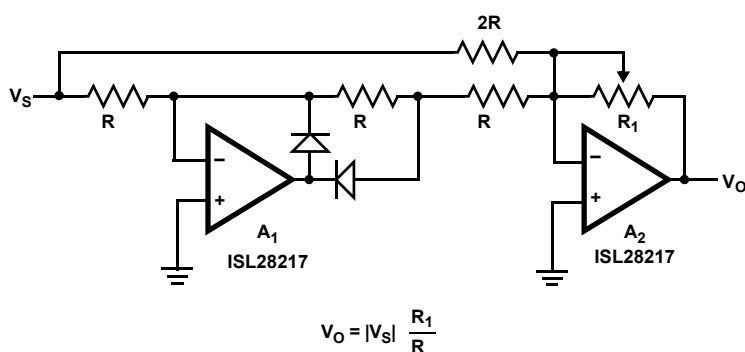
$$\angle V_O/V_S = 180^\circ - 2 \tan^{-1} \omega RC$$

FIGURE 15. PHASE SHIFTER



$$C_{IN} = C (1 + R_2/R_1)$$

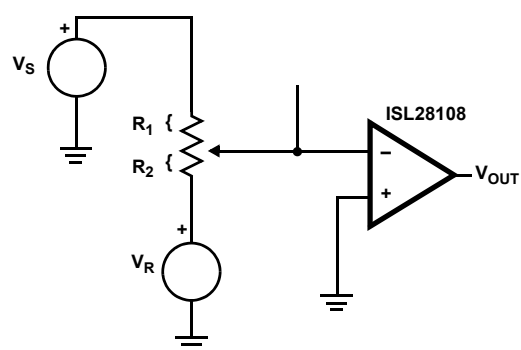
FIGURE 16. CAPACITANCEV MULTIPLIER



$$V_O = |V_S| \frac{R_1}{R}$$

FIGURE 17. ABSOLUTE VALUE AMPLIFIER WITH GAIN

Application Circuits (Continued)

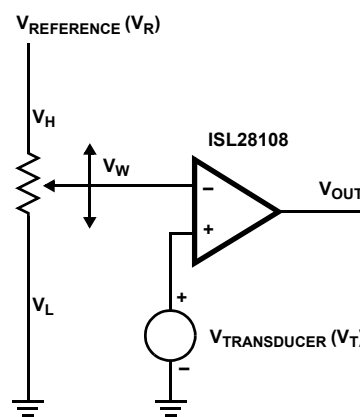


$$V_{OUT} = \text{HIGH FOR } V_S \leq \frac{R_1}{R_2} V_R$$

$$V_{OUT} = \text{LOW FOR } V_S \geq \frac{R_1}{R_2} V_R$$

$$R_1 + R_2 = R_{POT}$$

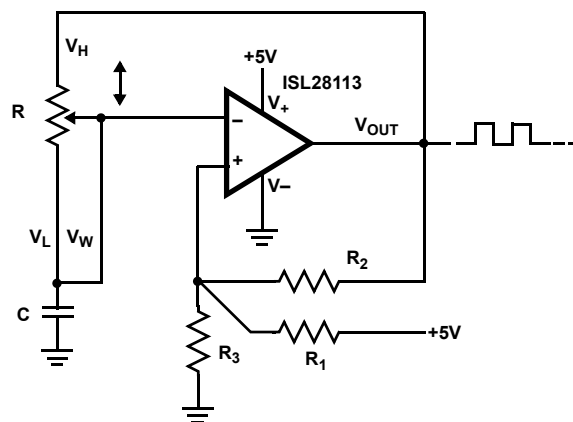
FIGURE 18. LEVEL DETECTOR



$$V_T > V_W, V_{OUT} = \text{HIGH}$$

$$V_T < V_W, V_{OUT} = \text{LOW}$$

FIGURE 19. LEVEL DETECTOR



$$\text{Frequency} \propto R, C$$

$$\text{Duty Cycle} \propto R_1, R_2, R_3$$

FIGURE 20. OSCILLATOR

Application Circuits (Continued)

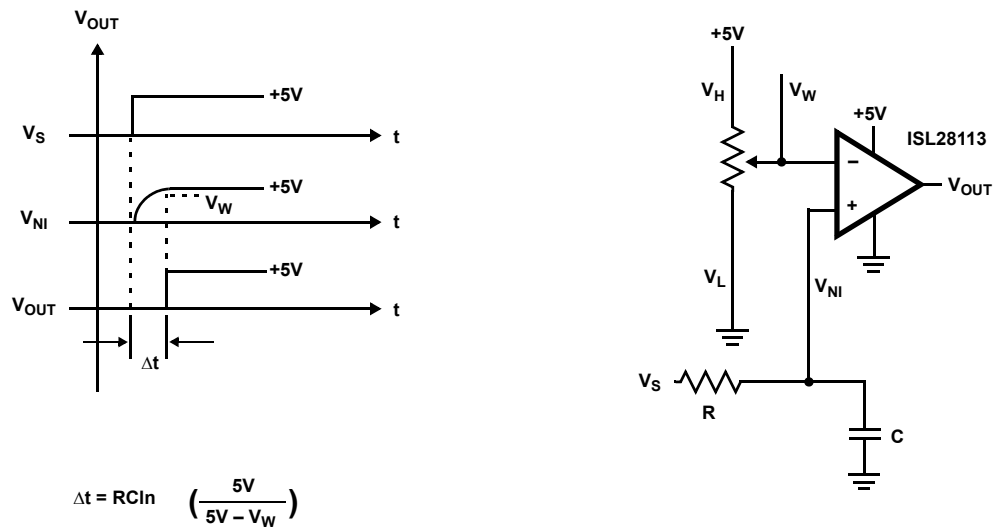


FIGURE 21. TIME DELAY

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Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852-2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886-2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338