

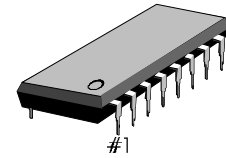
INTRODUCTION

The S5A2250A01 is a CMOS designed for the electronization of dual volume. It is suitable for M/C, and car stereos.

FEATURES

- Wide supply voltage range: $V_{DD} = 6V - 12V$
(Backup is possible up to 4V)
- Attenuation can be controlled from 0dB to -66dB by 2dB/step.
- Controlling attenuation by means of the built in osc and the up/down terminals.
- Single power supply operation as well as split power supply operation.

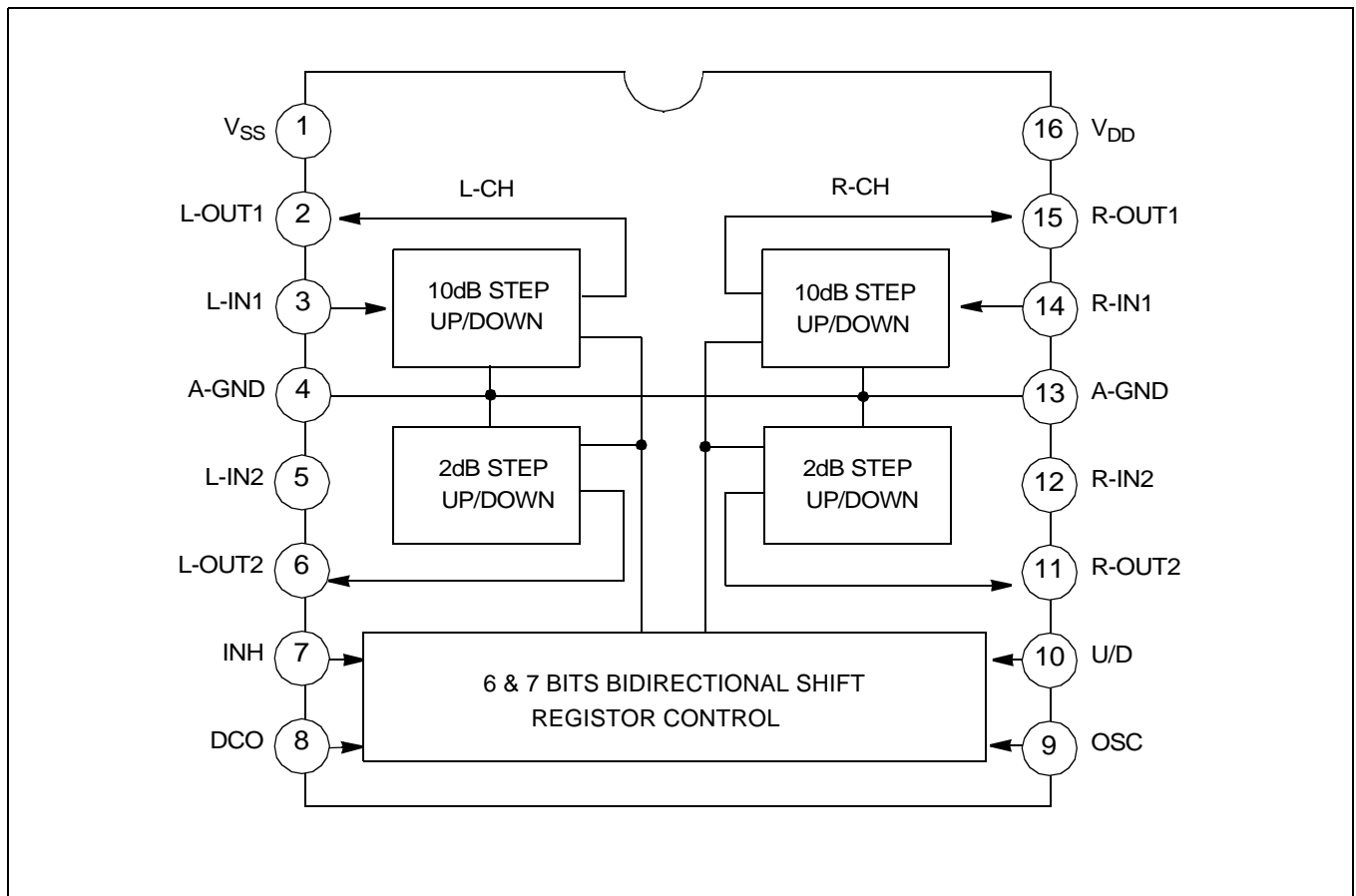
16-DIP-300A



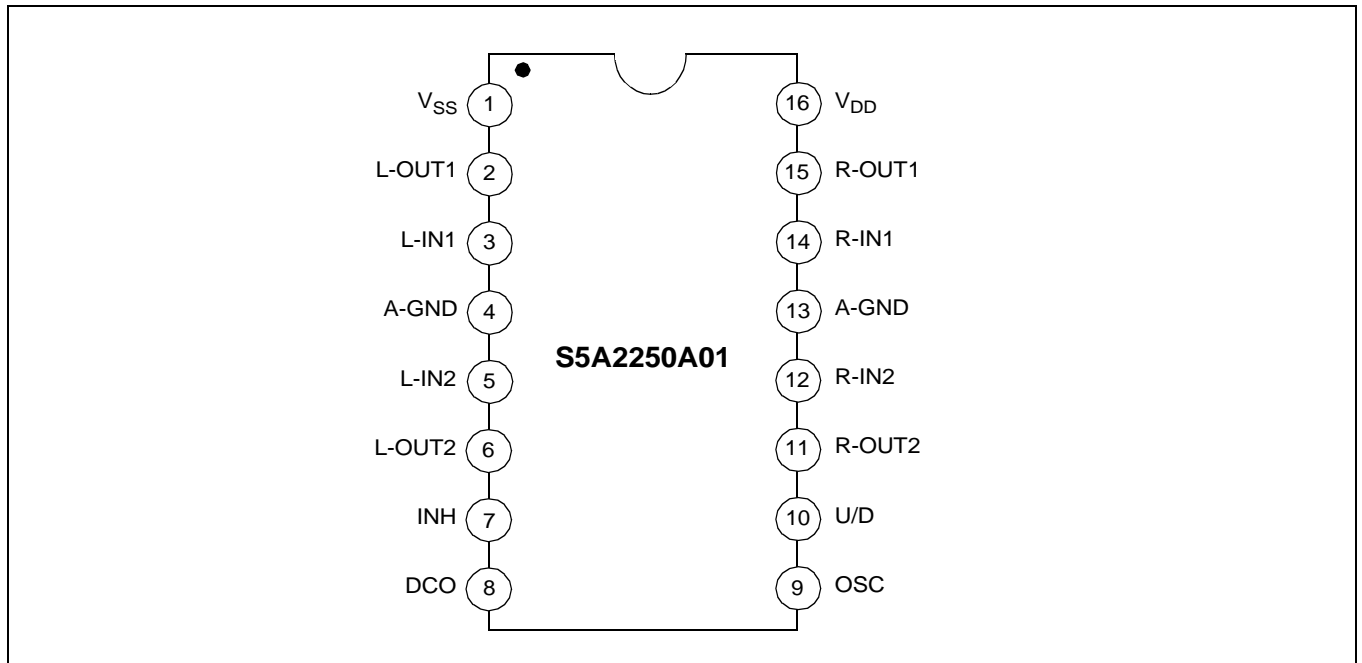
ORDERING INFORMATION

| Device | Package | Operating Temperature |
|-----------------|-------------|-----------------------|
| S5A2250A01-D0B0 | 16-DIP-300A | -20°C - +70°C |

BLOCK DIAGRAM



PIN CONFIGURATION



PIN DESCRIPTION

| Pin No. | Symbol | Descriptions |
|---------|------------------|-------------------------------------------------------------------------------------------------------|
| 1 | V _{SS} | (-) power supply (GND) |
| 2, 15 | L-OUT1 R-OUT1 | 10dB/step attenuator output. A signal applied to IN is attenuated in 7 steps from 0dB to 60dB at 10dB |
| 3, 14 | L-IN1 R-IN2 | 10dB/step attenuator inputs |
| 4, 13 | A-GND | Analog ground |
| 5, 12 | L-IN2 R-IN2 | 2dB/step attenuator inputs |
| 6, 11 | L-OUT2 R-OUT2 | 2dB/step attenuator output. A signal applied to IN is attenuated in 5 steps from 0dB to 60dB at 2dB |
| 16 | V _{DD} | (+) power supply (V _{DD}) |
| 7 | INH | When at "H" level, normal operation |
| 8 | DCO | DC current output for displaying attenuation |
| 9 | OSC | R, C connecting pin for the oscillator |
| 10 | U/D | Attenuation up/down control input |

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Characteristic | Symbol | Value | Unit |
|-----------------------|-----------|-------------------------------|------|
| Supply Voltage | V_{DD} | 13 | V |
| Power Dissipation | P_D | 150 | mW |
| Operating Temperature | T_{OPR} | - 20 - + 75 | °C |
| Storage Temperature | T_{STG} | - 55 - + 125 | °C |
| Input Voltage | V_I | $V_{DD} + 0.3 - V_{SS} - 0.3$ | V |

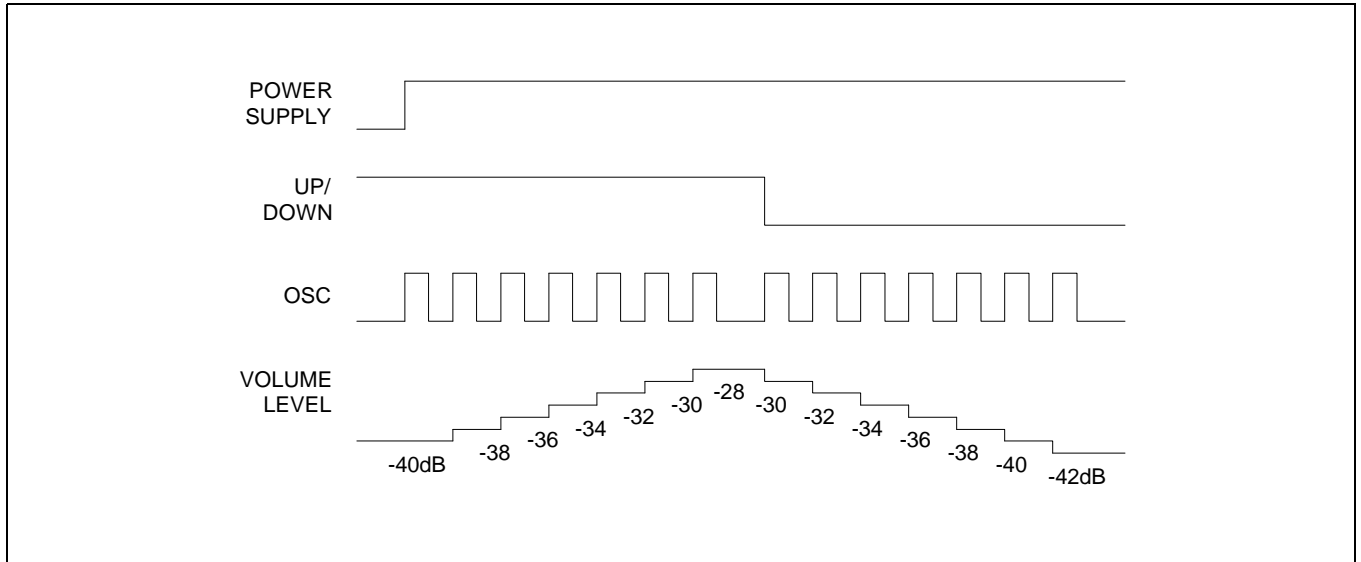
ELECTRICAL CHARACTERISTICS(V_{DD} = 12V, f = 1kHz, Ta = 25°C, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------------|-----------------------------------------------|------|-------|------|------------------|
| Circuit Current | I_{DD1} | $V_{DD} = 13V$ | 0.1 | 1.0 | 2.5 | mA |
| | I_{DD2} | $V_{DD} = 6V$ | 0.1 | 0.8 | 2.0 | |
| Attenuator Resistor | RATT1 | pin 3 - pin 4 pin 14 - pin 13 | 25 | 50 | 70 | kΩ |
| | RATT2 | pin 5 - pin 4 pin 12 - pin 13 | 10 | 20 | 30 | |
| Backup Current | I_{BACKUP} | $V_{DD} = 4V$, s/w1 = b | - | - | 10 | μA |
| Input High Voltage | V_{IH} | -up (down) s/w on | 9.6 | 11.8 | 12.3 | V |
| Input Low Voltage | V_{IL} | s/w1 = a | | | | |
| Total Harmonic Distortion | THD | $V_I = 1.0 V_{pp}$, ATT = 10dB, f = 15kHz | - | 0.005 | 0.01 | % |
| Attenuator Error | $V_{ATT(ERR)}$ | $V_O = 5$ step | -2 | 0 | 2 | dB |
| Max Input Amplitude | $V_{I(MAX)}$ | THD = 1%, $V_{OL} = \max$ | 1.0 | 2.5 | 4.0 | V _{rms} |
| DCO Output current | $I_{O(DCO)}$ | 1 step | 70 | 100 | 140 | μA |
| Cross Talk | CT | ATT = - 10dB | 55 | 65 | - | dB |
| Operating Frequency | f_{OSC1} | UP/SW ON, S/W 3 = a | 5 | 13 | 20 | Hz |
| | f_{OSC2} | S/W 3 = d | 9 | 11 | 13 | kHz |

APPLICATION INFORMATION

Setting of Attenuation

Attenuation is automatically set at the -40dB position when power is applied.

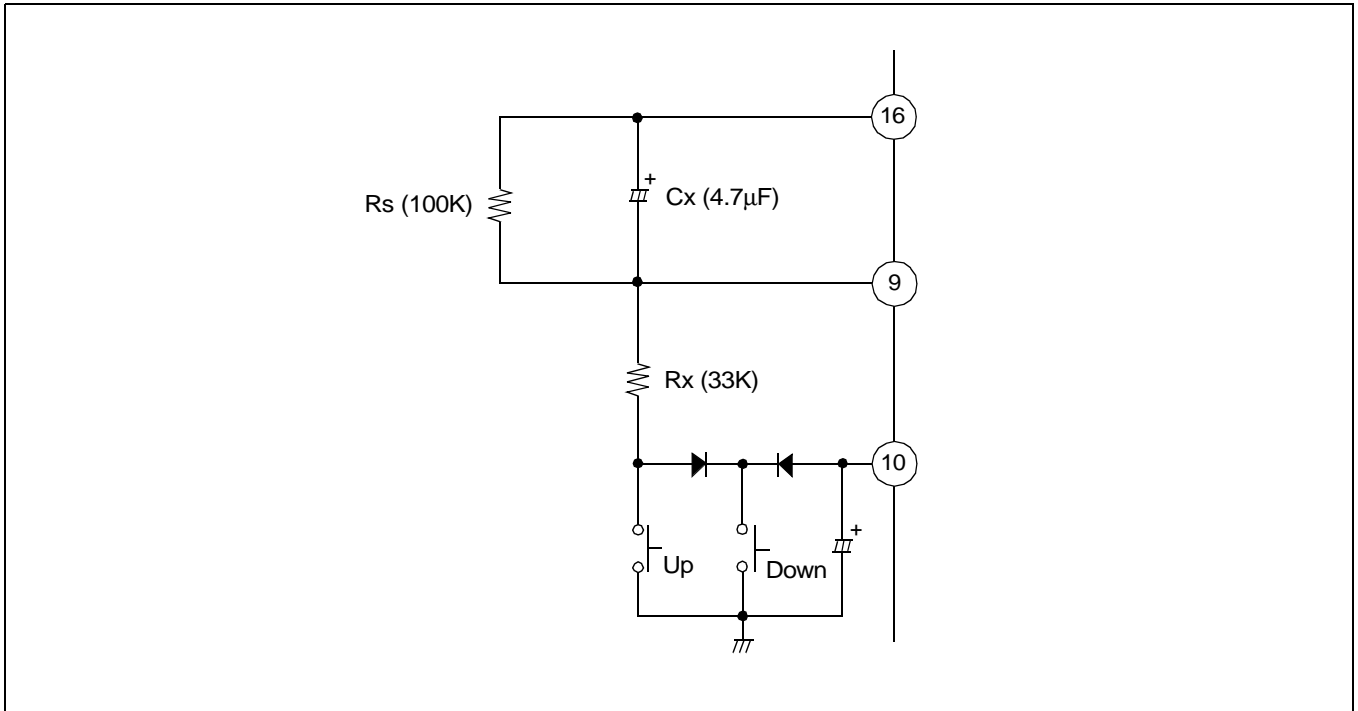


As soon as the UP key is pressed after power on, the U/P pin is placed in the up state at “H” level, and the oscillator is actuated.

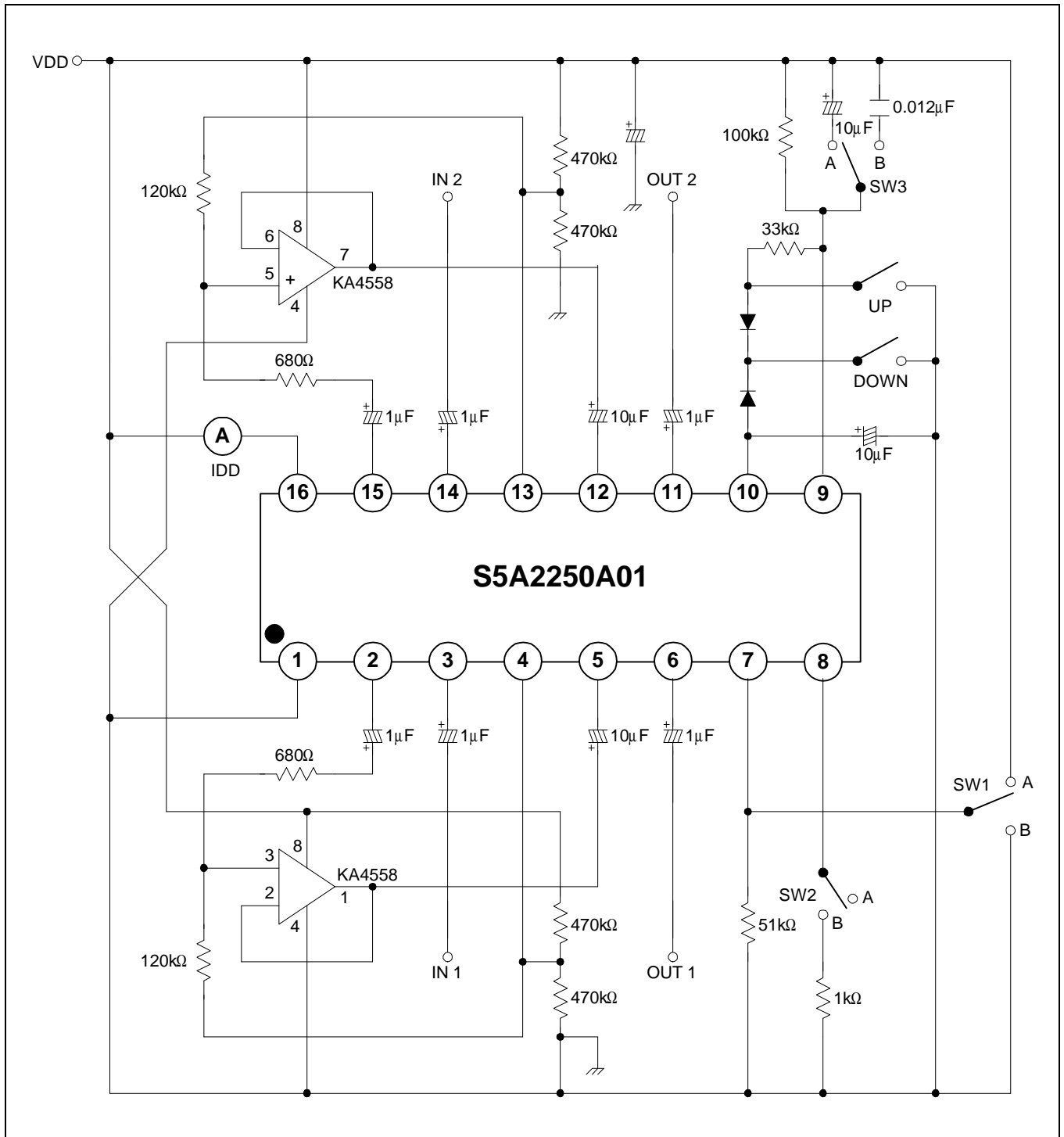
When the DOWN key is pressed, the U/P pin is kept at “L” level as long as the DOWN key is pressed, and the oscillator is actuated in the down State, decreasing the attenuation.

Oscillation frequency is decided by Cx & Rx.

$$f_{osc} = \frac{1}{0.7C_x * R_x} \text{ (Hz) } (R_s \geq 3R_x)$$



TEST CIRCUIT



Attenuation Display Output

The S5A2250A01 is provided with the DC current output pin for displaying attenuation.

Steps of attenuation from 0 dB - - ∞ are shown in the table below.

The current of each step is increased or decreased approximately 100/uA.

| STEP | DCO | ATTENUATION |
|------|----------------------------------------|-----------------|
| 0 | 0 | - 64dB - - ∞ |
| 1 | $I = 100 \mu\text{A} + 30 \mu\text{A}$ | - 60dB - - 62dB |
| 2 | 2*1 | - 54dB - - 58dB |
| 3 | 3*1 | - 50dB - - 52dB |
| 4 | 4*1 | - 44dB - - 48dB |
| 5 | 5*1 | - 40dB - - 42dB |
| 6 | 6*1 | - 34dB - - 38dB |
| 7 | 7*1 | - 30dB - - 32dB |
| 8 | 8*1 | - 24dB - - 28dB |
| 9 | 9*1 | - 20dB - - 22dB |
| 10 | 10*1 | - 14dB - - 18dB |
| 11 | 11*1 | - 10dB - - 12dB |
| 12 | 12*1 | - 4dB - - 8dB |
| 13 | 13*1 | - 0dB - -2dB |

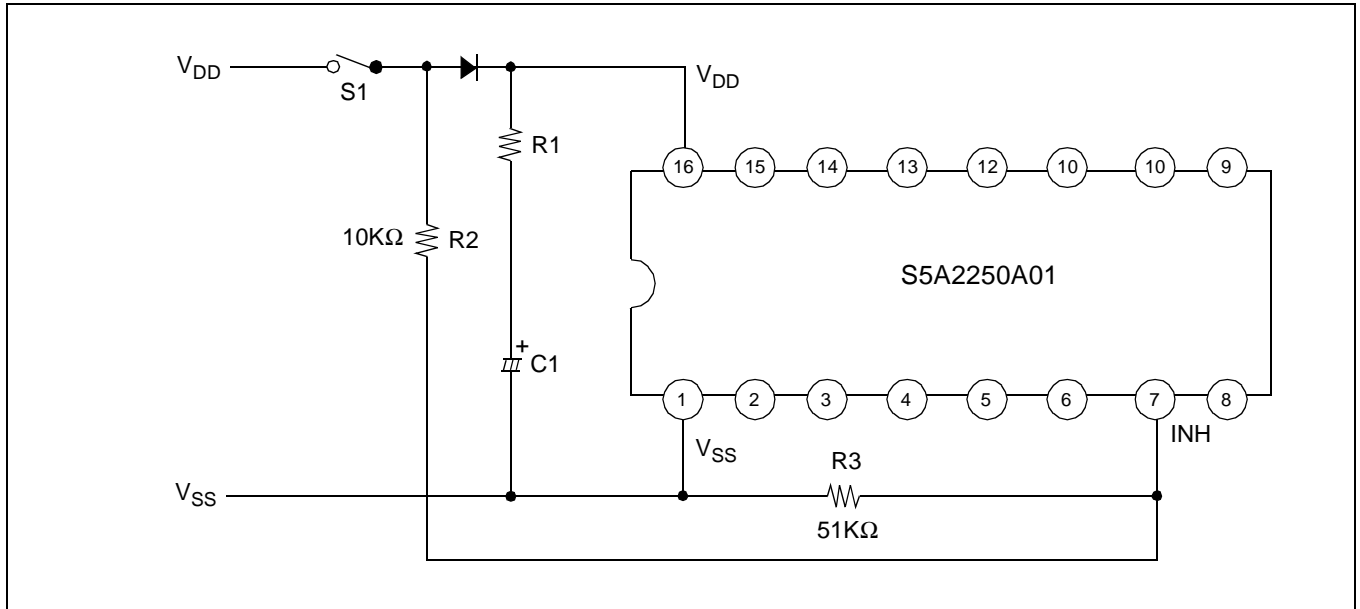
* Current value may fluctuate depending upon the IC.

When high precision is required use a variable resistor as a load resistor.

BACKUP

On the S5A2250A01, when power is off (S1 spon) or the INH pin is set at L (- VSS) level, all I/O pin are shut off and current consumption is reduced to the minimum.

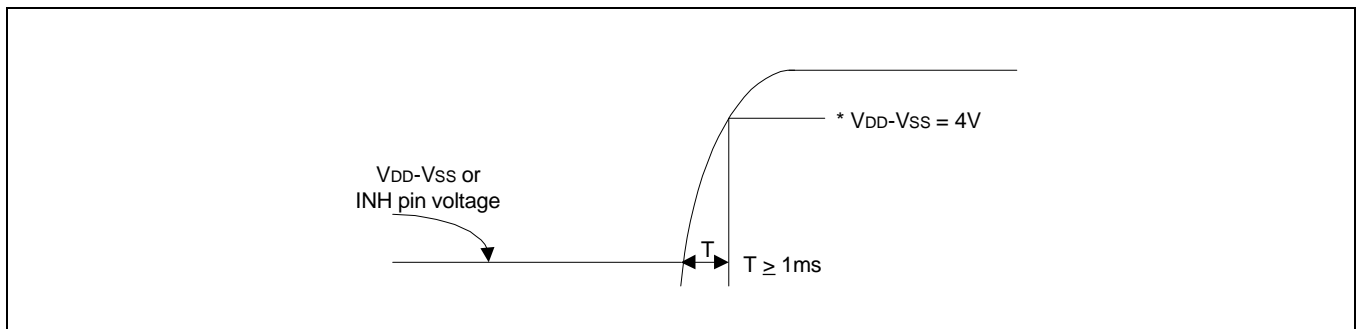
Backup by means of a capacitor (C1) becomes possible in this condition. Fig 6 shows an example of an application when a backup capacitor is used.



NOTE: If $V_{DD}-V_{SS}$ become below 4.0V, the backup is impossible.

Initialization When Power On

The S5A2250A01 has a built-in auto-initializing function for initialization when power is on. As the initializing system is adopted through detection of supply voltage level, if rise of power supply is too fast, the initialization may not be fully effected (no external initialization is necessary) In addition for effective initialization, it is necessary that the INH pin is raised simultaneously with the supply voltage. Further, the initializing level is -40dB. It is recommended to raise the supply voltage and the INH pin as illustrated Fig.

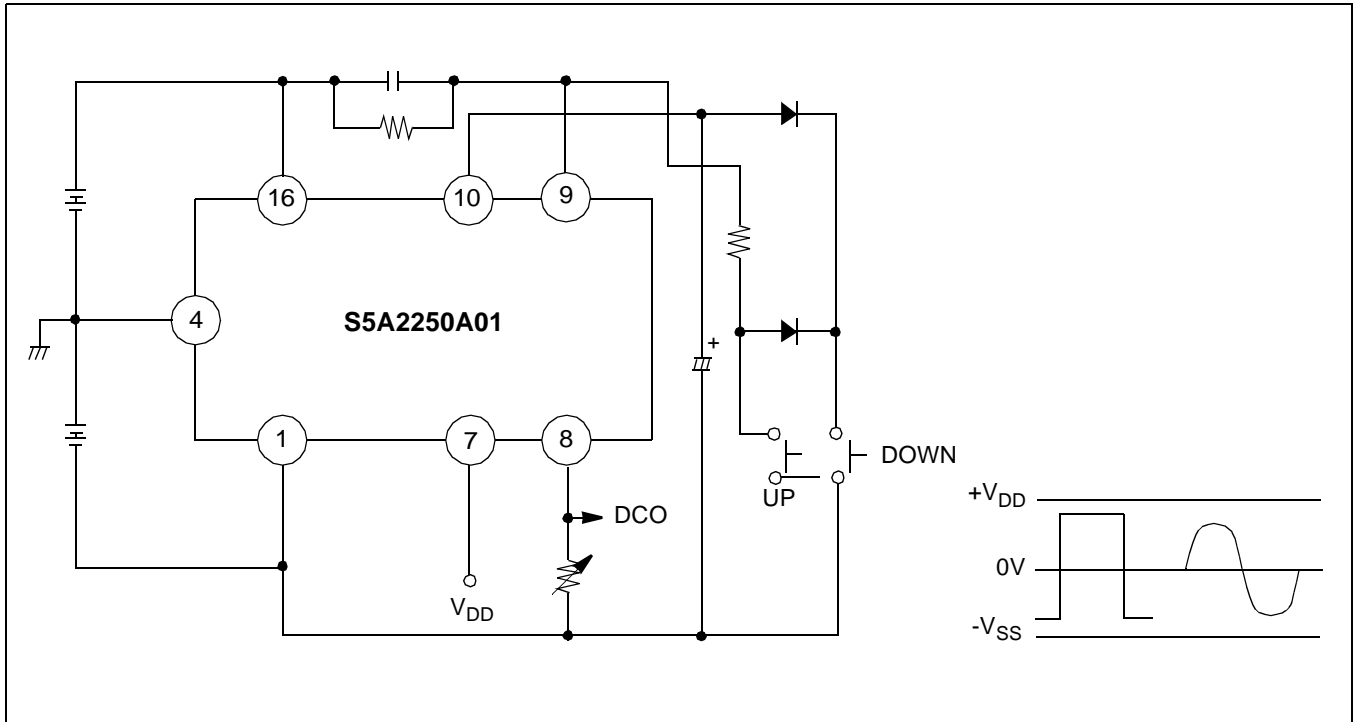


NOTE: If the voltage between V_{DD} and V_{SS} is below 4.0V, the auto-initializing function is actuated.

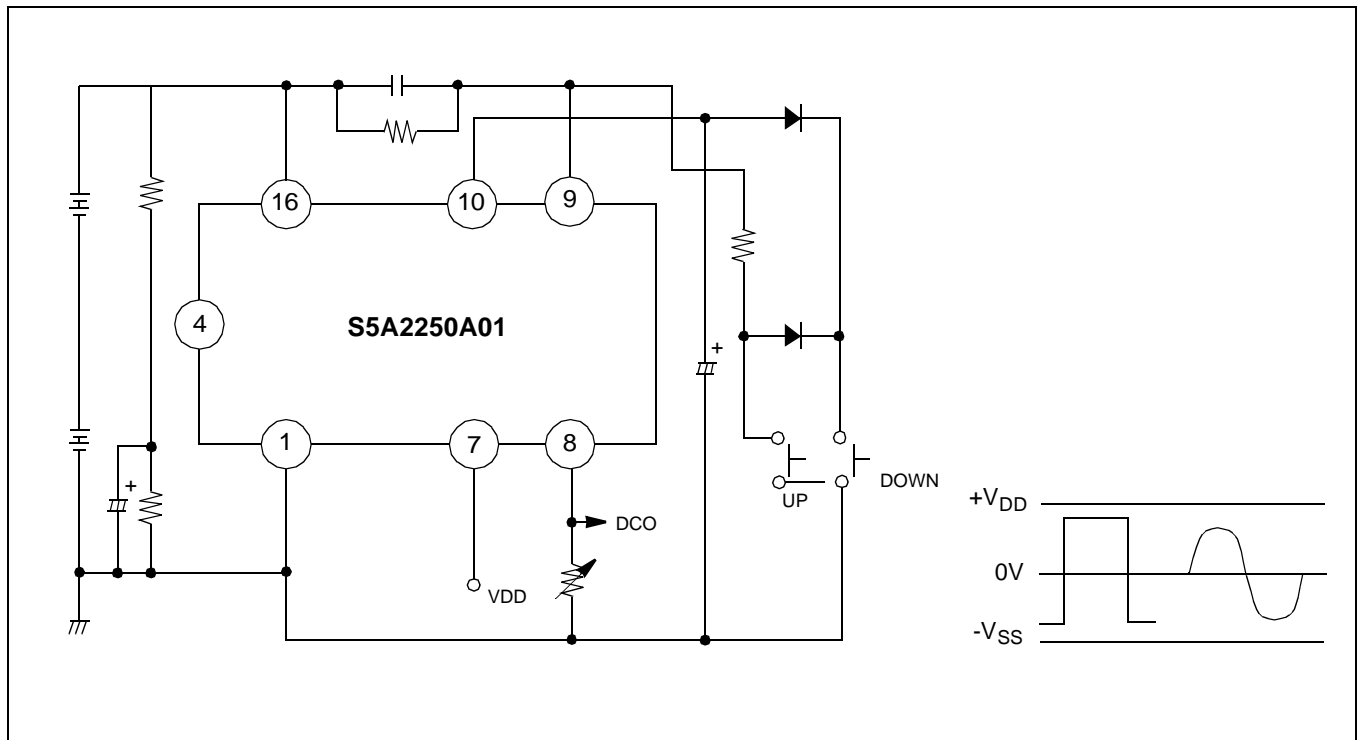
POWER SUPPLY

The S5A2250A01 is able to carry out single power supply operation as well as split power supply operation.

Split Power Supply



Single Power Supply



APPLICATION CIRCUIT

