SM7153

ELECTRONIC VOLUME CONTROLLER

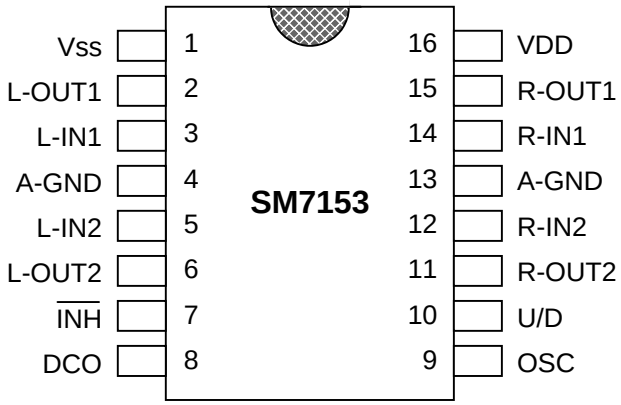
FEATURES

* 0dB to -66dB attenuation controlled by 2dB/step
* 2 channels built in
* High voltage CMOS technology operating voltage range: VCC=6 ~ 12V

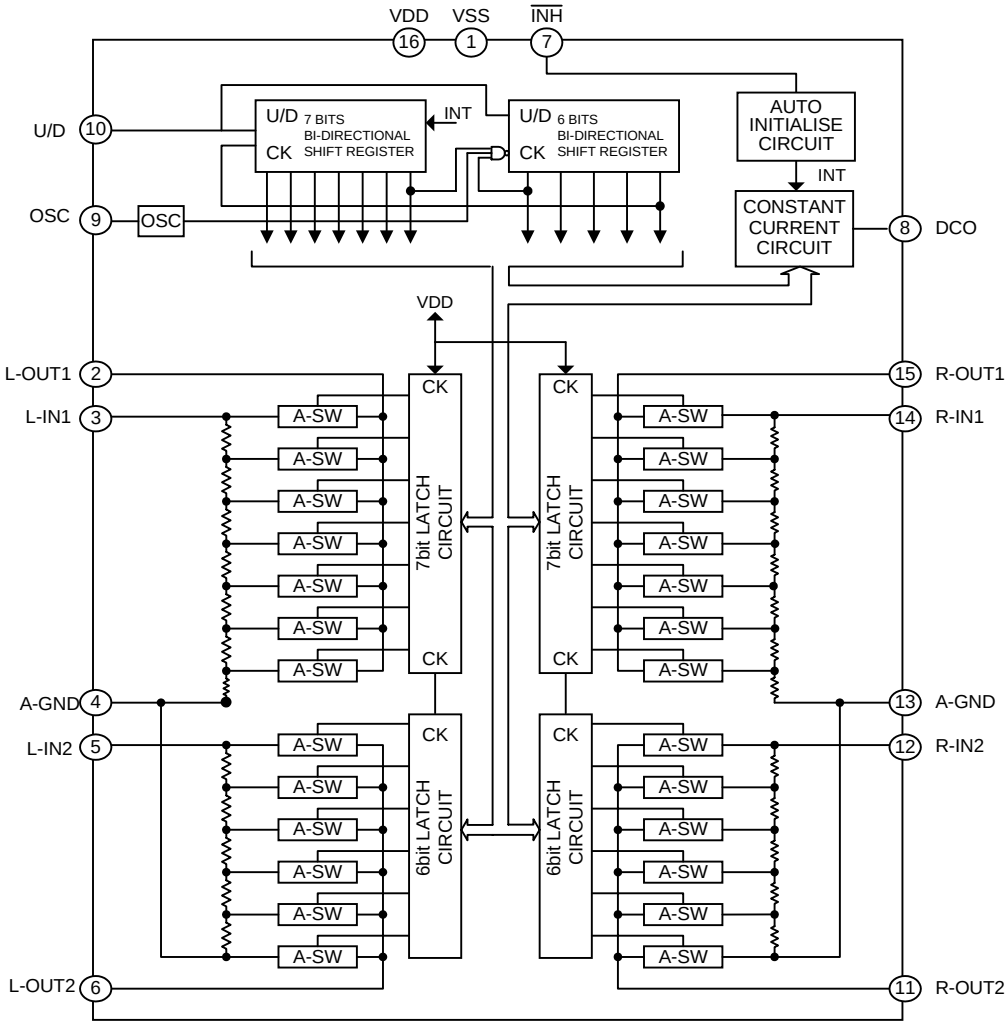
APPLICATION

Audio Equipment Volume Control.

PIN ASSIGNMENT



BLOCK DIAGRAM



PIN DESCRIPTION

Pin	Symbol	Description
2 15	L-OUT1 R-OUT1	10dB/step attenuator outputs. A signal applied to IN is attenuated in 7 steps from 0dB to 60dB at 10dB/step.
3 14	L-IN1 R-IN1	10dB/step attenuator inputs
4 13	A-GND	Analog ground terminal
5 12	L-IN2 R-IN2	2 dB/step attenuator inputs
6 11	L-OUT2 R-OUT2	2 dB/step attenuator inputs A signal applied to IN is attenuated in 5 steps from 0dB to 8dB at 2 dB/step.
7	$\overline{\text{INH}}$	Inhibit terminal. When this terminal is at ' L ' level, all input/ output cut off and the SM7153 is placed in the inhibit state. When at ' H ' level, the SM7153 operates normally.
8	DCO	DC current output for displaying attenuation.
9	OSC	C, R connecting terminal for the oscillator. up/down speed of attenuation is decided by the attenuation up/down control oscillator according to this time constant.
10	U/D	Attenuation up/down control input terminal. When this terminal is at ' H ' level, sound volume is increased synchronising with rise of the oscillator. Conversely, when this pin is at ' L ' level, sound volume is decreased.
1	VSS	Negative Power Supply
16	VDD	Positive Power Supply (Substrate)

FUNCTION DESCRIPTION

(1) Setting Of Attenuation

After power on, attenuation is automatically set at -40dB.

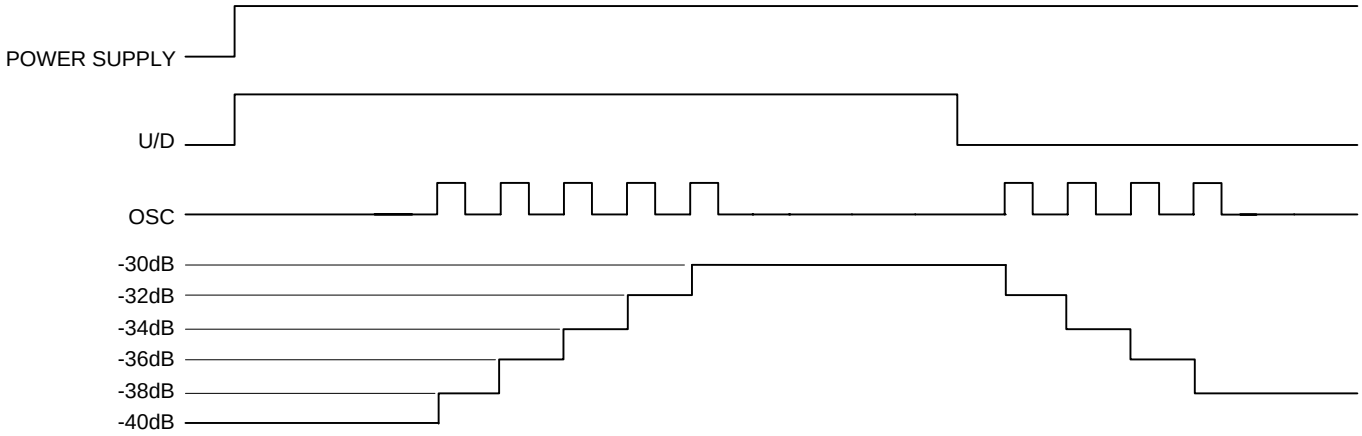


Figure 1

When the UP key is pressed after power ON, the U/D terminal is placed in the up state at ' H ' level, and the oscillator is actuated.
When the DOWN key is pressed, t
DOWN key is pressed, and the oscillator is actuated in the down state and therefore, attenuation is decreased. Oscillation frequency is decided by Cx and Rx.

$$fosc \quad \frac{1}{0.7\ Cx * Rx} \quad (Hz)\ (Rs \geqq 3Rx)$$

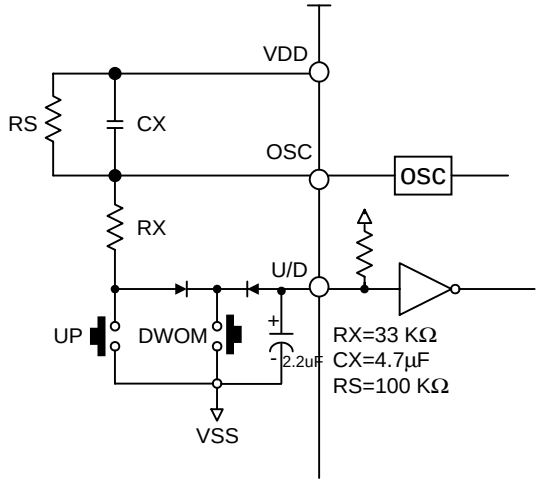


Figure 2

(2) Attenuation Display Output

The SM7153 is provided with the DC current output terminal for displaying attenuation. With 0dB ~ ∞ divided into 13 steps, current of approx. 100μA/step is transmitted.

Step	DCO	Attenuation
0	0	-64 dB ~ ∞
1	I = 100 μ A + 30 μ A	-60dB ~ -62dB
2	2 x I	-54dB ~ -58dB
3	3 x I	-50dB ~ -52dB
4	4 x I	-44dB ~ -48dB
5	5 x I	-40dB ~ -42dB
6	6 x I	-34dB ~ -38dB
7	7 x I	-30dB ~ -32dB
8	8 x I	-24dB ~ -28dB
9	9 x I	-20dB ~ -22dB
10	10 x I	-14dB ~ -18dB
11	11 x I	-10dB ~ -12dB
12	12 x I	-4dB ~ -8dB
13	13 x I	0dB ~ -2dB

TABLE 1

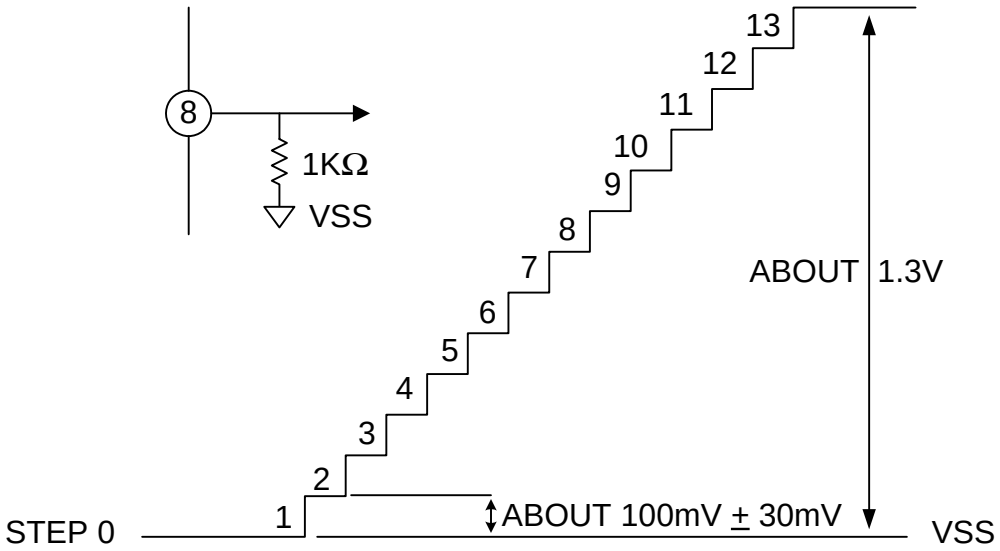


Figure 3

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

(3) Attenuator

The attenuator unit consist of diffused resistors and analog switches. Attenuator 1 attenuates 0~60dB at 10dB/step while Attenuator 2 attenuates 2~8dB at 2dB/step, a total of 0~66dB at 2dB/step.

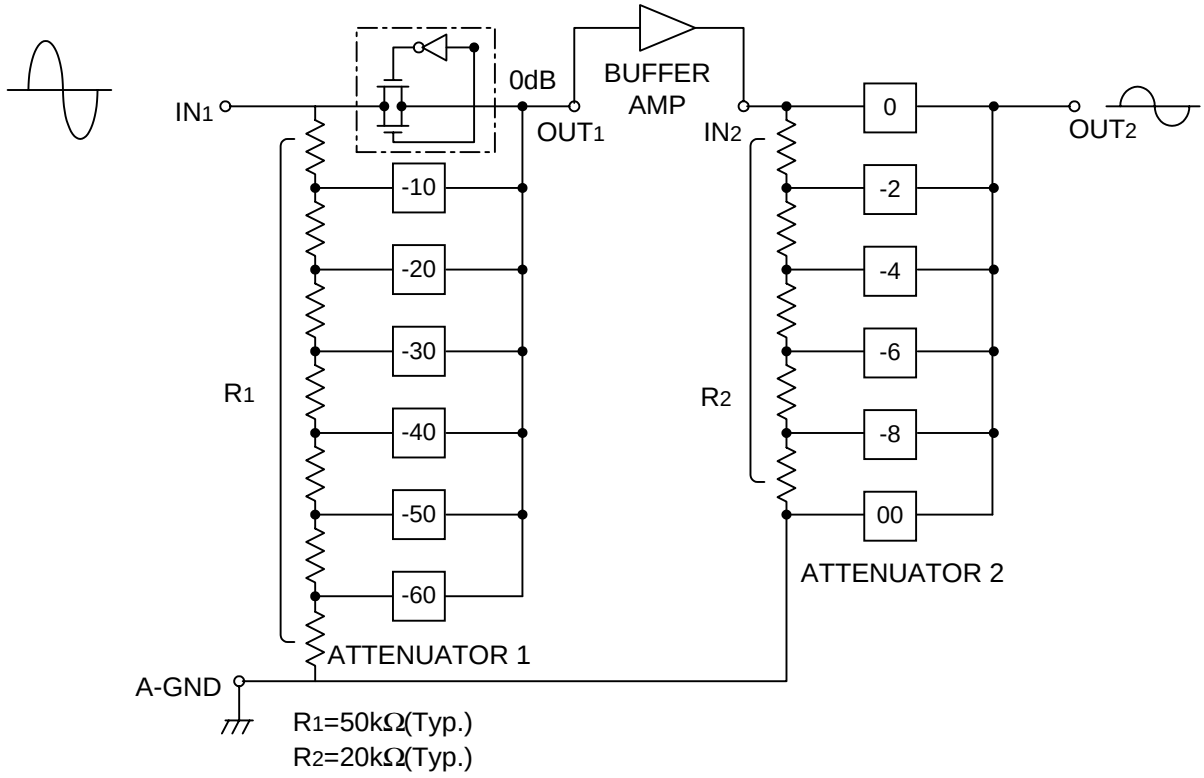


Figure 4

If there is the possibility for excessive voltage being to the attenuator, it is recommended to insert a protective diode as illustrated below.

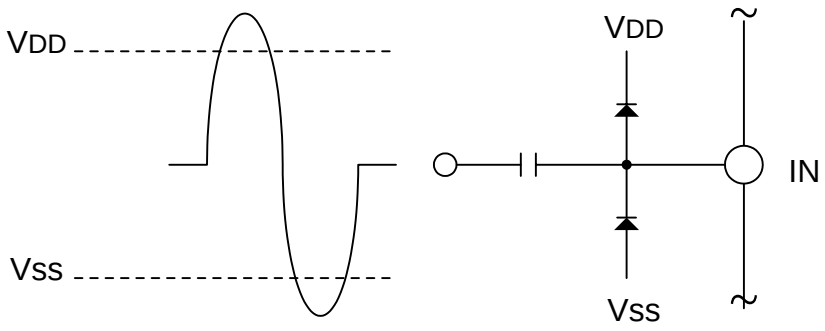


Figure 5

(4) Power Supply

(a) Dual Power Supply

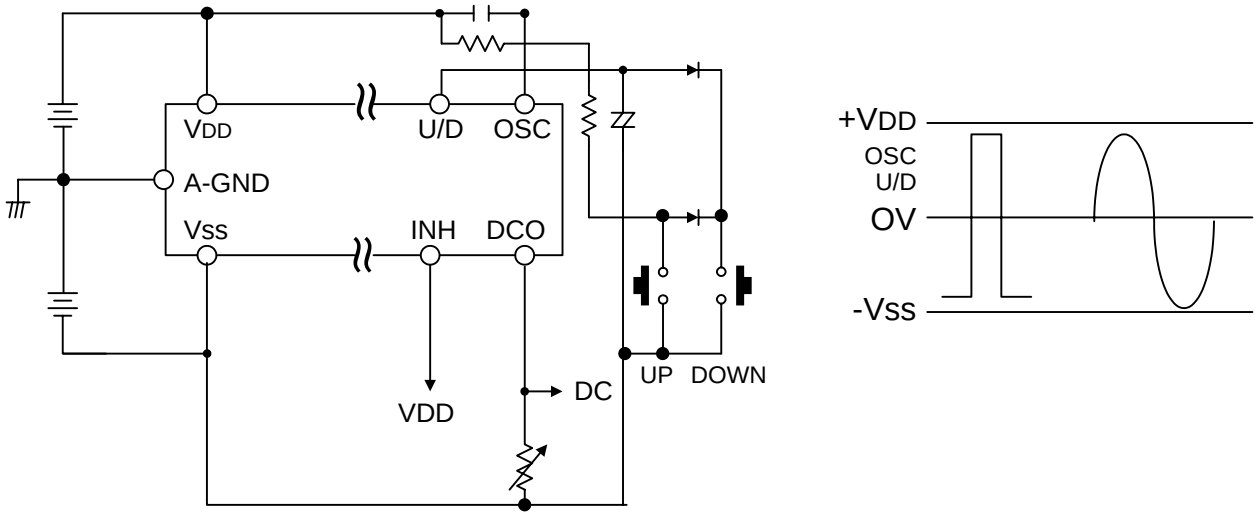


Figure 6

(b) Single Power Supply

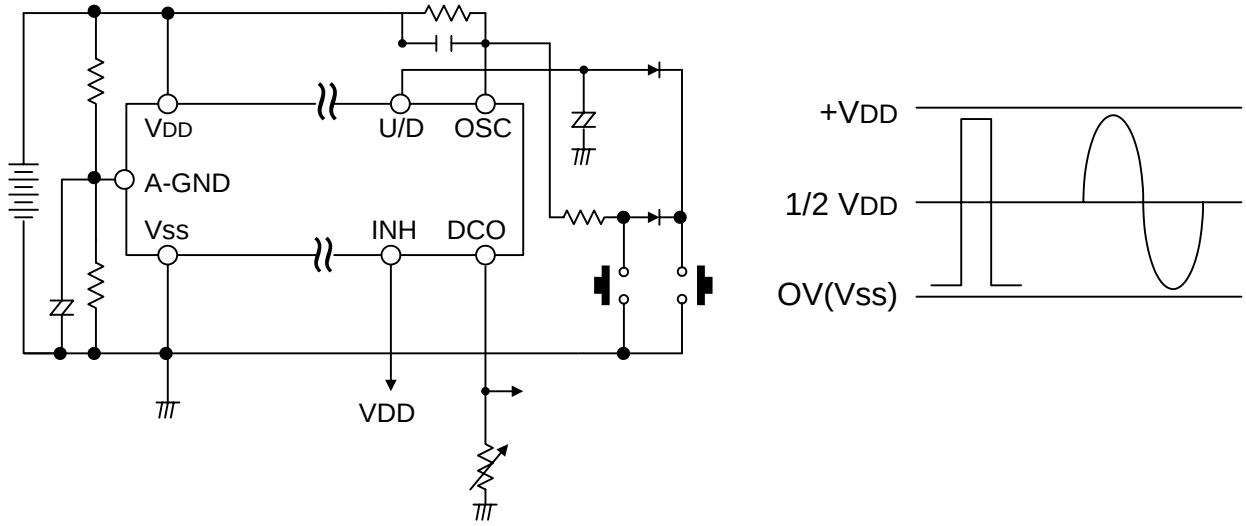


Figure 7

(5) Backup When Power Off

When the INH terminal is set at ' L ' level, all input/output terminals are shut off and current consumption is reduced to the minimum. The back up by means of a capacitor becomes possible in this condition. An application circuit is shown in Figure 8.

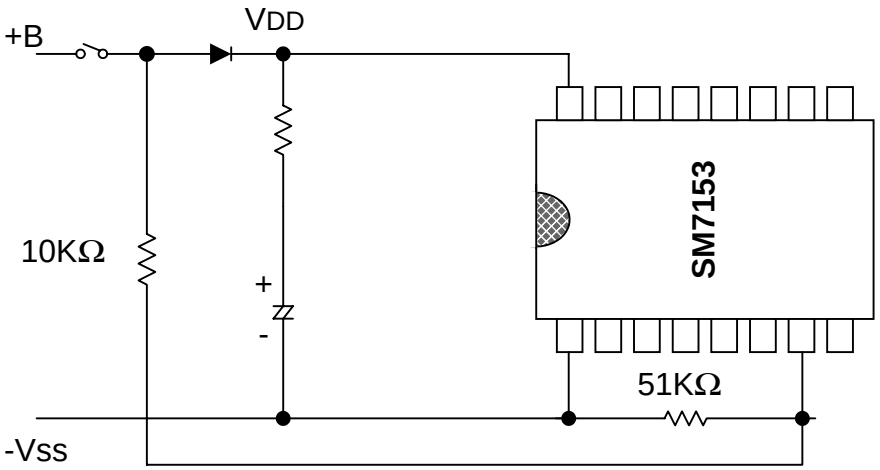


Figure 8

If VDD-Vss drops below 4V, the backup becomes impossible.

(6) Initialisation When Power ON

When VDD-VSS drops below 4V, the auto-initialising function is actuated. The initialising level is -40dB. If rise of power supply is to
It is recommended to rise supply voltage and the INH terminal as illustrated below.

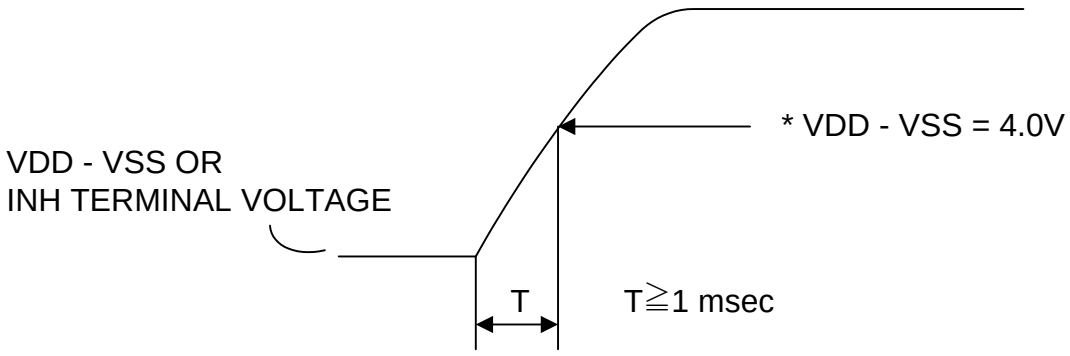


Figure 9

MAXIMUM RATINGS (TA=25°C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	VDD	15	V
Input Voltage	VIN	VSS-0.3 ~ VDD+0.3	V
Power Dissipation	PD	150	mW
Operating Temperature	Topr	-20 ~ +75	℃
Storage Temperature	Tstg	-40 ~ +125	℃

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, VDD=12V, VSS=0V, Ta=25°C)

Parameter		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage		VDD		6	-	12	V
Supply Current		IDD		-	1	3	mA
Stand-by Current		IB	VDD=4V,INH=L	-	-	300	μA
Input Voltage	' H ' LEVEL	VIH	INH, U/D Terminal	0.8VDD	-	VDD+0.3	V
	' L ' LEVEL	VIL		VSS-0.3	-	VDDx0.2	
Attenuator 1 resistor (10dB / step)		RATT-1	R-IN1 -A-GND (L-IN1)	25	50	70	KΩ
Attenuator 2 resistor (2dB / step)		RATT-2	R-IN2 -A-GND (L-IN2)	10	20	28	KΩ
Attenuation Error		-		-	-	2	dB
Max input Amplitude		Vin	Biase 0V	-	-	4.0	Vrms
Max clock Frequency		fck		-	-	100	KHz
Min clock Width		Tck		5	-	-	μS

APPLICATION CIRCUIT (L-ch Only)