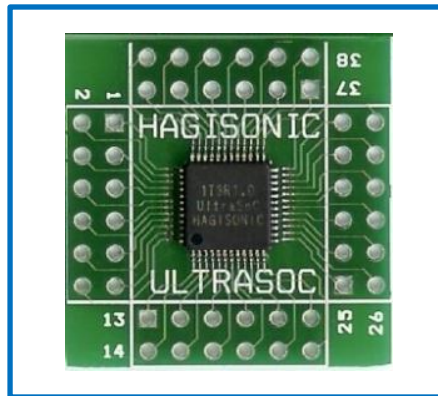


ASIC Designed Chip for a Ultrasonic Sensor

※ 1 Transmitter, 1 Receiver Channel Embed



■ Feature

- Small chip size (7 mm x 7 mm Package 48pin)
- Low voltage & low power consumption (5 Vdc / 5 mA Typical)
- Very high sensitivity (Receiver Gain 70 dB / x3,000)
- V.G.A (Variable Gain Amplifier) proportional to Time Of Flight (Distance)
 - Long distance corresponds to high gain to detect the object
 - Low gain is given at short distance not to be saturated, so that there is no Acoustic Crosstalk between sender & receiver
 - If not necessary, it can be selected to constant gain mode.
- Various transmitter drive mode
 - Free Run Mode : self OSC and self triggering
 - External Trigger Mode : Trigger pulse from processor system.
 - Constant Wave Mode : Constant high signal inlets and ultrasound continually occurs.
- Various Output
 - VRx0 : Amplified ultrasonic signal in real time (Analog)
 - V Pulse : Square wave in real time
 - Time Pulse : Pulse width wave form of T.O.F
 - High Power Drive.

(If you want more Strong Acoustic Pressure, the input power voltage can be increased until 40 Volt)

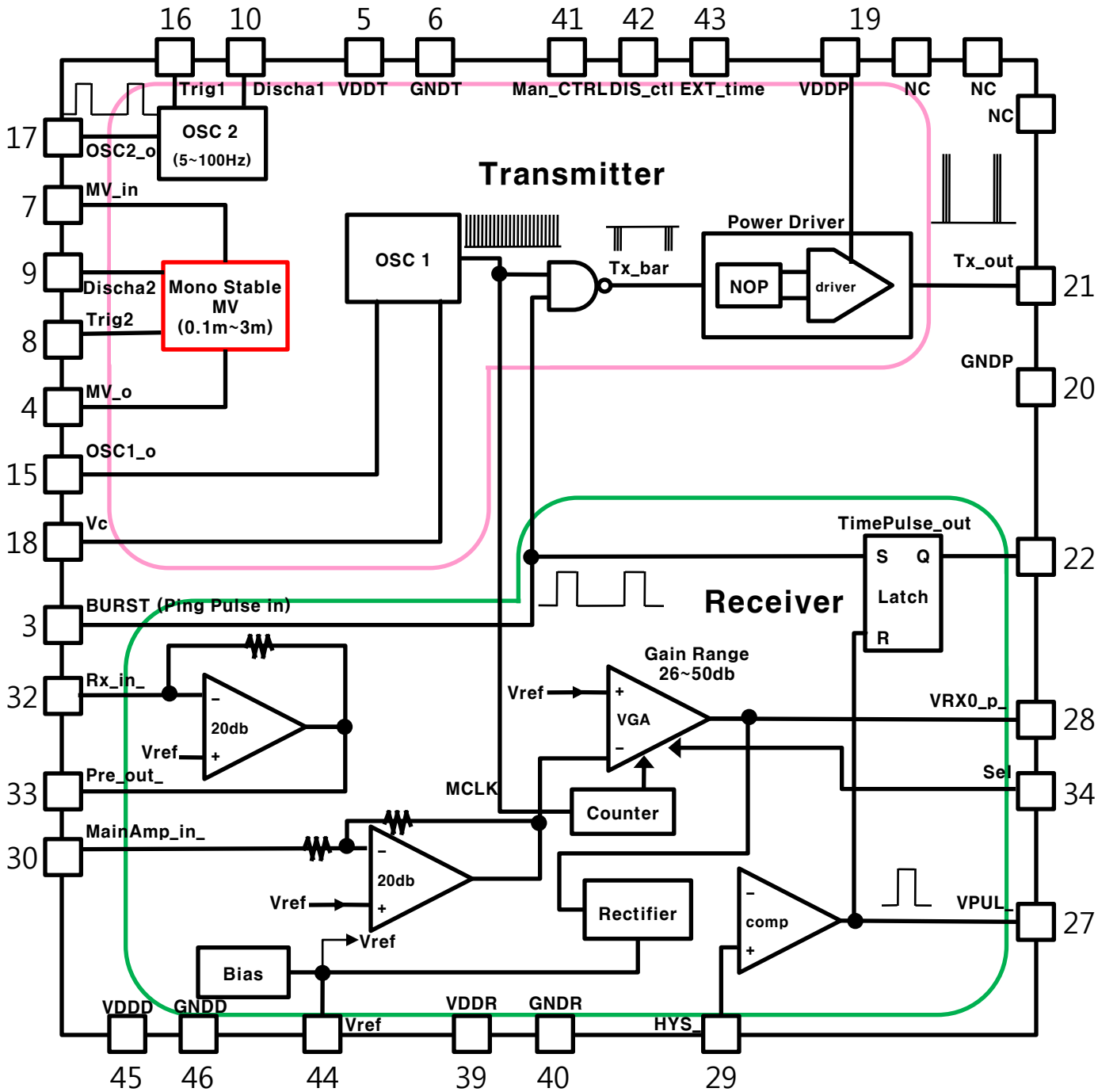
■ Description

- Hagisonic Ultra-1T1R is a specially customized ASIC designed chip where the basic circuit of ultrasonic transmitter & receiver is embedded and it also has various function for ultrasonic sensor application.
- With this chip, user can set up various features for 'Pulser-Receiver'.
The frequency, timing and type of a transmitter and a receiver can be controlled and selected.
User can choose the signal to build up an optimized system owing to various output signals.
- Power consumption is very low (5 V / 5 mA) to be suitable for a digital micro processor system.
- The most special function is Variable Gain Control Amplifier (V.G.A.) where amplification is proportional to the distance (Time of Flight). This function is designed to get a clear signal with limited gain against the signal overflow at short distance. And weak signal from long distance is amplified automatically.
- It can be applied for a range finder, a mobile robot, a vehicle and so on.

■ Specification

Frequency (OSC1)	20 kHz ~ 100 kHz Variable
Trigger Frequency (OSC2)	5 Hz ~ 100 Hz Variable
Burst Pulse Width (Mono Stable M.V.)	0.1 ms ~ 3 ms Variable
Output Level of Ultrasonic Signal	5 V ~ 40 Vp-p (max) / 20 mA
Receiving Gain	40 ~ 70 dB Variable
V.G.A.	Automatic control at 16 ~ 40 dB range selectable enable / disable
Other Function	Receiving function can be stopped at the moment of driving a transmitter
Types of Receiving Signals (Real Time)	- Amplified analog signal - Real time square pulse signal - Pulse with the width to be proportional to the distance
Power	5 Vdc (Main Circuit) 5~40 Vdc (Transmitter Driving)
Power Consumption	5 mA Typical
Dimension	7 mm X 7 mm Package 48 pin

N.C. (No Connection) : 1, 2, 11, 12, 13, 14, 23, 24, 25, 26
31, 35, 36, 37, 38, 47, 48



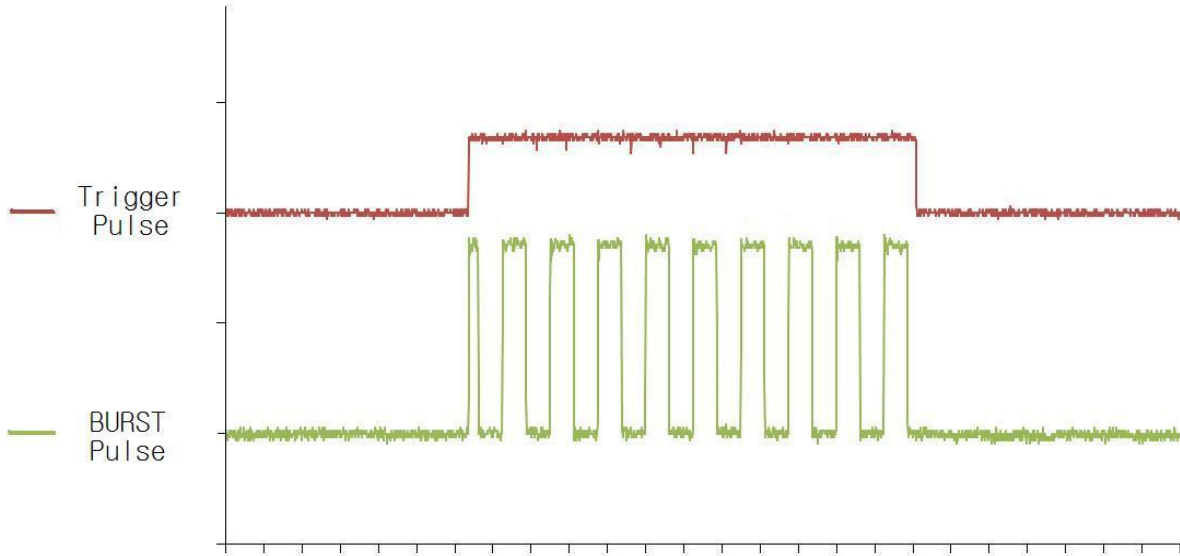


Fig. Trigger Pulse and Ultrasonic Burst Output Waveform

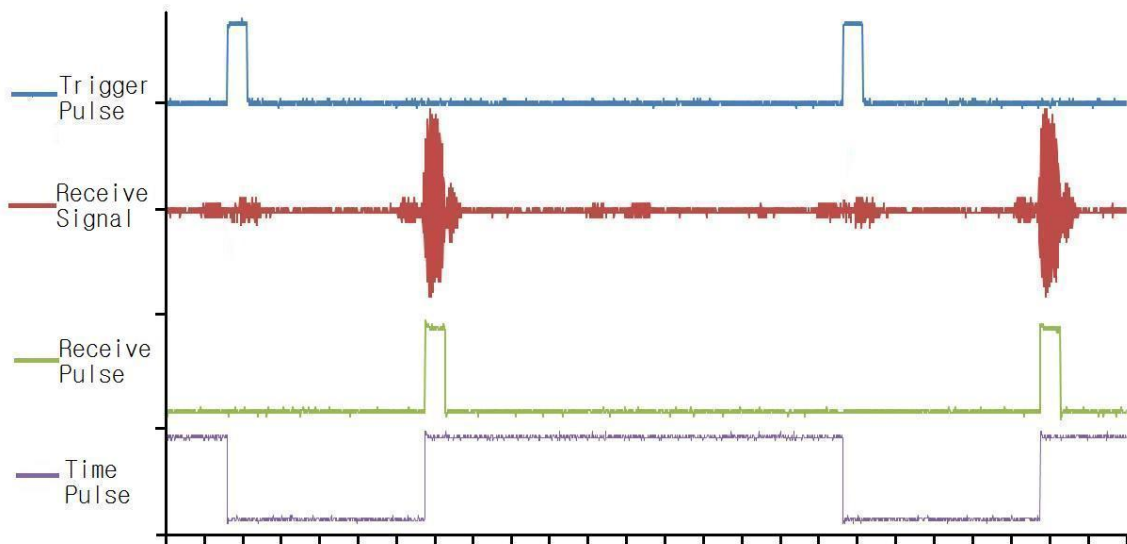
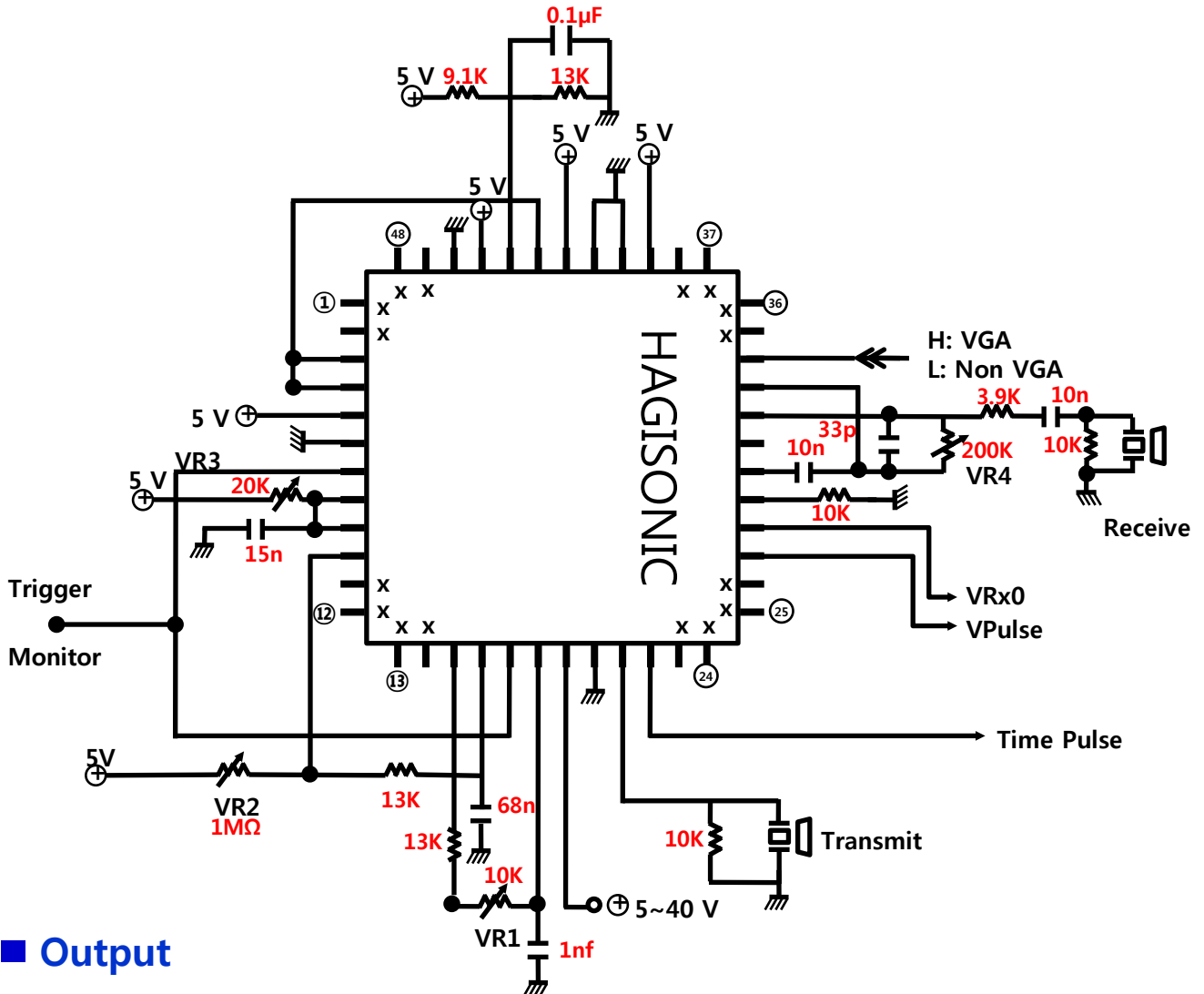


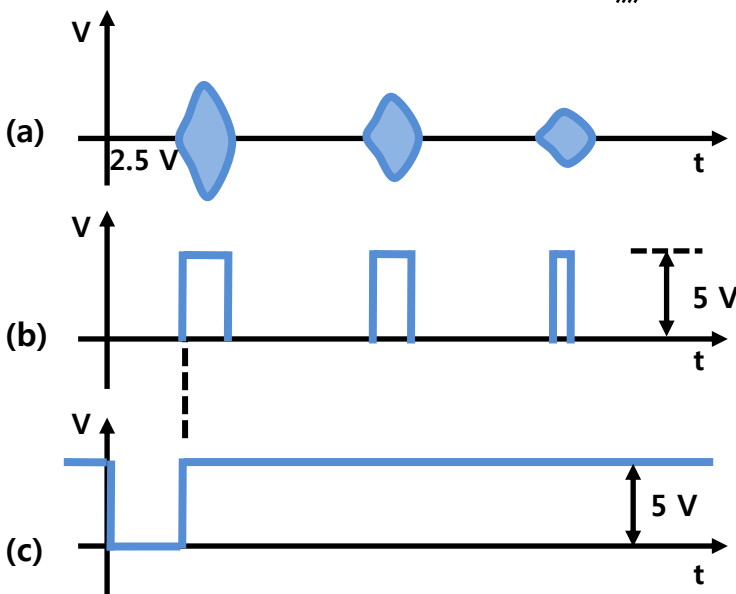
Fig. Timing Chart of Trigger Signal and 3 Type of Receiver Output of Waveform

Schematic Diagram of Application

Application Example (Free Run Mode)



Output



- VR1 = 20~100 kHz Adj
- VR2 = 5~100 Time Trigger Per Second
- VR3 = Trigger Pulse Width (0.5~3 ms)
- VR4 = Pre Amplifier Gain of Receiver

- (a) Amplified Analog Signal Output (VRx0)
- (b) Real time Square Output (V-pulse)
- (c) Distance Proportional Pulse Width Output (Time Pulse)

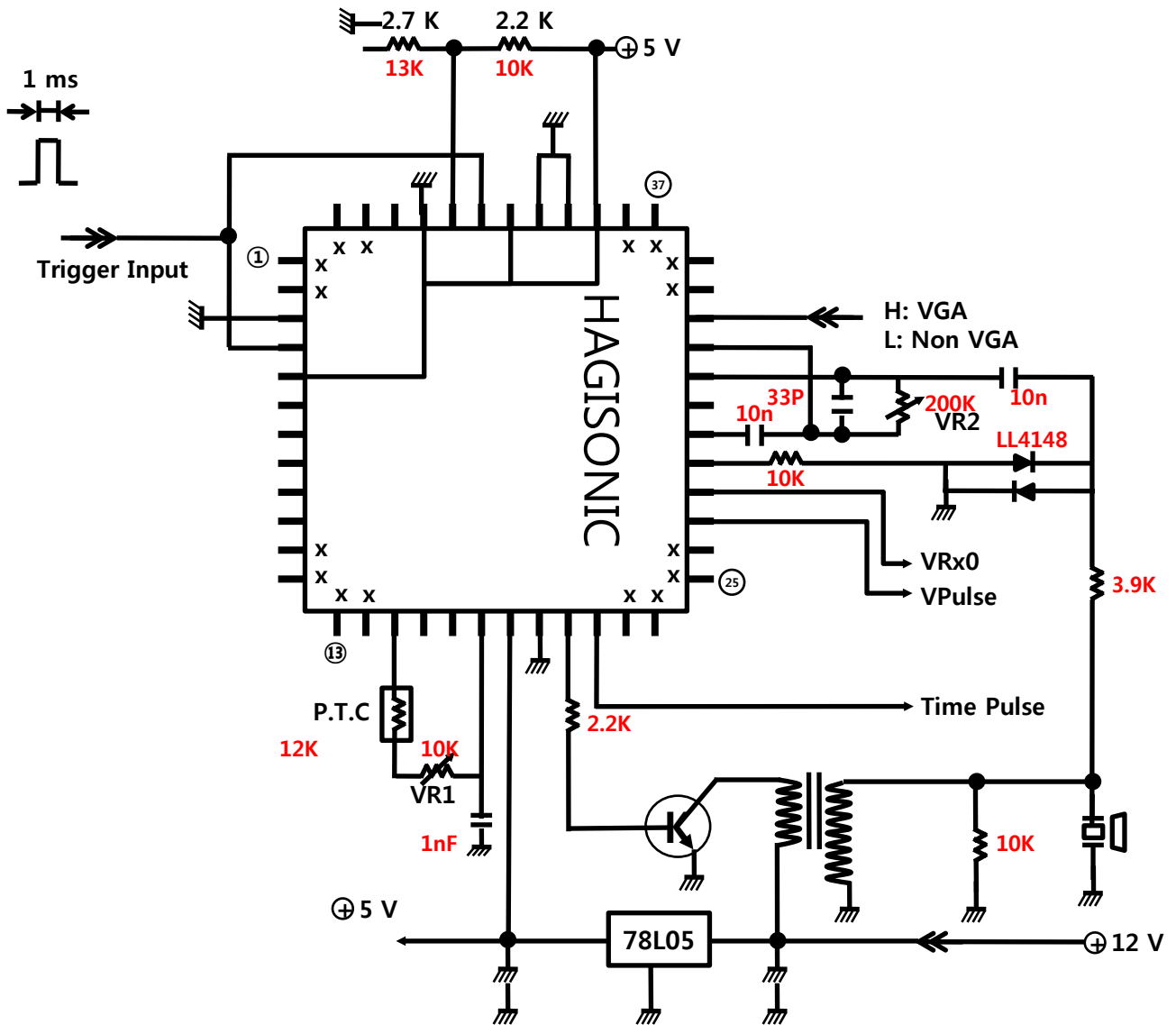
■ Free Run Mode

- All function is operated automatically with power inlet only.
- A transmitter and a receiver are separated and applied for a range finder and a proximity sensor and for detecting obstacles for mobile robots, etc.
- It is composed of five control parts.
 - VR1 : Trimmer of ultrasonic frequency 20 kHz ~ 100 kHz (Typically 40 kHz for robots)
 - VR2 : Control of trigger period, adjustable in the range of 5 ~ 100 times per second (20 ~ 30 times/sec recommended)
 - VR3 : Control of duration of burst, adjustable in 0.2 ~ 3 ms range (about 1 ms recommended)
 - VR4 : Control of receiving sensitivity (pre-amp). Adjustable in 0~ 30 dB gain
 - VR5 : Control of threshold level (Vref) at a receiving part.
(Optimum condition : about 55% of Vdd. Eg) 2.7 V for 5 V (Vdd)
Where, if change is not necessary, it can be simplified by using only a fixed resistor.
- Receiving amplification can be one of 'automatic' or 'constant' which is depending on connection of pin number 34
 - to high (5 V), where VGA function is enable
 - to low (GND), where VGA function is disableIn any mode, the manual gain (VR4) can be adjustable independently.
- Output voltage is proportional to the additional power inlet applied to 'pin 19' in the range 5 ~ 40 Vdc.
 - 5 V inlet : Detectable range of wall; 0 ~ 4 m
 - 40 V inlet : Detectable range of wall; 0 ~10 m

Reverse Parking Detector



■ Usage : One Sensor Transceiver w/ External Trigger Mode



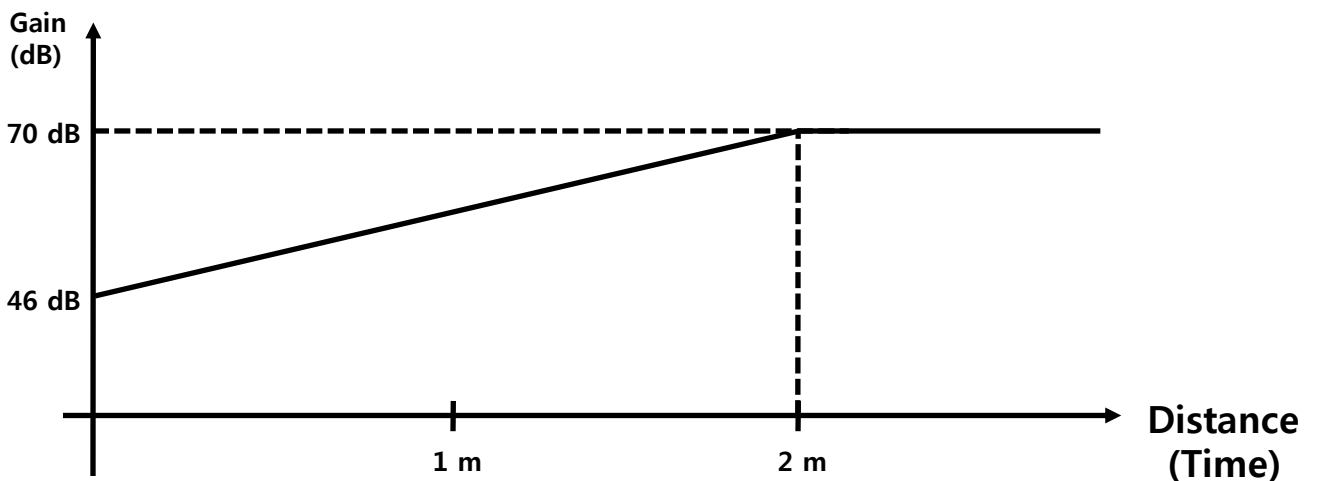
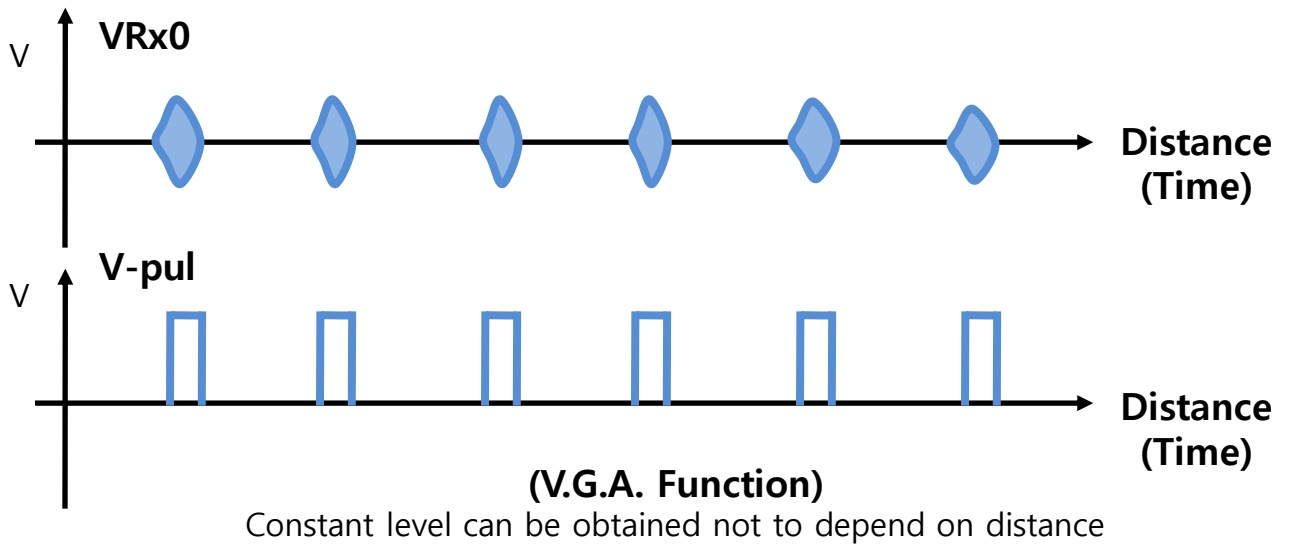
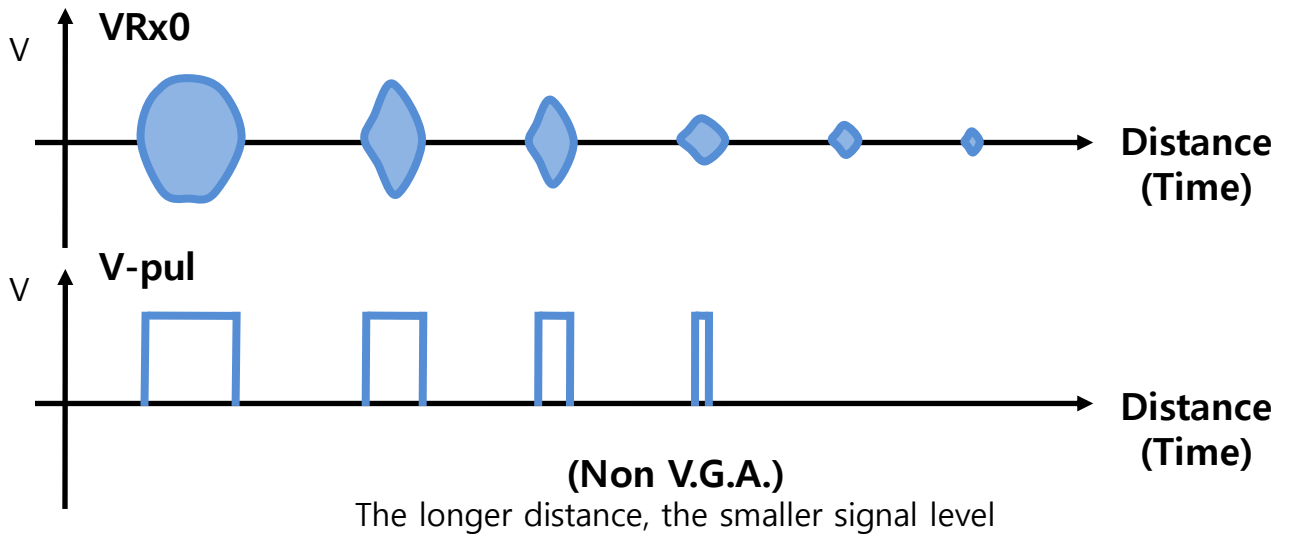
■ Specification (One Sensor Transceiver)

- Strong driver power for a sealed type outdoor system
- Designed for 12 V input power and addition of a separate booster circuit
(Power Amplification and Booster Circuit)
- Booster transformer has useful function, auto impedance matching and selection of T / R
- Limiter circuit to prevent over signal at input port of a receiver
- This application is operated by the trigger signal from main system and self trigger function is not necessary. It is simply compared with Free Run Mode.
(Trigger Pulse Width : about 1 ms TTL signal recommended)
- Two control parts
 - VR1 : Control Ultrasonic Frequency P.T.C (Positive Temperature Coefficient) series resistance can be compensated for temperature.
 - VR2 : Preset of receiver gain. Some case it can be replaced with fixed resistor.
- Receiver Amplifier Mode (VGA / Non VGA) also can be selected
- 3 types of receiver signal outputs are available but generally V-pul or T-pul is useful

■ Merit of ASIC Chip for Vehicle

- The Specific circuit is embedded to drive a transmitter at an optimum frequency to compensate temperature. Automatically tracking the resonant frequency change of ultrasonic sensor depending on temperature.
- Very tiny and low power consumption and useful to a very small type of a module
- A specially designed embedded V.G.A. circuit enhances S/N ratio on obstacle detection and distance measurement in the long range.
- No algorithm and no malfunction owing to a fully analog circuit.
- Optimized setting is available to each sensors with adjust point.
- Only a few of extra parts are necessary- cost efficiency and easy design.
- Strong output power with only a simple booster circuit.
- It's possible to select several input modes and output signals

The Effect of V.G.A. (Variable Gain Amplifier)



Characteristics of Gain Control vs. Distance

(Compensation proportional to distance in the range of 0~2m)

