

# **B6453 TMH VERTIGO**

## **49.860MHz RECEIVER OPERATIONAL DESCRIPTION**

The TMH Vertigo is a full function radio controlled toy truck. It operates on 7.2Volts supplied by 7.2V NiMH battery pack. It is designed to operate on a single fixed frequency in the 49.82-49.90MHz band .See the attached block diagram and schematic.

The modulated RF signal from the transmitter induces an electrical signal into the truck's permanently attached internal wire antenna.

The vehicle receiver receives and demodulates the AM transmitted signal from the transmitter, using a standard super-regenerative AM receiver/demodulator circuit comprised of ANT1, Q4, L1, L2, L3 and associated passive components. L2 is a tunable core slug inductor that is used to tune the receiver for maximum sensitivity. The output of the AM receiver/demodulator is AC coupled to a high input impedance CMOS inverter stage of the U1 decoder IC biased into their linear region through C19, C20, C23, R22, R23, R25, R27 which amplify, filter and shape the data. After the last inverter stage the incoming waveform is a digitized enough to be fed into the SI pin for on-chip decoding.

A Zener regulator circuit comprised of C25, C21, D10A, Q3, R17, and R18 creates the supply voltage, VDD for the super-regenerative radio, decoder IC and Comparator section.

Drive motors M1 and M2 are controlled by the U1 decoder IC, low power switching transistors Q7, Q8, and Q13, Q14 and a high power H-bridge comprised of Q5, Q6, Q9, Q10 and Q11, Q12, Q15, Q16 respectively. R32 and R37 are current sense resistors that permit a proportional sense voltage to be developed above them that is proportional to the amount of current through the bridge. The M1 Sense and M2 Sense signals are fed into low pass filters composed of R8 & C6 and R3 & C3 which filter transient current spikes and then into U2A and U2B, 2 sections of an LM339 quad comparator. These two signals are independently compared to identical reference voltages established by R1 & R2 and R5 & R6 that establish the trip point for the output of U2A and U2B, the over current output.

By using negative logic the outputs can be OR'ed together to generate and common over current condition output. When the output is active, over current is true, C8 will begin discharging through R47. After a delay the voltage on pin 8 of U2C is less than the reference voltage established by R7 & R46 causing the Shutdown output on pins 14 to switch to VDD. This inturn sinks the over current input to U2C to ground and latches the motors off via Q2, D5, D6, D7, D8. The wheels of the vehicle are "freewheeling" at this point and can only be reactivated when the control output (joystick control) signal is released and reengaged. D1, D2, D3, D4, and Q25, Q24 act to monitor joystick states as control signals at the output of the U1 decoder IC.

U2D acts as a low battery voltage dector. When the battery voltage drops to the setting value, R60 and R59 will detect this change, the voltage on pin11 will be less than the reference voltage (on pin10) established by R12 and D19, causing the shutdown output on pin14. It also causes no output to motor M1 and M2, until the control output (joystick control) signal is released and reengaged.

When the joystick is released the output of Q24 toggles state, resets the latch and the vehicle is returned to its normal play state.

Receiving some kind of control signal from transmitter, Pin11 and Pin6, or Pin10 and Pin 7 from U1 will have signal and will trigger integrated circuit (U3), LEDS will flash.

All tuning and verifications are performed by the manufacturer and there are no adjustments which can be made by the user. No external ground is required or used with this receiver.