WEDNESDAY, OCTOBER 3, 2007

Working with IC555

IC555 is the most versatile chip and is used in all most every kind of application because of its multi functionaly. as we know its on chip multivibrator means with IC555 one can design astable, monostable, bistable multivibrator. its main application is to generate timings, clock waveform, generate synchronizing signals, used as square wave oscillator and many more.

so here we are going to discuss some of the applications of IC555. here you will not find a theory of IC555 that how does it work in astable or monostable operation as everybody is already familiar with that, but here there is a practical approach given to design various application of the chip.

Astable Multivibrator:-

for astable operation of IC555 we have two design equations

f = 1.44 / (R1+2*R2)*C and

% duty cycle = $(R_1+R_2) / (R_1+2^*R_2)$

we have to find out three unknowns R1, R2 & C.

for given values of design parameters frequency and duty cycle we have to find out these three unknown. so lets understand it with one example. let's design 40KHz multivibrator for 60% duty cycle.

from given values

40000 = 1.44/(R1+2*R2)*C and

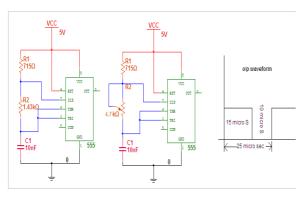
0.6 = (R1+R2) / (R1+2*R2)

here we have to assume the value of C. as from two equation we can not find three unknown. let us assume C=0.01 microF. substuting this value

(R1+2*R2) = 3600 substuting this value in second equation

(R1+R2) = 2160

from these two equations R1 = 720 ohm and R2 = 1.44K. the nearest practical values will be 780 ohm and 1.5K. putting these values we shall get freq = 38 KHz and duty cycle = 60%. if we use potentiometer of 4.7K instead of fixed value of R2 then we can set the exact 40 KHz freq.



if you want to design astable multivibrator for exact 50% dutycycle then the slight modification is done by connecting one diode accros registrer R2 as shown. now the value of both registers will be R1=R2=R and there is only one design equation

f = 1 / 0.69*R*C. here by assuming value of capacitor one can easily find the value of register. duty cycle will be always 50%. for above values of frequency and capacitor value of R will be 3.6K.

Monostable multivibrator:-

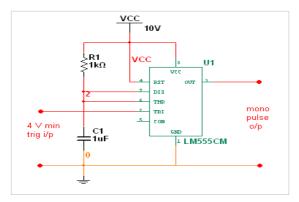
for monostable operation there is only one design equation

T = 1.1RC

this is the time for which the o/p remains high. if required time period is 1 ms. then

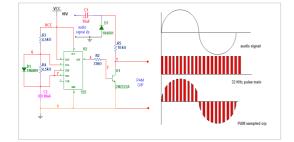
0.001 = 1.1RC here assume any suitable value of capacitor say 1 microF, so

R = 0.001 / 1.1*0.000001 = 990 ohm. if we take nearest value of 1K then time period will be 1.1ms.



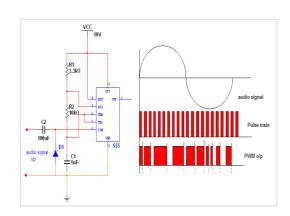
Pulse Amplitude Modulation(PAM):-

IC555 can be configured to generate PAM with one NPN transistor connected at output. the chip is configured in astable mode to generate high frequency carrier wave probabely 100-500KHz. this output is fed to base of NPN transistor. the collector of transistor is coupled with low frequency information signal probabely audio signal, the output at the collector of transistor that you get is PAM wave. the amplitude of pulses generated by IC555 varies in accrodance with the instanteneous amplitude of information signal.



Pulse Width Modulation(PWM):-

if IC555 is configured in monostable and high frequency trigger is applied (10-20KHz) with modulating signal applied to control input the output from chip with be PWM wave in which width width of pulse varies as amplitude of modulating wave changes, the capacitor and diode connected before control i/p to provide proper DC shift to i/p wave, internally the control voltage will change the reference voltage of comparator so charging time of capacitor changes every time so width of o/p pulse also changes.



Pulse Position Modulation (PPM):-

again IC555 is configured in astable mode(to generate carrier wave) and modulating wave is applied to control i/p via capacitor diode circuit. the output from chip will be PPM wave. the control i/p will change the position of pulse as the amplitude of modulating wave changes.

