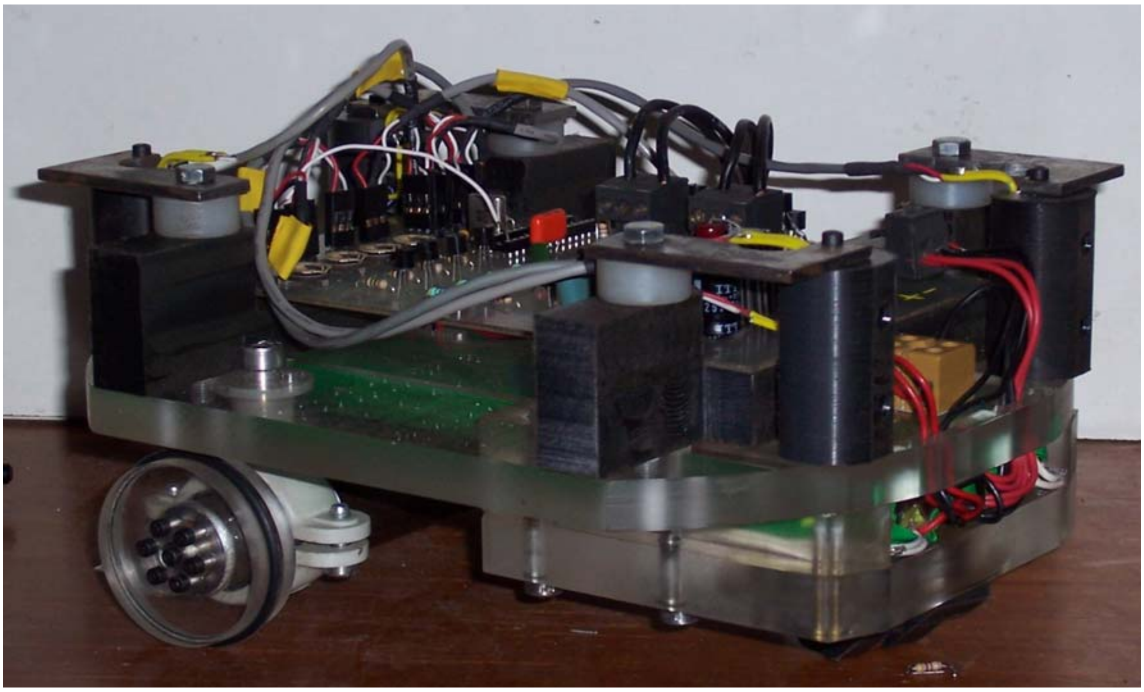
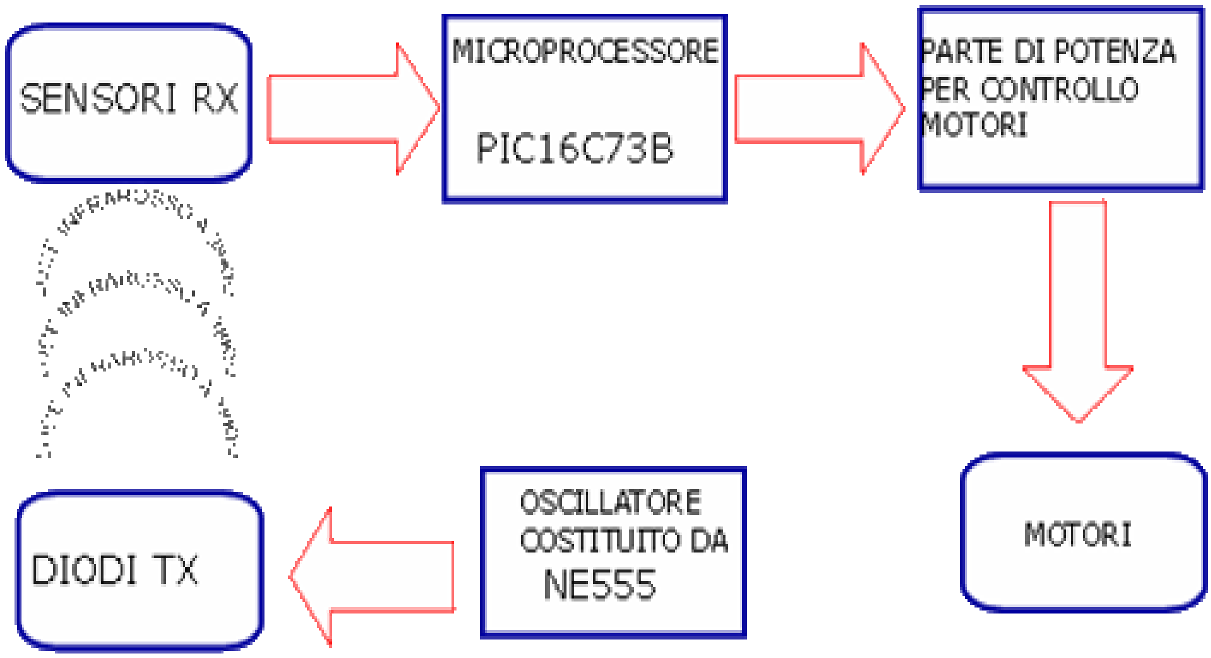


Un altro utilizzo del NE555

Circuito di rilevamento degli ostacoli in un robot

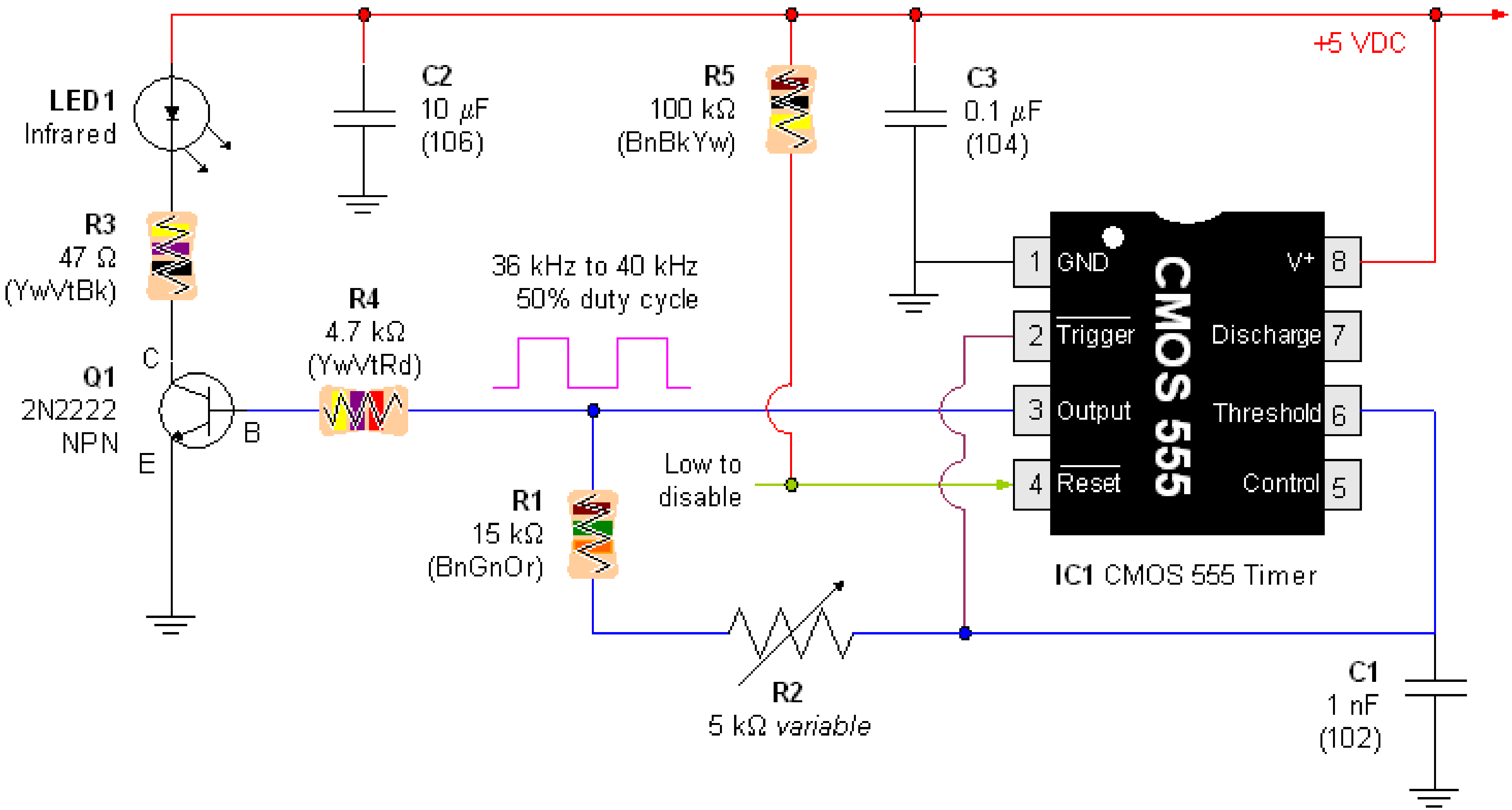
Vediamo un altro utilizzo del NE555. vogliamo realizzare un robot in grado di seguire autonomamente un percorso rilevando ostacoli sulla sua traettoria. Lo schema generale del sistema è il seguente



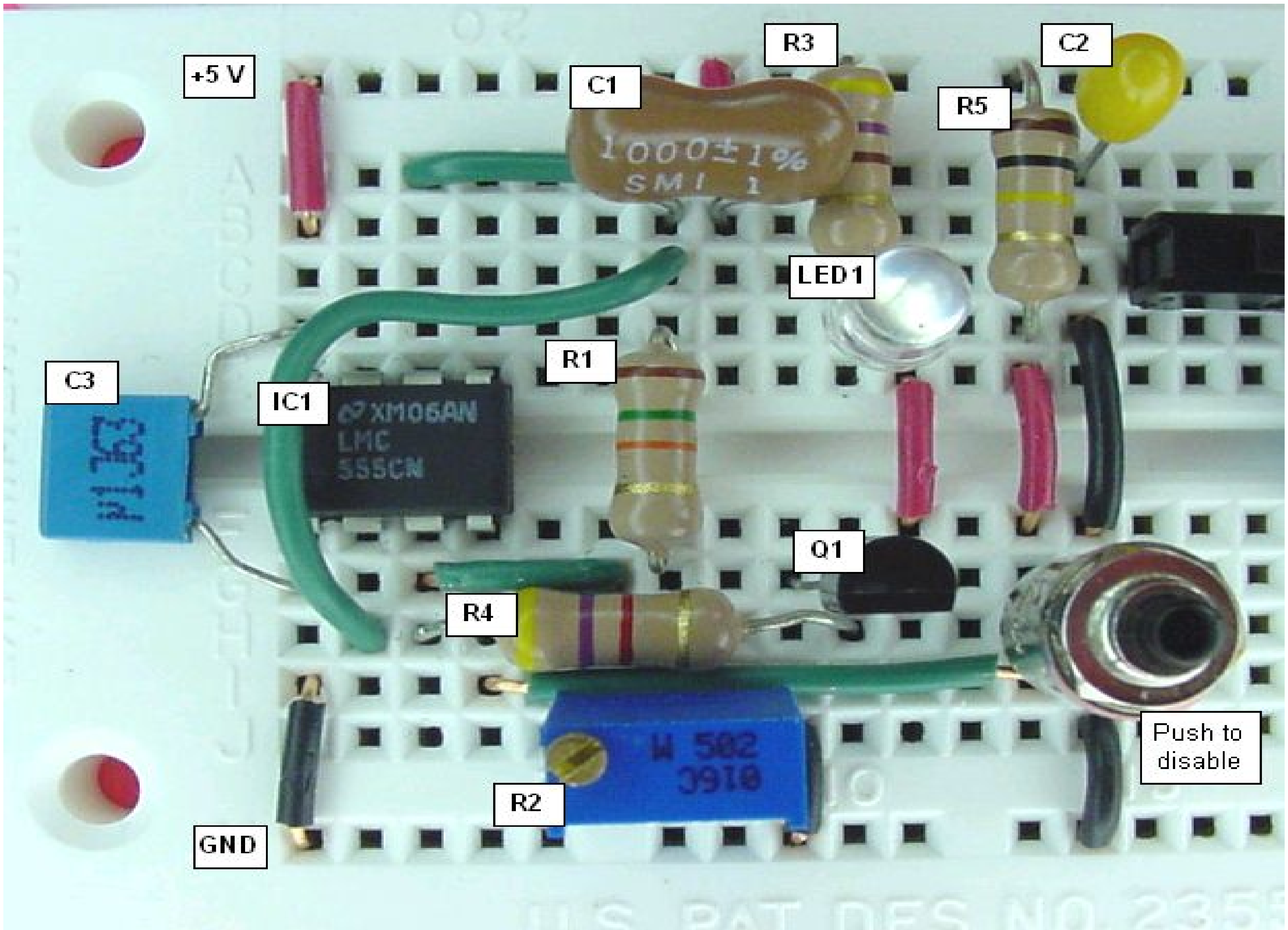
Un microcontrollore riceve informazioni da un sistema di rilevazione degli ostacoli, ed in base ad esse modifica la traettoria seguita comandando le ruote del robot.

Il circuito di rilevamento degli ostacoli è costituito da sensori PNA4602 della Panasonic che rilevano radiazioni nel campo del infrarosso. Questo sensore ha una frequenza di lavoro di 38 KHz. Un led d infrarossi deve emettere una radiazione ad infrarosso con questa frequenza, questa radiazione rimbalza sull'ostacolo e raggiunge il sensore consentendo di rilevare l'ostacolo.

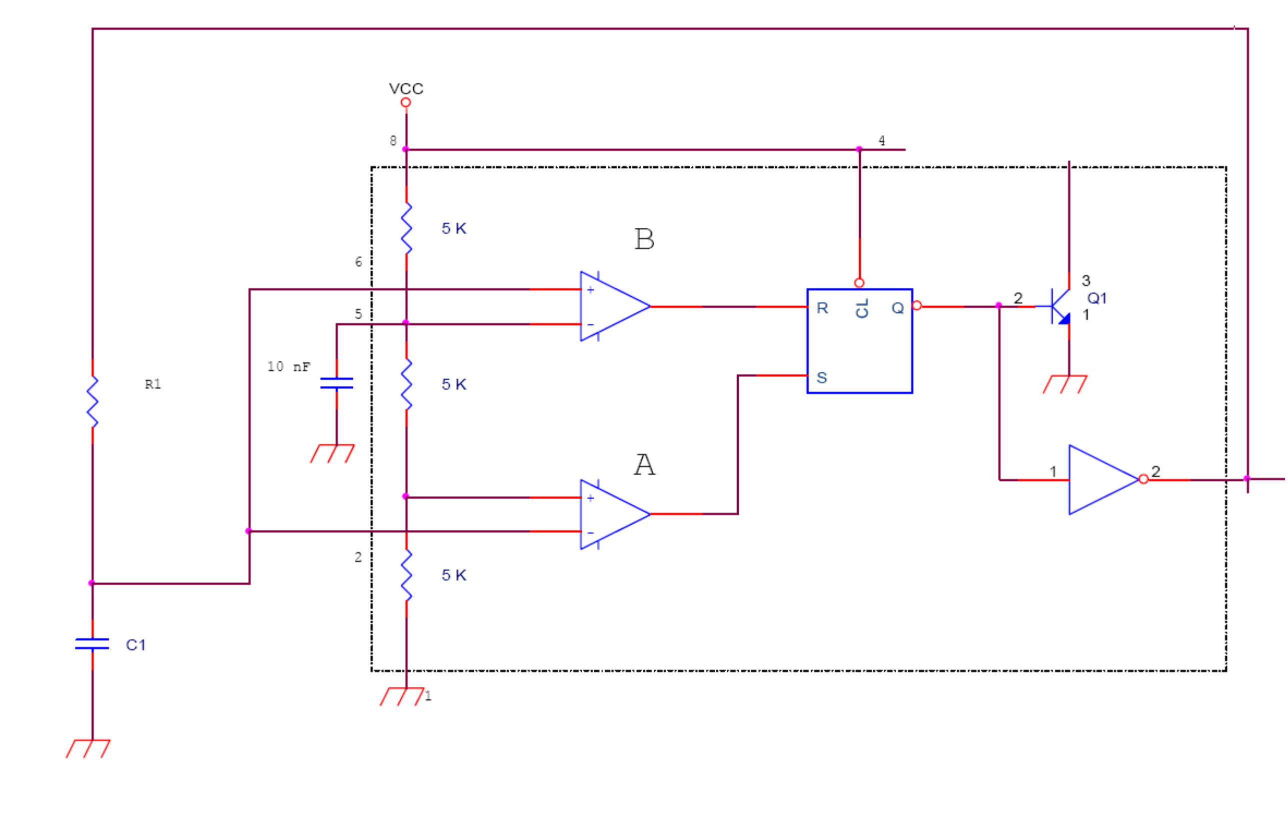
Di seguito abbiamo il circuito di pilotaggio del led. Un oscillatore basato su NE555 genera un'onda quadra di frequenza opportuna che comanda un bjt il quale comanda l'accensioen e lo spegnimento del led a infrarossi gereando il segnale che deve rimbalzare sull'ostacolo.



+5 VDC
LED1
Infrared
C2
10 µF
(106)
R5
100 kΩ
(BnBkYw)
C3
0.1 µF
(104)
R3
47 Ω
(YwVtBk)
36 kHz to 40 kHz
50% duty cycle
R4
4.7 kΩ
(YwVtRd)
Q1
2N2222
NPN
C
B
E
Low to
disable
R1
15 kΩ
(BnGnOr)
R2
5 kΩ variable
1 GND
2 Trigger
3 Output
4 Reset
V+ 8
Discharge 7
Threshold 6
Control 5
CMOS 555
IC1 CMOS 555 Timer
C1
1 nF
(102)


+5 V
C1
R3
C2
R5
LED1
R1
C3
IC1
Q1
R4
Push to disable
R2
GND

Il circuito è leggermente diverso da quello studiato come astabile, ma il funzionamento è identico. Con il condensatore C1 inizialmente scarico l'uscita del NE555 si trova a livello alto poiché nel latch S=1 ed R=0. il condensatore carica attraverso R1 che lo collega all'uscita Out fino a alla soglia di 2/3Vcc in corrispondenza della quale l'uscita del NE55 commuta a zero facendo scaricare il condensatore e così via.



Si avrà

$$T = t_H + t_L = 0.7(2R_1)C = 1.4R_1C$$

$$f = \frac{1}{1.4R_1C}$$

Scelto C da 1 nF, per ottenere una frequenza di 38 KHz dovremo avere

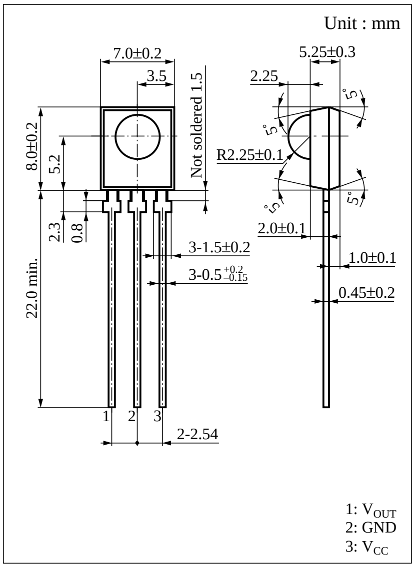
$$R_1 = \frac{1}{1.4fC} = \frac{1}{1.4*38*10^3*10^{-9}} = 0.0188*10^{-6} = 18.8K\Omega$$

Tale valore verrà ottenuto nel circuito mediante la resistenza fissa R1 ed il trimmer R2. la resistenza R5 è una resistenza di pull up che serve per interfacciare un pulsante non esplicitamente visibile nello schema che serve a portare il reste del NE555 a zero bloccando così l'oscillatore.

PNA4601M Series (PNA4601M/4602M/4608M/4610M)

Bipolar Integrated Circuit with Photodetection Function

For infrared remote control systems



■ Features

- Extension distance is 8 m or more
- External parts not required
- Adoption of visible light cutoff resin

■ Absolute Maximum Ratings (Ta = 25˚C)

Parameter	Symbol	Ratings	Unit
Power supply voltage	V_{CC}	– 0.5 to +7	V
Power dissipation	P_D	200	mW
Operating ambient temperature	T_{opr}	–20 to +75	˚C
Storage temperature	T_{stg}	– 40 to +100	˚C

■ Main Characteristics (Ta = 25˚C V_{CC} = 5V)

Parameter		Symbol	Conditions	min	typ	max	Unit
Operating supply voltage		V_{CC}		4.7	5.0	5.3	V
Current consumption		I_{CC}	Note 3	1.8	2.4	3.0	mA
Maximum reception distance		L_{max}	Note 1	8	10		m
Low-level output voltage		V_{OL}	Note 2		0.35	0.5	V
High-level output voltage		V_{OH}	Note 3	4.8	5.0	V_{CC}	V
Low-level pulse width		T_{WL}	Note 1	200	400	600	µs
High-level pulse width		T_{WH}	Note 1	200	400	600	µs
Carrier frequency	PNA4601M	f_0			36.7		kHz
	PNA4602M				38.0		
	PNA4608M				56.9		
	PNA4610M				33.3		

Note 1) Fig. 1 burst wave, L = L_{max}, 16 pulses
Note 2) Fig. 2 continuous wave, L ≤ L_{max}
Note 3) Light shut off condition

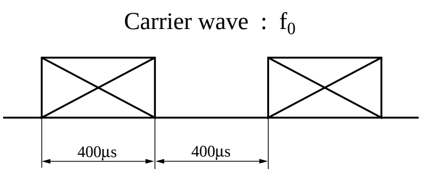


Fig.1

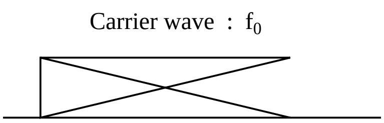
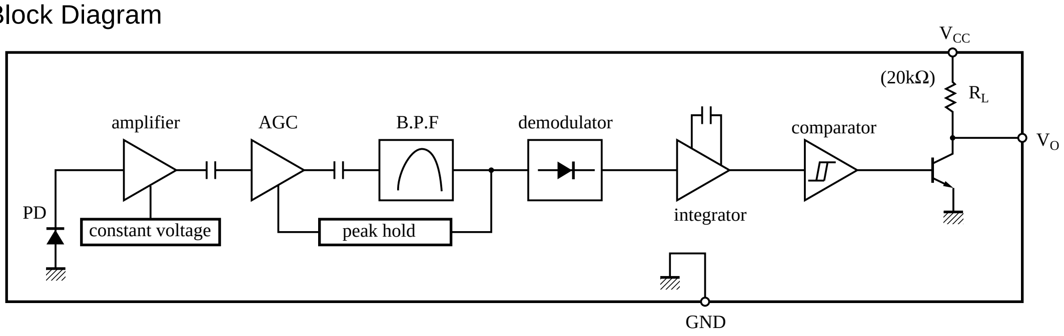
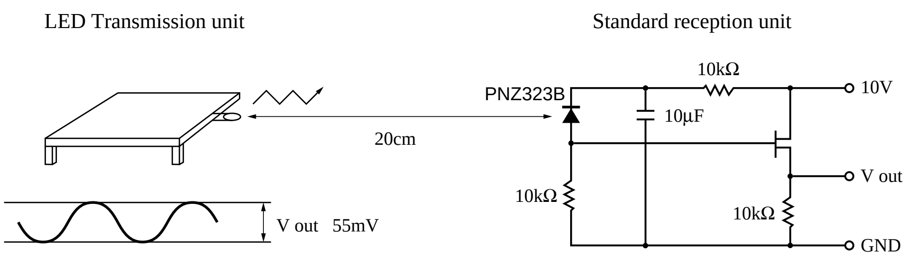


Fig.2

■ Block Diagram

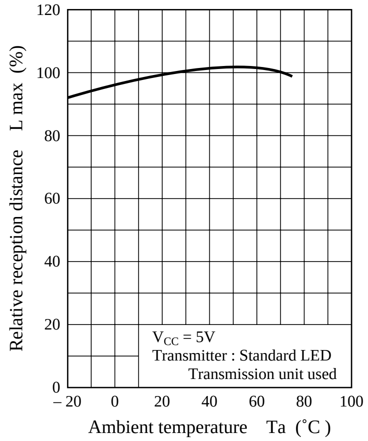


■ Panasonic Transmitter Specifications

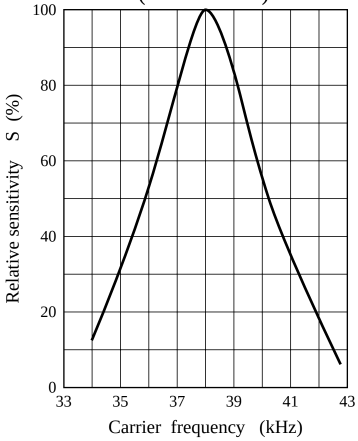


- The light output of the LED transmission unit is adjusted so that the transmission output (V out) of the standard reception unit will be 55 mV when the transmission waveform (duty = 50%) is output from the LED transmission unit. Here, infrared sensitivity (SIR) of PNZ323B is 0.53 µA when emission illuminance (H) is 12.45 µW/cm^2.
- The maximum reception distance under these specifications is an assurance that T_{WH} and T_{WL} values will be within the tolerance ranges when 16 consecutive pulses of an optical output equivalent to the maximum reception distance are transmitted by the above transmission unit (The maximum reception distance is measured in the dark without external disturbance noise.)

L max — Ta

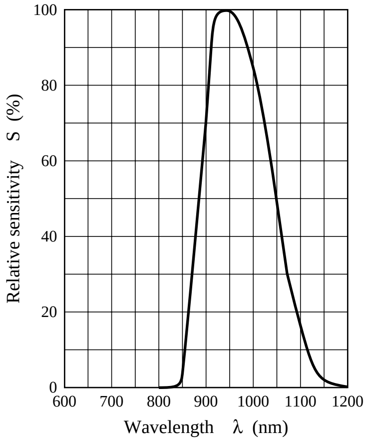


B.P.F frequency characteristics (PNA4602M)*

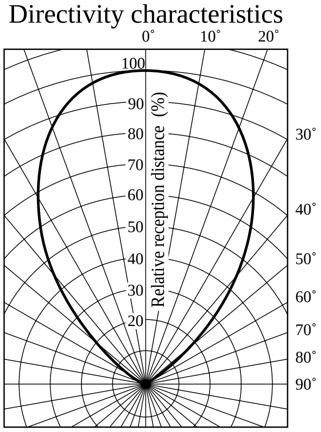


* The peaks for PNA4601M, PNA4608M, and PNA4610M are all f_0.

Spectral sensitivity characteristics



Directivity characteristics

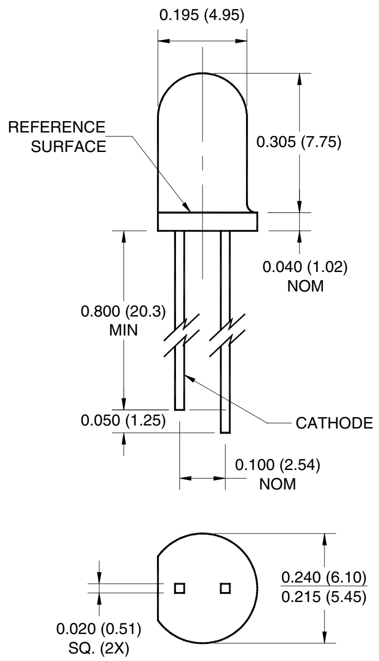


FAIRCHILD SEMICONDUCTOR®

PLASTIC INFRARED LIGHT EMITTING DIODE

QED233 QED234

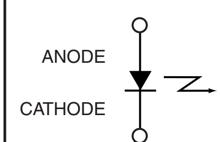
PACKAGE DIMENSIONS



NOTES:

1. Dimensions for all drawings are in inches (mm).
2. Tolerance of ± .010 (.25) on all non-nominal dimensions unless otherwise specified.

SCHEMATIC



DESCRIPTION

The QED233 / QED234 is a 940 nm GaAs / AlGaAs LED encapsulated in a clear untinted, plastic T-1 3/4 package.

FEATURES

- λ= 940 nm
- Chip material =GaAs with AlGaAs window
- Package type: T-1 3/4 (5mm lens diameter)
- Matched Photosensor: QSD122/123/124
- Medium Emission Angle, 40°
- High Output Power
- Package material and color: Clear, untinted, plastic
- Ideal for remote control applications

FAIRCHILD SEMICONDUCTOR®

QED233 QED234

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit
Operating Temperature	T_{OPR}	-40 to +100	°C
Storage Temperature	T_{STG}	-40 to +100	°C
Soldering Temperature (Iron)(2,3,4)	T_{SOL-I}	240 for 5 sec	°C
Soldering Temperature (Flow)(2,3)	T_{SOL-F}	260 for 10 sec	°C
Continuous Forward Current	I_F	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation(1)	P_D	200	mW
Peak Forward Current	I_{FP}	1.5	A

1. Derate power dissipation linearly 2.67 mW/°C above 25°C.
2. RMA flux is recommended.
3. Methanol or isopropyl alcohols are recommended as cleaning agents.
4. Soldering iron 1/16" (1.6mm) minimum from housing.
5. Pulse conditions; tp = 100 µs, T = 10 ms.

ELECTRICAL / OPTICAL CHARACTERISTICS (T_A =25°C)

PARAMETER	TEST CONDITIONS	DEVICE	SYMBOL	MIN	TYP	MAX	UNITS
Peak Emission Wavelength	I_F = 20 mA	ALL	λ_{PE}	—	940	—	nm
Spectral Bandwidth	I_F = 20 mA	ALL	—	50	—	nm	
Temp. Coefficient of λ_{PE}	I_F = 100 mA	ALL	TC_λ	—	0.2	—	nm/K
Emission Angle	I_F = 100 mA	ALL	$2\Theta 1/2$	—	40	—	Deg.
Forward Voltage	I_F = 100 mA, tp = 20 ms	ALL	V_F	—	—	1.6	V
Temp. Coefficient of V_F	I_F = 100 mA	ALL	TC_V	—	-1.5	—	mV/K
Reverse Current	V_R = 5 V	ALL	I_R	—	—	10	µA
Radiant Intensity	I_F = 100 mA, tp = 20 ms	QED233	I_E	10	—	50	mW/sr
		QED234		27	—	—	
Temp. Coefficient of I_E	I_F = 20 mA	ALL	TC_I	—	-0.6	—	%/K
Rise Time	I_F = 100 mA	ALL	t_r	—	1000	—	ns
Fall Time		ALL	t_f	—	1000	—	

TYPICAL PERFORMANCE CURVES TBD

Fig. 1 Normalized Radiant Intensity vs. Forward Current

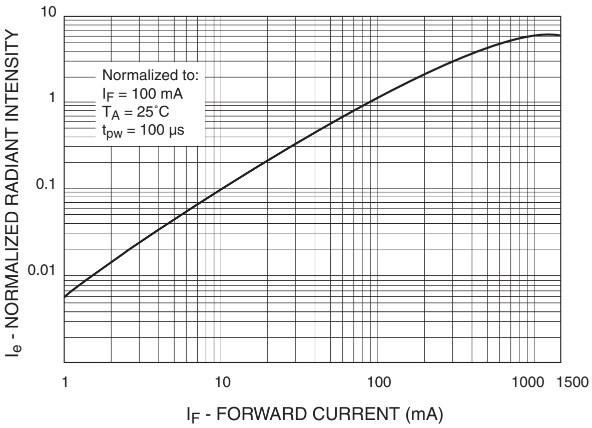


Fig. 2 Forward Voltage Vs. Ambient Temperature

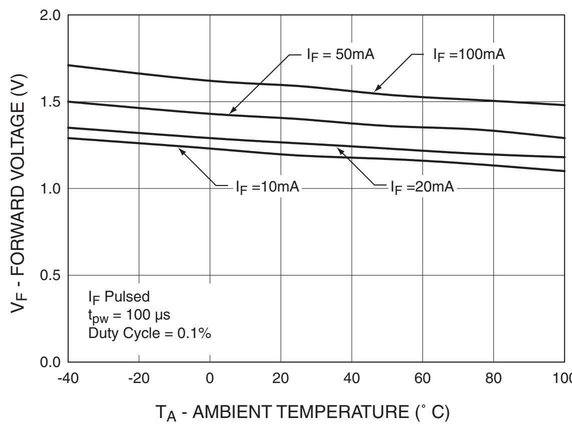


Fig. 3 Normalized Radiant Intensity vs. Wavelength

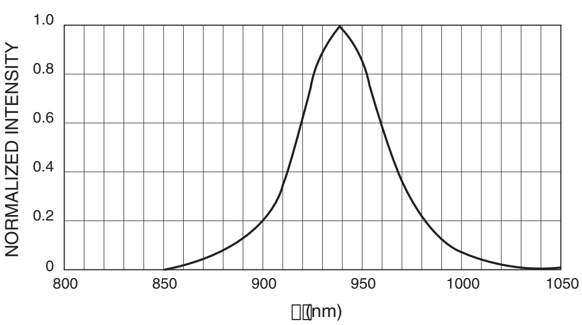


Fig. 4 Radiation Diagram

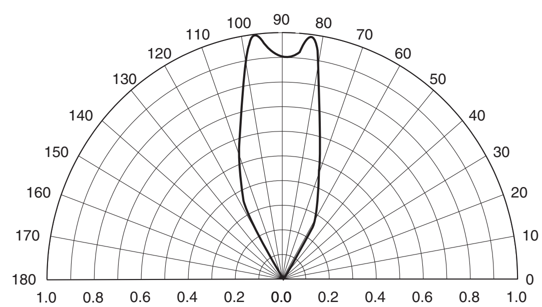
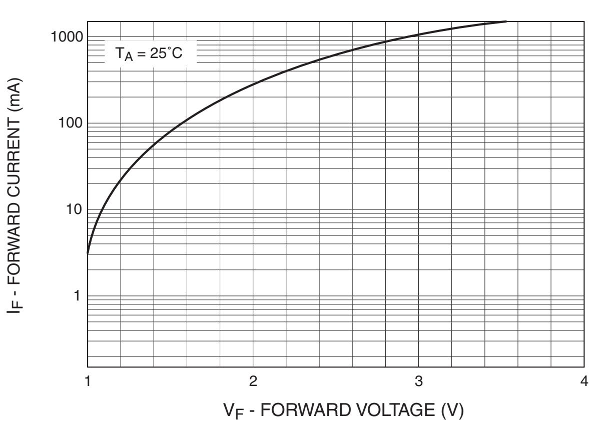


Fig. 5 Forward Current vs. Forward Voltage



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.