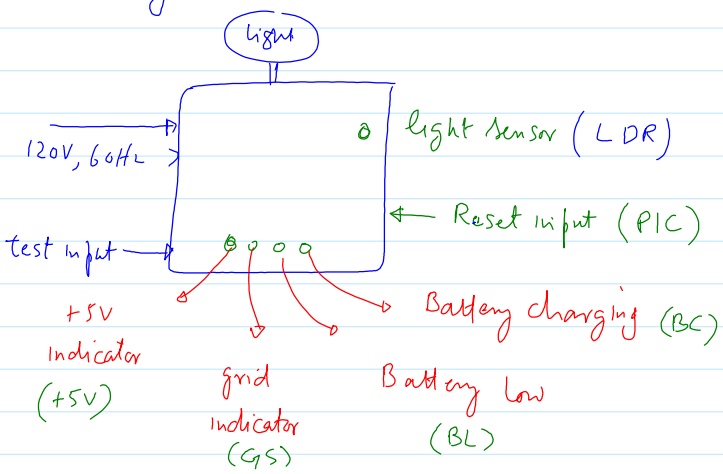
Lab4: Design a PIC16F684 based portable emergency light control circuit.

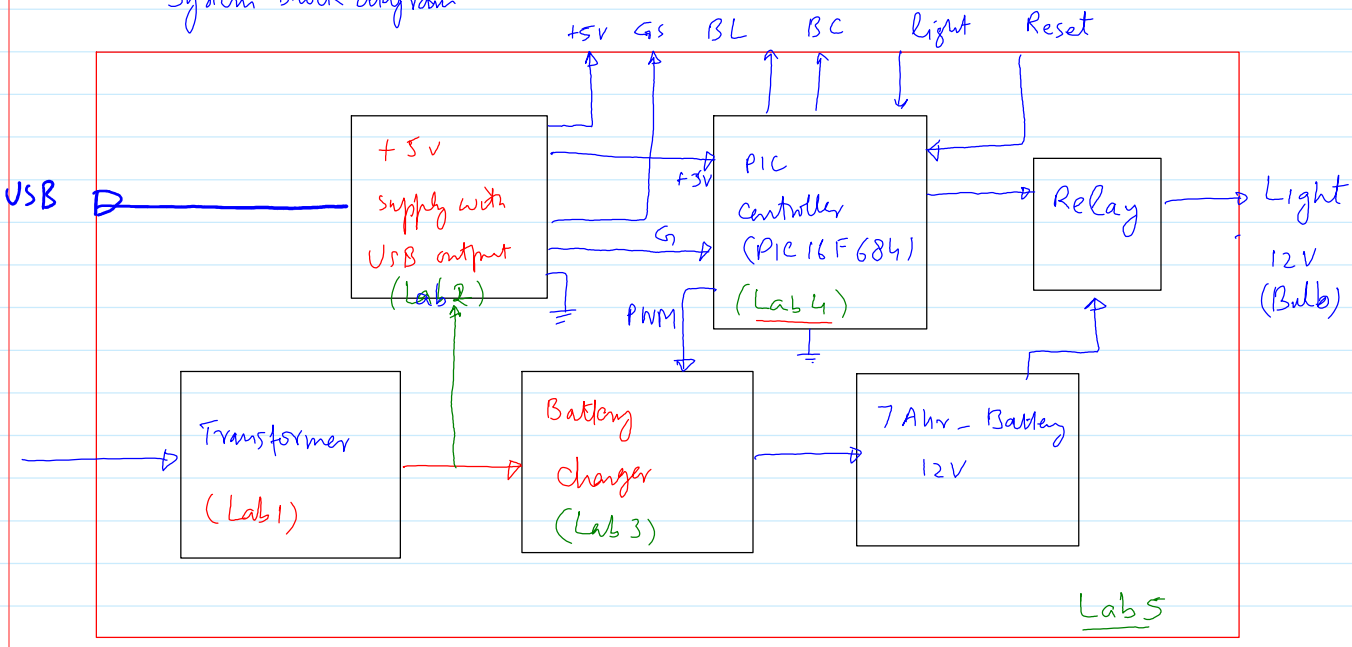
Lab5: Package, verify, demonstrate and present a brochure of the designed emergency light system.

Ideal

System sketch

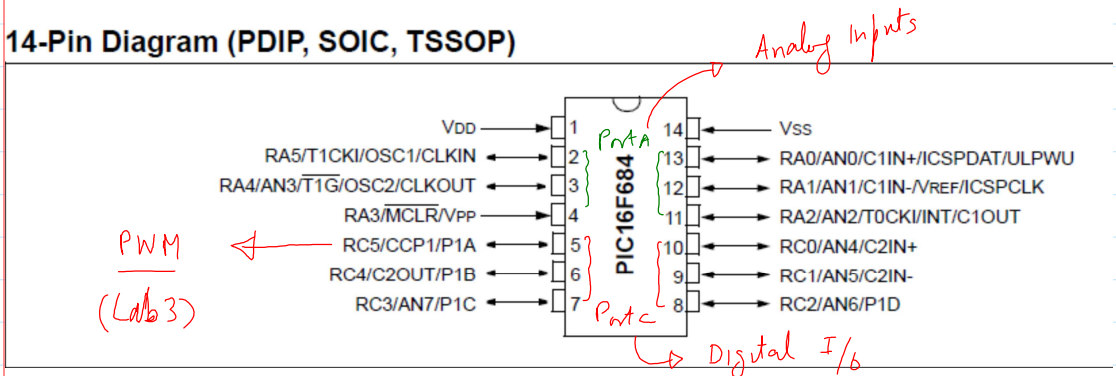


System Block diagram



PIC16F684

14-Pin Diagram (PDIP, SOIC, TSSOP)



Relay:

Product Overview	
Digi-Key Part Number	255-3350-ND
Quantity Available	22,035 Can ship immediately
Manufacturer	Panasonic Electric Works
Manufacturer Part Number	LKT1AF-12V
Description	RELAY GEN PURPOSE SPST 5A 12V
Expanded Description	General Purpose Relay SPST-NO (1 Form A) 12VDC Coil Through Hole
Lead Free Status / RoHS Status	Lead free / RoHS Compliant
Moisture Sensitivity Level (MSL)	1 (Unlimited)
Manufacturer Standard Lead Time	26 Weeks

Price & Procurement

Quantity 1

255-3350-ND

Customer Reference

Add to Cart

All prices are in CAD.

Price Break	Unit Price	Extended Price
1	2.45000	2.45
10	2.29500	22.95
25	2.04040	51.01
50	1.93840	96.92
100	1.83640	183.64
250	1.63232	408.08
500	1.53030	765.15
1,000	1.42828	1,428.28
5,000	1.37727	6,886.34

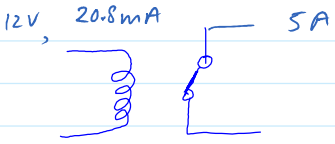
Submit a request for quotation on quantities greater than those displayed.

Documents & Media

Datasheets	LK-T Relays
Other Related Documents	How to Read Date Codes

Product Attributes Select All

Categories	Relays Power Relays, Over 2 Amps
Manufacturer	Panasonic Electric Works
Series	LK-T
Packaging	Tube
Part Status	Active
Relay Type	General Purpose
Coil Type	Non Latching
Coil Current	20.8mA
Coil Voltage	12VDC
Contact Form	SPST-NO (1 Form A)
Contact Rating (Current)	5A



SPST – NO

(single pole single throw
normally open)

All prices are in Canadian dollars.

Digi-Key Part Number	PDV-P8104-ND
Quantity Available	Digi-Key Stock: 1,767 Can ship immediately
Manufacturer	Advanced Photonix Inc
Manufacturer Part Number	PDV-P8104
Description	PHOTOCELL 27-60KOHM
Lead Free Status / RoHS Status	Contains lead / RoHS non-compliant
Moisture Sensitivity Level (MSL)	1 (Unlimited)

Price Break	Unit Price	Extended Price
1	1.35000	1.35
5	1.29200	6.46
10	1.12500	11.25
25	0.98840	24.71
50	0.82120	41.06
100	0.69950	69.95
250	0.63868	159.67
500	0.60826	304.13
1,000	0.53222	532.22

Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

Quantity 1 | Item Number PDV-P8104-ND | Customer Reference | Add to Cart

When requested quantity exceeds displayed pricing table quantities, a lesser unit price may appear on your order. You may submit a request for quotation on quantities which are greater than those displayed in the pricing table.

All prices are in Canadian dollars.

Digi-Key Part Number	PDV-P8104-ND
Quantity Available	Digi-Key Stock: 1,767 Can ship immediately
Manufacturer	Advanced Photonix Inc
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Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

Quantity: 1 | Item Number: PDV-P8104-ND | Customer Reference: | Add to Cart

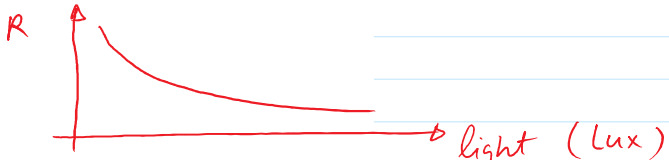
When requested quantity exceeds displayed pricing table quantities, a lesser unit price may appear on your order. You may submit a request for quotation on quantities which are greater than those displayed in the pricing table.

Datasheets	PDV-P8104
Product Photos	PDV-P8104
Standard Package	400
Category	Sensors, Transducers
Family	Optical Sensors - Photo Detectors - CdS Cells
Series	-
Wavelength	520nm
Voltage - Max	150Vpk
Rise Time (Typ)	60ms
Fall Time (Typ)	25ms
Cell Resistance (Min) @ Dark	2 MOhms @ 10 seconds
Cell Resistance @ Illuminance	27 ~ 60 kOhms @ 10 lux
Operating Temperature	-30°C ~ 75°C (TA)
Catalog Page	2723 (CA2011 PDF)
Other Names	PDVP8104 PT-PDV-P8104

Customers who are interested in this product are also interested in:

PDV-P5003
Advanced Photonix Inc
PHOTOCELL 12K-58K OHM 11MM
Unit Price 3.38000

PDV-P8103
Advanced Photonix Inc
PHOTOCELL 16-33KOHM
Unit Price 1.35000

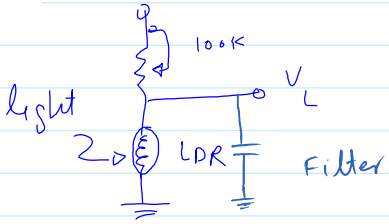


ELECTRO-OPTICAL CHARACTERISTICS RATING (TA)= 23°C UNLESS OTHERWISE NOTED

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN	TYP	MAX	UNITS
R_D	Dark Resistance	After 10 sec. @ 10 Lux @ 2856 °K	2			MΩ
R_I	Illuminated Resistance	10 Lux @ 2856 °K	27		60	KΩ
S	Sensitivity	LOG(R100)-LOG(R10)** LOG(E100)-LOG(E10)***		0.8		Ω/Lux
λrange	Spectral Application Range	Flooded	400		700	nm
λpeak	Spectral Application Range	Flooded		520		nm
t_r	Rise Time	10 Lux @ 2856 °K		60		ms
T_f	Fall Time	After 10 Lux @ 2856 °K		25		ms

light ↑ R_{LDR} ↓

+5V



light ↑ , V_L ↓

Feit Electric 35W-Equivalent MR16 Reflector LED Bulb
Product #52-0686-4

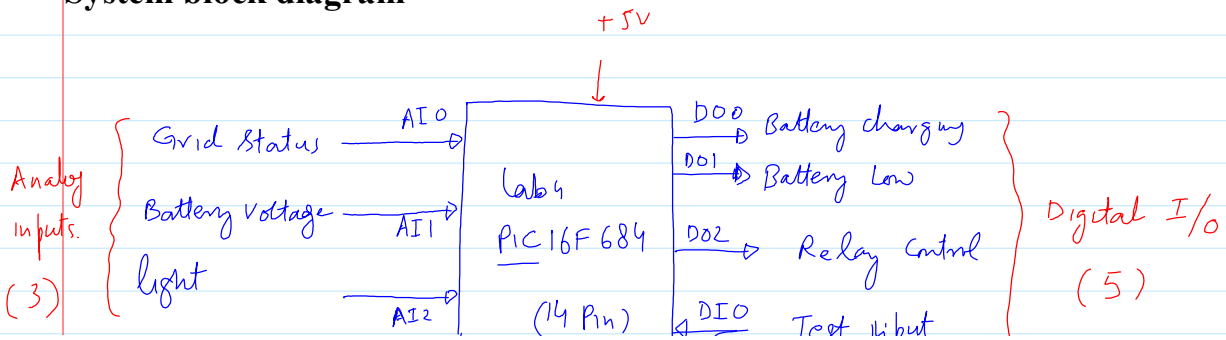
or similar 12V LED Bulb

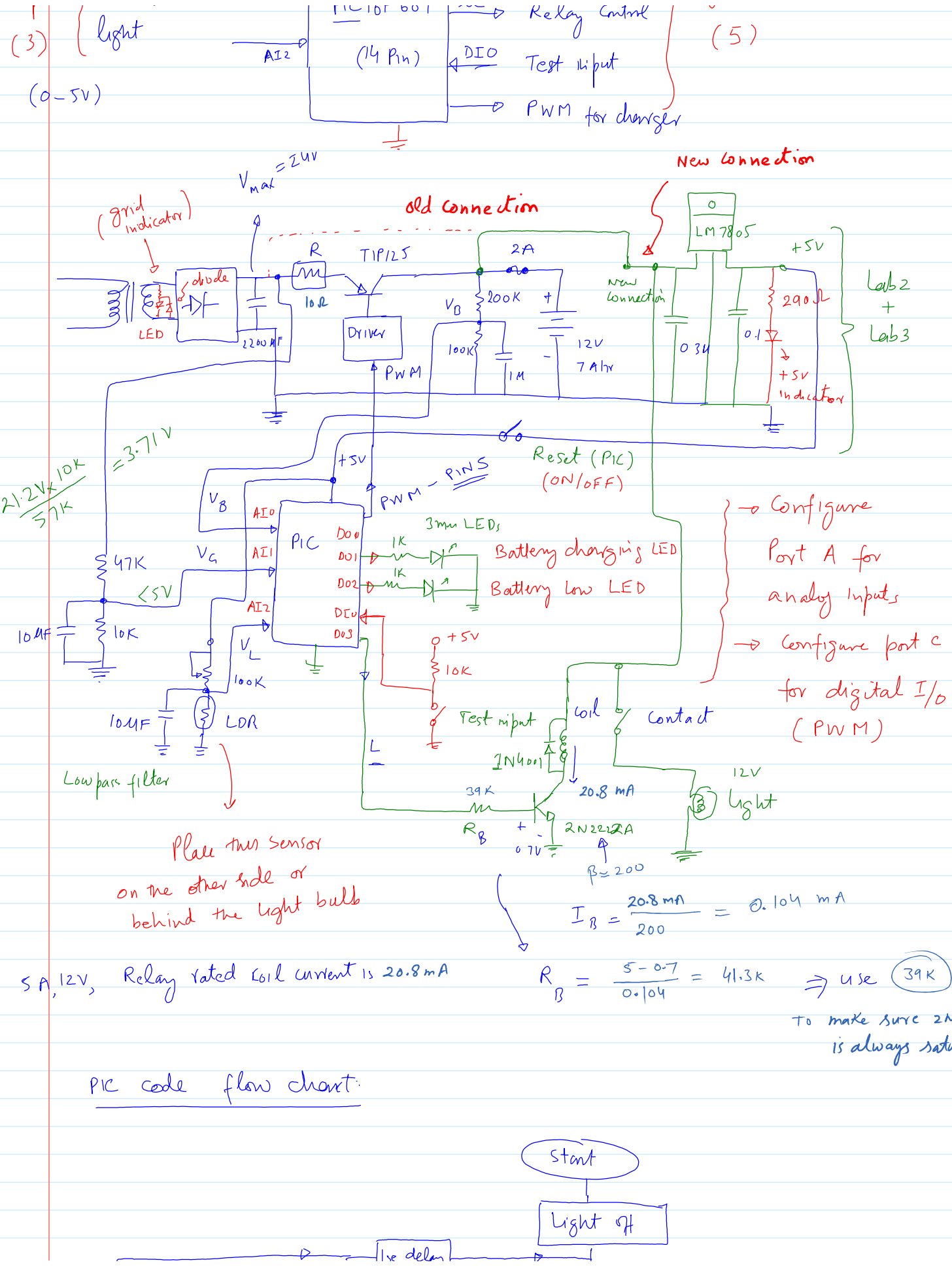
Draws about 6.5W

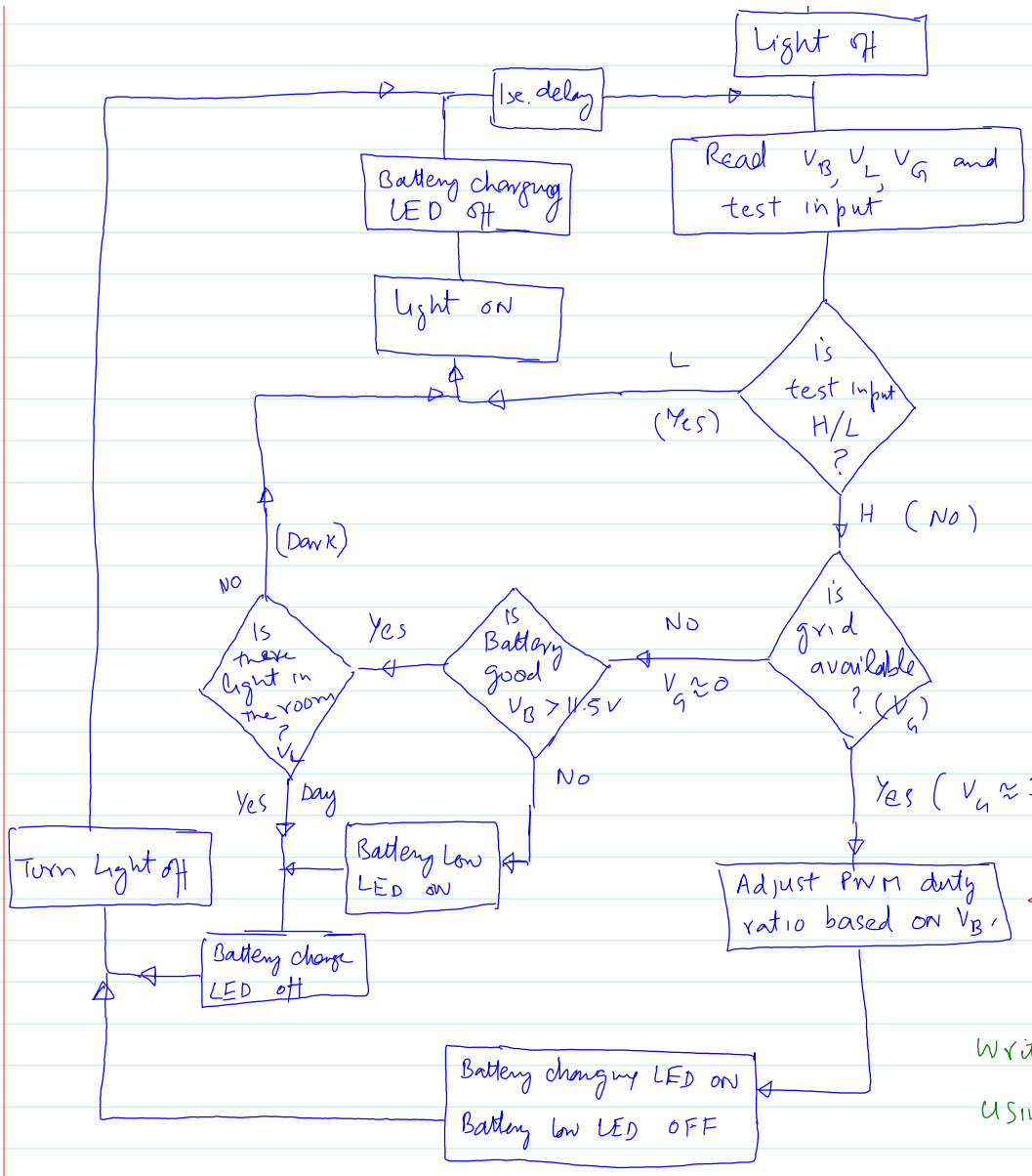
$\frac{6.5W}{12V} = 0.54A$

Battery 7Ah ⇒ $\frac{7Ah}{0.54} \approx 13$ hr of operation (Good battery 100% discharge)

System block diagram




(3)
light
(0-5V)
AI2
PIC for bot
(14 Pin)
DIO
Relay Control
Test input
PWM for charger
(5)
New connection
old connection
V_{max} = 24V
(grid indicator)
LED
diode
2200 MF
R
10Ω
TIP125
Driver
PWM
2A
200K
V_B
100K
1M
12V
7 Ahr
LM7805
0
New connection
+5V
290Ω
0.1
0.33
+5V indicator
Lab2 + Lab3
Reset (PIC) (ON/OFF)
PWM - PINS
+5V
21.2V * 10K / 71K = 3.71V
47K
<5V
10MF
10K
V_B
V_C
V_L
100K
LDR
10MF
Low pass filter
AI0
AI1
AI2
PIC
DO0
DO1
DO2
DO3
DIO
3mm LEDs
1K
1K
Battery charging LED
Battery low LED
+5V
10K
Test input
L
Coil
Contact
IN4001
39K
R_B
20.8 mA
2N2222A
0.7V
β ≈ 200
12V
Light
→ Configure Port A for analog inputs
→ Configure port C for digital I/O (PWM)
Place this sensor on the other side or behind the light bulb
5A, 12V, Relay rated coil current is 20.8mA
$I_B = \frac{20.8\,mA}{200} = 0.104\,mA$
$R_B = \frac{5 - 0.7}{0.104} = 41.3K$ ⇒ use 39K
To make sure 2N222A is always saturated
PIC code flow chart:
Start
Light ON
1s delay



← Charger Part (Lab 3)

Write your PIC Code using this flow chart.

TASKS: Add above circuit to your board, Program PIC16F684 and test and circuit and code.

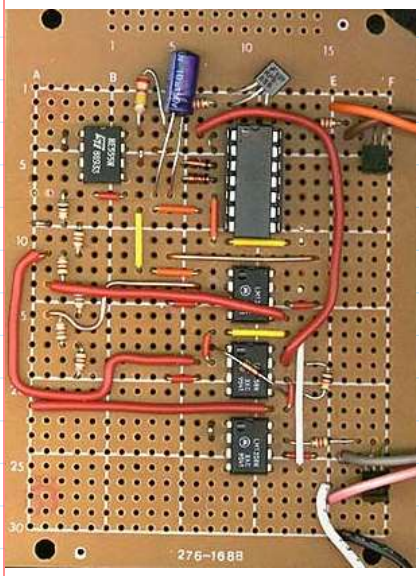
Testing

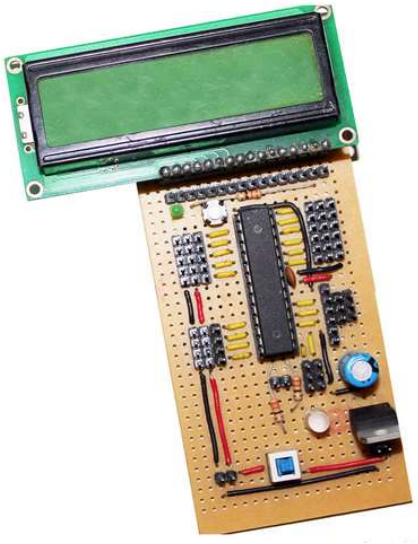
Test input	Battery Good (V_B) $V_B > 11.5V$	Grid (V_G) $V_G > 3V$	Dark (V_L) $V_L > 2.5V$	Light	Battery charging	Battery Low LED
N	N	N	N	OFF	OFF	ON
N	N	N	Y	OFF	OFF	ON
N	N	Y	N	OFF	ON	OFF
N	N	Y	Y	OFF	ON	OFF
N	Y	N	N	OFF	OFF	OFF
N	Y	N	Y	ON	OFF	OFF
N	Y	Y	N	OFF	ON	OFF
N	Y	Y	Y	OFF	ON	OFF
Y	Y	Y	X	ON	OFF	OFF

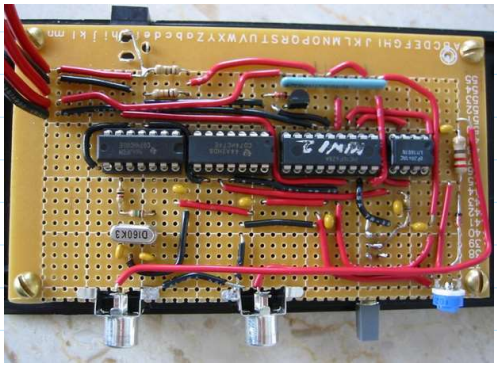
N	Y	Y	1	ON		OFF
Y	X	X	X	ON	OFF	OFF

|Depending upon your code, your test results table may be different from the above table.

Some good circuit building examples using prototype boards







Some groups have built this quality circuit.

Watch: https://youtu.be/mIE79Vai5z0