Open Source Lights - RC Light Controller

	Schematic Part	Manufacturer	Item Description	Manufacturer Part Number	Retailer Part Number	Price Ea.	Qty	Notes
	IC1	Atmel	Arduino bootloader-programmed Atmega328P		123	$5.95	1	Recommended - bootloader already installed - Purchase from Adafruit
Alternate	IC1	Atmel	MCU AVR 32K FLASH 28-PDIP	ATMEGA328P-PU	ATMEGA328P-PU-ND	$4.98	1	This one needs an Arduino bootloader installed before placing on board
	-	3M	SOCKET IC OPEN FRAME 28POS .3"	4828-3004-CP	3M5480-ND	$0.77	1	Optional (but recommended) Atmega socket - allows removal of the chip if necessary
	Y1	TXC Corp	CRYSTAL 16.000 MHZ 18PF HC49US	9B-16.000MAAJ-B	887-1019-ND	$0.46	1	Crystal
	C1-C2	Kemet	CAP 22PF 200V 5% CER RADIAL	C315C220J2G5TA	399-4162-ND	$0.43	2	22pf caps for crystal
	C3-C5	Kemet	CAP .1UF 50V 20% CER RADIAL	C315C104M5U5TA	399-4265-ND	$0.30	3	Bypass caps - VCC, ARef, DTR Reset
	C6	Nichicon	CAP ALUM 220UF 50V 20% RADIAL	UVZ1H221MPD	493-1342-ND	$0.47	1	Power supply cap
	D1	Fairchild	DIODE SS FAST 100V 200MA DO35	1N4148TA	1N4148TACT-ND	$0.14	1	Voltage drop diode - keeps Atmega near 5v even in 6v system
	T1-T8	Fairchild	TRANS NPN 45V 0.8A TO-92	BC33725TA	BC33725TACT-ND	$0.21	8	BC337 NPN transistors, TO92
	RC & FTDI Header	Samtec	CONN HEADER 15POS .100" SGL GOLD	TSW-115-23-L-S	SAM1071-15-ND	$1.19	1	Male break-away headers for RC inputs and FTDI cable
Choose	Light 1-8 sockets	JST	CONN HEADER PH SIDE 2POS 2MM	S2B-PH-K-S(LF)(SN)	455-1719-ND	$0.98	8	JST male sockets - right angle. (Price for 10)
One	Light 1-8 sockets	JST	CONN HEADER PH TOP 2POS 2MM	B2B-PH-K-S(LF)(SN)	455-1704-ND	$0.99	8	JST male sockets - vertical. (Price for 10)
	R1-R8	Yageo	RES 562 OHM 1/4W 1% AXIAL	MFR-25FBF52-562R	562XBK-ND	$0.84	8	Base resistors (Price for 10)
	R9-R10	Yageo	RES 221 OHM 1/4W 1% METAL FILM	MFR-25FBF-221R	221XBK-ND	$0.50	2	Resistors. (Price for 5)
	R11-18	Yageo	RES 100 OHM 1/4W 1% METAL FILM	MFR-25FBF-100R	100XBK-ND	$0.84	8	LED current-limiting resistors: OR CHOOSE YOUR OWN VALUES
	R19	Yageo	RES 10.0K OHM 1/4W 1% METAL FILM	MFR-25FBF-10K0	10.0KXBK-ND	$0.63	1	10k Reset pull-up resistor. (Price for 5)
	Red LED	Panasonic	LED RED DIFFUSED 3MM ROUND	LN28RCPX	67-2295-ND	$0.45	1	3mm red indicator LED
	Green LED	Panasonic	LED GREEN DIFFUSED 3MM ROUND	LN38GCPX	67-2238-ND	$0.46	1	3mm green indicator LED
	S1	TE Conn.	SWITCH TACTILE SPST-NO 0.05A 24V	1825910-6	450-1650-ND	$0.11	1	Pushbutton - standard 6x6mm outline tactile switch, 5mm actuator height off board

NOTES ABOUT SERIES RESISTORS FOR LEDs:

Series resistors for the off-board LEDs can be tailored to fit the LEDs in use. Typically the LEDs available in the RC Car market today come in a string of two LEDs per cable, wired in parallel.
Unfortunately specs are rarely listed for any of these products. Testing has found that a series resistor of 100 ohms is almost always adequate for these arrangements, even if operating at 6 volts.

If you wish to maximize the light output you may go to a lower resistor, say 75 or even 50 ohms. However be sure to measure current draw with a meter - you shouldn't usually exceed 20mAh per LED,
which would be 40mAh total for a string of two LEDs in parallel.

If you want to be extra safe, a 150 ohm resistor could be used.

If you make your own LED strings or know the specs of the LED you are using, you can calculate the resistor value precisely using free online calculators,
such as this one: Led Resistor Calculator

NOTES ABOUT SOURCES FOR LEDs:

The least expensive LEDs that already come soldered to cable assemblies with JST plugs are the ones from YeahRacing (series LK-0008 for 3mm LEDs, LK-0009 for 5mm LEDs)
3Racing brand LEDs will also work as will the Tamiya LEDs, though the Tamiyas are overpriced and require different resistors (often lower than 100 ohms)
The YeahRacingt lights can be purchased in many places, my favorite is RCMart. Here is there YeahRacing LED list: RCMart YeahRacing LEDs
At the time of writing they were about $3 for a string of 2 LEDs.

NOTES ABOUT MAKING YOUR OWN LED CABLE ASSEMBLIES:

If you have your own LEDs and want to make your own cable assemblies, you will need some thin gauge wire and the female JST plugs and pins. You can find pre-assembled plugs with pigtails on eBay,
do a search for something like "PH 2.0mm Female Connector Wire".
But if you really want to make your own, here are part numbers at DigiKey:
   Note: you can easily find wire for cheaper than this - use old servo extensions, strip it from old mouse/network cables, whatever…
   Note: crimping these miniature connectors is not very easy. Buying pre-made is recommended.

Manufacturer	DigiKey Description	Manufacturer Part Number	DigiKey Part Number	Price Ea.	Notes
JST	CONN HOUSING PH 2POS 2MM WHITE	PHR-2(P)	455-1165-ND	$0.10	This is the female JST plug that will mate with the connectors on the board.
JST	CONN TERM CRIMP PH 24-30AWG	SPH-002T-P0.5S	455-1127-1-ND	$0.50	These are the crimp terminals for the female connectors. (Price for 10)
Alpha Wire	HOOK-UP WIRE 26AWG STRAND RED	3049 RD005	A3049R-100-ND	$16.25	26 AWG red hookup wire in 100 foot spool. You can probably find cheaper wire elsewhere.
Alpha Wire	HOOK-UP WIRE 26AWG STRAND BLACK	3049 BK005	A3049B-100-ND	$16.25	26 AWG black hookup wire in 100 foot spool. You can probably find cheaper wire elsewhere.

If you need a crimping tool, Hansen Hobbies sells an inexpensive (~$15) one that will work on these JST pins as well as allow you to make your own servo extensions:
Hansen Hobbies Economy Crimping Tool