Description

The HR1124S、HR1154D is a 1-channel H-bridge driver IC for DC motor application. It has the features of low stand-by current, low operating current, large current output and low RDSON. Those features make it suitable for toy.

When load motor with low internal resistance is in locked rotor or output is short-circuit, HR1124S、HR1154D output current will increase momentarily, power dissipation of the circuit will go up sharply, and the chip temperature will soar. But, when the chip temperature exceeds a maximum temperature point (typically 150℃) set by internal temperature protection circuit, the internal circuit will switch off the on-chip power switching transistor of It，and switch off load current, preventing potential safety hazards such as fuming, ligniting, etc. of plastic package caused by over-high temperature. Only after having confirmed that the circuit has returned to safety temperature, can the on-chip temperature hysteresis circuit be allowed to re-control the circuit.

Applications

- Toy motor drive with 2-4 batteries
- Electronic toy robot

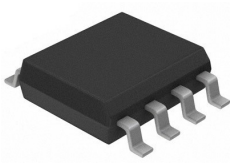
Order Information

Part Number	Package
HR1124S	SOP 8
HR1154D	DIP 8

Features

- channel H-bridge driver built-in power PMOS and NMOS.
- The driver with forward, reverse, stop and brake function.
- Low stand-by and operating current.
- Low on-resistance. (0.3 Ω), continuous current ：
  HR1124S:1.2A(SOP8);
  HR1154D:1.5A(DIP8);
- Low voltage operation.
- Built-in thermal shutdown function.
- RoHS Compliant

Package



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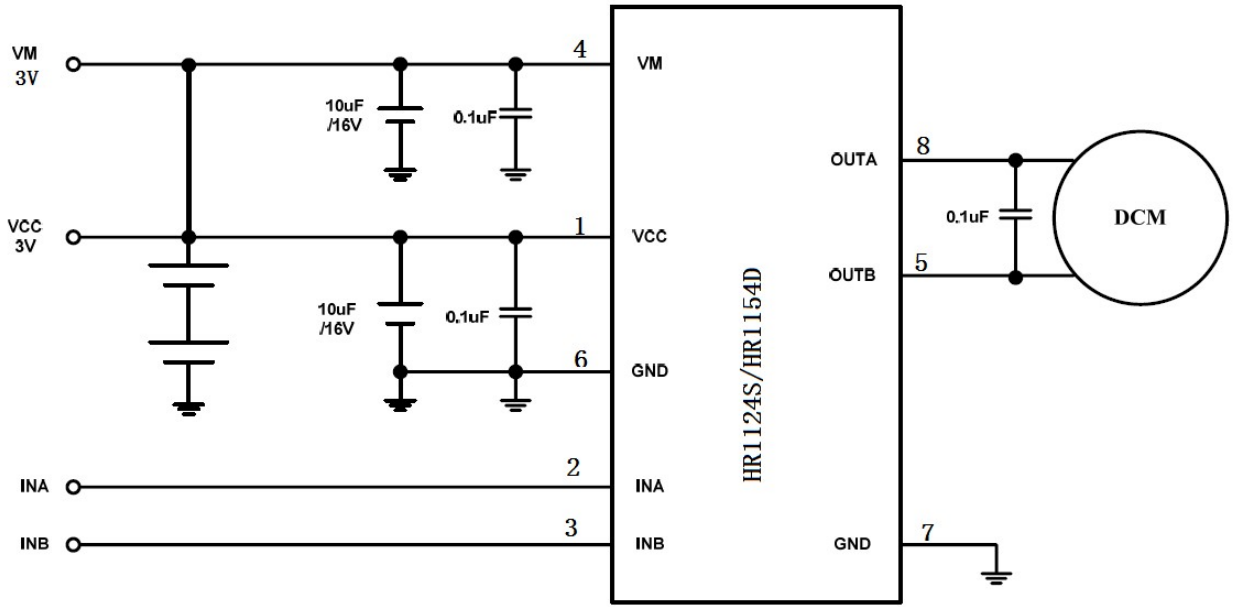
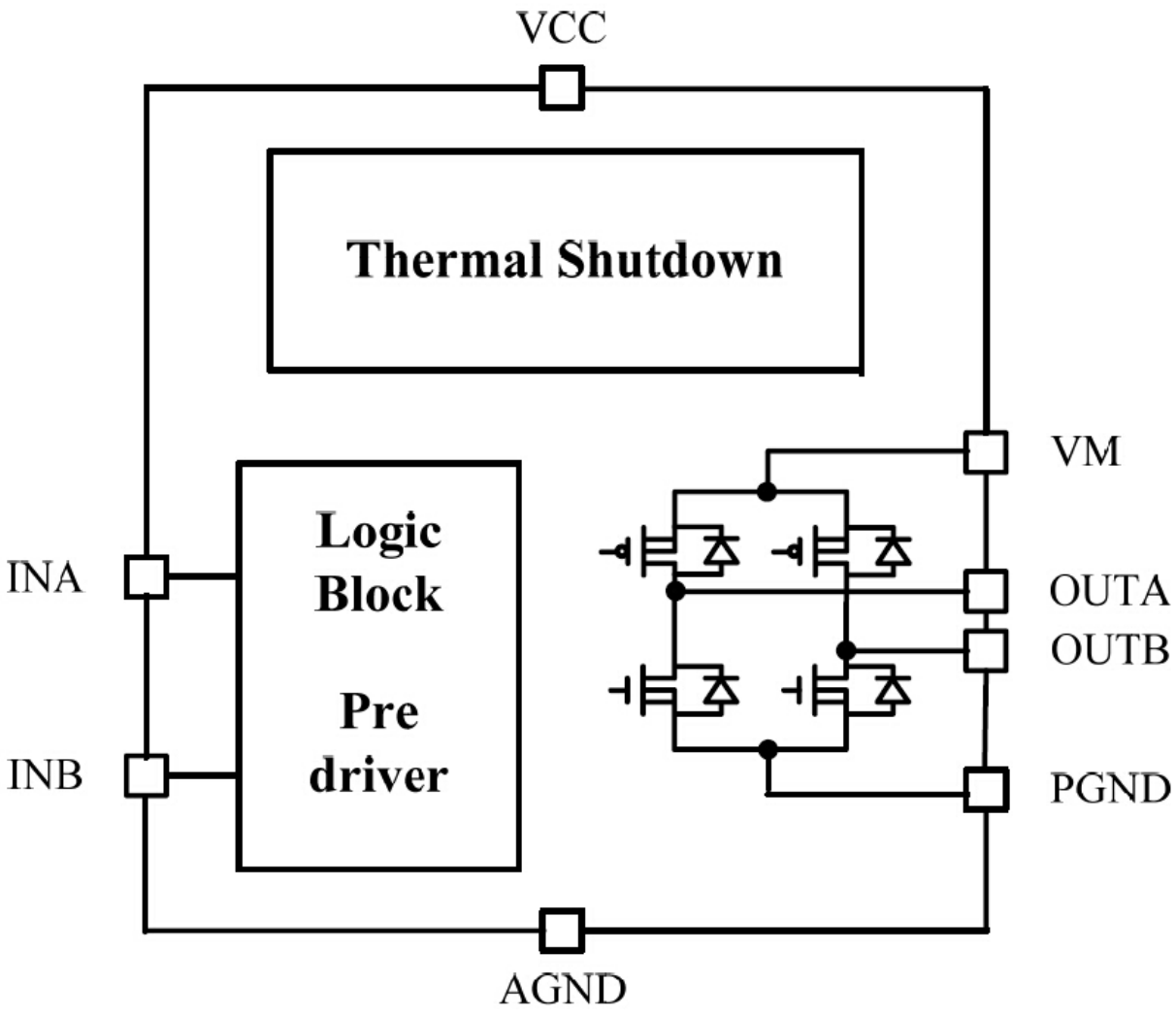

VM
3V
VCC
3V
10uF
/16V
0.1uF
10uF
/16V
0.1uF
4
VM
1
VCC
6
GND
2
INA
3
INB
HR1124S/HR1154D
OUTA
OUTB
GND
8
5
7
0.1uF
DCM
INA
INB

Block Diagram



Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Logic Supply Voltage	VCC		5.5	V
Load Supply Voltage	VM		6.8	V
Logic Input voltage	V_{IN}		VCC	V
Output Current	I_{OUT}		±2	A
Peak Out Current	Iop		3	A
Operating Ambient Temperature	T_A	Range S	-20 to 85	°C
Maximum Junction	T_J(max)		150	°C
Storage Temperature	T_{stg}		-55 to 150	°C

Recommended Operating Conditions at Ta = 25°C

		Min	NOM	Max	Unit
Logic Supply Voltage Range	VCC	1.8	-	5	V
Load Supply Voltage Range	VM	1.8	-	6	V
Logic Input Voltage Range	VIN	0	-	VCC	V
Continuous output current	IOUT(HR1124S)		±1200		mA
	IOUT(HR1154D)		±1500		mA

Electrical Characteristics

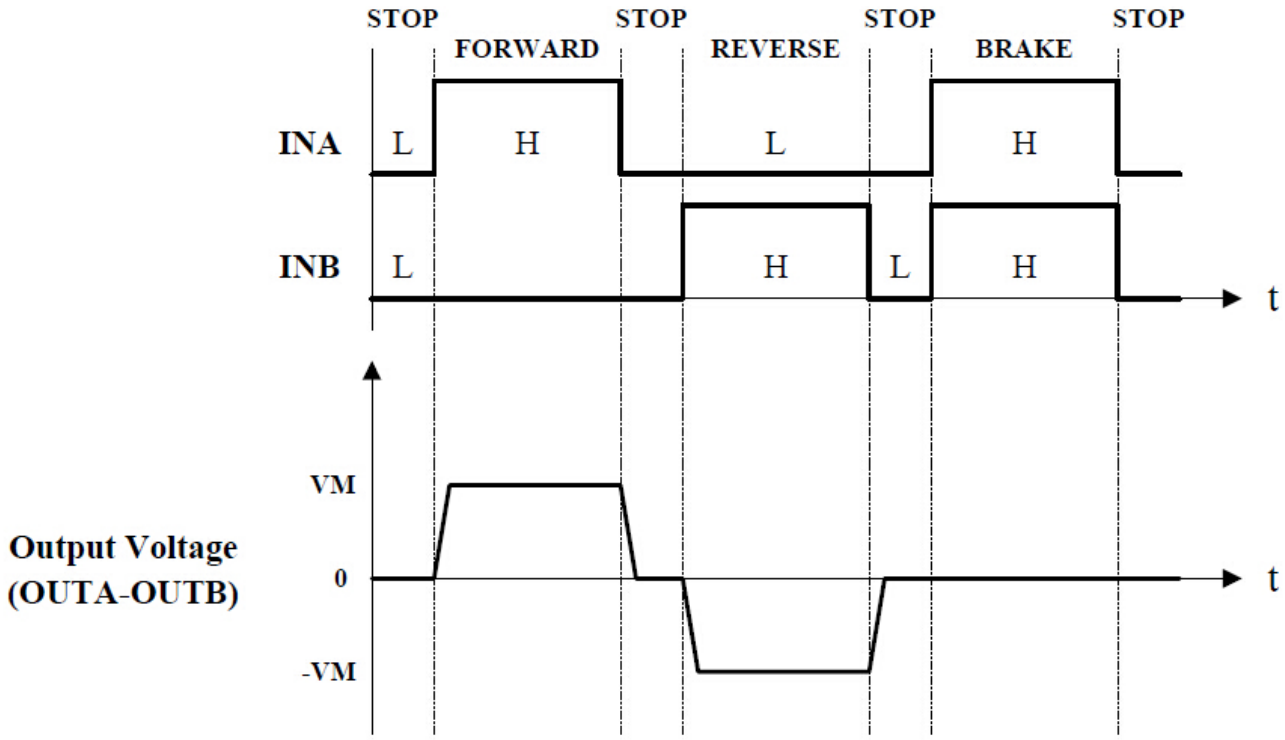
at Ta = 25°C, VCC= 3 V， VM=3V， RL=15Ω， unless otherwise noted。

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
ICCST	Circuit current at standby	INA=INB = L		0	1	uA
IVMST	VM current at standby	INA=INB = L		0	1	uA
ICC	Circuit current	INA=L ,INB = H or INA=H ,INB = L or INA=H ,INB = H		0.2	1	mA
IVM	VM current	INA=L ,INB = H or INA=H ,INB = L or INA=H ,INB = H		0.2	1	mA
LOGIC-LEVEL INPUTS						
VINL	Input low voltage				0.3VCC	V
VINH	Input High voltage		0.7VCC			V
RPD	Input pull-down resistance			1.5		MΩ
IINL	Input low current	VIN = 0V	-1	0		uA
IINH	Input high current	VIN = 3V		5	20	uA
H-BRIDGE FETS						
RDS(ON)	Output on resistance	IO= ±200 mA		0.3	0.6	Ω
PROTECTION CIRCUITS						
tTSD	Thermal shutdown temperature	Die temperature		150		℃

Input - Output Logic Table

INPUT		OUTPUT		MODE
INA	INB	OUTA	OUTB	
L	L	Hi-Z	Hi-Z	Standby（STOP）
H	L	H	L	Forward
L	H	L	H	Reverse
H	H	L	L	Brake

Input - Output Wave



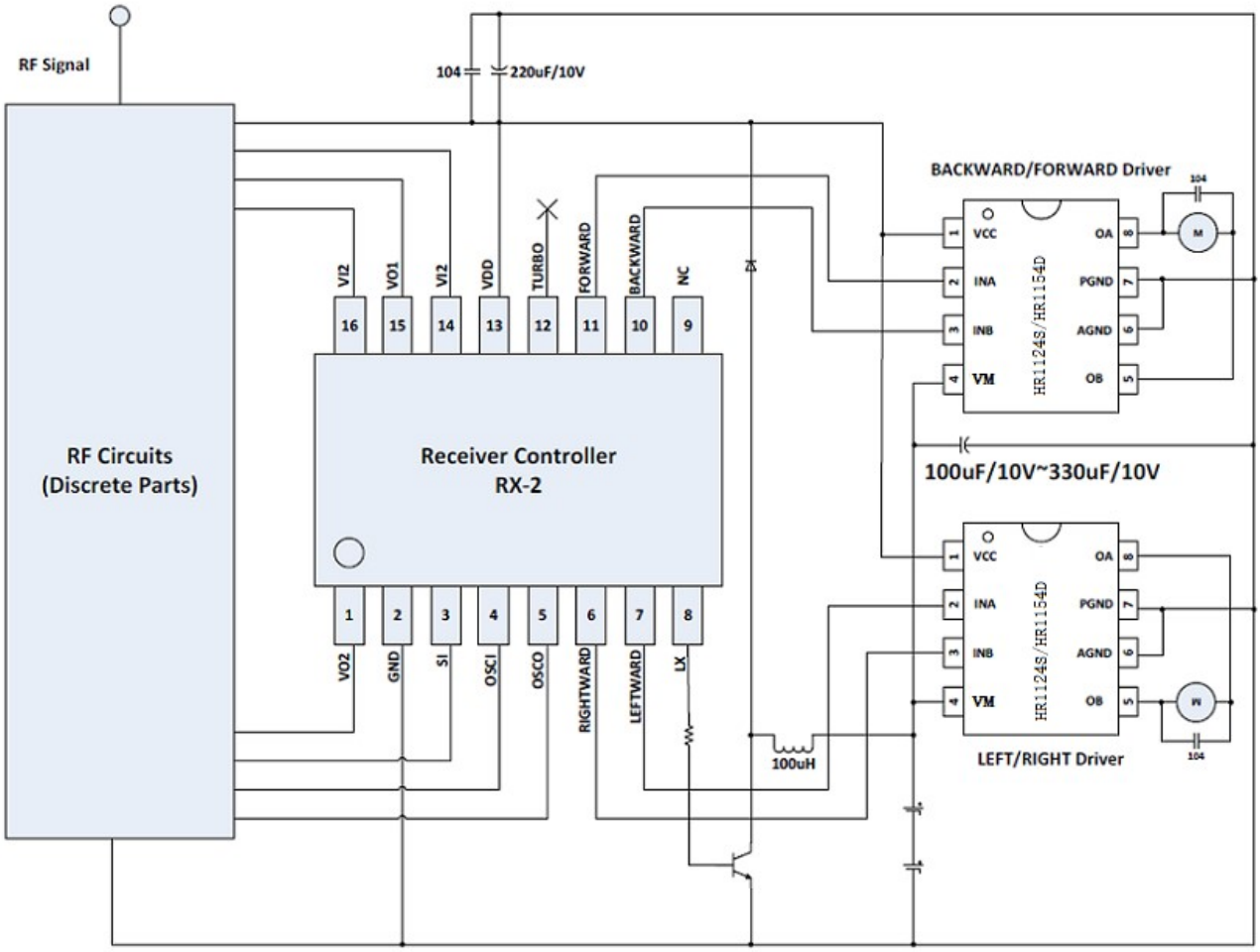
NOTE：When you need to change the direction of motor, you should reserve enough time for discharging. Ensure that the motor has stopped already, then turn on the motor again in the opposite direction. If the release time is not enough, the motor may not work, even damage the chip. To stop the motor can take the input state 00 stop or 11 brake.

When you need the function of speed regulation, just apply a PWM to the input. For example, if the input state is that: INA is HIGH, INB is LOW, keep this state is the max speed. If you apply a PWM wave to INA, and keep INB is LOW, now the duty cycle of HIGH level is the speed ratio. Of course, you also apply a PWM wave to INB, and keep INA is HIGH, then the duty cycle of LOW level is speed ratio.

Application reference

Thermal shut down (TSD)

When junction temperature normally reaches 150℃, HR1124S、HR1154D switch off all outputs of the circuit. The reason for this is to prevent burnout of circuit due to over-high junction temperature. TSD has hysteresis of about 25℃.



application circuit for 2-battery operated remote control toy car

The schematic diagram of application circuit for 2-battery operated remote control toy car uses 2 HR1124S、HR1154D circuits, which are used to drive the forward-and-backward steering motor and the right-and-left steering motor, respectively. Under normal conditions, RX2 power supply VDD utilizes voltage enhancement design in order to ensure that RX2 obtains a stable power supply when the battery voltage decreases. RX2 power supply terminal (VDD) will need connecting with an electrolytic capacitor of 220uF/10V relative to ground and a ceramic capacitor 104.

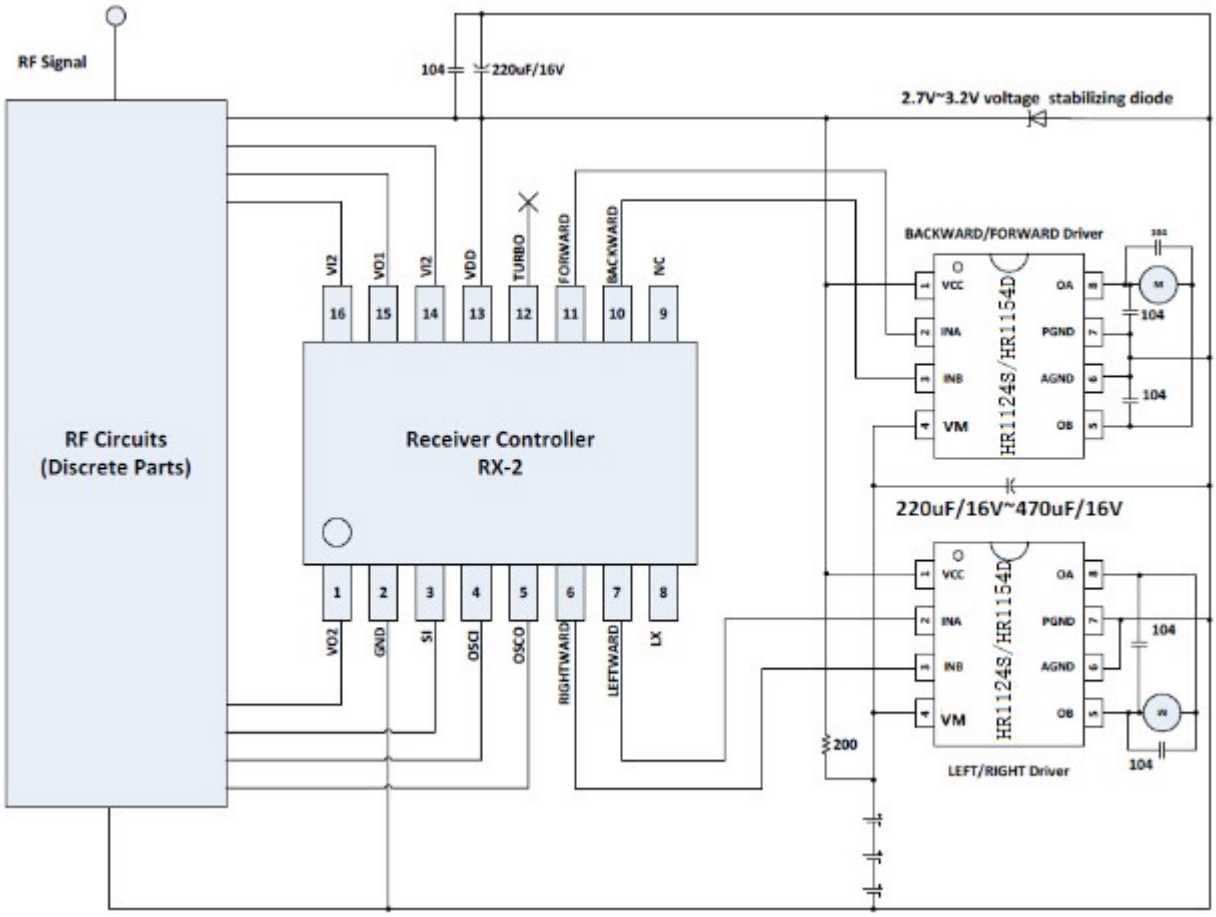
Notice of power supply connection:

HR1124S、HR1154D logic power supply VCC must be connected to controller chip (RX2) VDD.

HR1124S、HR1154D power supply VDD must be connected directly to battery anode.

HR1124S、HR1154D logic ground and power ground are connected directly together first, and then are connected to RX2 GND.

HR1124S、HR1154D VDD and GND need adding an electrolytic capacitor that is as much close to 2 chips as possible. Recommended parameters are 100uF/10V—330uF/10V. Select the concrete parameters reasonably according to practical use.



application circuit for 3or4-battery operated remote control toy car

The schematic diagram of application circuit for 2-battery operated remote control toy car uses 2 HR1124S、HR1154D circuits, which are used to drive the forward-and-backward steering motor and the right-and-left steering motor, respectively. Under normal conditions, RX2 power supply VDD utilizes voltage enhancement design in order to ensure that RX2 obtains a stable power supply when the battery voltage decreases. RX2 power supply terminal (VDD) will need connecting with an electrolytic capacitor of 220uF/10V relative to ground and a ceramic capacitor 104.

Notice of power supply connection:

HR1124S、HR1154D logic power supply VCC must be connected to controller chip (RX2) VDD.

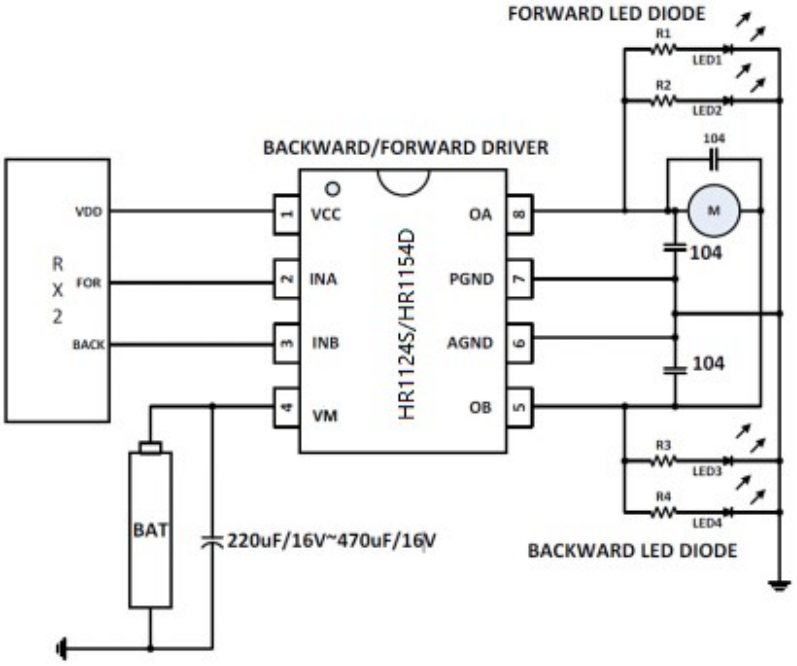
HR1124S、HR1154D power supply VDD must be connected directly to battery anode.

HR1124S、HR1154D logic ground and power ground are connected directly together first, and then are connected to RX2 GND.

HR1124S、HR1154D VDD and GND need adding an electrolytic capacitor that is as much close to 2 chips as possible. Recommended parameters are 100uF/10V—330uF/10V. Select the concrete parameters reasonably according to practical use.

In use, the rear wheel motor easily generates larger peak voltage. To prevent chip damage, it is recommended that capacitor 104 relative to ground should be connected to each of nearest possible output terminals of it chip for rear wheel motor steering respectively.

Current of front wheel steering motor is lower, and peak voltage generated by front wheel steering motor is lower than that by rear wheel steering motor. Due to higher supply voltage, it is still possible to cause the circuit to be damaged. It is suggested to connect capacitor 104 either between output terminals OA and OB.

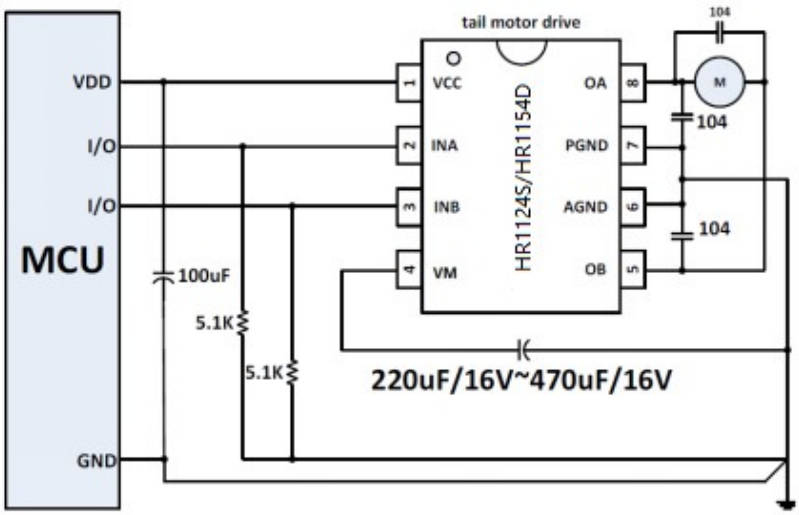


remote controlled toy car LED indicator connection

Schematic diagram for HR1124S、HR1154D remote controlled toy car LED indicator connection in forward, backward or left, and right turn. R1-4 are current-limiting resistors. Select a suitable resistance as the case may be.

As shown, when the command “forward” is effective, port OA outputs high level but port OB outputs low level. At this time, LED1 and LED2 light up.

Tt is not recommended that customers use the method of LED indicator’s negative electrode connecting with it output and LED indicator’s positive electrode connecting with current-limiting resistor to power supply.



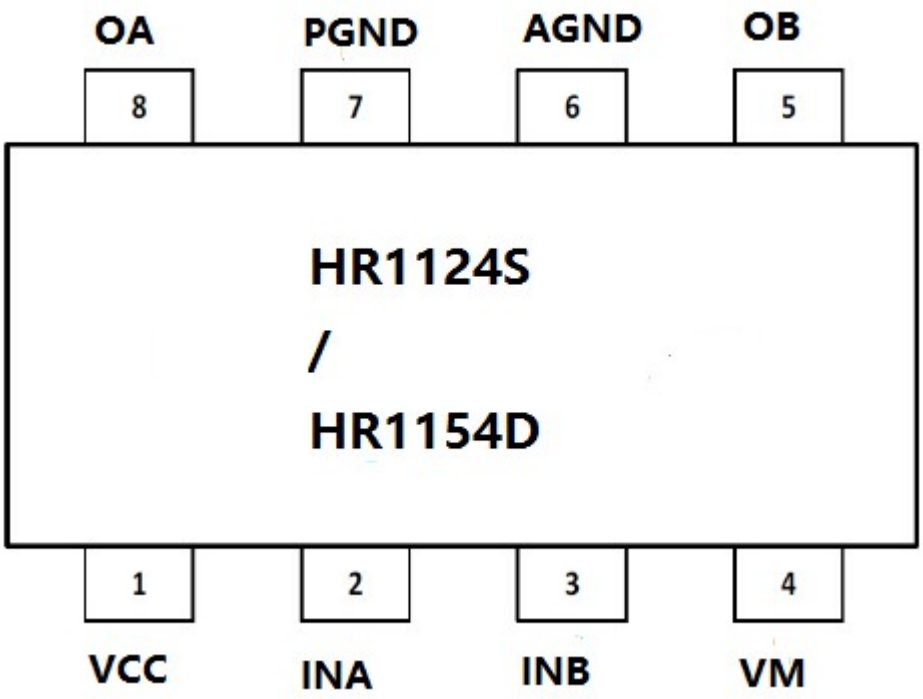
single-lithium battery, radio controlled electric plane tail motor drive application for reference

Schematic diagram of single-lithium battery, radio controlled electric plane tail motor drive application. When chip microprocessors are switched on, the state of I/O port is indefinite. Therefore, uncertainty of chip microprocessor output would cause it to mistake it for the high level that chip microprocessor outputs, resulting in load motor turn. Adding 5.1K ohm ground pull down resistor to resolves the above issue.

If output is definitely low level when chip microprocessor is switched on, then ground pull-down resistor may not be added.

Pin Configuration

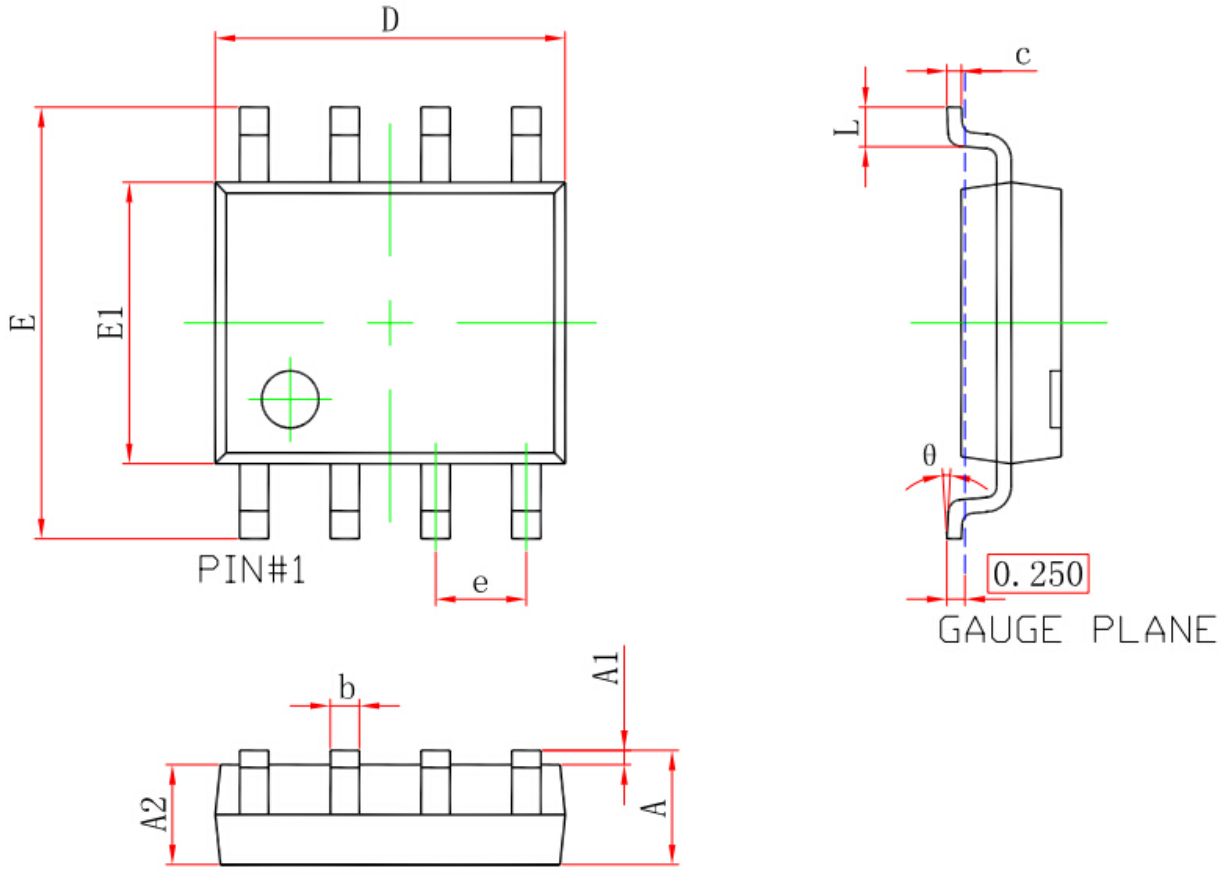
TOP VIEW



Pin Description

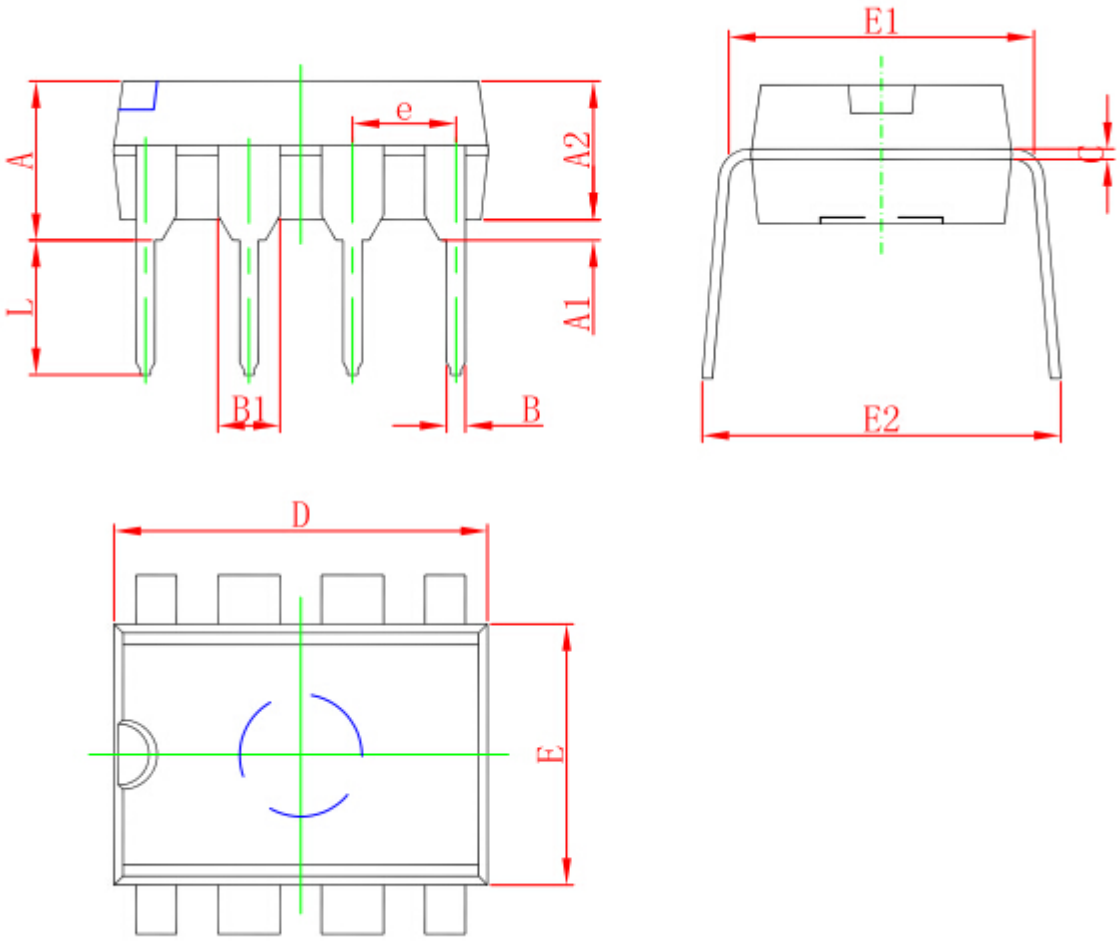
NAME	PIN	IO	Pin Description
VCC	1	P	Power supply for logic
INA	2	I	It combines INB to decide the state of the driver
INB	3	I	It combines INA to decide the state of the driver
VM	4	P	Power supply for driver
OB	5	O	H-bridge output terminal B of the driver
AGND	6	G	GND
PGND	7	G	GND
OA	8	O	H-bridge output terminal A of the driver

Package
SOP 8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.031
θ	0°	8°	0°	8°

DIP 8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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