M54544L

Bi-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION

DESCRIPTION

The M54544L is a semiconductor integrated circuit that is capable of directly driving a smallsize bi-directional motor rotating in both forward and reverse directions.

FEATURES

- Wide range of operating voltage (V_{CC}=4 – 16V)
- Possible direct driving with TTL, PMOS and CMOS IC outputs
- Low output saturation voltage (large voltage across motors)
- Built-in clamp diode
- Large output current drive ($I_{O(max)}$ = ±1.2A)
- Provided with brake function

APPLICATION

Sound equipment such as tape deck and radio cassette, VTR, and other general consumer appliances

FUNCTION

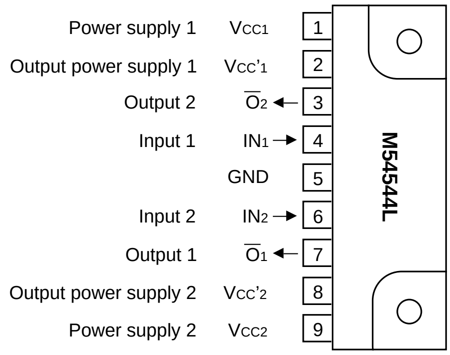
The M54544L is an IC for driving a smallsize bi-directional motor that rotates in both forward and reverse directions.

When both inputs 1 and 2 are set to low-level, outputs 1 and 2 are set to "OFF". When input 1 is set to high-level and input 2 is set to low-level, output 1 is set to high-level and output 2 is set to low-level (forward rotation status). When input 1 is set to low-level and input 2 is set to high-level, output 1 is set to low-level and output 2 is set to high-level (reverse rotation). When both inputs 1 and 2 are set to high-level, both outputs 1 and 2 are set to low-level (brake status).

The power supply (V_{CC}) to the control circuit and the power supply (V_{CC}') for output are independently provided. The rotating speed of the motor can be therefore changed by using V_{CC} and V_{CC}' as different power supplies and by making V_{CC} or V_{CC}' variable.

If the resistance of the motor is high (light load and small drive current: tens of mA), and V_{CC} is larger than V_{CC}', current does not flow backward from the V_{CC} pin to the V_{CC}' pin.

PIN CONFIGURATION (TOP VIEW)

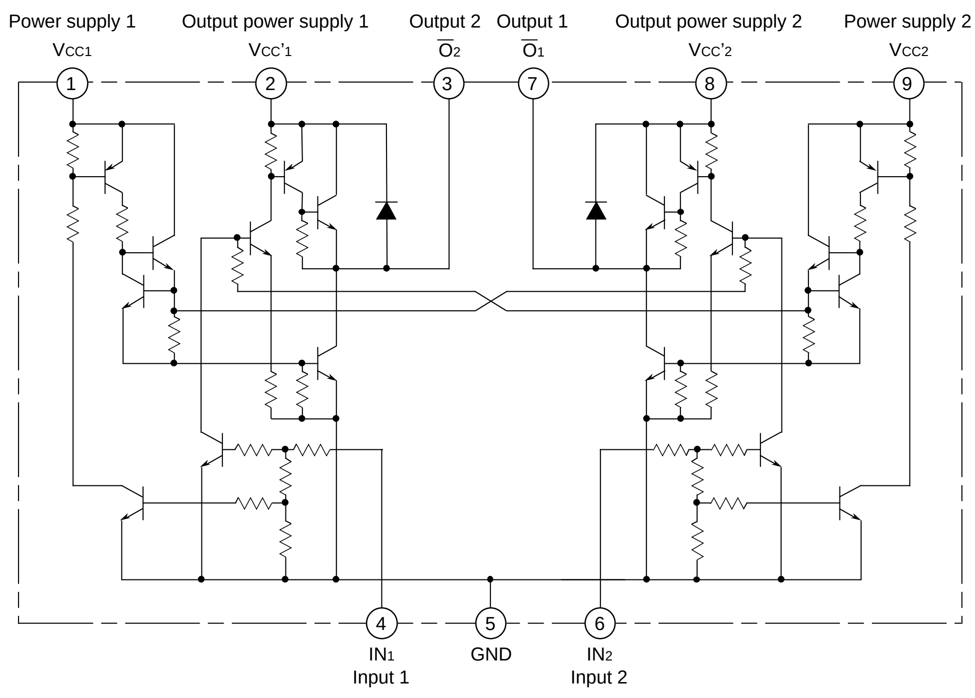


Outline 9P9

LOGIC TRUTH TABLE

Input		Output		Remarks
IN1	IN2	$\overline{O_1}$	$\overline{O_2}$	
L	L	"OFF" state	"OFF" state	No operation of IC
H	L	H	L	ex Forward rotation
L	H	L	H	Reverse rotation
H	H	L	L	Brake

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC(1)}$	Supply voltage(1)		-0.5 – +16	V
$V_{CC(2)}$	Supply voltage(2)	With an external heat sink (3000mm^2 x 1.5mm)	-0.5 – +20	V
V_{CC}'	Output supply voltage		-0.5 – +16	V
V_I	Input voltage		0 – V_{CC}	V
V_O	Output voltage		-0.5 – V_{CC}'+2.5	V
$I_{O(max)}$	Allowable motor rush current	t_{op}=10ms : cycle time 0.2Hz or less	±1.2	A
$I_{O(1)}$	Continuous output current(1)		±330	mA
$I_{O(2)}$	Continuous output current(2)	With an external heat sink (3000mm^2 x 1.5mm)	±600	mA
P_d	Power dissipation	Ta=75˚C	1.15	W
T_{opr}	Operating temperature		-10 – 75	°C
T_{stg}	Storage temperature		-55 – 125	°C

RECOMMENDED OPERATING CONDITION (Ta=25°C, unless otherwise noted)

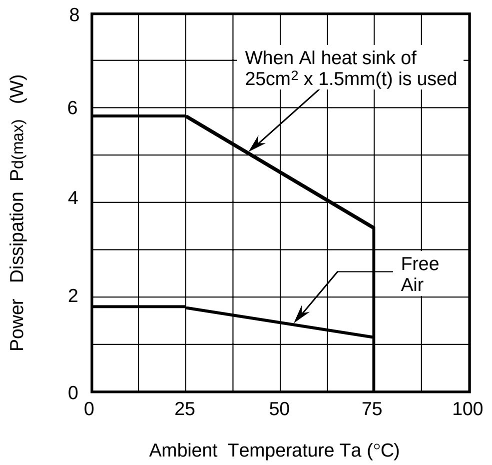
Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	Supply voltage		4	12	15	V
I_O	Output current				±300	mA
V_{IH}	“H” input voltage		2		V_{CC}	V
V_{IL}	“L” input voltage		0		0.4	V
t_B	Motor braking interval		10	100		ms

ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise noted)

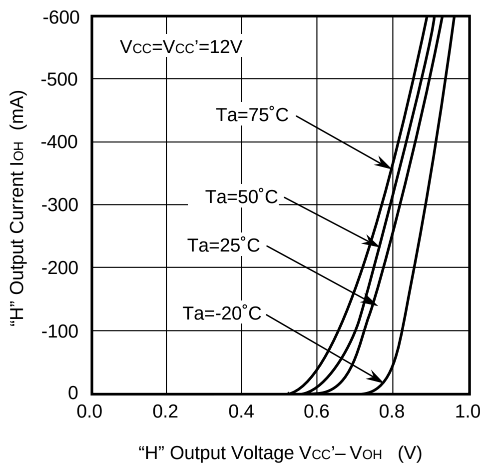
Symbol	Parameter	Test conditions			Limits			Unit
					Min.	Typ.	Max.	
$I_{O(leak)}$	Output leak current	V_{CC}=V_{CC}'=20V, V_{I1}=V_{I2}=0V		V_O=20V			100	μA
				V_O=0V			-100	
$V_{OH(1)}$	“H” output saturation voltage(1)	V_{CC}=V_{CC}'=12V	V_{I1}=2V, V_{I2}=0V	$I_{OH(1)}$=-300mA	10.8	11.2		V
				$I_{OH(1)}$=-500mA	10.7	11.1		
$V_{OH(2)}$	“H” output saturation voltage(2)	V_{CC}=V_{CC}'=12V	V_{I1}=0V, V_{I2}=2V	$I_{OH(2)}$=-300mA	10.8	11.2		V
				$I_{OH(2)}$=-500mA	10.7	11.1		
$V_{OL(1)}$	“L” output saturation voltage(1)	V_{CC}=V_{CC}'=12V	V_{I1}=0V, V_{I2}=2V	$I_{OL(1)}$=300mA		0.18	0.5	V
				$I_{OL(1)}$=500mA		0.3	0.65	
			V_{I1}=V_{I2}=2V			0.3	0.65	
$V_{OL(2)}$	“L” output saturation voltage(2)	V_{CC}=V_{CC}'=12V	V_{I1}=2V, V_{I2}=0V	$I_{OL(2)}$=300mA		0.18	0.5	V
				$I_{OL(2)}$=500mA		0.3	0.65	
			V_{I1}=V_{I2}=2V			0.3	0.65	
$I_{IH(1)}$	“H” input current(1)	V_{CC}=V_{CC}'=12V, V_{I1}=2V, V_{I2}=0V			70		200	μA
$I_{IH(2)}$	“H” input current(2)	V_{CC}=V_{CC}'=12V, V_{I1}=0V, V_{I2}=2V			70		200	μA
I_{CC}	Supply current	V_{CC}=V_{CC}'=16V, Output open		V_{I1}=2V, V_{I2}=0V			30	mA
				V_{I1}=0V, V_{I2}=2V				
				V_{I1}=V_{I2}=2V			60	
				V_{I1}=V_{I2}=0V		0		

TYPICAL CHARACTERISTICS

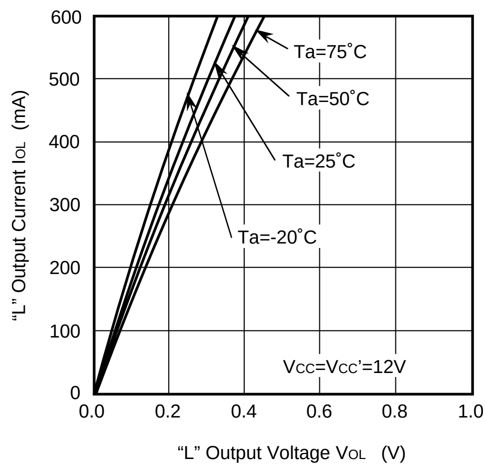
Thermal Derating (Absolute Maximum Rating)



"H" Output Saturation Characteristics



"L" Output Saturation Characteristics

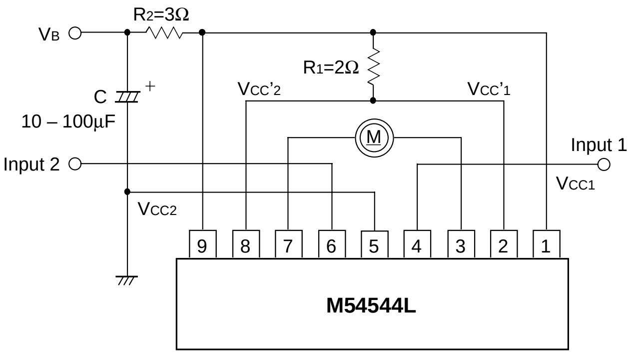


CAUTIONS

Since pass current of 2 to 4A flows from the power supply to the GND for the period of 2 to 4µs when a mode is switched to another, be sure to put the capacitance of 10 to 100µF between the output power supply and the GND.
When the motor back electromotive force is large with the brakes applied, for example, malfunction may occur in internal parasitic Di.
If flyback current of 1A or more flows, add Schottky Di to the portion between the output and the GND.
When the IC is used at a high speed for PWM, etc., note that switching of output results in delay of approx. 10µs.

APPLICATION EXAMPLES

1) When VCC and VCC' are used as the same power supply



2) When VCC is used as a fixed power supply and VCC' is used as a variable power supply