

# 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 ( $I_{O(max)} = \pm 1.2A$ )
- Provided with brake function

### APPLICATION

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

### FUNCTION

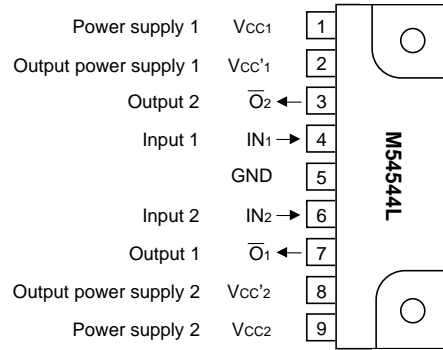
The M54544L is an IC for driving a smallsize bi-directional motor that rotates in both forward and reverse directions.

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)

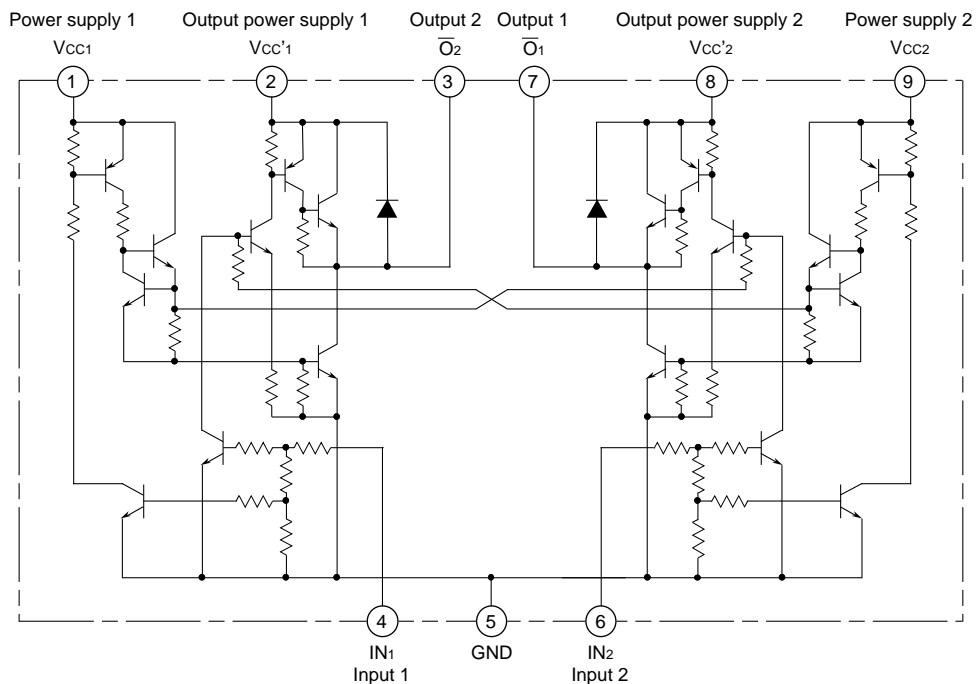


Outline 9P9

### LOGIC TRUTH TABLE

Input		Output		Remarks
IN <sub>1</sub>	IN <sub>2</sub>	$\bar{O}_1$	$\bar{O}_2$	
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



BI-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION

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

Symbol	Parameter	Conditions	Ratings	Unit
Vcc(1)	Supply voltage(1)		-0.5 – +16	V
Vcc(2)	Supply voltage(2)	With an external heat sink (3000mm <sup>2</sup> x 1.5mm)	-0.5 – +20	V
Vcc'	Output supply voltage		-0.5 – +16	V
Vi	Input voltage		0 – Vcc	V
Vo	Output voltage		-0.5 – Vcc'+2.5	V
Io(max)	Allowable motor rush current	top=10ms : cycle time 0.2Hz or less	±1.2	A
Io(1)	Continuous output current(1)		±330	mA
Io(2)	Continuous output current(2)	With an external heat sink (3000mm <sup>2</sup> x 1.5mm)	±600	mA
Pd	Power dissipation	Ta=75°C	1.15	W
Topr	Operating temperature		-10 – 75	°C
Tstg	Storage temperature		-55 – 125	°C

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

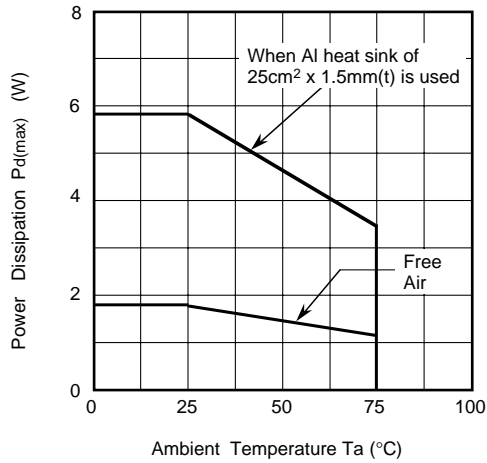
Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
Vcc	Supply voltage		4	12	15	V
Io	Output current				±300	mA
VIH	"H" input voltage		2		Vcc	V
VIL	"L" input voltage		0		0.4	V
tB	Motor braking interval		10	100		ms

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

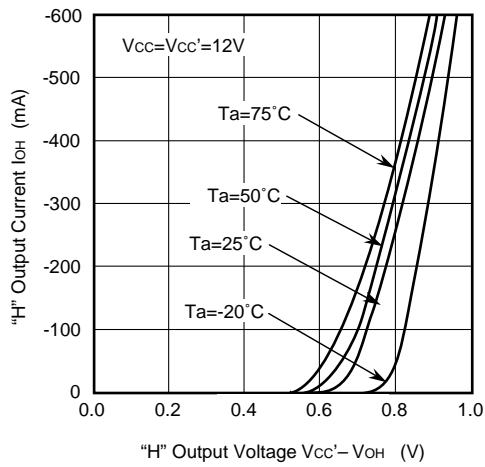
Symbol	Parameter	Test conditions		Limits			Unit
				Min.	Typ.	Max.	
Io(leak)	Output leak current	Vcc=Vcc'=20V V1=V2=0V	Vo=20V Vo=0V			100 -100	μA
VOH(1)	"H" output saturation voltage(1)	Vcc=Vcc'=12V	V1=2V V2=0V	IOH(1)=-300mA IOH(1)=-500mA	10.8 10.7	11.2 11.1	V
VOH(2)	"H" output saturation voltage(2)	Vcc=Vcc'=12V	V1=0V V2=2V	IOH(2)=-300mA IOH(2)=-500mA	10.8 10.7	11.2 11.1	V
VOL(1)	"L" output saturation voltage(1)	Vcc=Vcc'=12V	V1=0V V2=2V V1=V2=2V	IoL(1)=300mA IoL(1)=500mA		0.18 0.3 0.65 0.3 0.65	V
VOL(2)	"L" output saturation voltage(2)	Vcc=Vcc'=12V	V1=2V V2=0V V1=V2=2V	IoL(2)=300mA IoL(2)=500mA		0.18 0.3 0.65 0.3 0.65	V
IIH(1)	"H" input current(1)	Vcc=Vcc'=12V, V1=2V, V2=0V			70	200	μA
IIH(2)	"H" input current(2)	Vcc=Vcc'=12V, V1=0V, V2=2V			70	200	μA
Icc	Supply current	Vcc=Vcc'=16V Output open	V1=2V, V2=0V V1=0V, V2=2V V1=V2=2V V1=V2=0V			30 60 0	mA

**TYPICAL CHARACTERISTICS**

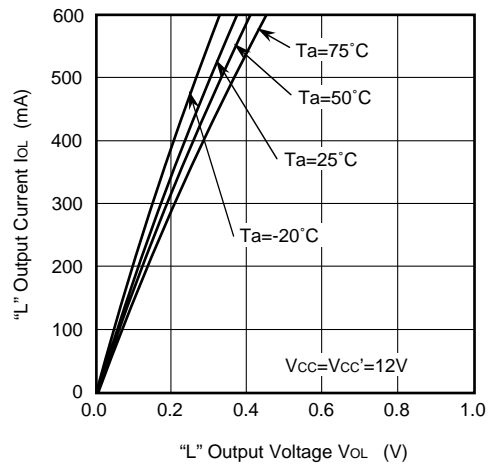
Thermal Derating (Absolute Maximum Rating)



"H" Output Saturation Characteristics



"L" Output Saturation Characteristics



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**CAUTIONS**

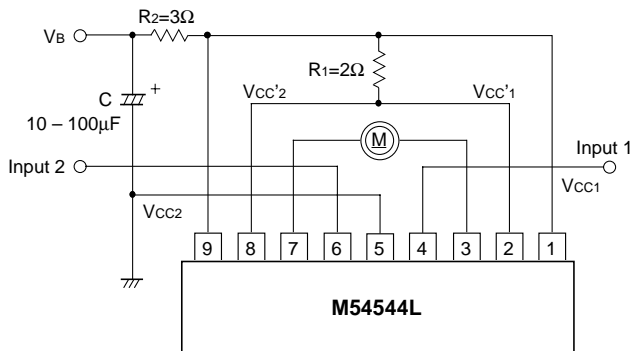
Since pass current of 2 to 4A flows from the power supply to the GND for the period of 2 to 4 $\mu$ s when a mode is switched to another, be sure to put the capacitance of 10 to 100 $\mu$ F between the output power supply and the GND.

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. 10 $\mu$ s.

**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

