

# M54543ASL/FP

## BI-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION AND THERMAL SHUT DOWN FUNCTION

### DESCRIPTION

The M54543ASL/FP is a semiconductor IC capable of directly driving a smallsize bi-directional motor for forward/reverse rotation.

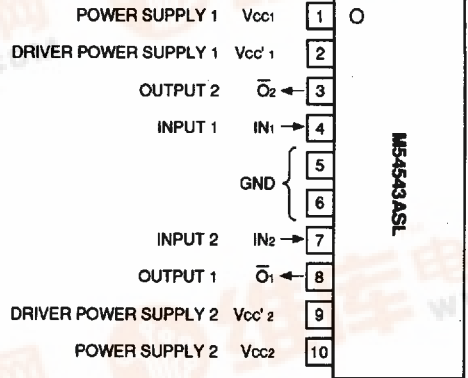
### FEATURES

- Wide operating voltage range ( $V_{cc} = 4V$  to  $15V$ )
- Direct drive capability by TTL, PMOS and CMOS IC outputs
- Small outline (10-pin SIP/SOP)
- Low output saturation voltage (large voltage across motor)
- Built-in clamp diode
- Large output current drive ( $I_o$  (max) =  $\pm 700mA$ )
- With brake function
- Built-in thermal shut-down protector circuit

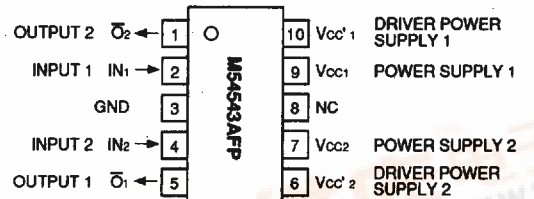
### APPLICATION

Commercial-use equipment, audio such as tape recorder or radio cassette recorder, and VCR.

### PIN CONFIGURATION (TOP VIEW)



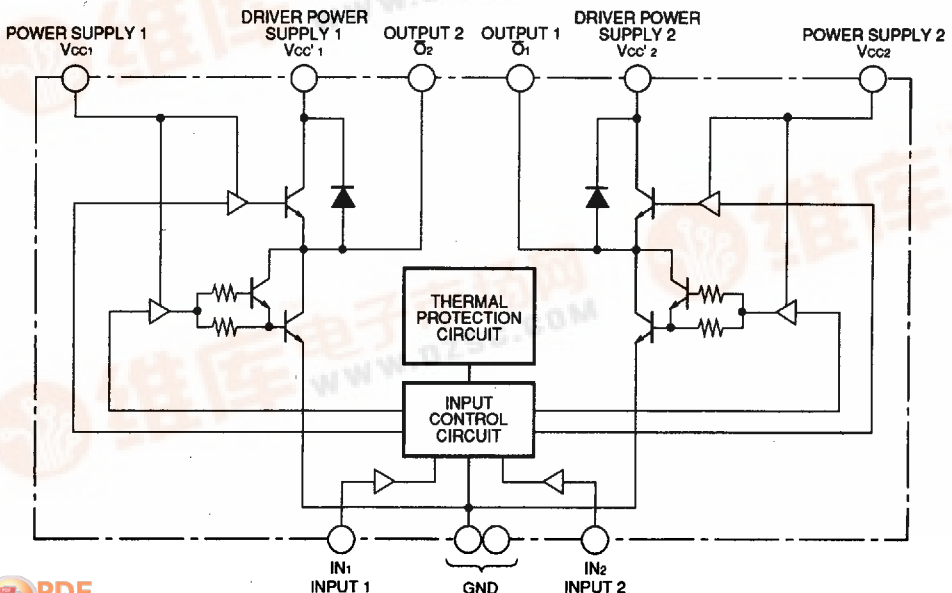
Outline 10P5



Outline 10P2-C

NC : NO CONNECTION

### BLOCK DIAGRAM



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### FUNCTIONAL DESCRIPTION

The M54543ASL/FP is an IC for driving a smallsize bi-directional motor for forward/reverse rotation. When both of inputs 1 and 2 are "L", outputs 1 and 2 are "OFF". When input 1 is "H" and input 2 is "L", output 1 is "H" and output 2 is "L" (forward rotation). When input 1 is "L" and input 2 is "H", output 1 is "L" and output 2 is "H" (reverse rotation). When both of inputs 1 and 2 are "H", both of outputs 1 and 2 are "L" (braking).

The IC is provided with a control circuit power supply (Vcc) and an output power supply (Vcc') independently. The motor rotation speed can be changed by operating Vcc and Vcc' from a separate supply and varying the voltage of Vcc or Vcc'.

The IC is also provided with a built-in thermal protector circuit to protect it from thermal destruction in case of abnormal condition such as motor blocking.

### LOGIC TRUTH TABLE

INPUT		OUTPUT		NOTE
IN <sub>1</sub>	IN <sub>2</sub>	O <sub>1</sub>	O <sub>2</sub>	
L	L	"OFF" state	"OFF" state	Open
H	L	H	L	ex. Forward (→)
L	H	L	H	ex. Reverse (←)
H	H	L	L	Braking

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

Symbol	Parameter	Conditions	Ratings	Unit
Vcc (1)	Supply voltage (1)		-0.5 to +16	V
Vcc' (1)	Driver supply voltage (1)		-0.5 to +16	V
Vi	Input voltage		0 to Vcc	V
Vo	Output voltage		-0.5 to Vcc'+2.5	V
Io (max)	Peak output current	tcc=10ms : Repetitive cycle 0.2Hz max	±700	mA
Io (1)	Continuous output current (1)		±150	mA
Pd	Power dissipation	Ta=75°C	600 (ASL) /200 (AFP)	mW
Topr	Operating temperature		-10 to +75	°C
Tstg	Storage temperature		-55 to +75	°C

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

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Vcc	Supply voltage		4	12	15	V
Io	Continuous output current				±100	mA
VIH	"H" Input voltage		2	5	Vcc	V
VIL	"L" Input voltage		0		0.4	V
tB	Motor braking interval		10	100		ms
Tj (shut)	Thermal shutdown temperature	Junction temperature, Vcc ≥ 7V		150		°C

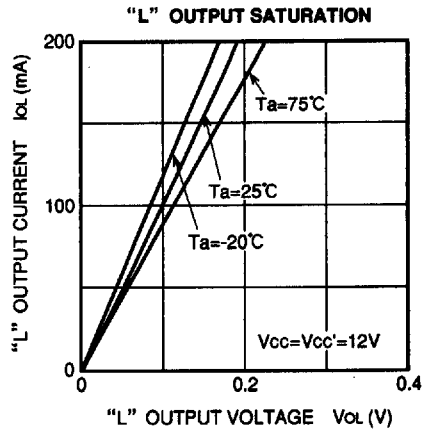
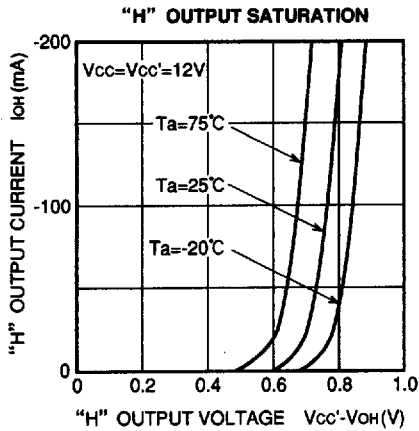
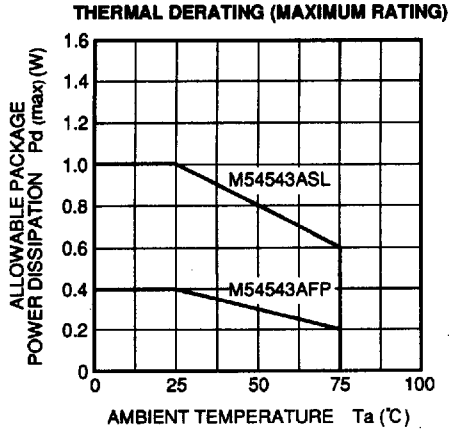
### ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Io (leak)	Output leak current	Vcc=Vcc'=16V Vi1=Vi2=0V			100	μA
		Vo=16V				
		Vo=0V				
VOH	"H" Output saturation voltage	Vcc=Vcc'=12V Vi1=0V, Vi2=2V or Vi1=2V, Vi2=0V				V
		IoH=-50mA	11.0	11.25		
		IoH=-100mA	10.9	11.20		
VOL	"L" Output saturation voltage	Vcc=Vcc'=12V Vi1=2V, Vi2=0V or Vi1=0V, Vi2=2V				V
		IoH=50mA		0.05	0.2	
		IoH=100mA		0.1	0.4	
VO1-O2	Voltage between output (1) and output (2) (voltage across motors)	Vcc=Vcc'=12V, Vi1=2V, Vi2=0V or Vi1=0V, Vi2=2V Io=±100mA, VO1-VO2=VOH1-VOL2	9.6			V
Ii	Input current	Vcc=Vcc'=12V, Vi=2V	50		120	μA
Icc	Supply current	Vcc=Vcc'=12V				mA
		Output open				
		Vi1=2V, Vi2=0V			20	
		Vi1=0V, Vi2=2V				
		Vi1=2V, Vi2=2V				
		Vi1=0V, Vi2=0V			4	

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## TYPICAL CHARACTERISTICS



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## BI-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION AND THERMAL SHUT DOWN FUNCTION

### PRECAUTIONS FOR APPLICATION

(1) The thermal protection of the IC may not work depending on an abnormal condition (such as oscillation, low supply voltage or output short). When using the function, check its operation in the actual using state.

If the motor has a large counter electromotive force at a braking time, etc., the internal parasitic Di may malfunction.

If fly-back current of 1A or more flows, put a shottkey Di between the output and the GND.

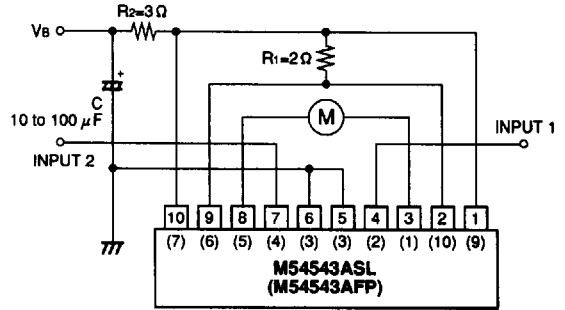
Remember that the IC has an about  $10\mu\text{s}$  delay in output switching for high-speed applications such as PWM.

(2) As far as motor control and driver IC's are concerned, some possibilities are considered for these IC's to cause such unexpected cases as fire or smoke if they are used beyond its ratings in datasheet or used, even transiently, under the overload conditions. So your action will be highly appreciated to fully look into the rating limits and the using conditions before you use these IC's.

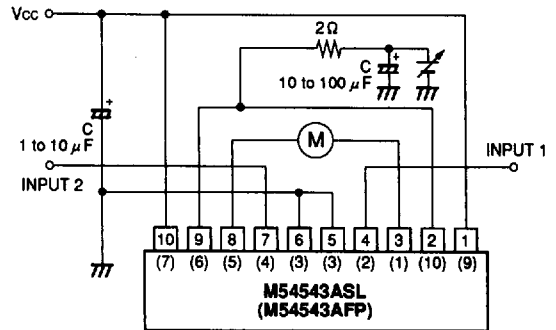
And if these IC's are to be used under the conditions out of our specifications, please never fail to give us a contact as to under what conditions they are used.

### APPLICATION EXAMPLES

#### 1) Motor speed control by Vcc and Vcc'



#### 2) Motor speed control by the Vcc'



#### 3) Motor speed control by the Vcc

