

M54641L/FP

BI-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION

DESCRIPTION

The M54641 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 ($V_{CC} = 4 - 10V, V_{CC'(max)} = 20V$)
- Low output saturation voltage in stationary motor circuit (large voltage across motors)
- Built-in clamp diode
- Provided with output voltage control pin (V_z)
- Built-in thermal shutdown circuit ($T_{j(shut)} = 120^\circ C$ standard)

APPLICATION

Sound equipment such as tape deck and radio cassette, and VTR

FUNCTION

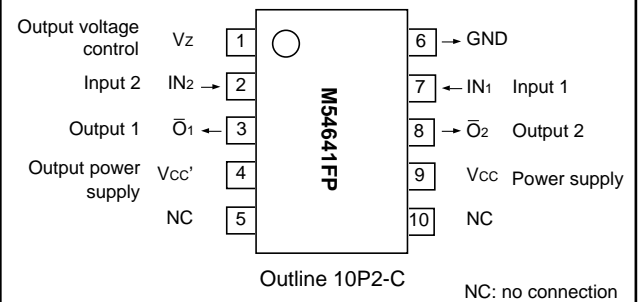
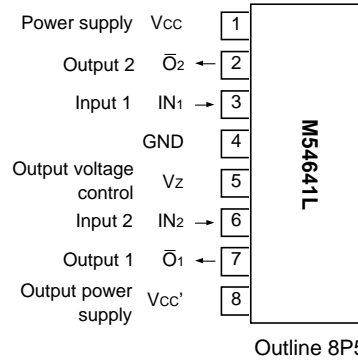
The M54641 is an IC for driving a smallsize bi-directional motor that rotates in both forward and reverse directions. Giving signal to inputs IN_1 and IN_2 outputs the signal of the same phase to output pins \bar{O}_1 and \bar{O}_2 . That is, giving high-level signal to input IN_1 and low-level signal to input IN_2 sets output \bar{O}_1 to high-level and output \bar{O}_2 to low-level. Connection of a motor between output pins \bar{O}_1 and \bar{O}_2 uses \bar{O}_1 as an output current source and \bar{O}_2 as an output current sink to rotate the motor. In addition, giving the reverse signal to inputs IN_1 and IN_2 sets \bar{O}_1 and \bar{O}_2 to low-level and high-level, respectively, resulting in rotating the motor reversely. However, when both IN_1 and IN_2 are set to "H", both \bar{O}_1 and \bar{O}_2 are set to low-level, resulting in sudden stop of motor rotation. (Brake mode)

If the Zener diode of certain voltage, for example, is added to the V_z pin, the output "H" voltage does not rise over the Zener voltage and the motor rotates at constant speed.

If the V_z pin is connected to the output power supply $V_{CC'}$ pin, the rotating speed of the motor can be varied by varying the $V_{CC'}$ voltage.

The motor rush current and the current with the motor put in stationary status are as follows: $I_{op(max)} = 800mA$ and $I_o(max) = 150mA$.

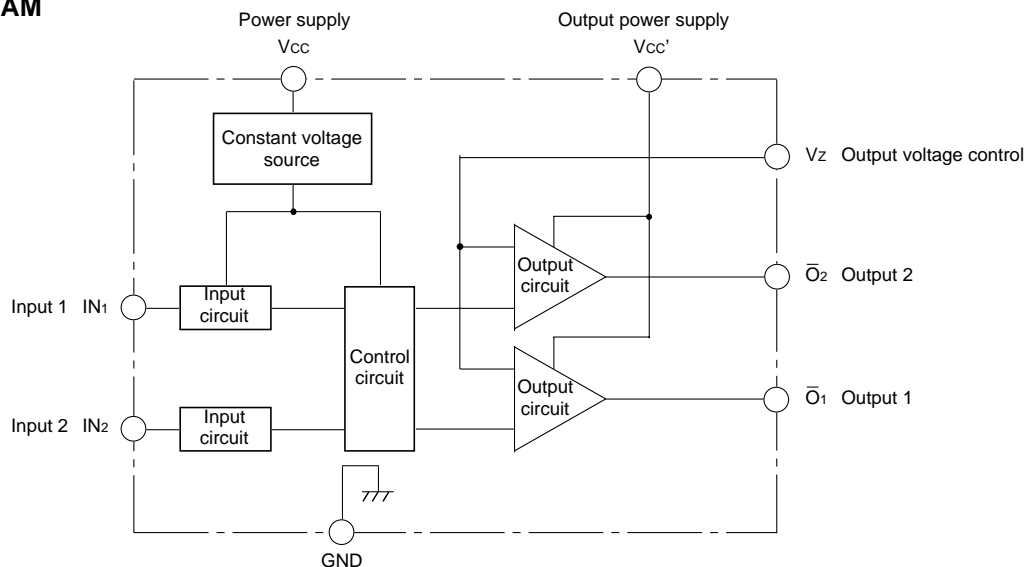
PIN CONFIGURATION (TOP VIEW)



LOGIC TRUTH TABLE

Input		Output		Remarks
IN_1	IN_2	\bar{O}_1	\bar{O}_2	
L	L	"OFF" state	"OFF" state	No operation of IC
H	L	H	L	^e xForward rotation
L	H	L	H	Reverse rotation
H	H	L	L	Brake

BLOCK DIAGRAM

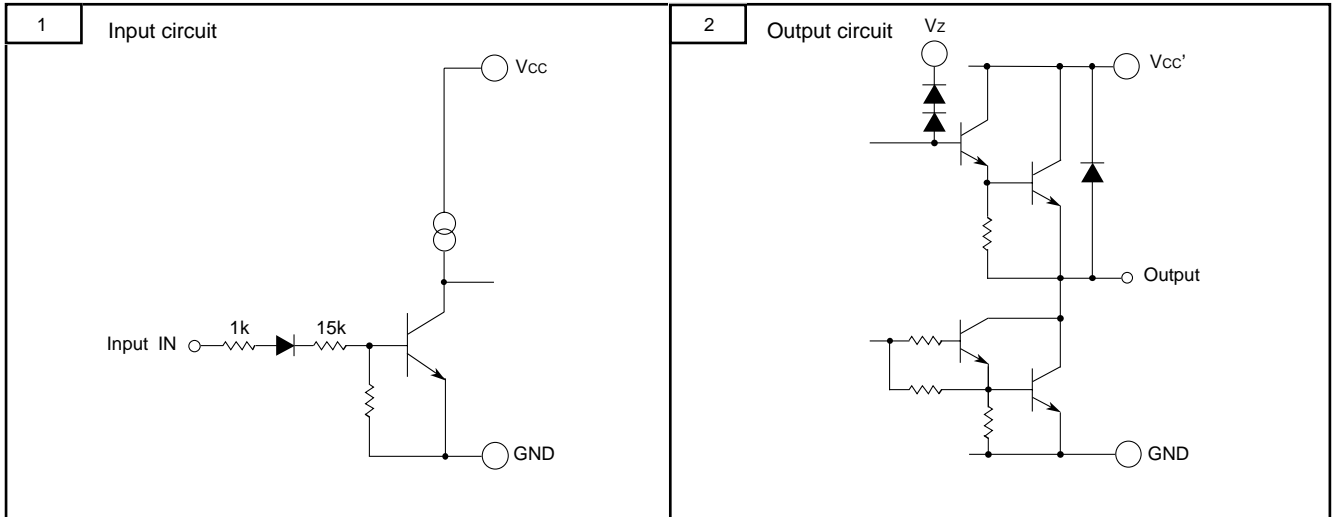


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BI-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION

Though the IC is equipped with a thermal shutdown circuit for prevention against thermal breaking, the threshold temperature is set to 100°C min. Set the driving current in such a way that this thermal shutdown circuit cannot operate during normal operation.

INPUT/OUTPUT CIRCUIT



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

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		-0.5 – +12	V
Vcc'	Output Supply voltage		-0.5 – +20	V
Vi	Input voltage	Vi < Vcc	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	±800	mA
Io	Continuous output current		±150	mA
Pd	Power dissipation	Ta = 60°C(M54641L)	570	mW
Tj	Junction temperature		100	°C
Topr	Operating temperature		-10 – 60	°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	5	10	V
Io	Output current				±100	mA
ViH	“H” input voltage		3.0		Vcc	V
ViL	“L” input voltage		0		0.6	V
ts	Motor braking interval		10	100		ms
Ts	Operation temperature of thermal protection circuit (junction temperature)		100	120		°C

Bi-DIRECTIONAL MOTOR DRIVER WITH BRAKE FUNCTION

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc = 5V, unless otherwise noted)

Symbol	Parameter	Test conditions		Limits			Unit	
				Min.	Typ.	Max.		
Io(leak)	Output leak current	Vcc' = 20V Vz: Open	Vo = 20V			100	μA	
			Vo = 0V			-100		
VOH	“H” output saturation voltage	Vcc' = 12V Vz: Open	IoH = -50mA	10.2	10.5		V	
			IoH = -100mA	10.0	10.4			
VOL	“L” output saturation voltage	Vcc' = 12V Vz: Open	IoH = 50mA		0.1	0.3	V	
			IoH = 100mA		0.2	0.4		
VO1-02	Voltage between outputs (1) and (2) (Voltage across Motor)	Vcc' = 12V Vz = 7V	Io = ±100mA	6.3	7.0	7.7	V	
Ii	Input voltage	Vcc' = 12V	Output open	Vi = 3V		100	180	μA
				Vi = 5V		240	380	
Icc	Supply current	Vcc = 10V Vcc' = 12V Output OPEN	In “OFF” state		1.2	3.0	mA	
			Forward rotation or reverse rotation		4.5	8.0		
			Braking		7.5	12.0		

TYPICAL CHARACTERISTICS Condition • With basic installation (epoxy board of 5cm x 5cm x 0.8mm with copper foil on a single side)
• t : Power apply time

