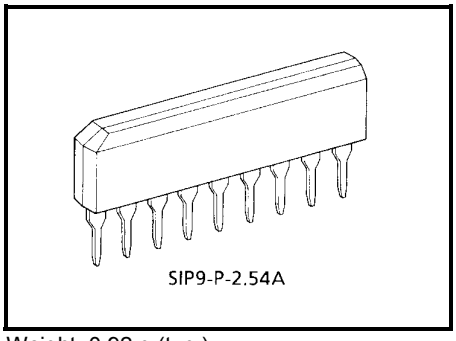
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8405S

Sequential Dual-Bridge Driver (Driver for Switching between Forward and Reverse Rotation) for DC Motor

The TA8405S can control a DC motor in four different modes (forward rotation, reverse rotation, stop, and brake), using its bridge driver best suited for switching between forward and reverse rotation.
The IC can deliver an output current of 0.4 A (AVE.) and 1.0 A (PEAK). It has a circuit configuration best suited especially for VCR front loading and tape loading.

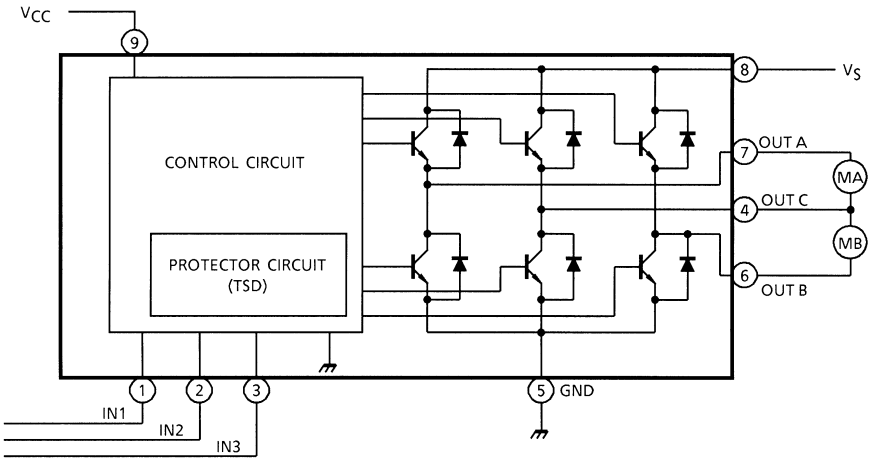


Weight: 0.92 g (typ.)

Features

- Wide range of operating voltage: V_{CC} (opr.) = 4.5 to 22 V
  V_S (opr.) = 0 to 22 V
  No malfunction occurs even if V_{CC} is higher than VS or vice versa. However, observe $V_{ref} \leq V_S$.
- Output current up to 0.4 A (AVE.) and 1.0 A (PEAK)
- Built−in thermal shutdown circuit
- Panch-through current restriction circuit
- Built-in back electromotive force absorber diode
- Built-in hysteresis circuit

Block Diagram

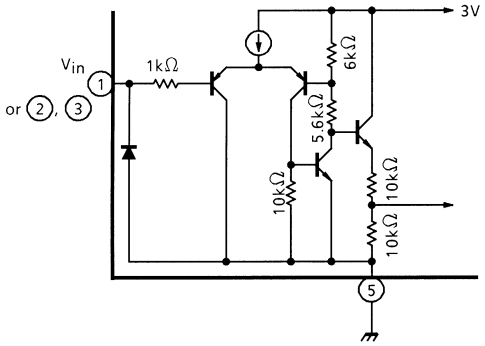


Pin Function

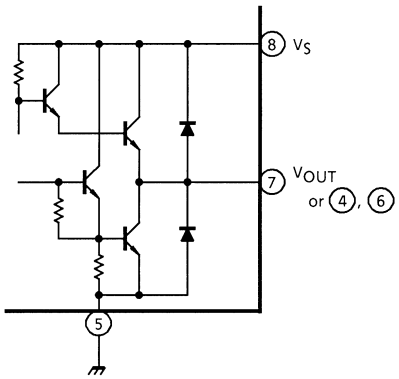
Pin No.	Symbol	Functional Description
1	IN_1	Input terminal
2	IN_2	Input terminal
3	IN_3	Input terminal
4	OUT C	Output terminal
5	GND	GND terminal
6	OUT B	Output terminal
7	OUT A	Output terminal
8	V_S	Supply voltage terminal for motor drive
9	V_{CC}	Supply voltage terminal for logic

Function Specification

(1) Input circuit



(2) Output circuit



Function

Input			Output			Mode	
IN 1	IN 2	IN 3	OUT C	OUT A	OUT B	MA	MB
0	0	1/0	∞	∞	∞	STOP	STOP
1	0	0	H	L	∞	CW/CCW	STOP
1	0	1	L	H	∞	CCW/CW	STOP
0	1	0	H	∞	L	STOP	CW/CCW
0	1	1	L	∞	H	STOP	CCW/CW
1	1	1/0	L	L	L	BRAKE	BRAKE

∞: High impedance

Note: Inputs are all low active type.

Maximum Ratings (Ta = 25°C)

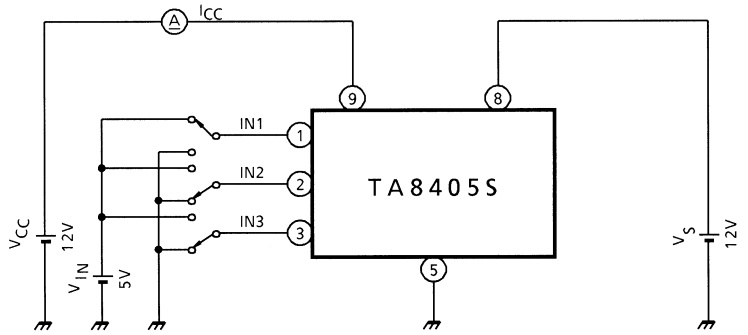
Characteristics		Symbol	Rating	Unit
Supply voltage		V_{CC}	25	V
Motor drive voltage		V_S	25	V
Output current	PEAK	$I_{O\ (PEAK)}$	1.0 (Note 1)	A
	AVE.	$I_{O\ (AVE.)}$	0.4	
Power dissipation		P_D	0.75 (Note 2)	W
Operating temperature		T_{opr}	−30 to 75	°C
Storage temperature		T_{stg}	−55 to 150	°C

Note 1: Duty 1/10, 100 ms
Note 2: No heat sink

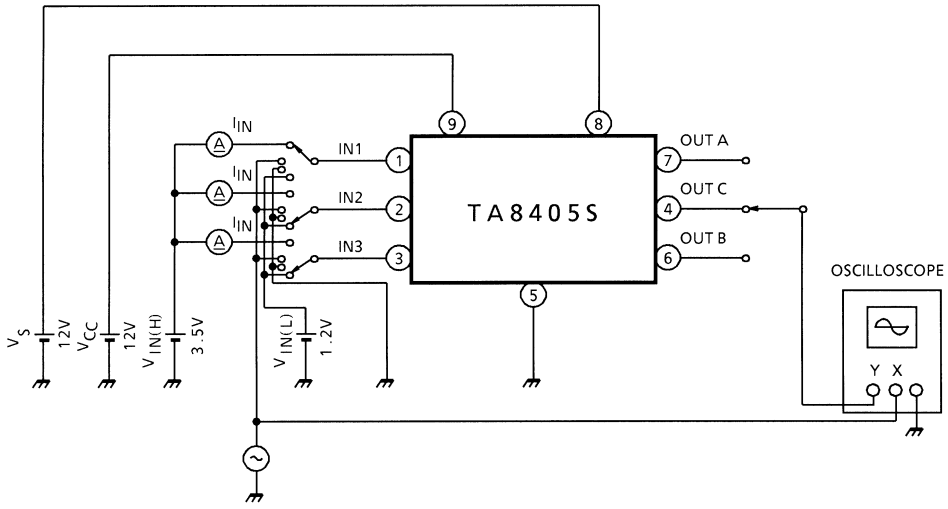
Electrical Characteristics (unless otherwise specified, Ta = 25°C, V_{CC} = 12 V, V_S = 12 V)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Supply current		I_{CC1}	1	Output open, CW/CCW mode	—	7	15	mA
		I_{CC2}	1	Output open, BRAKE mode	—	15	38	
		I_{CC3}	1	Output open, STOP mode	—	7	15	
Input operating voltage	1 (High)	$V_{IN\,1}$	2	—	3.5	—	5.5	V
	2 (Low)	$V_{IN\,2}$	2	—	GND	—	1.2	
Input current		I_{IN}	2	V_{IN} = GND, source mode	—	4	60	μA
Input hysteresis voltage		ΔV_T	2	—	—	1.5	—	V
Output saturation voltage	Upper	$V_{SAT\,U-1}$	3	I_O = 0.4 A , $V_{OUT}-V_S$ measure	—	1.0	1.4	V
	Lower	$V_{SAT\,L-1}$	3	I_O = 0.4 A V_{OUT}−GND measure	—	0.8	1.2	
	Upper	$V_{SAT\,U-2}$	3	$V_{OUT}-V_S$ measure I_O = 1.0 A, ON LOAD : 20 ms	—	1.3	2.3	
	Lower	$V_{SAT\,L-2}$	3	V_{OUT}−GND measure I_O = 1.0 A, ON LOAD : 20 ms	—	1.0	1.5	
Output transistor leakage current	Upper	$I_{L\,U}$	5	V_S = 25 V	—	—	50	μA
	Lower	$I_{L\,L}$	5	V_S = 25 V	—	—	50	
Diode forward voltage	Upper	$V_{F\,U}$	4	I_F = 1.0 A	—	2.1	—	V
	Lower	$V_{F\,L}$	4	I_F = 1.0 A	—	1.6	—	
Thermal shut down operating temperature		T_{SD}	—	T_j	—	130	—	°C

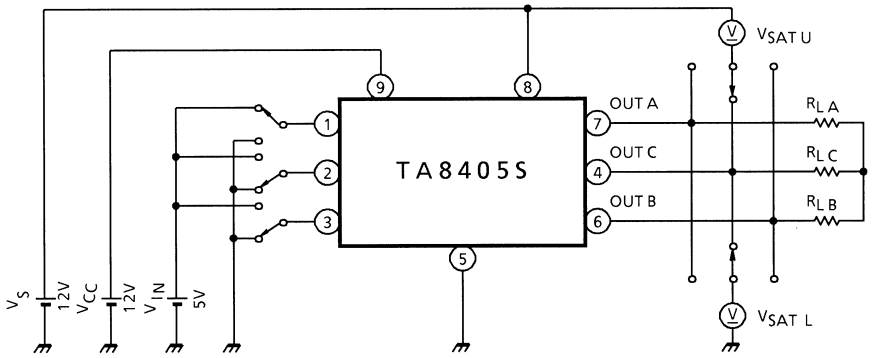
Test Circuit 1
$I_{CC1, 2, 3}$



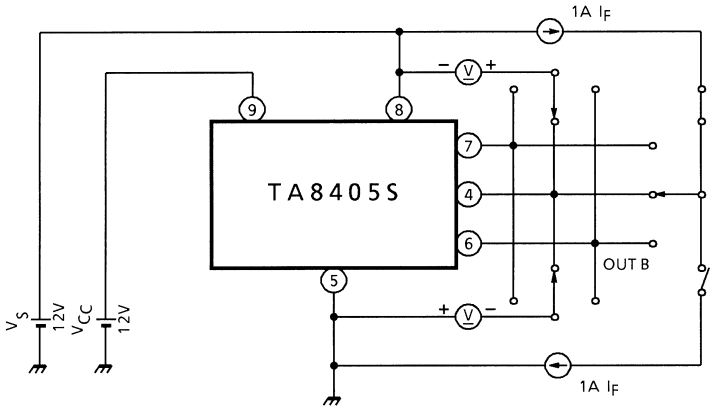
Test Circuit 2
$V_{IN1, 2}$, I_{IN}, ΔV_T



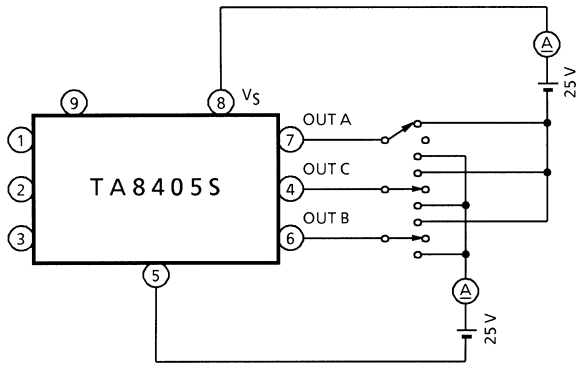
Test Circuit 3
$V_{SAT\ U-1,\ L-1,\ U-2,\ L-2}$

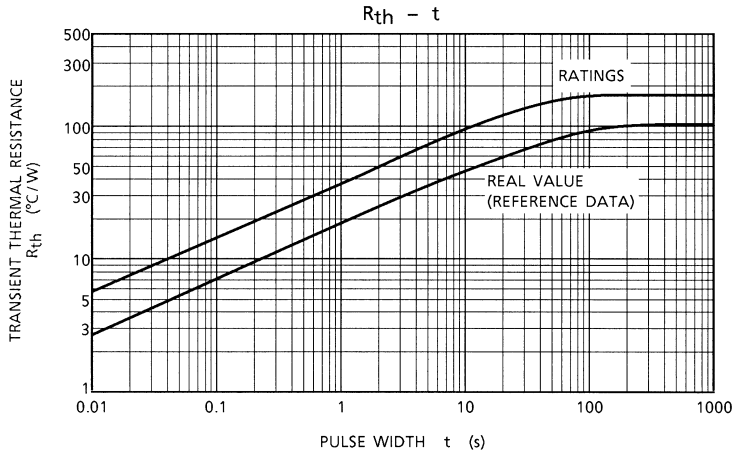


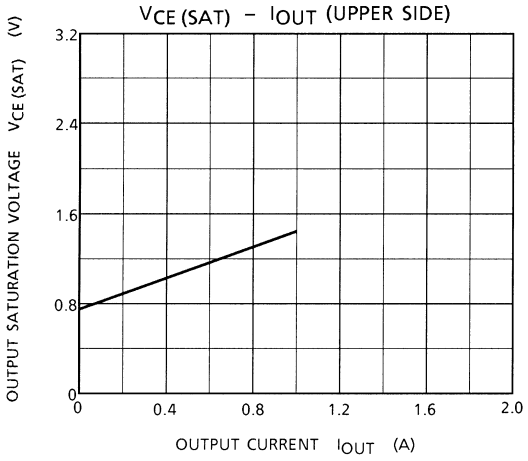
Test Circuit 4
$V_{F\ U,\ L}$

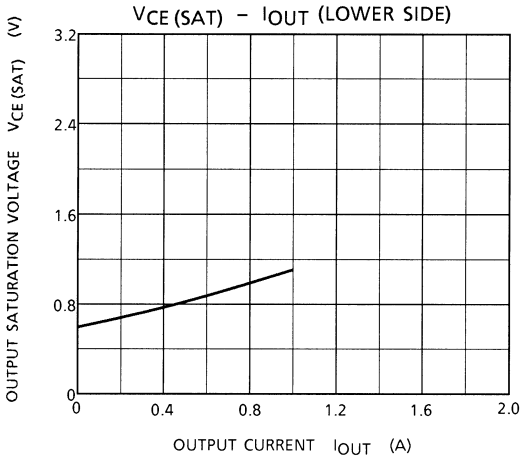


Test Circuit 5
$I_{L\ U,\ L}$

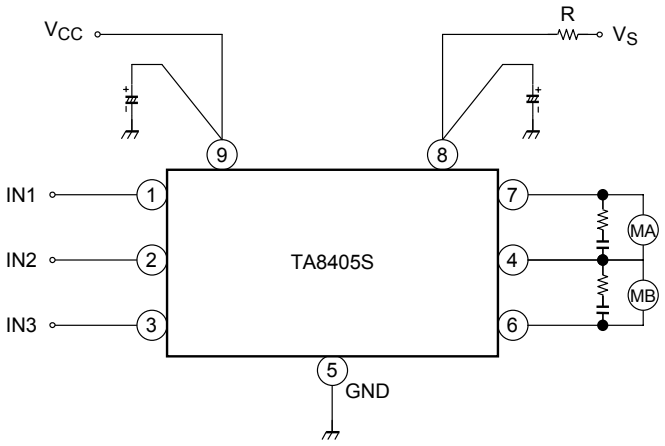



R_{th} – t
TRANSIENT THERMAL RESISTANCE R_{th} (°C/W)
500
300
100
50
30
10
5
3
1
0.01
0.1
1
10
100
1000
RATINGS
REAL VALUE
(REFERENCE DATA)
PULSE WIDTH t (s)


$V_{CE\ (SAT)}$ – I_{OUT} (UPPER SIDE)
OUTPUT SATURATION VOLTAGE $V_{CE\ (SAT)}$ (V)
3.2
2.4
1.6
0.8
0
0
0.4
0.8
1.2
1.6
2.0
OUTPUT CURRENT I_{OUT} (A)


$V_{CE\ (SAT)}$ – I_{OUT} (LOWER SIDE)
OUTPUT SATURATION VOLTAGE $V_{CE\ (SAT)}$ (V)
3.2
2.4
1.6
0.8
0
0
0.4
0.8
1.2
1.6
2.0
OUTPUT CURRENT I_{OUT} (A)

Application Circuit



Note 1: Select an optimum value for the capacitor by experiment.

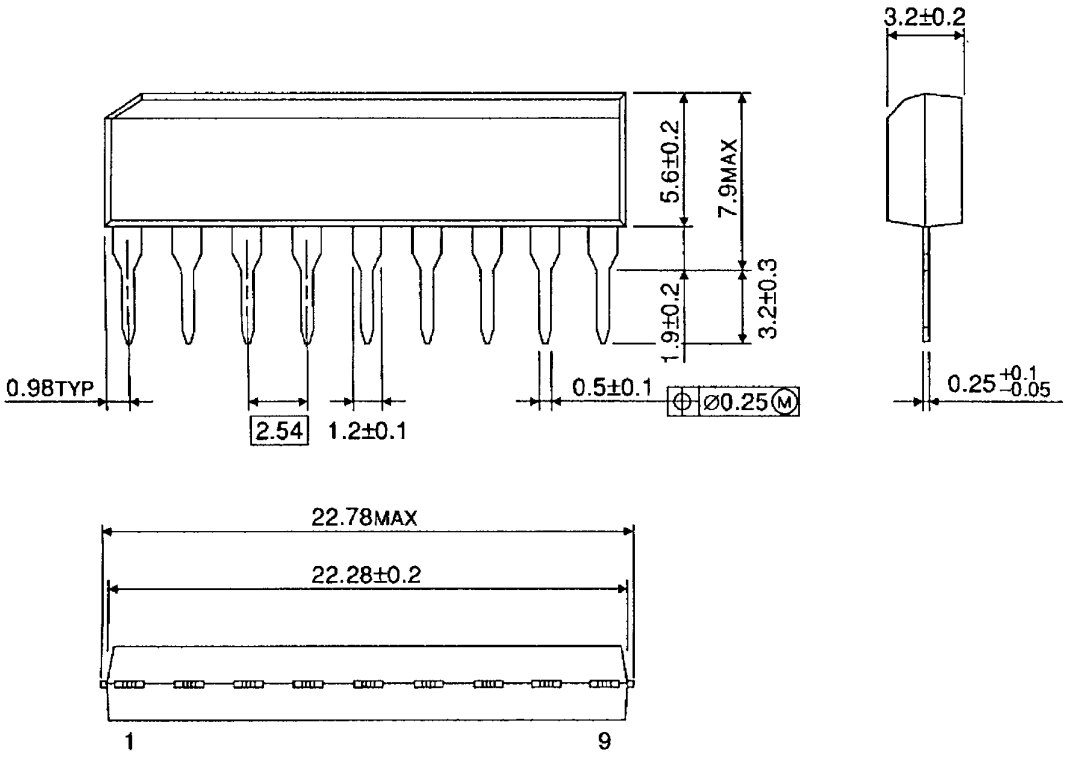
Note 2: A short-circuit between outputs, an output voltage fault, and a ground fault may break down the ICs and supply an overvoltage and overcurrent to components around the them. Be very careful when designing the output, V_{CC}, V_S, and ground lines.
Note in mind that mounting the IC in the reverse orientation may also cause a breakdown.

Note 3: Use a current limiting resistor (R) or fuse for overcurrent protection.

Note 4: When turning on the power for the ICs, apply V_S after V_{CC} (or V_{CC} and V_S simultaneously). When shutting off the power, drop V_S before V_{CC} (or V_S and V_{CC} simultaneously).
When turning on the power (V_{CC}), keep both the inputs (IN1, IN2 and IN3) on a low level.

Package Dimensions

SIP9-P-2.54A Unit : mm



Weight: 0.92 g (typ.)

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