TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7291P, TA7291S, TA7291F

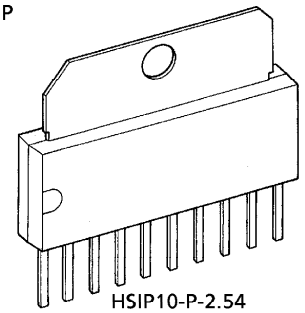
BRIDGE DRIVER

The TA7291P/S/F are Bridge Driver with output voltage control.

FEATURES

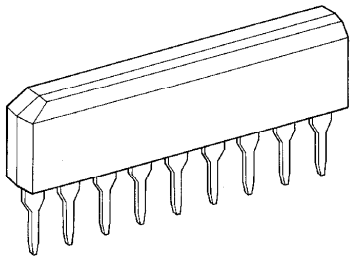
- 4 modes available (CW / CCW / STOP / BRAKE)
- Output current : P type 1.0 A (AVE.) 2.0 A (PEAK)
  S/F type 0.4 A (AVE.) 1.2 A (PEAK)
- Wide range of operating voltage : $V_{CC\,(opr.)}$ = 4.5~20 V
  $V_{S\,(opr.)}$ = 0~20 V
  $V_{ref\,(opr.)}$ = 0~20 V
- Build in thermal shutdown, over current protector and punch = through current restriction circuit.
- Stand-by mode available (STOP MODE)
- Hysteresis for all inputs.

TA7291P



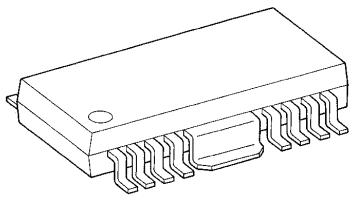
HSIP10-P-2.54

TA7291S



SIP9-P-2.54A

TA7291F

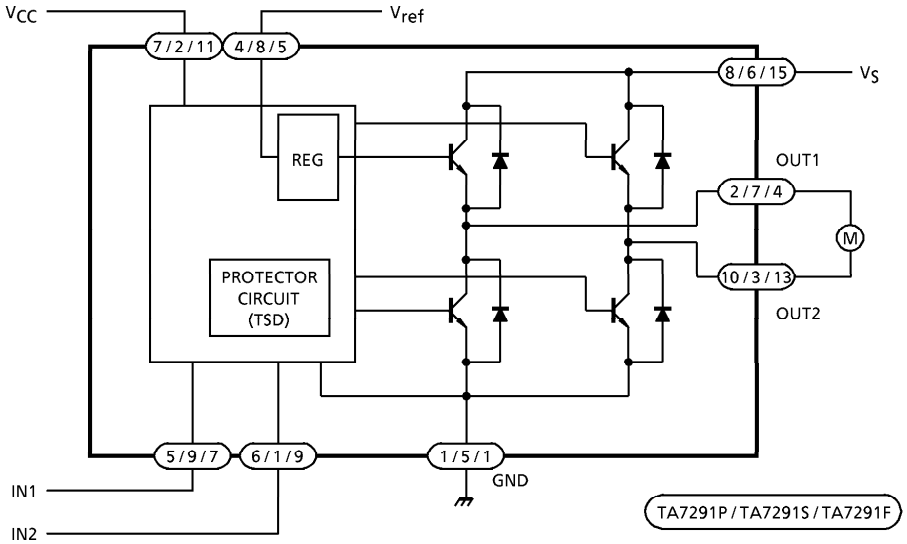


HSOP16-P-300-1.00

Weight
HSIP10-P-2.54 : 2.47 g (Typ.)
SIP9-P-2.54A : 0.92 g (Typ.)
HSOP16-P-300-1.00 : 0.50 g (Typ.)

980910EBA1

BLOCK DIAGRAM



PIN FUNCTION

PIN No.			SYMBOL	FUNCTIONAL DESCRIPTION
P	S	F		
7	2	11	V_{CC}	Supply voltage terminal for Logic
8	6	15	V_S	Supply voltage terminal for Motor driver
4	8	5	V_{ref}	Supply voltage terminal for control
1	5	1	GND	GND terminal
5	9	7	IN1	Input terminal
6	1	9	IN2	Input terminal
2	7	4	OUT1	Output terminal
10	3	13	OUT2	Output terminal

P Type : PIN ③, ⑨ : NC
S Type : PIN ④ : NC
F Type : PIN ②, ③, ⑥, ⑧, ⑩, ⑫, ⑭, and ⑯ : NC
For F Type, We recommend FIN to be connected to the GND.

FUNCTION

INPUT		OUTPUT		MODE
IN1	IN2	OUT1	OUT2	
0	0	∞	∞	STOP
1	0	H	L	CW / CCW
0	1	L	H	CCW / CW
1	1	L	L	BRAKE

∞ : High impedance
(Note) Inputs are all high active type

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC			SYMBOL	RATING	UNIT
Supply Voltage			V_{CC}	25	V
Motor Drive Voltage			V_S	25	V
Reference Voltage			V_{ref}	25	V
Output Current	PEAK	P Type	I_O (PEAK)	2.0	A
		S / F Type		1.2	
	AVE.	P Type	I_O (AVE.)	1.0	
		S / F Type		0.4	
Power Dissipation		P Type	P_D	(*1) 12.5	W
		S Type		(*2) 0.95	
		F Type		(*3) 1.4	
Operating Temperature			T_{opr}	−30~75	°C
Storage Temperature			T_{stg}	−55~150	°C

(*1) Tc = 25°C (TA7291P)
(*2) No heat sink
(*3) PCB (60 × 30 × 1.6 mm, occupied copper area in excess of 50%) Mounting Condition.

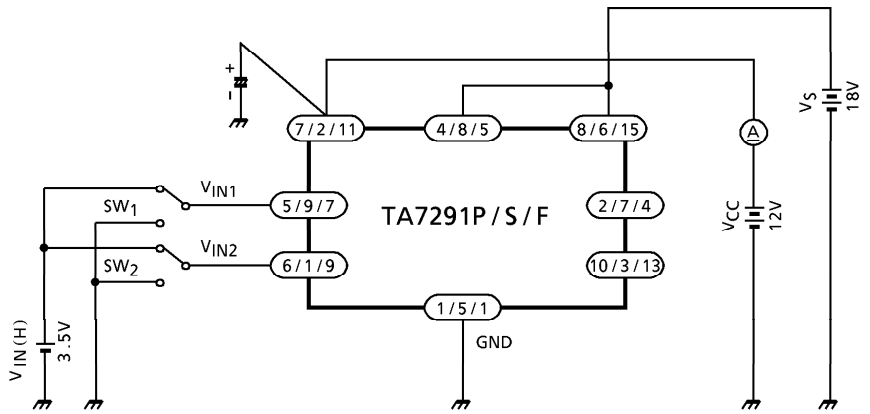
Wide range of operating voltage : $V_{CC\,(opr.)}$ = 4.5~20 V
$V_{S\,(opr.)}$ = 0~20 V
$V_{ref\,(opr.)}$ = 0~20 V
$V_{ref} \leqq V_S$

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = 25°C, V_{CC} = 12 V, V_S = 18 V)

CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current			I_{CC1}	1	Output OFF, CW / CCW mode	—	8.0	13.0	mA
			I_{CC2}		Output OFF, Stop mode	—	0	50	μA
			I_{CC3}		Output OFF, Brake mode	—	6.5	10.0	mA
Input Operating Voltage	1 (High)		V_{IN1}	2	T_j = 25°C	3.5	—	5.5	V
	2 (Low)		V_{IN2}			GND	—	0.8	
Input Current			I_{IN}		V_{IN} = 3.5 V, Sink mode	—	3	10	μA
Input Hysteresis Voltage			ΔV_T		—	—	0.7	—	V
Saturation Voltage	P / S / F Type	Upper Side	$V_{SAT\ U-1}$	3	V_{ref} = V_S, V_{OUT} – V_S measure I_O = 0.2 A, CW / CCW mode	—	0.9	1.2	V
		Lower Side	$V_{SAT\ L-1}$		V_{ref} = V_S, V_{OUT} – GND measure I_O = 0.2 A, CW / CCW mode	—	0.8	1.2	
	S / F Type	Upper Side	$V_{SAT\ U-2}$		V_{ref} = V_S, V_{OUT} – V_S measure I_O = 0.4 A, CW / CCW mode	—	1.0	1.35	
		Lower Side	$V_{SAT\ L-2}$		V_{ref} = V_S, V_{OUT} – GND measure I_O = 0.4 A, CW / CCW mode	—	0.9	1.35	
	P Type	Upper Side	$V_{SAT\ U-3}$		V_{ref} = V_S, V_{OUT} – V_S measure I_O = 1.0 A, CW / CCW mode	—	1.3	1.8	
		Lower Side	$V_{SAT\ L-3}$		V_{ref} = V_S, V_{OUT} – GND measure I_O = 1.0 A, CW / CCW mode	—	1.2	1.85	
Output Voltage (Upper Side)	S / F Type		$V_{SAT\ U-1'}$	3	V_{ref} = 10 V, V_{OUT} – GND measure, I_O = 0.2 A, CW / CCW mode	—	11.2	—	V
			$V_{SAT\ U-2'}$		V_{ref} = 10 V, V_{OUT} – GND measure, I_O = 0.4 A, CW / CCW mode	10.4	10.9	12.2	
	P Type		$V_{SAT\ U-3'}$		V_{ref} = 10 V, V_{OUT} – GND measure, I_O = 0.5 A, CW / CCW mode	—	11.0	—	
			$V_{SAT\ U-4'}$		V_{ref} = 10 V, V_{OUT} – GND measure, I_O = 1.0 A, CW / CCW mode	10.2	10.7	12.0	
Leakage Current		Upper Side	$I_{L\ U}$	4	V_L = 25 V	—	—	50	μA
		Lower Side	$I_{L\ L}$		V_L = 25 V	—	—	50	
Diode Forward Voltage	S / F Type	Upper Side	$V_{F\ U-1}$	5	I_F = 0.4 A	—	1.5	—	V
	P Type	Lower Side	$V_{F\ U-2}$		I_F = 1 A	—	2.5	—	
	S / F Type	Upper Side	$V_{F\ L-1}$		I_F = 0.4 A	—	0.9	—	
	P Type	Lower Side	$V_{F\ L-2}$		I_F = 1 A	—	1.2	—	
Reference Current			I_{ref}	2	V_{ref} = 10 V, Source mode	—	20	40	μA

TEST CIRCUIT 1

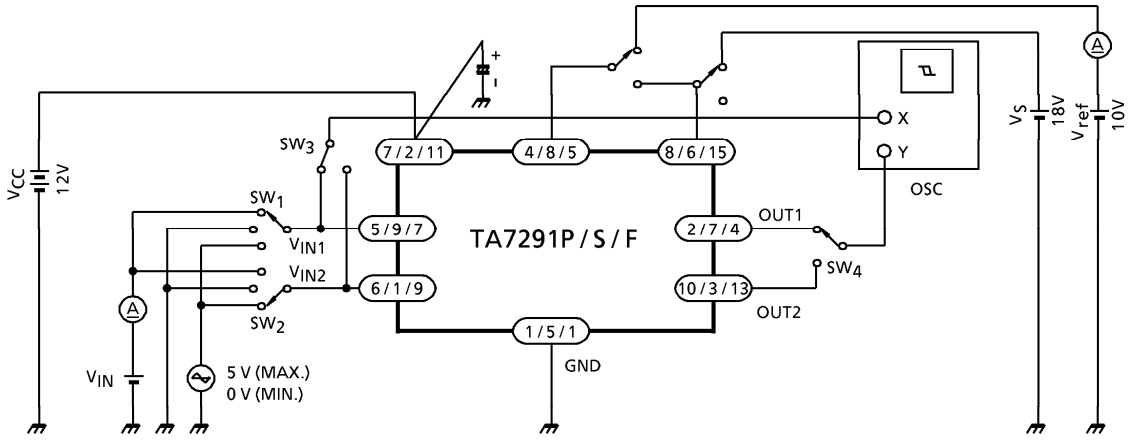
I_{CC1}, I_{CC2}, I_{CC3}



(Note) HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 2

V_{IN1}, V_{IN2}, I_{IN}, ΔV_T, I_{ref}

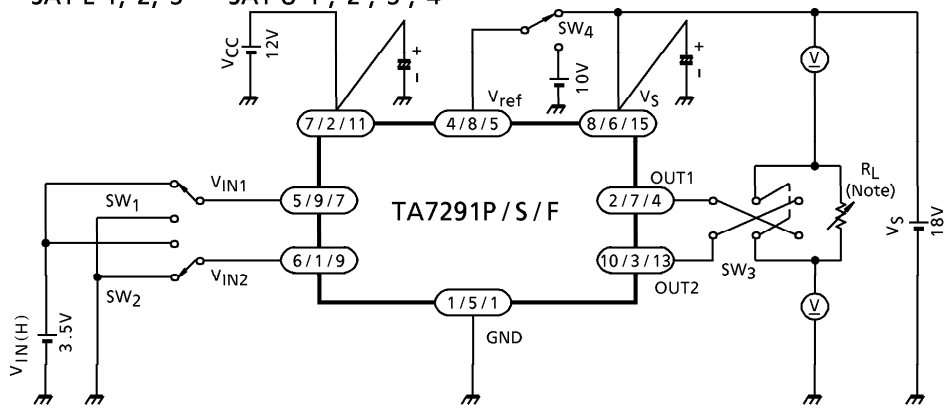


TA7291P / TA7291S / TA7291F

(Note) HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 3

$V_{SAT\ U\text{-}1,\ 2,\ 3}$ $V_{SAT\ L\text{-}1,\ 2,\ 3}$ $V_{SAT\ U\text{-}1',\ 2',\ 3',\ 4'}$

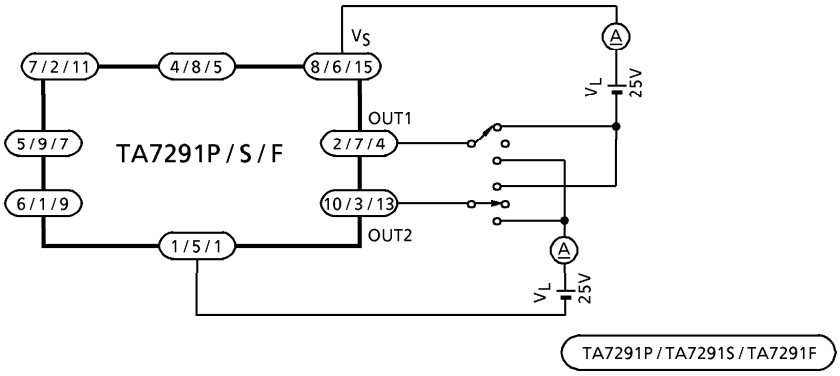


(Note) I_{OUT} calibration is required to adjust specified values of test conditions by R_L. (I_{OUT} = 0.2 A / 0.4 A / 0.5 A / 1.0 A)

(Note) HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 4

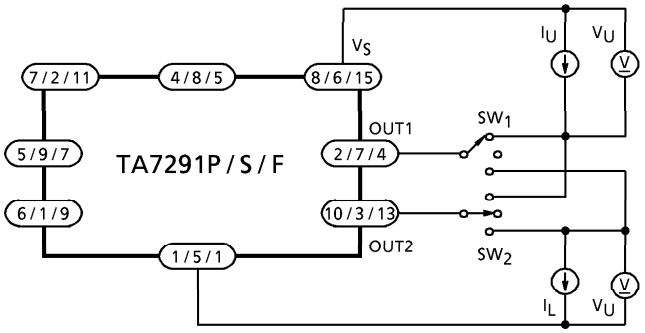
$I_{L\ U,\ L}$



(Note) HEAT FIN of TA7291F is connected to GND.

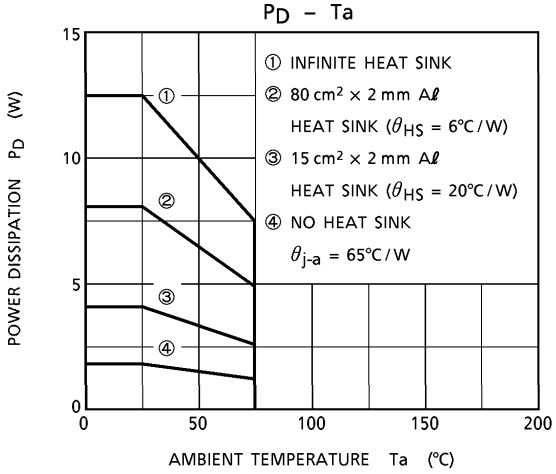
TEST CIRCUIT 5

$V_{F\ U\text{-}1,\ 2}$ $V_{F\ L\text{-}1,\ 2}$



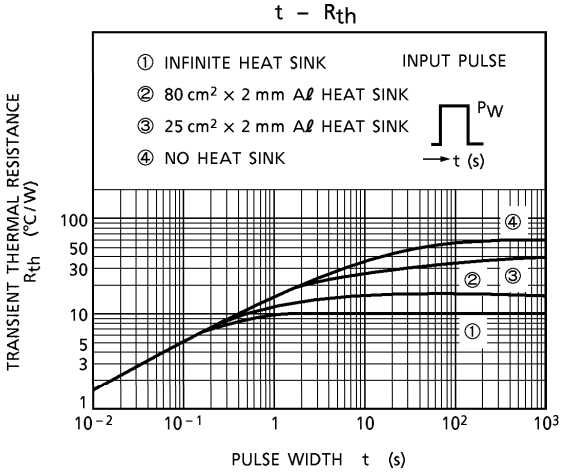
TA7291P

P_D – Ta



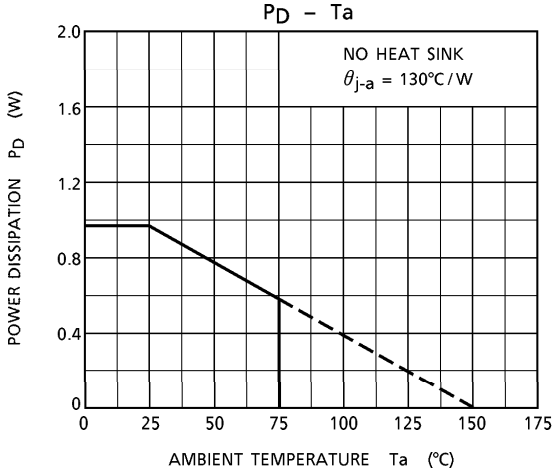
TA7291P

t – R_{th}



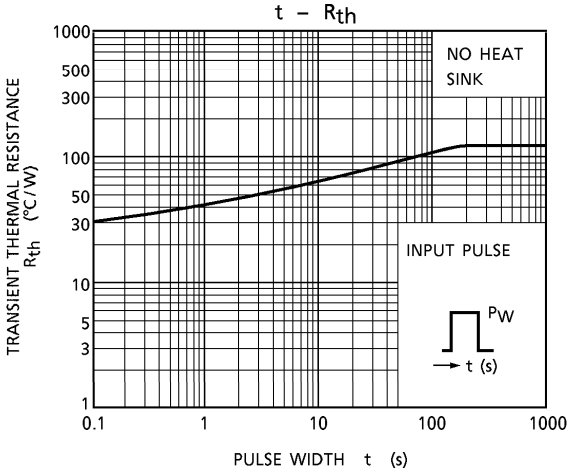
TA7291S

P_D – Ta



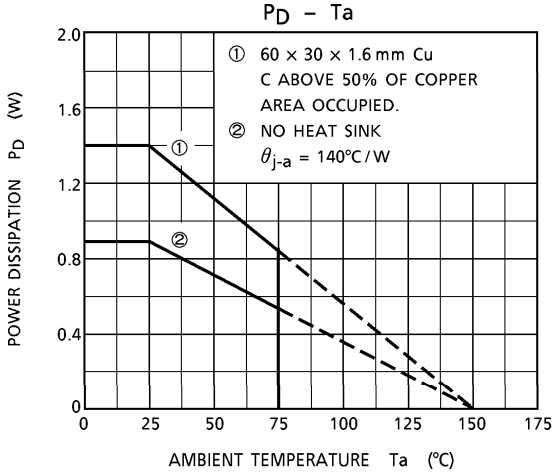
TA7291S

t – R_{th}



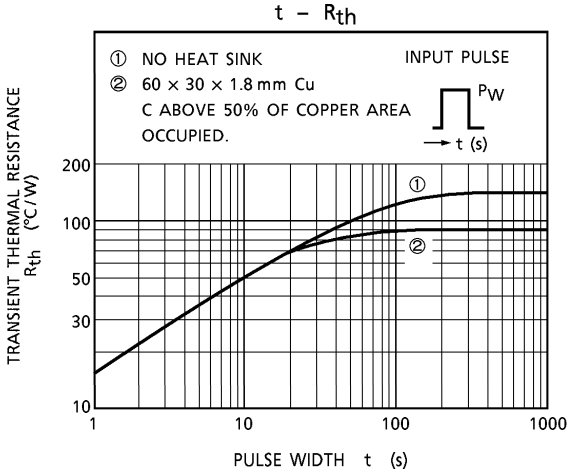
TA7291F

P_D – Ta



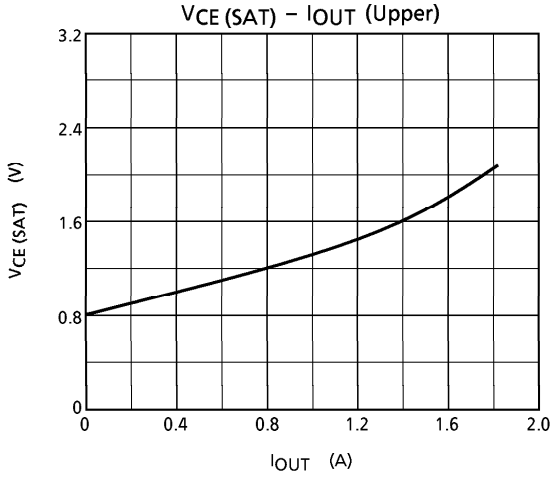
TA7291F

t – R_{th}



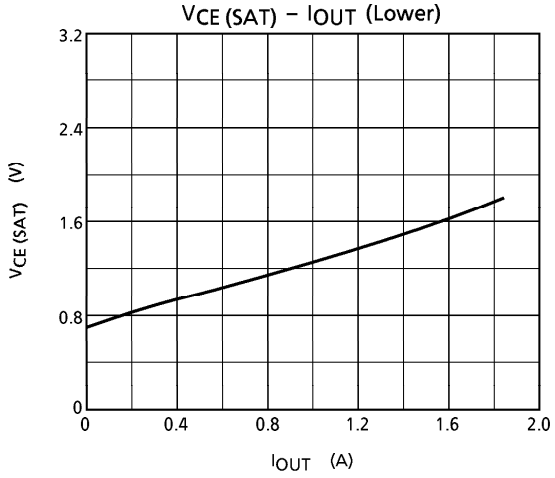
TA7291P

$V_{CE\,(SAT)}$ – I_{OUT} (Upper)

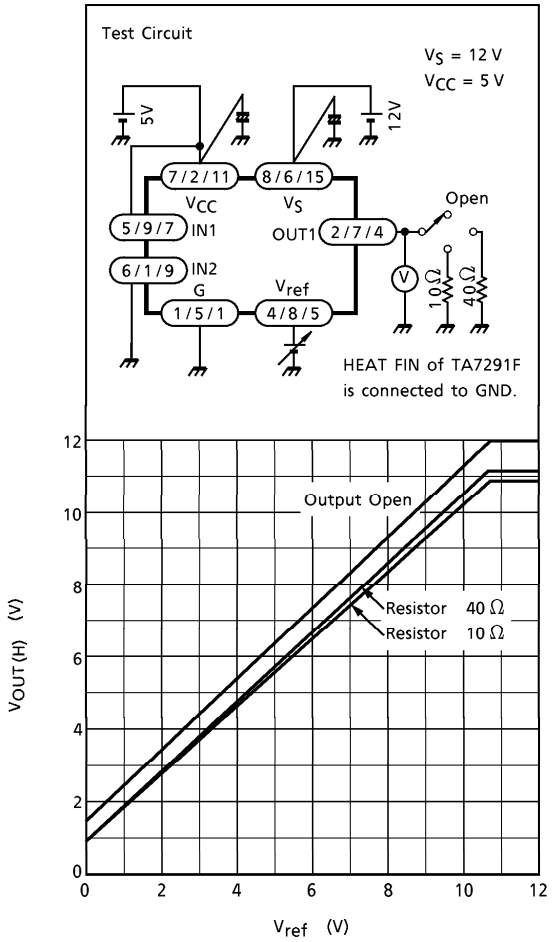


TA7291P

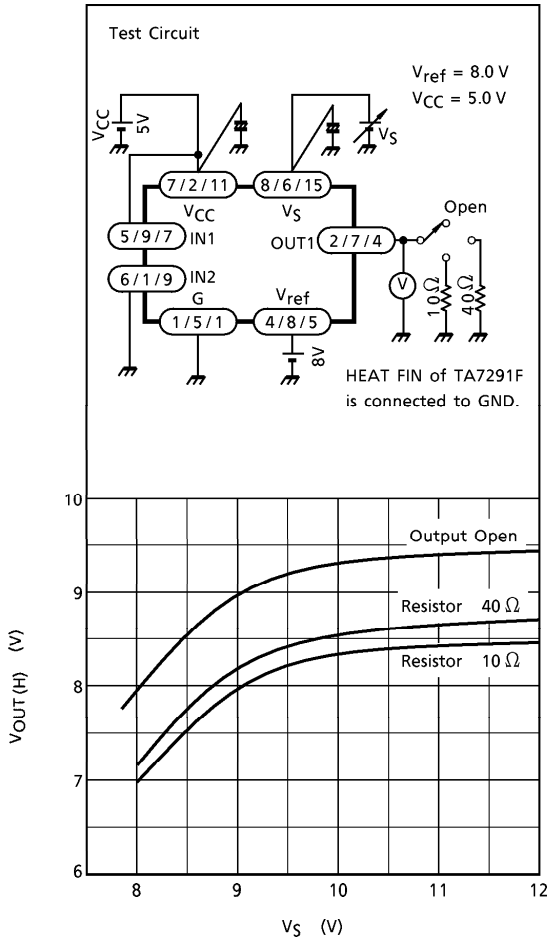
$V_{CE\,(SAT)}$ – I_{OUT} (Lower)



V_{ref} – $V_{OUT\,(H)}$



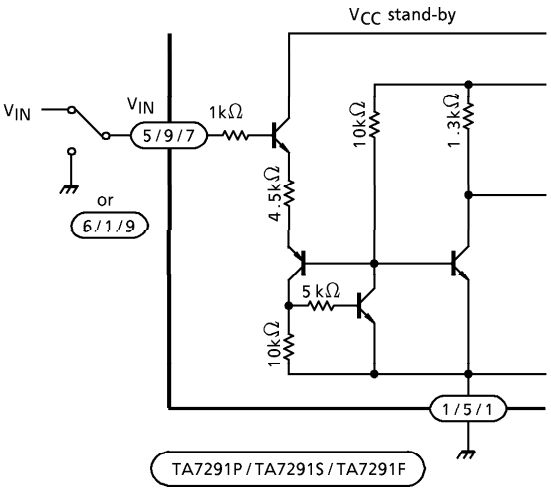
V_S – $V_{OUT\,(H)}$



NOTES

Input circuit

Input Terminals of pin ⑤ and ⑥ (TA7291P) are all high active type and have a hysteresis of 0.7 V (typ.), 3 μA (typ.) of source mode input current is required.



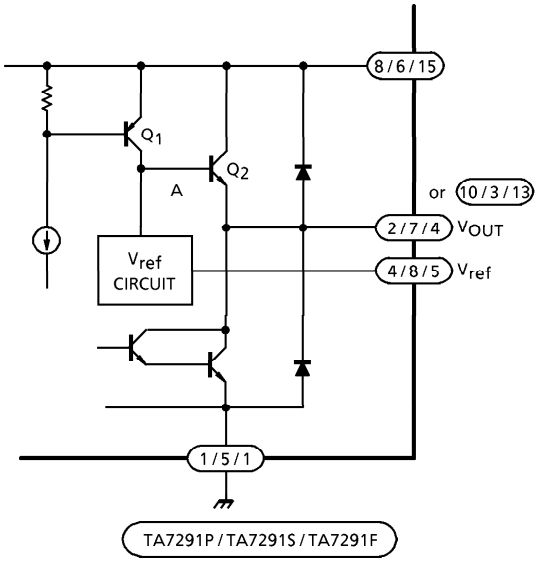
Output circuit

Output voltage is controlled by V_{ref} voltage.
Relationship between V_{OUT} and V_{ref} is

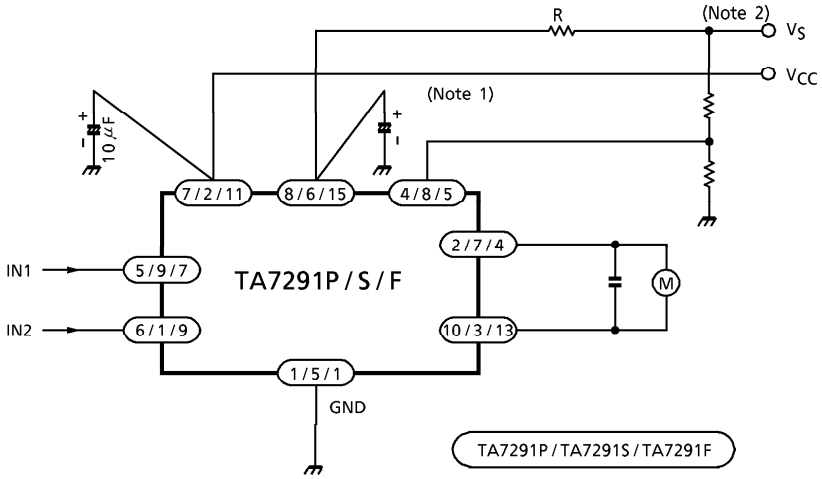
$V_{OUT} = V_{BE}$ ($\fallingdotseq 0.7$) + V_{ref}

V_{ref} terminal required to connect to V_S terminal for stable operation in case of no requirement of V_{OUT} control.

$V_{ref} \leqq V_S$



APPLICATION CIRCUIT



(Note 1) Experiment to find the optimum capacitor valve.
(Note 2) To protect against excess current, current limitation resistor R should be inserted where necessary.

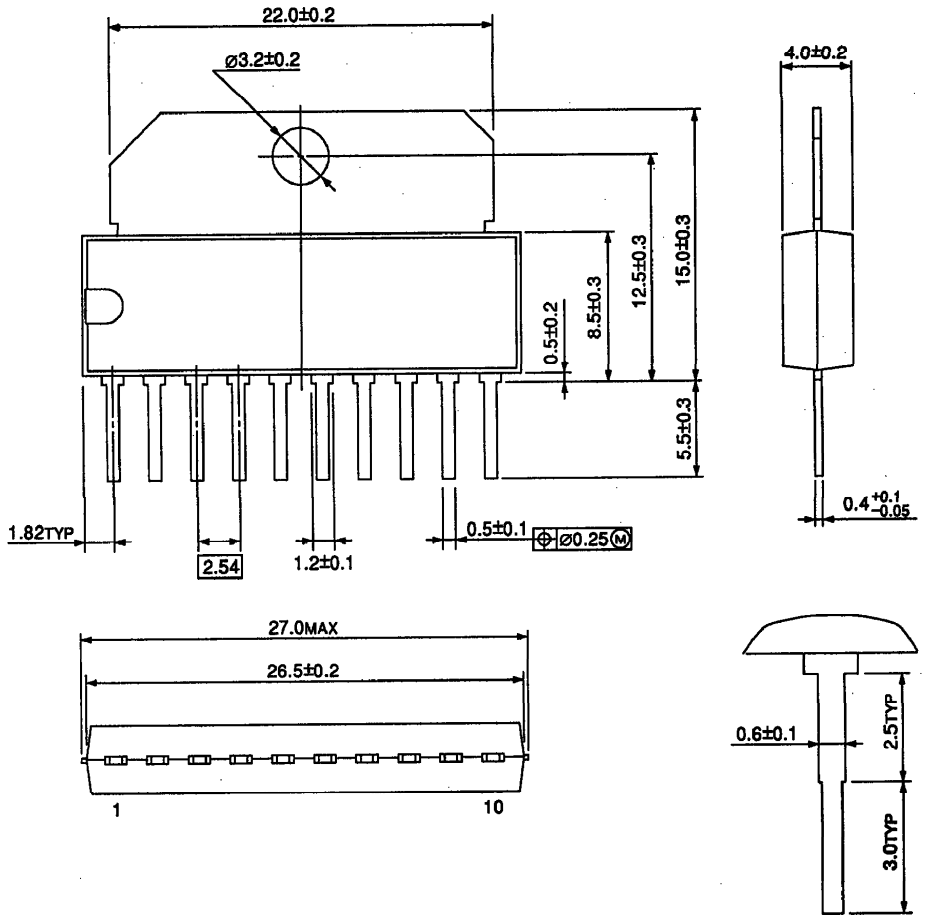
NOTES

- Be careful when switching the input because rush current may occur.
  When switching, stop mode should be entered or current limitation resister R should be inserted.
- The IC functions cannot be guaranteed when turning power on of off.
  Before using the IC for application, check that there are no problems.
- Utmost care is necessary in the design of the output line, V_S, V_{CC} and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING

HSIP10-P-2.54

Unit : mm

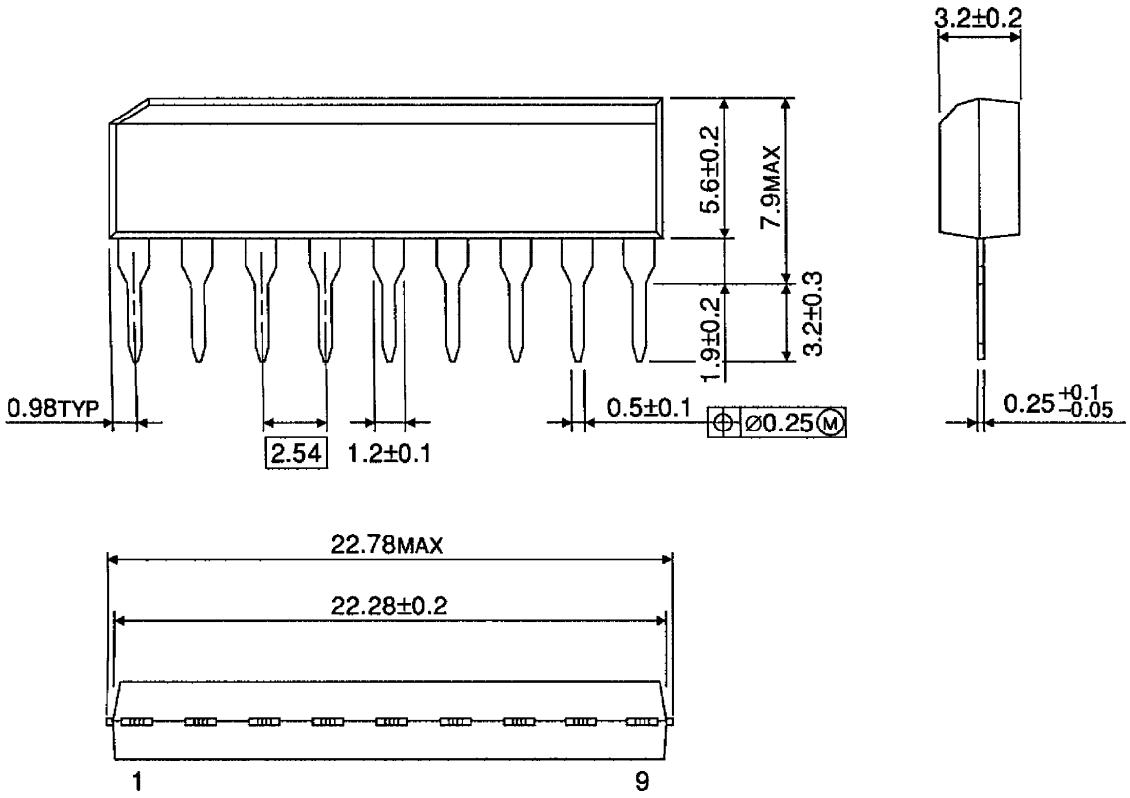


Weight : 2.47 g (Typ.)

OUTLINE DRAWING

SIP9-P-2.54A

Unit : mm

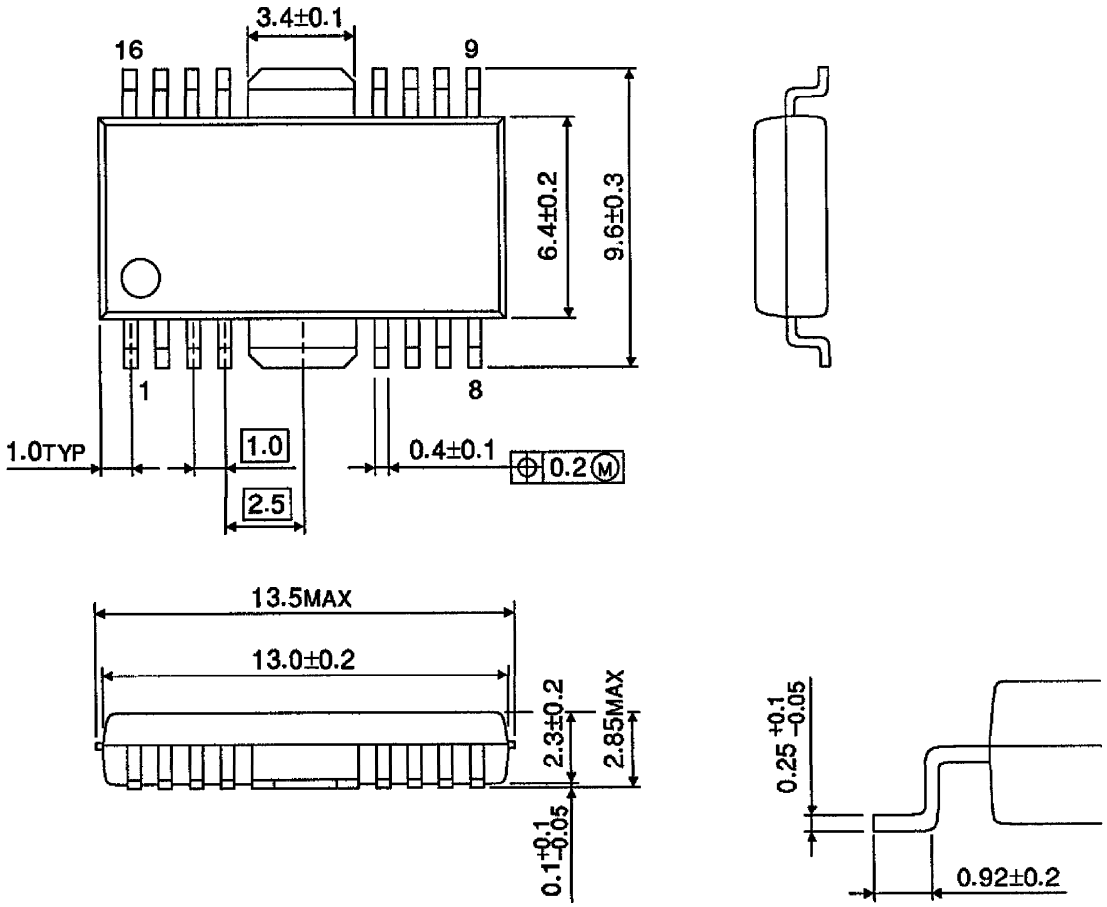


Weight : 0.92 g (Typ.)

OUTLINE DRAWING

HSOP16-P-300-1.00

Unit : mm



Weight : 0.50 g (Typ.)