TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7291P,TA7291S,TA7291F

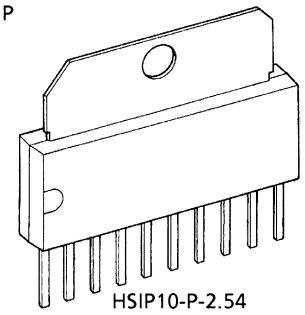
BRIDGE DRIVER

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

FEATURES

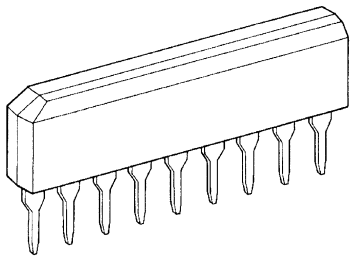
- 4 modes available (CW / CCW / STOP / BRAKE)
- Output current: P type 1.0 A (AVE.) 2.0 A (PEAK)
  S / F type 0.4 A (AVE.) 1.2 A (PEAK)
- Wide range of operating voltage: $V_{CC\ (opr.)}$ = 4.5~20 V
  $V_{S\ (opr.)}$ = 0~20 V
  $V_{ref\ (opr.)}$ = 0~20 V
- Build in thermal shutdown, over current protector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

TA7291P



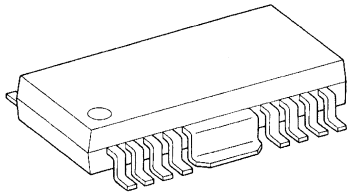
HSIP10-P-2.54

TA7291S



SIP9-P-2.54A

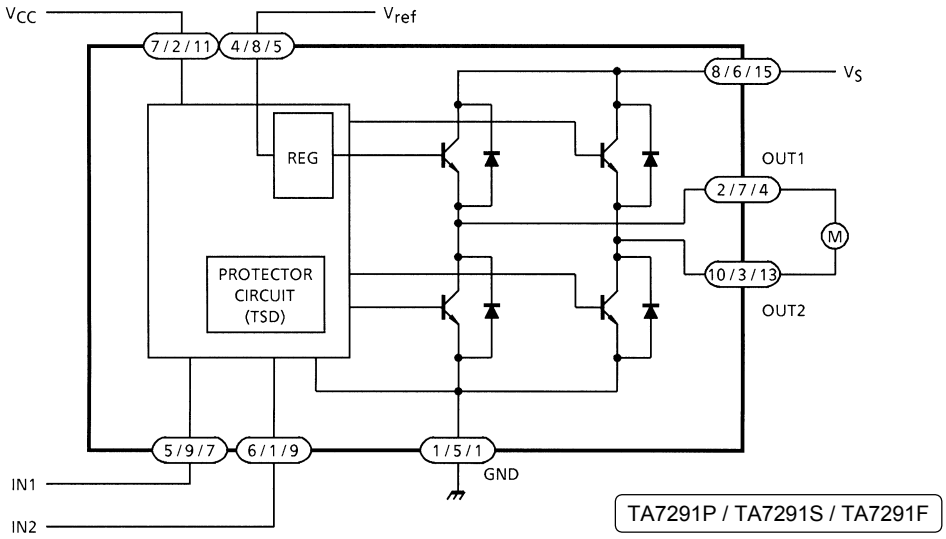
TA7291F



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.)

BLOCK DIAGRAM



PIN FUNCTION

PIN No.			SYMBOL	FUNCTION 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	12.5 (Note 1)	W
		S Type		0.95 (Note 2)	
		F Type		1.4 (Note 3)	
Operating Temperature			T_{opr}	−30~75	°C
Storage Temperature			T_{stg}	−55~150	°C

Note 1: Tc = 25°C (TA7291P)
Note 2: No heat sink
Note 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
$V_{ref} \leq V_S$

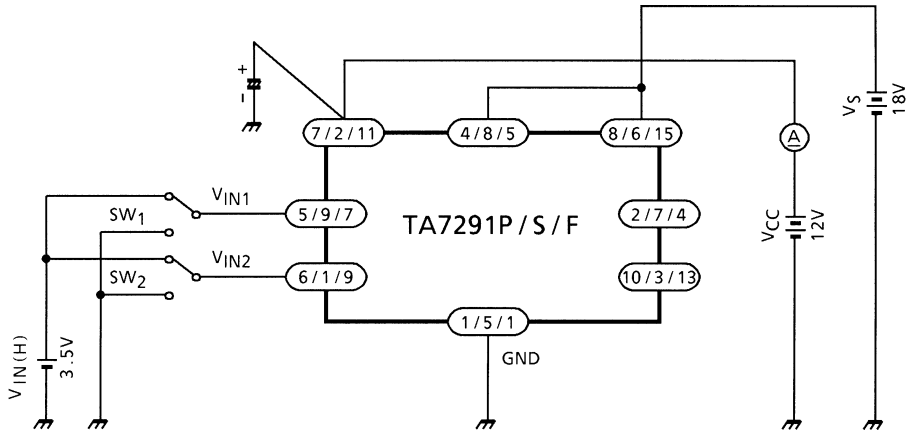
ELECTRICAL CHARACTERISTICS

(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

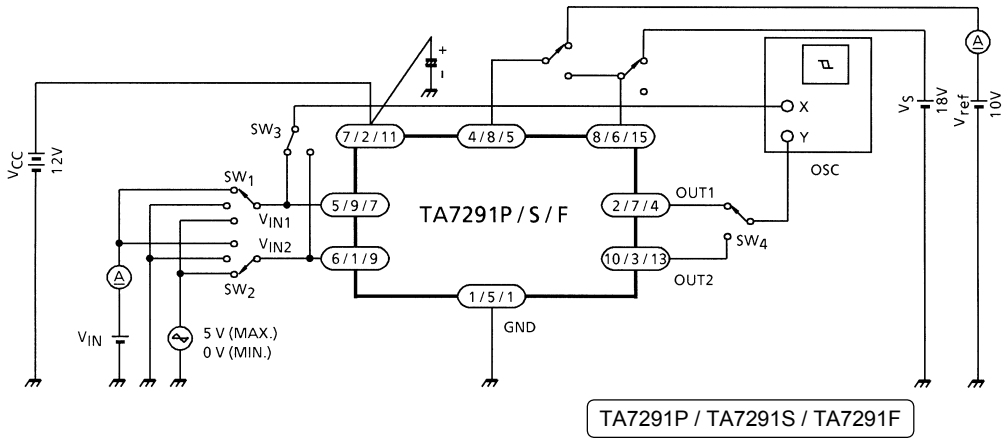
I_{CC1}, I_{CC2}, I_{CC3}



Note: HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 2

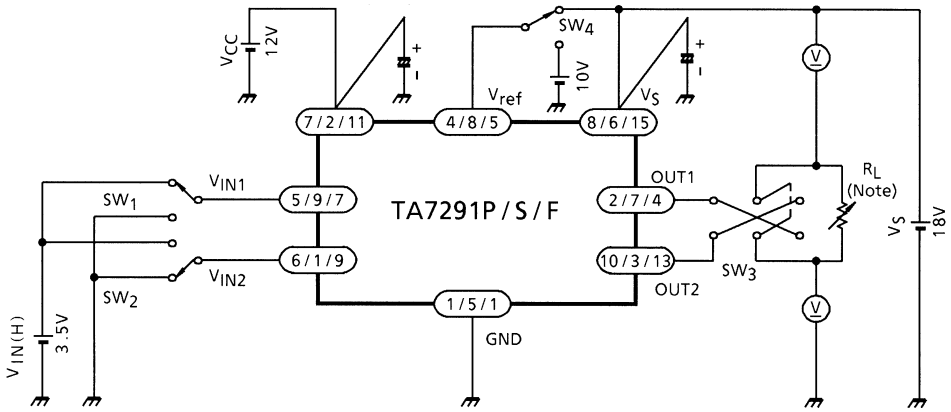
$V_{IN\ 1}$, $V_{IN\ 2}$, I_{IN} , ΔV_T, I_{ref}



Note: HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 3

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

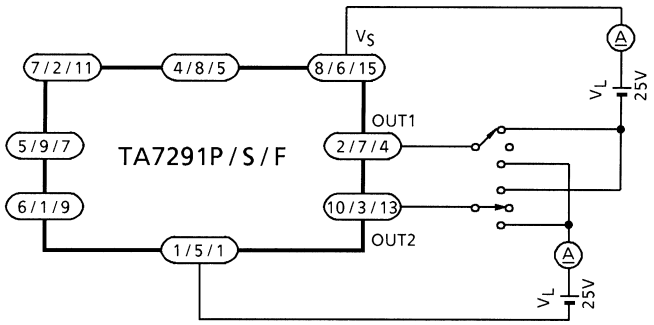


Note: I_{OUT} calibration is required to adjust specified values of test conditions by R_L.
(I_{OUT} = 0.2 A / 0.4 A / 0.5 A / 1.0 A)

Note: HEAT FIN of TA7291F is connected to GND.

TEST CIRCUIT 4

$I_{L\ U,\ L}$

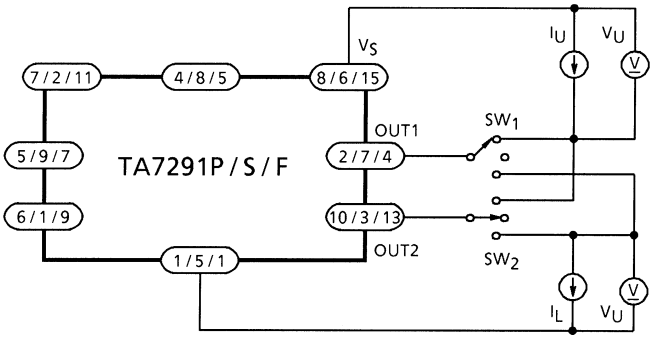


TA7291P / TA7291S / TA7291F

Note: HEAT FIN of TA7291F is connected to GND.

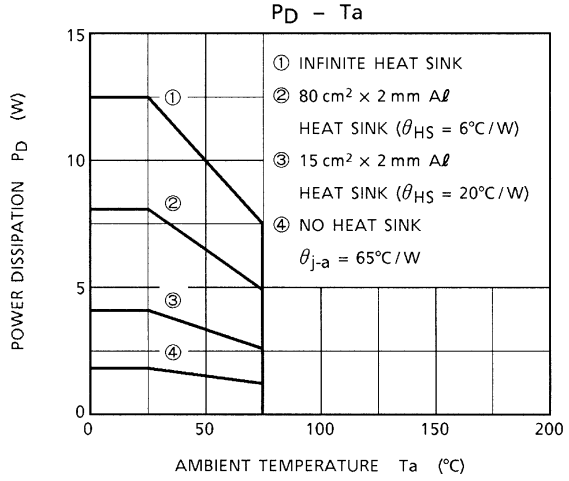
TEST CIRCUIT 5

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



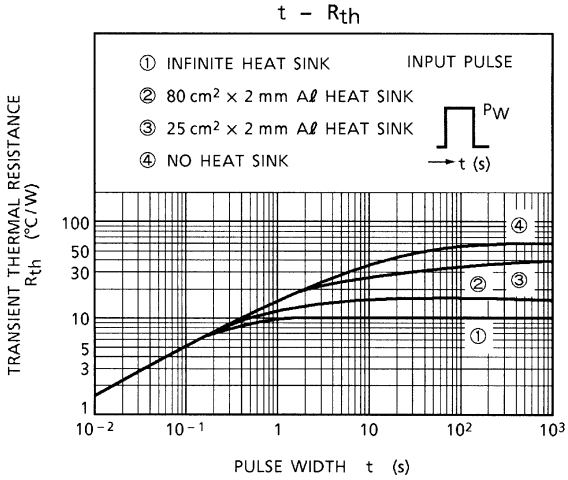
TA7291P

P_D – Ta



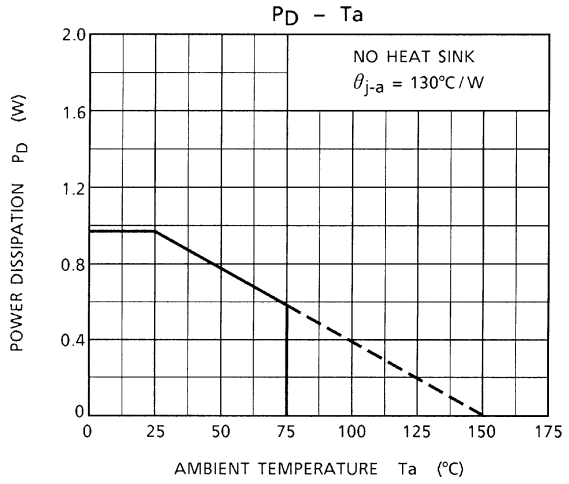
TA7291P

t – R_{th}



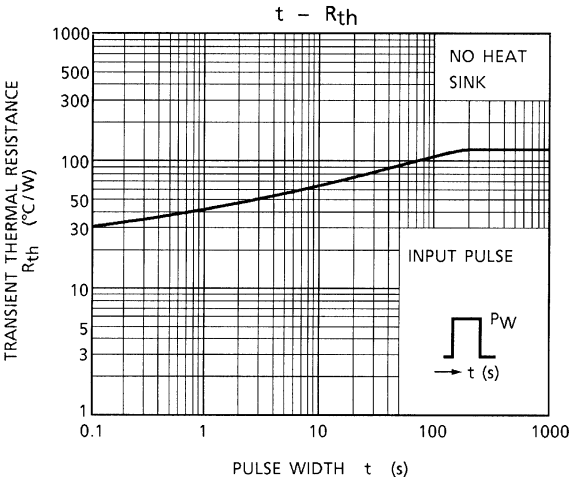
TA7291S

P_D – Ta



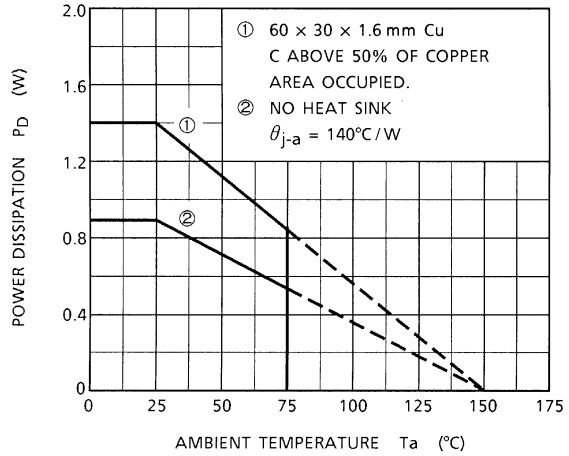
TA7291S

t – R_{th}



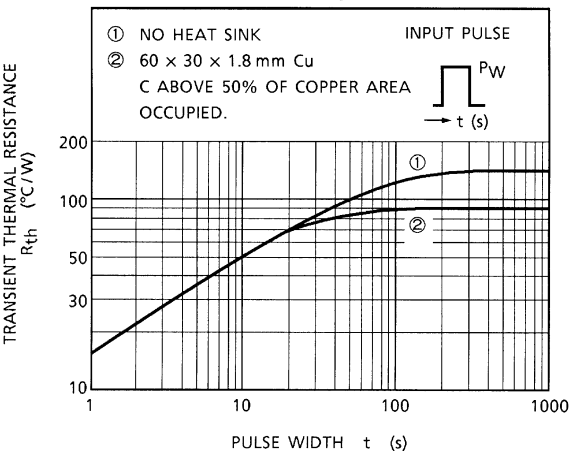
TA7291F

P_D – Ta



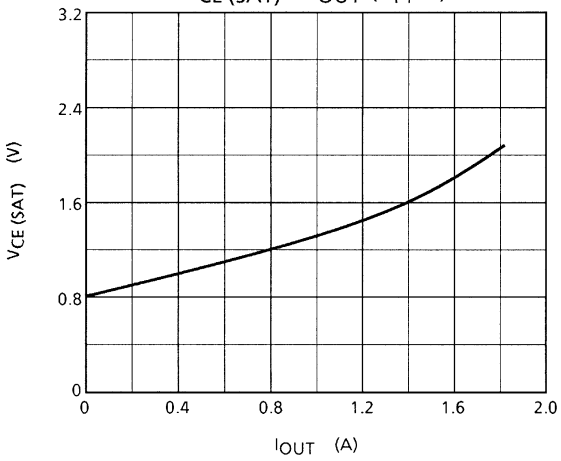
TA7291F

t – R_{th}



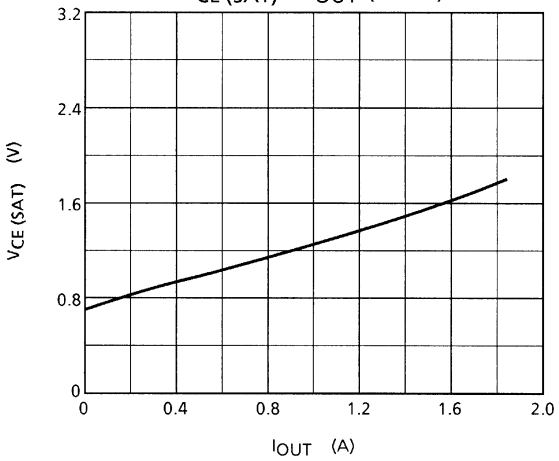
TA7291P

$V_{CE\,(SAT)}$ – I_{OUT} (Upper)

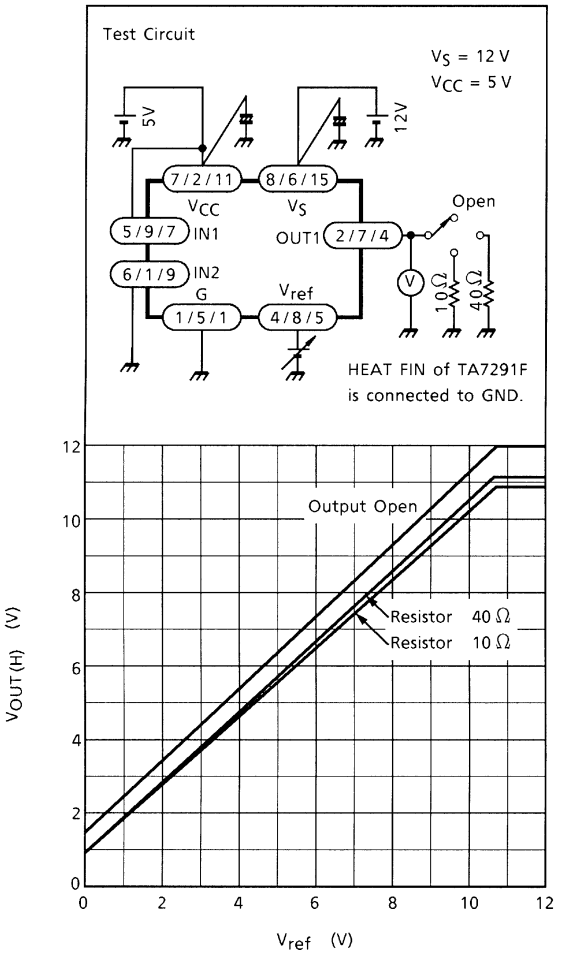


TA7291P

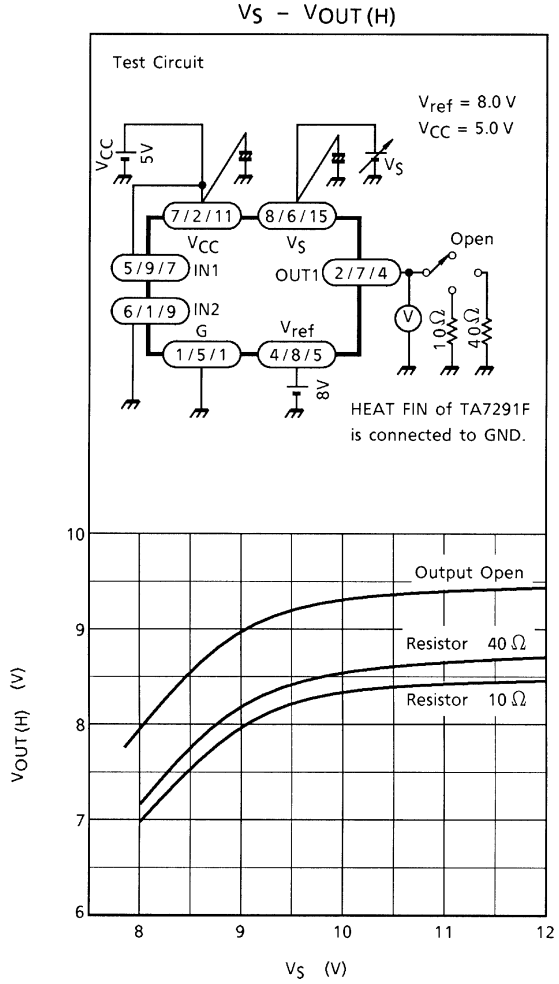
$V_{CE\,(SAT)}$ – I_{OUT} (Lower)



V_{ref} – $V_{OUT\,(H)}$



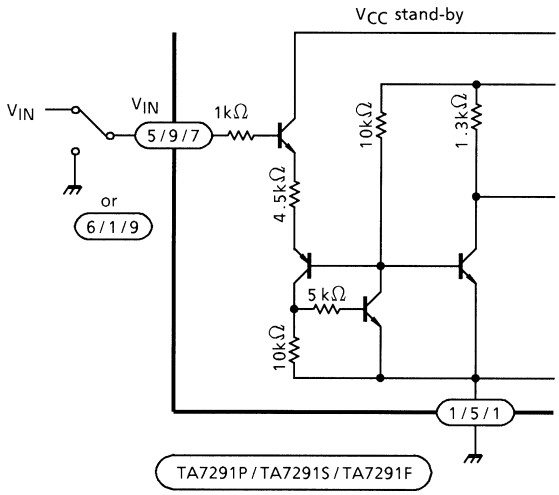
V_S – $V_{OUT\,(H)}$



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.



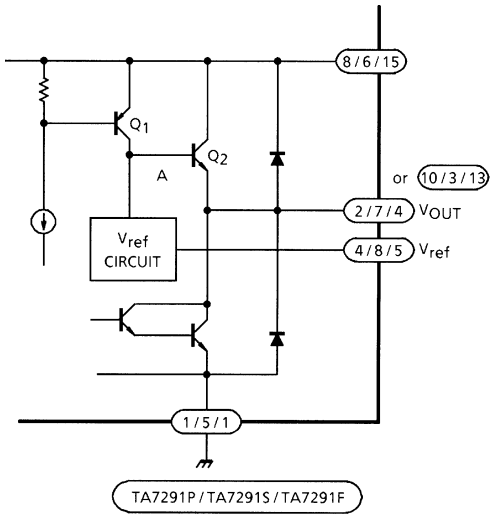
Output circuit

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

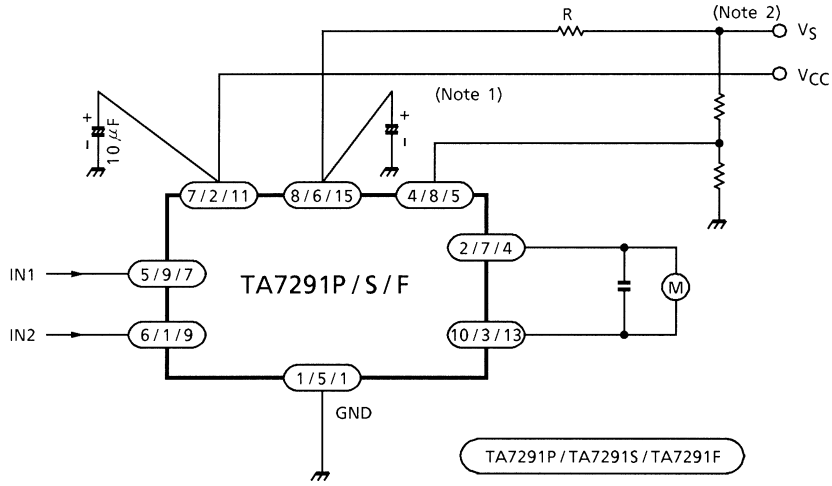
$V_{OUT} = V_{BE} (\approx 0.7) + V_{ref}$

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

$V_{ref} \leq V_S$



APPLICATION CIRCUIT



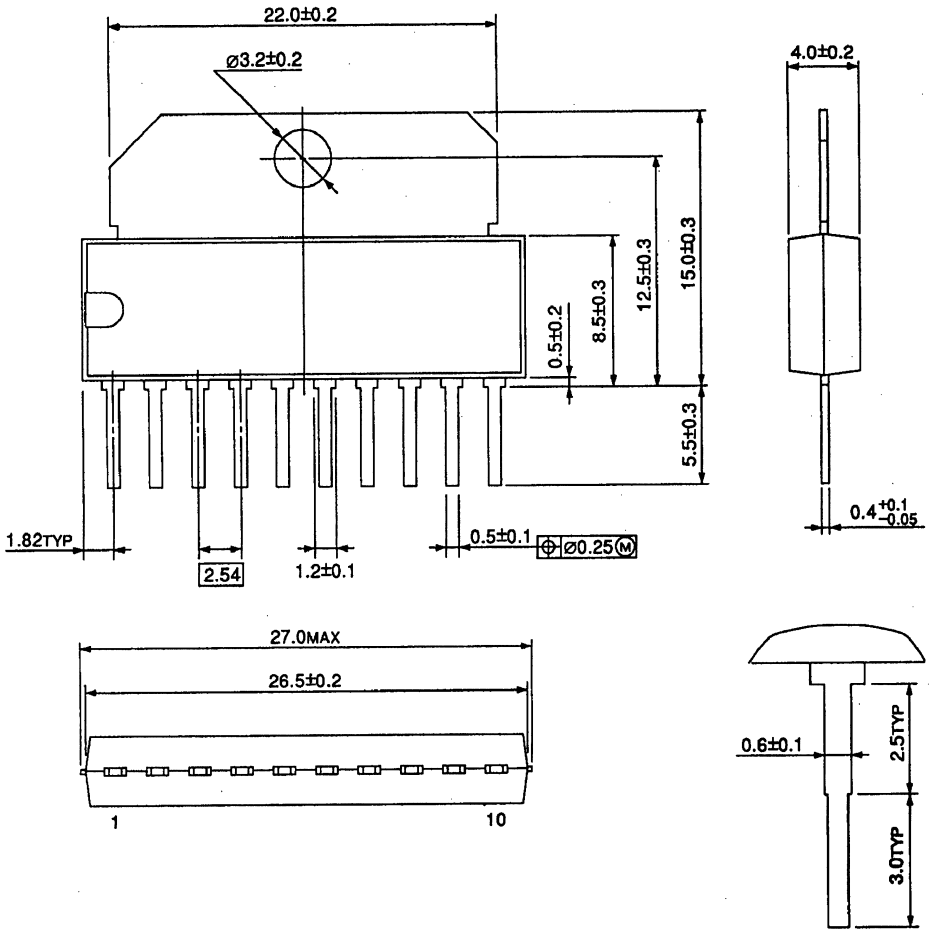
Note 1: Experiment to find the optimum capacitor valve.
Note 2: To protect against excess current, current limitation resistor R should be inserted where necessary.

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.

PACKAGE DIMENSIONS

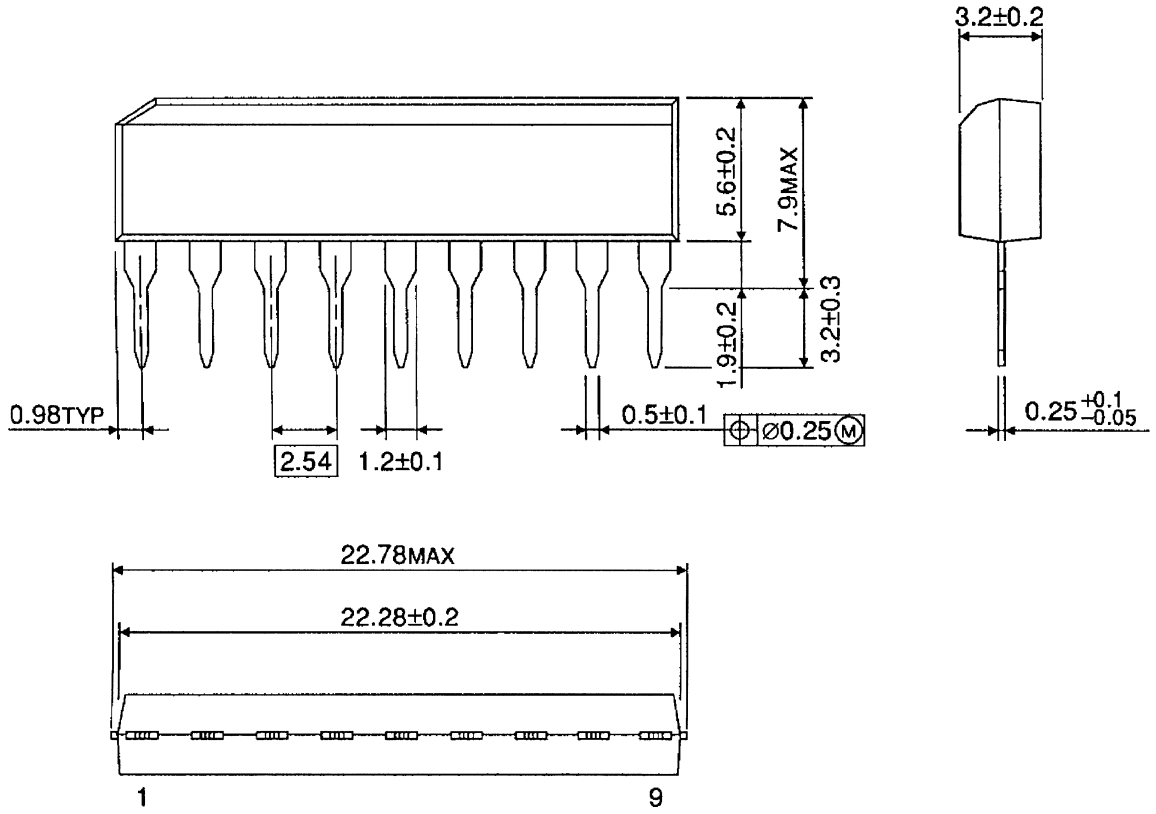
HSIP10−P−2.54 Unit: mm



Weight: 2.47 g (Typ.)

PACKAGE DIMENSIONS

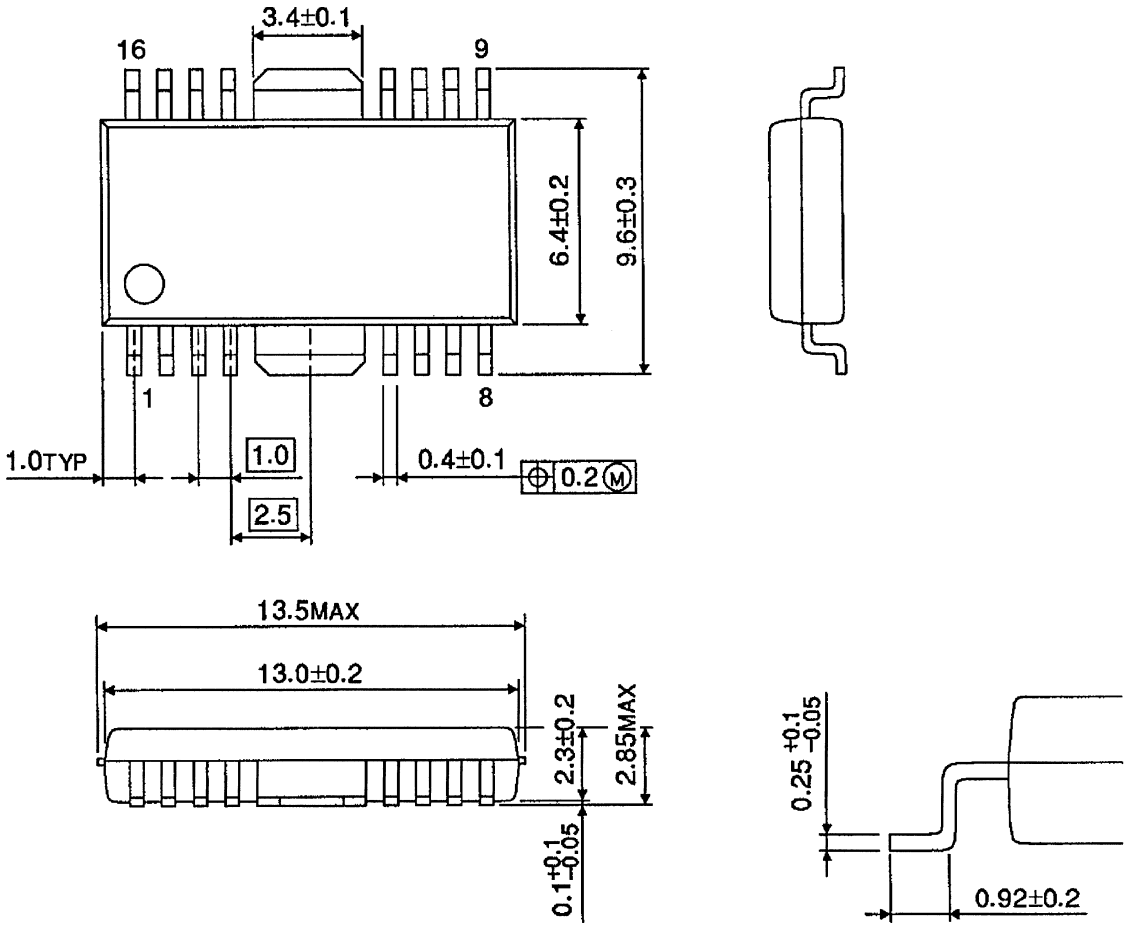
SIP9−P−2.54A Unit: mm



Weight: 0.92 g (Typ.)

PACKAGE DIMENSIONS

HSOP16−P−300−1.00 Unit: mm



Weight: 0.50 g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.