

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8428K(S), TA8428F

## FULL BRIDGE DRIVER

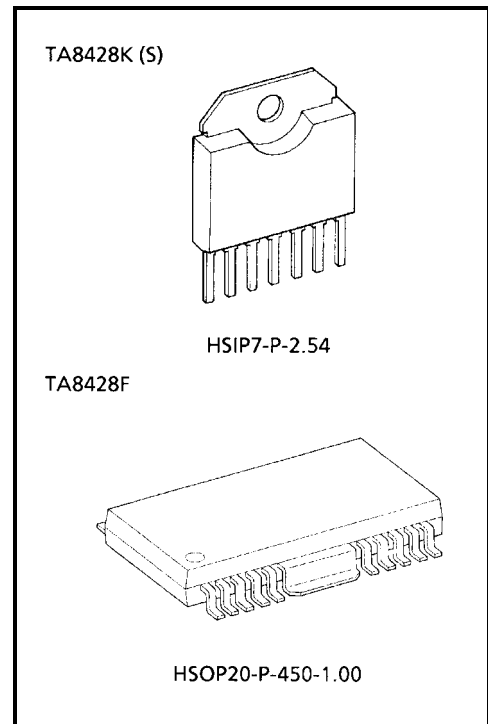
The TA8428K (S), TA8428F is Full Bridge Driver IC for Brush Motor Rotation Control.

Forward Rotation, Reverse Rotation, Stop and Braking operations are available.

Thermal Shutdown and Short Current Protector are provided.

### FEATURES

- Output Current : TA8428K (S) 1.5 A (AVE.), 3.0 A (PEAK)  
TA8428F 0.8 A (AVE.), 2.4 A (PEAK)
- 4 modes (forward / reverse / short brake and stop) are available with 2 TTL compatible inputs control.
- Free wheeling diodes are equipped.
- Multi protection system driver  
(Thermal shutdown and short current protector)

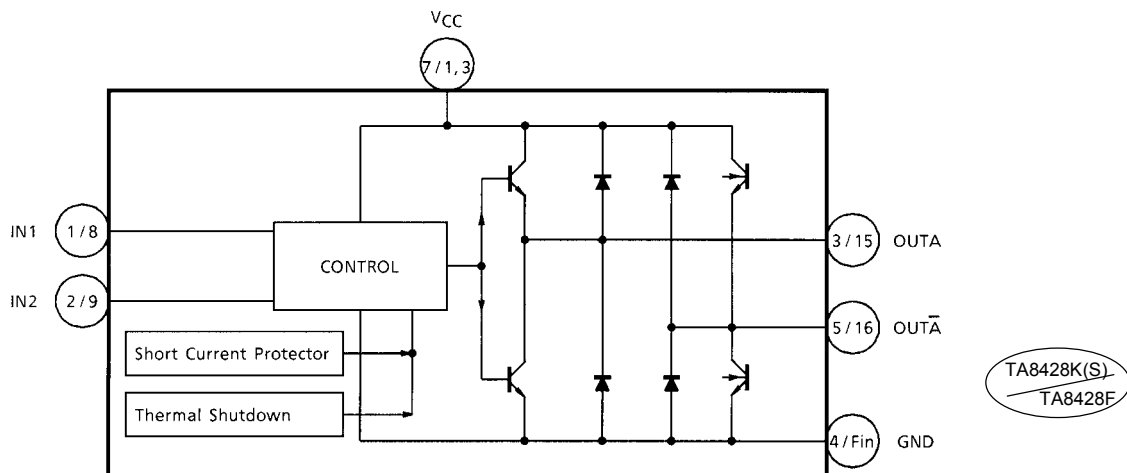


Weight

HSIP7-P-2.54 : 1.88 g (Typ.)

HSOP20-P-450-1.00 : 0.79 g (Typ.)

## BLOCK DIAGRAM

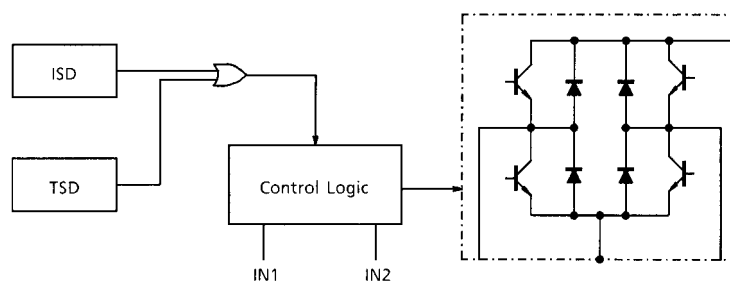


TA8428K(S)  
TA8428F

## PIN FUNCTION

| PIN No. |           | SYMBOL          | FUNCTIONAL DESCRIPTION   |
|---------|-----------|-----------------|--|
| K(S)    | F         |                 |  |
| 1       | 8         | IN 1            | TTL compatible control inputs.   |
| 2       | 9         | IN 2            | (PNP type low active comparator inputs)  |
| 3       | 15        | OUTA            | Output terminals and free wheeling diodes are connected between each output to GND and V <sub>CC</sub> . |
| 4       | Fin       | GND             | GND terminal   |
| 5       | 16        | OUT $\bar{A}$   | Output terminals and free wheeling diodes are connected between each output to GND and V <sub>CC</sub> . |
| 6       | Other pin | N.C             | Non connection   |
| 7       | 1, 3      | V <sub>CC</sub> | Supply voltage terminal for control and motor drive.   |

TA8428K (S), TA8428F has 2 build-in protective functions which work independently. These circuit operations are as follows.

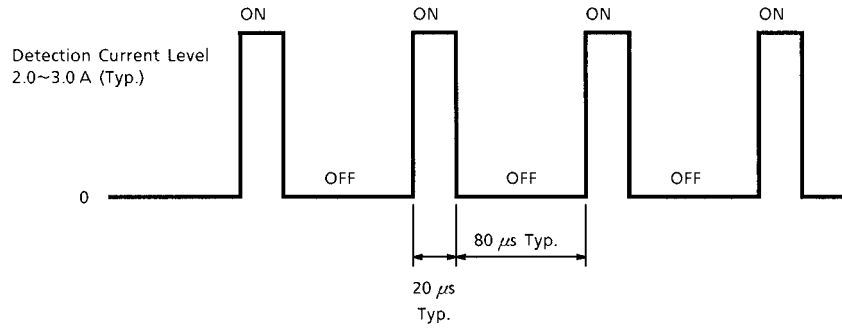


- Thermal shutdown (TSD)

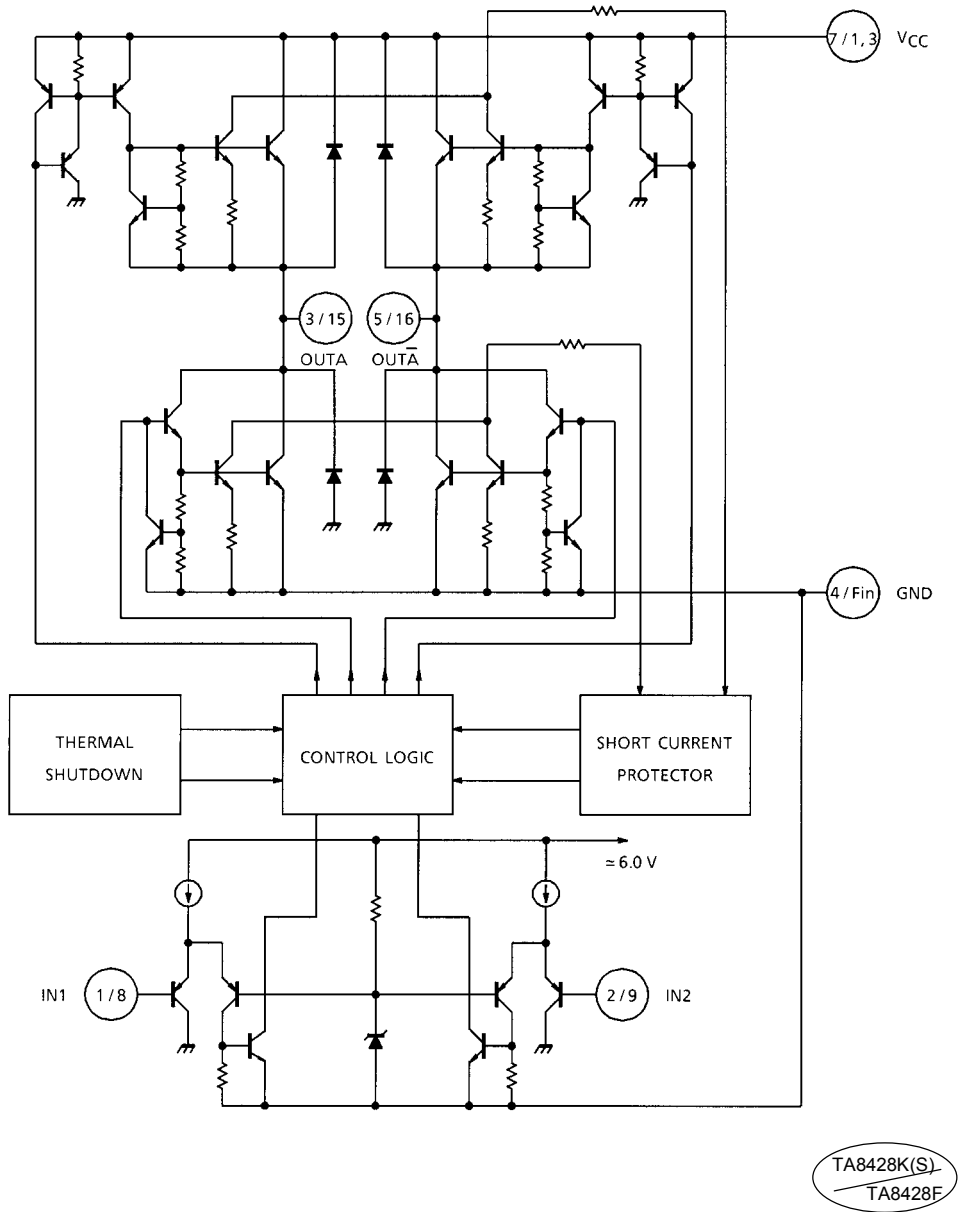
If junction temperature of TA8428K (S), TA8428F is over the specified temperature (150°C Typ.) by excess power dissipation or abnormal ambient temperature change, thermal Shutdown circuit turn "ON" and output 4 transistors become High impedance. (All transistors turn "OFF")

- Short current protector (ISD)

Short current protector circuit senses all output transistor current. If output transistor current is over the specified limiting current value (2.0~3.0 A Typ.), short current protector operates and all output transistors periodically turn "OFF" (High Impedance Mode) in a period of approximately 80  $\mu$ s. This state is continued until the release of over current mode.



## INTERNAL CIRCUIT



## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC        |            | SYMBOL           | RATING                | UNIT         |
|-----------------------|------------|------------------|-----------------------|--------------|
| Supply Voltage        |            | V <sub>CC</sub>  | 30                    | V            |
| Input Voltage         |            | V <sub>IN</sub>  | -0.3~V <sub>CC</sub>  | V            |
| Output Current        | K (S) type | PEAK             | I <sub>O</sub> (PEAK) | 3.0 (Note 1) |
|                       |            | AVE.             | I <sub>O</sub> (AVE.) | 1.5          |
|                       | F type     | PEAK             | I <sub>O</sub> (PEAK) | 2.4 (Note 1) |
|                       |            | AVE.             | I <sub>O</sub> (AVE.) | 0.8          |
| Power Dissipation     | K (S) type | P <sub>D</sub>   | 1.25 (Note 2)         | W            |
|                       |            |                  | 10.0 (Note 3)         |              |
|                       | F type     | P <sub>D</sub>   | 1.9 (Note 4)          |              |
|                       |            |                  | 2.5 (Note 5)          |              |
| Operating Temperature |            | T <sub>opr</sub> | -30~85                | °C           |
| Storage Temperature   |            | T <sub>stg</sub> | -55~150               | °C           |

Note 1: t = 100 ms

Note 2: No heat sink

Note 3: T<sub>c</sub> = 85°C

Note 4: This value is obtained by 30 × 30 × 1.6 mm PCB mounting occupied copper area in excess of 60%

Note 5: This value is obtained by 50 × 50 × 1.6 mm PCB mounting occupied copper area in excess of 60%

## ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 24 V, Ta = 25°C)

| CHARACTERISTIC                                 |            | SYMBOL                   | TEST CIR-CUIT | Test Condition                                | MIN | TYP. | MAX | UNIT |
|--|------------|--------------------------|---------------|---|-----|------|-----|------|
| Quiescent Current                              |            | I <sub>CC1</sub>         | 1             | Stop mode                                     | —   | 8    | 15  | mA   |
|  |            | I <sub>CC2</sub>         |               | Forward / reverse mode                        | —   | 35   | 85  |      |
|  |            | I <sub>CC3</sub>         |               | Brake mode                                    | —   | 16   | 30  |      |
| Input Voltage                                  |            | V <sub>IL</sub>          | 2             | —   | —   | —    | 0.8 | V    |
|  |            | V <sub>IH</sub>          |               | —   | 2.0 | —    | —   |      |
| Input Current                                  |            | I <sub>IL</sub>          | 2             | V <sub>IN</sub> = GND                         | —   | —    | 50  | μA   |
|  |            | I <sub>IH</sub>          |               | V <sub>IN</sub> = V <sub>CC</sub>             | —   | —    | 10  |      |
| Output Saturation Voltage                      | K (S) type | V <sub>sat</sub> (total) | 3             | I <sub>O</sub> = 1.5 A, T <sub>c</sub> = 25°C | —   | 2.2  | 2.9 | V    |
|  | F type     |                          |               | I <sub>O</sub> = 0.8 A, T <sub>c</sub> = 25°C | —   | 1.8  | 2.5 |      |
| Output Leakage Current                         |            | I <sub>LU</sub>          | 4             | V <sub>L</sub> = 25 V                         | —   | —    | 50  | μA   |
|  |            | I <sub>LL</sub>          |               |   | —   | —    | 50  |      |
| Diode Forward Voltage                          | K (S) type | I <sub>LU</sub>          | 4             | I <sub>F</sub> = 1.5 A                        | —   | 2.6  | —   | V    |
|  |            | I <sub>LL</sub>          |               |   | —   | 1.5  | —   |      |
|  | F type     | I <sub>LU</sub>          |               | I <sub>F</sub> = 0.8 A                        | —   | 2.2  | —   |      |
|  |            | I <sub>LL</sub>          |               |   | —   | 1.2  | —   |      |
| Thermal Shutdown Circuit Operating Temperature |            | T <sub>SD</sub>          | —             | —   | —   | 150  | —   | °C   |
| Propagation Delay Time                         |            | t <sub>pLH</sub>         | 2             | —   | —   | 1    | —   | μs   |
|  |            | t <sub>pHL</sub>         | 2             | —   | —   | 1    | —   |      |

## FUNCTION

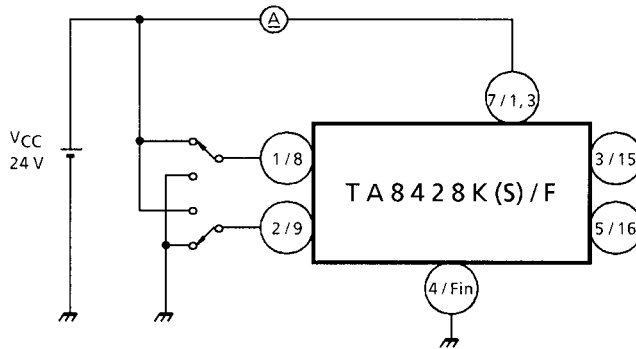
| INPUT |     | OUTPUT               |               | RATING   |
|-------|-----|----------------------|---------------|----------|
| IN1   | IN2 | OUTA                 | OUT $\bar{A}$ |          |
| H     | H   | L                    | L             | Brake    |
| L     | H   | L                    | H             | CW / CCW |
| H     | L   | H                    | L             | CCW / CW |
| L     | L   | OFF (high impedance) |               | Stop     |

Note: PIN (6) is non connection.

Note: Heat fin is connected with GND with low impedance.

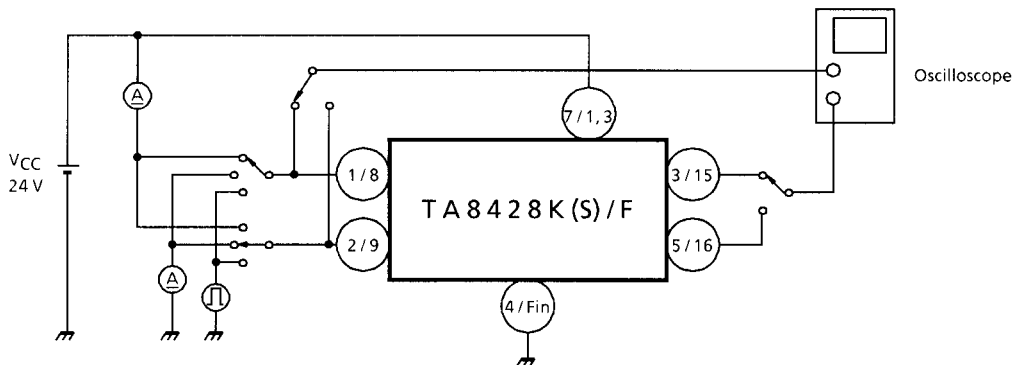
## TEST CIRCUIT 1

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



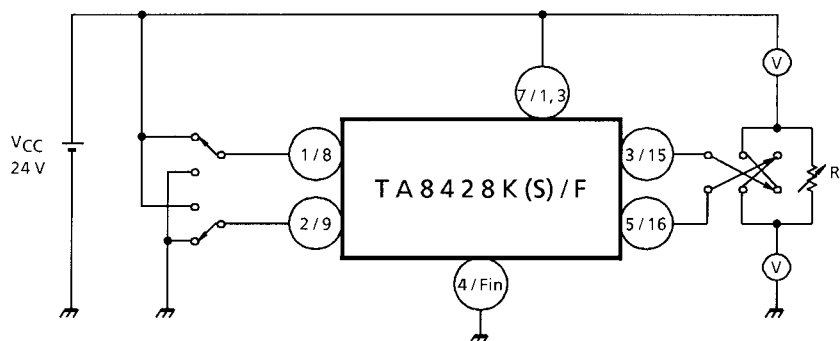
## TEST CIRCUIT 2

$V_{IL}$ ,  $V_{IH}$ ,  $I_{IL}$ ,  $I_{IH}$ ,  $t_{pLH}$ ,  $t_{pHL}$



## TEST CIRCUIT 3

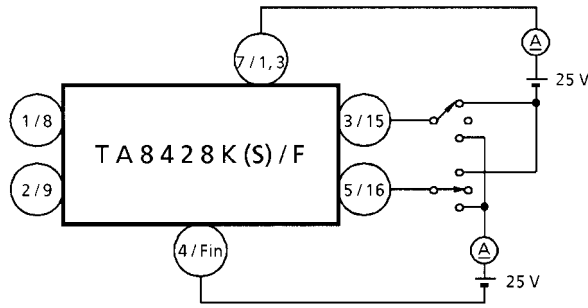
$V_{sat}$



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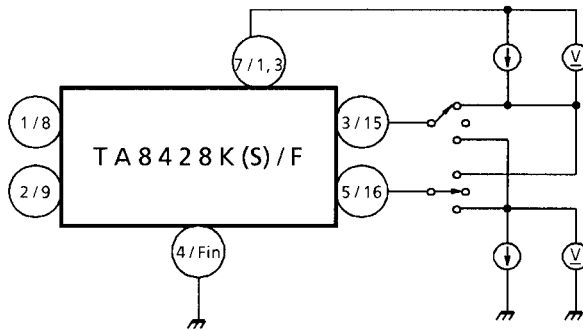
## TEST CIRCUIT 4

$I_{LH}$ ,  $I_{LL}$

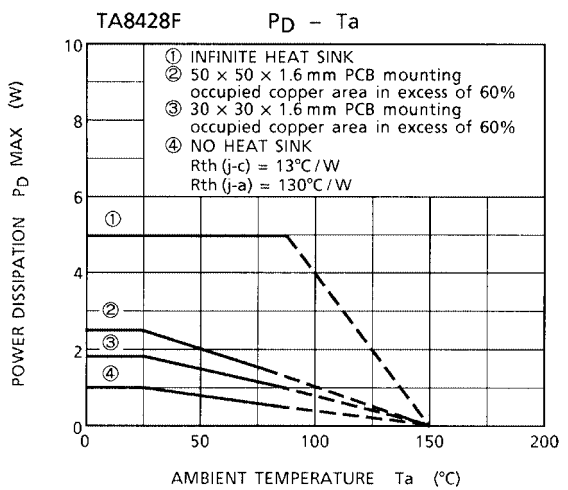
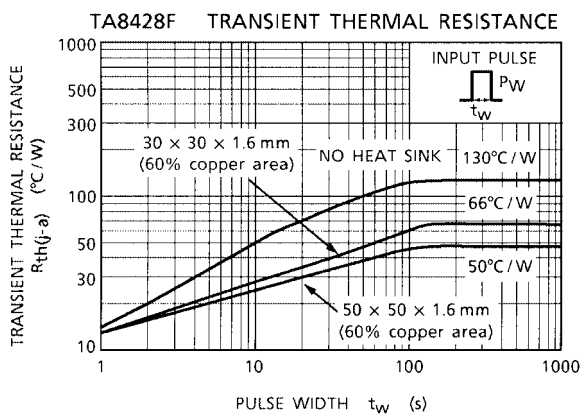
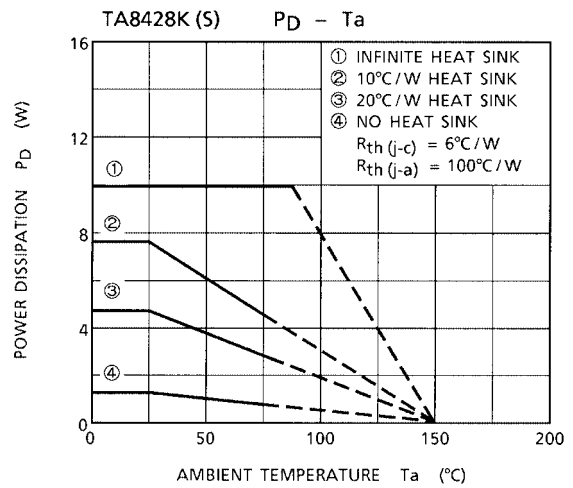
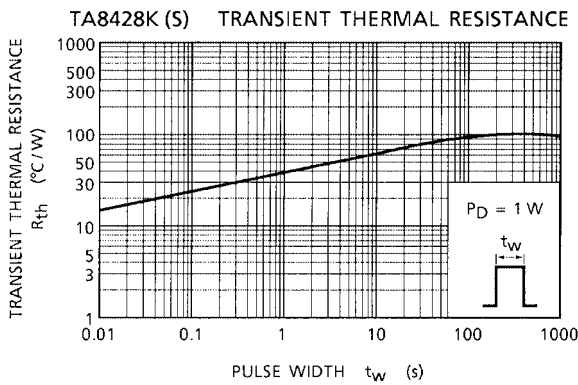
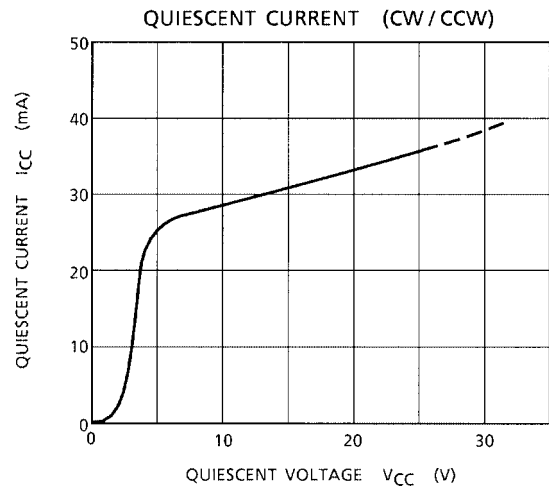
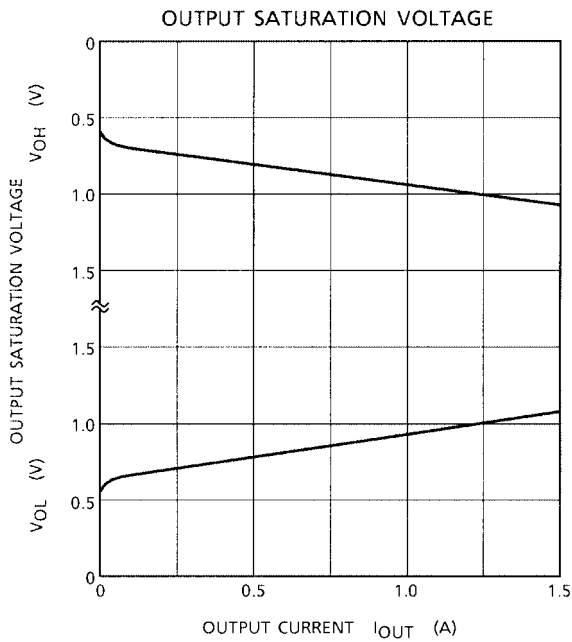


## TEST CIRCUIT 5

$V_{FU}$ ,  $V_{FL}$

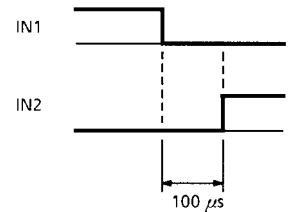
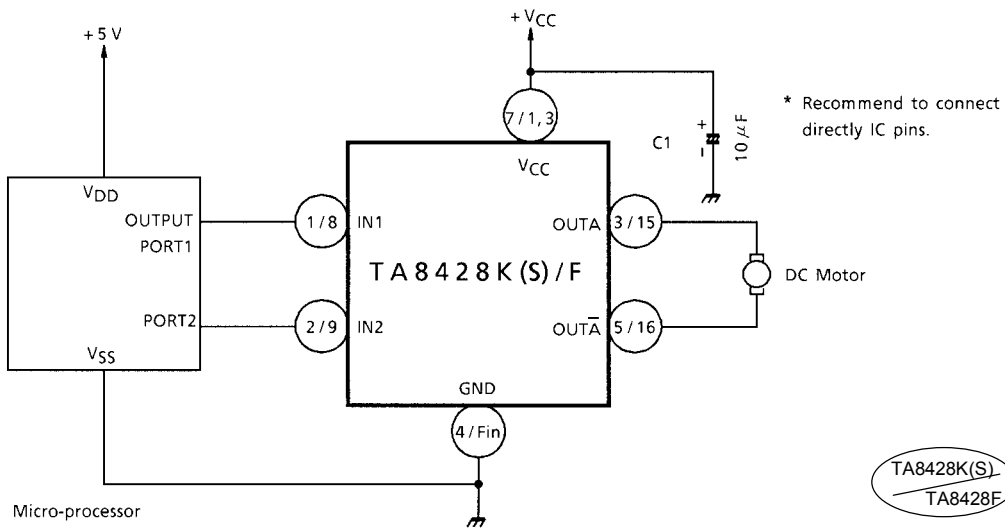


TA8428K(S)  
TA8428F





## APPLICATION CIRCUIT

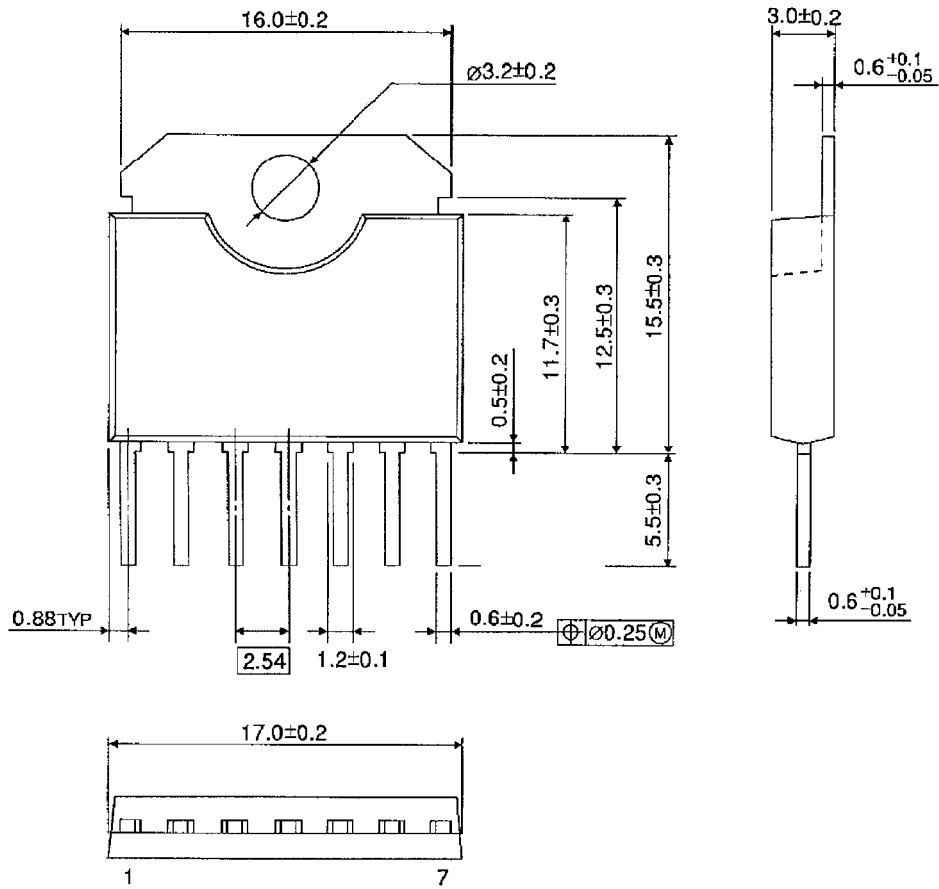


- Note: Recommend to take approximately 100  $\mu\text{s}$  of input dead time for reliable operations.
- Note: Utmost care is necessary in the design of the output line,  $V_{CC}$  and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.
- Note: In case of mounted on radiators, do not use silicon rubber. (TA8428K (S))
- Note: Connect and use 1 pin and 3 pin surely. (TA8428F)

## PACKAGE DIMENSIONS

HSIP7-P-2.54

Unit : mm

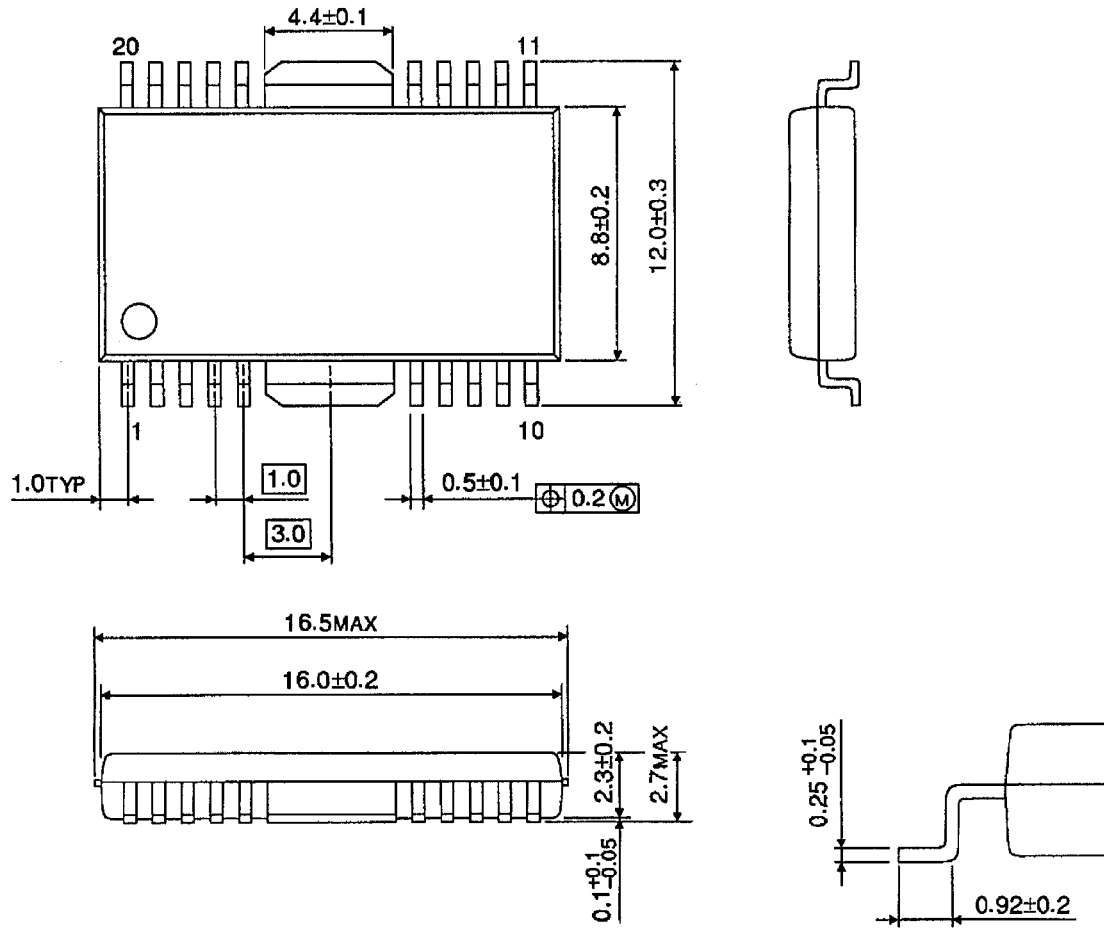


Weight : 1.88 g (Typ.)

## PACKAGE DIMENSIONS

HSOP20-P-450-1.00

Unit : mm



Weight : 0.79 g (Typ.)

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000707EBA

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