

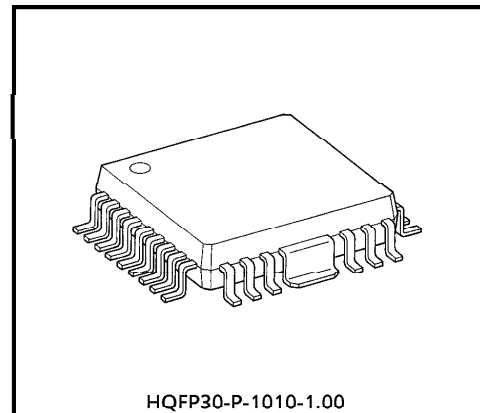
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

**TA8463F****SINGLE CHIP 3 PHASE MOTOR DRIVER FOR FDD SPINDLE MOTOR.**

The TA8463F is Single Chip Motor Driver IC for FDD Spindle Motor.

**FEATURES**

- 1 Chip motor driver with 3 phase semi-linear driving.
- Adjustment free with digital servo system.
- 300, 360rpm are obtained.
- Built-in index pulse output current.
- Operating supply voltage range :  $V_{CC} = 4.2 \sim 7V$
- Output current :  $I_O (MAX.) = 0.5A (AVE.)$
- Built-in thermal shutdown circuit.
- Built-in over current protection circuit.
- Built-in stand-by circuit.

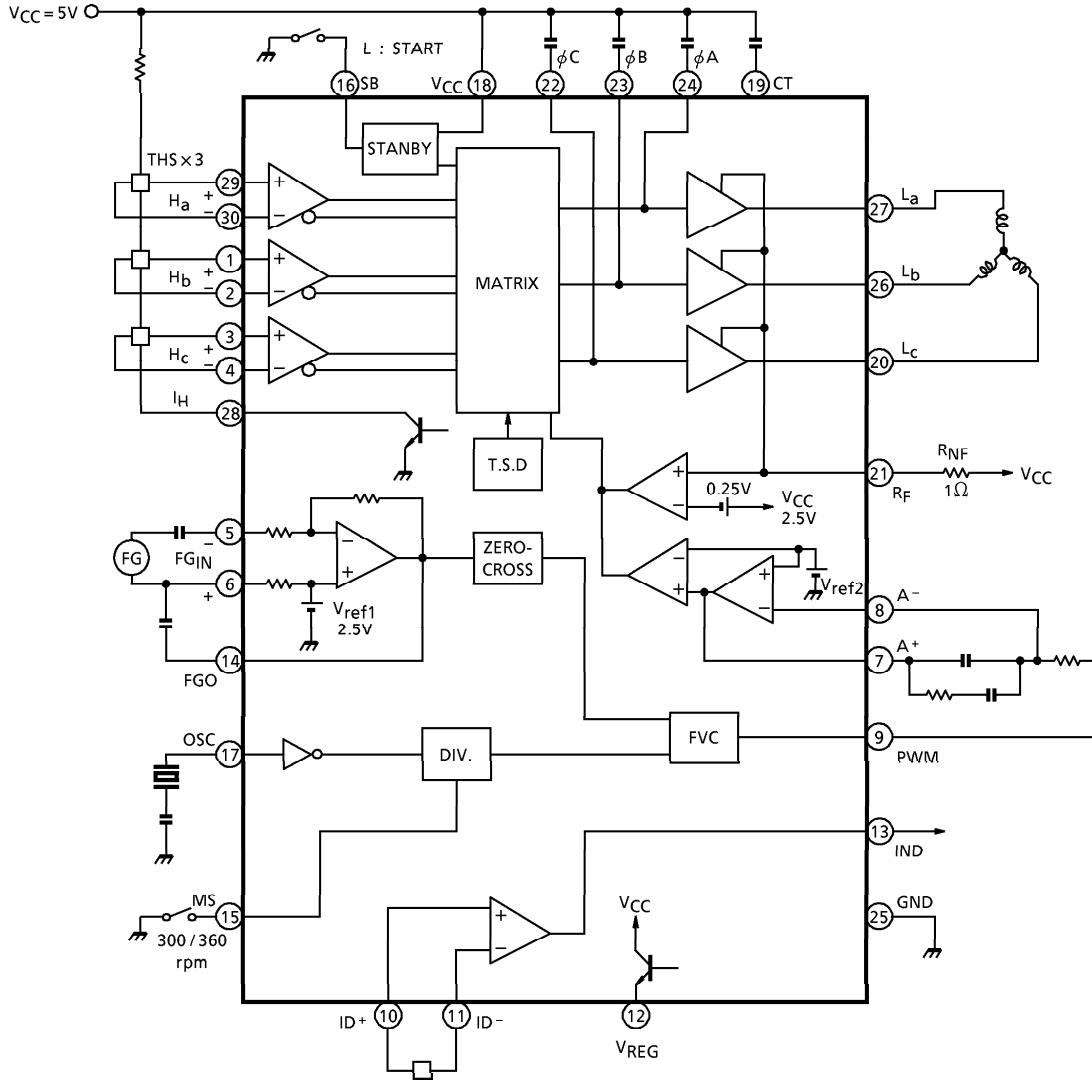


Weight : 0.61g (Typ.)

961001EBA2

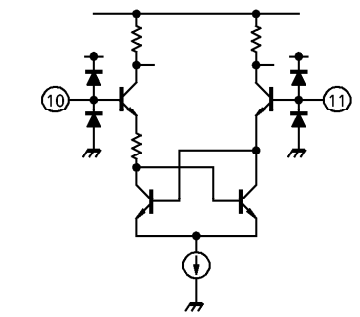
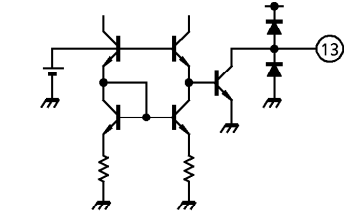
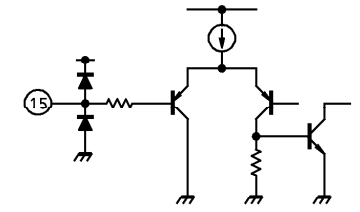
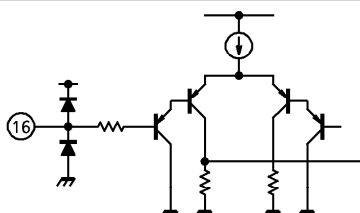
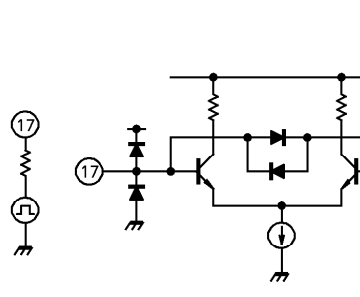
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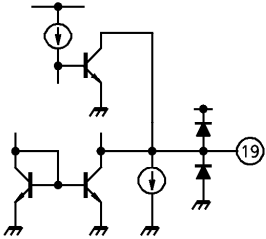
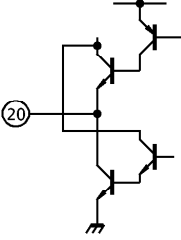
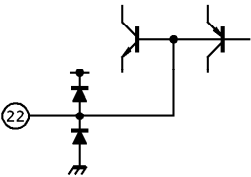
BLOCK DIAGRAM



PIN FUNCTION

| PIN No.                      | SYM-BOL  | FUNCTIONAL DESCRIPTION  | EQUIVALENT CIRCUIT |
|------------------------------|--|---|--------------------|
| 29<br>30<br>1<br>2<br>3<br>4 | H <sub>a</sub> +<br>H <sub>a</sub> -<br>H <sub>b</sub> +<br>H <sub>b</sub> -<br>H <sub>c</sub> +<br>H <sub>c</sub> - | <ul style="list-style-type: none"> <li>Hall Amp. + / - Input Terminal.</li> </ul> <p>The Hall Input Range is ;<br/> <math>V_H = 50 \sim 300</math> [mV<sub>p-p</sub>]<br/> <math>CMR = 1.3 \sim (V_{CC} - 0.9)</math> [V]</p>         |                    |
| 28                           | I <sub>H</sub>   | <ul style="list-style-type: none"> <li>Hall Bias Negative Side Connecting Terminal.</li> </ul> <p>Open collector output.</p>  |                    |
| 5<br>6<br>14                 | FG <sub>IN</sub> -<br>FG <sub>IN</sub> +<br>FGO  | <ul style="list-style-type: none"> <li>FG Amp. Negative Input Terminal.</li> <li>FG Amp. Positive Input Terminal.</li> <li>FG Amp. Output Terminal.</li> </ul> <p>High Sensitivity of FG Amp. ;<br/> <math>V_{HFG} = 2.5</math>mV</p> |                    |
| 7<br>8                       | A +<br>A -   | <ul style="list-style-type: none"> <li>Error Amp. Output Terminal.</li> <li>Error Amp. Input Terminal.</li> </ul> <p>External Ports Value (C.R) is determined by matching between Motor and IC.</p>                                   |                    |
| 9                            | PWM  | <ul style="list-style-type: none"> <li>F/V Converter Output Terminal</li> </ul> <p>Reference : No.7 and No.8</p>  |                    |

| PIN No.  | SYM-BOL    | FUNCTIONAL DESCRIPTION   | EQUIVALENT CIRCUIT   |
|----------|------------|--|--|
| 10<br>11 | ID+<br>ID- | <ul style="list-style-type: none"> <li>● Index Positive Input Terminal.</li> <li>● Index Negative Input Terminal.</li> </ul>   |    |
| 13       | IND        | <ul style="list-style-type: none"> <li>● Index Amp. Output Terminal.</li> </ul> <p>Reference : No.10 and No.11</p>   |    |
| 15       | MS         | <ul style="list-style-type: none"> <li>● Mode Select Terminal.</li> </ul> <p>300rpm : L<br/>360rpm : H</p>   |   |
| 16       | SB         | <ul style="list-style-type: none"> <li>● Stand-by Terminal.</li> </ul> <p>SB : H<br/>ST : L</p>  |  |
| 17       | OSC        | <ul style="list-style-type: none"> <li>● Oscillation Terminal.</li> </ul> <p>The correct value of the exterior condenser constant differs depending on the type of ceramic oscillator used. To determine the constant, refer to the oscillator manufacturer.</p> <p>External CK Pulse is used, connect Resistor (min. 20kΩ) in series.</p> |  |

| PIN No.        | SYM-BOL  | FUNCTIONAL DESCRIPTION  | EQUIVALENT CIRCUIT  |
|----------------|--|---|---|
| 18             | V <sub>CC</sub>                                    | <ul style="list-style-type: none"> <li>Supply Voltage Input Terminal.</li> </ul>  |   |
| 19             | CT   | <ul style="list-style-type: none"> <li>Phase Compensation Terminal.</li> </ul> <p>Connect Capacitor between pin ⑱ and GND.</p>  |    |
| 20<br>26<br>27 | L <sub>c</sub><br>L <sub>b</sub><br>L <sub>a</sub> | <ul style="list-style-type: none"> <li>Output Terminals.</li> </ul>   |    |
| 21             | R <sub>F</sub>                                     | <ul style="list-style-type: none"> <li>Power Supply Voltage Input Terminal.</li> </ul> <p>By connecting resistors between V<sub>CC</sub> terminal and pin ㉑, Current Limiter is available.</p> $I_{LIM} = \frac{V_{ISD}}{R_{NF}}$ <p>V<sub>ISD</sub> = 0.14V    I<sub>O</sub> (MAX.) = 0.5A</p> |   |
| 22<br>23<br>24 | φ <sub>C</sub><br>φ <sub>B</sub><br>φ <sub>A</sub> | <ul style="list-style-type: none"> <li>Capacitor Connect Terminal for prevention of oscillation.</li> </ul>   |  |
| 25<br>Fin      | GND  | <ul style="list-style-type: none"> <li>GND</li> </ul>   |   |

## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC        | SYMBOL           | RATING     | UNIT |
|-----------------------|------------------|------------|------|
| Supply Voltage        | V <sub>CC</sub>  | 8          | V    |
| Output Current        | I <sub>O</sub>   | 0.6        | A    |
| Power Dissipation     | P <sub>D</sub>   | 1.0        | W    |
|                       |                  | (Note) 1.5 |      |
| Operating Temperature | T <sub>opr</sub> | -30~75     | °C   |
| Storage Temperature   | T <sub>stg</sub> | -55~150    | °C   |

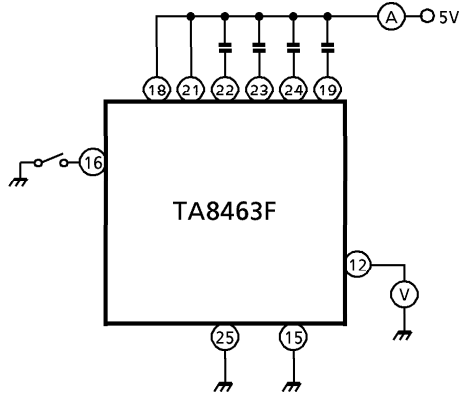
(Note) With Heat-Sink (60 × 60 × 1.6mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V<sub>CC</sub> = 5V, Ta = 25°C)

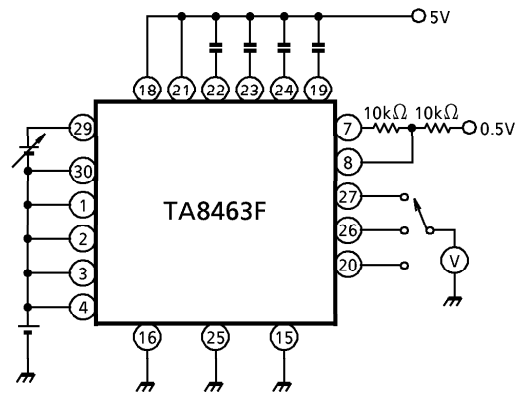
| CHARACTERISTIC      |                           | SYMBOL             | TEST CIRCUIT       | TEST CONDITION             | MIN. | TYP. | MAX.                  | UNIT              |
|---------------------|---------------------------|--------------------|--------------------|----------------------------|------|------|-----------------------|-------------------|
| Supply Current      |                           | I <sub>CC1</sub>   | 1                  | SB = OPEN, output open     | —    | 125  | 200                   | μA                |
|                     |                           | I <sub>CC2</sub>   | 1                  | SB = GND, output open      | —    | 23.9 | 36                    | mA                |
| Hall Amp.           | Gain                      | G <sub>HO</sub>    | —                  | Output connection state    | —    | 31   | —                     | dB                |
|                     | Input Sensitivity         | V <sub>H</sub>     | 2                  |                            | 50   | —    | 300                   | mV <sub>p-p</sub> |
|                     | Common Mode Voltage Range | V <sub>CMRH</sub>  | 2                  |                            | 1.3  | —    | V <sub>CC</sub> - 0.9 | V                 |
| PG Amp.             | Closed Loop Gain          | G <sub>FGO</sub>   | 3                  |                            | 40   | 46   | 50                    | dB                |
|                     | Reference Voltage         | V <sub>ref</sub>   | 3                  |                            | 2.15 | 2.6  | 2.9                   | V                 |
|                     | Input Sensitivity         | V <sub>HFG</sub>   | 3                  |                            | —    | 2.5  | —                     | mV <sub>p-p</sub> |
|                     | Input Offset Voltage      | V <sub>OFFG</sub>  | 3                  |                            | —    | 1    | —                     | mV                |
| Integrator Amp.     | Output Voltage            | High               | V <sub>INT-H</sub> | 4                          | 3.4  | 3.8  | 4.7                   | V                 |
|                     |                           | Low                | V <sub>INT-L</sub> | 4                          | 0.4  | 1.0  | 1.6                   | V                 |
|                     | A-Input Current           | I <sub>A-</sub>    | 4                  |                            | —    | —    | 0.4                   | μA                |
|                     | Open Loop Gain            | G <sub>INT</sub>   | —                  | -3dB point                 | —    | 55   | —                     | dB                |
| Speed Changing      | Input Switching Voltage   | V <sub>MS-th</sub> | 5                  | H : 360rpm                 | 3.0  | —    | V <sub>CC</sub>       | V                 |
|                     |                           |                    |                    | L : 300rpm                 | 0    | —    | 2.0                   |                   |
|                     | Input Current             | I <sub>MS</sub>    | 5                  | V <sub>MS</sub> = GND      | —    | -2.5 | 0.1                   | μA                |
| OSC Frequency Range |                           | f <sub>osc</sub>   | —                  | T <sub>j</sub> = -30~125°C | 300  | 490  | 600                   | kHz               |

| CHARACTERISTIC                         |                               | SYMBOL              | TEST CIRCUIT         | TEST CONDITION  | MIN.   | TYP.                  | MAX.            | UNIT                   |         |
|--|-------------------------------|---------------------|----------------------|---|--|-----------------------|-----------------|------------------------|---------|
| PWM Output Voltage                     | High                          | V <sub>PWM H</sub>  | 6                    | I <sub>OH</sub> = -100 $\mu$ A<br>(f <sub>x</sub> /8192) < FG                                     | —  | V <sub>CC</sub> - 0.1 | —               | V                      |         |
|  | Hiddle                        | V <sub>PWM M</sub>  | 6                    | OUTPUT-V <sub>CC</sub> : 50k $\Omega$<br>OUTPUT-GND : 50k $\Omega$<br>(f <sub>x</sub> /8192) = FG | —  | V <sub>CC</sub> /2    | —               | V                      |         |
|  | Low                           | V <sub>PWM L</sub>  | 6                    | I <sub>OL</sub> = -100 $\mu$ A<br>(f <sub>x</sub> /8192) > FG                                     | —  | 0.1                   | —               | V                      |         |
| Output Stage                           | Static Voltage                |                     | V <sub>MID</sub>     | —   | G <sub>V</sub> (INT) = 1<br>V = (V <sub>CC</sub> /2) + 1V  | —                     | 2.2             | —                      | V       |
|  | Output Refferencial Voltage-1 |                     | V <sub>M-diff1</sub> | —   | G <sub>V</sub> (INT) = 1<br>V = (V <sub>CC</sub> /2) + 1V  | —                     | 10              | 60                     | mV      |
|  | Output Refferencial Voltage-2 |                     | V <sub>M-diff2</sub> | —   | G <sub>V</sub> (INT) = 1<br>V = (V <sub>CC</sub> /2) - 1V<br>H <sub>a</sub> = H <sub>b</sub> = H <sub>c</sub> = V <sub>CC</sub> /2 | —                     | 0.4             | —                      | V       |
|  | Saturation Voltage            | Upper               | V <sub>sat U</sub>   | 7   | I <sub>O</sub> = 500mA   | —                     | 1.1             | 1.35                   | V       |
| Lower                                  |                               | V <sub>sat L</sub>  | 7                    | I <sub>O</sub> = 500mA  | —  | 0.5                   | 0.75            | V                      |         |
| Stand-by Input                         | Switching Voltage             |                     | V <sub>ST-th</sub>   | 5   | H : Stand-by Mode<br>L : Enable Mode   | 2.4<br>0              | —<br>—          | V <sub>CC</sub><br>0.8 | V       |
|  | Input Current                 |                     | I <sub>ST</sub>      | 5   | V <sub>ST</sub> = GND  | —                     | 0.05            | 1.0                    | $\mu$ A |
| Hall Bias Storation Voltage            |                               | V <sub>SB-SAT</sub> | 7                    | I <sub>IH</sub> = 10mA<br>I <sub>IH</sub> = 20mA  | —<br>—   | 0.11<br>0.19          | 0.3<br>0.5      | V                      |         |
| Current Limit Operating Voltage        |                               | V <sub>ISD</sub>    | —                    | R <sub>f</sub> Voltage  | —  | 140                   | —               | mV                     |         |
| Index Stage                            | Input Current                 |                     | I <sub>IDX</sub>     | 8   |  | —                     | —               | 3                      | $\mu$ A |
|  | Common Mode Voltage Range     |                     | V <sub>CMRI</sub>    | 8   |  | 1.5                   | —               | V <sub>CC</sub> - 0.3  | V       |
|  | Hysteresis Width              |                     | V <sub>hys</sub>     | —   |  | —                     | 2.5             | —                      | mV      |
|  | Output Voltage                | Low                 | V <sub>IDXL</sub>    | 8   | I <sub>O</sub> = 1.0mA   | —                     | 1.0             | 0.4                    | V       |
|  |                               | High                | V <sub>IDXH</sub>    | 8   | I <sub>O</sub> = 1.0mA   | —                     | V <sub>CC</sub> | —                      | V       |
| Maximum Input                          |                               | V <sub>INI</sub>    | 8                    |   | —  | —                     | 0.3             | V <sub>p-p</sub>       |         |
| Index Sensor Bias                      |                               | V <sub>REG</sub>    | 1                    | R <sub>L</sub> = 1k $\Omega$  | 2.1  | 2.5                   | 2.9             | V                      |         |
| Thermal Shutdown Operating Temperature |                               | TSD                 | —                    |   | 150  | —                     | —               | $^{\circ}$ C           |         |

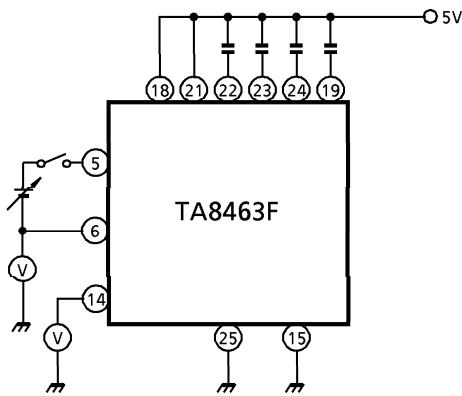
TEST CIRCUIT 1  $I_{CC1}$ ,  $I_{CC2}$ ,  $V_{REG}$



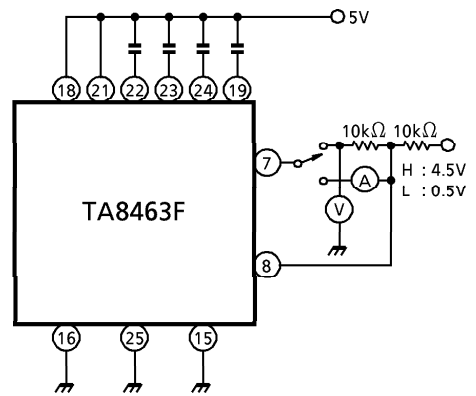
TEST CIRCUIT 2  $V_H$ ,  $V_{CMRH}$



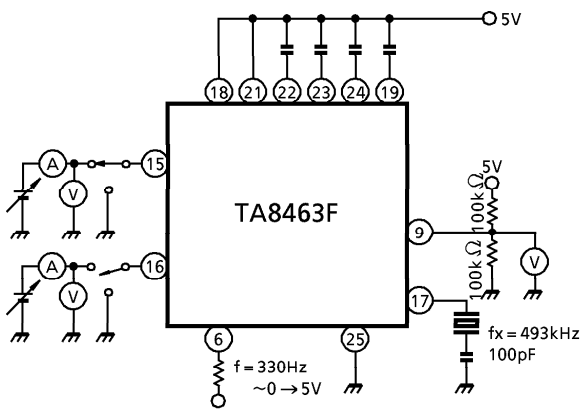
TEST CIRCUIT 3  $G_{FGO}$ ,  $V_{ref}$ ,  $V_{HFG}$ ,  $V_{OFG}$



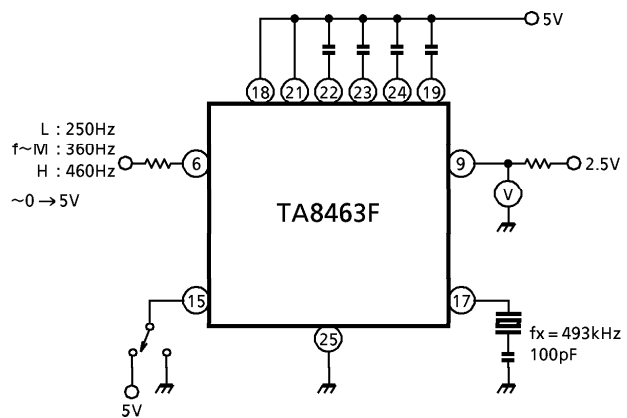
TEST CIRCUIT 4  $V_{INT-H}$ ,  $V_{INT-L}$ ,  $I_A$



TEST CIRCUIT 5  $V_{MS-th}$ ,  $I_{MS}$ ,  $V_{ST-th}$ ,  $I_{ST}$

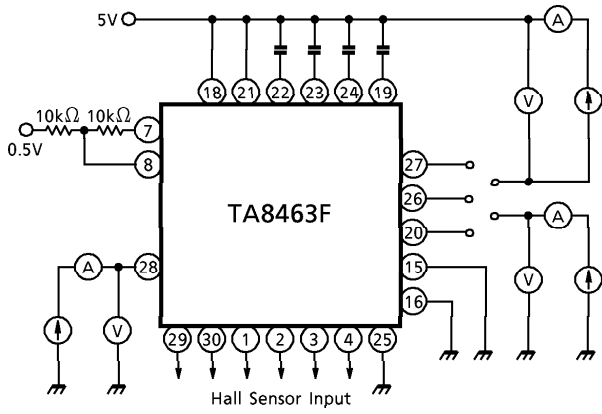


TEST CIRCUIT 6  $V_{PWM-H}$ ,  $V_{PWM-M}$ ,  $V_{PWM-L}$

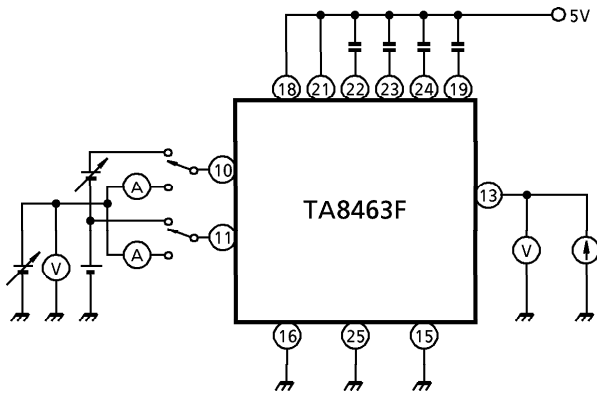




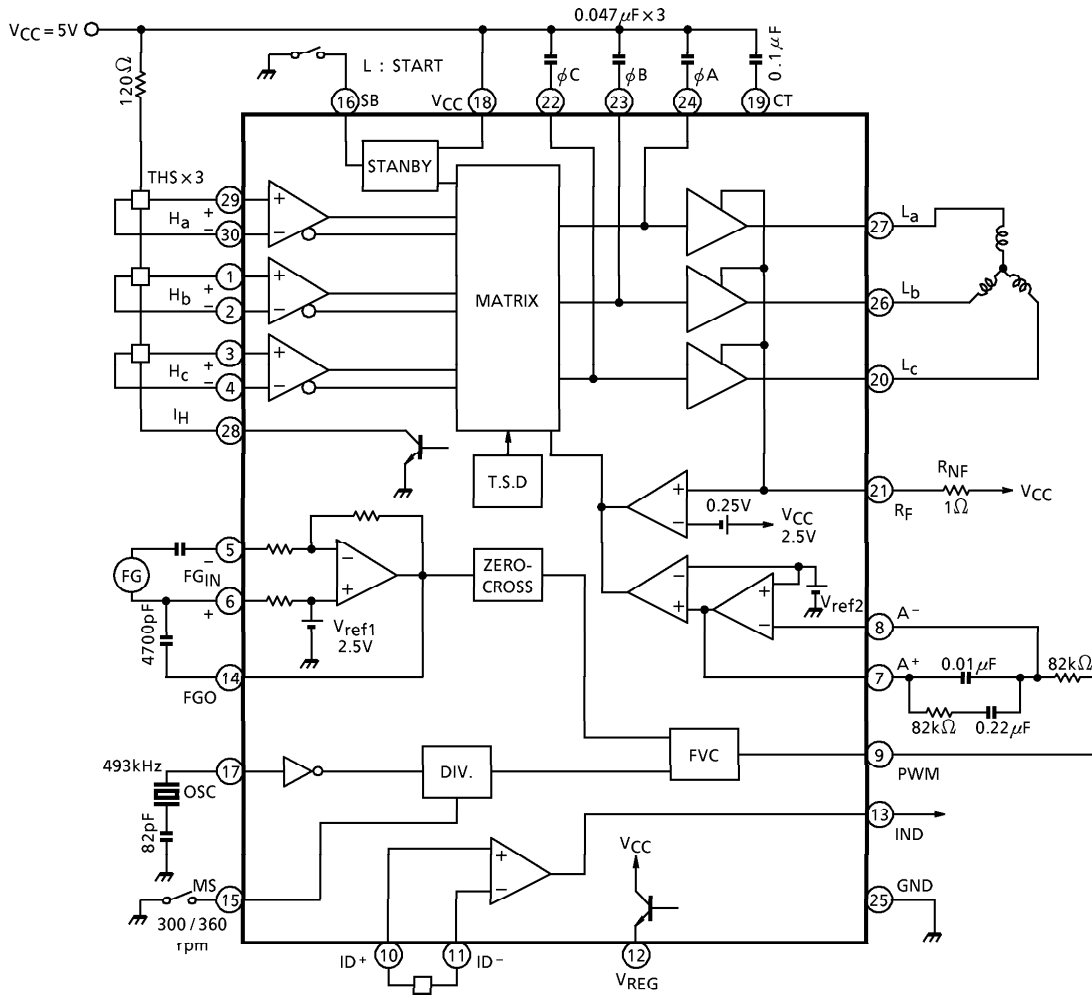
TEST CIRCUIT 7  $V_{sat U}$ ,  $V_{sat L}$ ,  $V_{SB-SAT}$



TEST CIRCUIT 8  $I_{IDX}$ ,  $V_{CMRI}$ ,  $V_{TH}$ ,  $V_{IDL}$ ,  $V_{IDXH}$ ,  $V_{INI}$



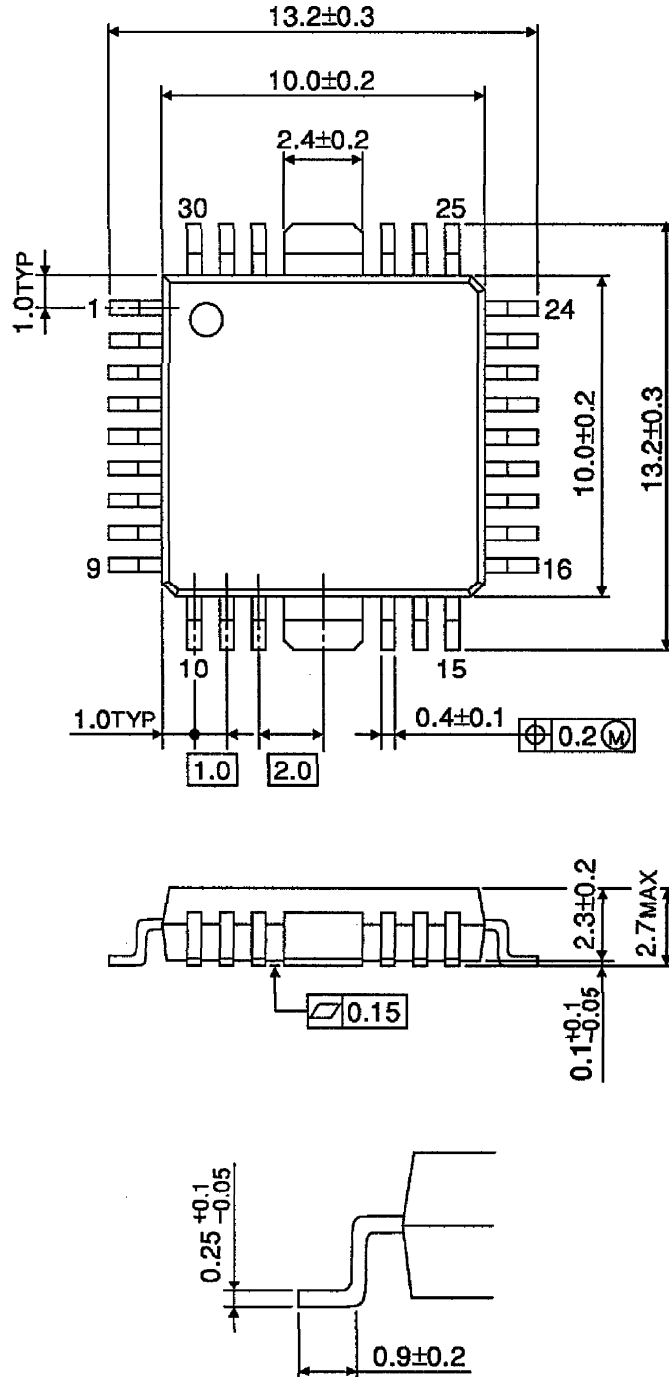
APPLICATION CIRCUIT



(Note) Utmost care is necessary in the design of the output line, V<sub>CC</sub> and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING  
HQFP30-P-1010-1.00

Unit : mm



Weight : 0.61g (Typ.)