

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

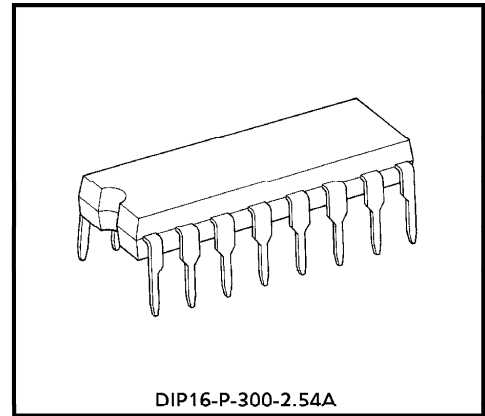
TB6515AP

SENSORLESS MOTOR DRIVER IC

The TB6515AP is a sensorless motor driver IC developed mainly for use with VTR cylinder motors. The PG and FG sensors are sensorless three-phase brushless motor driver ICs with sharing capabilities (specific magnetism is required).

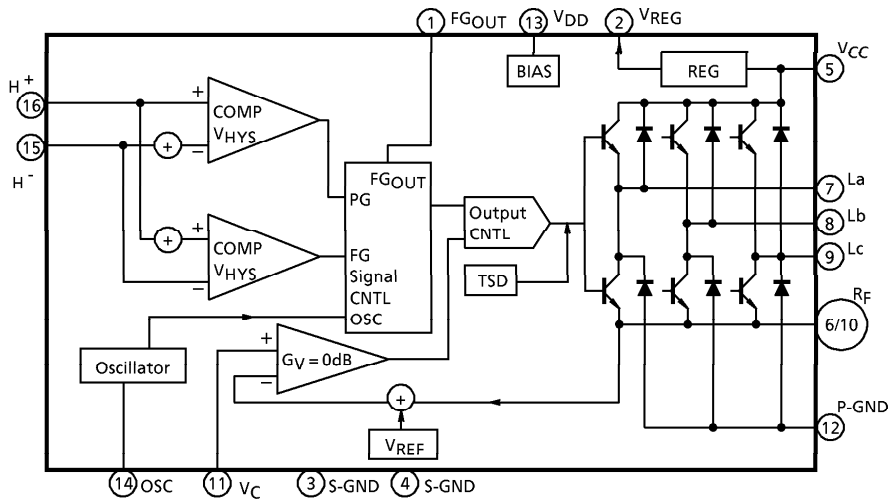
FEATURES

- The PG and FG sensors can be shared, and the motor driver areas are sensorless.
- Three-phase full-wave drive models.
- Equipped with FG output.
- Built-in thermal shut-down circuits.
- Built-in power source for the PG and FG sensors.



Weight : 1.11g (Typ.)

BLOCK DIAGRAM



961001EBA1

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PIN FUNCTION

| PIN No. | PIN SYMBOL | PIN FUNCTION |
|---------|----------------|--|
| 1 | FGOUT | FG signal output pin |
| 2 | VREG | Internal power source voltage output pin |
| 3 | S-GND | Small signal ground pin |
| 4 | S-GND | Small signal ground pin |
| 5 | VCC | Power source applied voltage pin |
| 6 | R _F | Output current detection pin |
| 7 | La | a-phase drive output pin |
| 8 | Lb | b-phase drive output pin |
| 9 | Lc | c-phase drive output pin |
| 10 | R _F | Output current detection pin |
| 11 | V _C | Control amplifier positive input pin |
| 12 | P-GND | Output ground pin |
| 13 | VDD | Internal power source voltage output pin |
| 14 | OSC | Oscillation condenser connection pin |
| 15 | H ⁻ | PG / FG comparator negative input pin |
| 16 | H ⁺ | PG / FG comparator positive input pin |

MAXIMUM RATINGS (Ta = 25°C)

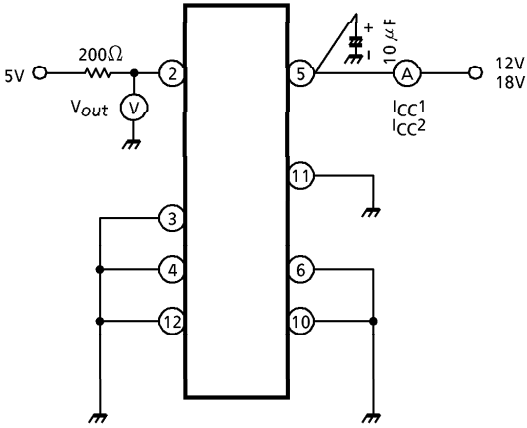
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|--------------------------|------------------|------------|------|
| Power Suplly Voltage | V _{CC} | 18 | V |
| Output Current | I _O | 1.0 | A |
| Regulator Output Current | I _{REG} | 12 | mA |
| FG Output Current | I _{FG} | 2.0 | mA |
| Power Dissipation | P _D | (Note) 1.2 | W |
| Operating Temperature | T _{opr} | - 30 ~ 85 | °C |
| Storage Temperature | T _{stg} | - 55 ~ 150 | °C |

(Note) IC units

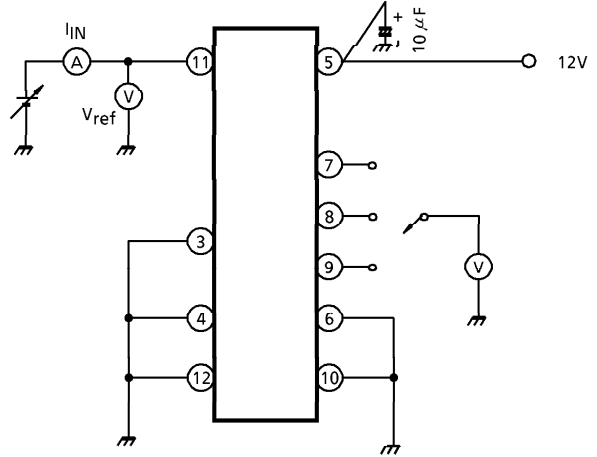
ELECTRICAL CHARACTERISTICS ($V_{CC} = 12V, T_a = 25^\circ C$)

| CHARACTERISTIC | | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|----------------------|--------------|---------------|--|------|----------|------|------------|
| Power Suplly Current | | I_{CC1} | 1 | $V_{CC} = 12V, V_C = 0V, V_{REG} = OPEN$ | — | 9.0 | 15 | mA |
| | | I_{CC2} | 1 | $V_{CC} = 18V, V_C = 0V, V_{REG} = OPEN$ | — | 9.3 | 15 | |
| Control Amplifier | Standard Voltage | V_{ref} | 2 | | — | 2.6 | — | V |
| | Voltage Gain | G_V | 6 | | — | 1.0 | — | |
| | Input Current | I_{IN} | 2 | $V_C = 3.5V$ | — | 2.5 | 10 | μA |
| Leak Current | Upper | $I_{OL(U)}$ | — | $V_{CC} = 18V, V_C = 0V$ | — | — | 50 | μA |
| | Lower | $I_{OL(L)}$ | | $V_{CC} = 18V, V_C = 0V$ | — | — | 50 | |
| Output Saturation Voltage | Upper | $V_{sat(U)}$ | 3 | $I_O = 1A$ | — | 1.5 | 1.9 | V |
| | Lower | $V_{sat(L)}$ | | $I_O = 1A$ | — | 0.8 | 1.2 | |
| Correlated Gain Difference | | ΔG_V | — | | — | — | | % |
| Residual Output Voltage | | V_{or} | 6 | $V_C = 0V$ | — | 0 | 10 | mV |
| FG / PG Threshold Level | FG Upper Level | V_{FGH} | 5 | L → H | 91 | 104 | 117 | mV |
| | FG Lower Level | V_{FGL} | | H → L | 108 | 121 | 134 | |
| | PG Upper Level | V_{PGH} | | L → H | 118 | 131 | 144 | |
| | PG Lower Level | V_{PGL} | | H → L | 139 | 152 | 165 | |
| Hall Amp Common-Mode Input Voltage | | CMR | — | | | — | 2.0 | V |
| FG Output Voltage | | $V_{FG(L)}$ | 4 | $I_{FG} = 1mA$ | — | — | 1.1 | V |
| FG Output Current | | I_{FG} | — | | 1.8 | 2.0 | — | mA |
| Delta-Wave Oscillation Frequency | | f_{OSC} | 7 | $C_{OSC} = 0.1\mu F$ | — | 8 | — | Hz |
| Rated Voltage Output Circuit | Output Voltage | V_{REG} | | $RL = 200\Omega : 5V$ | 1.35 | 1.45 | 1.55 | V |
| | Temperature Variable | ΔV_O | 1 | $RL = 200\Omega, T_j = -20\sim 70^\circ C$ | — | ± 30 | — | mV |
| | Output Current | I_{REG} | — | | 20 | — | — | mA |
| Thermal Shut-Off Circuit Operating Temperature | | TSD | — | | 150 | — | — | $^\circ C$ |

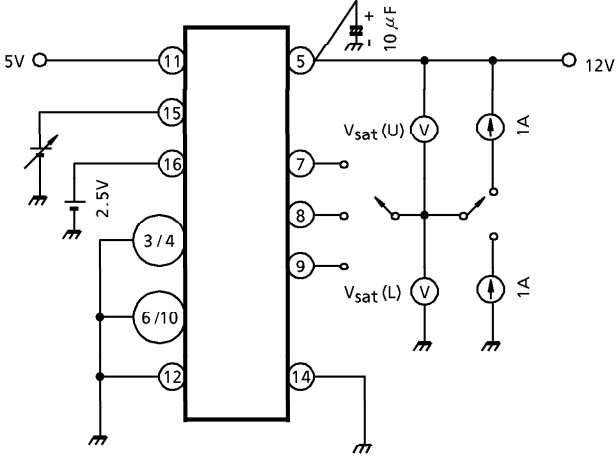
TEST CIRCUIT 1.



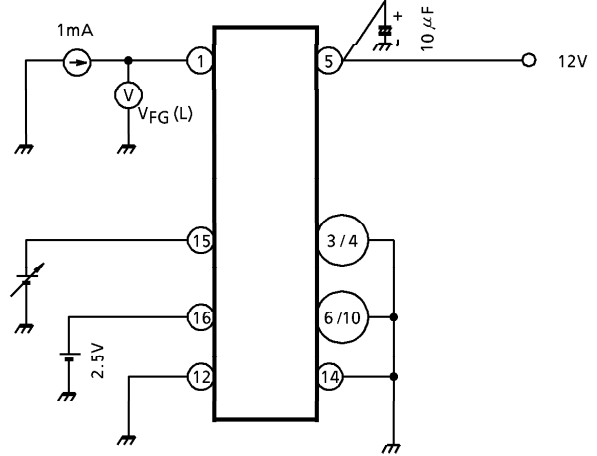
TEST CIRCUIT 2.



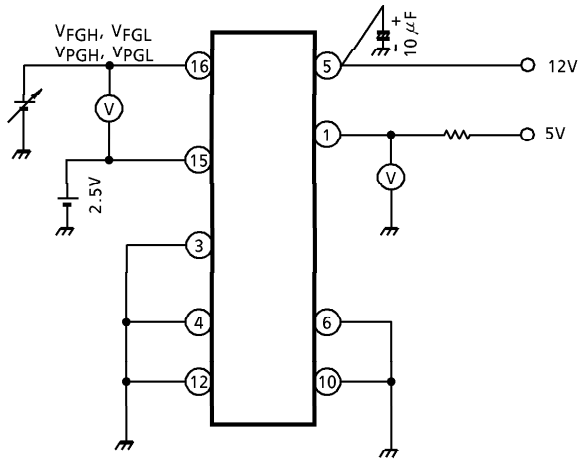
TEST CIRCUIT 3.



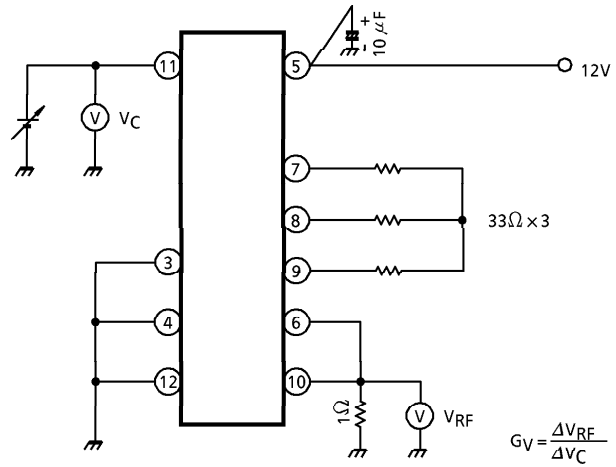
TEST CIRCUIT 4.



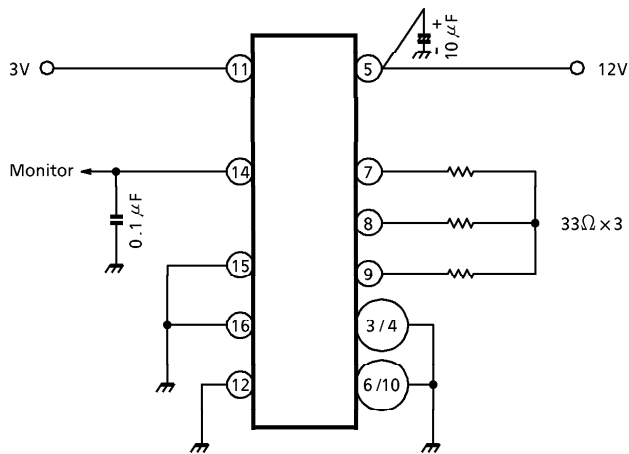
TEST CIRCUIT 5.

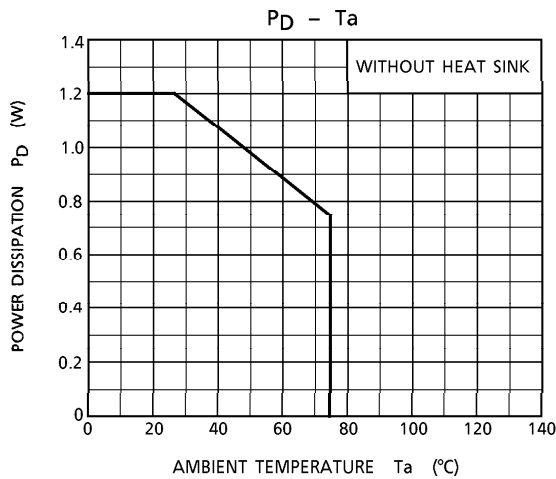


TEST CIRCUIT 6.

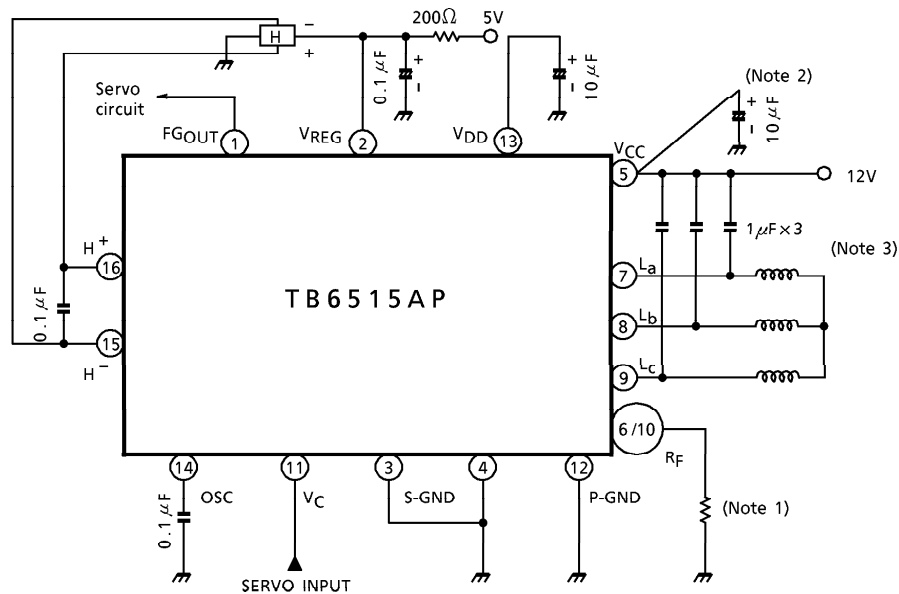


TEST CIRCUIT 7.





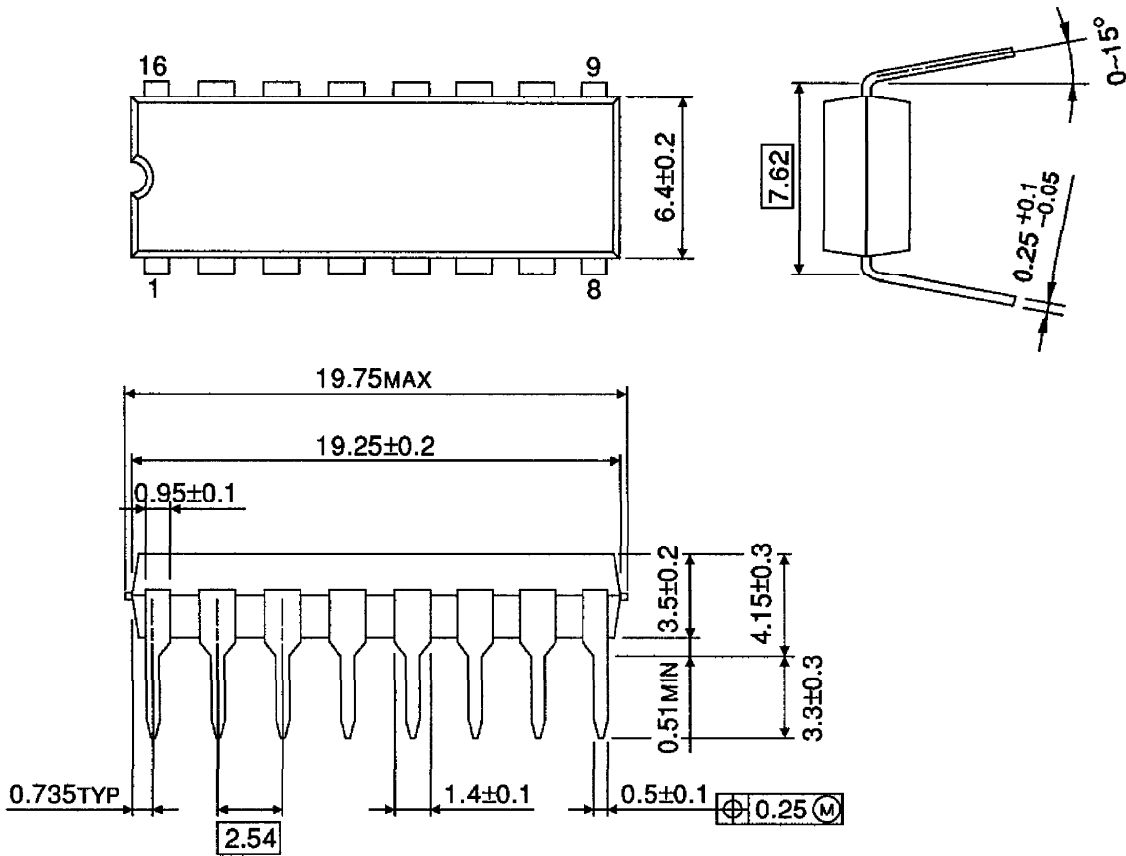
APPLICATION CIRCUIT



- (Note 1) R_F is determined in accordance with coil impedance, F/V conversion voltage (control input), the required torque and other factors, but between approximately 0.3Ω and 5Ω should be used.
- (Note 2) It is recommended that the IC pin and GND are connected directly. Ever larger levels of capacity may be required depending on the shared impedance of the power source line.
- (Note 3) There may be cases where connections (various output → GND, etc.) and capacity needs to be amended in order to prevent noise and vibrations from the motor.

OUTLINE DRAWING
DIP16-P-300-2.54A

Unit : mm



Weight : 1.11g (Typ.)