

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

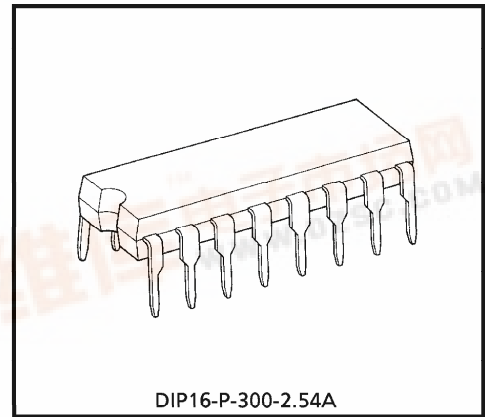
# TB6515AP

## 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).

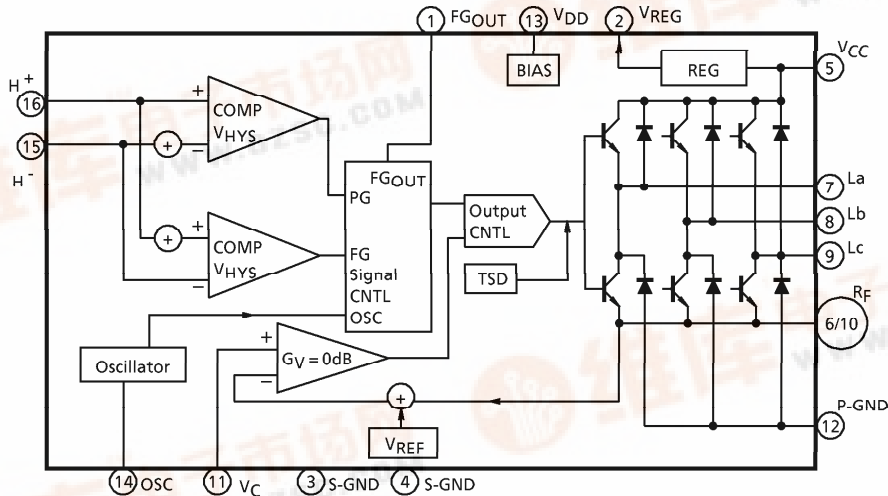
### FEATURES

- 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	FG <sub>OUT</sub>	FG signal output pin
2	V <sub>REG</sub>	Internal power source voltage output pin
3	S-GND	Small signal ground pin
4	S-GND	Small signal ground pin
5	V <sub>CC</sub>	Power source applied voltage pin
6	R <sub>F</sub>	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 <sub>F</sub>	Output current detection pin
11	V <sub>C</sub>	Control amplifier positive input pin
12	P-GND	Output ground pin
13	V <sub>DD</sub>	Internal power source voltage output pin
14	OSC	Oscillation condenser connection pin
15	H <sup>-</sup>	PG / FG comparator negative input pin
16	H <sup>+</sup>	PG / FG comparator positive input pin

**MAXIMUM RATINGS (Ta = 25°C)**

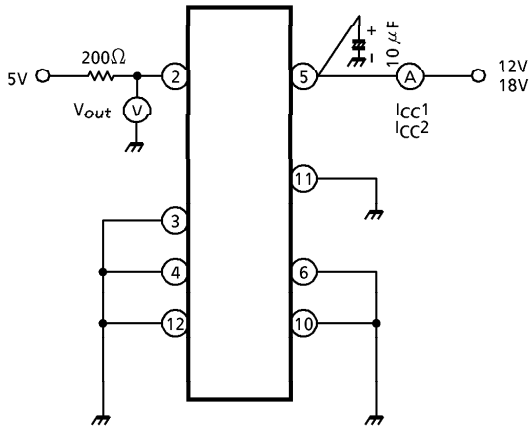
CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Suplly Voltage	V <sub>CC</sub>	18	V
Output Current	I <sub>O</sub>	1.0	A
Regulator Output Current	I <sub>REG</sub>	12	mA
FG Output Current	I <sub>FG</sub>	2.0	mA
Power Dissipation	P <sub>D</sub>	(Note) 1.2	W
Operating Temperature	T <sub>opr</sub>	- 30 ~ 85	°C
Storage Temperature	T <sub>stg</sub>	- 55 ~ 150	°C

(Note) IC units

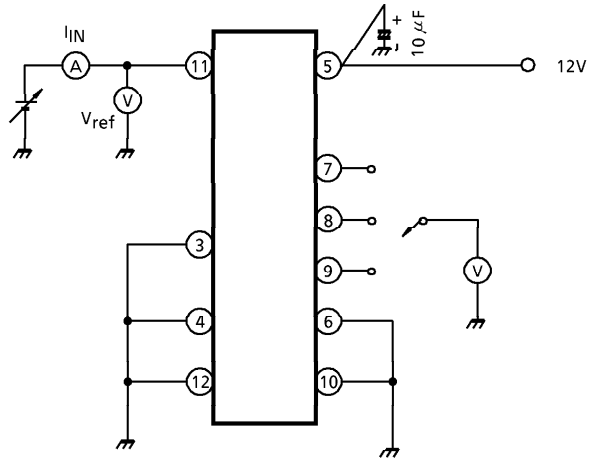
**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 12V$ ,  $T_a = 25^{\circ}C$ )

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply 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	$\mu A$
Leak Current	Upper	$I_{OL(U)}$	—	$V_{CC} = 18V, V_C = 0V$	—	—	50	$\mu A$
	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		$\Delta G_V$	—		—	—		%
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	$V_{REG}$	—	$R_L = 200\Omega : 5V$	1.35	1.45	1.55	V
	Temperature Variable	$\Delta V_O$	1	$R_L = 200\Omega, T_j = -20 \sim 70^{\circ}C$	—	$\pm 30$	—	mV
	Output Current	$I_{REG}$	—		20	—	—	mA
Thermal Shut-Off Circuit Operating Temperature		$T_{SD}$	—		150	—	—	$^{\circ}C$

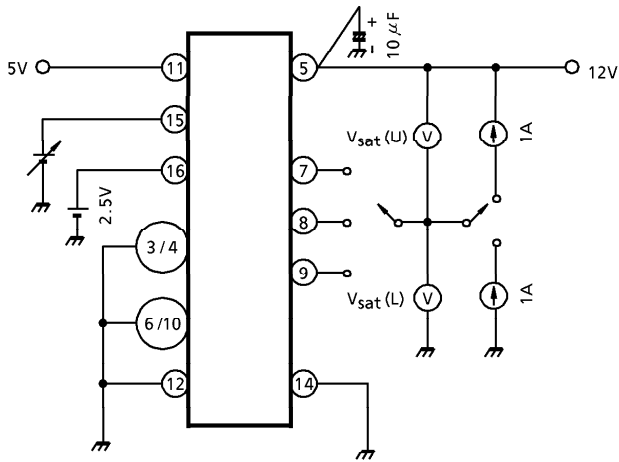
**TEST CIRCUIT 1.**



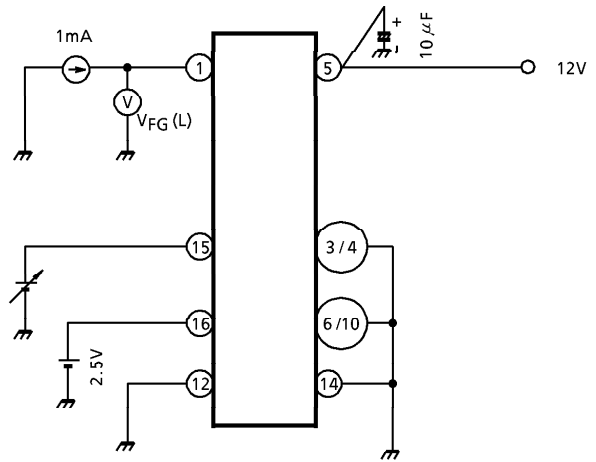
**TEST CIRCUIT 2.**



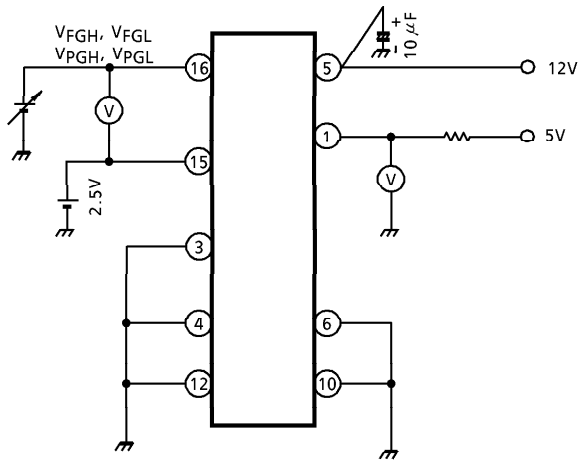
**TEST CIRCUIT 3.**



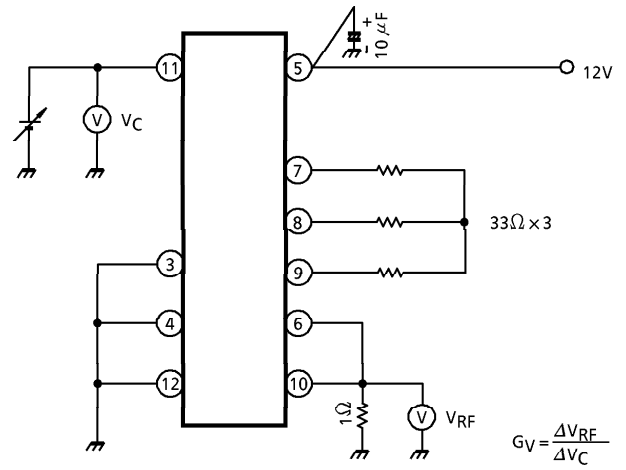
**TEST CIRCUIT 4.**



**TEST CIRCUIT 5.**

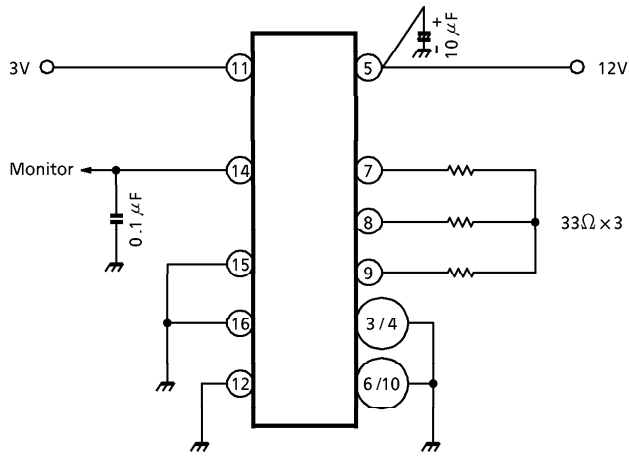


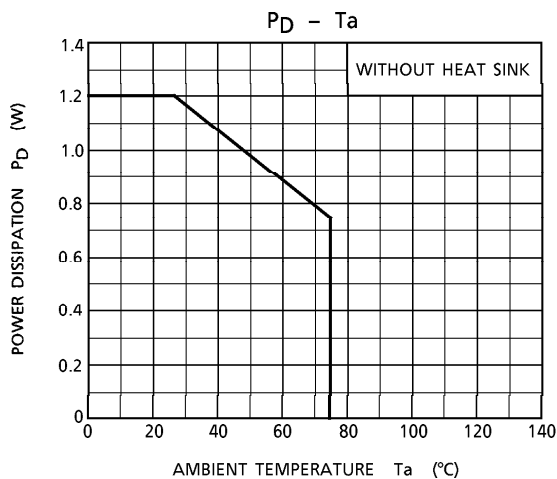
**TEST CIRCUIT 6.**



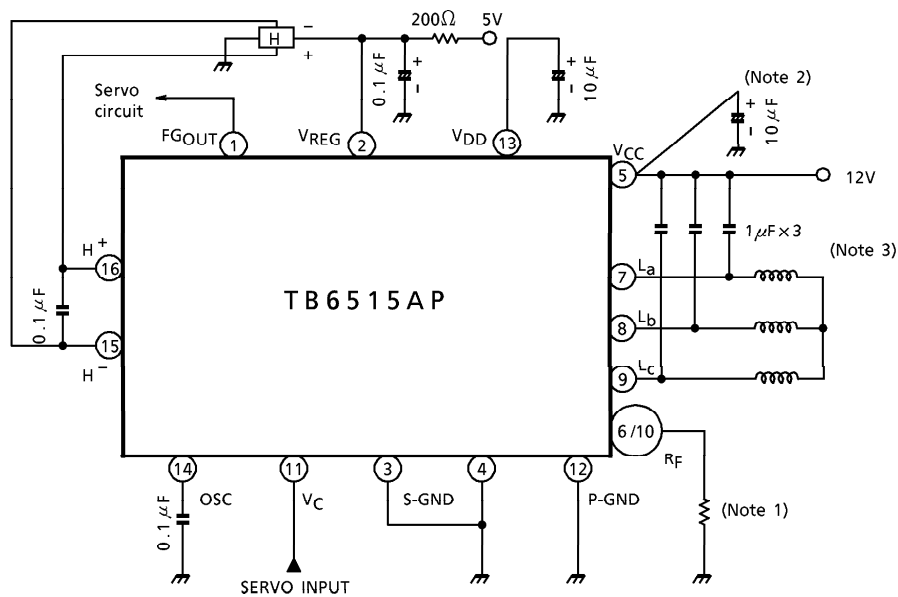
$$G_V = \frac{\Delta V_{RF}}{\Delta V_C}$$

**TEST CIRCUIT 7.**





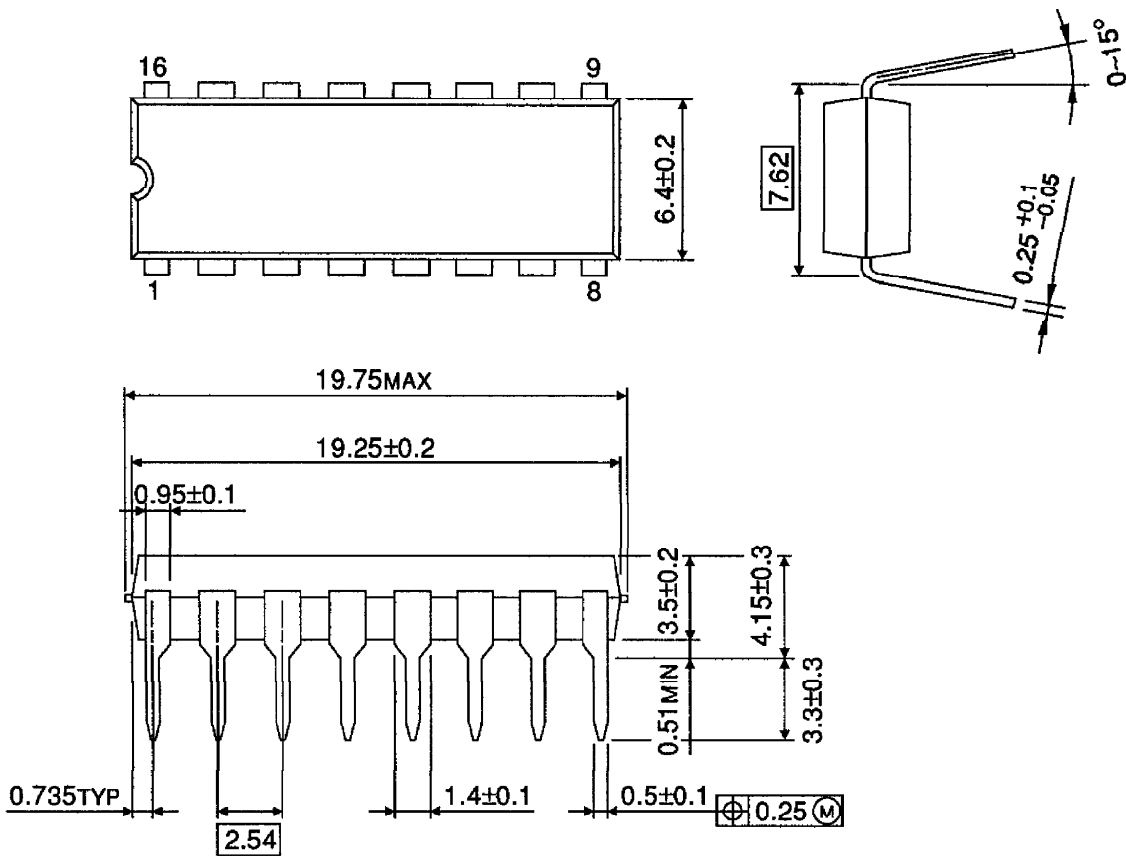
APPLICATION CIRCUIT



- (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 0.3 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.)