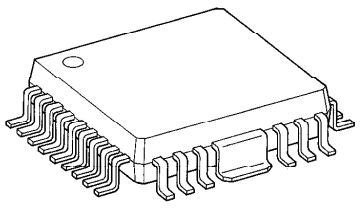
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8463F

SINGLE CHIP 3 PHASE MOTOR DRIVER FOR FDD SPINDLE MOTOR.

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



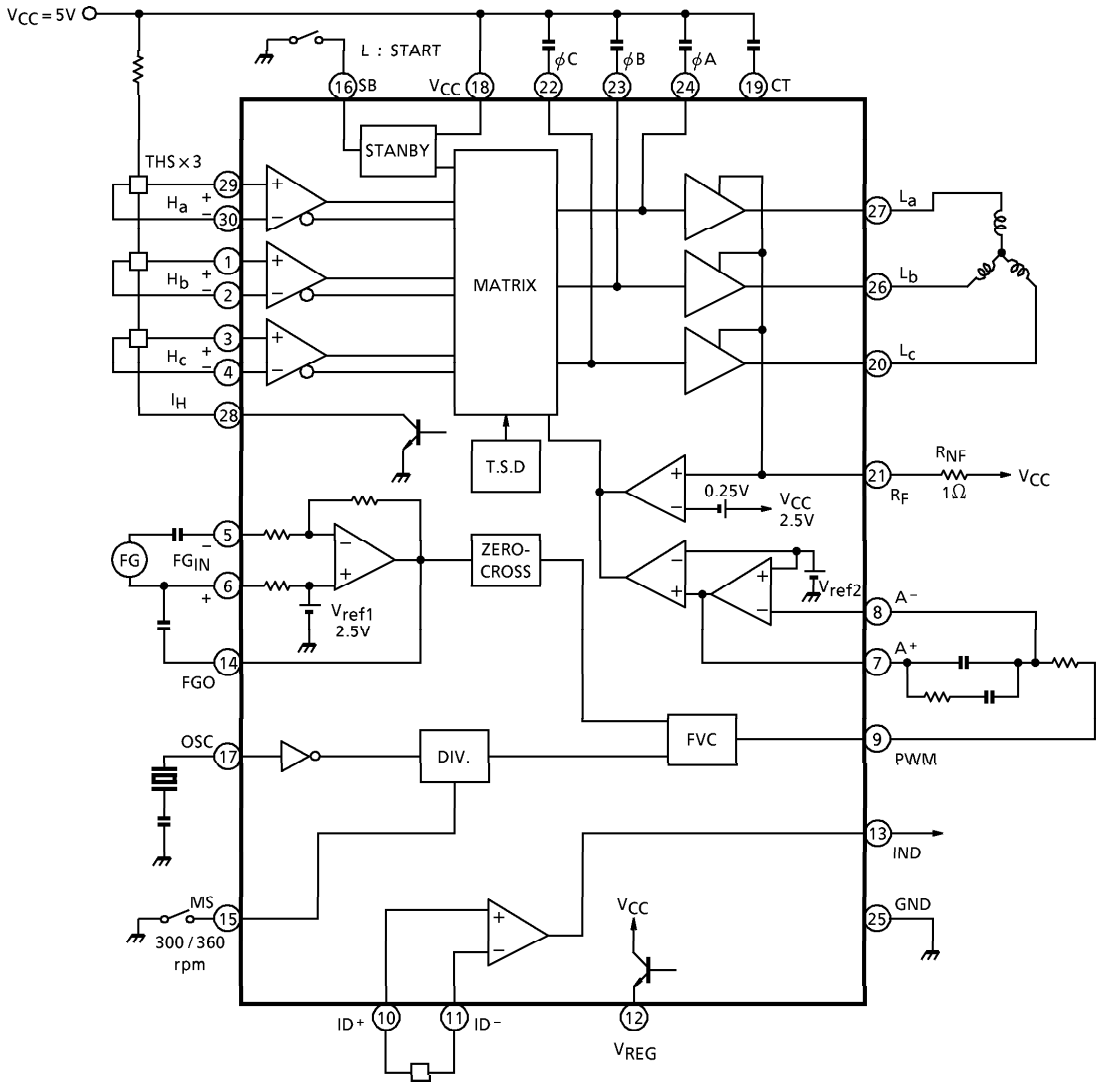
HQFP30-P-1010-1.00

Weight : 0.61g (Typ.)

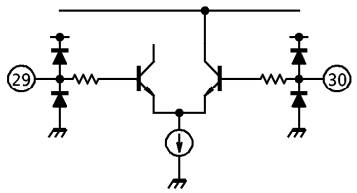
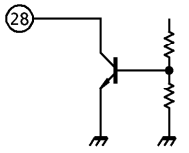
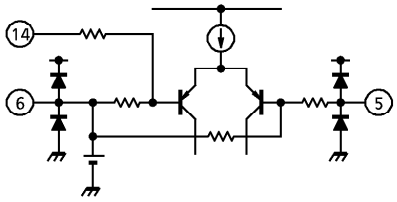
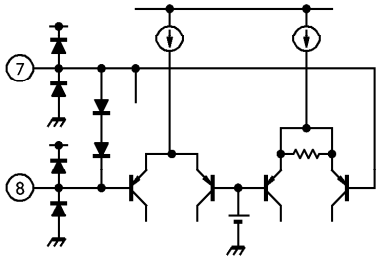
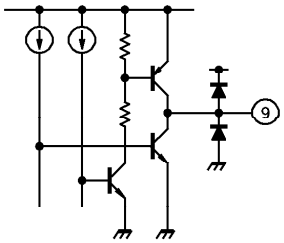
FEATURES

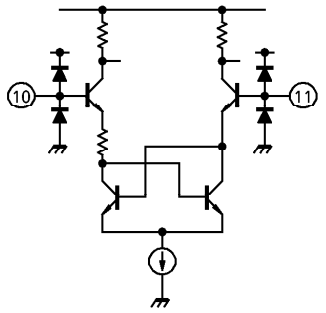
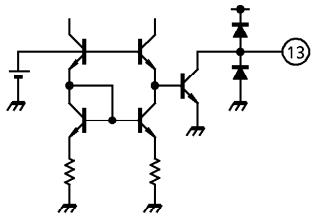
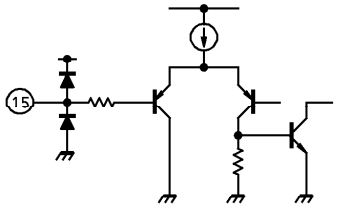
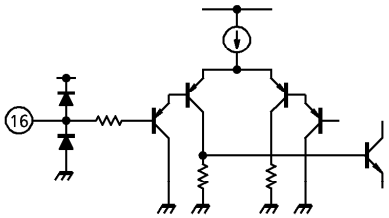
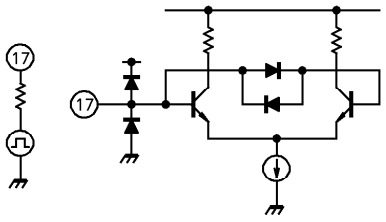
- 1 Chip motor driver with 3 phase semi-linear driving.
- Adjustment free with digital servo system.
- 300, 360rpm are obtained.
- Built-in index pulse output current.
- Operating supply voltage range : $V_{CC} = 4.2 \sim 7V$
- Output current : $I_{O\ (MAX.)} = 0.5A$ (AVE.)
- Built-in thermal shutdown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

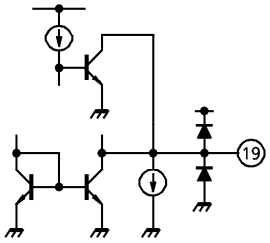
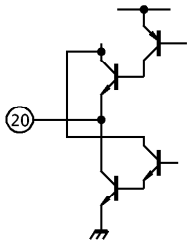
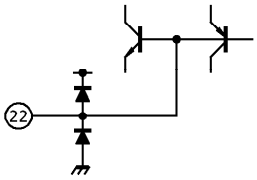
BLOCK DIAGRAM



PIN FUNCTION

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION	EQUIVALENT CIRCUIT
29 30 1 2 3 4	H_a^+ H_a^- H_b^+ H_b^- H_c^+ H_c^-	● Hall Amp. + / − Input Terminal. The Hall Input Range is ; $V_H = 50 \sim 300$ [mV_{p-p}] CMR = 1.3~(V_{CC} − 0.9) [V]	
28	I_H	● Hall Bias Negative Side Connecting Terminal. Open collector output.	
5 6 14	FG_{IN}^- FG_{IN}^+ FGO	● FG Amp. Negative Input Terminal. ● FG Amp. Positive Input Terminal. ● FG Amp. Output Terminal. High Sensitivity of FG Amp. ; V_{HFG} = 2.5mV	
7 8	A+ A−	● Error Amp. Output Terminal. ● Error Amp. Input Terminal. External Ports Value (C.R) is determined by matching between Motor and IC.	
9	PWM	● F / V Converter Output Terminal Reference : No.7 and No.8	

PIN No.	SYM-BOL	FUNCTIONAL DESCRIPTION	EQUIVALENT CIRCUIT
10 11	ID+ ID−	● Index Positive Input Terminal. ● Index Negative Input Terminal.	
13	IND	● Index Amp. Output Terminal. Reference : No.10 and No.11	
15	MS	● Mode Select Terminal. 300rpm : L 360rpm : H	
16	SB	● Stand-by Terminal. SB : H ST : L	
17	OSC	● Oscillation Terminal. 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. External CK Pulse is used, connect Resistor (min. 20kΩ) in series.	

PIN No.	SYM-BOL	FUNCTIONAL DESCRIPTION	EQUIVALENT CIRCUIT
18	V_{CC}	● Supply Voltage Input Terminal.	
19	CT	● Phase Compensation Terminal. Connect Capacitor between pin ⑲ and GND.	
20 26 27	L_c L_b L_a	● Output Terminals.	
21	R_F	● Power Supply Voltage Input Terminal. By connecting resistors between V_{CC} terminal and pin ㉑, Current Limiter is available. $I_{LIM} = \frac{V_{ISD}}{R_{NF}}$ $V_{ISD} = 0.14V$ $I_{O\ (MAX.)} = 0.5A$	
22 23 24	ϕC ϕB ϕA	● Capacitor Connect Terminal for prevention of oscillation.	
25 Fin	GND	● GND	

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	8	V
Output Current	I_O	0.6	A
Power Dissipation	P_D	1.0	W
		(Note) 1.5	
Operating Temperature	T_{opr}	−30~75	°C
Storage Temperature	T_{stg}	−55~150	°C

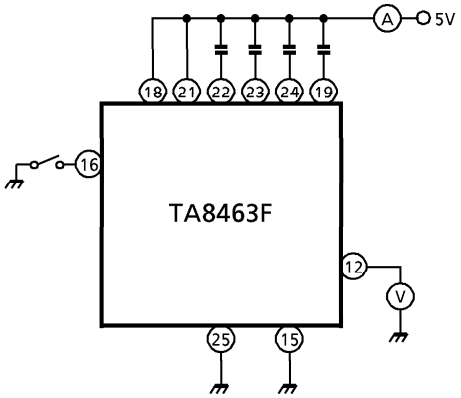
(Note) With Heat-Sink (60 × 60 × 1.6mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 5V, Ta = 25°C)

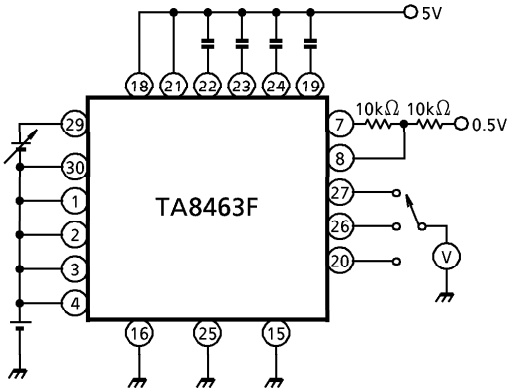
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current			I_{CC1}	1	SB = OPEN, output open	—	125	200	μA
			I_{CC2}	1	SB = GND, output open	—	23.9	36	mA
Hall Amp.	Gain		G_{HO}	—	Output connection state	—	31	—	dB
	Input Sensitivity		V_H	2		50	—	300	mV_{p-p}
	Common Mode Voltage Range		V_{CMRH}	2		1.3	—	V_{CC} − 0.9	V
PG Amp.	Closed Loop Gain		G_{FGO}	3		40	46	50	dB
	Reference Voltage		V_{ref}	3		2.15	2.6	2.9	V
	Input Sensitivity		V_{HFG}	3		—	2.5	—	mV_{p-p}
	Input Offset Voltage		V_{OFG}	3		—	1	—	mV
Integra-tor Amp.	Output Voltage	High	V_{INT-H}	4		3.4	3.8	4.7	V
		Low	V_{INT-L}	4		0.4	1.0	1.6	V
	A-Input Current		I_{A-}	4		—	—	0.4	μA
	Open Loop Gain		G_{INT}	—	−3dB point	—	55	—	dB
Speed Changing	Input Switching Voltage		V_{MS-th}	5	H : 360rpm	3.0	—	V_{CC}	V
					L : 300rpm	0	—	2.0	
	Input Current		I_{MS}	5	V_{MS} = GND	—	−2.5	0.1	μA
OSC Frequency Range			f_{osc}	—	T_j = −30~125°C	300	490	600	kHz

CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
PWM Output Voltage		High	$V_{PWM\ H}$	6	I_{OH} = −100μA (fx / 8192) < FG	—	V_{CC} − 0.1	—	V
		Hiddle	$V_{PWM\ M}$	6	OUTPUT-V_{CC} : 50kΩ OUTPUT-GND : 50kΩ (fx / 8192) = FG	—	V_{CC} / 2	—	V
		Low	$V_{PWM\ L}$	6	I_{OL} = −100μA (fx / 8192) > FG	—	0.1	—	V
Output Stage	Static Voltage		V_{MID}	—	$G_{V\ (INT)}$ = 1 V = (V_{CC} / 2) + 1V	—	2.2	—	V
	Output Refferencial Voltage-1		$V_{M\text{-}diff1}$	—	$G_{V\ (INT)}$ = 1 V = (V_{CC} / 2) + 1V	—	10	60	mV
	Output Refferencial Voltage-2		$V_{M\text{-}diff2}$	—	$G_{V\ (INT)}$ = 1 V = (V_{CC} / 2) − 1V $H_a = H_b = H_c = V_{CC}$ / 2	—	0.4	—	V
	Saturation Voltage	Upper	$V_{sat\ U}$	7	I_O = 500mA		1.1	1.35	V
		Lower	$V_{sat\ L}$	7	I_O = 500mA		0.5	0.75	V
Stand-by Input	Switching Voltage		$V_{ST\text{-}th}$	5	H : Stand-by Mode	2.4	—	V_{CC}	V
					L : Enable Mode	0	—	0.8	
	Input Current		I_{ST}	5	V_{ST} = GND	—	0.05	1.0	μA
Hall Bias Storation Voltage			$V_{SB\text{-}SAT}$	7	I_{IH} = 10mA	—	0.11	0.3	V
					I_{IH} = 20mA	—	0.19	0.5	
Current Limit Operating Voltage			V_{ISD}	—	R_f Voltage	—	140	—	mV
Index Stage	Input Current		I_{IDX}	8		—	—	3	μA
	Common Mode Voltage Range		V_{CMRI}	8		1.5	—	V_{CC} − 0.3	V
	Hysteresis Width		V_{hys}	—		—	2.5	—	mV
	Output Voltage	Low	V_{IDXL}	8	I_O = 1.0mA	—	1.0	0.4	V
		High	V_{IDXH}	8	I_O = 1.0mA	—	V_{CC}	—	V
	Maximum Input		V_{INI}	8		—	—	0.3	$V_{p\text{-}p}$
Index Sensor Bias			V_{REG}	1	R_L = 1kΩ	2.1	2.5	2.9	V
Thermal Shutdown Operating Temperature			TSD	—		150	—	—	°C

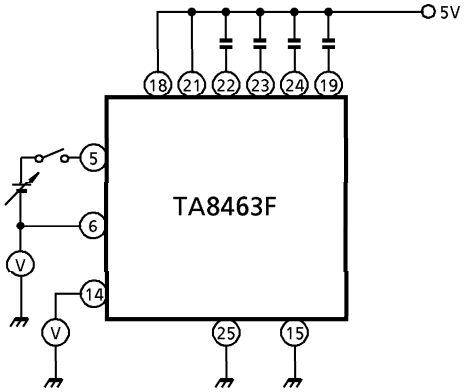
TEST CIRCUIT 1 I_{CC1}, I_{CC2}, V_{REG}



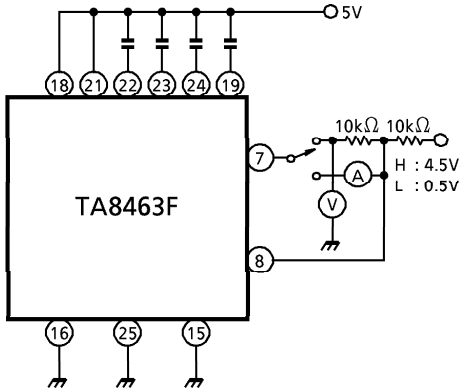
TEST CIRCUIT 2 V_H, V_{CMRH}



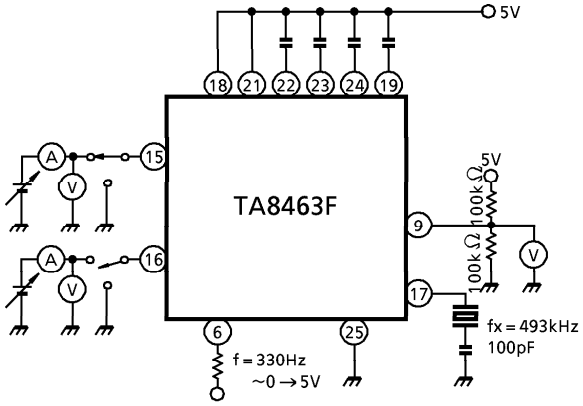
TEST CIRCUIT 3 G_{FGO}, V_{ref}, V_{HFG}, V_{OFG}



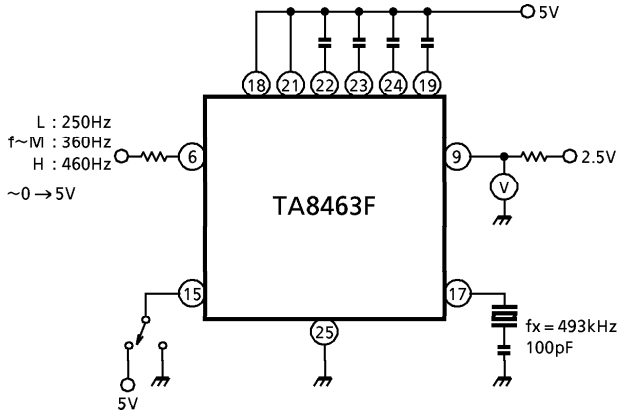
TEST CIRCUIT 4 V_{INT-H}, V_{INT-L}, I_{A-}



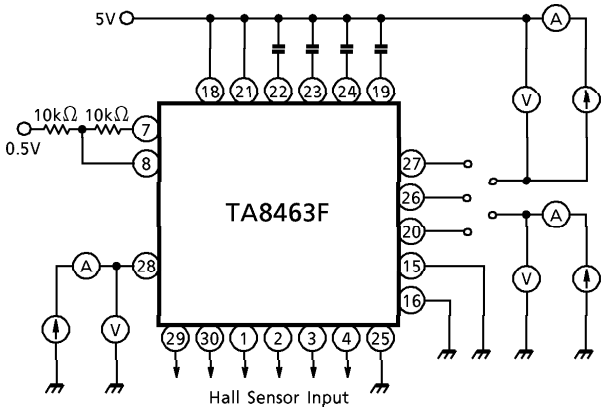
TEST CIRCUIT 5 V_{MS-th}, I_{MS}, V_{ST-th}, I_{ST}



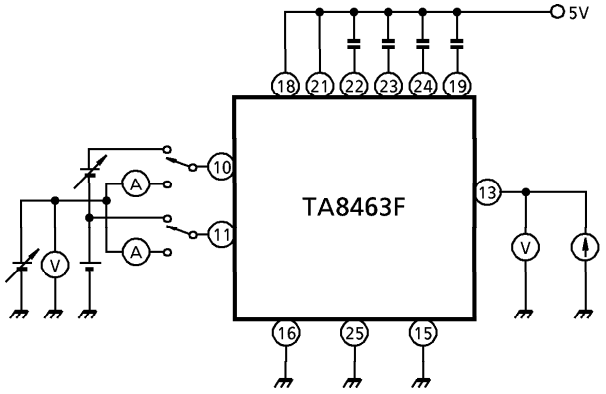
TEST CIRCUIT 6 $V_{PWM\ H}$, $V_{PWM\ M}$, $V_{PWM\ L}$



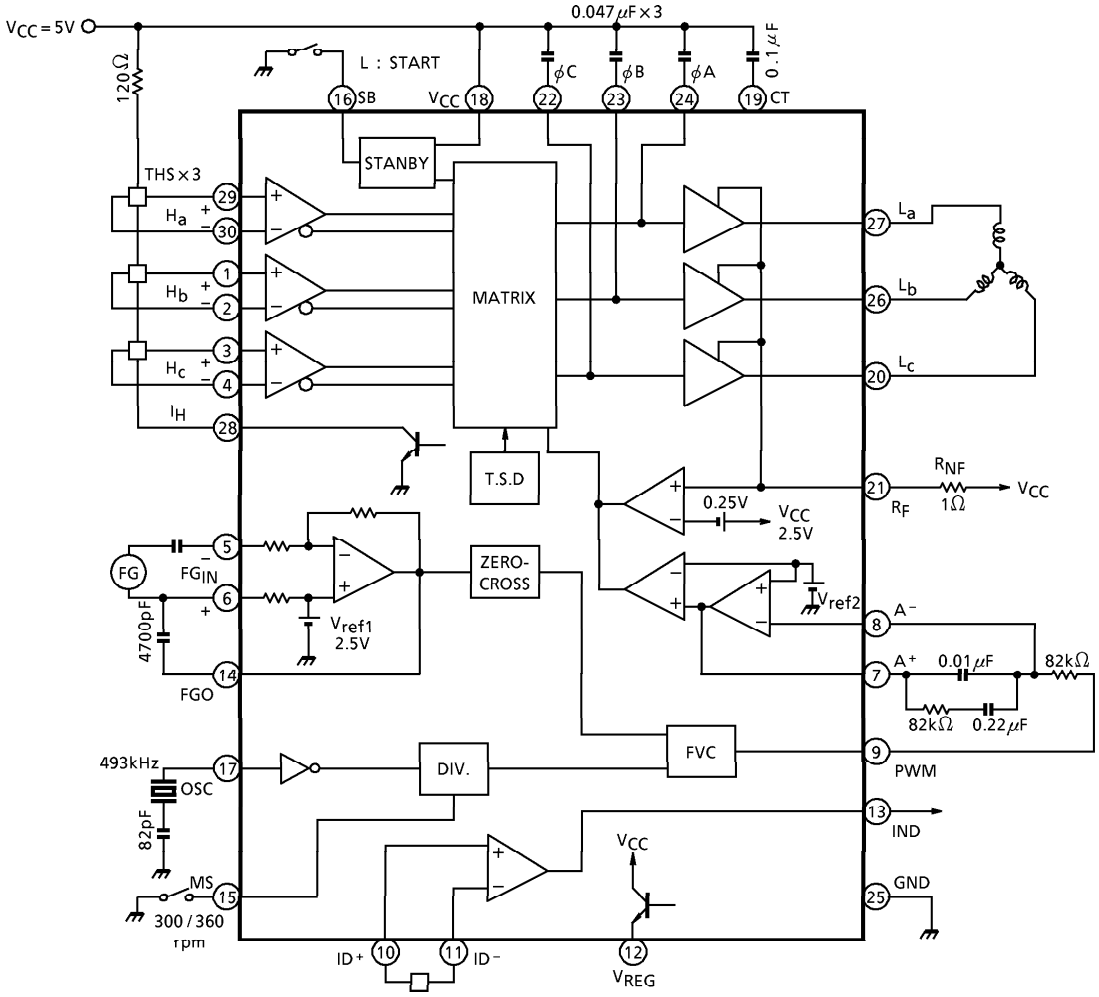
TEST CIRCUIT 7 $V_{sat\ U}$, $V_{sat\ L}$, $V_{SB\text{-}SAT}$



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



APPLICATION CIRCUIT

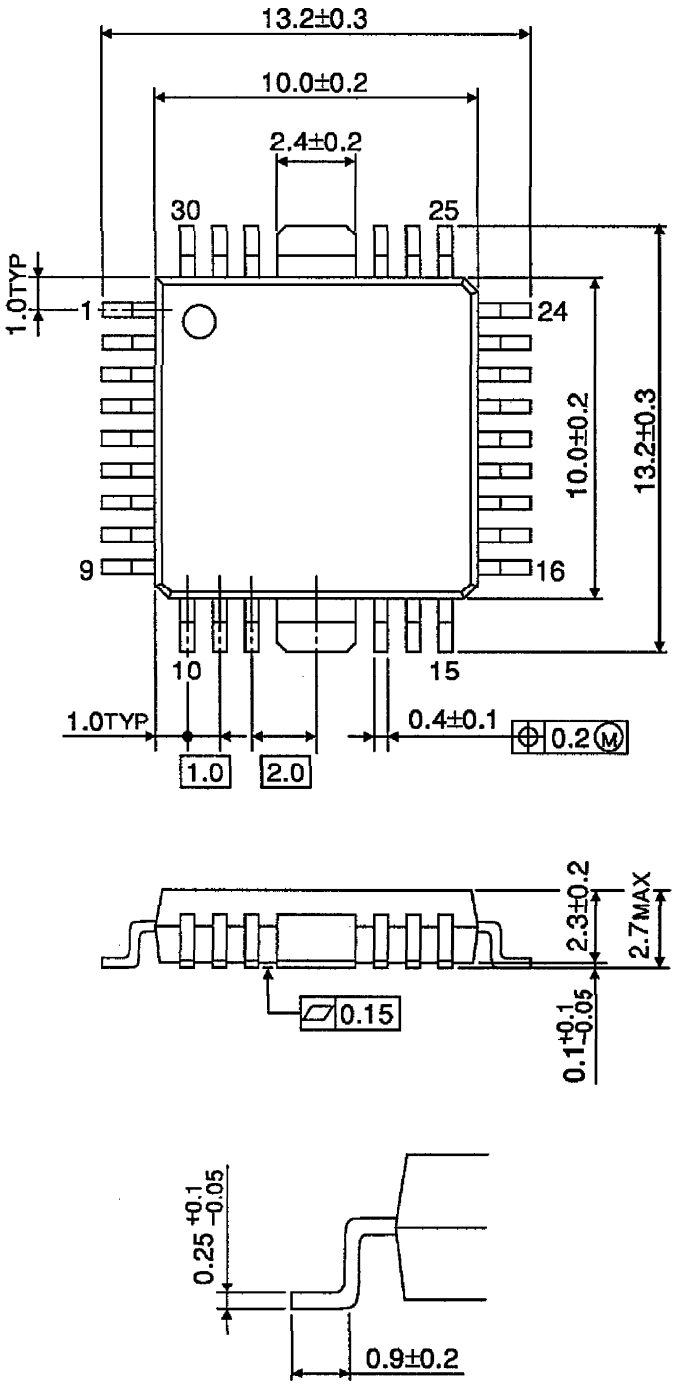


(Note) Utmost care is necessary in the design of the output line, V_{CC} and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING

HQFP30-P-1010-1.00

Unit : mm



Weight : 0.61g (Typ.)