

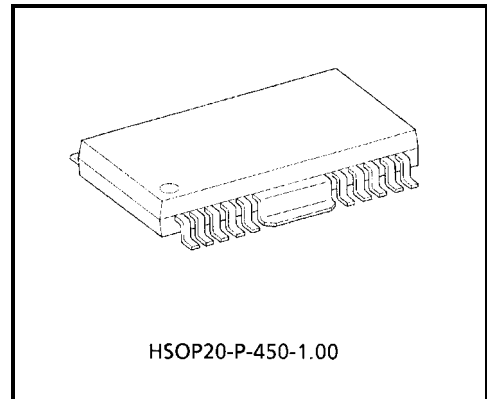
# TA8424F

## 3 PHASE HALL MOTOR DRIVER IC

The TA8424F is non switching type 3 Phase Hall Motor Driver IC consisted of FG Amplifier, Regulator for Hall Sensors, control Amplifier and 3 Phase Output Drivers.

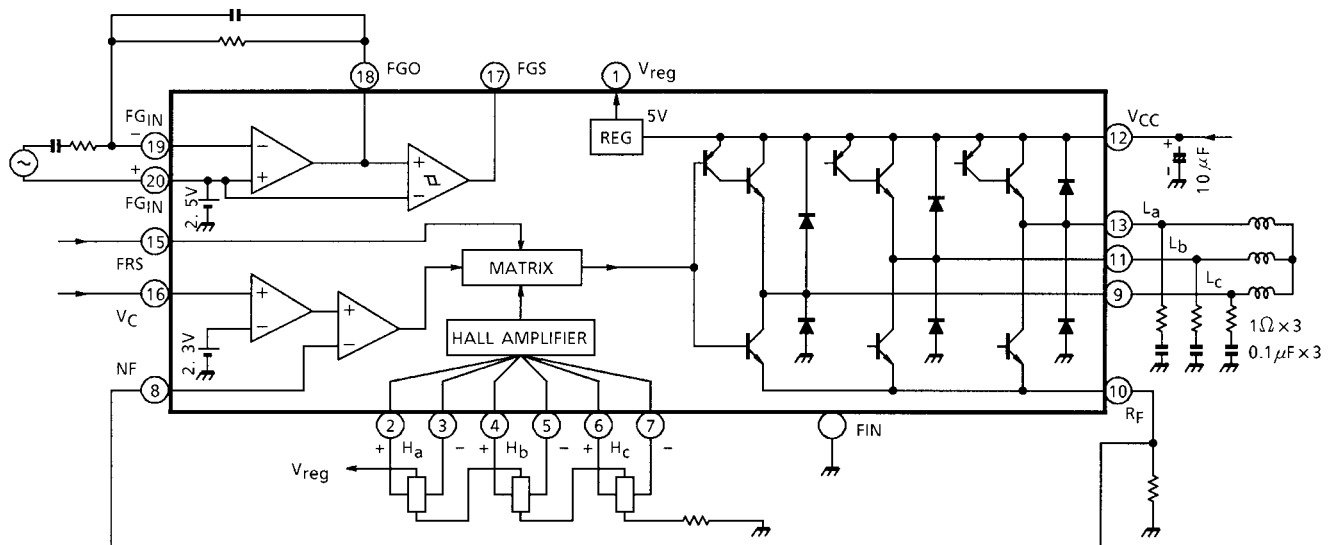
### FEATURES

- Low Noise (Quasi Sinusoidal Drive), Current Control Motor Driver.
- Low Output Impedance with B Class Push-Pull Driver.
- Output Current Up to 1.2 A.
- Operating Voltage Range :  $V_{CC} = 7\sim 17$  V
- Built-in Thermal Shutdown Circuit, FG Amplifier and Regulator.
- 2 Brake Modes Available (Short Brake and Dumping Brake).
- Build in regulator for Hall Sensors.



Weight : 0.79 g (Typ.)

**BLOCK DIAGRAM**



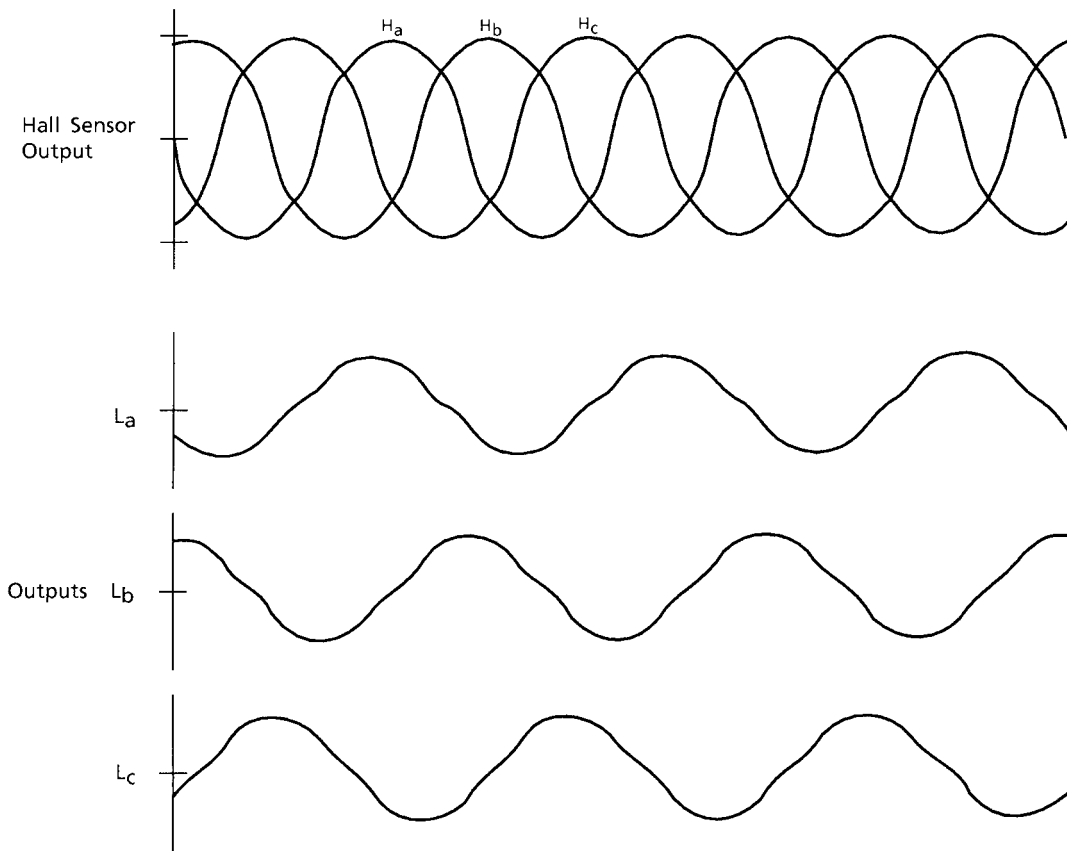
**PIN FUNCTION**

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	V <sub>reg</sub>	Internal power supply output terminal.
2	H <sub>a</sub> <sup>+</sup>	a-phase Hall-Amp positive input terminal.
3	H <sub>a</sub> <sup>-</sup>	a-phase Hall-Amp negative input terminal.
4	H <sub>b</sub> <sup>+</sup>	b-phase Hall-Amp positive input terminal.
5	H <sub>b</sub> <sup>-</sup>	b-phase Hall-Amp negative input terminal.
6	H <sub>c</sub> <sup>+</sup>	c-phase Hall-Amp positive input terminal.
7	H <sub>c</sub> <sup>-</sup>	c-phase Hall-Amp negative input terminal.
8	NF	Feedback resistance connection terminal.
9	L <sub>c</sub>	c-phase drive output terminal.
10	R <sub>F</sub>	Output current detection terminal.
11	L <sub>b</sub>	b-phase drive output terminal.
12	V <sub>CC</sub>	Power supply input terminal.
13	L <sub>a</sub>	a-phase drive output terminal.
14	N.C.	Non connection.
15	FRS	Forward / Reverse control terminal.
16	V <sub>C</sub>	Control signal input terminal.
17	FGS	Hysteresis Amp. output terminal.
18	FGO	FG Amp. output terminal.
19	FG <sub>IN</sub> <sup>-</sup>	FG Amp. negative input terminal.
20	FG <sub>IN</sub> <sup>+</sup>	FG Amp. positive input terminal.
	FIN	GND terminal.

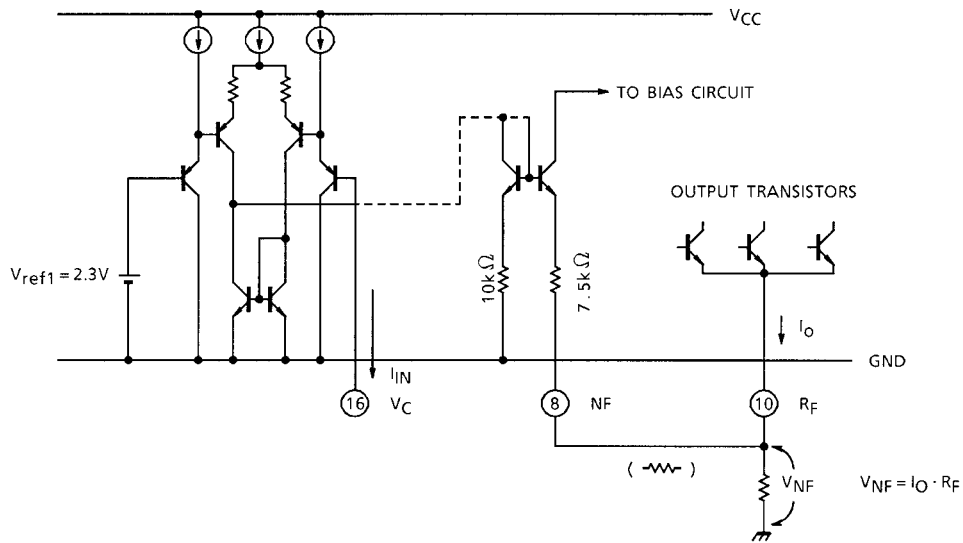
**OPERATING MODE**

MODE	FRS	$V_C$	OUTPUT
Forward	L	$V_C > 2.3\text{ V}$	$L_a = H_a - H_b$ $L_b = H_b - H_c$ $L_c = H_c - H_a$
Reverse	H	$V_C > 2.3\text{ V}$	$L_a = -(H_a - H_b)$ $L_b = -(H_b - H_c)$ $L_c = -(H_c - H_a)$
Stand-By	M	—	Center (Note)
Brake	—	$V_C < 2.3\text{ V}$	Center (Note)

Note: Low Impedance



1. Control Gain ( $G_{VCO}$ )

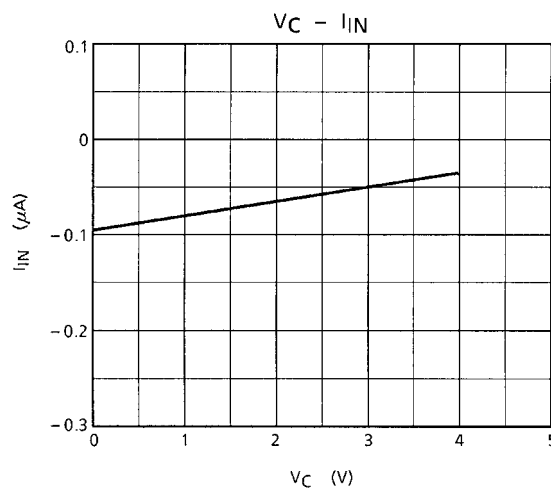


Negative Feedback is looped by  $R_F$  and connected its line to pin (8).

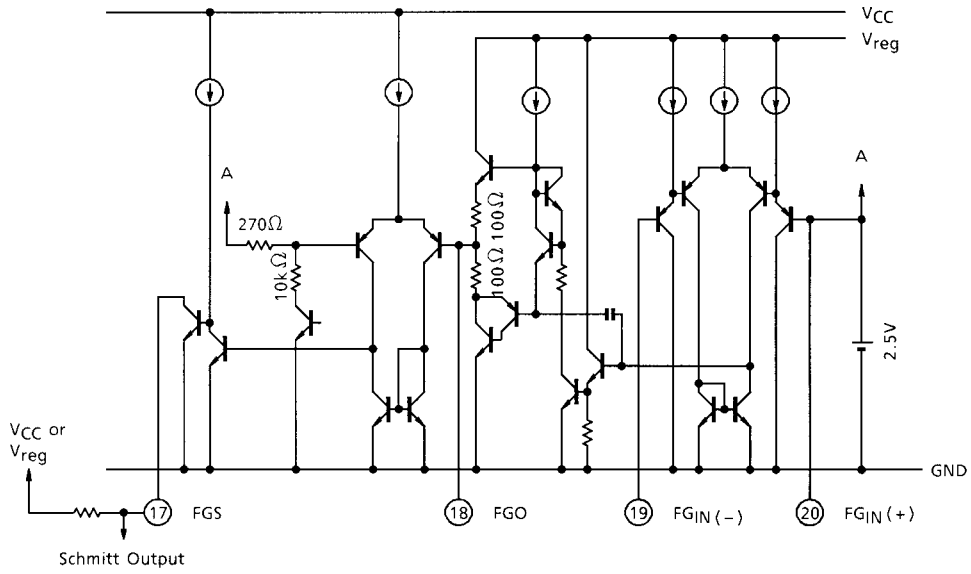
Feedback Voltage  $V_{NF}$  is generated by  $R_F$  and Output Current  $I_O$ .

It is possible to decrease the feedback by connecting a resistor between pin (10) and pin (8).

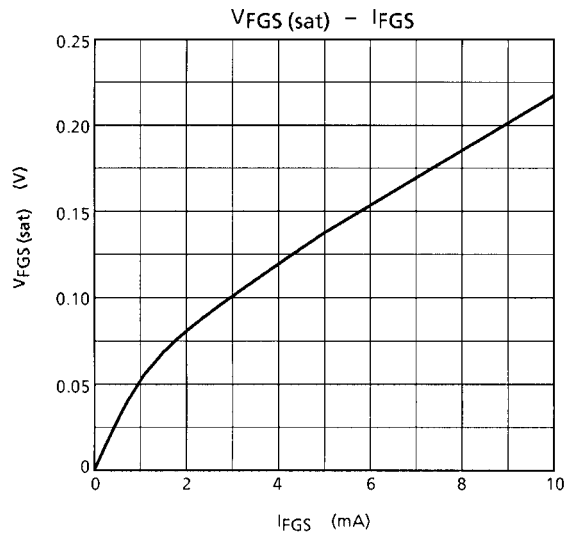
Input current of  $V_C$  ( $I_{IN}$ ) vs  $V_C$  characteristic is shown below.



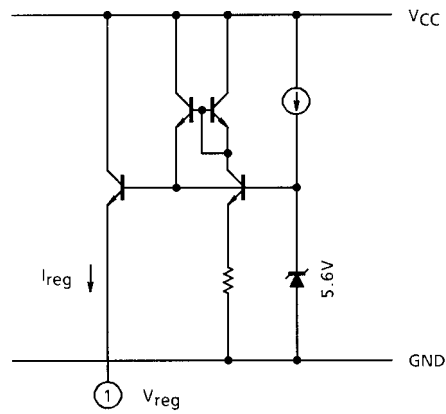
**2. FG Amplifier and Hysteresis Amplifier**



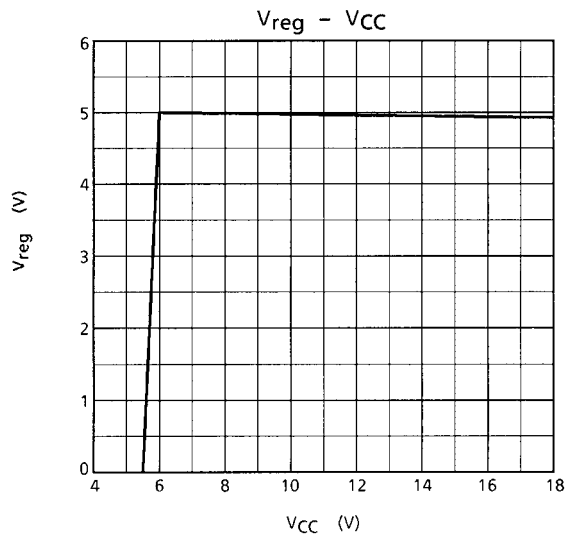
2.5 V of Internal Reference is equipped with FG Amplifier. FG signal is fed into FG<sub>IN</sub> + and FG<sub>IN</sub> - inputs with differential mode and outputs to FGO (Pin (18)). Amplified FG signal is wave shaped by Hysteresis Amplifier in following stage and outputs a wave shaped signal to FGS (Pin (17)).



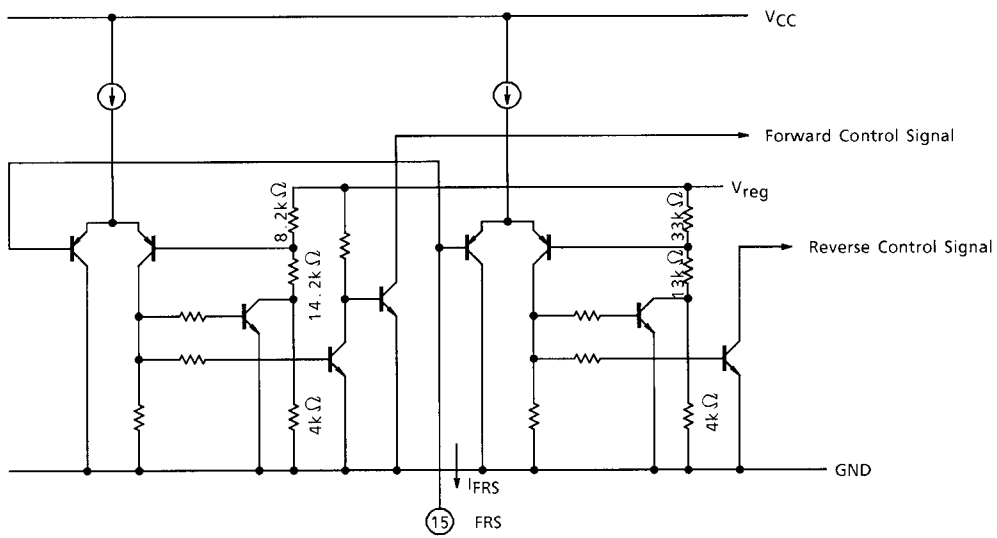
3. Regulator ( $V_{reg}$ )



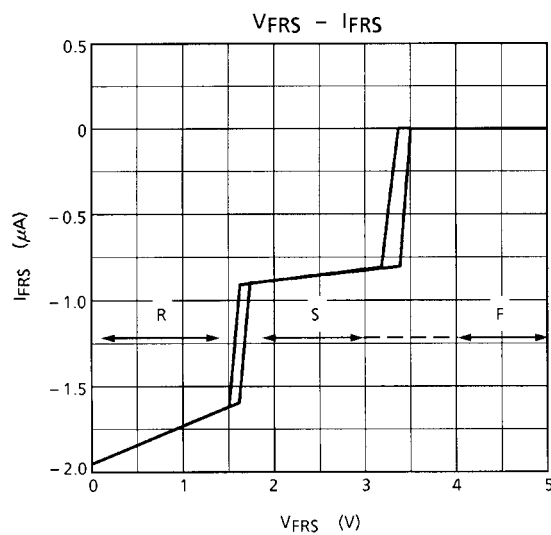
Internal regulator outputs 5 V and this current capability is up to 30 mA.  $V_{CC}$  vs  $V_{reg}$  characteristic is shown below.



4. FRS input (Rotation direction and stop control)



FRS input is a control terminal of Motor Rotation Direction and Stop.  
 $V_{FRS}$  vs  $I_{FRS}$  characteristic is shown below.



## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	18	V
Output Current (Average)	I <sub>O</sub> (MAX.)	1.2	A
FG Output Current	I <sub>FGO</sub>	12	mA
	I <sub>FGS</sub>	14	
Power Dissipation	P <sub>D</sub>	1.0 (Note 1)	W
		3.2 (Note 2)	
		5.8 (Note 3)	
Operating Temperature	T <sub>opr</sub>	-30~75	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

Note 1: No Heat Sink

Note 2: 50 × 50 × 1mm Fe board, Mounting

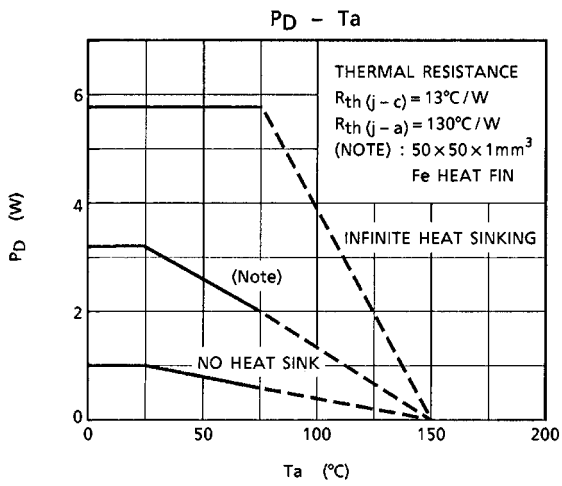
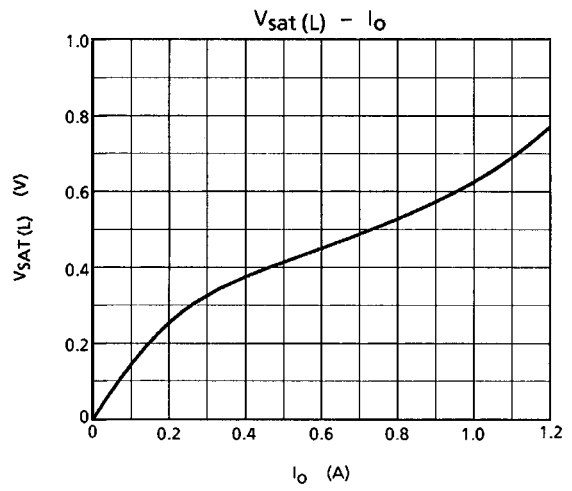
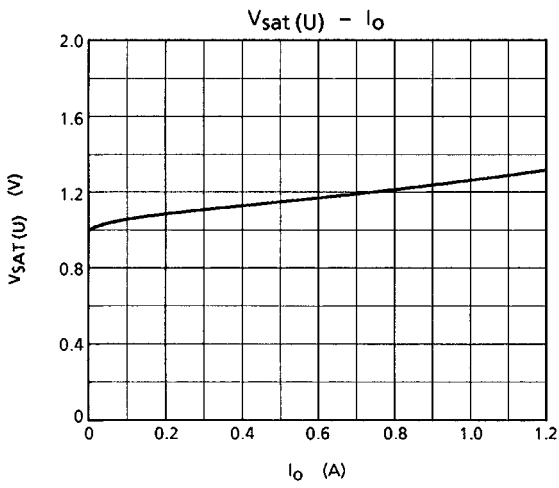
Note 3: T<sub>c</sub> = 75°C

## ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 12 V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Supply Current		I <sub>CC1</sub>	—	Output open, FRS = 2.5 V	—	12.5	25	mA
		I <sub>CC2</sub>	—	Output open, FRS = GND	—	14	25	
		I <sub>CC3</sub>	—	Output open, FRS = 5 V	—	14	25	
Rotation Control Circuit	Control Gain (V <sub>C</sub> → Out)	G <sub>VCO</sub>	—	V <sub>CC</sub> = 12 V, V <sub>H</sub> = 50 mV <sub>p-p</sub>	7.5	13	18	dB
	Input Current (V <sub>C</sub> )	I <sub>CIN</sub>	—	V <sub>C</sub> = GND (Sink current)	—	0.2	5	μA
	Internal Reference-1	V <sub>ref 1</sub>	—	—	2.15	2.30	2.45	V
Position Sensing Circuit	Common Mode Range	CMR <sub>H</sub>	—	—	1.5	—	5	V
	Input Current	I <sub>H</sub>	—	V <sub>IH</sub> = 2.5 V	—	0.2	3	μA
	Voltage Gain (Each Hall Input to OUT)	G <sub>VHO</sub>	—	V <sub>C</sub> = 5 V, V <sub>CC</sub> = 12 V	40	47	51	dB
Output Driver	Upper Side Saturation	V <sub>sat (U)</sub>	—	I <sub>O</sub> = 1.0 A	—	1.2	1.9	V
	Lower Side Saturation	V <sub>sat (L)</sub>	—	I <sub>O</sub> = 1.0 A	—	0.7	1.5	
	Quiescent Voltage	V <sub>O</sub> S	—	V <sub>C</sub> = 1.0 V	5.0	5.5	7.0	V
	Quiescent Voltage Difference	V <sub>O</sub> OF	—	Each output to output	—	25	50	mV
FG Amp	Open Loop Gain	G <sub>VFG</sub>	—	f <sub>FG</sub> = 1 kHz	—	70	—	dB
	Band Width	f <sub>FG</sub>	—	—	DC	—	50	kHz
	Output Voltage Swing	V <sub>FGO</sub>	—	I <sub>FGO</sub> = 5 mA	1.0	2.1	4	V
	FGS Saturation	V <sub>sat (FGS)</sub>	—	I <sub>FGS</sub> = 4 mA	—	0.15	0.25	V
	Internal Reference-2	V <sub>ref 2</sub>	—	—	2.1	2.5	2.9	V
	Hysteresis Voltage	V <sub>HYS</sub>	—	—	—	100	250	mV
Rotation Direction Control	FWD	Operating Voltage	V <sub>FWD</sub>	—	4.0	—	V <sub>CC</sub>	V
	STOP	Operating Voltage	V <sub>STOP</sub>	—	1.9	—	3.1	V
	REVERSE	Operating Voltage	V <sub>REV</sub>	—	0	—	1.3	V
Regulator Output Voltage		V <sub>REG</sub>	—	I <sub>H</sub> = 10 mA	4.7	5.1	5.5	V
Thermal Shutdown Operating Temperature		T <sub>SD</sub>	—	—	150	—	—	°C



**Output Amplifier Saturation Voltage Characteristics**

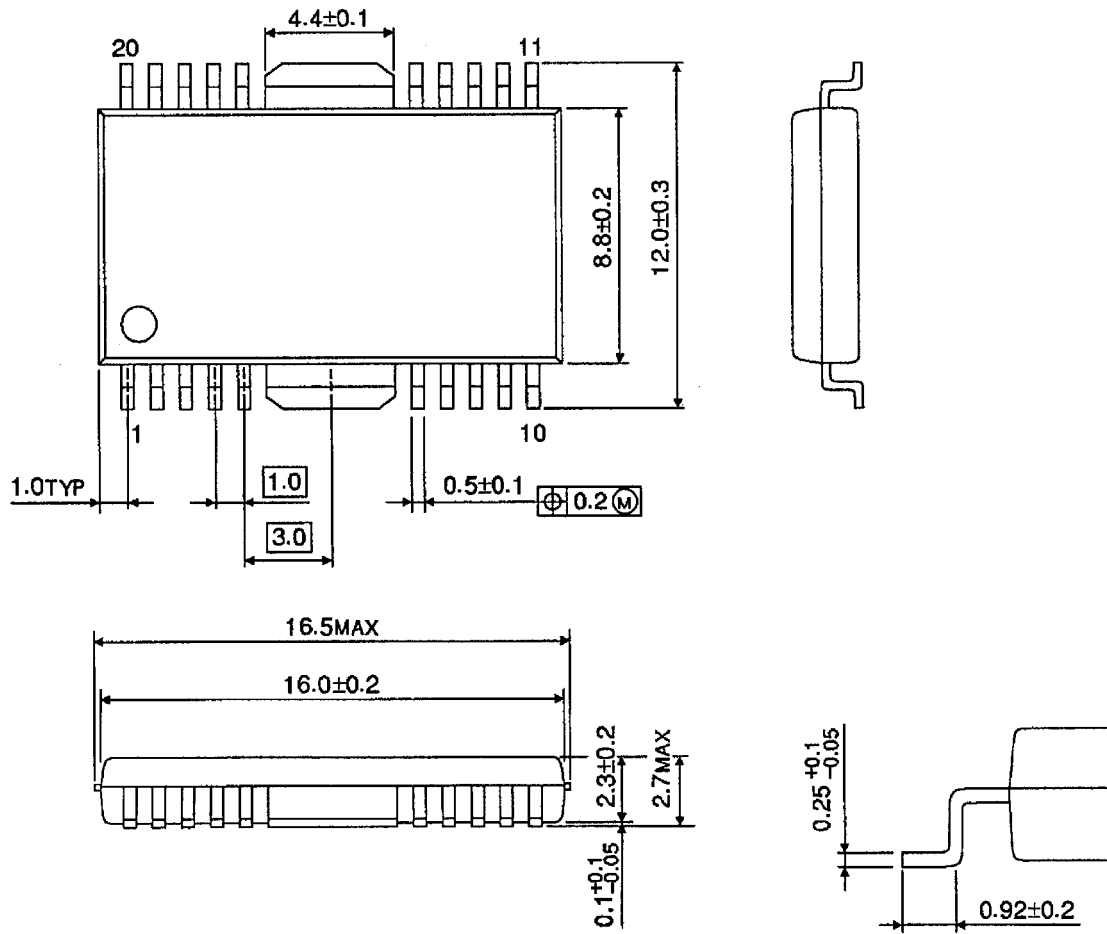




## PACKAGE DIMENSIONS

HSOP20-P-450-1.00

Unit : mm



Weight : 0.79 g (Typ.)

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