

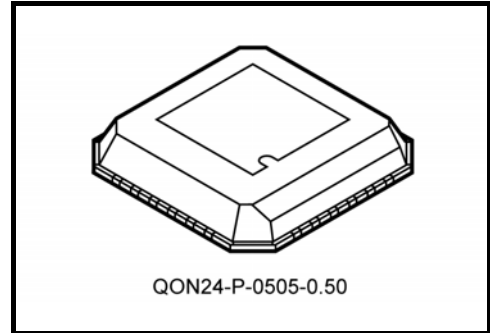
Toshiba Bipolar Linear Integrated Circuit
Silicon Monolithic**TA8496FL/FLG**

Magnetic Head R/W IC

This IC enables writing and detection of magnetic recording signals.

Features

- Operating voltage range: $V_{CC} = 3.5$ to 7 V
 $V_{BAT} = 1.8$ to 7 V
- Output current: $I_{out} = 20$ mA (max)
- Constant current operating function
 $I_{OC} = (0.25 \text{ (V)} \times 160 \text{ (A)})/R_{WR}$ (typ.)



Weight: 0.05 g (typ.)

TA8496FLG:

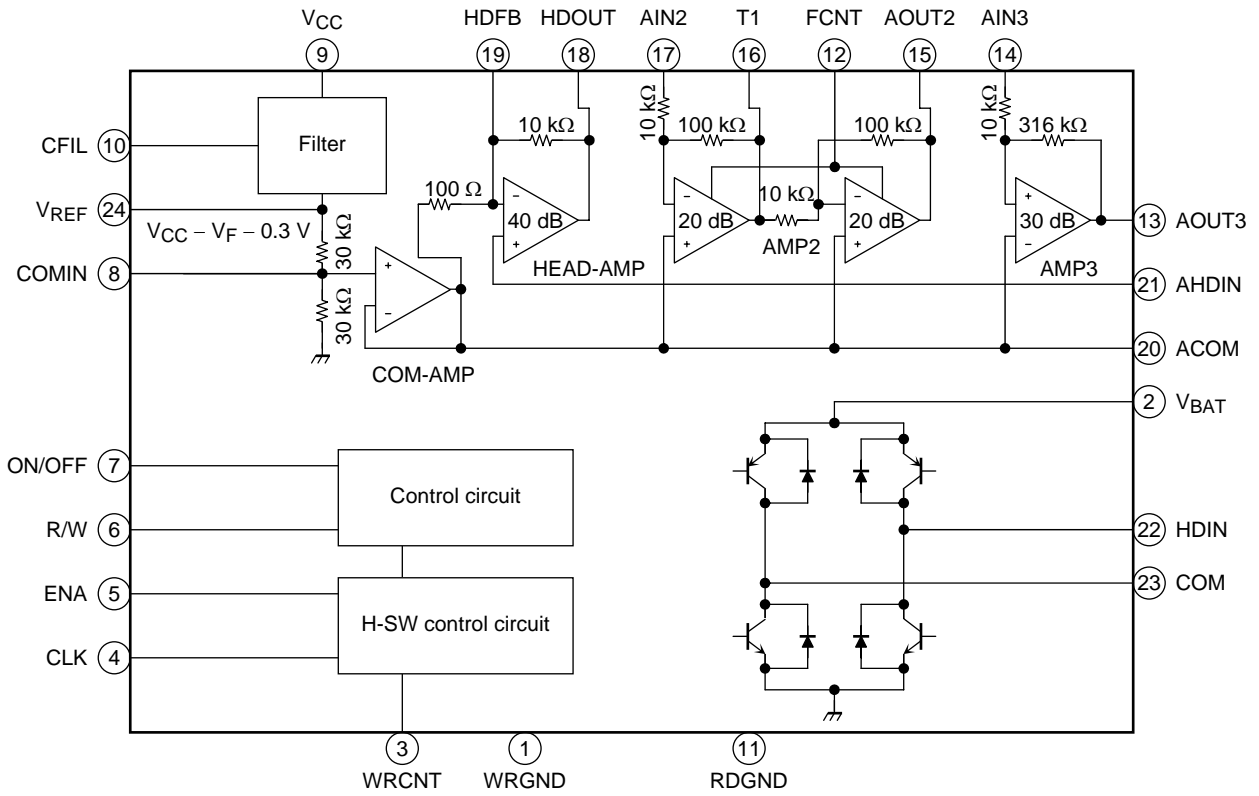
The TA8496FLG is a Pb-free product.

The following conditions apply to solderability:

***Solderability**

1. Use of Sn-37Pb solder bath
 - *solder bath temperature = 230°C
 - *dipping time = 5 seconds
 - *number of times = once
 - *use of R-type flux
2. Use of Sn-3.0Ag-0.5Cu solder bath
 - *solder bath temperature = 245°C
 - *dipping time = 5 seconds
 - *the number of times = once
 - *use of R-type flux

Block Diagram



Pin Function

Pin Number	Symbol	Description
1	WRGND	GND for write block
2	V _{BAT}	High-switch control power supply
3	WRCNT	Write output setting pin
4	CLK	High-switch operation control signal input
5	ENA	High-switch enable signal input
6	R/W	Read/write select signal input
7	ON/OFF	Chip enable signal input
8	COMIN	Internal reference voltage setting (fine adjustment)
9	V _{CC}	Power supply input pin
10	CFIL	Power supply filter connecting pin (C = 0.1 μF)
11	RDGND	GND for read block
12	FCNT	Cut-off frequency setting pin
13	AOUT3	Amp 3 output
14	AIN3	Amp 3 input
15	AOUT2	Amp 2 output
16	T1	Amp 2 test pin
17	AIN2	Amp 2 input
18	HDOUT	Head amp output
19	HDFB	Head amp feedback input
20	ACOM	COM amp output
21	AHDIN	Head amp output
22	HDIN	Write output
23	COM	Write output
24	V _{ref}	V _{CC} filter output (internal power supply)

Absolute Maximum Rating (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power Supply Voltage	V _{CC}	8	V
	V _{BAT}	8	V
Input Voltage	V _I	6	V
Output Current	I _{OUT}	20	mA
Operating Temperature	T _{opr}	-20 to 70	°C
Storage Temperature	T _{stg}	-50 to 150	°C

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power Supply Voltage	V _{CC}	3.5 to 7.0	V
	V _{BAT}	1.8 to 7.0	

Functions

Input				Write Unit		Read Unit
ON/OFF	R/W	ENA	CLK	COM	HDin	
H	H	H/L	H/L	∞	∞	Enable
	L	H	H	L	H	Disable
	L	H	L	H	L	Disable
	L	L	L	L	L	Disable
	L	L	H	∞	∞	Disable
L	H/L	H/L	H/L	∞	∞	Disable

∞ : High impedance

Electrical Characteristics

Interface Block (unless otherwise is specified, $V_{CC} = 5\text{ V}$, $V_{BAT} = 3\text{ V}$, $T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input Voltage	V_{IN1-Hi}	—	ENA, ON/OFF	2.5	—	V_{CC}	V
	V_{IN1-Lo}	—	ENA, ON/OFF	—	—	1.0	
	V_{IN2-Hi}	—	CLK, R/W	1.5	—	V_{CC}	
	V_{IN2-Lo}	—	CLK, R/W	—	—	0.5	
Input Current	I_{IN1-Hi}	1	CLK, $V_{IN} = 5\text{ V}$	—	15	25	μA
	I_{IN1-Lo}		CLK, $V_{IN} = 0\text{ V}$	—	-85	-120	
	I_{IN2-Hi}		ENA, $V_{IN} = 5\text{ V}$	—	85	120	
	I_{IN3-Hi}		R/W, $V_{IN} = 5\text{ V}$	—	15	25	
	I_{IN3-Lo}		R/W, $V_{IN} = 0\text{ V}$	—	-85	-120	
	I_{IN4-Hi}		ON/OFF, $V_{IN} = 5\text{ V}$	—	85	120	

Read Block (unless otherwise is specified, $V_{CC} = 5\text{ V}$, $V_{BAT} = 3\text{ V}$, $T_a = 25^\circ\text{C}$)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Current Dissipation		I_{CCR}	2	When read block in operation	—	3.2	4.6	mA
		I_{CCO}		When chip disabled (on/off = low or open)	—	0	1	μA
Gain Characteristics	Head amp	G_H	3	—	—	40	—	dB
	Amp 2	G_2		—	—	40	—	
	Amp 3	G_3		—	—	30	—	
Head Amp Input Conversion Noise		E_{n1}		$R_g = 0\ \Omega$, $f_c = 19\ \text{kHz}$	—	0.33	(0.64)*	μV_{rms}
		E_{n2}		$R_g = 0\ \Omega$, $f_c = 1.7\ \text{kHz}$	—	0.15	(0.26)*	
Reference Voltage		V_{ACOM}	3	—	1.9	2.0	2.1	V
Output Offset Voltage	Head amp	V_{HOS}	3	—	—	-0.1	± 0.25	V
	Amp 2	V_{2OS}			—	+0.7	± 1.1	
	Amp 3	V_{3OS}			—	+0.1	± 0.25	
Amp 3 Output Voltage Range	Low	V_{3OL}	4	$R_L = 10\ \text{k}\Omega$	—	0.2	—	V
	High	V_{3OH}			—	4.1	—	
Amp 3 Output Current	Output	I_{3OUT}	4	—	2.0	—	—	mA
	Input	I_{3IN}		—	0.1	0.2	0.3	

*: Guaranteed by design. Determined at design and does not change at manufacturing. Test not conducted.

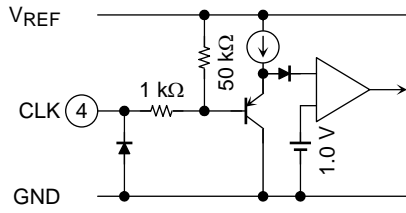
Write Block (unless otherwise is specified, $V_{CC} = 5\text{ V}$, $V_{BAT} = 3\text{ V}$, $T_a = 25^\circ\text{C}$)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Current Dissipation		I_{CCw}	2	During write, CLK = Low/High	—	3.7	5.2	mA	
		I_{CCe}		When write enabled	—	1.9	2.8		
		I_{CCB}		When write in break	—	4.4	6.1		
		I_{bat}		During write, reactive current ($R_{WR} = 5\ \text{k}\Omega$)	—	1.4	1.8		
		I_{baB}		When write in break	—	1.0	1.6	μA	
		I_{bar}		During read	—	0	1		
		I_{bao}		When chip disabled (on/off = low or open)	—	0	1		
Set Output Current		I_{OC}	5	$I_{OC} = 10\ \text{mA}$ (at $V_{BAT} = 2.0\ \text{V}$)	$V_{BAT} = 2.0\ \text{V}$	8	10	12	mA
				$V_{BAT} = 5.0\ \text{V}$	—	11	13		
CLK Output Transfer Time		T_{pLH1}	6	0 to 10% (Note1)	—	0.1	—	μs	
		T_{pLH2}		0 to 90% (Note1)	—	0.5	—		
		T_{pHL1}		0 to 10% (Note1)	—	0.1	—		
		T_{pHL2}		0 to 90% (Note1)	—	0.5	—		
ENA Output Transfer Time		T_{pZH1}	6	0 to 10% (Note1)	—	0.3	—	μs	
		T_{pZH2}		0 to 90% (Note1)	—	0.5	—		
		T_{pHZ1}		0 to 10% (Note1)	—	0.3	—		
		T_{pHZ2}		0 to 90% (Note1)	—	0.5	—		

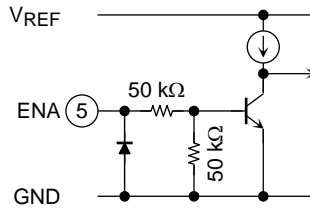
Note 1: Load $R_L = 36\ \Omega$, $C_L = 10\ \text{pF}$

Input/Output Circuit

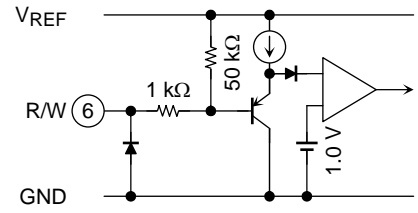
- CLK pin



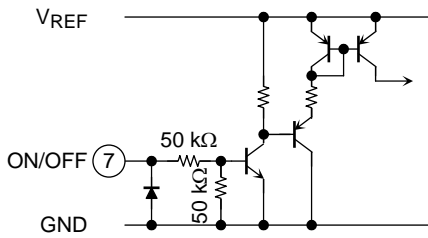
- ENA pin



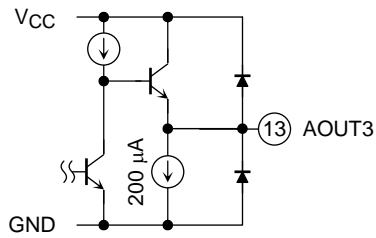
- R/W pin



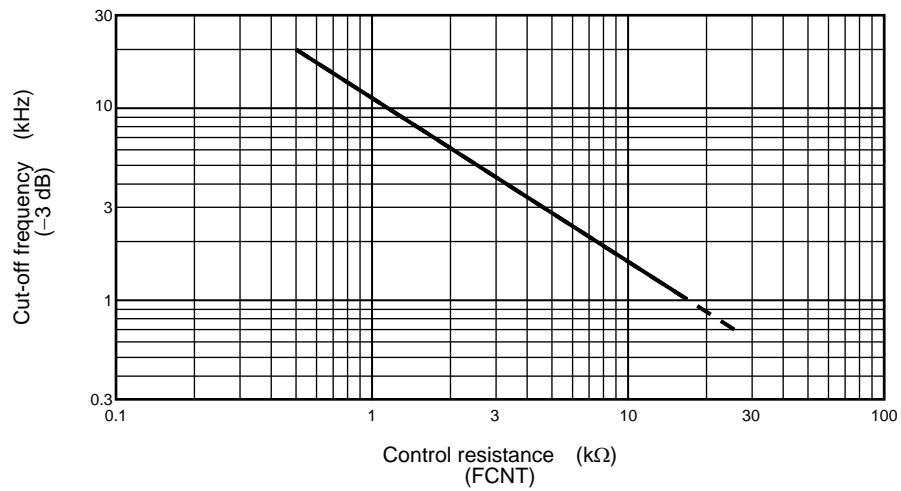
- ON/OFF pin



- AOUT3 pin

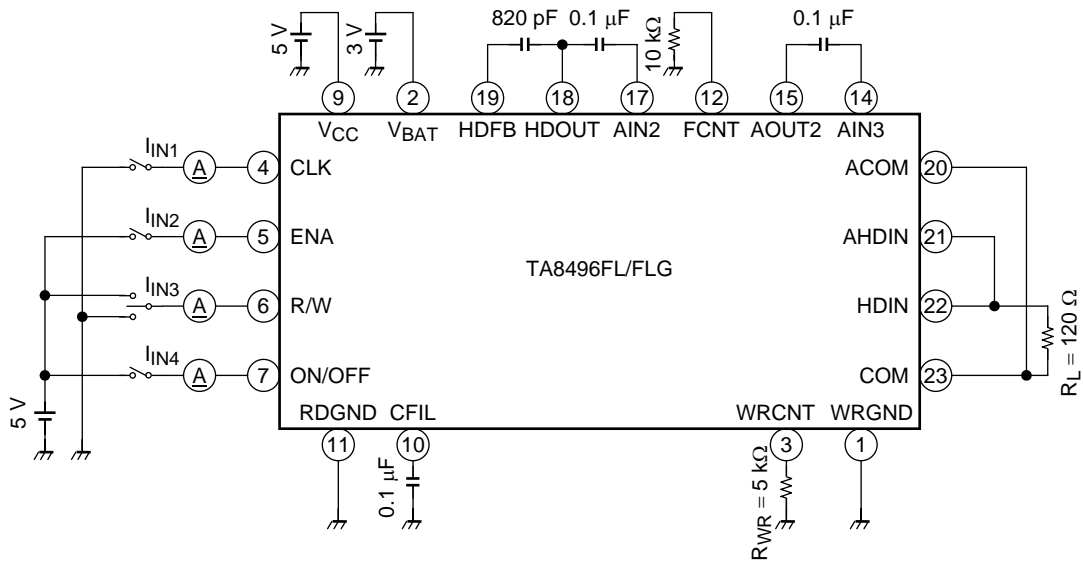


Secondly L.P.F characteristics (amp 2)

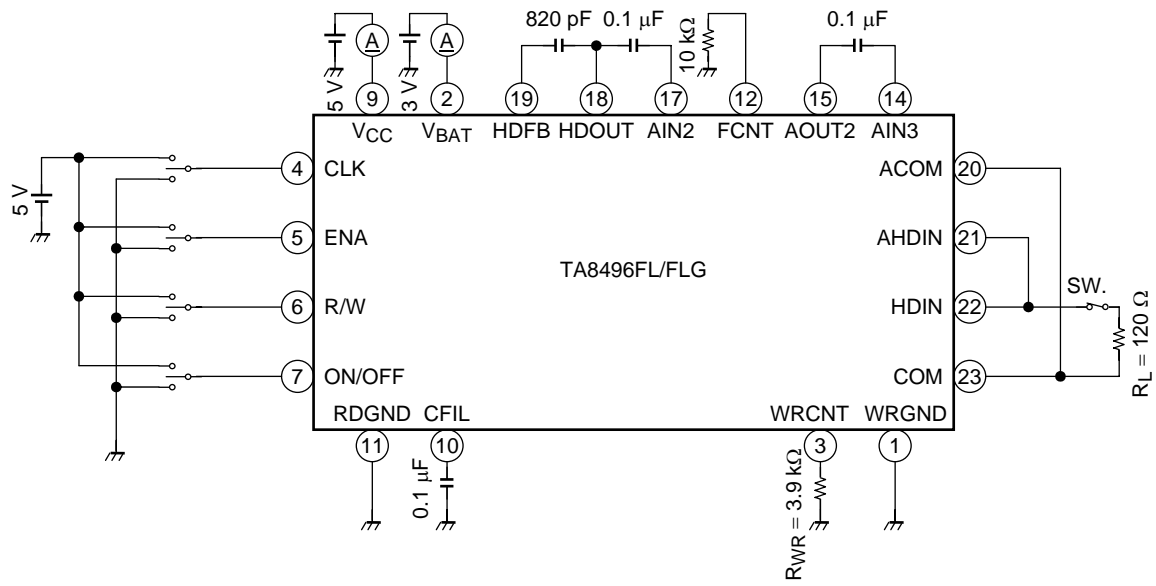


Test Circuit

1. Input Current (I_{IN1} , I_{IN2} , I_{IN3} , I_{IN4})



2. Current Consumption (I_{CCR} , I_{CCO} , I_{CCW} , I_{CCe} , I_{CCB} , I_{bat} , I_{baB} , I_{bar} , I_{bao})

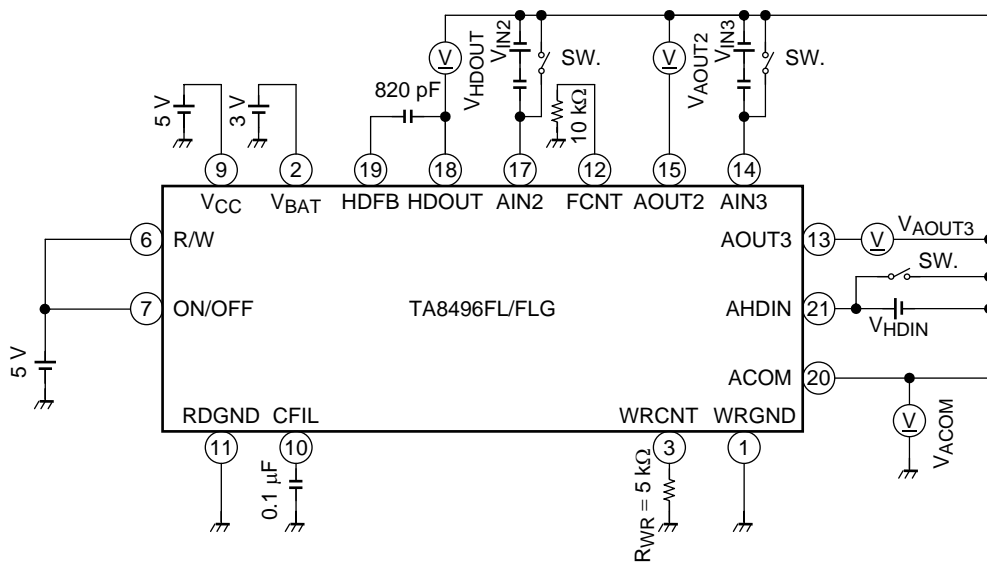


Input Sequence (H = 5 V, L = 0 V)

Current Consumption (V_{CC} , V_{BAT})	ON/OFF	R/W	ENA	CLK
I_{CCR}	H	H	L	H
I_{CCO}	L/OPEN	H	H/L	H
I_{CCW}	H	L	H	H/L
I_{CCe}	H	L	L	H
I_{CCB}	H	L	L	L
I_{bat} (Note2)	H	L	H	H/L
I_{baB}	H	L	L	L
I_{bar}	H	H	H/L	H/L
I_{bao}	L/OPEN	H/L	H/L	H/L

Note 2: SW. OFF

3. Gain Characteristics (G_H , G_2 , G_3), Power Off-Set Voltage (V_{HOS} , V_{2OS} , V_{3OS})

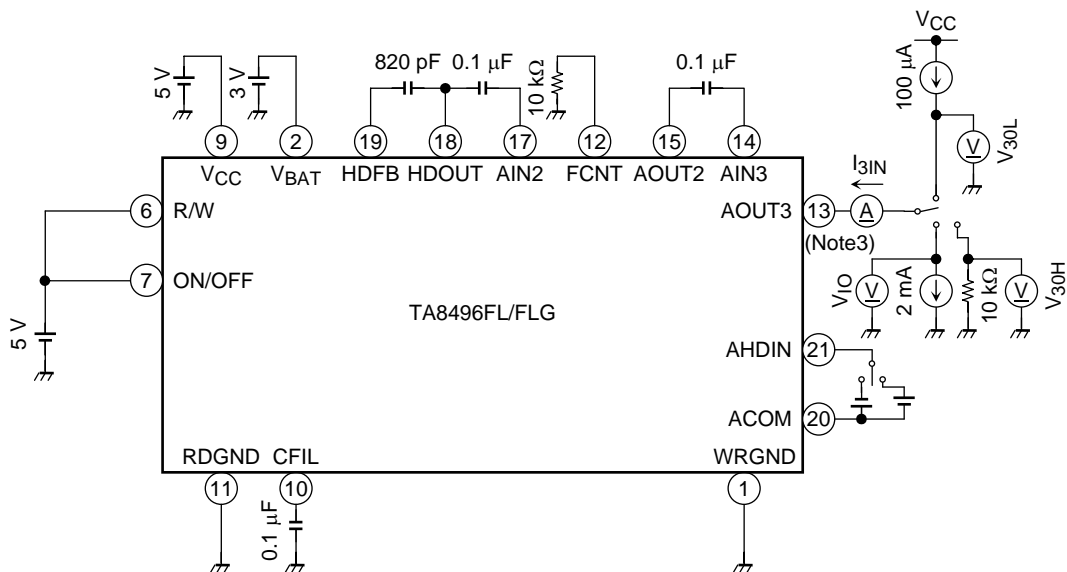


$$G_H = 20 \log \left| \frac{V_{HDOUT}}{V_{HDIN}} \right|, \quad G_2 = 20 \log \left| \frac{V_{AOUT2}}{V_{IN2}} \right|, \quad G_3 = 20 \log \left| \frac{V_{AOUT3}}{V_{IN3}} \right|$$

When off-set voltage is measured, SW turns ON.

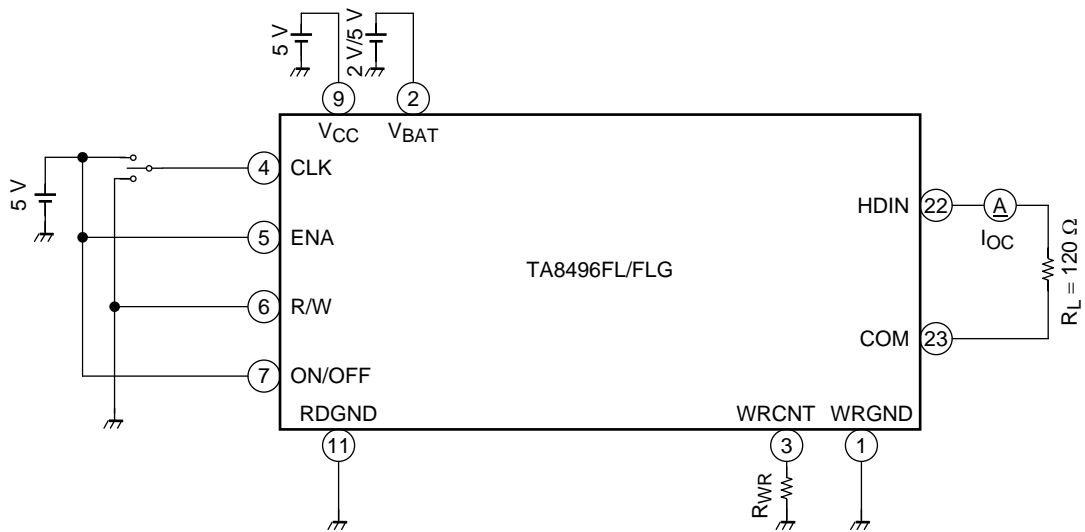
$$V_{HOS} = |V_{HDOUT}|, \quad V_{2OS} = |V_{AOUT2}|, \quad V_{3OS} = |V_{AOUT3}|$$

4. Amp 3 Output Voltage Range (V_{30L} , V_{30H}), Amp 3 Output Current (I_{3OUT} , I_{3IN})



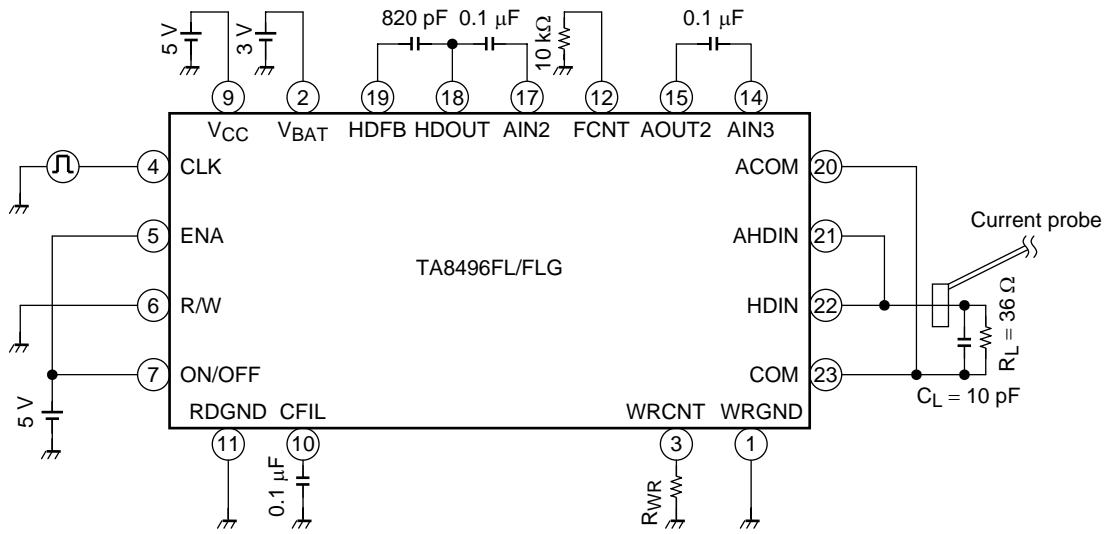
Note 3: I_{3OUT} must be measured on condition in $V_{IO} \geq 4.0$ V

5. Set Output Current (I_{OC})

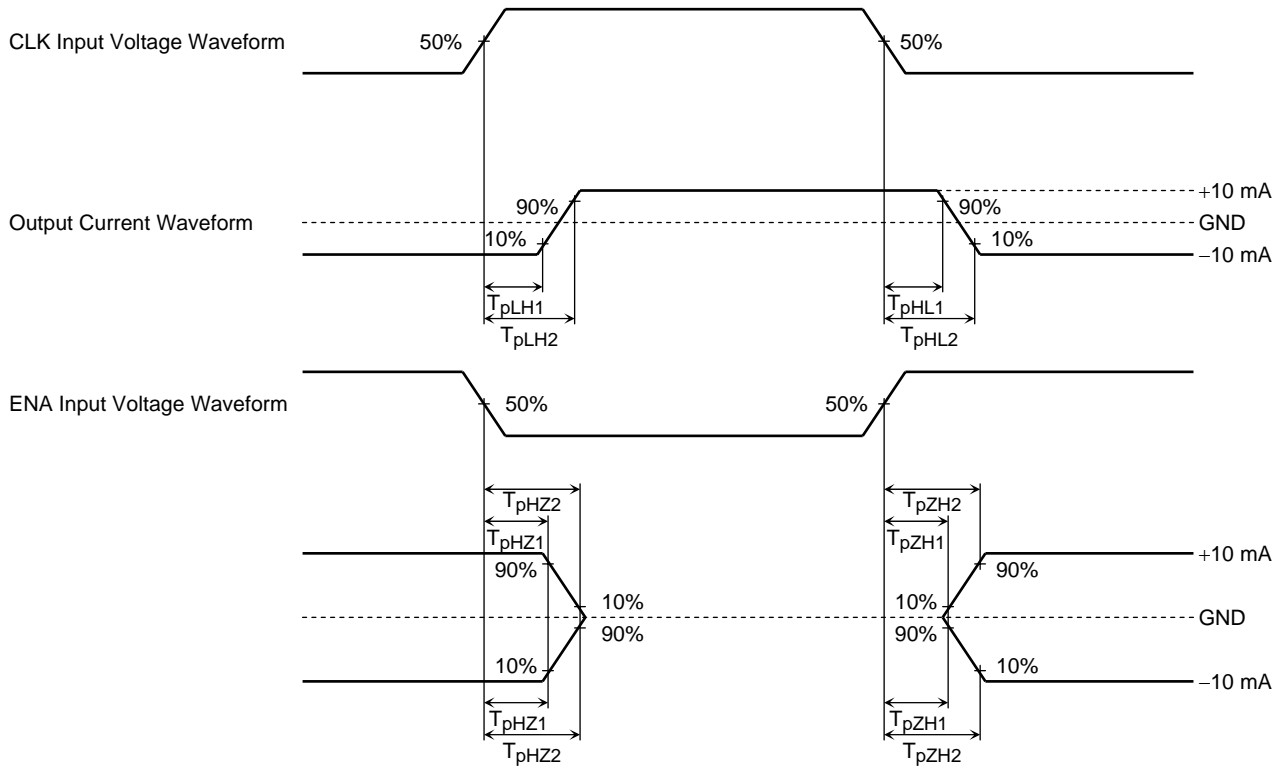


Set R_{WR} so that $I_{OC} = 10 \text{ mA}$ (at $V_{BAT} = 2 \text{ V}$).
 At this time, due to fluctuation in samples, I_{OC} fluctuates in the range of 8 to 12 mA. Also, I_{OC} fluctuates depending on the power supply (V_{BAT}) as follows: $I_{OC} = 10 \text{ mA}$ (at $V_{BAT} = 2 \text{ V}$) $\rightarrow I_{OC} \approx 13 \text{ mA}$ (at $V_{BAT} = 5 \text{ V}$).

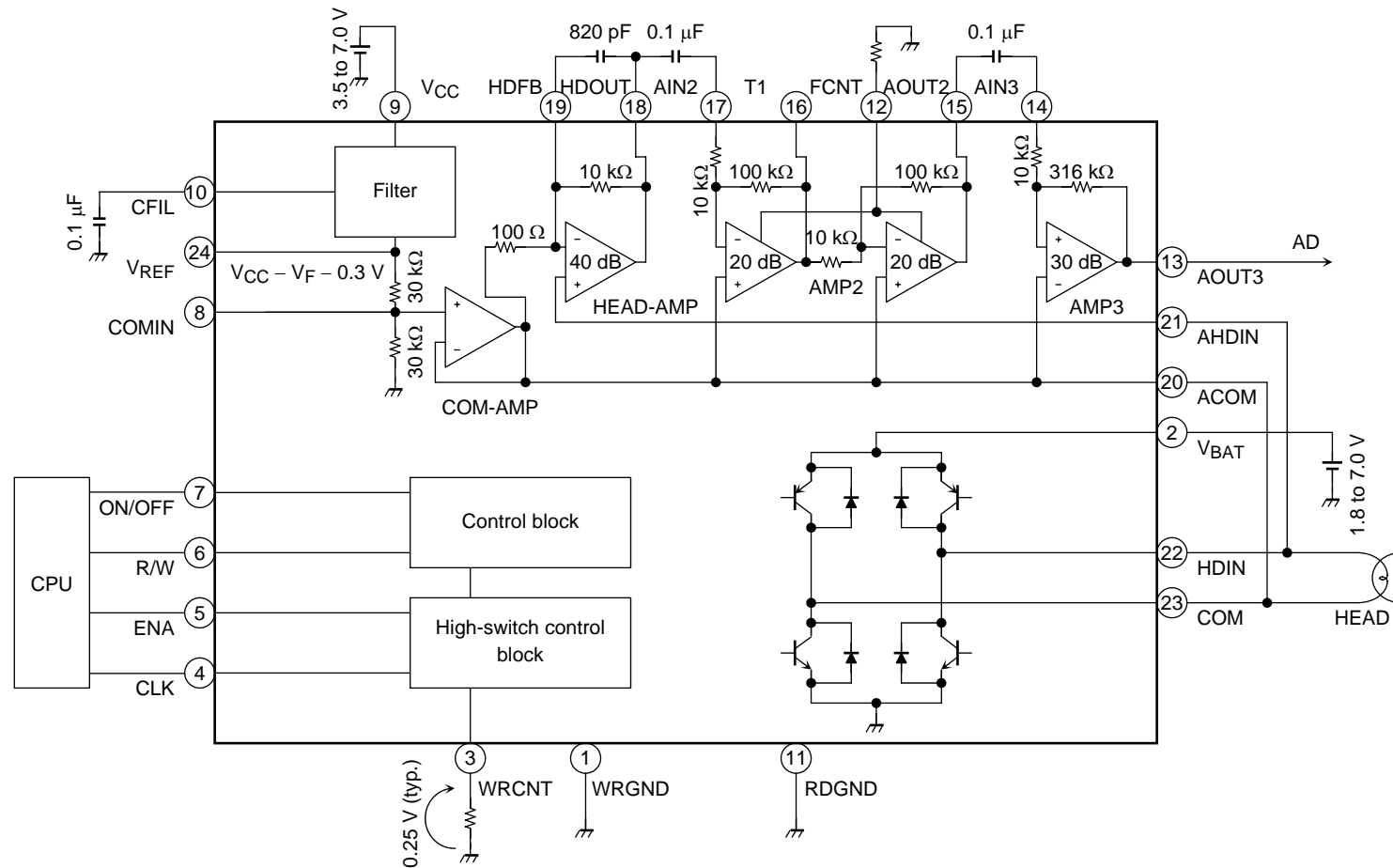
6. CLK, ENA Output Propagation Time ($T_{pLH1/2}$, $T_{pHL1/2}$, $T_{pZH1/2}$, $T_{pHZ1/2}$)



RWR: I_{OC} is set 10 mA.



Example of Application Circuit



Note 4: Operating supply voltage range

$V_{CC} = 3.5 \text{ to } 7.0 \text{ V}$, $V_{BAT} = 1.8 \text{ to } 7.0 \text{ V}$

However, set V_{CC} so that $V_{ACOM} \cong V_{BAT} + 0.5 \text{ V}$. $V_{CC} \cong V_{BAT}$.

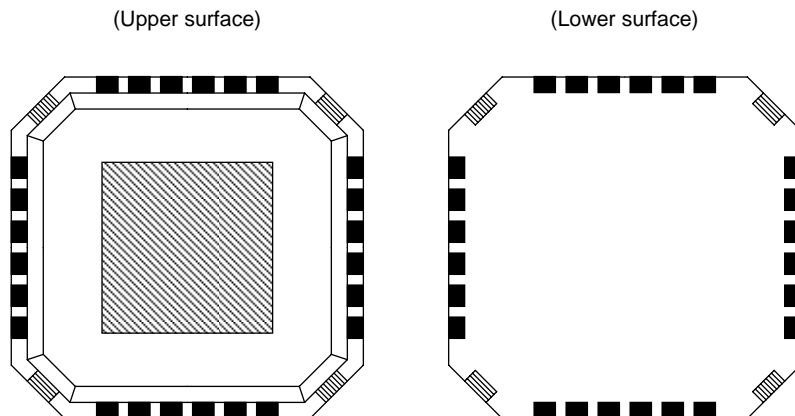
$(V_{ACOM} = (V_{CC} - V_F - 0.3)/2)$

By connecting a resistor to the COMIN pin, V_{ACOM} can be varied.

Note 5: Utmost care is necessary in the design of the output, V_{CC} , V_M , and GND lines since the IC may be destroyed by short-circuiting between outputs, air contamination faults, or faults due to improper grounding, or by short-circuiting between contiguous pins.

Requests Concerning Use of QON

Outline Drawing of Package



When using QON, please take into account the following items.

Caution

- (1) Do not carry out soldering on the island section in the four corners of the package (the section shown on the lower surface drawing with diagonal lines) with the aim of increasing mechanical strength.
- (2) The island section exposed on the package surface (the section shown on the upper surface drawing with diagonal lines) must be used as (Note 6) below while electrically insulated from outside.

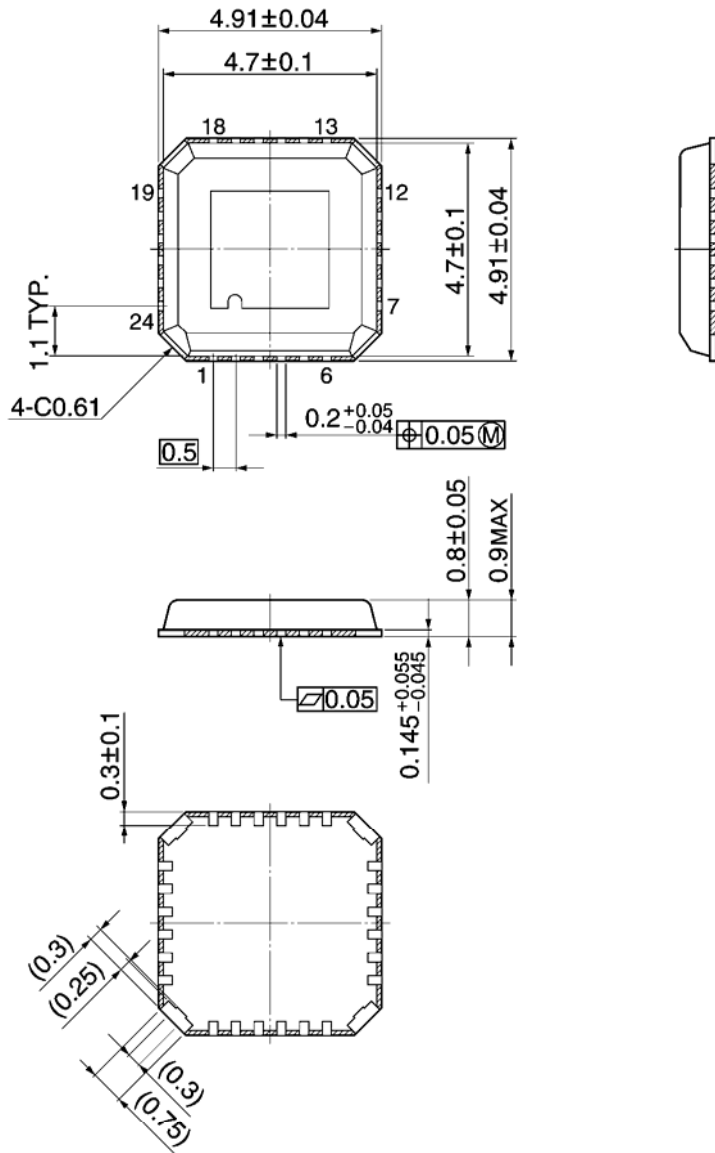
Note 6: Ensure that the island section (the section shown on the lower surface drawing with diagonal lines) does not come into contact with solder from through-holes on the board layout.

- When mounting or soldering, take care to ensure that neither static electricity nor electrical overstress is applied to the IC (measures to prevent anti-static, leaks, etc.).
- When incorporating into a set, adopt a set design that does not apply voltage directly to the island section.

Package Dimensions


QON24-P-0505-0.50

Unit: mm



Note 1) The solder plating portion in four corners of the package shall not be treated as an external terminal.

Note 2) Don't carry out soldering to four corners of the package.

Note 3)  area : Resin surface

Weight: 0.05 g (typ.)

Notes on Contents

1. Block Diagrams

Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purposes.

2. Equivalent Circuits

The equivalent circuit diagrams may be simplified or some parts of them may be omitted for explanatory purposes.

3. Timing Charts

Timing charts may be simplified for explanatory purposes.

4. Application Circuits

The application circuits shown in this document are provided for reference purposes only. Thorough evaluation is required, especially at the mass production design stage.

Toshiba does not grant any license to any industrial property rights by providing these examples of application circuits.

5. Test Circuits

Components in the test circuits are used only to obtain and confirm the device characteristics. These components and circuits are not guaranteed to prevent malfunction or failure from occurring in the application equipment.

IC Usage Considerations

Notes on handling of ICs

- [1] The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings.
Exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.
- [2] Use an appropriate power supply fuse to ensure that a large current does not continuously flow in case of over current and/or IC failure. The IC will fully break down when used under conditions that exceed its absolute maximum ratings, when the wiring is routed improperly or when an abnormal pulse noise occurs from the wiring or load, causing a large current to continuously flow and the breakdown can lead smoke or ignition. To minimize the effects of the flow of a large current in case of breakdown, appropriate settings, such as fuse capacity, fusing time and insertion circuit location, are required.
- [3] If your design includes an inductive load such as a motor coil, incorporate a protection circuit into the design to prevent device malfunction or breakdown caused by the current resulting from the inrush current at power ON or the negative current resulting from the back electromotive force at power OFF. IC breakdown may cause injury, smoke or ignition.
Use a stable power supply with ICs with built-in protection functions. If the power supply is unstable, the protection function may not operate, causing IC breakdown. IC breakdown may cause injury, smoke or ignition.
- [4] Do not insert devices in the wrong orientation or incorrectly.
Make sure that the positive and negative terminals of power supplies are connected properly. Otherwise, the current or power consumption may exceed the absolute maximum rating, and exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.
In addition, do not use any device that is applied the current with inserting in the wrong orientation or incorrectly even just one time.

Points to remember on handling of ICs**(1) Back-EMF**

When a motor rotates in the reverse direction, stops or slows down abruptly, a current flow back to the motor's power supply due to the effect of back-EMF. If the current sink capability of the power supply is small, the device's motor power supply and output pins might be exposed to conditions beyond maximum ratings. To avoid this problem, take the effect of back-EMF into consideration in system design.

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