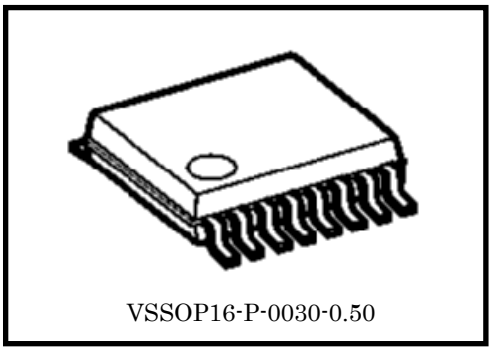
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TB6079AFKG

Shock Sensor IC

TB6079AFKG is multi op amp IC for analog signal processing of a shock sensor.



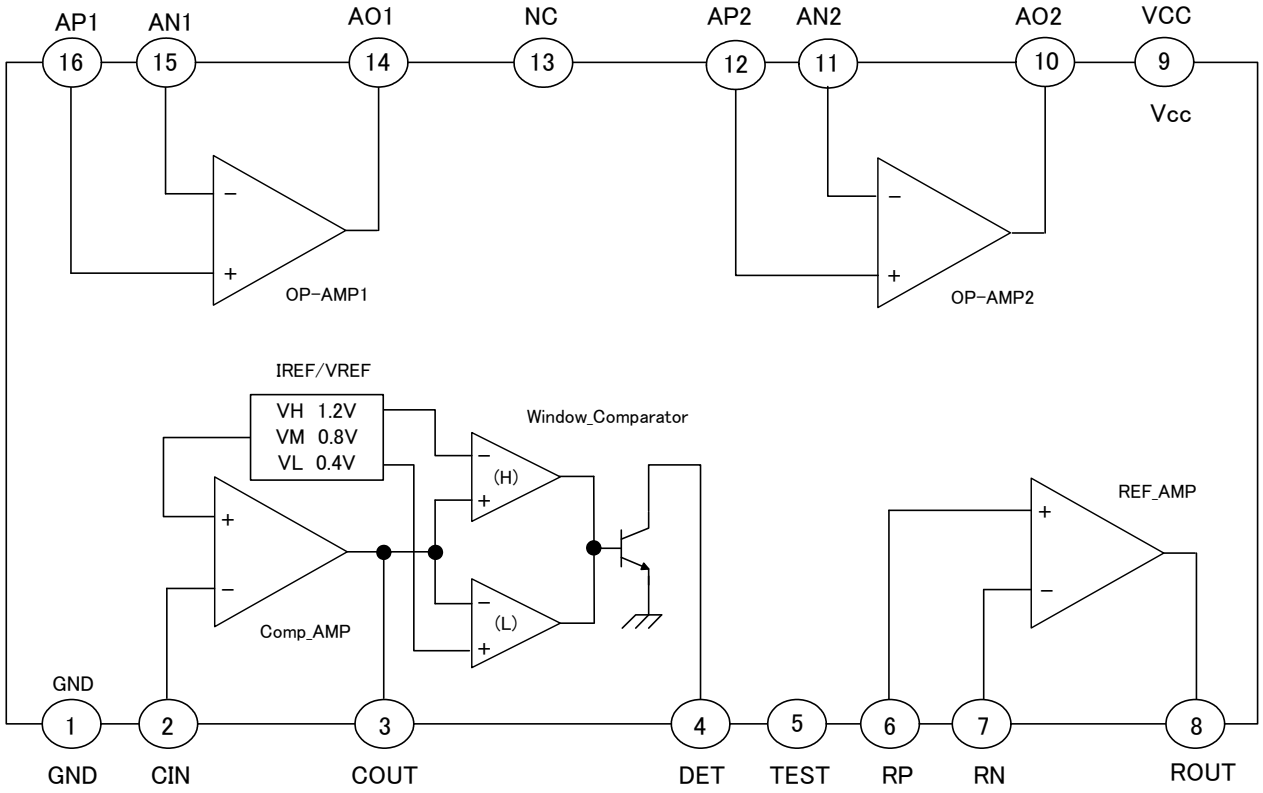
VSSOP16-P-0030-0.50

Weight: 0.02 g (Typ.)

Feature

- TB6079AFKG is operated in the range; 2.3 V ~ 5.5 V DC in power supply voltage.
- Tow op-amps and one reference amp are built independently, for utility of electrical design (setting the gain or fc of filter).
- The Window comparator has a hysteresis which width is about 60mV.
- Very Small Package : VSSOP16-P-0030-0.50 (0.50 mm pitch)

Block Diagram

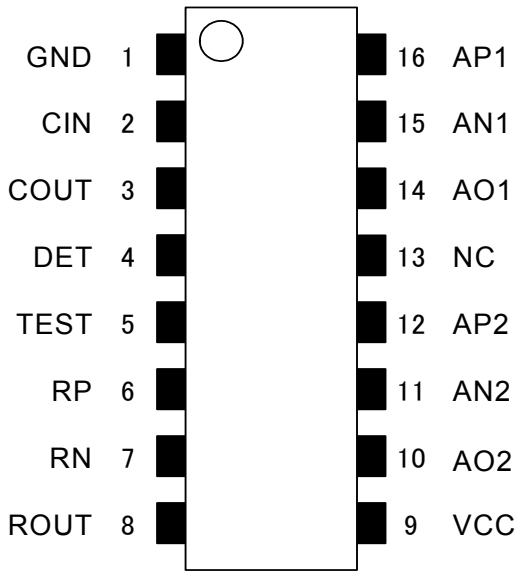


Note: Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purpose. Please use REF-AMP only as buffer amplifier.

Pin Function

Pin No.	Pin Name	Function
1	GND	Ground terminal
2	CIN	Input terminal of window comparator
3	COUT	Output terminal of comparator amp
4	DET	Output terminal of window comparator (output = "L", when voltage of input cross the thresh voltage.)
5	TEST	TEST terminal (* connect the TEST terminal to GND)
6	RP	Non-inverting input terminal of reference amp
7	RN	Inverting input terminal of reference amp
8	ROUT	Output terminal of reference amp
9	VCC	Power supply voltage
10	AO2	Output terminal of op amp2
11	AN2	Inverting input terminal of op amp2
12	AP2	Non-inverting input terminal of op amp2
13	NC	No connection terminal
14	AO1	Output terminal of op amp1
15	AN1	Inverting input terminal of op amp1
16	AP1	Non-inverting input terminal of op amp1

Pin Connection (top view)



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage	AV_{CC}	6	V
Power dissipation	P_D	300	mW
Storage temperature	T_{stg}	−55 ~ 150	°C
Input voltage	V_{IN}	−0.3 ~ Vcc+0.3	V
Output voltage	V_{OUT}	−0.3 ~ Vcc+0.3	V

* Except pin 4

Note: 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 devise breakdown, damage or deterioration, and may result injury by explosion or combustion.

Operating Condition

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	2.3 ~ 5.5	V
Operating temperature	T_{opr}	−25 ~ 85	°C

Note: The IC may be destroyed due to short circuit between adjacent pins, incorrect orientation of device's mounting, connecting positive and negative power supply pins wrong way round, air contamination fault, or fault by improper grounding.

Electrical Characteristics --- Guaranteed data
(unless otherwise specified, V_{CC} = 3.3 V, Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output supply voltage		4pin pull-up resistance connection point	—	—	5.5	V
Supply current	I_{CC}	No input signal	—	2.7	4.0	mA

OP-AMP Characteristics

Note: (*1): Definition of direction of current is as follows; + is source current, - is sink current.

(OP-AMP1/2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input bias current	I_{IB}	Vcc/2 (*1)	−70	0	70	nA
Input offset voltage	Voff	Vcc/2	−5	0	5	mV
Maximum input voltage	Vin	—	0.1	—	Vcc−0.3	V
Maximum output voltage	V_{OH1}	RL = 20kΩ	Vcc−0.2	—	—	V
	V_{OL1}	RL = 20kΩ	—	—	0.2	V
	V_{OH2}	RL = 2kΩ	Vcc−0.3	—	—	V
	V_{OL2}	RL = 2kΩ	—	—	0.3	V

Note: RL connection point is Vcc/2.

(REF-AMP)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input bias current	$I_{IB}R$	Vcc/2 (*1)	—	35	80	nA
Input offset voltage	$V_{off}R$	Vcc/2	−5	0	5	mV
Output voltage shift	VosR	IL = 0.5mA	−5	0	5	mV

(Comp-AMP)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input bias current	$I_{IB}C$	(*1)	—	50	110	nA
Output DC voltage	VoC	—	0.74	0.8	0.86	V
Output sink current	IsiC	VoL = 0.3V	0.5	1.0	—	mA
Output source current	IsoC	VoH = Vcc−0.3V	0.15	0.19	—	mA

(Window Comparator)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Hysteresis width	Vwhys	—	30	60	80	mV
Detection voltage level (High side)	Vwsh	—	1.11	1.2	1.29	V
Detection voltage level (Low side)	Vwsl	—	0.37	0.4	0.43	V
Output sink current	Iwsi	VoL = 0.3 V	0.3	1.0	—	mA

Electrical Characteristics--- Reference data for application (Note)

(OP-AMP1/2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Cut-off frequency	f_T	—	—	1.5	—	MHz
Open-loop gain	Gvo	—	—	100	—	dB

(REF-AMP)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Cut-off frequency	f_{TR}	—	—	1.2	—	MHz
Open-loop gain	GvoR	—	—	80	—	dB

(Comp-AMP)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Cut-off frequency	f_{TC}	—	—	2.0	—	MHz
Open-loop gain	GvoC	—	—	100	—	dB
Feedback resistance (recommend)		—	30	—	500	kΩ

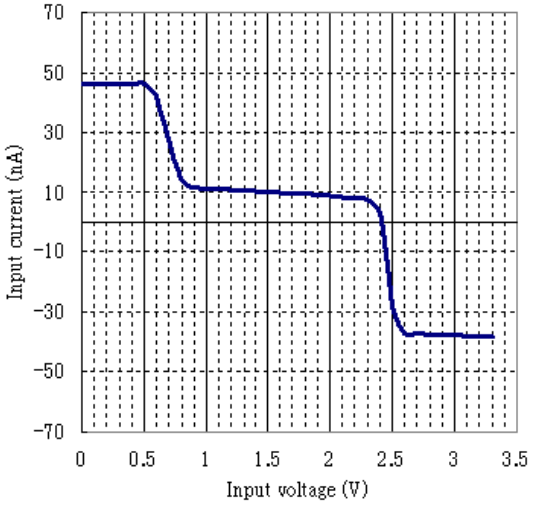
(Window Comparator)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Delay time	t_d	—	—	−2	—	μsec

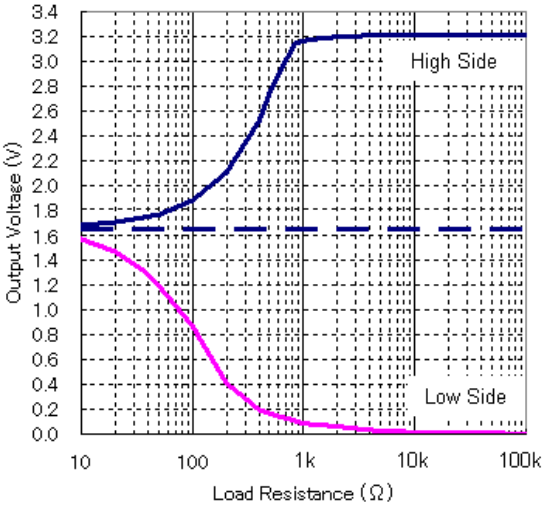
Note: The “reference data for application” is not performed the electrical test.

Typical Performance Characteristics (unless otherwise specified, V_{CC} = 3.3 V, Ta = 25°C)

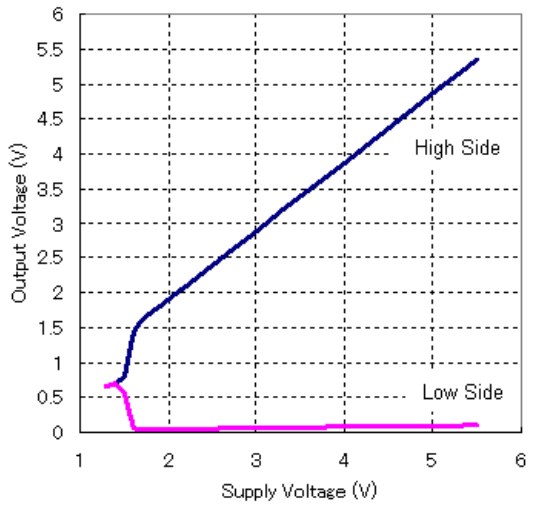
OPAMP1,2 Input Current VS Input Voltage



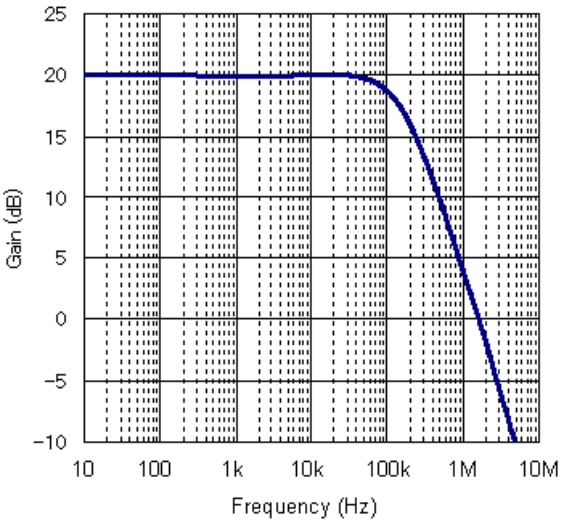
OPAMP1,2 Output Voltage VS Load Resistance



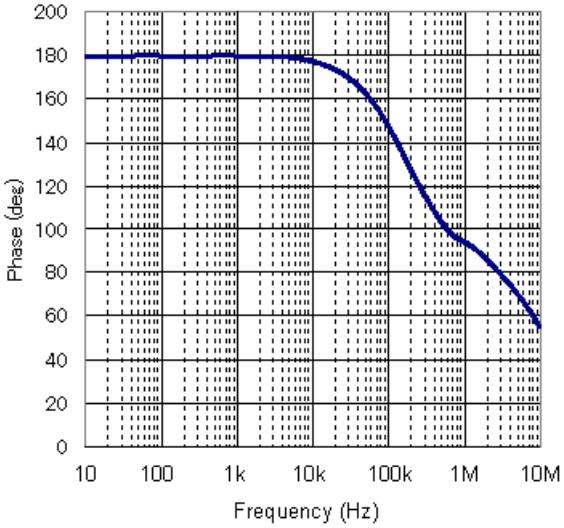
OPAMP1,2 Output Voltage VS Supply Voltage



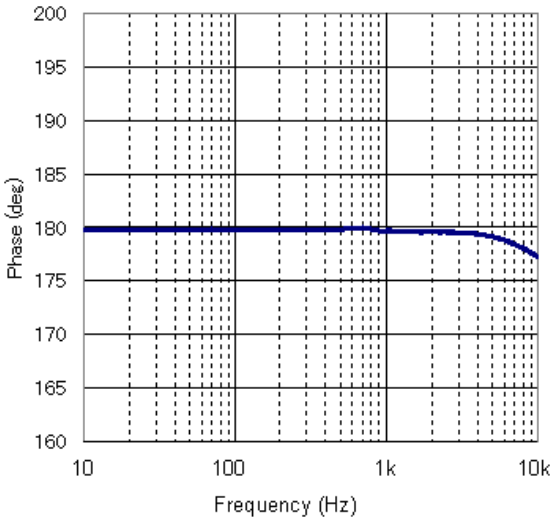
OPAMP1,2 Gain VS Frequency



OPAMP1,2 Phase VS Frequency(10～10MHz)

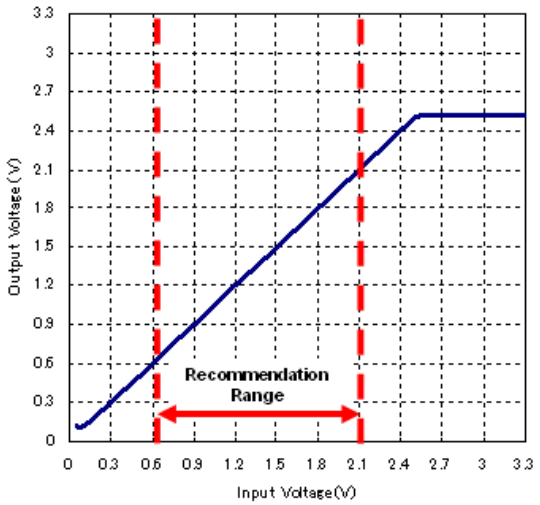


OPAMP1,2 Phase VS Frequency(10～10kHz)



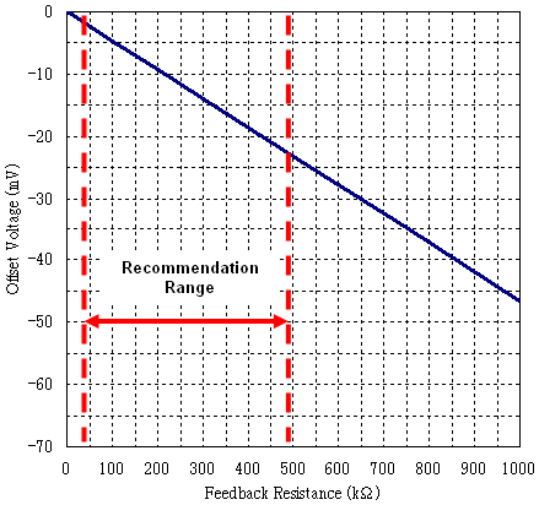
Typical Performance Characteristics (unless otherwise specified, V_{CC} = 3.3 V, Ta = 25°C)

REF AMP Output Voltage VS Input Voltage



*This figure is only usage for buffer amplifier.

COMP AMP Offset Voltage VS Feedback Resistance

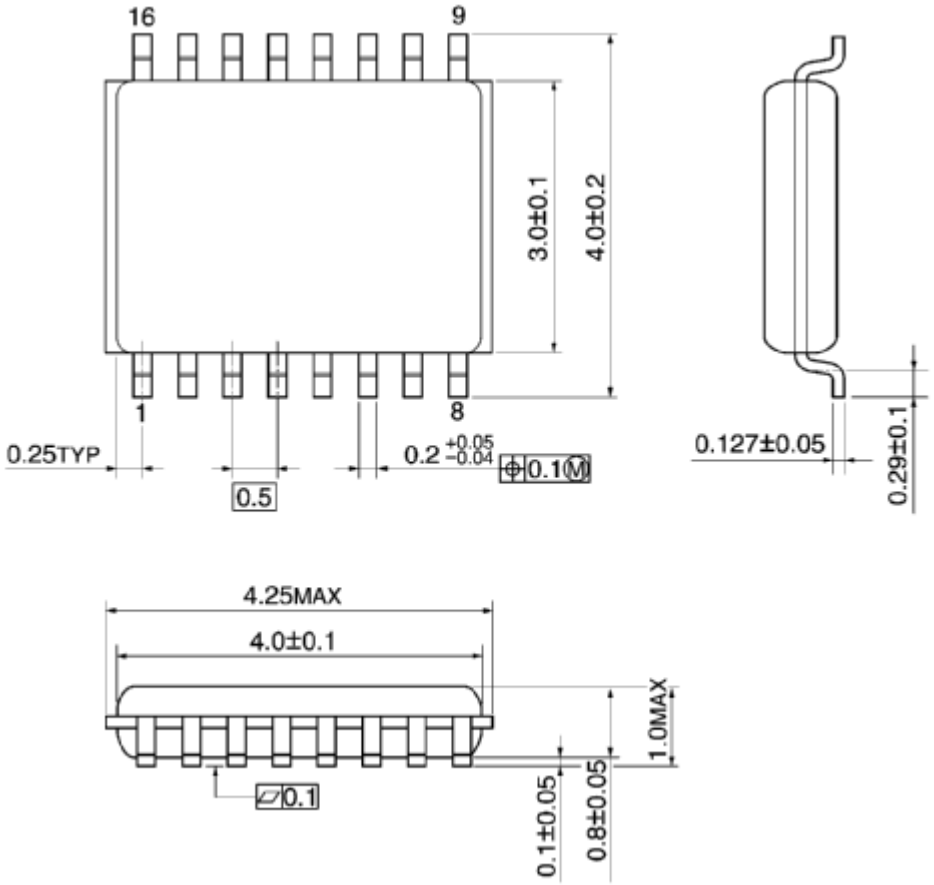


Note: The “typical performance characteristics” shown in this document are provided for reference purposes only. Especially, thorough evaluation is required on the phase of mass production design.

Package Dimension

VSSOP16-P-0030-0.50

Unit: millimeter



Weight: 0.02 g (typ.)

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