

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

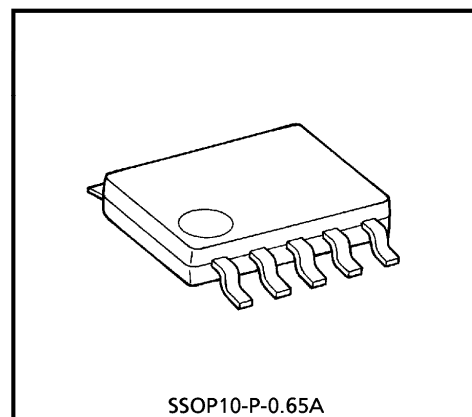
TA6009FN

SHOCK SENSOR IC (1ch VERSION)

TA6009FN detects an existence of external shock through the shock sensor and output.

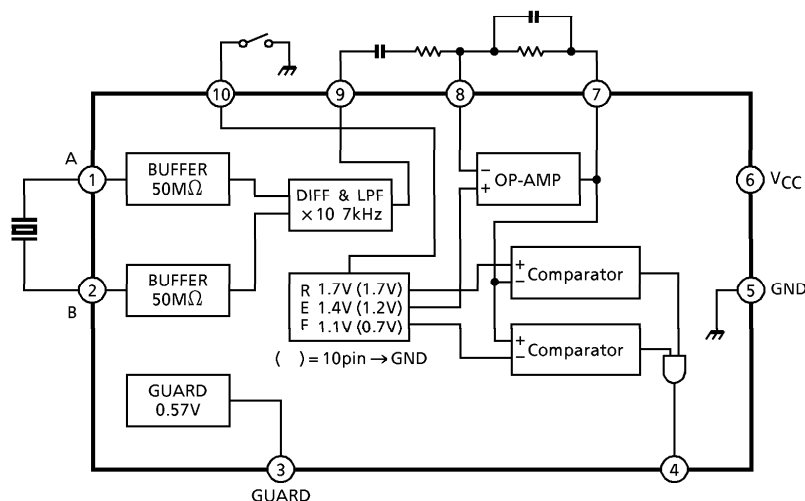
FEATURES

- TA6009FN operates from 2.7~5.5V DC single power supply voltage.
- Signal from the shock sensor is amplified according to setting gain, and is detected through the internal window comparator.
- TA6009FN incorporates 1-ch shock detecting circuitry.
- Input terminal of sensor signal is designed high impedance.
Differential input impedance = 100M Ω (Typ.)
- LPF (Low Pass Filter) circuitry is incorporated.
Cut-off frequency of LPF = 7kHz
- Sensitivity of shock detection can be adjusted by external devices.
- Small Package
SSOP10-P-0.65A (0.65mm pitch)

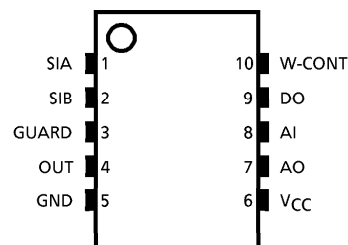


Weight : 0.04g (Typ.)

BLOCK DIAGRAM



PIN CONNECTION (TOP VIEW)



980910EBA1

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PIN FUNCTION

PIN No.	PIN NAME	FUNCTION
1	SIA	Connection terminal of shock sensor
2	SIB	Connection terminal of shock sensor
3	GUARD	Input (1, 2pin) GUARD terminal
4	OUT	Output terminal (Output = "L" when shock is detected.)
5	GND	Ground terminal
6	V _{CC}	Power supply voltage
7	AO	Op-Amp output terminal
8	AI	Op-Amp input terminal
9	DO	Differential-Amp output terminal
10	W-CONT	WindComp. trip voltage selection terminal

MAXIMUM RATING (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V _{CC}	7	V
Power Dissipation	P _D	300	mW
Storage Temperature	T _{stg}	- 55~150	°C

RECOMMEND OPERATING CONDITION

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V _{CC}	2.7~5.5	V
Operating Temperature	T _{opr}	- 25~85	°C

ELECTRICAL CHARACTERISTICS (Unless Otherwise Specified, $V_{CC} = 3.3V$, $T_a = 25^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}			2.7	3.3	5.5	V
Supply Current	I_{CC}		$V_{CC} = 3.3V$		1.8	2.4	mA
			$V_{CC} = 5.0V$		1.8	2.4	

(GUARD)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{oGur}			0.52	0.57	0.62	V

(DIFF-AMP)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Input Impedance	Z_{in}			50	100		$M\Omega$
Gain	G_{vBuf}			19	20	21	dB
Output DC Voltage	V_{oBuf}		Connect C = 100pF between 1pin and 2pin	0.7	1	1.3	V
Low Pass Filter Cut-Off Freq.	f_c		Frequency at -3dB point	5	7	10	kHz
Output Source Current	I_{Bso}		$V_{oh} = V_{CC} - 1V$	400	800		μA
Output Sink Current	I_{Bsi}		$V_{ol} = 0.3V$	75	130		μA

(OP-AMP)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Cut-Off Frequency	f_T			1.5	2		MHz
*1 Openloop Gain	G_{vo}			80	90		dB
Input Voltage 1	V_{in1}		10pin $\rightarrow$ OPEN *2	1.33	1.4	1.47	V
Input Voltage 2	V_{in2}		10pin $\rightarrow$ GND *2	1.14	1.2	1.26	V
Input Current	I_{in}				25	50	nA
*1 Offset Voltage	V_{off}			-5	0	5	mV
Output Source Current	I_{Aso}		$V_{oh} = V_{CC} - 1V$	300	800		μA
Output Sink Current	I_{Asi}		$V_{ol} = 0.3V$	130	200		μA

(Window-Comparator)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Trip Voltage 1	V_{trp1}		10pin $\rightarrow$ OPEN *2	$V_{in1} \pm 0.285$	$V_{in1} \pm 0.3$	$V_{in1} \pm 0.315$	V
*1 Trip Voltage 2	V_{trp2}		10pin $\rightarrow$ GND *2	$V_{in1} \pm 0.475$	$V_{in2} \pm 0.5$	$V_{in1} \pm 0.525$	V
Output Source Current	I_{Wso}		$V_{oh} = V_{CC} - 0.5V$	30	50		μA
Output Sink Current	I_{Wsi}		$V_{ol} = 0.3V$	300	800		μA

*1 Marked parameters are reference data.

*2 10pin must be non-connected otherwise connected to GND.

Application Note

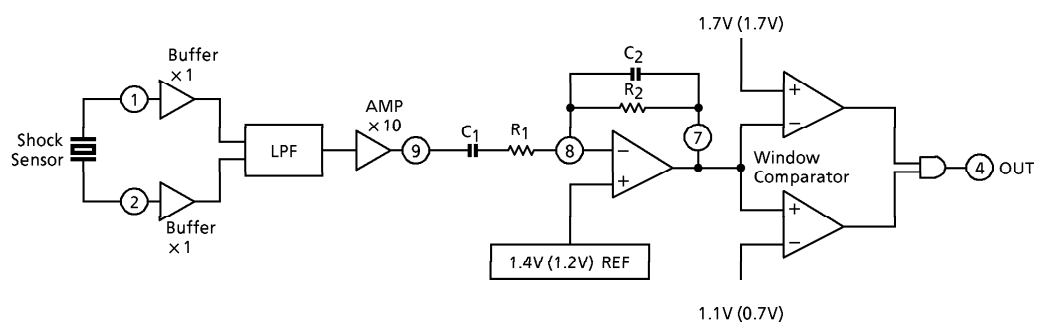


Fig.1 The Composition of G-Force Sense Amplifier

Fig.1 is the composition of G-Force sense amplifier.

The shock sensor is connected between 1 and 2 terminal.

When G-force Sensor (Sensor sensibility = s (mV/G)) is used to detect external shock of g (G), the external parts are determined as following.

(Gain setting) * 10PIN → GND

$$500 / (s \times g) = G1$$

$$G1 / 10 = G \text{ (OP-AMP)}$$

(HPF setting)

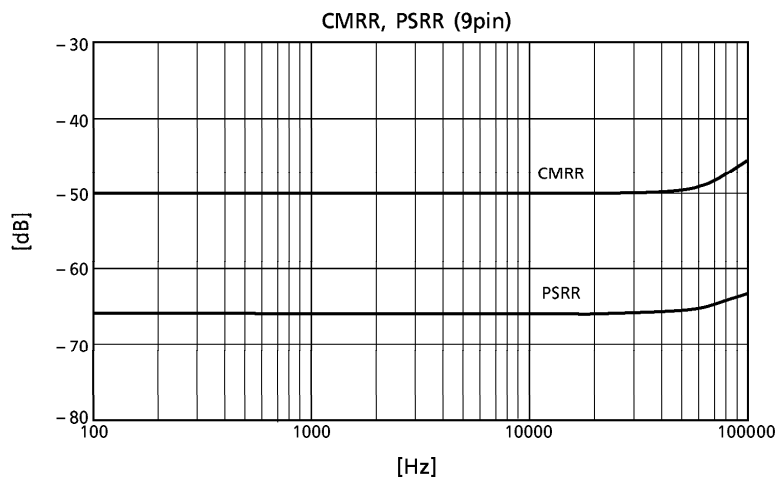
$$f_c = 1 / (2\pi \times R1 \times C1)$$

(LPF setting)

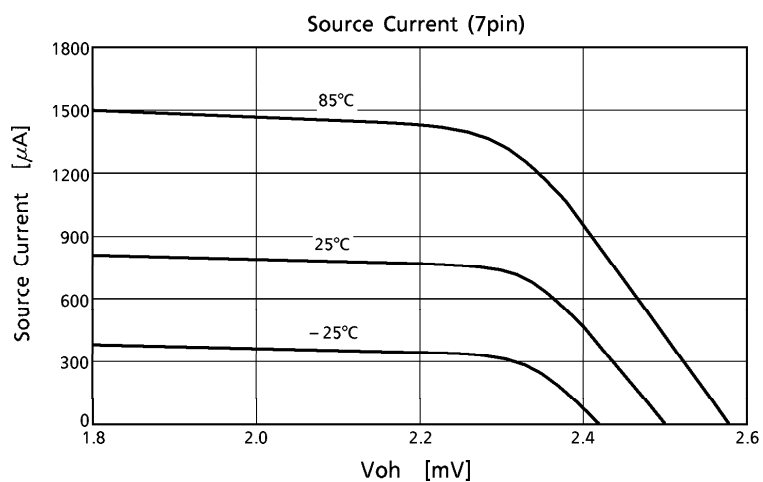
$$f_c = 1 / (2\pi \times R2 \times C2)$$

Reference Data

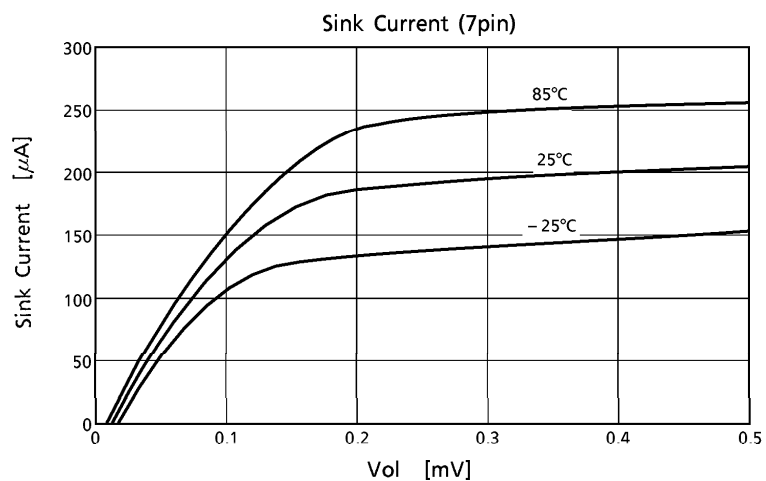
(1) 9pin (Diff-Amp output) CMRR, PSRR

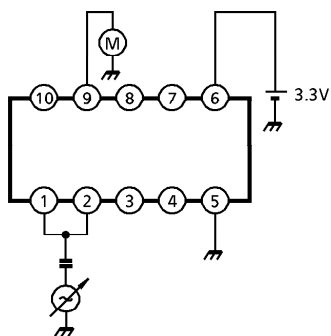
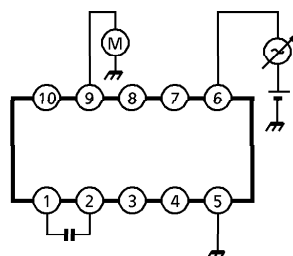
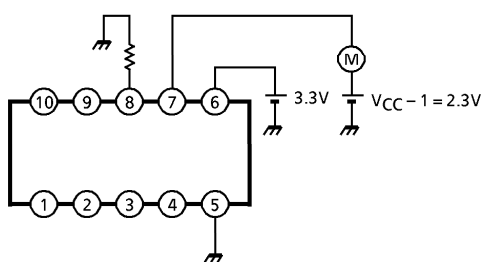
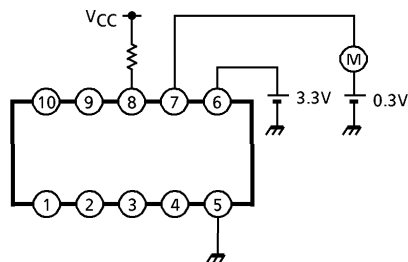


(2) 7pin (OP-AMP output) Source Current



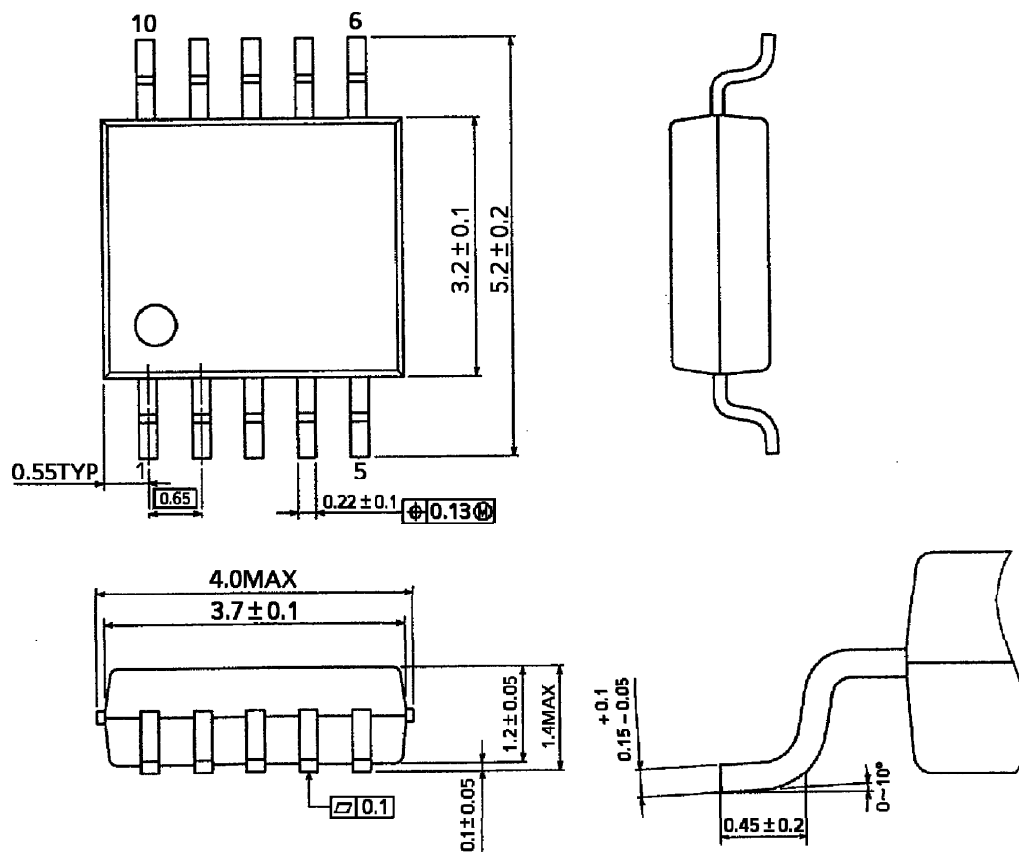
(3) 7pin (OP-AMP output) Sink Current



TEST CIRCUIT
(1-a) 9pin (Diff-Amp output) CMRR

(1-b) 9pin (Diff-Amp output) PSRR

(2) 7pin (OP-AMP output) Source Current

(3) 7pin (OP-AMP output) Sink Current


OUTLINE DRAWING
SSOP10-P-0.65A

Unit : mm



Weight : 0.04g (Typ.)