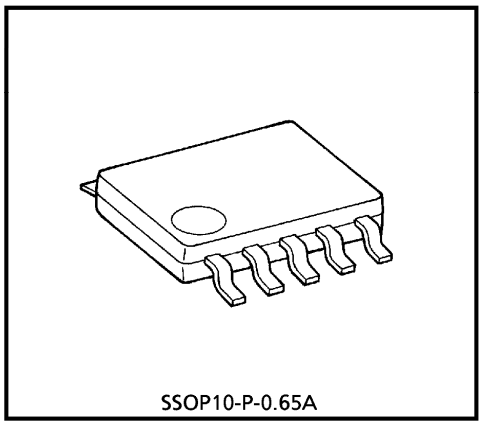
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA6009FN

SHOCK SENSOR IC (1ch VERSION)

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

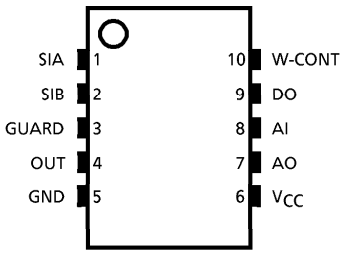


Weight : 0.04g (Typ.)

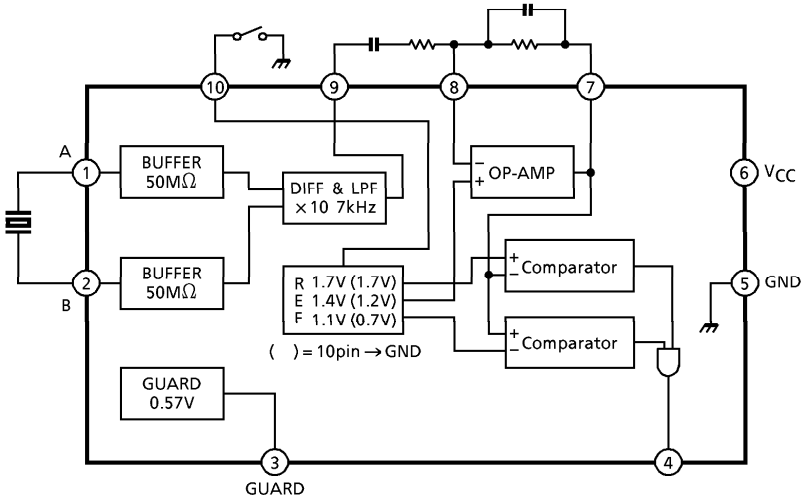
FEATURES

- 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 = 100MΩ (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)

PIN CONNECTION (TOP VIEW)



BLOCK DIAGRAM



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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	mV
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, Ta = 25°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	VoGur			0.52	0.57	0.62	V

(DIFF-AMP)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Input Impedance	Zin			50	100		MΩ
Gain	GvBuf			19	20	21	dB
Output DC Voltage	VoBuf		Connect C = 100pF between 1pin and 2pin	0.7	1	1.3	V
Low Pass Filter Cut-Off Freq.	fc		Frequency at −3dB point	5	7	10	kHz
Output Source Current	IBso		Voh = V_{CC} − 1V	400	800		μA
Output Sink Current	IBsi		Vol = 0.3V	75	130		μA

(OP-AMP)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Cut-Off Frequency	fT			1.5	2		MHz
*1 Openloop Gain	Gvo			80	90		dB
Input Voltage 1	Vin1		10pin → OPEN *2	1.33	1.4	1.47	V
Input Voltage 2	Vin2		10pin → GND *2	1.14	1.2	1.26	V
Input Current	I_{in}				25	50	nA
*1 Offset Voltage	Voff			−5	0	5	mV
Output Source Current	IAso		Voh = V_{CC} − 1V	300	800		μA
Output Sink Current	IAsi		Vol = 0.3V	130	200		μA

(Window-Comparator)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
*1 Trip Voltage 1	Vtrp1		10pin → OPEN *2	Vin1 ±0.285	Vin1 ±0.3	Vin1 ±0.315	V
*1 Trip Voltage 2	Vtrp2		10pin → GND *2	Vin1 ±0.475	Vin2 ±0.5	Vin1 ±0.525	V
Output Source Current	IWso		Voh = V_{CC} − 0.5V	30	50		μA
Output Sink Current	IWsi		Vol = 0.3V	300	800		μA

*1 Marked parameters are reference data.
*2 10pin must be non-connected otherwise connected to GND.

Application Note

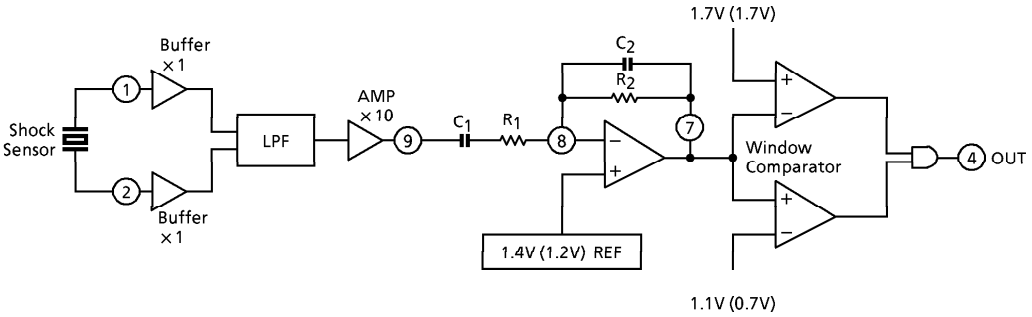


Fig.1 The Composition of G-Force Sense Amplifier

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.

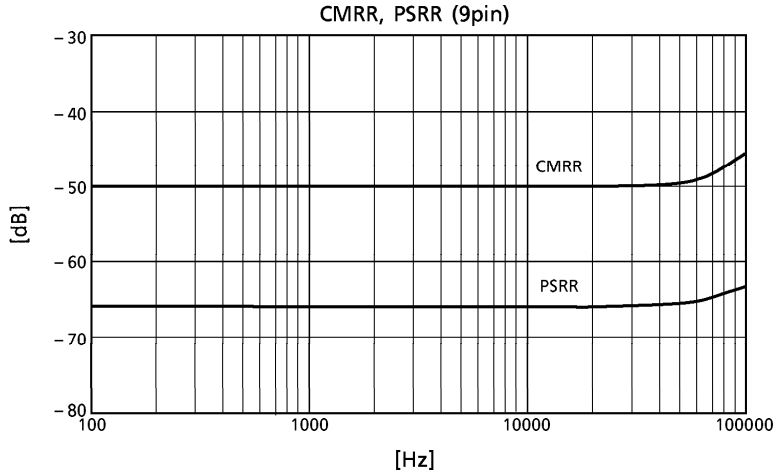
(Gain setting) * 10PIN → GND
500 / (s × g) = G1
G1 / 10 = G (OP-AMP)

(HPF setting)
$fc = 1 / (2\pi \times R1 \times C1)$

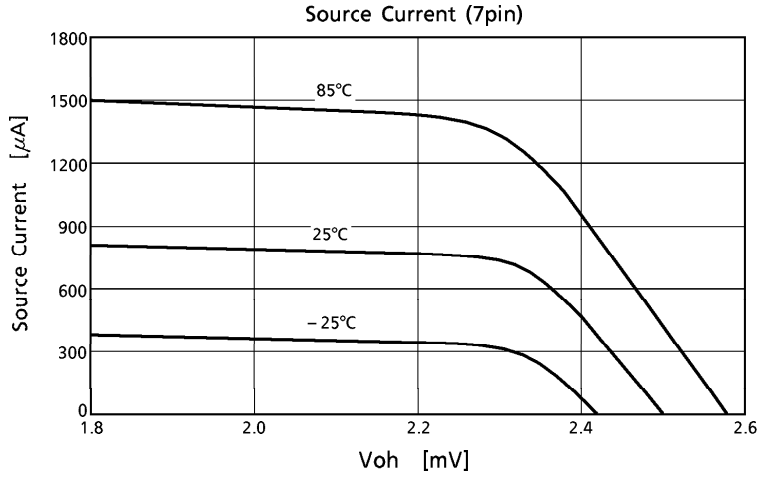
(LPF setting)
$fc = 1 / (2\pi \times R2 \times C2)$

Reference Data

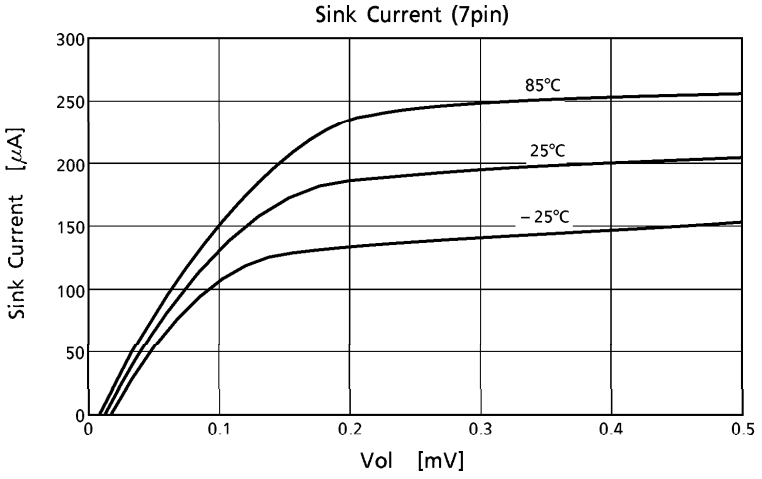
(1) 9pin (Diff-Amp output) CMRR, PSRR



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

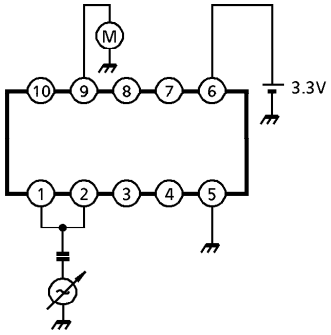


(3) 7pin (OP-AMP output) Sink Current

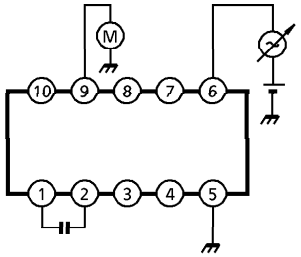


TEST CIRCUIT

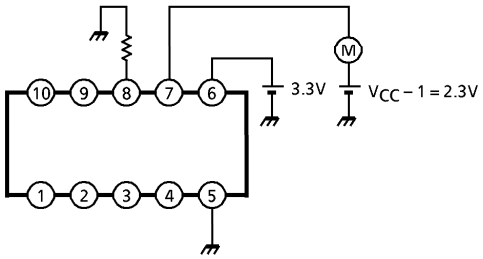
(1-a) 9pin (Diff-Amp output) CMRR



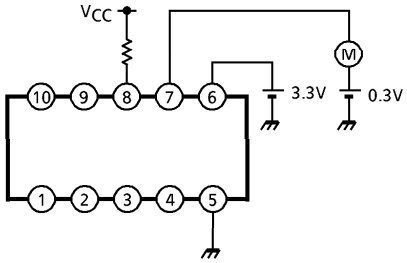
(1-b) 9pin (Diff-Amp output) PSRR



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



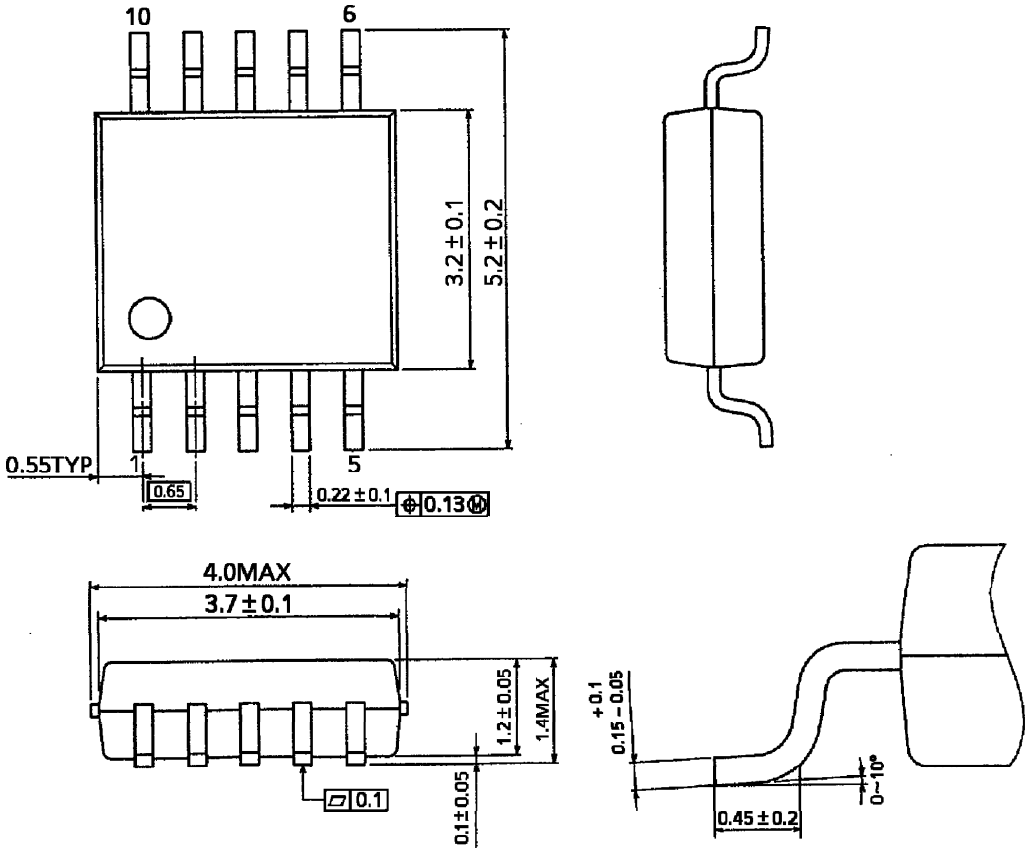
(3) 7pin (OP-AMP output) Sink Current



OUTLINE DRAWING

SSOP10-P-0.65A

Unit : mm



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