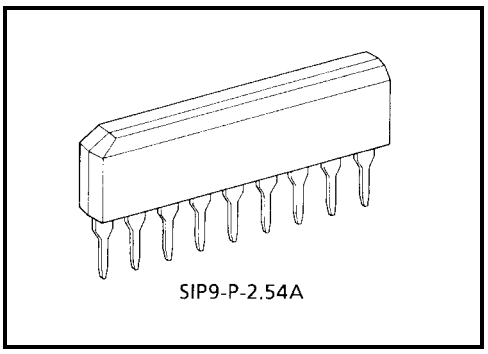
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8029S

FREQUENCY TO VOLTAGE CONVERTER

The TA8029S is a small 9-pin SIP IC incorporating an accurate frequency / voltage converter and two voltage comparators. It has a Schmitt input circuit and becomes active on the positive edge of the input. Its F / V output is stable even when it is supplied with a high-frequency input. Since the V_{CC} pin connects to a shunt regulator, stable frequency detection is assured regardless of the battery voltage. In addition, its wide operating temperature range allows it to be used for a wide variety of applications.

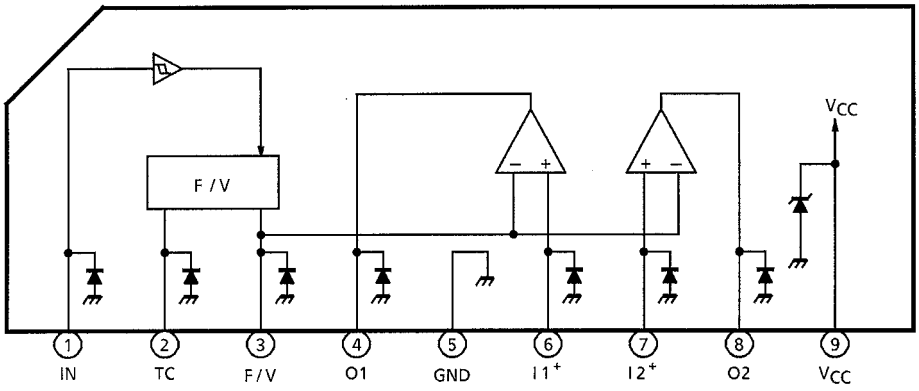


Weight: 0.92 g (typ.)

FEATURES

- Schmitt input circuit incorporated
- Stable F / V output in response to high-frequency input
- Two comparators served by single power supplies are incorporated.
- Shunt regulator incorporated
- Operating temperature range : from −40~85°C
- Small plastic SIP-9 pin

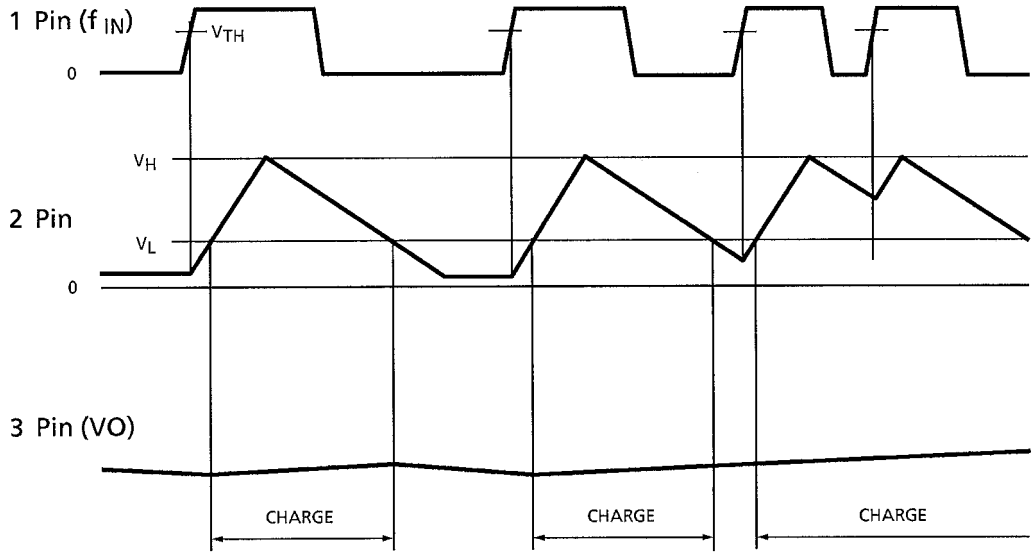
BLOCK DIAGRAM AND PIN LAYOUT



PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	IN	Frequency input pin. The IC becomes active on the leading edge of the input.
2	TC	One-shot pulse setting pin which connects to a capacitor.
3	F / V	F / V conversion output pin which connects to an charging capacitor and resistor. The signal from this pin is also the input to the two built-in comparator.
4	O1	Comparator 1 output pin. This pin provides an NPN transistor open-collector output and has a current capacity of up to 30mA.
5	GND	Grounded
6	I_1^+	Non-inverted PNP input pin for comparator 1.
7	I_2^+	Non-inverted PNP input pin for comparator 2.
8	O_2	Comparator 2 output pin. This pin provides an NPN transistor open-collector output and has a current capacity of up to 30mA.
9	V_{CC}	Power supply pin which connects to a 6V Zener diode.

TIMING CHART



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Current	I_{CC}	30	mA
Input Voltage	V_{IN}	−0.3~30	V
Output Voltage	V_{OUT}	−0.3~30	V
Output Current	I_{OUT}	30	mA
Power Dissipation	P_D	350 (Note)	mW
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~150	°C

Note: Ta≤85°C

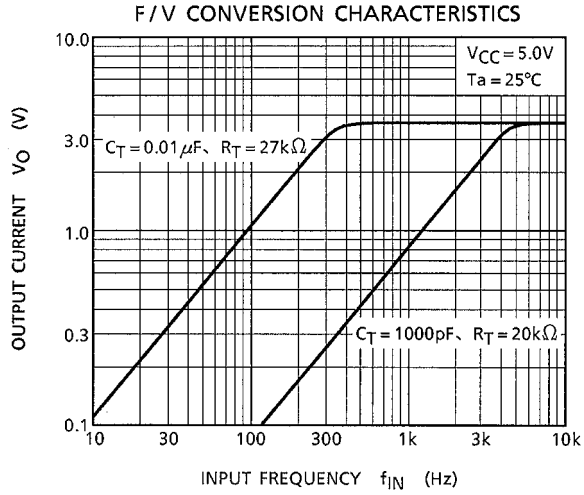
ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{CC} = 5V)

CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Current Consumption	I_{CC}	V_{CC}	—		—	3.0	5	mA
Regulated Voltage	V_R	V_{CC}	—	I_{CC} = 12mA	5.5	6.0	6.5	V
Input Current	I_{IN}	IN	—	V_{IN} = 0~20V	−10	—	10	μA
Input Voltage	V_{IH}	IN	—		2.8	—	—	V
	V_{IL}		—		—	—	0.8	
Input Rise Rate	V_{LH}	IN	—		0.5	—	—	V / ms
Input Fall Rate	V_{HL}	IN	—		0.1	—	—	V / ms
Output Current	I_{OL}	TC	—	V_{TC} = 2.5V	—	43	—	μA
	I_{OH}		—	V_{TC} = 2.5V	—	−73	—	
	I_{OH}	F / V	—		−250	−350	−500	
F / V Conversion Coefficient	K	F / V	—	C_T = 0.01μF, R_T = 27kΩ f = 100Hz (Note 1)	—	7.8	—	—
Linearity			—	C_T = 0.01μF, R_T = 27kΩ (Note 2)	—	±3.0	—	%
Input Offset Voltage	V_{IO}	I_1^+ / I_2^+	—		—	2	10	mV
Input Current	I_{IN}	I_1^+ / I_2^+	—		—	−0.2	−1	μA
Common-mode Input Voltage	V_{CM}	I_1^+ / I_2^+	—		0	—	V_{CC} −1.5	V
Voltage Gain	A_V		—		—	100	—	dB
Output Voltage	V_{OL}	O_1 / O_2	—	I_{OL} = 10mA	—	—	0.5	V
Output Leakage Current	I_{LEAK}	O_1 / O_2	—	V_O = 16V	—	—	5	μA

Notes:

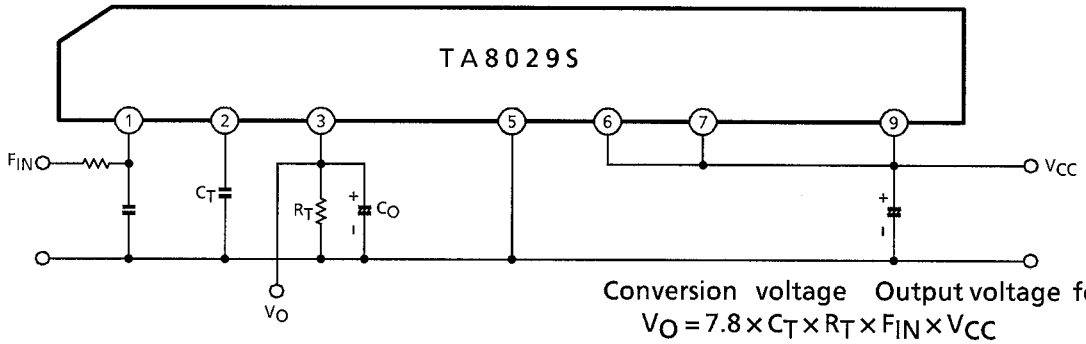
1. Calculated from $V_O = K \cdot V_{CC} \cdot C_T \cdot R_T \cdot f$
2. Straight line deviation at f = 50Hz and f = 150Hz relative to that at f = 100Hz

STANDARD CHARACTERISTICS



EXAMPLE OF APPLICATION CIRCUIT

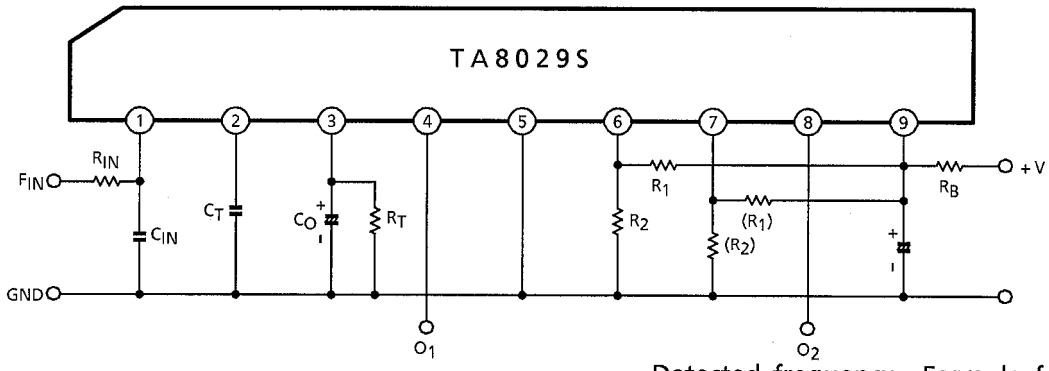
1. FREQUENCY−VOLTAGE CONVERSION CIRCUIT



Conversion voltage Output voltage formula

$$V_O = 7.8 \times C_T \times R_T \times F_{IN} \times V_{CC}$$

2. FREQUENCY DETECTION CIRCUIT



Detected frequency Formula for F_{IN}

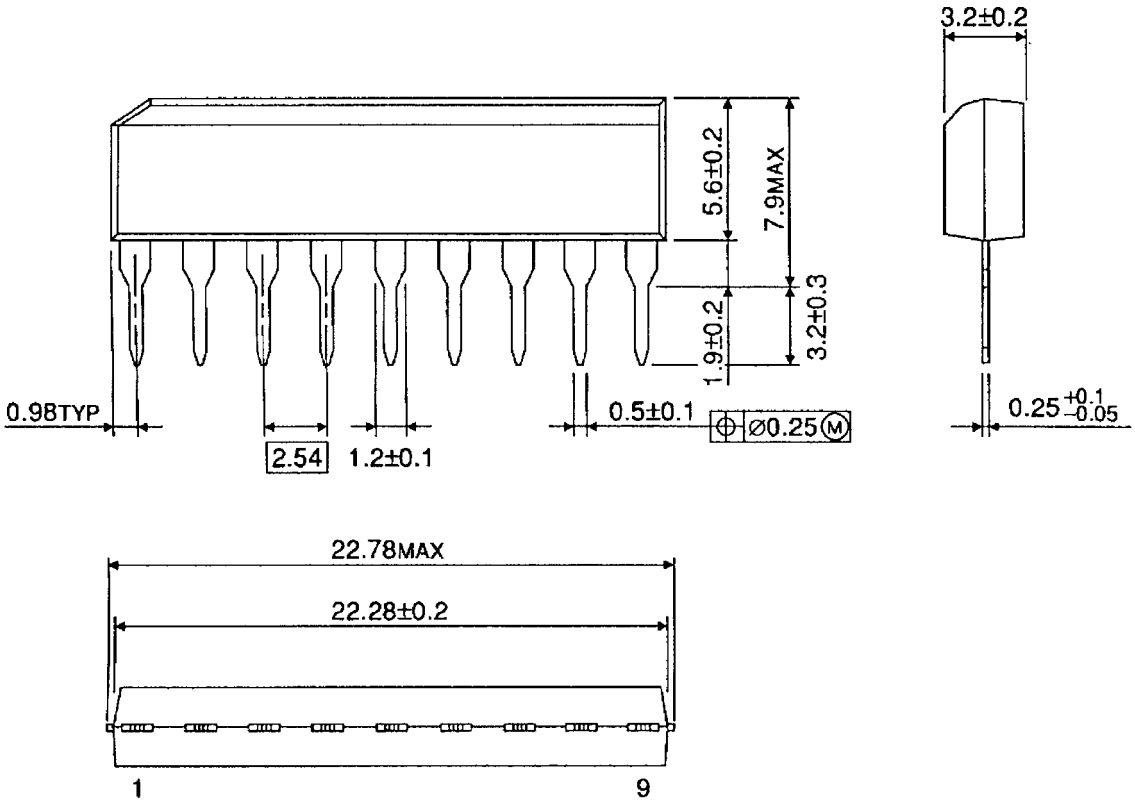
$$F_{IN} = \frac{R_2}{7.8 \times C_T \times R_T \times (R_1 + R_2)}$$

RECOMMENDED CONDITION

PART NAME	MIN	MAX	UNIT
C_T	1000		pF
R_T	20		kΩ
f_{IN}		5	kHz

PACKAGE DIMENSIONS

SIP9-P-2.54A Unit : mm



Weight: 0.92g (Typ.)

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