

**LA2000M****Audio Level Sensor**

Overview

LA2000M is an IC for detecting interprogram spaces to pick out the starting point of a program immediately preceding or following a musical program recorded on tape, and to detect end of tape.

Used in

- Radio-cassette recorders
- Cassette decks
- Car stereos

Applications

- Detection of spaces between programs recorded on tape
- Detection of end of tape
- Other

Features

- Has transistors capable of driving plungers with maximum 50 mA, and a protective diode to prevent induced reverse voltages.
- Can provide designated time delays by externally connected capacitors and resistors.
- Has a comparator with stable hysteresis to handle variations in power supply voltage.
- Detects unrecorded portions of tape.

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

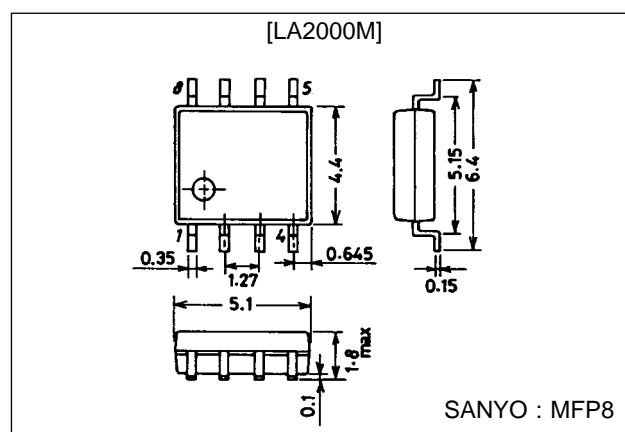
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		15	V
Allowable power dissipation	P_d max		300	mW
Flow-in current	I_6 max		50	mA
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

- Note:1. The voltage at pin 7 must not exceed the supply voltage at pin 8.
2. The maximum current flowing into pin 7 should be no greater than 0.5 mA.

Package Dimensions

unit : mm

3032B-MFP8



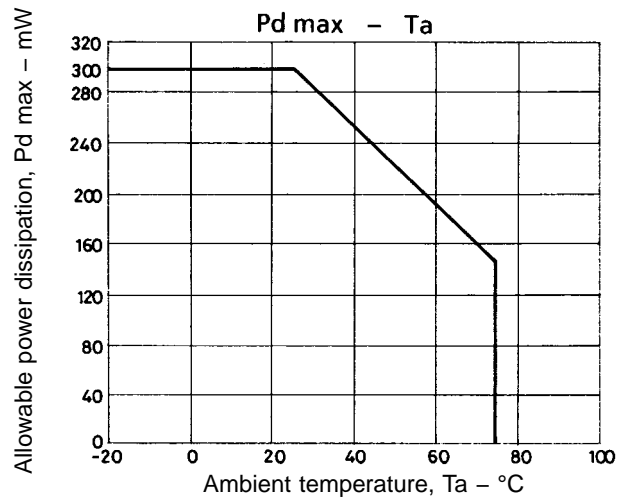
LA2000M

Operating Conditions at $T_a = 25^\circ\text{C}$

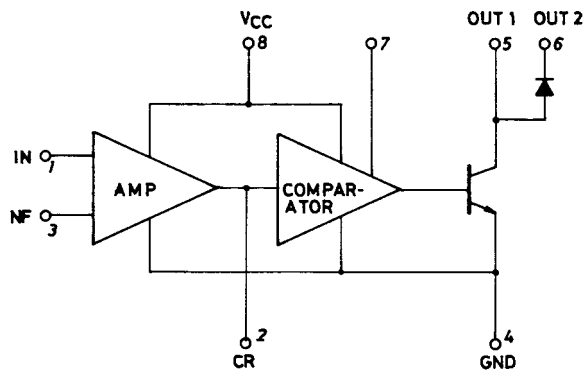
Parameter	Symbol	Conditions	Ratings	Unit
Operating supply voltage	$V_{CC\text{ op}}$		3.5 to 14	V

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 9.0\text{ V}$, $f = 1\text{ kHz}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Circuit current	I_{CC}	$f = 1\text{ kHz}$, $V_{IN} = -45\text{ dBm}$		6	12	mA
Output transistor saturating voltage	$V_{CE\text{ (sat)}}$	$I_6 = 50\text{ mA}$		0.5	1.8	V
Output diode forward voltage	V_F	$I_F = 50\text{ mA}$		0.7	1.5	V
Output-off level in input equivalent	V_{IN}	$f = 1\text{ kHz}$	-43	-50	-54	dBm
Comparator-on level	V_{TH-H}		3.0	3.5	4.0	V
Comparator-off level	V_{TH-L}		1.8	2.2	2.6	V
Pin 7 high level	$V_7\text{ pin}$		0.45	0.55		V
Output transistor leakage current	I_{L-TR}				100	μA
Output diode leakage current	I_{L-Di}				100	μA

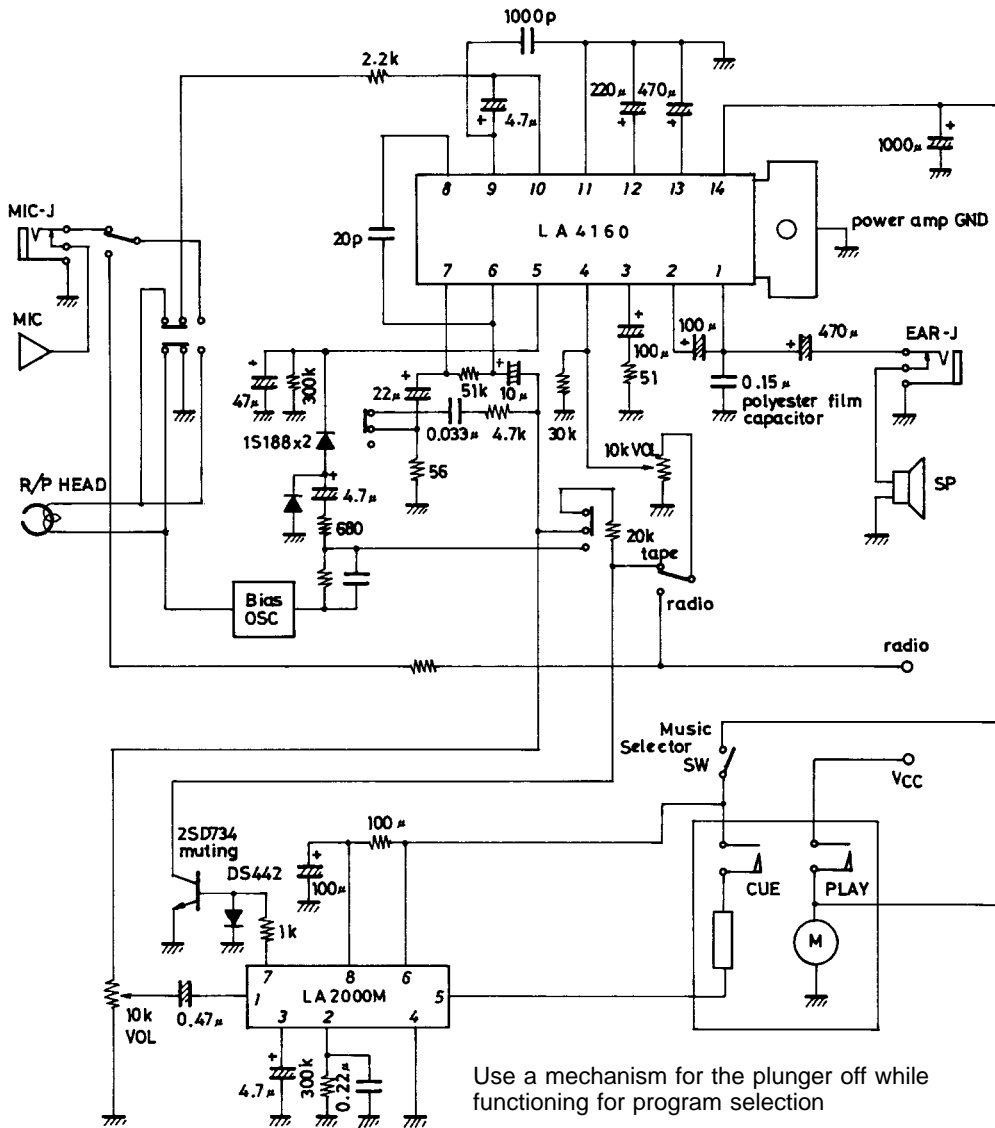


Equivalent Circuit Block Diagram



LA2000M

Sample Application Circuit 2

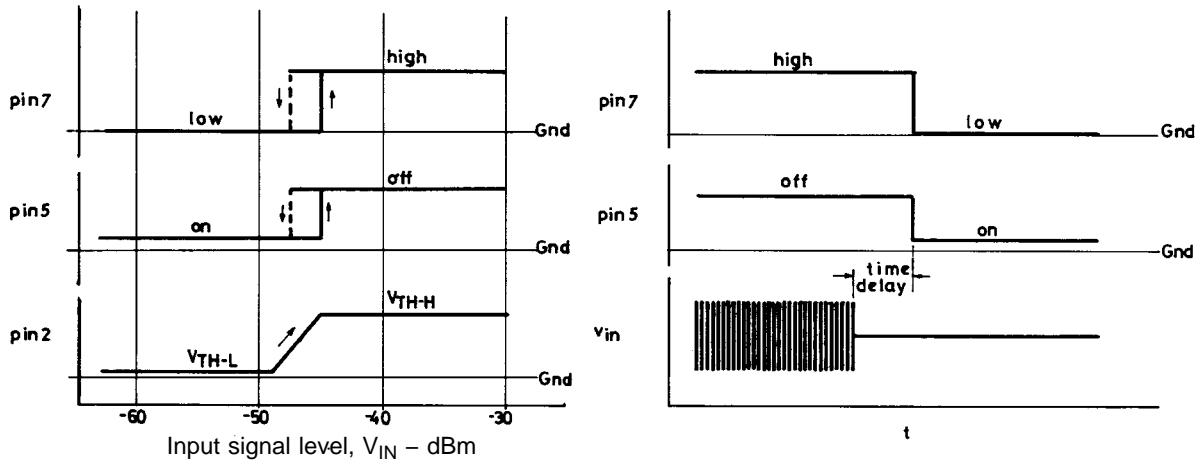


Unit (resistance: Ω , capacitance: F)

1. Externally connected components

C1	Input coupling capacitor	0.47 to 2.2 μ F recommended.
C2	NF capacitor	Capacitance is reduced, so the off level in input equivalent becomes lower in the bass frequency range. We recommend 1 to 10 μ F.
C3, R1	For designation of time delays	Any time delay can be obtained by adequate choice of C3 and R1. We recommend 150 k Ω to 500 k Ω for R1.
C4, R3	Power supply ripple filter	
R2	Bias resistor	For diode when pin 7 is used to drive external transistors. A 1 k Ω resistor is recommended.

2. Individual pins and their operations



As shown above, when input level is raised and the pin 2 voltage reaches the V_{TH-H} level of the comparator, pins 5 and 7 turn over. ($V_{IN} = -45$ dBm).

- pin 5 is for driving plungers. When it is on the “L” side, pin 5 turns on and can draw current up to 50 mA maximum.
- Pin 6 is a diode that prevents reverse voltages induced when the plunger is turned off from on.
- Pin 7 functions in phase with pin 5 and can drive external transistors (such as for MUTE).

3. Time delays and obtaining CRs

When input signals that have been applied at a level not less than -45 dBm are removed, discharging occurs through the CR connected at pin 2, lowering pin 2 potential. A time delay is provided before the hysteresis comparator turns over.

$$\frac{E1}{E0} = - \frac{t}{e^\tau}$$

$E0$: Initial voltage
 $E1$: Threshold voltage
 τ : Time constant

Accordingly,

$$t = -\tau \ln \frac{E1}{E0}$$

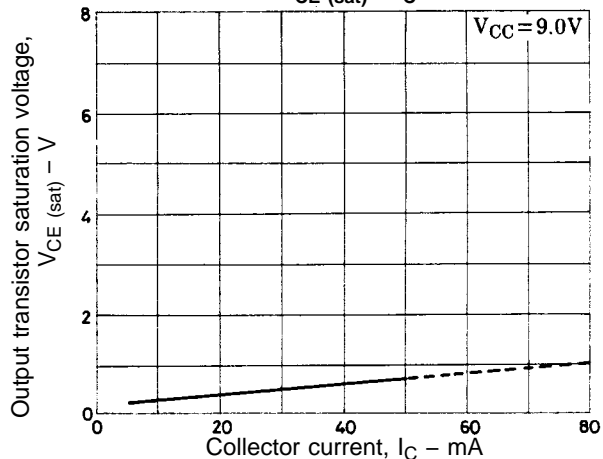
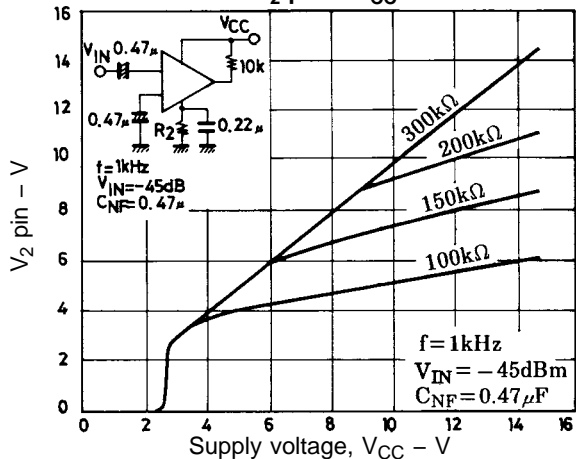
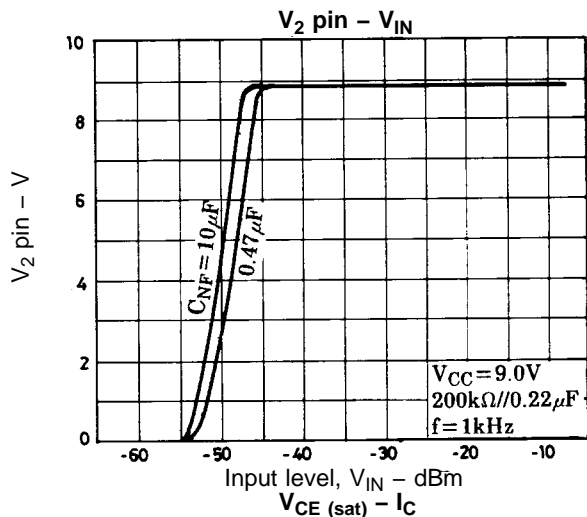
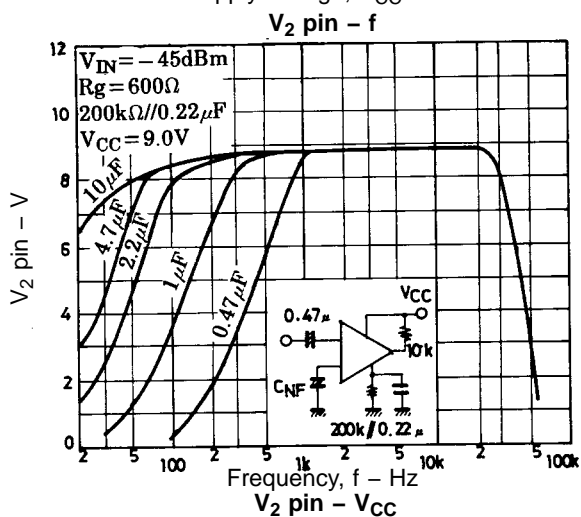
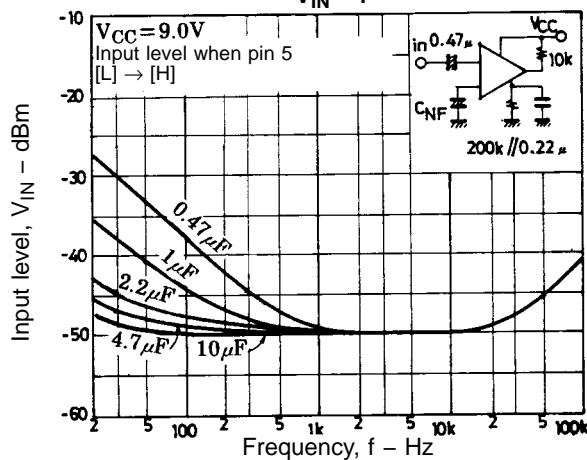
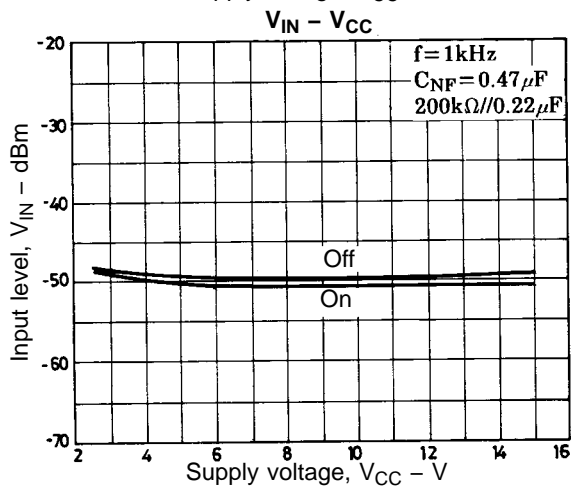
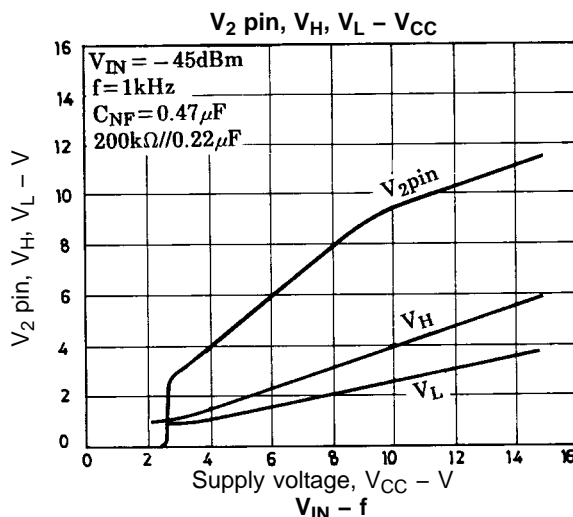
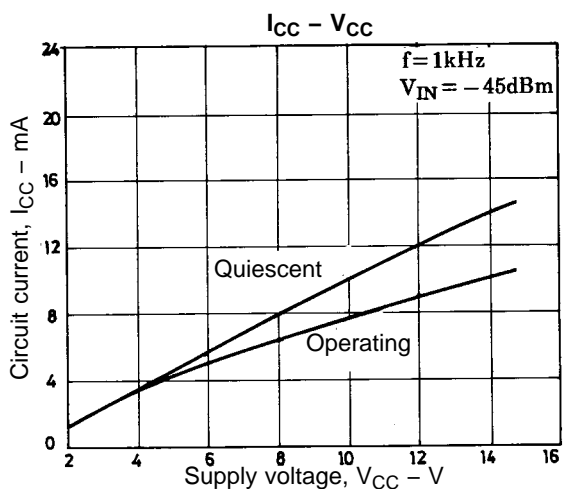
$E1/E0$, within the IC, is 0.26. A desired time delay is obtained by an appropriate choice of τ ($\tau = C_3R_1$). Therefore, the time delay is obtained by the following formula:

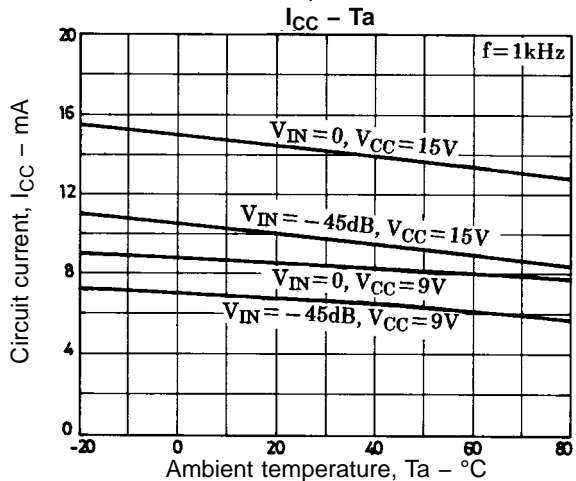
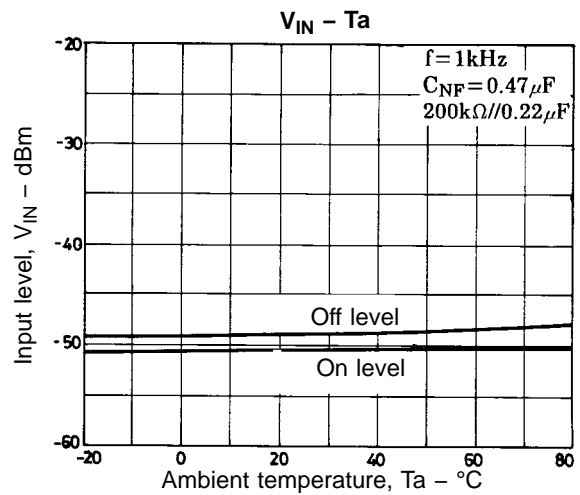
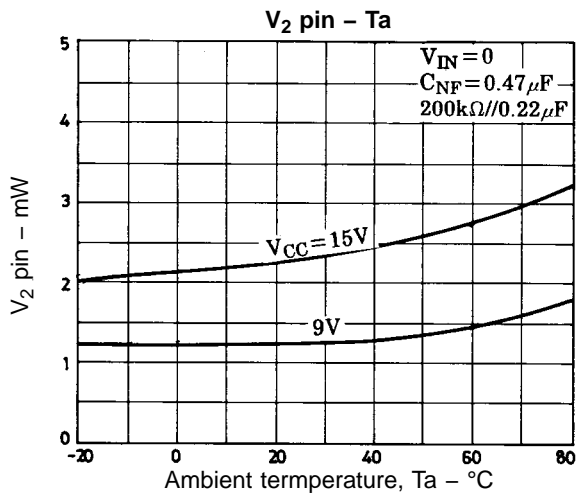
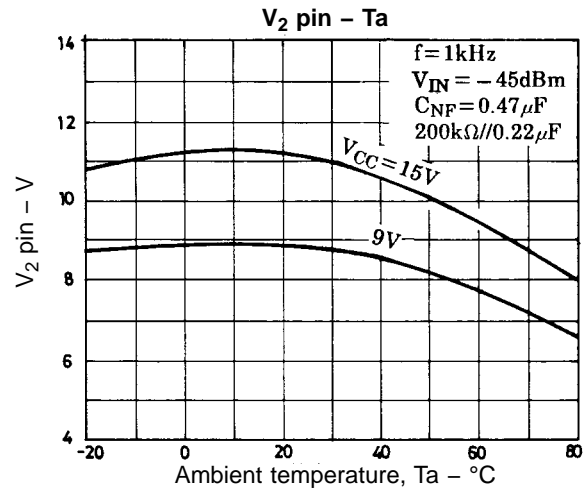
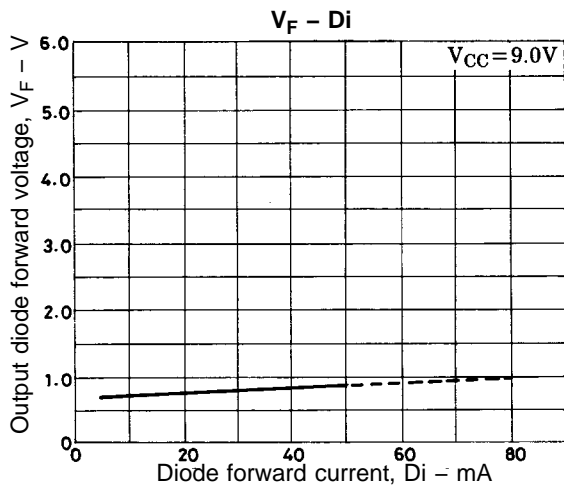
$$t = 1.34 \times C_3R_1 \text{ (sec)}$$

We recommend $150 \text{ k}\Omega$ to $500 \text{ k}\Omega$ for R when determining CR.

4. IC usage notes

- Maximum ratings
When maximum ratings are surpassed, destruction or deterioration may result.
- Interpin short circuits and reverse insertions
These cause destruction or deterioration of the IC: be careful when mounting on circuit board.
- Voltage applied to pin 7 should never exceed pin 8 voltage.
- The current flowing into pin 7 is to be 0.5 mA maximum.





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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331