Ordering number: EN4158

Monolithic Linear IC

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

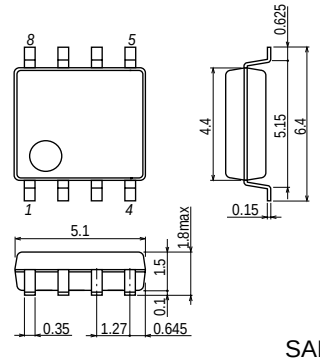
- Has transistors capable of driving plungers with maximum 50 mA, and a protective diode to prevent induced reverse voltages.
- Can provide designated time delays by externally connected capacitors and resistors.
- Has a comparator with stable hysteresis to handle variations in power supply voltage.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

Package Dimensions

unit : mm

3032B-MFP8

[LA2000M]



SANYO : MFP8

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		15	V
Allowable power dissipation	Pd max		300	mW
Flow-in current	I_6 max		50	mA
Operating temperature	Topr		–20 to +75	°C
Storage temperature	Tstg		–40 to +125	°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.

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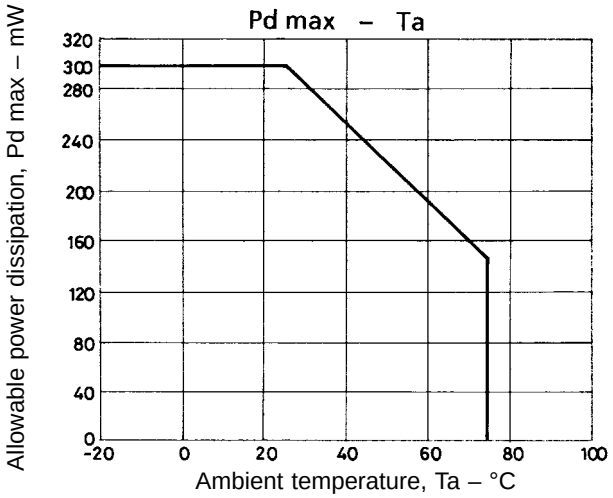
Operating Conditions at Ta = 25°C

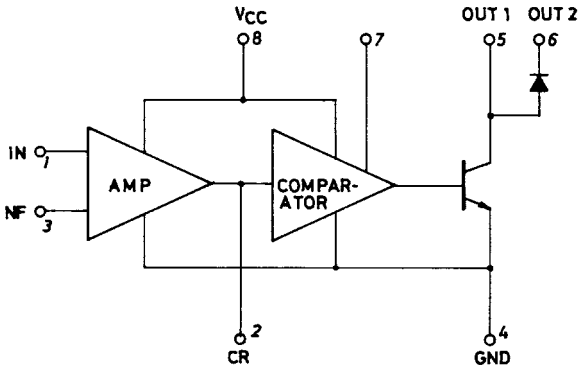
Parameter	Symbol	Conditions	Ratings	Unit
Operating supply voltage	V_{CC} op		3.5 to 14	V

Operating Characteristics at Ta = 25°C, V_{CC} = 9.0 V, f = 1 kHz

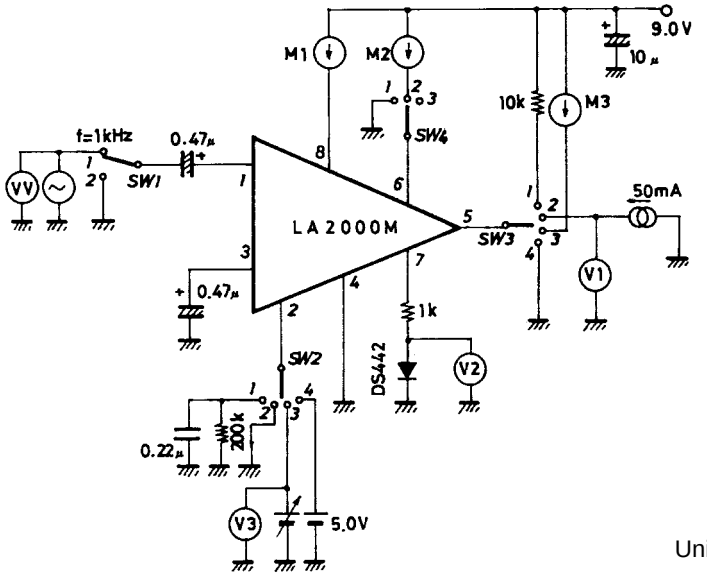
Parameter	Symbol	Conditions	min	typ	max	Unit
Circuit current	I_{CC}	f = 1 kHz, V_{IN} = –45 dBm		6	12	mA
Output transistor saturating voltage	$V_{CE\ (sat)}$	I_6 = 50 mA		0.5	1.8	V
Output diode forward voltage	V_F	I_F = 50 mA		0.7	1.5	V
Output-off level in input equivalent	V_{IN}	f = 1 kHz	–43	–50	–54	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 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



Test Circuit

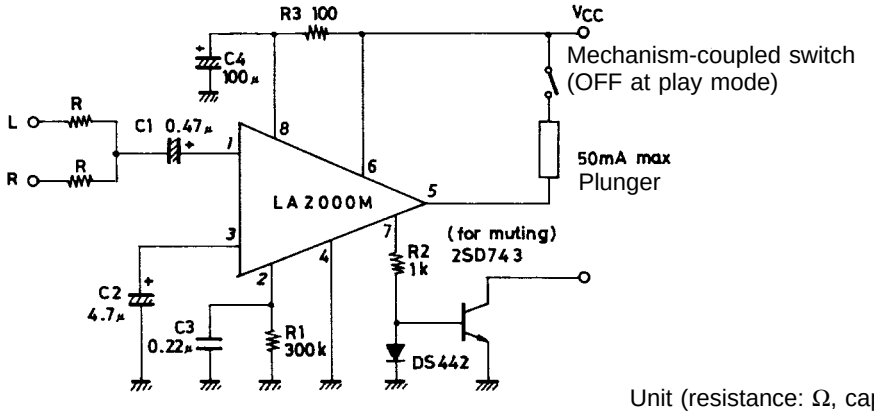


Unit (resistance: Ω, capacitance: F)

Test Conditions

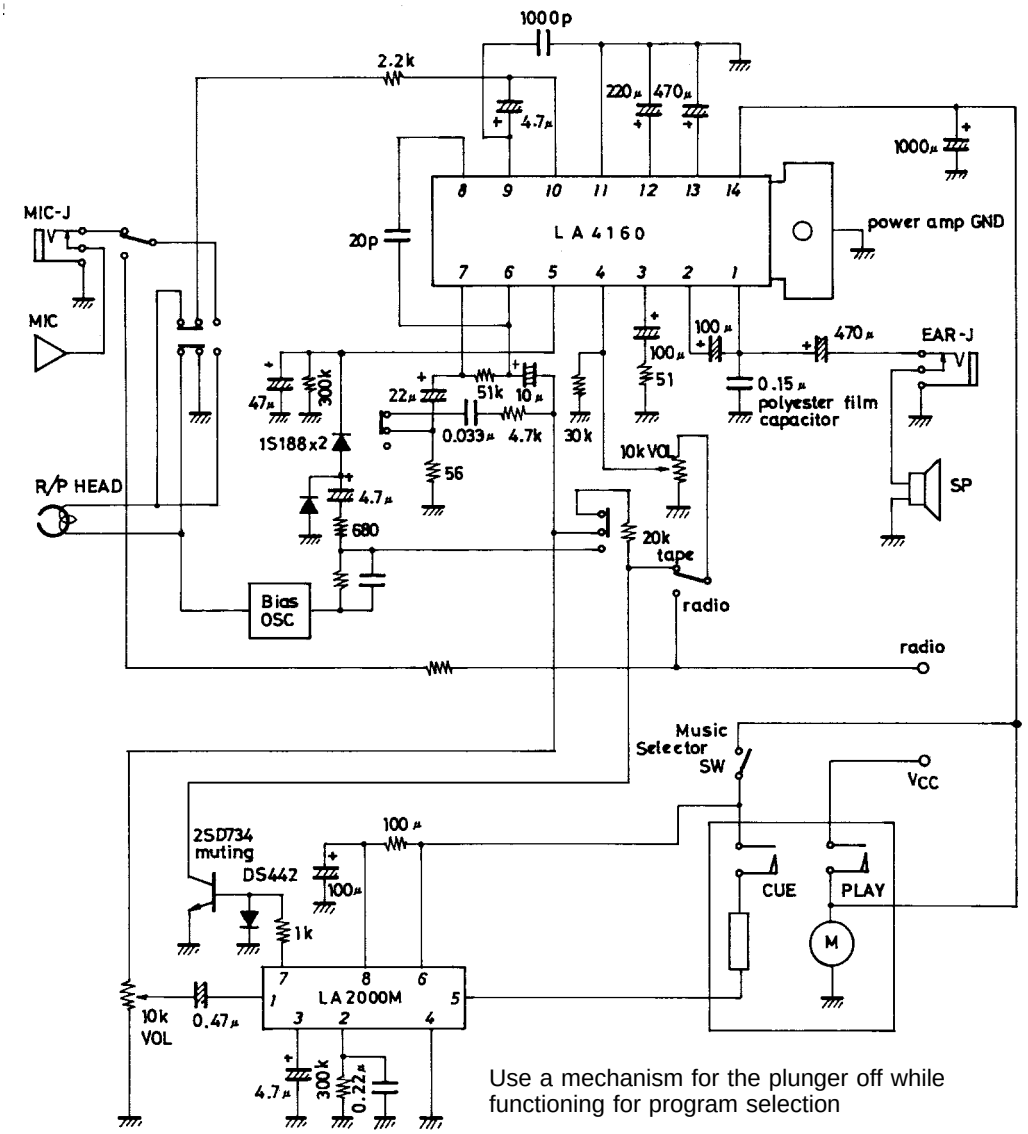
Test items	Symbol	SW-1	SW-2	SW-3	SW-4	Conditions
Circuit current	I_{CC}	1	1	1	3	Measure current flowing into pin 8 at V_{IN} = –45 dB
Output transistor saturation voltage	$V_{CE\ (sat)}$	2	2	2	3	Measure V_{IN} at pin 5
Output diode forward voltage	V_F	2	4	2	1	Measure V_{IN} at pin 5
Output-off level in input equivalent	V_{IN}	1	1	1	3	Input level (v.v) when pin 5 turns over
Comparator-on level	V_H	2	3	1	3	Measure V_3 when pin 5 turns over
Comparator-off level	V_L	2	3	1	3	Measure V_3 when pin 5 turns over
Pin 7 high level	Vp-7	2	4	1	3	Measure V_2 at pin 7
Output transistor leakage current	I_{TL}	2	4	3	3	Measure M3
Output diode leakage current	I_{DL}	2	4	4	2	Measure M2

Sample Application Circuit 1



Unit (resistance: Ω, capacitance: F)

Sample Application Circuit 2



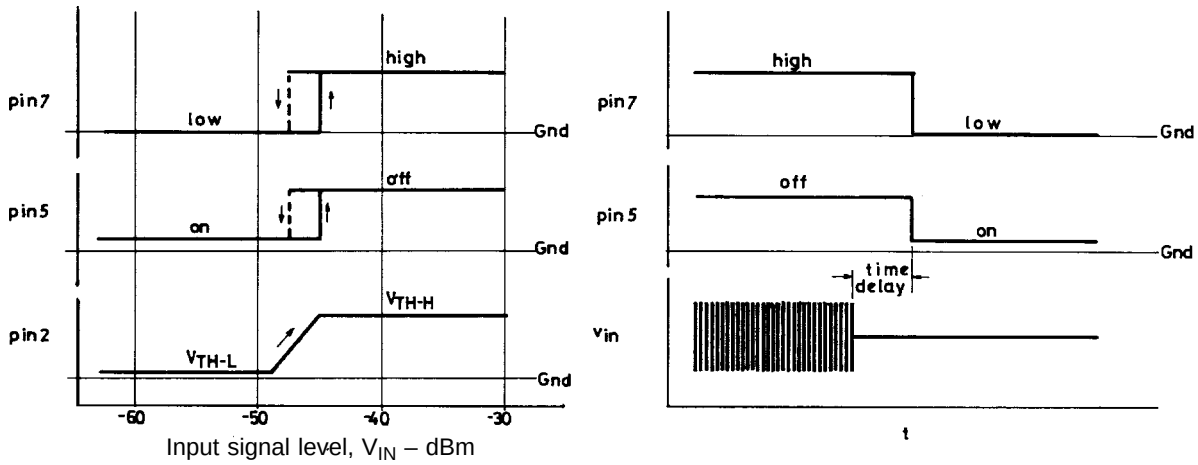
Use a mechanism for the plunger off while functioning for program selection

Unit (resistance: Ω, capacitance: F)

1. Externally connected components

C1	Input coupling capacitor	0.47 to 2.2 µF 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 µF.
C3, R1	For designation of time delays	Any time delay can be obtained by adequate choice of C3 and R1. We recommend 150 kΩ to 500 kΩ for R1.
C4, R3	Power supply ripple filter	
R2	Bias resistor	For diode when pin 7 is used to drive external transistors. A 1 kΩ 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,

$$t = -\tau \mathrm{In} \frac{E1}{E0}$$

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:

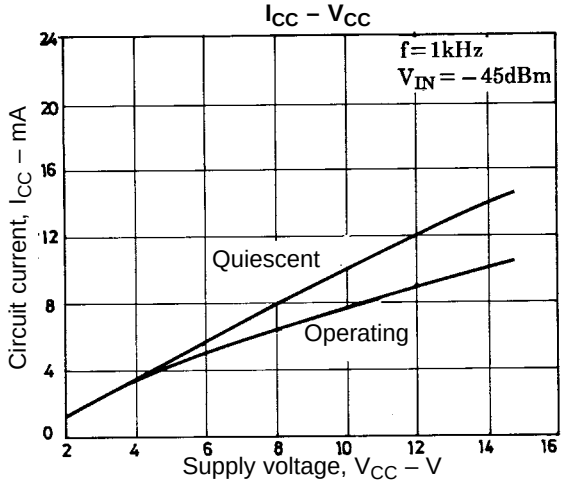
$$t = 1.34 \times C_3R_1 \text{ (sec)}$$

We recommend 150 kΩ to 500 kΩ for R when determining CR.

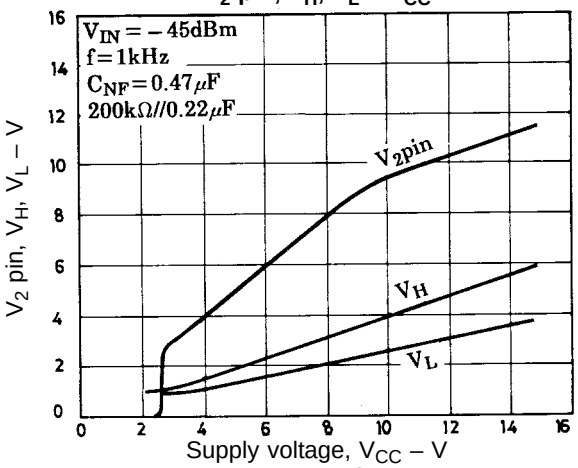
4. IC usage notes

- 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.

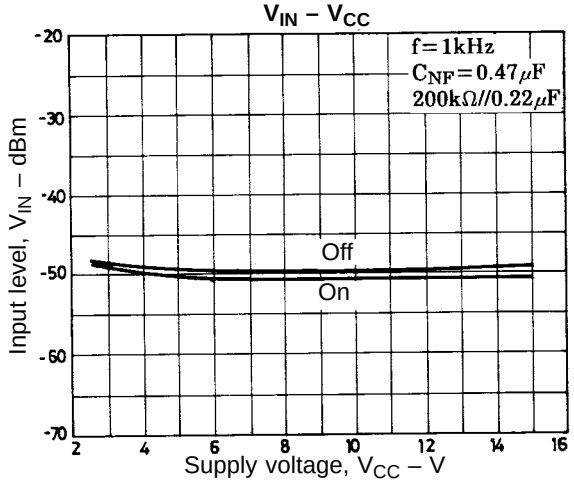
I_{CC} – V_{CC}



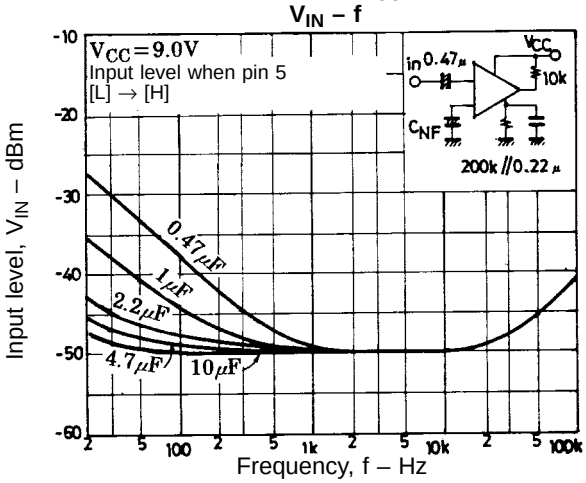
V_2 pin, V_H, V_L – V_{CC}



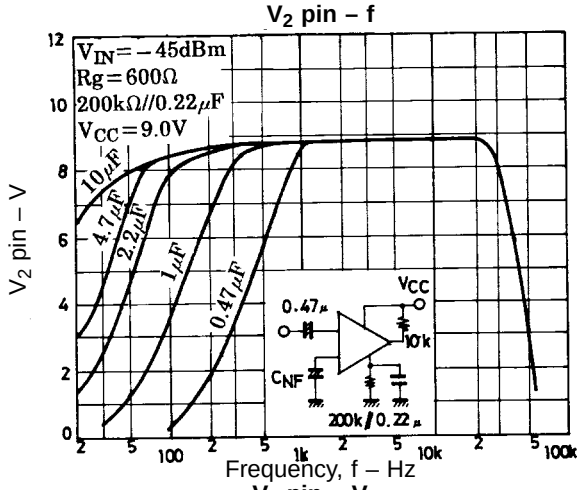
V_{IN} – V_{CC}



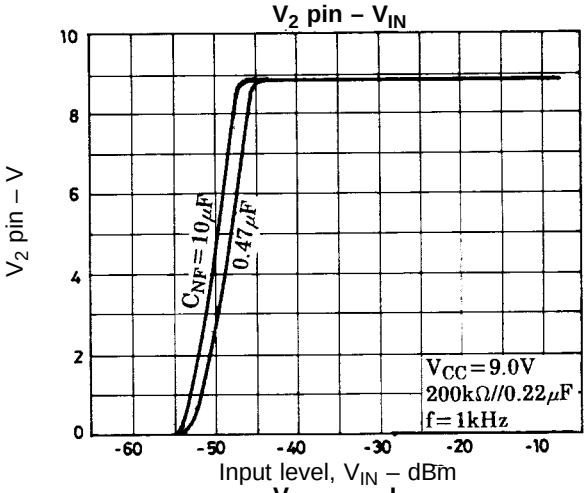
V_{IN} – f



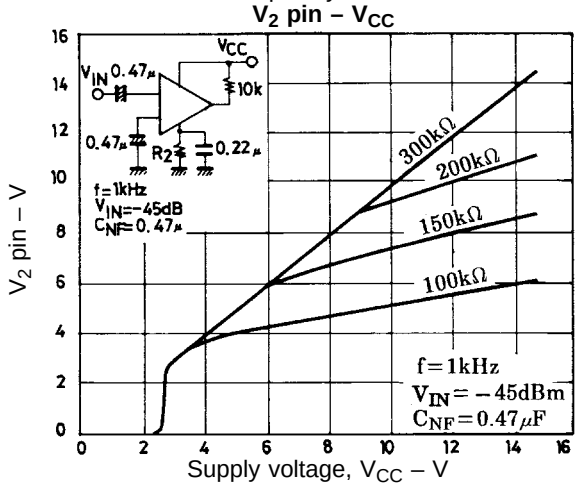
V_2 pin – f



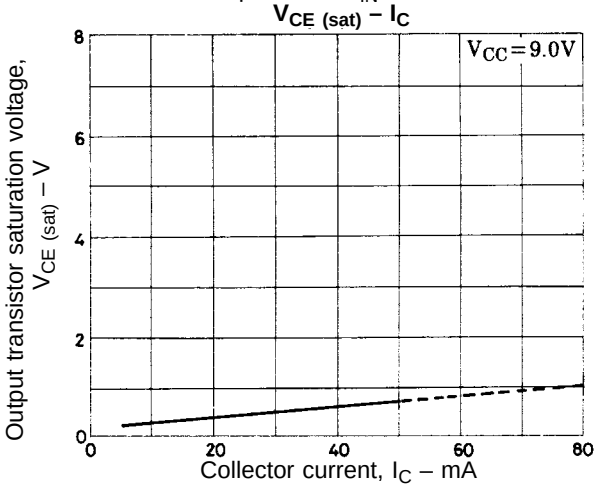
V_2 pin – V_{IN}



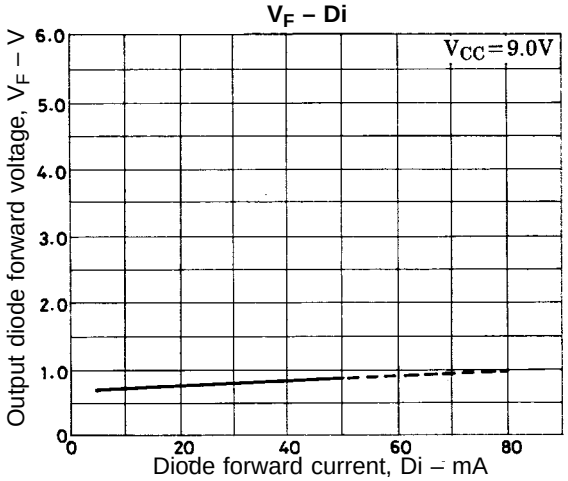
V_2 pin – V_{CC}



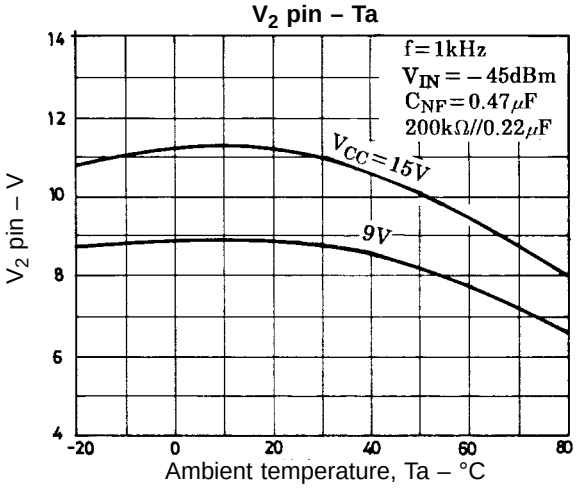
$V_{CE\ (sat)}$ – I_C



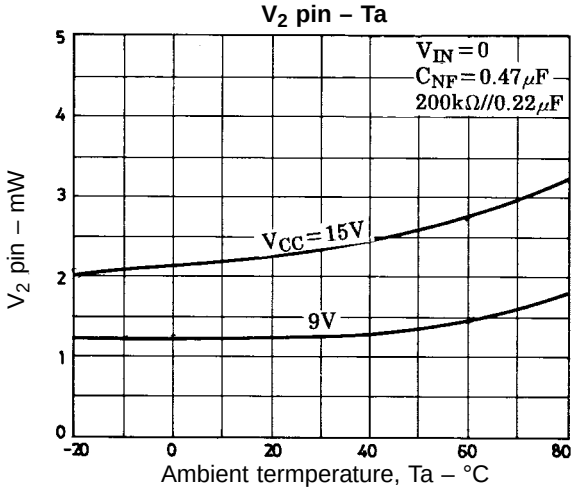
V_F – Di



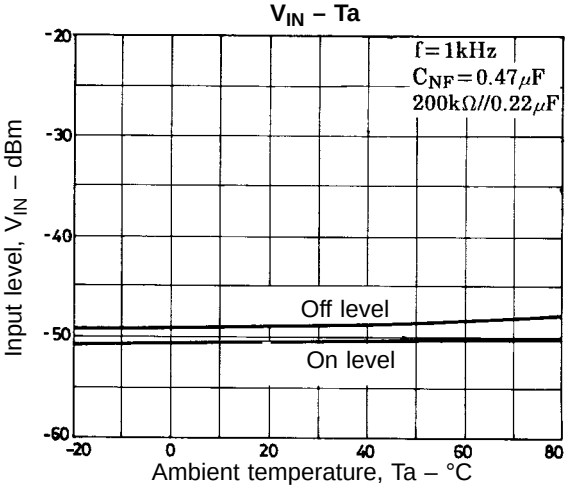
V_2 pin – Ta



V_2 pin – Ta



V_{IN} – Ta



I_{CC} – Ta