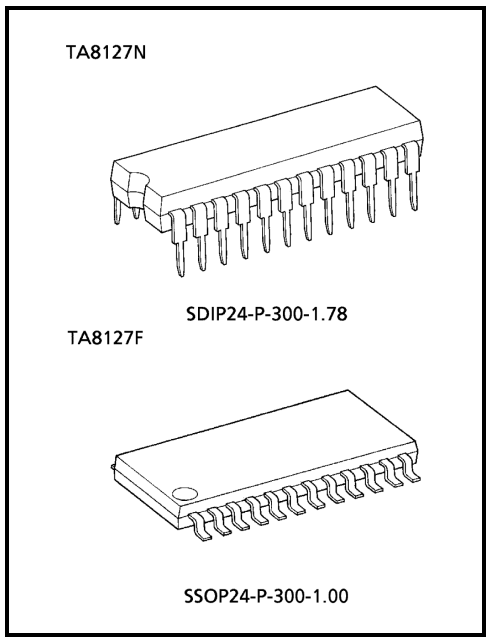
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA8127N,TA8127F

3V AM / FM 1chip Tuner IC

TA8127N and TA8127F are the AM / FM 1chip tuner ICs, which are designed for portable radios and 3V headphone radios.

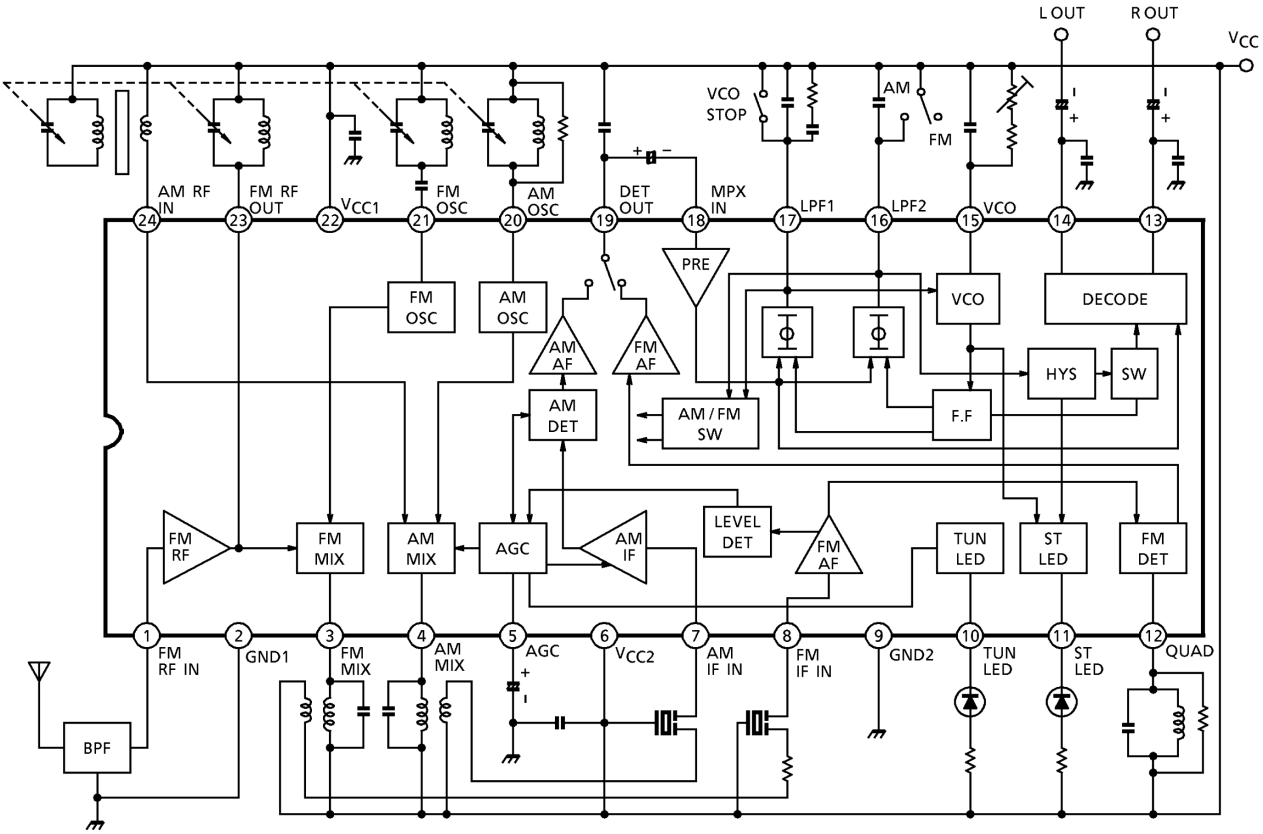



Weight
SDIP24−P−300−1.78: 1.2g (typ.)
SSOP24−P−300−1.00: 0.31 (typ.)

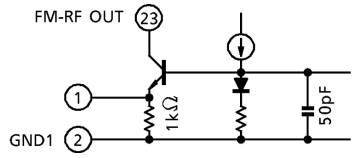
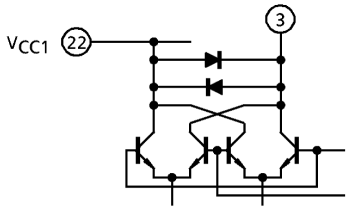
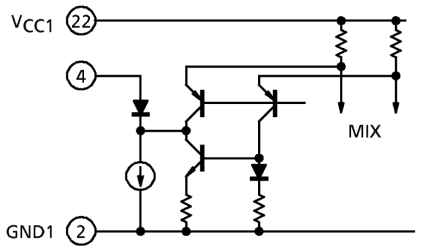
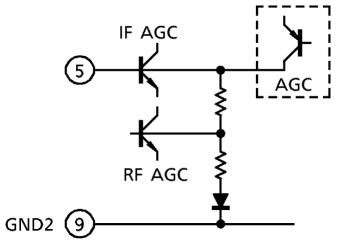
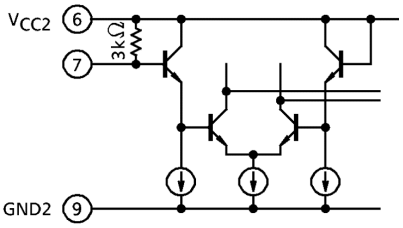
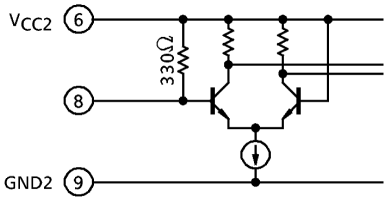
## Features

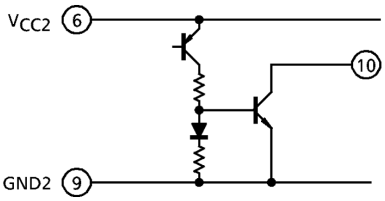
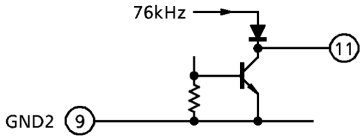
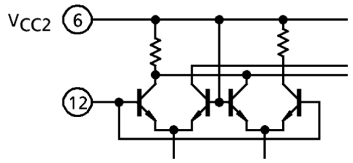
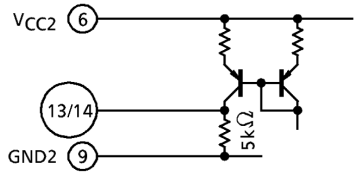
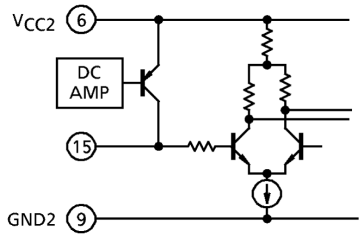
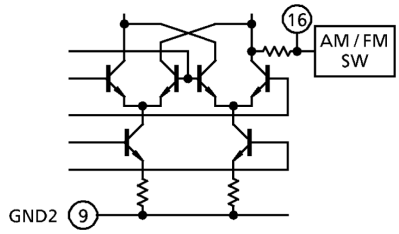
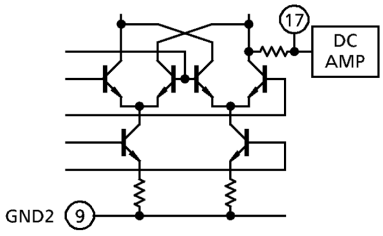
- Built−in
  FM F / E, AM / FM IF and FM MPX
- AM detector coil and IF coupling condenser are not needed.
- Compact package
  TA8127N: Shrink DIP 24 pin (1.78mm pitch)
  TA8127F: Mini flat packge 24 pin
- Operating supply voltage range
  $V_{CC}$ = 1.8~7.0V (Ta = 25°C)

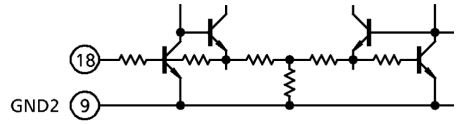
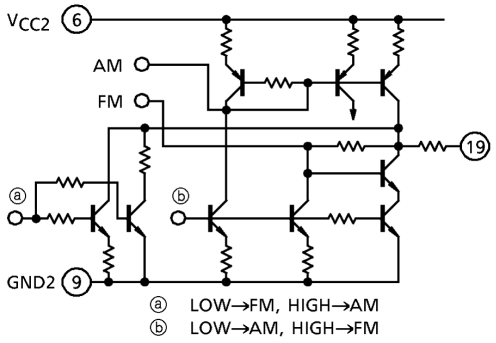
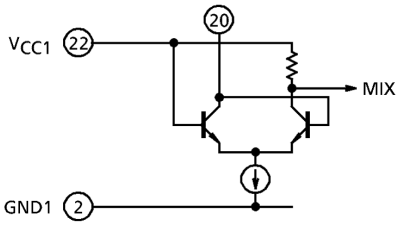
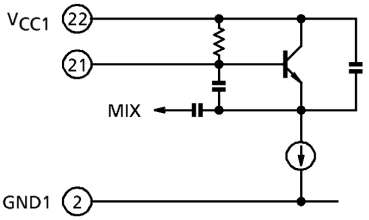
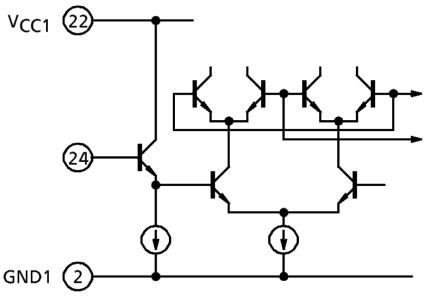
## Block Diagram



## Explanation Of Terminals

| Pin No. | Item | Internal Circuit | DC Voltage (V) (at no Signal) | |
|---|---|---|---|---|
| | | | AM | FM |
| 1 | FM−RF IN |  | 0 | 0.7 |
| 2 | GND1 (GND for RF stage) | — | 0 | 0 |
| 3 | FM MIX |  | 3.0 | 3.0 |
| 4 | AM MIX |  | 3.0 | 3.0 |
| 5 | AGC (AM AGC) |  | 0 | 0 |
| 6 | $V_{CC2}$ ($V_{CC}$ for IF / MPX stage) | — | 3.0 | 3.0 |
| 7 | AM IF IN |  | 3.0 | 3.0 |
| 8 | FM IF IN |  | 3.0 | 3.0 |

| Pin No. | Item | Internal Circuit | DC Voltage (V) (at no Signal) | |
|---|---|---|---|---|
| | | | AM | FM |
| 9 | GND2 (GND for IF / MPX stage) | — | 0 | 0 |
| 10 | TUN LED (tuning LED) |  | — | — |
| 11 | ST LED (stereo LED) |  | — | — |
| 12 | QUAD (FM QUAD. Detector) |  | 3.0 | 3.0 |
| 13<br>14 | R−OUT (R−ch output)<br>L−OUT (L−ch output) |  | 1.0 | 1.0 |
| 15 | VCO |  | 2.5 | 2.5 (VCO stop mode) |
| 16 | LPF2<br>・LPF terminal for synchronous detector<br>・Bias terminal for AM / FM SW circuit<br>$V_{16}$ = $V_{CC}$ → AM (VCO stop)<br>$V_{16}$ = OPEN → FM |  | 3.0 | 2.2 (VCO stop mode 2.7) |
| 17 | LPF1<br>・LPF terminal for phase detector<br>・VCO stop terminal<br>$V_7$ = $V_{CC}$ →VCO stop |  | 2.7 | 2.2 |

| Pin No. | Item | Internal Circuit | DC Voltage (V) (at no Signal) | |
|---|---|---|---|---|
| | | | AM | FM |
| 18 | MPX IN |  | 0.7 | 0.7 |
| 19 | DET OUT |  | 1.5 | 1.2 |
| 20 | AM OSC |  | 3.0 | 3.0 |
| 21 | FM OSC |  | 3.0 | 3.0 |
| 22 | $V_{CC1}$ ($V_{CC}$ for RF stage) | — | 3.0 | 3.0 |
| 23 | FM RF OUT | Cf. Pin(1) | 3.0 | 3.0 |
| 24 | AM RF IN |  | 3.0 | 3.0 |

## Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | 8 | V |
| LED current | | $I_{LED}$ | 10 | mA |
| LED voltage | | $V_{LED}$ | 8 | V |
| Power dissipation | TA8127N | $P_D$ (Note) | 1200 | mW |
| | TA8127F | | 400 | |
| Operating temperature | | $T_{opr}$ | −25~75 | °C |
| Storage temperature | | $T_{stg}$ | −55~150 | °C |

Note: Derated above 25°C in the proportion of 9.6mW / °C for TA8127N and of 3.2mW / °C for TA8127F.

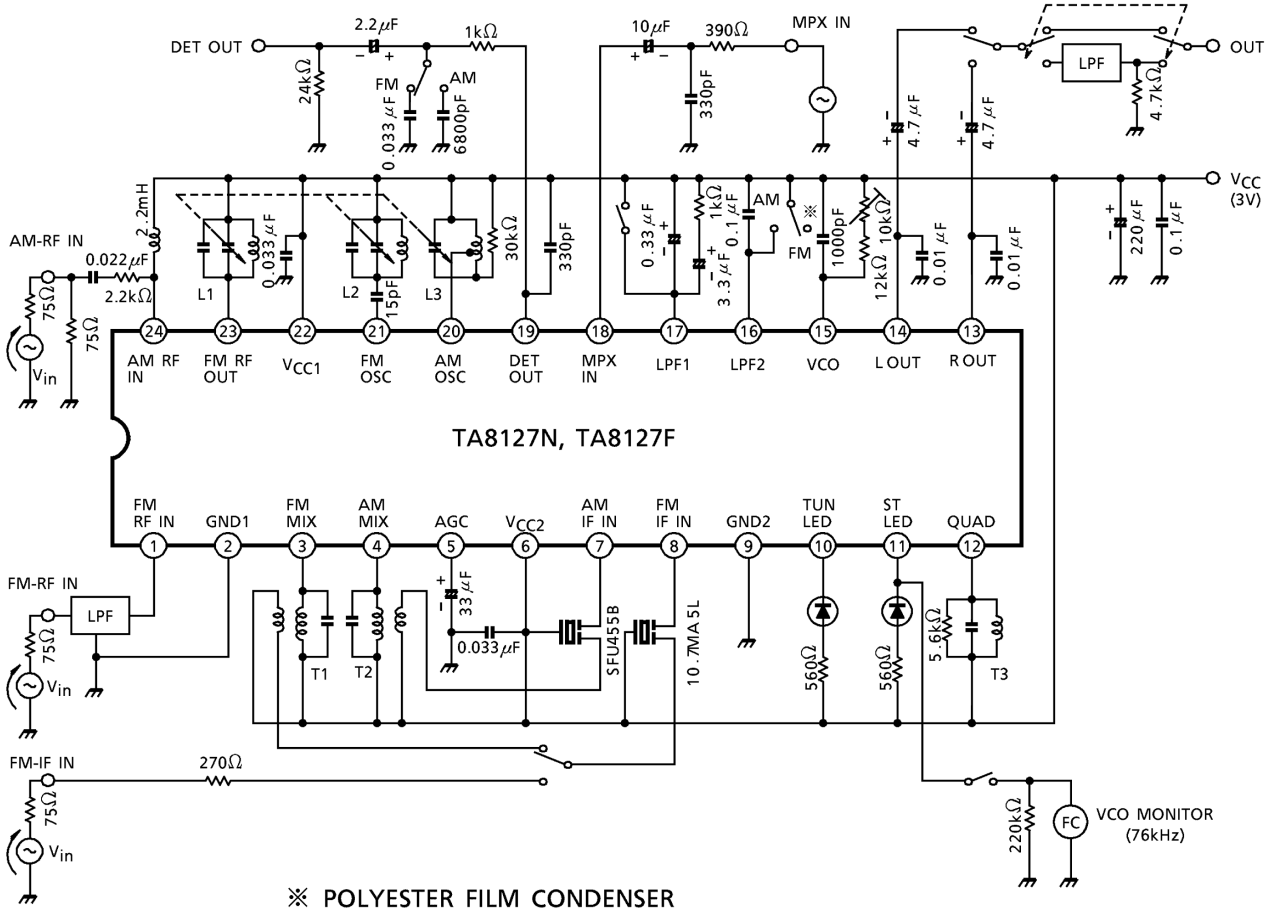
**Electrical Characteristics**

Unless Otherwise Specified,
Ta = 25°C, $V_{CC}$ = 3V, F / E: f = 83MHz, $f_m$ = 1kHz
FM IF: f = 10.7MHz, Δf = ±22.5kHz, $f_m$ = 1kHz
AM: f = 1MHz, MOD = 30%, $f_m$ = 1kHz
MPX: $f_m$ = 1kHz

| Characteristic | | Symbol | Test Cir- cuit | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Supply current | | $I_{CC\ (FM)}$ | 1 | $V_{in}$ = 0, FM mode | — | 13.2 | 20.0 | mA |
| | | $I_{CC\ (AM)}$ | 1 | $V_{in}$ = 0, AM mode | — | 8.4 | 13.5 | |
| F / E | Input limiting voltage | $V_{in\ (lim.)}$ | 1 | − 3dB limiting | — | 10.0 | — | dBμV EMF |
| | Local OSC voltage | $V_{OSC}$ | 2 | $f_{OSC}$ = 72.3MHz | — | 105 | — | $mV_{rms}$ |
| FM IF | Input limiting voltage | $V_{in\ (lim.)\ IF}$ | 1 | − 3dB limiting | 40 | 46 | 53 | dBμV EMF |
| | Rcovered output voltage | $V_{OD}$ | 1 | $V_{in}$ = 80dBμV EMF | 55 | 80 | 110 | $mV_{rms}$ |
| | Signal to noise ratio | S / N | 1 | $V_{in}$ = 80dBμV EMF | — | 70 | — | dB |
| | Total harmonic distortion | THD | 1 | $V_{in}$ = 80dBμV EMF | — | 0.4 | — | % |
| | AM rejection ratio | AMR | 1 | $V_{in}$ = 80dBμV EMF | — | 32 | — | dB |
| | Lamp on sensitivity | $V_L$ | 1 | $I_L$ = 1mA | 45 | 51 | 56 | dBμV EMF |
| AM | Gain | $G_V$ | 1 | $V_{in}$ = 26dBμV EMF | 40 | 70 | 110 | $mV_{rms}$ |
| | Recovered output voltage | $V_{OD}$ | 1 | $V_{in}$ = 60dBμV EMF | 55 | 80 | 110 | |
| | Signal to noise ratio | S / N | 1 | $V_{in}$ = 60dBμV EMF | — | 42 | — | dB |
| | Total harmonic distortion | THD | 1 | $V_{in}$ = 60dBμV EMF | — | 1.0 | — | % |
| | Lamp on sensitivity | $V_L$ | 1 | $I_L$ = 1mA | 20 | 25 | 30 | dBμV EMF |
| Pin(19) output resistance | | $R_{19}$ | 1 | FM mode | — | 0.75 | — | kΩ |
| | | | | AM mode | — | 12.5 | — | |

| Characteristic | | | Symbol | Test Cir- cuit | Test Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| MPX | Input resistance | | $R_{IN}$ | — | — | | — | 24 | — | kΩ |
| | Output resistance | | $R_{OUT}$ | — | — | | — | 5 | — | |
| | Max. Composite signal input voltage | | $V_{in\ (max.)}$ stereo | 1 | L+R = 90%, P = 10% $f_m$ = 1kHz, THD = 3% | | — | 350 | — | $mV_{rms}$ |
| | Separation | | Sep | 1 | L+R = 135$mV_{rms}$ P = 15$mV_{rms}$ | $f_m$ = 100Hz | — | 42 | — | dB |
| | | | | | | $f_m$ = 1kHz | 35 | 42 | — | |
| | | | | | | $f_m$ = 10kHz | — | 42 | — | |
| | Total harmonic distortion | Monaural | THD (monaural) | 1 | $V_{in}$ = 150$mV_{rms}$ | | — | 0.2 | — | % |
| | | Stereo | THD (stereo) | | L+R = 135$mV_{rms}$, P = 15$mV_{rms}$ | | — | 0.2 | — | |
| | Voltage gain | | $G_{V\ (MPX)}$ | 1 | $V_{in}$ = 150$mV_{rms}$ | | −5 | −3 | −1 | dB |
| | Channel balance | | C. B. | 1 | $V_{in}$ = 150$mV_{rms}$ | | −2 | 0 | 2 | |
| | Stereo lamp sensitivity | On | $V_{L\ (ON)}$ | 1 | Pilot input | | — | 8 | 16 | $mV_{rms}$ |
| | | Off | $V_{L\ (OFF)}$ | | Pilot input | | 2 | 6 | — | |
| | Stereo lamp hysteresis | | $V_H$ | 1 | To LED turn off from LED turn on | | — | 2 | — | $mV_{rms}$ |
| | Caputure range | | C. R. | 1 | P = 15$mV_{rms}$ | | — | ±3 | — | % |
| | Signal to noise ratio | | S / N | 1 | $V_{in}$ = 150$mV_{rms}$ | | — | 70 | — | dB |

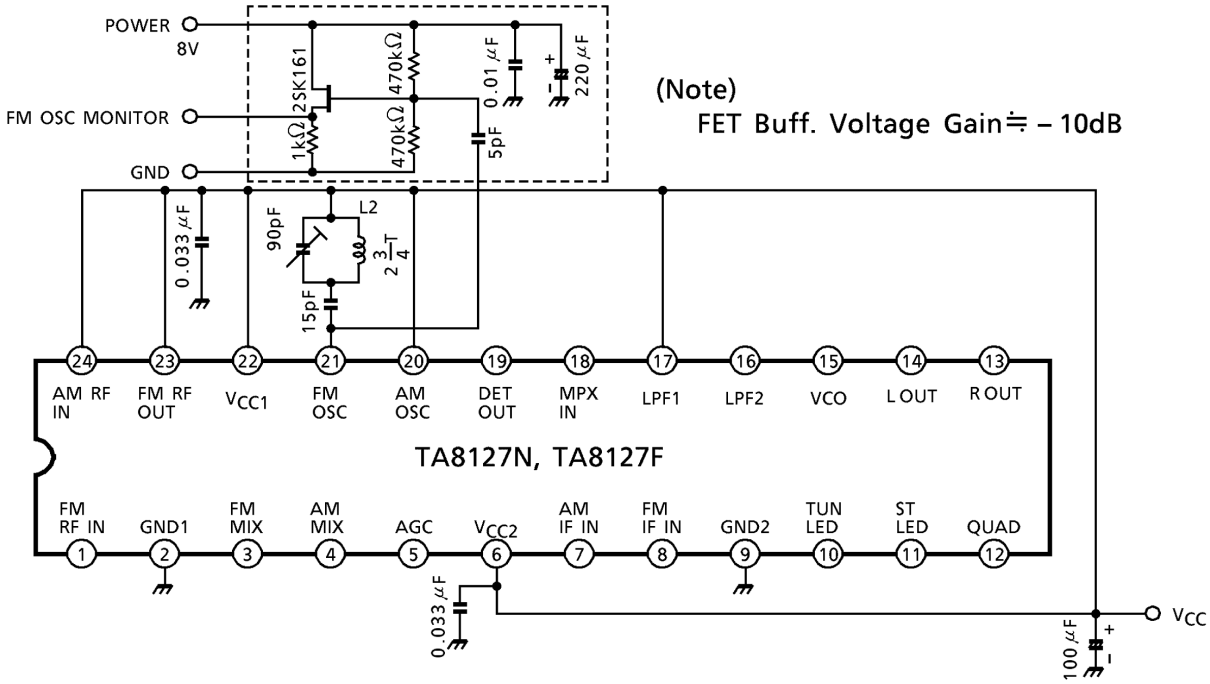
## Test Circuit 1




※ POLYESTER FILM CONDENSER

Using other types of condensers, there are some cases that the MPX does not do normal stereo action at high temperature or low temperature.

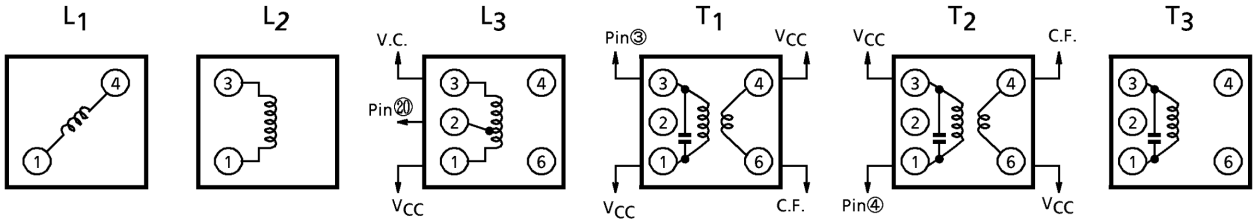
## Test Circuit 2




## Coil Data

| Coil No. | Test Freq. (Hz) | L (μH) | $C_O$ (pF) | $Q_O$ | Turns | | | | | Wire (mmϕ) | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1–2 | 2–3 | 1–3 | 1–4 | 4–6 | | |
| $L_1$ FM RF | 100M | — | — | 100 | — | — | — | $2\frac{1}{2}$ | — | 0.5UEW | (S) 53T–037–202 |
| $L_2$ FM OSC | 100M | — | — | 100 | — | — | $2\frac{3}{4}$ | — | — | 0.5UEW | (S) 0258–244 |
| $L_3$ AM OSC | 796k | 288 | — | 115 | 13 | 73 | — | — | — | 0.08UEW | (S) 4147–1356–038 |
| $T_1$ FM MIX | 10.7M | — | 75 | 100 | — | — | 13 | — | 2 | 0.1UEW | (S) 2153–414–041 |
| $T_2$ AM MIX | 455k | — | 180 | 120 | — | — | 180 | — | 15 | 0.08UEW | (S) 2150–2162–165 |
| $T_3$ FM DET | 10.7M | — | 47 | 165 | — | — | 16 | — | — | 0.09UEW | (S) 2153–4095–122 |

(S): SUMIDA electric CO., LTD

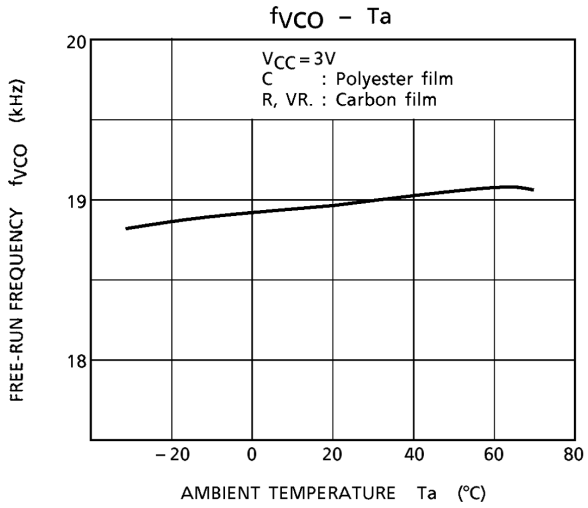


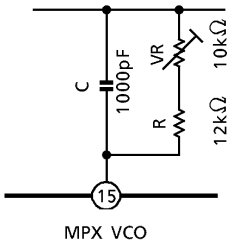
## Hint On Use Of TA8127N And TA8127F

External parts of MPX VCO

(1) Temperature characteristic of MPX VCO free –run frequency. The temperature characteristic of MPX VCO is shown in the diagram as below. Select one with a better temperature characteristic (C, R and VR. ) in use. We recommend,

C : Polyester film
R, VR: Carbon film



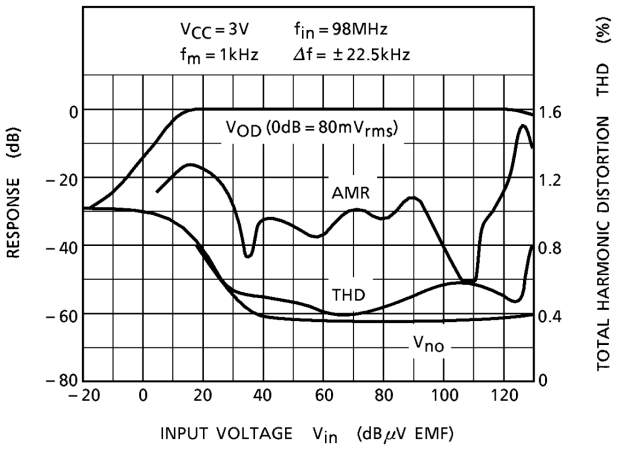

(2) Value of the external parts

We recommend to set up these value as below.

R = 12kΩ
VR = 10kΩ
C = 1000pF

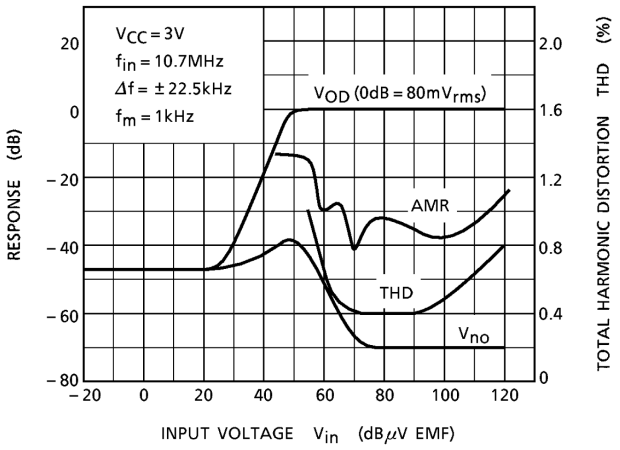
FM (F / E + IF)

$V_{OD}$, $V_{no}$, THD, AMR – $V_{in}$



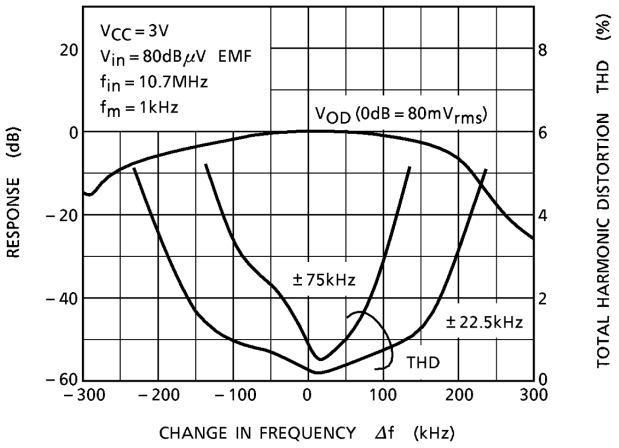

FM (IF)

$V_{OD}$, $V_{no}$, THD, AMR – $V_{in}$



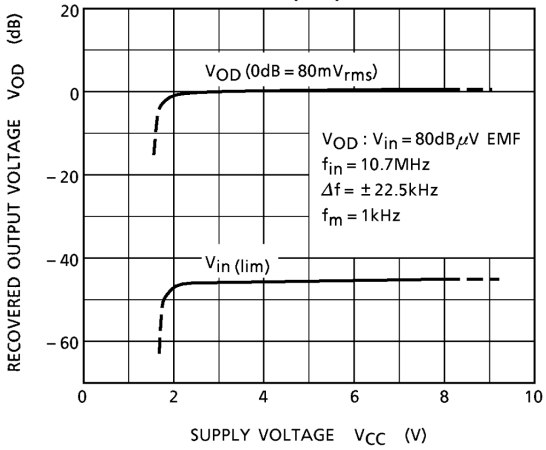

FM (IF)

$V_{OD}$, THD – Δf



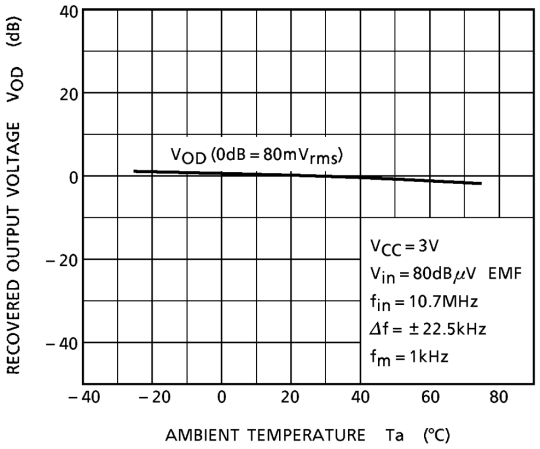

FM (IF)

$V_{OD}$, $V_{in}$ (lim.) – $V_{CC}$



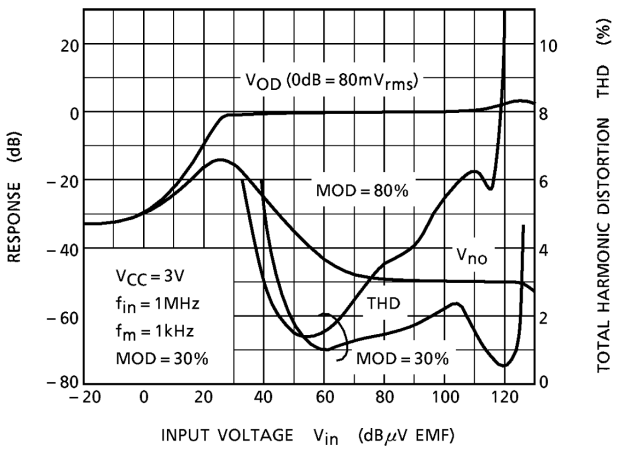

FM (IF)

$V_{OD}$ – Ta

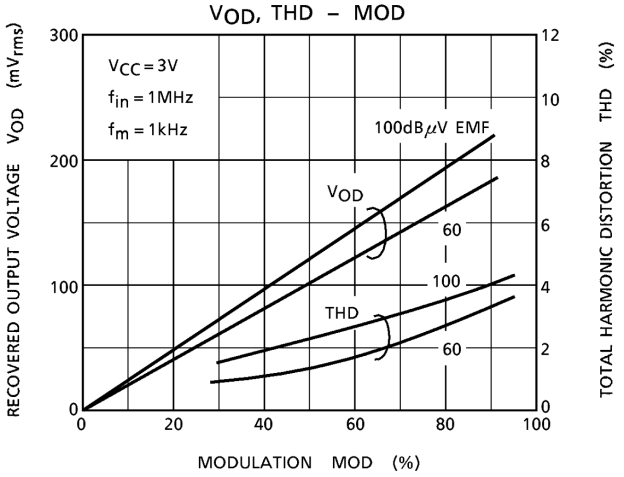



AM

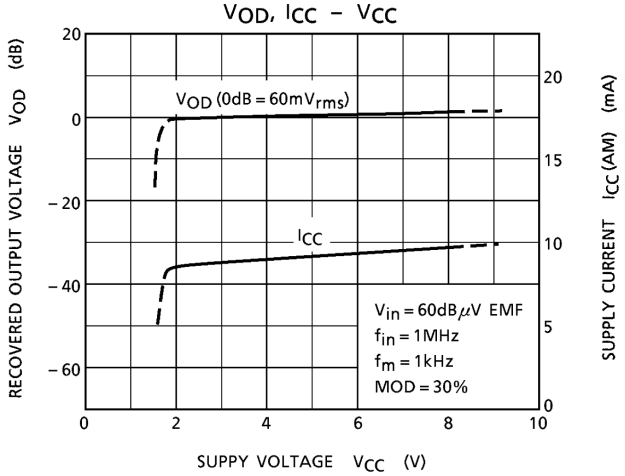
$V_{OD}$, $V_{no}$, THD – $V_{in}$



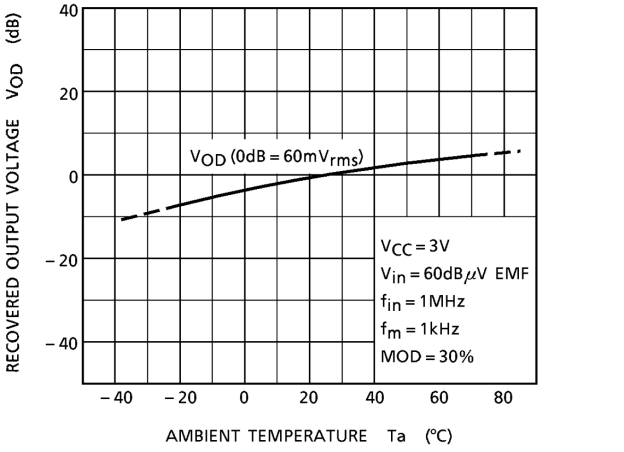
$V_{OD}$, THD – MOD




$V_{OD}$, $I_{CC}$ – $V_{CC}$

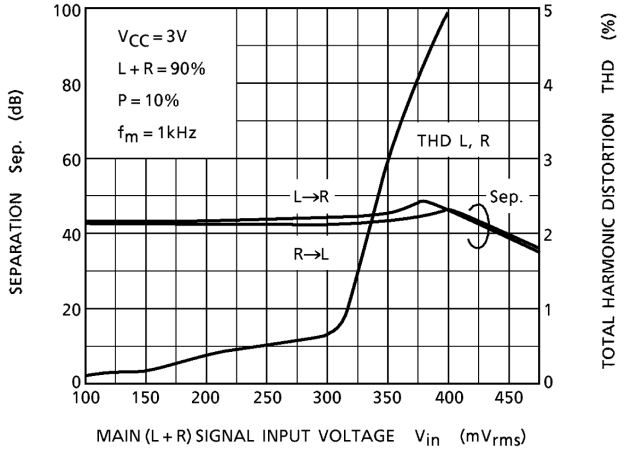



$V_{OD}$ – Ta

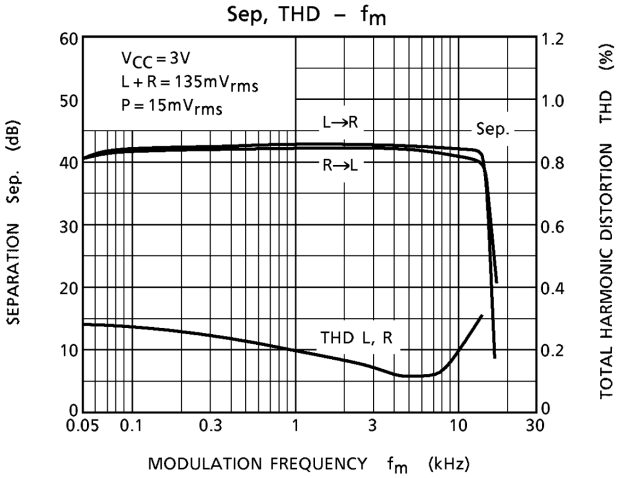



MPX

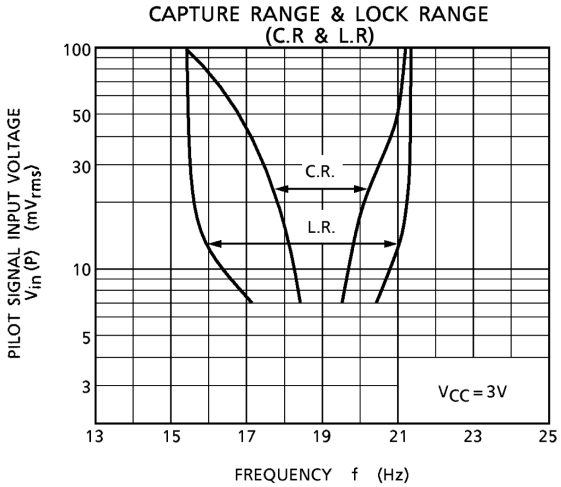
Sep, THD – $V_{in}$



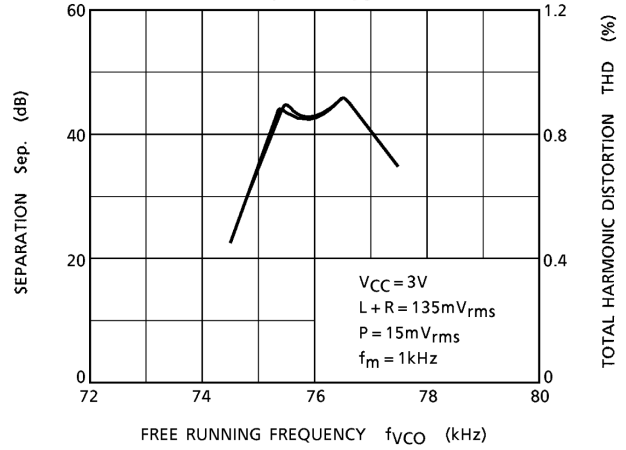

Sep, THD – $f_m$



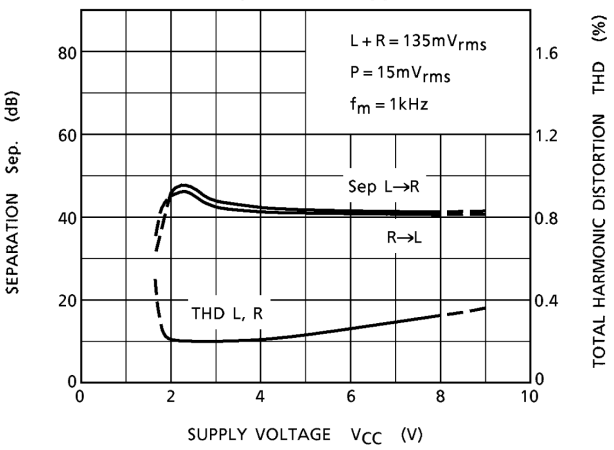

CAPTURE RANGE & LOCK RANGE (C.R & L.R)



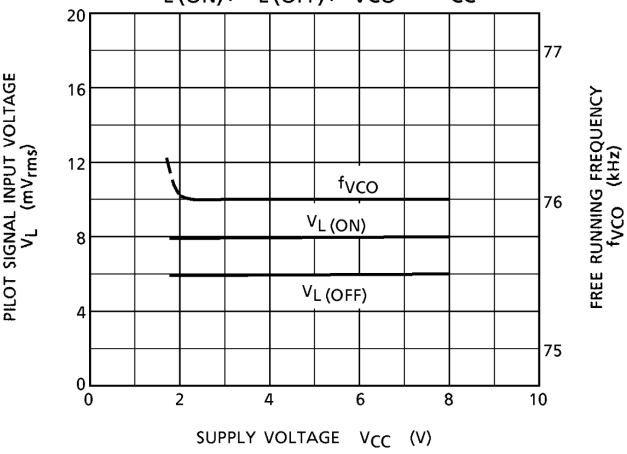
Sep – $f_{VCO}$




Sep, THD – $V_{CC}$

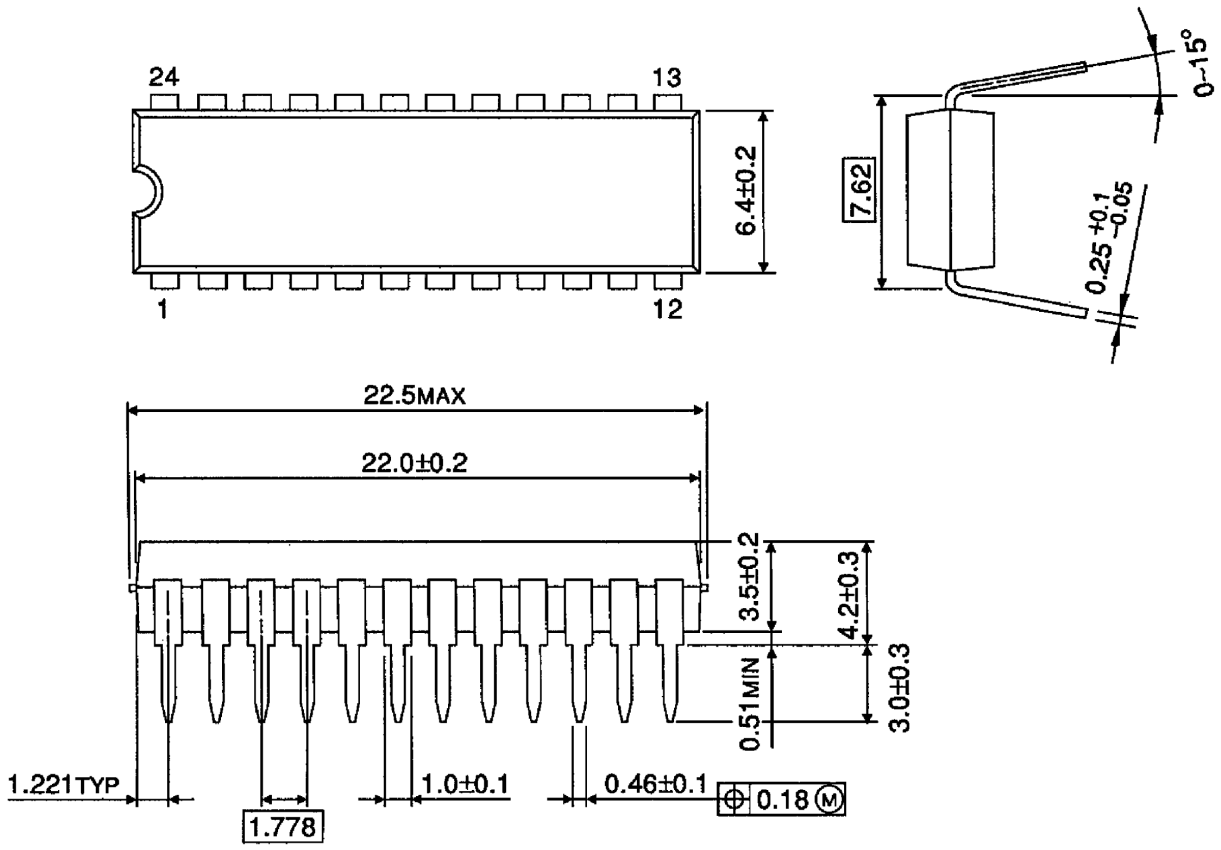



$V_{L\,(ON)}$, $V_{L\,(OFF)}$, $f_{VCO}$ – $V_{CC}$



## Package Dimensions

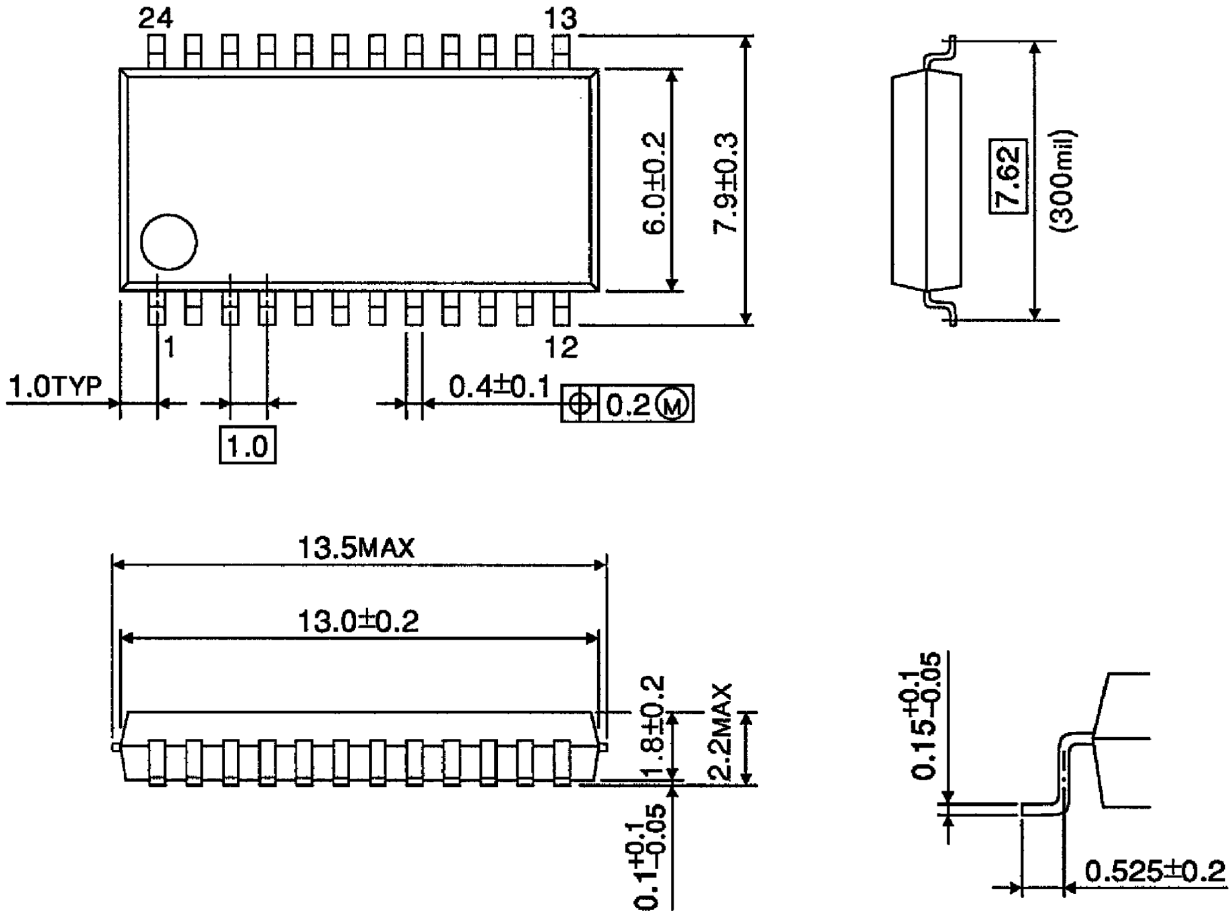
SDIP24-P-300-1.78 Unit : mm




Weight: 1.2g (typ.)

## Package Dimensions

SSOP24-P-300-1.00 Unit : mm




Weight: 0.31g (typ.)

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000707EBA

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