Ordering number : EN1844C

Monolithic Linear IC

# LA1800

## FM/AM Single-Chip Radio

### Functions

- FM : Front end, low-pass filter, IF amp, quadrature detector, muting.
- AM : RF amp, detector.
- AM : AF driver (earphone driver).

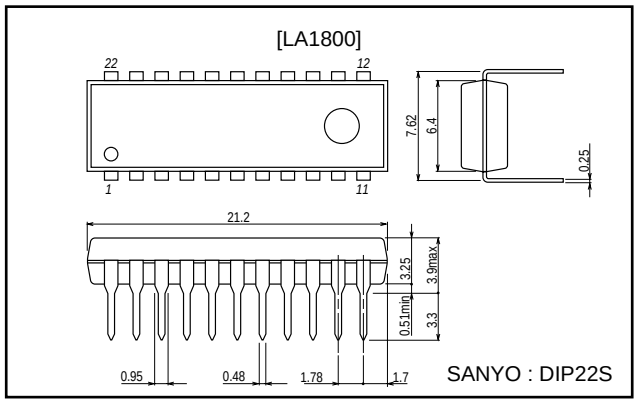
### Features

- Minimum number of external parts required : One tuning circuit each for FM, AM
- Low current dissipation : 5.6mA/FM, 3.2mA/AM
- Low-voltage operation : $V_{CC}$ min=2.5V

### Package Dimensions

unit : mm

**3059-DIP22S**




### Specifications

### Maximum Ratings at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Maximum supply voltage | $V_{CC}$ max | Pin 3 | 6.0 | V |
| Allowable power dissipation | Pd max | | 200 | mW |
| Operating temperature | Topr | | –20 to +70 | °C |
| Storage temperature | Tstg | | –40 to +125 | °C |

### Operating Conditions at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Recommended operating voltage | $V_{CC}$ | | 3.0 | V |
| Operating voltage range | $V_{CC}$ op | | 2.5 to 5.0 | V |

### Operating Characteristics at Ta=25°C, $V_{CC}$=3V, See Test Circuit

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| [AM] | | | | | | |
| Current drain | Icco | | | 3.6 | 5.5 | mA |
| Pin 2 voltage | $V_2$ | | 1.9 | 2.4 | 2.9 | V |
| Pin 14 voltage | $V_{14}$ | | 0.4 | 0.9 | 1.6 | V |
| Pin 21 voltage | $V_{21}$ | | 0.6 | 0.9 | 1.2 | V |
| [FM] | | | | | | |
| Current drain | Icco | | | 5.6 | 8.0 | mA |
| Pin 2 voltage | $V_2$ | | 1.9 | 2.6 | 2.9 | V |
| Pin 4 voltage | $V_4$ | | 1.7 | 2.3 | 2.9 | V |
| Pin 5 voltage | $V_5$ | | 1.7 | 2.3 | 2.9 | V |

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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Pin 6 voltage | $V_6$ | | 1.1 | 1.7 | 2.3 | V |
| Pin 7 voltage | $V_7$ | | 1.1 | 1.7 | 2.3 | V |
| Pin 8 voltage | $V_8$ | | 1.1 | 1.7 | 2.3 | V |
| Pin 9 voltage | $V_9$ | | 1.9 | 2.6 | 2.9 | V |
| Pin 10 voltage | $V_{10}$ | | 1.8 | 2.5 | 2.9 | V |
| Pin 13 voltage | $V_{13}$ | | | 0 | 0.6 | V |
| Pin 14 voltage | $V_{14}$ | | 0.5 | 1.0 | 1.7 | V |
| Pin 16 voltage | $V_{16}$ | | 1.6 | 2.3 | 2.9 | V |
| Pin 17 voltage | $V_{17}$ | | 1.6 | 2.3 | 2.9 | V |
| Pin 19 voltage | $V_{19}$ | | 0.6 | 0.86 | 14 | V |
| Pin 20 voltage | $V_{20}$ | | 0.6 | 0.86 | 14 | V |
| [AF] | | | | | | |
| Pin 11 current | $I_{11}$ | | 0.5 | 1.0 | 1.5 | mA |
| Pin 12 voltage | $V_{12}$ | | | 0 | 0.5 | V |

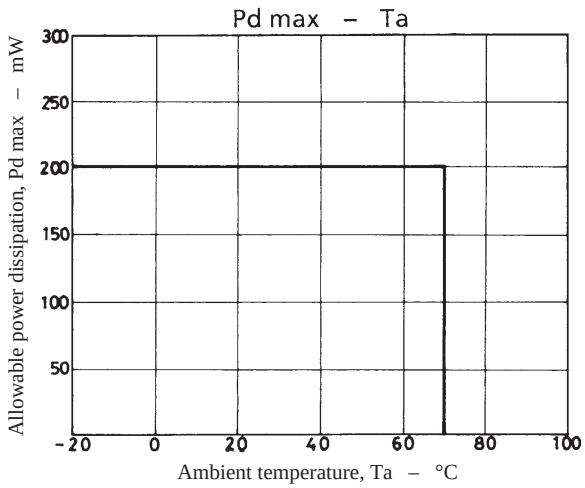
[Reference characteristics]

## Operating Characteristics at Ta=25°C, $V_{CC}$=3V, See Test Circuit 2

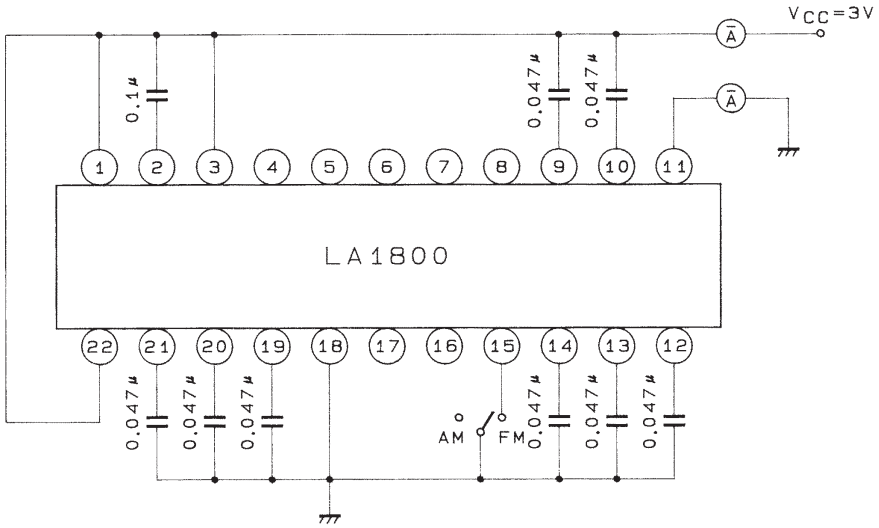
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| [AM : $f_C$=1MHz, $f_m$=400Hz] | | | | | | |
| Current drain | Icco | Quiescent | | 3.6 | | mA |
| Detection output | $V_O1$ | $V_{IN}$=40dBμ, 30% mod | | 10 | | mV |
| | $V_O2$ | $V_{IN}$=70dBμ, 30% mod | | 100 | | mV |
| Signal to noise ratio | S/N | $V_{IN}$=70dBμ, 30% mod | | 47 | | dB |
| [FM : $f_C$=90MHz, $f_m$=400Hz] | | | | | | |
| Current drain | Icco | Quiescent | | 5.6 | | mA |
| Input limiting sensitivity | –3dBL.S. | 3dB down, 30% mod | | 16 | | dBμ |
| Demodulation output | $V_O$ | $V_{IN}$=80dBμ, 30% mod | | 90 | | mV |
| Total harmonic distortion | THD | $V_{IN}$=80dBμ, 30% mod | | 0.8 | | % |
| Signal to noise ratio | S/N | $V_{IN}$=80dBμ | | 59 | | dB |
| [AF : $f_m$=400Hz] | | | | | | |
| Voltage gain | VG | $V_O$=50mV | | 24 | | dB |
| Total harmonic distortion | THD | $V_O$=50mV | | 0.3 | | % |

Note : 1. Current drain for FM, AM includes current of AF driver stage.

2. When handling the IC, be careful not to cause dielectric breakdown.

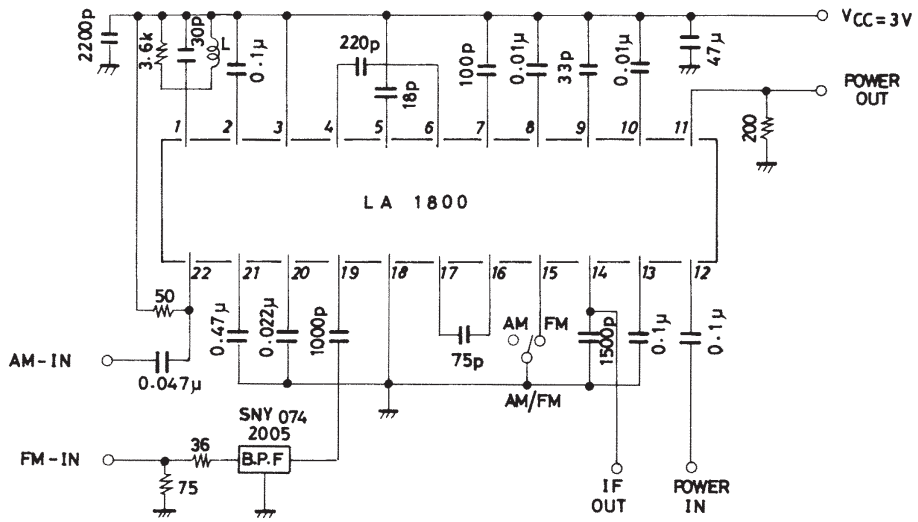


## DC Test Circuit



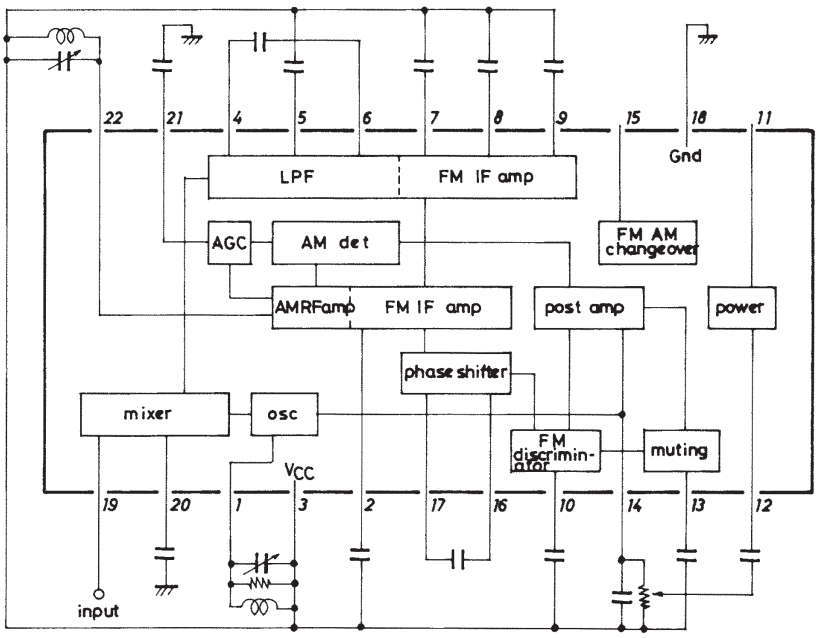

Unit (resistance : Ω, capacitance : F)

## AC Test Circuit

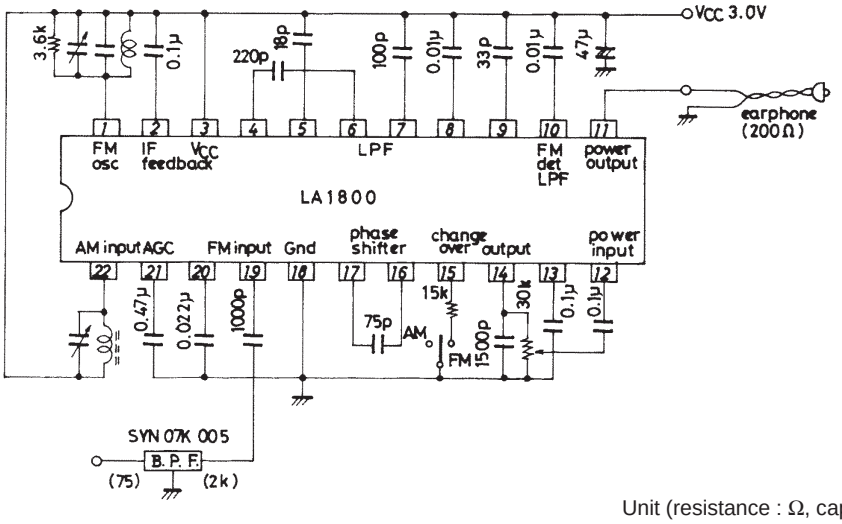



Unit (resistance : Ω, capacitance : F)

## Equivalent Circuit Block Diagram

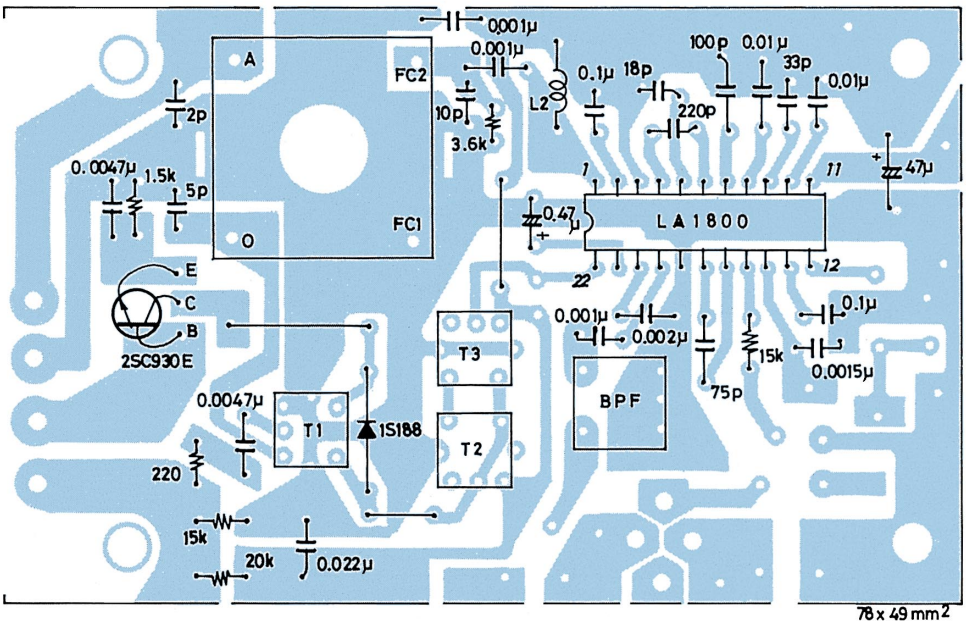


## Sample Application Circuit



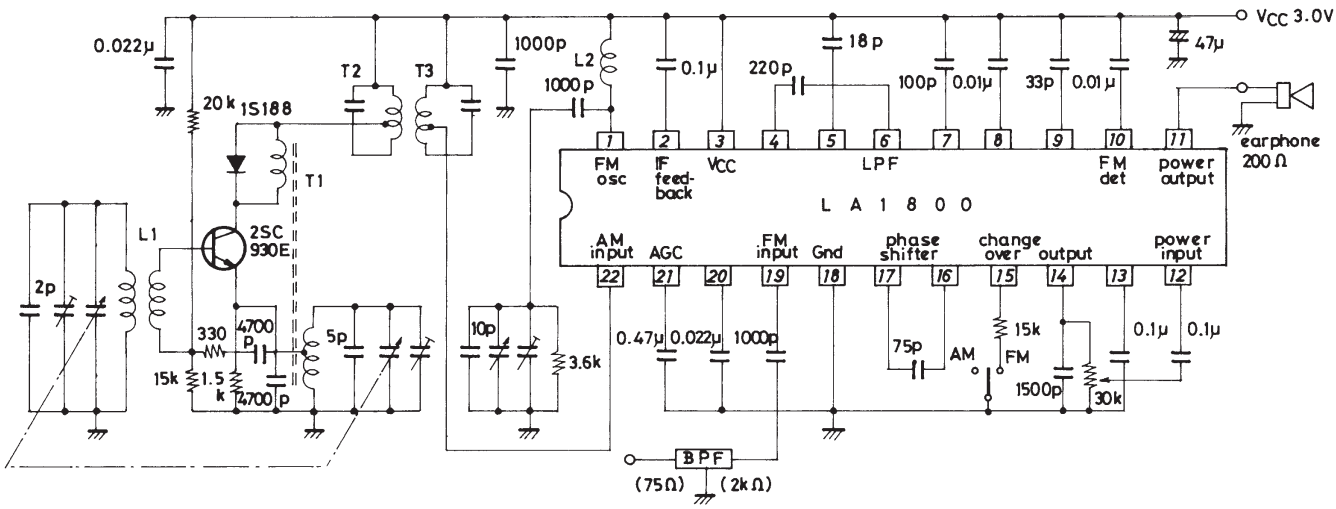

Unit (resistance : Ω, capacitance : F)

## Sample Printed Circuit Pattern (Cu-foiled side)



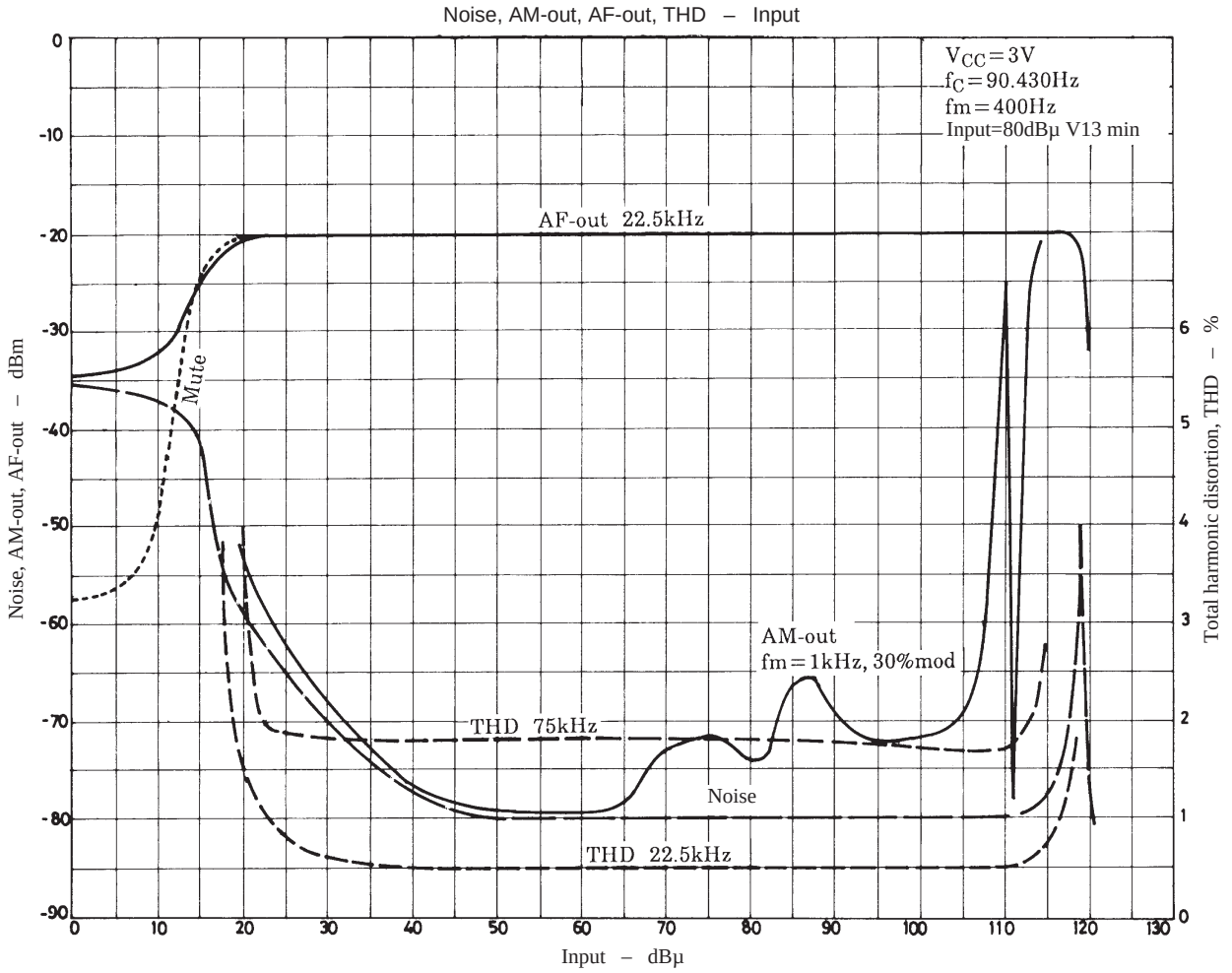

Unit (resistance : Ω, capacitance : F)

## MW Superheterodyne Use

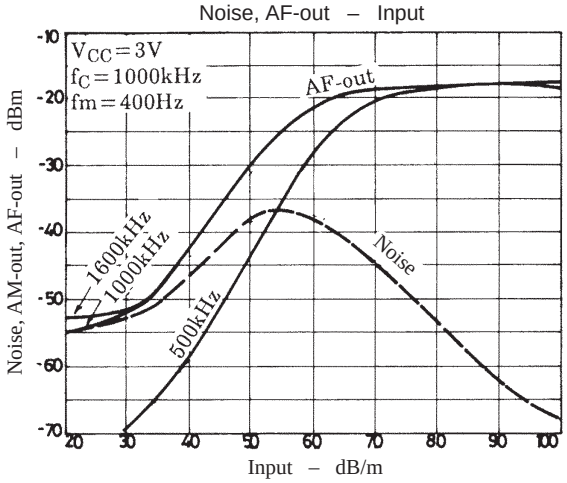



| | | |
|---|---|---|
| Variable capacitor | 2LXT-L | Mitsumi |
| L1 | HH-40947 | Mitsumi |
| T1 | HW-40217 | Mitsumi |
| T2 | HW-40194 | Mitsumi |
| T3 | HW-50005 | Mitsumi |
| B.P.F. | SNY-074-2005 | Sumida |

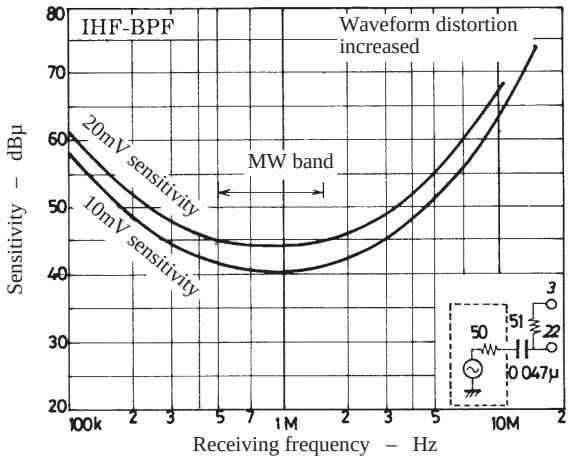
Unit (resistance : Ω, capacitance : F)



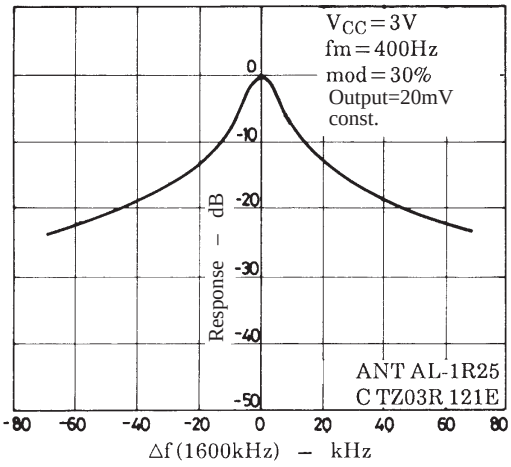
Noise, AF-out – Input



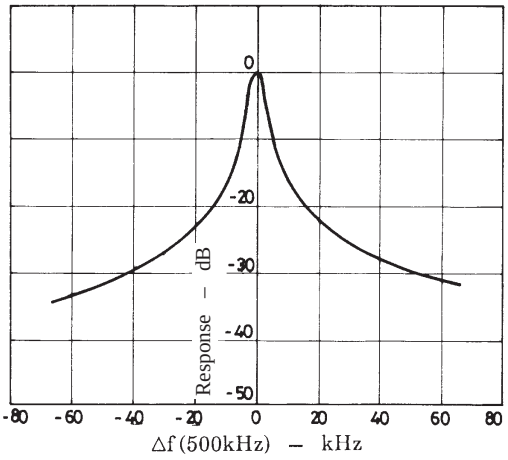

AM Band Characteristic



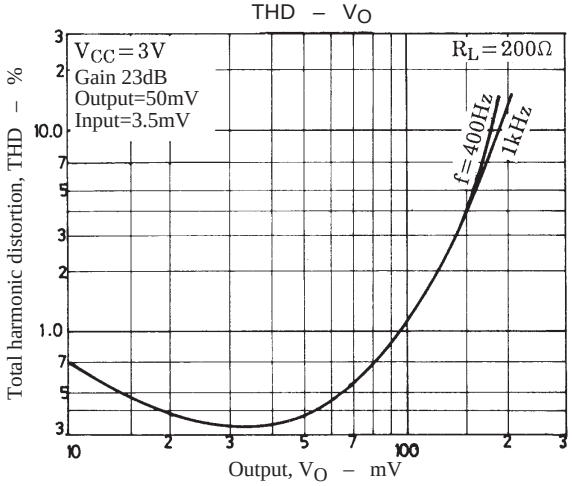

AM Selectivity



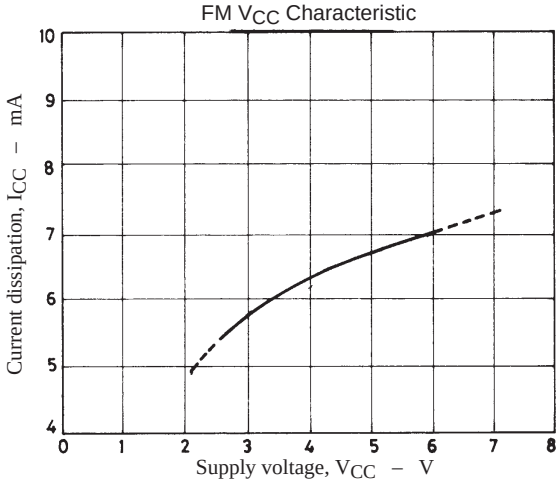

AM Selectivity



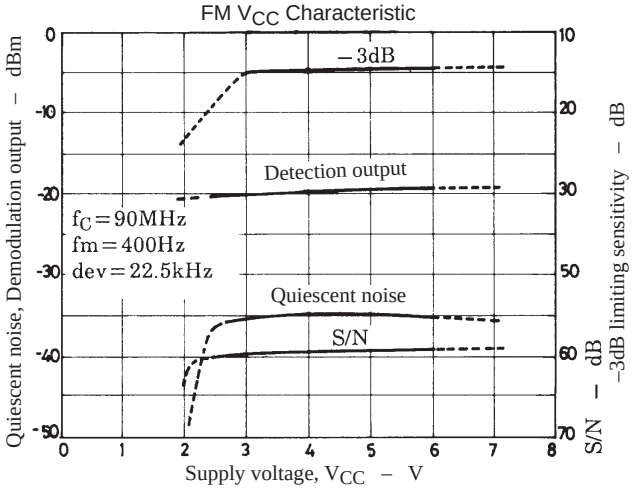

THD – $V_O$



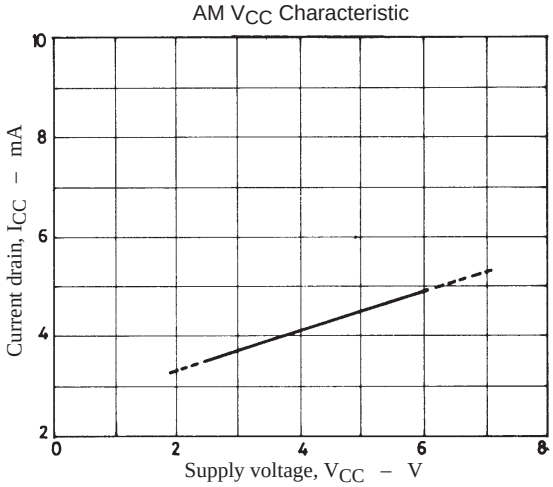

FM $V_{CC}$ Characteristic



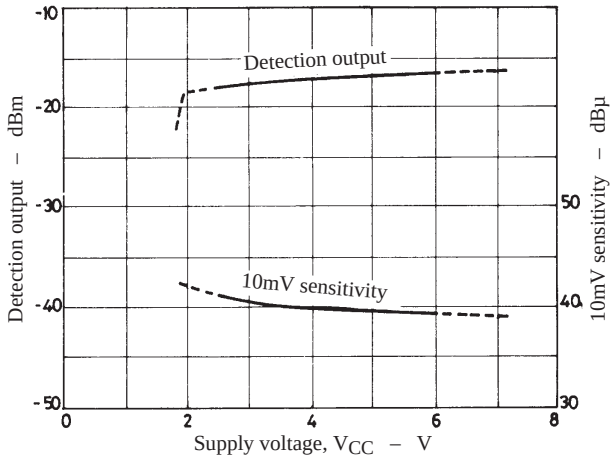

FM $V_{CC}$ Characteristic



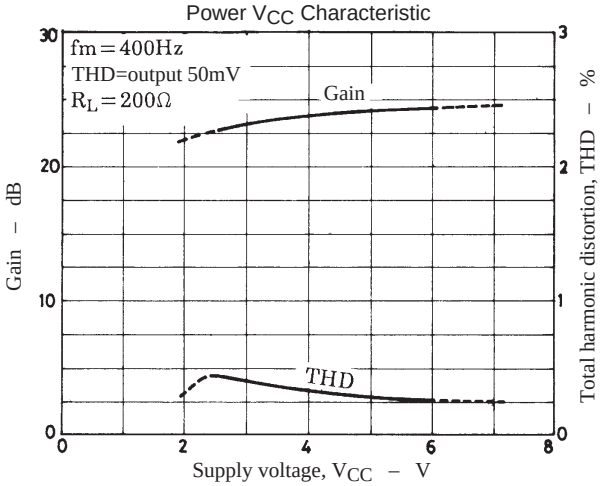

AM $V_{CC}$ Characteristic



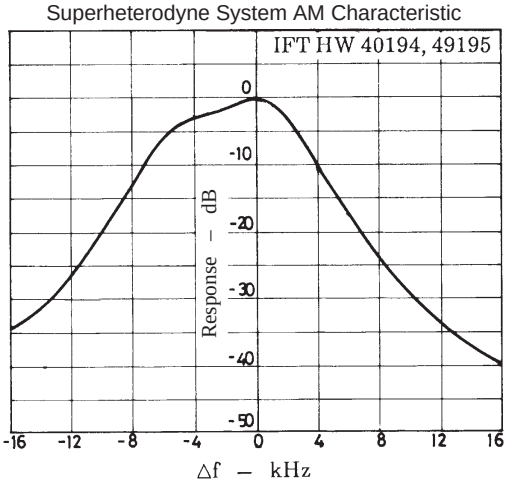
AM $V_{CC}$ Characteristic



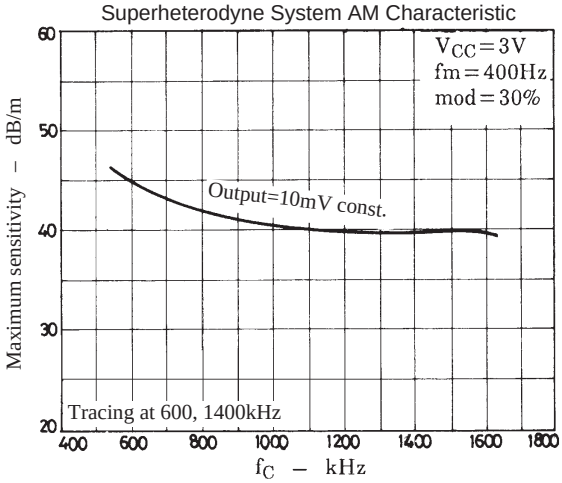

Power $V_{CC}$ Characteristic



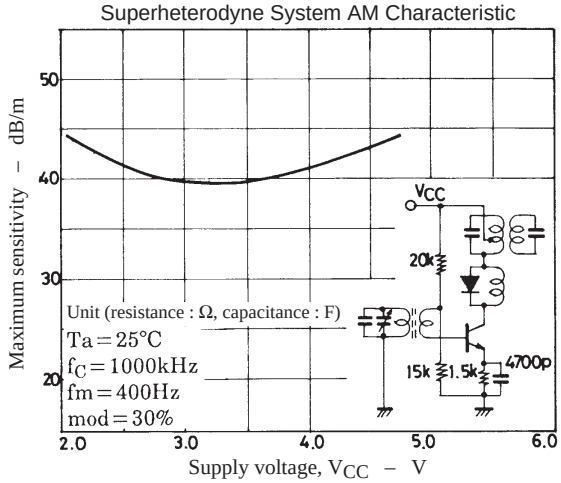

Superheterodyne System AM Characteristic




Superheterodyne System AM Characteristic




Superheterodyne System AM Characteristic



Superheterodyne System AM Characteristic