

图3 LA 1816测试电路

LA1875M AM/FM 立体声收音机电路

LA 1875M是一种电调谐 AM/FM 立体声收音机电路。AM 部分包含有：混频、本振、高放 AGC、天线阻尼衰减 AGC、中放、IF 缓冲输出、检波、AGC 急速充放电回路、信号表、调谐指示 LED；FM 部分包含有中放、鉴频、信号表、调谐指示 LED、IF 缓冲输出、静噪、FM 立体声解码，强制单声道、立体声指示 LED、立体声噪声切割和高频切割电路。LA 1875M 工作电源电压范围为 7 ~ 11V，推荐值为 8.5V，外形采用 36 脚双列扁平封装。

电参数 ($V_{CC} = 8.5V$, $T_A = 25^\circ C$)

| 参数 | 单位 | 测试条件 | 最小值 | 典型值 | 最大值 |
|--|---------------------------|--|-----|-----------|-----|
| FM部分: $f_c = 10.7MHz$, $f_m = 1$, $\Delta f = 75kHz$, $V_{IN} = 100dB\mu$, $L + R = 90\%$, $P = 10\%$ | | | | | |
| 静态电流 | I_0 (mA) | 无信号 | | 28 | |
| 鉴频输出 | V_O (mV) | $V_{IN} = 100dB\mu$ | | 270 | |
| 信噪比 | S/N (dB) | $V_{IN} = 100dB\mu$ | | 75 | |
| 限幅灵敏度 | $V_{IN(LIM)}$ (dB μ) | -3 dB, $V_{IN} = 100dB\mu$, 静噪通 | | 38 | |
| AM抑制比 | AMR (dB) | $V_{IN} = 100dB\mu$, AM = 1 kHz, 30% Mod | | 60 | |
| 信号表输出电压 | V_{SM} (V) | 无信号 | | 1.1 | |
| | | $V_{IN} = 100dB\mu$ | | 6.2 | |
| LED点灯电平 | $V_{L(ON)}$ (dB μ) | $V_{Z6} = 2V$ | | 60 | |
| LED点灯带宽 | BW (kHz) | $V_{IN} = 100dB\mu$, $V_{Z6} > 2V$ | | 170 | |
| IF缓冲输出电压 | V_{IF} (mV) | $V_{IN} = 80dB\mu$ | | 330 | |
| 捕捉范围 | CR (%) | $CR = (F - 456)/456 \times 100$ | | ± 1.2 | |
| 声道分离度 | Sep (dB) | $V_{IN} = 100dB\mu$, $L + R = 90\%$, $P = 10\%$ | | 45 | |
| 立体声LED点灯电平 | $V_{L(IST-ON)}$ (%) | $V_{IN} = 100dB\mu$ | | 3.0 | |
| 立体声LED灭灯电平 | $V_{L(IST-OFF)}$ (%) | $V_{IN} = 100dB\mu$ | | 2.2 | |
| VCO振荡 | f_F (kHz) | 无输入 | | 456 | |
| 谐波失真 | THD (%) | $V_{IN} = 100dB\mu$, 单声道 | | 0.1 | |
| | | $V_{IN} = 100dB\mu$, 立体声 | | 0.1 | |
| 声道平衡 | CB (dB) | | | 0 | |
| SNC输出电压 | V_{O-SUB} (mV) | $V_{IN} = 100dB\mu$, $L - R = 90\%$, $P = 10\%$, $V_{Z4} = 0.1V$ | | 0.2 | |
| HCC输出衰减 | $A_{TT(HCC)}$ (dB) | $V_{IN} = 100dB\mu$, $L - R = 90\%$, $P = 10\%$, $V_{Z3} = 0.6V$, $f_m = 10kHz$ | | -5.0 | |
| AM部分: $f_o = 1MHz$, $f_m = 1kHz$, 30% Mod | | | | | |
| 静态电流 | I_0 (mA) | | | 25 | |
| 检波输出 | V_O (mV) | $V_{IN} = 25dB\mu$ | | 20 | |
| | | $V_{IN} = 74dB\mu$ | | 100 | |
| 信噪比 | S/N (dB) | $V_{IN} = 25dB\mu$ | | 20 | |
| | | $V_{IN} = 74dB\mu$ | | 50 | |
| 谐波失真 | THD (%) | $V_{IN} = 74dB\mu$ | | 0.5 | |
| | | $V_{IN} = 130dB\mu$ | | 0.5 | |
| LED点灯电平 | $V_{L(ON)}$ (dB μ) | $V_{Z6} = 2V$ | | 30 | |
| IF缓冲输出电压 | V_{IF} (mV) | $V_{IN} = 50dB\mu$ | | 200 | |
| 信号表输出电压 | V_{SM} (V) | 无输入 | | 0.85 | |
| | | $V_{IN} = 74dB\mu$ | | 3.33 | |

外形图、方框图及应用电路

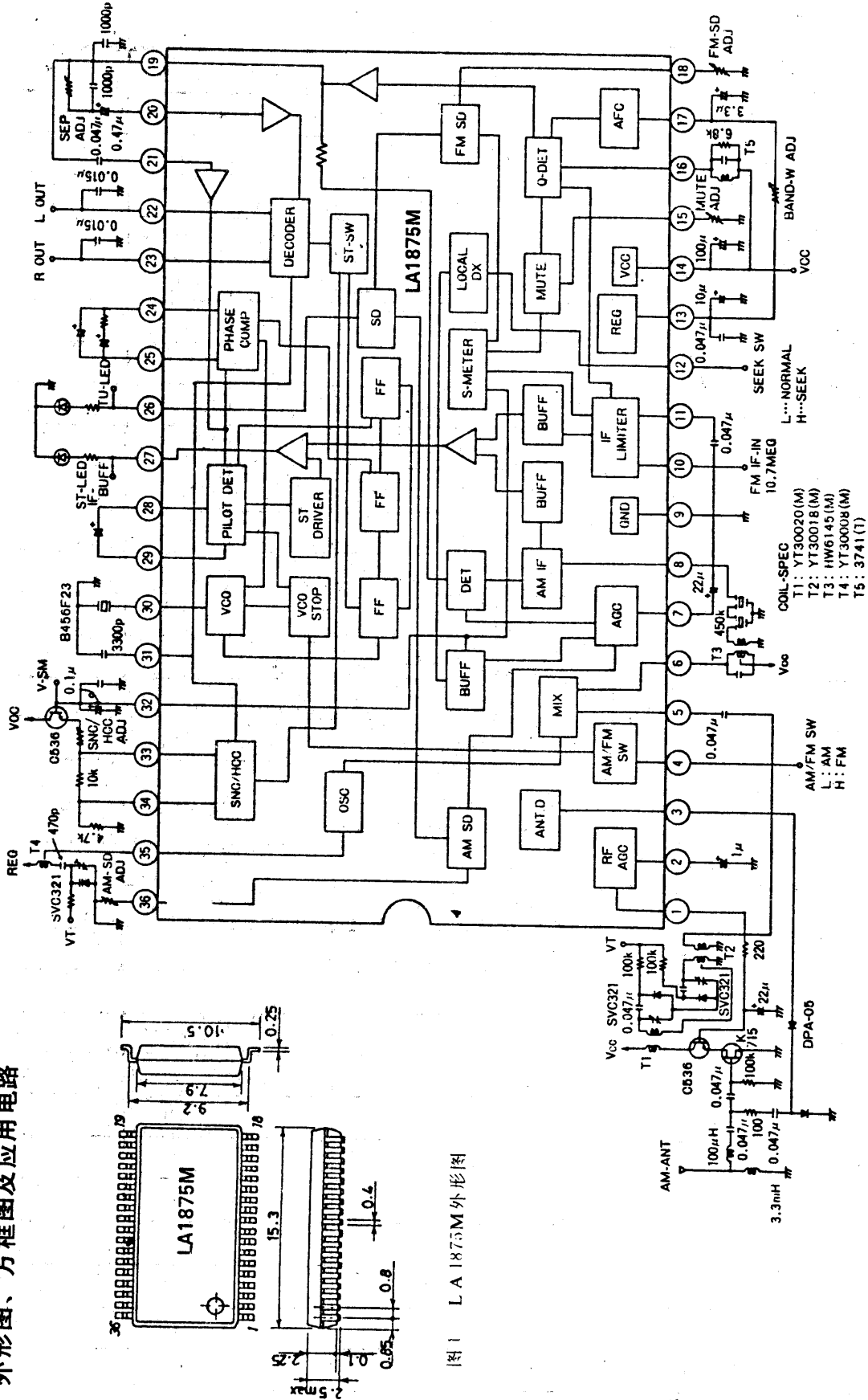


图 2 LA1875M 内部方框图

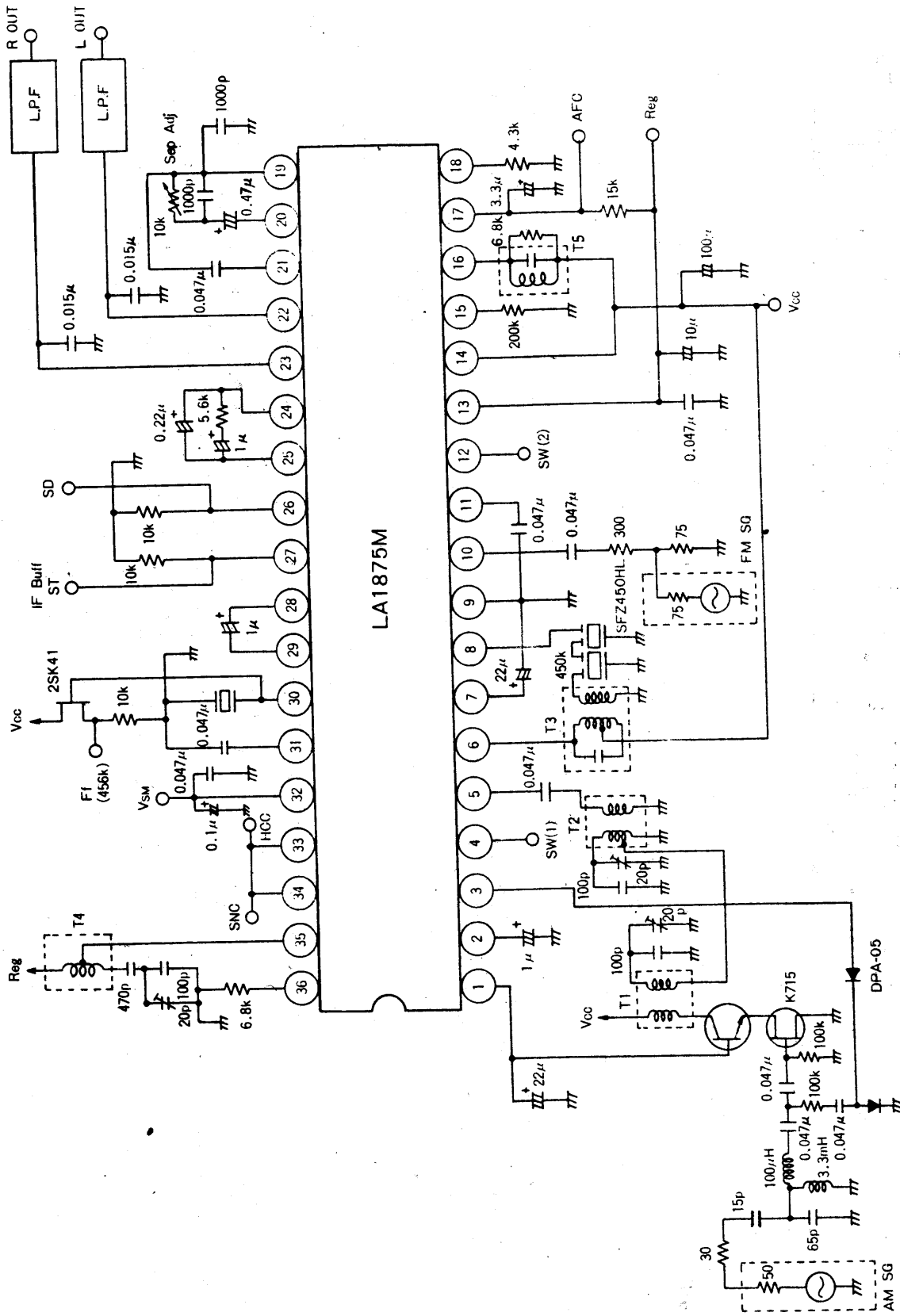


图3 LA 1875M测试电路

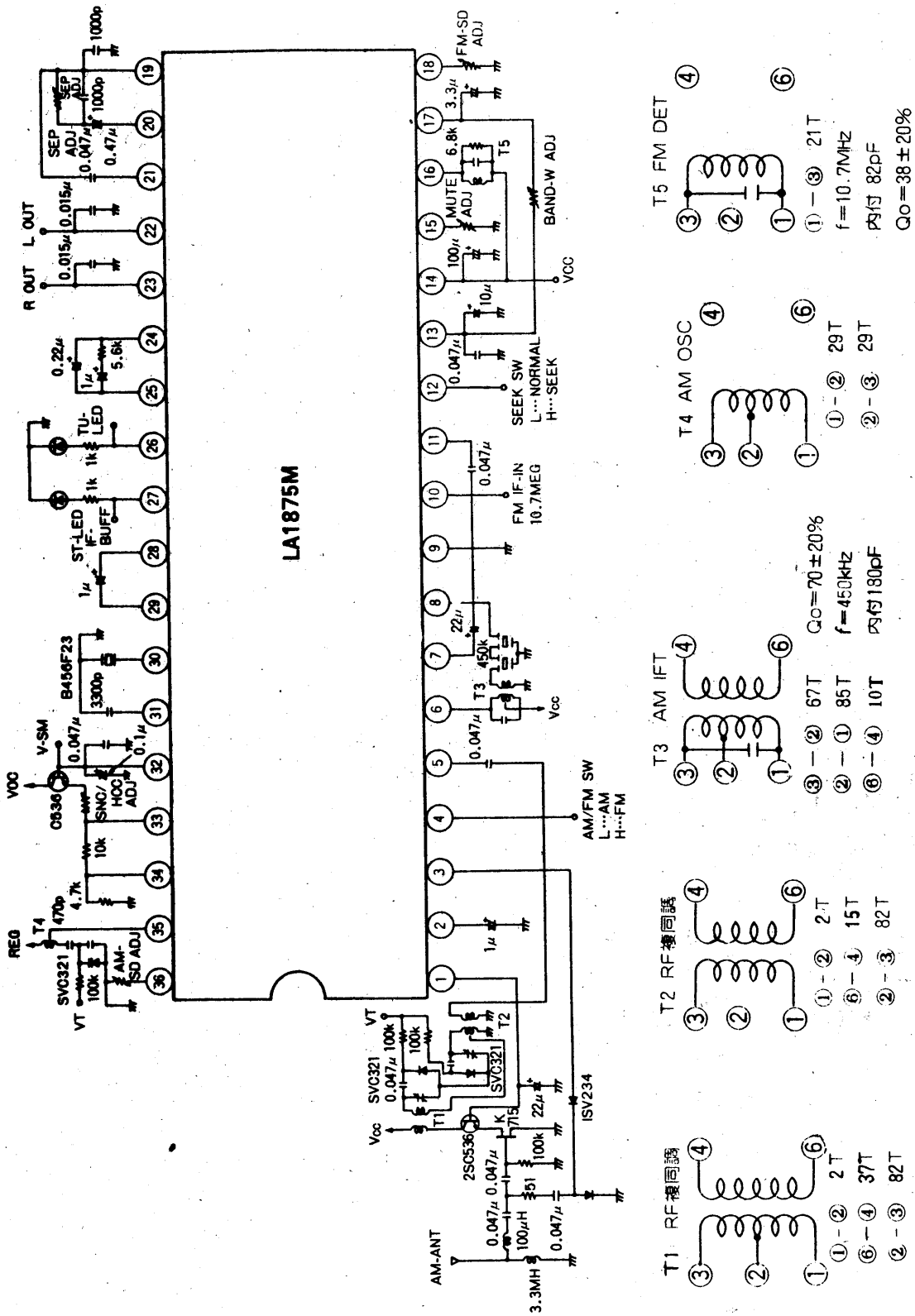
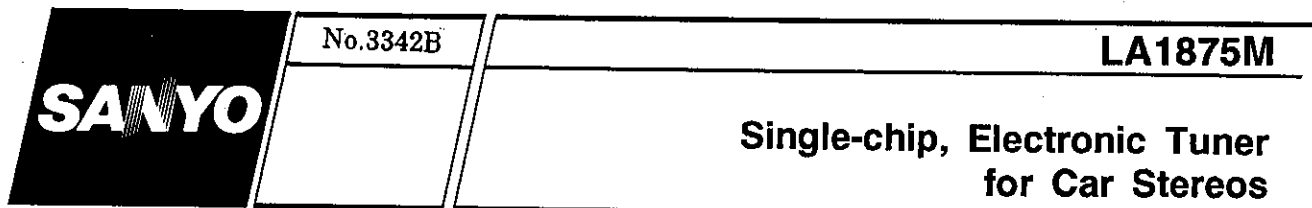


图 1 LA1875M 应用电路



OVERVIEW

The LA1875M is an electronic tuner IC that incorporates AM, FM IF and MPX circuit sections on a single chip, making it ideal for use in car stereo equipment.

The LA1875M features an antenna-damping AM AGC circuit with rapid charge and discharge characteristics. It also features an S-meter driver, tuning and FM-stereo LED outputs, FM soft-mute and forced-mono modes and a no-adjustment MPX VCO.

The LA1875M AM circuit comprises a mixer, oscillator, RF AGC, IF amplifier and IF buffer. The FM IF circuit comprises an IF amplifier, quadrature detector, and AFC and IF buffer outputs. The MPX circuit comprises a VCO and stereo noise control (SNC) and high-cut control (HCC) circuits.

The LA1875M operates from a 7 to 10 V supply and is available in 36-pin MFPs.

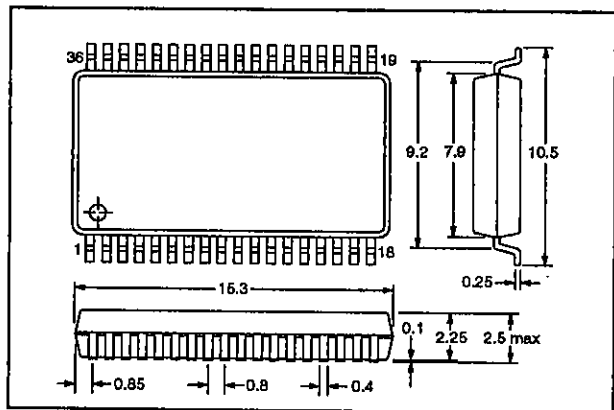
FEATURES

- AM, FM IF and MPX circuits
- Antenna-damping AM AGC circuit with rapid charge and discharge characteristics
- S-meter driver
- Tuning and FM-stereo LED outputs
- AFC and IF buffer outputs
- AM mixer, oscillator, AGC, IF amplifier and IF buffer
- FM IF amplifier, quadrature detector
- MPX no-adjustment VCO, SNC and HCC
- FM soft-mute and forced-mono modes
- 7 to 10 V supply
- 36-pin MFP

PACKAGE DIMENSIONS

Unit: mm

3129-MFP36S



SPECIFICATIONS

Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|-----------|------------|------------------|
| Supply voltage | V_{CC} | 11 | V |
| Power dissipation ($T_a \leq 50\text{ }^\circ\text{C}$) | P_D | 720 | mW |
| Operating temperature range | T_{opr} | -30 to 80 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -40 to 150 | $^\circ\text{C}$ |

Recommended Operating Conditions

$T_a = 25\text{ }^\circ\text{C}$

| Parameter | Symbol | Rating | Unit |
|----------------------|----------|---------|------|
| Supply voltage | V_{CC} | 8.5 | V |
| Supply voltage range | V_{CC} | 7 to 10 | V |

Electrical Characteristics

FM characteristics

$V_{CC} = 8.5\text{ V}$, $T_a = 25\text{ }^\circ\text{C}$, $f_c = 10.7\text{ MHz}$, $f_m = 1\text{ kHz}$, 75 kHz deviation unless otherwise noted

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|------------|--|--------|------|------|----------|
| | | | min | typ | max | |
| Quiescent supply current | I_{CCQ} | No signal | 21 | 31 | 41 | mA |
| -3 dB limiting sensitivity | -3dBLS | Referred to $V_1 = 100\text{ dB}\mu$. Mute is ON. | 27 | 37 | 47 | dB μ |
| Tuning LED turn-on input voltage | V_{LED} | $V_{26} = 2\text{ V}$ | 43 | 58 | 73 | dB μ |
| Detector output voltage | V_O | $V_1 = 100\text{ dB}\mu$ | 165 | 250 | 345 | mV |
| S-meter output voltage | V_{SM} | No signal | 0 | 0.15 | 0.7 | V |
| | | $V_1 = 100\text{ dB}\mu$ | 5.0 | 6.1 | 7.0 | |
| IF buffer output voltage | V_{IF} | $V_1 = 80\text{ dB}\mu$, $V_{12} = 5\text{ V}$ | 200 | 360 | 540 | mV |
| SNC output voltage | V_{SUB} | $V_1 = 100\text{ dB}\mu$, $V_{34} = 0.1\text{ V}$. See note. | - | 0.5 | 5.0 | mV |
| Tuning LED turn-on bandwidth | BW_{LED} | $V_1 = 100\text{ dB}\mu$, $V_{26} \geq 2\text{ V}$ | 85 | 130 | 180 | kHz |
| Signal-to-noise ratio | S/N | $V_1 = 100\text{ dB}\mu$ | 66 | 74 | - | dB |
| AM suppression ratio | AMR | $V_1 = 100\text{ dB}\mu$ at 1 kHz with 30% AM modulation | 38 | 60 | - | dB |
| Separation | Sep | $V_1 = 100\text{ dB}\mu$. See note. | 30 | 45 | - | dB |
| Channel balance | CB | | -1.5 | 0 | 1.5 | dB |
| HCC output attenuation | α | $V_1 = 100\text{ dB}\mu$, $V_{33} = 0.6\text{ V}$, $f_m = 10\text{ kHz}$. See note. | -10.0 | -5.0 | -0.5 | dB |
| Stereo LED turn-on pilot tone modulation | LED-ON | $V_1 = 100\text{ dB}\mu$ | 1.8 | 3.2 | 5.0 | % |
| Stereo LED turn-off pilot tone modulation | LED-OFF | $V_1 = 100\text{ dB}\mu$ | - | 2.2 | - | % |

| Parameter | Symbol | Condition | Rating | | | Unit |
|---------------------------|--------|---|--------|-----|-----|------|
| | | | min | typ | max | |
| Total harmonic distortion | THD | $V_1 = 100 \text{ dB}\mu$, mono signal | - | 0.5 | 2.5 | % |
| | | $V_1 = 100 \text{ dB}\mu$, main channel signal | - | 0.5 | 2.5 | |

Note

V_1 comprises 90% left + right signal and 10% pilot signal.

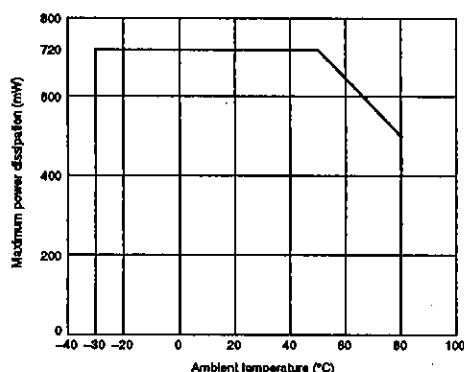
AM characteristics

$V_{CC} = 8.5 \text{ V}$, $T_a = 25 \text{ }^\circ\text{C}$, $f_c = 1 \text{ MHz}$, $f_m = 1 \text{ kHz}$ with 30% modulation

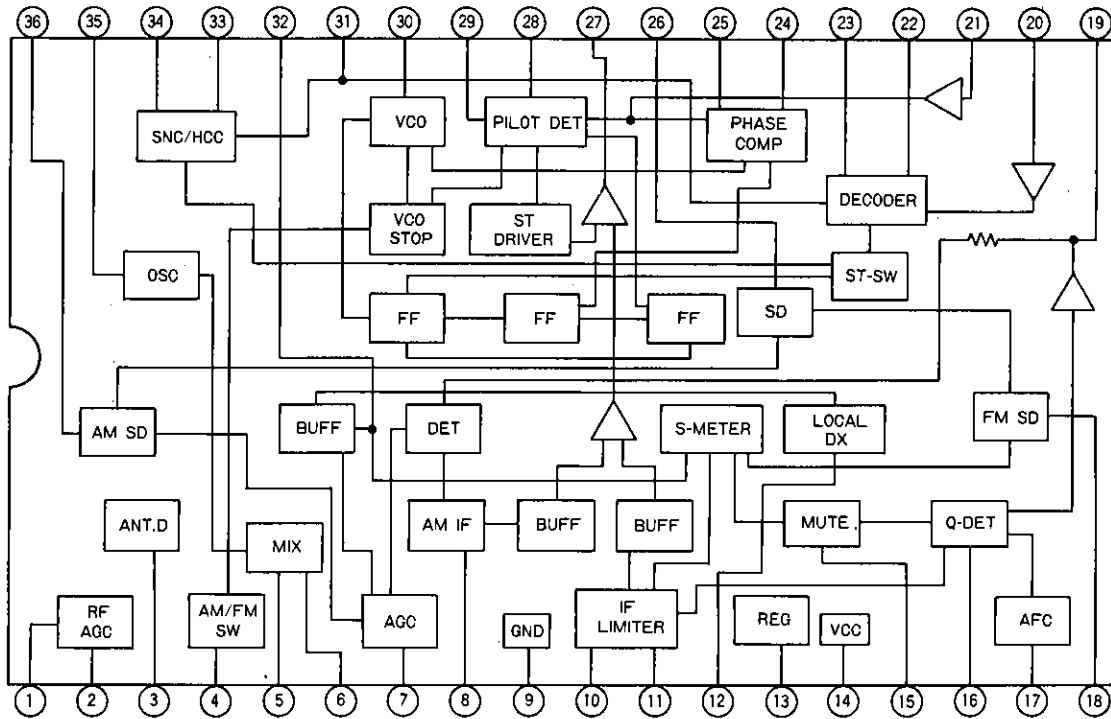
| Parameter | Symbol | Condition | Rating | | | Unit |
|----------------------------------|------------|---|--------|------|-----|----------------|
| | | | min | typ | max | |
| Quiescent supply current | I_{CCO} | No signal | 15 | 24 | 33 | mA |
| Tuning LED turn-on input voltage | V_{LED} | $V_{26} = 2 \text{ V}$ | 21 | 30 | 39 | $\text{dB}\mu$ |
| RF AGC turn-on input voltage | V_{AGC} | $V_1 = 3 \text{ V}$ | 50 | 57 | 64 | $\text{dB}\mu$ |
| Detector output voltage | V_O | $V_1 = 25 \text{ dB}\mu$ | 18 | 40 | 68 | mV |
| | | $V_1 = 74 \text{ dB}\mu$ | 70 | 105 | 156 | |
| IF buffer output voltage | V_{IF} | $V_1 = 50 \text{ dB}\mu$, $V_{12} = 5 \text{ V}$ | 150 | 260 | 390 | mV |
| S-meter output voltage | V_{SM} | No signal | 0 | 0.7 | 1.3 | V |
| | | $V_1 = 74 \text{ dB}\mu$ | 2.6 | 3.7 | 5.2 | |
| Pin-diode driver current | I_{antd} | $V_1 = 0.7 \text{ V}$ | 2.0 | 2.5 | 3.0 | mA |
| Signal-to-noise ratio | S/N | $V_1 = 25 \text{ dB}\mu$ | 17 | 21 | - | dB |
| | | $V_1 = 74 \text{ dB}\mu$ | 42 | 49 | - | |
| Total harmonic distortion | THD | $V_1 = 74 \text{ dB}\mu$ | - | 0.35 | 1.0 | % |
| | | $V_1 = 130 \text{ dB}\mu$ | - | 0.4 | 2.0 | |

Typical Performance Characteristics

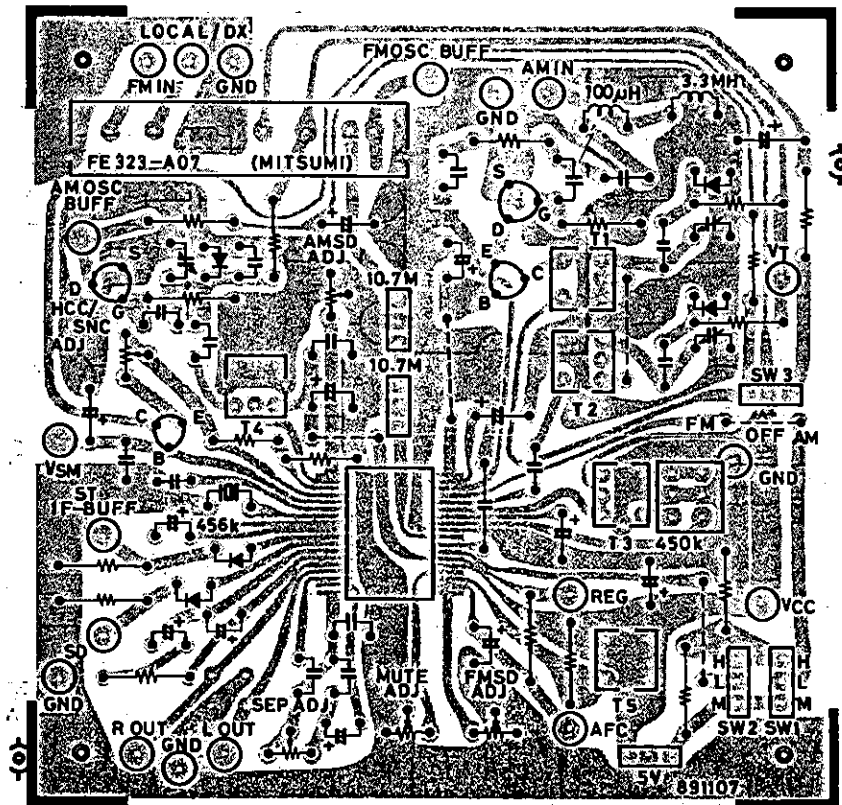
Maximum power dissipation vs. ambient temperature



Block Diagram

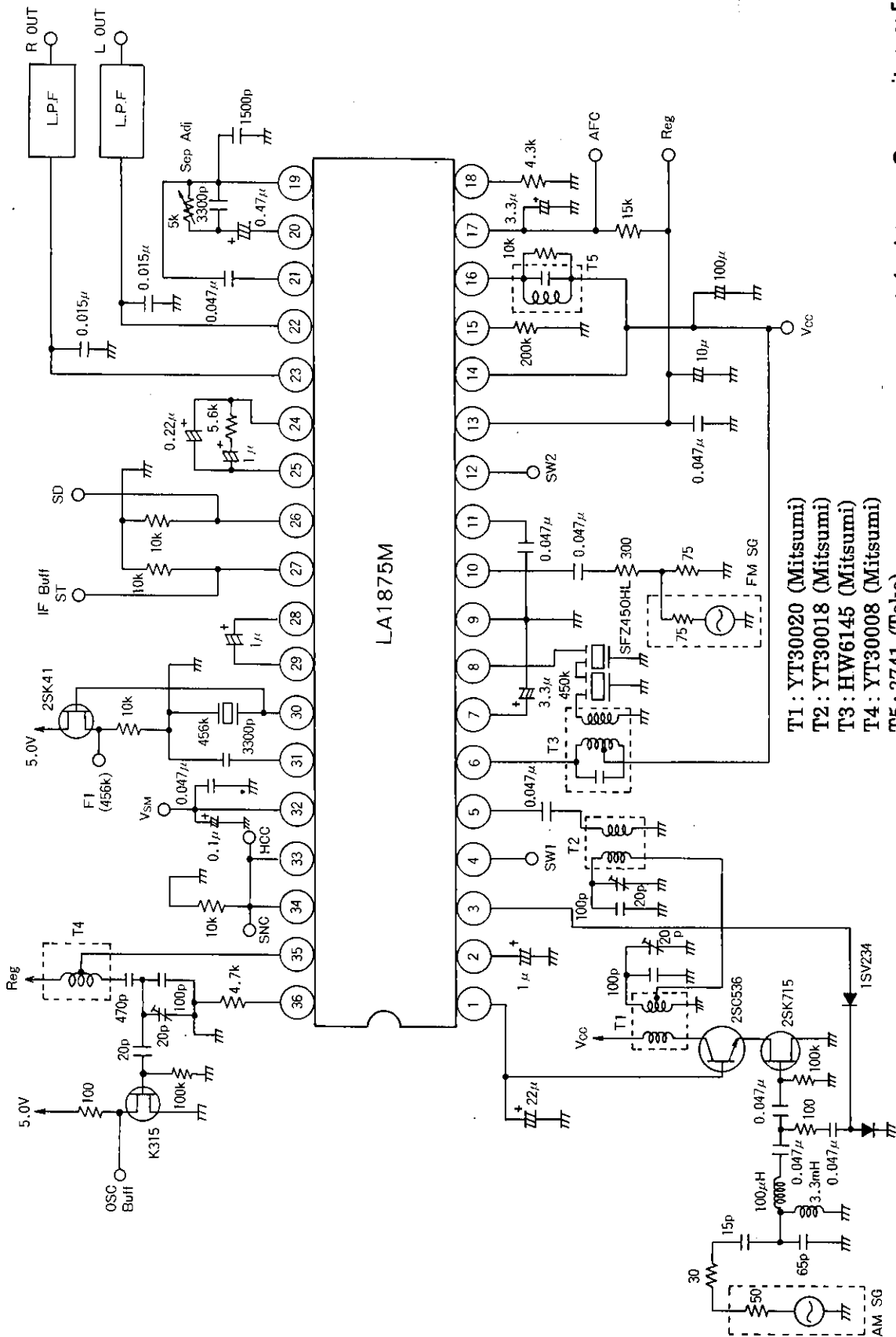


Sample Printed Circuit Pattern



Cu-foiled area 90×90mm²

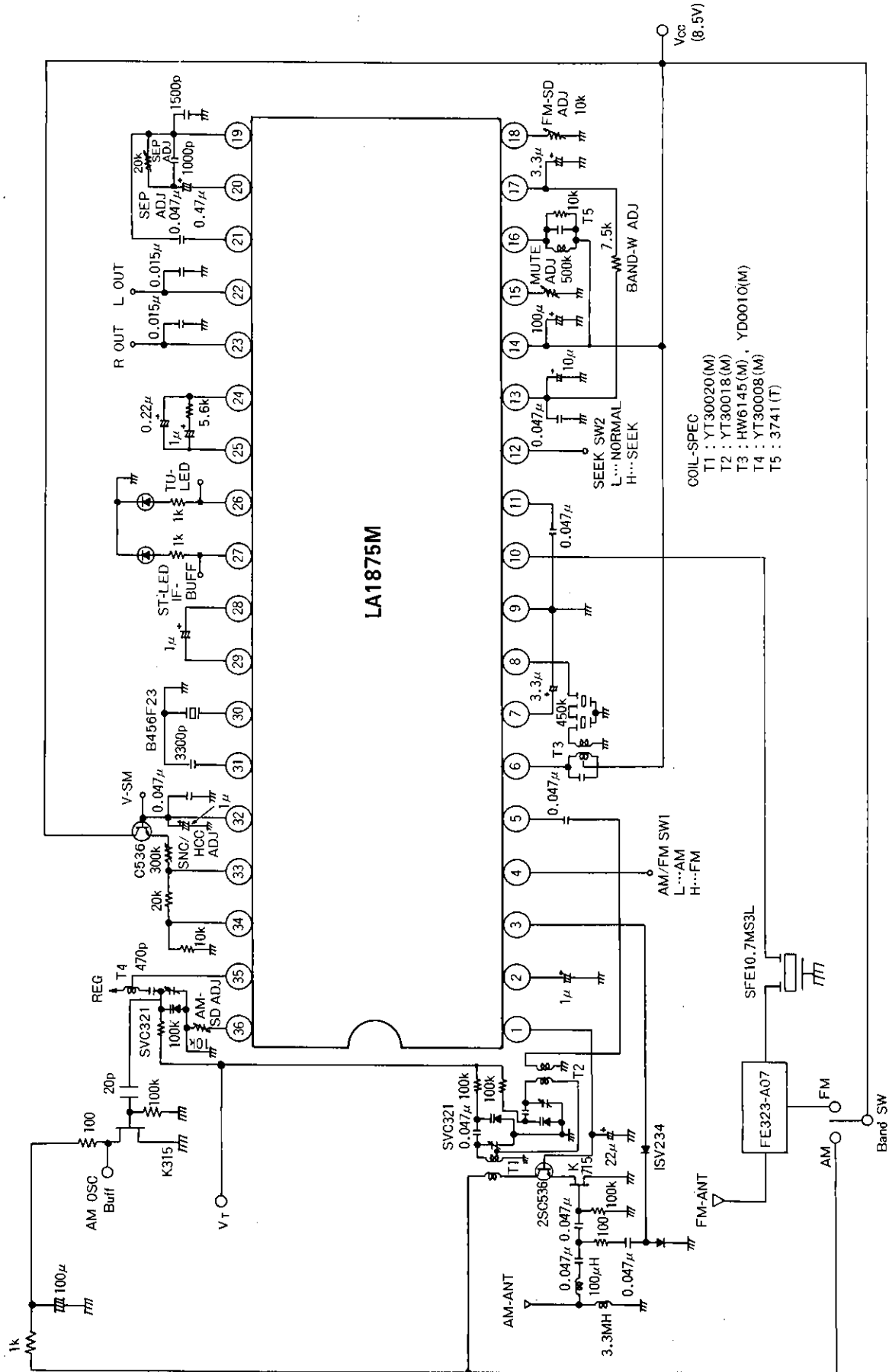
Specified Test Circuit



- T1: YT30020 (Mitsumi)
- T2: YT30018 (Mitsumi)
- T3: HW6145 (Mitsumi)
- T4: YT30008 (Mitsumi)
- T5: 3741 (Toko)
- Ceralock B456F23 (Murata)

Unit (resistance: Ω, capacitance: F)

Sample Application Circuit

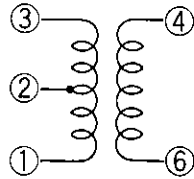


- COIL-SPEC
 T1 : YT30020(M)
 T2 : YT30018(M)
 T3 : HW6145(M), YD0010(M)
 T4 : YT30008(M)
 T5 : 3741(T)

Unit (resistance: Ω, capacitance: F)

LA1875M Coil Specifications

T1 RF double tuning coil (Primary)

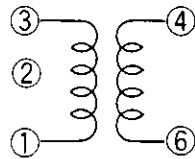


$L1 - 3 = 224\mu\text{H}$

YT-30020 (Mitsumi)

- ① - ② 2T
- ⑥ - ④ 37T
- ② - ③ 82T

T2 RF double tuning coil (Secondary)

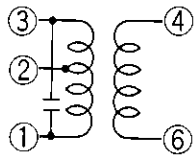


$L1 - 3 = 224\mu\text{H}$

YT-30018 (Mitsumi)

- ① - ② 2T
- ⑥ - ④ 15T
- ② - ③ 82T

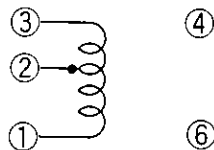
T3 AM IFT Coil (Matching Coil for SFZ 450 HL3)



HW-6145 (Mitsumi)

- ③ - ② 67T $Q_0 = 70 \pm 20\%$
- ② - ① 85T $f = 450\text{kHz}$
- ⑥ - ④ 10T internal 180pF

T4 AM OSC Coil

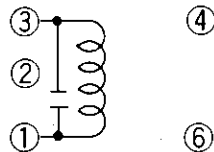


$L1 - 3 = 118\mu\text{H}$

YT-30008 (Mitsumi)

- ① - ② 29T
- ② - ③ 29T

T5 FM DET Coil

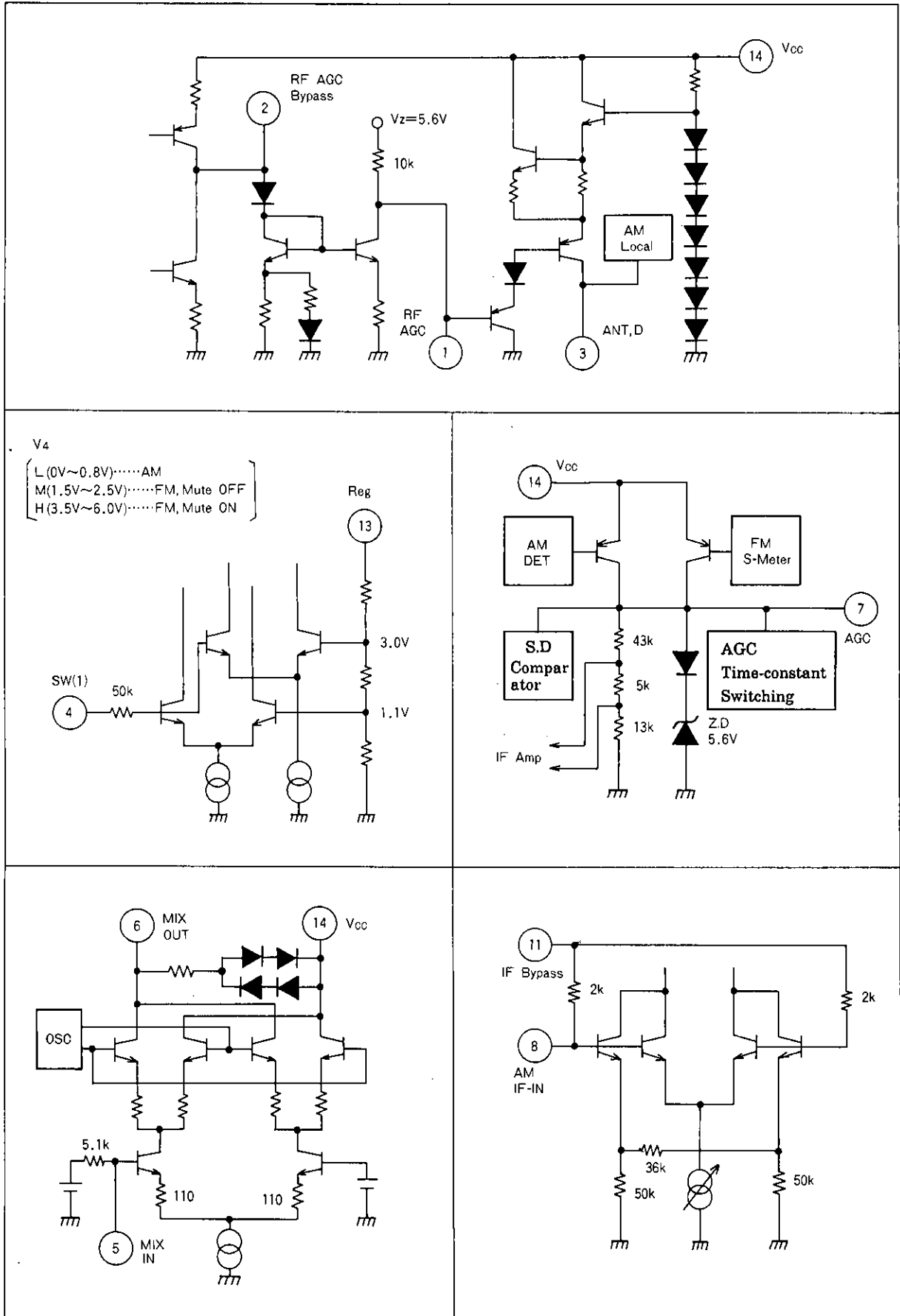


292TEAS-3741Z (Toko)

- ① - ③ 21T
- $f = 10.7\text{MHz}$
- internal 82pF
- $Q_0 = 38 \pm 20\%$

IC Internal Equivalent Circuit Diagrams

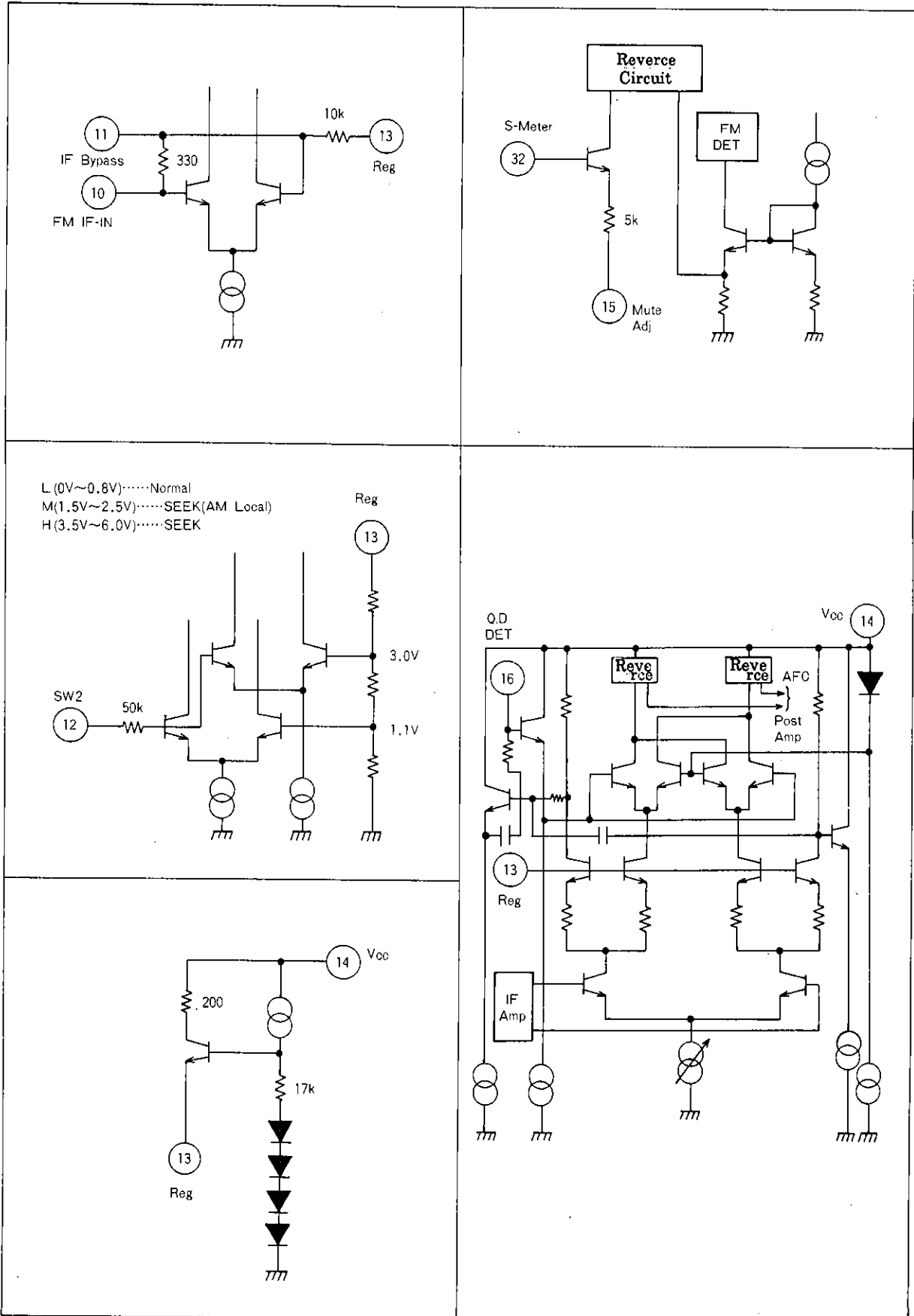
Unit (resistance: Ω)



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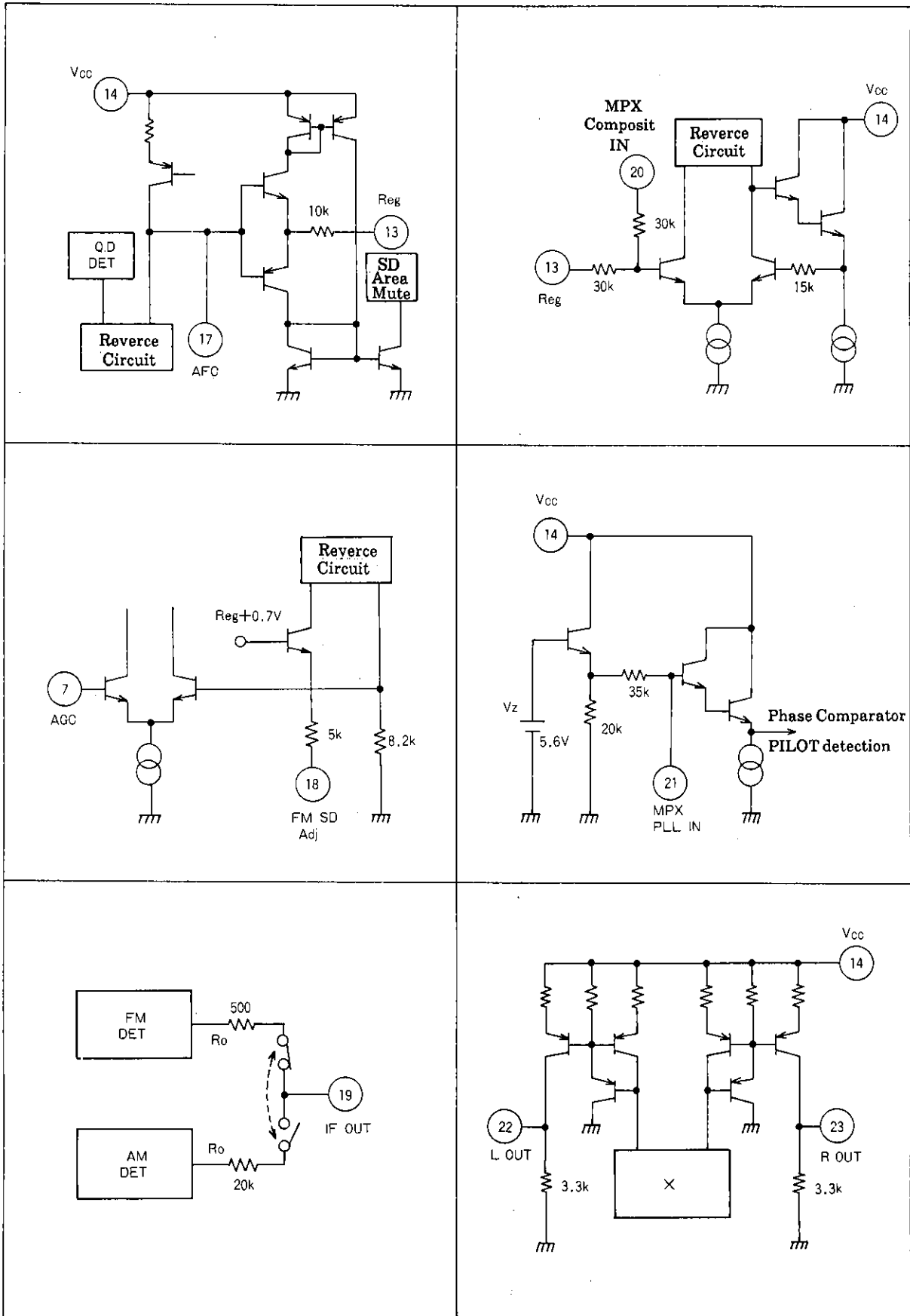
Unit (resistance: Ω)



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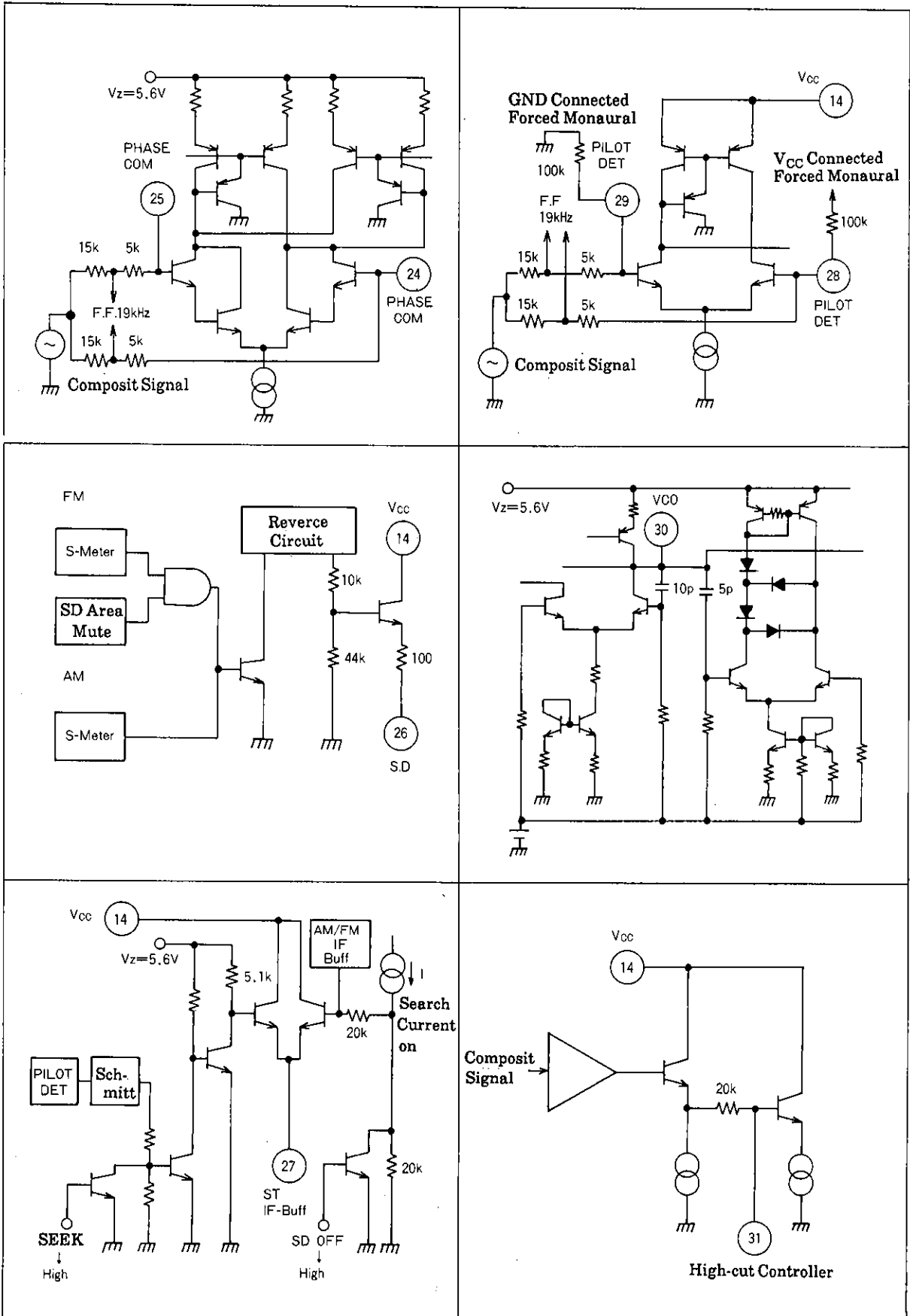
Unit (resistance: Ω)



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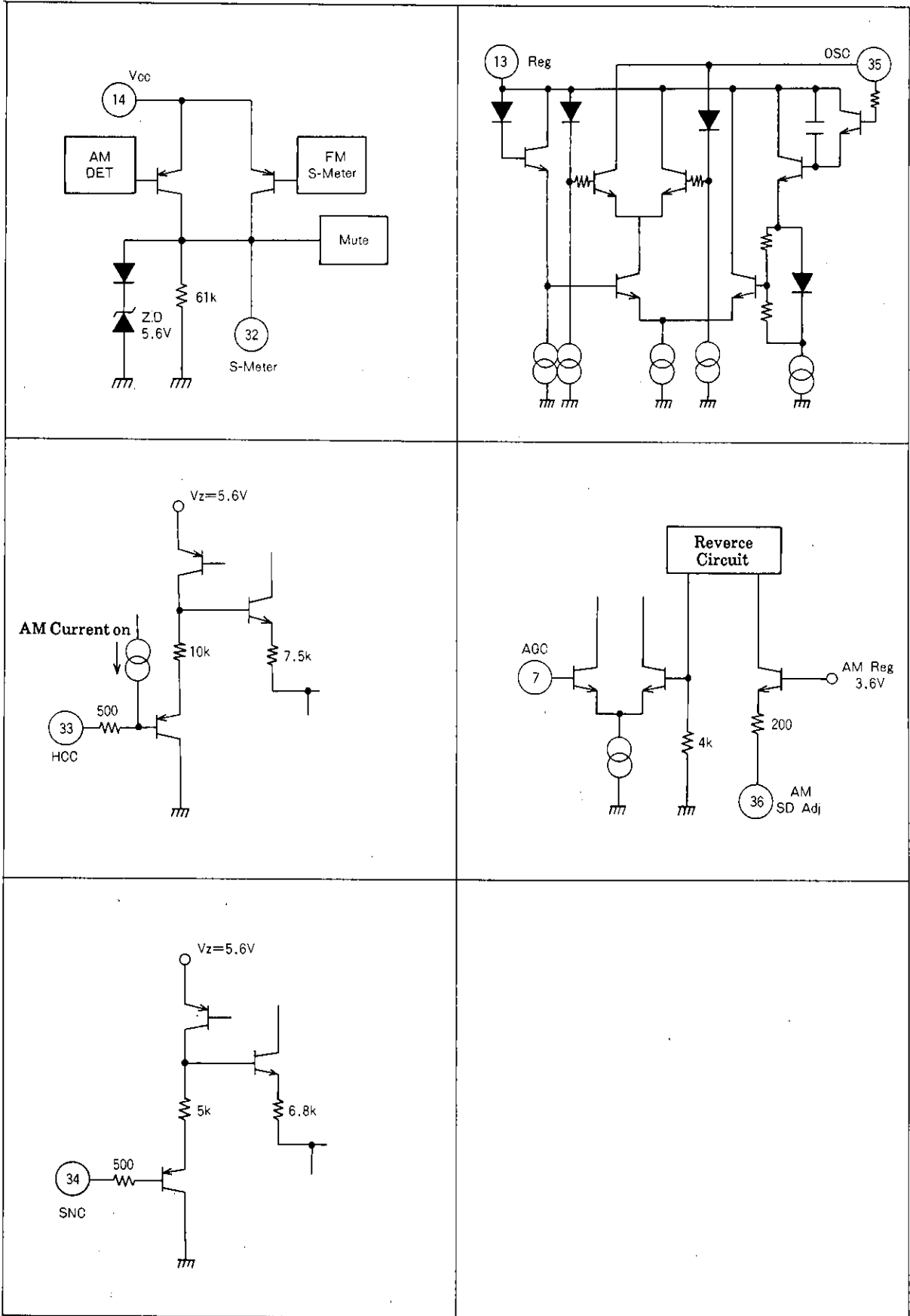
Unit (resistance: Ω)



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Unit (resistance: Ω)



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