

FM IF SYSTEM FOR CAR STEREO

The KA22441 is a monolithic integrated circuit consisting of FM IF system suitable for use in car stereo and music centers.

It features practically all of the functions for use a FM tuner, including AGC output, AFC output, level meter output in a single package.

FUNCTIONS

- FM IF amplifier.
- Quadrature detector.
- AFC output.
- AGC output.
- Level meter output.
- Muting for weak signal.
- Muting for detuned condition.

FEATURES

- Soft muting function.
- Variable muting maximum attenuation.
- Variable muting attack input signal.
- Variable muting slope with respect to input signal level.
- Level meter output.
- AFC output.
- AGC output.
- High sensitivity ($V_{i(LIM)} = 25\text{dB}\mu$: Typ).
- High output level.
- Good S/N ratio (78dB: Typ).
- Low distortion (0.05%: Typ).
- Wide operating supply voltage range: $V_{CC} = 6\text{V} \sim 14\text{V}$

BLOCK DIAGRAM

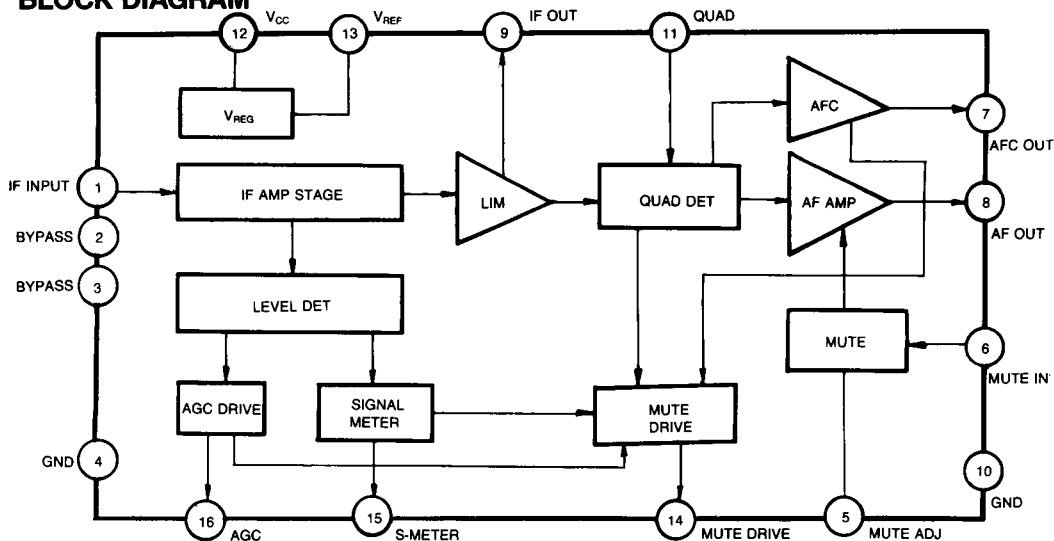
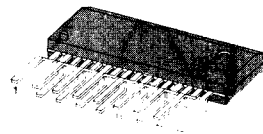


Fig. 1

16 ZSIP



ORDERING INFORMATION

| Device | Package | Operating Temperature |
|---------|---------|-----------------------|
| KA22441 | 16 ZSIP | -20°C ~ +70°C |

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

| Characteristic | Symbol | Value | Unit |
|-----------------------|-----------|------------|------------------|
| Supply Voltage | V_{CC} | 16 | V |
| Power Dissipation | P_D | 640 | mW |
| Operating Temperature | T_{OPR} | -20 ~ +70 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | -40 ~ +125 | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS

($T_a = 25^\circ\text{C}$, $V_{CC} = 8\text{V}$, $\Delta f = \pm 75\text{KHz}$, $V_i = 100\text{dB}\mu$, $f_m = 400\text{Hz}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------------------------|--------------|---|-----|------|-----|----------------|
| Supply Voltage | V_{CC} | | 6 | 8 | 14 | V |
| -3dB Limiting Sensitivity | I_{CCQ} | $V_i = 0$ | 15 | 21 | 27 | mA |
| Input Limiting Sensitivity | $V_{i(LIM)}$ | $V_o (V_o = 100\text{dB}\mu) - 3\text{dB down}$ | | 25 | 29 | $\text{dB}\mu$ |
| Dectector Output Voltage | $V_{O(DET)}$ | | 200 | 260 | 320 | mV |
| Total Harmonic Distortion | THD | | | 0.05 | 0.2 | % |
| Signal to Noise Ratio | S/N | | 70 | 78 | | dB |
| AM Rejection Ratio | AMR | AM: $f_m = 1\text{KHz}$, 30% Mod | 50 | 63 | | dB |
| Signal Meter Output Voltage | V_M | $V_i = 0$ | 0 | 0.1 | 0.3 | V |
| | | $V_i = 100\text{dB}\mu$ | 4.5 | 5.3 | 6.0 | |
| AGC Output Voltage | $V_{O(AGC)}$ | $V_i = 0$ | 3.5 | 4.1 | 4.5 | V |
| | | $V_i = 100\text{dB}\mu$ | 0 | 0.02 | 0.3 | |
| Muting Sensitivity | S_{MUTE} | $V_{14} = 2\text{V}$ | 22 | 26 | 32 | $\text{dB}\mu$ |
| Muting Attenuation | ATT_{MUTE} | $V_6 = 2\text{V}$ | 10 | 15 | 20 | dB |
| | | $V_6 = 5\text{V}$ | 24 | 28 | 32 | |
| Muting Bandwidth | BW_{MUTE} | $V_{14} = 2\text{V}$ | 140 | 210 | 370 | KHz |

APPLICATION INFORMATION

C₁, C₂, C₃: IF amplifier bypass capacitors

These capacitors bypass to the ground both the carrier signal and the high-frequency components of the amplifier output.

C₁₀ : Power supply bypass capacitor

C₉ : Internal regulated power supply bypass capacitor

C₈ : AFC output smoothing capacitor

This capacitor bypasses to the ground the detector signal output at Pin 7.

C₇ : De-emphasis capacitor

The value of the C₈ determines the de-emphasis time constant.

C₆ : Mute drive output smoothing capacitor

This capacitor bypasses to the ground high-frequency noise components included in the muting output.

C₅ : Signal meter output voltage smoothing capacitor

This capacitor is used to reduce any IF carrier signal components or other high-frequency components remaining on the level meter output voltage.

C₄ : AGC voltage smoothing capacitor

If C₁₁ is not connected, the AGC output will contain residual IF carrier frequency components.

R₁ : IF amplifier resistor

The IF amplifier input impedance is determined by the value of this resistance.

R₂ : Muting maximum attenuation adjustment resistor

The value of this resistor sets the maximum muting attenuation which is used when no signal is present or in the detuned condition. If the value of R₅ is made small, the maximum muting attenuation is decreased.

R₃ : Mute drive current adjusting resistor

This resistor is used to adjust the slope of the muting attenuation. If the value of this resistor is made small, the muting slope for the input signal level is increased.

R₄ : Muting bandwidth adjustment resistor

This resistor is capable of adjusting the muting bandwidth and AFC sensitivity. If the value of R₇ is made small, the muting bandwidth widens and the AFC sensitivity decreases.

R₅ : Damping resistor

If the value of R₁₁ is made small, the Q of the tuned circuit decreases with an accompanying decrease in gain.

R₆ : Damping resistor

R₇ : Mute drive load resistor

If R₁₄ is made large, the time required for muting to be removed will increase.

R₈ : Signal meter output load resistor

This resistor is used to adjust the slope of the muting attenuation. If the value of this resistor is made small, the slope of the muting attenuation is increased.

R₉ : AGC output load resistor

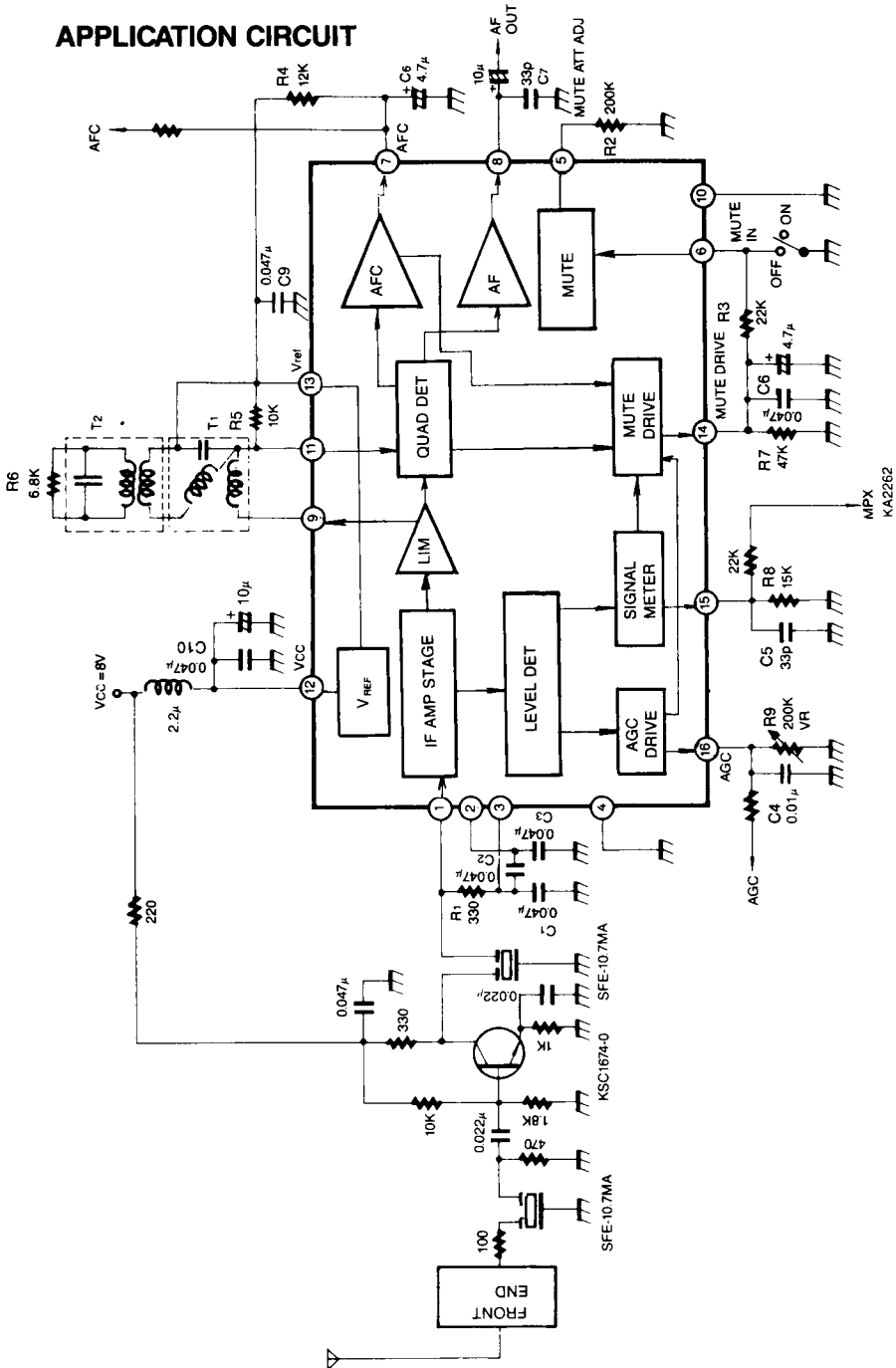
This resistor is used to set the weak-signal muting starting point. If the value of this resistor is made small, the starting point of input signal level for muting is raised.

L₁ : Power supply chock coil

T₁, T₂ : IF transformer

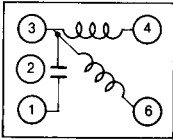
The detector output voltage and total harmonic distortion are determined by the Q of this quadrature detector coil.

APPLICATION CIRCUIT



COIL SPECIFICATIONS

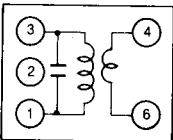
1. T1



| C _o (pF) | f (MHz) | Q _o (%) | Turns | |
|---------------------|---------|--------------------|--------|--------|
| | | | 3-4 | 6-3 |
| 120 | 10.7 | 20 (Min) | 89 1/2 | 17 1/2 |

KOREA TOKO 292MEA-K5018FKG-KR 0.07ϕ 2UEW

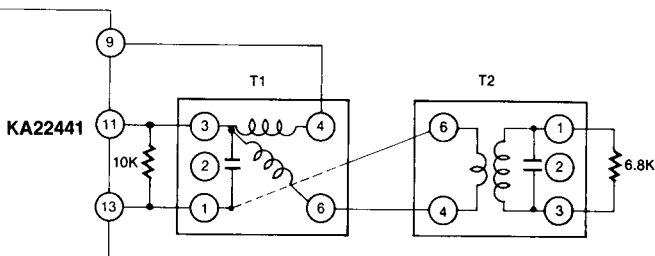
2. T2



| C _o (pF) | f (MHz) | Q _o (%) | Turns | |
|---------------------|---------|--------------------|-------|-----|
| | | | 1-3 | 6-4 |
| 62 | 10.7 | 20 (Min) | 24 | 1 |

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COIL COMBINATION





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