

# AN7025K

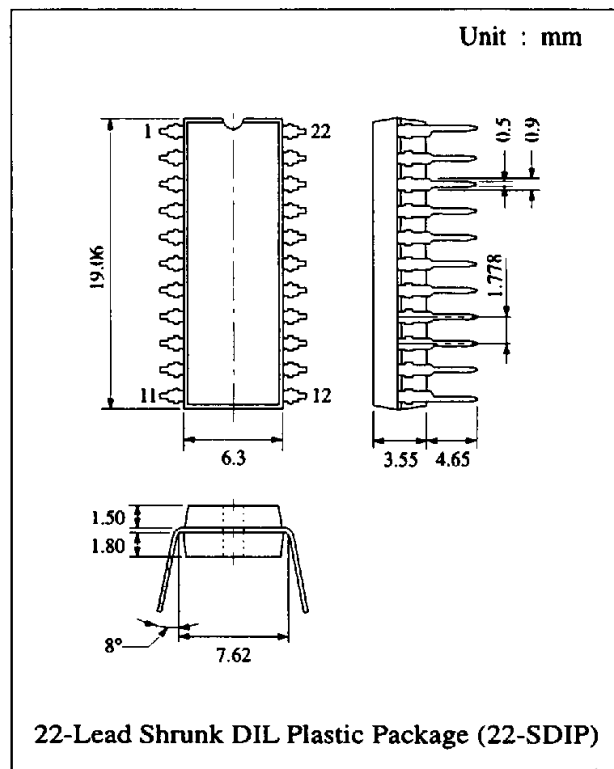
## AM Tuner/FM-IF + FM MPX

### ■ Description

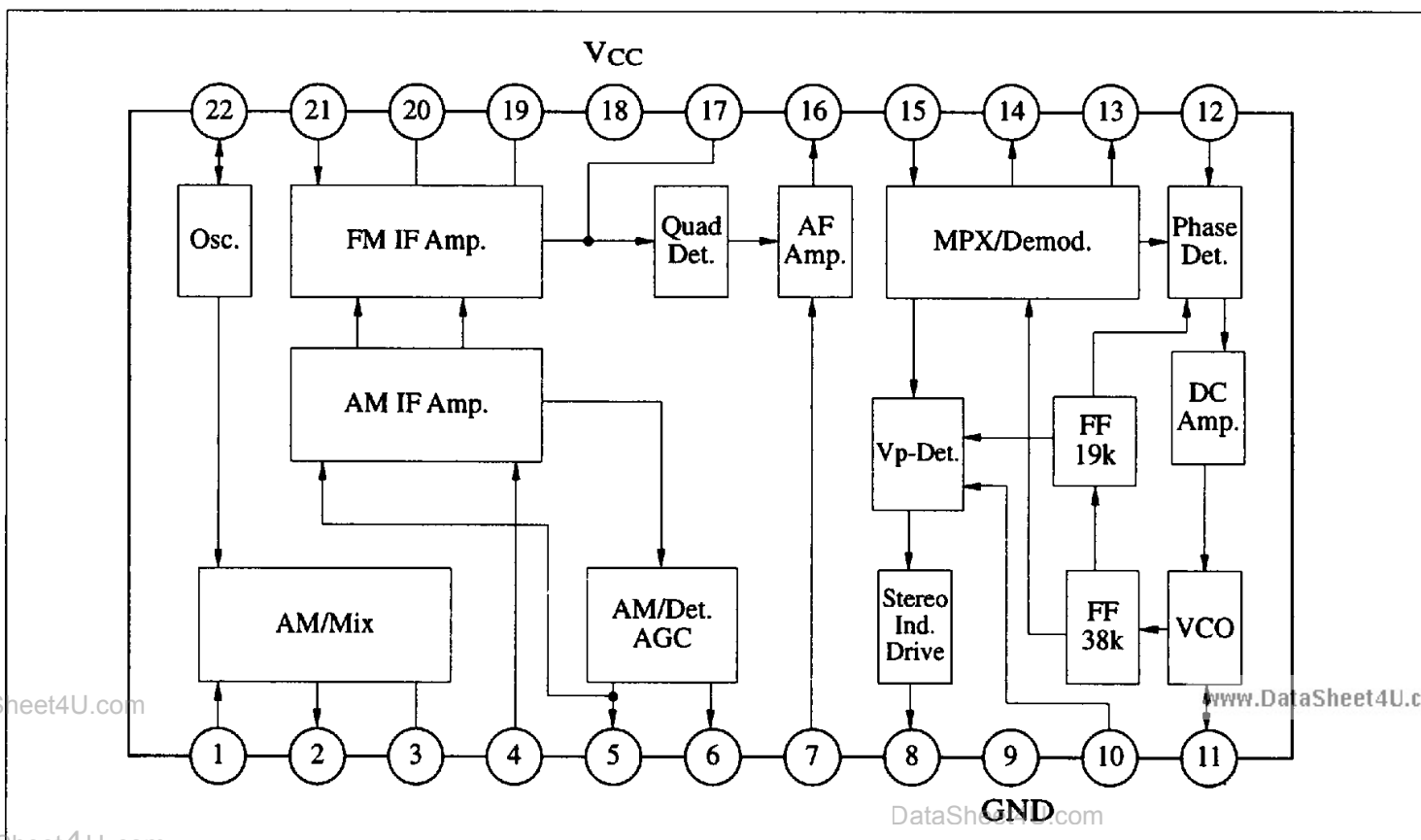
The AN7025K is a one chip monolithic integrated circuit incorporating AM-Tuner, FM-IF, FM-MPX functions within a single 22-pin DIP package. Applications for this IC include use in portable radios and radio-cassette tape recorders.

### ■ Features

- 1-chip IC incorporating AM Tuner, FM IF and FM MPX functions
- Low power consumption,  $I_{CQ} = 7.2\text{mA}$  (FM),  $4.3\text{mA}$  (AM)
- Wide operating voltage supply range:  $V_{CC} = 1.8\text{V} \sim 6.6\text{V}$
- Built-in stereo indicator drive and AM AGC
- Phase-locked-loop MPX demodulation



### ■ Block Diagram



## ■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply Voltage	V <sub>CC</sub>	6.6	V
Supply Current	I <sub>CC</sub>	27	mA
Power Dissipation	P <sub>D</sub>	180	mW
Operating Ambient Temperature	T <sub>opr</sub>	-20 ~ +75	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ +150	°C

Operating Supply Voltage Range: V<sub>CC</sub> = 1.8V ~ 6.6V

## ■ Electrical Characteristics (V<sub>CC</sub>=3V, Ta=25±2°C)

Item	Symbol	Condition	min.	typ.	max.	Unit
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### FM

Detector Output Voltage	V <sub>O</sub>	V <sub>in</sub> = 80dBμ, Mono	45	56	70	mV
Limiting Sensitivity	V <sub>in(lim)</sub>	V <sub>O</sub> = -3dB	26	28.5	31	dBμ
Channel Balance	CB	V <sub>in</sub> = 80dBμ, Mono	-1.2	0	1.2	dB
Minimum Supply Voltage	V <sub>min</sub>	V <sub>in(lim)</sub> (V <sub>CC</sub> = V <sub>min</sub> ) = V <sub>in(lim)</sub> (V <sub>CC</sub> = 3V) - 3[dB]		1.7		V
Quiescent Current	I <sub>CQ</sub>	Stereo		7.2		mA
Signal to Noise Ratio	S/N	V <sub>in</sub> = 80dBμ		62		dB

### AM

Detector Output Voltage	V <sub>O</sub>	V <sub>in</sub> = 60dBμ	50	65	90	mV
Sensitivity	V <sub>G</sub>	V <sub>O(AM)</sub> = 20mV	12	16	23	dBμ
Minimum Supply Voltage	V <sub>min</sub>	V <sub>G</sub> (V <sub>CC</sub> = V <sub>min</sub> ) = V <sub>in(lim)</sub> (V <sub>CC</sub> = 3V) - 3[dB]		1.7		V
Quiescent Current	I <sub>CQ</sub>			4.3		mA
Signal to Noise Ratio	S/N	V <sub>in</sub> = 60dBμ		39		dB
Local Oscillation Level	V <sub>OSC</sub>	f <sub>OSC</sub> = 1.455MHz		130		mV

### MPX

Separation	Sep	V <sub>in</sub> = 80dBμ, V <sub>p</sub> = 10%	30	40		dB
Total Harmonic Distortion	THD	V <sub>in</sub> = 80dBμ, V <sub>p</sub> = 10%		0.5	1.5	%
Pilot ON Level	V <sub>p(ON)</sub>	V <sub>in</sub> = 80dBμ, V <sub>p</sub> = 10% mod (19kHz)		5.5	7.5	%
Pilot OFF Level	V <sub>p(OFF)</sub>	V <sub>in</sub> = 80dBμ, V <sub>p</sub> = 10% mod (19kHz)	1.1	3.1		%
Capture Range	CR	V <sub>p</sub> = 10%		±4		%
Carrier Leak	CL	V <sub>L+R</sub> = 90%, f = 1kHz, V <sub>p</sub> = 10%		30		dB
Input Impedance	Z <sub>in</sub>	Pin 15		22		kΩ
Output Impedance	Z <sub>out</sub>	Pin 13, 14		5		kΩ

Note: FM - f<sub>in</sub> = 10.7MHz, 1kHz, 30% mod.

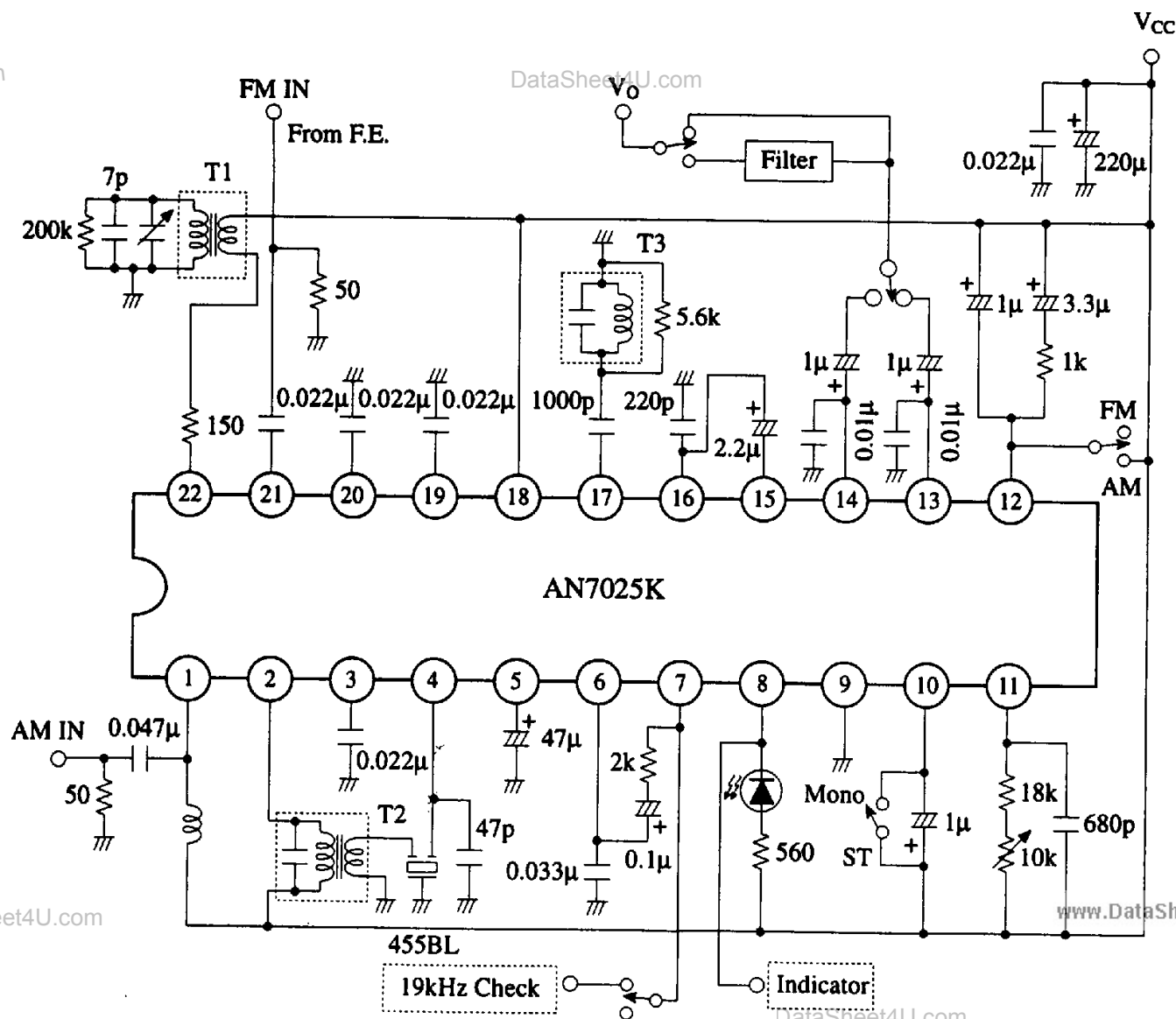
AM - f<sub>in</sub> = 1MHz, 400Hz, 30% mod.

MPX - f<sub>in</sub> = 10.7MHz, 1kHz, 100% mod.

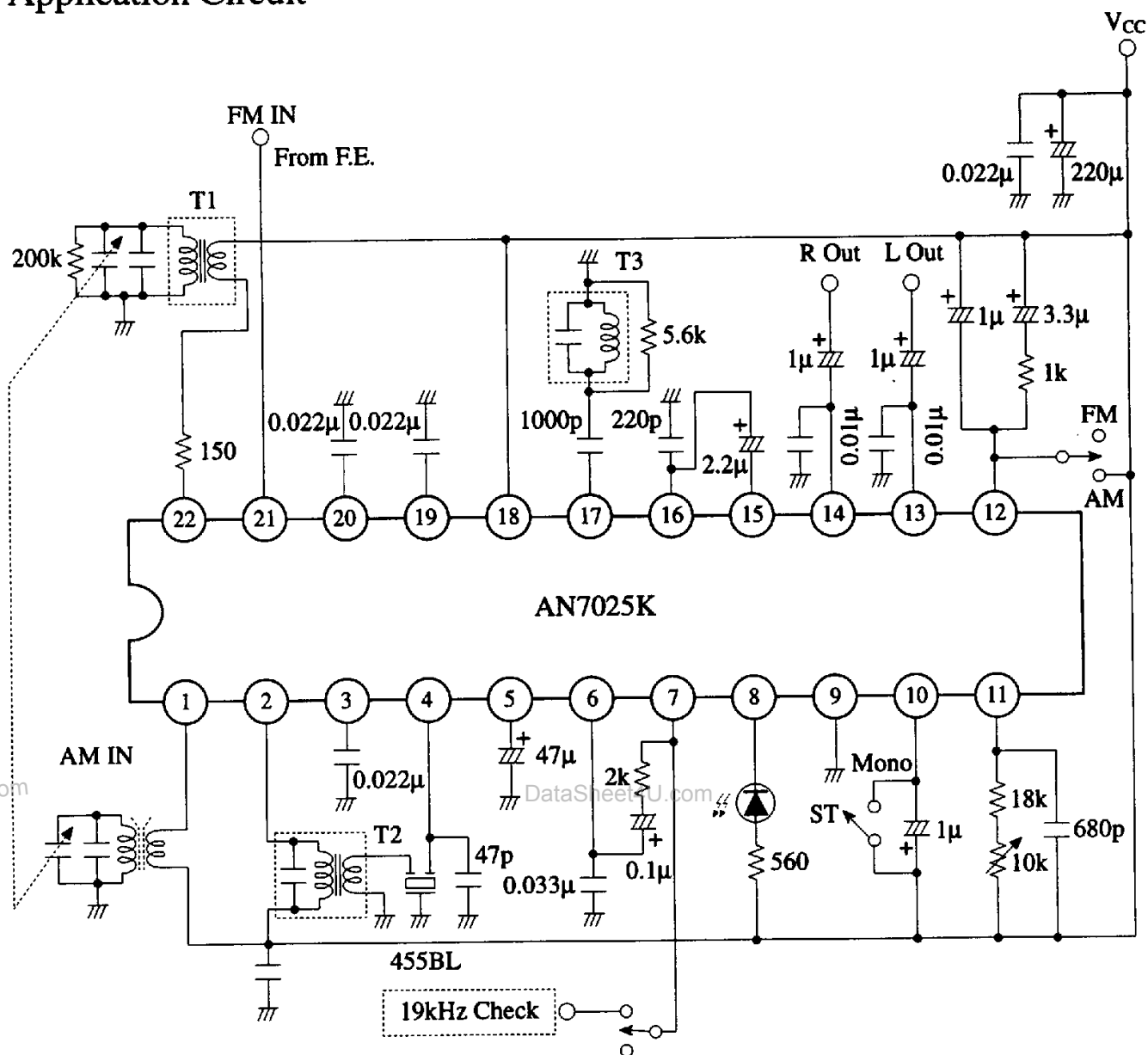
■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	AM Mixer Input	12	MPX Phase Detector Filter
2	AM Mixer Output	13	L-Channel Output
3	AM Mixer By-pass	14	R-Channel Output
4	AM IF Input	15	MPX Input
5	AM AGC	16	IF Detector Output
6	AM Detector Output	17	Quad. detector coil.
7	AM AF Input	18	Vcc
8	Stereo Indicator	19	IF By-pass 1
9	GND	20	IF By-pass 2
10	MPX Pilot Detector Filter	21	FM IF Input
11	VCO	22	AM Local Oscillator

Test Circuit



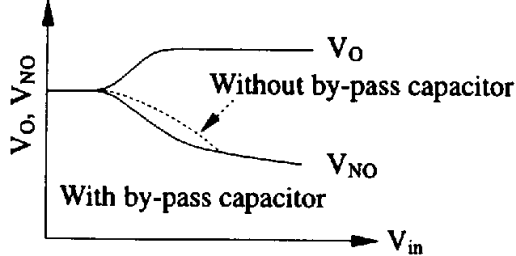
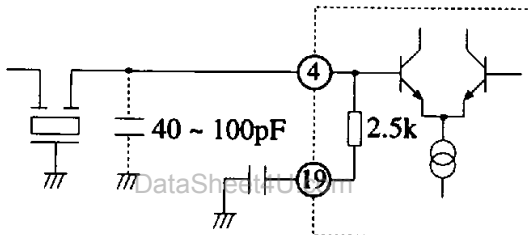
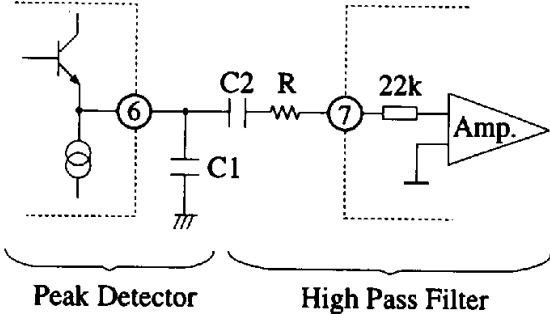
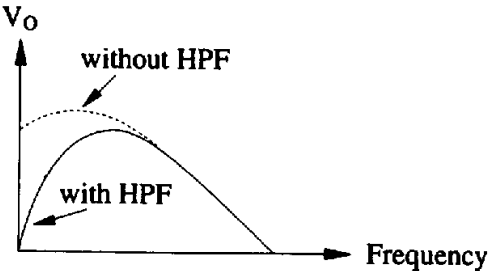
## Application Circuit



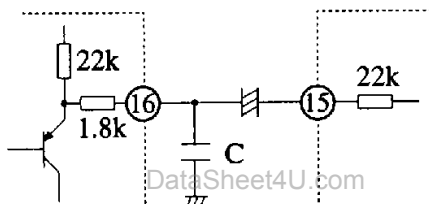
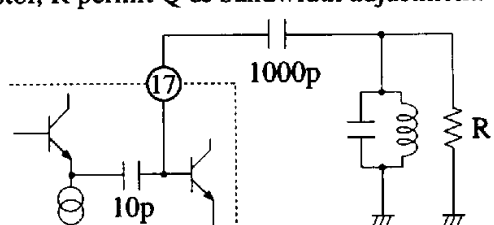
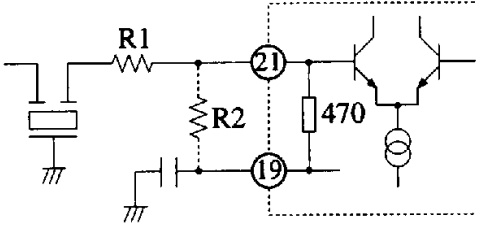
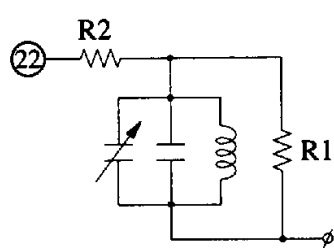
## Coil Specifications

Symbol	Use, Freq.	Type No.	Maker	Connection Diagram	Number of Turns	Unloaded Q
T1	AM Osc.	AO 2B105	MITSUMI (L-5K7-H4)		①...③ 87T ④...⑥ 6T	130±20% (f=796kHz)
T2	AM IFT 455kHz	12B 153M	MITSUMI (IFT-21K7-1-14)		①...② 10T ②...③ 4.3T ④...⑥ 1.4T	100±30%
T3	FM IFT 10.7MHz	FI - 101	MITSUMI (IFT-41K9)		①...② 8T ②...③ 2T ④...⑥ 5T	90±20%

## Application Notes

Function	Pin No.	Description	DC Bias (V <sub>CC</sub> =3V)
AM	1	AM Mixer input. Open base input.	3V
	2	AM Mixer output. Open collector output.	3V
	3	AM Mixer by-pass. Small adjustments in noise level can be achieved by changing the by-pass capacitor value. 	0.78V
	4	AM IF Input. Input impedance at 455kHz is 2.5kΩ. An additional 40 ~ 100pF by-pass capacitor may be added after the ceramic filter to reduce AM IF beat. S/N may be changed by this modification. 	2.6V
	6	AM detector output.	1.8V
	7	AM AF input. The external components between these two pins form part of the peak detector and high pass filter. C1 forms part of the peak detector circuit and C2, R part of the high pass filter or low frequency gain reduction.  	0.7V
		By changing the values of R & C2, V <sub>O</sub> level at low frequencies may be changed. R also acts as load for the VCO 19kHz check signal in FM stereo mode.	

## Application Notes (Continue)

Function	Pin No.	Description	DC Bias (V <sub>CC</sub> =3V)
MPX	8	LED stereo indicator. Open collector output with maximum current $\approx 5\text{mA}$ hence only red LED's may be used.	-
	10	MPX pilot level/detection low pass filter or mono/stereo switch. VCO operation is stopped when this pin is connected directly to V <sub>CC</sub> .	2.3V
	11	VCO free-run frequency adjust. VCO frequency can be adjusted manually through the variable resistor connected at this pin.	2.4V
	12	FM/AM switch or PLL low pass filter.	2.3V
	13	Left & right channels output.	1.4V
	14	Output impedance = $5\text{k}\Omega$	-
	15	MPX input. Input impedance = $22\text{k}\Omega$	0.6V
	16	IF detector (AM/FM) output. Output impedance = $2.5\text{k}\Omega$ . Capacitor C determines channel separation. 	1.3V
FM	17	Quad. detector coil. The internal $10\text{pF}$ capacitor and quad. detector coil form the phase shifter of the quad. detector. Small adjustments of damping resistor, R permit Q & bandwidth adjustment. 	2.45V
	21	FM IF input. Input impedance at $10.7\text{MHz}$ is $470\Omega$ . FE gain can be reduced by adding R1 & R2 as required to reduce FM IF input level. 	-
	22	AM local oscillator. Oscillator level = $100\text{mV}$ at $1.455\text{MHz}$ . R2 prevents oscillator stopping. R1 is a dumping resistor to reduce oscillator level. 	3V