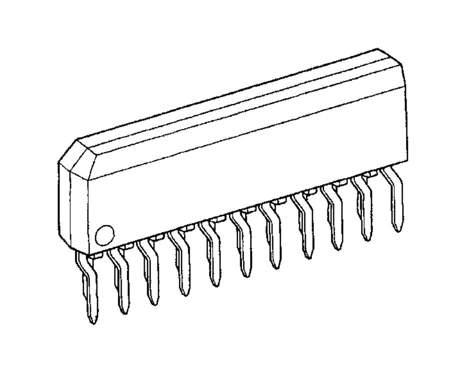
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA1230Z

TV SOUND MULTIPLEX BROADCAST DEMODULATOR IC FOR EIAJ SYSTEM

The TA1230Z incorporates the functions required for EIAJ system TV sound multiplex broadcast demodulation and a trap for eliminating facsimile broadcast signals multiplexed in the sound multiplex broadcasting band. Automatic adjustment based on a 32 f_H-oscillator makes adjustments other than separation unnecessary.



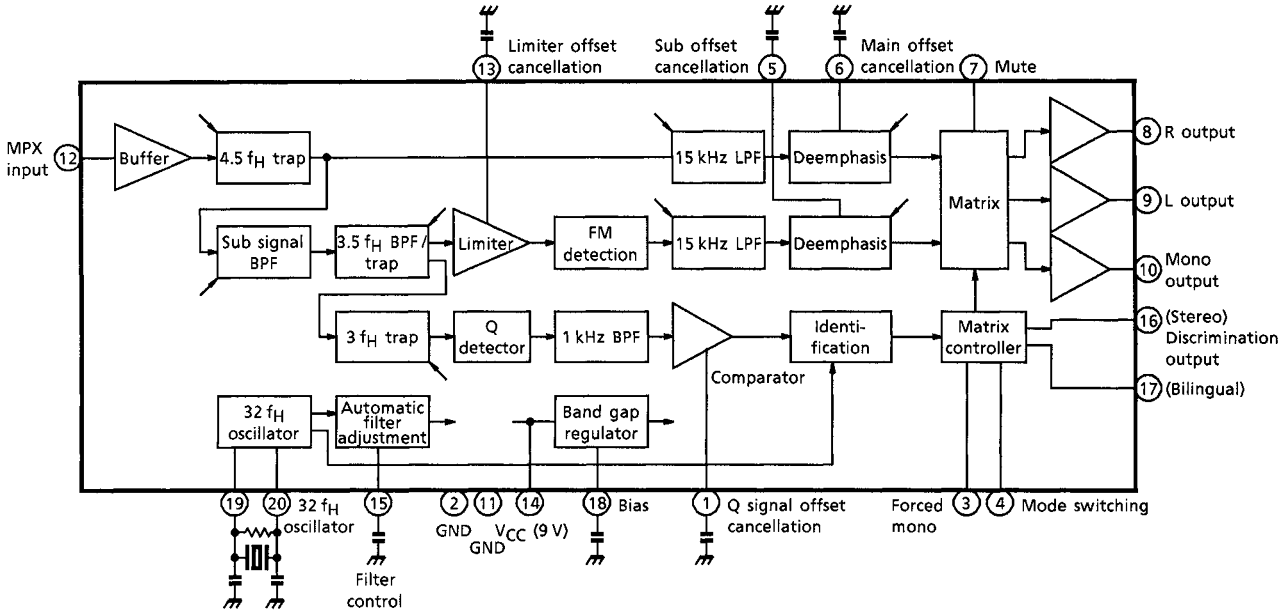
SZIP21-P-0.89

Weight: 1.00 g (Typ.)

FEATURES

- Self-adjusting filter and discriminator circuit based on a 32 f_H-oscillator
- Built-in trap eliminates facsimile broadcast signals

BLOCK DIAGRAM



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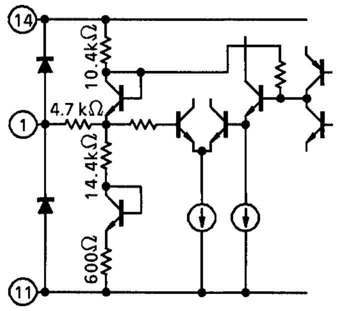
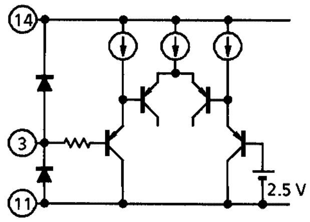
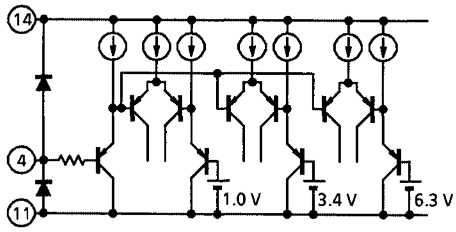
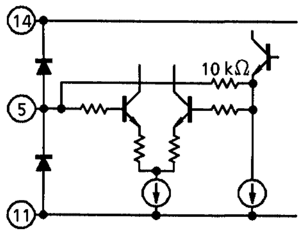
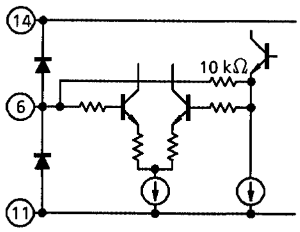
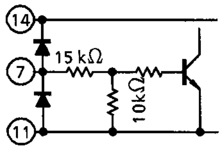
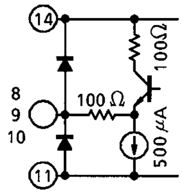
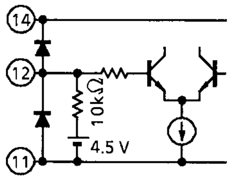
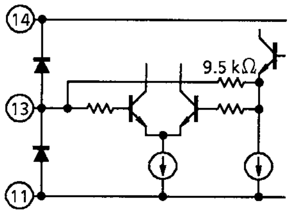
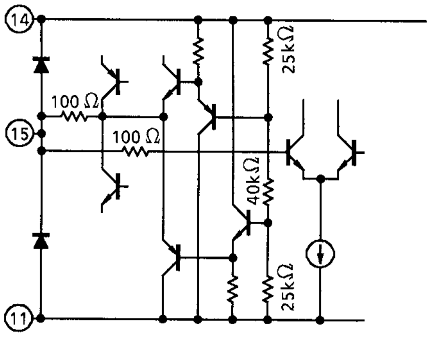
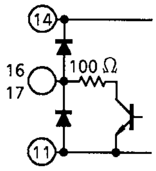
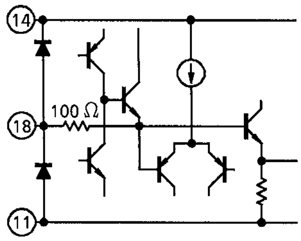
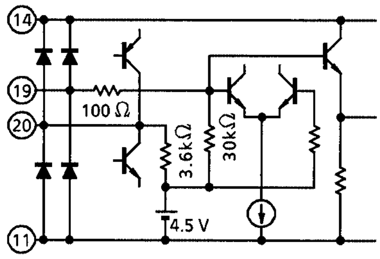
PIN FUNCTIONS

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
1	Q signal offset cancellation	Cuts the DC component of the circuit shaping the waveform of the AM-detected cue signal. Connect a 0.1 μF capacitor between this pin and GND. A 0.01 μF capacitor may cause lower discrimination sensitivity because of the fluctuations in a capacitor of that rating.	
2	GND	—	—
3	Forced mono	Setting this pin to 5 V forcibly sets the mode to mono. This does not affect the discrimination output or bilingual broadcast decoding. As this is the PNP transistor input circuit, leaving the pin open sets the mode to forced mono. However, do not leave the pin open.	
4	Mode switching	The voltage of this pin is used to control the output state for bilingual broadcasting. 0 V : Main sound 2.5 V : Main / sub sound 5 V : Sub sound 9 V : Main / sub sound	
5	Sub offset elimination	Cuts the DC component of the sub sound signal processing section. Connect a 10 μF capacitor between this pin and GND.	
6	Main offset elimination	Cuts the DC component of the main-sound signal processing section. Connect a 10 μF capacitor between this pin and GND.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
7	Mute	Setting this pin to 5V mutes all the outputs. Normally, fix to GND.	
8 9 10	R output L output Mono output	Output pins. A mono sound signal is output from pin 10 regardless of the state of pins 3 and 4 and the broadcasting mode. Set so that the maximum current output from these pins does not exceed 500 μA.	
11	GND	—	—
12	MPX input	Sound multiplex signal input pin. The input resistance is 10 kΩ (Typ.). The standard input level is 250 mV_{rms} (Equivalent to 100% modulation)	
13	Limiter offset elimination	Cuts the DC component of the sub-sound signal demodulation section. Connect a 0.01 μF capacitor between this pin and GND.	
14	V_{CC}	The operating power supply voltage range is 9 V ± 10%.	—
15	Filter control	Used for the automatic filter adjustment circuit incorporated into the IC. Connect a 0.01 μF capacitor between this pin and GND.	
16 17	Stereo discrimination output Bilingual discrimination output	Broadcast mode discrimination output pins. This circuit is an open collector whose maximum sink current is 1 mA.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
18	Bias	Eliminates IC internal bias noise. Connect a 10 μF capacitor between this pin and GND.	
19 20	32 f_H oscillation	Ceramic oscillator connecting pins. TA1230Z uses this oscillation to automatically adjust the internal filter and to perform discrimination. Use a Murata CSB503E7 ceramic oscillator.	

ABSOLUTE RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D	890	mW
Operating Temperature	T_{opr}	−20~75	°C
Storage Temperature	T_{str}	−55~150	°C

Note: The power dissipation rating drops by 7.2 mW for every 1°C over 25°C.

OPERATING SUPPLY VOLTAGE

PIN No.	PIN NAME	MIN	TYP.	MAX	UNIT
14	V_{CC}	8.1	9.0	9.9	V

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 9 V, Ta = 25°C)

DC CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Current Dissipation	I_{CC}	—	—	28	34	42	mA
Pin Voltage	V_1	—	—	4.2	5.2	6.2	V
	V_5	—	—	3.5	4.5	5.5	
	V_6	—	—	3.5	4.5	5.5	
	V_8	—	—	2.1	3.1	4.1	
	V_9	—	—	2.1	3.1	4.1	
	V_{10}	—	—	2.1	3.1	4.1	
	V_{12}	—	—	3.5	4.5	5.5	
	V_{13}	—	—	2.8	3.9	4.9	
	V_{15}	—	—	2.5	4.5	6.5	
	V_{18}	—	—	5.0	5.7	6.4	
	V_{19}	—	—	3.5	4.5	5.5	
	V_{20}	—	—	7.0	7.6	8.2	

AC CHARACTERISTICS

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Output Level		V_{OUT}	—	(Note 1)	500	600	700	mV_{rms}
Output Level Fluctuation		ΔV_{OUT}	—	(Note 2)	—	0.0	1.5	dB
Sub Output Level Power Dependency		ΔVSUB	—	(Note 3)	—	0.0	0.5	dB
Frequency Characteristics	Main Sound 100 Hz	A100 M	—	(Note 4)	0.0	1.0	2.5	dB
	Main Sound 10 kHz	A10k M	—		−16	−13	−10	
	Sub Sound 100 Hz	A100 S	—		0.0	1.0	2.5	
	Sub Sound 10 kHz	A10k S	—		−16	−13	−10	
Total Harmonic Distortion	Main Sound	THD M	—	(Note 5)	—	0.2	1.0	%
	Sub Sound	THD S	—		—	0.7	1.0	
S / N	Main Sound	S / N M	—	(Note 6)	70	75	—	dB
	Sub Sound	S / N S	—		60	65	—	
Carrier Leakage	Main Sound	VLeak M	—	(Note 7)	—	50	70	mVp-p
	Sub Sound	VLeak S	—		—	50	70	
Stereo Separation		Sepa	—	(Note 8)	34	—	—	dB
Bilingual Crosstalk		CT	—	(Note 9)	60	—	—	dB
Bilingual Mode Switching Voltage	Main (Max.)	Vmax M	—	(Note 10)	1.0	—	—	V
	Main / Sub (1) (Min.)	Vmin B (1)	—		—	—	1.2	
	Main / Sub (1) (Max.)	Vmax B (1)	—		2.9	—	—	
	Sub (Min.)	Vmin S	—		—	—	4.2	
	Sub (Max.)	Vmax S	—		5.4	—	—	
	Main / Sub (2) (Min.)	Vmin B (2)	—		—	—	6.6	
Forced Mono Voltage	Off Voltage	Vmin FMono	—	(Note 11)	2.4	—	—	V
	On Voltage	Vmax FMono	—		—	—	2.6	
Mute on Voltage		V Mute	—	(Note 12)	—	—	2.0	V
Mute Residual Noise		V Mute	—	(Note 13)	—	—	1.5	mV_{p-p}
Mute DC Offset Voltage	L / R Output	V_{OS}	—	(Note 14)	—	5	100	mV
	M Output		—		—	—	300	
Sub Carrier Sensitivity		S_{SUB}	—	(Note 15)	—	—	12	dB
Cue Signal Sensitivity	No Modulation	SQo	—	(Note 16)	8	—	—	dB
	L-R 900 Hz 100%	SQ900	—		6	—	—	
	Sub Sound 1kHz 100%	SQ1k	—		6	—	—	
Input Resistance		R_{IN}	—	(Note 17)	7	10	13	kΩ
Output Resistance		R_{OUT}	—	(Note 18)	70	100	130	Ω

TEST CONDITIONS

NOTE	INPUT SIGNAL	MODE SETTING			TEST PIN	TEST METHOD
		PIN 3	PIN 4	PIN 7		
1	Signal A	0 [V]	0 [V]	0 [V]	Pins 8, 9, 10	Measure the output level of each pin (V_{OUT} [mV_{rms}])
2	Signal A	0 [V]	0 [V]	0 [V]	Pins 8, 9	Calculate the output level ratio between pins 8 and 9 (V_8, V_9). ΔV_{OUT} [dB] = 20·| λog (V_8 / V_9)|
3	Signal B	0 [V]	5 [V]	0 [V]	Pins 8, 9	Raise V_{CC} from 8.1V to 9.9 V and measure the output level ($V_{V'}$). Calculate the ratio against the output level (V_V) when V_{CC} = 9V ΔVSub [dB] = 20·|ℓog ($V_{V'}$ / V_V)|
4	Signal A Signal B Signal C Signal D	0 [V]	0 / 5 [V]	0 [V]	Pins 8, 9	Set pin 4 to 0 V. Input signal A and measure the output level (V_{M1k}). Next, input signal C, D and measure its output level at 100 Hz and 10 kHz (V_{M100} and V_{M10k}). A100 M [dB] = 20 ℓog (V_{M100} / V_{M1k}) A10k M [dB] = 20 ℓog (V_{M10k} / V_{M1k}) Set pin 4 to 5 V. Input signal B and measure the output level (V_{S1k}). Next, input signal C, D and measure its output level at 100 Hz and 10 kHz (V_{S100} and V_{S10k}). A100 S [dB] = 20 ℓog (V_{S100} / V_{S1k}) A10k S [dB] = 20 ℓog (V_{S10k} / V_{S1k})
5	Signal A Signal B	0 [V]	0 / 5 [V]	0 [V]	Pins 8, 9	Set pin 4 to 0 V. Input signal A and measure the distortion factor (THD M [%]). Set pin 4 to 5 V. Input signal B and measure the distortion factor (THD S [%]).
6	Signal A Signal B Signal E	0 [V]	0 / 5 [V]	0 [V]	Pins 8, 9	Set pin 4 to 0 V. Input signal B and measure the output level (S_M). Next, measure its output level (N_M) on no signal input condition. S / N M [dB] = 20 ℓog (S_M / N_M) Set pin 4 to 5 V. Input signal B and measure the output level (S_S). Next, input signal E and measure its output level (N_S). S / N M [dB] = 20 ℓog (S_S / N_S)
7	Signal E	0 [V]	0 / 5 [V]	0 [V]	Pins 8, 9	Set pin 4 to 0 V and set LPF output to through. Measure the output level (VLeak M). Set pin 4 to 5 V and set LPF output to through. Measure the output level (VLeak S).

NOTE	INPUT SIGNAL	MODE SETTING			TEST PIN	TEST METHOD
		PIN 3	PIN 4	PIN 7		
8	Signal F	0 [V]	0 [V]	0 [V]	Pins 8, 9	Adjust the input signal amplitude so that the output level of pin 8 is at minimum. Measure the output levels of 1 kHz spectrum of pin 8 (V_8) and pin 9 (V_9) by a spectrum analyzer. Sepa [dB] = 20 ℓog (V_9 / V_8)
9	Signal H	0 [V]	2.5 [V]	0 [V]	Pins 8, 9	Measure the output levels of 1 kHz spectrum of pin 8 (V_8) and pin 9 (V_9) by a spectrum analyzer. CT [dB] = 20 ℓog (V_9 / V_8)
10	Signal I	0 [V]	Variable	0 [V]	Pin 4	Raise the voltage of pin 4 from 0 V. Measure the upper limit voltage (Vmax M [V]) holding the output from pin 8 at 1 kHz. Reduce the voltage of pin 4 from 2.5 V. Measure the lower limit voltage (Vmin B (1) [V]) holding the output from pin 8 at 400 Hz.Raise the voltage of pin 4 from 2.5 V. Measure the upper limit voltage (Vmax B (1) [V]) holding the output from pin 9 at 1 kHz. Reduce the voltage of pin 4 from 5 V. Measure the lower limit voltage (Vmin B (1) [V]) holding the output from pin 9 at 400Hz. Raise the voltage of pin 4 from 5 V. Measure the upper limit voltage (Vmax S [V]) holding the output from pin 9 at 400 Hz. Reduce the voltage of pin 4 from 9 V. Measure the lower limit voltage (Vmin B (2) [V]) holding the output from pin 9 at 1 kHz.
11	Signal E	Variable	0 [V]	0 [V]	Pin 3	Raise the voltage of pin 3 from 0 V. Measure the upper limit voltage (Vmax FMono [V]) holding the output from pin 8 to 0 V. Reduce the voltage of pin 3 from 5 V. Measure the lower limit voltage (Vmin FMono [V]) holding the output from pin 8 at 1 kHz.
12	Signal A	0 [V]	0 [V]	Variable	Pin 7	Raise the voltage of pin 7 from 0 V. Measure the voltage (Vmute [V]) when the output from pin 8 or pin 9 changes to 0 V.
13	Signal A	0 [V]	0 [V]	5 [V]	Pins 8, 9, 10	Measure the output levels of the pins (VMute [mV_{p-p}]).
14	No signal	0 [V]	0 [V]	0 / 5 [V]	Pins 8, 9, 10	Switch the pin 7 voltage between 0 V and 5 V. Measure the DC voltage change of the pins (V_{OS} [V]).

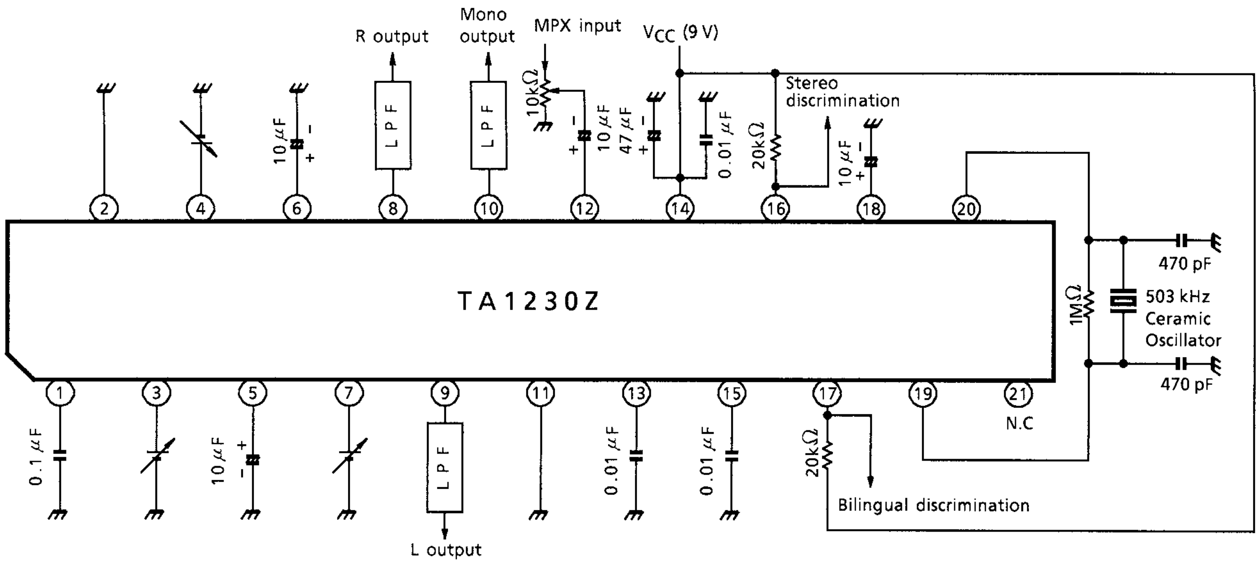
TEST CONDITIONS

NOTE	INPUT SIGNAL	MODE SETTING			TEST PIN	TEST METHOD
		PIN 3	PIN 4	PIN 7		
15	Signal J	0 [V]	0 [V]	0 [V]	Pin 17	Input signal J. Lower the 31.47 [kHz] signal level from 150 [mV_{rms}]. Measure the 31.47 [kHz] signal level when the pin 17 voltage changes to 9 [V] (VSUB). S SUB = 20 ℓog (150 / VSUB) [dB]
16	Signal K Signal L Signal M	0 [V]	0 [V]	0 [V]	Pins 16, 17	Input signal K. Lower the cue signal level from 20 mV_{rms}. Measure the cue signal level when the pin 17 voltage changes to 9 V (V Qo [mV_{rms}]) S Qo [dB] = 20 ℓog (20 / VQo) Input signal L. Lower the cue signal level from 20mV_{rms}. Measure the cue signal level when the pin 17 voltage changes to 9 V (VQ900 [mV_{rms}]) S Q900 [dB] = 20 ℓog (20 / VQ900). Input signal M. Lower the cue signal level from 20 [mV_{rms}]. Measure the cue signal level when the pin 16 voltage changes to 9 V (VQ1k [mV_{rms}]) S Q1k [dB] = 20 ℓog (20 / VQ1k).
17	Signal A	0 [V]	0 [V]	0 [V]	Pin 12	Measure the input resistance.
18	Signal A	0 [V]	0 [V]	0 [V]	Pins 8, 9, 10	Measure the output resistance.

INPUT SIGNAL TABLE

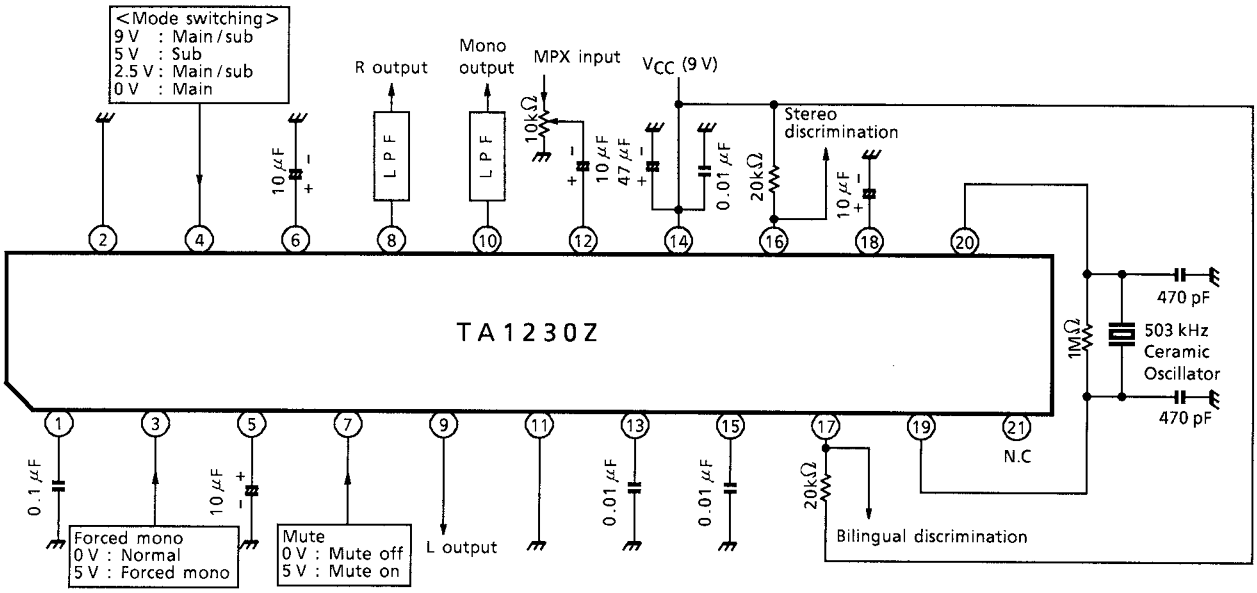
SIGNAL	MAIN SIGNAL	SUB SIGNAL		CUE SIGNAL	
		CARRIER	MODULATION	CARRIER	MODULATION
Signal A	1 kHz, 250 mV_{rms}	No signal	—	No signal	—
Signal B	No signal	31.47 kHz, 150 mV_{rms}	1 kHz, 100% FM	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal C	100Hz, 250 mV_{rms}	31.47 kHz, 150 mV_{rms}	100Hz, 100% FM	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal D	10 kHz, 250 mV_{rms}	31.47 kHz, 150 mV_{rms}	10 kHz, 100% FM	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal E	No signal	31.47 kHz, 150 mV_{rms}	No signal	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal F	1 kHz, 125 mV_{rms}	31.47 kHz, 200 mV_{rms}	1 kHz (In-phase), 50% FM	55.07 kHz, 20 mV_{rms}	982.5 Hz, 60%AM
Signal G	1 kHz, 250 mV_{rms}	31.47 kHz, 150 mV_{rms}	No signal	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal H	1 kHz, 250 mV_{rms}	31.47 kHz, 150 mV_{rms}	1 kHz, 100% FM	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal I	1 kHz, 250 mV_{rms}	31.47 kHz, 150 mV_{rms}	400Hz, 100% FM	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal J	No signal	31.47 kHz, Variable	No signal	55.07 kHz, 20 mV_{rms}	922.5 Hz, 60%AM
Signal K	No signal	31.47 kHz, 150 mV_{rms}	No signal	55.07 kHz, Variable	922.5 Hz, 60%AM
Signal L	No signal	31.47 kHz, 200 mV_{rms}	900Hz, 100% FM	55.07 kHz, Variable	982.5 Hz, 60%AM
Signal M	No signal	31.47 kHz, 150 mV_{rms}	1 kHz, 100% FM	55.07 kHz, Variable	922.5 Hz, 60%AM

TEST CIRCUIT



LFP : 4-stage Butterworth, cutoff frequency 15 kHz

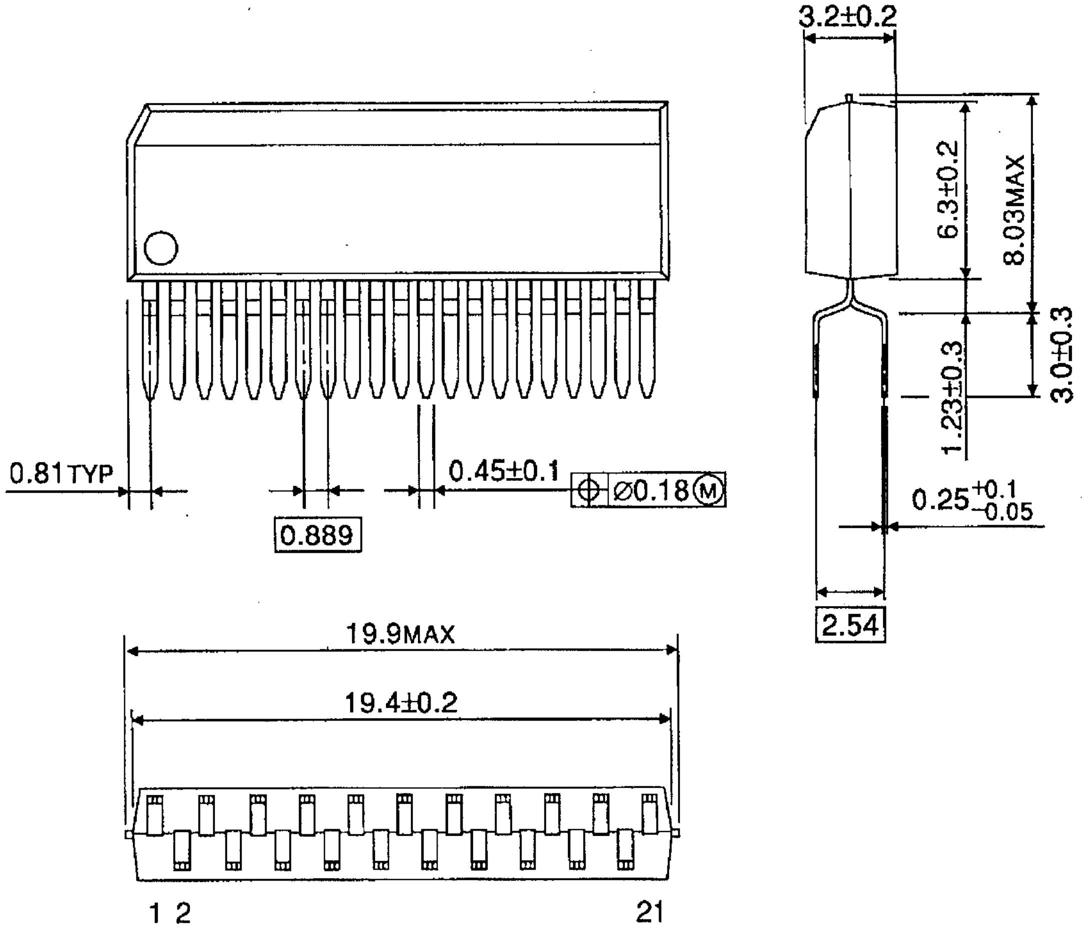
APPLICATION CIRCUIT



Ceramic oscillator : CSB503E7 (Murata)

PACKAGE DIMENSIONS

SZIP21-P-0.89 Unit : mm



Weight: 1.00g (Typ.)