Ordering number: EN3231C

Monolithic Linear IC

No. 3231C

LA1851N

DTS Single-chip Tuner IC

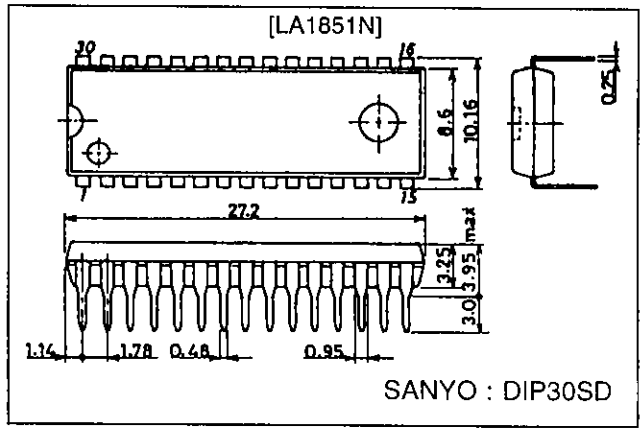
Overview

The LA1851N is a tuner IC designed for home-use stereo equipment which supports the SD system and IF counter system and incorporates AM/FM IF/MPX functions on a single chip.

Package Dimensions

unit : mm

3196-DIP30SD



Features

- AM/FM tuner and multiplex demodulator on a single chip
- No multiplexer adjustments required
- Output (FM/AM) for IF counter buffer compatible with electronic tuning
- Stereo separation control
- Forced monaural and VCO stop functions
- Minimal multiplexer carrier leakage
- Excellent VCO temperature characteristics: f_o = 0.1% typ. with ±50 deg. variation

Functions

[FM Block]
- IF amplifier
- Quadrature detector
- IF counter buffer
- S-meter output
- Tuner indicator (variable sensitivity)

[AM Block]
- RF amplifier
- Mixer
- Oscillator
- Oscillator buffer
- IF amplifier
- Detector
- AGC
- IF counter buffer
- Tuner indicator (variable sensitivity)

[MPX Block]
- PLL decoder
- ST indicator
- VCO stop
- Mute
- Separation control
- No VCO adjustment
- Forced monaural (VCO stop)

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	Pins 3, 7, 10, 21, 22 and 26	14	V
Maximum supply current	I_{CC} max	Pin 3	40	mA
		Pins 21 and 22	20	mA
Allowable power dissipation	Pd max	Ta = 70°C	480	mW
Operating temperature	Topr		–20 to +70	°C
Storage temperature	Tstg		–40 to +125	°C

SANYO Electric Co.,Ltd. Semiconductor Business Headquarters
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

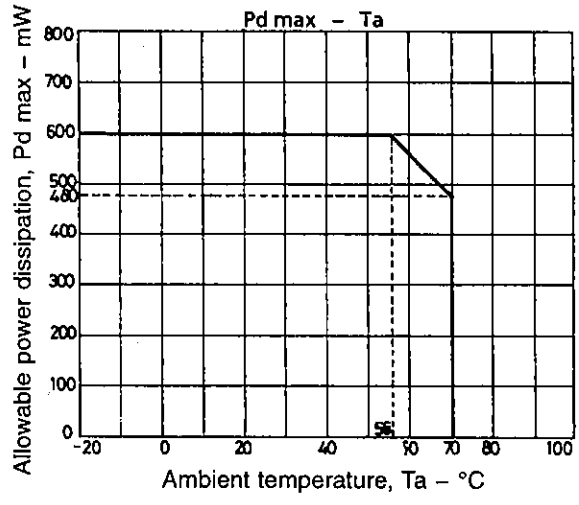
Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		8.5	V
Operating supply voltage range	V_{CC} op		6 to 12	V

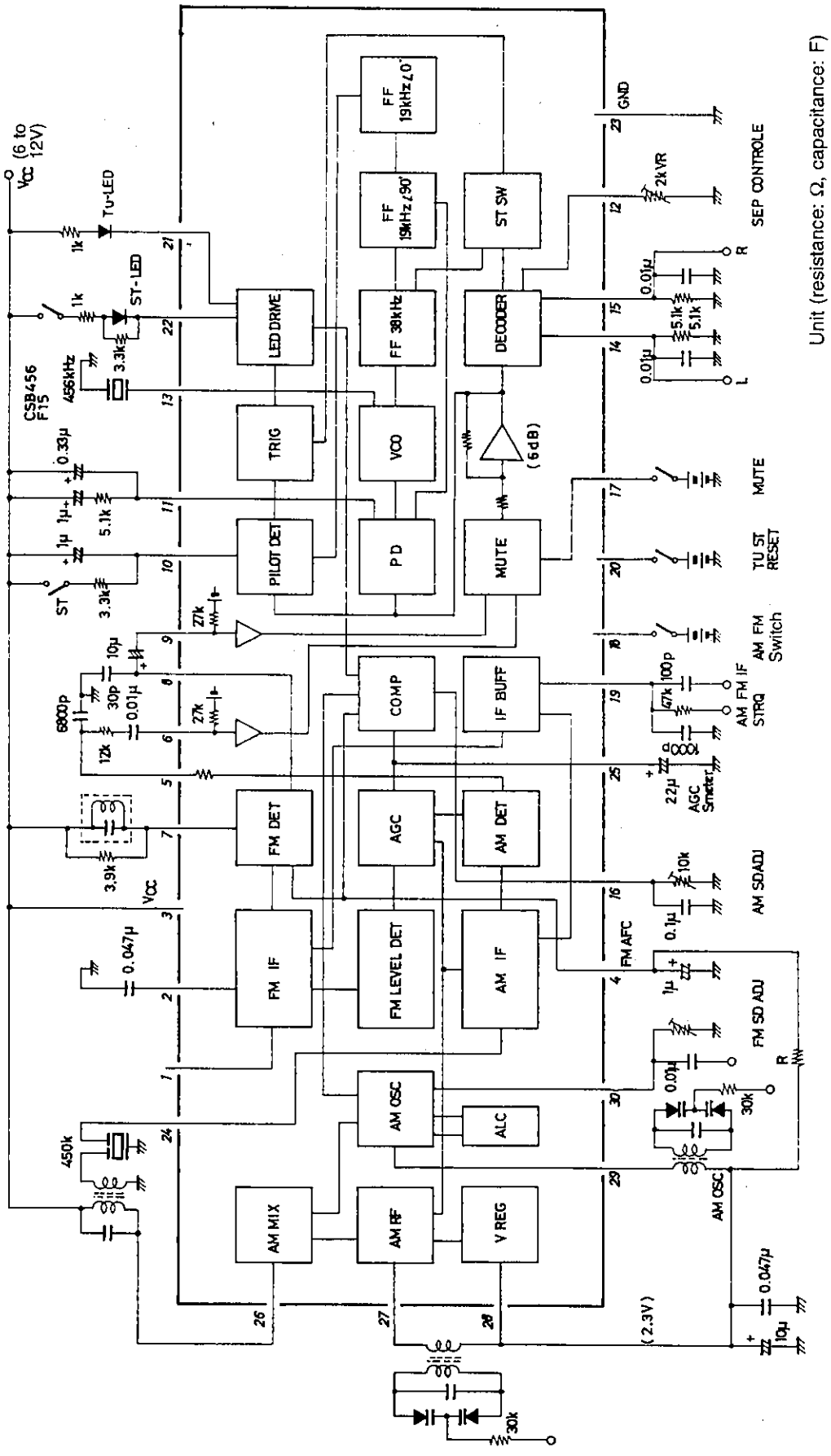
Operating Characteristics at Ta = 25°C, V_{CC} = 8.5 V

Parameter	Symbol	Conditions	min	typ	max	Unit
[AM: f_{in} = 1 MHz, 1 kHz tone]						
Quiescent current	I_{CCO}	No input		26	37	mA
Detector output	V_O1	V_{IN} = 23 dBμ, 30% AM	70	140	260	mV
	V_O2	V_{IN} =80 dBμ, 30% AM	170	280	390	mV
Singal-to-nose ratio	S/N1	V_{IN} = 23 dBμ, 30% AM	15	19		dB
	S/N2	V_{IN} = 80 dBμ, 30% AM	45	50		dB
Total harmonic distortion	THD1	V_{IN} = 80 dBμ, 30% AM		0.5	1.2	%
	THD2	V_{IN} = 100 dBμ, 30% AM		0.6	1.3	%
IF buffer output	V_{IF}	V_{IN} = 20 dBμ	110	170	230	mV
Local oscillator buffer output	V_{OSC}	f_{OSC} = 1.450 MHz	290	350	420	mV
Tuner turn-on sensitivity	V_S	Variable sensitivity		(13)		dBμ
[FM mono: f_{in} = 10.7 MHz, 1 kHz tone]						
Quiesect current	I_{CCO}	No input		27	38	mA
Input limiting sensitivity	LMS	3 dB down, 100% FM		32	38	dBμ
Demodulation output	V_O	V_{IN} = 100 dBμ, 100% FM	380	560	750	mV
Signal-to-noise ratio	S/N	V_{IN} = 100 dBμ	71	77		dB
Amplitude modulation rejection ratio	AMR	V_{IN} = 100 dBμ, 30% AM, 1 kHz tone	48	61		dB
Total harmonic distortion	THD	V_{IN} = 100 dBμ, 100% FM		0.2	1.0	%
Signal meter output	$V_{SM}1$	No input	0	0.1	0.3	%
	$V_{SM}2$	V_{IN} = 70 dBμ	0.7	1.2	1.8	V
	$V_{SM}3$	V_{IN} = 100 dBμ	2.1	2.9	3.3	V
IF buffer output	V_{IF}	V_{IN} = 50 dBμ	170	260	350	mV
Tuner turn-on sensitivity	V_S	Variable sensitivity		(59)		dBμ
[FM stereo: L + R = 90%, pilot = 10%, V_{IN} = 100 dBμ, f_m = 1 kHz]						
Channel separation	Sep 1K		30	45		dB
Total harmonic distortion	THD main	Stereo, main		0.3	1.0	%
Bandwidth	BW	Stereo, main	160	210	280	kHz
Channel balance	CB	Mono AM	−1.0	0	0.1	dB
Mute attenuation	ATT	Mono	67	82		dB
Lamp turn-on level	Pilot	Stereo, main	1.2	3.1	4.5	%
Lamp hysteresis	Hs	Stereo, main		(2.5)		dB

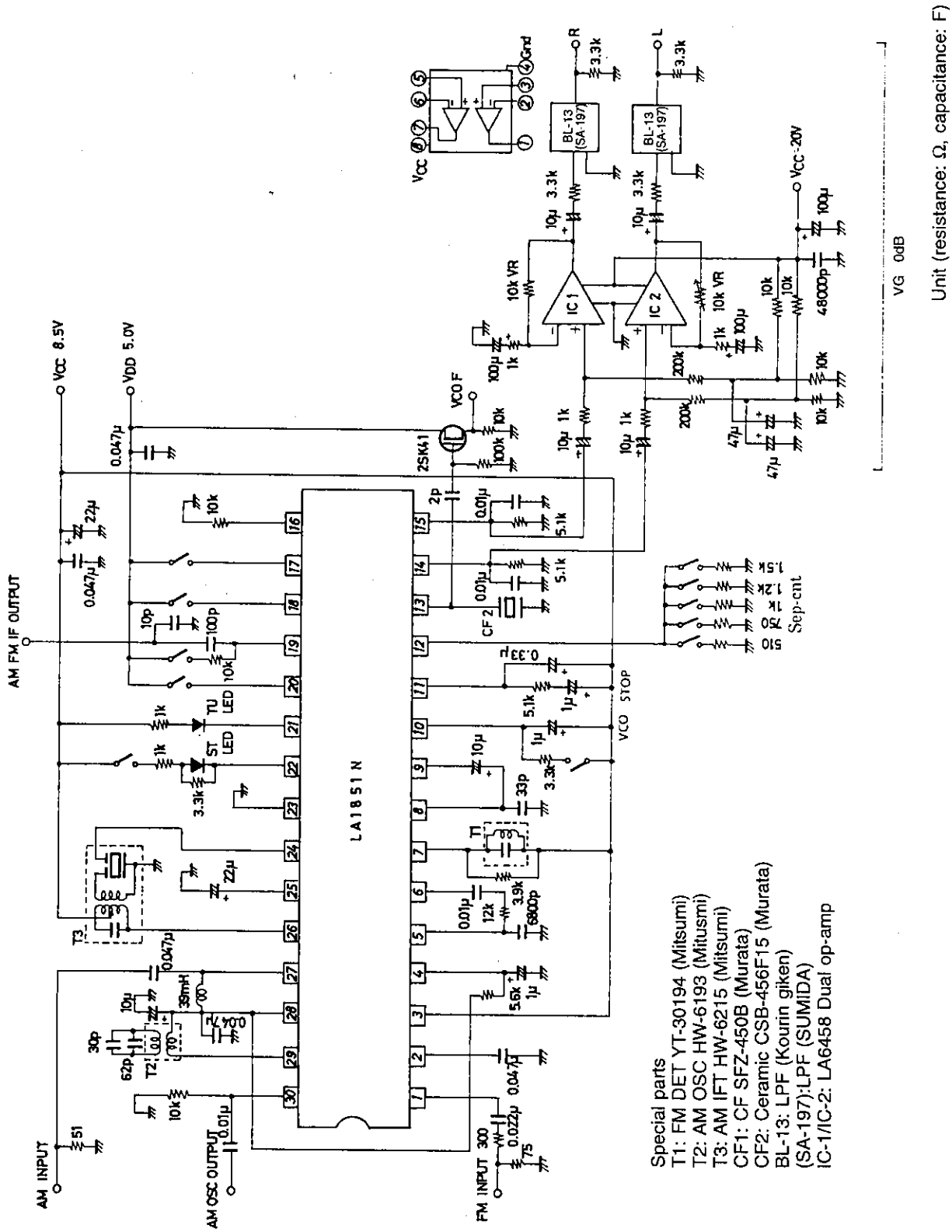
Note: Figures in parenthesis denote design guarantee values.



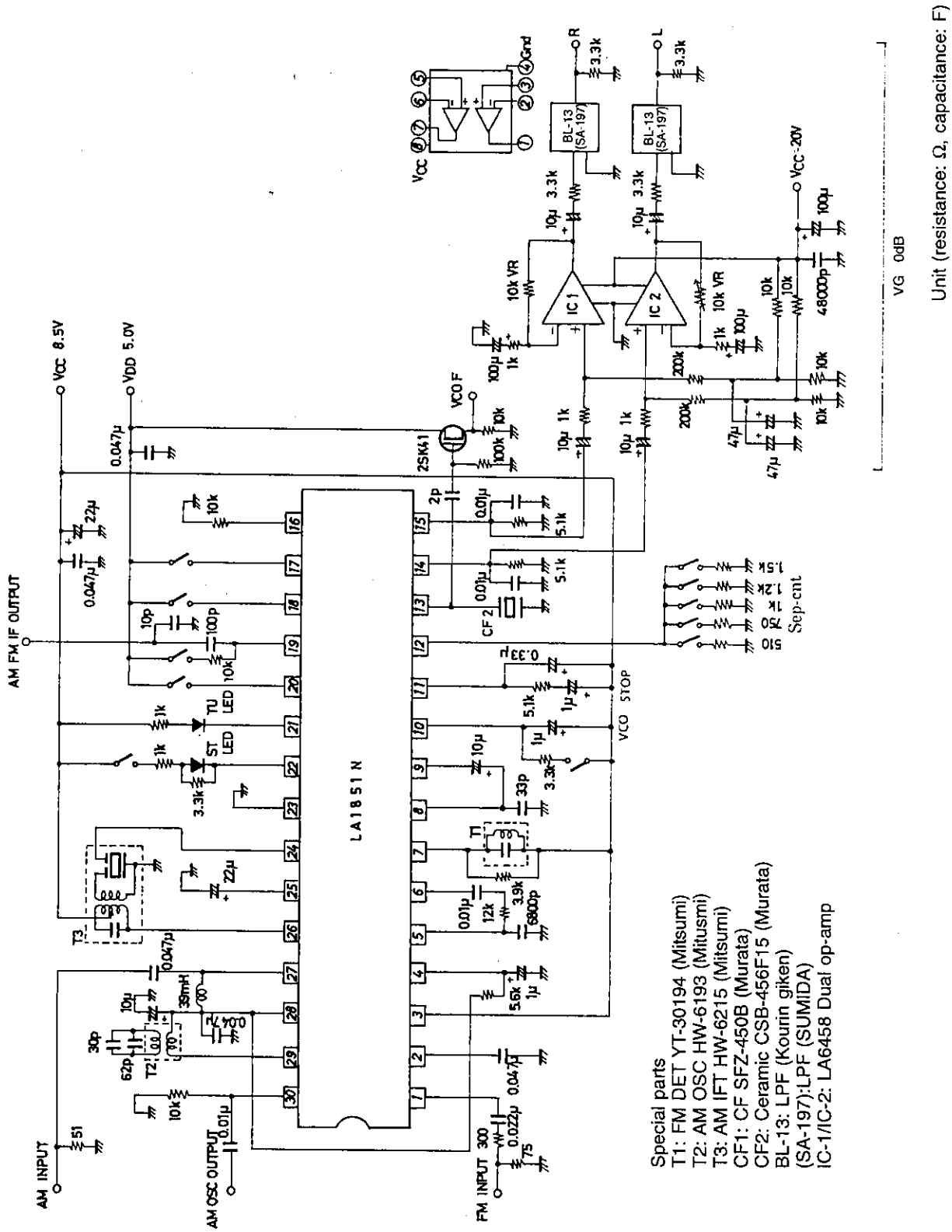
Block Diagram



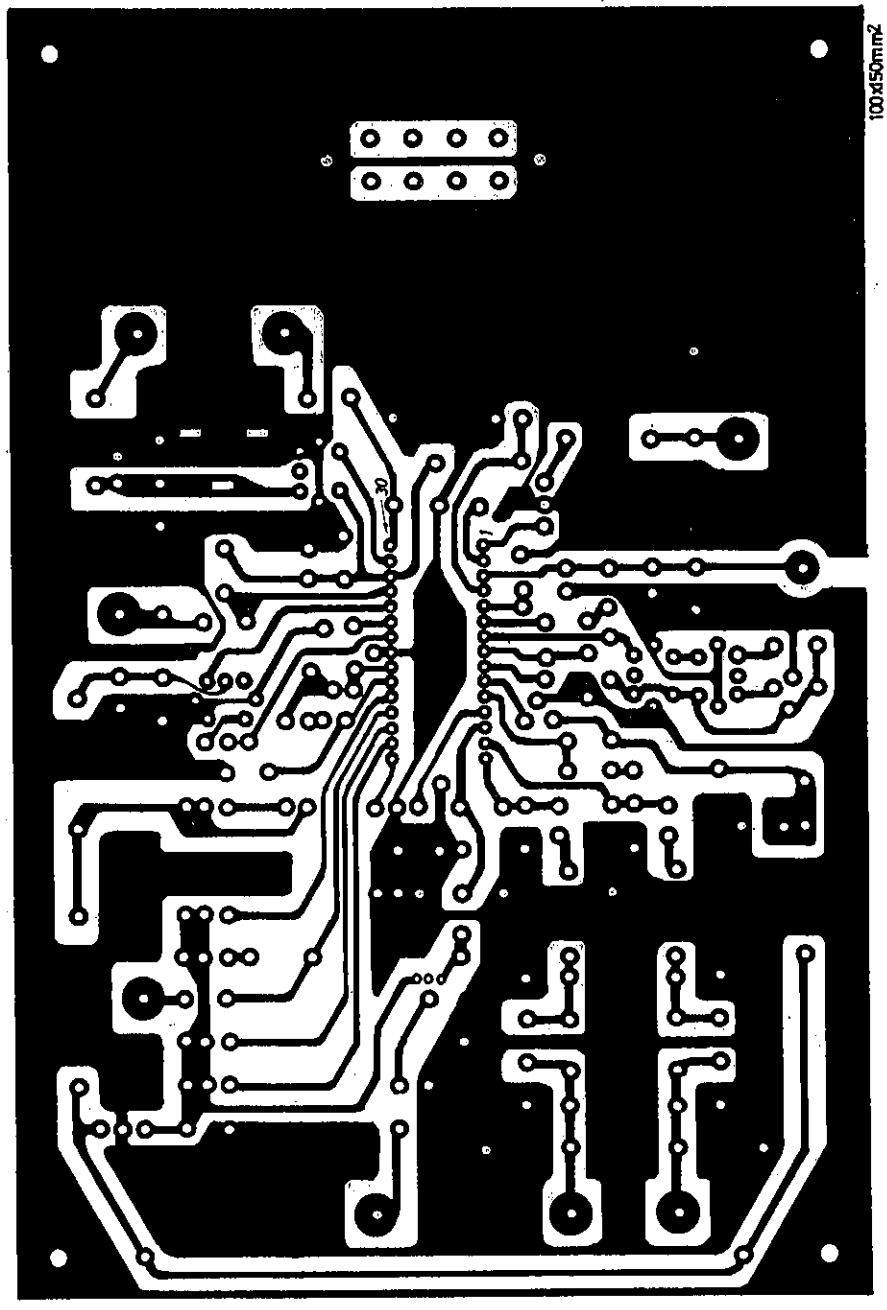
Test Circuit



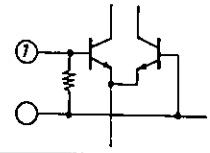
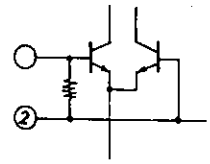
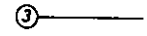
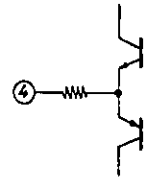
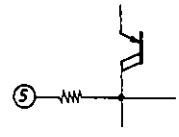
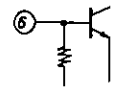
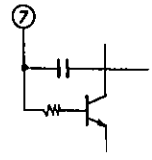
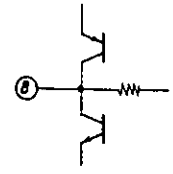
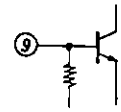
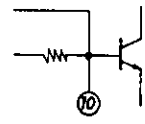
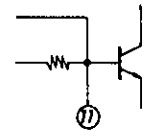
Test Circuit



Printed Circuit Board Layout

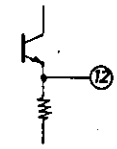
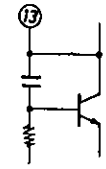
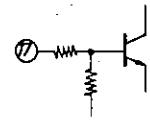
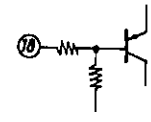
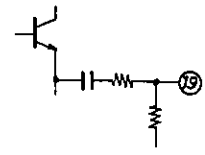
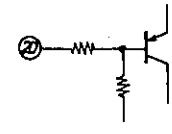
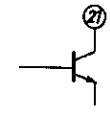
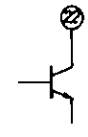


Pin Functions

Pin no.	Function	Internal equivalent circuit	Remarks
1	FM IF input		Input impedance: 330 Ω
2	FM IF bias		
3	V_{CC}		
4	FM AFC output		Forced monaural mode is established in synchronization with the extinguishing of ST LED during FM AFC detuning.
5	AM demodulation output		
6	MPX AM DET input		MPX block AM demodulation input pin Input impedance: 27 kΩ
7	FM discriminator output		
8	FM demodulation output		Output impedance: 5 kΩ
9	MPX FM DET output		MPX block FM demodulation input pin Input impedance: 27 kΩ
10	MPX pilot sync detection filter		MPX VCO is stopped by shorting the V10 voltage in the V3 V_{CC} line. However, a 3.3 kΩ current-limiting resistor is required.
11	MPX PLL loop filter		

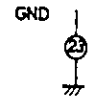
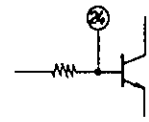
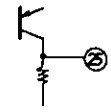
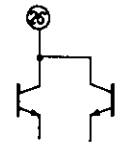
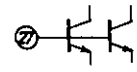
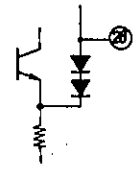
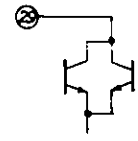
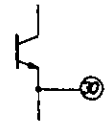
Continued on next page.

Continued from preceding page.

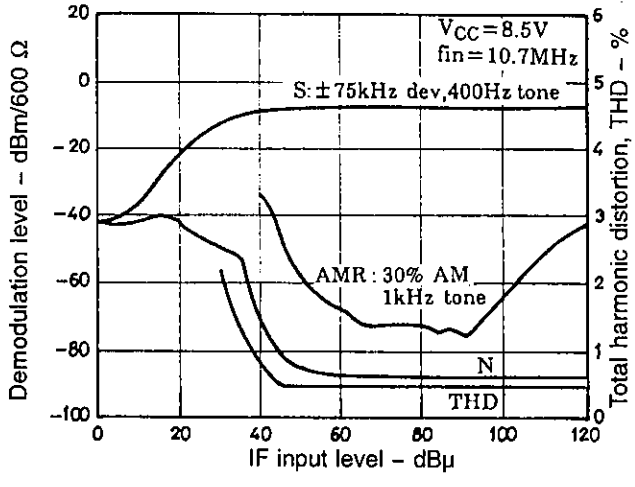
Pin no.	Function	Internal equivalent circuit	Remarks
12	MPX Separation control		
13	MPX VCO		Ceramic oscillator connection pin. CSB456F15 (Murata) recommended
14	MPX Left channel output		
15	MPX Right channel output		
16	AM SD ADJ		
17	MPX AF muting drive		V_{HI} (≧1.5 V): Mute on V_{LO} (<1.5 V): Mute off (μ-COM direct control enabled)
18	AM/FM switch		V_{HI} (≧ 1.5V): FM V_{LO} (< 1.5V): AM (μ-COM direct control enabled)
19	AM/FM IF counter output/ switch		V_{HI} (≧1.5 V): IF CNT ON V_{LO} (<1.5 V): IF CNT OFF (μ-COM direct control enabled)
20	Forced TU/ST LED extinguishing drive pin		V_{HI} (≧1.5 V): LED forced OFF (forced monaural mode) V_{LO} (<1.5 V): Normal (μ-COM direct control enabled)
21	AM/FM TU LED		
22	MPX ST LED		

Continued on next page.

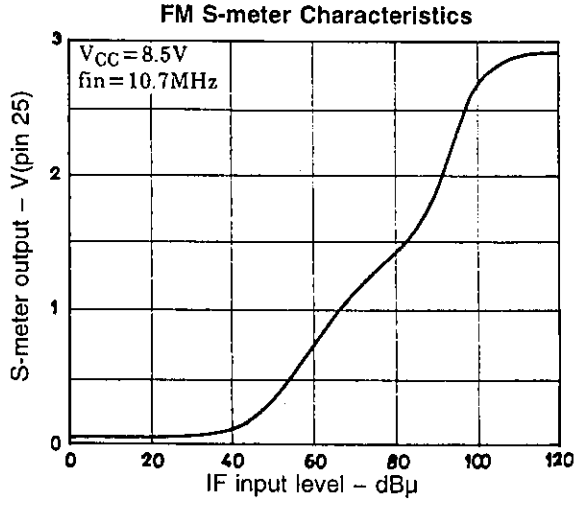
Continued from preceding page.

Number	Symbol	Equivalent circuit	Description
23	AM/FM MPX GND		
24	AM IF input		Input impedance: 2 kΩ
25	AM AGC output FM S-meter output		
26	AM MIXER output		
27	AM RF input		
28	V Reg		Vreg = 2.3 V
29	AM OSC		
30	AM OSC buffer output/ FM SD ADJ		

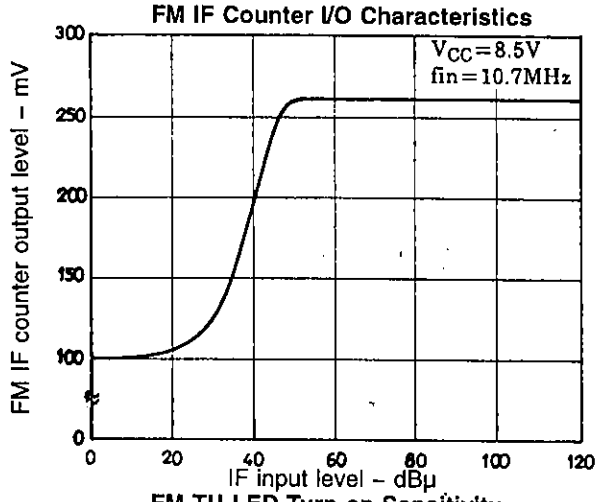
FM IF I/O Characteristics



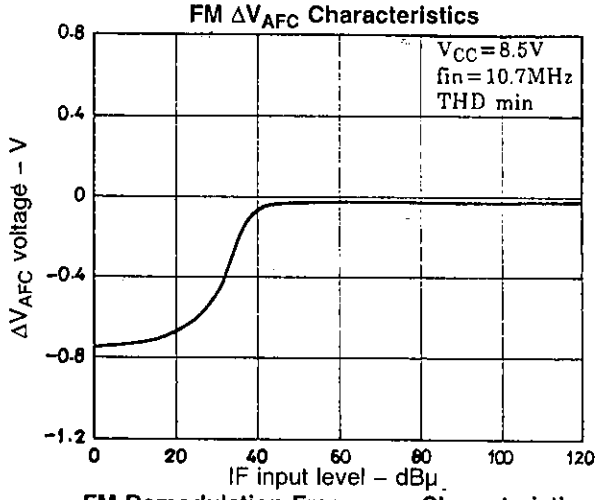
FM S-meter Characteristics



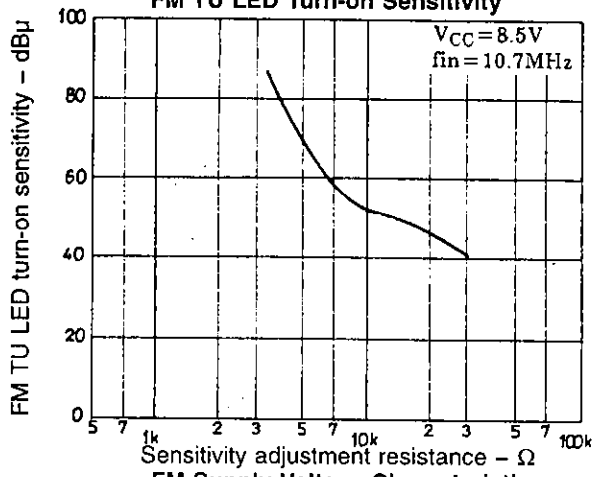
FM IF Counter I/O Characteristics



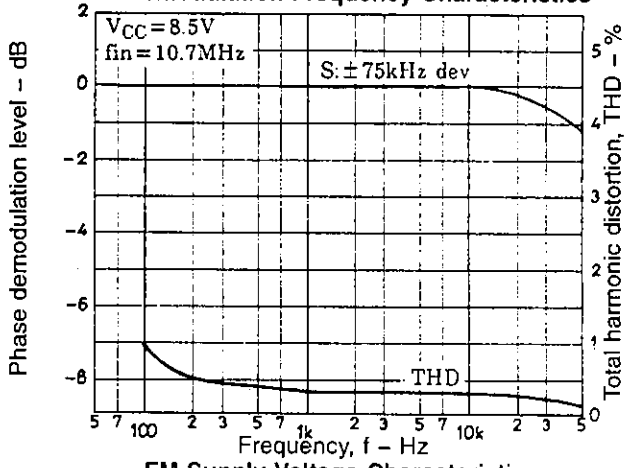
FM ΔV_{AFC} Characteristics



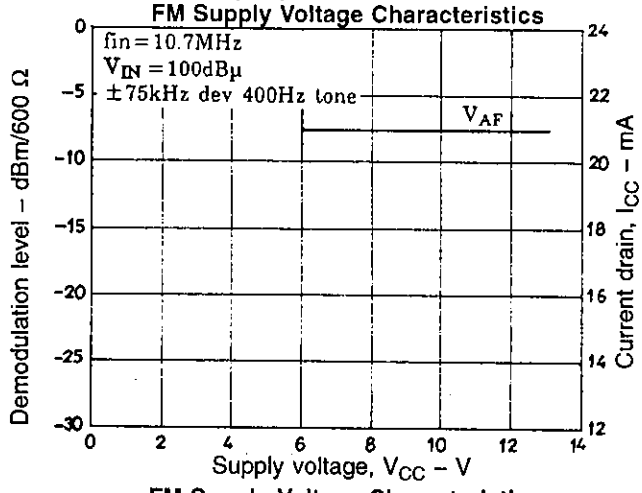
FM TU LED Turn-on Sensitivity



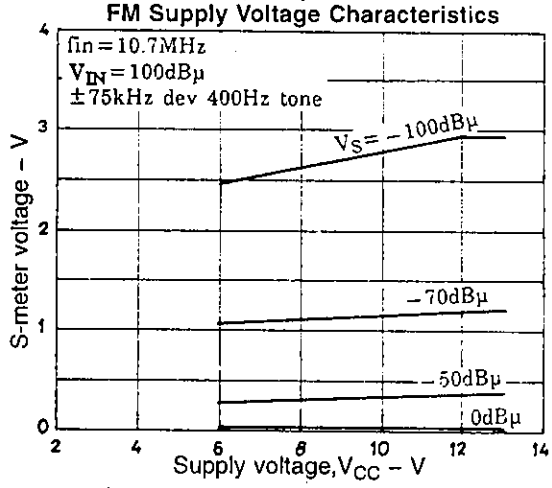
FM Demodulation Frequency Characteristics



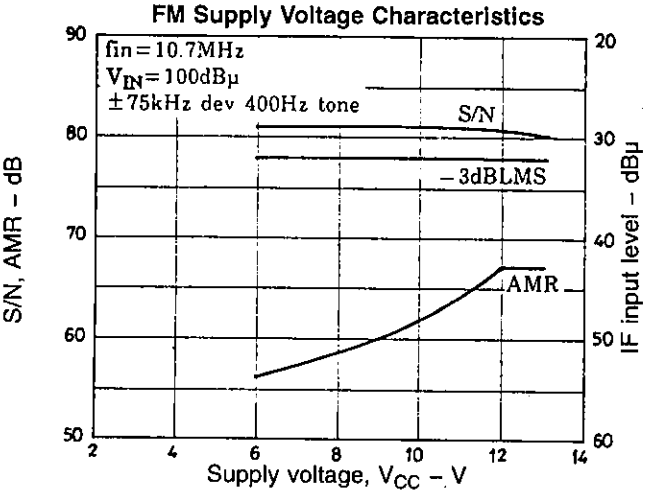
FM Supply Voltage Characteristics



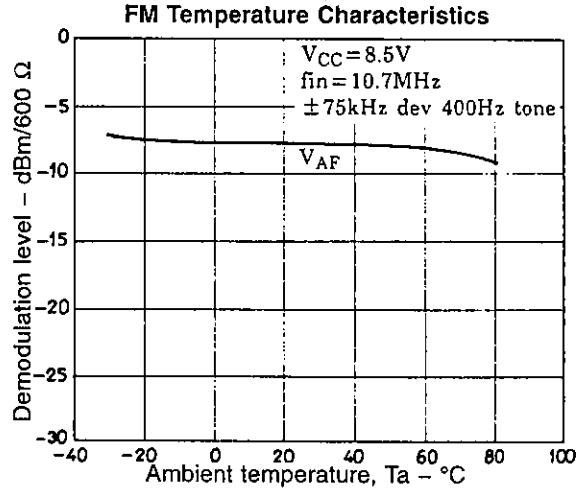
FM Supply Voltage Characteristics



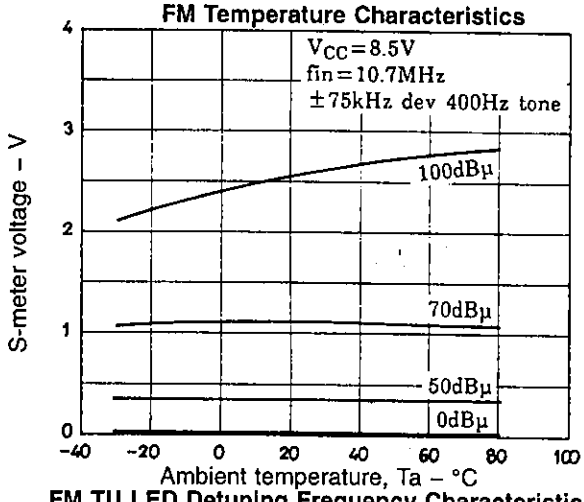
FM Supply Voltage Characteristics



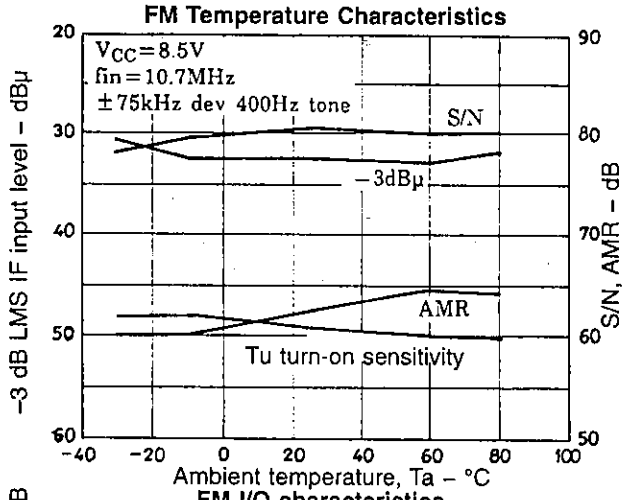
FM Temperature Characteristics



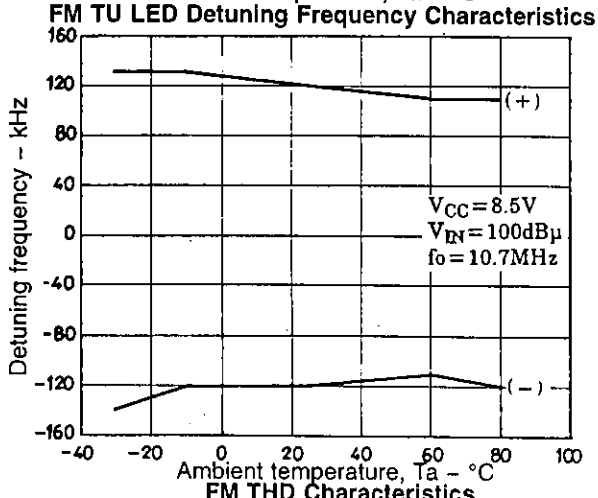
FM Temperature Characteristics



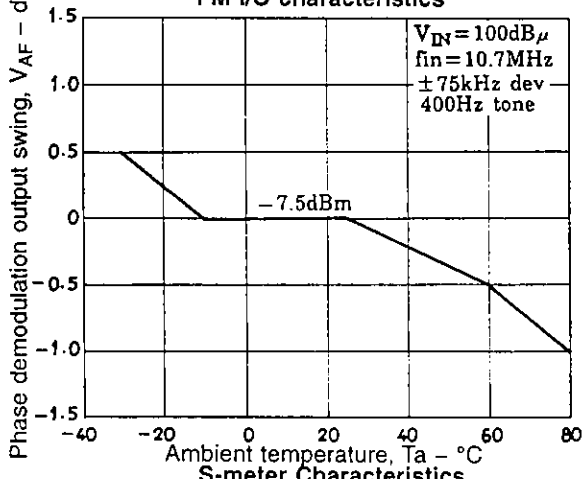
FM Temperature Characteristics



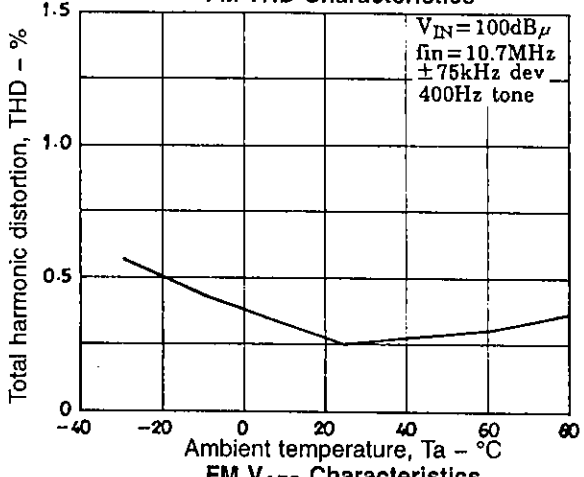
FM TU LED Detuning Frequency Characteristics



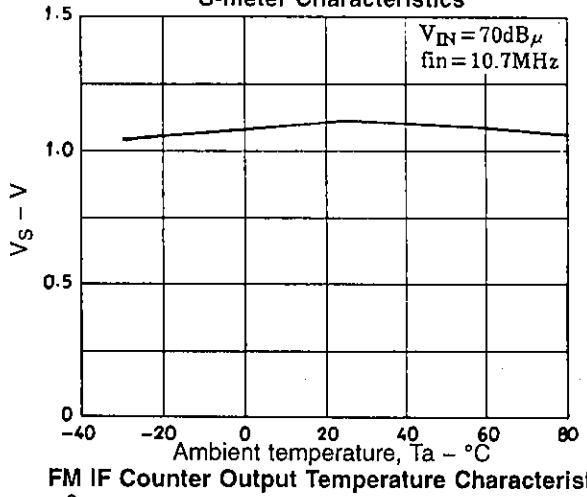
FM I/O characteristics



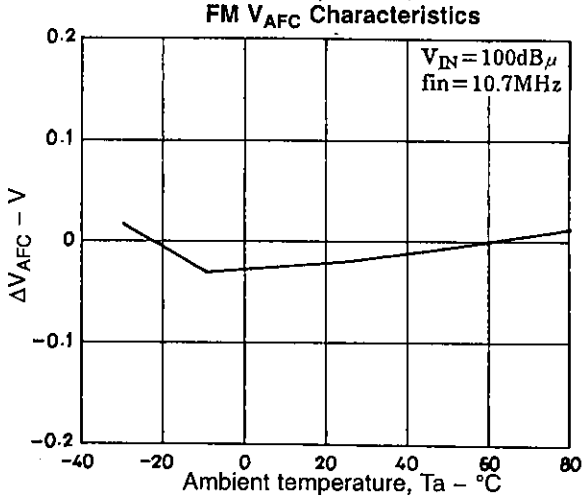
FM THD Characteristics



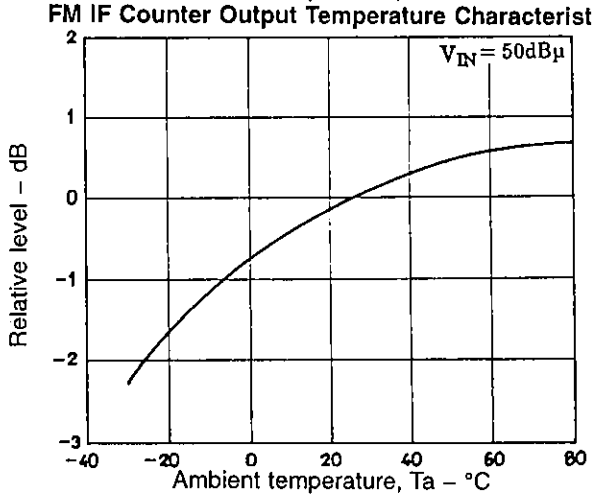
S-meter Characteristics



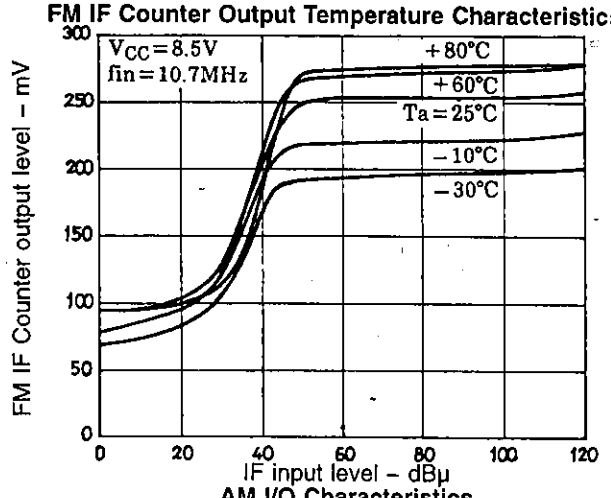
FM V_{AFC} Characteristics



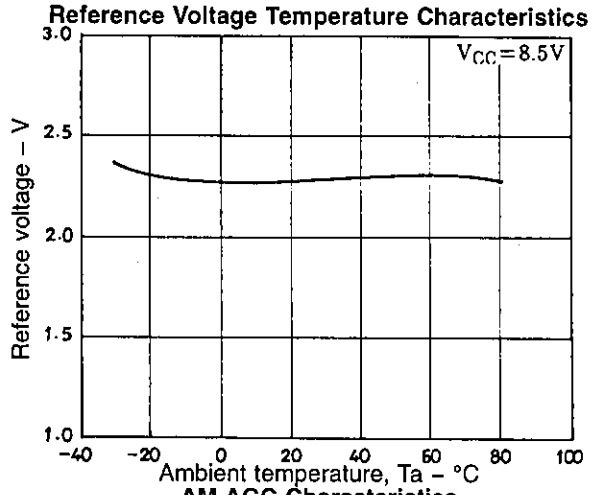
FM IF Counter Output Temperature Characteristics



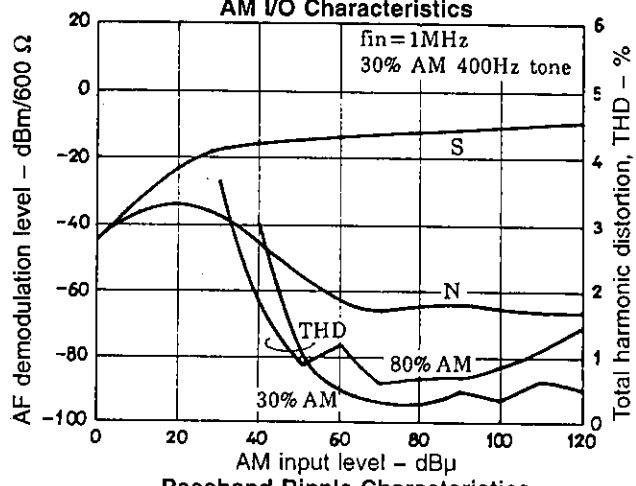
FM IF Counter Output Temperature Characteristics



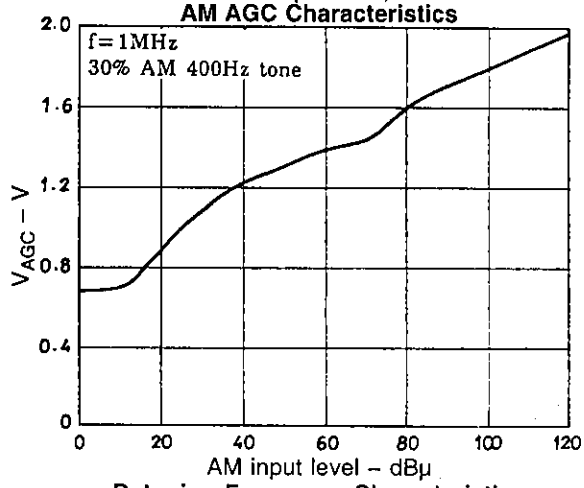
Reference Voltage Temperature Characteristics



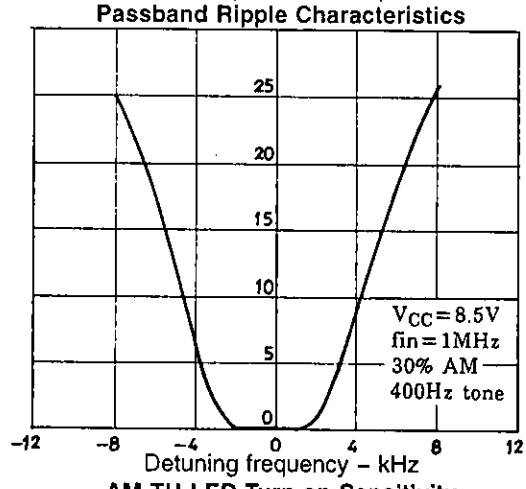
AM I/O Characteristics



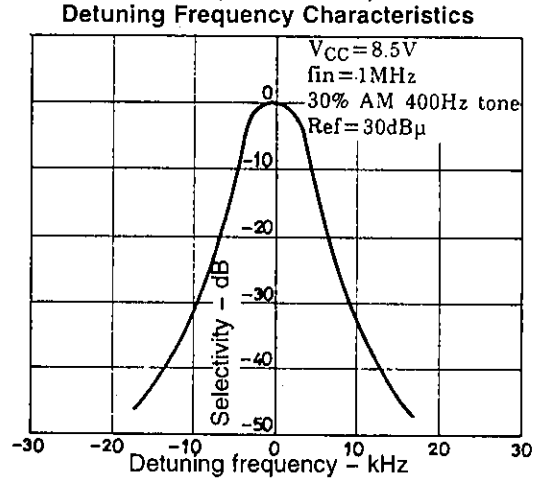
AM AGC Characteristics



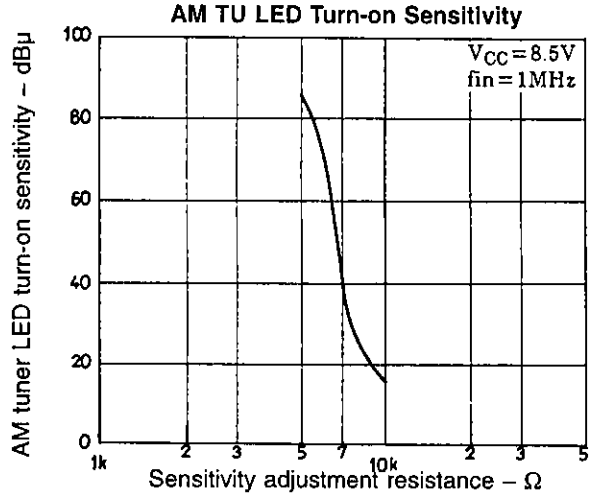
Passband Ripple Characteristics



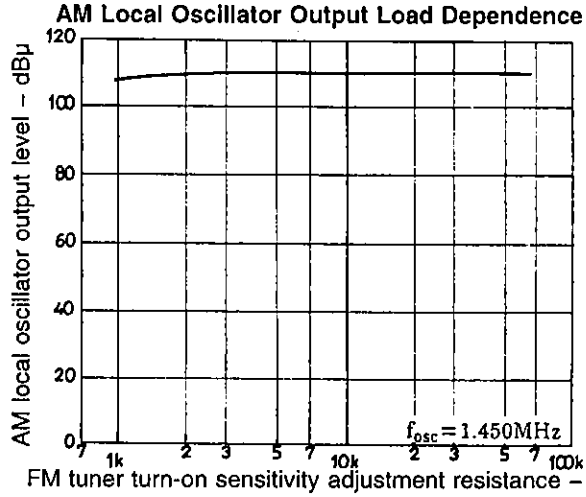
Detuning Frequency Characteristics



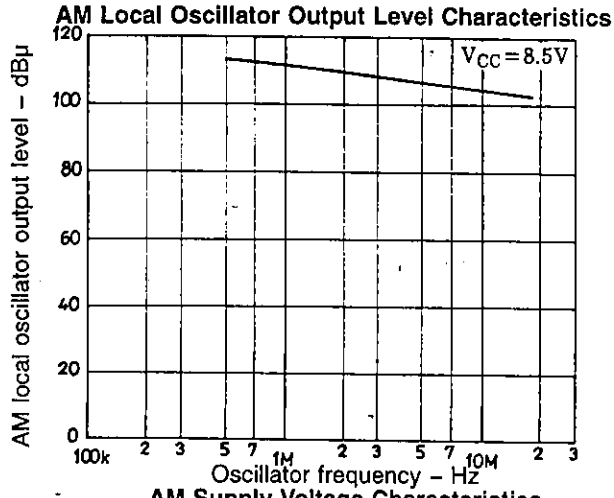
AM TU LED Turn-on Sensitivity



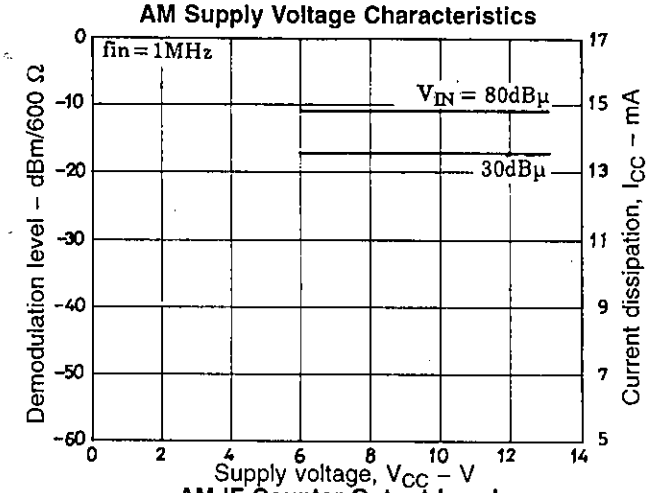
AM Local Oscillator Output Load Dependence



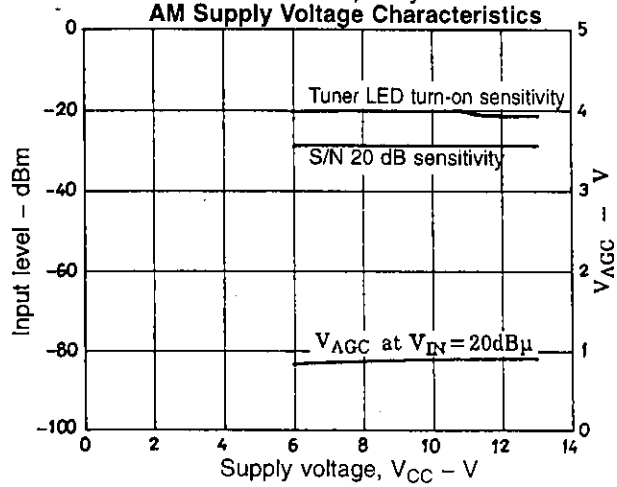
AM Local Oscillator Output Level Characteristics



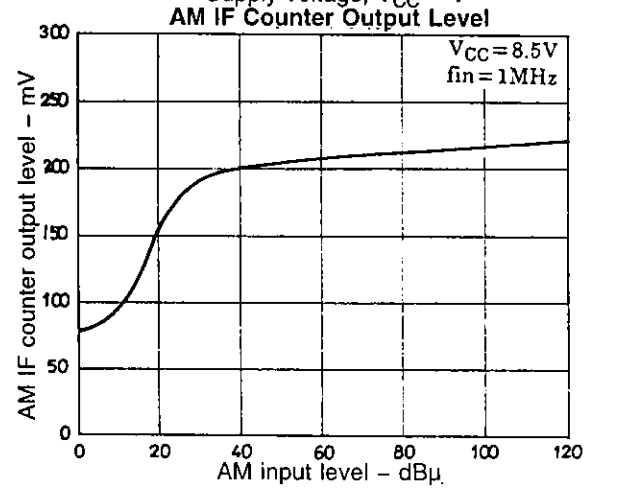
AM Supply Voltage Characteristics



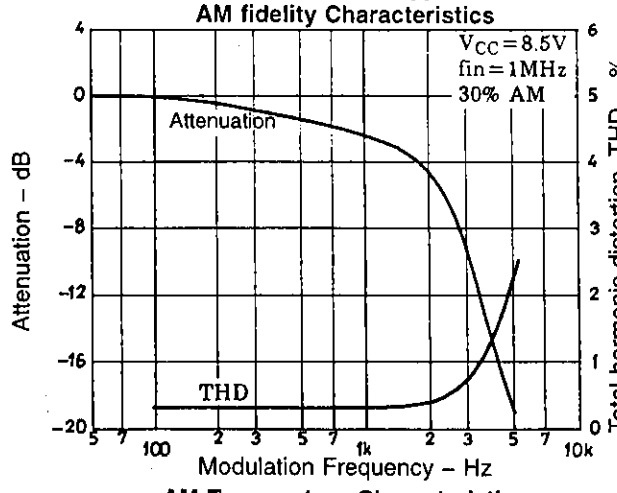
AM Supply Voltage Characteristics



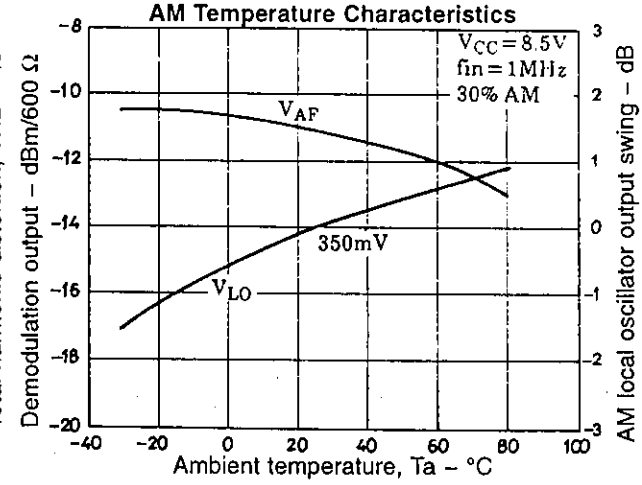
AM IF Counter Output Level



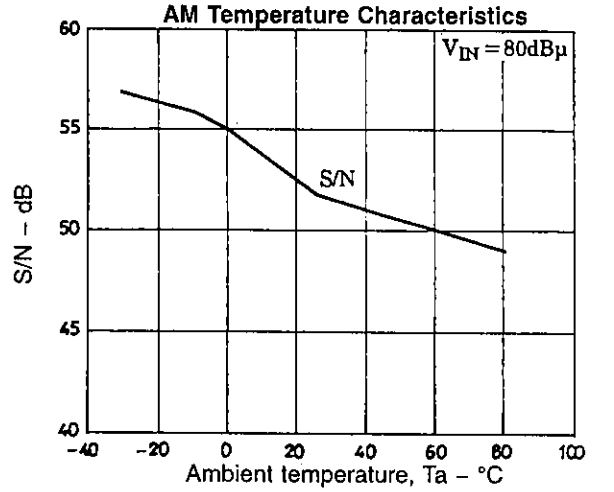
AM fidelity Characteristics



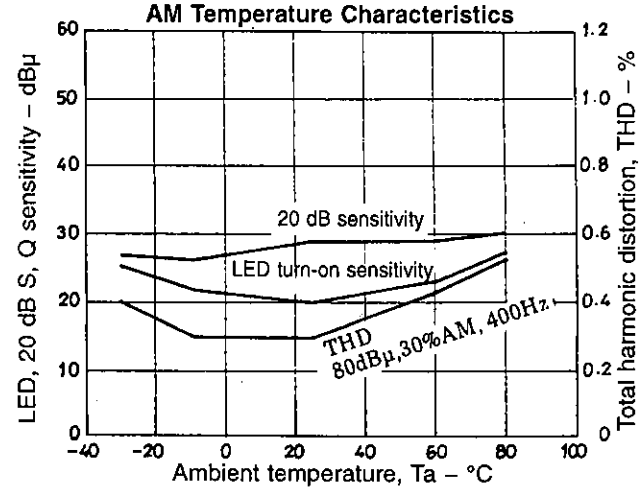
AM Temperature Characteristics



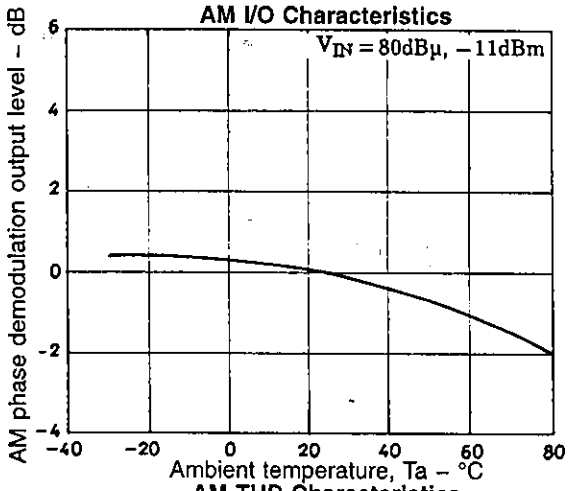
AM Temperature Characteristics



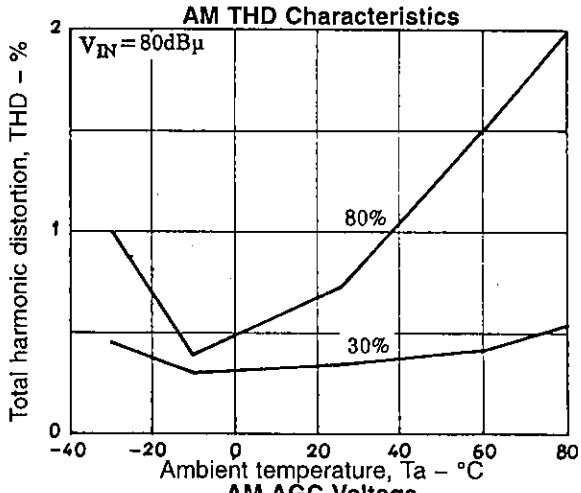
AM Temperature Characteristics



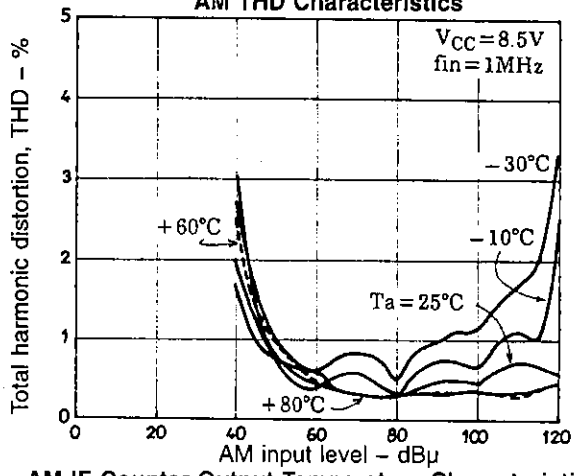
AM I/O Characteristics



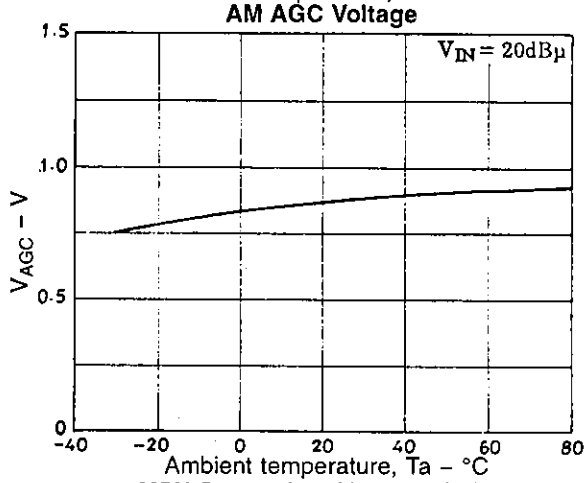
AM THD Characteristics



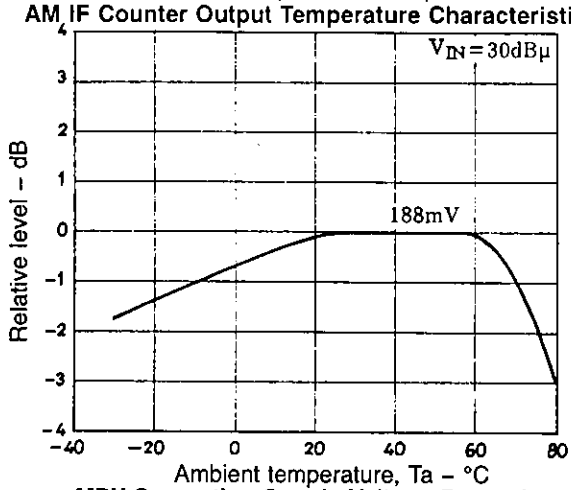
AM THD Characteristics



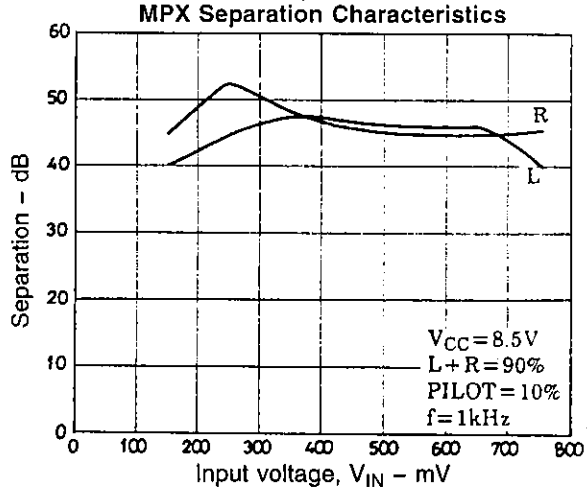
AM AGC Voltage



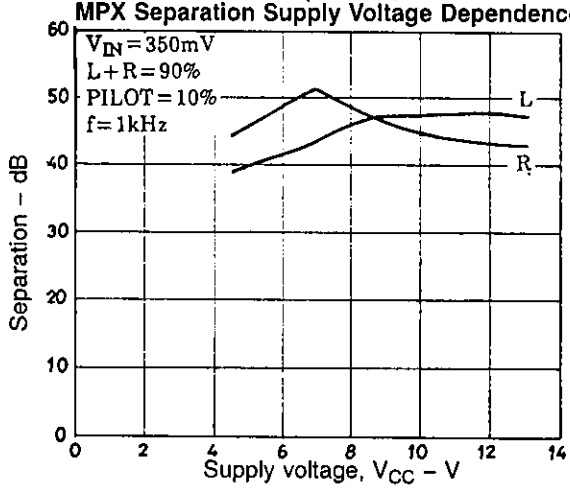
AM IF Counter Output Temperature Characteristics



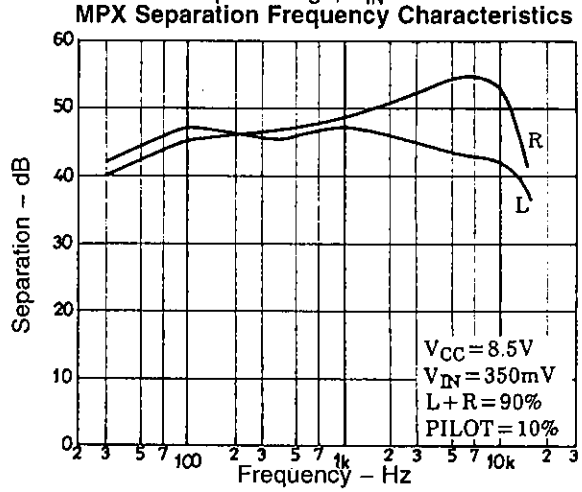
MPX Separation Characteristics



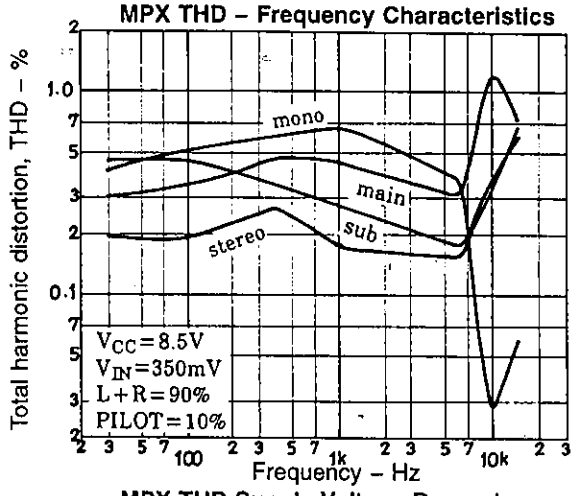
MPX Separation Supply Voltage Dependence



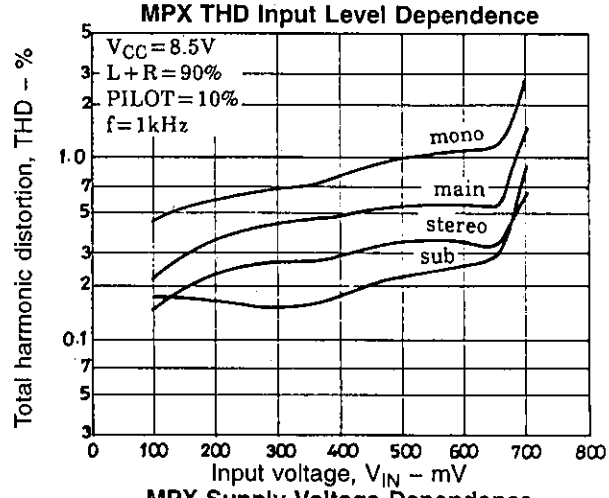
MPX Separation Frequency Characteristics



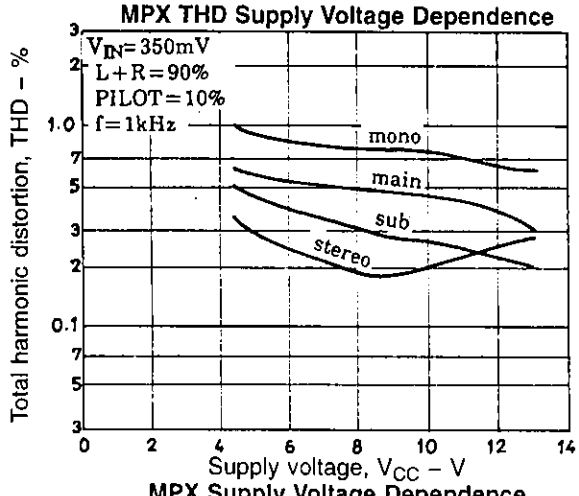
MPX THD – Frequency Characteristics



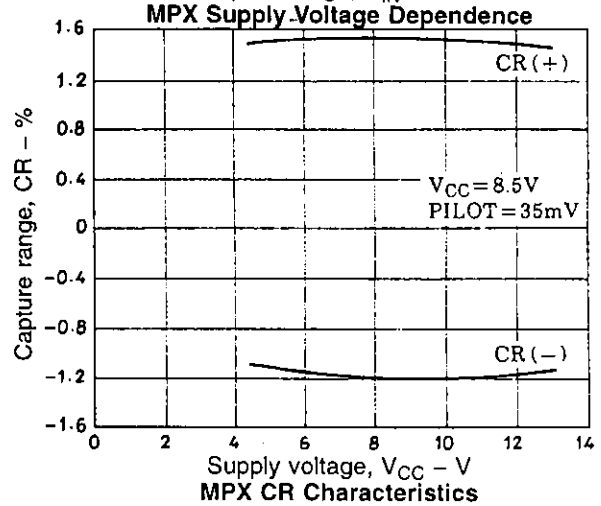
MPX THD Input Level Dependence



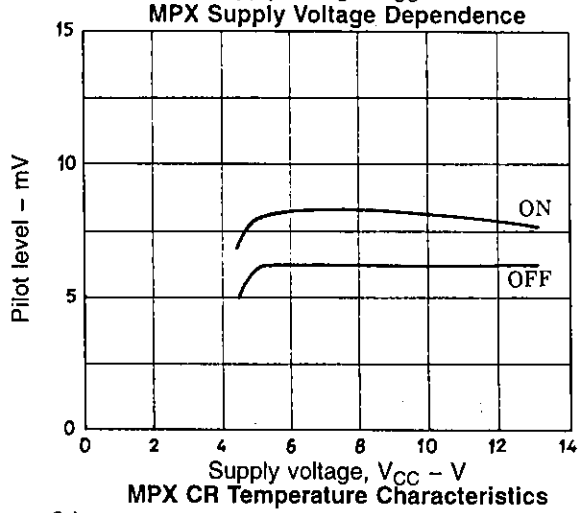
MPX THD Supply Voltage Dependence



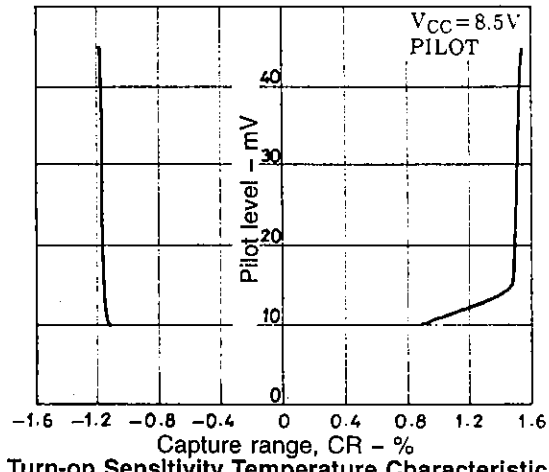
MPX Supply Voltage Dependence



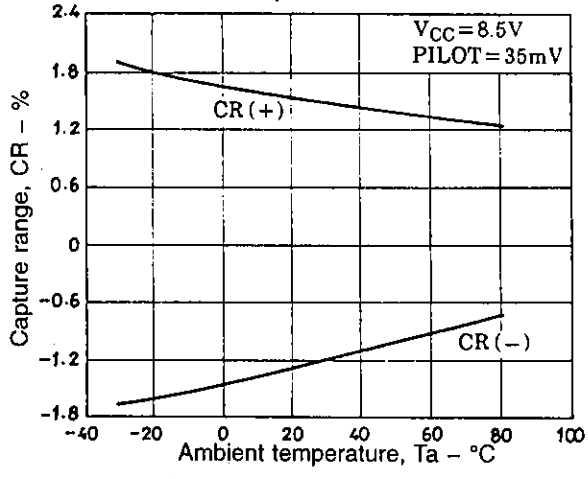
MPX Supply Voltage Dependence



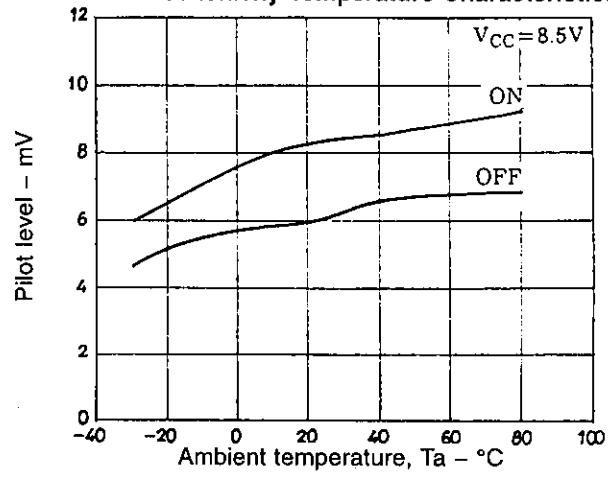
MPX CR Characteristics



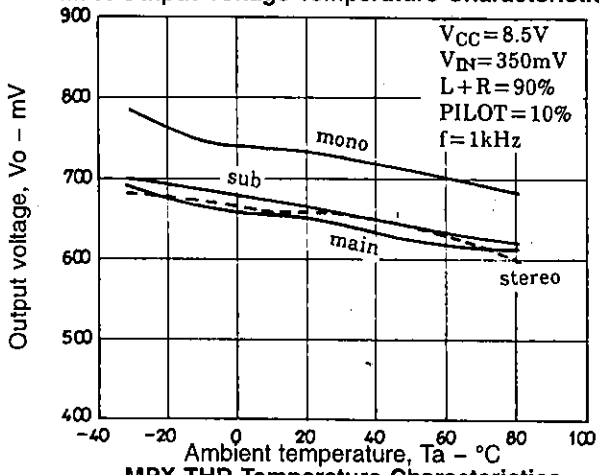
MPX CR Temperature Characteristics



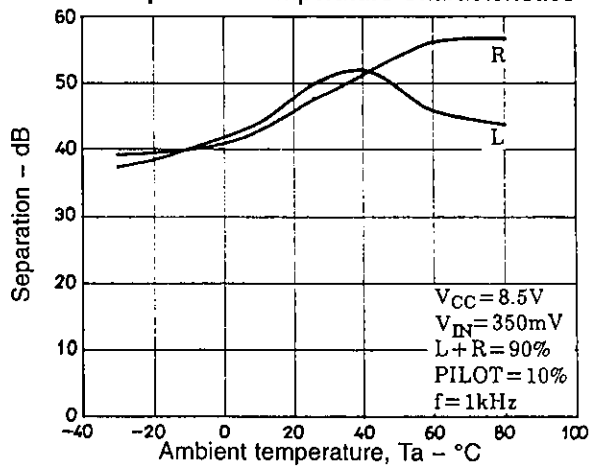
Turn-on Sensitivity Temperature Characteristics



MPX Output Voltage Temperature Characteristics



MPX Separation Temperature Characteristics



MPX THD Temperature Characteristics