No.C1141C

LA1232

Monolithic Linear Integrated Circuit

FM IF SYSTEM

Functions

1. IF amp, limiter
2. Quadrature detector
3. AF preamp
4. Muting at weak input
5. Muting during detuning
6. Signal meter drive output
7. AFC, tuning meter drive output
8. Delay AGC output
9. Muting drive voltage inverter
10. IF amp stop circuit

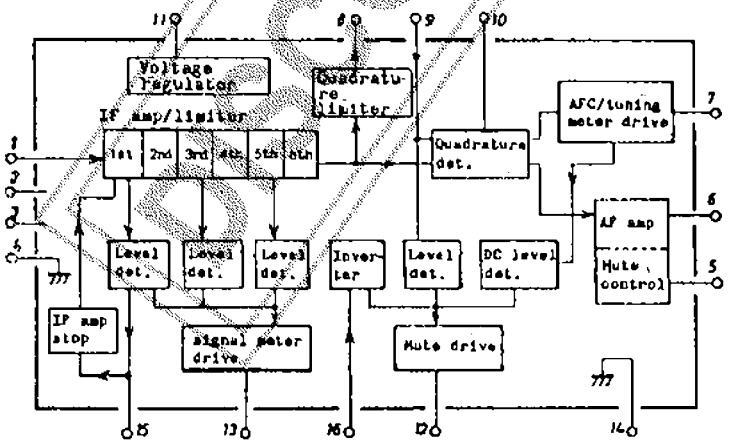
Features

1. High limiting sensitivity: 18uV typ
2. Low distortion: 0.05% typ. (Depends on the linearity of the phase characteritic of the phase shifter.)
3. High demodulation output: 330mVrms typ.
4. High S/N: 84.0dB typ.
5. Pop noise reduced muting during detuning
6. Signal meter drive output in proportion to input signal level (dB)
7. Detuning muting band having good symmetry
8. Tuning meter drive output having wide deflection
9. Delay AGC drive output for front end
10. On-chip voltage regulator: operating voltage=9 to 14V
11. Excellent interstation muting characteristic
12. Pin compatible with LA1231N

General Description

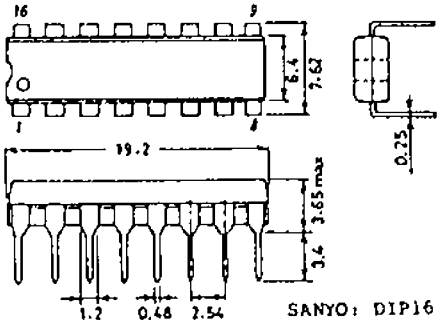
The LA1232 is a high integration IC that is intended for use in FM IF systems and contains almost all the functions required for the IF stage of an FM tuner. The equivalent circuit block diagram is shown below. A sample application circuit is also shown below together with its peripheral circuit.
The IF amplifier/limiter stage consists of 6 stages of double-ended differential amplifier having good AMR characteristic, and a signal meter drive stage coupled in parallel with the amplifier/limiter stage is composed of 3 stages of level detector and a drive circuit for extending the linearity range.

Equialent Circuit Block Diagram



Case Outline 3006B-D16IC

(unit:mm)



SANYO: DIP16

These specifications are subject to change without notice.

TOKYO SANYO ELECTRIC CO. LTD. SEMICONDUCTOR DIVISION
15-13 6-CHOME, SOTOKANDA, CHIYODA-KU, TOKYO 101 JAPAN

The FM detector stage consists of a double-balanced quadrature detector to which a low frequency preamplifier and a muting controller are attached.
The muting drive stage consists of a level detector to detect the S/N ratio of the carrier when the input signal is weak and a circuit to detect the DC output of the S curve supplied from the FM detector during detuning and a drive circuit, and operates to reduce interstation noise and pop noise caused by muting during detuning.
Further, a voltage inverter is contained so that muting can be turned ON at any input signal level. The output of the voltage inverter is connected to the muting drive output pin. Muting can be turned ON/OFF by externally applying the control voltage to the input pin of the voltage inverter. For the control voltage, the signal meter drive output is suited.
The AFC output and tuning meter drive stage are of current type. The AFC sensitivity and muting bandwidth during detuning can be adjusted by an external resistor.
The IF amplifier stop circuit, being a circuit to stop the FM IF amplifier at the AM reception mode, makes it possible to reduce pop noise caused by FM-AM reception mode switchover.

Maximum Ratings at Ta=25°C

				unit
Maximum Supply Voltage	$V_{CC}max$	Pin 11	16	V
Maximum Input Voltage	V_I	Pin 1-2	±1	Vp-p
Maximum Current Dissipation	I_{CC}	Pin 11	40	mA
Maximum Flow-in Current	I_{15}	Pin 15	1	mA
	I_{16}	Pin 16	1	mA
Maximum Flow-out Current	I_{10}	Pin 10	2	mA
	I_{12}	Pin 12	2	mA
	I_{13}	Pin 13	2	mA
	I_{15}	Pin 15	2	mA
Allowable Power Dissipation	Pdmax		650	mW
Operating Temperature	Topg		-20 to +70	°C
Storage Temperature	Tstg		-20 to +125	°C

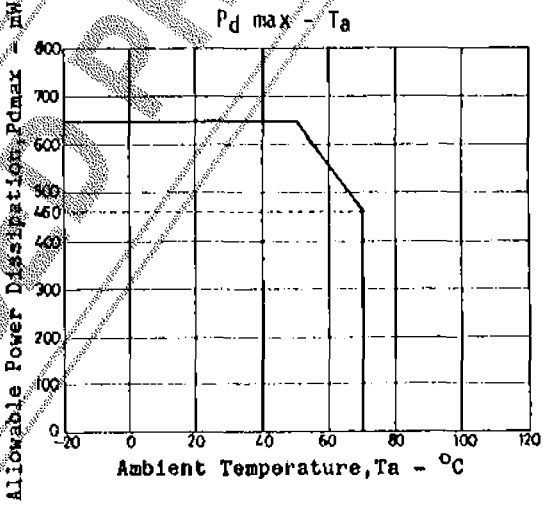
Operating Conditions at Ta=25°C

			unit
Recommended Operating Voltage	V_{CC}	12	V

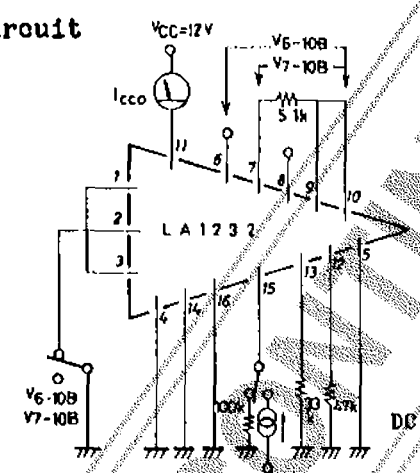
Operating Characteristics at Ta=25°C, V_{CC}=12V, f=10.7MHz

			min	typ	max	unit
Quiescent Current	Iccq	Quiescent		22	30	mA
Current Dissipation	I_{CC}	Vin=100dBu		26.5	33	mA
Demodulation Output	Vo	Vin=100dBu, 400Hz 100%mod	240	330	460	mVrms
S/N		Vin=100dBu, 400Hz 100%mod	78	84		dB
Input Limiting Voltage	Vin(Lim)	Vo 3dB down, 400Hz 100%mod		25	31	dB
Total Harmonic Distortion	THD	Vin=100dBu, 400Hz 100%mod		0.05	0.3	%
Muting Sensitivity	Vin(mute)	V12=1.4V	23	29	35	dB
Muting Attenuation	Mute(att)	V5=2V, Vin=100dBu, 400Hz 100%mod	60	65		dB
Muting Bandwidth	BW(mute)	Vin=100dBu, V12=1.4V	140	220	370	kHz
AM Rejection	AMR	Vin=100dBu, FM 400Hz 100%mod, AM 1kHz 30%mod	45	60		dB
Muting Drive Output	V_{12}	Quiescent	4.0	4.9	6.0	V
		Vin=100dBu	0	0	0.3	V
Signal Meter Drive Output	V_{13}	Quiescent	0	0	0.1	V
		Vin=70dBu	1.9	3.0	4.2	V
		Vin=100dBu	4.5	5.5		V

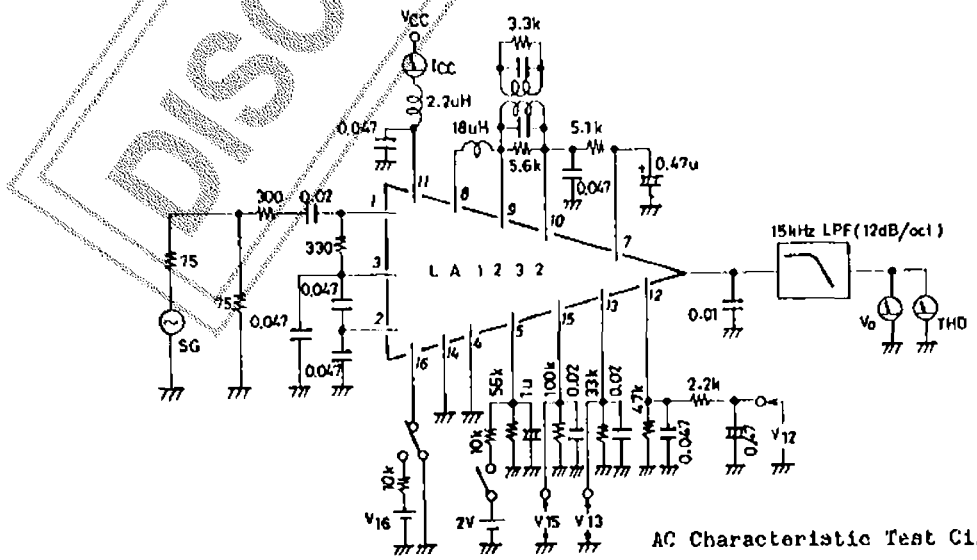
			min	typ	max	unit
AGC Output	V_{15}	Quiescent	4.2	5.0	5.5	V
		Vin=100dBu	0	0	0.5	V
IF OFF Current	I_{15}(off)	Quiescent, $V_{8-10} \leq 20$mV	10	35	60	uA
Muting Operation Level Voltage	V_{16}(mute)	Vin=100dBu, V12=1.4V	0.7	0.84	1.0	V
Offset Voltage	$V_{6-10\ B}$	Quiescent, Pin6-10	-0.5	0	+0.5	V
	$V_{7-10\ B}$	Quiescent, Pin7-10, R_{7-10}=5.1kohm	-0.25	0	+0.25	V
Pin Voltage	V_1	Quiescent		2.6		V
	V_2	Quiescent		2.6		V
	V_3	Quiescent		2.6		V
	V_6	Quiescent		5.6		V
	V_7	Quiescent		5.6		V
	V_8	Quiescent		5.4		V
	V_{10}	Quiescent		5.6		V
	V_{12}	Quiescent		4.9		V
	V_{13}	Quiescent		0		V
	V_{15}	Quiescent		5.0		V



Test Circuit

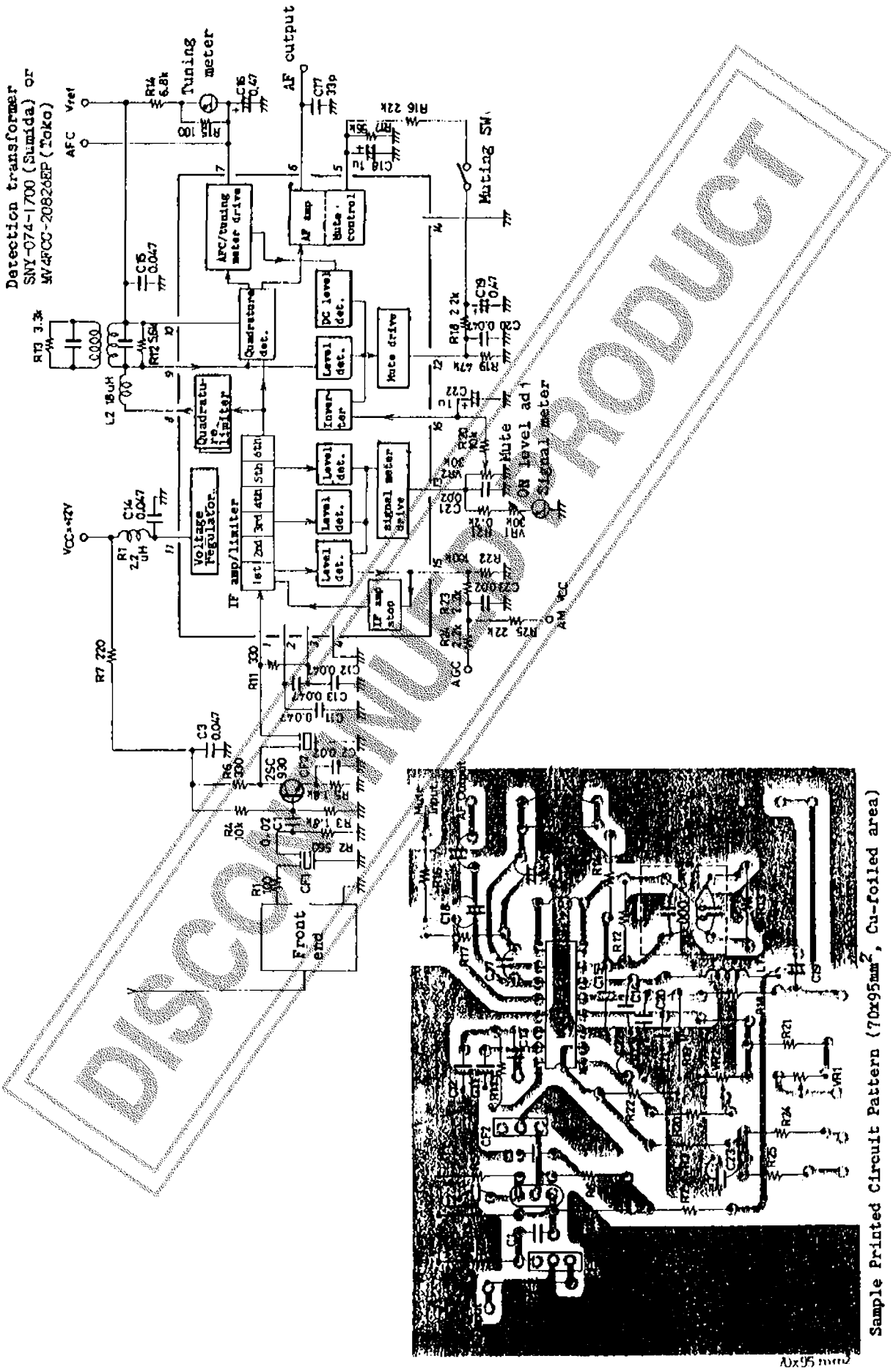


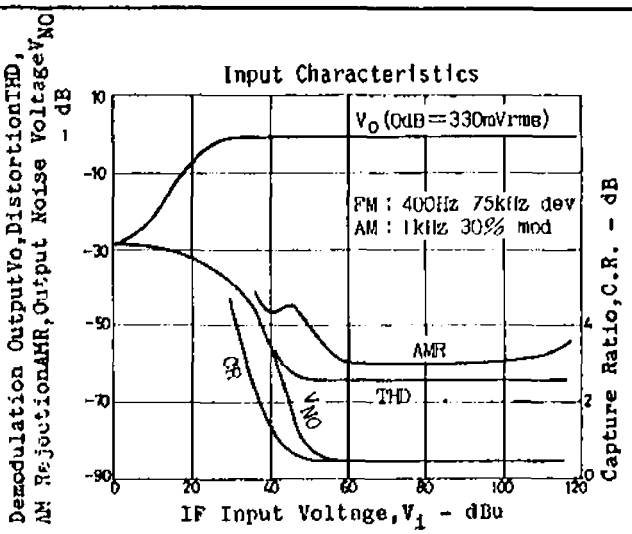
DC Characteristic Test Circuit

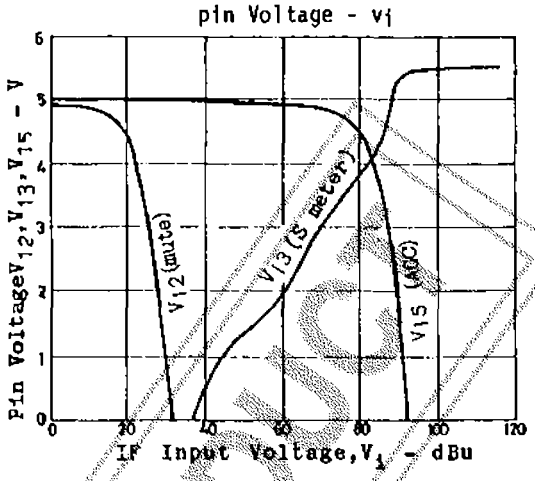


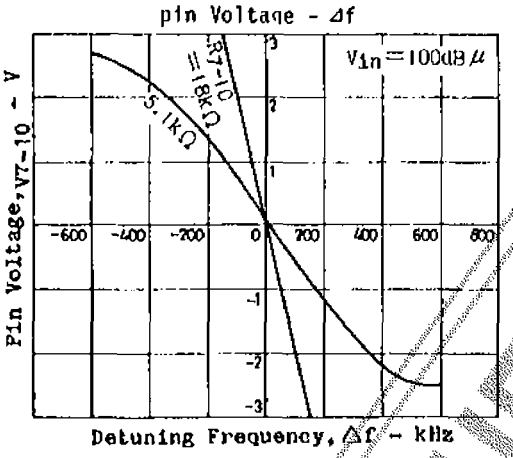
AC Characteristic Test Circuit

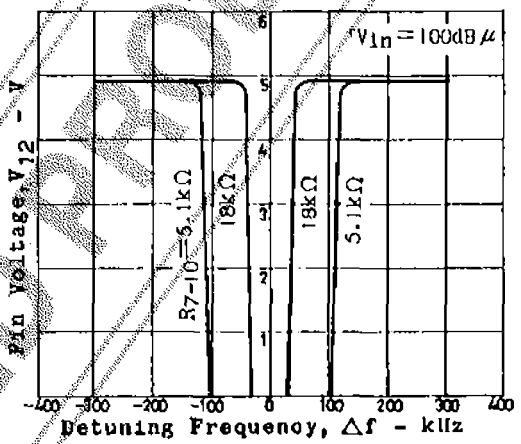
Sample Application Circuit

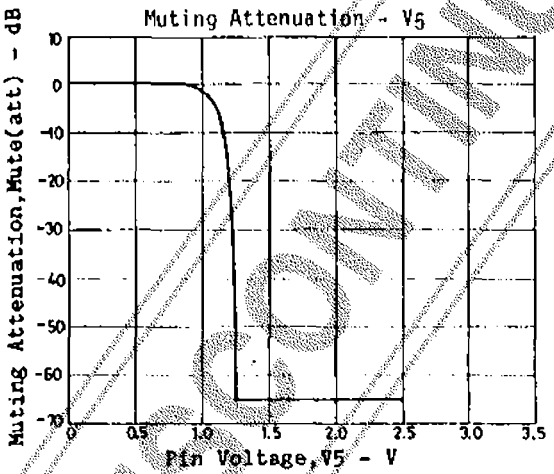


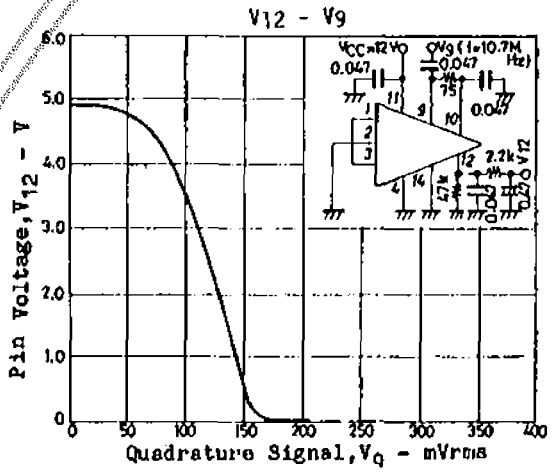


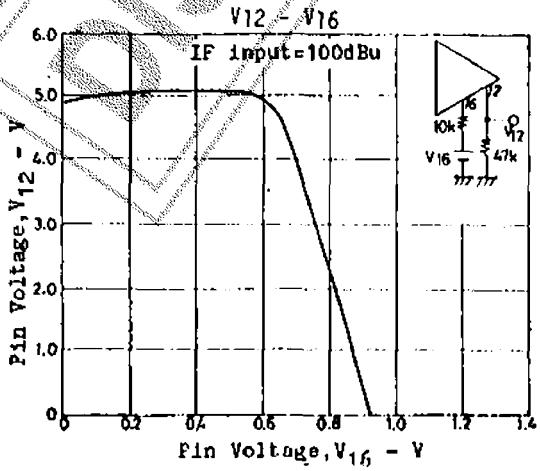


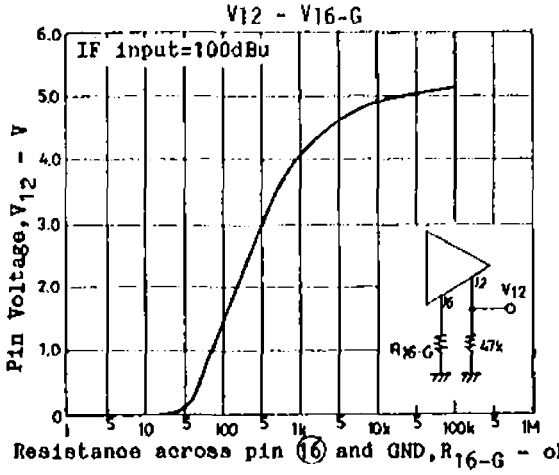


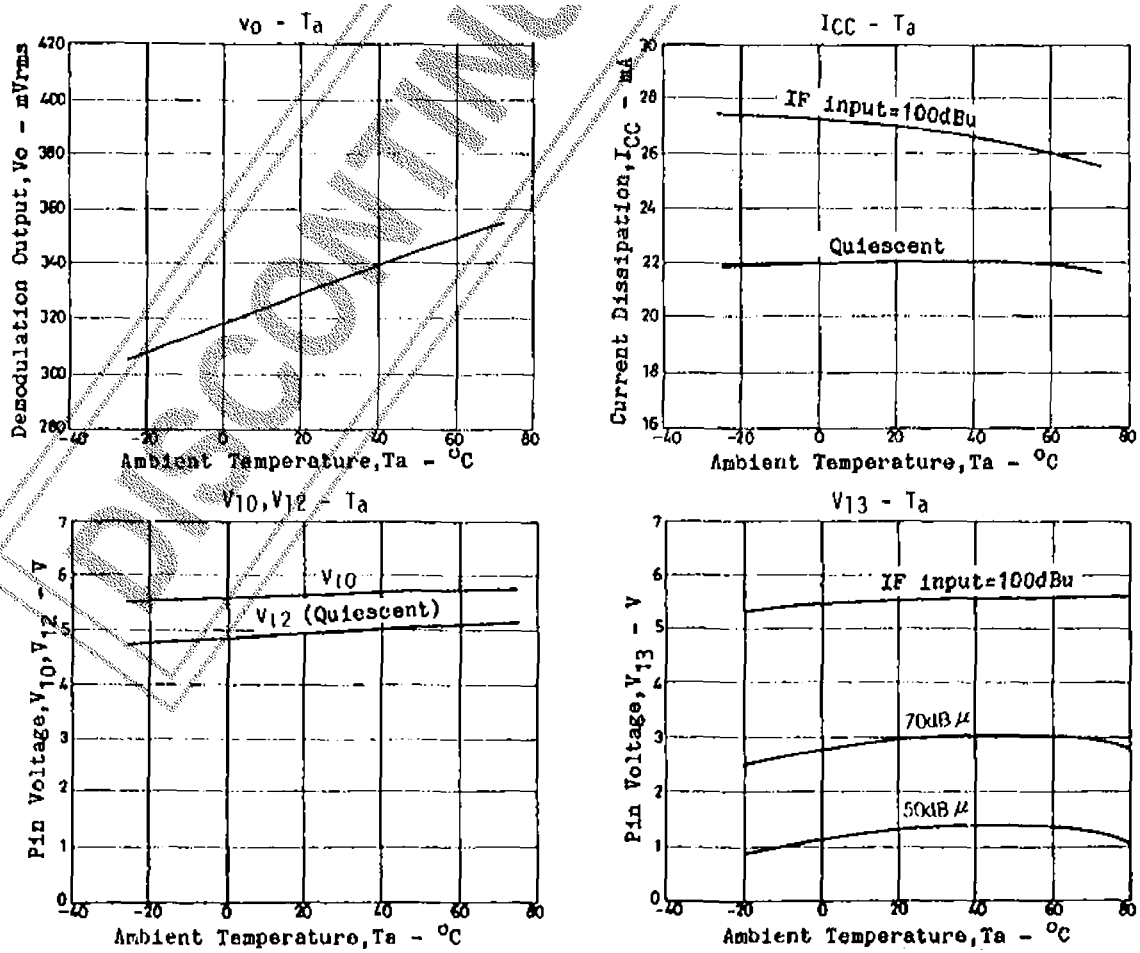


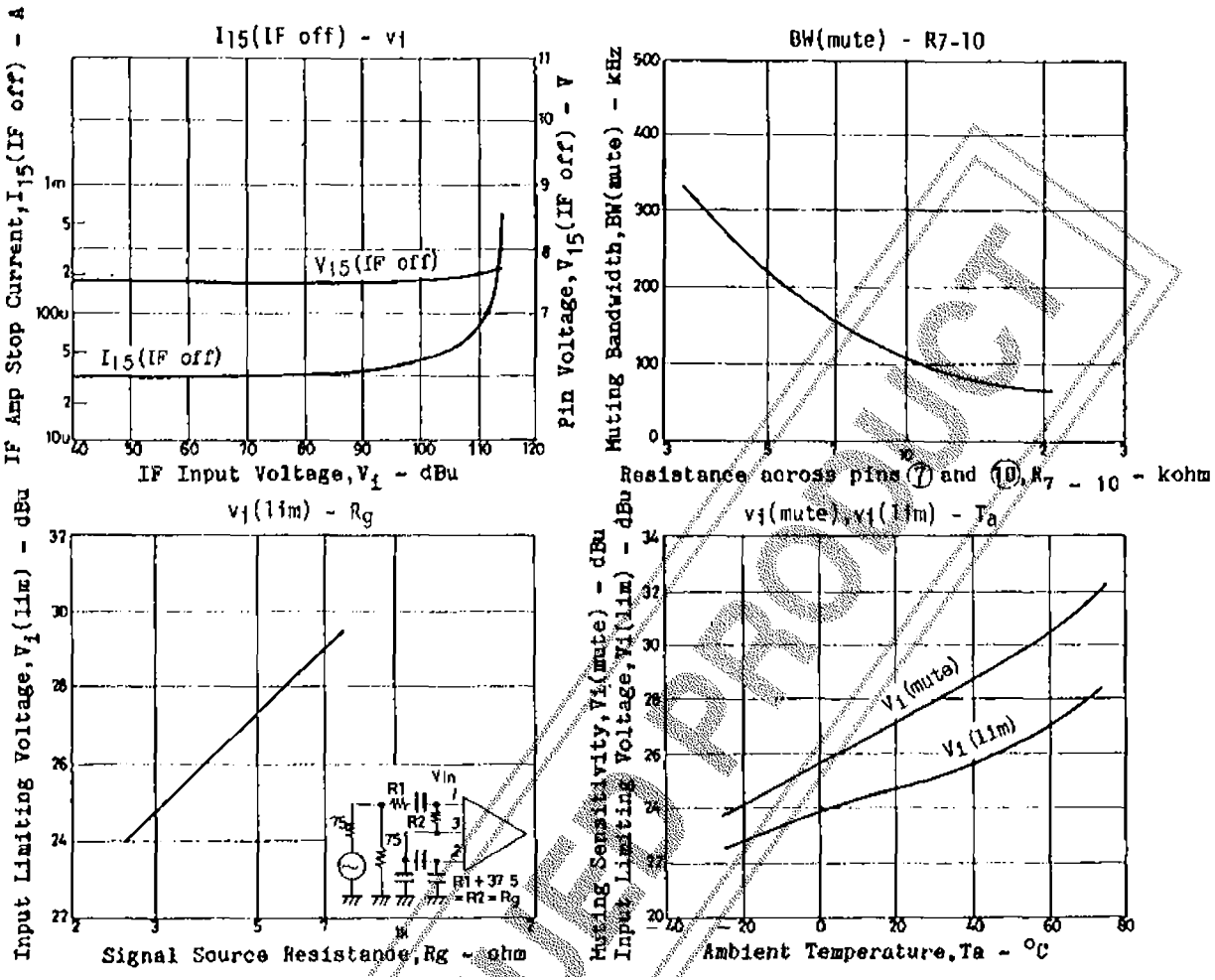











I15(IF off) - vi
IF Amp Stop Current, I15(IF off) - A
Pin Voltage, V15(IF off) - V
V15(IF off)
I15(IF off)
IF Input Voltage, Vi - dBu
BW(mute) - R7-10
Muting Bandwidth, BW(mute) - kHz
Resistance across pins (7) and (10), R7 - 10 - kohm
vi(lim) - Rg
Input Limiting Voltage, Vi(lim) - dBu
Signal Source Resistance, Rg - ohm
R1
R2
R1 + 37.5 = R2 = Rg
vi(mute), vi(lim) - Ta
Muting Sensitivity, Vi(mute) - dBu
Input Limiting Voltage, Vi(lim) - dBu
Vi(mute)
Vi(lim)
Ambient Temperature, Ta - °C