Ordering number : EN4416A

Monolithic Linear IC

LA2232, 2232M

RDS Decorder

Overview

The LA2232 and LA2232M are RDS demodulator ICs that provide both a 57 kHz bandpass filter as well as ARI-SK and DK signal recognition functions on chip. Cost-effective RDS decoder systems can be constructed by using an LA2232 or 2232M in conjunction with a synchronization and error detection/correction LSI from the LC7070 series. The LA2232 and 2232M provide improved sensitivity LA2230 and 2230M.

Applications

- RDS signal demodulation
- ARI signal demodulation and SK and DK recognition

Functions

- 57 kHz bandpass filter
- RDS signal demodulation
- Bit rate clock regeneration
- RDS identification output
- ARI signal demodulation
- SK identification output
- DK identification output
- Adjustable ARI detection sensitivity

Features

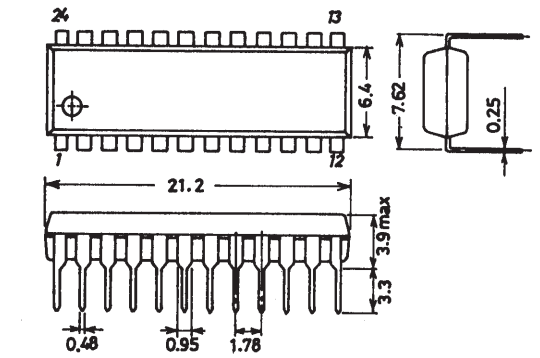
- High RDS demodulation sensitivity
- Reduced costs and PCB area due to the inclusion of an on-chip 57 kHz bandpass filter
- Supports improved interference rejection characteristics by providing ARI detection sensitivity adjustment
- Quick operation startup due to a built-in rapid charging circuit for use at power application.

Package Dimensions

unit: mm

3067-DIP24S

[LA2232]

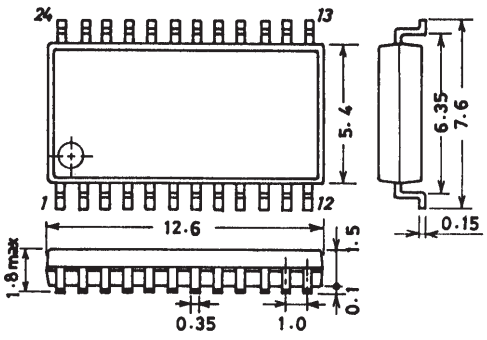


SANYO: DIP24S

unit: mm

3112-MFP24S

[LA2232M]



SANYO: MFP24S

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	Pins 13, 14, 15, 23	12	V
Allowable power dissipation	Pd max	LA2232: Ta ≤ 80°C LA2232M: Ta ≤ 37.5°C LA2232M: Ta = 80°C	450 450 280	mW mW mW
Entering current	I_{LED}	Pins 13, 14, 15	20	mA
Operating temperature	Topr		–30 to +80	°C
Storage temperature	Tstg	LA2232 LA2232M	–40 to +125 –40 to +150	°C °C

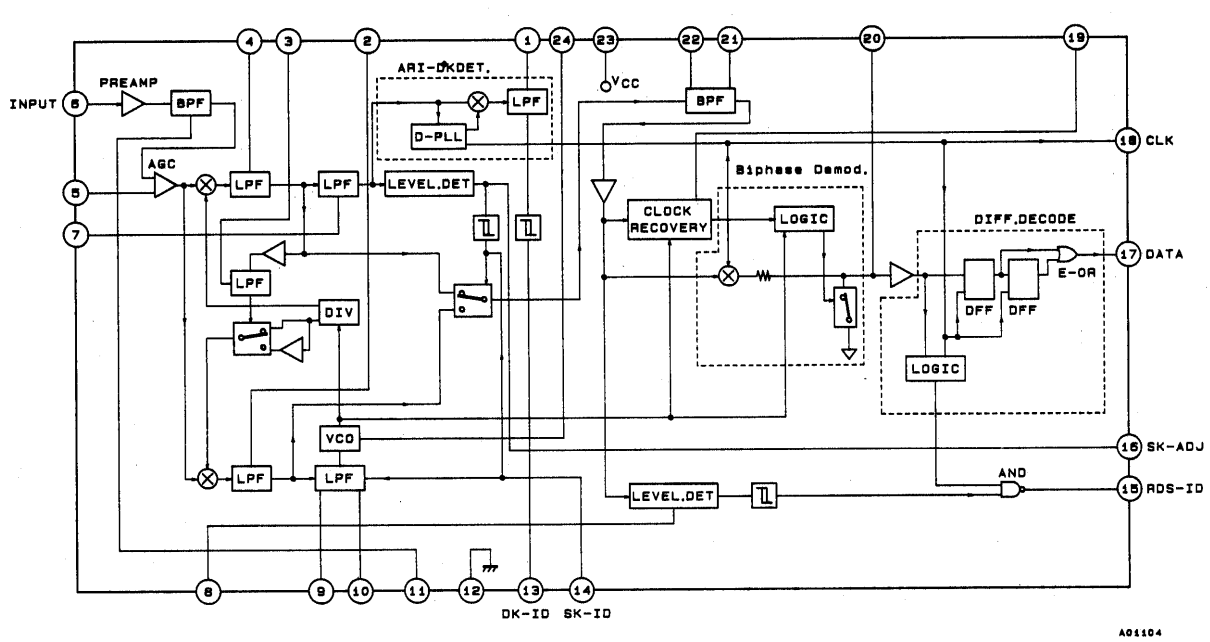
Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}	Pin 23	5.0	V
Operating voltage range	V_{CC} op	Pin 23	4.7 to 5.5	V

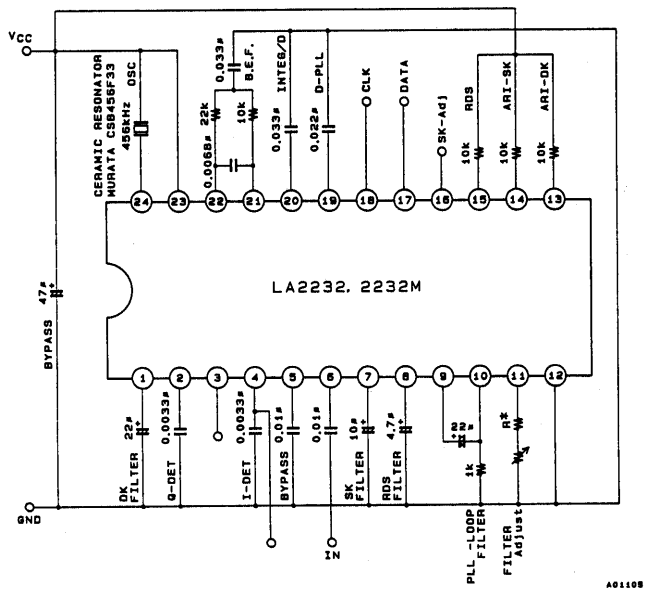
Operating Characteristics at Ta = 25°C, V_{CC} = 5.0 V

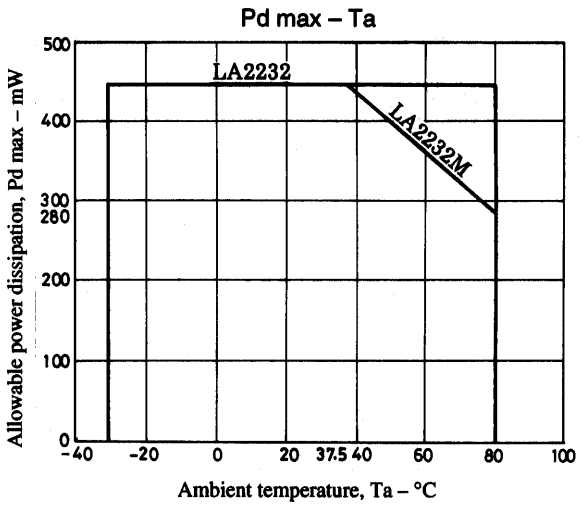
Parameter		Symbol	Ratings			Unit
			min	typ	max	
Quiescent current			14	22	28	mA
Band pass filter gain		f = 57 kHz	9	12.5	17	dB
Band pass filter selectivity		f = 60 kHz (57 kHz = 0 dB) f = 54 kHz (57 kHz = 0 dB) f = 38 kHz (57 kHz = 0 dB)	–6 –6	–2.5 –3.5 –39	0 0 –33	dB dB dB
PLL capture range		5 mVrms CW input		–0.5 +0.8		% %
RDS detection sensitivity		The pin 6 input when pin 15 goes low		0.4	1.0	mVrms
SK detection sensitivity		The pin 6 input when pin 14 goes low		1.0	2.0	mVrms
DK detection sensitivity		The pin 6 input when pin 13 goes low		1.1	2.0	mVrms
Input dynamic range	RDS	The maximum input on pin 6 for the (ARI + RDS) signal when pin 15 goes low	30	50		mVrms
	RDS	The maximum input on pin 6 for the RDS signal when pin 15 goes low	250			mVrms
	DK	The maximum input on pin 6 for the ARI signal when pin 15 goes low	75	100		mVrms
Bit rate clock jitter			±8	±9	±10	μs
RDS lockup time		The time until pin 15 goes low following RDS becoming a 3 mV input		35		ms
SK lockup time		The time until pin 14 goes low following ARI becoming an 8 mV input		45		ms
SK + RDS lockup time		The time until pin 15 goes low following RDS + ARI becoming an 8.5 mV input		80		ms
Data output		The high level for pin 17	4.7	4.9	5.0	V
		The low level for pin 17	0	0.1	0.3	V
Bit rate clock output		The high level for pin 18	4.7	4.9	5.0	V
		The low level for pin 18	0	0.1	0.3	V
VCO free-running frequency			453	456	459	kHz

Equivalent Circuit Block Diagram



Test Circuit

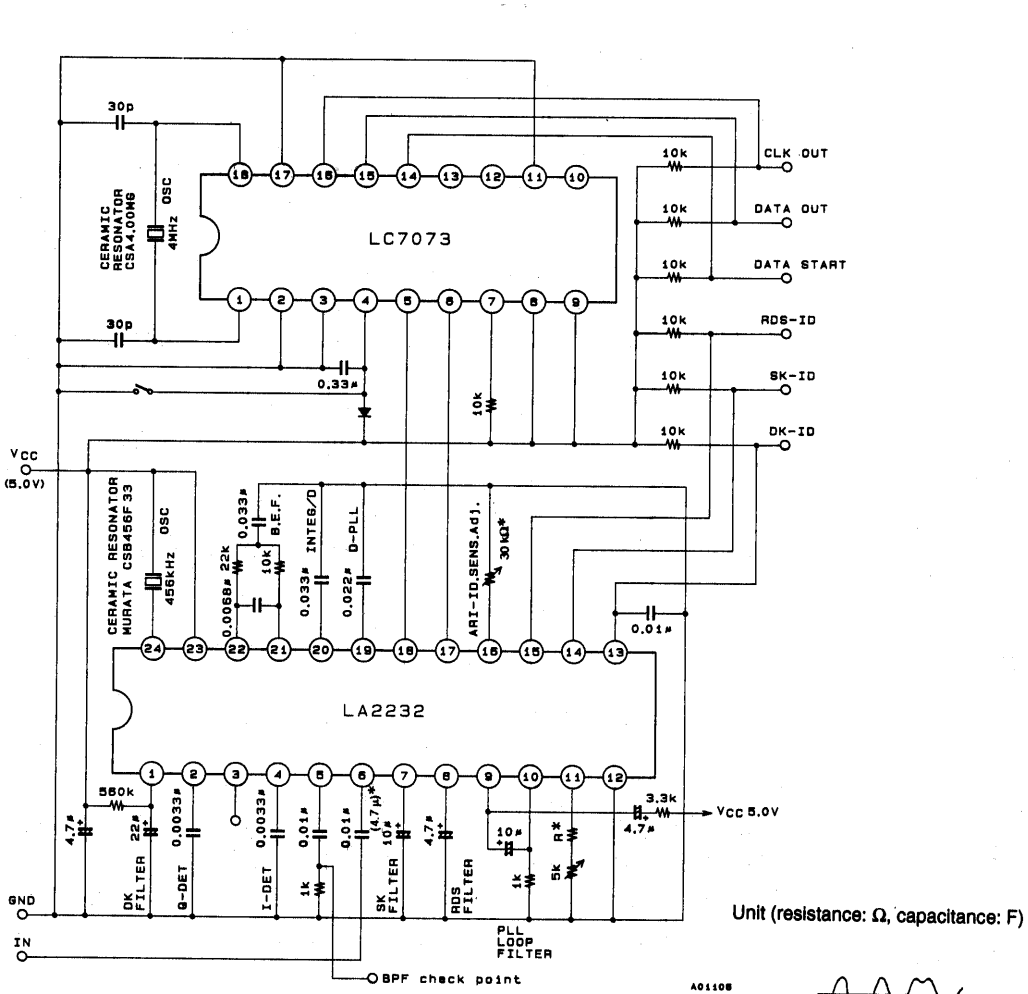


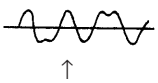


*R = 6.8 kΩ (for the LA2232)
R = 5.6 kΩ (for the LA2232M

Unit (resistance: Ω, capacitance: F)

Sample Application Circuit Using the LA2232/M and the LC7073/M





Bi-phase signal

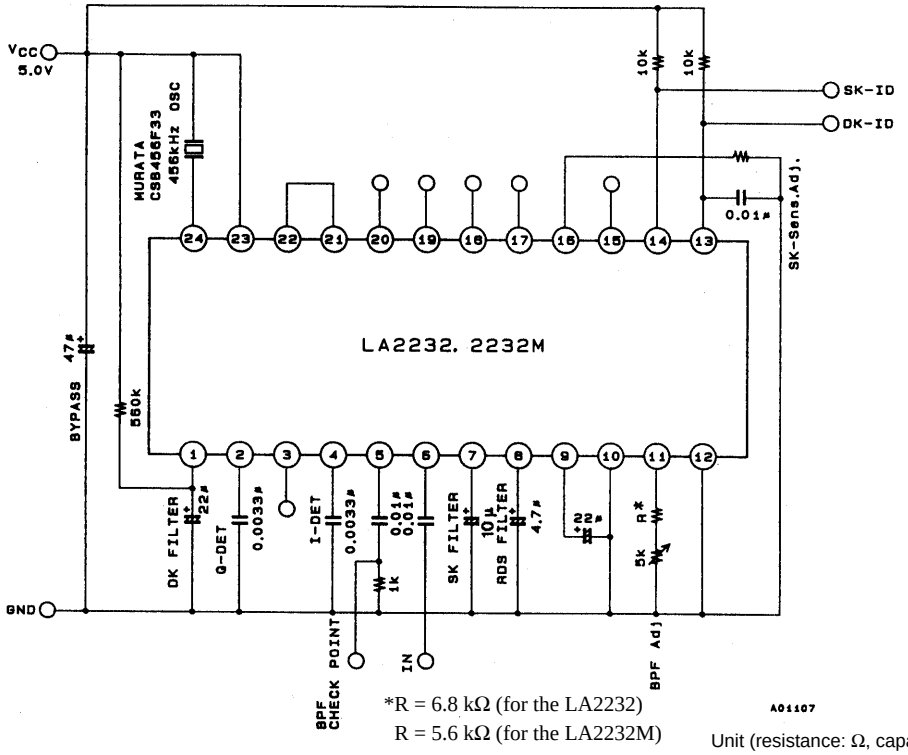
3 to 6 mVrms
Recommended input signal level
(when RDS Δf = ±2.0 kHz)

*R = 6.8 kΩ (for the LA2232)
R = 5.6 kΩ (for the LA2232M)

Adjusting the 57 kHz BPF

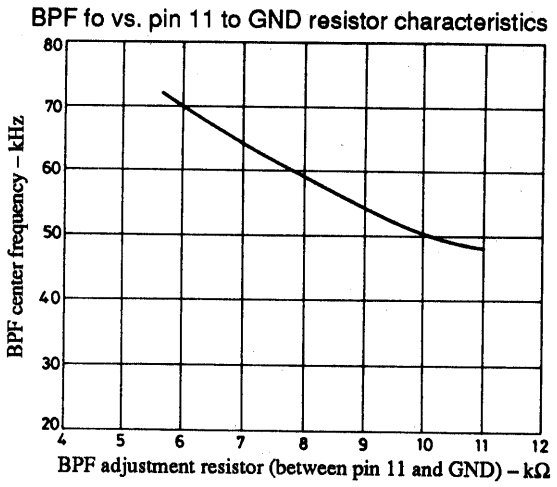
(A) Check the output level of the bi-phase signal from pin 4 or pin 22 (with the pin 6 RDS input at about 1 mVrms and the ALC circuit not operating).
(B) Check the signal level of the BPF checkpoint (with the pin 6 RDS input in the range 3 to 6 mVrms or higher).

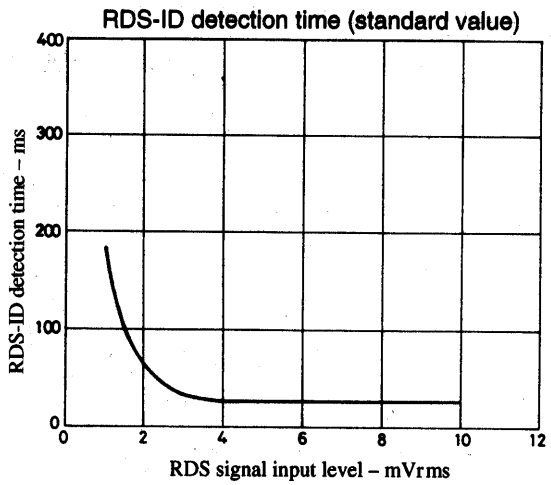
ARI Decoder Application Circuit

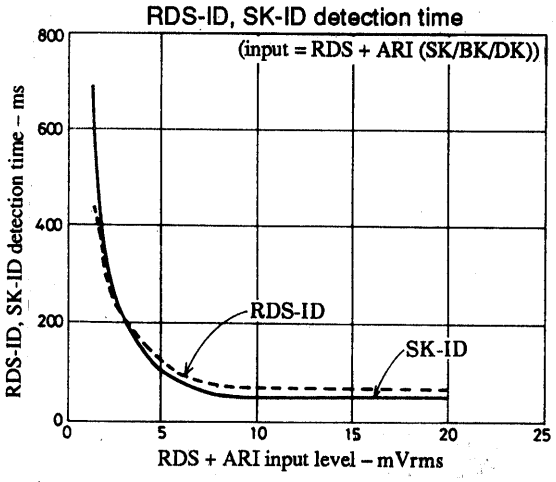


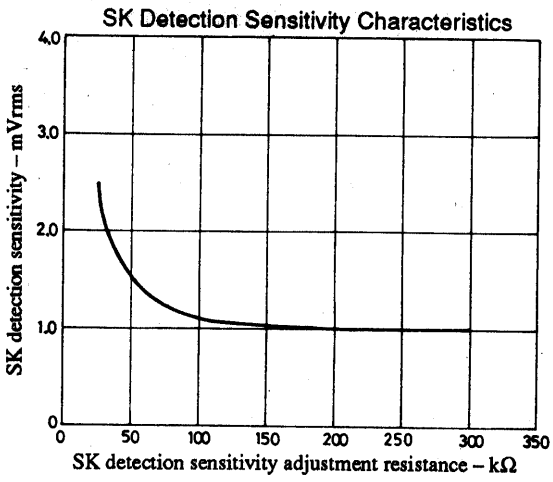
*R = 6.8 kΩ (for the LA2232)
R = 5.6 kΩ (for the LA2232M)

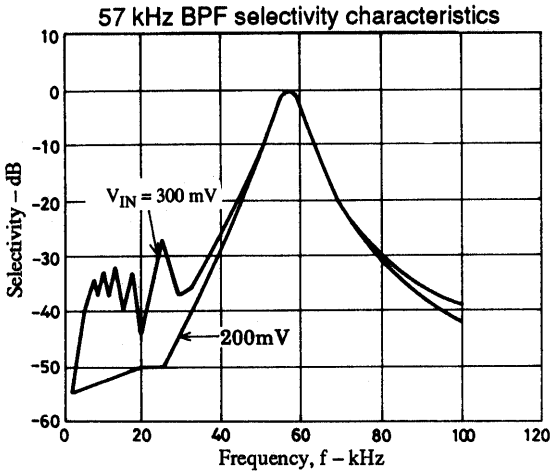
Unit (resistance: Ω, capacitance: F)



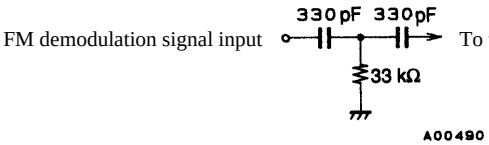




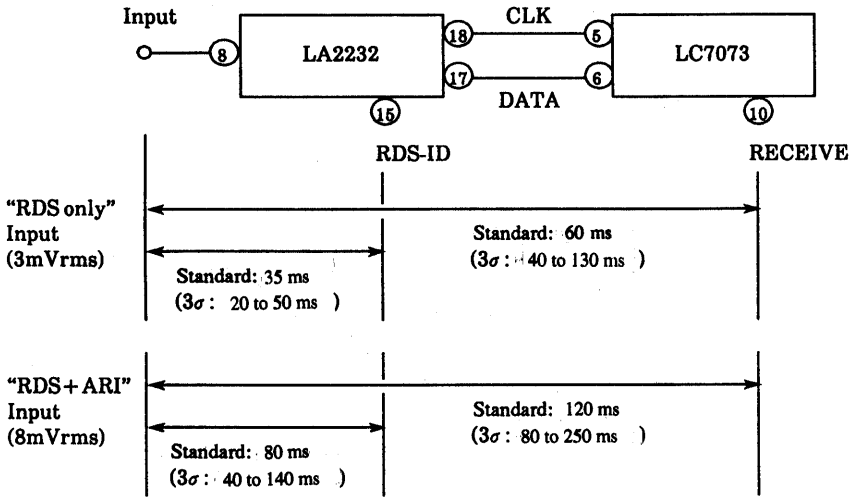


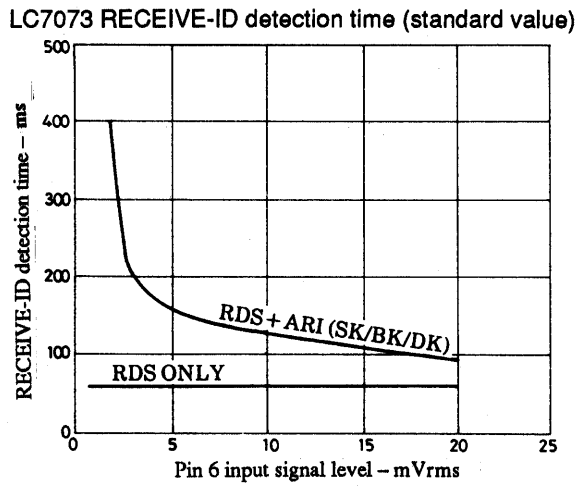


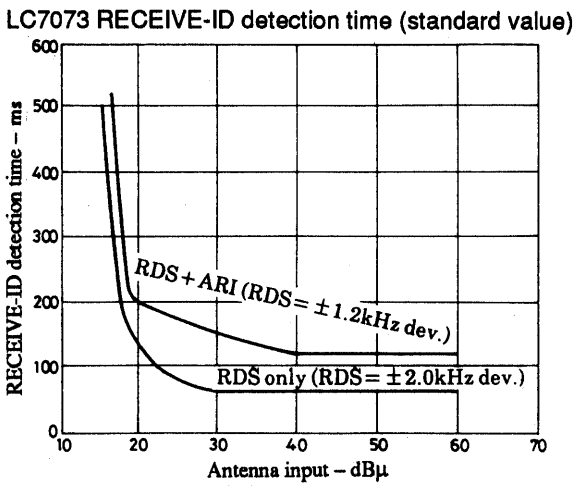
• For the LA2232, an input level of under 300 mVrms on pin 6 is desirable for a 100% FM demodulation output.
• We recommend the use of a pre-high pass filter as shown in the figure below if the 100% FM demodulation output level is over 300 mVrms.



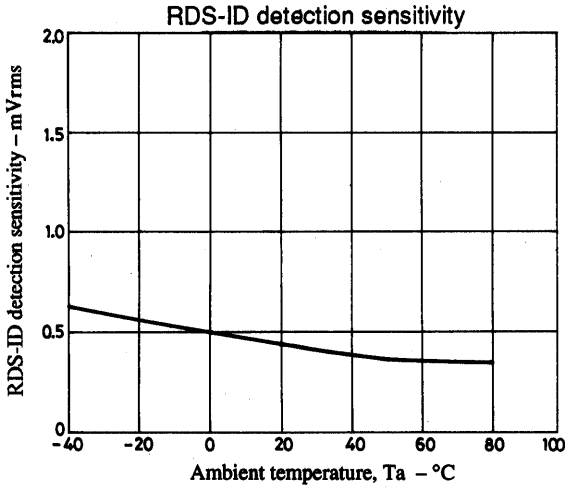
RDS-ID (LA2232), RECEIVE-ID (LC7073) Detection Time
(the RECEIVE-ID indicates synchronization completion).



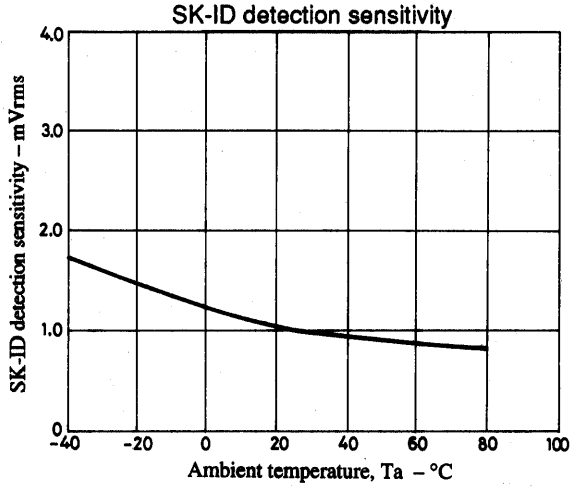




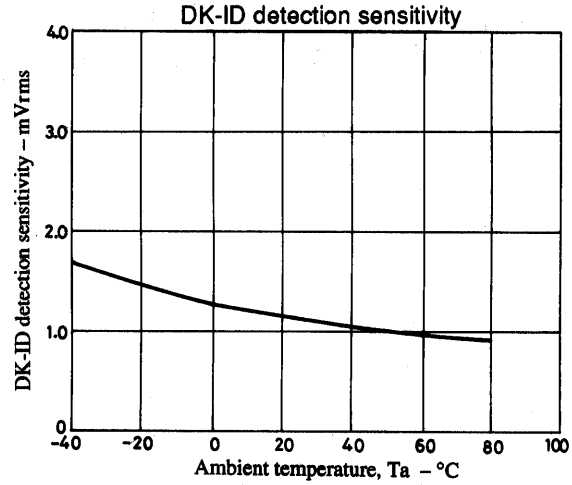
RDS-ID detection sensitivity



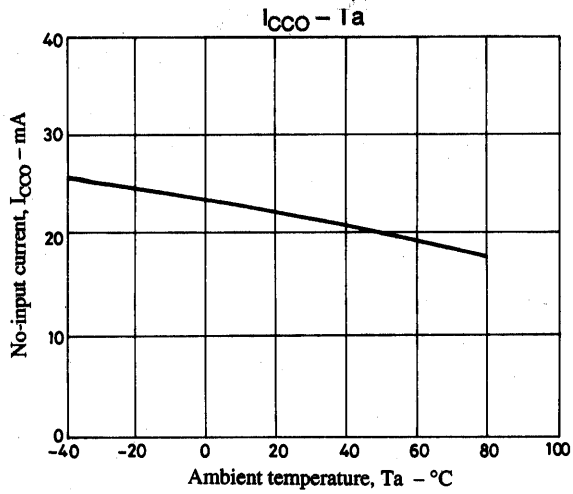
SK-ID detection sensitivity



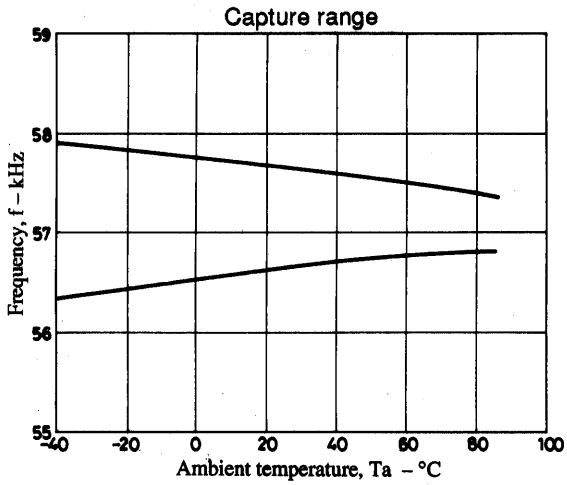
DK-ID detection sensitivity



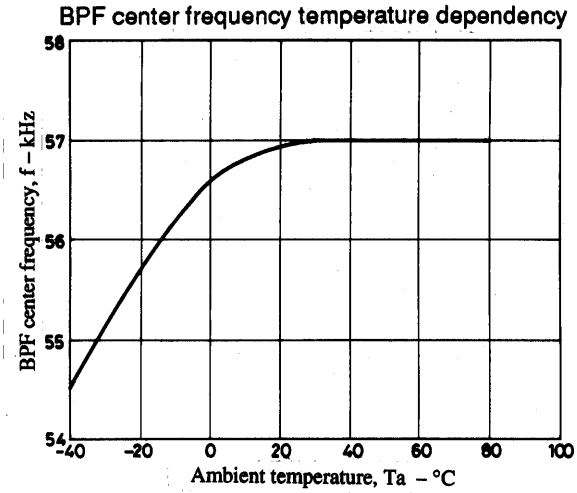
I_{CCO} – Ta



Capture range

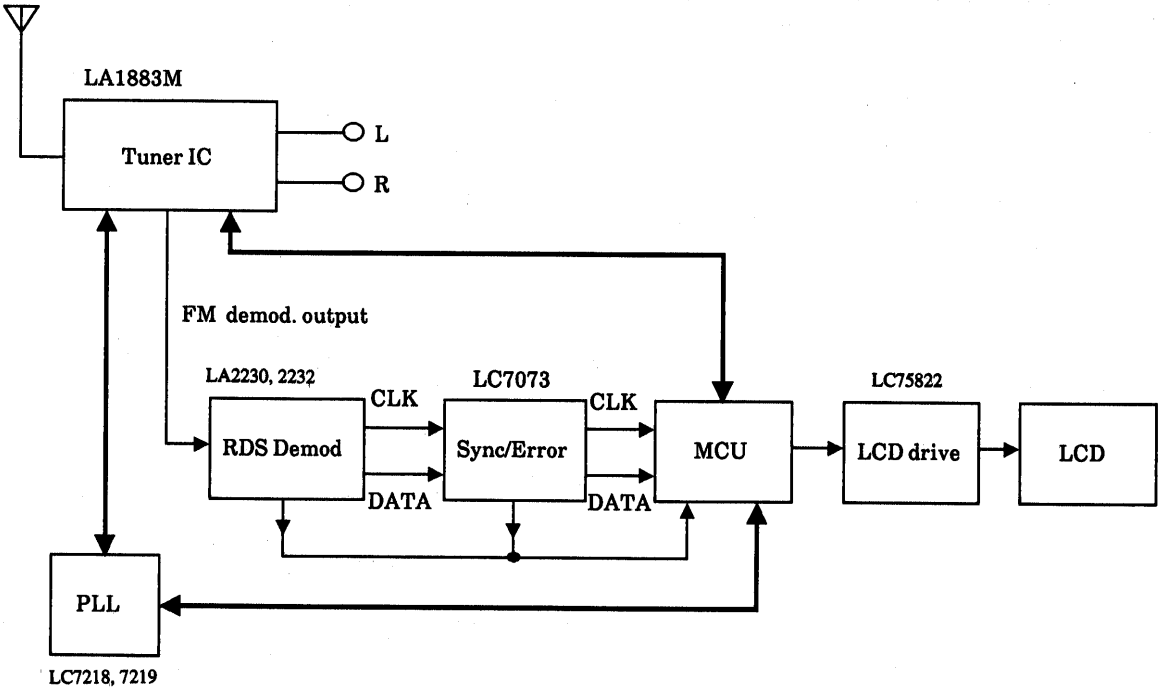


BPF center frequency temperature dependency



RDS Application IC Lineup

(1)



(2)