

IR3R20A 5-Program Random Selector

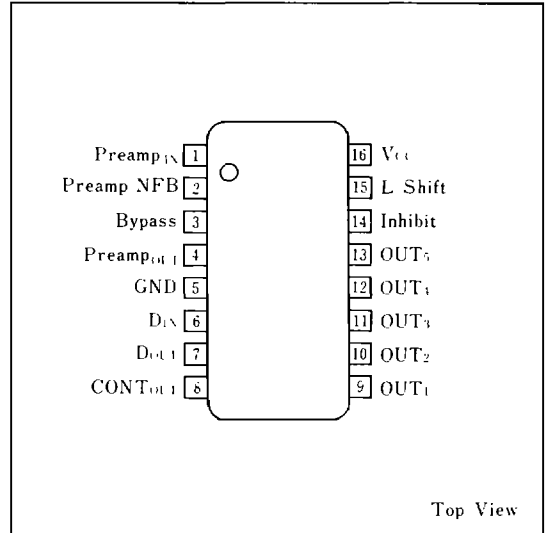
Description

The IR3R20A is a program selector IC which can scan and detect the start of up to 5-program. Program number is selected by pressing the select button number times in succession (L-shift set) or by pressing the desiring number button (Direct set).

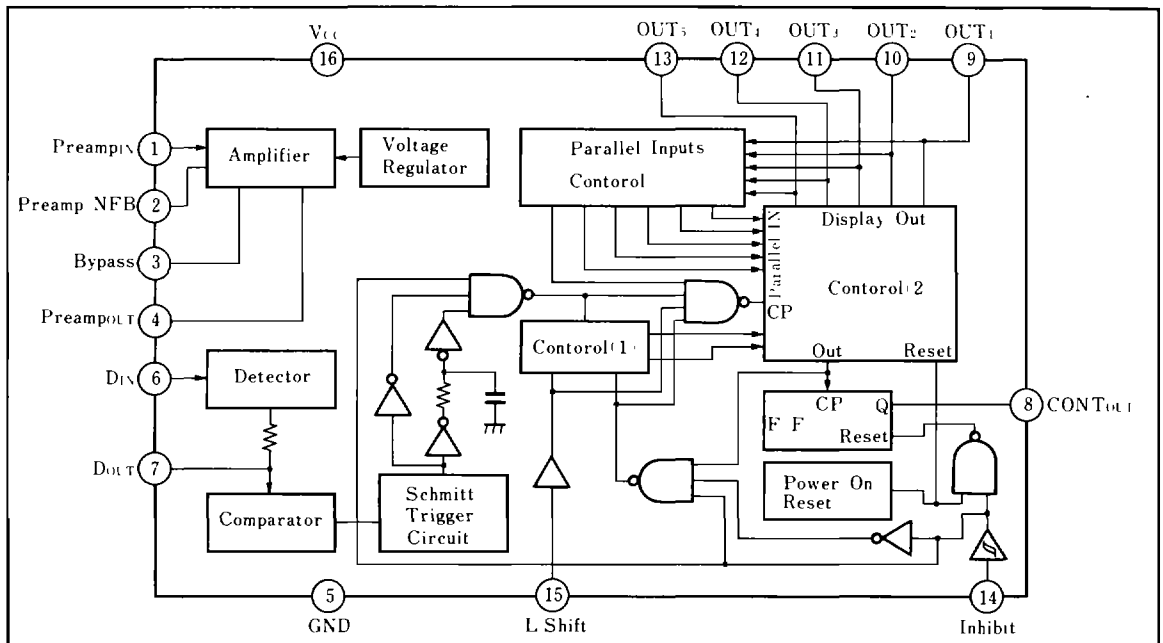
Features

1. Maximum 5-program random search
2. 5-dots of LED display
3. On-chip amplifier, detector and comparator
4. On-chip power on reset circuit
5. Operating supply voltage range $V_{CC}=5\sim 16V$
6. 16-pin dual-in-line package

Pin Connections



Block Diagram



Absolute Maximum Ratings

(Ta=25°C)

| Parameter | Symbol | Condition | Rating | Unit |
|------------------------|------------------|--------------|-------------------|------|
| Supply voltage | V _{CC} | | 20 | V |
| Input voltage | V _{IN} | Except pin 1 | 0~V _{CC} | V |
| Output voltage | V _{OUT} | | 0~V _{CC} | V |
| Control output current | I _{OUT} | | 15 | mA |
| Display output current | I _D | | 30 | mA |
| Power dissipation | P _D | | 650 | mW |
| Operating temperature | T _{opr} | | -20~+60 | °C |
| Storage temperature | T _{stg} | | -55~+150 | °C |

Electrical Characteristics

(V_{CC}=9V, f=10kHz, R_G=600Ω, 0dB=1V_{rms}, Ta=25°C)

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|--------------------------|-----------------|----------------|------|------|------|------|
| Operating supply voltage | V _{CC} | Ta = -20~+60°C | 5 | 9 | 16 | V |
| Supply current | I _{CC} | | | 7 | 11 | mA |

Input level

| | | | | | | |
|---|--------------------|---|------|-----|-------|-----|
| Input threshold level | V _{ITH} | A _v =53dB | -58 | -56 | -53 | dB |
| Input threshold level frequency characteristics | F _{VIH} | V _{IH} =V _{IL} =V _{ITH} +3dB | 40 | 68 | | kHz |
| | F _{VIL} | | | 600 | 800 | Hz |
| Input threshold level power supply fluctuation | SVR _I | V _{ITH} difference at V _{CC} =9V, 5V | | 1 | 2 | dB |
| Operation compensation max. input level | V _{I MAX} | | -9.1 | | | mV |
| Response time | t | Change V _I = -37dB to -97dB. | | 75 | 110 * | ms |
| Response time power supply fluctuation | SVR _t | t difference at V _{CC} =9V, 5V | | 5 | | ms |

Control output

| | | | | | | |
|----------------------------------|-----------------|------------------------|---|--|---|----|
| ON state output voltage | V _{OH} | I _{OUT} =10mA | 7 | | | V |
| OFF state output leakage current | I _{OL} | | | | 1 | μA |

Display output

| | | | | | | |
|----------------------------------|-----------------|------------------------|--|--|-----|----|
| On state output voltage | V _{OL} | I _{OUT} =20mA | | | 0.4 | V |
| Off state output leakage current | I _{OL} | | | | 1 | μA |

Parallel input

| | | | | | | |
|----------------------|-----------------|--|---|--|-----|---|
| Input "High" voltage | V _{IH} | | 2 | | | V |
| Input "Low" voltage | V _{IL} | | | | 0.6 | V |

L shift input

| | | | | | | |
|----------------------|-----------------|--|---|---|-----|----|
| Input "High" voltage | V _{IH} | | 2 | | | V |
| Input "Low" voltage | V _{IL} | | | | 0.6 | V |
| Input current | I _{IL} | | | 1 | 10 | μA |

Inhibit

| | | | | | | |
|----------------------|-----------------|--|-----|-----|-----|----|
| Input "High" voltage | V _{IH} | | 1.8 | | | V |
| Input "Low" voltage | V _{IL} | | | | 1.0 | V |
| Input current | I _{IL} | | | 1 | 10 | μA |
| Hysteresis width | | | | 100 | | mV |

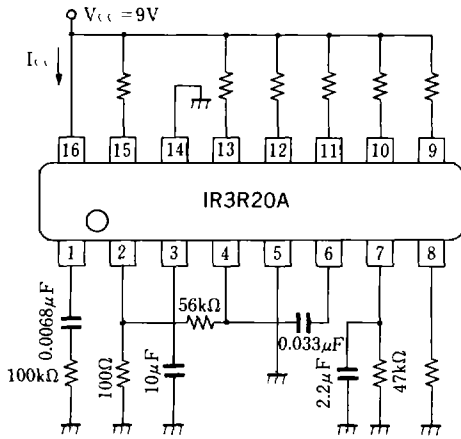
Preamplifier

| | | | | | | |
|------------------------|-----------------|---|----|----|----|-------------------|
| Input resistance | R _{IN} | A _v =53dB | 37 | 47 | 57 | kΩ |
| Noise voltage | V _N | A _v =53dB, R _G =100kΩ | | | 20 | mV _{rms} |
| Open loop voltage gain | A _{VO} | Open loop, V _{IN} =-90dB | 66 | 70 | 73 | dB |

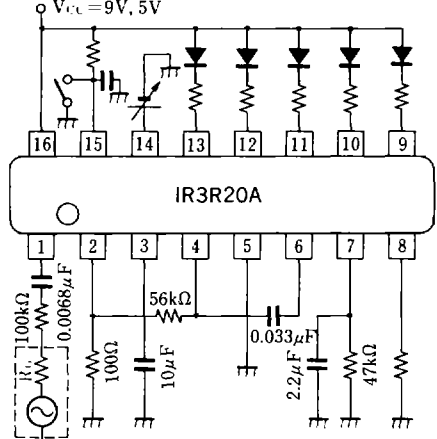
* Value when C=2.2μF+20%, R=47kΩ+10% at pin 7.

■ Test Circuits

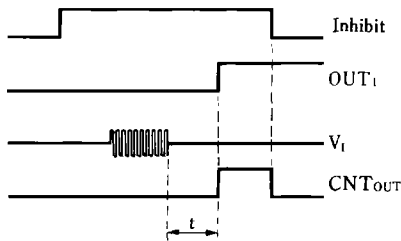
(1) I_{CC}



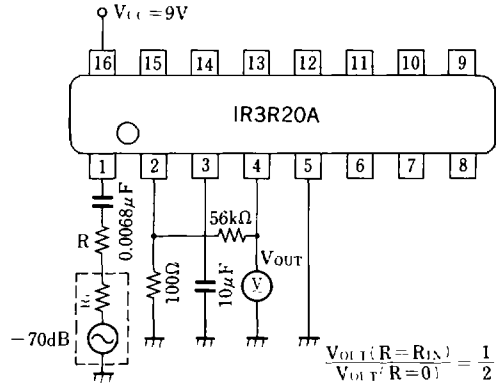
(2) V_{ITH}, SVR_1, v_1



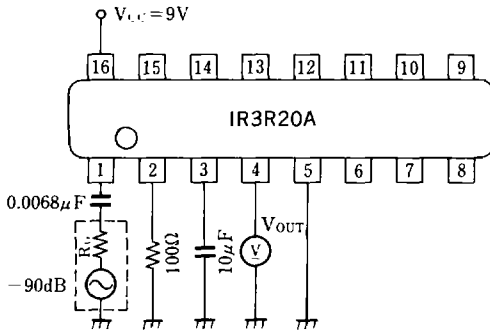
(3) t, SVR_t



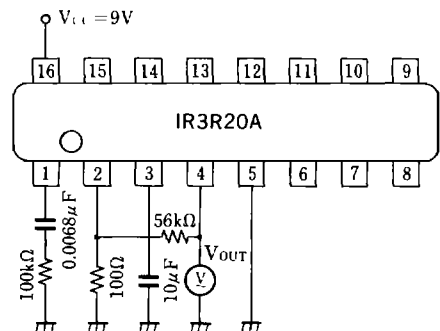
(4) R_{IN}



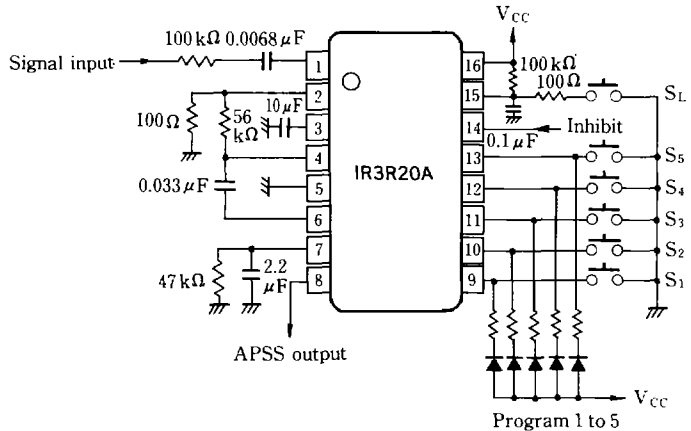
(5) A_{VO}



(6) V_N



Basic Connection Diagram



Truth Table of Control Output

| V _{CC} | Input(t _n) | | | | | | | | | Output(t _{n-1}) | | | | | Note |
|-----------------|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------------------------|---------|---------|---------|------|------|
| | Inhibit | L shift | R shift | 5-Prog. | 4-Prog. | 3-Prog. | 2-Prog. | 1-Prog. | 5-Prog. | 4-Prog. | 3-Prog. | 2-Prog. | 1-Prog. | CONT | |
| ↑ | X | X | X | X | X | X | X | X | H | H | H | H | H | L | 1 |
| H | ↑ | H | X | H | H | H | H | H | H | H | H | H | L | L | 2 |
| H | ↑ | H | X | H | H | H | H | L | H | H | H | H | L | L | 3 |
| H | X | ↓ | X | H | H | H | L | H | H | H | L | H | H | L | 4 |
| H | X | ↓ | X | L | H | H | H | H | H | H | H | H | L | L | 5 |
| H | X | H | X | ↓ | H | H | H | L | L | H | H | H | H | L | 6 |
| H | H | H | ↓ | L | H | H | H | H | H | L | H | H | H | L | 7 |
| H | H | H | ↓ | H | H | H | H | L | H | H | H | H | H | H | 8 |
| H | L | H | ↓ | H | H | L | H | H | H | H | L | H | H | L | 9 |

↓ — Falling edge of the pulse
 ↑ — Rising edge of the pulse
 X — Any state of H or L
 The 1st ~ 5th program — correspond to pins 9 ~ 1
 R shift input — goes "H" or "L" if V_I is higher or low than V_{ITH} respectively.

Note1 : Reset on power-up (auto reset)
 2 : Preset to one program on the rise of INHIBIT (PRESET ON INHIBIT)
 3 : Not to be affected if 1~5 programs are already displayed.
 4 : Shifts to the left on the fall. of L-SHIFT. (L shift)
 5 : Displays one program if neither program 1~5 is being displayed.
 6 : Displays that program on the fall of program 1~5. (Direct program selecting)
 7 : Shifts the display output to the right on the fall of R-SHIFT (with INHIBIT AT "High" level)
 8 : Turns ON the control output if R-shifted with INHIBIT at "Low" level while the control output turns OFF. (R-shift inhibit and control output reset)
 9 : Not to be R-shifted with INHIBIT at "Low" level while the control output turns OFF (R-shift inhibit and control output reset)



Precautions

(1) Auto reset

It will be reset between V_{CC}=1.7 and 4V on the rise of the supply voltage on power-up. Faulty operations may occur if the rise of the supply voltage lasts longer than 0.1V/μs.

(2) Preset in case of the supply and INHIBIT turned ON simultaneously

The preset using the INHIBIT pin on power-up, do it after V_{CC} has risen above 4V. V_{CC} lower than 4V may prevent presetting with auto reset in operation. And if too fast rise of supply voltage may cause the detector output to exceed the comparator threshold level. Should it occur, preset after the detector output has fallen. A rise as slow as 0.05V/ms can rarely cause the detector output to rise.

(3) Detector time constant

The 2.7kΩ (TYP.) on-chip resistor in the detector circuit for limiting current may cause the threshold level to rise or the response time variation to be greater.

(4) L-shift input

The fall time from L-shift input V_{IH} to V_{IL} should be more than 1.5V/ms. And the rise time from V_{IL} to V_{IH}, should be more than 0.7V/ms.

(5) INHIBIT chattering

A chattering that goes beyond the hysteresis range at a threshold level (V_{IH}~V_{IL}) may cause faulty operations except when the chattering frequency is greater than 500kHz.