IR3T24/IR3T24N/IR3T26/IR3T26N

Remote Control Receiver Pre-Amp

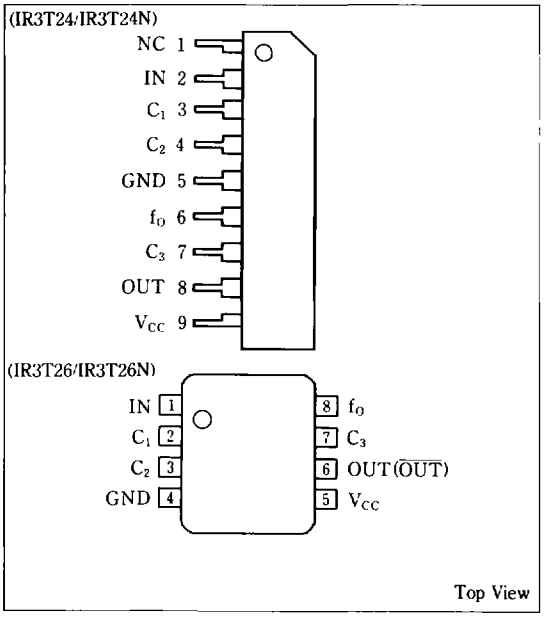
■ Description

The IR3T24/IR3T24N/IR3T26/IR3T26N is a receiver preamplifier IC for the infrared remote control system. It consists of a head amplifier, limiter amplifier, BPF, signal waveform detection circuit, waveform shaping circuit and others.

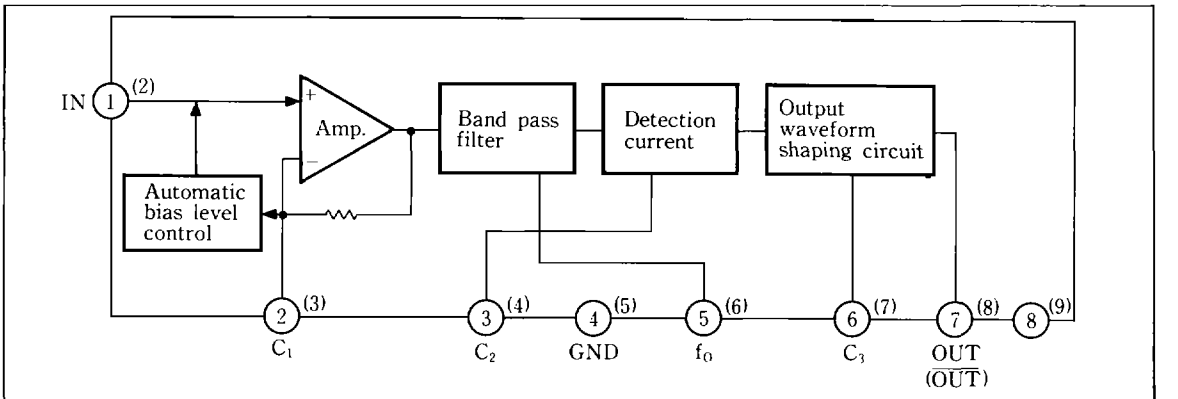
■ Features

1. Low power consumption (8mW TYP. at V_{CC}= 5V)
2. Low supply voltage (V_{CC}=5V)
3. Built-in filter (The center frequency can be varied by an external resistor)
4. No induction by a magnetic field because of no coil
5. Photodiode may be directly connected.
6. Open collector output (Active low output TTL or CMOS compatible) IR3T24/IR3T24N
7. Complementary darlington output (Active high output, CMOS compatible)··· IR3T26/IR3T26N
8. 9-pin single-in-line package (IR3T24/IR3T26)
   8-pin small outline package (IR3T24N/IR3T26N)

■ Pin Connections



■ Block Diagram



The pin numbers in parentheses are applied to the IR3T24 and IR3T26, the symbol in parentheses is applied to the IR3T24 and IR3T24N.

■ Pin Description

Pin No.	Symbol	Description
1	IN	The IN is an input to connect a photo diode.
2	C_1	The C_1 is used to set the head amp gain.
3	C_2	The C_2 is used to connect a capacitor for detection.
4	GND	Ground
5	f_O	The f_O is used to set the band pass filter frequency.
6	C_3	The C_3 is used to set the integrating capacitor.
7	OUT	Output
8	V_{CC}	Power supply

■ Absolute Maximum Ratings

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage	V_{CC}		15	V
Input voltage	V_{IN}	Input pin 1	5	V_{P-P}
Power disspation	P_D	IR3T24/IR3T26	600	mW
		IR3T24N/IR3T26N	300	
Operating temperature	T_{opr}		−20~+75	℃
Storage temperature	T_{stg}		−55~+150	℃

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.7~5.3	V

■ Electrical Characteristics (1)

(V_{CC}=5V, Ta=25℃)

Parameter	Symbol	Conditions			Remarks	Test point	MIN.	TYP.	MAX.	Unit
		Signal	Level	ON—SW						
Input voltage (1)	V_{IN1}			1,7,10		A	2.4	2.6	2.8	V
Input voltage (2)	V_{IN2}			1,2,7,10,12		A	0.8	1.1	1.5	V
Output "Low" voltage	V_{OL}			3,4,9,10	IR3T24/ IR3T24N	D	−	0.22	0.44	V
				3,4,10	IR3T26/ IR3T26N			0	0.1	
Output "High" voltage	V_{OH}			3,5,9,10		D	3.6			V
Output leakage current	I_{OH}			3,5,8,10	IR3T24/ IR3T24N	C	−	0	2.2	μA
Voltage gain	A_v	40kHz CW	50 μV_{P-P}	2,6,10,13,14		B	74	80	84	dB
BPF characteristics	A_vQ	30kHz 37kHz 43kHz 50kHz CW	50 μV_{P-P}	2,6,10,13,14	Note1	B	4	9	−	dB
Input impedance	r_{in}	40kHz CW	0.2V_{P-P}	1,2,7,10,12,14	Note2	A	20	27	44	kΩ
Detection capability (1)	RI_1	Burst waveform	50 μV_{P-P}	2,7,9,10,13,14	Note3	D	300		700	μs
Detection capability (2)	RI_2	Burst waveform	50mV_{P-P}	2,7,9,11,13,14	Note3	D	300		700	μs
Circuit current	I_{CC}			3,7,10		E	1.0	1.6	2.4	mA

■ Electrical Characteristics (2)

Parameter	Symbol	Conditions			Remarks	Test point	MIN.	TYP.	MAX.	Unit
		Signal	Level	ON—SW						
Input voltage (1)	V_{IN1}			1,7,10		A	1.9	2.6	3.2	V
Input voltage (2)	V_{IN2}			1,2,7,10,12		A	0.5	1.1	1.8	V
Output "Low" voltage	V_{OL}			3,4,9,10	IR3T24/ IR3T24N	D	—	0.22	0.6	V
				3,4,10	IR3T26/			0	0.2	
Output "High" voltage	V_{OH}			3,5,9,10	IR3T26N	D	$V_{CC}-1.5$			V
Output leakage current	I_{OH}			3,5,8,10	IR3T24/ IR3T24N	C	—	0	0.5	μA
Voltage gain	A_V	40kHz CW	50 μV_{P-P}	2,6,10,13,14		B	68	80		dB
Current consumption	I_{CC}			3,7,10		E	0.8	1.6	2.6	mA

Note1 Ratio of the AC level at 37kHz to that at 30kHz

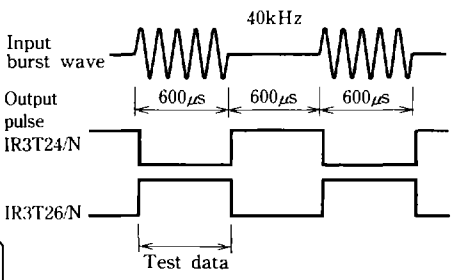
$$20 \log \frac{\text{Test data (f=37kHz)}}{\text{Test data (f=30kHz)}}$$

Ratio of the AC level at 43kHz to that at 50kHz

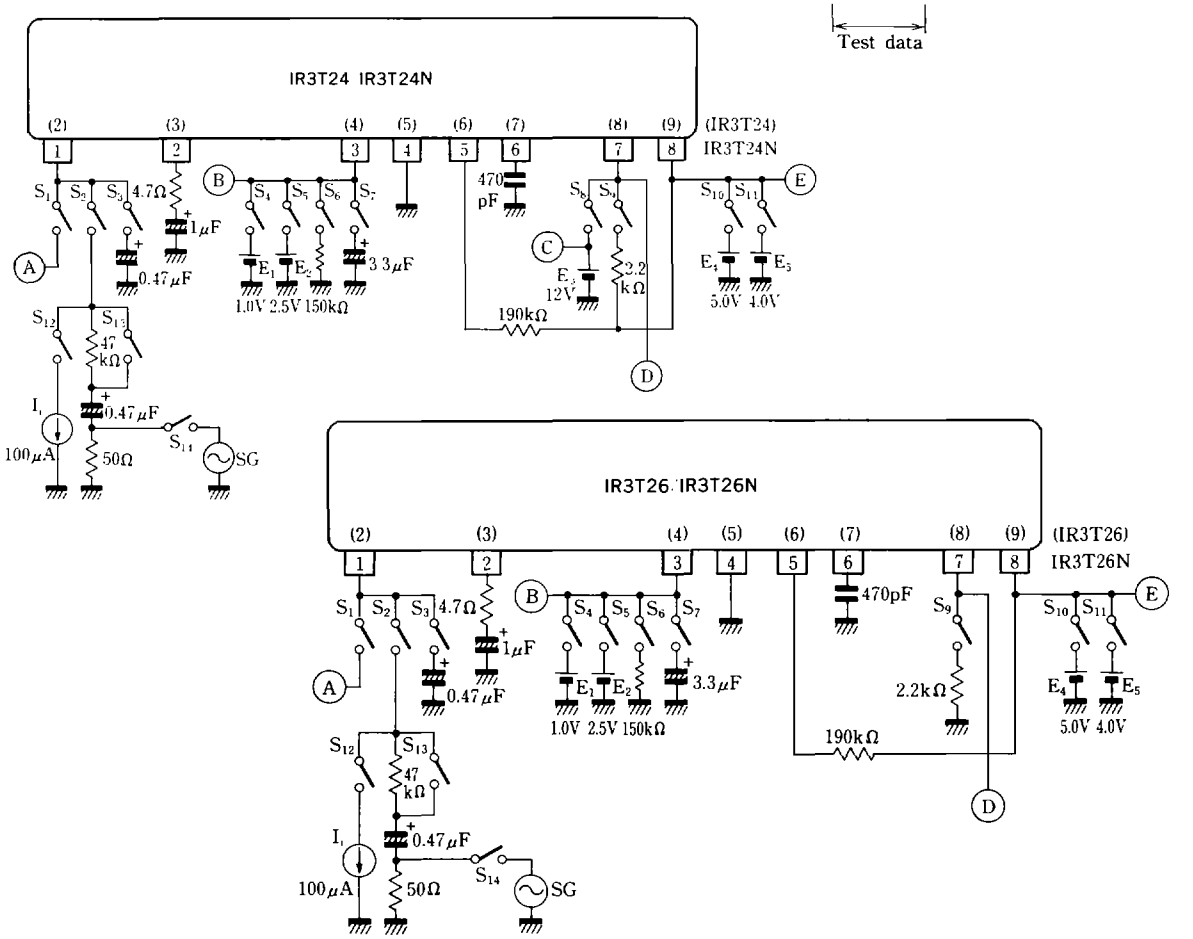
$$20 \log \frac{\text{Test date (f=43kHz)}}{\text{Test date (f=50kHz)}}$$

Note2 Assume that the input level is V_i and the test data is V_x. $r_{in}=47/(V_i/V_x-1)k\Omega$

Note3



■ Test Circuit



■ Pin Function

(1) IN (Input pin, photo diode connection pin)

Directly connect a PIN photo diode between this pin and GND. The internal impedance is 27kΩ TYP. To prevent the input level from saturating due to incoming light, the ABLC (Automatic Bias Level Control) circuit is provided in the input section. With strong incoming light, this circuit is actuated to fix the bias level of the input pin.

(2) C_1 (Head amplifier gain setting pin)

Connect a resistor and capacitor in series between this pin and GND, and set the frequency characteristic and gain of the head amplifier. The gain is decreased as the resistor is made larger or the capacitor is made smaller. Since an excessively small resistor may cause oscillation, use the resistor of 4.7 Ω or more.

(3) C_2 (Pin to connect the capacitor for detection)

Connect the capacitor for detection between this pin and GND. The larger is the capacitor, the nearer to the mean value detection is the result, the smaller is the capacitor, the nearer to the peak detection is the result. Select the capacitor in the range from 1 to 10 μF so that the output pulse width fluctuation and noise filter characteristics may become optimal.

(4) GND (GND pin)

This is the GND pin of the IC. External parts should be grounded at a single point as near to this pin as possible.

(5) f_O (Band pass filter frequency setting pin)

Connect a resistor between this pin and V_{CC}. This resistor determines the center frequency of the built-in BPF.

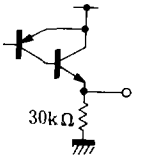
(6) C_3 (Pin to connect the capacitor for integration)

Connect the capacitor for integration between this pin and GND. The larger is the capacitor, the less disturbance noise occurs, but the longer is the LOW level time (IR3T24/IR3T24N) and HIGH level time (IR3T26/IR3T26N) of the output pulse. Select the capacitor in the range from 220 to 680 pF.

(7) $\overline{OUT}$ (Output pin)

This is the output pin for active "LOW" and is the NPN transistor open collector. Connect a load resistor between this pin and the V_{CC} pin or another power supply. For the output voltage, 15V is assured. (IR3T24/IR3T24N)

This is the output pin for active "High" and is the complementary darlington output. Connect a load resistor between this pin and GND to shorten the fall time of output pulse. (IR3T26/IR3T26N)

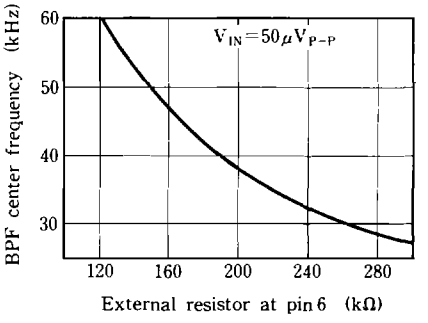


(8) V_{CC} (Power supply pin)

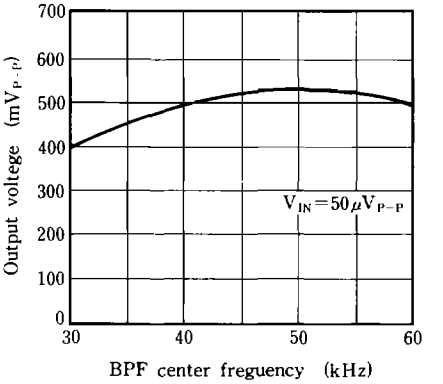
5V±0.3V of power is applied to this pin.

■ Electrical Characteristic Curves (Unless otherwise specified: Ta=25℃, V_{CC}=5V)

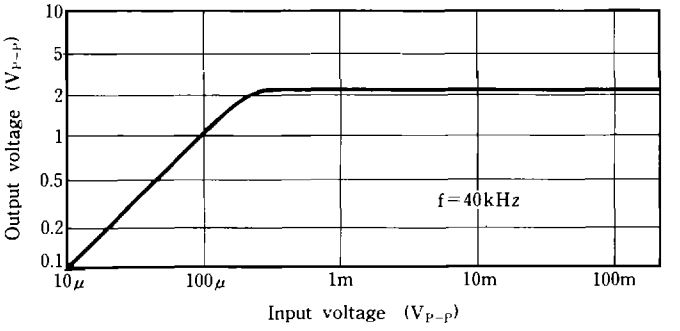
BPF center frequency—External resistor at pin 6



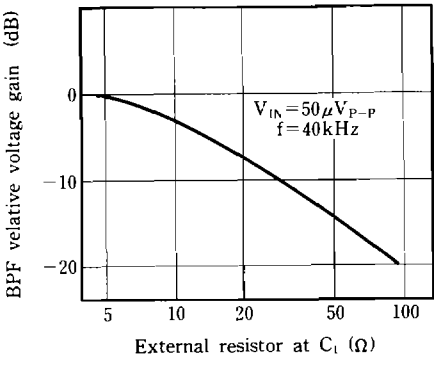
Output voltage—BPF center frequency



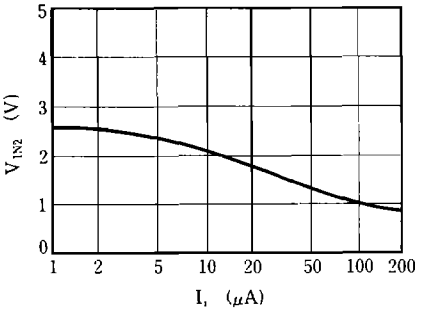
BPF input/output characteristics (IN input and C_2 output)



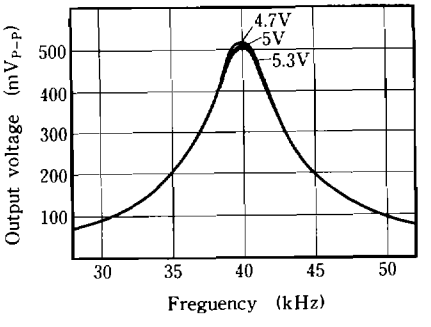
Avi-External resistor at C_1 (IN input C_2 output)



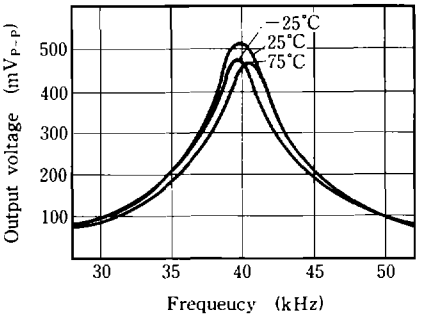
V_{IN2}—Input current



BPF supply voltage characteristics



BPF temperature characteristics



■ Application Circuit Example