
DEDICATED INFRARED RECEIVER

Features

- Highly integrated device with no external components except PIN diode
- High sensitivity due to adaptive gain control
- High immunity against interference from ambient light
- Available for carrier frequencies of 33k, 38k, 56k
- Wide supply voltage range: 2.7V to 5.5V
- TTL compatible

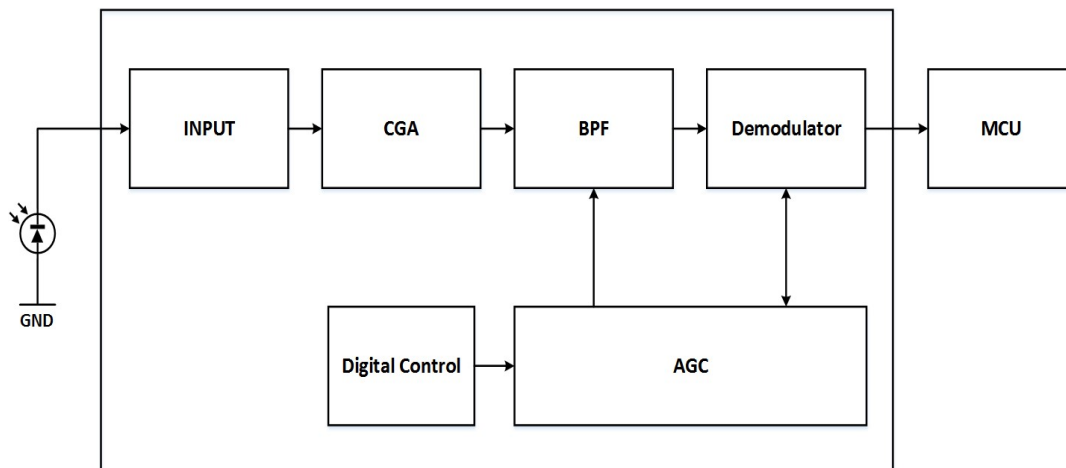
Applications

- Home entertainment applications
- Remote control equipment
- Home appliances

Description

TS3112 is a complete IR receiver for use in carrier-frequency-modulated transmission applications. The IC combines small size with high sensitivity as well as high suppression of interference from daylight and lamps. TS3112 operates in a supply voltage range of 2.7V to 5.5V, and is available with standard frequencies (33, 38, 56kHz). The function of TS3112 is described using the block diagram of Figure 1. The IC contains input stage IV conversion circuit, variable gain VGA, bandpass filter BPF, integral demodulation circuit and output stage circuit. The input stage has two main functions: first, it provides a suitable bias voltage for the PIN diode; second, the pulsed photo current signals are transformed into a voltage.

The signals have to pass a Controlled Gain Amplifier (CGA), and then pass a bandpass filter (BPF) with a center frequency, which is equal to the carrier frequency. The demodulator converts the input burst signal to a digital envelope output pulse. The output stage provides a certain drive capability. The analog control loop circuit and the Controlled Gain Amplifier can realize that the chip can always keep the most sensitive state in any case, which means the chip always stays above the noise state. Once the signal is sent, it will be immediately received and demodulated.



1. Ordering information

| Product Model | Period | Material Numbers | Ecology Plan | Package Type | Packing Type, Package Quantity |
|---------------|------------|------------------|--------------|--------------|--------------------------------|
| TS3112 | Production | | Rohs | Dice | N/A |

2. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Parameter | Symbol | Minimum | Maximum | Unit |
|-----------------------|-----------|---------|------------|------|
| Supply voltage | V_{DD} | -0.3 | 6 | V |
| Output voltage | V_O | -0.3 | V_{DD} | V |
| Output current | I_O | 8 | - | mA |
| Operating temperature | T_{amb} | -25 | 85 | °C |
| Storage temperature | T_{stg} | -40 | 125 | °C |
| ESD HBM | | | ± 4000 | V |

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3. Electrical Characteristics, 3V Operation

T_{amb} = -25°C to +85°C, V_S = 2.7V~ 3.3V unless otherwise specified.

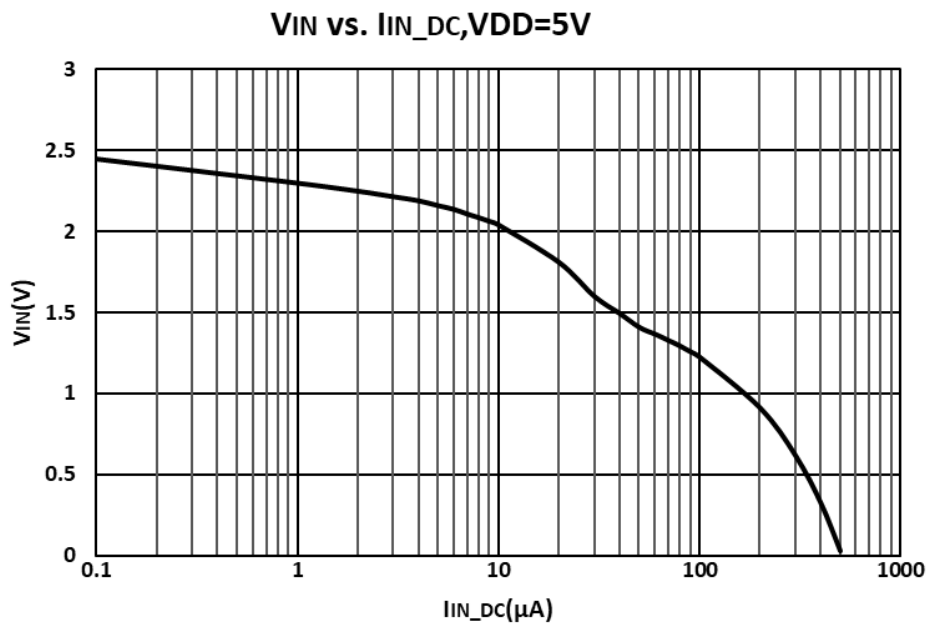
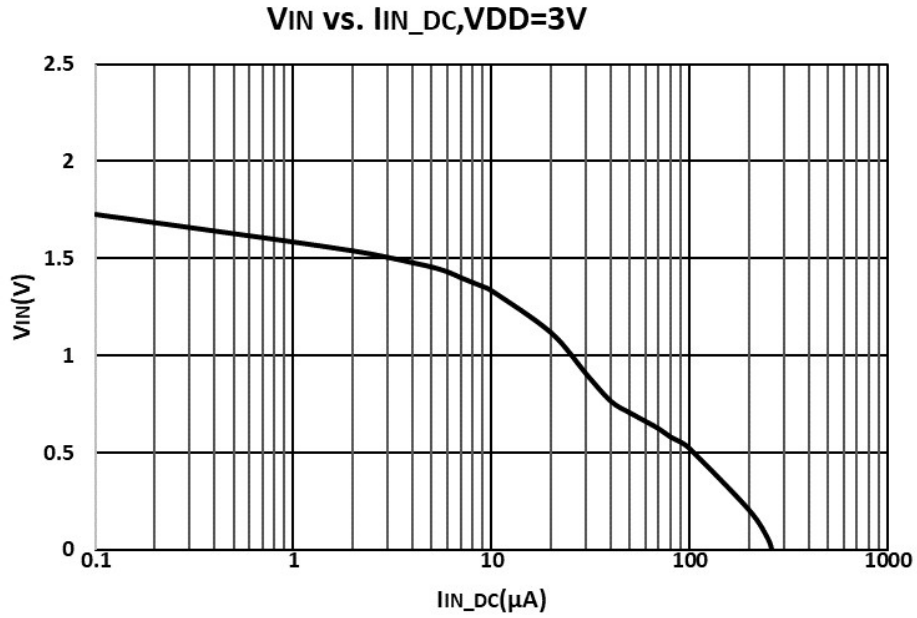
| No. | Parameters | Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|-----|--|---|------------------------|-----------------------|----------------|----------------|------|
| 1 | Supply | | | | | | |
| 1.1 | Supply-voltage range | | V _S | 2.7 | 3 | 3.3 | V |
| 1.2 | Supply current | I _{IN} =0 | I _S | | 0.53 | | mA |
| 2 | Output | | | | | | |
| 2.1 | Internal pull-up resistor | T _{amb} =25°C | R _{PU} | | 37 | | kΩ |
| 2.2 | Output voltage low | R ₂ =1.4kΩ | V _{OL} | | | 0.125 | V |
| 2.3 | Output voltage high | | V _{OH} | V _S -0.125 | | V _S | V |
| 2.4 | Output current clamping | | I _{OCL} | | 7.6 | | mA |
| 3 | Input | | | | | | |
| 3.1 | Input DC current | V _{IN} =0, V _S =2.7V | I _{IN_DC} MAX | 200 | | | μA |
| 3.2 | Input DC current | V _{IN} =0, V _S =3V, T _{amb} =25°C | I _{IN_DC} MAX | | 285 | | μA |
| 3.3 | Minimum detection threshold current | | I _{Eemin} | | 0.95 | | nA |
| 3.4 | Minimum detection threshold current with AC current disturbance I _{IN_AC} 100 =3 μA at 100 Hz | V _S =3V, I _{IN_DC} =1μA, T _{amb} =25°C, burst N=16, f=f ₀ | I _{Eemin} | | TBD | | nA |
| 3.5 | Maximum detection threshold current with V _{IN} > 0V | V _S =3V, I _{IN_DC} =1uA T _{amb} =25°C, burst N=16, f=f ₀ | I _{Eemax} | | TBD | | μA |
| 4 | Controlled Amplifier and Filter | | | | | | |
| 4.1 | Maximum value of variable gain (CGA) | V _S =3V, T _{amb} =25°C | G _{VAR} MAX | | 70 | | dB |
| 4.2 | Minimum value of variable gain (CGA) | V _S =3V, T _{amb} =25°C | G _{VAR} MIN | | -9 | | dB |
| 4.3 | Total internal amplification(VGA+BPF) | V _S =3V, T _{amb} =25°C | G _{MAX} | | 88 | | dB |
| 4.4 | Center frequency fusing accuracy of bandpass | V _S =3V, T _{amb} =25°C 0.5% accuracy | f _{03V_FUSE} | -2.5 | f ₀ | 2.5 | % |
| 4.5 | Overall accuracy center frequency of bandpass | | f _{03V} | TBD | f ₀ | TBD | % |
| 4.6 | Overall accuracy center frequency of bandpass | T _{amb} =0 to 70°C | f _{03V} | TBD | f ₀ | TBD | % |
| 4.7 | BPF bandwidth | -3dB, f ₀ =38kHz | BW | | 4 | | kHz |

4. Electrical Characteristics, 5V Operation

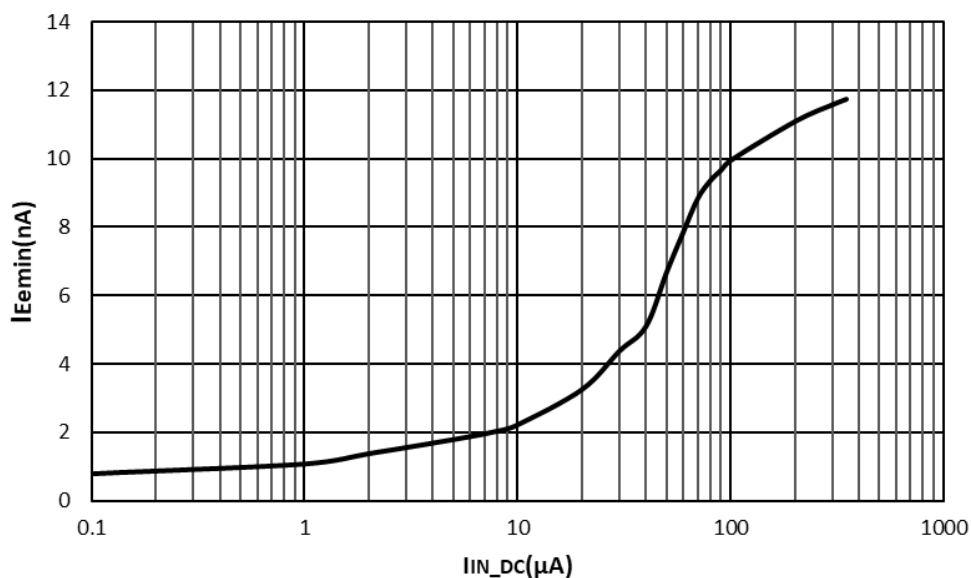
Tamb = -25°C to +85°C, VS = 4.5 V ~5.5V unless otherwise specified.

| No. | Parameters | Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|-----|---|---|-----------------|-------------|------|-------|------------|
| 1 | Supply | | | | | | |
| 1.1 | Supply-voltage range | | V_S | 4.5 | 5 | 5.5 | V |
| 1.2 | Supply current | $I_{IN}=0$ | I_S | | 0.6 | | mA |
| 2 | Output | | | | | | |
| 2.1 | Internal pull-up resistor | $T_{amb}=25^{\circ}C$ | R_{PU} | | 37 | | k Ω |
| 2.2 | Output voltage low | $R_2=1.4k\Omega$ | V_{OL} | | | 0.125 | V |
| 2.3 | Output voltage high | | V_{OH} | $V_S-0.125$ | | V_S | V |
| 2.4 | Output current clamping | | I_{OCL} | | 7.6 | | mA |
| 3 | Input | | | | | | |
| 3.1 | Input DC current | $V_{IN}=0, V_S=4.5V$ | V_{IN_DCMAX} | 400 | | | μA |
| 3.2 | | $V_{IN}=0, V_S=5V, T_{amb}=25^{\circ}C$ | I_{IN_DCMAX} | | 530 | | μA |
| 3.3 | Minimum detection threshold current | | I_{Eemin} | | 0.92 | | nA |
| 3.4 | Minimum detection threshold current with AC current disturbance $I_{IN_AC100}=3\mu A$ at 100 Hz | $V_S=5V, I_{IN_DC}=1\mu A, T_{amb}=25^{\circ}C,$ burst N=16, $f=f_0$ | I_{Eemin} | | TBD | | nA |
| 3.5 | Maximum detection threshold current with $V_{IN} > 0V$ | $V_S=5V, I_{IN_DC}=1\mu A$ $T_{amb}=25^{\circ}C, \text{burst } N=16, f=f_0$ | I_{Eemax} | | TBD | | μA |
| 4 | Controlled Amplifier and Filter | | | | | | |
| 4.1 | Maximum value of variable gain (CGA) | $V_S=5V, T_{amb}=25^{\circ}C$ | G_{VARMAX} | | 70 | | dB |
| 4.2 | Minimum value of variable gain (CGA) | $V_S=5V, T_{amb}=25^{\circ}C$ | G_{VARMIN} | | -9 | | dB |
| 4.3 | Total internal amplification(VGA+BPF) | $V_S=5V, T_{amb}=25^{\circ}C$ | G_{MAX} | | 88 | | dB |

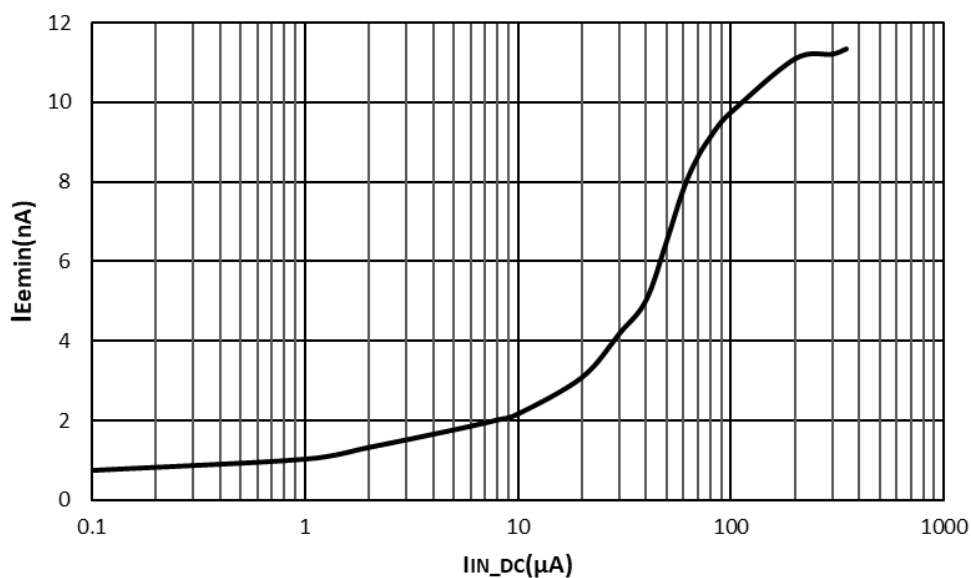
5. Typical Electrical Curves at $T_{amb}=25^{\circ}C$



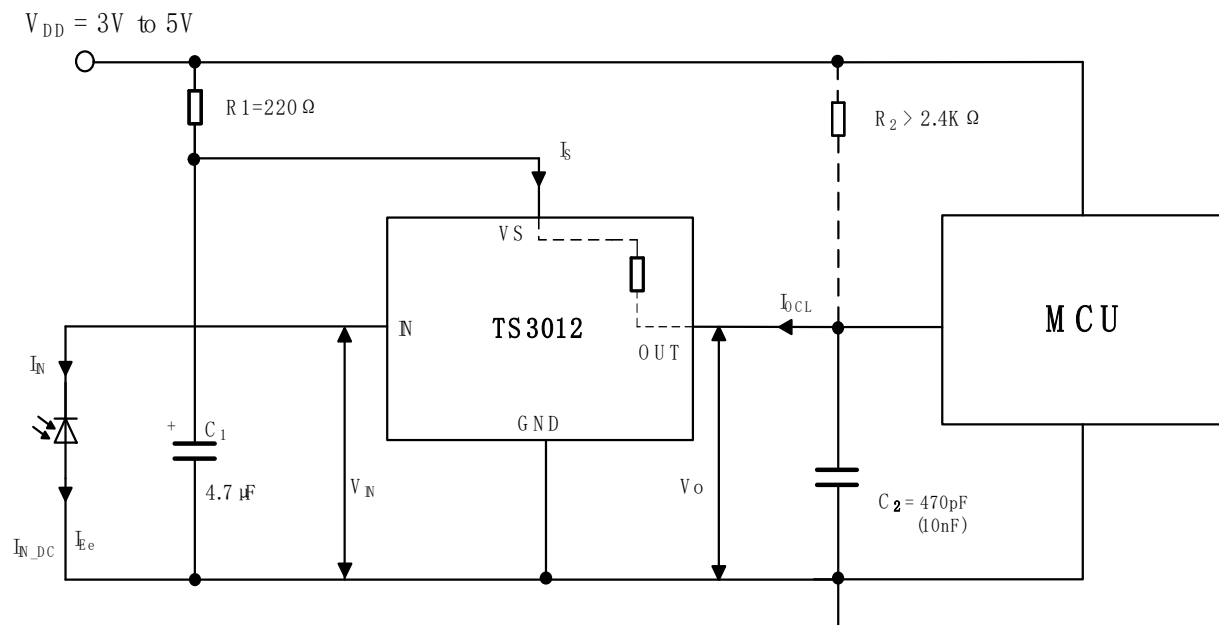
I_{Eemin} vs. I_{IN_DC}, VDD = 3V



I_{Eemin} vs. I_{IN_DC}, VDD = 5V



6. Application Circuit



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