# Receiver IC for infrared remote control

# TSA9455/TSA9456

## GENERAL DESCRIPTION

The TSA9455 and TSA9456 are bipolar IC's designed to perform all filter, amplifier and pulse shaping functions required for a fully integrated IR-receiver. The typical signal sent from a IR-transmitter may be biphase coded or pulse distance coded.

## FEATURES

- On board voltage reference and ripple rejection.
- Automatic bias level control input stage providing rejection of sunlight and incandescent lamp interferences.
- Limiter.
- Band-pass filter with internal capacitors.
- Amplifiers with controlled gain (AGC) by means of an external capacitor.
- Pulse shaper.
- LS-TTL compatible output buffer.
- Active HIGH output (TSA9455).
- Active LOW output (TSA9456).

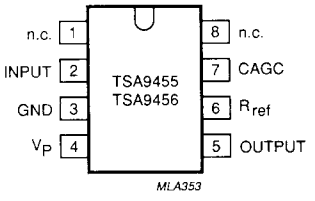


Fig.1 Pinning diagram.

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_P$ | supply voltage range | 4 | 4.5 | 5 | V |
| $I_P$ | supply current (see note 1) | - | - | 2.2 | mA |
| $f_o$ | carrier frequency | - | 455 | - | kHz |
| $T_{amb}$ | operating ambient temperature range | –40 | - | +85 | °C |

**Note**

1. When the output is not loaded.

## PINNING

| SYMBOL | PIN | DESCRIPTION |
|---|---|---|
| - | 1 | n.c. |
| INPUT | 2 | input signal |
| GND | 3 | ground |
| $V_P$ | 4 | supply voltage |
| OUTPUT | 5 | output signal |
| $R_{ref}$ | 6 | reference voltage and current input |
| CAGC | 7 | AGC control |
| - | 8 | n.c. |

## ORDERING AND PACKAGE INFORMATION

| EXTENDED TYPE NUMBER | PACKAGE | | | |
|---|---|---|---|---|
| | PINS | PIN POSITION | MATERIAL | CODE |
| TSA9455, TSA9456 | 8 | DIL | plastic | SOT96A |

## LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_P$ | supply voltage | | –0.3 | 6.5 | V |
| $V_O$ | output voltage | | –0.3 | 6.5 | V |
| $I_O$ | output current DC | | - | note 1 | mA |
| $P_d$ | total power dissipation | | - | note 1 | mW |
| $T_{stg}$ | storage temperature range | | –40 | +85 | °C |
| $T_{amb}$ | operating ambient temperature range | | –40 | +85 | °C |
| $T_j$ | operating junction temperature | | - | 150 | °C |

**Note**

1. Value to be fixed.

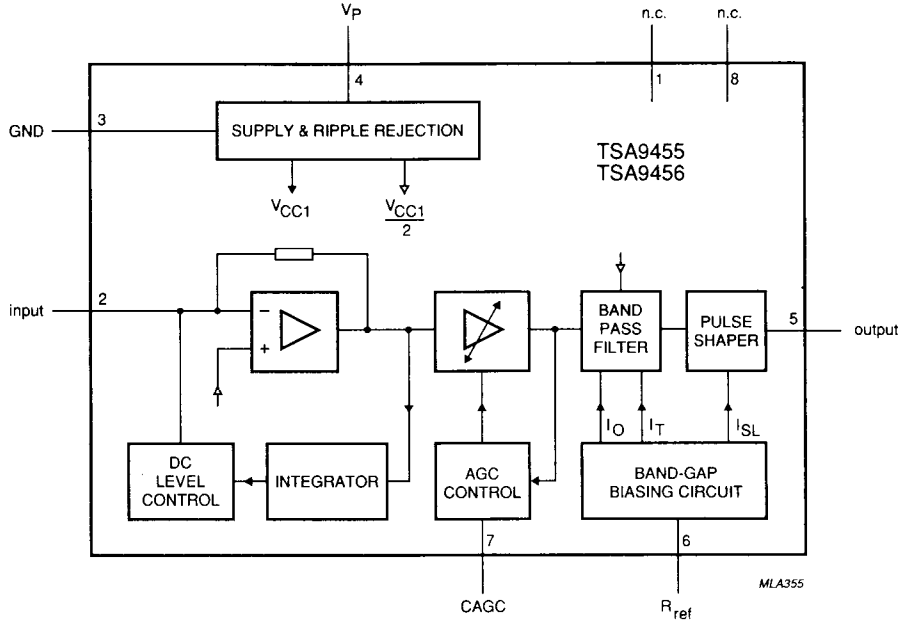


Fig.2 Block diagram.

## CHARACTERISTICS

$V_P$ = +5 V; $T_{amb}$ = +25 °C, unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **Supply** | | | | | | |
| $V_P$ | supply voltage | | 4 | 4.5 | 5 | V |
| $I_P$ | supply current | | - | - | note 2 | mA |
| **Input stage** | | | | | | |
| - | DC voltage | | - | 1.4 | - | V |
| - | compensated DC signal | | - | - | 3 | mA |
| - | AC signal | | - | note 2 | - | |
| $Z_i$ | imput impedance | | - | note 2 | - | |
| - | sensitivity | note 1 | - | note 2 | - | nA |
| **Band-pass filter** | | | | | | |
| $f_0$ | centre frequency | | - | 455 | - | kHz |
| $\left\|\frac{\Delta\phi_0}{f_0}\right\|$ | tolerance on $f_0$ | $R_{ref}$ = note 2 | - | 15 | - | % |
| BW | bandwidth (−3 dB) | | - | note 2 | - | MHz |
| **AGC detector** | | | | | | |
| $V_{AGC}$ | control voltage | | note 2 | - | note 2 | V |
| $A_{AGC}$ | AGC control range | | 55 | 60 | 65 | dB |
| $t_{attack}$ | attack time, see Fig.3 | CAGC = note 2 | - | 10 | - | µs |
| $t_{hold}$ | hold time see, Fig.3 | CAGC = note 2 | - | 1 | - | ms |
| **Output** | | | | | | |
| $V_{OH}$ | signal output voltage, HIGH | | 3 | - | - | V |
| $I_{OH}$ | signal output current, HIGH | | −200 | - | - | µA |
| $V_{OL}$ | output voltage , LOW | | 0 | - | 0.4 | V |
| $I_{OL}$ | signal output current, LOW | | - | - | 1 | mA |
| **Switching time (see Fig.4)** | | | | | | |
| $t_r$ | rise time | $C_L$ = 15 pF | - | note 2 | - | ns |
| $t_f$ | fall time | $C_L$ = 15 pF | - | note 2 | - | ns |

**Notes**

1. Peak value of current pulses at $f_0$ necessary to create correct data at the output. Duty factor = 50%; $I_{DC}$ = 0.
2. Value to be fixed.

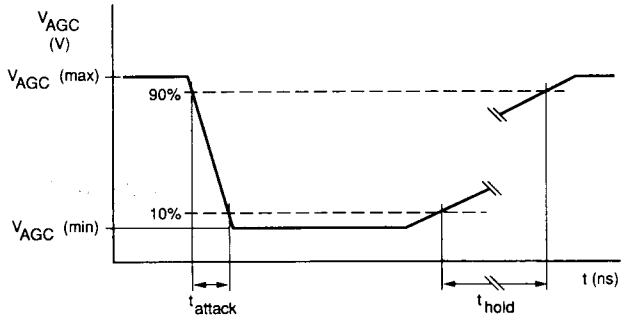


Fig.3 AGC attack and hold times.

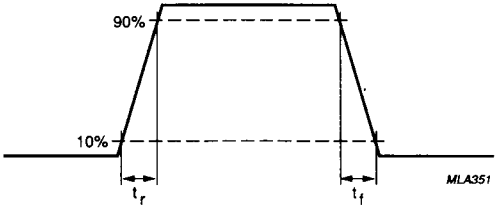


Fig.4 Switching times with a $C_L$ = 15 pF at the output.

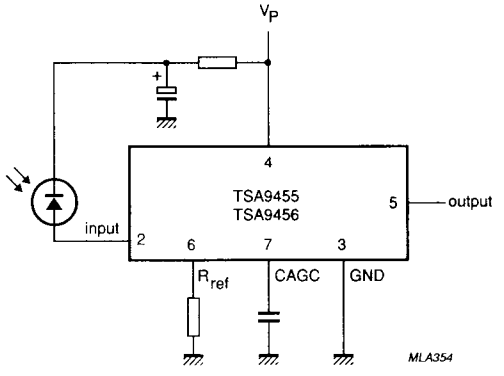


Fig.5 Typical application diagram.