



ON Semiconductor®

<http://onsemi.com>

LA7784

Monolithic Linear IC Downconverter IC for Digital CATV

Overview

The LA7784 is a downconverter IC for digital CATV. It accepts RF input frequencies from 50 to 150MHz and supports the DOCSIS (USA) and Euro-DOCSIS (Europe) standards.

Features

- RF Mixer.
- Attenuation control for RF Mixer.
- Driver for SAW filter.
- IF AGC amplifier.
- IF Driver amplifier for ADC.

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------|-----------------------------------|-------------|------------------|
| Maximum supply voltage | $V_{CC\ max}$ | Pin 8, 14, 19, 20, 21, 22, 26, 27 | 6.0 | V |
| Circuit voltages | V max | Pin 9 | V_{CC} | V |
| Circuit current | $I_{12, 13}$ | Pin 12, 13 sink current | 2 | V |
| Allowable power dissipation | $Pd\ max$ | $T_a \leq 70^\circ\text{C}$ | 900* | mW |
| Operating temperature range | T_{opr} | | -20 to +70 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | | -55 to +150 | $^\circ\text{C}$ |

* On the board (114.3×76.1×1.6mm)

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Operating Conditions at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------------|--------------|-----------------------------------|------------|------|
| Recommended supply voltage | V_{CC} | Pin 8, 14, 19, 20, 21, 22, 26, 27 | 5.0 | V |
| Operating supply voltage range | $V_{CC\ op}$ | Pin 8, 14, 19, 20, 21, 22, 26, 27 | 4.5 to 5.5 | V |

LA7784

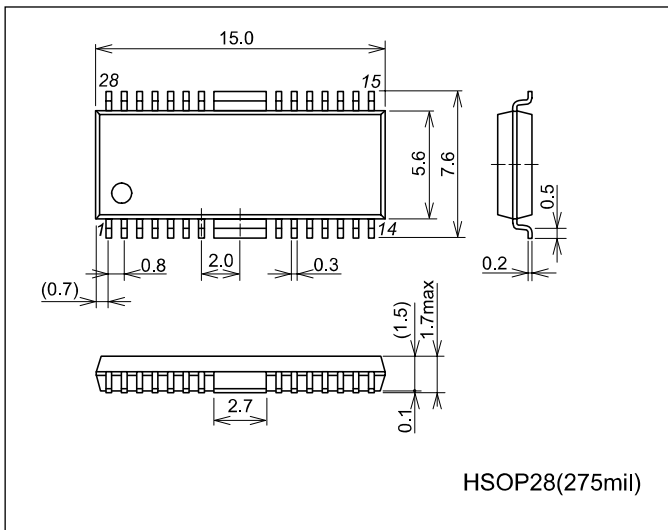
AC Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$

| Parameter | Symbol | Pin No. | Conditions | Ratings | | | Unit |
|--------------------------|----------------------|-------------------------------|---|---------|-----|-----|------|
| | | | | min | typ | max | |
| Circuit current | I_{total} | 8, 14, 19, 20, 21, 22, 26, 27 | No Signal | 80 | 105 | 130 | mA |
| RF input frequency range | $f_{(\text{RF})}$ | 23, 24 | $f_c: -3\text{dB}$ | 50 | | 150 | MHz |
| RF AGC range | GR1 | 26, 27 | $V_9 = 2.5 \text{ to } 0\text{V}$ | 45 | 53 | | dB |
| Mixer conversion gain | CG1 | 26/23, 24 27/23, 24 | $V_9 = 2.5\text{V}$ | 19 | 22 | 25 | dB |
| Mixer inter modulation 1 | IM3 1 | 26/23, 24 27/23, 24 | Input = $75\text{dB}\mu$ $V_9 = 2.5\text{V}$ | 40 | 50 | | dB |
| IF input frequency range | $f_{(\text{IF})}$ | 4, 5 | $f_c: -3\text{dB}$ | 30 | | 100 | MHz |
| IF amplifier gain | $G_{(\text{AGC})}$ | 12/4, 5 13/4, 5 | $V_9 = 2.5\text{V}$ | 51 | 55 | 59 | dB |
| IF inter modulation 2 | IM3 2 | 12/4, 5 13/4, 5 | Output = $110\text{dB}\mu$ | 40 | 50 | | dB |
| Range | GR2 | 12, 13 | IF Output Level $< \pm 1\text{dB}$ | 3 | 5 | | dB |
| IF AGC output level | $V_{O(\text{IF}) 1}$ | 12 | Single output | | 1.0 | | Vp-p |
| IF output level | $V_{O(\text{IF}) 2}$ | 13 | Single output | | 1.0 | | Vp-p |

Package Dimensions

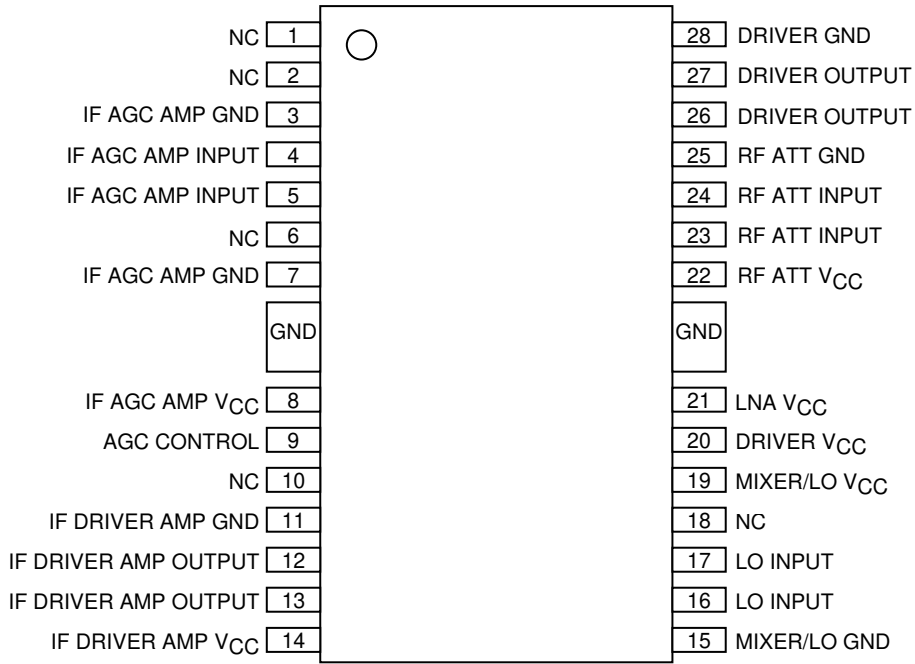
unit: mm

3222A

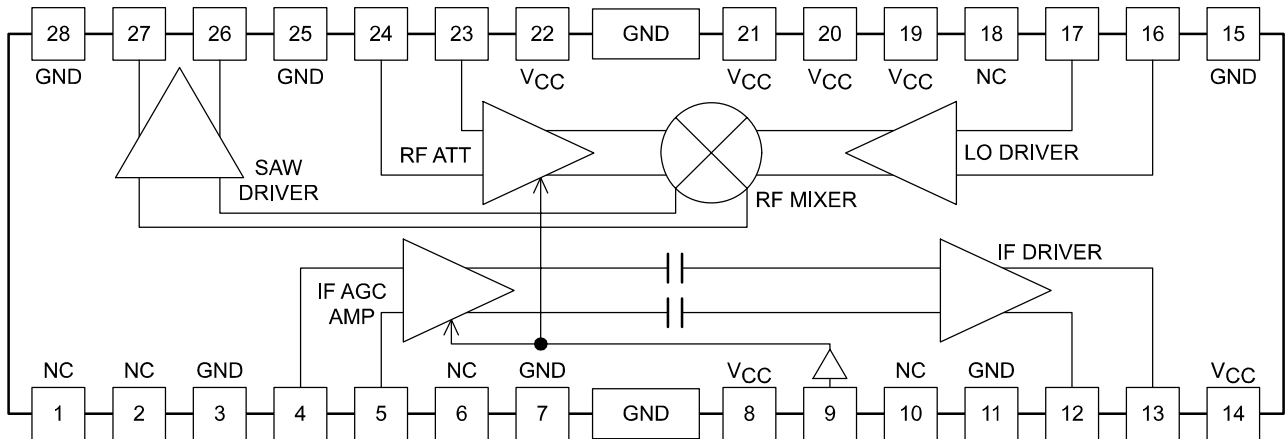


LA7784

Pin Assignment



Block Diagram

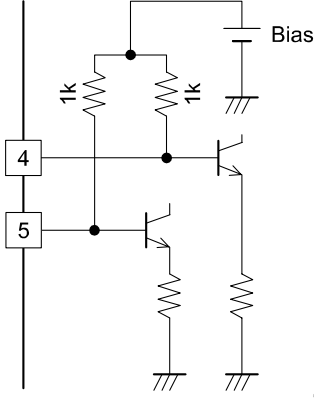
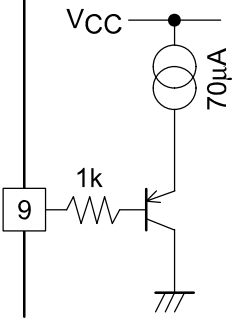


OMB05021

LA7784

Pin Description

(unit: Ω)

| Pin Number | Description | Equivalent circuit |
|------------|------------------|--|
| 1 | No Connection | |
| 2 | No Connection | |
| 3 | AGC Amp GND | |
| 4 5 | AGC Amp Input |  <p style="text-align: right; font-size: small;">OMP05090</p> |
| 6 | No Connection | |
| 7 | AGC Amp GND | |
| 8 | AGC Amp V_{CC} | |
| 9 | AGC Control |  <p style="text-align: right; font-size: small;">OMP05091</p> |
| 10 | No Connection | |
| 11 | Post Amp GND | |

Continued on next page.

LA7784

Continued from preceding page.

(unit: Ω)

| Pin Number | Description | Equivalent circuit |
|------------|-------------------|--|
| 12 13 | Post Amp Outputs | <p style="text-align: right; margin-top: 10px;">OMP05092</p> |
| 14 | Post Amp V_{CC} | |
| 15 | Mixer/LO GND | |
| 16 17 | LO Input | <p style="text-align: right; margin-top: 10px;">OMP05093</p> |
| 18 | No Connection | |
| 19 | Mixer/LO V_{CC} | |
| 20 | Driver V_{CC} | |

Continued on next page.

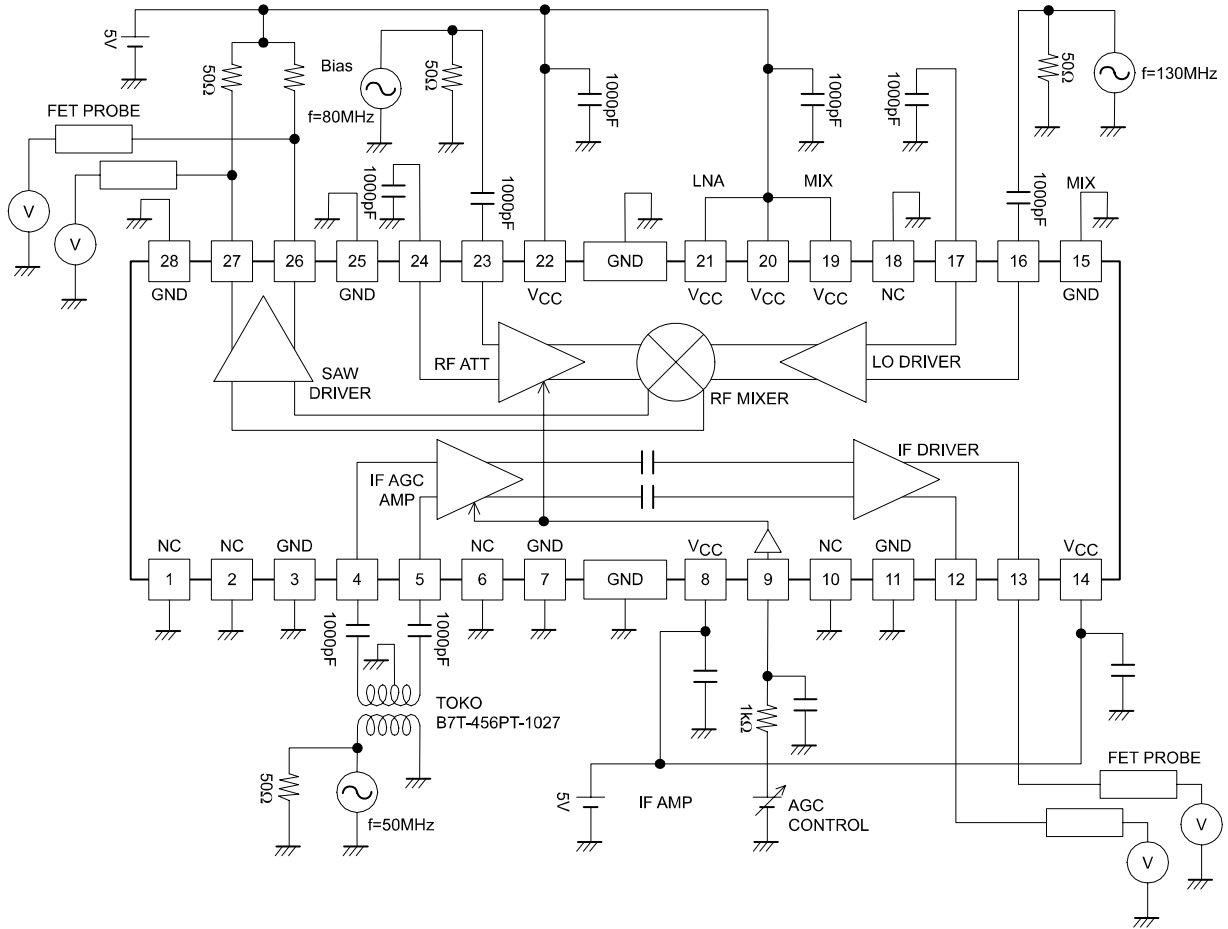
LA7784

Continued from preceding page.

(unit: Ω)

| Pin Number | Description | Equivalent circuit |
|------------|---------------------|--|
| 21 22 | LNA V _{CC} | <p style="text-align: right; margin-right: 20px;">OMP05094</p> |
| 23 24 | LNA Inputs | |
| 25 | LNA GND | |
| 26 27 | Driver Outputs | <p style="text-align: right; margin-right: 20px;">OMP05095</p> |
| 28 | Driver Gnd | |

Test Circuit



OMB05022

ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.