Ordering number:ENN4185

Monolithic Linear IC

# LA5685N

## Multifunction, Multi-Power Supply IC for Car Radios

## Overview

The LA5685N is a multifunction, multipower supply IC developed for car radios. It has 8.5V AM output, 8.5V FM output, 8.5V common output, 5.2V microcomputer output, and 5.1V bias output, making it the ideal power supply for LA1833 and LA1887 ICs for FM/AM tuner systems.

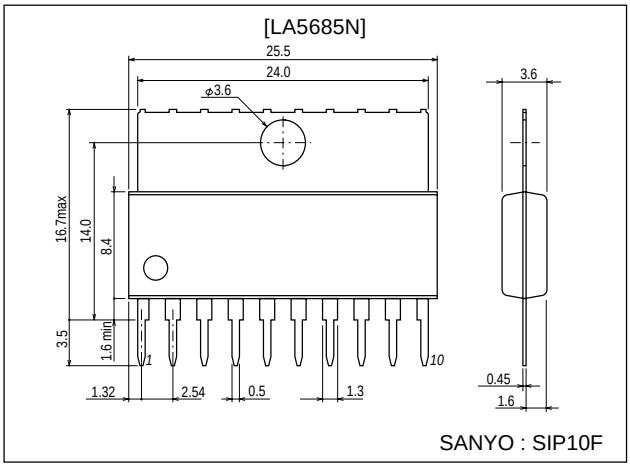
## Features

- A total of five built-in outputs : $V_1$=8.5V (AM), $V_2$=8.5V (FM), $V_3$=8.5V (common), $V_4$=5.2V (microcomputer), and $V_5$=5.1V.
- R ON/OFF, FM/AM switching functions.
- Minimal static current for backup (120μA typ).
- Built-in overvoltage protection circuit ($V_1$, $V_2$, and $V_3$ go off at 28V (typ.), $V_4$ and $V_5$ go off at 56V (typ)).
- Built-in thermal shutdouwn circuit (output goes off at Tj=170°C (typ.)).
- Built-in short protection circuit.

## Package Dimensions

unit:mm

3046B-SIP10F




## Specifications

### Maximum Ratings at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Input votage | $V_{CC}$ max1 | 4% duty pulse width 200ms pulse input (input pulse when output on) | 75 | V |
| | $V_{CC}$ max2 | | 25 | V |
| Output current | I1 max | | 80 | mA |
| | I2 max | | 100 | mA |
| | I3 max | | 200 | mA |
| | I4 max | | 50 | mA |
| | I5 max | | 5 | mA |
| Allowable power dissipation | Pd max | | 2.45 | W |
| Operating temperature | Topr | | –35 to +85 | ˚C |
| Storage temperature | Tstg | | –40 to +125 | ˚C |

### Operating Conditions at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ op | 9V to 10.5V not regulated | 9 to 16 | V |
| B/U voltage | B/U | 6V to 8.5V not regulated | 6 to 16 | V |




**SANYO Electric Co.,Ltd. Semiconductor Company**

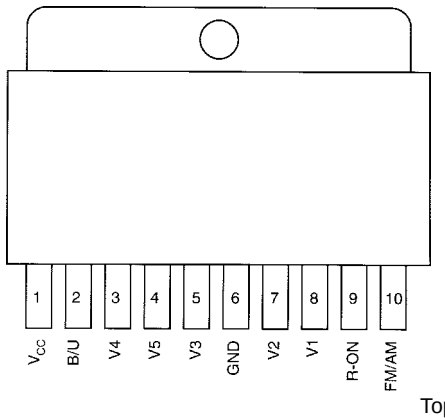
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

**Operating Characteristics** at Ta = 25˚C, unless otherwise noted, $V_{CC}$=12V, R-ON=FM/AM=5V
External 33µF OS capacitor connected to V1, V2, V3, and V4

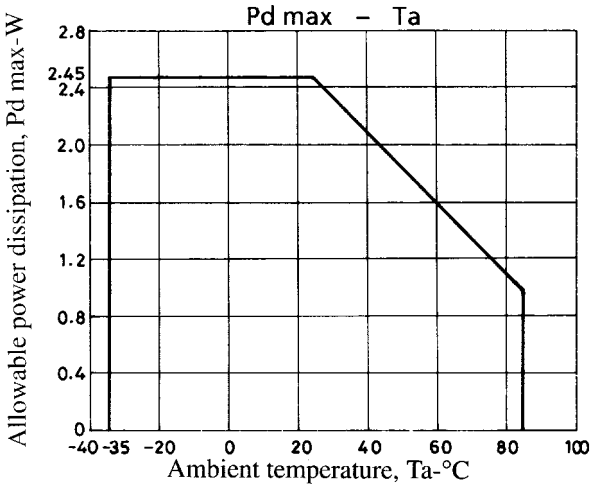
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Static current | $I_{CC}1$ | R-ON=FM/AM=0V | | 4.5 | 7.0 | mA |
| | $I_{CC}2$ | R-ON=FM/AM=5V | | 4.5 | 7.0 | mA |
| Output voltage | V1 | FM/AM=0V, I1=20mA | 7.8 | 8.5 | 9.2 | V |
| | V2 | FM/AM=5V, I2=50mA | 7.8 | 8.5 | 9.2 | V |
| | V3 | I3=100mA | 7.8 | 8.5 | 9.0 | V |
| | V4 | I4=20mA | 4.9 | 5.2 | 5.5 | V |
| | V5 | I5=1mA | V4–0.5 | | V4 | V |
| Line regulation | ΔV1 line | FM/AM=0V, 11V<$V_{CC}$<15V, I1=20mA | | | 50 | mV |
| | ΔV2 line | FM/AM=5V, 11V<$V_{CC}$<15V, I1=50mA | | | 50 | mV |
| | ΔV3 line | I3=100mA, 11V<$V_{CC}$<15V | | | 50 | mV |
| | ΔV4 line | I4=20mA, 11V<$V_{CC}$<15V | | | 50 | mV |
| | ΔV5 line | I5=1mA, 11V<$V_{CC}$<15V | | | 50 | mV |
| B/U static current | IB/U | B/U=16V, $V_{CC}$=0V | | | 0.3 | mA |
| V5 on-off TH voltage | $V5_{TH}$ | B/U=12V | 6 | 7 | 8 | V |
| R-ON on voltage | R-ON ON | | 2.5 | | $V_{CC}$ | V |
| R-ON off voltage | R-ON-OFF | | –0.3 | | +1.0 | V |
| FM/AM on voltage | FM/AM ON | | 2.5 | | $V_{CC}$ | V |
| FM/AM off voltage | FM/AM OFF | | –0.3 | | +1.0 | V |
| Input current R-ON | IR-ON | R-ON=5V | | | 0.2 | mA |
| Input current FM/AM | IFM/AM | FM/AM=5V | | | 0.2 | mA |
| Load regulation | ΔV1 Load | FM/AM=0V, 1mA<I1<65mA | | | 50 | mV |
| | ΔV2 Load | FM/AM=5V, 1mA<I2<90mA | | | 50 | mV |
| | ΔV3 Load | 1mA<I3<160mA | | | 100 | mV |
| | ΔV4 Load | 1mA<I4<40mA | | | 50 | mV |
| | ΔV5 Load | 0.1mA<I5<2mA | | | 200 | mV |
| Ripple regulation | Rr1 | FM/AM=0V, f=120Hz, I1=20mA | 40* | | | dB |
| | Rr2 | FM/AM=5V, f=120Hz, I2=50mA | 40* | | | dB |
| | Rr3 | f=120Hz, I3=100mA | 40* | | | dB |
| | Rr4 | f=120Hz, I4=20mA | 40* | | | dB |
| | Rr5 | f=120Hz, I5=1mA | 40* | | | dB |

Note : * indicates design guaranteed value.

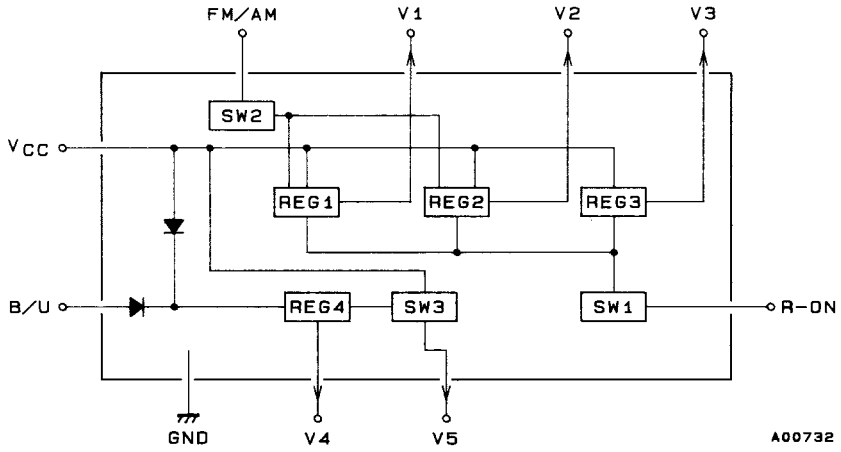
## Pin Assignment




Top view

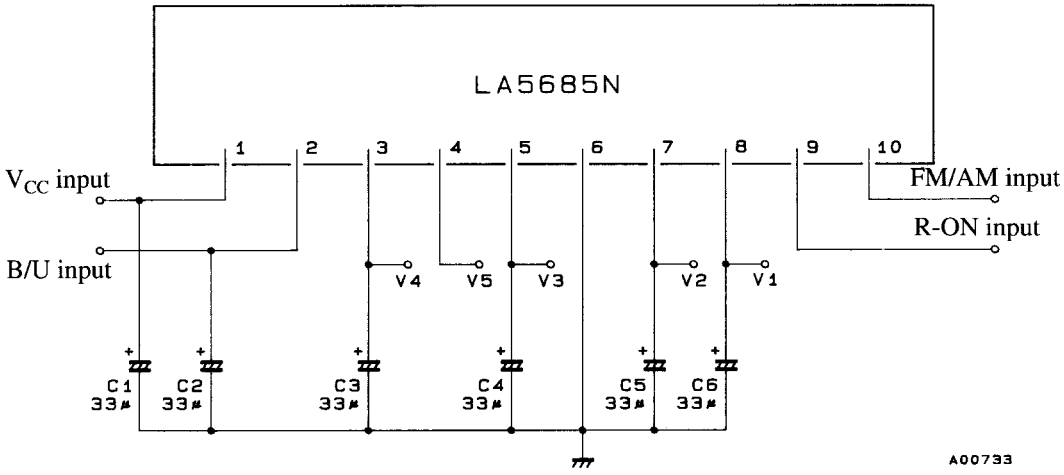


## Block Diagram



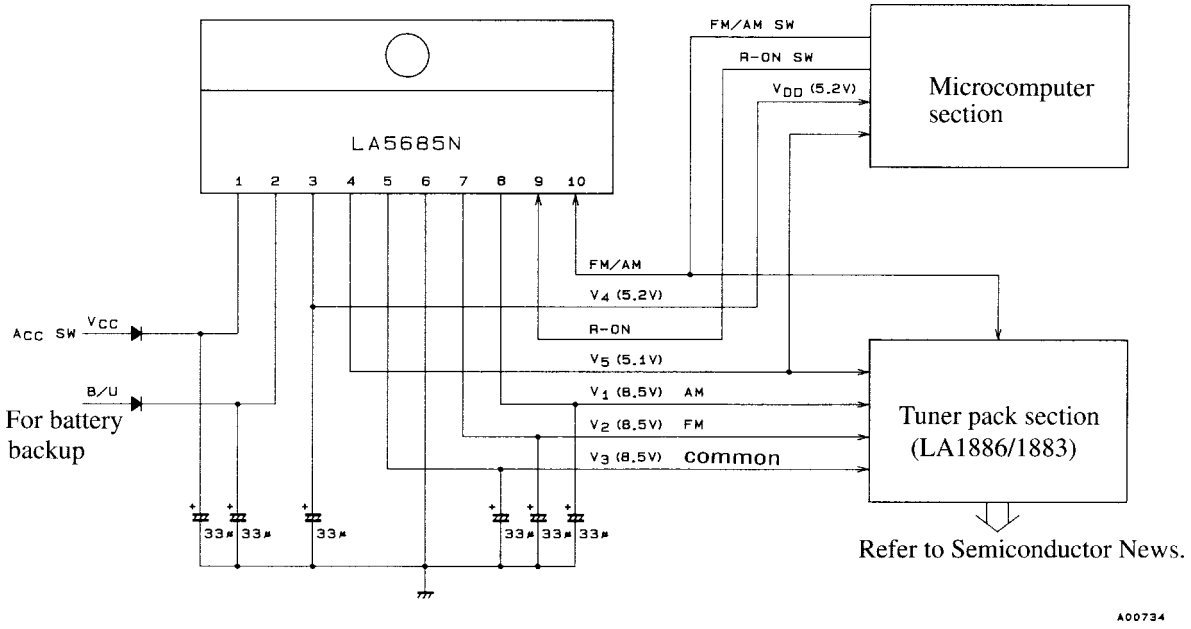

| Pin | Name | Pin | Name |
|---|---|---|---|
| 1 | $V_{CC}$ | 6 | GND |
| 2 | B/U | 7 | V2 |
| 3 | V4 | 8 | V1 |
| 4 | V5 | 9 | R-ON |
| 5 | V3 | 10 | FM/AM |

## Test Circuit




Unit ( capacitance: F )

## Sample Application Circuit



### Input/Output Table

| Inputs | | | | Outputs | | | | |
|---|---|---|---|---|---|---|---|---|
| $A_{CC}$ | B/U | R-ON | FM/AM | V1 | V2 | V3 | V4 | V5 |
| L | L | * | * | L | L | L | L | L |
| L | H | * | * | L | L | L | H | L |
| H | * | H | L | H | L | H | H | H |
| H | * | H | H | L | H | H | H | H |
| H | * | L | * | L | L | L | H | H |

- Negative voltages are not to be applied to these pins.
- Always use input/output capacitors (instead of for V5).
  (We recommended OS capacitors with good characteristics at low temperature.)
- Built-in overvoltage protection circuit (V1, V2, and V3 go off at 28V (typ.), V4 and V5 go off at 56V (typ.))
- Built-in thermal shutdown circuit (output goes off at Tj=170°C (typ.))
- Built-in short protection circuit.