Ordering number: EN4185

Monolithic Linear IC

No. 4185

# LA5685N

## Multi-function, multi-power supply IC for car radios

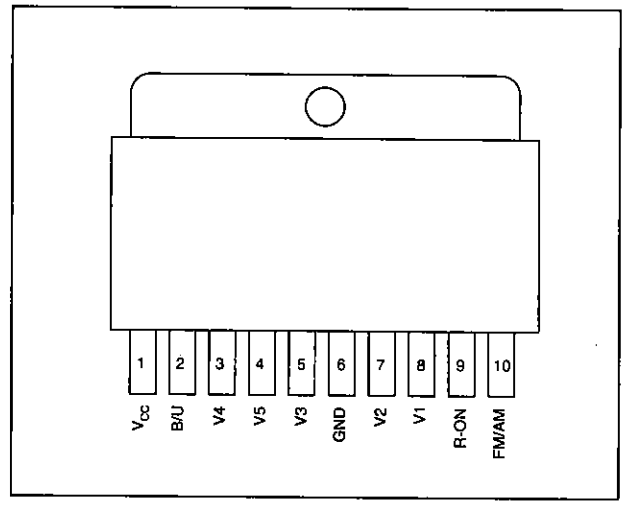
### OVERVIEW

The LA5685N is a multi-function, multi-power 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: $V_1$=8.5 V (AM), $V_2$=8.5 V (FM), $V_3$=8.5 V (common), $V_4$=5.2 V (microcomputer), and $V_5$=5.1 V
- R ON/OFF, FM/AM switching functions
- Minimal static current for back up (120 μA typ.)
- Built-in overvoltage protection circuit ($V_1$, $V_2$, and $V_3$ go off at 28 V (typ.), $V_4$ and $V_5$ go off at 56 V (typ.))
- Built-in thermal shutdown circuit (output goes off at Tj = 170°C (typ.))
- Built-in short protection circuit

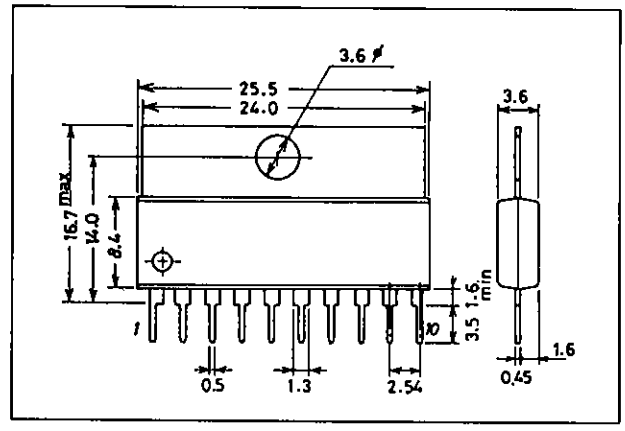
### Pinout




### Package Dimensions

Unit: mm

3046B-SIP10F



**Maximum Ratings** / Ta = 25°C

| | | | unit |
|---|---|---|---|
| Input voltage | $V_{CC}$ max1 4% duty pulse width 200 mS 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 |
| Operation temperature | **Topr** | −35~+85 | °C |
| Storage temperature | Tstg | −40~+125 | °C |

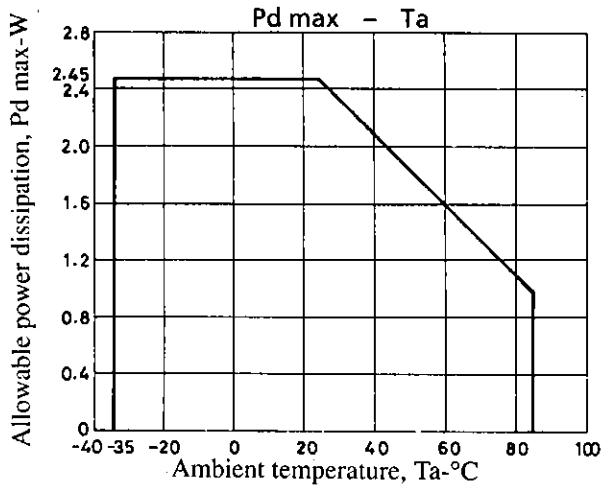
**Operating Conditions** / Ta = 25°C

| | | | | unit |
|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ op | 9 V~10.5 V not regulated | 9~16 | V |
| B/U voltage | B/U | 6 V~8.5 V not regulated | 6~16 | V |

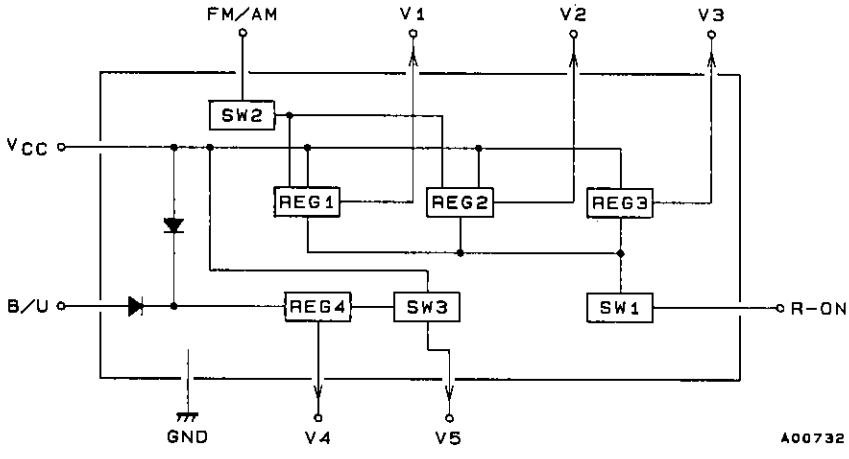
**Operating Characteristics** / Ta = 25°C; unless otherwise noted, $V_{CC}$ = 12V, R-ON = FM/AM = 5V
External 33μF OS capacitor connected to V1, V2, V3, and V4

| | x | | min | typ | max | unit | Note |
|---|---|---|---|---|---|---|---|
| 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 | △V1 line | FM/AM = 0V, 11 < $V_{CC}$ < 15V, I1 = 20mA | | | 50 | mV | |
| | △V2 line | FM/AM = 5V, 11V < $V_{CC}$ < 15V, I2 = 50mA | | | 50 | mV | |
| | △V3 line | I3 = 100mA, 11V < $V_{CC}$ < 15V | | | 50 | mV | |
| | △V4 line | I4 = 20mA, 11V < $V_{CC}$ < 15V | | | 50 | mV | |
| | △V5 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 | △V1 Load | FM/AM = 0V, 1mA < I1 < 65mA | | | 50 | mV | |
| | △V2 Load | FM/AM = 5V, 1mA < I2 < 90mA | | | 50 | mV | |
| | △V3 Load | 1mA < I3 < 160mA | | | 100 | mV | |
| | △V4 Load | 1mA < I4 < 40mA | | | 50 | mV | |
| | △V5 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.

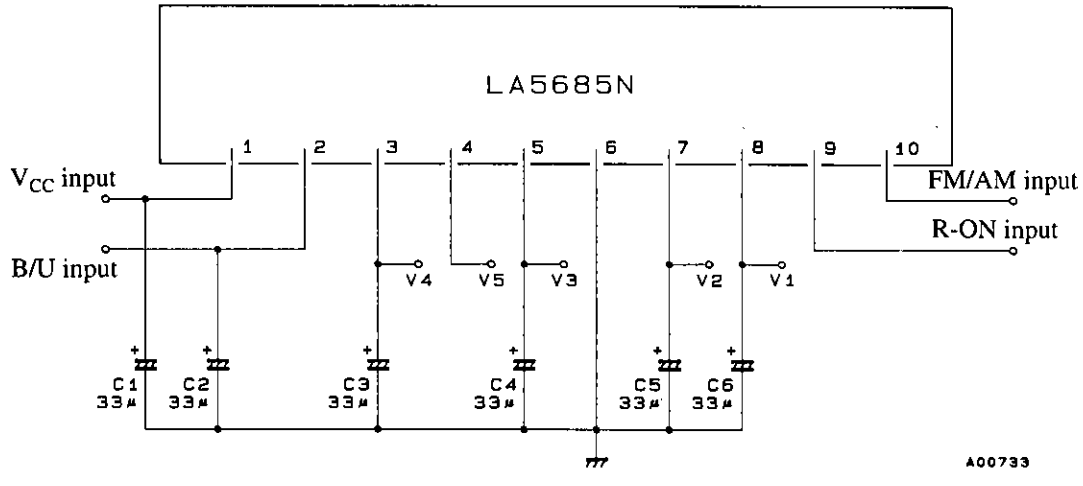



**Block Diagram**



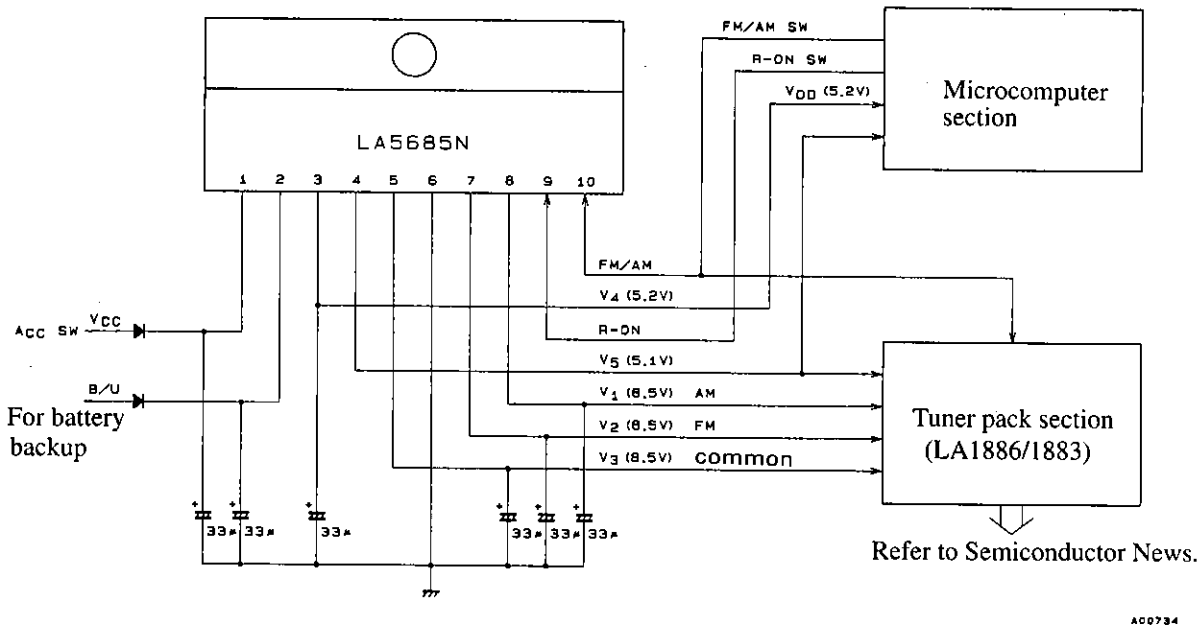

| Pin | Name | Pin | Name |
|---|---|---|---|
| 1 | $V_{CC}$ | 6 | GND |
| 2 | B/U | 7 | V2 |
| 3 | V4 | 8 | V1 |
| 4 | V5 | 9 | R-ON |
| 5 | V3 | 10 | FM/AM |

**Measurement Circuit**




Unit (capacitance: F)

## Application Circuit Examples




## 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 recommend 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