



# 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.

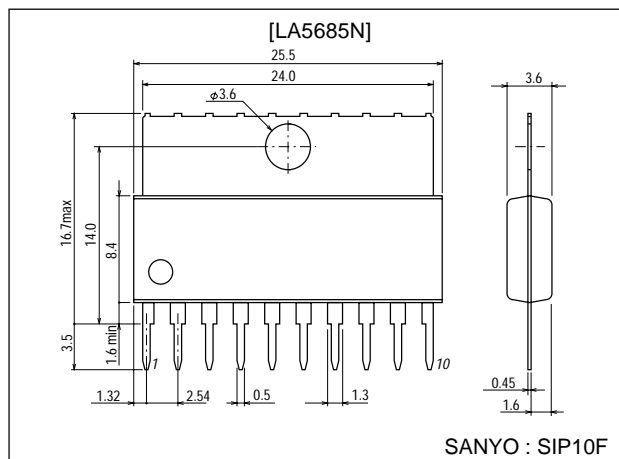
### Features

- 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 (120 $\mu A$  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 shutdown circuit (output goes off at  $T_j=170^{\circ}C$  (typ.)).
- Built-in short protection circuit.

### Package Dimensions

unit:mm

3046B-SIP10F



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{CC\ max1}$	4% duty pulse width 200ms pulse input (input pulse when output on)	75	V
	$V_{CC\ max2}$		25	V
Output current	$I_1\ max$		80	mA
	$I_2\ max$		100	mA
	$I_3\ max$		200	mA
	$I_4\ max$		50	mA
	$I_5\ max$		5	mA
Allowable power dissipation	$P_d\ max$		2.45	W
Operating temperature	$T_{opr}$		$-35$ to $+85$	$^{\circ}C$
Storage temperature	$T_{stg}$		$-40$ to $+125$	$^{\circ}C$

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

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

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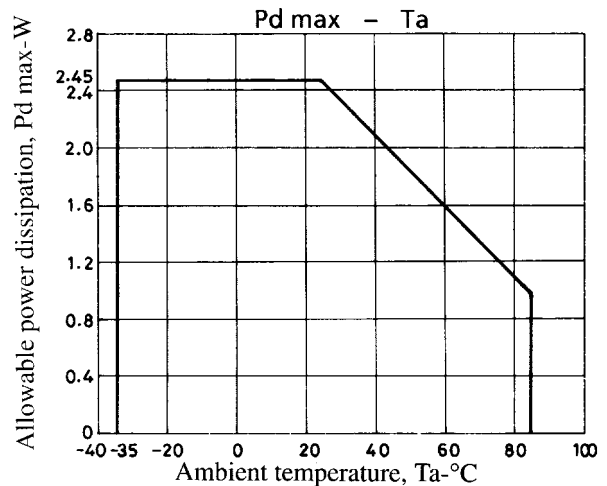
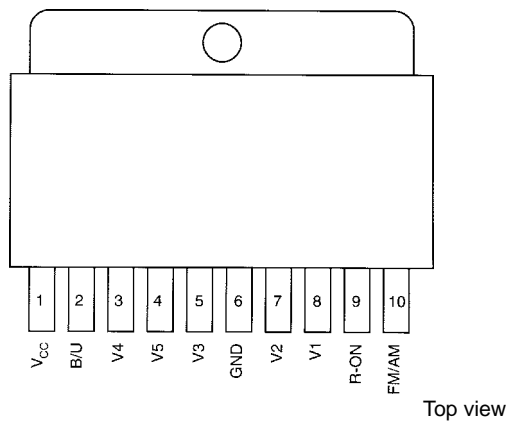
**Operating Characteristics** at  $T_a = 25^\circ\text{C}$ , unless otherwise noted,  $V_{CC}=12\text{V}$ , R-ON=FM/AM=5V

External 33 $\mu\text{F}$  OS capacitor connected to V1, V2, V3, and V4

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Static current	$I_{CC1}$	R-ON=FM/AM=0V		4.5	7.0	mA
	$I_{CC2}$	R-ON=FM/AM=5V		4.5	7.0	mA
Output voltage	V1	FM/AM=0V, $I_1=20\text{mA}$	7.8	8.5	9.2	V
	V2	FM/AM=5V, $I_2=50\text{mA}$	7.8	8.5	9.2	V
	V3	$I_3=100\text{mA}$	7.8	8.5	9.0	V
	V4	$I_4=20\text{mA}$	4.9	5.2	5.5	V
	V5	$I_5=1\text{mA}$	V4-0.5		V4	V
Line regulation	$\Delta V1$ line	FM/AM=0V, $11\text{V}<V_{CC}<15\text{V}$ , $I_1=20\text{mA}$			50	mV
	$\Delta V2$ line	FM/AM=5V, $11\text{V}<V_{CC}<15\text{V}$ , $I_1=50\text{mA}$			50	mV
	$\Delta V3$ line	$I_3=100\text{mA}$ , $11\text{V}<V_{CC}<15\text{V}$			50	mV
	$\Delta V4$ line	$I_4=20\text{mA}$ , $11\text{V}<V_{CC}<15\text{V}$			50	mV
	$\Delta V5$ line	$I_5=1\text{mA}$ , $11\text{V}<V_{CC}<15\text{V}$			50	mV
B/U static current	$I_{B/U}$	B/U=16V, $V_{CC}=0\text{V}$			0.3	mA
V5 on-off TH voltage	$V_{5TH}$	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	$I_{R-ON}$	R-ON=5V			0.2	mA
Input current FM/AM	$I_{FM/AM}$	FM/AM=5V			0.2	mA
Load regulation	$\Delta V1$ Load	FM/AM=0V, $1\text{mA}<I_1<65\text{mA}$			50	mV
	$\Delta V2$ Load	FM/AM=5V, $1\text{mA}<I_2<90\text{mA}$			50	mV
	$\Delta V3$ Load	$1\text{mA}<I_3<160\text{mA}$			100	mV
	$\Delta V4$ Load	$1\text{mA}<I_4<40\text{mA}$			50	mV
	$\Delta V5$ Load	$0.1\text{mA}<I_5<2\text{mA}$			200	mV
Ripple regulation	Rr1	FM/AM=0V, $f=120\text{Hz}$ , $I_1=20\text{mA}$	40*			dB
	Rr2	FM/AM=5V, $f=120\text{Hz}$ , $I_2=50\text{mA}$	40*			dB
	Rr3	$f=120\text{Hz}$ , $I_3=100\text{mA}$	40*			dB
	Rr4	$f=120\text{Hz}$ , $I_4=20\text{mA}$	40*			dB
	Rr5	$f=120\text{Hz}$ , $I_5=1\text{mA}$	40*			dB

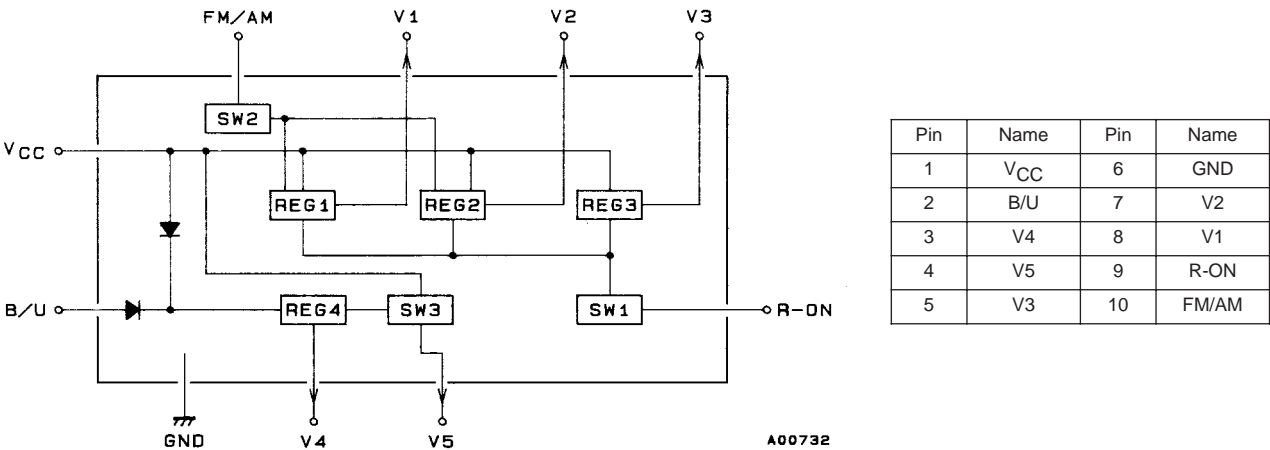
Note : \* indicates design guaranteed value.

## Pin Assignment

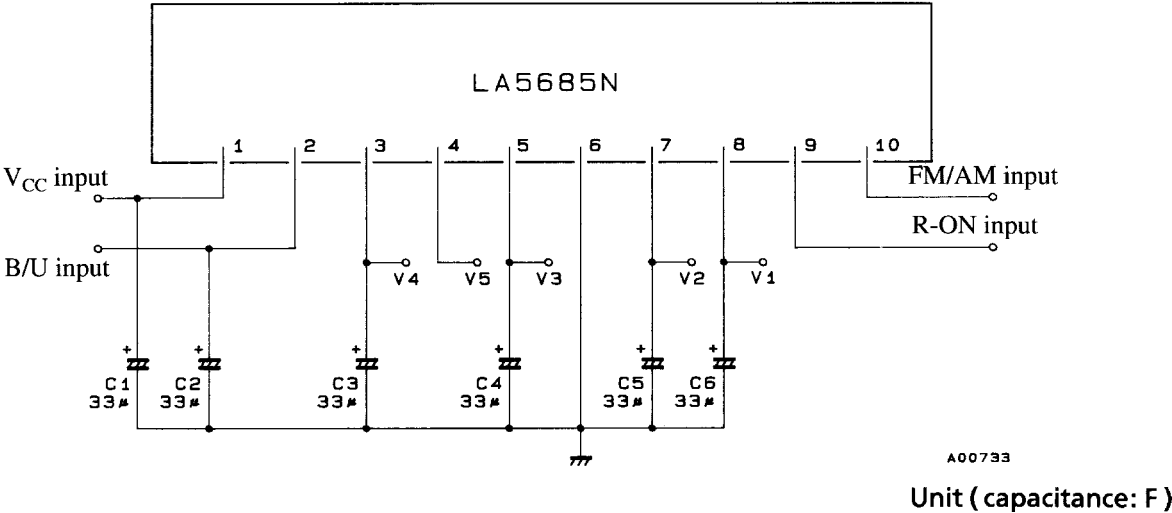


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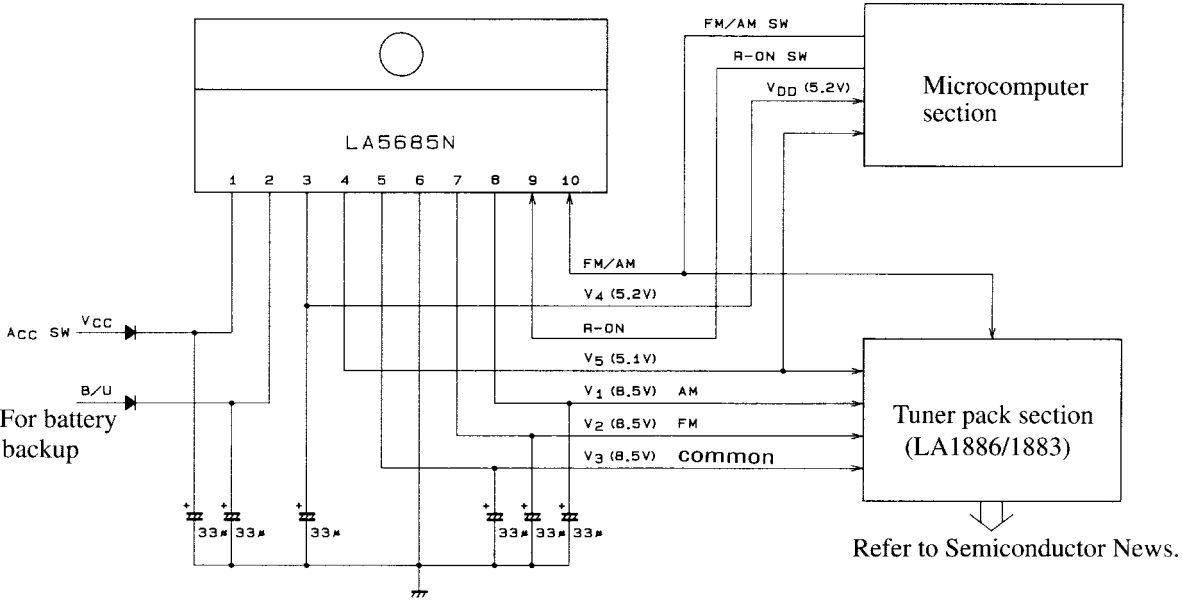
Block Diagram



Test Circuit



Sample Application Circuit



A00734

**Input/Output Table**

Inputs				Outputs				
A <sub>CC</sub>	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 T<sub>j</sub>=170°C (typ.))
- Built-in short protection circuit.

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