

No.2605B

# L79M00T Series

## -5 to -12V 0.5A 3-Pin Voltage Regulators

**Features**

- Output voltage      L79M05T: -5V    L79M06T: -6V    L79M08T: -8V    L79M09T: -9V  
                             L79M10T: -10V    L79M12T: -12V
- 500mA output
- Small-sized power package TP-3H permitting the equipment to be made compact
- The allowable power dissipation can be increased by being surface-mounted on the board.
- Capable of being mounted in a variety of methods because of various lead forming versions available
- On-chip protectors (overcurrent limiter, ASO protector, thermal protector)
- Can meet tape-used automatic mounting requirements.

[Common to L79M00T series]

**Maximum Ratings at Ta = 25°C**

			unit
Maximum Supply Voltage	V <sub>CC</sub> max	-5 to -12V output	-35 V
Allowable Power Dissipation	P <sub>d</sub> max		1.0 W
Operating Temperature	T <sub>opr</sub>		-30 to +80 °C
Storage Temperature	T <sub>stg</sub>		-40 to +150 °C

[L79M05T]

**Recommended Operating Conditions at Ta = 25°C**

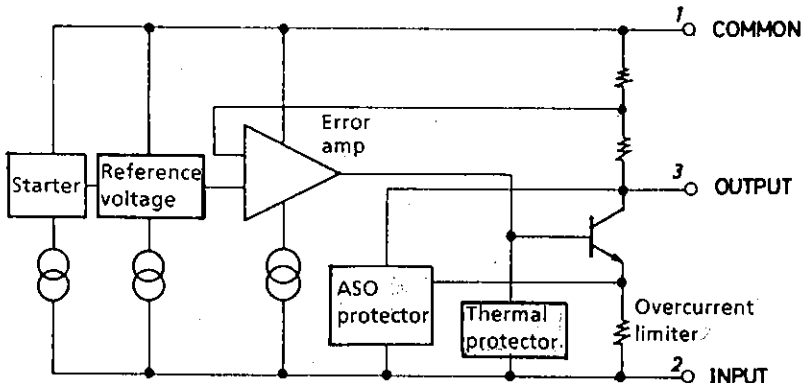
			unit
Input Voltage	V <sub>IN</sub>	-20 to -7.5	V
Output Current	I <sub>OUT</sub>	5 to 500	mA

**Operating Characteristics at Ta = 25°C, V<sub>IN</sub> = -10V, I<sub>OUT</sub> = 350mA, C<sub>IN</sub> = 2μF, C<sub>OUT</sub> = 1μF**

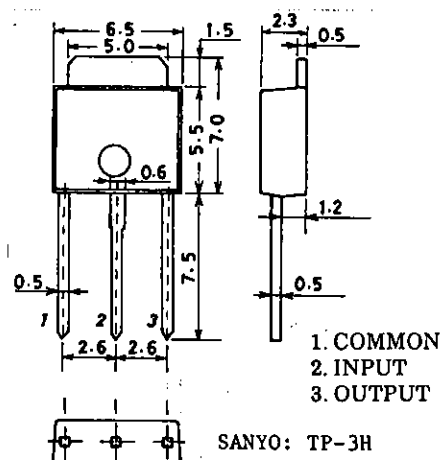
			min	typ	max	unit
Output Voltage	V <sub>OUT</sub>	T <sub>j</sub> = 25°C	-5.2	-5.0	-4.8	V
Line Regulation	ΔV <sub>oline</sub>	T <sub>j</sub> = 25°C, -25V ≤ V <sub>IN</sub> ≤ -7V		7.0	50	mV
		T <sub>j</sub> = 25°C, -18V ≤ V <sub>IN</sub> ≤ -8V		3.0	30	mV
Load Regulation	ΔV <sub>oload</sub>	T <sub>j</sub> = 25°C, 5mA ≤ I <sub>OUT</sub> ≤ 500mA		10	100	mV
		T <sub>j</sub> = 25°C, 5mA ≤ I <sub>OUT</sub> ≤ 350mA		5		mV

Continued on next page.

**Equivalent Circuit**



**Package Dimensions 3110-S3HIC (unit: mm)**



L79M00T Series

Continued from preceding page.

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$-25V \leq V_{IN} \leq -7V,$ $5mA \leq I_{OUT} \leq 350mA$	-5.25		-4.75	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ C$		1.0	2.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-25V \leq V_{IN} \leq -8V$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5mA \leq I_{OUT} \leq 350mA$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10Hz \leq f \leq 100kHz$		125		$\mu V$
Ripple Rejection	$R_{rej}$	$f = 120Hz$ $-18V \leq V_{IN} \leq -8V$ $T_j = 25^\circ C$	$I_{OUT} = 100mA$ 50 $I_{OUT} = 300mA$ 50		65	dB dB
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ C, I_{OUT} = 350mA$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ C, V_{IN} = -30V$		130		mA
Peak Output Current	$I_{op}$			800		mA

[L79M06T]

Recommended Operating Conditions at  $T_a = 25^\circ C$

				unit
Input Voltage	$V_{IN}$		-21 to -8.5	V
Output Current	$I_{OUT}$		5 to 500	mA

Operating Characteristics at  $T_a = 25^\circ C, V_{IN} = -11V, I_{OUT} = 350mA, C_{IN} = 2\mu F, C_{OUT} = 1\mu F$

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$T_j = 25^\circ C$	-6.25	-6.0	-5.75	V
Line Regulation	$\Delta V_{oline}$	$T_j = 25^\circ C, -25V \leq V_{IN} \leq -8V$		7.0	60	mV
		$T_j = 25^\circ C, -19V \leq V_{IN} \leq -9V$		3.0	40	mV
Load Regulation	$\Delta V_{oload}$	$T_j = 25^\circ C, 5mA \leq I_{OUT} \leq 500mA$		10	120	mV
		$T_j = 25^\circ C, 5mA \leq I_{OUT} \leq 350mA$		5		mV
Output Voltage	$V_{OUT}$	$-25V \leq V_{IN} \leq -8V,$ $5mA \leq I_{OUT} \leq 350mA$	-6.3		-5.7	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ C$		1.0	2.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-25V \leq V_{IN} \leq -9V$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5mA \leq I_{OUT} \leq 350mA$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10Hz \leq f \leq 100kHz$		150		$\mu V$
Ripple Rejection	$R_{rej}$	$f = 120Hz$ $-19V \leq V_{IN} \leq -9V$ $T_j = 25^\circ C$	$I_{OUT} = 100mA$ 50 $I_{OUT} = 300mA$ 50		65	dB dB
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ C, I_{OUT} = 350mA$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ C, V_{IN} = -30V$		130		mA
Peak Output Current	$I_{op}$			800		mA

[L79M08T]

Recommended Operating Conditions at  $T_a = 25^\circ C$

				unit
Input Voltage	$V_{IN}$		-23 to -11	V
Output Current	$I_{OUT}$		5 to 500	mA

## L79M00T Series

**Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{IN} = -14\text{V}$ ,  $I_{OUT} = 350\text{mA}$ ,  $C_{IN} = 2\mu\text{F}$ ,  $C_{OUT} = 1\mu\text{F}$**

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$	-8.3	-8.0	-7.7	V
Line Regulation	$\Delta V_{oline}$	$T_j = 25^\circ\text{C}$ , $-25\text{V} \leq V_{IN} \leq -10.5\text{V}$		8.0	80	mV
Load Regulation	$\Delta V_{oload}$	$T_j = 25^\circ\text{C}$ , $-21\text{V} \leq V_{IN} \leq -11\text{V}$		4.0	50	mV
		$T_j = 25^\circ\text{C}$ , $5\text{mA} \leq I_{OUT} \leq 500\text{mA}$		11	160	mV
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$ , $5\text{mA} \leq I_{OUT} \leq 350\text{mA}$	-8.4		-7.6	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ\text{C}$		1.0	2.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-25\text{V} \leq V_{IN} \leq -10.5\text{V}$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5\text{mA} \leq I_{OUT} \leq 350\text{mA}$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}$		200		$\mu\text{V}$
Ripple Rejection	$R_{rej}$	$f = 120\text{Hz}$ $-21.5\text{V} \leq V_{IN} \leq -11.5\text{V}$ $T_j = 25^\circ\text{C}$	$I_{OUT} = 100\text{mA}$	50		dB
				$I_{OUT} = 300\text{mA}$	50	64
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ\text{C}$ , $I_{OUT} = 350\text{mA}$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ\text{C}$ , $V_{IN} = -30\text{V}$		130		mA
Peak Output Current	$I_{op}$			800		mA

[L79M09T]

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

				unit
Input Voltage	$V_{IN}$		-25 to -12	V
Output Current	$I_{OUT}$		5 to 500	mA

**Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{IN} = -16\text{V}$ ,  $I_{OUT} = 350\text{mA}$ ,  $C_{IN} = 2\mu\text{F}$ ,  $C_{OUT} = 1\mu\text{F}$**

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$	-9.4	-9.0	-8.6	V
Line Regulation	$\Delta V_{oline}$	$T_j = 25^\circ\text{C}$ , $-25\text{V} \leq V_{IN} \leq -11.5\text{V}$		8.0	80	mV
Load Regulation	$\Delta V_{oload}$	$T_j = 25^\circ\text{C}$ , $-20\text{V} \leq V_{IN} \leq -12\text{V}$		4.0	50	mV
		$T_j = 25^\circ\text{C}$ , $5\text{mA} \leq I_{OUT} \leq 500\text{mA}$		12	200	mV
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$ , $5\text{mA} \leq I_{OUT} \leq 350\text{mA}$	-9.5		-8.5	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ\text{C}$		1.0	2.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-25\text{V} \leq V_{IN} \leq -11.5\text{V}$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5\text{mA} \leq I_{OUT} \leq 350\text{mA}$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}$		225		$\mu\text{V}$
Ripple Rejection	$R_{rej}$	$f = 120\text{Hz}$ $-22.5\text{V} \leq V_{IN} \leq -12.5\text{V}$ $T_j = 25^\circ\text{C}$	$I_{OUT} = 100\text{mA}$	50		dB
				$I_{OUT} = 300\text{mA}$	50	63
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ\text{C}$ , $I_{OUT} = 350\text{mA}$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ\text{C}$ , $V_{IN} = -30\text{V}$		130		mA
Peak Output Current	$I_{op}$			800		mA

L79M00T Series

[L79M10T]

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

			unit
Input Voltage	$V_{IN}$	-25 to -13	V
Output Current	$I_{OUT}$	5 to 500	mA

Operating Characteristics at  $T_a = 25^\circ\text{C}, V_{IN} = -17\text{V}, I_{OUT} = 350\text{mA}, C_{IN} = 2\mu\text{F}, C_{OUT} = 1\mu\text{F}$

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$	-10.4	-10	-9.6	V
Line Regulation	$\Delta V_{oline}$	$T_j = 25^\circ\text{C}, -25\text{V} \leq V_{IN} \leq -12.5\text{V}$		9.0	80	mV
Load Regulation	$\Delta V_{oload}$	$T_j = 25^\circ\text{C}, -22\text{V} \leq V_{IN} \leq -13\text{V}$		5.0	50	mV
		$T_j = 25^\circ\text{C}, 5\text{mA} \leq I_{OUT} \leq 500\text{mA}$		12	200	mV
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}, 5\text{mA} \leq I_{OUT} \leq 350\text{mA}$		7		mV
Output Voltage	$V_{OUT}$	$-25\text{V} \leq V_{IN} \leq -12.5\text{V},$ $5\text{mA} \leq I_{OUT} \leq 350\text{mA}$	-10.5		-9.5	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ\text{C}$		1.0	2.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-25\text{V} \leq V_{IN} \leq -12.5\text{V}$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5\text{mA} \leq I_{OUT} \leq 350\text{mA}$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}$		250		$\mu\text{V}$
Ripple Rejection	$R_{rej}$	$f = 120\text{Hz}$		50		dB
		$-23.5\text{V} \leq V_{IN} \leq -13.5\text{V}$	$I_{OUT} = 100\text{mA}$	50	63	dB
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ\text{C}, I_{OUT} = 350\text{mA}$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ\text{C}, V_{IN} = -30\text{V}$		130		mA
Peak Output Current	$I_{op}$			800		mA

[L79M12T]

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

			unit
Input Voltage	$V_{IN}$	-25 to -15	V
Output Current	$I_{OUT}$	5 to 500	mA

Operating Characteristics at  $T_a = 25^\circ\text{C}, V_{IN} = -19\text{V}, I_{OUT} = 350\text{mA}, C_{IN} = 2\mu\text{F}, C_{OUT} = 1\mu\text{F}$

			min	typ	max	unit
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}$	-12.5	-12	-11.5	V
Line Regulation	$\Delta V_{oline}$	$T_j = 25^\circ\text{C}, -30\text{V} \leq V_{IN} \leq -14.5\text{V}$		9.0	80	mV
Load Regulation	$\Delta V_{oload}$	$T_j = 25^\circ\text{C}, -25\text{V} \leq V_{IN} \leq -15\text{V}$		5.0	50	mV
		$T_j = 25^\circ\text{C}, 5\text{mA} \leq I_{OUT} \leq 500\text{mA}$		9	240	mV
Output Voltage	$V_{OUT}$	$T_j = 25^\circ\text{C}, 5\text{mA} \leq I_{OUT} \leq 350\text{mA}$		6		mV
Output Voltage	$V_{OUT}$	$-30\text{V} \leq V_{IN} \leq -14.5\text{V},$ $5\text{mA} \leq I_{OUT} \leq 350\text{mA}$	-12.6		-11.4	V
Current Dissipation	$I_{CC}$	$T_j = 25^\circ\text{C}$		1.6	3.5	mA
Current Dissipation Variation (Line)	$\Delta I_{CCline}$	$-30\text{V} \leq V_{IN} \leq -14.5\text{V}$			1.0	mA
Current Dissipation Variation (Load)	$\Delta I_{CCload}$	$5\text{mA} \leq I_{OUT} \leq 350\text{mA}$			0.4	mA
Output Noise Voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}$		300		$\mu\text{V}$
Ripple Rejection	$R_{rej}$	$f = 120\text{Hz}$		50		dB
		$-25\text{V} \leq V_{IN} \leq -15\text{V}$	$I_{OUT} = 100\text{mA}$	50	72	dB
Minimum Input-Output Voltage Drop	$V_{drop}$	$T_j = 25^\circ\text{C}, I_{OUT} = 350\text{mA}$		1.1		V
Short Current	$I_{OS}$	$T_j = 25^\circ\text{C}, V_{IN} = -30\text{V}$		130		mA
Peak Output Current	$I_{op}$			800		mA

<b>SANYO</b>	No. 4185	<b>LA5685N</b>
	<b>Multi-function, multi-power supply IC for car radios</b>	

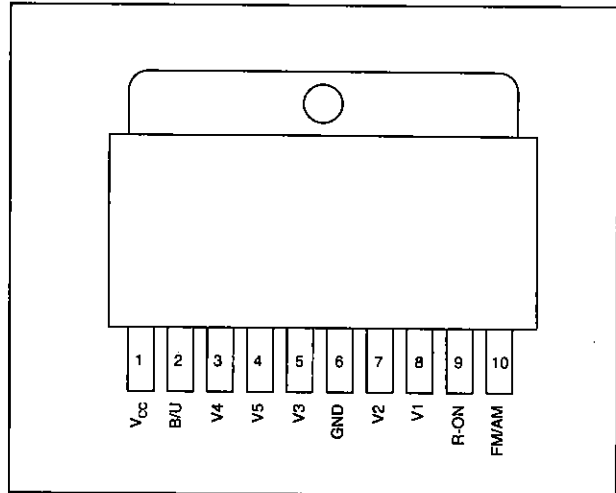
**OVERVIEW**

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 micro-computer 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:  $V_1=8.5\text{ V}$  (AM),  $V_2=8.5\text{ V}$  (FM),  $V_3=8.5\text{ V}$  (common),  $V_4=5.2\text{ V}$  (microcomputer), and  $V_5=5.1\text{ V}$
- R ON/OFF, FM/AM switching functions
- Minimal static current for back up ( $120\ \mu\text{A}$  typ.)
- Built-in overvoltage protection circuit ( $V_1$ ,  $V_2$ , and  $V_3$  go off at  $28\text{ V}$  (typ.),  $V_4$  and  $V_5$  go off at  $56\text{ V}$  (typ.))
- Built-in thermal shutdown circuit (output goes off at  $T_j = 170^\circ\text{C}$  (typ.))
- Built-in short protection circuit

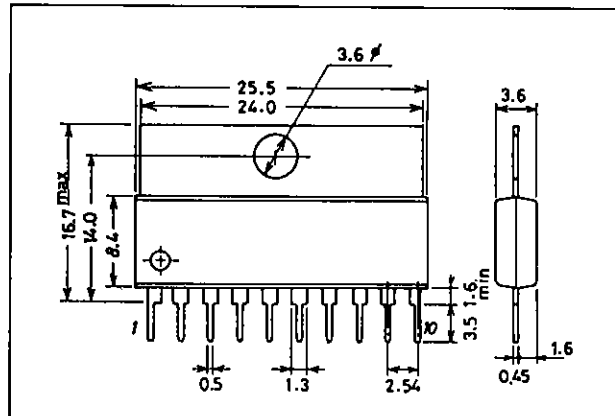
**Pinout**



**Package Dimensions**

Unit: mm

3046B-SIP10F



## LA5685N

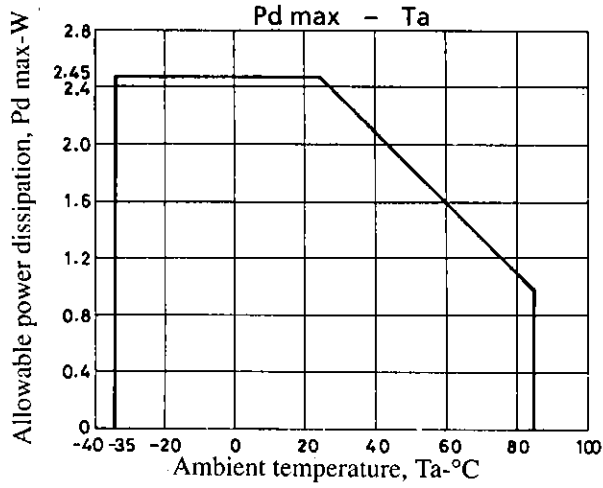
Maximum Ratings / Ta = 25°C				unit
Input voltage	V <sub>CC</sub> max1	4% duty pulse width 200 mS pulse input (input pulse when output on)	75	V
Output current	V <sub>CC</sub> max2		25	V
	I1 max		80	mA
	I2 max		100	mA
	I3 max		200	mA
	I4 max		50	mA
Allowable power dissipation	I5 max		5	mA
	Pd max		2.45	W
Operation temperature	<b>Topr</b>		-35~+85	°C
Storage temperature	<b>Tstg</b>		-40~+125	°C

Operating Conditions / Ta=25°C				unit
Power supply voltage	V <sub>CC</sub> 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

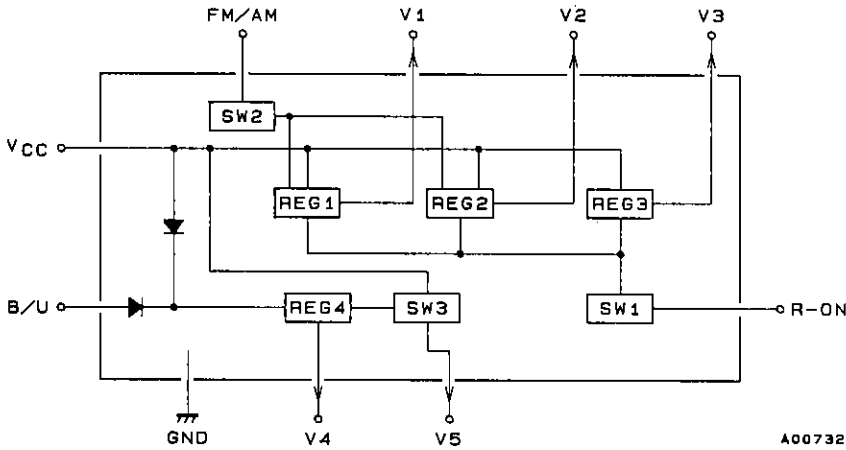
Operating Characteristics / Ta=25°C; unless otherwise noted, V <sub>CC</sub> =12V, R-ON=FM/AM=5V External 33μF OS capacitor connected to V1, V2, V3, and V4							
	x		min	typ	max	unit	Note
Static current	I <sub>CC</sub> 1	R-ON=FM/AM=0V		4.5	7.0	mA	
	I <sub>CC</sub> 2	R-ON=FM/AM=5V		4.5	7.0	mA	
Output 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 <sub>CC</sub> <15V, I1=20mA			50	mV	
	ΔV2 line	FM/AM=5V, 11V<V <sub>CC</sub> <15V, I2=50mA			50	mV	
	ΔV3 line	I3=100mA, 11V<V <sub>CC</sub> <15V			50	mV	
	ΔV4 line	I4=20mA, 11V<V <sub>CC</sub> <15V			50	mV	
	ΔV5 line	I5=1mA, 11V<V <sub>CC</sub> <15V			50	mV	
B/U static current	IB/U	B/U=16V, V <sub>CC</sub> =0V			0.3	mA	
V5 On-Off TH voltage	V5 <sub>TH</sub>	B/U=12V	6	7	8	V	
R-ON on voltage	R-ON ON		2.5		V <sub>CC</sub>	V	
R-ON off voltage	R-ON OFF		-0.3		+1.0	V	
FM/AM on voltage	FM/AM ON		2.5		V <sub>CC</sub>	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.

# LA5685N



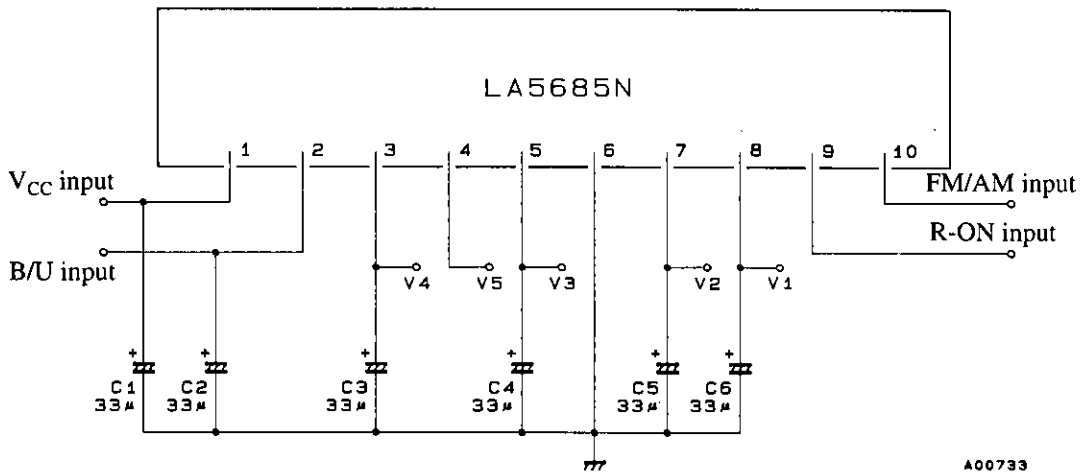
## Block Diagram



Pin	Name	Pin	Name
1	V <sub>CC</sub>	6	GND
2	B/U	7	V2
3	V4	8	V1
4	V5	9	R-ON
5	V3	10	FM/AM

A00732

## Measurement Circuit

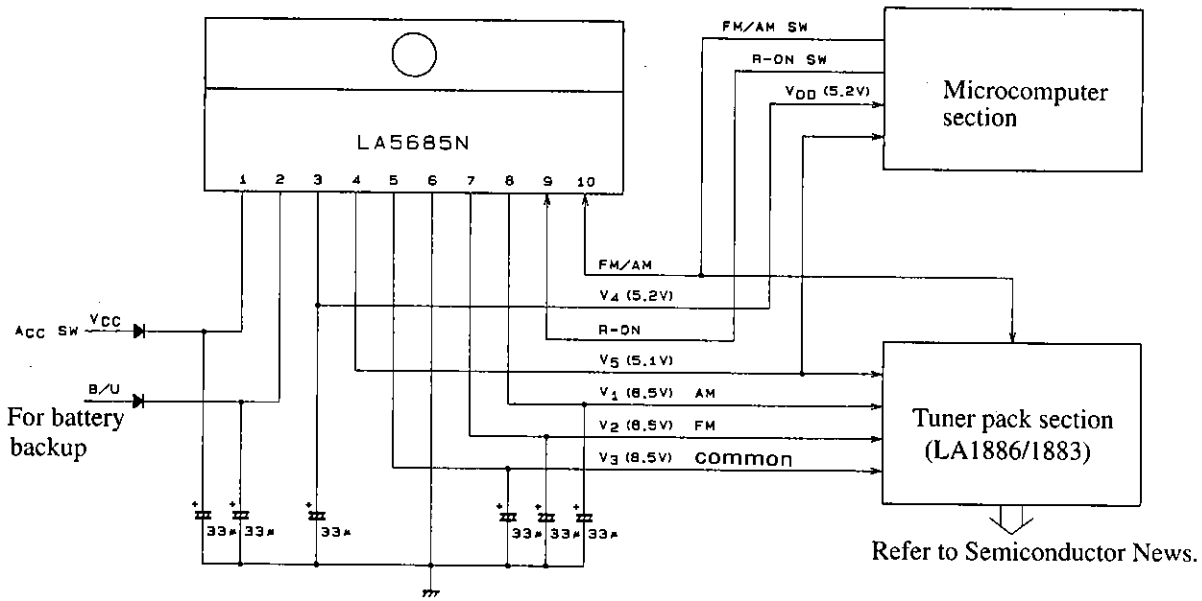


A00733

Unit (capacitance: F)

# LA5685N

## Application Circuit Examples



AC0734

## Input/Output Table

Inputs				Outputs				
ACC	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  $T_j = 170^\circ\text{C}$  (typ.))
- Built-in short protection circuit

■ No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.

■ Anyone purchasing any products described or contained herein for an above-mentioned use shall:

① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use;

② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.

■ Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.