

BA3902 BA3904A BA3906

Power supply, standard voltage

The BA3902, BA3904A, and BA3906 are power supplies used in car audio systems.

Features

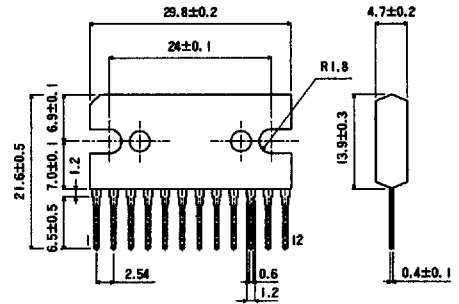
- available in an SIP-M12 package
- four power sources available from each IC
 - BA3902: 5.0 V, 8.5 V (×2), 9.0 V
 - BA3904A: 5.6 V, 8.55 V (×2), 9.0 V
 - BA3906: 5.6 V, 8.3 V (×3)
- incorporates a chip enable output and a mute output for the reference voltage output and accessory voltage detection
- all output circuits use a PNP transistor with a low saturation voltage
- AM and FM band selection switch included with a standby switch, which shuts down the IC when OFF
- internal output overload protection circuit prevents damage to the IC in the event the load is short circuited
- overvoltage protection circuit
- internal thermal overload also protects the IC

Applications

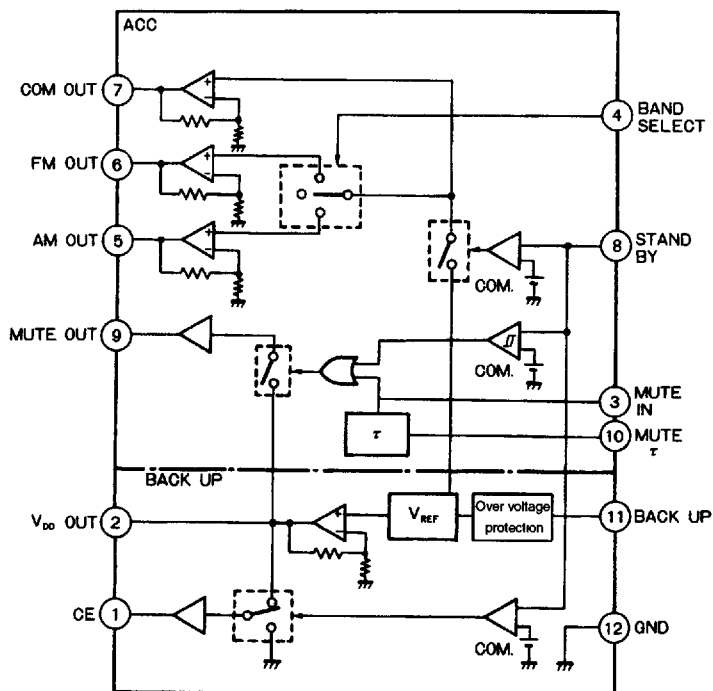
- car radio

Dimensions (Units : mm)

BA2902, BA3904A, and BA3906 (SIP-M12)



Block diagram



absolute maximum ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Limits	Unit	Conditions
supply voltage	BACK UP	24	V	
power dissipation	P_d	3000	mW	
operating temperature	T_{opr}	$-30 \sim +85$	$^\circ\text{C}$	
storage temperature	T_{stg}	$-55 \sim +150$	$^\circ\text{C}$	
maximum supply voltage	BACK UP peak	50	V	$t_r \geq 1 \text{ ms}$, maximum supply time is $< 200 \text{ ms}$

recommended operating conditions ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Min	Typical	Max	Unit	
recommended operating supply	BA3902 BA4904A	BACK UP	10	13.2	16	V
	BA3906	BACK UP	9.2	13.2	16	V
operating voltage range	BA3904A BA3906	BACK UP	9.0	13.2	24	V

552

Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$, BACK UP = 13.2 V)
(Sheet 1 of 3)

Parameter		Symbol	Min	Typical	Max	Unit	Conditions
Standby current		I_{st}		0.7	1.0	mA	Stand by = 0 V
Output voltage 1 (V_{DD})							
Output voltage 1	BA3902	V_{O1}	4.7	5.0	5.3	V	$I_{O1} = 40 \text{ mA}$
	BA3904A		5.3	5.6	5.9		
	BA3906		5.3	5.6	5.9		
Line regulation		ΔV_{O11}		20	100	mV	Back up = 10 ~ 16 V, $I_{O1} = 40 \text{ mA}$
Load regulation		ΔV_{O12}		20	100	mV	$I_{O1} = 10 \sim 50 \text{ mA}$
Dropout voltage		ΔV_{O13}		0.45	1.0	V	$I_{O1} = 40 \text{ mA}$
Output current	BA3902	I_{11}	0		60	mA	$V_{O1} \geq 4.7 \text{ V}$
	BA3904A		0		60		$V_{O1} \geq 5.3 \text{ V}$
	BA3906		0		60		$V_{O1} \geq 5.3 \text{ V}$
Output voltage 2 (COM)							
Output voltage 2	BA3902	V_{O2}	8.6	9.0	9.4	V	$I_{O2} = 80 \text{ mA}$
	BA3904A		8.6	9.0	9.4		
	BA3906		7.95	8.3	8.65		
Line regulation		ΔV_{O21}		10	200	mV	Back up = 10 ~ 16 V, $I_{O2} = 80 \text{ mA}$
Load regulation		ΔV_{O22}		20	200	mV	$I_{O2} = 10 \sim 100 \text{ mA}$
Dropout voltage	BA3902	ΔV_{O23}		0.3	0.6	V	$I_{O2} = 80 \text{ mA}$
	BA3904A			0.3	0.6		
	BA3906			0.3	0.55		
Output current	BA3902	I_{21}	0		130	mA	$V_{O2} \geq 8.6 \text{ V}$
	BA3904A		0		130		$V_{O2} \geq 8.6 \text{ V}$
	BA3906		0		125		$V_{O2} \geq 7.85 \text{ V}$
Output voltage 3 (FM)							
Output voltage 3	BA3902	V_{O3}	8.1	8.5	8.9	V	$I_{O3} = 150 \text{ mA}$
	BA3904A		8.2	8.55	8.9		
	BA3906		7.95	8.3	8.65		
Line regulation		ΔV_{O31}		10	200	mV	Back up = 10 ~ 16 V, $I_{O3} = 150 \text{ mA}$
Load regulation		ΔV_{O32}		20	200	mV	$I_{O3} = 10 \sim 200 \text{ mA}$

BA3902, BA3904A, BA3906 System power supply, BA3900 & BA3910 series

Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$, BACK UP = 13.2 V)
 (Sheet 2 of 3)

Parameter		Symbol	Min	Typical	Max	Unit	Conditions
Dropout voltage	BA3902	ΔV_{O33}		0.4	0.6	V	$I_{O3} = 150 \text{ mA}$
	BA3904A			0.4	0.55		
	BA3906			0.4	0.55		
Output current	BA3902	I_{31}	0		200	mA	$V_{O3} \geq 8.1 \text{ V}$
	BA3904A		0		250		$V_{O3} \geq 8.1 \text{ V}$
	BA3906		0		250		$V_{O3} \geq 7.85 \text{ V}$
Output voltage 4 (AM)							
Output voltage 4	BA3902	V_{O4}	8.1	8.5	8.9	V	$I_{O4} = 80 \text{ mA}$
	BA3904A		8.2	8.55	8.9		
	BA3906		7.95	8.3	8.65		
Line regulation		ΔV_{O41}		10	200	mV	Back up = 10 ~ 16 V, $I_{O4} = 80 \text{ mA}$
Load regulation		ΔV_{O42}		20	200	mV	$I_{O4} = 10 \sim 100 \text{ mA}$
Dropout voltage	BA3902	ΔV_{O43}		0.3	0.6	V	$I_{O4} = 80 \text{ mA}$
	BA3904A			0.3	0.55		
	BA3906			0.3	0.55		
Output current	BA3902	I_{41}	0		130	mA	$V_{O4} \geq 8.1 \text{ V}$
	BA3904A		0		145		$V_{O4} \geq 8.1 \text{ V}$
	BA3906		0		145		$V_{O4} \geq 7.85 \text{ V}$
Input 1 (STAND BY)							
Input change level		V_{IH1}	5.5	6.0	6.5	V	COM = ON
Input current, high		V_{H1}	100	180	260	μA	Stand by = 8 V
CE up threshold voltage		V_{TH11}	6.0	6.3	6.6	V	Stand by > V_{TH11} , CE = HIGH
CE down threshold voltage		V_{TH12}	5.2	5.5	5.8	V	Stand by < V_{TH12} , CE = LOW
MUTE down threshold voltage	BA3902	V_{TH21}	6.7	7.1	7.5	V	Stand by < V_{TH21} , MUTE OUT = LOW
	BA3904A		6.85	7.25	7.65		
	BA3906		6.85	7.25	7.65		
MUTE up threshold voltage		V_{TH22}	7.6	8.0	8.4	V	Stand by > V_{TH22} , MUTE OUT = HIGH
Input 2 (BAND SELECT)							
FM out change level		V_{IH2}	1.0	1.4	1.8	V	
AM out change level		V_{IM2}	3.0	3.4	3.8	V	
Input current, high		I_{H2}		10	60	μA	Band select = 5 V

Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$, BACK UP = 13.2 V)
 (Sheet 3 of 3)

Parameter	Symbol	Min	Typical	Max	Unit	Conditions	
Input 3 (MUTE IN)							
MUTE OUT change level	V_{TH3}	1.4	2.3	3.3	V	Mute out HI	
Input current, high	I_{H3}		100	170	μA	Mute in = 5 V	
MUTE OUT output current	I_{O5}	12	19		mA	Mute out > 4.2 V	
CE output voltage	BA3902	V_{O61}	$0.82 \times V_{DD}$		V_{DD}	V	CE = HIGH, $I_{O6} = 1 \text{ mA}$
	BA3904A		0.82×5				
	BA3906		0.82×5				
CE output voltage	V_{O62}		0	0.3	V	CE = LOW	
Ripple rejection ratio	RR		60		dB	$f = 100 \text{ Hz}$	

Figure 1 Test circuit

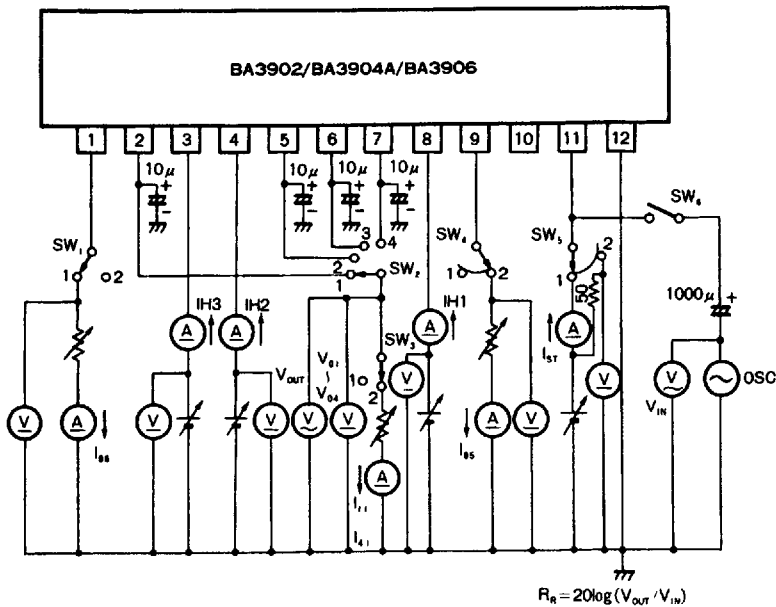


Figure 2 Application example—BA3902

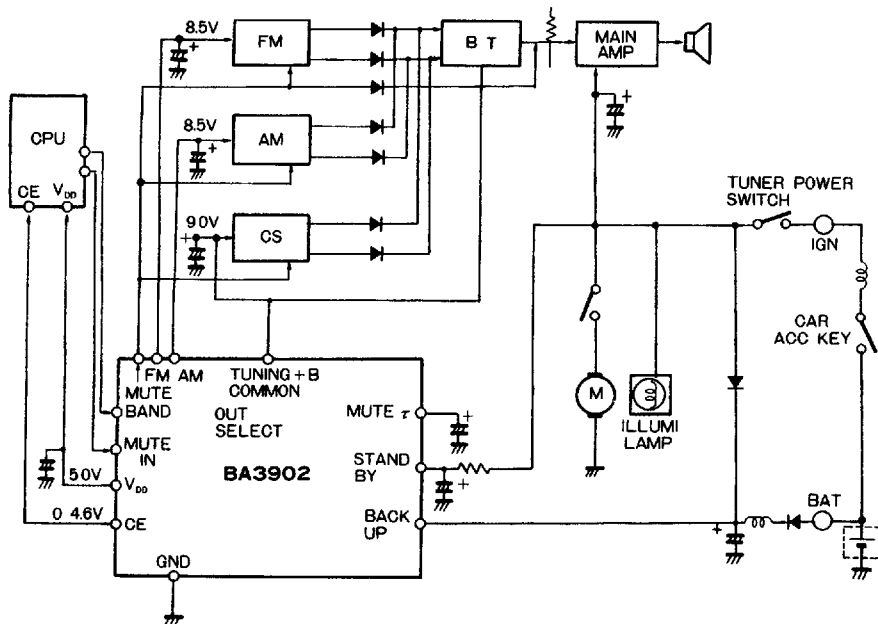


Figure 3 Application example—BA3904A

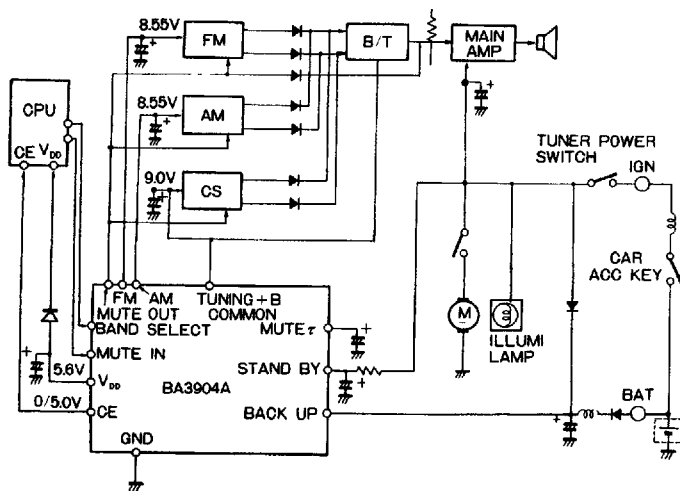


Figure 4 Application example—BA3906

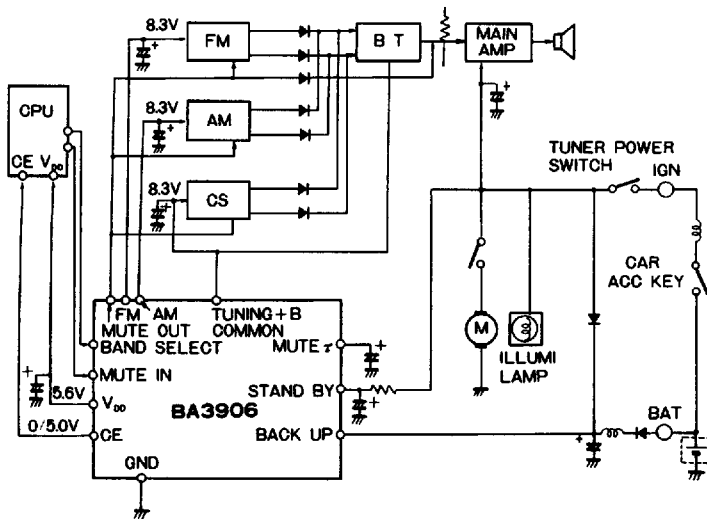
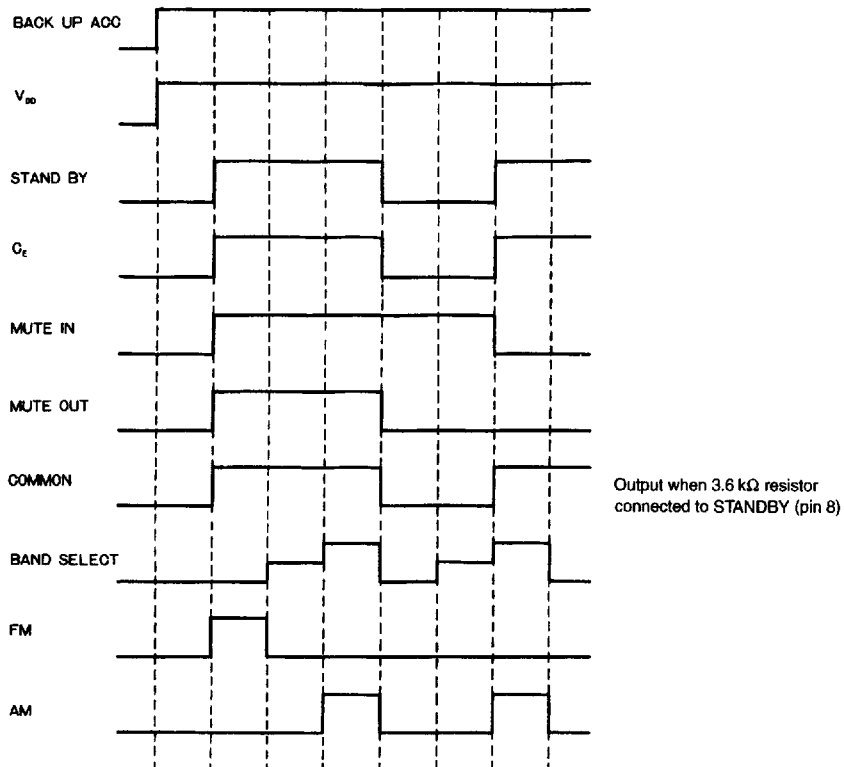


Figure 5 Input and output timing chart



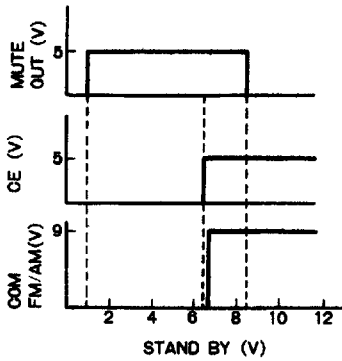


Figure 6 Standby (pin 8) 3.6 kΩ

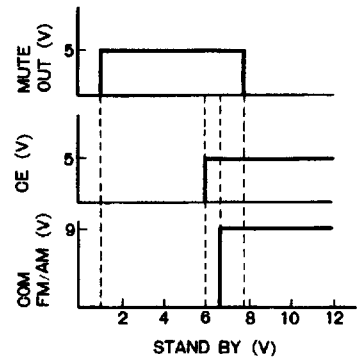


Figure 7

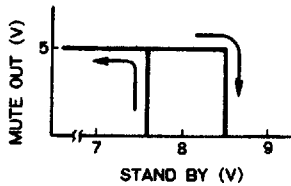


Figure 8 MUTEOUT (pin 9) output pin

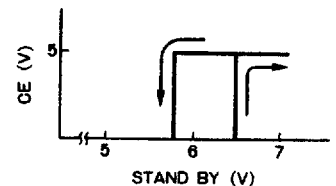
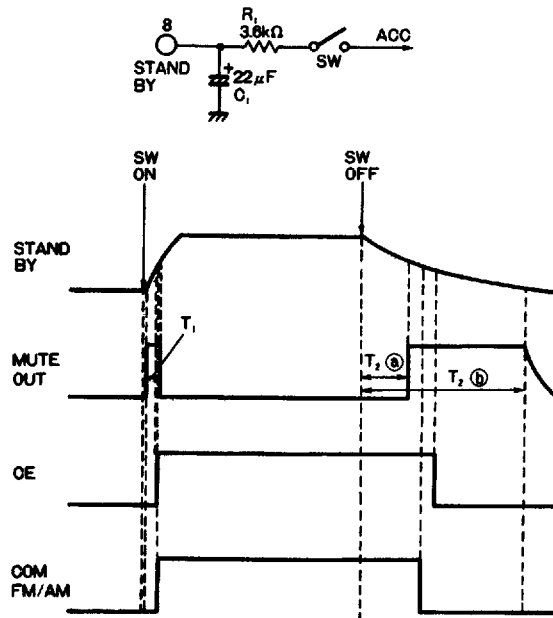


Figure 9 CE (pin 1) output pin

Figure 10



Electrical characteristic curves

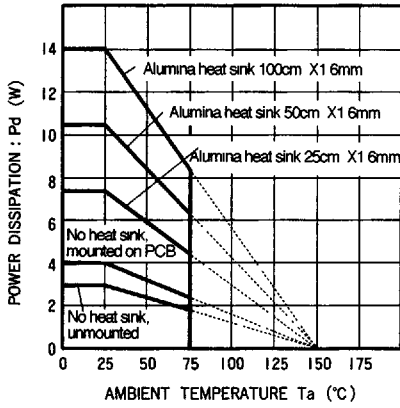


Figure 11

STAND BY (pin 8)

BACK UP = 13.2 v

STAND BY: SW ON = 13.2 V: SW OFF = OPEN

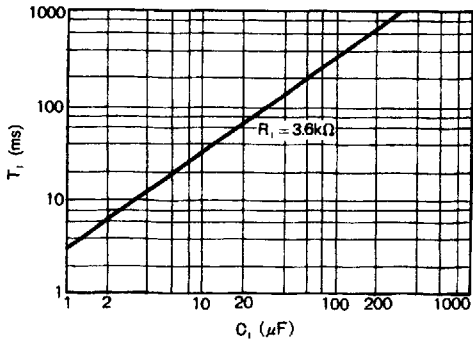


Figure 12

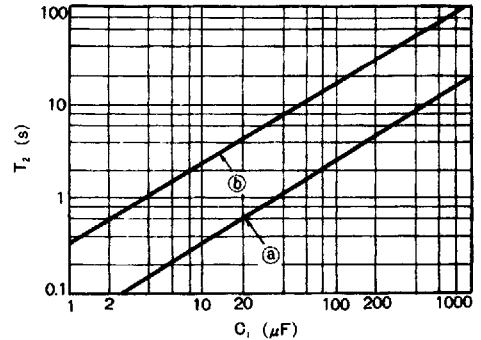


Figure 13

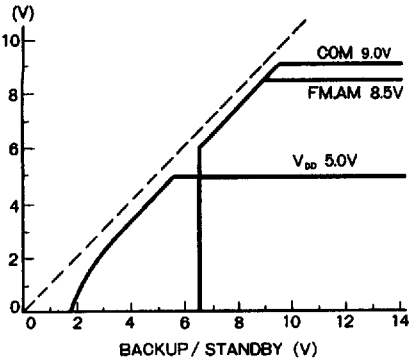


Figure 14 (BA3902)

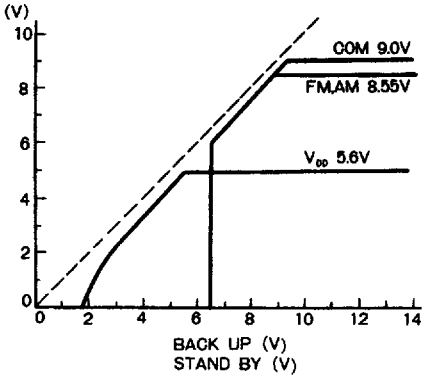


Figure 15 (BA3904A)

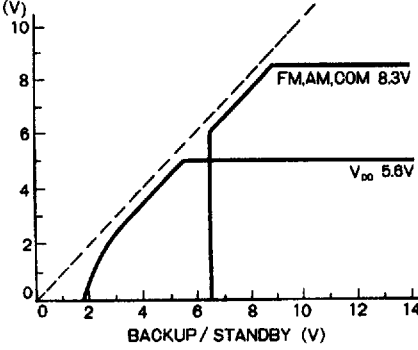


Figure 16 BA3906