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Class-AB Speaker Amplifiers

5W+5W
Stereo Speaker Amplifiers

BA5406,BA5417

● Description

The BA5406/BA5417 is a dual OTL monolithic power IC with two built-in, high output speaker amplifier circuits. High output of 5W×2 can be produced when V_{CC}=12 V and R_L=3Ω, and 2.8 W×2 when V_{CC}=9V and R_L=3Ω. The BA5406, which uses a high allowable power dissipation package, has a simple heatsink design. The BA5417 not only exceeds basic characteristics, but also has a built-in soft clip circuit, thermal shutdown and standby circuits.

● Features

BA5406
1) Good low voltage characteristics (Operation from Vcc=5 V)
2) Ripple filter (6pin) also can be used as muting pin (Make 6pin GND potential)
3) Small thermal resistance package and simple heatsink design

BA5417
1) Small pop noise when standby switches ON/OFF
2) Built-in circuit to prevent ripple addition when motor starts
3) Built-in thermal shutdown circuit
4) Built-in standby switch circuit
5) Built-in soft clip circuit

● Applications

Stereo radio cassette players, mini-audio systems, LCD TVs, etc.

● Line up matrix

Part No.	BA5406	BA5417	Units
Supply voltage	5 ~ 15	6 ~ 15	V
Power dissipation	20	15	W
Quiescent current	40	22	mA
Standby current	—	0	μA
Closed loop voltage gain	46	45	dB
Output noise voltage	0.6	0.3	mVrms
Total harmonic distortion	0.3	0.1	%
Ripple rejection	—	55	dB
Package	SIP-M12	HSIP15	—

2011.11 - Rev.C

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Ratings		Unit
		BA5406	BA5417	
Supply voltage	Vcc	18 *1	20 *1	V
Power dissipation	Pd	20 *2	15 *3	W
Operating temperature	Topr	-20 ~ +75	-20 ~ +75	℃
Storage temperature	Tstg	-30 ~ +125	-55 ~ +150	℃

*1 When no signal
*2 Back metal temperature 75℃
*3 Ta=75°C (Using infinite heatsink)

●Operating range (Ta=25℃)

Parameter	Symbol	Ratings		Unit
		BA5406	BA5417	
Supply voltage	V_{CC}	5.0 ~ 15.0	6.0 ~ 15.0	V

●Electrical characteristics   (BA5406 : Unless otherwise noted, Ta=25℃, Vcc=12V)
                                      (BA5417 : Unless otherwise noted, Ta=25℃, Vcc=9V)

Parameter		Symbol	Limits		Unit.	Conditions
			BA5406	BA5417		
Quiescent current		I_O	40	22	mA	V_{IN}=0Vms
Rated output power		P_{OUT}	5.0	5.0	W	THD=10%,Vcc=12V, R_L=3Ω
Closed loop voltage gain		G_{VC}	46	45	dB	—
Output noise voltage		V_{NO}	0.6	0.3	mVrms	Rg=10kΩ, DIN-Audio
Total harmonic distortion		THD	0.3	0.1	%	P_{OUT}=0.5W, f=1kHz
Ripple rejection		RR	—	55	dB	f_{RR}=100Hz,V_{RR}=-10dBm
Crosstalk		CT	—	65	dB	V_O=0dBm
Standby current		I_{OFF}	—	0	μA	—
Standby pin input current		I_{SIN}	—	0.15	mA	V_{STBY}=V_{CC}
Standby pin control voltage	Activated	V_{STH}	—	3.5 ~ Vcc	V	—
	Not Activated	V_{STL}	—	0 ~ 1.2	V	—

* Note: This IC is not designed to be radiation-resistant.
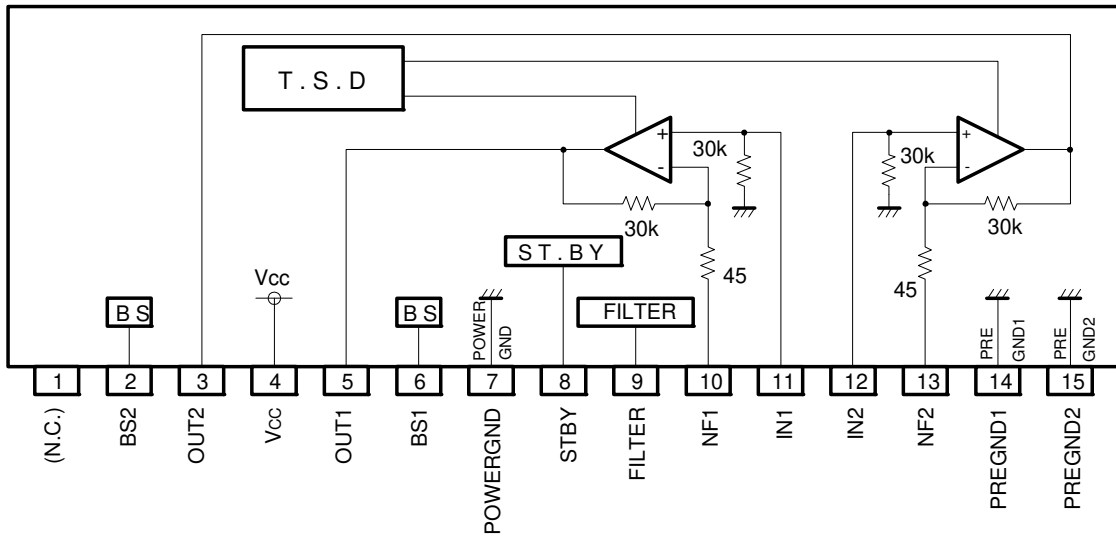
●Block diagram
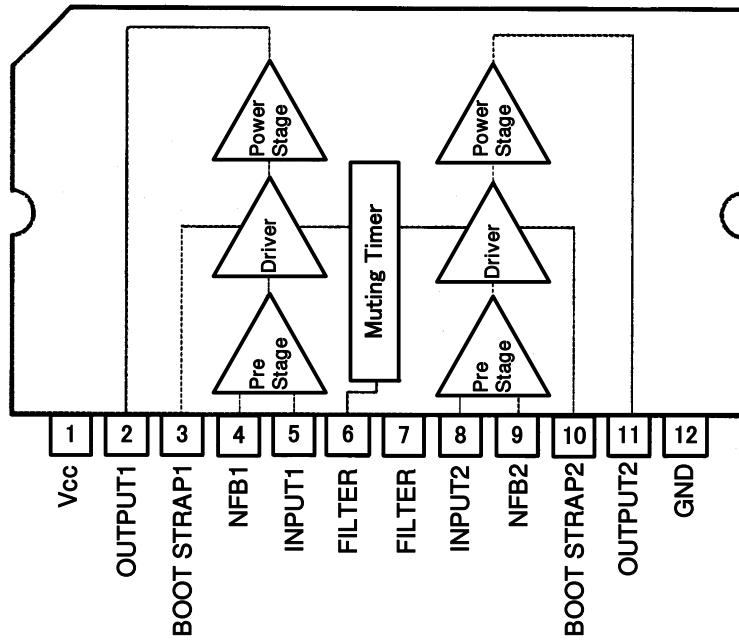
Fig.1   BA5406

Fig.2   BA5417

●Measurement circuit

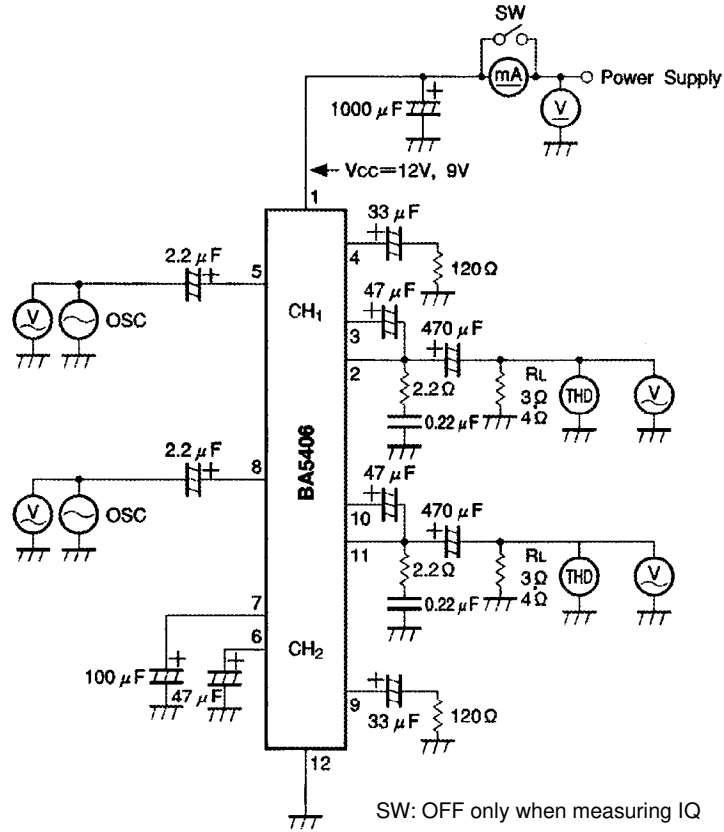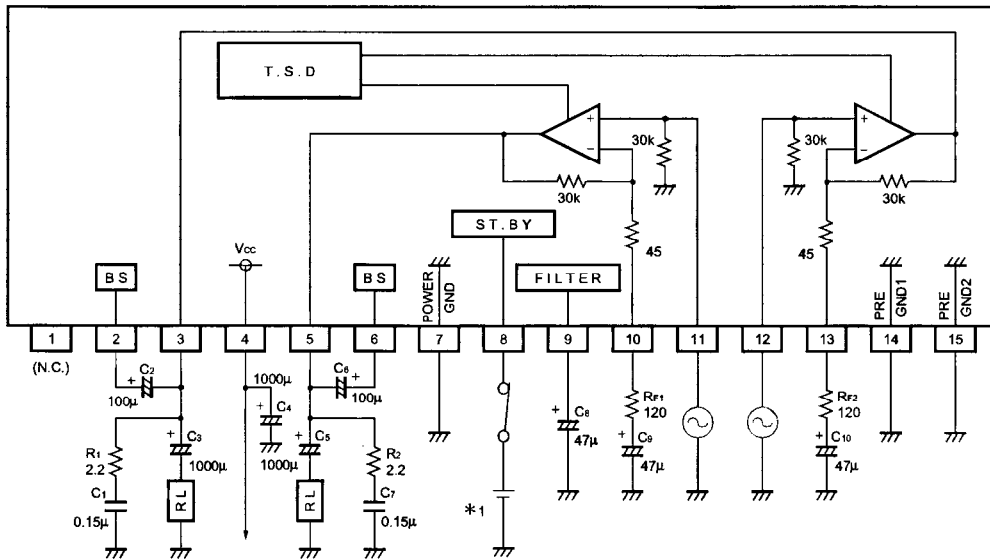

SW: OFF only when measuring IQ

Fig.3   BA5406

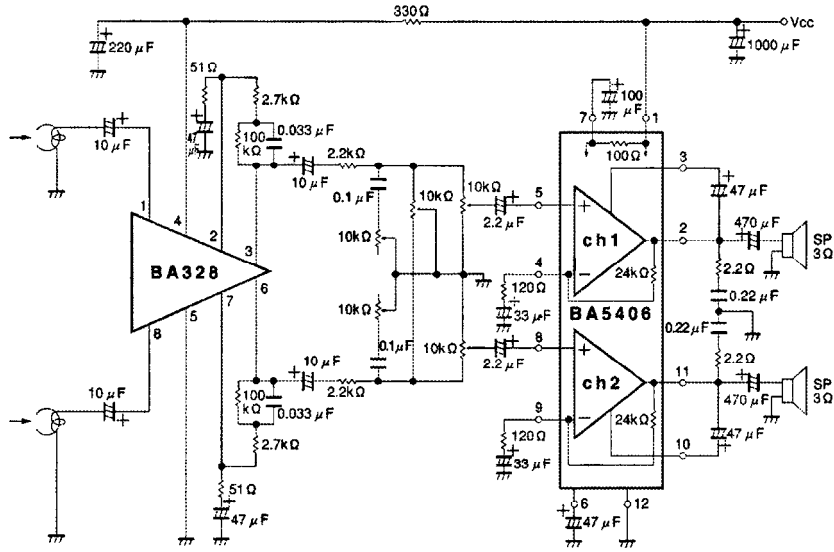*1 V$_{STBY}$=3.5V-Vcc

Fig.4   BA5417

●**Application circuit**
   BA5406

Fig.5

   BA5417
      OTL mode circuit
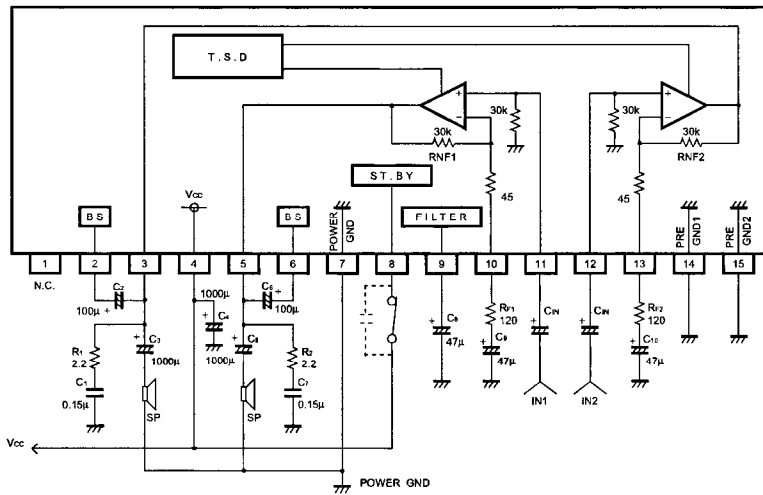
Fig.6
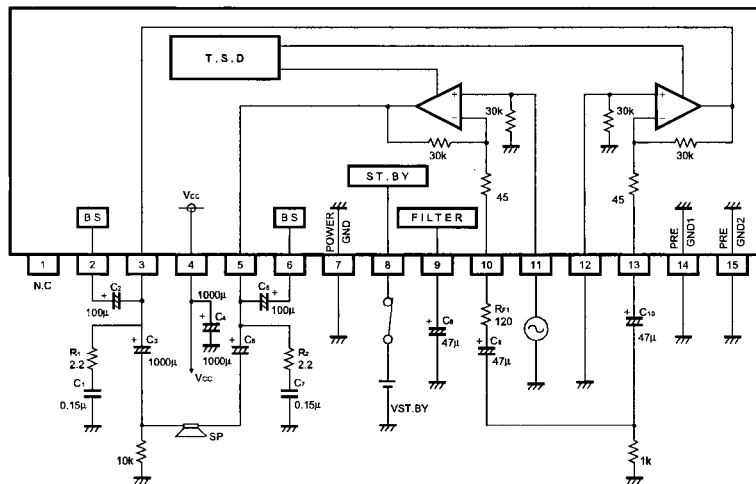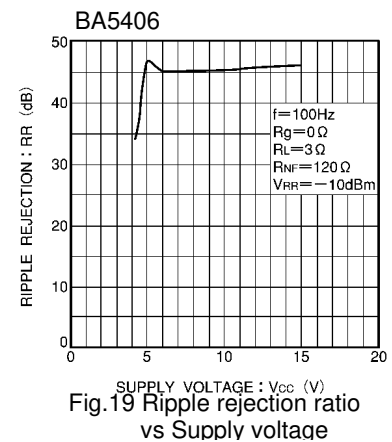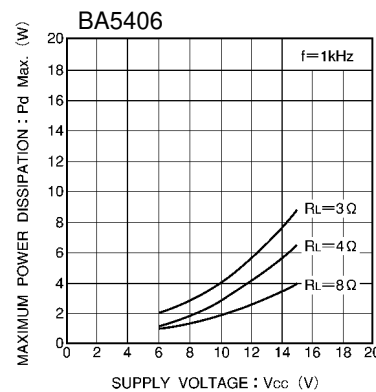
   BTL mode circuit

Fig.7

●Reference data

BA5406

Fig.8 Thermal derating curve

BA5406

Fig.9 Quiescent current and voltage gain
vs Supply voltage

BA5406

Fig.10 Voltage gain vs frequency

BA5406

Fig.11Crosstalk vs frequency

BA5406

Fig.12 Distortion vs power supply voltage

BA5406

Fig.13 Distortion vs Output power

BA5406

Fig.14 Output power
vs power supply voltage

BA5406

Fig.15 Power dissipation
vs Output power(1)

BA5406

Fig.16 Power dissipation
vs Output power(2)

BA5406

Fig. 17 Power dissipation
vs Output power(3)

BA5406

Fig.18 Muximum power dissipation
vs Supply voltage

BA5406

Fig.19 Ripple rejection ratio
vs Supply voltage
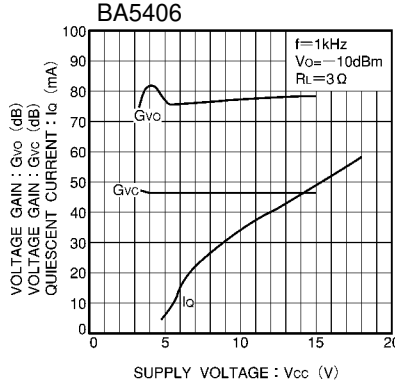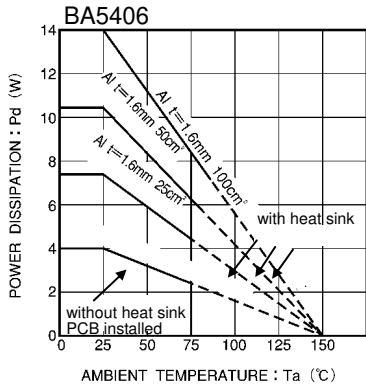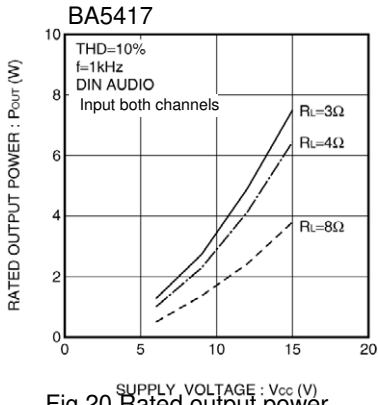
BA5417   OTL mode

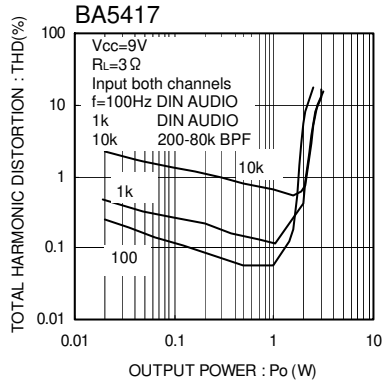Fig.20 Rated output power
vs Supply voltage

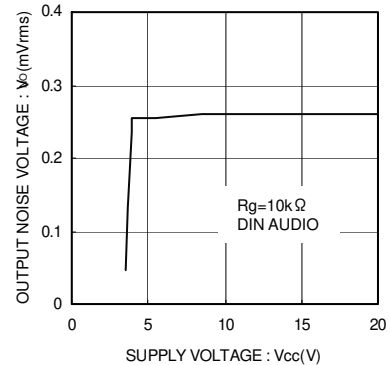Fig.21 Total harmonic distortion
vs Output power

Fig.22 Output noise voltage
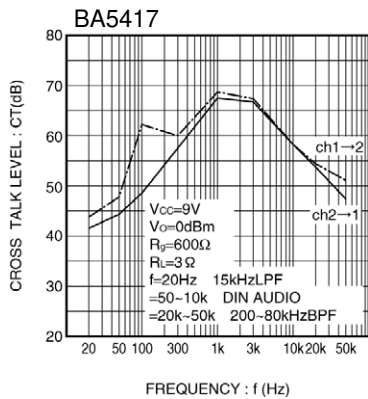vs Supply voltage

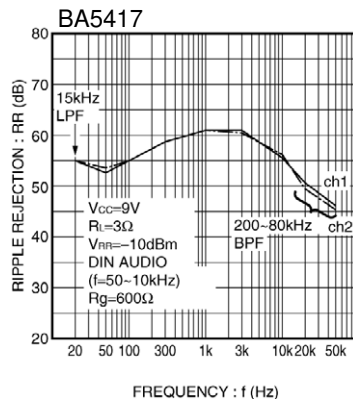Fig.23 Crosstalk vs. Frequency
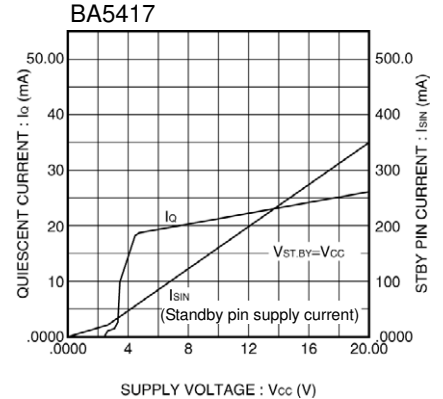

Fig.24 Ripple rejection vs. Frequency

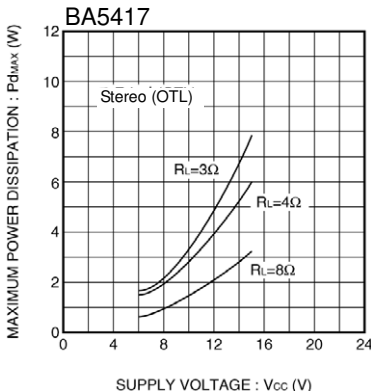Fig.25 Quiescent, standby pin input current
vs. Supply voltage

Fig.26 Maximum power dissipation
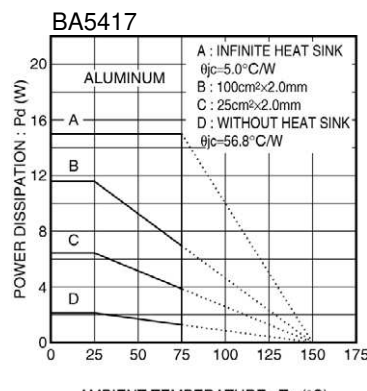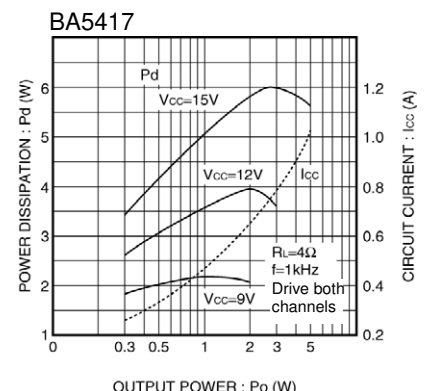vs. Supply voltage

Fig.27 Thermal derating curve

Fig.28 Power dissipation, circuit current
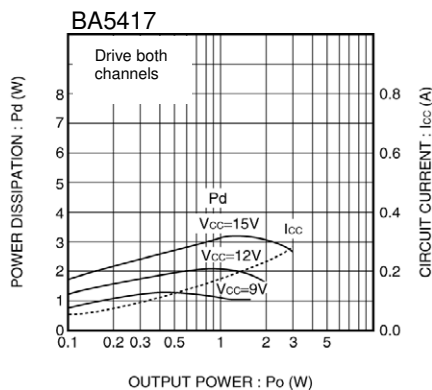vs. Supply Voltage(R_L=4Ω)

Fig.29 Power dissipation, circuit current
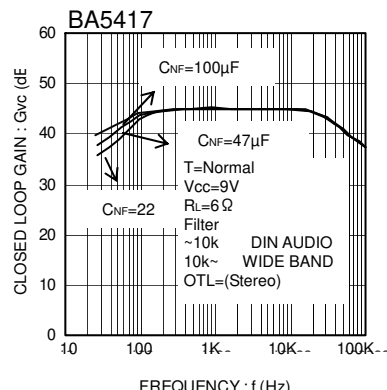vs. Supply Voltage （R_L=8Ω)

Fig.30 Closed loop gain
vs. Frequency

BA5417 BTL mode
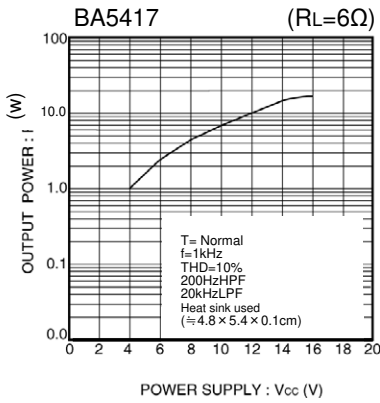
Fig.31 Rated output power
vs. Supply Voltage
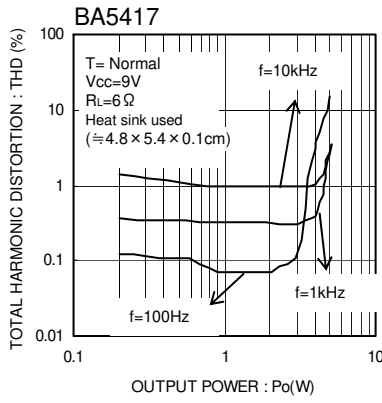
Fig.32 Total harmonic distortion
vs. Output power
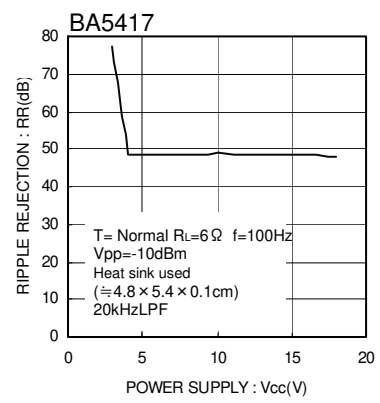
Fig.33 Ripple rejection ratio
vs. Supply Voltage
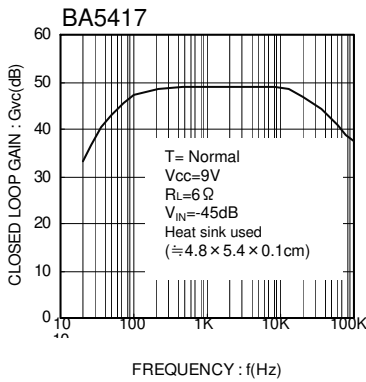
Fig.34 Close loop gain vs. Frequency
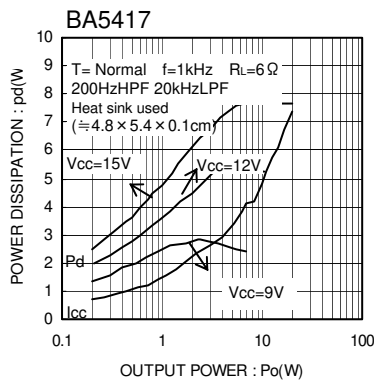
Fig.35 Power dissipation,
Supply current vs. Frequency
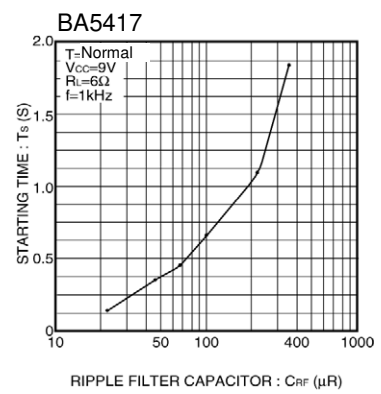
Fig.36 Starting time
vs. Ripple filter capacitor
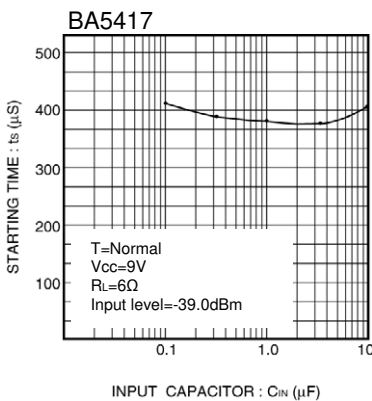
Fig.37 Starting time
vs. Input coupling capacitor

Fig.38 Starting time vs. Supply Voltage

Fig.39 Output voltage,
Negative feed back voltage
vs. Supply Voltage

Fig.40 Output offset voltage
vs. Supply Voltage

Fig.41 Ripple rejection
vs. Ripple filter capacitor

●Notes for use

1) Numbers and data in entries are representative design values and are not guaranteed values of the items.

2) Although ROHM is confident that the example application circuit reflects the best possible recommendations, be sure to verify circuit characteristics for your particular application. Modification of constants for other externall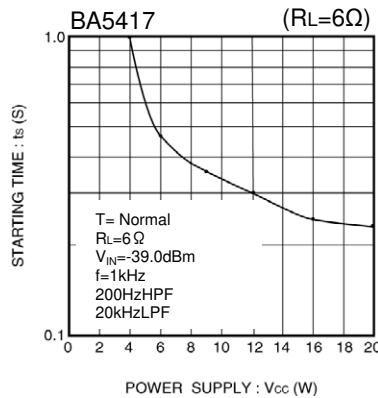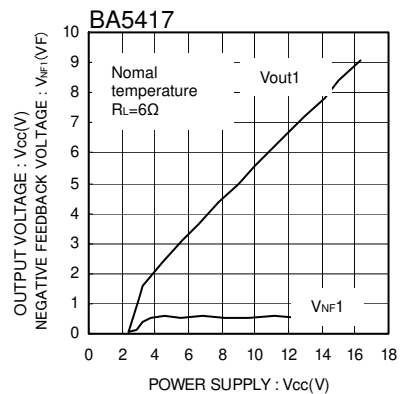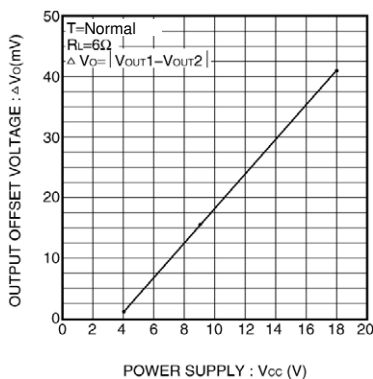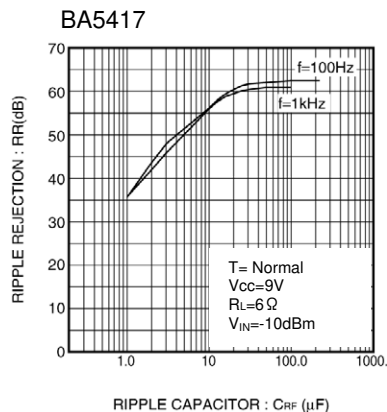y connected circuits may cause variations in both static and transient characteristics for external components as well as this Rohm IC. Allow for sufficient margins when determining circuit constants.

3) Absolute maximum ratings
Use of the IC in excess of absolute maximum ratings, such as the applied voltage or operating temperature range (Topr), may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure, such as a fuse, should be implemented when using the IC at times where the absolute maximum ratings may be exceeded.

4) GND potential
Ensure a minimum GND pin potential in all operating conditions. Make sure that no pins are at a voltage below the GND at any time, regardless of whether it is a transient signal or not.

5) Thermal design
Perform thermal design, in which there are adequate margins, by taking into account the permissible dissipation (Pd) in actual states of use.

6) Short circuit between terminals and erroneous mounting
Pay attention to the assembly direction of the ICs. Wrong mounting direction or shorts between terminals, GND, or other components on the circuits, can damage the IC.

7) Operation in strong electromagnetic field
Using the ICs in a strong electromagnetic field can cause operation malfunction.

●Ordering part number

| B | A | | 5 | 4 | 0 | 6 | | | | - | | |

Part No.

Part No.
5406
5417

Package
None: SIP-M12
      HSIP15

Packaging and forming specification
None: Tube

SIP-M12
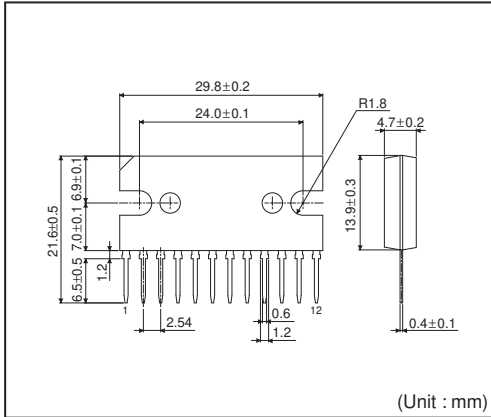
(Unit : mm)

<Tape and Reel information>	
Container	Tube
Quantity	300pcs
Direction of feed	Direction of products is fixed in a container tube
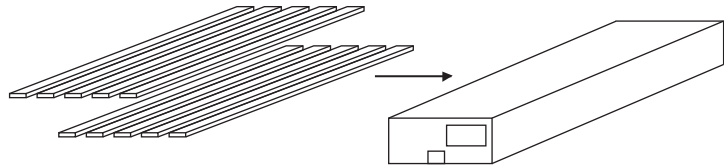
＊Order quantity needs to be multiple of the minimum quantity.

HSIP15
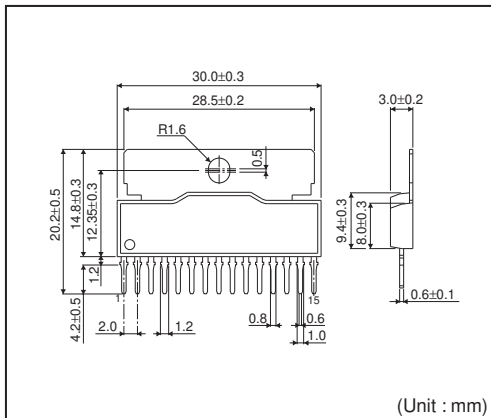
(Unit : mm)

<Tape and Reel information>	
Container	Tube
Quantity	300pcs
Direction of feed	Direction of products is fixed in a container tube
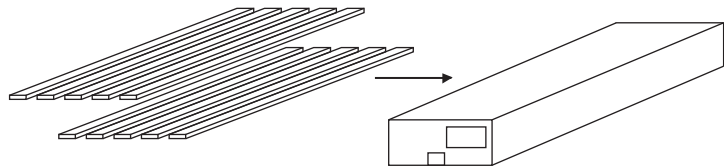
＊Order quantity needs to be multiple of the minimum quantity.

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