

Speaker / Headphone Amplifier Series

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 $V_{CC}=12\text{ V}$ and $R_L=3\Omega$, and 2.8 W×2 when $V_{CC}=9\text{ V}$ and $R_L=3\Omega$.

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 $V_{CC}=5\text{ V}$)
- 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.

•Product lineup

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

● **Absolute maximum ratings** (Ta=25°C)

Parameter	Symbol	Limits		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	°C
Storage temperature	Tstg	-30~+125	-55~+150	°C

*¹ When no signal

*² Back metal temperature 75°C

*³ Ta=75°C (Using infinite heatsink)

● **Operating range** (Ta=25°C)

Parameter	Symbol	Limits		Unit
		BA5406	BA5417	
Supply voltage	Vcc	5.0~15.0	6.0~15.0	V

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

Parameter	Symbol	BA5406	BA5417	Unit.	Conditions	
Quiescent current	Io	40	22	mA	VIN=0Vms	
Rated output power	POUT	5.0	5.0	W	THD=10%, Ta=12V, RL=32Ω	
Closed loop voltage gain	Gvc	46	45	dB	—	
Output noise voltage	VNO	0.6	0.3	mVrms	Rg=10kΩ, DIN-Audio	
Total harmonic distortion	THD	0.3	0.1	%	POUT=0.5W, f=1kHz	
Ripple rejection	RR	—	55	dB	fRR=100Hz, VRR=-10dBm	
Crosstalk	CT	—	65	dB	VO=0dBm	
Standby current	Ioff	—	0	μA	—	
Standby pin input current	ISIN	—	0.15	mA	VSTBY=VCC	
Standby pin control voltage	Activated	VSTH	—	3.5~Vcc	V	—
	Not Activated	VSTL	—	0~1.2	V	—

* Note: This IC is not designed to be radiation-resistant.

● **Cautions on use**

- Numbers and data in entries are representative design values and are not guaranteed values of the items.
- 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 externally 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.
- 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.
- 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.
- Thermal design**
Perform thermal design, in which there are adequate margins, by taking into account the permissible dissipation (Pd) in actual states of use.
- 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.
- Operation in strong electromagnetic field**
Using the ICs in a strong electromagnetic field can cause operation malfunction.

●Block diagram

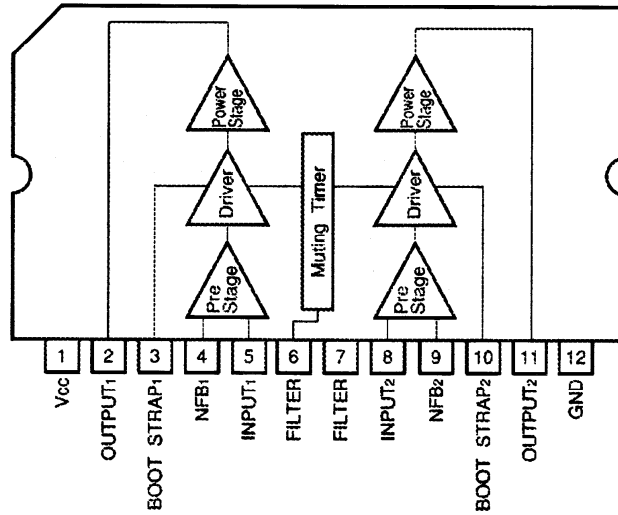


Fig.1 BA5406

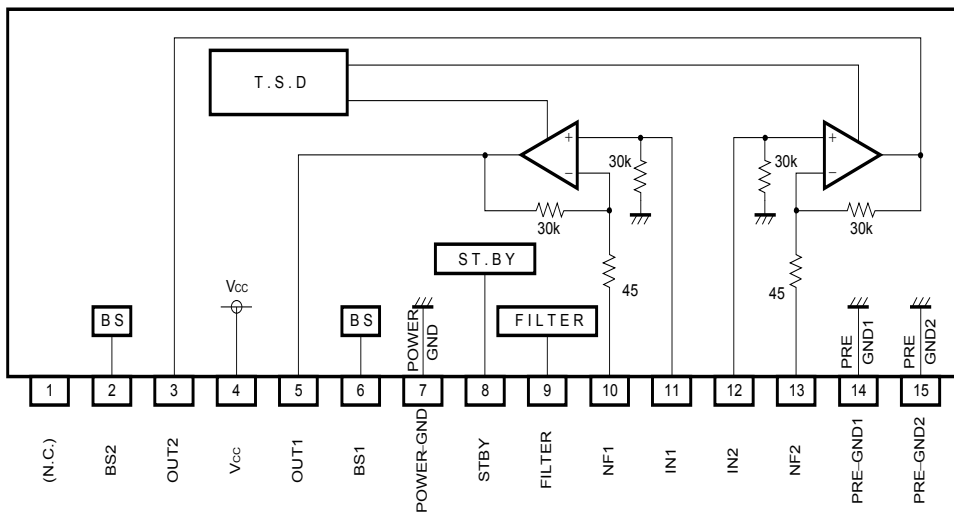


Fig.2 BA5417

●Measurement circuit

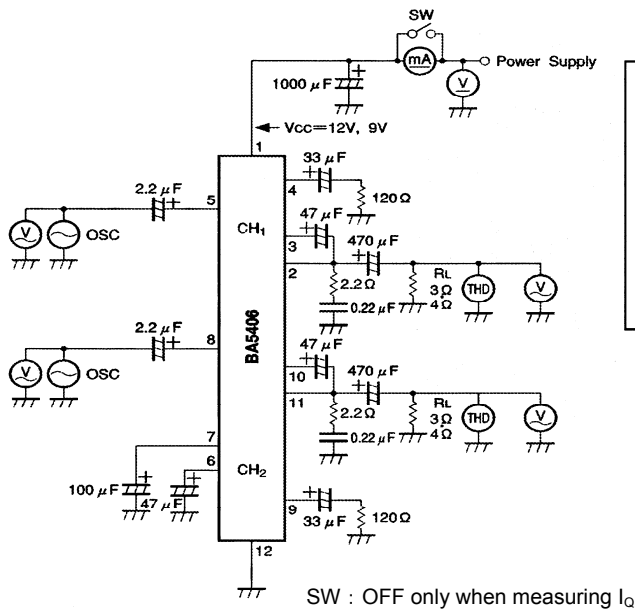


Fig.3 BA5406

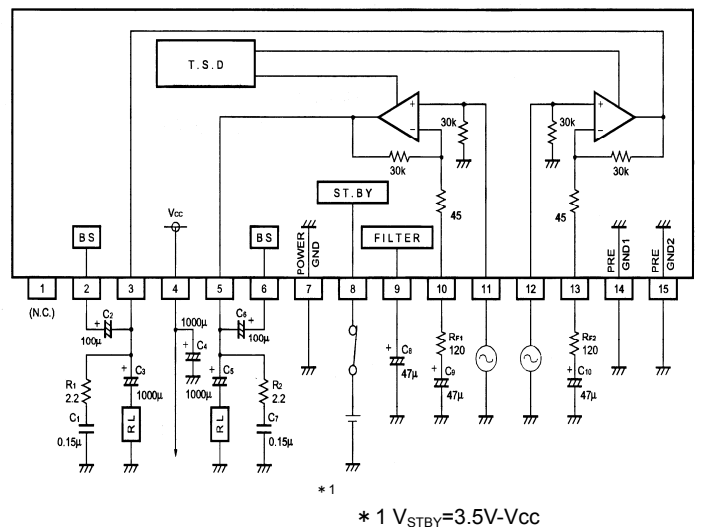
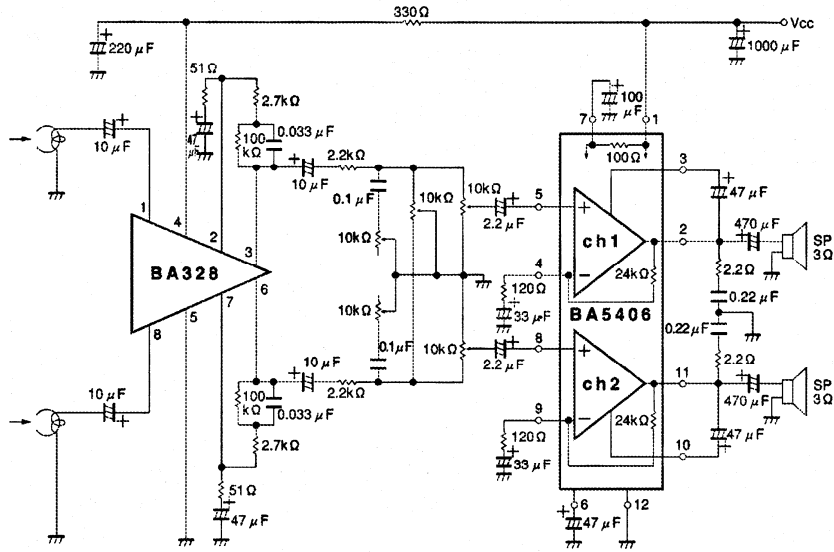


Fig.4 BA5417

●Application circuit
BA5406



BA5417

OTL mode circuit

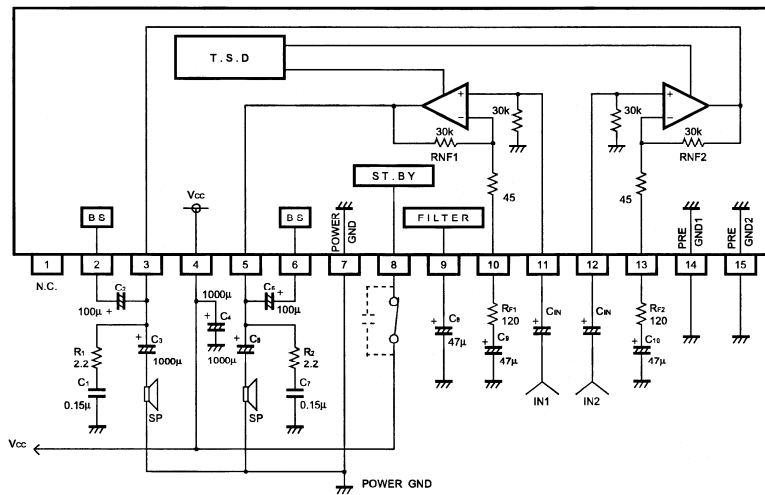


Fig.6

BTL mode circuit

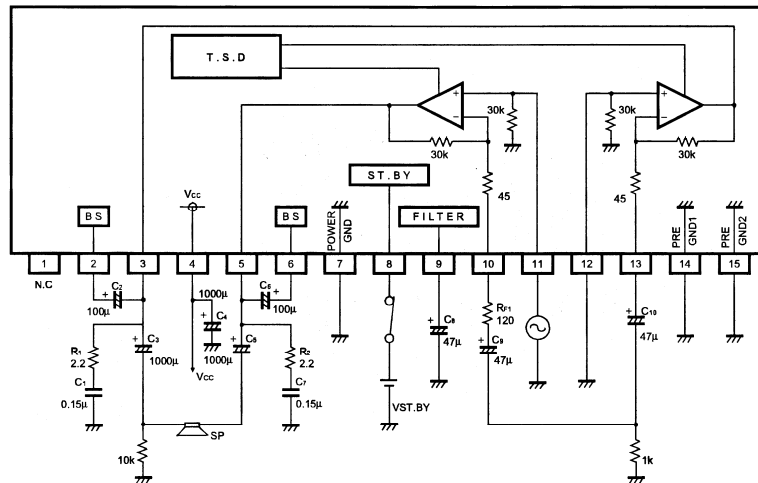


Fig.7

●Reference data

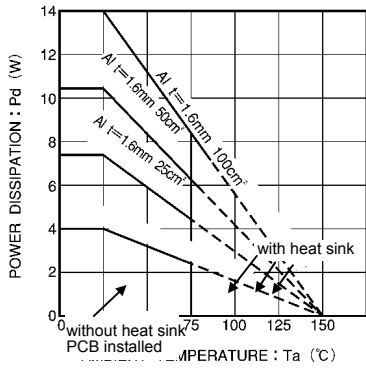


Fig.8 Thermal derating curve

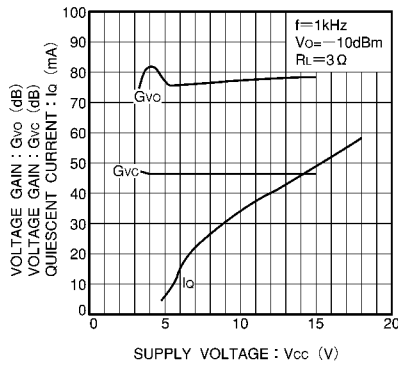


Fig.9 Quiescent current and voltage gain vs Supply voltage

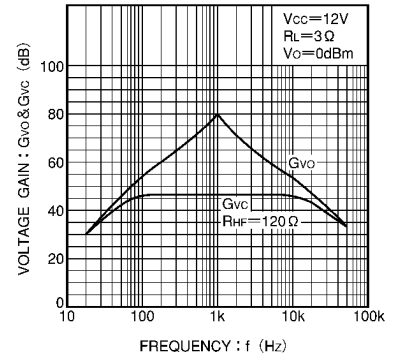


Fig.10 Voltage gain vs frequency

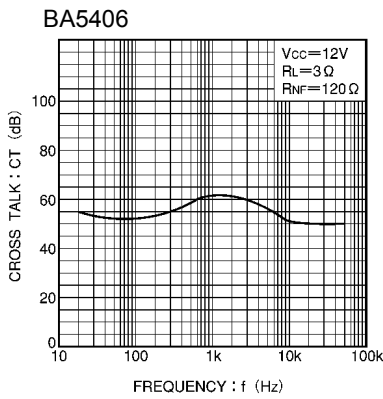


Fig.11 Crosstalk vs frequency

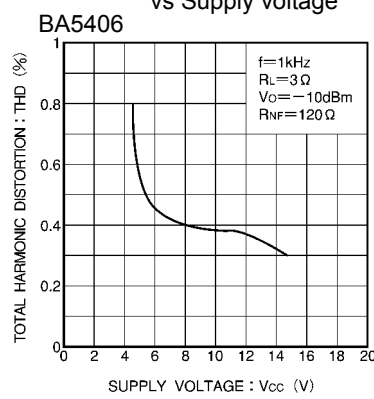


Fig.12 Distortion vs power supply voltage

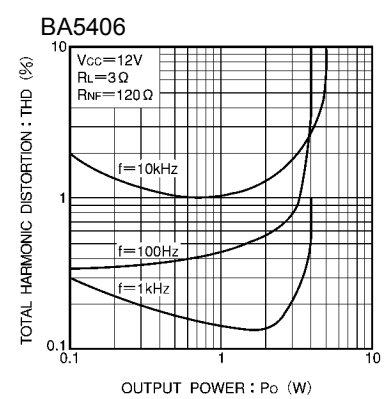


Fig.13 Distortion vs Output power

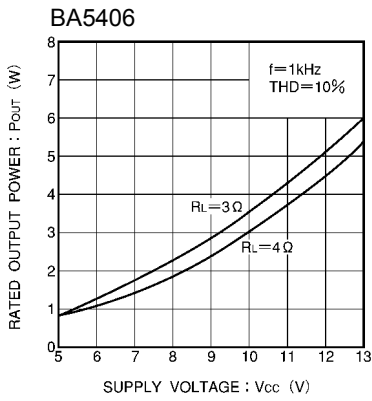


Fig.14 Output power vs power supply voltage

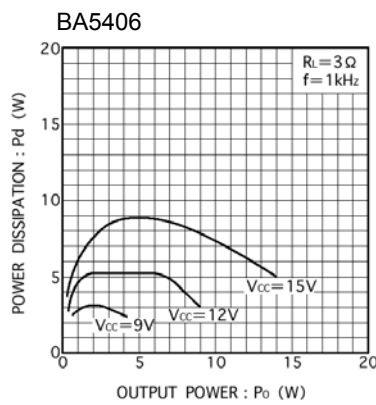


Fig.15 Power dissipation vs Output power(1)

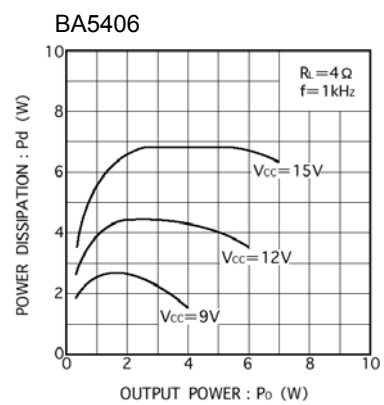


Fig.16 Power dissipation vs Output power(2)

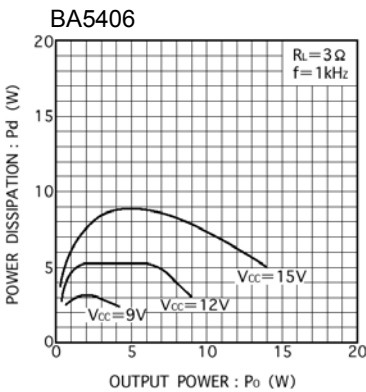


Fig.17 Power dissipation vs Output power(3)

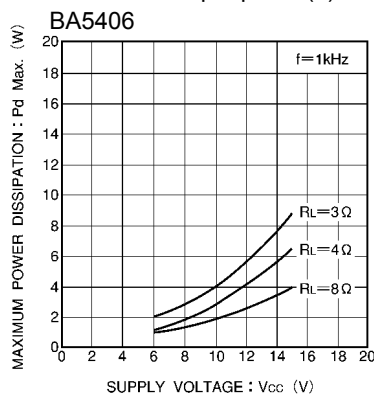


Fig.18 Maximum power dissipation vs Supply voltage

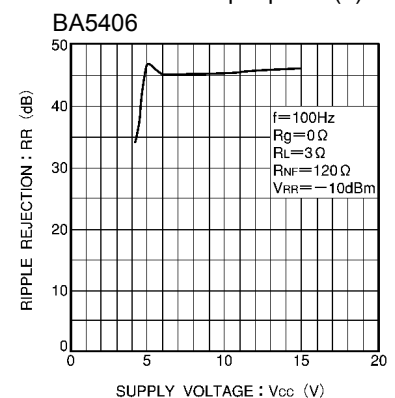


Fig.19 Ripple rejection ratio vs Supply voltage

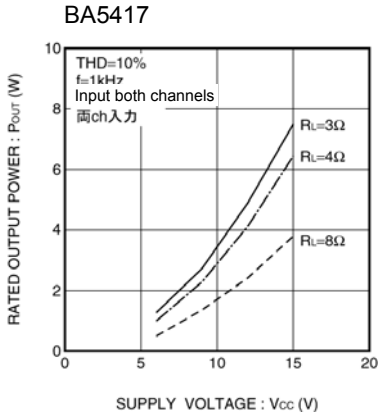


Fig.20 Rated output power vs Supply voltage

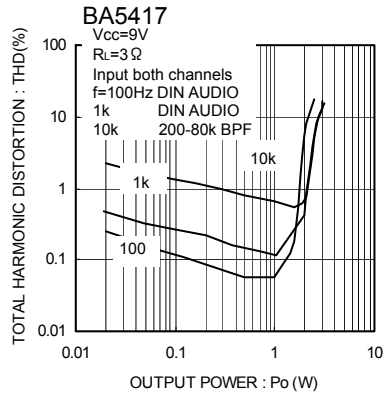


Fig.21 Total harmonic distortion vs Output power

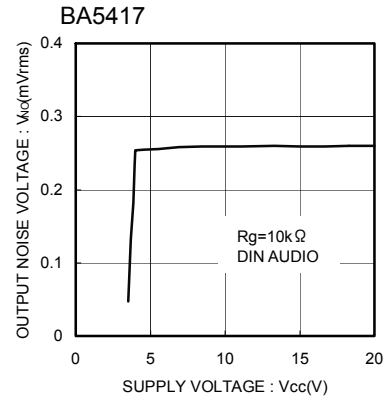


Fig.22 Output noise voltage vs Supply voltage

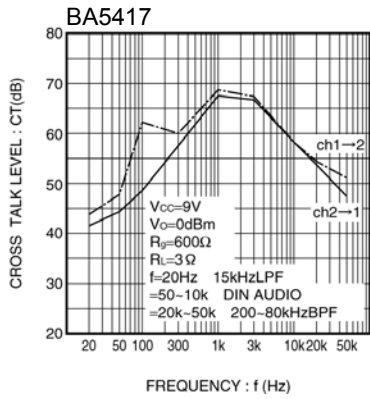


Fig.23 Crosstalk vs. Frequency

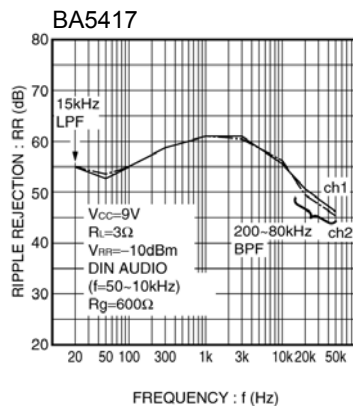


Fig.24 Ripple rejection vs. Frequency

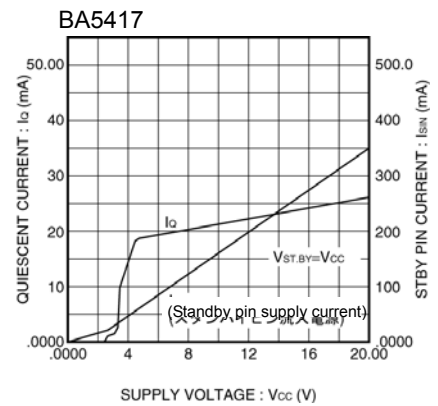


Fig.25 Quiescent, standby pin input current vs. Supply voltage

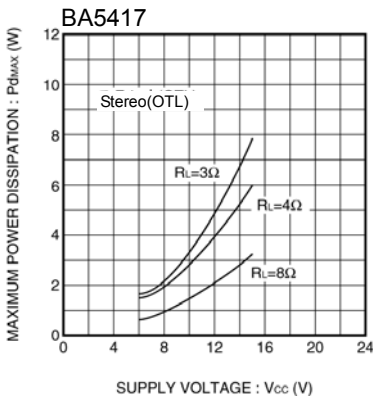


Fig.26 Maximum power dissipation vs. Supply voltage

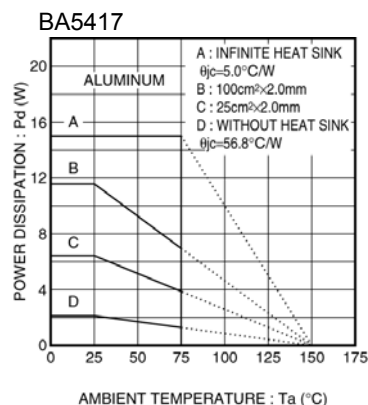


Fig.27 Thermal derating curve

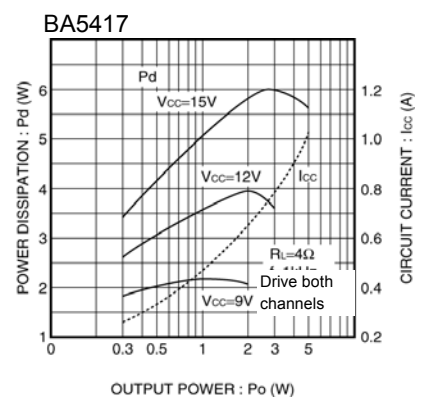


Fig.28 Power dissipation, circuit current vs. Supply Voltage (RL=4Ω)

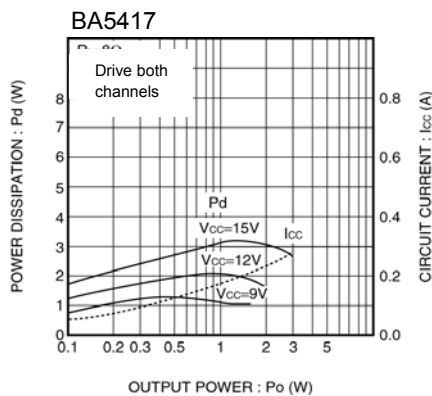


Fig.29 Power dissipation, circuit current vs. Supply Voltage (RL=8Ω)

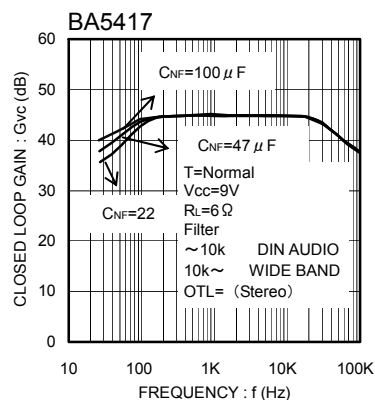


Fig.30 Closed loop gain vs. Frequency

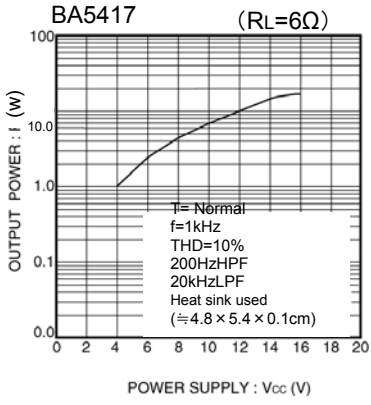


Fig.31 Rated output power vs. Supply Voltage

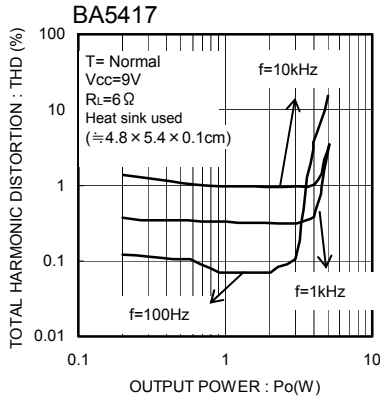


Fig.32 Total harmonic distortion vs. Output power

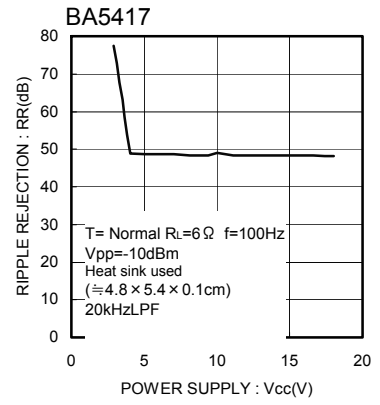


Fig.33 Ripple rejection ratio vs. Supply Voltage

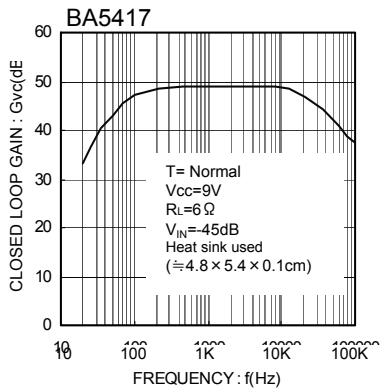


Fig.34 Close loop gain vs. Frequency

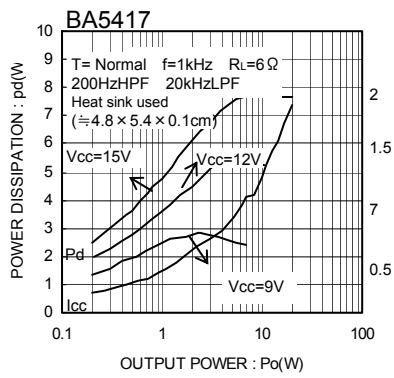


Fig.35 Power dissipation, Supply current vs. Frequency

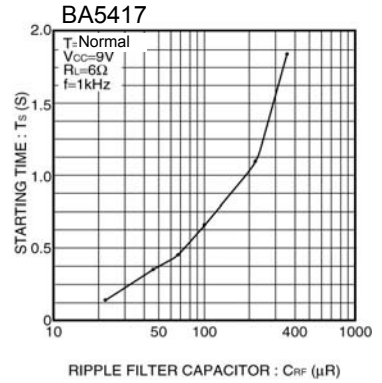


Fig.36 Starting time vs. Ripple filter capacitor

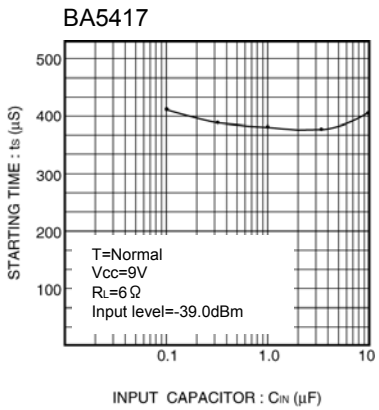


Fig.37 Starting time vs. Input coupling capacitor

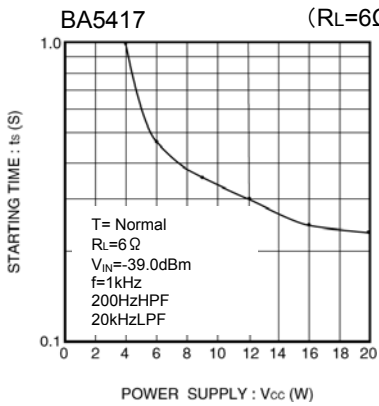


Fig.38 Starting time vs. Supply Voltage

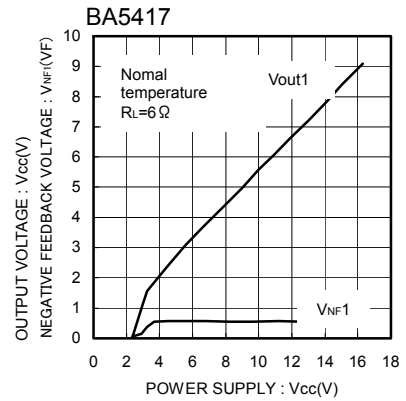


Fig.39 Output voltage, Negative feedback voltage vs. Supply Voltage

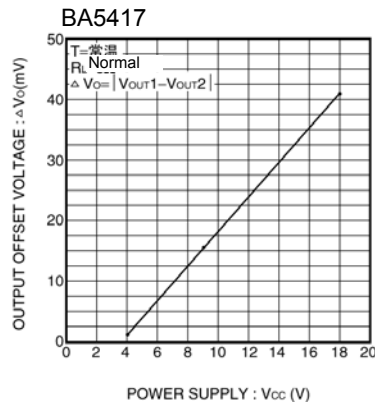


Fig.40 Output offset voltage vs. Supply Voltage

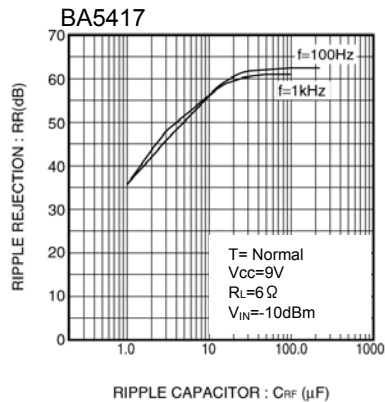
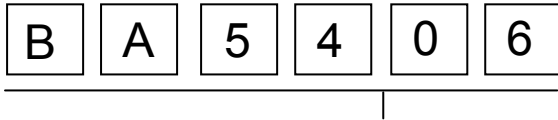


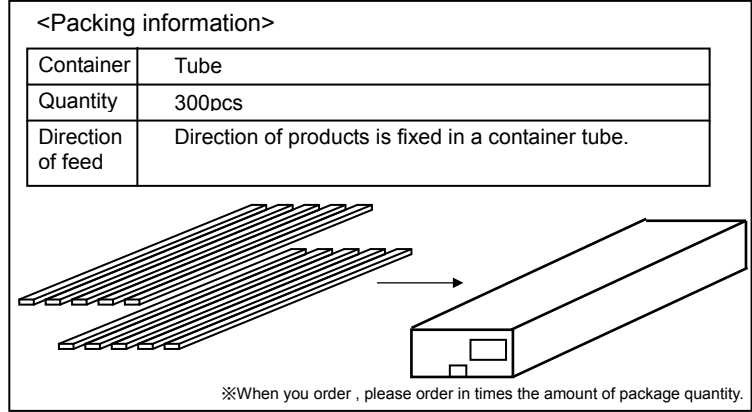
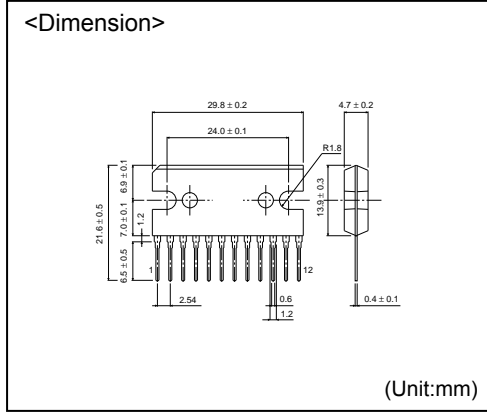
Fig.41 Ripple rejection vs. Ripple filter capacitor

● Selection of order type

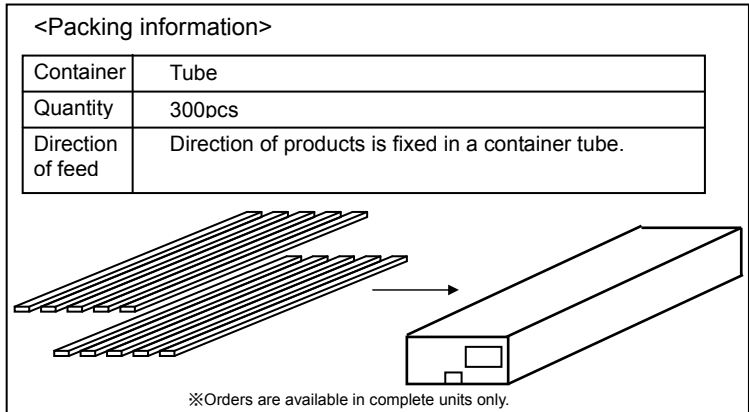
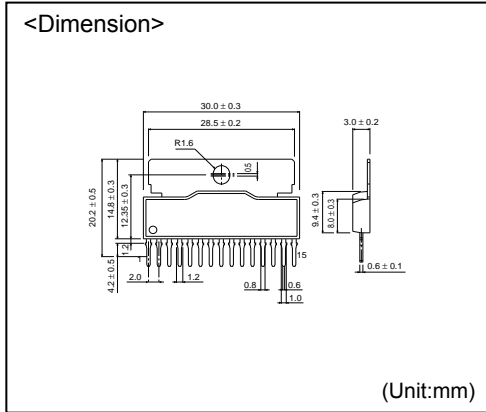


Part No.
BA5406
BA5417

SIP-M12



HSIP15



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