Ordering number : ENN3227E

SANYO Semiconductors
DATA SHEET

LA4630N — Monolithic Linear IC For Radio Cassette Recorders 9V/12V 3-Dimension Power Amplifier

Features

- Stereo section 9V/3Ω 3W×2, 12V/3Ω 5W×2 : NF-capacitorless power
- Super bass section 9V/3Ω 6W, 12V/3Ω 10W : output capacitor, B-S capacitorless power
  This chip employs technology for eliminating pins and external connections to realize 3-dimensional power on a single chip. This IC is a single package power amplifier for making sound systems with punch.
- On-chip pop noise suppressor
- On-chip power switch circuit
- External and mute functions on chip.
- Protection functions on chip (thermal protection circuit and BTL section R_L short protection circuit)

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	no signal*1	20	V
Thermal resistance	θj-c		2	°C/W
Maximum output current	I_O peak		3	A
Allowable power dissipation	Pd max	With infinite heat sink	37.5	W
Operating temperature	Topr		-20 to +75	°C
Storage temperature	Tstg		-40 to +150	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		9	V
			12	V
Recommended load resistance	R_L		3 to 8	Ω
Operating voltage	V_{CC} op	*2	5 to 18	V

Continued on next page.

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*1 : Operational notes on the maximum supply voltage.

FRONT L/R	BTL	V_{CC} max	Conditions
$R_L \geq 3\Omega$	$R_L \geq 3\Omega$	20V	No signal Front L/R input with capacitor Rg = 0 BTL L/R input without capacitor Rg = 0
$R_L \geq 3\Omega$	$R_L \geq 4\Omega$	21V	
$R_L \geq 3\Omega$	$R_L \geq 5\Omega$	22V	
$R_L \geq 3\Omega$	$R_L \geq 6\Omega$	23V	
$R_L \geq 3\Omega$	$R_L \geq 7\Omega$	24V	
$R_L \geq 3\Omega$	$R_L \geq 8\Omega$	24V	

For power supply transistor regulation, the equivalent power line resistance is 3Ω or greater.

*2 : The upper limit for V_{CC} op is V_{CC} max–2V.

[Design Note]

Select the target P_O under the a rated load/rated supply voltage conditions of R_L = 3 to 8Ω and V_{CC} = 5 to 18V. Make sure that it does not exceed the package Pd max of 37.5W. Note that heavy load and high V_{CC} conditions would bring about power efficiency deterioration depending on the drive design employed.

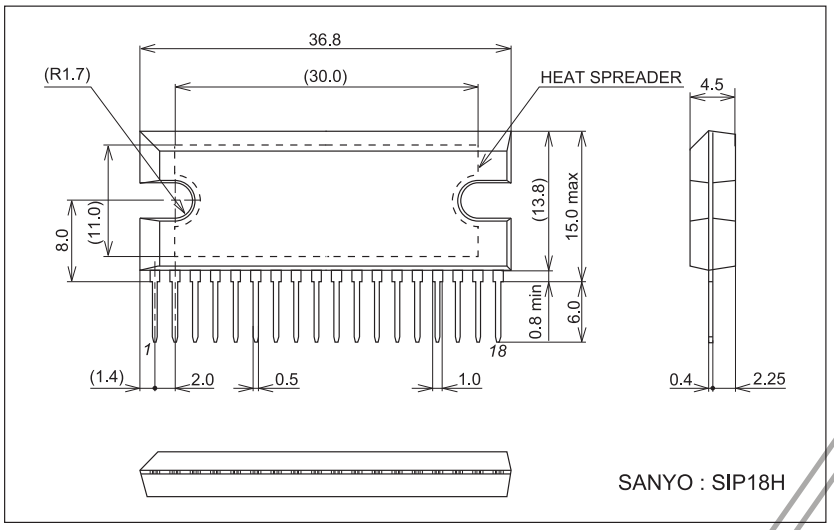
Electrical Characteristics at Ta = 25°C, V_{CC} = 9V, R_L = 3Ω, f = 1kHz

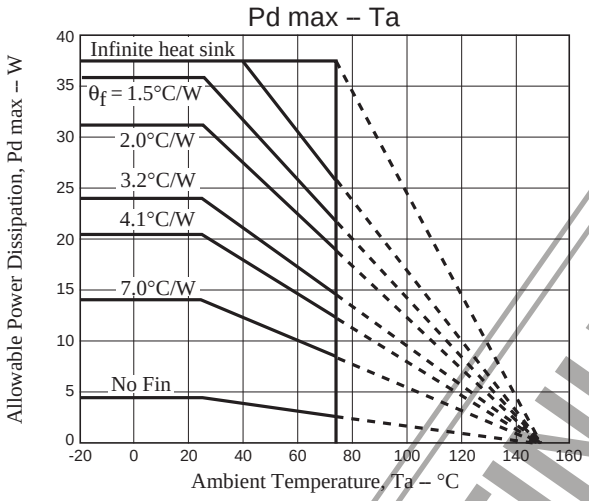
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent flow-in current	I_{CCO}		35	70	140	mA
Standby current	I_{ST}			1.0	10.0	μA
Power switch pin flow-in current	I_{SW}			10.0		mA
Mute supply flow-in current	I_{CCm}			35.0	70.0	mA
Stereo Section						
Output power	P_O1	V_{CC} = 9V, THD = 10%	2.2	3.0		W
	P_O2	V_{CC} = 12V, THD = 10%	4.2	5.0		W
Total harmonic distortion	THD	V_O = 1V		0.20	1.0	%
Input resistance	R_i			50		kΩ
Voltage gain	VG		43	45	47	dB
Output noise voltage	V_{NO}	Rg = 0, BPF = 20Hz to 20kHz		0.15	0.40	mV
Ripple rejection	SVRR	f_R = 100Hz, V_R = 0dBm	45	55		dB
Channel separation	CHsep	Rg = 10kΩ, V_O = 0dBm	45	50		dB
Muting attenuation	A_{tt}	V_O = 0dBm		80		dB
Low-region roll off frequency	f_L	VG = -3dB		50		Hz
High-region roll off frequency	f_H	VG = -3dB		50		kHz
Super Bass Section						
Output power	P_O1	V_{CC} = 9V, THD = 10%	5.0	6.0		W
	P_O2	V_{CC} = 12V, THD = 10%	8.0	10.0		W
Total harmonic distortion	THD	V_O = 1V		0.20	1.0	%
Input resistance	R_i			30		kΩ
Voltage gain	VG		43	45	47	dB
Output noise voltage	V_{NO}	Rg = 0, BPF = 20Hz to 20kHz		0.3	0.6	mV
Ripple rejection	SVRR	f_R = 100Hz, V_R = 0dBm	50	60		dB
Muting attenuation	A_{tt}	V_O = 0dBm		80		dB
Low-region roll off frequency	f_L	VG : -3dB		5		Hz
High-region roll off frequency	f_H	VG : -3dB		40		kHz
Output offset voltage	V_{OFF}	Rg = 0	-150		+150	mV

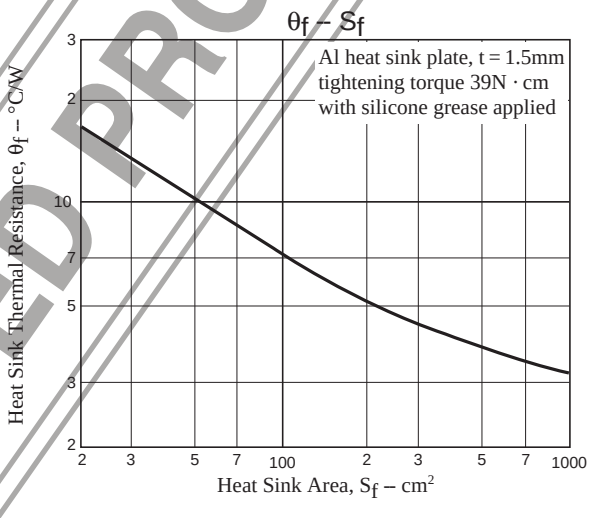
Package Dimensions

unit : mm (typ)

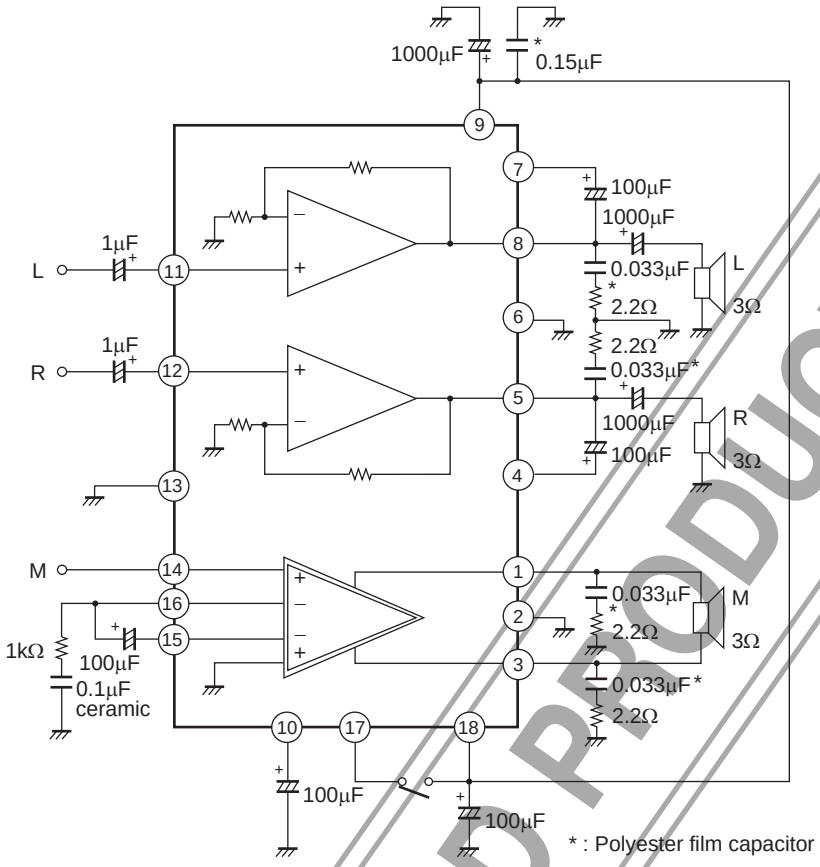
3109A







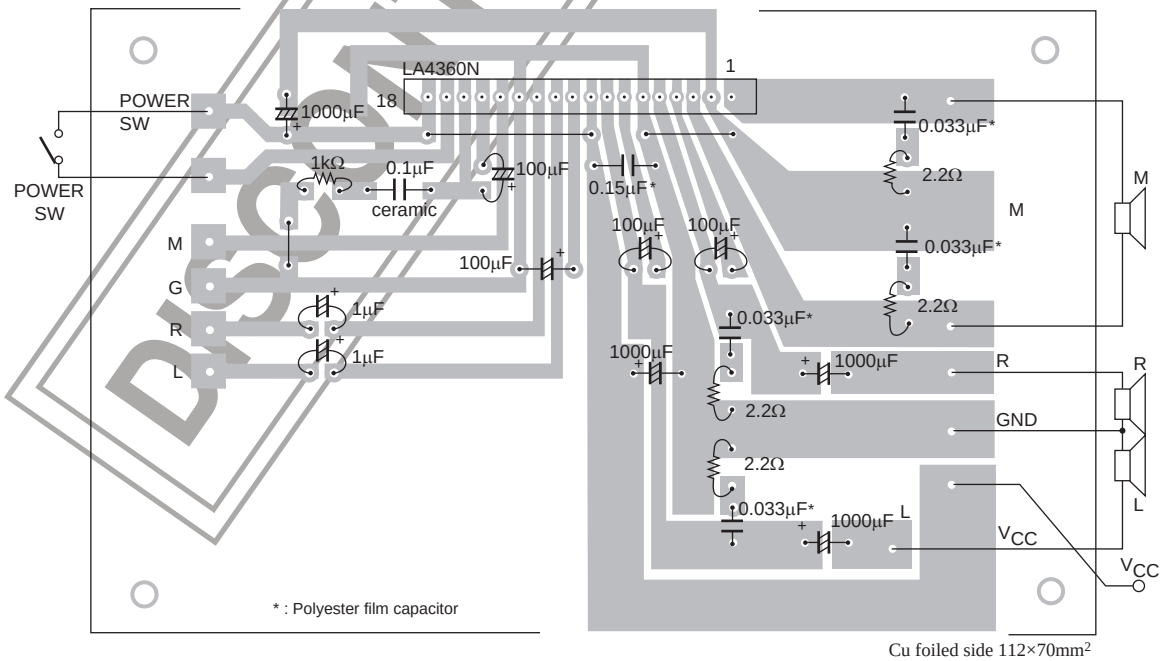
Block Diagram



Note 1 : The motor should not be connected to the power switch pin since transient noise may appear on the amplifier outputs when the motor is started or stopped.

Note 2 : Audio mute is enabled by connecting a 300Ω resistance between the DC pin (pin 10) and ground. DC bias control of both the stereo (L ch, R ch) and BTL (super bass) channels is there enabled, and all audio output signals can be muted by controlling the MUTE pin.

Sample Printed Circuit Pattern



* : Insert 0.15μF between power supply and ground at the root of the pins.

Pin Voltages

Pin No.	1	2	3	4	5	6	7	8	9
Name	OUT No	PWR GND 2	OUT Inv	BS R	OUT R	PWR GND 1	BS L	OUT L	V_{CC} 1
Pin Voltage (V)	4.0	0	4.0	8.1	4.5	0	8.1	4.0	9.0

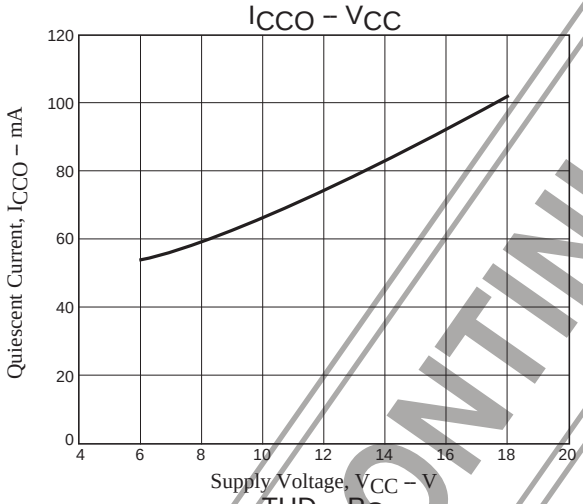
Pin No.	10	11	12	13	14	15	16	17	18
Name	DC	IN L	IN R	PRE GND	IN No	NF Inv	NF No	PWR SW	V_{CC} 2
Pin Voltage (V)	4.5	1.4	1.4	0	21 [mV]	1.4	1.4	9.0	9.0

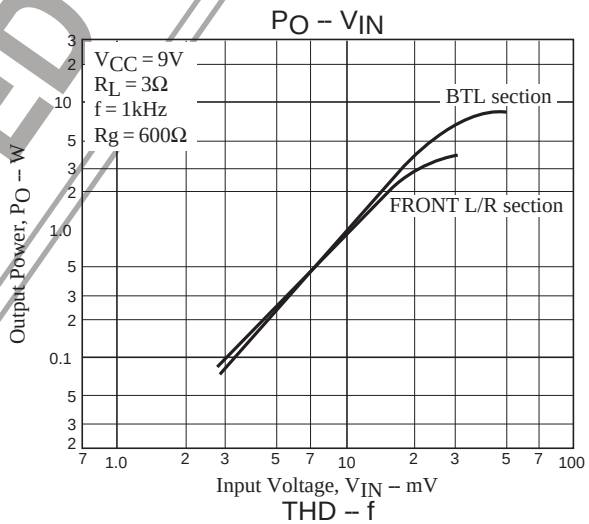
P_O Chart (THD = 10%)

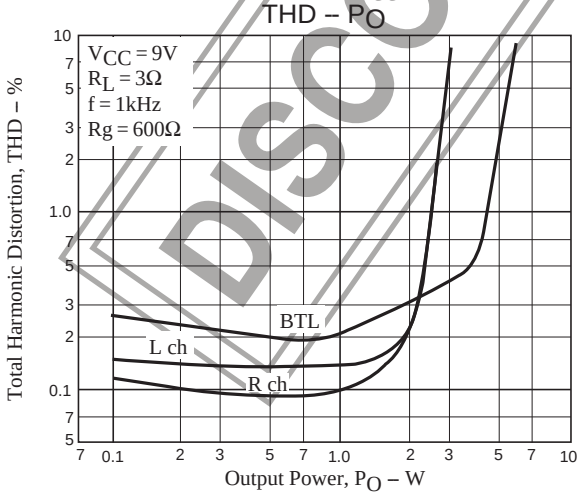
Item	R_L	9V	12V	15V
FRONT L/R	8Ω	1.4W	2.5W	3.9W
	6Ω	1.75W	3.2W	5.0W
	4Ω	2.4W	4.3W	6.4W
	3Ω	3.2W	5.6W	–
BTL	8Ω	3.2W	6.4W	11.0W
	6Ω	4.0W	8.1W	13.5W
	4Ω	5.3W	10.4W	–
	3Ω	6.4W	12.4W	–

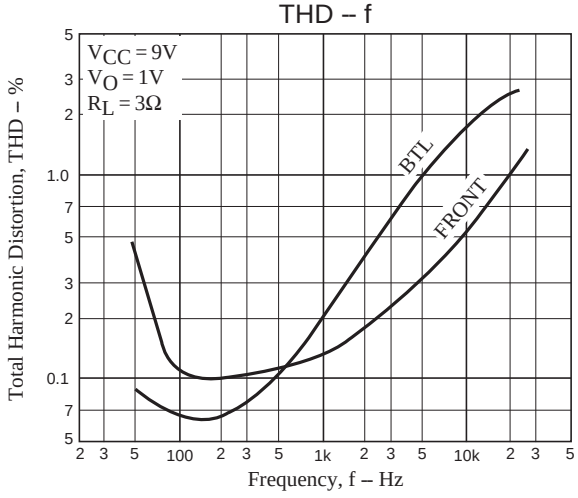
Pd max Chart

Item	R_L	9V	12V	15V
FRONT L/R	8Ω	2.0W	3.2W	4.6W
	6Ω	2.4W	3.8W	5.7W
	4Ω	3.1W	5.0W	5.4W
	3Ω	3.8W	6.2W	–
BTL	8Ω	2.8W	4.8W	7.2W
	6Ω	3.6W	6.0W	9.0W
	4Ω	5.0W	8.8W	–
	3Ω	6.3W	11.2W	–

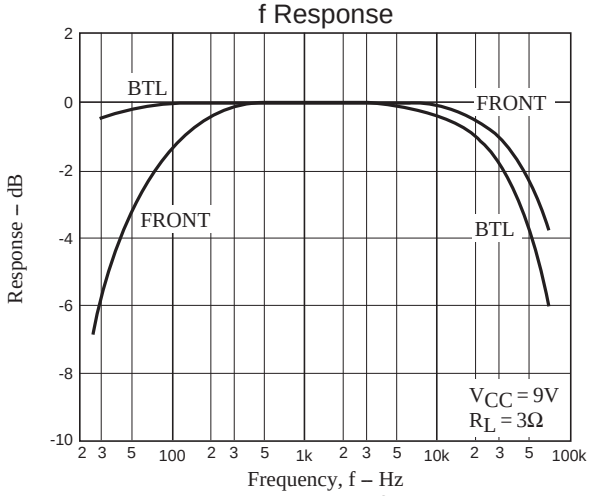




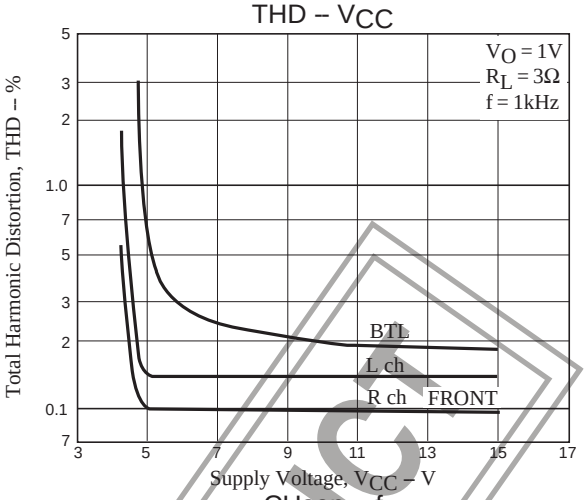




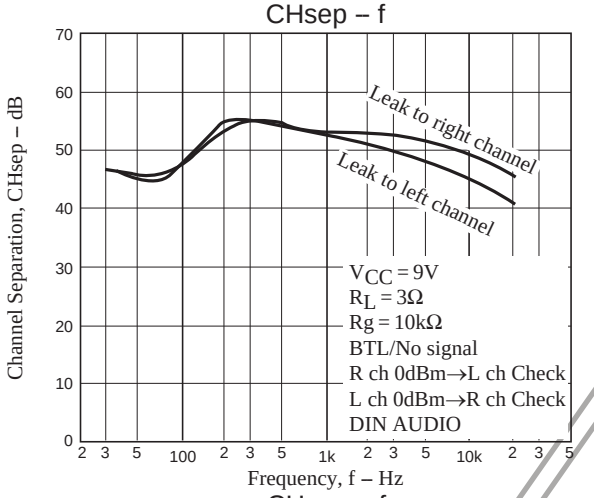
f Response



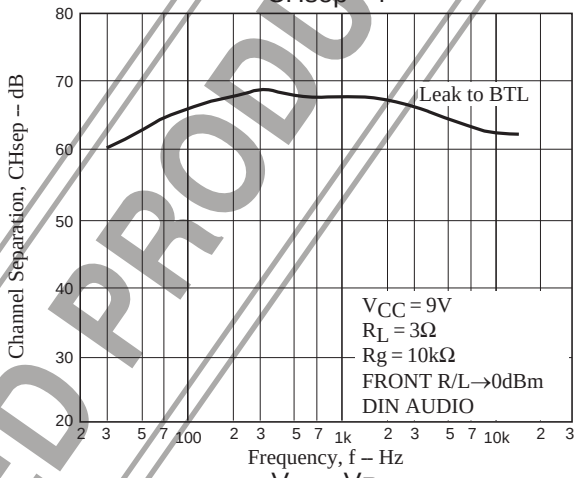
THD – V_{CC}



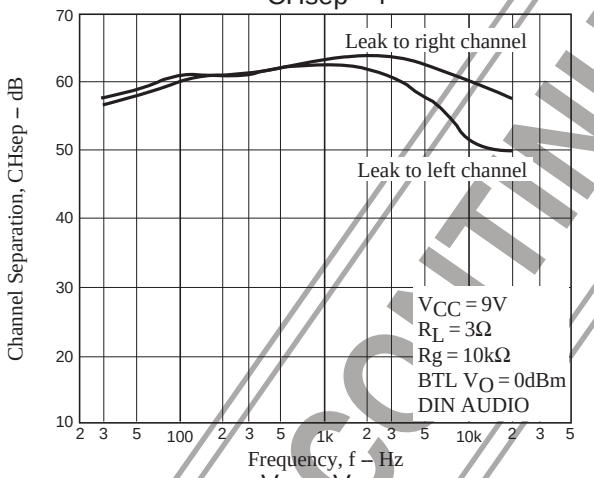
CHsep – f



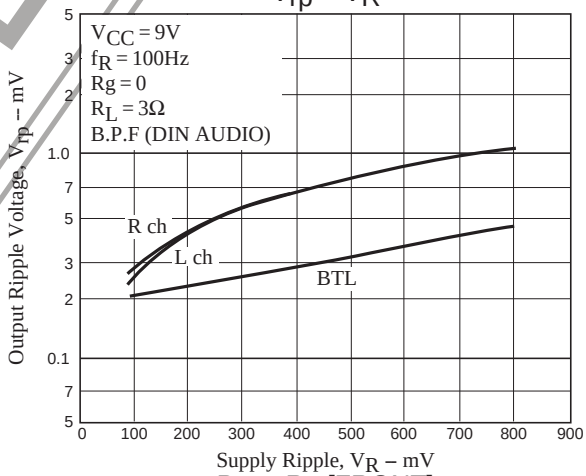
CHsep – f



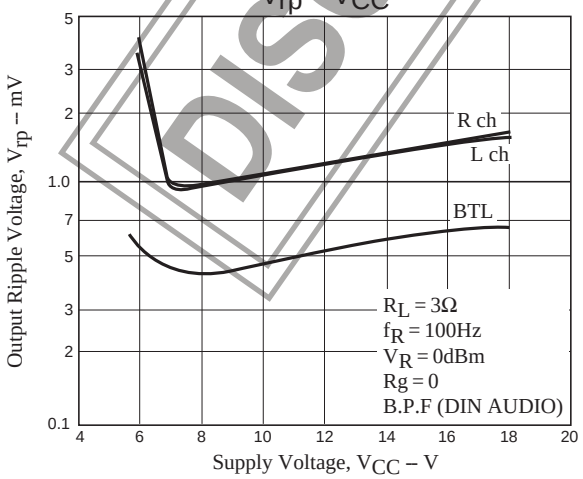
CHsep – f



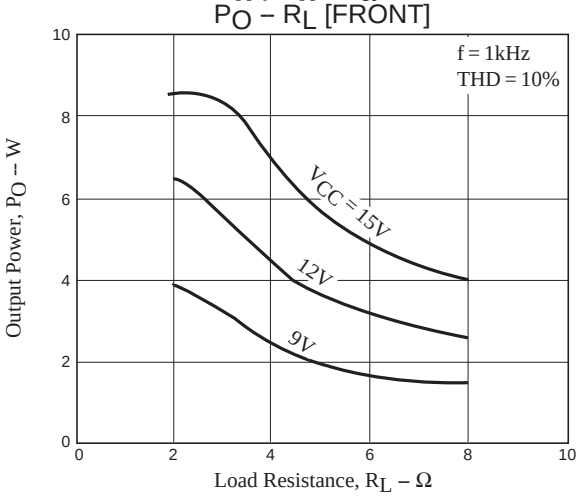
V_{rp} – V_R



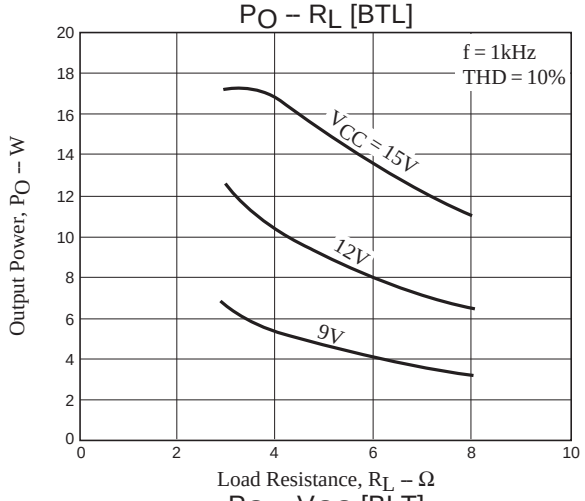
V_{rp} – V_{CC}



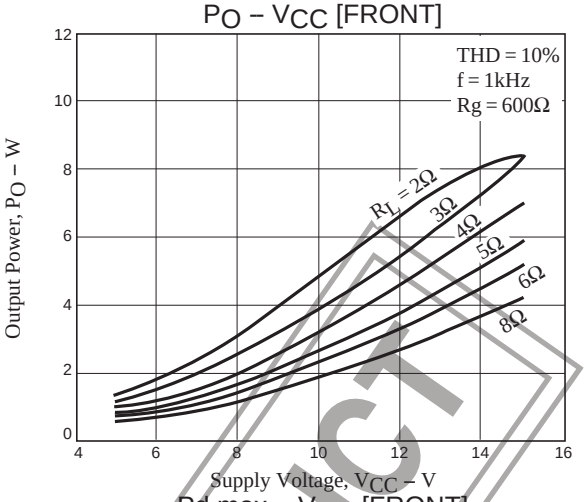
P_O – R_L [FRONT]



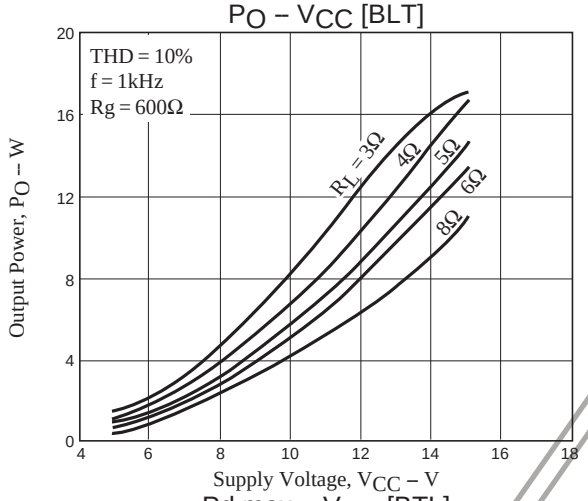
$P_O - R_L$ [BTL]



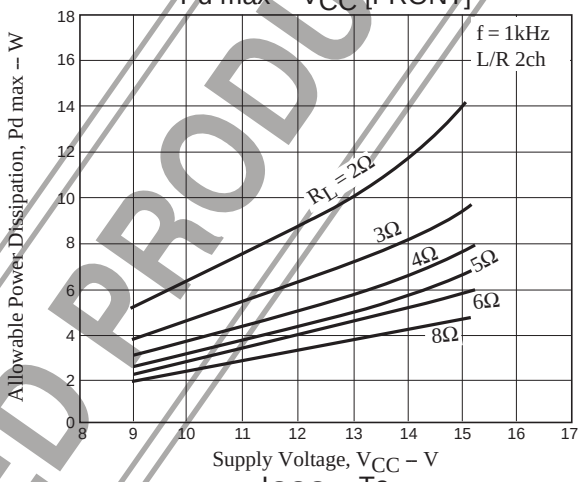
$P_O - V_{CC}$ [FRONT]



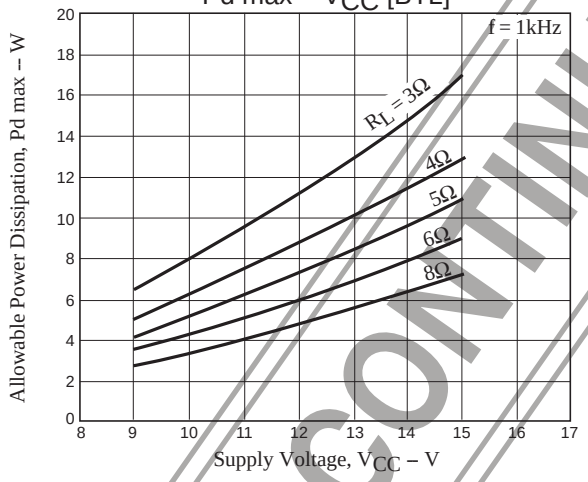
$P_O - V_{CC}$ [BLT]



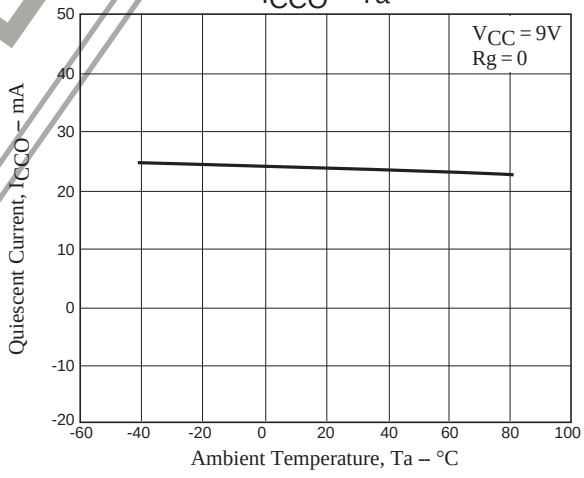
Pd max – V_{CC} [FRONT]



Pd max – V_{CC} [BTL]



I_{CCO} – Ta

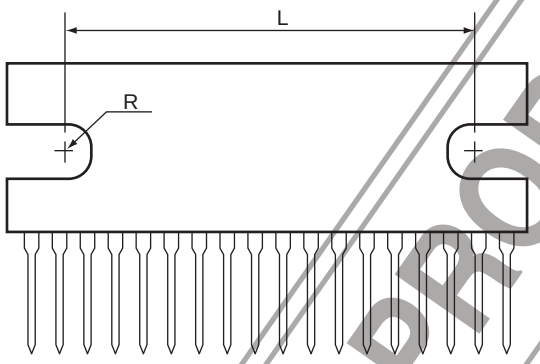


Notes on using this IC

- Always short power supply pins 9 and 16 on the copper foil of the printed circuit pattern and apply the equivalent power supply voltage.
- Pin 17 is designed for the power switch.
  It can be switched on and off with a small current capacity switch, but the point to watch out for is that if the voltgae loss between pins 17 and 18 is too large, there may be problems in the biasing and the power may drop.
- When switching with a transistor, the general practice is to insert a PNP transistor between pins 17 and 18.

Notes on Mounting Radiator Fin

1. The tightening torque should be in the range of 39 to 59N · cm.
2. The distance between screw holes of the radiator fin must coincide with the distance between screw holes of the IC. With case outline dimensions L and R referred to, the screws must be tightened with the distance between them as close to each other as possible.



3. The screw to be used must have a head equivalent to the one of truss machine screw or binder machine screw defined by JIS. Washers must be also used to protect the IC case.
4. No foreign matter such as cutting particles must exist between heat sink and radiator fin. When applying grease on the junction surface, it must be applied uniformly on the whole surface.
5. IC lead pins must be soldered to the printed circuit board after the radiator fin is mounted on the IC.