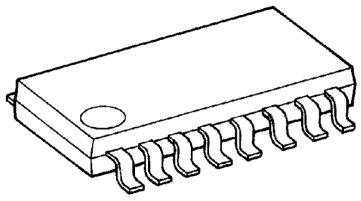
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA2028F,TA2028P

Filter IC For Σ−Δ Modulation System DA Converter

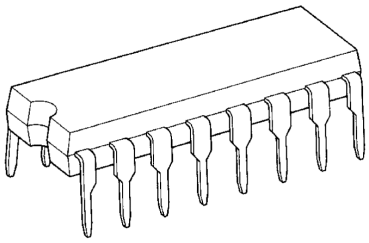
TA2028F, TA2028P are an analog filter IC for Σ−Δ modulation system DA converter.
Using the TA2028F, TA2028P in combination the TC9237BF, TC9237BN (the Σ−Δ modulation system DA converter with a built−in digital filter), it is possible to construct a DA conversion system with less external parts.

TA2028F



SSOP16-P-225-1.00A

TA2028P



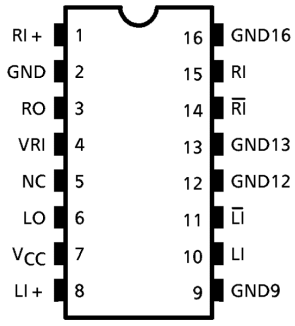
DIP16-P-300-2.54A

Weight
SSOP16−P−225−1.00A: 0.14g (typ.)
DIP16−P−300−2.54A: 1.00g (typ.)

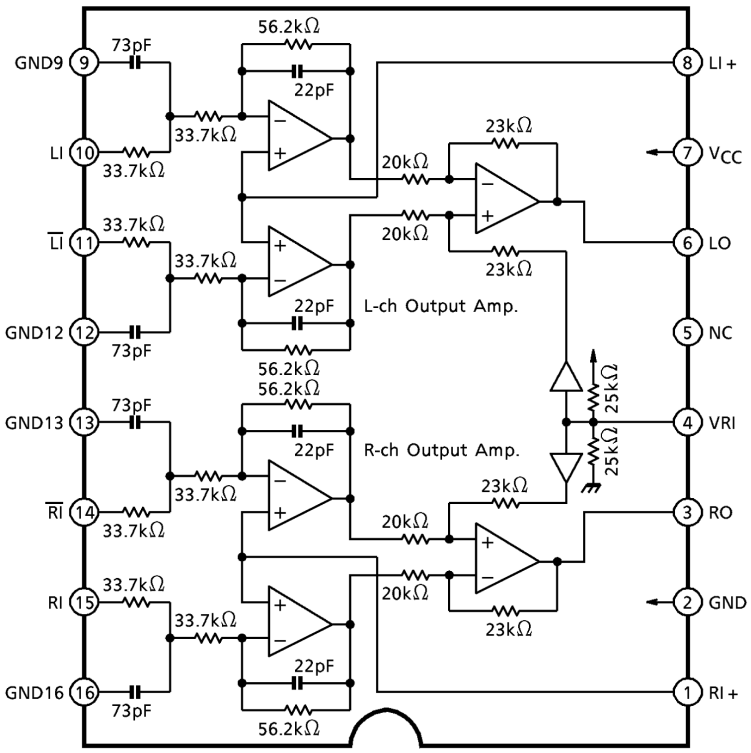
Features

- Built−in CR for LPFs and output (differential) amplifiers for the left and right channel.
- Single power supply operation.
  (+9V operation: BS tuner system)
- Noise distortion factor and S / N ratio are as follows
  (when operating at +5V single power supply):
  Noise distortion factor: −86dB (typ.)
  S / N: 100dB (typ.)

Pin Connection (top view)



Block Diagram



Description Of Pin Functions

Pin No.	Symbol	I / O	Function & Operation	Remarks
1	RI +	I	R channel operational amplifier forward input pin. Connect to VRI.	—
2	GND	—	Ground pin.	—
3	RO	O	R channel analog output pin.	—
4	VRI	—	Reference voltage pin. (V_{CC} / 2)	See the block diagram
5	NC	—	Non−connecting pin. NC pin is used in the open state.	—
6	LO	O	L channel analog output pin.	—
7	V_{CC}	—	Supply voltage pin.	—
8	LI +	I	L channel operational amplifier forward input pin. Connect to VRI.	—
9	GND9	—	Ground pin for L channel reverse input side filter.	—
10	LI	I	L channel forward input pin.	Connect to LO of TC9237BF, TC9237BN
11	$\overline{LI}$	I	L channel reverse input pin.	Connect to $\overline{LO}$ of TC9237BF, TC9237BN
12	GND12	—	Ground pin for L channel forward input side filter.	—
13	GND13	—	Ground pin for R channel forward input side filter.	—
14	$\overline{RI}$	I	R channel reverse input pin.	Connect to $\overline{RO}$ of TC9237BF, TC9237BN
15	RI	I	R channel forward input pin.	Connect to RO of TC9237BF, TC9237BN
16	GND16	—	Ground pin for R channel reverse input side filter.	—

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Supply voltage		V_{CC}	11	V
Power dissipation	TA2028F	P_D	350 (*)	mW
	TA2028P		1388 (**)	
Operating temperature		T_{opr}	−25~75	°C
Storage temperature		T_{stg}	−55~150	°C

(*) Reduce 2.8mW / °C at Ta = above 25°C.

(**) Reduce 11.2mW / °C at Ta = above 25°C.

Electrical Characteristics (unless otherwise specified, V_{CC} = 5V, Ta = 25°C)

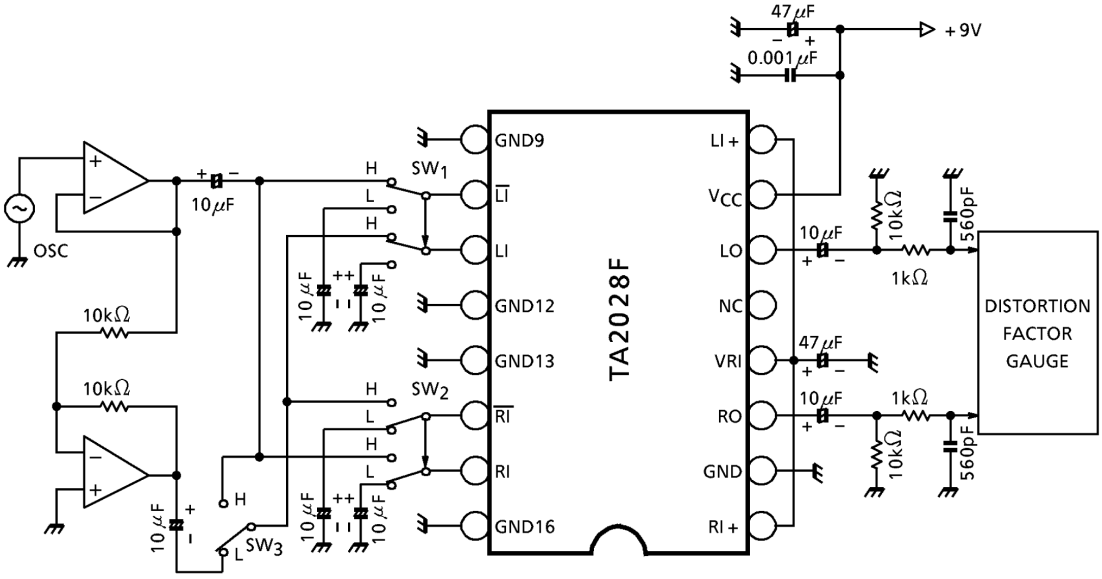
Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Operating supply voltage	V_{CC}	—	Ta = −35~85°C	8.0	9.0	10	V
Operating supply current	I_{CCQ}	—	At no signal	8.1	11.0	13.7	mA
Reference voltage	VRI	—	—	4.4	4.5	4.6	V
Noise distortion factor	THD (1)	1	1kHz, V_o = 2mV$_{rms}$	—	−86	−83	dB
	THD (2)		10kHz, V_o = 2mV$_{rms}$	—	−86	−83	
	THD (3)		1kHz, V_o = 100mV$_{rms}$	—	−74	−70	
Cross talk	CT	1	1kHz, V_o = 2mV$_{rms}$	—	−100	−90	dB
Attenuation	ATT (1)	1	40kHz, V_o = −10dBV$_{rms}$	0.51	0.71	1.41	dB
	ATT (2)		80kHz, V_o = −10dBV$_{rms}$	1.50	2.70	4.50	
Max. output level	V_{omax}	1	1kHz, THD = 1%	2.5	2.6	—	V_{rms}
Differential balance	G_{VB}	1	1kHz, 1.1dBV$_{rms}$ In−phase input	—	—	−40	dB
LR output difference	G_{VD}	1	1kHz, 1.1dBV$_{rms}$ Differential input	—	0	0.5	dB

(Note 1) When the TC9327BF, TC9237BN (+5V) and +9V single power supply are operated : Full scale = 2mV$_{rms}$ (typ.).

(Note 2) The amount of attenuations is based on 1kHz, V_o = −10dBV$_{rms}$.

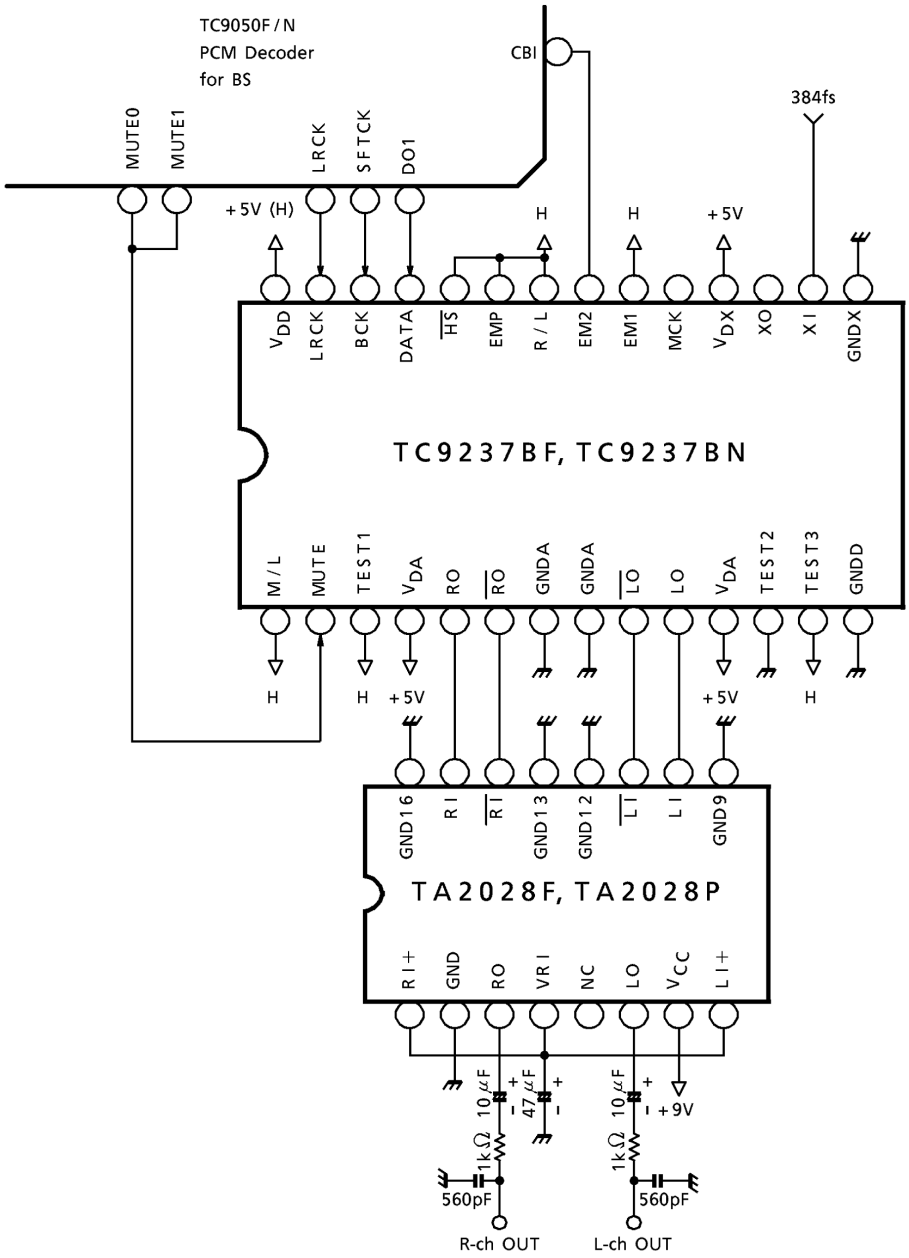
(Note 3) Measuring circuit−1: Indicates the measuring circuit.

Test Circuit–1



SW_1	SW_2	SW_3	Measuring Item
L	L	—	Operating supply voltage, reference voltage
L	H	L	Cross talk (R→L)
H	L	L	Cross talk (L→R)
H	H	L	Noise distortion factor, attenuation, maximum output level, LR output difference
H	H	H	Difference balance

Application Circuit Example

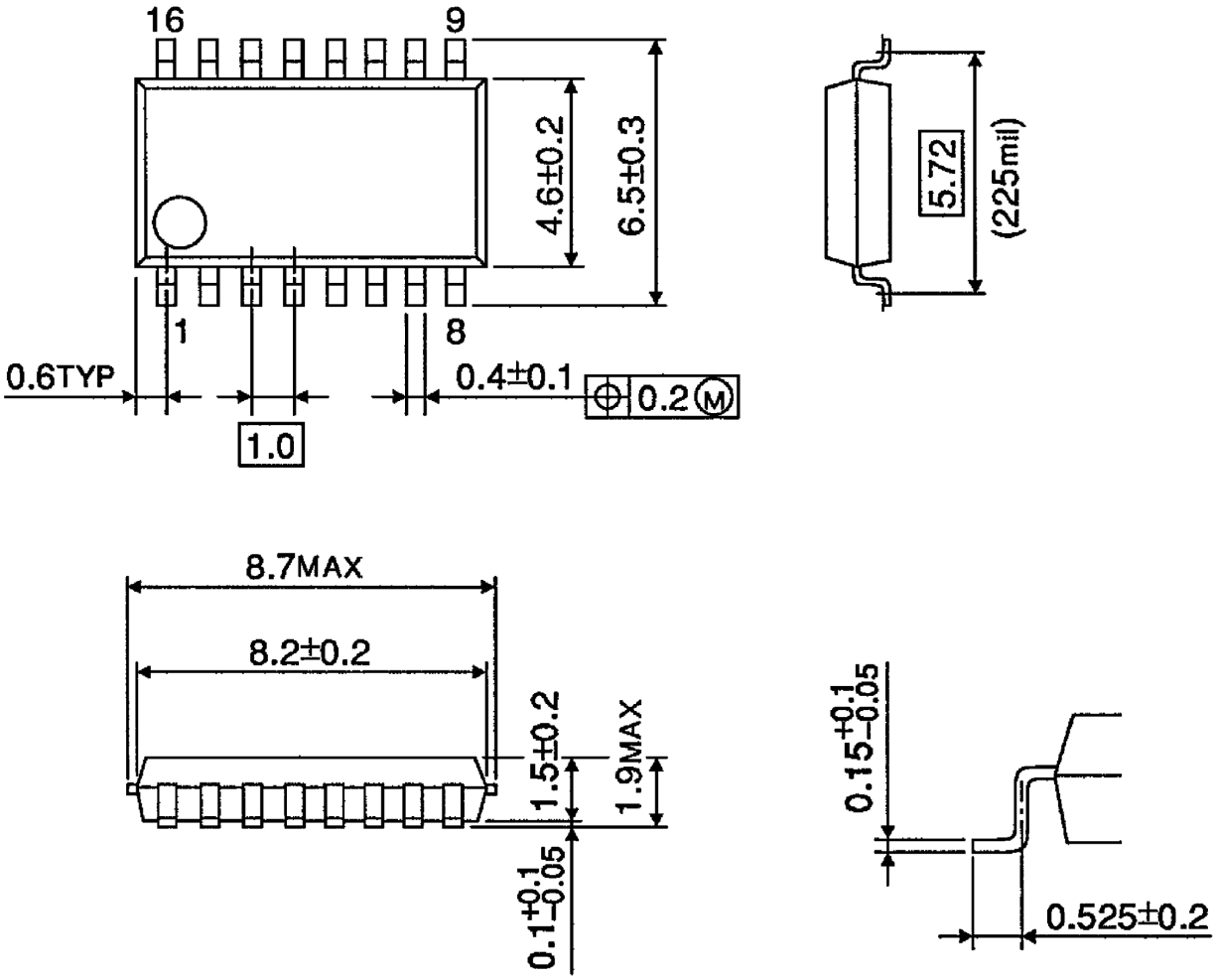


(Cautions)

- Quality of crystal oscillation waveform largely effects S / N ratio.
  Further, this is also true when system clock is input externally through the XI pin of pin(16).
- Suppress glitch of input signals (LRCK, BCK, DATA) as could as possible.
- The wiring between the TC9237BF, TC9237BN output and the analog filter amplifier input must be made the shortest
- The capacitor between V_{DA} and GNDA shall be connected as close to the pin as possible.
- NC pin is used in the open state.

Package Dimensions

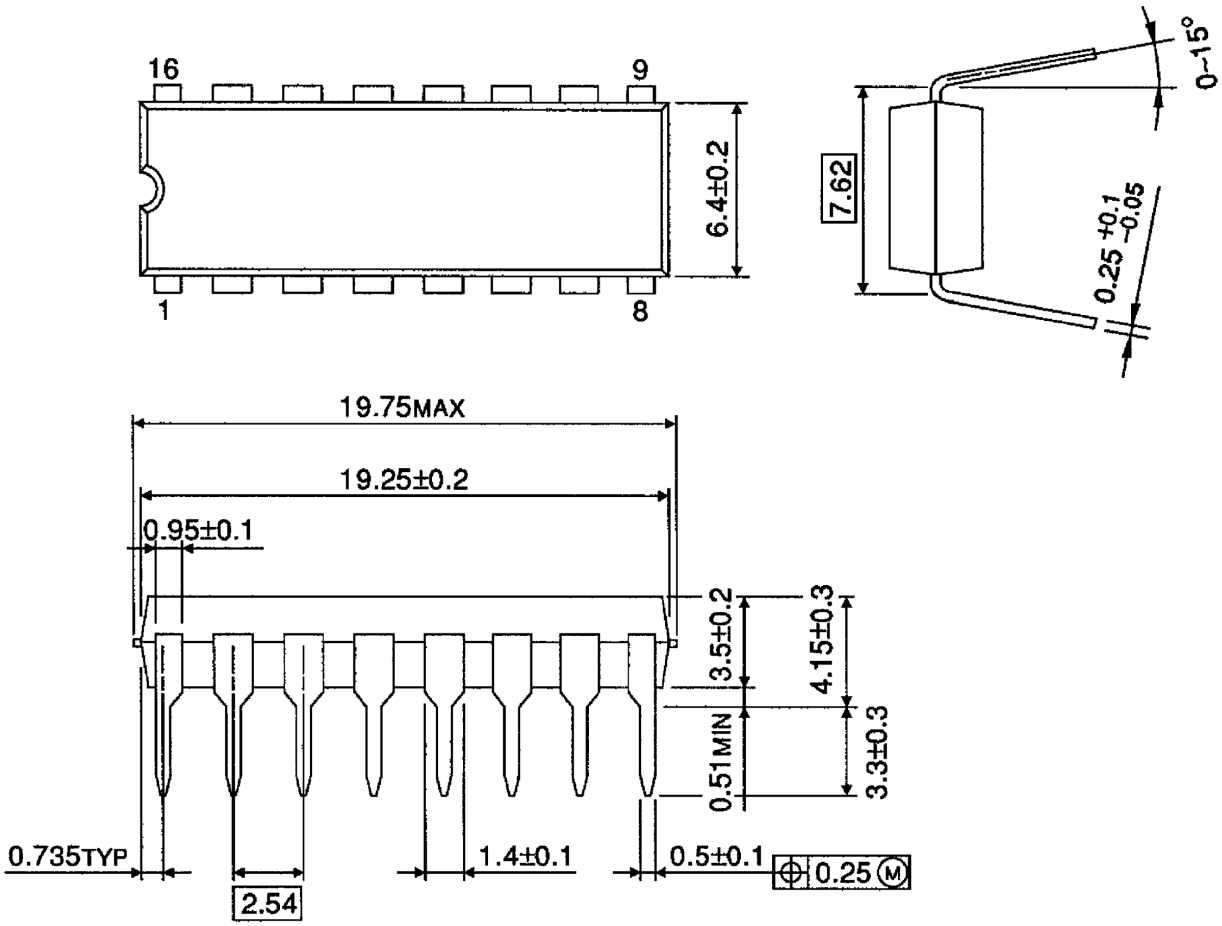
SSOP16-P-225-1.00A Unit : mm



Weight: 0.14g (typ.)

Package Dimensions

DIP16-P-300-2.54A Unit : mm



Weight: 1.00g (typ.)

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