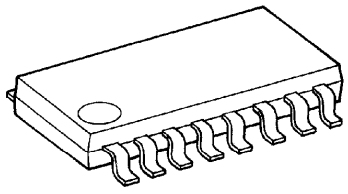
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2028F, TA2028P

FILTER IC FOR Σ-Δ MODULATION SYSTEM DA CONVERTER

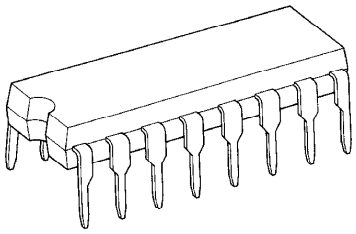
TA2028F, TA2028P are an analog filter IC for Σ-Δ modulation system DA converter.
Using the TA2028F, TA2028P in combination the TC9237BF, TC9237BN (the Σ-Δ modulation system DA converter with a built-in digital filter), it is possible to construct a DA conversion system with less external parts.

TA2028F



SSOP16-P-225-1.00A

TA2028P



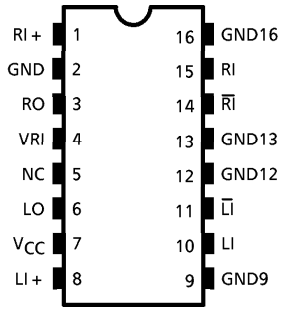
DIP16-P-300-2.54A

Weight
SSOP16-P-225-1.00A : 0.14g (Typ.)
DIP16-P-300-2.54A : 1.00g (Typ.)

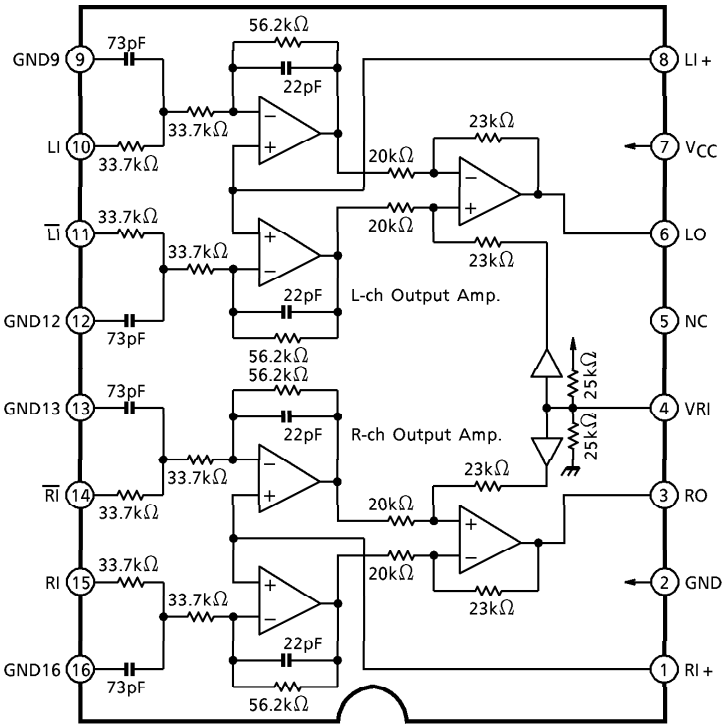
FEATURES

- 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

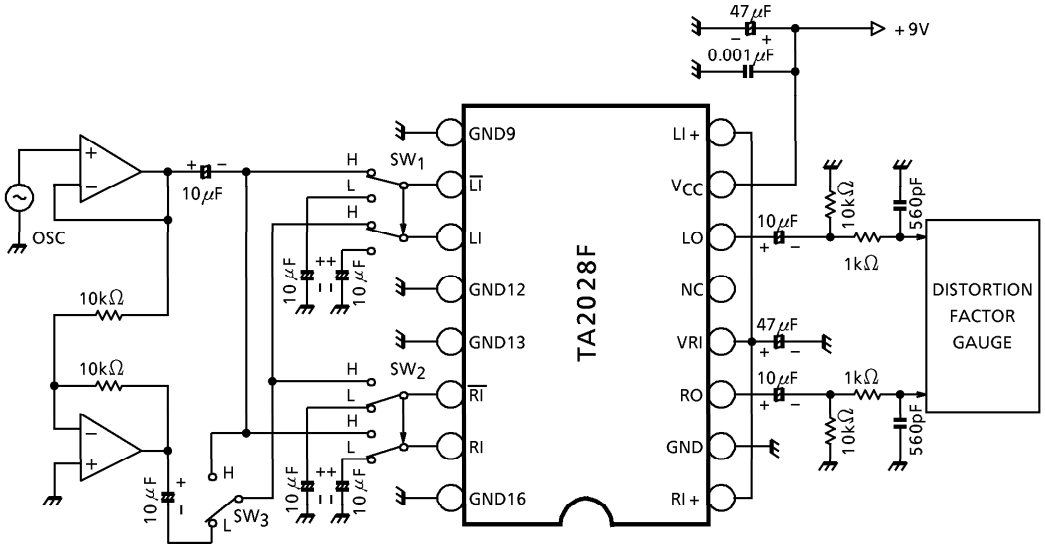
(*) Reduce 2.8mW / °C at Ta = above 25°C.
(**) Reduce 11.2mW / °C at Ta = above 25°C.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 5V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	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

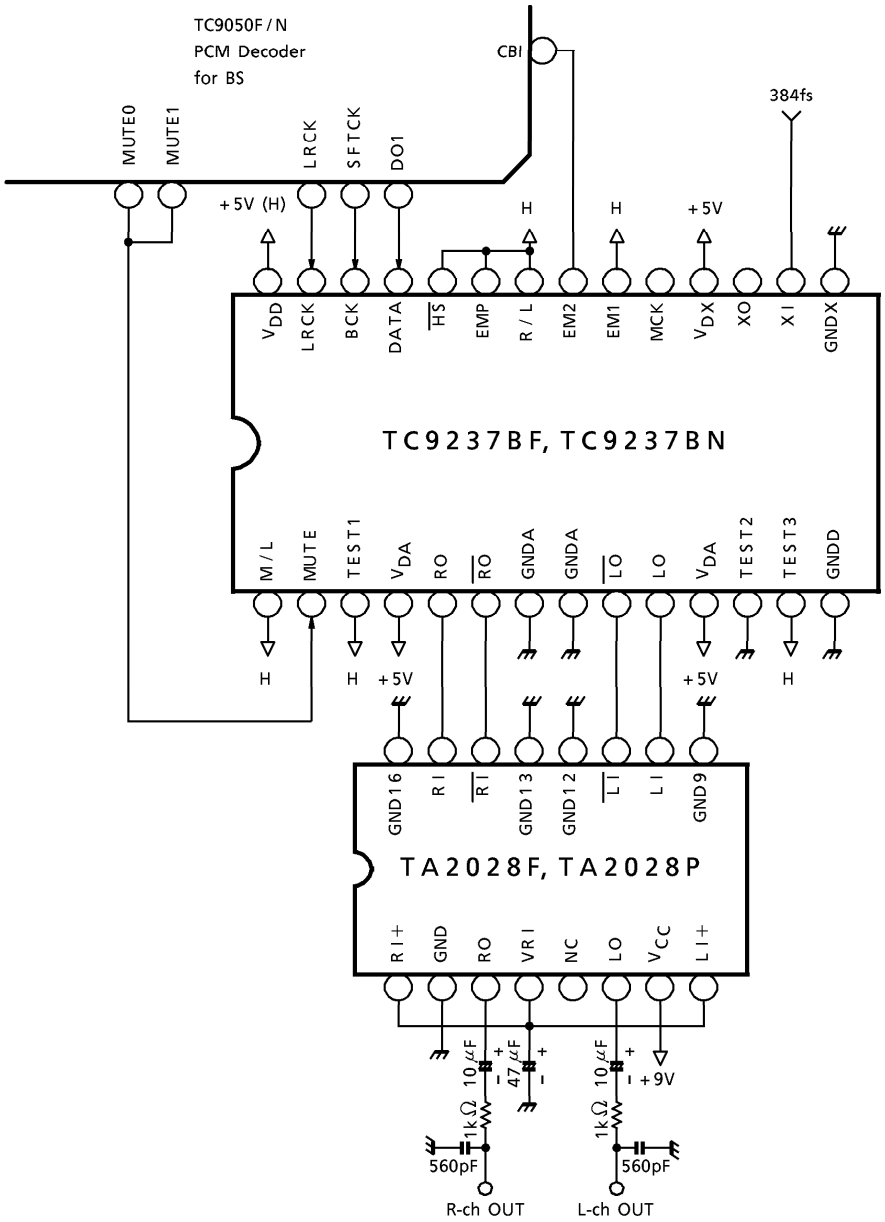
(Note 1) When the TC9237BF, TC9237BN (+5V) and +9V single power supply are operated : Full scale = $2mV_{rms}$ (Typ.).
(Note 2) The amount of attenuations is based on 1 kHz, $V_O = -10\,dBV_{rms}$.
(Note 3) Measuring circuit-1 : indicates the measuring circuit.

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

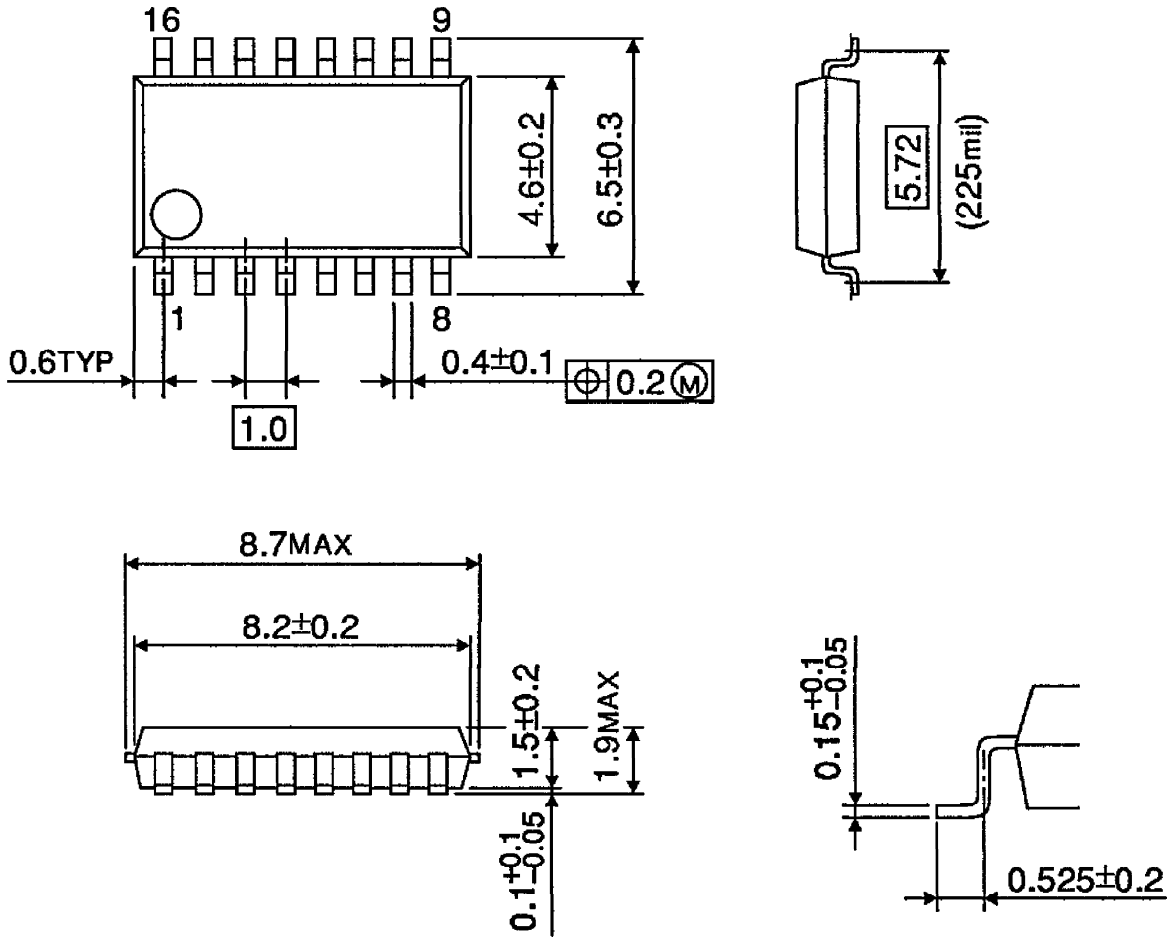


(Cautions)

- 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 pin⑯.
- 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

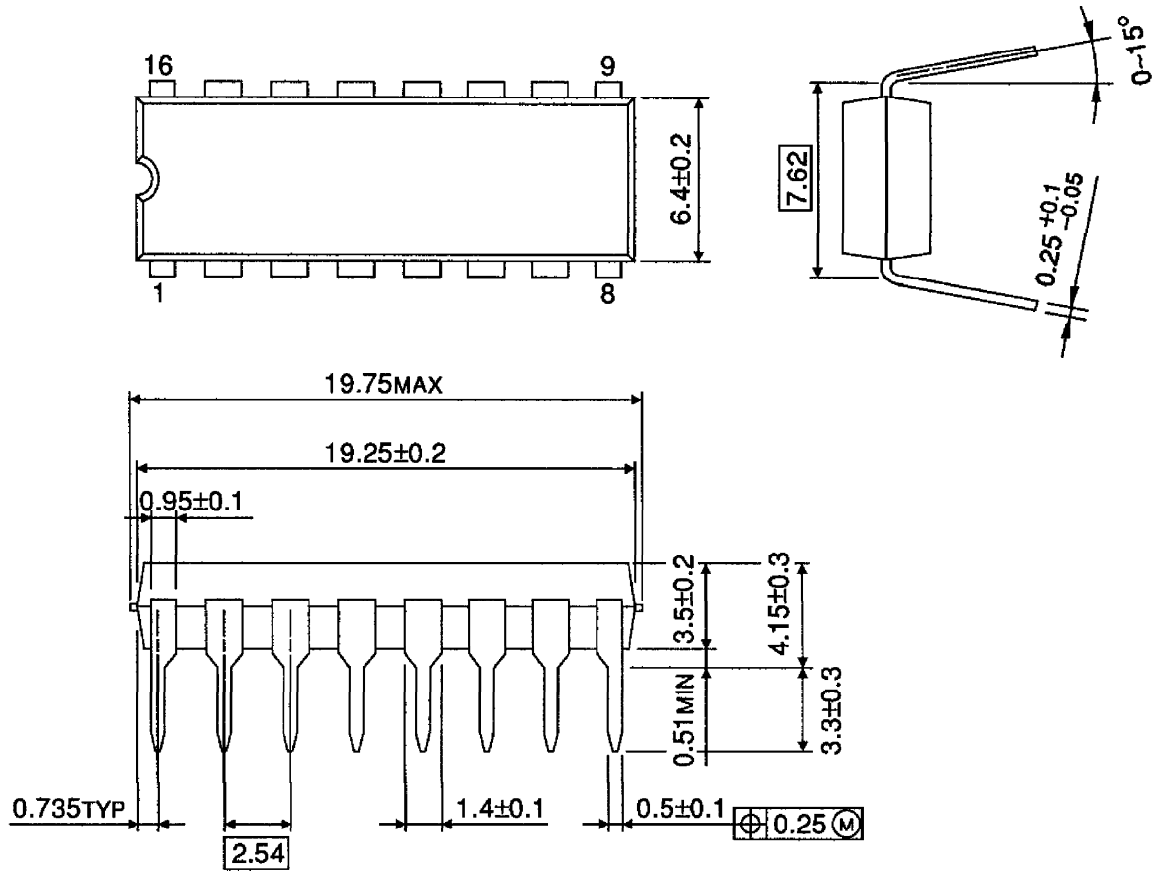


Weight : 0.14g (Typ.)

PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit : mm



Weight : 1.00g (Typ.)