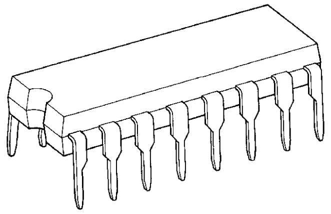
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7792PG, TA7792FG

AM / FM 1 CHIP TUNER SYSTEM IC (1.5V USE)

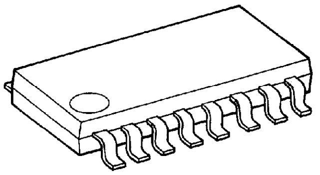
The TA7792PG, TA7792FG are AM / FM 1 chip tuner system (FM FRONT END + AM / FM IF) ICs, which are designed for low voltage operation (1.5V, 3.0V). Those are especially suitable for stereo headphone radio and radio cassette recorder equipments. These item can realize the low power dissipation and few external parts.

TA7792PG



DIP16-P-300-2.54A

TA7792FG



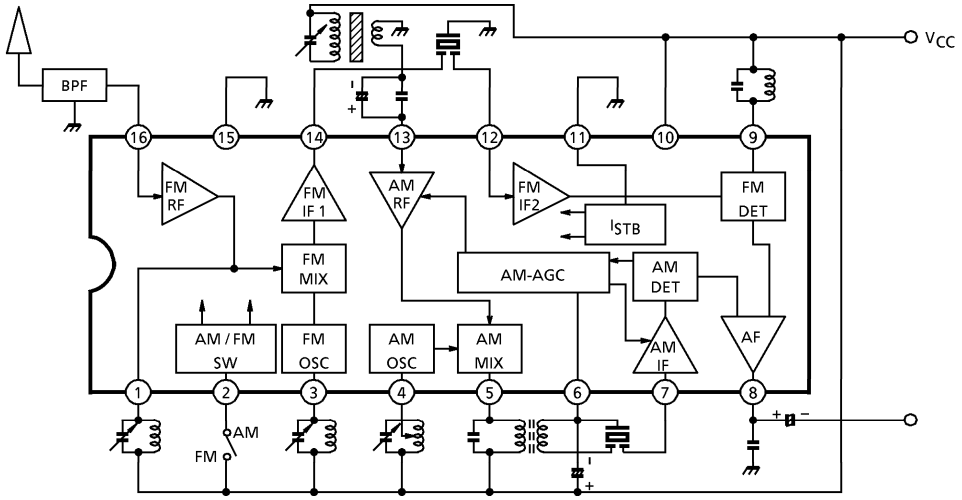
SSOP16-P-225-1.00A

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

FEATURES

- AM detector coil-less
- FM mixer coil-less
- Switchover between AM / FM mode is possible with one-make switch.
- Operating supply voltage range
  $V_{CC\,(opr)} = 0.95\sim5\text{V}$ (Ta = 25°C)
- Excellent low supply current ($V_{CC} = 1.5\text{V}$, Ta = 25°C)
  I_{CC} (AM) = 1.2mA (Typ.)
  I_{CC} (FM) = 4.0mA (Typ.)

BLOCK DIAGRAM



APPLICATION NOTE

<FM SECTION>

- RF amplifier (See Fig.1)

  This stage is composed of the emitter-grounded and cascade connection amplifier.
  The input impedance of pin⑯ is about 260Ω, which is determined by D_1.

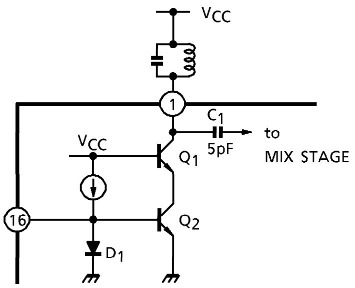


Fig.1

- Mixer amplifier (See Fig.2)

  The amplified RF signal is transformed into IF signal by the mixer circuit which is composed of a differential amplifier.
  The amplified IF signal is appeared through the emitter follower circuit at pin⑭. The output impedance of pin ⑭ is about 300Ω, due to match the impedance of the ceramic filter.

  (Note)

  > The spurious characteristic is determined by the characteristic of the ceramic filter (10.7MHz), because the mixer coil is dispensable. It is possible to improve the spurious characteristic that the two ceramic filters of different characteristics are connected in series.

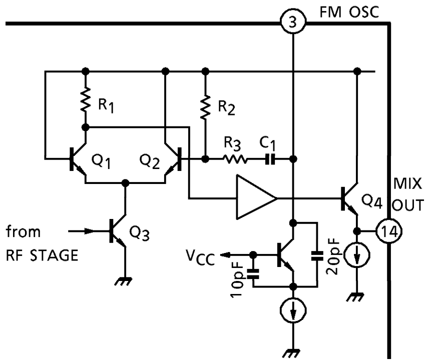


Fig.2

- IF limiter amplifier (See Fig.3)

  The IF limiter amplifier is composed of six emitter-grounded amplifiers and a differential amplifier. The basis composition of the emitter-grounded amplifiers is shown as Fig.3.

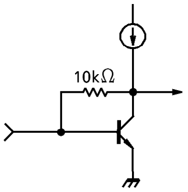


Fig.3

- Detector circuit

  This stage is composed of the quadrature detector circuit, which has double balanced.

<AM SECTION>

- RF amplifier (See Fig.4)

  This stage is composed of emitter-grounded amplifier, the input impedance of which has about 7.3kΩ.
  It is necessary to connect as Fig.4, because the condenser, C_1 is available to the audio by-pass of the RF-AGC, the noise of low frequency.

- Mixer circuit

  The amplified RF signal is transformed into IF signal by the mixer circuit, which is composed of a differential amplifier.

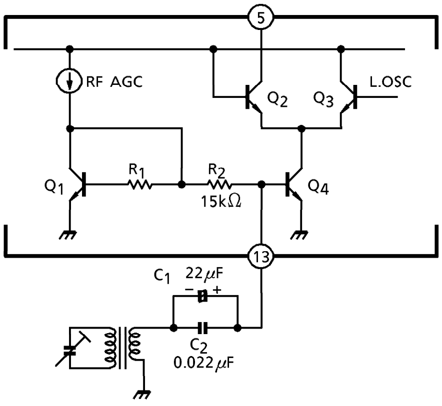


Fig.4

- IF amplifier

  This stage is composed of four emitter-grounded amplifiers and the two differential amplifiers. The input impedance is rather high, because it is changed by the amplitude of input signal (AGC level). So the input terminal of the IF amplifier must be matched with the impedance of ceramic filter.

<COMMON SECTION>

- AM / FM mode switchover

  Switchover between AM / FM mode is possible with one-make switch. In case of the opened, this IC has AM mode.
  Another in case that the terminal is connected to V_{CC} directly, that has FM mode.
  And the terminal of pin② is V_{CC} terminal of FM FRONT END section, too.

- Output circuit (See Fig.5)

  Both of the AM / FM detector signal is appeared through the pin⑧.
  Those output are chosen by the mode switchover.
  At the same time, the output impedance is changed as follow at AM / FM mode, due to cut the AM carrier signal and pass the FM composite signal smoothly, with only one condenser.

  $R_{out\,(AM)} = 8k\Omega$ (Typ.)
  $R_{out\,(FM)} = 1.4k\Omega$ (Typ.)

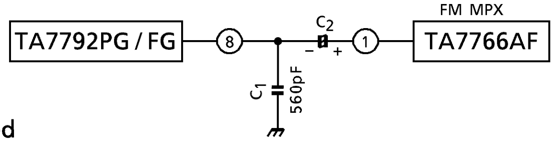


Fig.5

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	5	V
Power Dissipation	TA7792PG	P_D (Note)	750	mW
	TA7792FG		350	
Operating Temperature		T_{opr}	−25~75	°C
Storage Temperature		T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 6mW / °C for TA7792PG, and of 2.8mW / °C for TA7792FG.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, Ta = 25°C, V_{CC} = 1.5V

FM : V_{in} = 60dBμV EMF, f = 83MHz, f_m = 1kHz, Δf = ±22.5kHz

AM : V_{in} = 60dBμV EMF, f = 1MHz, f_m = 1kHz, MOD = 30%

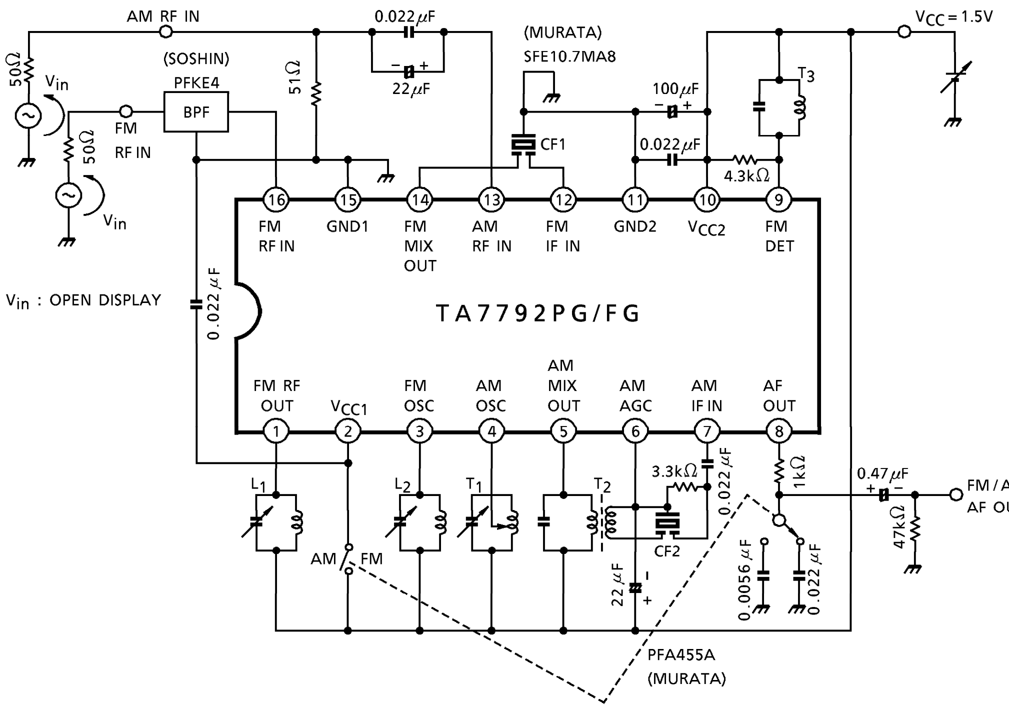
CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current		I_{CC} (FM)	1	V_{in} = 0	—	4.0	5.2	mA
		I_{CC} (AM)	1	V_{in} = 0	—	1.2	1.8	
FM	Input Limiting Voltage	$V_{in\ (lim)}$	1	−3dB limiting	—	10	16	dBμV EMF
	Total Harmonic Distortion	THD (FM)	1		—	0.25	—	%
	Signal To Noise Ratio	S / N (FM)	1		—	62	—	dB
	Quiescent Sensitivity	Q_S	1	S / N = 30dB	—	12	—	dBμV EMF
	AM Rejection Ratio	AMR	1	MOD = 30%	—	30	—	dB
	Oscillator Voltage	V_{osc}	2	f = 60MHz	53	90	135	mVrms
	Oscillator Stop Supply Voltage	V_{stop} (FM)	1	$V_{in} < -20$dBμV EMF	—	0.85	0.95	V
	Recovered Output Voltage	V_{OD} (FM)	1		28	45	68	mVrms
AM	Voltage Gain	G_V	1	V_{in} = 30dBμV EMF	14	25	50	mVrms
	Recovered Output Voltage	V_{OD} (AM)	1		25	40	60	mVrms
	Total Harmonic Distortion	THD (AM)	1		—	1.5	—	%
	Signal To Noise Ratio	S / N (AM)	1		—	40	—	dB
	Oscillator Stop Supply Voltage	V_{stop} (AM)	1	$V_{in} < -20$dBμV EMF	—	0.85	0.95	V
Output Resistance Pin⑧	FM	R_o (FM)	1	f = 1kHz	—	1.4	—	kΩ
	AM	R_o (AM)	1	f = 1kHz	—	8	—	

※ V_{in} : Open Display

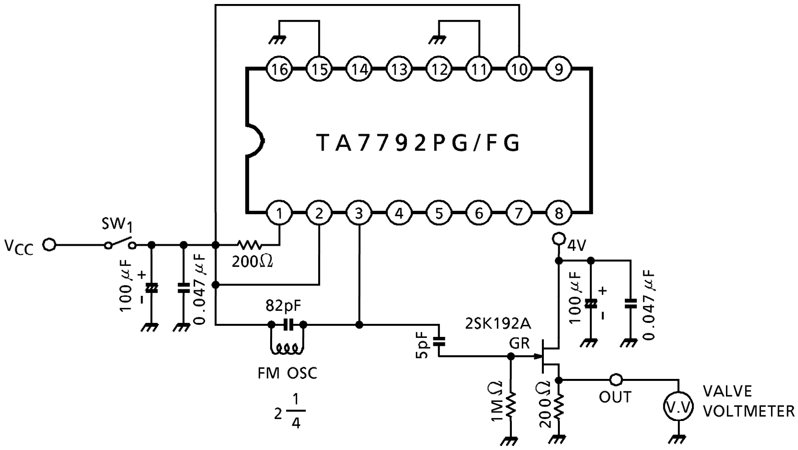
TERMINAL VOLTAGE : Terminal voltage at no signal with test circuit ($V_{CC} = 1.5V$, $Ta = 25°C$)

PIN No.	PIN NAME	SYMBOL	TYP.		UNIT	PIN No.	PIN NAME	SYMBOL	TYP.		UNIT
			AM	FM					AM	FM	
1	FM RF OUT	V_1	—	1.5	V	9	FM DET	V_9	1.5	1.5	V
2	V_{CC1}	V_2	—	1.5	V	10	V_{CC2}	V_{10}	1.5	1.5	V
3	FM OSC	V_3	—	1.5	V	11	GND2	V_{11}	0	0	V
4	AM OSC	V_4	1.5	1.5	V	12	FM IF IN	V_{12}	—	0.7	V
5	AM MIX OUT	V_5	1.5	1.5	V	13	AM RF IN	V_{13}	0.7	—	V
6	AM AGC	V_6	0.8	—	V	14	FM MIX OUT	V_{14}	—	0.8	V
7	AM IF IN	V_7	1.4	1.5	V	15	GND1	V_{15}	0	0	V
8	AF OUT	V_8	0.6	0.6	V	16	FM RF IN	V_{16}	—	0.7	V

TEST CIRCUIT 1

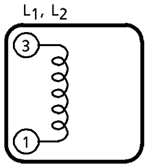


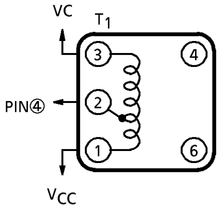
TEST CIRCUIT 2

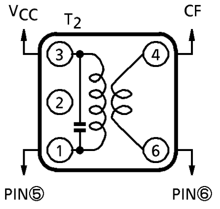


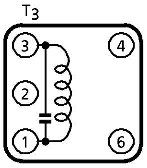
COIL DATA (Test circuit) Ⓢ : SUMIDA ELECTRIC Co., Ltd.

COIL STAGE	TEST FREQUENCY	L (μH)	C_0 (pF)	Q_0	TURN				WIRE (mmφ)	REFERENCE
					1-2	2-3	1-3	4-6		
L_1 FM RF	100MHz	0.053	—	100	—	—	$1\frac{3}{4}$	—	0.5UEW	Ⓢ 0258-000-020
L_2 FM OSC	100MHz	0.065	—	100	—	—	$2\frac{1}{4}$	—	0.5UEW	Ⓢ 0258-000-021
T_1 AM OSC	796kHz	288	—	115	13	73	—	—	0.08UEW	Ⓢ 4147-1356-038
T_2 AM IFT	455kHz	—	180	120	—	—	180	15	0.06UEW	Ⓢ 2150-2162-165
T_3 FM DET	10.7MHz	—	82	110	—	—	13	—	0.12UEW	Ⓢ 4152-4095-015



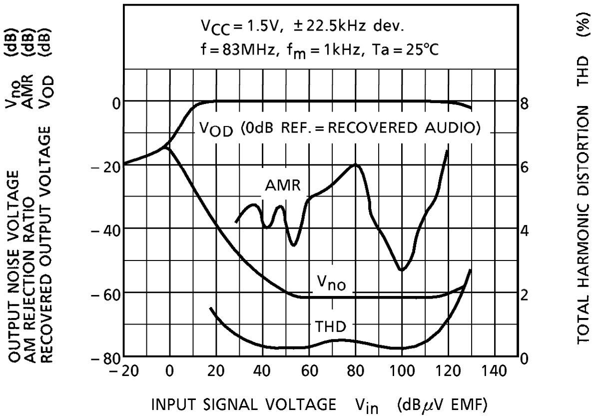




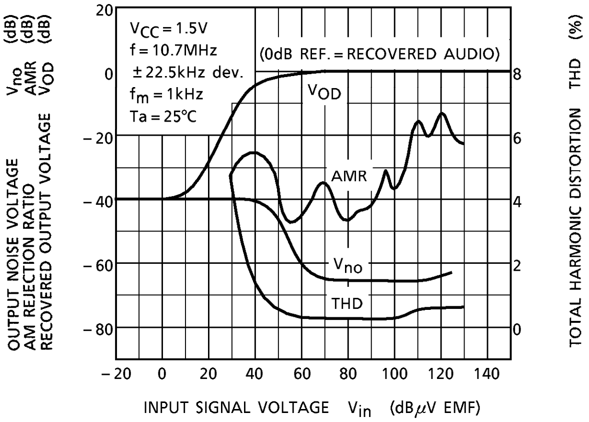


CHARACTERISTICS CURVES

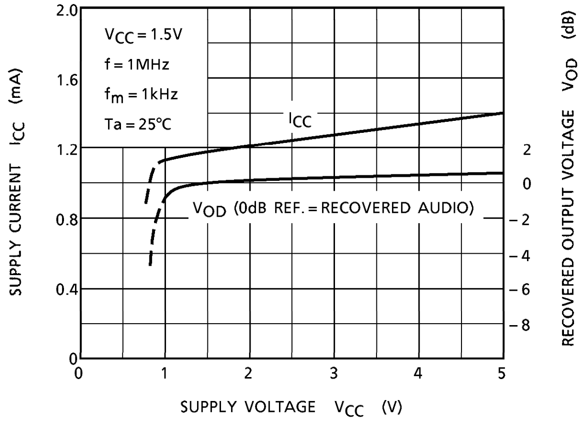
FM (F / E + IF) V_{OD}, AMR, V_{no}, THD – V_{in}



FM (IF) V_{OD}, AMR, V_{no}, THD – V_{in}

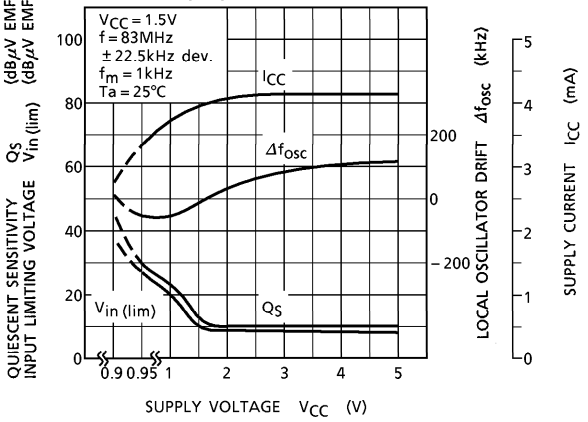


AM I_{CC}, V_{OD} – V_{CC}

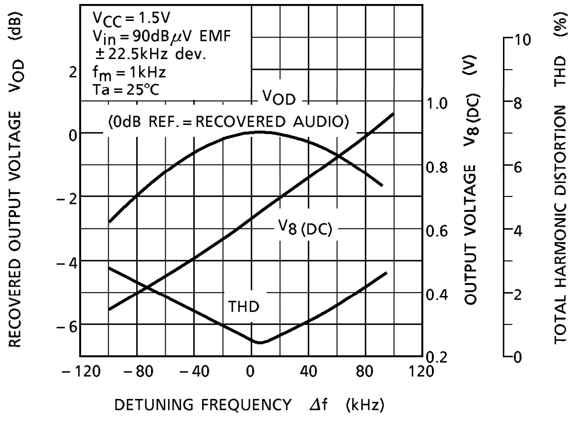


FM (F / E + IF)

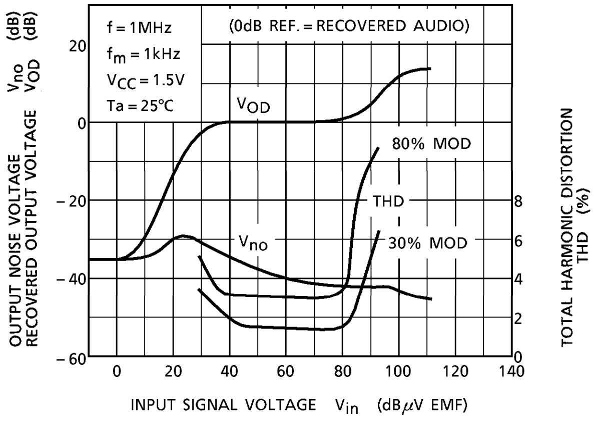
Q_S, $V_{in\,(lim)}$, Δf_{osc}, I_{CC} – V_{CC}



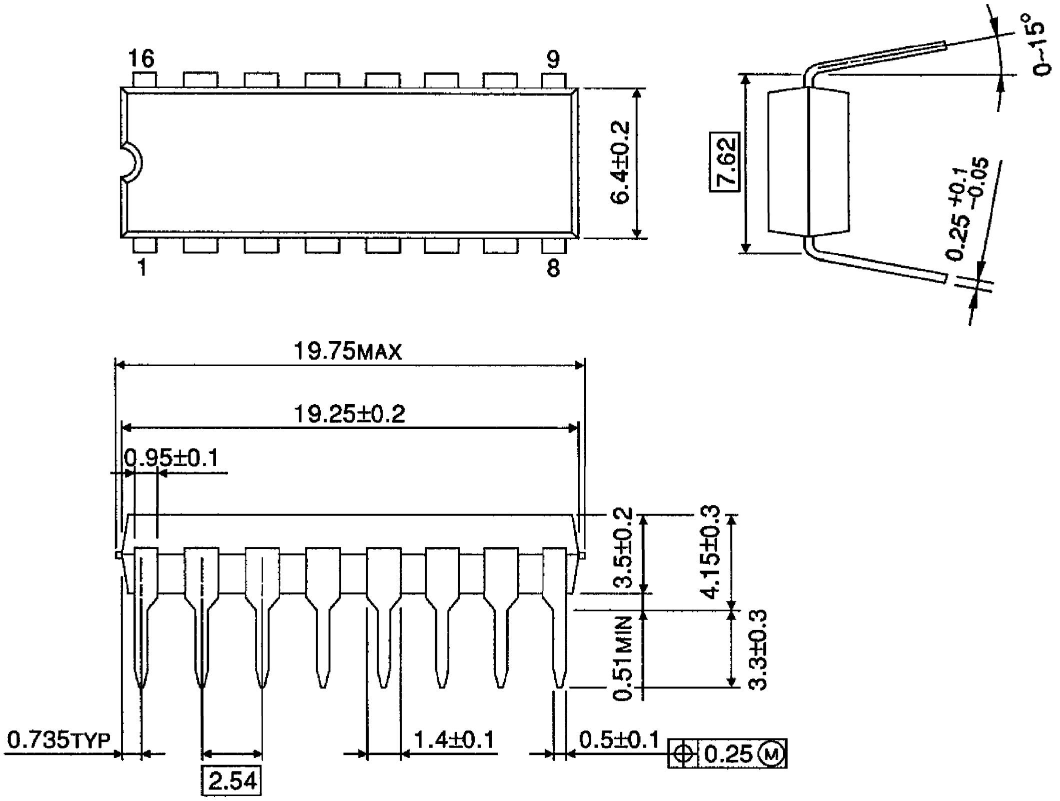
FM (IF) V_{OD}, $V_{8\,(DC)}$, THD – Δf



AM V_{OD}, V_{no}, THD – V_{in}



PACKAGE DIMENSIONS
DIP16-P-300-2.54A Unit : mm

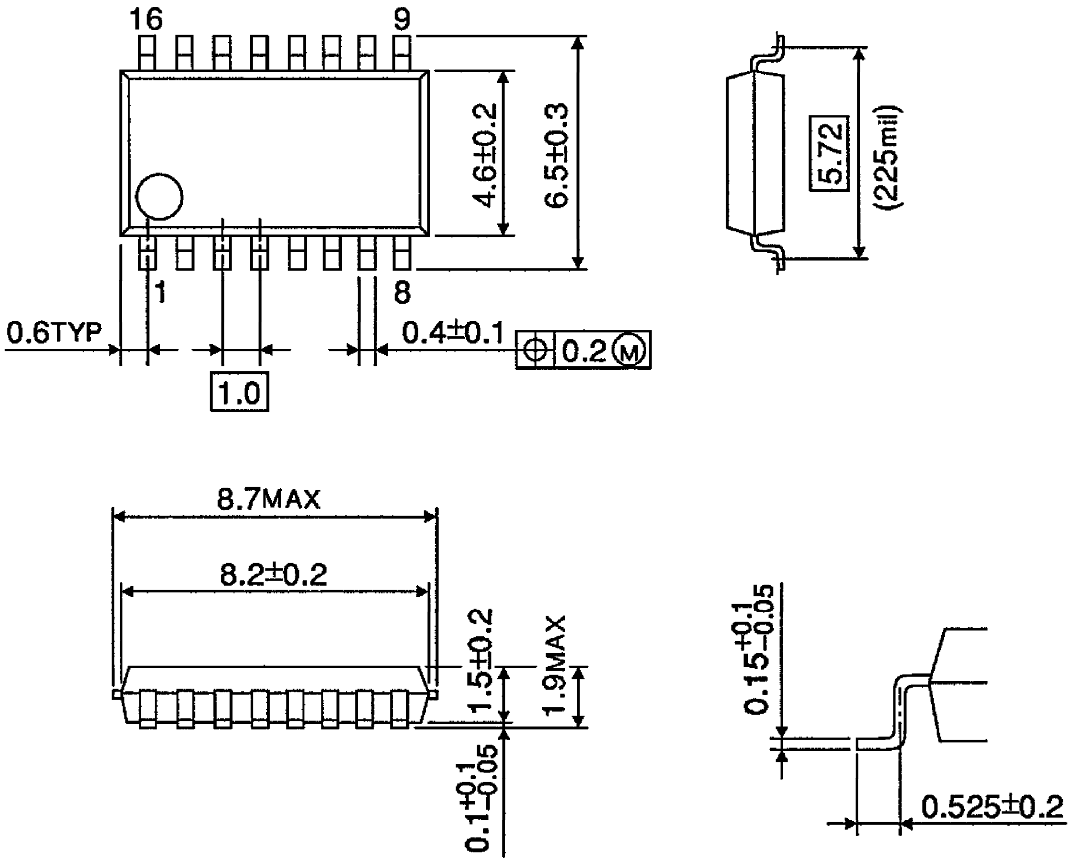


Weight : 1.00g (Typ.)

PACKAGE DIMENSIONS

SSOP16-P-225-1.00A

Unit : mm



Weight : 0.14g (Typ.)

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About solderability, following conditions were confirmed

- Solderability
  (1) Use of Sn-37Pb solder Bath
    · solder bath temperature = 230°C
    · dipping time = 5 seconds
    · the number of times = once
    · use of R-type flux
  (2) Use of Sn-3.0Ag-0.5Cu solder Bath
    · solder bath temperature = 245°C
    · dipping time = 5 seconds
    · the number of times = once
    · use of R-type flux