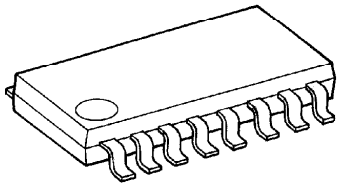
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7765AF

AM / FM IF SYSTEM (1.5V USE)

The TA7765AF is an AM / FM IF system IC designed for low voltage operation (1.5V), which is especially suitable for a stereo headphone radio and a radio cassette recorder. This IC can realize the low power dissipation and few external parts.



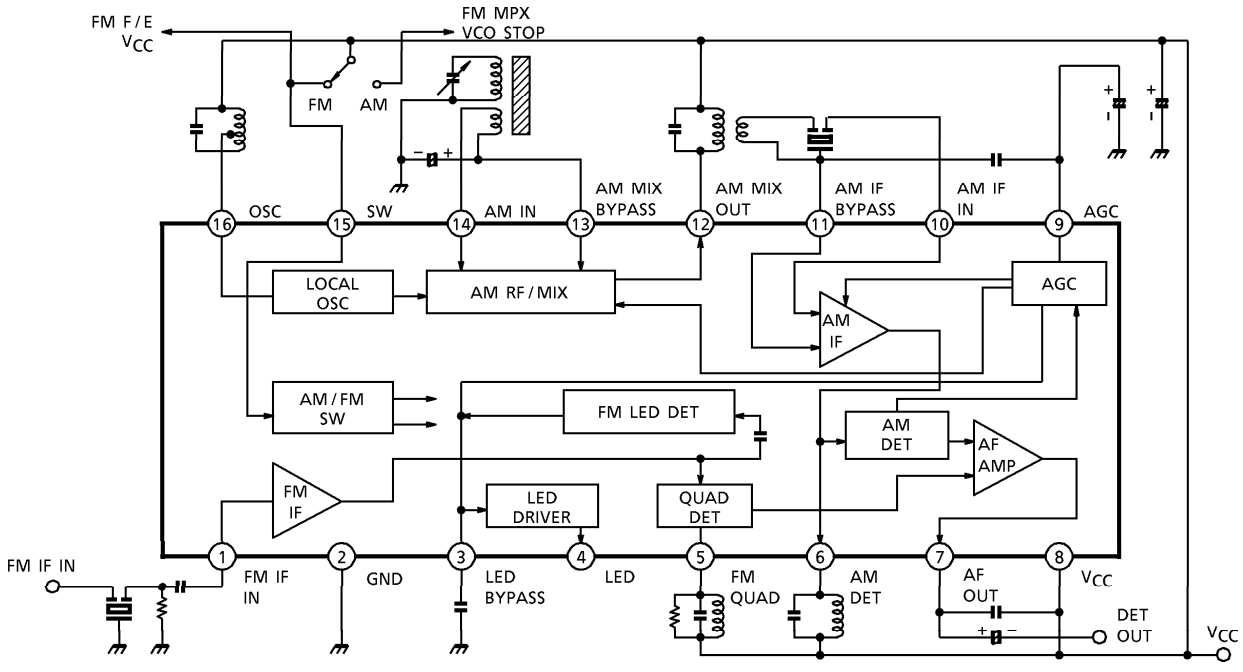
SSOP16-P-225-1.00A

Weight : 0.14g (Typ.)

FEATURES

- Including the AM / FM switch.
- Including the single output terminal for AM / FM.
- Including the LED driver for tuning indicator. ($V_{LED} \geqq 2.5V$)
- Few external parts and small installed area.
- Excellent supply current : (V_{CC} = 1.5V, Ta = 25°C)
  AM : I_{CC} = 1.1mA (Typ.)
  FM : I_{CC} = 1.8mA (Typ.)
- Operating supply voltage range.
  : $V_{CC\ (opr)}$ = 0.95~5V (Ta = 25°C)

BLOCK DIAGRAM



961001EBA2

APPLICATION NOTE

(1) FM-IF input stage

The terminal pin① is the FM-IF input terminal which is the base of common-emitter transistor. (Fig.1)

(2) FM-IF stage

This is composed of the six stage of the common-emitter amplifiers with active loads. As the third stage and the fourth stage are connected with internal coupling condenser, it is composed of HPF. Therefore, it is possible to reduce the noise of low frequency range.

(3) AM input stage

The terminal pin⑭ is the AM input terminal which is the base of common-emitter transistor.
And this transistor is the current source of the Mixer which is composed of emitter coupled pair transistors. (Fig.2)

(4) AM-IF input stage

The AM-IF signal from the MIX OUT terminal (pin⑫) is applied to the AM-IF input terminal (pin⑩) through the transformer.
The terminal pin⑩ is the base of common-emitter transistor, and the input resistance is 3kΩ (Typ.).

(5) AGC circuit

This AGC circuit is composed of the internal Double-AGC get high applied widely.

- medium input : AGC applied to IF section.
- strong input : AGC applied to RF and IF section.

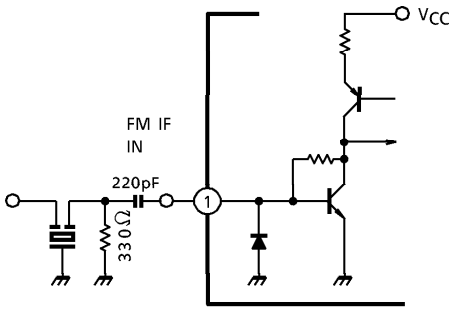


Fig.1

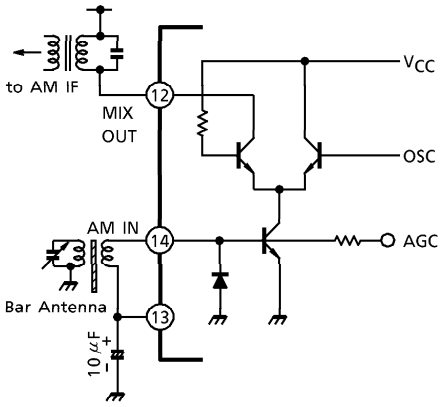


Fig.2

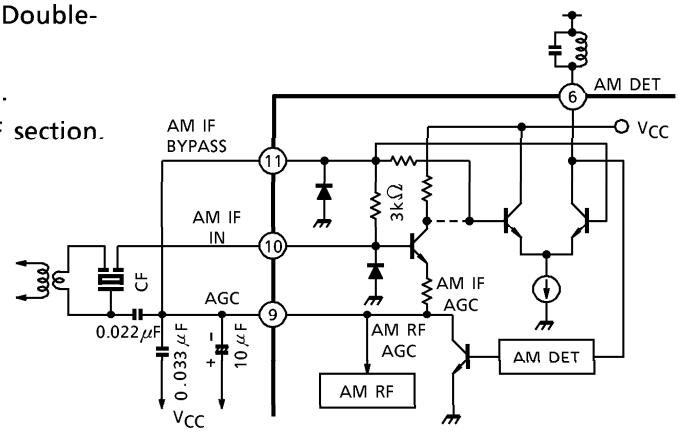


Fig.3

(6) Output buffer amplifier (AF)

The output impedance differs in FM / AM mode. At FM mode, it is low output impedance due to pass the sub-carrier. On the other hand, at AM mode, it is high output impedance due to high frequency-cut easily.

R_{OUT} (FM) = 1.3kΩ (Typ.)

R_{OUT} (AM) = 8kΩ (Typ.)

(7) LED driver

Fig.4 shows the LED driver.
The "LED supply voltage" must be more than about 2.5V, for using this function.
Without the LED, it is necessary to connect the terminal pin④ to GND, then the supply current is reduced.

(8) FM / AM mode switch circuit

When the terminal pin⑮ is connected to V_{CC} directly, the FM mode is given, and when this terminal is opened, the AM mode is given.
In case of connecting as Fig.5, one-circuit switch is enough to stop the VCO at AM mode.

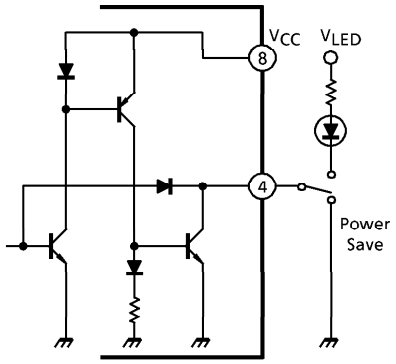


Fig.4

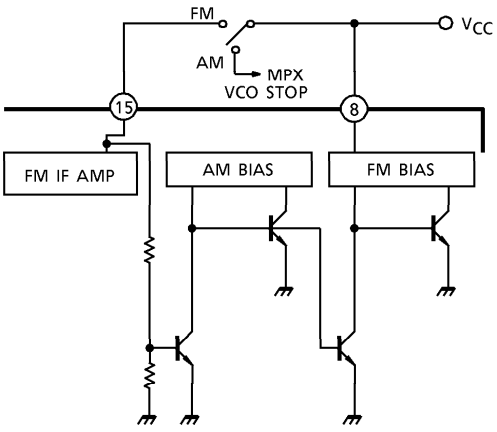


Fig.5

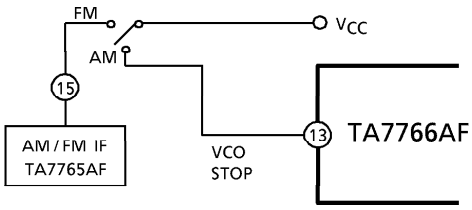


Fig.6

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	5	V
Lamp Voltage	V_{LAMP}	6	V
Lamp Current	I_{LAMP}	5	mA
Power Dissipation	P_D (Note)	350	mW
Operating Temperature	T_{opr}	−25~75	°C
Storage Temperature	T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 2.8mW / °C.

ELECTRICAL CHARACTERISTICS

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

FM : f = 10.7MHz, Δf = ±22.5kHz, f_m = 1kHz, V_{in} = 90dBμV EMF

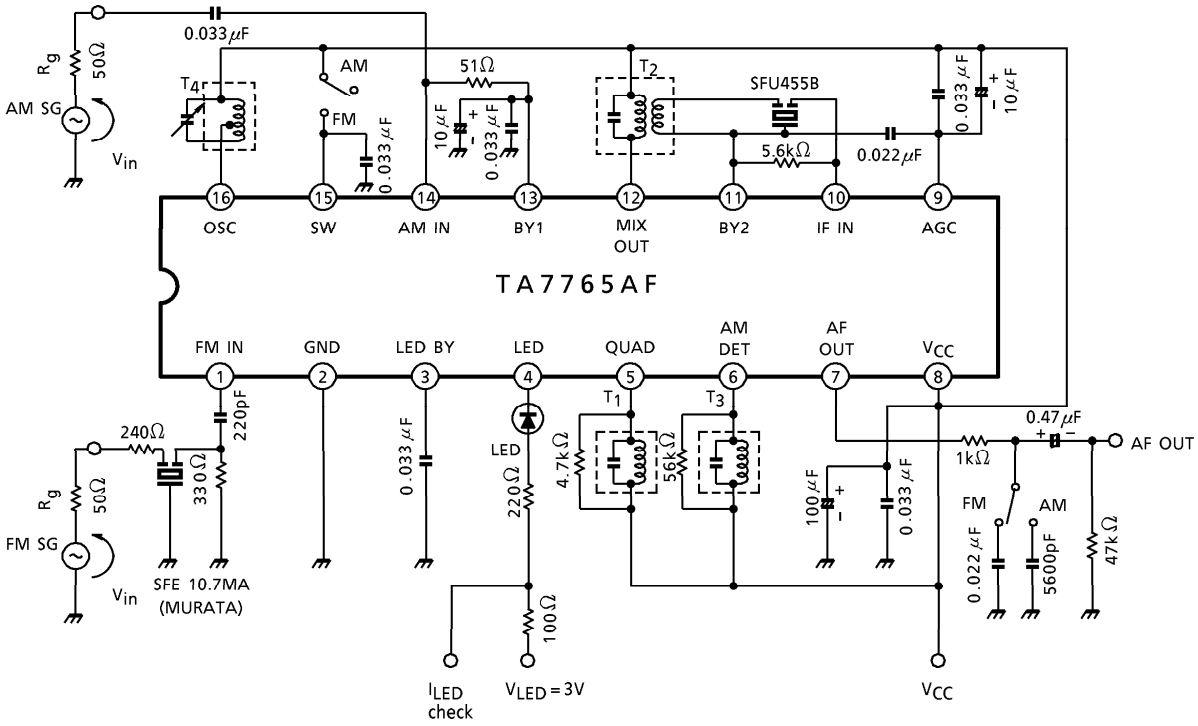
AM : f = 1MHz, MOD = 30%, f_m = 1kHz, V_{in} = 60dBμV EMF

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current		I_{CC} (1)	—	FM V_{in} = 0	—	1.8	2.8	mA
		I_{CC} (2)		AM V_{in} = 0	—	1.1	1.8	
FM	Input Limiting Voltage	V_{in} (lim)	—	−3dB Limiting point	—	53	59	dBμV EMF
	Recovered Output Voltage	V_{OD}	—		28	48	60	mV_{rms}
	Signal To Noise Ratio	S / N	—		—	62	—	dB
	Total Harmonic Distortion	THD	—		—	0.5	—	%
	AM Rejection Ratio	AMR	—	MOD = 30%	—	22	—	dB
	Lamp On Sensitivity	V_L	—	I_L = 1mA	—	48	56	dBμV EMF
AM	Gain	G_V	—	V_{in} = 30dBμV EMF	10	32	50	mV_{rms}
	Recovered Output Voltage	V_{OD}	—		30	48	75	mV_{rms}
	Signal To Noise Ratio	S / N	—		—	40	—	dB
	Total Harmonic Distortion	THD	—		—	1.6	—	%
	Lamp On Sensitivity	V_L	—	I_L = 1mA	—	30	—	dBμV EMF
	Local OSC Stop Voltage	V_{stop}	—		—	—	0.95	V
Pin⑦ Output Resistance		R_O (FM)	—	f = 1kHz	—	1.3	—	kΩ
		R_O (AM)			—	8	—	

DC CHARACTERISTICS (V_{CC} = 1.5V, Ta = 25°C, terminal voltage at no signal)

PIN No.	SYMBOL	TYP.		UNIT
		AM	FM	
PIN ① (FM IF IN)	V_1	—	0.7	V
PIN ② (GND)	V_2	0	0	V
PIN ③ (LED BYPASS)	V_3	—	—	V
PIN ④ (LED)	V_4	—	—	V
PIN ⑤ (FM QUAD DET)	V_5	1.5	1.5	V
PIN ⑥ (AM DET)	V_6	1.5	1.5	V
PIN ⑦ (AF OUT)	V_7	0.6	0.7	V
PIN ⑧ (V_{CC})	V_8	1.5	1.5	V
PIN ⑨ (AGC)	V_9	0.8	—	V
PIN ⑩ (AM IF IN)	V_{10}	1.4	1.5	V
PIN ⑪ (AM IF BYPASS)	V_{11}	1.4	1.5	V
PIN ⑫ (AM MIX OUT)	V_{12}	1.5	1.5	V
PIN ⑬ (AM MIX BYPASS)	V_{13}	0.7	—	V
PIN ⑭ (AM IN)	V_{14}	0.7	—	V
PIN ⑮ (SW)	V_{15}	—	1.5	V
PIN ⑯ (OSC)	V_{16}	1.5	1.5	V

TEST CIRCUIT

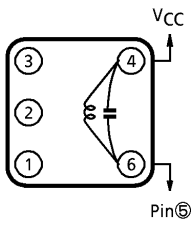


COIL DATA (Test circuit) Ⓢ : SUMIDA ELECTRIC Co., Ltd.

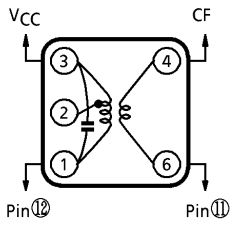
COIL No.	STAGE	f	L (μH)	CO (pF)	QO	TURN				WIRE (mmϕ)	REF.
						1-2	2-3	1-3	4-6		
T_1	FM DET	10.7MHz	—	82	130	—	—	—	11	0.12UEW	Ⓢ 0133-3099-181
T_2	AM IFT	455kHz	—	180	110	88	60	—	8	0.07UEW	Ⓢ 48T-037-423
T_3	AM DET	455kHz	—	180	110	146	6	—	13	0.07UEW	Ⓢ 44M-037-935C
T_4	AM OSC	796kHz	288	—	125	13	75	—	—	0.08UEW	Ⓢ 0137-135-262

(Bottom view)

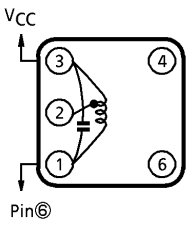
T_1 FM DET



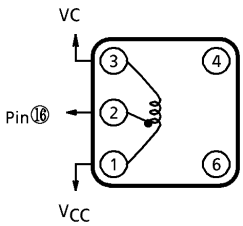
T_2 AM IFT



T_3 AM DET

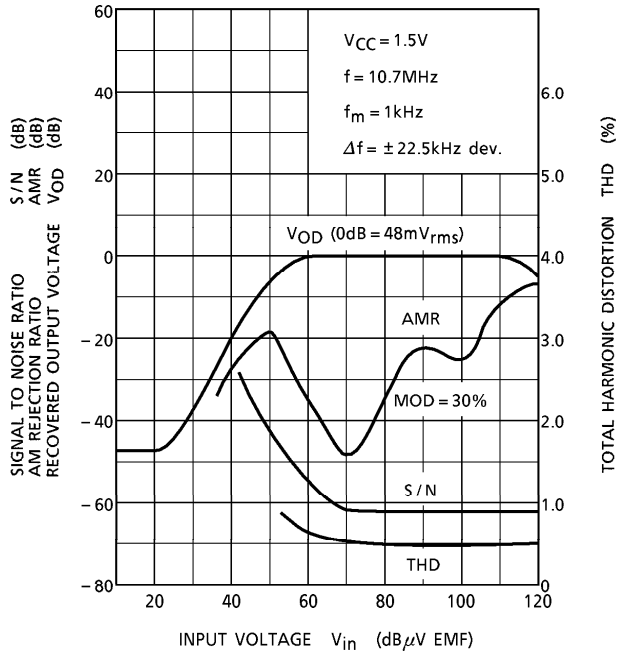


T_4 AM OSC

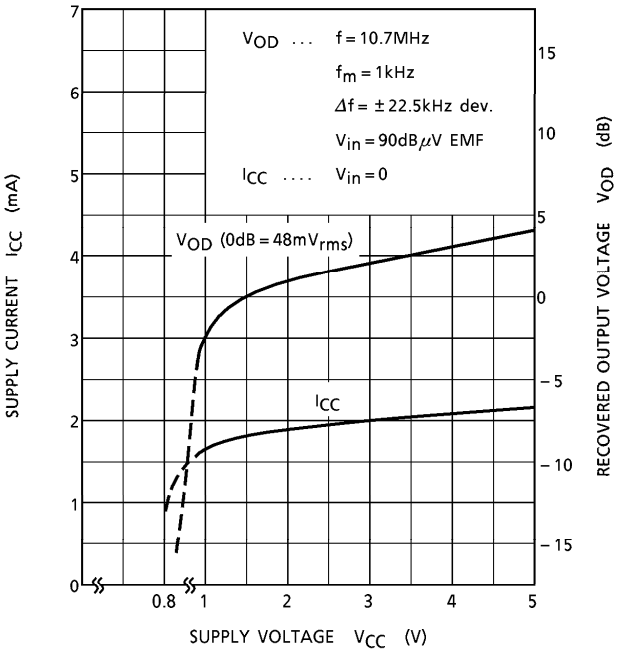


FM

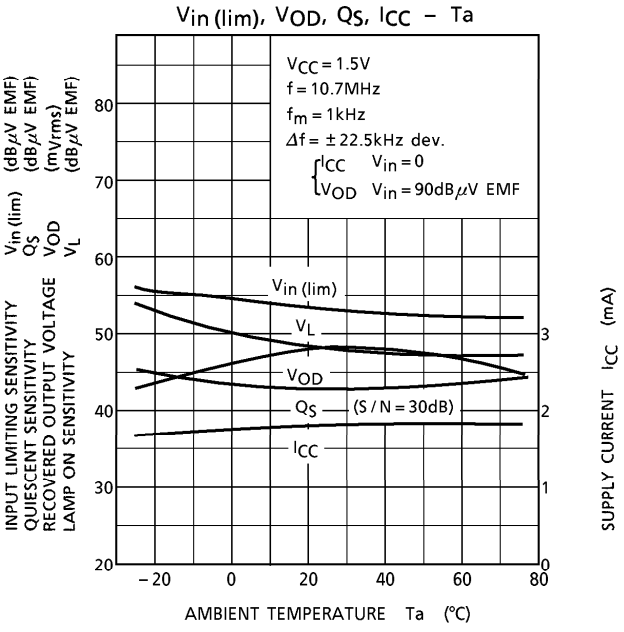
V_{OD}, AMR, S/N, THD – V_{in}



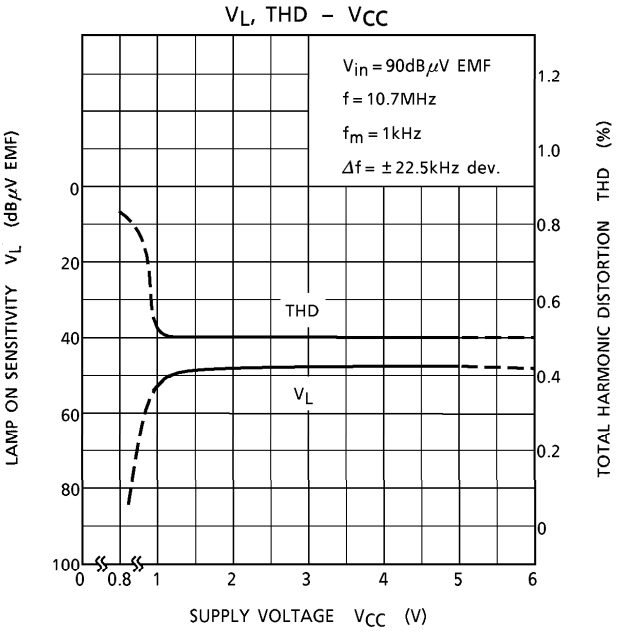
I_{CC}, V_{OD} – V_{CC}



$V_{in\,(lim)}$, V_{OD}, Q_S, I_{CC} – Ta

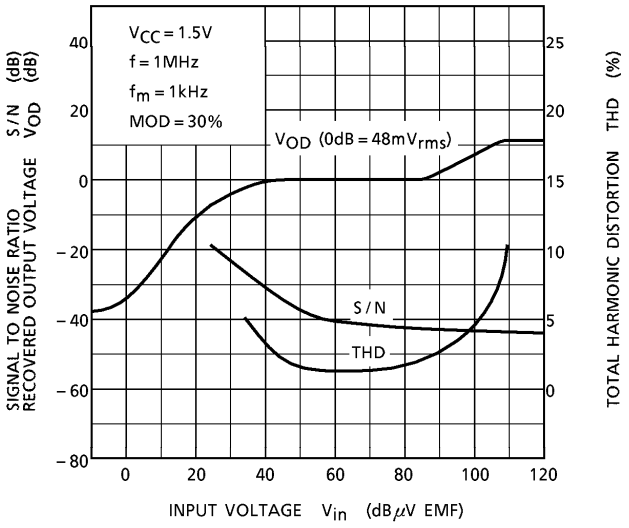


V_L, THD – V_{CC}

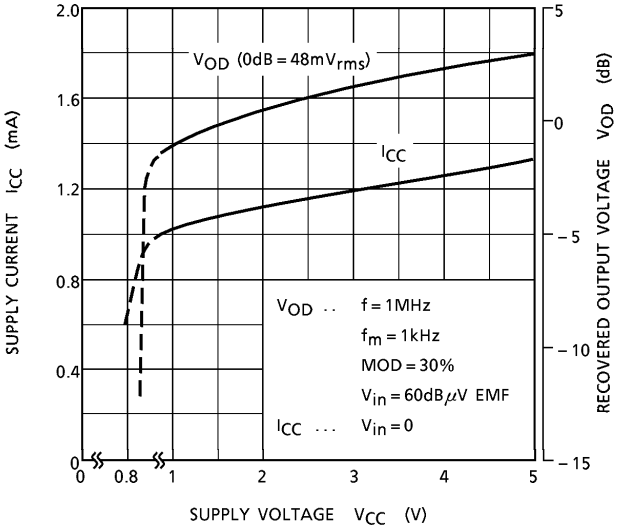


AM

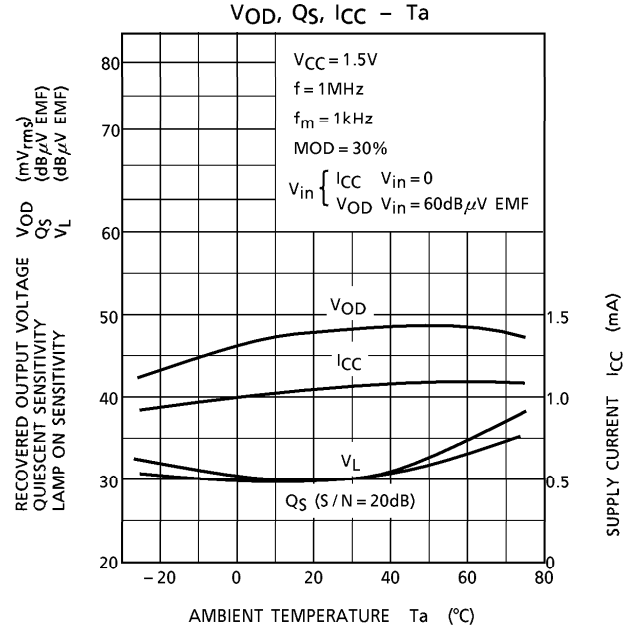
V_{OD}, S/N, THD – V_{in}



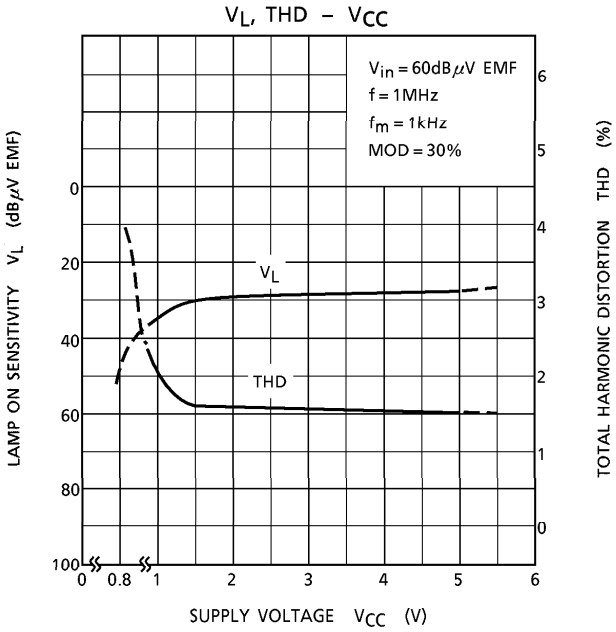
I_{CC}, V_{OD} – V_{CC}



V_{OD}, Q_S, I_{CC} – Ta



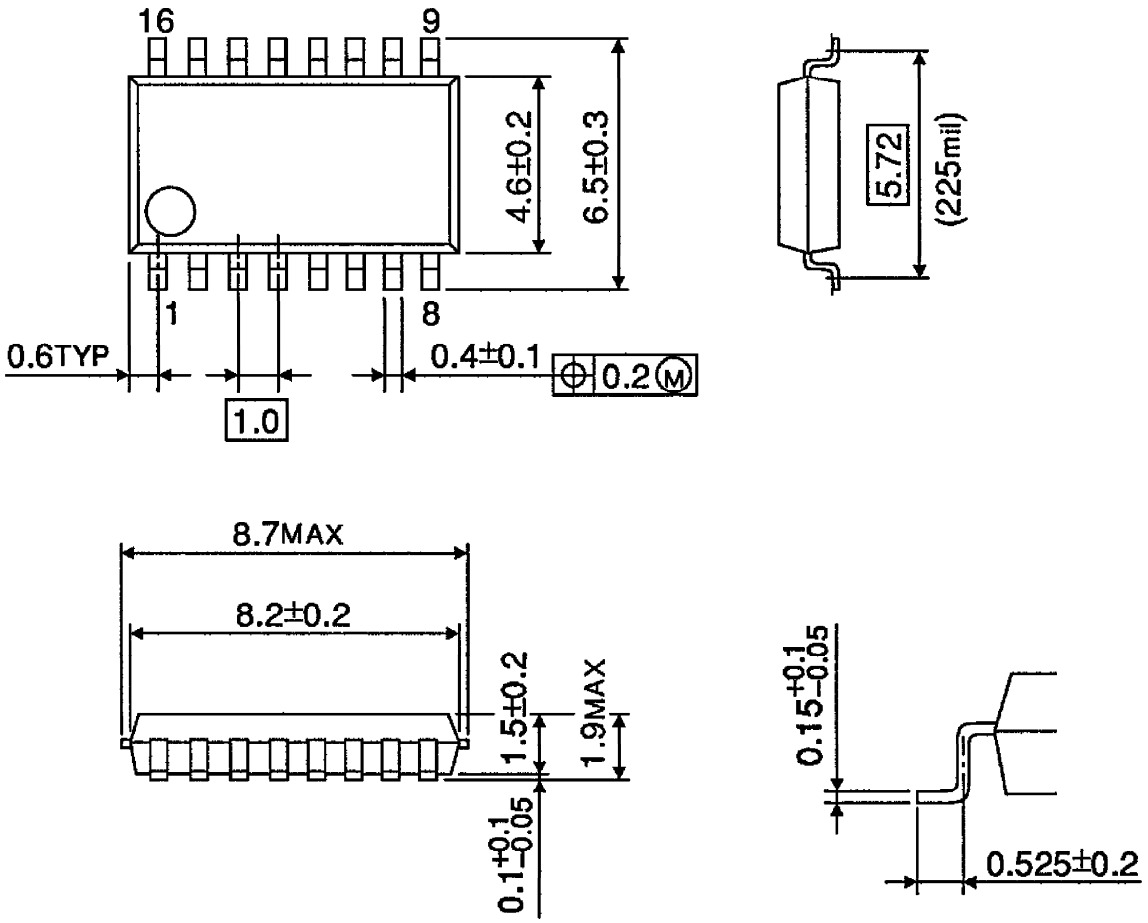
V_L, THD – V_{CC}



OUTLINE DRAWING

SSOP16-P-225-1.00A

Unit : mm



Weight : 0.14g (Typ.)