

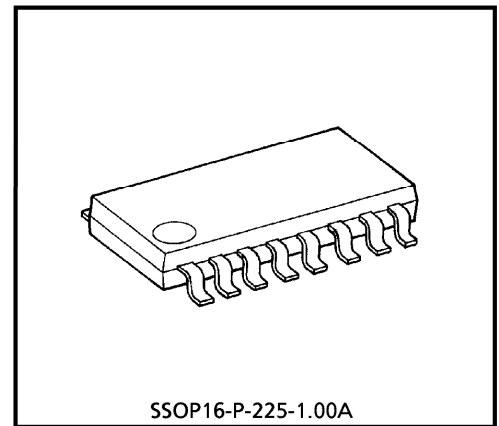
TA7765AF

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.

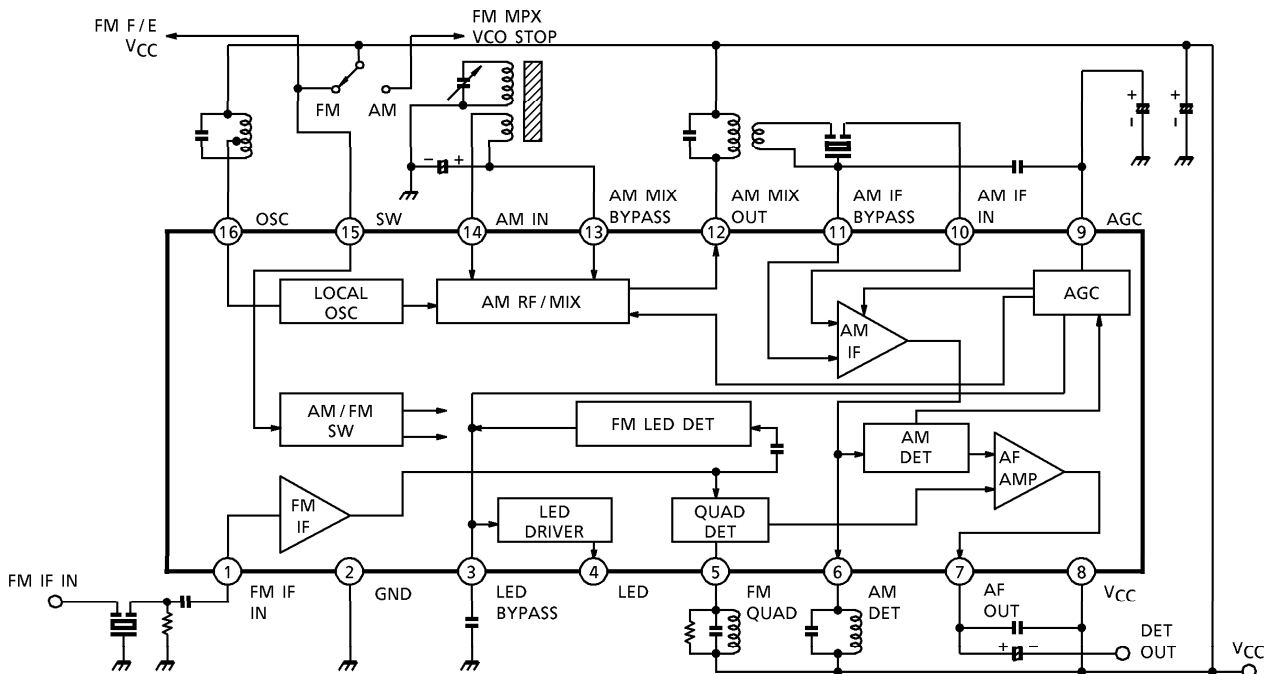
FEATURES

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



Weight : 0.14g (Typ.)

BLOCK DIAGRAM



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.

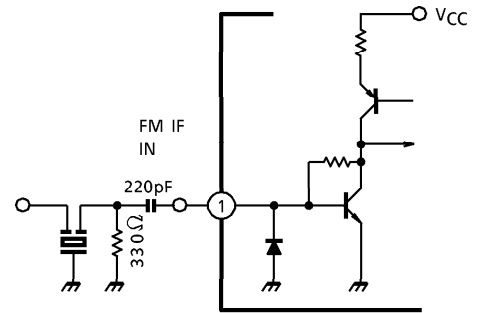


Fig.1

(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.).

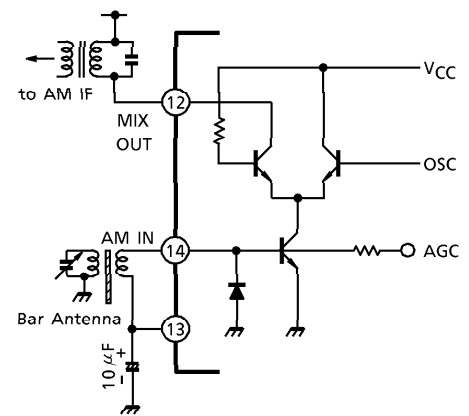


Fig.2

(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.

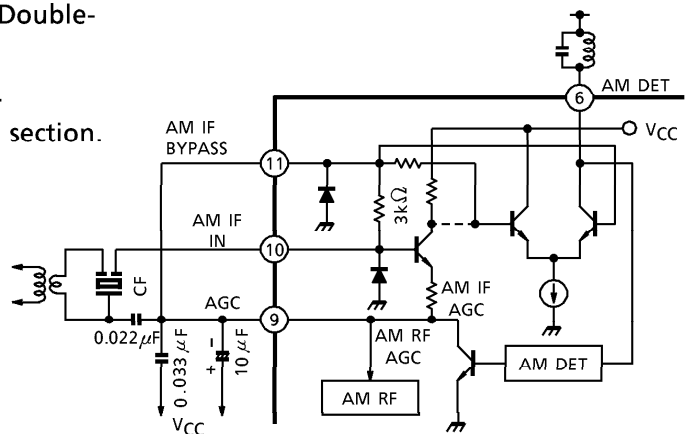


Fig.3

(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.

$$R_{OUT}(FM) = 1.3k\Omega \text{ (Typ.)}$$

$$R_{OUT}(AM) = 8k\Omega \text{ (Typ.)}$$

(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 VCC 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.

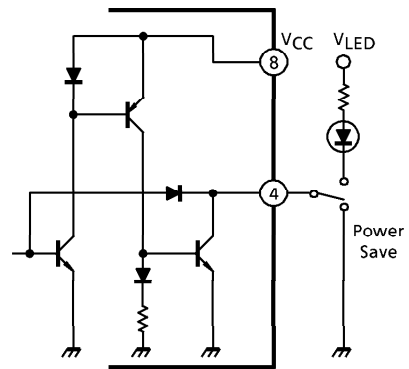


Fig.4

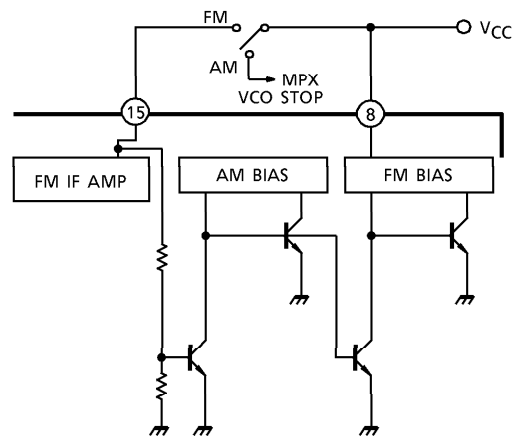


Fig.5

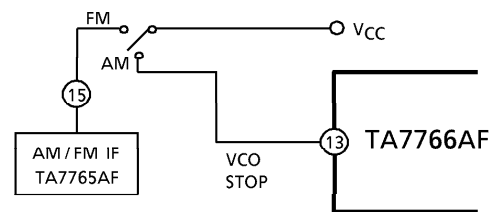


Fig.6

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} = 90dB_μV EMF

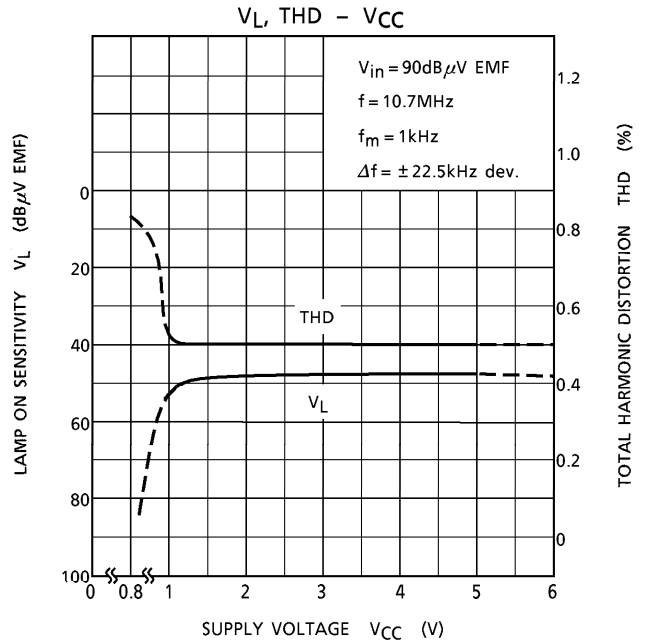
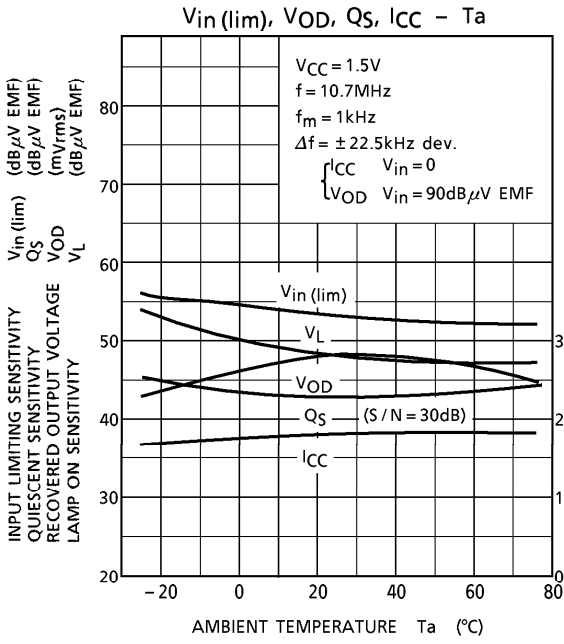
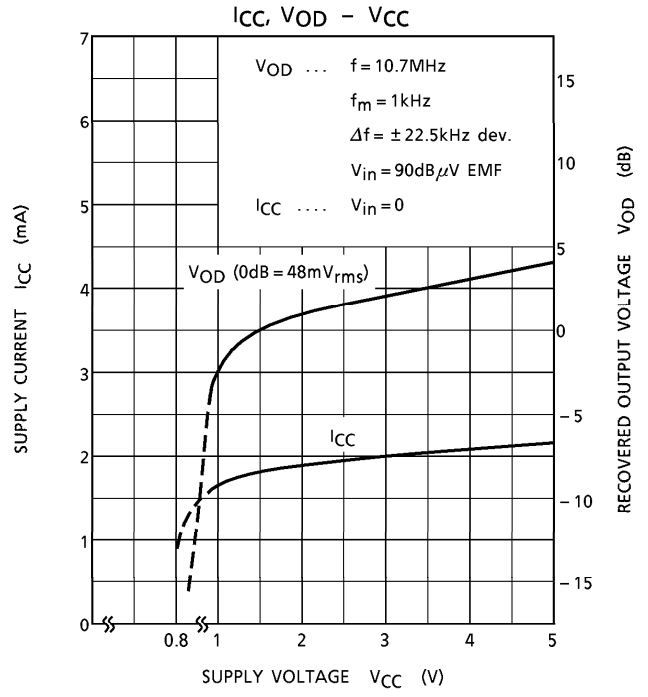
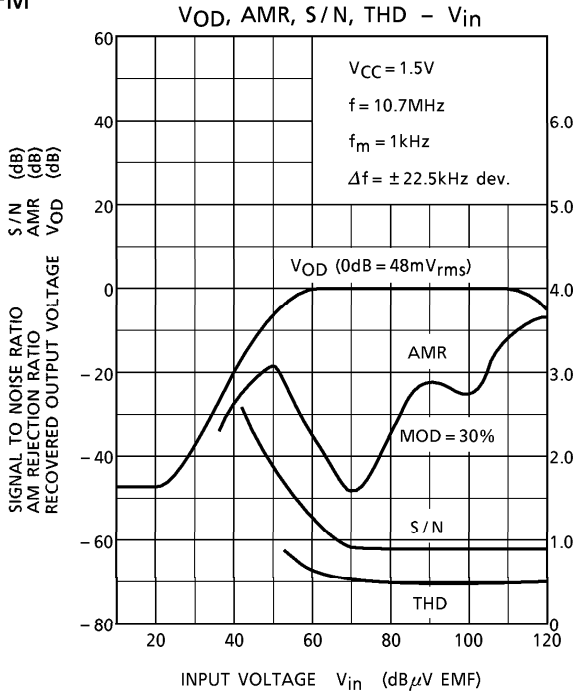
AM : f = 1MHz, MOD = 30%, f_m = 1kHz, V_{in} = 60dB_μV EMF

| 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 | dB _μ V 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 | dB _μ V EMF |
| AM | Gain | G _V | — | V _{in} = 30dB _μ V 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 | — | dB _μ V 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 ($V_{CC} = 1.5V$, $T_a = 25^\circ C$, terminal voltage at no signal)

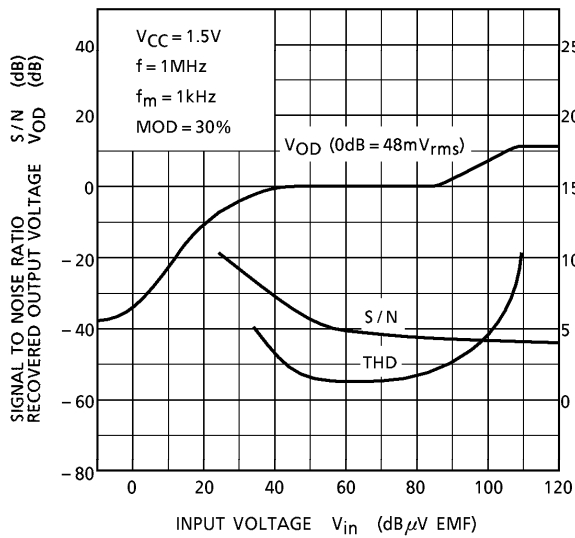
| PIN No. | SYMBOL | TYP. | | UNIT |
|-----------------------|----------|------|-----|------|
| | | AM | FM | |
| PIN ① (FM IF IN) | V_1 | — | 0.7 | V |
| PIN ② (GND) | V_2 | 0 | 0 | V |
| PIN ③ (LED BYPASS) | V_3 | — | — | V |
| PIN ④ (LED) | V_4 | — | — | V |
| PIN ⑤ (FM QUAD DET) | V_5 | 1.5 | 1.5 | 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 |

FM

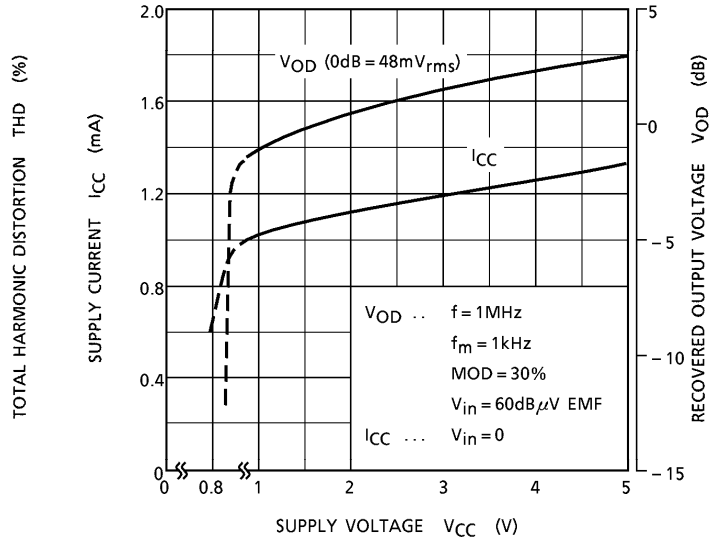


AM

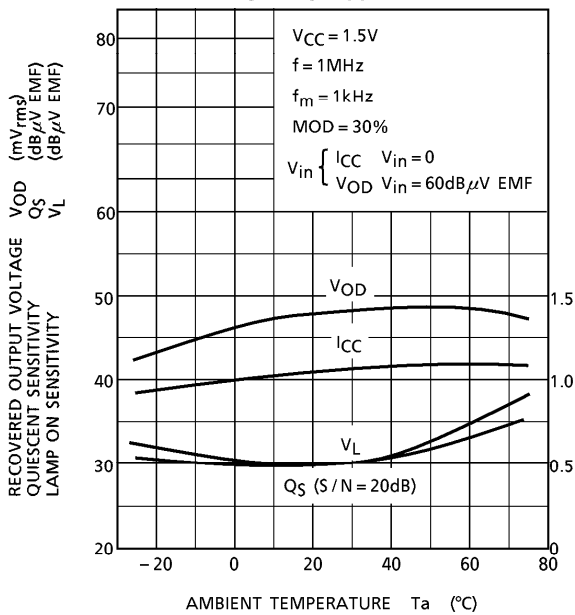
VOD, S/N, THD - V_{in}



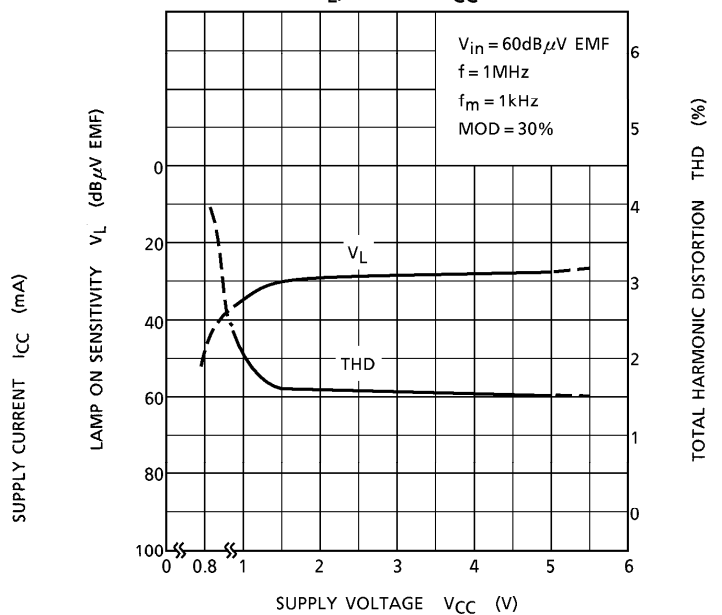
I_{CC} , VOD - V_{CC}



VOD, Q_S , I_{CC} - T_a

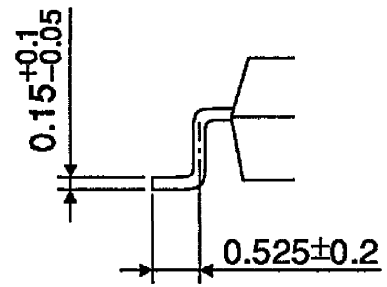
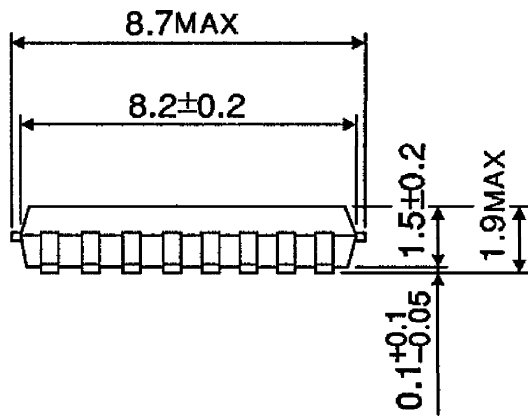
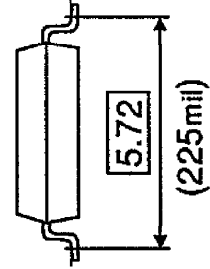
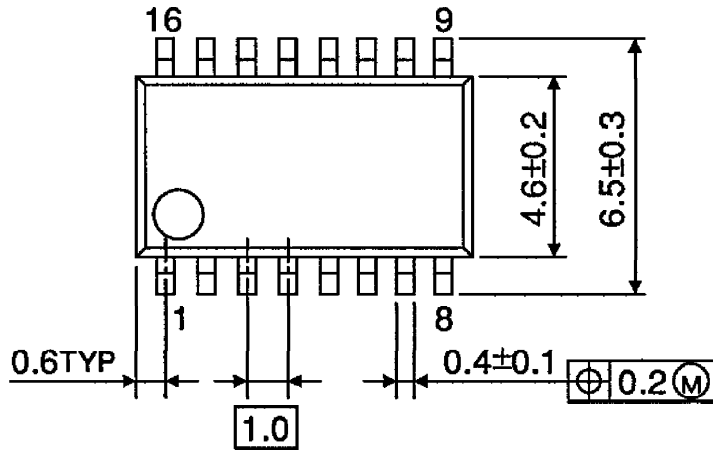


V_L , THD - V_{CC}



PACKAGE DIMENSIONS
SSOP16-P-225-1.00A

Unit : mm



Weight : 0.14g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.