To our customers,

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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

# BIPOLAR ANALOG INTEGRATED CIRCUIT

Phase-out/Discontinued

# μPC1316

## DUAL AUDIO POWER AMPLIFIER

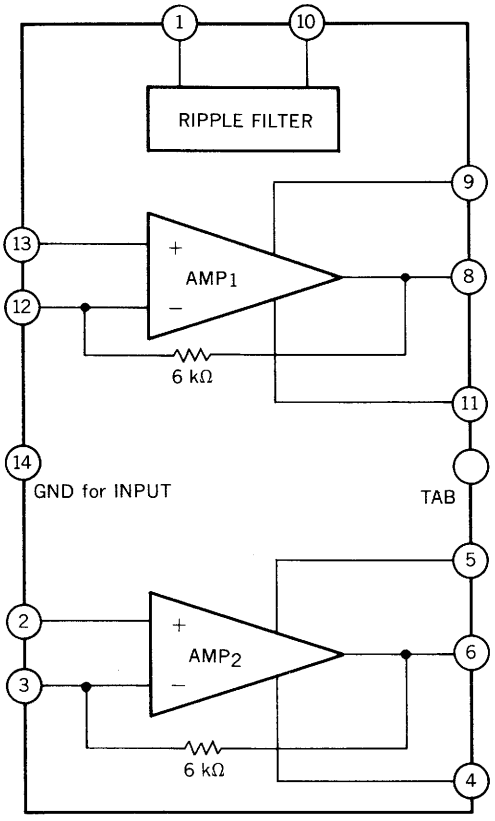
### DESCRIPTION

The μPC1316 is a dual audio power amplifier designed for portable audio sets.

### FEATURES

- Wide operating voltage range. $V_{CC}$ = 3 to 16 V
- High output power. $P_O$ = 2 W TYP. @ 12 V / 8 Ω / 10 %
  $P_O$ = 1.6 W TYP. @ 9 V / 4 Ω / 10 %
  $P_O$ = 1.2 W TYP. @ 9 V / 8 Ω / 10 %
  $P_O$ = 0.7 W TYP. @ 6 V / 4 Ω / 10 %
  $P_O$ = 0.5 W TYP. @ 6 V / 8 Ω / 10 %
  $P_O$ = 80 mW @ 4.5 V / 32 Ω / 10 %
  ($V_{CC}$ / $R_L$ / THD)
- High supply voltage rejection. SVR = 45 dB
- Low quiescent current. $I_{CC}$ = 12 mA
- Low pop noise at power switch on and off.

### BLOCK DIAGRAM




### CONNECTION DIAGRAM

| PIN NO | CONNECTION |
|---|---|
| 1 | Filter |
| 2 | Input 2 |
| 3 | NFB 2 |
| 4 | Compensation 2 |
| 5 | Bootstrap 2 |
| 6 | Output 2 |
| 7 | NC |
| TAB | GND |
| 8 | Output 1 |
| 9 | Bootstrap 1 |
| 10 | $V_{CC}$ |
| 11 | Compensation 1 |
| 12 | NFB 1 |
| 13 | Input 1 |
| 14 | GND |

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(O.D.No. IC–6816A)
Date Published October 1991 M
Printed in Japan

## ORDERING INFORMATION

| PART NUMBER | PACKAGE | QUALITY GRADE |
|---|---|---|
| μPC1316C | 14 PIN PLASTIC DIP WITH TAB (300 mil) | Standard |

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

## ABSOLUTE MAXIMUM RATINGS ($T_a$ = 25 °C)

| | | | |
|---|---|---|---|
| Supply Voltage (No Signal) | $V_{CC1}$ | 18 | V |
| Supply Voltage (Operating) | $V_{CC2}$ | 16 | V |
| Power Dissipation | $P_D$ | 2.4 * | W |
| Operating Temperature | $T_{opt}$ | −20 to +70 | °C |
| Storage Temperature | $T_{stg}$ | −40 to +150 | °C |

* 50 x 50 x 0.035 mm Copper heat sink on PCB

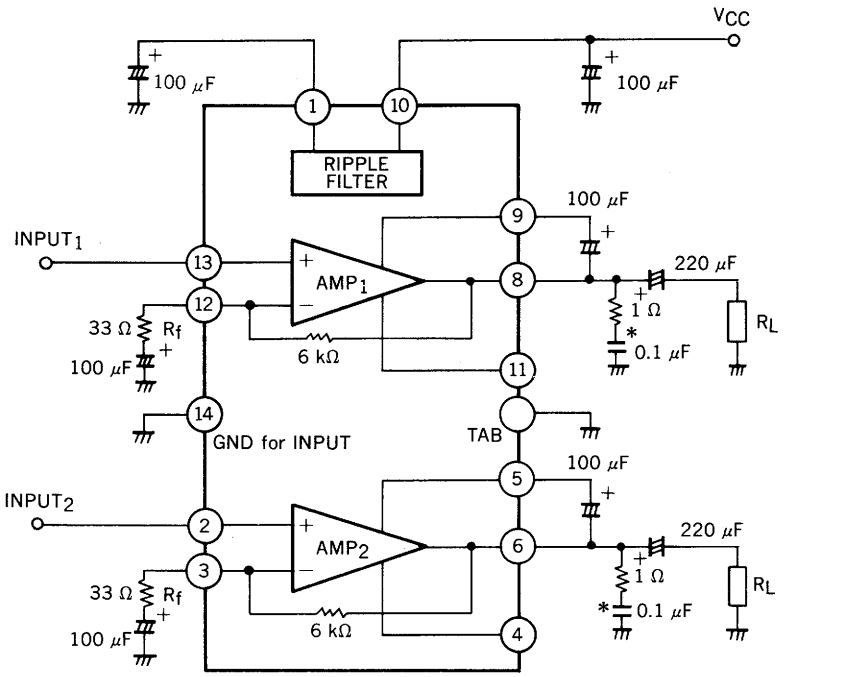
## RECOMMENDED OPERATING CONDITIONS ($T_a$ = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| Supply Voltage ($R_L$=16 Ω) | $V_{CC}$ (16) | 3 | | 16 | V |
| Supply Voltage ($R_L$=8 Ω) | $V_{CC}$ (8) | 3 | | 13 | V |
| Supply Voltage ($R_L$=4 Ω) | $V_{CC}$ (4) | 3 | | 9 | V |
| Load Impedance | $R_L$ | 4 | 8 | | Ω |
| Voltage Gain | $A_v$ | 34 | 44 | | dB |

## ELECTRICAL CHARACTERISTICS ($T_a$ = 25 °C)
## ($V_{CC}$=9 V, $R_f$=33 Ω, f=1 kHz, $R_L$=8 Ω)

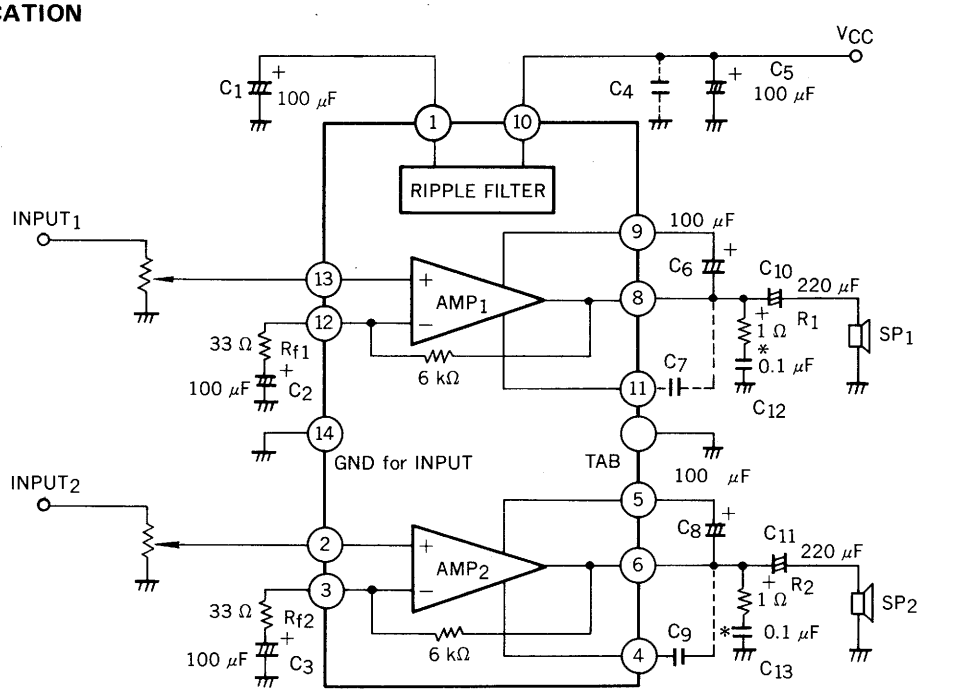
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITION |
|---|---|---|---|---|---|---|
| Circuit Current | $I_{CC}$ | | 12 | 25 | mA | No Signal |
| Voltage Gain | $A_{v1}$ | 41 | 44 | 47 | dB | $P_O$=0.25 W, $R_f$=33 Ω |
| | $A_{v2}$ | | 34 | | dB | $P_O$=0.25 W, $R_f$=120 Ω |
| Output Power | $P_{O1}$ | | 2 | | W | $V_{CC}$=12 V, $R_L$=8 Ω, THD = 10 % |
| | $P_{O2}$ | | 1.6 | | W | $V_{CC}$=9 V, $R_L$=4 Ω, THD = 10 % |
| | $P_{O3}$ | 0.9 | 1.2 | | W | $V_{CC}$=9 V, $R_L$=8 Ω, THD = 10 % |
| | $P_{O4}$ | | 0.7 | | W | $V_{CC}$=6 V, $R_L$=4 Ω, THD = 10 % |
| | $P_{O5}$ | | 0.5 | | W | $V_{CC}$=6 V, $R_L$=8 Ω, THD = 10 % |
| | $P_{O6}$ | | 80 | | mW | $V_{CC}$=4.5 V, $R_L$=32 Ω, THD = 10 % |
| Total Harmonic Distortion | THD1 | | 0.4 | 1.6 | % | $P_O$=0.5 W, $R_f$=33 Ω |
| | THD2 | | 0.3 | | % | $P_O$=0.5 W, $R_f$=120 Ω |
| Output Noise Voltage | NL | | 0.9 | 1.5 | $mV_{r.m.s.}$ | $R_G$=10 kΩ |
| Supply Voltage Rejection | SVR | 36 | 45 | | dB | $R_G$=0, f(ripple)=100 Hz, V(ripple)=0.3 $V_{r.m.s.}$ |
| Cross Talk | CT | 40 | 55 | | dB | $R_G$=0, $P_O$=0.25 W |
| Channel Balance | ChB | −2 | 0 | 2 | dB | $P_O$=0.25 W |
| Input Impedance | $Z_{in}$ | | 5 | | MΩ | |

## TEST CIRCUIT




* Mylar Capacitor

## TYPICAL APPLICATION




* Mylar Capacitor

## NOTE FOR USE

(1) Mylar capacitor is recommended as $C_{12}$, $C_{13}$.

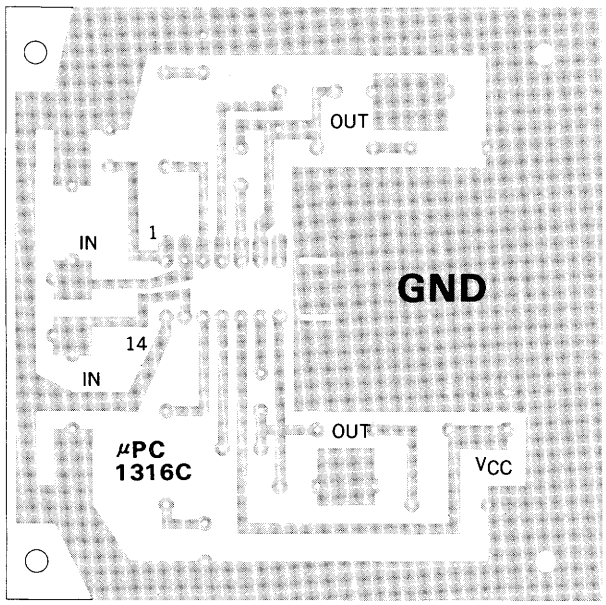
(2) Add $C_7$, $C_9$, in the case of reducing voltage gain at high frequency.

(3) Add $C_4$ or increase capacitance of $C_{12}$, $C_{13}$ when a oscillation may occur due to the pattern layout on PCB.

(4) Voltage gain can be changed by value of $R_{f1}$, $R_{f2}$, The voltage gain should be set more than 34 dB.

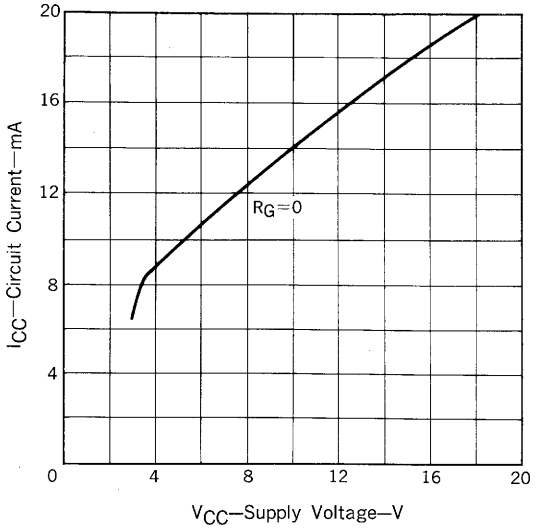
(5) When a input capacitor is connected the input terminal, a bias resistor should be connected between its terminal and GND.

## EXAMPLE FOR PRINTED CIRCUIT BOARD (Copper foil side)

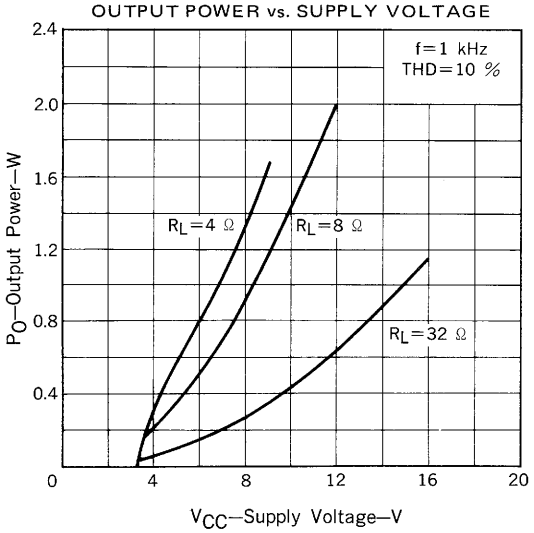


## TYPICAL CHARACTERISTICS ($T_a$ = 25 °C)

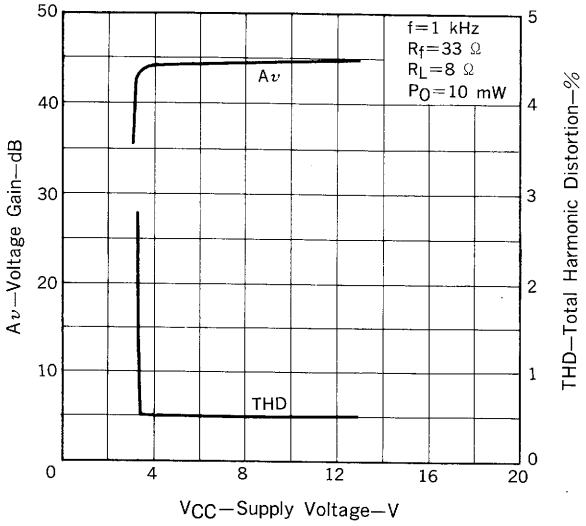
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



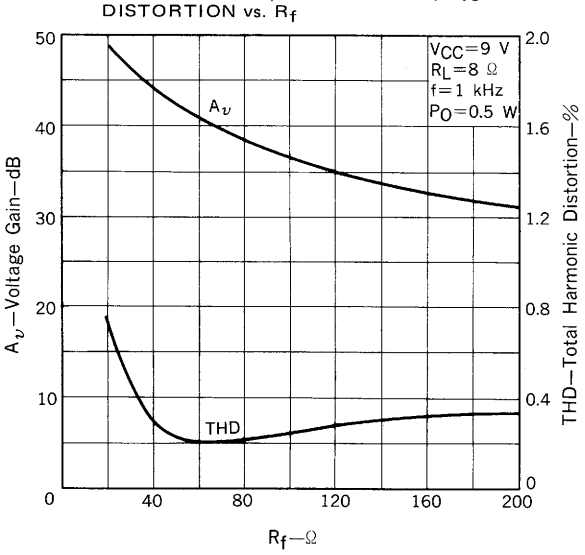

OUTPUT POWER vs. SUPPLY VOLTAGE



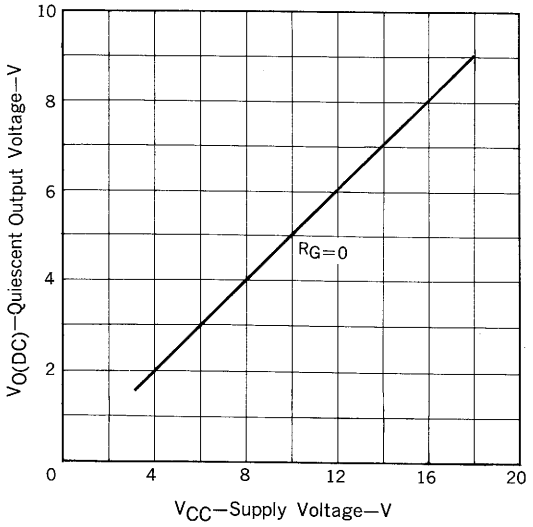

VOLTAGE GAIN, TOTAL HARMONIC DISTORTION vs. SUPPLY VOLTAGE



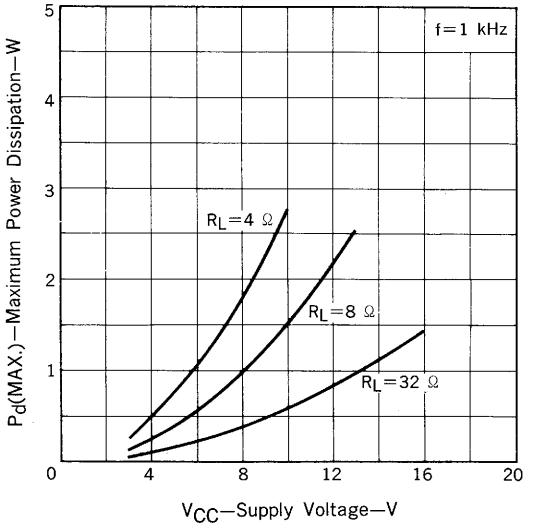

VOLTAGE GAIN, TOTAL HARMONIC DISTORTION vs. $R_f$



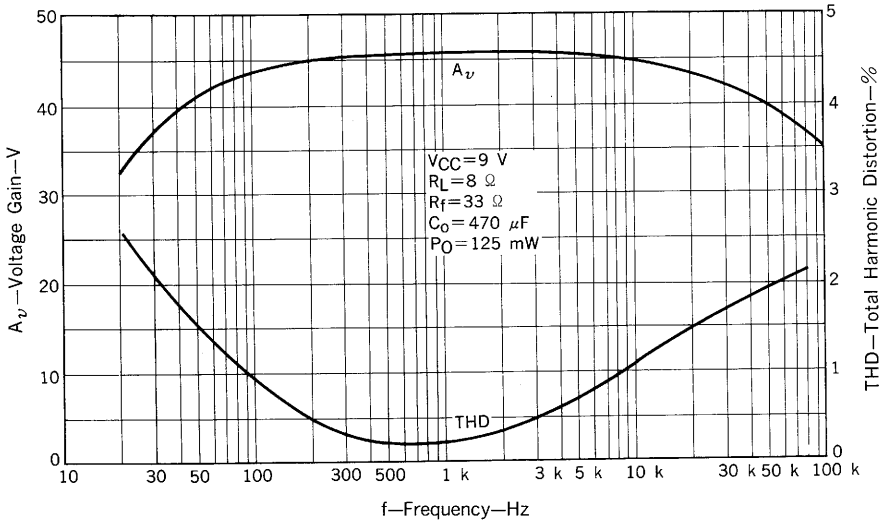

QUIESCENT OUTPUT VOLTAGE vs. SUPPLY VOLTAGE



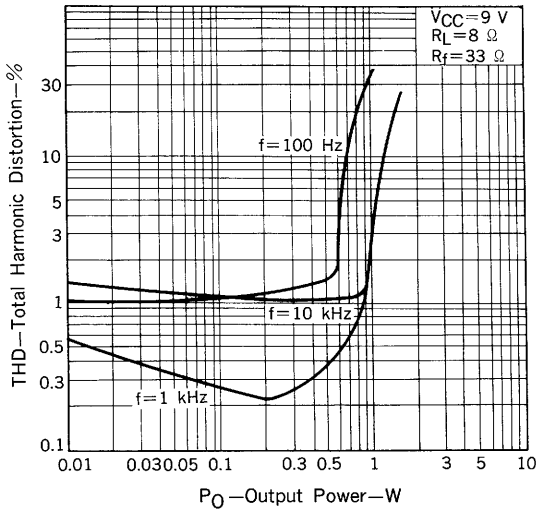

MAXIMUM POWER DISSIPATION vs. SUPPLY VOLTAGE



VOLTAGE GAIN, TOTAL HARMONIC DISTORTION vs. FREQUENCY




TOTAL HARMONIC DISTORTION vs. OUTPUT POWER




PACKAGE DISSIPATION vs. AMBIENT TEMPERATURE

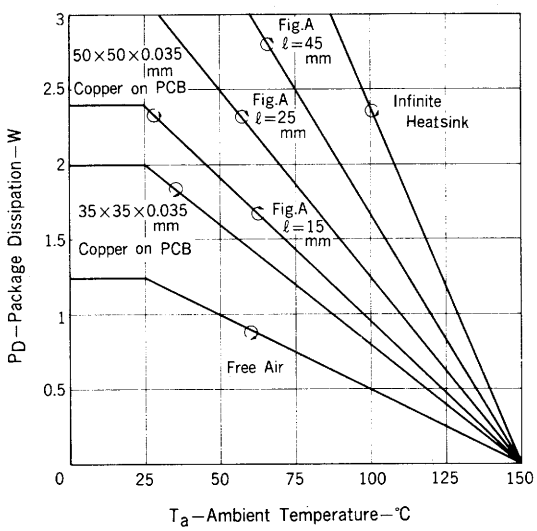
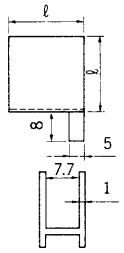
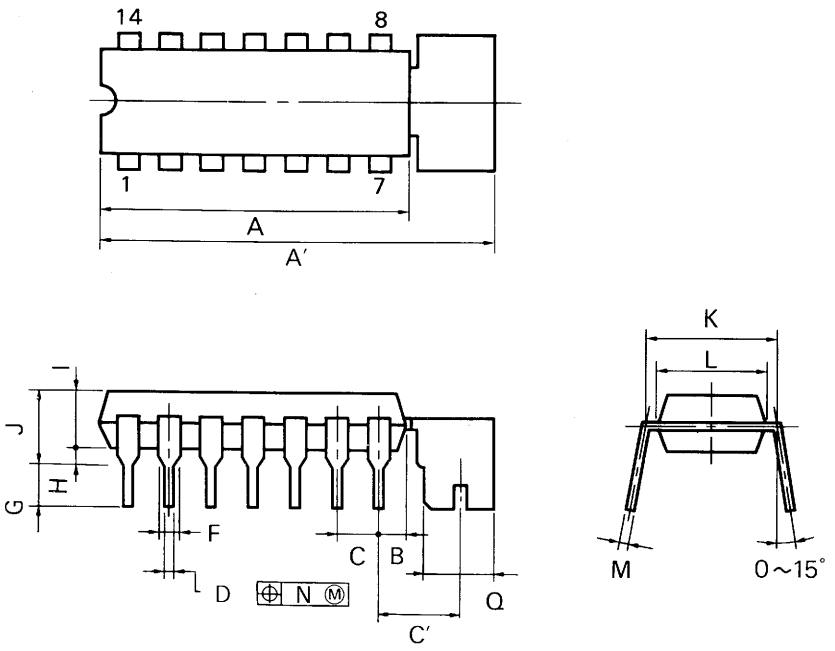



Fig.A




UNIT : mm

## 14PIN PLASTIC DIP WITH TAB (300 mil)




P14CT-100-300B

### NOTES

1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

| ITEM | MILLIMETERS | INCHES |
|---|---|---|
| A | 20.32 MAX. | 0.800 MAX. |
| A' | 24.60 MAX. | 0.969 MAX. |
| B | 2.54 MAX. | 0.100 MAX. |
| C | 2.54 (T.P.) | 0.100 (T.P.) |
| C' | 4.74 | 0.187 |
| D | $0.50^{\pm 0.10}$ | $0.020^{+0.004}_{-0.005}$ |
| F | 1.1 MIN. | 0.043 MIN. |
| G | $3.4^{\pm 0.3}$ | $0.134^{\pm 0.012}$ |
| H | 0.51 MIN. | 0.020 MIN. |
| I | 4.31 MAX. | 0.170 MAX. |
| J | 5.08 MAX. | 0.200 MAX. |
| K | 7.62 (T.P.) | 0.300 (T.P.) |
| L | 6.4 | 0.252 |
| M | $0.30^{+0.10}_{-0.05}$ | $0.012^{+0.004}_{-0.003}$ |
| N | 0.25 | 0.01 |
| Q | $4.40^{\pm 0.50}$ | $0.173^{\pm 0.020}$ |

[MEMO]