



# BIPOLAR ANALOG INTEGRATED CIRCUIT

## $\mu$ PC1480CA

### US TV SOUND MPX DECODER IC

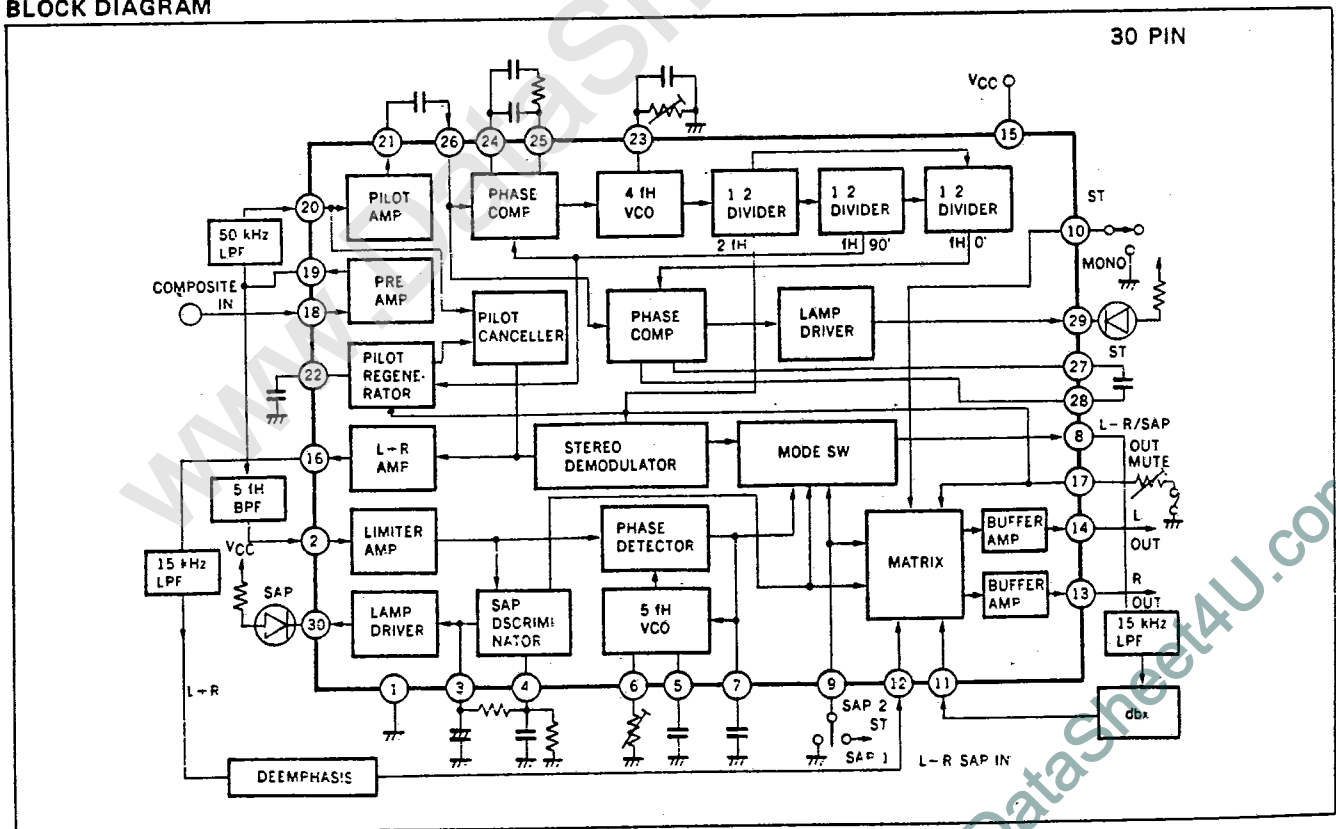
#### DESCRIPTION

This IC,  $\mu$ PC1480CA contains all function STEREO SUBCHANNEL DECODER, L.R. MATRIX etc., which is necessary to decode US SOUND MPX SIGNAL.  
It's contained in a 30 PIN shrink DIP

#### FEATURES

- It's easy to combine with the dbx NR decoder IC ( $\mu$ PC1481CA).
- Mode changing is convenient for remote control.
- It includes muting function and PILOT cancel circuit.

#### BLOCK DIAGRAM



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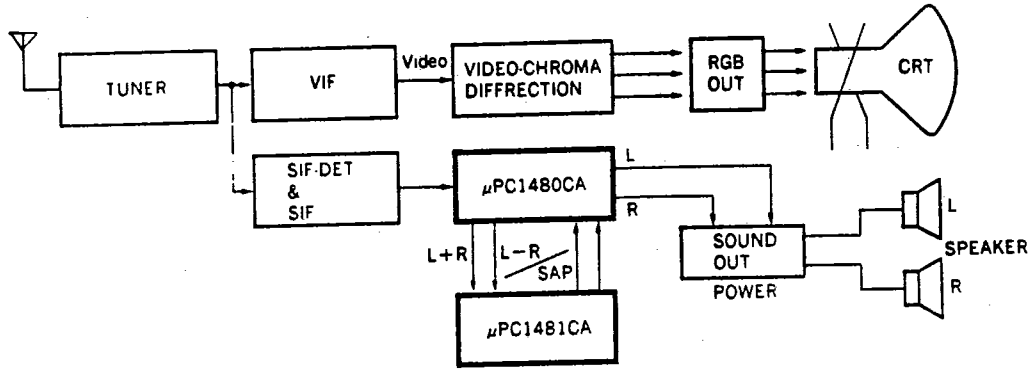
NEC Corporation

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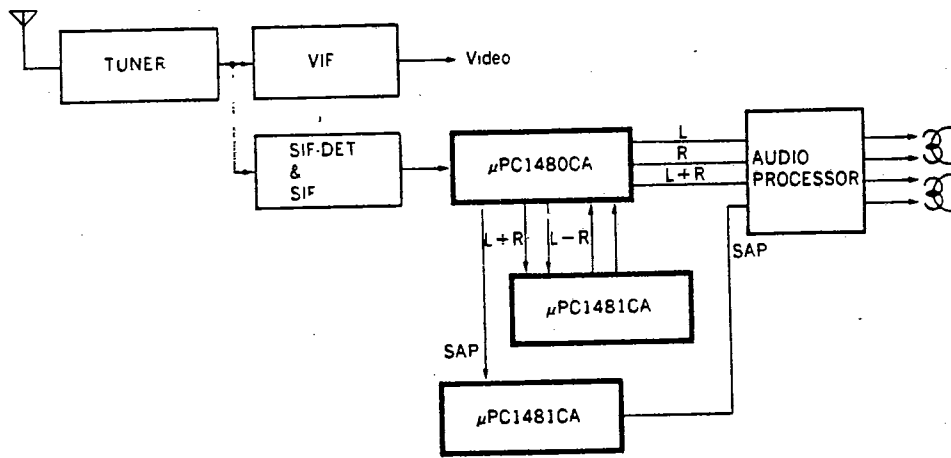
**μPC1480CA**

**NEC** ELECTRON DEVICE

**APPLICATION FOR TV**



**APPLICATION FOR VCR**



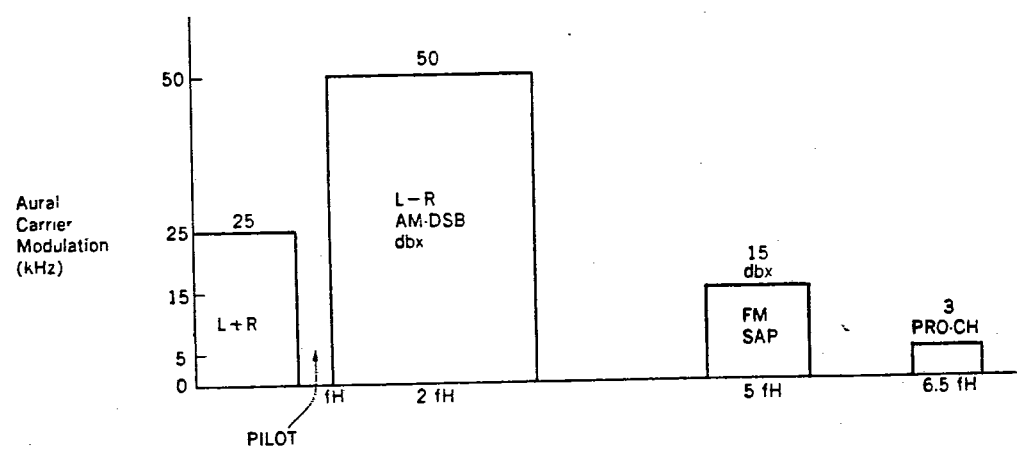
**ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = 25 °C)**

|                       |                   |                              |                  |
|-----------------------|-------------------|------------------------------|------------------|
| Operating Voltage     | V <sub>CC</sub>   | 15                           | V                |
| Input Voltage         | V <sub>in</sub>   | 5.0                          | V <sub>p-p</sub> |
| Control Voltage       | V <sub>cont</sub> | V <sub>CC</sub>              | V                |
| Package Dissipation   | P <sub>d</sub>    | 640 (T <sub>a</sub> = 70 °C) | mW               |
| Operating Temperature | T <sub>opt</sub>  | -20 to +70                   | °C               |
| Storage Temperature   | T <sub>stg</sub>  | -40 to +125                  | °C               |
| Lamp Driver Current   | I <sub>imp</sub>  | 30                           | mA               |

**RECOMMENDED OPERATING CONDITIONS**

| CHARACTERISTIC                        | SYMBOL          | MIN. | TYP. | MAX. | UNIT                 |
|---------------------------------------|-----------------|------|------|------|----------------------|
| Operating Voltage                     | V <sub>CC</sub> | 8.0  | 12.0 | 13.2 | V                    |
| Composite Input Signal Voltage (MONO) | V <sub>in</sub> |      | 300  |      | mV <sub>r.m.s.</sub> |

**US SOUND MPX SYSTEM**



**μPC1480CA**

**NEC** ELECTRON DEVICE

**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C ± 3 °C, RH = 70 %, V<sub>CC</sub> = 12 V)**

| CHARACTERISTIC                                 | SYMBOL               | MIN. | TYP. | MAX. | UNIT                 | CONDITION  |
|--|----------------------|------|------|------|----------------------|--|
| Operating Current                              | I <sub>CC</sub>      | 27   | 39   | 52   | mA                   | V <sub>CC</sub> = 12 V NO Signal   |
| Stereo Phase Detector Capture Range            | CC <sub>1</sub>      | ±1.5 | ±3.0 |      | %                    | Stereo Decoder Input Terminal Pilot Level 30 mV <sub>r.m.s.</sub>              |
| Stereo SW Input Sensitivity                    | SW <sub>sense</sub>  | 12   | 18   | 22   | mV <sub>r.m.s.</sub> | Measure Pilot Level at Stereo Input Terminal OFF → ON                          |
| Stereo SW Hysterisys                           | Hy <sub>1</sub>      | 5    | 7    | 9    | dB                   | Measure Pilot Level at Stereo Input Terminal OFF → ON ON → OFF                 |
| Stereo Decoder L-R Output Voltage              | V <sub>o</sub> L-R   | 380  | 430  | 480  | mV <sub>r.m.s.</sub> | Stereo Decoder Input Voltage 150 mV <sub>r.m.s.</sub> (MONO)                   |
| L+R Output Voltage                             | V <sub>o</sub> L+R   | 380  | 430  | 480  | mV <sub>r.m.s.</sub> | Stereo Decoder Input Voltage 150 mV <sub>r.m.s.</sub> (MONO)                   |
| L+R Output Voltage to Pilot Leak Voltage Ratio | fHREJ                | 30   | 35   |      | dB                   | Stereo Decoder Input Voltage 150 mV <sub>r.m.s.</sub> (MONO)                   |
| L-R Distortion                                 | THD <sub>L-R</sub>   | -    | 0.2  | 0.7  | %                    | Stereo Decoder Input Voltage 150 mV <sub>r.m.s.</sub> (MONO) f = 1 kHz         |
| L+R Distortion                                 | THD <sub>L+R</sub>   | -    | 0.2  | 0.5  | %                    | Stereo Decoder Input Voltage 150 mV <sub>r.m.s.</sub> (MONO) f = 1 kHz         |
| SAP Phase Detector Capture Range               | CC <sub>2</sub>      | ±19  | ±25  |      | %                    | SAP Input Voltage 90 mV <sub>r.m.s.</sub>                                      |
| SAP Input Sensitivity                          | SAP <sub>sense</sub> | 25   | 35   | 45   | mV <sub>r.m.s.</sub> | Measure SAP Input Level at SAP Input Terminal Lamp OFF → ON                    |
| SAP SW Hysterisys                              | Hy <sub>2</sub>      | 2.5  | 4.5  | 6.5  | dB                   | Measure SAP Input Level at SAP Input Terminal Lamp OFF → ON ON → OFF           |
| SAP Output Distortion                          | THD <sub>SAP</sub>   | -    | 0.3  | 1.0  | %                    | SAP Input Voltage 90 mV <sub>r.m.s.</sub> f = 1 kHz Δf = 10 kHz                |
| SAP Output Voltage                             | V <sub>o</sub> SAP   | 380  | 430  | 480  | mV <sub>r.m.s.</sub> | SAP Input Voltage 90 mV <sub>r.m.s.</sub> f = 1 kHz Δf = 10 kHz                |
| Mode SW Cross Talk                             | CT                   | 45   | 60   | -    | dB                   | Stereo Input 150 mV <sub>r.m.s.</sub> (MONO) SAP Input 90 mV <sub>r.m.s.</sub> |
| L.R. Separation                                | SEP                  | 30   | 40   | -    | dB                   | Composite Input 150 mV <sub>r.m.s.</sub> (MONO)                                |
| Matrix Output Voltage (MONO)                   | V <sub>o</sub> MONO  | 450  | 500  | 550  | mV <sub>r.m.s.</sub> | Matrix Input 215 mV <sub>r.m.s.</sub> IN-PHASE                                 |
| Matrix Output Voltage (STEREO)                 | V <sub>o</sub>       | 450  | 500  | 550  | mV <sub>r.m.s.</sub> | Matrix Input 215/2 mV <sub>r.m.s.</sub> IN-PHASE                               |
| Matrix Output Voltage (STEREO)                 | V <sub>o</sub>       | 450  | 500  | 550  | mV <sub>r.m.s.</sub> | Matrix Input 215/2 mV <sub>r.m.s.</sub> ANTI-PHASE                             |
| Matrix Output Voltage (SAP)                    | V <sub>om</sub> SAP  | 450  | 500  | 550  | mV <sub>r.m.s.</sub> | Matrix Input 215 mV <sub>r.m.s.</sub>  |
| Matrix Output Voltage (MUTE)                   | MUTE                 |      | -70  | -60  | dB                   | Pin 17 Should be open.   |

## MATRIX MODE STATE DIAGRAM

| MODE             | ST/SAP <sub>1</sub> /SAP <sub>2</sub> | MONO/ST | MUTE | L         | R         |
|------------------|---------------------------------------|---------|------|-----------|-----------|
| MONO             | —                                     | L       | L    | L+R       | L+R       |
| ST               | —                                     | —       | L    | L         | R         |
| SAP <sub>1</sub> | L                                     | —       | L    | SAP       | SAP       |
| SAP <sub>2</sub> | H                                     | —       | L    | L+R       | SAP       |
| MUTE             |                                       |         | —    | NO Signal | NO Signal |

H: VCC, L: GND, —: OPEN

## MATRIX MODE TABLE

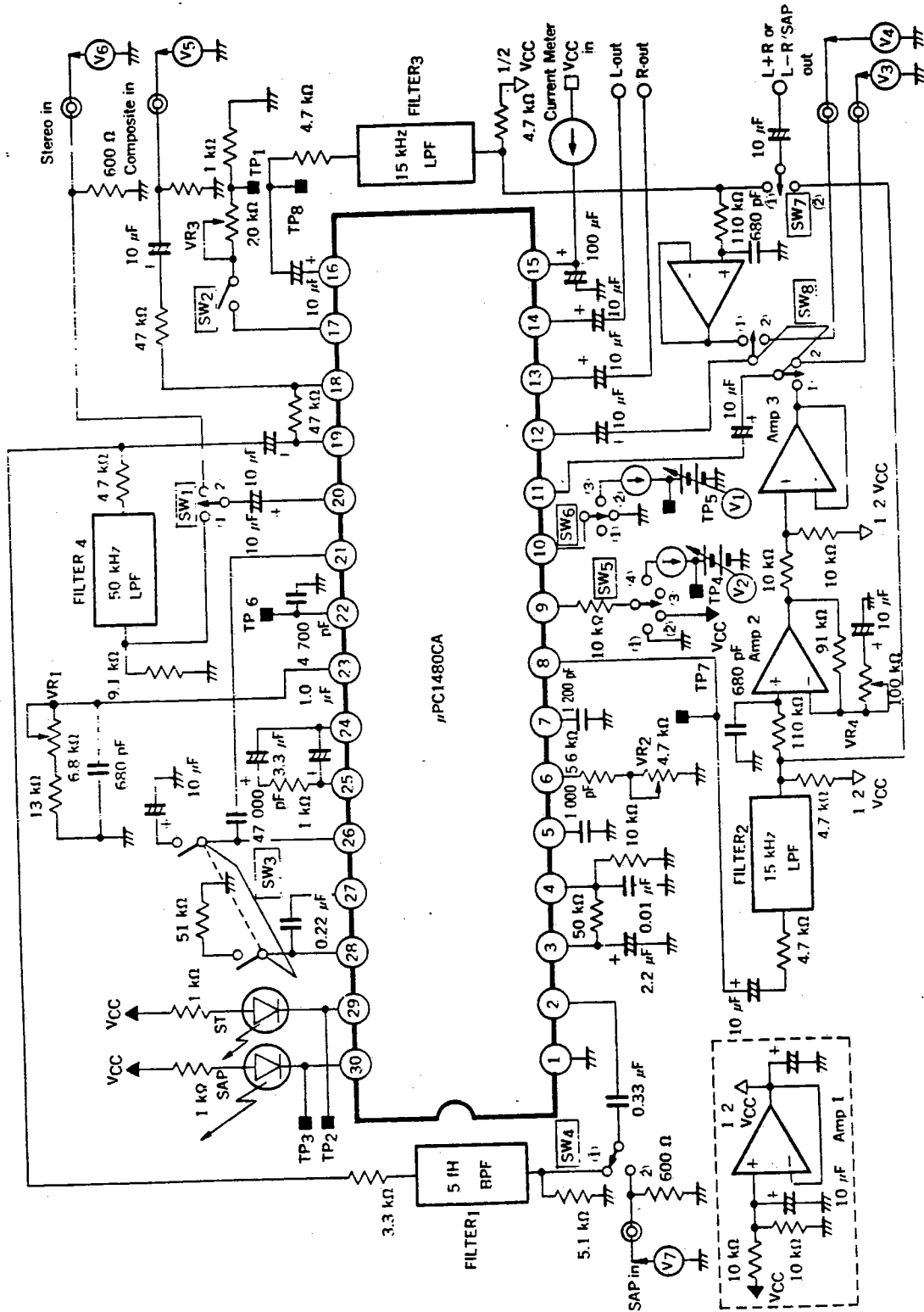
| BROADCASTING MODE         | SELECT MODE |                  | OUTPUT |      |
|---------------------------|-------------|------------------|--------|------|
|                           | PIN 10      | PIN 9            | L      | R    |
| STEREO : ON<br>SAP : ON   | •           | SAP <sub>1</sub> | SAP    | SAP  |
|                           | •           | SAP <sub>2</sub> | MAIN   | SAP  |
|                           | ST          | ST               | L      | R    |
|                           | MONO        | ST               | MAIN   | MAIN |
| STEREO : OFF<br>SAP : ON  | •           | SAP <sub>1</sub> | SAP    | SAP  |
|                           | •           | SAP <sub>2</sub> | MAIN   | SAP  |
|                           | ST          | ST               | MAIN   | MAIN |
|                           | MONO        | ST               | MAIN   | MAIN |
| STEREO : ON<br>SAP : OFF  | •           | SAP <sub>1</sub> | L      | R    |
|                           | •           | SAP <sub>2</sub> | L      | R    |
|                           | ST          | ST               | L      | R    |
|                           | MONO        | ST               | MAIN   | MAIN |
| STEREO : OFF<br>SAP : OFF | •           | SAP <sub>1</sub> | MAIN   | MAIN |
|                           | •           | SAP <sub>2</sub> | MAIN   | MAIN |
|                           | ST          | ST               | MAIN   | MAIN |
|                           | MONO        | ST               | MAIN   | MAIN |

• : Either is good.

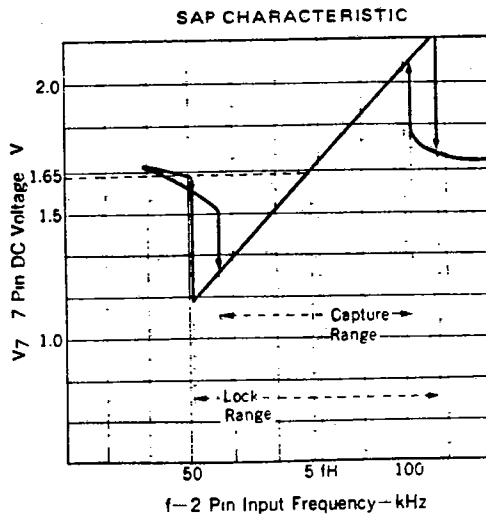
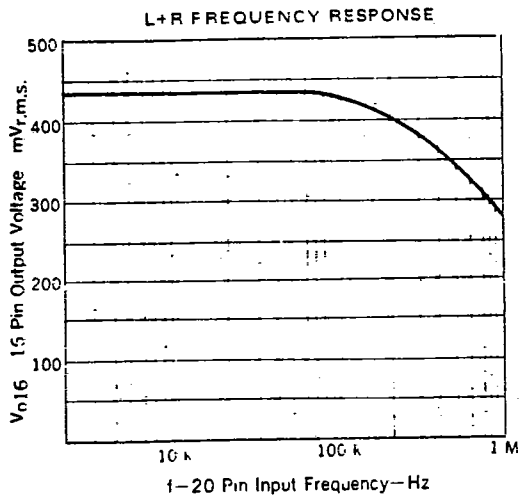
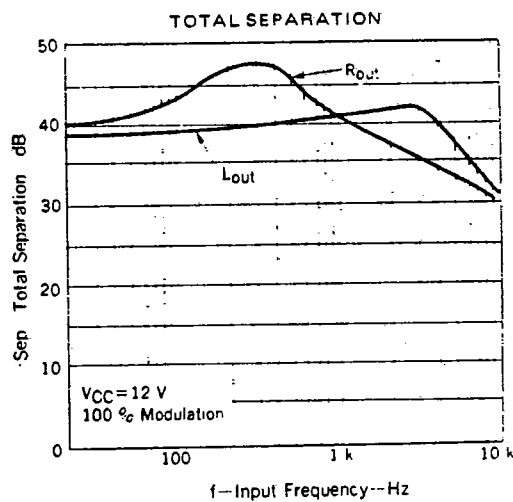
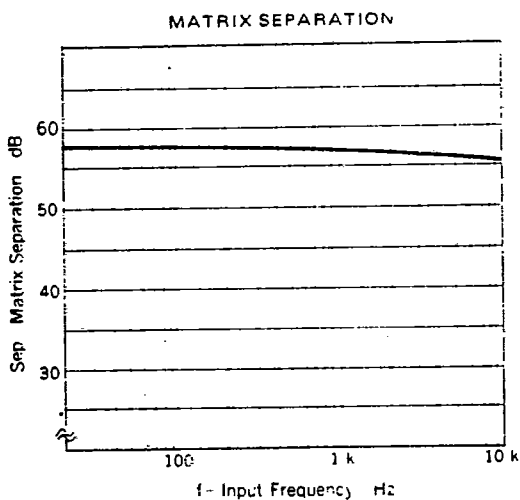
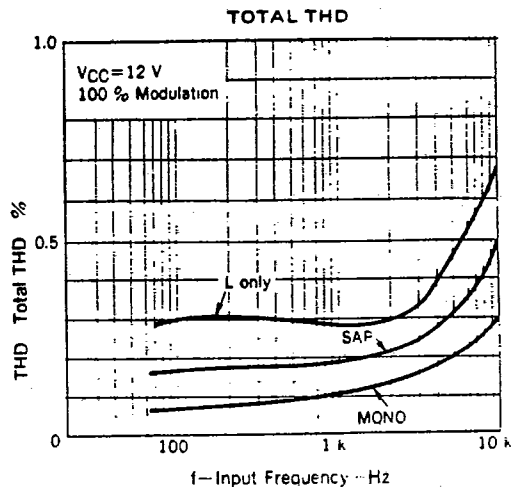
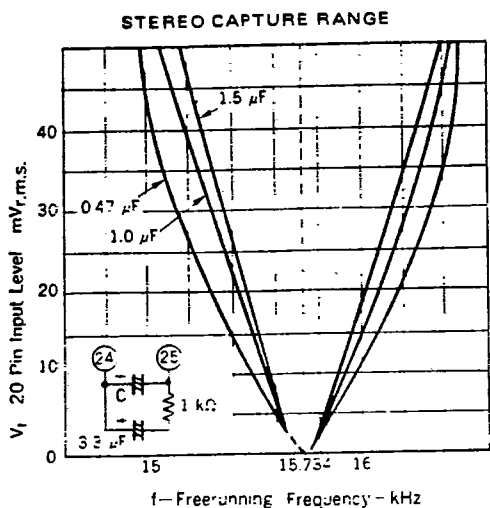
The state of pilot lamp, STEREO and SAP, should be based on broad-casting mode in spite of select mode.  
(eg. If broadcasting mode is SAP and STEREO ON, SAP and STEREO lamp turn on in spite of select mode.)

# μPC1480CA

## TEST CIRCUIT

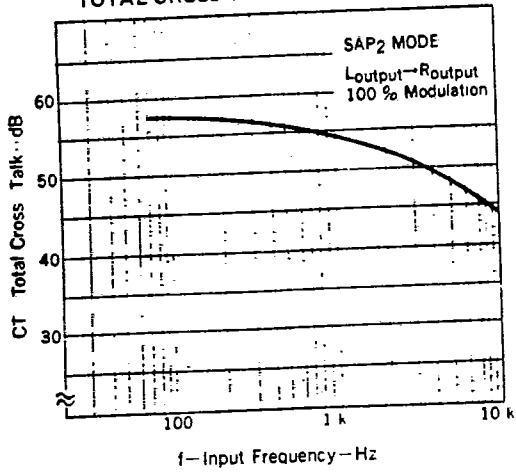


TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

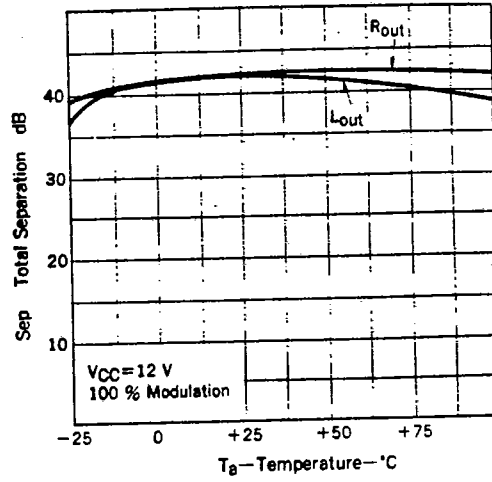


**μPC1480CA**

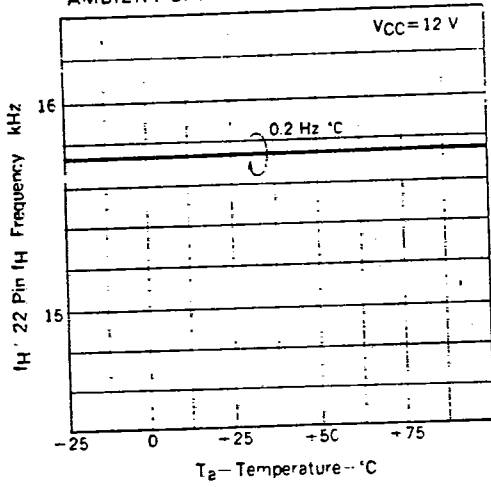
**TOTAL CROSS TALK CHARACTERISTIC**



**TOTAL SEPARATION AMBIENT CHARACTERISTIC**

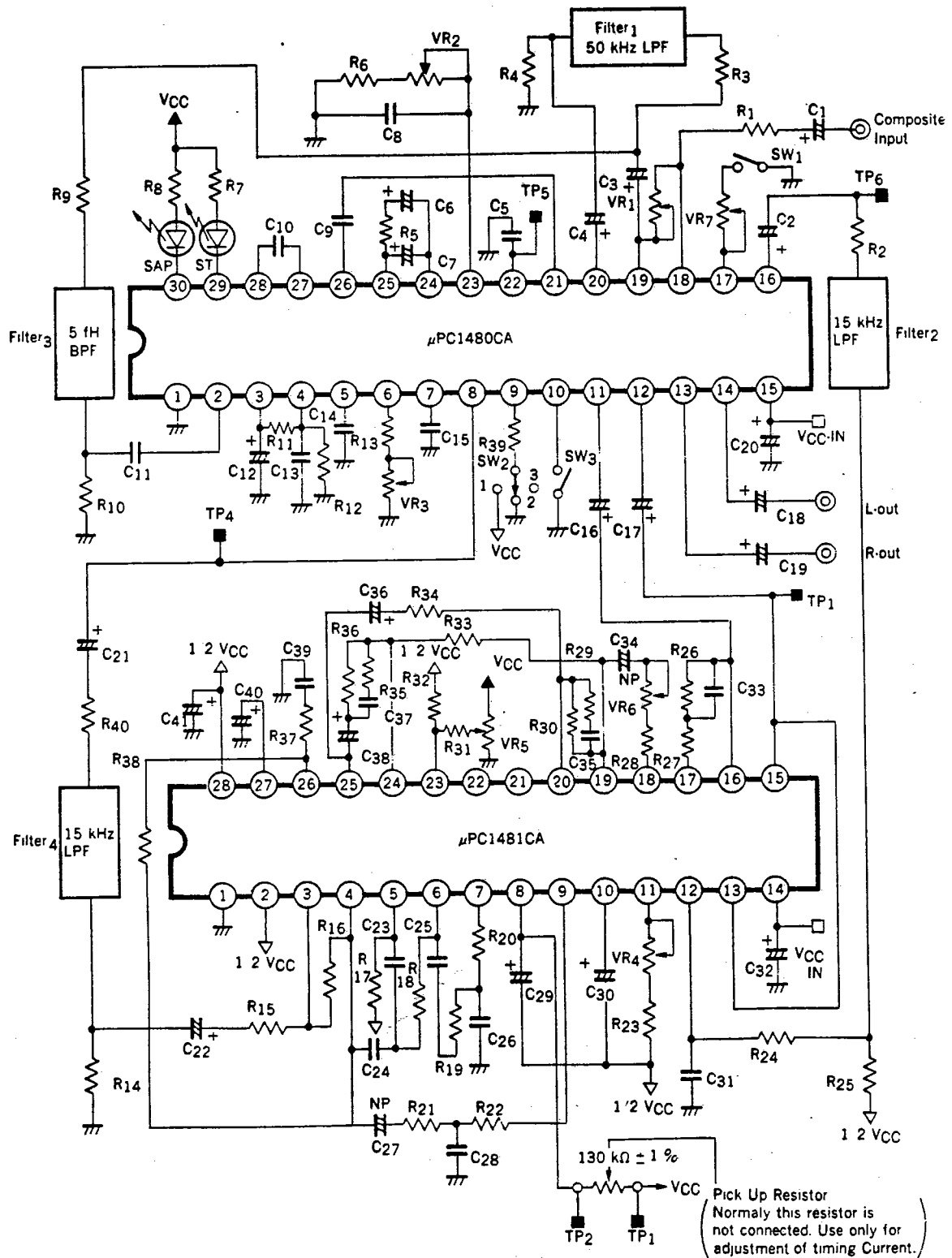


**STEREO FREE RUNNING FREQUENCY AMBIENT CHARACTERISTIC**





APPLICATION CIRCUIT



**μPC1480CA**

**NEC** ELECTRON DEVICE

**US SOUND MPX APPLICATION PARTS LIST**

**US SOUND MPX APPLICATION PARTS LIST**

| PARTS NO. | VALUE  | PRECISION  | NOTE                     |
|-----------|--------|--|--------------------------|
| R1        | 22 kΩ  |  | LPF Matching             |
| R2        | 4.7 kΩ |  | LPF Matching             |
| R3        | 4.7 kΩ |  | LPF Matching             |
| R4        | 9.1 kΩ |  | PLL Loop Filter          |
| R5        | 1.0 kΩ |  | 4 fH VCO                 |
| R6        | 13 kΩ  | ±5 %   | LED Load                 |
| R7        | 1.0 kΩ |  | LED Load                 |
| R8        | 1.0 kΩ |  | BPF Matching             |
| R9        | 3.3 kΩ |  | BPF Matching             |
| R10       | 5.1 kΩ |  | SAP Discriminator Filter |
| R11       | 50 kΩ  |  | SAP Discriminator Filter |
| R12       | 110 kΩ |  | SAP 5 fH VCO             |
| R13       | 6.2 kΩ | ±5 %   | LPF Matching             |
| R14       | 4.7 kΩ |  |                          |
| R15       | 100 kΩ |  | Feed Back                |
| R16       | 330 kΩ |  | Spectral Control Filter  |
| R17       | 12 kΩ  |  | Spectral Control Filter  |
| R18       | 3.3 kΩ |  | Spectral Control Filter  |
| R19       | 4.7 kΩ |  | Spectral Control Filter  |
| R20       | 4.7 kΩ |  | Wide Band Input Filter   |
| R21       | 4.7 kΩ |  | Wide Band Input Filter   |
| R22       | 4.7 kΩ |  | Timing Current Set       |
| R23       | 150 kΩ | ±1 %   | L+R De Emphasis          |
| R24       | 110 kΩ |  | LPF Matching             |
| R25       | 4.7 kΩ |  | De Emphasis              |
| R26       | 12 kΩ  |  | De Emphasis              |
| R27       | 1.0 kΩ |  |                          |
| R28       | 39 kΩ  |  | Variable Emphasis        |
| R29       | 3.6 kΩ |  | Variable Emphasis        |
| R30       | 180 kΩ |  |                          |
| R31       | 1 kΩ   |  |                          |
| R32       | 33 Ω   |  | Variable Emphasis        |
| R33       | 180 kΩ |  | Variable Emphasis        |
| R34       | 180 kΩ |  | Variable Emphasis        |
| R35       | 3.6 kΩ |  | Variable Emphasis        |
| R36       | 180 kΩ |  | Variable Emphasis        |
| R37       | 1.2 kΩ |  | De Emphasis              |
| R38       | 33 kΩ  |  | De Emphasis              |
| *R39      | 10 kΩ  | 10 kΩ (SAP <sub>1</sub> )<br>18 kΩ (SAP <sub>2</sub> ) | LPF Matching             |
| R40       | 4.7 kΩ |  |                          |
| VR1       | 50 kΩ  |  | Input Level Adjust       |
| VR2       | 6.8 kΩ |  | 4 fH VCO Adjust          |
| VR3       | 5 kΩ   |  | 5 fH VCO Adjust          |
| VR4       | 200 kΩ |  | Timing Current Adjust    |
| VR5       | 10 kΩ  |  | Spectral Control         |

| PARTS NO. | VALUE       | PRECISION   | NOTE                     |
|-----------|-------------|---|--------------------------|
| VR6       | 50 kΩ       |   | Wide Band Control        |
| VR7       | 20 kΩ       |   | Pilot Cancel Level Adj.  |
| C1        | 10 μF (EL)  |   | Coupling                 |
| C2        | 10 μF (EL)  |   | Coupling                 |
| C3        | 10 μF (EL)  |   | Coupling                 |
| C4        | 10 μF (EL)  |   | Coupling                 |
| C5        | 4 700 pF    |   | Coupling                 |
| C6        | 3.3 μF (EL) |   | Coupling                 |
| C7        | 1.0 μF (EL) |   | Coupling                 |
| C8        | 680 pF      | Polystyrol, ±5 %<br>Temperature<br>Coefficient is minus.    | 4 fH VCO                 |
| C9        | 47 000 pF   |   | Coupling                 |
| C10       | 0.22 μF     |   | Pilot Detect Filter      |
| C11       | 0.33 μF     |   | Coupling                 |
| C12       | 2.2 μF (EL) |   | SAP Discriminator Filter |
| C13       | 0.01 μF     |   | SAP Discriminator Filter |
| C14       | 1 000 pF    | Film Capacitor, ±5 %<br>Temperature<br>Coefficient is plus. | SAP 5 fH VCO             |
| C15       | 1 000 pF    |   | PLL Filter               |
| C16       | 10 μF (EL)  |   | Coupling                 |
| C17       | 10 μF (EL)  |   | Coupling                 |
| C18       | 10 μF (EL)  |   | Coupling                 |
| C19       | 10 μF (EL)  |   | Coupling                 |
| C20       | 100 μF (EL) |   | Bypass Capacitor         |
| C21       | 10 μF (EL)  |   | Coupling                 |
| C22       | 1.0 μF (EL) |   | Coupling                 |
| C23       | 0.003 3 μF  | ±5 %  | Spectral Control Filter  |
| C24       | 0.003 3 μF  | ±5 %  | Spectral Control Filter  |
| C25       | 0.003 3 μF  | ±5 %  | Spectral Control Filter  |
| C26       | 0.003 3 μF  | ±5 %  | Spectral Control Filter  |
| C27       | 0.47 μF     | Nonpolar, ±20 %   | Wide Band Input Filter   |
| C28       | 0.033 μF    | ±5 %  | Wide Band Input Filter   |
| C29       | 10 μF       | Tantalum, ±5 %  | Time Constant            |
| C30       | 10 μF       | Tantalum, ±5 %  | Time Constant            |
| C31       | 680 pF      | ±5 %  | L+R De Emphasis          |
| C32       | 100 μF (EL) |   | Bypass Capacitor         |
| C33       | 0.033 μF    | ±5 %  | De Emphasis              |
| C34       | 22 μF       | Nonpolar, ±20 %   | Coupling                 |
| C35       | 2 200 pF    | ±5 %  | Variable Emphasis        |
| C36       | 1.0 μF (EL) | ±20 %   | Variable Emphasis        |
| C37       | 2 200 pF    | ±5 %  | Variable Emphasis        |
| C38       | 1.0 μF (EL) | ±20 %   | Variable Emphasis        |
| C39       | 2 200 pF    | ±5 %  | De Emphasis              |

$\mu$ PC1480CA

NEC ELECTRON DEVICE

| PARTS NO. | VALUE                               | PRECISION | NOTE                 |
|-----------|-------------------------------------|-----------|----------------------|
| C40       | 100 $\mu$ F (EL)                    |           | Bypass Capacitor     |
| C41       | 22 $\mu$ F (EL)                     |           | Bypass Capacitor     |
| Filter 1  | A257BLT-4670N<br>or<br>257BLR-4835N | TOKO      | 50 kHz LPF           |
| Filter 2  | 257BLR-3666N<br>or<br>3890N         | TOKO      | 15 kHz LPF           |
| Filter 3  | 258BBV-4808N                        | TOKO      | 5 fH (78.67 kHz) BPF |
| Filter 4  | 257BLR-3666N<br>or<br>3890N         | TOKO      | 15 kHz LPF           |

All tolerances which are not specified are  $\pm 5\%$ \* This value is at the time  $V_{CC} = 12.0$  V

## US MULTIPLEX ALIGNMENT MANUAL

1. 4 fH VCO: ( $\mu$ PC1480CA)

Without inputting signal, grounding pin 28 ( $\mu$ PC1480CA) with 50 k $\Omega$ . Then grounding pin 26 ( $\mu$ PC1480CA) with 10  $\mu$ F capacitor. Connecting a frequency counter with pin 22, and fix the frequency at 15.734 kHz by adjusting the variable resistor at pin 23.

2. 5 fH VCO: ( $\mu$ PC1480CA)

Inputting 5 fH (78.67 kHz) nonmodulation signal and checking sap lamp turn on situation. Then making pin 9 ( $\mu$ PC1480CA) open or stereo mode. In measuring the output DC voltage on pin 8, making pin 9 high or low mode (SAP MODE). Then making pin 8 output DC voltage equal to the output DC voltage in stereo mode by adjusting the variable resistor at pin 6.

3. Pilot cancel level: ( $\mu$ PC1480CA)

Inputting pilot signal ( $V_{in} = 60$  mV<sub>r.m.s.</sub>) into Composite input terminal and monitoring the output level on L+R output terminal (pin 16), and then minimizing the output power by adjusting the variable resistor at pin 17. in this case, SW<sub>1</sub> shall be short.

4. dbx Timing adjustment: ( $\mu$ PC1481CA)

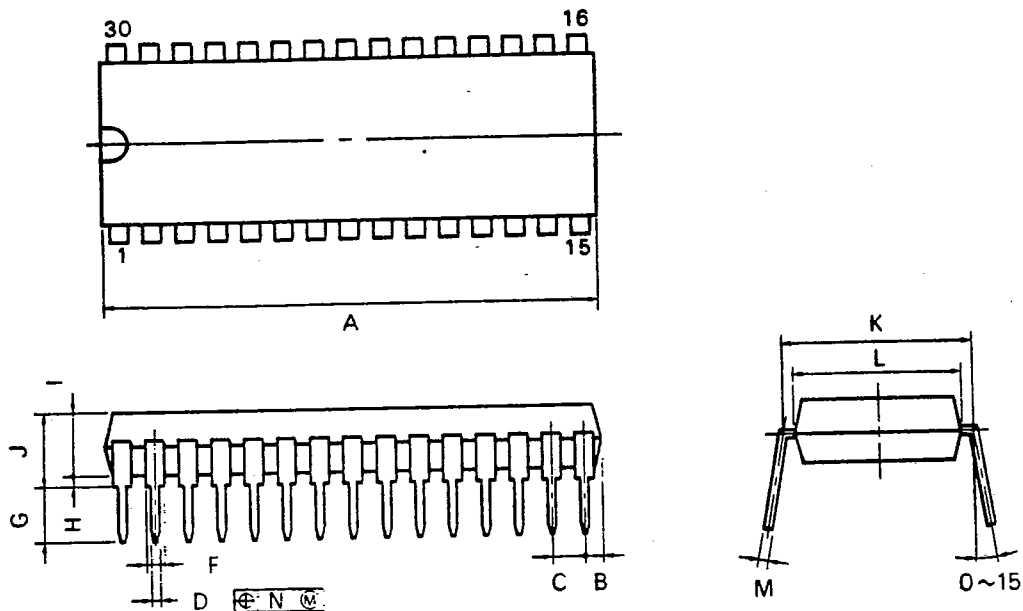
Inputting the signal, 300 Hz, 100 mV<sub>r.m.s.</sub>, at pin 4 ( $\mu$ PC1481CA). Then pulling up pin 8 with 130 k $\Omega$  resistor, and monitoring the voltage between pin 8 and V<sub>CC</sub>. Then making it 2.964 V (130 k $\Omega$  22.8  $\mu$ A) by adjusting the variable resistor at pin 11 ( $\mu$ PC1481CA).

5. Separation adjustment: ( $\mu$ PC1481CA)

Inputting composite L only signal (300 Hz, 20 % modulation) from Composite input terminal, dbx NR on. Adjusting VR<sub>1</sub> to make L+R signal level on pin 12 ( $\mu$ PC1480CA) into 21.5 mV<sub>r.m.s.</sub>. Then, monitoring R output terminal and adjusting VR<sub>6</sub> in order to minimize the L signal leakage. In the above setting, making the input frequency 3 kHz and adjusting VR<sub>5</sub> in order to minimize the L signal leakage.

6427525 N E C ELECTRONICS INC  
30PIN PLASTIC SHRINK DIP (400 mil)

98D 18394 D T-77-07-07



**NOTES**

- 1) Each lead centerline is located within 0.17 mm (0.007 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    | 28.46 MAX.           | 1.121 MAX.             |
| B    | 1.78 MAX.            | 0.070 MAX.             |
| C    | 1.778 (T.P.)         | 0.070 (T.P.)           |
| D    | 0.50 <sup>0.10</sup> | 0.020 <sup>0.004</sup> |
| F    | 0.85 MIN.            | 0.033 MIN.             |
| G    | 3.2 <sup>0.3</sup>   | 0.126 <sup>0.012</sup> |
| H    | 0.51 MIN.            | 0.020 MIN.             |
| I    | 4.31 MAX.            | 0.170 MAX.             |
| J    | 5.08 MAX.            | 0.200 MAX.             |
| K    | 10.16 (T.P.)         | 0.400 (T.P.)           |
| L    | 8.6                  | 0.339                  |
| M    | 0.25 <sup>0.10</sup> | 0.010 <sup>0.003</sup> |
| N    | 0.17                 | 0.007                  |