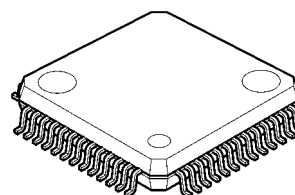


## Multi Input Wide Band Video Interface with I<sup>2</sup>C Control

### ■ GENERAL DESCRIPTION

**NJW1328** is a multi input wide band video interface IC with I<sup>2</sup>C control. Also the **NJW1328** includes 7-input 2 channel video switch for CVBS, isolation amplifier for CVBS, 3-input 1 channel video switch for Component Video Signal, 2 channel 75-ohm driver for CVBS and 1 channel 75-ohm driver for Component Video Signal. **NJW1328** is suitable for video equipment that has multi input and multi output.

### ■ PACKAGE OUTLINE

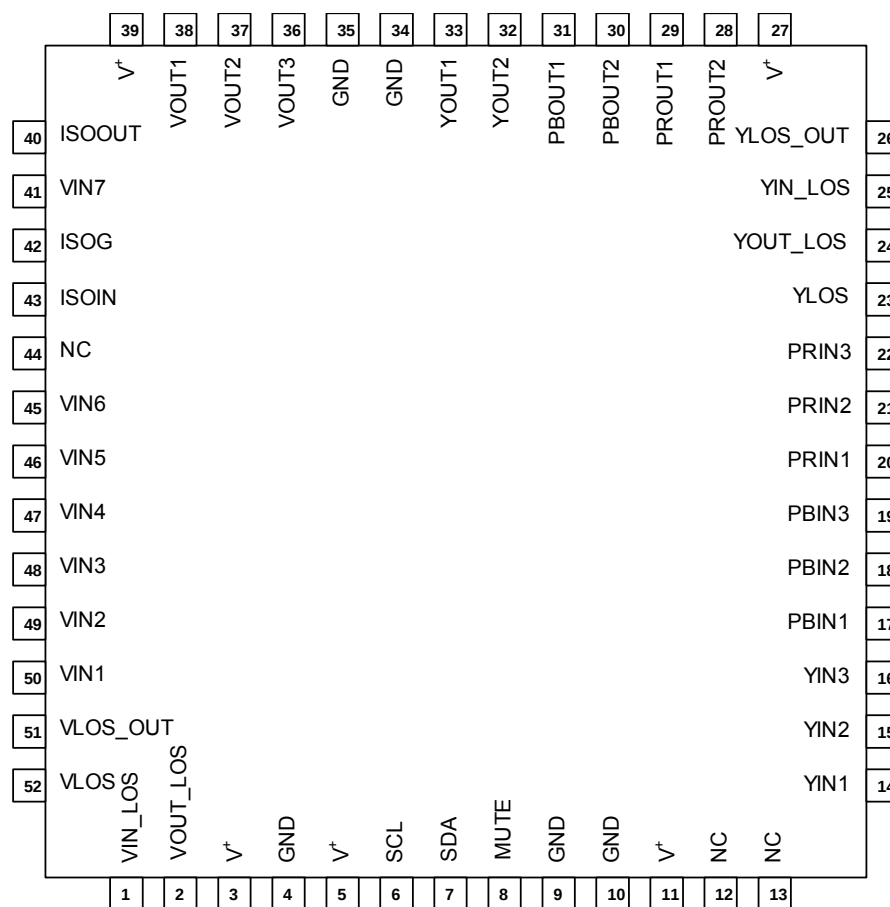


**NJW1328FH2**

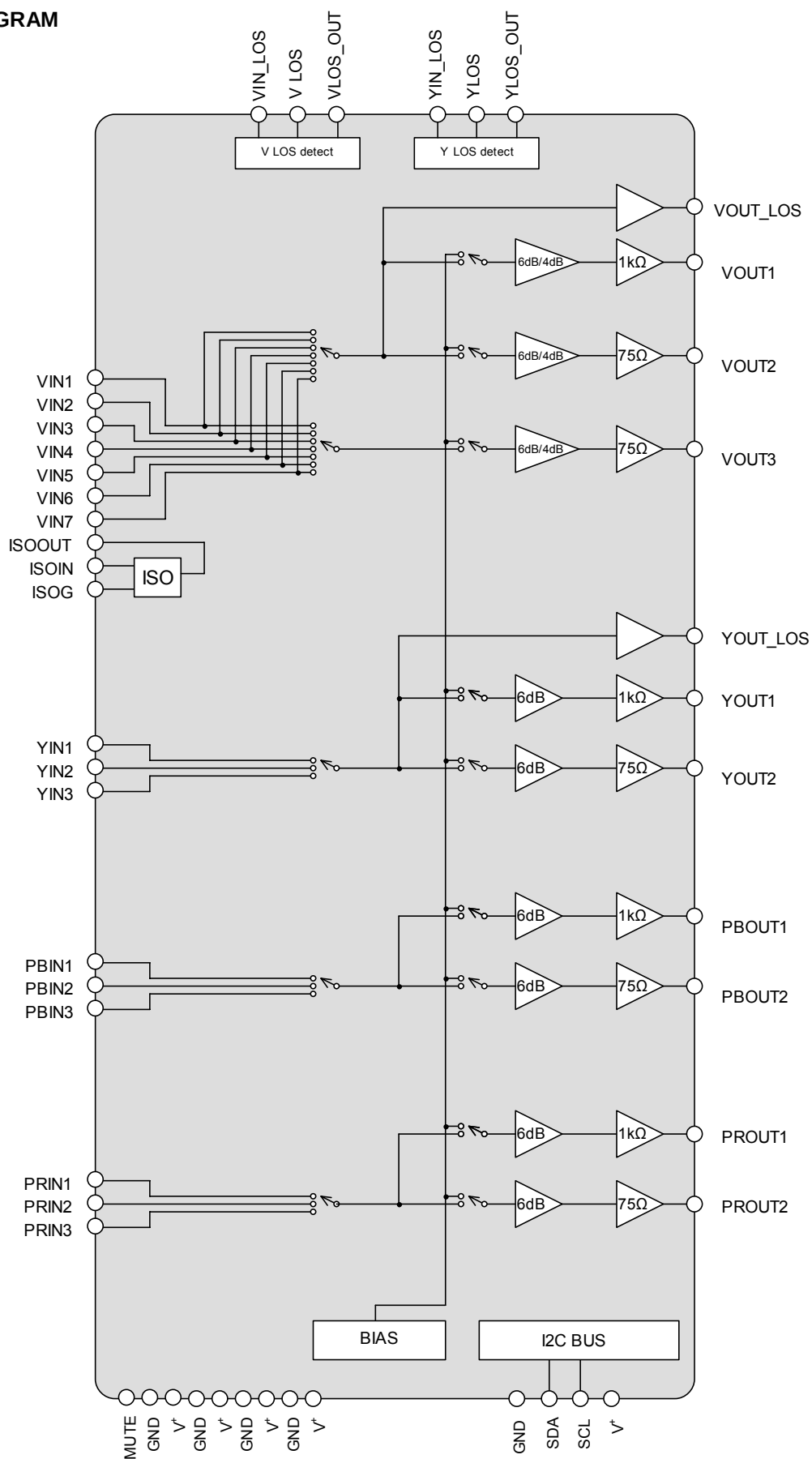
### ■ FEATURES

- Operating Voltage Single Supply 4.5 to 5.5V
- 7-input 2 channel video switch for CVBS
- 3-input 1 channel video switch for Component Video Signal
- Ground ISO (Isolation) amplifier for CVBS
- 2 channel 75-ohm driver for CVBS
- 1 channel buffer for CVBS
- 1 channel 75-ohm driver for Component Video Signal
- 1 channel buffer for Component Video Signal
- 1 channel LOS (Loss Of Signal) detector for each CVBS and Component Video Signal
- I<sup>2</sup>C BUS control
- LQFP52-H2

### ■ PIN CONFIGURATION



## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER                   | SYMBOL         | RATINGS               | UNIT |
|-----------------------------|----------------|-----------------------|------|
| Supply Voltage              | V <sup>+</sup> | 7.0                   | V    |
| Power Dissipation           | P <sub>D</sub> | 1900 <sup>NOTE)</sup> | mW   |
| Operating Temperature Range | Topr           | -20 to +75            | °C   |
| Storage Temperature Range   | Tstr           | -40 to +150           | °C   |

(Note) At on a board of EIA/JDAC specification. ( 114.3 x 76.2 x 1.6mm Two layers,FR-4)

## ■ RECOMMEND OPERATING VOLTAGE

(Ta=25°C)

| PARAMETER         | SYMBOL | TEST CONDITION       | MIN. | TYP. | MAX. | UNIT |
|-------------------|--------|----------------------|------|------|------|------|
| Operating Voltage | Vopr   | V <sup>+</sup> - GND | 4.5  | 5.0  | 5.5  | V    |

## ■ ELECTRICAL CHARACTERISTICS

### ● Power Supply Characteristics

(TEST CONDITION: Ta=25°C, V<sup>+</sup>= 5.0V all controls unless otherwise specified)

### ● DC CHARACTERISTICS

| PARAMETER                            | SYMBOL            | TEST CONDITION                   | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|-------------------|----------------------------------|------|------|------|------|
| Operating Current                    | I <sub>CC</sub>   | V <sup>+</sup> , No Signal       | -    | 65   | 100  | mA   |
| Operating Current at power save mode | I <sub>save</sub> | V <sup>+</sup> , Power Save Mode | -    | 1.0  | 3.0  | mA   |

### ● AC CHARACTERISTICS

| PARAMETER                                     | SYMBOL          | TEST CONDITION                                                                  | MIN. | TYP. | MAX. | UNIT  |
|-----------------------------------------------|-----------------|---------------------------------------------------------------------------------|------|------|------|-------|
| Maximum Output Voltage                        | V <sub>OM</sub> | Input sine signal voltage (100kHz), THD=1%                                      | 2.4  | -    | -    | Vp-p  |
| Voltage Gain 1                                | Gv1             | Input sine signal (100kHz, 1.0Vp-p),4dB mode                                    | 3.5  | 4.0  | 4.5  | dB    |
| Voltage Gain 2                                | Gv2             | Input sine signal (100kHz, 1.0Vp-p),6dB mode                                    | 5.5  | 6.0  | 6.5  | dB    |
| Voltage Gain 3                                | Gv3             | Input sine signal (100kHz, 1.0Vp-p) for ISO output terminal                     | -0.5 | 0.0  | 0.5  | dB    |
| Frequency Characteristic 1                    | Gf1             | Input sine signal (12MHz/100kHz, 1.0Vp-p) 6dB mode for V input terminal         | -3.0 | 0.0  | -    | dB    |
| Frequency Characteristic 2                    | Gf2             | Input sine signal (6MHz/100kHz, 1.0Vp-p) 6dB mode for ISO input terminal        | -3.0 | 0.0  | -    | dB    |
| Frequency Characteristic 3                    | Gf3             | Input sine signal (100MHz/100kHz, 1.0Vp-p) 6dB mode for Y/PB/PR input terminal  | -    | -3.0 | -    | dB    |
| Frequency Characteristic 4                    | Gf4             | Input sine signal (150MHz/100kHz, 100mVp-p) 6dB mode for Y/PB/PR input terminal | -    | -3.0 | -    | dB    |
| Cross Talk between Input terminals            | CT              | Input sine signal (3.58MHz, 1.0Vp-p)                                            | -    | -60  | -50  | dB    |
| Differential Gain                             | DG              | Input Video signal (1.0Vp-p, 10step)                                            | -    | 0.5  | -    | %     |
| Differential Phase                            | DP              | Input Video signal (1.0Vp-p, 10step)                                            | -    | 0.5  | -    | deg   |
| Signal Detective Voltage                      | Vdet            | Input Square pulse (16kHz, 4.7μs)                                               | -    | 200  | -    | mVp-p |
| Common Mode Rejection Ratio                   | CMRR            | Input sine signal (20kHz, 1.0Vp-p)                                              | -    | -55  | -    | dB    |
| Output/output voltage difference on mute mode | dVDo            | On mute mode                                                                    | -0.4 | -    | 0.4  | V     |
| S/N ratio                                     | SNv             | Input White Video signal (1.0Vp-p, 100%) for V/Y/PB/PR input terminal           | -    | 75   | -    | dB    |

## ● AC CHARACTERISTICS

| PARAMETER                            | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX.           | UNIT |
|--------------------------------------|--------|----------------|------|------|----------------|------|
| Switch Change Over Voltage (H level) | VthH   |                | 2.0  | -    | V <sup>+</sup> | V    |
| Switch Change Over Voltage (L level) | VthL   |                | 0    | -    | 1.0            | V    |
| Maximum inflow current on Switch ON  | IthH   | V=5.0V         | -    | -    | 120            | uA   |
| Maximum inflow current on Switch OFF | IthL   | V=0.3V         | -    | -    | 8              | uA   |

## ■ MUTE CONTROL

NJW1328 performs Mute for all output voltages simultaneously with MUTE terminal.

| MUTE TERMINAL VOLTAGE | OPERATION |
|-----------------------|-----------|
| <VthL                 | MUTE ON   |
| >VthH                 | MUTE OFF  |

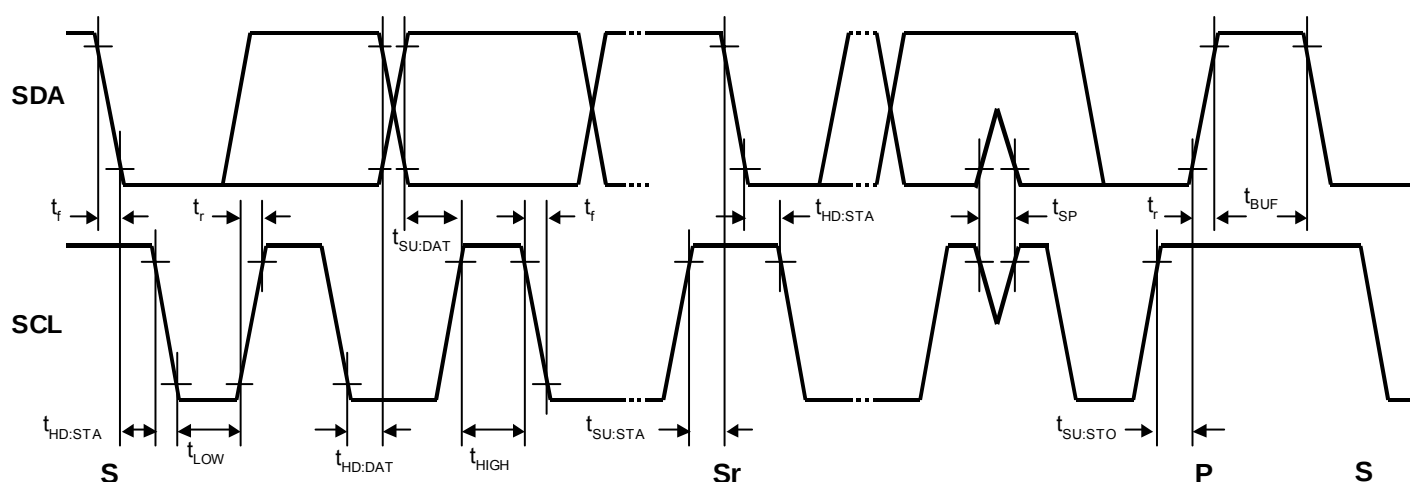
## ■ SIGNAL DETECTION

NJW1328 detects a signal that is larger than Signal Detective Voltage (SDV).

| INPUT SIGNAL VOLTAGE   | LOS_OUT | CONDITION                  |
|------------------------|---------|----------------------------|
| Vdet > V <sub>IN</sub> | H       | Signal is smaller than SDV |
| Vdet < V <sub>IN</sub> | L       | Signal is larger than SDV  |

NOTE) If you input a signal except for video signal with sync, there is the case that output of LOS\_OUT terminal is not stable.

## ■ TIMING on the I<sup>2</sup>C BUS (SDA, SCL)



## ■ CHARACTERISTICS OF I/O STAGES FOR I<sup>2</sup>C BUS (SDA, SCL)

I<sup>2</sup>C BUS Load Conditions

STANDARD MODE: Pull up resistance 4k $\Omega$  (Connected to V<sup>+</sup>), Load capacitance 200pF (Connected to GND)

HIGH-SPEED MODE: Pull up resistance 4k $\Omega$  (Connected to V<sup>+</sup>), Load capacitance 50pF (Connected to GND)

| PARAMETER                                                                                          | SYMBOL          | STANDARD MODE     |      |                   | HIGH-SPEED MODE   |      |                   | UNIT    |
|----------------------------------------------------------------------------------------------------|-----------------|-------------------|------|-------------------|-------------------|------|-------------------|---------|
|                                                                                                    |                 | MIN.              | TYP. | MAX.              | MIN.              | TYP. | MAX.              |         |
| Low Level Input Voltage                                                                            | V <sub>IL</sub> | 0.0               | -    | 0.3V <sup>+</sup> | 0.0               | -    | 0.3V <sup>+</sup> | V       |
| High Level Input Voltage                                                                           | V <sub>IH</sub> | 0.7V <sup>+</sup> | -    | 5.5               | 0.7V <sup>+</sup> | -    | 5.5               | V       |
| Low Level Output Voltage (3mA at SDA pin)                                                          | V <sub>OL</sub> | 0                 | -    |                   | 0                 | -    | 0.4               | V       |
| Input current each I/O pin with an input voltage between 0.1V <sub>cc</sub> and 0.9V <sub>cc</sub> | I <sub>i</sub>  | -10               | -    | 10                | -10               | -    | 10                | $\mu$ A |

## ■ CHARACTERISTICS OF BUS LINES (SDA, SCL) FOR I<sup>2</sup>C BUS DEVICES

| PARAMETER                                        | SYMBOL       | STANDARD MODE |      |      | HIGH-SPEED MODE |      |      | UNIT    |
|--------------------------------------------------|--------------|---------------|------|------|-----------------|------|------|---------|
|                                                  |              | MIN.          | TYP. | MAX. | MIN.            | TYP. | MAX. |         |
| SCL clock frequency                              | $f_{SCL}$    | -             | -    | 100  | -               | -    | 400  | kHz     |
| HOLD time                                        | $t_{HD:STA}$ | 4.0           | -    | -    | 0.6             | -    | -    | $\mu s$ |
| Low period of the SCL clock                      | $t_{LOW}$    | 4.7           | -    | -    | 1.3             | -    | -    | $\mu s$ |
| High period of the SCL clock                     | $t_{HIGH}$   | 4.0           | -    | -    | 0.6             | -    | -    | $\mu s$ |
| Set-up time for a repeated START condition       | $t_{SU:STA}$ | 4.7           | -    | -    | 0.6             | -    | -    | $\mu s$ |
| Data Hold Time <sup>(NOTE)</sup>                 | $t_{HD:DAT}$ | 0             | -    | -    | 0               | -    | -    | $\mu s$ |
| Data set-up Time                                 | $t_{SU:DAT}$ | 250           | -    | -    | 100             | -    | -    | ns      |
| Rise time of both SDA and SCL signals            | $t_r$        | -             | -    | 1000 | -               | -    | 300  | ns      |
| Fall time of both SDA and SCL signals            | $t_f$        | -             | -    | 300  | -               | -    | 300  | ns      |
| Set-up time for STOP condition                   | $t_{SU:STO}$ | 4.0           | -    | -    | 0.6             | -    | -    | $\mu s$ |
| Bus free time between a STOP and START condition | $t_{BUF}$    | 4.7           | -    | -    | 1.3             | -    | -    | $\mu s$ |
| Capacitive load for each bus line                | $C_b$        | -             | -    | 400  | -               | -    | 400  | pF      |
| Noise margin at the Low level                    | $V_{nL}$     | 0.5           | -    | -    | 0.5             | -    | -    | V       |
| Noise margin at the High level                   | $V_{nH}$     | 1             | -    | -    | 1               | -    | -    | V       |

$C_b$  ; total capacitance of one bus line in pF

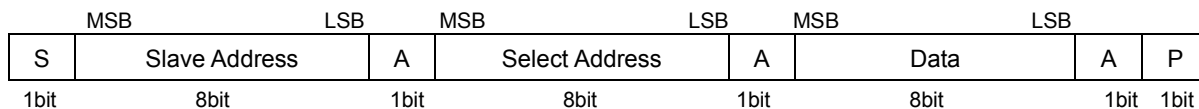
NOTE) Data hold time:  $t_{HD:DAT}$

Please hold the Data Hold Time ( $t_{HD:DAT}$ ) to 300ns or more to avoid status of unstable at SCL falling edge.

## ■ DEFINITION OF I<sup>2</sup>C REGISTER

You can send and transmit address by I<sup>2</sup>C REGISTER with SDA input and SCL input.

### • I<sup>2</sup>C BUS FORMAT



S: Starting term

A: Acknowledge bit

P: Ending term

### • SLAVE ADDRESS

| Slave Address |   |   |   |     |   |   |   | Hex   |
|---------------|---|---|---|-----|---|---|---|-------|
| MSB           |   |   |   | LSB |   |   |   | -     |
| 1             | 0 | 0 | 1 | 0   | 1 | 1 | 0 | 96(h) |

NJW1328 is not suitable for read mode.

### • CONTROL REGISTER TABLE

The auto increment function cycles the select address as follows.

00H → 01H → 00H

| No. | BIT            |            |            |                         |    |                          |                          |            |
|-----|----------------|------------|------------|-------------------------|----|--------------------------|--------------------------|------------|
|     | D7             | D6         | D5         | D4                      | D3 | D2                       | D1                       | D0         |
| 00H | VOUT1,2 Select |            |            | VOUT3 Select            |    |                          | VOUT1,2 Gain             | VOUT3 Gain |
| 01H | VOUT1 Mute     | VOUT2 Mute | VOUT3 Mute | YOUT/PBOUT/PROUT Select |    | YOUT1/PBOUT1/PROUT1 Mute | YOUT2/PBOUT2/PROUT2 Mute | Power Save |

### ■ CONTROL REGISTER INITIAL VALUE

| No. | BIT |    |    |    |    |    |    |    |
|-----|-----|----|----|----|----|----|----|----|
|     | D7  | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 00H | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 01H | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

## ■ INSTRUCTION CODE

a)

| No. | BIT            |    |    |              |    |    |              |            |
|-----|----------------|----|----|--------------|----|----|--------------|------------|
|     | D7             | D6 | D5 | D4           | D3 | D2 | D1           | D0         |
| 00H | VOUT1,2 Select |    |    | VOUT3 Select |    |    | VOUT1,2 Gain | VOUT3 Gain |

### •VOUT1,2 SIGNAL SELECT TABLE

| VOUT1,2 Select |    |    | VOUT1,2 |
|----------------|----|----|---------|
| D7             | D6 | D5 |         |
| 0              | 0  | 0  | VIN1*   |
| 0              | 0  | 1  | VIN2    |
| 0              | 1  | 0  | VIN3    |
| 0              | 1  | 1  | VIN4    |
| 1              | 0  | 0  | VIN5    |
| 1              | 0  | 1  | VIN6    |
| 1              | 1  | 0  | VIN7    |

\*Default Value

### •VOUT3 SIGNAL SELECT TABLE

| VOUT3 Select |    |    | VOUT3 |
|--------------|----|----|-------|
| D4           | D3 | D2 |       |
| 0            | 0  | 0  | VIN1* |
| 0            | 0  | 1  | VIN2  |
| 0            | 1  | 0  | VIN3  |
| 0            | 1  | 1  | VIN4  |
| 1            | 0  | 0  | VIN5  |
| 1            | 0  | 1  | VIN6  |
| 1            | 1  | 0  | VIN7  |

\*Default Value

### •VOUT1,2 GAIN SELECT TABLE

| VOUT Gain | Gain |
|-----------|------|
| D1        |      |
| 0         | 4dB* |
| 1         | 6dB  |

\*Default Value

### •VOUT3 GAIN SELECT TABLE

| VOUT Gain | Gain |
|-----------|------|
| D0        |      |
| 0         | 4dB* |
| 1         | 6dB  |

\*Default Value

## ■ INSTRUCTION CODE

b)

| No. | BIT           |               |               |                             |    |                                     |                                     |               |
|-----|---------------|---------------|---------------|-----------------------------|----|-------------------------------------|-------------------------------------|---------------|
|     | D7            | D6            | D5            | D4                          | D3 | D2                                  | D1                                  | D0            |
| 01H | VOUT1<br>Mute | VOUT2<br>Mute | VOUT3<br>Mute | YOUT/PBOUT/<br>PROUT Select |    | YOUT1/<br>PBOUT1/<br>PROUT1<br>Mute | YOUT2/<br>PBOUT2/<br>PROUT2<br>Mute | Power<br>Save |

### •VOUT1 SIGNAL Mute/Through SELECT TABLE

| VOUT1 Mute | VOUT1   |
|------------|---------|
| D7         |         |
| 0          | Mute*   |
| 1          | Through |

\*Default Value

### •VOUT2 SIGNAL Mute/Through SELECT TABLE

| VOUT2 Mute | VOUT2   |
|------------|---------|
| D6         |         |
| 0          | Mute*   |
| 1          | Through |

\*Default Value

### •VOUT3 SIGNAL Mute/Through SELECT TABLE

| VOUT3 Mute | VOUT3   |
|------------|---------|
| D5         |         |
| 0          | Mute*   |
| 1          | Through |

\*Default Value

### •YOUT/PBOUT/PROUT SIGNAL SELECT TABLE

| YOUT/PBOUT/<br>PROUT Select |    | YOUT  | PBOUT  | PROUT  |
|-----------------------------|----|-------|--------|--------|
| D4                          | D3 |       |        |        |
| 0                           | 0  | YIN1* | PBIN1* | PRIN1* |
| 0                           | 1  | YIN2  | PBIN2  | PRIN2  |
| 1                           | 0  | YIN3  | PBIN3  | PRIN3  |

\*Default Value

•YOUT1/PBOUT1/PROUT1 SIGNAL Mute/Through SELECT TABLE

| YOUT1/PBOUT1/<br>PROUT1 Mute | YOUT1/PBOUT1/<br>PROUT1 |
|------------------------------|-------------------------|
| D2                           |                         |
| 0                            | Mute*                   |
| 1                            | Through                 |

\*Default Value

•YOUT2/PBOUT2/PROUT2 SIGNAL Mute/Through SELECT TABLE

| YOUT2/PBOUT2/<br>PROUT2 Mute | YOUT2/PBOUT2/<br>PROUT2 |
|------------------------------|-------------------------|
| D1                           |                         |
| 0                            | Mute*                   |
| 1                            | Through                 |

\*Default Value

•POWER SAVE SELECT TABLE

| Power Save | Power Save       |
|------------|------------------|
| D0         |                  |
| 0          | Power Save Mode* |
| 1          | Normal Mode      |

\*Default Value

■ TERMINAL DESCRIPTION

| No.                      | SYMBOL                                                                                           | FUNCTION                             | EQUIVALENT CIRCUIT | VOLATGE |
|--------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------|--------------------|---------|
| 1<br>25                  | VIN_LOS<br>YIN_LOS                                                                               | V Input for LOS<br>Y Input for LOS   |                    | 3.1V    |
| 2<br>24                  | VOUT_LOS<br>YOUT_LOS                                                                             | V output for LOS<br>Y output for LOS |                    | 1.9V    |
| 3<br>5<br>11<br>27<br>39 | V <sup>+</sup> 1<br>V <sup>+</sup> 2<br>V <sup>+</sup> 3<br>V <sup>+</sup> 4<br>V <sup>+</sup> 5 | Supply                               |                    | 5V      |
| 4<br>9<br>10<br>34<br>35 | GND                                                                                              | Ground                               |                    | 0V      |

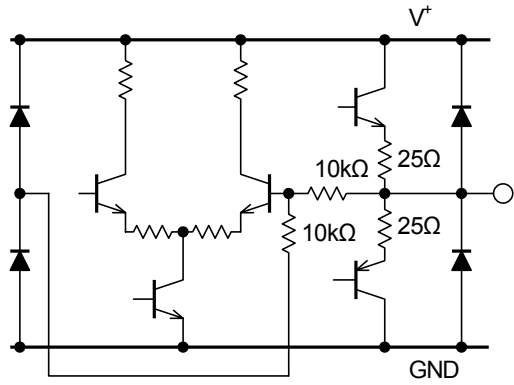
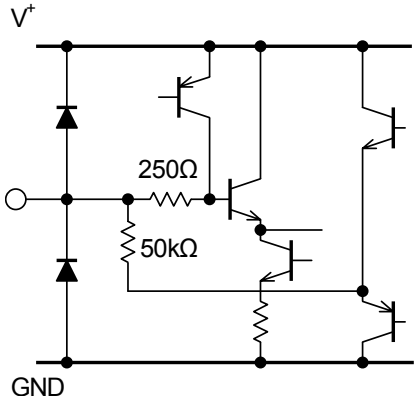
| No. | SYMBOL | FUNCTION                     | EQUIVALENT CIRCUIT | VOLATGE |
|-----|--------|------------------------------|--------------------|---------|
| 6   | SCL    | I <sup>2</sup> C Clock Input |                    | -       |
| 7   | SDA    | I <sup>2</sup> C Data Input  |                    | -       |
| 8   | MUTE   | Mute                         |                    | -       |

| No.                                                      | SYMBOL                                                                       | FUNCTION                                         | EQUIVALENT CIRCUIT | VOLATGE |
|----------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------|--------------------|---------|
| 50<br>49<br>48<br>47<br>46<br>45<br>41<br>14<br>15<br>16 | VIN1<br>VIN2<br>VIN3<br>VIN4<br>VIN5<br>VIN6<br>VIN7<br>YIN1<br>YIN2<br>YIN3 | V Input<br>Y Input                               |                    | 1.9V    |
| 17<br>18<br>19<br>20<br>21<br>22                         | PBIN1<br>PBIN2<br>PBIN3<br>PRIN1<br>PRIN2<br>PRIN3                           | Pb Input<br>Pr Input                             |                    | 2.5V    |
| 52<br>23                                                 | VLOS<br>YLOS                                                                 | V LOS<br>Detect Filter<br>Y LOS<br>Detect Filter |                    | -       |

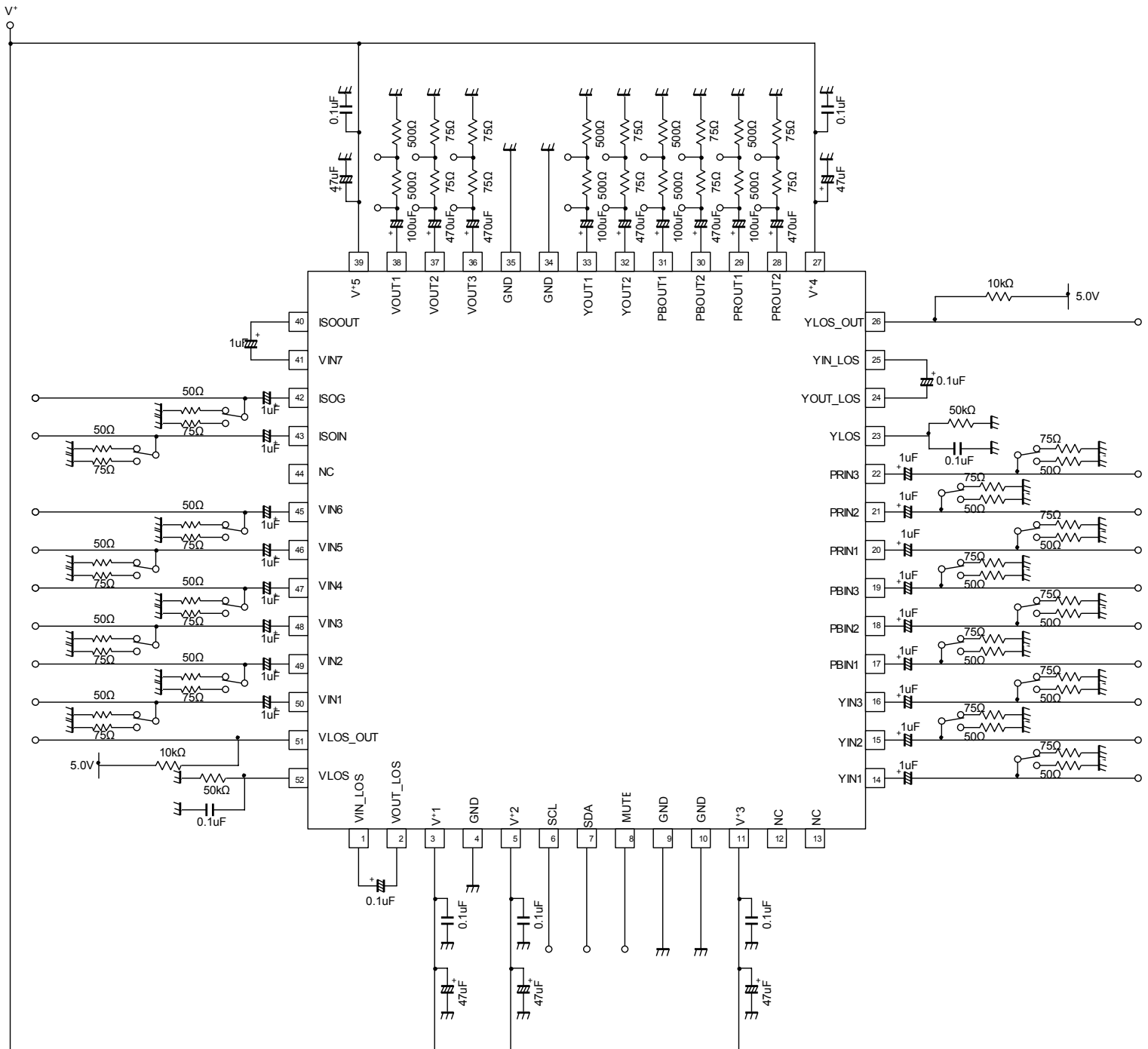
| No.            | SYMBOL                    | FUNCTION                                                          | EQUIVALENT CIRCUIT | VOLATGE              |
|----------------|---------------------------|-------------------------------------------------------------------|--------------------|----------------------|
| 51<br>26       | VLOS_OUT<br>YLOS_OUT      | VLOS Output<br>YLOS Output                                        |                    | -                    |
| 30<br>28       | PBOUT2<br>PROUT2          | Pb Output<br>Pr Output<br>For 75Ω Drive                           |                    | 2.5V                 |
| 33<br>31<br>29 | YOUT1<br>PBOUT1<br>PROUT1 | Y Output<br>Pb Output<br>Pr Output<br>With load<br>resistance 1kΩ |                    | 1.3V<br>2.5V<br>2.5V |

| No.      | SYMBOL         | FUNCTION                                | EQUIVALENT CIRCUIT | VOLATGE |
|----------|----------------|-----------------------------------------|--------------------|---------|
| 32       | YOUT2          | Y Output<br>For 75Ω Drive               |                    | 1.3V    |
| 37<br>36 | VOUT2<br>VOUT3 | V Output<br>For 75Ω Drive               |                    | 1.3V    |
| 38       | VOUT1          | V Output<br>With load<br>resistance 1kΩ |                    | 1.3V    |

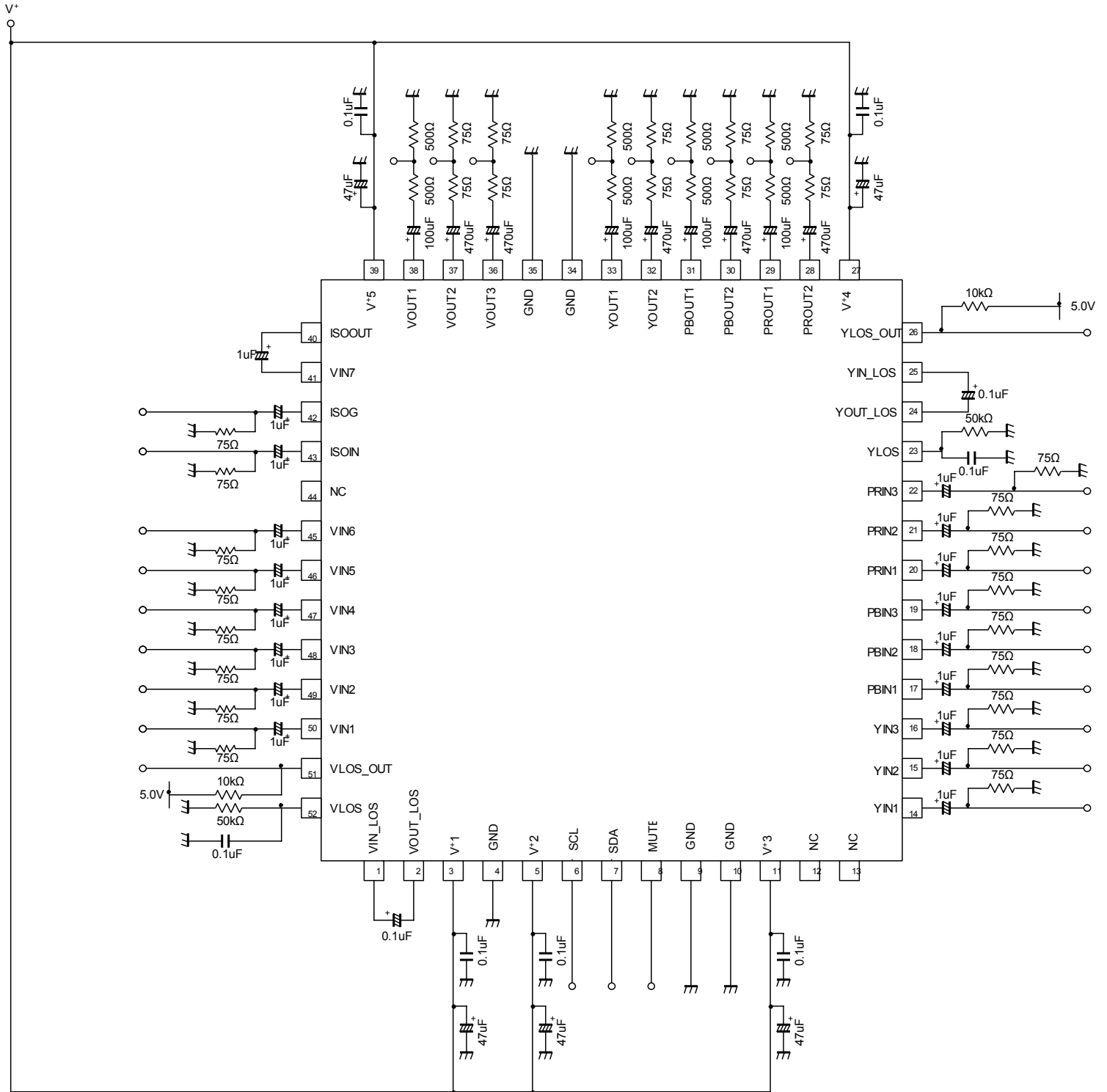
| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLATGE |
|-----|--------|----------|--------------------|---------|
|-----|--------|----------|--------------------|---------|

|          |               |                                              |                                                                                     |      |
|----------|---------------|----------------------------------------------|-------------------------------------------------------------------------------------|------|
| 40       | ISOOUT        | Isolation Output                             |   | 2.9V |
| 43<br>42 | ISOIN<br>ISOG | Isolation Input<br>Isolation Ground<br>Input |  | 2.9V |

## ■ TEST CIRCUIT



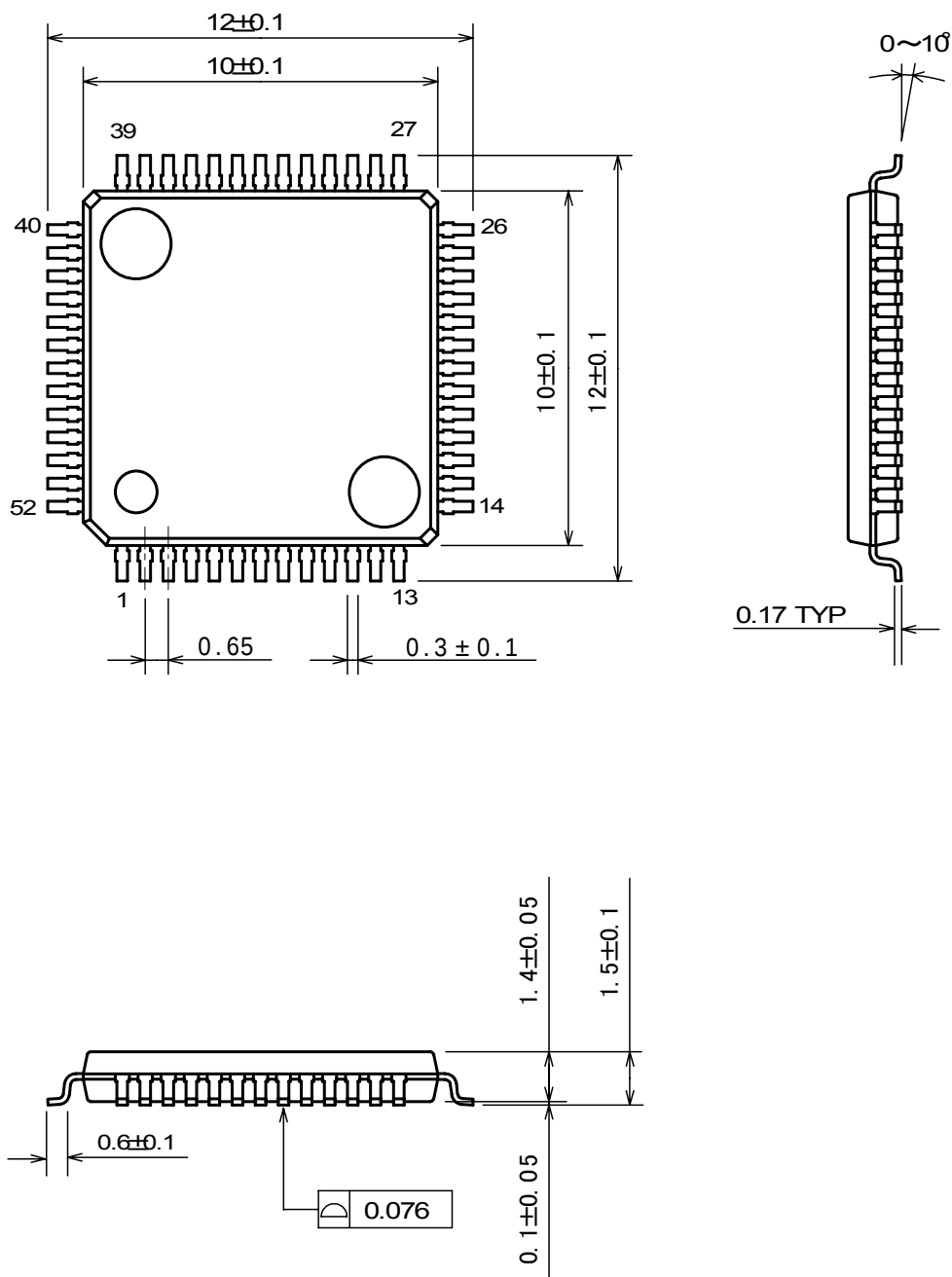
## APPLICATION CIRCUIT



## EXTERNAL DIMENSIONS

### LQFP52-H2

Unit : mm



[CAUTION]  
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