

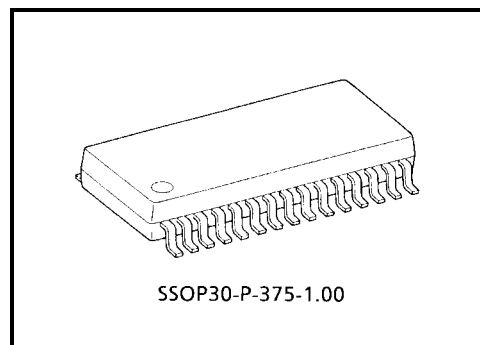
## TA8696F

### $\gamma$ Correction IC for LCD TV

TA8696F operates with a power supply voltage of 3.3 to 7.5 V and can be directly driven with a dry battery.

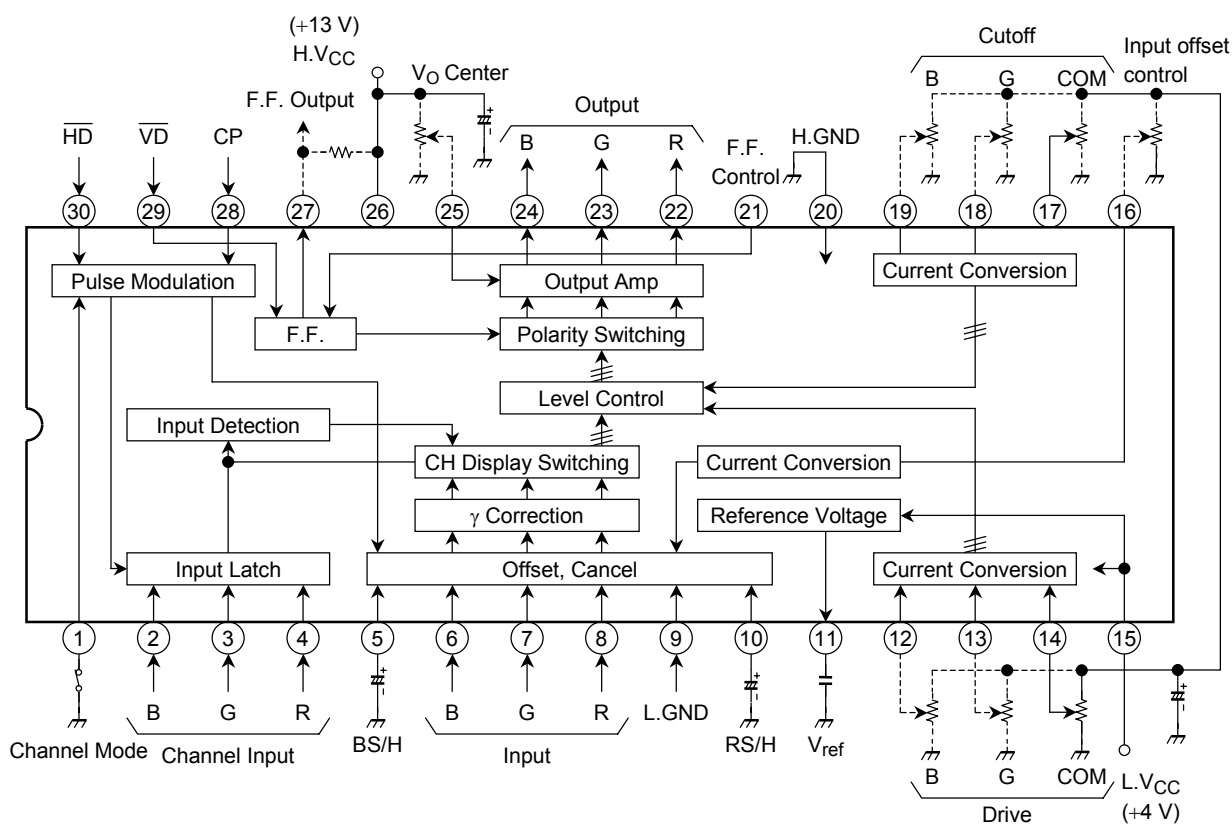
### Features

- Enables high-precision  $\gamma$  correction using logarithmic compression.
- $\gamma$  correction for normally white LCD panel is possible.
- Offset/cancel input circuit enables high-quality  $\gamma$  correction without distorting the primary color input signals.
- Cut-off voltage and drive voltage can be independently controlled.
- Unsusceptible to negative effects of fluctuation of power supply voltage.
- Either latch mode or through mode can be selected using the CH display mode switching pin.



Weight: 0.63 g (typ.)

### Block Diagram



## Pin Function

| Pin No. | Pin Name               | Reference Voltage (V) | Reference Current (mA) | Function                                            |
|---------|------------------------|-----------------------|------------------------|-----------------------------------------------------|
| 1       | Mode Switch            | 0                     | 0                      | CH display mode switching (latch mode/through mode) |
| 2       | CH B Input             | 0                     | 0                      | CH display signal blue input                        |
| 3       | CH G Input             | 0                     | 0                      | CH display signal green input                       |
| 4       | CH R Input             | 0                     | 0                      | CH display signal red input                         |
| 5       | BS/H                   | 1.6                   | 0                      | Blue input signal sample and hold capacitor         |
| 6       | B Input                | 1.6                   | 0                      | Blue primary color input                            |
| 7       | G Input                | 1.6                   | 0                      | Green primary color input                           |
| 8       | R Input                | 1.6                   | 0                      | Red primary color input                             |
| 9       | L.GND                  | 0                     | -8.1                   | Low-voltage signal GND                              |
| 10      | RS/H                   | 1.6                   | 0                      | Red input signal sample and hold capacitor          |
| 11      | V <sub>ref</sub>       | 1.6                   | 0                      | Internal reference voltage                          |
| 12      | B Drive                | 2                     | 0                      | B-axis drive control                                |
| 13      | R Drive                | 2                     | 0                      | R-axis drive control                                |
| 14      | COM Drive              | 2                     | 0                      | Common drive control                                |
| 15      | L.V <sub>CC</sub>      | 4.0                   | 8.1                    | Low-voltage signal V <sub>CC</sub>                  |
| 16      | $\gamma$ Offset        | 2                     | 0                      | $\gamma$ correction starting point control          |
| 17      | COM Cut-off            | 2                     | 0                      | Common cut-off control                              |
| 18      | R Cut-off              | 2                     | 0                      | R-axis cut-off control                              |
| 19      | B Cut-off              | 2                     | 0                      | B-axis cut-off control                              |
| 20      | H.GND                  | 0                     | -4.6                   | High-voltage signal GND                             |
| 21      | F.F. CONT.             | 1.4                   | —                      | —                                                   |
| 22      | R Output               | 6.5                   | 0                      | Red signal input                                    |
| 23      | G Output               | 6.5                   | 0                      | Green signal input                                  |
| 24      | B Output               | 6.5                   | 0                      | Blue signal input                                   |
| 25      | V <sub>O</sub> Center  | 6.5                   | 0                      | Signal output center voltage control                |
| 26      | H.V <sub>CC</sub>      | 13.0                  | 4.6                    | High-voltage signal V <sub>CC</sub>                 |
| 27      | F.F. Output            | 0.2                   | 0                      | Flip-flop output                                    |
| 28      | CP                     | 0.9                   | 0                      | Clamp pulse input                                   |
| 29      | $\overline{\text{VD}}$ | 1.4                   | 0                      | Vertical drive pulse input                          |
| 30      | $\overline{\text{HD}}$ | 0.9                   | 0                      | Horizontal drive pulse input                        |

Note 1: Reference voltage and reference current are for DC bias with no signal.  
The current which flows into the IC considered to be positive current.

| Pin No.     | Pin Name and Function                                                                                                            | Typical Signal Level                                                                                                                                                                    | Interface Current |
|-------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 1           | Mode switch<br>Switches channel indication mode<br>High level: Character mode<br>Low level: Latch mode<br>(synchronized with HD) | Internal bias 0 V<br>$V_{IH} = L.V_{CC}$<br>$V_{IL} = GND$<br>$V_{TH} = 1.9 V$<br>$V_{IH} \text{ Max} = L.V_{CC}$<br>$V_{IL} \text{ Min} = GND$<br>Clamped on L.V <sub>CC</sub> and GND |                   |
| 2<br>3<br>4 | CH B input<br>CH G input<br>CH R input<br>Channel indication signal<br>Input pin                                                 | Internal bias 0 V<br>$V_{TH} = 1.7 V$<br>$V_{IH} \text{ Max} = 5.5 V$<br>$V_{IL} \text{ Min} = GND$<br>Clamped on GND                                                                   |                   |
| 5<br>10     | BS/H<br>RS/H<br>Regenerate B/R-axis direct current voltage<br>Capacitor pin                                                      | Internal bias 1.6 V<br>External capacitance 1 μF<br>Permissible load current 0<br>Clamped on L.V <sub>CC</sub> and GND                                                                  |                   |
| 6<br>7<br>8 | B input<br>G input<br>R input<br>Primary color input pins                                                                        | Internal bias 1.6 V<br>White signal level 1.6 V<br>Black signal level 0.9 V<br>Maximum input level 1.4 V <sub>p-p</sub><br>Clamped on L.V <sub>CC</sub> and GND                         |                   |
| 11          | V <sub>ref</sub><br>Internal standard voltage reference pin                                                                      | Internal bias 1.6 V<br>Permissible load current 0<br>Clamped on L.V <sub>CC</sub> and GND                                                                                               |                   |

| Pin No.              | Pin Name and Function                        | Typical Signal Level                                                                                                                | Interface Current |
|----------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 12<br>13<br>18<br>19 | B drive<br>R drive<br>R cut-off<br>B cut-off | Internal bias $L.V_{CC}/2$<br>$V_{iH} \text{ Max} = L.V_{CC}$<br>$V_{iL} \text{ Min} = \text{GND}$<br>Clamped on $L.V_{CC}$ and GND |                   |
| 14<br>17             | COM drive<br>COM cut-off                     | Internal bias $L.V_{CC}/2$<br>$V_{iH} \text{ Max} = L.V_{CC}$<br>$V_{iL} \text{ Min} = \text{GND}$<br>Clamped on $L.V_{CC}$ and GND |                   |
| 16                   | $\gamma$ off-set                             | Internal bias $L.V_{CC}/2$<br>$V_{iH} \text{ Max} = L.V_{CC}$<br>$V_{iL} \text{ Min} = \text{GND}$<br>Clamped on $L.V_{CC}$ and GND |                   |
| 22<br>23<br>24       | R output<br>G output<br>B output             | Inverted in sync with VD<br><br>Clamped on $H.V_{CC}$ and GND                                                                       |                   |

| Pin No. | Pin Name and Function                               | Typical Signal Level                                                                                                                                                                                   | Interface Current |
|---------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 25      | $V_O$ center                                        | Internal bias $H.V_{CC}/2$<br>$V_{iH}$ Max = $H.V_{CC}$<br>$V_{iL}$ Min = GND<br>Clamped on $H.V_{CC}$ and GND                                                                                         |                   |
| 27      | F.F. output                                         | Desaturated open collector output<br>Maximum sink current 0.5 mA<br>( $V_{oL}$ Max = 0.3 V)<br>$V_{oH}$ Max = $H.V_{CC}$<br>Clamped on $H.V_{CC}$ and GND                                              |                   |
| 28      | CP<br>Clamp pulse input                             | Be sure CP is correspondent to the back porch of primary color input signal.<br>Input<br>$V_{TH}$ = 1.6 V<br>$V_{iH}$ Max = 5.5 V<br>$V_{iL}$ Min = GND<br>Clamped on $H.V_{CC}$ and GND               |                   |
| 29      | $\overline{VD}$ input<br>Vertical drive pulse input | Be sure $\overline{VD}$ falls within the vertical blanking period of primary color input signal.<br>Input<br>$V_{TH}$ =<br>$V_{iH}$ Max = 5.5 V<br>$V_{iL}$ Min = GND<br>Clamped on $H.V_{CC}$ and GND |                   |
| 30      | $\overline{HD}$ input                               | Be sure $\overline{HD}$ falls within the horizontal blanking period of primary color input signal.<br>Input<br>$V_{TH}$ = 0.9 V<br>$V_{iH}$ Max = 5.5 V<br>$V_{iL}$ Min = GND<br>Clamped on GND        |                   |

## Maximum Ratings (Ta = 25°C)

| Characteristics                 | Symbol            | Rating     | Unit  |
|---------------------------------|-------------------|------------|-------|
| Power supply voltage            | L.V <sub>CC</sub> | 8          | V     |
| Power supply voltage            | H.V <sub>CC</sub> | 14.5       | V     |
| Power dissipation               | P <sub>D</sub>    | 890        | mW    |
| Power dissipation lowering rate | θ <sub>ja</sub>   | 7.2        | mW/°C |
| Operating temperature           | T <sub>opr</sub>  | -20 to +75 | °C    |
| Storage temperature             | T <sub>stg</sub>  | -55 to 150 | °C    |

Note 2: When the IC is operated at 25°C or higher, reduce power dissipation by 12.8 mW per degree.

## Recommended Power Supply Voltage

| Pin No. | Pin Name          | Min  | Typ. | Max  | Unit |
|---------|-------------------|------|------|------|------|
| 15      | L.V <sub>CC</sub> | 3.3  | 5.0  | 7.5  | V    |
| 26      | H.V <sub>CC</sub> | 10.0 | 13.0 | 14.0 |      |

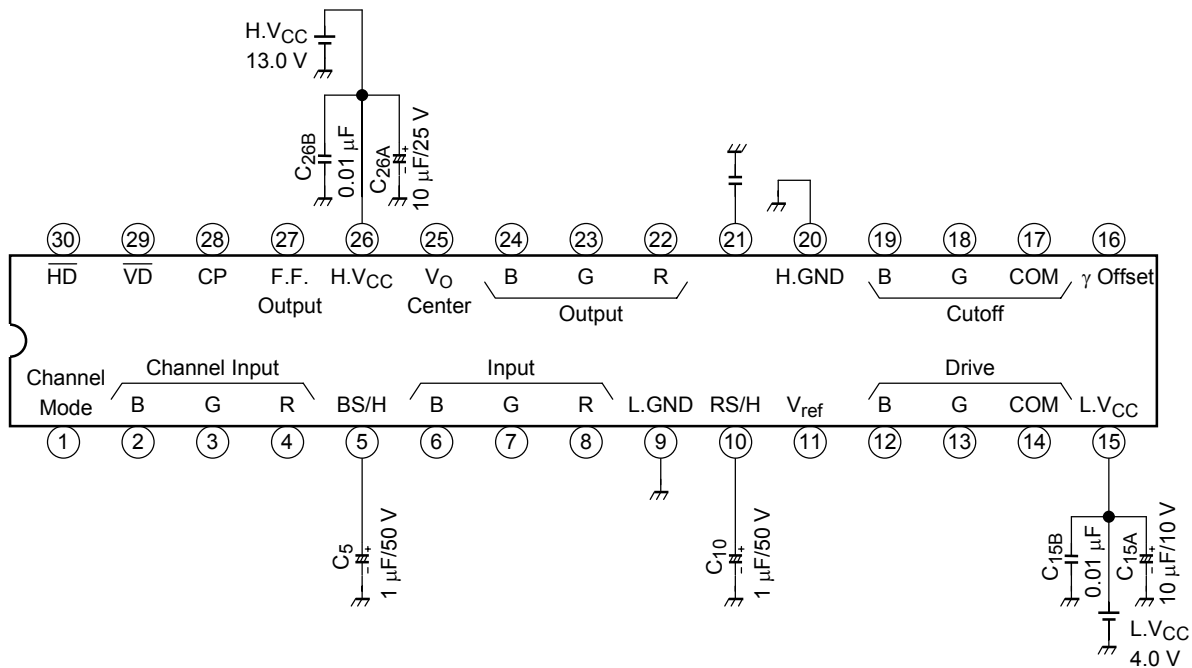
Electrical Characteristics (unless otherwise specified, V<sub>CC</sub> = 4 V, Ta = 25°C)

| Characteristics                                   | Symbol          | Test Circuit | Test Condition                               | Min  | Typ. | Max  | Unit |
|---------------------------------------------------|-----------------|--------------|----------------------------------------------|------|------|------|------|
| [1] Operating range                               |                 |              |                                              |      |      |      |      |
| Primary color input white signal level            | —               | 2            | The same conditions are given to R/G/B-axis. | —    | 1.6  | —    | V    |
| Primary color input black signal level            | —               | 2            | The same conditions are given to R/G/B-axis. | —    | 0.9  | —    | V    |
| CH indication signal level                        | —               | 2            | The same conditions are given to R/G/B-axis. | 3    | 5    | 5.5  | V    |
| Timing pulse level                                | —               | 2            | HD, VD, LD                                   | 3    | 5    | 5.5  | V    |
| [2] Electrical characteristics                    |                 |              |                                              |      |      |      |      |
| Operating power supply current (1)                | —               | 2            | Pin 15.L.V <sub>CC</sub> = 4 V No load.      | 5.8  | 8.4  | 10.9 | mA   |
| Operating power supply current (2)                | —               | 2            | Pin 26.H.V <sub>CC</sub> = 13 V No load.     | 3.2  | 4.6  | 6.0  | mA   |
| Input signal dynamic range                        | —               | 2            | —                                            | 1.2  | 1.4  | 1.6  | V    |
| Input signal pin resistor                         | R <sub>IN</sub> | 2            | —                                            | 10.5 | 14.0 | 17.5 | kΩ   |
| Input signal pin capacity                         | C <sub>IN</sub> | 2            | —                                            | —    | 1    | 3    | pF   |
| Black signal level off-set                        | —               | 2            | γ off-set open                               | —    | 100  | 200  | mV   |
| Black signal level off-set difference in the axes | —               | 2            | —                                            | —    | 50   | 100  | mV   |
| Black signal level off-set adjustment amount      | —               | 2            | —                                            | —    | 0.3  | —    | V    |
| Black signal level off-set adjustment sensitivity | —               | 2            | —                                            | —    | 300  | —    | mV/V |
| Input off-set elimination capacity                | —               | 2            | —                                            | 20   | 26   | —    | dB   |
| Off-set cancel difference in the axes             | —               | 2            | —                                            | —    | 50   | —    | mV   |
| Typical gain                                      | —               | 2            | Drive adjustment open                        | 9.4  | 12.4 | 15.4 | dB   |
| Typical gain difference in the axes               | —               | 2            | Drive adjustment open                        | —    | 0.5  | —    | dB   |
| Typical gain difference in the polarity           | —               | 2            | Drive adjustment open                        | —    | 0.5  | —    | dB   |
| Maximum gain                                      | —               | 2            | —                                            | 15.4 | 18.4 | —    | dB   |
| Minimum gain                                      | —               | 2            | —                                            | —    | -20  | -10  | dB   |

| Characteristics                                         | Symbol | Test Circuit | Test Condition                                | Min  | Typ. | Max  | Unit             |
|---------------------------------------------------------|--------|--------------|-----------------------------------------------|------|------|------|------------------|
| Gain control sensitivity                                | —      | 2            | —                                             | —    | 6    | —    | dB/V             |
| Polarity reverse center voltage                         | —      | 2            | V <sub>O</sub> center pin open                | 6.3  | 6.5  | 6.7  | V                |
| Polarity reverse center voltage difference in the axes  | —      | 2            | —                                             | —    | 50   | 100  | mV               |
| Polarity reverse center voltage variable range          | —      | 2            | —                                             | —    | 2    | —    | V                |
| Polarity reverse center voltage controlling sensitivity | —      | 2            | —                                             | —    | 1    | —    | V/V              |
| Typical cut-off level (N.W)                             | —      | 2            | Difference from V <sub>O</sub> center voltage | ±4.8 | ±5   | ±5.2 | V                |
| Cut-off level difference in the axes                    | —      | 2            | —                                             | —    | 50   | 100  | mV               |
| Cut-off level variable amount                           | —      | 2            | —                                             | —    | ±4   | —    | V                |
| Cut-off level controlling sensitivity                   | —      | 2            | —                                             | —    | 2    | —    | V/V              |
| Output dynamic range                                    | —      | 2            | —                                             | —    | 10   | —    | V <sub>p-p</sub> |
| Output impedance                                        | —      | 2            | —                                             | —    | 10   | —    | Ω                |
| Frequency characteristic                                | —      | 2            | Loaded amount 120 pF, -3dB point              | 3    | 4    | —    | MHz              |
| Frequency characteristic difference in the axes         | —      | 2            | Loaded amount 120 pF, -3dB point              | —    | 0.1  | 0.3  | MHz              |
| Slew rate                                               | —      | 2            | Loaded amount 120 pF                          | —    | 4    | —    | V/μs             |
| Slew rate difference in the axes                        | —      | 2            | Loaded amount 120 pF                          | —    | —    | 10   | %                |
| Crosstalk in the axes                                   | —      | 2            | —                                             | —    | 50   | 40   | dB               |
| Direct current transmission rate                        | —      | 2            | —                                             | —    | 100  | —    | %                |
| S/N N                                                   | —      | 2            | —                                             | 40   | 50   | —    | dB               |
| CH indication signal threshold                          | —      | 2            | —                                             | —    | 2.2  | —    | V                |
| CH indication mode switch threshold                     | —      | 2            | —                                             | —    | 2.2  | —    | V                |
| CH indication output delay (line mode)                  | —      | 2            | —                                             | —    | 1    | —    | μs               |
| CH indication output delay (dot mode)                   | —      | 2            | —                                             | —    | 0.1  | —    | μs               |
| CH indication latch minimum operation voltage           | —      | 2            | —                                             | —    | —    | 3    | V                |
| HD pulse threshold                                      | —      | 2            | —                                             | 1.3  | 1.6  | 1.9  | V                |
| LD pulse threshold                                      | —      | 2            | —                                             | 1.3  | 1.6  | 1.9  | V                |
| VD pulse threshold                                      | —      | 2            | —                                             | 1.3  | 1.6  | 1.9  | V                |
| F.F. minimum operation voltage                          | —      | 2            | —                                             | —    | —    | 10   | V                |
| F.F. phase delay                                        | —      | 2            | —                                             | —    | 3    | —    | μs               |
| F.F. response frequency                                 | —      | 2            | —                                             | 20   | —    | —    | kHz              |
| F.F. output high level                                  | —      | 2            | —                                             | 11.0 | 13.0 | —    | V                |
| F.F. output low level                                   | —      | 2            | —                                             | 0.1  | 0.3  | 0.5  | V                |
| γ correction value (1) NW                               | —      | 2            | —                                             | —    | 0.35 | —    | —                |
| γ correction value (2) NW                               | —      | 2            | —                                             | —    | 20   | —    | —                |
| γ correction value difference in the axes (1)           | —      | 2            | —                                             | —    | —    | 10   | %                |
| γ correction value difference in the axes (2)           | —      | 2            | —                                             | —    | —    | 10   | %                |

## Test Circuit 1

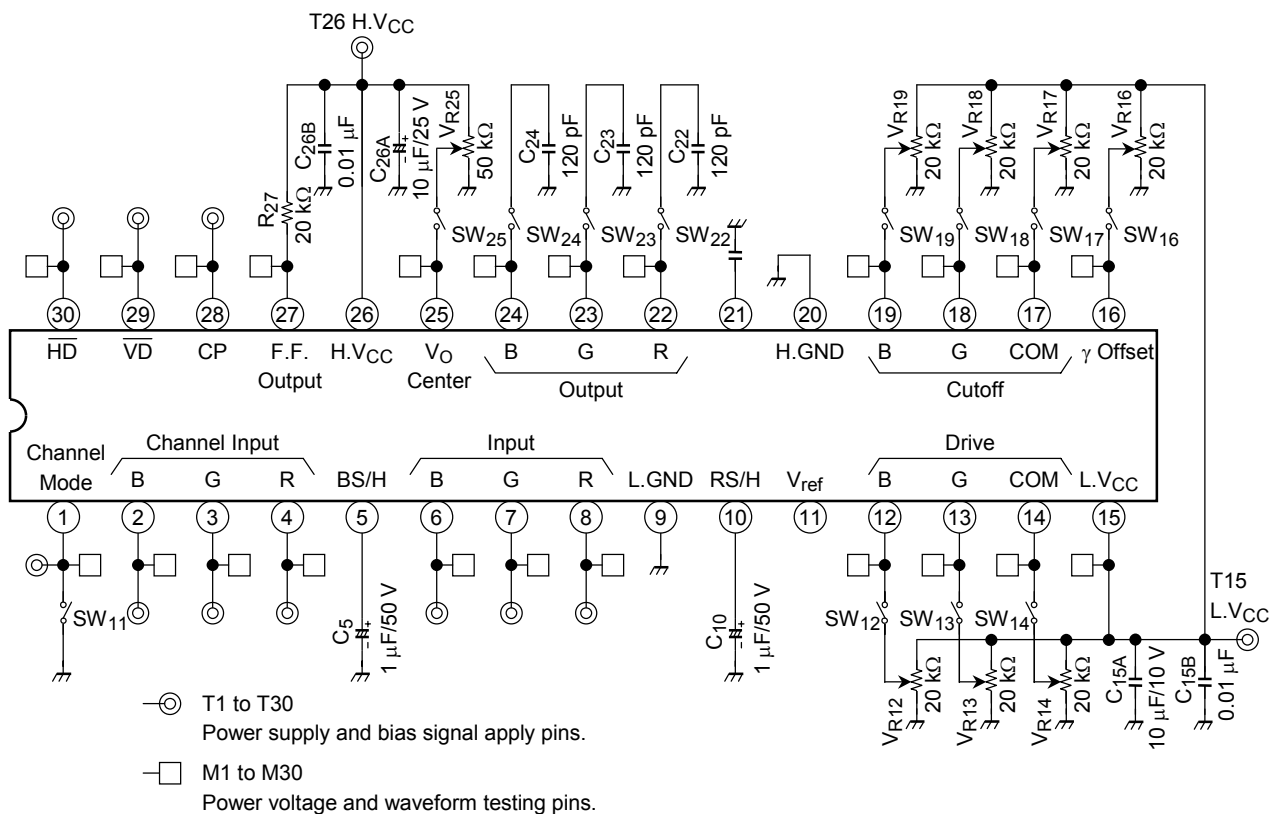
### Direct Current Characteristic



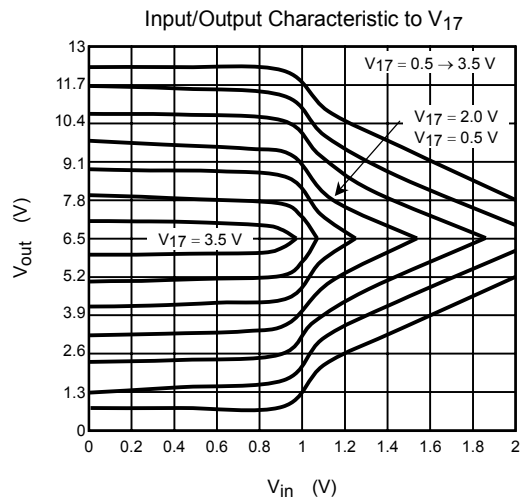
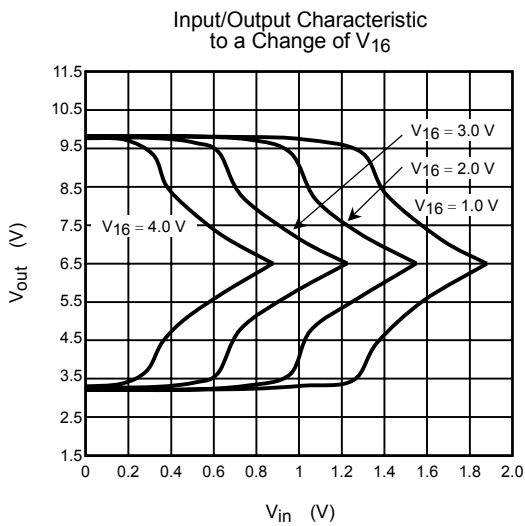
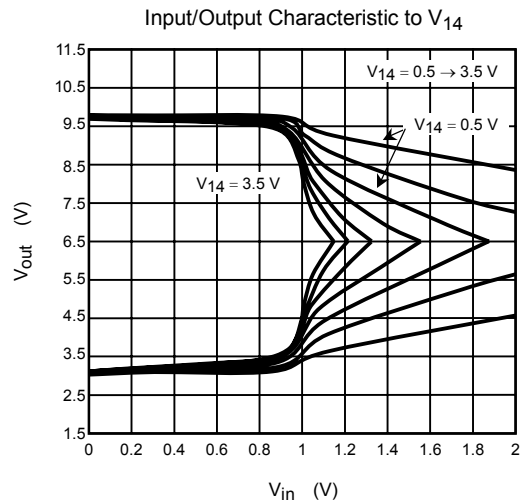
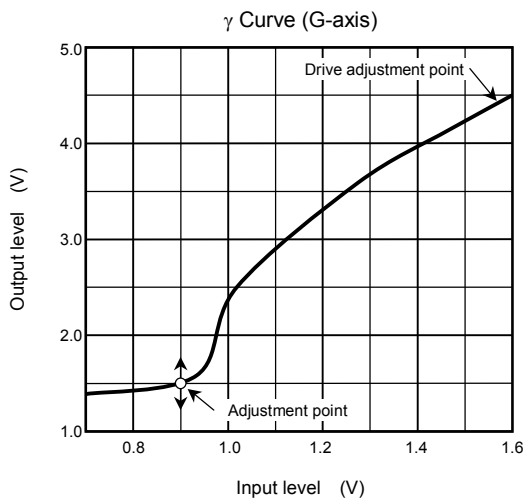
Note 3: Connect test pins directly to IC pins. (not shown above.)  
Test value is written as V.1 to V.30.

## Test Circuit 2

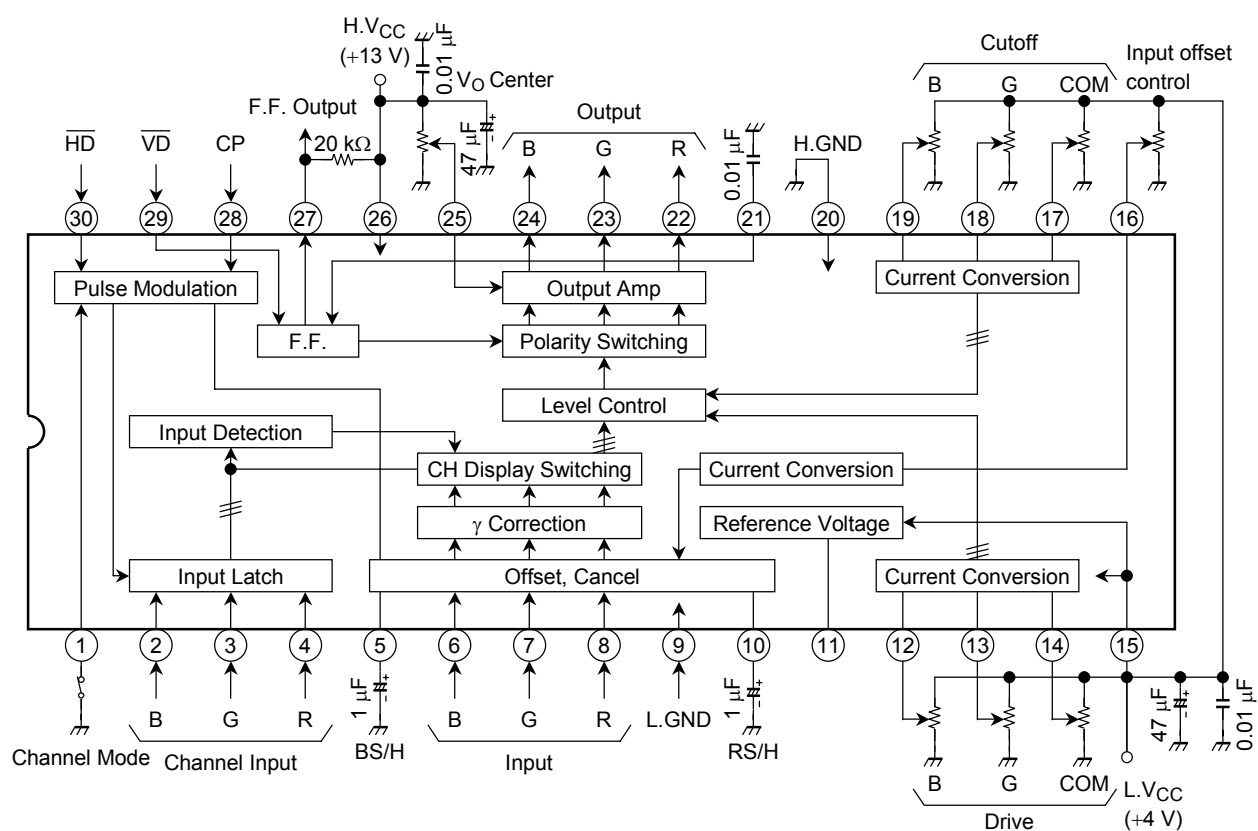
### Alternating Current Characteristic



Note 4: The numbers of testing pins are not shown above because they are the same as IC pin numbers.



## Typical Application Circuits

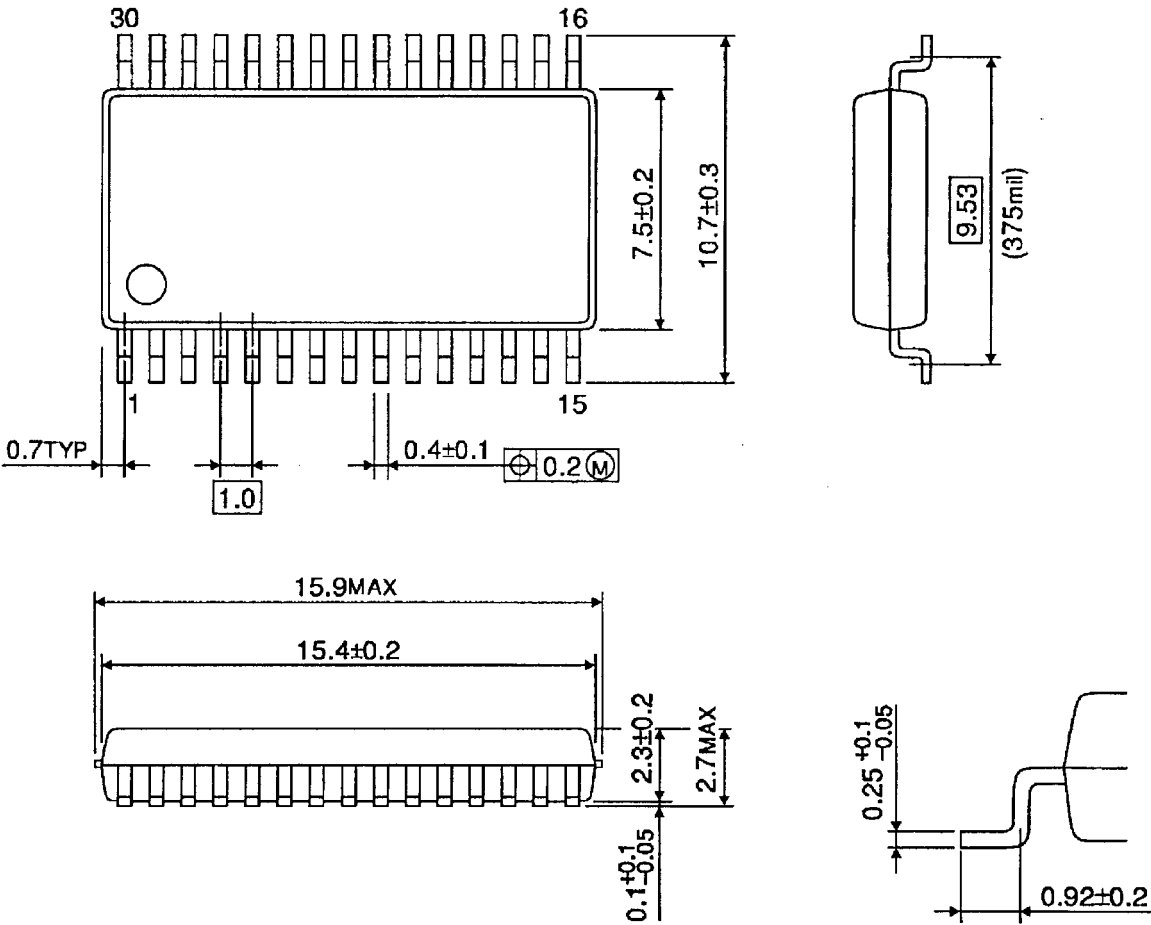


- All control VR is 20 kΩ. Connect 0.01 μF close to each control pin.

Package Dimensions

SSOP30-P-375-1.00

Unit : mm



Weight: 0.63 g (typ.)

**RESTRICTIONS ON PRODUCT USE**

000707EBA

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