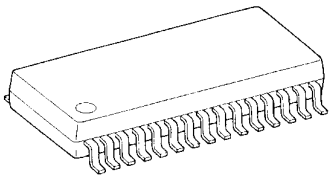
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8696F

γ 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.



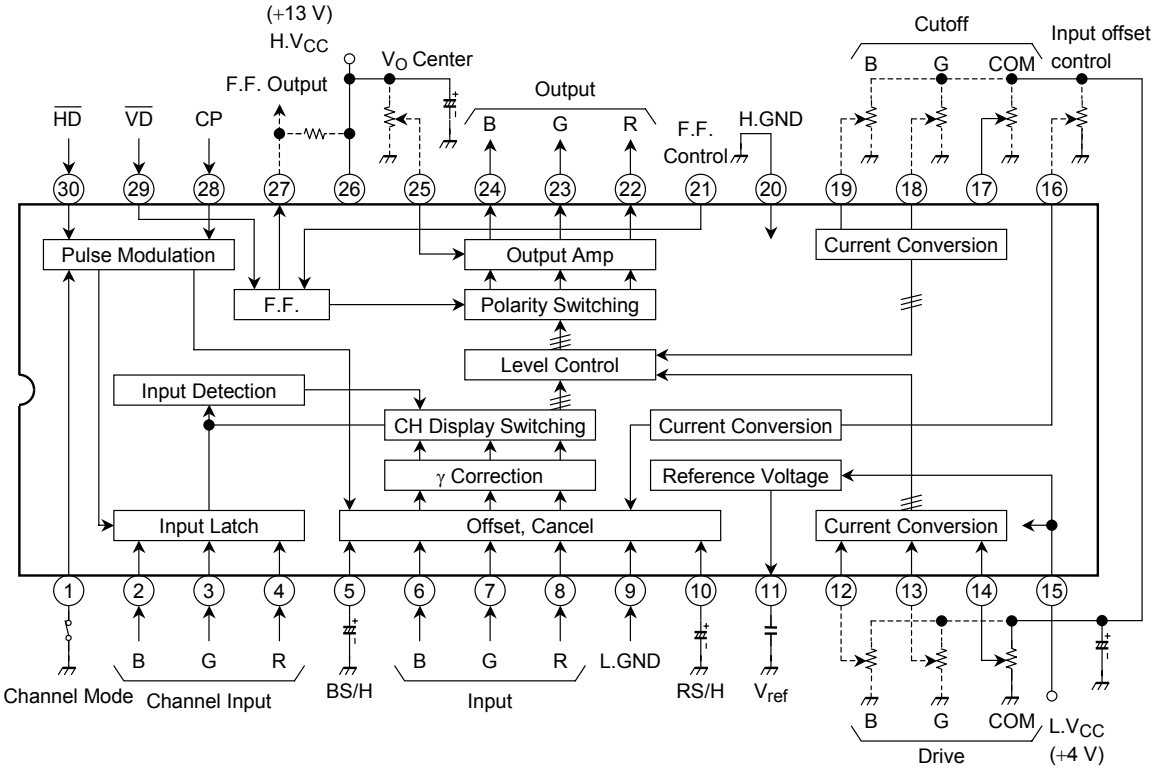
SSOP30-P-375-1.00

Weight: 0.63 g (typ.)

Features

- Enables high-precision γ correction using logarithmic compression.
- γ correction for normally white LCD panel is possible.
- Offset/cancel input circuit enables high-quality γ 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.

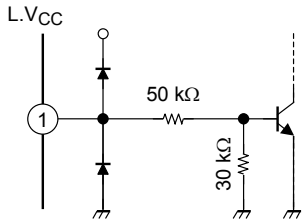
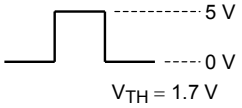
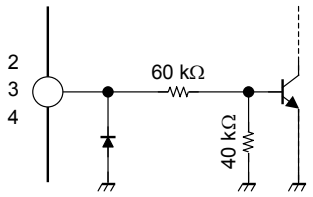
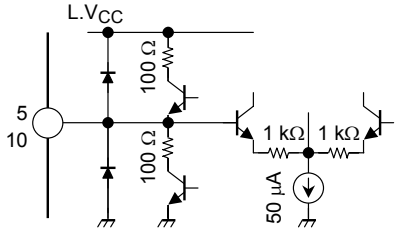
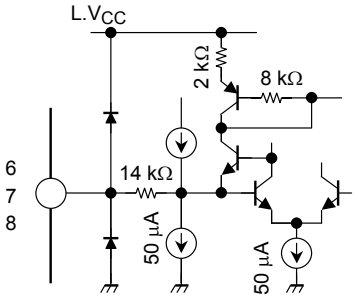
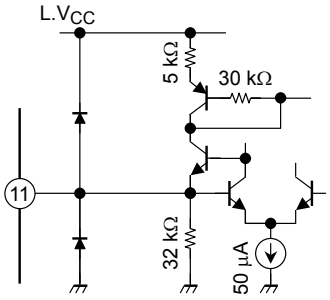
Block Diagram

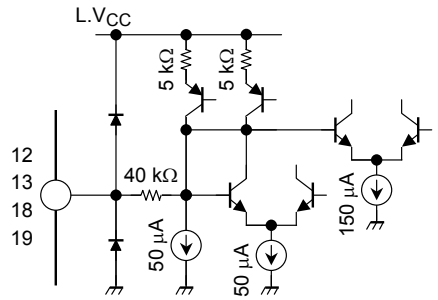
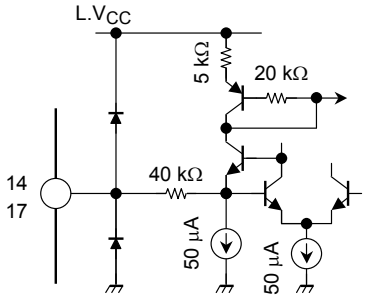
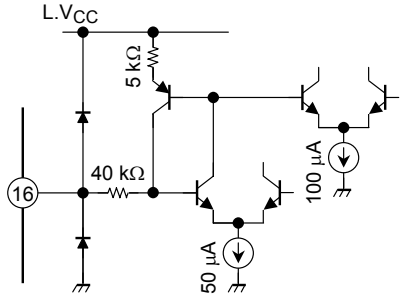
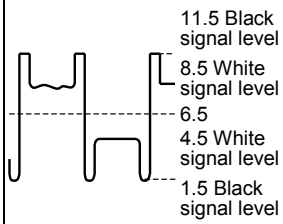
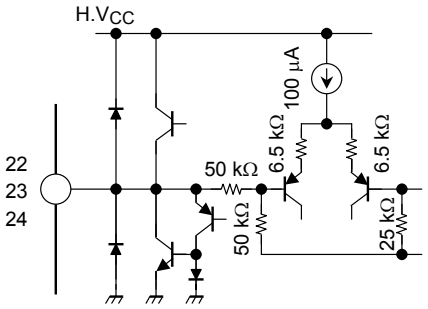


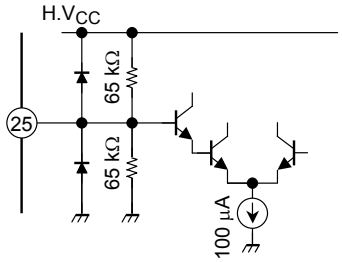
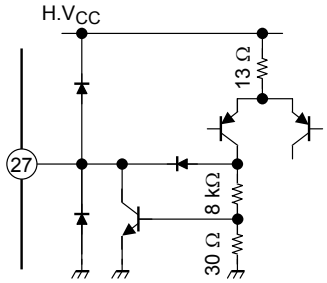
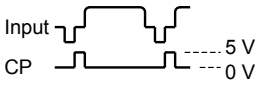
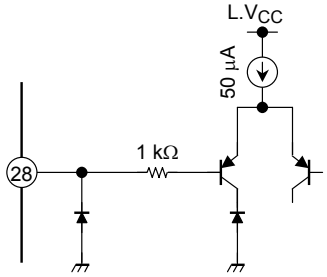
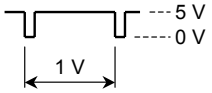
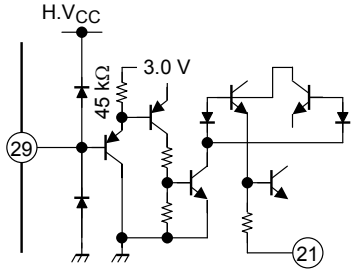
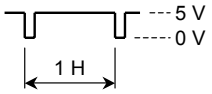
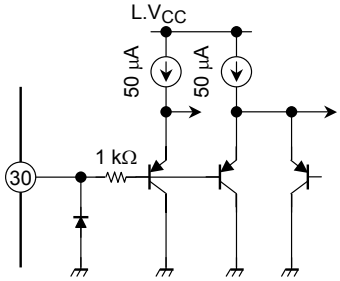
Pin Function

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_{ref}	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_{CC}	4.0	8.1	Low-voltage signal V_{CC}
16	γ Offset	2	0	γ 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_O Center	6.5	0	Signal output center voltage control
26	H.V_{CC}	13.0	4.6	High-voltage signal V_{CC}
27	F.F. Output	0.2	0	Flip-flop output
28	CP	0.9	0	Clamp pulse input
29	$\overline{VD}$	1.4	0	Vertical drive pulse input
30	$\overline{HD}$	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 Switches channel indication mode High level: Character mode Low level: Latch mode (synchronized with HD)	Internal bias 0 V V_{iH} = L.V_{CC} V_{iL} = GND V_{TH} = 1.9 V $V_{iH\ Max}$ = L.V_{CC} $V_{iL\ Min}$ = GND Clamped on L.V_{CC} and GND	
2 3 4	CH B input CH G input CH R input Channel indication signal Input pin	Internal bias 0 V  $V_{iH\ Max}$ = 5.5 V $V_{iL\ Min}$ = GND Clamped on GND	
5 10	BS/H RS/H Regenerate B/R-axis direct current voltage Capaciator pin	Internal bias 1.6 V External capacitance 1 μF Permissible load current 0 Clamped on L.V_{CC} and GND	
6 7 8	B input G input R input Primary color input pins	Internal bias 1.6 V White signal level 1.6 V Black signal level 0.9 V Maximum input level 1.4 V_{p-p} Clamped on L.V_{CC} and GND	
11	V_{ref} Internal standard voltage reference pin	Internal bias 1.6 V Permissible load current 0 Clamped on L.V_{CC} and GND	

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

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

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage	$L.V_{CC}$	8	V
Power supply voltage	$H.V_{CC}$	14.5	V
Power dissipation	P_D	890	mW
Power dissipation lowering rate	θ_{ja}	7.2	mW/°C
Operating temperature	T_{opr}	−20 to +75	°C
Storage temperature	T_{stg}	−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	$L.V_{CC}$	3.3	5.0	7.5	V
26	$H.V_{CC}$	10.0	13.0	14.0	

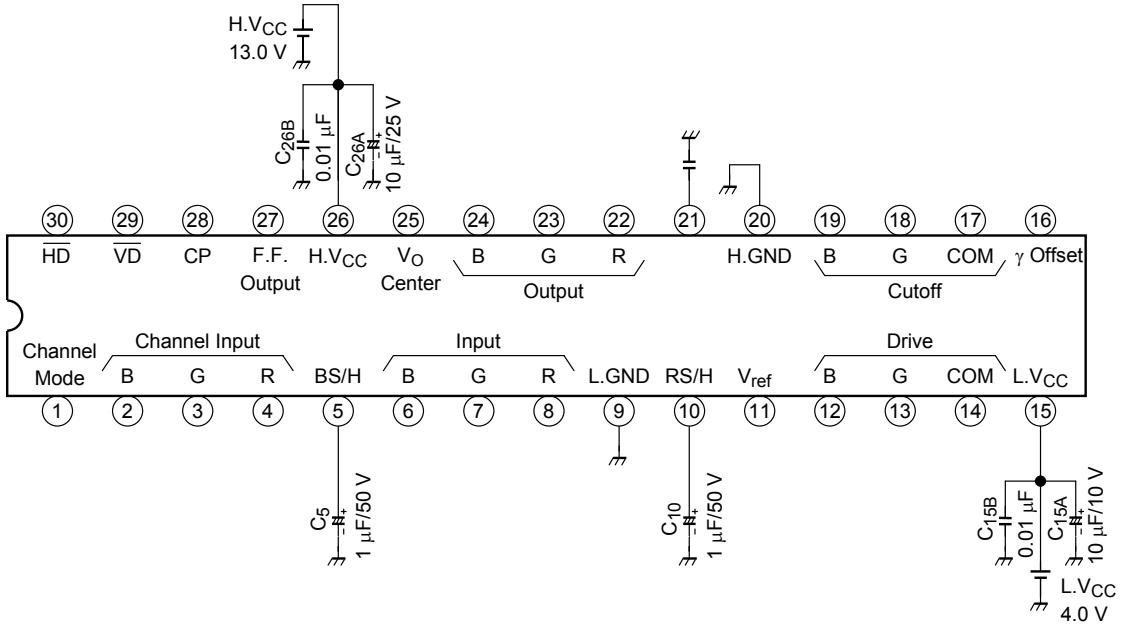
Electrical Characteristics (unless otherwise specified, V_{CC} = 4 V, Ta = 25°C)

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	$\overline{HD}$, $\overline{VD}$, $\overline{LD}$	3	5	5.5	V
[2] Electrical characteristics							
Operating power supply current (1)	—	2	Pin 15.$L.V_{CC}$ = 4 V No load.	5.8	8.4	10.9	mA
Operating power supply current (2)	—	2	Pin 26.$H.V_{CC}$ = 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_{IN}	2	—	10.5	14.0	17.5	kΩ
Input signal pin capacity	C_{IN}	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_O 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_O 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_{p-p}
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

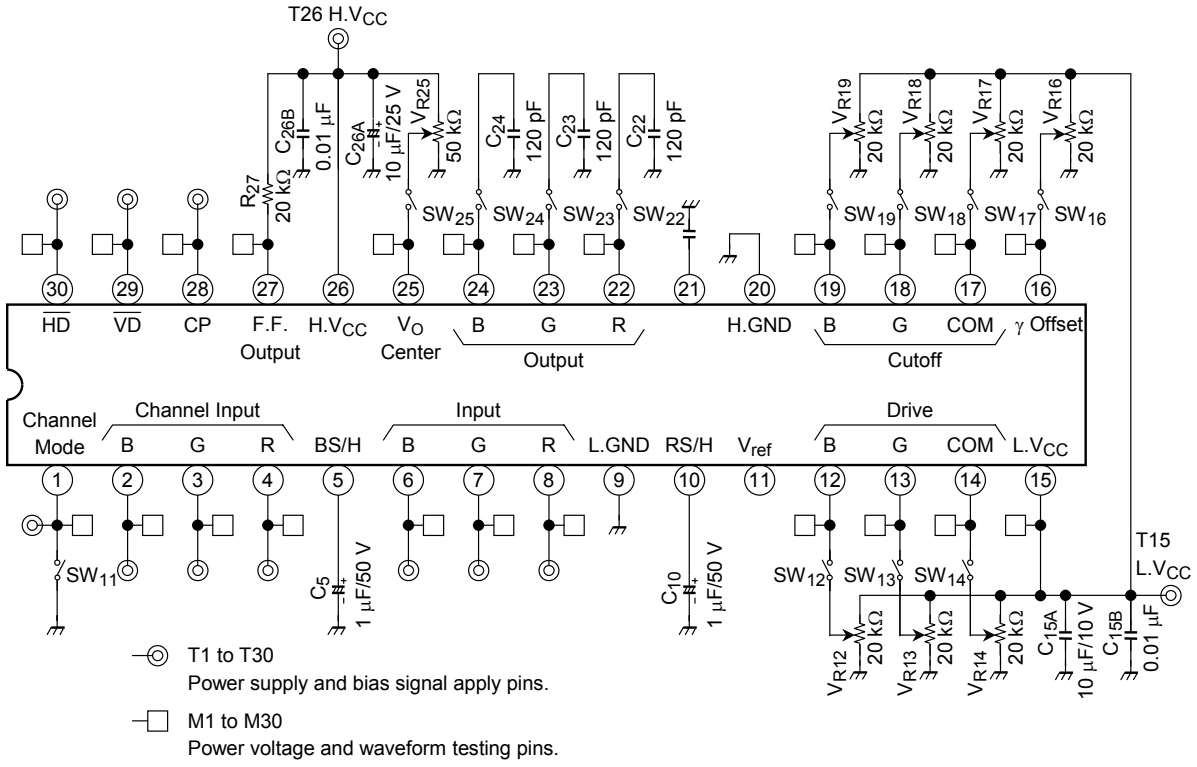
Direct Current Characteristic



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

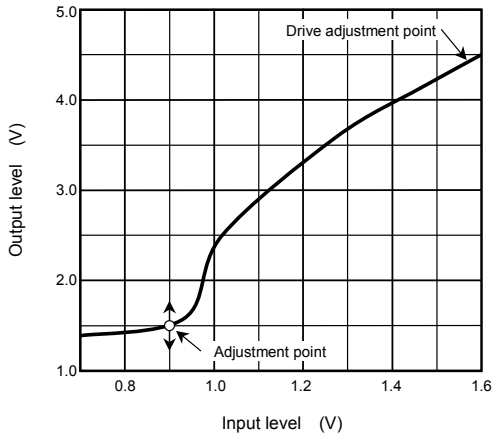
Test Circuit 2

Alternating Current Characteristic

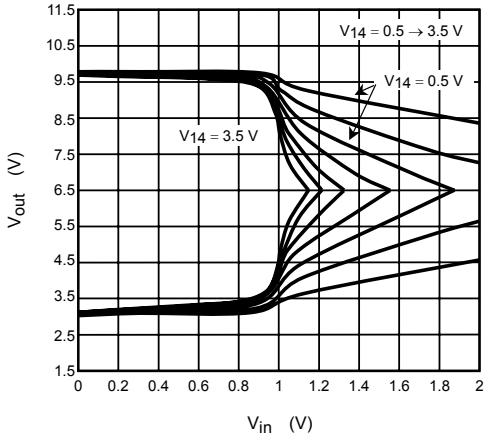


Note 4: The numbers of testing pins are not shown above because they are the same as IC pin numbers.

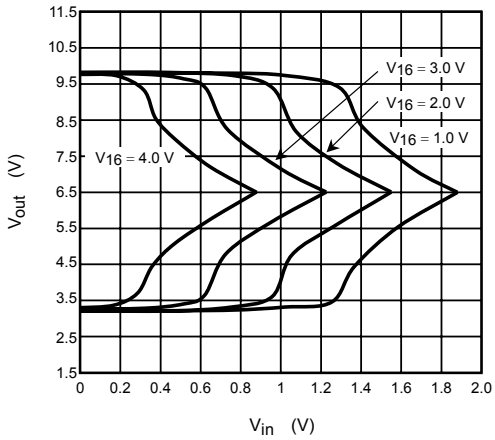
γ Curve (G-axis)



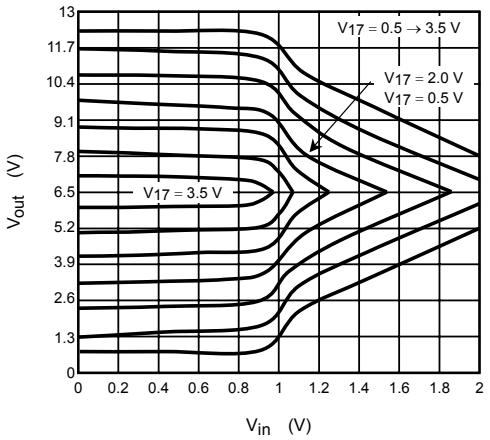
Input/Output Characteristic to V_{14}



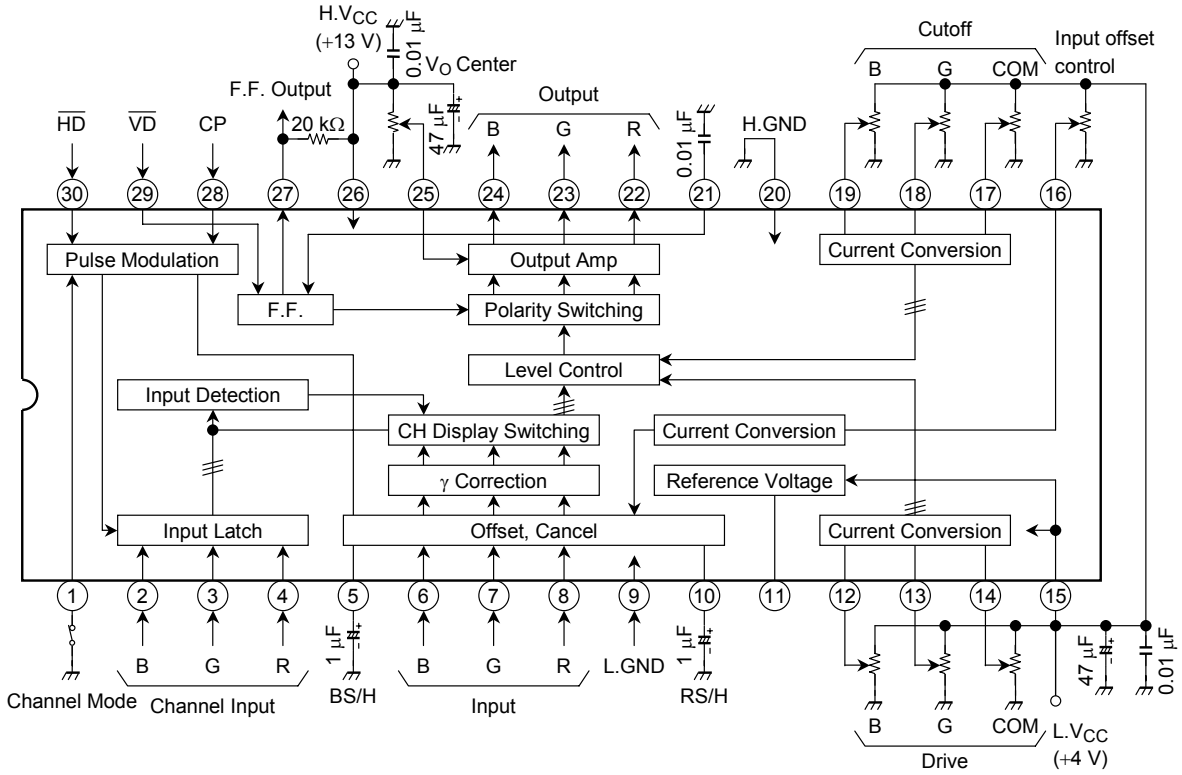
Input/Output Characteristic to a Change of V_{16}



Input/Output Characteristic to V_{17}



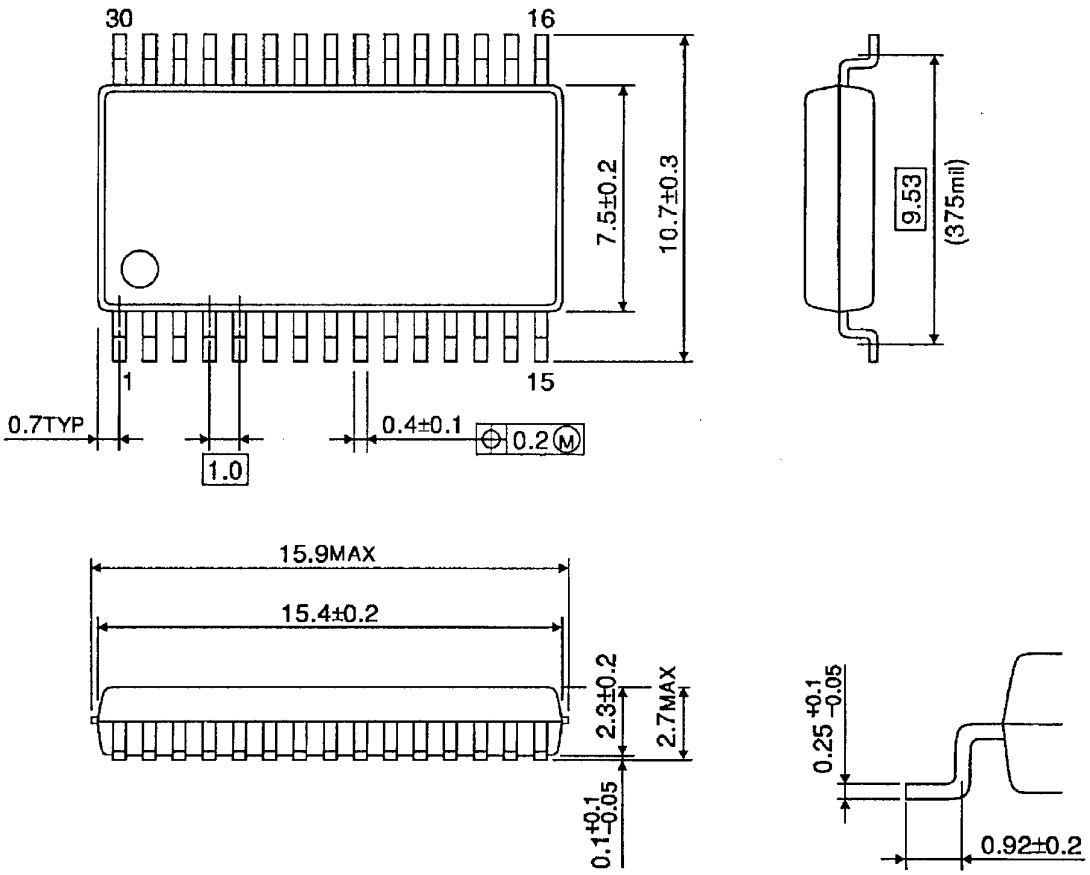
Typical Application Circuits



○ All control VR is 20 kB. Connect 0.01 µF close to each control pin.

Package Dimensions

SSOP30-P-375-1.00 Unit : mm



Weight: 0.63 g (typ.)

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000707EBA

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