

# M65677FP

## Digital NTSC/PAL Encoder

REJ03F0189-0201

Rev.2.01

Mar 31, 2008

### Description

The M65677FP encodes CCIR601 or CCIR656 format Y/Cb/Cr data into analog NTSC and PAL video signals, including Digital Signal Processing functions such as Closed Caption encoding. Overlay OSD, Anti Video Copy Processing<sup>Note1</sup> e.t.c. It also includes peripheral processing function such as 10 bit DAC e.t.c., so that low cost and compact system can be realized.

### Features

- Macrovision's video anti copy process Rev 7.01 supported<sup>Note1</sup>
- Overlay CGMS signal online 20/283 for 525/60<sup>Note3</sup>
- Generate CRCC for CGMS Signal
- Overlay WSS signal online 23 for 625/50<sup>Note4</sup>
- Color adjustment (TINT/color control)
- NTSC, B/G PAL or MPAL Video Outputs
- Component Y/C Video (S-Video) and CVBS or Y/U/V Outputs
- Supporting CCIR601 and CCIR656 format data
- Closed Caption Manager online 21/284 for NTSC
- Generate ODD parity for Closed Caption Manager
- H/V Sync and Composite generating
- Overlay Digital OSD Supporting Y/Cb/Cr 4:4:4
- Over sampling Filter
- 2 ch 10 bit DAC and 3 ch 6 dB Amp<sup>Note2</sup>
- 3.3 V I/O interface
- I<sup>2</sup>C Bus Interface for Controls
- Power down mode

Notes: 1. This device is protected by U.S. patent numbers 4631603, 4577216 and 4819098 and other intellectual property rights. The use of Macrovision Corporation's copy protection technology in the device must be authorized by Macrovision and is intended for home and other limited pay-par-view uses only, unless otherwise authorized in writing by Macrovision. Reverse engineering or disassembly is prohibited.

2. 6 dB Amp max. output is 1.0 Vp-p

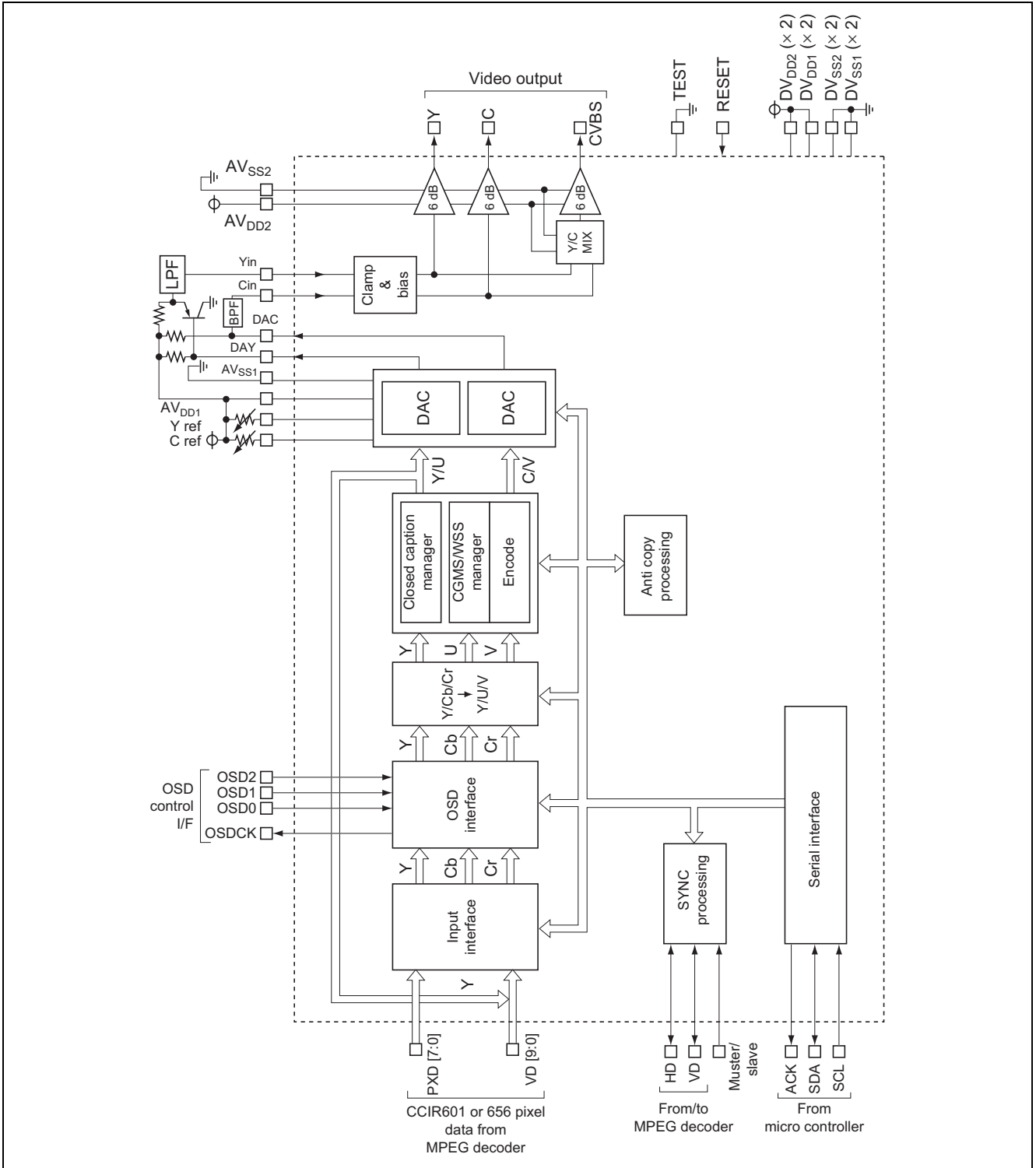
3. Copy Generation Management System-A (IEC1880)

4. Wide Screen Signaling (ETS300 294)

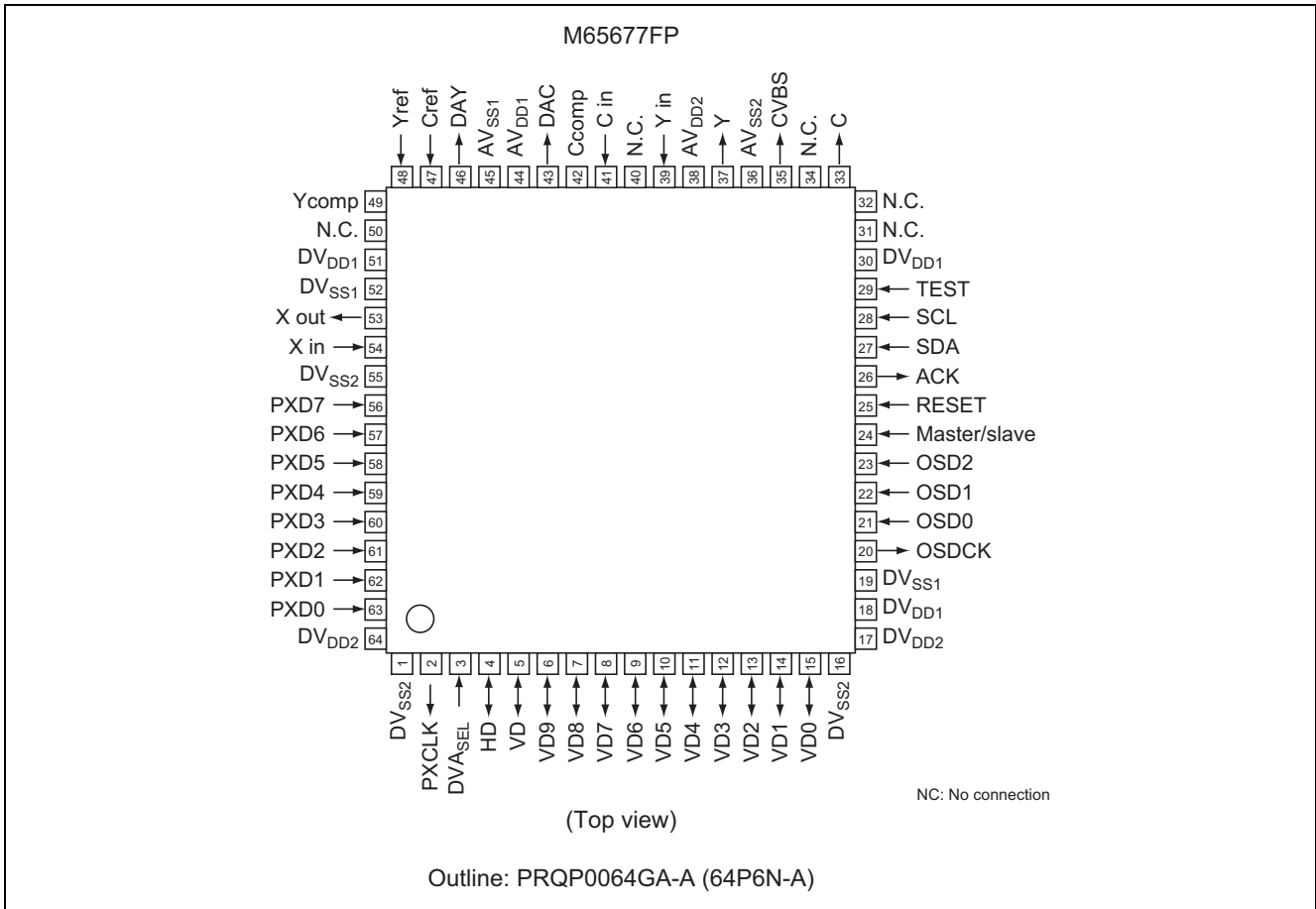
### Application

DVB, DVD, Digital CATV, Video CD

Block Diagram



# Pin Arrangement



## Pin Description

Pin No	Pin Name	Type	Function
1	DV <sub>SS2</sub>	Supply	Digital ground for the I/O
2	PXCLK	O	Reference clock for input pixel data. The clock frequency is 27.0 MHz
3	DVA <sub>SEL</sub>	I	I <sup>2</sup> C slave address setting. "Low" is for the address of 40h, "High" is for the address of 42h.
4	HD	I/O	Horizontal sync signal input or output. It is an input and output in the slave and master mode, respectively.
5	VD	I/O	Vertical sync input or output. Or Odd Even signal output. It is an input and output in the slave and master mode, respectively.
6	VD9	I/O	Video data outputs. In the Y/U/V output mode, the output is the 10-bit digital luma signal with a composite sync. VD9 is MSB and VD0 is LSB.
7	VD8		
8	VD7		
9	VD6		
10	VD5		
11	VD4		
12	VD3		
13	VD2		
14	VD1		
15	VD0		
16	DV <sub>SS2</sub>	Supply	Digital ground for the I/O.
17	DV <sub>DD2</sub>	Supply	Digital supply for the I/O
18	DV <sub>DD1</sub>	Supply	Digital supply for the internal logic.
19	DV <sub>SS1</sub>	Supply	Digital ground for the internal logic.
20	OSDCK	O	The reference clock for an external OSD microcontroller. The frequency is 13.5 MHz or 6.25 MHz, alternated by I <sup>2</sup> C bus control.
21	OSD0	I	The color look-up table address input. MSB and LSB are OSD2 and OSD0, respectively.
22	OSD1		
23	OSD2		
24	Master/Slave	I	Synchronizing mode selection. "Low" is for the slave mode. "High" is for the master mode.
25	RESET	I	Initializing reset. "Low" is active.
26	ACK	O	Acknowledge line (Open drain output).
27	SDA	I/O	Serial data line/acknowledge line (Open drain output).
28	SCL	I	Serial clock line.
29	TEST	I	For testing. Is should be grounded during an actual use.
30	DV <sub>DD1</sub>	Supply	Digital supply for the internal logic.
31	N.C.	—	No connection.
32	N.C.	—	No connection.
33	C	O	The analog chroma output from a 6 dB amplifier. The output amplitude is 1.0 V <sub>P-P</sub> (Typ), while the input is 0.5 V <sub>P-P</sub> .
34	N.C.	—	No connection.
35	CVBS	O	The analog composite video signal from a 6 dB amplifier. The output amplitude is 1.24 V <sub>P-P</sub> (Typ).
36	AV <sub>SS2</sub>	Supply	Analog ground for 6 dB amplifiers.
37	Y	O	The analog luma output from a 6 dB amplifier. The output amplitude is 1.2 V <sub>P-P</sub> (Typ), while input is 0.6 V <sub>P-P</sub> .
38	AV <sub>SS2</sub>	Supply	Analog supply for 6 dB amplifiers.

## Pin Description (cont.)

Pin No	Pin Name	Type	Function
39	Yin	I	The analog luma input from an external LPF. This input has bias circuit. The signal must input via a capacitor.
40	N.C.	—	No connection.
41	Cin	I	The analog chroma input from an external LPF. This input has bias circuit. The signal must input via a capacitor.
42	Ccomp	I	Phase compensation for chroma or V output DAC. It should be connected to the analog ground via a capacitor.
43	DAC	O	Chroma or V signal output. The DAC output should be connected to the analog supply via a load resistor ( $R_L$ ). The output amplitude is set up by reference resistor ( $R_{ref}$ ) and $R_L$ .
44	AV <sub>DD1</sub>	Supply	Analog supply for DACs.
45	AV <sub>SS1</sub>	Supply	Analog ground for DACs.
46	DAY	O	Luma or U signal output. It should be connected to the analog supply via a load resistor ( $R_L$ ). The output amplitude is set up by reference resistor ( $R_{ref}$ ) and $R_L$ .
47	Cref	I	A reference current source for chroma or V signal output DAC. It should be connected to the analog supply via a reference resistor ( $R_{ref}$ ).
48	Yrel	I	A reference current source for Y or U DAC. It should be connected to the analog supply via a reference resistor ( $R_{ref}$ ).
49	Ycomp	I	Phase compensation for Y or U DAC. It should be connected to the analog ground via a capacitor.
50	N.C.	—	No connection.
51	DV <sub>DD1</sub>	Supply	Digital supply for the internal logic.
52	DV <sub>SS1</sub>	Supply	Digital ground for the internal logic.
53	Xout	O	System clock output. It must be in no connection except for a connection to a X'tal oscillator.
54	Xin	I	System clock input. The clock frequency is only 27.0 MHz.
55	DV <sub>SS2</sub>	Supply	Digital ground for the I/O.
56	PXD7	I	Pixel data inputs. The acceptable video data are; <ul style="list-style-type: none"> <li>Multiplexed video data (Y/Cb/Cr) including timing reference code of SAV and EAV, defined in CCIR Rec656</li> <li>Multiplexed video data (Y/Cb/Cr) defined in CCIR Rec601</li> </ul> MSB and LSB are PXD7 and PXD0, respectively.
57	PXD6		
58	PXD5		
59	PXD4		
60	PXD3		
61	PXD2		
62	PXD1		
63	PXD0		
64	DV <sub>DD2</sub>	Supply	Digital supply for the I/O.

## Absolute Maximum Ratings

Item	Symbol	Limits			Unit
		Min	Typ	Max	
Supply voltage	V <sub>DD</sub>	-0.3	—	4.5	V
Digital input voltage	V <sub>I</sub>	-0.3	—	V <sub>DD</sub> + 0.3	V
Digital output voltage	V <sub>O</sub>	-0.3	—	V <sub>DD</sub> + 0.3	V
Operating temperature	T <sub>a</sub>	-20	+25	+75	°C
Storage temperature	T <sub>stg</sub>	-40	—	+125	°C

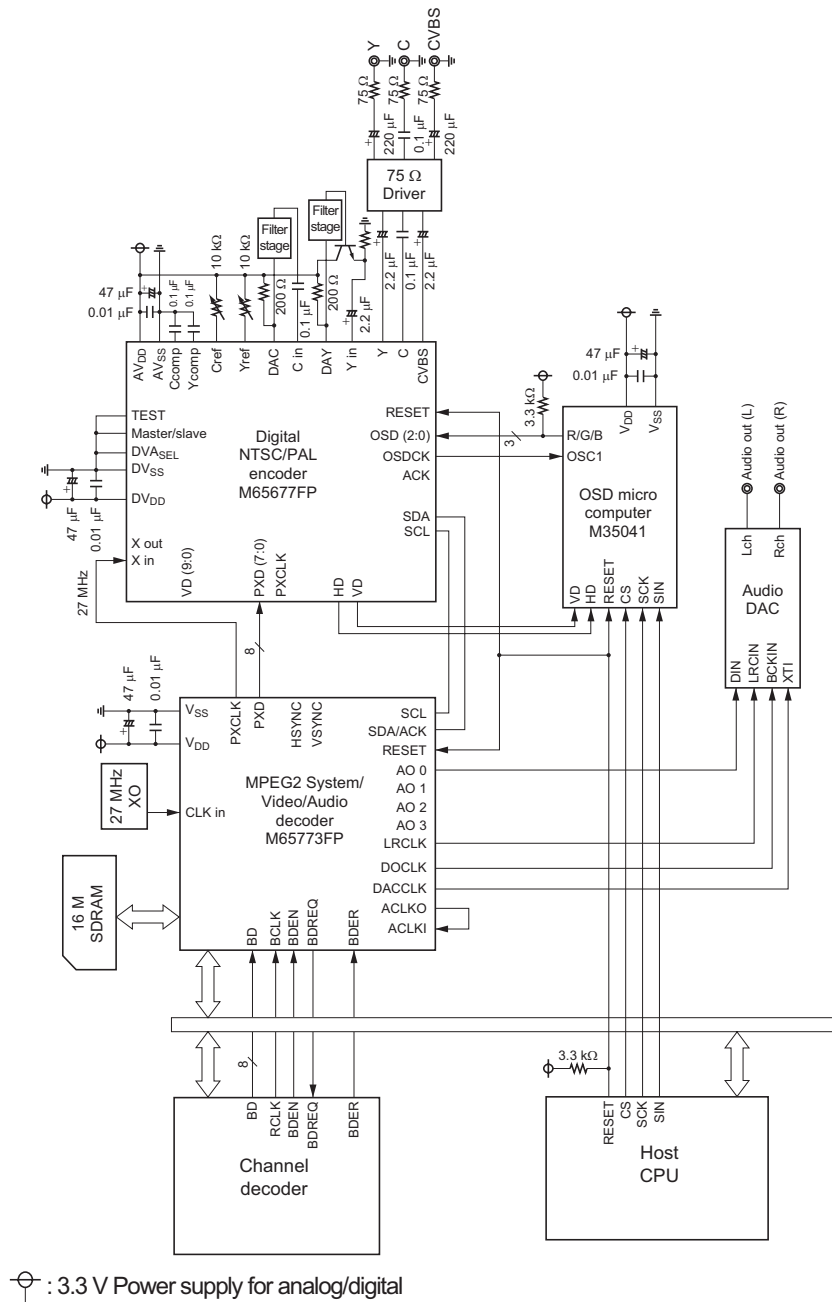
## Recommended Operating Condition

( $T_a = 25^\circ\text{C}$ ,  $DV_{DD} = AV_{DD} = 3.3\text{ V}$ ,  $DV_{SS} = AV_{SS} = 0\text{ V}$ , unless otherwise noted)

Item	Symbol	Limits			Unit	Test Conditions
		Min	Typ	Max		
Supply						
Digital supply voltage	$DV_{DDX}$	3.0	3.3	3.6	V	
Analog supply voltage	$AV_{DDX}$	3.15	3.3	3.45	V	
Digital current consumption	$DI_{DD}$	0	—	45	mA	
Analog current consumption	$AI_{DD}$	0	—	55	mA	
Digital input						
Input voltage	$V_{IL}$	0	—	0.8	V	$DV_{DD} = 3.0\text{ V}$
	$V_{IH}$	2.5	—	3.6	V	$DV_{DD} = 3.6\text{ V}$
Input leakage current	$I_{IL}/I_{IH}$	—	—	15	$\mu\text{A}$	$DV_{DD} = 3.0\text{ V}$ , $V_I = 0\text{ V}$ or $V_I = 3.6\text{ V}$
Input capacitance	$C_I$	—	7	15	pF	$f = 1\text{ MHz}$ , $V_{DD} = 0\text{ V}$
Digital output						
Output voltage	$V_{OL}$	—	—	0.05	V	$DV_{DD} = 3.3\text{ V}$ , $ I_O  < 1\text{ A}$
	$V_{OH}$	3.25	—	—	V	
Output capacitance	$C_O$	—	7	15	pF	$f = 1\text{ MHz}$ , $V_{DD} = 0\text{ V}$
$I^2\text{C}$ Bus						
Output current	$I_O$	4.0	—	—	mA	$DV_{DD} = 3.0\text{ V}$ , $V_{IL} = 0.4\text{ V}$
Output leakage current (off)	$I_{OZ}$	—	—	15	$\mu\text{A}$	$DV_{DD} = 3.6\text{ V}$ , $V_I = 0\text{ V}$ or $V_I = 3.6\text{ V}$
D/A converter						
Resolution	Res	—	10	—	Bit	
Integral non-linearity error	INL	—	—	2.0	LSB	
Differential non-linearity error	DNL	—	—	1.0	LSB	
Maximum output amplitude	$V_{fS_{MAX}}$	1.5	—	—	V <sub>p-p</sub>	
6-dB amplifier						
Bias resistor	$R_{bias}$	7.5	10.0	11.5	k $\Omega$	
Output gain (Y/C)	$G_{V_{YC}}$	5.50	6.00	6.50	dB	
Output Gain (CVBS)	$G_{V_{CV}}$	5.10	6.00	6.85	dB	
Input dynamic range	$DR_{in}$	0.8	—	—	V <sub>p-p</sub>	
Output dynamic range	$DR_{out}$	1.6	—	—	V <sub>p-p</sub>	
Yin clamp charge current	$I_{ych}$	-12	-26	-50	$\mu\text{A}$	
Yin clamp discharge current	$I_{yids}$	0.26	0.65	1.80	$\mu\text{A}$	
Yin clamp discharge current	$R_{ycl}$	20	0.65	70	—	$R_{ycl} = -\frac{I_{ych}}{I_{yids}}$
Yin input clamp voltage	$V_{ycl}$	0.45	0.50	0.55	V	
Yin output clamp voltage	$V_{yocl}$	0.40	0.50	0.60	V	
CVBS output clamp voltage	$V_{cvcl}$	0.30	0.50	0.70	V	
Cin input bias voltage	$V_{cin}$	0.95	1.00	1.05	V	
C output bias voltage	$V_{cob}$	0.90	1.00	1.10	V	
Output current	$I_{amp}$	1.00	—	—	mA	

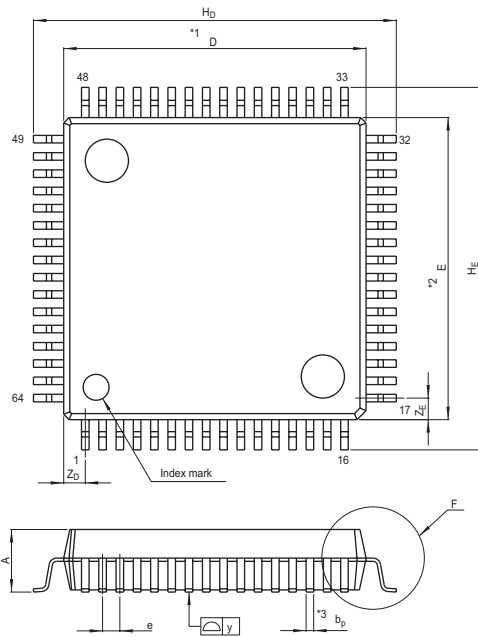
# Application Example

(CCIR656 I/F, Y/C/CVBS Output Mode)



### Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-QFP64-14x14-0.80	PRQP0064GA-A	64P6N-A	1.1g



NOTE)  
 1. DIMENSIONS \*\*1\* AND \*\*2\* DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION \*\*3\* DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	13.8	14.0	14.2
E	13.8	14.0	14.2
A <sub>2</sub>	—	2.8	—
H <sub>D</sub>	16.5	16.8	17.1
H <sub>E</sub>	16.5	16.8	17.1
A	—	—	3.05
A <sub>1</sub>	0	0.1	0.2
b <sub>p</sub>	0.3	0.35	0.45
c	0.13	0.15	0.2
θ	0°	—	10°
e	0.65	0.8	0.95
y	—	—	0.10
Z <sub>D</sub>	—	1.0	—
Z <sub>E</sub>	—	1.0	—
L	0.4	0.6	0.8



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