

MN657021F

Low Power 8-Bit, 3-Channel CMOS D/A Converter for Image Processing

Overview

The MN657021F is a high-speed 8-bit, 3-channel CMOS digital-to-analog converter. (Two channels use serial input.)

It uses both a matrix cell and weighted current technology to achieve both low power consumption and high speed.

It provides independent output amplitude adjustment for the Y (luminance) and C (chroma) synchronization signals. The Y (luminance signal) can be superimposed with an external SYNC signal.

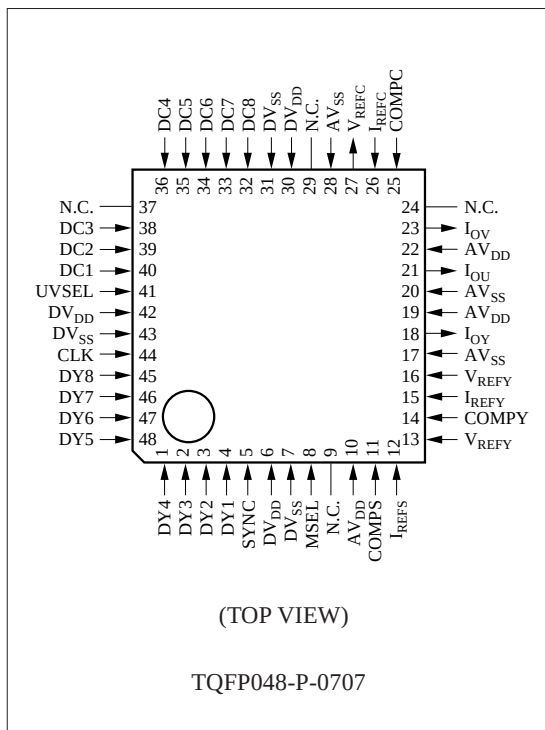
Features

- Maximum conversion rate: 27 MSPS (min.)
- Linearity error: ± 0.2 LSB (typ.)
- Differential linearity error: ± 0.2 LSB (typ.)
- Power supply voltage: 3.15 ± 0.3 V
- Full scale current: 1.75 mA (typ.)
- Power consumption: 54 mW (typ.) ($f_{CLK}=27$ MHz)

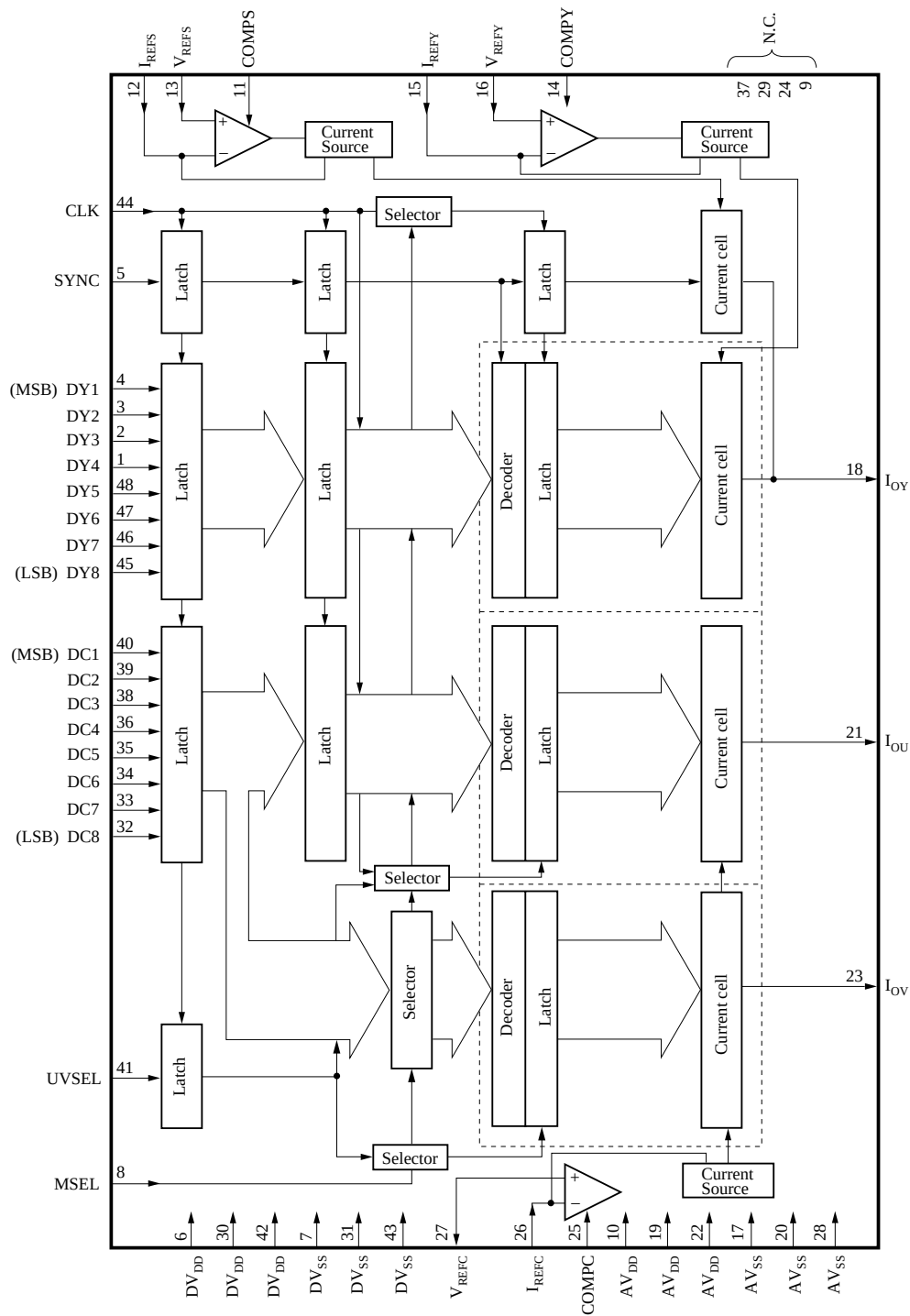
Applications

- Digital television
- Digital video equipment
- Digital image processing equipment

Pin Assignment



■ Block Diagram



Pin Descriptions

Pin No.	Symbol	Function Description
1	DY4	Y (luminance) digital input
2	DY3	Y (luminance) digital input
3	DY2	Y (luminance) digital input
4	DY1	Y (luminance) digital input (MSB)
5	SYNC	SYNC signal judgment signal
6	DV _{DD}	Power supply for digital circuits
7	DV _{SS}	Ground for digital circuits
8	MSEL	Y, C/Y, R-Y, B-Y discrimination signal
9	N.C.	No connection
10	AV _{DD}	Power supply for analog circuits
11	COMPS	Phase compensation
12	I _{REFS}	Full scale adjustment resistor
13	V _{REFS}	SYNC reference voltage input
14	COMPY	Phase compensation
15	I _{REFY}	Full scale adjustment resistor
16	V _{REFY}	Luminance reference voltage input
17	AV _{SS}	Ground for analog circuits
18	I _{OY}	Y signal analog current output
19	AV _{DD}	Power supply for analog circuits
20	AV _{SS}	Ground for analog circuits
21	I _{OU}	U signal analog current output
22	AV _{DD}	Ground for analog circuits
23	I _{OV}	V signal analog current output
24	N.C.	No connection
25	COMPC	Phase compensation
26	I _{REFC}	Full scale adjustment resistor
27	V _{REFC}	Chroma reference voltage input
28	AV _{SS}	Ground for analog circuits
29	N.C.	No connection
30	DV _{DD}	Power supply for digital circuits
31	DV _{SS}	Ground for digital circuits
32	DC8	C (chroma) digital input (LSB)
33	DC7	C (chroma) digital input
34	DC6	C (chroma) digital input
35	DC5	C (chroma) digital input
36	DC4	C (chroma) digital input
37	N.C.	No connection
38	DC3	C (chroma) digital input
39	DC2	C (chroma) digital input
40	DC1	C (chroma) digital input (MSB)
41	UVSEL	U/V signal discrimination for C (chroma) signal
42	DV _{DD}	Power supply for digital circuits

■ Pin Descriptions (continued)

Pin No.	Symbol	Function Description
43	DV _{SS}	Ground for digital circuits
44	CLK	Sampling clock
45	DY8	Y (luminance) digital input (LSB)
46	DY7	Y (luminance) digital input
47	DY6	Y (luminance) digital input
48	DY5	Y (luminance) digital input

■ Absolute Maximum Ratings $T_a=25^{\circ}\text{C}$

Parameter	Symbol	Rating	Unit
Power supply voltage for digital circuits	DV _{DD}	− 0.3 to +7.0	V
Power supply voltage for analog circuits	AV _{DD}	− 0.3 to +7.0	V
Input voltage	V _I	− 0.3 to DV _{DD} +0.3	V
Output voltage	V _O	− 0.3 to AV _{DD} +0.3	V
Operating ambient temperature	T _{opr}	−20 to +70	°C
Storage temperature	T _{stg}	−55 to +125	°C

■ Recommended Operating Conditions $V_{DD}=AV_{DD}=DV_{DD}=3.0\text{V}$, $V_{SS}=AV_{SS}=DV_{SS}=0\text{V}$, $T_a=25^{\circ}\text{C}$

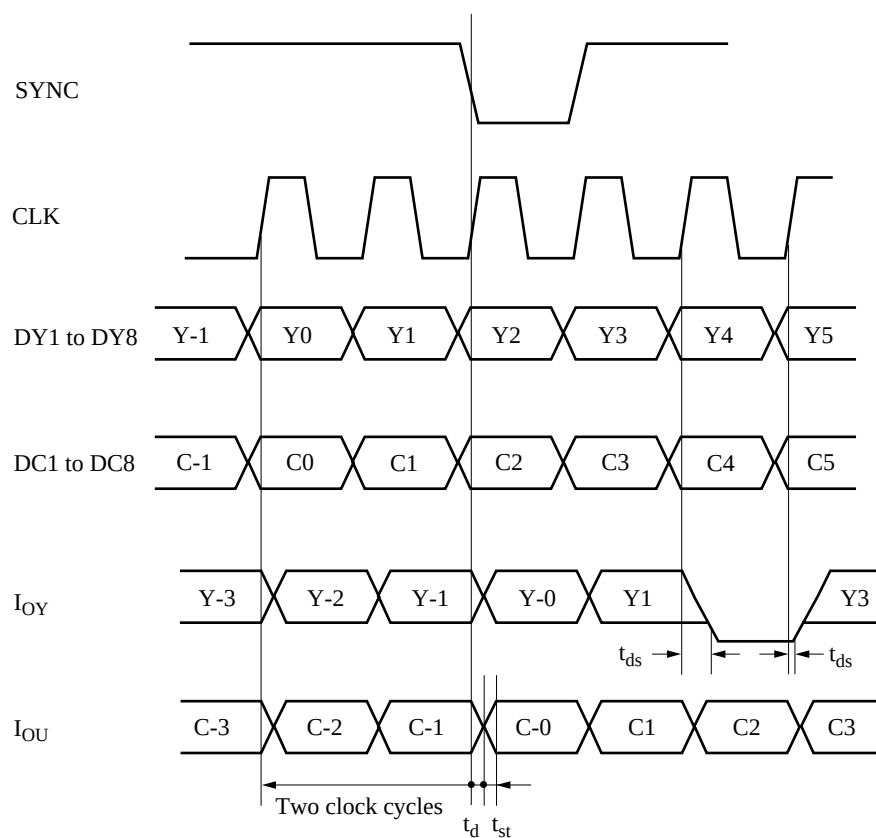
Parameter	Symbol	min	typ	max	Unit
Power supply voltage	V _{DD}	2.85	3.0	3.45	V
Reference voltage	V _{REFS/Y, C}	1.0	1.85/1.63	2.3	V
Reference resistance	R _{REFS/Y, C}	2.0/0.58	5.0/2.5	8.0/5.0	kΩ
External compensation capacitor	C _{COMPS, Y, C}	0.33	1.0	3.3	μF
Output load resistance	R _{OUT}	75	400	500	Ω
Digital input voltage	"H" level	V _{IH}	V _{DD} × 0.75	V _{DD}	V
	"L" level	V _{IL}	V _{SS}	V _{DD} × 0.25	V
Clock	"H" level pulse width	t _{WH}	16		ns
	"L" level pulse width	t _{WL}	16		ns

■ Electrical Characteristics $DV_{DD}=AV_{DD}=3.0\text{V}$, $DV_{SS}=AV_{SS}=0\text{V}$, $T_a=25^{\circ}\text{C}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Power supply current	I _{DD}	F _{CLK} =30MHz, MSEL="H", Output amplitude=0.7 V, R _{OUT} =400Ω		18	28	mA
Resolution	RES			8		bit
Linearity error	E _L	V _{DD} =3.0V, Y output amplitude=0.7V		±0.2	±0.5	LSB
Differential linearity error	E _D	UV output amplitude=0.7V		±0.2	±0.5	LSB
Full scale current	I _{FS}	R _{OUT} =400Ω R _{REFY} =2.5kΩ, R _{REFC} =2.5kΩ		1.75		mA
Setup time	t _S		12			ns
Hold time	t _H		10			ns
Settling time	t _{ST}	V _{DD} =3.0V, Y output amplitude=0.7V,		25	37	ns
Maximum conversion speed	F _{C(max.)}	UV output amplitude=0.7V R _{OUT} =400Ω, R _{REF} =2.5kΩ	27			MSPS
Analog output delay time	t _d	V _{DD} =3.0V, Y output amplitude=0.7V, UV output amplitude=0.7V		10		ns

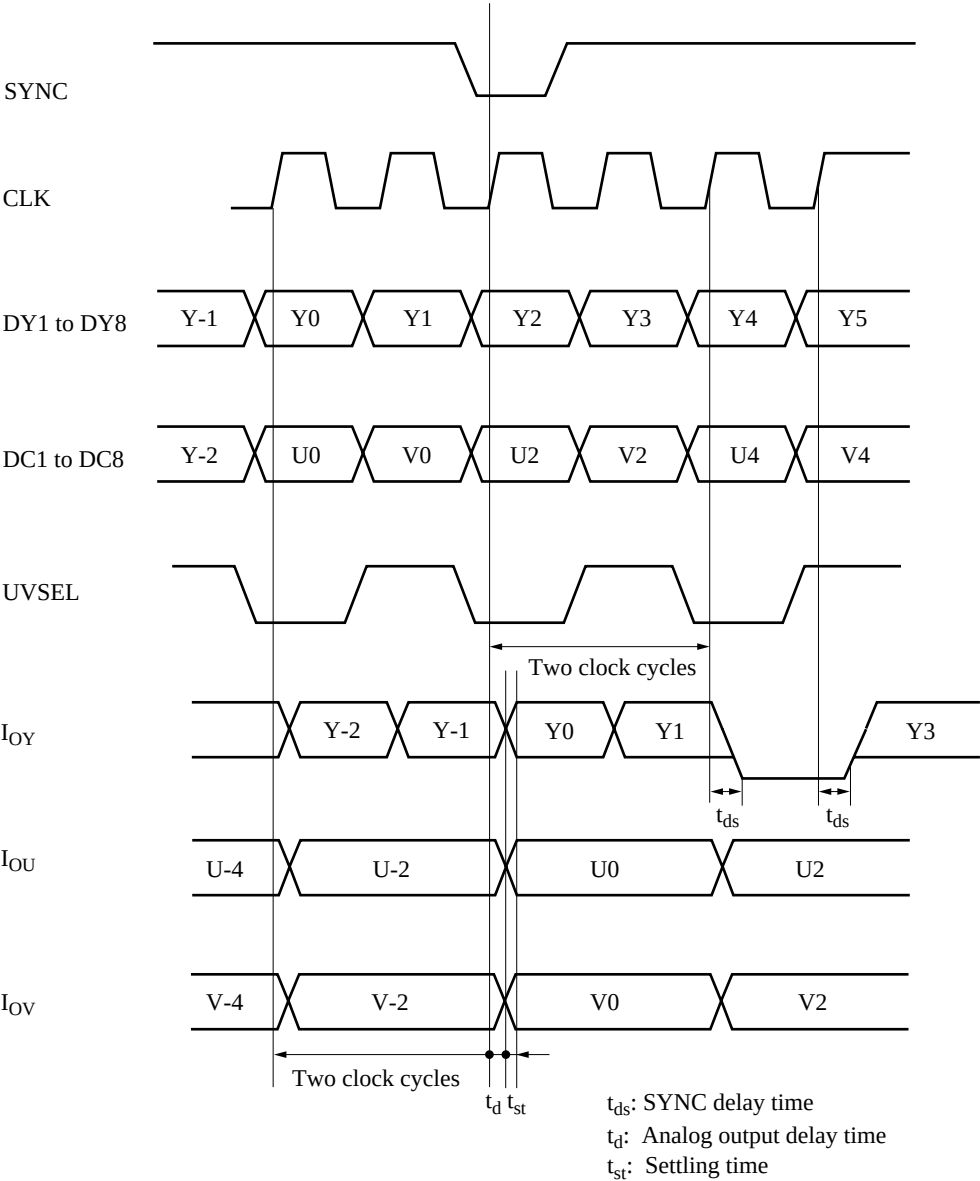
Timing Chart

M SELECT = "L," Y and U(C), 2-channel output



t_{ds} : SYNC delay time
 t_d : Analog output delay time
 t_{st} : Settling time

M SELECT = "H," Y and U(C), 3-channel output



■ Package Dimensions (Unit:mm)

TQFP048-P-0707

