

MN6570F, MN6570TF, and MN6570EF

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

Overview

The MN6570F, MN6570TF, and MN6570EF are high-speed 8-bit, 3-channel CMOS digital-to-analog converters with maximum conversion rates of 35 MSPS, 40 MSPS, and 40 MSPS, respectively.

They use both a matrix cell and weighted current technology.

The three channels use separate clock signals, so they may be used as totally independent D/A converters.

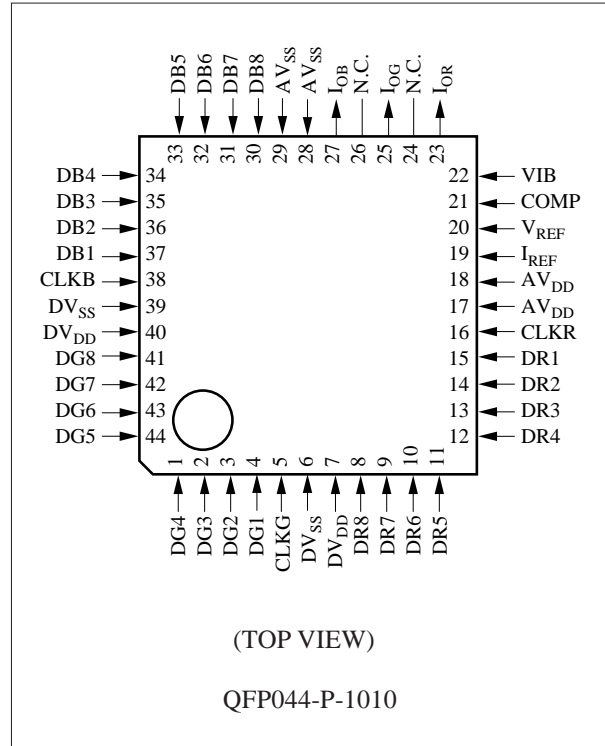
Features

- Maximum conversion rate:
MN6570F: 35MSPS (min.)
MN6570TF and MN6570EF: 40 MSPS (min.)
- Linearity error: ± 0.2 LSB (typ.)
- Differential linearity error: ± 0.2 LSB (typ.)
- Power supply voltage: $V_{CC} = 5.0 \pm 0.5$ V
- Power consumption:
MN6570F: 340 mW (typ.)
MN6570TF and MN6570EF: 190 mW (typ.)
- Full scale current:
MN6570F: 13 mA (typ.)
MN6570TF and MN6570EF: 5 mA (typ.)

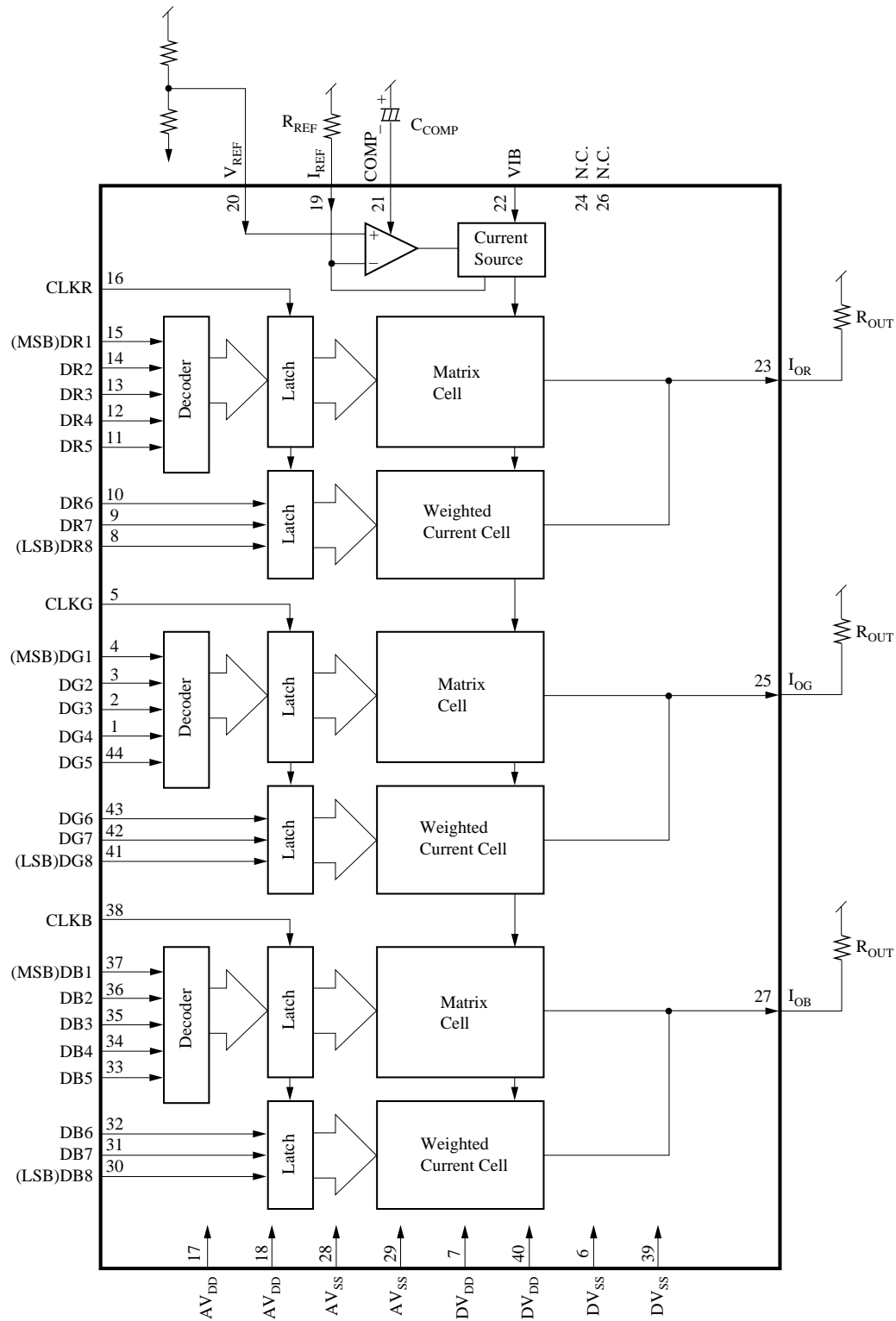
Applications

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

Pin Assignment



■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Function Description
1	DG4	G signal digital input
2	DG3	G signal digital input
3	DG2	G signal digital input
4	DG1	G signal digital input (MSB)
5	CLKG	G signal sampling clock
6	DV _{SS}	Ground for digital circuits
7	DV _{DD}	Power supply for digital circuits
8	DR8	R signal digital input (LSB)
9	DR7	R signal digital input
10	DR6	R signal digital input
11	DR5	R signal digital input
12	DR4	R signal digital input
13	DR3	R signal digital input
14	DR2	R signal digital input
15	DR1	R signal digital input (MSB)
16	CLKR	R signal sampling clock
17	AV _{DD}	Power supply for analog circuits
18	AV _{DD}	Power supply for analog circuits
19	I _{REF}	Full scale adjustment resistor
20	V _{REF}	Reference voltage input
21	COMP	Phase compensation
22	VIB	Capacitor connection
23	I _{OR}	R signal analog current output
24	N.C.	No connection
25	I _{OG}	G signal analog current output
26	N.C.	No connection
27	I _{OB}	B signal analog current output
28	AV _{SS}	Ground for analog circuits
29	AV _{SS}	Ground for analog circuits
30	DB8	B signal digital input (LSB)
31	DB7	B signal digital input
32	DB6	B signal digital input
33	DB5	B signal digital input
34	DB4	B signal digital input
35	DB3	B signal digital input
36	DB2	B signal digital input
37	DB1	B signal digital input (MSB)
38	CLKB	B signal sampling clock
39	DV _{SS}	Ground for digital circuits
40	DV _{DD}	Power supply for digital circuits

■ Pin Descriptions (continued)

Pin No.	Symbol	Function Description
41	DG8	G signal digital input (LSB)
42	DG7	G signal digital input
43	DG6	G signal digital input
44	DG5	G signal 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	$DV_{SS} - 0.3$ to $DV_{DD} + 0.3$	V
Output voltage	V_O	$AV_{SS} - 0.3$ to $AV_{DD} + 0.3$	V
Operating ambient temperature	T_{opr}	-20 to +70 ^{*1} / -20 to +75 ^{*2} / -30 to 85 ^{*3}	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +125	$^\circ\text{C}$

*1 MN6570F

*2 MN6570TF

*3 MN6570EF

■ Recommended Operating Conditions $V_{DD}=AV_{DD}=DV_{DD}=5.0\text{V}$, $V_{SS}=AV_{SS}=DV_{SS}=0\text{V}$, $T_a=25^\circ\text{C}$

Parameter	Symbol	min	typ	max	Unit	
Power supply voltage	V_{DD}	4.5	5.0	5.5	V	
Reference voltage	MN6570F	V_{REF}	2.0	2.3	3.5	V
	MN6570TF/EF		2.0	2.42	3.7	
Reference resistance	MN6570F	R_{REF}	390	430	1500	Ω
	MN6570TF/EF		820	1100	1400	
External compensation capacitor	C_{COMP}	0.33	1.0	3.3	μF	
Output load resistance	MN6570F	R_{OUT}	50	75	330	Ω
	MN6570TF/EF		300	400	500	
Digital input voltage	"H" level	V_{IH}	2.4	—	V_{DD}	V
	"L" level	V_{IL}	V_{SS}	—	0.8	V
Clock	"H" level pulse width	t_{WH}	10	—	—	ns
	"L" level pulse width	t_{WL}	10	—	—	ns

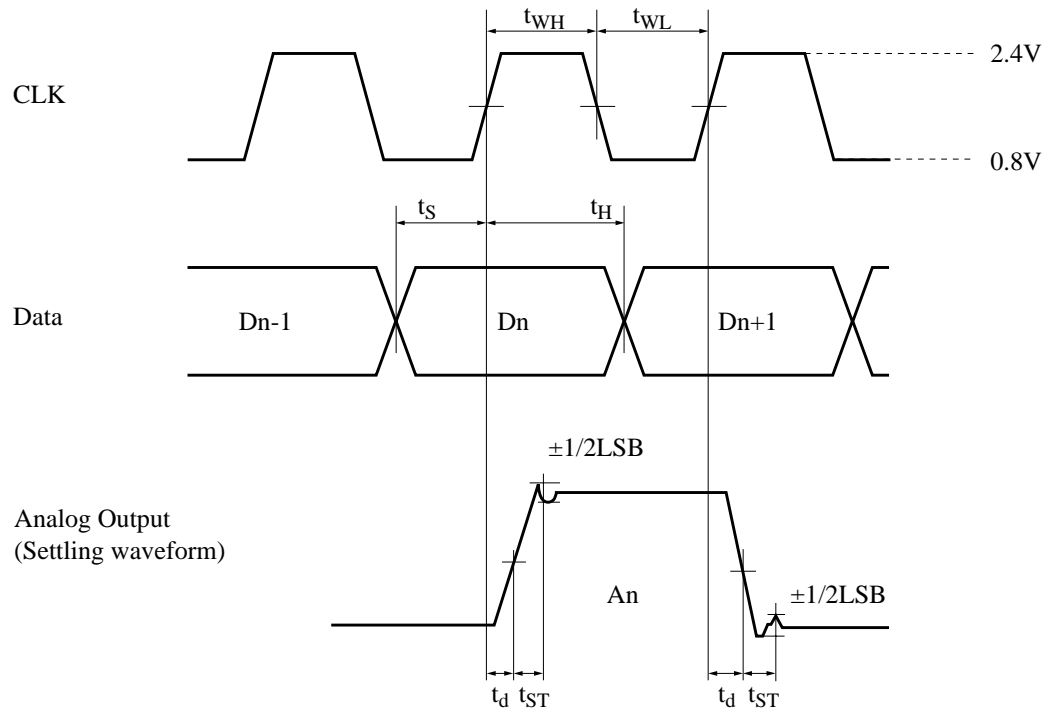
■ Electrical Characteristics $DV_{DD}=AV_{DD}=5.0V, DV_{SS}=AV_{SS}=0V, T_a=25^{\circ}C$
•MN6570F

Parameter	Symbol	Conditions	min	typ	max	Unit
Power supply current	I_{DD}	$V_{DD}=5.0V, t_{CLK}=35MHz,$ $R_{OUT}=75\Omega, \text{Output amplitude}=1V,$ $T=25^{\circ}C$		68	85	mA
Resolution	RES			8		bit
Linearity error	E_L	$V_{DD}=5.0V, R_{OUT}=75\Omega$		± 0.2	± 0.5	LSB
Differential linearity error	E_D	$R_{REF}=430\Omega$		± 0.2	± 0.5	LSB
Full scale current	I_{FS}	$V_{REF}=2.3V$		13		mA
Setup time	t_s		8			ns
Hold time	t_H		8			ns
Settling time	t_{ST}	$V_{DD}=5.0V, R_{OUT}=75\Omega$		20	28	ns
Maximum conversion speed	$F_{C(max.)}$	$R_{REF}=430\Omega$ $V_{REF}=2.3V$	35	50		MSPS
Analog output delay	t_d			5		ns

•MN6570TF, MN6570EF

Parameter	Symbol	Conditions	min	typ	max	Unit
Power supply current	I_{DD}	$V_{DD}=5.0V, t_{CLK}=40MHz,$ $R_{OUT}=400\Omega, \text{Output amplitude}=2V,$ $T=25^{\circ}C$		38	55	mA
Resolution	RES			8		bit
Linearity error	E_L	$V_{DD}=5.0V, R_{OUT}=400\Omega$		± 0.2	± 0.5	LSB
Differential linearity error	E_D	$R_{REF}=1100\Omega$		± 0.2	± 0.5	LSB
Full scale current	I_{FS}	$V_{REF}=2.42V$		5		mA
Setup time	t_s		8			ns
Hold time	t_H		8			ns
Settling time	t_{ST}	$V_{DD}=5.0V, R_{OUT}=400\Omega$		20	25	ns
Maximum conversion speed	$F_{C(max.)}$	$R_{REF}=1100\Omega$ $V_{REF}=2.42V$	40	50		MSPS
Analog output delay time	t_d			5		ns

■ Timing Chart



■ Package Dimensions (Unit:mm)

QFP044-P-1010

