

# 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.

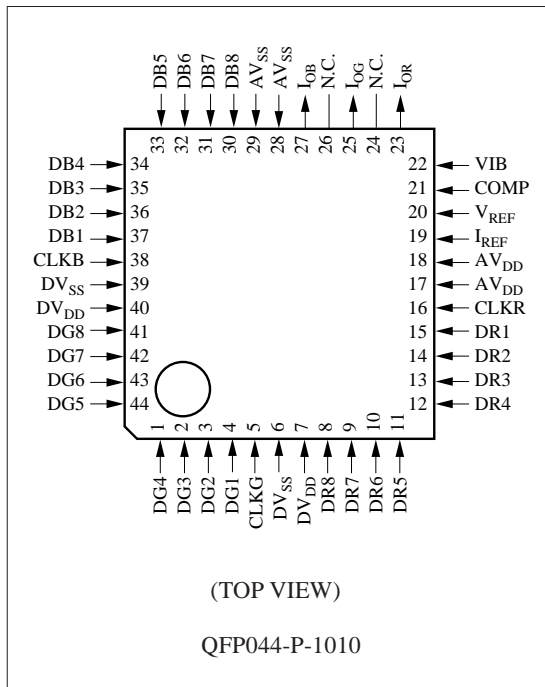
### ■ Features

- Maximum conversion rate:  
MN6570F: 35MSPS (min.)  
MN6570TF and MN6570EF: 40 MSPS (min.)
- Linearity error:  $\pm 0.2$  LSB (typ.)
- Differential linearity error:  $\pm 0.2$  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.)

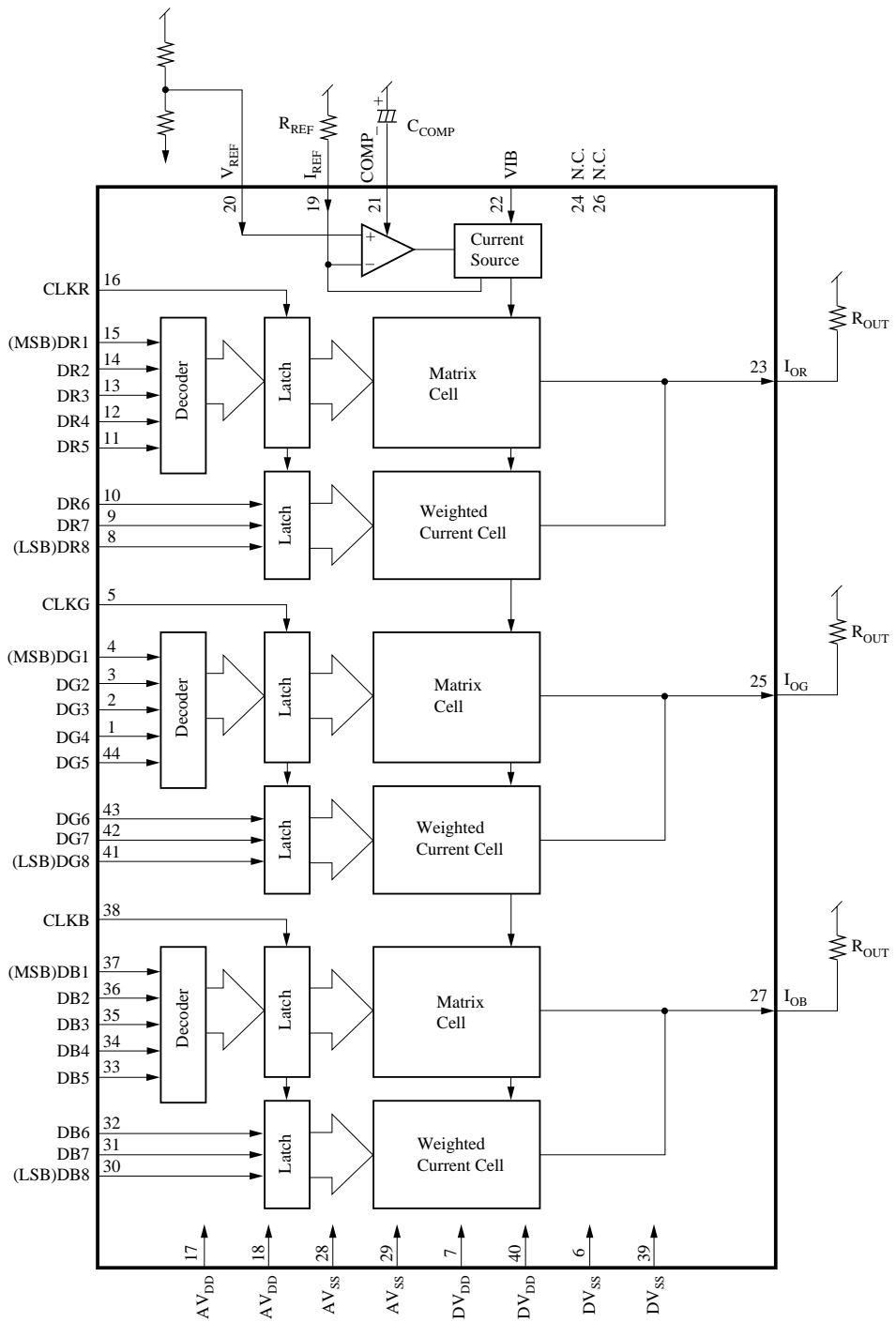
### ■ Applications

- 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 <sub>SS</sub>	Ground for digital circuits
7	DV <sub>DD</sub>	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 <sub>DD</sub>	Power supply for analog circuits
18	AV <sub>DD</sub>	Power supply for analog circuits
19	I <sub>REF</sub>	Full scale adjustment resistor
20	V <sub>REF</sub>	Reference voltage input
21	COMP	Phase compensation
22	VIB	Capacitor connection
23	I <sub>OR</sub>	R signal analog current output
24	N.C.	No connection
25	I <sub>OG</sub>	G signal analog current output
26	N.C.	No connection
27	I <sub>OB</sub>	B signal analog current output
28	AV <sub>SS</sub>	Ground for analog circuits
29	AV <sub>SS</sub>	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 <sub>SS</sub>	Ground for digital circuits
40	DV <sub>DD</sub>	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 <sup>*1</sup> / -20 to +75 <sup>*2</sup> / -30 to 85 <sup>*3</sup>	$^\circ\text{C}$
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	$\Omega$
	MN6570TF/EF		820	1100	1400	
External compensation capacitor	$C_{COMP}$	0.33	1.0	3.3	$\mu\text{F}$	
Output load resistance	MN6570F	$R_{OUT}$	50	75	330	$\Omega$
	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  $DV_{DD}=AV_{DD}=5.0V$ ,  $DV_{SS}=AV_{SS}=0V$ ,  $T_a=25^\circ C$

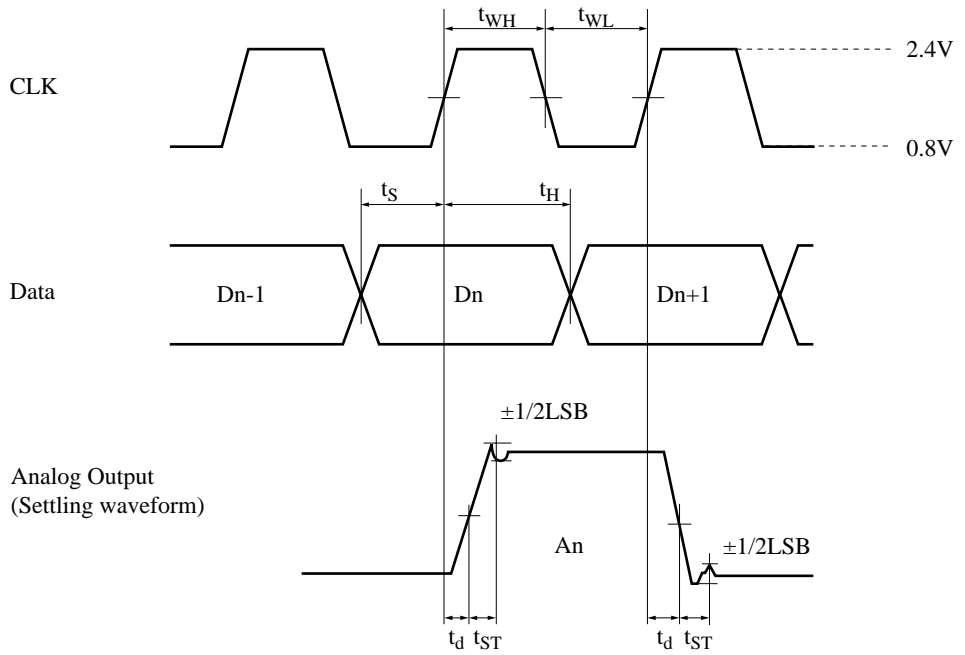
•MN6570F

Parameter	Symbol	Conditions	min	typ	max	Unit
Power supply current	$I_{DD}$	$V_{DD}=5.0V$ , $t_{CLK}=35MHz$ , $R_{OUT}=75\Omega$ , Output amplitude =1 V, $T=25^\circ C$		68	85	mA
Resolution	RES			8		bit
Linearity error	$E_L$	$V_{DD}=5.0V$ , $R_{OUT}=75\Omega$		$\pm 0.2$	$\pm 0.5$	LSB
Differential linearity error	$E_D$	$R_{REF}=430\Omega$		$\pm 0.2$	$\pm 0.5$	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	$I_{DD}$	$V_{DD}=5.0V$ , $t_{CLK}=40MHz$ , $R_{OUT}=400\Omega$ , Output amplitude =2V, $T=25^\circ C$		38	55	mA
Resolution	RES			8		bit
Linearity error	$E_L$	$V_{DD}=5.0V$ , $R_{OUT}=400\Omega$		$\pm 0.2$	$\pm 0.5$	LSB
Differential linearity error	$E_D$	$R_{REF}=1100\Omega$		$\pm 0.2$	$\pm 0.5$	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

