ISI IDEAL SEMICONDUCTOR INC.

"Your Best Defense Against Obsolescence"

NE/SE5118/5119
8-Bit Microprocessor-Compatible D/A Converter — Current Output

Linear Products

Product Specification

DESCRIPTION

The NE/SE5118/19 is a high-speed 8-bit digital-to-analog converter subsystem on one monolithic chip. The data inputs have input latches, controlled by a latch enable pin. The data and latch enable inputs are ultralow loading for easy interfacing with all logic systems. The latches appear transparent when the $\overline{LE}$ input is in the low state. When $\overline{LE}$ goes high, the input data present at the moment of transition is latched and retained until $\overline{LE}$ again goes low. This feature allows easy compatibility with most microprocessors.

The chip also comprises a stable voltage reference (5V nominal). The voltage reference may be externally trimmed with a potentiometer for easy adjustment of full-scale, while maintaining a low temperature coefficient.

The output has high voltage compliance, increasing versatility.

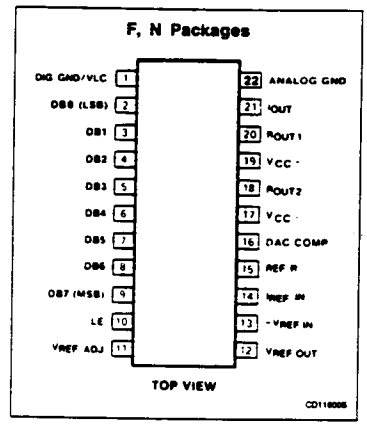
FEATURES

- **8-bit resolution**
- **Input latches**
- **Low-loading data inputs**
- **On-chip voltage reference**
- **Fast settling output current — 200ns**
- **Accurate to ± ¼LSB (0.1%)**
- **Monotonic to 8 bits**
- **Reference short-circuit protected**
- **Compatible with 8086, 6800 and many other microprocessors**

APPLICATIONS

- **Precision 8-BIT D/A converters**
- **A/D converters**
- **Programmable power supplies**
- **Test equipment**
- **Measuring instruments**
- **Analog-digital multiplication**
- **CRT display drivers**
- **High-speed modems**

PIN CONFIGURATION



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
22-Pin Plastic DIP	0 to +70°C	NE5119N
22-Pin Ceramic DIP	0 to +70°C	NE5119F
22-Pin Ceramic DIP	−55°C to +125°C	SE5119F

46721 Fremont Blvd. • Fremont, California 94538 • Telephone: (510) 226-7000 • Fax: (510) 226-1564

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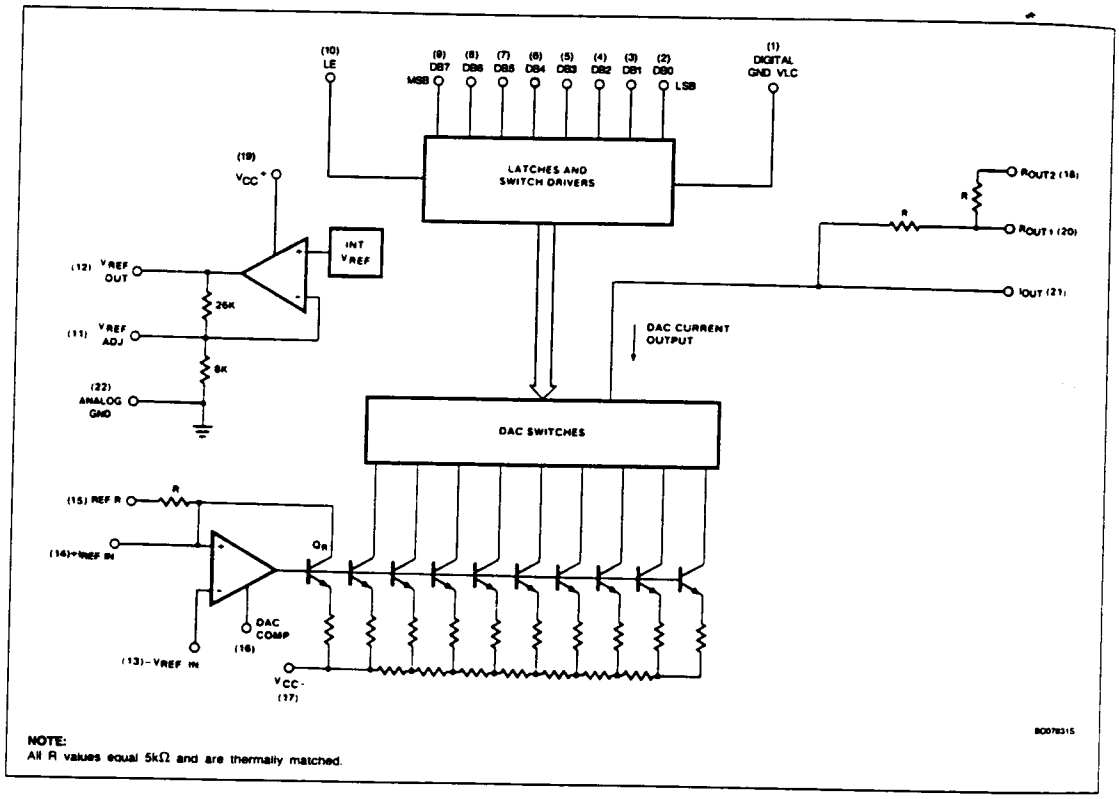
BLOCK DIAGRAM



NOTE:
All R values equal 5kΩ and are thermally matched.

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
$V_{CC}+$	Positive supply voltage	18	V
$V_{CC}-$	Negative supply voltage	−18	V
V_{IN}	Logic input voltage	0 to 18	V
$V_{REF\ IN}$	Voltage at V_{REF} input	12	V
$V_{REF\ ADJ}$	Voltage at V_{REF} adjust	0 to V_{REF}	V
V_{SUM}	Voltage at sum node	12	V
I_{REFSC}	Short-circuit current to ground at V_{REF} OUT	Continuous	
$I_{REF\ IN}$	Reference input current (Pin 14)	3	mA
P_D	Maximum power dissipation T_A = 25°C (still-air)[1] F package N package	 1740 2190	 mW mW
T_A	Operating ambient temperature range SE5119 NE5119	 −55 to +125 0 to +70	 °C °C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTE:
1. Derate above 25°C, at the following rates:
   F package at 13.9mW/°C.
   N package at 17.5mW/°C.

DC ELECTRICAL CHARACTERISTICS

$V_{CC}+$ = +15V, $V_{CC}-$ = −15V, SE5119. −55°C ≤ T_A ≤ 125°C, NE5119. 0°C ≤ T_A ≤ 70°C, unless otherwise specified. Typical values are specified at 25°C.

SYMBOL	PARAMETER	TEST CONDITIONS	NE/SE5118			NE/SE5119			UNIT
			Min	Typ	Max	Min	Typ	Max	
	Resolution		8	8	8	8	8	8	Bits
	Monotonicity		8	8	8	8	8	8	Bits
	Relative accuracy				±0.1			±0.1	%FS
$V_{CC}+$	Positive supply voltage		11.4	15	16.5	11.4	15	16.5	V
$V_{CC}-$	Negative supply voltage		−11.4	−15	−16.5	−11.4	−15	−16.5	V
$V_{IN(1)}$	Logic "1" input voltage	Pin 1 = 0V	2.0			2.0			V
$V_{IN(0)}$	Logic "0" input voltage	Pin 1 = 0V			0.8			0.8	V
$I_{IN(1)}$	Logic "1" input current	Pin 1 = 0V, 2V < V_{IN} < 18V		0.1	10		0.1	10	μA
$I_{IN(0)}$	Logic "0" input current	Pin 1 = 0V, −5V < V_{IN} < 0.8V		−2.0	−10		−2.0	−10	μA
I_{FS}	Full-scale output current	Unipolar operation $V_{REF\ IN}$ = 5.000V, T_A = 25°C	1.90	1.992	2.10	1.90	1.992	2.10	mA
I_{ZS}	Zero-scale current			1			1		μA
V_{REF}	Reference voltage	I_{REF} = 1mA, T_A = 25°C	4.9	5.0	5.25	4.9	5.0	5.25	V
$PSR+_{(OUT)}$	Output power supply rejection (+)	V− = −15V, 13.5V ≤ V+ ≤ 16.5V external $V_{REF\ IN}$ = 5.000V		0.001	0.01		0.001	0.01	%FS/%VS

DC ELECTRICAL CHARACTERISTICS (Continued) $V_{CC}+ = +15V$, $V_{CC}- = -15V$, SE5119. $-55°C \leq T_A \leq 125°C$, NE5119. $0°C \leq T_A \leq 70°C$, unless otherwise specified. Typical values are specified at 25°C.

SYMBOL	PARAMETER	TEST CONDITIONS	NE/SE5118			NE/SE5119			UNIT
			Min	Typ	Max	Min	Typ	Max	
$RSR-_{(OUT)}$	Output power supply rejection (–)	V+ = 15V, $-13.5V \leq V- \leq -16.5V$ external $V_{REF\ IN} = 5.000V$		0.001	0.01		0.001	0.01	%FS/%VS
TC_{FS}	Full-scale temperature coefficient	$V_{REF\ IN} = 5.000V$ (Pin 15)		20			20		ppm/°C
TC_{ZS}	Zero-scale temperature coefficient	$I_{REF\ IN} = 1.00mA$ (Pin 14)		5			5		ppm/°C
I_{REF}	Reference output current	$T_A = 25°C$			3			3	mA
I_{REFSC}	Reference short circuit current[1]	$V_{REF\ OUT} = 0V$		15	30		15	30	mA
$PSR+_{(REF)}$	Reference power supply rejection (+)	$V- = -15V$, $13.5V \leq V+ \leq 16.5V$, $I_{REF} = 1.0mA$		0.003	0.01		0.003	0.01	%VR/%VS
$PSR-_{(REF)}$	Reference power supply rejection (–)	V+ = 15V, $-13.5V \leq V- \leq 16.5V$, $I_{REF} = 1.0mA$		0.003	0.01		0.003	0.01	%VR/%VS
TC_{REF}	Reference voltage temperature coefficient	$I_{REF} = 1.0mA$		60			60		ppm/°C
Z_{IN}	DAC $R_{REF\ IN}$ input impedance			5.0			5.0		kΩ
$I_{CC}+$	Positive supply current	$V_{CC}+ = 15V$		7	14		7	14	mA
$I_{CC}-$	Negative supply current	$V_{CC}- = -15V$		–10	–15		–10	–15	mA
P_D	Power dissipation	$I_{REF} = 1.0mA$, $V_{CC} = \pm 15V$		255	435		255	435	mW

NOTE:
1. For reference currents > 3mA, use of an external buffer is required.

AC ELECTRICAL CHARACTERISTICS $V_{CC} = \pm 15V$, $T_A = 25°C$, unless otherwise specified.

SYMBOL	PARAMETER	TO	FROM	TEST CONDITIONS	NE/SE5118/19			UNIT
					Min	Typ	Max	
t_{SLH}	Settling time	± ½ LSB	Input	All bits Low-to-High		200		ns
t_{SHL}	Settling time	± ½ LSB	Input	All bits High-to-Low		200		ns
t_{PLH}	Propagation delay	Output	Input	All bits switched Low-to-High		60		ns
t_{PHL}	Propagation delay	Output	Input	All bits switched High-to-Low		60		ns
t_{PLSB}	Propagation delay	Output	Input	1 LSB change		60		ns
t_{PLH}	Propagation delay	Output	$\overline{CE}$	Low-to-High transition		60		ns
t_{PHL}	Propagation delay	Output	$\overline{CE}$	High-to-Low transition		60		ns
t_S	Setup time	$\overline{CE}$	Input		100			ns
t_H	Hold time	Input	$\overline{CE}$		50			ns
t_{PW}	Latch enable pulse width				150			ns

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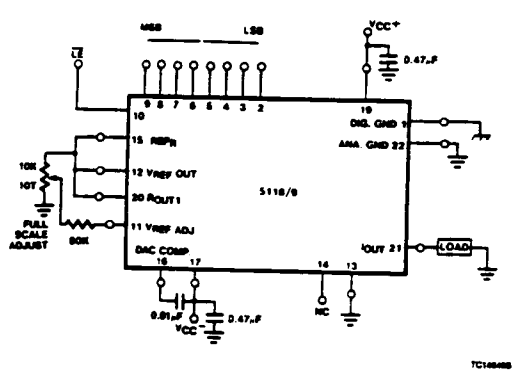
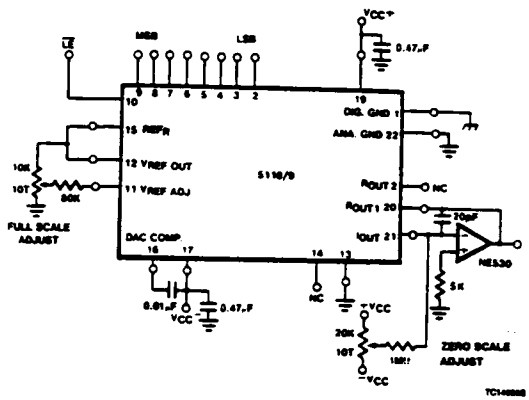
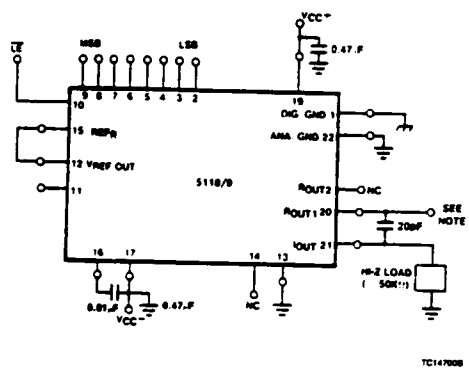
TYPICAL APPLICATIONS

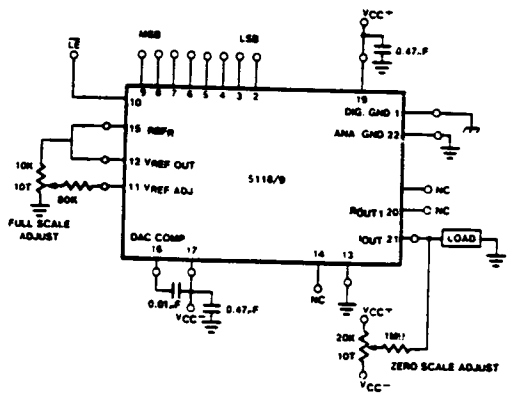


Bipolar Output Operation (−1mA to +1mA)



Unipolar Voltage Output (0 to +10V)





NOTE:

DATA INPUT CODE	VOLTAGE OUTPUT (PIN 21)	
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1	+10V 0V	0V −10V
	Pin 20 tied to +10V	Pin 20 tied to 0V

Fast Voltage Output

Basic Unipolar Current Output (0 to −2mA)