

OVERVIEW

The SM5158A is a serial data programmable PLL Frequency Synthesizer LSI fabricated in NPC's proprietary Molybdenum-gate CMOS technology.

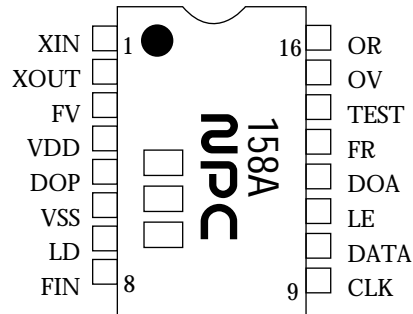
Ratios of reference frequency divider and input frequency divider can be independently set.

FEATURES

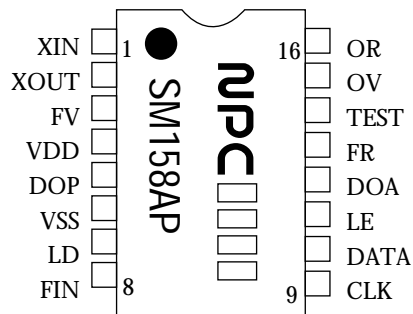
- Up to 200MHz input frequency (VDD=4.5V)
- Up to 35MHz reference frequency (VDD=4.5V)
- 5 to 65535 programmable reference frequency divider ratio
- 1056 to 65535 programmable input frequency divider ratio
- Lock detector
- Either Active or Passive filter can be externally used.
- 16-pin plastic DIP and 16-pin S-SOP
- Molybdenum gate CMOS structure

PIN OUT

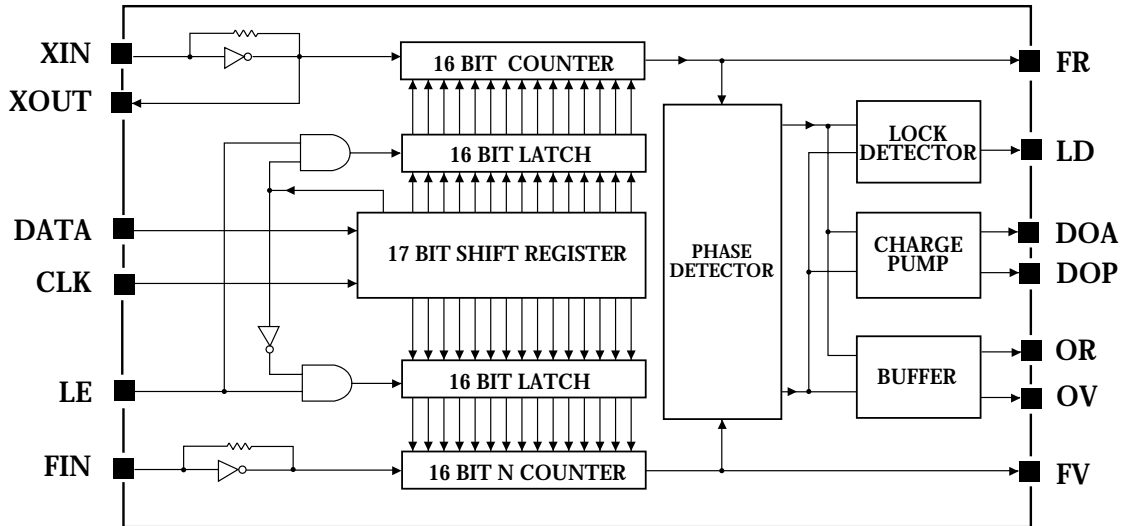
16-pin SSOP (SM5158AM)



16-pin DIP (SM5158AP)



BLOCK DIAGRAM



PIN DESCRIPTION

Number	Name	Description
1	XIN	To connect external crystal and capacitor, or external clock input pin.
2	XOUT	To connect external crystal and capacitor, or oscillator output signal can be available at this pin.
3	FV	Buffered input frequency divider output. phase detector input
4	VDD	Positive supply pin. Apply +2.7 to 5.5 Volts.
5	DOP	Charge pump output for passive lowpass filter. Single ended tristate output.
6	VSS	Ground.
7	LD	Lock detector output. Logic Low when PLL is unlocked.
8	FIN	Comparison frequency input. Internal feedback resistor for AC coupling. Input frequency range 20MHz to 200MHz.
9	CLK	Shift register clock input.
10	DATA	Serial data input.
11	LE	Latch enable input.
12	DOA	Charge pump output for active lowpass filter. Single ended tristate output.
13	FR	Buffered reference frequency divider output. Phase detector input.
14	TEST	Test pin. Left open.
15	OV	Buffered phase detector output to a differential lowpass filter.
16	OR	Buffered phase detector output to a differential lowpass filter.

SPECIFICATION

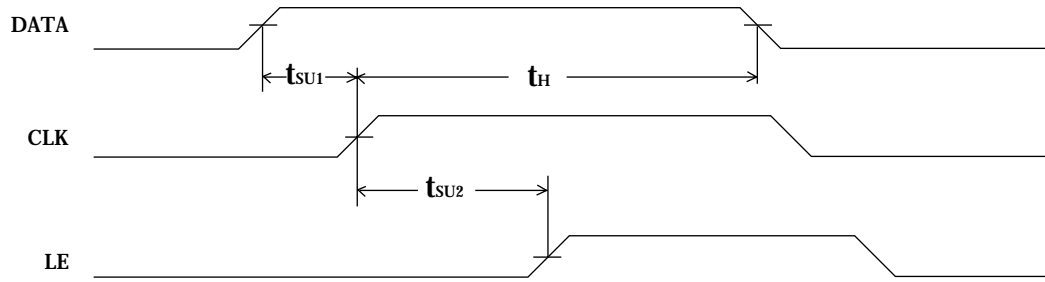
Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage range	$V_{DD} - V_{SS}$	-0.3 to 7.0	V
Input voltage range	V_{IN}	$V_{SS}-0.3$ to $V_{DD}+0.3$	V
Operating temperature range	T_{OPR}	-30 to +85	deg.C
Storage temperature	T_{stg}	-40 to 125	deg.C
Soldering temperature	T_{sld}	255	deg.C
Soldering time	t_{sld}	10	S

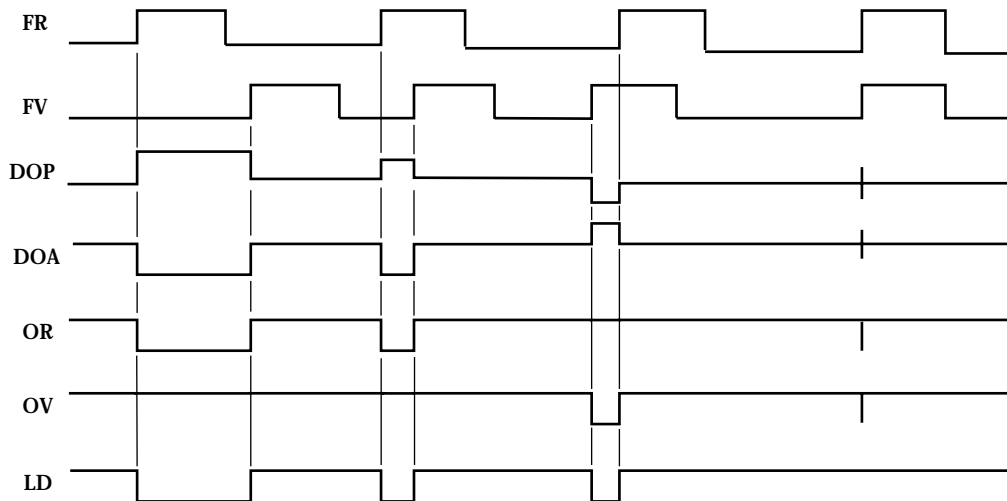
Electrical Characteristics

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Supply Voltage	V_{DD}		2.7		5.5	V
Supply current in operating mode	I_{DD}	$f_{IN}=200\text{MHz}$, $V_{FIN}=0.5\text{Vp-p}$ sine wave $X_{IN}=20\text{MHz}$, $V_{FIN}=0.5\text{Vp-p}$ sine wave		10	23.5	mA
Supply current in stanby mode	I_{DD2}	R/N latch's all bits="0"	-	-	10	uA
FIN maximum operating frequency	f_{max1}	$F_{IN}=0.5\text{Vp-p}$, sine wave ($V_{DD}=2.7\text{V}$)	100	120		MHz
		$F_{IN}=0.5\text{Vp-p}$, sine wave ($V_{DD}=4.5\text{V}$)	200	240		
XIN maximum operating frequency	f_{max2}	$X_{IN}=0.5\text{Vp-p}$, sine wave($V_{DD}=2.7\text{V}$)	20			
		$X_{IN}=0.5\text{Vp-p}$, sine wave($V_{DD}=4.5\text{V}$)	35			
FIN minimum operating frequency	f_{min1}	$F_{IN}=0.5\text{Vp-p}$, sine wave			20	
XIN minimum operating frequency	f_{min2}	$F_{IN}=0.5\text{Vp-p}$, sine wave			1	
FIN input voltage	V_{FIN}	$f_{FIN} = 20$ to 200MHz sine wave, AC coupling	0.5		$V_{DD}-0.5$	Vp-p
XIN input voltage	V_{XIN}	$f_{XIN} = 1$ to 35MHz sine wave, AC coupling	0.5		$V_{DD}-0.5$	Vp-p
CLK, DATA, LE HIGH-level input voltage	V_{IH}		$V_{DD}-0.3$			uA
CLK, DATA, LE LOW-level input voltage	V_{IL}				0.3	uA
FIN HIGH-level input current	I_{IH1}	$V_{IH}=V_{DD}$			100	uA
FIN LOW-level input current	I_{IL1}	$V_{IL}=0\text{V}$			100	uA
XIN HIGH-level input current	I_{IH2}	$V_{IH}=V_{DD}$			100	uA
XIN LOW-level input current	I_{IL2}	$V_{IL}=0\text{V}$			100	uA
FV, DOP, LD,DOA, FR, OV, OR, HIGH-level output current	I_{OH}	$V_{OH}=V_{DD}-0.4\text{V}$	0.4			mA
FV, DOP, LD,DOA, FR, OV, OR, LOW-level output current	I_{OL}	$V_{OL}=0.4\text{V}$	0.4			mA
DATA to CLK and CLK to LE setup time	t_{su1}		80			ns
	t_{su2}		80			ns
Hold time	t_H		80			ns

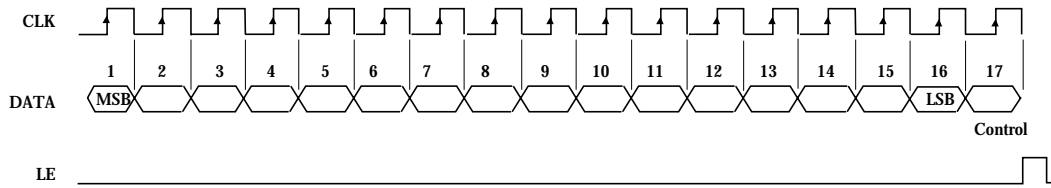
Serial data input timing



Phase detector timing

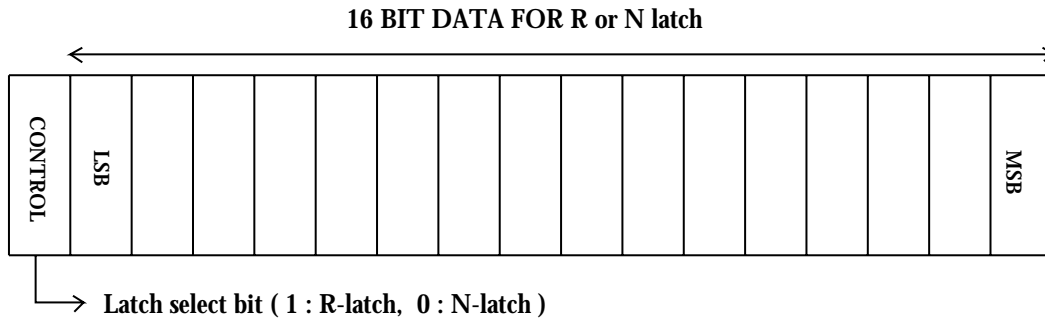


DIVIDER DATA SETTING PROCEDURE



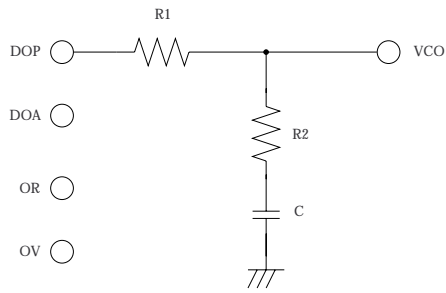
Input data must be MSB first. Final bit(17th bit) is assigned to the control bit.
 Data are written into shift register at the rising edge of the CLK signal.
 When LE is HIGH, data is transferred from the shift register to either the latch of reference divider or input divider. Thus data must be written on the shift register while LE is remaining LOW.
 While all bits of the N latch to are "0", the N

counter will be disabled, DOA, DOP are floating, and the supply current will be decreased.
 While all bits of the R latch are "0", oscillator will be disabled.
 While all bits of R and N latches are "0", supply current decreases to 10uA or less.

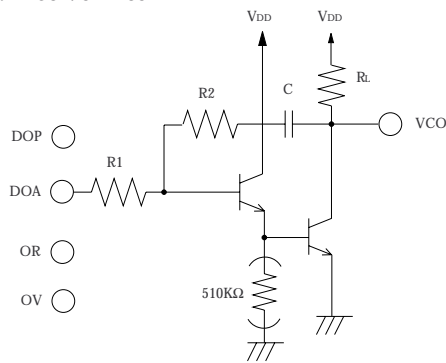


LOW PASS FILTERS

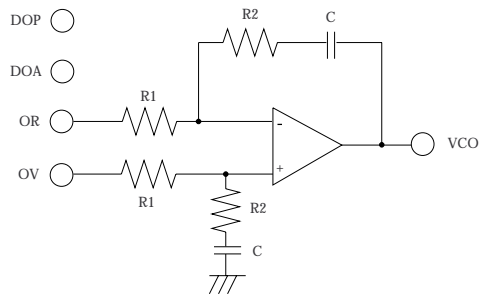
a. Passive filter



b. Active filter



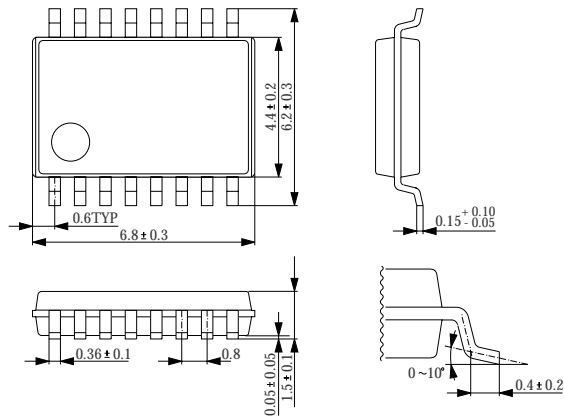
c. Differential filter



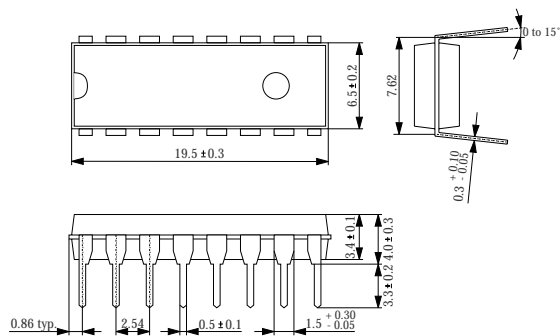
PACKAGE DIMENSIONS

UNIT:mm

16pin SSOP



16pin DIP



NIPPON PRECISION CIRCUITS INC. reserves the right to make changes to the products described in this data sheet in order to improve the design or performance and to supply the best possible products. Nippon Precision Circuits Inc. assumes no responsibility for the use of any circuits shown in this data sheet, conveys no license under any patent or other rights, and makes no claim that the circuits are free from patent infringement. Applications for any devices shown in this data sheet are for illustration only and Nippon Precision Circuits Inc. makes no claim or warranty that such applications will be suitable for the use specified without further testing or modification. The products described in this data sheet are not intended to use for the apparatus which influence human lives due to the failure or malfunction of the products. Customers are requested to comply with applicable laws and regulations in effect now and hereinafter, including compliance with export controls on the distribution or dissemination of the products. Customers shall not export, directly or indirectly, any products without first obtaining required licenses and approvals from appropriate government agencies.

NPC
NIPPON PRECISION CIRCUITS INC.

NIPPON PRECISION CIRCUITS INC.

4-3, 2-chome Fukuzumi, Koto-ku
Tokyo, 135-8430, JAPAN
Telephon: 03-3642-6661
Facsimile: 03-3642-6698