

LC78211, 78212, 78213

Analog Function Switch

Applications

Function switching under serial data control in amplifiers, receivers, and other electronic equipment

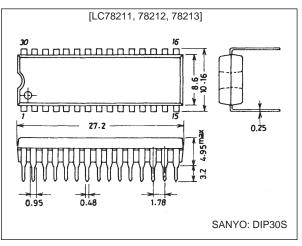
Features

- Two sets of eight (or in the LC78213, seven) built-in circuits with three switching configurations available based on differing internal connections
- Control according to serial data sent from a microprocessor, and easy connection to 5 V microprocessors
- Two identical products can be connected to a shared bus due to the provision of a select pin (S).
- A reset pin that turns off all analog switches
- A ±20 V withstand voltage rating allows these products to provide a wide dynamic range.

Package Dimensions

unit: mm

3061-DIP30S



Specifications

Absolute Maximum Ratings at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{DD} max	V _{DD}	-0.3 to +20	V
	V _{EE} max	V _{EE}	-20 to +0.3	V
Maximum input voltage	V _I 1	DI, CL, CE, S, RES	-0.3 to +20	V
Maximum input voltage	V _I 2	L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4	$V_{EE} - 0.3$ to V_{DD} + 0.3	V
Analog switch potential difference when on	ΔV_{ON}	With the switch on	0.5	V
Allowable power dissipation	Pd max	Ta ≤ 75°C	100	mW
Operating temperature range	Topr		-30 to +75	°C
Storage temperature range	Tstg		-40 to +125	°C

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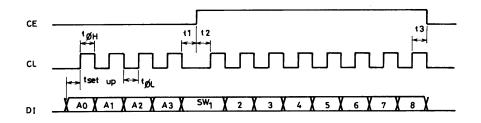
Pin Assignments

-			ſ		1	ſ		1	
L1 T		30 R1	い []		30 R1	L1 🗾		30 R1	
L2 2		29 R2	L2 🛛		29 R2	12 2		29 R2	
L3 3		20 R3	L3 [3		26/R3	LCOM1 3		28 RCOM1	
L4 4		27 R4	LCOM1 4		27 RCOM1	L3 🕹		27 R3	
LCOM1 5		26 RCOM1	L4 5		26 R4	L4 5		26 R4	
6 کا		25 R5	LS 6		25 RS	LCOM2 6		P RCOM2	
L6 7		24 R6	L6 🛛		24 R6	LS 🛛		24 RS	
LCOM2	LC78211	23 RCOM2	LCOM2 🖉	LC78212	23 RCOM 2	L6 🖉	LC78213	23 R6	
L7 9		22 R7	L7 9		22 R7	LCOM 3 9		22 RCOM3	
L8 10		21 R8	L8 10		21 R8	L7 10		21 R7	
LCOM3		20 RCOM3	LCOM3 []]		20 RCOM3	LCOM 4 11		20 RCOM4	
VEE 12		19 VDD	VEE 12		79 VDD	VEE 12		ND VDD	
CE /3		18 RES	CE 13		18 RES	CE [13		M RES	
DI 14		17 S	DI 14		m/s	DI 14		17 S	
CL 15		16 VSS	CL [5		16 V _{SS}	CL 15		16 [∨] ss	
L	Aug 17	1	L		1	I		1	Top view

Allowable Operating Ranges at Ta = 25°C, V_{SS} = 0 V, $\mid V_{DD} \mid \, \geq \, \mid V_{EE} \mid$

Parameter	Symbol	Conditions	min	typ	max	Unit
Maximum supply voltage	V _{DD}	$V_{DD} - V_{EE} \ge 12 \text{ V: } V_{DD}$			18.5	V
waximum supply voltage	V _{EE}	$V_{DD} - V_{EE} \ge 12 \text{ V}: V_{EE}$	-18.5		0	V
Input high level voltage	V _{IH} 1	DI, CL, CE	4.0		18.5	V
Input night level voltage	V _{IH} 2	S, RES	0.7 V _{DD}		V _{DD}	V
Input low lovel voltage	V _{IL} 1	DI, CL, CE	0		0.7	V
Input low level voltage	V _{IL} 2	S, RES	0		0.3 V _{DD}	V
Analog switch input voltage range	V _{IN}	L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4	V _{EE}		V _{DD}	V
Low level clock pulse width	t _{øL}	CL	0.5			μs
High level clock pulse width	t _{øH}	CL	0.5			μs
	t _{set up}	CL, DI	0.5			μs
Satur time	t1*	CL, CE	0.5			μs
Setup time	t2*	CL, CE	0.5			μs
	t3*	CL, CE	0.5			μs
Minimum reset pulse width	twRES	$V_{DD} \ge 6 V: \overline{RES}$	1.0			μs
Hysteresis	V _H	CL, CE, DI	0.3			V

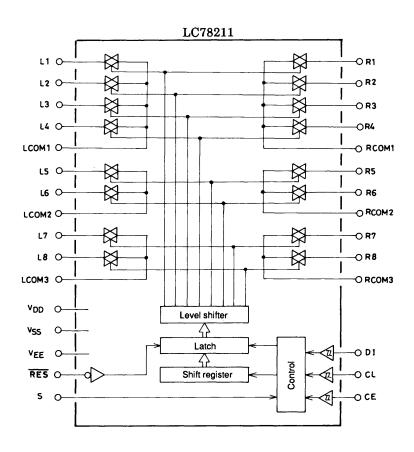
Note: * CE, CL and DI waveforms



Parameter	Symbol	Conditions min typ		max	Unit	
	R _{ON} 1	I = 1 mA, V _{DD} - V _{EE} = 12 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		150		Ω
Analog switch on resistance	R _{ON} 2	I = 1 mA, V _{DD} - V _{EE} = 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		70		Ω
Total harmonic distortion	THD1	V_{IN} = 1 Vrms, f = 1 kHz, $V_{DD} - V_{EE}$ = 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		0.0015	0.01	%
Total harmonic distortion	THD2	V _{IN} = 0.1 Vrms, f = 1 kHz, V _{DD} - V _{EE} = 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		0.01	0.05	%
Feedthrough	F _{TH}	V _{IN} = 0 dBV, f = 10 kHz, V _{DD} - V _{EE} = 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		55		dB
Crosstalk	СТ	V _{IN} = 0 dBV, f = 10 kHz, V _{DD} - V _{EE} = 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		75		dB
Input high level current	IIH	V _I = 18.5 V: DI, CL, CE, S, RES			+10	μA
Input low level current	Ι _{ΙL}	V _I = 0 V: DI, CL, CE, S, RES	-10			μA
Analog switch leakage current (off state)	IOFF	V _I = V _{EE} to V _{EE} + 37 V: L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4	11 to LCOM4, -10		+10	μA
Current drain	I _{DD}	V _{DD}			1.0	mA

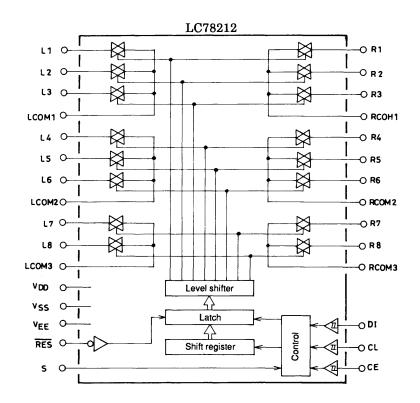
Electrical Characteristics at Ta = 25°C, V_{SS} = 0 V

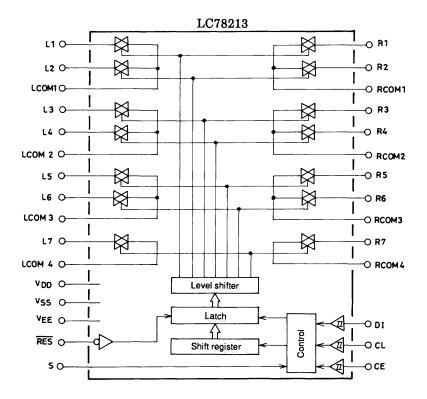
Equivalent Circuit Block Diagrams



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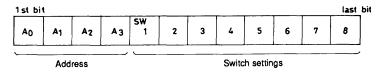
Pin Functions

Pin	I/O	Internal equivalent circuit	Pin function							
V _{DD} , V _{SS} , V _{EE}			Power supply							
L1 to L8, R1 to R8, LCOM1 to LCOM4, RCOM1 to RCOM4		See the block diagram.	Analog switch input and output							
CL, DI, CE	I	□	Serial data input (Schmitt buffer) CLClock input DIData input CEChip enable							
			Selection of one of two chips The address is set to the values shown in the table below according to the level input to the S pin.							
			Product	S pin level						
_				L	A ₀	A ₁	A ₂	A ₃		
S	I		LC78211	H	1	1	0	1		
				L	0	0	1	1		
			LC78212	H	1	0	1	1		
				L	0	1	1	1		
			LC78213	Н	1	1	1	1		
					1					
RES	I		Reset input The states of the a applied. Setting thi							

Operation

1. Data Input Procedure

The LC78211, LC78212 and LC78213 are controlled by inputting specified data to the CL, DI and CE pins. The input data consists of 12 bits, of which four bits are address and eight bits are data.



Bits correspond to the L1 to L8 and R1 to R8 analog switches, and a value of one turns the corresponding switch on, and a value of zero turns it off.

0.....Off

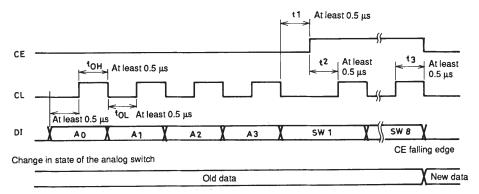
1.....On

The address is used when the chip is connected to a shared bus. The data (address) that must be transmitted depends on the S pin and the particular product as shown in the table below.

Product	S pin	Address					
Product	level	A ₀	A ₁	A ₂	A ₃		
LC78211	L	0	1	0	1		
	н	1	1	0	1		
LC78212	L	0	0	1	1		
	н	1	0	1	1		
LC78213	L	0	1	1	1		
	н	1	1	1	1		

Note: The bit for switch eight in the LC78213 is a "don't care" bit, that is it can be either 0 or 1 without affecting chip function. This is because the LC78213 has two sets of seven (not eight) circuits.

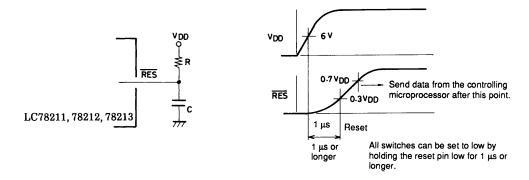
2. DI, CL and CE Timing



Data is read in on the rising edge of CL and latched on the falling edge of CE.

3. Notes on the Reset Pin

The states of the analog switches are undefined when power is first applied. However, it is possible to use the reset pin to force all switches to the off state by connecting an RC circuit to this pin.



 Using a CCB Bus with Multiple ICs The LC78211, LC78212 and LC78213 retain their prior state until they receive data with a matching address.

5. Replacing Earlier Models

Caution is required when replacing an LC7821N, LC7823N and LC7823N with an LC78211, LC78212 and LC78213, since the S pin threshold levels differ.

6. Handling of Unused Input Pins

We recommend connecting any unused switch pin to V_{SS} through a resistor of up to a few 100 k Ω to prevent damage from static electricity.

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