HBS-Compatible Driver and Receiver Monolithic IC XL1161

Features

- Built in power management function
- Built in decoding error correction function
- Enhanced anti-interference ability
- Simple circuit design
- High reliability
- Communication speed adaptation from 9.6kbps to 57.6kbps
- Operating temperature -40℃~125℃
- Available in SOP16 package

Applications

- Central Air Conditioner
- HVAC
- Smart Home
- Remote Monitoring and Sensing

General Description

The XL1161 conforms to the HBS(Home Bus) specification, built in power management function, decoding error correction function, and has functions for the reception and transmission of data. AMI is adopted for the waveforms of signals handled by the transmission and reception units, designed for connection to twisted-pair lines. XL1161 can stably reduce the voltage from 8V~32V to 5V to supply power to the chip and peripheral circuit modules and incorporates an output transistor to reduce the number of external components required.

XL1161 is a special encoding and decoding chip for DC carrier communication. It supports DC carrier and nonpolar connection. It has flexible bus topology and strong anti-interference ability. It can communicate while powered by twisted pair cablies. It has built-in protection module, simple peripheral circuit and high reliability.

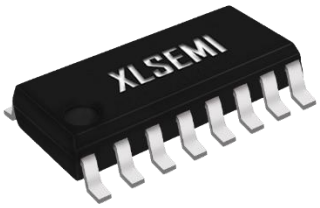


Figure1.Package Type of XL1161

Pin Configurations

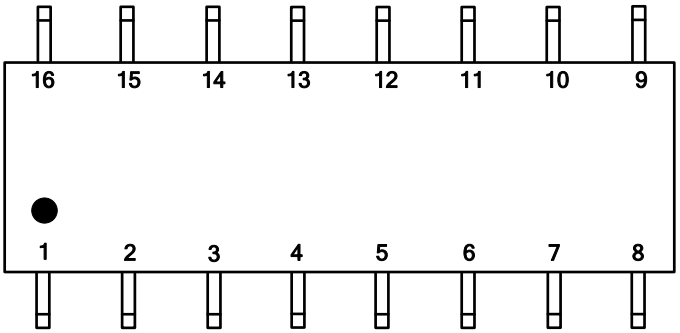


Figure2.Pin Configuration of XL1161 (Top View)

Table 1.Pin Description

Pin Number	Pin Name	Description
1	DATA OUT	Data output pin.
2	NC	No connected.
3	BC2	Boost capacitor pin 2.
4	BC1	Boost capacitor pin 1.
5	RESET	Reset control pin.
6	DATA IN	Data input pin.
7	VIN	Supply Voltage Input Pin.XL1161 operates voltage range from a 8V to 32V.Bypass VIN to GND with a suitably large capacitor eliminate noise on the input.
8	SW	Power Switch Output Pin (SW).
9	OUT(A)	Bus signal transmission pin A.
10	OUT(B)	Bus signal transmission pin B.
11	VCC	Supply voltage input pin (5V).
12	NC	No connected.
13	GND	Ground pin.
14	NC	No connected.
15	IN(2)	Bus signal receiving pin 2.
16	IN(1)	Bus signal receiving pin 1.

Function Block

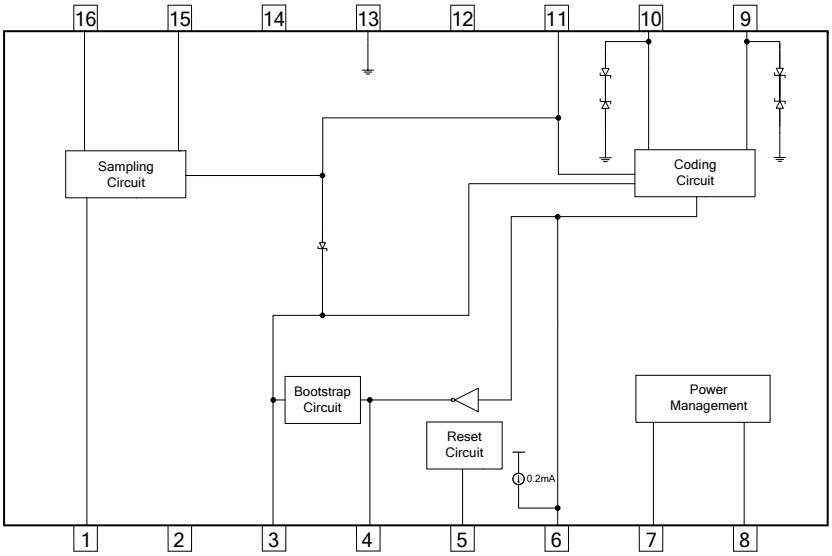


Figure3. Function Block Diagram of XL1161

Typical Application Circuit

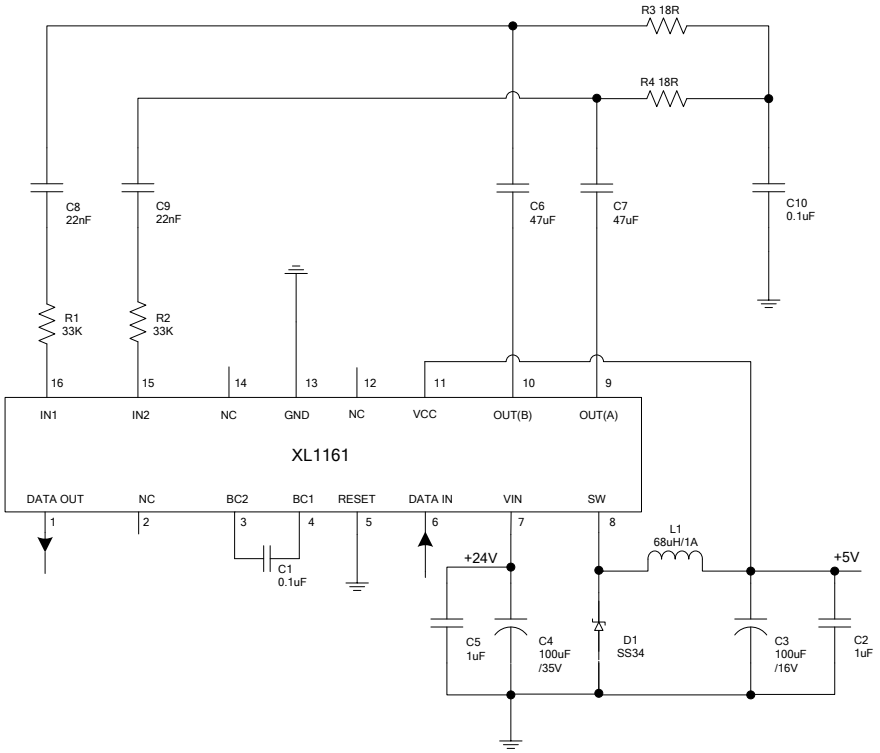


Figure4.XL1161 Typical Application Circuit

Ordering Information

Order Information	Marking ID	Package Type	Eco plan	Packing Type Supplied As
XL1161	XL1161	SOP16	RoHS & HF	2500 Units on Tape & Reel

Absolute Maximum Ratings (T_A = 25℃)

Parameter	Symbol	Value	Unit
Operating power supply voltage (VCC)	V_{CCOP1}	4.5 ~ 5.5	V
Power supply voltage (VCC)	V_{CC}max.	−0.3 ~ 7	V
Power supply voltage (VIN)	V_{IN}	−0.3 ~ 40	V
SW Pin voltage	V_{SW}	−0.3 ~ V_{IN}	V
Pin3 voltage	V_{PIN3}	−0.3 ~ 10	V
Other pins voltage	V	−0.3 ~ VCC	V
Power Dissipation	P_D	Internally limited	mW
Operating Junction Temperature	T_J	−40 ~ 125	℃
Storage Temperature	T_{STG}	−40 ~ 125	℃
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	℃
ESD (HBM) (Other PINs)	−	⩾8000	V
ESD (HBM) (PIN7,PIN13)	−	⩾3000	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Note2: Pin 9 and Pin 10 have built-in bus burr voltage absorption circuit. They can absorb positive and negative burr voltage, and the clamping voltage is designed to be positive and negative 7.2V.

XL1161 Electrical Characteristics

VIN = 24V, GND = 0V, T_A = 25℃; DATA IN = 57.6kbps, PIN5 = 0V, R_L = 36Ω, System parameters test circuit figure4, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	V_{IN}	Power management module	8	–	32	V
Output voltage	V_{CC}		4.75	–	5.25	V
Output current	I_{OUT}		–	400	–	mA
Power supply current 1	I_{CCO1}	PIN5=5V	–	12	–	mA
Power supply current 2	I_{CCO2}	–	–	68	–	mA
Transmission output voltage	V_{TO}	Both pins 9 and 10	3.8	4.2	4.6	V_{P-P}
Transmission waveform symmetry	V_{TR}	$V_{TO}1/V_{TO}2$	0.75	1.0	1.25	–
Reception Sensitivity	V_{RS}	–	–	0.75	–	V_{P-P}
Noise resistance	V_{RN}	Level at which no errors are output	0.55	–	–	V_{P-P}
Input impedance	R_{IN}	Both pins 15 and 16	25	36	46	kΩ
Transmission delay time 1	T_d1	cf. transmit/receive waveform diagrams	–	0.4	–	μs
Transmission delay time 2	T_d2		–	0.5	–	μs
Transmission delay time 3	T_d3		–	1.0	–	μs
Transmission delay time 4	T_d4		–	1.2	–	μs
Reception output H voltage	V_{ROH}	–	4.5	–	–	V
Reception output L voltage	V_{ROL}	–	–	–	0.5	V
H level input voltage 1	V_{LIH}	PIN6	2.4	–	–	V
L level input voltage 1	V_{LIL}	PIN6	–	–	0.6	V
H level input current 1	I_{LIH}	$V_{DATA\ IN}$=2.4V	–	–	10	μA
L level input current 1	I_{LIL}	$V_{DATA\ IN}$=0.4V	–	–	-400	μA
Bootstrap output H voltage	V_{BR}	–	–	8.0	–	V

Timing Chart

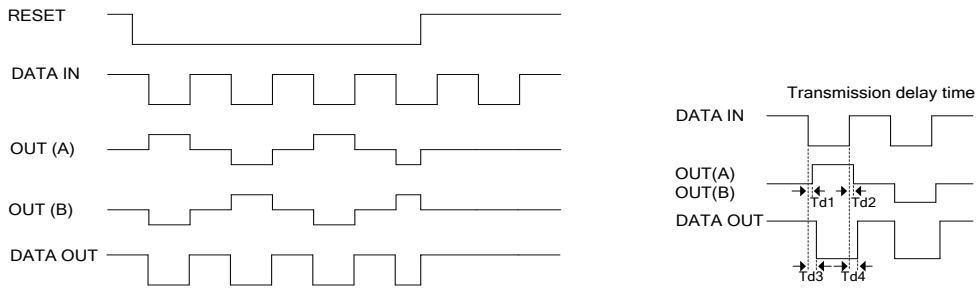


Figure5.XL1161 Timing Chart

Using an external power supply

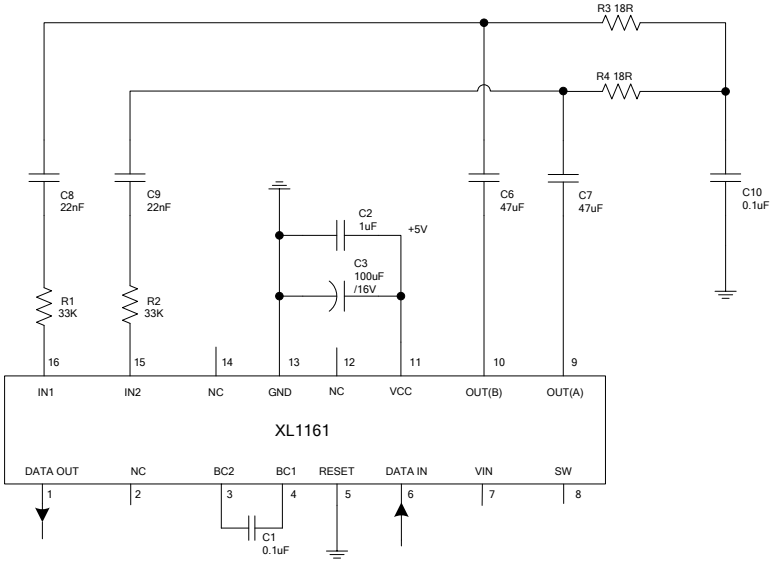


Figure6. XL1161 application schematic diagram with external power supply

Precautions

1. The peripheral components in the block diagram are the constants for Data Rates 57.6kbps.
2. If the built-in power management module of the XL1161 is used, the VCC pin must not be connected to any other 5V power supply. If VCC is connected to an external 5V regulated source, chips' PIN7 and PIN8 should be left unconnected.
3. The chip has a built-in current protection circuit. If the output terminal is short-circuited, the chip will generate heat. Its temperature will vary depending on the area of the PCB substrate and needs to be evaluated based on actual conditions.
4. When wiring PCB, ceramic capacitors should be placed near the VIN and GND pins of the chip, and capacitors should be placed near the VCC and GND pins of the chip. Increasing the number of GND vias appropriately can reduce parasitic parameters.

Function Description

Power management function

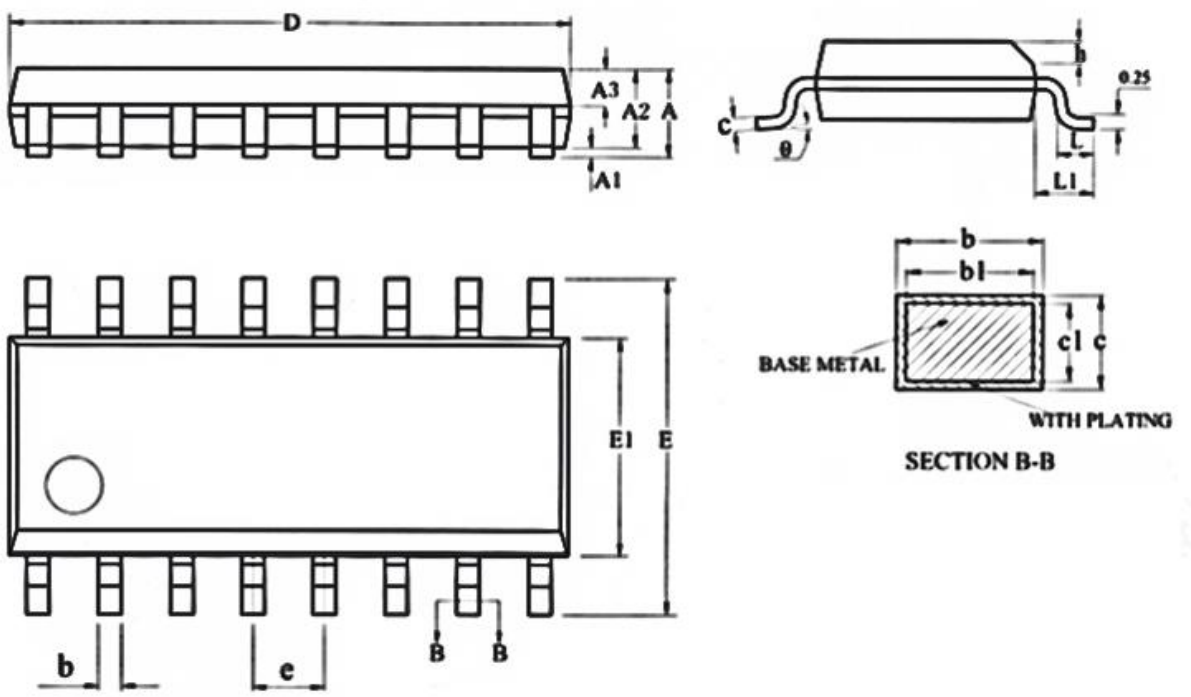
XL1161 has a built-in power management module. It can reduce the voltage of DC8-32V and output a constant 5V voltage to power XL1161 and other peripheral circuit modules.

Decoding error correction function

XL1161 has built-in decoding and error correction function. It can solve errors caused by bus interference or oscillation, improve decoding accuracy and stability.

Package Information

SOP16



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	–	–	1.75	–	–	0.069
A1	0.10	0.15	0.25	0.004	0.006	0.010
A2	1.30	1.40	1.50	0.051	0.055	0.059
A3	0.55	0.65	0.75	0.022	0.026	0.030
b	0.33	–	0.51	0.013	–	0.020
b1	0.35	0.40	0.45	0.014	0.016	0.018
c	0.17	–	0.25	0.007	–	0.010
c1	0.19	0.20	0.21	0.007	0.008	0.008
D	9.80	10.00	10.20	0.386	0.394	0.402
E	5.80	6.00	6.20	0.229	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.158
e	1.27 REF			0.050 REF		
h	0.25	–	0.50	0.010	–	0.020
L	0.40	–	1.27	0.016	–	0.050
L1	1.05 REF			0.041 REF		
θ	0°	–	8°	0°	–	8°

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