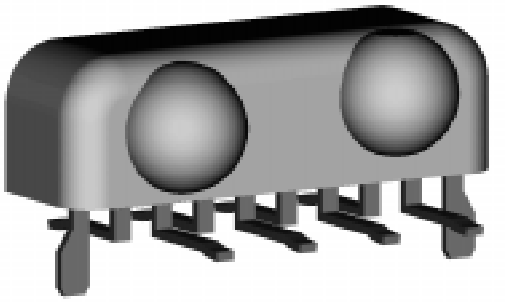
IBM31T1100A

Integrated Infrared Transceiver Module

Highlights

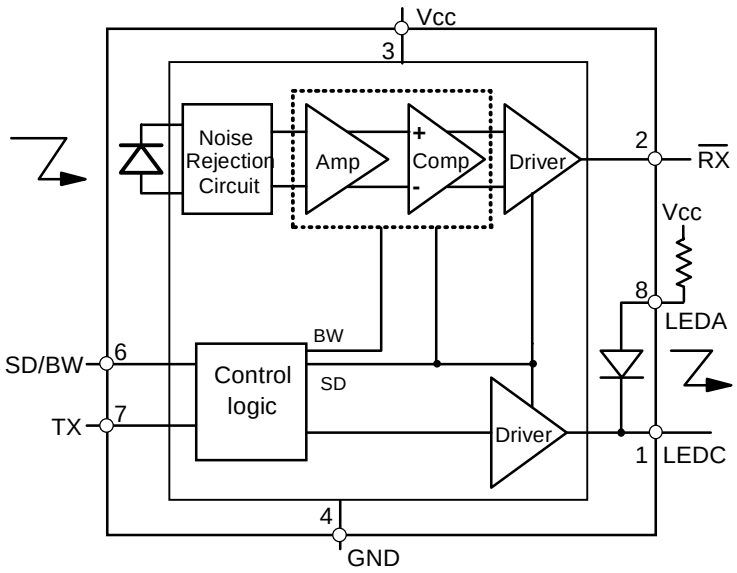
- IrDA 1.1, HP-SIR and Sharp ASK compliant
- Supports IrDA data rates up to 4 Mbps
- Low profile (height = 5.6 mm max.)
- Minimum external components
- On-chip LED protection circuit
- Low power consumption
- 5 V Supply Voltage
- Complete differential receiver design
- Ambient light and noise rejection circuitry
- Shutdown pin for power management
- Programmable bandwidth control
- Compatible with all major Super I/Os



Package

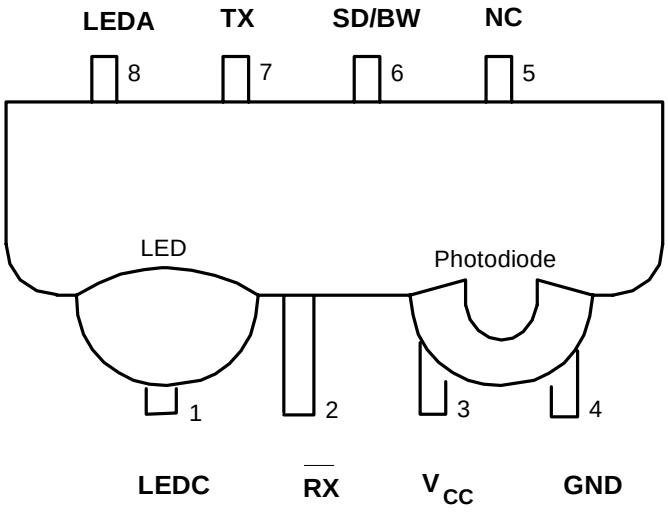
General Description

The IBM31T1100A is a multi-mode integrated infrared (IR) transceiver module for data communication systems. The transceiver supports IrDA speeds up to 4 Mbps, HP-SIR and Sharp ASK modes. Integrated into this tiny package is a photodiode, LED and analog transceiver ASIC to provide a total solution in a single package. A current limiting resistor in series with the LED and a Vcc bypass capacitor are the only external components required to implement a complete transceiver.



Block Diagram

Pin Assignments and Descriptions



Pin	Pin Name	Description	I/O	Active
1	**LEDC**	Indicates the state of the internal LED cathode. Normally not connected.	O	Low
2	**$\overline{RX}$**	Indicates received serial data. It is a push-pull CMOS driver capable of driving a standard CMOS or TTL load. No external pull-up or pull-down resistor is required. May switch indeterminately when the IBM31T1100A is transmitting.	O	Low
3	**V_{cc}**	Connect to +5 V power supply. Place a 1.0-10 µF ceramic bypass capacitor as close as possible to this pin.		
4	**GND**	Connect to ground of the power supply. A solid ground plane is recommended for proper operation.		
5	**NC**	This pin is reserved for special application use only. No signal should be connected to this pin.		
6	**SD/BW**	This CMOS input is used to put the IBM31T1100A in shutdown mode. Nominal supply current draw in this mode is 35 µA versus 5 mA in normal mode. Together with the TX input, this pin also sets the receiver bandwidth. If TX is low when SD/BW transitions from high to low, the receiver bandwidth is optimized for operation up to 1.2 Mbps. If TX is high when SD/BW transitions from high to low, the receiver bandwidth is optimized for operation at 4 Mbps.	I	High
7	**TX**	Used to transmit serial data when SD/BW is low. This CMOS input controls the LED driver. An on-chip protection circuit disables the LED driver if TX is high for more than 60 µsec. This pin is also used to program the bandwidth of the receiver. See SD/BW pin description.	I	High
8	**LEDA**	Connect this input to Vcc through a resistor to set the proper LED current. Add an external LED in series to increase output intensity if required.	I	
	Guide Pins (not shown above)	Two through-hole guide pins provide mechanical stability during board mounting. They also improve heat conduction when the part is in operation.		

NOTE: The IBM31T1100A is pin and plug compatible with the Temic TFDS6000D.

Electrical and Timing Specifications

Absolute Maximum Ratings

Symbol	*Parameter*	*Min*	*Typ*	*Max*	*Unit*	*Condition*
V_{CC}	Supply Voltage Range	- 0.5		6	V	
P_D	Power Dissipation			450	mW	
T_J	Junction Temperature			125	°C	
	Storage Temperature Range	- 25		85	°C	
	Soldering Temperature			240	°C	See application notes
I_{LED}	LED Current			0.8	A	<2 µs, t_{on}<10%
	Voltage at Any Pin	- 0.5		V_{CC}+ 0.5	V	

Recommended Operating Conditions

Symbol	*Parameter*	*Min*	*Typ*	*Max*	*Unit*	*Condition*
V_{CC}	Supply Voltage	4.5	5	5.5	V	
T_A	Operating Temperature Range	0		70	°C	

DC Electrical Characteristics

T_A = 0 - 70 °C, V_{CC} = 5 V ± 10 %, unless otherwise specified

Symbol	*Parameter*	*Min*	*Typ*	*Max*	*Unit*	*Condition*
I_{CC}	Dynamic Supply Current		5	7	mA	SD = 0 V
I_{CC}	Standby Supply Current		35	100	uA	SD = V_{CC} - 0.5, SC = NC
I_{LED}	Repetitive Pulsed LED Current			0.55	A	< 60 µs, t_{on} ≤ 25 %
V_{OL}	$\overline{RX}$ Output Voltage Low @ I_{OL} = 2.5 mA		0.3	0.5	V	
V_{OH}	$\overline{RX}$ Output Voltage High @ -I_{OH} = 2.5 mA	V_{CC} - 0.5			V	
V_{IL}	Input Voltage Low (TX, SD/BW)	0		0.8	V	
V_{IH}	Input Voltage High (TX)	3.0			V	
V_{IH}	Input Voltage High (SD/BW)	V_{CC} - 0.5			V	
I_L	Input Leakage Current	-10		+10	uA	
C_I	Input Capacitance			5	pF	

AC Electrical Characteristics

T_A = 0 - 70 °C, V_{CC} = 5 V ± 10 %, unless otherwise specified

Symbol	*Parameter*	*Min*	*Typ*	*Max*	*Unit*	*Condition*
t_R	$\overline{RX}$ Rise Time	10		40	ns	R_{LED} = 2.0 KΩ, C = 50 pF
t_F	$\overline{RX}$ Fall Time	10		40	ns	R_{LED} = 2.0 KΩ, C = 50 pF
t_S	TX Setup Time to SD/BW Low	200			ns	
t_H	TX Hold Time from SD/BW Low	200			ns	
t_{PW}	$\overline{RX}$ Pulse Width	0.8		20	us	9.6 kbps
t_{PW}	$\overline{RX}$ Pulse Width	100		500	ns	1.2 Mbps
t_{PW}	$\overline{RX}$ Pulse Width	60		165	ns	4 Mbps
t_{PW}	$\overline{RX}$ Pulse Width	185		290	ns	4 Mbps double pulse
t_D	Output Delay @ E_e = 40 mW/cm^2		1	2	us	≤ 1.2 Mbps
t_L	Latency			120	us	
t_{RXEN}	$\overline{RX}$ Valid After Shutdown			60	us	
t_{DIS_LED}	LEDC Inactive After TX High			60	us	

Optical Characteristics

T_A = 0 - 70 °C, V_{CC} = 5 V ± 10%, unless otherwise specified

Symbol	*Parameter*	*Min*	*Typ*	*Max*	*Unit*	*Condition*
E_{emin}	Minimum Detection Irradiance (SIR mode)		0.025	0.035	Wm^{-2}	9.6 - 115 kbps
E_{emin}	Minimum Detection Irradiance		0.035	0.05	Wm^{-2}	1.2 Mbps
E_{emin}	Minimum Detection Irradiance		0.07	0.08	Wm^{-2}	4 Mbps
E_{emax}	Maximum Detection Irradiance	5000			Wm^{-2}	All speeds
I_e	Output Radiant Intensity	100	140	320 (1)	mW/sr	Tx = High, SD = Low, R_{LED} = 5.6 Ω V_{CC}=5.0, α=0 °, α=±15 °, T_A=25 °C
				0.4	uW/sr	Tx=Low or SD=High, R_{LED}=5.6 Ω V_{CC}=5.0, α=0 °, α=±15 °, T_A=25 °C
α	Output Radiant Intensity Half Angle		±24		°	
λ_P	Peak Wavelength	880		900	nm	
	Optical Overshoot			25	%	

1. Maximum intensity specified for class 1 operation of IEC 825-1

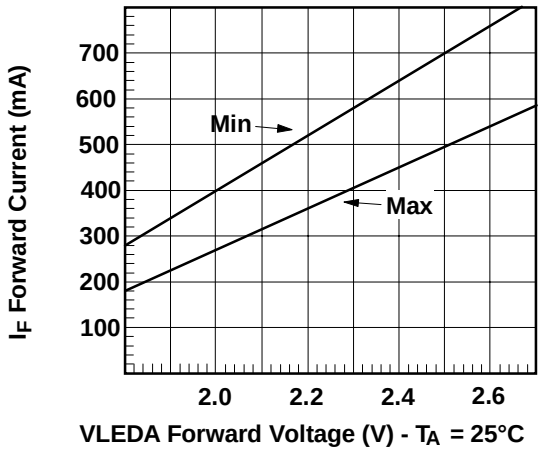


Figure 1. VLEDA to GND Voltage vs. peak LED current.

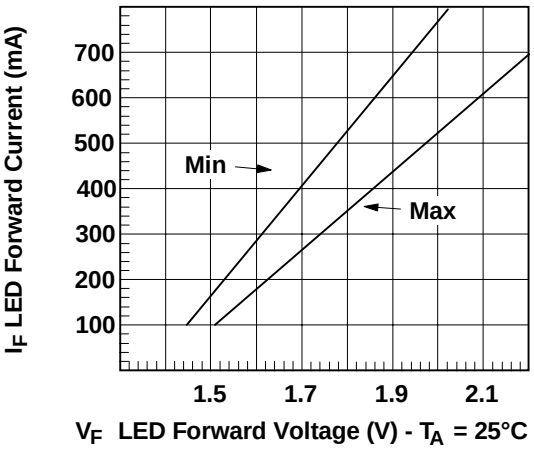


Figure 2. LED Forward Voltage vs. Current

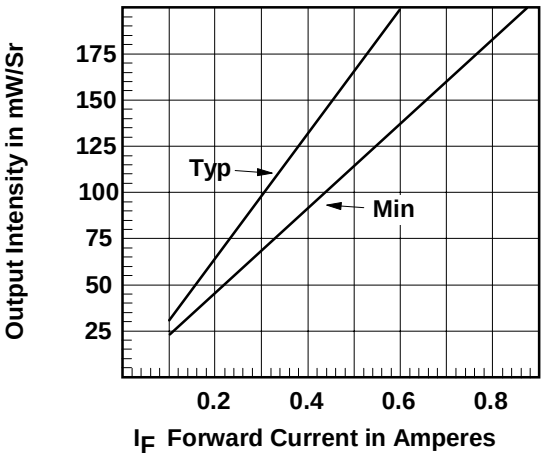


Figure 3. Output Intensity vs. Current

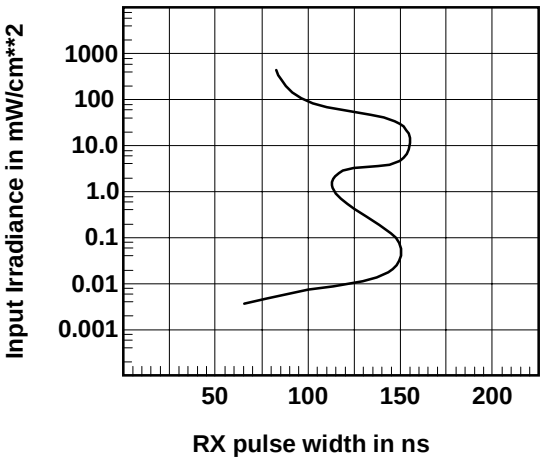


Figure 4. $\overline{RX}$ pulse width vs. Irradiance - 4 Mbps mode.

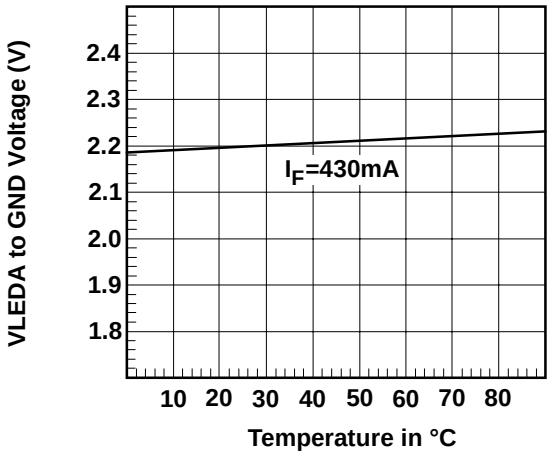


Figure 5. VLEDA to GND Voltage vs. Temperature.

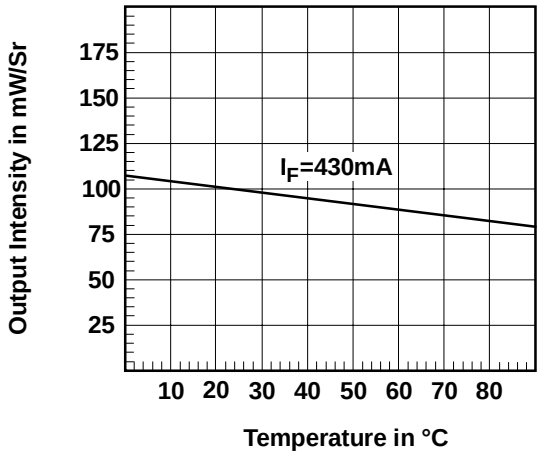


Figure 6. Output Intensity vs. Temperature

Timing Diagrams

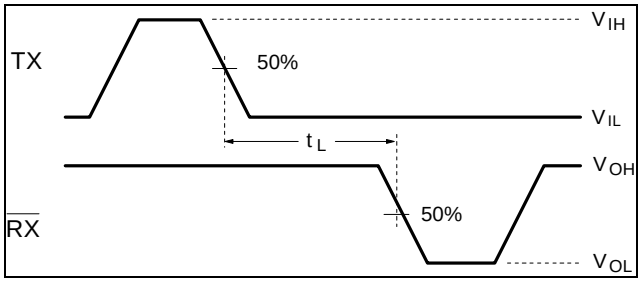


Figure 7. Latency Timing

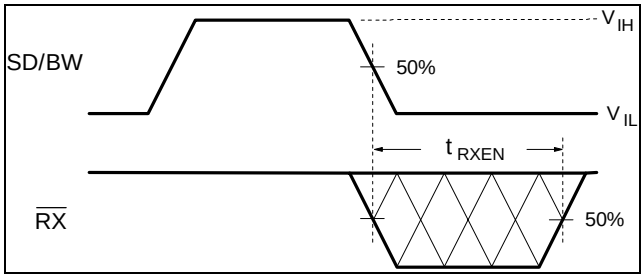


Figure 8. $\overline{RX}$ valid after Shutdown.

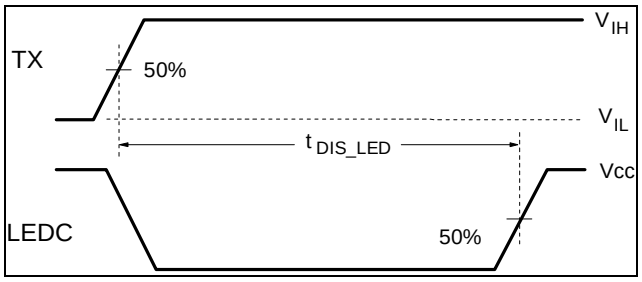


Figure 9. LED Protection Timing

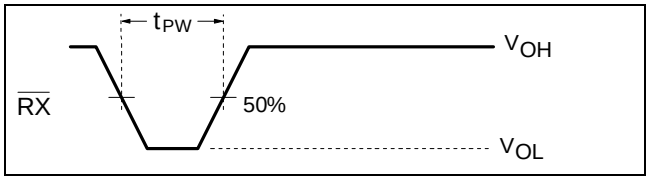


Figure 10. $\overline{RX}$ Timing, 1.2 and 4 Mbps mode

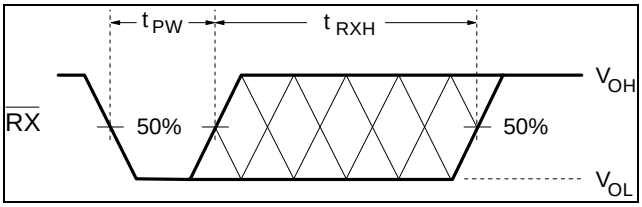


Figure 11. $\overline{RX}$ Timing, SIR mode. The output is indeterminate in the shaded area. Spurious transitions may occur.

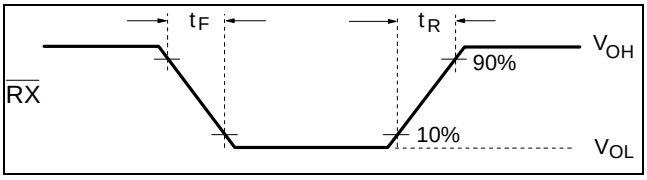


Figure 12. $\overline{RX}$ Rise and Fall timing measurements.

Programming the Receiver Bandwidth

The IBM31T1100A powers on with the upper limit of the receiver bandwidth set to 1.2 Mbps operation. To set the bandwidth for operation at 4 Mbps, apply timings as shown in Figure 14 to the SD/BW and the TX inputs. Note that the internal LED driver is disabled when SD/BW is active and is not enabled until the next rising edge of TX. This ensures that the LED(s) will not be active during bandwidth adjustment. It is recommended that the SD/BW pin be connected to GND if bandwidth adjustment and shutdown mode are not used.

To switch the IBM31T1100A from the default state to 4 Mbps and vice versa, the programming specifications are as follows:

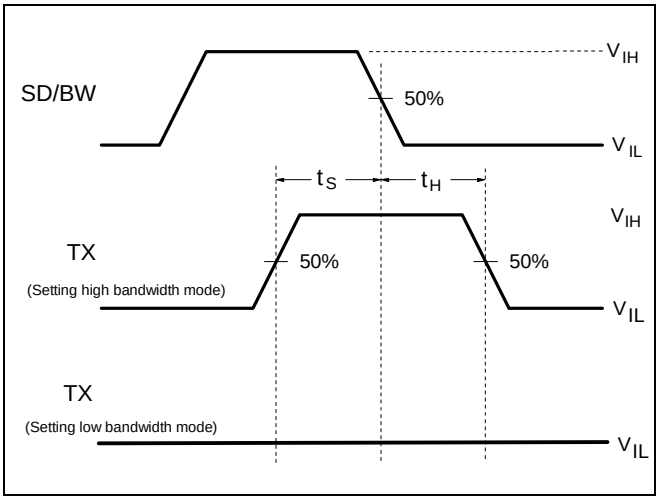


Figure 13. Bandwidth Programming

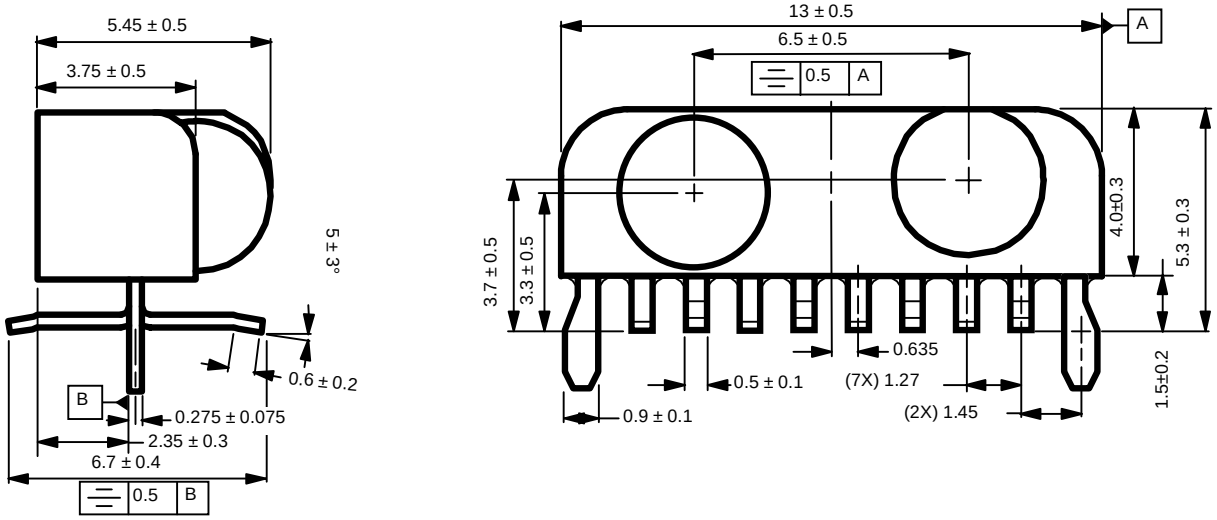
Setting the receiver to 4 Mbps mode

1. Set the SD/BW input to logic high.
2. Set the TX input to logic high. Wait $t_S \geq 200$ ns.
3. Set the SD/BW to logic low. (This high-to-low transition latches the state of TX, which determines the receiver bandwidth.)
4. After waiting $t_H \geq 200$ ns, set the TX input to logic low. The receiver is now in high bandwidth mode, the optimal setting for 4 Mbps operation.

Setting the receiver to 9.6 kbps-to-1.2 Mbps mode

1. Set the SD/BW input to logic high.
2. Ensure that the TX input is at logic low. Wait $t_S \geq 200$ ns.
3. Set the SD/BW to logic low. (This high-to-low transition latches the state of TX, which determines the receiver bandwidth.)
4. Ensure that the TX input remains low for $t_H \geq 200$ ns. The receiver is now in low bandwidth mode, which is the optimal setting for data rates from 9.6 kbps to 1.2 Mbps.

Package Dimensions



Dimensions in mm.

Revision History

The following changes have been made in the specifications from the IBM31T1100 data sheet.

1. Improved Irradiance values have been updated.
2. LED protection circuit has been added.
3. The $\overline{RX}$ rise time specification is 40 ns instead of 35 ns.
4. 200K internal pull-down resistor has been removed from the SD/BW pin.
5. Output Intensity and $\overline{RX}$ pulse width graphs have been updated.

Ordering Information

Order Part Number	Qty/Reel
IBM31T1100A	750 Pieces

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