SIRFIR™ 4Mbps IrDA Transceiver

GENERAL DESCRIPTION

The Novalog SIRFIR™ is a 5 volt, low power, infrared (IR) transceiver that supports Infrared Data Association (IrDA) speeds up to 4Mbps, Sharp ASK/DASK, HP-SIR and TV Remote modes. It features a wide band analog signal processor that maintains pulse jitter below 20 ns over a large input dynamic range. A unique design technique enables the SIRF to directly interface IrDA compatible detector diodes and operate over a wide input signal dynamic range. The output is capable of driving a 25pF load at CMOS/TTL levels for direct interfacing into IR Serial Controllers.

A single pin is used to place the SIRF in a power down mode as well as to set the receiver bandwidth. When in the power down mode, it's 12 mA operating current is reduced to under 10 μA.

FEATURES

- Supports IrDA Data Rates Up to 4Mbps
  IrDA 1.0 2400bps to 115.2kbps
  IrDA 1.1 0.576Mbps to 4Mbps

- Sharp ASK/DASK, HP-SIR and TV Remote Compatible

- 5 Volt Supply Operation ($\pm$ 10%)

- 12 mA Operating Current

- 10 μA Power Down Current

- Zero Receiver Latency (No Link Turn-Around)

- On-Chip MOSFET LED Driver

- Direct Interface to IrDA Compatible Serial Controllers

- Interfaces to a Wide Range of Photodiodes

- 14 Pin SSOP (5.3 mm)

PIN CONFIGURATION

Top View
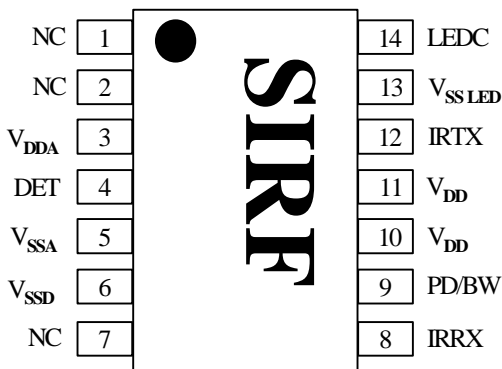
TYPICAL APPLICATION CIRCUIT
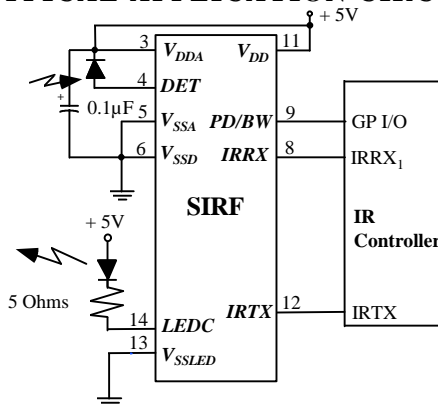
ABSOLUTE MAXIMUM RATINGS

V_{DD} ....- 0.3V to + 6.0V
Voltage at PD/BW (respect to GND)....................................- 0.3V to V_{DD}
Input Source Current to Det (Duty Cycle = 25%)........................... 80 mA
LED Sink Current (Duty Cycle = 25%)..900 mA
Power Dissipation .... 225 mW
Operating Temperature Range....................................... -10°C to + 70°C
Storage Temperature Range .... 40°C to + 100°C

Stresses beyond "Absolute Maximum Ratings" may cause damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability permanently.

ELECTRICAL CHARACTERISTICS

(4.5V £ V_{DD} £ 5.5V, V_{SS} (Analog) = V_{SS} (Digital) = 0V, T_A = Full Temperature Range, unless otherwise noted. Photodiode junction capacitance = 30 pf.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Dynamic Supply Current (I_{DD})	No Load, I_{det} = 1 µA DC.		12	15	mA
Power down Supply Current (I_{PD})	PD/BW = High		10		µA

DETECTOR INPUT

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
AC Photo Input Current	Photo Diode Current Source $P_w < 2.7$µs			40	mA
DC Photo Input Current				200	µA
Input Resistance, R_{IN}			350		Ohm
Detection Threshold, IRRX	BW = 115.2kbps BW = 0.576/1.2/4Mbps		180 320		nA
Signal To Noise Ratio, IRRX	BW = 115.2kbps BW = 0.576/1.2/4Mbps		11.2 11.2		

DIGITAL INPUT/OUTPUT

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input High (Logic 1) Voltage, V_{IH}		3.2		V_{dd}+ 0.5	V
Input Low (Logic 0) Voltage, V_{IL}		-0.5		1.3	V
Output High Voltage, V_{OH}	IRRX*, LEDC, I_{OH} = -3.0 mA	2.4			V
Output Low Voltage, V_{OL}	IRRX*, I_{OL} = 3.0 mA			0.4	V
Output Low Voltage, V_{OL}	LEDC, I_{OL} = 600mA Duty Cycle = 25%			0.75	V
Input Capacitance			8		pF
Input Leakage	PD/BW	-1		+1	µA

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United States of America	*2 of 8*		*April 1996*

ELECTRICAL CHARACTERISTICSCONTINUED

AC CHARACTERISTICS

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
BW Mode Switching Pulse (BW_P)		0.1		2	μs
Recovery Delay From Power down To Full Sensitivity ($T_{recovery}$)				50	μs
Delay To Power down (PD_D)				20	μs
IRRX* Pulse Width (P_w) (BW = 115.2kbps) (400 nA input pulse Trise/Tfall = 600 ns)	9.6kbps (1.6 - 19.5 μs input) 115.2kbps (1.6 μs input)	1.2 1.2		22.0 2.2	μs
IRRX* Pulse Width (P_w) (BW = 0.576/1.2/4Mbps) (700 nA input pulse Trise/Tfall = 40 ns)	0.576Mbps (434 ns input) 1.2Mbps (217 ns pulse) 4Mbps (125 ns pulse) 4Mbps (250 ns pulse)	390 170 90 200		475 260 160 300	ns
Output Delay (t_D) (BW = 115.2 kbps) (BW = 0.576/1.2/4 Mbps)	≤ 115 kbps ≤ 4 Mbps		1.3 0.07		μs
Pulse Jitter (t_J)			20		ns

Mode Switching

At power on, the SIRF is set to low speed mode (input bit rate to 115.2kbps). To switch from this default state to BW = 0.576/1.2/4Mbps (and vice versa), the following programming sequences are required

Set To 0.576/1.2/4Mbps Mode
1. Pulse the PD/BW mode input to logic "High" for 0.1 to 2μs and then "Low".
2. BW = 0.576/1.2/4Mbps IrDA operation is now enabled.

Reset To 9.6 - 115.2kbps From 0.576/1.2/4Mbps Mode
1. Pulse the PD/BW mode input to logic "High" for 0.1 to 2μs and then "Low".
2. BW = 9.6-115.2kbps mode is now enabled.

Set to Power down Mode
1. Pulse the PD/BW mode input to logic "High"
2. SIRF Power down mode is now enabled.

Reset to 9.6 - 115.2kbps Mode From Power down
1. When SIRF is in Power down mode, pulse the PD/BW mode input to logic "Low"
2. BW = 9.6-115.2kbps mode is now enabled.

Pin Descriptions

DET *Detector (Input).* This input is normally connected to the Photodiode anode. The photodiode should be placed as close as possible to this input and separated by ground from both SIRF receive data outputs.

V$_{SS}$ (Analog), V$_{SS}$ (Digital) *Analog and Digital Ground* (Power). Connect to ground of the power supply. A solid ground plane is essential for proper operation.

IRRX* *IR Receive Data* (Output, active low). This output indicates received serial data. It is a tri-state dual bandwidth CMOS output driver capable of driving a standard CMOS or LSTTL load (no external resistor is required). The SIRF powers on with the upper limit of the bandwidth set to 115.2kbps (9600.to 115.2kbps operation). To set the bandwidth for operation at 0.576/1.2/4Mbps, timings as described in Mode Switching (above) should be applied to the PD/BW input.

PD/BW, *Power down/Bandwidth* (Input, active high). This input is used to put the SIRF into power down mode. Nominal current draw in this mode is 10 µA and outputs are tri-stated. This pin is also used to set the IRRX* receiver bandwidth (see Mode Switching above).

V$_{DD}$, V$_{DDA}$ *5V* Digital and Analog (Power). Connect to a +5V power supply. Placement of a low ESR 0.1 µF bypass capacitor as close as possible to these pins is recommended.

LEDC *LED Cathode (Output).* This output is connected to the LED cathode. Current to the LED must be limited to a maximum of 800 mA. (25% Duty Cycle max). A Low indicates the LED is active.

VssLED *Ground (Power input).* This ground input pin provides a separate ground path for the LED Driver circuit.

IRTX *Transmit Data (Input, active high).* This input is controls the LED buffer serial data driver.

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RECOMMENDED PARTS LIST, LAYOUT, GROUNDING & PAD SIZE

Reference Design Parts List

Qty	Function	S/R	Description
	Transmit Circuit		
1	LED Bypass Capacitor	C1	4.7 µF, 6.3V
3	Current Limiting Resistors	R1 - R3	$33\Omega \pm 5\%$, 1/8W
1	IrDA IR Emitting Diode	LED	($T_r/T_f \leq 40$ns)
	Receive Circuit		
1	IrDA PIN IR Diode	PD	$C_D \leq 30$ pF
1	V_{DD} Bypass Capacitor	C2	0.1 µF (Ceramic)
1	SIRF Transceiver	U1	IrDA 1.1 Compliant
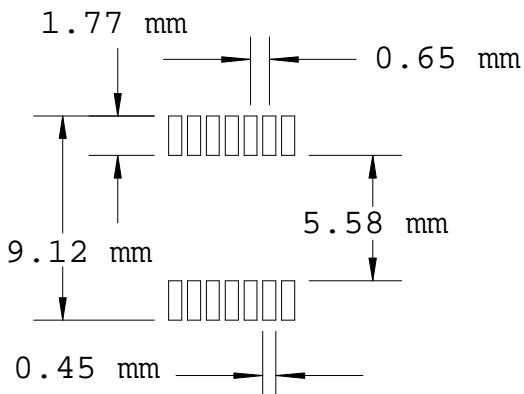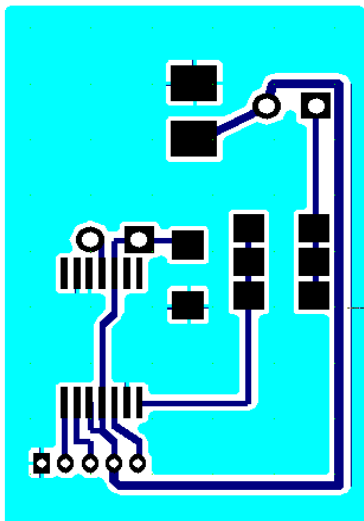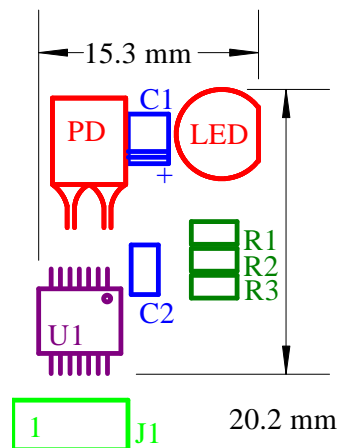
PACKAGE INFORMATION

SIRF

7.65/7.9

5.2/5.38

NOTES:

1. Dimensions in Millimeters

0.12

1.68/1.78

←6.07/6.33→

0.09/0.25

0/8°

1.73/1.99

0.65 BSC
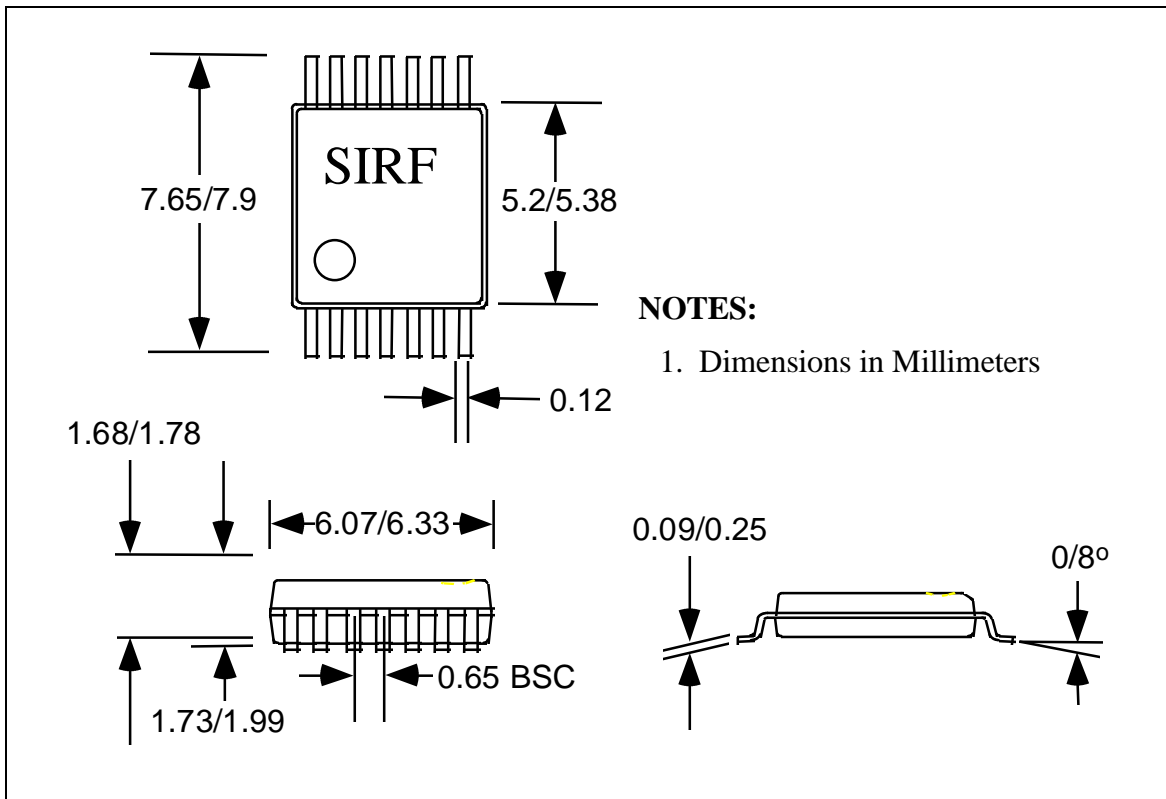
ORDERING INFORMATION

PART NO.	TEMP RANGE	PACKAGE
SIRF	-10°C TO 70°C	14 PIN SSOP

APPLICATION HINTS

Layout and Bypassing

The SIRF should be bypassed with a 0.1µF low ESR capacitor positioned as close to pin 3 as possible. Connections to the SIRF photodiode input should be short, surrounded by ground and as direct as possible to reduce stray capacitance and noise pick-up. To obtain maximum performance, a separate ground plane and metal EMI shield may be used with the SIRF, photodiode, and IR LED. The optical port surface of the transmit LED and photodiode should be positioned at least 1 centimeter away from an IR optical filter window and equipment case to ensure that direct sunlight does not impinge onto the photodiode surface.

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Infrared Data Association
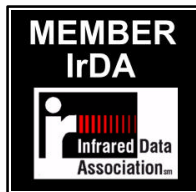
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