

Simblee™ RFD77402

IoT 3D ToF Sensor Module



Simblee™ IoT 3D ToF Sensor Module RFD77402

DATASHEET

Features

- Fully Integrated microelectronic device with an embedded sensor and VCSEL (Vertical Cavity Surface Emitting Laser)
 - 850 nm VCSEL and electronic driver
 - Optical receiver sensor and optics
 - Microelectronic controller
- Time-of-Flight (ToF) is a highly accurate distance mapping and 3D imaging technology
- Eye safe invisible infrared (IR) illumination using a class 1 laser emitter
- High accuracy and high repeatability
- I2C interface for device control and data transfer
- Ultra-small SMD package
- Standard solder reflow compatible
- Lead-free, RoHS compliant
- Small size 4.8mm x 2.8mm x 1mm

Applications

- Absolute and highly accurate distance measurement at distances ranging from 100 mm to 2000 mm
- User detection for IoT devices
- Robotics applications such as obstacle detection and obstacle avoidance
- White goods type of applications such as hand detection in automatic faucets and soap dispensers
- 1D gesture recognition
- Directional movement detection along Z-axis
- Volume or height control

1. General Characteristics

1.1 Technical Specifications

Parameter	Description	Units
Package Size	4.8 x 2.8 x 1.0 (LxWxH)	mm
Interface	I2C (up to 1 MHz)	
I2C address	0x4C	hex
Light source (type/wavelength)	VCSEL / 850 nm	nm
Field of Illumination	29° @1/e2	degree
Field of View	55° @1/e2	degree
Measurement range	100 mm to 2000 mm (*)	mm
Maximum refresh rate	10	Hz
Precision	+/-10 (*)	%
Laser eye safety	Class 1 laser product	
MSL	Class 3	

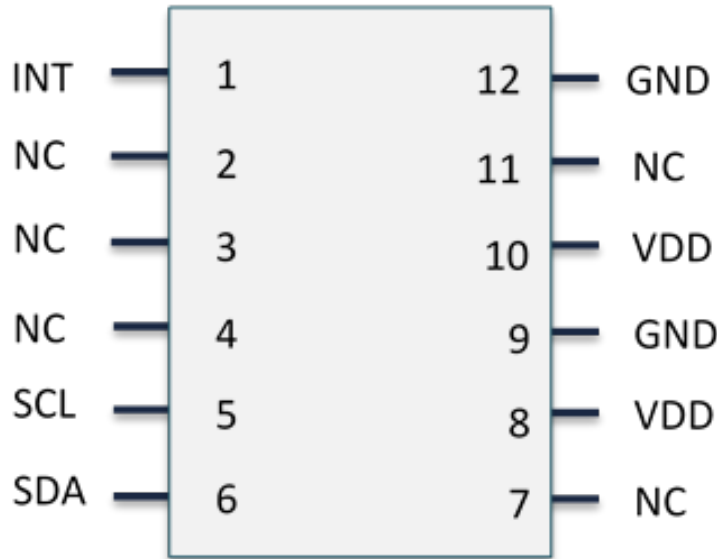
(*) target with 90% reflectivity in dark environment and with no cover glass

1.2 Electrical Specifications

Parameter	Min	Typ	Max	Units	Notes
Standby current	9.3	9.7	15	μA	
Current consumption (@ full range, 10 Hz –worst case)	-	7	15	mA	
Operating Voltage	2.7	3.0	3.3	V _{dd}	
Pull-up Voltage	1.8	-	V _{dd}	V _{pull-up}	
Operating Temperature	-10	-	60	°C	
Temperature not to exceed	-	-	245	°C	
I2C: SDA and SCL					
V _{IL}	0	-	0.9	V	
V _{IH}	1.2	-	-	V	
V _{OL} (@ 3mA)	-	0.02	-	V	
I _{OL} (@ V _{OL} = 0.4V)	-	8	-	mA	

2. Device Pinout

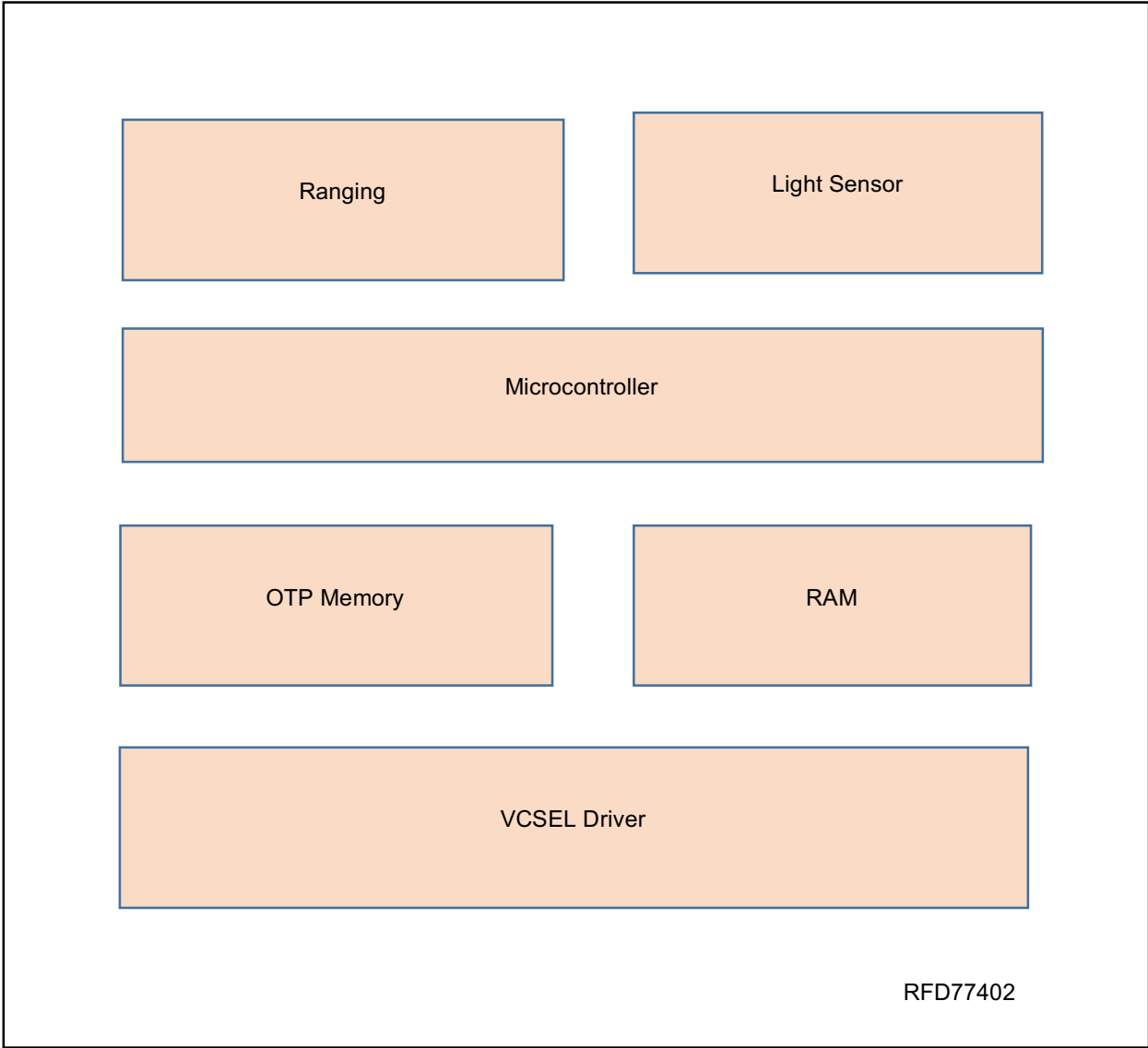
2.1 IoT 3D Tof Module Pinout



2.2 Pin Descriptions

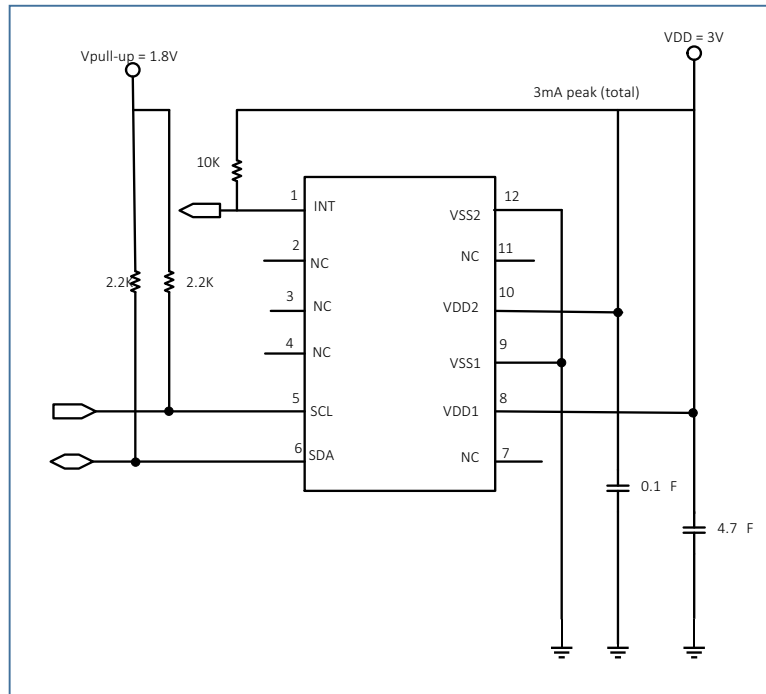
Name	Pin	Type	Signal	Comments
1	INT	Digital output	Reserved	
2	NC	NC	DO NOT CONNECT	
3	NC	NC	DO NOT CONNECT	
4	NC	NC	DO NOT CONNECT	
5	SCL	Digital input	I2C serial clock	
6	SDA	Digital input/output	I2C serial data	
7	NC	NC	DO NOT CONNECT	
8	VDD	Supply	Power Supply	
9	GND	Ground	To be connected to main ground	
10	VDD	Supply	Power Supply	
11	NC	NC	DO NOT CONNECT	
12	GND	Ground	To be connected to main ground	

3. Block Diagram



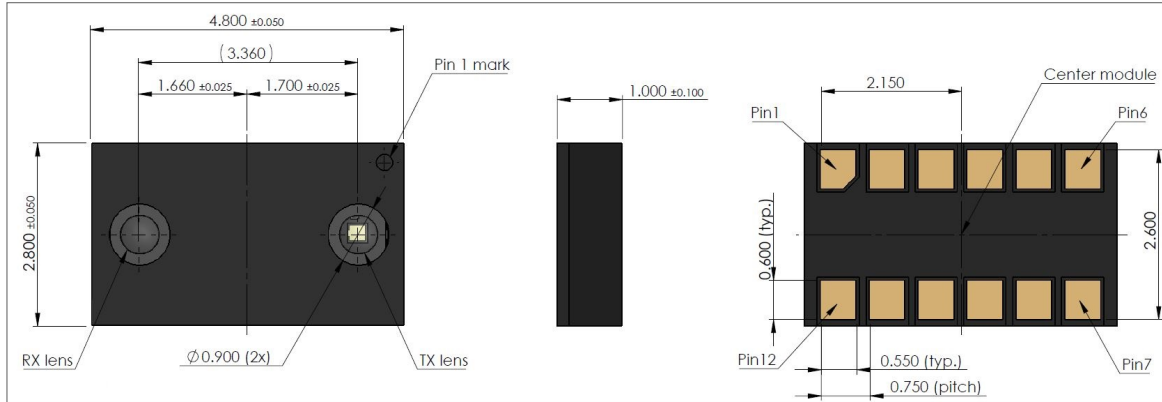
4. Example Circuit Diagrams

4.1 Basic Circuit

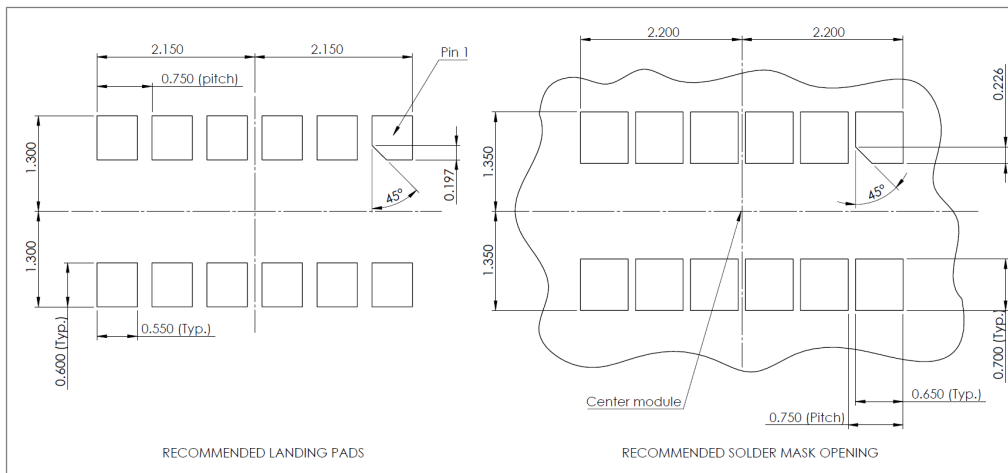


5. Mechanical Specifications

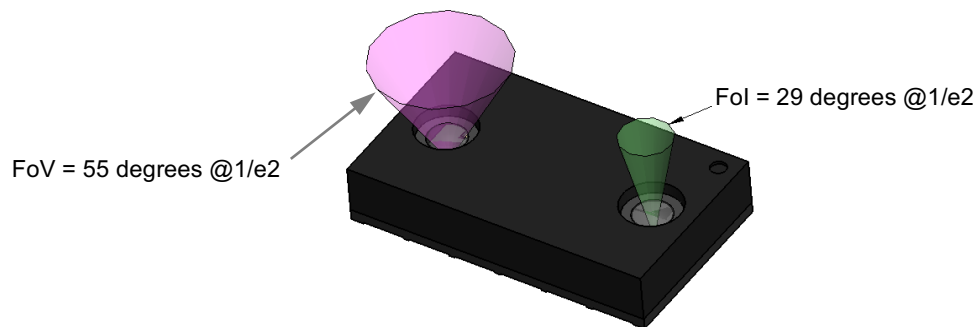
5.1 Physical Dimension



5.2 PCB Land Pattern



5.3 Field of View (FoV) and Field of Illumination (Fol)



6. Cover Glass

The module supports use behind a cover glass under certain defined conditions. This might be done for cosmetic or protective purposes. Sensor performance can be the same as without cover glass so long as the correct cover glass material is selected and the calibration procedure is followed.

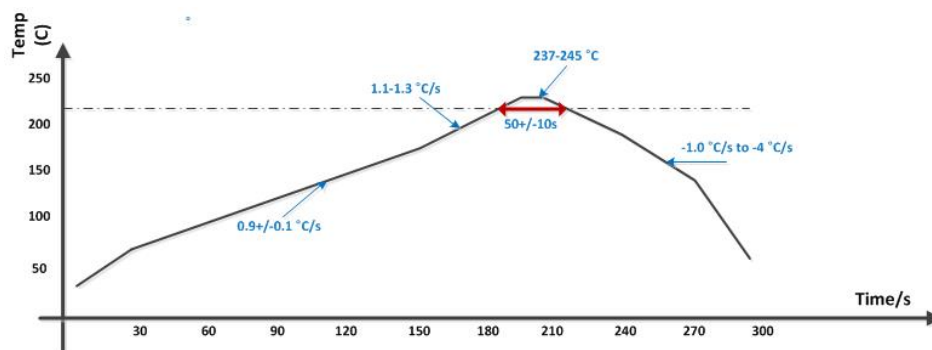
6.1 Selection Guide

In order to obtain the best performances, the following rules should be taken into account for the Cover Glass:

- Material: PMMA, Acrylic
- Spectral transmittance: $T < 5\%$ for $\lambda < 770\text{nm}$, $T > 90\%$ for $\lambda > 820\text{nm}$
- Air gap: $< 100\mu\text{m}$
- Thickness $< 1\text{mm}$, thinner is better
- Dimensions: bigger than $6\times 8\text{mm}$
- All the surfaces of the CG not relevant for the VCSEL emission and signal detection (e.g. lateral faces) should be absorbing (e.g. by applying black non-reflective color on the edges (short sides) of the cover glass.).

7. Reflow Temperature Profile

7.1 Solder Profile

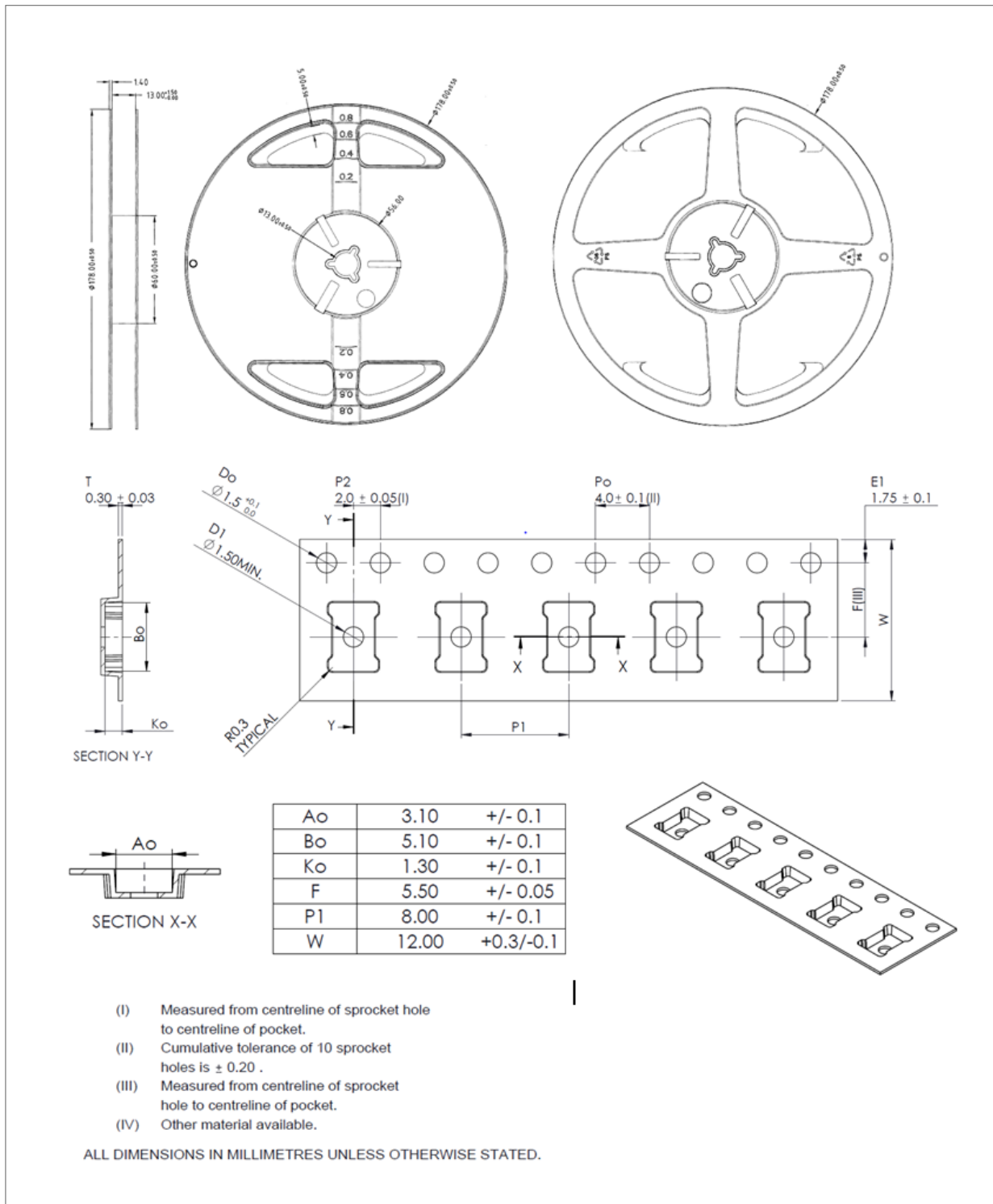


7.2 Recommended Reflow Profile

Profile	Ramp to strike	
Temperature gradient in preheat	(T= 70 - 180°C):	0.9 +/- 0.1°C/s
Temperature gradient	(T= 200 - 225°C):	1.1 - 3.0°C/s
Peak temperature in reflow	237°C - 245°C	
Time above 220°C	50 +/- 10 seconds	
Temperature gradient in cooling	-1 to -4 °C/s (-6°C/s maximum)	
Time from 50 to 220°C	160 to 220 seconds	

8. Packaging

8.1 Tape and Reel Dimensions



8.2 Storage Conditions

MSL Level	Floor Life (out of bag) at Factory Ambient <30oC/60% RH
3	1 week

After this limit, dry bake to be done; 6 hours at 85°C.

9. Certifications

9.1 RoHS & REACH Compliance

The RFD77402 module is compliant with the European RoHS Directive 2002/95/EC (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) and REACH (Registration, Authorization and Restriction of Chemicals, European Union Regulation (EC) 1907/2006).

10. Considerations

10.1 Eye Safety

The RFD77402 module contains a laser emitter and corresponding drive circuitry. The laser output is Class 1 laser safety under all reasonably foreseeable conditions including single faults in compliance with IEC 60825-1:2014. The laser output will remain within Class 1 limits as long as the Simblee recommended device settings are used and the operating conditions specified in this datasheet are respected. The laser output power must not be increased by any means and no optics should be used with the intention of focusing the laser beam.

10.2 Class 1 Laser Product Label



11. Revision Control

11.1 Revision Table

Revision No.	Date	Notes
1.0	02.06.17	Initial release

RF Digital Corporation

1601 Pacific Coast Hwy
Suite 290
Hermosa Beach, CA 90254
USA
Tel: (949) 610-0008
Fax: (949) 610-0009
www.rfdigital.com
support@rfdigital.com

© 2015 RF Digital Corporation. All rights reserved.

Important Notice

RF Digital reserves the right to make corrections, modifications, and/or improvements to the product and/or its specifications at any time without notice. RF Digital assumes no liability for the user's product and/or applications. RF Digital products are not authorized for use in safety-critical applications, including but not limited to life-support applications. RF Digital assumes no liability for parts or their application beyond replacement or refunding the original purchase price. All trademarks and trade names belong to their respective owners. Information provided in this document is for reference only. The user must conduct testing and prototyping on their own for their own application. This document only provides an example of a possible use for the parts shown in this design and requires actual testing to confirm its accuracy or validity or proper application. There is NO suggestion that the devices shown in this document should be used for the implied application. There is no guarantee or warranty of suitability for any specific application. The information disclosed in this document is AS-IS. By using any information contained in this document you are assuming all risks and liability associated therewith. RF Digital reserves the right to make corrections, modifications, changes and/or improvements to specifications or details at any time without notice or obligation. RF Digital assumes no liability for the user's product and/or applications. RF Digital products are not authorized for use in safety-critical applications, including but not limited to lifesupport applications. RF Digital assumes no liability for parts or their application beyond replacement or refunding the original purchase price paid to RF Digital.

Limited Product Warranty

RF Digital warrants that RF Devices manufactured by RF Digital are free from defects in material and workmanship, for Ninety (90) Days from date of delivery. RF Devices covered by this warranty and returned to RF Digital within the Ninety Day Warranty Period will be eligible for replacement, repair, or credit, limited to the amount RF Digital was paid for the RF Device. To obtain a remedy under this Warranty, the following conditions must be met: (1) Customer must notify RF Digital in writing promptly on discovery of the deficiency with reasonable detail within the Warranty Period; (2) Customer must return the RF Devices to RF Digital promptly upon receipt of an RMA from RF Digital, at Customer's risk and expense; and (3) RF Digital confirms the claimed deficiency is present. If all of these conditions are met, RF Digital, at its sole option, will either replace or repair the RF Device or credit Customer's account for the amount the Customer paid to RF Digital for the RF Device.