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USER MANUAL
MDU2000

FCC-ID: ROO-MDU2000
IC: 10829A-MDU2000

Description

The Microwave Solutions MDU2000 Motion Detector Unit is an X-Band microwave transceiver that utilises the Doppler shift phenomenon to "sense" motion. The unit, housed in a metal can, features a dielectric resonator stabilised FET oscillator, which provides stable operation over a broad temperature range in either CW or low duty cycle pulse mode and an integrated homodyne receiver for enhanced sensitivity and reliability.
The basic principle of operation consists of detecting the frequency shift between a transmitted and a received signal reflected back from a moving object within the field of view of the unit. The unit produces a low level output signal which can be amplified and processed to provide an audible or visual alarm signal. The MDU2000 employs low cost surface mount manufacturing techniques which are field proven as being rugged and reliable.

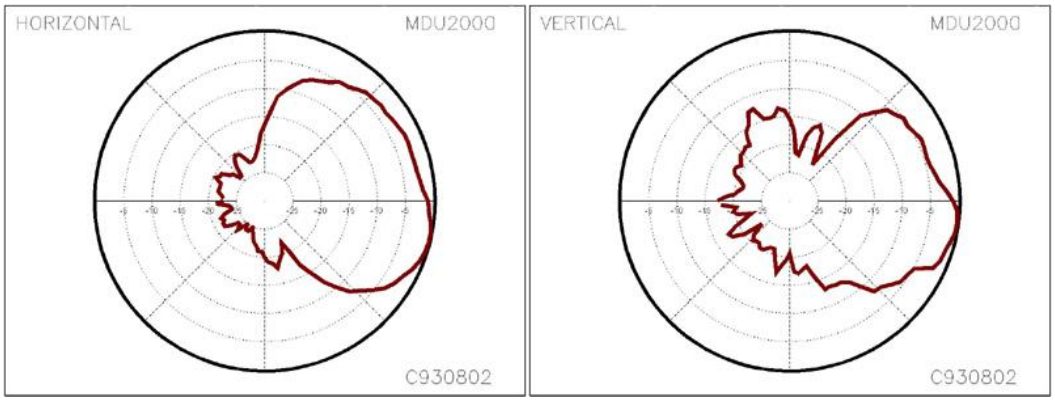
Absolute Maximum Ratings

Parameter	Symbol	Rating	Units	Comment
Supply Voltage	V_{CC}	+5.25	V	
Operating Temperature	T_{OP}	-20 to +70	°C	Performance level not guaranteed
Storage Temperature	T_{STG}	-40 to +80	°C	

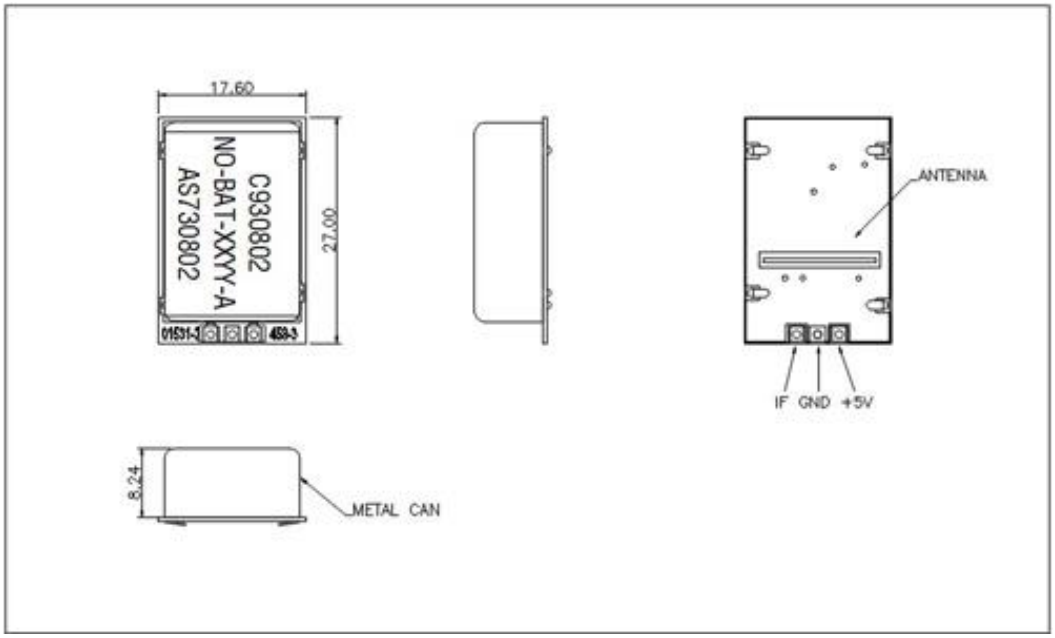
Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Comment
Transmit Frequency	f_T	10.500	10.525	10.550	GHz	Pre-set during manufacture.
Temperature Stability	Δf			5	MHz	Over T_{OP} range below
Output Power	P_{OUT}		10		dBm	EIRP
Antenna Gain	G_a		5		dBi	
Antenna Beamwidth			50		°	-3dB, horizontal with tab down
			60		°	-3dB, vertical with tab down
IF Output Offset	V_{DC}		1.5		V	Into free space
Sensitivity			-84		dBm	10dB S/N ratio
Noise				10	µV	In 3Hz – 80Hz bandwidth
Supply Voltage	V_{CC}	4.75	5.00	5.25	V	
Supply Current	I_{CC}		20	25	mA	
Pulse Width		5			µs	Min. duty cycle – 1%
Operating Temp	T_{OP}	-20		+55	°C	Full specification compliance

Coverage Patterns



Connections & Mechanical Outline



Handling Precautions

The MDU2000 is sensitive to damage from ESD.

- Normal precautions as usually applied to CMOS devices are sufficient when handling the module.
- Touching the connection points should be avoided before soldering the module into circuit.
- Using a multimeter (e.g. for resistance measurement) between any of the connection points may cause damage to the module.

Certification

Microwave Solutions Ltd. has established and maintains a Quality System that has been audited by BSI and holds ISO 9001:2008 approval under certificate FM56058.
The MDU2000 complies with the requirements of the RoHS Directive European Union Directive 2011/65/EU and with the requirements of the REACH Regulations EC 1907/2006.

OEM Responsibilities

Manufacturers of mobile or fixed devices incorporating MDU2000 modules are authorized to use the FCC Grants and IC Certificates of the MDU2000 modules for their own final products under the conditions referenced in this document. It is the responsibility of the manufacturer of the final product to ensure that the MDU2000 module is operated within the approved conditions shown below. If the FCC/IC label of the module is not visible when the module is installed inside the final product then the outside of the final product must also display a label stating "Contains FCC ID: ROO-MDU2000" and "Contains IC: 10829A-MDU2000".

Approved Operating Conditions to meet FCC/IC requirements

The MDU2000 module can be operated in full compliance with FCC/IC requirements (depending on the characteristics of the final product) under the following conditions:

1) The power supply voltage provided to the module (at the module terminals) must be maintained within the specified range of +5 ± 0.25 volts under all conditions of AC line voltage irregularities, battery voltages, ambient temperatures and worst case load conditions.
2) If the module is operated under pulsed conditions, the rise and fall times of the power pulse shall be less than 1 µs and, during the pulse, the power supply voltage shall be maintained within the limits of 1) above under all conditions.
3) A minimum separation distance of 1.7cm is required between the user and the module.
4) If the final product is designed for use in any situation except in motor vehicles or on aircraft the module can be operated with any duty cycle up to and including 100% (averaged over 100ms).
5) If the final product is designed for use in motor vehicles or on aircraft, the module can be operated with a maximum duty cycle of 100% (averaged over 100ms) as long as the final product includes features to prevent continuous operation (as defined in the FCC Rules and Industry Canada Standards). A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

FCC statement:

- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
  (1) This device may not cause harmful interference, and
  (2) This device must accept any interference received, including interference that may cause undesired operation.

  This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.

- This device may only be operated using the approved integral antenna.
- This device must not be co-located or operating in conjunction with any other antenna or transmitter.
- Changes or modifications not expressly approved by Microwave Solutions Ltd. may void the user's authority to operate this equipment
- In the event that these conditions or the Approved Operating Conditions above cannot be met, then the FCC and Industry Canada certifications are no longer considered valid and the FCC ID and IC Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate certification.

Industry Canada statement:

- This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions:
  (1) This device may not cause harmful interference, and
  (2) This device must accept any interference received, including interference that may cause undesired operation.
- Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.