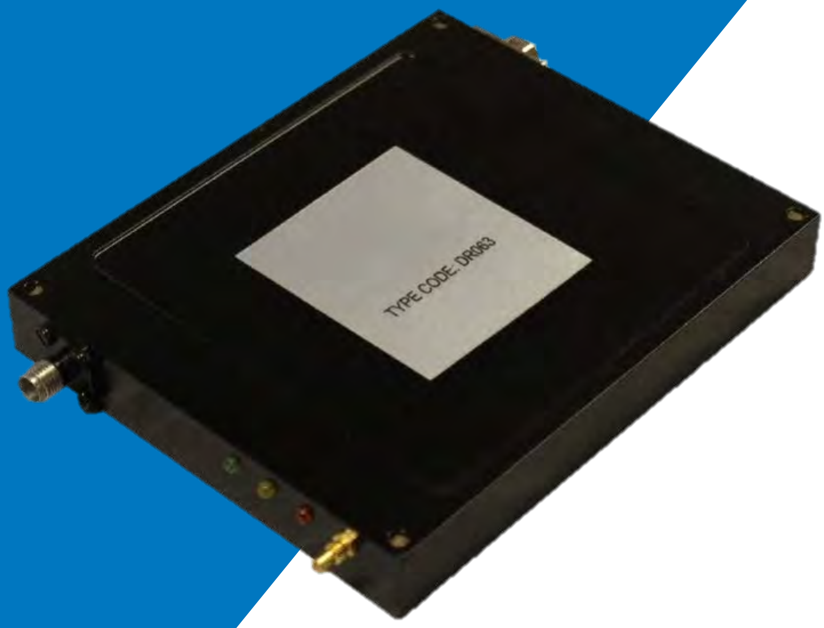
0.5 – 2.4GHz Instantaneous Frequency Measurement Unit

DR063



0.5 to 2.4GHz Instantaneous Frequency Measurement Unit

The DR063 uses proprietary Teledyne Defence & Space (TDS) Technology to provide state of the art performance in a package measuring 130mm x 90mm x 18mm.

The DR063 provides a 12 bit absolute binary digital output word. The frequency measurement word is updated in response to an external trigger input signal, and internally generated trigger or is continuously updated every clock cycle. These operational modes are controlled via a serial interface.

The 12 bit frequency word offers a nominal resolution of 0.5MHz with an RMS accuracy of 2MHz for SNRs of +3dB or better. The unique feature of the DR063 is the ability to configure the IFM during operation in order to achieve improved frequency resolution and accuracy when capturing longer pulses under poor SNR conditions.

The DR063 has a smaller frequency footprint and lower power consumption than traditional 0.5 – 2.4GHz IFM's.

External connections are made via a 51 – way micro-D Type connector for power, frequency measurement data and control. An SMA (female) is provided for the RF input.

For further information, please contact the TDS sales team.

FEATURES

- Full 0.5 – 2.4GHz
- 12 Bit Resolution 60dB Dynamic Range
- 50ns Pulse Width Measurement Internally or Externally Triggered Very Small Size
- Low Power Consumption Software Configurable

APPLICATIONS

- Electronic Support Measures (ESM)
- Communications Jamming (COMJAM)
- Radar Warning Receivers (RWR)
- ESM for low weight, low power, small or portable payload applications

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SPECIFICATIONS

Parameter	Units	Min	Nominal	Max
Operating Frequency Range	GHz	0.5		2.4
Unambiguous Bandwidth	GHz	0.45		2.45
Frequency Resolution	MHz		0.5	
Digital Frequency Resolution	Bits		12	
System Clock Rate	MHz	49.99	50	50.01
Throughput Time	ns		200	
RF Input Dynamic Range	dBm	-55		5
RF Input Signal/Noise Ratio	dBm	0		
RF Input Pulse Width	ns	50		CW
RF Input VSWR				2:2:1
Frequency Error (RMS)				
0dB SNR	MHz			4
3dB SNR	MHz			2
Frequency Peak Error	MHz		15	
Peak Error Rate				
0dB SNR	%			0.4
3dB SNR	%			0.04
Bad data Error rate				
0dB SNR	%			3
3dB SNR	%			1
Simultaneous Signal: Level	dBc	6		
Simultaneous Signal: Frequency Separation	MHz	50		
Temperature Range	°C	-40		+85
Power Consumption	Watts		6	
Power Supply Current: +5v Rail	mA		300	
Power Supply Current: +3.3V Rail	mA		1300	
Power Supply Current: -5V Rail	mA		60	
Size	mm		130x90x18	
Weight	g		400	

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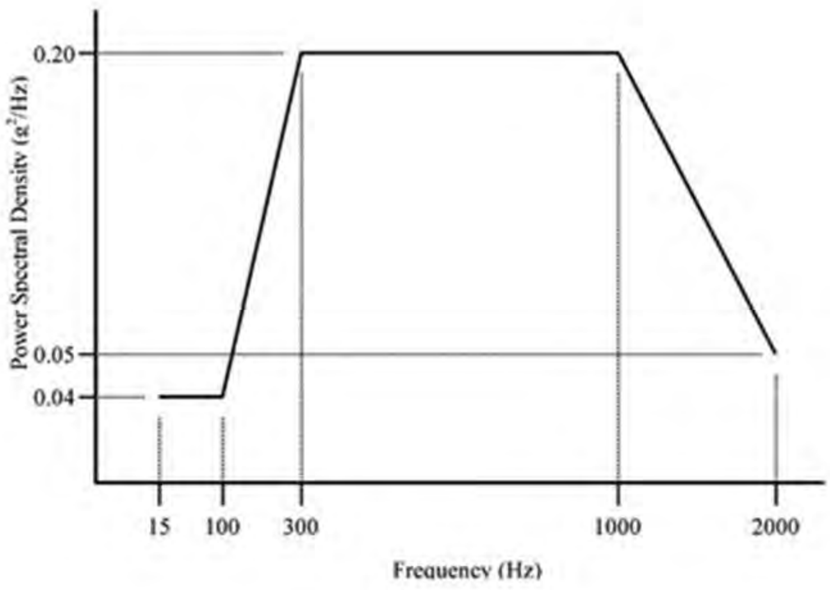
ENVIRONMENTAL SPECIFICATION

Operating temperature: –40ºC to +85ºC

Sinusoidal Vibration: 5g RMS between 50Hz to 1KHz (MIL-STD-202F Method 204) Random Vibration: MIL-STD-810F Method 514.5.

Power Spectral Density according to figure below Mechanical



Mechanical Shock: MIL STD 202 F - Method 213 B Test condition: 20g / 11 ms half-sinusoidal.

Humidity: MIL-STD-810F Method 507.4. Procedure 2.

R.H. 85% to 95% Temperature between +30°C and +60ºC Salt Fog: MIL-STD-810F Method 509.4.

Reliability: Failure Rate of 20 per million hours, which equates to an MTBF of 50,000 hours for a ARW Airborne Rotary Wing Environment and a Failure Rate of 15 per million hours, which equates to an MTBF of 67,000 for a AUF, Airborne Uninhabited Fighter Environment using MIL-HDBK-217F Parts Stress Method.

Both predictions are for an ambient temperature of +70 °C.

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TECHNICAL INFORMATION

The ability for the DR063 to be configured on the fly to suit operational scenarios offers performance attributes unmatched by currently available IFMs. Specifically, increased resolution and accuracies can be achieved for longer pulse durations. A number of modes of operation are available via a serial interface, these include:

Operating Mode	Operation
Standard	Configured to measure minimum pulse width (50 ns)
Selectable PW	Minimum pulse width is user selectable (50ns to 'CW'). Unit measures longer pulses with improved accuracy and resolution.
Variable PW	Unit performs measurements of pulse on continuous basis throughout the duration of the pulse. Subsequent measurements have improved resolution and accuracy. In this mode, frequency measurement accuracy is optimised on a pulse-by-pulse basis.
Trigger Mode	Continuous clocked output: Frequency output word is updated at system clock rate. Externally Triggered: Frequency output word is updated in response to rising edge of external trigger input. Internally Triggered: Frequency output word is updated in response to rising edge of internally generated trigger input (derived from internal pulse detection threshold circuit.)
Trigger Level	The internal trigger level can be adjusted to optimise the POI and false alarms in the presence of injected noise or CW.
Power Down	Various power down modes can be configured reduce quiescent power consumption.

The Variable PW mode uses Teledyne propriety techniques, and as such offers improved performance levels when compared with standard Instantaneous Frequency Measurement units currently available.

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TECHNICAL INFORMATION

P1	Signal	Direction			Description
1	Reserved	Output	-	LVDS	
2	Reserved	Output	-	LVDS	
3	Freq(1)+	Output	-	LVDS	Frequency Measurement Word
4	Freq(1)-	Output	-	LVDS	Frequency Measurement Word
5	Freq(2)+	Output	-	LVDS	Frequency Measurement Word
6	Freq(2)-	Output	-	LVDS	Frequency Measurement Word
7	Freq(3)+	Output	-	LVDS	Frequency Measurement Word
8	Freq(3)-	Output	-	LVDS	Frequency Measurement Word
9	DGND	Power			
10	Freq(4)+	Output	-	LVDS	Frequency Measurement Word
11	Freq(4)-	Output	-	LVDS	Frequency Measurement Word
12	Freq(5)+	Output	-	LVDS	Frequency Measurement Word
13	Freq(5)-	Output	-	LVDS	Frequency Measurement Word
14	Freq(6)+	Output	-	LVDS	Frequency Measurement Word
15	Freq(6)-	Output	-	LVDS	Frequency Measurement Word
16	Freq(7)+	Output	-	LVDS	Frequency Measurement Word
17	Freq(7)-	Output	-	LVDS	Frequency Measurement Word
18	DGND	Power			
19	+3.3V	Power			
20	Freq(8)+	Output	-	LVDS	Frequency Measurement Word
21	Freq(8)-	Output	-	LVDS	Frequency Measurement Word
22	Freq(9)+	Output	-	LVDS	Frequency Measurement Word
23	Freq(9)-	Output	-	LVDS	Frequency Measurement Word
24	Freq(10)+	Output	-	LVDS	Frequency Measurement Word
25	Freq(10)-	Output	-	LVDS	Frequency Measurement Word
26	+5V	Power			
27	AGND	Power			
28	DataValid+	Output	-	LVDS	Data Valid Signal
29	DataValid-	Output	-	LVDS	Data Valid Signal
30	Freq_BD+	Output	-	LVDS	Frequency Measurement Bad Data
31	Freq_BD-	Output	-	LVDS	Frequency Measurement Bad Data
32	Reserved	Output	-	LVTTL	
33	RF Detect	Output	-	LVTTL	RF Present asynchronous
34	RF_Pres+	Output	-	LVDS	RF Present synchronous
35	RF_Pres-	Output	-	LVDS	RF Present synchronous
36	+3.3V	Power			
37	STATUS	Output	-	LVTTL	IFM passed self-test
38	Serial Out	Output	-	LVTTL	Serial Data Link Output
39	Serial In	Input	-	LVTTL	Serial Data Link Input
40	Reserved	Input	-	LVTTL	Reserved
41	+5V	Power			
42	Freq(11)+	Output	-	LVDS	Frequency Measurement Word
43	Freq(11)-	Output	-	LVDS	Frequency Measurement Word
44	Reserved	Input	-	LVTTL	Reserved
45	Freq(12)+	Output	-	LVDS	Frequency Measurement Word
46	Freq(12)-	Output	-	LVDS	Frequency Measurement Word
47	-5V	Power			
48	TRIG_IN -	Input	-	LVDS	External Trigger Input
49	TRIG_IN +	Input	-	LVDS	External Trigger Input
50	CLK_IN-	Input	-	LVDS	Master Clock Input
51	CLK_IN+	Input	-	LVDS	Master Clock Input

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BLOCK DIAGRAM

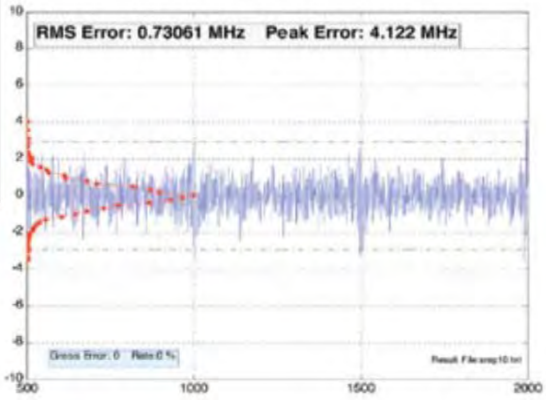

Fig 1. Clean Signal

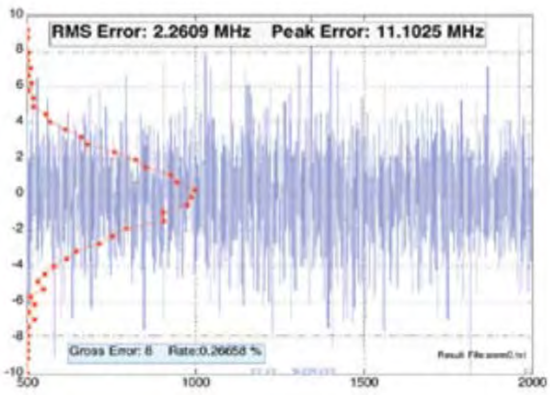

Fig 2. 0dB SNR

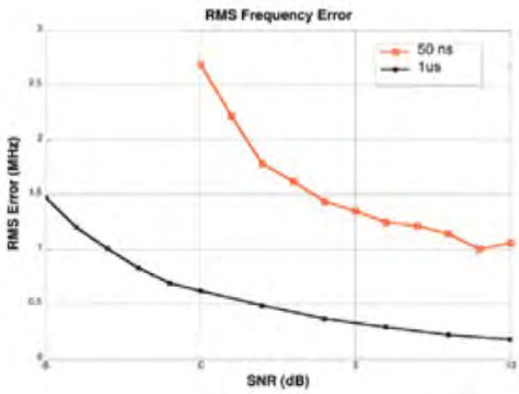

Fig 3. RMS Error vs. SNR

Figures 1 & 2 show typical performance achieved in clean signal and 0dB SNR respectively. Although these test were performed with CW signals, the performance with 50 ns pulses is only marginally reduced.

Figure 3 shows how RMS frequency errors can be reduced when selectable pulse width mode is used. A 1 us pulse is measured with improved accuracy over a system configured to measure 50 ns pulses. Furthermore, pulses are measured reliably in negative SNR conditions.

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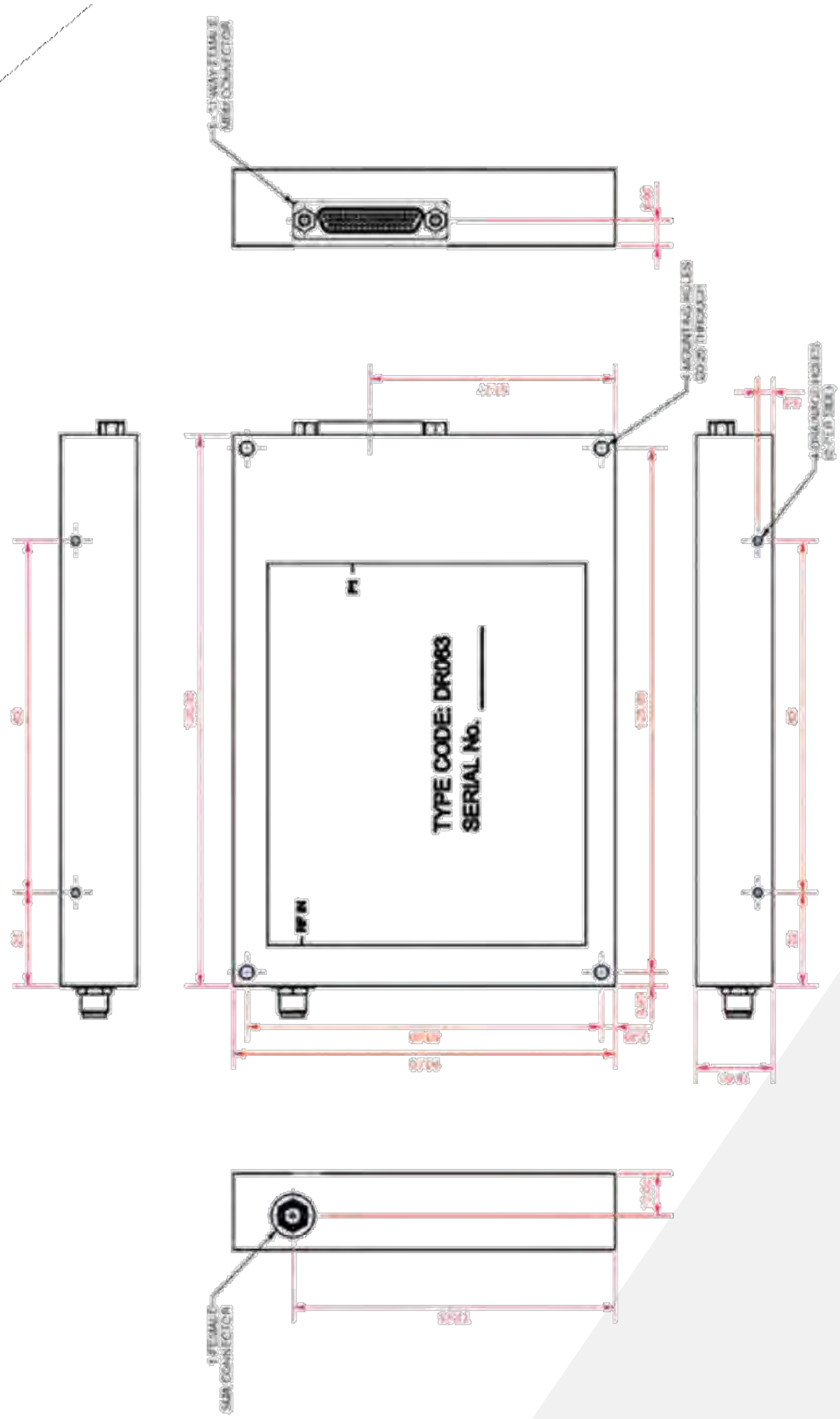
OUTLINE DRAWING



Surface Finish –
25um Nickel Plate

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