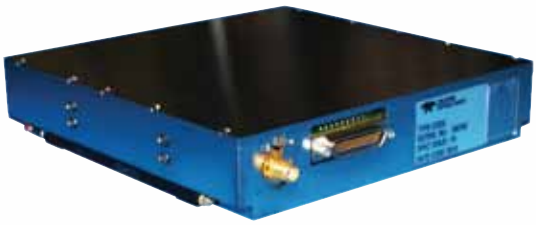
TELEDYNE DEFENCE
A Teledyne Technologies Company

2 to 18Ghz Instantaneous Frequency Measurement Unit

Technical Data **DR058**



Features

12 Bit resolution
External trigger or clocked sampling
50ns pulse capable
16GHz Instantaneous bandwidth
-50dBm sensitivity
Small form factor
Low weight
Low power consumption

Applications

Electronic support measures (ESM)
Radar warning receivers (RWR)
ECM set-on
Airborne, fixed wing & rotary
Land
Naval

Product Description

The DR058 utilises proprietary Teledyne Defence Limited (TDL) technology to provide state of the art performance in a package measuring only 152mm x 147mm x 30mm and weighing 1.55kg.

The DR058 is a clocked sampling IFM, providing a digital 12-bit output word of the RF input frequency for each clock cycle. An external trigger will force a sample to be taken asynchronously. The internal analogue bandwidth is sufficient to capture a 50ns pulse.

With a resolution of 12 bits, the DR058 gives a nominal frequency resolution of 3.93MHz and an rms accuracy of ≤4.5MHz with an input SNR of 3dB or better.

Designed specifically for fast jet applications, this product will withstand the most demanding of environments. It is characterised for –40°C to +85°C. For applications outside this range, please contact the TDL sales team.

External connections are made via a 51 way high density D type for power and digital I/O and SMA for the RF input.

This product is recommended for new designs. Other IFM configurations are available and for further information, please contact the TDL Sales Team.

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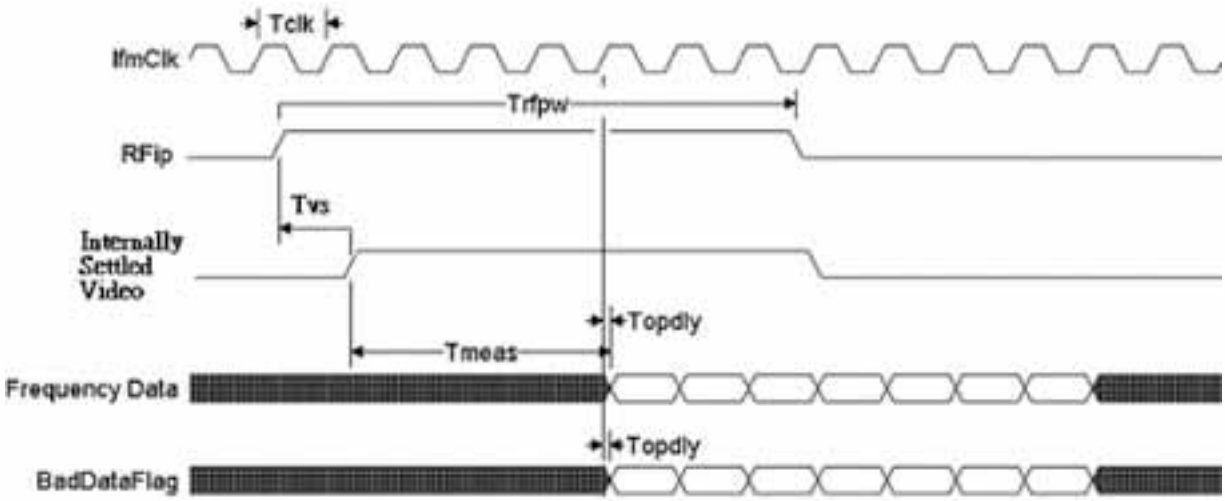
Electrical Specification

Ref	Parameter	Units	Value Min	Value Nom	Value Max	Notes
1	Operating Frequency Range	GHz	1.955		18.045	
2	Unambiguous Bandwidth	GHz	1.5		18.5	
3	Frequency Resolution	MHz		3.93		1
4	Digital Frequency Resolution	Bits		12		
5	Clock Rate	MHz	10		50	
6	Throughput Time	ns	106		139	2
7	RF Input Dynamic Range	dBm	-50		10	
8	RF Input Signal/Noise Ratio	dB	3			3
9	RF Input Pulse Width	ns	50		CW	4
10	Recovery Time	ns			50	5
11	RF Input VSWR				2.2:1	
12	Frequency Error (RMS) at 3 dB SNR	MHz			4.5	6
13	Frequency Peak Error at 3 dB SNR	MHz		15		6
14	Peak Error Rate at 3 dB SNR	%			0.04	7
15	Bad Data Error Rate at 3 dB SNR	%			1	8
16	Simultaneous Signal: Level	dBc	10			9
17	Simultaneous Signal: Frequency Separation	MHz		100		9
18	Overload Power	dBm			20	10
19	Temperature Range (operating)	°C	-40		85	
20	Power Consumption	Watts			25	
21	Power Supply Current: +15v Rail	mA			900	
22	Power Supply Current: +5v Rail	mA			2500	
23	Power Supply Current: -5v Rail	mA			350	
24	Weight (Approx.)	kg			1.55	

1. Nominal frequency resolution is unambiguous bandwidth divided by number of bits.
2. See timing diagrams. Based on a 40 MHz clock.
3. Minimum SNR required for nominal operation.
4. Minimum pulse width is defined by internal video bandwidth.
5. Given as the maximum time required between the removal of a pulse of RF at any power within the operating dynamic range and the arrival of the next pulse to ensure the correct measurement of the second pulse.
6. The actual resolution, i.e. the change of frequency required to change 1 bit of the output word varies with frequency. The rms accuracy is calculated as the standard deviation of the frequency distribution. The rms accuracy is specified for 3dB and 0dB input SNR. The rms error excludes those measurements that are flagged as "bad data".
7. The percentage number of measurements that exceed the peak error frequency.
8. The percentage number of measurements that cause the 'bad data' signal to be asserted.
9. Simultaneous signals are defined as signals which overlap by at least 30ns during a measurement cycle. A valid measurement will be made on the larger of two signals provided that a) the amplitude difference between them is 10dB and b) there is at least 100MHz frequency separation.
10. Maximum input power without damage.

Timing Information

Continuously Clocked Mode.

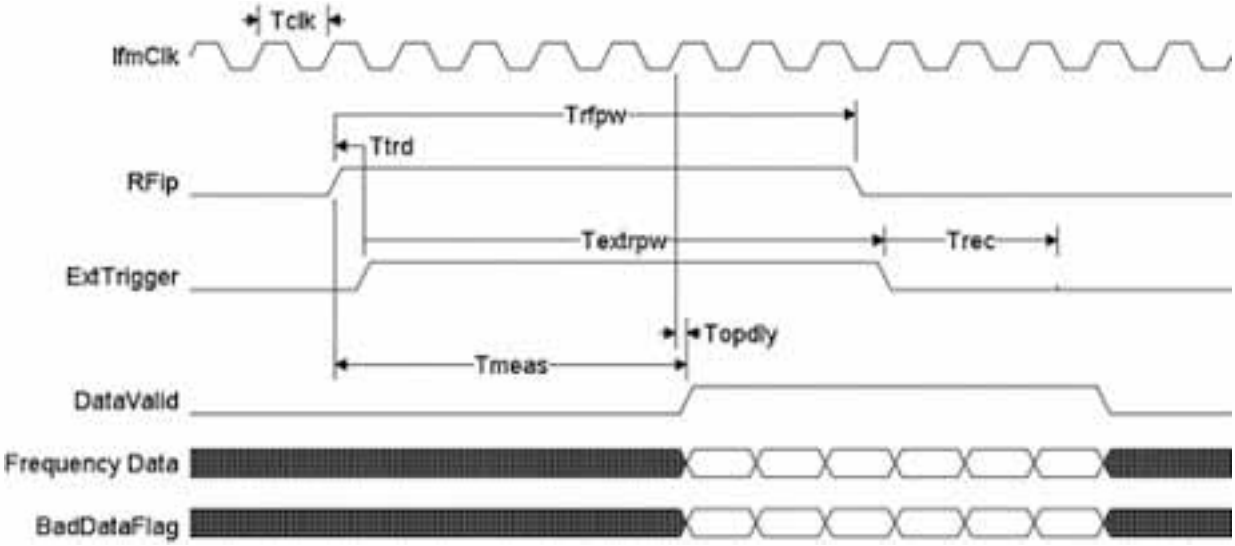


Parameter	Description	Timings Min	Timings Nominal	Timings Max
Tclk	Clock Period	20 ns		67 ns
Trfpw	RF Pulse Width	Tclk+30 ns		CW
Topdly	Data Output Delay	0 ns		10 ns
Tvs	Video Settling time	15 ns		25 ns
Tmeas	Throughput Time from settled video digitisation		Tclk(3.5±0.5)+Topdly	

Note that the recovery time between two consecutive pulses can be as low as Tclk.
No Data Valid output is provided in continuous clock mode.

Timing Information

Triggered Mode.



Parameter	Description	Timings Min	Timings Nominal	Timings Max
Tclk	Clock Period	20 ns		67 ns
Trfpw	RF Pulse Width	50 ns		CW
Textrpw	External Trigger Width	35 ns		CW
Topdly	Data Output Delay	0 ns		10 ns
Trec (Note 1)	Recovery Time			50 ns
Ttrd (Note 2)	Trigger Delay from RF	4 ns		12 ns
Tvs	Video Setting Time	15ns		25ns
Tmeas	Throughput Time		Trd+Tclk (4.5±0.5)+Topdly	

Note 1 If a second pulse starts within this period the frequency measured may not be correct.
Note 2 This timing will ensure that the frequency within a 50 ns pulse is measured correctly..

When no external trigger is supplied, but RF is present, the device will run in continuous clock mode. The rising edge of ExtTrigger causes the digitized tier video data at the front of the pipeline to be held (frozen) after a delay of approximately 25 ns (to allow video to settle) for a minimum period of 1 clock cycle to guarantee that this data enters the pipeline at the next rising clock edge.

Pin Designations

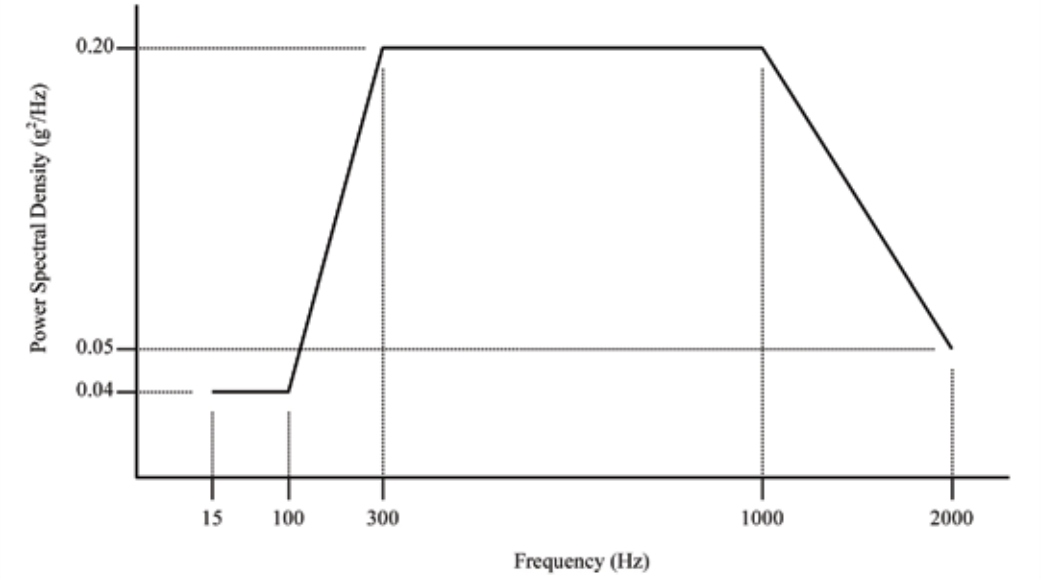
Pin	Signal	Direction
1	IFM Clock -	Input
2	0V	Return
3	0V	Return
4	Ext Trigger -	Input
5	Freq 1 -	Output
6	Ext Trigger +	Input
7	Freq 3 -	Output
8	Bad Data -	Output
9	Freq 7 -	Output
10	Freq 9 -	Output
11	Data Valid -	Output
12	Freq 11 -	Output
13	Data Valid +	Output
14	Not used	
15	0V	Return
16	0V	Return
17	-5V	Power
18	0V	Return
19	IFM Clock +	Input
20	0V	Return
21	0V	Return
22	Freq 0 -	Output
23	Freq 1 +	Output
24	Freq 2 -	Output
25	Freq 3 +	Output
26	Freq 4 -	Output
27	Bad Data +	Output
28	Freq 8 -	Output
29	Freq 11 +	Output
30	Freq 10 -	Output
31	Not used	
32	0V	Return
33	POST -	Output
34	0V	Return
35	POST +	Output
36	+12V	Power
37	0V	Return
38	Freq 0 +	Output
39	Freq 2 +	Output
40	Freq 4 +	Output
41	Freq 5 +	Output
42	Freq 5 -	Output
43	Freq 7 +	Output
44	Freq 6 +	Output
45	Freq 6 -	Output
46	Freq 9 +	Output
47	Freq 8 +	Output
48	Freq 10 +	Output
49	0V	Return
50	+5V	Power
51	+5V	Power

Environmental Screening

100% of units subjected to: burn in 8 hours operational at 71ºC, random vibration (as below), 5min per axis, thermal shock (as below), random vibration (as below), 5min per axis.

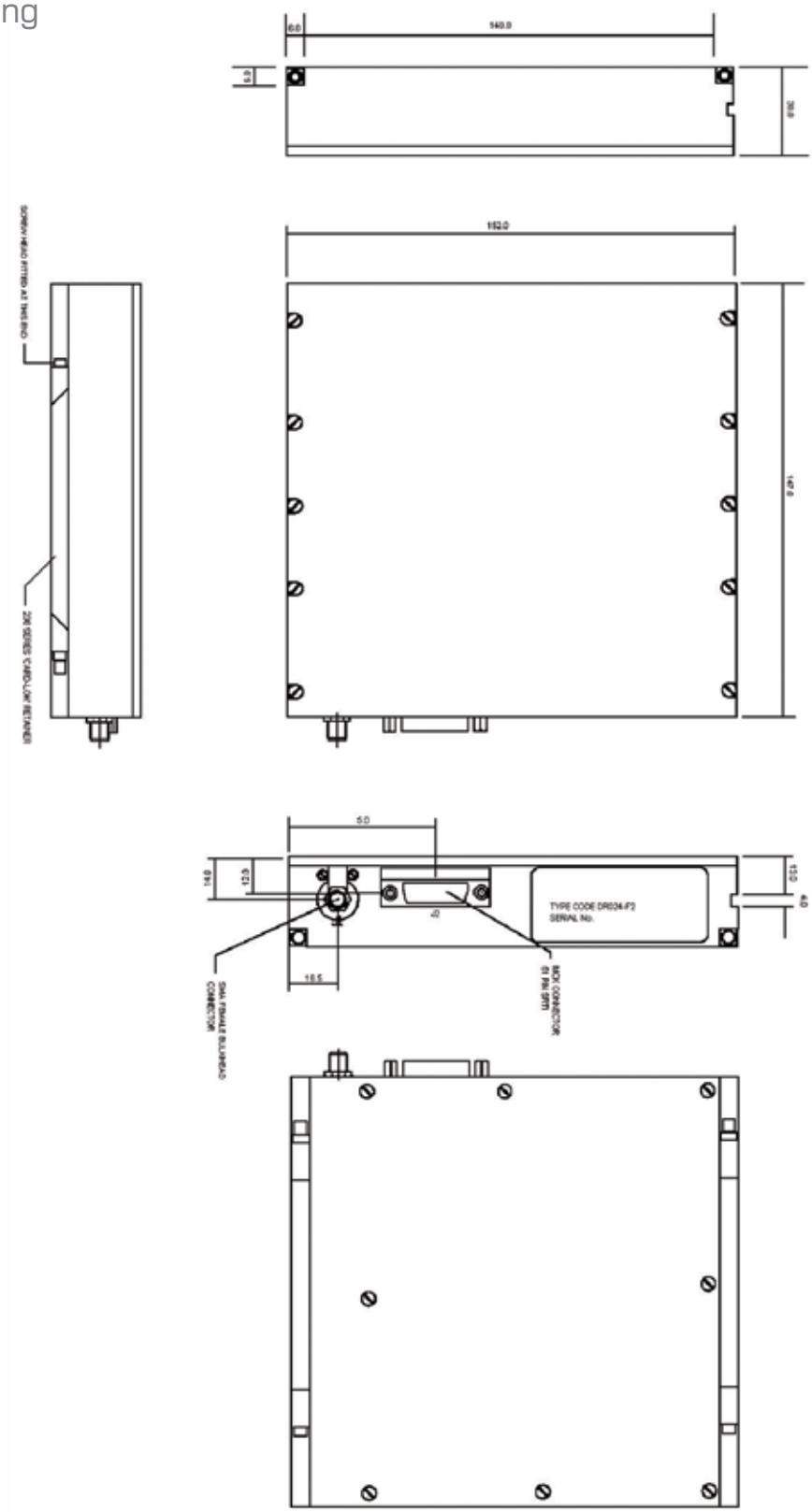
Environmental Data
Compliance can be shown by similarity to the following environmental conditions:

Sinusoidal Vibration: MIL-STD-202F, Method 204 - 5g profile between 5 and 104Hz for 90 min per axis
Random Vibration: MIL-STD-810D, Method 514.3 – specified profile (below) with max of 0.2g²/Hz for 60 min per axis, 20 to 2000Hz



Mechanical Shock: MIL-STD-202F, Method 213B – 15g/11ms, 3 shocks in each axis in each direction (18 total)
Acceleration: MIL-STD-202F, Method 212A, condition B, 6 to 14g
High Temperature storage: MIL-STD-810D, Method 501.2 - 95ºC for 8 hours
High Temperature operational: MIL-STD-820D, Method 501.2 – 71ºC / 30min, 60ºC / 60min, 55ºC / 4hr
Thermal Shock: 10 Cycles of –40ºC to 71ºC, 5 min ramp, 2hr dwell
Low Temperature storage: MIL-STD-810D, Method 502.2 - -54ºC for 8 hours.
Low temperature operational: MIL-STD-810D, Method 502.2 - -40ºC / 60min.
Combined temperature, altitude & humidity: MIL-STD-810D. Method 520 – temperature –40ºC to 70ºC, storage condition sea level to 17000m (87.6mb), operating condition sea level to 11000m (228mb), relative humidity at sea level 75%, 10 Cycles.
Humidity: MIL-STD-810D, Method 507.2, procedure 2 – RH 85% to 95%, temperature 30ºC to 60ºC, 24 hour cycle, 10 cycles.
EMI/EMC: Generally in accordance with MIL-STD-461E. Please note that system precautions must be taken to prevent interfering signals entering the high gain RF front end.

Outline Drawing



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