**TELEDYNE**
**DEFENCE & SPACE**
Everywhere**you**look™

## 2 to 18GHz Instantaneous Frequency Measurement Unit

The DR024-F2 uses proprietary Teledyne Defence & Space technology to provide state of the art performance in a package measuring 152mm x 147mm x 30mm weighing 1.45kg.

The DR024-F2 is an externally triggered IFM, providing a digital 12-bit output word of the RF input with every sample. The internal analogue bandwidth is sufficient to capture a 50ns pulse.

With a resolution of 12 bits, the DR024-F2 gives a nominal frequency resolution of 3.93MHz and an rms accuracy of 4.5MHz with an SNR of 3dB or better.

Designed specifically for fast jet applications this product will withstand the most demanding of environments. It is characterised for –40ºC to +85ºC. For applications outside this range, please contact the Sales Dept.

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; please contact the Sales Department for further information.

### ◤ FEATURES

- 12 Bit resolution
- External trigger
- 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

See restrictions on published datasheets at www.teledynedefence.co.uk/

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## ELECTRICAL SPECIFICATIONS

| Ref | Parameter | Units | Value | | | Notes |
|---|---|---|---|---|---|---|
| | | | Min | Nom | Max | |
| 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 | Throughput Time | ns | 330 | | 370 | 2 |
| 6 | RF Input Dynamic Range | dBm | -50 | | 10 | |
| 7 | RF Input Signal/Noise Ratio | dB | 3 | | | 3 |
| 8 | RF Input Pulse Width | ns | 50 | | CW | 4 |
| 9 | Recovery Time | ns | | | 50 | 5 |
| 10 | RF Input VSWR | | | | 2.2:1 | |
| 11 | Frequency Error (RMS) at 3 dB SNR | MHz | | | 4.5 | 6 |
| 12 | Frequency Peak Error at 3 dB SNR | MHz | | 15 | | |
| 13 | Peak Error Rate at 3 dB SNR | % | | | 0.04 | 7 |
| 14 | Bad Data Error Rate at 3 dB SNR | % | | | 2 | 8 |
| 15 | Simultaneous Signal: Level | dBc | 10 | | | 9 |
| 16 | Simultaneous Signal: Frequency Separation | MHz | | 100 | | 9 |
| 17 | Overload Power | dBm | | | 20 | 10 |
| 18 | Temperature Range (operating) | °C | -40 | | 85 | |
| 19 | Power Consumption | Watts | | | 18.5 | |
| 20 | Power Supply Current: +15v Rail | mA | | | 850 | |
| 21 | Power Supply Current: +5v Rail | mA | | | 1000 | |
| 22 | Weight (Approx.) | kg | | | 1.55 | |

1. Nominal frequency resolution is unambiguous bandwidth divided by number of bits.
2. See timing diagrams.
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. 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.
10. 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.
11. Maximum input power without damage.

## TIMING INFORMATION
Operation with external trigger
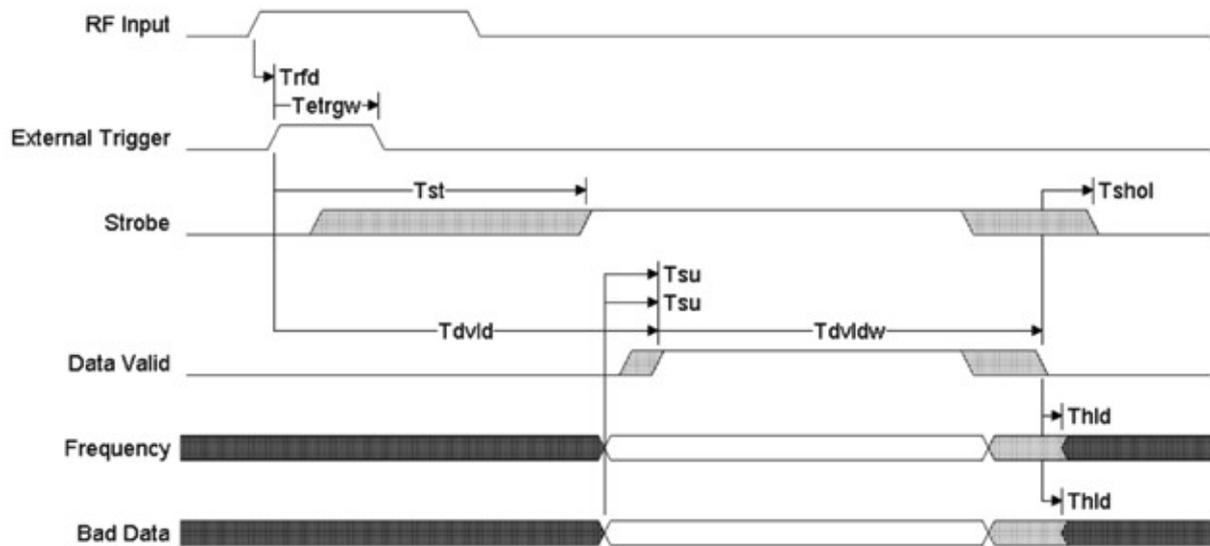


| Parameter | Description | Min | Timings | Max |
|-----------|-------------|-----|---------|-----|
| **Trfd** | Delay from RF to External Trigger | 4 ns | | 12 ns |
| **Tetrgw** | External Trigger width | 50 ns | | |
| **Tst** | Delay from External Trigger to Strobe | 40 ns | | 300 ns |
| **Tdvld** | Delay from External Trigger to data Valid | 330 ns | | 370 ns |
| **Tdvldw** | Data Valid width | 330 ns | | 370 ns |
| **Tsu** | Data set up time w.r.t. Data Valid | 20 ns | | |
| **Thld** | Data hold time w.r.t. Data Valid | 20 ns | | |
| **Tshol** | Strobe hold time w.r.t. Data Valid | 0 ns | | |

## TIMING INFORMATION

Strobe only, no external trigger.
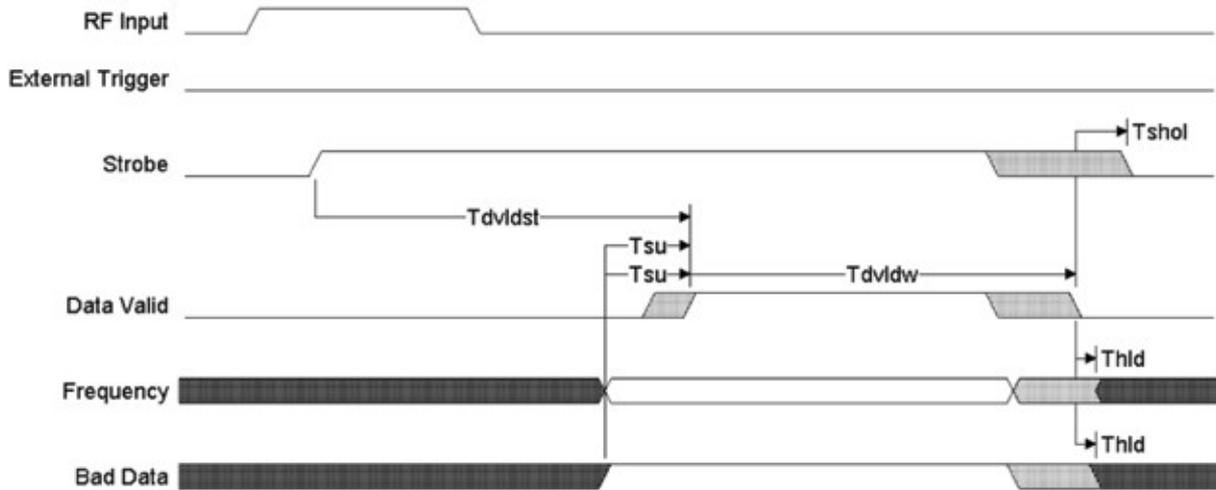


| Parameter | Description | Min | Timings | Max |
|-----------|-------------|-----|---------|-----|
| **Tdvldst** | Delay from Strobe to data Valid | 320 ns | | 360 ns |
| **Tdvldw** | Data Valid width | 330 ns | | 370 ns |
| **Tsu** | Data set up time w.r.t. Data Valid | 20 ns | | |
| **Thld** | Data hold time w.r.t. Data Valid | 20 ns | | |
| **Tshol** | Strobe hold time w.r.t. Data Valid | 0 ns | | |

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## PIN DESIGNATIONS

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

## 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
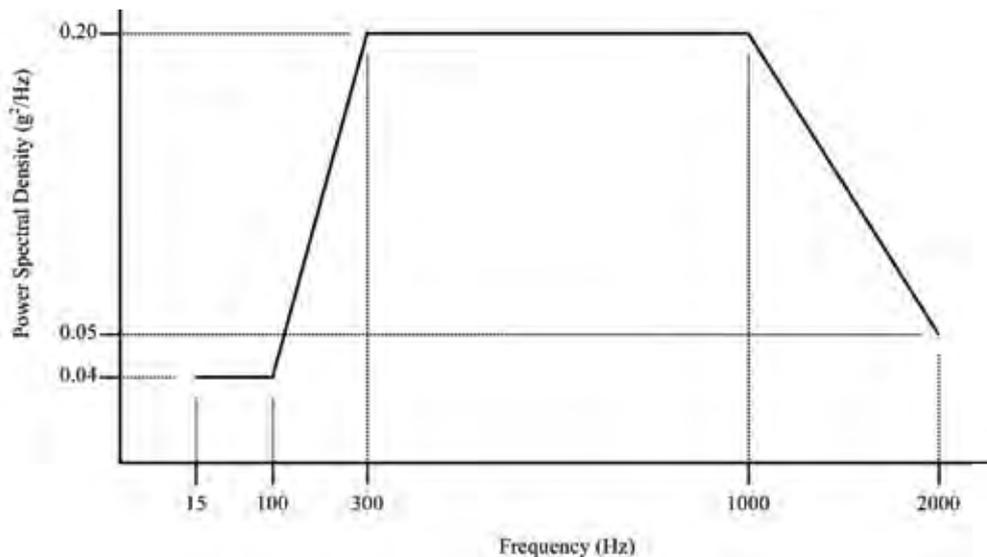


Mechanical Shock: MIL-STD-202F, Method 213B – 15g/11ms, 3 shocks in each axis in each direction (18 total)
Acceleration: MIL-STD-202F, Method 212A, condition B, 6 to 14g

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 8hours. Low temperature operational: MIL-STD-810D, Method 502.2 - -40ºC / 60min.
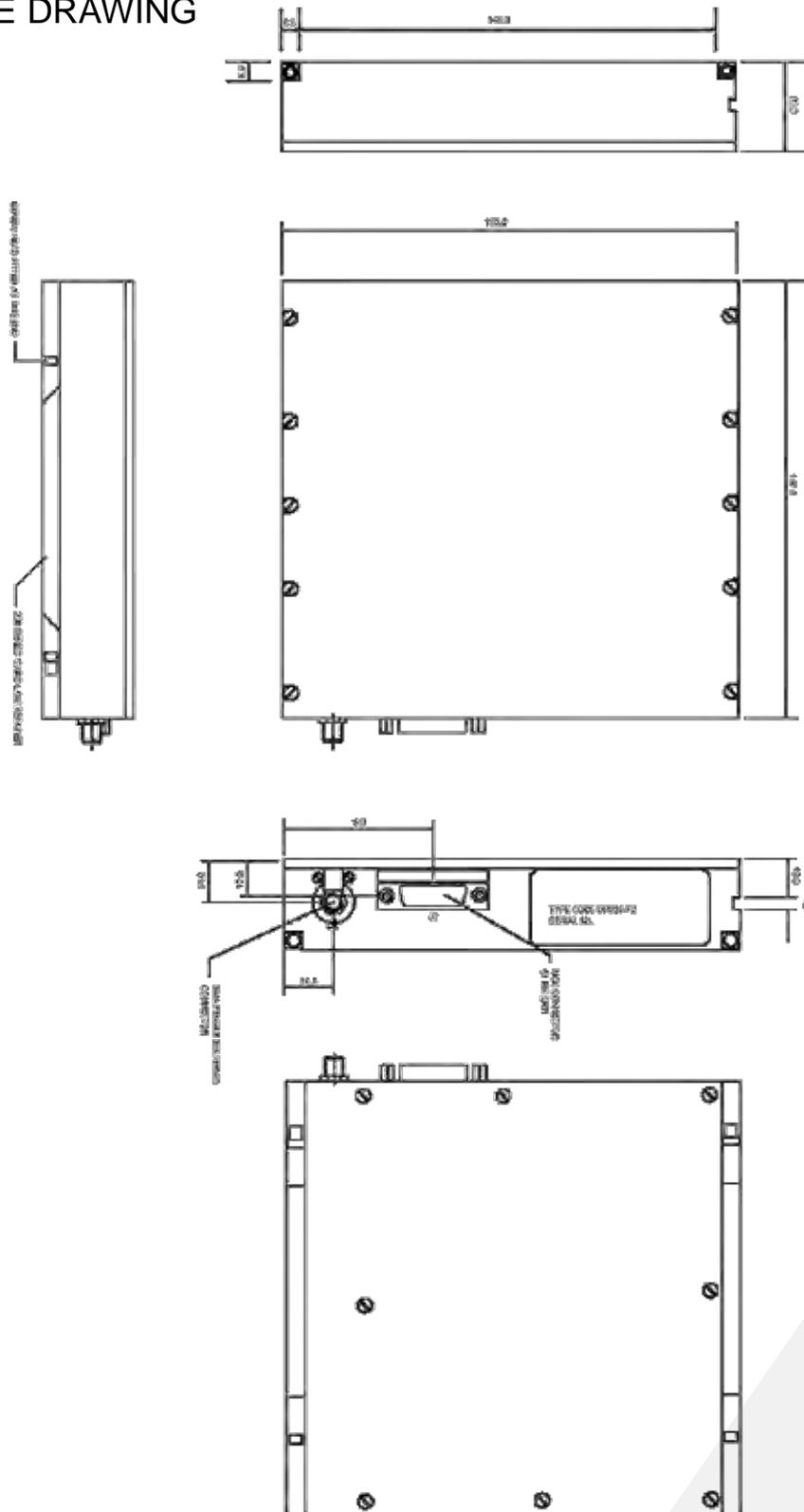
Combined temperature, altitude & humidity: MIL-STD-810D. Method 520 – temperature –40ºC to 70ºC, storage condition sea level to 17000m (87.6mb), operating condition sea level to 11000m (228mb), relative humidity at sea level 75%, 10 Cycles.

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.

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## OUTLINE DRAWING

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