

# Electron Devices

For Military and Commercial Applications



**communications**

Electron Devices

# L-3 Electron Devices Product Line

The Electron Devices Division of L-3 Communications has designed and manufactured microwave vacuum devices for over 50 years. Our ISO-9001:2000 certified facilities produce hundreds of microwave tubes, amplifiers and other vacuum devices every month for use in a variety of military and commercial systems. Our military product lines meet and exceed the stringent requirements for operation and durability in today's advanced radar, EW, missile and

communication systems. We are proud to supply products for many of the most successful programs in the United States. Electron Devices also provides commercial devices for satellite communications, medical applications, and high energy physics research. New devices continue to advance the state of the art such as the development of a line of commercial and military Microwave Power Modules (MPMs).

| HELIX PULSED   | Model       | Frequency<br>GHz                              | Output<br>Power<br>kW    | Duty<br>Cycle<br>%         | Rated<br>Gain<br>dB      | Cathode<br>Voltage<br>kV          | Cathode<br>Current<br>Amps  |
|----------------|-------------|---|--------------------------|----------------------------|--------------------------|-----------------------------------|-----------------------------|
|                | L5827       | 0.7 – 2.0                                     | 1.0                      | 4.0                        | 30                       | -7.7                              | 2.10                        |
|                | L5873       | 2.5 – 8.0                                     | 1.0                      | 8.0                        | 45                       | -8.5                              | 1.40                        |
|                | L5843       | 7.0 – 16.5                                    | 0.3                      | 7.0                        | 48                       | -6.35                             | 0.735                       |
|                | L5850       | 8.5 – 10.5                                    | 2.0                      | 6.0                        | 60                       | -11                               | 1.40                        |
|                | L6022       | 7.5 – 18.0                                    | 1.0                      | 5.0                        | 50                       | -11                               | 1.60                        |
| L6113          | 8.5 – 9.5   | 1.0   | 5.0                      | 31                         | -7.5                     | 1.0                               |                             |
| HELIX CW       | Model       | Frequency<br>GHz                              | Output<br>Power<br>Watts | Rated<br>Gain<br>dB        | Cathode<br>Voltage<br>KV | Cathode<br>Current<br>mA          | Collector*<br>Voltage<br>kV |
|                | L2086       | 1.8 – 3.6                                     | 600                      | 30                         | -5.6                     | 770                               | 4.00                        |
|                | L2124       | 2.5 – 7.5                                     | 400                      | 35                         | -6.3                     | 600                               | 4.0 / 1.3                   |
|                | L6019       | 2.5 – 8.0                                     | 125                      | 38                         | -5.0                     | 315                               | 3.0 / 2.0                   |
|                | L6021       | 7.5 – 18.0                                    | 125                      | 42                         | -9.2                     | 190                               | 4.6 / 2.76                  |
| RING LOOP      | Model       | Frequency<br>GHz                              | Output<br>Power<br>KW    | Duty<br>Cycle<br>%         | Rated<br>Gain<br>dB      | Cathode<br>Voltage<br>kV          | Cathode<br>Current<br>Amps  |
|                | L5714       | 2.0 – 2.6                                     | 20.0                     | 0.04                       | 45                       | -20.0                             | 5.2                         |
|                | L6028       | 8.7 – 9.4                                     | 8.0                      | 2.50                       | 60                       | -15.0                             | 2.6                         |
| MINI TUBES     | Model       | Frequency<br>GHz                              | Output<br>Power<br>Watts | Small Signal<br>Gain<br>dB | Collector<br>Stages      | Dimensions<br>L x W x H<br>inches |                             |
|                | L6115       | 2.0 – 8.0                                     | 65                       | 21                         | Triple                   | 10.5 x 1.5 x 1.25                 |                             |
|                | L6043       | 2.0 – 8.0                                     | 50                       | 30                         | Single                   | 14.1 x 1.05 x 1.75                |                             |
|                | L5936       | 4.5 – 18.0                                    | 20                       | 43                         | Single                   | 12.05 x .0795 x 1.75              |                             |
|                | L6035       | 4.5 – 18.0                                    | 35                       | 30                         | Dual                     | 9.0 x 1.8 x 1.0                   |                             |
|                | L6103       | 4.5 – 18.0                                    | 110                      | 34                         | Triple                   | 9.0 x 1.8 x 1.5                   |                             |
|                | L6084       | 5.0 – 10.0                                    | 200                      | 35                         | Triple                   | 11.0 x 1.3 x 1.5                  |                             |
|                | L5928       | 6.0 – 18.0                                    | 65                       | 40                         | Single                   | 12.25 x 1.035 x 1.81              |                             |
|                | L6117       | 6.0 – 18.0                                    | 50                       | 40                         | Single                   | 12.05 x 0.840 x 2.44              |                             |
|                | L6074       | 6.0 – 18.0                                    | 65                       | 23                         | Triple                   | 6.1 x 0.9 x 1.1                   |                             |
|                | L6130       | 6.0 – 18.0                                    | 100                      | 27 – 38                    | Triple                   | development                       |                             |
|                | L5990       | 9.5 – 10.5                                    | 140                      | 30                         | Single                   | 7.3 x 1.3 x 1.25                  |                             |
|                | L6108       | 13.75 – 14.5                                  | 125                      | 35                         | Dual                     | 9.0 x 1.23 x 0.9                  |                             |
|                | L6083       | 26.0 – 40.0                                   | 20                       | 30                         | Triple                   | 6.0 x 1.0 x 1.0                   |                             |
|                | L6120       | 27.0 – 33.0                                   | 100                      | 35                         | Triple                   | development                       |                             |
| L6112          | 40.0 – 46.0 | 50  | 30                       | Triple                     | 6.0 x 1.0 x 1.0          |                                   |                             |
| POWER SUPPLIES | Model       | Input Voltage                                 | Application              | Dimensions<br>Inches       | Weight<br>Lbs            |                                   |                             |
|                | M702        | 28 VDC  | For L5843                | 12.0 x 3.0 x 4.0           | 8.5                      |                                   |                             |
|                | M713        | 3 Phase 50 – 400 Hz, 200 V $\mu$ , or 270 VDC | For 1 – 2 kW peak TWTs   | 14.0 x 7.5 x 5.0           | 24                       |                                   |                             |

**HELIX, RING LOOP and RING BAR TWTs** — Electron Devices is widely recognized as an industry leader in the design and manufacture of high power Pulsed and CW Helix and Ring Loop TWTs for radar, EW and missile applications. These TWTs operate in the standard bands over the 2 to 18 GHz frequency spectrum and provide superior performance and reliability. Electron Devices supplies these TWTs for electronic countermeasures and missile seekers.

**COUPLED CAVITY TWTs** — Primarily used in ground-based or airborne radar applications, our C, X and Ku band TWTs are available with up to 125 kW of peak power. Our coupled cavity TWTs are found on a wide variety of avionic and surveillance radar systems.

|                                |              |                                   |                               |                                      |                                    |                                |                             |                             |                              |
|--------------------------------|--------------|-----------------------------------|-------------------------------|--------------------------------------|------------------------------------|--------------------------------|-----------------------------|-----------------------------|------------------------------|
| <b>COUPLED CAVITY</b>          | <b>Model</b> | <b>Frequency GHz</b>              | <b>Output Power kW</b>        | <b>Max Duty %</b>                    | <b>Cathode Voltage kV</b>          | <b>Cathode Current Amps</b>    | <b>Rated Gain dB</b>        | <b>Cooling</b>              | <b>Collector* Voltage kV</b> |
|                                | L5391        | 9.1 – 9.6                         | 125                           | 0.4                                  | -45.3                              | 13.5                           | 45                          | Liquid                      | 17                           |
|                                | L5630        | 9.0 – 9.2                         | 20                            | 0.5                                  | -24.5                              | 5.0                            | 60                          | Air                         | 17                           |
|                                | L6094        | 9.5 – 9.9                         | 1.6                           | 45                                   | -11.5                              | 0.7                            | 50                          | Liquid                      | 6.7                          |
|                                | L5638        | 9.5 – 10.0                        | 15.0                          | 4.0                                  | -26.1                              | 3.1                            | 60                          | Liquid                      | 14.4 / 6.5 / 5.2             |
|                                | L5649        | 16.2 – 16.8                       | 50                            | 0.13                                 | -37.0                              | 6.2                            | 60                          | Conduction                  | 0                            |
|                                | L5652HI      | 9.8 – 10.3                        | 40.0                          | 3.5                                  | -35                                | 6.0                            | 60                          | Liquid                      | 20.65 / 13.3 / 9.1           |
|                                | L5652LO      | 9.8 – 10.3                        | 4.5                           | 25.0                                 | -35                                | 1.4                            | 30                          | Liquid                      | 20.65 / 13.3 / 9.1           |
|                                | L5755        | 9.4 – 10.0                        | 26.0                          | 1.2                                  | -26                                | 5.8                            | 50                          | Air                         | 11.0                         |
|                                | L5810        | 9.5 – 10.0                        | 15.0                          | 0.4                                  | -23.5                              | 4.0                            | 60                          | Liquid                      | 13.0                         |
|                                | L5844        | 9.7 – 9.9                         | 20                            | 1.5                                  | -23                                | 4.5                            | 60                          | Air                         | 12.5                         |
|                                | L5849        | 13.4 – 14.0                       | 15.0                          | 5.0                                  | -32.5                              | 2.4                            | 50                          | Liquid                      | 19.0 / 15.7                  |
|                                | L5878        | 5.3 – 5.8                         | 60                            | 3.5                                  | -37.5                              | 11.5                           | 50                          | Liquid                      | 26                           |
|                                | L5906        | 9.4 – 10.0                        | 50.0                          | 1.0                                  | -32.5                              | 7.5                            | 55                          | Air                         | 18.1 / 13.5                  |
|                                | L6060        | 9.0 – 10.0                        | 60.0                          | 4.0                                  | -34.5                              | 7.4                            | 45                          | Liquid                      | 24.5 / 17.9                  |
| <b>KLYSTRONS/SWITCH TUBES</b>  | <b>Model</b> | <b>Frequency GHz</b>              | <b>Output Power MW</b>        | <b>Duty %</b>                        | <b>Instantaneous Bandwidth MHz</b> | <b>Rated Gain dB</b>           | <b>Cathode Voltage kV</b>   | <b>Cathode Current Amps</b> |                              |
|                                | L5859        | 0.805                             | 12                            | 0.17                                 | 3                                  | 50                             | -180                        | 155                         |                              |
|                                | L6048        | 0.805                             | 2.75                          | 10                                   | 1                                  | 45                             | -115                        | 44                          |                              |
|                                | L5782        | 2.7 – 3.0                         | 1.50                          | 0.16                                 | 15                                 | 53                             | -79                         | 44                          |                              |
|                                | L5892        | 2.8 – 3.2                         | 3.0 – 4.5                     | 0.18                                 | 400                                | 38                             | -117                        | 80                          |                              |
|                                | L5822        | 2.856                             | 5.5                           | 0.10                                 | 5                                  | 50                             | -127                        | 92                          |                              |
| <b>MICROWAVE POWER MODULES</b> | <b>Model</b> | <b>Hold Off Collector Voltage</b> | <b>Peak Collector Current</b> | <b>Average Collector Dissipation</b> |                                    | <b>Peak Mod-Anode Voltage</b>  | <b>Pulse Width</b>          |                             |                              |
|                                | L5097        | 170 kV                            | 60 A                          | 60 kW                                |                                    | 20 kV                          | 20 µsec                     |                             |                              |
| <b>MICROWAVE POWER MODULES</b> | <b>Model</b> | <b>Frequency GHz</b>              | <b>Output Power Watts</b>     | <b>Input Voltage</b>                 | <b>Dimensions Inches</b>           | <b>Weight Lbs</b>              | <b>Application</b>          |                             |                              |
|                                | M1000        | 2.0 – 8.0                         | 50                            | 90 – 260 VAC                         | 12 x 10.5 x 2.0                    | 12.0                           | Commercial                  |                             |                              |
|                                | M1020        | 6.0 – 18.0                        | 60                            | 90 – 260 VAC                         | 10.3 x 9.6 x 2.0                   | 10.0                           | Commercial                  |                             |                              |
|                                | M1025        | 14.0 – 14.5                       | 80                            | 90 – 260 VAC                         | 10.3 x 9.6 x 2.0                   | 10.0                           | Commercial                  |                             |                              |
|                                | M1040        | 26.0 – 40.0                       | 20                            | 90 – 260 VAC                         | 12.0 x 10.0 x 2.0                  | 12.0                           | Commercial                  |                             |                              |
|                                | M1220        | 6.0 – 18.0                        | 60                            | 270 VDC                              | 7.5 x 6.25 x 1.0                   | 3.75                           | Military                    |                             |                              |
|                                | M1221        | 6.0 – 18.0                        | 60                            | 28 VDC                               | 7.8 x 7.5 x 1.25                   | 4.0                            | Military                    |                             |                              |
|                                | M1231        | 12.75 – 14.5                      | 80                            | 270 VDC                              | 7.5 x 6.25 x 1.0                   | 3.75                           | Military                    |                             |                              |
|                                | M1232        | 12.75 – 14.5                      | 75                            | 115/208 VDC                          | 7.5 x 6.2 x 1.6                    | 4.5                            | Military                    |                             |                              |
|                                | M1270        | X-Band                            | 1 kw pulsed                   | 28 VDC                               | 11.0 x 6.0 x 2.0                   | 9.0                            | Military                    |                             |                              |
|                                | M1282        | 26.0 – 40.0                       | 20                            | 28 VDC                               | 7.5 x 8.5 x 1.25                   | 6.0                            | Military                    |                             |                              |
| <b>ELECTRON GUNS</b>           | <b>Model</b> | <b>Cathode Voltage kV</b>         | <b>Grid Cutoff V</b>          | <b>Grid Drive V</b>                  | <b>Heater Voltage V Max</b>        | <b>Heater Current Amps Max</b> | <b>Perveance Micropervs</b> | <b>Duty Cycle Max</b>       |                              |
|                                | M592         | -9.0 to -15                       | -55 to -65                    | 50 to 70                             | 6.3                                | 2.0                            | 0.01 to 1.4                 | 0.04                        |                              |
|                                | M792         | -4 to -25                         | -140                          | 0 to 200                             | 5.0 to 7.0                         | 4.0 to 5.5                     | 0.001 to 0.3                | 0.001 to 0.0021             |                              |

\* All collector voltages are referenced to cathode.

**KLYSTRONS** — Since the development of the first multi megawatt L-band klystron in 1952, we have been a leader in support of the superpower radar community. Today, state-of-the-art Cluster Cavity™ klystrons provide the wide-band, high-power capability for the USAF warning system. Other megawatt klystrons are in use at the FAA, medical radiation therapy and high energy plasma research applications.

**ACCELERATOR DEVICES** — Electron Devices offers an FDA Certified medical klystron as a replacement device in the Varian medical linear accelerator as well as a demountable high energy electron gun for the system. Smaller electron guns are used in medical accelerator systems.

**MINI TUBES** — Electron Devices has a complete line of mini tubes, covering multi-octave bandwidths over the frequency range of 2 to 46 GHz with output power up to 140 watts. The tubes have multi-stage collectors for high efficiency, are of rugged thermal design and offer long life through superior gun optics and beam magnetics. These mini tubes are used in towed decoys.

**MICROWAVE POWER MODULES** — Electron Devices Microwave Power Module (MPM) is a super component combining a solid state driver with a VPB and integrated power conditioner (IPC) in one package that is much smaller, lighter and more efficient than the traditional TWTA. The VPB and IPC are both manufactured at our San Carlos facility, providing the user with standard or custom designs at one location.

The MPM is available in bands from 2 to 46 GHz with output power from 40 to 150 watts. They are offered in small and light military qualified formats or slightly larger and lower cost commercial versions. Our MPMs are used in the data links for various satcom applications around the world.

**POWER SUPPLIES** — Electron Devices has built custom military high voltage TWT power supplies and specialized electronic subsystems for over 40 years. High voltage, low noise, high power density power supplies are available for CW or Pulse applications with our line of Helix and Ring-loop TWTs and are designed with full automatic protection. Our power supplies and subsystems are used in surveillance radar and helicopter ECM systems.

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