DETECTOR LOG VIDEO AMPLIFIERS (DLVA)
WHAT IS A DLVA?

- DLVA stands for Detector Logarithmic Video Amplifier. DLVA’s are employed to convert relatively large dynamic range RF signals into smaller dynamic range Video signals suitable for presentation on active displays or within the dynamic range of Digital-to-Analog converting circuits. DLVA’s can convert 70dB or higher RF dynamic range signals into 30dB, maximum Video dynamic range. The precise logarithmic transfer function of a DLVA provides relatively easy interpretation of RF signal strength from Video signal amplitudes.
WHERE ARE DLVA’S USED?

• The DLVA is usually found in applications in which the input RF signal is converted directly into a video signal without the complications of down conversion. This results in very wideband capability to improve the probability of intercept of RF signals. Examples of applications are phased array radar receivers, passive direction finding receivers (such as radar warning receivers) and channelized receivers.
SHORT HISTORY OF DLVA

• DARPA funded the Microwave Monolithic Integrated Circuit (MIMIC) development technology in the late 1980s.

• MIMICS became the enabling technology for monolithic logarithmic video amplifiers. This new technology was fundamental to addressing many of the problems with DLVA technology such as repeatability, uniformity as well as significantly improved temperature compensated performance which had plagued earlier designs.

• AMC leveraged this new technology. AMC embarked in 1990 on an internally funded design program to enter the market as a quality supplier of DLVA Products
SHORT HISTORY OF DLVA

- AMC Model LVD-218-50 which was a 2-18GHz Detector Logarithmic Video Amplifier having 50 dB dynamic range, state of the art rise and recovery times as well as temperature compensation over the military temperature range of -55 degrees C to +85 Degrees C.

- In 1993, AMC introduced the LVD-218-70/75 which was an extended dynamic range DLVA (ERDLVA) covering the 2-18 GHz frequency band and having 75dB dynamic range. The early ERDLVA’s employed externally supplied microwave amplifiers which became a major cost element in the DLVA as well as a delivery issue causing production delays on the product.
SHORT HISTORY OF DLVA

• In 1997, AMC began the design and manufacture of its own amplifiers using MMIC Technology

• In 1995, AMC began developing a CW Immunity Capability to automatically null out CW Jamming Signals to allow for DLVA operation in a CW Jamming Environment.
SHORT HISTORY OF DLVA

• Early CW Immune circuits were crude by today’s standards, difficult to adjust in production with limited control features. Design improvements were made in 2008 that resulted in vastly improved CW Immune Circuitry which is being employed today in both the DLVA and ERDLVA product lines.
AMC’S DLVA PROGRAM HERITAGE

• ALQ-188 Jammer Pod

• LAMPS (Light Airborne Multi Purpose System)

• USM-464 Countermeasures Test Set

• APR-46 Radar Warning Receiver

• ALR-85 Radar Warning Receiver
AMC’S DLVA PROGRAM HERITAGE

• ALQ-119 Jammer

• ALR-69A
Today, AMC is building DLVA Integrated Assemblies that contain ERDLVA technology as well as CW Immunity, microwave solid state switches as well as MMIC amplifiers and limiters in multi input and output configurations. An example of a 6-18GHz DLVA Assembly is shown in Figures 1 through 6 below.

Figure 1. 6-18GHz ERDLVA RF Assembly with CW Immunity and Switchable Limiting RF Outputs

Figure 2. 6-18GHz ERDLVA Assembly Logarithmic Amplifiers, CW Immunity and Power Conditioning
Figure 3. 6-18 GHz ERDLVA Assembly Product Feature, Page 1 of 4, Specifications
LOG VIDEO OUTPUT SPECIFICATIONS:

- Dynamic Range: -71 dBm MINIMUM
- Log Slope: 65 to 40 dBm
- Log Linearity: 70 dBm/88 WMINIMUM
- Log Accuracy: 1.75 dB MAXIMUM
- Log Accuracy (deviation from 70nm/88 straight line @ 1000 Hz & 25°C)
- Absolute Log Accuracy: 3.6 dB MAXIMUM
- Matched (over frequency and temp range):
  - DC Offset @ RF INPUT is TERMINATED & DC POWER IS ON:
    - Pulse Response: ±0.56 dB MAXIMUM (BETWEEN ANY 2 6-18 GHz DETECTORS)
  - Rise Time: ±100ns to 0V
  - Settling Time: 560ns to 0 V MINIMUM WITHIN ±35V OF FINAL VALUE
  - Recovery Time: 500nS DEC MAXIMUM, MEASURED FROM 150nS BELOW PEAK OF THE (10nV, 300us) PULSE TO WHERE 1.4dBm. 10ns-10ns PULSE IS MEASURED WITHIN ±1dB ERROR AS WHEN THE FIRST 1.4dBm PULSE IS NOT PRESENT. MEASURED FROM 150nS BELOW PEAK TO WITHIN ±1dB OF THE BASELINE. TWO SPECIFICATIONS MEET 75W 30W 530±13nV
  - Driving 150 feet RS211 into 75 ohm LOAD:
    - 1.75mV MAXIMUM, ANY CONSTANT INPUT POWER FROM -85dBm to 0dBm, AS FREQUENCY IS VARIED FROM 6 to 18 GHz
  - 670nV MAXIMUM POWER CHANGES FROM -60dBm to 0dBm, PULSE WIDTH CHANGES FROM 100ns to 330μsec FOR DUTY CYCLE UP TO 50%, EXCEPT MAXIMUM TIME BETWEEN 1ST AND 2ND PULSE IS 2.6μsec
  - PULSE (100ns to 330μsec DUTY CYCLE UP TO 50%)
  - FIXED AC COUPLED MODE
    - 1200nV MAXIMUM
  - 450nV MAXIMUM, THE MAX ALLOWED FALSE ALARM COUNT IS 40/SECONDS WITH 400mV THRESHOLD.

- Signal Processing Capabilities:
  - Coupled Video:
  - Noise Level:
  - On Off-mode:

- To be done with a pulse frequency and on frequency difference of 500μsec min (combined signals are inputted to dual)

- Output of the output video pulse at lower power:
  - 450μW FOR PULSE WITH 33μS (19)

- Drop of the output video signal at lower power:
  - 450μW FOR PULSE WITH 33μS (19)

- Propagation Delay:
  - 80 VDC MAXIMUM @ SWITCH IS ON. POSITIVE FROM 500ns INPUT TO 100μS OUTPUT VIDEO

- DC Power Requirement:
  - Ripple from DC to 10mHz:
  - 10mA MAXIMUM
  - 0.5A FOR +5VDC
  - 0.5A FOR -15VDC

- Bit in, SW, RF OUT, RF IN, VIDEO OUT CONNECTORS:
  - SMA FEMALE

- Control Connector:
  - 9 Pin D FEMALE DE-95

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Figure 4. 6-18 GHz ERDLVA Assembly Product Feature, Page 2 of 4, Specifications
Figure 5. 6-18GHz ERDLVA Assembly Product Feature, Page 3 of 4, Outline Drawing
Figure 6. 6-18GHz ERDLVA Assembly Product Feature, Page 4 of 4, Functional Block Diagram
AMC has engineered two form, fit and function replacements in the last year. These units are replacements in systems where the original vendor has since stopped manufacturing the unit or exited the market. These type of applications typically represent high volume long term engagements which enable the life extension of elaborate high end Radar Warning Receiver’s. End user pays NRE charges for engineering work.
OTHER DLVA APPLICATIONS

• Among other applications for DLVA’s over the years are:
  1. Secure Airbase Perimeter Protection to detect unauthorized aircraft intrusion.
  2. Laboratory Test Equipment
  3. Specialized Test Equipment
  4. Channelized Receivers
## Quick Overview of AMC’s DLVA Line

<table>
<thead>
<tr>
<th>Model Number</th>
<th>LVD26-70-CW-SWM</th>
<th>LVD-218-70/75</th>
<th>LVD-218-50</th>
<th>LVD-618-70-CW-SWM</th>
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<tr>
<td>Frequency Range [Ghz]</td>
<td>2 TO 6</td>
<td>2 to 18</td>
<td>2 to 18</td>
<td>6 to 18</td>
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<tr>
<td>Frequency Flatness</td>
<td>+/- 2 dB Max</td>
<td>+/- 2.5 dB Max</td>
<td>+/- 1 dB Max</td>
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<tr>
<td>TSS</td>
<td>-71 dB Min</td>
<td>-65 dB typical</td>
<td>-42 dBM Typ.</td>
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<td>VSWR</td>
<td>2.0:1 Max</td>
<td>2.5:1 Max</td>
<td>3:1 Max</td>
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<tr>
<td>Dynamic Range</td>
<td>-65 to +0 dB</td>
<td>75 dB typical</td>
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<td>Logging Range</td>
<td>65 dB</td>
<td>-65 dB to +10 dB Min</td>
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<td>Log Linearity</td>
<td>+/- 0.75 dB Max</td>
<td>+/- 1.75 dB Max</td>
<td>+/- 1.0 dB Max</td>
<td>+/- 1.0 dB Max ( -54 to +85 C )</td>
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<tr>
<td>Log Slope</td>
<td>70mV/dB Max</td>
<td>50 mV/dB typical</td>
<td>50 mV/dB (+/- 10%)</td>
<td>70mV/dB Nominal</td>
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<tr>
<td>Log Slope Accuracy</td>
<td>+/- 1.75 dB Max</td>
<td>+/- 10%</td>
<td>+/- 10%</td>
<td>+/- 1 dB Max</td>
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<tr>
<td>Log Temperature Stability</td>
<td>+/- 2.5 dB Max 0-85 C</td>
<td>2.0 dB ( 0 to +60 C )</td>
<td>+/- 1 dB Max ( -54 to +85C )</td>
<td>+/-2.0 dB Max 0-85 C</td>
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<td>Rise Time</td>
<td>25 mSec Max</td>
<td>30 nSec Max, 20 nSec Typical</td>
<td>20 nS Max</td>
<td>25 nSec Max</td>
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<tr>
<td>Recovery Time</td>
<td>500 mSec Max</td>
<td>200 nSec Typical, 300 nSec Max</td>
<td>300 nS Max</td>
<td>500 nSec Max</td>
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<td>Video Load</td>
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<td>100 OHMS typical, or as desired</td>
<td>100 OHM</td>
<td>75 OHM</td>
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<td>CW Immunity</td>
<td>yes</td>
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<td>available</td>
<td>yes</td>
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<tr>
<td>DC Power (no load)</td>
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<tr>
<td>Plus Voltage</td>
<td>15V@1.0 Amp</td>
<td>9 to 18V @ 350 mA Max</td>
<td>12V @ 75MA Max</td>
<td>15V@ 1.0 Amp</td>
</tr>
<tr>
<td>Minus Voltage</td>
<td>15V@0.5 Amp</td>
<td>9 to 18V @ 200 mA Max</td>
<td>12V @ 75MA Max</td>
<td>15V@ 0.5 Amp</td>
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