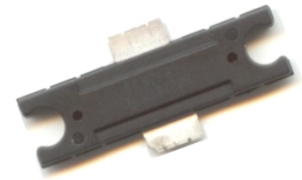
A decorative graphic on the left side of the page consisting of a complex network of light blue lines and circles, resembling a circuit board or a data network. The lines are of varying thickness and connect to small circles of varying sizes, creating a dense, organic structure.

OVERVIEW OF COMPANY AND PRODUCTS, 2015 REV2



WHY GAN ?

- ✓ Superior attributes than LDMOS and GaAs combined.
- ✓ Higher Breakdown Voltage
 - Greater Power Density: Increased W/mm allows for smaller gate width/periphery
 - Easier to match or broadband: $\text{Load} = V_{cc}^2 / (2 * P_{out})$
 - Smaller Capacitor Bank: $C = Q / V$ and Stored Energy $U = \frac{1}{2} C V^2$
- ✓ Higher Frequency Range
 - Extra Power Gain even at C/X/Ku/Ka-bands; therefore, amp stages are reduced
- ✓ Higher Efficiency
 - Goes hand-in-hand with excellent Thermal Conductivity and Power Dissipation
- ✓ GaN will pave for smaller, lighter, faster, & cheaper solutions for next-generation Radar and Communication Systems



HOW DO WE FIT IN?

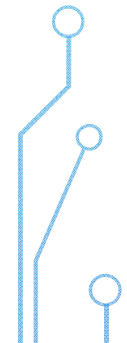
- ✓ XSYSTOR makes peripheral circuits for the GaN device. They are sequencers, controllers, modulators, switches, and analog linearizers.
- ✓ They are frequency neutral and would cover devices in L, S, C, X, Ku, & Ka-bands.
- ✓ We target users of GaN technology from NXP/Freescale, Qorvo=RFMD+Triquint, Cree, MACOM, and Sumitomo. These foundries simply do not have the bandwidth to address all application specific inquiries from their customers. That's where we step in and build trust.
- ✓ We offer solutions for Broadband Amplifiers, Radar, Milcom, Satcom, Point-to-point radio, and Telecom.

WHERE ARE WE IN THE MARKETPLACE?

- ✓ XSYSTOR is a start-up with a new product in the early stages of a III-V revolution.
- ✓ Our visible competitors are Teedia and MACOM. Teedia have discontinued all their sequencing products, while MACOM only offers a basic sequencer.
- ✓ Many foundries have put out rudimentary application notes or created bulky demonstrators. None are practical for manufacturing nor ready to be designed-in.
- ✓ We are in a great position to showcase a more extensive offering than any of our would-be competitors. Our products can reach most levels of engineering disciplines, from Design to Applications to Test.

A decorative graphic on the left side of the slide, consisting of several vertical and diagonal lines of varying lengths, some ending in small circles, resembling a circuit board or a network diagram.

WHO ARE WE?

- ✓ XSYSTOR was founded on the belief that GaN will usher-in new innovations and depth of applications that LDMOS or GaAs could not attain.
 - ✓ Our initial product introduction were designed to simplify or demystify the use of GaN HEMTs for all levels of engineering expertise.
 - ✓ Our modular approach maximizes solutions for a host of system variables, while minimizes costs with shorter design cycles, inexpensive material choices, and leveraging older techniques into new products.
 - ✓ Our principals each have 25 years of RF/Microwave amplifier design experience, and the business will take on new opportunities in this sector.
- 
- A decorative graphic on the right side of the slide, consisting of several vertical and diagonal lines of varying lengths, some ending in small circles, resembling a circuit board or a network diagram.

WHAT YOU NEED TO KNOW!

✓ Electrical Benefits of the Controller

- It is a sequencer. The primary job is to protect the GaN device from any order of supply and signal voltage turn-ON.
- It stabilizes the transistor. GaN maybe superior but it has a flaw; a tendency to oscillate at low voltages. To avoid instability when ramping or pulsing the drain, the gate is allowed to switch ON & OFF ONLY if drain voltage has reached a safe level. All this is happening from one TTL signal enable.
- Operate your GaN from either gate or drain. They have independent control, so you choose based on your application or preference.
- It's a modulator. You can do pulse-width modulation with the gate or dynamic envelope switching with the drain.

MORE TALKING POINTS

- Got Negative? No matter. A single power supply is all that's needed. Onboard inverter produces -4.3V at 30mA. If not enough, then attach another negative source and boost to -6V at 100mA.
 - One for all, and all for one! A single controller can switch several GaN devices at once, with about 200mA of total switch loads. However, use op-amp buffers for each gate for best results.
 - Very fast! It can do <200 nsec Rise, Fall, or Propagation times when used together with our power CMOS Switch products.
- ✓ **Mechanical Benefits of the Controller**
- Half the size of a nickel? At $\frac{1}{4}$ square inch, it can fit in the most demanding footprint and height restriction. Mount it upright, slanted, or flat & buried.

WANT TO HEAR MORE?

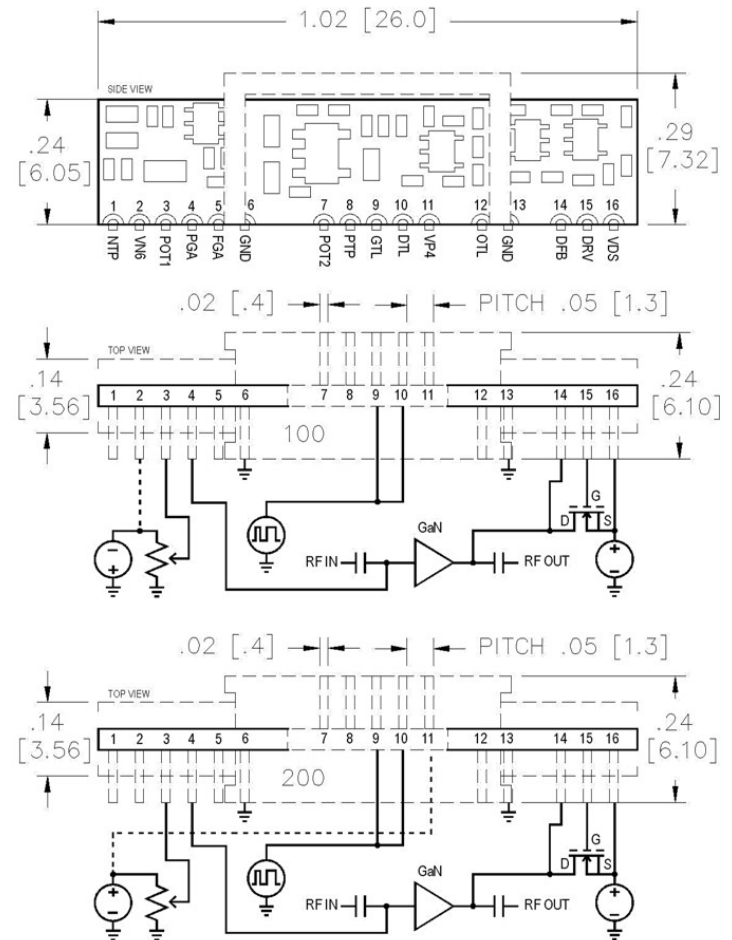
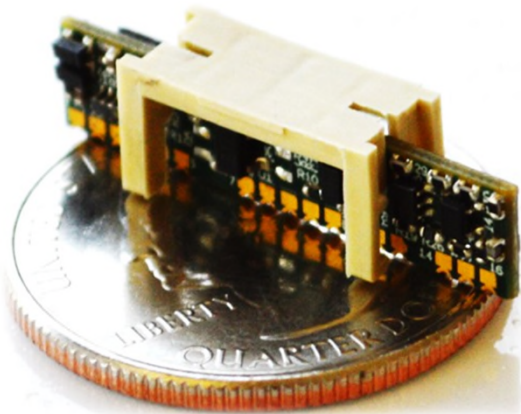
- Place it anywhere, any direction. Unlike our competitors, our in-line, castellated port design makes it possible to orientate the module 360° with no printed line crossover.

✓ Other qualities worth mentioning

- Functionality is scalable. A variety of products are implemented from a single PCB layout with most components being shared. Customers can have either negative or positive analog signals, bare-bones sequencer or an all-in-one controller, and basic switch or the fast and structured CMOS switch. This lowers manufacturing costs across the board.

GaN CONTROLLER

- The 100 & 200 Series GaN Controllers are a multi-functional circuits capable of handling and protecting all depletion-mode transistors.
- 100 Series: Non-inverting analog input accepts negative control voltage to produce negative gate bias voltage.
- 200 Series: Inverting analog input accepts positive control voltage to produce negative gate bias voltage.



GAN CONTROLLER FEATURES

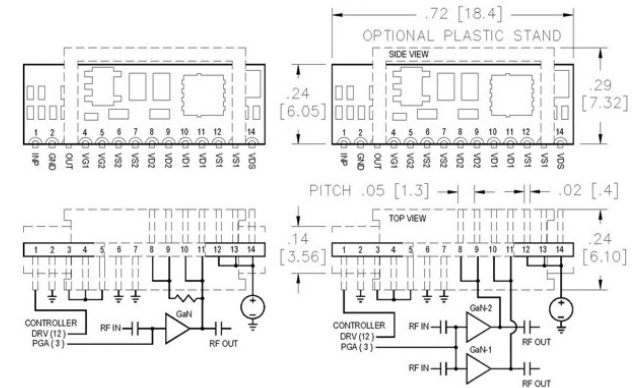
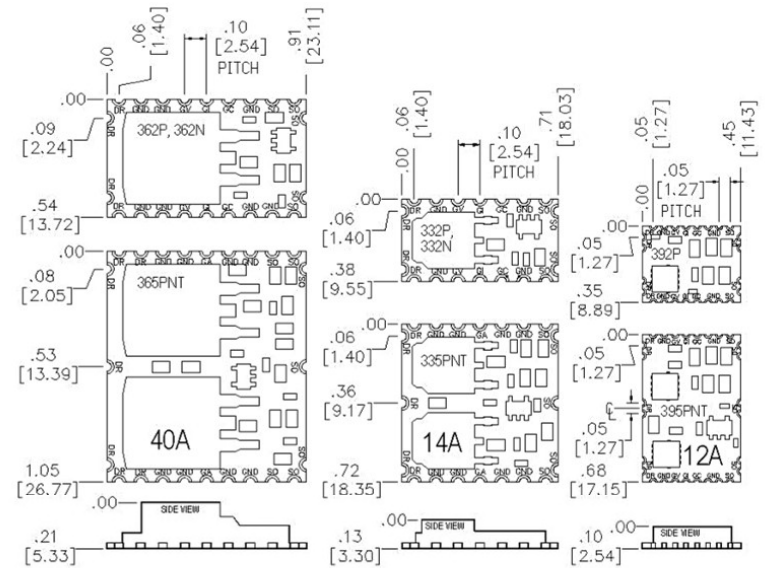
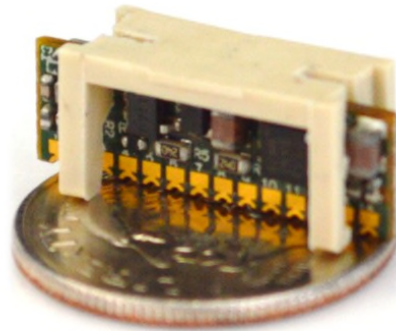
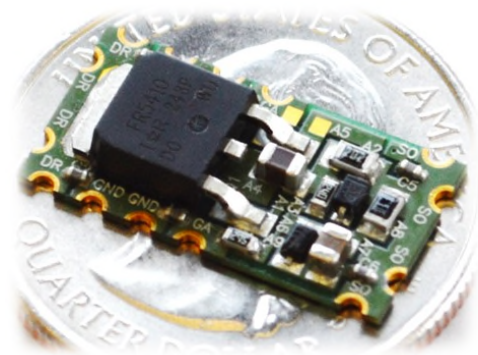
- Protects GaN devices from any Power ON/OFF sequence of internal and external supplies.
- Generates own Negative and Logic voltages from <80V supply **OR** accepts them for current boost.
- Gate Voltage Bias has Fixed Gate **OR** Pulsed Gate configuration.
- Drain-Gate switching features Master-Slave PWM **OR** Independent Control at gate or drain of device.
- Output to drive external MOSFET switching circuits comes in TTL **OR** Open Drain (<300mA).
- Temperature compensation is activated from either local **OR** remote temp sensor feedback.
- >25dB EMI/RFI Rejection at all I/O ports except from auxiliary taps.
- <500 nsec total delay from V_Logic to V_Drain with applicable switch.
- Standard I/O ports have 50 mil pitch [1.27 mm] while Low Profile have 60 mil pitch [1.52 mm].

Parameter	Min	Max
Supply (+) Voltage	+28 V	+80 V
Supply (-) Voltage	-6 V	0 V
Logic Voltage	-0.3 V	+4.0 V
Analog (-) Adjust Voltage	-6 V	0 V
Gate Bias Threshold Shutdown	-1.4V	-2.6V
Output Drive Voltage, Open Drain	0 V	+60 V
Output Drive Current, Open Drain		300 mA
Output ON Propagation Delay		120 ns
Output ON Fall Time, Active Low		120 ns
Output OFF Propagation Delay		80 ns
Output OFF Rise Time, Active Low		80 ns
Gate ON Propagation Delay		160 ns
Gate ON Rise Time		60 ns
Gate OFF Propagation Delay		160 ns
Gate OFF Fall Time		60 ns
Soldering Temp (10 sec)		+260°C
Operating Temperature	-40°C	+85°C
Storage Temperature	-65°C	+150°C

Propagation Delay is measured from 90% of TTL to 10% of Open Drain Output with pull-up resistor. Rise/Fall Times are measured at 10% and 90% of signal. Both measurements are summed for total time.

MOSFET SWITCH

- Allows direct placement on RF Choke on supply line. Comes in 10A up to 40A with good heat sinking. Are driven directly by the 100 or 200 Controllers.
- 300 Series: Single or Dual Switches for CW and Pulsed Applications. Also in CMOS for speed.
- 400 Series: Upright Mini Switches that comes in Dual PMOS or Complimentary MOS (Push-Pull).



MOSFET SWITCH FEATURES

- Rated for 100V
- Ultra-low Rds ON
- Operation up to 175°C, with derated voltage and current.
- CW and Pulsed versions available.
- Total switching times of <500 nsec when used together with 100 or 200 Controllers.
- Complementary MOS has Rise and Fall times of < 200 nsec when driven by the 100 or 200.

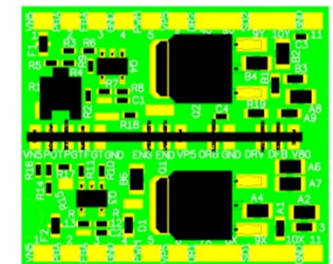
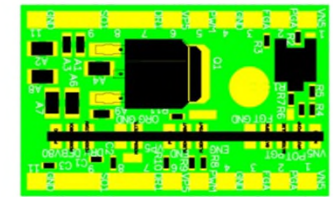
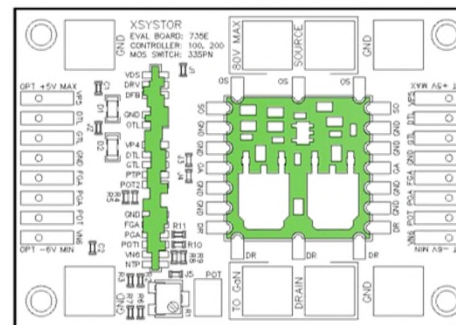
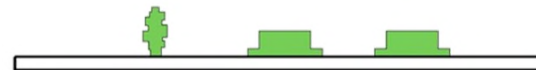
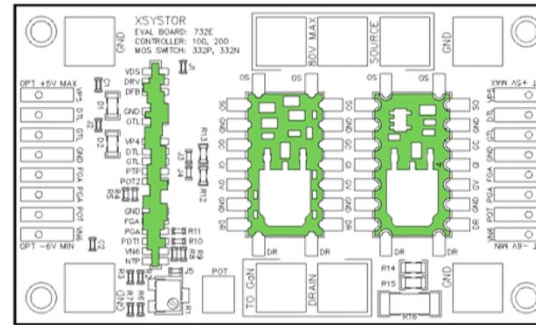
300 Series Parameter	Min	Max
Source Voltage	+28 V	+80 V
Gate Voltage	0 V	+20 V
Drain Voltage	+28 V	+80 V
Rds ON (14 A Switch)		0.22 Ω
Rds ON (40 A Switch)		0.07 Ω
Turn-ON Propagation Delay		100 ns
Turn-ON Rise Time		70 ns
Turn-OFF Propagation Delay		150 ns
Complementary MOS only		
Turn-OFF Fall Time		100 ns
Soldering Temp (10 sec)		+260°C
Operating Temperature	-40°C	+85°C
Storage Temperature	-65°C	+150°C

400 Series Parameter	Min	Max
Source Voltage	+28 V	+80 V
Gate Voltage	0 V	+20 V
Drain Voltage	+28 V	+80 V
Drain Current, CW		10 A
Rds ON, P-channel		0.18 Ω
Rds ON, N-channel		0.08 Ω
Turn-ON Propagation Delay		100 ns
Turn-ON Rise Time		70 ns
Turn-OFF Propagation Delay		150 ns
Complementary MOS only		
Turn-OFF Fall Time		100 ns
Soldering Temp (10 sec)		+260°C
Operating Temperature	-40°C	+85°C
Storage Temperature	-65°C	+150°C

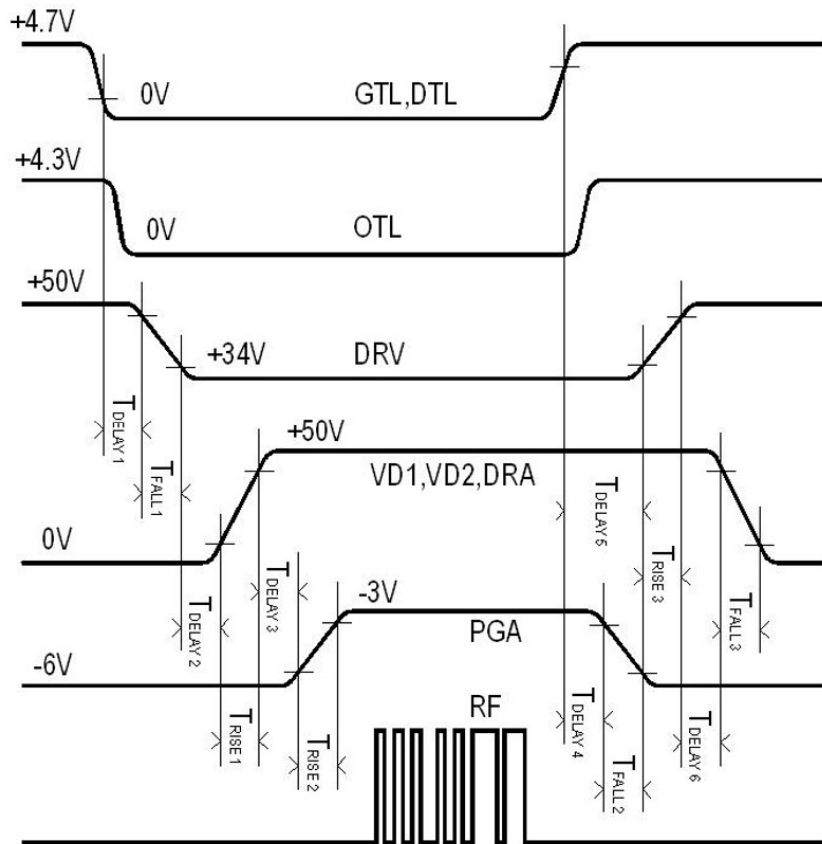
Propagation Delay is measured from 90% of Drive Signal from Controller to 10% of Drain Voltage Output with load of 1KΩ. Faster speeds occur with decreased load resistance. Rise/Fall Times are measured at 10% and 90% of signal. Both measurements are summed for total time.

DEMONSTRATION BOARDS

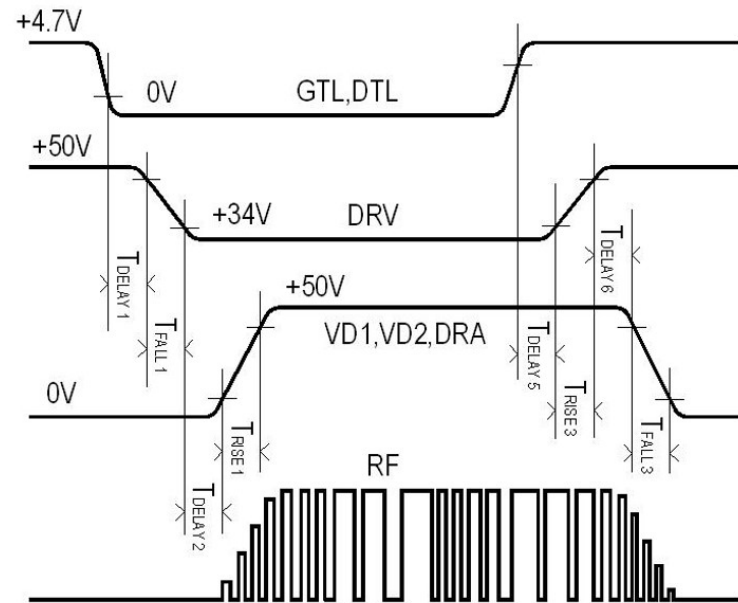
- 600 Series Evaluation Boards reflect the many possible combinations of 100, 200, 300, & 400 Series Controllers and Switches.
- 700 Series Eval Boards have modules that can be removed & reused once the evaluation phase has been completed.
- I/O ports come in castellated, isolated, or thru-hole for mounting on PCBs, metal surfaces, headers, and wires.



GAN SWITCHING SEQUENCE



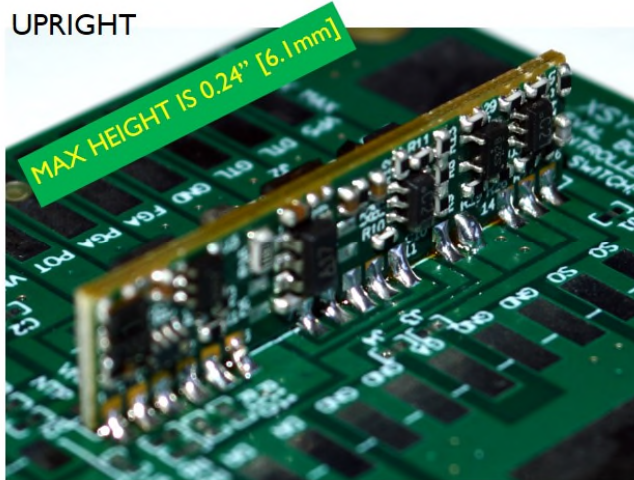
- Master-Slave switching of Drain-Gate Bias for stability prior to RF signal.
- Independent switching of Drain and Gate Bias.
- Pulse Modulation with Drain or Gate Voltage.



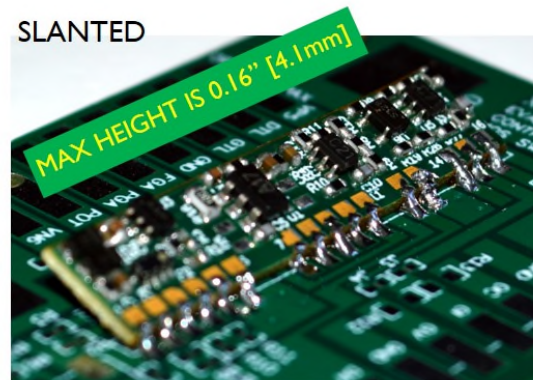
MOUNTING SCHEMES

- Refer to app note XAN-4

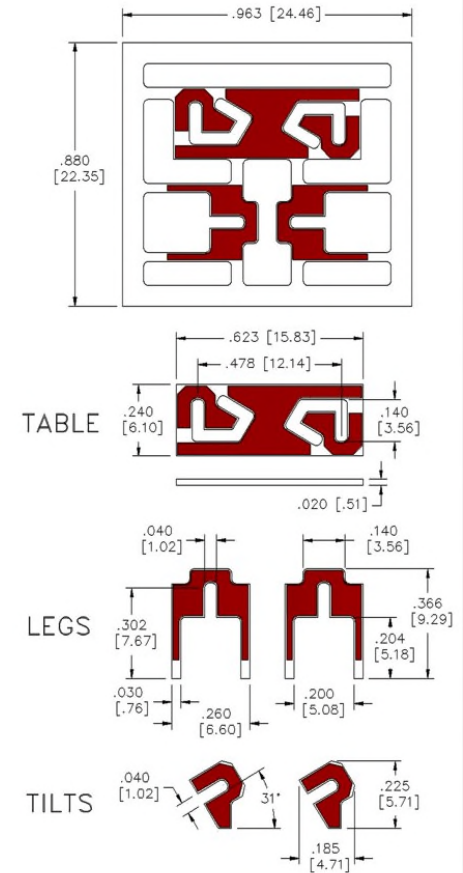
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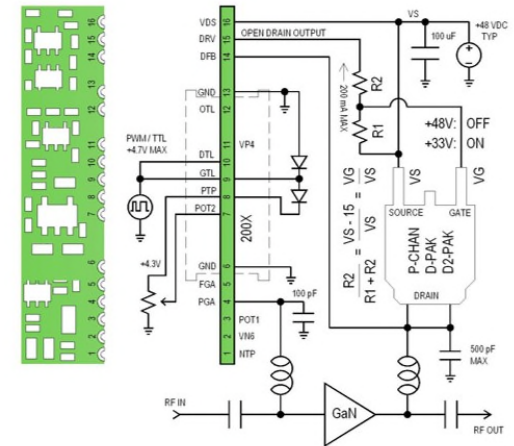
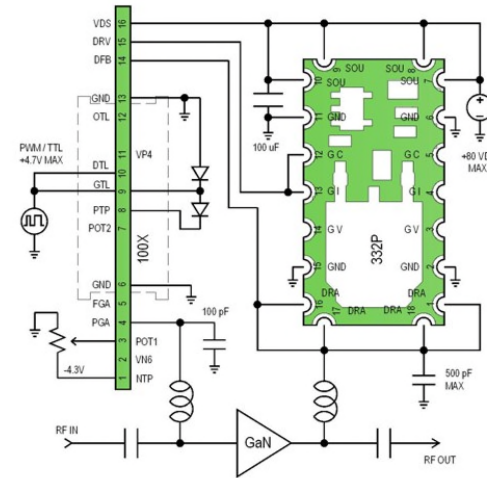
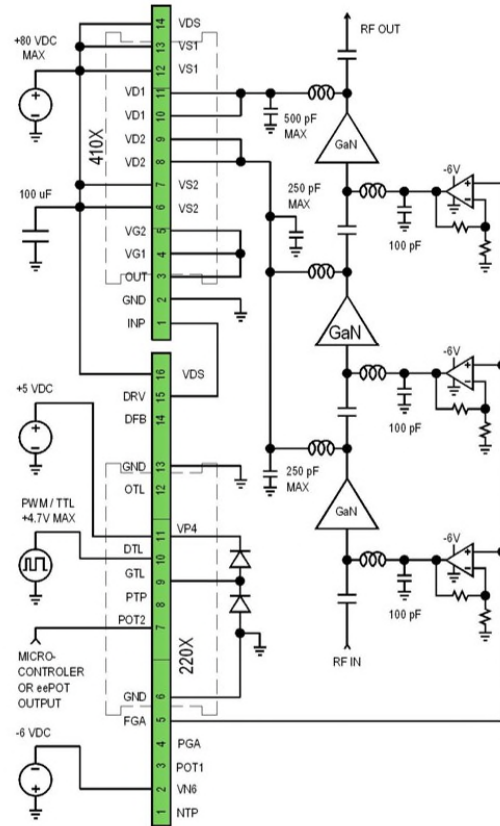
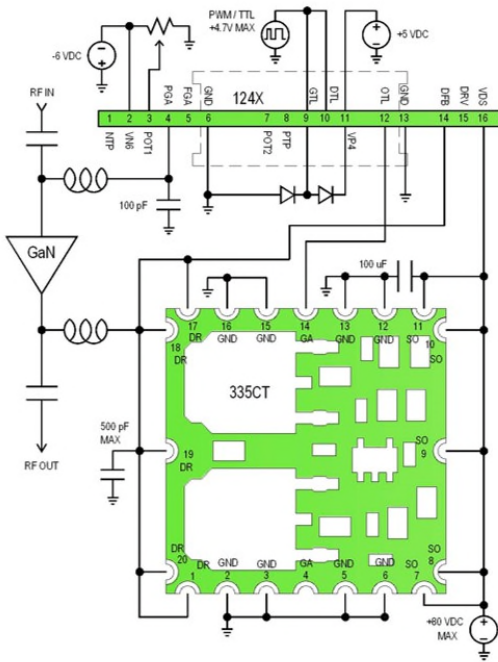


FLAT & BURIED



FUNCTIONAL DIAGRAMS

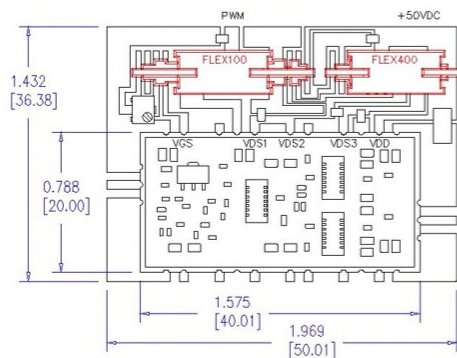
- Refer to app note XAN-2



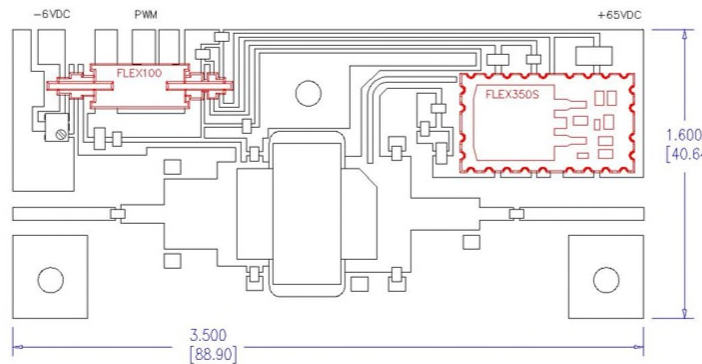
CUSTOM AMPLIFIERS

- XSYSTOR has principals each with 25 years of RF and Microwave design experience. We have built amplifiers using Bipolar, LDMOS, GaAs, & GaN with up to 18GHz and 1KW varieties.

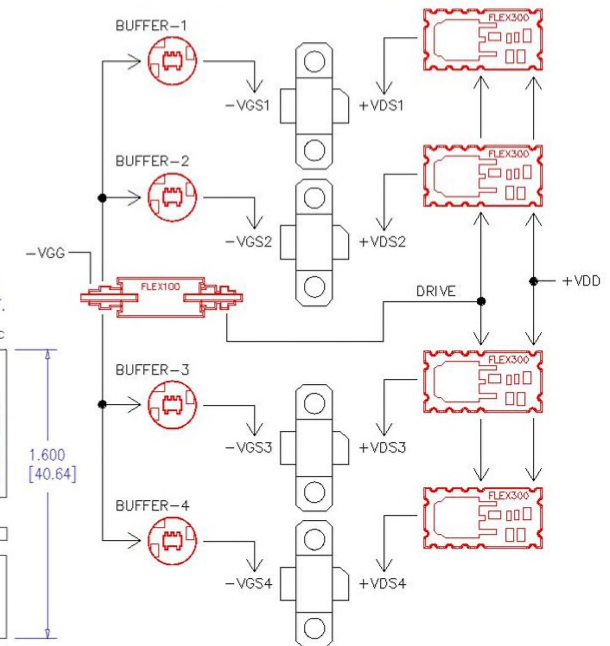
3-STAGE PLASTIC RF MODULE DRIVEN BY CONTROLLER AND DUAL SWITCH WITH A SINGLE SUPPLY SOURCE.



SINGLE LAYER LAYOUT WITH 1KW CERAMIC RF DEVICE. CONTROLLER AND SWITCH TAKES EXTERNAL NEGATIVE VOLTAGE FOR GATE CURRENT BOOST.



4-ELEMENT CASCODED (OR CASCADED) AMPLIFIER. A SINGLE CONTROLLER WITH VOLTAGE FOLLOWER OP-AMPS PROVIDES BUFFERED GATE BIAS. EACH TRANSISTOR HAS A DEDICATED MOSFET SWITCH RATHER THAN A LARGE ONE FOR ALL FOUR BECAUSE OF INDUCED PARASITICS FROM SUPPLY LINES.





CONTACT INFO

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- Distribution Sales: RFMW Global
- Samples available for Designers or Applications Engineers. Must contact your Local Sales Rep or ask your Independent GaN Reps to carry the line.