

# **Impellimax**

## *2008 Catalog Addendum*

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**We're on Mars, again !**

The successful landing of the Phoenix Mars explorer brings additional Impellimax hardware to our neighbor planet. A standard NX550A5-T driver was an integral part of the landing radar on the probe.

**High Speed TTL input Bias Supply For LNA**

**4102 Temp-compensating FET amp bias sequencer**

Size: .220 by .220 inch

Output voltage is settable to +2V, +2.5V, or +3V, set by wirebonds on Vset resistor string. TTL low switches output to approximately 0V, TTL high switches output to regulated positive level, capable of sourcing 180mA. 10 nsec switch speed, and voltage stability is +/-100mV max over time and temp, within 50nsec of switching.

**7 breakpoint linearizer for Attenuators, etc**

**AP17UAS High Speed Linearizer**

Size: .230 by .280 inch

7 Breakpoints allows for high-resolution linearization of even high slope-ratio curves.

Output sources current with high compliance.

Free software makes calculating breakpoint resistors easy.

**7 breakpoint linearizer for Attenuators, etc**

**APD7UAS Dual Output High Speed Linearizer**

Size: .230 by .280 inch

Very similar to AP17UAS (at left), except with dual outputs, to provide possibilities for multi-element PIN attenuators.

Second output can also be used to provide "smart spiking" for highest speed and best settling time. Call Impellimax for details.

**4106 hi speed Temp-comp FET amp bias**

Size: .350 by .240 inch

**High Speed TTL temp-comp Bias For LNA**

Unit provides a regulated positive output voltage in the range of +.98V to +1.42V at an output current of 30mA to 114mA. The output voltage is intentionally responsive to ambient temperature over the range of -40C to +100C, to provide temperature compensation for an amplifier drain bias. The 4106 also provides wideband noise rejection and switching speed under 60 nsec in most applications.

**4205 Neg Gen**

Size: .350 by .070 inch

**Negative Gate Voltage Generator for FET amps**

Unit uses +5V supply to generate a regulated negative output voltage in the range of -0.50V to -0.70V at an output current of 0.3mA to 3mA. +5V supply current consumption is 30mA max. Adjustment of output voltage to gate can be made by using an external adjustable chip resistor. Overall thickness is .065 max.  
(+5V input, -.7V output)

**4211 Neg Gen**

Size: .350 by .070 inch

**Negative Gate Voltage Generator for FET amps**

Unit uses +12V supply to generate a regulated negative output voltage of -6.8V with very low ripple. Adjustment of output voltage to gate can be made by using an external adjustable chip resistor. Overall thickness is .065 max.  
(+12V input, -6.8V output)

**High Speed TTL Noninverting PIN Driver**

**9020 Noninv PIN Driver**

Size: .350 by .070 inch

Max thickness .055. Single noninverting spiked high-speed PIN driver, 8 nsec. Power supplies have internal .01 uF bypassing.

**Tiny Dual Output PIN Driver**

**9047**

Size: .150 by .150 inch

Unusual Logic control input has three voltage levels, which selects Out 1, Out 2, or no output, to sink current. Outputs switch between +47V and Ground

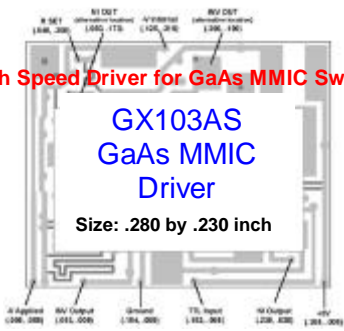
**Decoded 8 channel PIN driver**

**DS8 Decoded 8 channel PIN Driver**

Size: .515 by .370 inch

8 Channel, TTL Decoded Binary with Enable. One Output is negative, all others are positive. Enable input forces all outputs positive. Switching speed is approximately 50 nsec. Versions of this driver with 3 to 32 outputs (various size units) are also available.

**High Speed Driver for GaAs MMIC Switches**



**GX103AS  
GaAs MMIC  
Driver**

Size: .280 by .230 inch

High speed driver specifically for GaAs FET MMIC switches. 9 nsec typical RF switching speed, including delay. Outputs swing from ground to -V, and internal regulator allows -V to be set to any voltage between 0 and negative applied voltage, using a single resistor.

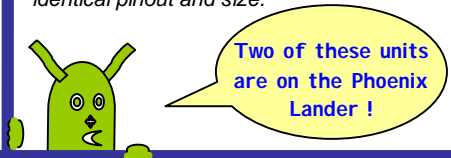
**3 Channel High Speed Noninverting PIN driver**



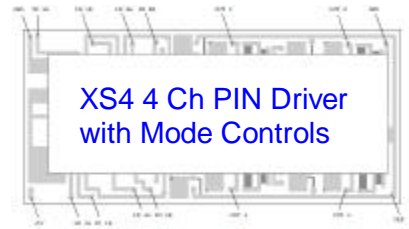
**NX3 High Speed  
Noninverting PIN  
Driver**

Size: .225 by .495 inch

Three independent TTL compatible noninverting PIN driver channels. Spiked outputs, 8 nsec typical delay. Logic inputs are ESD clamped. Internal .01 uF caps on supplies. *Inverting version (IX3) is also available, with identical pinout and size.*



**Moderate Speed, Exclusive-Or Input Logic**

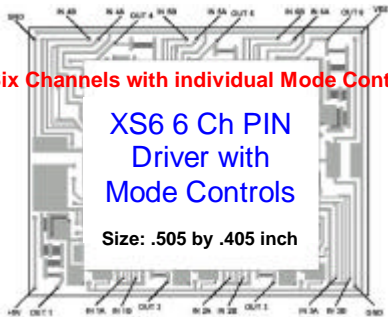


**XS4 4 Ch PIN Driver  
with Mode Controls**

Size: .235 by .505 inch

Connect either input to ground to cause the remaining input of the channel to be noninverting, or allow an input to float high to cause the remaining input of the channel to be inverting. Switching speed is 30 nsec typical into resistive loads.

**Six Channels with individual Mode Controls**

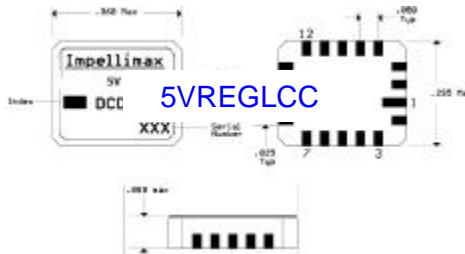


**XS6 6 Ch PIN  
Driver with  
Mode Controls**

Size: .505 by .405 inch

Switching speed is 30 nsec typical, 70 nsec max into resistive loads. Negative output current increases with increasing negative voltage. Unit is reverse bias protected and contains internal .01uF bypass capacitors on both power supplies. Exclusive-Or Logic provides inv/noninv selection for each channel.

**Hermetic 5 Volt Regulator in small LCC**

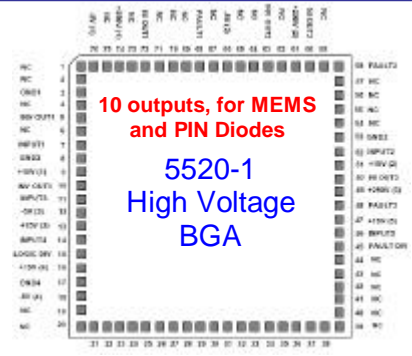


**5VREGLCC**

Size: .295 by .360 by .09 inch

Small, simple solution to the problem of moderate-current voltage regulation in hi-reliability environments. This unit contains an industry-standard LM7805 regulator in an easily-integrated hermetic package. Full MIL screening and Burn In are available.

*Similar packaging of other die is available.*



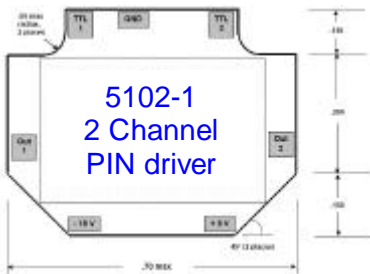
**10 outputs, for MEMS  
and PIN Diodes  
5520-1  
High Voltage  
BGA**

Size: 1.15 inch square, .22 max thk

Accepts 5 TTL logic inputs and provides 5 pairs of outputs that switch between +250V and -5V in under 150 nsec. Solders onto mother board using single-row non-melting BGA bumps.

*This technology is quick-turn and low cost*

**2 ch mini-pcb for easy switch integration**



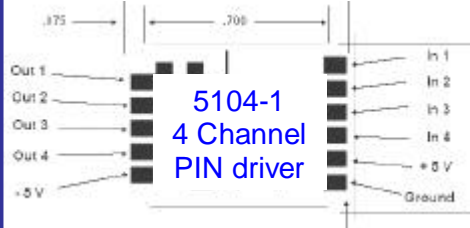
**5102-1  
2 Channel  
PIN driver**

Size: .70 inch by .55 inch .125 max thk

Backside is electrically insulated, so unit can drop right onto metal floor of housing. Central section is covered with a phenolic encapsulation.

*Easily modified to fit your available space*

**4 ch mini-pcb for easy switch integration**

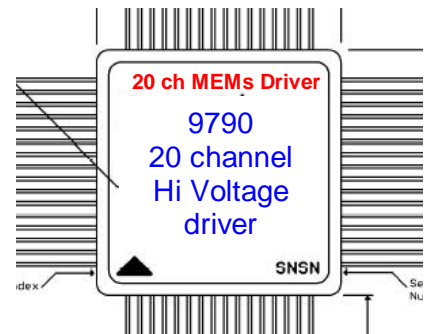


**5104-1  
4 Channel  
PIN driver**

Size: .70 inch by .55 inch .125 max thk

Backside is electrically insulated, so unit can drop right onto metal floor of housing. Central section is covered with a phenolic encapsulation.

*Easily modified to fit your available space*



**20 ch MEMS Driver  
9790  
20 channel  
Hi Voltage  
driver**

Size: 1 inch square by .185 max thk

Twenty individual channels switch between +5V and -90V. Many similar versions available. Leadforming option (not shown) allows for easy integration.

*Hermetic*

## YIG Drivers

Filters and oscillators using YIG (Yttrium-Iron Garnet) components are frequency-tuned using electromagnet coils that are in the range of 10 to 100 millihenries, typically. These coils require from low milliamperes to an ampere or more.

Impellimax YIG drivers simplify the integration of YIG devices into your system. They are available in hybrid or PCB technologies, to best fit your size, screening, and budget requirements. We will tailor our technologies to suit your application. At Impellimax, custom YIG driver design is the typical path, and NRE's are kept very low thru the use of our in-house rapid prototyping capabilities and design block re-use where applicable. Turn-around on new designs can be as quick as 2 to 3 weeks.

Input styles can include analog, digital tuned, and digitally tuned with an analog modulation input as well. Unusual logic levels (HiNIL, PECL, RS-482 etc) can be accommodated, as can packetized digital data, such as RS-422 and TCP-IP protocols.

Some YIG devices incorporate a smaller "dithering" coil, and Impellimax drivers can include special high-speed drivers for dithering coils within the same package or pcb as the main coil driver.

Self-test outputs can provide real-time or blanked status flags to indicate coil opens, shorts, or driver out-of-loop conditions. Real-time flags provide continuously-available fault data, but may also provide false indications during switching and settling of the output current. Blanked status outputs, on the other hand, incorporate automatic "blinking" to eliminate false fault flags during these times.

## Solenoid / Relay drivers

Electromechanical switches use an electromagnetic coil to cause the mechanical actuation of DC and RF switch paths. Impellimax manufactures drivers specially suited to the requirements of these devices.

Many electromechanical switches require a high DC current, on the order of tens to hundreds of milliamps, to remain actuated. Additionally, each device has a specified "pull-in" voltage which must be exceeded in order to overcome the mechanical and electrical hysteresis in the system.

Impellimax fault-tolerant designs can withstand continuous hard short-circuits applied to their outputs, returning to normal operation once the short circuit is removed.

Drivers with high current capabilities are available, routinely sourcing or sinking 3 amperes per output. Internal clamping diodes absorb the inductive kickback without damage.

Impellimax fault-sensing drivers can provide a TTL level signal as built-in-test to identify short circuited loads, absent or open loads, and/or power supply droop beyond safe levels to maintain pull-in.

Some relays operate in a bistable mode, such that they only require a short pulse of high current (typically called a "Set" coil) in order to switch, and then they will remain in that position until a similar current pulse is applied to a different coil (typically called a "Reset" coil) to return to the original switch position. These latching designs use a special Impellimax driver which provides the properly sequenced and timed pulses to make latching relays operate under simple TTL control.

## Unusual Logic Types

ECL, PECL and LVDS are balanced-line low-voltage, high-speed logic families. Impellimax has drivers that are directly compatible with these logic families, so that no conversion IC's are necessary. This saves space, reduces supply current, and eliminates gate delays in translation.

Some other unusual logic families that Impellimax has supported include HNIL (High Noise Immunity Logic), RS-485, TCP-IP and other various packetized data formats. RS-232, USB, and proprietary data formats have also been used. Fiberoptic links can also be specified.

The use of open-collector logic on BIT outputs can make integration of multiple drivers simple, as several BIT lines can optionally be OR-tied together to provide a system-level fault output.

## Obsoletes

Semiconductor and IC manufacturers routinely cease production on components, leaving only culls and questionable products available through brokerage. Impellimax produces several drop-in replacements for such DMS (Diminishing Manufacturing Sources) or obsolete components. We offer identical or improved parameters in many cases. In some cases we have been able to re-create the function of a previously available IC by designing very small, elegant hybrid microcircuits that maintain the same packaging or pin-out as the previous monolithic design. In other cases, we are able to locate same or similar die and assemble them into the now-obsolete hermetic packaging that is required for the systems. We are currently making several key obsolete components for Patriot and other legacy programs.

Upscreening is a related service we can provide to assist in providing materials suitable for high-rel applications. Frequently, manufacturers discontinue military versions of components, but still offer commercial units. In these cases, Impellimax can work with you to generate an upscreening plan that might include, temp cycle, burn-in, hermeticity checking, PIND, constant acceleration, X-Ray, DPA, and 100% temperature testing of some or all parameters, for example.

Specific testing of unusual parameters can also be of use. If, for example, there are lot-to-lot variations in a parameter, such as settling time, ripple rejection, or supply current, Impellimax can provide a testing program to quantify these variations, either thru serialized recorded data or binning of units by a given parameter.

Below is a short listing of Impellimax direct replacements for some legacy drivers :

|        |           |       |        |
|--------|-----------|-------|--------|
| 9D111  | (DD111)   | 9L230 | (L230) |
| 9D211  | (DD211)   | 9L325 | (L325) |
| 9F311  | (DDF311)  | 9L350 | (L350) |
| 9F2311 | (DDF2311) | 9L425 | (L425) |
| 9F3311 | (DDF3311) | 9L450 | (L450) |
| 9F4311 | (DDF4311) | 9L525 | (L525) |
| 9H110  | (H110)    | 9L550 | (L550) |
| 9H210  | (H210)    | 9L625 | (L550) |
| 9H310  | (H310)    | 9L650 | (L650) |



## Voltage Converters

Impellimax can easily custom-design a hybrid or pcb solution to your small- to mid-power requirements. We can convert aircraft power, for example, into isolated supplies suitable for your needs. The range of output voltages we have dealt with ranges from  $-0.8V$  up to nearly a hundred volts. Our smallest power converters, in an open-substrate format, are only a third of an inch long and .07 inch wide. Our largest power converters are multi-ampere units for the automotive market, incorporating a microprocessor for control. Most certainly your application falls somewhere in between these extremes.

Impellimax capacitively-coupled voltage converters allow voltage conversion and multiplication without concern for high magnetic fields and extreme temperature ranges, both of which can limit the usefulness of magnetic power conversion.

Custom toroid winding allows us to create magnetically-based power converters. We have designs incorporating aluminum wirebonds, positioned thru shaped magnetic regions, to create the windings within micro hybrid voltage converters. We can also use exotic materials, such as Teflon-coated gold wire, for applications where size and efficiency are paramount. Copper wire is still the material of choice for most of our magnetic power converters.

## Temperature-Compensating Circuits

Impellimax can provide a simple method to improve the performance of your products over temperature. The concept is that at any given temperature, there usually exists an optimum operating or tuning voltage that, if applied, would improve the overall functioning of your RF or Microwave system. This optimizing supply can be delivered by an Impellimax temperature-compensating linearizer. It does not matter if the optimizing voltage has a complicated temperature vs voltage characteristic. S-curves, concaves, convexes, and straight line transfer functions are all easily synthesized. These hybrids can provide low-level adjustments, such as gate voltage tweaking, or high current adjustments, such as drain or  $V_{supply}$  adjustment capable of several amperes, or high voltage temperature compensation, such as tuning voltage on a varactor. The process starts with measured data points of your unit over temperature, where you manually adjust the parameter to produce optimum results at each step in a set of temperatures. Impellimax will then work with your data points and provide a hybrid and/or pcb solution that can drop in and produce the required temperature-dependent optimizing voltage or current automatically. Impellimax temp-comp circuits are entirely analog, with smooth transitions in the temperature vs output transfer function. This is a critically important feature, since most systems cannot tolerate the discontinuous jumps that are inherent in ROM look-up tables, for example. With Impellimax temperature-compensating circuits, a change in temperature always results in a smooth change of optimizing output.

Multi-output compensators can also be created, provided more than one correcting voltage or current to simultaneously optimize your system in more complete ways.

## PCB Solutions

Impellimax has an in-house Quad pick-and-place system, screen printing, automated solder placement robot, belt furnace, and 750+ component types in inventory, stored in dessicated ESD bags, with RohS information and search functions to enable rapid prototyping and assembly.

Impellimax has created a Ball Grid Array (BGA) equivalent technology, based on proprietary brass pins which extend below a micro PCB. The bottoms of these pins present rounded brass protrusions which can be soldered down to a motherboard just as though they were non-melting BGA balls. Nearly any BGA pattern can be duplicated in this way. By using this technique, Impellimax drivers and circuit solutions can be integrated into legacy pcb layouts and system re-spins can be avoided.

Integrated RF circuitry can simplify your assembly. By leveraging one of the new generation of microwave/control circuit dual-use laminates, high performance RF circuits can coexist well with driver and power conversion circuits, all on one board. This cuts down on manual labor, interconnect count, assembly errors, and high parts count compared with traditional assembly techniques.

Impellimax has PCB milling centers that can repeatably make detailed RF tuning cuts to the copper traces which can allow a single RF/PCB layout to serve over many different frequency bands, for example.

## Space Products

Impellimax is proud to be a part of the successful Phoenix Lander which touched down on Mars on May 25, 2008. One of our high-speed 5 channel PIN diode drivers was a key component on the lander during it's final descent phase, as part of the landing altimeter radar system.

Hybrid designs for low-Earth-orbiting satellites (LEOs) must endure high levels of radiation. Impellimax radiation-tolerant PIN diode drivers are aboard several such satellites, performing despite conditions that can cause integrated circuits to latch up and become nonfunctional. These circuits have high gain and are free from SCR structures which can be sensitive to single-event upsets (SEUs).

## High Voltage Drivers

High speed moderate voltage drivers provide up to 30V back bias on diodes, but still can maintain 5 MHz repetition rates and high speed switching.

High speed intermediate voltage drivers provide up to 180V back bias, with switching speeds in the range of 50 nsec to low microseconds.

PIN drivers in the range of 200V to 750 Volts benefit from Impellimax's patented High Voltage driver circuit. These drivers utilize magnetics in a novel arrangement that provides DC controllability, protection from damaging shoot-thru during switching, low cost, and small size. Multi-ampere output currents are easily achieved, and switching speeds in low microseconds are possible.

Impellimax high voltage drivers frequently are controlled by balanced-line logic varieties. This is a beneficial concept in eliminating false logic switching due to noise transients induced by switching high voltages and currents in small confined devices. Balanced logic fault line outputs are similarly useful and available.

## MEMS and Piezo Drivers

Micro Electromechanical Systems (MEMS) are gaining an ever-increasing foothold in modern systems. They most typically operate thru the mechanisms of electrostatic attraction and repulsion. High voltages, in the range of 25 to 250 V, are needed to cause them to actuate. Impellimax has numerous high-voltage drivers and technologies which can be utilized in creating an optimized driver solution for your MEMS application.

Our MEMS drivers can generate their own high voltage from your lower-voltage system supplies, so the result is a turn-key one-chip solution for many applications.

For MEMS devices that only require high voltage pulses during switching, Impellimax provides latching-driver circuits that translate single logic line inputs into multi-output sequenced high voltage events as necessary to complete actuation.

Piezo-actuated devices, such as lens micropositioners, Squiggle? motors, etc, operate thru the electrostriction of piezoelectric elements. The drive requirements of Piezo devices vary broadly depending on the application, but Impellimax enabling technologies allow for rapid driver solutions.



## Mechanical Options

Physically, drivers are not “one-size-fits-all”. As some extreme examples of this, our tiniest hybrid PIN diode driver is only .150 inch by .150 inch, and our integrated circuit driver is .090 by .120. At the other end of the size spectrum, we have constructed entire PIN driver rack systems, with 544 outputs with 136 quad 500-volt PIN driver circuit cards, complete with a backplane, self-test, and RS-232 interface. There have also been diverse mechanical situations between these extremes, ranging from the obvious to the somewhat preposterous. In each case, we believe we have creatively brought forth the very best system solution within the constraints given, with the lowest risk and at the lowest cost to the customer.

The simplest and most common requirement is for thinner versions of our stock drivers. This can almost always be accommodated easily, except in cases where there are tall internal components that must be designed around, or where tall sidewalls are necessary, as in the case of seam-welded hybrids. So if an outline of a standard part has a dimension that is a problem for you, please feel free to let us know what is needed, and we will do our best to make it possible.

Another common mechanical option relates to substrate (packageless) drivers. In some space-constrained microwave devices, the substrate driver can be mounted to at least partially cover the RF circuit, acting in some ways as a lid on the RF basin beneath. In such cases, we can offer backside gold metallization on the bare driver. This can cut down on moding and cavity resonances by having the driver backside function electrically as a conductive lid on the RF area.

Solderable gold pads on substrate (packageless) drivers can simplify your assembly task. Although our typical gold process is most compatible with gold or aluminum bonding and welding connections, solderable gold is available as well. This gold plating scheme has a heavy undercoating of nickel for strong and reliable solder connections.

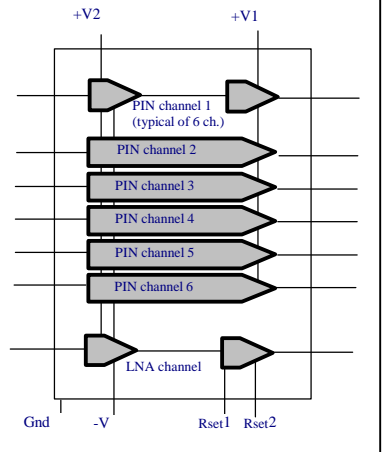
## Heaters and Controllers

Proportional and PWM (pulse width modulated) heater controllers and TEC (thermo-electric cooler) module controllers are available for high-reliability control of your thermal components. For highest stability and responsiveness, these controllers can incorporate PID (proportional, integral, derivative) feedback if so desired.

## Monolithic Driver IC's

Hybrid circuit drivers are typically the best technology for high performance military and high-reliability applications, but some applications may benefit from a monolithic custom IC approach. Impellimax has provided custom IC chips for telecom high-volume projects, and we are ready and able to design the optimal monolithic solution for you.

Our seven-channel PIN driver IC PN 9716 is available in die and packaged form. Contact the factory for details on how this capability can be of service to you.



## GaAs Drivers

The high speed capability inherent in GaAs switches is wasted if the driver is not up to the task. Impellimax high-speed GaAs drivers switch in low nanoseconds, with almost zero skew between outputs. Available in single-line TTL and balanced logic configurations, these drivers typically also incorporate an on-board negative voltage regulator.

Multi-output and decoded GaAs drivers are available, in TTL, ECL, and LVDS logic.

## Linearizers

To optimize control loop bandwidth, Impellimax linearizers can be the “secret ingredient” that makes your control loop design outperform all others. It is theoretically impossible to design an optimal control system if critical system blocks have nonlinear transfer functions. The remedy is to precede these system blocks with Impellimax linearizers having the inverse transfer function, thereby resulting in a linear transfer function for the revised system block. With this correction, it is now possible to apply frequency compensation that will be correct and optimal over the whole tuning range of the previously unoptimizable block. Impellimax Linearizers have a wide bandwidth, so the delay thru the linearizer is transparent to the system in most cases. Where extreme linearizer bandwidth is required, Impellimax HBT linearizers can be used.

Impellimax linearizers are applicable to PIN attenuators, GaAs Attenuators, VCO's, Varactor-tuned filters, Optical modulators, Vector Modulators, FET Vgs vs Id curves, Power detectors, Optical detectors, Chemical sensors, MEMs control voltages, and any other device where a transfer function needs to be modified.

## Obsolete IC Replacements

| <b>Part Number</b> | <b>Package</b> | <b># of Pins</b> | <b>Comments</b>  |
|--------------------|----------------|------------------|--|
| <b>1005</b>        | .250 by .375   | 14               | Replaces Sprague lamp driver. Tiny package, +70V 2 channel |
| <b>1021</b>        | TO-3           | 2                | Hermetic Power Voltage Regulator, +15V                     |
| <b>1022</b>        | TO-3           | 2                | Hermetic Power Voltage Regulator, +24V                     |
| <b>1023</b>        | TO-3           | 2                | Hermetic Power Voltage Regulator, -8V                      |
| <b>1024</b>        | TO-3           | 2                | Hermetic Power Voltage Regulator, -15V                     |
| <b>1041</b>        | TO-8           | 12               | LH0041G Equivalent   |
| <b>1121</b>        | TO-3           | 8                | LH0021 Equivalent  |
| <b>9535</b>        | TO-8           | 12               | DH0035 PIN Driver Equivalent                               |

## Linearizers

| <b>Part Number</b> | <b>Package code</b> | <b># of Bkpts</b> | <b>Comments</b>  |
|--------------------|---------------------|-------------------|--|
| <b>10M</b>         | 2                   | 7                 | 6 internal laser-trimmed bkpts plus one uncommitted          |
| <b>8001</b>        | 3                   | 9                 | Sources up to +90 mA   |
| <b>8004</b>        | 3                   | 8                 | 5 up bkpts, 3 down bkpts                                     |
| <b>8052</b>        | 2                   | 7                 | Dual outputs, 5 up bkpts, 2 down bkpts                       |
| <b>8101</b>        | 3                   | 7                 | 8 bit DAC input, Dual outputs for Series & Shunt of Pi Atten |
| <b>8147</b>        | 2                   | 7                 | Linearizer and +8V regulator in small package                |
| <b>8417</b>        | 2                   | 7                 | Linearizer and uncommitted op-amp in small package           |
| <b>8420</b>        | 3                   | 10                | Temperature-compensating linearizer for Quartz Crystals      |
| <b>8574</b>        | 3                   | 8                 | 8 bit DAC input, Dual matched outputs                        |
| <b>8602</b>        | 5                   | 4                 | Laser-trimmed internal breakpoints available                 |
| <b>8805</b>        | 2                   | 5                 | Linearizer for S-curve Vector Modulators                     |
| <b>5521</b>        | connectorized       | -                 | SMA input & output, internally set for a specific VVA series |

## Power Converters

| <b>Part Number</b> | <b>Package</b> | <b>Volts In</b> | <b>Volts Out</b> | <b>Comments</b>  |
|--------------------|----------------|-----------------|------------------|--|
| <b>4036</b>        | 2              | - 15 V          | - 36 V           | Capacitively coupled, caps and diodes external   |
| <b>4205</b>        | Substrate      | + 5 V           | - 1.3 V          | Provides Gate Bias for FET, .35 by .07 size  |
| <b>4211</b>        | Substrate      | + 12 V          | - 6.8V           | Provides regulated output voltage, .35 by .07 size   |
| <b>4212</b>        | 3              | + 15 V          | - 45 V           | 10 mA output current, no external components except Rset   |
| <b>5122</b>        | Hybrid/<br>PCB | +15 V           | - 8V             | Mini hi-reliability assembly has 4 GaAs drivers (8 outputs) and makes it's own -8V supply.                     |
| <b>5019</b>        | Hybrid/<br>PCB | +15V            | -50V             | Mini hi-reliability assembly has 4 High-Voltage PIN driver channels and makes it's own regulated -50 V supply. |

## Heaters and Controllers

| <b>Part Number</b> | <b>Package</b> | <b>Supply</b> | <b>Comments</b>                                  |
|--------------------|----------------|---------------|--|
| <b>2005</b>        | .39 by .3      |               | Hermetic proportionally controlled 1 Watt        |
| <b>2012</b>        | 2              |               | Hermetic proportionally controlled 1 Watt        |
| <b>2101</b>        | 3              |               | Heater controller, uses external sensor and load |

## Miscellaneous

| <b>Part Number</b> | <b>Package</b> | <b>Supply</b> | <b>Comments</b>   |
|--------------------|----------------|---------------|---|
| <b>3001</b>        | 2              | + 12 V        | Hermetic hybrid Tilt Sensor pre-amp and conditioner 4-20 mA out       |
| <b>4103</b>        | Substrate      |               | +300 mA power supply sequencer for FET amps                           |
| <b>4132</b>        | 14 DIP         | + 32 V        | Ceramic Hi-rel 14 DIP solenoid driver for relays, 3.5 Amperes         |
| <b>5105</b>        | PCB            | - 500 V       | Dual High Voltage PIN driver, 2 amp output current, BIT outputs       |
| <b>5109</b>        | PCB            | - 750 V       | Dual High Voltage PIN driver, 2 amp output current, BIT outputs       |
| <b>9573</b>        | Substrate      |               | 3 ch decoded PIN driver, line rec'vr inputs, Trise & fall adjustments |
| <b>9666</b>        | 5              | - 120 V       | 6 channels PIN driver, 50 nsec, with shutdown input                   |