

Drivers designed to optimally drive the Aeroflex/Metelics MSW2000 series and similar High-Power switches with series diodes and floating shunt diodes.

Versions available include :

- High speed switching
- SMD pick & place packaging
- **NEW! 32 output devices**
- **NEW! Super-mini Hermetic**
- Voltages from 5V to 150V
- Hermetic options
- Commercial options
- Line receiver option
- MRI-friendly option

Aeroflex/Metelics MSW2000 style switches provides a high-power T/R switch function in an easy-to-incorporate module. These types of T/R modules and multi-throw switches have the capability to withstand very high microwave power levels.

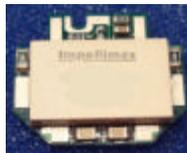
Impellimax provides several switch drivers which are tailored to such devices. External components are minimized for greatest ease of use, in various packaging including MRI-Friendly versions with almost no magnetic signature. These drivers provide RF performance which has already been characterized in tandem with the module, so your technical risk and uncertainty are greatly reduced.



9939



9943



9988



9990



9941, 9944

Individual data sheets are available for each of these versions, with specifications of performance as applicable to the MSW-200X switch module.

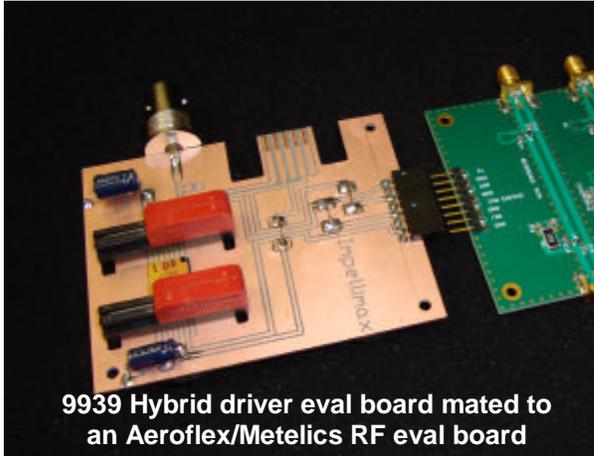
Impellimax Part #	Size	Application	Speed	Output Voltage Capability	Features
9939	.375 sq Hybrid	Comm or Military	500 nsec	Up to +28V	Micro size, High Speed
9943	.48 sq Hybrid Ceramic LCC	Commercial Medical	500 nsec	Up to +28V	MRI-Friendly (low magnetic) version of 9939
9988	FR-4 Module, 0.7 X 0.56 X 0.2	Commercial	500 nsec	Up to +50V	Low cost, Small and quick Backside fully insulated
9990	FR-4 Module, 0.56 X 0.43 X 0.12	Commercial	1.5 Usec	Up to +50V	Lowest cost driver, Small, SMD pick & place-friendly
9941	Hybrid	Comm or Military	500 nsec	Up to +150V	Line receiver option, Small size
9944	Hybrid	Comm or Military	250 nsec	Up to +90V	Higher speed version of 9941

Contact the factory for additional details and many available customization options.

See pages 6 and 7 for newest part types!

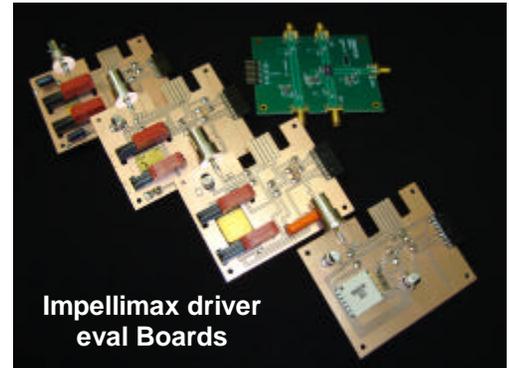
Impellimax can also provide evaluation boards to speed the development and evaluation of your project. These boards are configured with a BNC input jack for TTL control and a multipin edge connector which mates with the Aeroflex/Metelics RF Evaluation board.

The drivers are held nondestructively onto the evaluation boards, so that drivers that have been used in initial evaluation can then be available for installation into shippable devices.



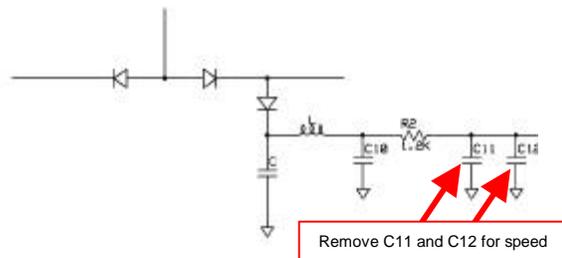
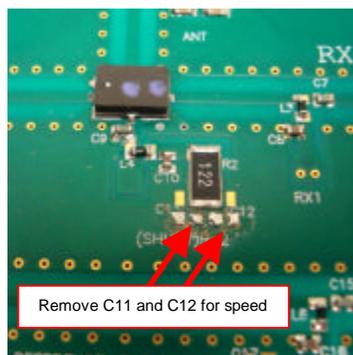
9939 Hybrid driver eval board mated to an Aeroflex/Metelics RF eval board

Different boards are available for each of the Impellimax T/R module drivers, several of which are shown below :

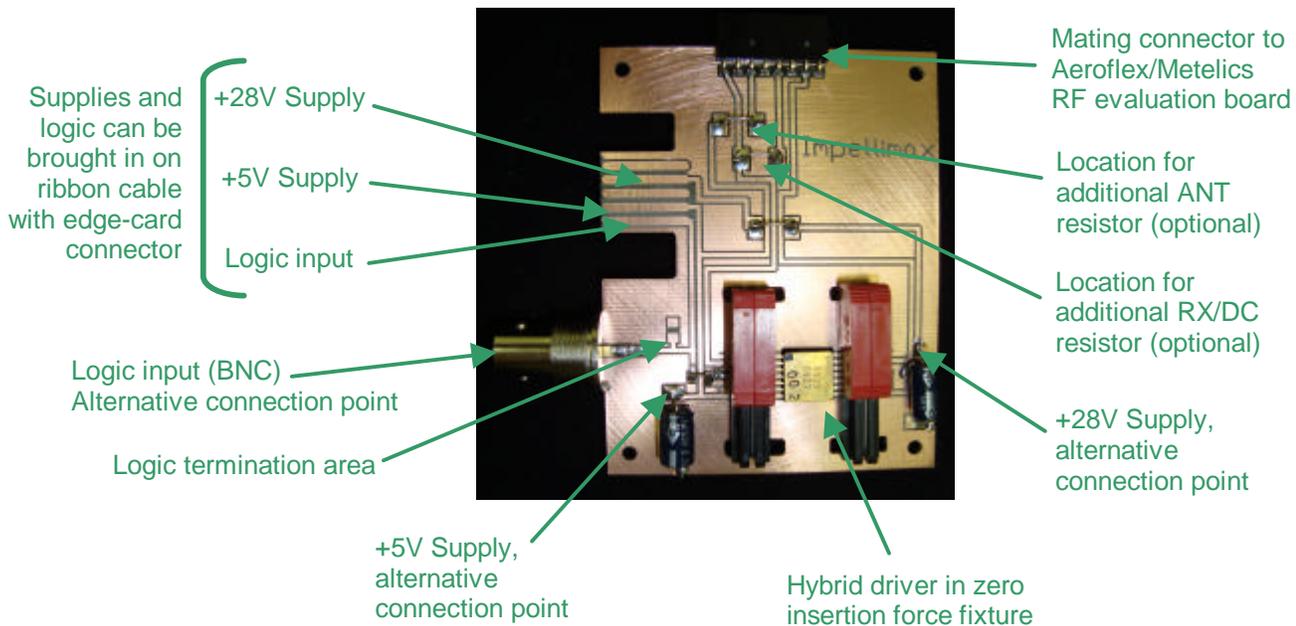


Impellimax driver eval Boards

The image below identifies bypass caps C11 and C12 on the Aeroflex/Metelics RF Evaluation board. These caps are acceptable in applications where the RX/DC (shunt) bias pad is biased thru a resistor to a DC source. Most Impellimax drivers for this module do not function this way, however, so to get optimal speed and reliability, these caps should be removed. Removing these caps does not affect the RF performance in any way, since they are normally isolated from the RF line by the series resistor (at least 1kohm) and the internal shunt capacitance at the RX/DC node of the RF module (150 to 350 pF).



(Note: T/R configuration is shown. For balanced modules with multiple shunts, remove the equivalent caps from the other bias resistors as well.)



9939 Driver Evaluation Board

The 9939 eval board (shown above) is typical of the other eval boards in this series. Some of the notable features are explained further, as follows :

The **edge-card connector** of the board can be used to make removable supply and logic connections, using Digikey PN C3EEG-1006M-ND ribbon cable, or equivalent. The backside of the board is completely exposed ground, including this edge-card connector area.

The **BNC connector** and **logic termination area** provide a means of connecting 50 ohm signal generators, and similar sources, as logic input to the driver.

The **Hybrid driver** is nondestructively held onto the board using **zero-insertion-force** insulating clamps. Complete access to the driver body allows thermal management as needed, and the driver can be easily removed and used when the system breadboarding phase is complete. LCC and PCB drivers are held with similar nondestructive clamping systems.

The two bypass capacitors provide convenient **alternative power supply connections**, if desired.

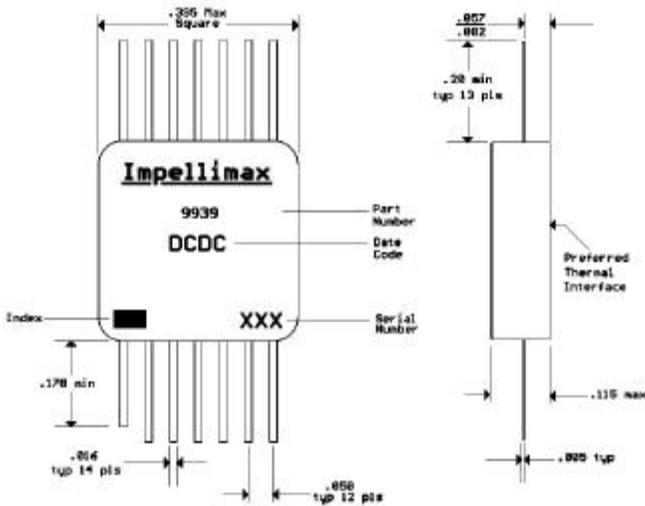
There is a **location for an additional RX/DC limiting resistor**, if needed. For most 28V applications, this is a zero-ohm jumper, and the 1.2K (R2) of the RF Eval board is sufficient current limiting for the shunt diode of the module. In applications where power must be further conserved, however, this location provides a convenient spot in which to add additional resistance. Also, since this is a somewhat generic driver eval board, higher voltages may sometimes be used (when the 9939 is not used as the driver) in which case the additional resistance may be necessary to limit shunt diode current to safe levels.

This is a **location for one or more additional (ANT) limiting resistor**, if needed. For most applications involving +5V, this is a zero-ohm jumper, and the ANT resistor of the RF Eval board is sufficient current limiting for the series diodes of the module. In non 5V applications, and in applications where power must be further conserved, however, this location provides a convenient spot in which to add additional resistance.

The **mating connector** allows easy attach and detach with the RF Evaluation Board.

Impellimax

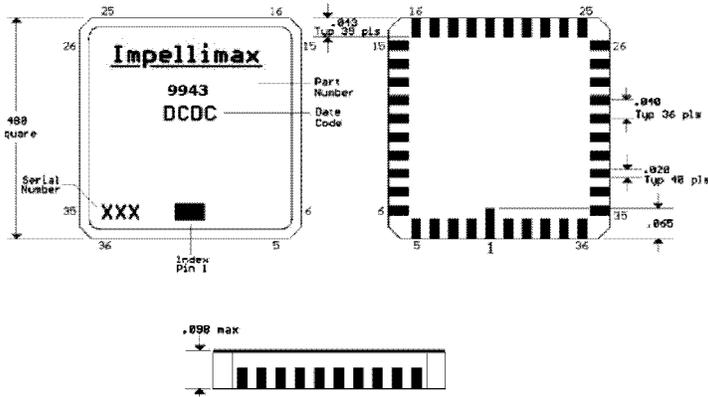
Drivers for MSW2000 and similar High-Power Modules



1. ANT bias to the T/R module should be supplied thru a 27 ohm series resistor to the +5V supply. This resistor will dissipate approximately .3 Watts.
2. Output TX/DC (pin 2) connects to the TX port thru passive RF bias network, and Output RX (pin 13) connects to the RX port thru a passive RF bias network.
3. An external 1K resistor should be connected between the T/R module RX2 (DC) connection and the Output TX/DC (pin 2) of the driver. This resistor will dissipate approximately .8 Watts. The 1K resistor value can be increased, thereby reducing the dissipation, in applications where the shunt diode of the T/R module can be operated at lower forward bias which would cause a slight reduction in RX switch isolation.
4. Logic 1 applied to the TTL input causes IL to the RX port and ISO to the TX port. Logic 0 results in a reversal of these states.

PIN	CONNECTION	PIN	CONNECTION
1	GND	14	GND
2	Output TX/DC	13	Output RX
3	GND	12	GND
4	NC	11	NC
5	Input TTL	10	NC
6	NC	9	NC
7	+5V	8	+28V

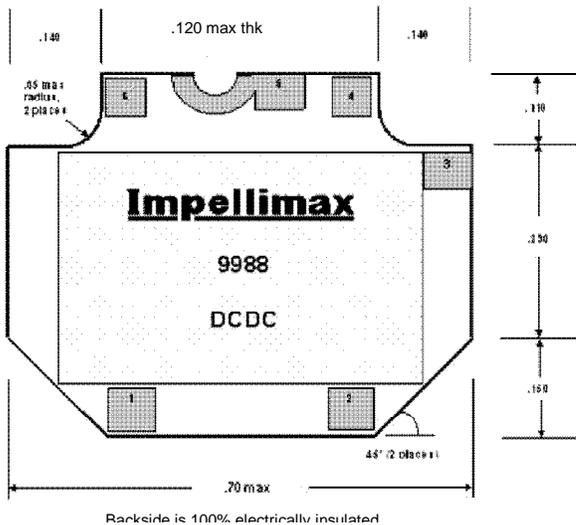
9939



1. ANT bias to the T/R module should be supplied thru a 27 ohm series resistor to the +5V supply. This resistor will dissipate approximately .3 Watts. Output TX/DC (pin 8) connects to the TX port thru passive RF bias network and Output RX (pin 33) connects to the RX port thru a passive RF bias network.
2. An external 1K resistor should be connected between the T/R module RX2 (DC) connection and the Output TX/DC (pin 8) of the driver. This resistor will dissipate approximately .8 Watts. The 1K resistor value can be increased, thereby reducing the dissipation, in applications where the shunt diode of the T/R module can be operated at lower forward bias which would cause a slight reduction in RX switch isolation.
3. Logic 1 applied to the TTL input IL to the RX port and ISO to the TX port, Logic 0 results in a reversal of these states.
4. This driver has a low magnetic signature, consisting primarily of Nickel underplating beneath the gold. The lid is nonmagnetic ceramic.

- Pin 8 : Out TX/DC
- Pin 13 : Input
- Pin 15 : +5V
- Pin 26 : +28V
- Pin 33 : Out RX
- Pins 6, 10, 31, & 35 : Ground

9943



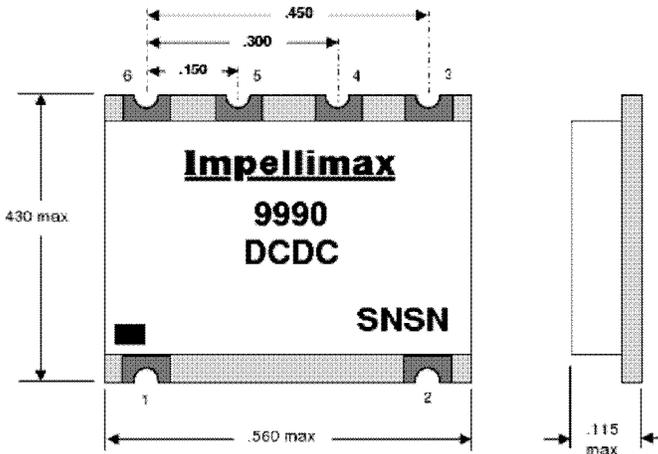
1. ANT bias to the T/R module should be supplied thru a 27 ohm series resistor to the +5V supply. This resistor will dissipate approximately .3 Watts.
2. Output TX/DC (pin 1) connects to the TX port thru passive RF bias network, and Output RX (pin 2) connects to the RX port thru a passive RF bias network.
3. An external 1K resistor should be connected between the T/R module RX2 (DC) connection and the Output TX/DC (pin 1) of the driver. This resistor will dissipate approximately .8 Watts. The 1K resistor value can be increased, thereby reducing the dissipation, in applications where the shunt diode of the T/R module can be operated at lower forward bias which would cause a slight reduction in RX switch isolation.
4. Logic 1 applied to the TTL input causes IL to the RX port and ISO to the TX port. Logic 0 results in a reversal of these states.

PIN	CONNECTION
1	Output TX/DC
2	Output RX
3	+50V
4	+5V
5	Ground
6	TTL

9988

Impellimax

Drivers for MSW2000 and similar High-Power Modules

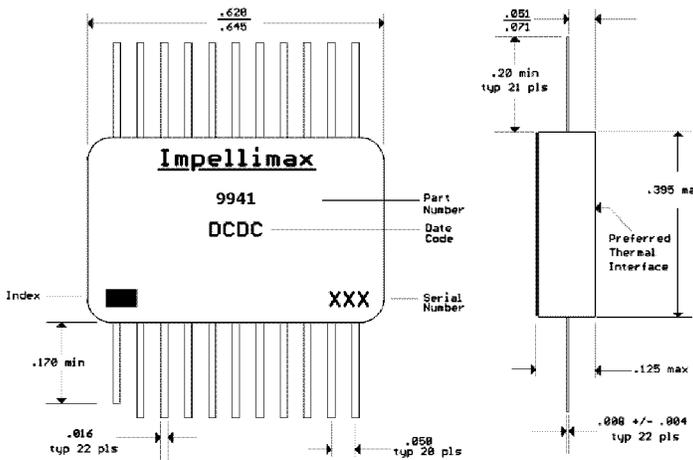


Backside is has 6 solderable lands to allow for solder reflow.
RoHS, Tape & reel available.

1. ANT bias to the T/R module should be supplied thru a 27 ohm series resistor to the +5V supply. This resistor will dissipate approximately .3 Watts. Output TX/DC (pin 1, noninverting) connects to the TX port thru passive RF bias network and Output RX (pin 2, inverting) connects to the RX port thru a passive RF bias network.
2. An external 1K resistor should be connected between the T/R module RX2 (DC) connection and the Output TX/DC (pin 1) of the driver. This resistor will dissipate approximately .8 Watts. The 1K resistor value can be increased, thereby reducing the dissipation, in applications where the shunt diode of the T/R module can be operated at lower forward bias which would cause a slight reduction in RX switch isolation.
3. Logic 1 applied to the TTL input causes ISO to the RX port and IL to the TX port. Logic 0 results in a reversal of these states.
4. The two outputs of this driver are capable of being swapped, with the result being that the logic vs RF port selection would be opposite to that given in note 3. The nomenclature applied to the two output pins, in the pinout table, refers to one of the two valid connectivities between the driver and an asymmetrical module.
5. Positive voltage (pin 3, +V) can be in the range of +5V to +50V.

- Pin 1 : Out TX/DC
- Pin 2 : Input
- Pin 3 : +5V
- Pin 4 : +28V
- Pin 5 : Out RX
- Pin 6 : Ground

9990

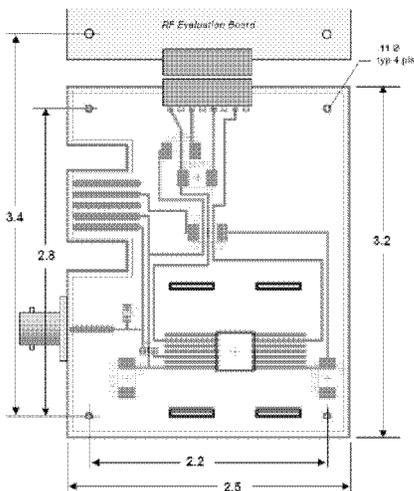


For 9941, +V can be in the range of 10V to 150V. For 9944, +V can be in the range of 10V to 90V.

1. ANT bias to the T/R module should be supplied thru a 27 ohm series resistor to the +5V supply. This resistor will dissipate approximately .3 Watts. Output TX/DC (pin 2) connects to the TX port thru passive RF bias network. Output RX (pin 13) connects to the RX port thru passive RF bias network.
2. An external 2K to 10K resistor should be connected between the T/R module RX2 (DC) connection and the Output TX/DC (pin 2) of the driver with a value depending on supply voltage and shunt current desired. This resistor will dissipate up to 4 Watts. The resistor value can be increased, thereby reducing the dissipation, in applications where the shunt diode of the T/R module can be operated at lower forward bias which would cause a slight reduction in RX switch isolation.
3. Logic input is a line receiver type. Logic 1 applied to the noninverting input causes IL to the RX port and ISO to the TX port. Logic 0 on the noninverting input results in a reversal of these states.

PIN	CONNECTION	PIN	CONNECTION
1	+V	22	NC
2	Output TX/DC	21	NC
3	NC	20	NC
4	NC	19	NC
5	NC	18	NC
6	Ground	17	NC
7	Input Inverting	16	NC
8	Input Noninverting	15	NC
9	NC	14	NC
10	Out RX	13	NC
11	+5V	12	NC

9941, 9944



The image and mechanical dimensions of the Impellimax 9939 driver evaluation board is provided at left. All of the evaluation boards share these dimensional characteristics. Detailed connection drawings and schematic are available upon request.

Evaluation board identification numbers for each of the drivers is given below:

Driver Number	Evaluation Board ID
9939	9939EB
9943	9943EB
9988	9988EB
9990	9990EB
9941	9941EB
9944	9944EB

Eval Boards

Multi-Channel hybrid reduces system complexity and cost

Per-channel cost is reduced to a small fraction of the cost of individual drivers.

PRELIMINARY



Multi-Channel High Voltage Drivers

Phased Array Applications and other systems, using large numbers of modules per system, can benefit greatly with reduced size, parts count, and cost by using new 1 inch square hybrid designs for :

20 independently-controlled output pairs - PN 9972

OR

32 binary-decoded output pairs - PN 9973

OR

32 serially-addressable output pairs - PN 9974

Moderate Speed operation up to +150V

High Speed operation up to +90V

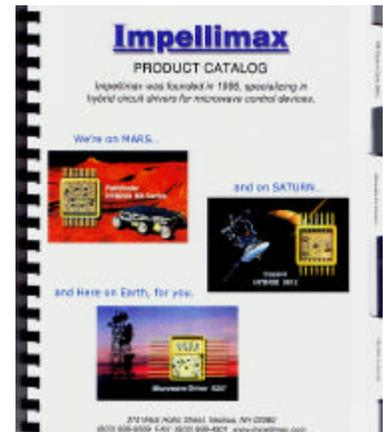
High Voltage Drivers with Positive and Negative Outputs

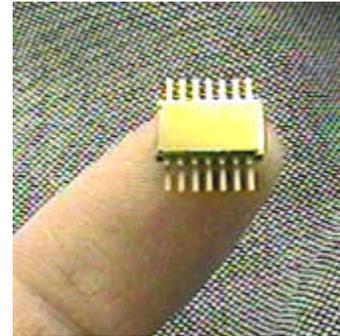
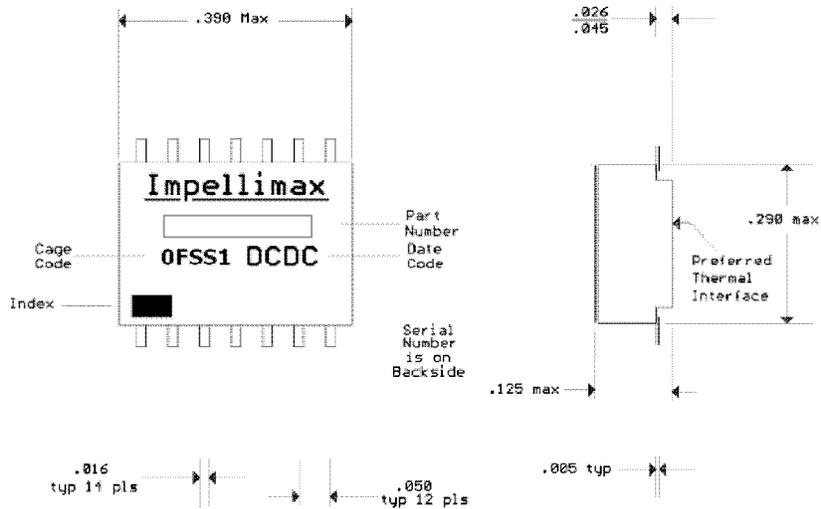
For cathode-grounded shunt designs, Impellimax provides a vast array of standard PIN diode driver options as standard products.

High Speed drivers up to 1 ampere, -500V

See the product line, download outlines and application notes at :

www.impellimax.com





PIN	CONNECTION	PIN	CONNECTION
1	NC	14	Input 1
2	Output 1	13	NC
3	NC	12	NC
4	+5V	11	GND
5	Output 2	10	NC
6	+100V	9	NC
7	NC	8	Input 2

Super-mini Hermetic hybrid driver has smallest package footprint

Leads extend from bottom (seating plane) of the package, providing LCC-like tiny size but easier soldering and inspection.

Available in tubes or tape & reel for automated assembly

Moderate Speed operation up to +150V
High Speed operation up to +90V

Unpackaged, fully tested open-substrate drivers are a mainstay product at Impellimax. Units are shipped in #5 ESD Gel-Pak for easy installation into hybrid circuit devices.

All conductor traces are 50 microinch minimum soft gold plated thin film circuits. They can be wirebonded in Gold or Aluminum, ribbon bonded, ball bonded, or welded for electrical connections. The backside is bare Al₂O₃ so driver can be attached with nonconductive or conductive epoxy, even over conductor traces.

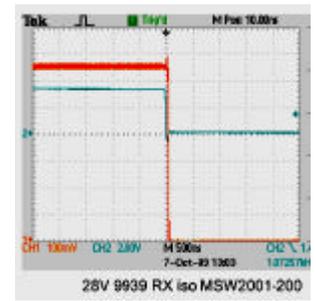
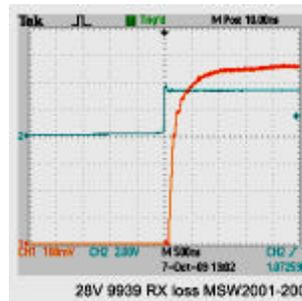
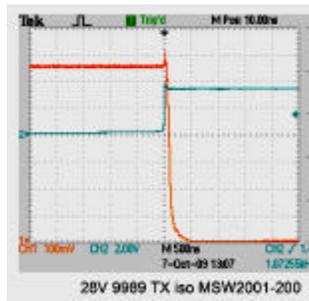
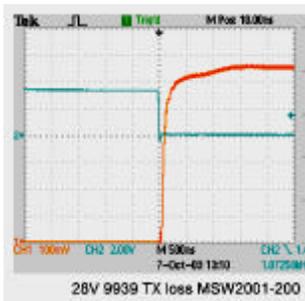
Special designs and requirements are easily and quickly implemented with very low NRE.



Typical Switching Performance

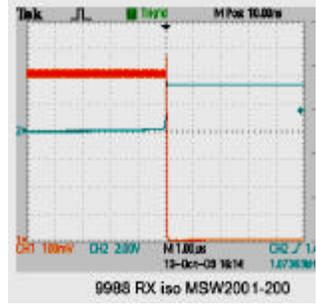
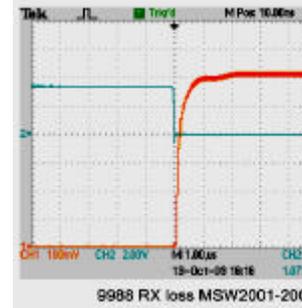
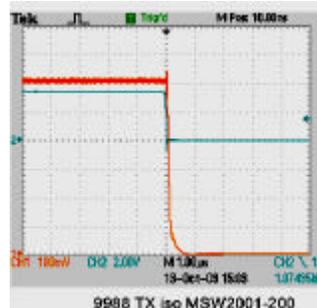
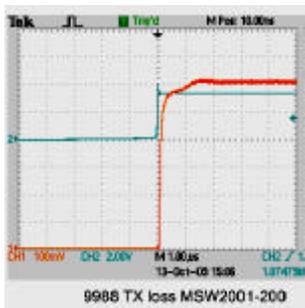
TX

RX



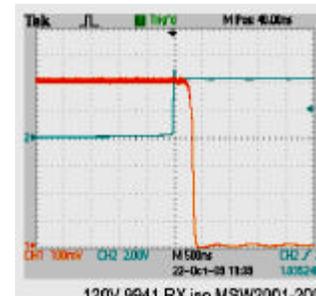
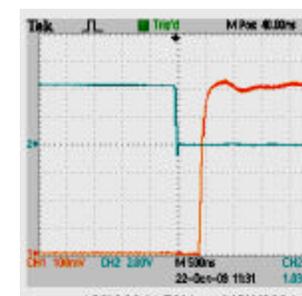
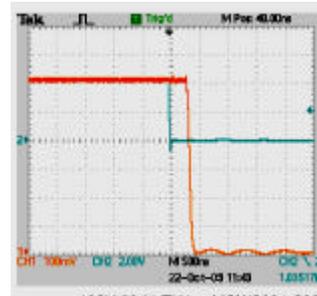
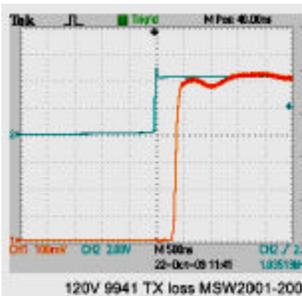
9939 (metal pkg) & 9943 (MRI-friendly pkg)

500 nsec/div



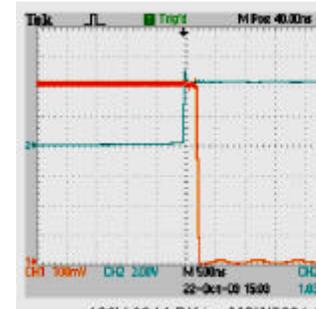
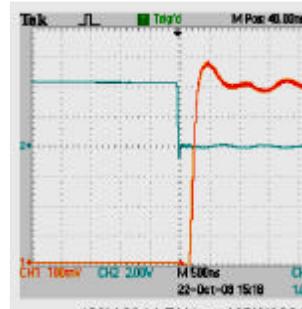
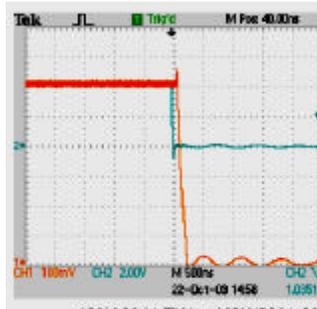
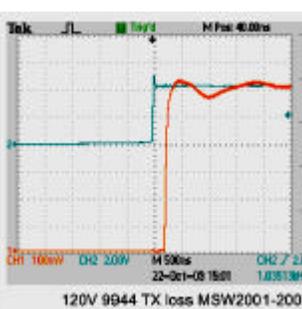
9988

1 Usec/div



9941

500 nsec/div



9944

500 nsec/div