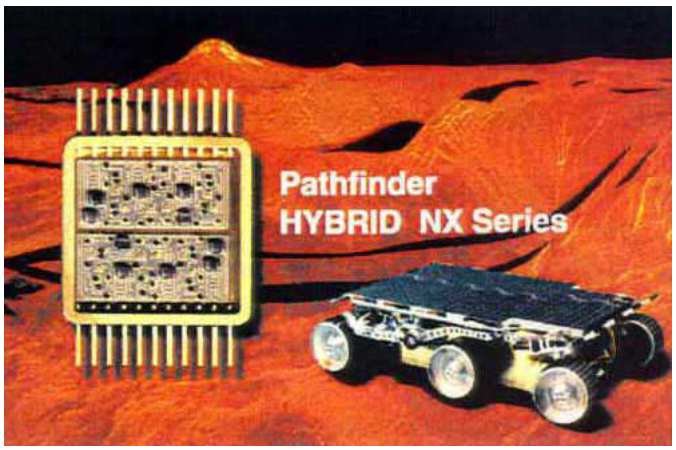
Impellimax

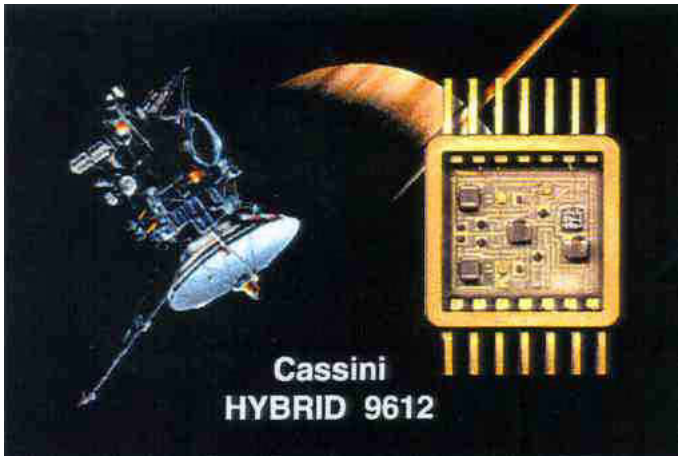
PRODUCT CATALOG

Impellimax was founded in 1986, specializing in hybrid circuit drivers for microwave control devices.

We're on MARS...



Going to SATURN...



and Here on Earth, for you.

375 West Hollis Street, Nashua, NH 03060
(603) 886-9569 FAX: (603) 886-4901 www.impellimax.com

Impellimax

Thank you for your interest in Impellimax.

We manufacture a broad line of products, including:

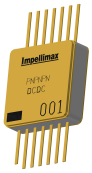
- PIN Switch Drivers
- GaAs MMIC Switch Drivers
- Linearizers for VCO's, Attenuators, and Sensors
- Drop-in Replacements for Hard-to-find or Obsolete Components
- Problem-Solving Special Assemblies using Mixed Technologies

This catalog provides information on our standard PIN and GaAs switch drivers, as well as a glimpse of the offerings we provide in our other product lines.

Please feel free to call or email us with whatever specifics you can offer regarding your application. We will be happy to provide direction and/or products to meet your needs.

Best Regards,

Phil Cassista
President



Impellimax

Catalog Table Of Contents

PIN DIODE DRIVERS AND GaAs MMIC DRIVERS

PIN Driver Data Sheets:

PIN Driver Substrate Examples:

PIN Driver Application Notes:

GaAs MMIC Driver Data Sheets:

GaAs MMIC Driver Substrate Examples:

GaAs MMIC Driver Application Notes:

ATTENUATOR DRIVERS AND LINEARIZERS

Attenuator Driver/Linearizer Data Sheets:

Attenuator Driver/Linearizer Application Notes:

OBSOLETE REPLACEMENTS AND SPECIAL ASSEMBLIES

Obsolete Replacements and Special Assemblies Application Notes:

Impellimax

HOW TO ORDER

							-	
LOGIC	SPEED	CHANNELS	OUTPUT	CURRENT	VOLTAGE	PACKAGE		QA CODES

Example: NX340B4-T Noninverting Extremely fast 3 channel 40 mA +5, -15V driver in 3/8 by 5/8 ceramic package, full 883 screening.

LOGIC CODES:

N: Noninverting TTL compatible. Logic '1' produces positive output.

I : Inverting TTL compatible. Logic '1' produces negative output.

S: Strappable TTL compatible. Driver is inverting when INV input is used, or noninverting when NONINV input is used and INV and TP are connected.

X: Exclusive-Or Mode Control TTL. Tie mode control to ground for noninverting operation, or tie mode control to +5V for inverting.

M: Mode control (exclusive nor) TTL. Logical complement to 'X' logic.

D: Decoded Binary TTL. Two or three bit input word selects one output to go negative out while all others stay positive out.

T: Toggle TTL. One TTL input controls a pair of complementary outputs.

G: Type code used to indicate a GaAs MMIC switch driver. See GaAs driver numbering sheet for specifics.

C: Complement Logic Input. Line receiver TTL with two complement inputs per channel.

E: ECL unbalanced (1 line) noninverting driver.

B: Balanced ECL (2 line) driver.

SPEED CODES:

S: Slow. 40 nsec typical, 100 nsec max.

F: Fast. 8 nsec typical, 12 nsec max.

X: Extremely Fast. 5 nsec typical, 8 nsec max.

NUMBER OF CHANNELS:

For drivers of logic codes N, I, S, X, M, C, E and B, each output constitutes a separate channel.

For drivers of logic codes T and G (See GaAs driver sheet) each pair of complementary outputs constitutes one channel.

For logic code D drivers, each output is counted as a separate channel.

The third character of a driver's Impellimax part number is a numeral from 1 thru 9 which is the total quantity of channels per driver as defined above.

HOW TO ORDER cont.

OUTPUT CURRENT:

The following output currents are available as standard parts:

05mA 10mA 15mA 20mA 25mA 30mA 40mA 50mA 60mA 70mA

These output currents are nominal values of positive current into a resistive load. For the list given above, the load resistances (in ohms) are:

220 Ω 100 Ω 68 Ω 51 Ω 39 Ω 33 Ω 27 Ω 22 Ω 18 Ω 15 Ω

These are standard RETMA values chosen to produce a voltage drop of approximately one volt at the nominal current value. In Impellimax drivers, unless stated otherwise in the particular data sheet, negative output current is nominally equal in magnitude to positive output current when the negative bias is -5V. This negative ouput current typically increases linearly versus increasing negative bias.

VOLTAGE CODE:

Maximum negative supply voltage:

A	**-12V**	**E**	**-100V**
B	**-15V**	**F**	**-250V**
C	**-30V**	**G**	**-500V**
D	**-50V**	**H**	**-1000V**

These are operating values.

Other standard supply voltage codes:

5	**+5V only, no negative supply**		
P	**+5V and +15V, no neg. supply**		
Q	**-5V, +5V, +250V**	**X**	**-5V, +30V**
R	**-5V, +5V, +500V**	**Y**	**-5V, +5V, +50V**
S	**-5V, +5V, +1000V**	**Z**	**-5V, +5V, +100V**

PACKAGE CODE:

The last character of a driver's Impellimax part number is as given below:

1	**3/8 * 3/8 Metal**	**14 leads**	**7**	**3/8 * 5/8 Ceramic Thin**	**22 leads**
2	**3/8 * 3/8 Ceramic**	**14 leads**	**K**	**1/4 * 3/8 Ceramic**	**14 leads**
3	**3/8 * 5/8 Metal**	**22 leads**	**C**	**5/8 * 5/8 Ceramic**	**22 leads**
4	**3/8 * 5/8 Ceramic**	**22 leads**	**S**	**Substrate driver.**	
5	**5/8 * 5/8 Metal**	**22 leads**	**L**	**LCC**	
6	**3/8 * 3/8 Ceramic Thin**	**14 leads**		**(See outline drawing for dimensions.)**	

QUALITY AND ENVIRONMENTAL CODES (Hyphenated):

Typical commercial screening for packaged Impellimax drivers is as follows:

In-Process Visual Inspection	**per MIL-STD-883, Method 2017**
Pre-Cap Visual Inspection	**per MIL-STD-883, Method 2017**
Gross Leak Test	**per Impellimax procedure**
Constant Acceleration	**per MIL-STD-883, Method 2012 Cond. A**
Final Visual Inspection	**per MIL-STD-883, Method 2009**

Substrate drivers receive Visual Inspection and Electrical Test.

QA and Environmental testing, in addition to these steps, is available and is indicated by a hyphenated letter code suffix (or suffixes) as follows:

A	**Constant Acceleration (specify)**	**G**	**Gross Leak Bomb (883, Method 1014 Cond. C1)**
B	**Burn-in (specify conditions)**	**L**	**100% Bondpull**
C	**Cut and/or formed leads**	**S**	**Space qualification necessary**
D	**PIND Testing**	**T**	**Screening per 883, Method 5008 Class B**
F	**Fine Leak**		

DESCRIPTION

BX series drivers are very high speed PIN drivers designed for use in Balanced ECL systems. They have a wide common-mode input voltage range (typically from +3 V to within 2 volts of the negative supply voltage) and high differential gain, which allows them to switch reliably even when driven by noisy twisted pair lines. The ECL inputs are of very high impedance and not capacitively loaded, so that ring-free matching to ECL system impedance can be accomplished with external matching resistors.

These drivers do not require a -5.2 V supply to assure ECL compatibility. Any negative voltage from -4 volts to -16 volts is acceptable, and the output open-circuit voltage swings to within a volt of the supply rails. Quiescent current consumption is less than 12mA, position and negative, per channel.

These drivers provide steady-state output current with current spikes for fast PIN and NIP switching. Testpoints are provided to allow tailoring of output currents and spikes to particular applications.

These drivers have integral reverse bias protection and contain internal .01 uF bypass capacitors on both supply inputs.

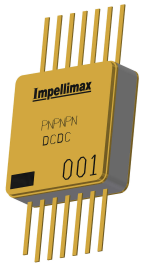
Screening to MIL-STD-883 is available.

FEATURES

-- Extremely High Speed, 5 nsec Typical
-- Low Quiescent Current
-- Wide Input Common Mode Voltage Range
-- Small Size; Up to Six Channels in One Package
-- Can be used as single-input ECL driver with proper termination of unused inputs.

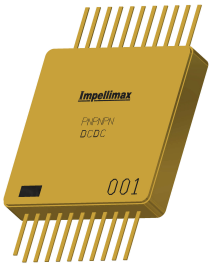
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Pos. Bias Voltage	V+	4.5	5	7	V
Neg. Bias Voltage	V-	-4	-5.2	-16	V
Switching Speed	Tsw	-	0	8	nsec
Pos. Supply (no load) per Chan.	1 q+	-	5	12	mA
Neg. Supply (no load) per Chan.	1q-	-	5	12	mA

OUTLINES



BX1
case 1, 2, 6

BX2, BX3
case 3, 4, 7



BX4, BX5, BX6
case C, 5

LOGIC

Outputs are non inverting with respect to the true (+) input. Therefore, when IN is more positive that $\overline{IN}$, output will be positive. Output will be negative when IN is more negative than $\overline{IN}$.

PIN CONNECTIONS

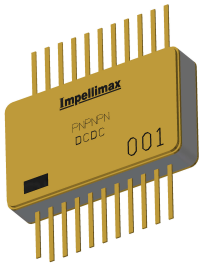
PIN	BX1	BX2	BX3	BX4	BX5	BX6
1	VEE	VEE	VEE	VEE	VEE	VEE
2	Out	IN1	IN1	IN1	IN1	IN1
3	Gnd	$\overline{IN1}$	$\overline{IN1}$	$\overline{IN1}$	$\overline{IN1}$	$\overline{IN1}$
4	NC	Out1	Out1	Out1	Out1	Out1
5	IN	IN2	IN2	IN2	IN2	IN2
6	$\overline{IN}$	$\overline{IN2}$	$\overline{IN2}$	$\overline{IN2}$	$\overline{IN2}$	$\overline{IN2}$
7	+5V	Out2	Out2	Out2	Out2	Out2
8	NC	NC	IN3	IN3	IN3	IN3
9	NC	NC	$\overline{IN3}$	$\overline{IN3}$	$\overline{IN3}$	$\overline{IN3}$
10	NC	+5V	Out3	Out3	Out3	Out3
11	NC	Gnd	+5V	+5V	+5V	+5V
12	NC	NC	Gnd	Gnd	Gnd	Gnd
13	NC	NC	NC	IN4	IN4	IN4
14	NC	NC	NC	$\overline{IN4}$	$\overline{IN4}$	$\overline{IN4}$
15	NC	NC	NC	Out4	Out4	Out4
16	NC	NC	NC	NC	IN5	IN5
17	NC	NC	NC	NC	$\overline{IN5}$	$\overline{IN5}$
18	NC	NC	NC	NC	Out5	Out5
19	NC	NC	NC	NC	NC	IN6
20	NC	NC	NC	NC	NC	$\overline{IN6}$
21	NC	NC	NC	NC	NC	Out6
22	NC	NC	NC	Gnd	Gnd	Gnd

DESCRIPTION

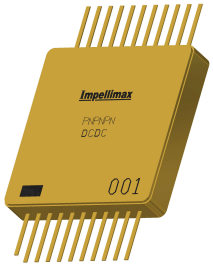
High speed PIN drivers with Binary TTL inputs and Enable/Disable pins to greatly simplify system requirements. Logic inputs select one-of-n outputs to go negative, while all other outputs remain positive.

Logic testpoints are accessible which allow the user to configure the device as a 0 to 4 or a 1 to 5 Binary decoder (DF5). Each output also has a test-point which allows for tailoring of output current levels and spike currents for specific applications.

OUTLINES



DF2
case 3, 4, 7



DF3, DF4, DF5
case C, 5

FEATURES

- **Low Quiescent Current, Stable vs VEE**
- **Dual Enable pins allow easy expansion**
- **Internal .01 uF bypass capacitors**
- **Selectable Coding, 0 → (n-1) or 1 → n**
- **Fast 20 nsec Tsw**

LOGIC

$\overline{E}$	E	OUTPUTS
0 or 1	0	ALL POS
1	0 or 1	ALL POS
0	1	DECODING

For Binary decoding starting at TTL 000, connect INPUT TP to LOGIC 0 pin. To decode starting at TTL 001, connect INPUT TP to LOGIC N pin.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Pos. Bias Voltage	V+	4.5	5	7	V
Neg. Bias Voltage	VEE	-2	-5	-16	V
TTL Input Current -	I- TTL0	-	-	1.8	mA
TTL Input Current +	I- TTL1	-	-	0.2	mA
Switching Speed	Tsw	-	14	20	nsec
Pos. Supply (no load) Total	I q +	-	50	95	mA
Neg. Supply (no load) Per Chan.	I q -	-	3	6	mA

PIN CONNECTIONS

PIN	DF2	DF3	DF4	DF5
1	+5V	A	A	A
2	A	B	B	B
3	B	NC	C	C
4	$\overline{E}$	$\overline{E}$	$\overline{E}$	$\overline{E}$
5	E	E	E	E
6	GND	GND	GND	GND
7	TP1	NC	NC	TP4
8	OUT1	NC	NC	OUT4
9	Input TP	NC	TP3	TP3
10	TP 0/2	NC	OUT3	OUT3
11	OUT 0/2	VEE	VEE	VEE
12	VEE	+5V	+5V	+5V
13	NC	NC	NC	NC
14	NC	TP2	TPs	TP2
15	NC	OUT2	OUT2	OUT2
16	NC	TP1	TP1	TP1
17	NC	OUT2	OUT1	OUT1
18	NC	OUT 0/3	OUT 0/4	OUT 0/5
19	NC	TP 0/2	TP 0/4	TP 0/5
20	NC	Input N	Input N	Input N
21	Logic 2	Logic 3	Logic 4	Logic 5
22	Logic 0	Logic 0	Logic 0	Logic 0

DESCRIPTION

Multiple-channel PIN driver hybrid, accepts binary TTL input and selects one-of-n outputs. Selected output goes negative, all others remain positive. Overriding enable input forces all outputs positive when low, allowing easy expansion.

Models DS3 thru DS7 provide 0→(n-1) or 1→n decoding, so decoding can start at 0 or at 1.

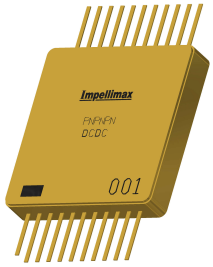
These drivers have integral reverse bias protection and contain internal .01uF bypass capacitors on both supply inputs.

For higher speed switching, see DF Series Data Sheet.

Screening to MIL-STD-883 available.

OUTLINES

DS3
Case Code 3, 4, 7



DS4 thru DS8
Case Code 5

FEATURES

- **Small Size**
- **Very Low Quiescent Current, Stable vs VEE**
- **40 nsec Typical Delay**
- **Selectable Coding, 0→(n-1) or 1→n**

PARAMETER	SYMBOL		MIN	TYP	MAX	UNITS
Positive Supply Voltage	V+		4.5	5.0	5.5	V
Negative Supply Voltage	V-	VEE	-2	-5	-16	V
		ZEN	-7	-	-21	V
TTL Input Currents, Input Low	I_{TTL0}	A, B, or C	-	-	-0.8	mA
		E	-	-	-1.6	mA
TTL Input Currents, Input High	I_{TTL1}	A, B, or C	-	-	40	uA
		E	-	-	80	uA
Switch Speed	Tsw		-	40	70	nsec
Positive Supply Current, No Load	I_{Q+}	DS3, DS4	-	18	25	mA
		DS5, DS6, DS7, DS8	-	20	34	mA
Negative Supply Current, No Load (5 to 21V)	I_{Q-}	DS3, DS4	-	10	15	mA
		DS5, DS6, DS7, DS8	-	16	20	mA

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA. Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

PIN CONNECTIONS

PIN	DS3	DS4	DS5	DS6	DS7	DS8
1	+5V	+5V	+5V	+5V	+5V	+5V
2	A	A	A	A	A	A
3	B	B	B	B	B	B
4	E	C	C	C	C	C
5	TP0	E	E	E	E	E
6	TP3	GND	GND	GND	GND	GND
7	IN 0/3	NC	NC	NC	NC	NC
8	OUT 0/3	NC	NC	NC	NC	NC
9	OUT1	ZEN	ZEN	ZEN	ZEN	ZEN
10	OUT2	NC	NC	NC	TP7	OUT7
11	VEE	VEE	VEE	VEE	VEE	VEE
12	GND	NC	NC	TP6	OUT6	OUT6
13	NC	NC	TP5	OUT5	OUT5	OUT5
14	NC	NC	NC	NC	NC	NC
15	NC	TP4	OUT4	OUT4	OUT4	OUT4
16	NC	NC	NC	NC	NC	NC
17	NC	OUT3	OUT3	OUT3	OUT3	OUT3
18	NC	IN 0/4	IN 0/5	IN 0/6	IN 0/7	NC
19	NC	OUT2	OUT2	OUT2	OUT2	OUT2
20	NC	OUT1	OUT1	OUT1	OUT1	OUT1
21	NC	OUT 0/4	OUT 0/5	OUT 0/6	OUT 0/7	OUT 0/8
22	GND	TP0	TP0	TP0	TP0	NC

1) **ZEN is an alternative negative input which provides a 5V series-connected zener in line with VEE input.**
2) **Connect IN 0/N to TP0 for active (000) channel. Connect IN 0/N to TP(n) for active (n) channel.**
3) **IN 0/N input is TTL compatible and can be driven from any TTL compatible logic input.**

Extremely Fast Inverting PIN Driver

DESCRIPTION

Extremely fast Inverting drivers with low quiescent current consumption and low TTL loading.

These drivers provide steady-state output current with current spikes for fast PIN and NIP switching.

Test points are provided to allow tailoring of output currents and spikes to particular applications. Internal current limiting assures that short-term accidental short-circuits to these test points will not damage driver.

Low input capacitance and logic current make these drivers TTL, LSTTL, High Speed CMOS, and NMOS compatible.

These circuits have high gain, making them relatively insensitive to radiation.

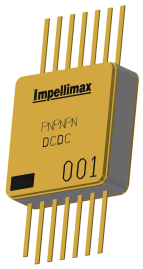
These drivers have integral reverse bias protection and contain internal .01 uF bypass capacitors on both supply inputs. All TTL inputs are ESD protected.

Screening to MIL-STD-883 available.

FEATURES

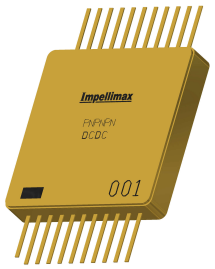
- **Extremely High Speed Switching**
- **Very Low Quiescent Supply Current, Stable vs VEE**
- **Compatible with TTL, LSTTL, HCT, NMOS**
- **Internal .01 uF bypass capacitors**
- **Testpoints are Short Circuit Protected**

OUTLINES



IX1, IX2
case 1, 2, 6

IX2, IX3, IX4
case 3, 4, 7



IX4, IX5, IX6
case C, 5

PIN CONNECTIONS

PIN	IX1	IX2	IX2	IX3	IX4	IX4	IX5	IX6
PKG	1,2,6	1,2,6	3,4,7	3,4,7	3,4,7	C, 5	C, 5	C, 5
1	VEE	VEE	VEE	VEE	VEE	VEE	VEE	VEE
2	OUT	OUT1	IN1	IN1	OUT1	IN1	IN1	IN1
3	GND	GND	TP1	TP1	TP1	TP1	TP1	TP1
4	IN	IN1	OUT1	OUT1	NC	OUT1	OUT1	OUT1
5	NC	NC	IN2	IN2	IN1	IN2	IN2	IN2
6	NC	NC	TP2	TP2	GND	TP2	TP2	TP2
7	+5V	+5V	OUT2	OUT2	IN2	OUT2	OUT2	OUT2
8	NC	+5V	NC	IN3	NC	IN3	IN3	IN3
9	NC	NC	NC	TP3	TP2	TP3	TP3	TP3
10	NC	NC	+5V	OUT3	OUT2	OUT3	OUT3	OUT3
11	TP	IN2	GND	+5V	NC	+5V	+5V	+5V
12	NC	GND	NC	GND	NC	VEE	VEE	VEE
13	NC	OUT2	NC	NC	OUT3	IN4	IN4	IN4
14	NC	VEE	NC	NC	TP3	TP4	TP4	TP4
15	NC	NC	NC	NC	NC	OUT4	OUT4	OUT4
16	NC	NC	NC	NC	IN3	NC	IN5	IN5
17	NC	NC	NC	NC	+5V	NC	TP5	TP5
18	NC	NC	NC	NC	IN4	NC	OUT5	OUT5
19	NC	NC	NC	NC	NC	NC	NC	IN6
20	NC	NC	NC	NC	TP4	NC	NC	TP6
21	NC	NC	NC	NC	OUT4	NC	NC	OUT6
22	NC	NC	NC	GND	NC	GND	GND	GND

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Voltage	V+	4.5	5	5.5	V
Negative Voltage	V-	-2	-	-17	V
Pos. Current (no load)	I_{Q+}	-	3.6	5	mA per Channel
Neg. Current (no load)	I_{Q-}	-	6.3	5	mA per Channel
Switching Speed	Tsw	-	5	8	nsec
TTL Sink Current	$I_{TTL\ 0}$	-	0.3	1.0	mA

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA.
Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

DESCRIPTION

High Speed PIN drivers with TTL compatible Exclusive-NOR inputs that allow for either inverting or non-inverting operation.

These drivers provide steady state output current with current spikes for fast PIN and NIP switching.

Testpoints are provided to allow tailoring of output currents and spikes to particular applications. Internal current limiting assures that short-term accidental short circuits to this test point will not damage driver.

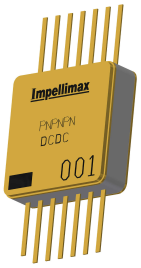
These drivers have integral reverse bias protection and contain .01 uF bypass capacitors on both supply inputs. All TTL inputs are ESD protected.

Screening to MIL-STD-833 is available.

FEATURES

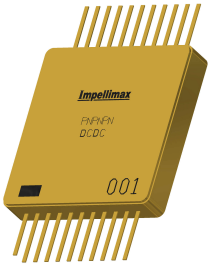
- -- **Reverse Bias/Short Circuit Protected**
- -- **Small Size**
- -- **Low Quiescent Current, Stable vs. VEE**
- -- **Choice of inverting or Non-Inverting Modes**
- -- **Low Input Capacitance, CMOS Compatible**
- -- **15 nsec Max Switch Delay**

OUTLINES



MF1, MF2
case 1, 2, 6

MF2, MF3, MF4
case 3, 4, 7



MF4
case C, 5

LOGIC

INA	INB	OUTPUT
0	0	+
0	1	-
1	0	-
1	1	+

If either INA or INB are connected to ground, then the output will be inverting relative to pulses input to the remaining input.

Allowing either INA or INB to 'float' Hi, or connecting INA or INB to +5V causes the output to be inverting relative to the remaining port.

PARAMETER	SYMBOL		MIN	TYP	MAX	UNITS
Positive Supply Voltage	V+		4.5	5.0	5.5	V
Negative Supply Voltage	V-		-2	-5	-16	V
TTL Input Currents, Input Low	I_{TTL0}		-	-	1.6	mA
TTL Input Currents, Input High	I_{TTL1}		-	-	40	uA
Switch Speed	Tsw		-	10	15	nsec
Positive Supply Current, No Load (VEE = -2V TO -16V)	I_{Q+}	Case 1 thru 4	-	12	15	mA
		Case 5, 6	-	24	30	mA
Negative Supply Current, No Load (VEE = -2V TO -16V)	I_{Q-}	MF1	-	5	7	mA
		MF2	-	10	14	mA
		MF4	-	20	28	mA

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA.
Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

PIN CONNECTIONS

PIN	MF1	MF2	MF2	MF3	MF4	MF4
PKG	1,2,6	1,2,6	3,4,7	3,4,7	3,4,7	C, 5
1	VEE	VEE	VEE	VEE	VEE	VEE
2	OUT	OUT1	OUT1	OUT1	OUT1	OUT1
3	GND	GND	TP1	TP1	TP1	TP1
4	NC	NC	IN 1A	IN 1A	IN 1A	IN 1A
5	IN A	IN 1A	IN 1B	IN 1B	IN 1B	IN 1B
6	IN B	IN 1B	GND	GND	GND	GND
7	+5V	+5V	IN 2B	IN 2B	IN 2B	IN 2B
8	NC	+5V	IN 2A	IN 2A	IN 2A	IN 2A
9	NC	IN 2B	TP2	TP2	TP2	TP2
10	NC	IN 2A	OUT2	OUT2	OUT2	OUT2
11	NC	NC	+5V	VEE	VEE	+5V
12	NC	GND	NC	NC	NC	VEE
13	NC	OUT2	NC	OUT3	OUT3	OUT3
14	NC	VEE	NC	TP3	TP3	TP3
15	NC	NC	NC	IN 3A	IN 3A	IN 3A
16	NC	NC	NC	IN 3B	IN 3B	IN 3B
17	NC	NC	NC	+5V	+5V	GND
18	NC	NC	NC	NC	IN 4B	IN 4B
19	NC	NC	NC	NC	IN 4A	IN 4A
20	NC	NC	NC	NC	TP4	TP4
21	NC	NC	NC	NC	OUT4	OUT4
22	NC	NC	NC	NC	NC	+5V

DESCRIPTION

Extremely fast noninverting drivers with low quiescent current consumption and low TTL loading.

These drivers provide steady-state output current with current spikes for fast PIN and NIP switching.

Test points are provided to allow tailoring of output currents and spikes to particular applications. Internal current limiting assures that short-term accidental short-circuits to these test points will not damage driver.

Low input capacitance and logic currents make these drivers TTL, LSTTL, High Speed CMOS, and NMOS compatible.

These circuits have high gain, making them relatively insensitive to radiation.

These drivers have integral reverse bias protection and contain internal .01 uF bypass capacitors on both supply inputs. All TTL inputs are ESD protected.

Screening to MIL-STD-883 available.

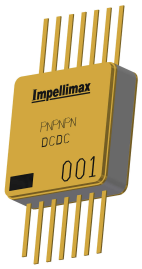
FEATURES

- **Extremely High Speed Switching**
- **Very Low Quiescent Supply Current, Stable vs. VEE.**
- **Compatible with TTL, LSTTL, HCT, NMOS**
- **Internal .01 uF bypass capacitors**
- **Testpoints are Short Circuit Protected.**

ELECTRICAL SPECIFICATIONS

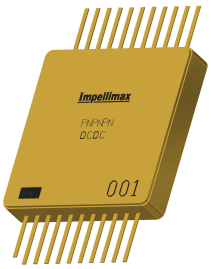
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Voltage	V+	4.5	5	5.5	V
Negative Voltage	V-	-2	-	-17	V
Pos. Current (no load)	I_{Q+}	-	3.6	7	mA per Channel
Neg. Current (no load)	I_{Q-}	-	3.6	7	mA per Channel
Switching Speed	Tsw	-	5	8	nsec
TTL Sink Current	$I_{TTL\ 0}$	-	0.3	1.0	mA

OUTLINES



NX1, NX2
case 1, 2, 6

NX2, NX3, NX4
case 3, 4, 7



NX4, NX5, NX6
case C, 5

PIN CONNECTIONS

PIN	NX1	NX2	NX2	NX3	NX4	NX4	NX5	NX6
PKG	1,2,6	1,2,6	3,4,7	3,4,7	3,4,7	C, 5	C, 5	C, 5
1	VEE	VEE	VEE	VEE	VEE	VEE	VEE	VEE
2	OUT	OUT1	IN1	IN1	OUT1	IN1	IN1	IN1
3	GND	GND	TP1	TP1	TP1	TP1	TP1	TP1
4	IN	IN1	OUT1	OUT1	NC	OUT1	OUT1	OUT1
5	NC	NC	IN2	IN2	IN1	IN2	IN2	IN2
6	NC	NC	TP2	TP2	GND	TP2	TP2	TP2
7	+5V	+5V	OUT2	OUT2	IN2	OUT2	OUT2	OUT2
8	NC	+5V	NC	IN3	NC	IN3	IN3	IN3
9	NC	NC	NC	TP3	TP2	TP3	TP3	TP3
10	NC	NC	+5V	OUT3	OUT2	OUT3	OUT3	OUT3
11	TP	IN2	GND	+5V	NC	+5V	+5V	+5V
12	NC	GND	NC	GND	NC	VEE	VEE	VEE
13	NC	OUT2	NC	NC	OUT3	IN4	IN4	IN4
14	NC	VEE	NC	NC	TP3	TP4	TP4	TP4
15	NC	NC	NC	NC	NC	OUT4	OUT4	OUT4
16	NC	NC	NC	NC	IN3	NC	IN5	IN5
17	NC	NC	NC	NC	+5V	NC	TP5	TP5
18	NC	NC	NC	NC	IN4	NC	OUT5	OUT5
19	NC	NC	NC	NC	NC	NC	NC	IN6
20	NC	NC	NC	NC	TP4	NC	NC	TP6
21	NC	NC	NC	NC	OUT4	NC	NC	OUT6
22	NC	NC	NC	GND	NC	GND	GND	GND

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA.
Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

Programmable Current Source/Sink with Mode Control

DESCRIPTION

Moderate speed drivers with true temperature-compensated current source and sink output. They are TTL compatible and have mode control inputs to allow for inverting and noninverting operation.

Current source and sink drivers reduce IL modulation in systems with poor VEE regulation. With multiple-series diode loads, where the forward voltage drop can change by volts over temperature, current source/sink drivers provide bias currents which are stable to within a few percent from -4V to -16V, and -55° C to +125 °C.

The designer is free to specify positive and negative output currents independently of each other and 'Boost' testpoints are provided that can be used to program output currents between the normal and Boosted values. The extent of the boosts are also per the designer's specifications.

FEATURES

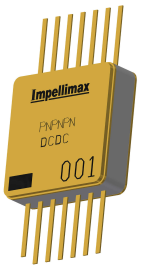
-- 30 nsec switching speed typical
-- Output currents stable vs VEE and load
-- Easy - to - integrate pinout
-- Iout pos & neg & boosts all independently programmable

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Pos. Bias Voltage	V+	4.5	5	7	V
Neg. Bias Voltage	V-	2.5	-5	-16	V
Switching Speed	Tsw	-	30	50	nsec
Pos. Supply (no load) per Chan.	1 q+	-	8	12	mA
Neg. Supply (no load) per Chan.	1 q-	-	5	-	mA

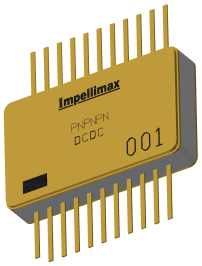
A wide range of normal and boost current values are possible, from 1 to 709 mA.

Consult factory with your requirements.

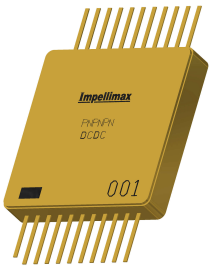
OUTLINES



PS1
case 1, 2, 6



PS2
case 3, 4, 7



PS3
case C, 5

INA	INB	OUTPUT
0	0	-
0	1	+
1	0	+
1	1	-

If either INA or INB are connected to ground, then the output will be noninverting relative to pulses input to the remaining input.

Allowing either INA or INB to 'float' HI, or connecting INA or INB to +5V causes the output to be inverting relative to the remaining port.

PIN CONNECTIONS

PIN	PS1	PS2	PS3
1	VEE	Input 1	VEE
2	- Boost	NC	-Boost 1
3	Input	-Boost 1	-Boost 2
4	GND	VEE	-Boost 3
5	Mode	-Boost 2	NC
6	+5V	NC	NC
7	+ Boost	+Boost 1	NC
8	NC	+5V	Input 1
9	NC	+Boost 2	Input 2
10	NC	NC	Input 3
11	Output	Input 2	GND
12	NC	NC	GND
13	NC	Output 2	Mode 3
14	NC	NC	Mode 2
15	NC	NC	Mode 1
16	NC	Mode 2	Output 3
17	NC	GND	Output 2
18	NC	Mode 1	Output 1
19	NC	NC	+Boost 3
20	NC	NC	+Boost 2
21	NC	Output 1	+Boost 1
22	NC	NC	+5V

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Extremely Fast Toggling PIN Driver

DESCRIPTION

TX series drivers consist of even quantities of inverting and noninverting channels convenient housed in a single package. By connecting the TT inputs of a pair of complementary driver channels together, the result is a single channel with complementary outputs.

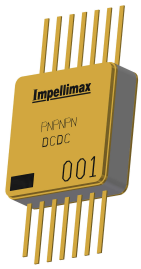
The switching speed of TX series drivers is excellent, since no gate delays are encountered. The skew time of TX complementary outputs is also small to unmeasurable, due to the lack of gate delay.

These drivers provide steady-state output current with current spikes for fast PIN and NIP switching. Testpoints are provided to allow tailoring of output currents and spikes to particular applications. Internal current limiting assures that short-term accidental short-circuits to the testpoints will not damage driver.

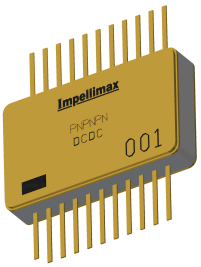
These drivers have integral reverse bias protection and contain internal .01 uF bypass capacitors on both supply inputs.

Screening to MIL-STD-883 is available.

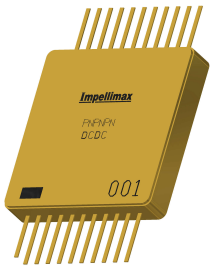
OUTLINES



TX1
case 1, 2, 6



TX1
case 3, 4, 7



TX2, TX3
case C, 5

FEATURES

- **Extremely High Speed Switching**
- **Very Low Quiescent Supply Current, Stable vs. VEE.**
- **Skew error typically ±2 nsec**
- **Internal .01 uF bypass capacitors**
- **Testpoints are Short Circuit Protected**

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Supply Voltage	V+	4.5	5.0	5.5	V
Negative Supply Voltage	V-	-2	-	-17	V
Positive Supply Current, No Load	I_{Q+}	-	3.6	7	mA output
Negative Supply Current, No Load	I_{Q-}	-	6.3	7	mA output
Switch Speed	Tsw	-	5	8	nsec
TTL Sink Current	I_{TTL0}	-	0.3	1.0	mA input

PIN CONNECTIONS

PIN PKG	TX1 1,2,6	TX1 3,4,7	TX2 C, 5	TX3 C, 5
1	VEE	VEE	VEE	VEE
2	OUT1 N	OUT1 N	IN1 N	IN1 N
3	GND	GND	TP1 N	TP1 N
4	IN1 N	IN1 N	OUT1 N	OUT1 N
5	NC	+5V	IN2 N	IN2 N
6	NC	NC	TP2 N	TP2 N
7	+5V	VEE	OUT2 N	OUT2 N
8	+5V	OUT2 I	NC	IN3 N
9	NC	GND	NC	TP3 N
10	NC	IN1 I	NC	OUT3 N
11	IN1 I	+5V	+5V	+5V
12	GND	NC	VEE	VEE
13	OUT1 I	NC	IN1 I	IN1 I
14	VEE	TP1	TP1 I	TP1 I
15	NC	NC	OUT1 I	OUT1 I
16	NC	NC	IN2 I	IN2 I
17	NC	NC	TP2 I	TP2 I
18	NC	NC	OUT2 I	OUT2 I
19	NC	NC	NC	IN3 I
20	NC	TPN	NC	TP3 I
21	NC	NC	NC	OUT3 I
22	NC	NC	GND	GND

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA. Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

DESCRIPTION

Moderate speed drivers designed for applications where space is at a premium, they are also suitable for use anywhere a simple, small driver is desired.

Three logic types are offered: Inverting, Noninverting, and Toggle. All drivers contain internal .01 uF capacitors to provide bypassing on both supplies.

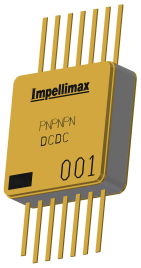
Low internal dissipation has been designed in to keep thermal requirements simple. These drivers are fully TTL compatible and unconditionally stable with a negative supply range of from 0V to -12V ("A" voltage code).

See Note #SD101 for other microminiature PIN driver styles and options.

FEATURES

- **Small Size, High Density**
- **Very Low Quiescent Supply Current**
- **Moderate Speed - 25 nsec Typical Delay**
- **Simple-to-Integrate Pinouts**
- **Each Input is One LSTTL Load**
- **Output Testpoints on IS2, NS2, & TS1**

OUTLINES



IS2, NS2, TS1, IS4, NS4
case 1, 2, 6

IS8, NS8
case 3, 4, 7

PIN CONNECTIONS

PIN	IS2, NS2	TS1	IS4, NS4	IS8, NS8
1	VEE	VEE	+5V	+5V
2	OUT1	INV OUT	IN1	IN1
3	IN1	GND	OUT1	OUT1
4	GND	IN	IN2	IN2
5	IN2	NC	OUT2	OUT2
6	OUT2	NINV OUT	NC	IN3
7	+5V	+5V	GND	OUT3
8	OUT2	NINV OUT	GND	IN4
9	NC	NC	NC	OUT4
10	TP2	NINV TP	IN3	NC
11	NC	NC	OUT3	GND
12	TP1	INV TP	IN4	GND
13	NC	NC	OUT4	NC
14	OUT1	INV OUT	VEE	IN5
15	NC	NC	NC	OUT5
16	NC	NC	NC	IN6
17	NC	NC	NC	OUT6
18	NC	NC	NC	IN7
19	NC	NC	NC	OUT7
20	NC	NC	NC	IN8
21	NC	NC	NC	OUT8
22	NC	NC	NC	VEE

Versions with fewer channels are available.
Delete unused pins.
Redundantly labeled pins are internally connected.

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25, 30, 40, and 50 mA.
Negative output current varies with negative supply voltage.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Supply Voltage	V+	4.5	5.0	5.5	V
Negative Supply Voltage	V-	0	-5	-16	V
Switch Speed	Tsw	-	25	60	nsec
Positive Supply Current, No Load Per Chan.	I_{Q+}	-	2	5	mA
Negative Supply Current, No Load Per Chan.	I_{Q-}	-	2	5	mA
TTL Input Currents, Input Low	I_{TTL0}	-	0.5	0.8	mA
TTL Input Currents, Input High	I_{TTL1}	-	0	40	uA

DESCRIPTION

High Speed PIN drivers with TTL compatible Exclusive-OR inputs that allow for either inverting or non-inverting operation.

These drivers provide steady state output current with current spikes for fast PIN and NIP switching.

Testpoints are provided to allow tailoring of output currents and spikes to particular applications. Internal current limiting assures that short-term accidental short circuits to this test point will not damage driver.

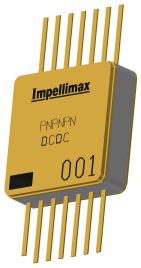
These drivers have integral reverse bias protection and contain .01 uF bypass capacitors on both supply inputs. All TTL inputs are ESD protected.

Screening to MIL-STD-833 is available.

FEATURES

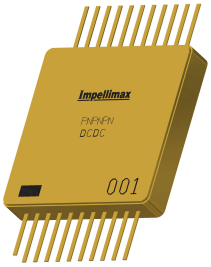
- **Reverse Bias/Short Circuit Protected**
- **Small Size**
- **Low Quiescent Current, Stable vs. VEE**
- **Choice of Inverting or Non-Inverting Modes**
- **Low Input Capacitance, CMOS Compatible**
- **15 nsec Max Switch Delay**

OUTLINES



XF1
case 1, 2, 6

XF2
case 3, 4, 7



XF3, XF4
case C, 5

LOGIC

INA	INB	OUTPUT
0	0	-
0	1	+
1	0	+
1	1	-

If either INA or INB are connected to ground, then the output will be noninverting relative to pulses input to the remaining input.

Allowing either INA or INB to 'float' Hi, or connecting INA or INB to +5V causes the output to be inverting relative to the remaining port.

PARAMETER	SYMBOL		MIN	TYP	MAX	UNITS
Positive Supply Voltage	V+		4.5	5.0	5.5	V
Negative Supply Voltage	V-		-2	-5	-16	V
TTL Input Currents, Input Low	I_{TTL0}		-	-	1.6	mA
TTL Input Currents, Input High	I_{TTL1}		-	-	40	uA
Switch Speed	Tsw		-	10	15	nsec
Positive Supply Current, No Load (VEE = -2V TO -16V)	I_{Q+}	Case 1 thru 4	-	12	15	mA
		Case 5, 6	-	24	30	mA
Negative Supply Current, No Load (VEE = -2V TO -16V)	I_{Q-}	XF1	-	5	7	mA
		XF2	-	10	14	mA
		XF4	-	20	28	mA

OUTPUT CURRENTS

The following nominal positive output currents are available:
5, 10, 15, 20, 25 mA, and 30, 40, 50, 60, 70 mA.
Negative output current is of equal magnitude at -5V, and increases linearly with increasing negative bias.

PIN CONNECTIONS

PIN PKG	XF1 1,2,6	XF2 1,2,6	XF2 3,4,7	XF3 C, 5	XF4 C, 5
1	VEE	VEE	VEE	VEE	VEE
2	OUT	OUT1	OUT1	OUT1	OUT1
3	GND	GND	TP OUT1	TP OUT1	TP OUT1
4	IN A	IN 1A	IN 1A	IN 1A	IN 1A
5	IN B	IN 1B	IN 1B	IN 1B	IN 1B
6	NC	NC	GND	GND	GND
7	+5V	+5V	IN 2B	IN 2B	IN 2B
8	NC	+5V	IN 2A	IN 2A	IN 2A
9	NC	NC	TP OUT2	TP OUT2	TP OUT2
10	NC	IN 2B	OUT2	OUT2	OUT2
11	NC	IN 2A	+5V	+5V	+5V
12	NC	GND	NC	VEE	VEE
13	NC	OUT2	NC	OUT3	OUT3
14	NC	VEE	NC	TP OUT3	TP OUT3
15	NC	NC	NC	IN 3A	IN 3A
16	NC	NC	NC	IN 3B	IN 3B
17	NC	NC	NC	GND	GND
18	NC	NC	NC	NC	IN 4B
19	NC	NC	NC	NC	IN 4A
20	NC	NC	NC	NC	TP OUT4
21	NC	NC	NC	NC	OUT4
22	NC	NC	NC	NC	+5V

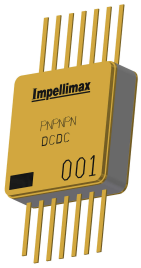
DESCRIPTION

Moderate speed PIN drivers with TTL mode control inputs. Outputs are positive when both inputs are logical complements.

XS Series drivers are reverse-bias protected and are rated for positive over-voltage to +7V. All TTL inputs are ESD protected. Both bias supplies have internal .01uF bypass capacitors.

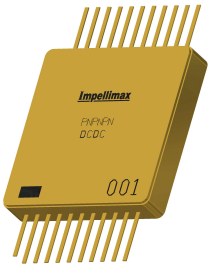
These drivers are guaranteed for stability when operating with any negative supply voltage from -2V to -12V (A voltage code) or -2V to -16V (B voltage code).

OUTLINES



XS1
case 1, 2, 6

XS2, XS3, XS4
case 3, 4, 7



XS5, XS6
case C, 5

LOGIC

INA	INB	OUTPUT
0	0	-
0	1	+
1	0	+
1	1	-

If either INA or INB are connected to ground, then the output will be noninverting relative to pulses input to the remaining input.

Allowing either INA or INB to 'float' Hi, or connecting INA or INB to +5V causes the output to be inverting relative to the remaining port.

FEATURES

- **Reverse Bias Protected**
- **Low Quiescent Current, Stable vs VEE**
- **Small Size: XS1, XS2 can be SIP**
  XS2, XS3, XS4 are 3/8 by 5/8
- **Inverting and Noninverting Modes**
- **Fast - 30 nsec Typical Delay**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Bias Voltage	+V	4.5	5.0	7	V
Negative Bias Voltage	-V	-2	-5.0	-16	V
TTL Input Currents, Input -	$I-_{TTL0}$	-	0.8	1.6	mA
TTL Input Currents, Input +	$I+_{TTL1}$	-	-	40	uA
Switch Speed	Tsw	-	30	70	nsec
Pos. Supply, No Load Per Chan.	I_Q+	-	3	8	mA
Neg. Supply, No Load Per Chan.	I_Q-	-	3	8	mA

PIN CONNECTIONS

PIN	XS1	XS2	XS3	XS4	XS5	XS6
1	VEE	+5V	+5V	+5V	+5V	+5V
2	OUT	IN 1A	IN 1A	IN 1A	OUT1	OUT1
3	GND	IN 1B	IN 1B	IN 1B	IN 1A	IN 1A
4	INA	IN 2A	IN 2A	IN 2A	IN 1B	IN 1B
5	INB	IN 2B	IN 2B	IN 2B	OUT2	OUT2
6	NC	NC	NC	NC	IN 2A	IN 2A
7	+5V	OUT1	OUT1	OUT1	IN 2B	IN 2B
8	NC	NC	NC	NC	OUT3	OUT3
9	NC	OUT2	OUT2	OUT2	IN 3A	IN 3A
10	NC	GND	NC	NC	IN 3B	IN 3B
11	NC	VEE	VEE	VEE	GND	GND
12	NC	NC	GND	GND	VEE	VEE
13	NC	NC	NC	NC	NC	OUT6
14	NC	NC	NC	OUT4	NC	IN 6A
15	NC	NC	NC	NC	NC	IN 6B
16	NC	NC	OUT3	OUT3	OUT5	OUT5
17	NC	NC	NC	NC	IN 5A	IN 5A
18	NC	NC	NC	IN 4B	IN 5B	IN 5B
19	NC	NC	NC	IN 4A	OUT4	OUT4
20	NC	NC	IN 3B	IN 3B	IN 4A	IN 4A
21	NC	NC	IN 3A	IN 3A	IN 4B	IN 4B
22	NC	NC	GND	GND	GND	GND

PIN Drivers for Series/Shunt Switches, Positive Voltage Only

DESCRIPTION

Positive-only drivers are designed for driving PIN switches in applications in which no negative supply voltages are available. Each channel has two outputs; one which switches between +.2V and +4.5V, and another which switches between +.2V and some more positive voltage, in the range of +4.5V to +16V. The .2 to 4.5V output is useful as a driver for shunt PINs, while the .2 to +V output can be used to drive series diodes and/or matching diodes. DC blocking capacitors must be included in the switch design to permit separate series and shunt diode biasing. Both "series" and "shunt" driver outputs have internal resistances to set output current magnitudes.

By applying a DC voltage offset to the anode of the series diode or diodes, the wide output voltage swing of the "series" output allows the series diode to be reverse biased in the isolation state. This improves power handling and switching speed, increases isolation, and in multi-throw switches decreases insertion loss of the low-loss path. The "series" output can also be used to bias matching diodes in the isolation state.

Each channel has independent mode controls to allow for inverting or noninverting operation, and these drivers have .01 uF bypass capacitors on both supply inputs.

For driving series diodes only, see 9235 driver data sheet.

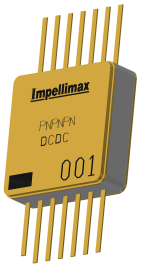
Screening to MIL-STD-883 is available.

FEATURES

-- 5 Only or +5/+V Operation
-- Inverting and Noninverting Mode Control
-- Fast -30 nsec Typical Delay
-- Internal .01uF on Both Supply Inputs

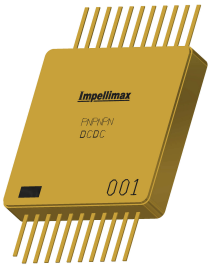
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Bias Voltage	+5V	4.5	5.0	7	V
+V Voltage	+V	4.5	10	15	V
TTL Input Currents, Input -	I_{TTL0}	-	0.8	1.6	mA
TTL Input Currents, Input +	I_{TTL1}	-	-	40	uA
Switch Speed	Tsw	-	30	70	nsec
+5V Supply, No Load Per Chan.	I_Q+5	-	5	12	mA
+V Supply, No Load Per Chan.	I_Q+V	-	5	12	mA

OUTLINES



XS1
case 1, 2, 6

XS2
case 3, 4, 7



XS3, XS4
case C,5

LOGIC

INA	INB	OUTPUT
0	0	< +0.2V
0	1	+5V, +V
1	0	+5V, +V
1	1	< +0.2V

If either INA or INB are connected to ground, then the outputs will be noninverting relative to pulses input to the remaining input.

Allowing either INA or INB to 'float' HI, or connecting INA or INB to +5V causes the outputs to be inverting relative to the remaining port.

PIN CONNECTIONS

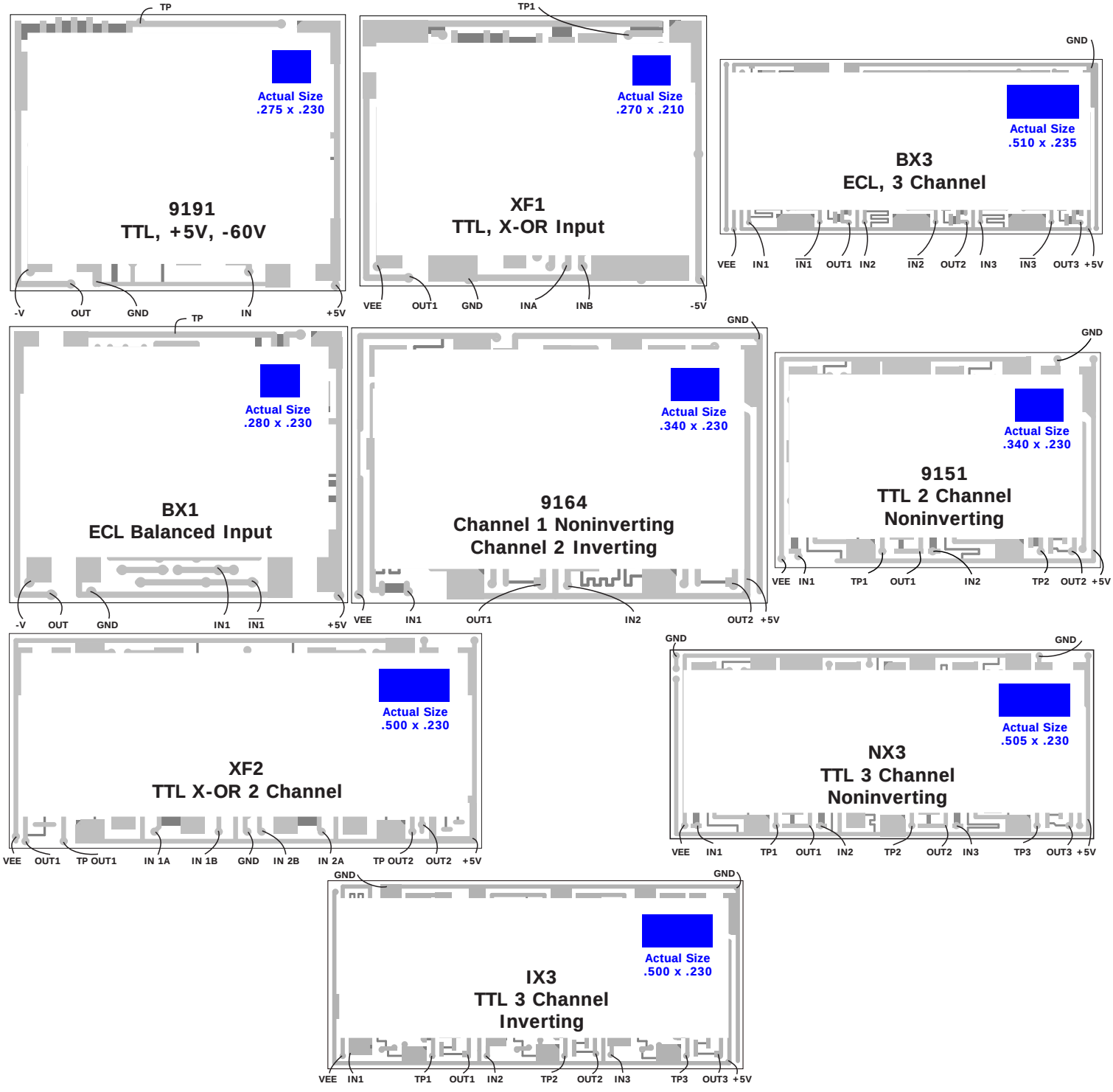
PIN	XS1 (P)	XS2 (P)	XS3 (P)	XS4 (P)
1	+v	+5V	+5V	+5V
2	SERIES	NC	SER 1	SER 1
3	GND	IN 1A	SHUNT 1	SHUNT 1
4	SHUNT	IN 1B	IN 1A	IN 1A
5	INA	NC	IN 1B	IN 1B
6	INB	GND	IN 2A	IN 2A
7	+5V	NC	IN 2B	IN 2B
8	NC	IN 2B	SHUNT 2	SHUNT 2
9	NC	IN 2A	SER 2	SER 2
10	NC	NC	NC	NC
11	NC	+V	GND	GND
12	NC	SER 2	+V	+V
13	NC	NC	SER 3	SER 3
14	NC	SHUNT 2	SHUNT 3	SHUNT 3
15	NC	NC	IN 3A	IN 3A
16	NC	NC	IN 3B	IN 3B
17	NC	NC	NC	IN 4A
18	NC	NC	NC	IN 4B
19	NC	NC	NC	SHUNT 4
20	NC	SHUNT 1	NC	SER 4
21	NC	NC	NC	NC
22	NC	SER 1	GND	GND

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

In some applications where space is very limited, a packaged driver can not be used. Most Impellimax drivers therefore are available as unpackaged, or Substrate, drivers. We denote such parts with an "S" in the package code portion of our standard parts nomenclature. Also, several of our 9000 series drivers are in substrate format.

Impellimax substrate drivers are 100% electrically tested and meet the visual inspection criteria of MIL-STD-883C methods 2017 and 2032.

Connections to the driver are typically made via 7 mil diameter pads located near the periphery of the substrate. These pads are gold plated and capable of being ultrasonically or thermosonically bonded to, using aluminum or gold ribbons or wires. The soldering of wires to these pads is not recommended.



375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

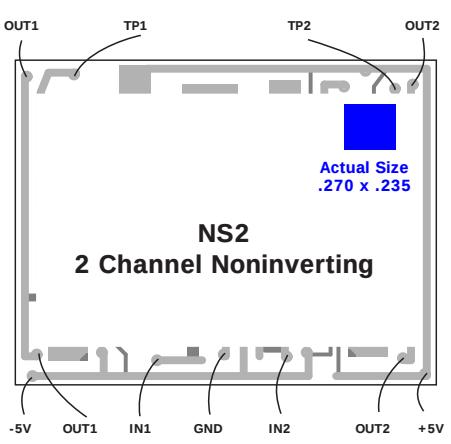
SUBSTRATE DRIVERS

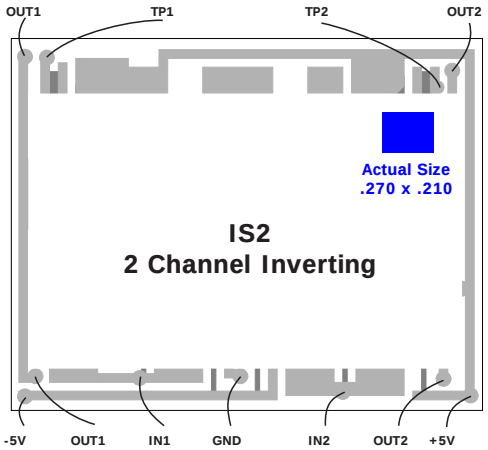
ULTRA COMPACT

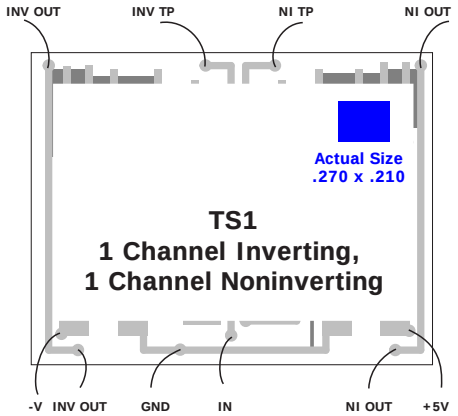
In some applications where space is very limited, a packaged driver can not be used. Most Impellimax drivers therefore are available as unpackaged, or Substrate, drivers. We denote such parts with an "S" in the package code portion of our standard parts nomenclature. Also, several of our 9000 series drivers are in substrate format.

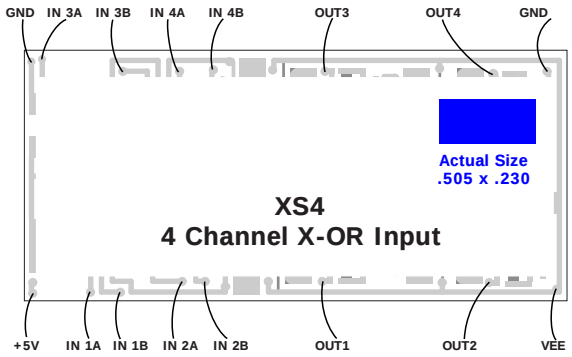
Impellimax substrate drivers are 100% electrically tested and meet the visual inspection criteria of MIL-STD-883C methods 2017 and 2032.

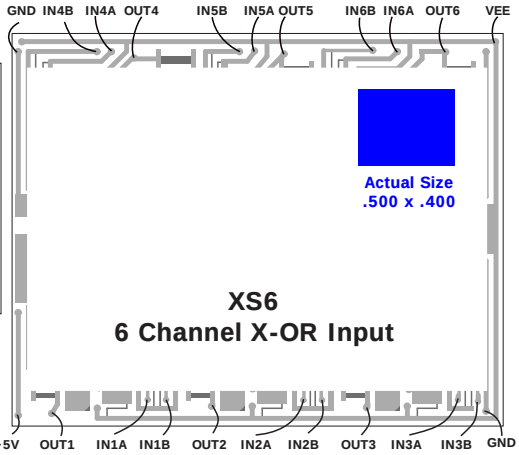
Connections to the driver are typically made via 7 mil diameter pads located near the periphery of the substrate. These pads are gold plated and capable of being ultrasonically or thermosonically bonded to, using aluminum or gold ribbons or wires. The soldering of wires to these pads is not recommended.

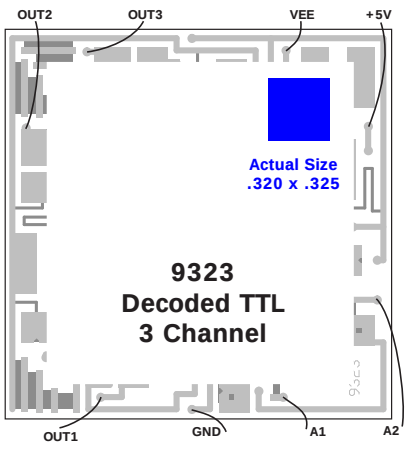


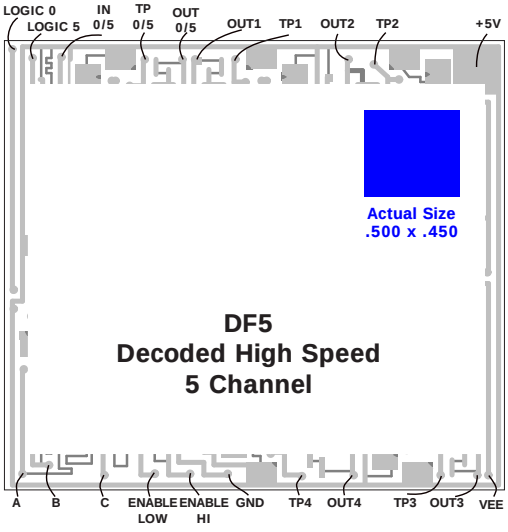


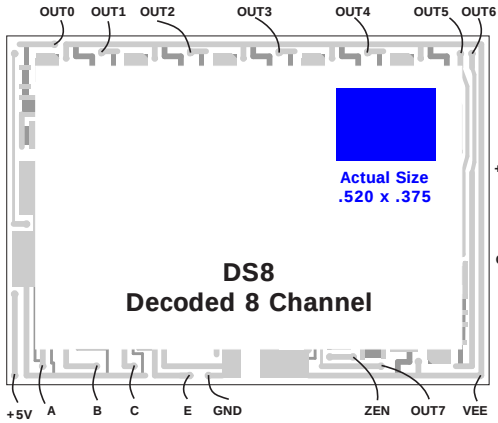


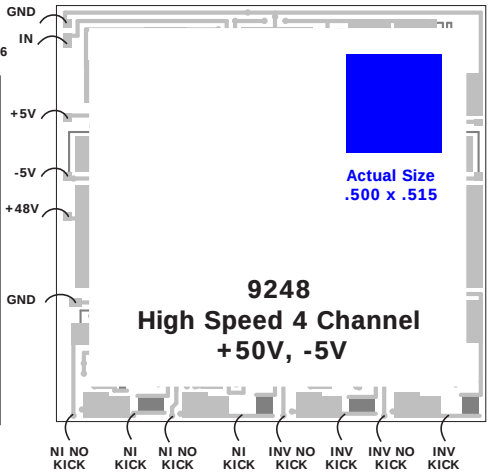




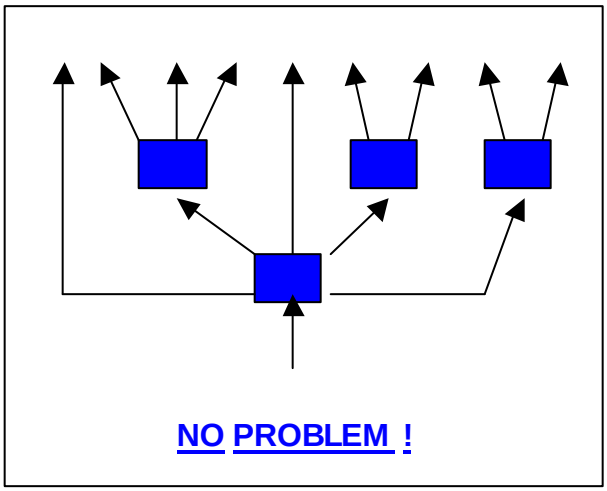








Decoding Chip Sets for Multi-throw Switches



Multi-throw microwave switches are sometimes made in a "tree-style" structure, in which there is an input multi-throw switch that feeds one or more multi-throws. Driving such a switch requires a special arrangement of logic decoding. This note introduces products and methods for dealing with such circumstances.

We are pleased to offer a range of useful PIN switch driver alternatives for designers of multi-throw switches.

The standard DS (Decoder Slow) and DF (Decoder Fast) PIN diode driver styles are well suited for multi-throw switches which have all of the switch arms converging at a common junction. In such a configuration, the truth table is basically that one arm is energized while the others are at the opposite state.

It is frequently useful, however, to design multi-throw switches in a "tree" formation, in which the main "trunk" splits into two or more branches, and some of the branches in turn split again one or more times to achieve the desired number of throws.

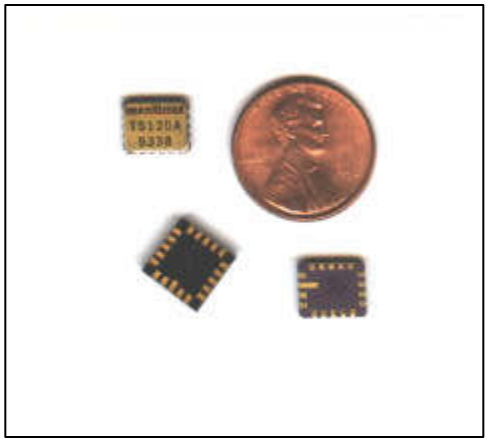
Of course, the simplest way to set this up, from a DC standpoint, is to make all of the splits be 2, 4, or 8-throws. This allows the binary selection word bits to directly control the tiers in the switch. As a simple example, consider an SP8T configured as a group of seven SP2T switches. The first tier is the single input SP2T. The second tier consists of two SP2T's fed by the first tier. Lastly, the third tier is a set of four SP2T's, all fed by the outputs of the second tier of switches. This configuration can be simply driven by using the MSB to control the first tier switches, the middle bit to control the second tier, and lastly the LSB to control the third tier.

This arrangement does not provide optimal isolation, however, because there will always be arms that are in insertion loss, despite the fact that they are in off-selected RF paths. Also, RF or mechanical considerations may require that the switch arrangement should be more exotic. If, for example, there are SP3T switches that must be configured into a binary-selected SP8T, or even an SP9T, this can be accommodated with appropriate driver logic.

At this writing, there exists a wide range of semi-custom decoded drivers with auxiliary TTL inputs and outputs to make these sorts of arrangements simple. We frequently embed "glue logic" for our customers, so that the simplest assemblies result.

Please feel free to call Impellimax early in your design cycle, so that we can provide the best driver solution to your multi-throw switch driver requirements. Fax us your set-up or your logic table. We may have just what you need. If not, we'll work at it until we do.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com



Leadless Chip Carrier (LCC) packaging provides tremendous possibilities for reducing the size of microwave switches. In many cases, LCC drivers can be soldered directly to the Duroid[tm] of the RF switch, reducing hand-wiring to a minimum.

Highly compact microwave switches usually require the use of unpackaged hybrid circuits, to minimize real estate usage. An alternative that can be considered is LCC packaging of drivers. With LCC drivers, it is possible to design switches into tight outlines while having the convenience and simple assembly of a drop-in driver.

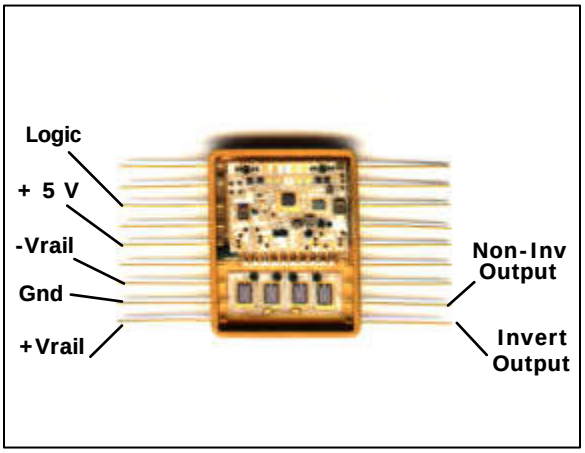
LCC drivers can be mounted directly to the Duroid[tm] of the RF switch, or on a separate driver PC board, in the usual surface-mount manner. Alternatively, they can be mounted inverted on the floor of the chassis, using a suitable epoxy, and wires can be soldered to the LCC pads. In extreme situations, LCC drivers have also been designed into the crevasses between component bodies, with connection to the sides of the package (the solderable crenellations) being made by hand-wiring.

The LCC drivers shown above are printed at actual size. The "TS120A" unit shown is our TS120AL driver, which provides two PIN diode driver outputs of opposite polarity. Switching speed is 30 nano-seconds, and TTL compatibility is assured over the full military temperature range. Output current is internally set, so no external components are needed between the driver and the diode loads.

Many other useful drivers are available In the same package style, including dual-output GaAs MMIC drivers, dual independent 30 nsec PIN drivers (both inverting, both noninverting, or one of each), and single high speed PIN drivers with 5 nanosecond switching speed. In slightly larger LCC packages, we have decoded multi-channel PIN drivers and attenuator linearizers available. In some applications, external power supply bypassing capacitors may be needed.

LCC packages can be hermetically sealed and full MIL screening is available. Many of our standard hybrids can be converted to LCC packaging. Contact the factory for details.

High Voltage Hybrid Drivers, 1 Kilovolt Capability



Using patent-pending high voltage technology, this unique family of devices allows very high voltage capability with switching speeds down to 500 nsec in some cases. The device at left is a two-output 350 Volt PIN diode driver, shown actual size.

By integrating miniature transformers within a chip-and-wire hybrid circuit, these drivers provide very high voltage switching in a compact form factor.

Logic input can be standard TTL or CMOS, High Noise Immunity TTL, or balanced logic (such as RS-422). Logic function is DC-coupled, as opposed to some high-voltage technologies that can't provide a persistent positive or negative output state.

Output currents can range to hundreds of milliamps per output, and the magnitude of the output current is set by external resistors. The user has complete control over the positive and negative output rail supply voltages. Each driver output structure can be thought of as a high-speed SP2T DC switch that switches to either of the two output rail supply voltages, provided that the "positive" rail is more positive than the "negative" rail and that the rated voltage deltas aren't exceeded. The outputs can sink and source current.

An Enable/Disable logic input can be provided, as an option, to totally isolate the driver outputs into a "tri-state" like mode. An internal +5 V regulator is an option to allow TTL compatible front-end circuitry to be operated from higher positive voltages.

The high voltage technology used in this family guarantees a fixed "dead-time" during switching, to assure safe and reliable switching without "shoot-thru" effects that can lead to high current consumption and device failure.

Hermetic packaging and MIL screening are available. Contact the factory for more complete details and applications assistance.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Impellimax

Decoded Five Channel -100 V PIN Diode Driver

Internally decoded high voltage driver for high power RF switching. Unit accepts a binary or BCD TTL word that selects one of the five outputs goes negative, while the remaining channels are positive. Outputs provide current spikes for fast switching speed.

Package size is .625 square, .10 thick, 22 leads

High-power multi-throw RF switches can be easily driven by this family of standard high-voltage decoded PIN diode drivers. Load diodes can be connected directly to the output pins, and TTL selection logic is applied to the device input pins.

switching speed is typically 30 nsec open circuit. Load diode lifetime and biasing considerations will affect RF switching speed. Where speed requirements are less of an issue, the slower DS version of this family can be used, to provide a lower cost solution.

The decoding arrangement of the unit can be user-configured to be either 0 to 4 (binary 000 to 100) or 1 to 5 (binary 001 to 101) by externally strapping the desired logic testpoints together. Other decoding arrangements can be provided. Contact the factory for details. Pin-out of the PIN driver family is consistent with the Impellimax lower voltage DF series, which simplifies the migration of low voltage designs to higher operating voltages.

These units contain internal .01 uF bypassing on the +5V supply, and 5000 pF bypassing on the negative supply. This bypassing eliminates high frequency noise components within the hybrid, but additional external bypassing is recommended for best switching speed performance. Negative supply range is -5 to -100 Volts.

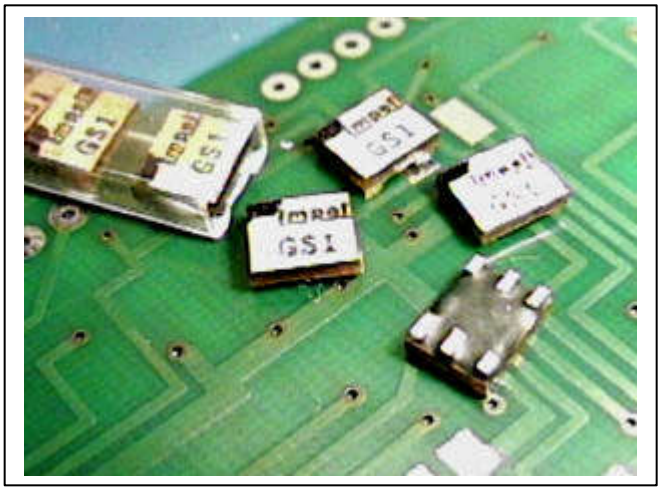
Output currents can be internally set for +10 mA thru +75 mA, and current spiking is provided by internal 1000 pF output spiking capacitors. Output testpoints are also provided, to allow the user to adjust output currents and current spikes, and to allow other output circuit capabilities.

Hermetic packaging and MIL screening are available. Contact the factory for more complete details and applications assistance.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Impellimax

Micro-mini, Low Cost GaAs Switch Drivers



Surface mountable GaAs FET switch drivers are available that pack high performance into a miniature device. COB (chip-on-board) and mass production combine to provide a low cost, convenient switch driver solution.

THIS IS A PRELIMINARY INFO SHEET
Some details are still TBD and are subject to modification as development progresses.

These drivers accept TTL or CMOS logic levels and provide two complementary output lines which switch between -V and ground, for use with grounded-die GaAs FET MMIC switch chips. The units are available in tubes for compatibility with automated SMT assembly equipment.

Two packaging options are available, .350 inch square (for high-speed applications) and SO-6 footprint (for medium-speed uses). In a .350 square package, switching speed is less typically under 8 nsec, and in the SO-6 footprint, various speed/power options are available, with switching times in the range of 200 nanoseconds to 2 microseconds, and supply currents as low as 50 microamperes.

The outputs are of a fail-safe design that will not apply positive voltage to the GaAs device, even if the negative supply is removed or interrupted. The circuit will function with any negative supply voltage, from -2V to -15V, and the negative output voltage is within millivolts of the negative supply.

The top surface of the package is flat and compatible with vacuum pick-up tools. The three leads of the device are gold plated and permanently affixed, so that misalignment or flexing of the leads is not a problem. The nomenclature and underside potting compound will not be damaged by PC board cleaning solvents.

In addition to their use on SMT PC Boards, these drivers can also be a convenient device for inclusion into RF switch housings, wherein the package can be mounted in an inverted fashion and wires can be soldered to the leads. As an additional alternative, the leads can be wirebonded or ribbon bonded.

This form of device is intended for non-military screening applications. Contact the factory for additional details and customization options.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Impellimax

HOW TO ORDER

GaAs MMIC SWITCH DRIVERS

G							-	
GaAs Driver	Type	Channels	Configuration		Voltage	Package		QA Codes

Example: **GX101B2-B** **GaAs MMIC Extremely fast TTL 1 channel +5, -15V driver in 3/8 by 3/8 ceramic package, Burned in.**

TYPE CODES:

X: Extremely fast TTL compatible.

S: Slow TTL compatible.

D: Decoded Binary TTL. Two or three bit input word selects one pair of outputs to be reversed relative to all other output pairs.

C: Complement Logic Input. Line receiver TTL with two complement inputs per channel.

E: ECL unbalanced (1 line) driver.

B: Balanced ECL (2 line) driver.

NUMBER OF CHANNELS:

For drivers of type codes X, S, C, E and B, each pair of outputs constitutes one channel.

For type code D drivers, each pair of outputs is counted as a separate channel.

The third character of a GaAs driver's Impellimax part number is a numeral from 1 thru 9 which is the total quantity of channels per driver as defined above.

CONFIGURATION CODE:

Two characters in the Impellimax part number of GaAs drivers are set aside to allow slight variations in performance, layout, and functions to be clearly identified by a sequential code, assigned by the factory. This allows customer-specific requirements to be met within the framework of a standard parts codification scheme.

VOLTAGE CODE: **See Impellimax PIN driver HOW TO ORDER sheet for details.**

PACKAGE: **See Impellimax PIN driver HOW TO ORDER sheet for details.**

QUALITY AND ENVIRONMENTAL CODES: **See Impellimax PIN driver HOW TO ORDER sheet for details.**

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

DESCRIPTION

GB series drivers are very high speed GaAs MMIC drivers designed for use in Balanced ECL Systems. They have a wide common-mode input voltage range (typically from +3V to within 2 volts of the negative supply voltage) and high differential gain, which allows them to switch reliably even when driven by noisy twisted pair lines. The ECL inputs are of very high impedance and not capacitively loaded, so that ring-free matching to ECL system impedance can be accomplished with external matching resistors.

These drivers do not require a -5.2V supply to assure ECL compatibility. Any negative voltage from -4 volts to -16 volts is acceptable. The outputs swing form 0 Volts to a negative voltage which can be set by an external resistor, or to the negative supply voltage if so desired. Quiescent current consumption is less than 10 mA, positive and negative, per channel. Each channel has two complementary outputs.

Screening to MIL-STD-883 is available.

FEATURES

-- High Speed, 6 nsec typical

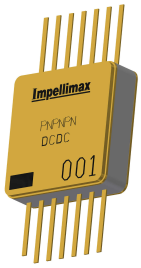
-- Selectable output voltage range

-- Low impedance outputs for fast charging of gate capacitance

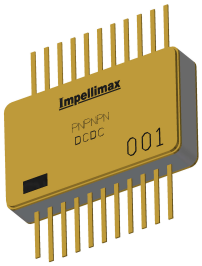
-- Complementary outputs for series and shunt FET biasing

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Positive Bias Voltage	+V	4.5	5.0	7	V
Negative Bias Voltage	-V	-4	-5.2	-16	V
Switch Speed	Tsw	-	6	8	nsec
Pos. Supply, Per Chan.	I_Q+	-	5	12	mA
Neg. Supply, Per Chan.	I_Q-	-	-5	12	mA

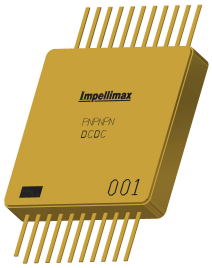
OUTLINES



GB1
Case 1, 2, 6



GB2
Case 3, 4, 7



GB3, GB4
Case C,5

PIN CONNECTIONS

PIN	GB1	GB2	GB3	GB4
1	VEE	VEE	VEE	VEE
2	INV OUT	R SET	R SET	R SET
3	GND	INV OUT1	INV OUT1	INV OUT1
4	INPUT	INPUT1	INPUT1	INPUT1
5	$\overline{\text{INPUT}}$	$\overline{\text{INPUT1}}$	$\overline{\text{INPUT1}}$	$\overline{\text{INPUT1}}$
6	NONINV OUT	NONINV OUT1	NONINV OUT1	NONINV OUT1
7	+5V	INV OUT2	INV OUT2	INV OUT2
8	NC	INPUT2	INPUT2	INPUT2
9	NC	INPUT2	INPUT2	INPUT2
10	-V INT	NONINV OUT2	NONINV OUT2	NONINV OUT2
11	NC	+5V	+5V	+5V
12	R SET	NC	GND	GND
13	NC	NC	-V INT	-V INT
14	NC	NC	INV OUT3	INV OUT3
15	NC	NC	INPUT3	INPUT3
16	NC	NC	INPUT3	INPUT3
17	NC	NC	NONINV OUT3	NONINV OUT3
18	NC	NC	NC	INV OUT4
19	NC	NC	NC	INPUT4
20	NC	GND	NC	INPUT4
21	NC	NC	NC	NONINV OUT4
22	NC	-V INT	+5V	+5V

Connect resistor between R set testpoint and negative supply input. Select resistance using R set = [1.4 (Vin - Vout - 1V)] / Vout.

To obtain maximum negative output voltage, as when operating from a -5V supply, connect negative input voltage directly to -Vint.

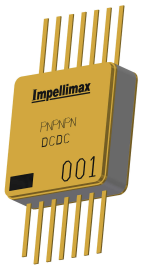
DESCRIPTION

Moderate speed drivers designed specifically for GaAs MMIC switch IC's. Each driver channel has one TTL compatible input and a pair of outputs which are complementary.

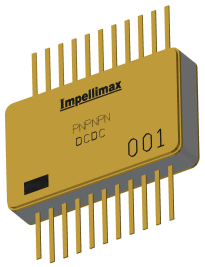
These drivers will operate with a negative supply of -5 volts to -15 volts. The outputs swing from 0 volts to a negative voltage which can be set by an external resistor, or to the negative supply voltage if so desired. This allows the designer to select an optimum gate bias voltage regardless of supply voltage level.

These drivers contain internal .01 uF bypass capacitors, and they are reverse bias and ESD protected. GS series drivers draw very little quiescent supply current, so that the performance of GaAs MMICs is in no way compromised.

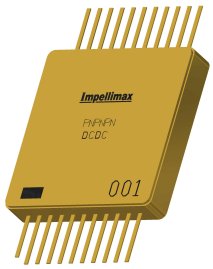
OUTLINES



GS1, GS2
Case 1, 2, 6



GS3, GS4
Case 3, 4, 7



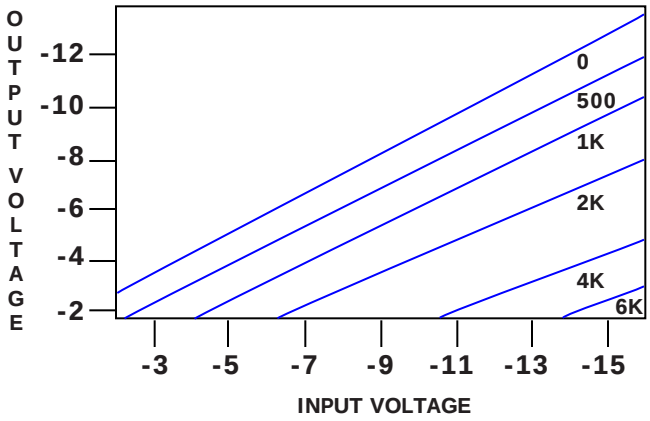
GS5, GS6
Case C, 5

FEATURES

- -- 40 nsec switching speed typical, 100 nsec max
- -- Selectable output voltage range
- -- High density; 4 output in a 3/8" X 3/8" package
- -- Low power, 3mA/channel typical Iq
- -- Complementary outputs for series and shunt FET biasing

PIN CONNECTIONS

PIN	GS1	GS2	GS3	GS4	GS5	GS6
1	VEE	VEE	VEE	VEE	VEE	VEE
2	OUT1 INV	GND	GND	GND	R SET	NC
3	GND	IN1	IN1	IN1	-V INT	GND
4	IN1	IN2	IN2	IN2	GND	IN1
5	NC	NC	NC	NC	IN1	IN2
6	OUT1 NINV	NC	+5V	+5V	IN2	IN3
7	+5V	+5V	GND	GND	IN3	IN4
8	NC	OUT2 INV	IN3	IN3	IN4	IN5
9	NC	OUT1 INV	NC	IN4	IN5	IN6
10	-V INT	NC	NC	NC	NC	OUT6 NINV
11	NC	OUT1 NINV	+5V	+5V	+5V	+5V
12	R SET	OUT2 NINV	NC	OUT4 NINV	OUT1 INV	OUT1 INV
13	NC	-V INT	OUT3 NINV	OUT3 NINV	OUT1 NINV	OUT1 NINV
14	NC	R SET	OUT3 INV	OUT3 INV	OUT2 INV	OUT2 INV
15	NC	NC	NC	OUT4 INV	OUT2 NINV	OUT2 NINV
16	NC	NC	NC	NC	OUT3 INV	OUT3 INV
17	NC	NC	OUT2 NINV	OUT2 NINV	OUT3 NINV	OUT3 NINV
18	NC	NC	OUT1 NINV	OUT1 NINV	OUT4 INV	OUT4 INV
19	NC	NC	OUT1 INV	OUT1 INV	OUT4 NINV	OUT4 NINV
20	NC	NC	OUT2 INV	OUT2 INV	OUT5 INV	OUT5 INV
21	NC	NC	-V INT	-V INT	OUT5 NINV	OUT5 NINV
22	NC	NC	R SET	R SET	NC	OUT6 INV



Connect resistor between R set testpoint and negative supply input. Select resistance using graph at left.

To obtain maximum negative output voltage, as when operating from a -5V supply, connect negative input voltage directly to -Vint testpoint. This overrides negative regulator circuit, and no external set resistor is necessary.

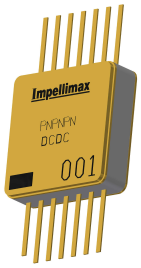
DESCRIPTION

High speed drivers designed specifically for GaAs MMIC switch IC's. Each driver channel has one TTL compatible input and a pair of outputs which are complementary.

These drivers will operate with a negative supply of -5 volts to -15 volts. The outputs swing from 0 volts to a negative voltage which can be set by an external resistor, or to the negative supply voltage if so desired. This allows the designer to select an optimum gate bias voltage regardless of supply voltage level.

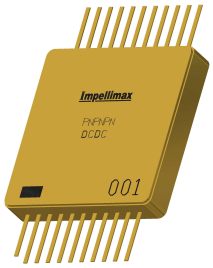
These drivers contain internal .01 uF bypass capacitors, and they are reverse bias and ESD protected. GX series drivers draw very little quiescent supply current, so that the performance of GaAs MMICs is in no way compromised.

OUTLINES



GX1
Case 1, 2, 6

GX2
Case 3, 4, 7



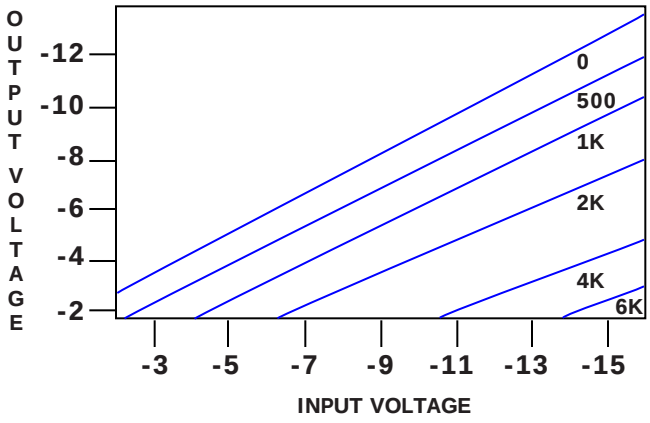
GX3, GX4
Case C, 5

FEATURES

- -- **High Speed, 6 nsec typical**
- -- **Selectable output voltage range**
- -- **Low impedance outputs for fast charging of gate capacitance**
- -- **Complementary outputs for series and shunt FET biasing**

PIN CONNECTIONS

PIN	GX1	GX2	GX3	GX4
1	VEE	VEE	VEE	VEE
2	OUT INV	R SET	R SET	R SET
3	GND	OUT1 INV	OUT1 INV	OUT1 INV
4	IN	IN1	IN1	IN1
5	NC	OUT1 NINV	OUT1 NINV	OUT1 NINV
6	OUT NINV	GND	GND	GND
7	+5V	OUT2 INV	OUT2 INV	OUT2 INV
8	NC	IN2	IN2	IN2
9	NC	OUT2 NINV	OUT2 NINV	OUT2 NINV
10	-V INT	NC	NC	NC
11	NC	+5V	+5V	+5V
12	R SET	-V INT	-V INT	-V INT
13	NC	NC	NC	NC
14	NC	NC	OUT3 INV	OUT3 INV
15	NC	NC	IN3	IN3
16	NC	NC	OUT3 NINV	OUT3 NINV
17	NC	NC	GND	GND
18	NC	NC	NC	OUT4 INV
19	NC	NC	NC	IN4
20	NC	NC	NC	OUT4 NINV
21	NC	NC	NC	NC
22	NC	NC	+5V	+5V



Connect resistor between R set testpoint and negative supply input. Select resistance using graph at left.

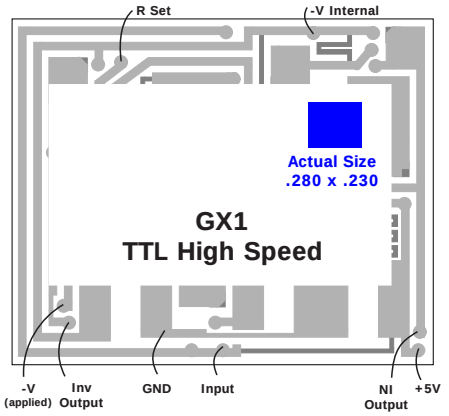
To obtain maximum negative output voltage, as when operating from a -5V supply, connect negative input voltage directly to -Vint testpoint. This overrides negative regulator circuit, and no external set resistor is necessary.

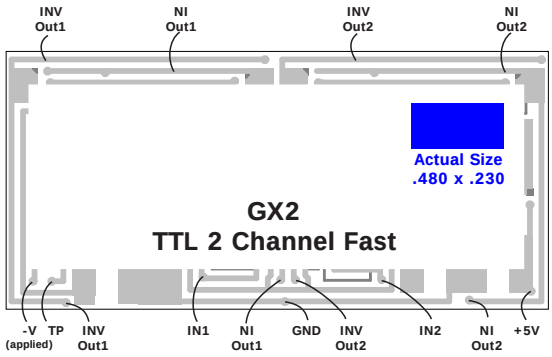
SUBSTRATE DRIVERS

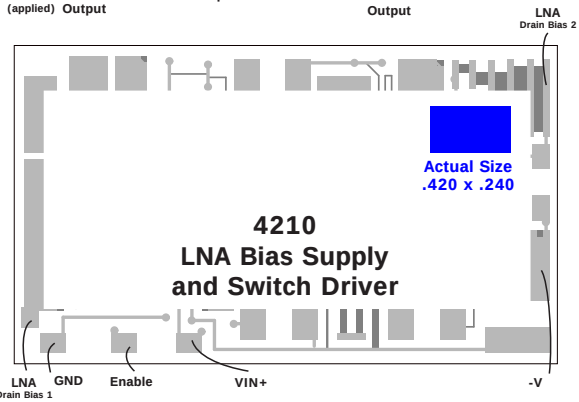
In some applications where space is very limited, a packaged driver can not be used. Most Impellimax drivers therefore are available as unpackaged, or Substrate, drivers. We denote such parts with an "S" in the package code portion of our standard parts nomenclature. Also, several of our 9000 series drivers are in substrate format.

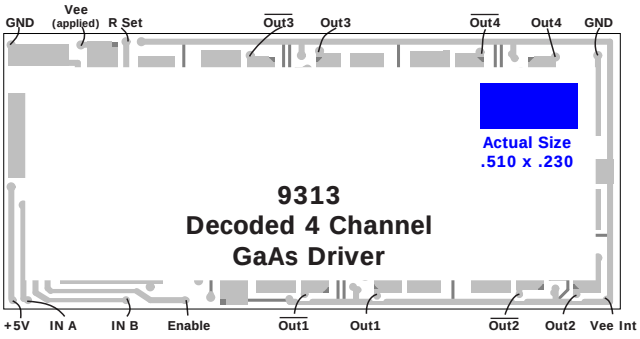
Impellimax substrate drivers are 100% electrically tested and meet the visual inspection criteria of MIL-STD-883C methods 2017 and 2032.

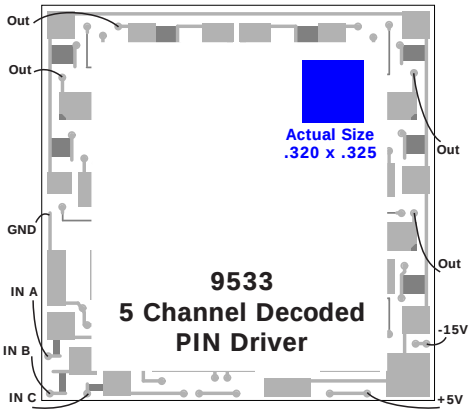
Connections to the driver are typically made via 7 mil diameter pads located near the periphery of the substrate. These pads are gold plated and capable of being ultrasonically or thermosonically bonded to, using aluminum or gold ribbons or wires. The soldering of wires to these pads is not recommended.

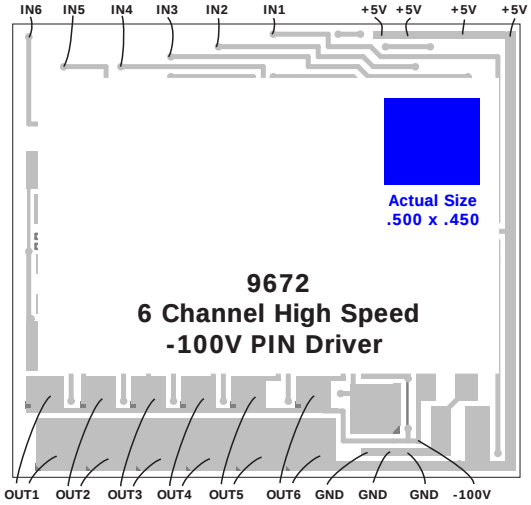


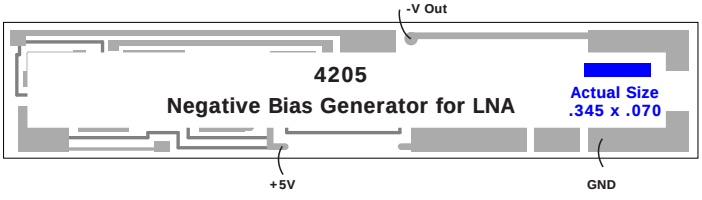






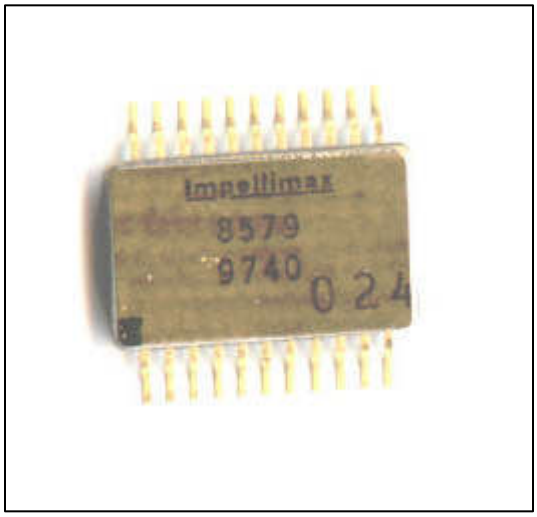






Impellimax

Binary Input Dual-Output Linearizer for GaAs MMICs



The 8579 and it's related product family provides a simple one-chip method of driving 2-input (series/shunt) GaAs MMIC attenuators with a binary coded word. The device is capable of 8-bit resolution, and linearizing resistors can be calculated with freely-provided software.

Package is .325 by .625, .115 thick 22 leads

The Impellimax model 8579 accepts an 8-bit binary word and provides two voltage outputs which can drive a GaAs MMIC attenuator in a linear mode, resulting in 256 linearly-spaced attenuation steps. The output transfer function curves are user-adjustable, by means of four breakpoint connections, to allow tailoring to specific GaAs IC's and attenuation ranges.

The unit operates with supplies in the range of +/-5V to +/-15V, with TTL compatibility assured over this full range. There are internal .01 uF power-supply-decoupling capacitors on both supplies. Power supply consumption is typically under 20 mA per supply, depending on the application circuit.

Settling time for a half-band step is typically in the range of 50 to 200 nsec.

The device is housed in a .375 by .625 inch flatpack, which is .115 thick. It is a 22-lead device, and gull-wing leadforming is available as a no-charge option. It is rated for operation from -55 °C to + 125 °C.

This device can also be used to drive certain types of PIN-diode attenuators. Related devices are available to provide similar functionality for single-output (either series or shunt) PIN attenuators, in which case there can be up to 9 breakpoints available for setting the linearity of the transfer function.

VCO linearizing versions are also available. Contact the factory for details.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Impellimax

HOW TO ORDER

ATTENUATOR DRIVERS FOR PINS AND GaAs MMICs

A							-	
Atten. Driver	Type	Channels	BKPT/LIN	Concave	Voltage	Package		QA Codes

Impellimax standard part attenuator drivers can be configured to drive either PIN or GaAs attenuators. See application notes for details.

Typical switching speed (type N, I, or M) into resistive load is 100 nsec.

Example: AN24UB4-T Attenuator driver, 2 noninverting channels, 4 breakpoints per channel, concave-up linearizer, +/-10V supplies, 3/8 by 5/8 ceramic package, 883 screened.

TYPE CODES:

N: Noninverting. Increasing input voltage makes output current or voltage more positive (closer to ground in GaAs attenuators).

I: Inverting. Increasing input voltage makes output current or voltage less positive (more negative in GaAs attenuators).

M: Mixed. Equal numbers of inverting and noninverting linearizers. Each pair of complementary linearizers is counted as one channel.

O: Operational Amplifier input.

Note: D/A Converter input models also available. Contact factory for details.

NUMBER OF CHANNELS:

Type N, I, and O drivers: Each linearizer is a channel.

Type M driver: Each pair of linearizers is a channel.

BREAKPOINTS PER LINEARIZER:

Quantity of Adjustments available on each linearizer.

CONCAVITY: **Graph of output versus input (with breakpoints utilized) is:**

U: Concave up (like letter U).

D: Concave down (like a rainbow).

M: Mixed. If Type code is also M, then noninverting linearizer is D and inverting linearizer is U.

S: Selectable concavity. Externally set by user.

VOLTAGE CODE: **A +/-10 V B +/-15 V C +/-15 V, internal regulator**

PACKAGE AND QA CODES: **See Impellimax PIN driver HOW TO ORDER sheet for details.**

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

DESCRIPTION

Family of high-density hybrid microcircuit linearizers which feature temperature-stable user-tune-able breakpoints, high impedance voltage inputs, and wide options in choice of transfer functions.

When used with PIN attenuators (Series, Shunt, or Series/Shunt topologies) each output is an independently tunable current source.

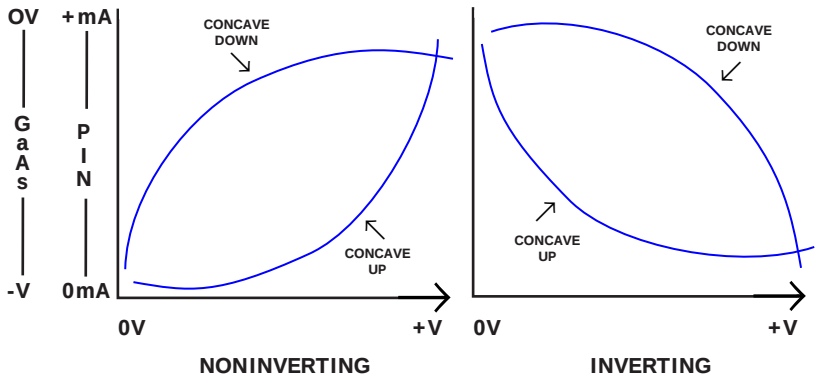
When used as a driver for GaAs MMIC FET attenuators, the current source outputs are used to drive the center node of a resistive divider between -V and ground. This creates a tunable voltage at the node which drives the FET gates of an MMIC attenuator.

Units are available with either concave up or down transfer functions, noninverting, inverting, and mixed types.

Only breakpoint-setting resistors are needed to implement a complete linearizing driver for most attenuator types.

Feel free to contact the factory for application notes and further assistance.

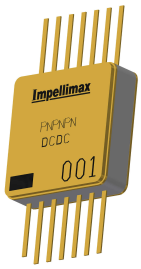
INPUT/OUTPUT TRANSFER FUNCTION



The graphs above are intended only to show the general shape of the input/output transistor function. Actual graphical data is application specific.

S-shaped curves can also be obtained. Contact factory for details.

OUTLINES



Case 1, 2, 6

Case 3, 4, 7

PIN CONNECTIONS

PIN PKG	AN15 AI15 1,2,6	AM13 1,2,6	AM15 3,4,7	AN25 AI25 3,4,7
1	-V	-V	+V	+V
2	OUT	INV OUT	INPUT	INPUT1
3	GND	GND	N BP1	1 BP1
4	INPUT	INPUT	N BP2	1 BP2
5	COMP	COMP	N BP3	1 BP3
6	NC	NI OUT	N BP4	1 BP4
7	+V	+V	N BP5	1 BP5
8	BP1	N BP1	NC	NC
9	BP2	N BP2	NI OUT	OUT1
10	NC	N BP3	NC	NC
11	BP3	NC	-V	-V
12	NC	I BP1	GND	GND
13	BP4	I BP2	NC	NC
14	BP5	I BP3	INV OUT	OUTPUT2
15	NC	NC	NC	NC
16	NC	NC	I BP5	2 BP5
17	NC	NC	I BP4	2 BP4
18	NC	NC	I BP3	2 BP3
19	NC	NC	I BP2	2 BP2
20	NC	NC	I BP1	2 BP1
21	NC	NC	NC	INPUT2
22	NC	NC	GND	GND

FEATURES

- -- **Small Size, High Density**
- -- **Very Low Quiescent Supply Current**
- -- **Temperature Stable Design, 1% Resistor Tolerances**
- -- **Moderate Speed - 100 nsec Typical Delay**
- -- **Simple-to-Integrate Pinouts**
- -- **Each Input is $\geq$ 10k Ω Load**
- -- **Compensation node allows for speed-up or slow-down of output transition time**

Driving PIN Diode Attenuators

PIN diode attenuators can be directly driven by the hybrid's current source or sink output. Typical topologies require the linearizer types given below:

Shunt PIN:	Noninverting Concave Up
Shunt NIP:	Mirrored Noninverting Concave
Series PIN:	Mirrored Inverting Concave Down
Series NIP:	Inverting Concave Down

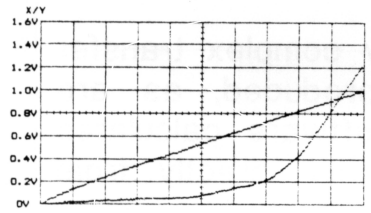
Independently biased series/shunt configurations can be accommodated as though they were independent series and shunt attenuators, with the appropriate driver styles chosen as given above.

Cascaded T or Pi sections frequently require two different bias levels for the outside elements relative to the inside one(s). This can most simply be achieved by using current split resistors on the output of the attenuator driver. More precision is achieved by using a separate linearizer for each required transfer function.

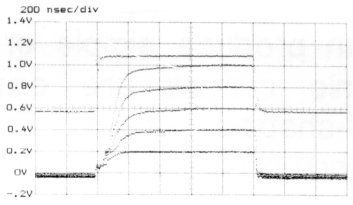
Typical bias currents for pin attenuators run in the range of 0 to 20 mA. Depending on supply voltages, this is within the output current capability of Impellimax Standard Linearizer Hybrids.

Switching performance of an uncompensated AN14UB4 driving a shunt 100 ohm resistor was evaluated. The transfer function was adjusted for 0 to 10 mA exponential rise of output current over a 0 to 10V input range. Small steps were settled in tens of nanoseconds, while a full-band step required 250 nsec to full positive and 100 nsec to 0 mA output. Compensation can be used to reduce these times substantially. Also, for best performance, breakpoint resistors should be connected with minimum parasitics, as close to the device as possible.

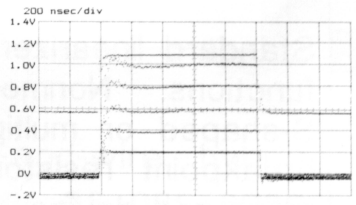
The transfer function was viewed over the temperature range of -55C to +125C and found to be quite stable. The typical shift of diode Rs over temperature is far greater than this, so that any temperature compensation that would be required is likely to be a function of diode characteristics, and not driver characteristics.



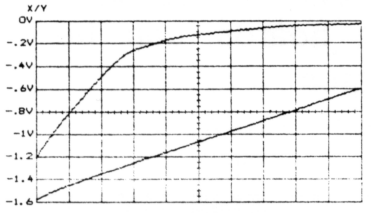
Typical Shunt PIN Transfer Function.
Current output is measured into 100 ohm load



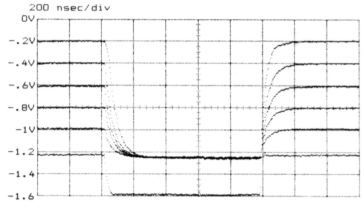
Uncompensated SettlingTime
Various Step Sizes



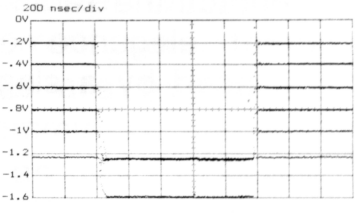
Compensated Settling Time
Various Step Sizes, 13 pF, 330 ohm



Typical Series PIN Transfer Function
Current output is measured into 100 ohm load



Uncompensated Settling Time
Various Step Sizes



Compensated Settling Time
Various Step Sizes, 13 pF, 330 ohm

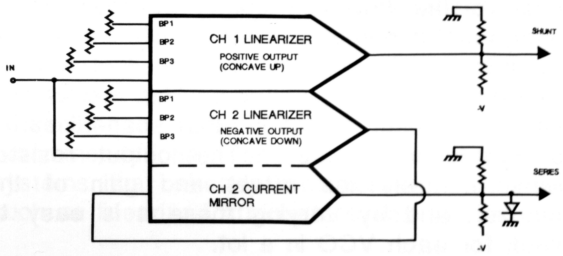
375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Driving GaAs MMIC Attenuators

GaAs MMIC attenuators typically require two separate nonlinear voltage controls to provide linear, impedance-matched attenuation. The attached figure shows a typical set of such curves.

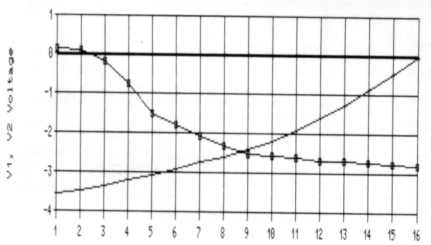
Impellimax standard linearizer hybrids are current-output devices. By connecting the output to the midpoint of a resistive divider set between ground and -V, the voltage at this node produces the required voltage curve. See the attached connection diagram.

Some manufacturers and users of GaAs attenuators get improvements in power handling and reduced insertion loss by allowing the series FET gate bias to go slightly positive for low attenuation conditions. Fortunately, these curves, though fairly complex, are easily achieved with Standard Linearizer Hybrids.



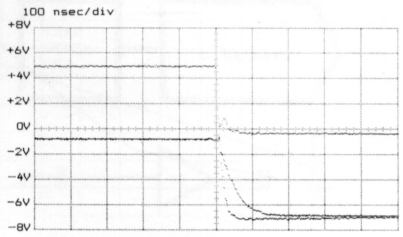
As can be seen in the example schematic, these curves are generated by a dual linearizer hybrid, of the AM13SB4 type. These devices have two separate linearizers in one package, each with their associated current mirror. One output (used for the Shunt curve) provides a positive concave-up current which increases with increasing input voltage, while the other output is used with its' current mirror to provide a positive concave-up current which decreases with increasing input voltage. Both linearizers provide their output current into the center node of a resistive divider, as mentioned earlier. To produce the initial positive voltage and short-lived down-going curve seen at the low attenuation portion of the Series bias curve, the Series linearizer output current is tuned to produce a positive voltage intercept at 0 attenuation, and this voltage is clamped by a diode (or two in series, as necessary) to ground, giving rise to the final set of curves as shown in the figures.

If multiple MMIC's are used in an assembly, they can be driven by the same linearizer set, provided care is taken to maintain sufficient RF isolation in the shared bias lines.



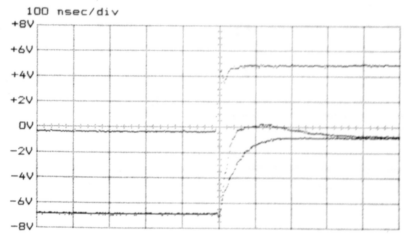
Typical GaAs MMIC Atten Curves

Data from MMIC vendor data sheets



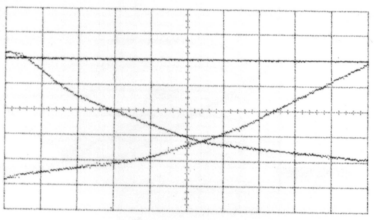
Voltage Settling Time, Shunt

Uncompensated vs 20 pF/1k Comp



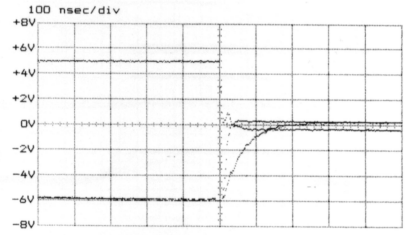
Voltage Settling Time, Shunt

Uncompensated vs 20 pF/1k Comp



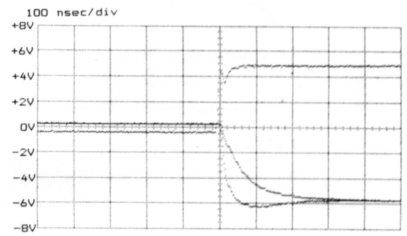
Curves Generated by Linearizer

Series curve shown with & without diode clipping



Voltage Settling Time, Series

Uncompensated vs 20 pF/1k Comp



Voltage Settling Time, Series

Uncompensated vs 20 pF/1k Comp

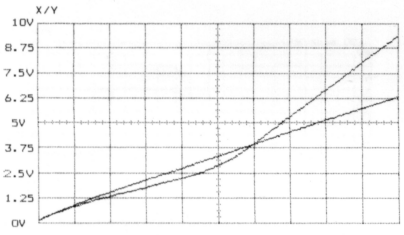
375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Linear tuning of varactor-tuned devices typically requires a single exponentially-curved control voltage, as shown in the figures. The following discussion will concern positive-voltage tuned devices, but it should be recognized that negative-tuning devices also exist, and similar, though inverted, procedures are used for these.

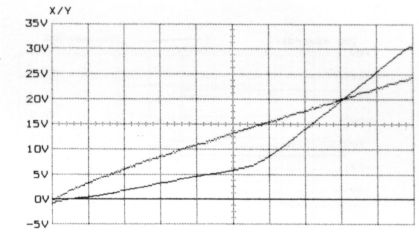
As can be seen in the connection diagram, the linearizer output provides concave-up noninverting positive output current. The output of the linearizer is connected to the center node of a resistive divider. One end of the divider is connected to a positive voltage reference, and the other end is connected to ground. The resistors and the reference are chosen so that the open-circuit voltage of the center node is equal to the lowest required varactor tuning voltage. The output current from the linearizer drives this node voltage more positive with increasing input tuning voltage. This results in a voltage transfer function that can linearize varactor-tuned devices. The output resistor divider controls the offset and gain of the linearizer, and by varying these it is easy to tweak for each VCO in a lot.

There are three voltage ratings available in the Standard Linearizer product line. The fastest version has 18V output capability, providing typical settling times of 200 to 500 nsec for a full-brand step. Where higher tuning voltages are required, the 40V variety provides typical settling times of approximately 500 nsec to 1 usec. Standard Linearizer Hybrids with 100V output capability require up to 2 usec for complete settling in a full-band step. These settling times are given as measured without compensation. Proper selection of compensation can substantially reduce settling time in most cases.

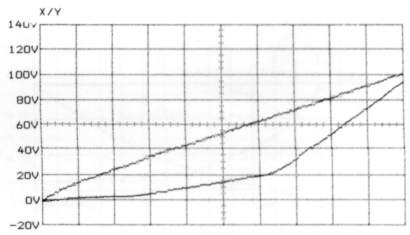
The output of a Standard Linear Hybrid is of moderately high impedance, so that accidental short circuits to ground will not damage the unit. When the varactor tuning path is of high capacitance, though, this high impedance can result in poor settling times. This is especially true if 'filter-conns' are involved in the varactor tuning port wiring. If this presents a problem in your application, contact the factory. Modified linearizers are available with output voltage buffers, to reduce the output impedance. This results in a lack of short-circuit protection, however, so the trade-offs should be thoroughly considered.



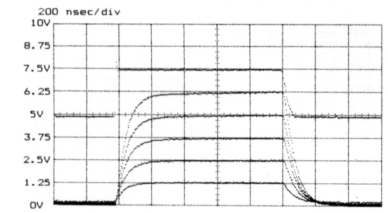
Voltage Output Trans Function
Low Voltage, High Speed Applications



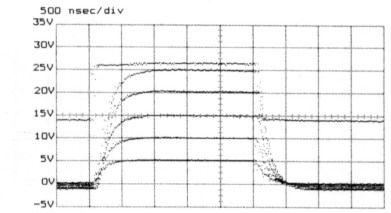
Voltage Output Transfer Function
Moderate Voltage, Medium Speed Appplications



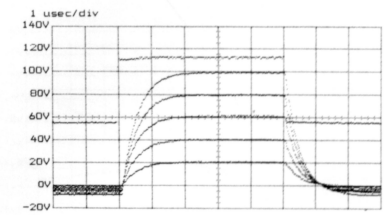
Voltage Output Transfer Function
High Voltage, Moderate Speed Applications



Current Output Trans Funct, Series
Current output is measured into 100 ohm



Voltage Settling Time, Series
Uncompensated vs 20 pF/1k Comp



Voltage Settling Time, Series
Uncompensated vs 20 pF/1k Comp

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Temperature Compensation Of RF Devices

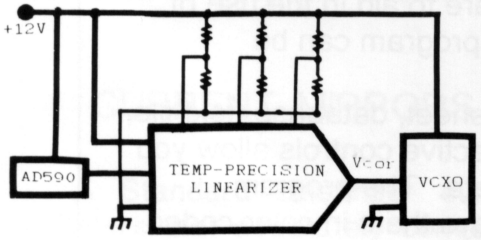
Many circuits and systems are prone to drift and loss of performance over wide temperature extremes. For example, amplifier gain, detector sensitivity, oscillator frequency, and oscillator output power can typically be improved and stabilized to near-perfection with a temperature-driven linearizer circuit. This method is far preferable to PROM-based compensation lookup schemes, since those techniques introduce step-wise corrections as a function of temperature. Such unpredictable stepwise corrections can wreak havoc when used in complicated systems.

The concept of linearizer-based temperature stabilization is to have the linearizer input be tuned with the output of a temperature sensor. As the temp sensor output varies (and many sensors nowadays provide linear output vs. temperature, though this feature is non-critical to this application), this sensor voltage tunes the input of the linearizer. This causes the output of the linearizer to output the desired correction signal at any given sensed temperature, in a smoothly varying and continuous manner.

The first step in making use of this technique is to identify the most appropriate node in the circuit for applying the temperature-correcting signal. Some examples are the adjustment pin of three-terminal adjustable regulators, the summing node of op-amps, the bias adjustment of laser diodes drivers, and the DC tuning network attached to VCO varactors.

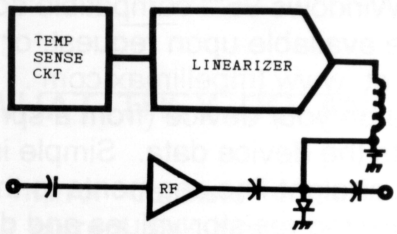
Next, experimentally determine the required current or voltage vs. temperature curve to provide optimum temperature stabilization. This data, along with design goal tolerances on stability, helps to determine what type of linearizer is best for the job. At this point, it's usually best to get us involved, since we have a large stable of designs from which to pick, and our experience can become your asset.

With the temperature compensation technique mentioned here, near-perfect temperature stability can be routinely achieved.



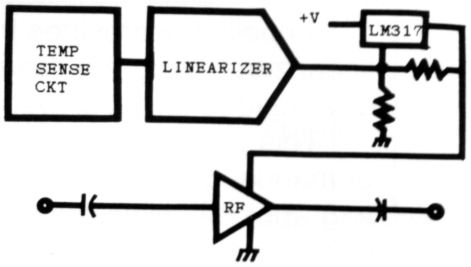
Temp-Precision TCXO Stabilization

Can also use thermistor as sensor



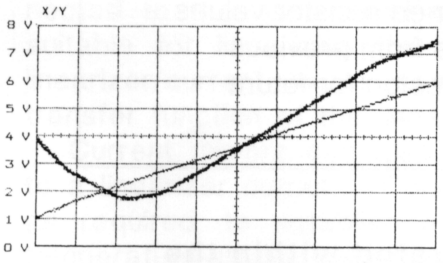
Amplifier Temp Comp of Gain

One of several possible methods



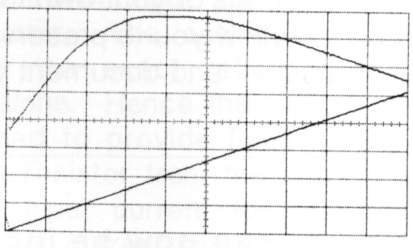
Generating Nonlinear Bias vs Temp

Provide tuneable, optimal performance vs Temp



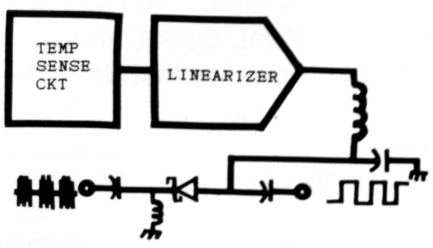
Typical TCXO Correction Curve

Generated by circuit as shown in upper figure



Hump Shaped Output vs Temp

Other curvatures are also easily generated



Bias Current for Detector Diode

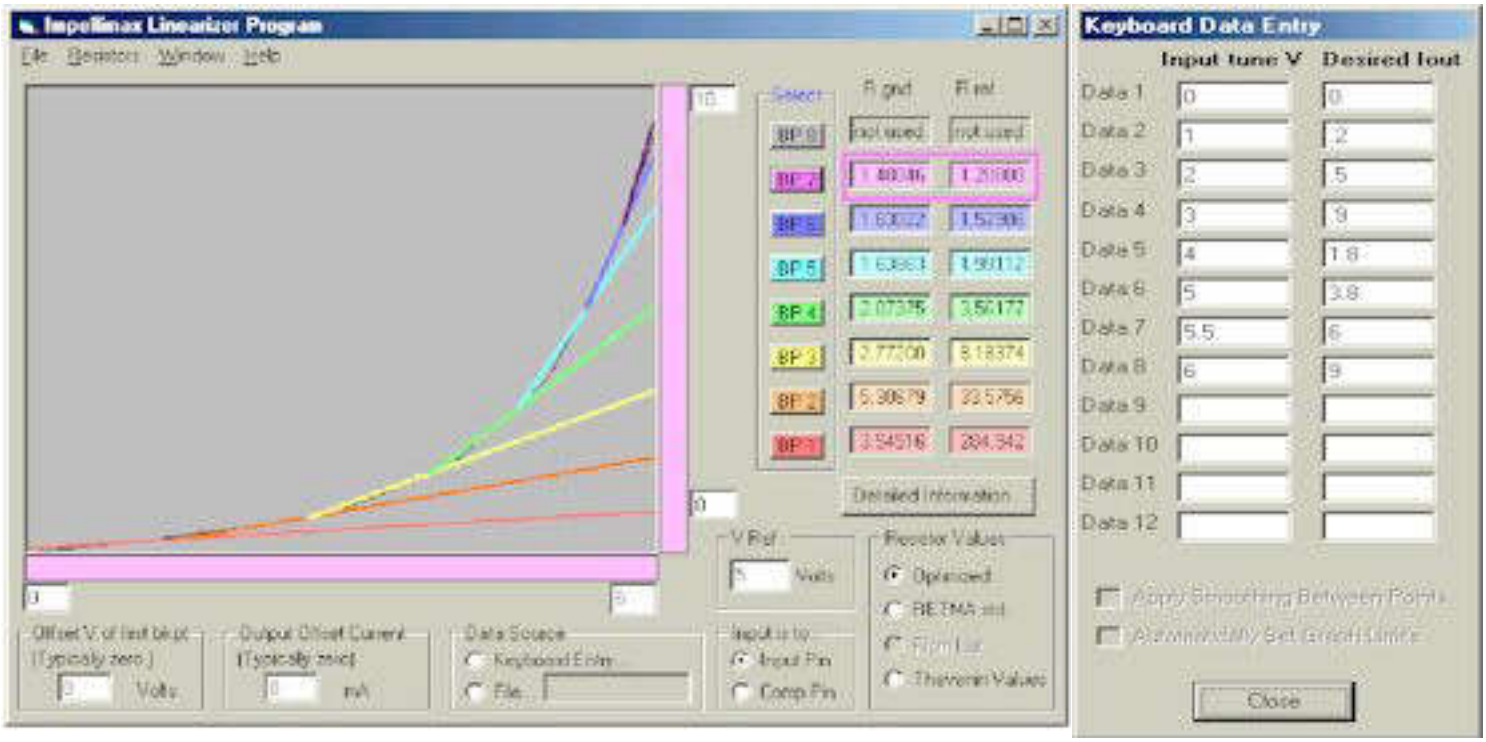
Stabilize and optimize sensitivity vs temp

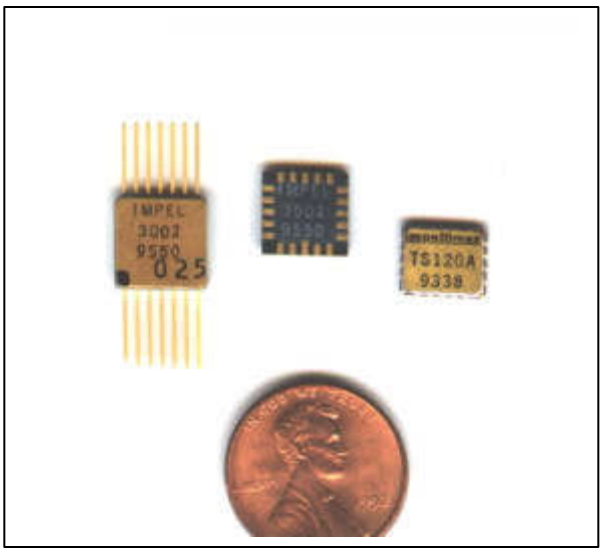
375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

This program accepts data on your device (from a text file or manual data entry) and plots the device data. Simple interactive controls allow you to graphically align breakpoint straight-line segments to the data. The program continuously calculates the required resistor values and displays them in color-coded fields to the right of the display area.

Resistor values can be listed as optimized values, or they can be constrained to follow either RETMA standard value listings or your own inventoried resistor values. Resister pairs can alternatively be displayed as Thevenin equivalent resistance and source pairs.

This program also suggests Impellimax standard linearizers that would be suitable for your particular application.





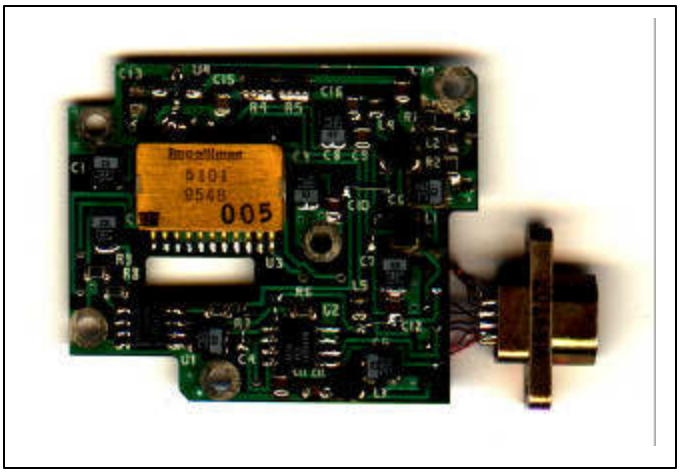
Hybrid Tilt Sensor Pre-amplifiers generate AC bias for electrolytic tilt sensors and produce a DC output current which is a function of the tilt of the device. They require only a single power supply, which can vary over a wide range of voltage.

Electrolytic tilt sensors require AC excitation, without a DC component, to avoid electrolysis and plating effects in the sensor solution. Impellimax Tilt Sensor Pre-amps provide this AC excitation, and they demodulate the AC tilt sensor output signal into a DC signal.

The output signal can be configured as either a current sink or a voltage output, depending on the model selected. Either way, the signal is minimized at one extreme of rotation and maximized when the sensor is tilted fully the other way.

The output magnitude is typically ratiometric; that is, the output signal amplitude of the device increases when the power supply voltage increases. In many instances, this results in a simpler implementation than if the output were not ratiometric. This is because it is not necessary to regulate the supply voltage into the pre-amp, provided that the next stage in the signal chain is differential and can be referenced to some mid-point voltage by a resistive divider. Since the resistive divider is inherently ratiometric, the two effects cancel each other and the need for a voltage regulator is eliminated. As a result, unregulated battery power can give good results.

Alternative electrical and mechanical configurations are easily created, to suit your application requirements. Threshold detectors, linearizers, current-loop outputs, and many other functions can be added to the basic design. Many variations in packaging are also available, including leadless chip carrier (LCC), hermetic hybrid leaded packaging, micro thick-film surface mount, and glop-topped chip-on-board (COB). Contact the factory for details.



Impellimax can design and build your whole DC subassembly as a turn-key drop-in solution. We optimize the use of space by dealing in whatever mix of technologies is best for the job.

The unit shown above combines:

a dual-output low-speed PIN switch driver

a dual-output high-speed PIN switch driver

a 75 MHz IF amplifier/attenuator

a detector diode bias circuit and threshold comparator

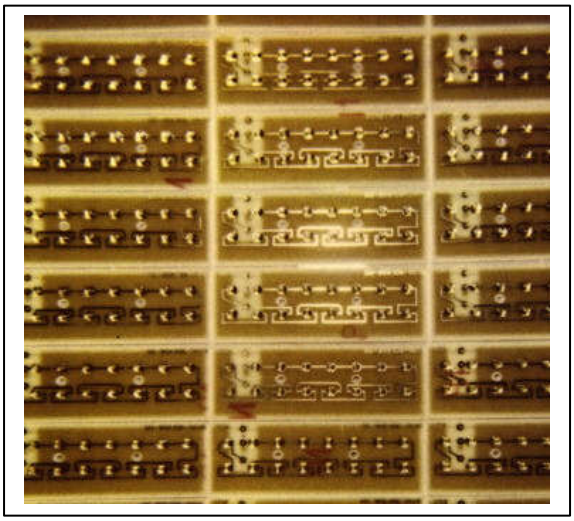
and copious LC filtering on +5, +15, and -15V supplies.

The backside is all groundplane for greatest signal sensitivity and low noise floor, and numerous vias maintain low impedance on critical supplies throughout the board.

This subassembly was designed, built, and tested by Impellimax, working with our customer's mechanical and electrical requirements.

At first, our customer feared that there would be no way to fit everything in the small space available. By having complete and seamless control over the layout process, though, we were able to fit the proverbial "ten pounds" in the area available. The hybrid portion of the assembly was designed for best fit, in terms of pin-out and function, into the PC board.

Although in most cases it is simpler to use standard or semi-standard Impellimax drivers, our capabilities in turn-key design can pull some impressive results out of what otherwise might be impossible situations.



Chip-On-Board (COB) is a form of direct die attach which minimizes cost and size in many applications. The unpackaged dice are mounted onto a prepared PC board, wirebonded, and coated for protection. COB can also be used in conjunction with standard SMT devices.

Shown above is a set of optoelectronic micro PC boards which combined soldered surface mount components and bare dice which are attached and directly bonded to the PC board. An optically clear protective layer was added to each die in a two-step process which assured a good mechanical and optical result.

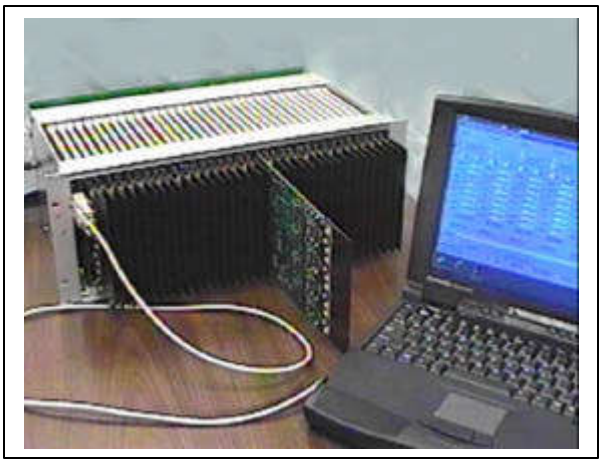
"Smart Cards", PCMCIA cards, and many other applications can make use of this low-cost microelectronic assembly technique. By eliminating the hybrid package, size, cost, weight, and complexity are greatly reduced.

This assembly method can be used with various substrate materials. Depending on design requirements, FR-4, PTFE, alumina, and glass are commonly used, and more exotic materials can also be considered. We have a choice of several wirebonding methods at our disposal, including aluminum ultrasonic wirebonding, gold wedge bonding, gold ball bonding, and gold ribbon bonding. We can also provide "Flip-Chip" direct die attach, in which the semiconductor device is mounted, inverted, onto an appropriately-arranged set of conductive pads on the substrate or PCB.

Impellimax can provide a turn-key assembly including PC board layout, fabrication, COB, and electrical testing in coordination with your engineering requirements. Alternatively, we can assemble your COB and special assemblies on a build-to-print basis, with or without customer supplied materials.

We can provide COB assemblies with pins, tinned wires, or ball-grid-array (BGA). Gold-ribbon flying leads are another possibility where space is at a premium. Contact the factory for details and design assistance.

High Voltage PIN Diode Driver System



High-Voltage PIN diode drivers can be configured as PC-controllable cards that are compatible with standard 19 inch rack mounting. On-board self test of temperature, currents, voltages, and logic states assures reliability. Control and self-test functions are transmitted by a built-in optically-isolated 9-pin serial port.

Shown above is a rack of 34 driver boards, each of which contains:

-- Four independent 500 Volt PIN diode driver channels, .8 to 2 Amperes
-- Eight channels of self-test (Positive current, negative current, heatsink temperature, monitor of all four output voltages, monitor of logic state of board)
-- Line receivers and line drivers for high-speed bus operations
-- Double set of data latches to hold "look-ahead" values
-- 8-bit address bus comparator to allow 255 boards per system

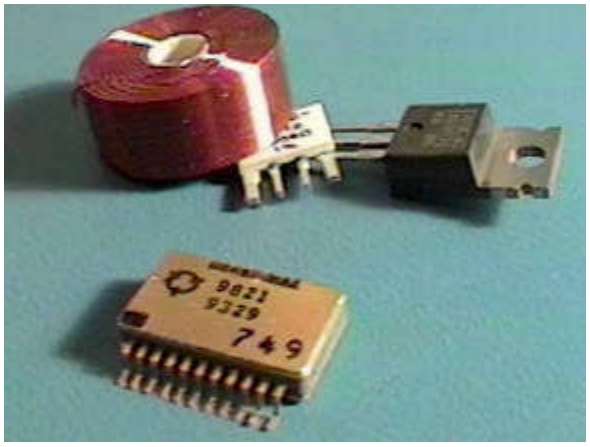
A single complete system consists of four racks of 36 quad drivers, resulting in a driver system having a total of 544 independently controllable outputs. Impellimax was responsible for the design of the complete system, including the motherboard backplanes, power distribution boards, and the opto-isolated PC-interface board. We can provide a turn-key assembly including PC board layout, fabrication and electrical testing in coordination with your engineering requirements.

Our patent-pending high-voltage PIN diode driver topology was used, which gives switching speeds of less than 2 microseconds and full DC-coupled operation with a minimal component count. Current spiking and wide output voltage compliance result in optimal switching for high power diodes.

The system is controlled by Windows 95™ compatible software.

Although this system is notable for it's high power specifications and enormous quantity of channels, similar construction methods and technologies can bring the value of our driver expertise to your system-level project.

High Current YIG Drivers



YIG drivers accept a voltage input or a binary word and output a stable, low-noise current for driving the tuning coil of typical YIG tuned devices. Units can be customized to suit particular requirements and specifications. Internal linearizers, sense resistors, and high speed FM or dithering outputs are available.

Package shown is .325 by .625, .125 thick 22 leads

The Impellimax YD series of YIG coil drivers covers a wide range of YIG requirements. The repertoire of available options that we have designed virtually guarantees that every requirement can be satisfied with a well-suited driver.

Binary input units are available, with 8 and 12 bit TTL logic as standard tuning resolutions. Both serial and parallel binary word format can be accommodated.

Lower-current units in standard hybrid packages (typically under 200 mA) can have internal power components. For higher current applications, units are available for use with external pass transistors, as shown in the image above. Alternatively, to keep integration simple, high current YIG drivers can be designed as an all-in-one high-power device. We make use of copper packages and BeO substrates in our high-current 40 Volt unit.

Some units have been made with internal thermal shutdown sensors to protect the device and load under incorrect thermal conditions, such as a shorted sense resistor, or the absence of a proper heatsink interface. Reverse EMF protection is included in most units, and BIT test outputs are available.

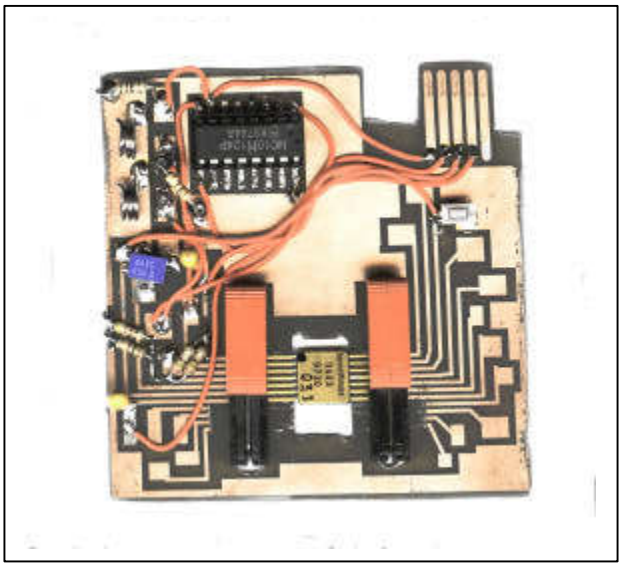
Settling time for a half-band step of a medium current device is typically in the range of 50 to 500 Usec. High-compliance output structures are used for best speed performance in driving the inductive load. Secondary outputs can be added on, specifically designed for highest-speed operation when driving low-current dithering coils (also called FM coils). Prototype testing at Impellimax can provide design assurance without incurring a cost to your organization.

YIG drivers can also have up to 9 breakpoints available for setting the linearity of the tuning transfer function. Either external or internal resistors can be used.

The device shown above is housed in a .375 by .625 inch flatpack, which is .125 thick. It is a 22-lead device, and gull-wing leadforming is available as a no-charge option. It incorporates a D/A converter, a four-breakpoint linearizer, and a current-source output. It is rated for operation from -55 °C to + 125 °C.

Contact the factory for details regarding your specific YIG driver needs.

Evaluation Boards to Aid in Prototype and Test



As as aid to developers, evaluation circuits and test boards are available from Impellimax at low cost. These boards can simplify the integration of new devices and technology into your products, as well as to provide a baseline of optimal device performance.

When incorporating a new device into a product, early "learning curve" difficulties can crop up that result in lost time and money. To reduce these impediments to a minimum, Impellimax can provide demo PC boards that incorporate the simple but crucial design concepts that will lead to success with the least difficulty.

Shown above is an example of an evaluation board for a high speed ECL PIN diode driver. On-board is a TTL - to - ECL converter IC and associated passive components. In this way, the user is freed from having to deal with the extra hassle of generating clean and repeatable ECL signals with which to test their prototype system. The backplane of the PC board is all grounded copper, and the power supplies are bypassed close to the driver. By using this board, then, the customer is more assured of having proper connections and signals to the driver.

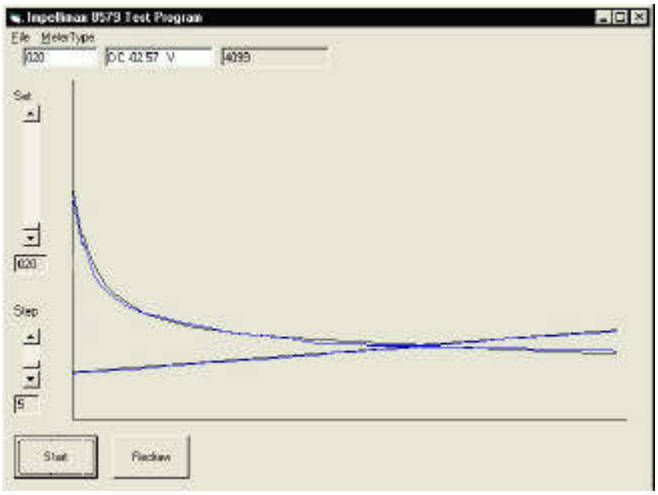
Prototyping is simplified because wires and connectors can be soldered to the test board, without potentially damaging the hybrid. If a prototype catastrophe occurs as they sometimes do, the driver can be easily removed and replaced without having to greatly disassemble the prototype system. (Of course, we would gladly then perform a failure analysis to help you understand the cause of the failure.)

Test and evaluation boards are especially helpful if the hybrid is one that performs a complex function, such as linearizers and special function hybrids. We can provide evaluation boards that are specifically configured to your application, saving you significant engineering time on you prototype.

Feel free to contact the factory for low-cost evaluation boards and applications assistance.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

"Virtual Tweaking" to Your Device Data



We can import your device data into our linearizer test software. This lets us optimize a linearizer scheme to the particulars of your application. We can provide you with resistor values and circuit recommendations so that your design can proceed with solid assurance of success.

It makes good sense to have your linearizer application set-up and verified by Impellimax, but you probably don't want to ship us your unit and test gear. That is why we have developed the capability for what we call "Virtual Tweaking".

The process begins with dialog between our engineers and yours, to see if one of our standard linearizers is well suited to your application, or if a custom or semi-custom part would be better. We will help you identify any areas of technical risk and opportunities for cost savings.

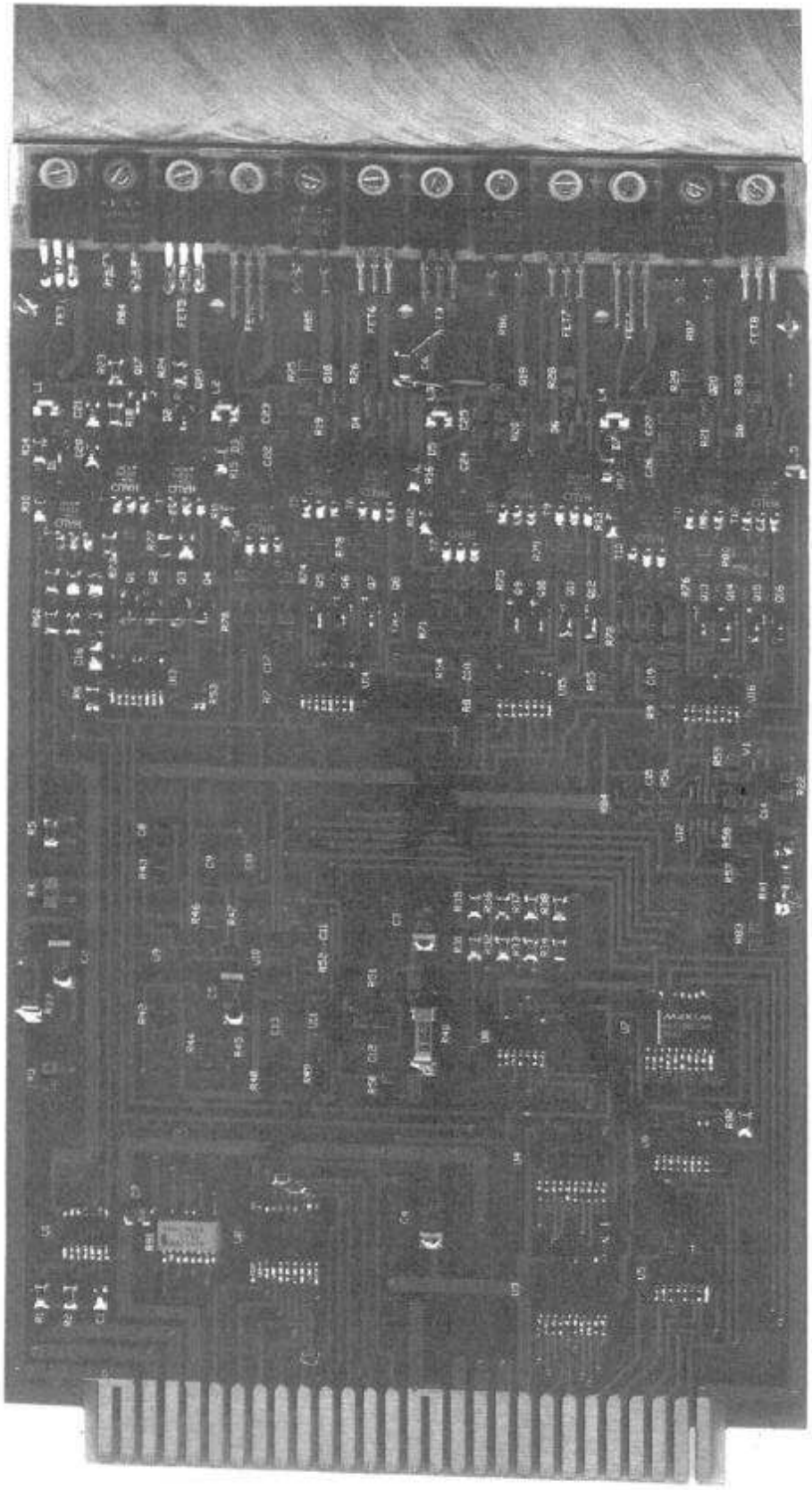
Virtual tweaking can be a benefit in many cases where the actual hardware is unavailable or hard to deal with. For example, it can take several hours to measure the voltage output of a gas sensor versus concentration. We can then import this data into our software so that "real-time" adjustments can be made and evaluated. Similarly, if data is available on an as-yet unpurchased or unshipped item, such as a microwave attenuator or VCO, the linearizer can be set to be ready for the device as soon as it is received.

There can be a substantial learning curve in new product development, and we offer our Virtual Tweaking as an excellent means of guiding you through the potentially complex issues of developing optimal linearization for your device. We have been at it for over a decade, and we have the in-house flexibility to rapidly adapt our hardware if necessary. If you feel you might benefit from this service, please give us a call to discuss specifics.

Most typically, this service is offered free of charge, to help you get the most benefit from Impellimax Linearizers and custom hybrids.

The software for Virtual Tweaking is also available for sale for our customer's use. The software can be customized for your engineering and production test requirements.

Impellimax



Hi-power, 4 channel driver, 500 volt, 2 amps, 2 microsecond switching speed, surface mount assembly for bus-orientated multi-card system. This device uses our patent-pending hi-voltage switch driver technology, and employs self-test features.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com

Direct Replacements for Obsolete Components

Direct drop-in replacements are available for many hard-to-find components. Commercial and full MIL-Spec devices can be provided. Costly and impractical redesign of systems can be avoided by extending the life of these legacy parts. TO-packages, flatpacks and DIP devices are among the many styles offered.

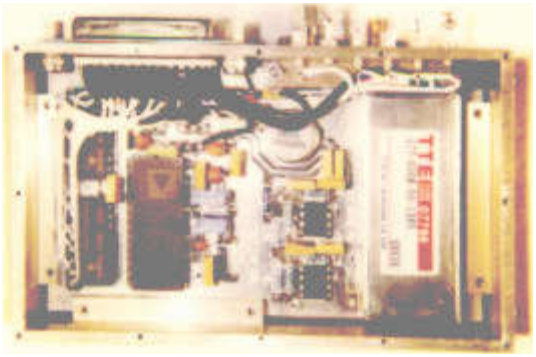
The major semiconductor manufacturers have ceased production on many components that are key to the viability of older systems. In many cases, we can provide drop-in replacement parts.

We provide replacements for many discontinued components by National Semiconductor (LH and DH series), Comlinear hybrids, Lambda regulators, Sprague, and others.

In some cases we have been fortunate enough to arrange a transfer of information and/or materials from the original manufacturer to assist us in these efforts. In other cases, we work from published data sheets and/or "dead" or "live" reference units, as applicable, to provide a device that is as nearly identical to the original as possible. We may already have units in stock or in process of the type you need.

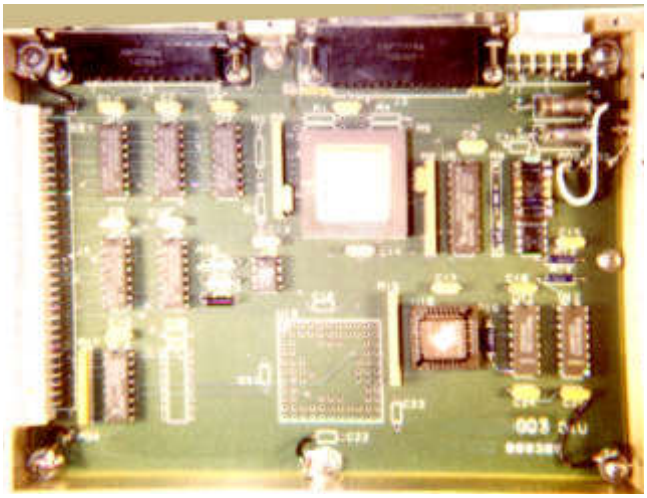
Alternatively, we can frequently offer upgraded versions of obsoleted components, for those cases where the performance of the original devices left something to be desired. Parameters such as switching speed, settling time, supply current, offset voltage, and noise performance can usually be optimized to improve system performance. Such upgrades must be handled with care, though, to ensure that an "upgrade" doesn't cause unexpected changes elsewhere in the system. To that end, in most such cases we are pleased to provide a prototype unit for evaluation, before committing to a larger volume and/or full MIL screening procedures.

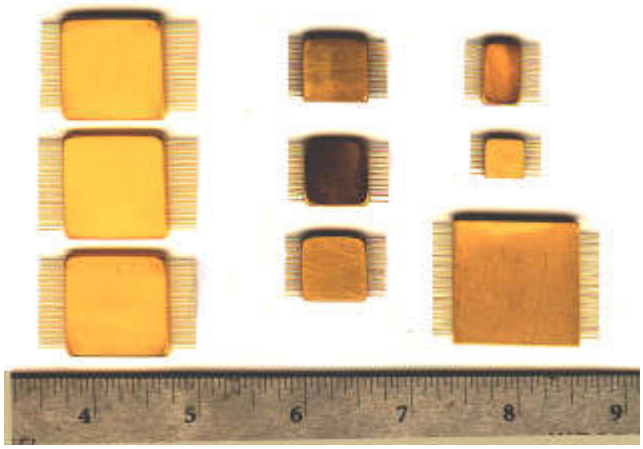
Commercial and MIL versions are possible. We can provide Life Test, DPA, RGA, Solderability, Vibration, Burn-in, Constant Acceleration, and other tests that are sometimes required when certifying a part from a new vendor. Oftentimes, qualification can be by similarity to the original manufacturer's device.

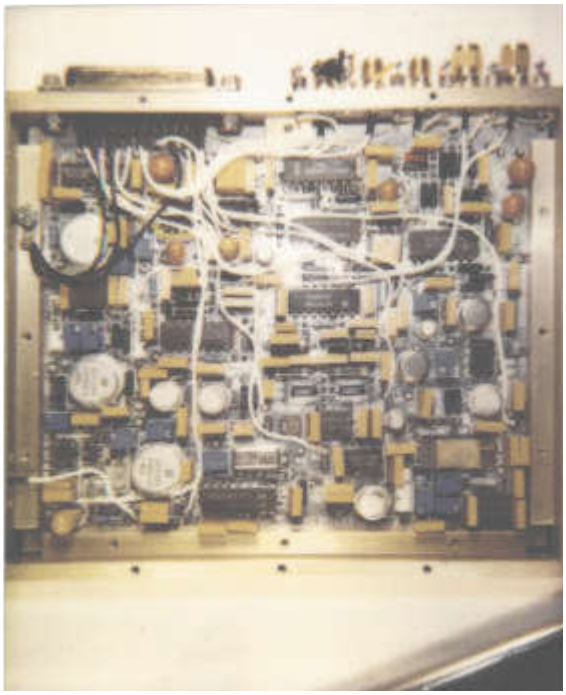


Impellimax

Hybridization miniaturizes your assembly and improves performance.







The three-module engineering prototype (shown at left) was hybridized into the set of hybrids which are displayed above.

These hybrids combined bare die and SMT devices, as well as channelized filters, in all-metal packages for lowest noise floor and best performance.

Trim pots and special RF devices were left out of the hybrids, but otherwise the entire set of assemblies was miniaturized thru hybridization.

375 West Hollis Street, Nashua, NH 03060
Tel. 603-886-9569 Fax. 603-886-4901
www.impellimax.com