PIN Diode Drivers

APITech offers a complete line-up of PIN diode switch drivers with output current capability of 10 mA to 50 mA and switching speeds as fast as 6 ns. Thin film metalization on ceramic substrates ensures low parasitic capacitance for fast switching, small size, and excellent reliability. AH FMt drivers are designed by our experienced engineering staff; thus, if the drivers listed in the table below do not meet your requirements, we would be happy to discuss a custom circuit to fit your exact needs.

Features

- MIL-STD-883 Level B Screening available
- Inverting and Non-inverting modes
- Positive and negative output currents
- –55° to +125°C operating temp range
- –65° to –150°C storage temp range

Model	NO. OF DRIVERS	① Output Current D.C. (mA) Positive Min.	Positive Max.	Negative Min.	Negative Max.	Minimum Peak (PA) Pos.	Minimum Peak (PA) Neg.	Minimum Open CKT Output (V) Pos.	Minimum Open CKT Output (V) Neg.	② Minimum Switching Times (ns) Ton	Minimum Switching Times (ns) Toff	Max. Rep. Rate (MHz)	③ Maximum Internal Current Drain (mA) +5V	Maximum Internal Current Drain (mA) Vee	④ Operating Voltage Limits (V) +5V Min.	+5V Max.	Vee Min.	Vee Max.	⑤ Max. Power Dissipation (W) 100 C Case	25 C Amb
DD111/M	1	12/24	18/36	12	18	100	150	2.5	5.5	25	25	5	45	25	4.5	5.5	5	16	0.8	0.5
DD211/M	2	12	18	12	18	100	150	2.5	5.5	25	25	5	90	50	4.5	5.5	5	16	1.6	0.5
DD211B	2	24	36	12	18	100	150	2.5	5.5	25	25	5	90	50	4.5	5.5	5	16	1.6	0.5
DD311A	1	8	12	24	36	300	300	4.0	11.0	6	8	20	15	15	4.5	5.5	5	16	0.8	0.5
DDF11/M	1	8	12	24	36	300	300	4.0	11.0	12	15	10	45	15	4.5	5.5	5	16	0.8	0.5
DDF2311	2	8	12	24	36	300	300	4.0	11.0	12	15	10	60	30	4.5	5.5	5	16	1.0	0.8
DDF3311	3	8	12	24	36	300	300	4.0	11.0	12	15	10	75	45	4.5	5.5	5	16	1.5	1.2
DDF4311	4	8	12	24	36	300	300	4.0	11.0	12	15	10	90	60	4.5	5.5	5	16	1.9	1.2
DDF5311	5	8	12	24	36	300	300	4.0	11.0	12	15	10	135	75	4.5	5.5	5	16	2.8	1.6
DDF6311	6	8	12	24	36	300	300	4.0	11.0	12	15	10	150	90	4.5	5.5	5	16	3.3	1.6

Notes: ***Specifications subject to change without notice.***

1. Output current is measured into a 10 Ohm load to ground.

2. Load is a 50 pF (39 + 10 scope probe) capacitor in parallel with a grounded cathode HP5082-0C01 PIN diode. Ton is measured from 50% of input (from a S<ASOO gate) to 10 +1 V diode load. Toff is measured from 50% of input to the rated open ckt negative voltage across diode load.

3. Exclusive of current supplied to the load.

4. To avoid exceeding power rating, the max. Vee should be held to 5 V when driving grounded anode diode.

5. De-rate linearity to 175 ° C. Temperature is measured at case bottom, which should be heat sunk if necessary.

PIN Diode Drivers

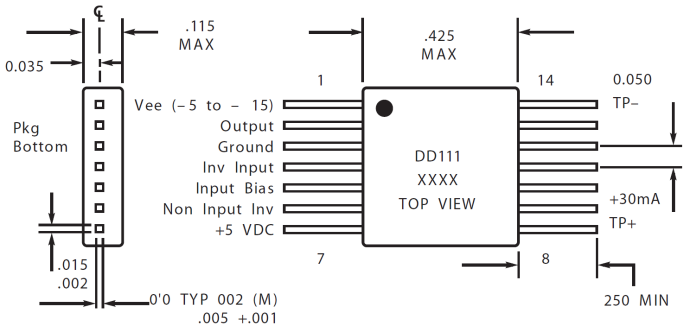
DD111
DD111M *

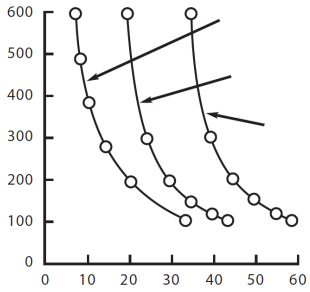
High Speed Drivers

A universal PIN diode driver with excellent noise immunity, very fast switching, 100 mA current spikes and available test points for increasing quiescent output current.

- When using inverting input, connect bias pin 5 to non-inverting input pin 6.
- When using non-inverting input, connect bias pin 5 to inverting input pin 4.
- For -30 mA output current, connect pin 8 to pin 9
- For positive output currents other than 15 mA or 30 mA, an external resistor can be connected between pin 8 and +5V. See graph.
- The negative output current varies with Vee and is specified at -12V. When driving grounded anode diodes, Vee should be kept at -5V where the negative current will be 5 mA. It may be increasing by connecting a resistor from TP-(pin 14) to Vee (pin 1). See figure.

**** M suffix denotes welded metal package instead of standard epoxy sealed ceramic package.***





PIN Diode Drivers

DD211
DD211B
DD211M *

Dual High Speed Drivers

A dual DD111 with current programming pins omitted. This driver is often used in SPDT applications by driving the inverting input of one channel and the non-inverting input of the other channel from the same TTL input signal.

- When using channel 1 inverting input pin 4, connect bias pin 5 to non-inverting input pin 6.
- When using channel 2 inverting input pin 11,. connect bias pin 10 to non-inverting pin 9.
- When using channel 1 non-inverting input pin 6, connect bias pin 5 to inverting input pin 4.
- When using channel 2 non-inverting input pin 9, connect bias pin 10 to inverting input pin 11.
- The two drivers are identical except for quiescent positive output current, which is nominally 15 mA for DD211 and 30 mA for DD211B.
- When driving anode-grounded diodes, care must be exercised to avoid excessive power dissipation. Vee should be limited to -10 V, at which point the negative output current will be approximately -10 mA. Consult factory for design assistance.

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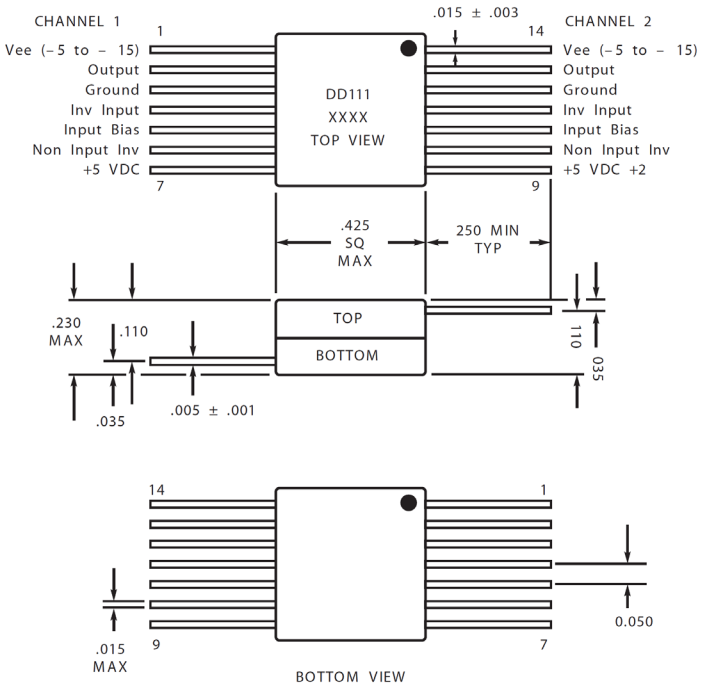

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PIN Diode Drivers

Model	NO. OF DRIVERS	① Output Current D.C. (mA) Positive Min.	Positive Max.	Negative Min.	Negative Max.	Minimum Open CKT Output (V) Pos.	Neg.	② Minimum Switching Times (ns) Ton	Toff	Max. Rep. Rate (MHz)	③ Maximum Internal Current Drain (mA) +5V	Vee	④ Operating Voltage Limits (V) +5V Min.	+5V Max.	Vee Min.	Vee Max.	⑤ Max. Power Dissipation (W) 100 C Case	25 C Amb
DD111/M	2	24/40	36/60	24/40	36/60	4.0	11.0	100	200	1	45	30	4.5	5.5	3	16	1.0	0.8
DD211/M	3	16	24	16	24	4.0	11.0	100	200	1	90	50	4.5	5.5	3	16	1.5	1.2
DD211B	3	40	60	40	60	4.0	11.0	100	200	1	90	50	4.5	5.5	3	16	1.5	1.2
DD311A	4	16	24	16	24	4.0	11.0	100	200	1	15	60	4.5	5.5	3	16	1.9	1.2
DDF11/M	4	40	60	40	60	4.0	11.0	100	200	1	45	60	4.5	5.5	3	16	1.9	1.2
DDF2311	6	16	24	16	24	4.0	11.0	100	200	1	60	90	4.5	5.5	3	16	2.8	1.2
DDF3311	6	40	60	40	60	4.0	11.0	100	200	1	75	90	4.5	5.5	3	16	2.8	1.2

Notes:

1. Output current is measured into a 10 Ohm load to ground.

2. Load is a 50 pF (39 + 10 scope probe) capacitor in parallel with a grounded cathode HP5082-0C01 PIN diode. Ton is measured from 50% of input (from a S<ASOO gate) to 10 +1 V diode load. Toff is measured from 50% of input to the rated open ckt negative voltage across diode load.

3. Exclusive of current supplied to the load.

4. To avoid exceeding power rating, the max. Vee should be held to 5 V when driving grounded anode diode.

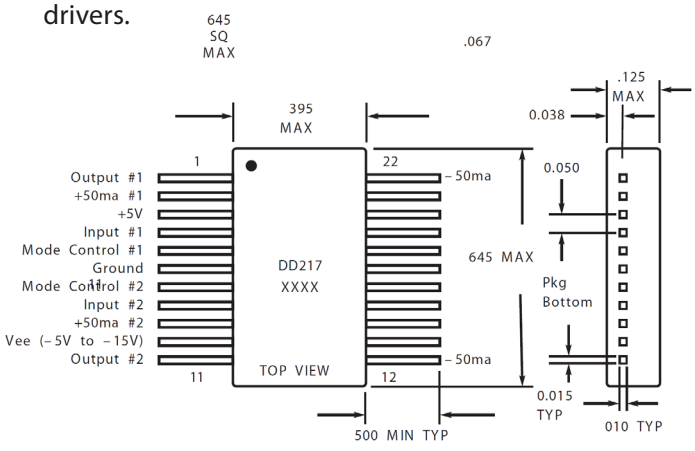
5. De-rate linearity to 175 º C. Temperature is measured at case bottom, which should be heat sunk if necessary.

DD217

Dual High Speed Driver

Two independent universal medium speed (100 ns) drivers with separate positive and negative quiescent output current programming and separate input logic mode control. This driver is often used in SPDT applications by driving both inputs from the same TTL input signal and applying opposite logic inputs to the two mode controls.

- Inputs are inverting when Mode control has a logic high input.
- Inputs are non-inverting when Mode control has a logic low input.
- To increase positive output current from the normal +30 mA to +50 mA, connect +50 mA pin to +5 V.
- To increase negative output current from the normal –30 mA to –50 mA, connect –50 mA pin to Vee.
- The negative output current does not vary with Vee, which should not exceed –5 V when driving grounded anode diodes to avoid high power dissipation in the drivers.



Melded Welded Package

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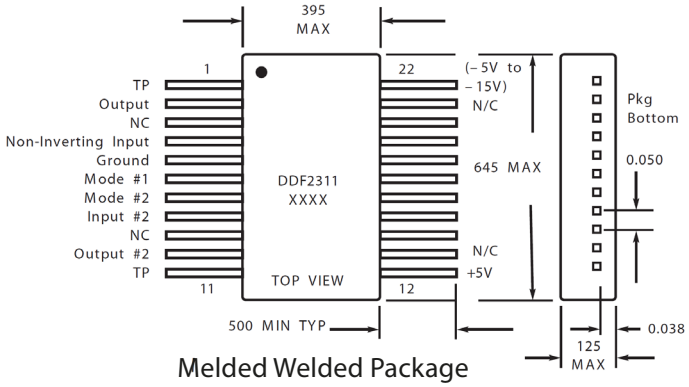
PIN Diode Drivers

DDF2311
DDF3311
DDF4311

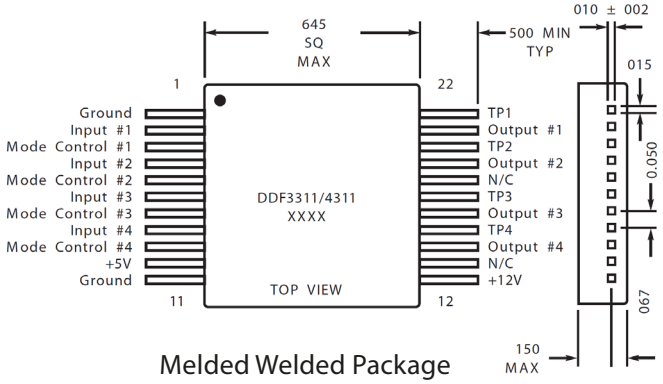
Two, Three, and Four Channel High Speed Drivers

Multiple independent high-speed drivers with 300 mA peak current spikes.

- Inputs are non-inverting when Mode control has a logic high input.
- Inputs are inverting when M ode control has a logic low input.
- To increase switching spike currents, add a capacitor of up to 560 pF between the output and TP pins.
- Mode control and input pins are interchangeable within any one channel.
- When driving anode-grounded diodes, excessive power dissipation must be avoided. Vee should be limited to -8V with -5V recommended.
- The DDF2311/3311/4311 do not have a true current source output. Instead the output is connected to a 380-ohm resistor in parallel with a 560 pF capacitor and the driven end of this RC combination is switched between +4V and Vee so that the negative output current varies directly with Vee.



Melded Welded Package



Melded Welded Package

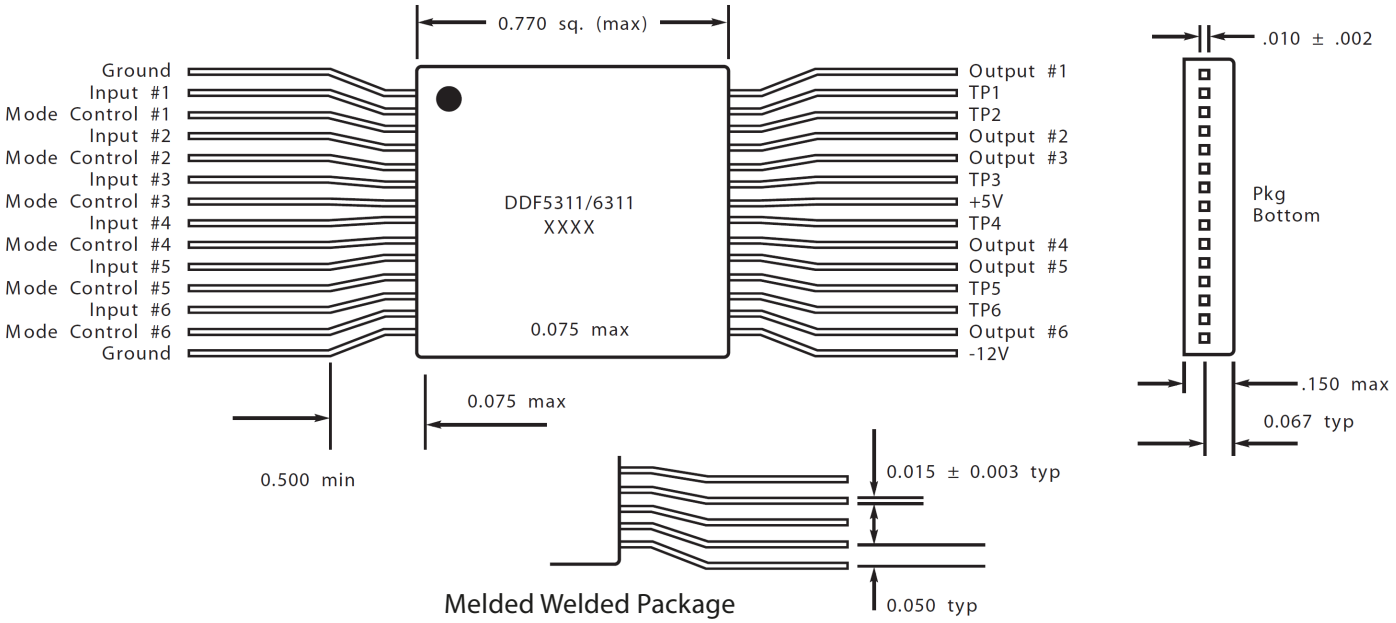
PIN Diode Drivers

DDF5311
DDF6311

Five and Six Channel High Speed Drivers

Independent high speed drivers with 300 mA peak current spikes.

- Inputs are non-inverting when Mode control has a logic high input.
- Inputs are inverting when Mode control has a logic low input.
- To increase switching spike currents, add a capacitor of up to 560 pF between the output and TP pins.
- Mode control and input pins are interchangeable within any one channel-
- When driving anode-grounded diodes, excessive power dissipation must be avoided. Vgg should be limited to -8V with -5V recommended.
- These drivers do not have a true current source output. Instead the output is connected to a 380-ohm resistor in parallel with a 560 pF capacitor and the driven end of this RC combination is switched between +4V and Vee so that the negative output current varies directly with Vee.



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PIN Diode Drivers

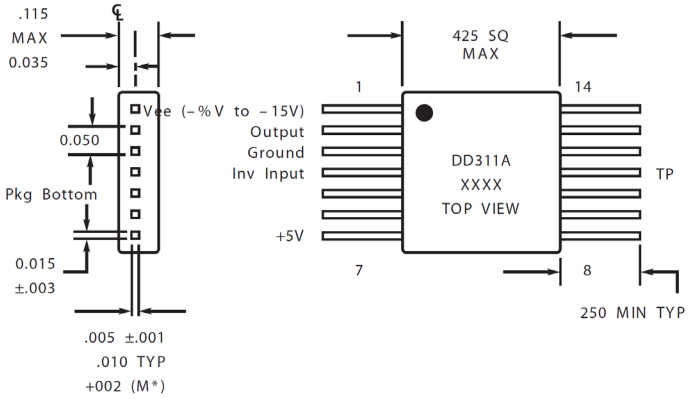
DD311A
DD311AM *

Ultra High Speed SPST

An inverting only ultra high speed driver with 300 mA switching current spikes. The DD311A output (pin 2) is connected to a 360 ohm resistor paralleled with a 560 pF capacitor and the driven end (pin 11) of the resistor/capacitor combination is switched between +4 and -10 V.

- The DD311A should be driven from an otherwise unloaded 54S, 54AS, or 54F type gate to achieve rated switching times. Input capacitance is approximately 50 pF.
- To increase switching peak currents, add a capacitor of up to 560 pF between the output and TP pin.

**** M suffix denotes welded metal package instead of standard epoxy-sealed ceramic package.***



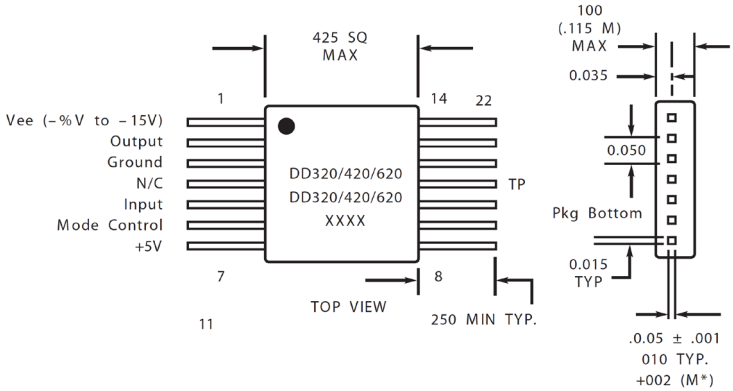
DDF311
DDF311M *

**** M suffix denotes welded metal package instead of standard epoxy-sealed ceramic package.***

High Speed Drivers

Single channel high speed drivers with 300 mA peak current spikes.

- Inputs are non-inverting when M ode control has a logic high input.
- Inputs are inverting when M ode control has logic low input.
- To increase switching peak currents, add a capacitor of up to 560 pF between the output and TP pin.
- Mode control and input pins are interchangeable within any one channel.
- DDF311 Series drivers do not have a true current source output. Instead the output is connected to a 380-ohm resistor in parallel with a 560 pF capacitor and the driven end of this RC combination is switched between +4 and Vee so that the negative output current varies directly with Vee.



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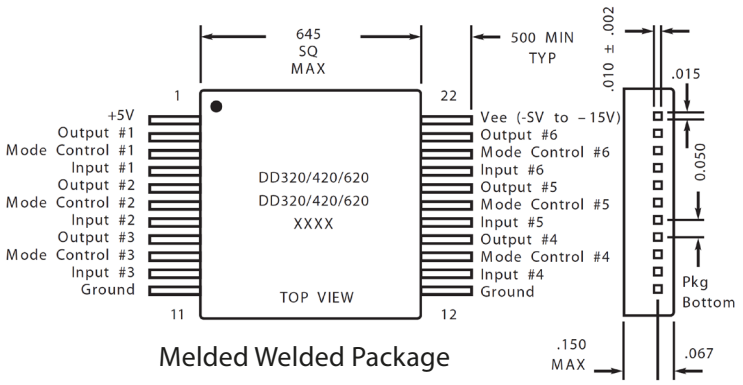
PIN Diode Drivers

DD320 DD350
DD420 DD450
DD620 DD650

Three, Four, and Six Channel High Current Drivers

Multiple independent medium speed drivers with separate input logic mode controls. Logic inputs are true TTL unit loads.

- Inputs are inverting when Mode control has a logic high input.
- Inputs are non-inverting when Mode control has a logic low input.
- Mode control and input pins are interchangeable within any one channel.
- Mode control and input pins are interchangeable within any one channel.
- The negative output current does not vary with Vee which should not exceed -5V when driving grounded anode diodes to avoid high power dissipation in the drivers.
- The last two digits of the part number signify out-put current. Other currents are available on special order.



Melded Welded Package

Application Notes

PIN Diode Switching Times

PIN diodes are used as RF switches because of their low off-capacitance/on-resistance product. However, they store a significant charge during conduction that must be removed before they will turn off. Typically, this is specified as storage time (TS), which is made to look better than it might be by rating it with a high ratio of reverse (IR) to forward (IF) current. When switching these diodes with a non-spiking driver, the typical TS will be multiplied by the specified ratio. For example, the MA47120 has a TS of 12 ns with IF=20 mA and IR= 200 mA. W ith symmetrical currents as delivered by high current drivers, the TS becomes 120 ns. High speed drivers supply a spike of several hundred mA at turn-on and turn-off to shorten the TS of the PIN diode.

Heat Sinking

The power dissipated in PIN diode switches is conducted to the bottom of the package. The thin walls leading to the top of the package represent a high thermal resistance. The total power in the hybrid is the sum of it own current drain multiplied by the voltage of each supply plus the output current of each driver multiplied by the supply voltage less the VF of the PIN diode.

The total can be substantial especially in the multiple high current drivers. If your calculations show that the hybrid should be heat sunk, you may find it convenient to place it top down on the PC board so that the bottom of the hybrid may be mounted directly to the metal case of your package.

Other Diode Drivers

In addition to these standard circuits, APITech produces a wide range of custom-designed drivers. These include a dual ECL-input driver (DD212) and a 28-channel 50 mA driver (DD2850). APITech is also one of the largest custom hybrid manufacturers in the United States. Please contact the factory or your local representative for a quote on your driver requirements or your own custom hybrid circuit.