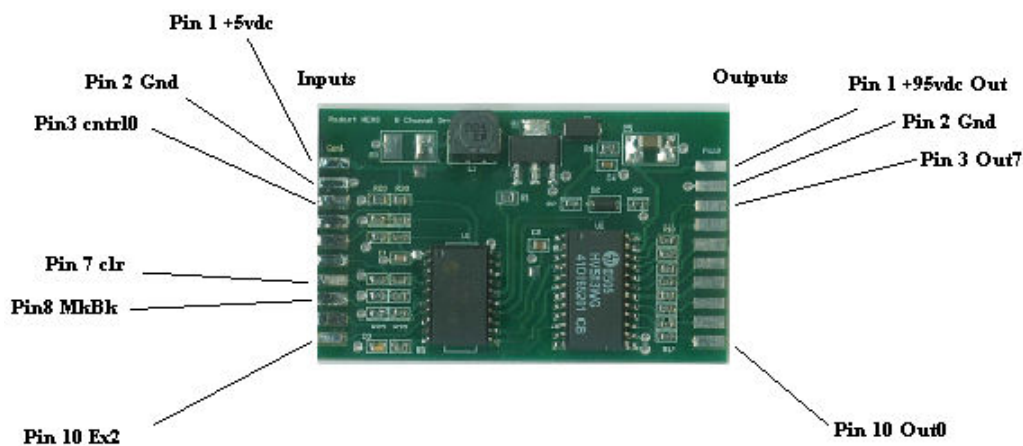


### Description

The RMDR1000 was designed to drive Radant's RF MEMS switches. The RMDR1000 greatly simplifies the design of MEMS switch gate drives by incorporating all the active components on a single PCB. Accepting a standard +5 VDC power supply voltage and logic level control inputs the device allows the user to easily control up to eight high voltage gate lines. The RMDR1000 offers a superior alternative to discrete drive circuitry.

### Features

- On board 5Vdc to 95Vdc DC-DC converter
- Eight independent gate lines
- Make before break control line
- DC up to 20KHz cycle rate
- Low power consumption (2 mA without LED)
- Single +5Vdc power supply required
- User programmable output states
- Brown-out shutdown and startup delay
- Low startup power consumption
- On board in-circuit reprogrammable flash microcontroller
- Low output voltage ripple
- On board LED status indicator
- Small size 2.1"x 1.3"
- Bottom side completely grounded



## Absolute Maximum Ratings

Supply Voltage Vdd	-.3Vdc to 6.0Vdc
Logic Input Voltage	-.2V to Vdd+.2v
Operating Temperature Range	-10C to 85C
Storage Temperature Range	-40C to 150C

## Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units
Supply Voltage	Vdd	4.5		5.5	Vdc
Supply Current (all outputs low)	Idd		5.0	10	mA
Supply Current (all outputs high)	Idd		5.0	10	mA
Supply Current (1khz all outputs low/high)	Idd		5.2	10	mA
Supply Current (5khz all outputs low/high)	Idd		6.5	15	mA
Supply Current (20khz all outputs low/high)	Idd		11.4	30	mA
Driver Output Low	VoutLow			5	Vdc
Driver Output High	VoutHigh	90		100	Vdc
DC-DC Output Voltage	Vc	90	95	100	Vdc
Output Voltage ripple	Vrip		0.4	1	Vpk-pk
Logic Input Low	Vlogiclow	Gnd		Vdd/4	Vdc
Logic Input High	Vlogichigh	Vdd- Vdd/4		Vdd	Vdc
Output Capacitive Load( 20khz switch freq)	Cload	0		10	pF
Output Resistive Load	Rload	10			MΩ
DC-DC Startup Time	Tstart		190	300	ms
High Voltage Output Rise Time	Trise		5	10	us
High Voltage Output Fall Time	Tfall		5	10	us
Delay Logic Input To Output (normal operation)	Tdelay		12	16	us
Delay Logic Input To Output (make before break operation)	Tmkdy		25	32	us
ESD logic input protection	Vprot	2			KV

Note: the LED status indicator draws 3mA, disable for reduced power consumption.

## Pin Outs

Input Power and Control Connector			
Pin	ID	Description	Pin-out for re-programming microcontroller*
1	+5Vdc	+5Vdc input power supply	Pin 1 +5v
2	Gnd	Input Ground connected to Bottom Gnd Plane	Pin 8 Gnd
3	Cntrl0	Logic Control Input 0 with Pull Down	Pin 7 A0
4	Cntrl1	Logic Control Input 1 with Pull Down	Pin 6 A1
5	Cntrl2	Logic Control Input 2 with Pull Down	NC
6	Cntrl3	Logic Control Input 3 with Pull Down	Pin 4 A3
7	Clr	Logic Input Clear Outputs On High with Pull Down	NC
8	BkMk	Logic Input Make before Break on High with Pull Down	NC
9	Ex0	Extra Logic I/O 0	NC
10	Ex1	Extra Logic I/O 1	NC
Output Connector			
Pin	ID	Description	
1	95Vdc	DC-DC output Voltage	
2	Gnd	Output Ground connected to Bottom Ground Plane	
3	Out7	High Voltage Output Signal 7	
4	Out6	High Voltage Output Signal 6	
5	Out5	High Voltage Output Signal 5	
6	Out4	High Voltage Output Signal 4	
7	Out3	High Voltage Output Signal 3	
8	Out2	High Voltage Output Signal 2	
9	Out1	High Voltage Output Signal 1	
10	Out0	High Voltage Output Signal 0	

\* referenced to 8-pin DIP. See page 5 or note on re-programming microcontroller.

## Startup Operation

The unit incorporates an intelligent startup mode to avoid high inrush power supply current and spurious undefined output conditions. On startup the unit is in shutdown mode till 2.1 Volts DC has been reached. The unit then blanks the high voltage output driver by loading the serial word \$00 into the output buffer and also keeping the blanking line activated. The unit then waits for approximately 100 milliseconds before allowing the DC to DC converter to charge the output capacitor. Once the DC to DC converter reaches the desired output voltage of approximately 95 volts the red LED indicator will then be activated. The user input on the control lines are then read by the microcontroller and the corresponding data is sent to the high voltage output buffer. Lastly the blanking line is then disabled and the unit remains active for normal operation. If the power supply voltage drops below 2.1 volts for any reason the microcontroller will enter shutdown mode and will restart once the power supply voltage is regain.

## Control Operation

The high voltage outputs are controlled with six digital input lines. The Clr line disables all the high voltage outputs. The MkBr mode line (Pin 8) at logic high will keep the last output state active and also activate the new state. In MkBr mode the old state will remain active for approximately 10us before it is disabled; this allows the desirable make before break operation. The four control lines (Cntrl0-Cntrl4) control output pins (Out0 to Out7). Currently Cntrl3 line is inactive and is for future expansion. The control output states follow the logic table below.

Cntrl0	Cntrl1	Cntrl2	Cntrl3	Clr	Function
Pin 3	Pin 4	Pin 5	Pin 6	Pin	
X	X	X	X	H	All output low
L	L	L	X	L	Out0 High
H	L	L	X	L	Out1 High
L	H	L	X	L	Out2 High
H	H	L	X	L	Out3 High
L	L	H	X	L	Out4 High
H	L	H	X	L	Out5 High
L	H	H	X	L	Out6 High
H	H	H	X	L	Out7 High

L= Logic Low  
H= Logic High  
X= Don't Care

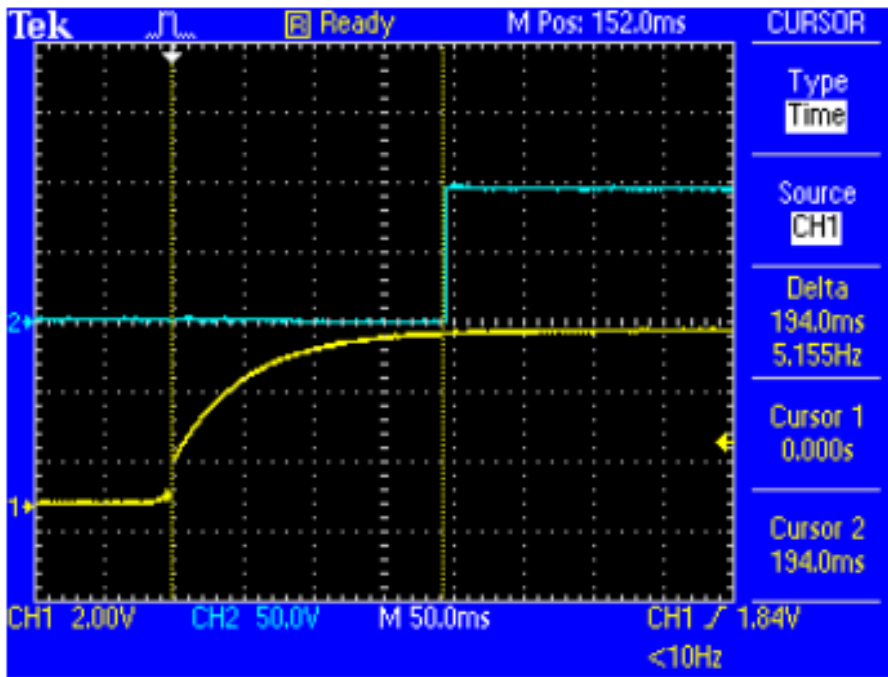
## Microcontroller Reprogramming

The on board microcontroller can be reprogrammed to allow for custom features. The Microchip PIC16F677 located on the circuits board is reprogrammed with the use of a five wire custom cable attached to the 10 pin input connector and an 8 or 16 pin DIP. The following hardware is required: Microchip's \$200 PICSTART Plus programmer, a PC with serial port, and the custom adapter cable. Microchip's latest version of MPLAB that is usually supplied with the PICSTART development system must be loaded on the host computer. Please contact Radant MEMS for the latest 8-channel driver firmware. The custom programming cable DIP end is then inserted into the PICSTART 40pin DIP socket and the 10pin DIN connector is attached to the PCB. No other power or cables are required. See the pin out table in this datasheet for wiring diagram. The PIC16F677 datasheet and latest version of MPLAB can be downloaded for free from the Microchip corporation web site.



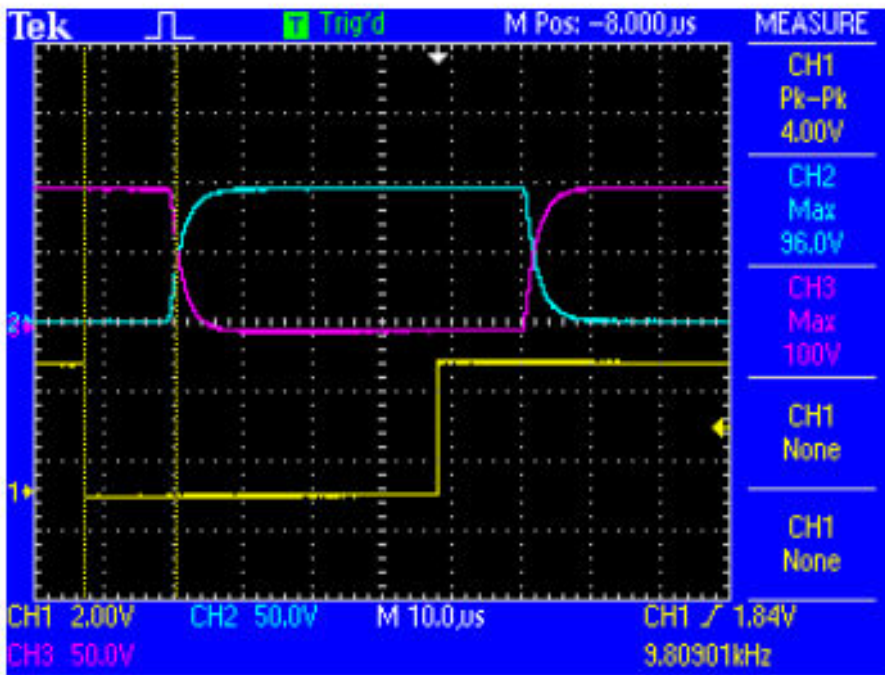
**Figure 1: Programming Cable**

# Typical Characteristics



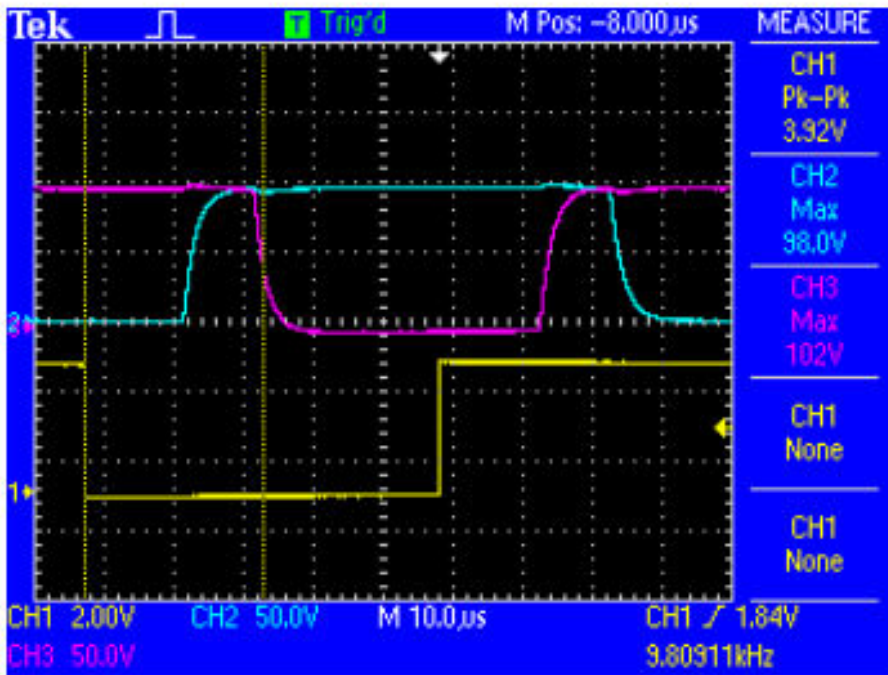
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Figure 2: Startup delay time



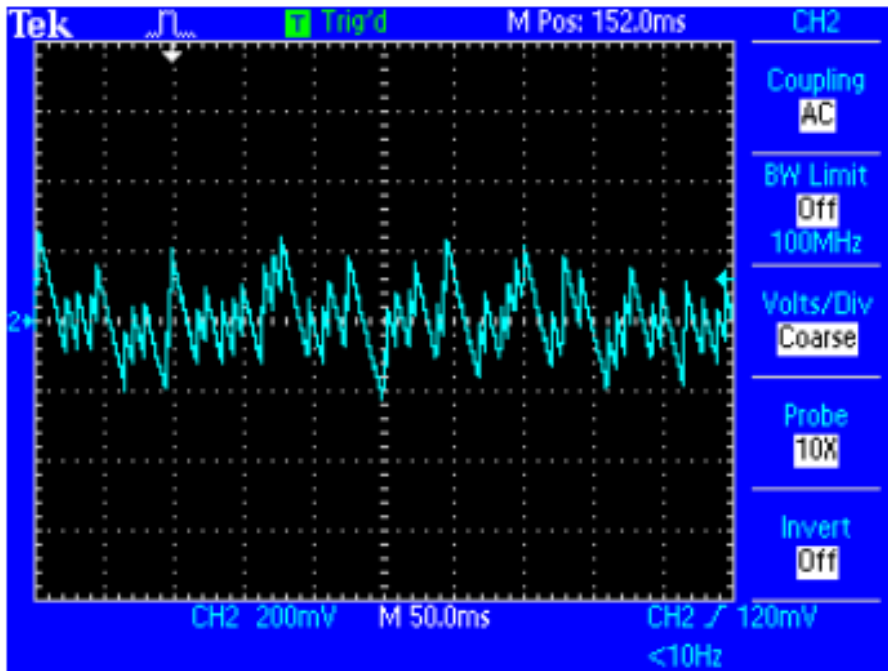
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Figure 3: Output Delay Times



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Figure 4: Make before break operation



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Figure 5: Output noise during on state