This paper presents a hysteretic (sliding mode) control IC for a buck DC/DC converter for use as an envelope tracking power supply to increase the efficiency of an RF power amplifier. The IC integrates a high-bandwidth error amplifier, a comparator with hysteresis, and a high-side driver for an external N-channel power MOSFET. The total control loop delay using the implemented IC is 35ns, this is shown to be a 30% reduction compared to a state-of-the-art discrete IC based solution. The presented results also show that it is viable to integrate a 100MHz operational amplifier on the same die as a high-voltage MOSFET driver operating with slew rates in excess of 5V/ns. The IC is demonstrated in a tracking power supply with 30W output power and 3μs rise/fall time, running from a 40V input. The complete IC, including pads, takes up 4mm\(^2\) in a 0.35μm 50V CMOS process.