

PWM Functionality Test

INTRODUCTION

Hybrid PWM amplifiers are widely used in applications such as motion control, offline drivers, capacitor discharge welder controller, and audio speaker drivers. When you first build an engineering prototype to check out your application circuit, it may not work the first time. So, you do the trouble shooting. One common question is, "is my PWM amplifier still working?" Well, maybe. You can always pull it out from your circuit board, ship to Apex and request for a retest in Apex' ATE tester. But, you may have to wait for days or weeks to get an answer back. Chances are you need the answer right then. Well, you can do it yourself and it is surprisingly simple. While they are not shown on these diagrams, be sure to bypass all supplies with ceramic capacitors (1 μ F recommended) with short leads. You don't need a 100V, 30A power supply to test, for example, an Apex SA03, which is rated at 100V and 30A. All you need is a 15V, 100mA power supply and an oscilloscope. Why? Because Apex had already tested every SA03 for its 100V, 30A capability, and all other guaranteed parameters before shipping to you. If the PWM is subsequently damaged in your application, the probability is remote that a 100V PWM amplifier will become an 80V amplifier, or its 30A

current capability will be reduced. More likely, it is damaged to the point of not functioning at all.

FUNCTIONALITY TEST CIRCUITS

The purpose of this application note is to prescribe a very simple circuit (Figure 1A and 1B) for each Apex PWM model to test for functionality. The circuit is not intended to test for parametric shifts.

LOOK FOR OUTPUT WAVEFORMS

Use an oscilloscope to look at the waveforms at AOUT and BOUT. You should see two square waves as shown in Figure 2; one is inverted, or 180 degrees out of phase, from the other. For half bridge models, the SA13, SA14, SA16 and SA18, you have only one output and will see only one square wave.

The square wave's amplitude should be the same as your power supply voltage, and its frequency is as follows:

SA01 - 42 KHz	SA13 - 22.5 KHz
SA03 - 22.5 KHz	SA14 - 22.5 KHz
SA04 - 22.5 KHz	SA16 - 22.5 KHz
SA06 - 22.5 KHz	SA18 - 22.5 KHz
SA07 - 500 KHz	SA50 - 45 KHz
SA08 - 22.5 KHz	SA51 - 45 KHz
SA12 - 200 KHz	SA60 - 45 KHz

FIGURE 1A. FUNCTIONALITY TEST CIRCUITS FOR DIFFERENT APEX PWM AMPLIFIER MODELS.

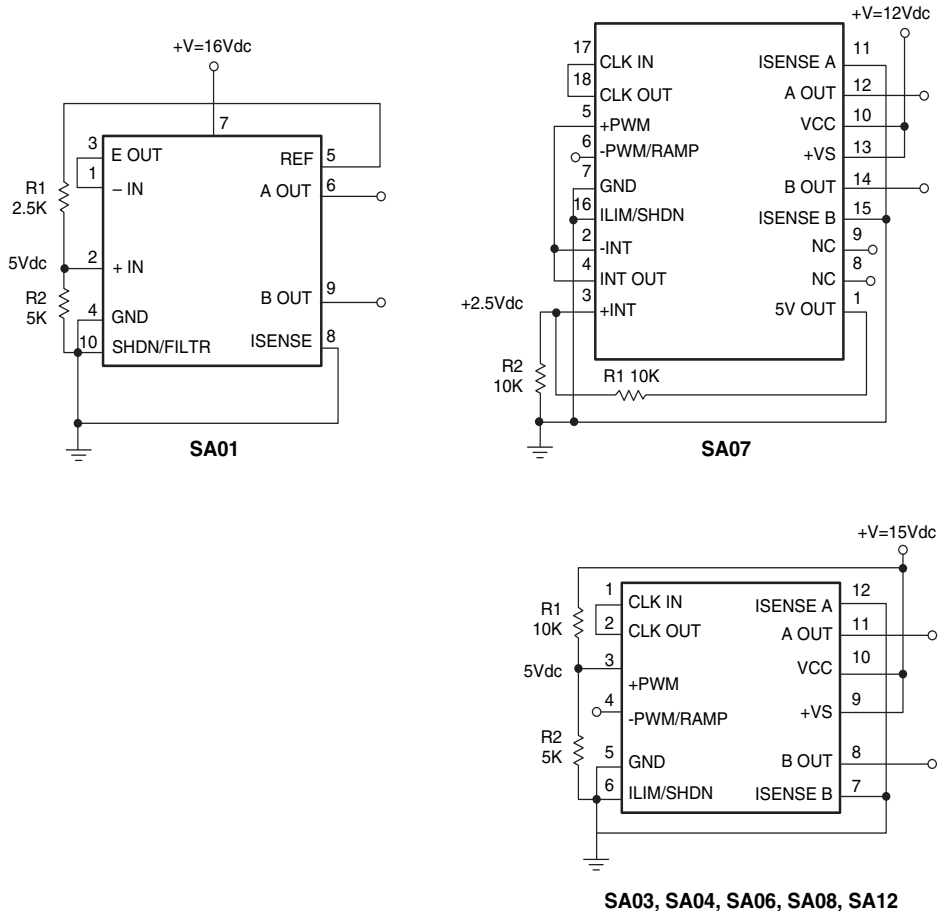
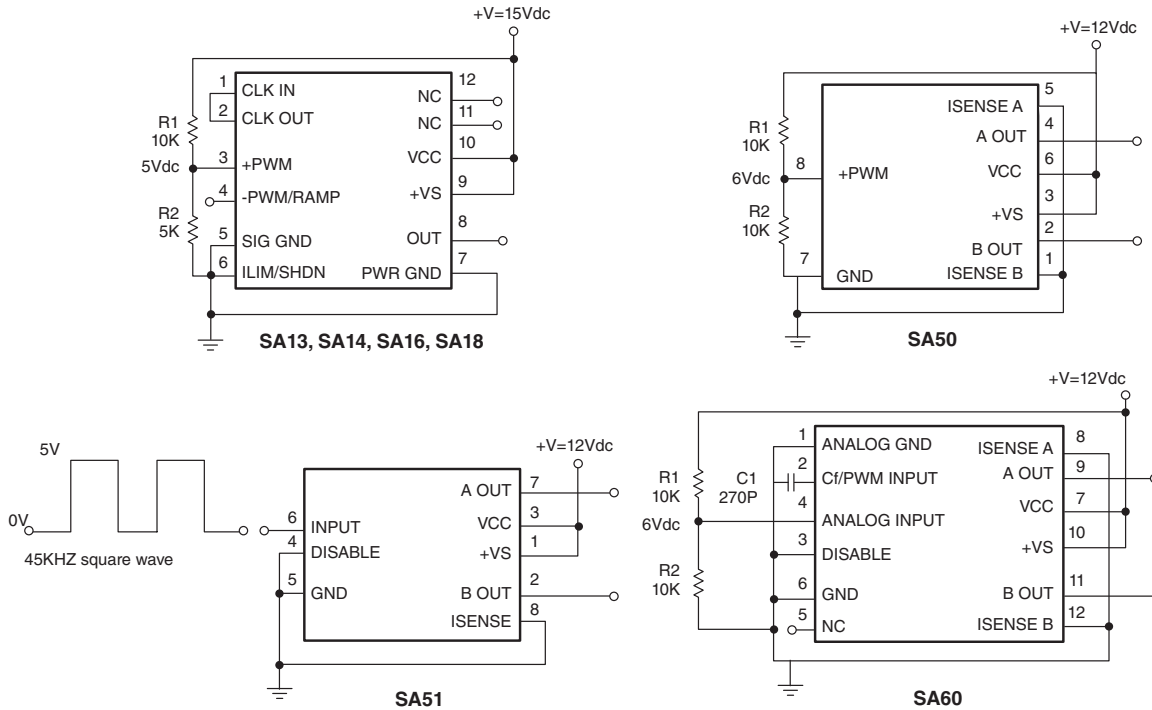


FIGURE 1B. FUNCTIONALITY TEST CIRCUITS FOR DIFFERENT APEX PWM AMPLIFIER MODELS.



If you do see two square wave outputs, or one square wave for a half bridge PWM amplifier, your amplifier is alive and well. Otherwise you will see at least one of the following symptoms, which implies your PWM amplifier is dead and needs to be replaced.

1. A high impedance DC voltage at AOUT or BOUT or both. That DC voltage can be near 0V or near +Vs. Or,
2. The output is not a square wave, but a ramp. Or,
3. High current drain, greater than 100mA, from your power supply.

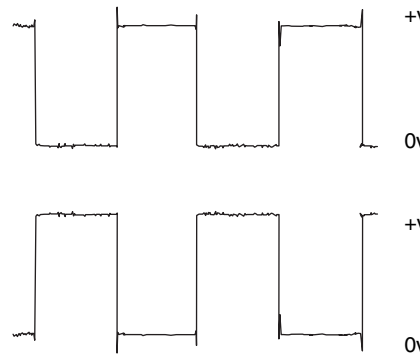


FIGURE 2. OUTPUT WAVEFORMS AT AOUT (TOP) AND BOUT (BOTTOM).

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