

## Benefits of IGBT vs. Sinewave Dimming

### Two Technologies, One Transistor

Insulated Gate Bipolar Transistor (IGBT) Dimming and Sinewave Dimming are two very different technologies used for dimming lighting loads, yet both technologies provide essentially the same benefits. IGBT Dimming was introduced in 1992 by Entertainment Technology. This patented dimming technology has been in use in Architectural and Theatrical applications around the world, including some of the world's most prestigious venues. Sinewave Dimming was introduced to the United States in 2005 by Strand and Electronic Theatre Controls (ETC). Sinewave dimming remains relatively new with only a few installations in North America.

Both IGBT dimming and Sinewave dimming offer quiet lamps, dimming circuits that do not buzz, the elimination of triplen harmonics, higher efficiencies and therefore less heat contribution, and intelligence that provides for dimming circuits that can regulate output voltage and current, monitor operating temperatures, and protect against shorted loads.

Both IGBT dimming and Sinewave dimming incorporate Insulated Gate Bipolar Transistor power devices, and neither circuit requires the large inductors (chokes) required by Silicon Controlled Rectifier (SCR) or Solid State Relay (SSR) dimmers.

### Quiet Dimming

Both IGBT Dimming and Sinewave Dimming offer quiet lamps. By eliminating harsh inrush currents, lamp filaments remain quiet, and last longer. Noisy lamps can be a real problem in performance spaces, or acoustically hard spaces. Older SCR and SSR Dimmers employed large chokes to limit the inrush current, and reduce lamp "sing." However, these chokes were large, heavy, and inefficient, reducing the output voltage of the dimmer and increasing the amount of heat each dimmer circuit produced. Also, these chokes were inconsistent - the amount of filtering they provided was dependent on the size of the connected load. IGBT and Sinewave dimming circuits do not use chokes, and therefore are lighter, and more efficient. Chokeless IGBT dimmers and Sinewave dimmers produce none of the audible buzzing usually associated with dimming equipment.

### More Efficient

Since IGBT and Sinewave dimmers do not use chokes, they output more voltage, and produce less waste heat. More efficiency translates into brighter lamps and lower HVAC requirements. Sinewave dimmers operate with an efficiency of 96.5% or better, while IGBT dimmers operate at a fixed efficiency of 97.6%. Many IGBT dimmers are so efficient, they are convection cooled, and do not produce any noise at all!

### No Triplen Harmonics

Large inrush currents create havoc on Neutral conductors called harmonics. These harmonics often cause service transformers to overheat, and conduit and panelboards to "chatter". For years, engineers have specified oversized neutral conductors, and K-Rated transformers to help reduce the negative effects of harmonics. Both IGBT and Sinewave dimming have solved the harmonics problem without the use of specialized equipment or wiring. Sinewave dimming creates no current inrushes on the output side of the dimmer. IGBT dimming circuitry greatly reduces the inrush current on the output side of the dimmer, but provides a feature that places complimentary pairs of dimmers in Forward Phase Control (FPC) and Reverse Phase Control (RPC). These "pairs" of dimmers have small harmonics, that cancel each other. This patented process of harmonic cancellation is called LOW HARM®.

### Intelligent Dimming

Both IGBT and Sinewave dimming circuits employ extensive intelligence. These new dimming technologies are able to sense temperature, load size, output voltage and current, and even detect shorts while shutting the output voltage off to prevent arcing and fires! Using this intelligence, IGBT and Sinewave dimmers are able to provide vital information when an error condition arises, or notify someone if a lamp has burned out.





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### Mutual Benefits

Clearly, IGBT and Sinewave dimming offer many of the same benefits desired when choosing a high-performance dimming system. Both technologies are quiet, efficient, and intelligent. And both technologies are available from reputable leaders in the dimming industry. However, there are a few differences between IGBT and Sinewave dimming which should be considered.

First, IGBT Dimming is a proven reliable technology, in use around the world since 1992. Sinewave is a newer technology, and its reliability is yet to be proven. Typically, a Sinewave dimmer incorporates twice the number of components compared to an IGBT dimmer, increasing circuit complexity and increasing the chances of a failure.

Second, IGBT Dimming is competitively priced with conventional SCR and SSR dimming equipment. Since IGBT Dimming is inexpensive, all the benefits of IGBT Dimming can be employed on every circuit instead of only a select few circuits. The cost of Sinewave remains high, and Sinewave is often presented as a solution for "problem circuits." IGBT Dimming affords you all the benefits of Sinewave Dimming, for the price of conventional SCR/SSR Dimming.

### IGBT Benefit Checklist

	Quiet	Efficient	Size	No RF Noise	Affordable
SINE WAVE	✓	✓			
IGBT	✓	✓	✓	✓	✓

For more information on IGBT Dimming, please visit the Entertainment Technology website at [www.etdimming.com](http://www.etdimming.com)

This product may be covered by one or more of the following U.S. Patents: #4,413,211; 4,430,576; 4,465,956; 4,733,138; 4,792,731; 4,880,950; 4,988,840; 4,992,709; 5,004,969; 5,004,969; 5,128,654; 5,153,816; 5,189,259; 5,194,858; 5,239,255; 5,239,255; 5,371,439; 5,371,444; 5,506,480; 5,636,111; 5,642,104; 5,646,490; 5,814,550; 5,821,704; 5,920,156; 5,930,126; Des. #307,578; 333,124; 435,203; 440,207; License #4482844; 5,004,969; 5,239,255; and corresponding foreign patents. Other Utility, Design and Foreign Patents Pending. We reserve the right to change details of design, materials and finish in any way that will not alter the installed appearance or reduce function performance. Specifications are subject to change without notice.



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