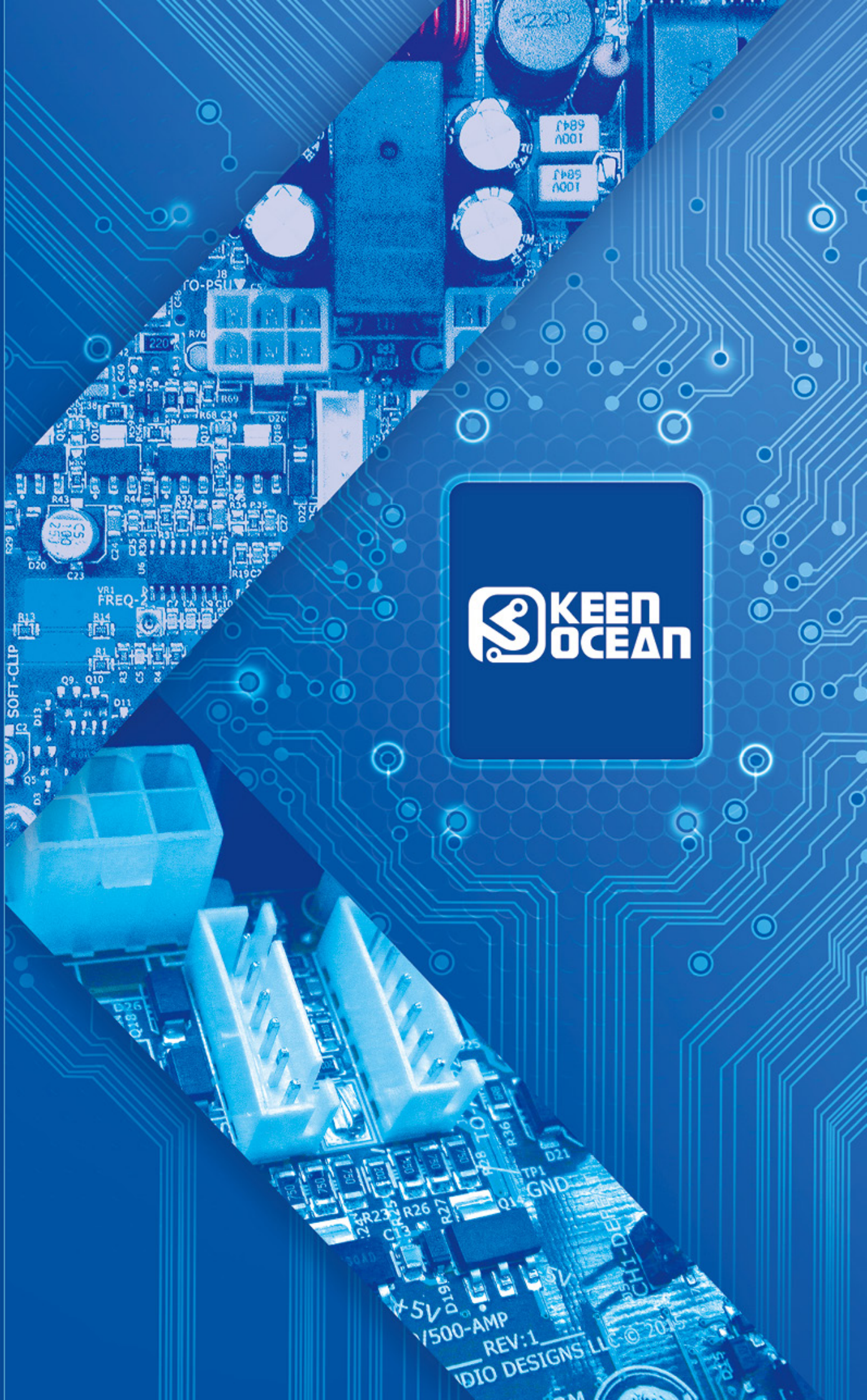


Keen Ocean Industrial Ltd

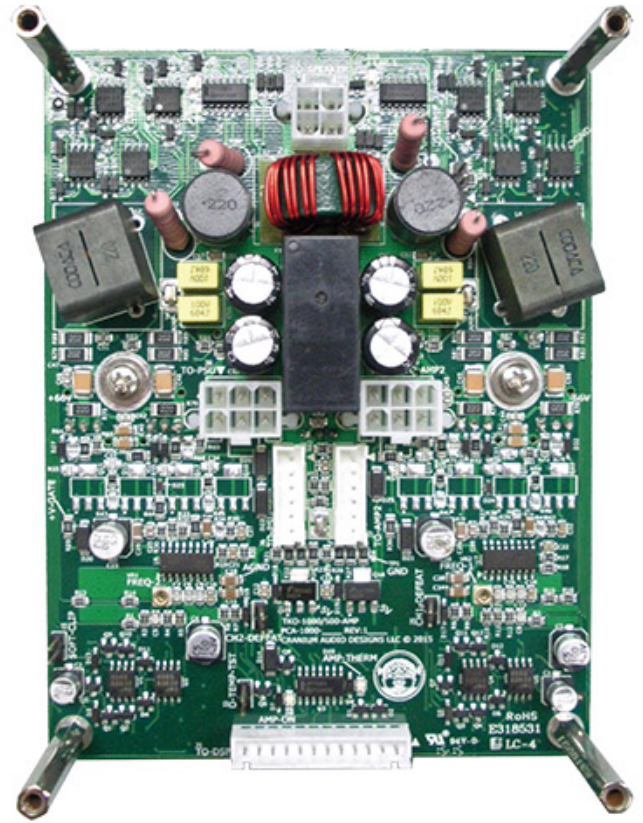
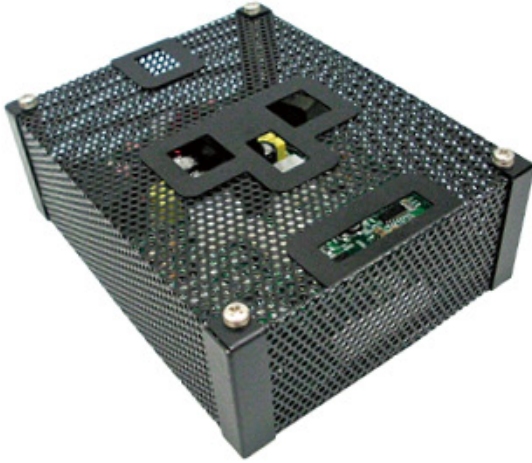
www.keenocean.com.hk



**KEEN
OCEAN**



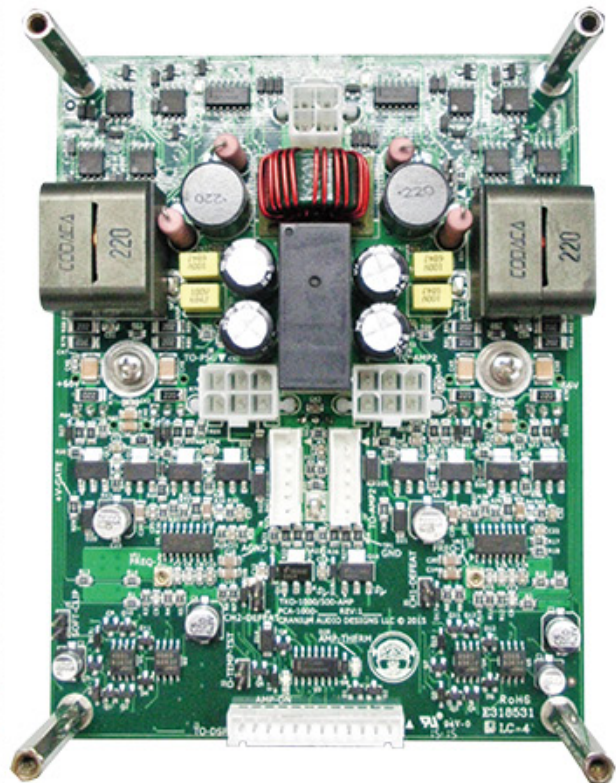
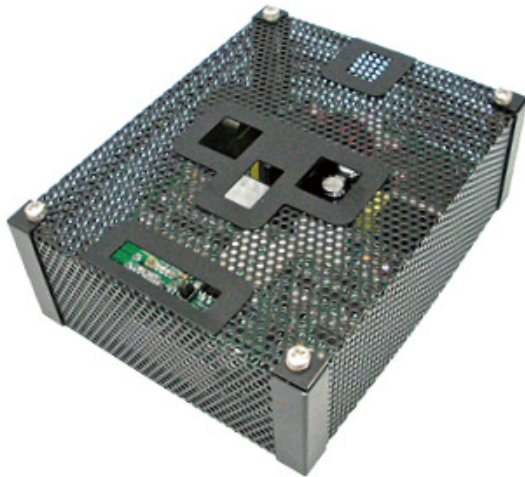
TKO-500W-AMP



TKO 1000/500W Amplifier Features:

- Dual mode output stage feedback
- Input stage soft-clip circuitry
- Real time readout of amplifier load impedance
- High power 35A / 150V high speed output Stage FETs (TKO-500W-AMP)
- High power 65A / 200V high speed output Stage FETs (TKO-1000W-AMP)
- 4-transistor discrete high current high speed gate drive stage (TKO-1000W-AMP)
- Extensive load and module protection circuits

TKO-1000W-AMP



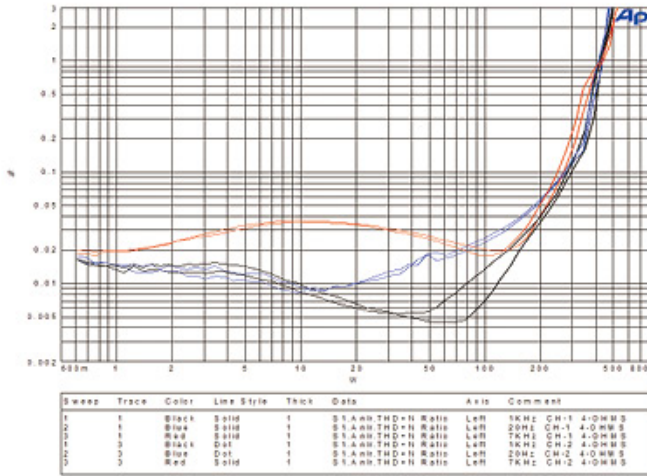
The TKO-1000W-AMP and TKO-500W-AMP assemblies are stand-alone flat panel power solutions designed to be mounted to a supplemental flat panel heatsink. Each 1000W module offers 2 channels of 500W class-D power or 1000W of power into a bridge tied load. Each 500W module offers 2 channels of 250W class-D power or 500W of power into a bridge tied load. Up to two modules can be used in the system, for a total of 4 output channels. Any combination of channel drive powers can be implemented by the end user and internal system protection systems will not kick in for total output power levels up to 1000W or 500W for the respective power supplies.

Power supply protection is provided by each amplifier stage having an input soft clipping circuit. Should customer-defined limiters not kick-in for whatever reason, the total output power will be limited to a total of 1100W of output power for the 1000W system and 550W for the 500W system. While it is of course more desirable to limit the amplifier output power via DSP limiters, the soft clipper allows for a second layer of protection for the overall power system. The soft clipper also displays a fairly benign clipping characteristic. It is not overly harsh to the ear so long as it's not called upon to act with high levels of attenuation.

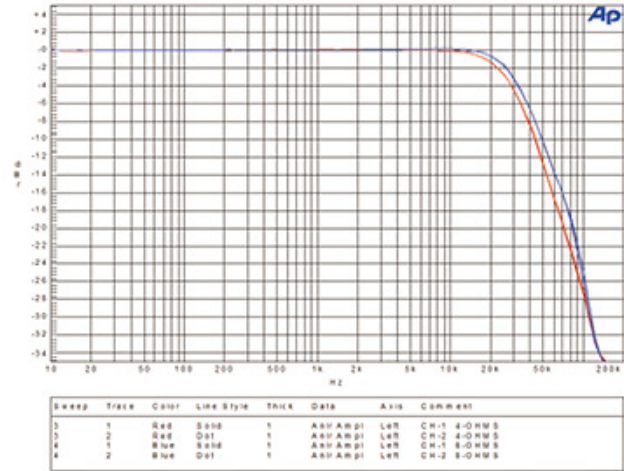
A dual-mode output feedback topology has been implemented in our power amplifiers. Taking feedback both before and after the reconstruction filter results in lower distortion and greater high frequency linearity delivered to a real speaker load. The high frequency peaking seen on all Class-D output stage reconstruction filters (when driving reactive loading) can be greatly reduced using this type of topology.

Each amplifier also features real time monitoring of the average speaker load impedance. With amplifier drive levels at 1W or greater, a voltage representing the output stage load impedance is delivered to the DSP board. These signals can be used to monitor each driver for proper operation, noting if a driver has opened-up or a voice coil has been shorted. For example this function can be used in a networked system as an aid to monitoring, maintaining and servicing each cabinet in a large array.

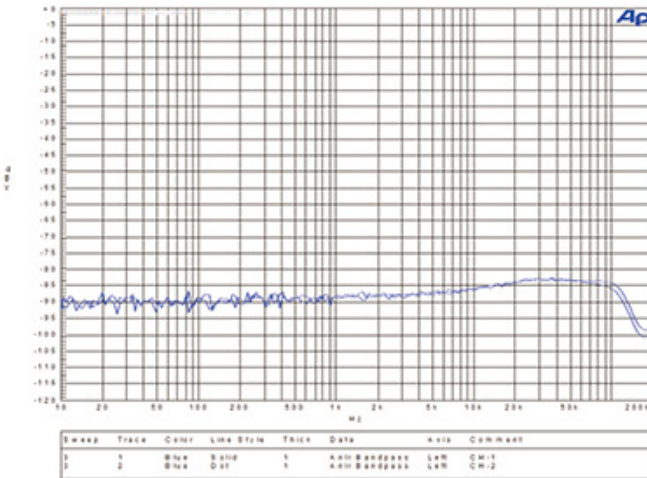
Power Amplifier Ratings	TKO-500-AMP	TKO-1000-AMP
Amplifier Topology	Class-D (Phase-shift self-oscillating Modulation)	
Carrier Frequency (@ Idle)	≈400KHz	
Output Power (0dB) <ul style="list-style-type: none"> Both Channels Driven Fo = 1KHz, <3% THD 	250W / 250W into 4Ω 125W / 125W into 8Ω 500W into 8Ω Bridged	500W / 500W into 4Ω 250W / 250W into 8Ω 1000W into 8Ω Bridged
Total Harmonic Distortion <ul style="list-style-type: none"> 1W to ½ rated power (-3dB) Fo = 20Hz – 7KHz 22KHz measurement bandwidth 	less than 0.2% (Less than 0.01% typical)	
Power Response <ul style="list-style-type: none"> 20Hz to 20KHz 1/2th Rated power (-3dB) 4Ω, 8Ω & unloaded resistive loading 	±2dB	
Signal to Noise Ratio / Dynamic Range (22Hz - 20KHz measurement Bandwidth, referenced to 0dB)	104dB (106dB Typical)	
Typical Amplifier Efficiency	90% @ Full power (1KHz Sine Stimulus)	
Input Impedance	22.5KΩ Balanced	
Input Signal Preconditioning	2nd order Butterworth (-3dB @ 32KHz)	
Voltage Gain	20.0dB (10V / V)	23.0dB (14.1V / V)
Input Sensitivity (for 0dB output)	+10.0dBV	+10.0dBV
Output DC Offset	less than ± 50mV (less than ± 1mV typical)	
Reconstruction Filter Response	2nd order Butterworth @ 41KHz (4Ω resistive loading)	
Carrier Bleed-Through	less than 3V p/p (@ idle)	
Output Muting	Via speaker relay: Turn-on and turn-off of amplifiers completely silent.	
Real-time output resistance detector	100mV / Ω (@ 1W of output power or greater)	
Module and Load Protections	Amplifier Soft Clipper Output DC offset Output stage over current Short circuit protection Amplifier and PSU over temperature Loss of AC Power High frequency pre-loading	



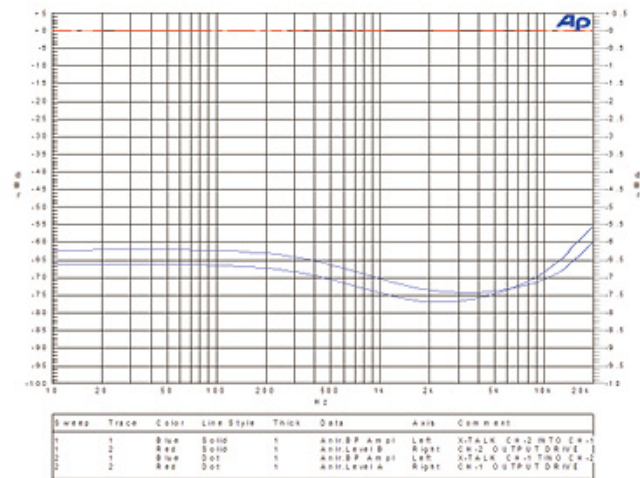
**TKO-1000W-AMP:
THD -VS- POWER INTO 4Ω**



**TKO-1000W-AMP:
POWER RESPONSE @ 1/2 POWER INTO 4Ω & 8Ω**



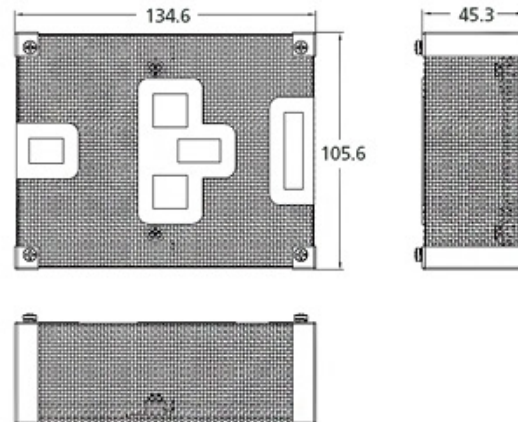
**TKO-1000W-AMP:
NOISE FLOOR into 4Ω (1/3 octave sweep)**



**TKO-500W-AMP:
CROSSTALK into 4Ω @ 1/10th rated power (25W X2)**

**TKO-500W-AMP
TKO-1000W-AMP**
(complete shielded assembly)

- Overall Dimensions :
- 134.6mm (W) X 105.6mm (D) X 45.3mm (H)
- Weight :
- 0.48KG. (1.05 Lbs.)



TKO-500W-PSU



TKO 1000/500W Power Supply Features:

- **Punchy, well defined, and powerful low frequency delivery:**
 - Stiff / high speed regulation of main power supply rails
 - Full output power delivery into transient loading
 - Low AC line ripple component resulting in low intermodulation distortion
- **Zero Current Switching LLC power supply:**
 - Low RF emissions & less stress on switching FETs
- **High power auxiliary keep-alive power supply (7V @ 2.5A)**
- **Extensive protection circuits surrounding the power supply designed to keep our power system *and your product* in one piece!**

The TKO-1000W-PSU and TKO-500W-PSU are flat-panel stand-alone modules, designed to be mounted to a supplemental flat panel heatsink. The power supply is a regulated series resonant LLC design operating from 100 – 260 KHz.

The control loop for this regulated supply has been carefully optimized to have a very tight regulation characteristic of just +3% / -5% from nominal: Why do you care? Because, for example on a hard kick drum transient, the system will deliver its full rated output power, resulting in a system with incredibly tight, punchy, and powerful bass. Given the high level of regulation exhibited by the TKO supplies, very little line frequency ripple (120Hz or 100Hz) is present on the rails. This contributes to very low intermodulation distortion when the amplifiers are driven hard (Into clipping).

In figure 1 to the right you will see a scope capture of the TKO-1000W power supply and amp driving a 20Hz sine wave driven to full-rated power of 1000W into an 8Ω bridge tied load. Note that the main two supplies remain regulated to $\pm 66V$ showing only ripple voltage related to the 20Hz sine wave. No 120Hz AC line related ripple is apparent. Also note the total lack of supply rail overshoot. (Finally note that the fuzzy appearance of the audio waveform at clip is an artifact of the output stage carrier frequency that is present with class-D amplifiers.)

TKO-1000W-PSU

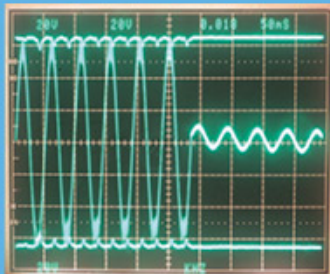
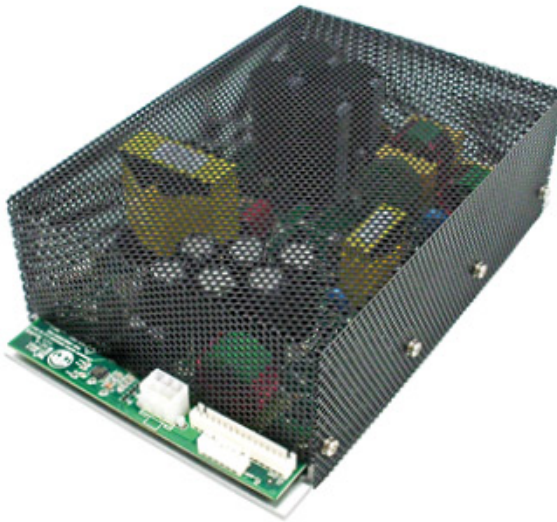


Figure-1



Figure-2

Many competing companies use LLC power supplies that are not regulated. Alternately some companies use supplies with a PFC front end (a regulated supply) followed by an unregulated LLC stage. While PFC front ends do a wonderful job of keeping the AC line current in check, their ability to do this also prevents them from following load transients quickly.

Figure-2 to the right shows a screen capture of the TKO-1000W amplifier connected to a supply with a PFC front end followed by an unregulated LLC supply. As you can see, even on the 1st 20Hz transient the power supply voltage has decayed from $\pm 66V$ to just $\pm 43V$. Rather than the amp delivering the full 1000W of output power (63V peak) this power system is delivering just 400W of output power (40V peak).

Further, even after 300mS of full power loading, the supply has just now almost recovered to full regulated voltage being at around $\pm 62V$ at the end of this 300mS transient.

Finally, upon the release of the PFC regulator from this transient, the supply shoots up to $\pm 72V$ (+9% of nominal) due to the slow loop response of the PFC stage. Why do you care? These higher transient voltages can be harder on the output stage of the power amplifiers connected to the supply, and could lead to early failure of the power system.

Both the 1000W and 500W power supplies are equipped with a keep-alive supply. As a result, the DSP board can shut down or power-up the main power supply while remaining alert to reactivate the system on demand. This can be done digitally (on a family of products with network capability) or in the analog domain by sensing the lack of (or presence of) input signal to the system. This capability is tailored to building very large systems where the ability to wake up the system remotely is desirable. Unique to our system is that the keep-alive power supply has very high current capability. While some competitors offer a keep-alive power supply, our output capability is around 4 times that of any of the competing designs, with 2.5A at 7V available. This much power for the DSP section can allow for a very complex DSP front end to be designed by our customer if they desire (Large LCD displays, lots of LED indicators, Bluetooth, networking, etcetera).

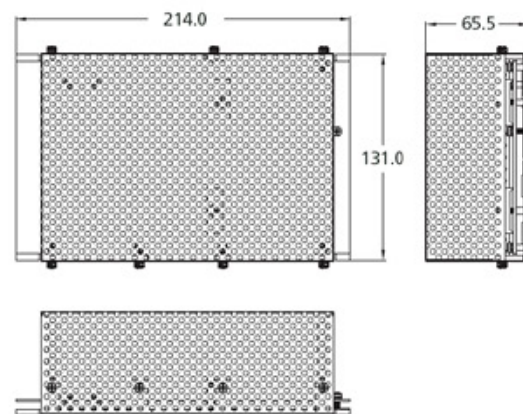
These power supplies also have many protection mechanisms designed to keep our power system, and our customers products, operating for years of trouble-free service.

Power Supply Ratings	TKO-500-PSU	TKO-1000-PSU
Main Supply Section		
Topology	Series Quasi-Resonant (LLC)	
	Very fast responding loop closed around $\pm 48V$ supplies	Very fast responding loop closed around $\pm 66V$ supplies
Input Regulation Range (From quiescent to full power loading)	108 - 132VAC / 216 – 264VAC ($\pm 10\%$)	
Operating Frequency	110 – 260 KHz	100 – 250 KHz
Winding Isolation	Supplies referencing GND-AMP (\pm HV-Supplies), AGND ($\pm 16V$ supplies) & DGND (+ 7V Keep Alive Supply) are galvanically isolated from each other excepting small bleeder resistors (10Ω to chassis ground). Primary supply employs reinforced insulation to all secondary supplies meeting class-I construction requirements.	
Transient response (High voltage rails): • Full Power to Quiescent • Quiescent to Full Power	Nominal output Voltage +3% Maximum Nominal output Voltage - 5% Maximum	
High Voltage Supply Ratings	$\pm 48V$	$\pm 66V$
Quiescent Operation	$\pm 50V$ Max. @ $\pm 80mA$	$\pm 69V$ Max. @ $\pm 80mA$
Full power Operation V-Ripple-LF	$\pm 48V \pm 3V$ @ $\pm 6.1A$ 4V p/p Max.	$\pm 66V \pm 4V$ @ $\pm 8.9A$ 6V p/p Max.
Full Power PSU Protection	Amplifier Soft Clipping Circuits immediately activated limiting power level to 110% of rated output.	
Maximum Operating time at Full power rating	20 Seconds (After which 25% power protection circuits are activated)	
25% power PSU Protection	Amplifier Soft Clipping Circuits activated after 20 seconds limiting power level to 25% of rated output.	
Long Term Power Output capability (Rated for continuous operation in 45°C ambient environment)	20 % of Full power	
Abnormal environment temperature protection	Should power transformer temperature rise abnormally high, Amplifier Soft Clipping Circuits will limit power level to 10% of rated output.	
Over temperature Fail-safe	Should power transformer temperature rise even higher, main supply will shut down until temperatures cool adequately	
Low Voltage Supply Ratings	$\pm 16V$ (2)	+V-GATE (1,3)
Output Voltage	$\pm 15.5V \pm 1.5V$	$+13.5V \pm 0.9V$
Rated Output Current (Continuous operation in 0°C to 45°C ambient)	$\pm 500mA$	300mA
Output Noise Level (RMS measurement, 22Hz - 20KHz Bandwidth, @ rated output current)	-30dBV	-30dBV
(1) Referenced to -48V or -66V supply		
(2) Supply regulation derived via cross regulation on main high voltage supplies		
(3) Supply output voltage regulated via additional series linear regulation		
Keep Alive Supply Section		
Topology	Discontinuous Conduction Mode Flyback	
Operating Frequency	130KHz	
Input Voltage Range	90-132VAC / 180-264VAC	
Rated Output Voltage	$+7V \pm 0.4V$ (Referenced to DGND)	
Rated Output Current	3A	

Power Supply Ratings	TKO-500-PSU	TKO-1000-PSU
Output Noise Level (RMS measurement, 22Hz - 20KHz Bandwidth, @ rated output current)	< -30dBV (-50dBV typical)	
Transient Response	Output voltage change will be less than $\pm 10\%$ of nominal voltage when load changes from 10% to 100% or 100% to 10% of full loading on all supplies.	
Overshoot	Overshoot on +7V output will not exceed $\pm 10\%$ during supply turn-on or turn-off.	
Both Supply Sections		
Short Circuit Protection	All supply outputs protected via either current sensing short circuit protection or fusing to ensure against permanent damage.	
Over Voltage Protection	Transient protection via ZNR. Supply shall not operate above 140 / 280VAC	
Under Voltage Protection	Supply will not operate below 80/160VAC and start below 90 / 180VAC	
Brownout Protection	Supply will shutdown under excessive loading and low AC input voltage to prevent permanent supply damage.	

TKO-500W-PSU TKO-1000W-PSU (complete shielded assembly)

- Overall Dimensions :
• 214mm (W) X 131mm (D) X 65.5mm (H)
- Weight :
• 1.16KG. (2.6 Lbs.)



TKO-STUDIO-MONITOR-DSP



DSP Features:

- 32 bit floating point signal processing
- 24 bit AKM A/D and D/A converters
- 2 DSP processing channels for independent low frequency and high frequency outputs
- 8 bands of equalization per channel for speaker tone customization
- 3 user-configurable rear panel controls for features such as LF boost, HF boost, etc.
- Signal processing configurable via USB control app for rapid product line development

A powerful DSP solution that ties the package of power supply and amplifiers together is the third and final piece added onto a product's rear panel. The TKO-SMON-DSP board is a low cost single input dual output DSP drive solution. This front end is a powerful yet very cost effective solution that allows a high quality product to hit low price points. It is also a very simple tool to use to evaluate the performance of our amplifiers and power supplies in your own test labs.

We provide your team with a computer application to tailor the DSP engine's compressors, parametric equalizers, LP and HP filter functions, delay functions, etc. Rear panel controls can also be customized via the control app, allowing you to add features like vocal boost EQ, low frequency boost or high frequency cut to your product.

Should the standard DSP front end with its assortment of connectors, switches, and LEDs not be adequate for your product, we can design a custom front end for you using our standard DSP building blocks, quickly arriving at a cost effective design meeting all of your needs. For instance, Ethernet AVB or Bluetooth audio can be added to the hardware, or feedback elimination can be added to the DSP software. A second offering from our staff, with two A/D inputs and 4 D/A outputs, is currently under development.

DSP Ratings	TKO-SMON-DSP
Number of A/D converters	1
Resolution	24 bits
Dynamic Range	103dB
Number of D/A converters	2
Resolution	24 bits
Dynamic Range	106dB
Sample Rate (System)	44.1KHz / 48KHz
Frequency Response	± 1dB 20Hz - 20KHz (-1dBFS)
Maximum Analog Through-put gain	+10.7dB
Maximum input Level	+20 dBV
Maximum Output Level	+12dBV (2dB greater than clip level of amps)
Panel Controls and connectors	
Input Level control Range	Off to + 10.7dB throughput gain
Balanced Inputs	XLR& 1/4" TRS Phone
Un-balanced Inputs	RCA
Power Indicator	Rear panel, hard wired to +7V PSU
Software features	
Phase Flip (0° / 180°)	LF & HF output
Input Clip Detector	Input-1, Digital detector, rear panel indicator
User Defined controls and switches	Parameter control switches (X3) each with 4 LED's for displaying function Bi-Color control of front panel LED lighting
Peak power Limiter	LF & HF output (I.E. amp clip prevention and LF excursion protection)
Average power compressor	LF & HF output (I.E. Driver thermal Protection)
Delay (adjustable 0 - 2 mS in single samples)	Can be placed in either the LF or HF signal path
High cut Filter (1st-4th order ; adjustable Q & Fc)	LF output (LF crossover)
Low cut filter (1st-4th order ; adjustable Q & Fc)	HF output (HF Crossover)
EQ-1 (4 bands) 1st and 4th bands editable HP/LP/shelving/peak	LF output and HF output tone shaping, excursion limiting
EQ-2 (4 bands) 1st and 4th bands editable HP/LP/shelving/peak	LF output and HF output final post compressor tone shaping

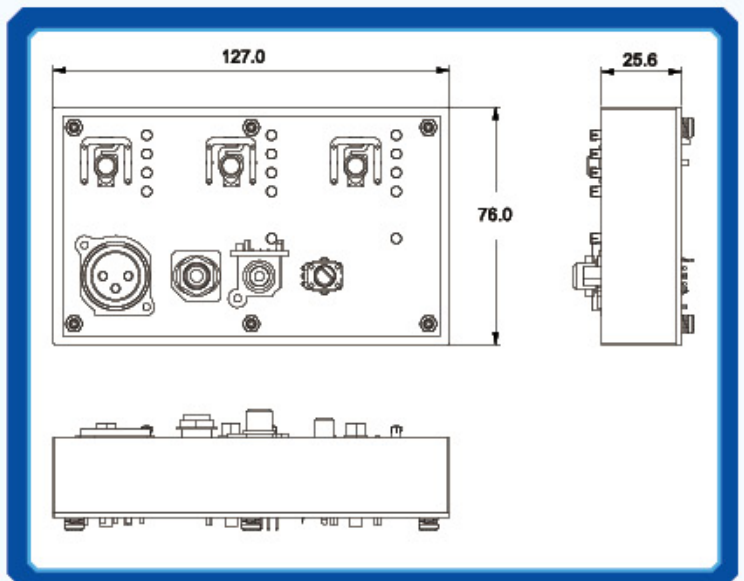
Block Diagram



TKO-STUDIO-MONITOR-DSP

(complete shielded assembly)

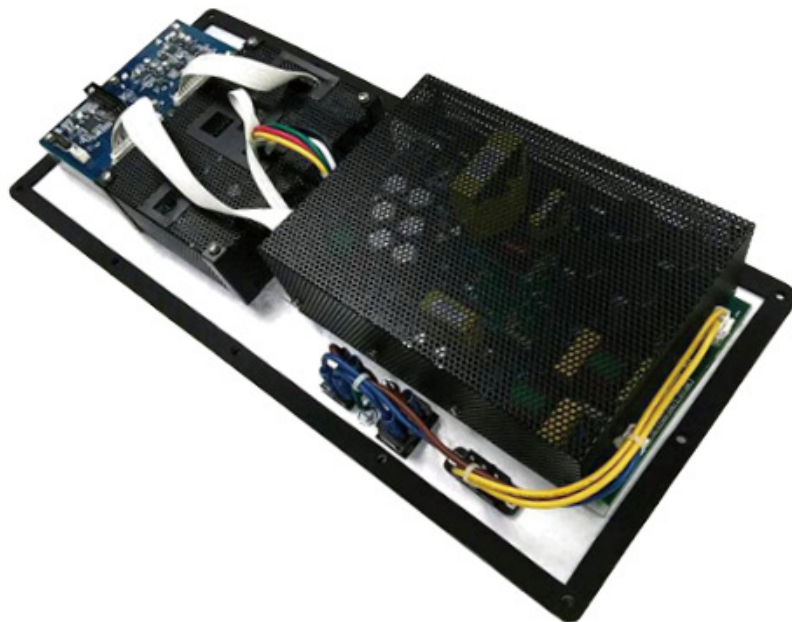
- Overall Dimensions :
- 127mm (W) X 76mm (D) X 25.6mm (H)
- Weight:
- 0.18KG (0.39 Lbs.)



TKO-500W-AMP2+PSU+DSP TKO-1000W-AMP2+PSU+DSP

Complete turnkey power solutions optimized for your product:

- Small and efficient Class-D amplifier modules
- Light weight regulated switching power supplies
- Low distortion powerful DSP front ends
- Safety tested and UL recognized power solutions with UL, C-UL and CB approvals
- EMC Compliance tested and certified
- Compete custom power solutions, cost effectively built for you, at our vertically integrated Chinese plant

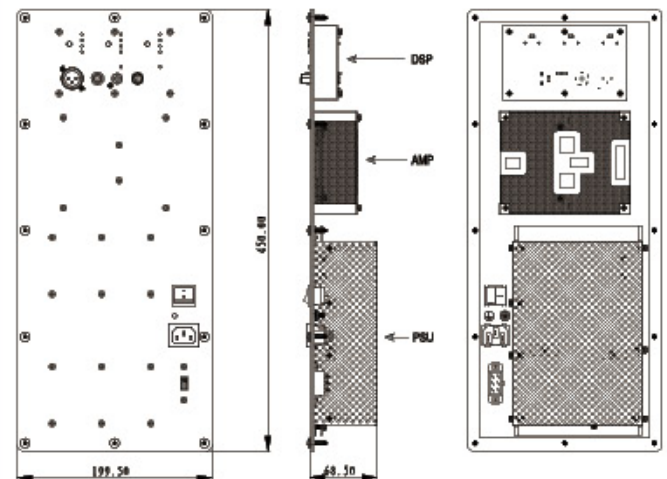


The TKO-1000W and 500W systems are designed to be a complete electronics solution to companies desiring a suite of electronics required to bring a powered loudspeaker product to market. Signal input to the system is provided by high quality A/D and D/A converters feeding a powerful DSP engine. AC line power is provided to the system by a lightweight and very efficient switching power supply. Two to four channels of speaker drive of up to 1000W or 500W total output power is provided via very efficient, low distortion class-D amplifiers. Given the high efficiency of the system, no cooling fan is needed: Only an enclosure possessing adequate volume and natural convection is required.

Whether your company desires a complete solution to your system needs, or wishes to purchase only power modules, Keen Ocean can accommodate your requirements. Several options are available to our customers.

- Purchase only the various, amp and supply modules from us. But then, if desired...
- Allow us to design a custom aluminum heatsink / rear panel to mount all of the modules upon, and marked in your company colors. And then, if desired...
- Use one of our two standard DSP front ends or let us design a custom DSP solution for you using our standard building blocks to finish out the system.
- We then build this assembly for you at a very competitive price in our vertically integrated factory in China.
- An assembly will then arrive at your factory fully tested, with UL, C-UL and CB safety certifications and full EMC testing for integration into your powered speaker products.

- Overall Dimensions :
- 199.5mm (W) X 68.5mm (D) X 450mm (H)
- Weight :
- 2.7 KG (5.9 Lbs.)



Modular power solutions with safety and EMC approvals:

One thing that needs to be made clear is what a burden both EMC testing and safety agency testing and certification can be to a company bringing products to market. For a company with little experience in submitting products for safety approval, this can be a time consuming, costly and sometimes frustrating experience. Several months of testing and 10's of thousands of dollars have been expended on your behalf obtaining safety approval under the 60065 unified safety standards for these products. Approvals for the USA, Canada and the European Union (CE) have been obtained.

Should you desire Keen Ocean to develop a custom assembly that uses our modules, tailored to your product requirements, only a small fee of a few thousand dollars, and a few weeks of test time at UL, will be required to obtain safety approval on your custom assembly.

The difficulty of getting powered products such as we offer to pass EMC testing on both conducted and radiated emissions cannot be understated. Again this can be a very time consuming, costly and a sometimes frustrating process, even for companies with experience. We have performed this service for you, eliminating yet another consumer of your valuable engineering staff hours and budgets. You will note that both our power supplies and amplifiers ship with steel shields. These shields ensure that the assemblies will meet their EMC requirements and also ensure an electronics assembly that is safe and doesn't present a shock hazard satisfying safety requirements of the 60065 safety standard.

Here at Keen Ocean it is our desire to give you a well-engineered and reliable solution for powering loudspeaker products. We provide a solution that is a cost effective to implement, a solution for getting a powered product to market quickly, with a minimum amount of hassle, and with all the necessary safety and EMC approvals to get you into the world markets you desire.

About US:

Keen Ocean Industrial Limited:

Our head office is in Hong Kong and our factory is in China (Guangdong). We have over 10 years experience designing and manufacturing toroidal transformers, EI transformers, high frequency magnetics, and manufacturing electronic assemblies for OEMs on Contract. We have a large staff and a factory with over 300,000 square feet (30,000 square meters) of floor space. Our factory has been approved by TUV and UL, and is also ISO9001:2000 certified.

We have a number of talented engineers on staff, and people on the factory floor who are eager to help you with your product vision. We pride ourselves on our high quality products, delivered at a low cost and with a short lead time.

TKO Product Design Team:

In addition to the manufacturing and mechanical engineering tasks being handled by the Keen Ocean Staff in China, our principal system designer is based in America. In addition to the design of both power amplifiers and the power supplies, he has handled the safety

design and EMC compliance for this series of products. His background has been in designing all manner and topology of high performance audio amplifiers and power supplies large and small for the last 25 years. Prior to joining us at Keen Ocean he was employed by JBL Professional, and then at Mackie Designs / Loud Technologies, Inc. for almost 20 years. For the last 15 years at Loud, he was responsible for safety compliance testing.

A team of experienced audio professionals based in Canada has developed our DSP platform. The group has hardware, DSP, and software specialists who have been working as professional designers in the audio industry for 25 years. They are well known for their innovation and for making sophisticated audio technology accessible and easy to use. The group has had the privilege to work with many of the most respected brands in the audio industry over their careers, including Universal Audio, QSC, Mackie, Yamaha, EAW, and Martin Audio.

香港辦事處: 僑洋實業有限公司
香港荃灣海盛路9號
有線電視大樓34樓3405室

HK Office: Keen Ocean Industrial Ltd
Room 3405, 34/F, Cable TV Tower,
9 Hoi Shing Road, Tsuen Wan,
N.T., Hong Kong.

Tel: (852) 3102-9700
Fax: (852) 3102-9710
Email: Keenocean@keenocean.com.hk

KO-POWER USA Sales and technical support
1567 Sky Terrace SE
Salem, OR 97306, USA
TEL (Toll Free): 855-797-5336 (855-PWR-KEEN)

河源天裕電子塑膠有限公司
河源工廠地址: 廣東省河源市高新技術開發區興工大道
東面科技七路南邊

Tel: (762) 360-3901
Fax: (762) 360-3934

www.keenocean.com.hk