amplifiers

Twin Pulse Series

TECHNICAL SPECIFICATIONS

Type of product	Professional 2-channel PWM amplifiers in Class "A-D" with switching power supply.
	Peak power, EIAJ (1kHz 200ms, 1% dist., crest factor 1:4, both channels driven), (8/4/2 Ohms):
T 2.5	450/ 850/ 1,400W RMS
T 4.5	700/ 1,300/ 2,250W RMS
T 6.5	950/ 1,700/ 3,000W RMS
Input impedance, (Ohms)	20k, balanced
Input sensitivity, (VRMS /4 Ohms)	0,775
Maximum input level (dBV)	+10
Voltage gain (dB)	
T 2.5	+ 38
T 4.5	+ 40
T 6.5	+ 41
Bandwidth, input filter by-passed	2 Hz ÷ 80 kHz
Total Harmonic Distortion (THD)	
From 0.1 W at full power:	< 0.5% (typical 0.01%)
Signal-to-noise ratio, input filter by-passed	97 dBA
Slew Rate, input filter by-passed (V/µsec)	60 (8 Ohms)
Damping factor (on 8 Ohm load)	400 @ 100Hz; 100 @ 10 kHz
Channel separation	90 dB

Amplifier protection

- short-circuit
- overheating with output power reduction and maintenance of constant running temperature.
- soft clipping with pick-up of stationary signals and reduction of output power.
- Automatic reduction of power to 1/4 in the event of stationary signals.

Load protection

- turn-on thumps
- turn-off thumps
- DC voltage on output
- Subsonic frequencies
- High Frequency signals
- Automatic reduction of power to 1/4 in the event of stationary signals.

Cooling	Single fan forced ventilation system with front intake and rear discharge.
Circuitry	
Full switching:	switching power supply and PWM amplifier in Class "A-D".
Input stage semiconductors	Hybrid circuit unbalancing stage and hybrid circuit PWM modulator.
Controls	
Front panel:	On/Off, Levels
Display	
Front panel:	Output level, Short-circuit, Overheating, Ready.
Input connectors	Balanced and unbalanced with paralleled male and female XLR connectors.
Output connectors	Neutrik Speakon NL4MP; Pin 1+,2+ pos.; Pin 1-,2- neg.
AC requirements	From 190 to 245V (50-60Hz)
Average consumption (Watts), 1/8 rated power into 4 Ohms	
T 2.5	350
T 4.5	500
T 6.5	650
Dimensions T2.5 T4.5 T6.5, (cm.)	
Height (with packing)	4.4 (10)
Width (with packing)	48.3 (65)
Depth (with packing)	50.7 (59)

FEATURES

- Extremely high power output (EIAJ 1% THD)
  - *T 2.5* 1,400 W per channel on 2 Ohms
  - *T 4.5* 2,250 W per channel on 2 Ohms
  - *T 6.5* 3,000 W per channel on 2 Ohms
- Very low weight
  - *T 2.5* 9.2 kg.
  - *T 4.5* 9.4 kg.
  - *T 6.5* 9.9 kg.
- Very compact dimensions
  - *T 2.5* 1 19" EIA rack unit (4.4 x 48.3 cm. H x L)
  - *T 4.5* 1 19" EIA rack unit (4.4 x 48.3 cm. H x L)
  - *T 6.5* 1 19" EIA rack unit (4.4 x 48.3 cm. H x L)
- Full Switching circuitry
- Complete display
- Twin balanced input connectors
- Integral protection with limiter

APPLICATIONS

- Outline's Series T amplifiers use patented technical solutions which enables them to achieve performance on a par with the best products in their category: Distortion, Bandpass, Slew-Rate, Damping Factor and output performance which is independent of any change in load value, are just some of the outstanding features offered by these amplifiers. The exceptional efficiency derived from the type of circuitry used (Full Switching) has allowed incredibly compact dimensions and low weight to be achieved, easily exceeding the expectations of portability and reduction of space in racks normally used by sound reinforcement system rental firms. As they are particularly unaffected by the load, Outline T Series power amplifiers can run constantly even on an impedance of 2 Ohms without any overheating problems (not the case with amplifiers using traditional power supplies).

DESCRIPTION

The necessity of ease of transport and therefore light weight, combined with high power, are now featured in the new Outline Series T power amplifiers which use DIGAM® technology, with a full switching output stage. The (patented) technological innovations used enable to fully exploit PWM systems' features of efficiency, sturdiness, efficiency and low cost, while at the same time maintaining and accentuating the musical quality of top analog systems. The use of a 250 kHz sampling rate, an output stage with very high polarising current and the adoption of innovative D/A power conversion systems are some of the solutions adopted to ensure maximum performance in the audio spectrum, thus allowing state of the art performance to be achieved. The very high efficiency of PWM (Pulse Width Modulation) conversion allows a reduction of dispersed power of approximately a tenth of an equivalent linear amplifier with standard musical programs. Exploiting "full switching" technology, Outline Series T amplifiers are capable of extremely high performance in terms of conversion efficiency: the amplifier's output stages achieve an efficiency of over 90%.
The high frequency conversion system, able to emulate a purely resistive load on the mains, corrects the power factor, enabling to obtain almost total stabilization of the output stage's power supply voltage, no matter what the main voltage, thus leaving the performance of the output stage unchanged and therefore minimizing the reactive power and harmonic distortion introduced on the current absorbed.

THE PHILOSOPHY of "TWIN PULSE" Series

Efficiency in Power Amplifiers

The efficiency of an amplification system in the pro audio sector is the decisive factor as far as weight, dimensions and reliability are concerned. As is known, the maximum theoretical efficiency of a traditional linear output stage polarised in class AB, is around 78%, which drops top 62-63% with relative corrections due to various losses. If we also consider that audio amplifiers have to run in a very wide dynamic range and on a real load which is a lot different from the resistive load on which the theoretical efficiency previously considered has been calculated, with an average music program, on a partially reactive load such as a loudspeaker, efficiency has a typical value of around 60-70% of the maximum power output.

PWM Amplification

Of the various types of high efficiency circuitry, PWM (Pulse Width Modulation) systems are definitely those which guarantee the best results, enabling (at least in theory) a condition of null dissipation during operation. The advantage of this system, widely used in industry, is to subject the system's active devices to two clearly distinct working conditions, in which the product of the voltage x current quantities is always null in the so-called switching phases. The non-ideal aspects of the devices, the transition intervals between the two non-null on/off states and some power losses in the system's controls, relatively condition the overall efficiency, which however easily exceeds 90%. A peculiar characteristic of switching systems is that of maintaining efficiency almost constant while the output power changes and dissipate only a fraction of the active power supplied to the load, behaving in the same way in energetic terms on resistive, capacitive and inductive loads. With a normal music program, these characteristics result in a power dissipation of about one tenth of that of a linear system capable of equivalent dynamics.

Reliability of PWM amplifiers in class AD

PWM technology has now been used for dozens of years in industry, thanks to its features of sturdiness and reliability. In high quality audio applications, where it's necessary to switch powerful high frequency current, there are no contrary indications in terms of reliability if some specific circuitry precautions are taken into consideration: The precision of the switching intervals must be absolute, as it's not acceptable for two switches in series on the same power supply branch to close simultaneously or for their conduction status to partially overlap. This condition is easily met by using very high speed switching controls system able to work at up to approximately 50MHz, compared with 250kHz used in pro audio applications; moreover any switching error is found cycle by cycle. Another decisive parameter in the switching of high current at high frequency is the ability to exclude from the current paths the power Mos-Fets' intrinsic diodes. This is effectively one of the most limiting factors in a PWM switching system, but DIGAM® uses a proprietary circuitry which eliminates this type of problem. Another decisive factor when using Mos-Fet semiconductors is limiting the running temperature, which lowers the device's closing characteristics. Amplifiers using DIGAM® technology are designed to maintain the system's running temperature below 70°C in any environmental temperature conditions and with any load. Taking advantage of PWM amplifiers' feature of maintaining constant efficiency no matter what power level is supplied to the load, DIGAM® uses an automatic gain reduction system which in the event of extreme running conditions makes the system run at constant temperature, ensuring continuous operation. Moreover, a sophisticated fin-type forced ventilation system enables the chassis to be used directly to extract heat generated by the system, freeing the set-up from any limits which might be caused by the type of application, which in many cases makes heat dispersion by convection or radiation ineffective. Due to the remarkable power which they're able to handle series amplifiers also run a real-time check on the power fed to the load in order to avoid transducer breakdown or damage, and enable the system to be dimensioned according to the power actually required. Three types of enclosure protection are combined to prevent possible damage:

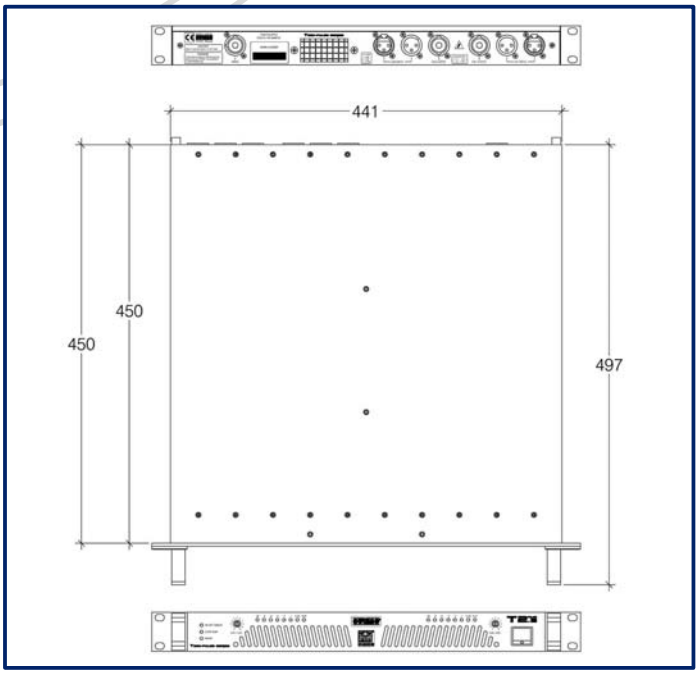
- power limiting for non-musical high frequency signals
- limiting of clipping in the event of excessive dynamics being requested from the amplifier;
- limiting the power for permanent, non-musical signals, dangerous for the enclosure system connected.

Power supply systems

In the pro audio field, the function of the power supply system has always been that of adapting what is normally available from the mains supply to the output stage, carrying out a simple voltage transformation, galvanic insulation and energy storage. Although this system has unquestionable advantages in terms of simplicity and cost, its limits are increasingly obvious in powerful, high performance systems. The characteristic of quadratic dependence of the output power of a sound reinforcement system in relation to its power supply voltage, shows just how dependent a power amplifier with a traditional power supply (or in any case not stabilized) is on the mains voltage. A reduction of 20% of the rated operating voltage results in a 36% reduction of the rated power. Such a large variation of the mains voltage isn't at all unusual, in high powered systems, which may have a large lighting rig connected to them. Moreover, in all cases, dependence on mains voltage and impedance is further conditioned by the characteristic capacitive load rectifier system typical of power amplifiers, systems which considerably feel source impedance characteristics' effects. In a system of this type, current taken from the source (distribution network), has a strongly impulsive nature. Since the current absorbed on average from the mains supply is compelled to circulate on the rectifier bridge in a very small conduction angle, very high effective values are imposed on the system. In a traditional amplifier, current can easily reach peak values of 40-50 times nominal value, further conditioning voltage drops on the mains supply and power supply transformer windings.

Active power factor correction

Use an exclusive circuitry covered by patent which solves the problems of dependence on main power voltage. Nominal performance is maintained on an extraordinarily wide input voltage range and the amplifier presents the main supply with an equivalent load of a resistive type, carrying out active power factor correction. The advantages in practical terms are obvious, particularly with medium/high power sound reinforcement systems, where the power supply lines and the generators must be consistently over-sized as far as power is concerned, to maintain the system's dynamic capacity. The benefits of a topology of this type are also seen in the reliability of the system itself, which always works in the same operating conditions, and which subjects it to less stress and less disturbing outside factors. Amplifiers with DIGAM® technology are the only ones in the world in compliance with norm IEC555-2 on harmonic distortion injected into the AC mains and on power factor.



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