LV MOSFET applications

High power, high quality discrete Class D amplifier

A range of Philips LV MOSFET devices is specifically targeted at demanding, high frequency switching applications like high power Class D audio amplifiers.

Efficient and cost-effective

The Class D concept allows efficient and cost-effective high output power audio amplifiers to be created. The Universal Class D (UcD) principle enables PWM amplifiers to perform at an excellent sonic level while making use of a relatively simple closed-loop topology.

UcD concept

Class D amplifiers consist of at least one comparator and one power stage (see figure 1). At the end of the power stage the PWM output signal is filtered using a second order LC filter. The UcD concept (developed by Philips Digital System Laboratories in Leuven, Belgium) includes the LC filter in the feedback loop, thus allowing active control over the filter behavior. This opens the door to extremely good performance high power Class D audio amplifiers.

Enabling MOSFETs

MOSFETs that are especially targeted at this application are a prerequisite for proper operation. Key features of these MOSFETs include:

- low Q_{GD} and C_{iss}
- low body diode Q_{rr} and t_{rr}
- low $R_{DS(on)}$

Discrete 200W UcD demonstration module

To demonstrate the UcD concept and the enabling MOSFETs, a 200W demo Class D amplifier board is available for Philips customers. The demo board will require an external power supply, a signal source (e.g. CD player) and a loudspeaker for initial evaluation. Contact your local Philips sales representative for additional information.

Environmental aspects

Compared to conventional high power high quality amplifiers, the UcD amplifier consumes 20% less power at maximum output power level. The reduction in dissipated power allows for a much smaller and lighter heatsink. When disposed of, the UcD amplifier produces less than 50% of the waste that a conventional amplifier would produce. As such, an amplifier designed according to the UcD concept is fully compliant with modern trends in sustainability. In this light, the amplifier together with its enabling semiconductor components have been awarded Philips "Green Flagship" status.

UcD Patent

The UcD principle has been patented by Philips. The right to use the patent is granted royalty-free to third parties who use enabling semiconductor components from Philips in their UcD amplifiers. For more details consult your Philips sales representative.

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Product overview

Package		V_{DS}	$R_{DS(on)}$	Q_{rr}	Q_{GD}	C_{iss}	typical Class D amplifier		
SOT 186A (TO220F)	SOT78 (TO220)	(V)	@V_{GS}=10V (mΩ)	(typ) (nC)	(typ) (nC)	(typ) (pF)	supply voltage	Pout theoretical (W)	Speaker Imp. (Ω)
PHX34NQ11T		110	40	240	18	1,700	+/- 45V	500	2
PHX27NQ11T		110	50	160	12	1,240	+/- 45V	400	2.5
PHX23NQ11T		110	70	120	10	830	+/- 45V	300	3
PHX18NQ11T	PHP18NQ11T	110	90	135	8	635	+/- 45V	250	4
	PHP28NQ15T	150	63	170	8	1,250	+/- 70V	600	4

200W demo amplifier specifications

Property	Condition	Value
Output power	Supply voltage = ± 45V R_{load} = 4Ω	200W (RMS)
Efficiency	P_{out} = 100W R_{load} = 4Ω	≥ 92%
THD + N	P_{out} = 10W 20Hz < f < 20kHz	≤ 0.03%
SNR		≥ 120dB

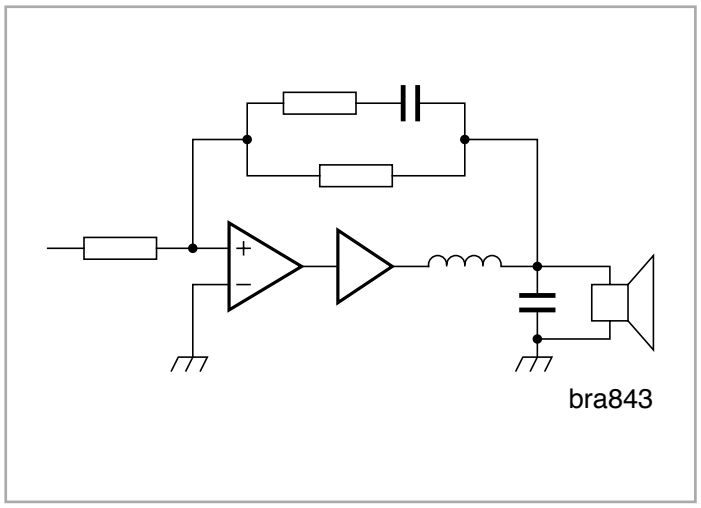

Fig.1 UcD principle diagram

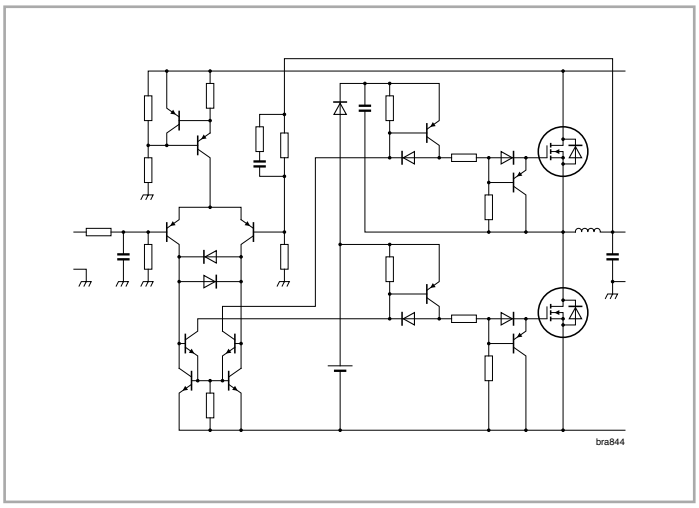

Fig. 2 Basic discrete UcD implementation

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Date of release: March 2006
Document order number: 9397 750 15527
Printed in the Netherlands