N-4168

LIGHT-DIODE DRIVER

11 SEP. 1981

EMI Nuclear Enterprises

N-4168

LIGHT-DIODE DRIVER

SPECIFICATION

The unit is a power amplifier which converts complementary logic input pulses of a given width to negative output pulses of adjustable amplitude and the same width. One module contains four channels with identical specifications. The output amplitude of each channel can be adjusted either with a potentiometer on the front panel or by an external D.C. voltage. The individual channels can also be activated or gated by a common input signal and their amplitudes set by a common external D.C. voltage. The three operating modes for setting the output amplitude can be selected by a front panel rotary switch.

Input

Number	: 4 independent inputs 1 common input
Impedance	: 50 ohms
Reflections	: $\leq \pm 7\%$ for pulse with $t_r = 2$ ns $\leq \pm 11\%$ for pulse with $t_r = 0.7$ ns
Voltage	: Complementary logic. If simultaneously an individual and common input are activated the output width will be equal to the overlap of the two inputs.
Ext. and Ext. Common D.C. voltages	: Must range from +6V (Min. output) to +24V (Max. output). Absorbed current is $\simeq$ 0 mA at +6.0V and $\simeq$ 20 mA at 24V for 'Ext.' input. The 'Ext. Comm.' input absorbs four times as much.
Maximum Rate	: $>$ 50 MHz for the minimum input pulse width and for an attenuation of the maximum output amplitude (16V) of 3 dB. In this case the A.C. coupling provides a baseline shift of about +1.4V.

Width : Min : Input for which the output amplitude has decreased by $\leq$ 6%,
at $\leq$ 12.0V out. , $\leq$ 2.0 ns in.
at $\leq$ 16.0V out. , $\leq$ 3.0 ns in.

Max : Long input pulses will come out with a noticable droop, as the driver is A.C. coupled. For an input signal of 50 us width, this has increased to $\leq$ 20%.

The same specifications are valid for the overlap between a single individual input and the common input. Widths at input defined at -200 mV level.

Output

Number : one from each channel (A.C. coupled)

Amplitude : INT. Mode : 1.2V to 16V (neg.) across 50 ohms
EXT. and EXT. COM. MODE : OV to 16V (neg.) across 50 ohms (output distorted below 1.2V).
A d.c. input voltage of +6V will give a neg. output pulse of 0 to 0.5V
A d.c. input voltage of +15V will give a neg. output pulse of 8.6 $\pm$ 0.5V
A d.c. input voltage of +24V will give a neg. output pulse of 16.0 $\pm$ 0.6V
Temperature dependence : $\leq$ 0.2%/^{o}C at 2.0V out.
$\leq$ 0.05%/^{o}C at 16.0V out.

Impedance : 5.0 ohms $\leq$ Zout $\leq$ 15.0 ohms over full amplitude range.

Rise and fall times : $t_r \leq$ 2.7 ns (10 to 90%0, over full ampl. range.
$t_f \leq$ 3.3 ns (10 to 90%), from 2.0 to 16.0V out,
$\leq$ 4.0 ns at 1.2V out.

Overshoot and Undershoot : $\leq$12.5%, for 1.2 to 16.0V out.

Propogation delay	: between -200 mV at leading edge of° input signal and 50% of leading of output signal : at 1.2V out, 9.2 ± 1.0 ns, increasing to 10 ± 1.0 ns at 16.0V out.
Width	: equal to input width, with the following tolerances : At output of 1.2V : 0 to + 5.0 ns At output of 6.0V : 0 to + 2.5 ns At output of 12.0V : 0 to + 2.0 ns At output of 16.0V : 0 to + 2.0 ns Input width defined at -200 mV.
Output differentiation	: Output shows a droop of ⩽ 20% for an input signal of 50 μs width (see further input specs.).
Noise	: With no input connected, the output noise is ⩽ 0.7 mV r.m.s.
Power Consumption	: +24V : 230 mA ± 30% -24V : 245 mA ± 5% +6V : 150 mA ± 5% -6V : 460 mA ± 25%
Ambient Temperature Range	: 0 to 60°C

ADJUSTMENT AND TEST PROCEDURES

Instruments Required

1. Power supply : +24V, 350 mA min
   −24V, 250 mA min
   +6V, 150 mA min
   −6V, 600 mA min
   Solartron type PSU AS14112 or equivalent
2. Sampling oscilloscope Tektronix type 561 A or equivalent.
3. Pulse Generator EH type 122 or equivalent.
4. Digital Voltmeter type ED 2043 Rochar or equivalent.
5. Clip-on DC milliammeter HP model 428B or equivalent.
6. Lemo cables.
7. GEN. RADIO attenuators, type 874 G6/874 G20 or equivalent.
8. Check-out table.

Adjustment Procedure

D. C. adjustment

(1) Turn all potentiometers fully anticlockwise.

(2) Set mode switch in INT. position.

(3) Connect supply voltages.

(4) T7 collector voltage :

(a) Connect D.V.M. between collector of T7 and ground,

(b) adjust turning potentiometer R34 clockwise to give reading of +20V.

(c) Repeat for each channel.

(5) Bias T3 :

(a) Apply −800 mV DC level to common input.

(b) Connect the 'Common' of the D.V.M. on the emitter of T4, and the other on the base of T3.

(c) Adjust, turning potentiometer R23 clockwise, to give reading of +0.3V.

(d) Repeat for each channel.

(6) Check the following points in each channel :

(a) +2.5 to +2.8V between emitter of T6 and ground. Note in check-out table.

(b) -0.4 to -0.48V between base of T2 and ground. Note in check-out table.

(7) Measure the current consumption and note them in table.

They should be :

+24V	between 140 and 320 mA
-24V	between 230 and 260 mA
+6V	between 140 and 160 mA
-6V	between 345 and 575 mA

Pulse Tests

(1) Turn all front panel potentiometers fully clockwise.

(2) Apply 100 ns complementary logic pulses, at rate of 100 kHz, to common input and check each output adjusting R18 to give 16V (neg) pulse on scope.

(3) Turn now a front panel potentiometer fully anticlockwise and check that the associated output amplitude is about 1.2V (neg). Turn back the front panel potentiometer fully clockwise. Repeat this for all channels.

(4) Set switch in EXT. COM. position. Apply input signal as above to the common input. Feed into AMPL. EXT. COMMON a D.C. voltage that can be varied between +6V and +24V. Check that each output pulse on scope varies between 0 to 0.5V and 16 ± 0.6V.