

# iC149

## PROGRAMMABLE ns-PULSE GENERATOR

preliminary



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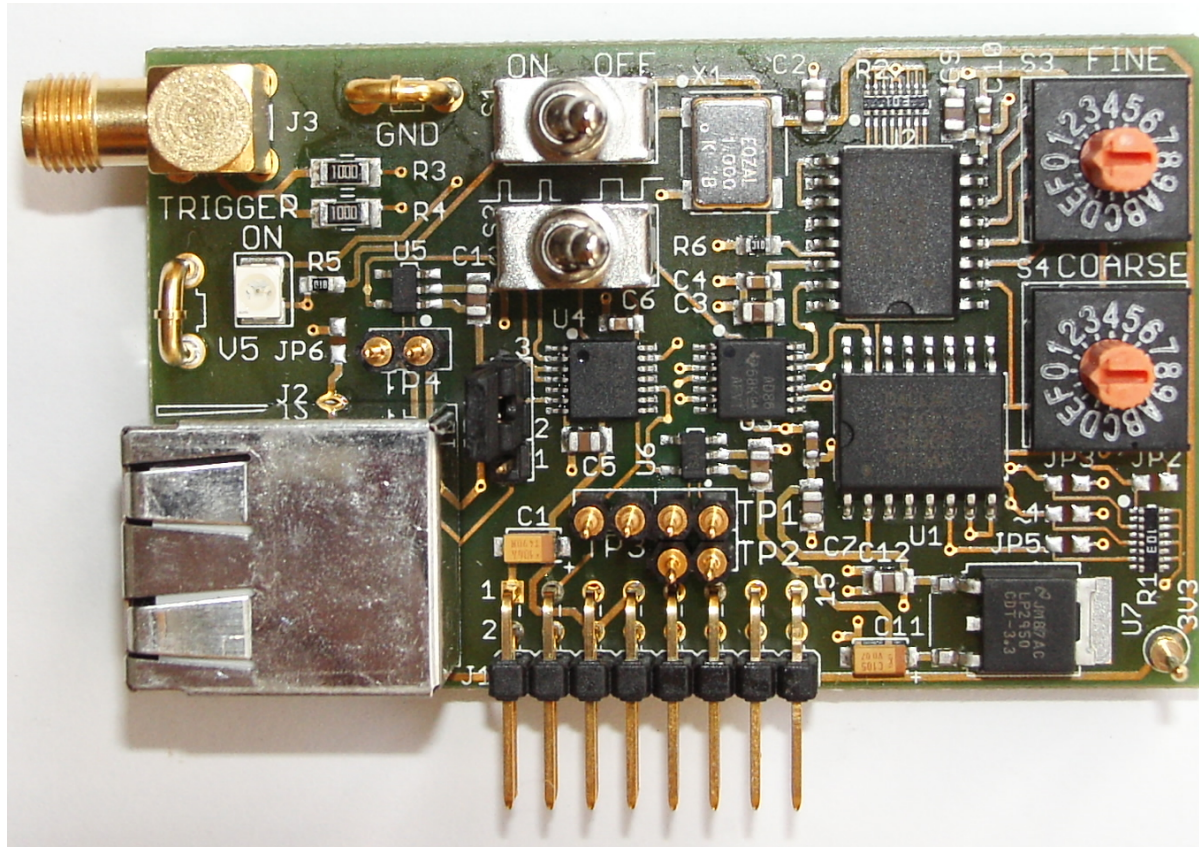
### FEATURES

Pulse width 1 bis 64 ns in steps of 0.25 ns  
Fixed frequency of 1 MHz  
LVDS und TTL outputs  
Compatible with HG1D, NZN1D, NZP1D

### APPLICATIONS

Pulse generator for fast laser diode drivers

### BLOCK DIAGRAM



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### DESCRIPTION

Pulse generator iC149 produces pulses with a small duty cycle in the range of ca. 1 ns up to 64 ns max. in steps of 0.25 ns at a pulse frequency of 1 MHz. The pulse width is set by means of two hexadecimal coding switches in coarse and fine steps.

The pulses are output both as LVDS and TTL signals.

This module can easily be used with the evaluation boards HG1D, NZN1D and NZP1D.

### ELECTRICAL CHARACTERISTICS

Test Conditions:  $V_s = \pm 15\text{ V}$ ,  $T_a = 25\text{ }^\circ\text{C}$ , System Impedance  $50\ \Omega$

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Power Supply</b>							
101	V5	Power Supply		4.75	5	5.25	V
102	I(V5)	Supply Current	V5 = 5 V, S1 = OFF V5 = 5 V, S1 = ON, TRIGGER open V5 = 5 V, S1 = ON, TRIGGER $50\ \Omega$ vs. Ground		45 50 75		mA mA mA
<b>Pulse Width</b>							
201	$T_{pmax}$	Maximum Pulsweite	V5 = 5 V, $T_a = 27\text{ }^\circ\text{C}$ , <i>coarse</i> = "F", <i>fine</i> = "F"		63.75		ns
202	$T_{pmin}$	Minimum Pulsweite	V5 = 5 V, $T_a = 27\text{ }^\circ\text{C}$ , <i>coarse</i> = "0", <i>fine</i> = "C"		1		ns

### SETTING THE PULSE WIDTH

Typical pulse widths as follows (measured values in parentheses):

m = 15	$\Delta T = 15 * 4 \text{ ns} = 60 \text{ ns}$	(60.2 ns)
m = 14	$\Delta T = 14 * 4 \text{ ns} = 56 \text{ ns}$	(56.4 ns)
m = 13	$\Delta T = 13 * 4 \text{ ns} = 52 \text{ ns}$	(52.3 ns)
m = 12	$\Delta T = 12 * 4 \text{ ns} = 48 \text{ ns}$	(48.7 ns)
m = 11	$\Delta T = 11 * 4 \text{ ns} = 44 \text{ ns}$	(44.7 ns)
m = 10	$\Delta T = 10 * 4 \text{ ns} = 40 \text{ ns}$	(40.9 ns)
m = 9	$\Delta T = 9 * 4 \text{ ns} = 36 \text{ ns}$	(36.7 ns)
m = 8	$\Delta T = 8 * 4 \text{ ns} = 32 \text{ ns}$	(32.6 ns)
m = 7	$\Delta T = 7 * 4 \text{ ns} = 28 \text{ ns}$	(28.7 ns)
m = 6	$\Delta T = 6 * 4 \text{ ns} = 24 \text{ ns}$	(24.7 ns)
m = 5	$\Delta T = 5 * 4 \text{ ns} = 20 \text{ ns}$	(20.2 ns)
m = 4	$\Delta T = 4 * 4 \text{ ns} = 16 \text{ ns}$	(15.7 ns)
m = 3	$\Delta T = 3 * 4 \text{ ns} = 12 \text{ ns}$	(12.4 ns)
m = 2	$\Delta T = 2 * 4 \text{ ns} = 8 \text{ ns}$	(7.5 ns)
m = 1	$\Delta T = 1 * 4 \text{ ns} = 4 \text{ ns}$	(3.0 ns)

Table 2: m = 1...15 (*coarse*), n = 0 (*fine*)

n = 15	$\Delta T = 4 \text{ ns} + 15 * 0.25 \text{ ns} = 7.75 \text{ ns}$	(7.2 ns)
n = 14	$\Delta T = 4 \text{ ns} + 14 * 0.25 \text{ ns} = 7.50 \text{ ns}$	(6.8 ns)
n = 13	$\Delta T = 4 \text{ ns} + 13 * 0.25 \text{ ns} = 7.25 \text{ ns}$	(6.5 ns)
n = 12	$\Delta T = 4 \text{ ns} + 12 * 0.25 \text{ ns} = 7.00 \text{ ns}$	(6.2 ns)
n = 11	$\Delta T = 4 \text{ ns} + 11 * 0.25 \text{ ns} = 6.75 \text{ ns}$	(6.0 ns)
n = 10	$\Delta T = 4 \text{ ns} + 10 * 0.25 \text{ ns} = 6.50 \text{ ns}$	(5.8 ns)
n = 9	$\Delta T = 4 \text{ ns} + 9 * 0.25 \text{ ns} = 6.25 \text{ ns}$	(5.5 ns)
n = 8	$\Delta T = 4 \text{ ns} + 8 * 0.25 \text{ ns} = 6.00 \text{ ns}$	(4.9 ns)
n = 7	$\Delta T = 4 \text{ ns} + 7 * 0.25 \text{ ns} = 5.75 \text{ ns}$	(4.5 ns)
n = 6	$\Delta T = 4 \text{ ns} + 6 * 0.25 \text{ ns} = 5.50 \text{ ns}$	(4.4 ns)
n = 5	$\Delta T = 4 \text{ ns} + 5 * 0.25 \text{ ns} = 5.25 \text{ ns}$	(4.3 ns)
n = 4	$\Delta T = 4 \text{ ns} + 4 * 0.25 \text{ ns} = 5.00 \text{ ns}$	(4.1 ns)
n = 3	$\Delta T = 4 \text{ ns} + 3 * 0.25 \text{ ns} = 4.75 \text{ ns}$	(3.9 ns)
n = 2	$\Delta T = 4 \text{ ns} + 2 * 0.25 \text{ ns} = 4.50 \text{ ns}$	(3.5 ns)
n = 1	$\Delta T = 4 \text{ ns} + 1 * 0.25 \text{ ns} = 4.25 \text{ ns}$	(3.2 ns)
n = 0	$\Delta T = 4 \text{ ns} + 0 * 0.25 \text{ ns} = 4.00 \text{ ns}$	(3.0 ns)

Table 3: m = 1 (*coarse*), n = 1...15 (*fine*)

n = 15	$\Delta T = 2.8 \text{ ns} \pm 0.4 \text{ ns}$	(2.8 ns)
n = 14	$\Delta T = 2.5 \text{ ns} \pm 0.4 \text{ ns}$	(2.6 ns)
n = 13	$\Delta T = 2.2 \text{ ns} \pm 0.4 \text{ ns}$	(2.1 ns)
n = 12	$\Delta T = 1.0 \text{ ns} \pm 0.4 \text{ ns}$	(1.1 ns)
n < 12	$\Delta T = 0.0 \text{ ns}$	

Table 4: m = 0 (*coarse*) und n  $\geq$  12 (*fine*)

Formula to calculate the pulse width:

$$\Delta T = (m * 4 \text{ ns} + n * 0.25 \text{ ns}) \pm 2 \text{ ns}$$

$$1 \leq m \text{ (coarse)} \leq 15,$$

$$0 \leq n \text{ (fine)} \leq 15,$$

$$m = 0 \text{ s. Tab. 4}$$

### PIN CONFIGURATION

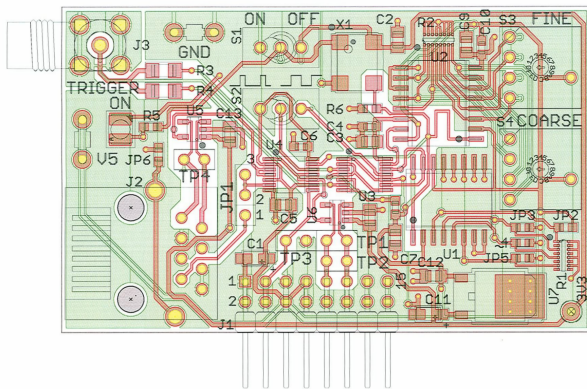


Figure 1: The populated PCB

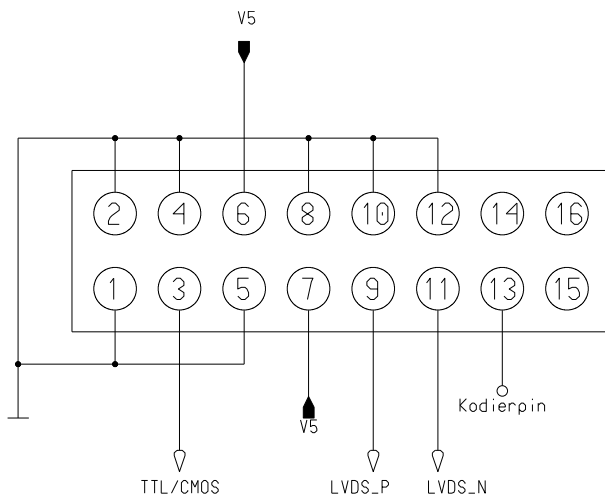


Figure 2: Pin configuration J1

- J1 16 pole pin header for power supply and signal outputs
- J2 RJ45 connector for output signals with LVDS or TTL/CMOS levels
- J3 TRIGGER: SMA connector for trigger output,  $R_{out} = 50 \Omega$
- JP1 Jumper at position 1-2 selects TTL/CMOS signals for J2
- S1 Oscillator ON/OFF
- S2 Selector switch: programmable pulse or symmetrical 1 MHz signal
- S3 Coding switch *fine*
- S4 Coding switch *coarse*
- TP1 LVDS signal at J1 (must be terminated with  $100 \Omega$  for measurement purpose)
- TP2 LVDS signal at J1
- TP3 TTL/CMOS signal at J1
- TP4 LVDS signal at J2
- GND GND
- V5 V5
- 3V3 3.3 V

Table 5: Connectors on the PCB

### SAMPLE PULSES

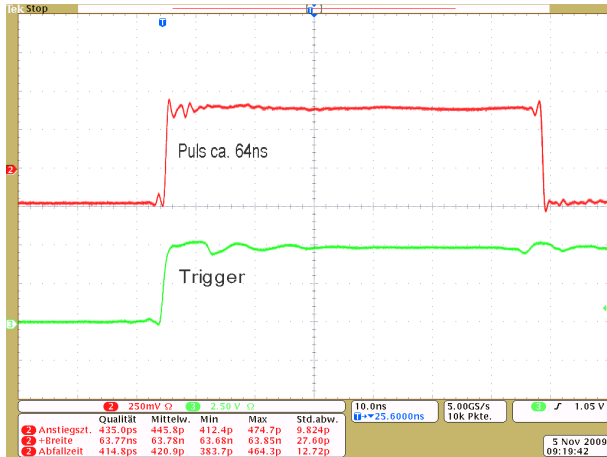


Figure 3: Maximum pulse width

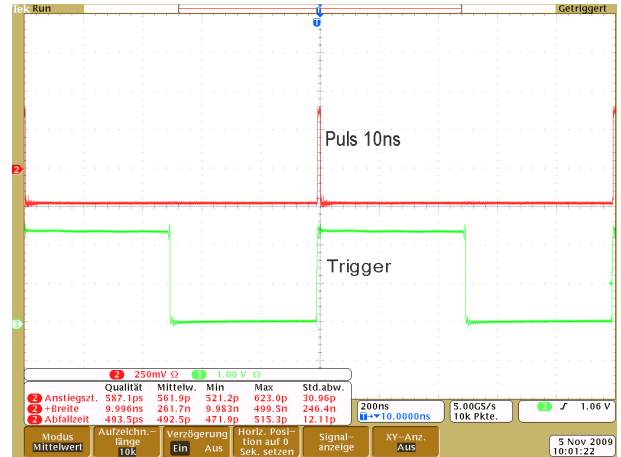


Figure 5: Trigger and LVDS pulse



Figure 4: Minimum pulse width

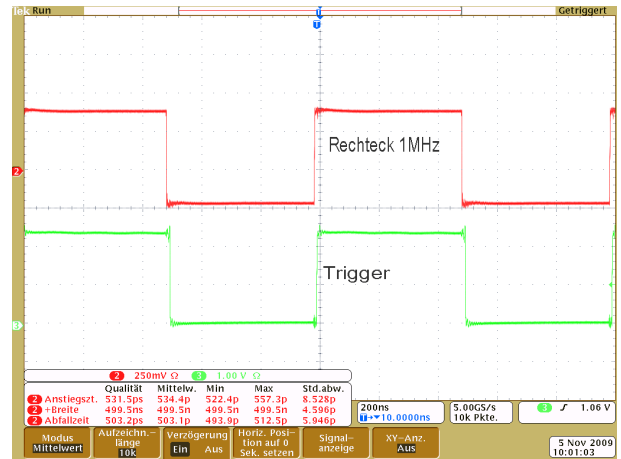


Figure 6: Trigger and 1 MHz LVDS signal

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### BLOCK DIAGRAM

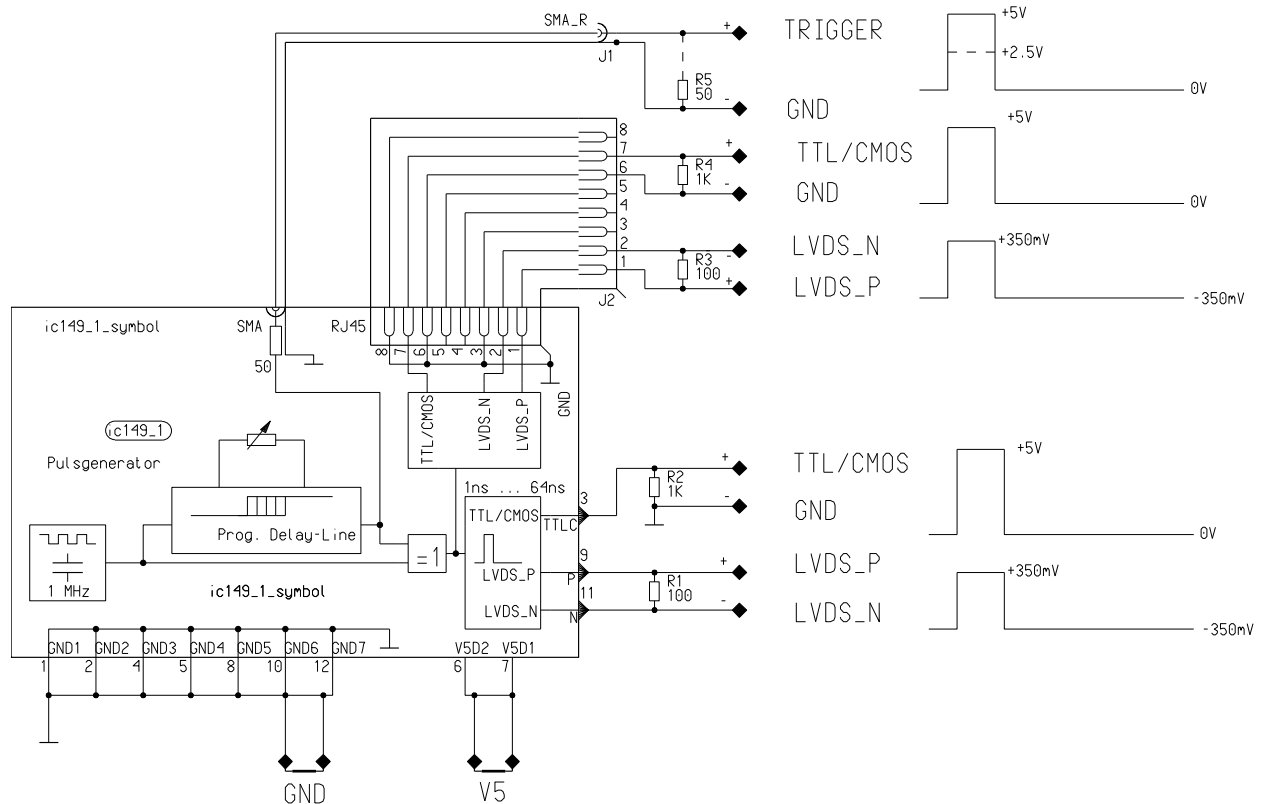


Figure 7: Block diagram of the iC149

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