Edge Control

The new Jauch JSO AC oscillator series offers a unique feature – Edge Control !

Edge Control is an advanced feature to control the EMI dissipation, or drive high capacitive loads by selecting the edge slew rate of the oscillators output signal depending on the customer's needs.

Edge Control default selection:

The default Edge Control selection "D" can be used for most applications that should drive a maximum load capacitance of 30pF up to ~83MHz and 15pF maximum above 83MHz.

However Edge Control offers you more flexibility to match the output driver performance to your circuit characteristics.

Edge Control selection for fast edges:

Edge control can be configured for driving high capacitive loads > 30pF by speeding up the signal edges vs. the default edge control setting for standard load capacitances. This may help eliminating additional signal buffers while maintaining full output swing.

Furthermore, speeding up the signal edges may improve the clock jitter in systems with noisy supply rails, as faster rising and falling edge times reduce the detection uncertainty of H or L levels in circuits that receive the clock signal being superposed by system noise.

However, the supply current of the oscillator will increase slightly if fast signal edges are selected.

Edge Control selection for slow edges:

Slow signal edges may be useful in EMI sensitive circuit environments, however it's important to keep an eye on the rise and fall time being required by subsequent circuits to ensure signal integrity.

Slowing down the edge slew rate may save supply current of the oscillator as output currents being fed into the output load reduce.

Edge Control & signal swing:

At higher frequencies, the output signal may no longer swing rail-to-rail if too slow signal edges are configured by the combination of a certain edge control setting with an existing output load capacitance.
Please refer to the tables below that show the maximum oscillator output frequency depending on the actual edge control setting and the output load that would still show rail-to-rail output swing.

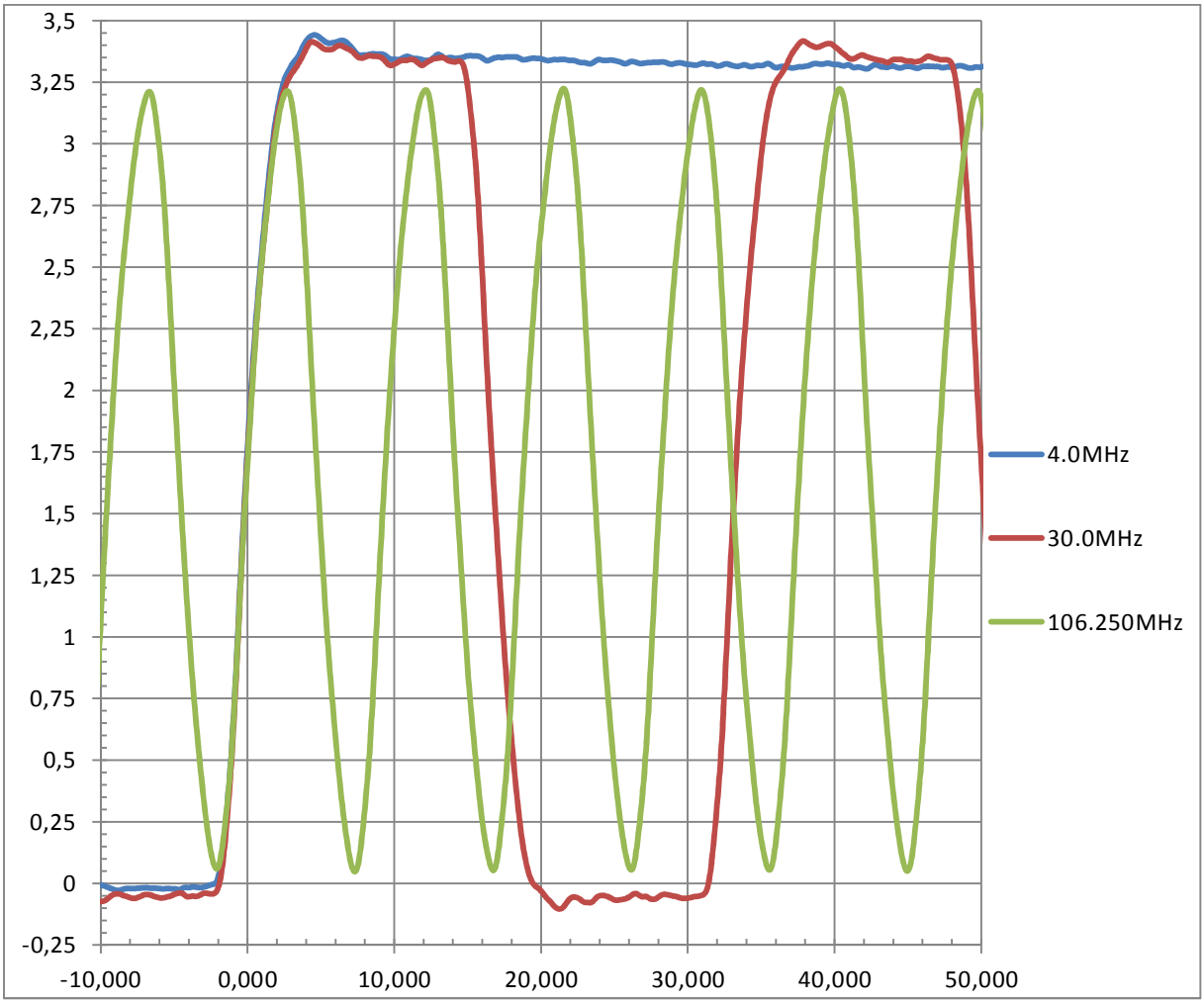
The edge control setting may be used to intentionally control the output amplitude, if rail-to-rail output swing is not required.

To estimate the maximum frequency at which the signal will swing rail-to-rail, the following formula can be used, which is based on the typical rise and fall time T_r and T_f at threshold levels of 10% and 90%:

$$F_{\max.} = \frac{1}{4xT_r} = \frac{1}{4xT_f}$$

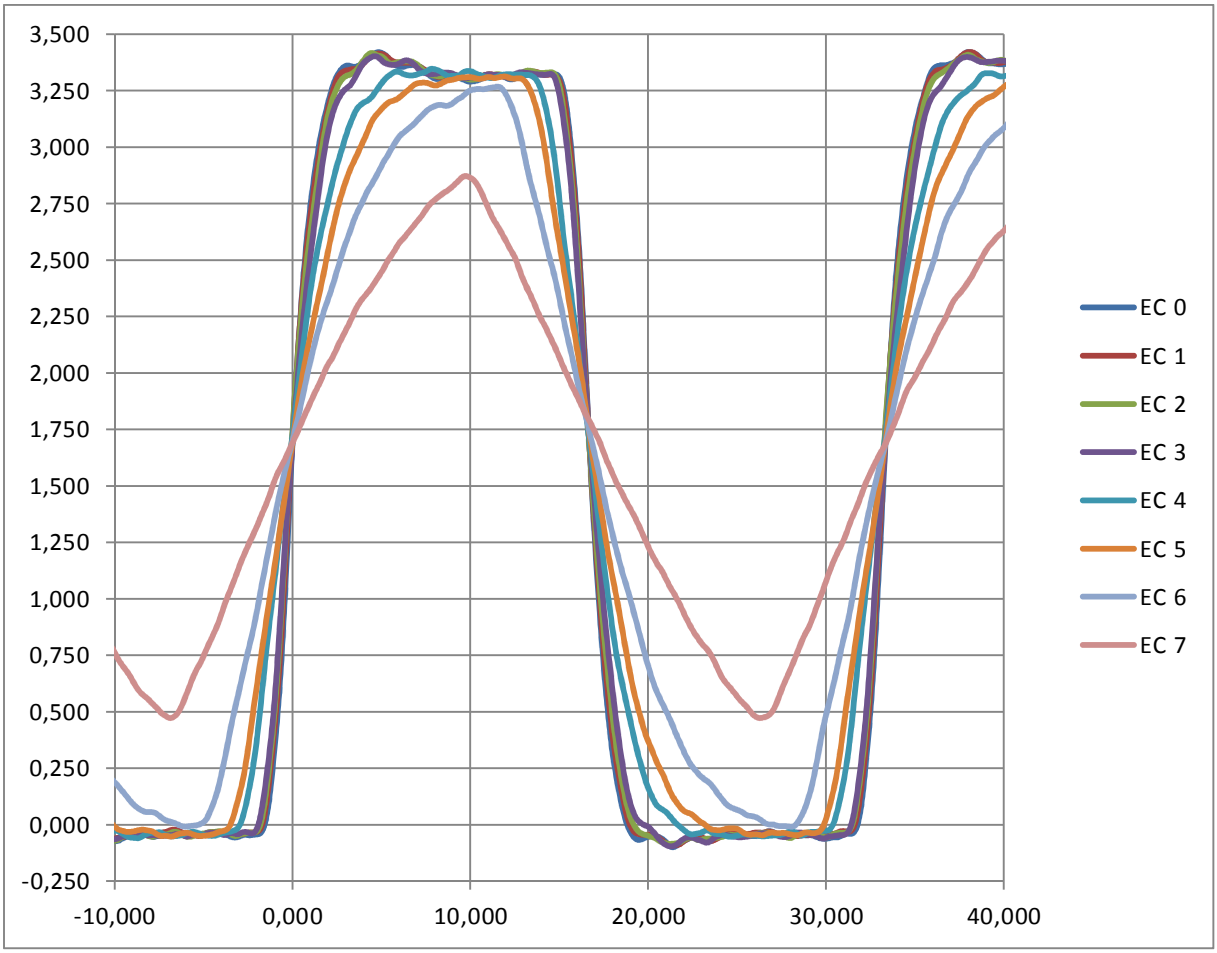
Example 1 – limited swing at high frequency

Condition: supply voltage 3.3V, CL = 30pF, default edge control setting D=3, at 3 frequencies



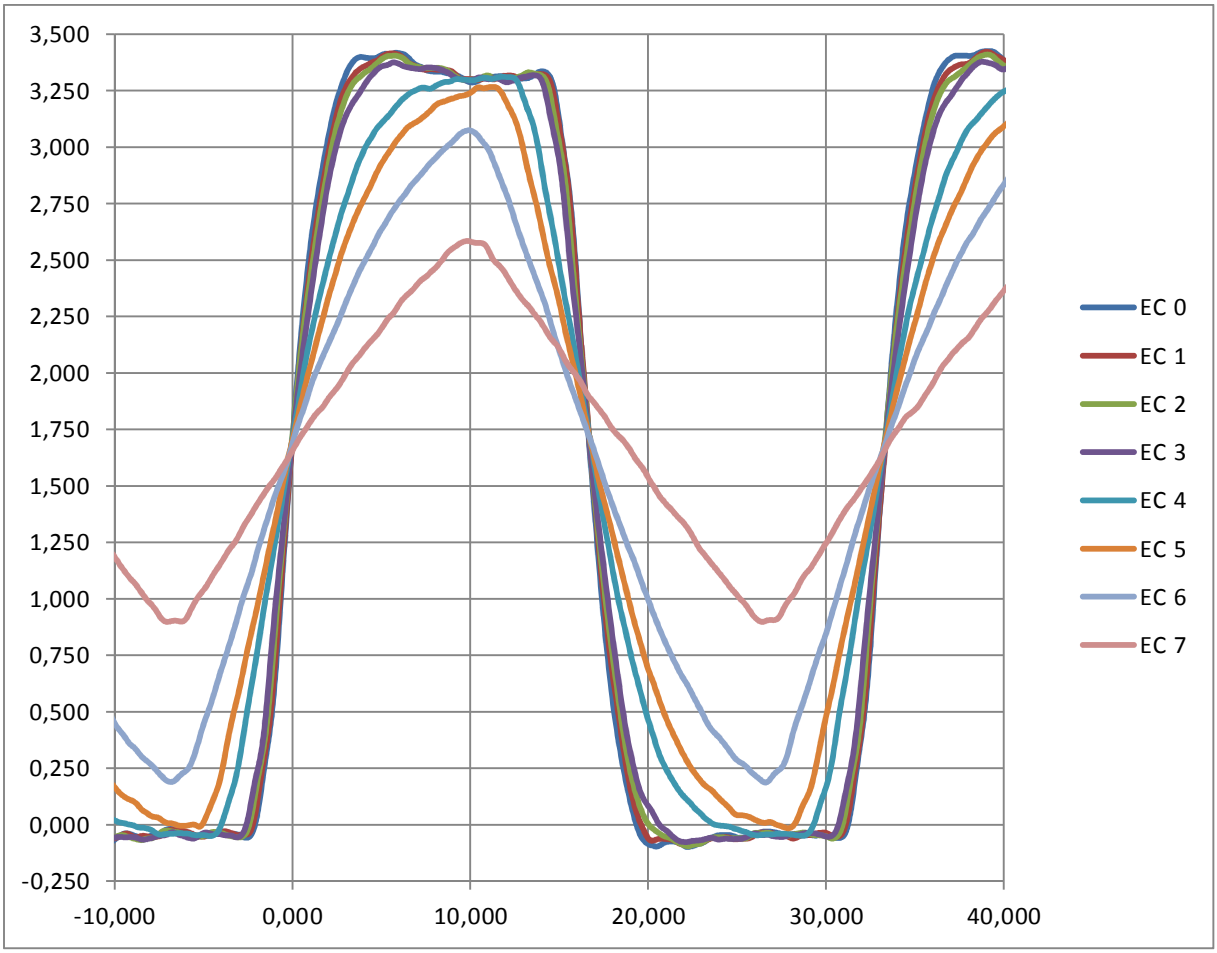
Example 2 - variation of rising / falling edge at constant load vs. Edge Control setting

Condition: supply voltage 3.3V, CL = 30pF, 30.0MHz, at edge control settings 0 ~ 7



Example 2 - variation of rising / falling edge at constant load vs. Edge Control setting

Condition: supply voltage 3.3V, CL = 45pF, 30.0MHz, at edge control settings 0 ~ 7



Default Edge Control setting and supply voltage:

As the rise and fall time at a certain edge control setting and a certain output load capacitance also depends on the supply voltage, please refer to the edge control table that refers to your nominal supply voltage. Please be aware that the default setting “D” varies with the nominal supply voltage.

Reference Edge Control Tables for JSOxxD1AC (1 ~ 110MHz) vs. Supply Voltages:

Note: Default Edge Control setting “D” at the corresponding supply voltage is highlighted. The rise time Tr and fall time Tf is shown in [ns] at threshold levels 10% ~ 90% and 20% ~ 80% of the supply voltage at supply voltages of 3.3V / 3.0V / 2.8V / 2.5V / 1.8V.

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.3V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,33	0,50	(>110)	0,60	0,85	(>110)	1,30	1,80	(>110)	1,90	3,00	83	2,50	3,50	71
1	0,35	0,55	(>110)	0,65	0,90	(>110)	1,50	2,20	(>110)	2,10	3,40	74	2,80	4,20	60
2	0,40	0,60	(>110)	0,90	1,30	(>110)	1,65	2,50	100	2,30	3,80	66	3,20	4,50	56
3	0,45	0,65	(>110)	1,00	1,50	(>110)	1,90	3,00	83	2,60	4,10	61	3,70	5,00	50
4	0,75	1,30	(>110)	1,90	2,70	93	3,20	4,70	53	5,00	6,50	38	6,00	8,40	30
5	1,20	1,70	(>110)	2,50	3,30	76	4,30	6,00	42	6,00	8,50	29	7,50	11,00	23
6	1,80	2,60	96	3,50	5,00	50	6,20	8,50	29	9,50	13,50	19	12,00	17,00	15
7	3,70	5,20	48	7,00	10,50	24	12,50	17,50	14	18,00	26,00	9,6	24,00	34,00	7,4
D	0,45	0,65	(>110)	1,00	1,50	(>110)	1,90	3,00	83	2,60	4,10	61	3,70	5,00	50

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.0V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,35	0,55	(>110)	0,70	1,00	(>110)	1,40	2,10	(>110)	2,15	3,20	78	2,80	4,00	63
1	0,38	0,60	(>110)	0,80	1,10	(>110)	1,65	2,40	104	2,40	3,60	69	3,10	4,40	57
2	0,45	0,65	(>110)	0,93	1,40	(>110)	1,80	2,70	93	2,70	4,00	63	3,50	4,90	51
3	0,50	0,75	(>110)	1,10	1,65	(>110)	2,00	3,10	81	3,10	4,30	58	3,90	5,50	45
4	0,90	1,40	(>110)	2,00	2,90	86	3,40	5,00	50	5,20	7,30	34	6,40	9,00	28
5	1,30	1,90	(>110)	2,60	3,70	68	4,50	6,50	38	6,50	9,30	27	8,50	11,50	22
6	1,90	2,75	91	3,80	5,50	45	6,70	9,50	26	10,00	14,50	17	12,70	18,00	14
7	3,90	5,70	44	7,30	11,00	23	13,50	20,00	13	19,00	28,50	8,8	25,00	36,00	6,9
D	0,50	0,75	(>110)	1,10	1,65	(>110)	2,00	3,10	81	3,10	4,30	58	3,90	5,50	45

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,37	0,57	(>110)	0,80	1,10	(>110)	1,50	2,30	109	2,30	3,40	74	3,00	4,20	60
1	0,42	0,65	(>110)	0,90	1,20	(>110)	1,75	2,60	96	2,60	3,90	64	3,30	4,70	53
2	0,50	0,75	(>110)	0,97	1,45	(>110)	1,90	2,85	88	2,85	4,20	60	3,70	5,20	48
3	0,55	0,80	(>110)	1,20	1,80	(>110)	2,20	3,20	78	3,25	4,60	54	4,10	5,70	44
4	1,00	1,50	(>110)	2,10	3,10	81	3,70	5,20	48	5,40	7,60	33	6,80	9,50	26
5	1,40	2,00	(>110)	2,70	3,80	66	4,70	6,80	37	7,00	10,00	25	9,00	12,50	20
6	2,00	2,90	86	4,00	5,80	43	7,10	10,50	24	10,50	15,50	16	13,50	19,00	13
7	4,10	6,00	42	7,60	11,50	22	14,00	21,00	12	20,50	30,50	8,2	26,00	37,50	6,7
D	0,50	0,75	(>110)	0,97	1,45	(>110)	1,90	2,85	88	2,85	4,20	60	3,70	5,20	48

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.5V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,40	0,60	(>110)	0,85	1,20	(>110)	1,70	2,60	96	2,50	3,70	68	3,30	4,60	54
1	0,45	0,70	(>110)	0,95	1,30	(>110)	1,90	2,90	86	2,80	4,20	60	3,50	5,00	50
2	0,55	0,80	(>110)	1,00	1,50	(>110)	2,00	3,00	83	3,00	4,50	56	4,00	5,60	45
3	0,60	0,90	(>110)	1,30	2,00	(>110)	2,30	3,30	76	3,50	5,00	50	4,50	6,30	40
4	1,10	1,60	(>110)	2,20	3,20	78	3,90	5,50	45	5,90	8,30	30	7,00	10,00	25
5	1,45	2,20	(>110)	2,90	4,20	60	5,20	7,30	34	7,60	11,50	22	10,00	14,00	18
6	2,20	3,30	76	4,30	6,20	40	7,60	11,50	22	11,50	17,00	15	15,00	21,00	12
7	4,30	6,40	39	8,30	12,50	20	15,00	23,00	11	22,00	33,00	7,6	28,00	40,00	6,3
D	0,55	0,80	(>110)	1,00	1,50	(>110)	2,00	3,00	83	3,00	4,50	56	4,00	5,60	45

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 1.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,60	0,90	(>110)	1,40	2,10	(>110)	2,40	3,40	74	3,50	5,20	48	4,50	6,50	38
1	0,70	1,10	(>110)	1,70	2,50	100	2,60	3,80	66	3,70	6,00	42	5,00	7,00	36
2	0,80	1,20	(>110)	1,90	2,80	89	3,00	4,40	57	4,20	6,30	40	5,50	7,70	32
3	0,90	1,40	(>110)	2,10	3,00	83	3,40	5,00	50	5,00	7,20	35	6,00	8,50	29
4	1,70	2,40	104	3,30	4,90	51	5,80	8,50	29	8,30	12,00	21	10,00	14,00	18
5	2,20	3,30	76	4,30	6,30	40	7,50	10,50	24	11,00	16,00	16	14,00	20,00	13
6	3,30	5,00	50	6,00	9,00	28	11,00	16,00	16	17,00	24,00	10	21,00	29,00	8,6
7	6,20	9,00	28	12,00	17,00	15	22,00	31,00	8,1	32,00	46,00	5,4	40,00	56,00	4,5
D	0,60	0,90	(>110)	1,40	2,10	(>110)	2,40	3,40	74	3,50	5,20	48	4,50	6,50	38

Note: the maximum frequency is limited by the rise & fall time (Tr & Tf). The maximum frequency in MHz can be calculated by the formula 1/(4 x Tr) = 1/(4 x Tf), based on the typical values in [ns] at 10% ~ 90% threshold level. At a given load capacitance CL, the output signal will no longer swing rail to rail above the calculated frequency.

Please be aware that frequency values being calculated by the above formula may lie above the highest programmed frequency of 110MHz for JSOxxD1AC. In that case "(>110MHz)" is shown.

Example: if the supply voltage is 3.0V, at the default setting "D" = "3" the JSOxxD1AC is able to drive 30pF at any programmed frequency below 81MHz. If a higher maximum frequency is required, either reduce the load capacitance, or select an appropriate edge control setting

Reference Edge Control Tables for JSOxxD2AC (115 ~ 137MHz) vs. Supply Voltage:

Note: Default Edge Control setting “D” at the corresponding supply voltage is highlighted. The rise time Tr and fall time Tf is shown in [ns] at threshold levels 10% ~ 90% and 20% ~ 80% of the supply voltage at supply voltages of 3.3V / 3.0V / 2.8V / 2.5V / 1.8V.

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.3V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,33	0,50	(>137)	0,60	0,85	(>137)	1,30	1,80	(>137)	1,90	3,00	(<115)	2,50	3,50	(<115)
1	0,35	0,55	(>137)	0,65	0,90	(>137)	1,50	2,20	(<115)	2,10	3,40	(<115)	2,80	4,20	(<115)
2	0,40	0,60	(>137)	0,90	1,30	(>137)	1,65	2,50	(<115)	2,30	3,80	(<115)	3,20	4,50	(<115)
3	0,45	0,65	(>137)	1,00	1,50	(>137)	1,90	3,00	(<115)	2,60	4,10	(<115)	3,70	5,00	(<115)
4	0,75	1,30	(>137)	1,90	2,70	(<115)	3,20	4,70	(<115)	5,00	6,50	(<115)	6,00	8,40	(<115)
5	1,20	1,70	(>137)	2,50	3,30	(<115)	4,30	6,00	(<115)	6,00	8,50	(<115)	7,50	11,00	(<115)
6	1,80	2,60	(<115)	3,50	5,00	(<115)	6,20	8,50	(<115)	9,50	13,50	(<115)	12,00	17,00	(<115)
7	3,70	5,20	(<115)	7,00	10,50	(<115)	12,50	17,50	(<115)	18,00	26,00	(<115)	24,00	34,00	(<115)
D	0,45	0,65	(>137)	1,00	1,50	(>137)	1,90	3,00	(<115)	2,60	4,10	(<115)	3,70	5,00	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.0V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,35	0,55	(>137)	0,70	1,00	(>137)	1,40	2,10	119	2,15	3,20	(<115)	2,80	4,00	(<115)
1	0,38	0,60	(>137)	0,80	1,10	(>137)	1,65	2,40	(<115)	2,40	3,60	(<115)	3,10	4,40	(<115)
2	0,45	0,65	(>137)	0,93	1,40	(>137)	1,80	2,70	(<115)	2,70	4,00	(<115)	3,50	4,90	(<115)
3	0,50	0,75	(>137)	1,10	1,65	(>137)	2,00	3,10	(<115)	3,10	4,30	(<115)	3,90	5,50	(<115)
4	0,90	1,40	(>137)	2,00	2,90	(<115)	3,40	5,00	(<115)	5,20	7,30	(<115)	6,40	9,00	(<115)
5	1,30	1,90	132	2,60	3,70	(<115)	4,50	6,50	(<115)	6,50	9,30	(<115)	8,50	11,50	(<115)
6	1,90	2,75	(<115)	3,80	5,50	(<115)	6,70	9,50	(<115)	10,00	14,50	(<115)	12,70	18,00	(<115)
7	3,90	5,70	(<115)	7,30	11,00	(<115)	13,50	20,00	(<115)	19,00	28,50	(<115)	25,00	36,00	(<115)
D	0,50	0,75	(>137)	1,10	1,65	(>137)	2,00	3,10	(<115)	3,10	4,30	(<115)	3,90	5,50	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,37	0,57	(>137)	0,80	1,10	(>137)	1,75	2,60	(<115)	2,30	3,40	(<115)	3,00	4,20	(<115)
1	0,42	0,65	(>137)	0,90	1,20	(>137)	1,75	2,60	(<115)	2,60	3,90	(<115)	3,30	4,70	(<115)
2	0,50	0,75	(>137)	0,97	1,45	(>137)	1,90	2,85	(<115)	2,85	4,20	(<115)	3,70	5,20	(<115)
3	0,55	0,80	(>137)	1,20	1,80	(>137)	2,20	3,20	(<115)	3,25	4,60	(<115)	4,10	5,70	(<115)
4	1,00	1,50	(>137)	2,10	3,10	(<115)	3,70	5,20	(<115)	5,40	7,60	(<115)	6,80	9,50	(<115)
5	1,40	2,00	125	2,70	3,80	(<115)	4,70	6,80	(<115)	7,00	10,00	(<115)	9,00	12,50	(<115)
6	2,00	2,90	(<115)	4,00	5,80	(<115)	7,10	10,50	(<115)	10,50	15,50	(<115)	13,50	19,00	(<115)
7	4,10	6,00	(<115)	7,60	11,50	(<115)	14,00	21,00	(<115)	20,50	30,50	(<115)	26,00	37,50	(<115)
D	0,50	0,75	(>137)	0,97	1,45	(>137)	1,90	2,85	(<115)	2,85	4,20	(<115)	3,70	5,20	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.5V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,40	0,60	(>137)	0,85	1,20	(>137)	1,70	2,60	(<115)	2,50	3,70	(<115)	3,30	4,60	(<115)
1	0,45	0,70	(>137)	0,95	1,30	(>137)	1,90	2,90	(<115)	2,80	4,20	(<115)	3,50	5,00	(<115)
2	0,55	0,80	(>137)	1,00	1,50	(>137)	2,00	3,00	(<115)	3,00	4,50	(<115)	4,00	5,60	(<115)
3	0,60	0,90	(>137)	1,30	2,00	125	2,30	3,30	(<115)	3,50	5,00	(<115)	4,50	6,30	(<115)
4	1,10	1,60	(>137)	2,20	3,20	(<115)	3,90	5,50	(<115)	5,90	8,30	(<115)	7,00	10,00	(<115)
5	1,45	2,20	(<115)	2,90	4,20	(<115)	5,20	7,30	(<115)	7,60	11,50	(<115)	10,00	14,00	(<115)
6	2,20	3,30	(<115)	4,30	6,20	(<115)	7,60	11,50	(<115)	11,50	17,00	(<115)	15,00	21,00	(<115)
7	4,30	6,40	(<115)	8,30	12,50	(<115)	15,00	23,00	(<115)	22,00	33,00	(<115)	28,00	40,00	(<115)
D	0,55	0,80	(>137)	1,00	1,50	(>137)	2,00	3,00	(<115)	3,00	4,50	(<115)	4,00	5,60	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 1.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,60	0,90	(>137)	1,40	2,10	119	2,40	3,40	(<115)	3,5	5,2	(<115)	4,5	6,5	(<115)
1	0,70	1,10	(>137)	1,70	2,50	(<115)	2,60	3,80	(<115)	3,7	6,0	(<115)	5,0	7,0	(<115)
2	0,80	1,20	(>137)	1,90	2,80	(<115)	3,00	4,40	(<115)	4,2	6,3	(<115)	5,5	7,7	(<115)
3	0,90	1,40	(>137)	2,10	3,00	(<115)	3,40	5,00	(<115)	5,0	7,2	(<115)	6,0	8,5	(<115)
4	1,70	2,40	(<115)	3,30	4,90	(<115)	5,80	8,50	(<115)	8,3	12,0	(<115)	10,0	14,0	(<115)
5	2,20	3,30	(<115)	4,30	6,30	(<115)	7,50	10,50	(<115)	11,0	16,0	(<115)	14,0	20,0	(<115)
6	3,30	5,00	(<115)	6,00	9,00	(<115)	11,00	16,00	(<115)	17,0	24,0	(<115)	21,0	29,0	(<115)
7	6,20	9,00	(<115)	12,00	17,00	(<115)	22,00	31,00	(<115)	32,0	46,0	(<115)	40,0	56,0	(<115)
D	0,60	0,90	(>137)	1,40	2,10	119	2,40	3,40	(<115)	3,5	5,2	(<115)	4,5	6,5	(<115)

Note: the maximum frequency is limited by the rise & fall time (Tr & Tf). The maximum frequency in MHz can be calculated by the formula 1/(4 x Tr) = 1/(4 x Tf), based on the typical values in [ns] at 10% ~ 90% threshold level. At a given load capacitance CL, the output signal will no longer swing rail to rail above the calculated frequency.

Please be aware that frequency values being calculated by the above formula may lie above or below the programmed frequency range 115 ~ 137MHz for JSOxxD2AC. In that case "(<115MHz)" or "(>137MHz)" is shown. At edge control settings and load capacitances where "(<115MHz)" is shown, the output signal will not swing rail to rail.

Example: if the supply voltage is 3.0V, at the default setting "D" = "3" the JSOxxD2AC is able to drive 15pF at any programmed frequency in the range of 115 ~ 137MHz.
If the supply voltage is 3.0V and the load is 30pF, the recommended edge control setting is "0". If a higher edge control setting was used at 30pF, the output signal will not swing rail to rail.

Reference Edge Control Tables for JSOxxD1AC (1 ~ 110MHz) at variable Supply Voltage:

Note: Default Edge Control setting “D” for the variable supply voltage range 2.5V ~ 3.3V is highlighted. The rise time Tr and fall time Tf is shown in [ns] at threshold levels 10% ~ 90% and 20% ~ 80% of the supply voltage at reference supply voltages of 3.3V / 3.0V / 2.8V / 2.5V.

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.3V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,33	0,50	(>110)	0,60	0,85	(>110)	1,30	1,80	(>110)	1,90	3,00	83	2,50	3,50	71
1	0,35	0,55	(>110)	0,65	0,90	(>110)	1,50	2,20	(>110)	2,10	3,40	74	2,80	4,20	60
2	0,40	0,60	(>110)	0,90	1,30	(>110)	1,65	2,50	100	2,30	3,80	66	3,20	4,50	56
3	0,45	0,65	(>110)	1,00	1,50	(>110)	1,90	3,00	83	2,60	4,10	61	3,70	5,00	50
4	0,75	1,30	(>110)	1,90	2,70	93	3,20	4,70	53	5,00	6,50	38	6,00	8,40	30
5	1,20	1,70	(>110)	2,50	3,30	76	4,30	6,00	42	6,00	8,50	29	7,50	11,00	23
6	1,80	2,60	96	3,50	5,00	50	6,20	8,50	29	9,50	13,50	19	12,00	17,00	15
7	3,70	5,20	48	7,00	10,50	24	12,50	17,50	14	18,00	26,00	9,6	24,00	34,00	7,4
D	0,45	0,65	(>110)	1,00	1,50	(>110)	1,90	3,00	83	2,60	4,10	61	3,70	5,00	50

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.0V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,35	0,55	(>110)	0,70	1,00	(>110)	1,40	2,10	(>110)	2,15	3,20	78	2,80	4,00	63
1	0,38	0,60	(>110)	0,80	1,10	(>110)	1,65	2,40	104	2,40	3,60	69	3,10	4,40	57
2	0,45	0,65	(>110)	0,93	1,40	(>110)	1,80	2,70	93	2,70	4,00	63	3,50	4,90	51
3	0,50	0,75	(>110)	1,10	1,65	(>110)	2,00	3,10	81	3,10	4,30	58	3,90	5,50	45
4	0,90	1,40	(>110)	2,00	2,90	86	3,40	5,00	50	5,20	7,30	34	6,40	9,00	28
5	1,30	1,90	(>110)	2,60	3,70	68	4,50	6,50	38	6,50	9,30	27	8,50	11,50	22
6	1,90	2,75	91	3,80	5,50	45	6,70	9,50	26	10,00	14,50	17	12,70	18,00	14
7	3,90	5,70	44	7,30	11,00	23	13,50	20,00	13	19,00	28,50	8,8	25,00	36,00	6,9
D	0,50	0,75	(>110)	1,10	1,65	(>110)	2,00	3,10	81	3,10	4,30	58	3,90	5,50	45

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,37	0,57	(>110)	0,80	1,10	(>110)	1,50	2,30	109	2,30	3,40	74	3,00	4,20	60
1	0,42	0,65	(>110)	0,90	1,20	(>110)	1,75	2,60	96	2,60	3,90	64	3,30	4,70	53
2	0,50	0,75	(>110)	0,97	1,45	(>110)	1,90	2,85	88	2,85	4,20	60	3,70	5,20	48
3	0,55	0,80	(>110)	1,20	1,80	(>110)	2,20	3,20	78	3,25	4,60	54	4,10	5,70	44
4	1,00	1,50	(>110)	2,10	3,10	81	3,70	5,20	48	5,40	7,60	33	6,80	9,50	26
5	1,40	2,00	(>110)	2,70	3,80	66	4,70	6,80	37	7,00	10,00	25	9,00	12,50	20
6	2,00	2,90	86	4,00	5,80	43	7,10	10,50	24	10,50	15,50	16	13,50	19,00	13
7	4,10	6,00	42	7,60	11,50	22	14,00	21,00	12	20,50	30,50	8,2	26,00	37,50	6,7
D	0,55	0,80	(>110)	1,20	1,80	(>110)	2,20	3,20	78	3,25	4,60	54	4,10	5,70	44

JSOxxD1AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.5V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,40	0,60	(>110)	0,85	1,20	(>110)	1,70	2,60	96	2,50	3,70	68	3,30	4,60	54
1	0,45	0,70	(>110)	0,95	1,30	(>110)	1,90	2,90	86	2,80	4,20	60	3,50	5,00	50
2	0,55	0,80	(>110)	1,00	1,50	(>110)	2,00	3,00	83	3,00	4,50	56	4,00	5,60	45
3	0,60	0,90	(>110)	1,30	2,00	(>110)	2,30	3,30	76	3,50	5,00	50	4,50	6,30	40
4	1,10	1,60	(>110)	2,20	3,20	78	3,90	5,50	45	5,90	8,30	30	7,00	10,00	25
5	1,45	2,20	(>110)	2,90	4,20	60	5,20	7,30	34	7,60	11,50	22	10,00	14,00	18
6	2,20	3,30	76	4,30	6,20	40	7,60	11,50	22	11,50	17,00	15	15,00	21,00	12
7	4,30	6,40	39	8,30	12,50	20	15,00	23,00	11	22,00	33,00	7,6	28,00	40,00	6,3
D	0,60	0,90	(>110)	1,30	2,00	(>110)	2,30	3,30	76	3,50	5,00	50	4,50	6,30	40

Note: the maximum frequency is limited by the rise & fall time (Tr & Tf). The maximum frequency in MHz can be calculated by the formula 1/(4 x Tr) = 1/(4 x Tf), based on the typical values in [ns] at 10% ~ 90% threshold level. At a given load capacitance CL, the output signal will no longer swing rail to rail above the calculated frequency.

Please be aware that frequency values being calculated by the above formula may lie above the highest programmed frequency of 110MHz for JSOxxD1AC. In that case "(>110MHz)" is shown.

Example: if the supply voltage is variable (2.5V ~ 3.3V), at the default setting "D" = "3" and the lowest supply voltage of 2.5V the JSOxxD1AC is able to drive 30pF at any programmed frequency below 76MHz. If a higher maximum frequency is required, either reduce the load capacitance, or select an appropriate edge control setting.

Reference Edge Control Tables for JSOxxD2AC (115 ~ 137MHz) at variable Supply Voltage:

Note: Default Edge Control setting “D” for the variable supply voltage range 2.5V ~ 3.3V is highlighted. The rise time Tr and fall time Tf is shown in [ns] at threshold levels 10% ~ 90% and 20% ~ 80% of the supply voltage at reference supply voltages of 3.3V / 3.0V / 2.8V / 2.5V.

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.3V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,33	0,50	(>137)	0,60	0,85	(>137)	1,30	1,80	(>137)	1,90	3,00	(<115)	2,50	3,50	(<115)
1	0,35	0,55	(>137)	0,65	0,90	(>137)	1,50	2,20	(<115)	2,10	3,40	(<115)	2,80	4,20	(<115)
2	0,40	0,60	(>137)	0,90	1,30	(>137)	1,65	2,50	(<115)	2,30	3,80	(<115)	3,20	4,50	(<115)
3	0,45	0,65	(>137)	1,00	1,50	(>137)	1,90	3,00	(<115)	2,60	4,10	(<115)	3,70	5,00	(<115)
4	0,75	1,30	(>137)	1,90	2,70	(<115)	3,20	4,70	(<115)	5,00	6,50	(<115)	6,00	8,40	(<115)
5	1,20	1,70	(>137)	2,50	3,30	(<115)	4,30	6,00	(<115)	6,00	8,50	(<115)	7,50	11,00	(<115)
6	1,80	2,60	(<115)	3,50	5,00	(<115)	6,20	8,50	(<115)	9,50	13,50	(<115)	12,00	17,00	(<115)
7	3,70	5,20	(<115)	7,00	10,50	(<115)	12,50	17,50	(<115)	18,00	26,00	(<115)	24,00	34,00	(<115)
D	0,45	0,65	(>137)	1,00	1,50	(>137)	1,90	3,00	(<115)	2,60	4,10	(<115)	3,70	5,00	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 3.0V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,35	0,55	(>137)	0,70	1,00	(>137)	1,40	2,10	119	2,15	3,20	(<115)	2,80	4,00	(<115)
1	0,38	0,60	(>137)	0,80	1,10	(>137)	1,65	2,40	(<115)	2,40	3,60	(<115)	3,10	4,40	(<115)
2	0,45	0,65	(>137)	0,93	1,40	(>137)	1,80	2,70	(<115)	2,70	4,00	(<115)	3,50	4,90	(<115)
3	0,50	0,75	(>137)	1,10	1,65	(>137)	2,00	3,10	(<115)	3,10	4,30	(<115)	3,90	5,50	(<115)
4	0,90	1,40	(>137)	2,00	2,90	(<115)	3,40	5,00	(<115)	5,20	7,30	(<115)	6,40	9,00	(<115)
5	1,30	1,90	132	2,60	3,70	(<115)	4,50	6,50	(<115)	6,50	9,30	(<115)	8,50	11,50	(<115)
6	1,90	2,75	(<115)	3,80	5,50	(<115)	6,70	9,50	(<115)	10,00	14,50	(<115)	12,70	18,00	(<115)
7	3,90	5,70	(<115)	7,30	11,00	(<115)	13,50	20,00	(<115)	19,00	28,50	(<115)	25,00	36,00	(<115)
D	0,50	0,75	(>137)	1,10	1,65	(>137)	2,00	3,10	(<115)	3,10	4,30	(<115)	3,90	5,50	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.8V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,37	0,57	(>137)	0,80	1,10	(>137)	1,50	2,30	(<115)	2,30	3,40	(<115)	3,00	4,20	(<115)
1	0,42	0,65	(>137)	0,90	1,20	(>137)	1,75	2,60	(<115)	2,60	3,90	(<115)	3,30	4,70	(<115)
2	0,50	0,75	(>137)	0,97	1,45	(>137)	1,90	2,85	(<115)	2,85	4,20	(<115)	3,70	5,20	(<115)
3	0,55	0,80	(>137)	1,20	1,80	(>137)	2,20	3,20	(<115)	3,25	4,60	(<115)	4,10	5,70	(<115)
4	1,00	1,50	(>137)	2,10	3,10	(<115)	3,70	5,20	(<115)	5,40	7,60	(<115)	6,80	9,50	(<115)
5	1,40	2,00	125	2,70	3,80	(<115)	4,70	6,80	(<115)	7,00	10,00	(<115)	9,00	12,50	(<115)
6	2,00	2,90	(<115)	4,00	5,80	(<115)	7,10	10,50	(<115)	10,50	15,50	(<115)	13,50	19,00	(<115)
7	4,10	6,00	(<115)	7,60	11,50	(<115)	14,00	21,00	(<115)	20,50	30,50	(<115)	26,00	37,50	(<115)
D	0,55	0,80	(>137)	1,20	1,80	(>137)	1,90	2,85	(<115)	2,85	4,20	(<115)	3,70	5,20	(<115)

JSOxxD2AC: Rise/Fall Time Typ [ns] and max. Frequency [MHz] at VDC = 2.5V															
	no load (5pF)			CL = 15pF			CL = 30pF			CL = 45pF			CL = 60pF		
edge contr.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.	20% 80%	10% 90%	max. freq.
0	0,40	0,60	(>137)	0,85	1,20	(>137)	*1,70*	*2,60*	(<115)	*2,50*	*3,70*	(<115)	*3,30*	*4,60*	(<115)
1	0,45	0,70	(>137)	0,95	1,30	(>137)	*1,90*	*2,90*	(<115)	*2,80*	*4,20*	(<115)	*3,50*	*5,00*	(<115)
2	0,55	0,80	(>137)	1,00	1,50	(>137)	*2,00*	*3,00*	(<115)	*3,00*	*4,50*	(<115)	*4,00*	*5,60*	(<115)
3	0,60	0,90	(>137)	1,30	2,00	125	*2,30*	*3,30*	(<115)	*3,50*	*5,00*	(<115)	*4,50*	*6,30*	(<115)
4	1,10	1,60	(>137)	*2,20*	*3,20*	(<115)	*3,90*	*5,50*	(<115)	*5,90*	*8,30*	(<115)	*7,00*	*10,00*	(<115)
5	1,45	2,20	(<115)	*2,90*	*4,20*	(<115)	*5,20*	*7,30*	(<115)	*7,60*	*11,50*	(<115)	*10,00*	*14,00*	(<115)
6	*2,20*	*3,30*	(<115)	*4,30*	*6,20*	(<115)	*7,60*	*11,50*	(<115)	*11,50*	*17,00*	(<115)	*15,00*	*21,00*	(<115)
7	*4,30*	*6,40*	(<115)	*8,30*	*12,50*	(<115)	*15,00*	*23,00*	(<115)	*22,00*	*33,00*	(<115)	*28,00*	*40,00*	(<115)
D	0,60	0,90	(>137)	1,30	2,00	125	*2,00*	*3,00*	(<115)	*3,00*	*4,50*	(<115)	*4,00*	*5,60*	(<115)

Note: the maximum frequency is limited by the rise & fall time (Tr & Tf). The maximum frequency in MHz can be calculated by the formula 1/(4 x Tr) = 1/(4 x Tf), based on the typical values in [ns] at 10% ~ 90% threshold level. At a given load capacitance CL, the output signal will no longer swing rail to rail above the calculated frequency.

Please be aware that frequency values being calculated by the above formula may lie above or below the programmed frequency range 115 ~ 137MHz for JSOxxD2AC. In that case "(<115MHz)" or "(>137MHz)" is shown. At edge control settings and load capacitances where "(<115MHz)" is shown, the output signal will not swing rail to rail.

Example: if the supply voltage is variable (2.5V ~ 3.3V), the load is 15pF and edge control is set at default "D" = "3", the maximum frequency is 125MHz at the lowest variable voltage 2.5V. If a higher maximum frequency is required, either reduce the load capacitance, or select an appropriate edge control setting.