



NOVATEK
聯詠科技

Data Sheet

NT39208

240/200 Outputs TFT-LCD Gate Driver

Version 0.3

Preliminary

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Revision History

NT39208 Specification Revision History		
Version	Content	Date
0.0	Original	2006/04/13
0.1	<ol style="list-style-type: none"> 1. Updated "Chip Outline Dimensions." 2. Updated the range of operating temperature. 3. Announced "Bonding Diagram." 	2006/06/01
0.2	<ol style="list-style-type: none"> 1. Revised the descriptions of symbols XONR and XONL. 2. Revised the absolute maximum ratings. 3. Revised AC electrical characteristics of symbol Txon. 4. Modified the timing diagrams, shown in page 15 and 16. 	2006/12/05
0.3	<ol style="list-style-type: none"> 1. Revised DC electrical characteristics of symbol VCC, Shown in page 10 2. Revised Operating temperature, Shown in page 10,11 3. Modify AC Electrical Characteristics: TPOR max.= 5ms for power-on reset slew time, Shown in page 11 	2007/06/13

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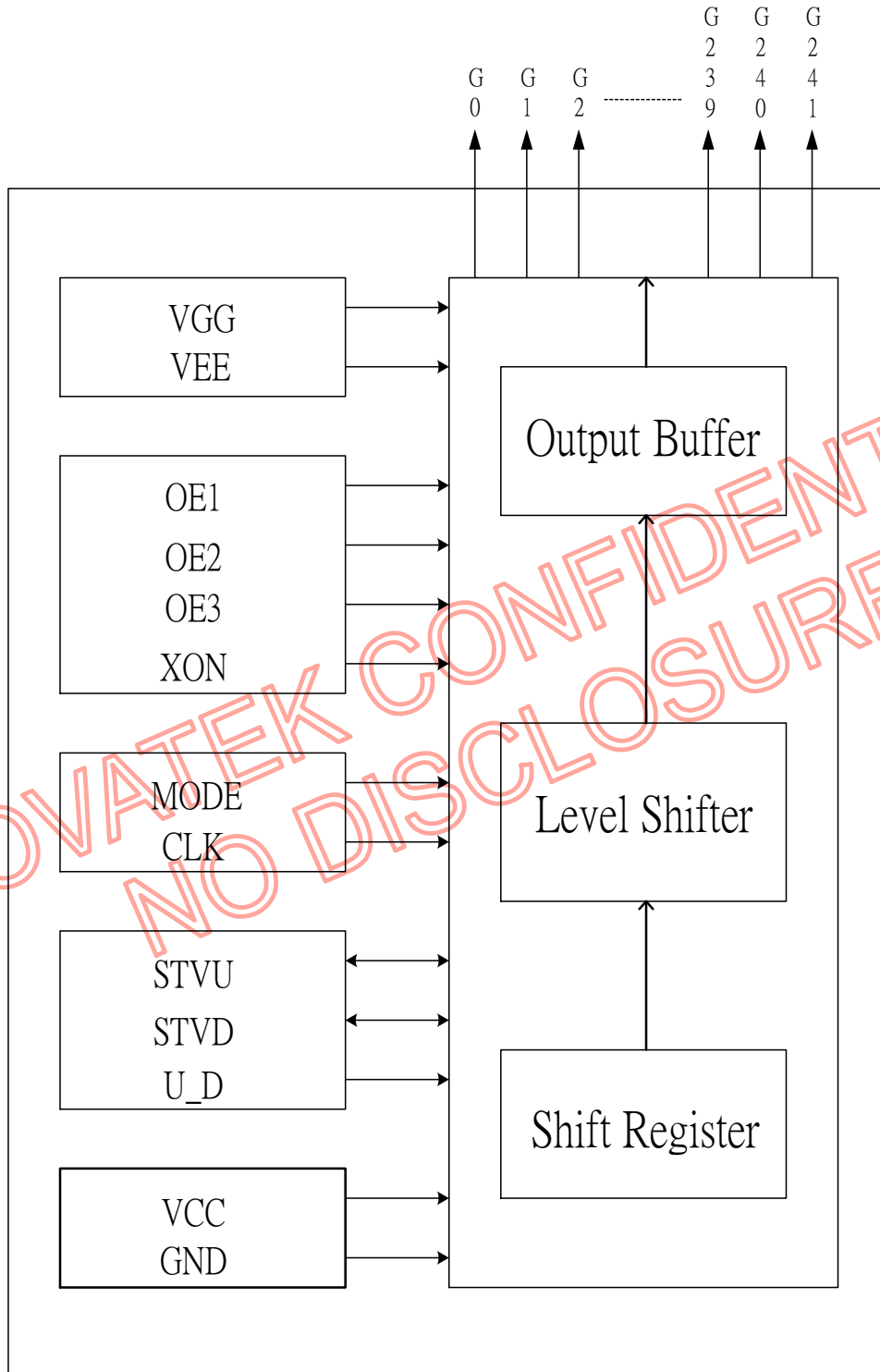
Features

- Gate driver for TFT-LCD panels
- 240/200 channel outputs and 2 channel outputs which are fixed to VEE
- Bi-directional shift function
- Driving voltage: VEE + 40V
- Double gate scan
- 2.7 ~ 5.5V logical interface
- Cascade dot-expansion function
- CMOS silicon gate (P-type)
- COG solution

General Descriptions

NT39208 is a dedicated gate driver IC for TFT-LCD panels. After a start pulse is triggered, channel outputs pins will sequentially output high-driving voltage pulses as the gate signals on TFT-LCD panels. NT39208 also provides shift up/down selection and cascade functions for dot expansion. The special pin location is designed for COG type.

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Block Diagram


Pin Descriptions

<i>Symbol</i>	<i>I/O</i>	<i>Description</i>
XONR, XONL	I	When XON goes low, all outputs are fixed to VGG. A 200k ohm pull-up resistor is connected between this pin and VCC. XON signal has priority over OE1/2/3. This pin should be connected to either "VCC" or "GND."
OE1R, OE1L	I	These pads are shorted internally, active high. When this pin is applied to "H", the (3n+1) th channel outputs, n=0, 1, 2, ...79, are disabled (=VEE). This condition will not affect the operation of the internal registers. OE1 control signal is independent with the CLK.
OE2R, OE2L	I	These pads are shorted internally, active high. When this pin is applied to "H", the (3n+2) th channel outputs, n=0, 1, 2, ...79, are disabled (=VEE). This condition will not affect the operation of the internal registers. OE2 control signal is independent with the CLK.
OE3R, OE3L	I	These pads are shorted internally, active high. When this pin is applied to "H", the (3n+3) th channel outputs, n=0, 1, 2, ...79, are disabled (=VEE). This condition will not affect the operation of the internal registers. OE3 control signal is independent with the CLK.
U_DR, U_DL	I	Shift up/down control signal U_D = "H", up shift: STVD (Input) → G1 ~ G240 → STVU (Output) U_D = "L", down shift: STVU (Input) → G240 ~ G1 → STVD (Output)
CLKR, CLKL	I	Shift clock signal for internal shift register
PATHR, PATHL	S	Internally connected together
STVD	I/O	This pin operates as an input pin under the condition of U_D = "H" and receives a pulse signal; this pin operates as an output pin under the condition of U_D="L" and send a pulse signal. Please refer to the descriptions of "STVU" and "U_D".
VGGR, VGGL	P	Positive power supply for G1 ~ G240 outputs
VEER, VEEL	P	Negative power supply for G0 ~ G241 outputs
VCCR, VCCL	P	Power supply for digital circuits
GNDR, GNDL	P	Ground
STVU	I/O	This pin operates as an input pin under the condition of U_D = "L" and receives a pulse signal; this pin operates as an output pin under the condition of U_D="H" and send a pulse signal. Please refer to the descriptions of "STVD" and "U_D".
G1 ~ G240	O	Pulse signals for driving the gates on TFT-LCD VGG minus VEE is the amplitude of G1 ~ G240. The timing of G1 ~ G240 is synchronous with the rising edge of the shift clock CLK.
G0, G241	O	Auxiliary pins. Regardless of shift data, G0 and G241 always output the potential of VEE.

MODER, MODEL	I	Selecting the output mode: 240/200 channels, normally pulled-high. MODER/L="L": 200 channels (G101 ~ G140 are disabled and fixed to VEE) MODER/L="H": 240 channels				
		Output Channel	200CH (MODER/L="L")	240CH (MODER/L="H")	OE Control	
		G1	1 st	1 st	OE1	OE1
		G2	2 nd	2 nd	OE2	OE2
		G3	3 rd	3 rd	OE3	OE3
		:	:	:	:	:
		G99	99 th	99 th	OE3	OE3
		G100	100 th	100 th	OE1	OE1
		G101	Fixed to VEE	101 th	-	OE2
		G102	Fixed to VEE	102 th	-	OE3
		G103	Fixed to VEE	103 th	-	OE1
		:	:	:	:	:
		G138	Fixed to VEE	138 th	-	OE3
		G139	Fixed to VEE	139 th	-	OE1
		G140	Fixed to VEE	140 th	-	OE2
		G141	101 th	141 th	OE2	OE3
		G142	102 th	142 th	OE3	OE1
		:	:	:	:	:
		G238	198 th	238 th	OE3	OE1
		G239	199 th	239 th	OE1	OE2
		G240	200 th	240 th	OE2	OE3

Note1: I: Input; O: Output; I/O: Input/Output; P: Power; S: Shorted line.

Note2: The unused input pins are recommended that this pin be connected to either VCC or GND.

Pass lines and pad names

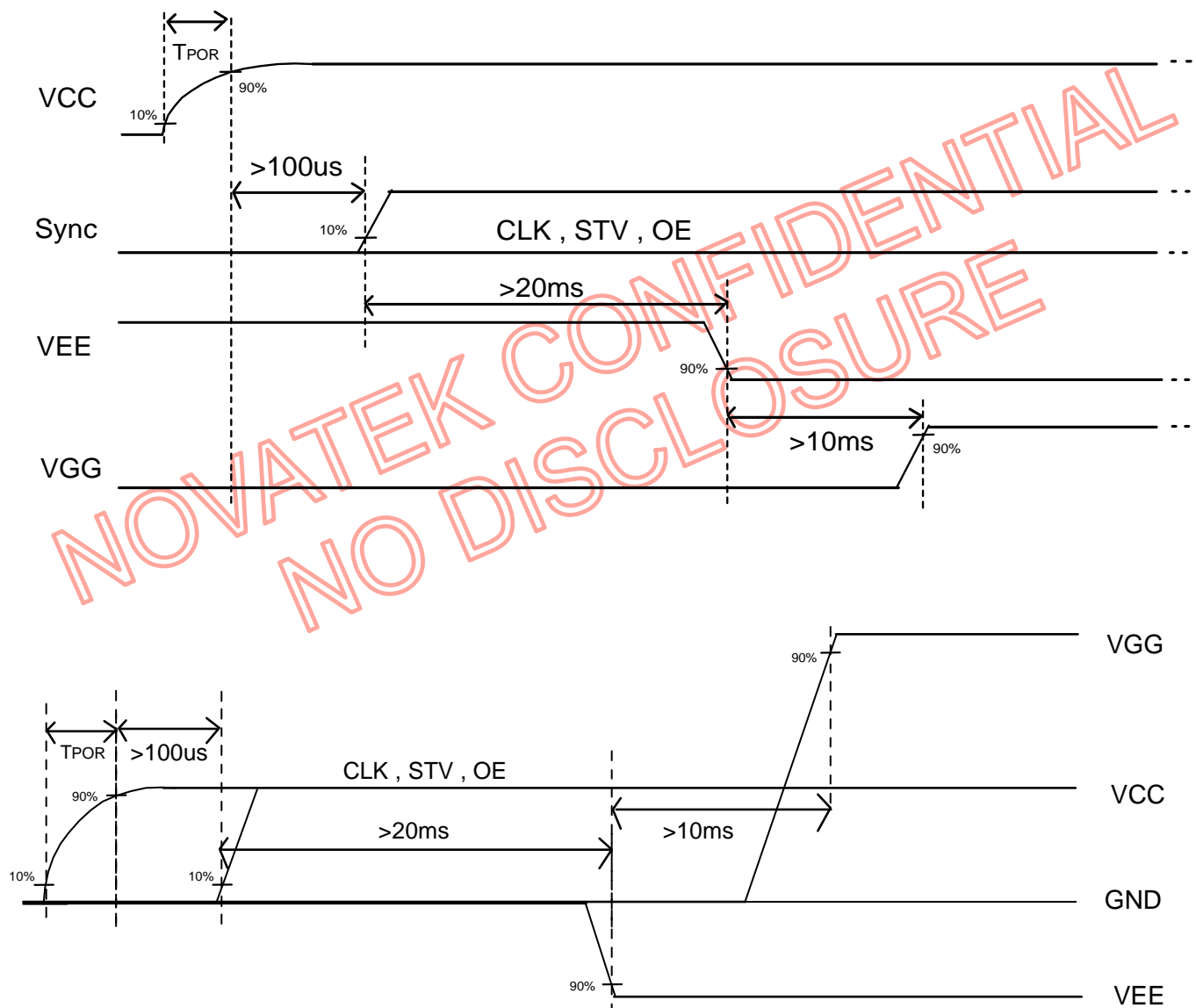
Pass Line No.	Pad Name	
1	XONR	XONL
2	OE1R	OE1L
3	OE2R	OE2L
4	OE3R	OE3L
5	U_DR	U_DL
6	CLKR	CLKL
7	PATHR	PATHL
8	VGGR	VGGL
9	VEER	VEEL
10	VCCR	VCCL
11	GNDR	GNDL
12	MODER	MODEL

Functional Descriptions

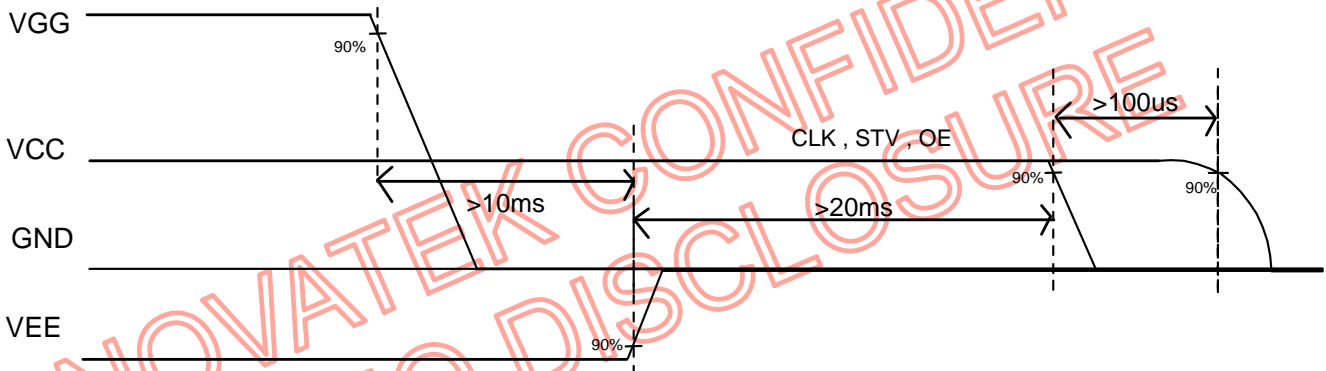
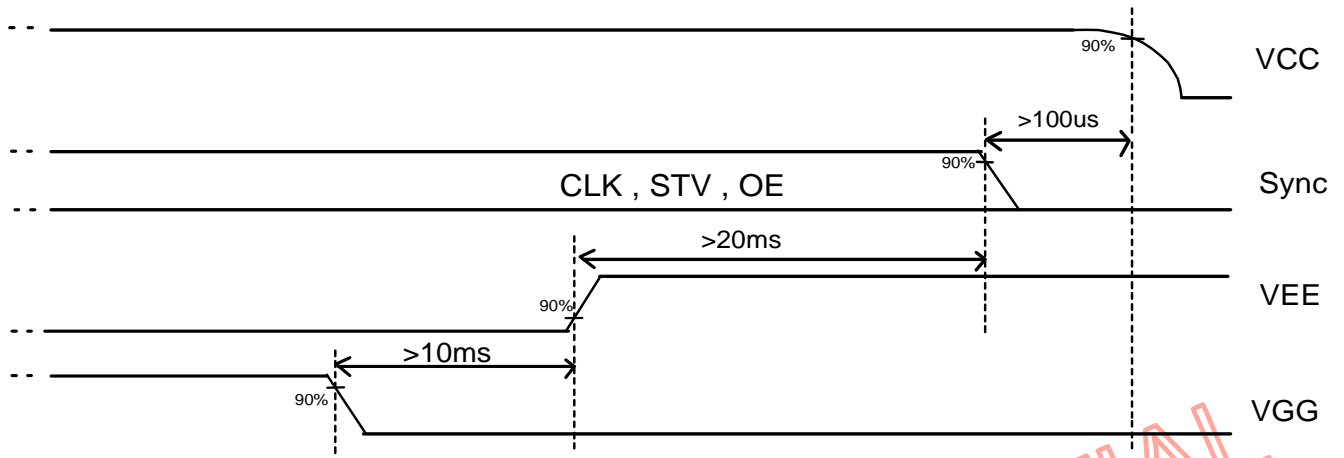
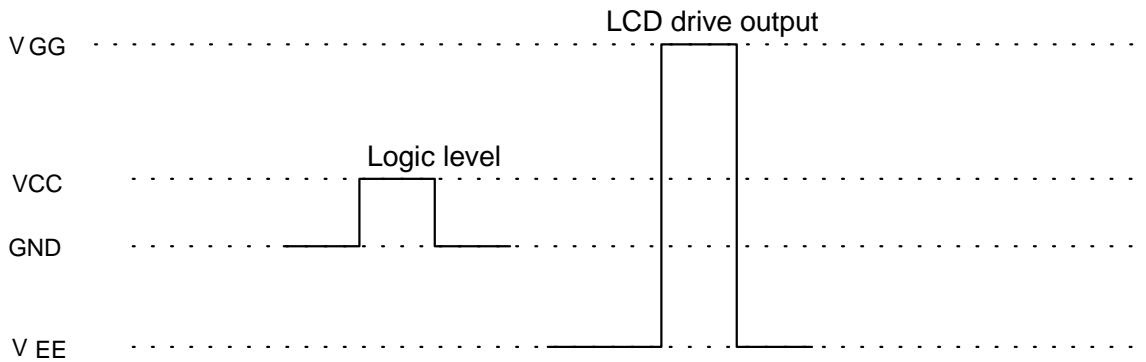
1. Power on/off sequence:

This IC is a high-voltage LCD driver, so it may be damaged by a large current flow if an incorrect power sequence is used. Connecting the drive powers, VEE & VGG, after the logical power, VCC, is the recommended sequence. When shutting off the power, shut off the drive power and then the logic system or turn off all power simultaneously.

■ Power on sequence



Note3: T_{POR} => Power-On Reset slew time. Refer to page-11

■ Power off sequence

2. Power level:


Note4: For the input signals: CLK, XON, OE, U_D, STVD & STVU, MODE, "High" level=VCC, "Low" level=GND

Absolute Maximum Ratings*

Logic supply voltage, VCC	-0.3V to 7V
Supply voltage, VGG	-0.3V to +40V
Supply voltage, VEE	-20V to +0.3V
Supply range, VGG-VEE	-0.3V to 40V
Operating temperature	-20°C to 85°C
Storage temperature	-55°C to 125°C

***Comments**

Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Electrical Characteristics

(VCC=3.3V, VGG=25V, VEE=-15V, GND=0V, TA= -20 to 85°C)

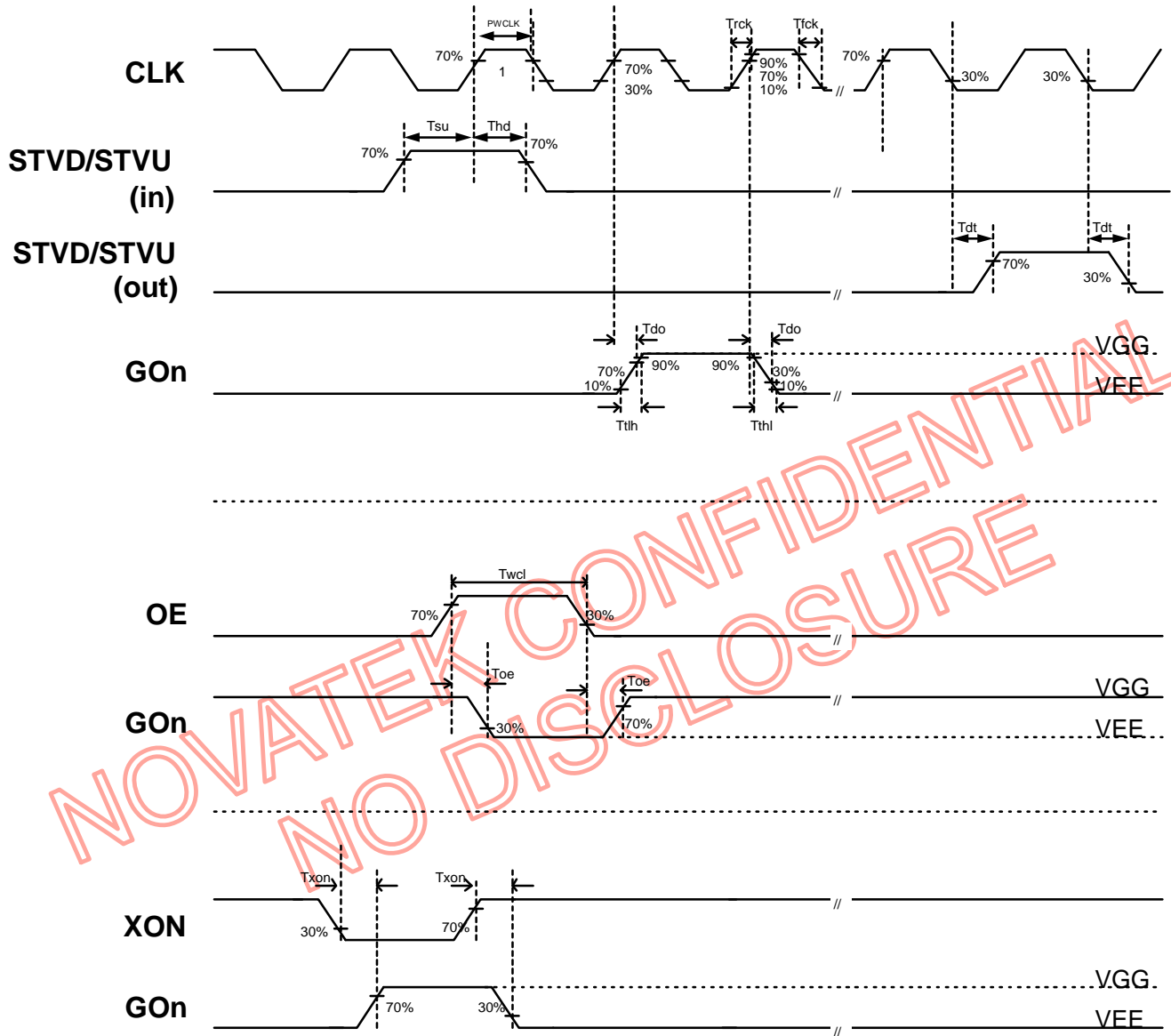
<i>Symbol</i>	<i>Parameters</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Unit</i>	<i>Conditions</i>
VGG	VGG Voltage	7	-	VEE + 40	V	
VEE	VEE Voltage	-20	-	-5	V	
Vxo	Voltage Range of VGG – VEE	12	-	40	V	VCC = 3.3V
VCC	VCC Supplied Voltage	2.7	3.3	5.5	V	
VIH	High Level Input Voltage	0.7VCC	-	VCC	V	VCC = 3.3V
VIL	Low Level Input Voltage	0	-	0.3VCC	V	VCC = 3.3V
IXOH	High Level Output Current	0.5	-	-	mA	Driving current, VO = VGG – 0.5V
IXOL	Low Level Output Current	-0.5	-	-	mA	Sinking current, VO = VEE + 0.5V
IPOH	High Level Output Current	200	-	-	uA	STVD/STVU, VO = VCC – 0.3V
IPOL	Low Level Output Current	-200	-	-	uA	STVD/STVU, VO = 0.3V
Rin	Pull-up Impedance	70K	200K	400K	ohm	XON pin
IIL	Input Leakage Current	-	-	± 1	uA	Except XON pin
ICC	Operating Current Consumption	-	-	50	uA	VCC=3.3V, Fclk=20KHz, No load

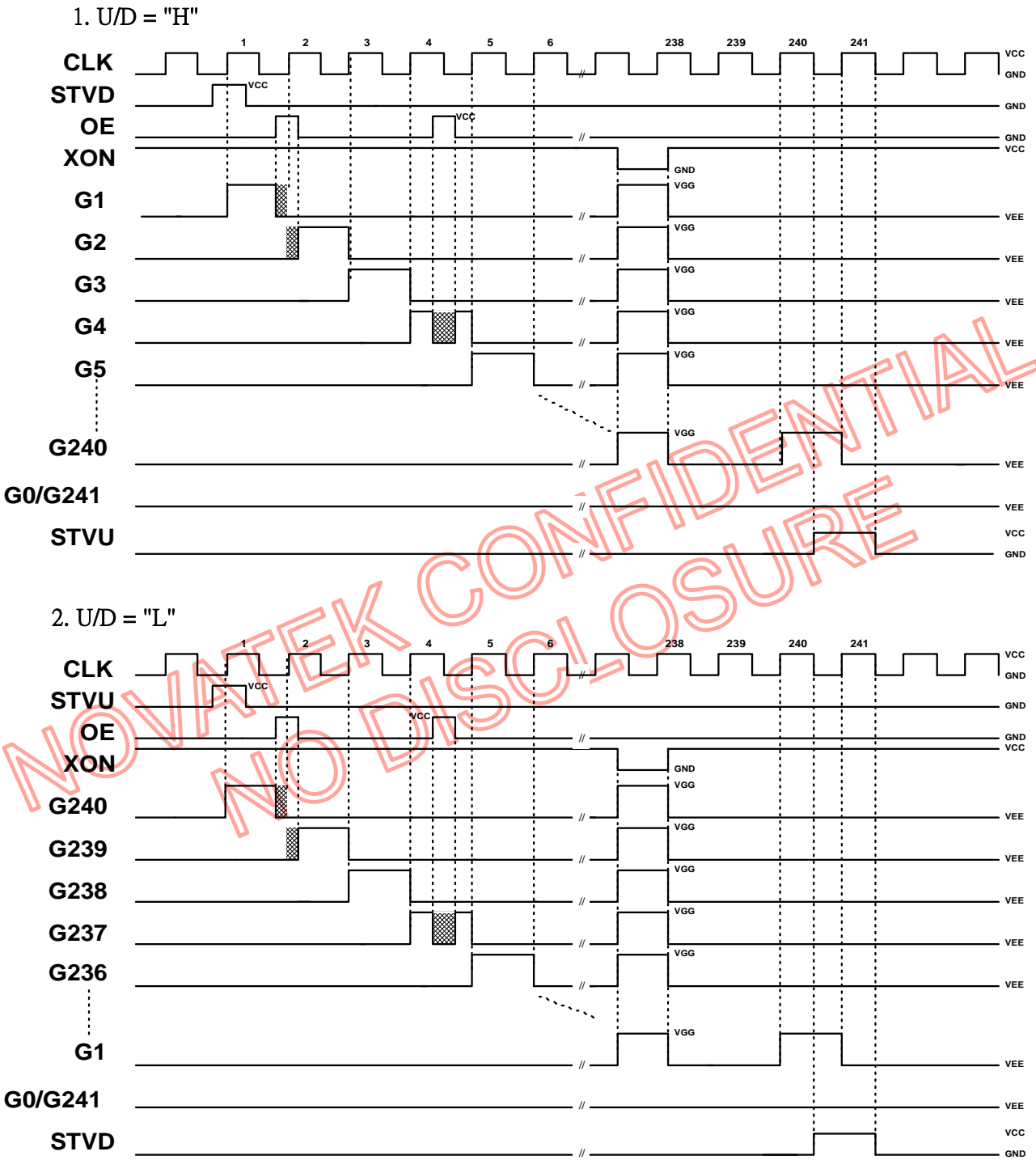
IGG	Operating Current Consumption	-	-	100	uA	VGG=25V, Fclk=20KHz, No load
IEE	Operating Current Consumption	-	-	-100	uA	VEE=-15V, Fclk=20KHz, No load

AC Electrical Characteristics

(VCC= 2.7 to 5.5V, VGG=25V, VEE=-15V, GND=0V, TA= -20 to 85°C)

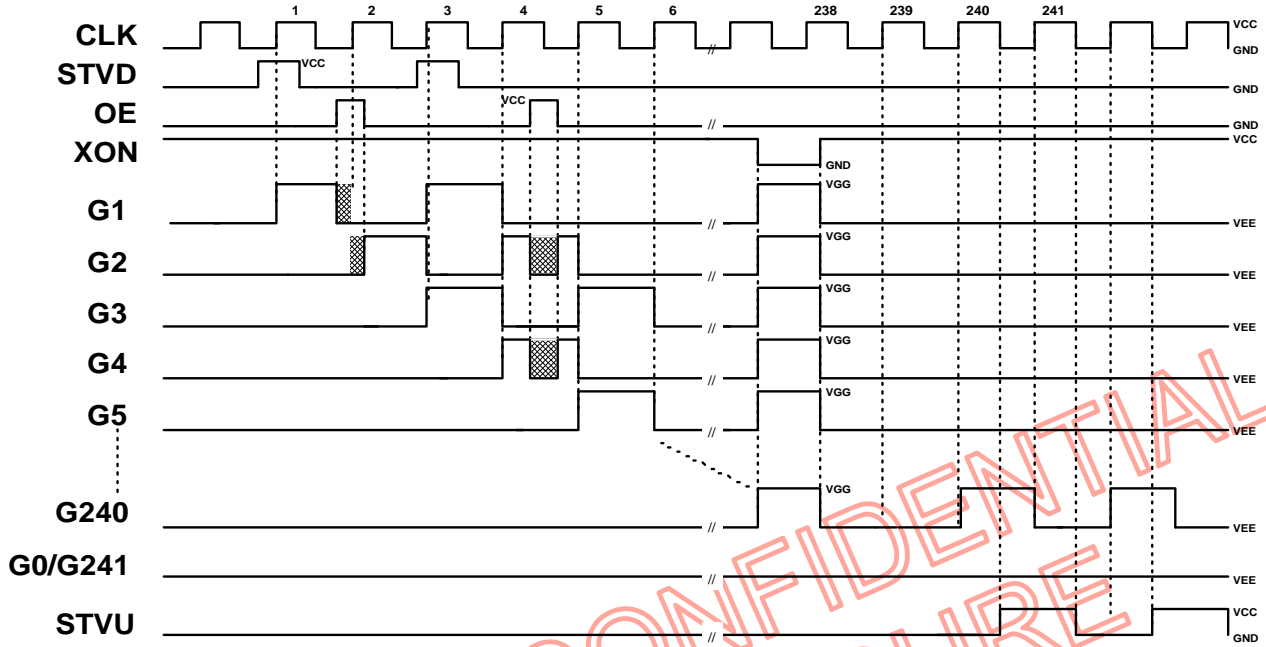
<i>Symbol</i>	<i>Parameters</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Unit</i>	<i>Conditions</i>
Tdt	STVD/STVU Delay Time	-	-	500	ns	CL = 20pF
Tdo	Driver Output Delay Time	-	-	900	ns	CL = 200pF
Tthl	Output Falling Time	-	400	800	ns	CL = 200pF, 90% to 10%
Ttlh	Output Rising Time	-	500	1000	ns	CL = 200pF, 10% to 90%
Txon	XON to Driver Output Delay Time	-	-	50	us	CL = 200pF
Toe	OEx to Driver Output Delay Time	-	-	900	ns	CL = 200pF
Fclk	Clock Frequency	-	-	200	KHz	In cascade connection
Trck	Clock Rising Time	-	-	100	ns	CL = 20pF
Tfck	Clock Falling Time	-	-	100	ns	CL = 20pF
PWCLK	Clock Pulse Width (High & Low)	500	-	-	ns	
Tsu	STVD/STVU Set-Up Time	200	-	-	ns	
Thd	STVD/STVU Hold Time	300	-	-	ns	
Twcl	Output Enabled Pulse Width	1	-	-	us	
TPOR	Power-On Reset slew time	-	-	5	ms	From 10% to 90% VCC

Timing Waveforms


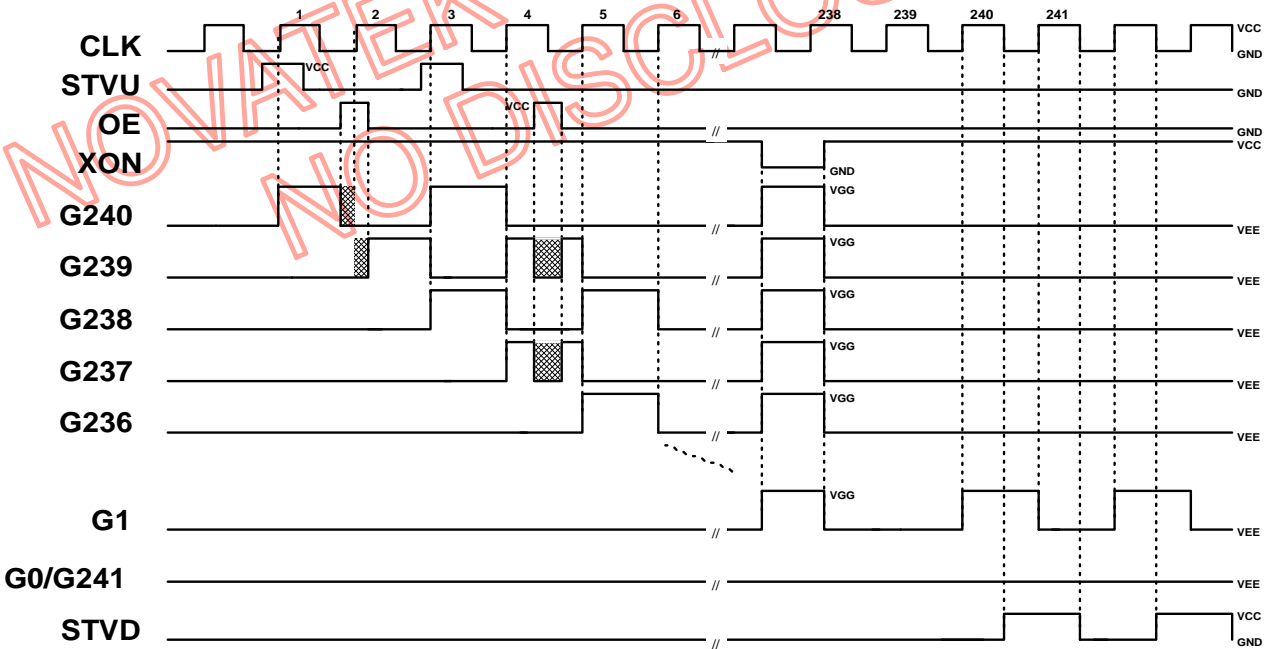
Operating Condition I: Single-Pulse


Operating Condition II: Double-Pulse

1. U/D = "H"

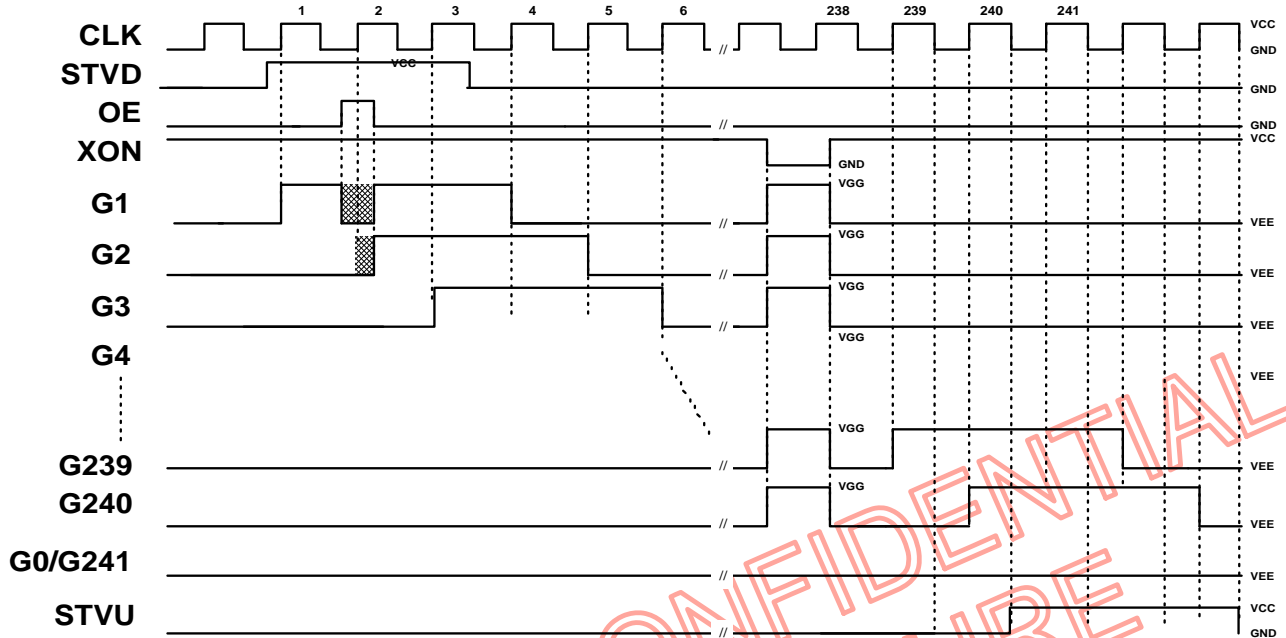


2. U/D = "L"

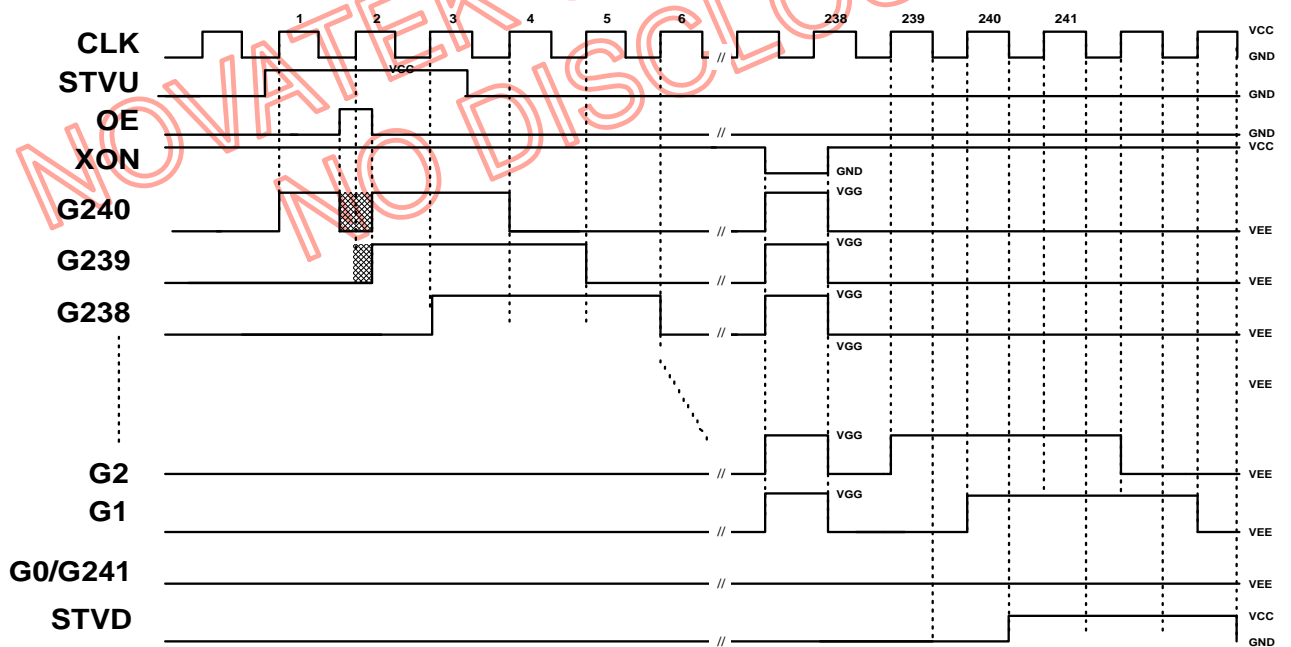


 : Deleted from normal output by OE

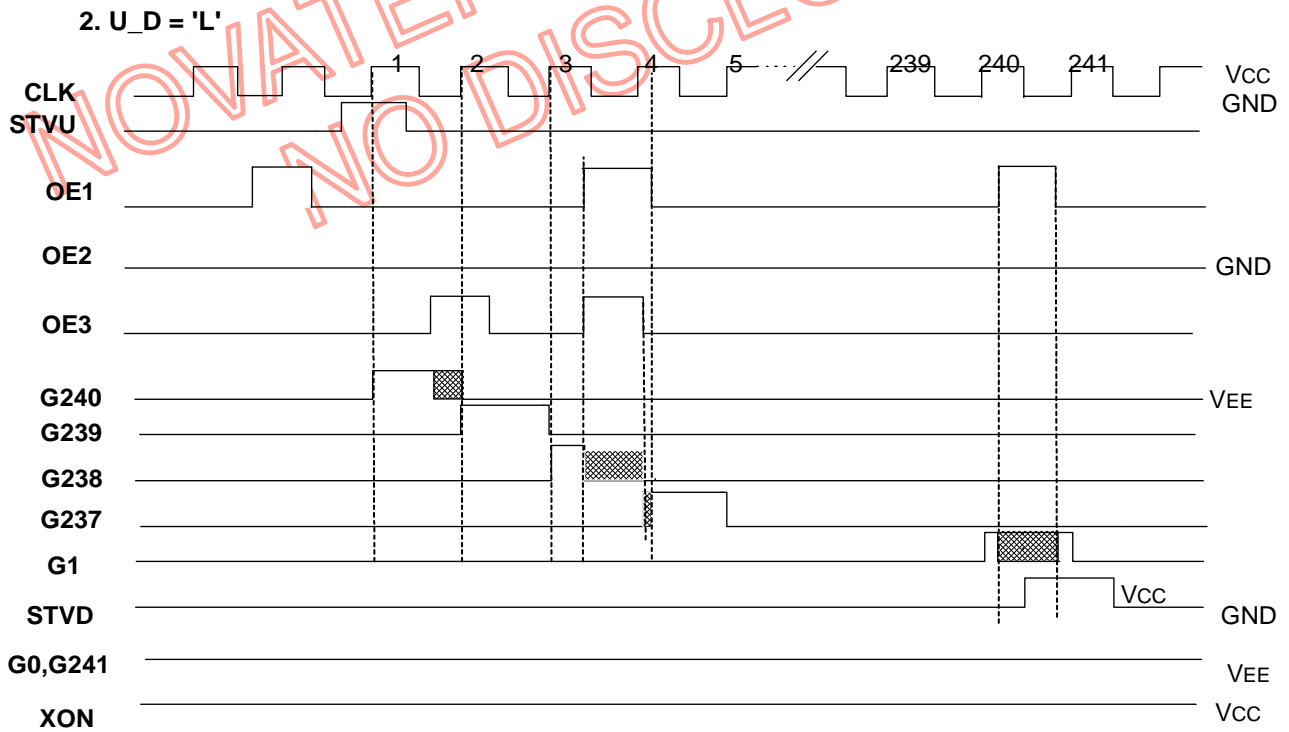
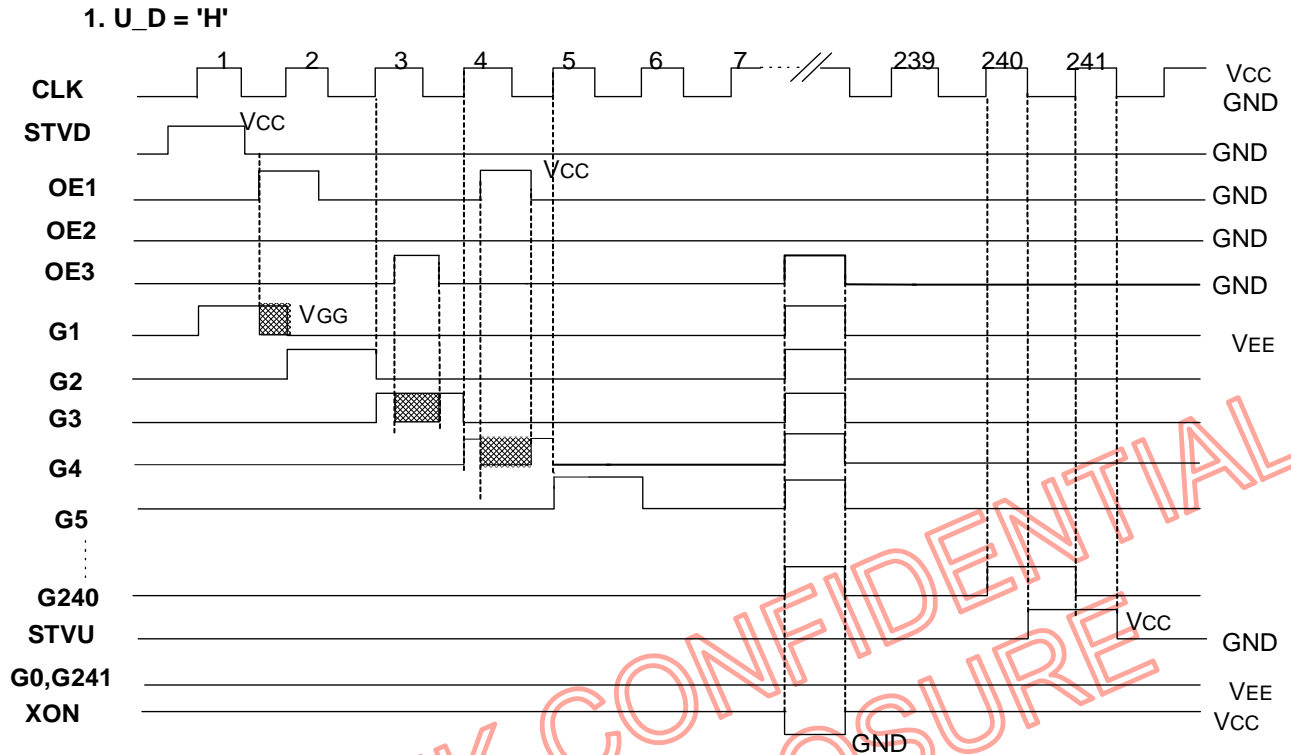
Operating Condition III: Long-Start-Pulse


1. U/D = "H"

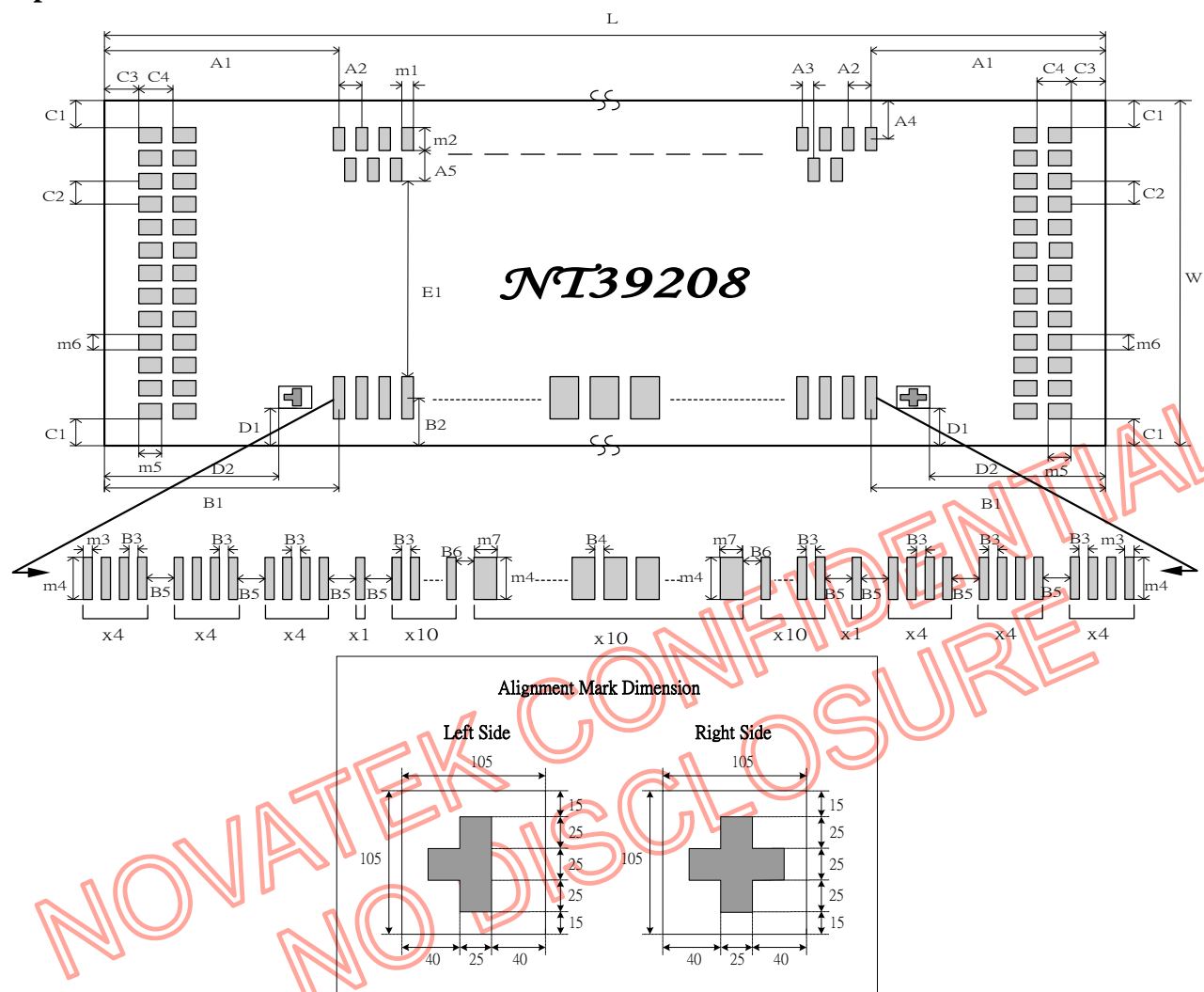


2. U/D = "L"


 : Deleted from normal output by OE

Operating Condition IV: 3-OE


 : Deleted from normal output by OEx

Chip Outline Dimensions


<i>Symbol</i>	<i>Dimensions (um)</i>	<i>Symbol</i>	<i>Dimensions (um)</i>	<i>Symbol</i>	<i>Dimensions (um)</i>
A1	626	B5	80	m1	22
A2	44	B6	44	m2	95
A3	22	C1	70	m3	40
A4	117.5	C2	68	m4	85
A5	130	C3	70	m5	50
B1	666	C4	65	m6	45
B2	112.5	D1	105	m7	105
B3	40	D2	390	L	6620
B4	30	E1	551	W	1001

(scribe-line included)

Bonding Diagram

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	XONL	-3215	408	41	GND	-1364	-388
2	XONL	-3150	408	42	GND	-1284	-388
3	OE1L	-3215	340	43	GND	-1204	-388
4	OE1L	-3150	340	44	GND	-1124	-388
5	OE2L	-3215	272	45	GND	-1044	-388
6	OE2L	-3150	272	46	GND	-964	-388
7	OE3L	-3215	204	47	GND	-884	-388
8	OE3L	-3150	204	48	GND	-804	-388
9	U_DL	-3215	136	49	GND	-724	-388
10	U_DL	-3150	136	50	DUMMY[1]	-607.5	-388
11	CLKL	-3215	68	51	DUMMY[2]	-472.5	-388
12	CLKL	-3150	68	52	DUMMY[3]	-337.5	-388
13	PATHL	-3215	0	53	DUMMY[4]	-202.5	-388
14	PATHL	-3150	0	54	DUMMY[5]	-67.5	-388
15	STVU	-3215	-68	55	DUMMY[6]	67.5	-388
16	STVU	-3150	-68	56	DUMMY[7]	202.5	-388
17	VGGL	-3215	-136	57	DUMMY[8]	337.5	-388
18	VGGL	-3150	-136	58	DUMMY[9]	472.5	-388
19	VGGL	-3215	-204	59	DUMMY[10]	607.5	-388
20	VGGL	-3150	-204	60	GND	724	-388
21	VCCL	-3215	-272	61	GND	804	-388
22	VCCL	-3150	-272	62	GND	884	-388
23	VCCL	-3215	-340	63	GND	964	-388
24	VCCL	-3150	-340	64	GND	1044	-388
25	MODEL	-3215	-408	65	GND	1124	-388
26	MODEL	-3150	-408	66	GND	1204	-388
27	VEE	-2644	-388	67	GND	1284	-388
28	VEE	-2564	-388	68	GND	1364	-388
29	VEE	-2484	-388	69	GND	1444	-388
30	VEE	-2404	-388	70	MODER	1564	-388
31	VGGL	-2284	-388	71	VCC	1684	-388
32	VGGL	-2204	-388	72	VCC	1764	-388
33	VGGL	-2124	-388	73	VCC	1844	-388
34	VGGL	-2044	-388	74	VCC	1924	-388
35	VCC	-1924	-388	75	VGGR	2044	-388
36	VCC	-1844	-388	76	VGGR	2124	-388
37	VCC	-1764	-388	77	VGGR	2204	-388
38	VCC	-1684	-388	78	VGGR	2284	-388
39	MODEL	-1564	-388	79	VEE	2404	-388
40	GND	-1444	-388	80	VEE	2484	-388

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
81	VEE	2564	-388	121	G[11]	2398	253
82	VEE	2644	-388	122	G[12]	2376	383
83	MODER	3150	-408	123	G[13]	2354	253
84	MODER	3215	-408	124	G[14]	2332	383
85	VCCR	3150	-340	125	G[15]	2310	253
86	VCCR	3215	-340	126	G[16]	2288	383
87	VCCR	3150	-272	127	G[17]	2266	253
88	VCCR	3215	-272	128	G[18]	2244	383
89	VGGR	3150	-204	129	G[19]	2222	253
90	VGGR	3215	-204	130	G[20]	2200	383
91	VGGR	3150	-136	131	G[21]	2178	253
92	VGGR	3215	-136	132	G[22]	2156	383
93	STVD	3150	-68	133	G[23]	2134	253
94	STVD	3215	-68	134	G[24]	2112	383
95	PATHR	3150	0	135	G[25]	2090	253
96	PATHR	3215	0	136	G[26]	2068	383
97	CLKR	3150	68	137	G[27]	2046	253
98	CLKR	3215	68	138	G[28]	2024	383
99	U_DR	3150	136	139	G[29]	2002	253
100	U_DR	3215	136	140	G[30]	1980	383
101	OE3R	3150	204	141	G[31]	1958	253
102	OE3R	3215	204	142	G[32]	1936	383
103	OE2R	3150	272	143	G[33]	1914	253
104	OE2R	3215	272	144	G[34]	1892	383
105	OE1R	3150	340	145	G[35]	1870	253
106	OE1R	3215	340	146	G[36]	1848	383
107	XONR	3215	408	147	G[37]	1826	253
108	XONR	3150	408	148	G[38]	1804	383
109	DUMMY[11]	2684	383	149	G[39]	1782	253
110	G[0]	2640	383	150	G[40]	1760	383
111	G[1]	2618	253	151	G[41]	1738	253
112	G[2]	2596	383	152	G[42]	1716	383
113	G[3]	2574	253	153	G[43]	1694	253
114	G[4]	2552	383	154	G[44]	1672	383
115	G[5]	2530	253	155	G[45]	1650	253
116	G[6]	2508	383	156	G[46]	1628	383
117	G[7]	2486	253	157	G[47]	1606	253
118	G[8]	2464	383	158	G[48]	1584	383
119	G[9]	2442	253	159	G[49]	1562	253
120	G[10]	2420	383	160	G[50]	1540	383

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
161	G[51]	1518	253	201	G[91]	638	253
162	G[52]	1496	383	202	G[92]	616	383
163	G[53]	1474	253	203	G[93]	594	253
164	G[54]	1452	383	204	G[94]	572	383
165	G[55]	1430	253	205	G[95]	550	253
166	G[56]	1408	383	206	G[96]	528	383
167	G[57]	1386	253	207	G[97]	506	253
168	G[58]	1364	383	208	G[98]	484	383
169	G[59]	1342	253	209	G[99]	462	253
170	G[60]	1320	383	210	G[100]	440	383
171	G[61]	1298	253	211	G[101]	418	253
172	G[62]	1276	383	212	G[102]	396	383
173	G[63]	1254	253	213	G[103]	374	253
174	G[64]	1232	383	214	G[104]	352	383
175	G[65]	1210	253	215	G[105]	330	253
176	G[66]	1188	383	216	G[106]	308	383
177	G[67]	1166	253	217	G[107]	286	253
178	G[68]	1144	383	218	G[108]	264	383
179	G[69]	1122	253	219	G[109]	242	253
180	G[70]	1100	383	220	G[110]	220	383
181	G[71]	1078	253	221	G[111]	198	253
182	G[72]	1056	383	222	G[112]	176	383
183	G[73]	1034	253	223	G[113]	154	253
184	G[74]	1012	383	224	G[114]	132	383
185	G[75]	990	253	225	G[115]	110	253
186	G[76]	968	383	226	G[116]	88	383
187	G[77]	946	253	227	G[117]	66	253
188	G[78]	924	383	228	G[118]	44	383
189	G[79]	902	253	229	G[119]	22	253
190	G[80]	880	383	230	G[120]	0	383
191	G[81]	858	253	231	G[121]	-22	253
192	G[82]	836	383	232	G[122]	-44	383
193	G[83]	814	253	233	G[123]	-66	253
194	G[84]	792	383	234	G[124]	-88	383
195	G[85]	770	253	235	G[125]	-110	253
196	G[86]	748	383	236	G[126]	-132	383
197	G[87]	726	253	237	G[127]	-154	253
198	G[88]	704	383	238	G[128]	-176	383
199	G[89]	682	253	239	G[129]	-198	253
200	G[90]	660	383	240	G[130]	-220	383

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
241	G[131]	-242	253	281	G[171]	-1122	253
242	G[132]	-264	383	282	G[172]	-1144	383
243	G[133]	-286	253	283	G[173]	-1166	253
244	G[134]	-308	383	284	G[174]	-1188	383
245	G[135]	-330	253	285	G[175]	-1210	253
246	G[136]	-352	383	286	G[176]	-1232	383
247	G[137]	-374	253	287	G[177]	-1254	253
248	G[138]	-396	383	288	G[178]	-1276	383
249	G[139]	-418	253	289	G[179]	-1298	253
250	G[140]	-440	383	290	G[180]	-1320	383
251	G[141]	-462	253	291	G[181]	-1342	253
252	G[142]	-484	383	292	G[182]	-1364	383
253	G[143]	-506	253	293	G[183]	-1386	253
254	G[144]	-528	383	294	G[184]	-1408	383
255	G[145]	-550	253	295	G[185]	-1430	253
256	G[146]	-572	383	296	G[186]	-1452	383
257	G[147]	-594	253	297	G[187]	-1474	253
258	G[148]	-616	383	298	G[188]	-1496	383
259	G[149]	-638	253	299	G[189]	-1518	253
260	G[150]	-660	383	300	G[190]	-1540	383
261	G[151]	-682	253	301	G[191]	-1562	253
262	G[152]	-704	383	302	G[192]	-1584	383
263	G[153]	-726	253	303	G[193]	-1606	253
264	G[154]	-748	383	304	G[194]	-1628	383
265	G[155]	-770	253	305	G[195]	-1650	253
266	G[156]	-792	383	306	G[196]	-1672	383
267	G[157]	-814	253	307	G[197]	-1694	253
268	G[158]	-836	383	308	G[198]	-1716	383
269	G[159]	-858	253	309	G[199]	-1738	253
270	G[160]	-880	383	310	G[200]	-1760	383
271	G[161]	-902	253	311	G[201]	-1782	253
272	G[162]	-924	383	312	G[202]	-1804	383
273	G[163]	-946	253	313	G[203]	-1826	253
274	G[164]	-968	383	314	G[204]	-1848	383
275	G[165]	-990	253	315	G[205]	-1870	253
276	G[166]	-1012	383	316	G[206]	-1892	383
277	G[167]	-1034	253	317	G[207]	-1914	253
278	G[168]	-1056	383	318	G[208]	-1936	383
279	G[169]	-1078	253	319	G[209]	-1958	253
280	G[170]	-1100	383	320	G[210]	-1980	383

