NEC

MOS INTEGRATED CIRCUIT

# μPD16707

## 263/256-OUTPUT TFT-LCD GATE DRIVER

### DESCRIPTION

The μPD16707 is a TFT-LCD gate driver equipped with 263/256-output lines. It can output a high-gate scanning voltage in response to CMOS level input because it provided with a level-shift circuit inside the IC circuit. It can also drive the XGA / SXGA / SXGA+, and since the input signal is placed symmetrically, this product can wire easily between gate drivers.

### FEATURES

- CMOS level input (2.3 to 3.6V)
- 263/256 outputs
- High-output voltage ($V_{DD2}$ to $V_{EE}$ : 40 V MAX.)
- Capable of All-ON outputting (/AOR, /AOL)
- Input terminal symmetrical placement
- Adapted to COG and TCP

**Remark** /xxx indicates active low signal.

### ORDERING INFORMATION

| Part Number | Package |
|---|---|
| μPD16707P | CHIP |
| μPD16707N-xxx | TCP (TAB package) |

**Remark** Purchasing the above chip entail the exchange of documents such as a separate memorandum or product quality, so please contact one of our sales representavies.
The TCP's external shape is customized. To order the required shape, so please contact one of our sales representatives.



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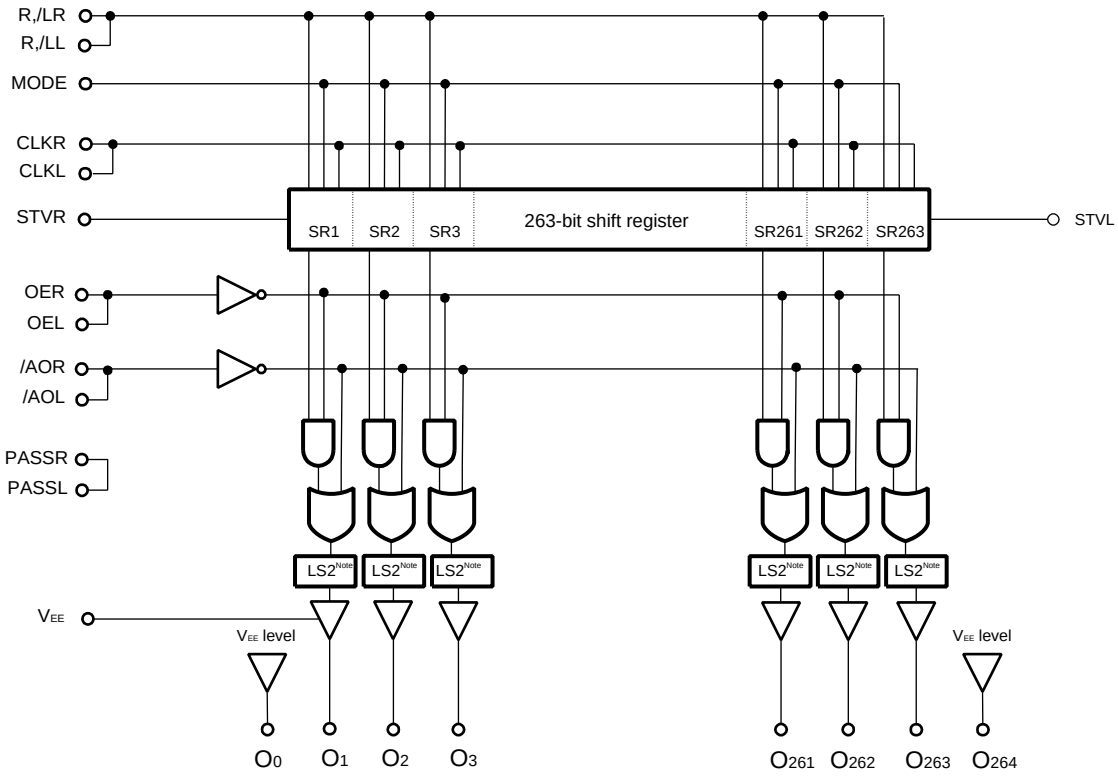
## 1. BLOCK DIAGRAM



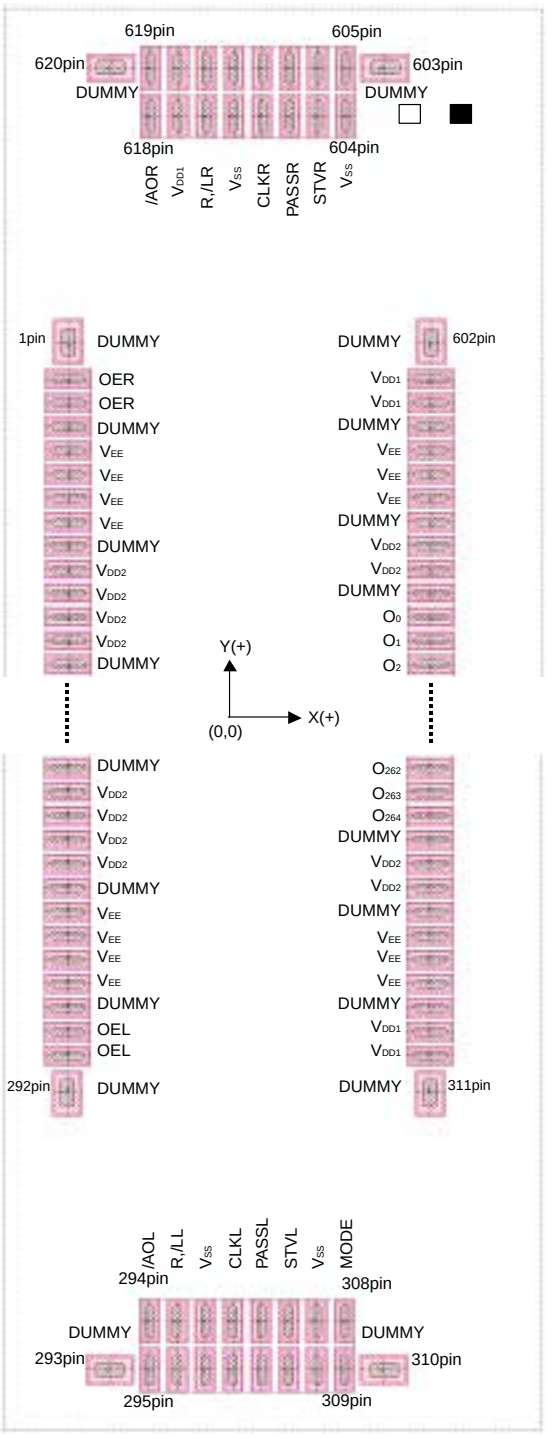

**Note** LS2 : shifts CMOS level and output level ($V_{DD2}$ to $V_{EE}$).

## 2. PIN CONFIGURATION

### 2.1 CHIP PAKAGE : μPD16707P Chip surface (Bump side)

Chip size : 1.06±0.02 x 16.01±0.02 [mm]

Chip thickness : 595±25 [μm]




Alignment Mark1

□ : 50 x 50 μm

coordinate : (267.5, −7785)
(267.5, 7785)

Alignment Mark2

■ : 50 x 50 μm

coordinate : (387.5, −7785)
(387.5, 7785)

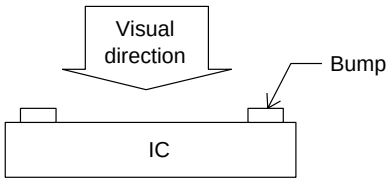


**Table 2-1 Pad Coordinate Bump size (1/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 1 | DUMMY | -404.0 | 7303.0 | 50:87 |
| 2 | OER | -404.0 | 7225.0 | 83:33 |
| 3 | OER | -404.0 | 7175.0 | 83:33 |
| 4 | DUMMY | -404.0 | 7125.0 | 83:33 |
| 5 | $V_{EE}$ | -404.0 | 7075.0 | 83:33 |
| 6 | $V_{EE}$ | -404.0 | 7025.0 | 83:33 |
| 7 | $V_{EE}$ | -404.0 | 6975.0 | 83:33 |
| 8 | $V_{EE}$ | -404.0 | 6925.0 | 83:33 |
| 9 | DUMMY | -404.0 | 6875.0 | 83:33 |
| 10 | $V_{DD2}$ | -404.0 | 6825.0 | 83:33 |
| 11 | $V_{DD2}$ | -404.0 | 6775.0 | 83:33 |
| 12 | $V_{DD2}$ | -404.0 | 6725.0 | 83:33 |
| 13 | $V_{DD2}$ | -404.0 | 6675.0 | 83:33 |
| 14 | DUMMY | -404.0 | 6625.0 | 83:33 |
| 15 | DUMMY | -404.0 | 6575.0 | 83:33 |
| 16 | DUMMY | -404.0 | 6525.0 | 83:33 |
| 17 | DUMMY | -404.0 | 6475.0 | 83:33 |
| 18 | DUMMY | -404.0 | 6425.0 | 83:33 |
| 19 | DUMMY | -404.0 | 6375.0 | 83:33 |
| 20 | DUMMY | -404.0 | 6325.0 | 83:33 |
| 21 | DUMMY | -404.0 | 6275.0 | 83:33 |
| 22 | DUMMY | -404.0 | 6225.0 | 83:33 |
| 23 | DUMMY | -404.0 | 6175.0 | 83:33 |
| 24 | DUMMY | -404.0 | 6125.0 | 83:33 |
| 25 | DUMMY | -404.0 | 6075.0 | 83:33 |
| 26 | DUMMY | -404.0 | 6025.0 | 83:33 |
| 27 | DUMMY | -404.0 | 5975.0 | 83:33 |
| 28 | DUMMY | -404.0 | 5925.0 | 83:33 |
| 29 | DUMMY | -404.0 | 5875.0 | 83:33 |
| 30 | DUMMY | -404.0 | 5825.0 | 83:33 |
| 31 | DUMMY | -404.0 | 5775.0 | 83:33 |
| 32 | DUMMY | -404.0 | 5725.0 | 83:33 |
| 33 | DUMMY | -404.0 | 5675.0 | 83:33 |
| 34 | DUMMY | -404.0 | 5625.0 | 83:33 |
| 35 | DUMMY | -404.0 | 5575.0 | 83:33 |
| 36 | DUMMY | -404.0 | 5525.0 | 83:33 |
| 37 | DUMMY | -404.0 | 5475.0 | 83:33 |
| 38 | DUMMY | -404.0 | 5425.0 | 83:33 |
| 39 | DUMMY | -404.0 | 5375.0 | 83:33 |
| 40 | DUMMY | -404.0 | 5325.0 | 83:33 |
| 41 | DUMMY | -404.0 | 5275.0 | 83:33 |
| 42 | DUMMY | -404.0 | 5225.0 | 83:33 |
| 43 | DUMMY | -404.0 | 5175.0 | 83:33 |
| 44 | DUMMY | -404.0 | 5125.0 | 83:33 |
| 45 | DUMMY | -404.0 | 5075.0 | 83:33 |
| 46 | DUMMY | -404.0 | 5025.0 | 83:33 |
| 47 | DUMMY | -404.0 | 4975.0 | 83:33 |
| 48 | DUMMY | -404.0 | 4925.0 | 83:33 |
| 49 | DUMMY | -404.0 | 4875.0 | 83:33 |
| 50 | DUMMY | -404.0 | 4825.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 51 | DUMMY | -404.0 | 4775.0 | 83:33 |
| 52 | DUMMY | -404.0 | 4725.0 | 83:33 |
| 53 | DUMMY | -404.0 | 4675.0 | 83:33 |
| 54 | DUMMY | -404.0 | 4625.0 | 83:33 |
| 55 | DUMMY | -404.0 | 4575.0 | 83:33 |
| 56 | DUMMY | -404.0 | 4525.0 | 83:33 |
| 57 | DUMMY | -404.0 | 4475.0 | 83:33 |
| 58 | DUMMY | -404.0 | 4425.0 | 83:33 |
| 59 | DUMMY | -404.0 | 4375.0 | 83:33 |
| 60 | DUMMY | -404.0 | 4325.0 | 83:33 |
| 61 | DUMMY | -404.0 | 4275.0 | 83:33 |
| 62 | DUMMY | -404.0 | 4225.0 | 83:33 |
| 63 | DUMMY | -404.0 | 4175.0 | 83:33 |
| 64 | DUMMY | -404.0 | 4125.0 | 83:33 |
| 65 | DUMMY | -404.0 | 4075.0 | 83:33 |
| 66 | DUMMY | -404.0 | 4025.0 | 83:33 |
| 67 | DUMMY | -404.0 | 3975.0 | 83:33 |
| 68 | DUMMY | -404.0 | 3925.0 | 83:33 |
| 69 | DUMMY | -404.0 | 3875.0 | 83:33 |
| 70 | DUMMY | -404.0 | 3825.0 | 83:33 |
| 71 | DUMMY | -404.0 | 3775.0 | 83:33 |
| 72 | DUMMY | -404.0 | 3725.0 | 83:33 |
| 73 | DUMMY | -404.0 | 3675.0 | 83:33 |
| 74 | DUMMY | -404.0 | 3625.0 | 83:33 |
| 75 | DUMMY | -404.0 | 3575.0 | 83:33 |
| 76 | DUMMY | -404.0 | 3525.0 | 83:33 |
| 77 | DUMMY | -404.0 | 3475.0 | 83:33 |
| 78 | DUMMY | -404.0 | 3425.0 | 83:33 |
| 79 | DUMMY | -404.0 | 3375.0 | 83:33 |
| 80 | DUMMY | -404.0 | 3325.0 | 83:33 |
| 81 | DUMMY | -404.0 | 3275.0 | 83:33 |
| 82 | DUMMY | -404.0 | 3225.0 | 83:33 |
| 83 | DUMMY | -404.0 | 3175.0 | 83:33 |
| 84 | DUMMY | -404.0 | 3125.0 | 83:33 |
| 85 | DUMMY | -404.0 | 3075.0 | 83:33 |
| 86 | DUMMY | -404.0 | 3025.0 | 83:33 |
| 87 | DUMMY | -404.0 | 2975.0 | 83:33 |
| 88 | DUMMY | -404.0 | 2925.0 | 83:33 |
| 89 | DUMMY | -404.0 | 2875.0 | 83:33 |
| 90 | DUMMY | -404.0 | 2825.0 | 83:33 |
| 91 | DUMMY | -404.0 | 2775.0 | 83:33 |
| 92 | DUMMY | -404.0 | 2725.0 | 83:33 |
| 93 | DUMMY | -404.0 | 2675.0 | 83:33 |
| 94 | DUMMY | -404.0 | 2625.0 | 83:33 |
| 95 | DUMMY | -404.0 | 2575.0 | 83:33 |
| 96 | DUMMY | -404.0 | 2525.0 | 83:33 |
| 97 | DUMMY | -404.0 | 2475.0 | 83:33 |
| 98 | DUMMY | -404.0 | 2425.0 | 83:33 |
| 99 | DUMMY | -404.0 | 2375.0 | 83:33 |
| 100 | DUMMY | -404.0 | 2325.0 | 83:33 |

**Table 2-1 Pad Coordinate Bump size (2/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 101 | DUMMY | -404.0 | 2275.0 | 83:33 |
| 102 | DUMMY | -404.0 | 2225.0 | 83:33 |
| 103 | DUMMY | -404.0 | 2175.0 | 83:33 |
| 104 | DUMMY | -404.0 | 2125.0 | 83:33 |
| 105 | DUMMY | -404.0 | 2075.0 | 83:33 |
| 106 | DUMMY | -404.0 | 2025.0 | 83:33 |
| 107 | DUMMY | -404.0 | 1975.0 | 83:33 |
| 108 | DUMMY | -404.0 | 1925.0 | 83:33 |
| 109 | DUMMY | -404.0 | 1875.0 | 83:33 |
| 110 | DUMMY | -404.0 | 1825.0 | 83:33 |
| 111 | DUMMY | -404.0 | 1775.0 | 83:33 |
| 112 | DUMMY | -404.0 | 1725.0 | 83:33 |
| 113 | DUMMY | -404.0 | 1675.0 | 83:33 |
| 114 | DUMMY | -404.0 | 1625.0 | 83:33 |
| 115 | DUMMY | -404.0 | 1575.0 | 83:33 |
| 116 | DUMMY | -404.0 | 1525.0 | 83:33 |
| 117 | DUMMY | -404.0 | 1475.0 | 83:33 |
| 118 | DUMMY | -404.0 | 1425.0 | 83:33 |
| 119 | DUMMY | -404.0 | 1375.0 | 83:33 |
| 120 | DUMMY | -404.0 | 1325.0 | 83:33 |
| 121 | DUMMY | -404.0 | 1275.0 | 83:33 |
| 122 | DUMMY | -404.0 | 1225.0 | 83:33 |
| 123 | DUMMY | -404.0 | 1175.0 | 83:33 |
| 124 | DUMMY | -404.0 | 1125.0 | 83:33 |
| 125 | DUMMY | -404.0 | 1075.0 | 83:33 |
| 126 | DUMMY | -404.0 | 1025.0 | 83:33 |
| 127 | DUMMY | -404.0 | 975.0 | 83:33 |
| 128 | DUMMY | -404.0 | 925.0 | 83:33 |
| 129 | DUMMY | -404.0 | 875.0 | 83:33 |
| 130 | DUMMY | -404.0 | 825.0 | 83:33 |
| 131 | DUMMY | -404.0 | 775.0 | 83:33 |
| 132 | DUMMY | -404.0 | 725.0 | 83:33 |
| 133 | DUMMY | -404.0 | 675.0 | 83:33 |
| 134 | DUMMY | -404.0 | 625.0 | 83:33 |
| 135 | DUMMY | -404.0 | 575.0 | 83:33 |
| 136 | DUMMY | -404.0 | 525.0 | 83:33 |
| 137 | DUMMY | -404.0 | 475.0 | 83:33 |
| 138 | DUMMY | -404.0 | 425.0 | 83:33 |
| 139 | DUMMY | -404.0 | 375.0 | 83:33 |
| 140 | DUMMY | -404.0 | 325.0 | 83:33 |
| 141 | DUMMY | -404.0 | 275.0 | 83:33 |
| 142 | DUMMY | -404.0 | 225.0 | 83:33 |
| 143 | DUMMY | -404.0 | 175.0 | 83:33 |
| 144 | DUMMY | -404.0 | 125.0 | 83:33 |
| 145 | DUMMY | -404.0 | 75.0 | 83:33 |
| 146 | DUMMY | -404.0 | 25.0 | 83:33 |
| 147 | DUMMY | -404.0 | -25.0 | 83:33 |
| 148 | DUMMY | -404.0 | -75.0 | 83:33 |
| 149 | DUMMY | -404.0 | -125.0 | 83:33 |
| 150 | DUMMY | -404.0 | -175.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 151 | DUMMY | -404.0 | -225.0 | 83:33 |
| 152 | DUMMY | -404.0 | -275.0 | 83:33 |
| 153 | DUMMY | -404.0 | -325.0 | 83:33 |
| 154 | DUMMY | -404.0 | -375.0 | 83:33 |
| 155 | DUMMY | -404.0 | -425.0 | 83:33 |
| 156 | DUMMY | -404.0 | -475.0 | 83:33 |
| 157 | DUMMY | -404.0 | -525.0 | 83:33 |
| 158 | DUMMY | -404.0 | -575.0 | 83:33 |
| 159 | DUMMY | -404.0 | -625.0 | 83:33 |
| 160 | DUMMY | -404.0 | -675.0 | 83:33 |
| 161 | DUMMY | -404.0 | -725.0 | 83:33 |
| 162 | DUMMY | -404.0 | -775.0 | 83:33 |
| 163 | DUMMY | -404.0 | -825.0 | 83:33 |
| 164 | DUMMY | -404.0 | -875.0 | 83:33 |
| 165 | DUMMY | -404.0 | -925.0 | 83:33 |
| 166 | DUMMY | -404.0 | -975.0 | 83:33 |
| 167 | DUMMY | -404.0 | -1025.0 | 83:33 |
| 168 | DUMMY | -404.0 | -1075.0 | 83:33 |
| 169 | DUMMY | -404.0 | -1125.0 | 83:33 |
| 170 | DUMMY | -404.0 | -1175.0 | 83:33 |
| 171 | DUMMY | -404.0 | -1225.0 | 83:33 |
| 172 | DUMMY | -404.0 | -1275.0 | 83:33 |
| 173 | DUMMY | -404.0 | -1325.0 | 83:33 |
| 174 | DUMMY | -404.0 | -1375.0 | 83:33 |
| 175 | DUMMY | -404.0 | -1425.0 | 83:33 |
| 176 | DUMMY | -404.0 | -1475.0 | 83:33 |
| 177 | DUMMY | -404.0 | -1525.0 | 83:33 |
| 178 | DUMMY | -404.0 | -1575.0 | 83:33 |
| 179 | DUMMY | -404.0 | -1625.0 | 83:33 |
| 180 | DUMMY | -404.0 | -1675.0 | 83:33 |
| 181 | DUMMY | -404.0 | -1725.0 | 83:33 |
| 182 | DUMMY | -404.0 | -1775.0 | 83:33 |
| 183 | DUMMY | -404.0 | -1825.0 | 83:33 |
| 184 | DUMMY | -404.0 | -1875.0 | 83:33 |
| 185 | DUMMY | -404.0 | -1925.0 | 83:33 |
| 186 | DUMMY | -404.0 | -1975.0 | 83:33 |
| 187 | DUMMY | -404.0 | -2025.0 | 83:33 |
| 188 | DUMMY | -404.0 | -2075.0 | 83:33 |
| 189 | DUMMY | -404.0 | -2125.0 | 83:33 |
| 190 | DUMMY | -404.0 | -2175.0 | 83:33 |
| 191 | DUMMY | -404.0 | -2225.0 | 83:33 |
| 192 | DUMMY | -404.0 | -2275.0 | 83:33 |
| 193 | DUMMY | -404.0 | -2325.0 | 83:33 |
| 194 | DUMMY | -404.0 | -2375.0 | 83:33 |
| 195 | DUMMY | -404.0 | -2425.0 | 83:33 |
| 196 | DUMMY | -404.0 | -2475.0 | 83:33 |
| 197 | DUMMY | -404.0 | -2525.0 | 83:33 |
| 198 | DUMMY | -404.0 | -2575.0 | 83:33 |
| 199 | DUMMY | -404.0 | -2625.0 | 83:33 |
| 200 | DUMMY | -404.0 | -2675.0 | 83:33 |

**Table 2-1 Pad Coordinate Bump size (3/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 201 | DUMMY | -404.0 | -2725.0 | 83:33 |
| 202 | DUMMY | -404.0 | -2775.0 | 83:33 |
| 203 | DUMMY | -404.0 | -2825.0 | 83:33 |
| 204 | DUMMY | -404.0 | -2875.0 | 83:33 |
| 205 | DUMMY | -404.0 | -2925.0 | 83:33 |
| 206 | DUMMY | -404.0 | -2975.0 | 83:33 |
| 207 | DUMMY | -404.0 | -3025.0 | 83:33 |
| 208 | DUMMY | -404.0 | -3075.0 | 83:33 |
| 209 | DUMMY | -404.0 | -3125.0 | 83:33 |
| 210 | DUMMY | -404.0 | -3175.0 | 83:33 |
| 211 | DUMMY | -404.0 | -3225.0 | 83:33 |
| 212 | DUMMY | -404.0 | -3275.0 | 83:33 |
| 213 | DUMMY | -404.0 | -3325.0 | 83:33 |
| 214 | DUMMY | -404.0 | -3375.0 | 83:33 |
| 215 | DUMMY | -404.0 | -3425.0 | 83:33 |
| 216 | DUMMY | -404.0 | -3475.0 | 83:33 |
| 217 | DUMMY | -404.0 | -3525.0 | 83:33 |
| 218 | DUMMY | -404.0 | -3575.0 | 83:33 |
| 219 | DUMMY | -404.0 | -3625.0 | 83:33 |
| 220 | DUMMY | -404.0 | -3675.0 | 83:33 |
| 221 | DUMMY | -404.0 | -3725.0 | 83:33 |
| 222 | DUMMY | -404.0 | -3775.0 | 83:33 |
| 223 | DUMMY | -404.0 | -3825.0 | 83:33 |
| 224 | DUMMY | -404.0 | -3875.0 | 83:33 |
| 225 | DUMMY | -404.0 | -3925.0 | 83:33 |
| 226 | DUMMY | -404.0 | -3975.0 | 83:33 |
| 227 | DUMMY | -404.0 | -4025.0 | 83:33 |
| 228 | DUMMY | -404.0 | -4075.0 | 83:33 |
| 229 | DUMMY | -404.0 | -4125.0 | 83:33 |
| 230 | DUMMY | -404.0 | -4175.0 | 83:33 |
| 231 | DUMMY | -404.0 | -4225.0 | 83:33 |
| 232 | DUMMY | -404.0 | -4275.0 | 83:33 |
| 233 | DUMMY | -404.0 | -4325.0 | 83:33 |
| 234 | DUMMY | -404.0 | -4375.0 | 83:33 |
| 235 | DUMMY | -404.0 | -4425.0 | 83:33 |
| 236 | DUMMY | -404.0 | -4475.0 | 83:33 |
| 237 | DUMMY | -404.0 | -4525.0 | 83:33 |
| 238 | DUMMY | -404.0 | -4575.0 | 83:33 |
| 239 | DUMMY | -404.0 | -4625.0 | 83:33 |
| 240 | DUMMY | -404.0 | -4675.0 | 83:33 |
| 241 | DUMMY | -404.0 | -4725.0 | 83:33 |
| 242 | DUMMY | -404.0 | -4775.0 | 83:33 |
| 243 | DUMMY | -404.0 | -4825.0 | 83:33 |
| 244 | DUMMY | -404.0 | -4875.0 | 83:33 |
| 245 | DUMMY | -404.0 | -4925.0 | 83:33 |
| 246 | DUMMY | -404.0 | -4975.0 | 83:33 |
| 247 | DUMMY | -404.0 | -5025.0 | 83:33 |
| 248 | DUMMY | -404.0 | -5075.0 | 83:33 |
| 249 | DUMMY | -404.0 | -5125.0 | 83:33 |
| 250 | DUMMY | -404.0 | -5175.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 251 | DUMMY | -404.0 | -5225.0 | 83:33 |
| 252 | DUMMY | -404.0 | -5275.0 | 83:33 |
| 253 | DUMMY | -404.0 | -5325.0 | 83:33 |
| 254 | DUMMY | -404.0 | -5375.0 | 83:33 |
| 255 | DUMMY | -404.0 | -5425.0 | 83:33 |
| 256 | DUMMY | -404.0 | -5475.0 | 83:33 |
| 257 | DUMMY | -404.0 | -5525.0 | 83:33 |
| 258 | DUMMY | -404.0 | -5575.0 | 83:33 |
| 259 | DUMMY | -404.0 | -5625.0 | 83:33 |
| 260 | DUMMY | -404.0 | -5675.0 | 83:33 |
| 261 | DUMMY | -404.0 | -5725.0 | 83:33 |
| 262 | DUMMY | -404.0 | -5775.0 | 83:33 |
| 263 | DUMMY | -404.0 | -5825.0 | 83:33 |
| 264 | DUMMY | -404.0 | -5875.0 | 83:33 |
| 265 | DUMMY | -404.0 | -5925.0 | 83:33 |
| 266 | DUMMY | -404.0 | -5975.0 | 83:33 |
| 267 | DUMMY | -404.0 | -6025.0 | 83:33 |
| 268 | DUMMY | -404.0 | -6075.0 | 83:33 |
| 269 | DUMMY | -404.0 | -6125.0 | 83:33 |
| 270 | DUMMY | -404.0 | -6175.0 | 83:33 |
| 271 | DUMMY | -404.0 | -6225.0 | 83:33 |
| 272 | DUMMY | -404.0 | -6275.0 | 83:33 |
| 273 | DUMMY | -404.0 | -6325.0 | 83:33 |
| 274 | DUMMY | -404.0 | -6375.0 | 83:33 |
| 275 | DUMMY | -404.0 | -6425.0 | 83:33 |
| 276 | DUMMY | -404.0 | -6475.0 | 83:33 |
| 277 | DUMMY | -404.0 | -6525.0 | 83:33 |
| 278 | DUMMY | -404.0 | -6575.0 | 83:33 |
| 279 | DUMMY | -404.0 | -6625.0 | 83:33 |
| 280 | $V_{DD2}$ | -404.0 | -6675.0 | 83:33 |
| 281 | $V_{DD2}$ | -404.0 | -6725.0 | 83:33 |
| 282 | $V_{DD2}$ | -404.0 | -6775.0 | 83:33 |
| 283 | $V_{DD2}$ | -404.0 | -6825.0 | 83:33 |
| 284 | DUMMY | -404.0 | -6875.0 | 83:33 |
| 285 | $V_{EE}$ | -404.0 | -6925.0 | 83:33 |
| 286 | $V_{EE}$ | -404.0 | -6975.0 | 83:33 |
| 287 | $V_{EE}$ | -404.0 | -7025.0 | 83:33 |
| 288 | $V_{EE}$ | -404.0 | -7075.0 | 83:33 |
| 289 | DUMMY | -404.0 | -7125.0 | 83:33 |
| 290 | OEL | -404.0 | -7175.0 | 83:33 |
| 291 | OEL | -404.0 | -7225.0 | 83:33 |
| 292 | DUMMY | -404.0 | -7303.0 | 50:87 |
| 293 | DUMMY | -320.0 | -7879.0 | 87:50 |
| 294 | /AOL | -242.0 | -7778.0 | 33:83 |
| 295 | /AOL | -242.0 | -7879.0 | 33:83 |
| 296 | R,/LL | -187.0 | -7778.0 | 33:83 |
| 297 | R,/LL | -187.0 | -7879.0 | 33:83 |
| 298 | $V_{SS}$ | -132.0 | -7778.0 | 33:83 |
| 299 | $V_{SS}$ | -132.0 | -7879.0 | 33:83 |
| 300 | CLKL | -77.0 | -7778.0 | 33:83 |

**Table 2-1 Pad Coordinate Bump size (4/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 301 | CLKL | -77.0 | -7879.0 | 33:83 |
| 302 | PASSL | -22.0 | -7778.0 | 33:83 |
| 303 | PASSL | -22.0 | -7879.0 | 33:83 |
| 304 | STVL | 33.0 | -7778.0 | 33:83 |
| 305 | STVL | 33.0 | -7879.0 | 33:83 |
| 306 | $V_{SS}$ | 88.0 | -7778.0 | 33:83 |
| 307 | $V_{SS}$ | 88.0 | -7879.0 | 33:83 |
| 308 | MODE | 143.0 | -7778.0 | 33:83 |
| 309 | MODE | 143.0 | -7879.0 | 33:83 |
| 310 | DUMMY | 221.0 | -7879.0 | 87:50 |
| 311 | DUMMY | 312.0 | -7303.0 | 50:87 |
| 312 | $V_{DD1}$ | 312.0 | -7225.0 | 83:33 |
| 313 | $V_{DD1}$ | 312.0 | -7175.0 | 83:33 |
| 314 | DUMMY | 312.0 | -7125.0 | 83:33 |
| 315 | $V_{EE}$ | 312.0 | -7075.0 | 83:33 |
| 316 | $V_{EE}$ | 312.0 | -7025.0 | 83:33 |
| 317 | $V_{EE}$ | 312.0 | -6975.0 | 83:33 |
| 318 | DUMMY | 312.0 | -6925.0 | 83:33 |
| 319 | $V_{DD2}$ | 312.0 | -6875.0 | 83:33 |
| 320 | $V_{DD2}$ | 312.0 | -6825.0 | 83:33 |
| 321 | DUMMY | 312.0 | -6775.0 | 83:33 |
| 322 | $O_{264}$ | 312.0 | -6725.0 | 83:33 |
| 323 | $O_{263}$ | 312.0 | -6675.0 | 83:33 |
| 324 | $O_{262}$ | 312.0 | -6625.0 | 83:33 |
| 325 | $O_{261}$ | 312.0 | -6575.0 | 83:33 |
| 326 | $O_{260}$ | 312.0 | -6525.0 | 83:33 |
| 327 | $O_{259}$ | 312.0 | -6475.0 | 83:33 |
| 328 | $O_{258}$ | 312.0 | -6425.0 | 83:33 |
| 329 | $O_{257}$ | 312.0 | -6375.0 | 83:33 |
| 330 | $O_{256}$ | 312.0 | -6325.0 | 83:33 |
| 331 | $O_{255}$ | 312.0 | -6275.0 | 83:33 |
| 332 | $O_{254}$ | 312.0 | -6225.0 | 83:33 |
| 333 | $O_{253}$ | 312.0 | -6175.0 | 83:33 |
| 334 | $O_{252}$ | 312.0 | -6125.0 | 83:33 |
| 335 | $O_{251}$ | 312.0 | -6075.0 | 83:33 |
| 336 | $O_{250}$ | 312.0 | -6025.0 | 83:33 |
| 337 | $O_{249}$ | 312.0 | -5975.0 | 83:33 |
| 338 | $O_{248}$ | 312.0 | -5925.0 | 83:33 |
| 339 | $O_{247}$ | 312.0 | -5875.0 | 83:33 |
| 340 | $O_{246}$ | 312.0 | -5825.0 | 83:33 |
| 341 | $O_{245}$ | 312.0 | -5775.0 | 83:33 |
| 342 | $O_{244}$ | 312.0 | -5725.0 | 83:33 |
| 343 | $O_{243}$ | 312.0 | -5675.0 | 83:33 |
| 344 | $O_{242}$ | 312.0 | -5625.0 | 83:33 |
| 345 | $O_{241}$ | 312.0 | -5575.0 | 83:33 |
| 346 | $O_{240}$ | 312.0 | -5525.0 | 83:33 |
| 347 | $O_{239}$ | 312.0 | -5475.0 | 83:33 |
| 348 | $O_{238}$ | 312.0 | -5425.0 | 83:33 |
| 349 | $O_{237}$ | 312.0 | -5375.0 | 83:33 |
| 350 | $O_{236}$ | 312.0 | -5325.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 351 | $O_{235}$ | 312.0 | -5275.0 | 83:33 |
| 352 | $O_{234}$ | 312.0 | -5225.0 | 83:33 |
| 353 | $O_{233}$ | 312.0 | -5175.0 | 83:33 |
| 354 | $O_{232}$ | 312.0 | -5125.0 | 83:33 |
| 355 | $O_{231}$ | 312.0 | -5075.0 | 83:33 |
| 356 | $O_{230}$ | 312.0 | -5025.0 | 83:33 |
| 357 | $O_{229}$ | 312.0 | -4975.0 | 83:33 |
| 358 | $O_{228}$ | 312.0 | -4925.0 | 83:33 |
| 359 | $O_{227}$ | 312.0 | -4875.0 | 83:33 |
| 360 | $O_{226}$ | 312.0 | -4825.0 | 83:33 |
| 361 | $O_{225}$ | 312.0 | -4775.0 | 83:33 |
| 362 | $O_{224}$ | 312.0 | -4725.0 | 83:33 |
| 363 | $O_{223}$ | 312.0 | -4675.0 | 83:33 |
| 364 | $O_{222}$ | 312.0 | -4625.0 | 83:33 |
| 365 | $O_{221}$ | 312.0 | -4575.0 | 83:33 |
| 366 | $O_{220}$ | 312.0 | -4525.0 | 83:33 |
| 367 | $O_{219}$ | 312.0 | -4475.0 | 83:33 |
| 368 | $O_{218}$ | 312.0 | -4425.0 | 83:33 |
| 369 | $O_{217}$ | 312.0 | -4375.0 | 83:33 |
| 370 | $O_{216}$ | 312.0 | -4325.0 | 83:33 |
| 371 | $O_{215}$ | 312.0 | -4275.0 | 83:33 |
| 372 | $O_{214}$ | 312.0 | -4225.0 | 83:33 |
| 373 | $O_{213}$ | 312.0 | -4175.0 | 83:33 |
| 374 | $O_{212}$ | 312.0 | -4125.0 | 83:33 |
| 375 | $O_{211}$ | 312.0 | -4075.0 | 83:33 |
| 376 | $O_{210}$ | 312.0 | -4025.0 | 83:33 |
| 377 | $O_{209}$ | 312.0 | -3975.0 | 83:33 |
| 378 | $O_{208}$ | 312.0 | -3925.0 | 83:33 |
| 379 | $O_{207}$ | 312.0 | -3875.0 | 83:33 |
| 380 | $O_{206}$ | 312.0 | -3825.0 | 83:33 |
| 381 | $O_{205}$ | 312.0 | -3775.0 | 83:33 |
| 382 | $O_{204}$ | 312.0 | -3725.0 | 83:33 |
| 383 | $O_{203}$ | 312.0 | -3675.0 | 83:33 |
| 384 | $O_{202}$ | 312.0 | -3625.0 | 83:33 |
| 385 | $O_{201}$ | 312.0 | -3575.0 | 83:33 |
| 386 | $O_{200}$ | 312.0 | -3525.0 | 83:33 |
| 387 | $O_{199}$ | 312.0 | -3475.0 | 83:33 |
| 388 | $O_{198}$ | 312.0 | -3425.0 | 83:33 |
| 389 | $O_{197}$ | 312.0 | -3375.0 | 83:33 |
| 390 | $O_{196}$ | 312.0 | -3325.0 | 83:33 |
| 391 | $O_{195}$ | 312.0 | -3275.0 | 83:33 |
| 392 | $O_{194}$ | 312.0 | -3225.0 | 83:33 |
| 393 | $O_{193}$ | 312.0 | -3175.0 | 83:33 |
| 394 | $O_{192}$ | 312.0 | -3125.0 | 83:33 |
| 395 | $O_{191}$ | 312.0 | -3075.0 | 83:33 |
| 396 | $O_{190}$ | 312.0 | -3025.0 | 83:33 |
| 397 | $O_{189}$ | 312.0 | -2975.0 | 83:33 |
| 398 | $O_{188}$ | 312.0 | -2925.0 | 83:33 |
| 399 | $O_{187}$ | 312.0 | -2875.0 | 83:33 |
| 400 | $O_{186}$ | 312.0 | -2825.0 | 83:33 |

**Table 2-1 Pad Coordinate Bump size (5/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 401 | O185 | 312.0 | -2775.0 | 83:33 |
| 402 | O184 | 312.0 | -2725.0 | 83:33 |
| 403 | O183 | 312.0 | -2675.0 | 83:33 |
| 404 | O182 | 312.0 | -2625.0 | 83:33 |
| 405 | O181 | 312.0 | -2575.0 | 83:33 |
| 406 | O180 | 312.0 | -2525.0 | 83:33 |
| 407 | O179 | 312.0 | -2475.0 | 83:33 |
| 408 | O178 | 312.0 | -2425.0 | 83:33 |
| 409 | O177 | 312.0 | -2375.0 | 83:33 |
| 410 | O176 | 312.0 | -2325.0 | 83:33 |
| 411 | O175 | 312.0 | -2275.0 | 83:33 |
| 412 | O174 | 312.0 | -2225.0 | 83:33 |
| 413 | O173 | 312.0 | -2175.0 | 83:33 |
| 414 | O172 | 312.0 | -2125.0 | 83:33 |
| 415 | O171 | 312.0 | -2075.0 | 83:33 |
| 416 | O170 | 312.0 | -2025.0 | 83:33 |
| 417 | O169 | 312.0 | -1975.0 | 83:33 |
| 418 | O168 | 312.0 | -1925.0 | 83:33 |
| 419 | O167 | 312.0 | -1875.0 | 83:33 |
| 420 | O166 | 312.0 | -1825.0 | 83:33 |
| 421 | O165 | 312.0 | -1775.0 | 83:33 |
| 422 | O164 | 312.0 | -1725.0 | 83:33 |
| 423 | O163 | 312.0 | -1675.0 | 83:33 |
| 424 | O162 | 312.0 | -1625.0 | 83:33 |
| 425 | O161 | 312.0 | -1575.0 | 83:33 |
| 426 | O160 | 312.0 | -1525.0 | 83:33 |
| 427 | O159 | 312.0 | -1475.0 | 83:33 |
| 428 | O158 | 312.0 | -1425.0 | 83:33 |
| 429 | O157 | 312.0 | -1375.0 | 83:33 |
| 430 | O156 | 312.0 | -1325.0 | 83:33 |
| 431 | O155 | 312.0 | -1275.0 | 83:33 |
| 432 | O154 | 312.0 | -1225.0 | 83:33 |
| 433 | O153 | 312.0 | -1175.0 | 83:33 |
| 434 | O152 | 312.0 | -1125.0 | 83:33 |
| 435 | O151 | 312.0 | -1075.0 | 83:33 |
| 436 | O150 | 312.0 | -1025.0 | 83:33 |
| 437 | O149 | 312.0 | -975.0 | 83:33 |
| 438 | O148 | 312.0 | -925.0 | 83:33 |
| 439 | O147 | 312.0 | -875.0 | 83:33 |
| 440 | O146 | 312.0 | -825.0 | 83:33 |
| 441 | O145 | 312.0 | -775.0 | 83:33 |
| 442 | O144 | 312.0 | -725.0 | 83:33 |
| 443 | O143 | 312.0 | -675.0 | 83:33 |
| 444 | O142 | 312.0 | -625.0 | 83:33 |
| 445 | O141 | 312.0 | -575.0 | 83:33 |
| 446 | O140 | 312.0 | -525.0 | 83:33 |
| 447 | O139 | 312.0 | -475.0 | 83:33 |
| 448 | O138 | 312.0 | -425.0 | 83:33 |
| 449 | O137 | 312.0 | -375.0 | 83:33 |
| 450 | O136 | 312.0 | -325.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 451 | O135 | 312.0 | -275.0 | 83:33 |
| 452 | O134 | 312.0 | -225.0 | 83:33 |
| 453 | O133 | 312.0 | -175.0 | 83:33 |
| 454 | O132 | 312.0 | -125.0 | 83:33 |
| 455 | DUMMY | 312.0 | -75.0 | 83:33 |
| 456 | DUMMY | 312.0 | -25.0 | 83:33 |
| 457 | DUMMY | 312.0 | 25.0 | 83:33 |
| 458 | DUMMY | 312.0 | 75.0 | 83:33 |
| 459 | DUMMY | 312.0 | 125.0 | 83:33 |
| 460 | O131 | 312.0 | 175.0 | 83:33 |
| 461 | O130 | 312.0 | 225.0 | 83:33 |
| 462 | O129 | 312.0 | 275.0 | 83:33 |
| 463 | O128 | 312.0 | 325.0 | 83:33 |
| 464 | O127 | 312.0 | 375.0 | 83:33 |
| 465 | O126 | 312.0 | 425.0 | 83:33 |
| 466 | O125 | 312.0 | 475.0 | 83:33 |
| 467 | O124 | 312.0 | 525.0 | 83:33 |
| 468 | O123 | 312.0 | 575.0 | 83:33 |
| 469 | O122 | 312.0 | 625.0 | 83:33 |
| 470 | O121 | 312.0 | 675.0 | 83:33 |
| 471 | O120 | 312.0 | 725.0 | 83:33 |
| 472 | O119 | 312.0 | 775.0 | 83:33 |
| 473 | O118 | 312.0 | 825.0 | 83:33 |
| 474 | O117 | 312.0 | 875.0 | 83:33 |
| 475 | O116 | 312.0 | 925.0 | 83:33 |
| 476 | O115 | 312.0 | 975.0 | 83:33 |
| 477 | O114 | 312.0 | 1025.0 | 83:33 |
| 478 | O113 | 312.0 | 1075.0 | 83:33 |
| 479 | O112 | 312.0 | 1125.0 | 83:33 |
| 480 | O111 | 312.0 | 1175.0 | 83:33 |
| 481 | O110 | 312.0 | 1225.0 | 83:33 |
| 482 | O109 | 312.0 | 1275.0 | 83:33 |
| 483 | O108 | 312.0 | 1325.0 | 83:33 |
| 484 | O107 | 312.0 | 1375.0 | 83:33 |
| 485 | O106 | 312.0 | 1425.0 | 83:33 |
| 486 | O105 | 312.0 | 1475.0 | 83:33 |
| 487 | O104 | 312.0 | 1525.0 | 83:33 |
| 488 | O103 | 312.0 | 1575.0 | 83:33 |
| 489 | O102 | 312.0 | 1625.0 | 83:33 |
| 490 | O101 | 312.0 | 1675.0 | 83:33 |
| 491 | O100 | 312.0 | 1725.0 | 83:33 |
| 492 | O99 | 312.0 | 1775.0 | 83:33 |
| 493 | O98 | 312.0 | 1825.0 | 83:33 |
| 494 | O97 | 312.0 | 1875.0 | 83:33 |
| 495 | O96 | 312.0 | 1925.0 | 83:33 |
| 496 | O95 | 312.0 | 1975.0 | 83:33 |
| 497 | O94 | 312.0 | 2025.0 | 83:33 |
| 498 | O93 | 312.0 | 2075.0 | 83:33 |
| 499 | O92 | 312.0 | 2125.0 | 83:33 |
| 500 | O91 | 312.0 | 2175.0 | 83:33 |

**Table 2-1 Pad Coordinate Bump size (6/7)**

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 501 | $O_{90}$ | 312.0 | 2225.0 | 83:33 |
| 502 | $O_{89}$ | 312.0 | 2275.0 | 83:33 |
| 503 | $O_{88}$ | 312.0 | 2325.0 | 83:33 |
| 504 | $O_{87}$ | 312.0 | 2375.0 | 83:33 |
| 505 | $O_{86}$ | 312.0 | 2425.0 | 83:33 |
| 506 | $O_{85}$ | 312.0 | 2475.0 | 83:33 |
| 507 | $O_{84}$ | 312.0 | 2525.0 | 83:33 |
| 508 | $O_{83}$ | 312.0 | 2575.0 | 83:33 |
| 509 | $O_{82}$ | 312.0 | 2625.0 | 83:33 |
| 510 | $O_{81}$ | 312.0 | 2675.0 | 83:33 |
| 511 | $O_{80}$ | 312.0 | 2725.0 | 83:33 |
| 512 | $O_{79}$ | 312.0 | 2775.0 | 83:33 |
| 513 | $O_{78}$ | 312.0 | 2825.0 | 83:33 |
| 514 | $O_{77}$ | 312.0 | 2875.0 | 83:33 |
| 515 | $O_{76}$ | 312.0 | 2925.0 | 83:33 |
| 516 | $O_{75}$ | 312.0 | 2975.0 | 83:33 |
| 517 | $O_{74}$ | 312.0 | 3025.0 | 83:33 |
| 518 | $O_{73}$ | 312.0 | 3075.0 | 83:33 |
| 519 | $O_{72}$ | 312.0 | 3125.0 | 83:33 |
| 520 | $O_{71}$ | 312.0 | 3175.0 | 83:33 |
| 521 | $O_{70}$ | 312.0 | 3225.0 | 83:33 |
| 522 | $O_{69}$ | 312.0 | 3275.0 | 83:33 |
| 523 | $O_{68}$ | 312.0 | 3325.0 | 83:33 |
| 524 | $O_{67}$ | 312.0 | 3375.0 | 83:33 |
| 525 | $O_{66}$ | 312.0 | 3425.0 | 83:33 |
| 526 | $O_{65}$ | 312.0 | 3475.0 | 83:33 |
| 527 | $O_{64}$ | 312.0 | 3525.0 | 83:33 |
| 528 | $O_{63}$ | 312.0 | 3575.0 | 83:33 |
| 529 | $O_{62}$ | 312.0 | 3625.0 | 83:33 |
| 530 | $O_{61}$ | 312.0 | 3675.0 | 83:33 |
| 531 | $O_{60}$ | 312.0 | 3725.0 | 83:33 |
| 532 | $O_{59}$ | 312.0 | 3775.0 | 83:33 |
| 533 | $O_{58}$ | 312.0 | 3825.0 | 83:33 |
| 534 | $O_{57}$ | 312.0 | 3875.0 | 83:33 |
| 535 | $O_{56}$ | 312.0 | 3925.0 | 83:33 |
| 536 | $O_{55}$ | 312.0 | 3975.0 | 83:33 |
| 537 | $O_{54}$ | 312.0 | 4025.0 | 83:33 |
| 538 | $O_{53}$ | 312.0 | 4075.0 | 83:33 |
| 539 | $O_{52}$ | 312.0 | 4125.0 | 83:33 |
| 540 | $O_{51}$ | 312.0 | 4175.0 | 83:33 |
| 541 | $O_{50}$ | 312.0 | 4225.0 | 83:33 |
| 542 | $O_{49}$ | 312.0 | 4275.0 | 83:33 |
| 543 | $O_{48}$ | 312.0 | 4325.0 | 83:33 |
| 544 | $O_{47}$ | 312.0 | 4375.0 | 83:33 |
| 545 | $O_{46}$ | 312.0 | 4425.0 | 83:33 |
| 546 | $O_{45}$ | 312.0 | 4475.0 | 83:33 |
| 547 | $O_{44}$ | 312.0 | 4525.0 | 83:33 |
| 548 | $O_{43}$ | 312.0 | 4575.0 | 83:33 |
| 549 | $O_{42}$ | 312.0 | 4625.0 | 83:33 |
| 550 | $O_{41}$ | 312.0 | 4675.0 | 83:33 |

(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 551 | $O_{40}$ | 312.0 | 4725.0 | 83:33 |
| 552 | $O_{39}$ | 312.0 | 4775.0 | 83:33 |
| 553 | $O_{38}$ | 312.0 | 4825.0 | 83:33 |
| 554 | $O_{37}$ | 312.0 | 4875.0 | 83:33 |
| 555 | $O_{36}$ | 312.0 | 4925.0 | 83:33 |
| 556 | $O_{35}$ | 312.0 | 4975.0 | 83:33 |
| 557 | $O_{34}$ | 312.0 | 5025.0 | 83:33 |
| 558 | $O_{33}$ | 312.0 | 5075.0 | 83:33 |
| 559 | $O_{32}$ | 312.0 | 5125.0 | 83:33 |
| 560 | $O_{31}$ | 312.0 | 5175.0 | 83:33 |
| 561 | $O_{30}$ | 312.0 | 5225.0 | 83:33 |
| 562 | $O_{29}$ | 312.0 | 5275.0 | 83:33 |
| 563 | $O_{28}$ | 312.0 | 5325.0 | 83:33 |
| 564 | $O_{27}$ | 312.0 | 5375.0 | 83:33 |
| 565 | $O_{26}$ | 312.0 | 5425.0 | 83:33 |
| 566 | $O_{25}$ | 312.0 | 5475.0 | 83:33 |
| 567 | $O_{24}$ | 312.0 | 5525.0 | 83:33 |
| 568 | $O_{23}$ | 312.0 | 5575.0 | 83:33 |
| 569 | $O_{22}$ | 312.0 | 5625.0 | 83:33 |
| 570 | $O_{21}$ | 312.0 | 5675.0 | 83:33 |
| 571 | $O_{20}$ | 312.0 | 5725.0 | 83:33 |
| 572 | $O_{19}$ | 312.0 | 5775.0 | 83:33 |
| 573 | $O_{18}$ | 312.0 | 5825.0 | 83:33 |
| 574 | $O_{17}$ | 312.0 | 5875.0 | 83:33 |
| 575 | $O_{16}$ | 312.0 | 5925.0 | 83:33 |
| 576 | $O_{15}$ | 312.0 | 5975.0 | 83:33 |
| 577 | $O_{14}$ | 312.0 | 6025.0 | 83:33 |
| 578 | $O_{13}$ | 312.0 | 6075.0 | 83:33 |
| 579 | $O_{12}$ | 312.0 | 6125.0 | 83:33 |
| 580 | $O_{11}$ | 312.0 | 6175.0 | 83:33 |
| 581 | $O_{10}$ | 312.0 | 6225.0 | 83:33 |
| 582 | $O_{9}$ | 312.0 | 6275.0 | 83:33 |
| 583 | $O_{8}$ | 312.0 | 6325.0 | 83:33 |
| 584 | $O_{7}$ | 312.0 | 6375.0 | 83:33 |
| 585 | $O_{6}$ | 312.0 | 6425.0 | 83:33 |
| 586 | $O_{5}$ | 312.0 | 6475.0 | 83:33 |
| 587 | $O_{4}$ | 312.0 | 6525.0 | 83:33 |
| 588 | $O_{3}$ | 312.0 | 6575.0 | 83:33 |
| 589 | $O_{2}$ | 312.0 | 6625.0 | 83:33 |
| 590 | $O_{1}$ | 312.0 | 6675.0 | 83:33 |
| 591 | $O_{0}$ | 312.0 | 6725.0 | 83:33 |
| 592 | DUMMY | 312.0 | 6775.0 | 83:33 |
| 593 | $V_{DD2}$ | 312.0 | 6825.0 | 83:33 |
| 594 | $V_{DD2}$ | 312.0 | 6875.0 | 83:33 |
| 595 | DUMMY | 312.0 | 6925.0 | 83:33 |
| 596 | $V_{EE}$ | 312.0 | 6975.0 | 83:33 |
| 597 | $V_{EE}$ | 312.0 | 7025.0 | 83:33 |
| 598 | $V_{EE}$ | 312.0 | 7075.0 | 83:33 |
| 599 | DUMMY | 312.0 | 7125.0 | 83:33 |
| 600 | $V_{DD1}$ | 312.0 | 7175.0 | 83:33 |

**Table 2-1 Pad Coordinate Bump size (7/7)**

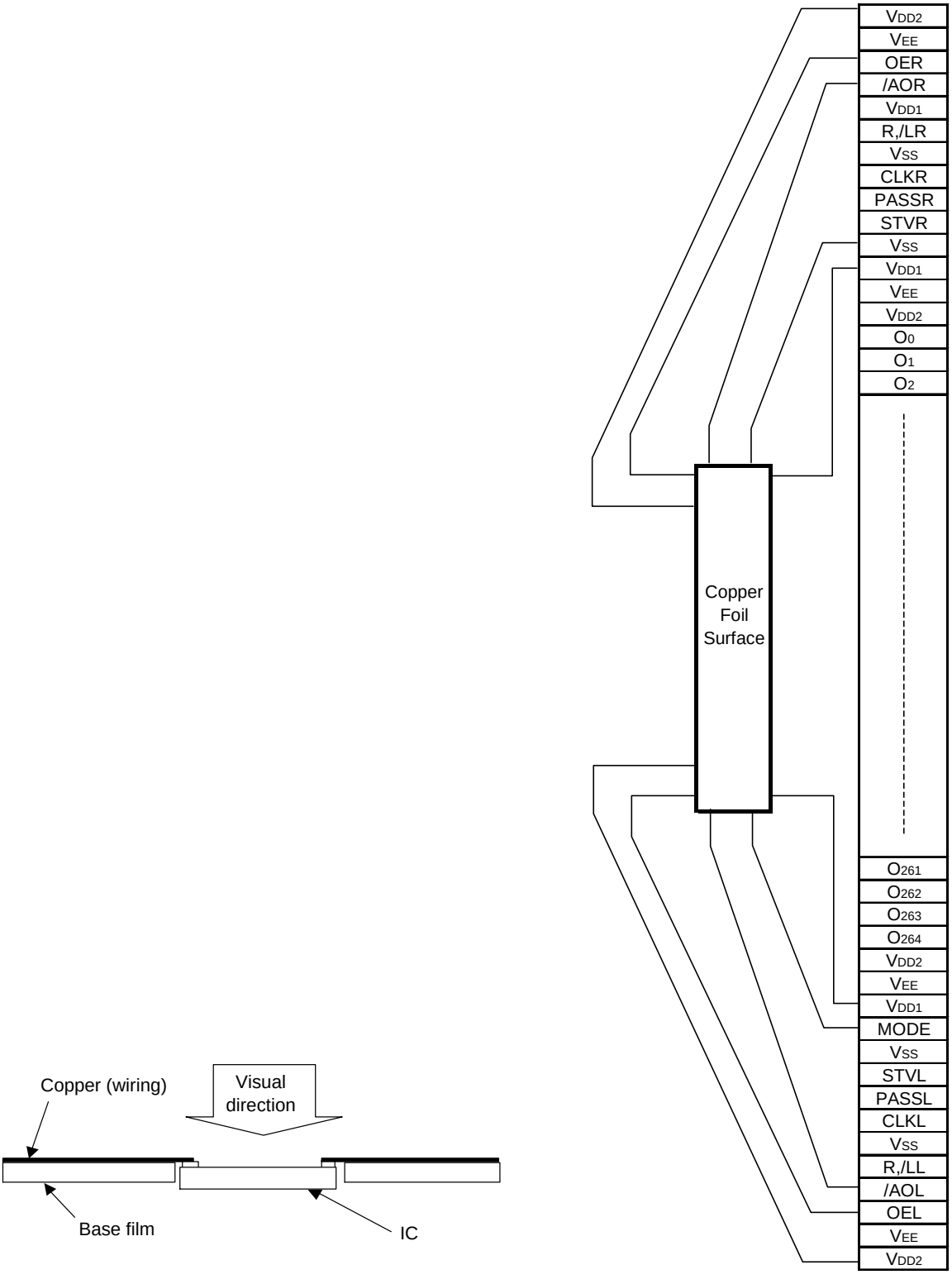
(X:Y) [μm]

| PAD No. | PAD Name | X | Y | Bump size |
|---|---|---|---|---|
| 601 | $V_{DD1}$ | 312.0 | 7225.0 | 83:33 |
| 602 | DUMMY | 312.0 | 7303.0 | 50:87 |
| 603 | DUMMY | 221.0 | 7879.0 | 87:50 |
| 604 | $V_{SS}$ | 143.0 | 7778.0 | 33:83 |
| 605 | $V_{SS}$ | 143.0 | 7879.0 | 33:83 |
| 606 | STVR | 88.0 | 7778.0 | 33:83 |
| 607 | STVR | 88.0 | 7879.0 | 33:83 |
| 608 | PASSR | 33.0 | 7778.0 | 33:83 |
| 609 | PASSR | 33.0 | 7879.0 | 33:83 |
| 610 | CLKR | -22.0 | 7778.0 | 33:83 |
| 611 | CLKR | -22.0 | 7879.0 | 33:83 |
| 612 | $V_{SS}$ | -77.0 | 7778.0 | 33:83 |
| 613 | $V_{SS}$ | -77.0 | 7879.0 | 33:83 |
| 614 | R,/LR | -132.0 | 7778.0 | 33:83 |
| 615 | R,/LR | -132.0 | 7879.0 | 33:83 |
| 616 | $V_{DD1}$ | -187.0 | 7778.0 | 33:83 |
| 617 | $V_{DD1}$ | -187.0 | 7879.0 | 33:83 |
| 618 | /AOR | -242.0 | 7778.0 | 33:83 |
| 619 | /AOR | -242.0 | 7879.0 | 33:83 |
| 620 | DUMMY | -320.0 | 7879.0 | 87:50 |

**Bump Specs (Standard reference value)**

| Parameter | Specifications |
|---|---|
| Bump size tolerance | ±5 μm |
| Bump height (design center value) | 15 μm |
| Bump height tolerance (within lot) | ±4 μm |
| Bump height tolerance (within chip) | Range : 3 μm |
| Bump hardness | 50 ± 20 Hv |

### 2.2 PIN CONFIGURATION : μPD16707N-xxx (Copper foil surface, face-up)




**Remark** This figure does not specify the TCP package.

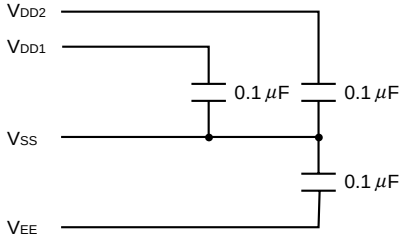
## 3. PIN FUNCTIONS

| Pin Symbol | Pin Name | I/O | Description |
|---|---|---|---|
| $O_1$ to $O_{263}$ | Driver output | Output | These pins output scan signals that drive the vertical direction (gate lines) of a TFT-LCD. The output signals change in synchronization with the rising edge of shift clock CLK. The driver output amplitude is $V_{DD2}$ to $V_{EE}$. |
| $O_0$, $O_{264}$ | Driver output | Output | The signal of $V_{EE}$ level is outputted by fixation. |
| R,/LR, R,/LL | Shift direction control | Input | The shift direction control pin of shift register. The shift directions of shift register are as follows.<br>R,/LR, R,/LL = H : right shift : STVR → $O_1$ → $O_{263}$ → STVL<br>R,/LR, R,/LL = L : left shift : STVL → $O_{263}$ → $O_1$ → STVR<br>R,/LR and R,/LL are connected inside IC. |
| STVR, STVL | Start pulse input/output | I/O | This is the I/O of the internal shift register. The start pulse is read at the rising edge of shift clock CLK (CLKR,CLKL), and scan signals are output from the driver output pins. The input level is a $V_{DD1}$ to $V_{SS}$ (logic level). When in MODE = H, the start pulse is output at the falling edge of the 263rd clock of shift clock CLK, and is cleared at the falling edge of the 264th clock.<br>The output level is $V_{DD1}$ to $V_{SS}$ (logic level). |
| CLKR, CLKL | Shift clock input | Input | This pin inputs a shift clock to the internal shift register. The shift operation is performed in synchronization with the rising edge of this input. CLKR and CLKL are connected inside IC. |
| OER,OEL | Output enable input | Input | When this pin goes high level, the driver output is fixed to $V_{EE}$ level.<br>The shift register is not cleared. CLK is asynchronous in the clock.<br>OER and OEL are connected inside IC. |
| /AOR, /AOL | All-on control | Input | When this pin goes low level, all driver output = $V_{DD2}$ level.<br>The shift register is not cleared. This pin has priority over OER,OEL.<br>This pin is pulled up to $V_{DD1}$ power supply inside IC.<br>CLK is asynchronous in the clock.<br>/AOR and /AOL are connected inside IC. |
| MODE | Selection of Number of outputs | Input | MODE = $V_{DD1}$ or open: 263 outputs<br>MODE = $V_{SS}$: 256 outputs (Driver pins $O_{129}$ to $O_{135}$ are invalid.)<br>Input level is $V_{DD1}$ to $V_{SS}$ (logic level)<br>This pin is pulled up to $V_{DD1}$ power supply inside IC. |
| PASSR, PASSL | Pass line | Input | PASSR and PASSL are connected inside IC. |
| $V_{DD1}$ | Logic power supply | – | 2.3 to 3.6 V |
| $V_{DD2}$ | Driver positive power supply | – | 15 to 25 V. The driver output: high level |
| $V_{SS}$ | Logic ground | – | Connect this pin to the ground of the system. |
| $V_{EE}$ | Negative Power supply for internal operation | – | –15 to –5 V. The driver output: low level |
| DUMMY [Note] | Dummy | – | No dummy pins are connected with other pins inside IC. |

**Note** DUMMY pins are adapted only for chip product. (There is no DUMMY pin in TCP product.)

**Cautions 1. To prevent latch-up, turn on power to $V_{DD1}$ → logic input → $V_{EE}$ → $V_{DD2}$ in this order. Turn off power in the reverse order. These power up/down sequence must be observed also during transition period.**

**2. Insert a capacitor of about 0.1 μF between each power line, as shown below, to secure noise margin such as $V_{IH}$ and $V_{IL}$.**

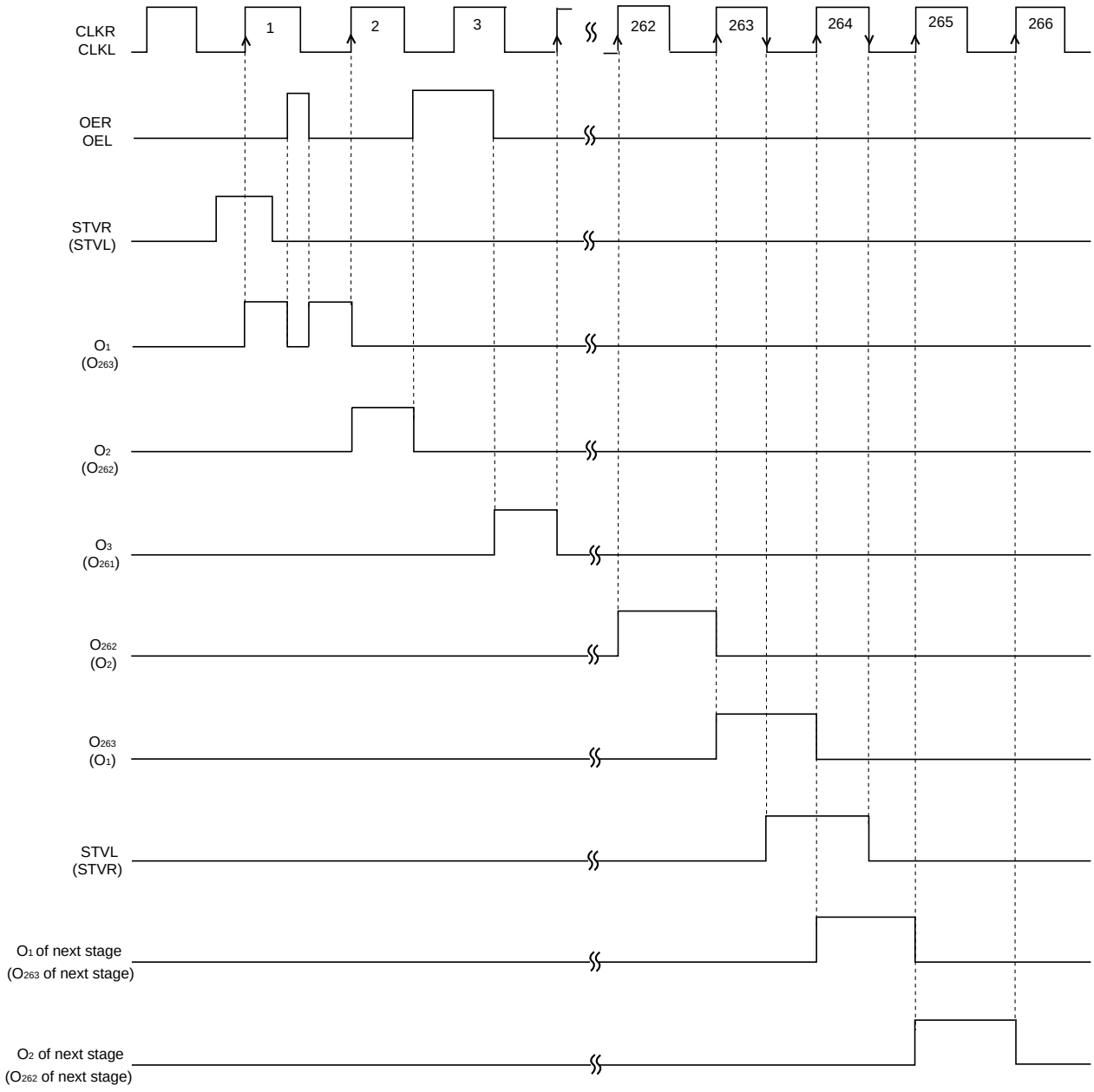


## 4. RELATIONS OF ENABLE INPUT AND OUTPUT TERMINAL

Switching is possible for 263/256 with μPD16707 by the MODE pin.

| MODE = H or open | MODE = L |
|---|---|
| 263 out Mode | 256 out Mode |
| $O_1$ | $O_1$ |
| $O_2$ | $O_2$ |
| $O_3$ | $O_3$ |
| $O_4$ | $O_4$ |
| $O_5$ | $O_5$ |
| $O_6$ | $O_6$ |
| ↓ | ↓ |
| $O_{127}$ | $O_{127}$ |
| $O_{128}$ | $O_{128}$ |
| $O_{129}$ | $V_{OUT} = V_{EE}$ |
| $O_{130}$ | $V_{OUT} = V_{EE}$ |
| $O_{131}$ | $V_{OUT} = V_{EE}$ |
| $O_{132}$ | $V_{OUT} = V_{EE}$ |
| $O_{133}$ | $V_{OUT} = V_{EE}$ |
| $O_{134}$ | $V_{OUT} = V_{EE}$ |
| $O_{135}$ | $V_{OUT} = V_{EE}$ |
| $O_{136}$ | $O_{136}$ |
| $O_{137}$ | $O_{137}$ |
| ↓ | ↓ |
| $O_{259}$ | $O_{259}$ |
| $O_{260}$ | $O_{260}$ |
| $O_{261}$ | $O_{261}$ |
| $O_{262}$ | $O_{262}$ |
| $O_{263}$ | $O_{263}$ |

## 5. TIMING CHART (R,/LR = R,/LL = H, MODE = H, /AOR = /AOL = H)




**Remark** The signal name in parenthesis is it at the time of R,/LR = R,/LL = L.

## 6. ELECTRICAL SPECIFICATIONS

**Absolute Maximum Ratings ($T_A$ = 25°C, $V_{SS}$ = 0 V)**

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Logic Supply Voltage | $V_{DD1}$ | –0.5 to +7.0 | V |
| Driver Positive Supply Voltage | $V_{DD2}$ | –0.5 to +28 | V |
| Power Supply Voltage | $V_{DD2}$-$V_{EE}$ | –0.5 to +42 | V |
| Internal Operation Negative Supply Voltage | $V_{EE}$ | –16 to + 0.5 | V |
| Input Voltage | $V_I$ | –0.5 to $V_{DD1}$ + 0.5 | V |
| Operating Ambient Temperature | $T_A$ | –20 to +75 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +125 | °C |

**Caution Product qualify may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.**

**Recommended Operating Range ($T_A$ = –20 to +75°C, $V_{SS}$ = 0 V)**

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Logic Supply Voltage | $V_{DD1}$ | 2.3 | 3.0 | 3.6 | V |
| Driver Positive Supply Voltage | $V_{DD2}$ | 15 | 23 | 25 | V |
| Internal Operation Negative Supply Voltage | $V_{EE}$ | –15 | –10 | –5.0 | V |
| Power Supply Voltage | $V_{DD2}$-$V_{EE}$ | 20 | 33 | 40 | V |
| Clock Frequency | $f_{CLK}$ | | | 500 | kHz |

**Electrical Characteristics ($T_A$ = –20 to +75°C, $V_{DD1}$ = 2.3V to 3.6V, $V_{DD2}$ = 23 V, $V_{EE}$ = –10 V, $V_{SS}$ = 0 V)**

| Parameter | Symbol | Condition | MIN. | TYP.[Note] | MAX. | Unit |
|---|---|---|---|---|---|---|
| High level Input Voltage | $V_{IH}$ | CLKR, CLKL, STVR, STVL, R,/LR, R,/LL, OER, OEL, MODE | 0.8 $V_{DD1}$ | | $V_{DD1}$ | V |
| Low level Input Voltage | $V_{IL}$ | | $V_{SS}$ | | 0.2 $V_{DD1}$ | V |
| High level Output Voltage | $V_{OH}$ | STVR (STVL), $I_{OH}$ = –40 μA | $V_{DD1}$ – 0.4 | | $V_{DD1}$ | V |
| Low level Output Voltage | $V_{OL}$ | STVR (STVL), $I_{OL}$ = +40 μA | $V_{SS}$ | | $V_{SS}$ + 0.4 | V |
| LCD Driver Output ON Resistance | $R_{ON}$ | $V_{OUT}$ = $V_{EE}$ + 1.0 V or $V_{DD2}$ – 1.0 V | | 0.3 | 1.0 | kΩ |
| Pull-up Resistance | $R_{PU}$ | $V_{DD1}$ = 3.0 V, /AOR, /AOL, MODE | 10 | 50 | 100 | kΩ |
| Input Leak Current | $I_{IL}$ | $V_I$ = 0 V or 3.6 V, except for /AOR, /AOL, MODE | | | ±1.0 | μA |
| Static Current Dissipation | $I_{DD1}$ | $V_{DD1}$, $f_{CLK}$ = 50 kHz, OER = OEL = L, $f_{STV}$ = 60 Hz, no load | | 20 | 200 | μA |
| | $I_{DD2}$ | $V_{DD2}$, $f_{CLK}$ = 50 kHz, OER = OEL = L, $f_{STV}$ = 60 Hz, no load | | 10 | 100 | μA |
| | $I_{EE}$ | $V_{EE}$, $f_{CLK}$ = 50 kHz, OER = OEL = L, $f_{STV}$ = 60 Hz, no load | –300 | –30 | | μA |

**Remark** STV : STVR (STVL)

**Note** The TYP.value refers to the measured values in $V_{DD1}$ = 3.0 V, $T_A$ = 25°C.

**Switching Characteristics ($T_A$ = –20 to +75°C, $V_{DD1}$ = 2.3V to 3.6V, $V_{DD2}$ = 23 V, $V_{EE}$ = –10 V, $V_{SS}$ = 0 V)**

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Cascade Output Delay Time | $t_{PHL1}$ | $C_L$ = 55 pF, | | | 500 | ns |
| | $t_{PLH1}$ | CLKR (CLKL) → STVL (STVR) | | | 500 | ns |
| Driver Output Delay Time | $t_{PHL2}$ | $C_L$ = 300 pF, | | | 500 | ns |
| | $t_{PLH2}$ | CLKR (CLKL) → $O_n$ | | | 500 | ns |
| | $t_{PHL3}$ | $C_L$ = 300 pF, | | | 500 | ns |
| | $t_{PLH3}$ | OER (OEL) → $O_n$ | | | 500 | ns |
| Output Rise Time | $t_{TLH}$ | $C_L$ = 300 pF | | | 800 | ns |
| Output Fall Time | $t_{THL}$ | | | | 800 | ns |
| Input Capacitance | $C_I$ | $T_A$ = 25°C | | | 50 | pF |

**Timing Requirements ($T_A$ = –20 to +75°C, $V_{DD1}$ = 2.3 to 3.6 V, $V_{DD2}$ = 23 V, $V_{EE}$ = –10 V, $V_{SS}$ = 0 V)**

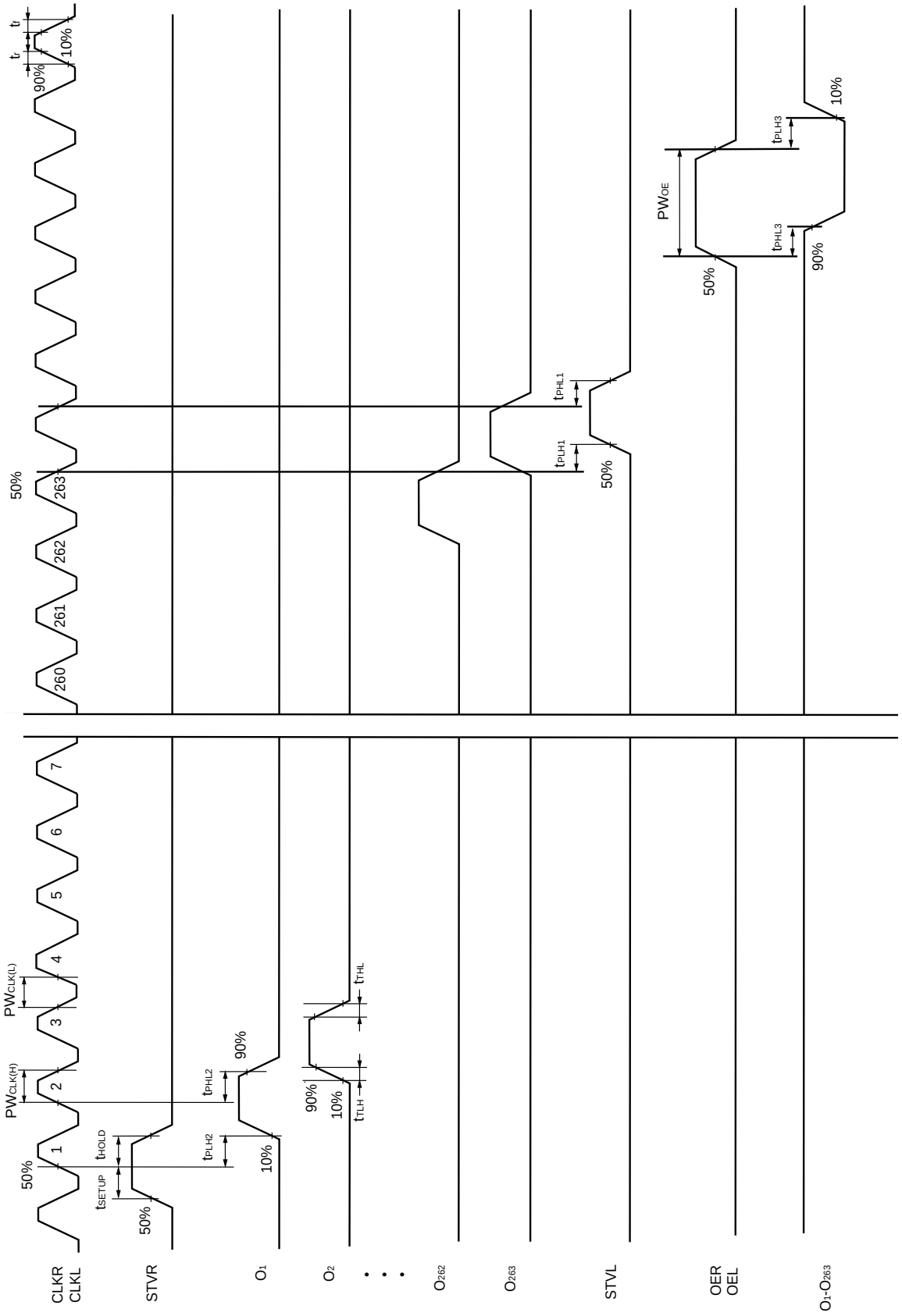
| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Clock Pulse High Width | $PW_{CLK(H)}$ | | 500 | | | ns |
| Clock Pulse Low Width | $PW_{CLK(L)}$ | | 500 | | | ns |
| Enable Pulse Width | $PW_{OE}$ | | 1000 | | | ns |
| Data Setup Time | $t_{SETUP}$ | STVR (STVL) ↑→ CLKR, CLKL↑ | 200 | | | ns |
| Data Hold Time | $t_{HOLD}$ | CLKR, CLKL ↑→ STVR (STVL) ↓ | 200 | | | ns |

**Remark** Unless otherwise specified, the input level is defined to be $V_{IH}$ = $V_{IL}$ = 0.5 $V_{DD1}$.

**Caution Keep the time and fall time of the logic input to $t_r$ = $t_f$ = 20 ns (10 to 90% of the rated values).**

**SWITCHING CHARACTERISTICS WAVEFORM (R,/LR = R,/LL = H, MODE = H)**

Unless otherwise specified, the input level is defined to be $V_{IH} = V_{IL} = 0.5\ V_{DD1}$.



## 7. RECOMMENDED MOUNTING CONDITIONS

The μPD16707 should be soldered and mounted under the following recommended conditions.

For details of the recommended soldering conditions, refer to the document **Semiconductor Device Mounting Technology Manual (C10535E).**

For soldering methods and conditions other than those recommended below, contact an NEC sales representative.

Recommended Soldering Conditions for Surface Mounting Soldering Conditions.

**μPD16707N-xxx: TCP (TAB Package)**

| Mounting Condition | Mounting Method | Condition |
|---|---|---|
| Thermocompression | Soldering | Heating tool 300 to 350°C, heating for 2 to 3 seconds : pressure 100g (per solder) |
| | ACF (Adhesive Conductive Film) | Temporary bonding 70 to 100°C: pressure 3 to 8 kg/cm$^2$: time 3 to 5 sec. Real bonding 165 to 180°C: pressure 25 to 45 kg/cm$^2$: time 30 to 40 sec. (When using the anisotropy conductive film SUMIZAC1003 of Sumitomo Bakelite,Ltd). |

**Caution To find out the detailed conditions for mounting the ACF part, please contact the ACF manufacturing company. Be sure to avoid using two or more mounting methods at a time.**

## NOTES FOR CMOS DEVICES

### ① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

### ② HANDLING OF UNUSED INPUT PINS FOR CMOS

Note:

No connection for CMOS device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to $V_{DD}$ or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

### ③ STATUS BEFORE INITIALIZATION OF MOS DEVICES

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

**Reference Documents**

**NEC Semiconductor Device Reliability/Quality Control System (C10983E)**

**Quality Grades On NEC Semiconductor Devices (C11531E)**

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