

Gate resistor installed Dual N-channel MOSFET

KFCAB22620L Datasheet

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1. GENERAL DESCRIPTION

Gate resistor installed Dual N-channel MOSFET for lithium-ion secondary battery protection circuits.

2. FEATURES

- Source-source On-state Resistance: $R_{SS(on)}$ typ = 2.4 m Ω (V_{GS} = 3.8 V)
- CSP (Chip Size Package)
- Halogen-free / RoHS compliant (EU RoHS / UL-94 V-0 / MSL: Level 1)

3. MARKING SYMBOL: W7

4. PACKAGING

Embossed type (Thermo-compression sealing): 8,000 pcs / reel (standard)

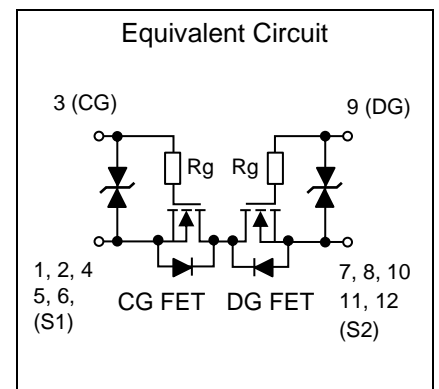
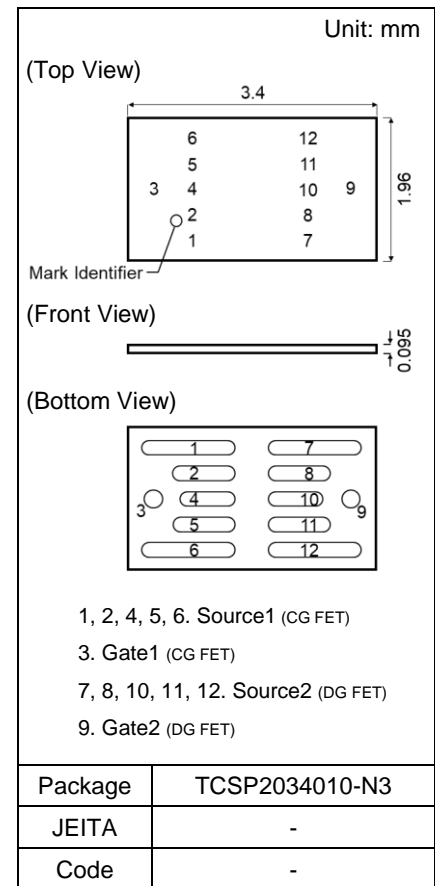
5. ABSOLUTE MAXIMUM RATINGS $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Rating | Unit |
|--|----------------------|---------------|------------------|
| Source-source Voltage | VSS | 23 | V |
| Gate-source Voltage | VGS | ± 12 | V |
| Source Current | DC ^{*1} | IS1 | A |
| | DC ^{*2} | IS2 | |
| | DC ^{*3} | IS3 | |
| | Pulsed ^{*4} | ISp | |
| Total Power Dissipation | DC ^{*1} | PD1 | W |
| | DC ^{*2} | PD2 | |
| | DC ^{*3} | PD3 | |
| Operating Junction and Storage Temperature Range | Tj, Tstg | - 55 to + 150 | $^\circ\text{C}$ |

6. THERMAL CHARACTERISTICS $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Rating | Unit |
|---------------------------|--------------------|--------|-----------------------------|
| Thermal Resistance (ch-a) | Rth1 ^{*1} | 212 | $^\circ\text{C} / \text{W}$ |
| | Rth2 ^{*2} | 66 | |
| | Rth3 ^{*3} | 36 | |

- Note
- *1 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm).
FR4 board partially covered with copper pad (41 mm² area, 36 μm thickness).
 - *2 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm).
FR4 board fully covered with copper pad (604 mm² area, 36 μm thickness).
 - *3 Mounted on ceramic board (70 mm x 70 mm x t1.0 mm).
 - *4 $t = 10 \mu\text{s}$, Duty Cycle $\leq 1\%$.



7. ELECTRICAL CHARACTERISTICS $T_a = 25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-----------------------------------|----------|----------------------------------|------|------|----------|---------------|
| Source-source Breakdown Voltage | VSSS | IS = 1 mA, VGS = 0 V | 23 | | | V |
| Zero Gate Voltage Source Current | ISSS | VSS = 23 V, VGS = 0 V | | | 1 | μA |
| Gate-source Leakage Current | IGSS1 | VGS = ± 8 V, VSS = 0 V | | | ± 10 | μA |
| | IGSS2 | VGS = ± 5 V, VSS = 0 V | | | ± 1 | |
| Gate-source Threshold Voltage | Vth | IS = 1.15 mA, VSS = 10 V | 0.35 | 0.90 | 1.40 | V |
| Source-source On-state Resistance | RSS(on)1 | IS = 6.9 A, VGS = 4.5 V | 1.6 | 2.2 | 2.9 | m Ω |
| | RSS(on)2 | IS = 6.9 A, VGS = 3.8 V | 1.7 | 2.4 | 3.1 | |
| | RSS(on)3 | IS = 6.9 A, VGS = 3.1 V | 1.8 | 2.8 | 4.6 | |
| | RSS(on)4 | IS = 6.9 A, VGS = 2.5 V | 3.0 | 5.0 | 9.8 | |
| Body Diode Forward Voltage | VF(s-s) | IF = 6.9 A, VGS = 0 V | | 0.7 | 1.0 | V |
| Input Capacitance *1 | Ciss | VSS = 10 V, VGS = 0 V, f = 1 kHz | | 3500 | | pF |
| Output Capacitance *1 | Coss | | | 430 | | |
| Reverse Transfer Capacitance *1 | Crss | | | 340 | | |
| Total Gate Charge *1 | Qg | VDD = 10 V | | 29 | | nC |
| Gate-source Charge *1 | Qgs | VGS = 0 to 4 V | | 8 | | |
| Gate-drain Charge *1 | Qgd | IS = 13.8 A | | 9 | | |

(MOSFET: CG FET)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|----------------------------|---------|------------------------------|-----|------|-----|---------------|
| Turn-on Delay Time *1, *2 | td(on) | VDD = 10 V, VCGS1 = 0 to 4 V | | 0.04 | | μs |
| Rise Time *1, *2 | tr | IS = 6.9 A | | 0.18 | | |
| Turn-off Delay Time *1, *2 | td(off) | VDD = 10 V, VCGS1 = 4 to 0 V | | 0.20 | | μs |
| Fall Time *1, *2 | tf | IS = 6.9 A | | 0.20 | | |
| Gate Resistance *1 | Rg | f = 1 MHz | 2 | 7 | 13 | Ω |

(MOSFET: DG FET)

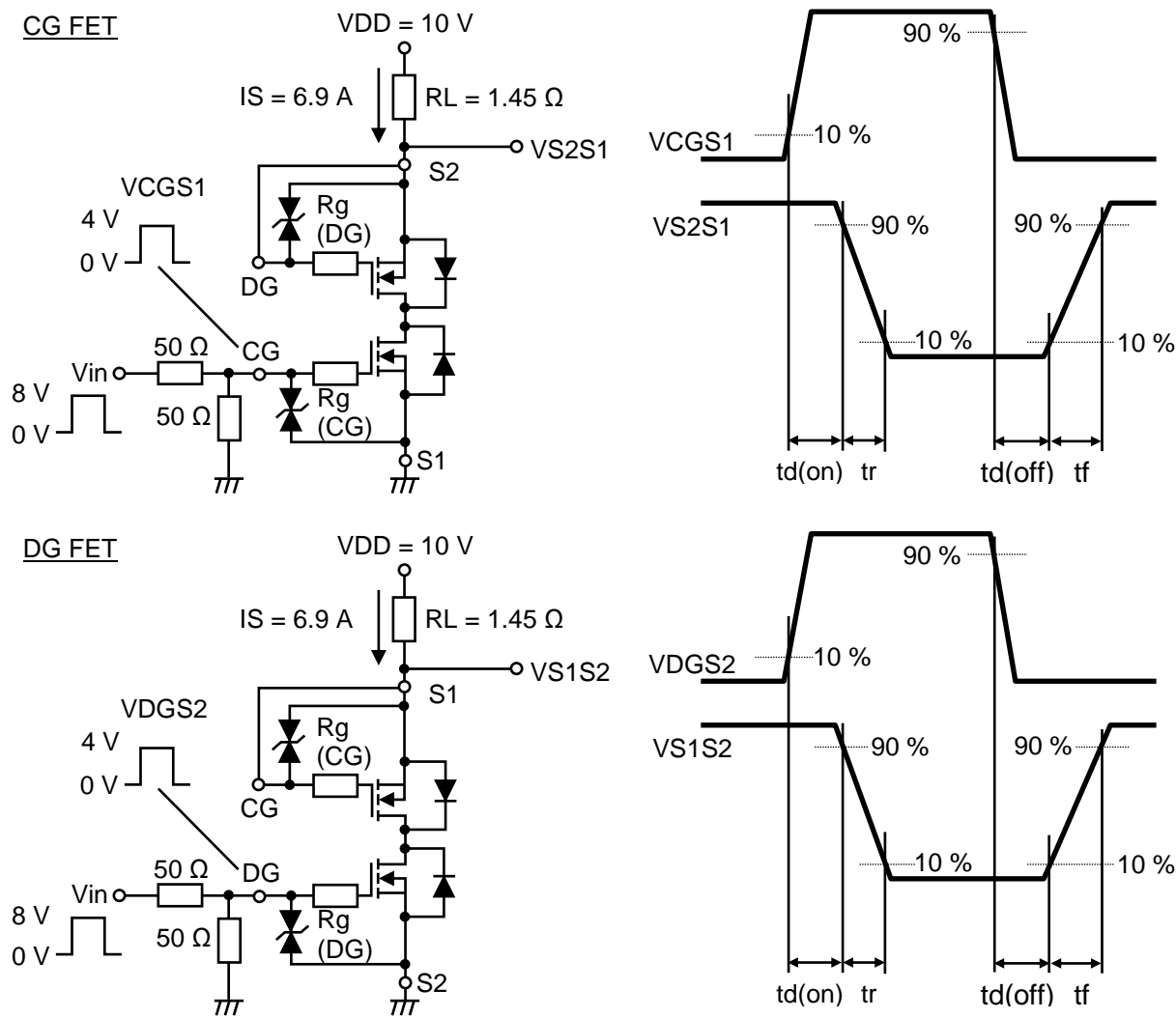
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|----------------------------|---------|------------------------------|-----|-----|------|---------------|
| Turn-on Delay Time *1, *2 | td(on) | VDD = 10 V, VDGS2 = 0 to 4 V | | 1.2 | | μs |
| Rise Time *1, *2 | tr | IS = 6.9 A | | 2.6 | | |
| Turn-off Delay Time *1, *2 | td(off) | VDD = 10 V, VDGS2 = 4 to 0 V | | 5.2 | | μs |
| Fall Time *1, *2 | tf | IS = 6.9 A | | 4.1 | | |
| Gate Resistance *1 | Rg | f = 1 MHz | 400 | 700 | 1000 | Ω |

Note Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.

*1 Guaranteed by design, not subject to production testing.

*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time.

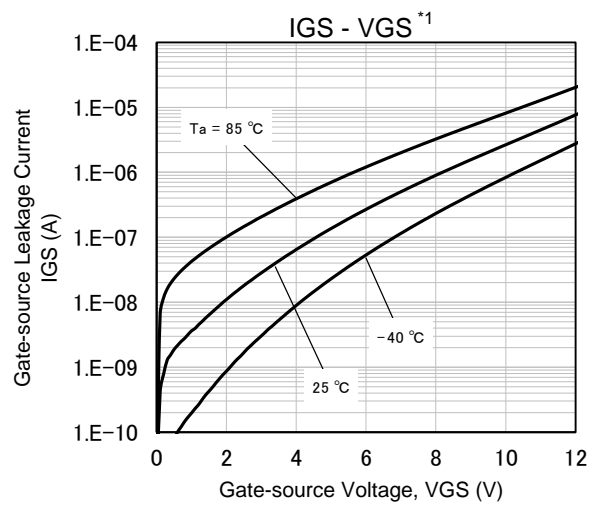
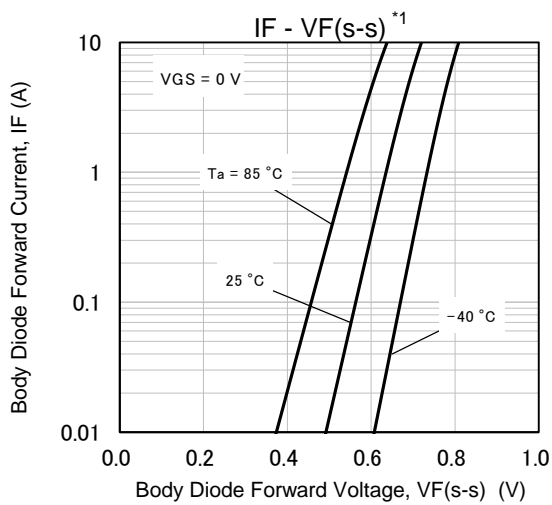
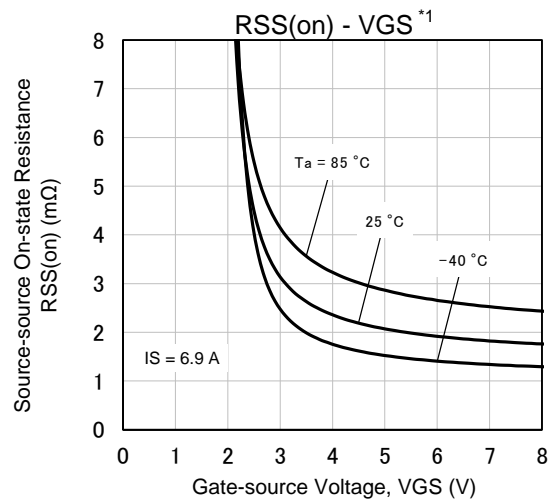
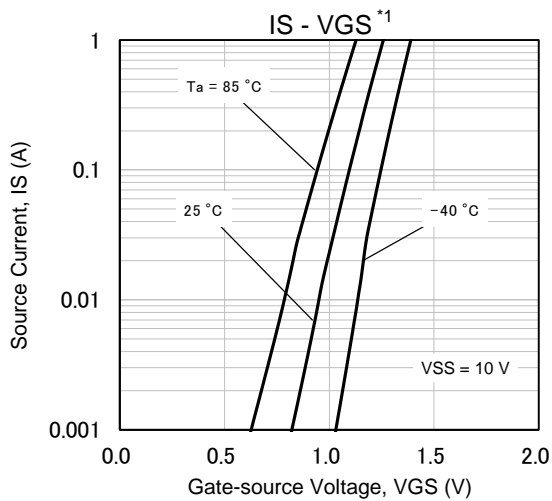
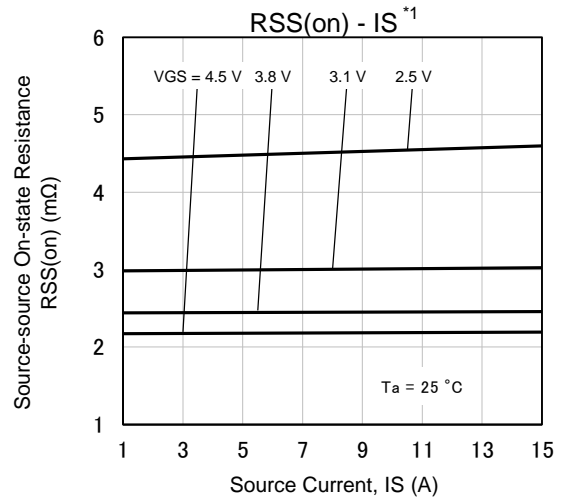
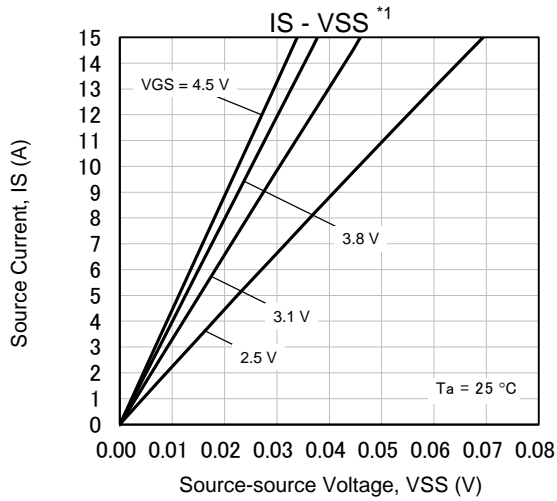
Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time



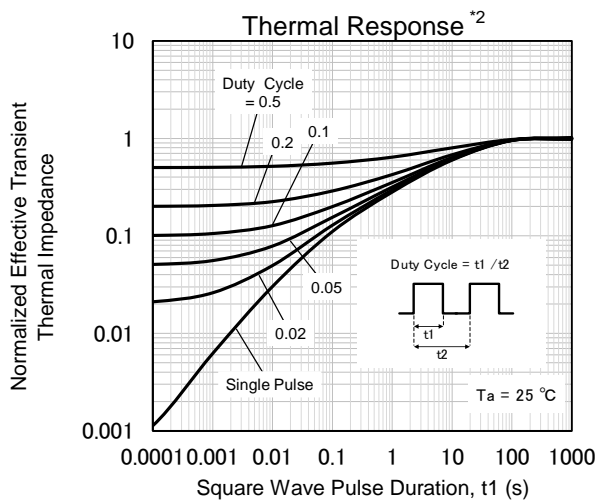
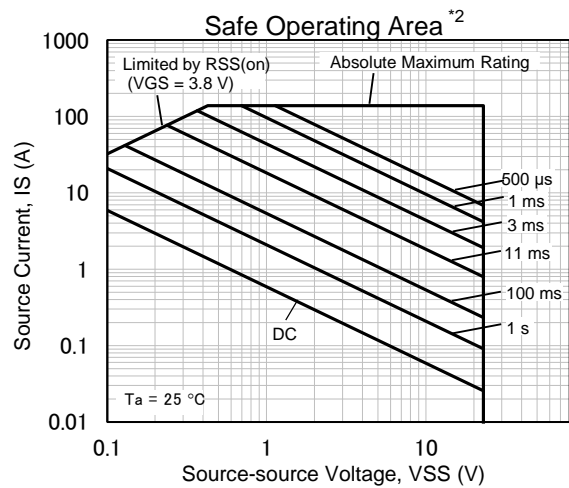
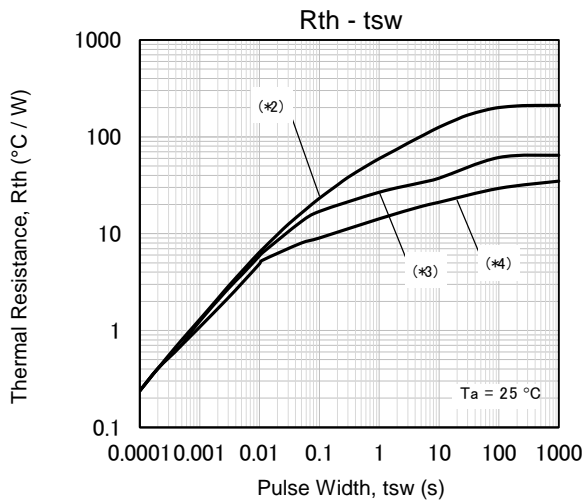
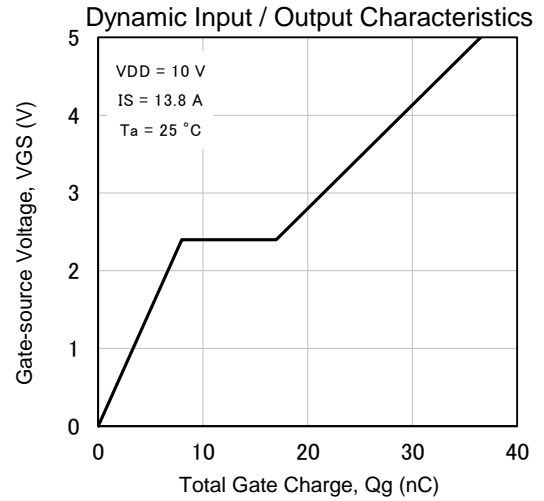
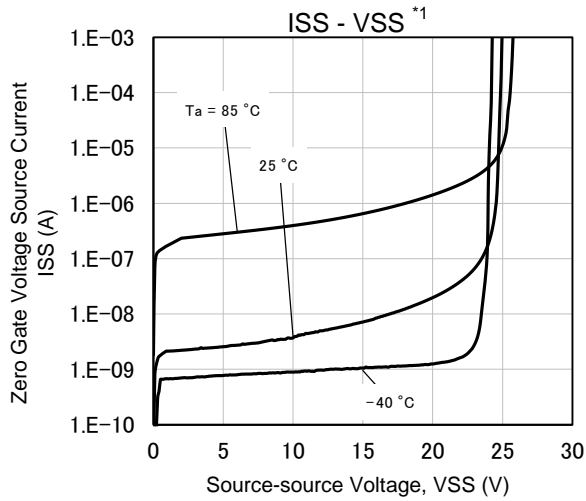
8. ELECTROSTATIC DISCHARGE CHARACTERISTIC Ta = 25 °C ± 3 °C

| Standard | Test Type | Symbol | Conditions | Class | Value | Unit |
|--------------|------------------|--------|------------------------|-------|------------|------|
| AEC-Q101-001 | Human Body Model | HBM | C = 100 pF, R = 1.5 kΩ | H2 | > 2 to ≤ 4 | kV |

9. TECHNICAL DATA (Reference)



TECHNICAL DATA (Reference)



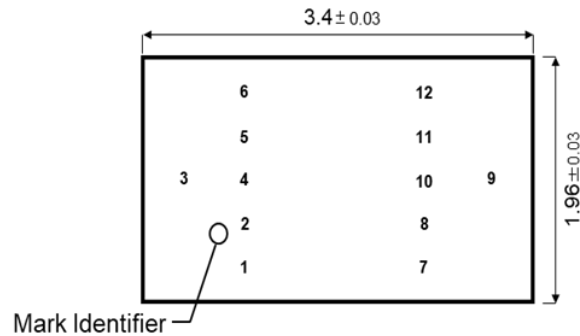
Note

- *1 Pulse measurement.
- *2 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm). FR4 board partially covered with copper pad (41 mm² area, 36 μm thickness).
- *3 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm). FR4 board fully covered with copper pad (604 mm² area, 36 μm thickness).
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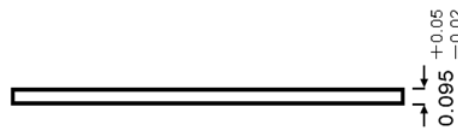
10. OUTLINE

(Top View)

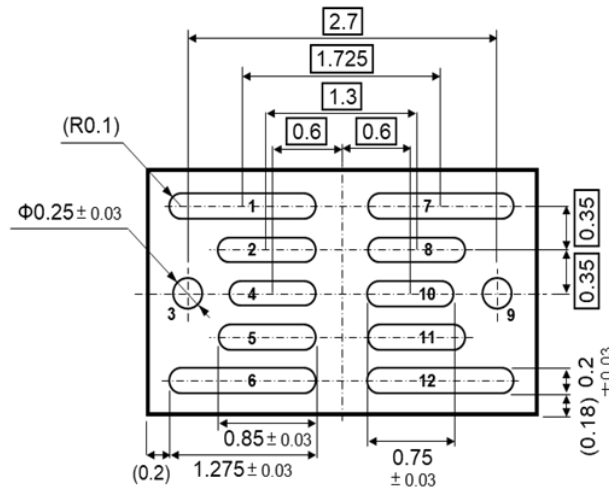
Unit: mm



(Front View)



(Bottom View)

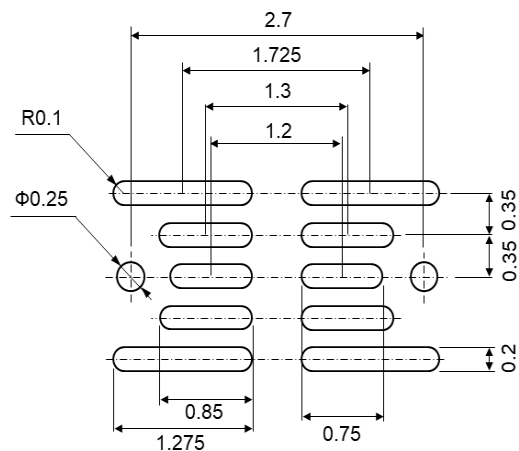
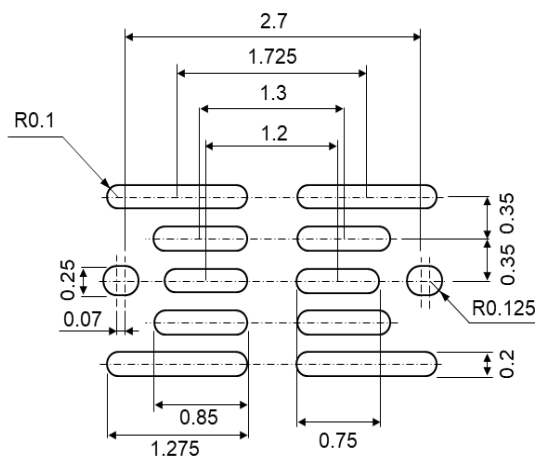


11. LAND & STENCIL PATTERN (Reference)

LAND

STENCIL

Unit: mm



Important notice:

Solder Mask Defined (SMD) pattern is strongly recommended for pad design.
Please check the information in the Nuvoton WL-CSP Application Notes about mounting process.

12. REVISION HISTORY

| Date | Revision | Description |
|------------|----------|--|
| 2021.06.03 | 1.00 | 1. Initially issued. |
| 2021.08.31 | 1.01 | 1. Changed document name from Product Standards to Datasheet. 2. Added important notice in Land Pattern. 3. Added special attention and precautions notes. |

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