

Dual N-channel MOSFET

KFC4B21A30L

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 = 13 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: 6V

4. PACKAGING

Embossed type (Thermo-compression sealing): 20,000 pcs / reel (standard)

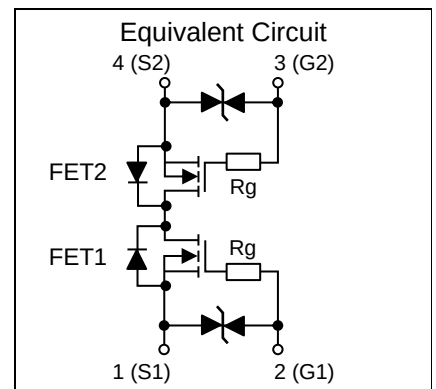
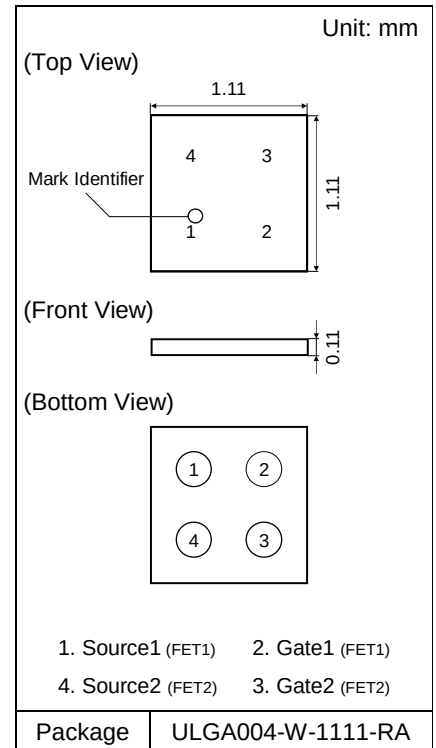
5. ABSOLUTE MAXIMUM RATINGS $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Source-source Voltage	VSS	12	V
Gate-source Voltage	VGS	± 8	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	347	$^\circ\text{C} / \text{W}$
	Rth2 *2	125	
	Rth3 *3	69	

- Note
- *1 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm).
FR4 board partially covered with copper pad (18 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 (613 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 $\leq 1\%$.



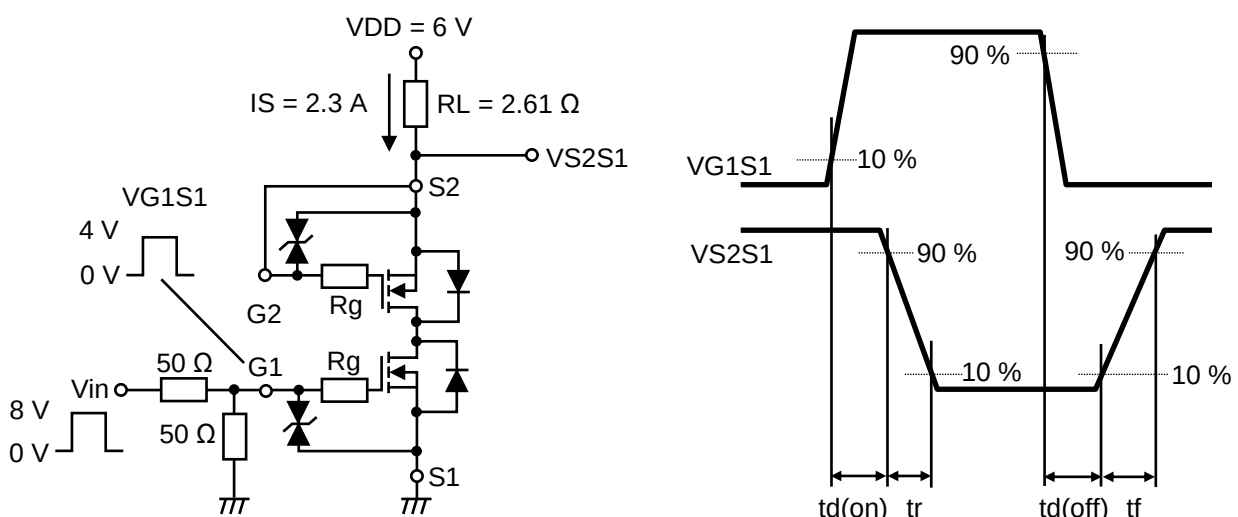
7. ELECTRICAL CHARACTERISTICS $T_a = 25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Source-source Breakdown Voltage	VSSS	$I_S = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	12			V
Zero Gate Voltage Source Current	ISSS	$V_{SS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
Gate-source Leakage Current	IGSS1	$V_{GS} = \pm 8\text{ V}$, $V_{SS} = 0\text{ V}$			± 1	μA
	IGSS2	$V_{GS} = \pm 3.8\text{ V}$, $V_{SS} = 0\text{ V}$			± 0.1	
Gate-source Threshold Voltage	V_{th}	$I_S = 0.20\text{ mA}$, $V_{SS} = 6\text{ V}$	0.35	0.90	1.40	V
Source-source On-state Resistance	RSS(on)1	$I_S = 2.3\text{ A}$, $V_{GS} = 4.5\text{ V}$	8.0	11.5	15.0	m Ω
	RSS(on)2	$I_S = 2.3\text{ A}$, $V_{GS} = 3.8\text{ V}$	9.0	13.0	16.5	
	RSS(on)3	$I_S = 2.3\text{ A}$, $V_{GS} = 3.1\text{ V}$	9.5	15.0	25.0	
	RSS(on)4	$I_S = 2.3\text{ A}$, $V_{GS} = 2.5\text{ V}$	11.5	19.5	38.5	
Body Diode Forward Voltage	$V_{F(s-s)}$	$I_F = 2.3\text{ A}$, $V_{GS} = 0\text{ V}$		0.7	1.0	V
Input Capacitance ^{*1}	C_{iss}	$V_{SS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ kHz}$		730		pF
Output Capacitance ^{*1}	C_{oss}			190		
Reverse Transfer Capacitance ^{*1}	C_{rss}			130		
Turn-on Delay Time ^{*1, *2}	$t_{d(on)}$	$V_{DD} = 6\text{ V}$, $V_{GS} = 0\text{ to }4\text{ V}$ $I_S = 2.3\text{ A}$		0.4		μs
Rise Time ^{*1, *2}	t_r			0.7		
Turn-off Delay Time ^{*1, *2}	$t_{d(off)}$	$V_{DD} = 6\text{ V}$, $V_{GS} = 4\text{ to }0\text{ V}$ $I_S = 2.3\text{ A}$		1.7		μs
Fall Time ^{*1, *2}	t_f			1.2		
Total Gate Charge ^{*1}	Q_g	$V_{DD} = 6\text{ V}$ $V_{GS} = 0\text{ to }4\text{ V}$ $I_S = 4.6\text{ A}$		7.3		nC
Gate-source Charge ^{*1}	Q_{gs}			1.9		
Gate-drain Charge ^{*1}	Q_{gd}			1.9		
Gate Resistance ^{*1}	R_g	$f = 1\text{ MHz}$	600	1000	1400	Ω

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

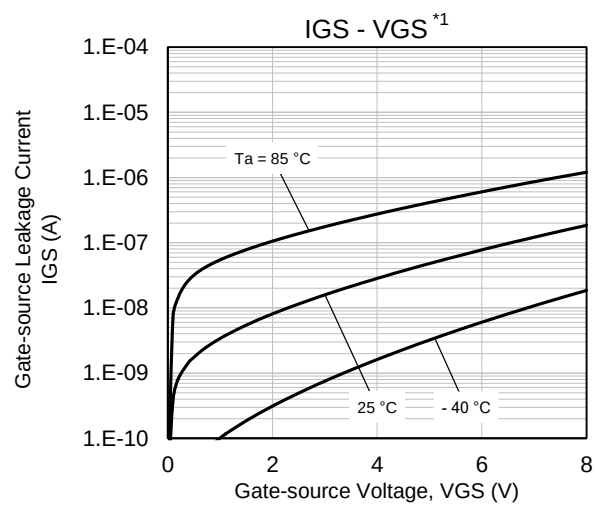
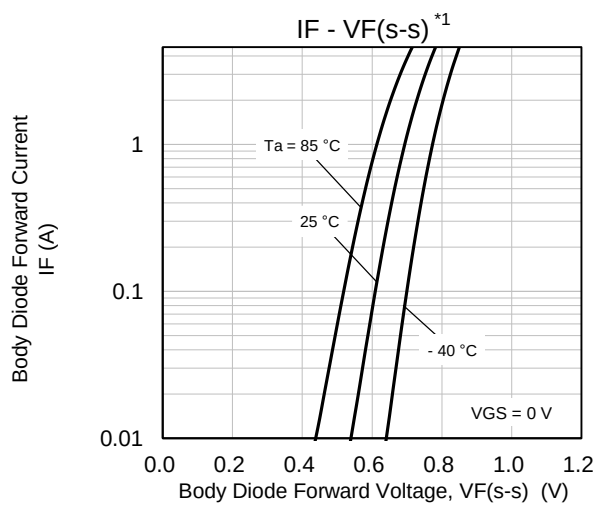
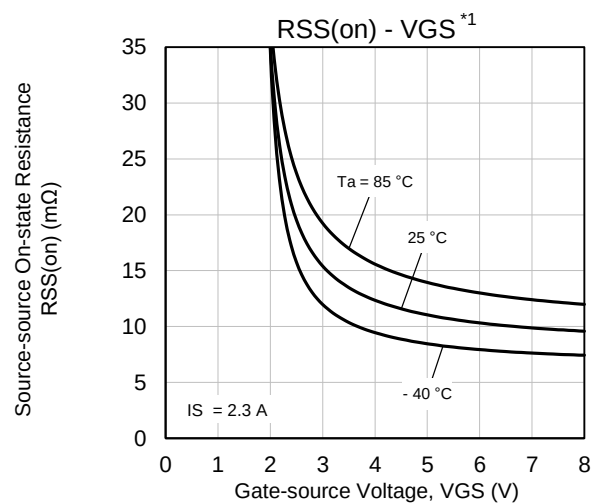
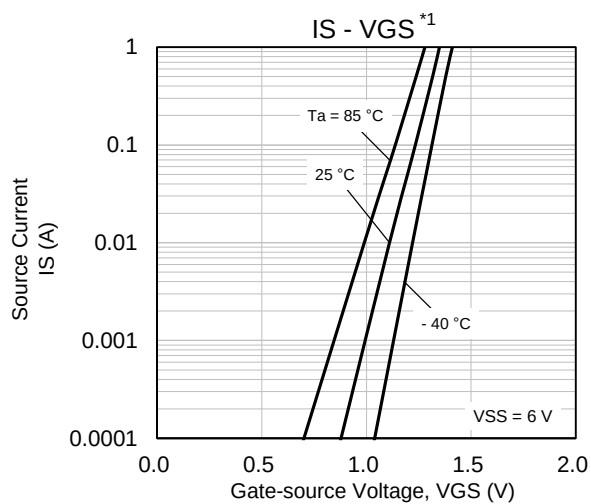
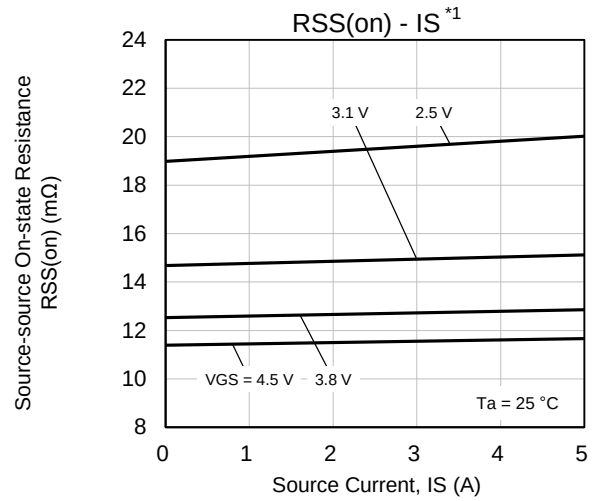
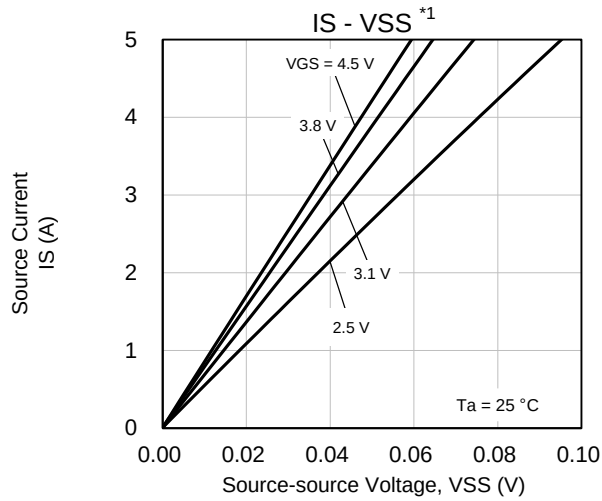
*1 Guaranteed by design, not subject to production testing.

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

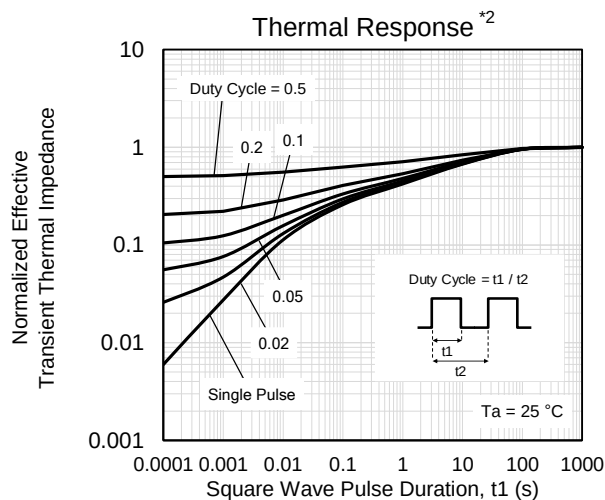
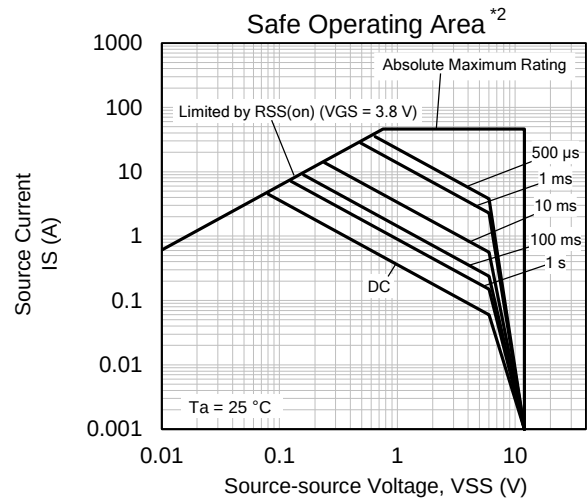
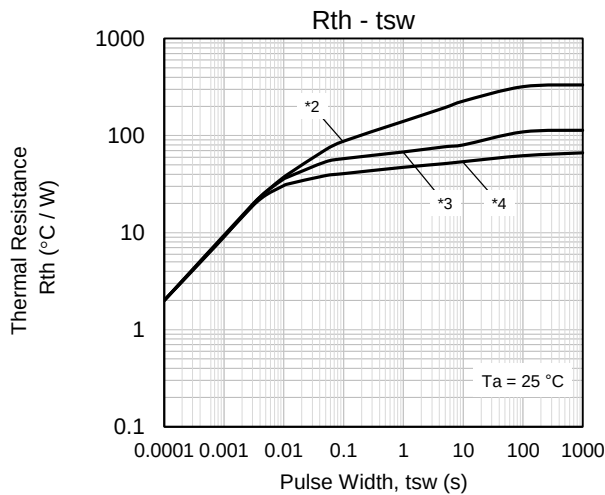
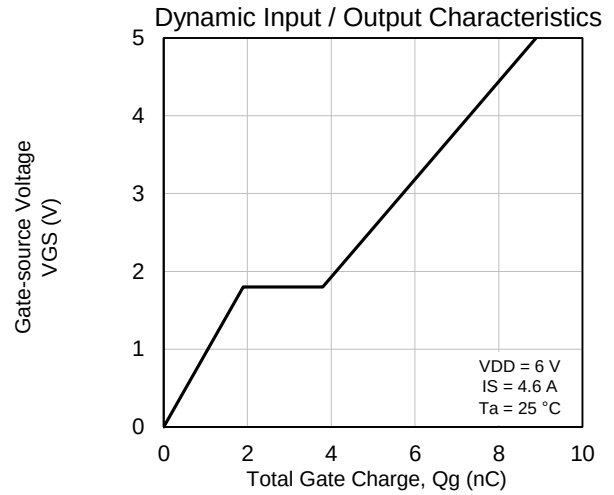
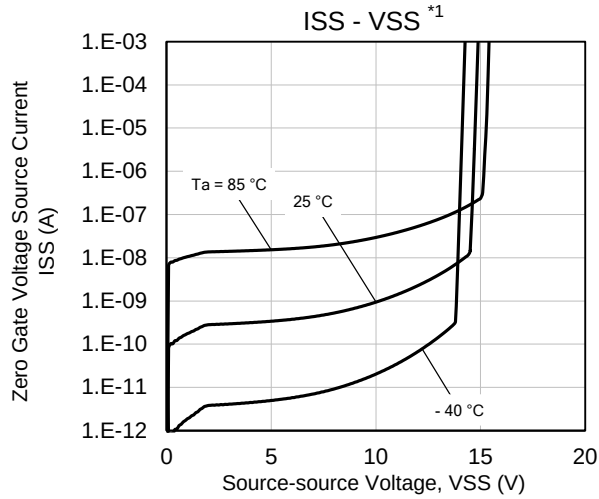
8. ELECTROSTATIC DISCHARGE CHARACTERISTIC $T_a = 25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Standard	Test Type	Symbol	Conditions	Class	Value	Unit
AEC-Q101-001	Human Body Model	HBM	$C = 100\text{ pF}$, $R = 1.5\text{ k}\Omega$	H1C	$> 1\text{ k to } \leq 2\text{ k}$	V

9. TECHNICAL DATA (Reference)



TECHNICAL DATA (Reference)



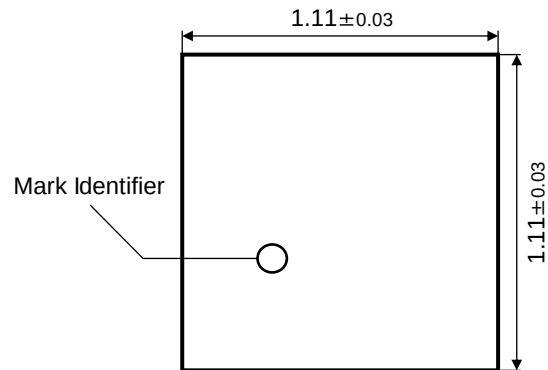
Note

- *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 (18 mm² area, 36 μm thickness).
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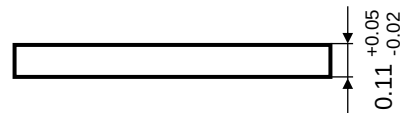
10. OUTLINE

(Top View)

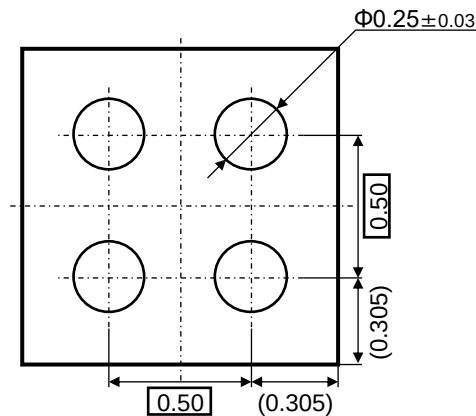
Unit: mm



(Front View)

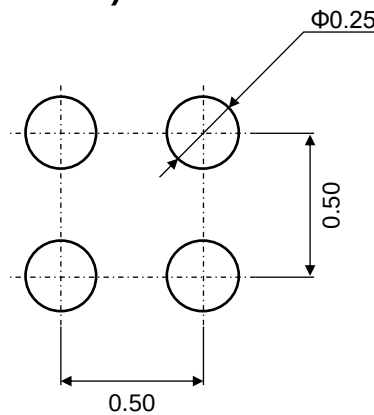


(Bottom View)



11. LAND & STENCIL PATTERN (Reference)

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
2021.7.8	1.00	1. Initially issued.
2021.7.14	2.00	1. Updated ELECTRICAL CHARACTERISTICS. 2. Updated TECHNICAL DATA.
2021.11.19	2.01	1. Changed document name from Product Standards to Datasheet. 2. Added important notice in Land Pattern. 3. Added special attention and precautions notes.
2022.11.15	3.00	1. Revised the value of Rg. 2. Changed Value notation for ELECTROSTATIC DISCHARGE CHARACTERISTIC.

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