

Gate resistor installed Dual N-channel MOSFET

KFCAB22680L 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: $R_{SS}(\text{on})$ typ. = $2.65 \text{ m}\Omega$ ($V_{GS} = 3.8 \text{ V}$)
- CSP (Chip Size Package)
- Halogen-free / RoHS compliant (EU RoHS / UL-94 V-0 / MSL: Level 1)

3. MARKING SYMBOL: WF

4. PACKAGING

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

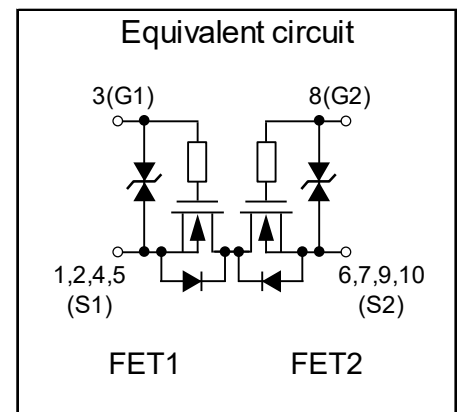
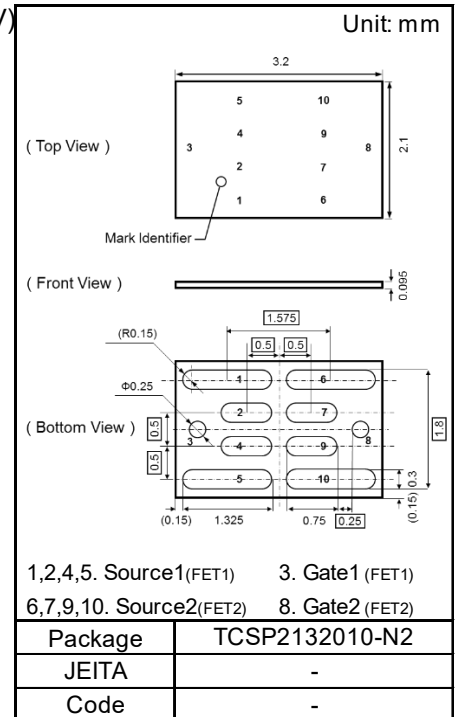
5. ABSOLUTE MAXIMUM RATINGS $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Source-source Voltage	VSS	23	V
Gate-source Voltage	VGS	± 12	V
Source Current	DC	IS1 *1	13
		IS2 *2	23.4
		IS3 *3	31.8
	Pulsed *4	ISp	130
Total Power Dissipation	DC	PD1 *1	0.59
		PD2 *2	1.9
		PD3 *3	3.5
Channel Temperature	Tch	150	$^\circ\text{C}$
Storage Temperature Range	Tstg	-55 to +150	$^\circ\text{C}$

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

Parameter	Symbol	Rating	Unit
Thermal Resistance (ch-a)	Rth *1	212	$^\circ\text{C} / \text{W}$
	Rth *2	66	
	Rth *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 (42 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 (605 mm² area, 36 μm thickness).
 - *3 Mounted on ceramic board (70 mm x 70 mm x t1.0 mm).
 - *4 $t = 10 \text{ }\mu\text{s}$, Duty Cycle $\leq 1 \%$



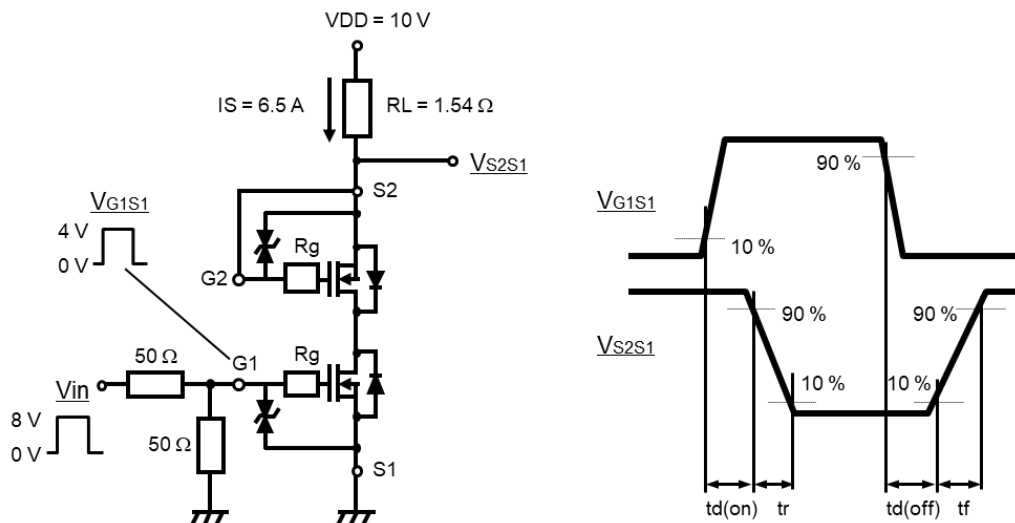
7. ELECTRICAL CHARACTERISTICS $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Source-source Breakdown Voltage	VSSS	$I_S = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	23			V
Zero Gate Voltage Source Current	ISSS	$V_{SS} = 23\text{ V}$, $V_{GS} = 0\text{ V}$			1.0	μA
Gate-source Leakage Current	IGSS1	$V_{GS} = \pm 8\text{ V}$, $V_{SS} = 0\text{ V}$			± 10	μA
	IGSS2	$V_{GS} = \pm 5\text{ V}$, $V_{SS} = 0\text{ V}$			± 1.0	
Gate-source Threshold Voltage	V_{th}	$I_S = 1.33\text{ mA}$, $V_{SS} = 6\text{ V}$	0.35	0.90	1.40	V
Source-source On-state Resistance	RSS(on)1	$I_S = 6.5\text{ A}$, $V_{GS} = 4.5\text{ V}$	1.80	2.45	3.20	$\text{m}\Omega$
	RSS(on)2	$I_S = 6.5\text{ A}$, $V_{GS} = 3.8\text{ V}$	1.90	2.65	3.45	
	RSS(on)3	$I_S = 6.5\text{ A}$, $V_{GS} = 3.1\text{ V}$	2.05	3.00	4.50	
	RSS(on)4	$I_S = 6.5\text{ A}$, $V_{GS} = 2.5\text{ V}$	2.30	3.85	7.60	
Body Diode Forward Voltage	$V_{F(s-s)}$	$I_F = 6.5\text{ A}$, $V_{GS} = 0\text{ V}$		0.6	1.0	V
Input Capacitance *1	Ciss	$V_{SS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ kHz}$		4770		pF
Output Capacitance *1	Coss			460		
Reverse Transfer Capacitance *1	Crss			400		
Turn-on Delay Time *1,*2	$t_{d(on)}$	$V_{DD} = 10\text{ V}$, $V_{GS} = 0\text{ to }4\text{ V}$ $I_S = 6.5\text{ A}$		1.4		μs
Rise Time *1,*2	t_r			2.8		
Turn-off Delay Time *1,*2	$t_{d(off)}$	$V_{DD} = 6\text{ V}$, $V_{GS} = 4\text{ to }0\text{ V}$ $I_S = 6.5\text{ A}$		5.8		μs
Fall Time *1,*2	t_f			4.0		
Total Gate Charge *1	Qg	$V_{DD} = 6\text{ V}$ $V_{GS} = 0\text{ to }4\text{ V}$ $I_S = 13\text{ A}$		36		nC
Gate-source Charge *1	Qgs			18		
Gate-drain Charge *1	Qgd			12		
Gate Resistance *1	Rg	$f = 10\text{ kHz}$	400	700	1000	Ω

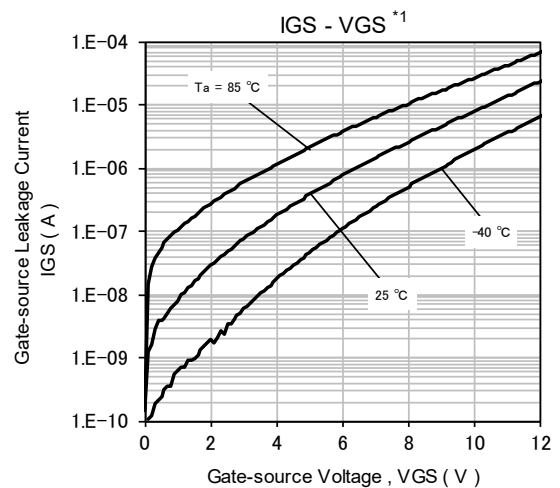
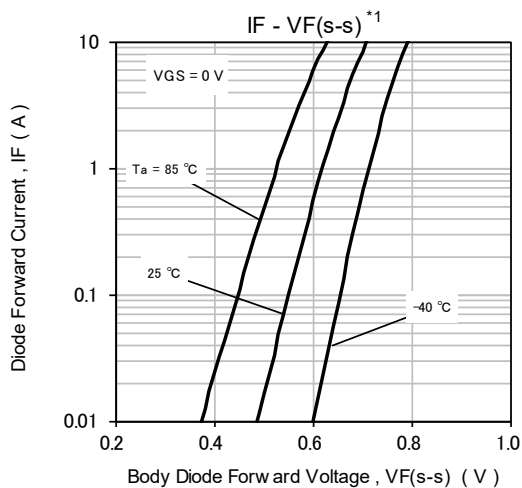
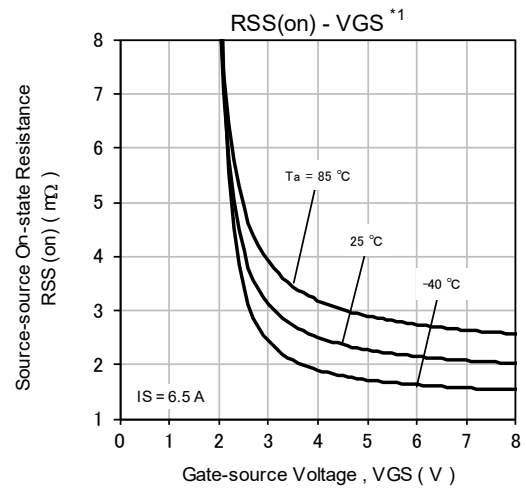
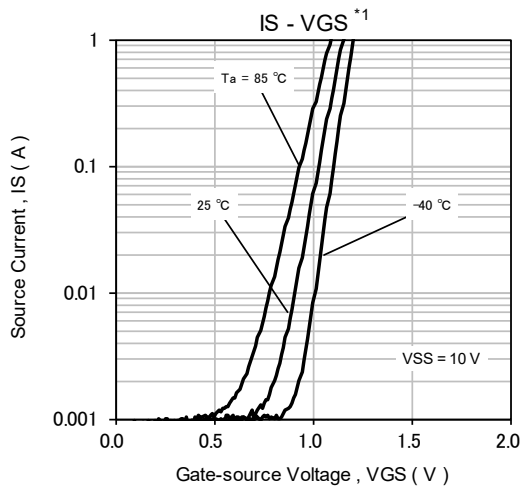
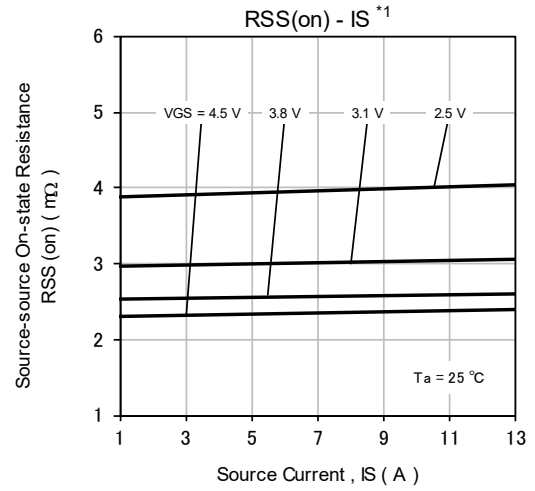
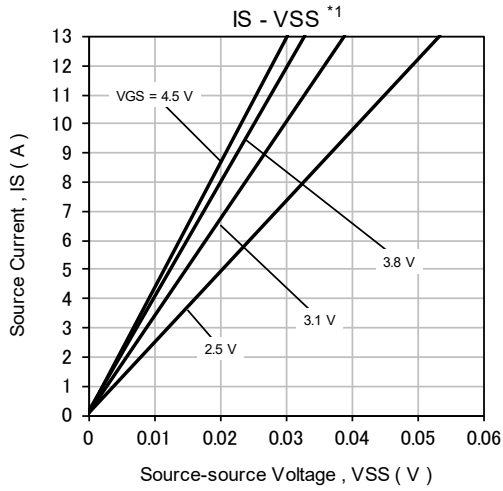
Note Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.

*1 Guaranteed by design, not subject to production testing

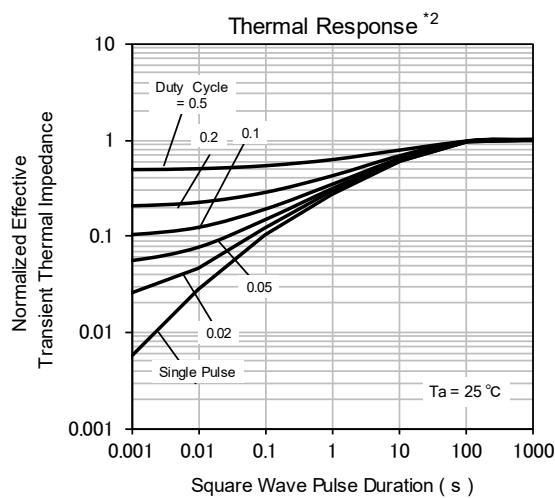
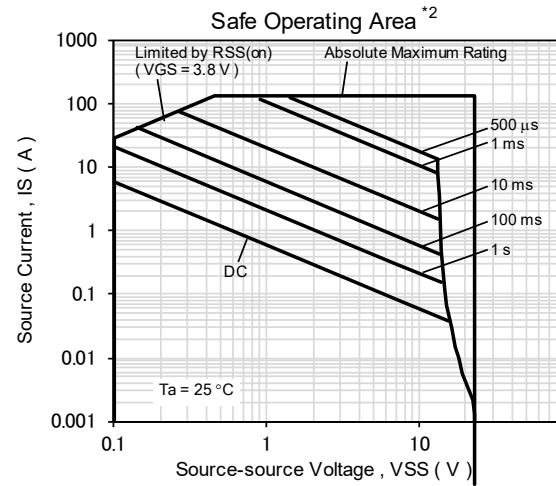
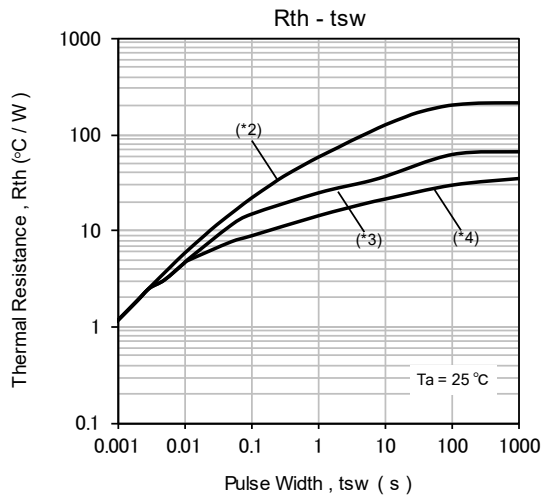
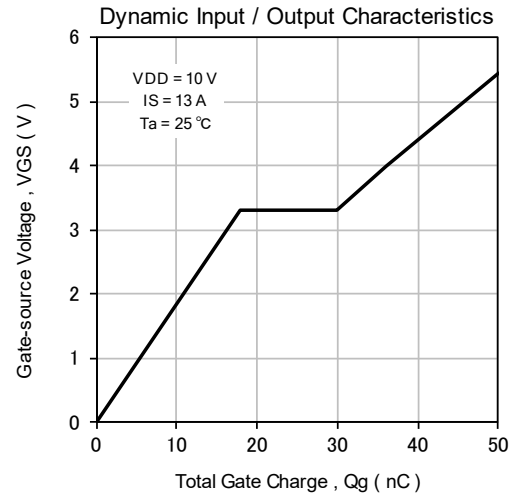
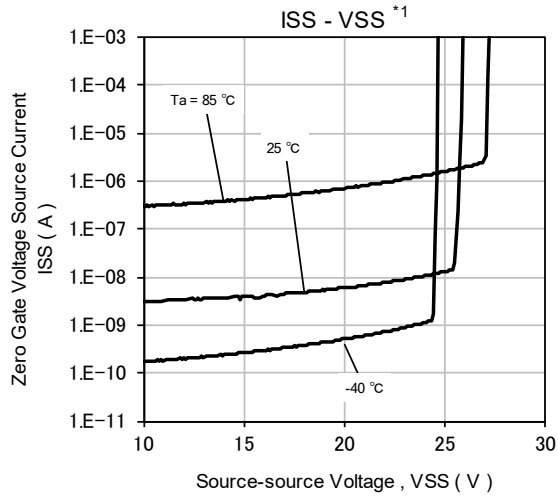
*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time



8. TECHNICAL DATA (Reference)



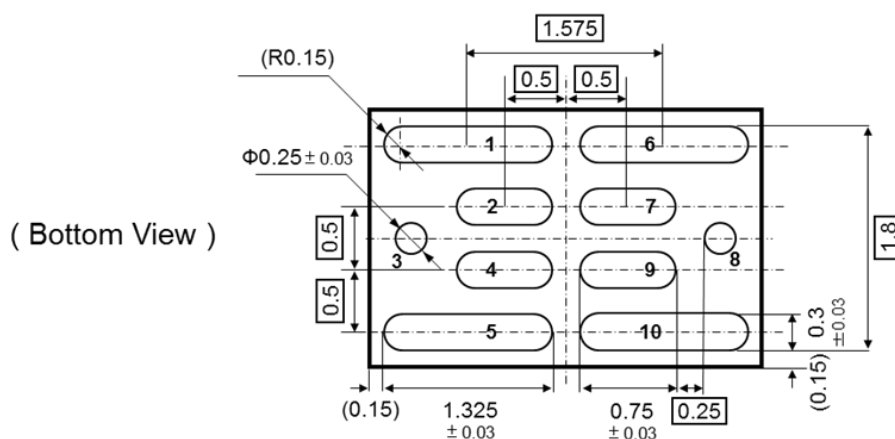
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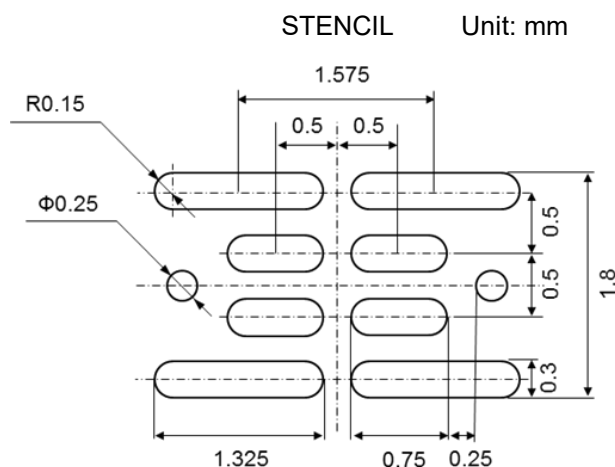
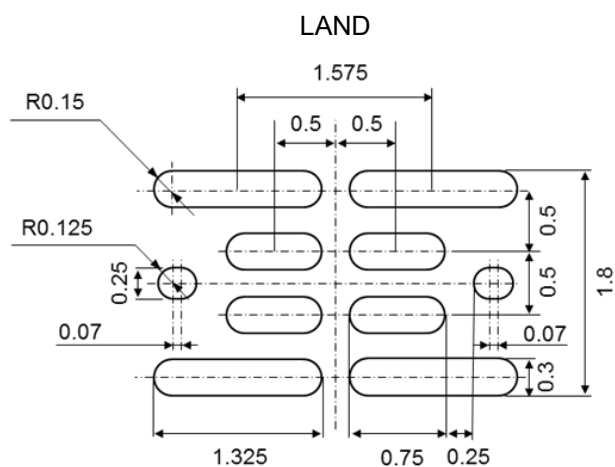
Note

- *1 Pulse measurement.
- *2 Mounted on FR4 board (25.4 mm × 25.4 mm × t1.0 mm).
FR4 board partially covered with copper pad
(42 mm² area, 36 µm thickness).
- *3 Mounted on FR4 board (25.4 mm × 25.4 mm × t1.0 mm).
FR4 board fully covered with copper pad
(605 mm² area, 36 µm thickness).
- *4 Mounted on Ceramic board (70 mm × 70 mm × t1.0 mm).

Unit: mm



10. LAND & STENCIL PATTERN (Reference)



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.

11. REVISION HISTORY

Date	Revision	Description
2021.2.3	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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