

Single P-channel MOSFET

KFJ9B0438ZL

Datasheet

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1. GENERAL DESCRIPTION

Single P-channel MOSFET for automotive.

2. FEATURES

- Drain-source On-state Resistance: $R_{DS(on)}$ typ = 20 m Ω ($V_{GS} = -10$ V)
- CSP (Chip Size Package)
- Halogen-free / RoHS compliant (EU RoHS / UL-94 V-0 / MSL: Level 1)
- AEC-Q101 Qualified

3. MARKING SYMBOL: 5R

4. PACKAGING

Embossed type (Thermo-compression sealing): 10,000 pcs / reel (standard)

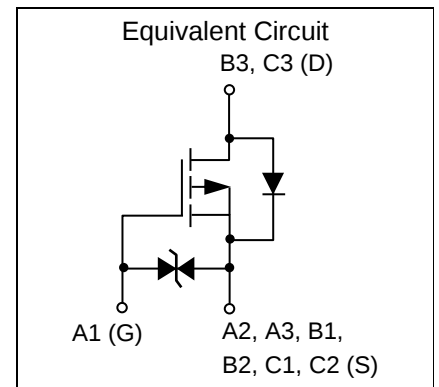
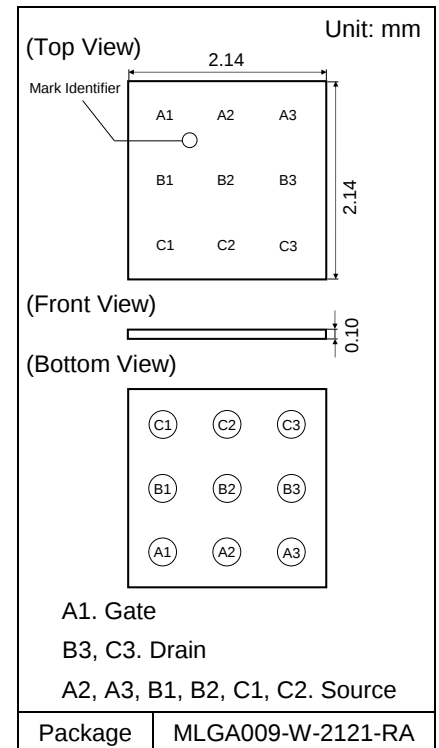
5. ABSOLUTE MAXIMUM RATINGS $T_a = 25^\circ\text{C}$

Parameter		Symbol	Rating	Unit
Drain-source Voltage		VDS	- 40	V
Gate-source Voltage		VGS	- 20 / + 10	V
Drain Current	DC ^{*1}	ID1	- 5.2	A
	DC ^{*2}	ID2	- 7.8	
	DC ^{*3}	ID3	- 9.4	
	Pulsed ^{*4}	IDp	- 62.4	
Total Power Dissipation	DC ^{*1}	PD1	0.71	W
	DC ^{*2}	PD2	1.60	
	DC ^{*3}	PD3	2.31	
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}	175	$^\circ\text{C} / \text{W}$
	Rth2 ^{*2}	79	
	Rth3 ^{*3}	54	

- Note
- *1 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm).
FR4 board partially covered with copper pad (79.2 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 (616 mm² area, 36 μm thickness).
 - *3 Mounted on ceramic board (70 mm x 70 mm x t1.0 mm).
 - *4 $t = 10$ μs , Duty Cycle $\leq 1\%$.



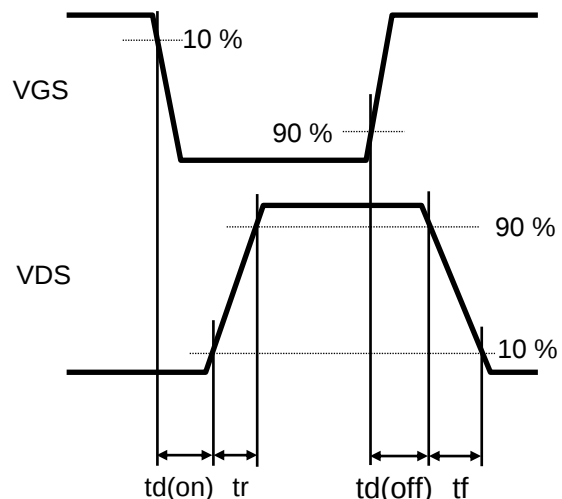
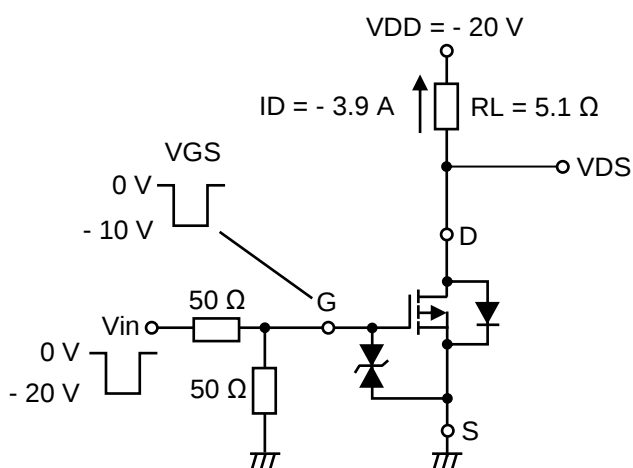
7. ELECTRICAL CHARACTERISTICS $T_a = 25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-source Breakdown Voltage	VDSS	ID = - 1 mA, VGS = 0 V	- 40			V
Zero Gate Voltage Drain Current	IDSS	VDS = - 40 V, VGS = 0 V			- 1	μA
Gate-source Leakage Current	IGSS	VGS = - 16 V, VDS = 0 V			- 10	μA
		VGS = + 8 V, VDS = 0 V			10	
Gate-source Threshold Voltage	Vth	ID = - 12.9 mA, VDS = - 10 V	- 1	- 2	- 3	V
Drain-source On-state Resistance	RDS(on)1	ID = - 2 A, VGS = - 10 V	14	20	26	m Ω
	RDS(on)2	ID = - 2 A, VGS = - 4.5 V	16	23	38	
Body Diode Forward Voltage	VF(s-d)	IF = - 2 A, VGS = 0 V		- 0.77	- 1.2	V
Input Capacitance ^{*1}	Ciss	VDS = - 20 V, VGS = 0 V f = 1 MHz		3500		pF
Output Capacitance ^{*1}	Coss			220		
Reverse Transfer Capacitance ^{*1}	Crss			200		
Turn-on Delay Time ^{*1, *2}	td(on)	VDD = - 20 V, VGS = 0 to - 10 V		22		ns
Rise Time ^{*1, *2}	tr	ID = - 3.9 A		35		
Turn-off Delay Time ^{*1, *2}	td(off)	VDD = - 20 V, VGS = - 10 to 0 V		250		
Fall Time ^{*1, *2}	tf	ID = - 3.9 A		100		
Total Gate Charge ^{*1}	Qg1	VDD = - 20 V, VGS = - 4.5 V ID = - 7.8 A		30		nC
	Qg2	VDD = - 20 V, VGS = - 10 V ID = - 7.8 A		60		
Gate-source Charge ^{*1}	Qgs			10		
Gate-drain Charge ^{*1}	Qgd			12		

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

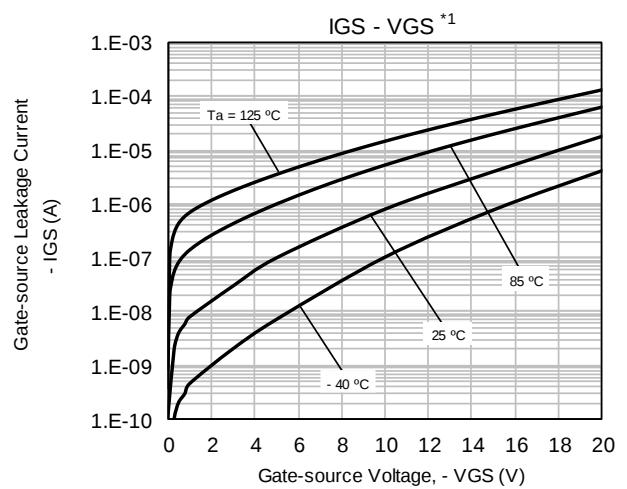
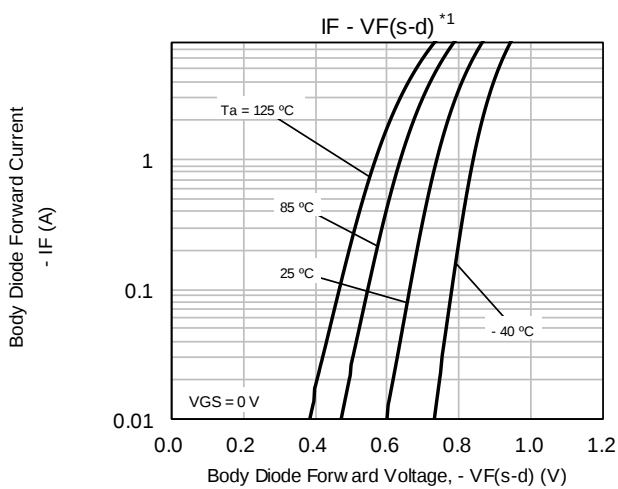
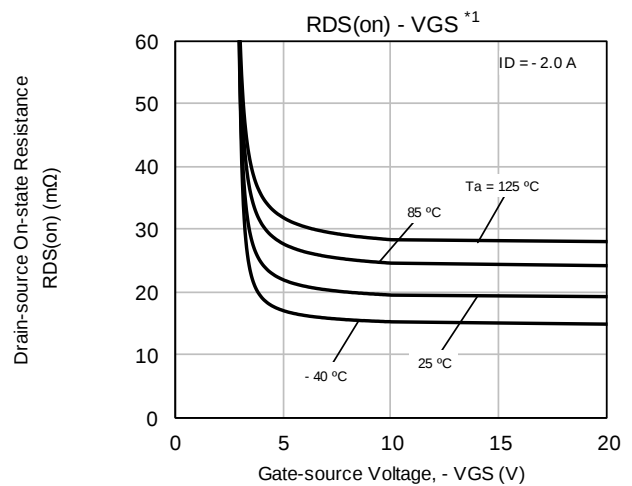
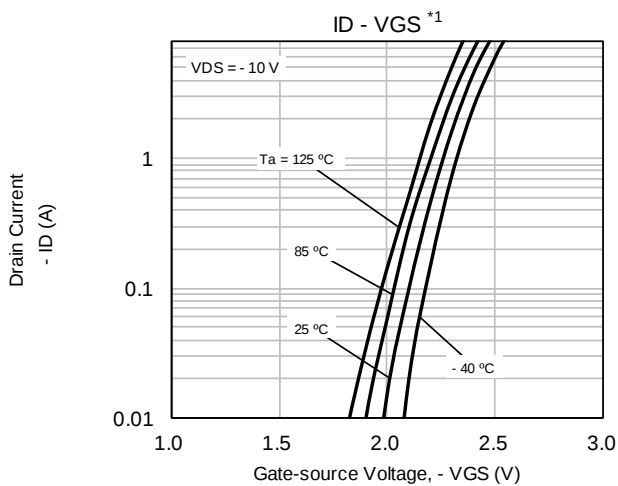
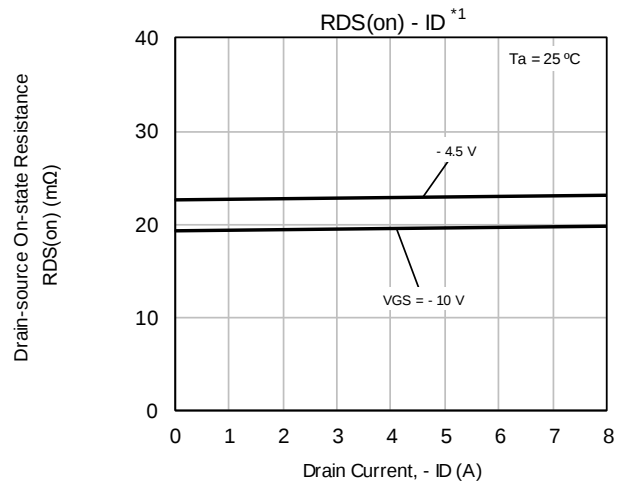
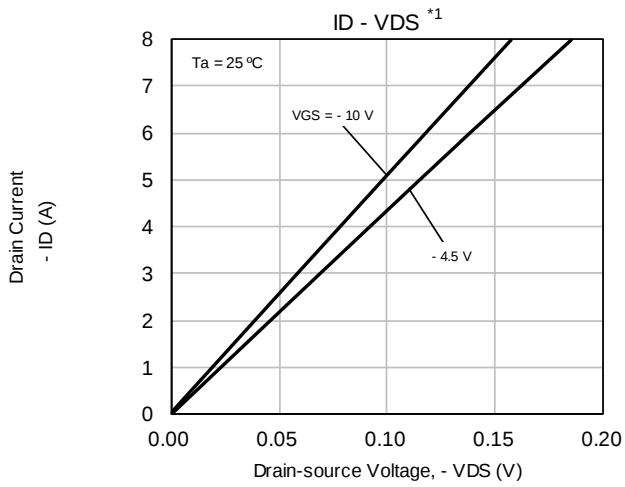
^{*1} Guaranteed by design, not subject to production testing.

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

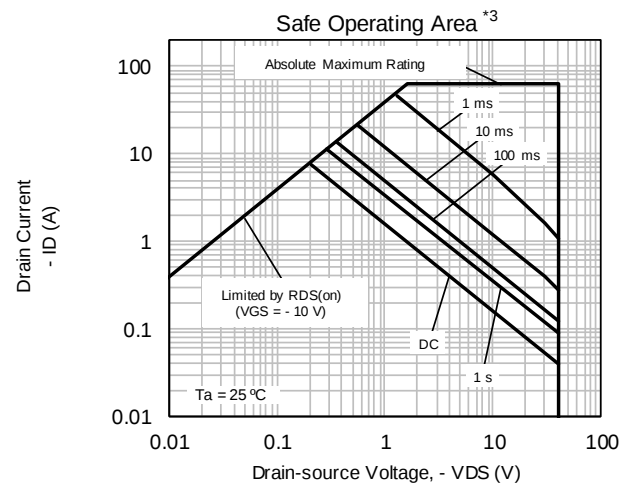
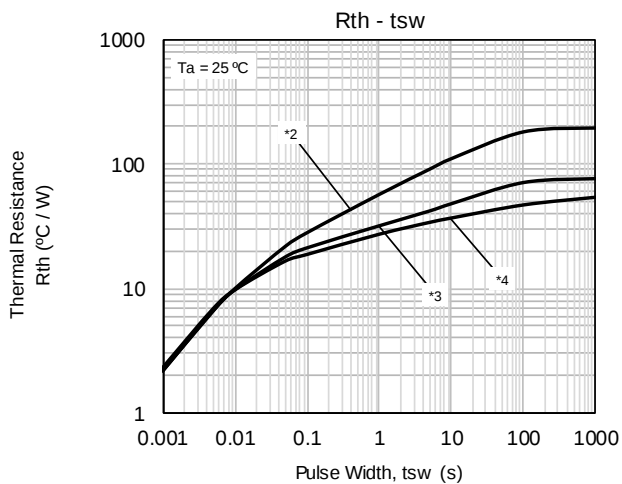
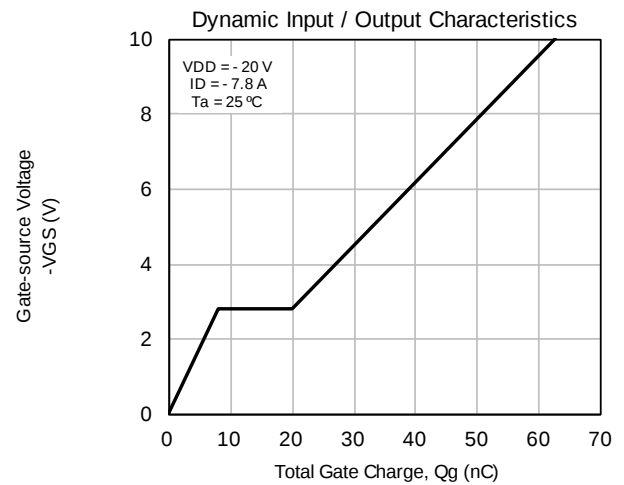
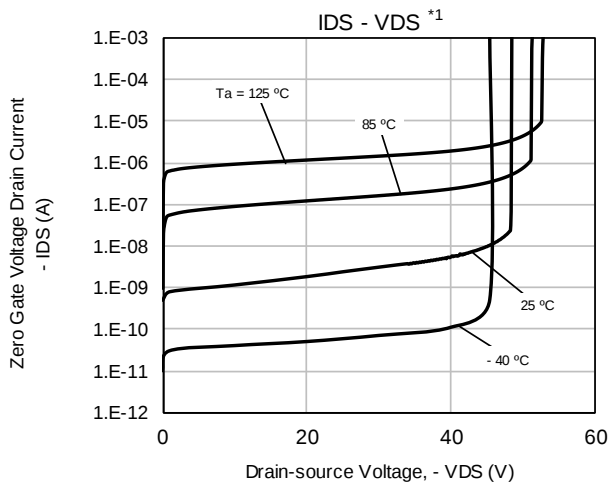
8. ELECTROSTATIC DISCHARGE CHARACTERISTIC $T_a = 25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Standard	Test Type	Symbol	Conditions	Class	Value	Unit
AEC-Q101-001	Human Body Model	HBM	C = 100 pF, R = 1.5 k Ω	H2	> 2 to $\leq$ 4	kV

9. TECHNICAL DATA (Reference)



TECHNICAL DATA (Reference)



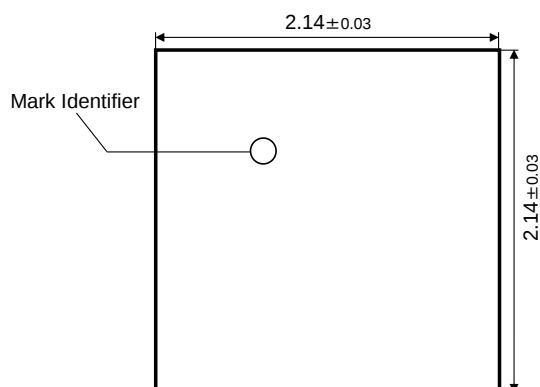
Note

- *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 (79.2 mm² area, 36 μ m thickness).
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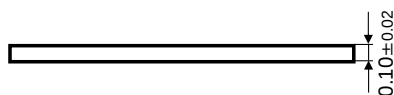
10. OUTLINE

(Top View)

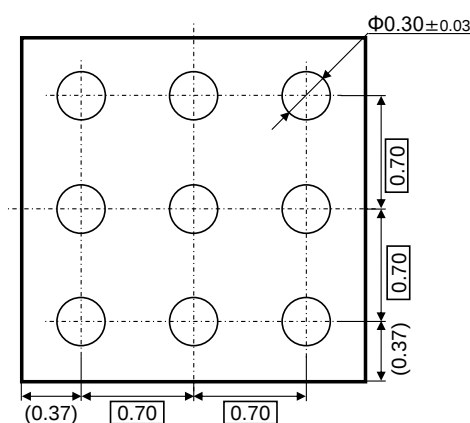
Unit: mm



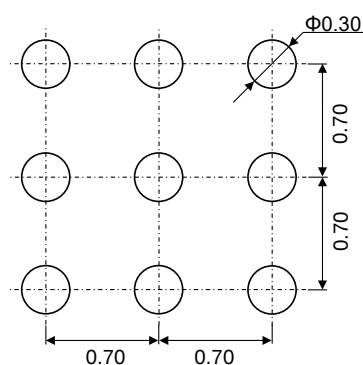
(Front View)



(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
2021.11.19	1.00	1. Initially issued.

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