

Dual N-channel Power MOSFET: 12V, 2.2mohm, 23A

Product Summary

VSSS	VGSS	RSS(ON) TYP/MAX	IS MAX ^{*2}
12V	± 8V	2.05/2.70 mΩ@VGS=4.5V 2.20/2.85 mΩ@VGS=3.8V 2.55/3.90 mΩ@VGS=3.1V 3.30/6.60 mΩ@VGS=2.5V	23A

Marking Symbol Code

- ❖ Laser Marking Device Code: G



GS : Gostone
G : Marking Device Code (fixed)
F : Factory Code
F : Year Code
W : Week Code
L : LOT Code
● : Pin#1 Identifier

Form

- ❖ Tape & Reel Embossed Type: 5,000pcs / reel

Absolute Maximum Rating (Ta=25°C)

Parameter	Symbol	Rating	Unit
Source-source Voltage	VSS	12	V
Gate-source Voltage	VGS	±8	V
Source Current	DC ^{*1}	IS1	14.6
	DC ^{*2}	IS2	23.0
	DC ^{*3}	IS3	31.0
	Pulsed ^{*4}	ISp	146
Total Power Dissipation	DC ^{*1}	PD1	0.61
	DC ^{*2}	PD2	1.60
	DC ^{*3}	PD3	2.80
Channel Temperature	Tch	150	°C
Storage Temperature Range	Tstg	-55 to +150	°C

Thermal Characteristic (Ta=25°C)

Parameter	Symbol	Rating	Unit
Thermal Resistance (ch-a)	Rth1 ^{*1}	205	°C / W
	Rth2 ^{*2}	79	
	Rth3 ^{*3}	45	

- Note
- *1 Mounted on FR4 board (25.4 mm x 25.4 mm x t1.0 mm).
FR4 board partially covered with copper pad (60 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 (611 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 ≤ 1 %.

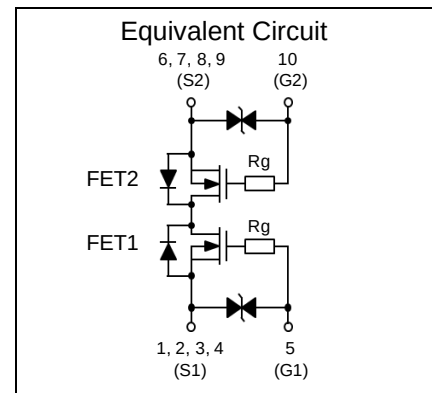
Features

- ❖ CSP (Chip Size Package)
- ❖ Halogen-Free / RoHS Compliant
- ❖ 2.5V Drive Low Source-Source On-State Resistance
- ❖ Gate Resistor Installed Common-Drain Type MOSFET
- ❖ ESD Protection Diode Installed (Gate-Source)

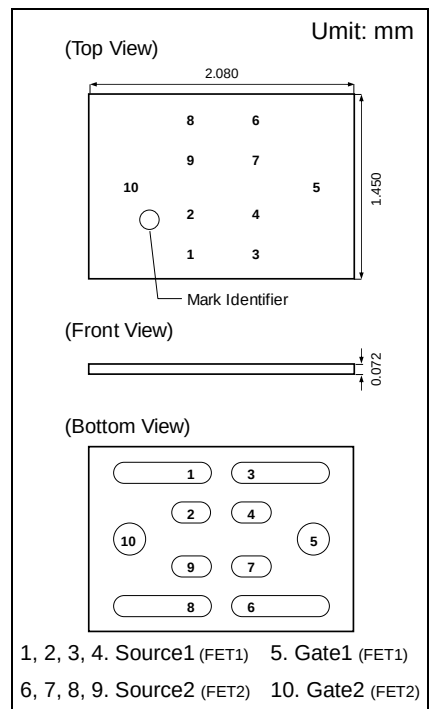
Application

- ❖ Lithium-Ion Secondary Battery Protection Circuits

Equivalent circuit



Pin Assignment



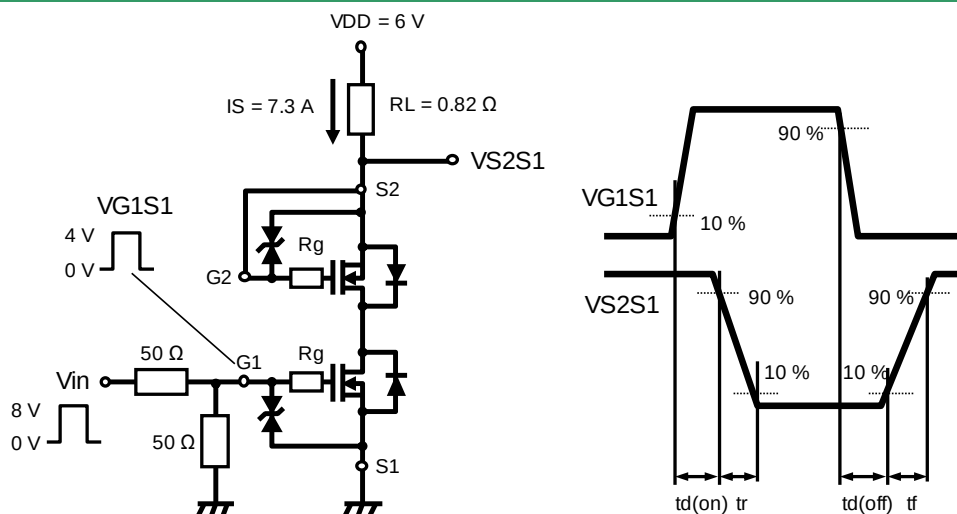
Electrical characteristics (Ta=25°C ± 3°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Source-source Breakdown Voltage	VSSS	IS = 1 mA, VGS = 0 V	12			V
Zero Gate Voltage Source Current	ISSS	VSS = 12 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 = 0.46 mA, VSS = 6 V	0.35	0.90	1.40	V
Source-source On-state Resistance	RSS(on)1	IS = 7.3 A, VGS = 4.5 V	1.50	2.05	2.70	mΩ
	RSS(on)2	IS = 7.3 A, VGS = 3.8 V	1.60	2.20	2.85	
	RSS(on)3	IS = 7.3 A, VGS = 3.1 V	1.75	2.55	3.90	
	RSS(on)4	IS = 7.3 A, VGS = 2.5 V	2.00	3.30	6.60	
Body Diode Forward Voltage	VF(s-s)	IF = 7.3 A, VGS = 0 V		0.71	1.00	V
Input Capacitance *1	Ciss	VSS = 10 V, VGS = 0 V, f = 1 kHz		3490		pF
Output Capacitance *1	Coss			425		
Reverse Transfer Capacitance *1	Crss			360		
Turn-on Delay Time *1,*2	td(on)	VDD = 6 V, VGS = 0 to 4 V		1.0		μs
Rise Time *1,*2	tr	IS = 7.3 A		1.6		
Turn-off Delay Time *1,*2	td(off)	VDD = 6 V, VGS = 4 to 0 V		6.1		μs
Fall Time *1,*2	tf	IS = 7.3 A		2.8		
Total Gate Charge *1	Qg	VDD = 6 V		32		nC
Gate-source Charge *1	Qgs	VGS = 0 to 4 V		7		
Gate-drain Charge *1	Qgd	IS = 14.6 A		6		
Gate Resistance *1	Rg	f = 1 MHz	400	700	1000	Ω

Note:

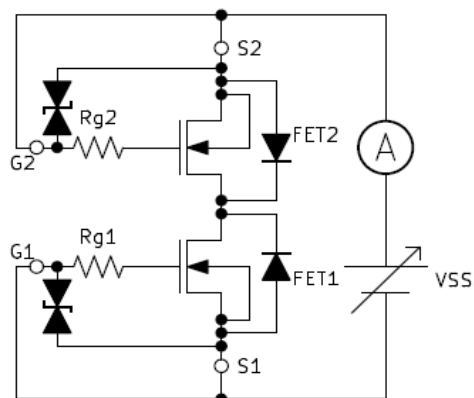
*1 Guaranteed by design, not subject to production testing.

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

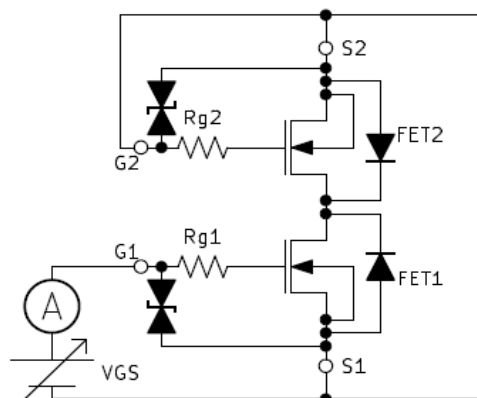
FET1 Measurement Circuit for Switching Characteristics td(on), tr, td(off), tf (FET2: Gate-Source Short)


□ Test circuits for FET1

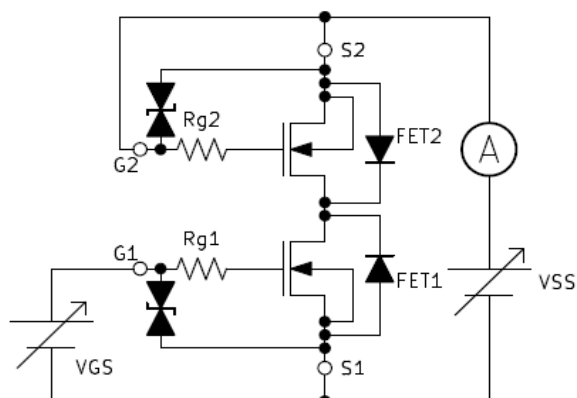
Test Circuit 1
 V_{SS}/I_{SS}



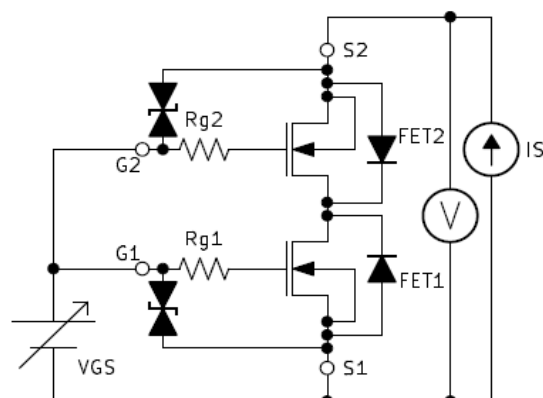
Test Circuit 2
 $I_{GSS1/2}$



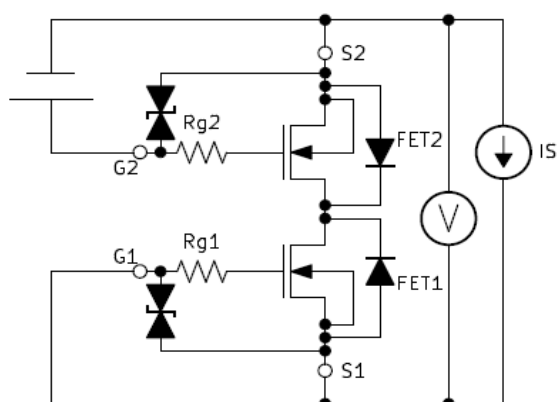
Test Circuit 3
 V_{th}



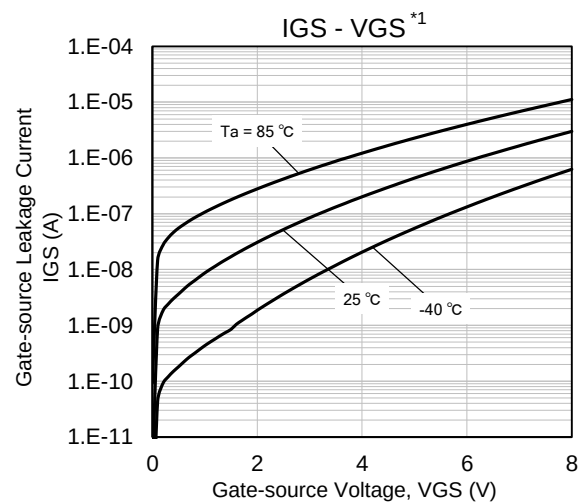
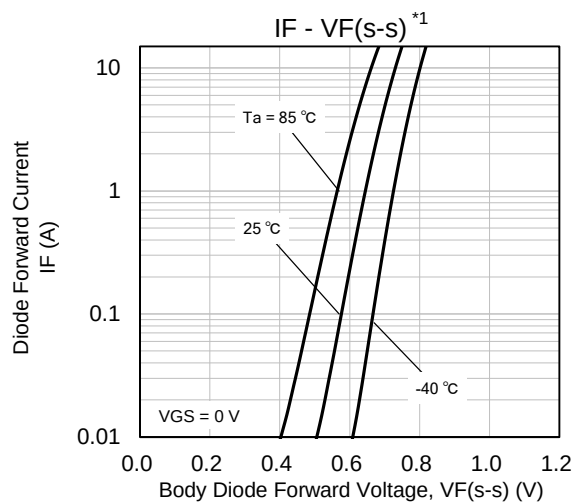
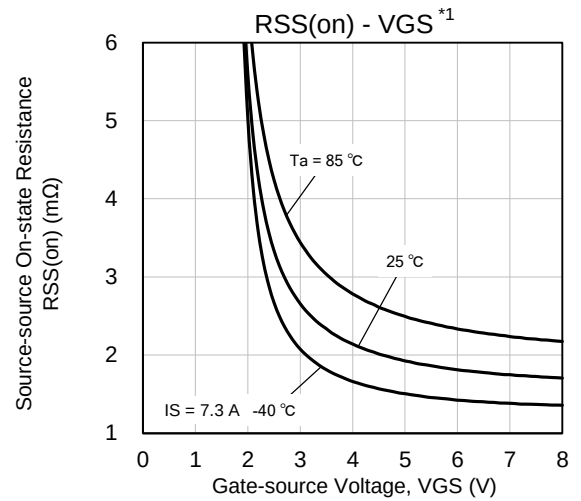
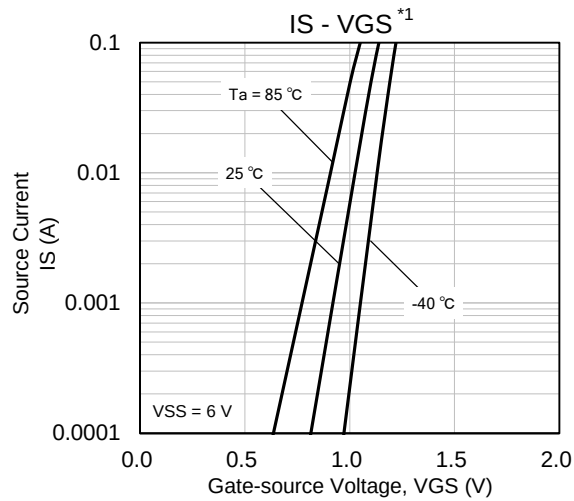
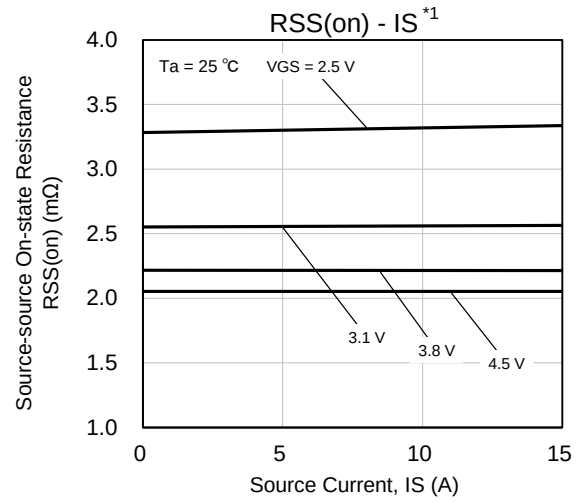
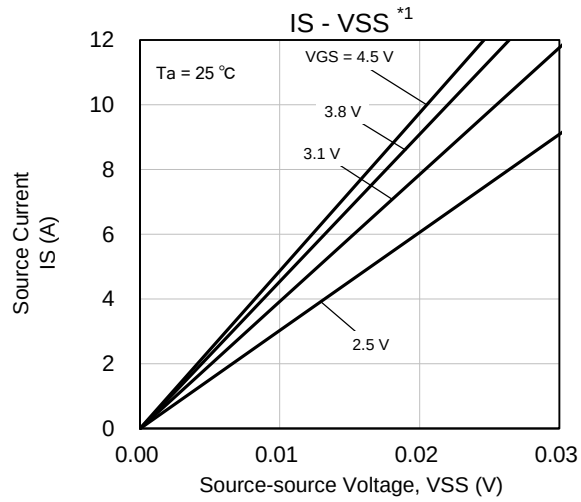
Test Circuit 4
 $R_{SS(on)}$



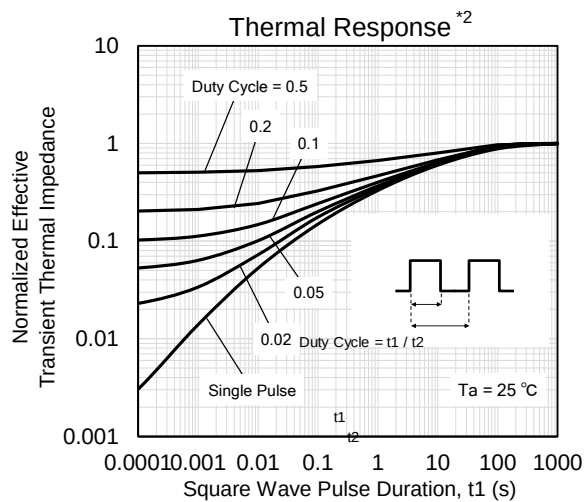
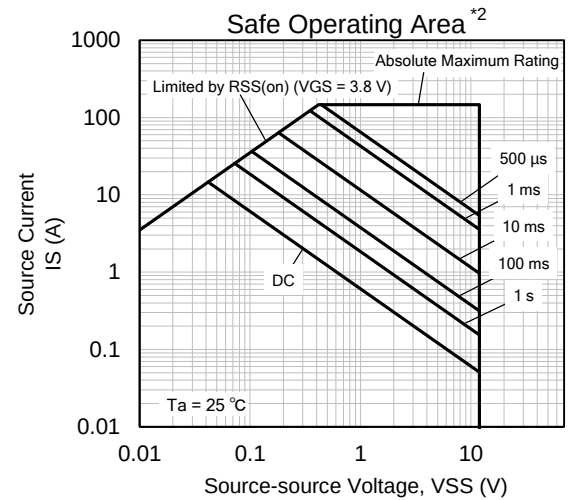
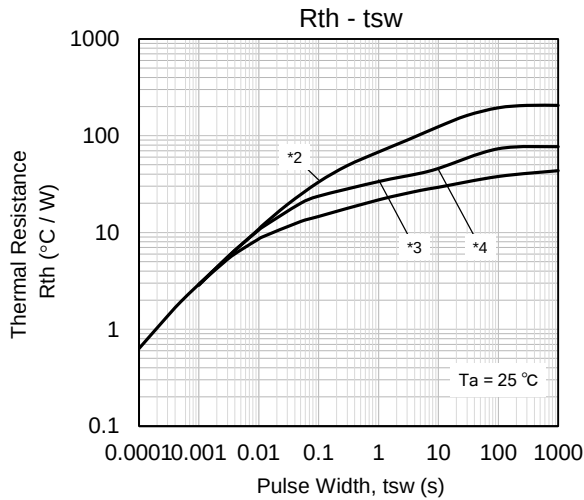
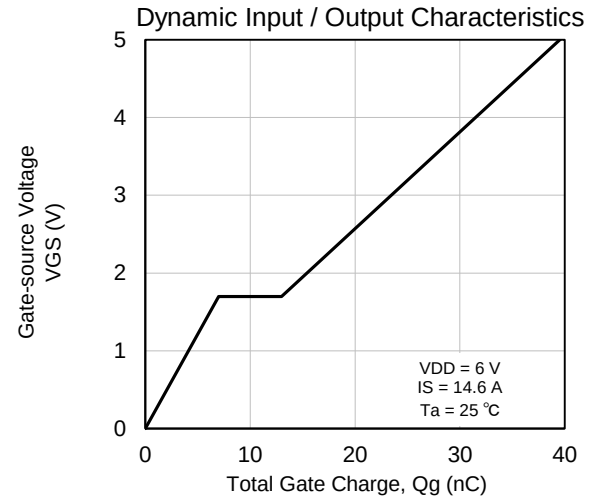
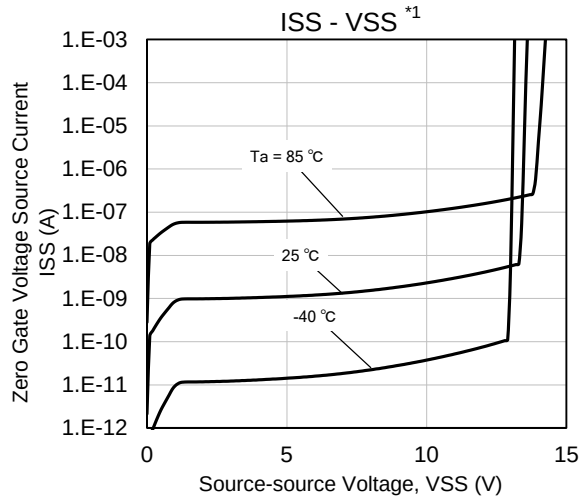
Test Circuit 5
 $V_F(S-S)$



□ Technical data



□ Technical data



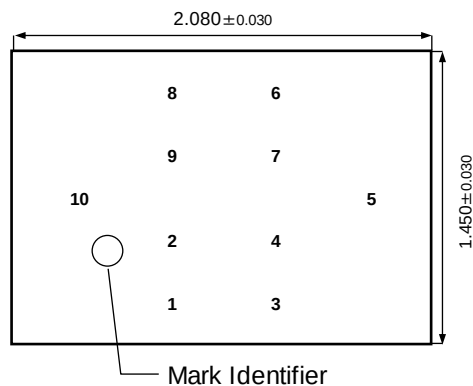
Note

- *1 Pulse measurement.
- *2 Mounted on FR4 board (25.4 mm × 25.4 mm × t1.0 mm).
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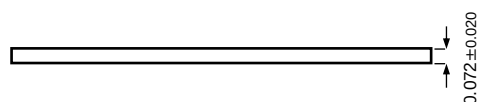
Package outline dimensions

(Top View)

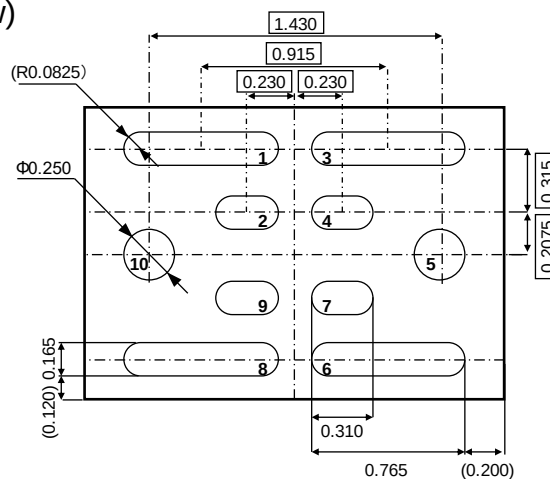
Unit: mm



(Front View)



(Bottom View)

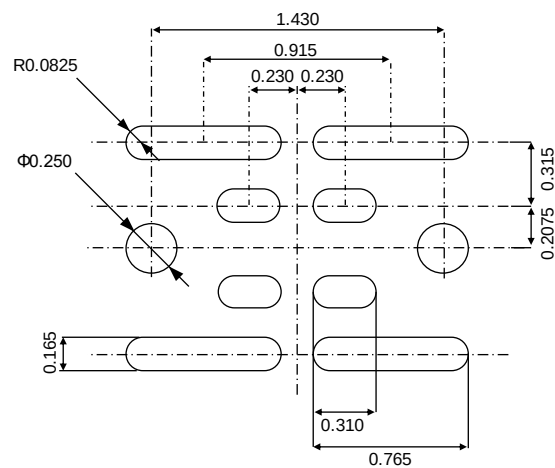
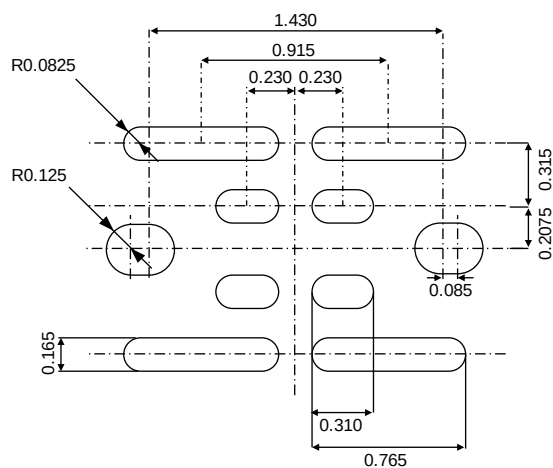


10. LAND & STENCIL PATTERN (Reference)

LAND

STENCIL

Unit: mm



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