

## **Notification about the transfer of the semiconductor business**

The semiconductor business of Panasonic Corporation was transferred on September 1, 2020 to Nuvoton Technology Corporation (hereinafter referred to as "Nuvoton"). Accordingly, Panasonic Semiconductor Solutions Co., Ltd. became under the umbrella of the Nuvoton Group, with the new name of Nuvoton Technology Corporation Japan (hereinafter referred to as "NTCJ").

In accordance with this transfer, semiconductor products will be handled as NTCJ-made products after September 1, 2020. However, such products will be continuously sold through Panasonic Corporation.

Publisher of this Document is NTCJ.

If you would find description "Panasonic" or "Panasonic semiconductor solutions", please replace it with NTCJ.

※ Except below description page

"Request for your special attention and precautions in using the technical information and semiconductors described in this book"

**Nuvoton Technology Corporation Japan**



# FC4B21080L

## Gate resistor installed Dual N-channel MOS FET

For lithium-ion secondary battery protection circuits

### ■ Features

- Low source-source ON resistance:  $R_{ss(on)}$  typ. = 27 mΩ (VGS = 4.5 V)
- CSP package: smallest & thinnest size
- RoHS compliant (EU RoHS / MSL: Level 1 compliant)

### ■ Marking Symbol: 12

### ■ Packaging

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

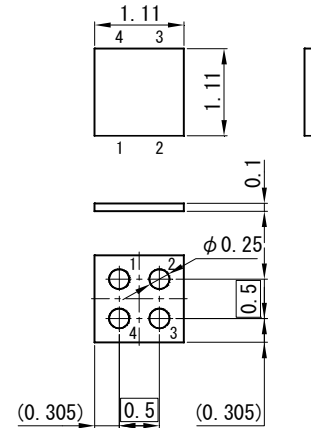
### ■ Absolute Maximum Ratings Ta = 25 °C

Parameter	Symbol	Rating	Unit
Source-source Voltage	VSS	12	V
Gate-source Voltage	VGS	±12	V
Source Current (DC) <sup>*1</sup>	IS	2.9	A
Source Current (Pulsed) <sup>*1,*2</sup>	ISp	29	A
Total Power Dissipation <sup>*1</sup>	PD	0.35	W
Channel Temperature	Tch	150	°C
Storage Temperature Range	Tstg	-55 to +150	°C
Thermal resistance (ch-a)	Rth(ch-a)	352	°C/W

Note <sup>\*1</sup> Mounted on FR4 board (25.4 mm × 25.4 mm × t1.0 mm)  
 using the minimum recommended pad size (Cu area = 47 mm<sup>2</sup> including traces).

<sup>\*2</sup> t = 10 μs, Duty Cycle ≤ 1 %

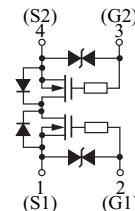
### ■ Package dimension Unit: mm



1. Source (FET1) 3. Gate (FET2)  
 2. Gate (FET1) 4. Source (FET2)

Panasonic	ULGA004-W-1212
JEITA	—
Code	—

### ■ Equivalent circuit, Pin name



1. Source (FET1) 3. Gate (FET2)  
 2. Gate (FET1) 4. Source (FET2)

■ Electrical Characteristics Ta = 25 °C ± 3 °C

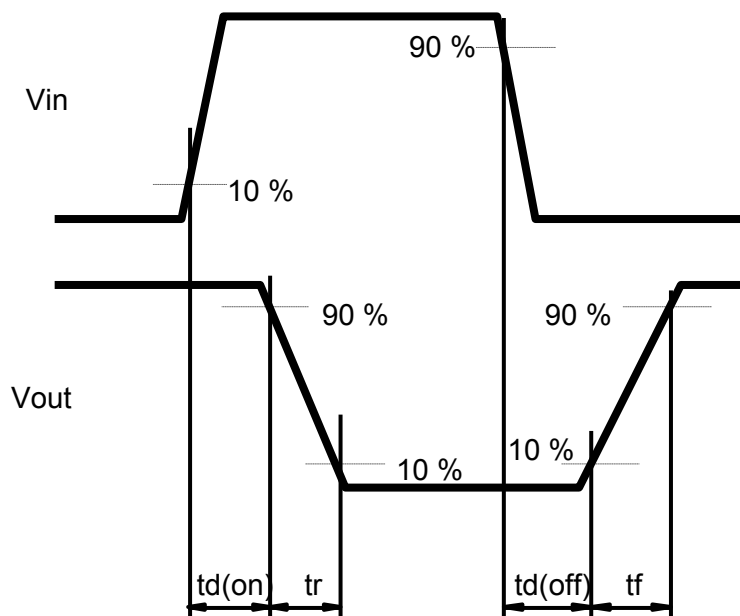
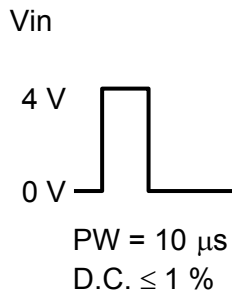
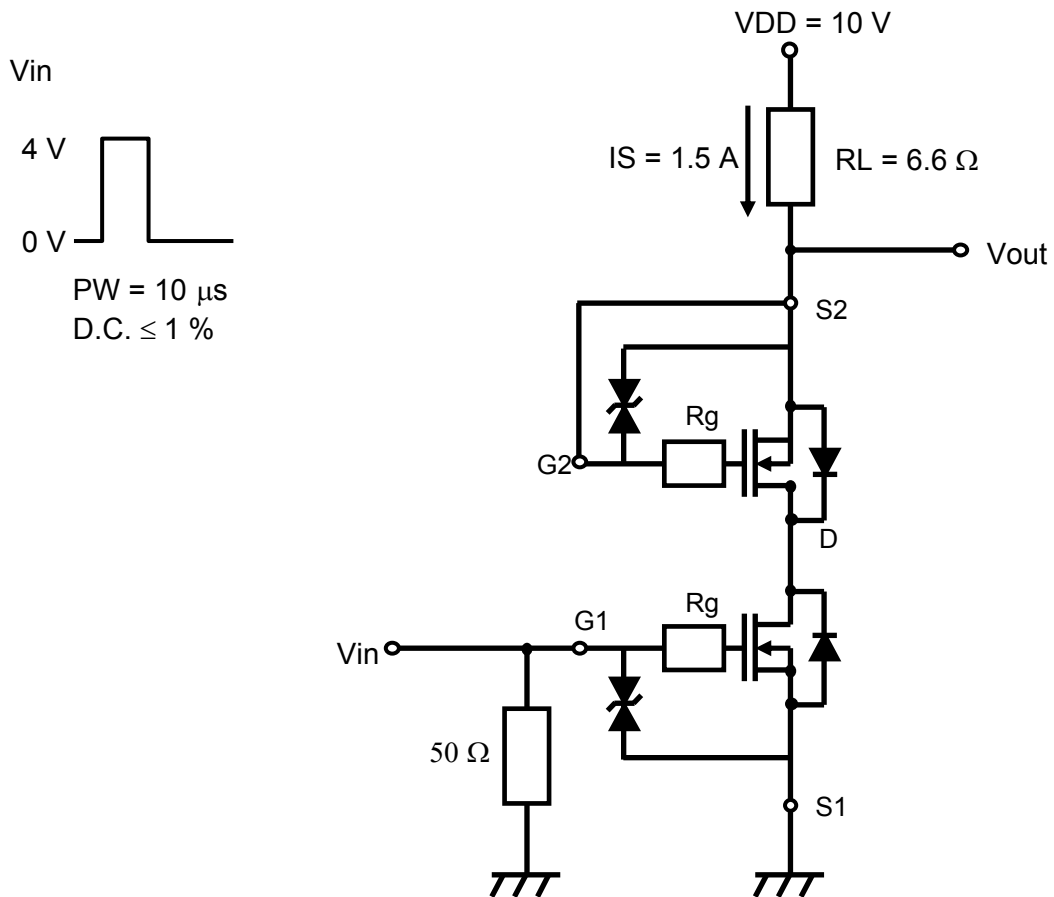
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Source-source Breakdown Voltage	VSSS	IS = 1 mA, VGS = 0 V	12			V
Zero Gate Voltage Source Current	ISSS	VSS = 12 V, VGS = 0 V			1.0	μA
Gate-source Leakage Current	IGSS	VGS = ±8 V, VSS = 0 V			±10	μA
		VGS = ±5 V, VSS = 0 V			±1.0	
Gate-source Threshold Voltage	Vth	IS = 1.0 mA, VSS = 10 V	0.4	0.85	1.4	V
Source-source On-state Resistance	RSS(on)1	IS = 1.5 A, VGS = 4.5 V	18	27	37	mΩ
	RSS(on)2	IS = 1.5 A, VGS = 3.8 V	21	30	41.5	
	RSS(on)3	IS = 1.5 A, VGS = 3.1 V	23	39	64	
	RSS(on)4	IS = 1.5 A, VGS = 2.5 V	30	60	100	
Input Capacitance <sup>*1</sup>	Ciss	VSS = 10 V, VGS = 0 V, f = 1 MHz		850		pF
Output Capacitance <sup>*1</sup>	Coss			205		
Reverse Transfer Capacitance <sup>*1</sup>	Crss			203		
Turn-on delay Time <sup>*1,*2</sup>	td(on)	VDD = 10 V, VGS = 0 to 4.0 V		0.6		μs
Rise Time <sup>*1,*2</sup>	tr	IS = 1.5 A		1.7		
Turn-off delay Time <sup>*1,*2</sup>	td(off)	VDD = 10 V, VGS = 4.0 to 0 V		2.6		μs
Fall Time <sup>*1,*2</sup>	tf	IS = 1.5 A		3.1		
Total Gate Charge <sup>*1</sup>	Qg	VDD = 10 V		7.1		nC
Gate-source Charge <sup>*1</sup>	Qgs	VGS = 0 to 4.0 V,		1.5		
Gate-drain Charge <sup>*1</sup>	Qgd	IS = 2.9 A		2.7		
Body Diode Forward Voltage	VF(s-s)	IF = 2.9 A, VGS = 0 V		0.8	1.2	V

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

\*1 Assured by design

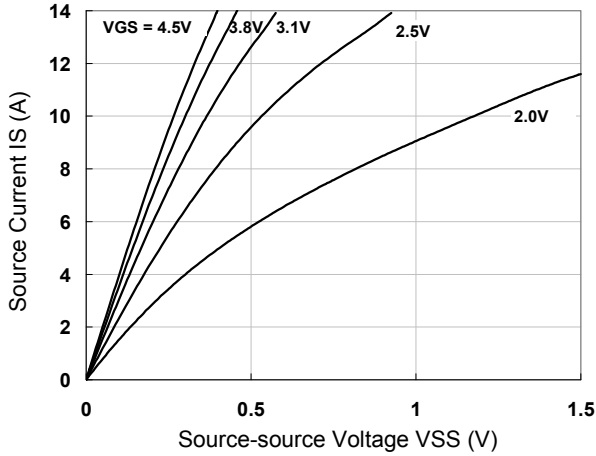
\*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time

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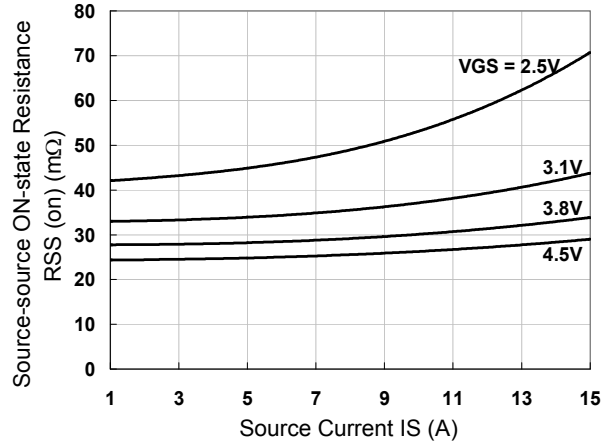


Technical Data ( reference )

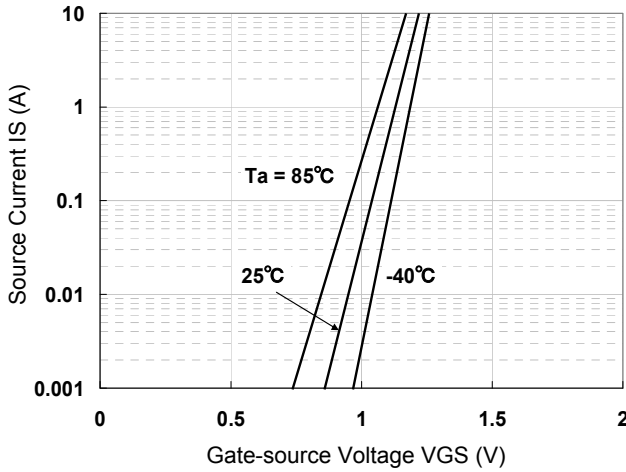
IS - VSS



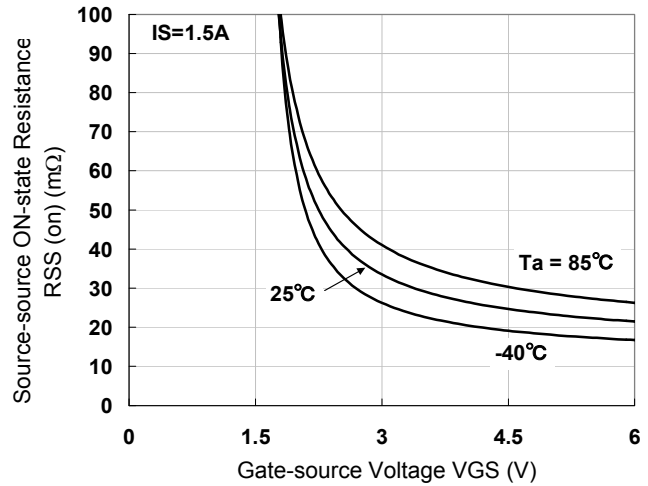
RDS(on) - ID



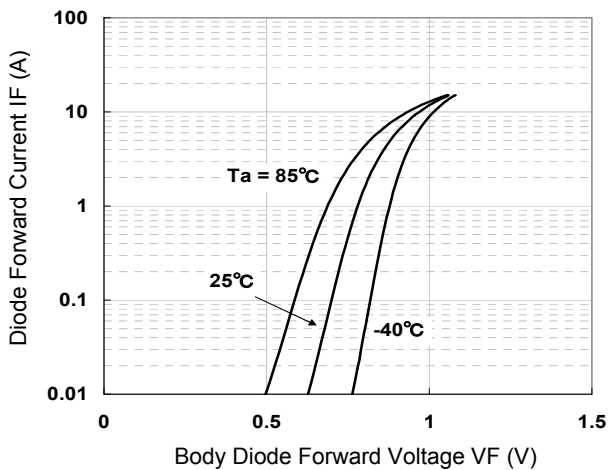
IS - VGS



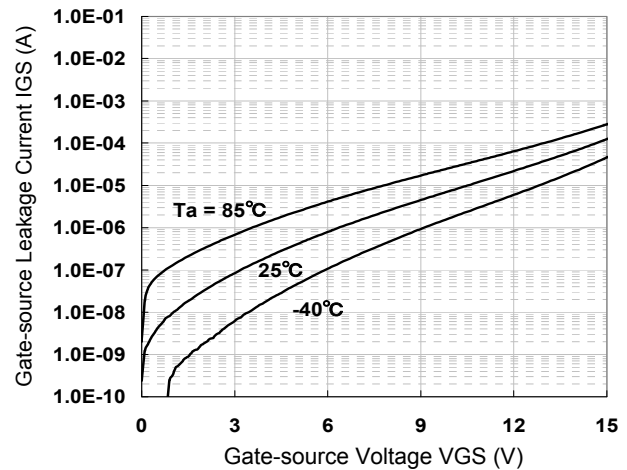
RDS(on) - VGS



IF - VF



IGS - VGS

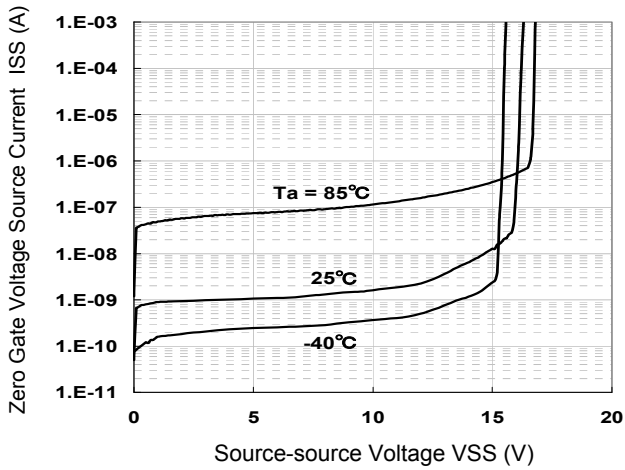




Technical Data ( reference )

ISSS - VSSS

Destruction Current

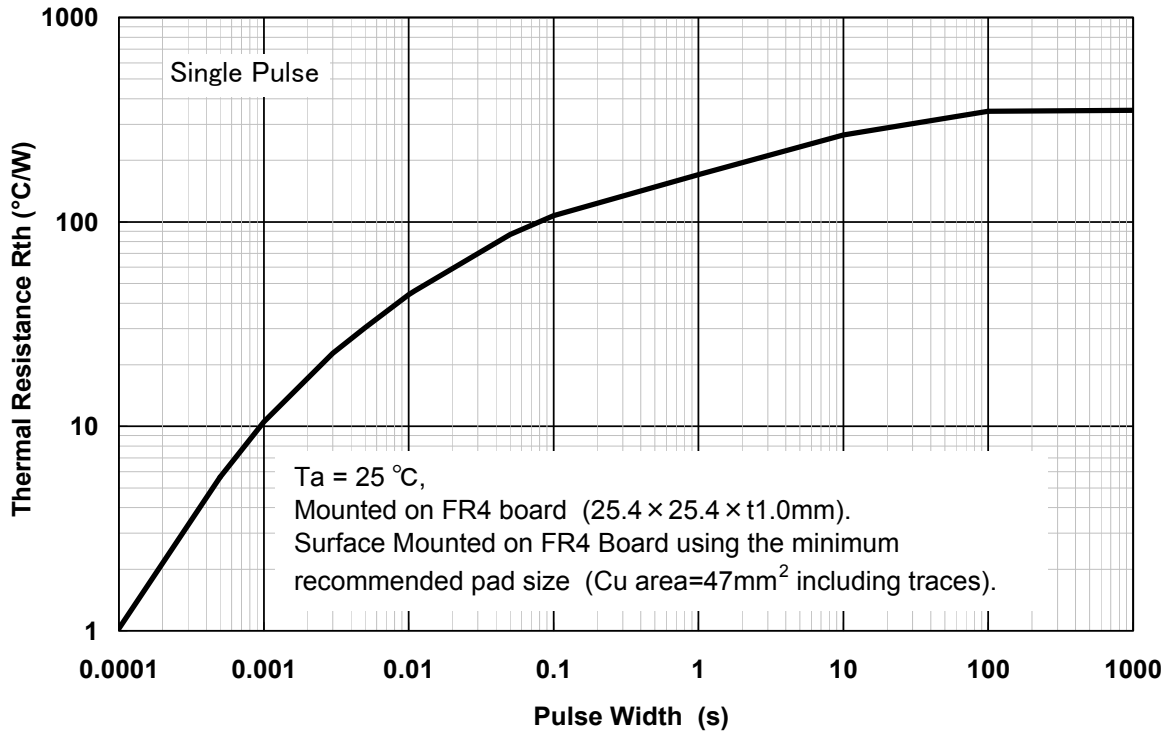


Parameter	Conditions	Result
Operation Test *1	VGS = 3.8 V, IS = 12 A, t = 3 ms	PASS
	VGS = 3.8 V, IS = 4.5 A, t = 11 ms	PASS
Destruction Current *1	VGS = 3.8 V, t = 3 ms	31 A
	VGS = 3.8 V, t = 11 ms	16 A

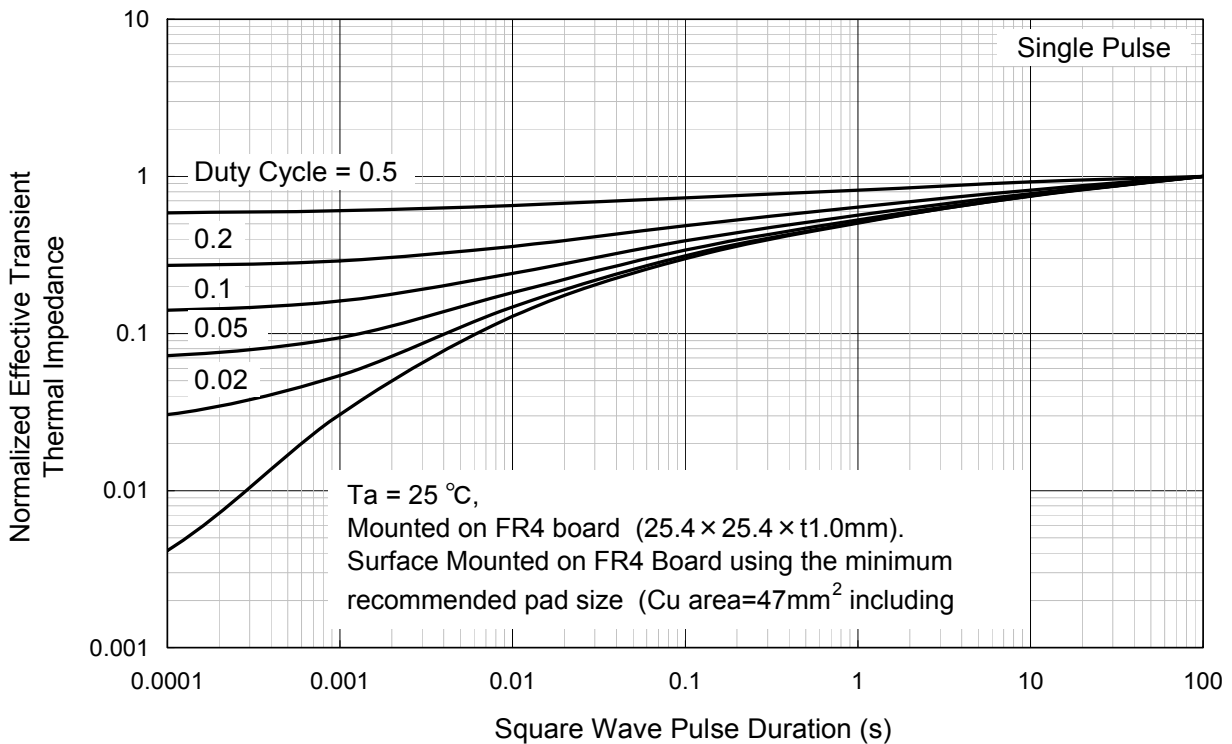
Ta = 25 °C,  
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 (Cu area = 47 mm<sup>2</sup> including traces).

Technical Data ( reference )

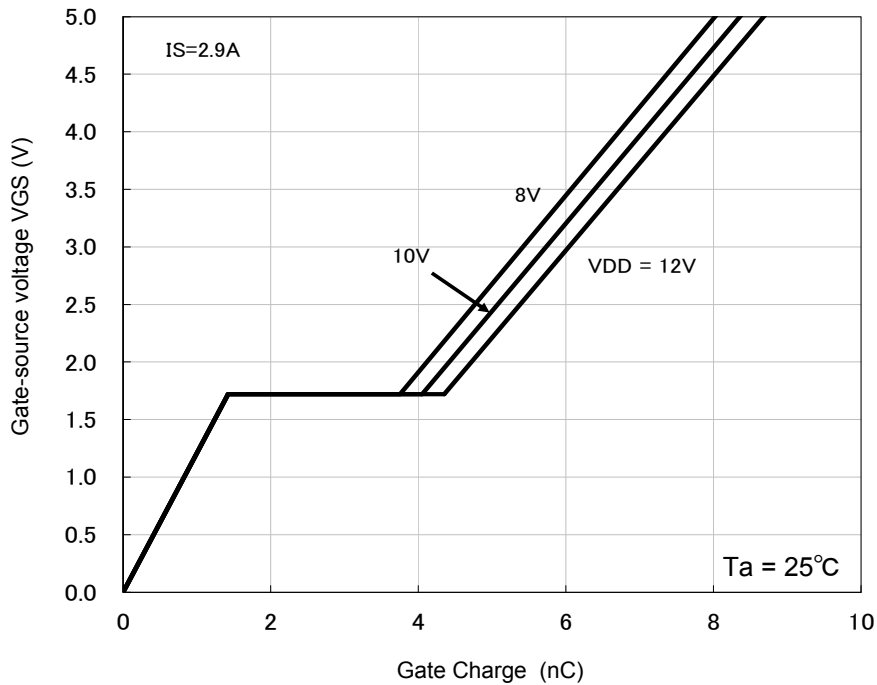
Rth - tsw



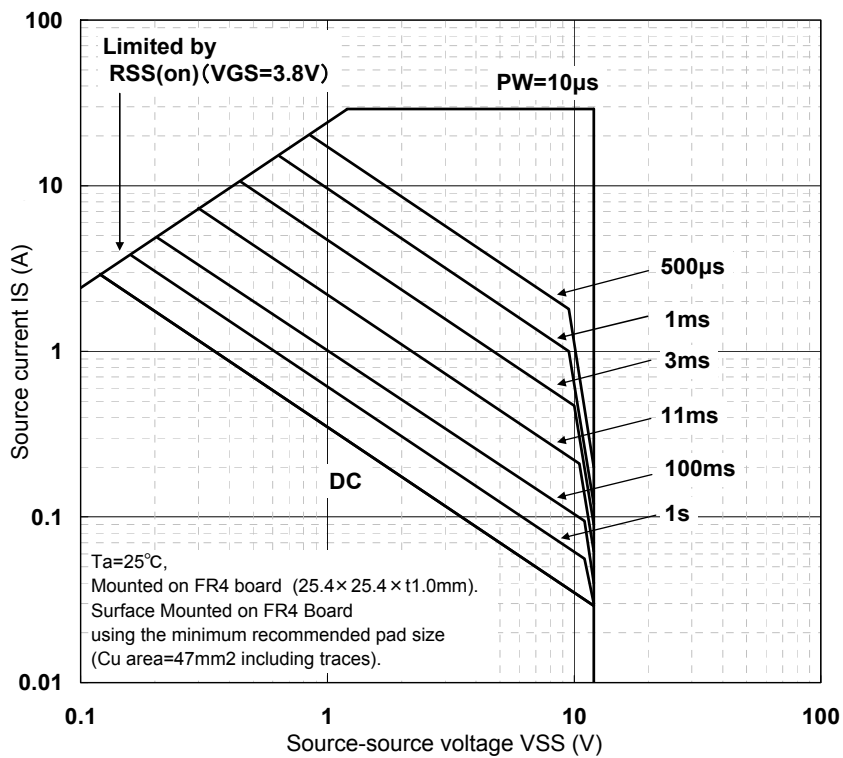
Thermal Response



Technical Data ( reference )  
 Dynamic Input/Output Characteristics



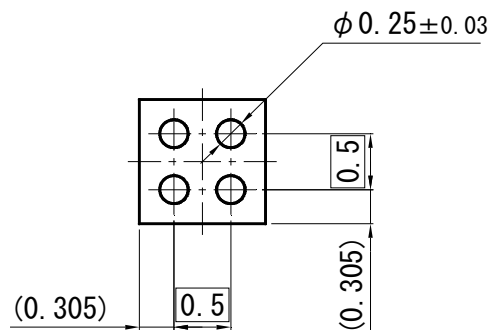
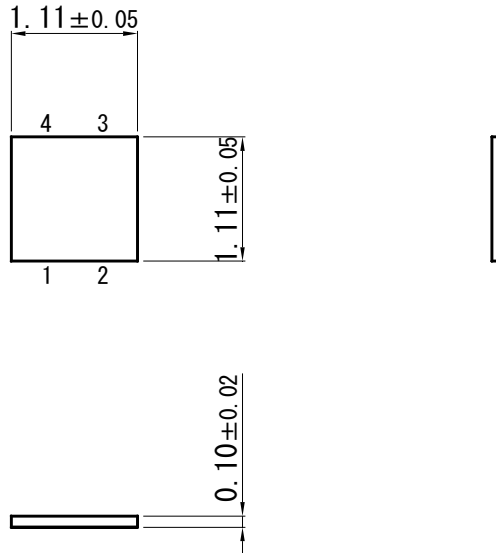
Safe Operating Area



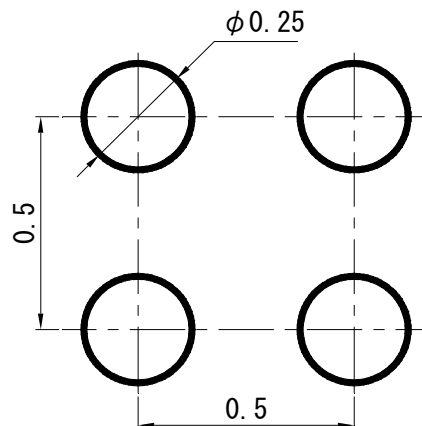


ULGA004-W-1212

Unit: mm



■ Land Pattern (Reference) (Unit: mm)



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