

FC6A21060L

Gate Resistor installed Dual N-Channel MOS FET

For lithium-ion secondary battery protection circuit

■ Features

- Low Source-source On-state Resistance:RSS(on)typ. = 8.7 mΩ (VGS = 4.5 V)
- CSP package:smallest & thinnest size
- Halogen-free / RoHS compliant
(EU RoHS / UL-94 V-0 / MSL:Level 1 compliant)

■ Marking Symbol:31

■ Packaging

FC6A21060L Embossed type (Thermo-compression sealing):
5 000 pcs / reel (standard)

■ Absolute Maximum Ratings Ta = 25 °C

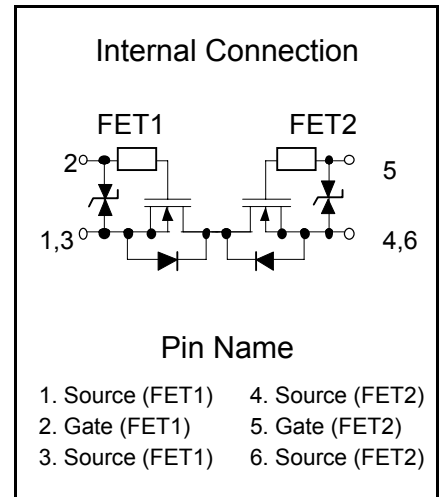
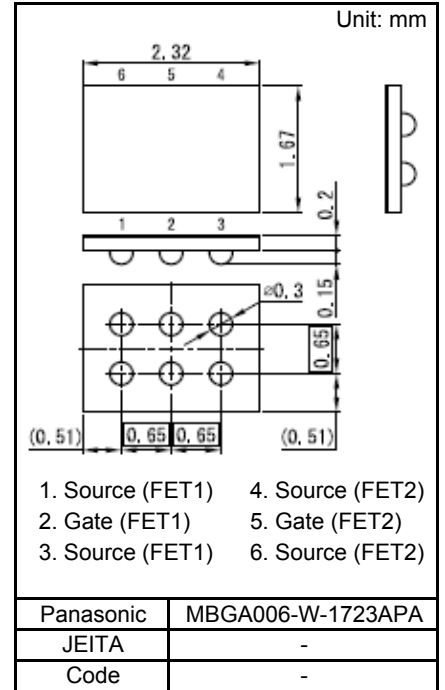
Parameter		Symbol	Rating	Unit
FET1 FET2	Source-source Voltage	VSS	12	V
	Gate-source Voltage	VGS	±12	V
	Source Current (DC) *1	IS	6	A
	Source Current (Pulsed) *1,*2	ISp	60	A
Overall	Total Power Dissipation *1	PD	0.45	W
	Channel Temperature	Tch	150	°C
	Storage Temperature Range	Tstg	-55 to +150	°C

■ Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal Resistance, Channel to Ambient	Rth (ch-a)	278	°C/W

Note *1 Mounted on FR4 board (25.4 mm × 25.4 mm × t1.0 mm).
Surface Mounted on FR4 Board using the minimum recommended pad size(Cu area = 47 mm² including traces).

*2 t = 10 μs, Duty Cycle ≤ 1 %



■ 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	IGSS1	VGS = ±5.0 V, VSS = 0 V		±0.50	±1.0	μA
	IGSS2	VGS = ±4.3 V, VSS = 0 V		±0.25	±0.5	
	IGSS3	VGS = ±4.1 V, VSS = 0 V		±0.20	±0.4	
	IGSS4	VGS = ±3.8 V, VSS = 0 V		±0.18	±0.36	
	IGSS5	VGS = ±3.5 V, VSS = 0 V		±0.15	±0.3	
	IGSS6	VGS = ±3.0 V, VSS = 0 V		±0.10	±0.2	
	IGSS7	VGS = ±2.5 V, VSS = 0 V		±0.05	±0.1	
Gate-source Threshold Voltage	Vth	IS = 1.0 mA, VSS = 10.0 V	0.4	0.85	1.4	V
Source-source On-State Resistance	RSS(on)1	IS = 3.5 A, VGS = 4.5 V	6.0	8.7	12.0	mΩ
	RSS(on)2	IS = 3.5 A, VGS = 3.8 V	6.5	9.0	12.5	
	RSS(on)3	IS = 3.5 A, VGS = 3.1 V	7.0	10.5	15.5	
	RSS(on)4	IS = 3.5 A, VGS = 2.5 V	8.0	12.5	19.0	
Input Capacitance ^{*1}	Ciss	VSS = 10 V, VGS = 0 V, f = 1MHz		2 300		pF
Output Capacitance ^{*1}	Coss			680		
Reverse Transfer Capacitance ^{*1}	Crss			670		
Turn-on Delay Time ^{*1,2}	td(on)	VDD = 10 V, VGS = 0 to 4.0 V		5.2		μs
Rise Time ^{*1,2}	tr	IS = 3.5 A		19.0		
Turn-off Delay Time ^{*1,2}	td(off)	VDD = 10 V, VGS = 4.0 to 0 V		3.5		μs
Fall Time ^{*1,2}	tf	IS = 3.5 A		8.2		
Total Gate Charge ^{*1}	Qg	VDD = 10 V, VGS = 0 to 4.0 V IS = 6 A		30.0		nC
Gate-source Charge ^{*1}	Qgs			6.5		
Gate-drain Charge ^{*1}	Qgd			10.0		
Body Diode Forward Voltage	VF(s-s)	IF = 6.0 A, VGS = 0 V		0.8	1.2	V

Note: *1 Assured by design

*2 See Test circuit

DESTRUCTION CURRENT

	Condition	Result
Operation test	VGS = 3.8 V t = 3 ms, IS = 40 A	PASS
	VGS = 3.8 V t = 11 ms, IS = 15 A	PASS
Destruction current	VGS = 3.8 V t = 3 ms	95 A
	VGS = 3.8 V t = 11 ms	63 A

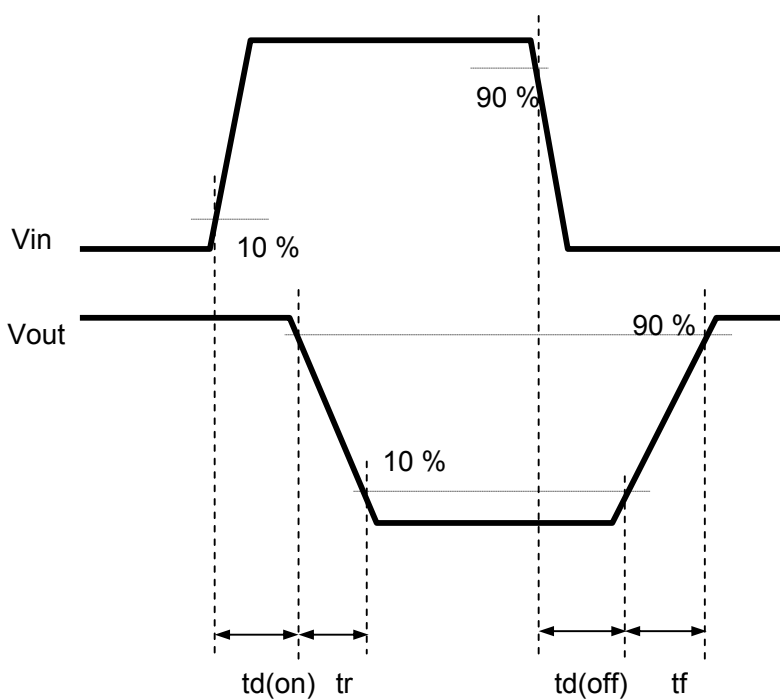
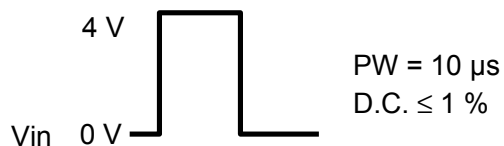
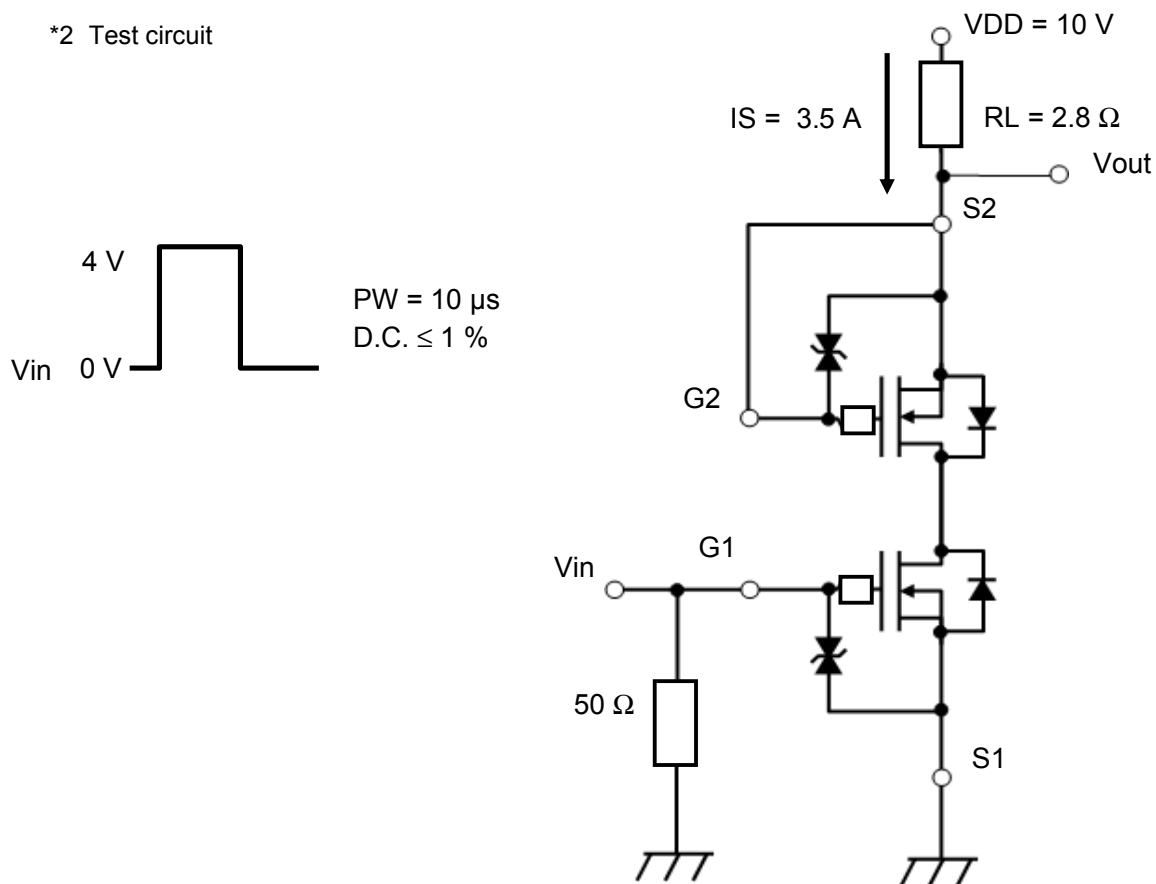
Ta = 25 °C,

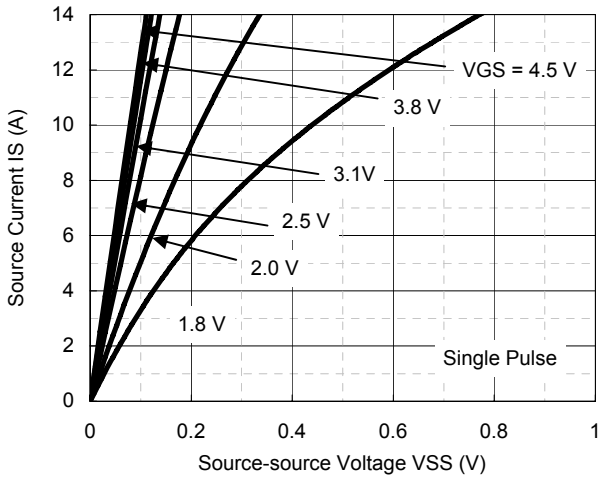
Mounted on FR4 board (25.4 × 25.4 × 1.0 mm)

Surface Mounted on FR4 Board using the minimum recommended

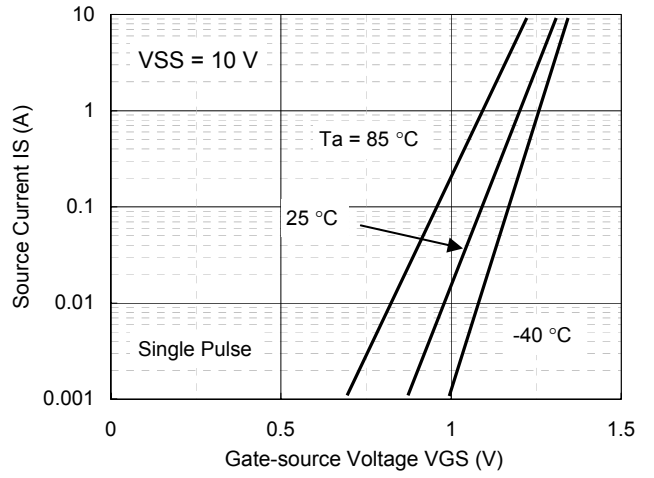
pad size (Cu area = 47 mm² including traces)

*2 Test circuit

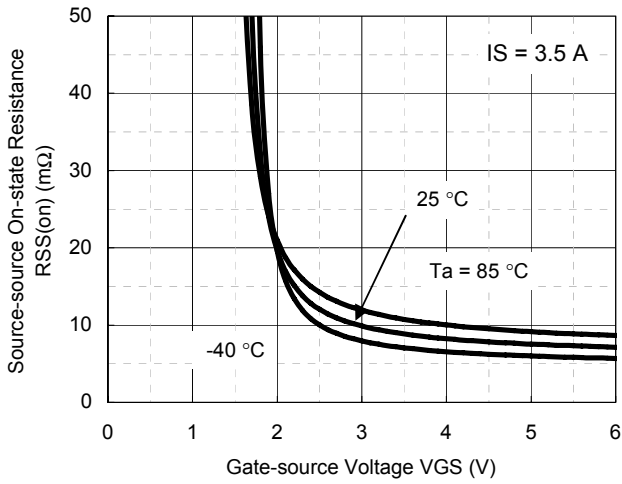




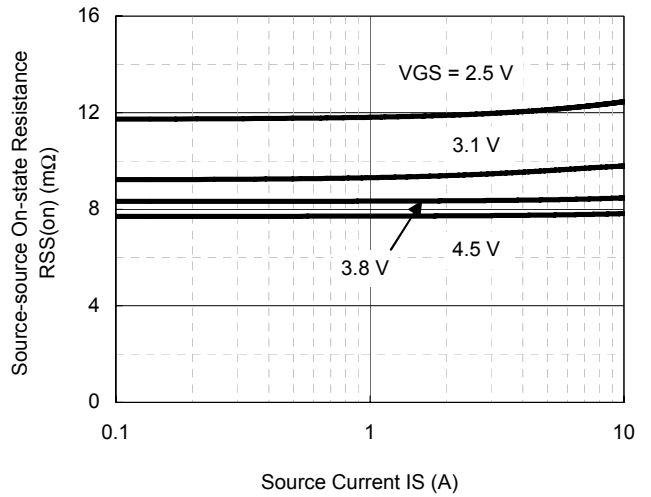
IS - VSS



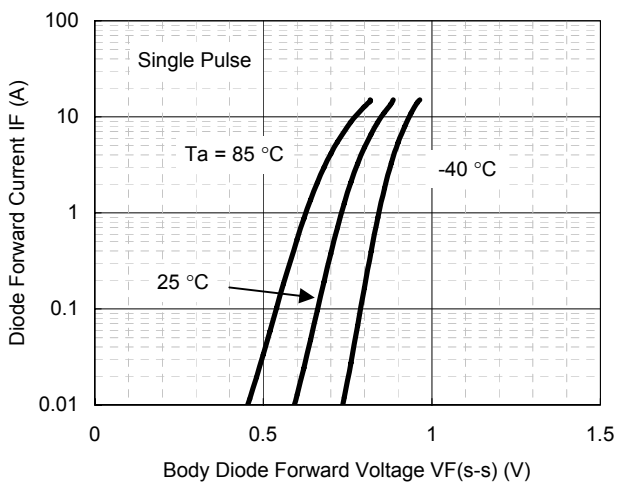
IS - VGS



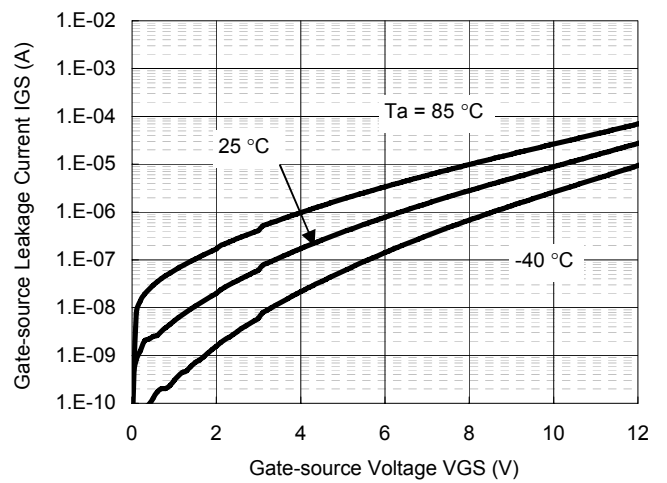
RSS(on) - VGS



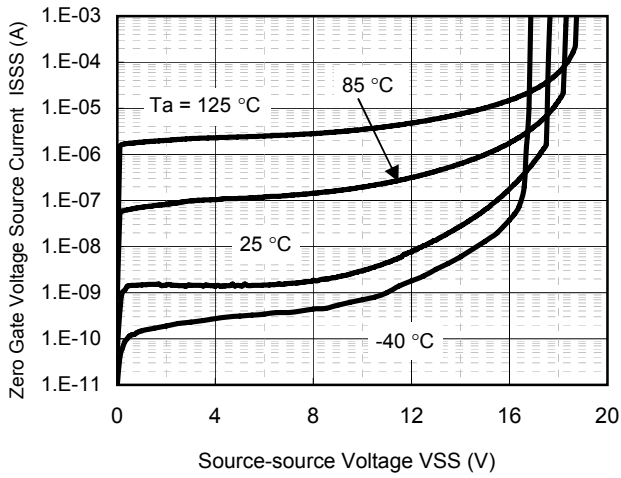
RSS(on) - IS



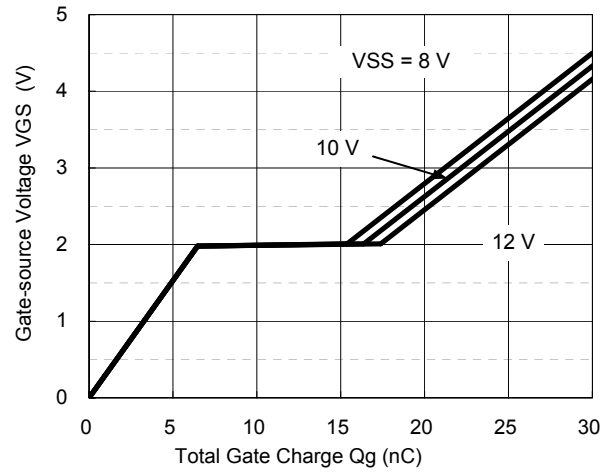
IF - VF(s-s)



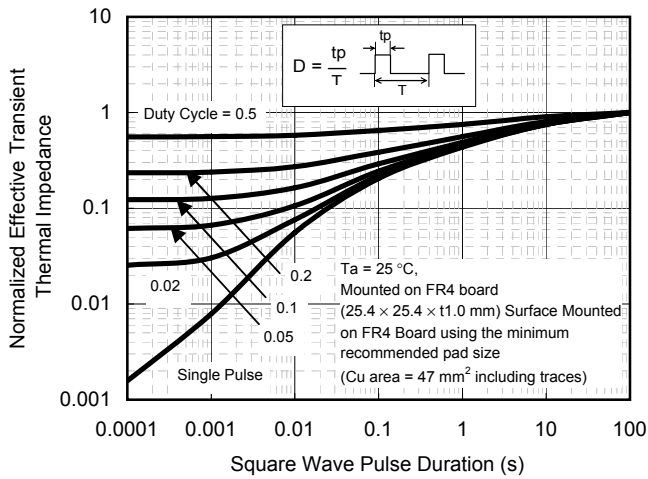
IGS - VGS



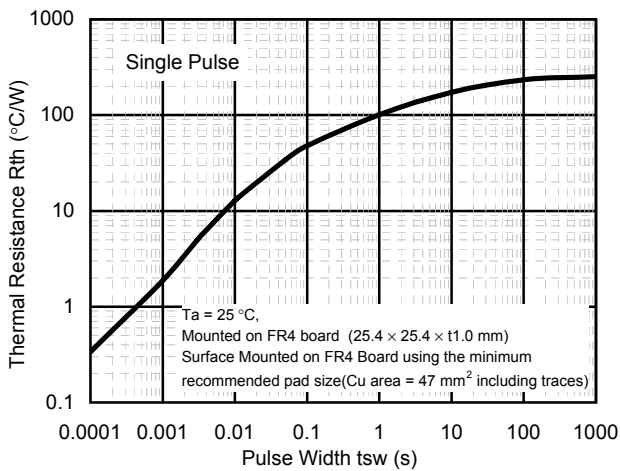
ISSS - VSS



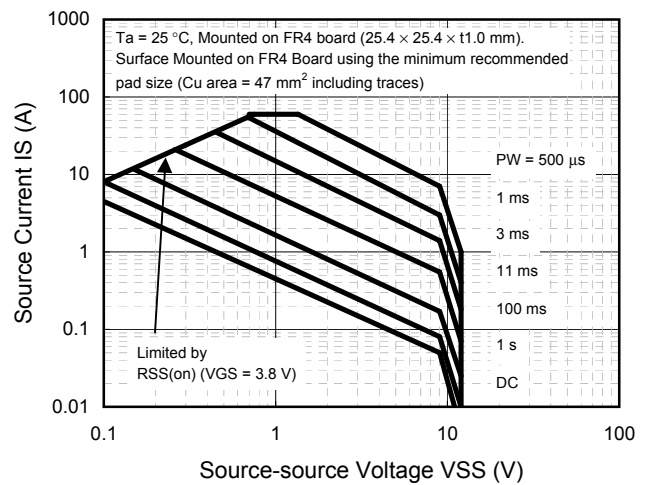
Dynamic Input/Output Characteristics



Thermal Response



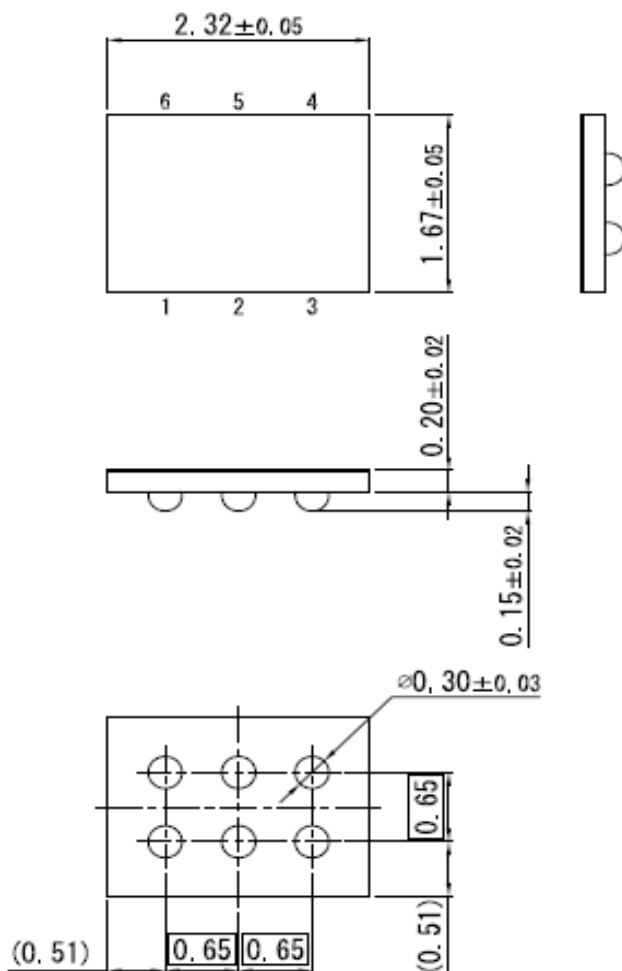
Rth - tsw



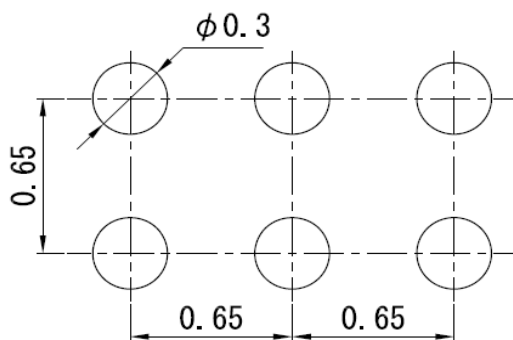
Safe Operating Area

MBGA006-W-1723APA

Unit: mm



■ Land Pattern (Reference) (Unit: mm)



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

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information de-scribed in this book.
- (3) The products described in this book are intended to be used for general applications (such as office equipment, communications equipment, measuring instruments and household appliances), or for specific applications as expressly stated in this book.
Please consult with our sales staff in advance for information on the following applications, moreover please exchange documents separately on terms of use etc.: Special applications (such as for in-vehicle equipment, airplanes, aerospace, automotive equipment, traffic signaling equipment, combustion equipment, medical equipment and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
Unless exchanging documents on terms of use etc. in advance, it is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the products described in this book for any special application.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. We do not guarantee quality for disassembled products or the product re-mounted after removing from the mounting board.
When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) When reselling products described in this book to other companies without our permission and receiving any claim of request from the resale destination, please understand that customers will bear the burden.
- (8) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of our company.