

# RBK04U04GNS

40V - 35A N-Channel Power MOSFET

R07DS1507EJ0100

Applications: Li-ion battery management system

Rev.1.00

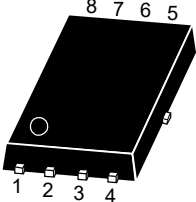
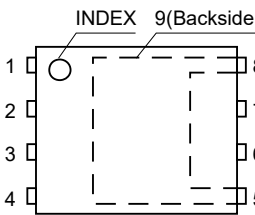
Mar.14.2022

## Features

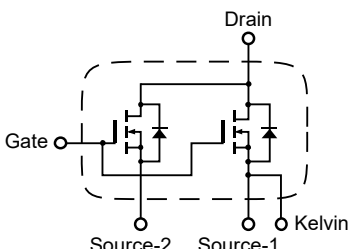
- Low on-state resistance  
 $R_{DS(on)} = 1.2 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ ,  $I_D = 18 \text{ A}$ )
- Current Sensing
- Surface mount package
- Quality grade: Standard

## Outline

RENESAS Package code: PTSN0008DB-A  
 (Package name: HSON-8pin)

1. Gate
2. Source-1
3. Source-1
4. Source-1
5. Drain
6. Source-2
7. Kelvin
8. Drain
9. Drain



Remark: Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Step must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

## Absolute Maximum Ratings

( $T_a = 25 \text{ }^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to source voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DS}$	40	V
Gate to source voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GS}$	$\pm 20$	V
Drain current (DC) <sup>Notes2</sup>	$I_{D(DC)}$	35	A
Drain current (Pulse) <sup>Notes1, 2</sup>	$I_{D(pulse)}$	320	A
Body diode forward current <sup>Notes2</sup>	$I_F$	35	A
Single avalanche current <sup>Notes3</sup>	$I_{AS}$	45	A
Single avalanche energy <sup>Notes3</sup>	$E_{AS}$	202	mJ
Total power dissipation ( $T_c = 25 \text{ }^\circ\text{C}$ )	$P_{T1}$	83	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

- Notes: 1.  $PW \leq 10 \text{ }\mu\text{s}$ , duty cycle  $\leq 1\%$   
 2. This data is on Renesas's measurement condition.  
 3. Starting  $T_{ch} = 25 \text{ }^\circ\text{C}$ ,  $V_{DD} = 20 \text{ V}$ ,  $R_G = 25 \text{ }\Omega$ ,  $V_{GS} = 10 \text{ to } 0 \text{ V}$ ,  $L = 100 \text{ }\mu\text{H}$

Note: Continuous heavy condition (e.g. high temperature / voltage / current or high variation of temperature) may affect a reliability even if it is within the absolute maximum ratings. Please consider derating condition for appropriate reliability in reference Renesas Semiconductor Reliability Handbook (Recommendation for Handling and Usage of Semiconductor Devices) and individual reliability data.

## Thermal Resistance Characteristics

Item	Symbol	Max. Value <sup>Notes4</sup>	Unit
Thermal resistance (Junction to case) ( $T_c = 25^\circ\text{C}$ )	$R_{th(j-c)}$	1.5	$^\circ\text{C/W}$
Thermal resistance (Junction to ambient)	$R_{th(j-a)}$	35 <sup>Notes6</sup> / 136 <sup>Notes5</sup>	$^\circ\text{C/W}$

Notes: 4. Designed target maximum value on Renesas measurement condition. (Not tested)

5. Mounted on FR4 board of 40mm x 40mm x 1.6mm<sup>†</sup>, 1 oz Cu with 4% Cu area.

6. Mounted on FR4 board of 50mm x 100mm x 1.0mm<sup>†</sup>, 1 oz Cu. (Reference data)

## Electrical Characteristics

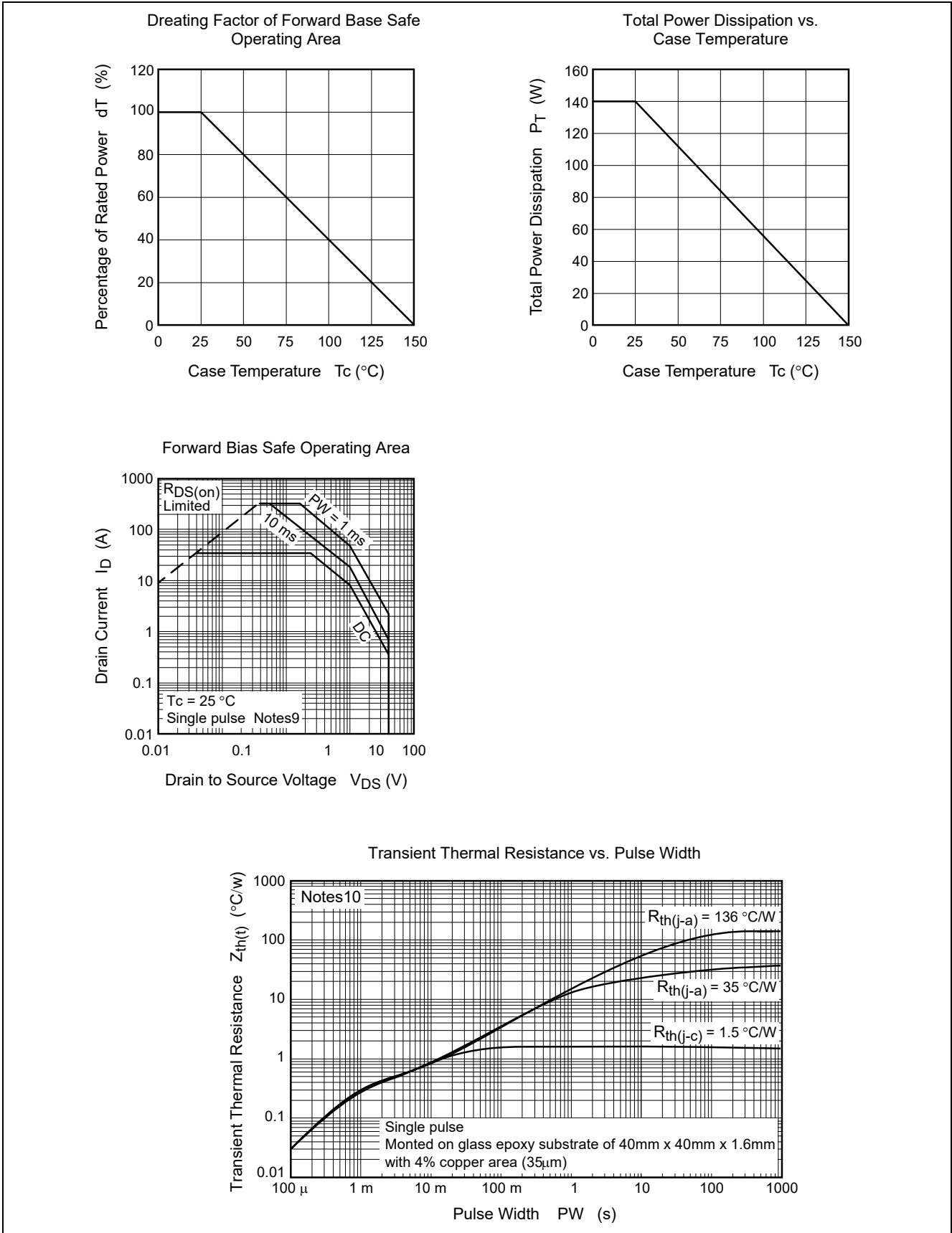
( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage drain current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$
Zero leakage current	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$
Gate cutoff voltage	$V_{GS(off)}$	2.0	—	4.0	V	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$
Drain to source on-state resistance <sup>Notes7</sup>	$R_{DS(on)}$	—	1.2	1.5	m $\Omega$	$V_{GS} = 10\text{ V}, I_D = 18\text{ A}$
Input capacitance	$C_{iss}$	—	6900	—	pF	$V_{DS} = 10\text{ V}$
Output capacitance	$C_{oss}$	—	1100	—	pF	$V_{GS} = 0\text{ V}$
Reverse transfer capacitance	$C_{rss}$	—	650	—	pF	$f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	37	—	ns	$I_D = 35\text{ A}$
Rise time	$t_r$	—	34	—	ns	$V_{DD} = 20\text{ V}$
Turn-off delay time	$t_{d(off)}$	—	116	—	ns	$V_{GS} = 10\text{ V}$
Fall time	$t_f$	—	42	—	ns	$R_G = 5\ \Omega$
Total gate charge	$Q_G$	—	111	—	nC	$I_D = 35\text{ A}$
Gate to source charge	$Q_{GS}$	—	28	—	nC	$V_{DD} = 32\text{ V}$
Gate to drain charge	$Q_{GD}$	—	31	—	nC	$V_{GS} = 10\text{ V}$
Body diode forward voltage <sup>Notes7</sup>	$V_{F(S-D)}$	—	0.79	1.5	V	$I_F = 35\text{ A}, V_{GS} = 0\text{ V}$
Reverse recovery time	$t_{rr}$	—	61	—	ns	$I_F = 35\text{ A}, V_{GS} = 0\text{ V}$
Reverse recovery charge	$Q_{rr}$	—	71	—	nC	$di/dt = 100\text{ A}/\mu\text{s}$
Current sensing ratio <sup>Notes8</sup>	$I_{ratio}$	—	10000	—	-	$V_{GS} = 10\text{ V}, I_D = 18\text{ A}$

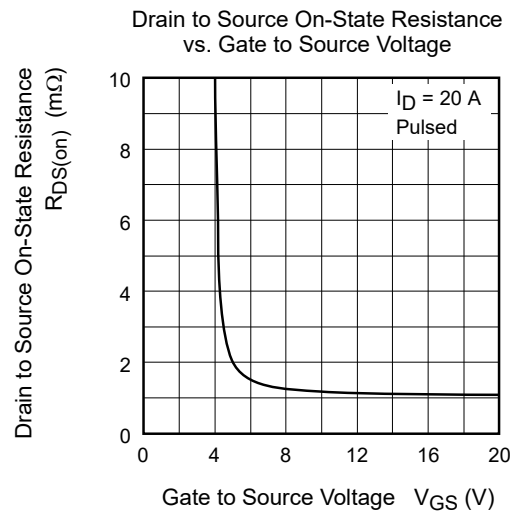
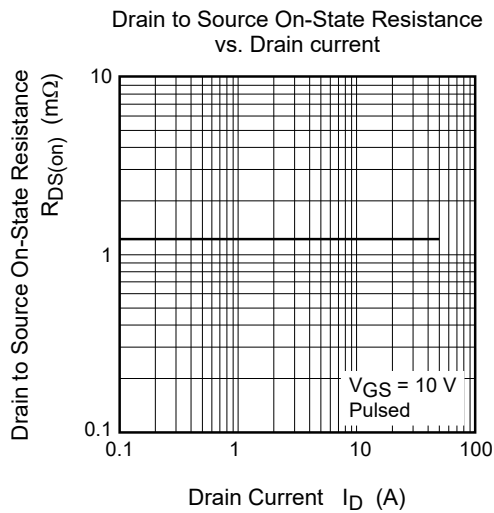
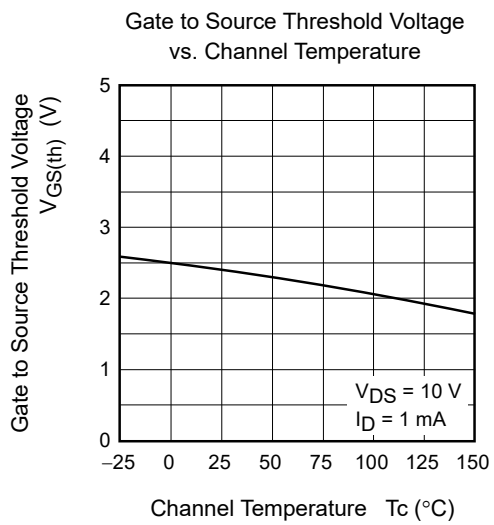
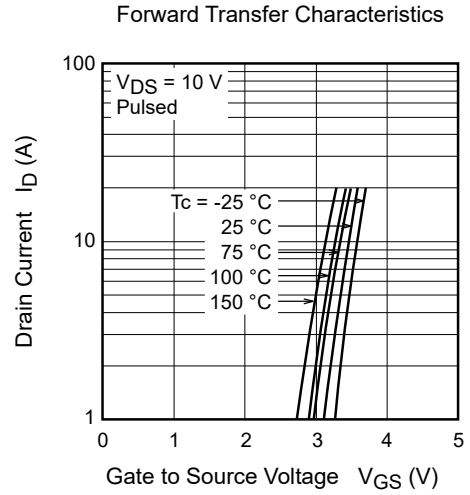
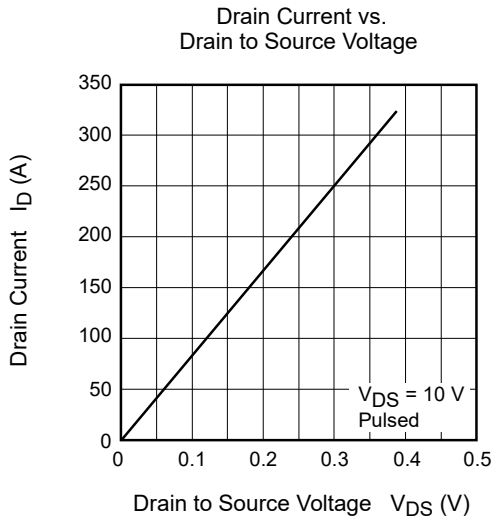
Notes: 7. Pulse test

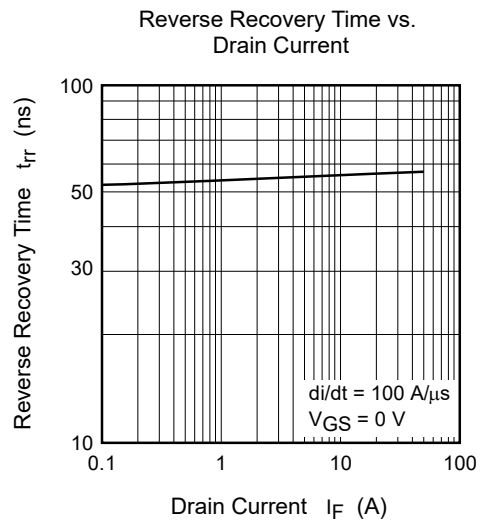
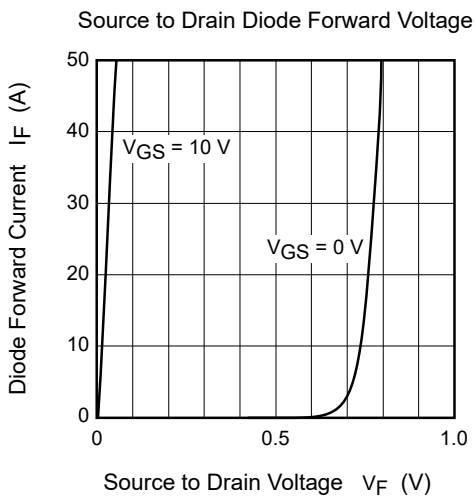
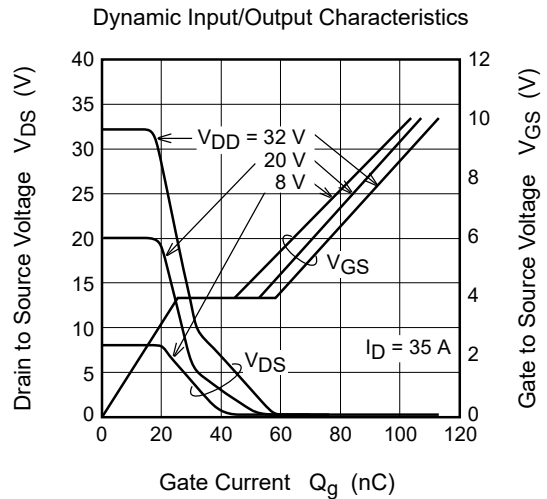
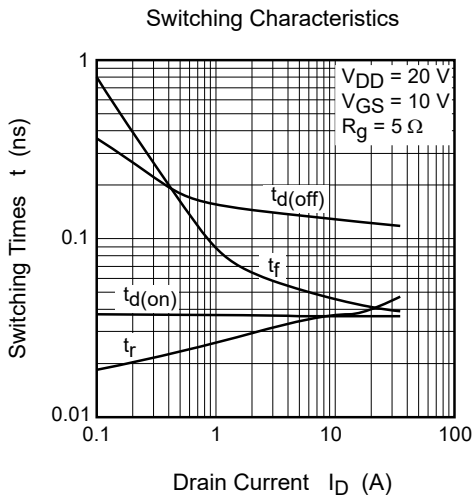
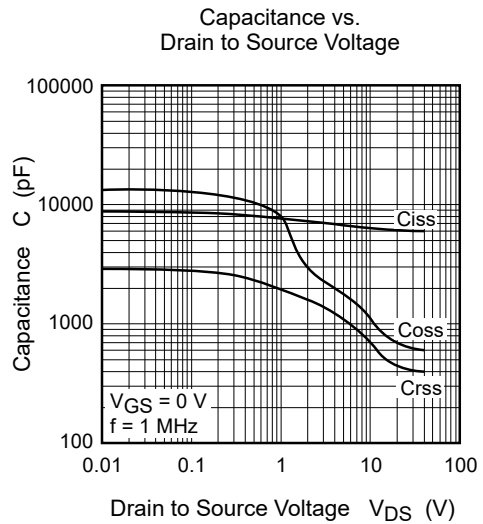
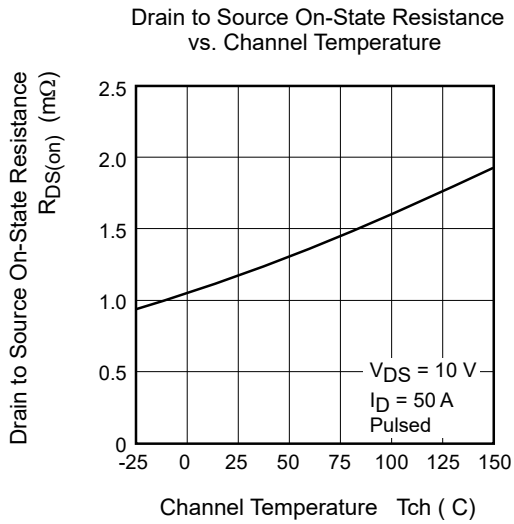
8. Designed target value on Renesas measurement condition. (Not tested)

### Main Characteristics

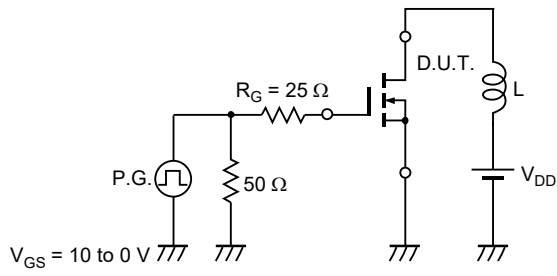


Notes: 9. Designed target value on Renesas measurement condition. (Not tested)  
 Renesas recommends that operating conditions are designed according to a document "Power MOS FET · IGBT Attention of Handling Semiconductor Devices".  
 10. Designed target value on Renesas measurement condition. (Not tested)

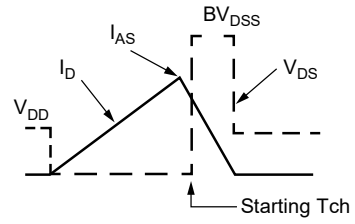




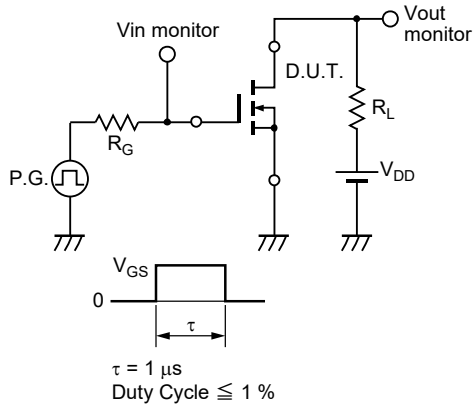
Avalanche Test Circuit



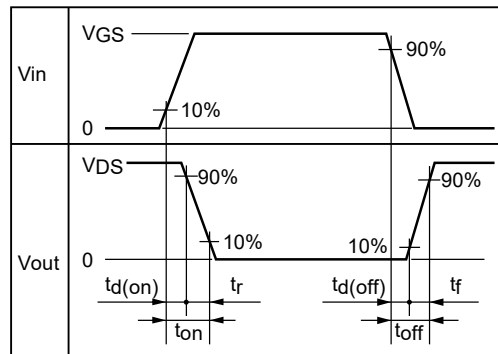
Avalanche Waveform



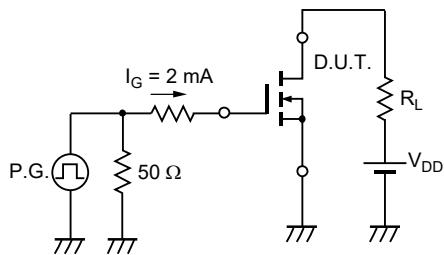
Switching Time Test Circuit



Waveform



Gate Charge Test Circuit

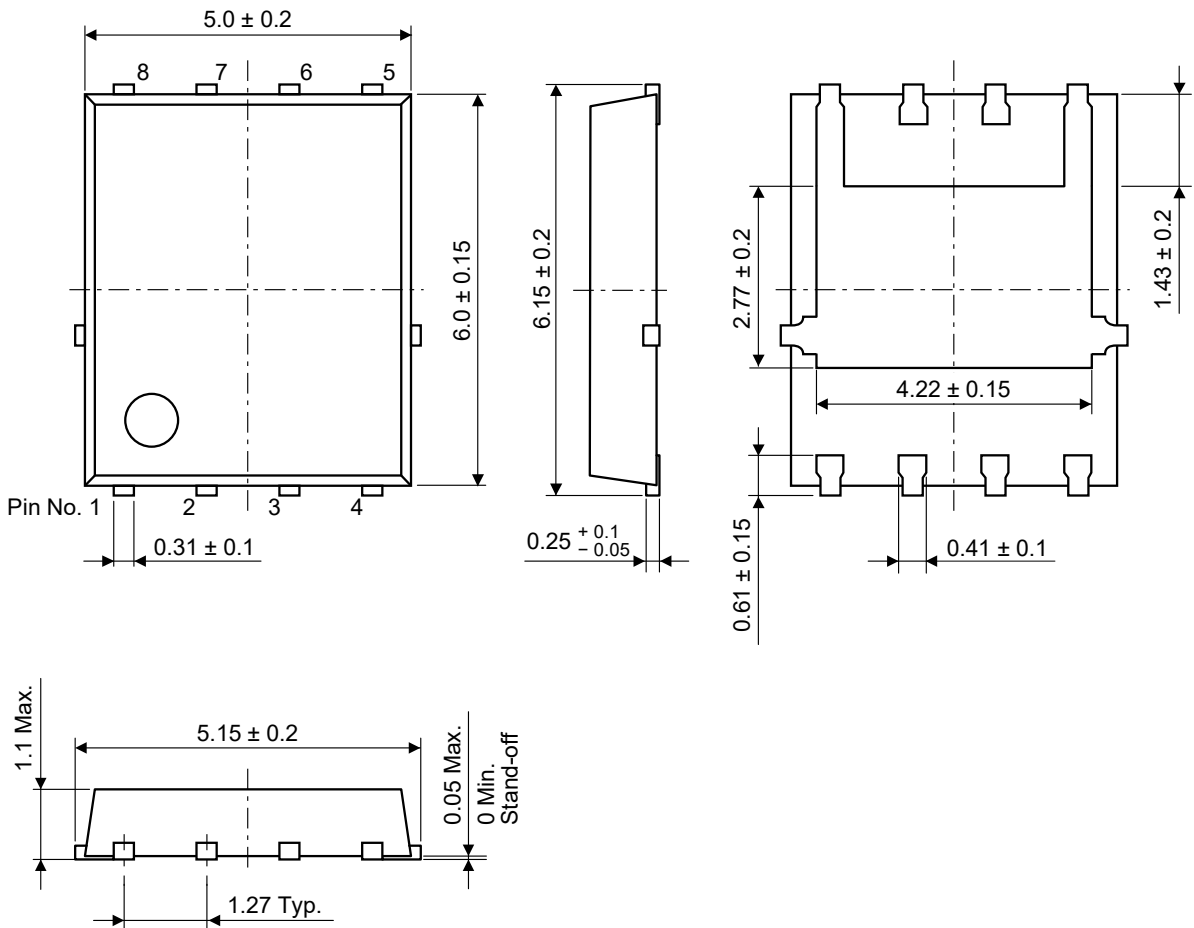


## Package Dimensions

### HSO8-8pin

JEDEC Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
—	PTSN0008DB-A	—	0.12

Unit: mm



## Ordering Information

Orderable Part Number	Quantity	Shipping Container
RBK04U04GNS-0000#HBH	3000 pcs	Taping (Reel)

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## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,

Koto-ku, Tokyo 135-0061, Japan

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