

# H5N5004PL-E0-E

500V - 50A - MOS FET  
High Speed Power Switching

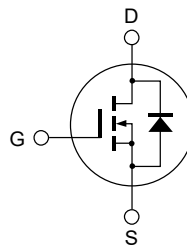
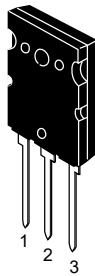
R07DS1198EJ0200  
Rev.2.00  
Oct.28.2021

## Features

- Low on-resistance  
 $R_{DS(on)} = 0.09 \Omega$  typ. (at  $I_D = 25$  A,  $V_{GS} = 10$  V,  $T_a = 25^\circ\text{C}$ )
- Low leakage current
- High speed switching
- Low gate charge
- Avalanche ratings
- Built-in fast recovery diode:  $t_{rr} = 190$  ns typ
- Quality grade: Standard

## Outline

RENESAS Package code: PRSS0003ZN-A, PRSS0003ZC-A  
(Package name: TO-264A, TO-264)



1. Gate
2. Drain
3. Source

## Absolute Maximum Ratings

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

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	500	V
Gate to source voltage	$V_{GSS}$	$\pm 30$	V
Drain current	$I_D$	50	A
Drain peak current	$I_{D(pulse)}$ <sup>Notes1</sup>	200	A
Body-drain diode reverse drain current	$I_{DR}$	50	A
Body-drain diode reverse drain peak current	$I_{DR(pulse)}$ <sup>Notes1</sup>	200	A
Avalanche current	$I_{AP}$ <sup>Notes3</sup>	25	A
Channel dissipation	$P_{ch}$ <sup>Notes2</sup>	250	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

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 .

- Notes: 1.  $PW \leq 10 \mu\text{s}$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_c = 25^\circ\text{C}$   
 3.  $ST_{ch} = 25^\circ\text{C}$ ,  $T_{ch} \leq 150^\circ\text{C}$

## Thermal Resistance Characteristics

(Ta = 25 °C)

Item	Symbol	Max. Value <sup>Notes4</sup>	Unit
Channel to case thermal impedance	$\theta_{ch-c}$	0.5	°C/W

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

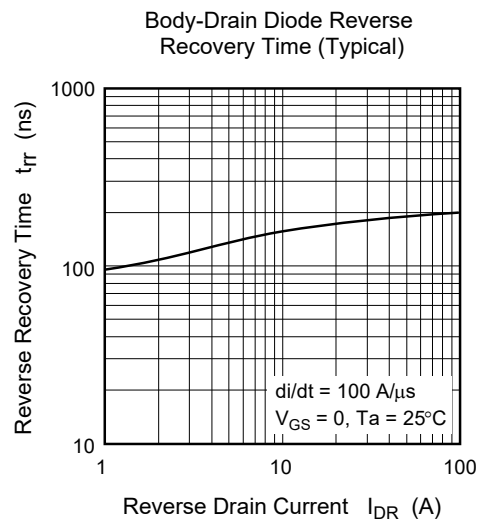
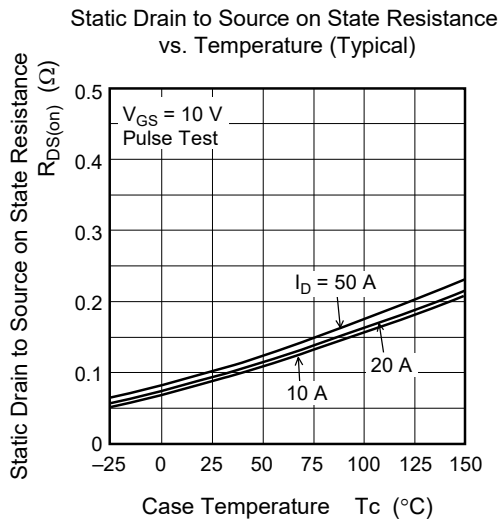
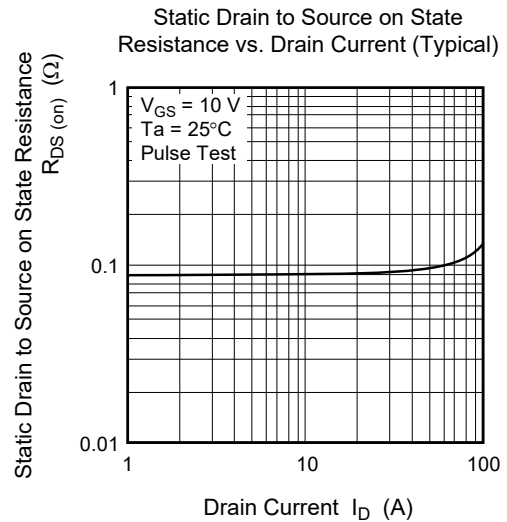
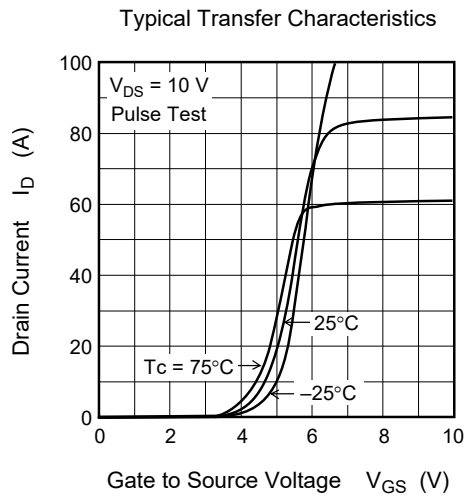
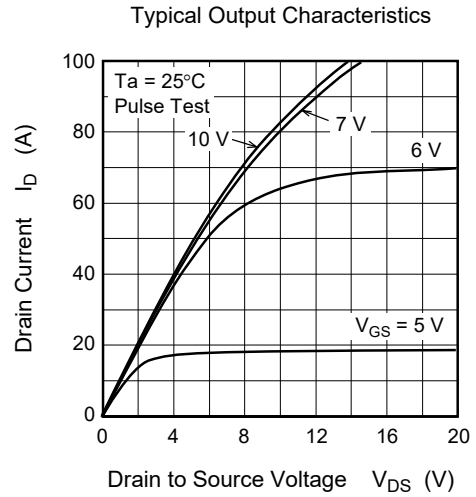
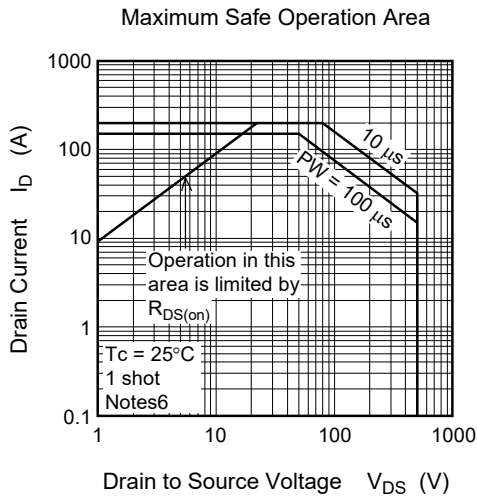
## Electrical Characteristics

(Ta = 25 °C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 0.1$	$\mu\text{A}$	$V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 500 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	2.0	—	4.0	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.09	0.11	$\Omega$	$I_D = 25 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Notes5</sup>
Forward transfer admittance	$ y_{fs} $	20	35	—	S	$I_D = 25 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Notes5</sup>
Input capacitance	$C_{iss}$	—	7630	—	pF	$V_{DS} = 25 \text{ V}$
Output capacitance	$C_{oss}$	—	770	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	160	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	90	—	ns	$I_D = 25 \text{ A}$
Rise time	$t_r$	—	340	—	ns	$V_{GS} = 10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	370	—	ns	$R_L = 10 \Omega$
Fall time	$t_f$	—	280	—	ns	$R_g = 10 \Omega$
Total gate charge	$Q_g$	—	220	—	nC	$V_{DD} = 400 \text{ V}$
Gate to source charge	$Q_{gs}$	—	30	—	nC	$V_{GS} = 10 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	110	—	nC	$I_D = 50 \text{ A}$
Body-drain diode forward voltage	$V_{DF}$	—	1.0	1.5	V	$I_F = 50 \text{ A}$ , $V_{GS} = 0$ <sup>Notes5</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	190	—	ns	$I_F = 50 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$
Body-drain diode reverse recovery charge	$Q_{rr}$	—	1.3	—	$\mu\text{C}$	

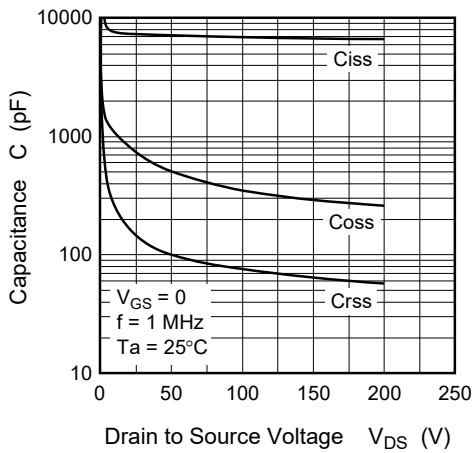
Notes: 5. Pulse test

### Main Characteristics

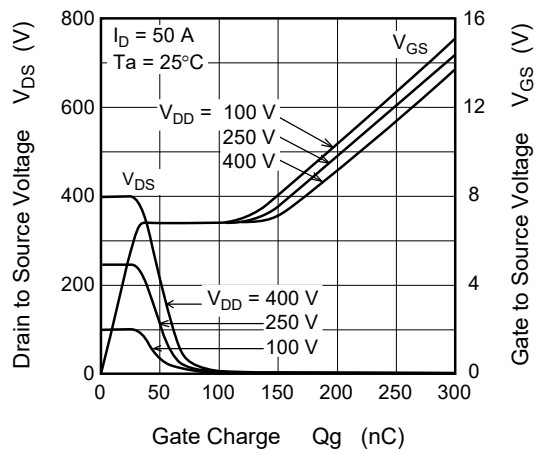


Notes: 6. Designed target value on Renesas measurement condition. (Not tested)  
 Renesas recommends that operating conditions are designed according to a document "Power MOS FET · IGBT Attention of Handling Semiconductor Devices".

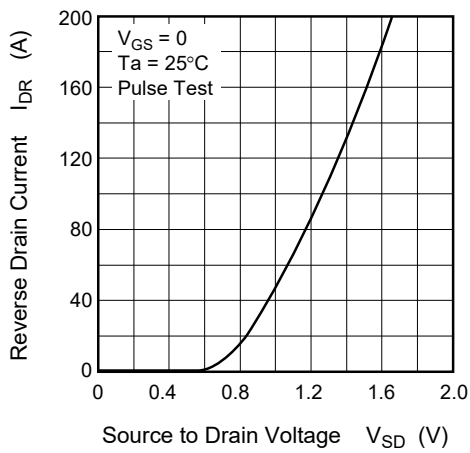
Typical Capacitance vs. Drain to Source Voltage



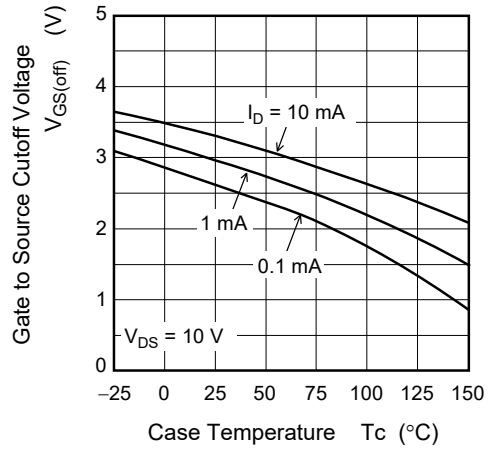
Dynamic Input Characteristics (Typical)

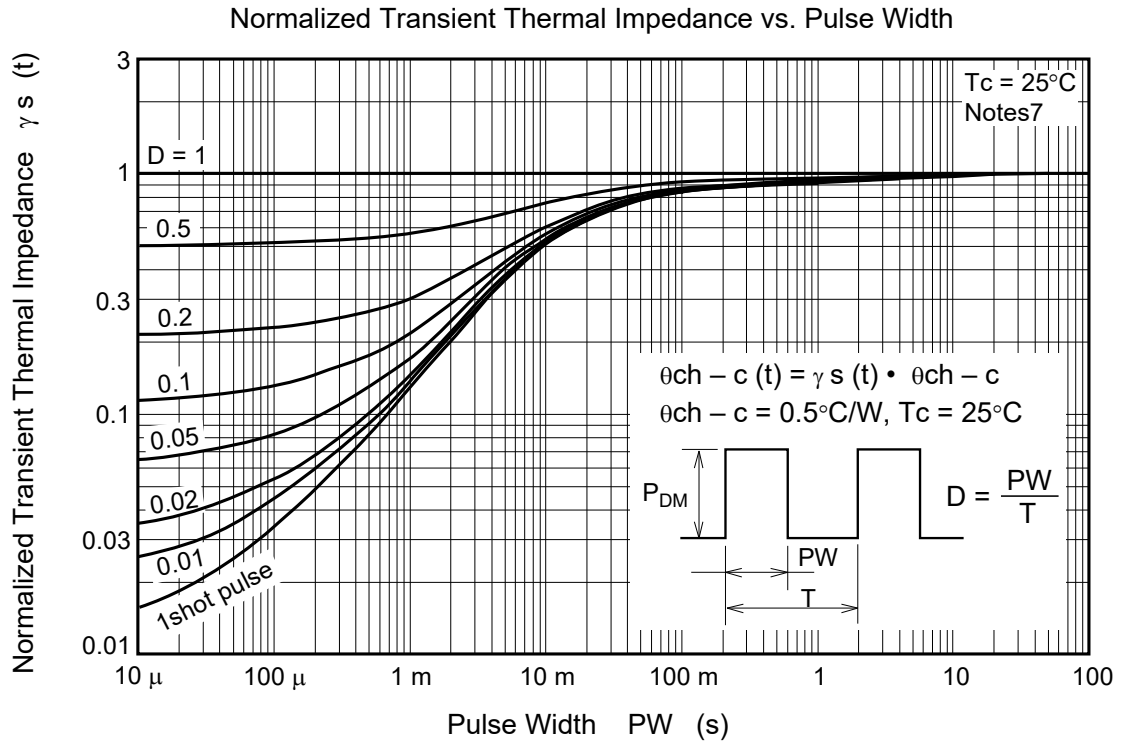


Reverse Drain Current vs. Source to Drain Voltage (Typical)

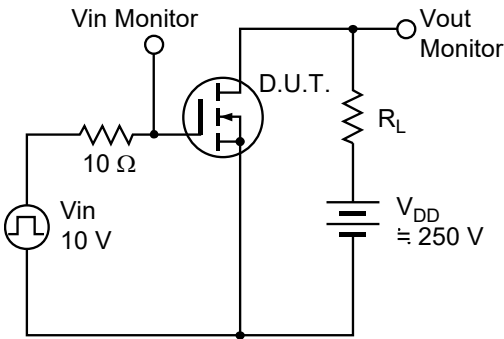


Gate to Source Cutoff Voltage vs. Case Temperature (Typical)

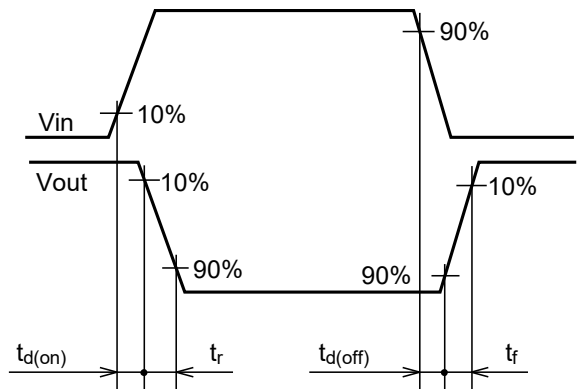




Switching Time Test Circuit



Waveform



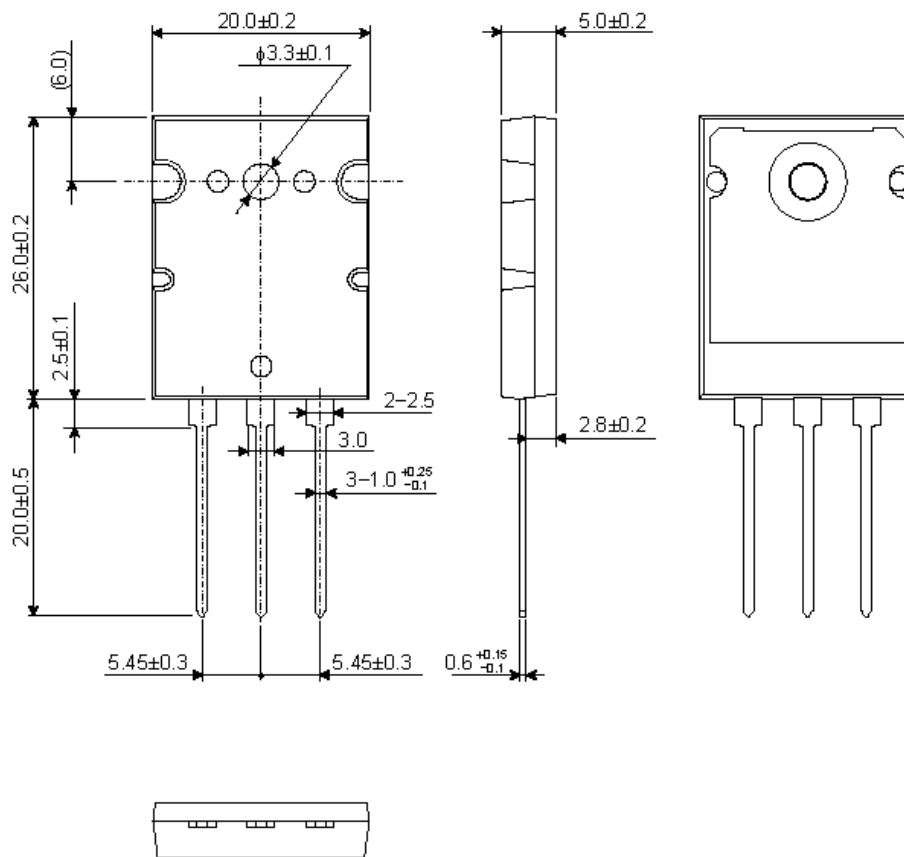
Notes: 7. Designed target value on Renesas measurement condition. (Not tested)

## Package Dimensions

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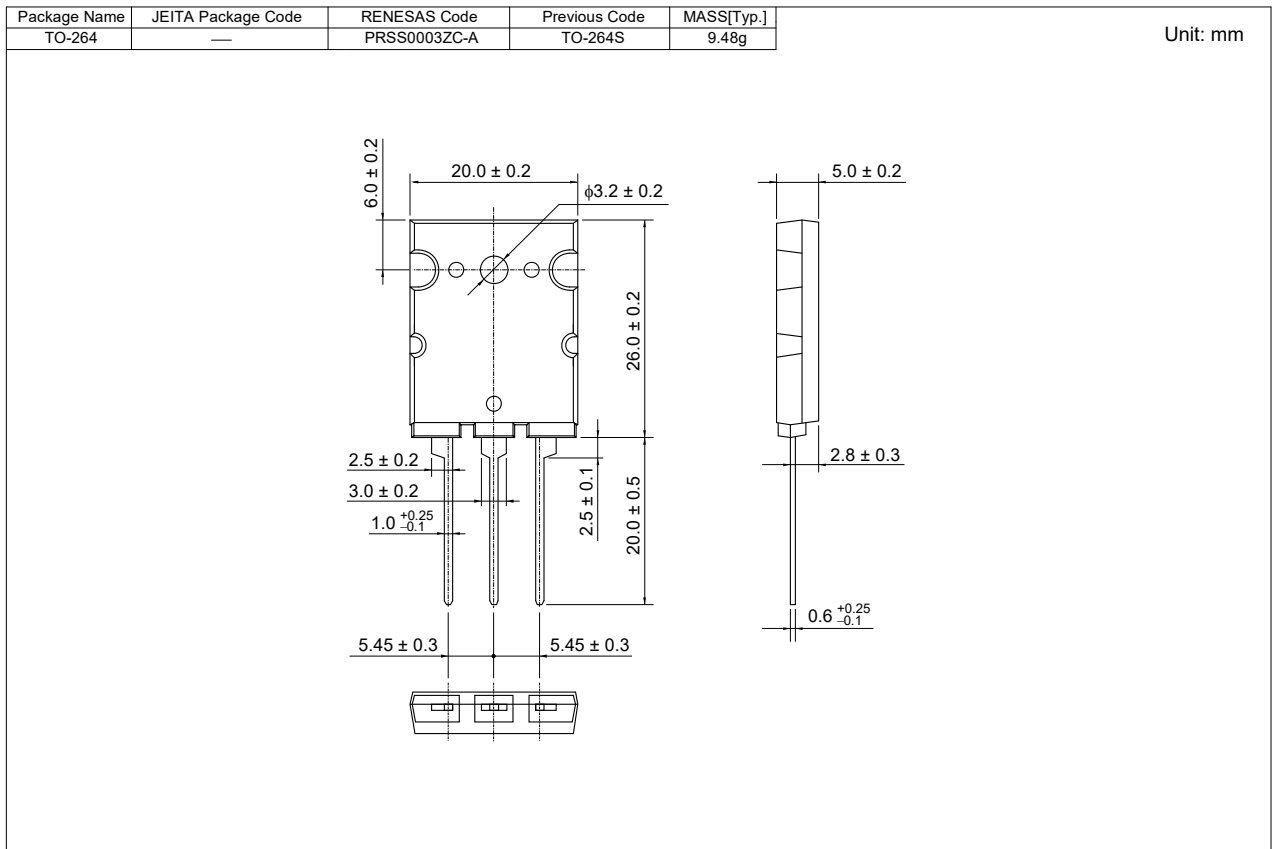
Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-264A	—	PRSS0003ZN-A	TO-264A	9.7

Unit: mm



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**ASSEMBLED IN KOREA**



**Ordering Information**

Orderable Part No.	Quantity	Shipping Container
H5N5004PL-E0-E#T2	25 pcs	Tube

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