



# H5N5001FM

Silicon N Channel MOS FET  
High Speed Power Switching

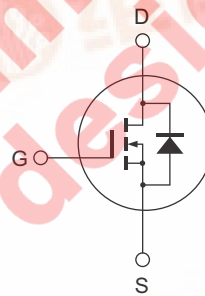
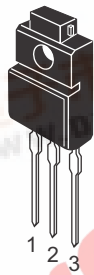
REJ03G1112-0200  
(Previous: ADE-208-1380)  
Rev.2.00  
Sep 07, 2005

## Features

- Low on-resistance:  $R_{DS(on)} = 1.1 \Omega$  typ.
- Low leakage current:  $I_{DSS} = 1 \mu A$  max (at  $V_{DS} = 500 V$ )
- High speed switching:  $t_f = 15 ns$  typ (at  $V_{GS} = 10 V$ ,  $V_{DD} = 250 V$ ,  $I_D = 2.5 A$ )
- Low gate charge:  $Q_g = 15 nC$  typ (at  $V_{DD} = 400 V$ ,  $V_{GS} = 10 V$ ,  $I_D = 5 A$ )
- Avalanche ratings

## Outline

RENESAS Package code: PRSS0003AD-A  
(Package name: TO-220FM)



1. Gate
2. Drain
3. Source

## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value	Unit
Drain to source voltage	V <sub>DSS</sub>	500	V
Gate to source voltage	V <sub>GSS</sub>	±30	V
Drain current	I <sub>D</sub>	5	A
Drain peak current	I <sub>D (pulse)</sub> <sup>Note 1</sup>	20	A
Body-drain diode reverse drain current	I <sub>DR</sub>	5	A
Body-drain diode reverse drain peak current	I <sub>DR (pulse)</sub> <sup>Note 1</sup>	20	A
Avalanche current	I <sub>AP</sub> <sup>Note 3</sup>	5	A
Channel dissipation	P <sub>ch</sub> <sup>Note 2</sup>	30	W
Channel to case thermal Impedance	θ <sub>ch-c</sub>	4.17	°C/W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%

2. Value at T<sub>c</sub> = 25°C3. T<sub>ch</sub> ≤ 150°C

## Electrical Characteristics

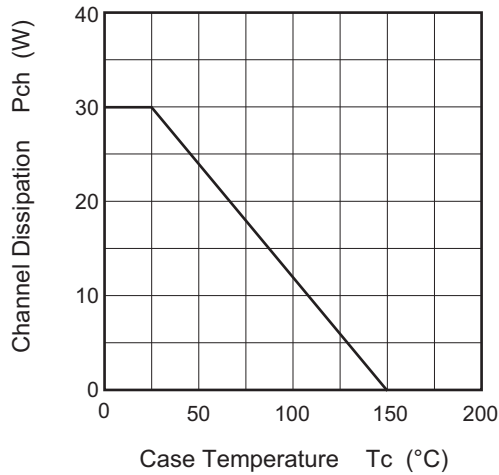
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	V <sub>(BR) DSS</sub>	500	—	—	V	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0
Gate to source leak current	I <sub>GSS</sub>	—	—	±0.1	μA	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0
Zero gate voltage drain current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0
Gate to source cutoff voltage	V <sub>GS (off)</sub>	3.0	—	4.0	V	I <sub>D</sub> = 1 mA, V <sub>DS</sub> = 10 V
Static drain to source on state resistance	R <sub>DS (on)</sub>	—	1.1	1.5	Ω	I <sub>D</sub> = 2.5 A, V <sub>GS</sub> = 10 V <sup>Note 4</sup>
Forward transfer admittance	y <sub>fs</sub>	3.0	4.5	—	S	I <sub>D</sub> = 2.5 A, V <sub>DS</sub> = 10 V <sup>Note 4</sup>
Input capacitance	C <sub>iss</sub>	—	580	—	pF	V <sub>DS</sub> = 25 V
Output capacitance	C <sub>oss</sub>	—	70	—	pF	V <sub>GS</sub> = 0
Reverse transfer capacitance	C <sub>rss</sub>	—	13	—	pF	f = 1 MHz
Turn-on delay time	t <sub>d (on)</sub>	—	20	—	ns	I <sub>D</sub> = 2.5 A
Rise time	t <sub>r</sub>	—	15	—	ns	V <sub>GS</sub> = 10 V
Turn-off delay time	t <sub>d (off)</sub>	—	65	—	ns	R <sub>L</sub> = 100 Ω
Fall time	t <sub>f</sub>	—	15	—	ns	R <sub>g</sub> = 10 Ω
Total gate charge	Q <sub>g</sub>	—	15	—	nC	V <sub>DD</sub> = 400 V
Gate to source charge	Q <sub>gs</sub>	—	3	—	nC	V <sub>GS</sub> = 10 V
Gate to drain charge	Q <sub>gd</sub>	—	8	—	nC	I <sub>D</sub> = 5 A
Body-drain diode forward voltage	V <sub>DF</sub>	—	0.85	1.3	V	I <sub>F</sub> = 5 A, V <sub>GS</sub> = 0
Body-drain diode reverse recovery time	t <sub>rr</sub>	—	400	—	ns	I <sub>F</sub> = 5 A, V <sub>GS</sub> = 0
Body-drain diode reverse recovery charge	Q <sub>rr</sub>	—	1.5	—	μC	di <sub>F</sub> /dt = 100 A/μs

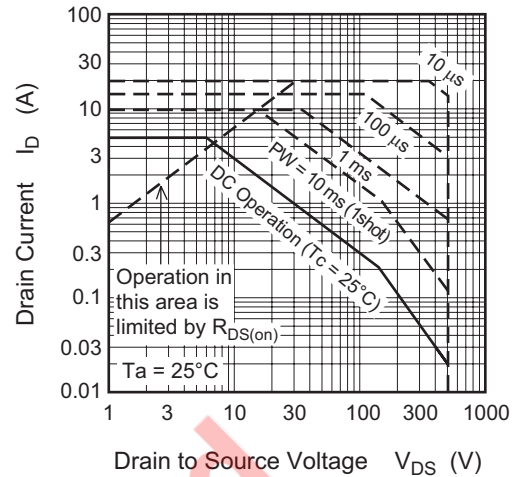
Note: 4. Pulse test

## Main Characteristics

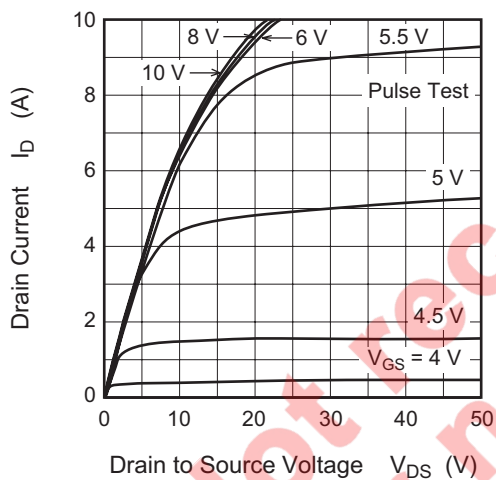
Power vs. Temperature Derating



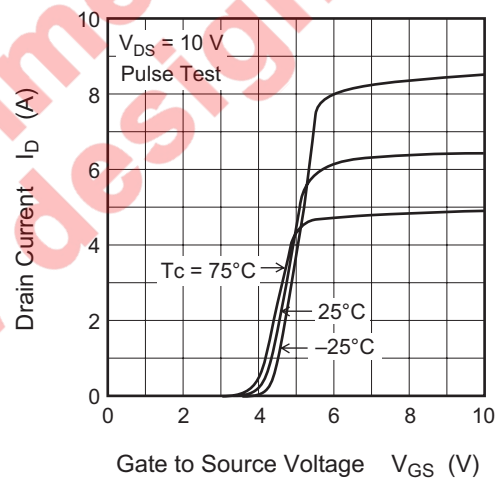
Maximum Safe Operation Area



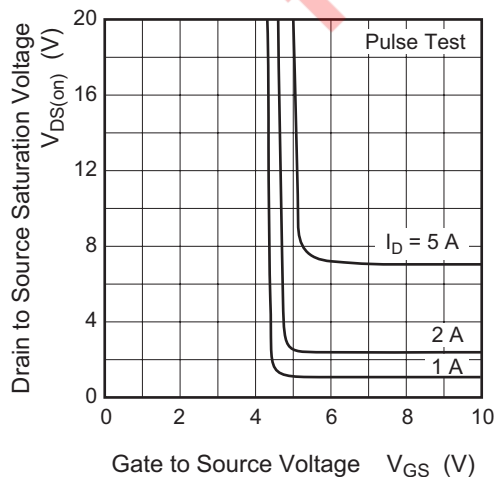
Typical Output Characteristics



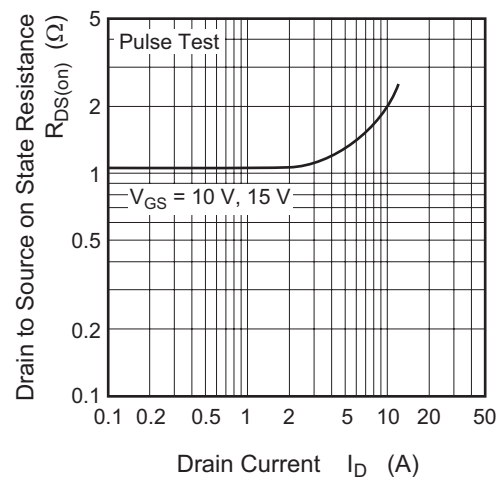
Typical Transfer Characteristics



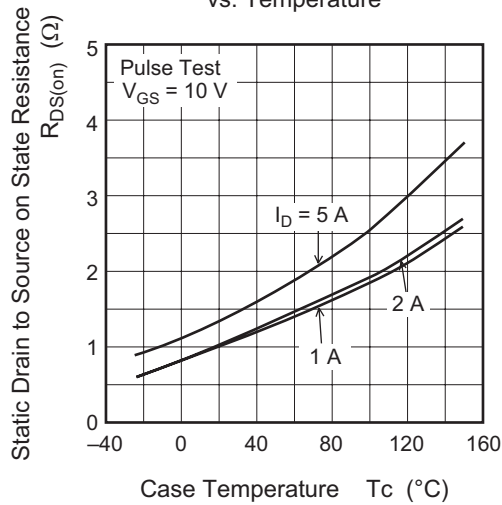
Drain to Source Saturation Voltage vs. Gate to Source Voltage



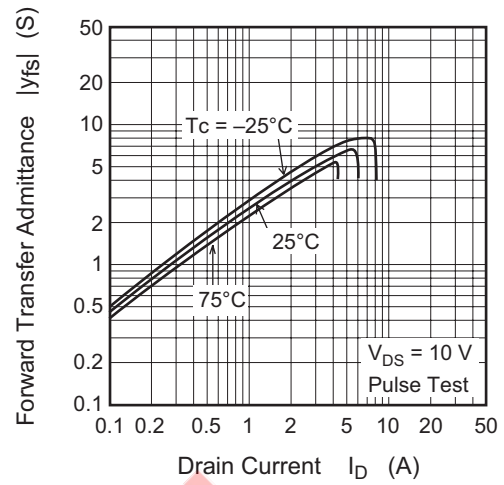
Static Drain to Source on State Resistance vs. Drain Current



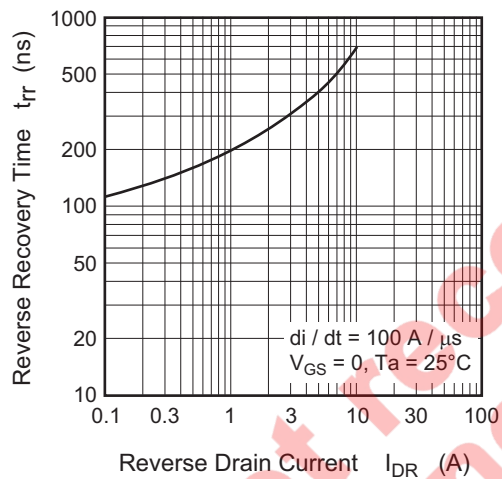
Static Drain to Source on State Resistance vs. Temperature



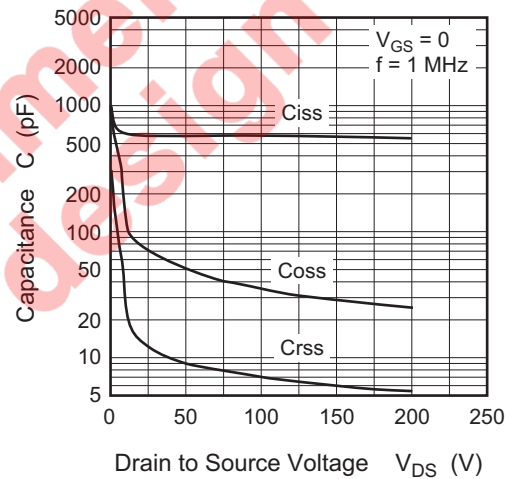
Forward Transfer Admittance vs. Drain Current



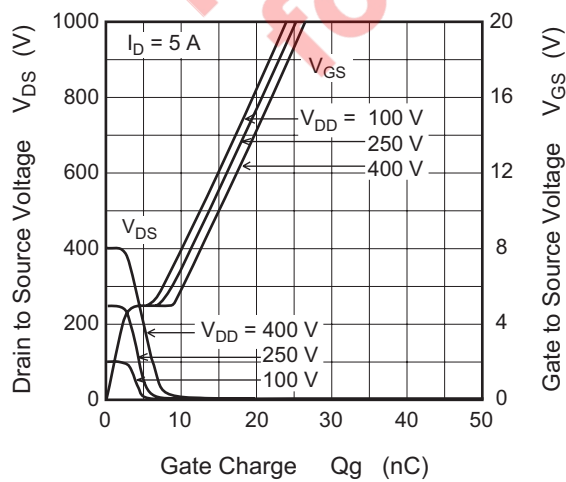
Body-Drain Diode Reverse Recovery Time



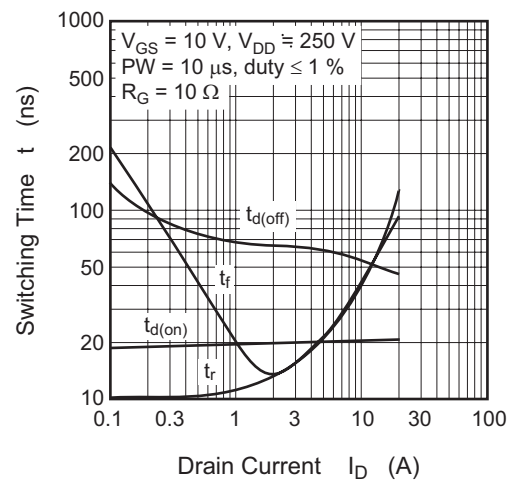
Typical Capacitance vs. Drain to Source Voltage

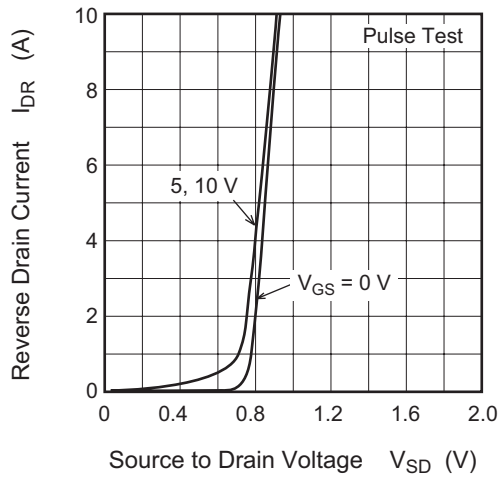
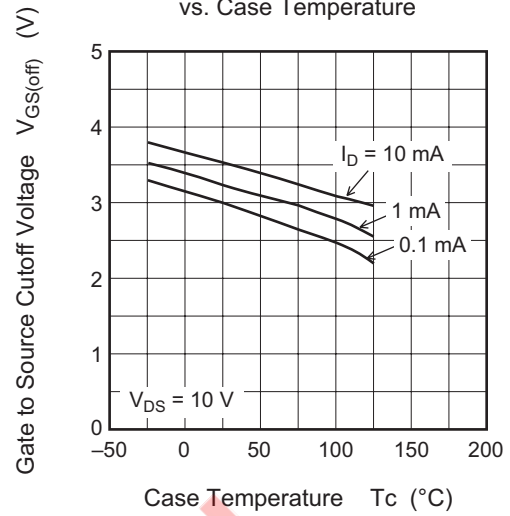


Dynamic Input Characteristics

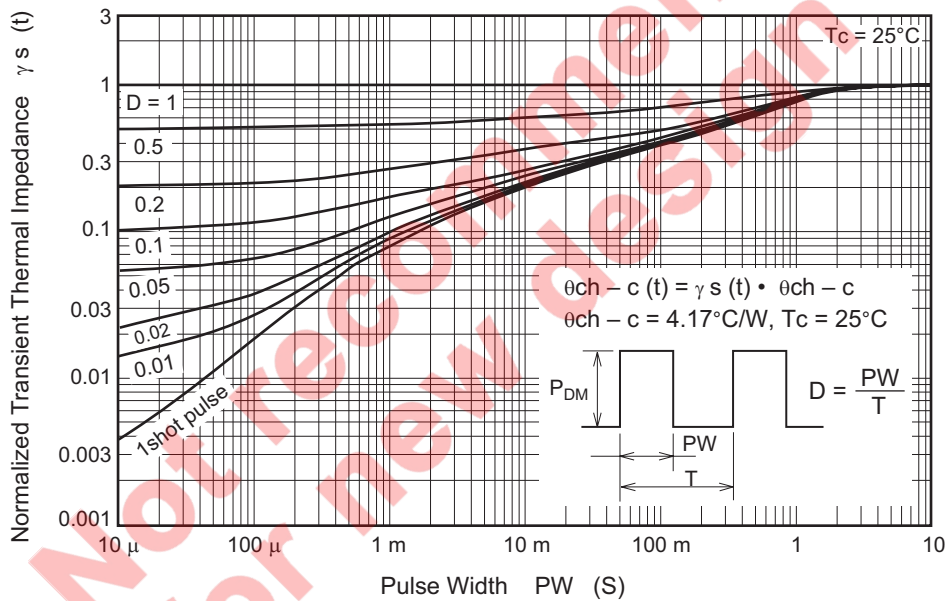


Switching Characteristics

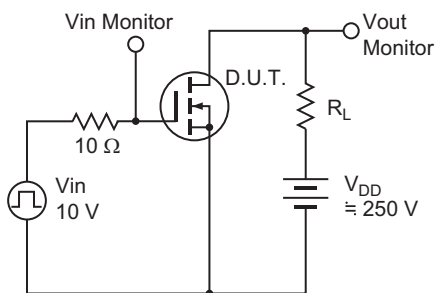


Reverse Drain Current vs.  
Source to Drain VoltageGate to Source Cutoff Voltage  
vs. Case Temperature

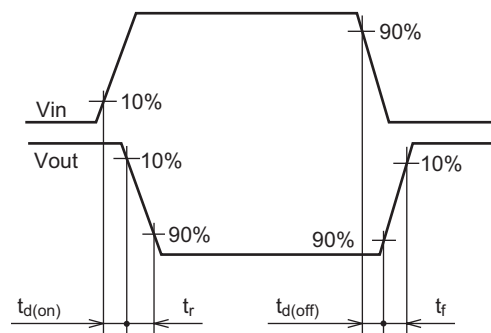
Normalized Transient Thermal Impedance vs. Pulse Width



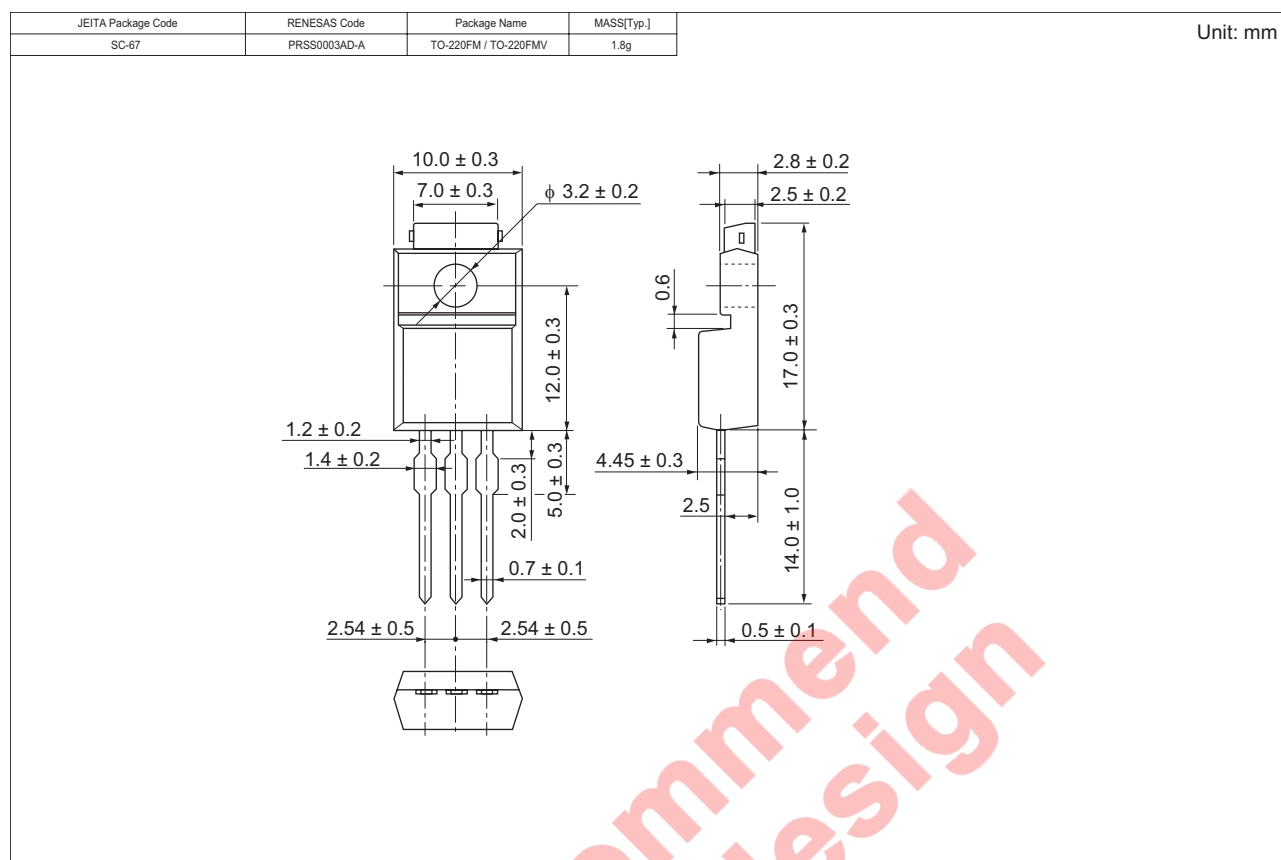
Switching Time Test Circuit



Waveform



## Package Dimensions



## Ordering Information

Part Name	Quantity	Shipping Container
H5N5001FM-E	500 pcs	Box (Sack)

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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