

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

To all our customers

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## **Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.**

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The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

# FS5UM-5

HIGH-SPEED SWITCHING USE

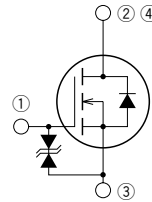
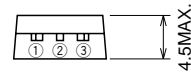
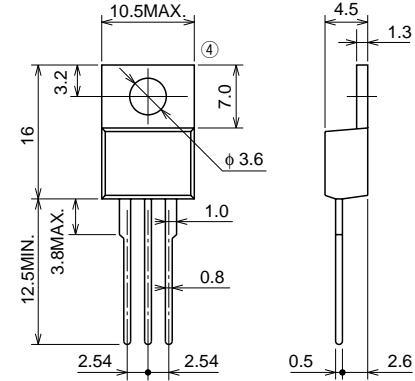
## FS5UM-5



- V<sub>DSS</sub> ..... 250V
- r<sub>DS (ON)</sub> (MAX) ..... 1.3Ω
- I<sub>D</sub> ..... 5A

## OUTLINE DRAWING

Dimensions in mm



- ① GATE
- ② DRAIN
- ③ SOURCE
- ④ DRAIN

TO-220

## APPLICATION

SMPS, DC-DC Converter, battery charger, power supply of printer, copier, HDD, FDD, TV, VCR, personal computer etc.

## MAXIMUM RATINGS (T<sub>c</sub> = 25°C)

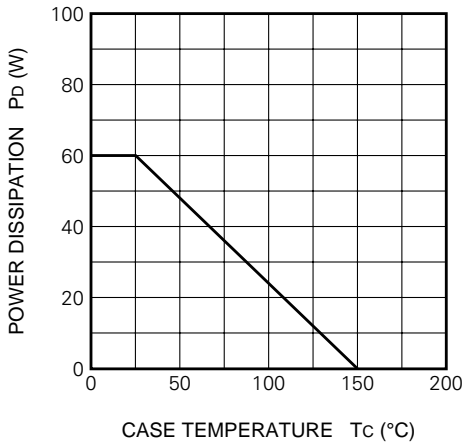
| Symbol           | Parameter                 | Conditions           | Ratings    | Unit |
|------------------|---------------------------|----------------------|------------|------|
| V <sub>DSS</sub> | Drain-source voltage      | V <sub>GS</sub> = 0V | 250        | V    |
| V <sub>GSS</sub> | Gate-source voltage       | V <sub>DS</sub> = 0V | ±30        | V    |
| I <sub>D</sub>   | Drain current             |                      | 5          | A    |
| I <sub>DM</sub>  | Drain current (Pulsed)    |                      | 15         | A    |
| P <sub>D</sub>   | Maximum power dissipation |                      | 60         | W    |
| T <sub>ch</sub>  | Channel temperature       |                      | -55 ~ +150 | °C   |
| T <sub>stg</sub> | Storage temperature       |                      | -55 ~ +150 | °C   |
| —                | Weight                    | Typical value        | 2.0        | g    |

**ELECTRICAL CHARACTERISTICS** (T<sub>ch</sub> = 25°C)

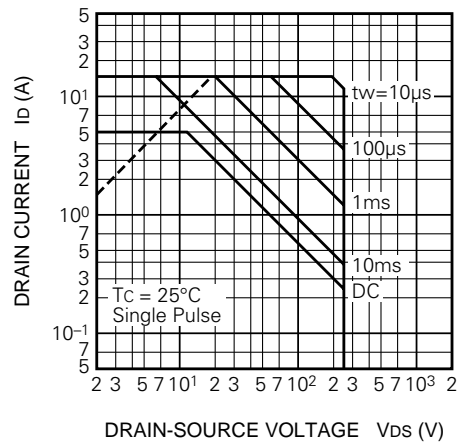
| Symbol                 | Parameter                        | Test conditions  | Limits |      |      | Unit |
|------------------------|----------------------------------|--|--------|------|------|------|
|                        |                                  |  | Min.   | Typ. | Max. |      |
| V (BR) DSS             | Drain-source breakdown voltage   | I <sub>D</sub> = 1mA, V <sub>GS</sub> = 0V   | 250    | —    | —    | V    |
| V (BR) GSS             | Gate-source breakdown voltage    | I <sub>G</sub> = ±100μA, V <sub>DS</sub> = 0V  | ±30    | —    | —    | V    |
| I <sub>GSS</sub>       | Gate-source leakage current      | V <sub>GS</sub> = ±25V, V <sub>DS</sub> = 0V   | —      | —    | ±10  | mA   |
| I <sub>DSS</sub>       | Drain-source leakage current     | V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V   | —      | —    | 1    | mA   |
| V <sub>GS</sub> (th)   | Gate-source threshold voltage    | I <sub>D</sub> = 1mA, V <sub>DS</sub> = 10V  | 2      | 3    | 4    | V    |
| r <sub>DS</sub> (ON)   | Drain-source on-state resistance | I <sub>D</sub> = 2A, V <sub>GS</sub> = 10V   | —      | 1.0  | 1.3  | W    |
| V <sub>DS</sub> (ON)   | Drain-source on-state voltage    | I <sub>D</sub> = 2A, V <sub>GS</sub> = 10V   | —      | 2.0  | 2.6  | V    |
| y <sub>fs</sub>        | Forward transfer admittance      | I <sub>D</sub> = 2A, V <sub>DS</sub> = 10V   | 1.6    | 2.5  | —    | S    |
| C <sub>iss</sub>       | Input capacitance                | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz  | —      | 270  | —    | pF   |
| C <sub>oss</sub>       | Output capacitance               |  | —      | 55   | —    | pF   |
| C <sub>rss</sub>       | Reverse transfer capacitance     |  | —      | 10   | —    | pF   |
| t <sub>d</sub> (on)    | Turn-on delay time               | V <sub>DD</sub> = 150V, I <sub>D</sub> = 2A, V <sub>GS</sub> = 10V, R <sub>GEN</sub> = R <sub>GS</sub> = 50Ω | —      | 11   | —    | ns   |
| t <sub>r</sub>         | Rise time                        |  | —      | 13   | —    | ns   |
| t <sub>d</sub> (off)   | Turn-off delay time              |  | —      | 32   | —    | ns   |
| t <sub>f</sub>         | Fall time                        |  | —      | 22   | —    | ns   |
| V <sub>SD</sub>        | Source-drain voltage             | I <sub>S</sub> = 2A, V <sub>GS</sub> = 0V  | —      | 1.5  | 2.0  | V    |
| R <sub>th</sub> (ch-c) | Thermal resistance               | Channel to case  | —      | —    | 2.08 | °C/W |

**PERFORMANCE CURVES**

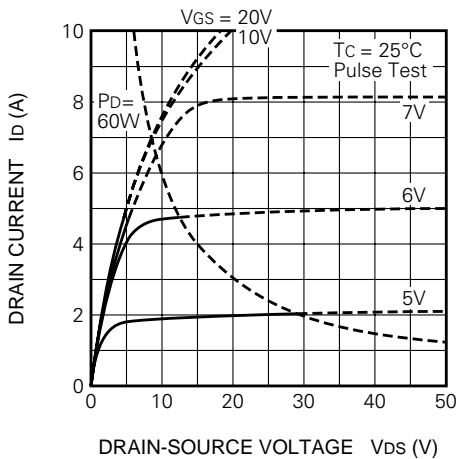
**POWER DISSIPATION DERATING CURVE**



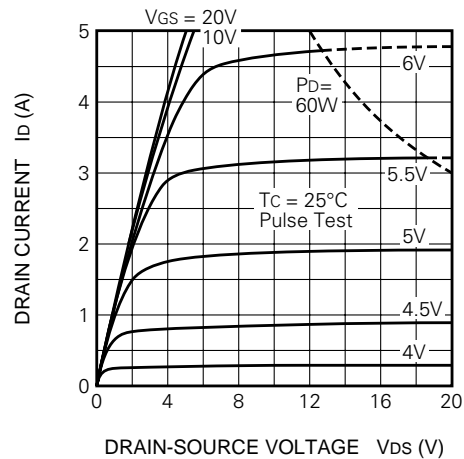
**MAXIMUM SAFE OPERATING AREA**



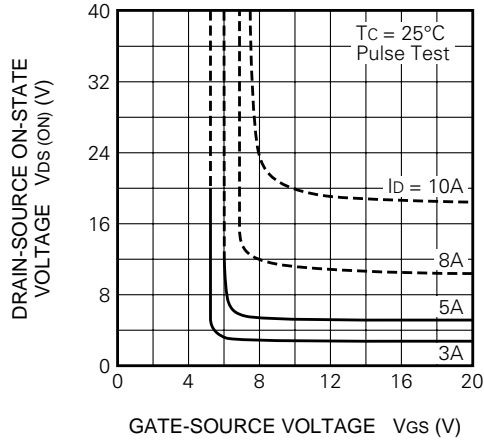
**OUTPUT CHARACTERISTICS (TYPICAL)**



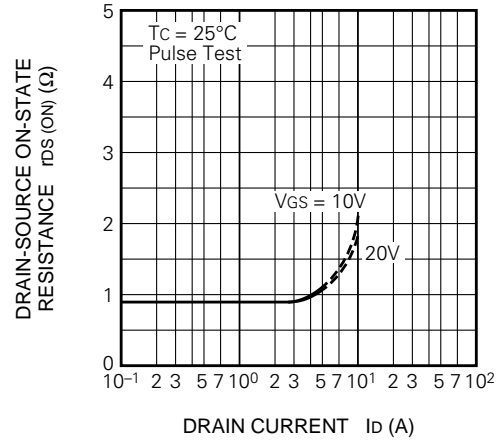
**OUTPUT CHARACTERISTICS (TYPICAL)**



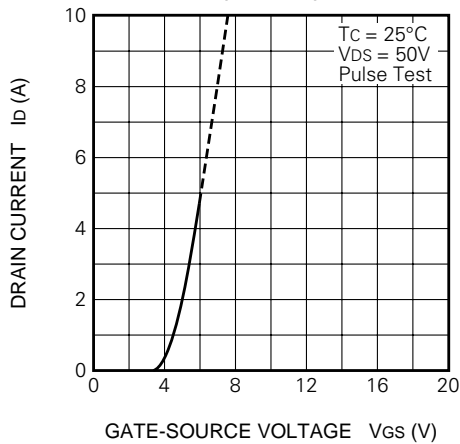
ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)



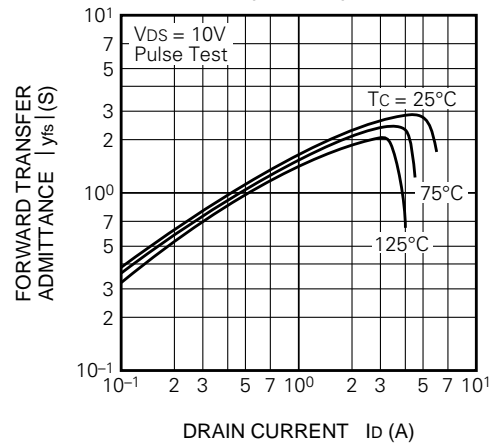
ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)



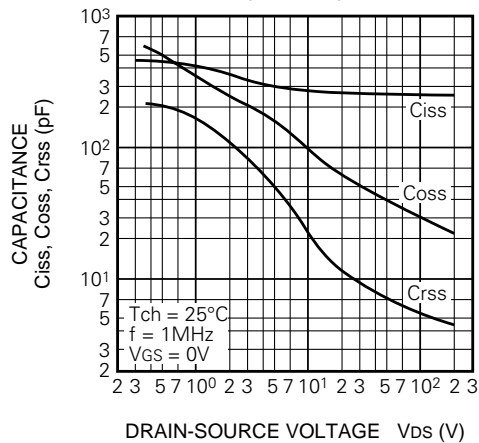
TRANSFER CHARACTERISTICS (TYPICAL)



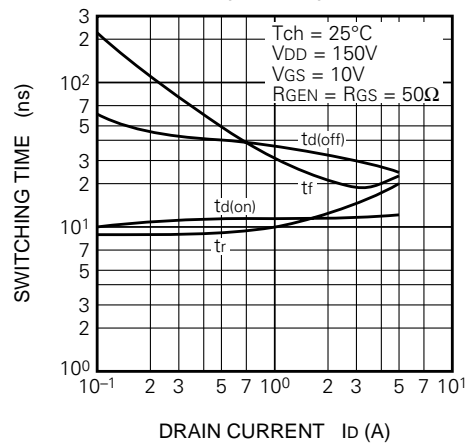
FORWARD TRANSFER ADMITTANCE VS. DRAIN CURRENT (TYPICAL)



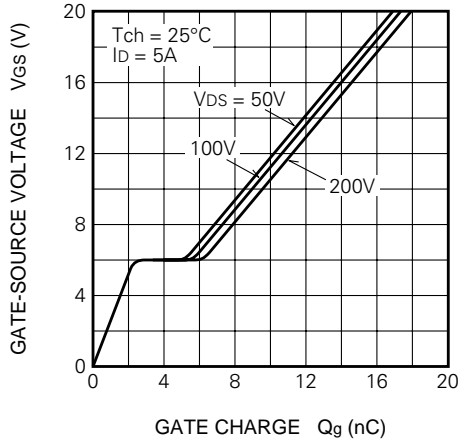
CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)



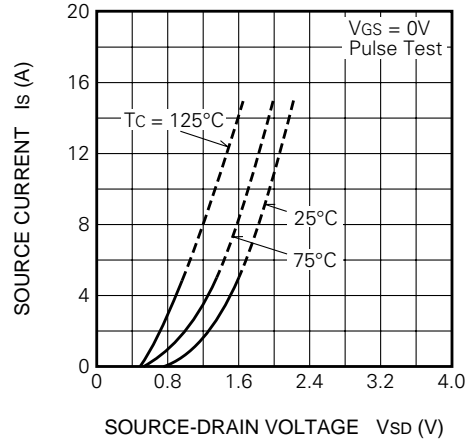
SWITCHING CHARACTERISTICS (TYPICAL)



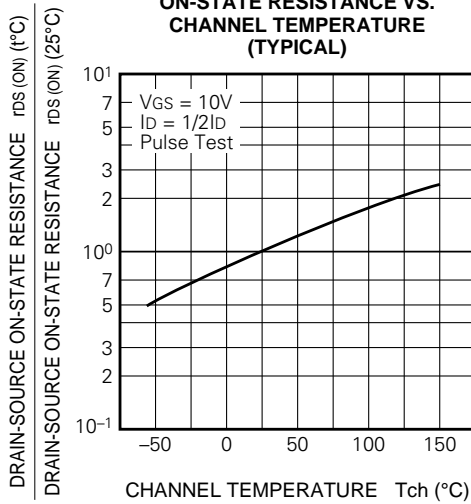
**GATE-SOURCE VOLTAGE VS. GATE CHARGE (TYPICAL)**



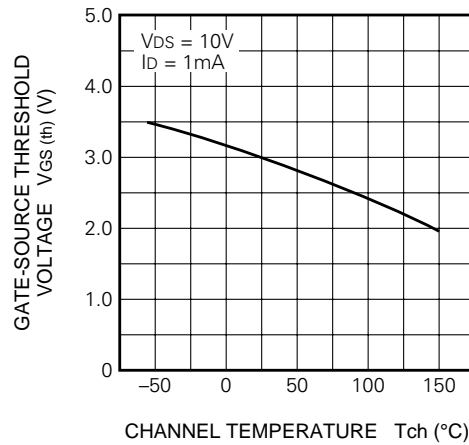
**SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)**



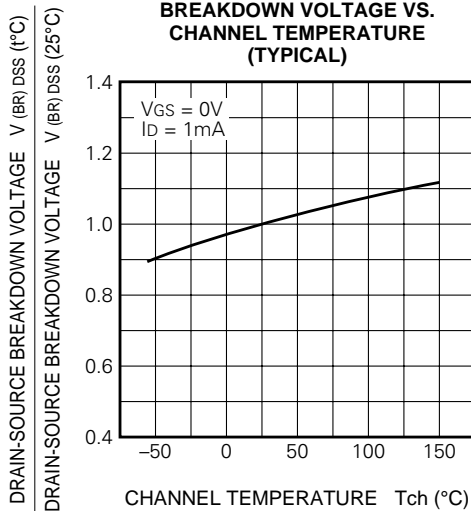
**ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)**



**THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)**



**BREAKDOWN VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS**

