

To all our customers

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

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Keep safety first in your circuit designs!

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# 2SK1404

Silicon N-Channel MOS FET

**RENESAS**

ADE-208-1284 (Z)

1st. Edition

Mar. 2001

## Application

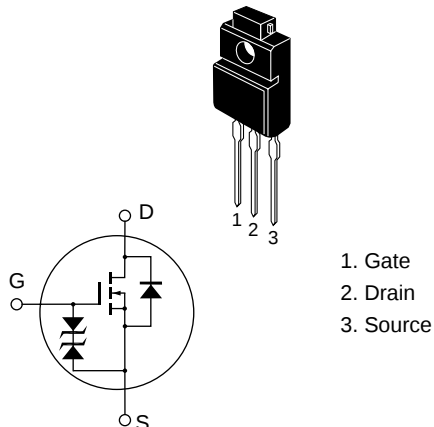
High speed power switching

## Features

- Low on-resistance
- High speed switching
- Low drive current
- No secondary breakdown
- Suitable for switching regulator and DC-DC converter

## Outline

TO-220FM



Absolute Maximum Ratings (Ta = 25°C)

| Item                                      | Symbol                              | Ratings     | Unit |
|-------------------------------------------|-------------------------------------|-------------|------|
| Drain to source voltage                   | V <sub>DSS</sub>                    | 600         | 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>*1</sup> | 20          | A    |
| Body to drain diode reverse drain current | I <sub>DR</sub>                     | 5           | A    |
| Channel dissipation                       | Pch <sup>*2</sup>                   | 35          | W    |
| Channel temperature                       | Tch                                 | 150         | °C   |
| Storage temperature                       | Tstg                                | −55 to +150 | °C   |

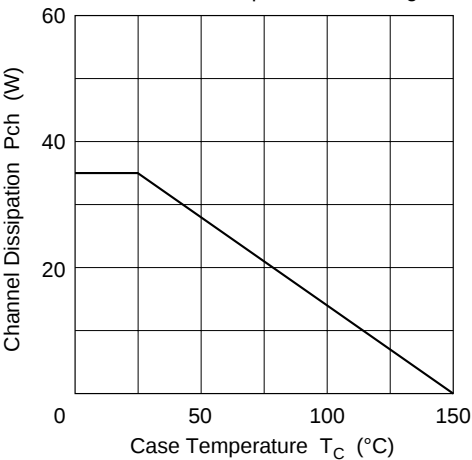
Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%  
2. Value at T<sub>c</sub> = 25°C

**Electrical Characteristics** (Ta = 25°C)

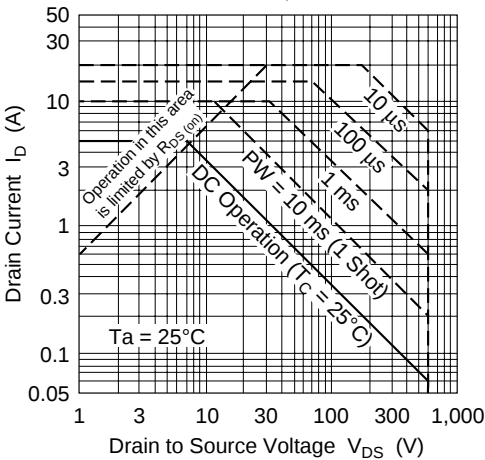
| Item                                       | Symbol        | Min      | Typ  | Max      | Unit          | Test conditions                                                                |
|--------------------------------------------|---------------|----------|------|----------|---------------|--------------------------------------------------------------------------------|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 600      | —    | —        | V             | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$                                           |
| Gate to source breakdown voltage           | $V_{(BR)GSS}$ | $\pm 30$ | —    | —        | V             | $I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$                             |
| Gate to source leak current                | $I_{GSS}$     | —        | —    | $\pm 10$ | $\mu\text{A}$ | $V_{GS} = \pm 25 \text{ V}$ , $V_{DS} = 0$                                     |
| Zero gate voltage drain current            | $I_{DSS}$     | —        | —    | 250      | $\mu\text{A}$ | $V_{DS} = 500 \text{ V}$ , $V_{GS} = 0$                                        |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | 2.0      | —    | 3.0      | V             | $I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}$                                 |
| Static drain to source on state resistance | $R_{DS(on)}$  | —        | 1.1  | 1.5      | $\Omega$      | $I_D = 2.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ * <sup>1</sup>                 |
| Forward transfer admittance                | $ y_{fs} $    | 3.0      | 5.0  | —        | S             | $I_D = 2.5 \text{ A}$ , $V_{DS} = 10 \text{ V}$ * <sup>1</sup>                 |
| Input capacitance                          | $C_{iss}$     | —        | 1000 | —        | pF            | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ ,<br>$f = 1 \text{ MHz}$                |
| Output capacitance                         | $C_{oss}$     | —        | 250  | —        | pF            |                                                                                |
| Reverse transfer capacitance               | $C_{rss}$     | —        | 45   | —        | pF            |                                                                                |
| Turn-on delay time                         | $t_{d(on)}$   | —        | 12   | —        | ns            | $I_D = 2.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ ,<br>$R_L = 12 \text{ }\Omega$ |
| Rise time                                  | $t_r$         | —        | 45   | —        | ns            |                                                                                |
| Turn-off delay time                        | $t_{d(off)}$  | —        | 105  | —        | ns            |                                                                                |
| Fall time                                  | $t_f$         | —        | 55   | —        | ns            |                                                                                |
| Body to drain diode forward voltage        | $V_{DF}$      | —        | 0.9  | —        | V             | $I_F = 5 \text{ A}$ , $V_{GS} = 0$                                             |
| Body to drain diode reverse recovery time  | $t_{rr}$      | —        | 500  | —        | ns            | $I_F = 5 \text{ A}$ , $V_{GS} = 0$ ,<br>$di_F/dt = 100 \text{ A}/\mu\text{s}$  |

Note: 1. Pulse test

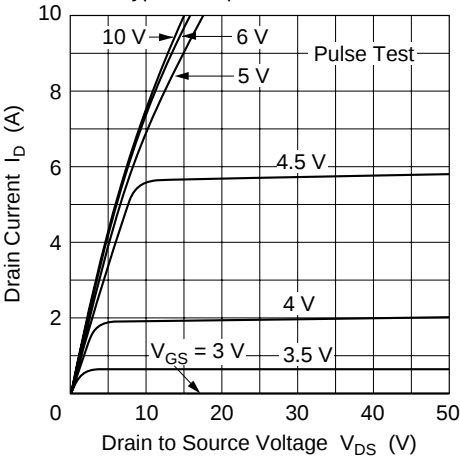
Power vs. Temperature Derating



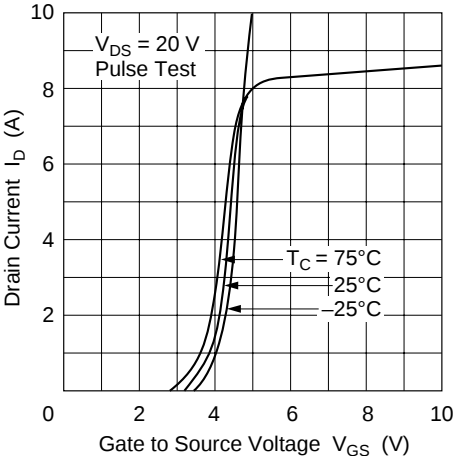
Maximum Safe Operation Area

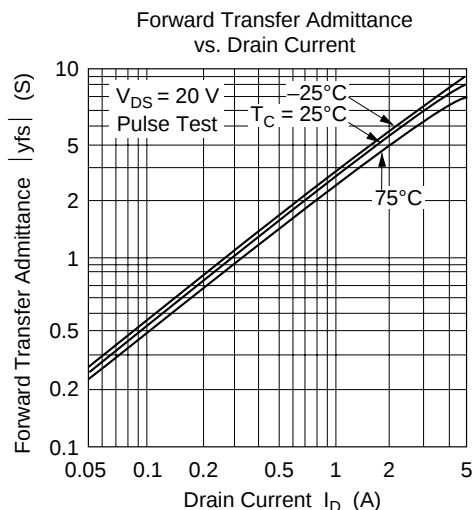
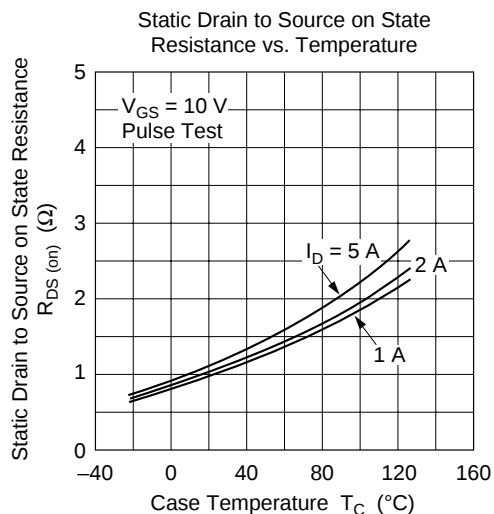
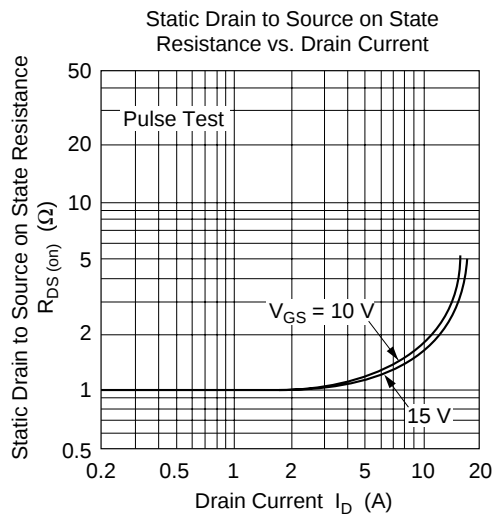
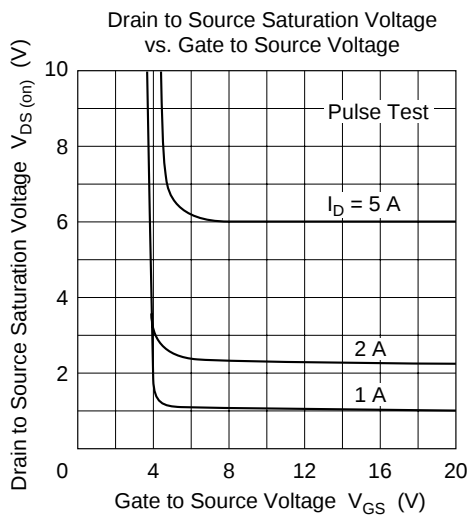


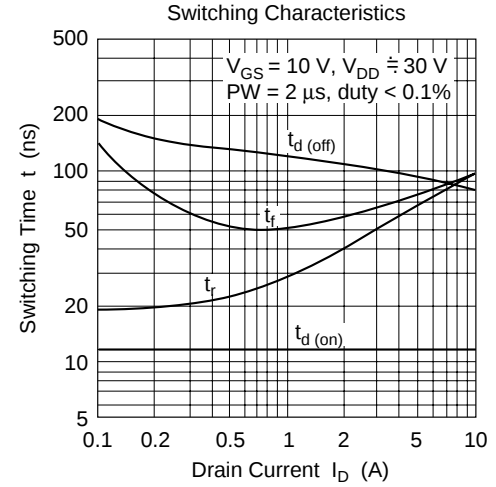
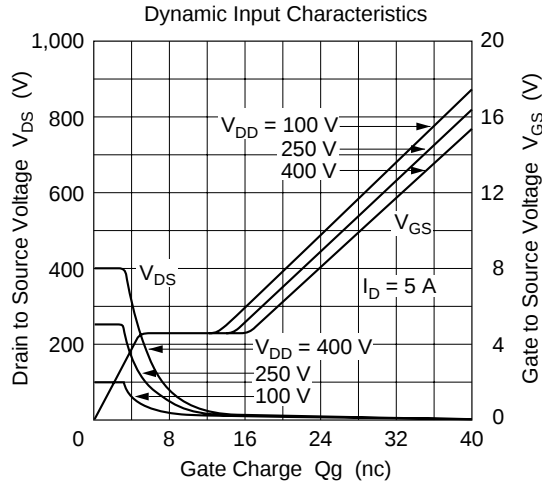
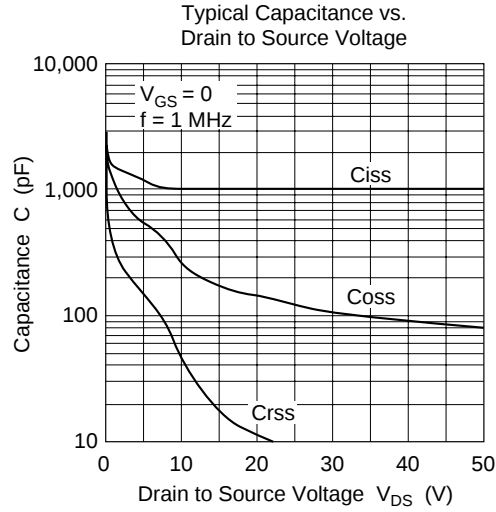
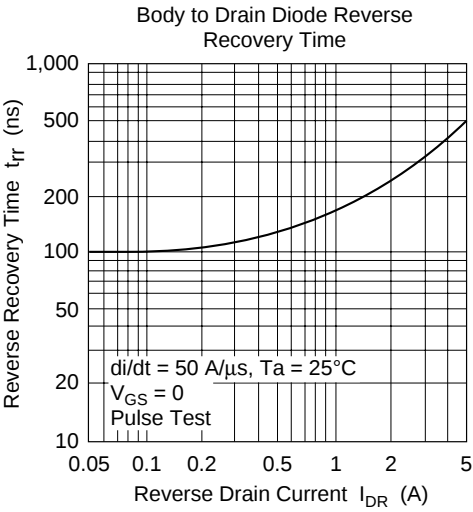
Typical Output Characteristics

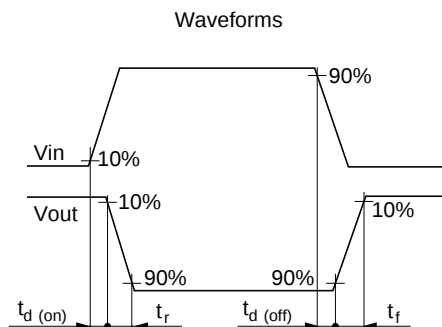
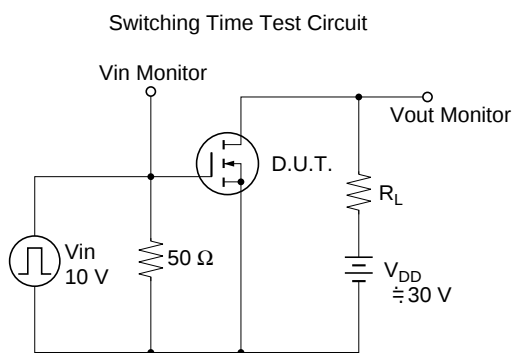
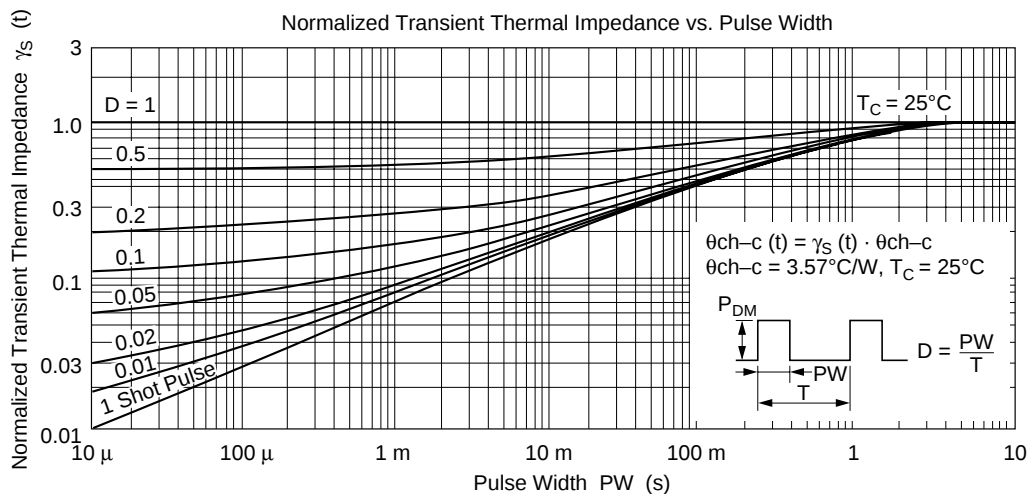
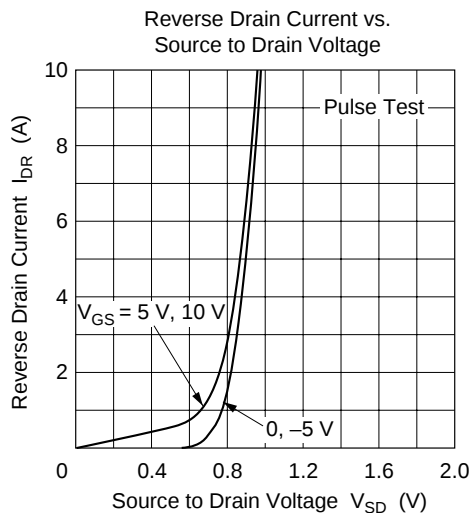


Typical Transfer Characteristics

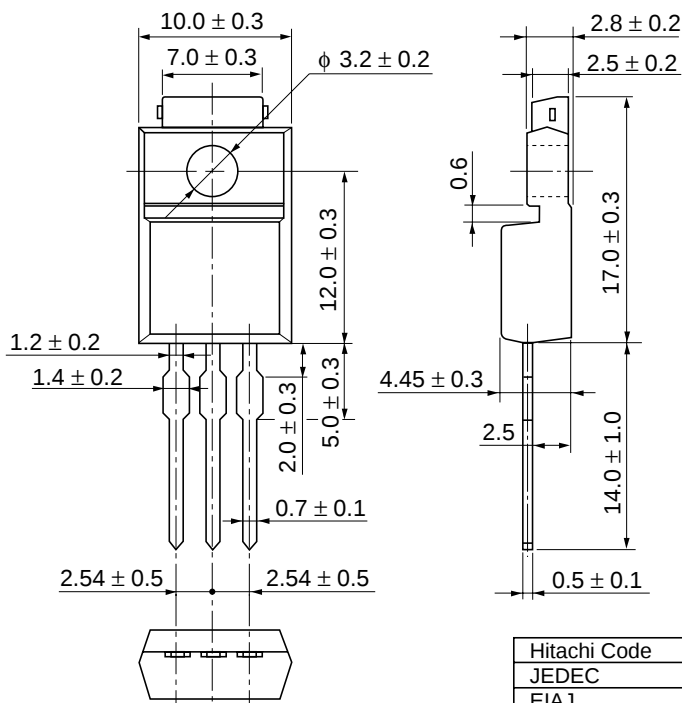




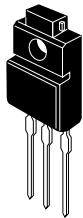




Package Dimensions



As of January, 2001  
Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | TO-220FM |
| JEDEC                  | —        |
| EIAJ                   | Conforms |
| Mass (reference value) | 1.8 g    |

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