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# 2SK1404

Silicon N-Channel MOS FET

# HITACHI

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## Application

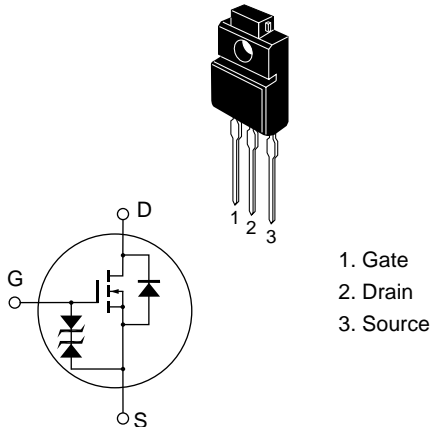
High speed power switching

## Features

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

## Outline

TO-220FM



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## 2SK1404

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### 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   |

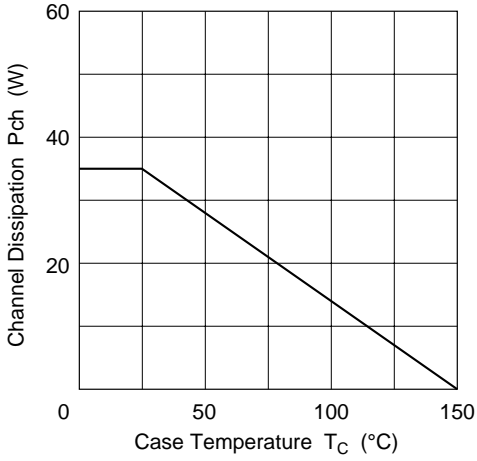
Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%  
2. Value at T<sub>C</sub> = 25°C

## Electrical Characteristics (Ta = 25°C)

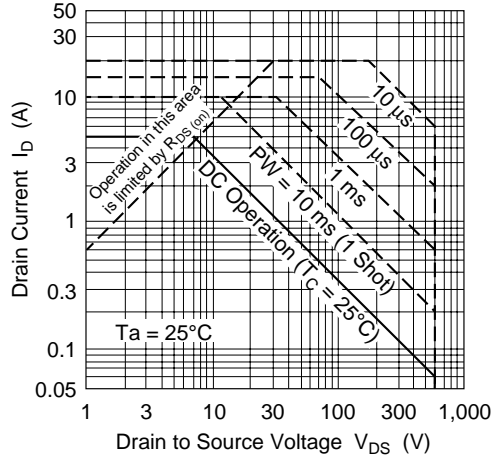
| Item                                       | Symbol        | Min      | Typ  | Max      | Unit          | Test conditions   |
|--|---------------|----------|------|----------|---------------|---|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 600      | —    | —        | V             | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$  |
| 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      | $\Omega$      | $I_D = 2.5 \text{ A}$ , $V_{GS} = 10 \text{ V}^{*1}$                          |
| Forward transfer admittance                | $ y_{fs} $    | 3.0      | 5.0  | —        | S             | $I_D = 2.5 \text{ A}$ , $V_{DS} = 10 \text{ V}^{*1}$                          |
| Input capacitance                          | $C_{iss}$     | —        | 1000 | —        | pF            | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ ,                                      |
| Output capacitance                         | $C_{oss}$     | —        | 250  | —        | pF            | $f = 1 \text{ MHz}$   |
| Reverse transfer capacitance               | $C_{rss}$     | —        | 45   | —        | pF            |   |
| Turn-on delay time                         | $t_{d(on)}$   | —        | 12   | —        | ns            | $I_D = 2.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ ,                             |
| Rise time                                  | $t_r$         | —        | 45   | —        | ns            | $R_L = 12 \text{ }\Omega$   |
| 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

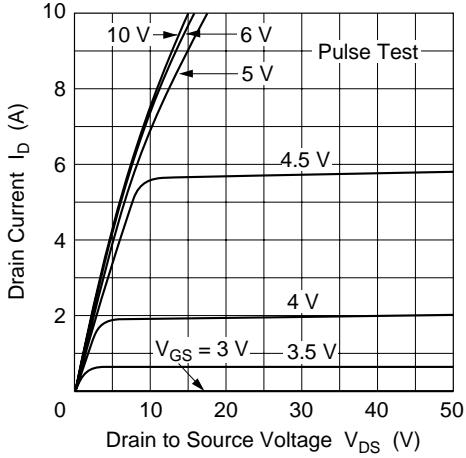
Power vs. Temperature Derating



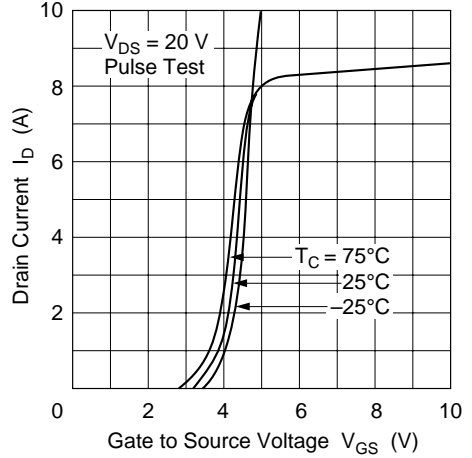
Maximum Safe Operation Area

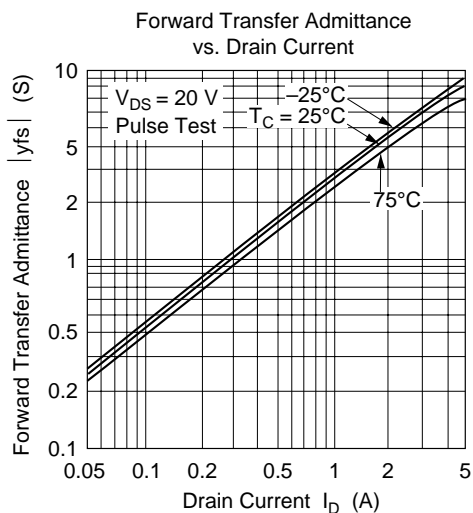
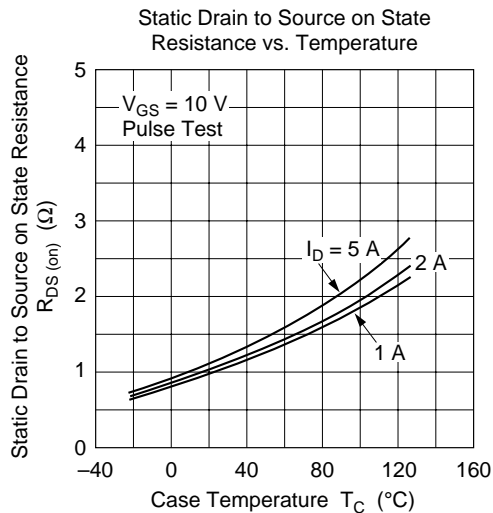
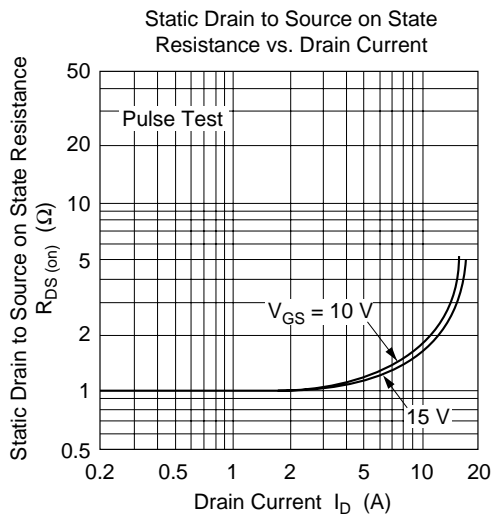
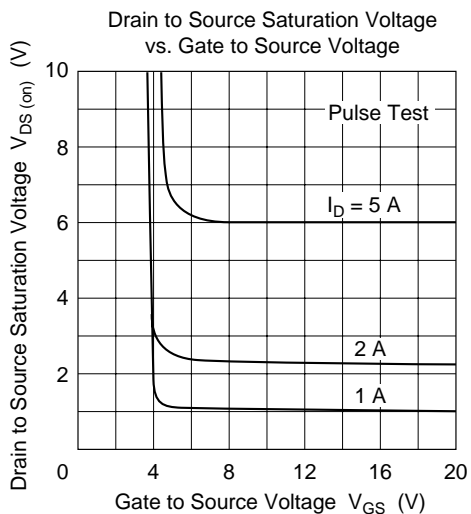


Typical Output Characteristics

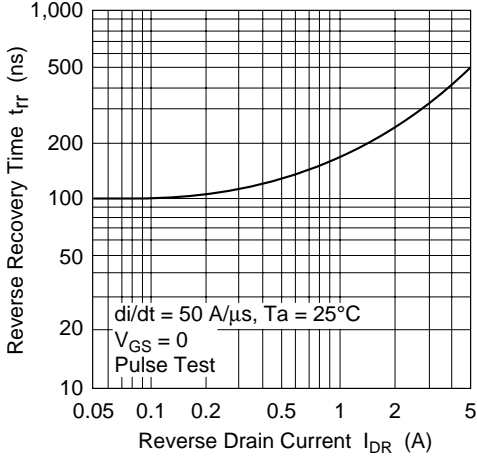


Typical Transfer Characteristics

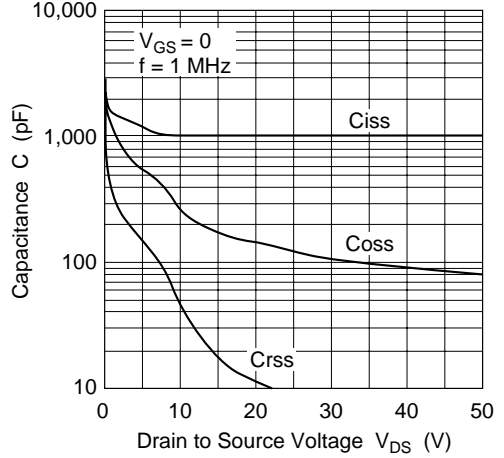




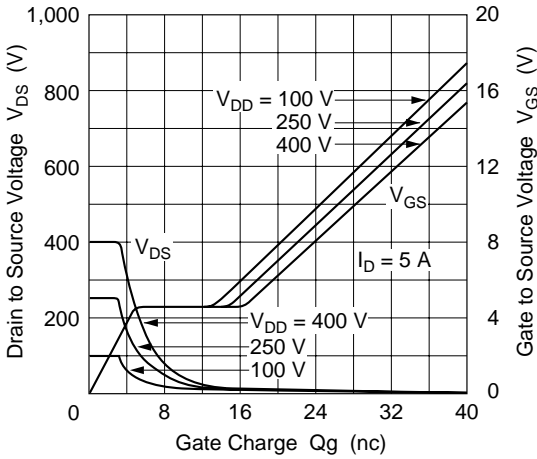
Body to Drain Diode Reverse Recovery Time



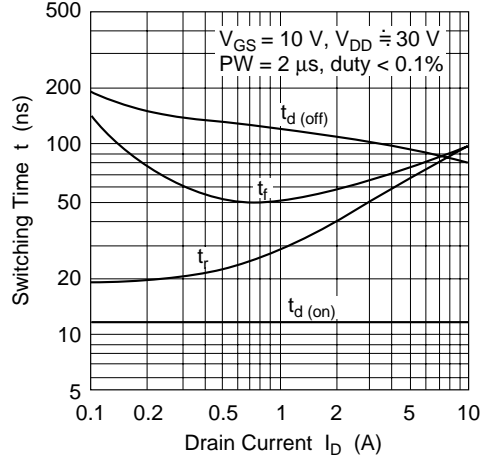
Typical Capacitance vs. Drain to Source Voltage

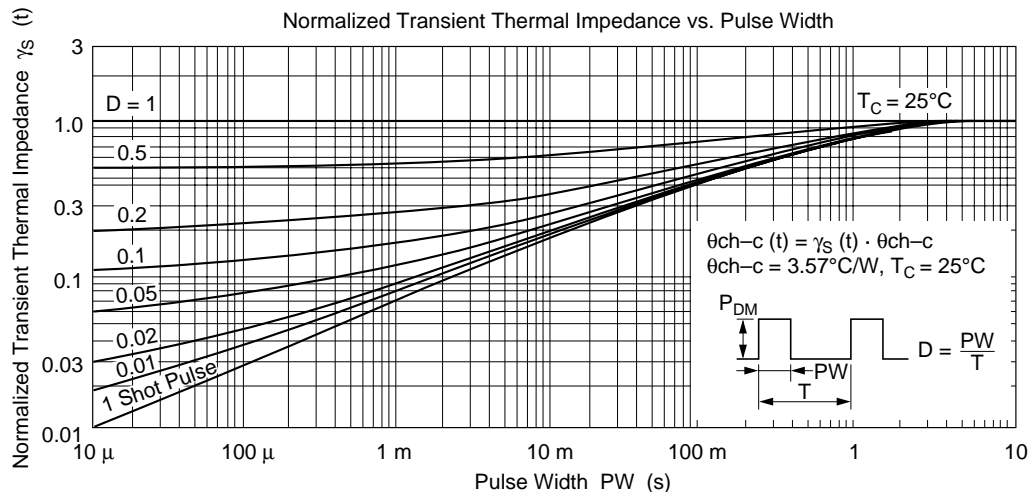
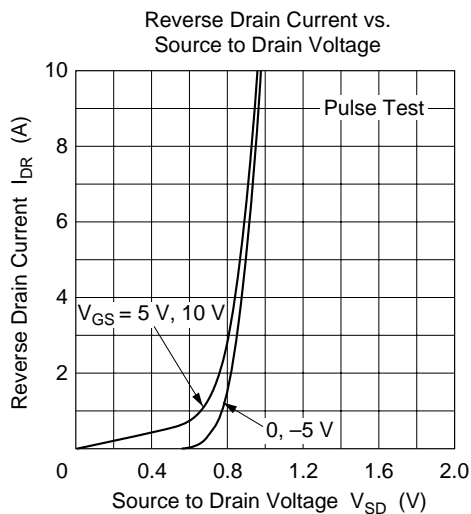


Dynamic Input Characteristics

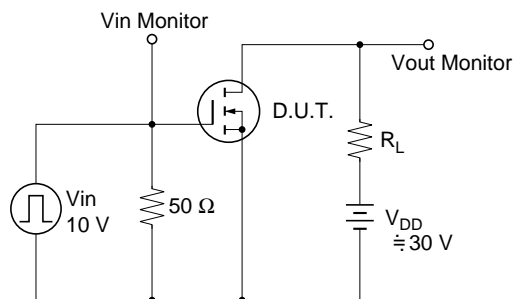


Switching Characteristics

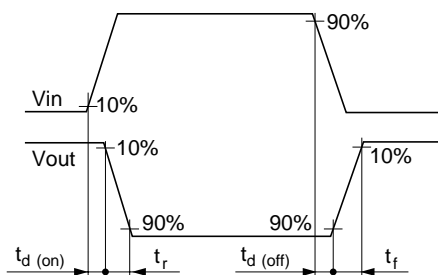




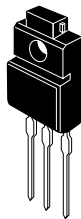
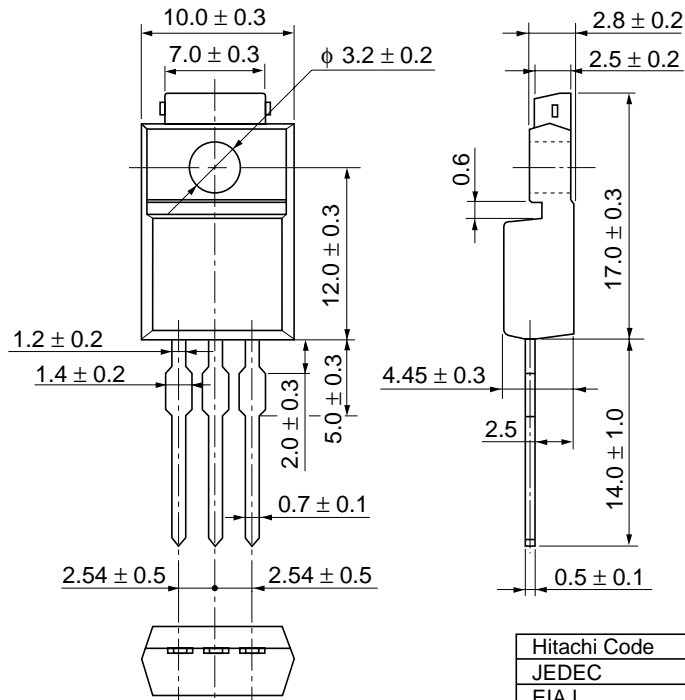
Switching Time Test Circuit



Waveforms



Unit: mm



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



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## Hitachi, Ltd.

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      North America      : <http://semiconductor.hitachi.com/>  
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## For further information write to:

Hitachi Semiconductor  
(America) Inc.  
179 East Tasman Drive,  
San Jose, CA 95134  
Tel: <1> (408) 433-1990  
Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
Electronic components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
Electronic Components Group.  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.  
16 Collyer Quay #20-00  
Hitachi Tower  
Singapore 049318  
Tel: 535-2100  
Fax: 535-1533

Hitachi Asia Ltd.  
Taipei Branch Office  
3F, Hung Kuo Building, No.167,  
Tun-Hwa North Road, Taipei (105)  
Tel: <886> (2) 2718-3666  
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon, Hong Kong  
Tel: <852> (2) 735 9218  
Fax: <852> (2) 730 0281  
Telex: 40815 HITEC HX

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