

# 2SK2934

Silicon N Channel MOS FET  
High Speed Power Switching

# HITACHI

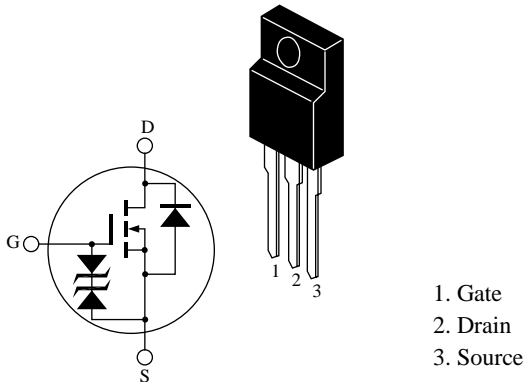
ADE-208-557B (Z)  
3rd. Edition  
Jun 1998

## Features

- Low on-resistance  
 $R_{DS} = 0.026 \Omega$  typ.
- High speed switching
- 4V gate drive device can be driven from 5V source

## Outline

TO-220CFM



**Absolute Maximum Ratings** ( $T_a = 25^\circ\text{C}$ )

| <b>Item</b>                            | <b>Symbol</b>          | <b>Ratings</b> | <b>Unit</b>      |
|--|------------------------|----------------|------------------|
| Drain to source voltage                | $V_{DSS}$              | 60             | V                |
| Gate to source voltage                 | $V_{GSS}$              | $\pm 20$       | V                |
| Drain current                          | $I_D$                  | 25             | A                |
| Drain peak current                     | $I_{D(pulse)}^{Note1}$ | 100            | A                |
| Body-drain diode reverse drain current | $I_{DR}$               | 25             | A                |
| Avalanche current                      | $I_{AP}^{Note3}$       | 20             | A                |
| Avalanche energy                       | $E_{AR}^{Note3}$       | 34             | mJ               |
| Channel dissipation                    | $P_{ch}^{Note2}$       | 25             | W                |
| Channel temperature                    | $T_{ch}$               | 150            | $^\circ\text{C}$ |
| Storage temperature                    | $T_{stg}$              | -55 to +150    | $^\circ\text{C}$ |

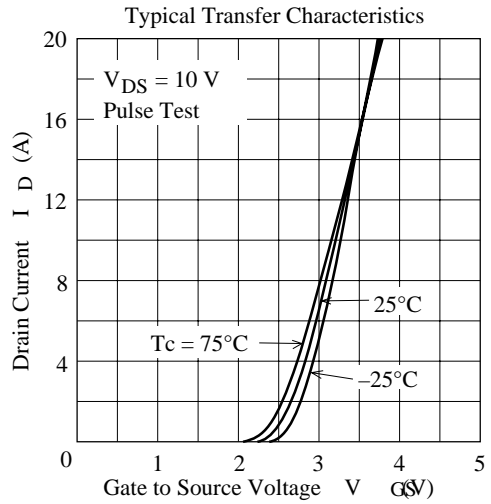
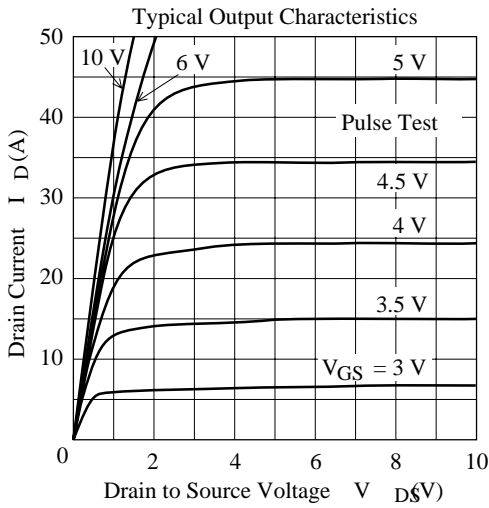
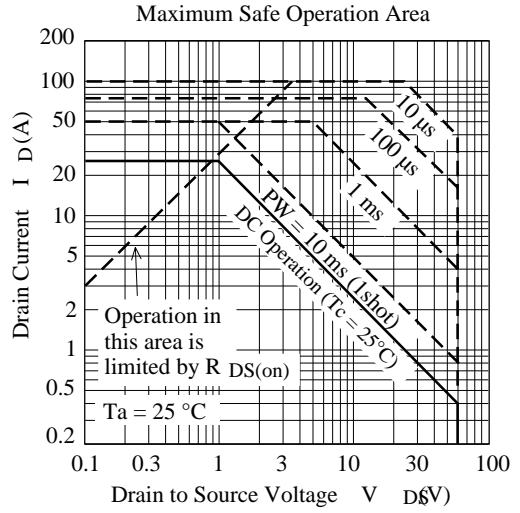
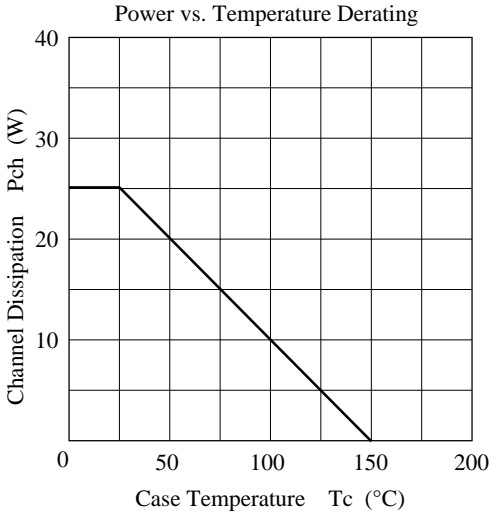
- Note: 1.  $PW \leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$   
2. Value at  $T_c = 25^\circ\text{C}$   
3. Value at  $T_{ch} = 25^\circ\text{C}$ ,  $R_g \geq 50\Omega$

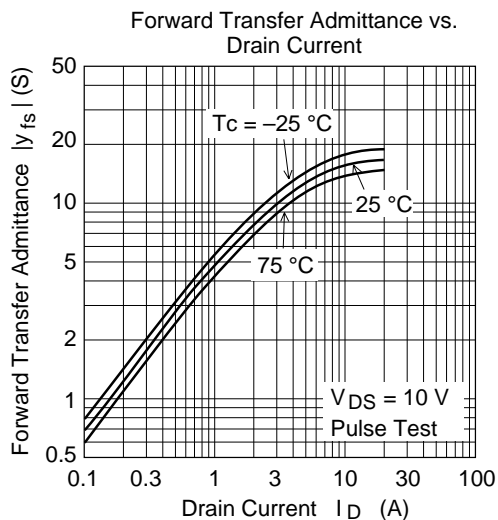
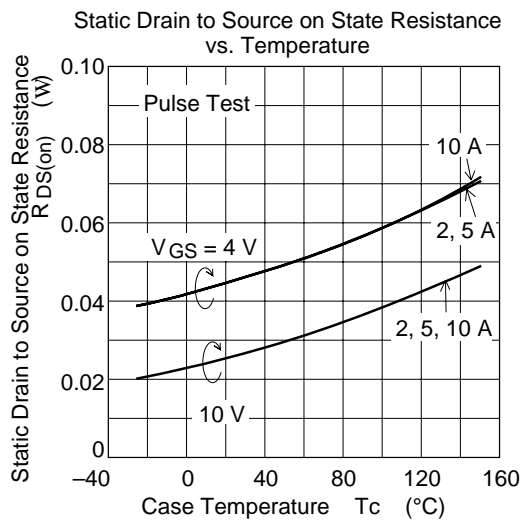
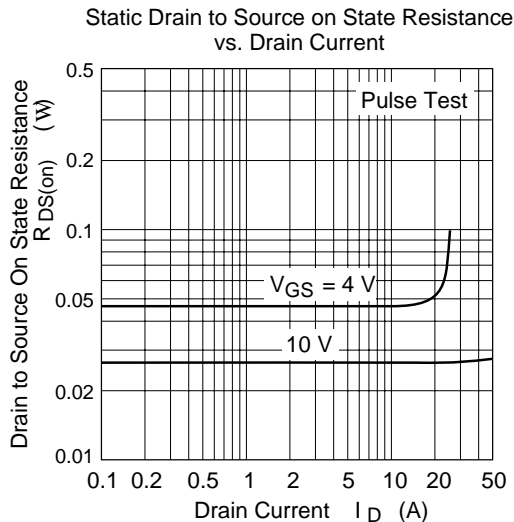
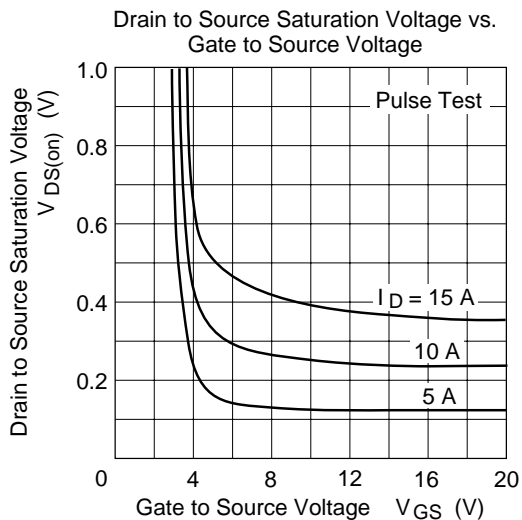
## Electrical Characteristics (Ta = 25°C)

| Item                                       | Symbol        | Min      | Typ   | Max      | Unit          | Test Conditions  |
|--|---------------|----------|-------|----------|---------------|--|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 60       | —     | —        | V             | $I_D = 10\text{mA}$ , $V_{GS} = 0$                                     |
| Gate to source breakdown voltage           | $V_{(BR)GSS}$ | $\pm 20$ | —     | —        | V             | $I_G = \pm 100\mu\text{A}$ , $V_{DS} = 0$                              |
| Gate to source leak current                | $I_{GSS}$     | —        | —     | $\pm 10$ | $\mu\text{A}$ | $V_{GS} = \pm 16\text{V}$ , $V_{DS} = 0$                               |
| Zero gate voltage drain current            | $I_{DSS}$     | —        | —     | 10       | $\mu\text{A}$ | $V_{DS} = 60\text{V}$ , $V_{GS} = 0$                                   |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | 1.5      | —     | 2.5      | V             | $I_D = 1\text{mA}$ , $V_{DS} = 10\text{V}$                             |
| Static drain to source on state resistance | $R_{DS(on)}$  | —        | 0.026 | 0.034    | $\Omega$      | $I_D = 15\text{A}$ , $V_{GS} = 10\text{V}$ <sup>Note4</sup>            |
|  | $R_{DS(on)}$  | —        | 0.045 | 0.07     | $\Omega$      | $I_D = 15\text{A}$ , $V_{GS} = 4\text{V}$ <sup>Note4</sup>             |
| Forward transfer admittance                | $ y_{fs} $    | 11       | 17    | —        | S             | $I_D = 15\text{A}$ , $V_{DS} = 10\text{V}$ <sup>Note4</sup>            |
| Input capacitance                          | $C_{iss}$     | —        | 740   | —        | pF            | $V_{DS} = 10\text{V}$  |
| Output capacitance                         | $C_{oss}$     | —        | 380   | —        | pF            | $V_{GS} = 0$   |
| Reverse transfer capacitance               | $C_{rss}$     | —        | 140   | —        | pF            | $f = 1\text{MHz}$  |
| Turn-on delay time                         | $t_{d(on)}$   | —        | 10    | —        | ns            | $I_D = 15\text{A}$ , $V_{GS} = 10\text{V}$                             |
| Rise time                                  | $t_r$         | —        | 160   | —        | ns            | $R_L = 2\Omega$  |
| Turn-off delay time                        | $t_{d(off)}$  | —        | 100   | —        | ns            |  |
| Fall time                                  | $t_f$         | —        | 150   | —        | ns            |  |
| Body-drain diode forward voltage           | $V_{DF}$      | —        | 0.95  | —        | V             | $I_F = 25\text{A}$ , $V_{GS} = 0$                                      |
| Body-drain diode reverse recovery time     | $t_{rr}$      | —        | 40    | —        | ns            | $I_F = 25\text{A}$ , $V_{GS} = 0$<br>$diF/dt = 50\text{A}/\mu\text{s}$ |

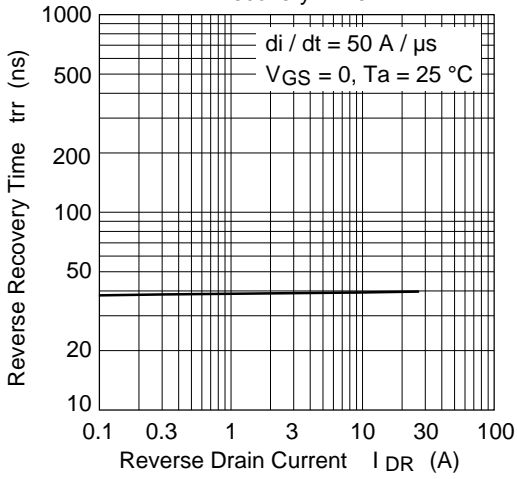
Note: 4. Pulse test

Main Characteristics

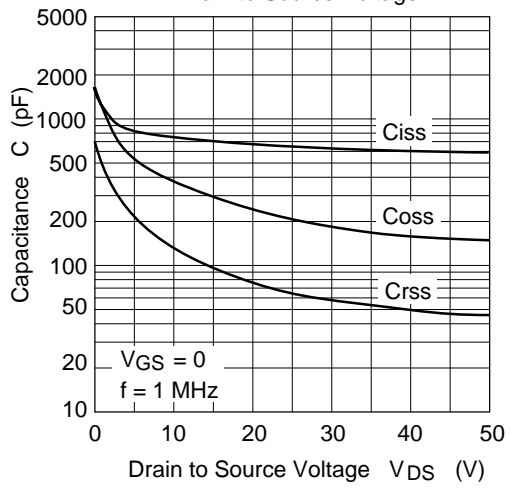




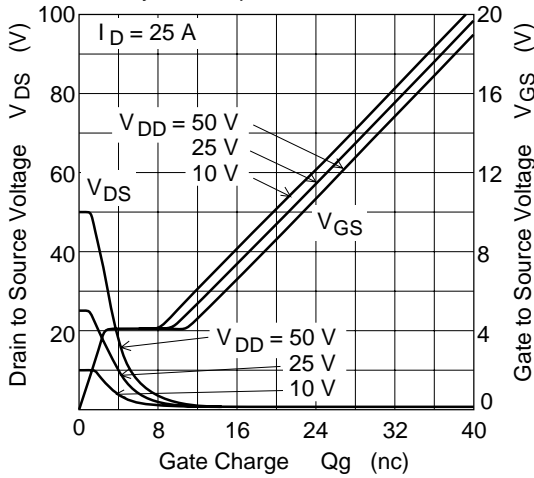
Body-Drain Diode Reverse Recovery Time



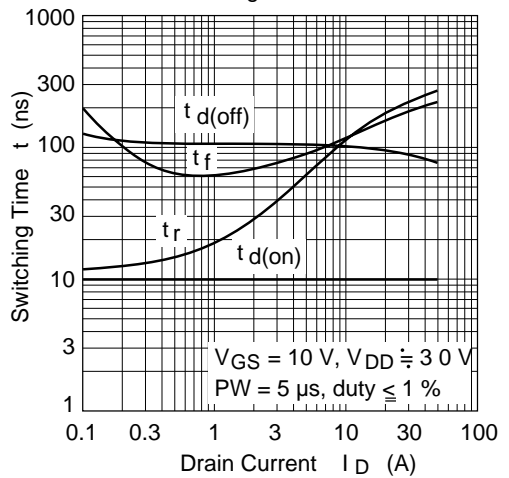
Typical Capacitance vs. Drain to Source Voltage

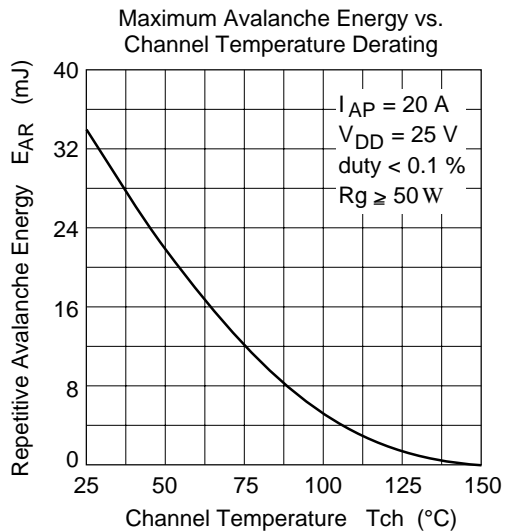
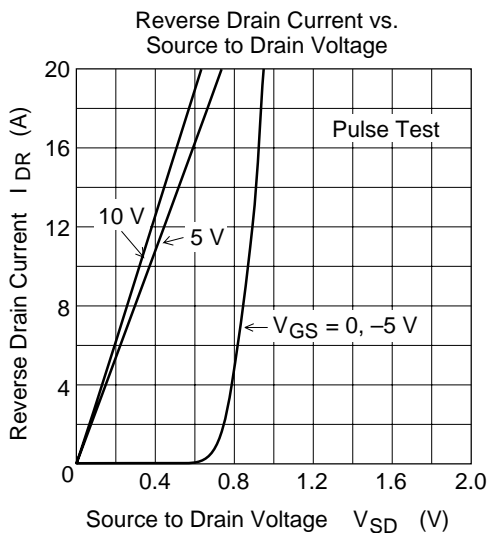


Dynamic Input Characteristics

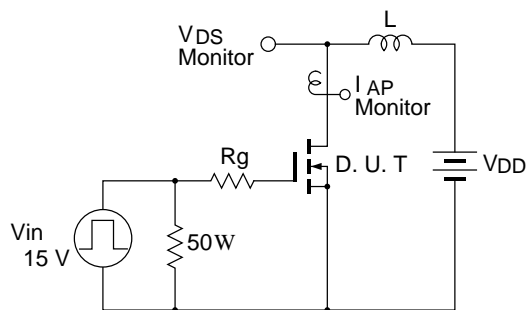


Switching Characteristics



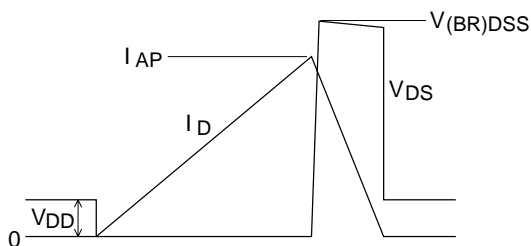


Avalanche Test Circuit

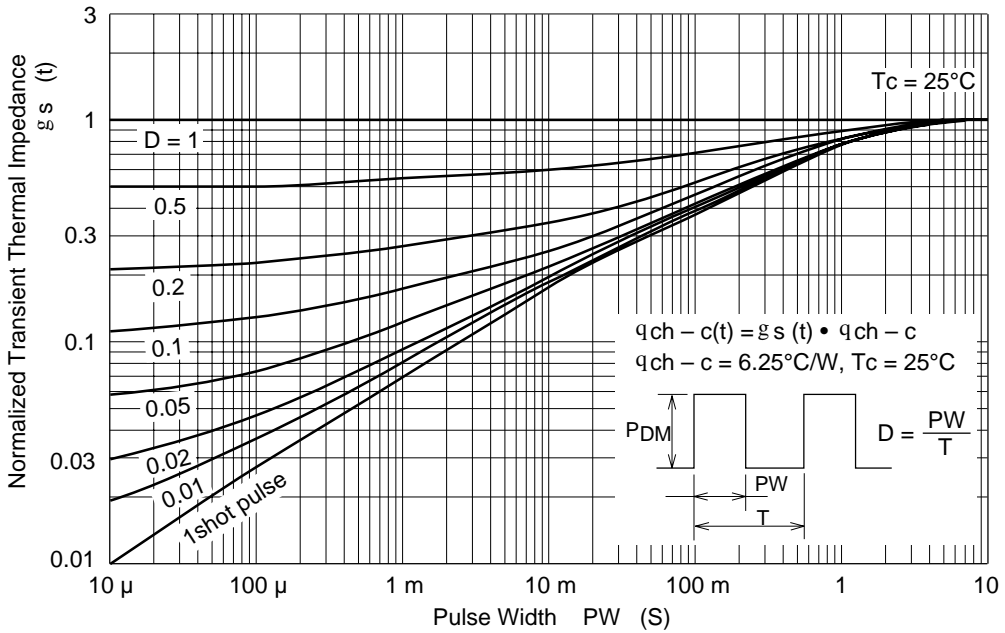


Avalanche Waveform

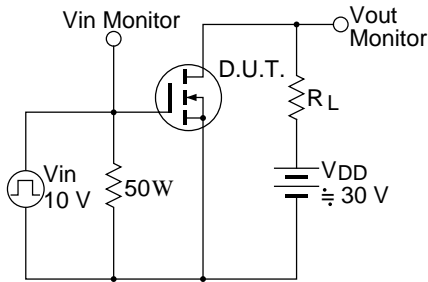
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



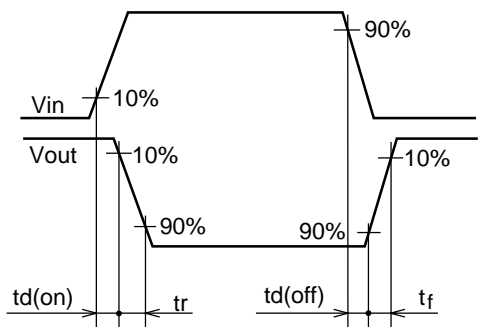
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



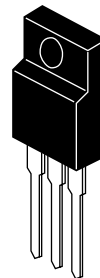
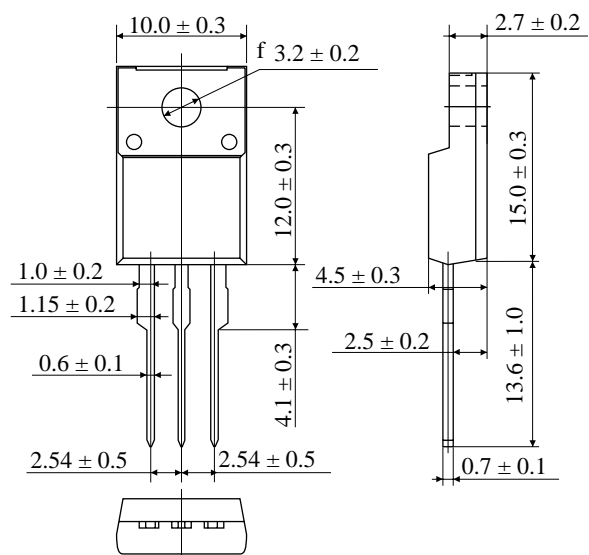
Waveform





## Package Dimensions

Unit: mm



|              |           |
|--------------|-----------|
| Hitachi Code | TO-220CFM |
| EIAJ         | —         |
| JEDEC        | —         |

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