

# 2SK3157

Silicon N Channel MOS FET  
High Speed Power Switching

# HITACHI

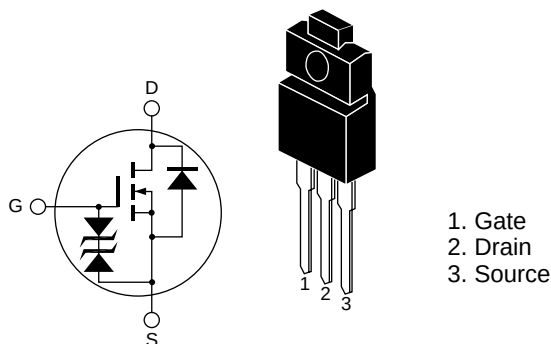
ADE-208-769A (Z)  
2nd. Edition  
Februaty 1999

## Features

- Low on-resistance  
 $R_{DS} = 50 \text{ m}\Omega$  typ.
- High speed switching
- 4 V gate drive device can be driven from 5 V source

## Outline

TO-220FM



Absolute Maximum Ratings (Ta = 25°C)

| Item                                   | Symbol                          | Ratings     | Unit |
|----------------------------------------|---------------------------------|-------------|------|
| Drain to source voltage                | $V_{DSS}$                       | 150         | V    |
| Gate to source voltage                 | $V_{GSS}$                       | $\pm 20$    | V    |
| Drain current                          | $I_D$                           | 20          | A    |
| Drain peak current                     | $I_{D(pulse)}$ <sup>Note1</sup> | 80          | A    |
| Body-drain diode reverse drain current | $I_{DR}$                        | 20          | A    |
| Avalanche current                      | $I_{AP}$ <sup>Note3</sup>       | 20          | A    |
| Avalanche energy                       | $E_{AR}$ <sup>Note3</sup>       | 30          | mJ   |
| Channel dissipation                    | $P_{ch}$ <sup>Note2</sup>       | 35          | W    |
| Channel temperature                    | $T_{ch}$                        | 150         | °C   |
| Storage temperature                    | $T_{stg}$                       | -55 to +150 | °C   |

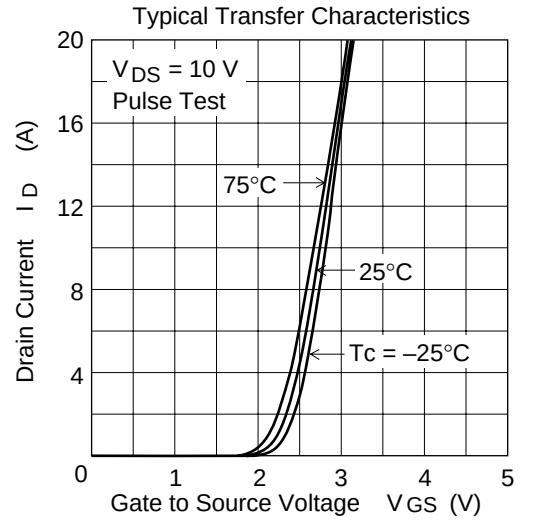
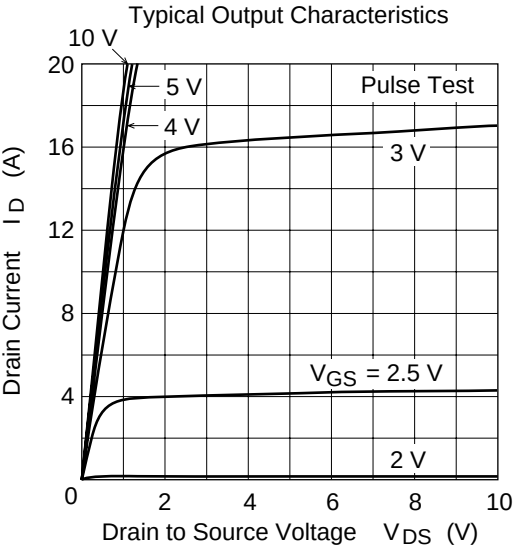
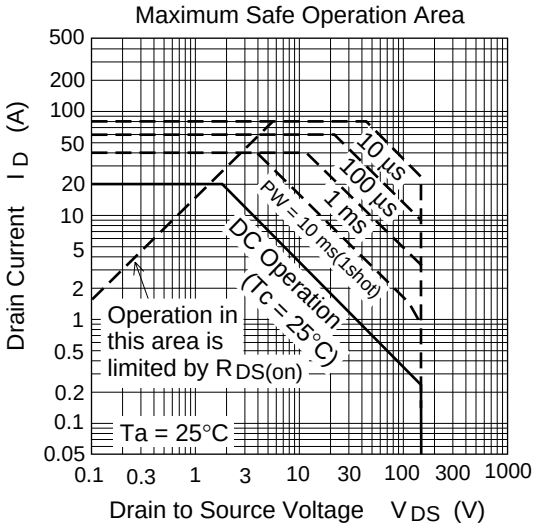
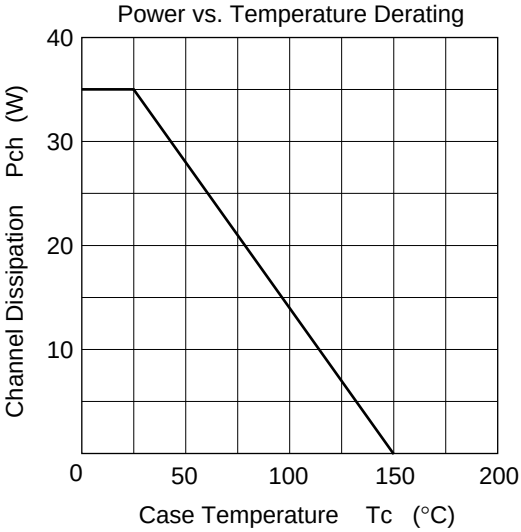
Note: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$   
2. Value at  $T_c = 25^\circ C$   
3. Value at  $T_{ch} = 25^\circ C$ ,  $R_g \geq 50 \Omega$

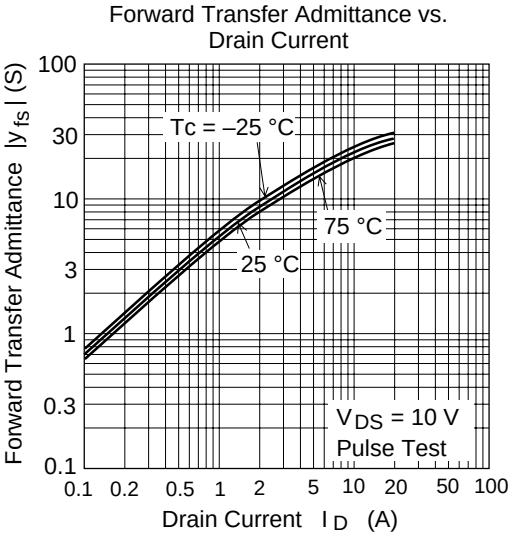
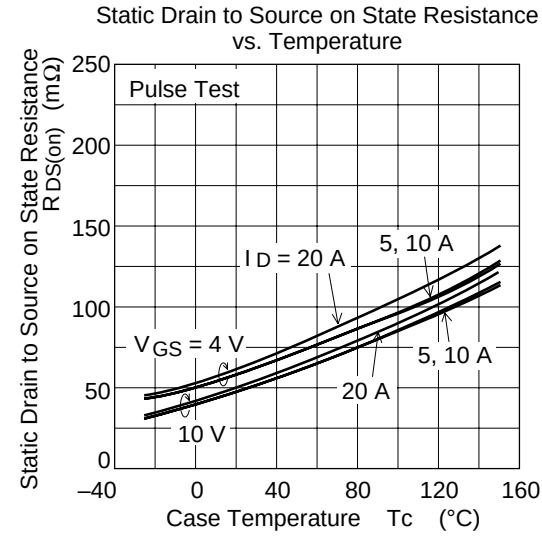
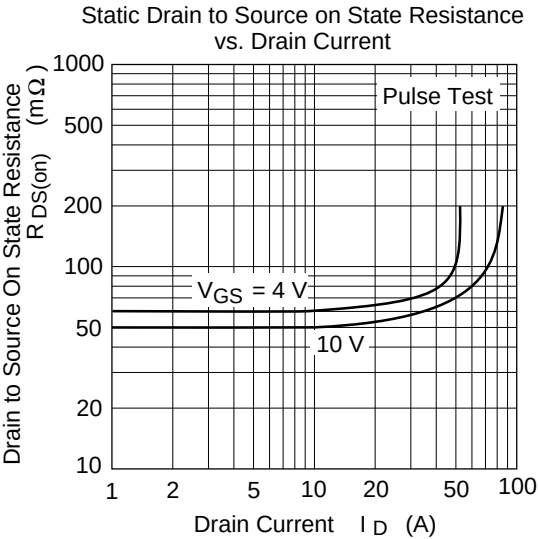
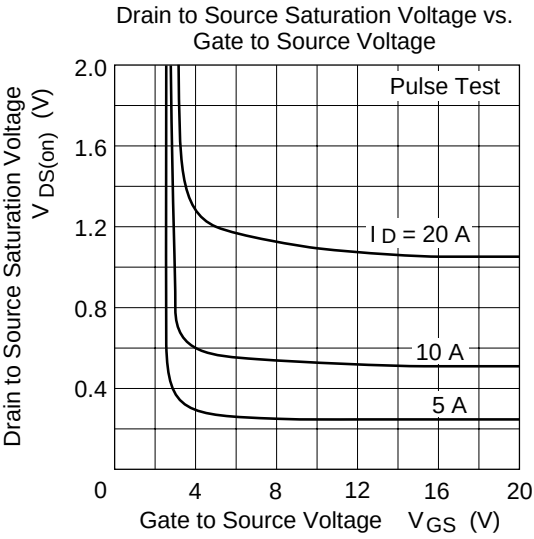
Electrical Characteristics (Ta = 25°C)

| Item                                       | Symbol        | Min      | Typ  | Max      | Unit      | Test Conditions                                                      |
|--------------------------------------------|---------------|----------|------|----------|-----------|----------------------------------------------------------------------|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 150      | —    | —        | V         | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$                                 |
| Gate to source breakdown voltage           | $V_{(BR)GSS}$ | $\pm 20$ | —    | —        | V         | $I_G = \pm 100 \mu A$ , $V_{DS} = 0$                                 |
| Gate to source leak current                | $I_{GSS}$     | —        | —    | $\pm 10$ | $\mu A$   | $V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$                           |
| Zero gate voltage drain current            | $I_{DSS}$     | —        | —    | 10       | $\mu A$   | $V_{DS} = 150 \text{ V}$ , $V_{GS} = 0$                              |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | 1.0      | —    | 2.5      | V         | $I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}$                       |
| Static drain to source on state resistance | $R_{DS(on)}$  | —        | 50   | 70       | $m\Omega$ | $I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>      |
|                                            | $R_{DS(on)}$  | —        | 60   | 80       | $m\Omega$ | $I_D = 10 \text{ A}$ , $V_{GS} = 4 \text{ V}$ <sup>Note4</sup>       |
| Forward transfer admittance                | $ y_{fs} $    | 13       | 22   | —        | S         | $I_D = 10 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>      |
| Input capacitance                          | $C_{iss}$     | —        | 1750 | —        | pF        | $V_{DS} = 10 \text{ V}$                                              |
| Output capacitance                         | $C_{oss}$     | —        | 600  | —        | pF        | $V_{GS} = 0$                                                         |
| Reverse transfer capacitance               | $C_{rss}$     | —        | 300  | —        | pF        | $f = 1 \text{ MHz}$                                                  |
| Turn-on delay time                         | $t_{d(on)}$   | —        | 18   | —        | ns        | $I_D = 10 \text{ A}$ , $V_{GS} = 10 \text{ V}$                       |
| Rise time                                  | $t_r$         | —        | 125  | —        | ns        | $R_L = 3 \Omega$                                                     |
| Turn-off delay time                        | $t_{d(off)}$  | —        | 400  | —        | ns        |                                                                      |
| Fall time                                  | $t_f$         | —        | 190  | —        | ns        |                                                                      |
| Body–drain diode forward voltage           | $V_{DF}$      | —        | 0.9  | —        | V         | $I_F = 20 \text{ A}$ , $V_{GS} = 0$                                  |
| Body–drain diode reverse recovery time     | $t_{rr}$      | —        | 170  | —        | ns        | $I_F = 20 \text{ A}$ , $V_{GS} = 0$<br>$diF/dt = 50 \text{ A}/\mu s$ |

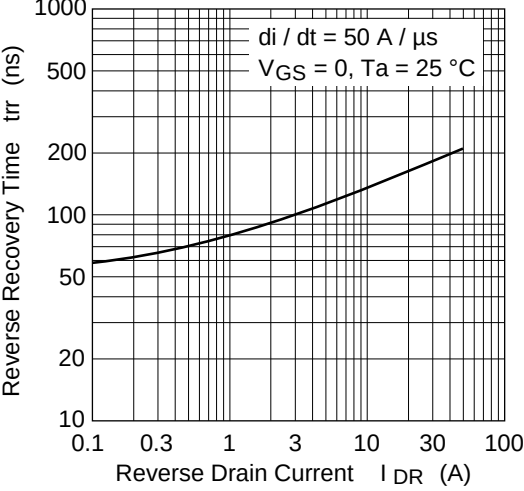
Note: 4. Pulse test

Main Characteristics

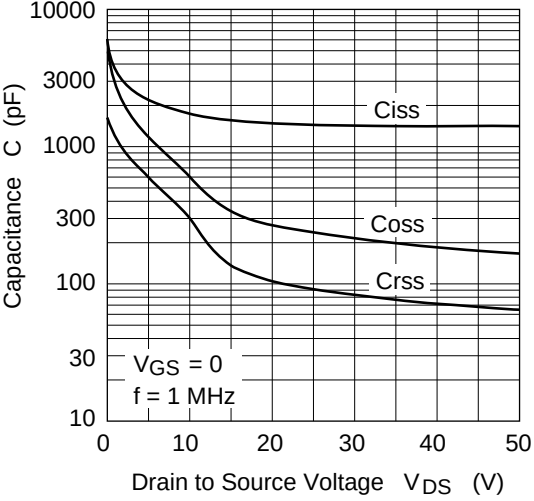




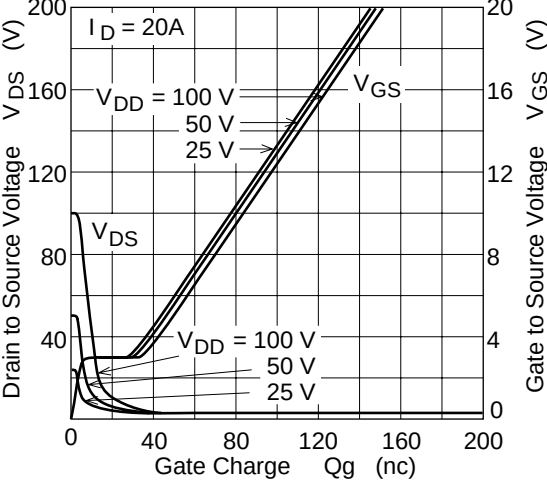
Body-Drain Diode Reverse Recovery Time



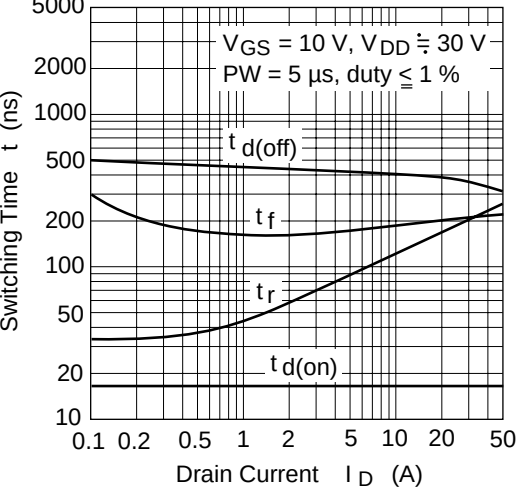
Typical Capacitance vs. Drain to Source Voltage

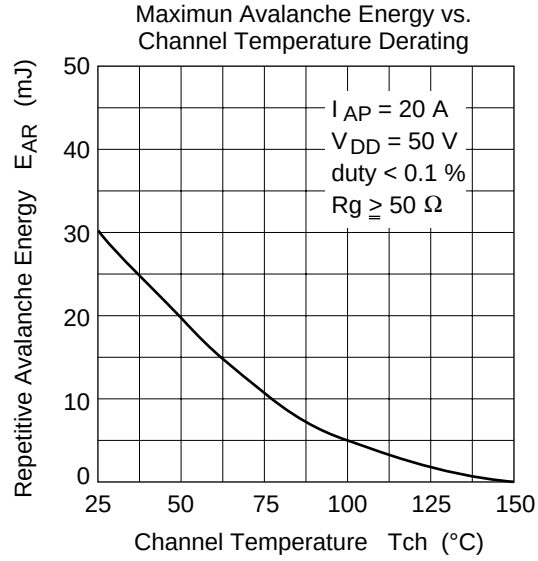
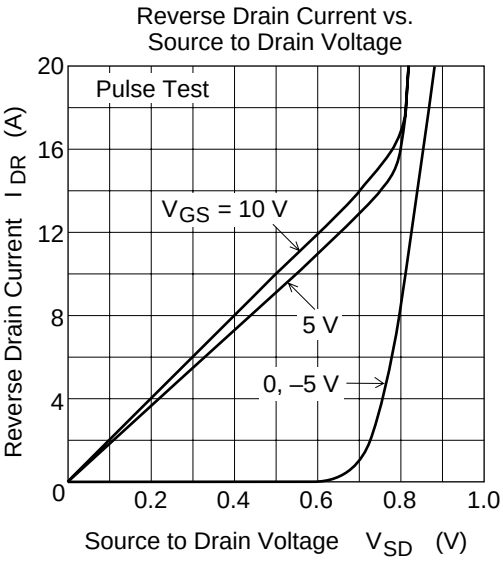


Dynamic Input Characteristics

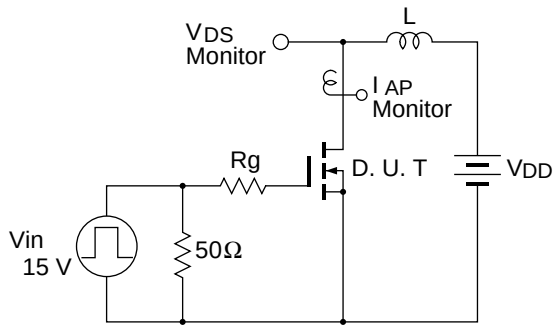


Switching Characteristics

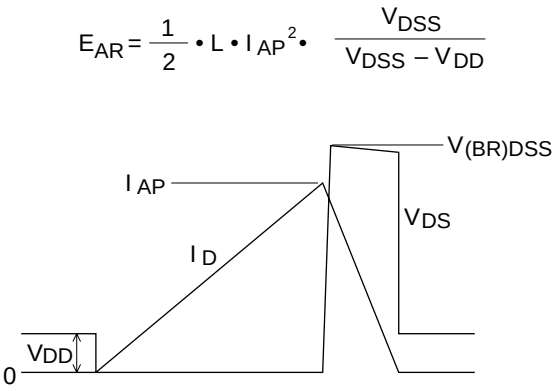




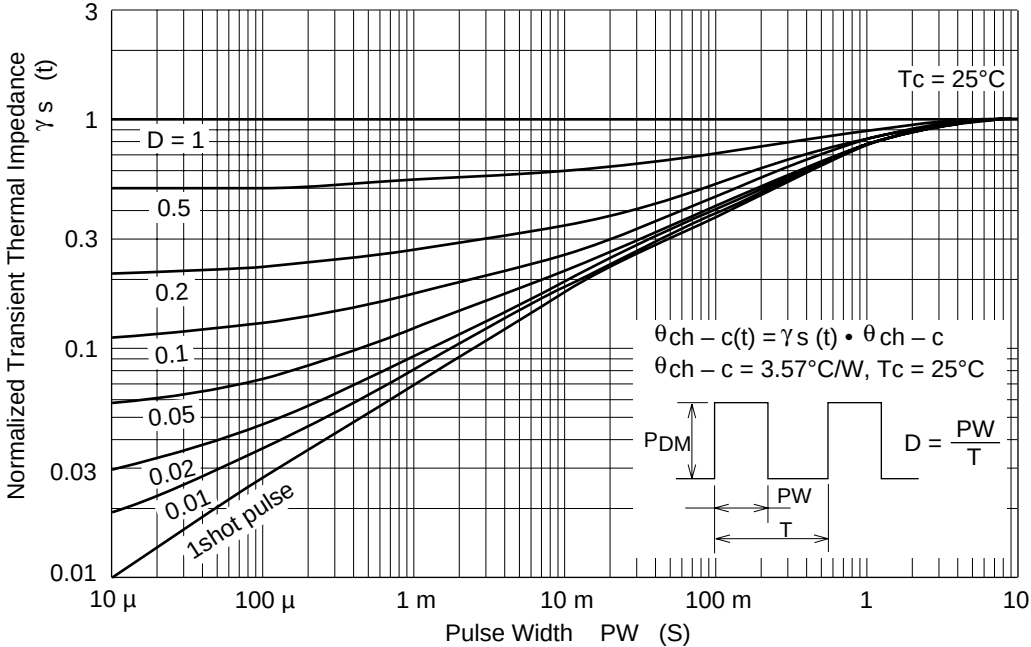
Avalanche Test Circuit



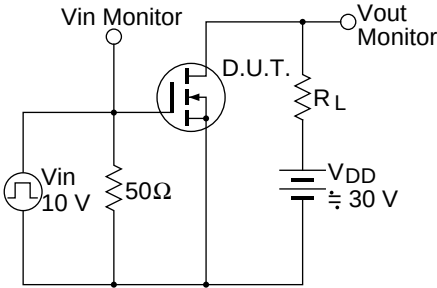
Avalanche Waveform



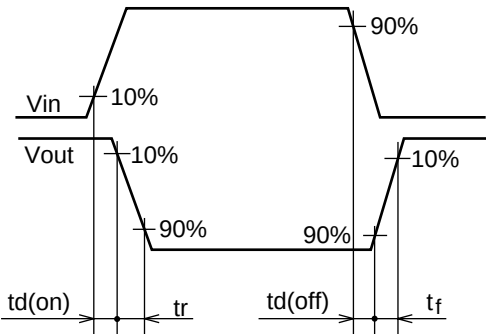
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit

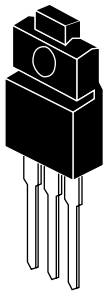
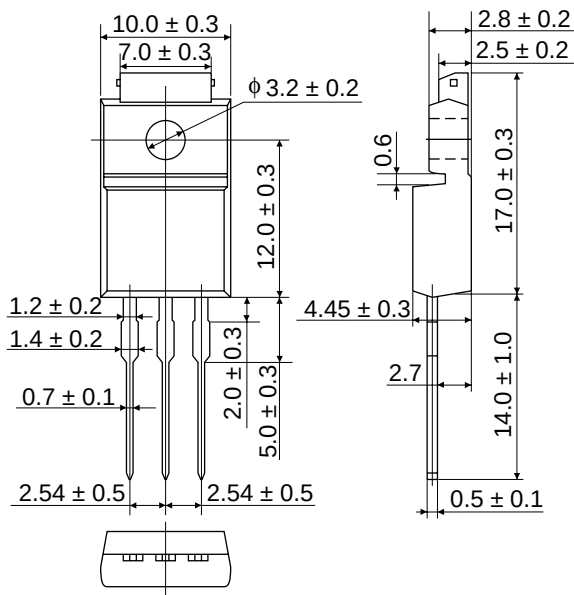


Waveform



Package Dimensions

Unit: mm



|              |          |
|--------------|----------|
| Hitachi Code | TO-220FM |
| EIAJ         | SC-67    |
| JEDEC        | —        |

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