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# 2SJ221

Silicon P-Channel MOS FET

# HITACHI

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## Application

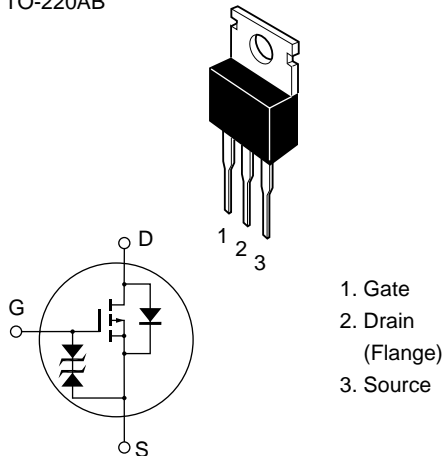
High speed power switching

## Features

- Low on-resistance
- High speed switching
- Low drive current
- 4 V gate drive device
  - Can be driven from 5 V source
- Suitable for motor drive, DC-DC converter, power switch and solenoid drive

## Outline

TO-220AB



## Absolute Maximum Ratings (Ta = 25°C)

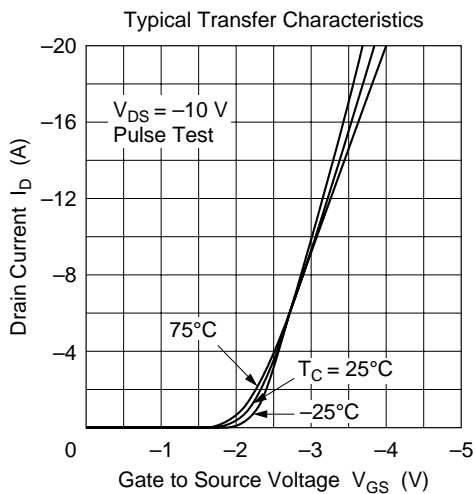
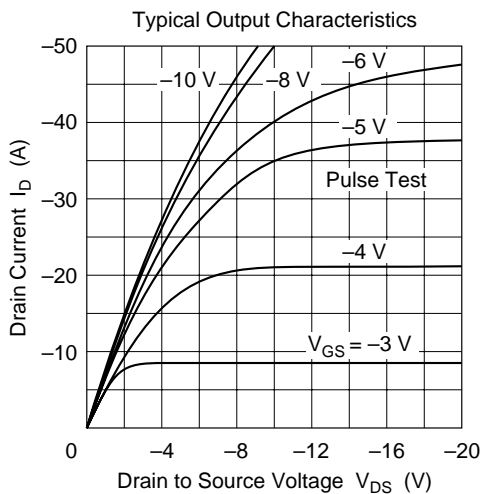
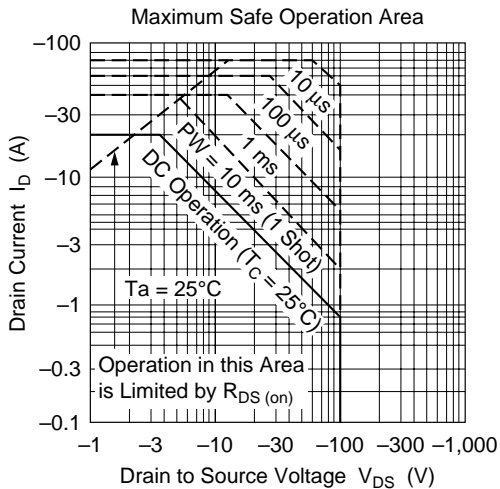
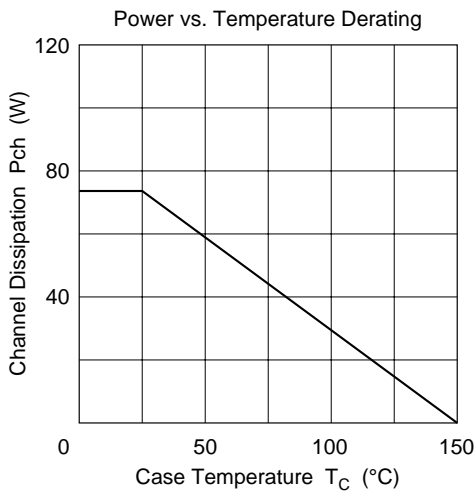
| Item                                      | Symbol              | Ratings     | Unit |
|---|---------------------|-------------|------|
| Drain to source voltage                   | $V_{DSS}$           | -100        | V    |
| Gate to source voltage                    | $V_{GSS}$           | ±20         | V    |
| Drain current                             | $I_D$               | -20         | A    |
| Drain peak current                        | $I_{D(pulse)}^{*1}$ | -80         | A    |
| Body to drain diode reverse drain current | $I_{DR}$            | -20         | A    |
| Channel dissipation                       | $Pch^{*2}$          | 75          | W    |
| Channel temperature                       | Tch                 | 150         | °C   |
| Storage temperature                       | Tstg                | -55 to +150 | °C   |

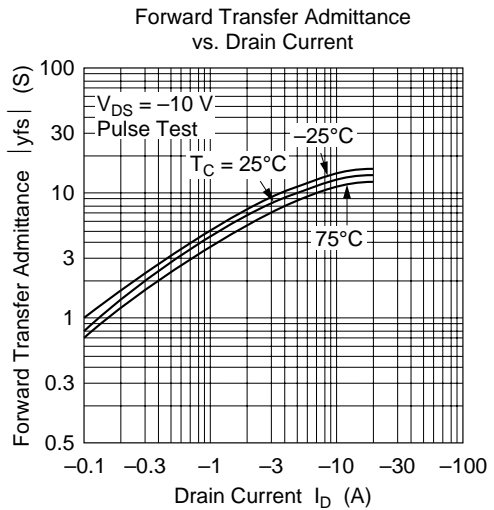
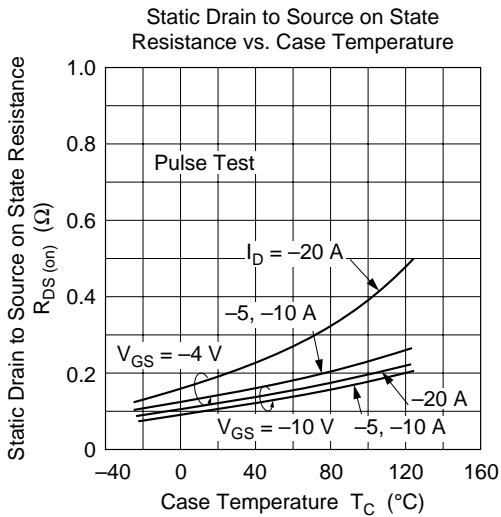
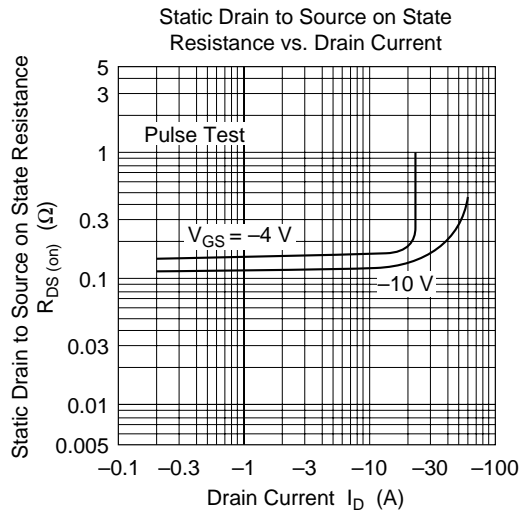
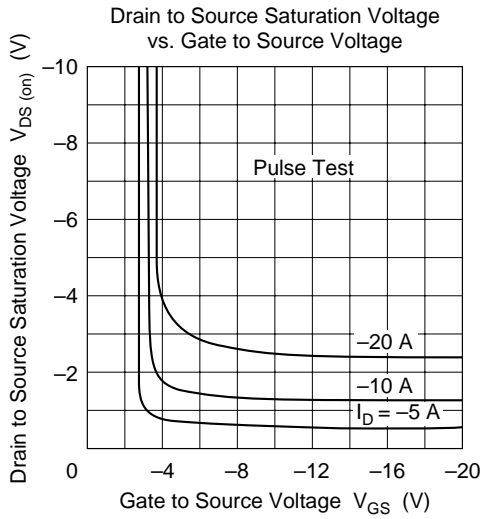
Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_C = 25^\circ C$

## Electrical Characteristics (Ta = 25°C)

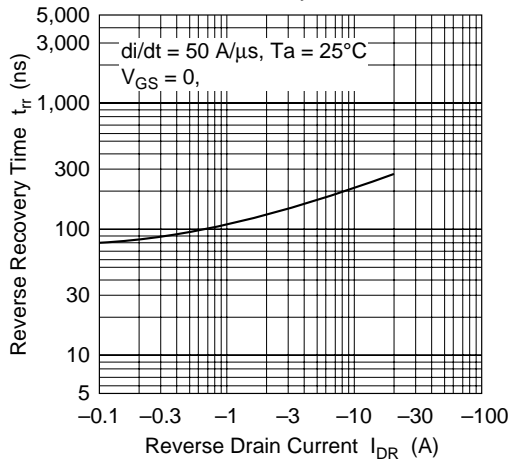
| Item                                       | Symbol        | Min  | Typ   | Max  | Unit | Test conditions  |
|--|---------------|------|-------|------|------|--|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | -100 | —     | —    | V    | $I_D = -10 \text{ mA}$ , $V_{GS} = 0$                                    |
| Gate to source breakdown voltage           | $V_{(BR)GSS}$ | ±20  | —     | —    | V    | $I_G = \pm 100 \mu A$ , $V_{DS} = 0$                                     |
| Gate to source leak current                | $I_{GSS}$     | —    | —     | ±10  | μA   | $V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$                               |
| Zero gate voltage drain current            | $I_{DSS}$     | —    | —     | -250 | μA   | $V_{DS} = -80 \text{ V}$ , $V_{GS} = 0$                                  |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | -1.0 | —     | -2.0 | V    | $I_D = -1 \text{ mA}$ , $V_{DS} = -10 \text{ V}$                         |
| Static drain to source on state resistance | $R_{DS(on)}$  | —    | 0.12  | 0.16 | Ω    | $I_D = -10 \text{ A}$ , $V_{GS} = -10 \text{ V}^{*1}$                    |
|  |               | —    | 0.16  | 0.22 |      | $I_D = -10 \text{ A}$ , $V_{GS} = -4 \text{ V}^{*1}$                     |
| Forward transfer admittance                | $ y_{fs} $    | 7.5  | 12    | —    | S    | $I_D = -10 \text{ A}$ , $V_{DS} = -10 \text{ V}^{*1}$                    |
| Input capacitance                          | $C_{iss}$     | —    | 1800  | —    | pF   | $V_{DS} = -10 \text{ V}$ , $V_{GS} = 0$ ,                                |
| Output capacitance                         | $C_{oss}$     | —    | 680   | —    | pF   | $f = 1 \text{ MHz}$  |
| Reverse transfer capacitance               | $C_{rss}$     | —    | 145   | —    | pF   |  |
| Turn-on delay time                         | $t_{d(on)}$   | —    | 15    | —    | ns   | $I_D = -10 \text{ A}$ , $V_{GS} = -10 \text{ V}$ ,                       |
| Rise time                                  | $t_r$         | —    | 115   | —    | ns   | $R_L = 3 \Omega$   |
| Turn-off delay time                        | $t_{d(off)}$  | —    | 320   | —    | ns   |  |
| Fall time                                  | $t_f$         | —    | 170   | —    | ns   |  |
| Body to drain diode forward voltage        | $V_{DF}$      | —    | -1.05 | —    | V    | $I_F = -20 \text{ A}$ , $V_{GS} = 0$                                     |
| Body to drain diode reverse recovery time  | $t_{rr}$      | —    | 280   | —    | ns   | $I_F = -20 \text{ A}$ , $V_{GS} = 0$ ,<br>$di_F/dt = 50 \text{ A}/\mu s$ |

Note: 1. Pulse test

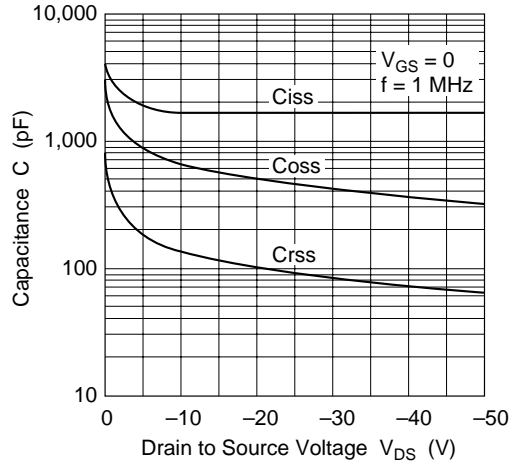




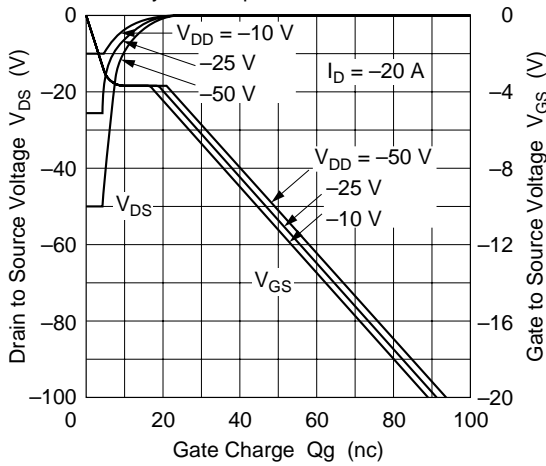
Body to Drain Diode Reverse Recovery Time



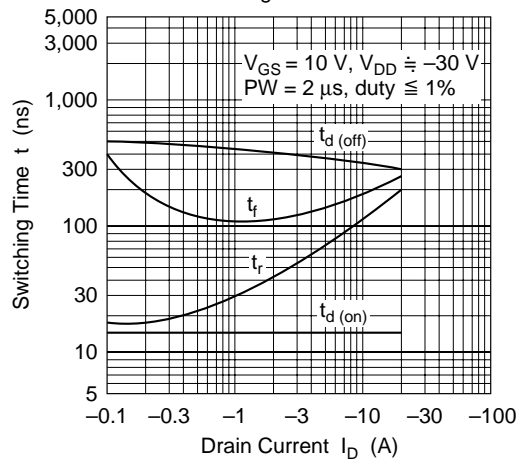
Typical Capacitance vs. Drain to Source Voltage



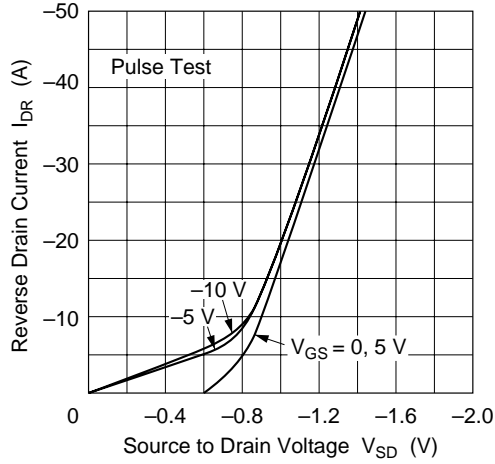
Dynamic Input Characteristics



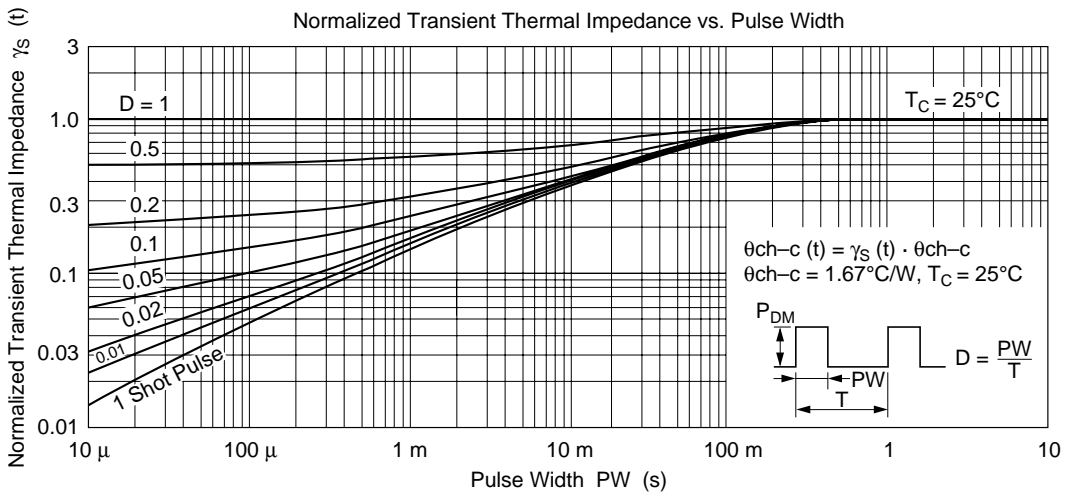
Switching Characteristics



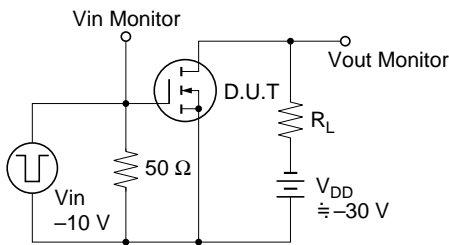
Reverse Drain Current vs. Source to Drain Voltage



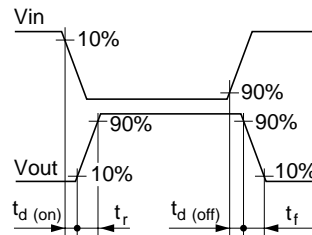
Normalized Transient Thermal Impedance vs. Pulse Width

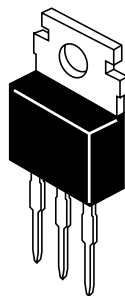
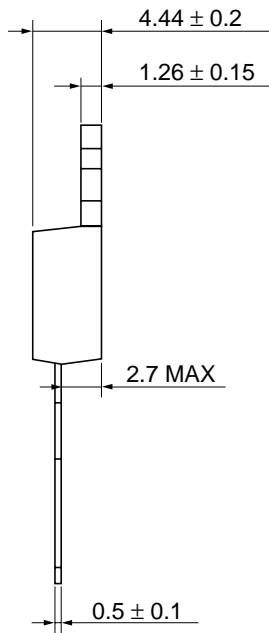
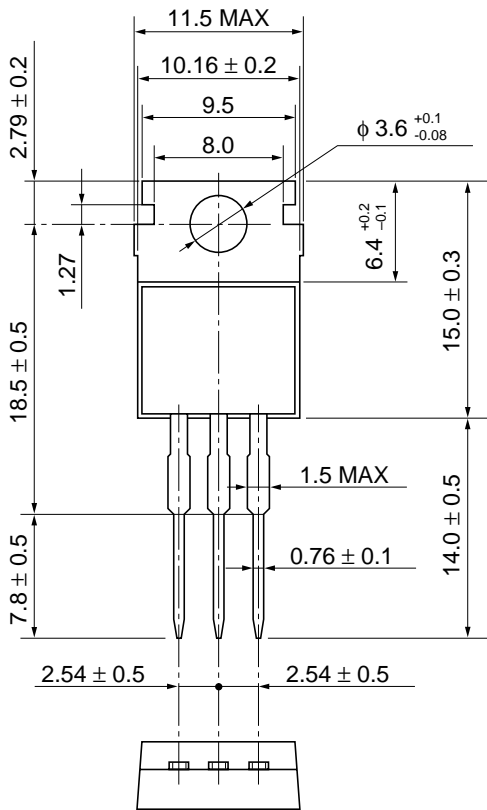


Switching Time Test Circuit



Waveforms





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

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