

# 2SJ540

Silicon P Channel MOS FET  
High Speed Power Switching

# HITACHI

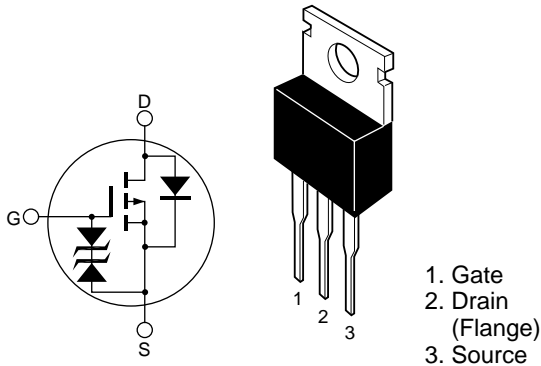
ADE-208-642A (Z)  
2nd. Edition  
Jun 1998

## Features

- Low on-resistance  
 $R_{DS(on)} = 0.11 \Omega$  typ.
- Low drive current
- 4 V gate drive devices
- High speed switching

## Outline

TO-220AB



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

| Item                                   | Symbol                          | Ratings     | Unit |
|--|---------------------------------|-------------|------|
| Drain to source voltage                | $V_{DSS}$                       | -60         | V    |
| Gate to source voltage                 | $V_{GSS}$                       | ±20         | V    |
| Drain current                          | $I_D$                           | -12         | A    |
| Drain peak current                     | $I_{D(pulse)}$ <sup>Note1</sup> | -48         | A    |
| Body-drain diode reverse drain current | $I_{DR}$                        | -12         | A    |
| Avalanche current                      | $I_{AP}$ <sup>Note3</sup>       | -12         | A    |
| Avalanche energy                       | $E_{AR}$ <sup>Note3</sup>       | 12          | mJ   |
| Channel dissipation                    | $P_{ch}$ <sup>Note2</sup>       | 50          | W    |
| Channel temperature                    | $T_{ch}$                        | 150         | °C   |
| Storage temperature                    | $T_{stg}$                       | -55 to +150 | °C   |

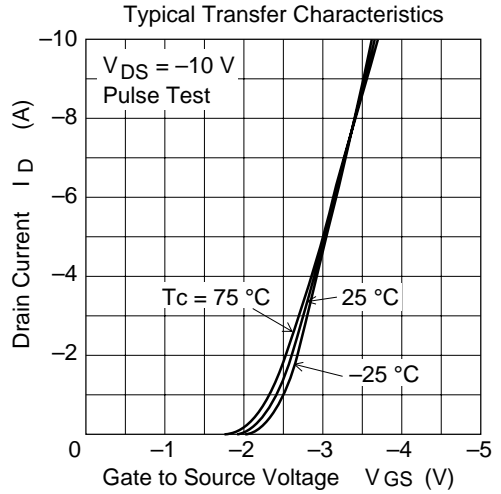
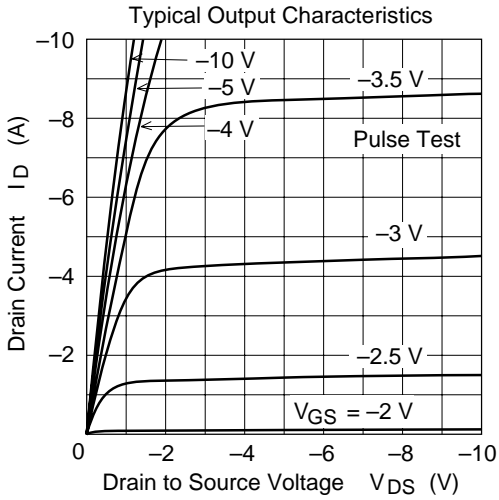
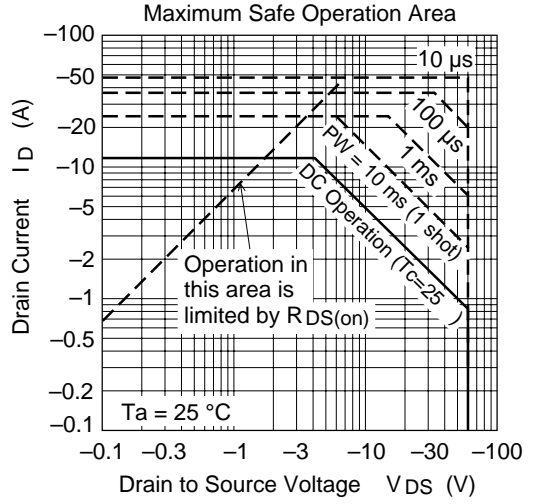
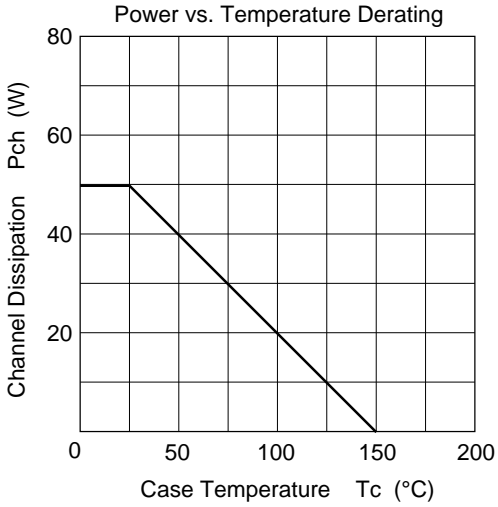
Note: 1.  $PW \leq 10\mu s$ , duty cycle  $\leq 1\%$   
 2. Value at  $T_c = 25^\circ C$   
 3. Value at  $T_{ch} = 25^\circ C$ ,  $R_g \geq 50 \Omega$

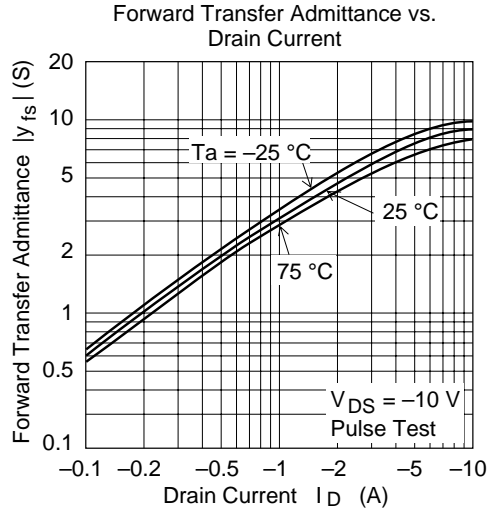
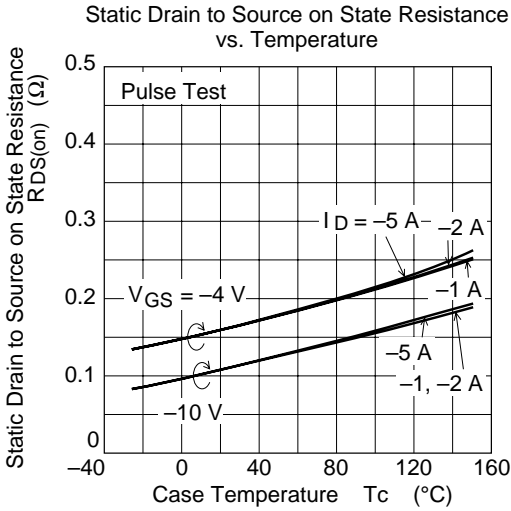
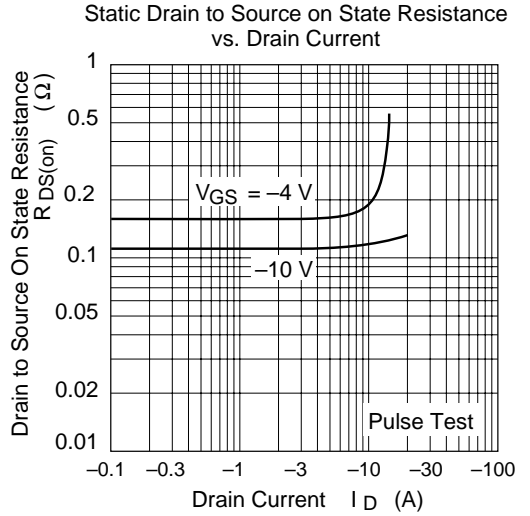
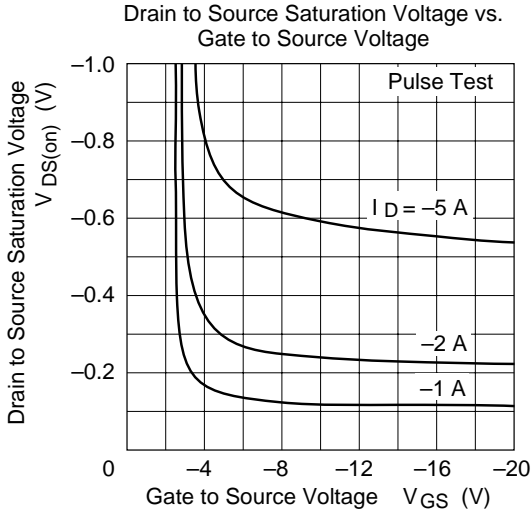
## Electrical Characteristics (Ta = 25°C)

| Item                                       | Symbol        | Min  | Typ  | Max  | Unit | Test Conditions                                     |
|--|---------------|------|------|------|------|---|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | -60  | —    | —    | V    | $I_D = -10mA$ , $V_{GS} = 0$                        |
| Gate to source breakdown voltage           | $V_{(BR)GSS}$ | ±20  | —    | —    | V    | $I_G = \pm 100\mu A$ , $V_{DS} = 0$                 |
| Zero gate voltage drain current            | $I_{DSS}$     | —    | —    | -10  | μA   | $V_{DS} = -60V$ , $V_{GS} = 0$                      |
| Gate to source leak current                | $I_{GSS}$     | —    | —    | ±10  | μA   | $V_{GS} = \pm 16V$ , $V_{DS} = 0$                   |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | -1.0 | —    | -2.0 | V    | $I_D = -1mA$ , $V_{DS} = -10V$                      |
| Static drain to source on state resistance | $R_{DS(on)}$  | —    | 0.11 | 0.15 | Ω    | $I_D = -6A$ , $V_{GS} = -10V$ <sup>Note4</sup>      |
|  | $R_{DS(on)}$  | —    | 0.16 | 0.23 | Ω    | $I_D = -6A$ , $V_{GS} = -4V$ <sup>Note4</sup>       |
| Forward transfer admittance                | $ y_{fs} $    | 5    | 8    | —    | S    | $I_D = -6A$ , $V_{DS} = -10V$ <sup>Note4</sup>      |
| Input capacitance                          | $C_{iss}$     | —    | 580  | —    | pF   | $V_{DS} = -10V$                                     |
| Output capacitance                         | $C_{oss}$     | —    | 300  | —    | pF   | $V_{GS} = 0$  |
| Reverse transfer capacitance               | $C_{rss}$     | —    | 85   | —    | pF   | $f = 1MHz$  |
| Turn-on delay time                         | $t_{d(on)}$   | —    | 10   | —    | ns   | $V_{GS} = -10V$ , $I_D = -6A$                       |
| Rise time                                  | $t_r$         | —    | 55   | —    | ns   | $R_L = 6\Omega$                                     |
| Turn-off delay time                        | $t_{d(off)}$  | —    | 85   | —    | ns   |   |
| Fall time                                  | $t_f$         | —    | 60   | —    | ns   |   |
| Body-drain diode forward voltage           | $V_{DF}$      | —    | -1.2 | —    | V    | $I_F = -12A$ , $V_{GS} = 0$                         |
| Body-drain diode reverse recovery time     | $t_{rr}$      | —    | 60   | —    | ns   | $I_F = -12A$ , $V_{GS} = 0$<br>$diF/dt = 50A/\mu s$ |

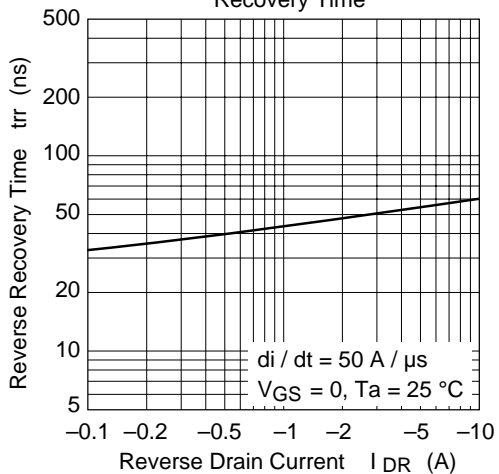
Note: 4. Pulse test

Main Characteristics

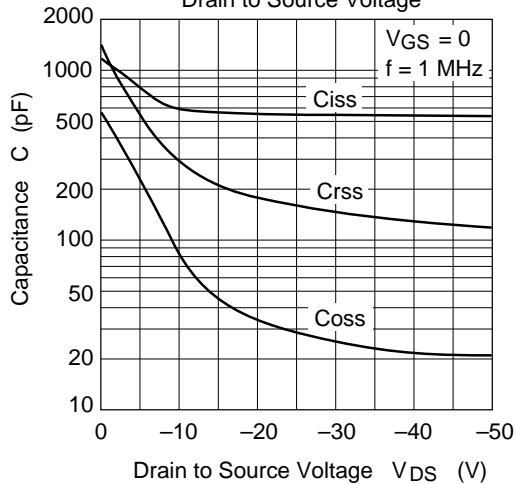




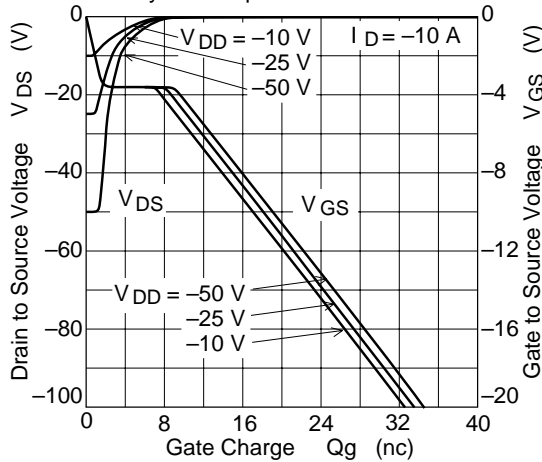
Body-Drain Diode Reverse Recovery Time



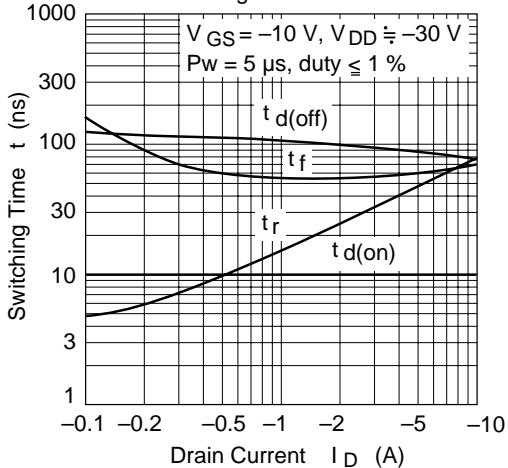
Typical Capacitance vs. Drain to Source Voltage

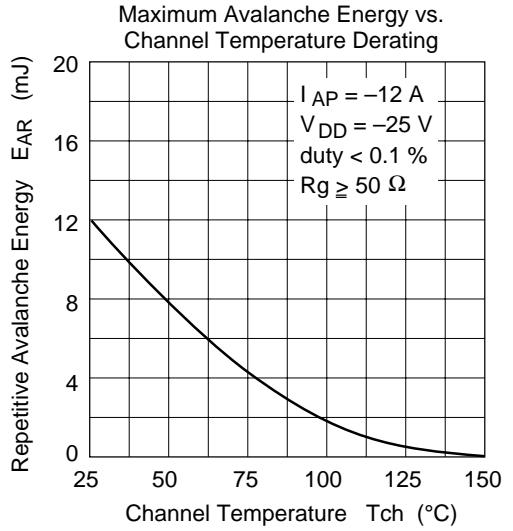
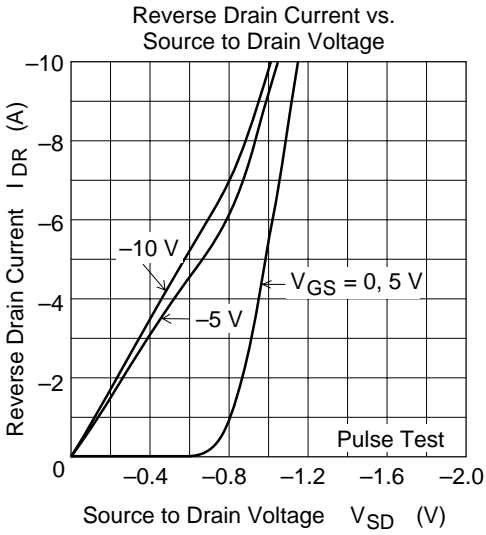


Dynamic Input Characteristics

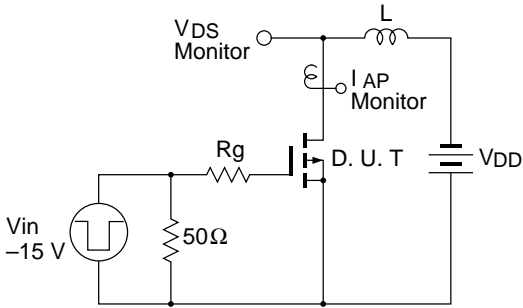


Switching Characteristics



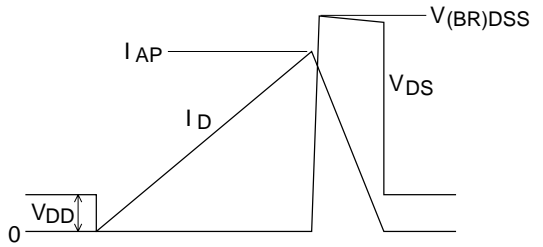


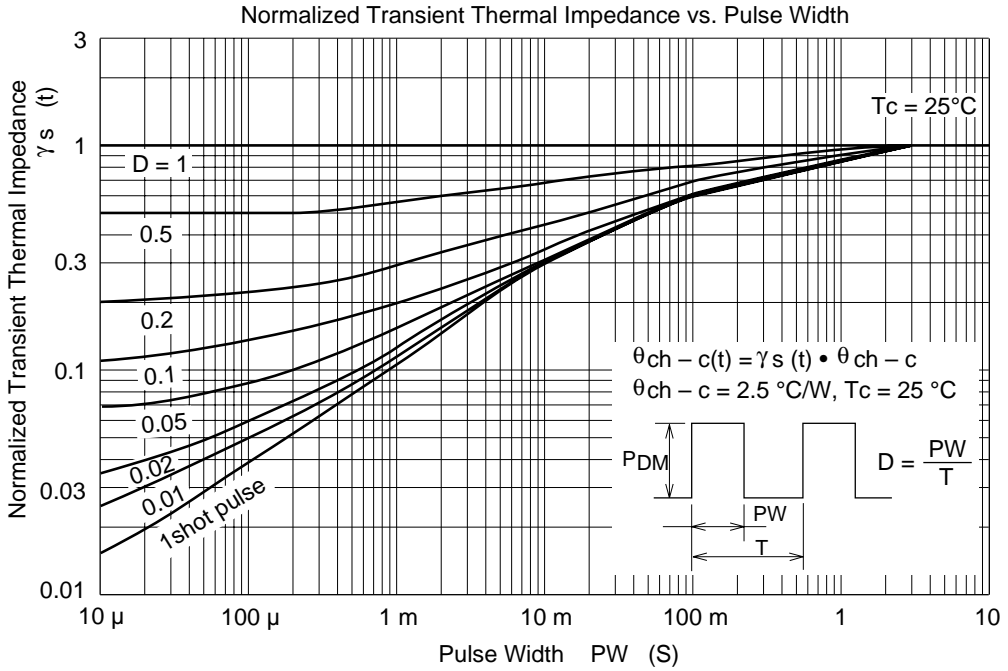
Avalanche Test Circuit



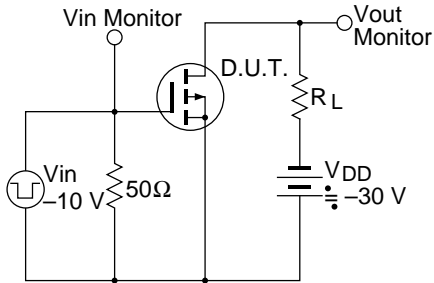
Avalanche Waveform

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

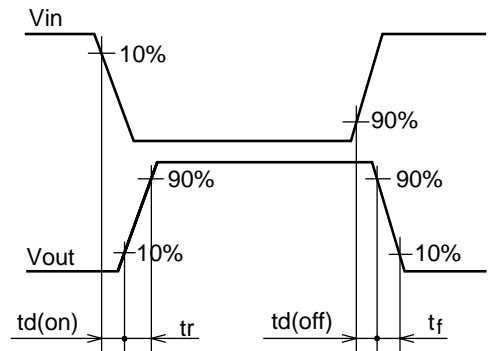




Switching Time Test Circuit

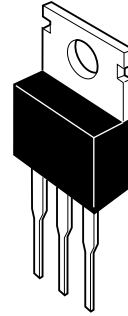
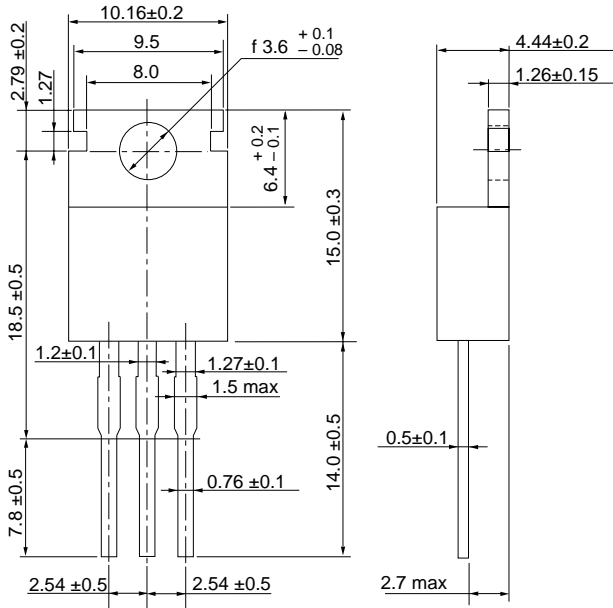


Waveform



Package Dimensions

Unit: mm



|              |          |
|--------------|----------|
| Hitachi Code | TO-220AB |
| EIAJ         | SC-46    |
| JEDEC        | —        |



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