To all our customers

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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# HAT1036R

## Silicon P Channel Power MOS FET
## Power Switching

ADE-208-662E (Z)

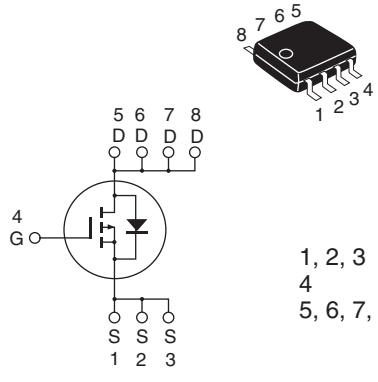
6th. Edition
Dec. 2002

### Features

- Low on-resistance
  $R_{DS(on)}$ = 11 m• typ
- Capable of -4 V gate drive
- Low drive current
- High density mounting

### Outline

SOP-8




| | |
|---|---|
| 1, 2, 3 | Source |
| 4 | Gate |
| 5, 6, 7, 8 | Drain |

## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | -30 | V |
| Gate to source voltage | $V_{GSS}$ | ±20 | V |
| Drain current | $I_D$ | -12 | A |
| Drain peak current | $I_{D(pulse)}$ Note1 | -96 | A |
| Body-drain diode reverse drain current | $I_{DR}$ | -12 | A |
| Channel dissipation | Pch Note2 | 2.5 | W |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW • 10 s

## Electrical Characteristics

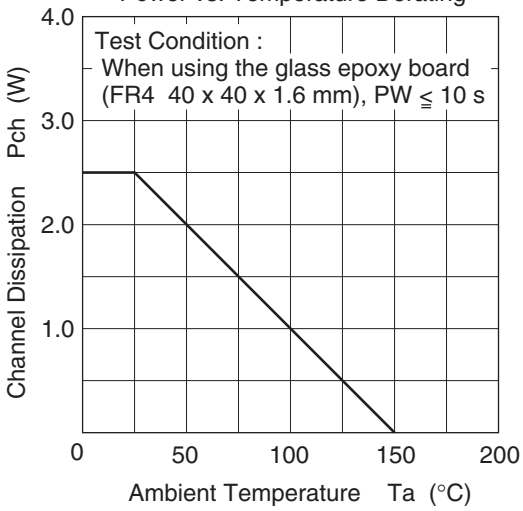
(Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | -30 | — | — | V | $I_D$ = -10 mA, $V_{GS}$ = 0 |
| Gate to source leak current | $I_{GSS}$ | — | — | ±0.1 | µA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 |
| Zero gate voltege drain current | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -30 V, $V_{GS}$ = 0 |
| Gate to source cutoff voltage | $V_{GS(off)}$ | -1.0 | — | -2.5 | V | $V_{DS}$ = -10 V, $I_D$ = -1 mA |
| Static drain to source on state resistance | $R_{DS(on)}$ | — | 11 | 14 | mΩ | $I_D$ = -6 A, $V_{GS}$ = -10 V [Note1] |
| | $R_{DS(on)}$ | — | 21 | 34 | mΩ | $I_D$ = -6 A, $V_{GS}$ = -4 V [Note1] |
| Forward transfer admittance | $\|y_{fs}\|$ | 12 | 20 | — | S | $I_D$ = -6 A, $V_{DS}$ = -10 V [Note1] |
| Input capacitance | Ciss | — | 4200 | — | pF | $V_{DS}$ = -10 V |
| Output capacitance | Coss | — | 870 | — | pF | $V_{GS}$ = 0 |
| Reverse transfer capacitance | Crss | — | 360 | — | pF | f = 1 MHz |
| Total gate charge | Qg | — | 70 | — | nc | $V_{DD}$ = -10 V |
| Gate to source charge | Qgs | — | 12 | — | nc | $V_{GS}$ = -10 V |
| Gate to drain charge | Qgd | — | 14 | — | nc | $I_D$ = -12 A |
| Turn-on delay time | $t_{d(on)}$ | — | 120 | — | ns | $V_{GS}$ = -4 V, $I_D$ = -6 A |
| Rise time | $t_r$ | — | 350 | — | ns | $V_{DD} \cong$ -10 V |
| Turn-off delay time | $t_{d(off)}$ | — | 100 | — | ns | |
| Fall time | $t_f$ | — | 120 | — | ns | |
| Body–drain diode forward voltage | $V_{DF}$ | — | -0.85 | -1.11 | V | $I_F$ = -12 A, $V_{GS}$ = 0 [Note1] |
| Body–drain diode reverse recovery time | $t_{rr}$ | — | 55 | — | ns | $I_F$ = -12 A, $V_{GS}$ = 0<br>diF/ dt = 20 A/ µs |

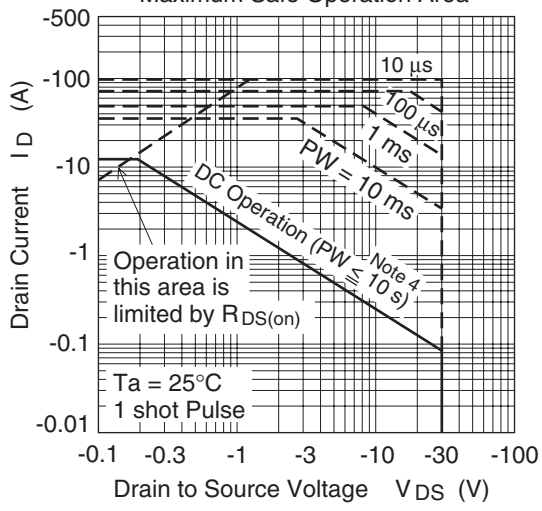
Note: 1. Pulse test

## Main Characteristics

Power vs. Temperature Derating

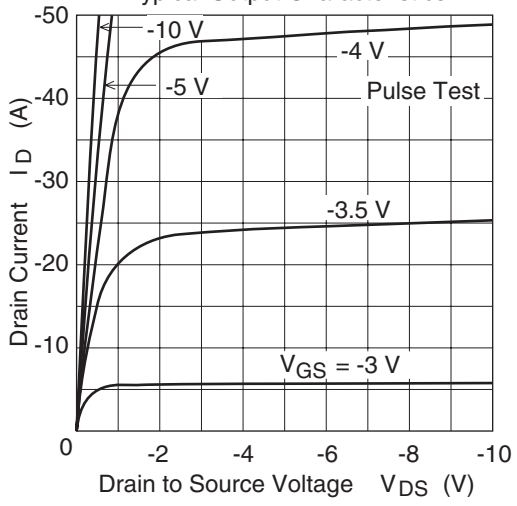



Maximum Safe Operation Area

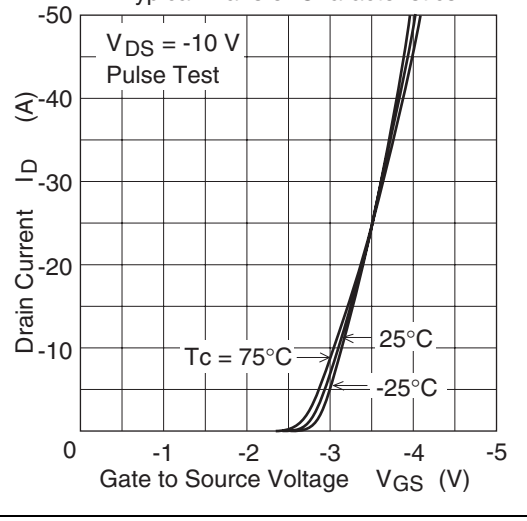



Note 4 :
When using the glass epoxy board
(FR4 40 x 40 x 1.6 mm)

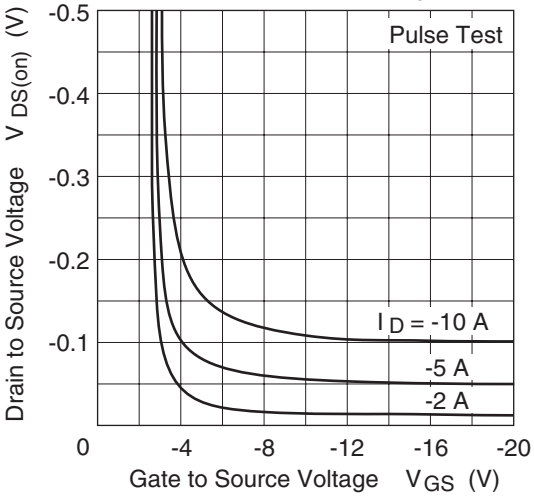
Typical Output Characteristics



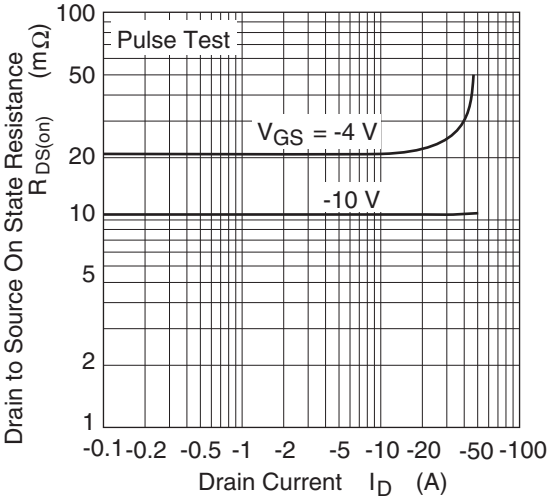

Typical Transfer Characteristics



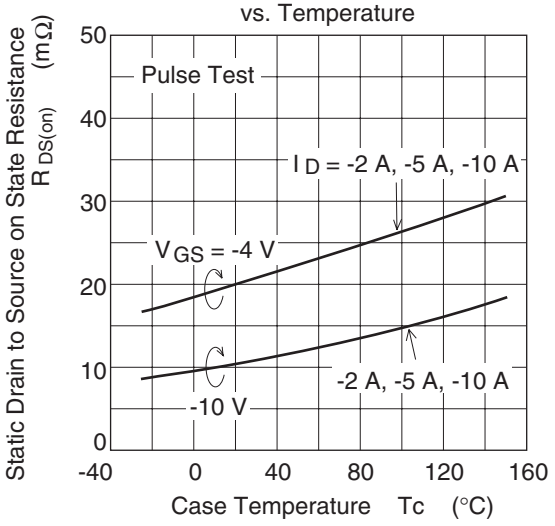
Drain to Source Saturation Voltage vs. Gate to Source Voltage



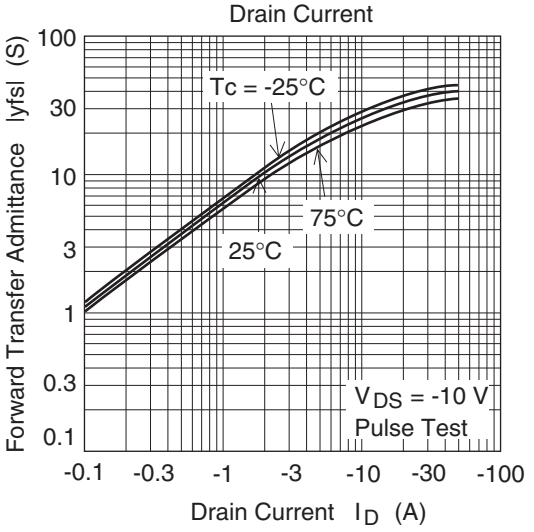

Static Drain to Source on State Resistance vs. Drain Current



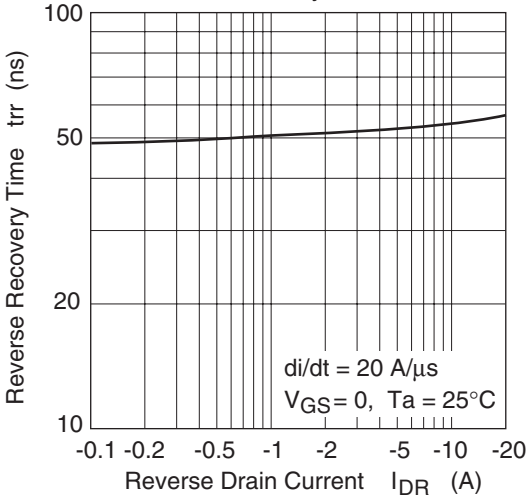

Static Drain to Source on State Resistance vs. Temperature



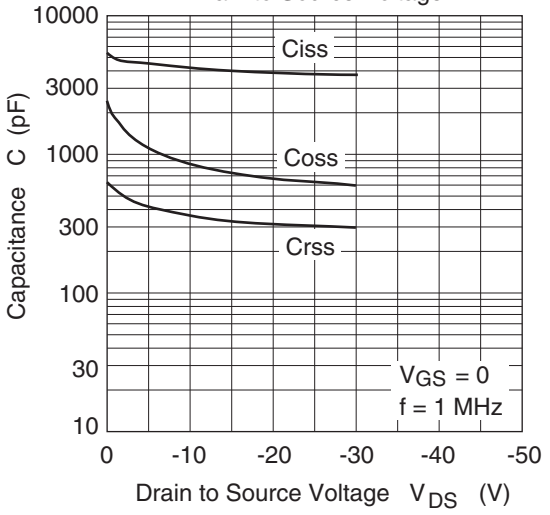

Forward Transfer Admittance vs. Drain Current



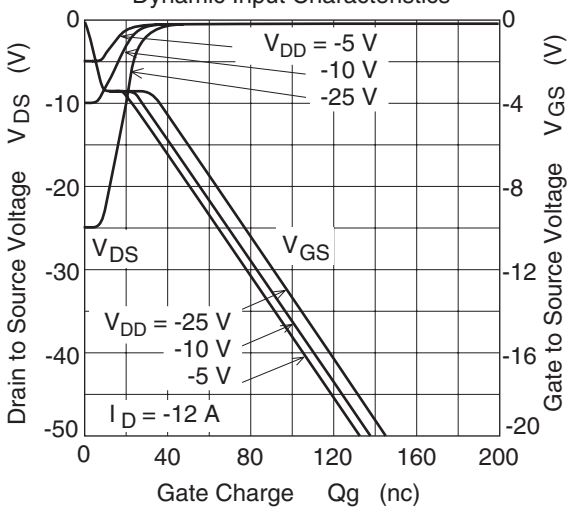
Body-Drain Diode Reverse Recovery Time



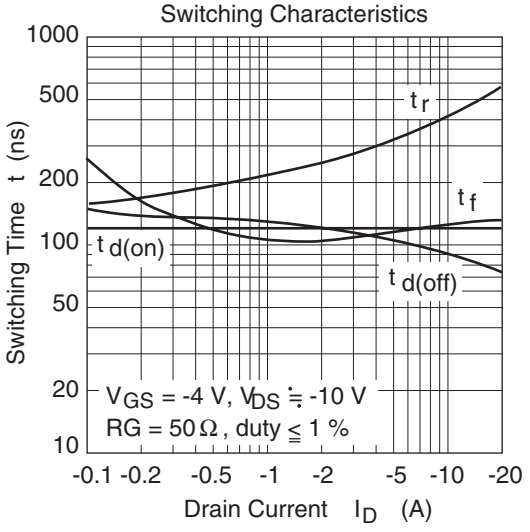

Typical Capacitance vs. Drain to Source Voltage



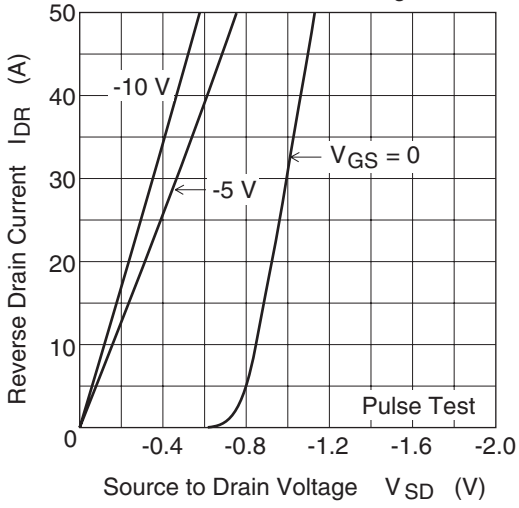

Dynamic Input Characteristics



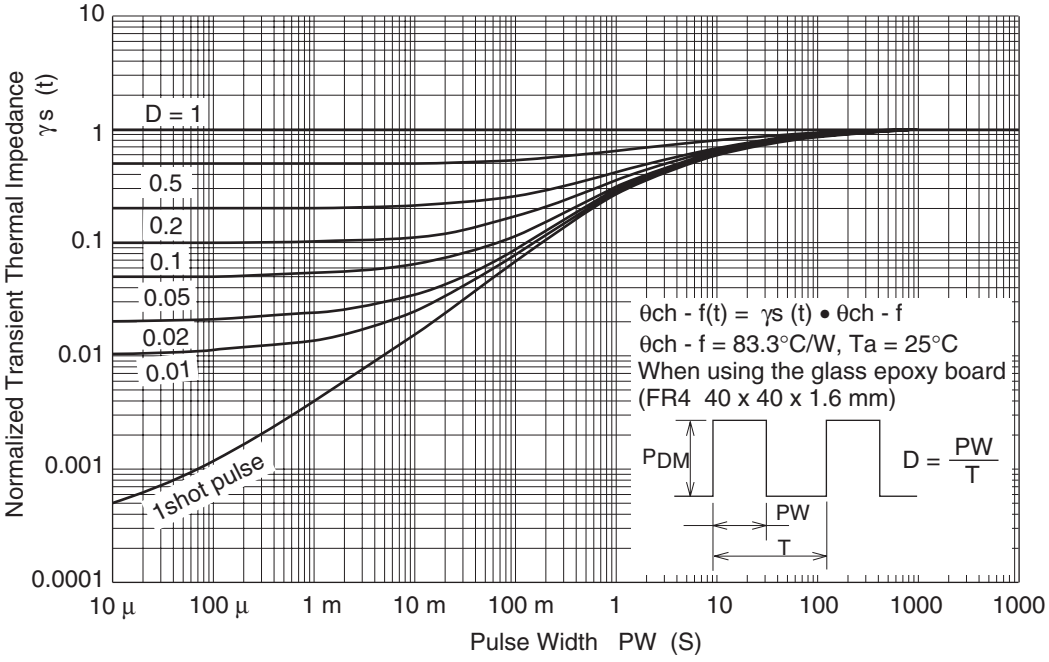

Switching Characteristics



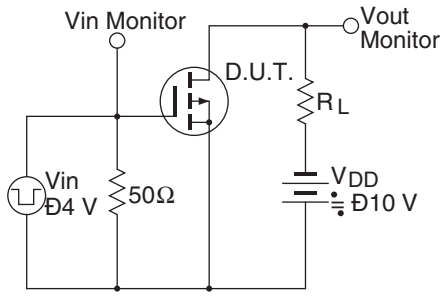
Reverse Drain Current vs.
Source to Drain Voltage



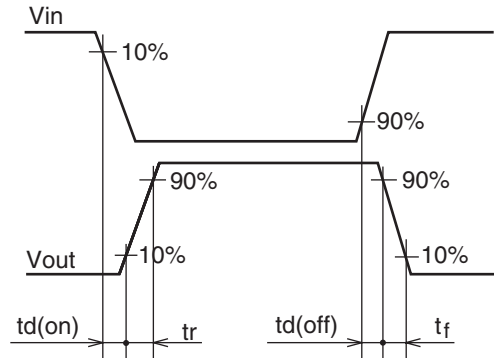

Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



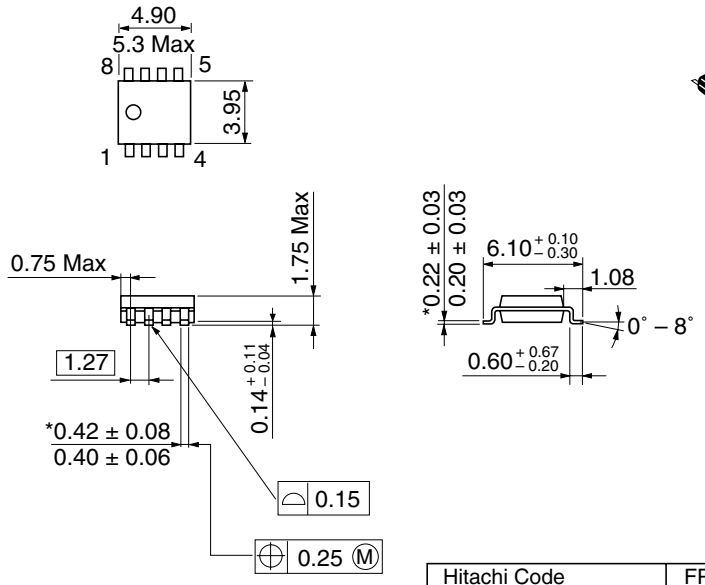

Switching Time Waveforms



## Package Dimensions

As of July, 2002

Unit: mm




*Dimension including the plating thickness
Base material dimension

| | |
|---|---|
| Hitachi Code | FP-8DA |
| JEDEC | Conforms |
| JEITA | — |
| Mass (reference value) | 0.085 g |

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