To our customers,

# Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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# 2SK3228

## Silicon N Channel MOS FET
## High Speed Power Switching

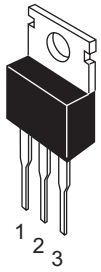
REJ03G1094-0400
Rev.4.00
May 15, 2006

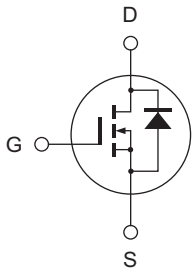
### Features

- Low on-resistance
  $R_{DS\ (on)}$ = 6 mΩ typ.
- Low drive current
- 4 V gate drive device can be driven from 5 V source

### Outline

RENESAS Package code: PRSS0004AC-A
(Package name: TO-220AB)




1. Gate
2. Drain (Flange)
3. Source

## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | 80 | V |
| Gate to source voltage | $V_{GSS}$ | ±20 | V |
| Drain current | $I_D$ | 75 | A |
| Drain peak current | $I_{D\ (pulse)}$ Note 1 | 300 | A |
| Body-drain diode reverse drain current | $I_{DR}$ | 75 | A |
| Avalanche current | $I_{AP}$ Note 3 | 50 | A |
| Avalanche energy | $E_{AR}$ Note 3 | 181 | mJ |
| Channel dissipation | Pch Note 2 | 100 | W |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

Notes: 1. PW ≤ 10 µs, duty cycle ≤ 1%
2. Value at Tc = 25°C
3. Value at Tch ≤ 25°C, Rg ≥ 50 Ω

## Electrical Characteristics

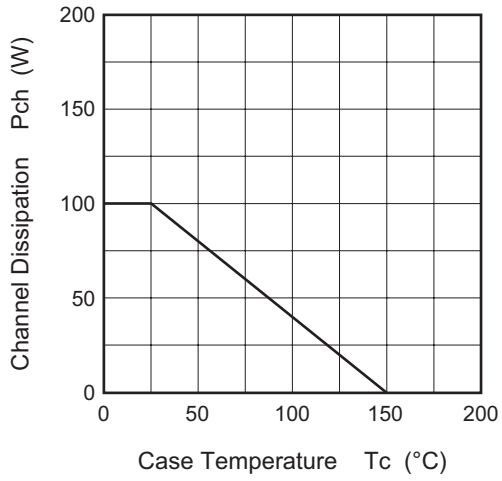
(Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)\ DSS}$ | 80 | — | — | 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 voltage drain current | $I_{DSS}$ | — | — | 10 | µA | $V_{DS}$ = 80 V, $V_{GS}$ = 0 |
| Gate to source cutoff voltage | $V_{GS\ (off)}$ | 1.0 | — | 2.5 | V | $I_D$ = 1 mA, $V_{DS}$ = 10 V |
| Static drain to source on state resistance | $R_{DS\ (on)}$ | — | 6.0 | 7.5 | mΩ | $I_D$ = 40 A, $V_{GS}$ = 10 V Note 4 |
| | $R_{DS\ (on)}$ | — | 8.0 | 12 | mΩ | $I_D$ = 40 A, $V_{GS}$ = 4 V Note 4 |
| Forward transfer admittance | $\|y_{fs}\|$ | 55 | 90 | — | S | $I_D$ = 40 A, $V_{DS}$ = 10 V Note 4 |
| Input capacitance | Ciss | — | 9700 | — | pF | $I_D$ = 10 V |
| Output capacitance | Coss | — | 1250 | — | pF | $V_{GS}$ = 0 |
| Reverse transfer capacitance | Crss | — | 290 | — | pF | f = 1 MHz |
| Total gate charge | Qg | — | 150 | — | nC | $V_{DD}$ = 25 V |
| Gate to source charge | Qgs | — | 30 | — | nC | $V_{GS}$ = 25 V |
| Gate to drain charge | Qgd | — | 30 | — | nC | $I_D$ = 75 A |
| Turn-on delay time | $t_{d\ (on)}$ | — | 80 | — | ns | $I_D$ = 10 A |
| Rise time | $t_r$ | — | 300 | — | ns | $V_{GS}$ = 40 V |
| Turn-off delay time | $t_{d\ (off)}$ | — | 770 | — | ns | $R_L$ = 0.75 Ω |
| Fall time | $t_f$ | — | 370 | — | ns | |
| Body-drain diode forward voltage | $V_{DF}$ | — | 1.05 | — | V | $I_F$ = 75 A, $V_{GS}$ = 0 |
| Body-drain diode reverse recovery time | $t_{rr}$ | — | 90 | — | ns | $I_F$ = 75 A, $V_{GS}$ = 0<br>$di_F/dt$ = 50 A/µs |

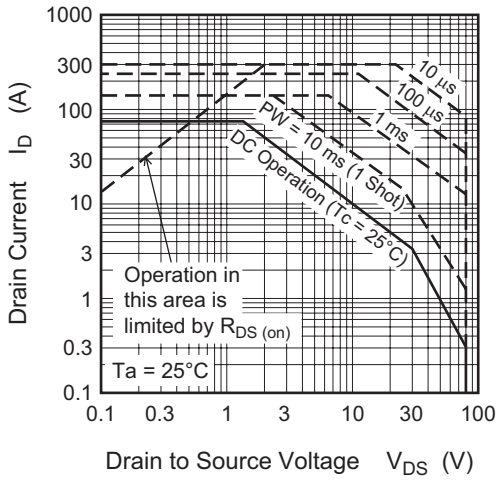
Note: 4. Pulse test

## Main Characteristics

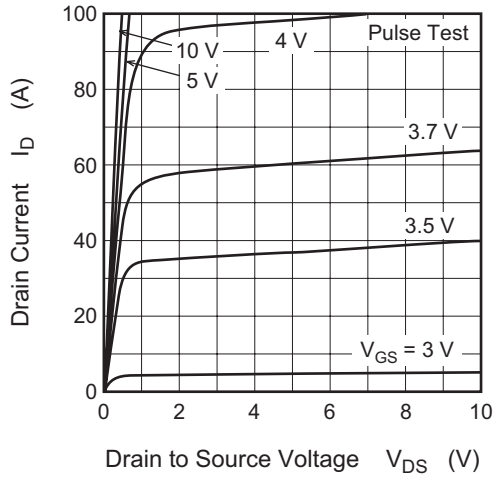
Power vs. Temperature Derating



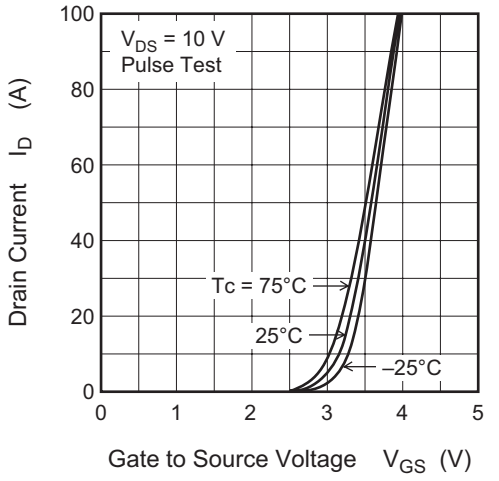

Maximum Safe Operation Area



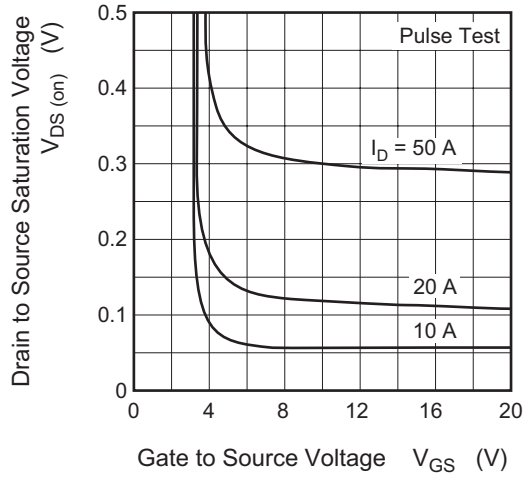

Typical Output Characteristics



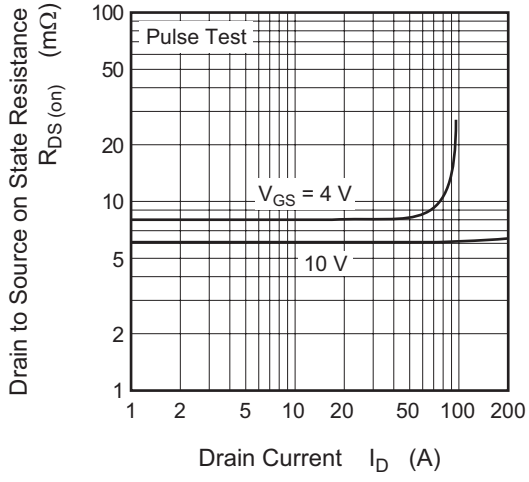

Typical Transfer Characteristics



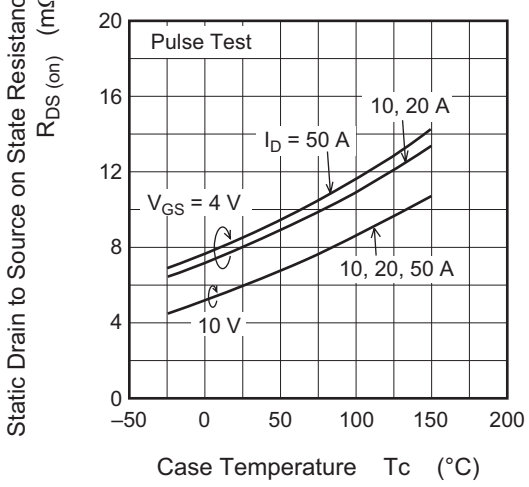

Drain to Source Saturation Voltage vs. Gate to Source Voltage



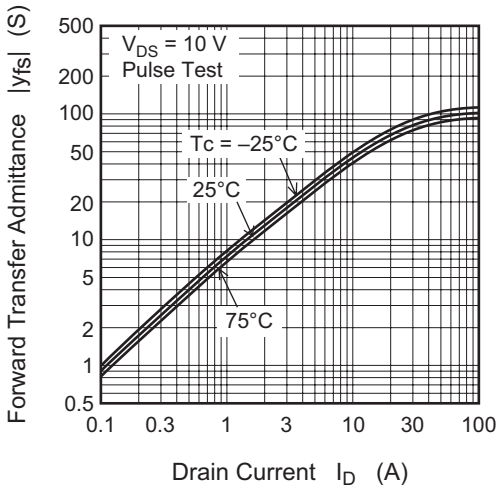

Static Drain to Source on State Resistance vs. Drain Current



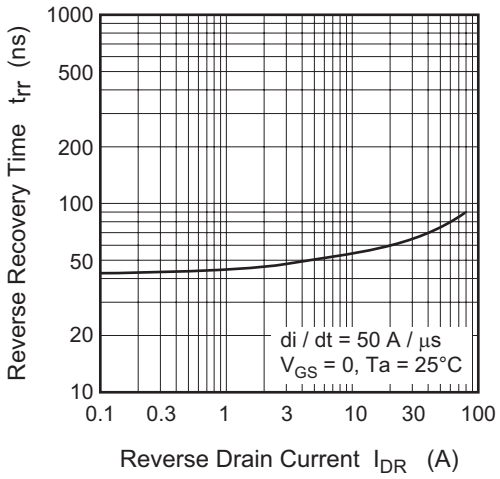
Static Drain to Source on State Resistance vs. Temperature



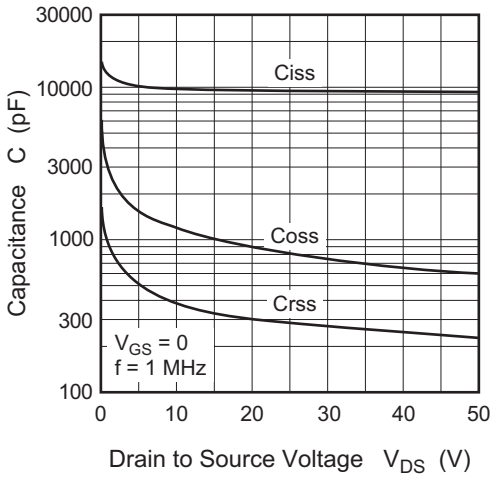

Forward Transfer Admittance vs. Drain Current



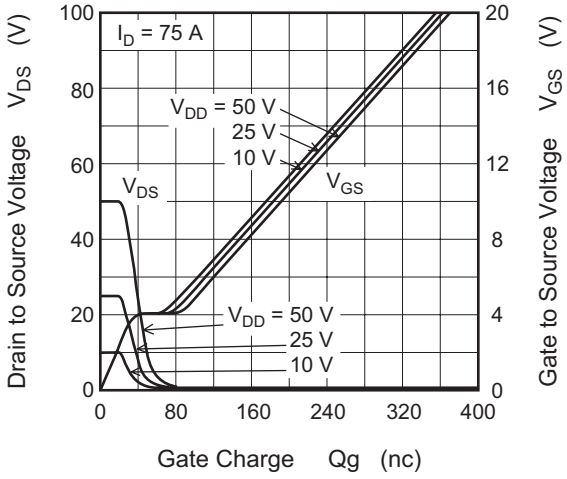

Body to Drain Diode Reverse Recovery Time



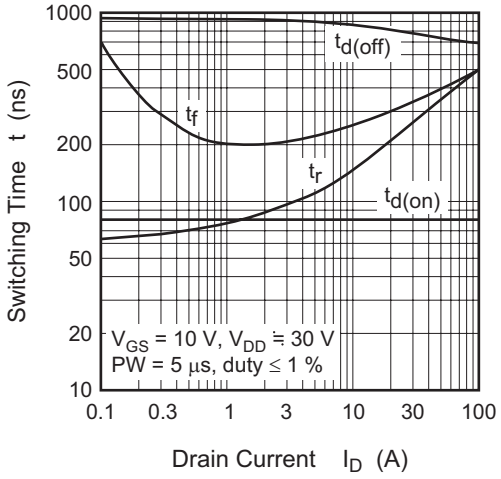

Typical Capacitance vs. Drain to Source Voltage



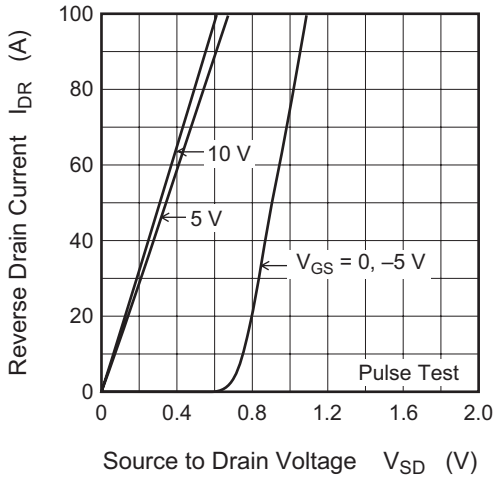

Dynamic Input Characteristics



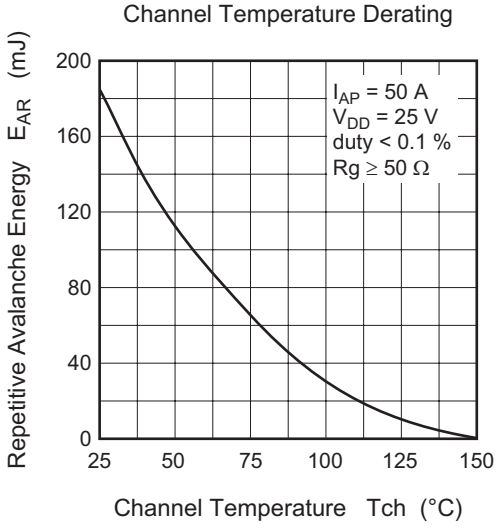

Switching Characteristics



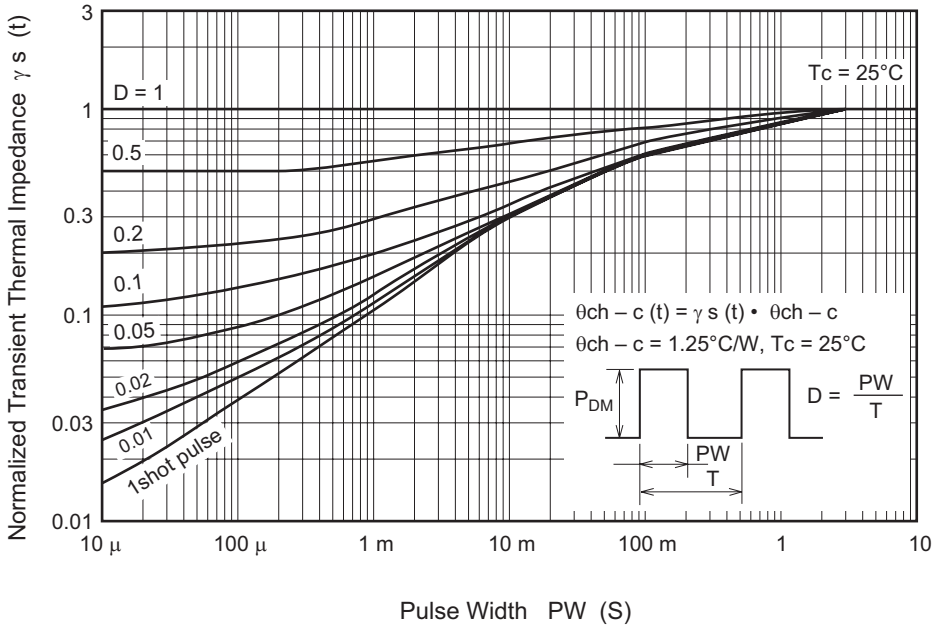
Reverse Drain Current vs.
Source to Drain Voltage



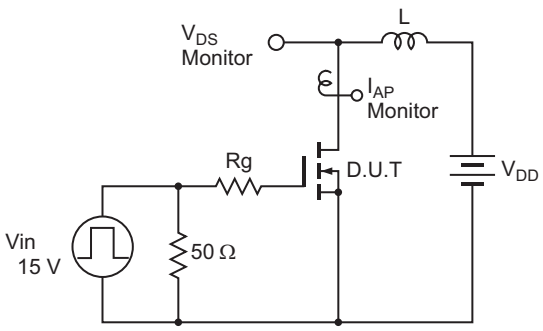

Maximum Avalanche Energy vs.
Channel Temperature Derating




Normalized Transient Thermal Impedance vs. Pulse Width

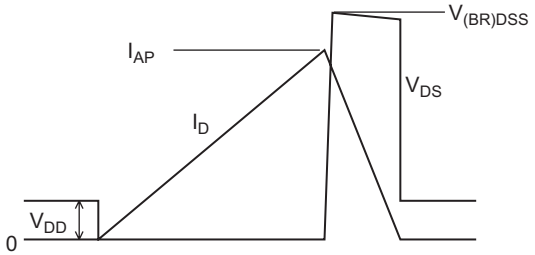



Avalanche Test Circuit

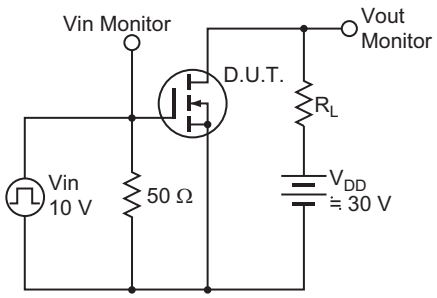



Avalanche Waveform

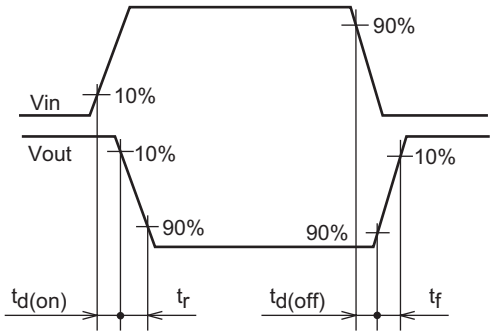
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit



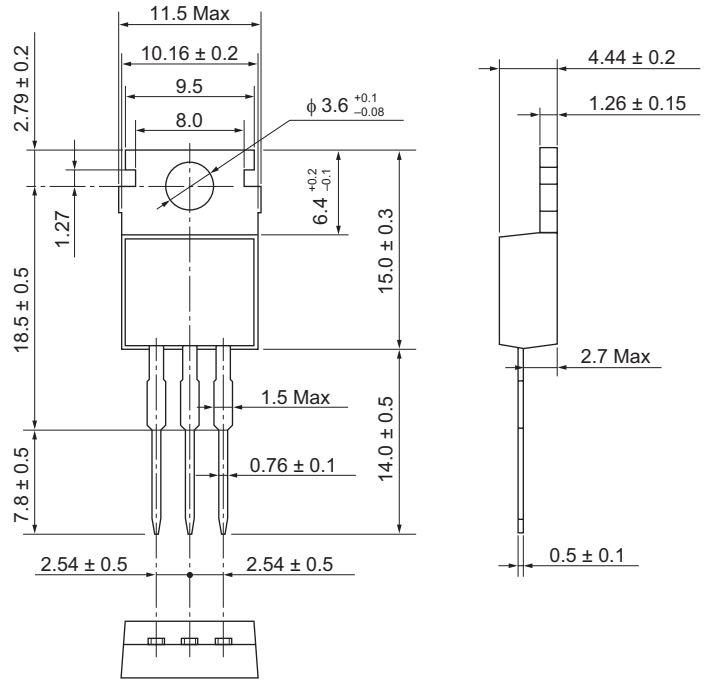

Switching Time Waveform



## Package Dimensions

| Package Name | JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|---|
| TO-220AB | SC-46 | PRSS0004AC-A | TO-220AB / TO-220ABV | 1.8g |

Unit: mm




## Ordering Information

| Part Name | Quantity | Shipping Container |
|---|---|---|
| 2SK3228-E | 500 pcs | Box (Sack) |

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