To all our customers

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

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# 2SK2728

Silicon N Channel MOS FET
High Speed Power Switching

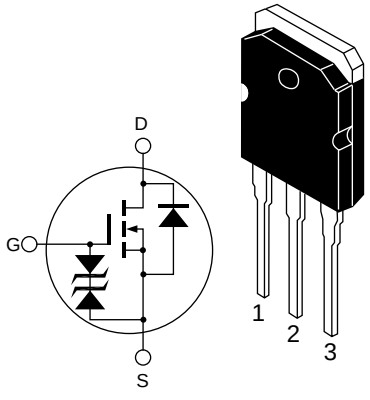
ADE-208-454B (Z)
3rd. Edition
Jul. 1997

## Features

- Low on-resistance
- High speed switching
- Low drive current
- Avalanche ratings

## Outline

TO–3P




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

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

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | 500 | V |
| Gate to source voltage | $V_{GSS}$ | ±30 | V |
| Drain current | $I_D$ | 18 | A |
| Drain peak current | $I_{D(pulse)}$*[1] | 72 | A |
| Body to drain diode reverse drain current | $I_{DR}$ | 18 | A |
| Avalanche current | $I_{AP}$*[3] | 18 | A |
| Avalanche energy | $E_{AR}$*[3] | 18 | mJ |
| Channel dissipation | Pch*[2] | 150 | W |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

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

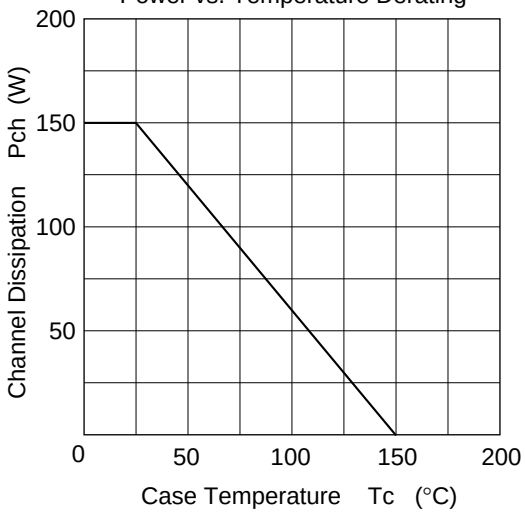
## Electrical Characteristics (Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | 500 | — | — | V | $I_D$ = 10mA, $V_{GS}$ = 0 |
| Gate to source breakdown voltage | $V_{(BR)GSS}$ | ±30 | — | — | V | $I_G$ = ±100µA, $V_{DS}$ = 0 |
| Gate to source leak current | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±25V, $V_{DS}$ = 0 |
| Zero gate voltege drain current | $I_{DSS}$ | — | — | 10 | µA | $V_{DS}$ = 500 V, $V_{GS}$ = 0 |
| Gate to source cutoff voltage | $V_{GS(off)}$ | 2.5 | — | 3.5 | V | $I_D$ = 1mA, $V_{DS}$ = 10V*[1] |
| Static drain to source on state resistance | $R_{DS(on)}$ | — | 0.38 | 0.45 | Ω | $I_D$ = 9A, $V_{GS}$ = 10V*[1] |
| Forward transfer admittance | $\|y_{fs}\|$ | 8 | 13 | — | S | $I_D$ = 9A, $V_{DS}$ = 10V*[1] |
| Input capacitance | Ciss | — | 2150 | — | pF | $V_{DS}$ = 10V |
| Output capacitance | Coss | — | 630 | — | pF | $V_{GS}$ = 0 |
| Reverse transfer capacitance | Crss | — | 100 | — | pF | f = 1MHz |
| Total gate charge | Qg | — | 38 | — | nc | $V_{DD}$ = 400V |
| Gate to source charge | Qgs | — | 10 | — | nc | $V_{GS}$ = 10V |
| Gate to drain charge | Qgd | — | 13 | — | nc | $I_D$ = 18A |
| Turn-on delay time | $t_{d(on)}$ | — | 35 | — | ns | $V_{GS}$ = 10V, $I_D$ = 9A |
| Rise time | $t_r$ | — | 120 | — | ns | $R_L$ = 3.3Ω |
| Turn-off delay time | $t_{d(off)}$ | — | 100 | — | ns | |
| Fall time | $t_f$ | — | 65 | — | ns | |
| Body to drain diode forward voltage | $V_{DF}$ | — | 1.0 | — | V | $I_D$ = 18A, $V_{GS}$ = 0 |
| Body to drain diode reverse recovery time | $t_{rr}$ | — | 380 | — | ns | $I_F$ = 18A, $V_{GS}$ = 0<br>diF/ dt = 100A/µs |

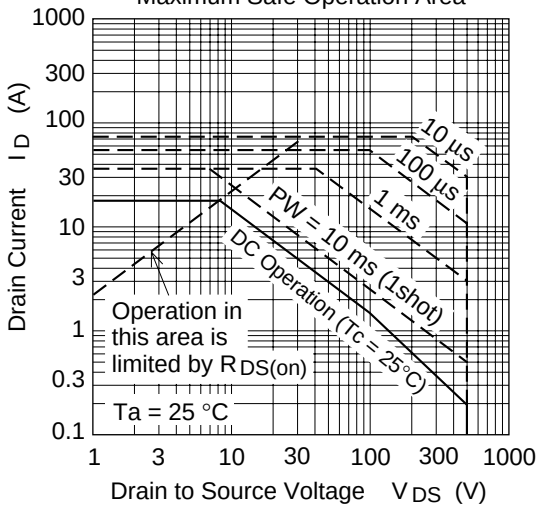
Note: 1. Pulse test

## Main Characteristics

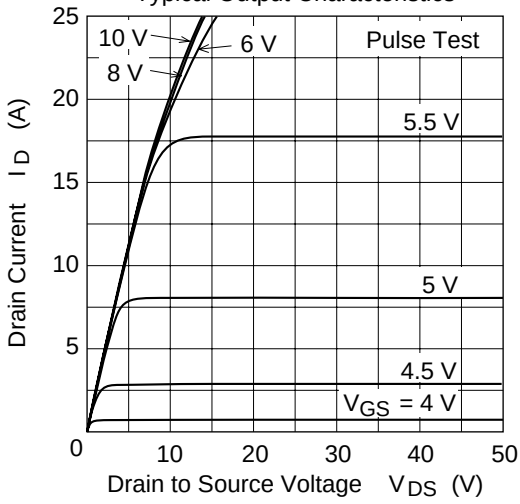
Power vs. Temperature Derating



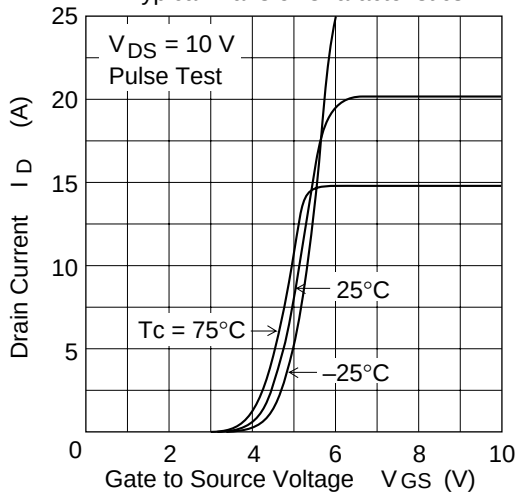

Maximum Safe Operation Area



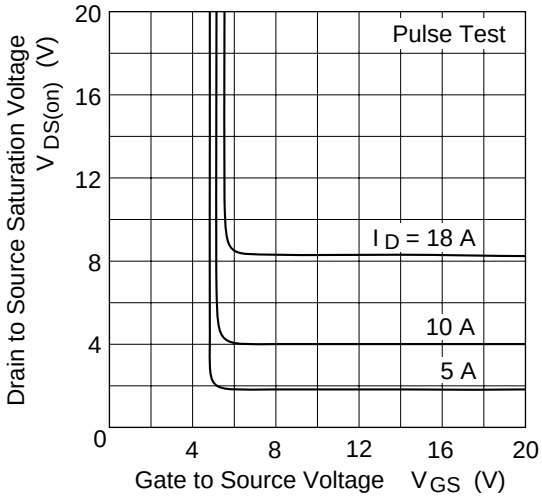

Typical Output Characteristics



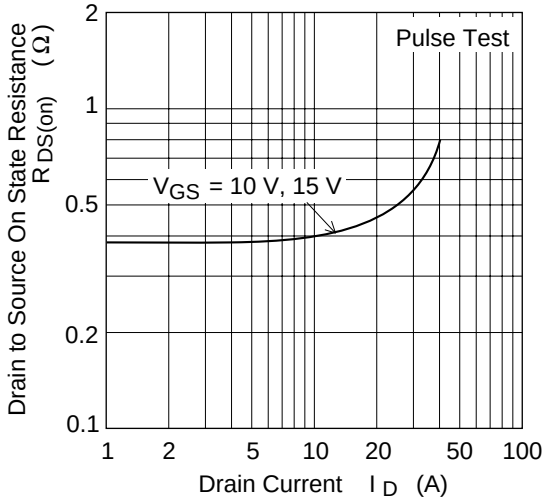

Typical Transfer Characteristics



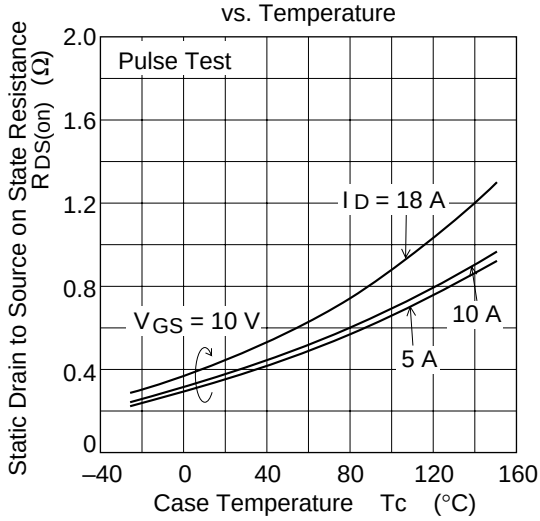
Drain to Source Saturation Voltage vs. Gate to Source Voltage



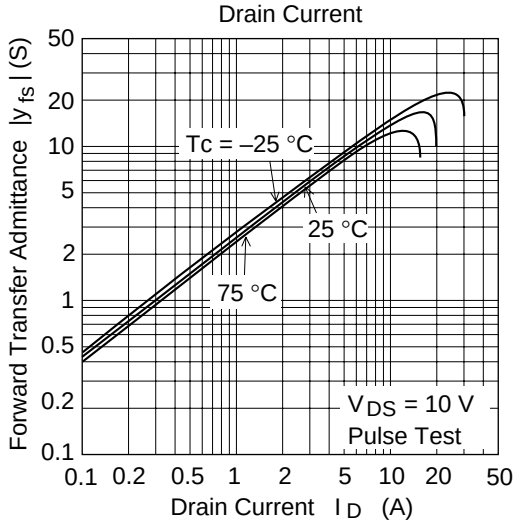

Static Drain to Source on State Resistance vs. Drain Current



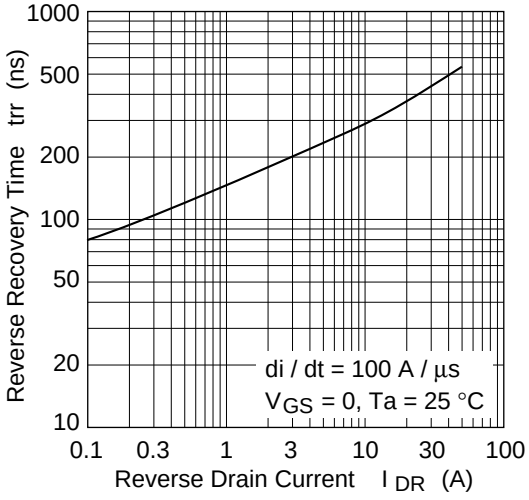

Static Drain to Source on State Resistance vs. Temperature



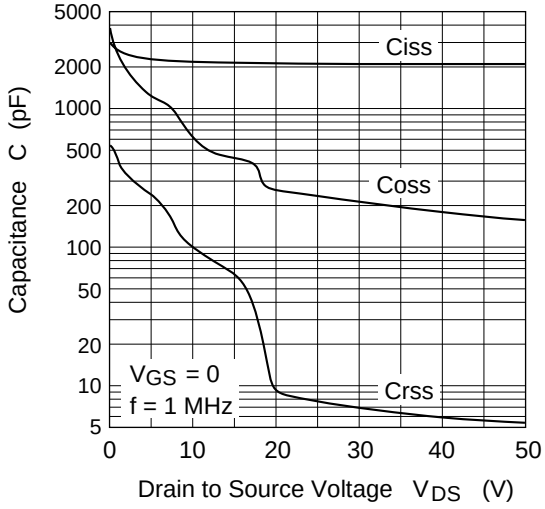

Forward Transfer Admittance vs. Drain Current



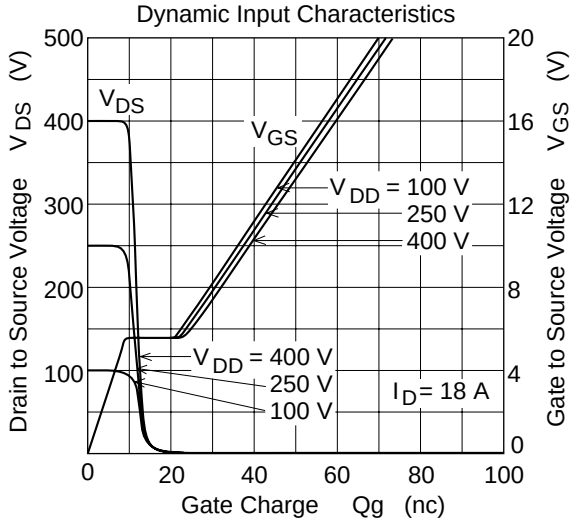
Body to Drain Diode Reverse Recovery Time



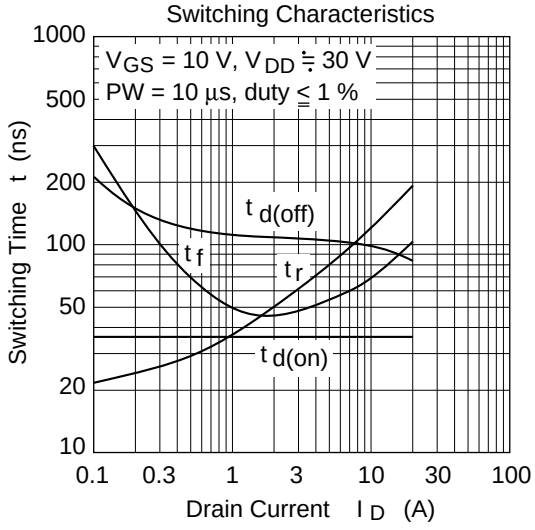

Typical Capacitance vs. Drain to Source Voltage



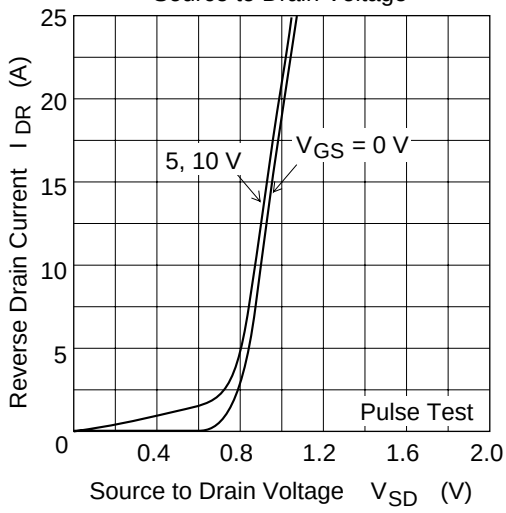

Dynamic Input Characteristics



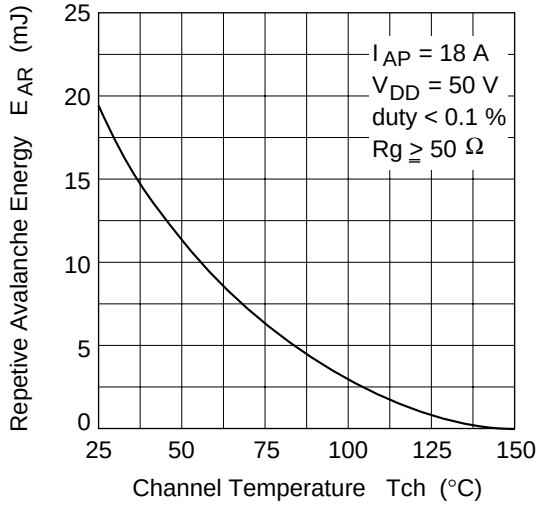

Switching Characteristics



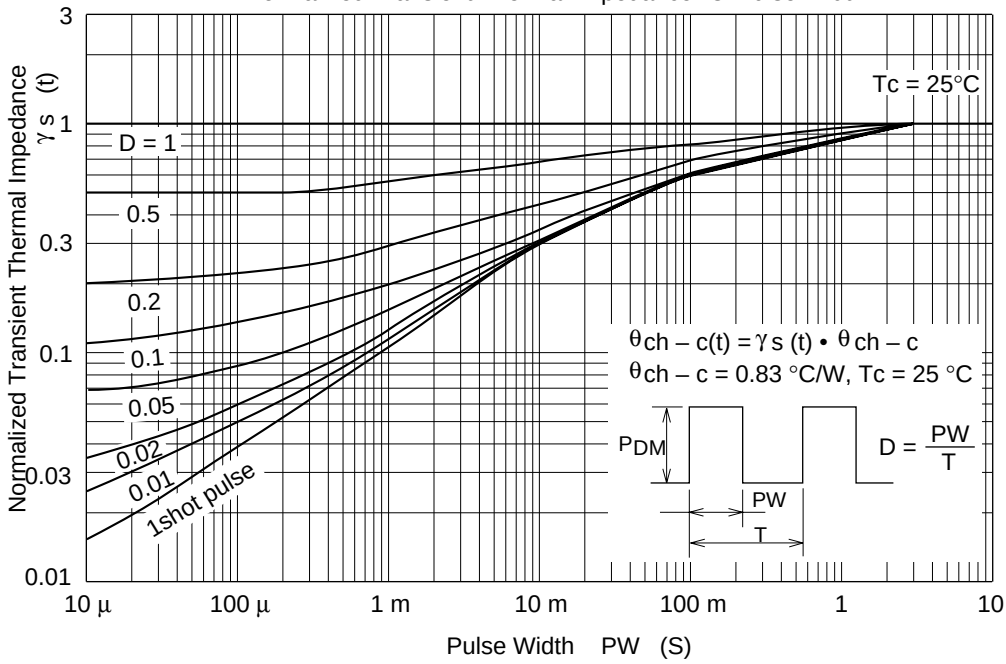
Reverse Drain Current vs.
Source to Drain Voltage



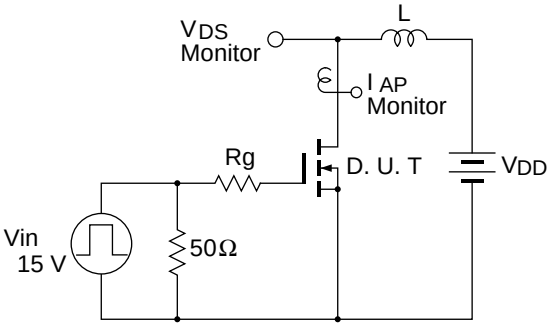

Maximun Avalanche Energy vs.
Channel Temperature Derating




Normalized Transient Thermal Impedance vs. Pulse Width

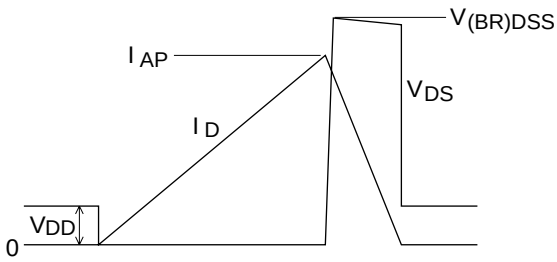


Avalanche Test Circuit

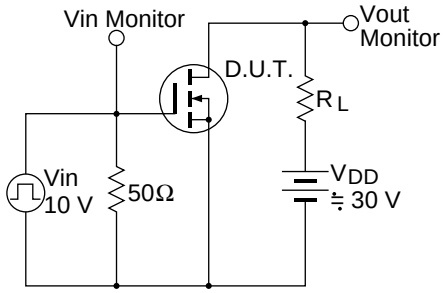



Avalanche Waveform

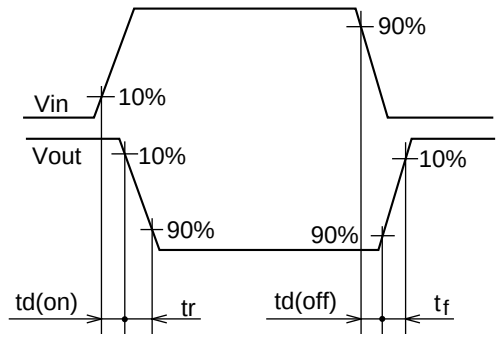
$$E_{AR} = \frac{1}{2} \bullet L \bullet I_{AP}^{2} \bullet \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$




Switching Time Test Circuit



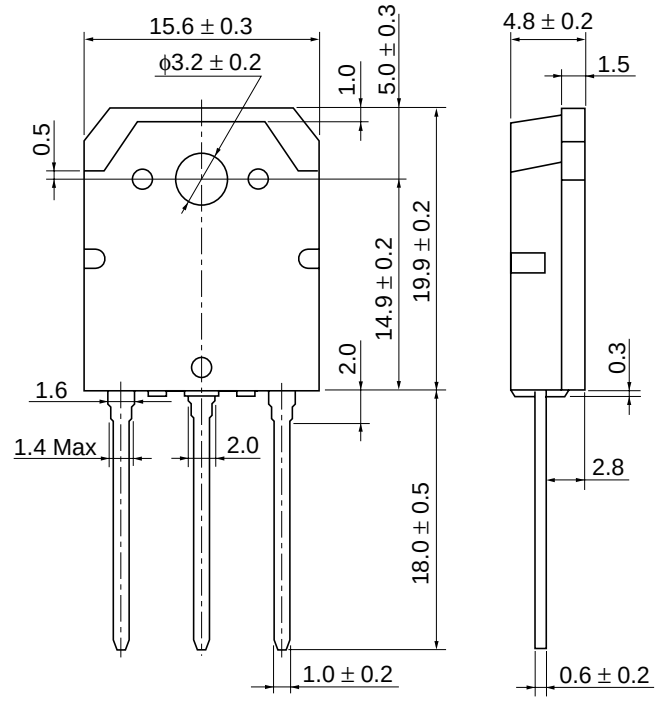

Switching Time Waveform

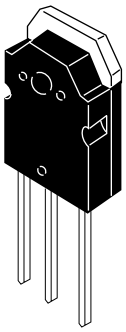


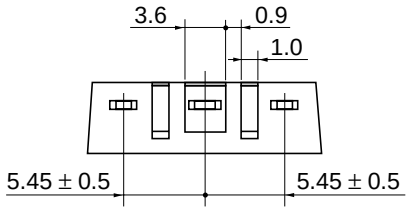
## Package Dimensions

As of January, 2001

Unit: mm






| | |
|---|---|
| Hitachi Code | TO-3P |
| JEDEC | — |
| EIAJ | Conforms |
| Mass (reference value) | 5.0 g |

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