

# HAT2099H

## Silicon N Channel Power MOS FET Power Switching

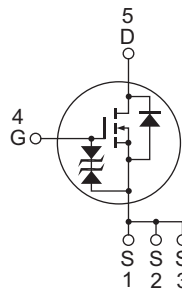
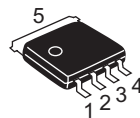
REJ03G1187-0500  
(Previous: ADE-208-1432C)  
Rev.5.00  
Sep 07, 2005

### Features

- Capable of 4.5 V gate drive
  - Low drive current
  - High density mounting
  - Low on-resistance
- $R_{DS(on)} = 2.9 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ )

### Outline

RENESAS Package code: PTZZ0005DA-A  
(Package name: LFAK)



1, 2, 3 Source  
4 Gate  
5 Drain

## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value	Unit
Drain to source voltage	$V_{DS}$	30	V
Gate to source voltage	$V_{GS}$	±20	V
Drain current	$I_D$	50	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	200	A
Body-drain diode reverse drain current	$I_{DR}$	50	A
Avalanche current	$I_{AP}$ <sup>Note 3</sup>	5	A
Avalanche energy	$E_{AR}$ <sup>Note 3</sup>	2.5	mJ
Channel dissipation	$P_{ch}$ <sup>Note 2</sup>	30	W
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%

2. Tc = 25 °C

3. Value at Tch = 25°C, Rg ≥ 50 Ω

## Electrical Characteristics

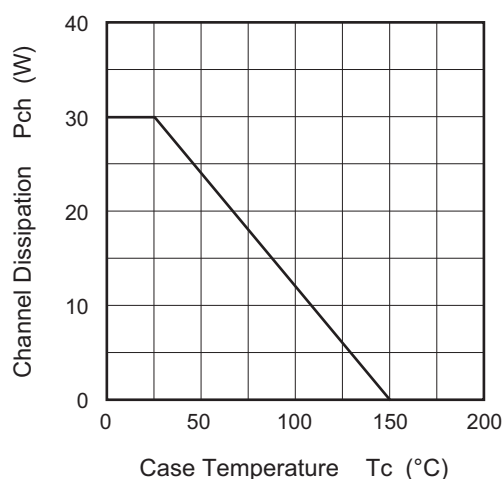
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	$I_G = \pm 100 \text{ } \mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	±10	μA	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	1	μA	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	2.9	3.7	mΩ	$I_D = 25 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note 4</sup>
	$R_{DS(on)}$	—	5.0	7.3	mΩ	$I_D = 25 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note 4</sup>
Forward transfer admittance	$ y_{fs} $	39	65	—	S	$I_D = 25 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note 4</sup>
Input capacitance	$C_{iss}$	—	4750	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	1180	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	650	—	pF	$f = 1 \text{ MHz}$
Total gate charge	$Q_g$	—	75	—	nC	$V_{DD} = 10 \text{ V}$
Gate to source charge	$Q_{gs}$	—	16	—	nC	$V_{GS} = 10 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	14	—	nC	$I_D = 50 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	26	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 25 \text{ A}$
Rise time	$t_r$	—	60	—	ns	$V_{DD} \cong 10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	85	—	ns	$R_L = 0.4 \text{ } \Omega$
Fall time	$t_f$	—	26	—	ns	$R_g = 4.7 \text{ } \Omega$
Body-drain diode forward voltage	$V_{DF}$	—	0.85	0.98	V	$I_F = 50 \text{ A}$ , $V_{GS} = 0$ <sup>Note 4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = 50 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$

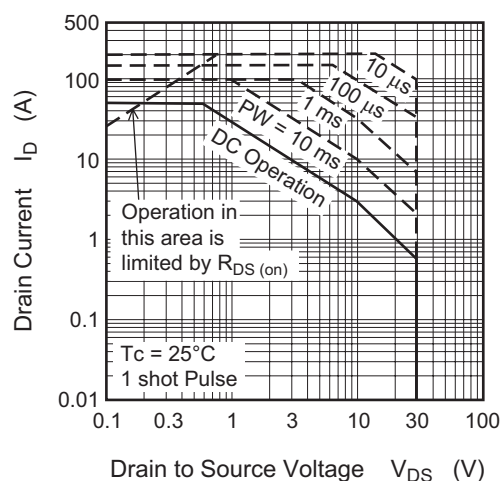
Note: 4. Pulse test

## Main Characteristics

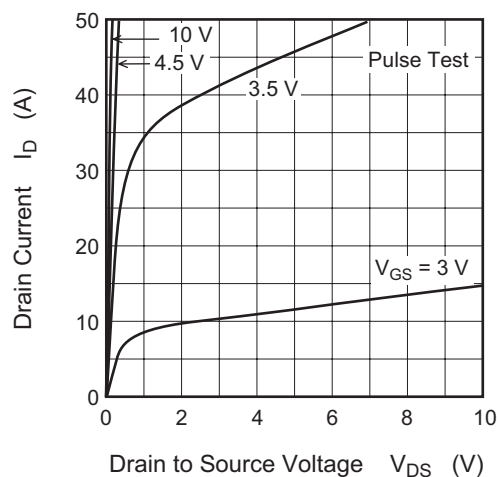
Power vs. Temperature Derating



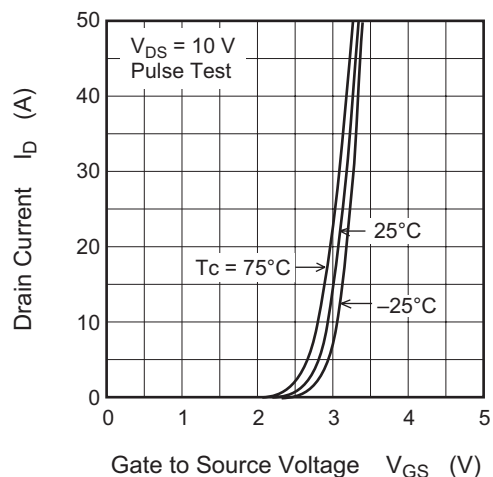
Maximum Safe Operation Area



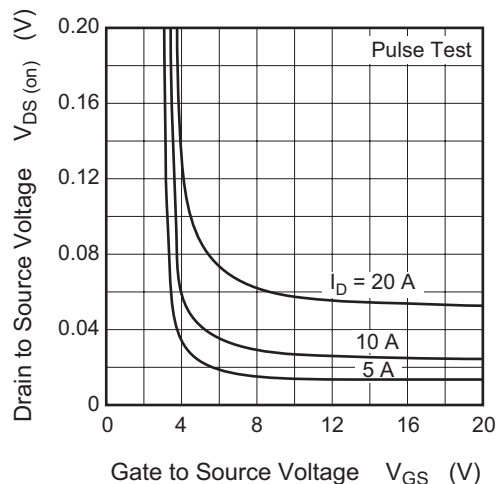
Typical Output Characteristics



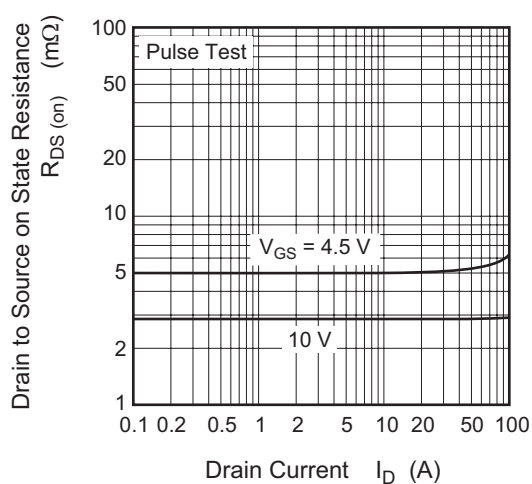
Typical Transfer Characteristics



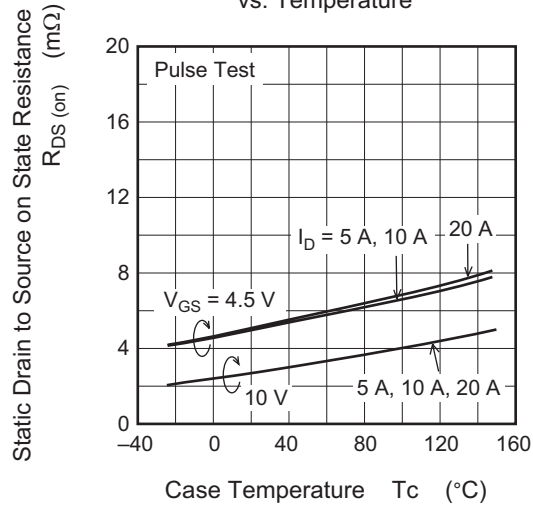
Drain to Source Saturation Voltage vs. Gate to Source Voltage



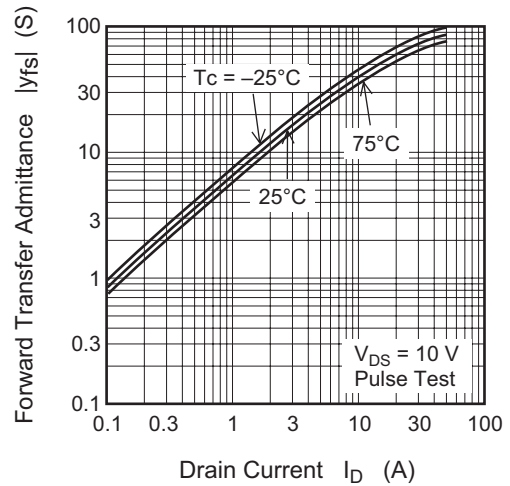
Static Drain to Source on State Resistance vs. Drain Current



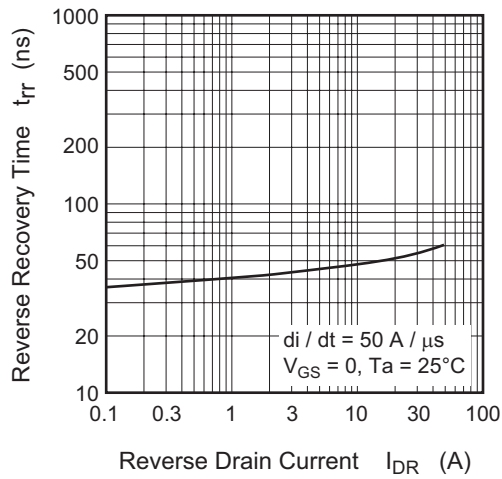
Static Drain to Source on State Resistance vs. Temperature



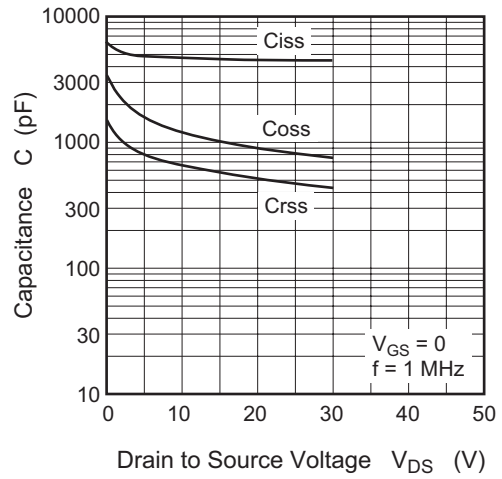
Forward Transfer Admittance vs. Drain Current



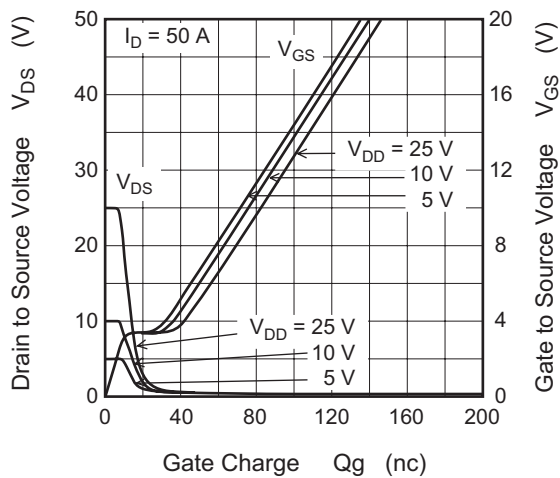
Body-Drain Diode Reverse Recovery Time



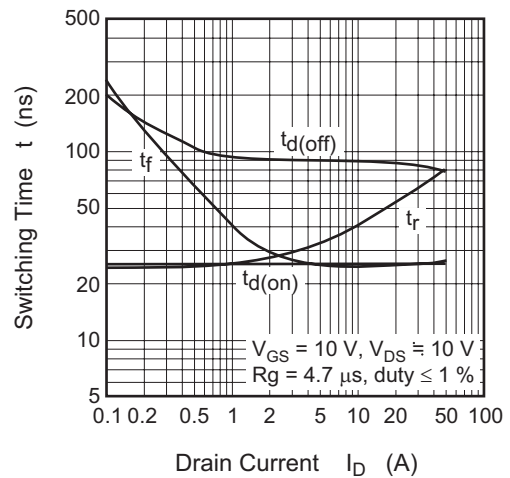
Typical Capacitance vs. Drain to Source Voltage

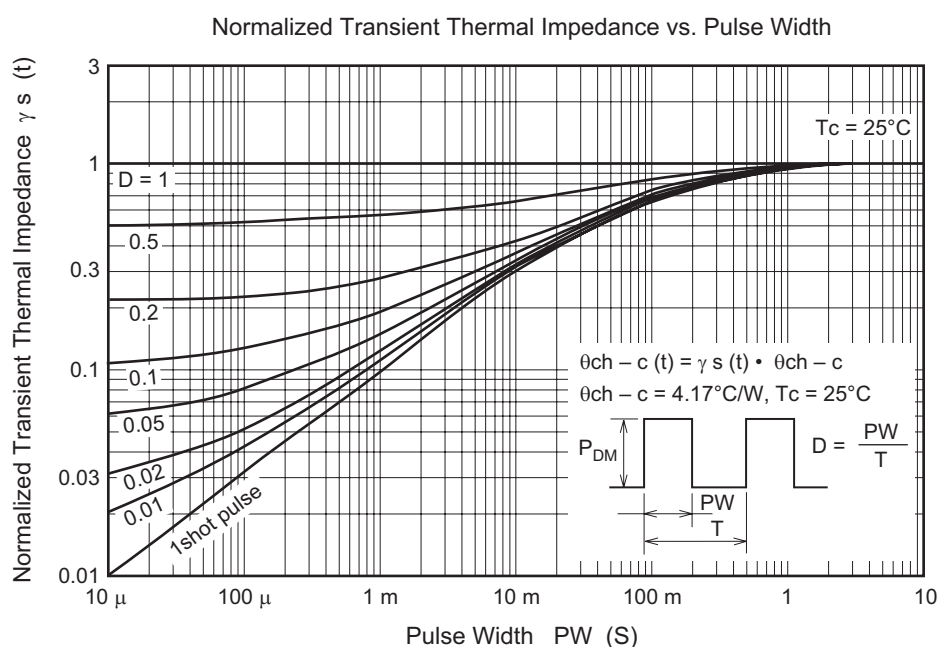
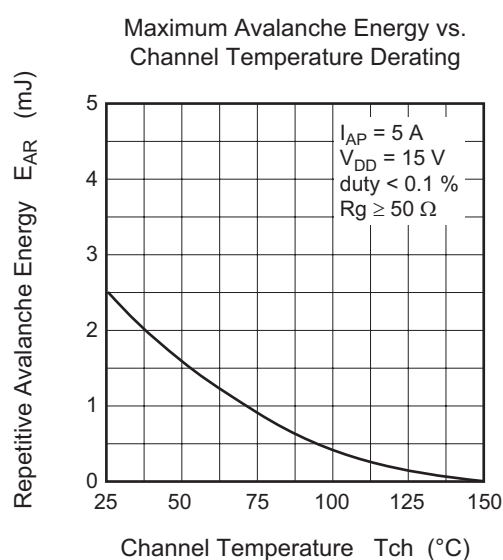
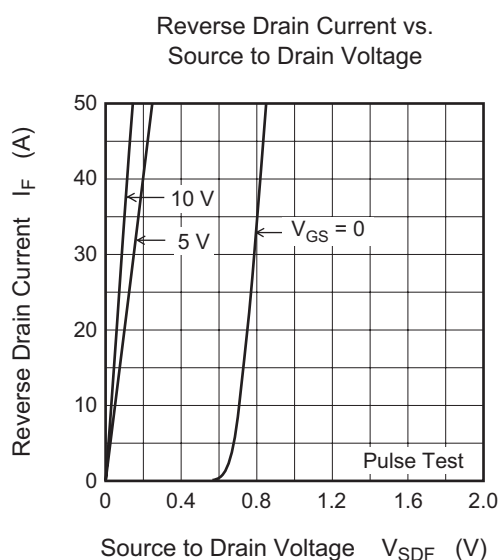


Dynamic Input Characteristics

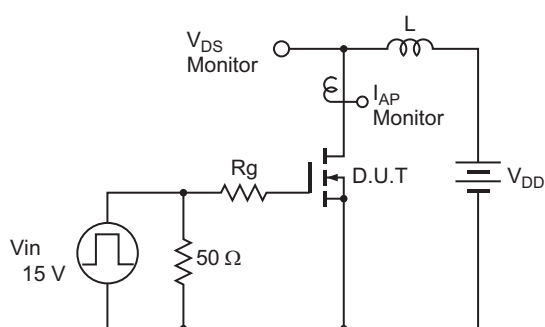


Switching Characteristics



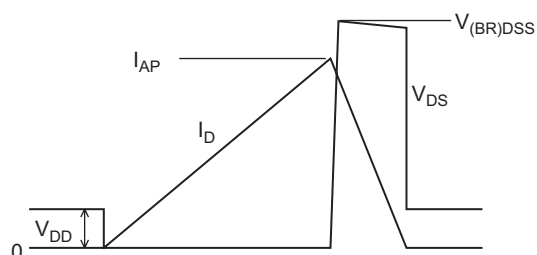


Avalanche Test Circuit

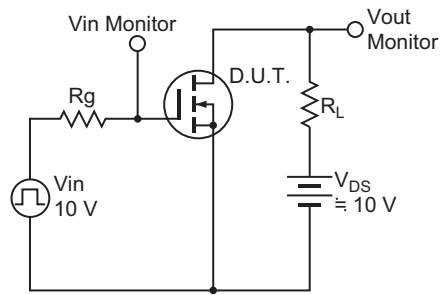


Avalanche Waveform

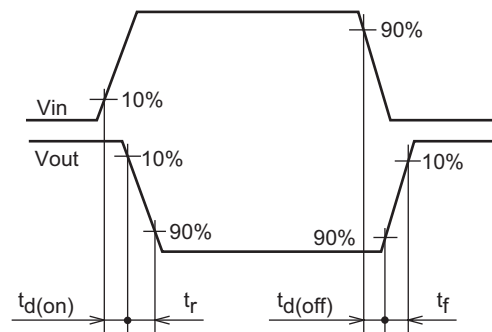
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

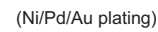


Switching Time Test Circuit



Switching Time Waveform



Unit: mm

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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