

## HAT2096H

Silicon N Channel Power MOS FET  
Power Switching

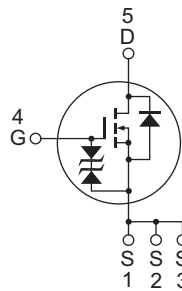
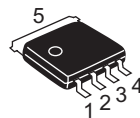
REJ03G1186-0400  
(Previous: ADE-208-1431B)  
Rev.4.00  
Sep 07, 2005

### Features

- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance  
 $R_{DS(on)} = 4.2 \text{ m}\Omega$  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 <sub>DSS</sub>	30	V
Gate to source voltage	V <sub>GSS</sub>	±20	V
Drain current	I <sub>D</sub>	40	A
Drain peak current	I <sub>D (pulse)</sub> <sup>Note 1</sup>	160	A
Body-drain diode reverse drain current	I <sub>DR</sub>	40	A
Channel dissipation	P <sub>ch</sub> <sup>Note 2</sup>	20	W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%

2. Tc = 25 °C

## Electrical Characteristics

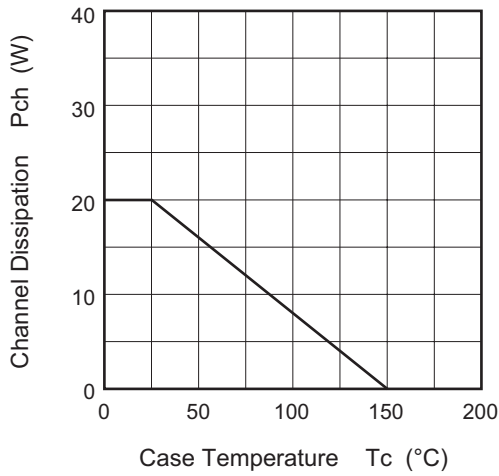
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	V <sub>(BR) DSS</sub>	30	—	—	V	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0
Gate to source breakdown voltage	V <sub>(BR) GSS</sub>	±20	—	—	V	I <sub>G</sub> = ±100 μA, V <sub>DS</sub> = 0
Gate to source leak current	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0
Zero gate voltage drain current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0
Gate to source cutoff voltage	V <sub>GS (off)</sub>	1.0	—	2.5	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Static drain to source on state resistance	R <sub>DS (on)</sub>	—	4.2	5.3	mΩ	I <sub>D</sub> = 20 A, V <sub>GS</sub> = 10 V <sup>Note 3</sup>
	R <sub>DS (on)</sub>	—	7.0	10	mΩ	I <sub>D</sub> = 20 A, V <sub>GS</sub> = 4.5 V <sup>Note 3</sup>
Forward transfer admittance	y <sub>fs</sub>	30	50	—	S	I <sub>D</sub> = 20 A, V <sub>DS</sub> = 10 V <sup>Note 3</sup>
Input capacitance	C <sub>iss</sub>	—	2200	—	pF	V <sub>DS</sub> = 10 V
Output capacitance	C <sub>oss</sub>	—	600	—	pF	V <sub>GS</sub> = 0
Reverse transfer capacitance	C <sub>rss</sub>	—	330	—	pF	f = 1 MHz
Total gate charge	Q <sub>g</sub>	—	40	—	nC	V <sub>DD</sub> = 10 V
Gate to source charge	Q <sub>gs</sub>	—	7	—	nC	V <sub>GS</sub> = 10 V
Gate to drain charge	Q <sub>gd</sub>	—	8	—	nC	I <sub>D</sub> = 40 A
Turn-on delay time	t <sub>d (on)</sub>	—	20	—	ns	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A
Rise time	t <sub>r</sub>	—	49	—	ns	V <sub>DD</sub> ≅ 10 V
Turn-off delay time	t <sub>d (off)</sub>	—	62	—	ns	R <sub>L</sub> = 0.5 Ω
Fall time	t <sub>f</sub>	—	15	—	ns	R <sub>g</sub> = 4.7 Ω
Body-drain diode forward voltage	V <sub>DF</sub>	—	0.85	1.11	V	I <sub>F</sub> = 40 A, V <sub>GS</sub> = 0 <sup>Note 3</sup>
Body-drain diode reverse recovery time	t <sub>rr</sub>	—	60	—	ns	I <sub>F</sub> = 40 A, V <sub>GS</sub> = 0 di <sub>F</sub> /dt = 50 A/μs

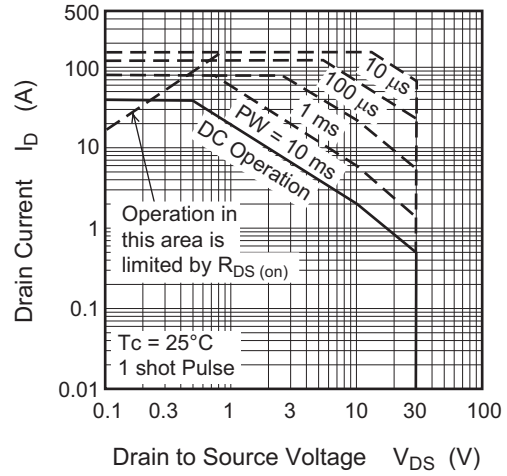
Note: 3. Pulse test

### Main Characteristics

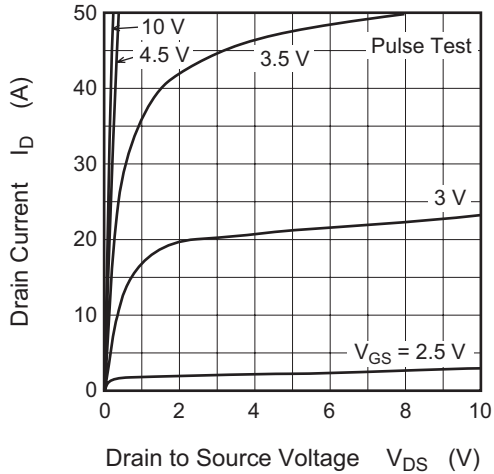
Power vs. Temperature Derating



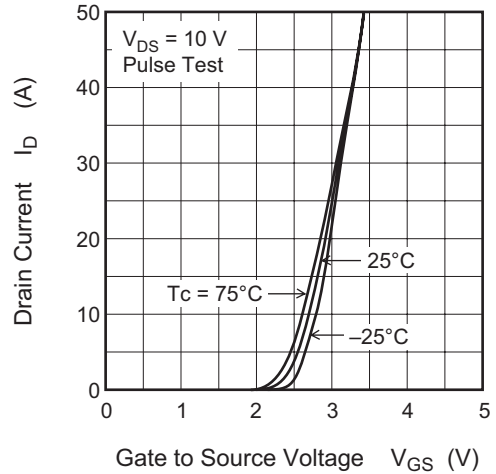
Maximum Safe Operation Area



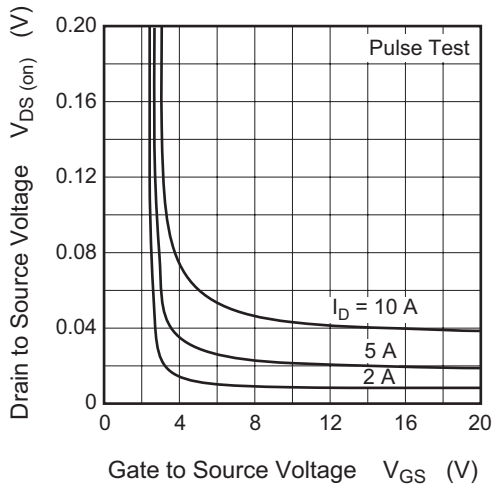
Typical Output Characteristics



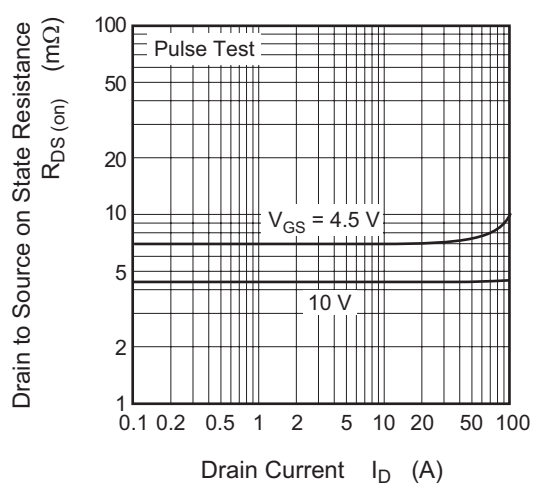
Typical Transfer Characteristics



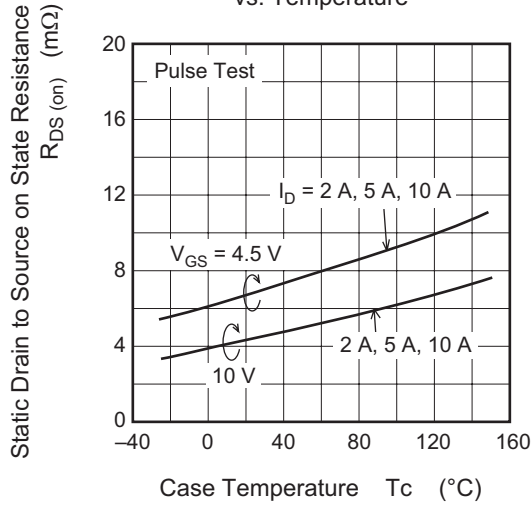
Drain to Source Saturation Voltage vs. Gate to Source Voltage



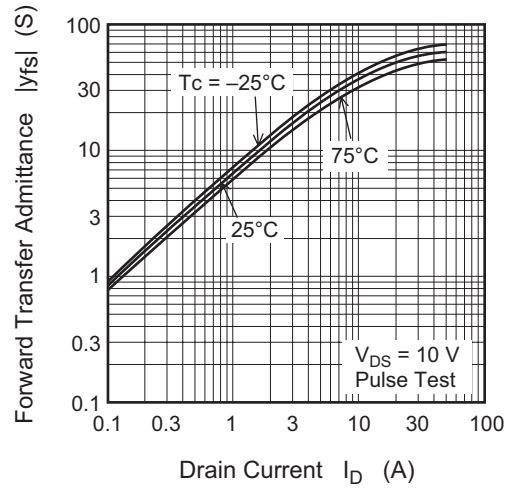
Static Drain to Source on State Resistance vs. Drain Current



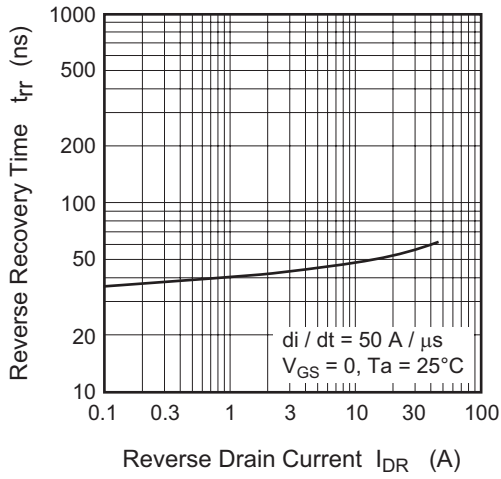
Static Drain to Source on State Resistance vs. Temperature



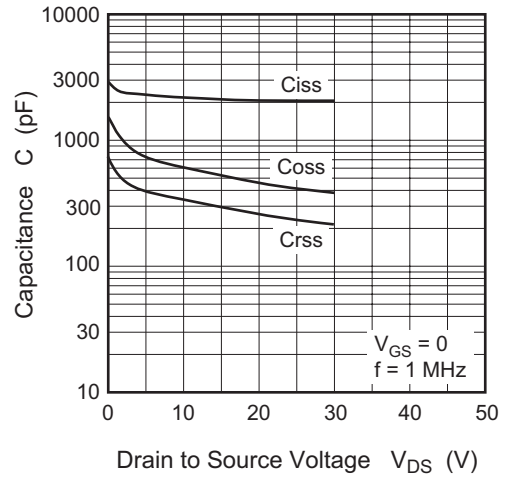
Forward Transfer Admittance vs. Drain Current



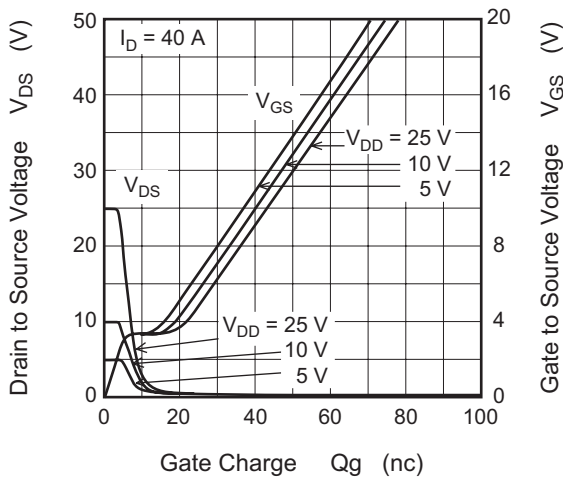
Body-Drain Diode Reverse Recovery Time



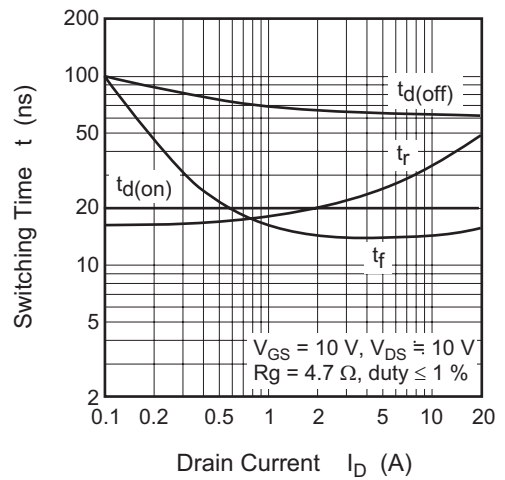
Typical Capacitance vs. Drain to Source Voltage



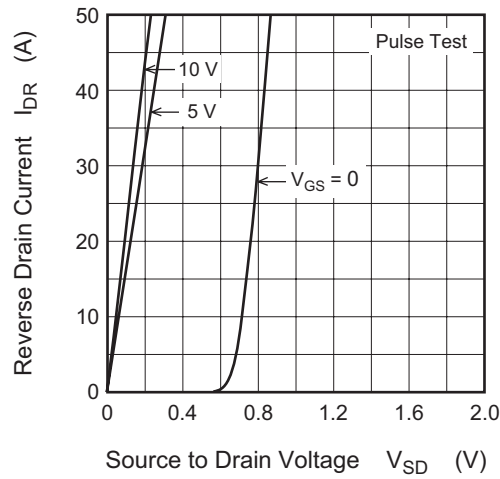
Dynamic Input Characteristics



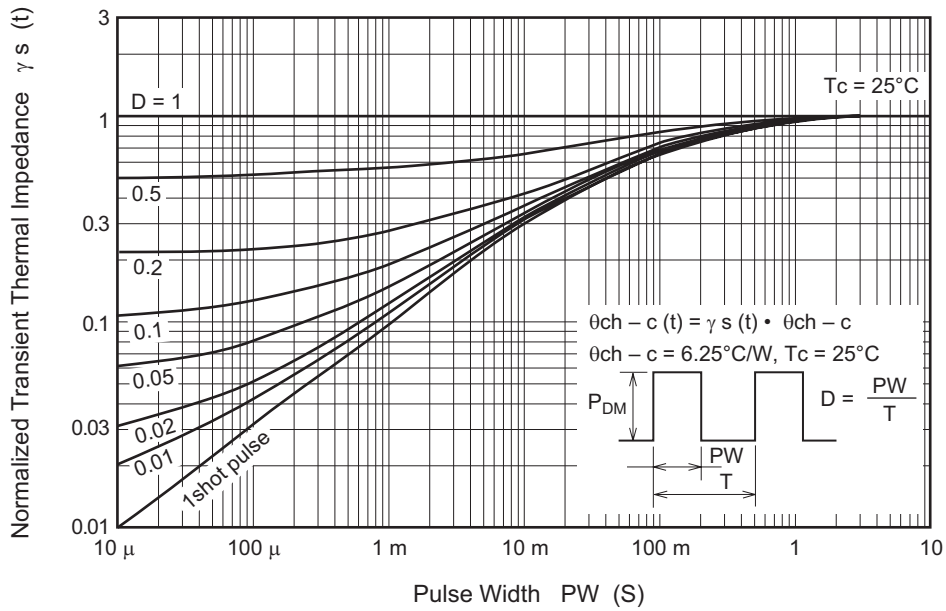
Switching Characteristics



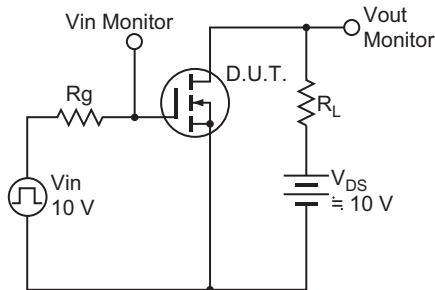
Reverse Drain Current vs. Source to Drain Voltage



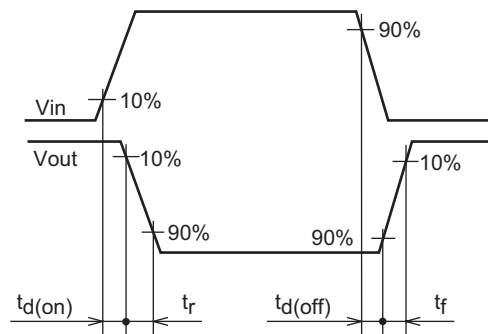
Normalized Transient Thermal Impedance vs. Pulse Width



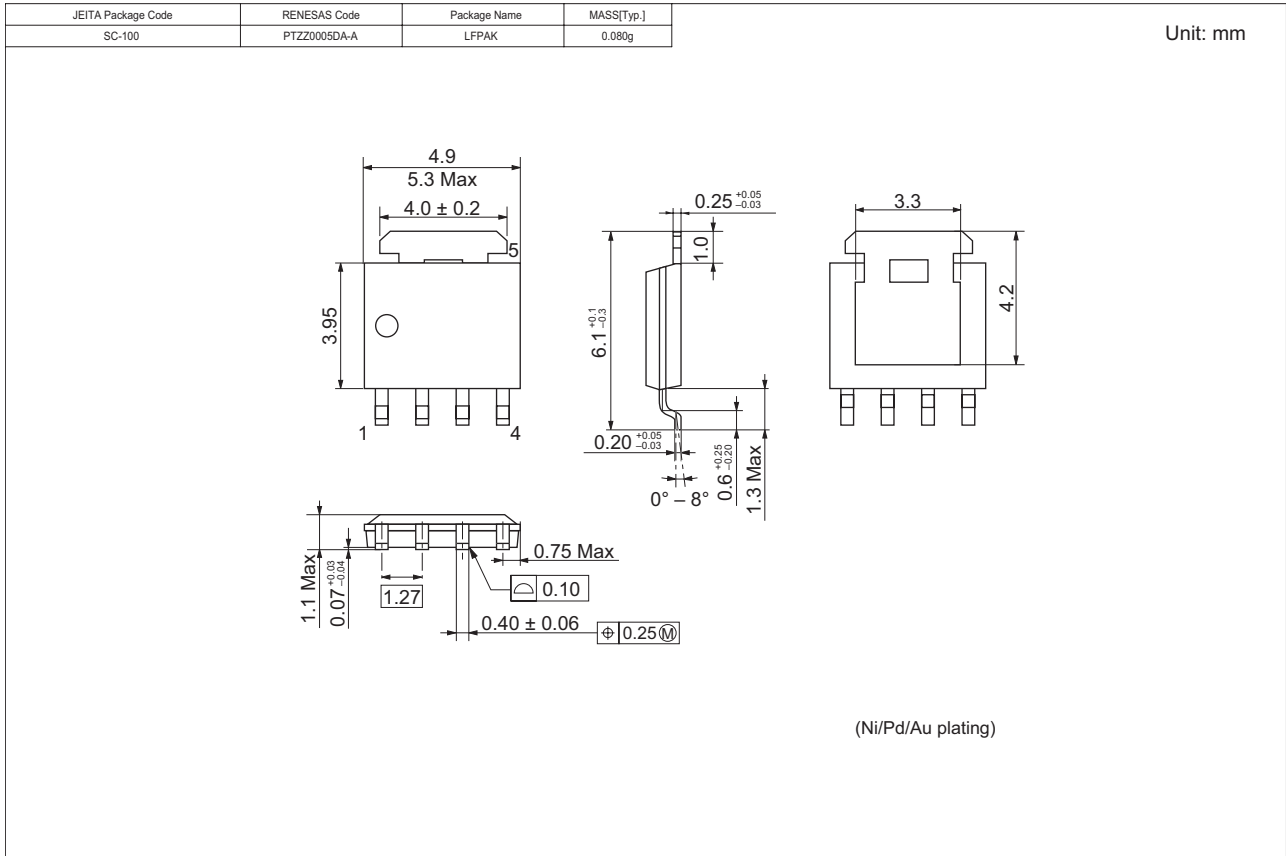
Switching Time Test Circuit



Switching Time Waveform



### Package Dimensions



### Ordering Information

Part Name	Quantity	Shipping Container
HAT2096H-EL-E	2500 pcs	Taping

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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