HAT2201R

Silicon N Channel Power MOS FET
Power Switching

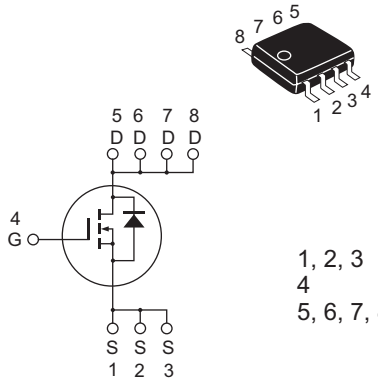
REJ03G0233-0300Z
Rev.3.00
Apr.07.2004

Features

- Capable of 8 V gate drive
- Low drive current
- High density mounting
- Low on-resistance
  $R_{DS(on)}$ = 34 mΩ typ. (at V_{GS} = 10 V)

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}	100	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	6	A
Drain peak current	$I_{D(pulse)}$ Note1	48	A
Body-drain diode reverse drain current	I_{DR}	6	A
Avalanche current	I_{AP} Note 2	6	A
Avalanche energy	E_{AR} Note 2	3.6	mJ
Channel dissipation	Pch Note3	2.5	W
Channel to Ambient Thermal Impedance	θch-a Note3	50	°C/W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Notes: 1. PW ≤ 10 µs, duty cycle ≤ 1%
2. Value at Tch = 25°C, Rg ≥ 50 Ω
3. When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10s

Electrical Characteristics

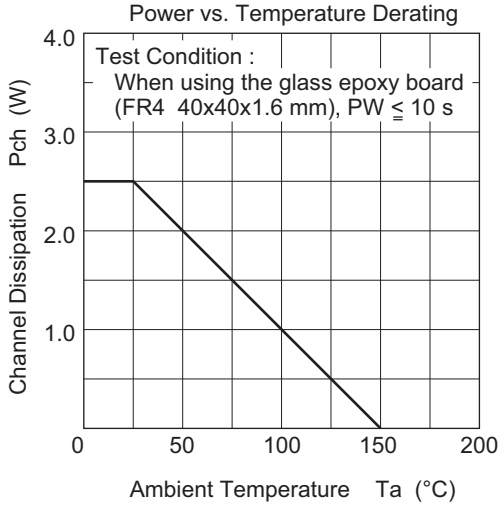
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	100	—	—	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}	—	—	1	µA	V_{DS} = 100 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	3.5	—	5.0	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	34	43	mΩ	I_D = 3 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	35	49	mΩ	I_D = 3 A, V_{GS} = 8 V Note4
Forward transfer admittance	$\|y_{fs}\|$	6	10	—	S	I_D = 3 A, V_{DS} = 10 V Note4
Input capacitance	Ciss	—	1450	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	180	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	65	—	pF	f = 1 MHz
Gate Resistance	Rg	—	0.9	—	Ω	
Total gate charge	Qg	—	21	—	nC	V_{DD} = 50 V
Gate to source charge	Qgs	—	7.6	—	nC	V_{GS} = 10 V
Gate to drain charge	Qgd	—	5.2	—	nC	I_D = 6 A
Turn-on delay time	$t_{d(on)}$	—	18	—	ns	V_{GS} = 10 V, I_D = 3 A
Rise time	t_r	—	2.5	—	ns	V_{DD} ≅ 30 V
Turn-off delay time	$t_{d(off)}$	—	36	—	ns	R_L = 10 Ω
Fall time	t_f	—	4.0	—	ns	Rg = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	0.79	1.03	V	IF = 6 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	40	—	ns	IF = 6 A, V_{GS} = 0 diF/ dt = 100 A/ µs

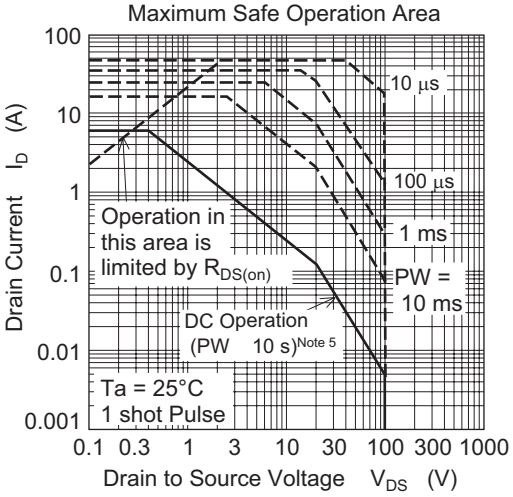
Notes: 4. Pulse test

Main Characteristics

Power vs. Temperature Derating

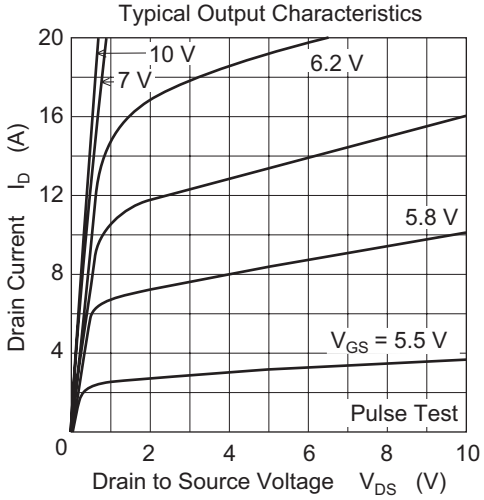


Maximum Safe Operation Area

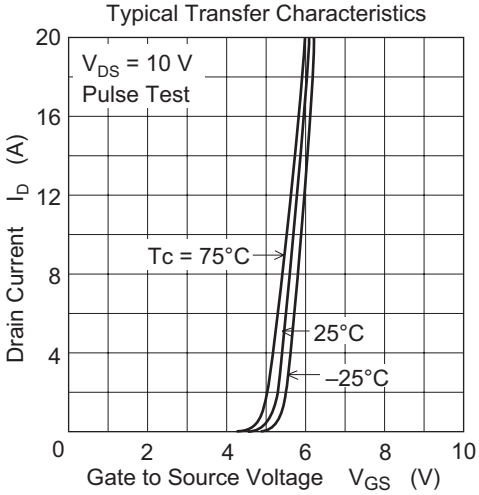


Note 5 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)

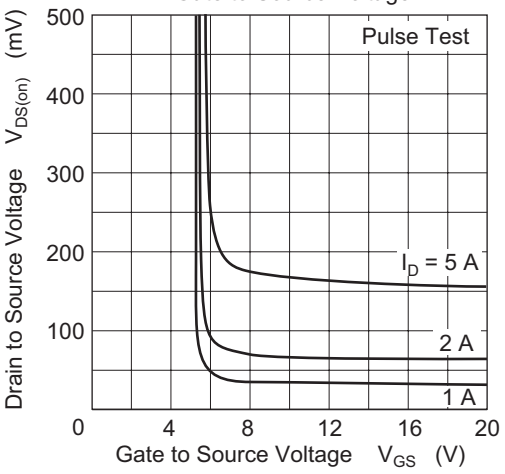
Typical Output Characteristics



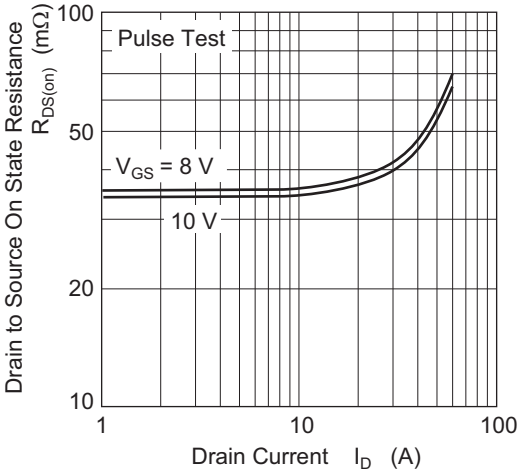
Typical Transfer Characteristics



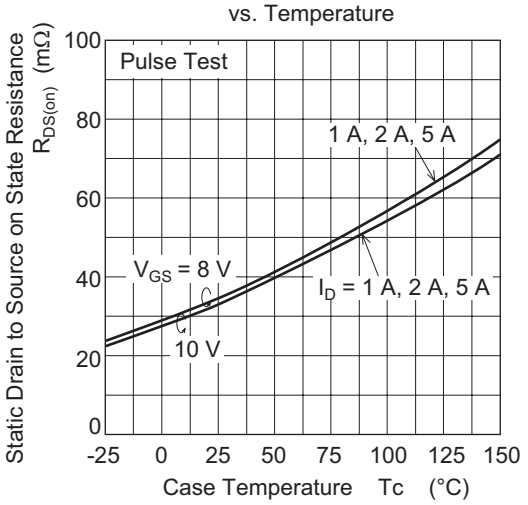
Drain to Source Saturation Voltage vs.
Gate to Source Voltage



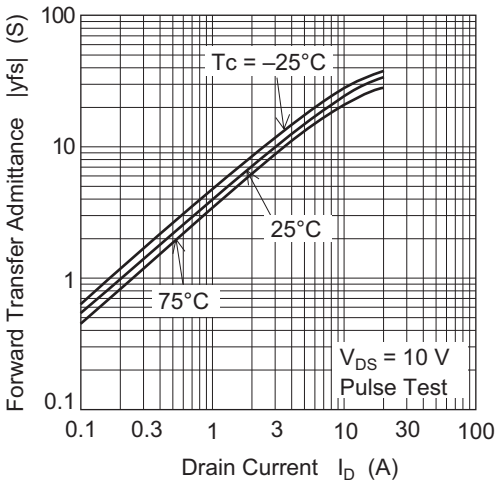
Static Drain to Source on State Resistance
vs. Drain Current



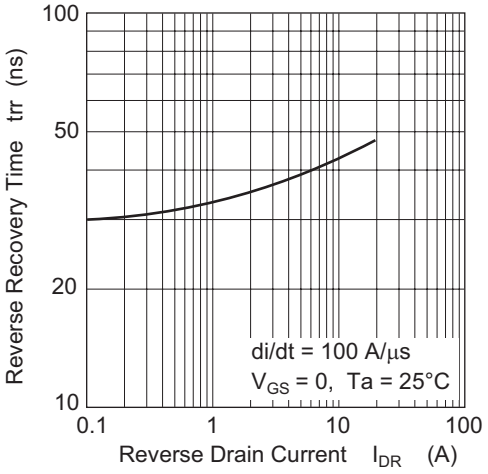
Static Drain to Source on State Resistance vs. Temperature



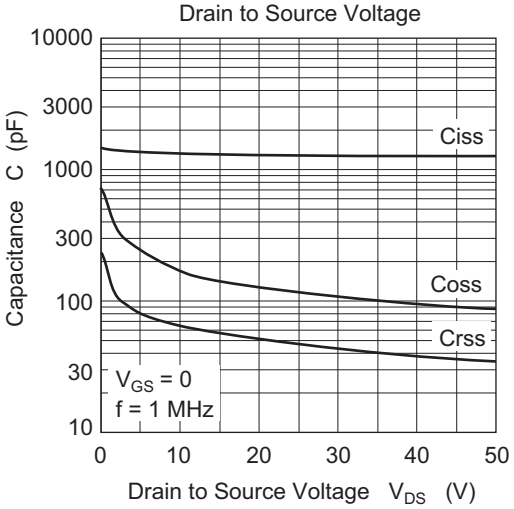
Forward Transfer Admittance vs. Drain Current



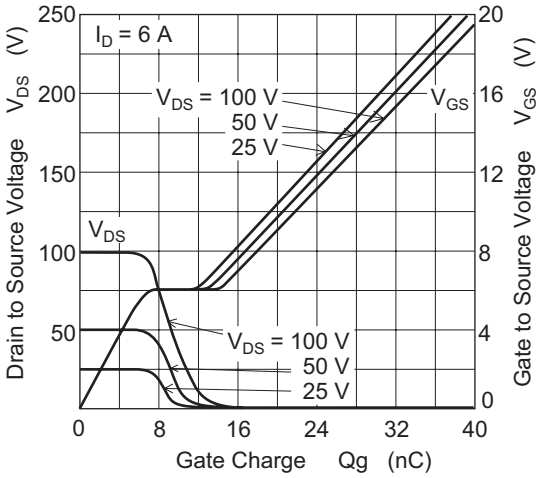
Body–Drain Diode Reverse Recovery Time



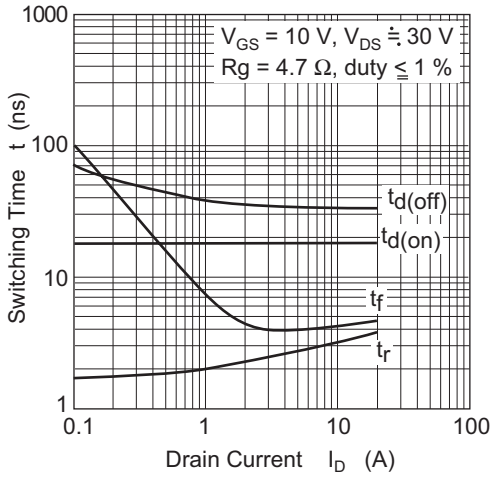
Typical Capacitance vs. Drain to Source Voltage

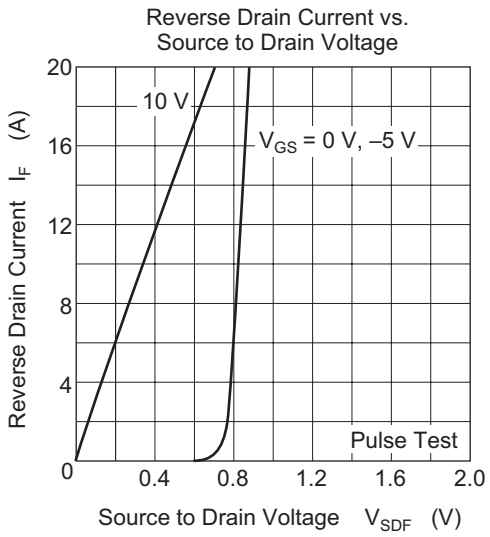


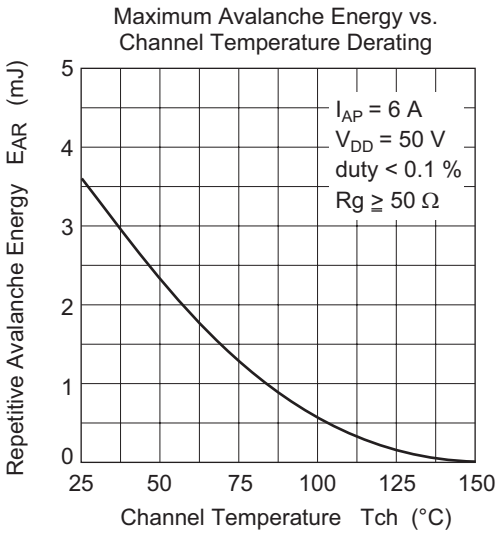
Dynamic Input Characteristics

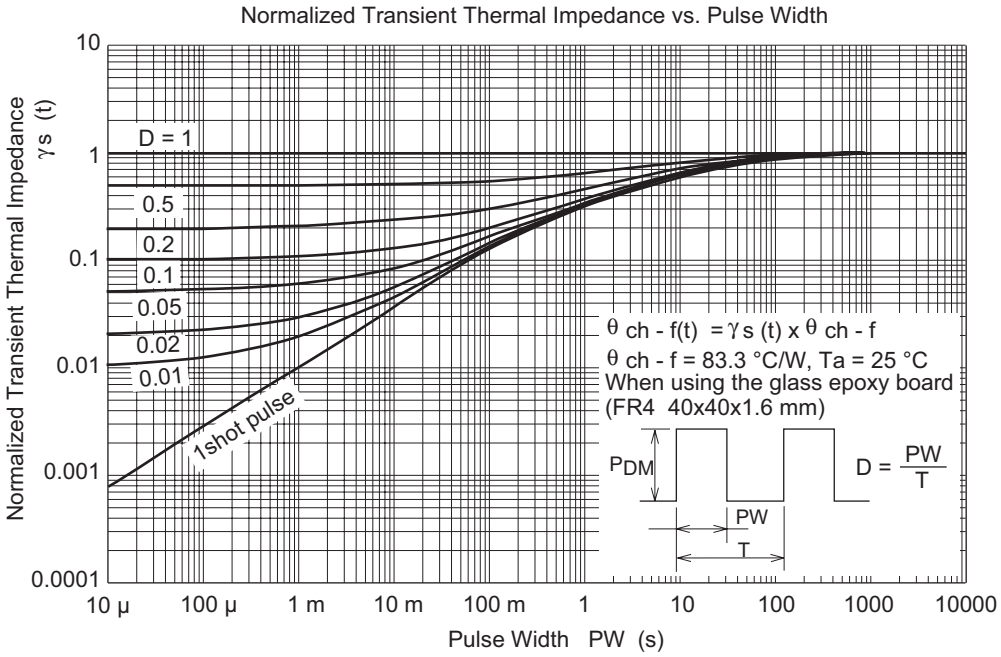


Switching Characteristics

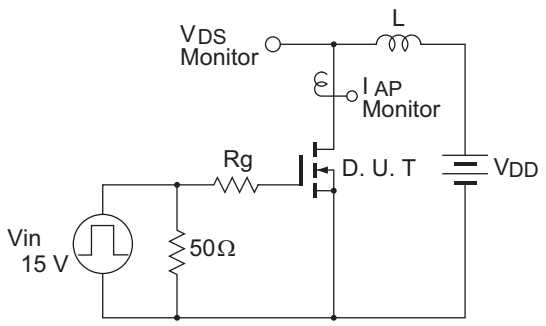



Reverse Drain Current vs.
Source to Drain Voltage
Reverse Drain Current I_F (A)
20
16
12
8
4
0
10 V
V_{GS} = 0 V, –5 V
Pulse Test
0.4
0.8
1.2
1.6
2.0
Source to Drain Voltage V_{SDF} (V)


Maximum Avalanche Energy vs.
Channel Temperature Derating
Repetitive Avalanche Energy E_{AR} (mJ)
5
4
3
2
1
0
I_{AP} = 6 A
V_{DD} = 50 V
duty < 0.1 %
Rg ≧ 50 Ω
25
50
75
100
125
150
Channel Temperature Tch (°C)

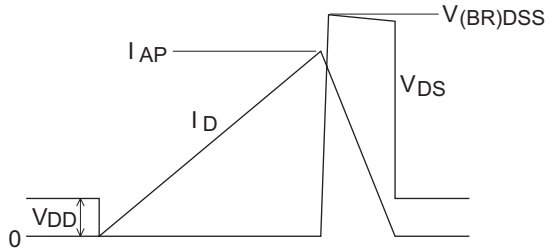

Normalized Transient Thermal Impedance vs. Pulse Width
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
0.001
0.0001
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θ ch - f(t) = γs (t) x θ ch - f
θ ch - f = 83.3 °C/W, Ta = 25 °C
When using the glass epoxy board
(FR4 40x40x1.6 mm)
P_{DM}
PW
T
D = PW/T
10 μ
100 μ
1 m
10 m
100 m
1
10
100
1000
10000
Pulse Width PW (s)

Avalanche Test Circuit

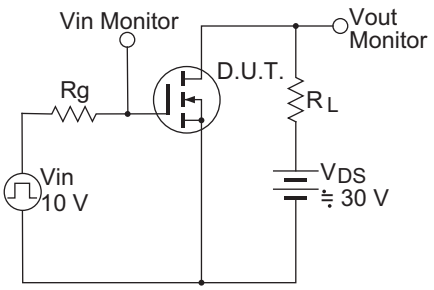


Avalanche Waveform

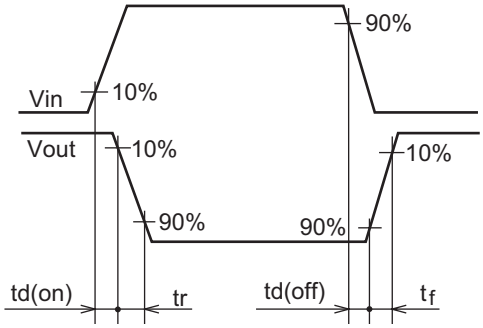
$$E_{AR} = \frac{1}{2} L \bullet I_{AP}^2 \bullet \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit



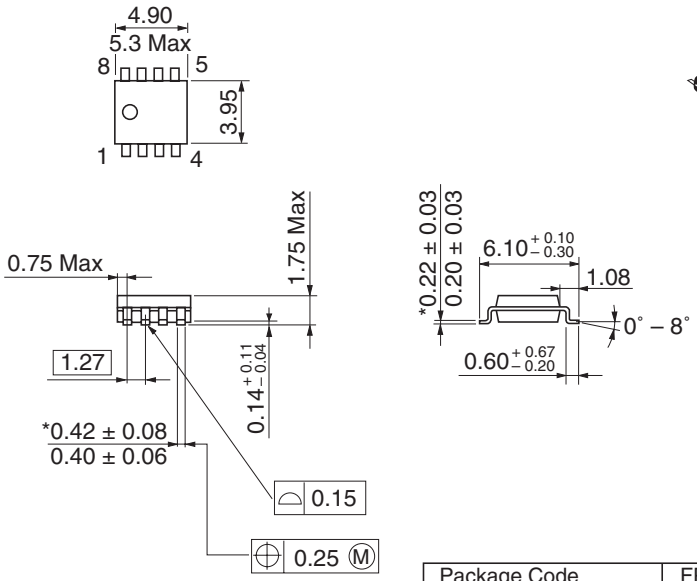
Switching Time Waveform



Package Dimensions

As of January, 2003

Unit: mm



*Dimension including the plating thickness / Base material dimension

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

Ordering Information

Part Name	Quantity	Shipping Container
HAT2201R-EL-E	2500pcs	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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