HAT3008R, HAT3008RJ

Silicon N / P Channel Power MOS FET
High Speed Power Switching

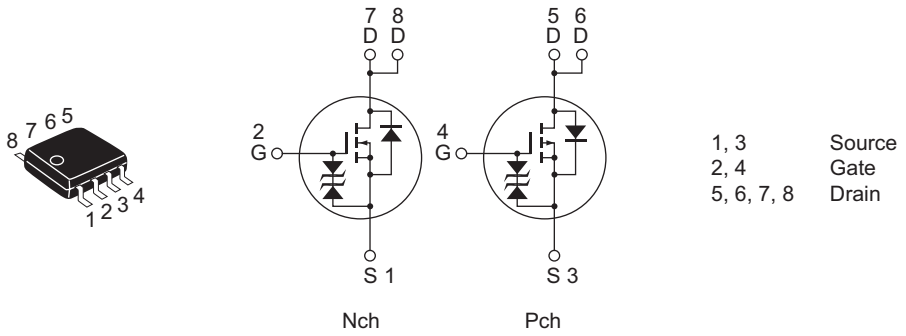
REJ03G1198-0500
Rev.5.00
Aug 25, 2009

Features

- For Automotive Application (at Type Code "J")
- Low on-resistance
- Capable of 4 V gate drive
- High density mounting

Outline

RENESAS Package code: PRSP0008DD-D
(Package name: SOP-8 <FP-8DAV>)



Absolute Maximum Ratings

(Ta = 25°C)

Item		Symbol	Value		Unit
			Nch	Pch	
Drain to source voltage		V_{DSS}	60	–60	V
Gate to source voltage		V_{GSS}	±20	±20	V
Drain current		I_D	5	–3.5	A
Drain peak current		$I_{D\ (pulse)}$ Note 1	40	–28	A
Body-drain diode reverse drain current		I_{DR}	5	–3.5	A
Avalanche current	HAT3008R	I_{AP} Note 4	—	—	—
	HAT3008RJ		5	–3.5	A
Avalanche energy	HAT3008R	E_{AR} Note 4	—	—	—
	HAT3008RJ		2.14	1.05	mJ
Channel dissipation		Pch Note 2	2	2	W
Channel dissipation		Pch Note 3	3	3	W
Channel temperature		Tch	150	150	°C
Storage temperature		Tstg	–55 to +150	–55 to +150	°C

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

Electrical Characteristics

N Channel

(Ta = 25°C)

Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)\ DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage		$V_{(BR)\ GSS}$	±20	—	—	V	I_G = ±100 μA, V_{DS} = 0
Gate to source leak current		I_{GSS}	—	—	±10	μA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	1	μA	V_{DS} = 60 V, V_{GS} = 0
	HAT3008RJ	I_{DSS}	—	—	0.1	μA	
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	—	μA	V_{DS} = 48 V, V_{GS} = 0
	HAT3008RJ	I_{DSS}	—	—	10	μA	Ta = 125°C
Gate to source cutoff voltage		$V_{GS\ (off)}$	1.2	—	2.2	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance		$R_{DS\ (on)}$	—	0.043	0.058	Ω	I_D = 3 A, V_{GS} = 10 V Note 5
		$R_{DS\ (on)}$	—	0.056	0.084	Ω	I_D = 3 A, V_{GS} = 4 V Note 5
Forward transfer admittance		$\|y_{fs}\|$	6	9	—	S	I_D = 3 A, V_{DS} = 10 V Note 5
Input capacitance		Ciss	—	520	—	pF	V_{DS} = 10 V
Output capacitance		Coss	—	270	—	pF	V_{GS} = 0
Reverse transfer capacitance		Crss	—	100	—	pF	f = 1 MHz
Turn-on delay time		$t_{d\ (on)}$	—	11	—	ns	V_{GS} = 10 V, I_D = 3 A
Rise time		t_r	—	40	—	ns	V_{DD} ≅ 30 V
Turn-off delay time		$t_{d\ (off)}$	—	110	—	ns	
Fall time		t_f	—	80	—	ns	
Body-drain diode forward voltage		V_{DF}	—	0.84	1.1	V	I_F = 5 A, V_{GS} = 0 Note 5
Body-drain diode reverse recovery time		t_{rr}	—	40	—	ns	I_F = 5 A, V_{GS} = 0 di_F/dt = 50 A/μs

Note: 5. Pulse test

P Channel

(Ta = 25°C)

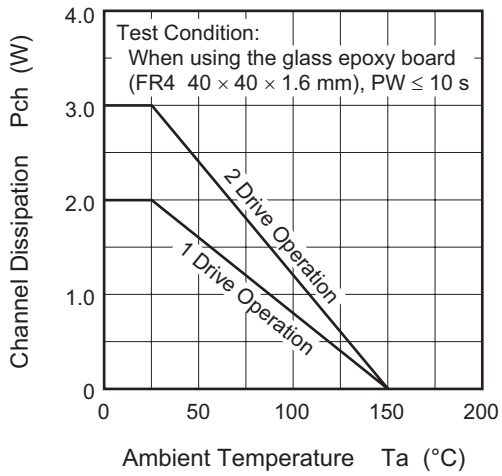
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)\ DSS}$	–60	—	—	V	I_D = –10 mA, V_{GS} = 0
Gate to source breakdown voltage		$V_{(BR)\ GSS}$	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current		I_{GSS}	—	—	±10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	–1	µA	V_{DS} = –60 V, V_{GS} = 0
	HAT3008RJ	I_{DSS}	—	—	–0.1	µA	
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	—	µA	V_{DS} = –48 V, V_{GS} = 0 Ta = 125°C
	HAT3008RJ	I_{DSS}	—	—	–10	µA	
Gate to source cutoff voltage		$V_{GS\ (off)}$	–1.2	—	–2.2	V	V_{DS} = –10 V, I_D = –1 mA
Static drain to source on state resistance		$R_{DS\ (on)}$	—	0.12	0.15	Ω	I_D = –2 A, V_{GS} = –10 V Note 6
		$R_{DS\ (on)}$	—	0.16	0.23	Ω	I_D = –2 A, V_{GS} = –4 V Note 6
Forward transfer admittance		$\|y_{fs}\|$	3	4.5	—	S	I_D = –2 A, V_{DS} = –10 V Note 6
Input capacitance		Ciss	—	600	—	pF	V_{DS} = –10 V V_{GS} = 0 f = 1 MHz
Output capacitance		Coss	—	290	—	pF	
Reverse transfer capacitance		Crss	—	75	—	pF	
Turn-on delay time		$t_{d\ (on)}$	—	11	—	ns	V_{GS} = –10 V, I_D = –2 A $V_{DD} \cong$ –30 V
Rise time		t_r	—	30	—	ns	
Turn-off delay time		$t_{d\ (off)}$	—	100	—	ns	
Fall time		t_f	—	55	—	ns	
Body-drain diode forward voltage		V_{DF}	—	–0.98	–1.28	V	I_F = –3.5 A, V_{GS} = 0 Note 6
Body-drain diode reverse recovery time		t_{rr}	—	70	—	ns	I_F = –3.5 A, V_{GS} = 0 di_F/dt = 50 A/µs

Note: 6. Pulse test

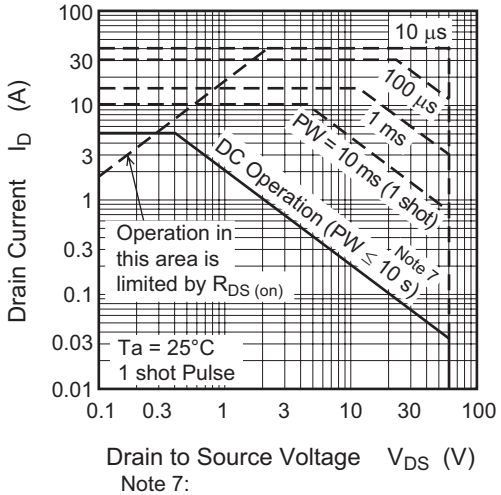
Main Characteristics

N Channel

Power vs. Temperature Derating

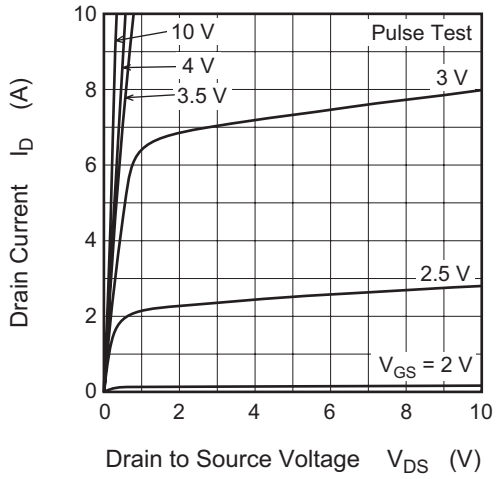


Maximum Safe Operation Area

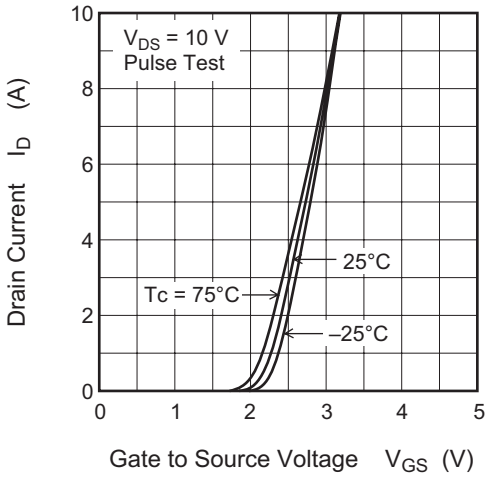


Note 7:
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)

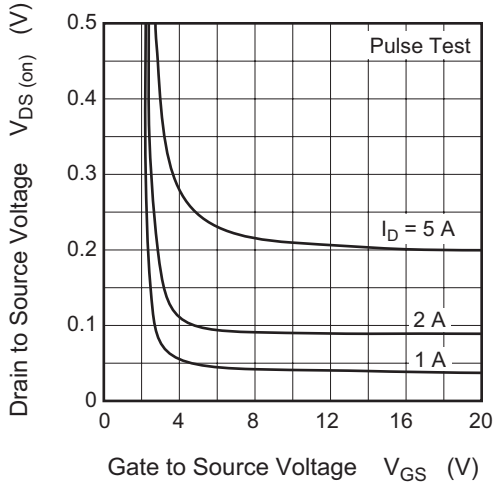
Typical Output Characteristics



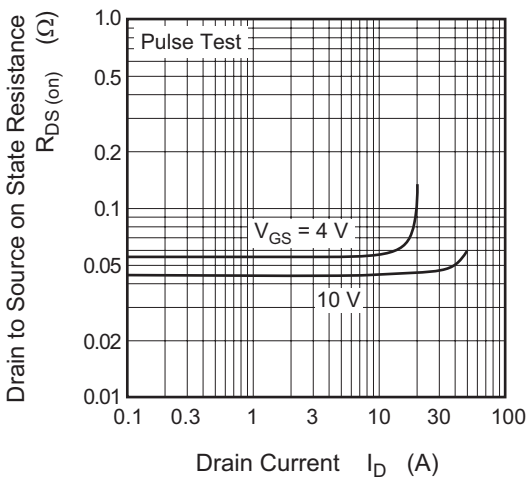
Typical Transfer Characteristics



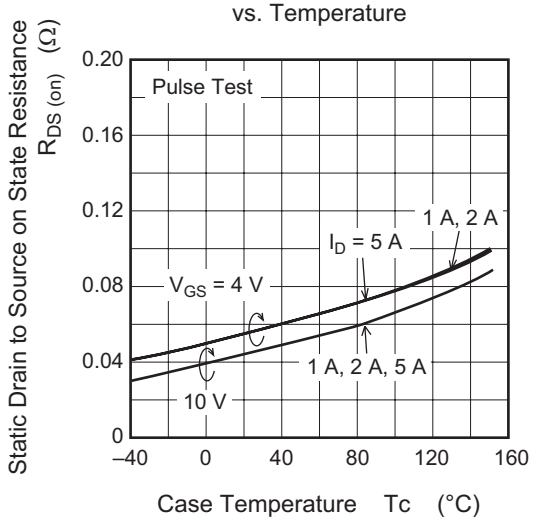
Drain to Source Saturation Voltage vs.
Gate to Source Voltage



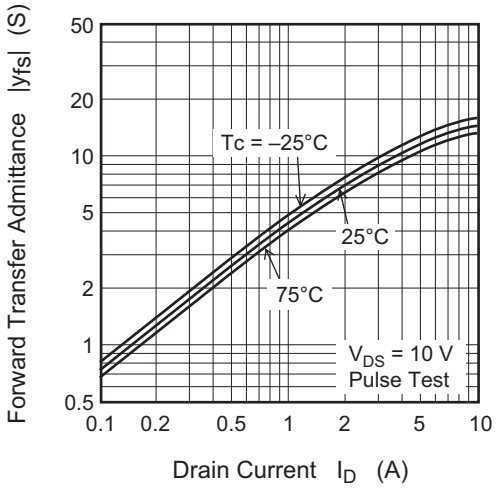
Static Drain to Source on State Resistance
vs. Drain Current



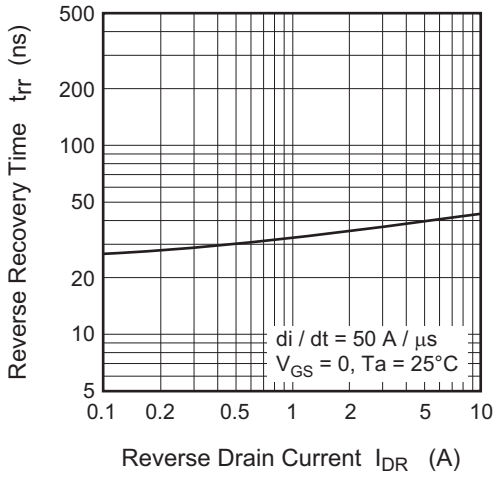
Static Drain to Source on State Resistance vs. Temperature



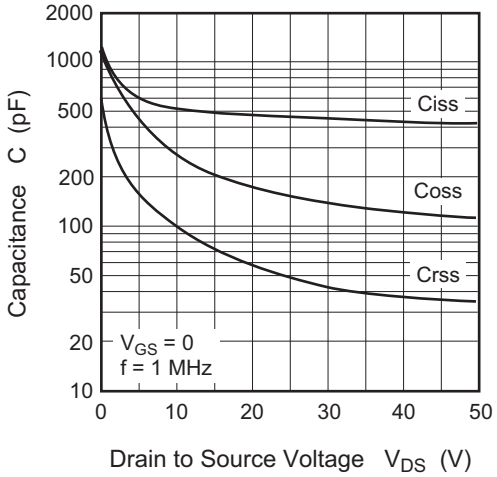
Forward Transfer Admittance vs. Drain Current



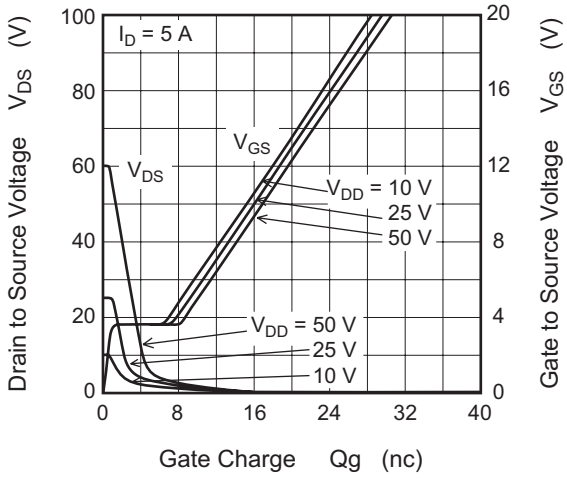
Body-Drain Diode Reverse Recovery Time



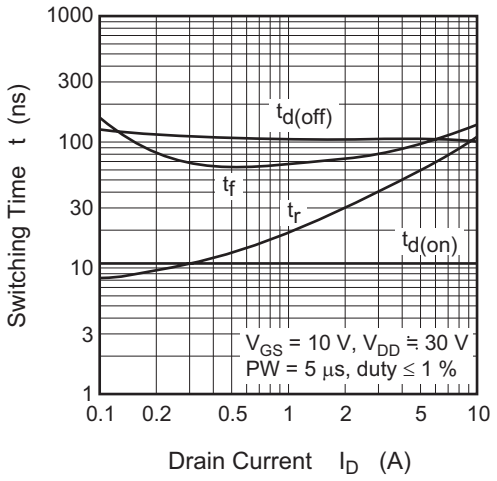
Typical Capacitance vs. Drain to Source Voltage



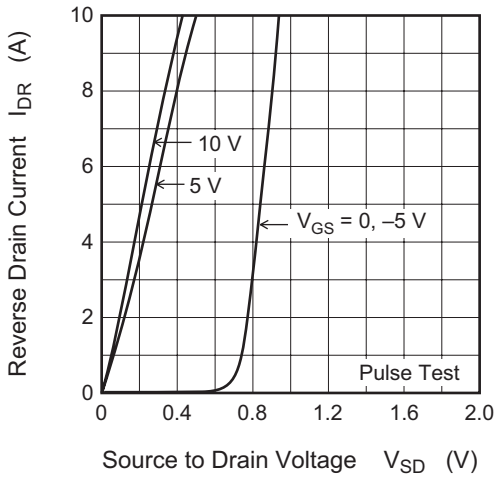
Dynamic Input Characteristics



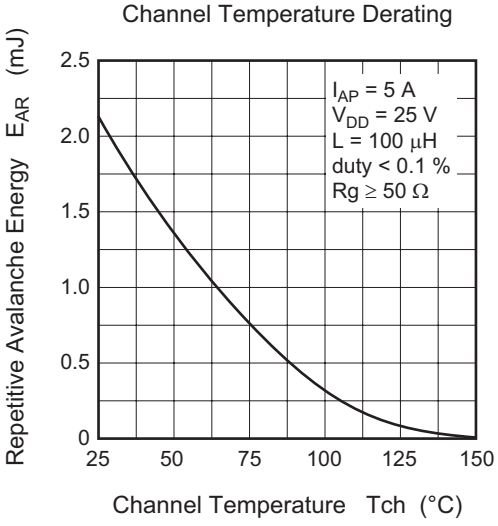
Switching Characteristics



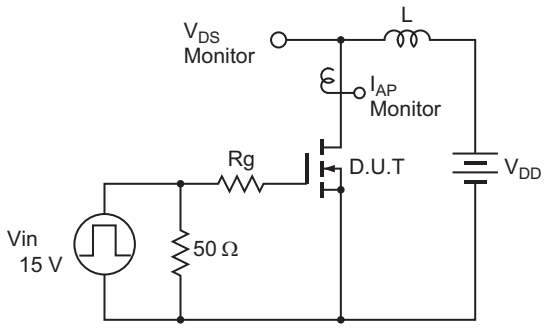
Reverse Drain Current vs.
Source to Drain Voltage



Maximum Avalanche Energy vs.
Channel Temperature Derating

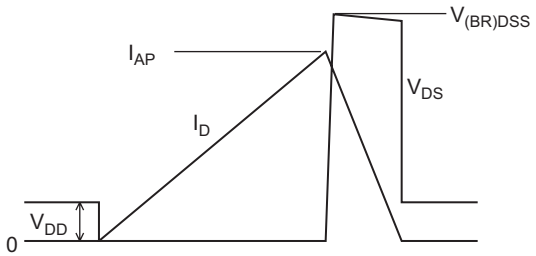


Avalanche Test Circuit

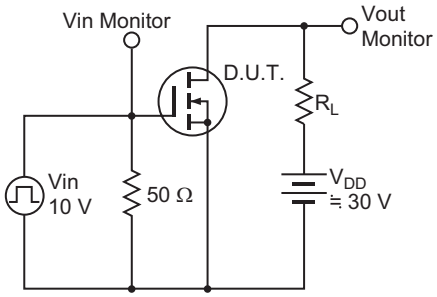


Avalanche Waveform

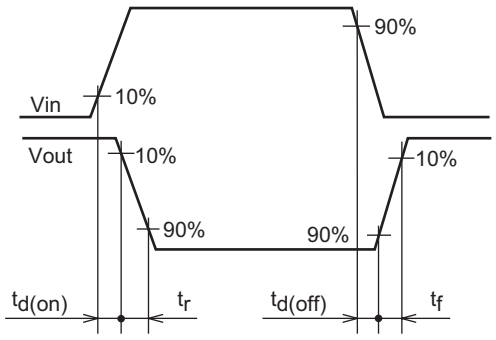
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

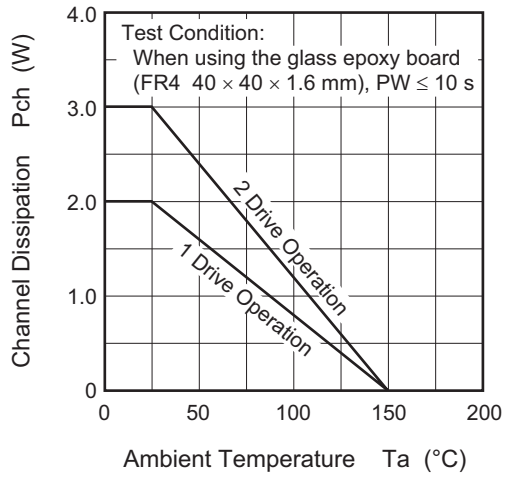


Switching Time Waveform

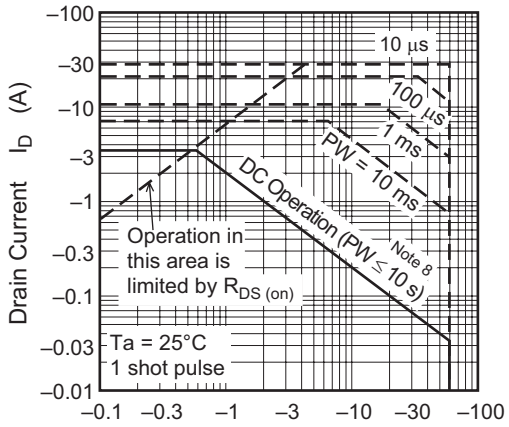


P Channel

Power vs. Temperature Derating

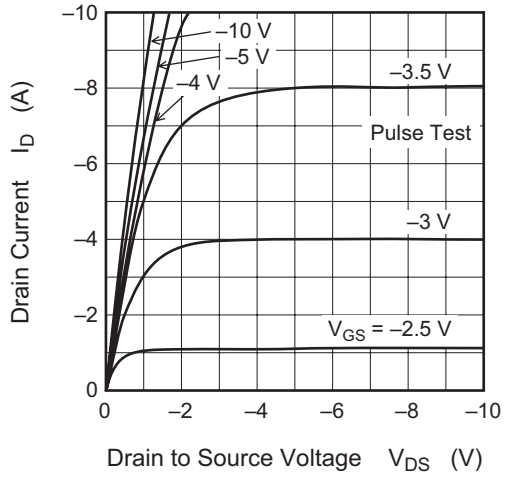


Maximum Safe Operation Area

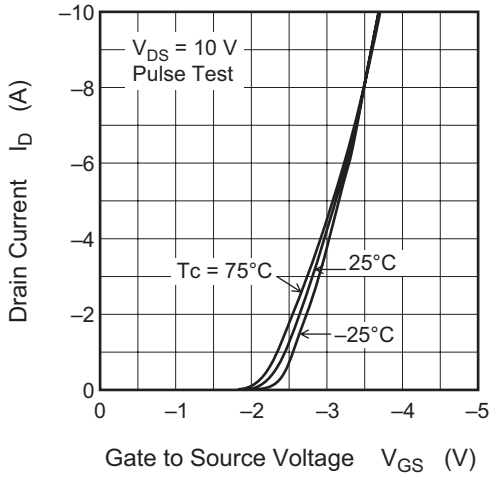


Note 8:
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)

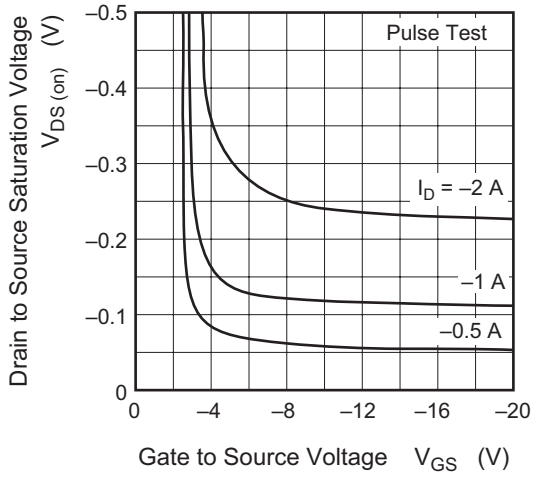
Typical Output Characteristics



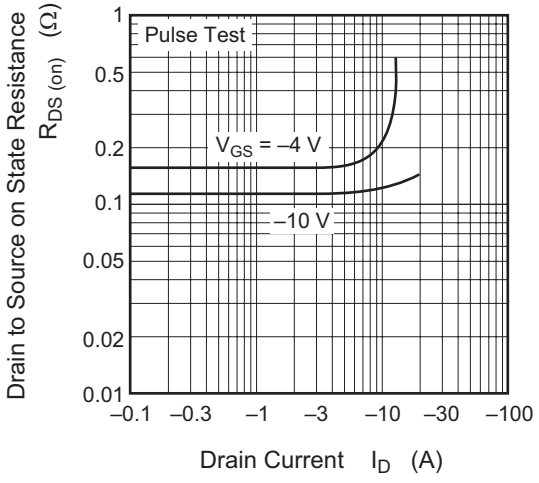
Typical Transfer Characteristics



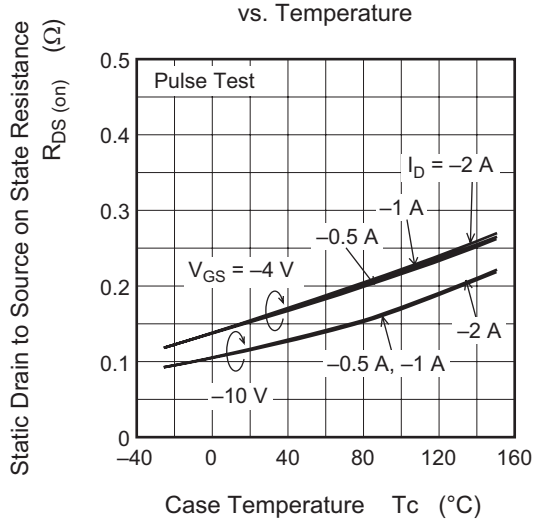
Drain to Source Saturation Voltage vs.
Gate to Source Voltage



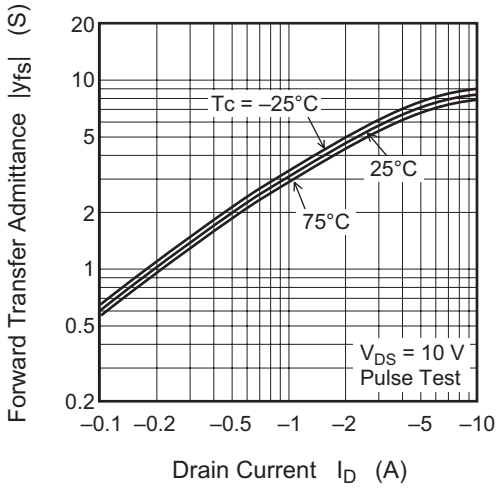
Static Drain to Source on State Resistance
vs. Drain Current



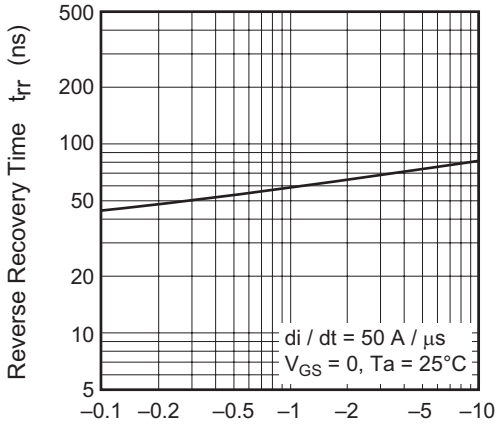
Static Drain to Source on State Resistance vs. Temperature



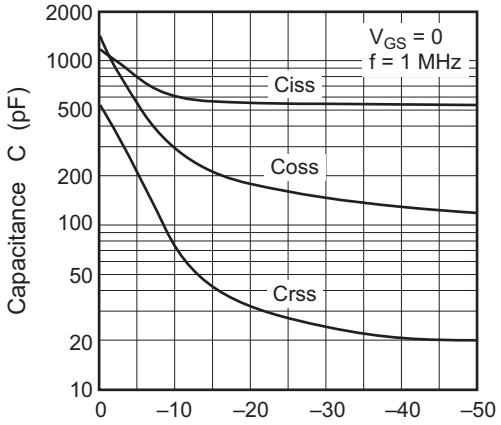
Forward Transfer Admittance vs. Drain Current



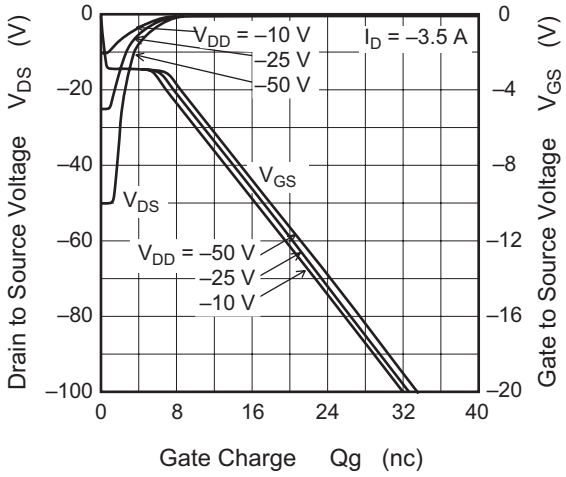
Body-Drain Diode Reverse Recovery Time



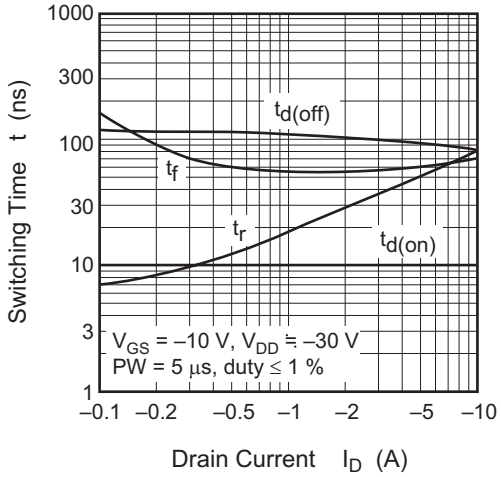
Typical Capacitance vs. Drain to Source Voltage



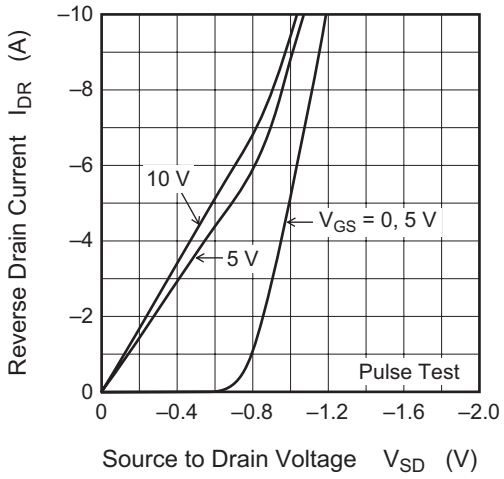
Dynamic Input Characteristics



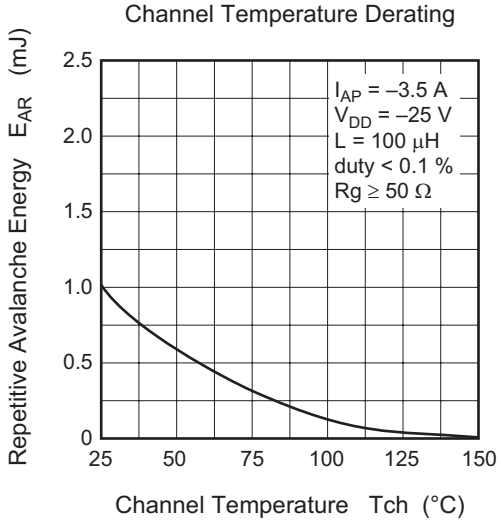
Switching Characteristics



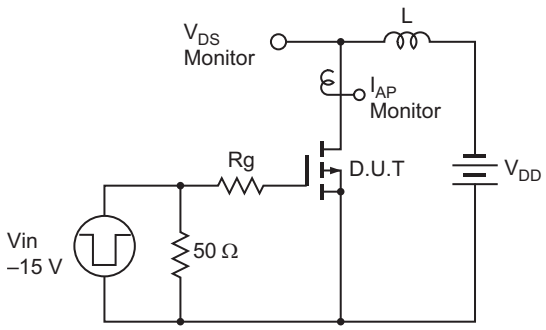
Reverse Drain Current vs.
Source to Drain Voltage



Maximum Avalanche Energy vs.
Channel Temperature Derating

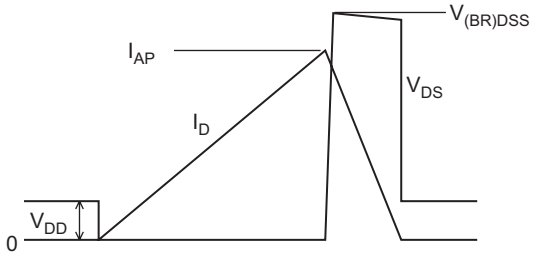


Avalanche Test Circuit

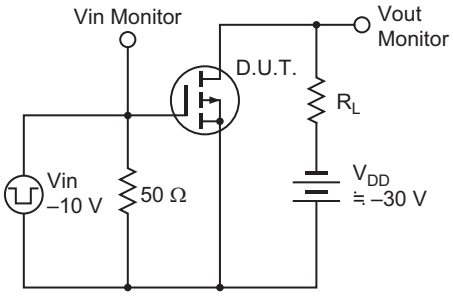


Avalanche Waveform

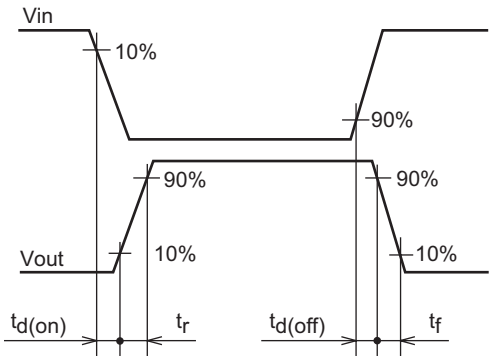
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



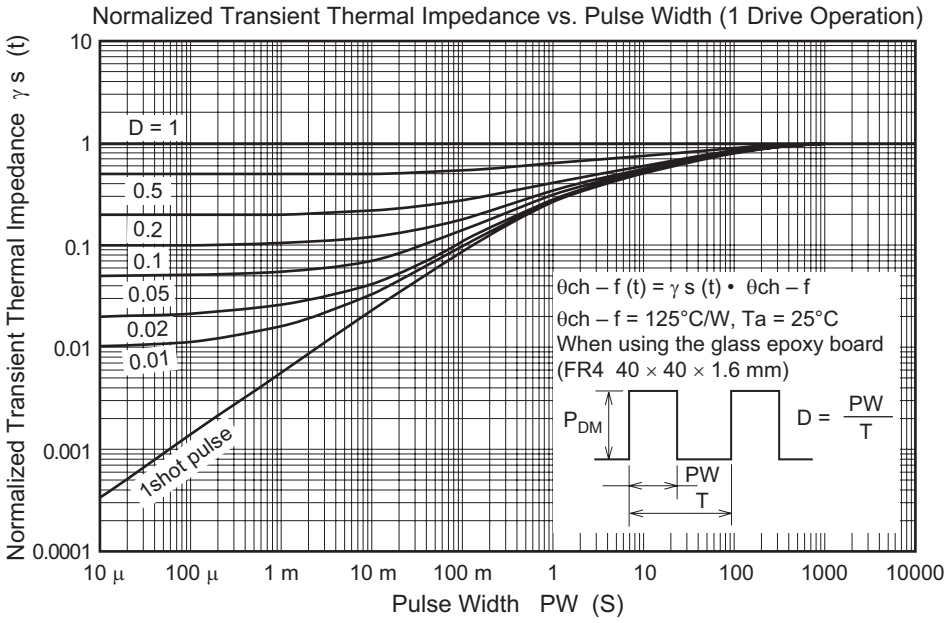
Switching Time Test Circuit

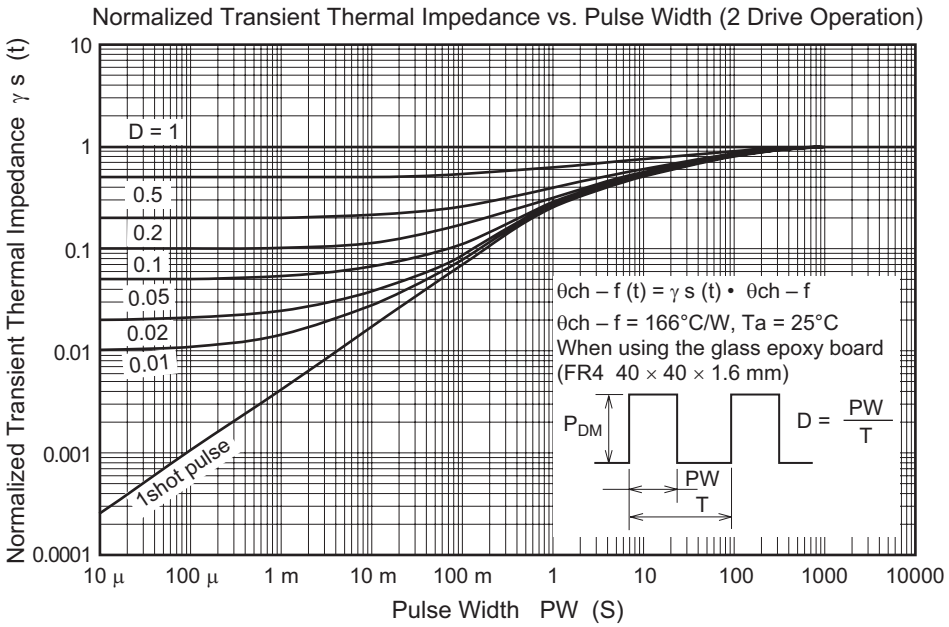


Switching Time Waveform



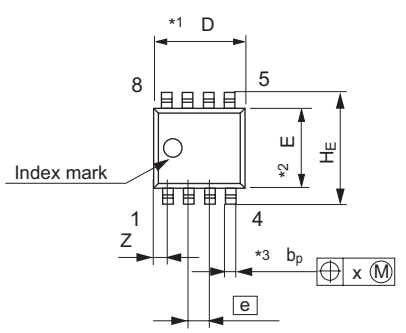
Common

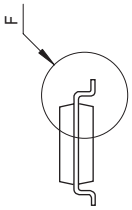

Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)
Normalized Transient Thermal Impedance γ s (t)
10
1
0.1
0.01
0.001
0.0001
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θch – f (t) = γ s (t) • θch – f
θch – f = 125°C/W, Ta = 25°C
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)
PDM
D = PW / T
PW
T
10 μ
100 μ
1 m
10 m
100 m
1
10
100
1000
10000
Pulse Width PW (S)

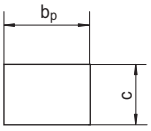

Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)
Normalized Transient Thermal Impedance γ s (t)
10
1
0.1
0.01
0.001
0.0001
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θch – f (t) = γ s (t) • θch – f
θch – f = 166°C/W, Ta = 25°C
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)
PDM
D = PW / T
PW
T
10 μ
100 μ
1 m
10 m
100 m
1
10
100
1000
10000
Pulse Width PW (S)

Package Dimensions

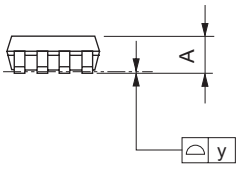
Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
SOP-8	P-SOP8-3.95 × 4.9-1.27	PRSP0008DD-D	FP-8DAV	0.085g

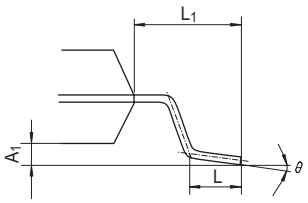






Terminal cross section
(Ni/Pd/Au plating)





Detail F

NOTE)
1. DIMENSIONS "*1(Nom)" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.90	5.3
E	—	3.95	—
A_2	—	—	—
A_1	0.10	0.14	0.25
A	—	—	1.75
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	5.80	6.10	6.20
e	—	1.27	—
x	—	—	0.25
y	—	—	0.1
Z	—	—	0.75
L	0.40	0.60	1.27
L_1	—	1.08	—

Ordering Information

Part Name	Quantity	Shipping Container
HAT3008R-EL-E	2500 pcs	Taping
HAT3008RJ-EL-E	2500 pcs	Taping

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2377-3473

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 3518-3399

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

Colophon .7.2