

# HAT3008R, HAT3008RJ

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

REJ03G1198-0500

Rev.5.00

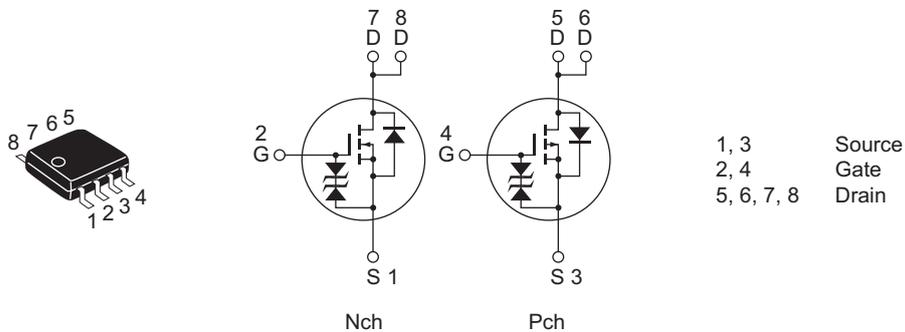
Aug 25, 2009

## 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	$I_{D(pulse)}$ <sup>Note 1</sup>	40	-28	A
Body-drain diode reverse drain current	$I_{DR}$	5	-3.5	A
Avalanche current	$I_{AP}$ <sup>Note 4</sup>	—	—	—
		5	-3.5	A
Avalanche energy	$E_{AR}$ <sup>Note 4</sup>	—	—	—
		2.14	1.05	mJ
Channel dissipation	$P_{ch}$ <sup>Note 2</sup>	2	2	W
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	3	3	W
Channel temperature	$T_{ch}$	150	150	°C
Storage temperature	$T_{stg}$	-55 to +150	-55 to +150	°C

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$

2. 1 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm),  $PW \leq 10 s$

3. 2 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm),  $PW \leq 10 s$

4. Value at  $T_{ch} = 25^\circ C$ ,  $R_g \geq 50 \Omega$

**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	$I_D = 10 \text{ mA}, V_{GS} = 0$
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	HAT3008R	$I_{DSS}$	—	—	1	$V_{DS} = 60 \text{ V}, V_{GS} = 0$
	HAT3008RJ	$I_{DSS}$	—	—	0.1	
Zero gate voltage drain current	HAT3008R	$I_{DSS}$	—	—	—	$V_{DS} = 48 \text{ V}, V_{GS} = 0$ $T_a = 125^\circ\text{C}$
	HAT3008RJ	$I_{DSS}$	—	—	10	
Gate to source cutoff voltage	$V_{GS(off)}$	1.2	—	2.2	V	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.043	0.058	Ω	$I_D = 3 \text{ A}, V_{GS} = 10 \text{ V}$ <sup>Note 5</sup>
	$R_{DS(on)}$	—	0.056	0.084	Ω	$I_D = 3 \text{ A}, V_{GS} = 4 \text{ V}$ <sup>Note 5</sup>
Forward transfer admittance	$ y_{fs} $	6	9	—	S	$I_D = 3 \text{ A}, V_{DS} = 10 \text{ V}$ <sup>Note 5</sup>
Input capacitance	$C_{iss}$	—	520	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	270	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	100	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	11	—	ns	$V_{GS} = 10 \text{ V}, I_D = 3 \text{ A}$ $V_{DD} \cong 30 \text{ V}$
Rise time	$t_r$	—	40	—	ns	
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	$I_F = 5 \text{ A}, V_{GS} = 0$ <sup>Note 5</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	40	—	ns	$I_F = 5 \text{ A}, V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$

Note: 5. Pulse test

**P Channel**

(Ta = 25°C)

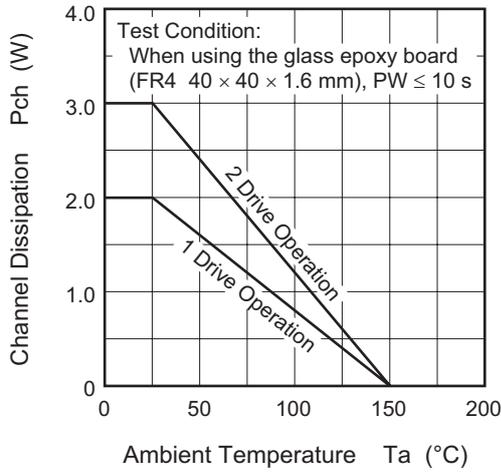
Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Drain to source breakdown voltage	$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10 \text{ mA}, V_{GS} = 0$	
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}, V_{DS} = 0$	
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0$	
Zero gate voltage drain current	HAT3008R	$I_{DSS}$	—	—	-1	$\mu\text{A}$	$V_{DS} = -60 \text{ V}, V_{GS} = 0$
	HAT3008RJ	$I_{DSS}$	—	—	-0.1	$\mu\text{A}$	
Zero gate voltage drain current	HAT3008R	$I_{DSS}$	—	—	—	$\mu\text{A}$	$V_{DS} = -48 \text{ V}, V_{GS} = 0$ $T_a = 125^\circ\text{C}$
	HAT3008RJ	$I_{DSS}$	—	—	-10	$\mu\text{A}$	
Gate to source cutoff voltage	$V_{GS(off)}$	-1.2	—	-2.2	V	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	
Static drain to source on state resistance	$R_{DS(on)}$	—	0.12	0.15	$\Omega$	$I_D = -2 \text{ A}, V_{GS} = -10 \text{ V}$ <sup>Note 6</sup>	
	$R_{DS(on)}$	—	0.16	0.23	$\Omega$	$I_D = -2 \text{ A}, V_{GS} = -4 \text{ V}$ <sup>Note 6</sup>	
Forward transfer admittance	$ y_{fs} $	3	4.5	—	S	$I_D = -2 \text{ A}, V_{DS} = -10 \text{ V}$ <sup>Note 6</sup>	
Input capacitance	$C_{iss}$	—	600	—	pF	$V_{DS} = -10 \text{ V}$	
Output capacitance	$C_{oss}$	—	290	—	pF	$V_{GS} = 0$	
Reverse transfer capacitance	$C_{rss}$	—	75	—	pF	$f = 1 \text{ MHz}$	
Turn-on delay time	$t_{d(on)}$	—	11	—	ns	$V_{GS} = -10 \text{ V}, I_D = -2 \text{ A}$	
Rise time	$t_r$	—	30	—	ns	$V_{DD} \cong -30 \text{ V}$	
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	$I_F = -3.5 \text{ A}, V_{GS} = 0$ <sup>Note 6</sup>	
Body-drain diode reverse recovery time	$t_{rr}$	—	70	—	ns	$I_F = -3.5 \text{ A}, V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$	

Note: 6. Pulse test

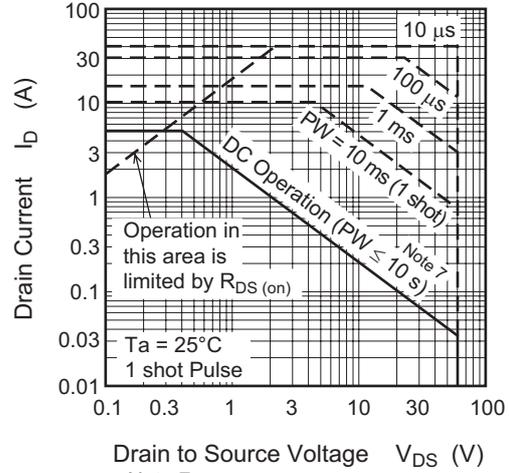
# Main Characteristics

## N Channel

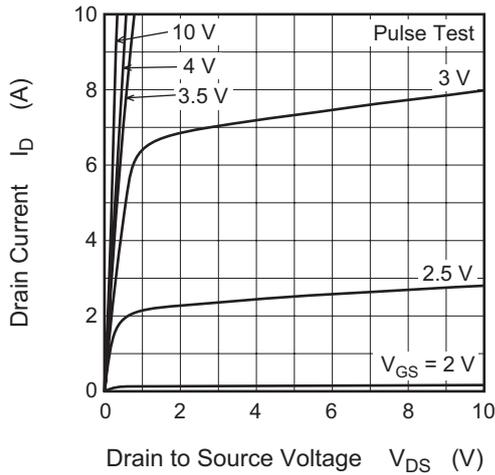
Power vs. Temperature Derating



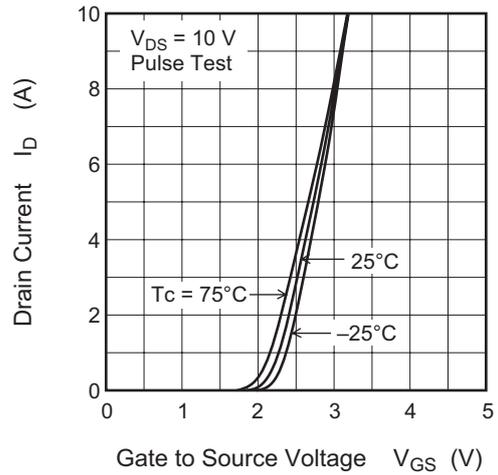
Maximum Safe Operation Area



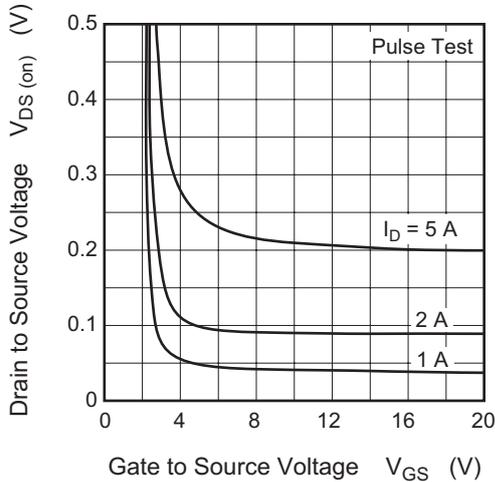
Typical Output Characteristics



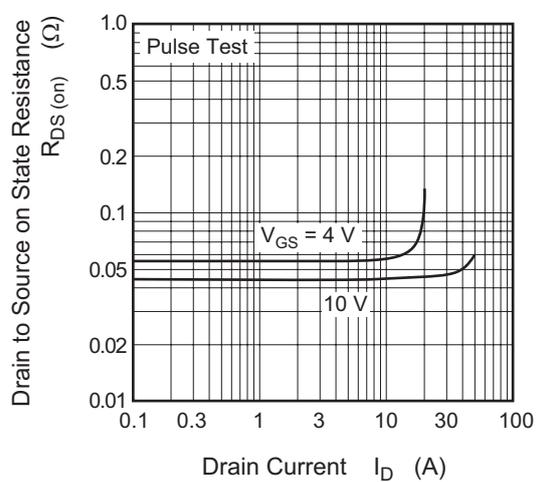
Typical Transfer Characteristics

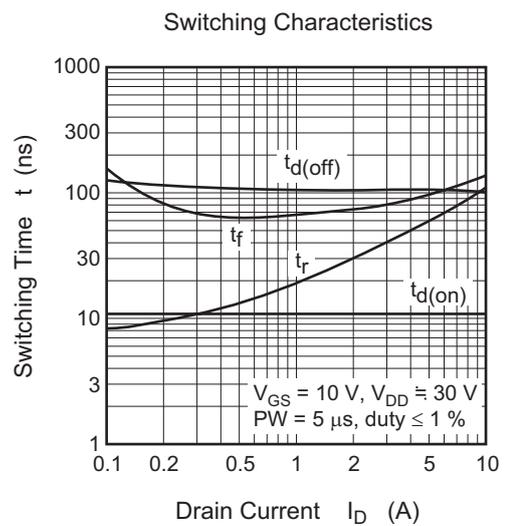
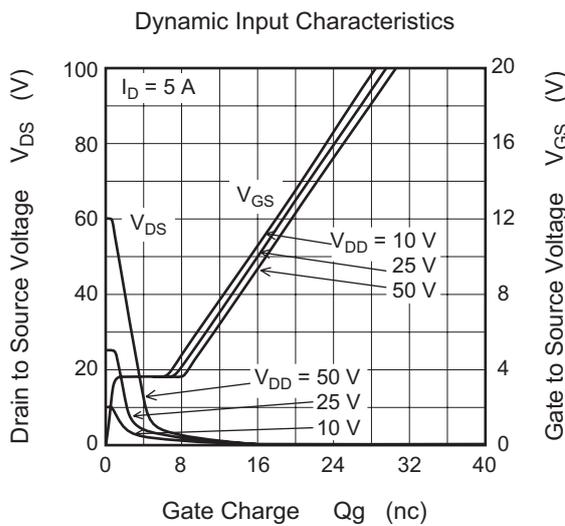
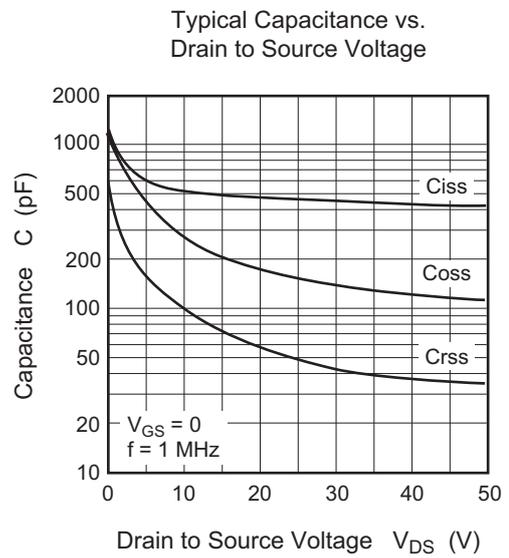
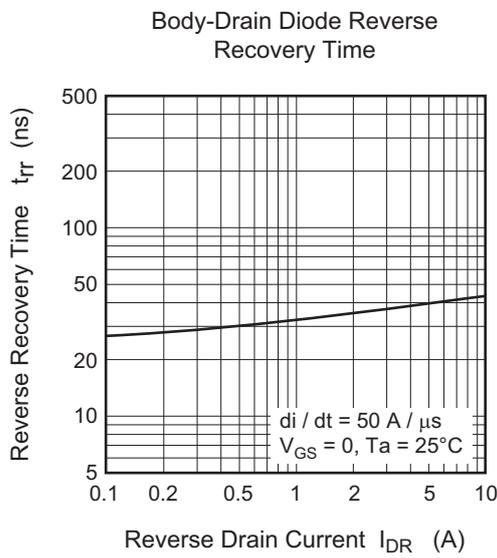
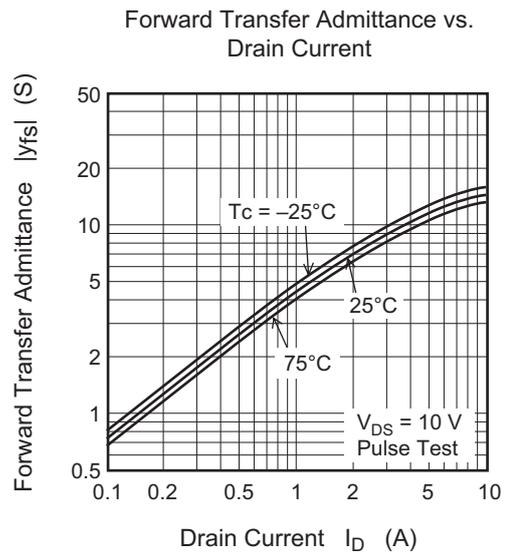
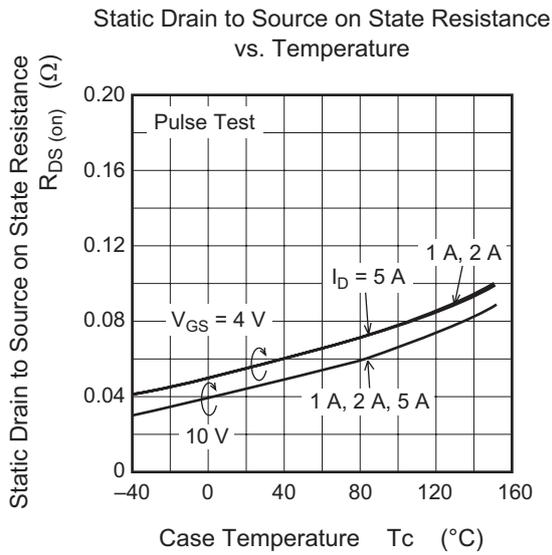


Drain to Source Saturation Voltage vs. Gate to Source Voltage

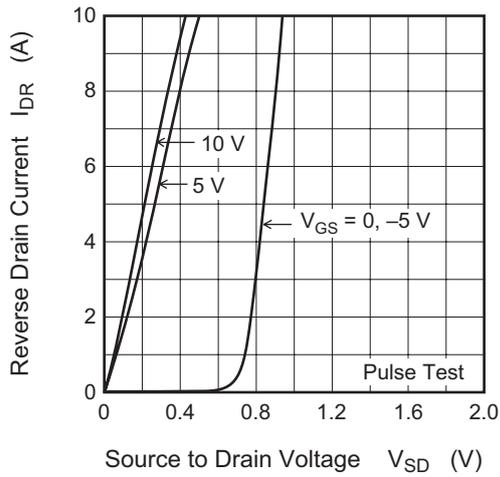


Static Drain to Source on State Resistance vs. Drain Current

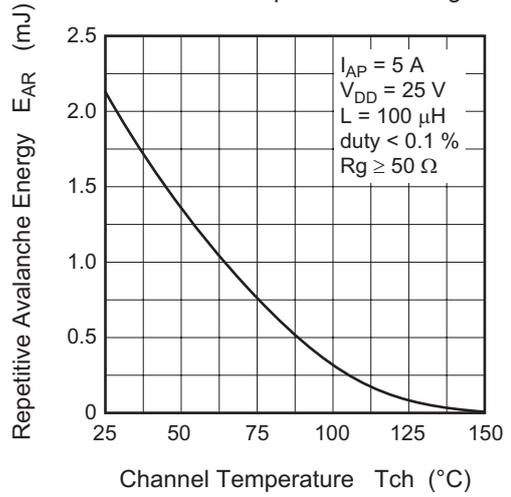




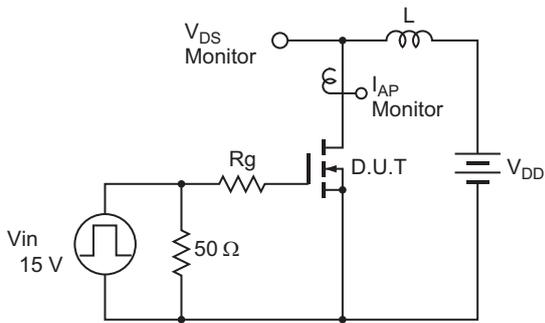
Reverse Drain Current vs. Source to Drain Voltage



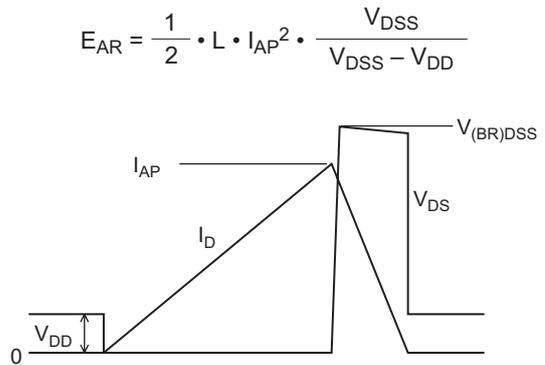
Maximum Avalanche Energy vs. Channel Temperature Derating



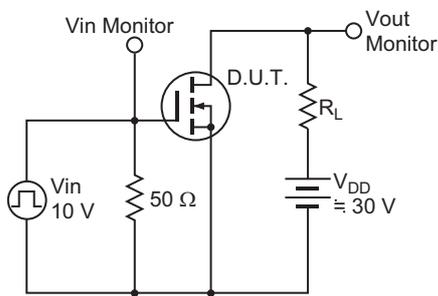
Avalanche Test Circuit



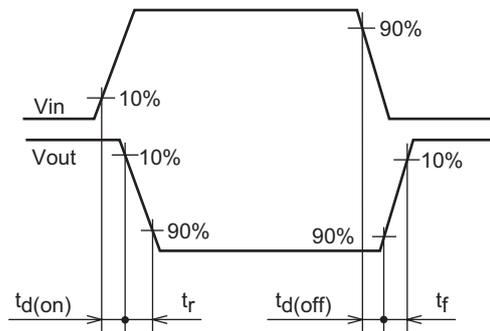
Avalanche Waveform



Switching Time Test Circuit

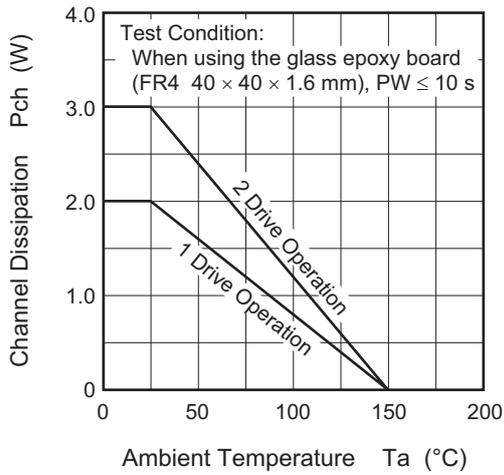


Switching Time Waveform

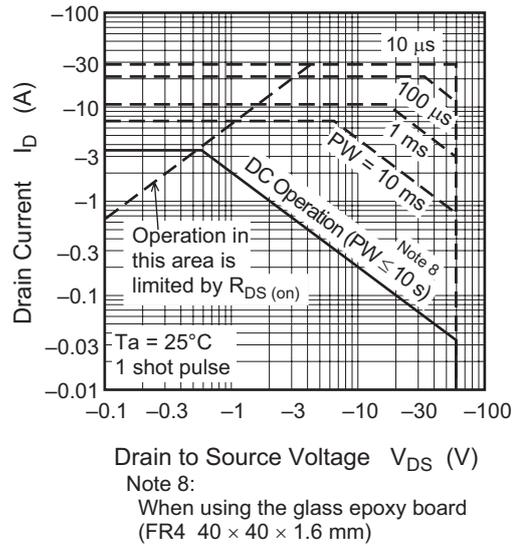


P Channel

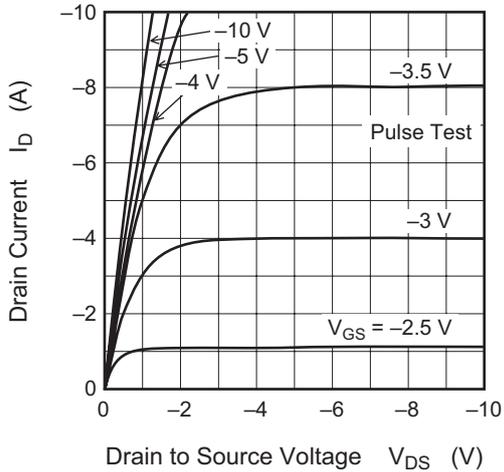
Power vs. Temperature Derating



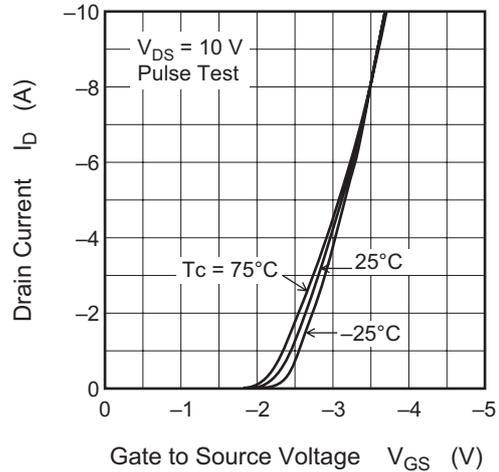
Maximum Safe Operation Area



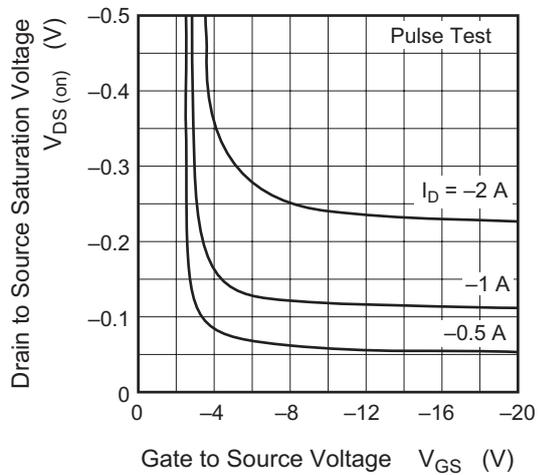
Typical Output Characteristics



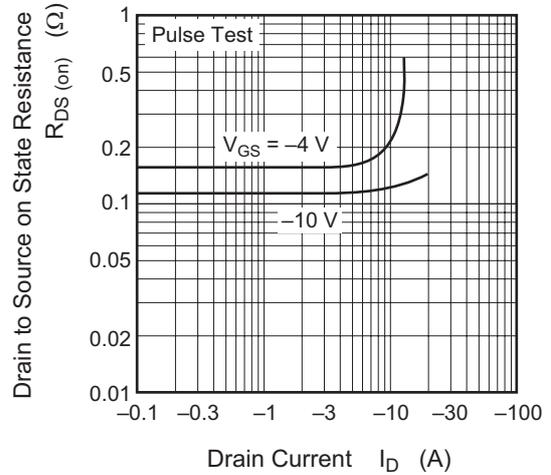
Typical Transfer Characteristics

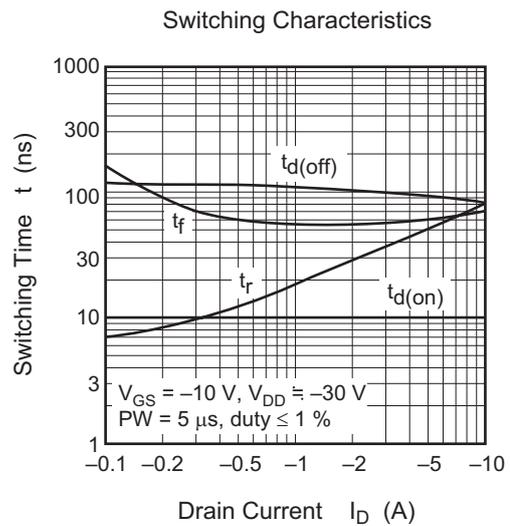
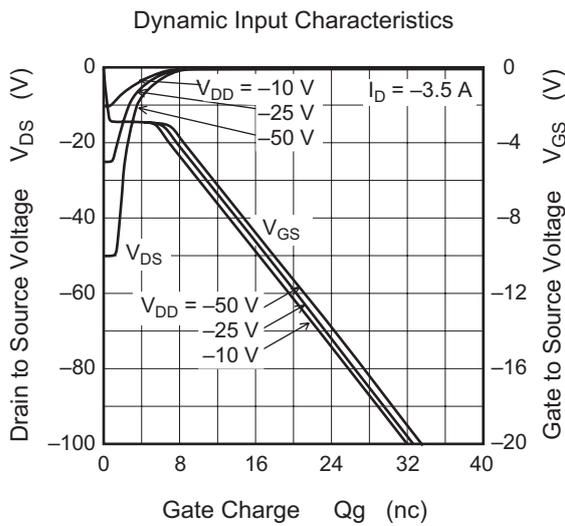
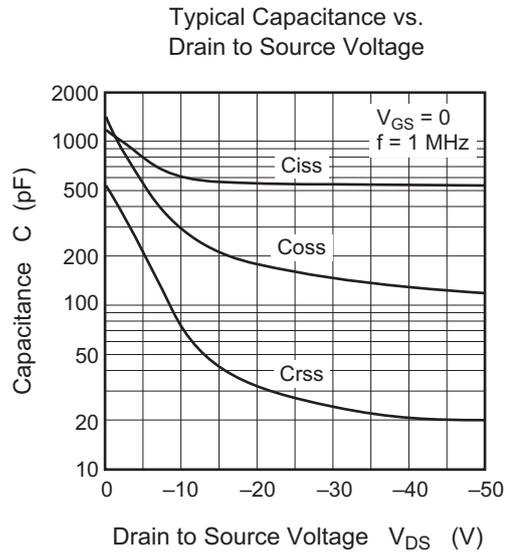
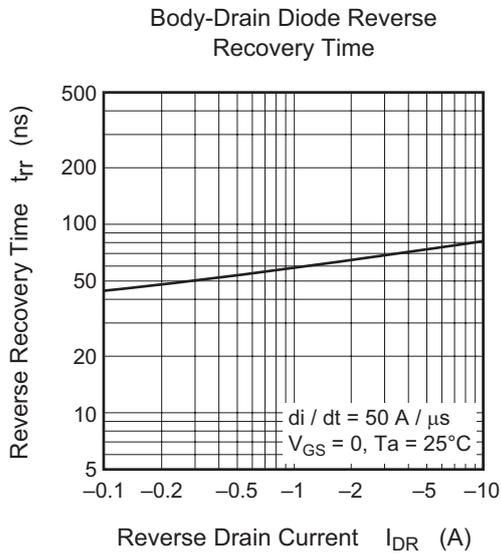
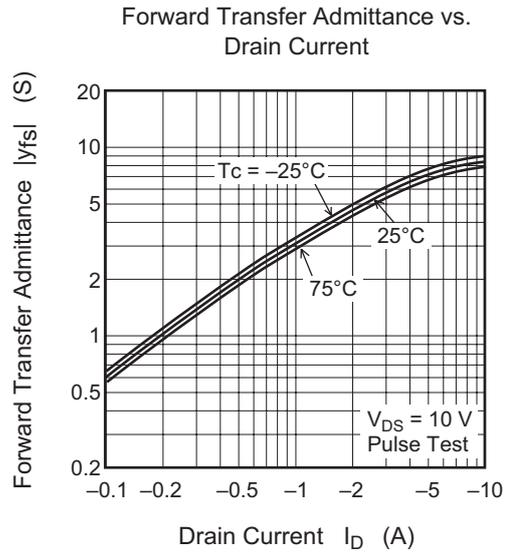
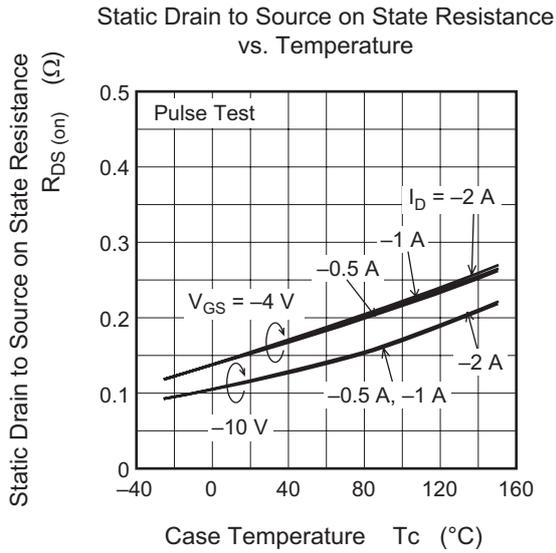


Drain to Source Saturation Voltage vs. Gate to Source Voltage

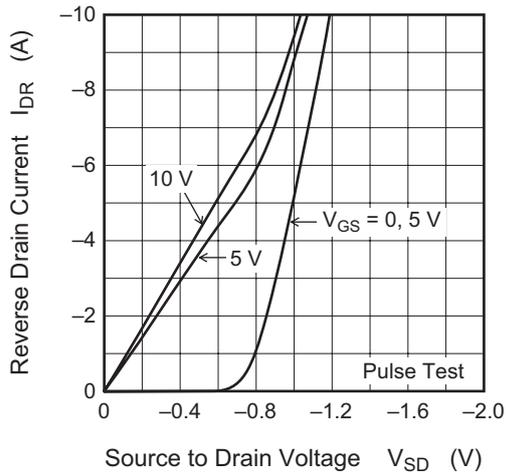


Static Drain to Source on State Resistance vs. Drain Current

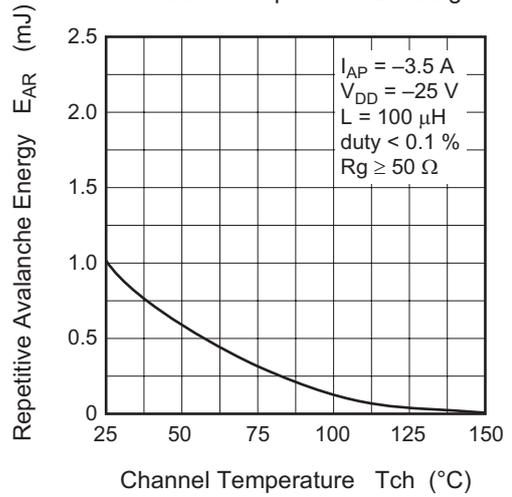




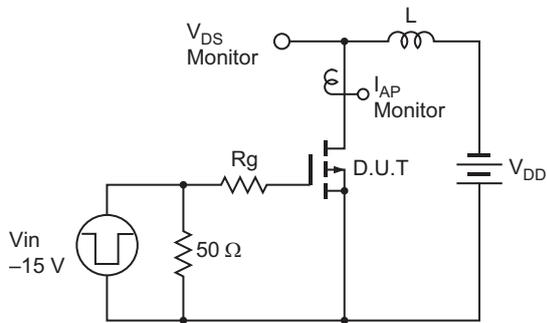
Reverse Drain Current vs. Source to Drain Voltage



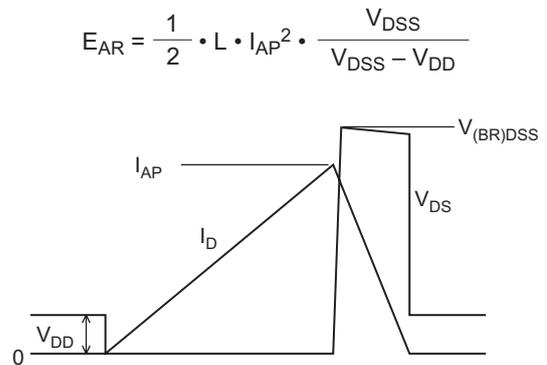
Maximum Avalanche Energy vs. Channel Temperature Derating



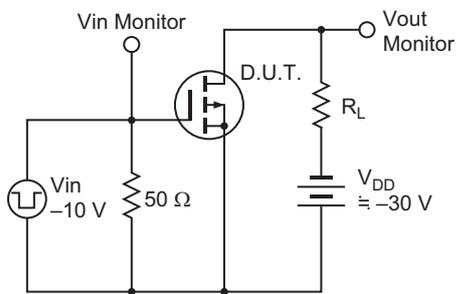
Avalanche Test Circuit



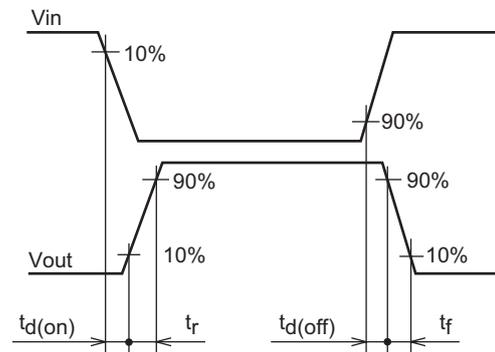
Avalanche Waveform



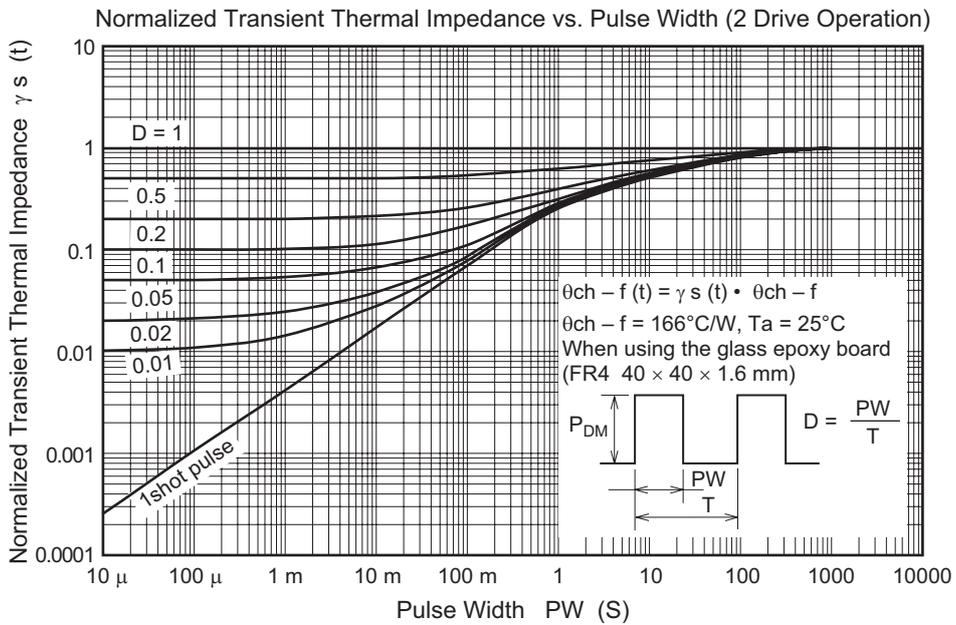
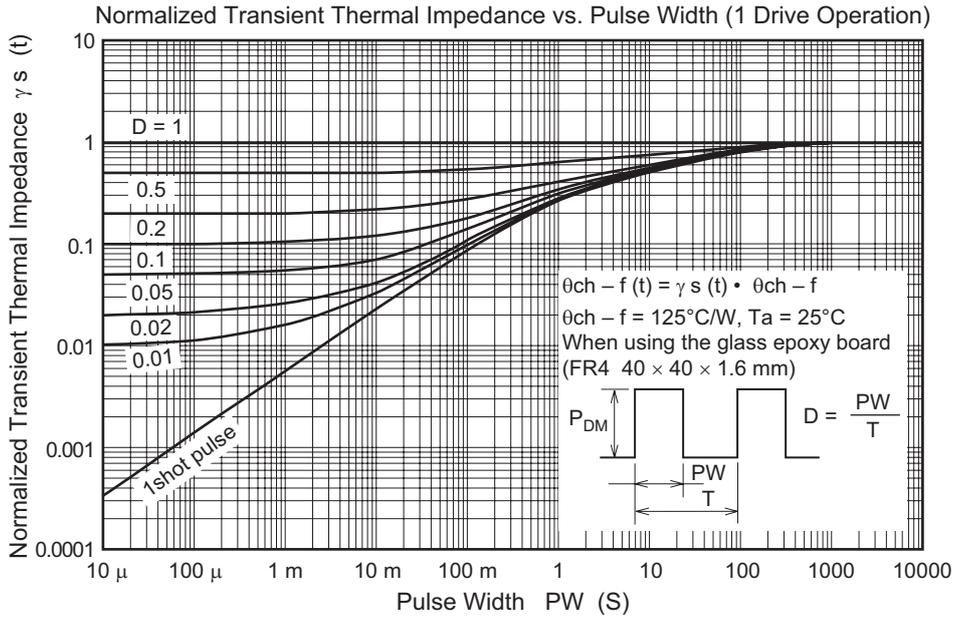
Switching Time Test Circuit



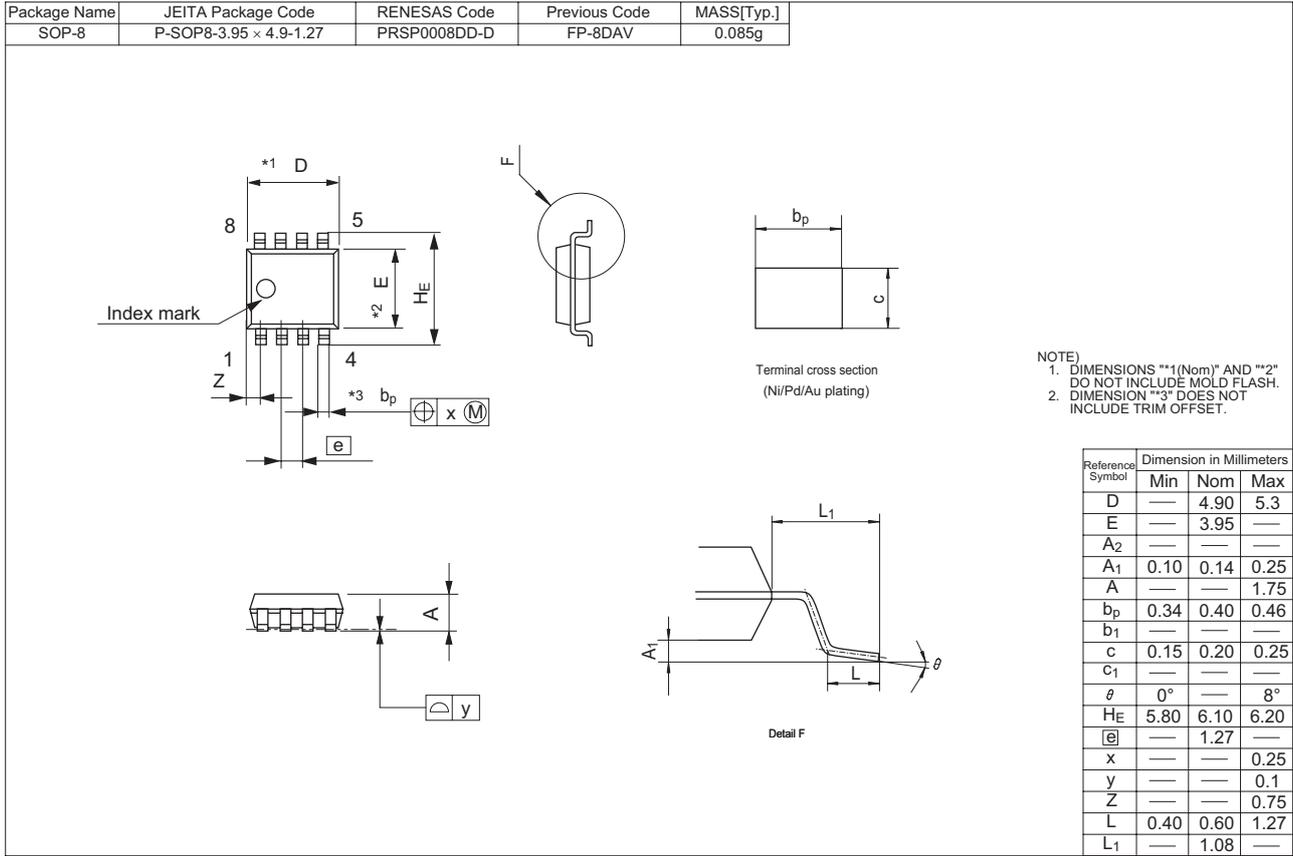
Switching Time Waveform



Common



### Package Dimensions



### Ordering Information

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

Notes:

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