

HAT3008R, HAT3008RJ

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

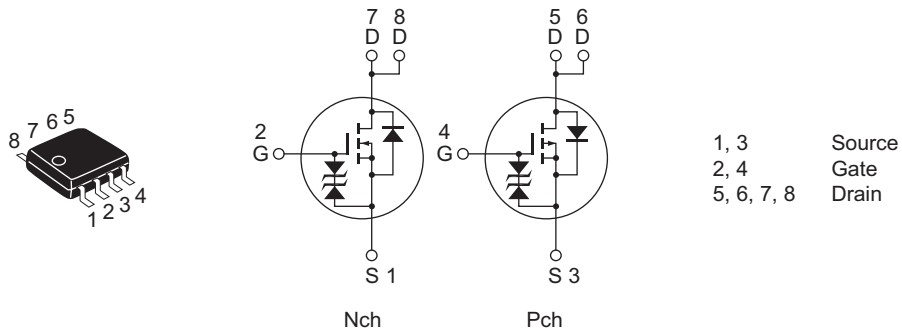
REJ03G1198-0400
(Previous: ADE-208-536B)
Rev.4.00
Sep 07, 2005

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
Avalanche energy	HAT3008R	E_{AR} ^{Note 4}	—	—
	HAT3008RJ		2.14	1.05
Channel dissipation	P_{ch} ^{Note 2}	2	2	W
Channel dissipation	P_{ch} ^{Note 3}	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	$I_G = \pm 100 \mu A$, $V_{DS} = 0$
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	μA	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0$
	HAT3008RJ	I_{DSS}	—	0.1	μA	
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	μA	$V_{DS} = 48 \text{ V}$, $V_{GS} = 0$ $T_a = 125^\circ C$
	HAT3008RJ	I_{DSS}	—	10	μA	
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	$I_D = 3 \text{ A}$, $V_{GS} = 10 \text{ V}$ ^{Note 5}
	$R_{DS(on)}$	—	0.056	0.084	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 4 \text{ V}$ ^{Note 5}
Forward transfer admittance	$ y_{fs} $	6	9	—	S	$I_D = 3 \text{ A}$, $V_{DS} = 10 \text{ V}$ ^{Note 5}
Input capacitance	C_{iss}	—	520	—	pF	$V_{DS} = 10 \text{ V}$ $V_{GS} = 0$ $f = 1 \text{ MHz}$
Output capacitance	C_{oss}	—	270	—	pF	
Reverse transfer capacitance	C_{rss}	—	100	—	pF	
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	$I_F = 5 \text{ A}$, $V_{GS} = 0$ ^{Note 5}
Body-drain diode reverse recovery time	t_{rr}	—	40	—	ns	$I_F = 5 \text{ A}$, $V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu s$

Note: 5. Pulse test

P Channel

(Ta = 25°C)

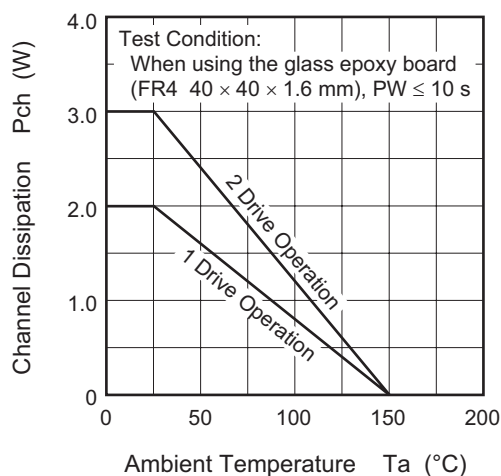
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10\text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage		$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100\text{ }\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current		I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16\text{ V}$, $V_{DS} = 0$
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	-1	μA	$V_{DS} = -60\text{ V}$, $V_{GS} = 0$
	HAT3008RJ	I_{DSS}	—	—	-0.1	μA	
Zero gate voltage drain current	HAT3008R	I_{DSS}	—	—	—	μA	$V_{DS} = -48\text{ V}$, $V_{GS} = 0$ $T_a = 125^\circ\text{C}$
	HAT3008RJ	I_{DSS}	—	—	-10	μA	
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	Ω	$I_D = -2\text{ A}$, $V_{GS} = -10\text{ V}$ ^{Note 6}
		$R_{DS(on)}$	—	0.16	0.23	Ω	$I_D = -2\text{ A}$, $V_{GS} = -4\text{ V}$ ^{Note 6}
Forward transfer admittance		$ y_{fs} $	3	4.5	—	S	$I_D = -2\text{ A}$, $V_{DS} = -10\text{ V}$ ^{Note 6}
Input capacitance		C_{iss}	—	600	—	pF	$V_{DS} = -10\text{ V}$ $V_{GS} = 0$ $f = 1\text{ MHz}$
Output capacitance		C_{oss}	—	290	—	pF	
Reverse transfer capacitance		C_{rss}	—	75	—	pF	
Turn-on delay time		$t_{d(on)}$	—	11	—	ns	$V_{GS} = -10\text{ V}$, $I_D = -2\text{ A}$ $V_{DD} \cong -30\text{ V}$
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	$I_F = -3.5\text{ A}$, $V_{GS} = 0$ ^{Note 6}
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

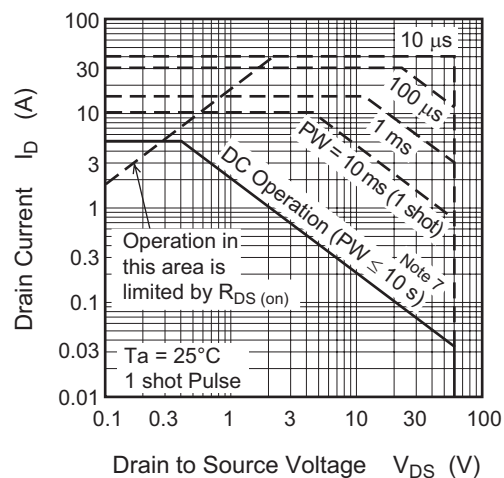
Main Characteristics

N Channel

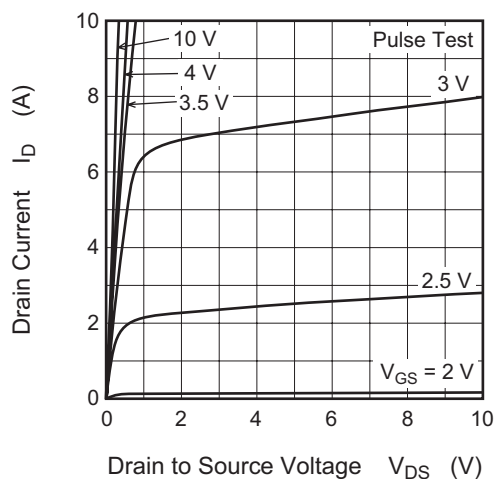
Power vs. Temperature Derating



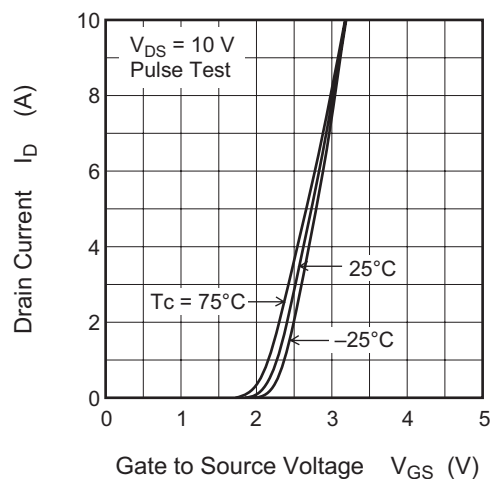
Maximum Safe Operation Area



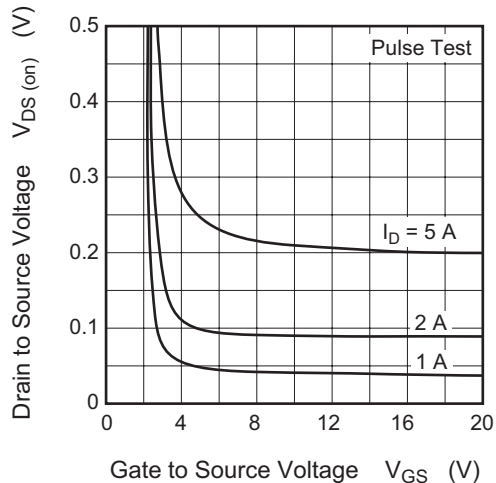
Typical Output Characteristics



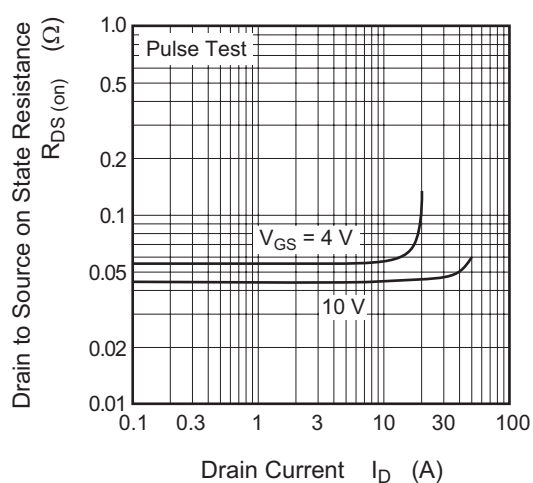
Typical Transfer Characteristics

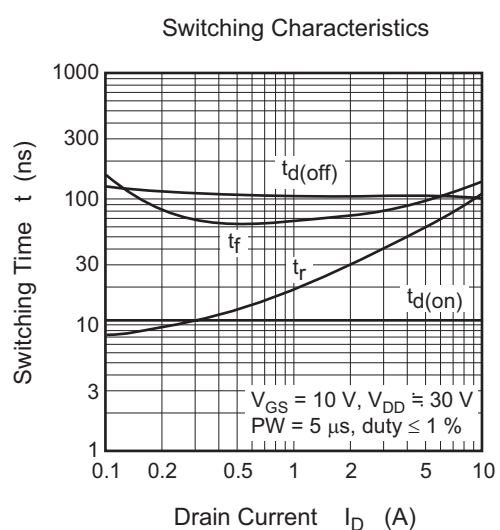
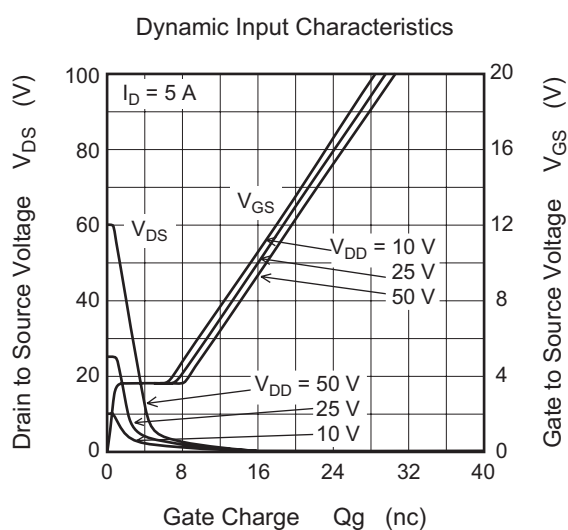
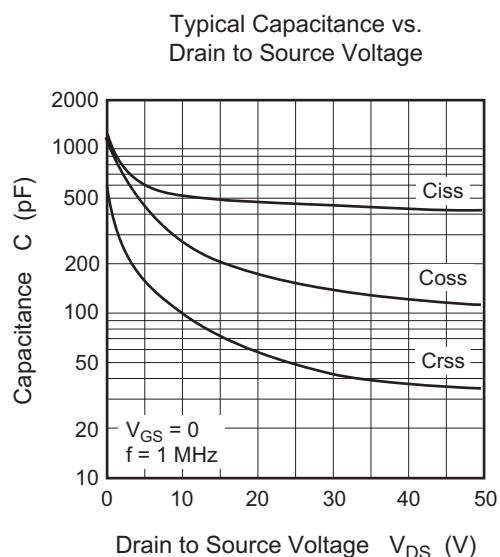
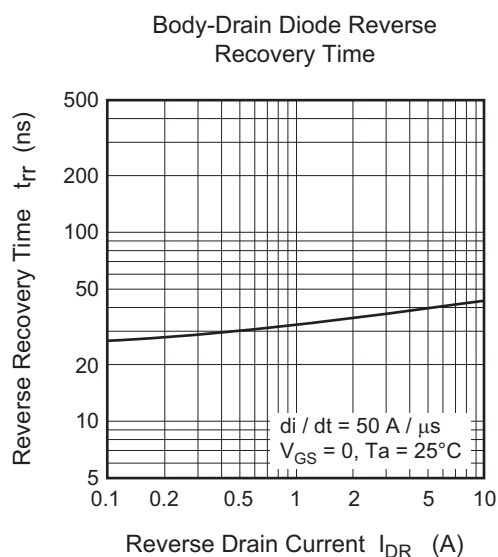
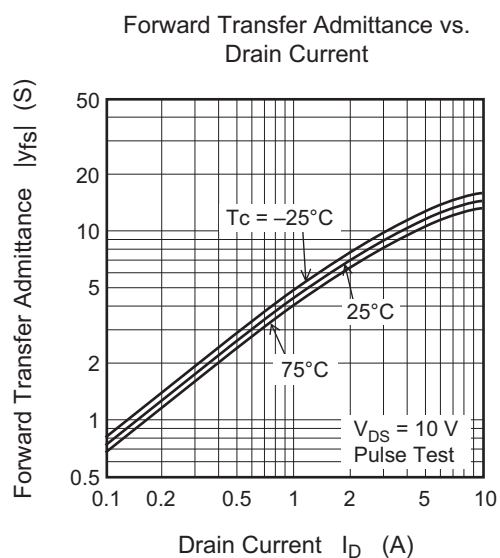
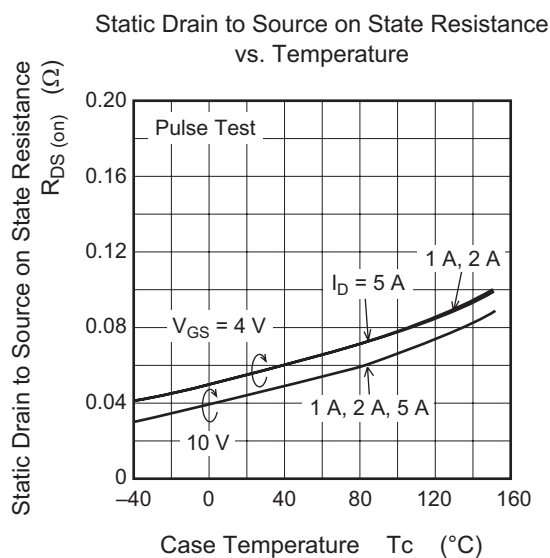


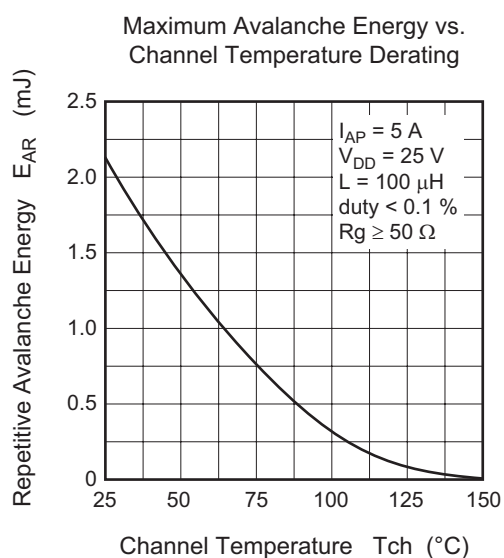
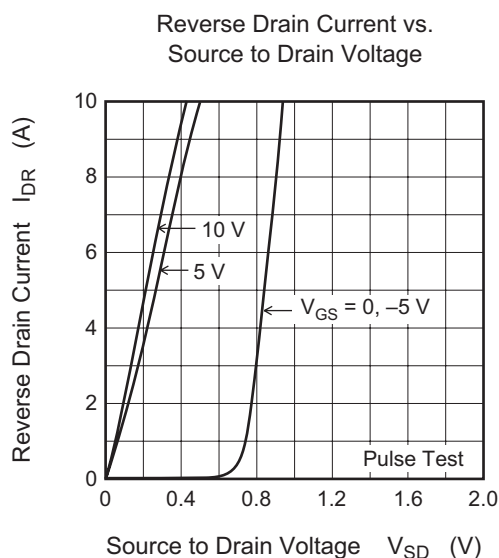
Drain to Source Saturation Voltage vs. Gate to Source Voltage



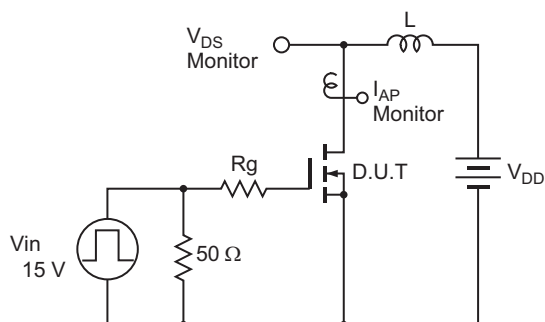
Static Drain to Source on State Resistance vs. Drain Current



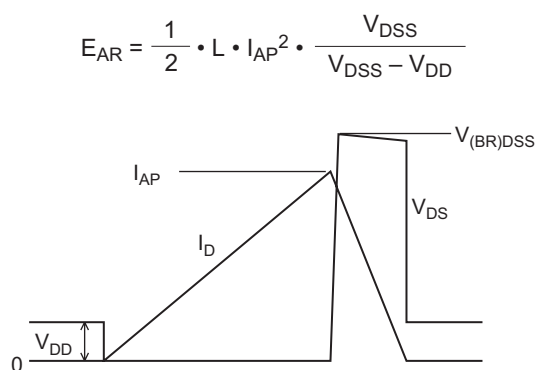




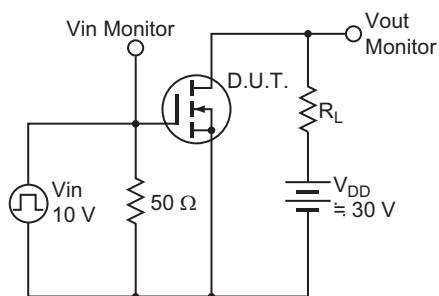
Avalanche Test Circuit



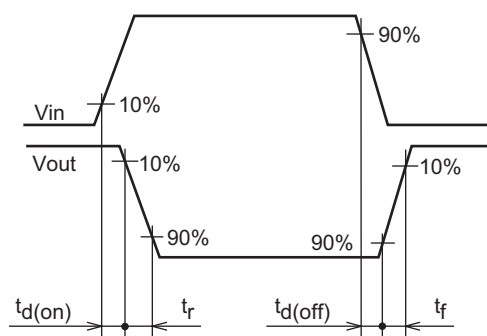
Avalanche Waveform



Switching Time Test Circuit

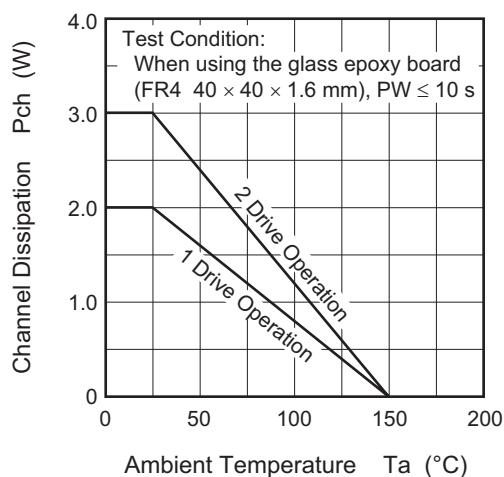


Switching Time Waveform

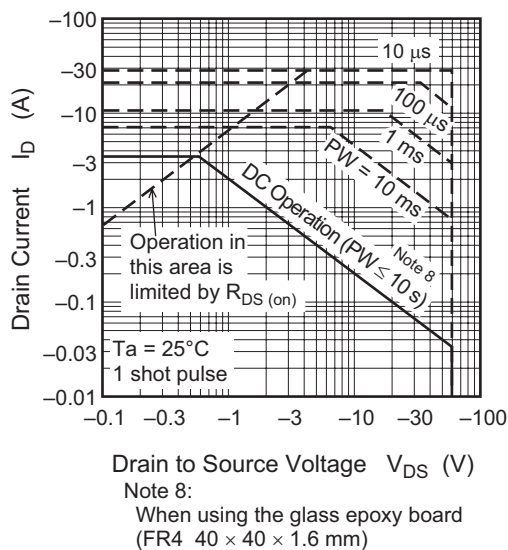


P Channel

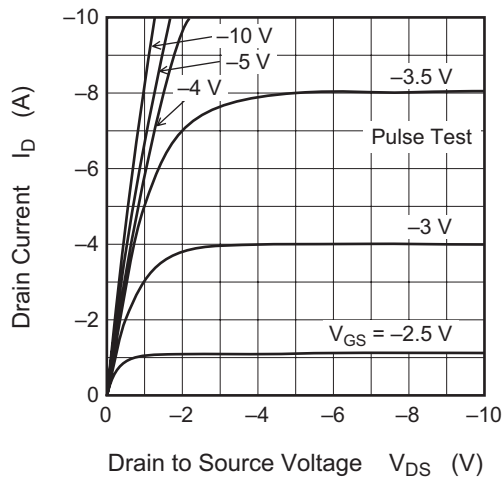
Power vs. Temperature Derating



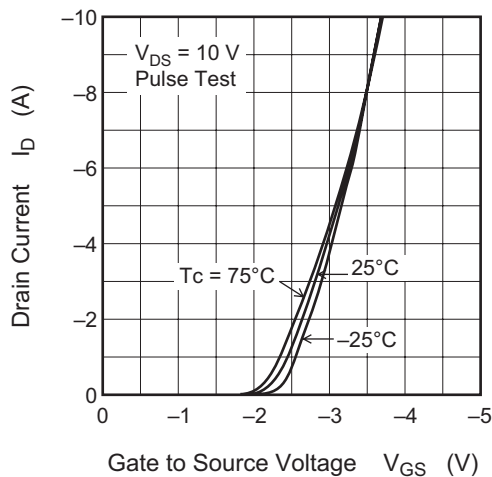
Maximum Safe Operation Area



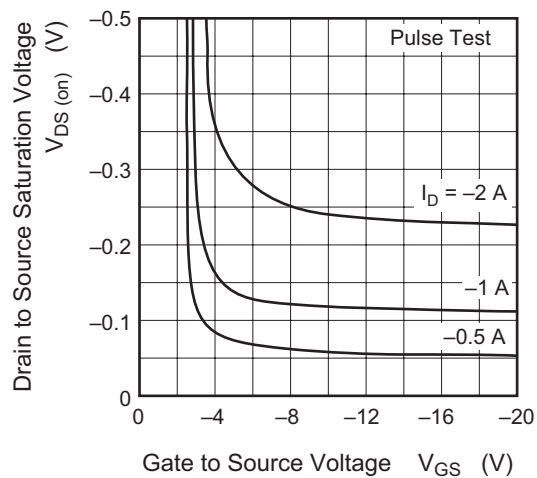
Typical Output Characteristics



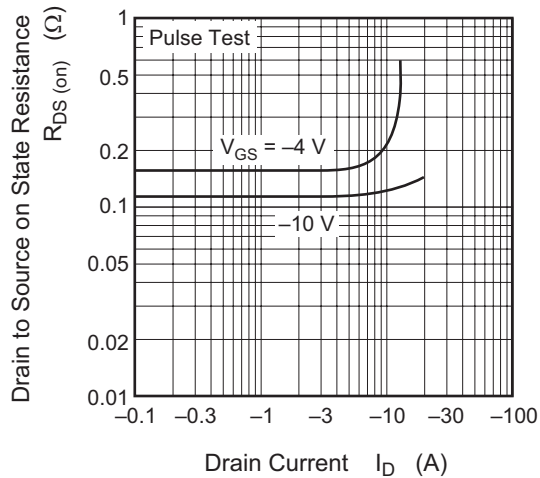
Typical Transfer Characteristics

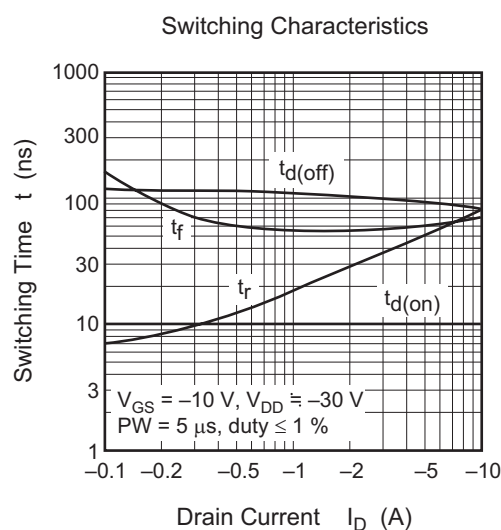
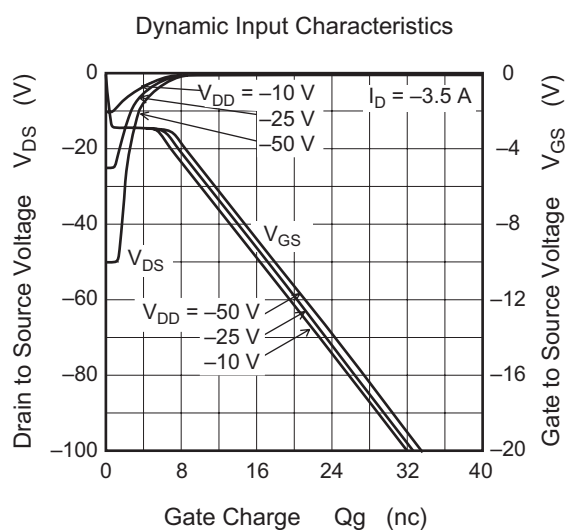
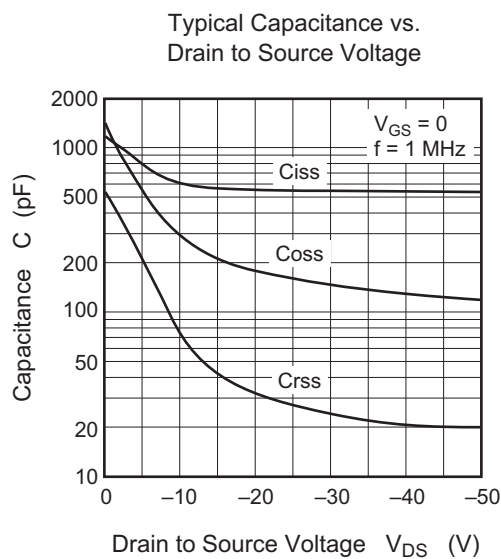
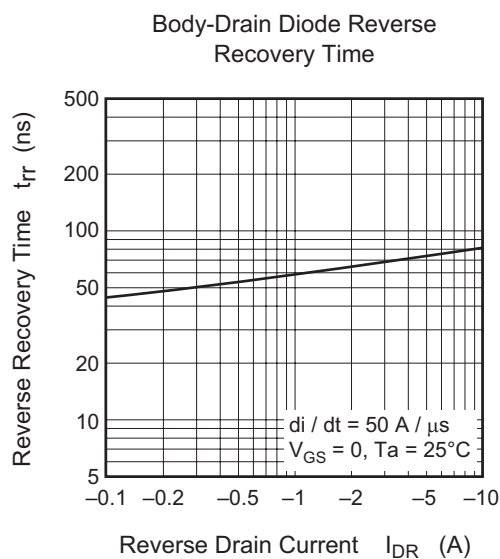
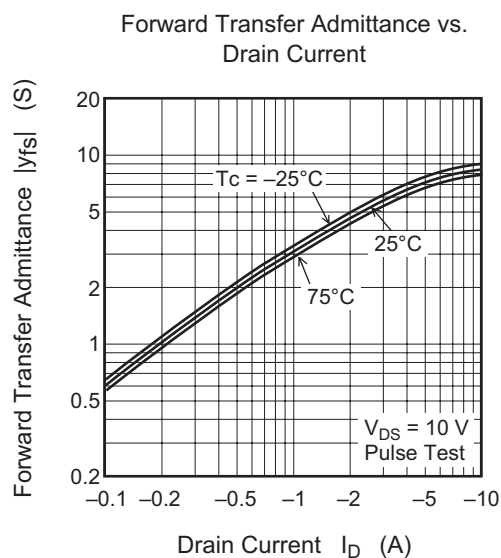
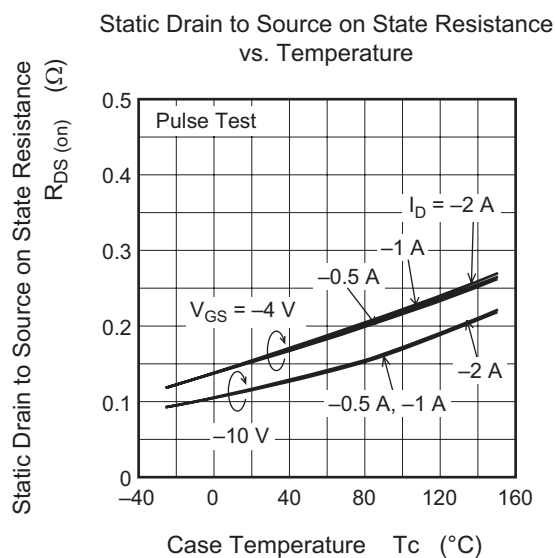


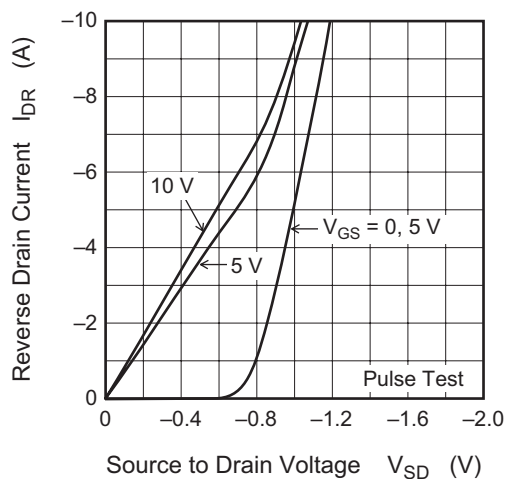
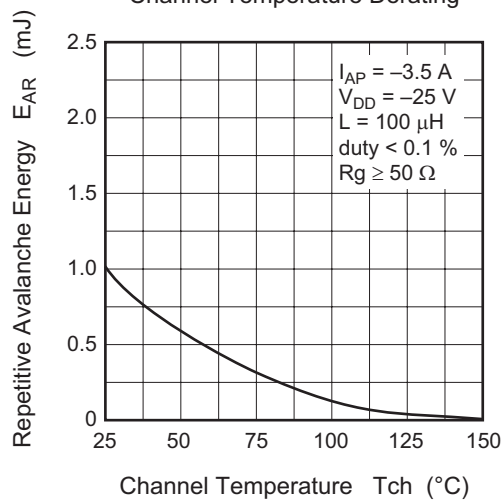
Drain to Source Saturation Voltage vs. Gate to Source Voltage



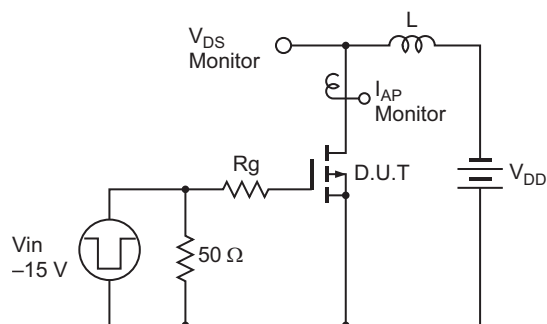
Static Drain to Source on State Resistance vs. Drain Current



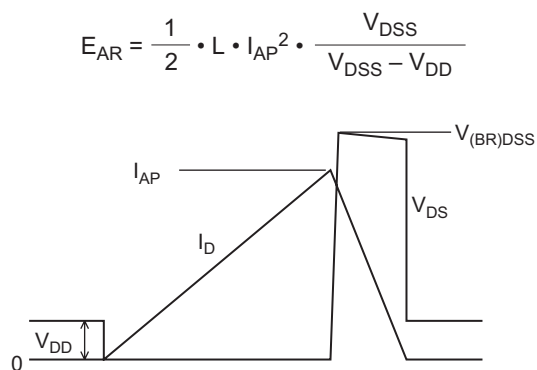


Reverse Drain Current vs.
Source to Drain Voltage

Maximum Avalanche Energy vs.
Channel Temperature Derating


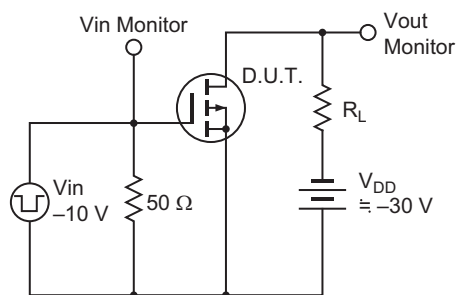
Avalanche Test Circuit



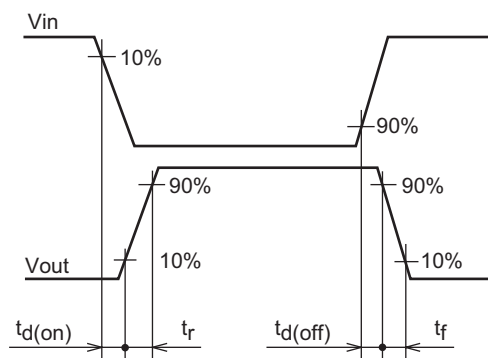
Avalanche Waveform



Switching Time Test Circuit

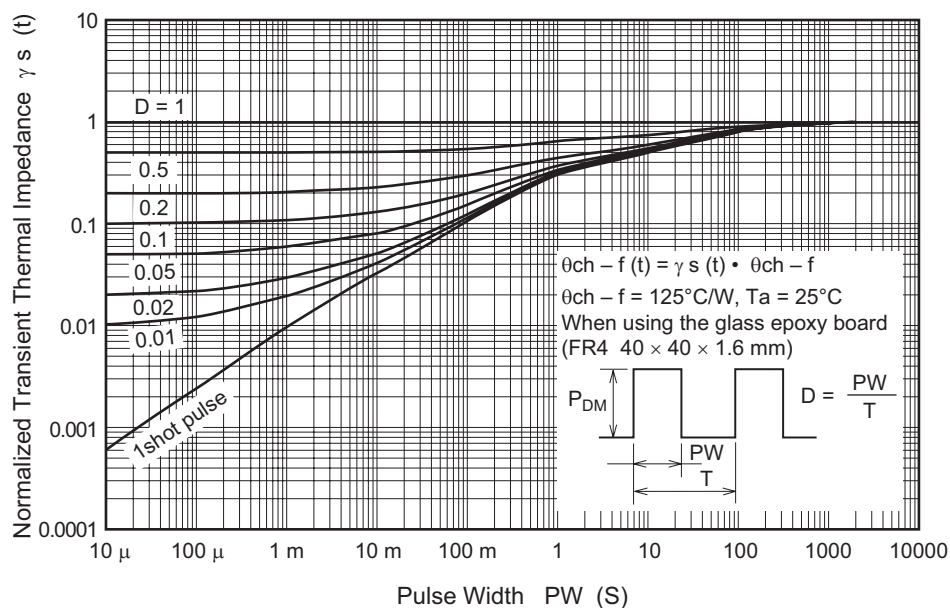


Switching Time Waveform

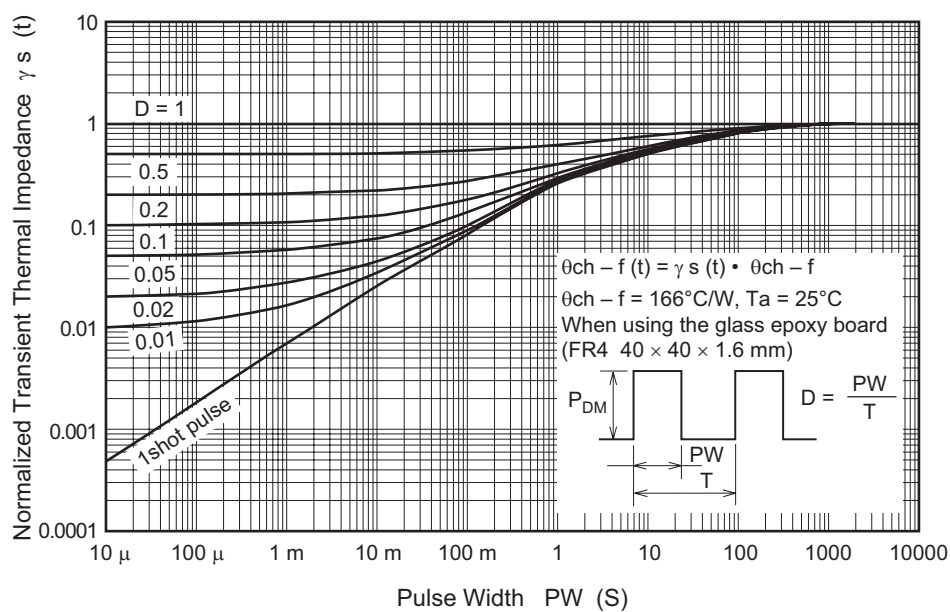


Common

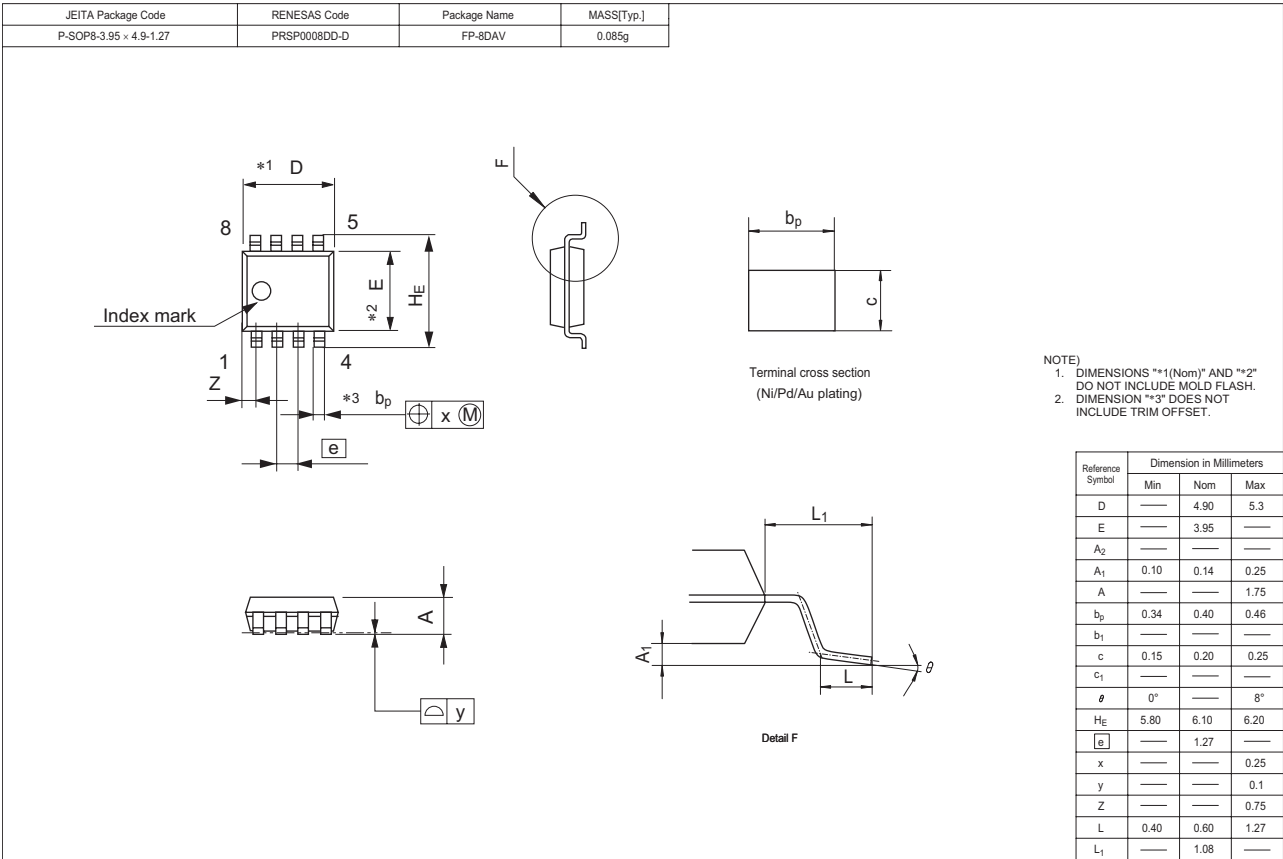
Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)



Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)



Package Dimensions



Ordering Information

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

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