
HAT3008R/HAT3008RJ

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

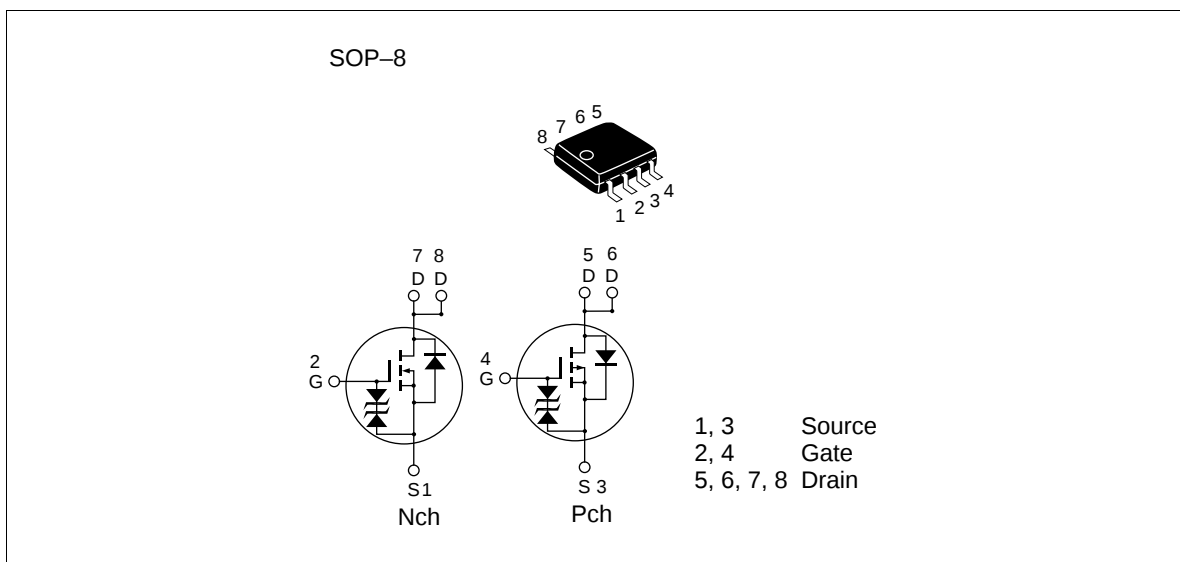
HITACHI

ADE-208-536B (Z)
3rd. Edition
February 1999

Features

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

Outline



HAT3008R/HAT3008RJ

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings		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	$I_{D(pulse)}$ ^{Note1}	40	– 28	A
Body-drain diode reverse drain current	I_{DR}	5	– 3.5	A
Avalanche current	HAT3008R I_{AP} ^{Note4}	—	—	—
	HAT3008RJ	5	– 3.5	A
Avalanche energy	HAT3008R E_{AR} ^{Note4}	—	—	—
	HAT3008RJ	2.14	1.05	mJ
Channel dissipation	P_{ch} ^{Note2}	2	2	W
Channel dissipation	P_{ch} ^{Note3}	3	3	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	– 55 to + 150	–55 to + 150	°C

- Note: 1. $PW \leq 10\mu s$, duty cycle $\leq 1\%$
2. 1 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), $PW \leq 10s$
3. 2 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), $PW \leq 10s$
4. Value at Tch=25°C, $R_g \geq 50\Omega$

Electrical Characteristics (Ta = 25°C)
(N Channel)

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	HAT3008R I_{DSS}	—	—	1	μA	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0$
drain current	HAT3008RJ I_{DSS}	—	—	0.1	μA	
Zero gate voltage	HAT3008R I_{DSS}	—	—	—	μA	$V_{DS} = 48 \text{ V}$, $V_{GS} = 0$
drain current	HAT3008RJ I_{DSS}	—	—	10	μA	$T_a = 125^\circ\text{C}$
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	$R_{DS(on)}$	—	0.043	0.058	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 10 \text{ V}$ ^{Note4}
resistance	$R_{DS(on)}$	—	0.056	0.084	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 4 \text{ V}$ ^{Note4}
Forward transfer admittance	$ y_{fs} $	6	9	—	S	$I_D = 3 \text{ A}$, $V_{DS} = 10 \text{ V}$ ^{Note4}
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	$V_{GS} = 10 \text{ V}$, $I_D = 3 \text{ A}$
Rise time	t_r	—	40	—	ns	$V_{DD} \cong 30 \text{ V}$
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	$I_F = 5 \text{ A}$, $V_{GS} = 0$ ^{Note4}
Body-drain diode reverse recovery time	t_{rr}	—	40	—	ns	$I_F = 5 \text{ A}$, $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

Note: 5. Pulse test

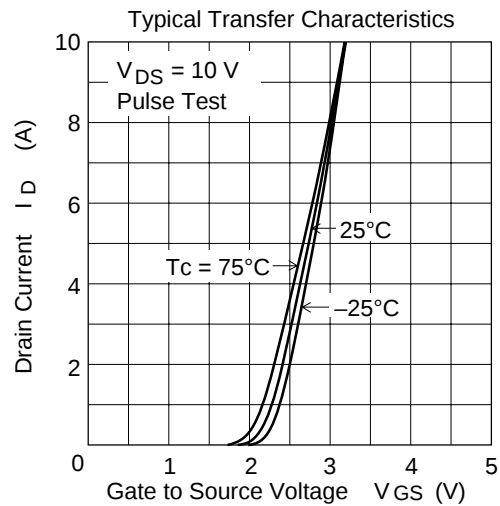
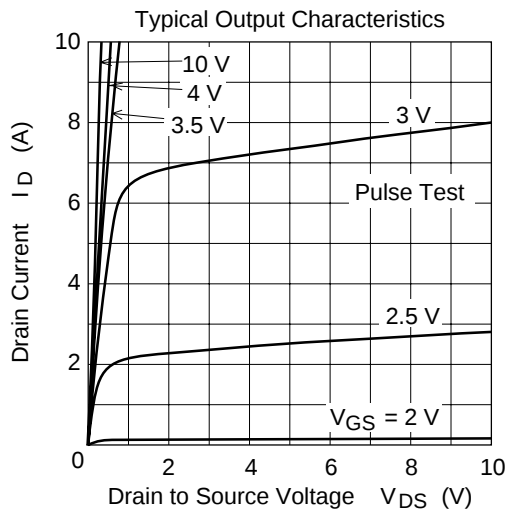
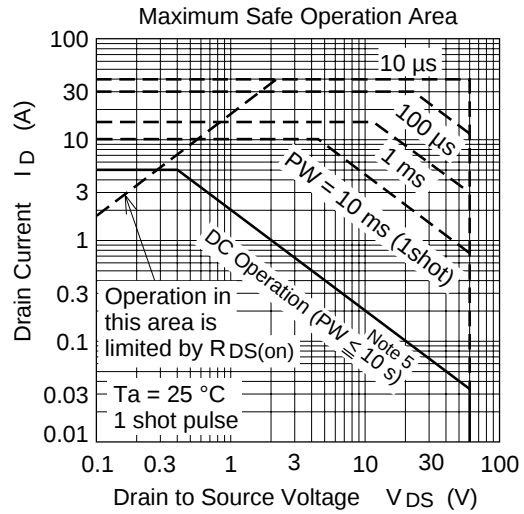
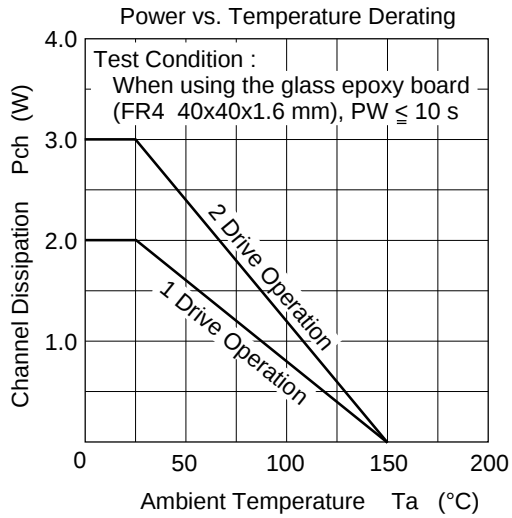
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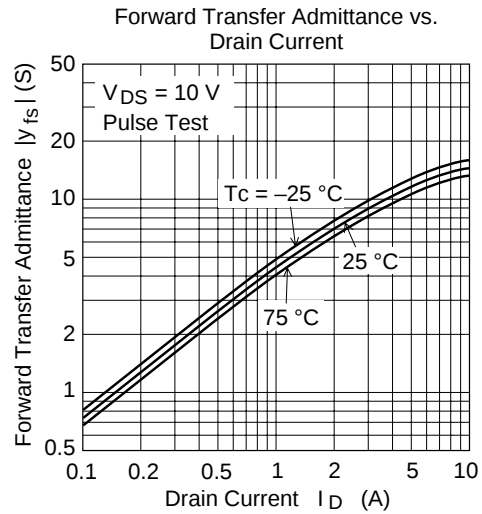
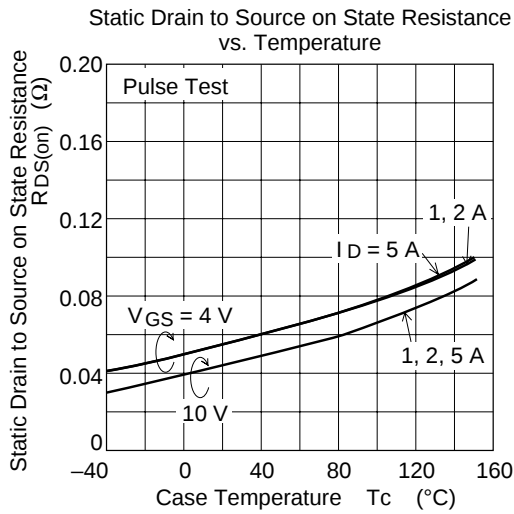
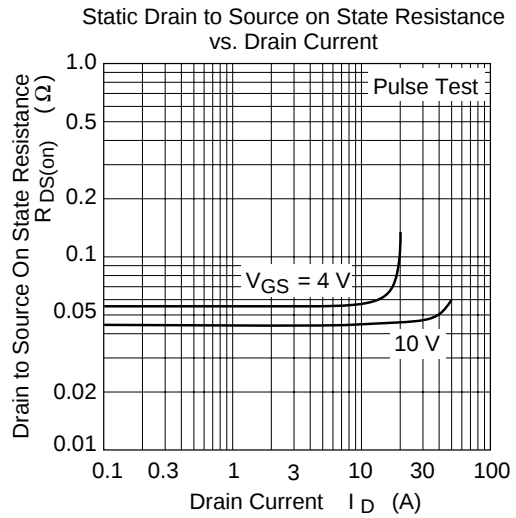
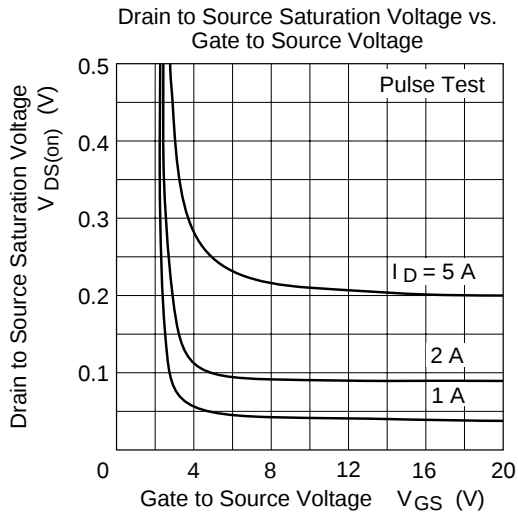
(P Channel)

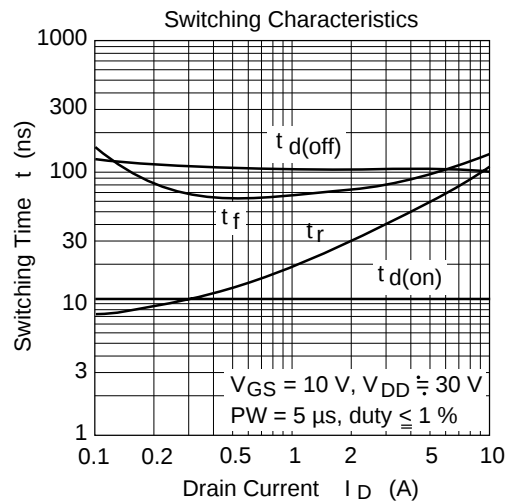
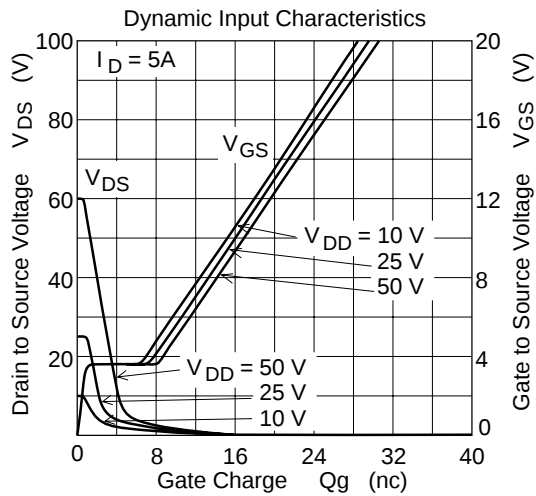
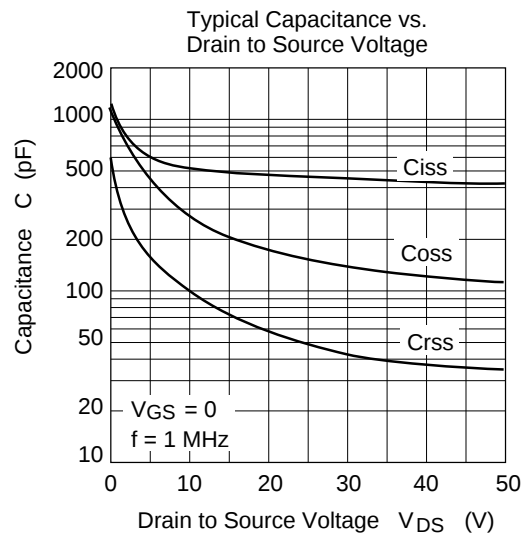
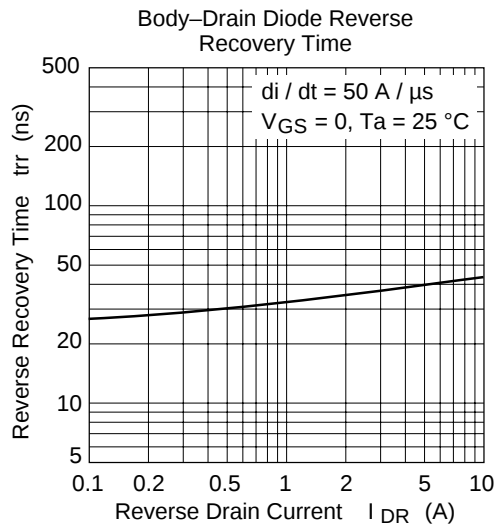
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)DSS}$	- 60	—	—	V	$I_D = -10 \text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage		$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current		I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0$
Zero gate voltage	HAT3008R	I_{DSS}	—	—	-1	μA	$V_{DS} = -60 \text{ V}$, $V_{GS} = 0$
drain current	HAT3008RJ	I_{DSS}	—	—	-0.1	μA	
Zero gate voltage	HAT3008R	I_{DSS}	—	—	—	μA	$V_{DS} = -48 \text{ V}$, $V_{GS} = 0$
drain current	HAT3008RJ	I_{DSS}	—	—	-10	μA	$T_a = 125^\circ\text{C}$
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		$R_{DS(on)}$	—	0.12	0.15	Ω	$I_D = -2 \text{ A}$, $V_{GS} = -10 \text{ V}$ ^{Note4}
resistance		$R_{DS(on)}$	—	0.16	0.23	Ω	$I_D = -2 \text{ A}$, $V_{GS} = -4 \text{ V}$ ^{Note4}
Forward transfer admittance		$ y_{fs} $	3	4.5	—	S	$I_D = -2 \text{ A}$, $V_{DS} = -10 \text{ V}$ ^{Note4}
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	$I_F = -3.5 \text{ A}$, $V_{GS} = 0$ ^{Note4}
Body-drain diode reverse recovery time		t_{rr}	—	70	—	ns	$I_F = -3.5 \text{ A}$, $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

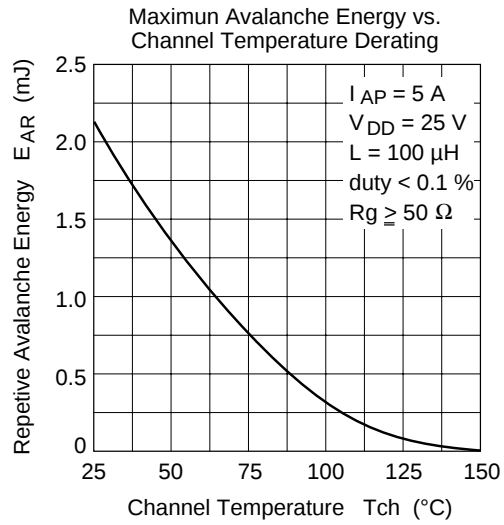
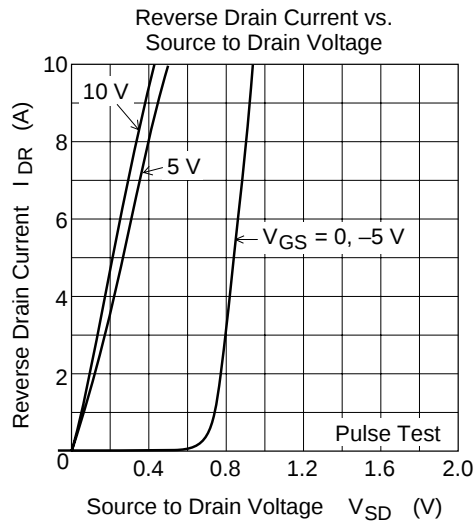
Note: 5. Pulse test

Main Characteristics (N Channel)

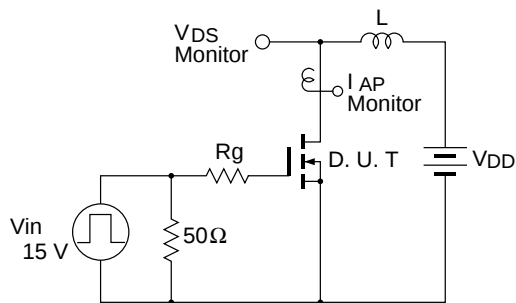






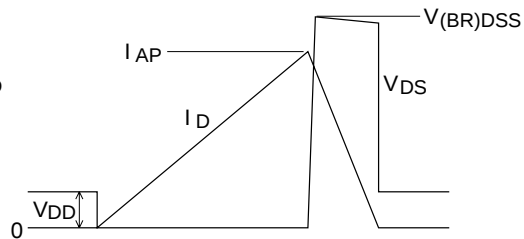


Avalanche Test Circuit

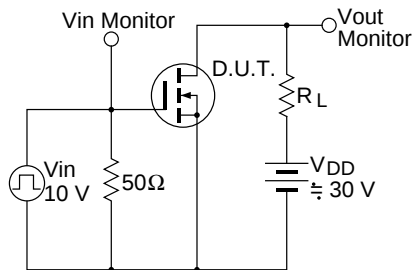


Avalanche Waveform

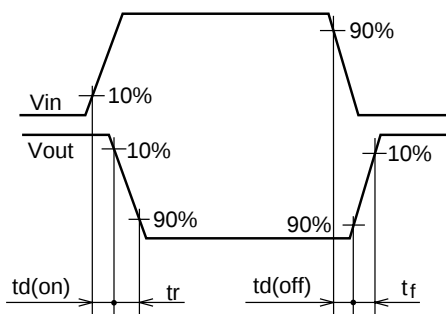
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



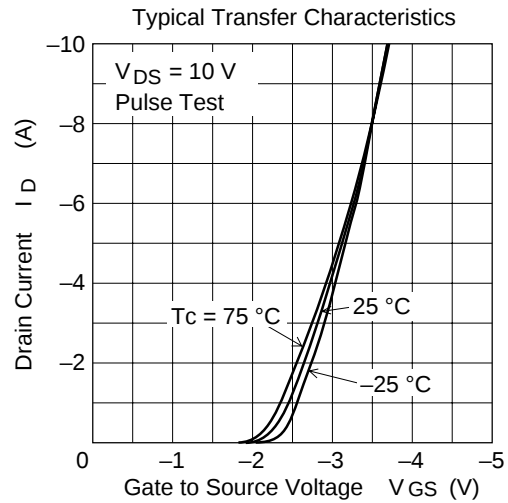
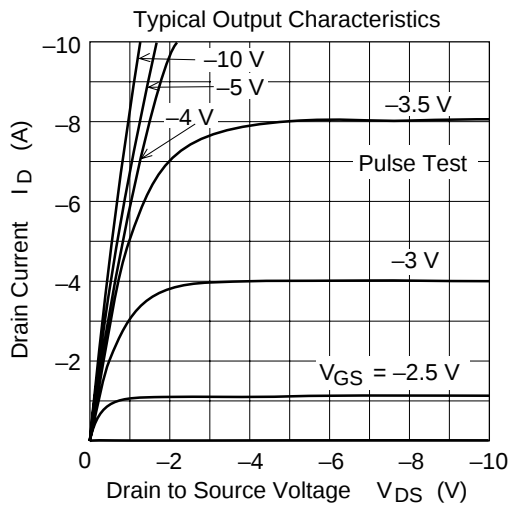
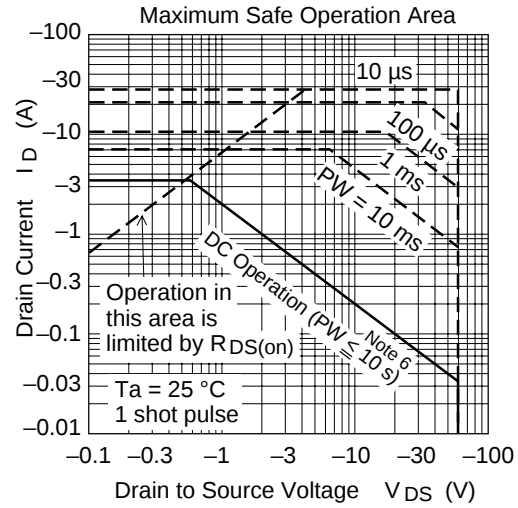
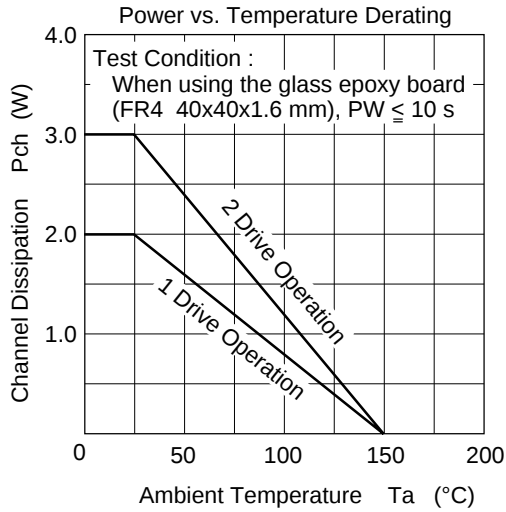
Switching Time Test Circuit

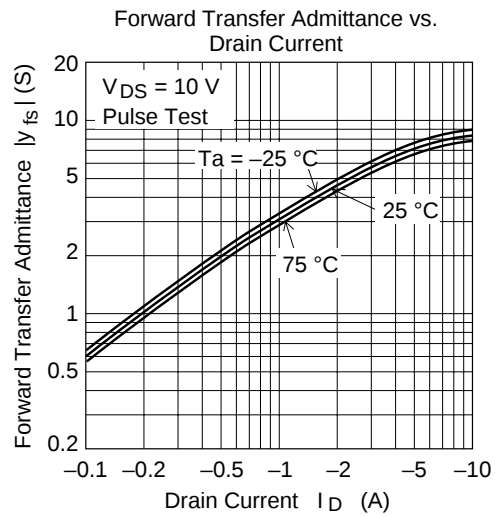
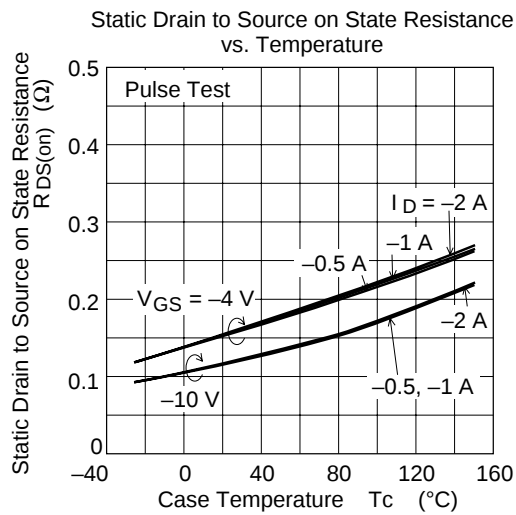
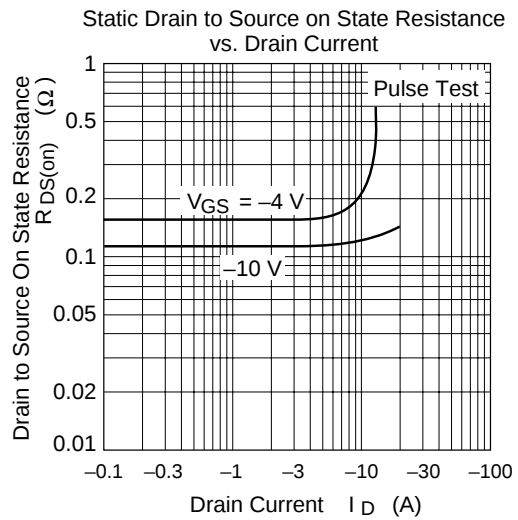
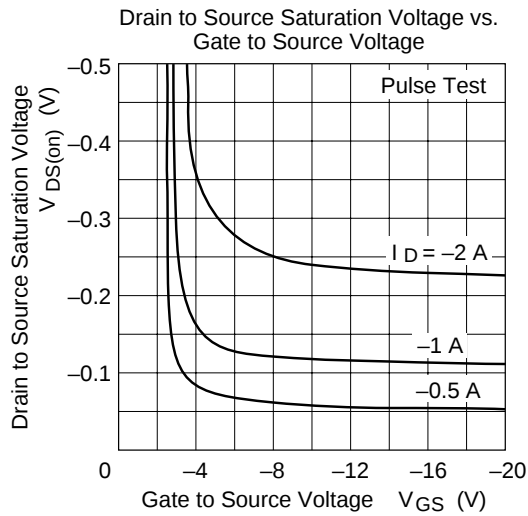


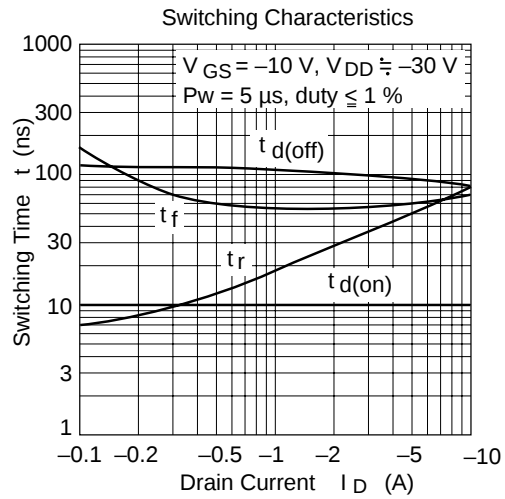
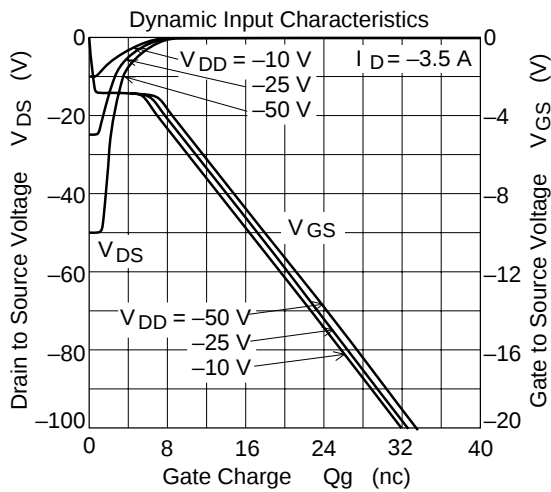
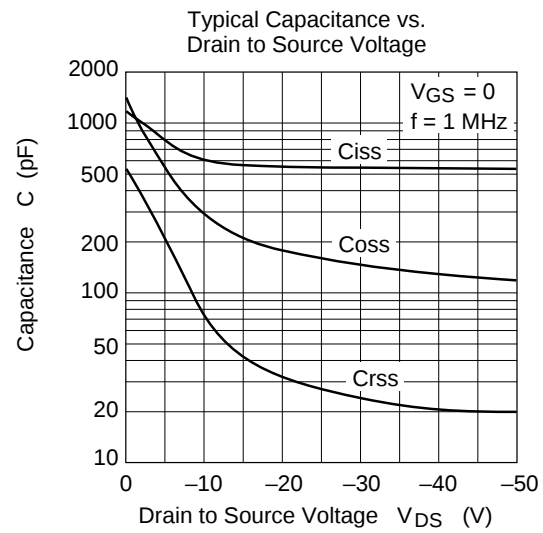
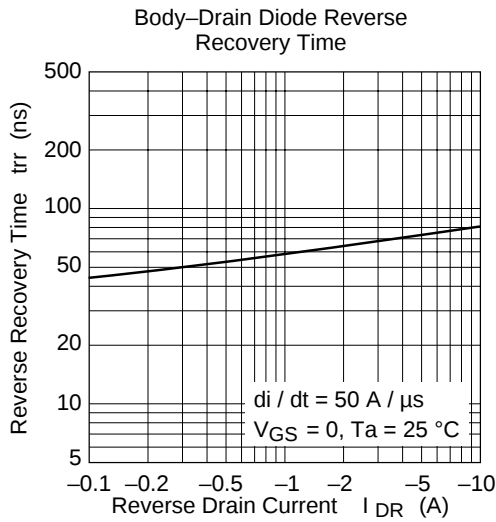
Switching Time Waveform

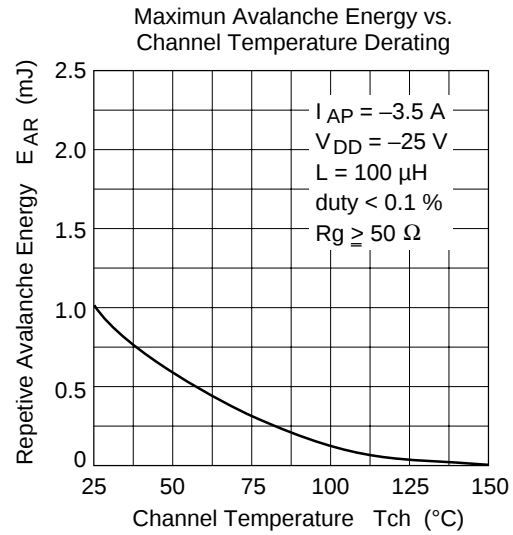
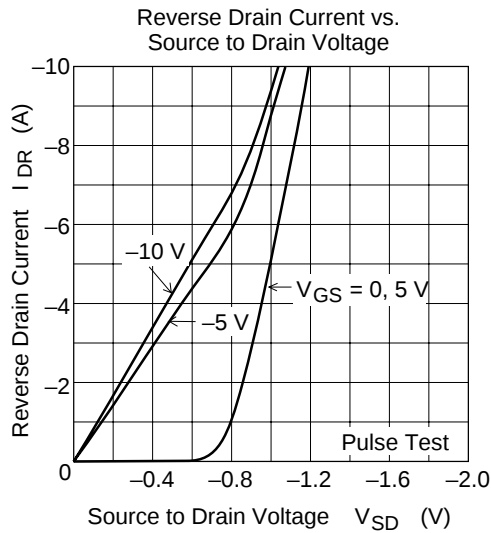


(P Channel)

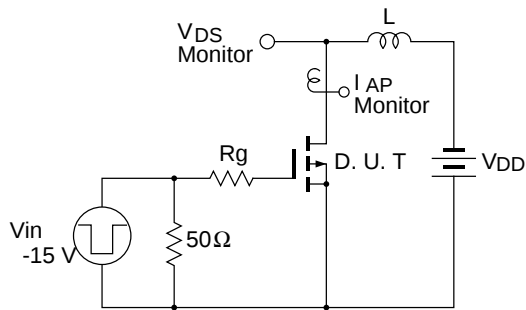






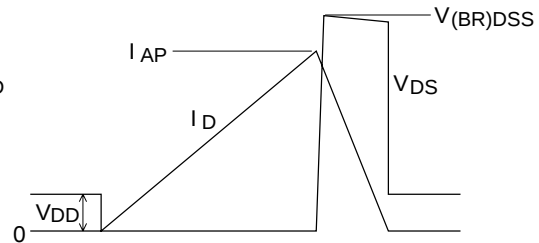


Avalanche Test Circuit

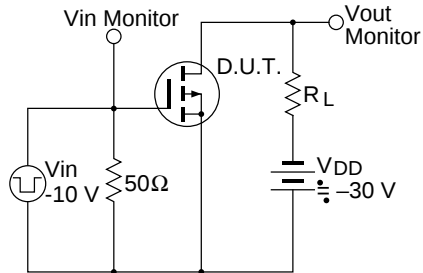


Avalanche Waveform

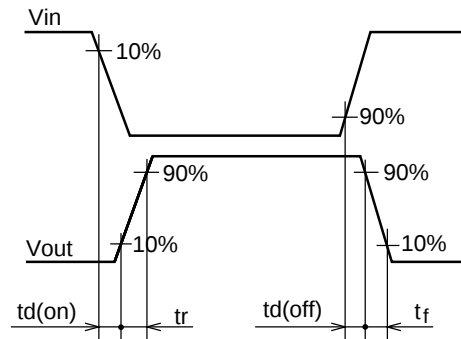
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

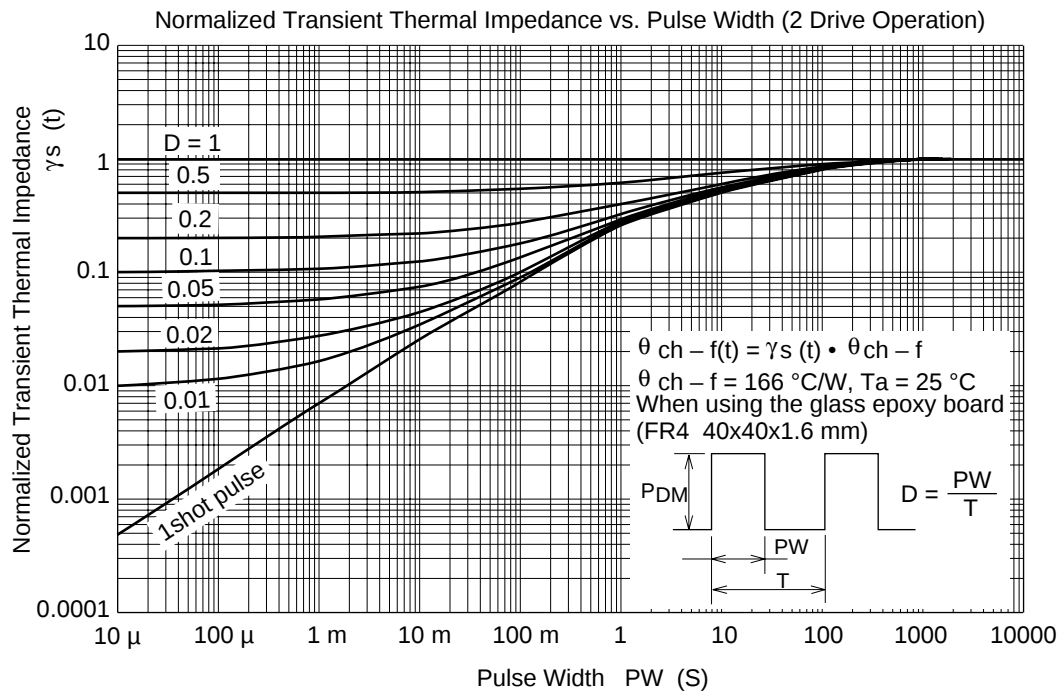
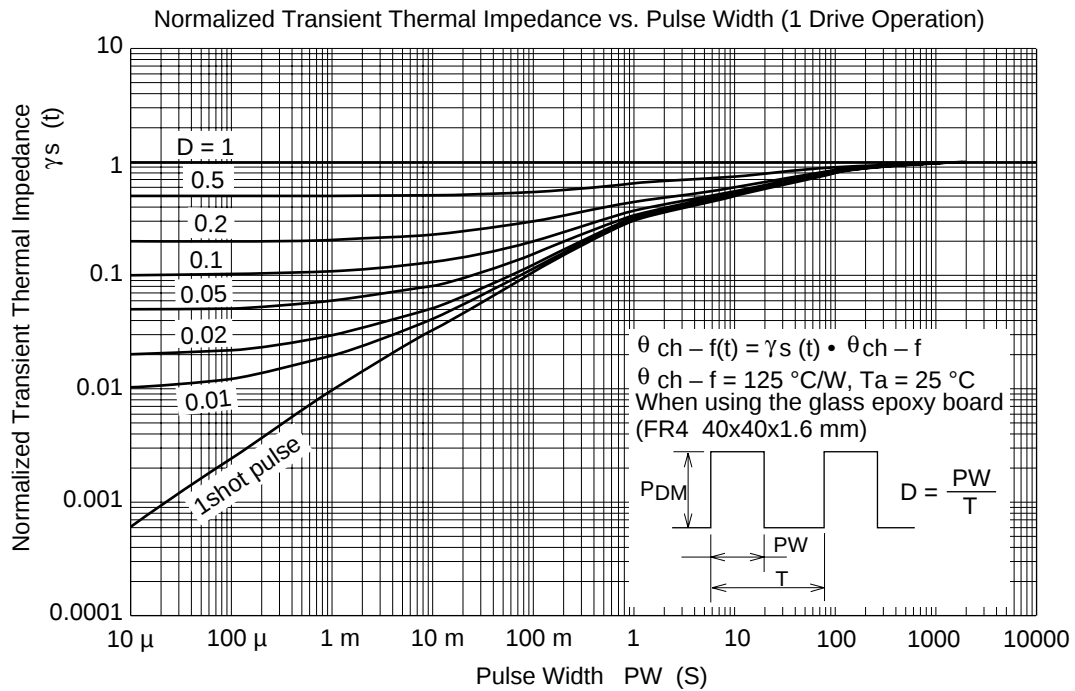


Switching Time Test Circuit



Switching Time Waveform

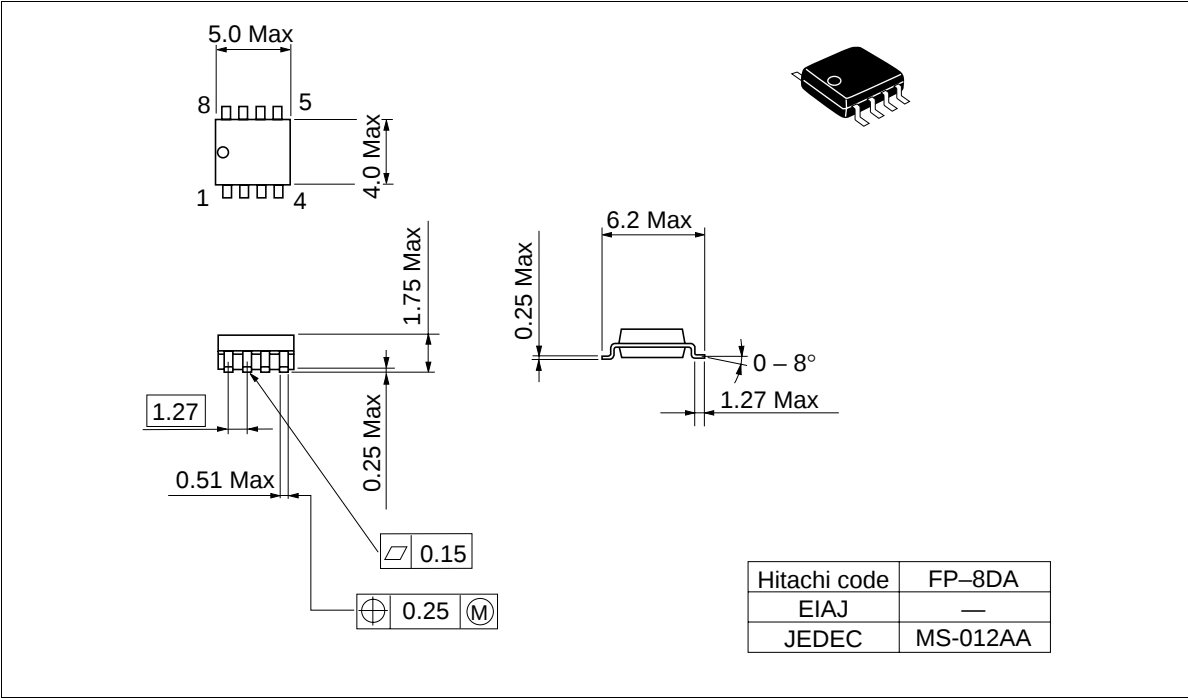




HAT3008R/HAT3008RJ

Package Dimensions

Unit: mm



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