

HAT3008R/HAT3008RJ

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

HITACHI

ADE-208-536B (Z)

3rd. Edition

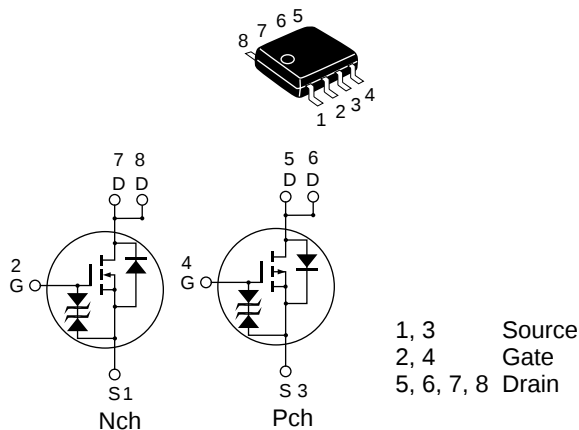
Feb. 1999

Features

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

Outline

SOP-8



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	Pch ^{Note2}	2	2	W
Channel dissipation	Pch ^{Note3}	3	3	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	− 55 to + 150	−55 to + 150	°C

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

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	$I_G = \pm 100 \mu\text{A}$, $V_{DS} = 0$
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	Ta = 125°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 resistance		$R_{DS(on)}$	—	0.043	0.058	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 10 \text{ V}$ ^{Note4}
		$R_{DS(on)}$	—	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 = 1MHz
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

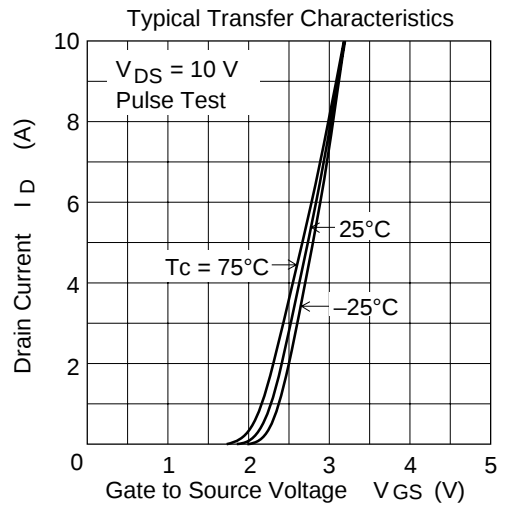
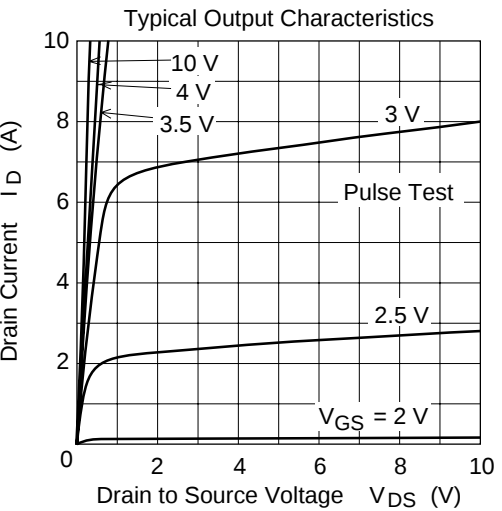
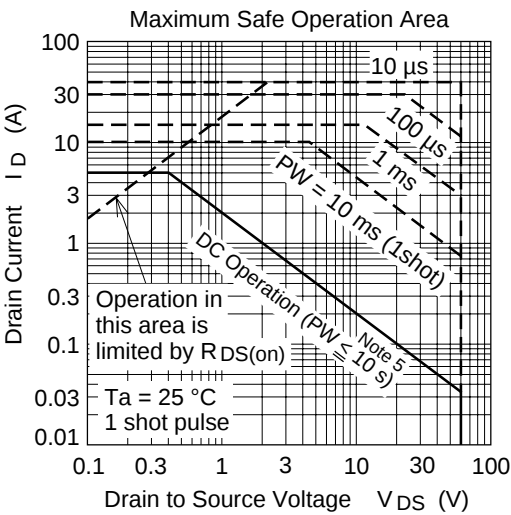
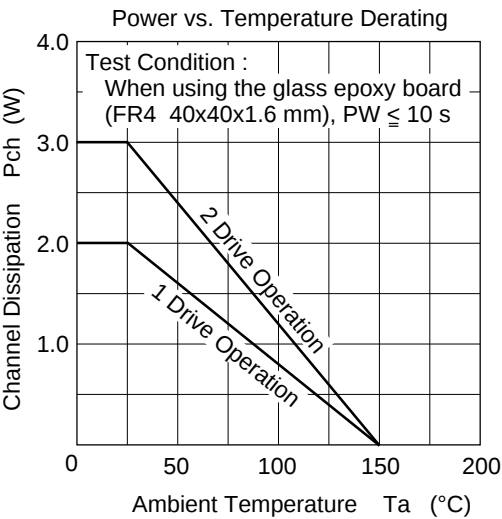
HAT3008R/HAT3008RJ

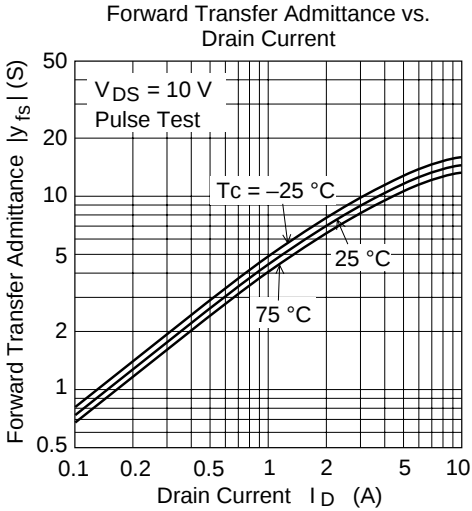
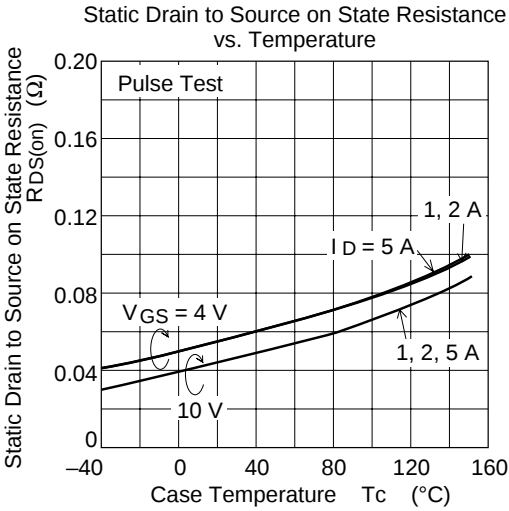
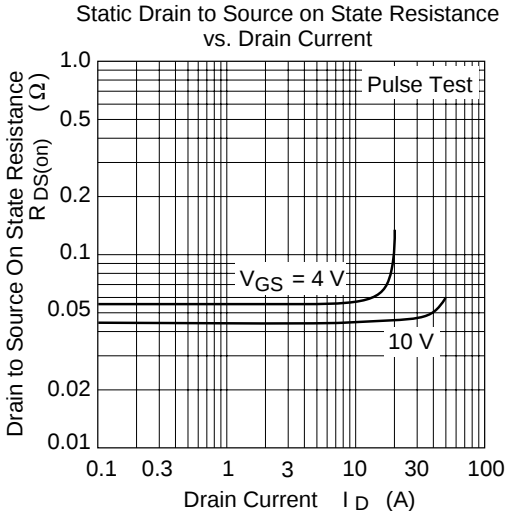
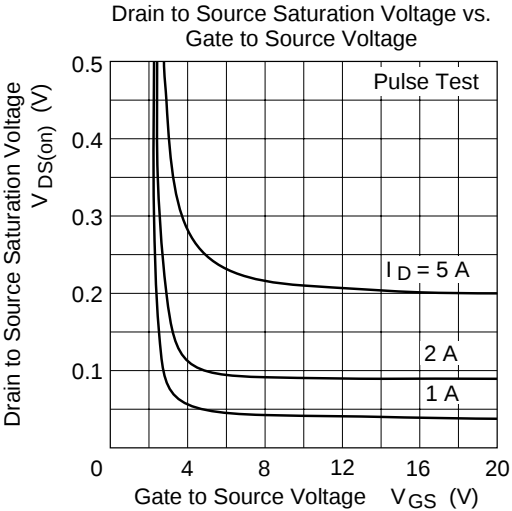
(P Channel)

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	$I_F = - 3.5 \text{ A}$, $V_{GS} = 0$ $diF/ dt = 50 \text{ A}/\mu\text{s}$

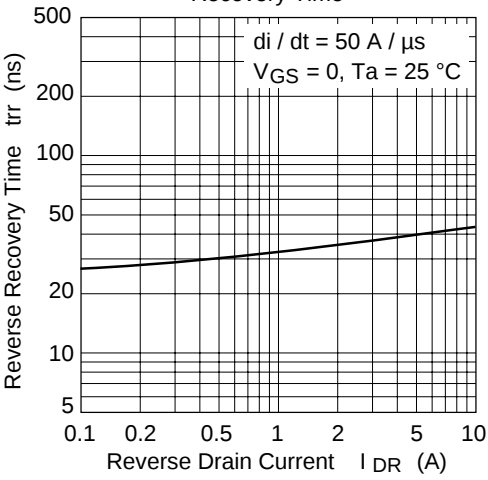
Note: 5. Pulse test

Main Characteristics (N Channel)

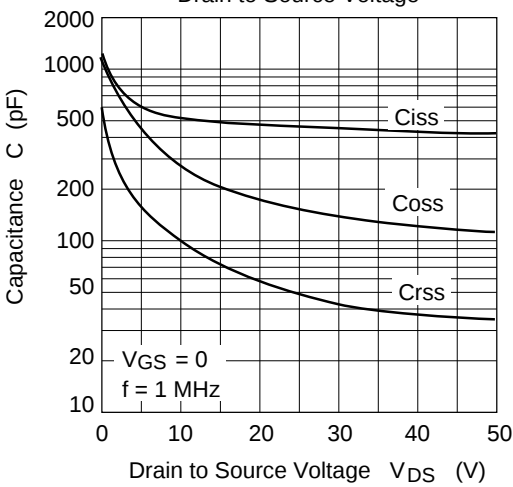




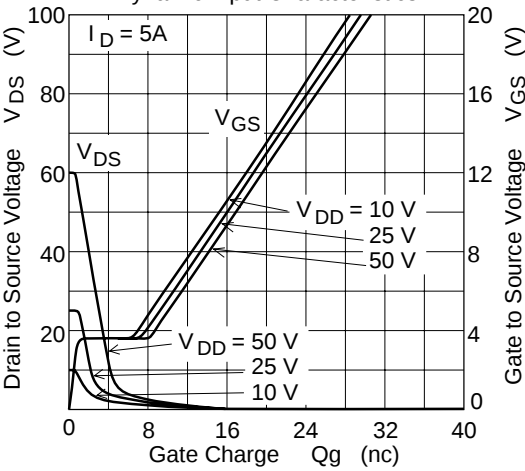
Body-Drain Diode Reverse Recovery Time



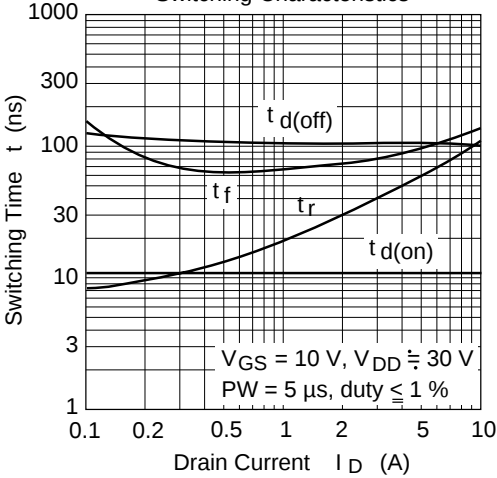
Typical Capacitance vs. Drain to Source Voltage

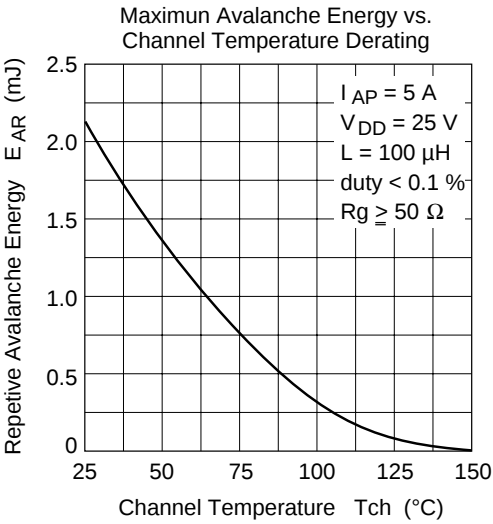
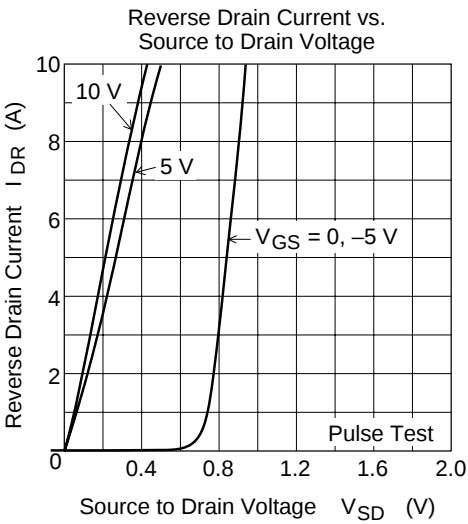


Dynamic Input Characteristics

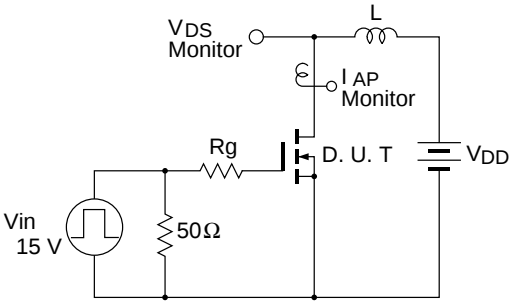


Switching Characteristics

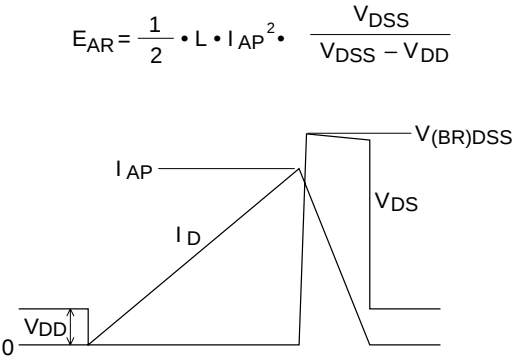




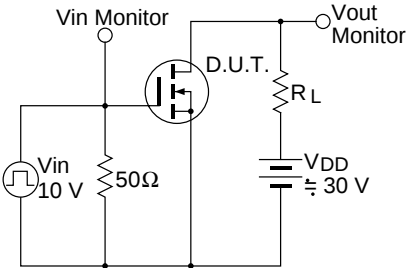
Avalanche Test Circuit



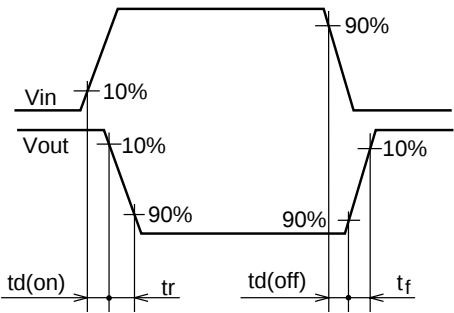
Avalanche Waveform



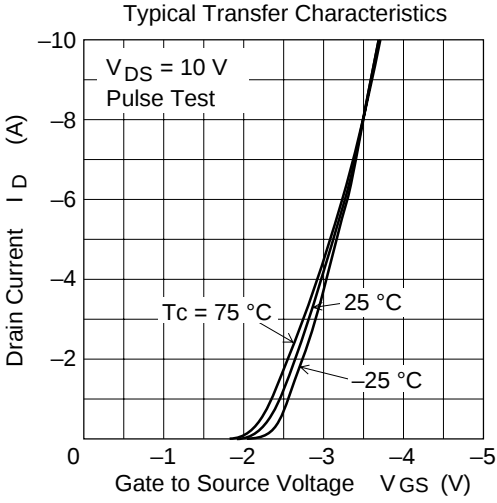
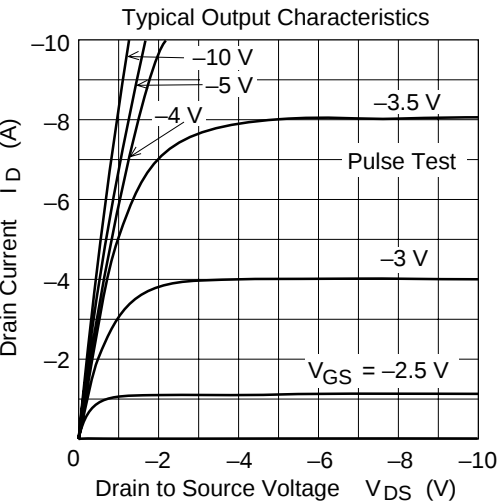
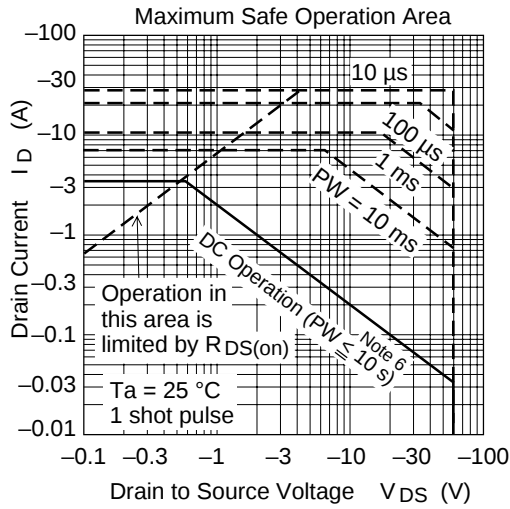
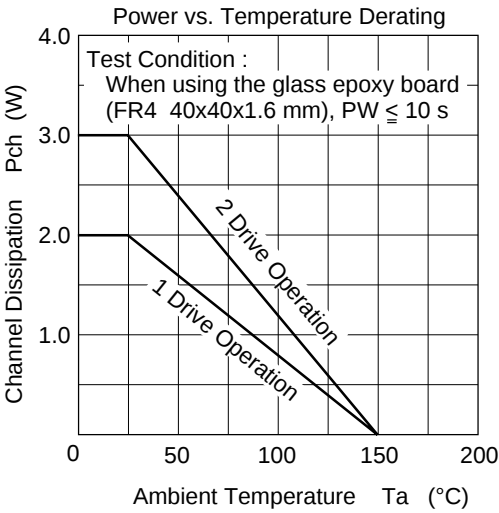
Switching Time Test Circuit

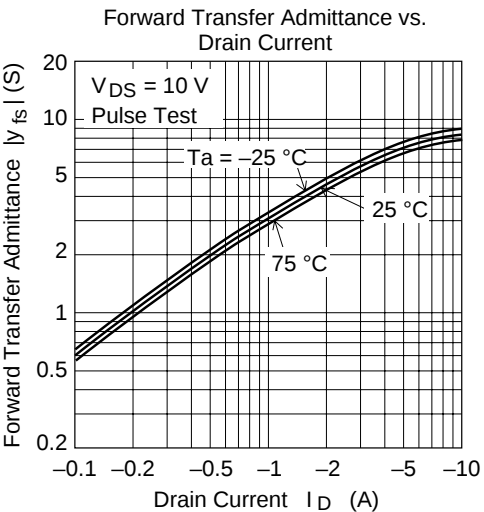
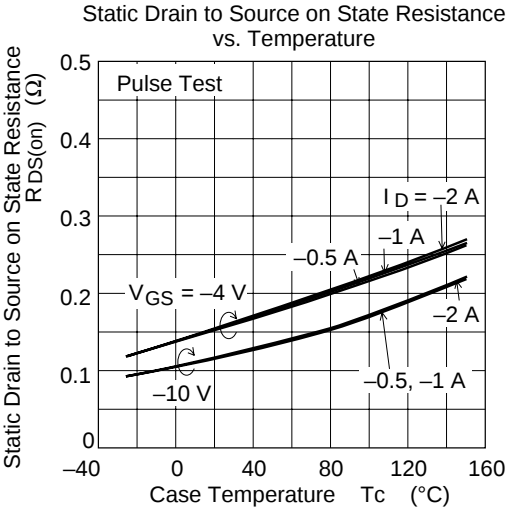
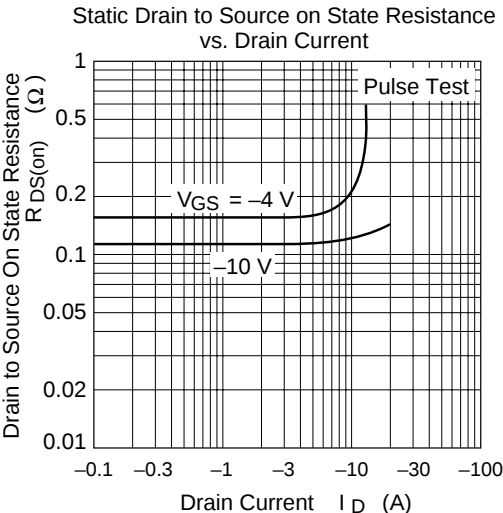
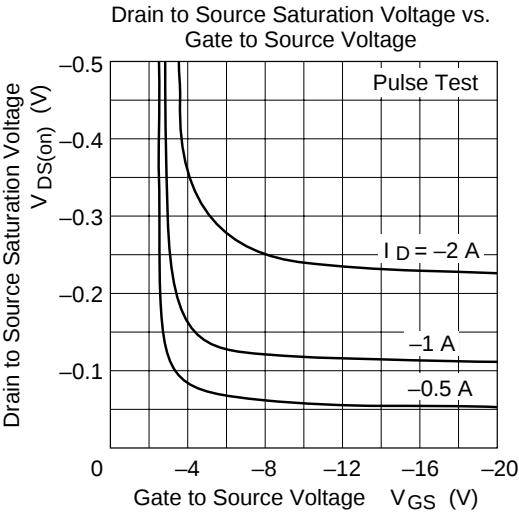


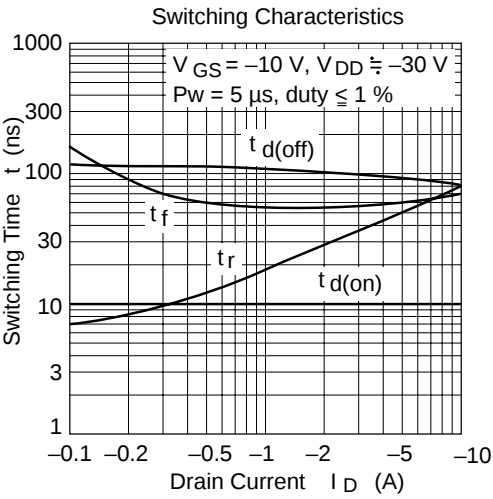
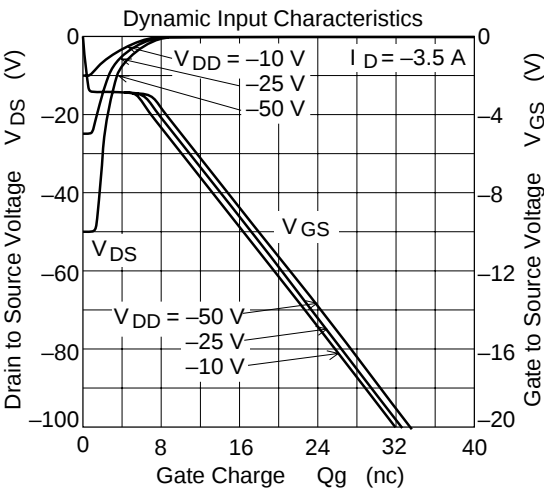
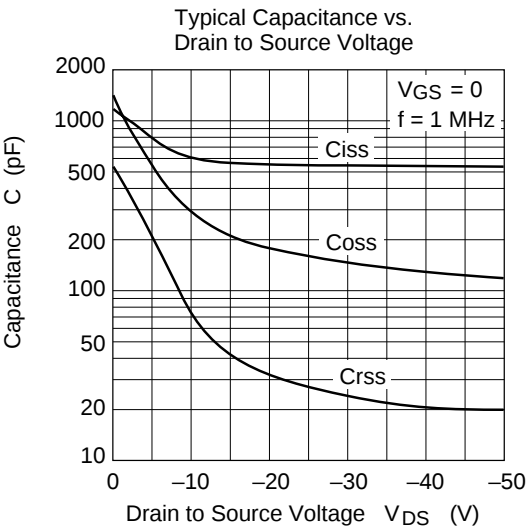
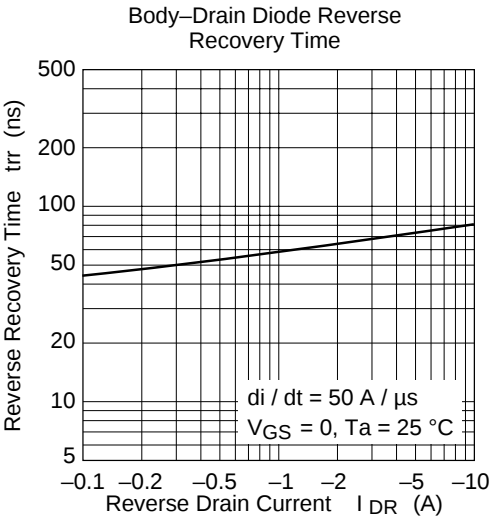
Switching Time Waveform

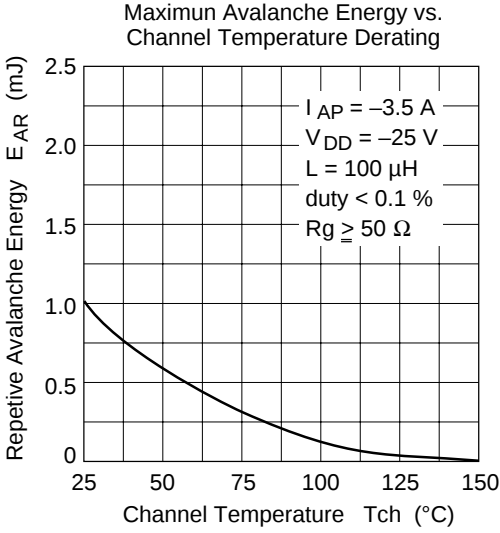
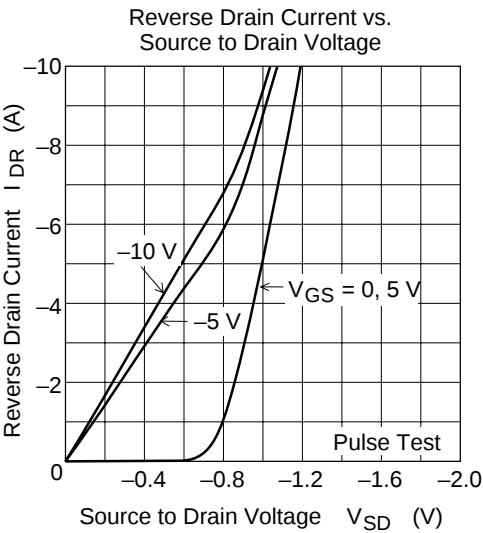


(P Channel)

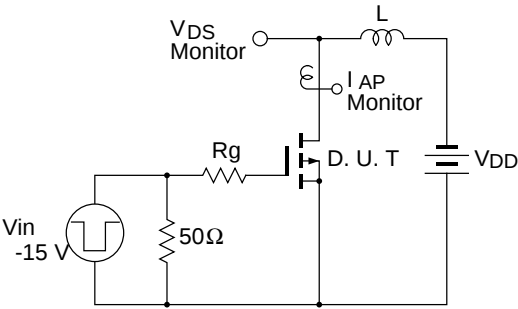






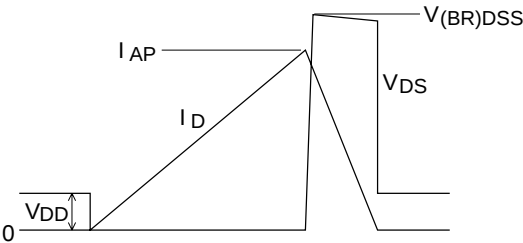


Avalanche Test Circuit

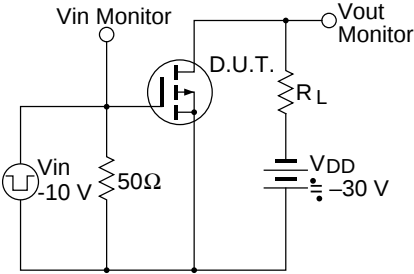


Avalanche Waveform

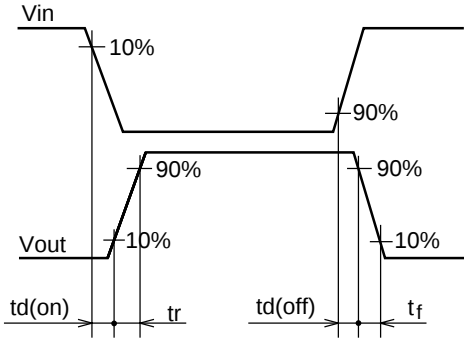
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



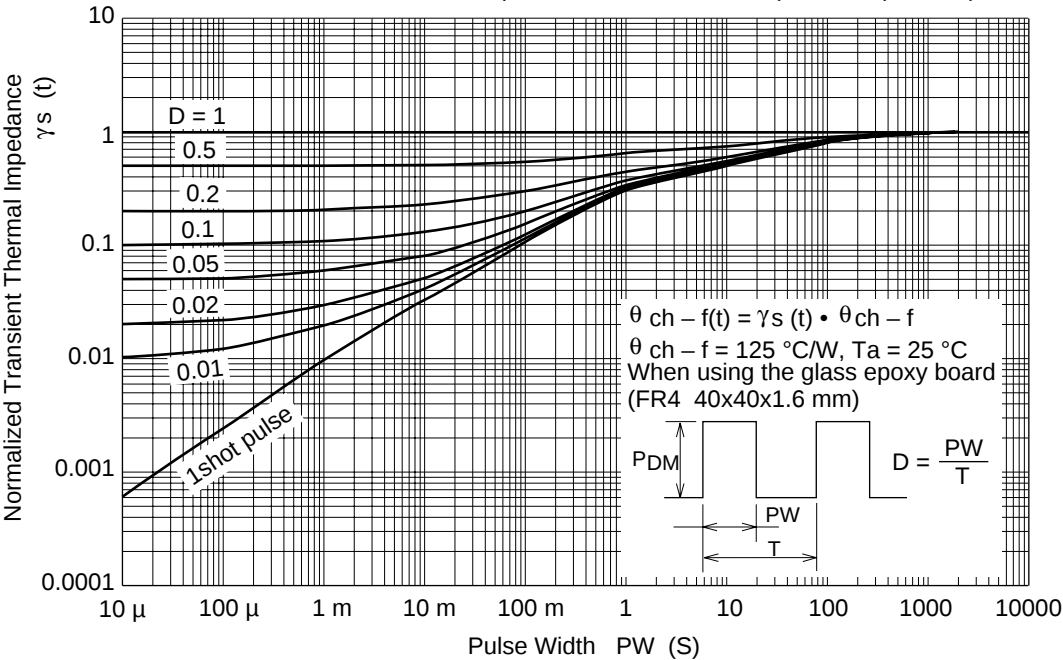
Switching Time Test Circuit



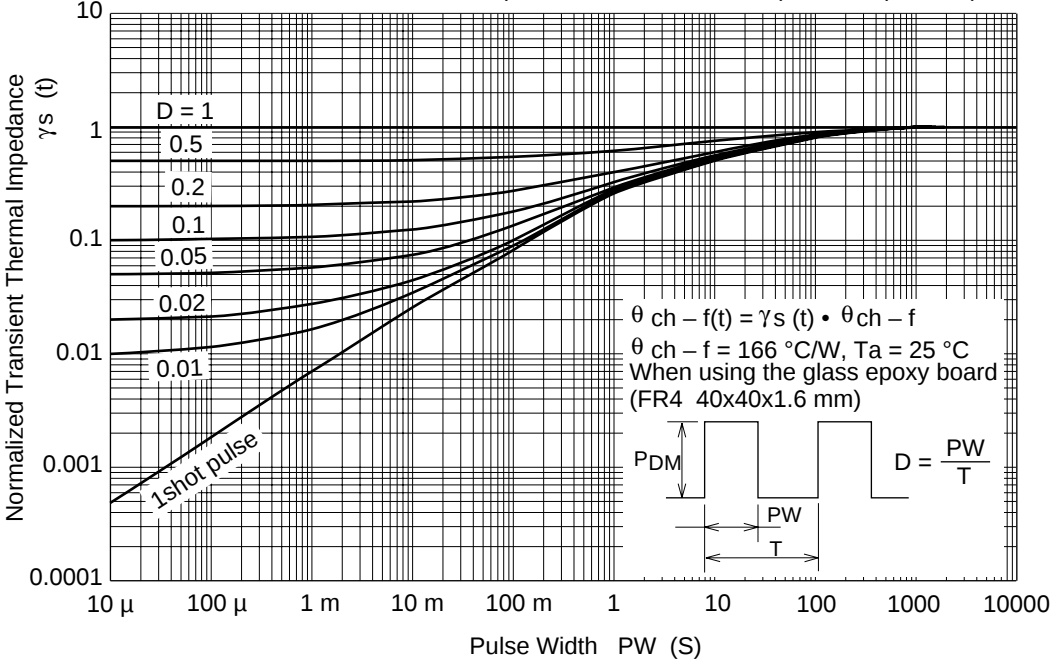
Switching Time Waveform



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

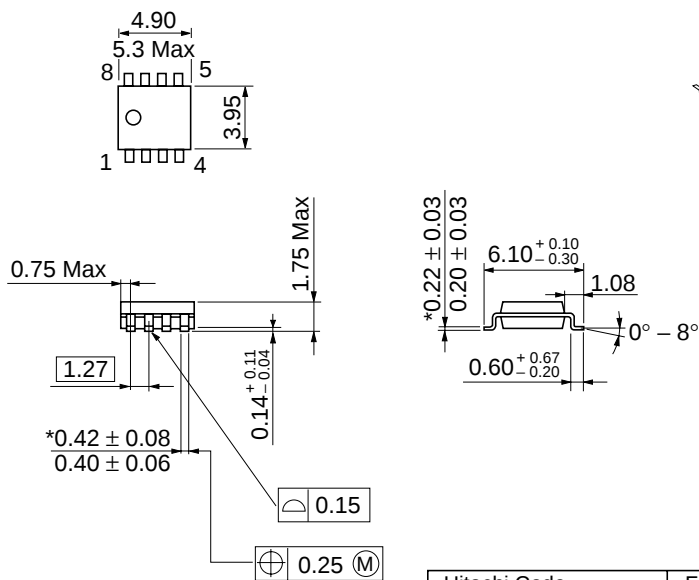


Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)



Package Dimensions

As of January, 2001
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-8DA
JEDEC	Conforms
EIAJ	—
Mass (reference value)	0.085 g

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