HAT3036R

Silicon N/P Channel Power MOSFET
Power Switching

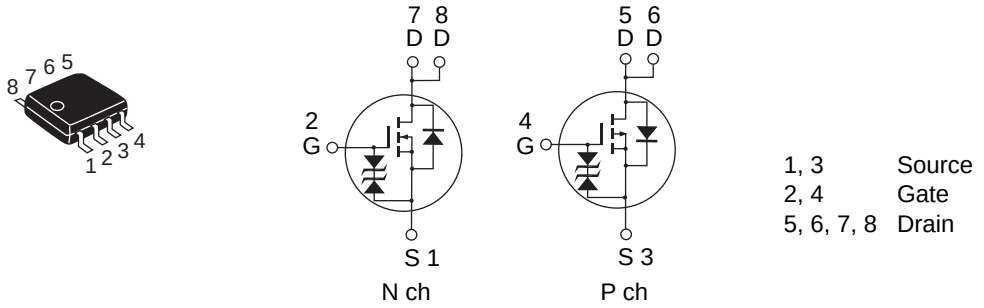
R07DS1373EJ0501
Rev.5.01
Jan 20, 2017

Features

- Capable of 4.5 V gate drive
- Low drive current
- High density mounting

Outline

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



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		Nch	Pch	
Drain to source voltage	V_{DSS}	30	–30	V
Gate to source voltage	V_{GSS}	±20	-20/+10	V
Drain current	I_D	4.8	–4.8	A
Drain peak current	$I_{D(pulse)}$ Note1	38.4	–38.4	A
Body-drain diode reverse drain current	I_{DR}	4.8	–4.8	A
Channel dissipation	Pch Note2	1.3		W
Channel dissipation	Pch Note3	2.0		W
Channel temperature	Tch	150		°C
Storage temperature	Tstg	–55 to +150		°C

Notes: 1. PW ≤ 10 μs, 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

Electrical Characteristics

• N Channel

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	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	I_{DSS}	—	—	1	μA	V_{DS} = 30 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	40	50	mΩ	I_D = 2.4 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	60	87	mΩ	I_D = 2.4 A, V_{GS} = 4.5 V Note4
Forward transfer admittance	$\|y_{fs}\|$	3.6	6.0	—	S	I_D = 2.4 A, V_{DS} = 10 V Note4
Input capacitance	Ciss	—	260	—	pF	V_{DS} = 10 V V_{GS} = 0 f = 1 MHz
Output capacitance	Coss	—	70	—	pF	
Reverse transfer capacitance	Crss	—	30	—	pF	
Total gate charge	Qg	—	2.2	—	nC	V_{DD} = 10 V V_{GS} = 4.5 V I_D = 4.8 A
Gate to source charge	Qgs	—	1.0	—	nC	
Gate to drain charge	Qgd	—	0.8	—	nC	
Turn-on delay time	$t_{d(on)}$	—	7.0	—	ns	V_{GS} = 10 V, I_D = 2.4 A V_{DD} ≅ 10 V R_L = 4.16 Ω Rg = 4.7 Ω
Rise time	t_r	—	17.5	—	ns	
Turn-off delay time	$t_{d(off)}$	—	35.5	—	ns	
Fall time	t_f	—	3.8	—	ns	
Body–drain diode forward voltage	V_{DF}	—	0.88	1.15	V	IF = 4.8 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	18	—	ns	IF = 4.8 A, V_{GS} = 0 diF/ dt = 100 A/ μs

Notes: 4. Pulse test

• P Channel

(Ta = 25°C)

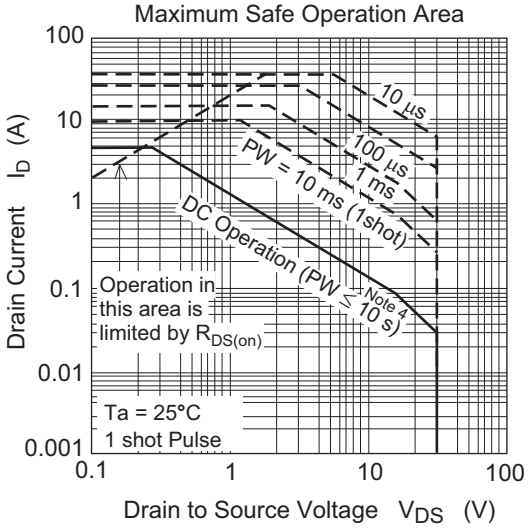
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	–30	—	—	V	I_D = –10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	-20/+10	—	—	V	I_G = ±100 μA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	μA	V_{GS} = –16,+8 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	–1	μA	V_{DS} = –30 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	–1.0	—	–2.5	V	V_{DS} = –10 V, I_D = –1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	50	63	mΩ	I_D = –2.4 A, V_{GS} = –10 V Note4
	$R_{DS(on)}$	—	75	109	mΩ	I_D = –2.4 A, V_{GS} = – 4.5 V Note4
Forward transfer admittance	$\|y_{fs}\|$	3.0	5.0	—	S	I_D = –2.4 A, V_{DS} = –10 V Note4
Input capacitance	Ciss	—	505	—	pF	V_{DS} = –10 V V_{GS} = 0 f = 1MHz
Output capacitance	Coss	—	125	—	pF	
Reverse transfer capacitance	Crss	—	70	—	pF	
Total gate charge	Qg	—	4.7	—	nC	V_{DD} = –10 V V_{GS} = –4.5 V I_D = -4.8 A
Gate to source charge	Qgs	—	1.5	—	nC	
Gate to drain charge	Qgd	—	1.2	—	nC	
Turn-on delay time	$t_{d(on)}$	—	16	—	ns	V_{GS} = –10 V, I_D = –2.4 A V_{DD} ≈ –10 V R_L = 4.16 Ω R_g = 4.7 Ω
Rise time	t_r	—	15	—	ns	
Turn-off delay time	$t_{d(off)}$	—	32	—	ns	
Fall time	t_f	—	7	—	ns	
Body–drain diode forward voltage	V_{DF}	—	–0.88	–1.15	V	IF = –4.8 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	35	—	ns	IF = –4.8 A, V_{GS} = 0 diF/ dt =100A/μs

Notes: 4. Pulse test

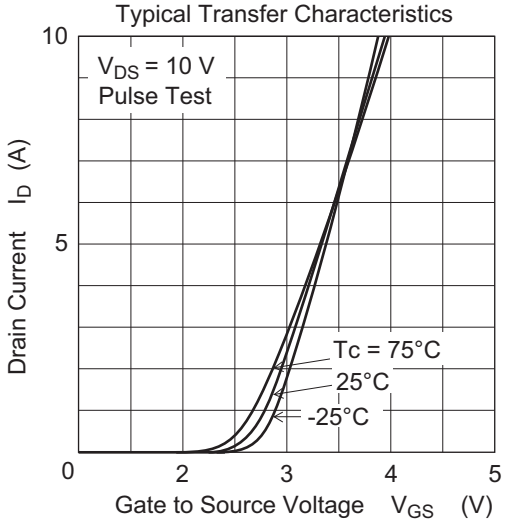
Main Characteristics

• N Channel

Maximum Safe Operation Area

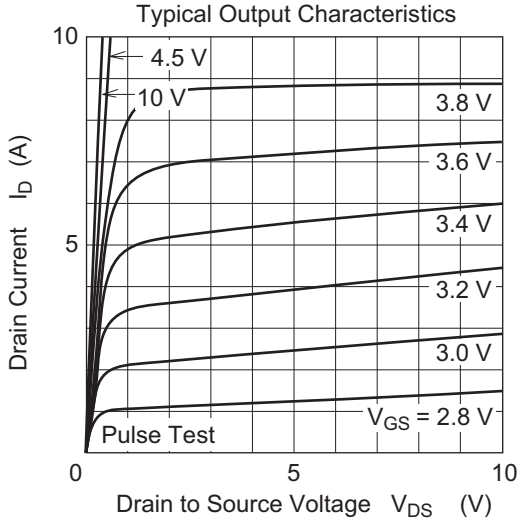


Typical Transfer Characteristics

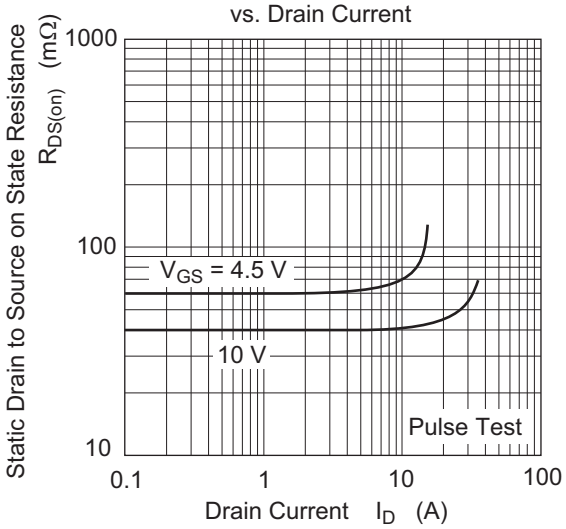


Note 5 :
When using the glass epoxy board (FR4 40x40x1.6 mm)

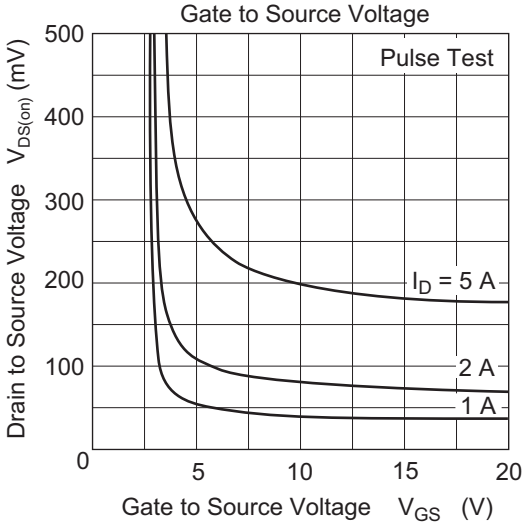
Typical Output Characteristics



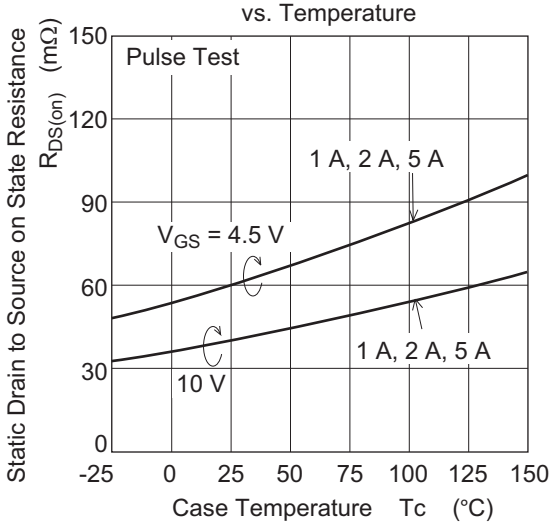
Static Drain to Source on State Resistance vs. Drain Current



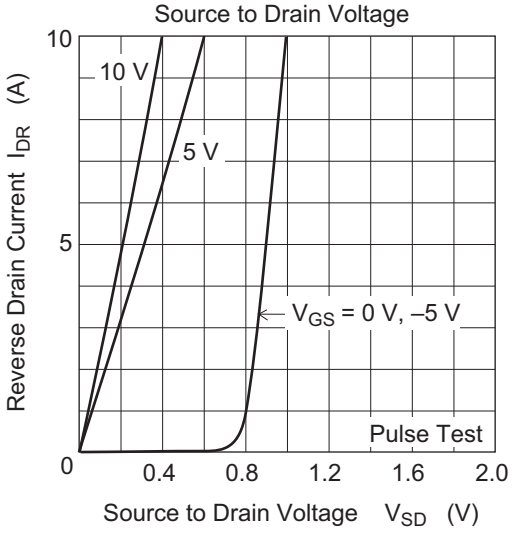
Drain to Source Saturation Voltage vs Gate to Source Voltage



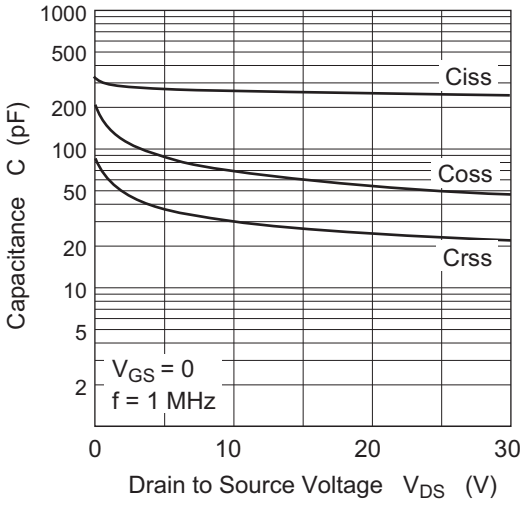
Static Drain to Source on State Resistance vs. Temperature



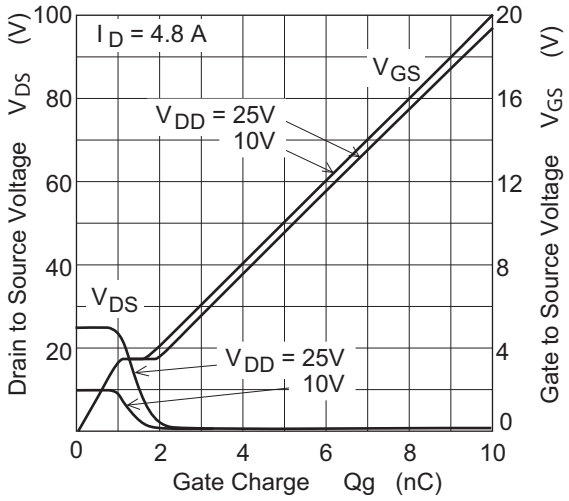
Reverse Drain Current vs.
Source to Drain Voltage



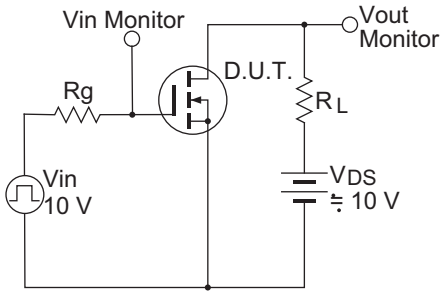
Typical Capacitance vs.
Drain to Source Voltage



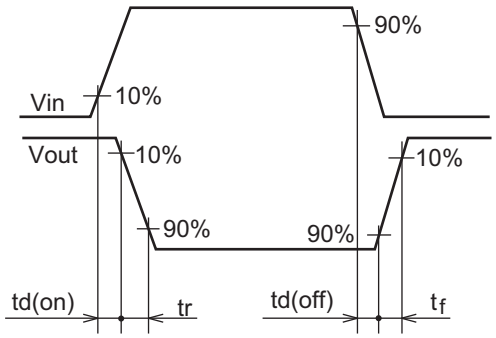
Dynamic Input Characteristics



Switching Time Test Circuit

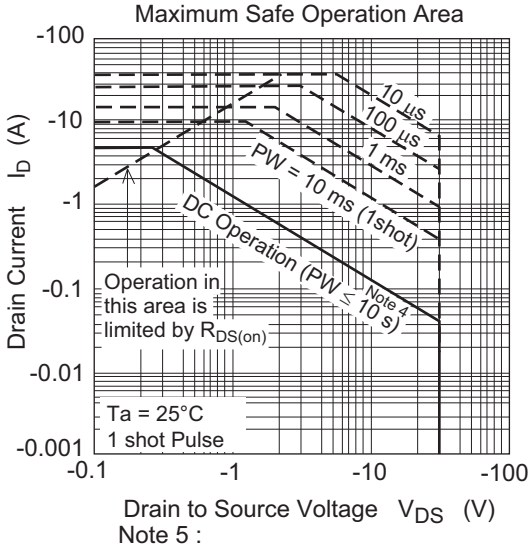


Switching Time Waveform



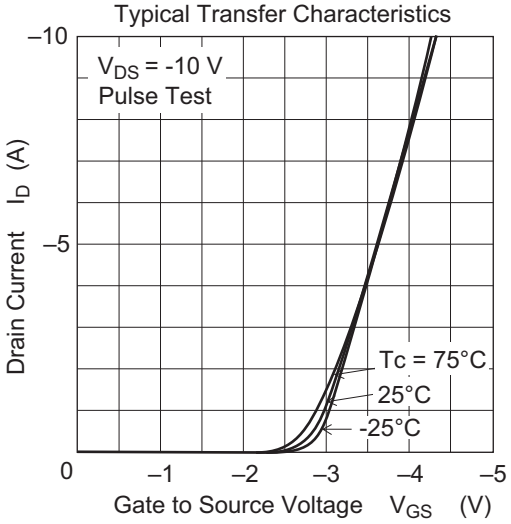
• **P Channel**

Maximum Safe Operation Area

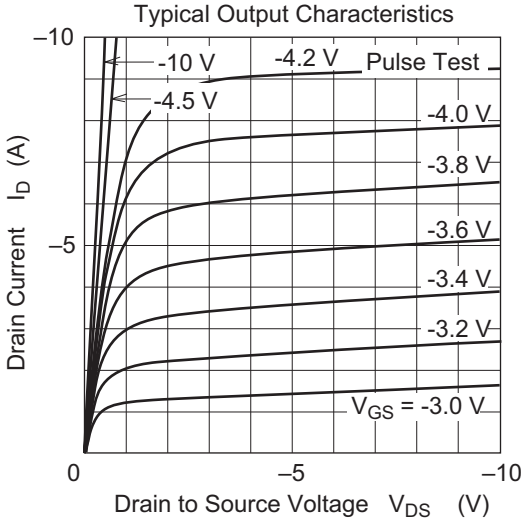


Note 5 :
When using the glass epoxy board (FR4 40x40x1.6 mm)

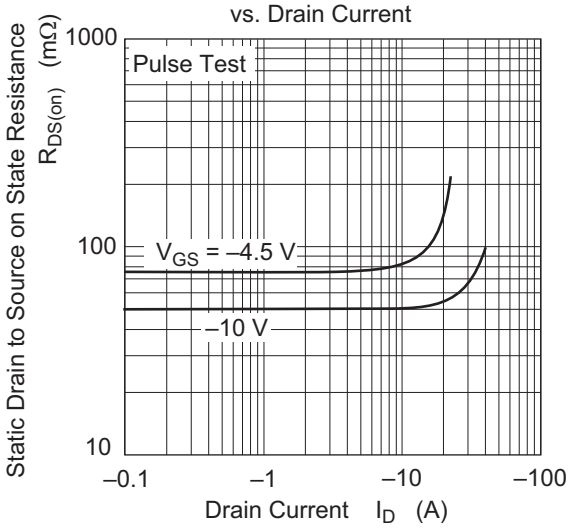
Typical Transfer Characteristics



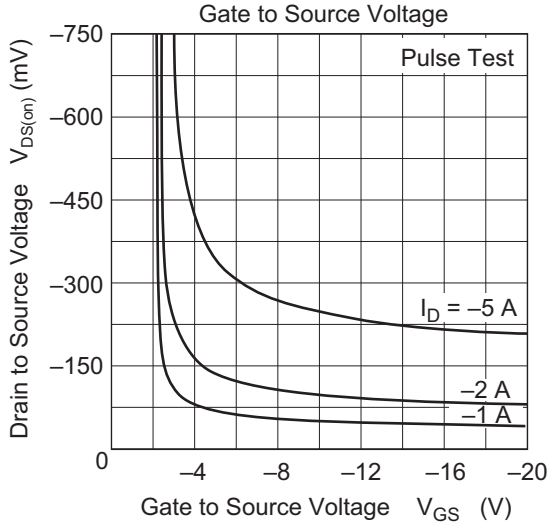
Typical Output Characteristics



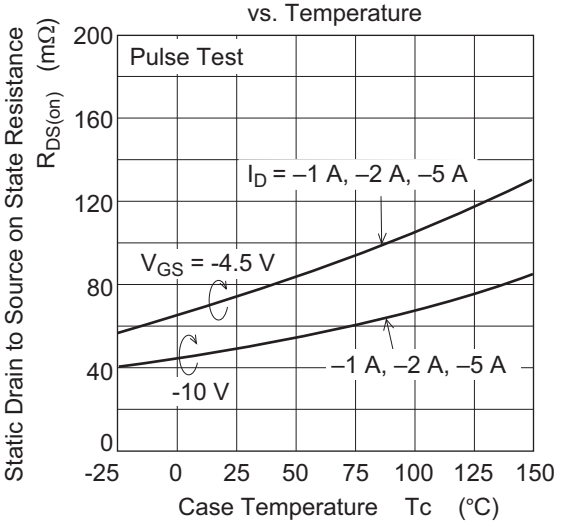
Static Drain to Source on State Resistance vs. Drain Current



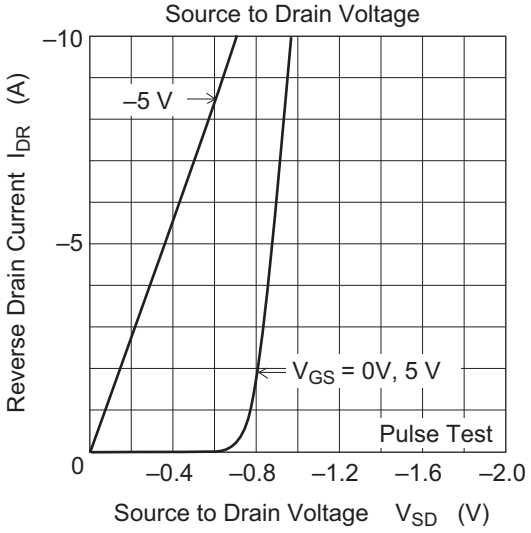
Drain to Source Saturation Voltage vs Gate to Source Voltage



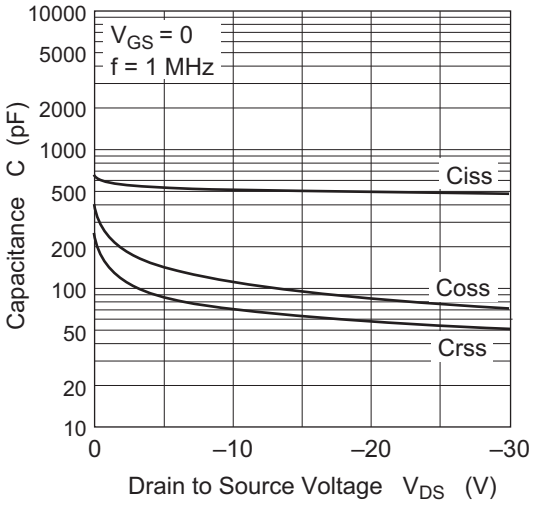
Static Drain to Source on State Resistance vs. Temperature



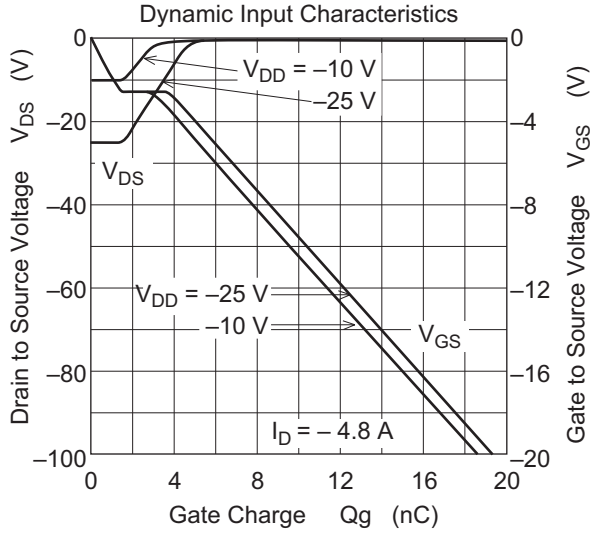
Reverse Drain Current vs.
Source to Drain Voltage



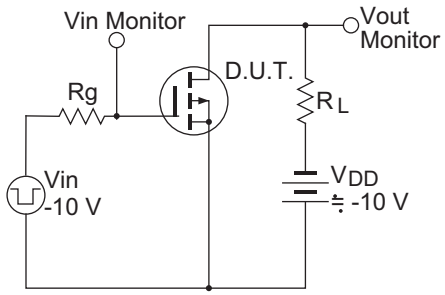
Typical Capacitance vs.
Drain to Source Voltage



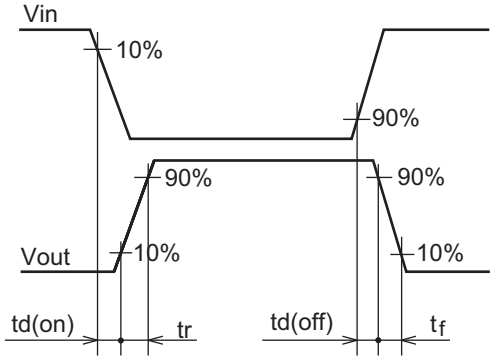
Dynamic Input Characteristics



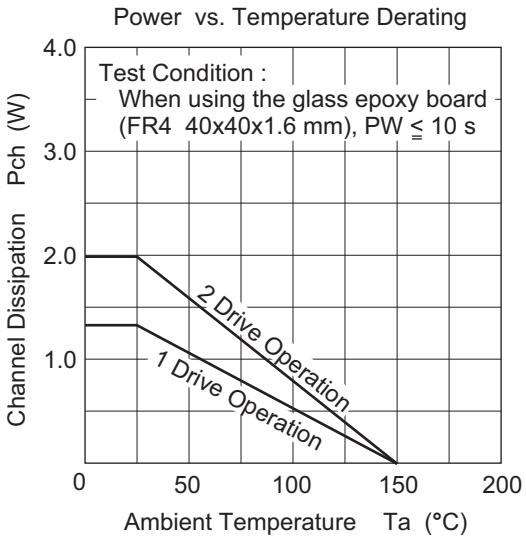
Switching Time Test Circuit

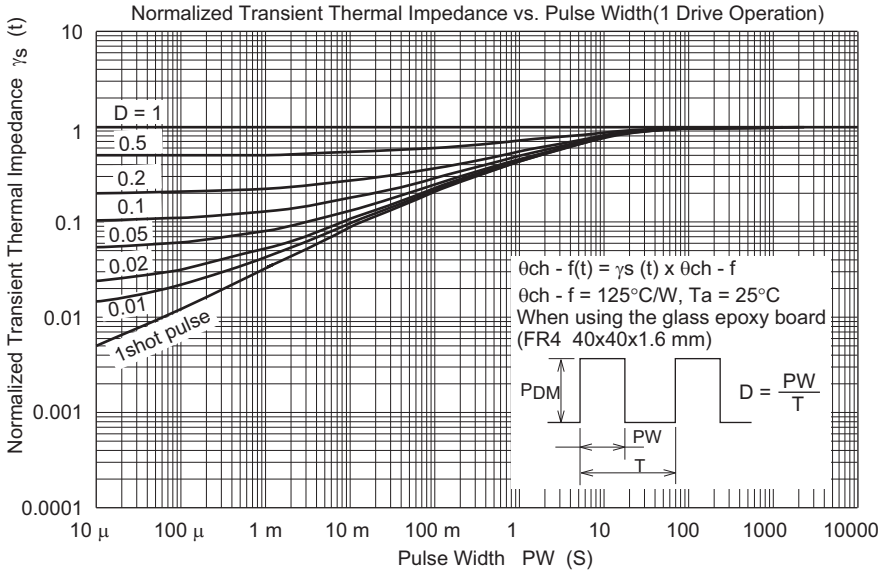


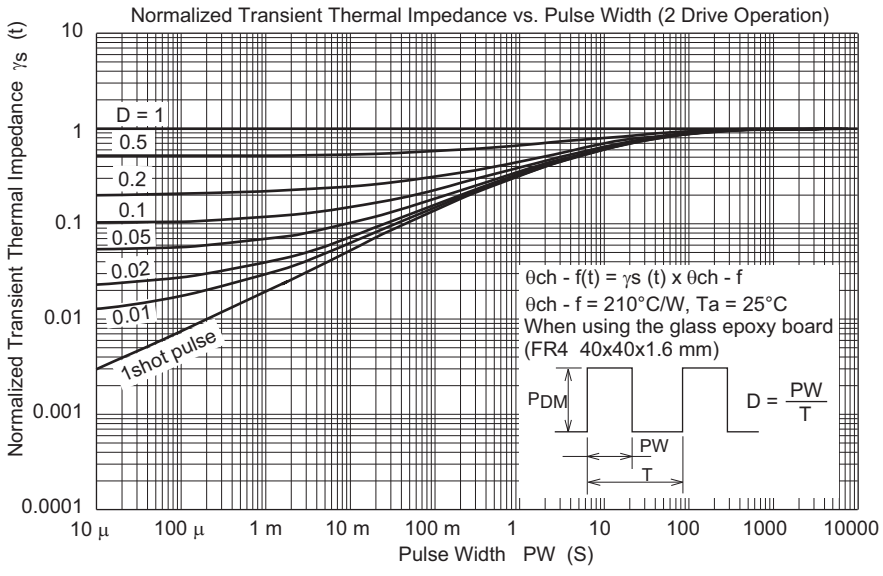
Switching Time Waveform



• **Common**

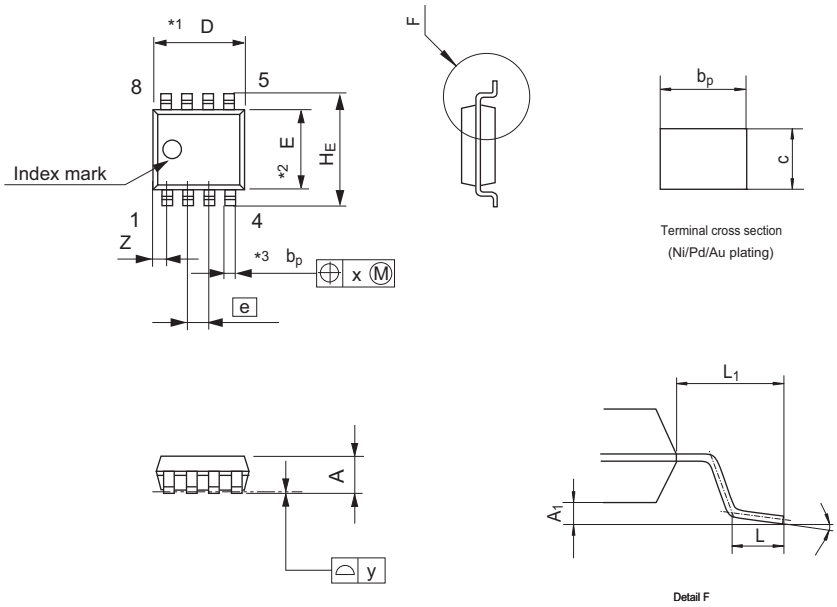

Power vs. Temperature Derating
Test Condition :
When using the glass epoxy board
(FR4 40x40x1.6 mm), PW ≦ 10 s
Channel Dissipation Pch (W)
4.0
3.0
2.0
1.0
0
50
100
150
200
2 Drive Operation
1 Drive Operation
Ambient Temperature Ta (°C)


Normalized Transient Thermal Impedance vs. Pulse Width(1 Drive Operation)
Normalized Transient Thermal Impedance γs (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) = γs (t) x θch - f
θch - f = 125°C/W, Ta = 25°C
When using the glass epoxy board
(FR4 40x40x1.6 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 γs (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) = γs (t) x θch - f
θch - f = 210°C/W, Ta = 25°C
When using the glass epoxy board
(FR4 40x40x1.6 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



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

Orderable Part Number	Quantity	Shipping Container
HAT3036R-EL-E	2500 pcs	Taping

Note: For some grades, production may be terminated. Please contact the Renesas sales Office to check the state of production before ordering the product.

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2. Quality grade
   - The quality grade of this product is “Standard”.
   - If you plan to use this product to “High quality” application, please inform to Renesas.
   - Fail safe system is necessary to prevent malfunction even if this product is broken.

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