RJK0223DNS

Silicon N Channel Power MOS FET with Schottky Barrier Diode
High Speed Power Switching

R07DS0126EJ0110
Rev1.10
May 16, 2012

Application

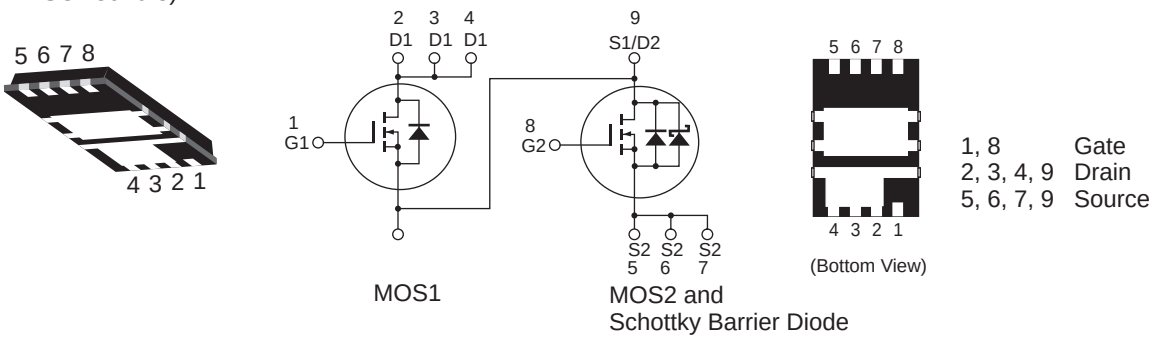
DC-DC conversion for PC and Server.

Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting
- Pb-free
- Halogen-free

Outline

RENESAS Package code: PWSN0008JD-A
(Package: HWSON3046-8)



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		MOS1	MOS2	
Drain to source voltage	V_{DSS}	25	25	V
Gate to source voltage	V_{GSS}	±20	±20	V
Drain current	I_D	14	16	A
Drain peak current	$I_{D(pulse)}$ Note1	56	64	A
Reverse drain current	I_{DR}	14	16	A
Avalanche current	I_{AP} Note 2	5	8.5	A
Avalanche energy	E_{AS} Note 2	3.1	9.0	mJ
Channel dissipation	Pch Note3	8	10	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	–55 to +150	–55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. Value at Tch = 25°C, Rg ≥ 50 Ω
3. Tc = 25°C

Electrical Characteristics

• MOS1

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	25	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source leak current	I_{GSS}	—	—	±0.1	μA	V_{GS} = ±20 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	1	μA	V_{DS} = 25 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.2	—	2.5	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	7.6	9.2	mΩ	I_D = 7 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	10.5	13.7	mΩ	I_D = 7 A, V_{GS} = 4.5 V Note4
Forward transfer admittance	$\|y_{fs}\|$	—	30	—	S	I_D = 7 A, V_{DS} = 5 V Note4
Input capacitance	Ciss	—	810	1130	pF	V_{DS} = 10 V
Output capacitance	Coss	—	130	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	74	—	pF	f = 1MHz
Gate Resistance	Rg	—	1.2	2.4	Ω	
Total gate charge	Qg	—	6.2	—	nC	V_{DD} = 10 V
Gate to source charge	Qgs	—	2.8	—	nC	V_{GS} = 4.5 V
Gate to drain charge	Qgd	—	1.9	—	nC	I_D = 14 A
Turn-on delay time	$t_{d(on)}$	—	7	—	ns	V_{GS} =10 V, I_D = 7 A
Rise time	t_r	—	4.1	—	ns	V_{DD} ≈ 10 V
Turn-off delay time	$t_{d(off)}$	—	33	—	ns	R_L = 1.42 Ω
Fall time	t_f	—	5.1	—	ns	R_g = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	0.84	1.10	V	IF = 14 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	20	—	ns	IF =14 A, V_{GS} = 0 di_F/ dt = 100 A/μs

Notes: 4. Pulse test

• MOS2

(Ta = 25°C)

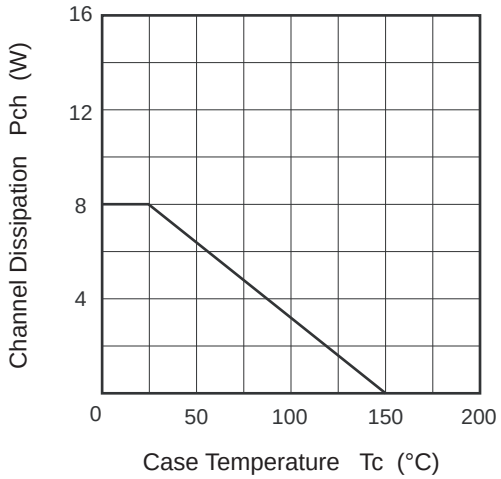
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	25	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source leak current	I_{GSS}	—	—	±0.1	μA	V_{GS} = ±20 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	1	mA	V_{DS} = 25 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.2	—	2.5	V	V_{DS} = 10 V, I_D =1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	5.4	6.5	mΩ	I_D =8 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	7.8	10.1	mΩ	I_D = 8 A, V_{GS} = 4.5 V Note4
Forward transfer admittance	$\|y_{fs}\|$	—	33	—	S	I_D = 8 A, V_{DS} = 5 V Note4
Input capacitance	Ciss	—	1243	1740	pF	V_{DS} = 10 V
Output capacitance	Coss	—	234	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	116	—	pF	f = 1MHz
Gate Resistance	Rg	—	2.4	4.8	Ω	
Total gate charge	Qg	—	8.4	—	nC	V_{DD} = 10 V
Gate to source charge	Qgs	—	3.5	—	nC	V_{GS} = 4.5 V
Gate to drain charge	Qgd	—	1.7	—	nC	I_D = 16 A
Turn-on delay time	$t_{d(on)}$	—	9.6	—	ns	V_{GS} = 10 V, I_D = 8 A
Rise time	t_r	—	4.6	—	ns	V_{DD} ≈ 10 V
Turn-off delay time	$t_{d(off)}$	—	40	—	ns	R_L = 1.25 Ω
Fall time	t_f	—	6.8	—	ns	R_g = 4.7 Ω
Schottky Barrier diode forward voltage	V_F	—	0.41	—	V	IF = 2 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	28	—	ns	IF = 16 A, V_{GS} = 0 di_F/ dt = 100 A/μs

Notes: 4. Pulse

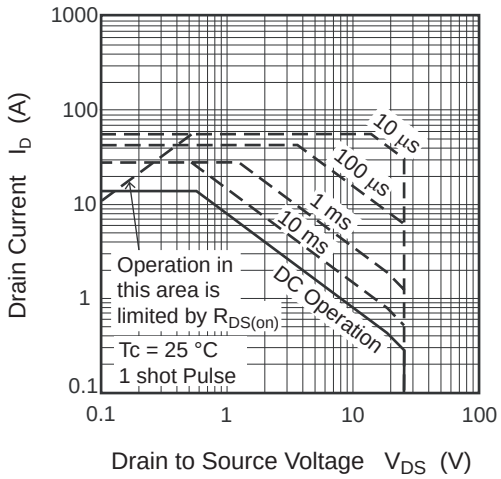
Main Characteristics

• MOS1

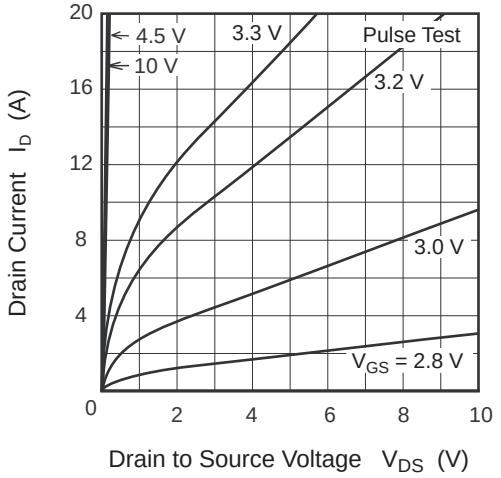
Power vs. Temperature Derating



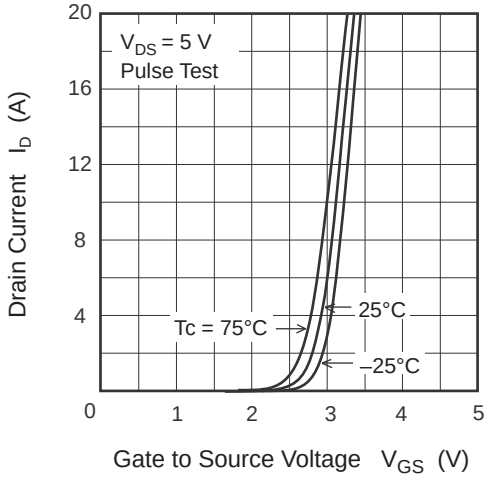
Maximum Safe Operation Area



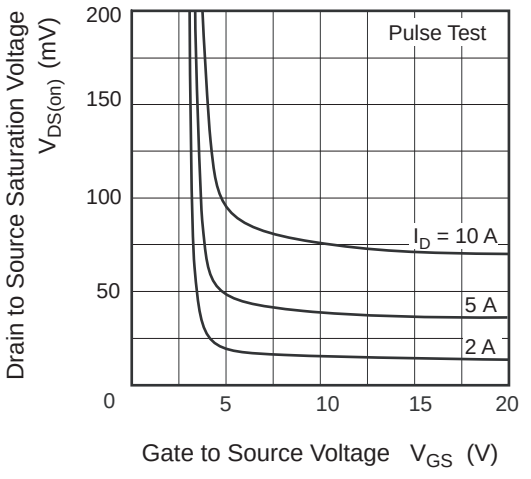
Typical Output Characteristics



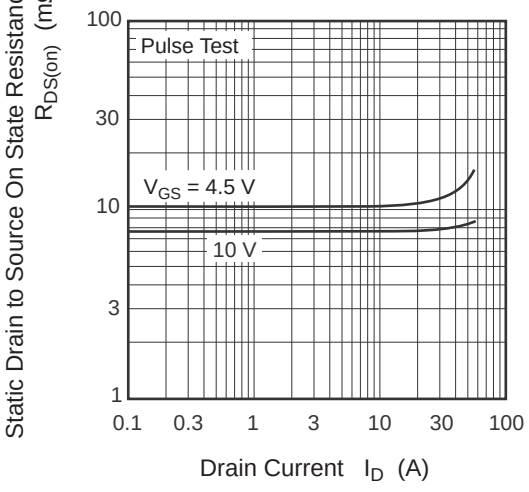
Typical Transfer Characteristics



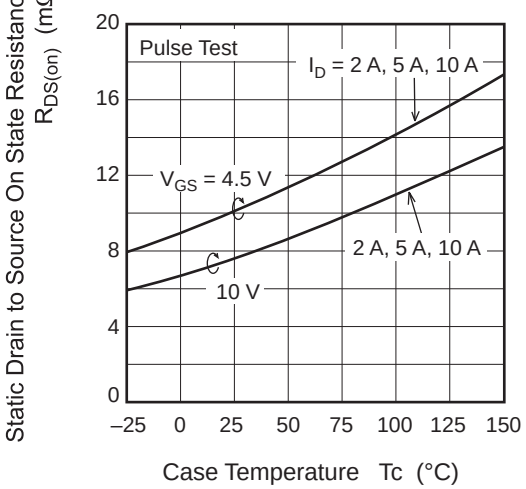
Drain to Source Saturation Voltage vs. Gate to Source Voltage



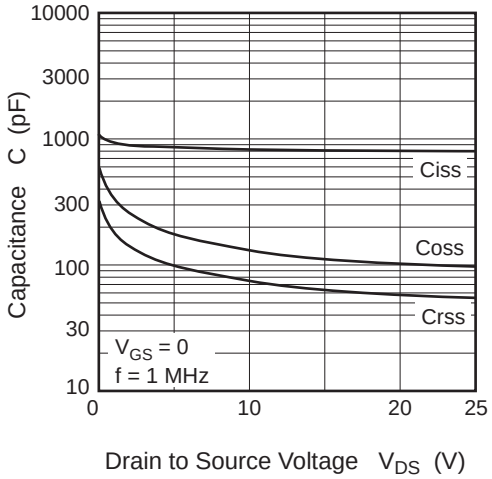
Static Drain to Source On State Resistance vs. Drain Current



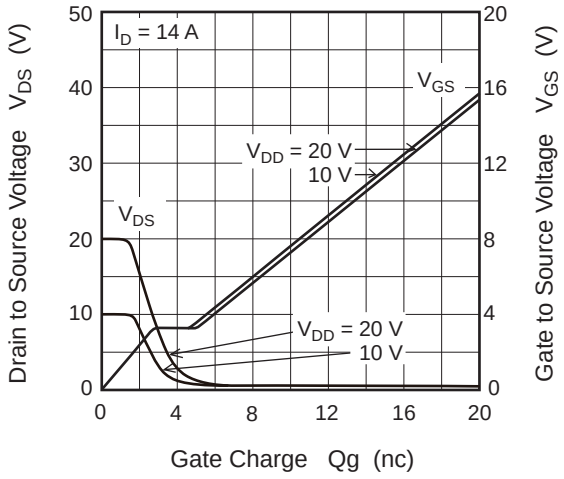
Static Drain to Source On State Resistance vs. Temperature



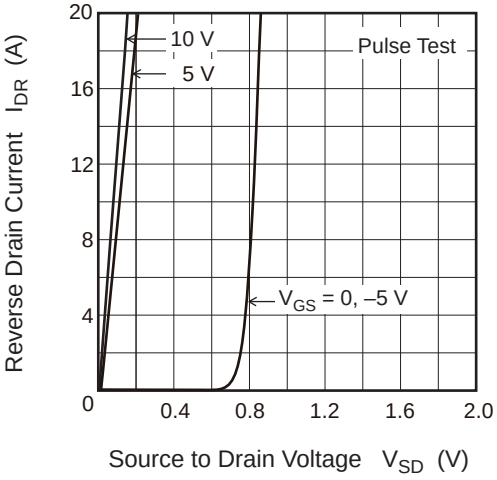
Typical Capacitance vs. Drain to Source Voltage



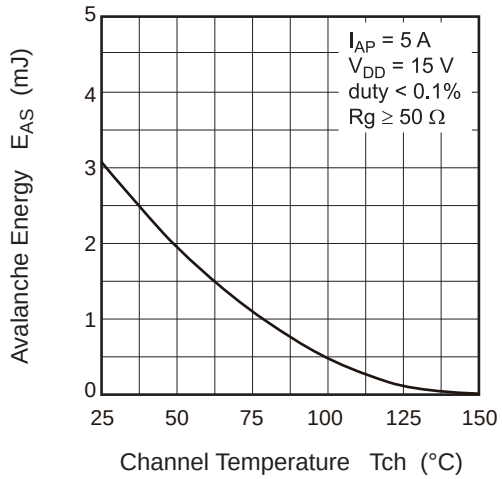
Dynamic Input Characteristics



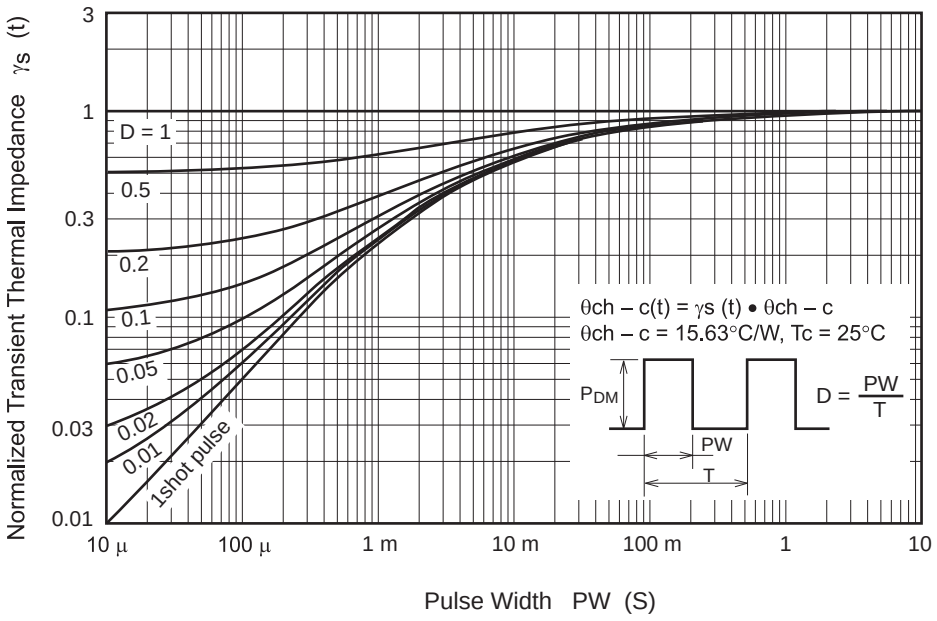
Reverse Drain Current vs. Source to Drain Voltage



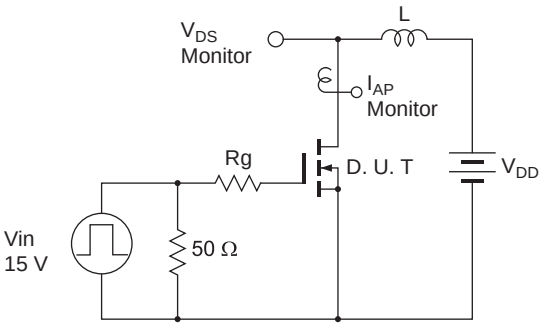
Maximum Avalanche Energy vs. Channel Temperature Derating



Normalized Transient Thermal Impedance vs. Pulse Width

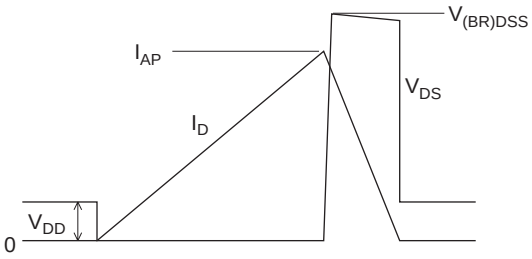


Avalanche Test Circuit

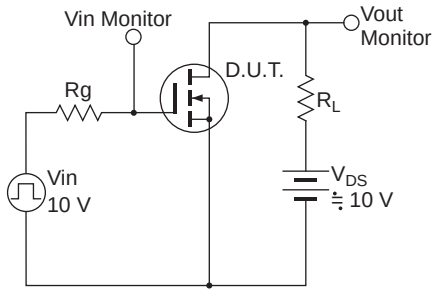


Avalanche Waveform

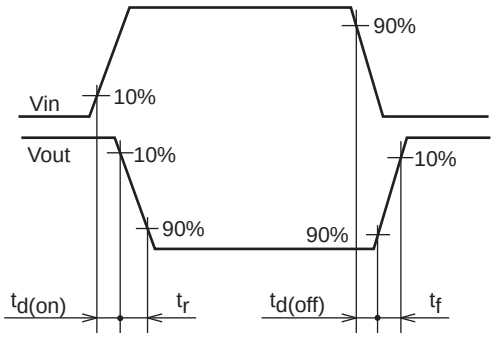
$$E_{AS} = \frac{1}{2} L \bullet I_{AP}^2 \bullet \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

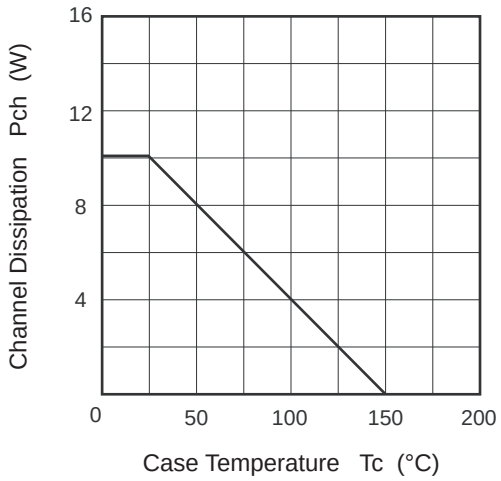


Switching Time Waveform

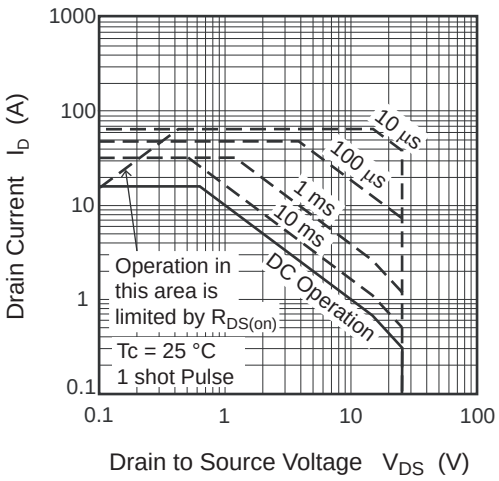


• MOS2 and Schottky Barrier Diode

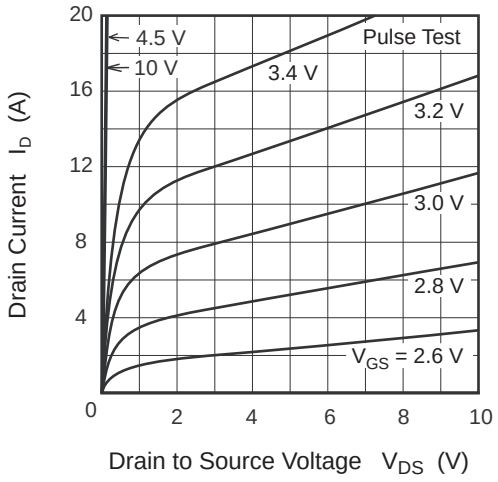
Power vs. Temperature Derating



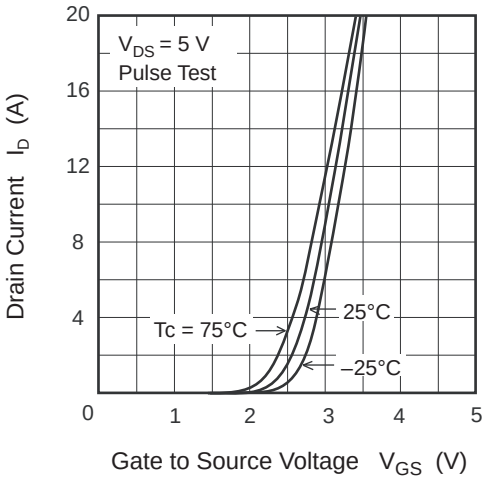
Maximum Safe Operation Area



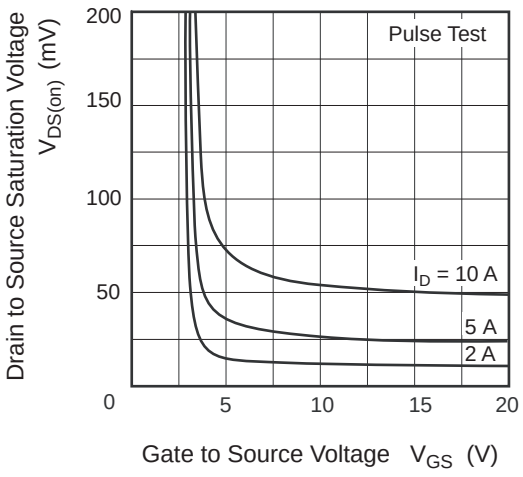
Typical Output Characteristics



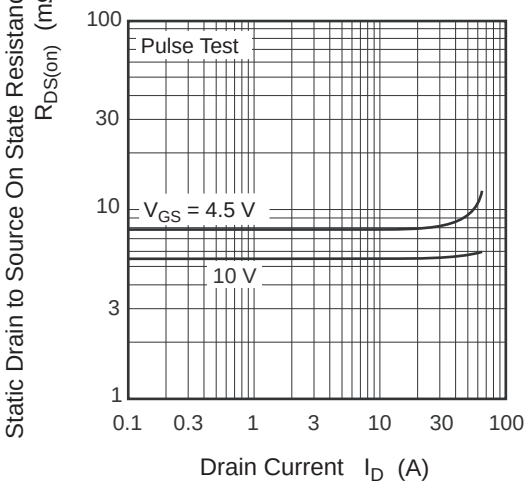
Typical Transfer Characteristics



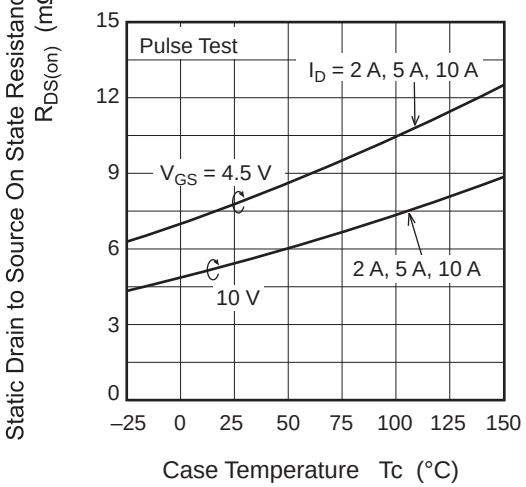
Drain to Source Saturation Voltage vs. Gate to Source Voltage



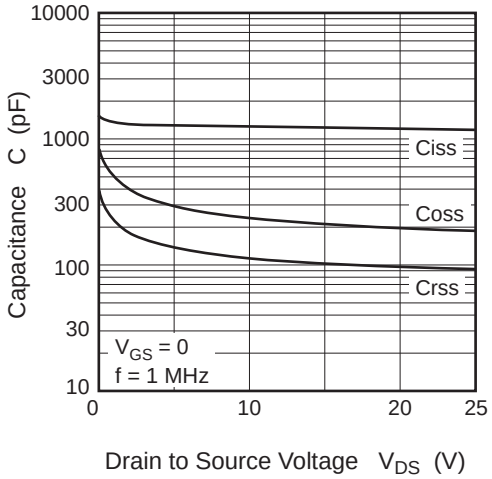
Static Drain to Source On State Resistance vs. Drain Current



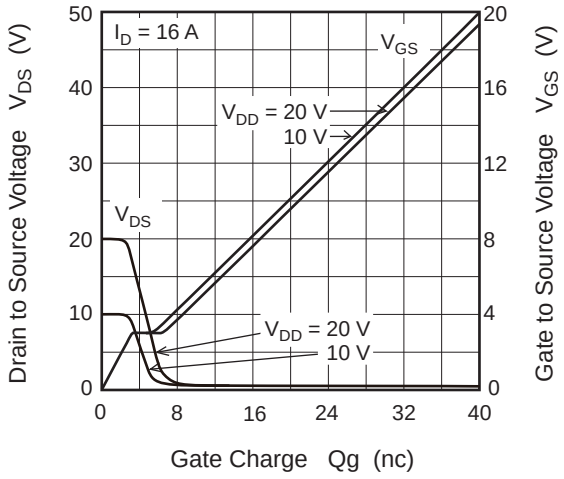
Static Drain to Source On State Resistance vs. Temperature



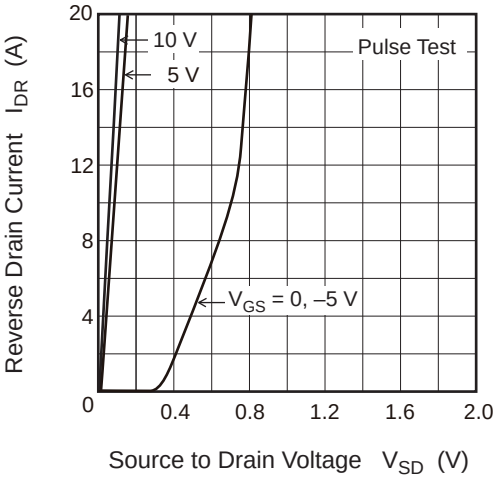
Typical Capacitance vs. Drain to Source Voltage



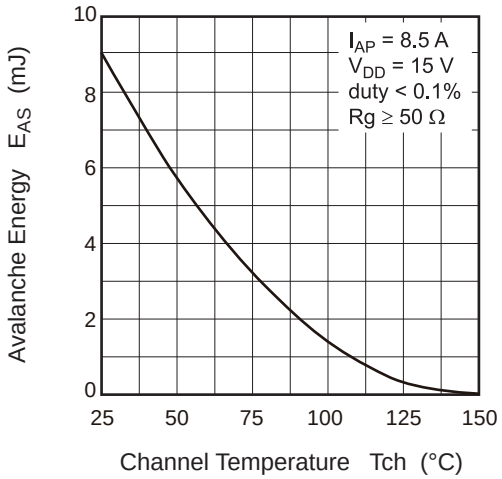
Dynamic Input Characteristics



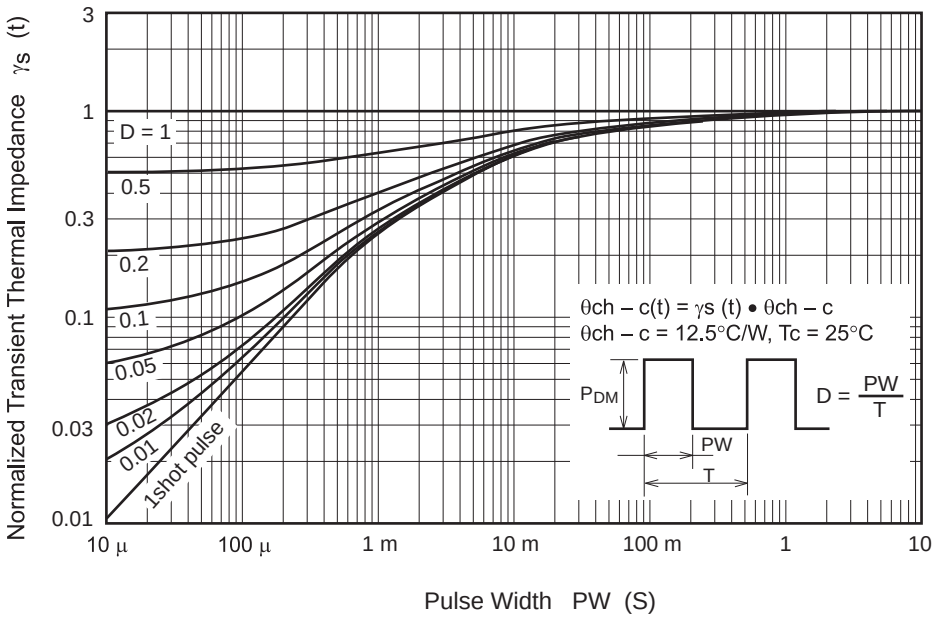
Reverse Drain Current vs. Source to Drain Voltage



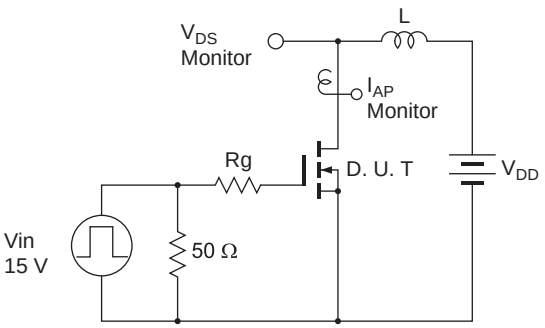
Maximum Avalanche Energy vs. Channel Temperature Derating



Normalized Transient Thermal Impedance vs. Pulse Width

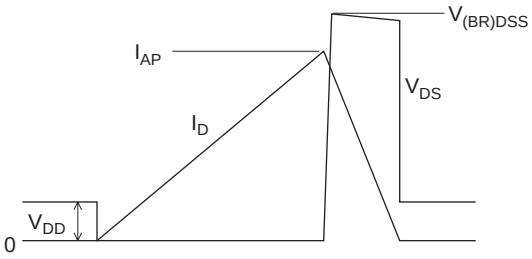


Avalanche Test Circuit

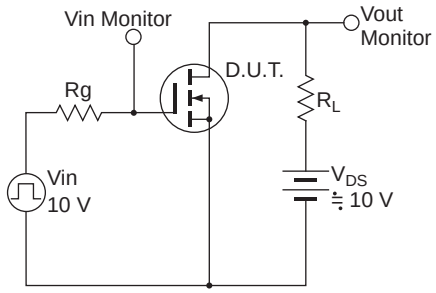


Avalanche Waveform

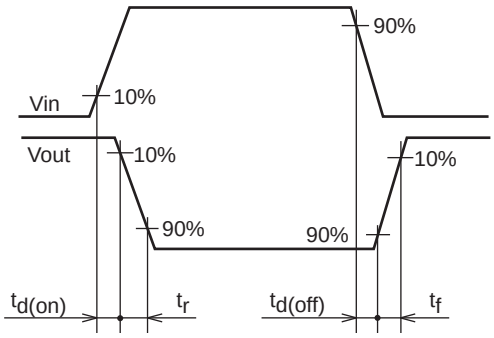
$$E_{AS} = \frac{1}{2} L \bullet I_{AP}^2 \bullet \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit



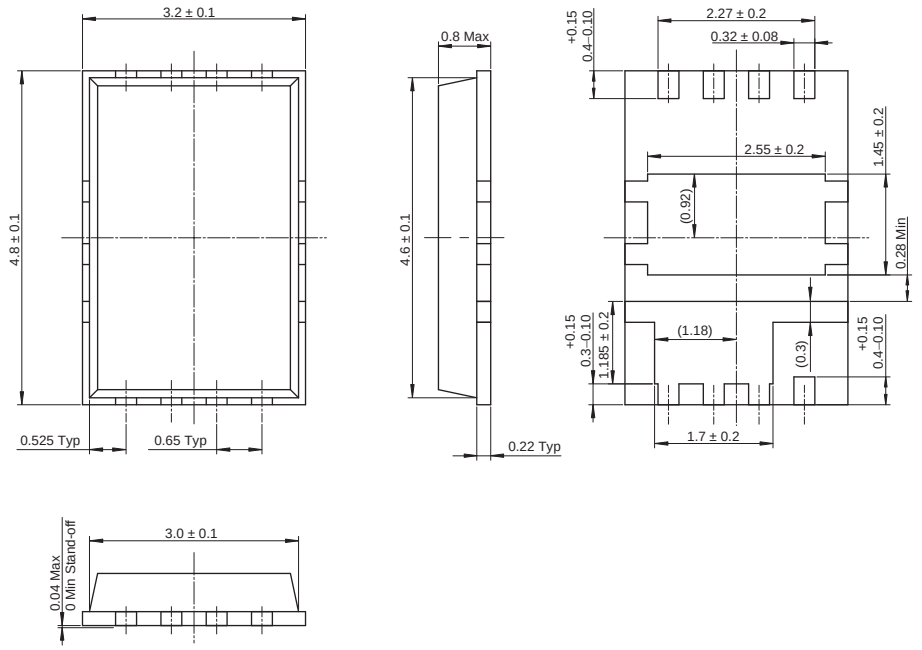
Switching Time Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
HWSON-8	—	PWSN0008JD-A	HWSON3046-8	0.032g

Unit: mm



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJK0223DNS-00-J5	5000 pcs	Taping

Note: The symbol of 2nd "-" is occasionally presented as "#".

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