

RJF0604DPD

Silicon N Channel MOS FET Series Power Switching

R07DS0713EJ0100
Rev.1.00
Apr 17, 2012

Description

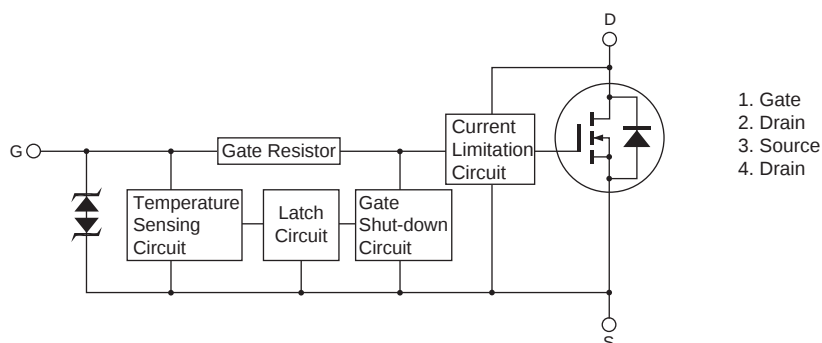
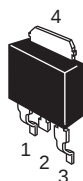
This FET has the over temperature shut-down capability sensing to the junction temperature. This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption, over current etc..

Features

- Logic level operation (4 V Gate drive).
- Built-in the over temperature shut-down circuit.
- High endurance capability against to the short circuit.
- Latch type shut down operation (need 0 voltage recovery).
- Built-in the current limitation circuit.
- Power supply voltage applies 12 V and 24 V.
- For Industrial applications

Outline

RENESAS Package code: PRSS0004ZD-C
(Package name: DPAK (S))



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	16	V
Gate to source voltage	V_{GSS}	-2.5	V
Drain current	I_D ^{Note 3}	5	A
Body-drain diode reverse drain current	I_{DR}	5	A
Avalanche current	I_{AP} ^{Note 2}	4.7	A
Avalanche energy	E_{AR} ^{Note 2}	94.7	mJ
Channel dissipation	P_{ch} ^{Note 1}	30	W
Channel temperature	T_{ch}	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

Notes: 1. Value at $T_c = 25^\circ\text{C}$
 2. $T_{ch} = 25^\circ\text{C}$, $R_g \geq 50 \Omega$
 3. It provides by the current limitation lower bound value.

Typical Operation Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	3.5	—	—	V	
	V_{IL}	—	—	1.2	V	
Input current (Gate non shut down)	I_{IH1}	—	—	100	μA	$V_i = 8 V, V_{DS} = 0$
	I_{IH2}	—	—	50	μA	$V_i = 3.5 V, V_{DS} = 0$
	I_{IL}	—	—	1	μA	$V_i = 1.2 V, V_{DS} = 0$
Input current (Gate shut down)	$I_{IH(sd)1}$	—	0.8	—	mA	$V_i = 8 V, V_{DS} = 0$
	$I_{IH(sd)2}$	—	0.35	—	mA	$V_i = 3.5 V, V_{DS} = 0$
Shut down temperature	Tsd	—	175	—	°C	Channel temperature
Gate operation voltage	Vop	3.5	—	12	V	
Drain current (Current limitation value)	$I_{D \text{ limit}}$	5	—	—	A	$V_{GS} = 5 V, V_{DS} = 10 V$ ^{Note 4}

Note; 4. Pulse test

Electrical Characteristics

(Ta = 25°C)

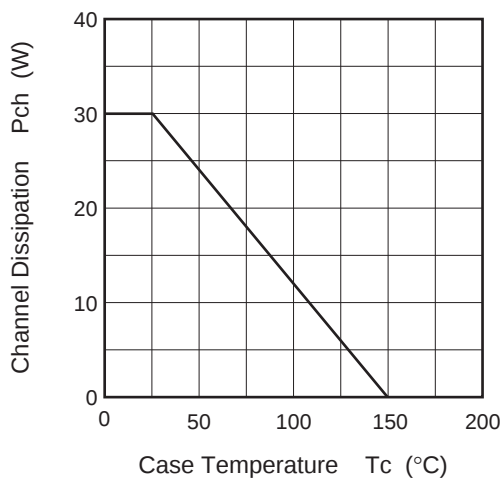
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	—	—	17	A	$V_{GS} = 3.5 V, V_{DS} = 10 V$ ^{Note 5}
	I_{D2}	—	—	10	mA	$V_{GS} = 1.2 V, V_{DS} = 10 V$
	I_{D3}	5	—	—	A	$V_{GS} = 5 V, V_{DS} = 10 V$ ^{Note 5}
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10 \text{ mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	$I_G = 800 \mu A, V_{DS} = 0$
	$V_{(BR)GSS}$	-2.5	—	—	V	$I_G = -100 \mu A, V_{DS} = 0$
Gate to source leak current	I_{GSS1}	—	—	100	μA	$V_{GS} = 8 V, V_{DS} = 0$
	I_{GSS2}	—	—	50	μA	$V_{GS} = 3.5 V, V_{DS} = 0$
	I_{GSS3}	—	—	1	μA	$V_{GS} = 1.2 V, V_{DS} = 0$
	I_{GSS4}	—	—	-100	μA	$V_{GS} = -2.4 V, V_{DS} = 0$
Input current (shut down)	$I_{GS(OP)1}$	—	0.8	—	mA	$V_{GS} = 8 V, V_{DS} = 0$
	$I_{GS(OP)2}$	—	0.35	—	mA	$V_{GS} = 3.5 V, V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	10	μA	$V_{DS} = 32 V, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.1	—	2.1	V	$V_{DS} = 10 V, I_D = 1 \text{ mA}$
Forward transfer admittance	$ y_{fs} $	4	9	—	S	$I_D = 2.5 \text{ A}, V_{DS} = 10 V$ ^{Note 5}
Static drain to source on state resistance	$R_{DS(on)}$	—	58	100	m Ω	$I_D = 2.5 \text{ A}, V_{GS} = 4 V$ ^{Note 5}
	$R_{DS(on)}$	—	42	75	m Ω	$I_D = 2.5 \text{ A}, V_{GS} = 10 V$ ^{Note 5}
Output capacitance	Coss	—	276	—	pF	$V_{DS} = 10 V, V_{GS} = 0, f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	1.6	—	μs	$V_{GS} = 10 V, I_D = 2.5 \text{ A}, R_L = 12 \Omega$
Rise time	t_r	—	4.7	—	μs	
Turn-off delay time	$t_{d(off)}$	—	3.7	—	μs	
Fall time	t_f	—	4.4	—	μs	
Body-drain diode forward voltage	V_{DF}	—	0.81	—	V	$I_F = 5 \text{ A}, V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	67	—	ns	$I_F = 5 \text{ A}, V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu s$
Over load shut down operation time ^{Note 6}	t_{os1}	—	3.4	—	ms	$V_{GS} = 5 V, V_{DD} = 16 V$
	t_{os2}	—	1.2	—	ms	$V_{GS} = 5 V, V_{DD} = 24 V$

Notes: 5. Pulse test

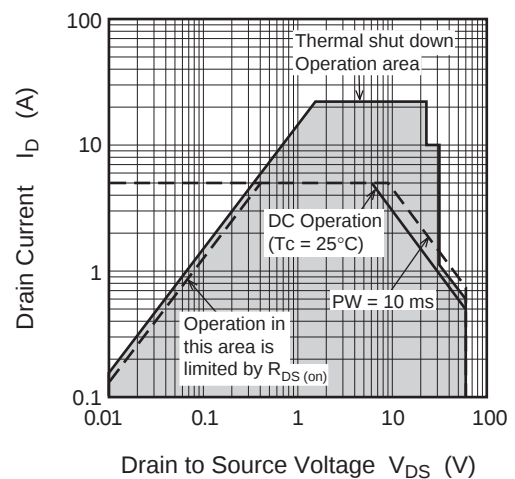
6. Including the junction temperature rise of the over loaded condition.

Main Characteristics

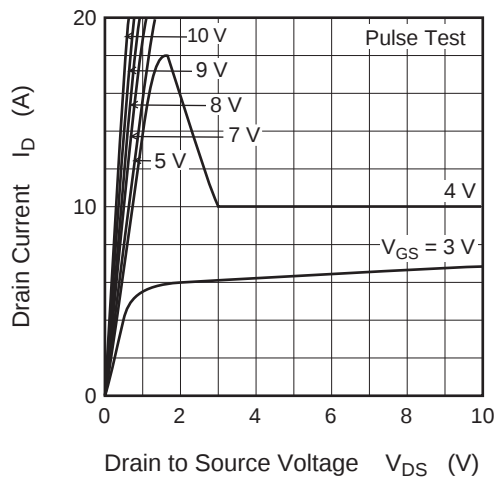
Power vs. Temperature Derating



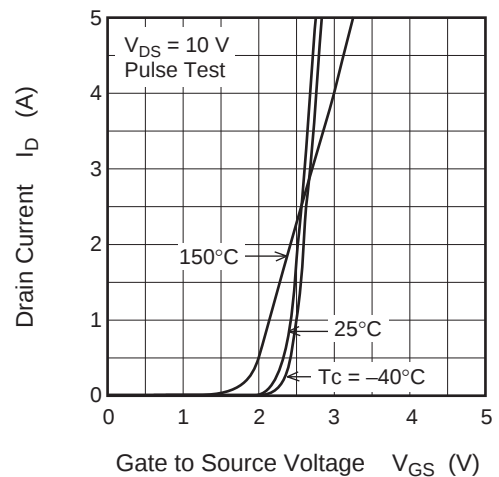
Maximum Safe Operation Area



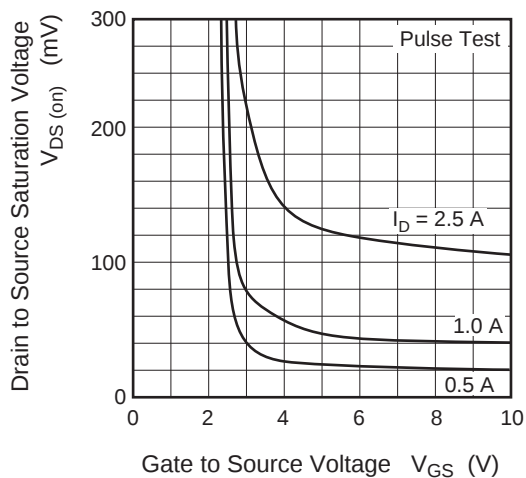
Typical Output Characteristics



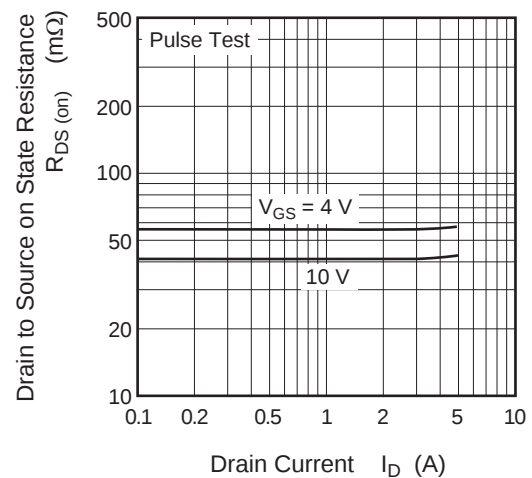
Typical Transfer Characteristics

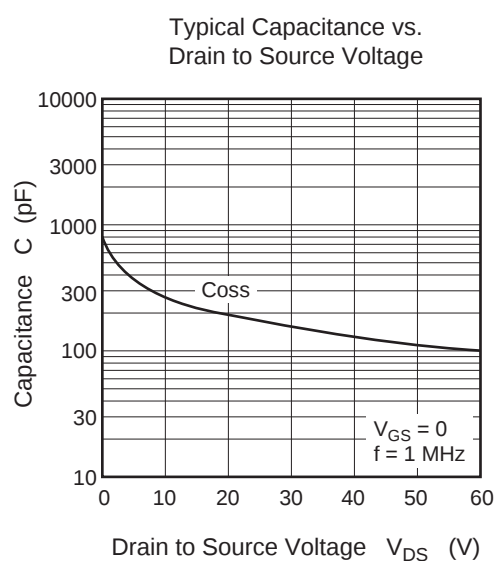
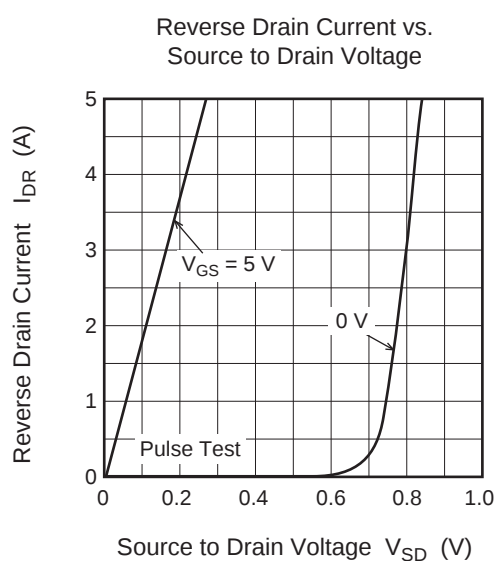
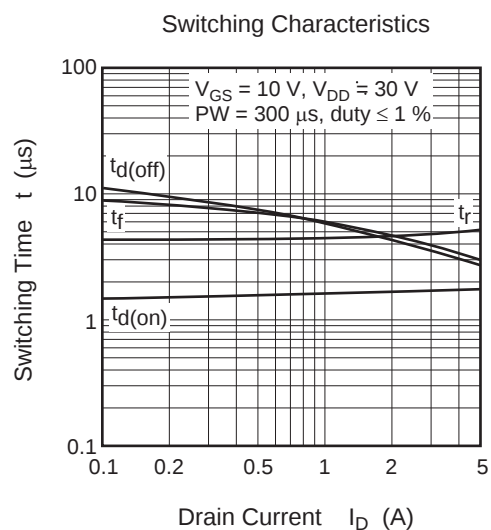
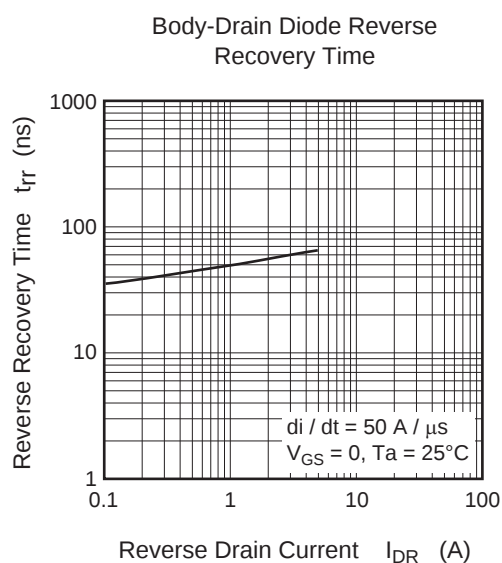
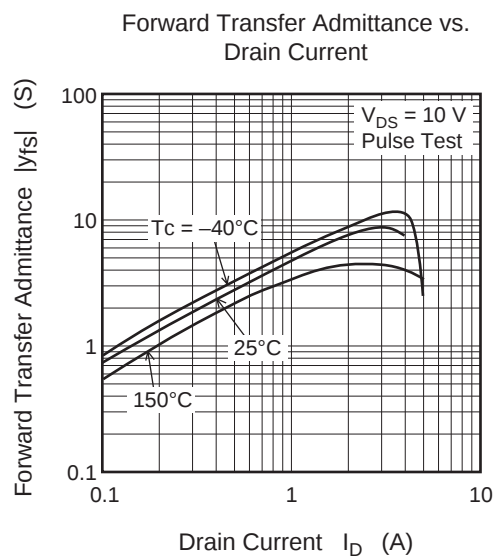
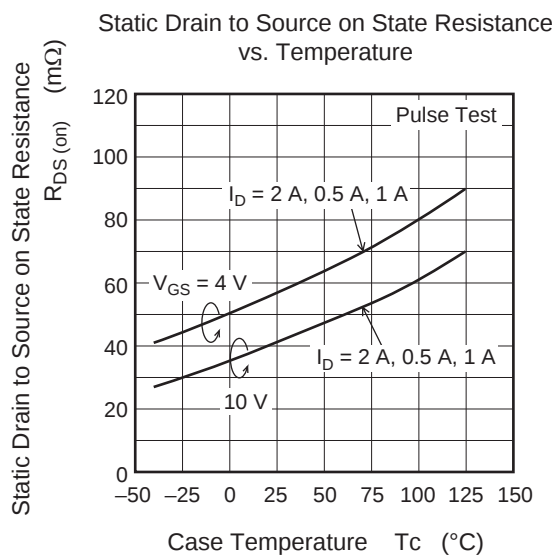


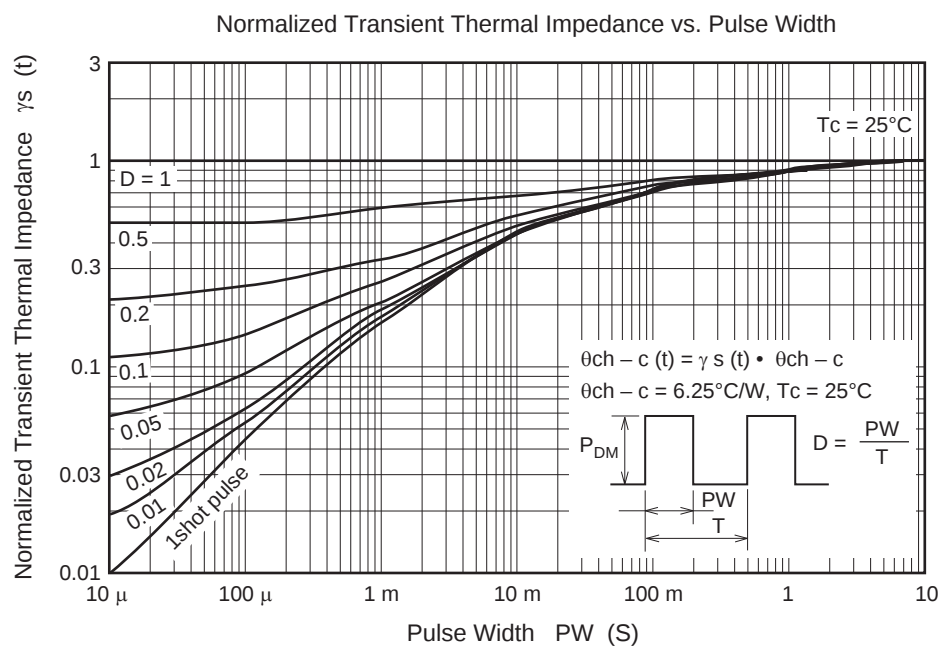
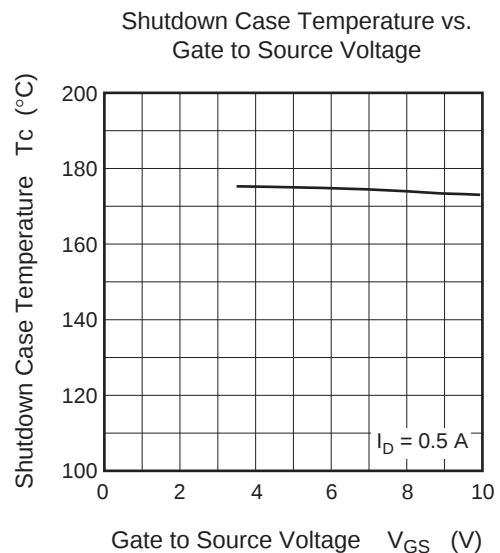
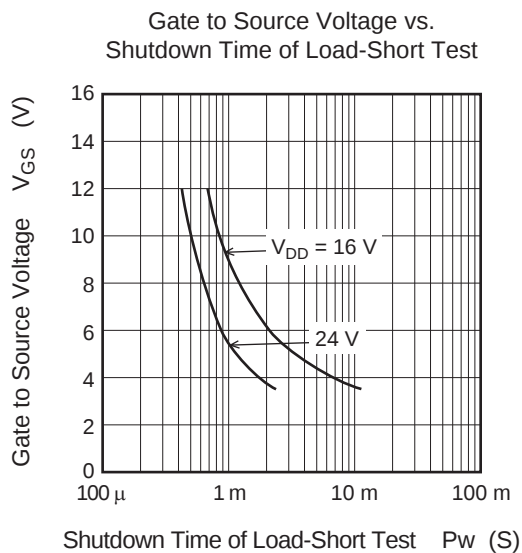
Drain to Source Saturation Voltage vs. Gate to Source Voltage



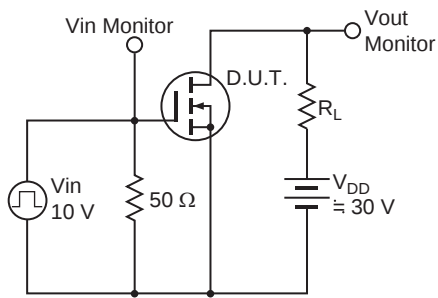
Static Drain to Source on State Resistance vs. Drain Current



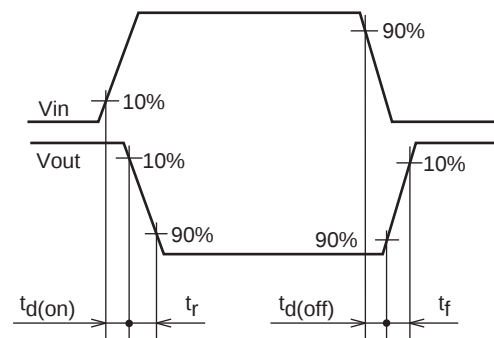




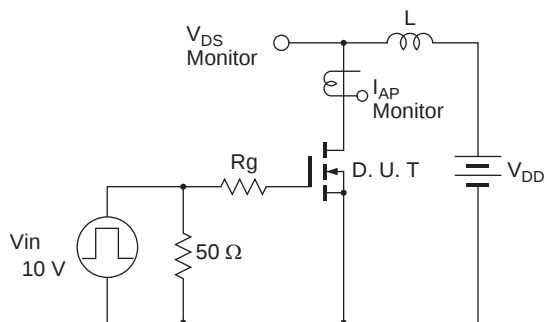
Switching Time Test Circuit



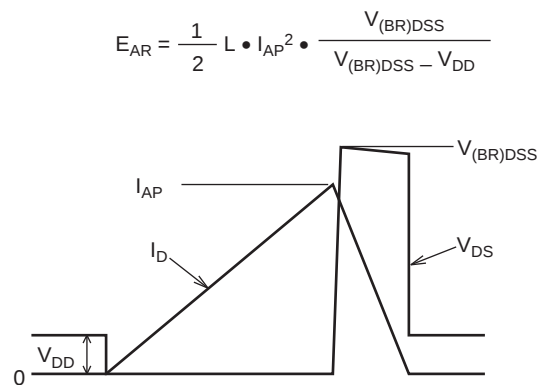
Waveform



Avalanche Test Circuit



Avalanche Waveform



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