RENESAS

Datasheet

RJF0605JPV

Silicon N Channel MOS FET Series
Power Switching

R07DS1386EJ0100
Rev.1.00
Apr 07, 2025

Description

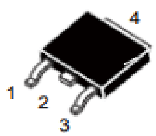
This FET has the over temperature shut-down capability sensing to the junction temperature. This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption,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

Features

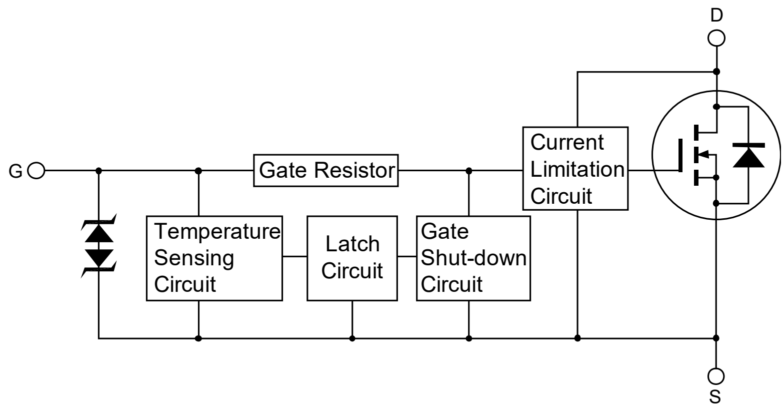
- Logic level operation (4 V Gate drive).
- Built-in the over temperature shut-down circuit.
- High endurance capability against to the short circuit.
- Latch type shut down operation (need 0 voltage recovery).
- Built-in the current limitation circuit.
- Power supply voltage applies 12 V and 24 V.
- AEC-Q101 Compliant

Outline

RENESAS Package code: PRSS0004ZV-A
(Package name: MP-3ZK)



1. Gate
2. Drain
3. Source
4. Fin (Drain)



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 Note3	20	A
Body-drain diode reverse drain current	I_{DR}	20	A
Avalanche current	I_{AP} Note 2	6.7	A
Avalanche energy	E_{AR} Note 2	192	mJ
Channel dissipation	Pch Note 1	40	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Notes: 1. Value at Tc = 25°C
2. Tch = 25°C, Rg ≥ 50 Ω
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	Vi = 8 V, V_{DS} = 0
	I_{IH2}	—	—	50	μA	Vi = 3.5 V, V_{DS} = 0
	I_{IL}	—	—	1	μA	Vi = 1.2 V, V_{DS} = 0
Input current (Gate shut down)	$I_{IH(sd)1}$	—	0.8	—	mA	Vi = 8 V, V_{DS} = 0
	$I_{IH(sd)2}$	—	0.35	—	mA	Vi = 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)	$I_{D\ limt}$	20	—	—	A	V_{GS} = 5 V, V_{DS} = 10 V Note 4

Note; 4 Pulse test

Electrical Characteristics

(Ta = 25°C)

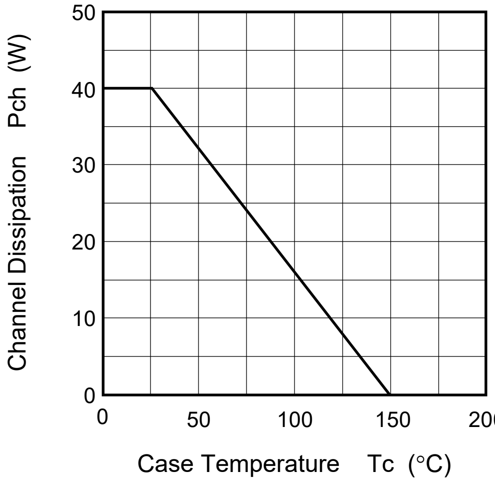
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	—	—	35	A	V_{GS} = 3.5 V, V_{DS} = 10 V Note 5
	I_{D2}	—	—	10	mA	V_{GS} = 1.2 V, V_{DS} = 10 V
	I_{D3}	20	—	—	A	V_{GS} = 5 V, V_{DS} = 10 V Note 5
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	I_G = 800 μA, V_{DS} = 0
	$V_{(BR)GSS}$	–2.5	—	—	V	I_G = –100 μA, 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}	—	—	1	μA	V_{DS} = 60 V, V_{GS} = 0,
Gate to source cutoff voltage	$V_{GS(off)}$	1.1	—	2.1	V	V_{DS} = 10 V, I_D = 1 mA
Forward transfer admittance	$\|y_{fs}\|$	12	21	—	S	I_D = 10 A, V_{DS} = 10 V Note 5
Static drain to source on state resistance	$R_{DS(on)}$	—	34	50	mΩ	I_D = 10 A, V_{GS} = 4 V Note 5
	$R_{DS(on)}$	—	24	38	mΩ	I_D = 10 A, V_{GS} = 10 V Note 5
Output capacitance	Coss	—	450	—	pF	V_{DS} = 10 V, V_{GS} = 0, f = 1MHz
Turn-on delay time	$t_{d(on)}$	—	3	—	μs	V_{GS} = 10 V, I_D= 10 A, R_L = 3 Ω
Rise time	t_r	—	10	—	μs	
Turn-off delay time	$t_{d(off)}$	—	4.4	—	μs	
Fall time	t_f	—	7.7	—	μs	
Body-drain diode forward voltage	V_{DF}	—	0.9	—	V	I_F = 20 A, V_{GS} = 0
Body-drain diode reverse recovery time Note 6	t_{rr}	—	85.3	—	ns	I_F = 20 A, V_{GS} = 0 di_F/dt = 50 A/μs
Over load shut down operation time Note 6	t_{os1}	—	0.3	—	ms	V_{GS} = 5 V, V_{DD} = 16 V
	t_{os2}	—	0.2	—	ms	V_{GS} = 5 V, V_{DD} = 24 V

Notes: 5. Pulse test

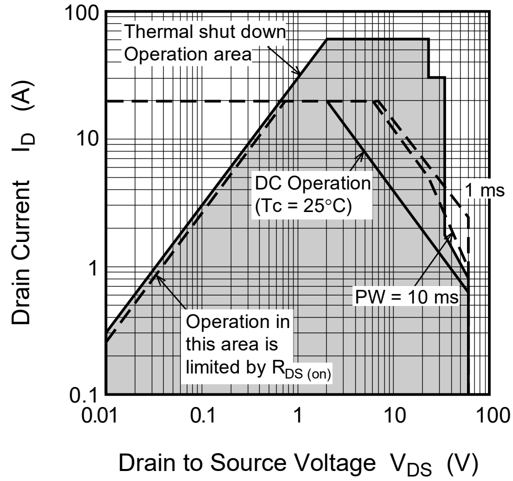
6. Including the junction temperature rise of the over loaded condition.

Main Characteristics

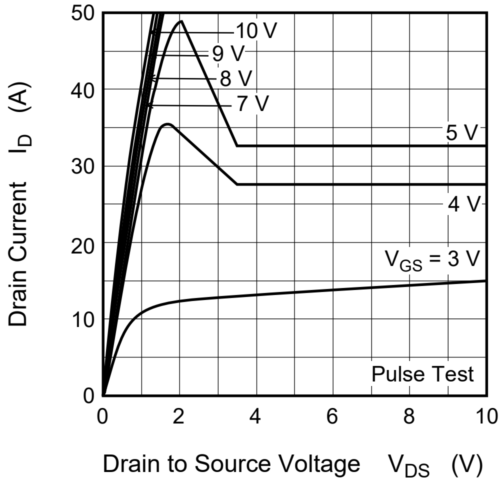
Power vs. Temperature Derating



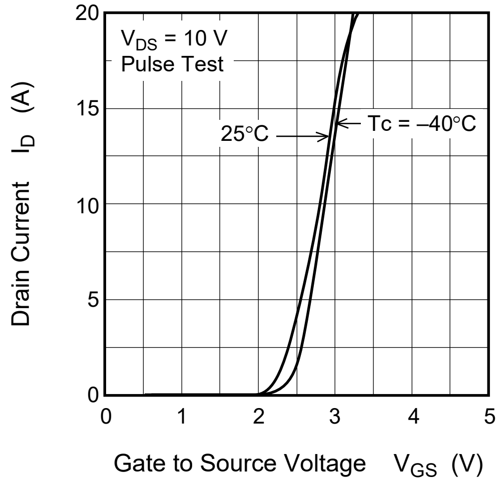
Maximum Safe Operation Area



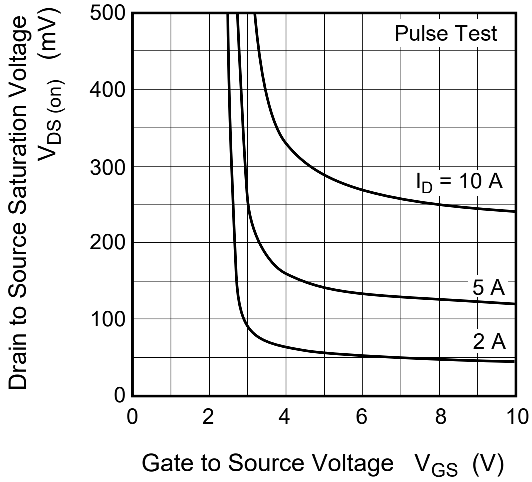
Typical Output Characteristics



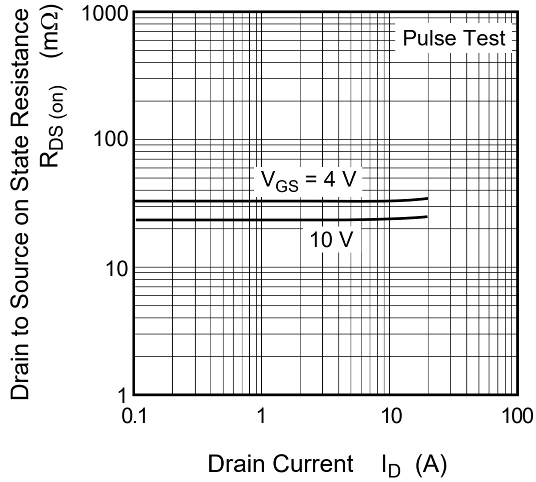
Typical Transfer Characteristics



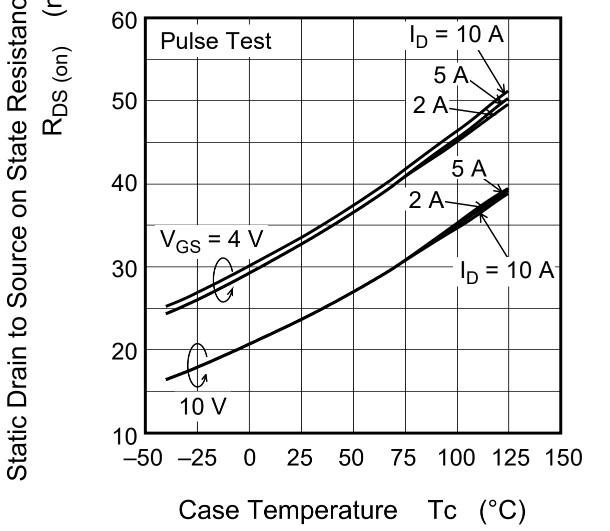
Drain to Source Saturation Voltage vs. Gate to Source Voltage



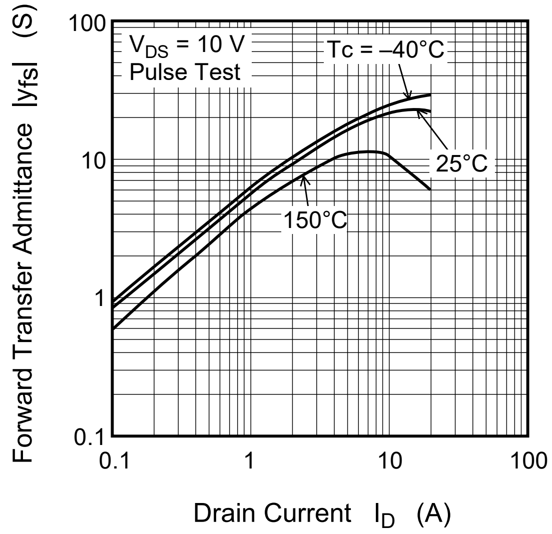
Static Drain to Source on State Resistance vs. Drain Current



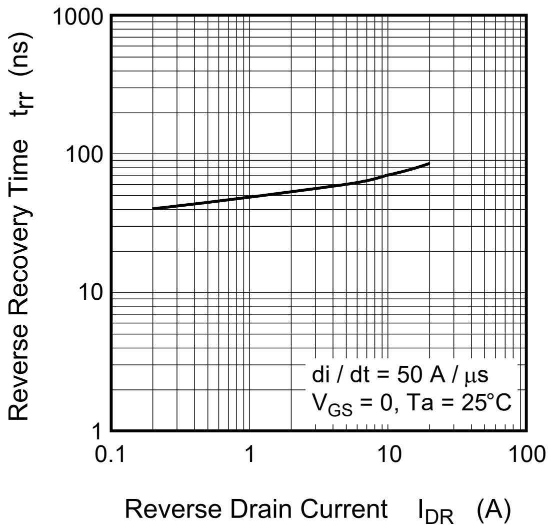
Static Drain to Source on State Resistance vs. Temperature



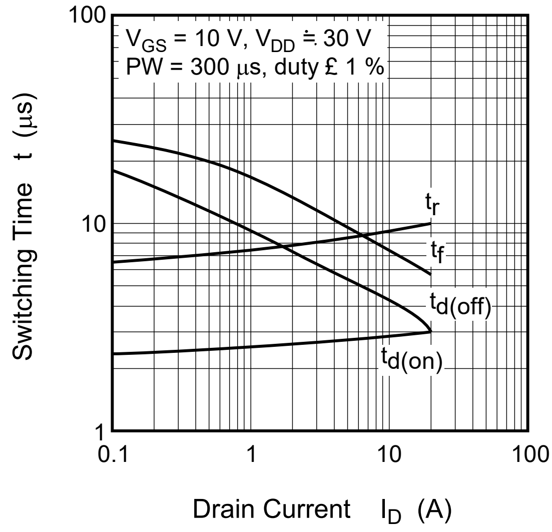
Forward Transfer Admittance vs. Drain Current



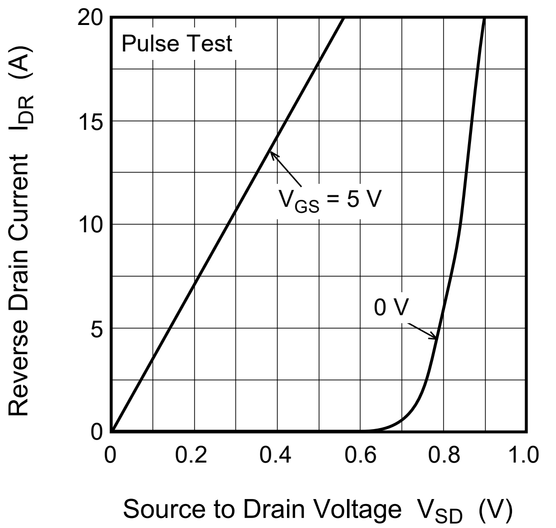
Body-Drain Diode Reverse Recovery Time



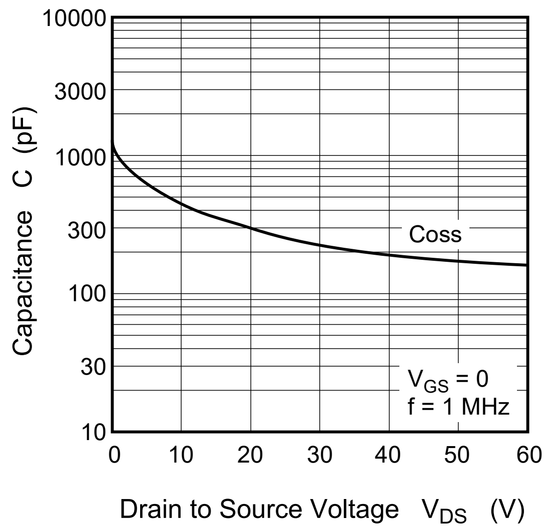
Switching Characteristics

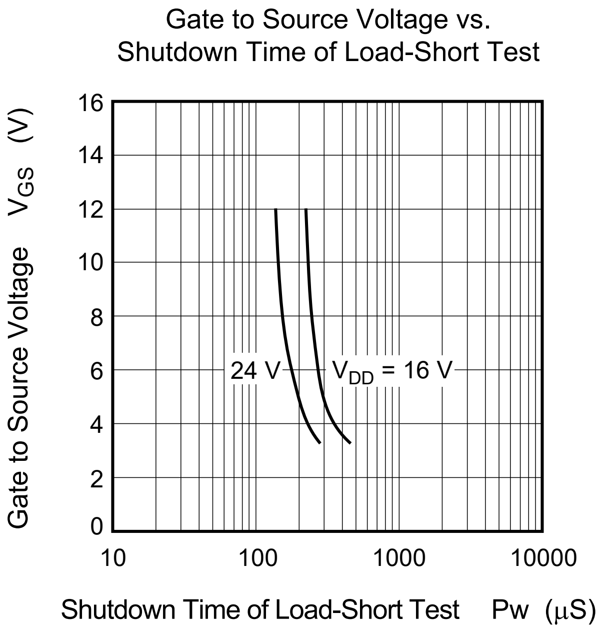


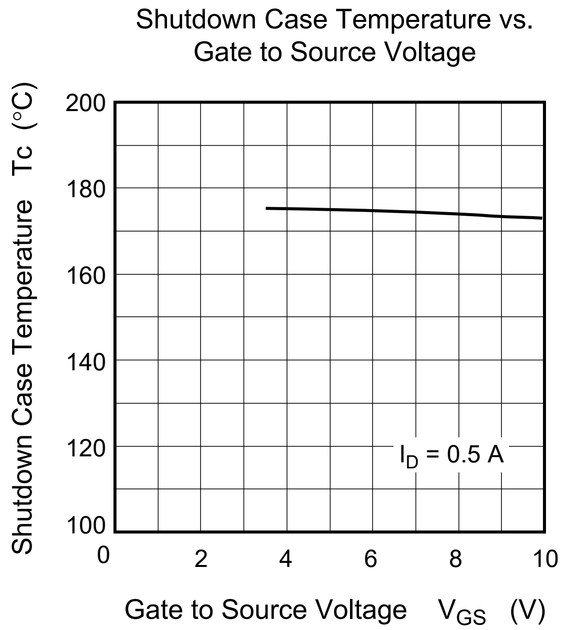
Reverse Drain Current vs. Source to Drain Voltage

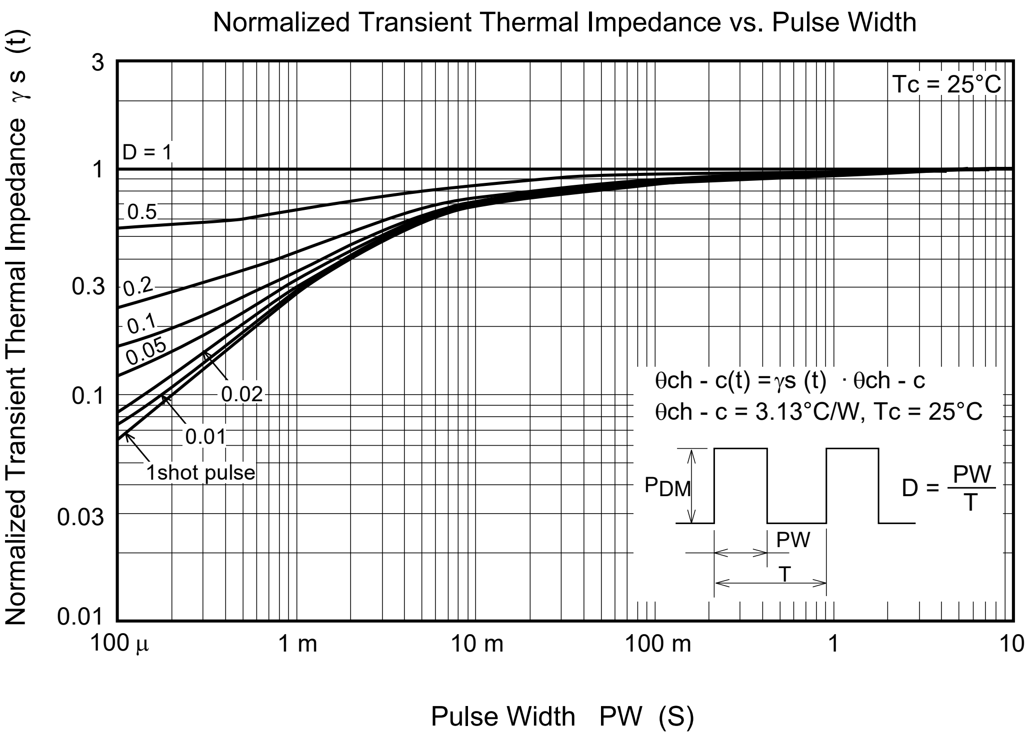


Typical Capacitance vs. Drain to Source Voltage

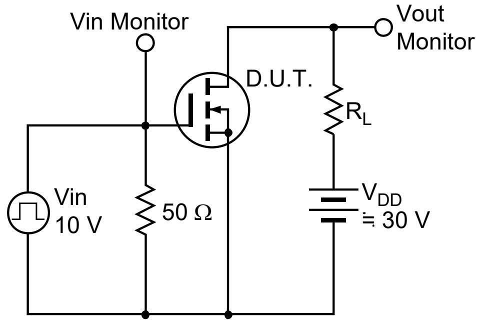



Gate to Source Voltage vs.
Shutdown Time of Load-Short Test
Gate to Source Voltage VGS (V)
16
14
12
10
8
6
4
2
0
10
100
1000
10000
24 V
VDD = 16 V
Shutdown Time of Load-Short Test Pw (μS)

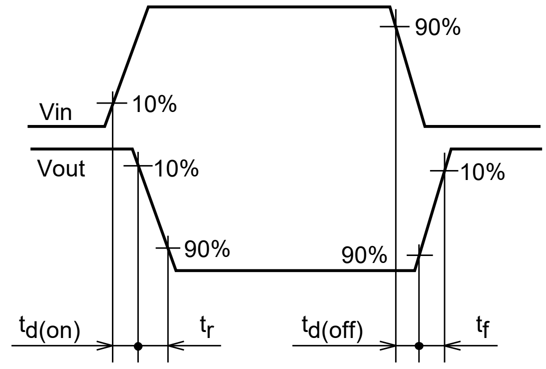

Shutdown Case Temperature vs.
Gate to Source Voltage
Shutdown Case Temperature Tc (°C)
200
180
160
140
120
100
0
2
4
6
8
10
ID = 0.5 A
Gate to Source Voltage VGS (V)


Normalized Transient Thermal Impedance vs. Pulse Width
Normalized Transient Thermal Impedance γ s (t)
3
1
0.3
0.1
0.03
0.01
Tc = 25°C
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θch - c(t) = γs (t) · θch - c
θch - c = 3.13°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
100 μ
1 m
10 m
100 m
1
10
Pulse Width PW (S)

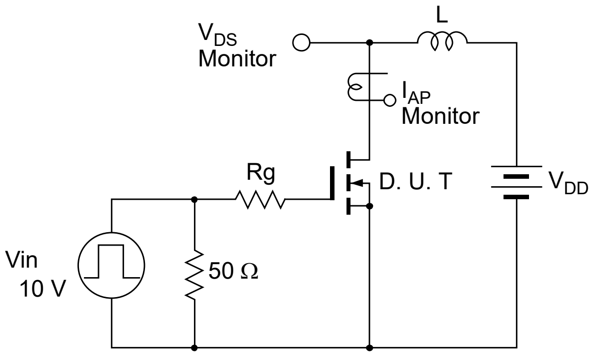
Switching Time Test Circuit



Waveform

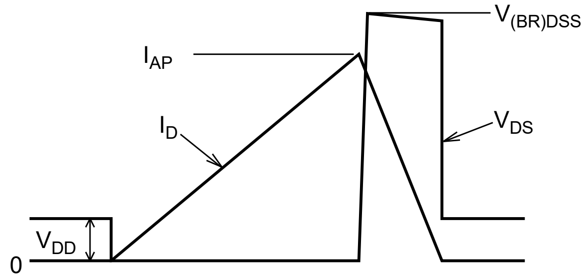


Avalanche Test Circuit

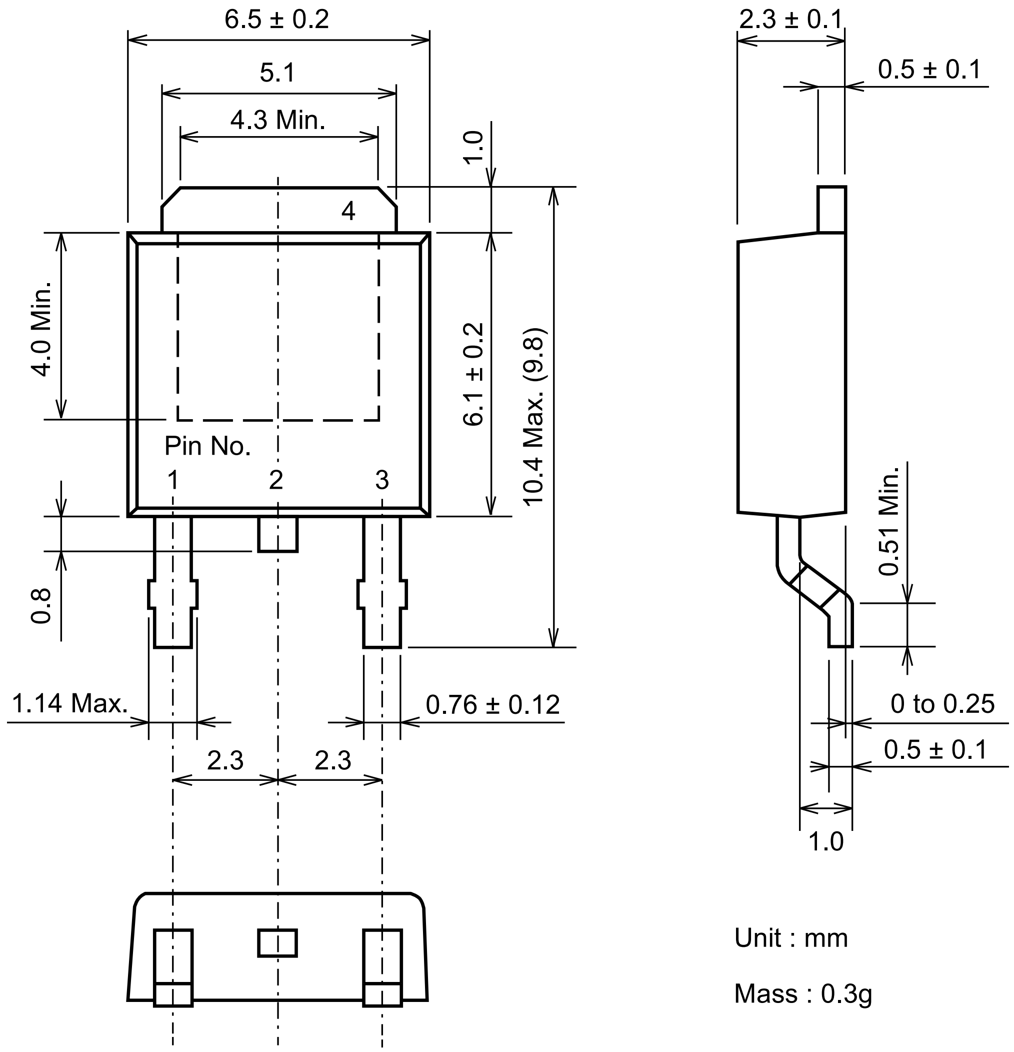


Avalanche Waveform

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



Package Dimensions



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJF0605JPV-00-Q7	2500 pcs/reel	Taping

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

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(Rev.5.0-1 October 2020)

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