

RJF0612JPE

60V - 50A - N Channel Thermal FET
Power Switching

R07DS0887EJ0200
Rev.2.00
Jan 29, 2014

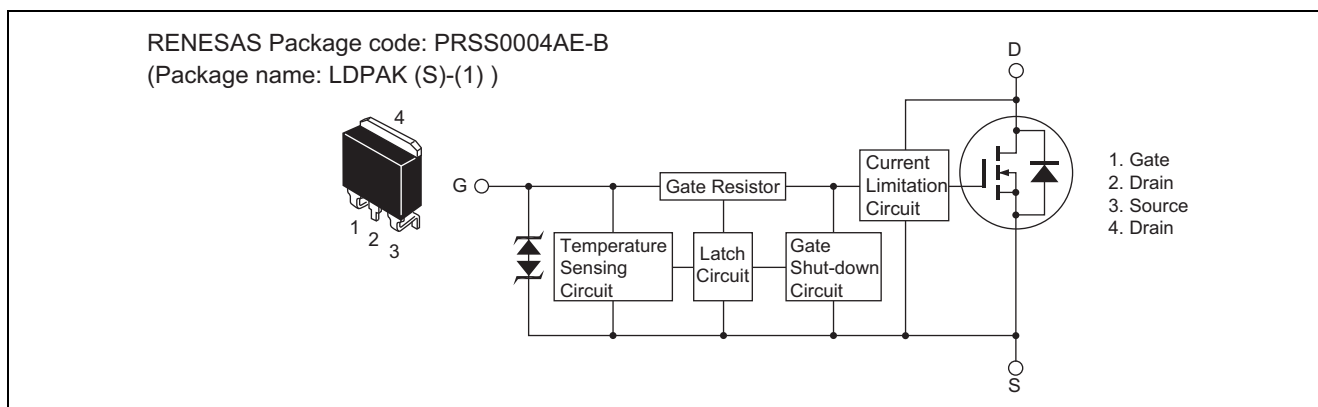
Description

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



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}	50	A
Body-drain diode reverse drain current	I_{DR}	50	A
Avalanche current	I_{AP} ^{Note 2}	15	A
Avalanche energy	E_{AR} ^{Note 2}	964	mJ
Channel dissipation	P_{ch} ^{Note 1}	100	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)	$I_{D \text{ limit}}$	50	—	—	A	$V_{GS} = 5 V, V_{DS} = 10 V$ ^{Note 4}

Notes: 4. Pulse test

Electrical Characteristics

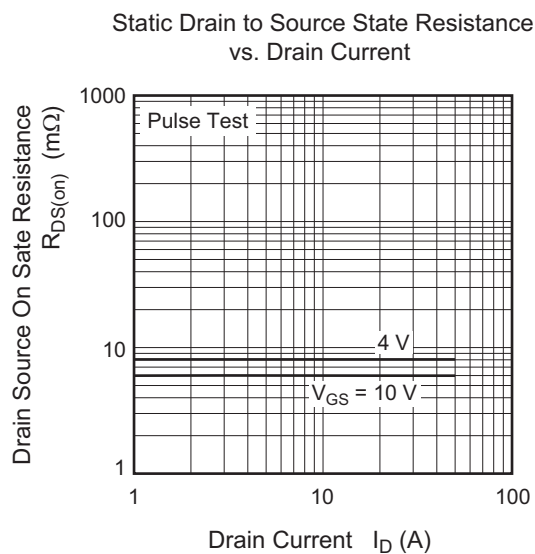
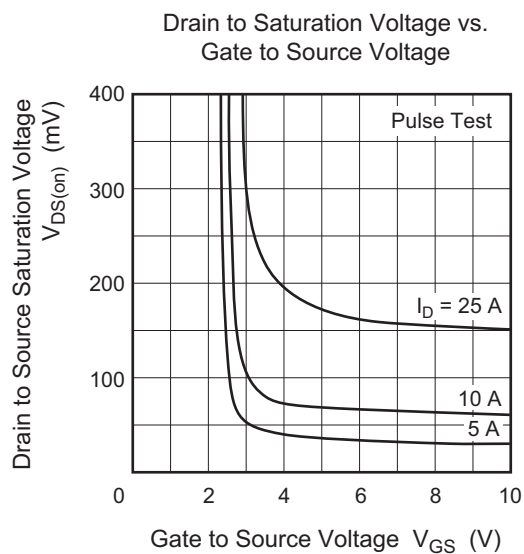
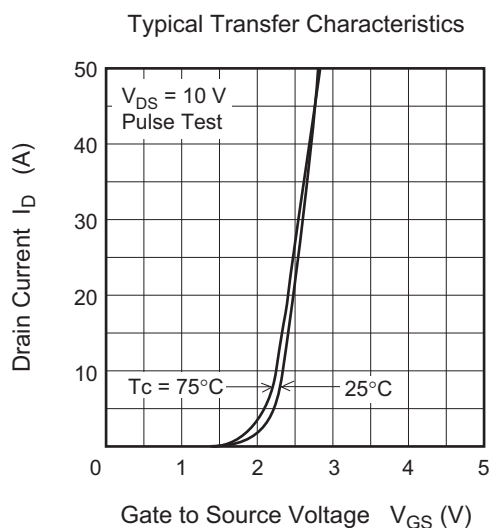
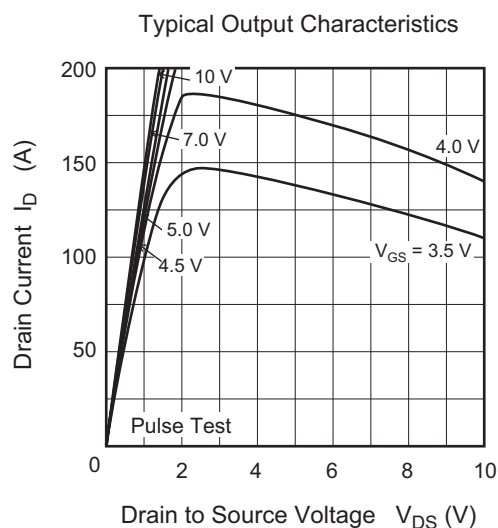
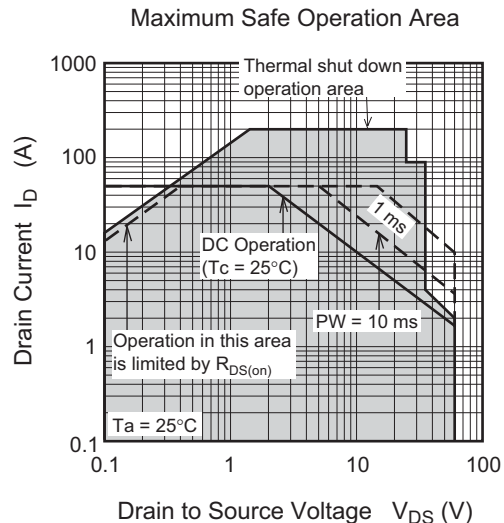
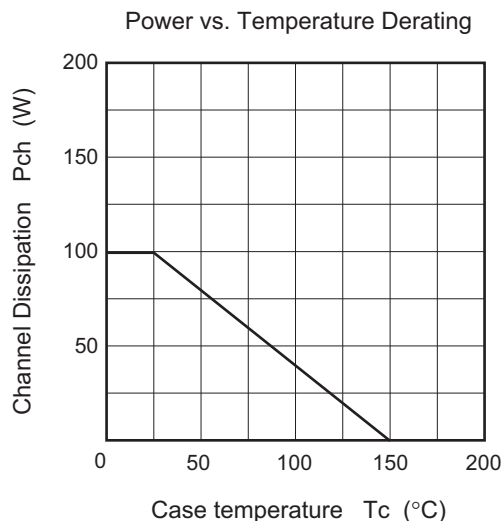
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	—	—	170	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}	50	—	—	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	$V_{DS} = 32 V, V_{GS} = 0, T_c = 110^\circ C$
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} $	26	80	—	S	$I_D = 25 \text{ A}, V_{DS} = 10 V$ ^{Note 5}
Static drain to source on state resistance	$R_{DS(on)}$	—	7.8	10	m Ω	$I_D = 25 \text{ A}, V_{GS} = 4 V$ ^{Note 5}
	$R_{DS(on)}$	—	5.9	7.5	m Ω	$I_D = 25 \text{ A}, V_{GS} = 10 V$ ^{Note 5}
Output capacitance	Coss	—	1974	—	pF	$V_{DS} = 10 V, V_{GS} = 0, f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	14.0	—	μs	$V_{GS} = 5 V, I_D = 25 \text{ A}, R_L = 1.2 \Omega$
Rise time	t_r	—	63.2	—	μs	
Turn-off delay time	$t_{d(off)}$	—	57.4	—	μs	
Fall time	t_f	—	84.5	—	μs	
Body-drain diode forward voltage	V_{DF}	—	0.9	—	V	$I_F = 50 \text{ A}, V_{GS} = 0$ ^{Note 5}
Body-drain diode reverse recovery time	t_{rr}	—	112	—	ns	$I_F = 50 \text{ A}, V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu s$
Over load shut down operation time ^{Note 6}	t_{os1}	—	0.5	—	ms	$V_{GS} = 5 V, V_{DD} = 16 V$
	t_{os2}	—	0.36	—	ms	$V_{GS} = 5 V, V_{DD} = 24 V$

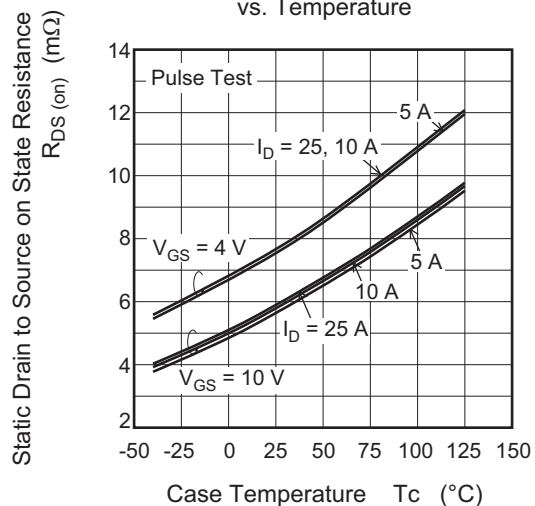
Notes: 5. Pulse test

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

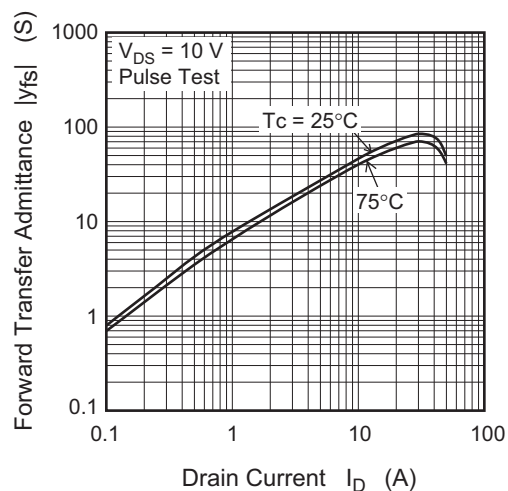
Main Characteristics



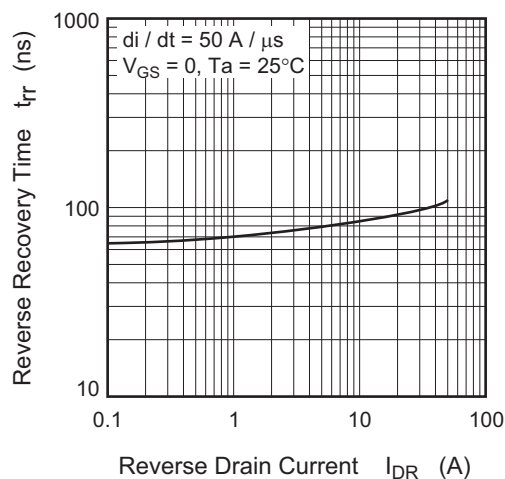
Static Drain to Source on State Resistance vs. Temperature



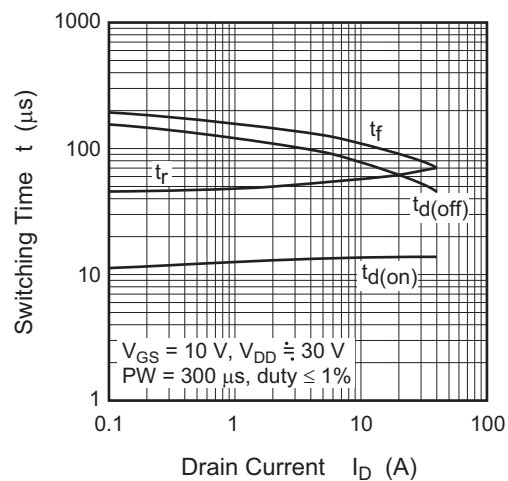
Forward Transfer Admittance vs. Drain Current



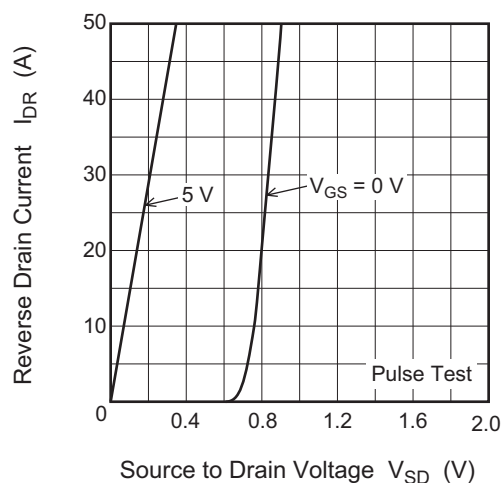
Body-Drain Diode Reverse Recovery Time



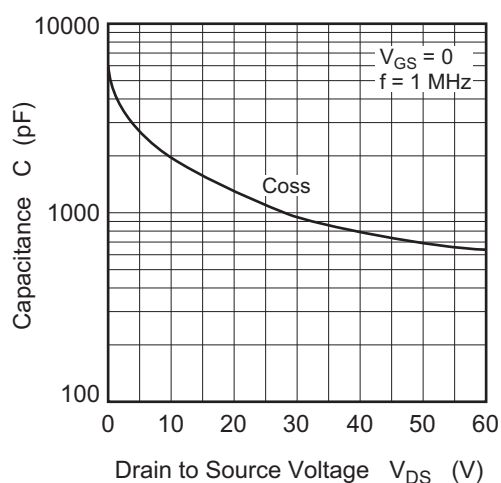
Switching Characteristics

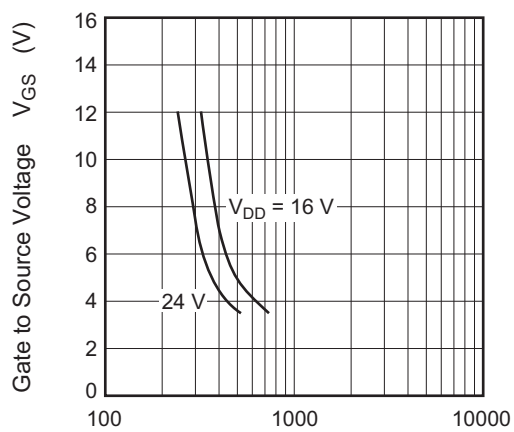


Reverse Drain Current vs. Source to Drain Voltage

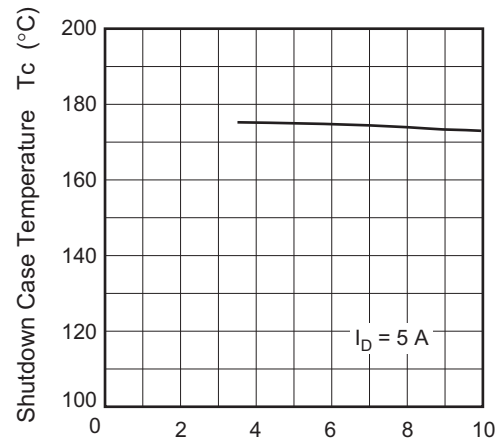


Typical Capacitance vs. Drain to Source Voltage



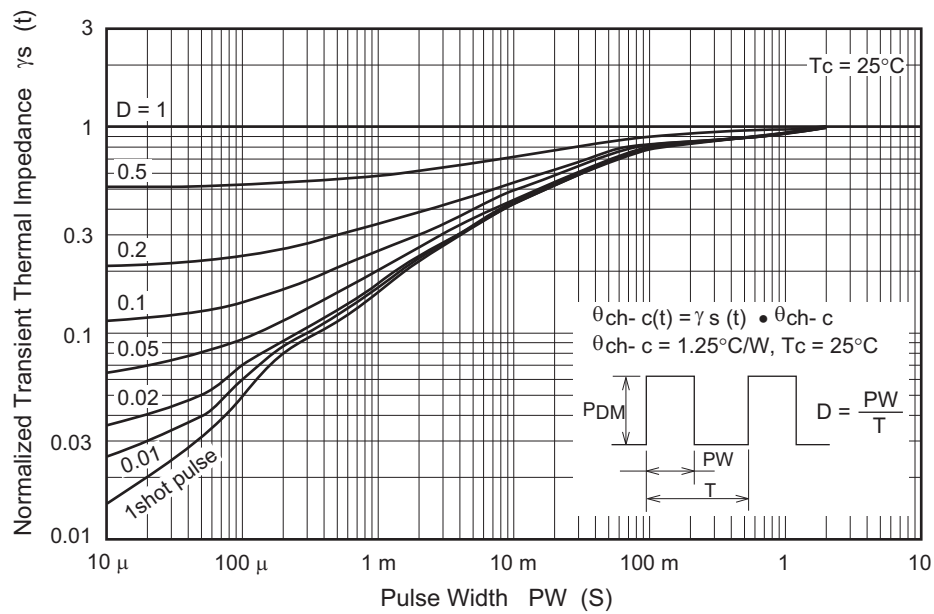
Gate to Source Voltage vs.
Shutdown Time of Load-Short Test


Shutdown Time of Load-Short Test Pw (μs)

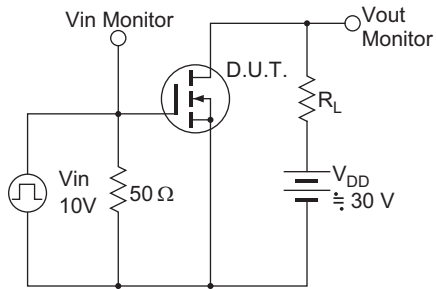
Shutdown Case Temperature vs.
Gate to Source Voltage


Gate to Source Voltage V_GS (V)

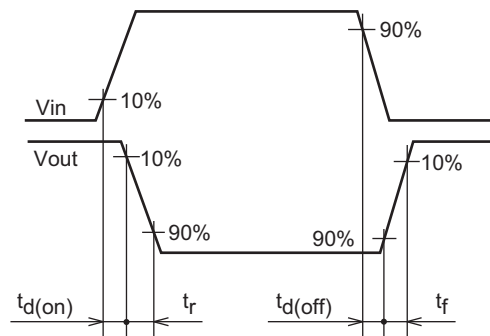
Normalized Transient Thermal Impedance vs. Pulse Width



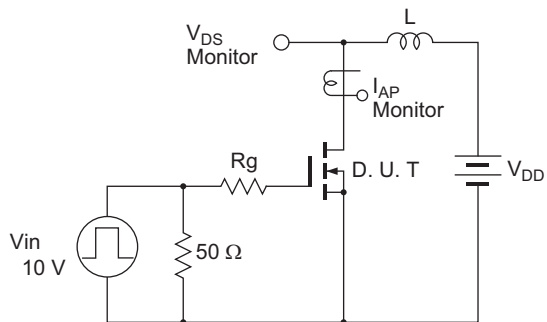
Switching Time Test Circuit



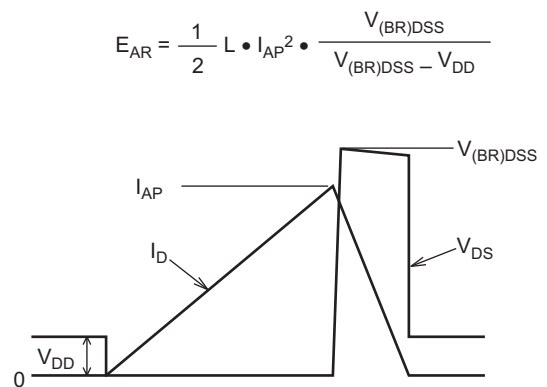
Waveform



Avalanche Test Circuit



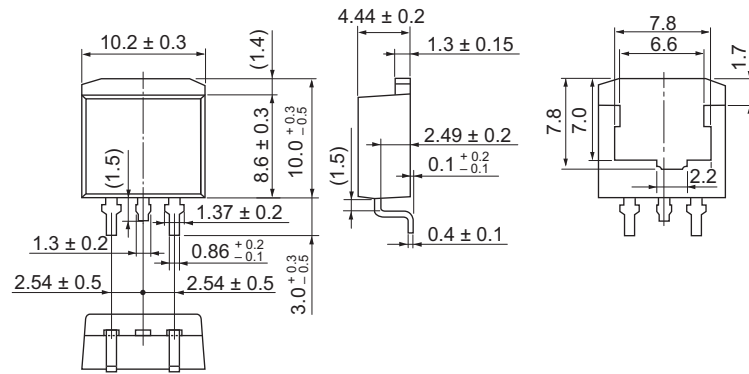
Avalanche Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
LDBAK(S)-(1)	SC-83	PRSS0004AE-B	LDBAK(S)-(1) / LDBAK(S)-(1)V	1.30g

Unit: mm



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJF0612JPE-00-J3	1000 pcs	Taping

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

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