40 V, 17 A P-channel Trench Power MOSFET with Reverse Battery Protection

DJR0417

Data Sheet

Description

DJR0417 is P-channel trench power MOSFET designed for the load switch of automotive electronic units requiring the reverse battery protection. Since DJR0417 has a bidirectional diode between Drain and Source, the reverse battery protection can be realized with only one load switch.

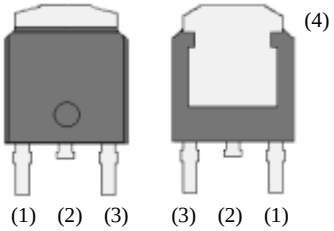
Features

- $V_{(BR)DSS}$ ---------- − 40 V (ID = − 100 μA)
- I_D ---------- − 17 A
- $R_{DS(ON)}$ ------ 75 mΩ max. (ID = − 8.5 A, VGS = − 10 V)

- Automotive Qualified
- Load switch can configure by only one component
- For reverse battery protection
- Compliant with RoHS Directive

Package

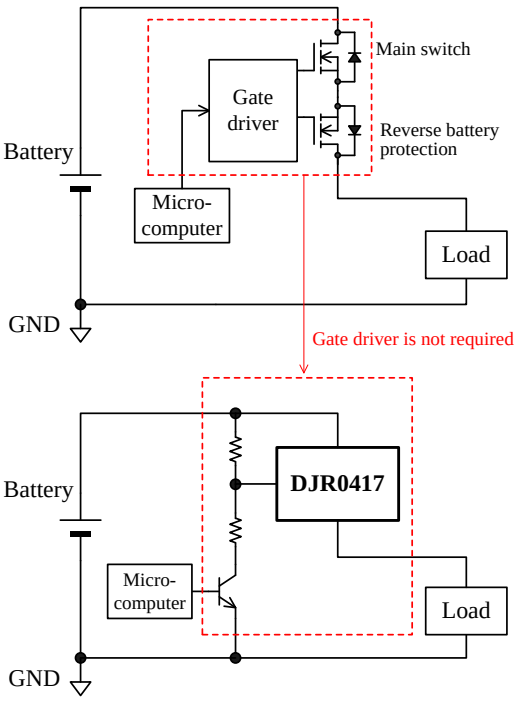
TO252



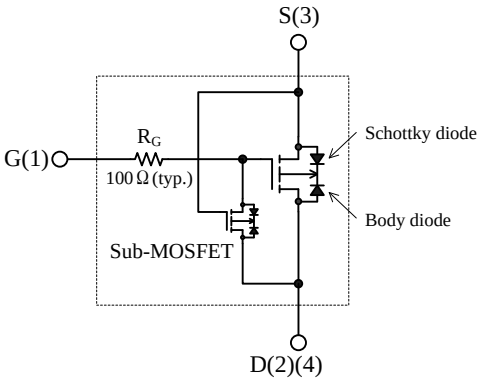
(1) Gate
(2)(4) Drain
(3) Source

Not to Scale

Typical Application



Equivalent circuit



Application

- Car battery

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Absolute Maximum Ratings

● Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test conditions	Rating	Unit
Drain to Source Voltage	V_{DS}		− 40	V
Source to Drain Voltage	V_{SD}		− 16	V
Gate to Source Voltage	V_{GS}		− 15,+ 0	V
Continuous Drain Current	I_D	T_C = 25 °C	− 17	A
Single Pulse Avalanche Energy	E_{AS}	V_{DD} = − 15 V, L = 1 mH, I_{AS} = − 17 A, unclamped, Refer to Figure 1	230	mJ
Power Dissipation	P_D	T_C = 25 °C	48	W
Operating Junction Temperature	T_J		− 55 to 150	°C
Storage Temperature Range	T_{STG}		− 55 to 150	°C
Maximum Drain to Source dv/dt	dv/dt		0.075	V/ns

Thermal Characteristics

● Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Thermal Resistance (Junction to Case)	$R_{\theta JC}$		−	−	2.6	°C/W

Electrical Characteristic

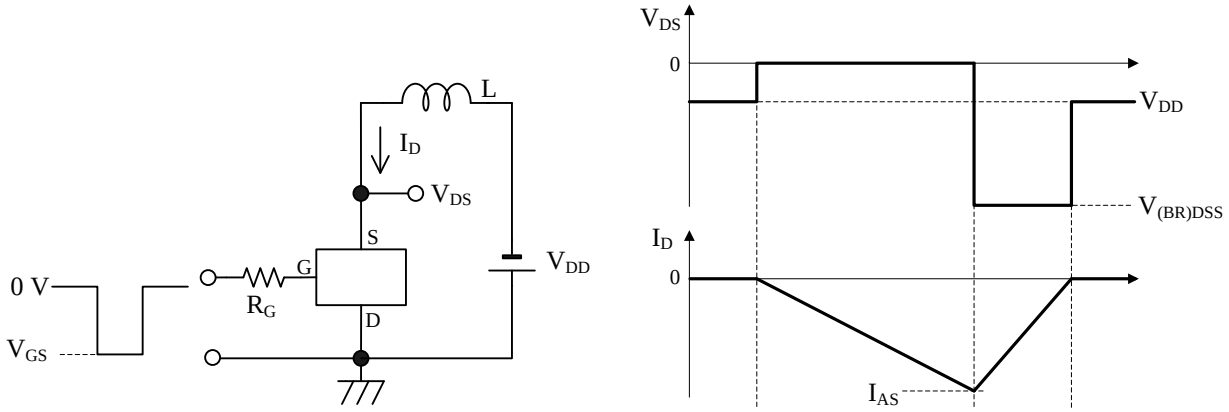
● Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = − 100 µA, V_{GS} = 0 V	− 40	−	−	V
Drain to Source Leakage Current	I_{DSS}	V_{DS} = − 40 V, V_{GS} = 0 V	−	−	− 100	µA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = − 15 V	−	−	− 100	µA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = − 10 V, I_D = − 1 mA	− 1.0	− 1.75	− 2.5	V
Static Drain to Source On-Resistance	$R_{DS(ON)}$	I_D = − 8.5 A, V_{GS} = − 10 V	−	50	75	mΩ
		I_D = − 5 A, V_{GS} = − 4.5 V	−	130	350	mΩ
Total Gate Charge (V_{GS} = 10 V)	Q_g	V_{DS} = -15 V I_D = − 8.5 A V_{GS} = − 10 V	−	75	−	nC
Gate to Source Charge	Q_{gs}		−	9	−	
Gate to Drain Charge	Q_{gd}		−	30	−	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = − 15 V I_D = − 8.5 A R_G = 10 Ω, R_L = 1.53 Ω, R_{GS} = 50 Ω V_{GS} = − 10 V Refer to Figure 2	−	90	−	ns
Rise Time	t_r		−	450	−	
Turn-Off Delay Time	$t_{d(off)}$		−	990	−	
Fall Time	t_f		−	910	−	
Source to Drain Breakdown Voltage	$V_{(BR)\ SD}$	I_S = − 1m A, V_{GS} = 0 V	− 16	−	−	V

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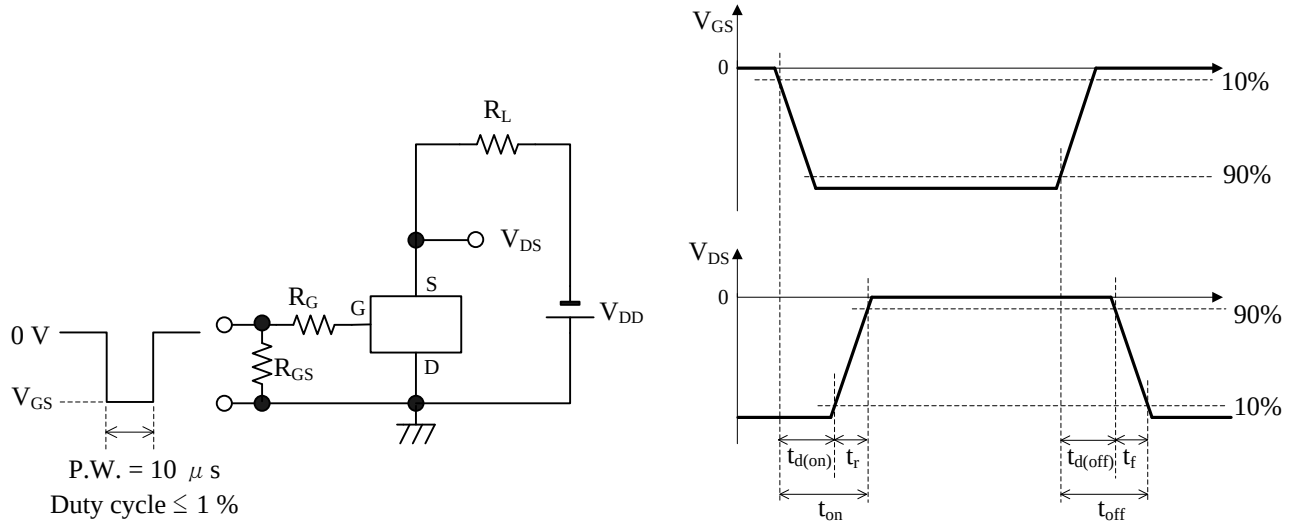
Test Circuits and Waveforms

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



(a) Test Circuit (b) Waveform

Figure 1 Unclamped Inductive Switching



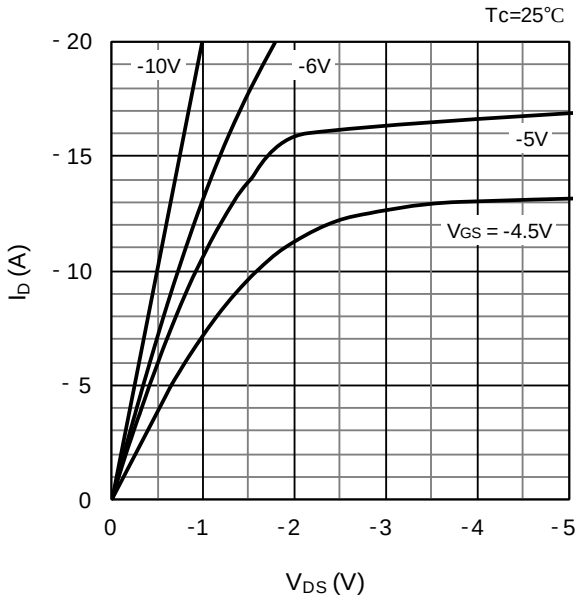
(a) Test Circuit (b) Waveform

Figure 2 Switching Time

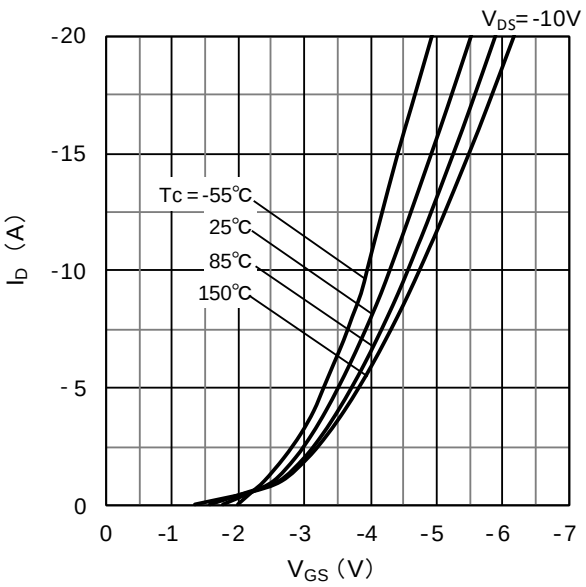
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Performance Curves

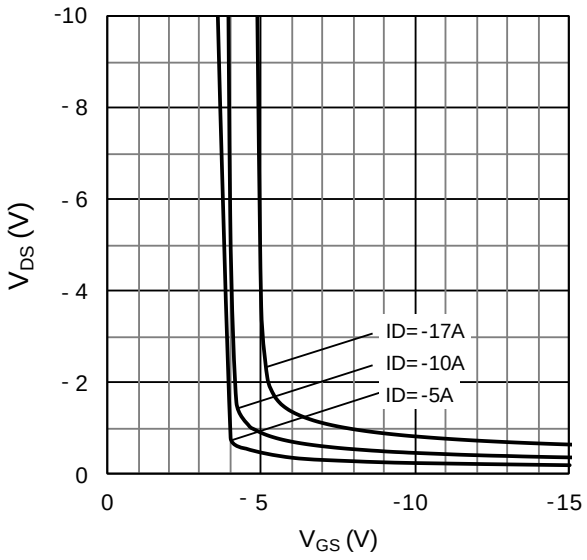
I_D-V_{DS} characteristics(typical)



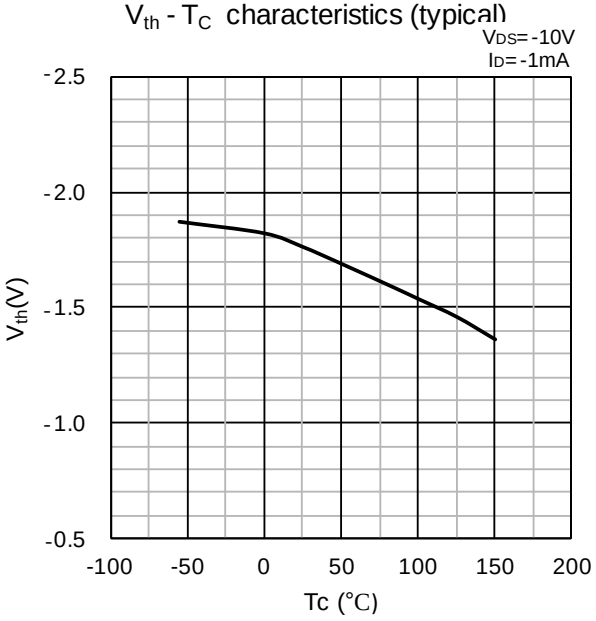
I_D-V_{GS} characteristics (typical)



V_{DS} - V_{GS} characteristics (typical)

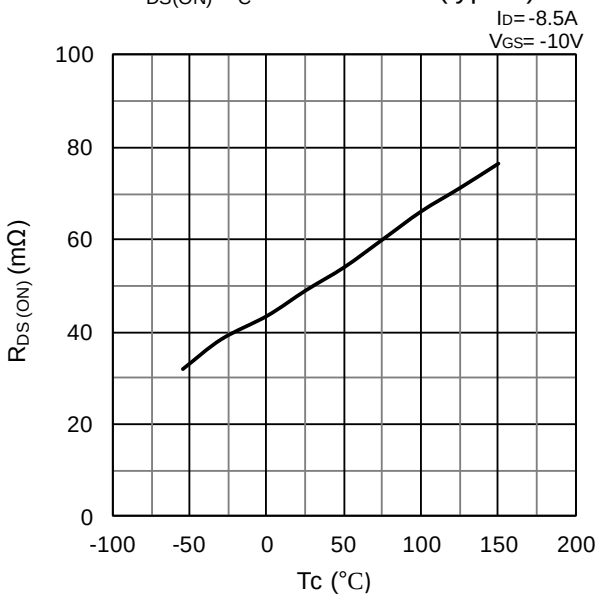


V_{th} - T_C characteristics (typical)

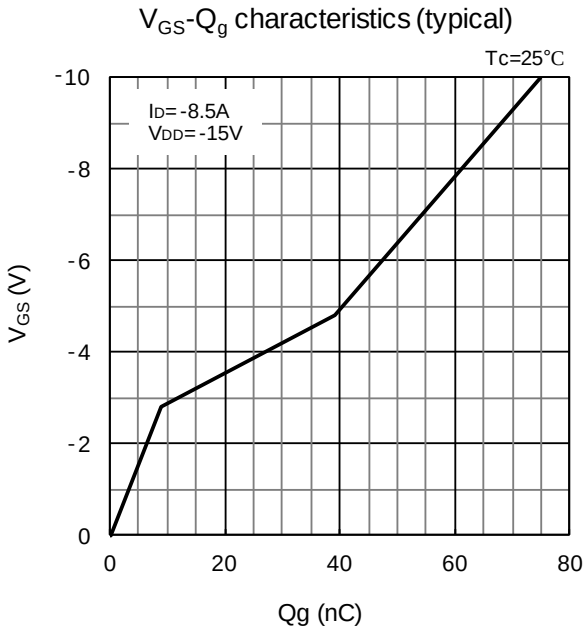


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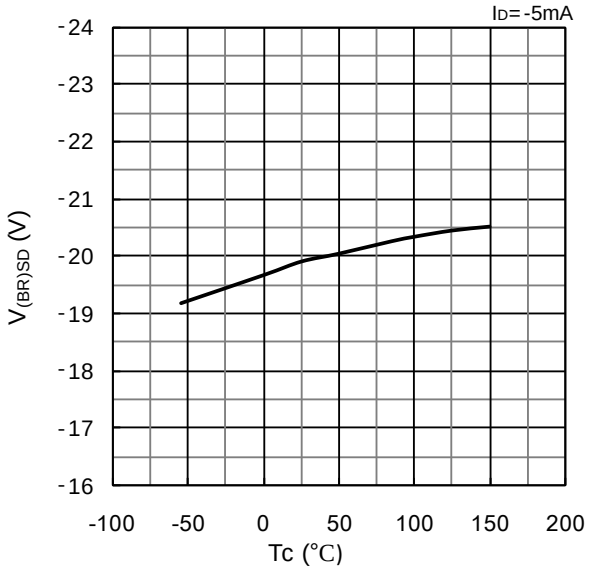
$R_{DS(ON)}$-T_C characteristics (typical)



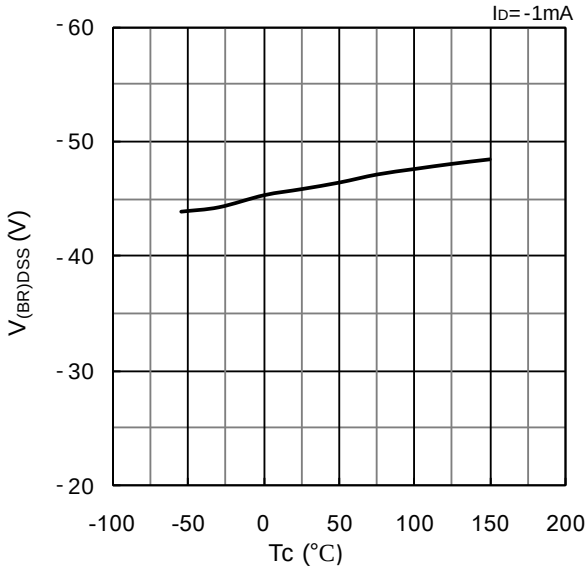
V_{GS}-Q_g characteristics (typical)



$V_{(BR)SD}$ - T_C characteristics (typical)

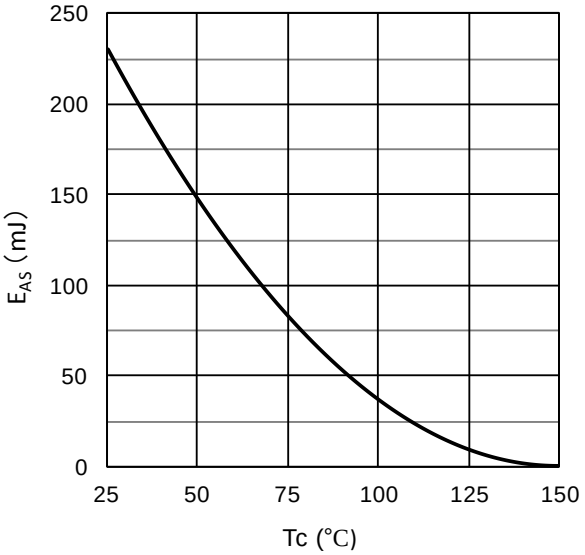


$V_{(BR)DSS}$ - T_C characteristics (typical)

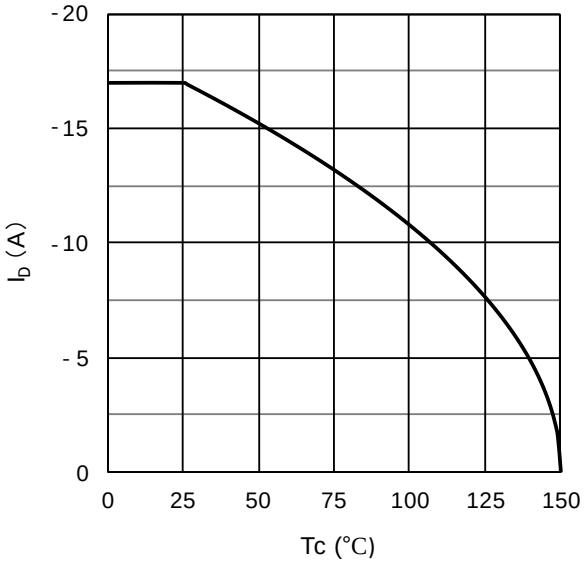


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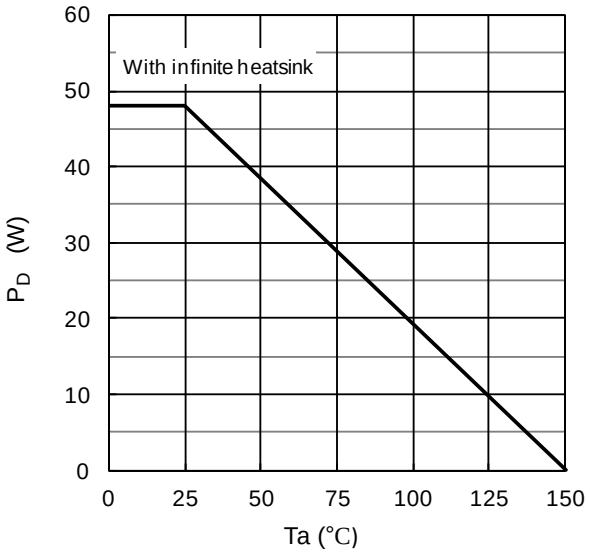
E_{AS}-Tc characteristics



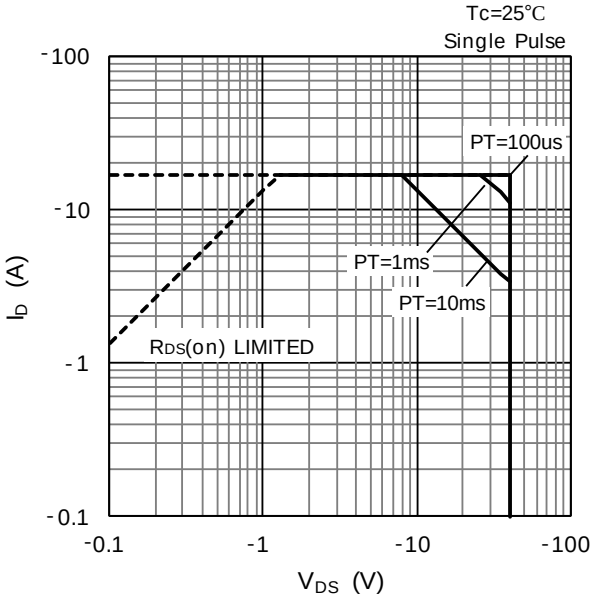
I_D-T_C characteristics



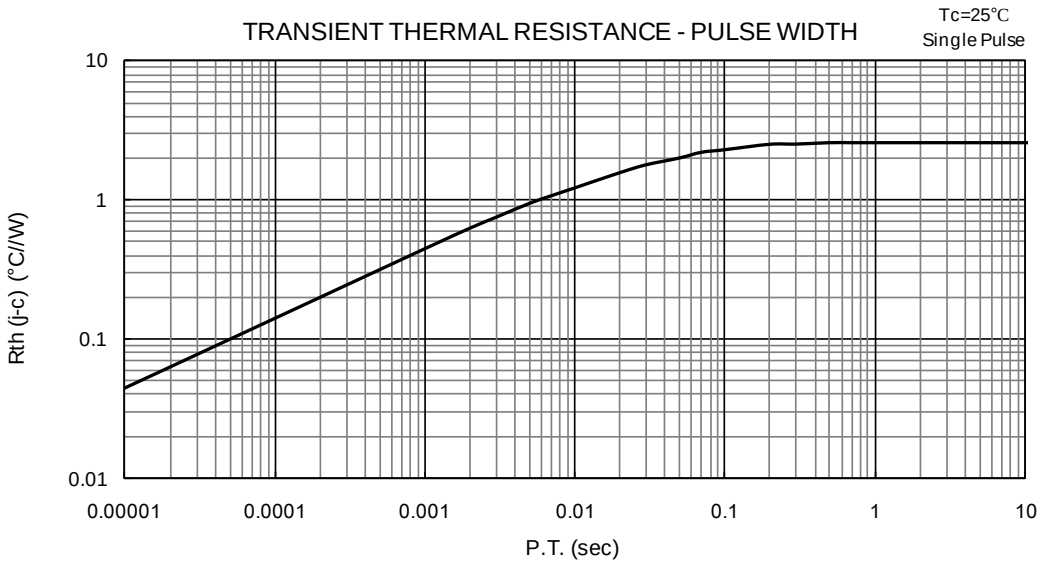
P_D-T_a Derating



SAFE OPARATING AREA



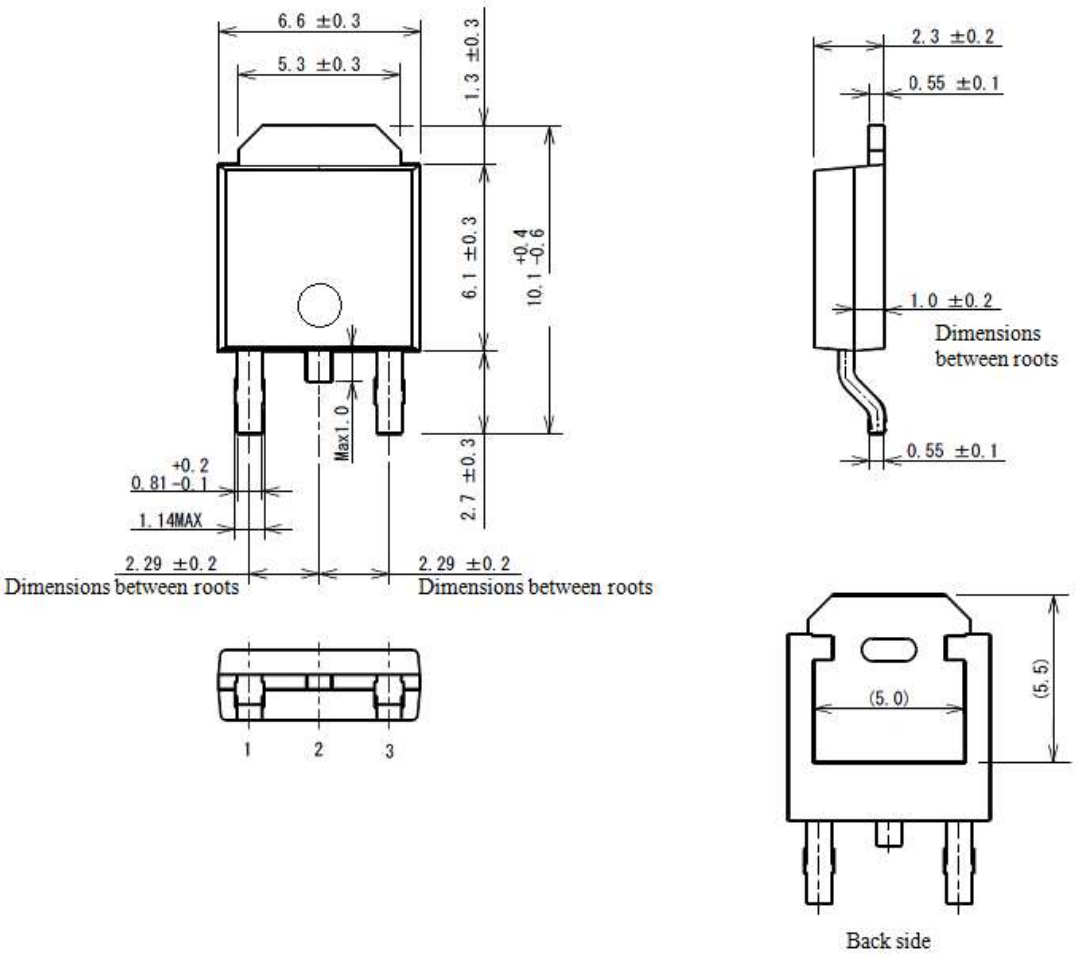
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External Dimensions

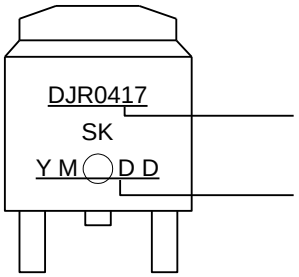
● TO252



NOTES:

● Dimension is in millimeters
● Pb-free. Device composition compliant with the RoHS directive

Marking Diagram



Part Number

Lot Number

Y is the Last digit of the year (0 to 9)
M is the Month (1 to 9, O, N or D)
DD is the Date (two digit of 01 to 31)

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