

## 2SK1381-VB Datasheet

### N-Channel 100-V (D-S) 175°C MOSFET

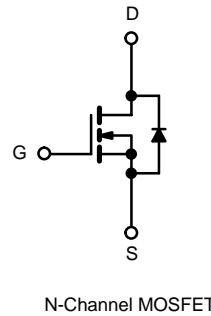
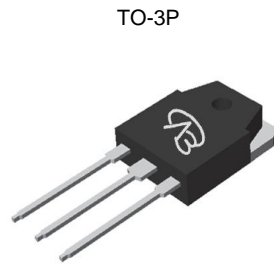
PRODUCT SUMMARY		
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
100	0.0085 at V <sub>GS</sub> = 10 V	100
	0.010 at V <sub>GS</sub> = 6 V	85

#### FEATURES

- Trench Power MOSFET
- 175 °C Maximum Junction Temperature
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT



ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	100	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	100
		T <sub>C</sub> = 125 °C	75 <sup>a</sup>
Pulsed Drain Current	I <sub>DM</sub>	300	A
Avalanche Current	I <sub>AS</sub>	75	
Single Pulse Avalanche Energy <sup>b</sup>	E <sub>AS</sub>	280	mJ
Maximum Power Dissipation <sup>b</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C (TO-220AB and TO-263)	250 <sup>c</sup>
		T <sub>A</sub> = 25 °C (TO-263) <sup>d</sup>	3.75
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient	R <sub>thJA</sub>	PCB Mount (TO-263) <sup>d</sup>	40
		Free Air (TO-220AB)	62.5
Junction-to-Case	R <sub>thJC</sub>	0.6	°C/W

Notes:

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

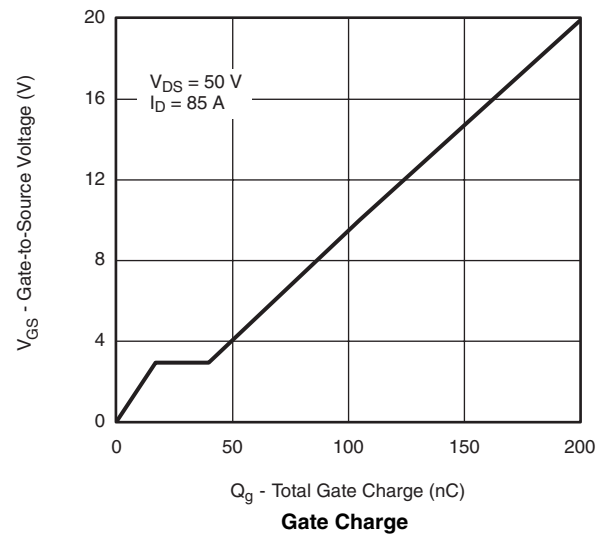
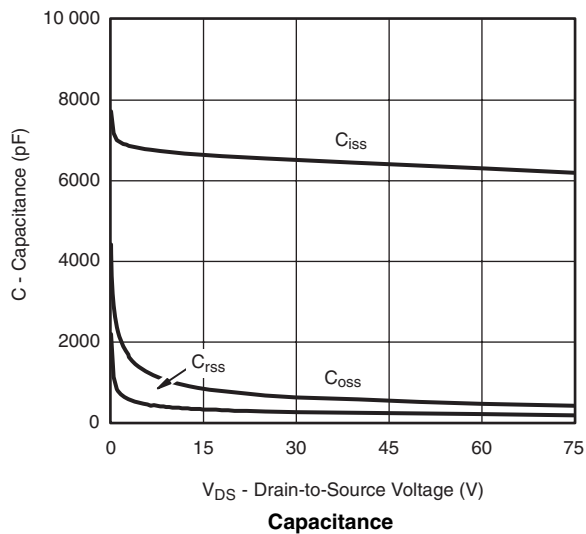
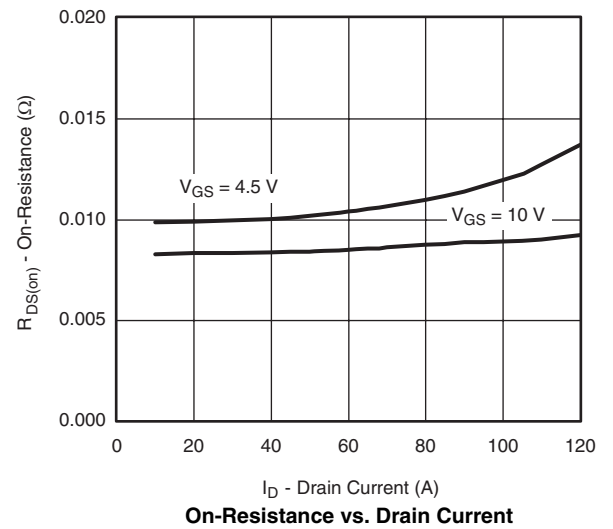
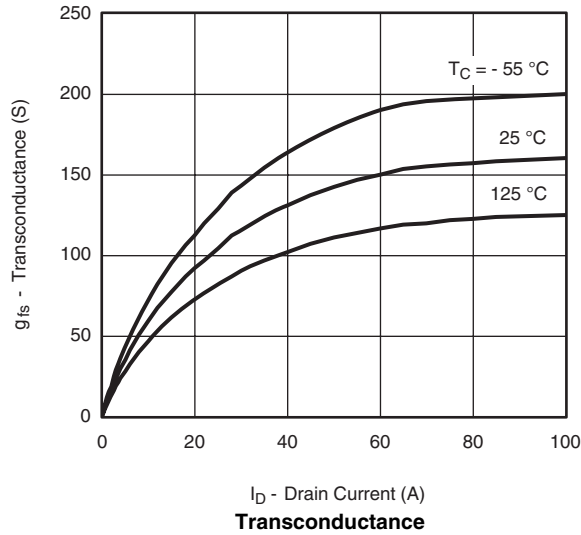
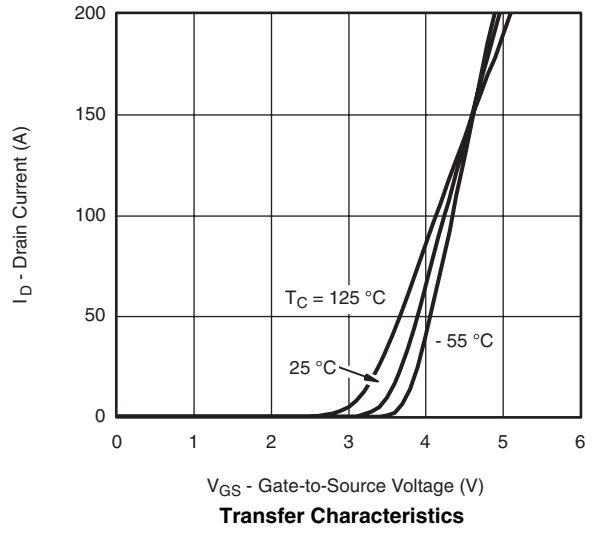
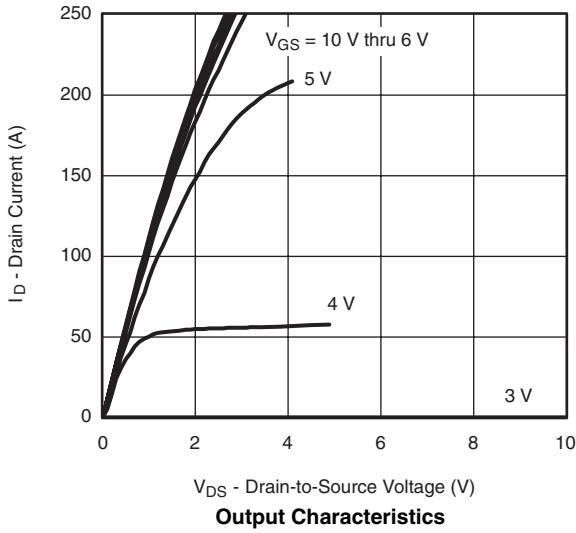
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0085		$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.010		
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.017		
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$		0.022		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	25			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6550		$\text{pF}$
Output Capacitance	$C_{oss}$			665		
Reverse Transfer Capacitance	$C_{rss}$			265		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50\text{ V}, V_{GS} = 10\text{ V}, I_D = 85\text{ A}$		105	160	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			17		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			23		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 50\text{ V}, R_L = 0.6\text{ }\Omega$ $I_D \cong 85\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		12	25	ns
Rise Time <sup>c</sup>	$t_r$			90	135	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			130	195	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				85	A
Pulsed Current	$I_{SM}$				240	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 85\text{ A}, V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		85	140	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			4.5	7	A
Reverse Recovery Charge	$Q_{rr}$			0.17	0.35	$\mu\text{C}$

## Notes:

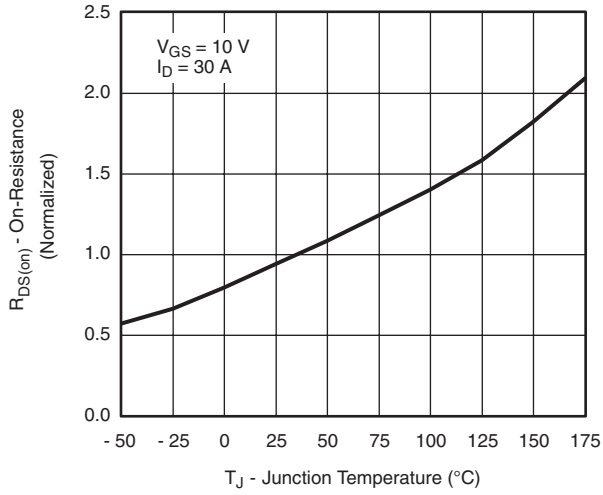
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
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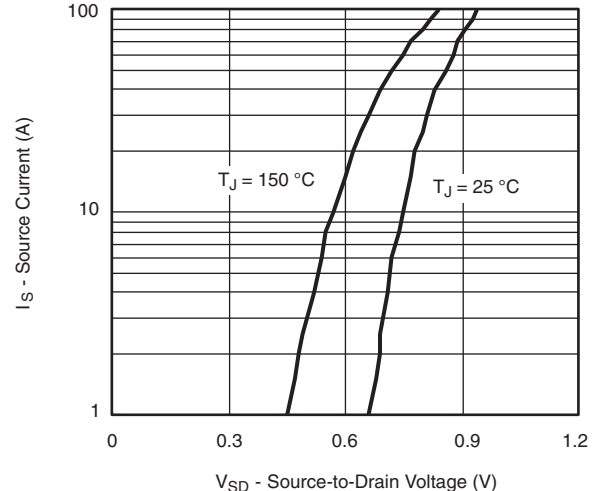
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



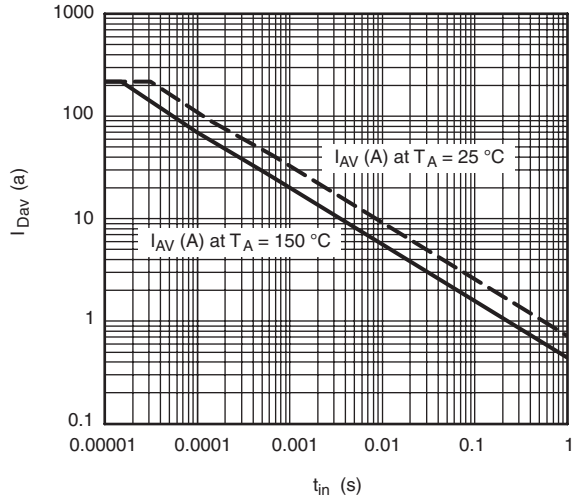
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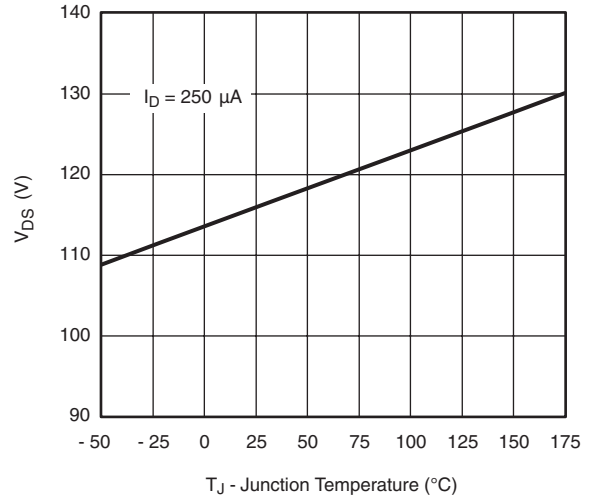
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

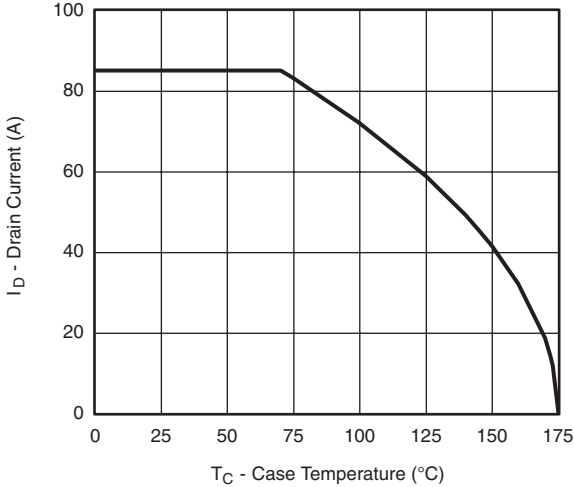


**Avalanche Current vs. Time**

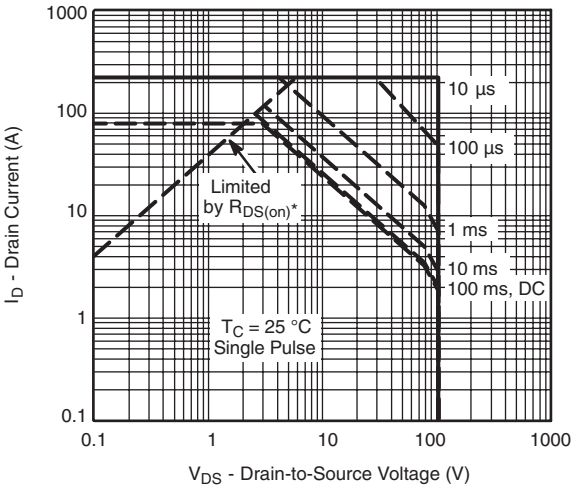


**$T_J$  - Drain-Source Breakdown vs. Junction-Temperature**

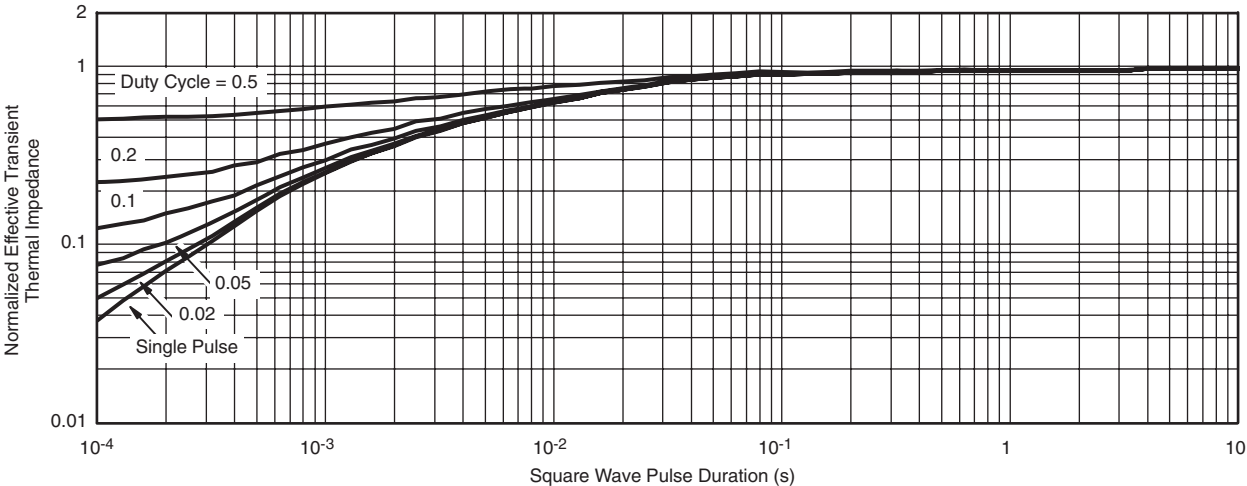
**THERMAL RATINGS**



**Maximum Avalanche and Drain Current vs. Case Temperature**

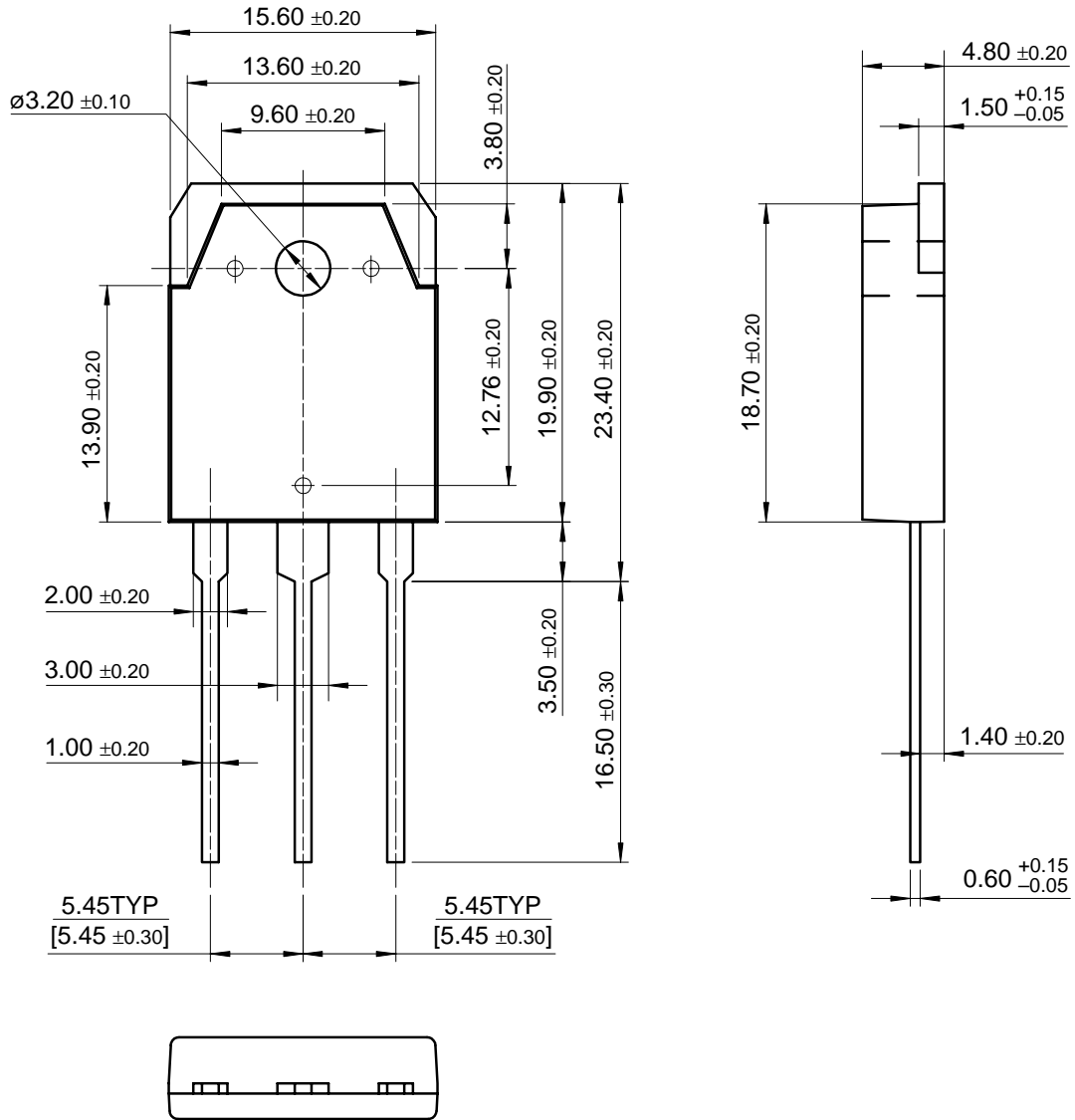


**Safe Operating Area**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



**Normalized Thermal Transient Impedance, Junction-to-Case**

# TO-3P



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