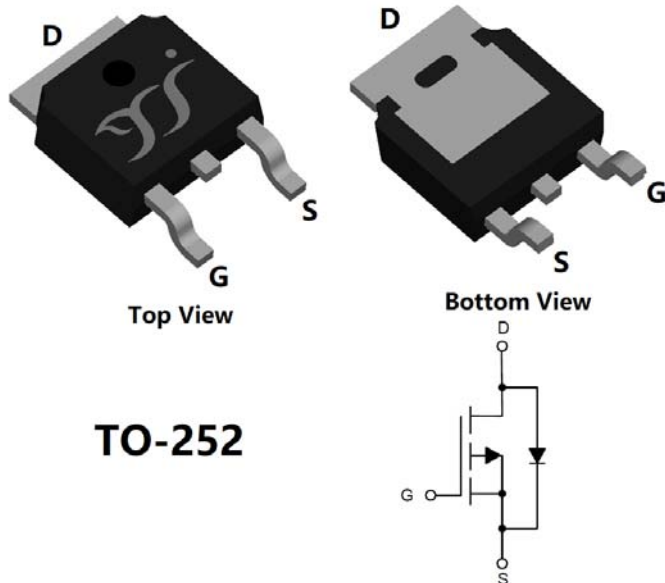


## P-Channel Enhancement Mode Field Effect Transistor



### Product Summary

• $V_{DS}$	-40 V
• $I_D$	-50 A
• $R_{DS(ON)}$ ( at $V_{GS}=-10V$ )	< 15 m $\Omega$
• $R_{DS(ON)}$ ( at $V_{GS}=-4.5V$ )	< 22 m $\Omega$
• 100% EAS Tested	
• 100% $\nabla V_{DS}$ Tested	

### General Description

- Low  $R_{DS(on)}$  & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

### Applications

- Power management
- Portable equipment
- 12V Automotive systems

### ■ Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	-50	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current	$T_A=25^\circ\text{C}$	$I_D$	8	A
	$T_A=100^\circ\text{C}$		7	
	$T_C=25^\circ\text{C}$		50	
	$T_C=100^\circ\text{C}$		31	
Pulsed Drain Current <sup>A</sup>		$I_{DM}$	200	A
Avalanche energy <sup>B</sup>		EAS	22.5	mJ
Total Power Dissipation <sup>C</sup>	$T_A=25^\circ\text{C}$	$P_D$	2.5	W
	$T_A=100^\circ\text{C}$		1	
	$T_C=25^\circ\text{C}$		83	
	$T_C=100^\circ\text{C}$		33	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+150	$^\circ\text{C}$

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient <sup>D</sup>	Steady-State	$R_{\theta JA}$	40	50	$^\circ\text{C/W}$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	1.2	1.5	

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJD50P04AJQ	F1	YJD50P04AJ	2500	/	25000	13" reel



# YJD50P04AJQ

## ■ Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =-250μA	-40	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1	-1.5	-2.5	V
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A		11.5	15	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	-	14	22	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =-20A, V <sub>GS</sub> =0V	-	-0.85	-1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz	-	10	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	-50	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1MHz	-	3500	-	pF
Output Capacitance	C <sub>oss</sub>		-	270	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	230	-	
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, I <sub>D</sub> =-25A	-	73.3	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	8.9	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	15.3	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =-25A, di/dt=100A/us	-	12.9	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	25.4	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =-10V, V <sub>DD</sub> =-20V, I <sub>D</sub> =-25A R <sub>GEN</sub> =6Ω	-	13.6	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	11.8	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	201.5	-	
Turn-off fall Time	t <sub>f</sub>		-	92.5	-	

A. Repetitive rating; pulse width limited by max. junction temperature.

B. T<sub>J</sub>=25°C, V<sub>DD</sub>=-70V, V<sub>G</sub>=-10V, L=0.5mH, I<sub>AS</sub>=-9.5A.

C. P<sub>d</sub> is based on max. junction temperature, using junction-case and junction-ambient thermal resistance.

D. The value of RθJA is measured with the device mounted on the minimum recommend pad size, in the still air environment with TA =25°C. The maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.



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## Typical Electrical and Thermal Characteristics Diagrams

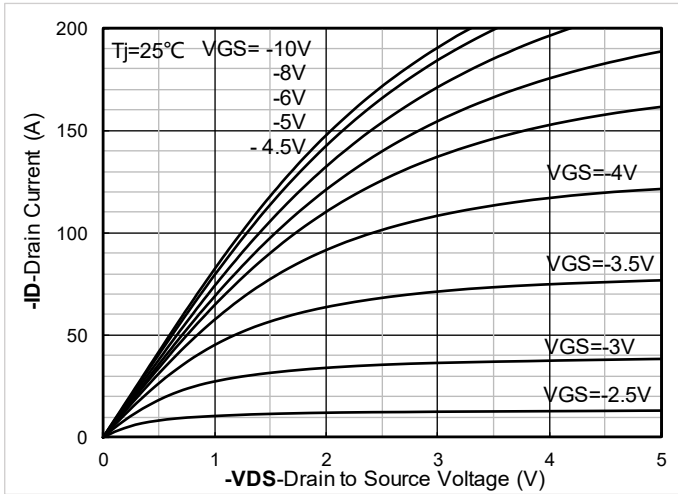


Figure 1. Output Characteristics

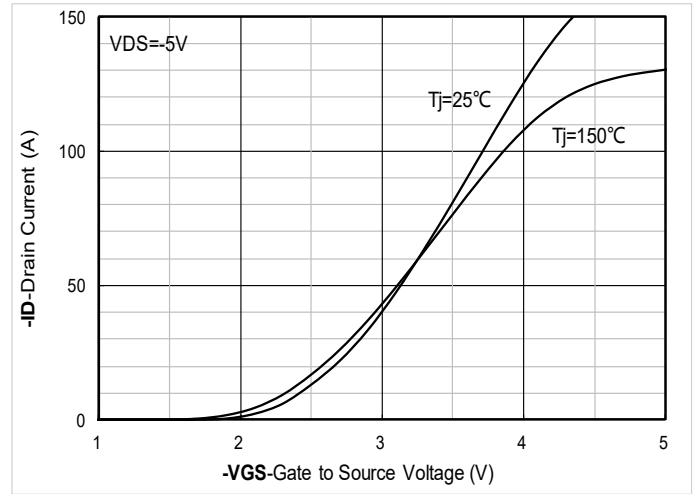


Figure 2. Transfer Characteristics

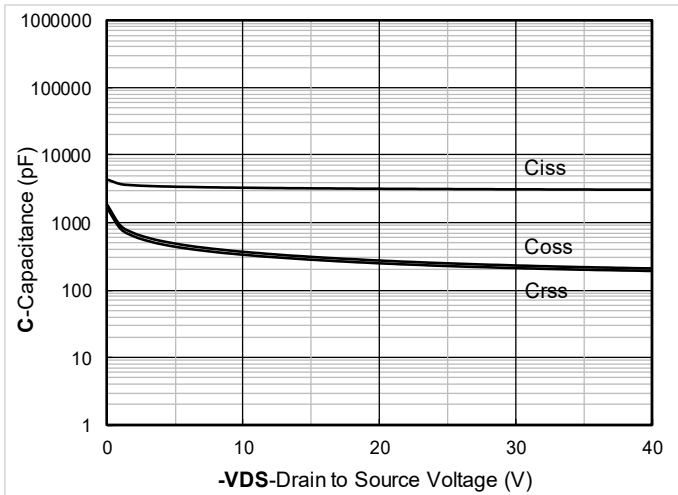


Figure 3. Capacitance Characteristics

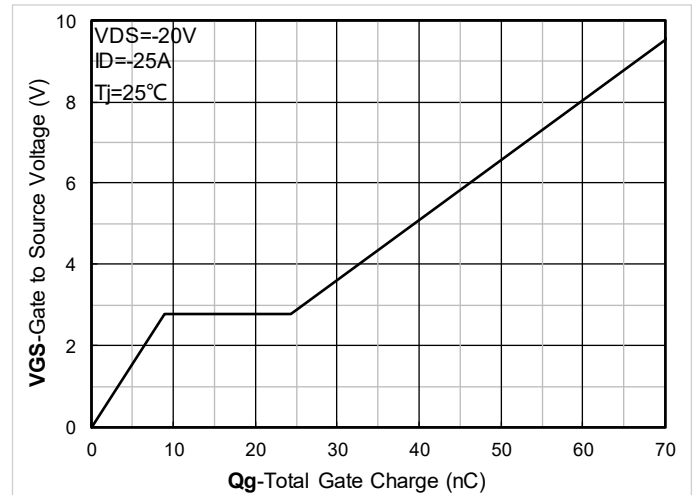


Figure 4. Gate Charge

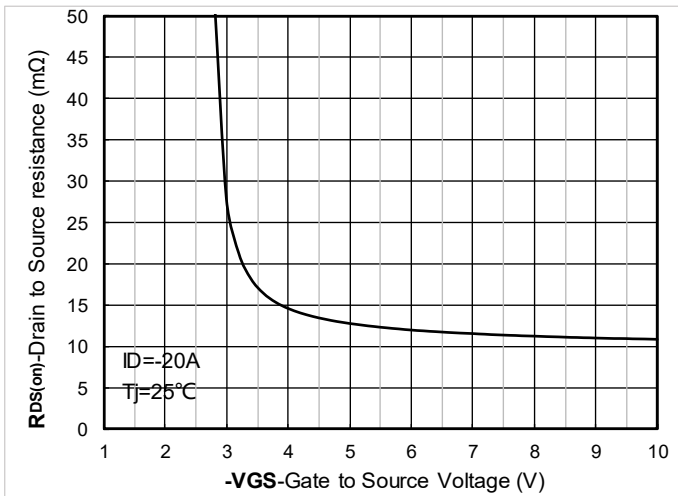


Figure 5. On-Resistance vs Gate to Source Voltage

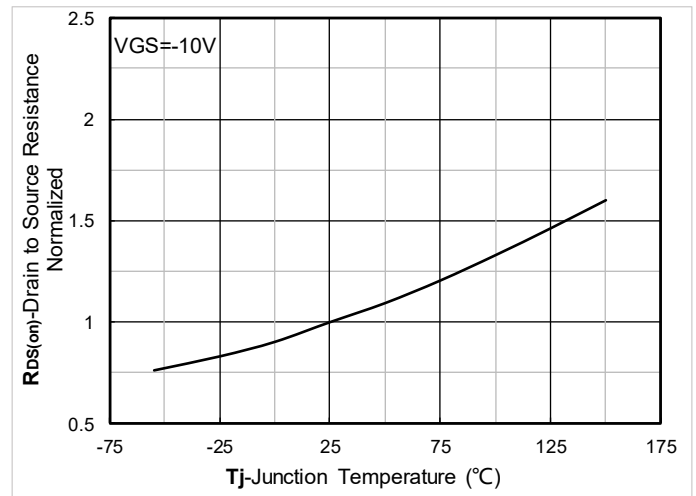


Figure 6. Normalized On-Resistance



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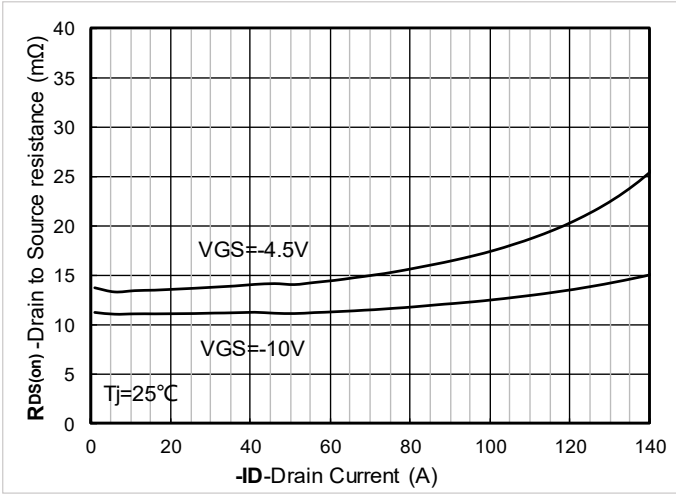


Figure 7.  $R_{DS(on)}$  VS Drain Current

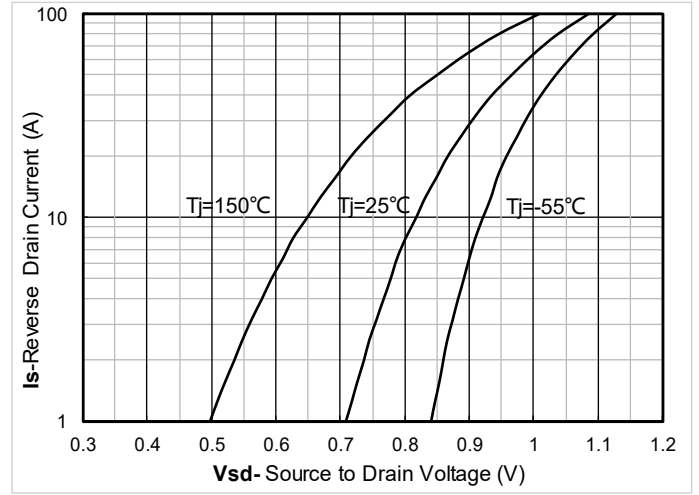


Figure 8. Forward characteristics of reverse diode

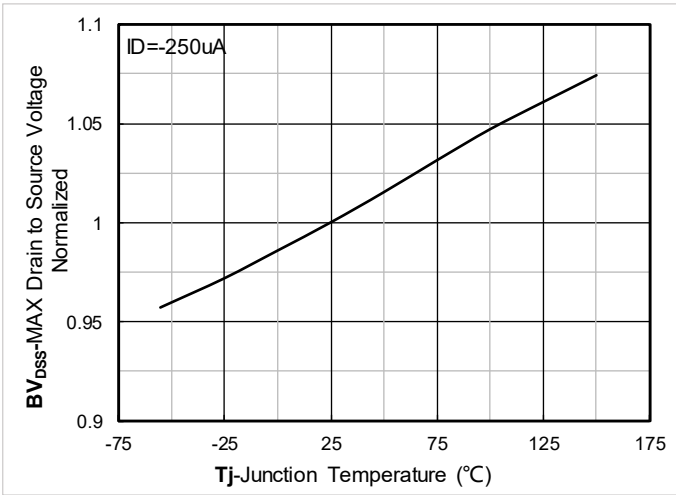


Figure 9. Normalized breakdown voltage

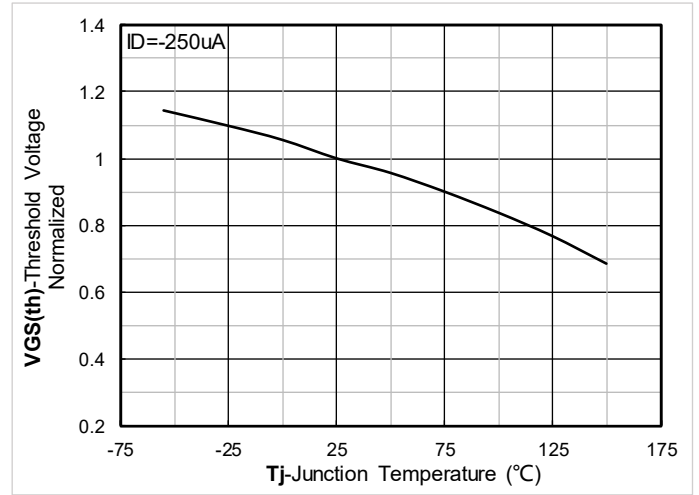


Figure 10. Normalized Threshold voltage

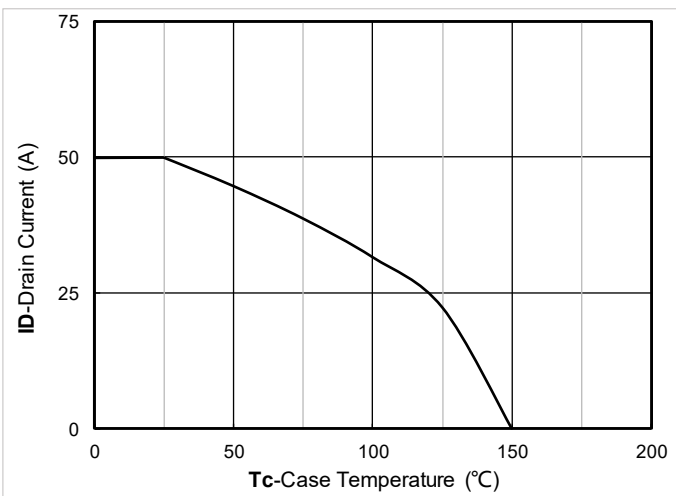


Figure 11. Current dissipation

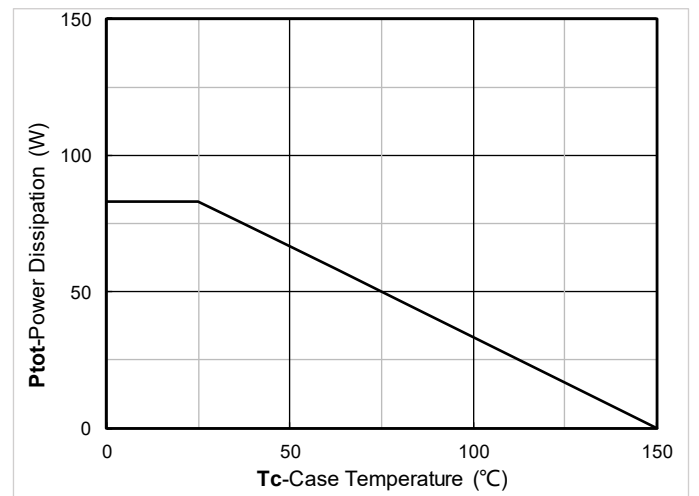


Figure 12. Power dissipation



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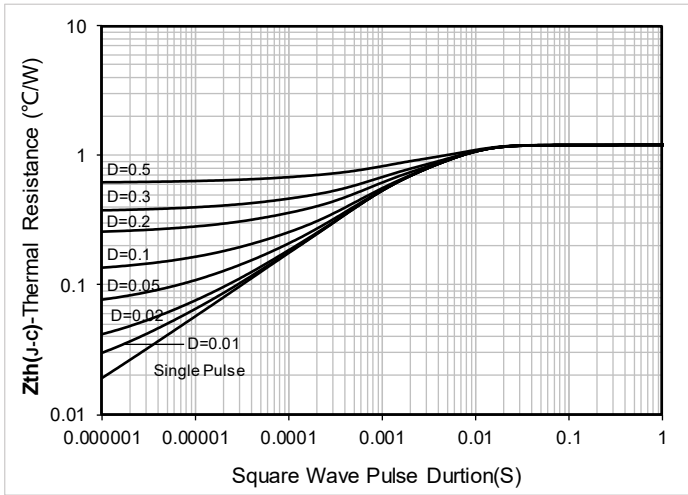


Figure 13. Maximum Transient Thermal Impedance

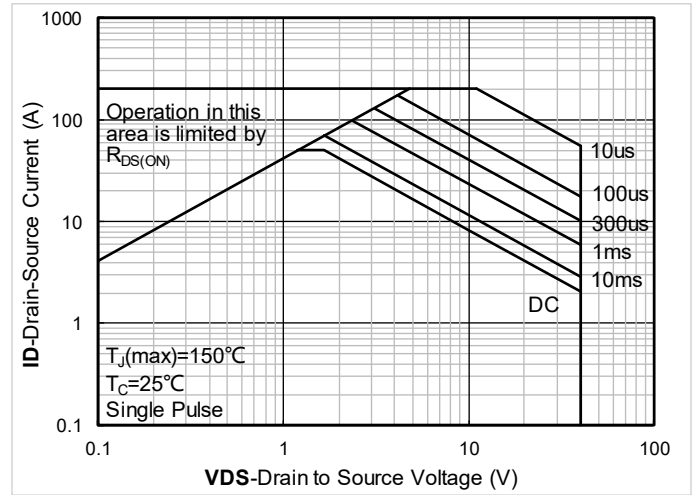
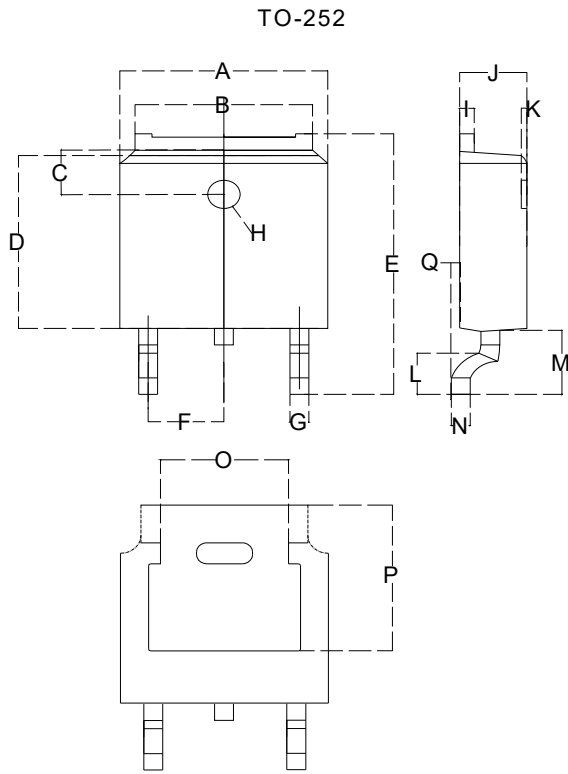


Figure 14. Safe Operation Area



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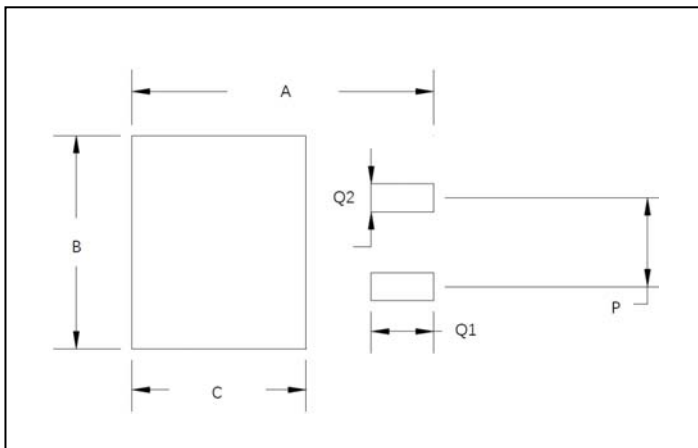
## ■ TO-252 Package information



Dimensions in millimeters

TO-252		
Dim	Min	Max
A	6.500	6.700
B	5.100	5.460
C	1.400	1.800
D	6.000	6.200
E	10.000	10.400
F	2.166	2.366
G	0.660	0.860
H	Φ1.050	Φ1.350
I	0.460	0.580
J	2.200	2.400
K	0	0.300
L	0.890	2.290
M	2.730	3.080
N	0.430	0.580
O	4.20	4.95
P	5.15	5.45
Q	0	0.2

## ■ Suggested Pad Layout



Dim	Millimeters
A	11.4
B	6.74
C	6.23
P	4.56
Q1	2.28
Q2	1.52



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