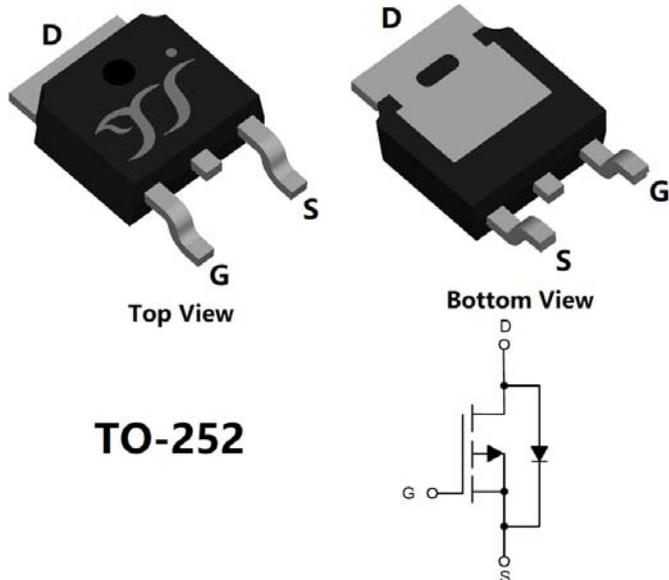


## P-Channel Enhancement Mode Field Effect Transistor



TO-252

### 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		$V_{DS}$	-40	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.



# YJD50P04AJQ

## Typical Electrical and Thermal Characteristics Diagrams

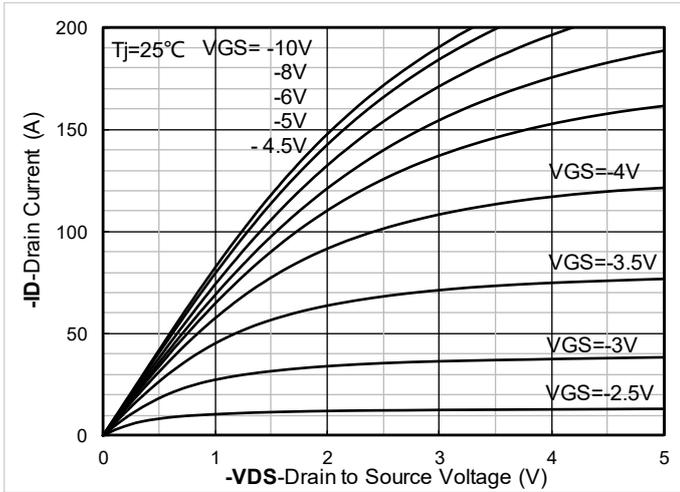


Figure 1. Output Characteristics

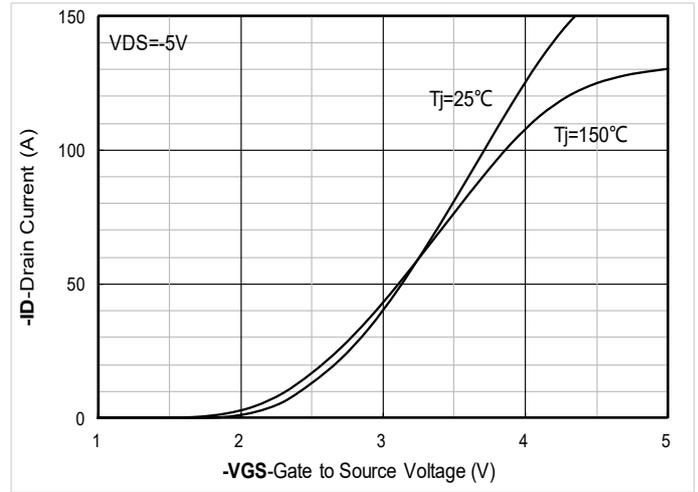


Figure 2. Transfer Characteristics

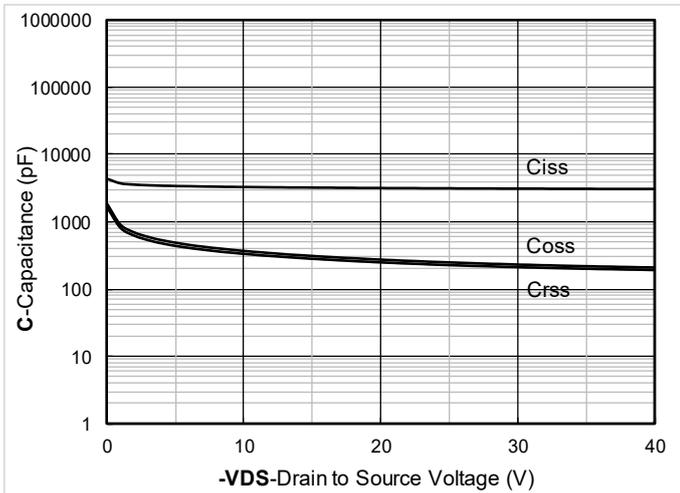


Figure 3. Capacitance Characteristics

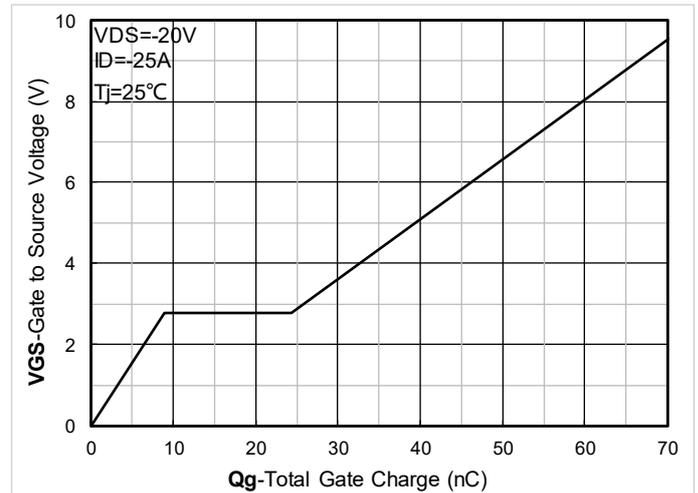


Figure 4. Gate Charge

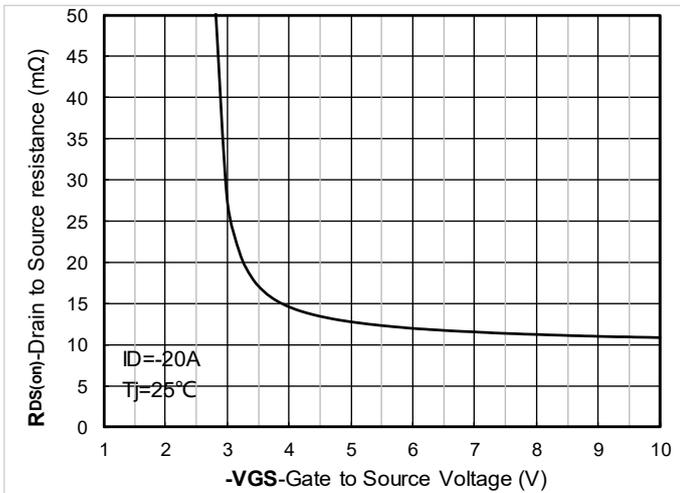


Figure 5. On-Resistance vs Gate to Source Voltage

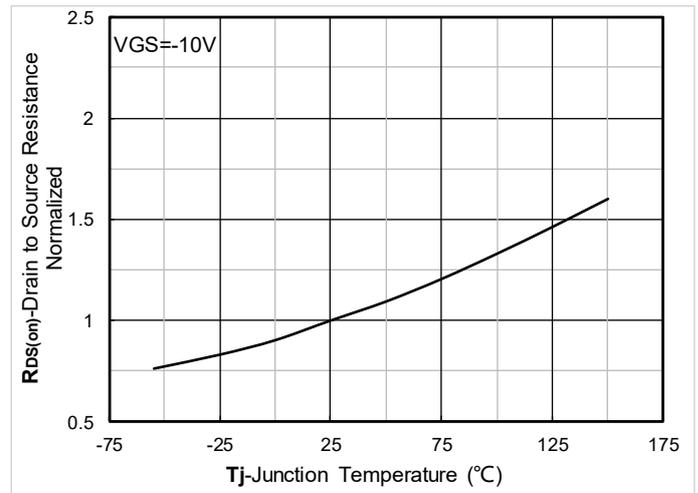


Figure 6. Normalized On-Resistance



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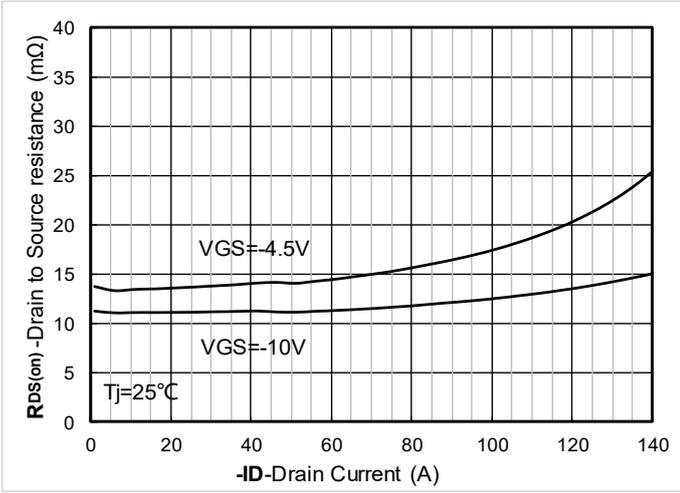


Figure 7.  $R_{DS(on)}$  VS Drain Current

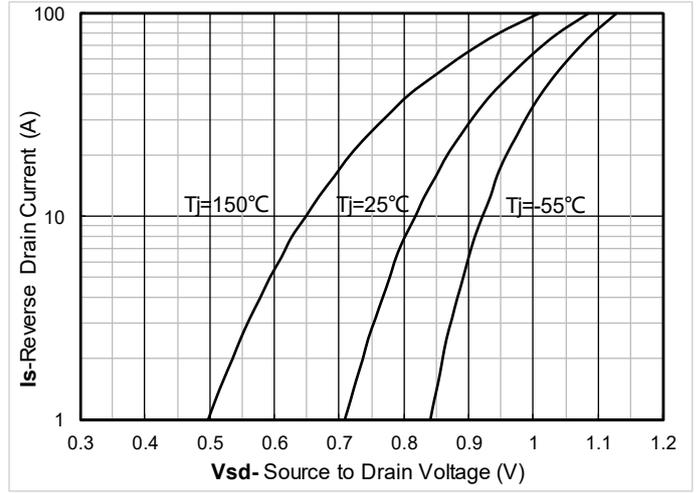


Figure 8. Forward characteristics of reverse diode

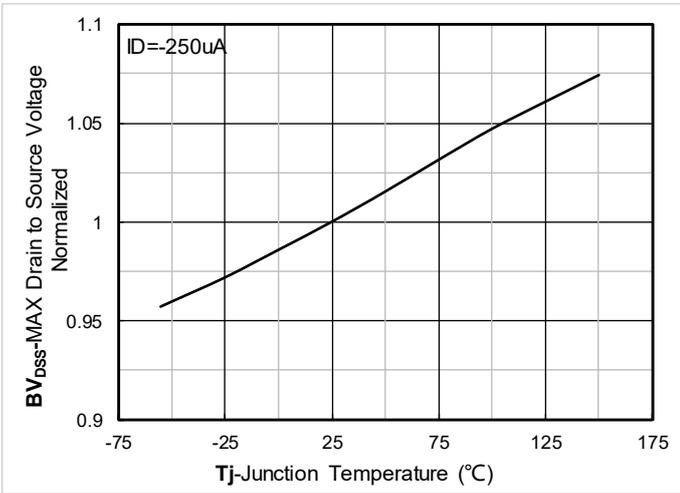


Figure 9. Normalized breakdown voltage

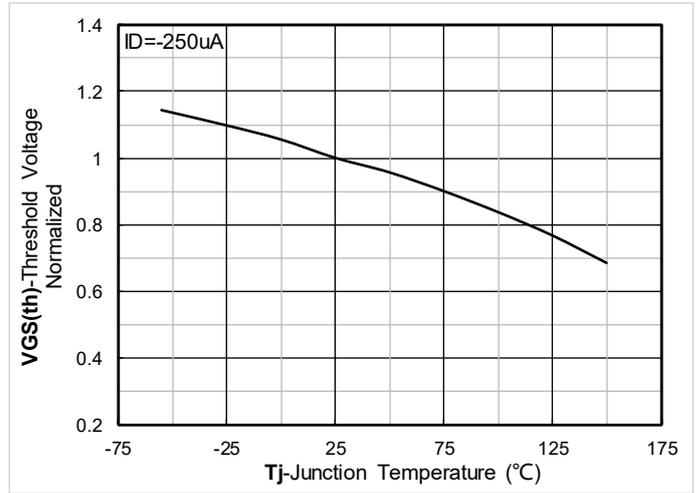


Figure 10. Normalized Threshold voltage

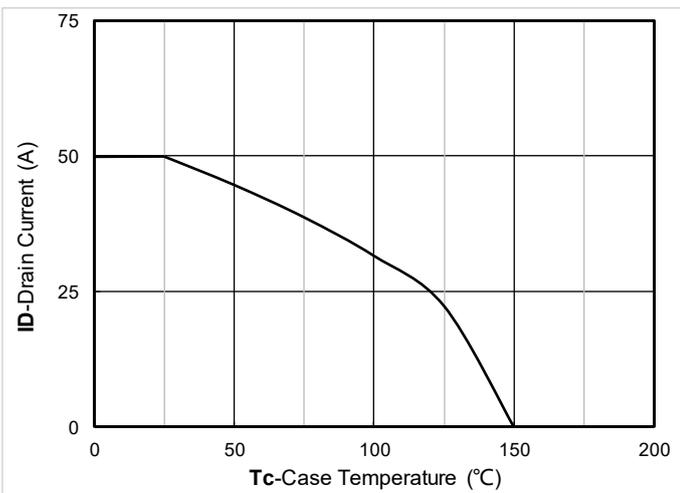


Figure 11. Current dissipation

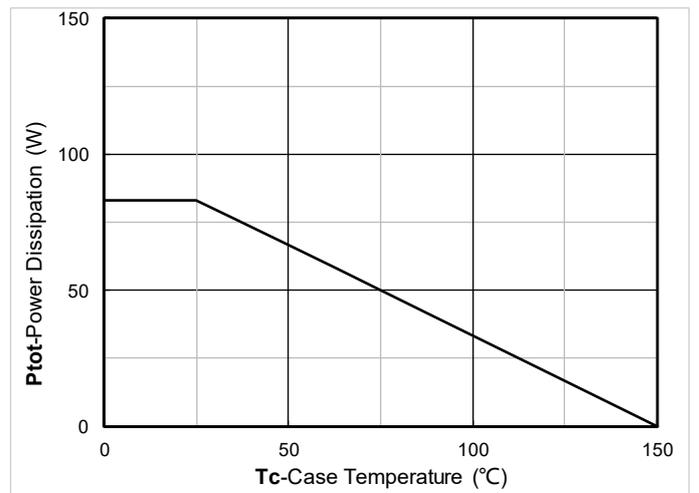


Figure 12. Power dissipation



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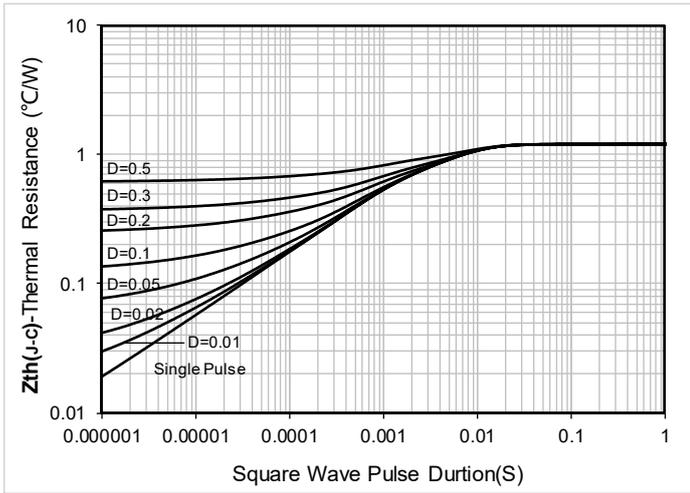


Figure 13. Maximum Transient Thermal Impedance

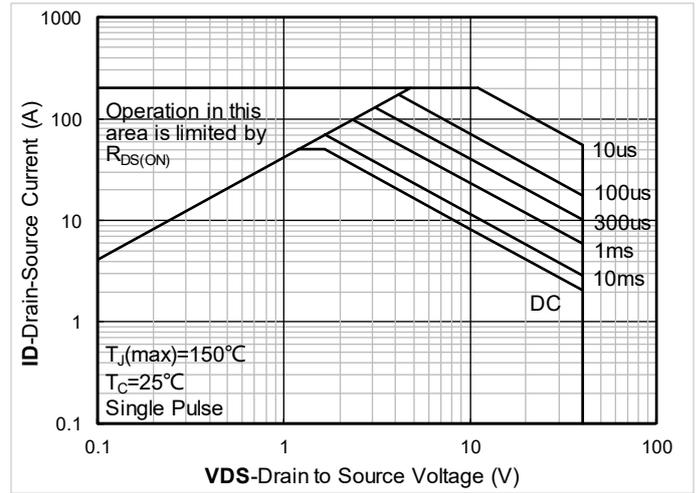
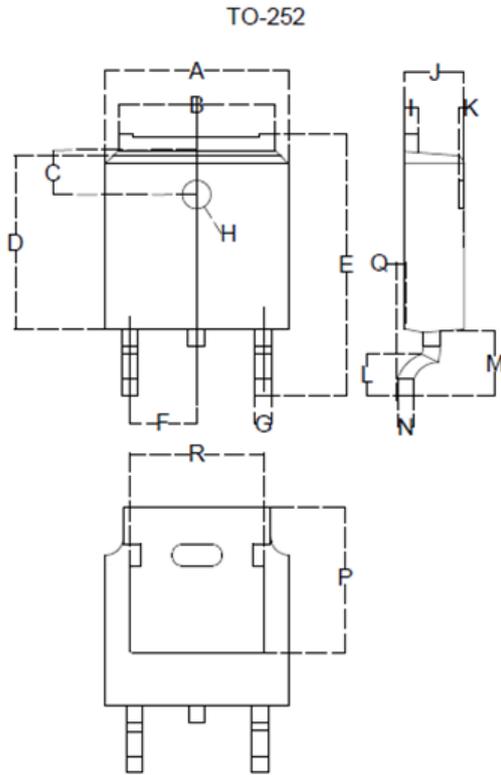


Figure 14. Safe Operation Area



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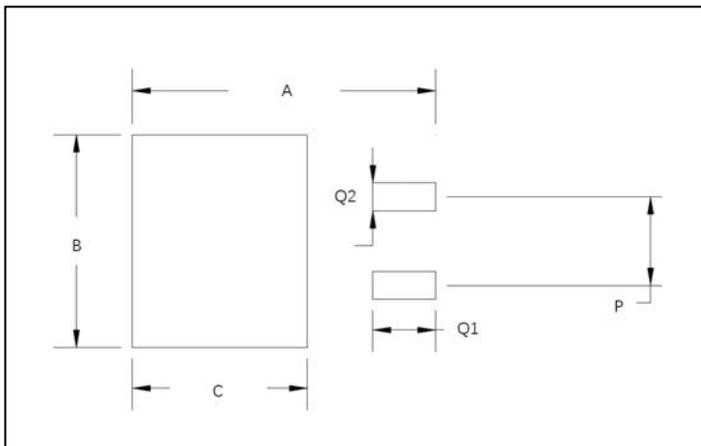
## ■ TO-252 Package information



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
P	5.15	5.45
Q	0	0.2
R	4.500	5.100

Dimensions in millimeters

## ■ Suggested Pad Layout

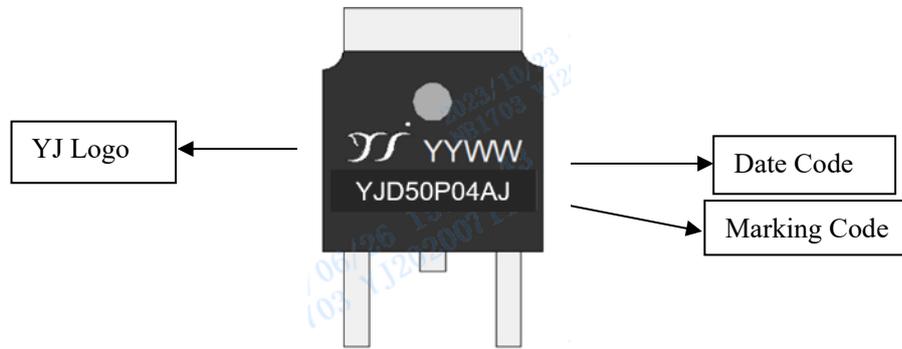


Dim	Millimeters
A	11.4
B	6.74
C	6.23
P	4.56
Q1	2.28
Q2	1.52



## YJD50P04AJQ

### ■ Marking Information



**Note:**

1. All marking is at middle of the product body
2. All marking is in laser printing
3. YJD50P04AJ is Marking Code, YYWW is date code, "YY" is year, "WW" is week
4. Body color: Black



## YJD50P04AJQ

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