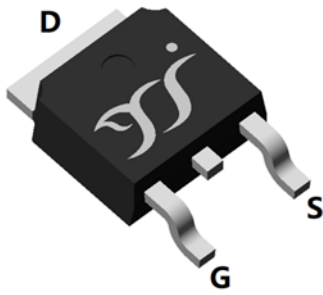
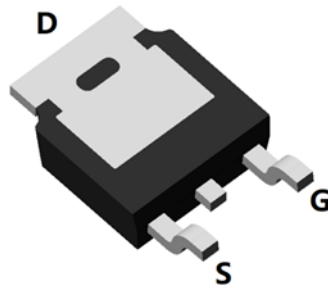


## N-Channel Enhancement Mode Field Effect Transistor

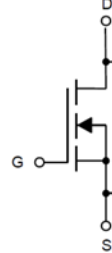


Top View



Bottom View

TO-252



### Product Summary

- $V_{DS}$  40V
- $I_D$  110A
- $R_{DS(ON)}$ ( at  $V_{GS}=10V$ )  $<3.1m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

### General Description

- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$
- 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 switching application
- Uninterruptible power supply
- DC-DC convertor
- 12V Automotive systems

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

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	40	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current	$T_A=25^\circ C$	$I_D$	21	A
	$T_A=100^\circ C$		14	
	$T_C=25^\circ C$		110	
	$T_C=100^\circ C$		77	
Pulsed Drain Current <sup>A</sup>		$I_{DM}$	440	A
Avalanche energy <sup>B</sup>		EAS	175.5	mJ
Total Power Dissipation <sup>C</sup>	$T_A=25^\circ C$	$P_D$	3	W
	$T_A=100^\circ C$		1.5	
	$T_C=25^\circ C$		83	
	$T_C=100^\circ C$		41	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+175	$^\circ C$

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient <sup>D</sup>	Steady-State	$R_{\theta JA}$	40	50	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	1.5	1.8	

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJD3D1G04HQ	F1	YJD3D1G04H	2500	/	25000	13"Reel



# YJD3D1G04HQ

## ■ 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> =1mA	40	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-	-	100	
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	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	2.4	3.1	mΩ
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V	-	-	1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz	-	2	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	110	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	-	2130	-	pF
Output Capacitance	C <sub>oss</sub>		-	930	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	75	-	
<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> =40A	-	38	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	10.5	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	12.5	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =40A, di/dt=100A/us	-	41	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	46	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =4.5V, V <sub>DD</sub> =20V, I <sub>D</sub> =40A R <sub>GEN</sub> =1Ω	-	14	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	13	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	24	-	
Turn-off fall Time	t <sub>f</sub>		-	11	-	

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

B. T<sub>J</sub>=25°C, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=26.5A.

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

D. The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in the still air environment with T<sub>A</sub>=25°C. The maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.



# YJD3D1G04HQ

## Typical Electrical and Thermal Characteristics Diagrams

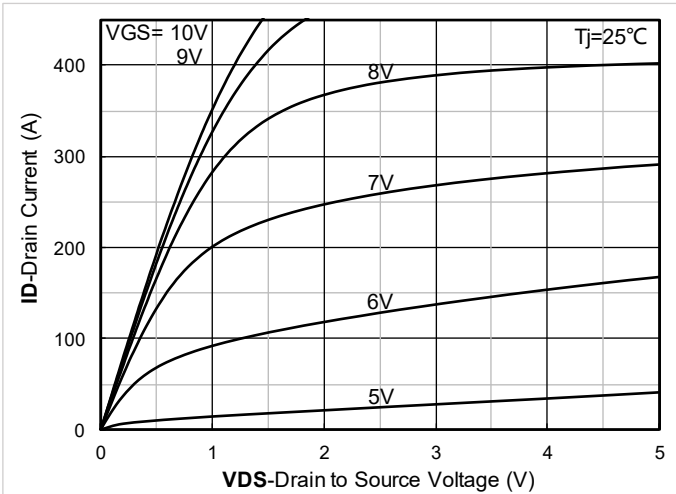


Figure 1. Output Characteristics

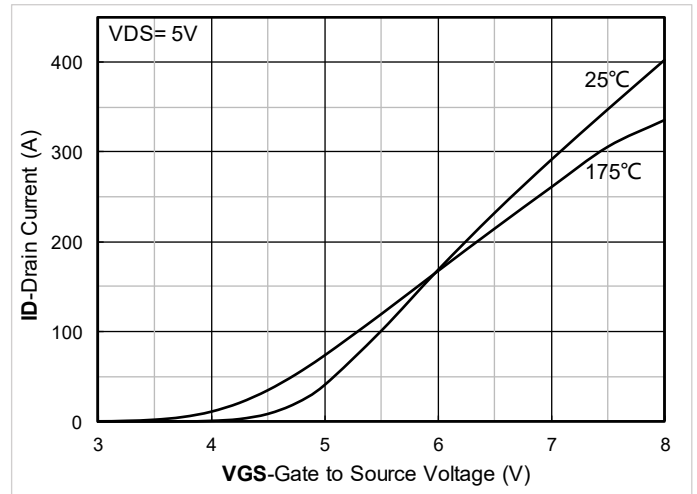


Figure 2. Transfer Characteristics

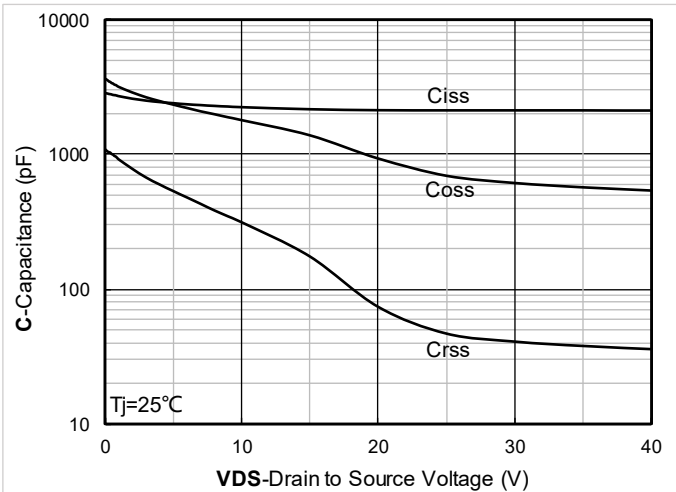


Figure 3. Capacitance Characteristics

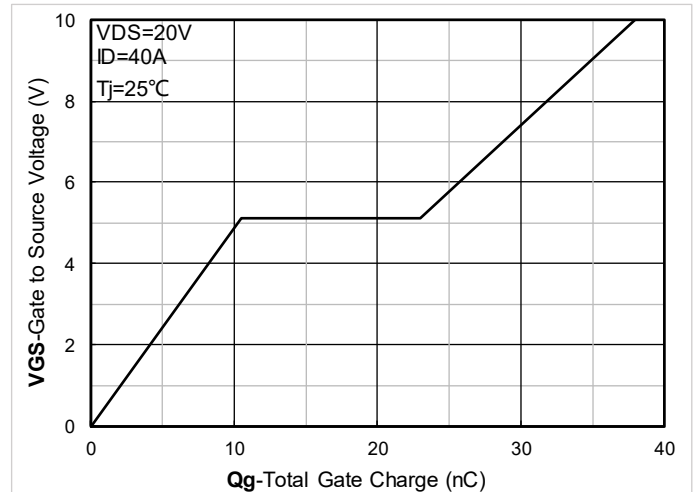


Figure 4. Gate Charge

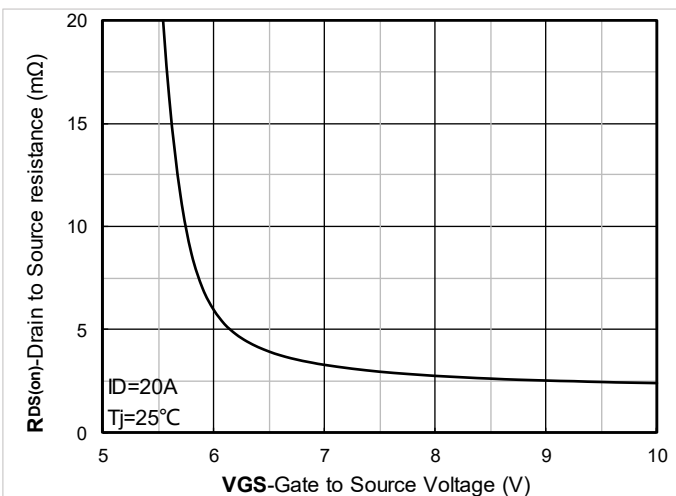


Figure 5. On-Resistance vs Gate to Source Voltage

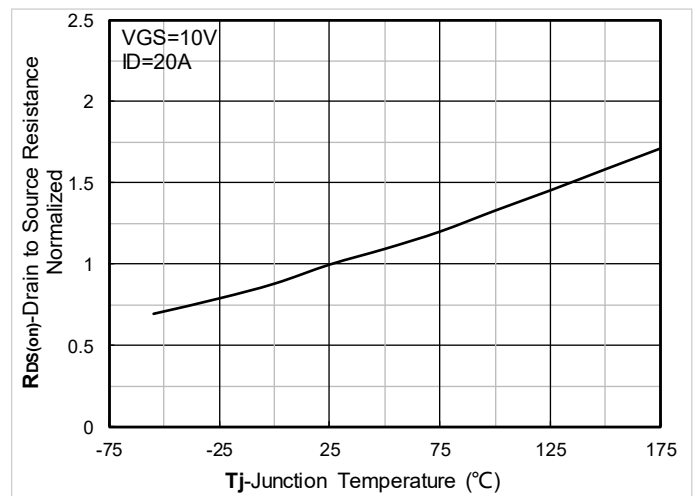


Figure 6. Normalized On-Resistance



# YJD3D1G04HQ

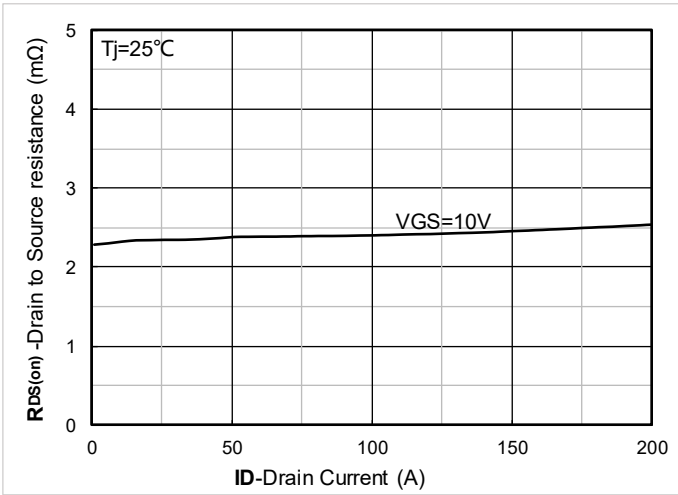


Figure 7. RDS(on) VS Drain Current

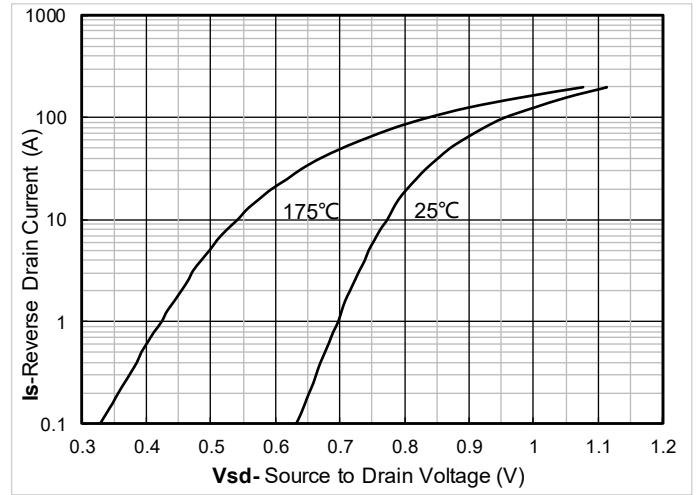


Figure 8. Forward characteristics of reverse diode

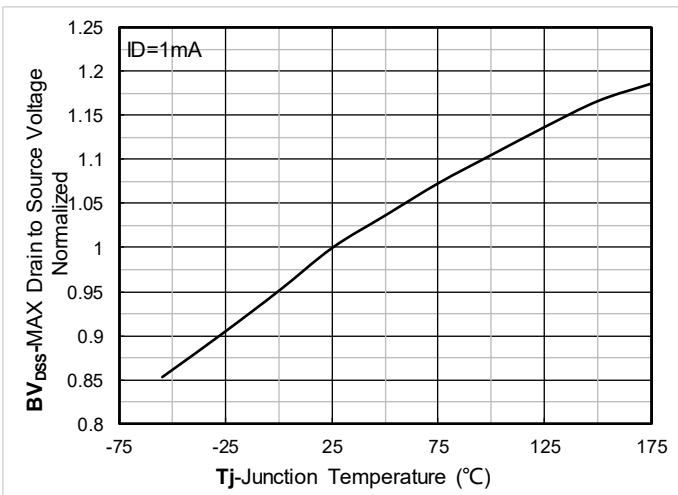


Figure 9. Normalized breakdown voltage

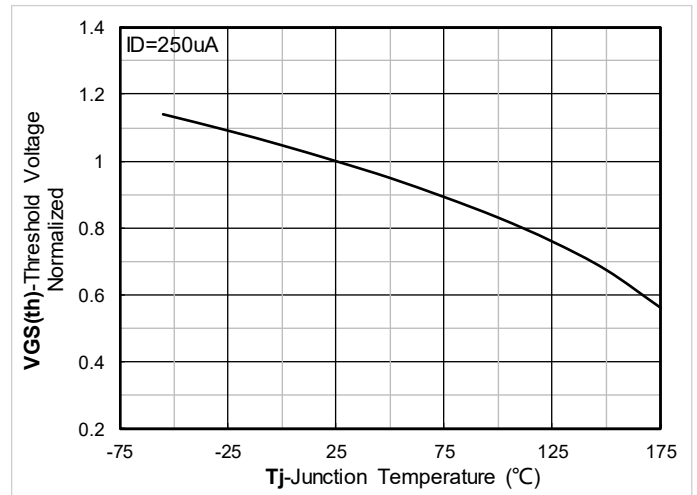


Figure 10. Normalized Threshold voltage

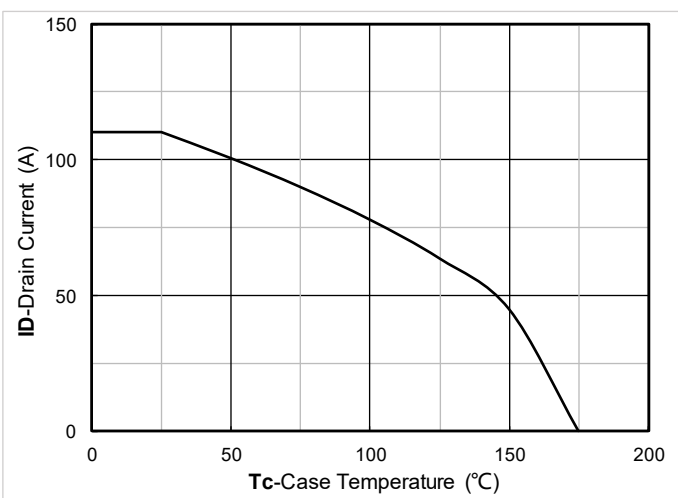


Figure 11. Current dissipation

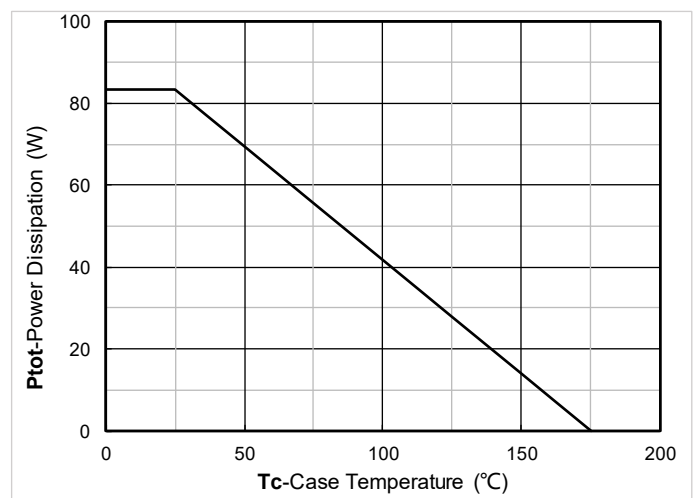


Figure 12. Power dissipation

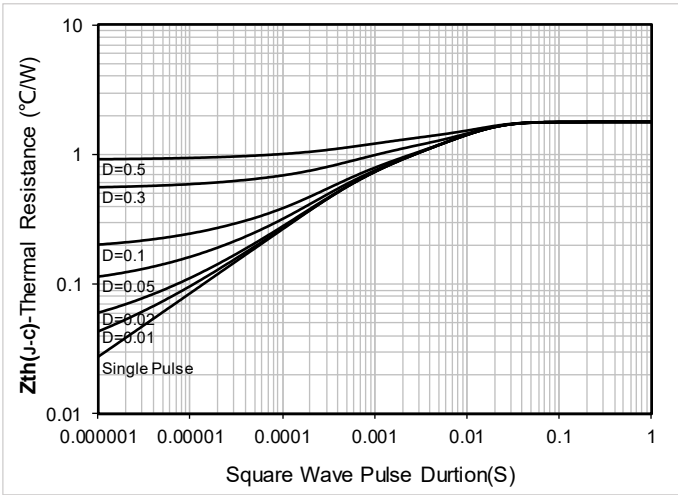


Figure 13. Maximum Transient Thermal Impedance

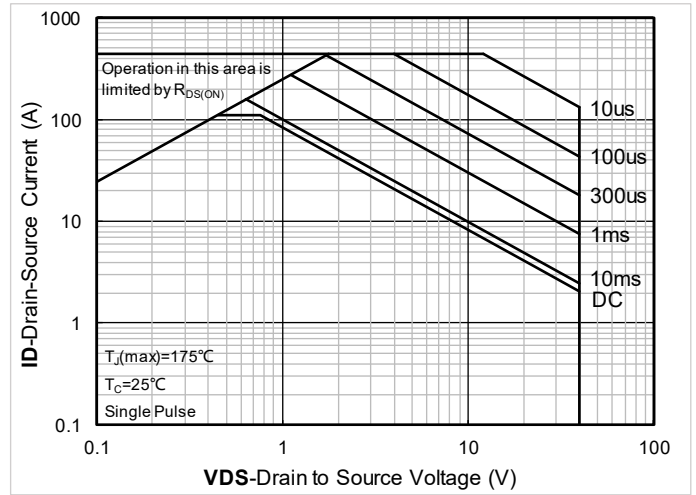


Figure 14. Safe Operation Area

## ■ Test Circuits & Waveforms

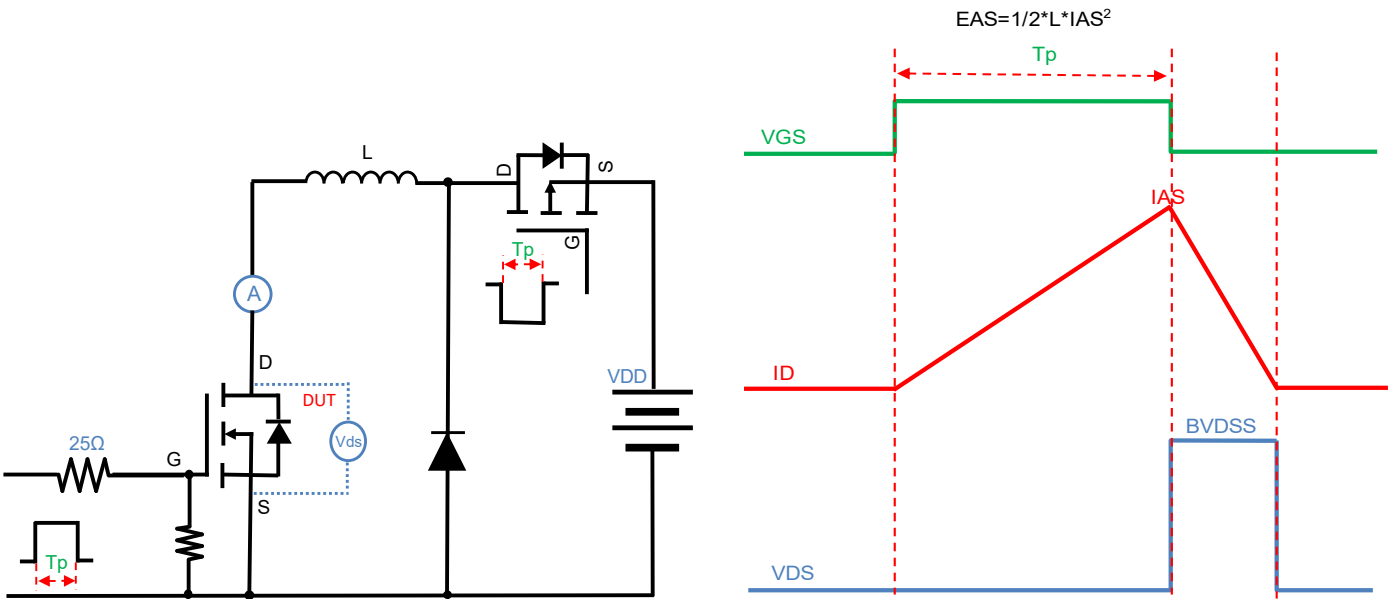


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

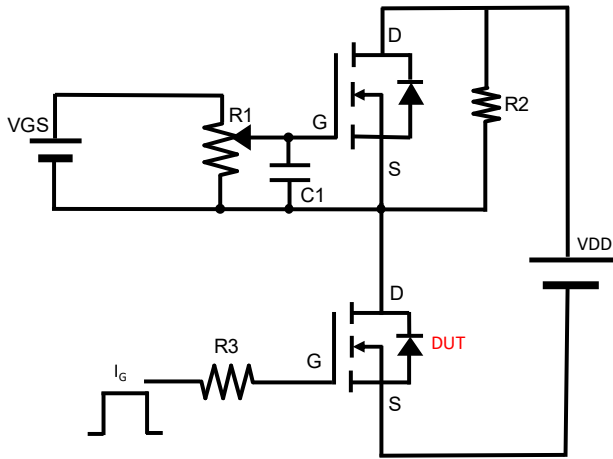


Figure B. Gate Charge Test Circuit & Waveform

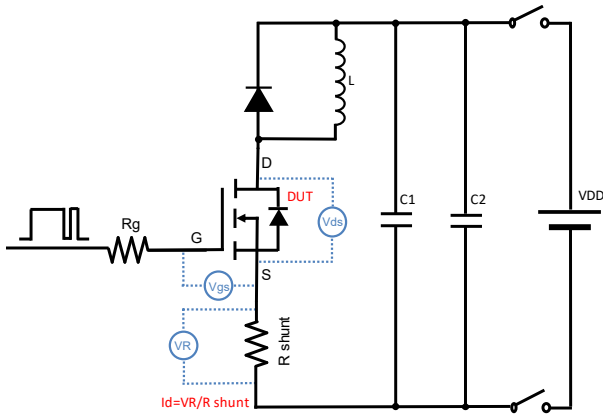


Figure C. Resistive Switching Test Circuit & Waveform

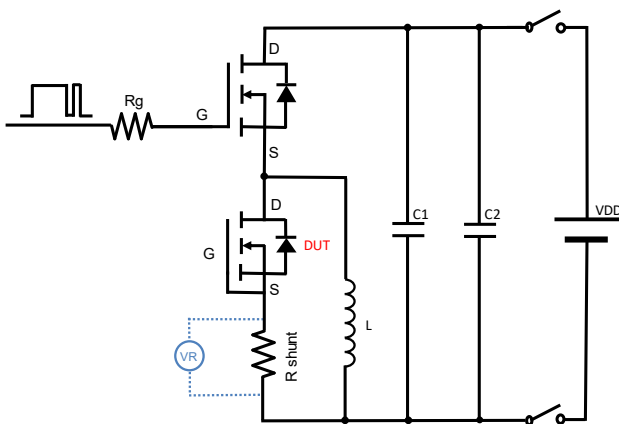
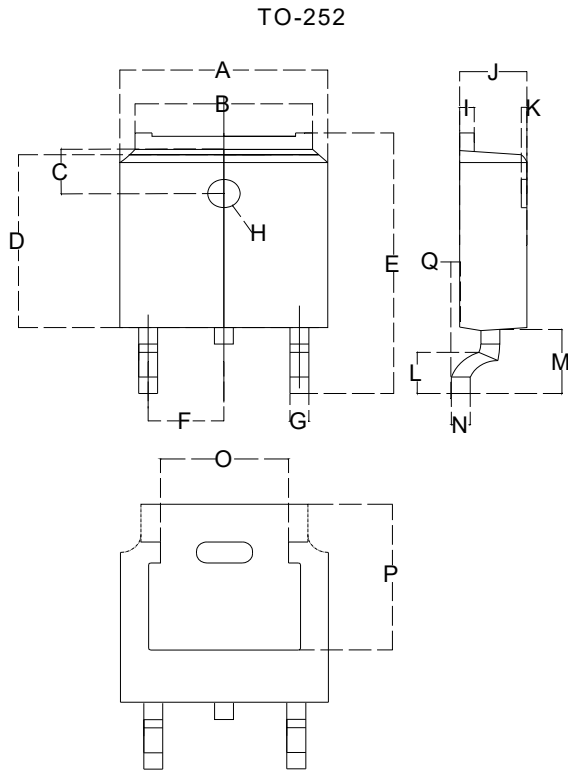


Figure D. Diode Recovery Test Circuit & Waveform



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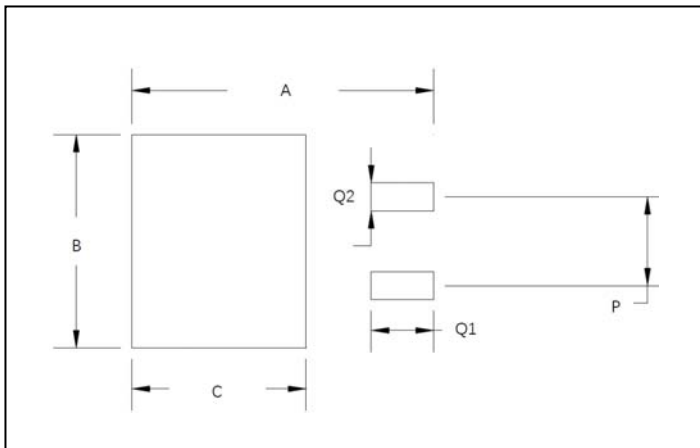
## ■ TO-252 Package information



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



## YJD3D1G04HQ

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