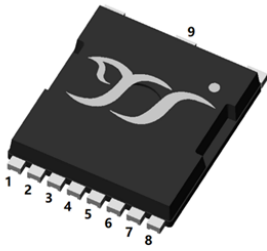
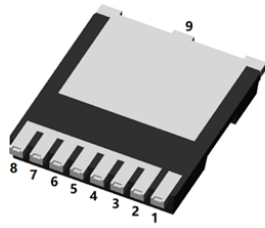


## N-Channel Enhancement Mode Field Effect Transistor

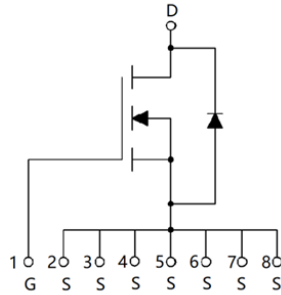


Top View



Bottom View

**TOLL**



### Product Summary

- $V_{DS}$  40V
- $I_D$  210A
- $R_{DS(ON)}$  ( at  $V_{GS}=10V$  )  $< 1.4m\Omega$
- $R_{DS(ON)}$  ( at  $V_{GS}=4.5V$  )  $< 1.9m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

### General Description

- Split gate trench MOSFET technology
- 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

### Applications

- Power switching application
- Uninterruptible power supply
- DC-DC convertor

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

Parameter		Symbol	Limit	Unit	
Drain-source Voltage		$V_{DS}$	40	V	
Gate-source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current (Note 1,2)	Steady-State	$I_D$	$T_A=25^\circ C$	32	A
			$T_A=100^\circ C$	20	
Continuous Drain Current (Note 1,3)	Steady-State		$T_C=25^\circ C$	210	
			$T_C=100^\circ C$	132	
Pulsed Drain Current	$T_C=25^\circ C, t_p=100\mu s$	$I_{DM}$	840	A	
Avalanche energy	$V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=49A$	EAS	600.25	mJ	
Total Power Dissipation (Note 1,2)	Steady-State	$P_D$	$T_A=25^\circ C$	2.7	W
			$T_A=100^\circ C$	1.1	
Total Power Dissipation (Note 1,3)	Steady-State		$T_C=25^\circ C$	113	
			$T_C=100^\circ C$	45	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+150	$^\circ C$	

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	36	45	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	0.9	1.1	

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJT1D4G04AJ	F1	YJT1D4G04AJ	2000	4000	20000	13" reel



# YJT1D4G04AJ

## ■ 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
		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> =40V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, T <sub>J</sub> =150°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	1.3	1.8	2.3	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =50A	-	1	1.4	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =25A	-	1.4	1.9	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =50A, V <sub>GS</sub> =0V	-	-	1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz	-	3.3	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	210	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	-	6140	-	pF
Output Capacitance	C <sub>oss</sub>		-	1860	-	
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> =50A	-	89	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	18	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	15	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =50A, di/dt=100A/us	-	53	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	55	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =20V, I <sub>D</sub> =50A R <sub>GEN</sub> =3Ω	-	14	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	15	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	84	-	
Turn-off fall Time	t <sub>f</sub>		-	44	-	

Note:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of R<sub>θJA</sub> is measured with the device mounted on the 40mm\*40mm\*1.1mm single layer FR-4 PCB board with 1 in<sup>2</sup> pad of 2oz. Copper, 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.
- Thermal resistance from junction to soldering point (on the exposed drain pad).



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## Typical Electrical and Thermal Characteristics Diagrams

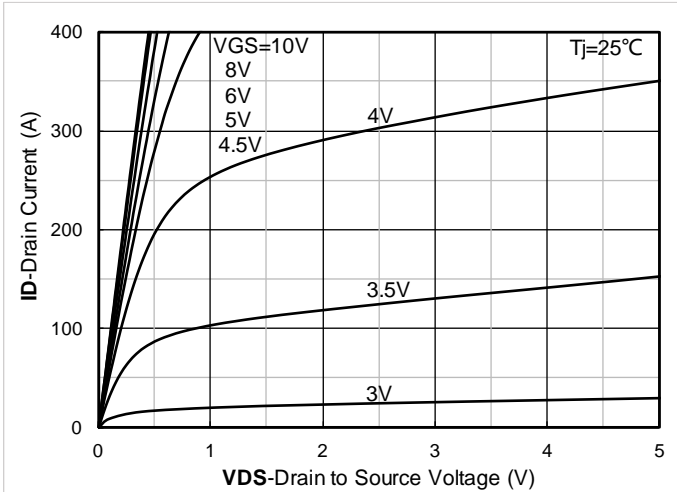


Figure 1. Output Characteristics

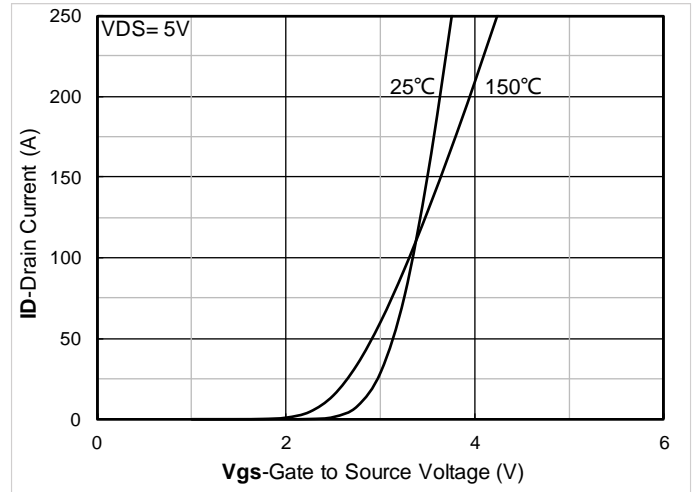


Figure 2. Transfer Characteristics

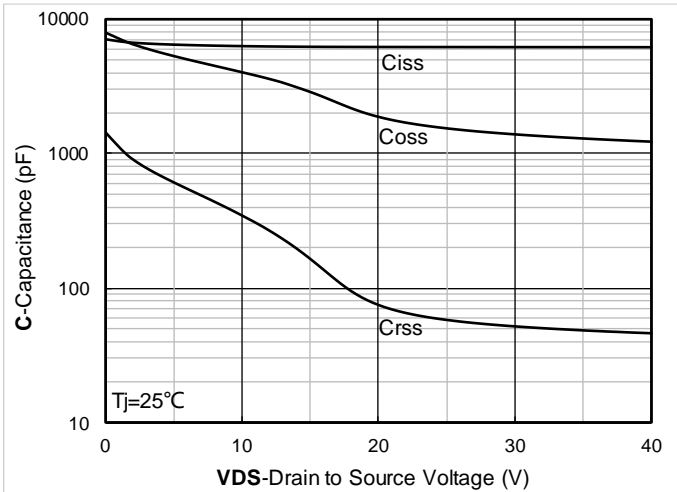


Figure 3. Capacitance Characteristics

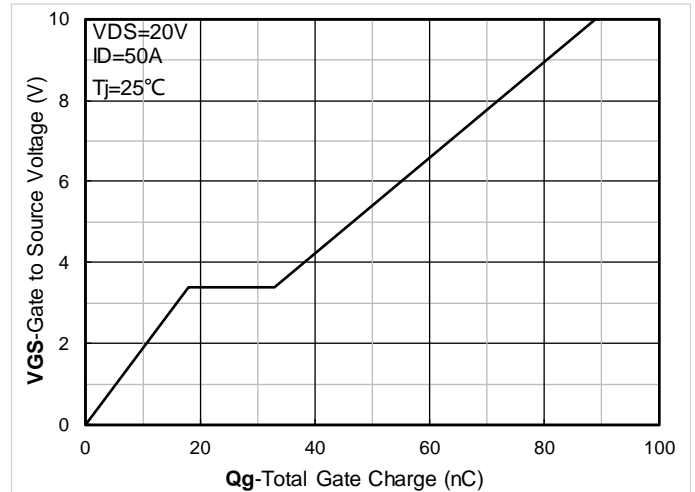


Figure 4. Gate Charge

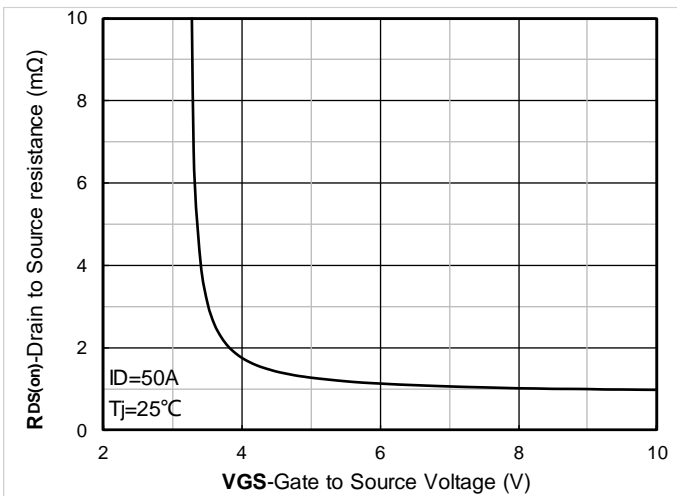


Figure 5. On-Resistance vs Gate to Source Voltage

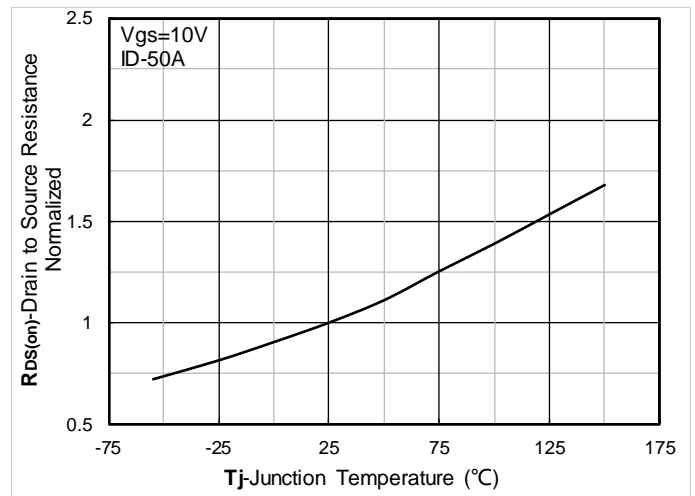


Figure 6. Normalized On-Resistance



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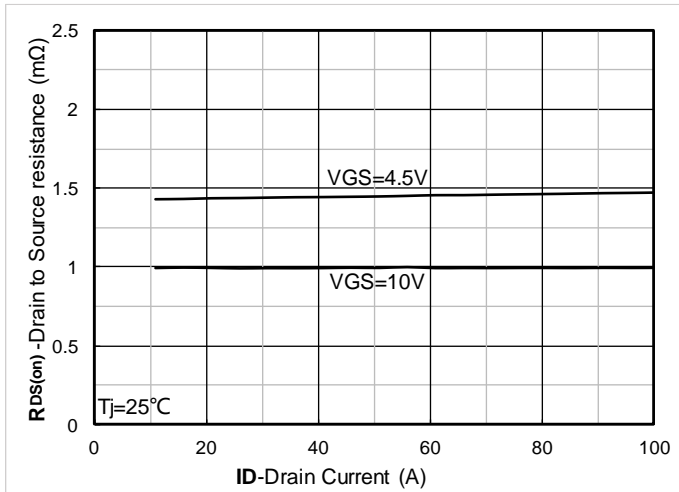


Figure 7. RDS(on) VS Drain Current

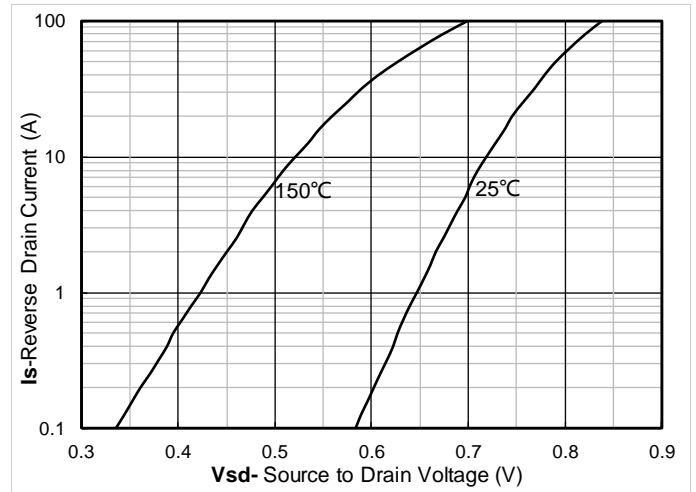


Figure 8. Forward characteristics of reverse diode

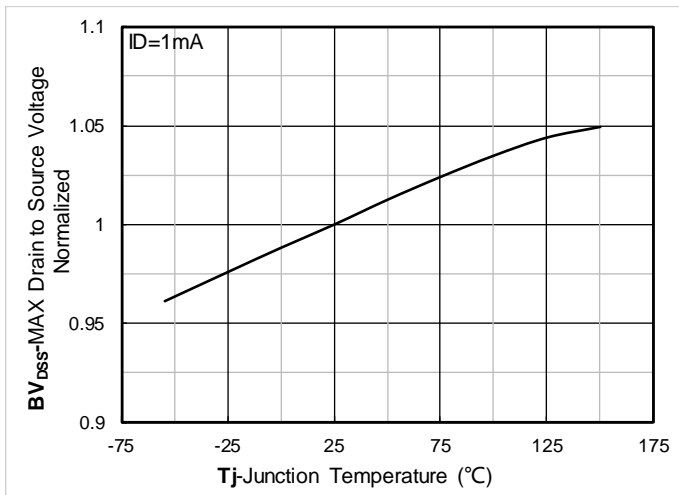


Figure 9. Normalized breakdown voltage

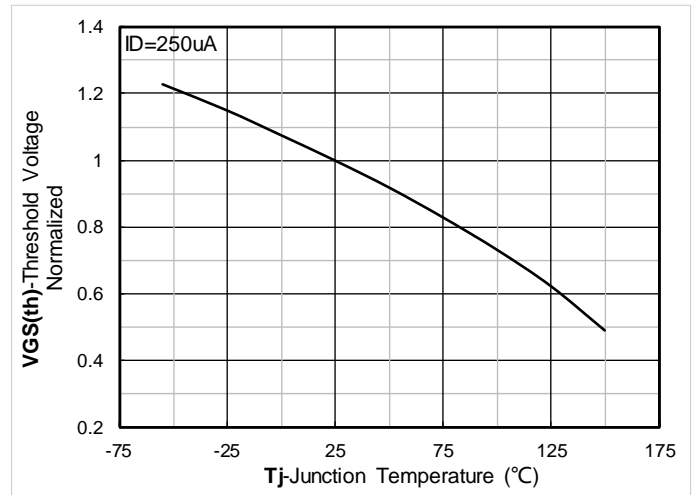


Figure 10. Normalized Threshold voltage

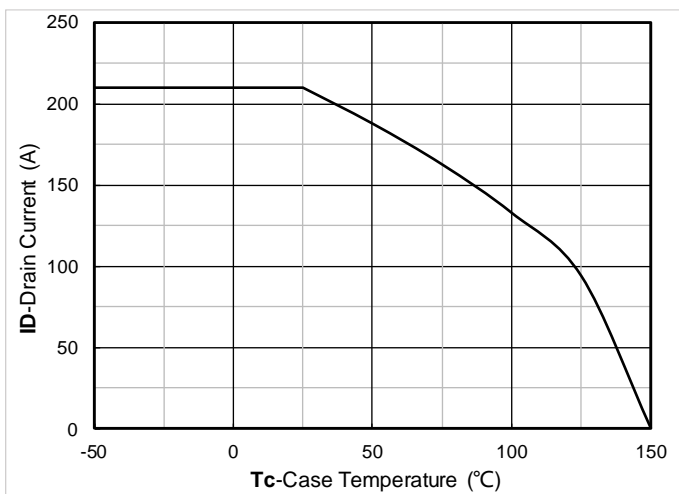


Figure 11. Current dissipation

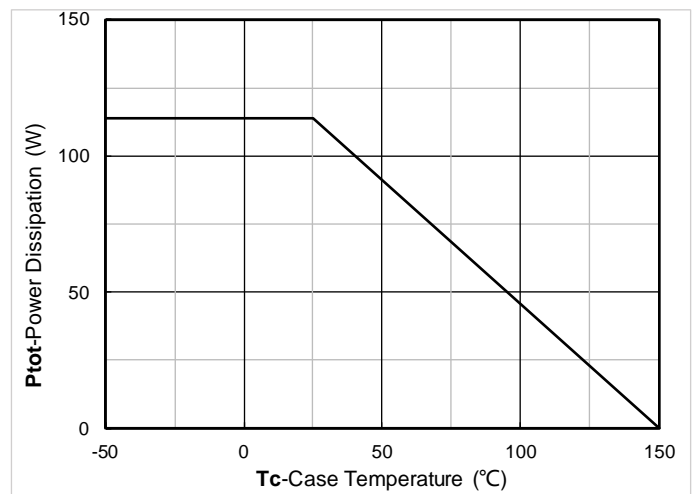


Figure 12. Power dissipation

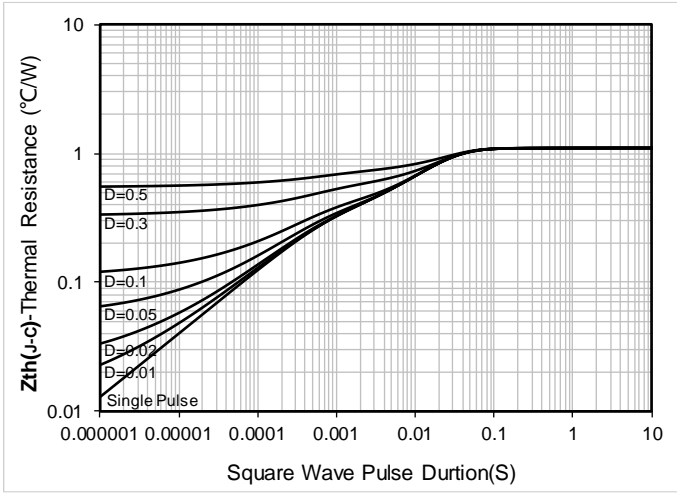


Figure 13. Maximum Transient Thermal Impedance

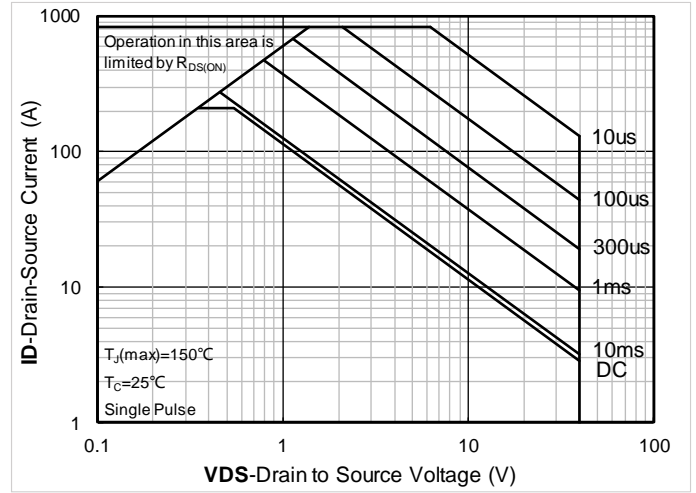


Figure 14. Safe Operation Area

## ■ Test Circuits & Waveforms

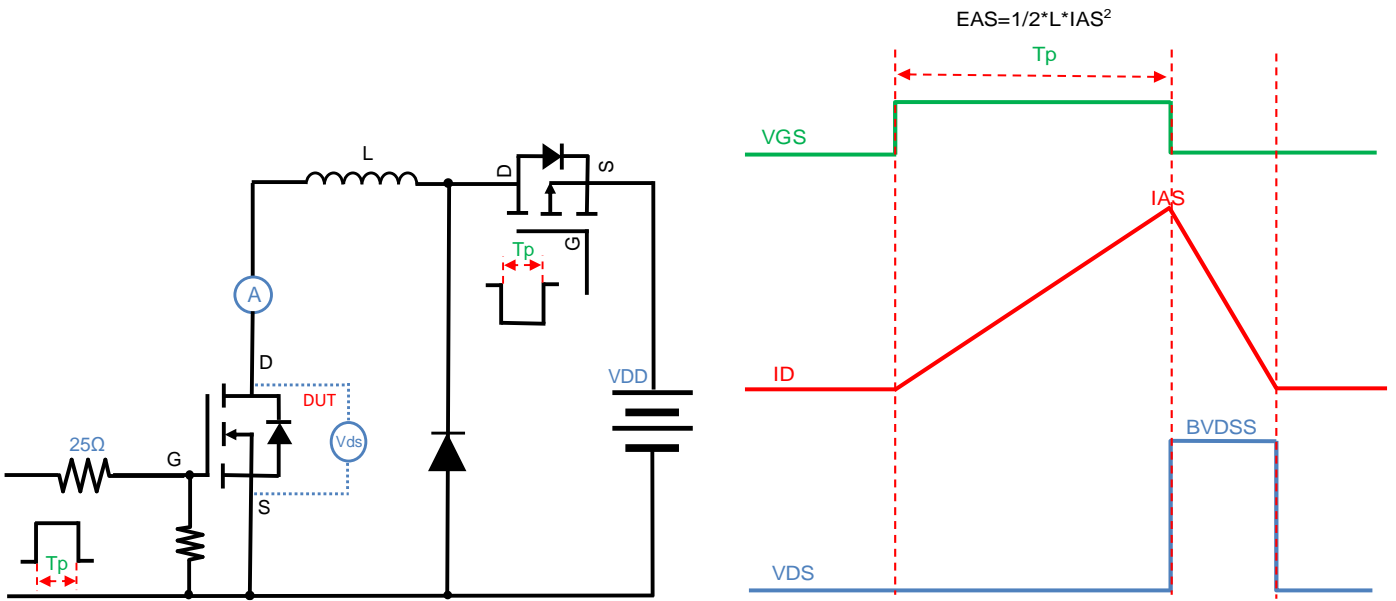


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform



Figure B. Gate Charge Test Circuit & Waveform



Figure C. Resistive Switching Test Circuit & Waveform

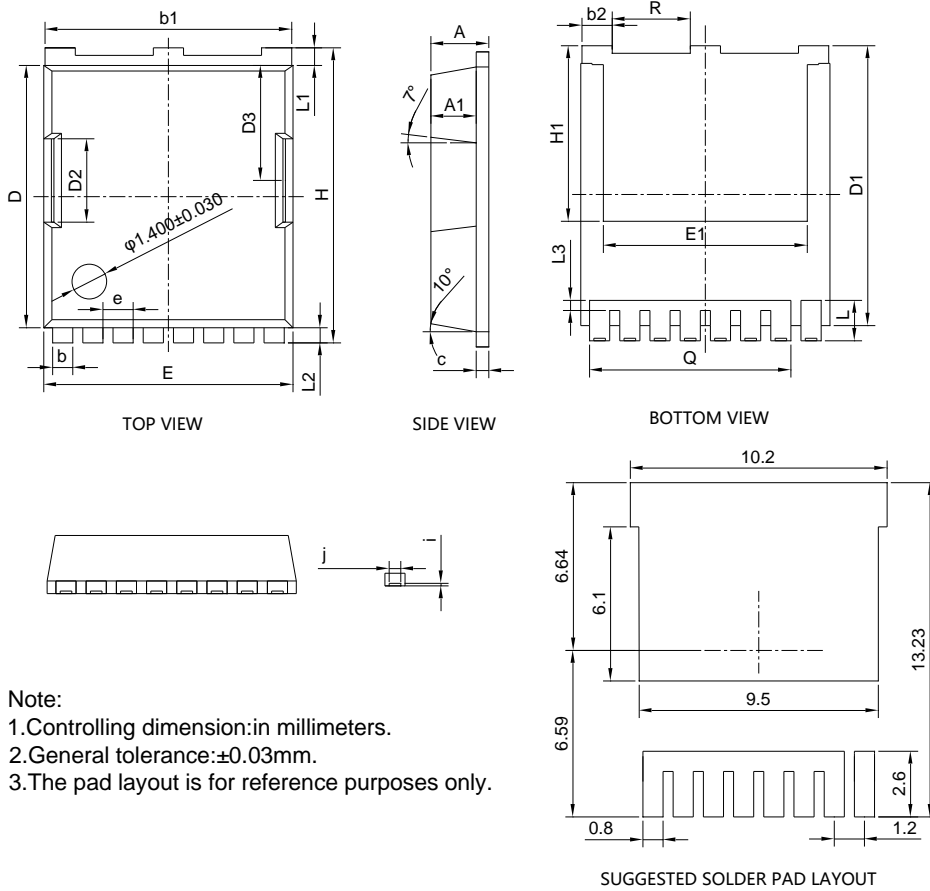


Figure D. Diode Recovery Test Circuit & Waveform



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## ■ TOLL Package information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.2	2.3	2.4
A1	1.7	1.8	1.9
b	0.7	0.8	0.9
b1	9.7	9.8	9.9
b2	1.1	1.2	1.3
c	0.4	0.5	0.6
D	10.28	10.38	10.48
D1	10.98	11.08	11.18
D2	3.2	3.3	3.4
D3	4.45	4.55	4.65
E	9.8	9.9	10
E1	8	8.1	8.2
e	1.2 BSC		
H	11.58	11.68	11.78
H1	6.95 BSC		
i	0.1 REF		
j	0.46 REF		
L	1.5	1.6	1.7
L1	0.6	0.7	0.8
L2	0.5	0.6	0.7
L3	0.3	0.4	0.5
Q	8 REF		
R	3.0	3.1	3.2

- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.03\text{mm}$ .
  3. The pad layout is for reference purposes only.

UNIT: mm



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