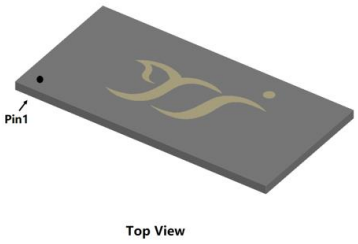
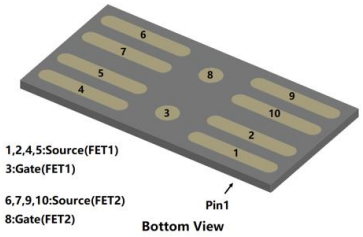
N-Channel Enhancement Mode Field Effect Transistor

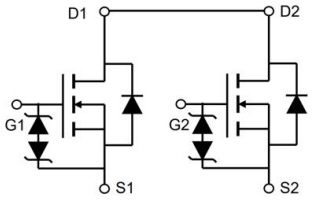


Top View



Bottom View

WLCSP-10L



Product Summary

- V_{SS} 12V
- I_S 13A
- $R_{SS(ON)}$(at V_{GS}=4.5V) ＜2.7mΩ
- $R_{SS(ON)}$(at V_{GS}=3.8V) ＜3.2mΩ
- $R_{SS(ON)}$(at V_{GS}=3.1V) ＜3.95mΩ
- $R_{SS(ON)}$(at V_{GS}=2.5V) ＜6.1mΩ

General Description

- Trench MOSFET technology
- Extremely Low RSS(ON)
- ESD HBM Class 2
- Common Drain Design
- RoHS compliant
- Halogen-free

Applications

- Battery Protection

■ Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Source-source Voltage			V_{SS}	-	12	V
Gate-source Voltage			V_{GS}	-8	8	
Continuous Source Current (Note 1,2)	Steady-State	T_A=25℃,V_{GS}=4.5V	I_S	-	13	A
		T_A=100℃,V_{GS}=4.5V		-	10	
Pulsed Source Current	T_A=25℃,t_p≤10μs		I_{SM}	-	52	
Maximum Body-Diode Continuous Current	T_A=25℃		I_S		13	
Total Power Dissipation (Note 1,2)	Steady-State	T_A=25℃	P_D	-	0.5	W
Junction and Storage Temperature Range			T_J ,T_{STG}	-55	150	℃

■Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	-	250	℃/W

■ Ordering Information (Example)

PREFERED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJZ2D4N012AJ	F1	2D4N012AJ	5000	/	/	Tape Reel

■ Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Source-Source Breakdown Voltage	BV_{SSS}	V_{GS}=0V,I_S=250μA,Tj=25℃	12	-	-	V
Zero Gate Voltage Source Current	I_{SSS}	V_{SS}=12V,V_{GS}=0V,Tj=25℃	-	-	1	μA
		V_{SS}=12V,V_{GS}=0V,Tj=150℃	-	-	100	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±8V,V_{DS}=0V,Tj=25℃	-	-	±10	
		V_{GS}=±5V,V_{DS}=0V,Tj=25℃	-	-	±1	
Gate Threshold Voltage	$V_{GS(th)}$	V_{SS}=V_{GS},I_S=1mA,Tj=25℃	0.55	0.9	1.3	V
Static Source-Source On-Resistance	$R_{SS(ON)}$	V_{GS}=4.5V,I_S=6A,Tj=25℃	1.6	2.15	2.7	mΩ
		V_{GS}=3.8V,I_S=6A,Tj=25℃	1.8	2.35	3.2	
		V_{GS}=3.1V,I_S=6A,Tj=25℃	2	2.7	3.95	
		V_{GS}=2.5V,I_S=6A,Tj=25℃	2.2	3.5	6.1	
Diode Forward Voltage	V_{SS}	I_S=4A,V_{GS}=0V,Tj=25℃	-	0.6	1.2	V
Gate Resistance	R_G	f=1MHz,Tj=25℃	-	620	-	Ω
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{SS}=10V,V_{GS}=0V,f=1MHz,Tj=25℃	-	3500	-	pF
Output Capacitance	C_{oss}		-	450	-	
Reverse Transfer Capacitance	C_{rss}		-	400	-	
Switching Parameters						
Total Gate Charge	Q_g	V_{GS}=4.5V,V_{DD}=6V,I_S=4A,Tj=25℃	-	23	-	nC
Gate-Source Charge	Q_{gs}		-	11	-	
Gate-Drain Charge	Q_{gd}		-	5	-	
Turn-on Delay Time	$t_{D(on)}$	V_{GS}=4.5V,V_{DD}=6V,I_S=4A,R_{GEN}=3Ω, Tj=25℃	-	0.6	-	ns
Turn-on Rise Time	t_r		-	1.4	-	
Turn-off Delay Time	$t_{D(off)}$		-	6.6	-	
Turn-off Fall Time	t_f		-	4	-	

Note：

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 in^2 pad of 2oz. Copper, in the still air environment with T_A=25℃.The maximum allowed junction temperature of 150℃. The value in any given application depends on the user's specific board design.

■Typical Electrical and Thermal Characteristics Diagrams

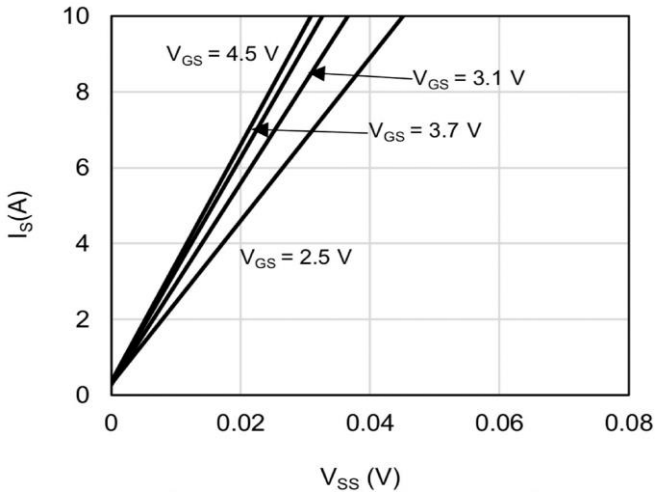


Figure 1. Output Characteristics; typical values

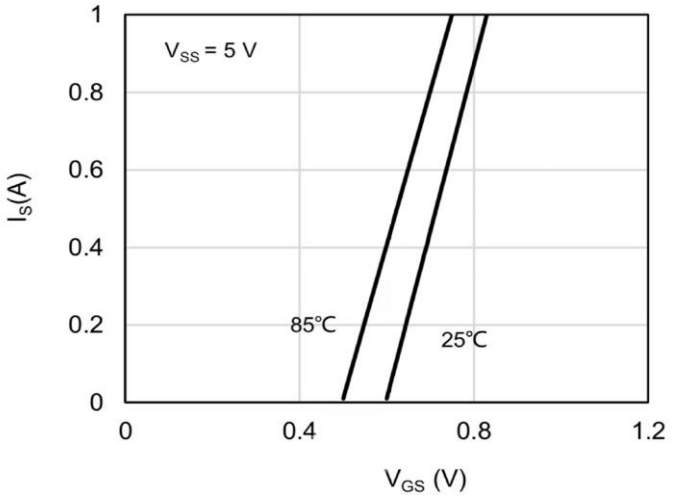


Figure 2. Transfer Characteristics; typical values

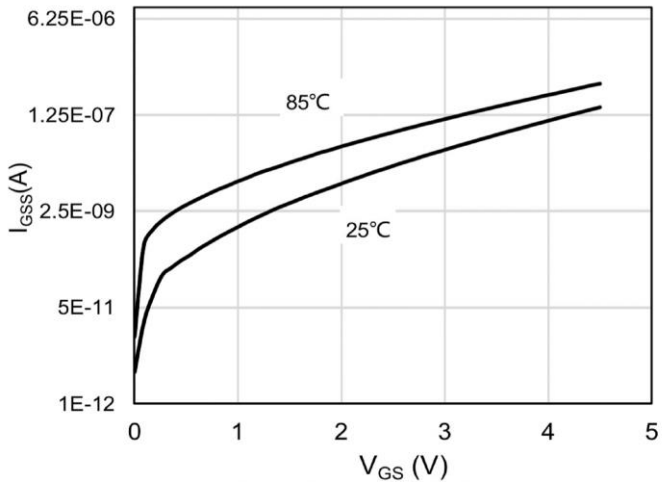


Figure 3. Gate Voltage vs. Gate Leakage Current; typical values

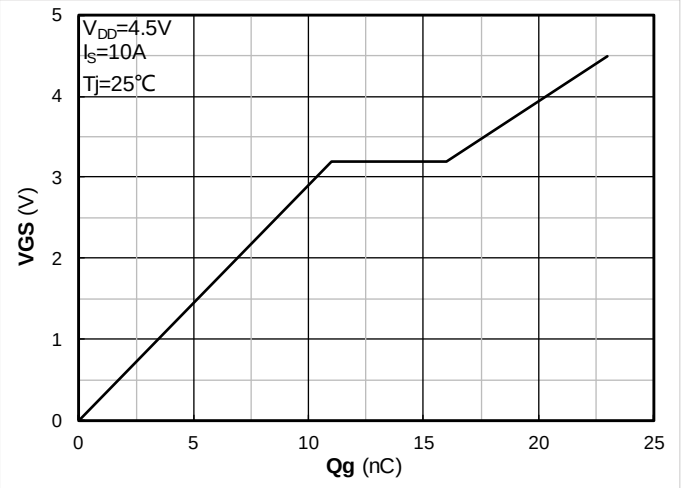


Figure 4. Gate Charge; typical values

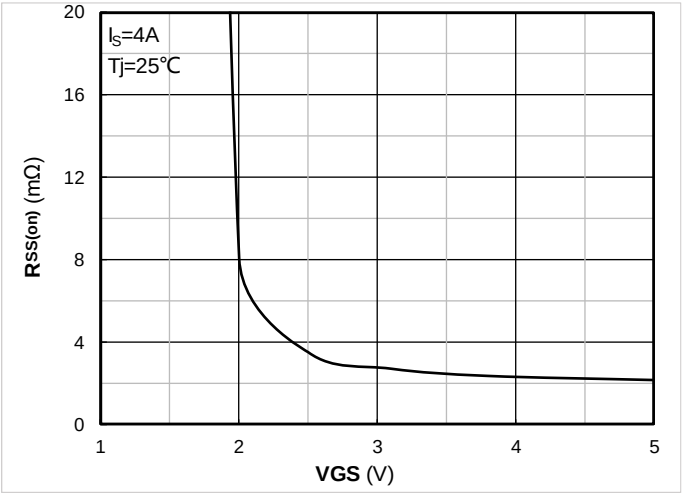


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

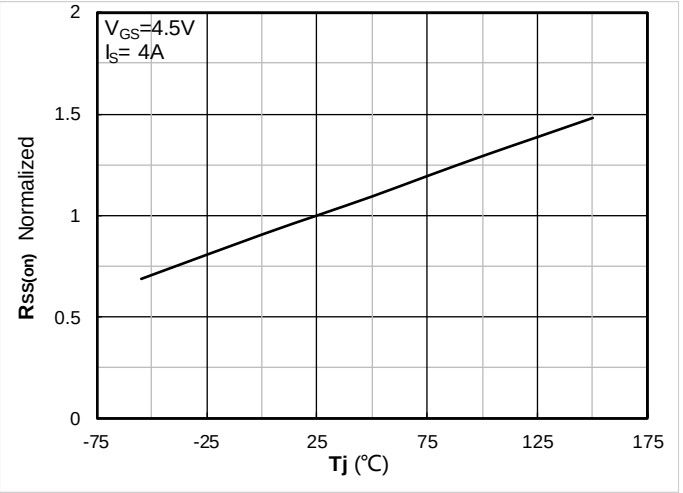


Figure 6. Normalized On-Resistance

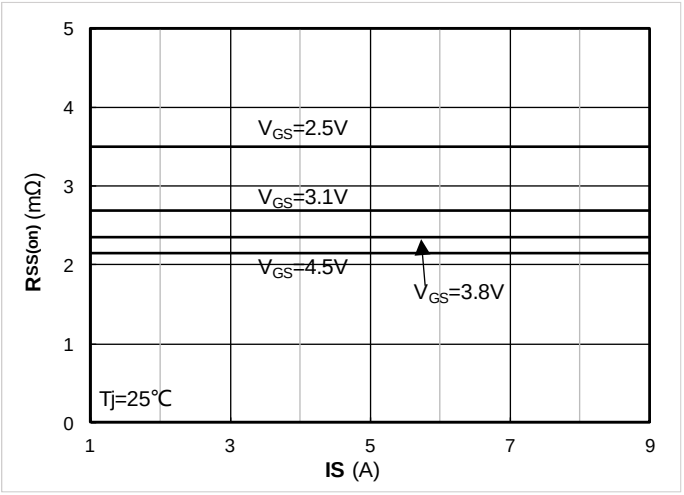


Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

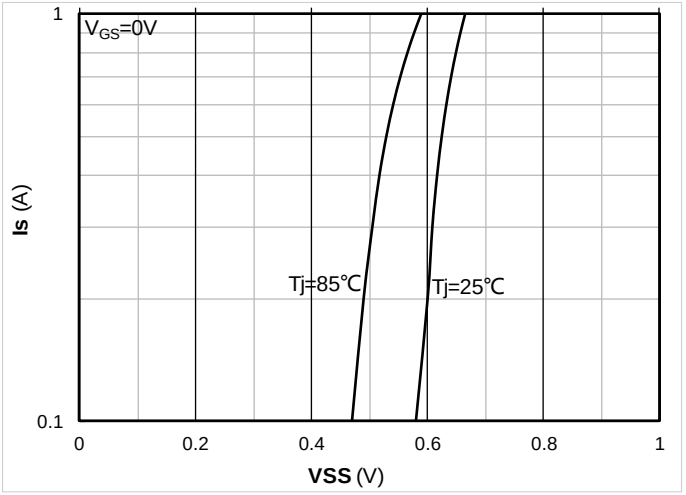


Figure 8. Forward characteristics of reverse diode; typical values

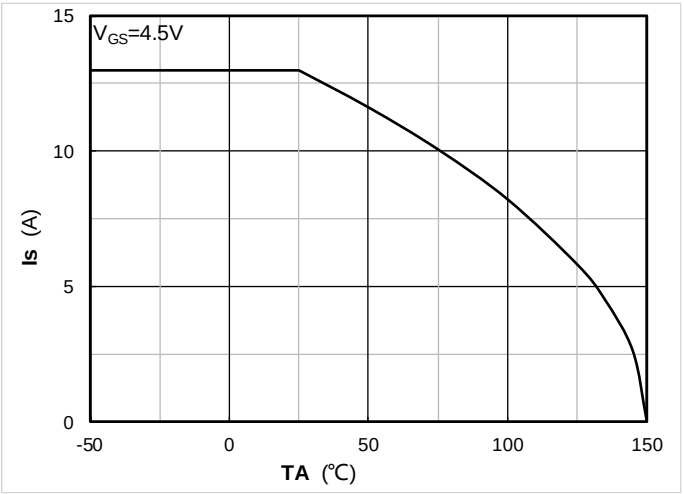


Figure 9. Current dissipation

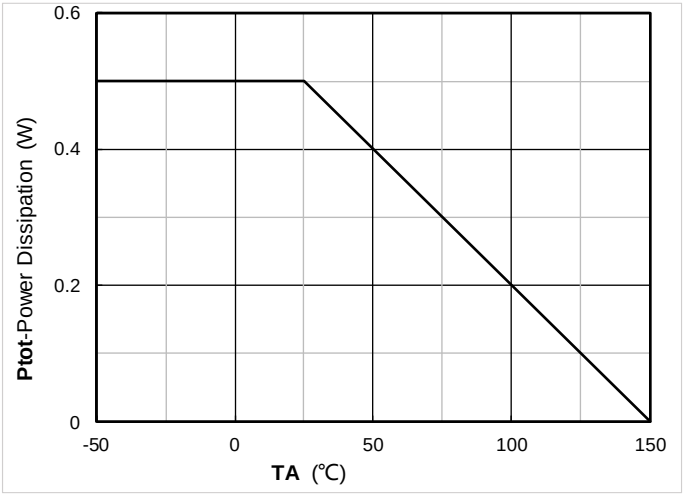


Figure 10. Power dissipation

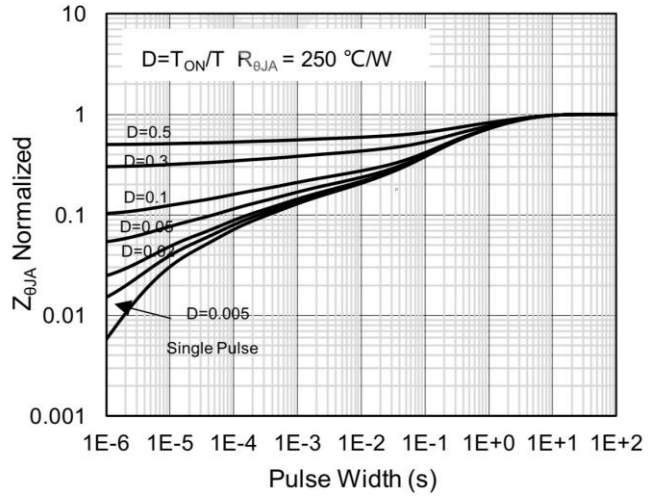


Figure 11. Normalized Maximum Transient Thermal Impedance

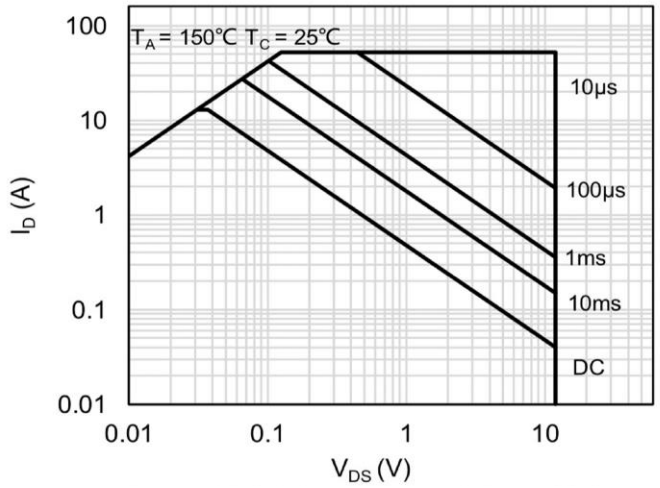


Figure 12. Safe Operation Area

■ Test Circuits & Waveforms

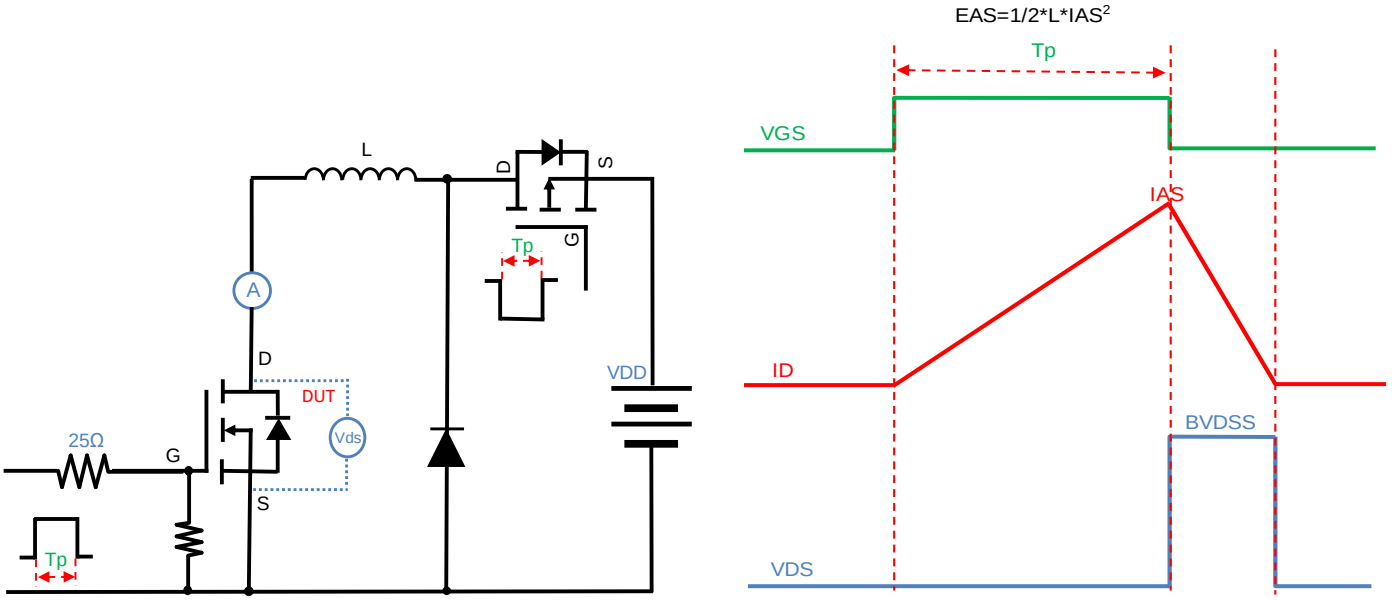


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

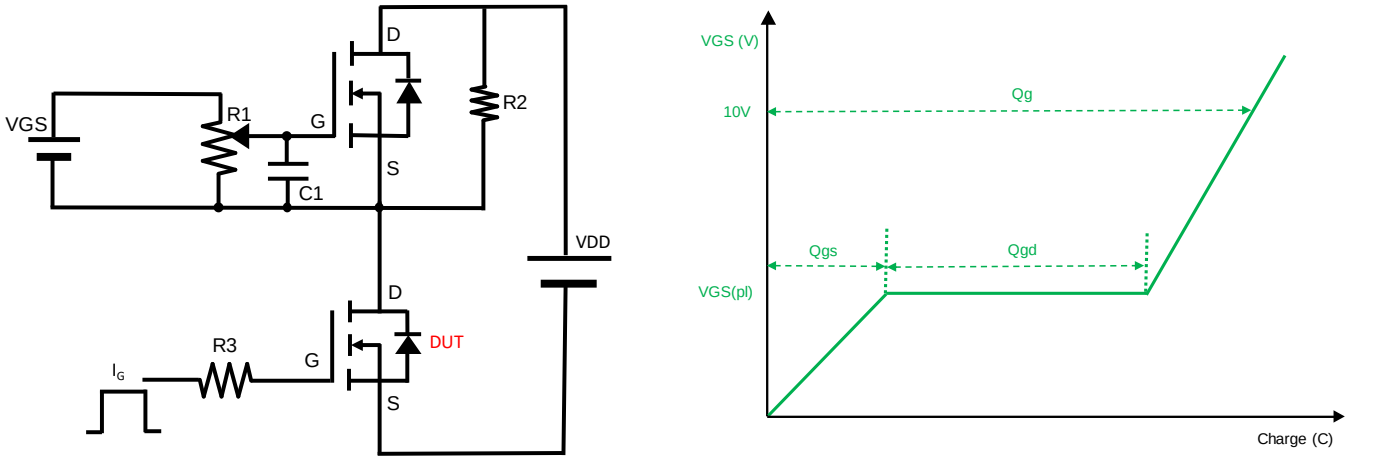


Figure B. Gate Charge Test Circuit & Waveform

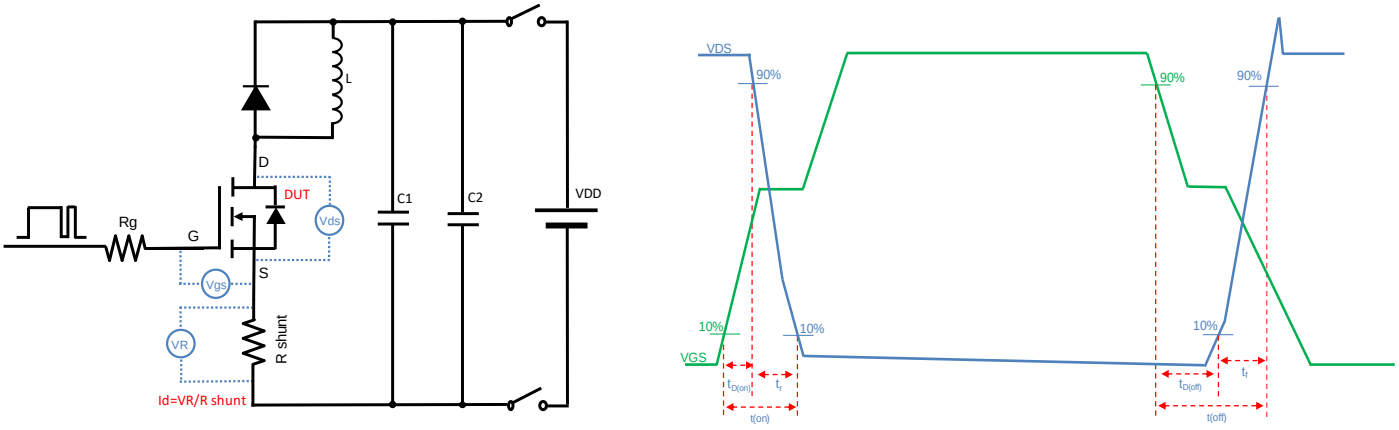


Figure C. Resistive Switching Test Circuit & Waveform

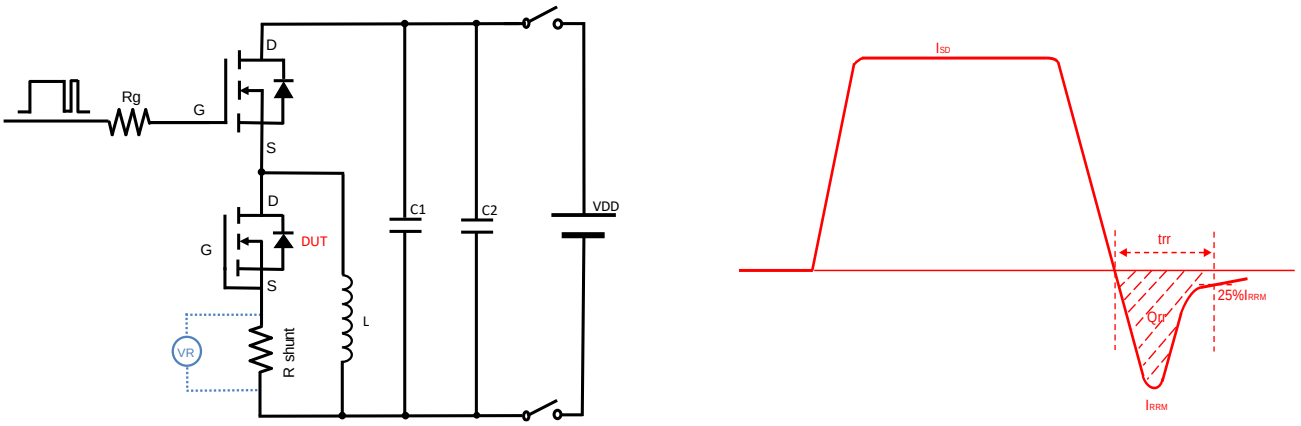
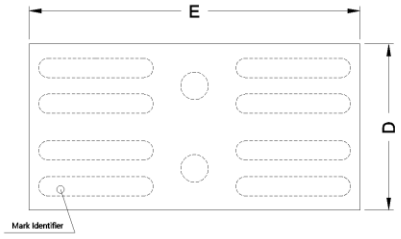


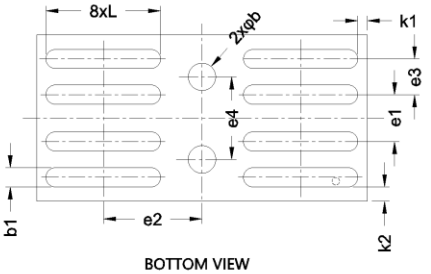
Figure D. Diode Recovery Test Circuit & Waveform

■ WLCSP-10L Package information

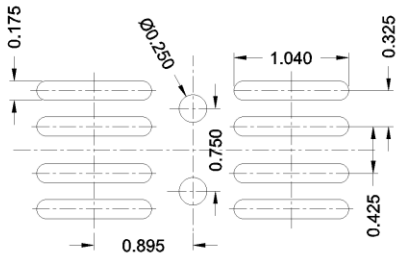


TOP VIEW

SIDE VIEW



BOTTOM VIEW

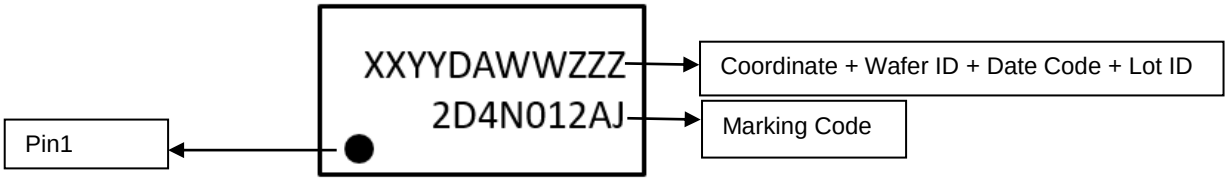


SUGGESTED SOLDER PAD LAYOUT

UNIT：mm

DIMENSIONS				
SYMBOL	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.0041	0.0063	0.105	0.160
b	0.0098TYP.		0.250TYP.	
b1	0.0069TYP.		0.175TYP.	
D	0.0575	0.0614	1.460	1.560
E	0.1161	0.1201	2.950	3.050
e1	0.0167TYP.		0.425TYP.	
e2	0.0352TYP.		0.895TYP.	
e3	0.0128TYP.		0.325TYP.	
e4	0.0295TYP.		0.750TYP.	
L	0.0409TYP.		1.040TYP.	
k1	0.0033TYP.		0.085TYP.	
k2	0.0051TYP.		0.130TYP.	

■ Marking Information



Note：
1. All marking is at middle of the product body
2. All marking is in laser printing
3. 2D4N012AJ is marking code, XXYYDAWWZZZ is Coordinate&Wafer ID&Date Code&Lot ID, “XXYY” is Coordinate, “D” is Wafer ID, “A” is year, “WW” is week, “ZZZ” is Lot ID
4. Body color: Black

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The product listed herein is designed to be used with ordinary electronic equipment or devices, and not designed to be used with equipment or devices which require high level of reliability and the malfunction of with would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), Yangjie or anyone on its behalf, assumes no responsibility or liability for any damages resulting from such improper use of sale.

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