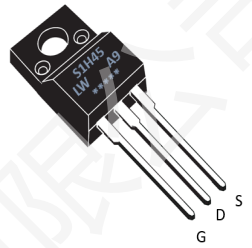
General Description:

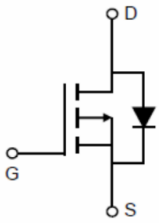
The LWS1H45A9 uses advanced SGT technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications. The package form is TO-220F, which accords with the ROHS standard and Halogen Free standard.

V_{DSS}	-100	V
I_D	-20	A
P_D	42	W
$R_{DS(ON)\ TYPE}$	45	mΩ

Marking and Pin Assignment



Inner Equivalent Principium Chart



Features:

- Fast Switching
- Low Gate Charge and $R_{DS(ON)}$
- Low Reverse transfer capacitances

Applications:

- DC-DC Converter
- Portable Equipment
- Power Management

100% DVDS Tested

100% Avalanche Tested

RoHS H F

Package Marking and Ordering Information:

Marking	Part Number	Package	Packing	Qty.
S1H45/LW A9/D.C.	LWS1H45A9	TO-220F	Tube	50 Pcs

Absolute Maximum Ratings:

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		-100	V
I_D	Continuous Drain Current	T_C=25℃	-20	A
	Continuous Drain Current	T_C=100℃	-13	A
I_{DM}[a1]	Pulsed Drain Current		-80	A
E_{AS}[a2]	Single pulse avalanche energy		225	mJ
V_{GS}	Gate-to-Source Voltage		±20	V
P_D	Power Dissipation		42	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range		150, -55 to 150	℃
T_L	Maximum Temperature for Soldering		260	℃

Thermal Characteristics:

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.0	℃/W
$R_{\theta JA}$[a3]	Thermal Resistance, Junction-to-Ambient	50	℃/W

Electrical Characteristic (T_A = 25 °C, unless otherwise specified)**:**

Static Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=-250μA	-100	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=-100V, V_{GS}=0V	--	--	1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS}=-20V, V_{DS}=0V	--	--	-100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS}=+20V, V_{DS}=0V	--	--	100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250μA	-1.5	-2.0	-2.5	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	V_{GS}=-10V, I_D=-20A	--	45	60	mΩ
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	V_{GS}=-4.5V, I_D=-10A	--	55	75	mΩ

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} =-50V f = 1.0MHz	--	2100	--	pF
C_{oss}	Output Capacitance		--	168	--	
C_{rss}	Reverse Transfer Capacitance		--	26	--	
R_g	Gate resistance	V_{GS} = 0V,V_{DS}=0V,f=1MHz	--	2.8	--	Ω

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =-20A V_{DS} =-50V V_{GS} =-10V R_G =5.0Ω	--	8.2	--	ns
t_r	Rise Time		--	19.6	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	62.8	--	
t_f	Fall Time		--	41.4	--	
Q_g	Total Gate Charge	V_{GS} =-10V V_{DS} = -50V I_D =-20A	--	38	--	nC
Q_{gs}	Gate Source Charge		--	6.4	--	
Q_{gd}	Gate Drain Charge		--	6.8	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	T_C =25 °C	--	--	-20	A
V_{SD}	Diode Forward Voltage	I_S=-20A, V_{GS}=0V	--	--	-1.2	V
t_{rr}	Reverse Recovery time	IS=-20A, VDD=-50V dI/dt=100A/μs	--	68	--	ns
Q_{rr}	Reverse Recovery Charge		--	200	--	nC

a1：Repetitive rating; pulse width limited by maximum junction temperature

a2：V_{DD}=-50V,L=0.5mH, R_g=25Ω, Starting T_J=25 °C

a3：Surface Mounted on FR4 Board, t ≤ 10 sec.

Characteristics Curve:

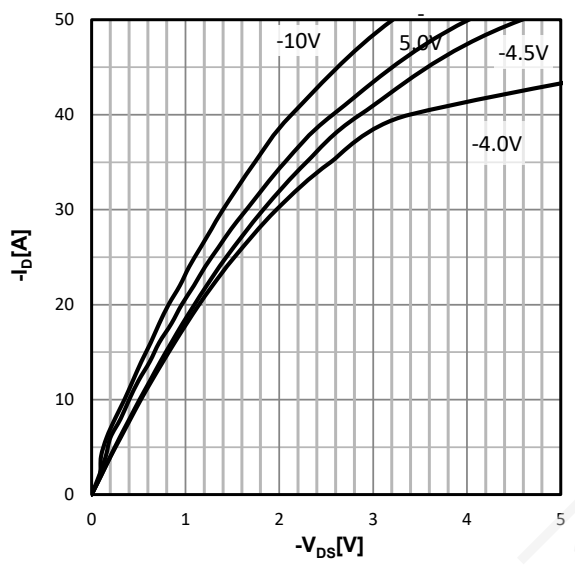
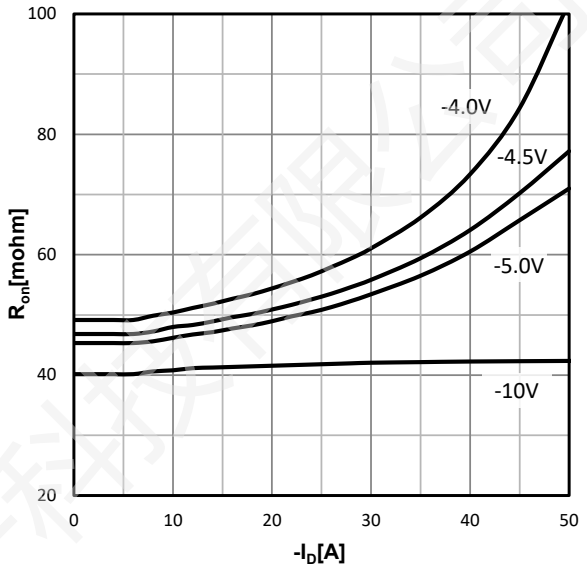
Figure 1: Typ. output characteristics	Figure 2: Typ. drain-source on resistance
	
$I_D=f(V_{DS})$, T_j=25 °C; parameter: V_{GS}	$R_{DS(on)}=f(I_D)$, T_j=25 °C; parameter: V_{GS}

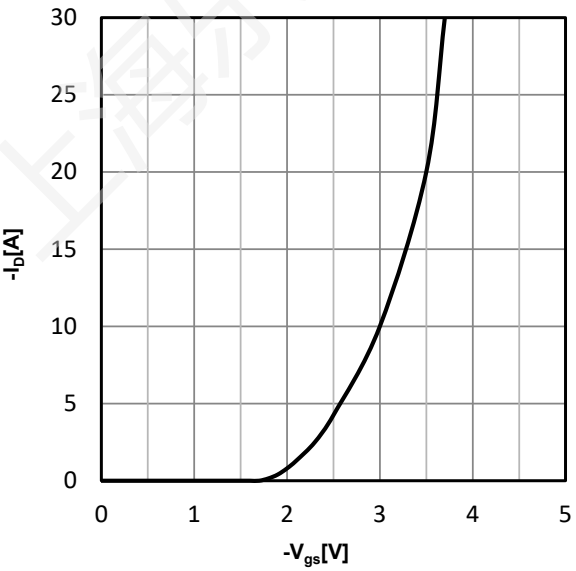
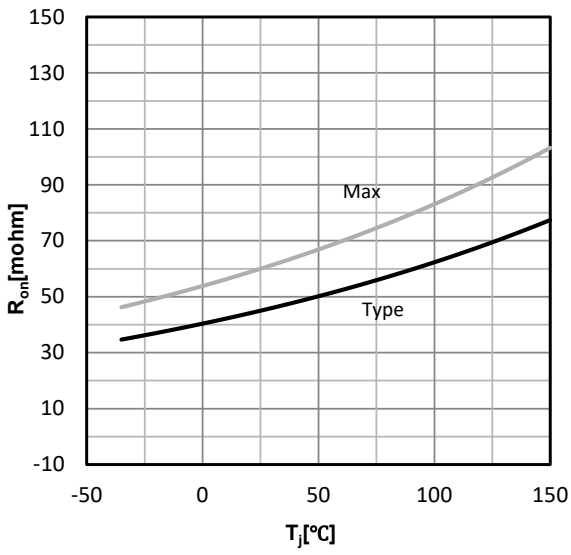
Figure 3: Typ. transfer characteristics	Figure 4: drain-source on resistance
	
$I_D=f(V_{GS})$, $\|V_{DS}\|>2\|I_D\|R_{DS}$(on)max;	$R_{DS(on)}=f(T_j)$, I_D=-20A, V_{GS}=-10V;

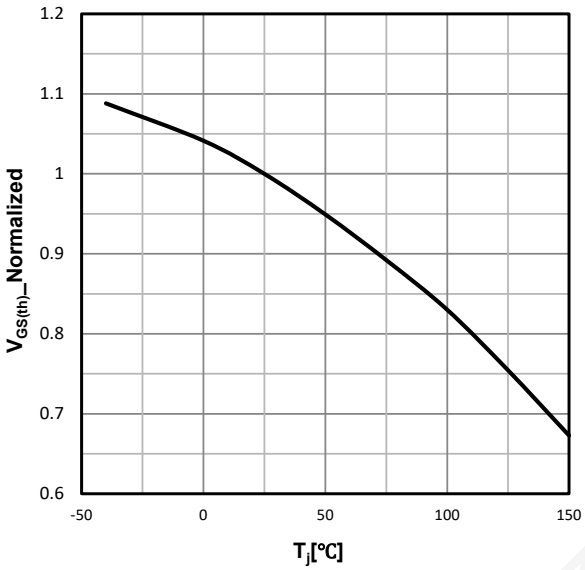
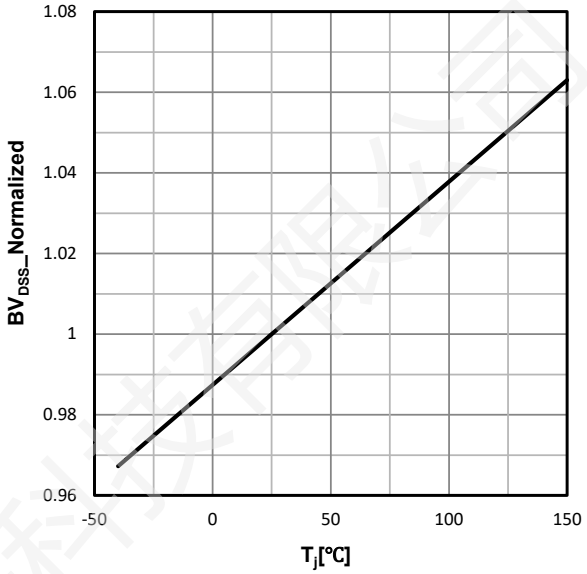
Figure 5: Typ. gate threshold voltage	Figure 6: Drain-source breakdown voltage
	
V_{GS}=f(T_j),I V_{GS}=V_{DS},I_D=-250μA;	$V_{BR(DSS)}$=f(T_j); I_D=-250μA;

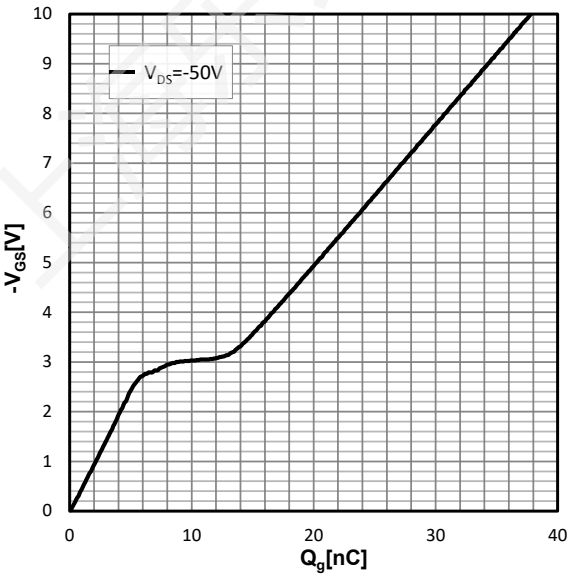
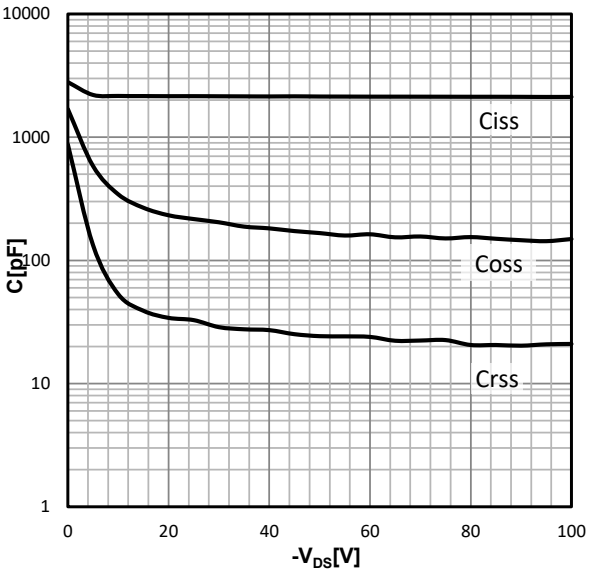
Figure 7: Typ. gate charge	Figure 8: Typ. Capacitances
	
V_{GS}=f(Q_g), I_D=-20A, T_j=25 °C; parameter: V_{DS}	C=f(V_{DS}); V_{GS}=0V; f=1.0 MHz;

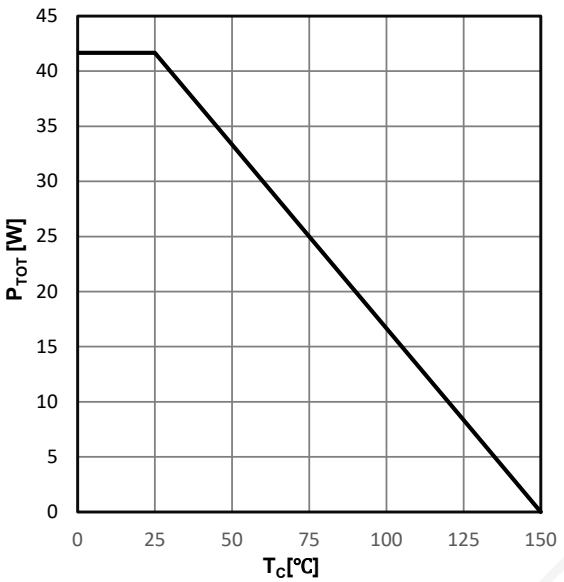
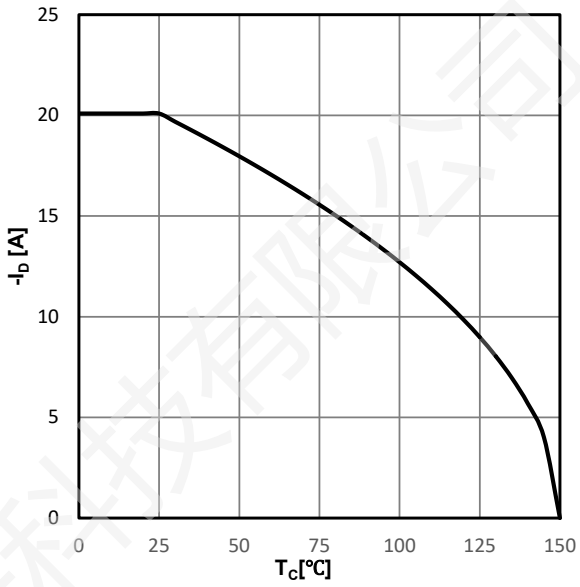
Figure 9: Power dissipation	Figure 10:Drain current
	
$P_{tot}=f(T_C)$;	$I_D=f(T_C)$;

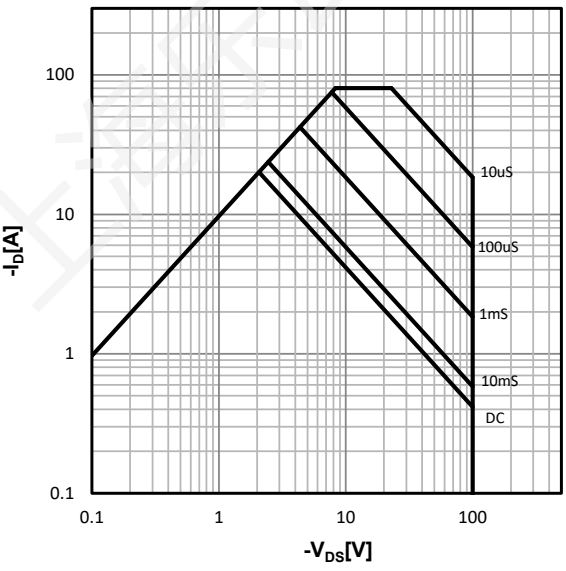
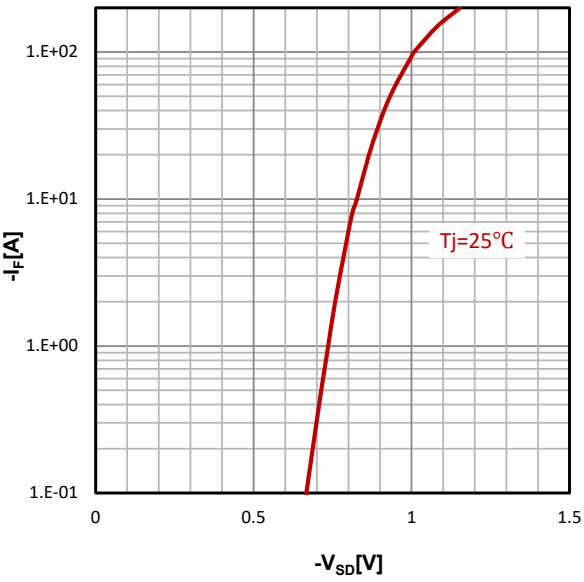
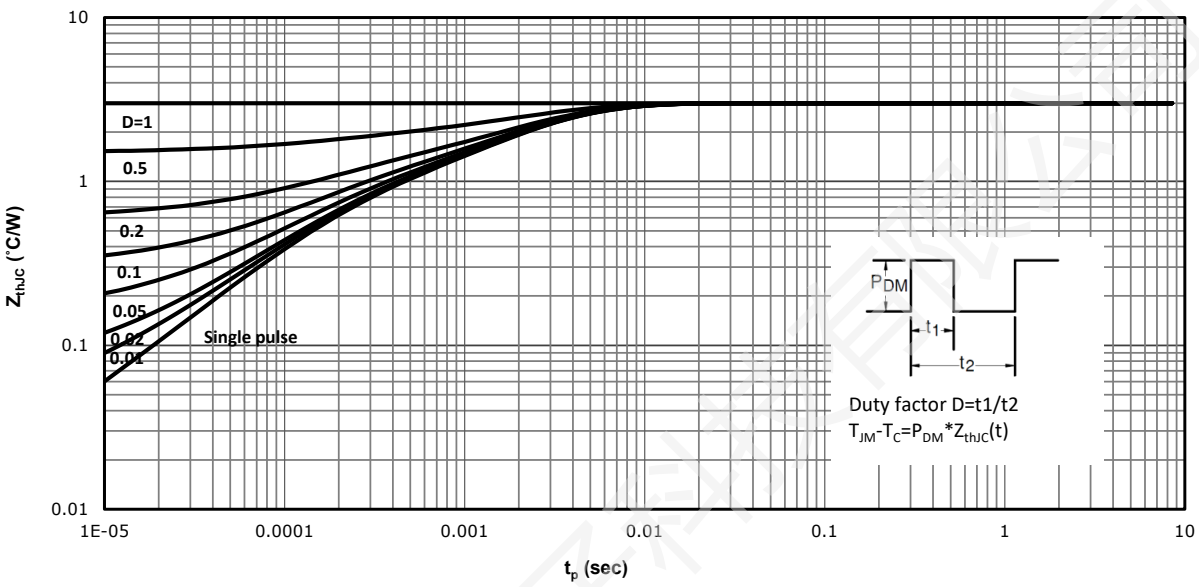
Figure 11: Safe operating area	Figure 12: Typ. forward characteristics
	
$I_D=f(V_{DS})$; T_C=25 °C; D=0; parameter: tp	$I_F=f(V_{SD})$;

Figure 13: Max. Transient Thermal Impedance



$Z_{thJC}=f(t_p)$; parameter: D

Test Circuit & Waveform:

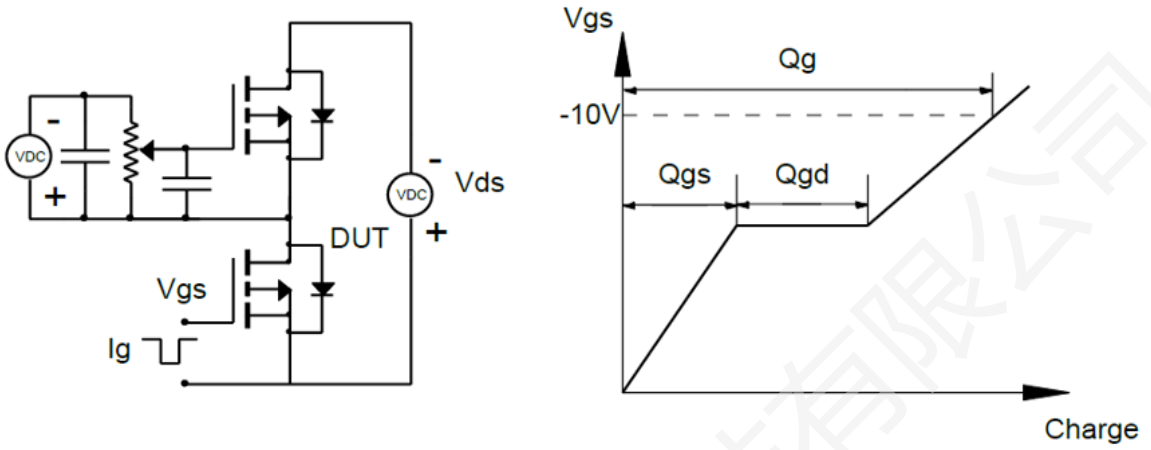


Figure 14: Gate Charge Test Circuit & Waveform

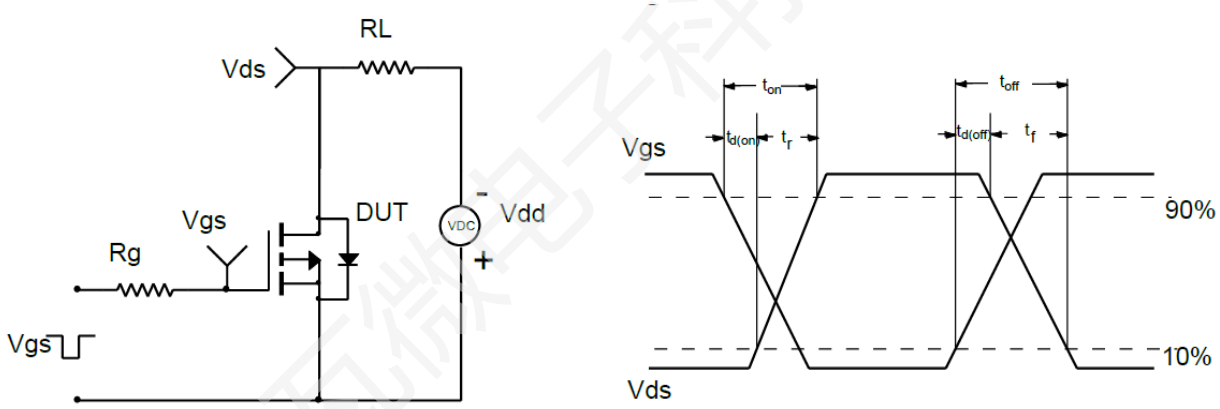


Figure 15: Resistive Switching Test Circuit & Waveforms

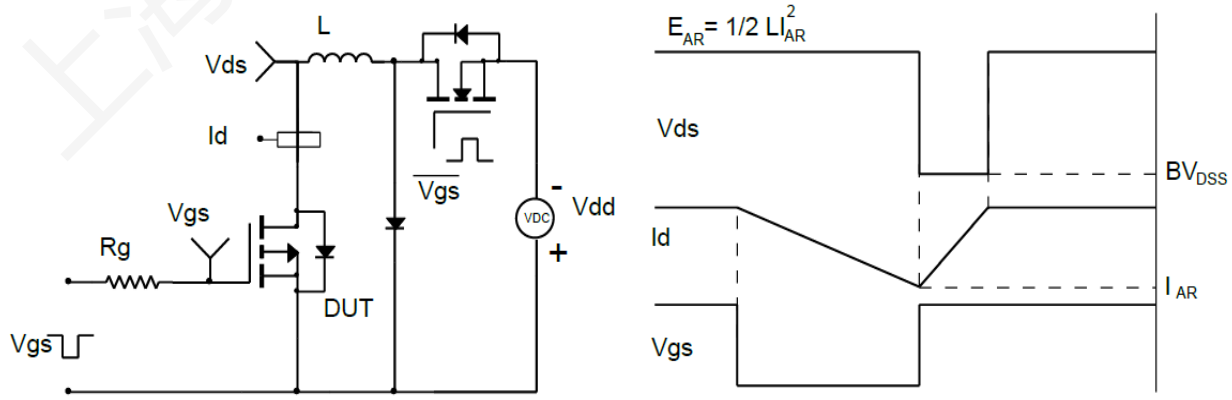
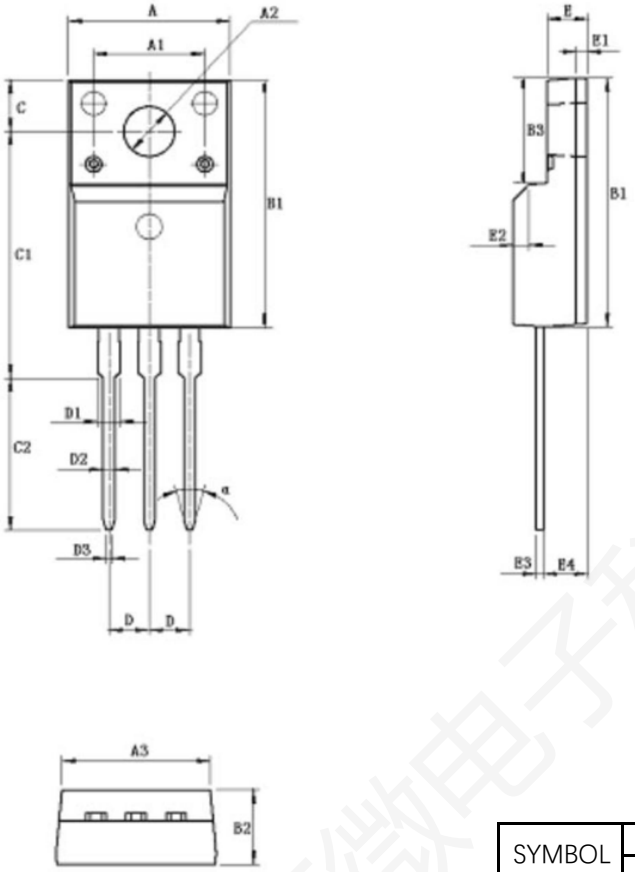


Figure 16: Unclamped Inductive Switching Test Circuit & Waveforms

Package Outline:



SYMBOL	MILLIMETER	
	MIN	MAX
A	9.90	10.36
A1	7.00	
A2	3.08	3.28
A3	9.25	9.65
B1	15.40	16.40
B2	4.40	5.00
B3	6.20	6.80
C	3.05	3.55
C1	15.20	16.00
C2	9.75	10.15
D	2.54	
D1	1.08	1.48
D2	0.70	0.90
D3	0.28	0.48
E	2.25	2.85
E1	0.70	
E2	1.0x45°	
E3	0.36	0.65
E4	2.55	2.95
a	30°	

Revision History:

Revison	Date	Descriptions
Rev 1.0	Dec.2022	Initial Version

Disclaimer:

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