

General Description:

The LWN2012AL uses trench technology and designs to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications. The package form is SOT23-3L, which accords with the ROHS standard and Halogen Free standard.

Features:

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

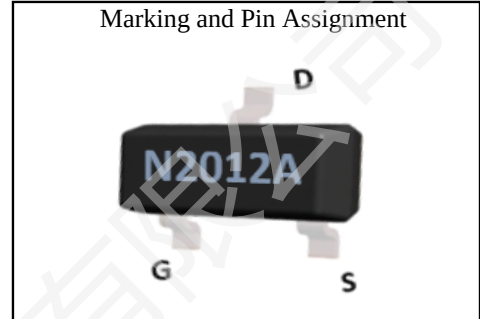
Applications:

- DC-DC Converter
- Portable Equipment
- Power Management

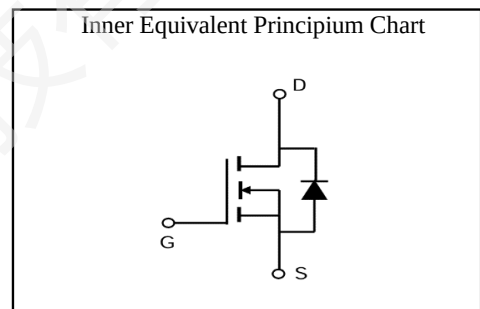


V_{DSS}	20	V
I_D	10	A
P_D	1.5	W
$R_{DS(ON)}$ TYPE	8.5	$m\Omega$

Marking and Pin Assignment



Inner Equivalent Principium Chart



Package Marking and Ordering Information:

Marking	Part Number	Package	Packing	Qty.
N2012A	LWN2012AL	SOT23-3L	Reel	3000 Pcs

Absolute Maximum Ratings:

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		20	V
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	10	A
	Continuous Drain Current	$T_A=100^\circ\text{C}$	6.3	A
I_{DM}^{a1}	Pulsed Drain Current		40	A
V_{GS}	Gate-to-Source Voltage		± 10	V
P_D	Power Dissipation		1.5	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range		150, -55 to 150	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering		260	$^\circ\text{C}$

Thermal Characteristics:

Symbol	Parameter	Value	Units
$R_{\theta JA}^{a2}$	Thermal Resistance, Junction-to-Ambient	83.3	$^\circ\text{C/W}$

Electrical Characteristic ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise specified):

Static Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=20V, V_{GS}=0V$	--	--	1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+10V, V_{DS}=0V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-10V, V_{DS}=0V$	--	--	-100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.45	0.7	1.0	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=4.5V, I_D=10A$	--	8.5	10	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=2.5V, I_D=8.0A$	--	12	16	$m\Omega$

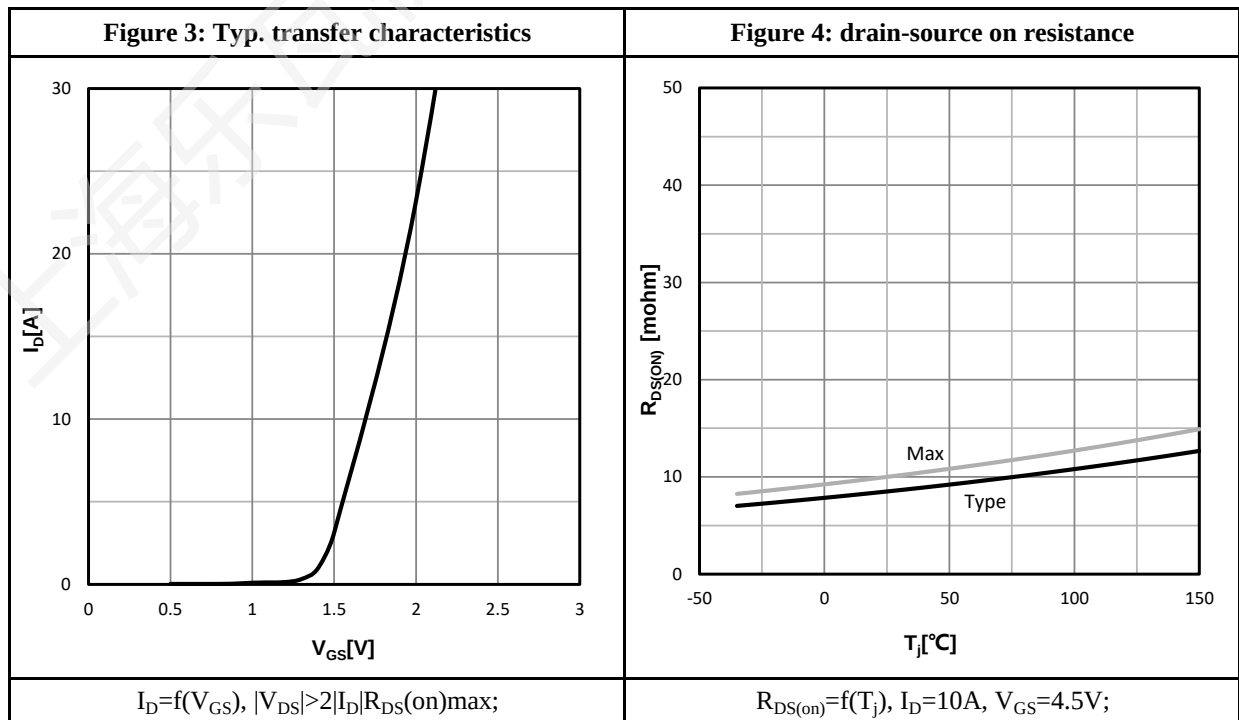
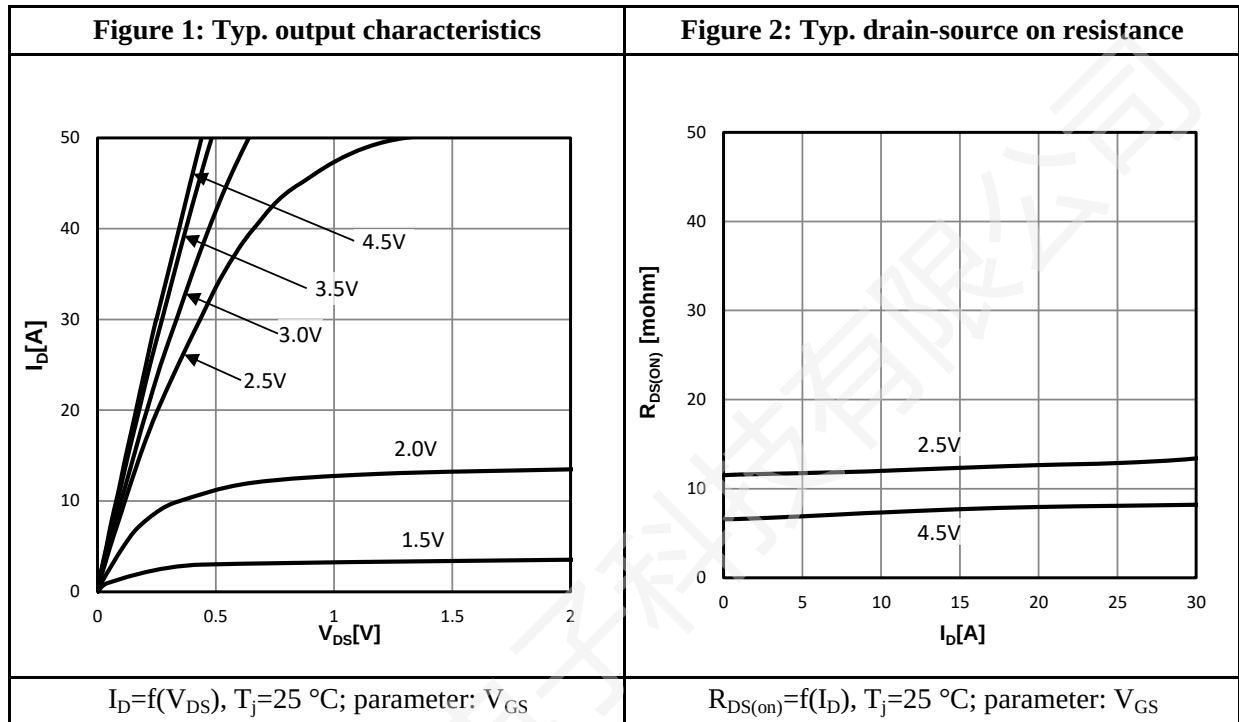
Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$	--	1186	--	pF
C_{oss}	Output Capacitance	$V_{DS}=10V$	--	196	--	
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	--	186	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	2.0	--	Ω

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=10A$	--	7.6	--	ns
t_r	Rise Time	$V_{DS}=10V$	--	14	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS}=4.5V$	--	32	--	
t_f	Fall Time	$R_G=3.0\Omega$	--	12	--	
Q_g	Total Gate Charge	$V_{GS}=4.5V$	--	16	--	nC
Q_{gs}	Gate to Source Charge	$V_{DS}=10V$	--	1.9	--	
Q_{gd}	Gate to Drain Charge	$I_D=5.0A$	--	6.7	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_A=25\text{ }^{\circ}\text{C}$	--	--	10	A
V_{SD}	Diode Forward Voltage	$I_S=10A, V_{GS}=0V$	--	--	1.2	V

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

a2: Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection.

Characteristics Curve:


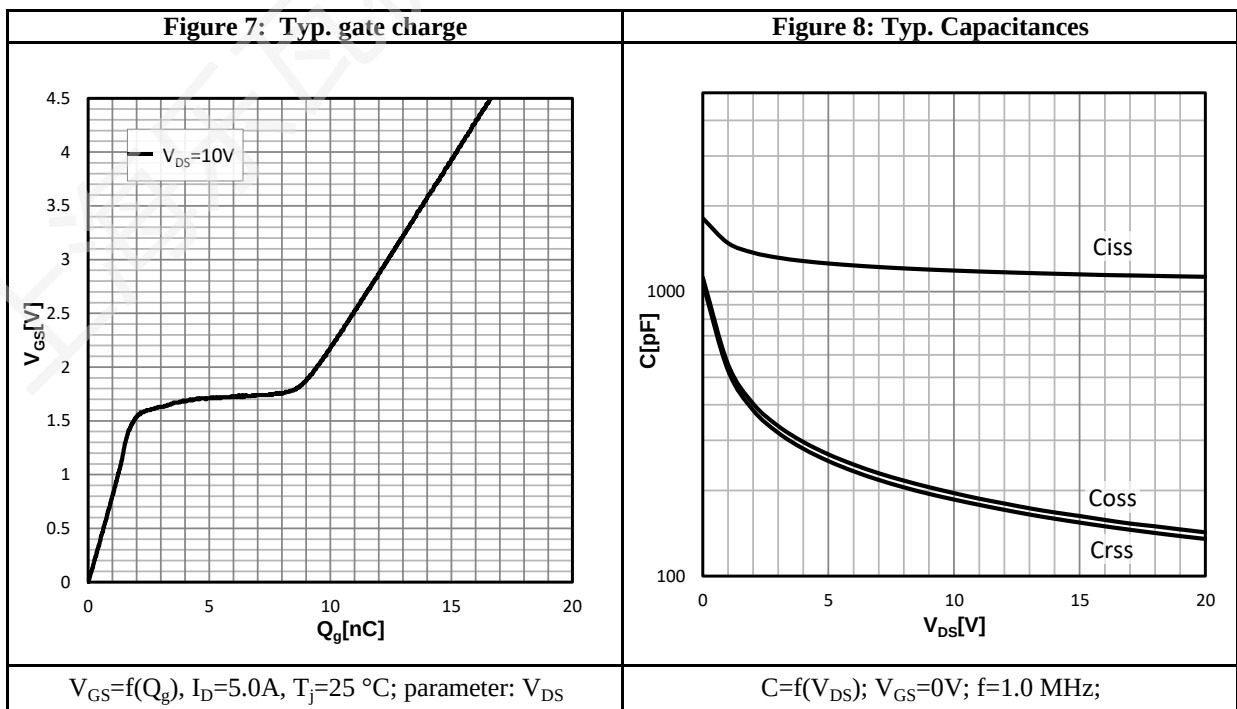
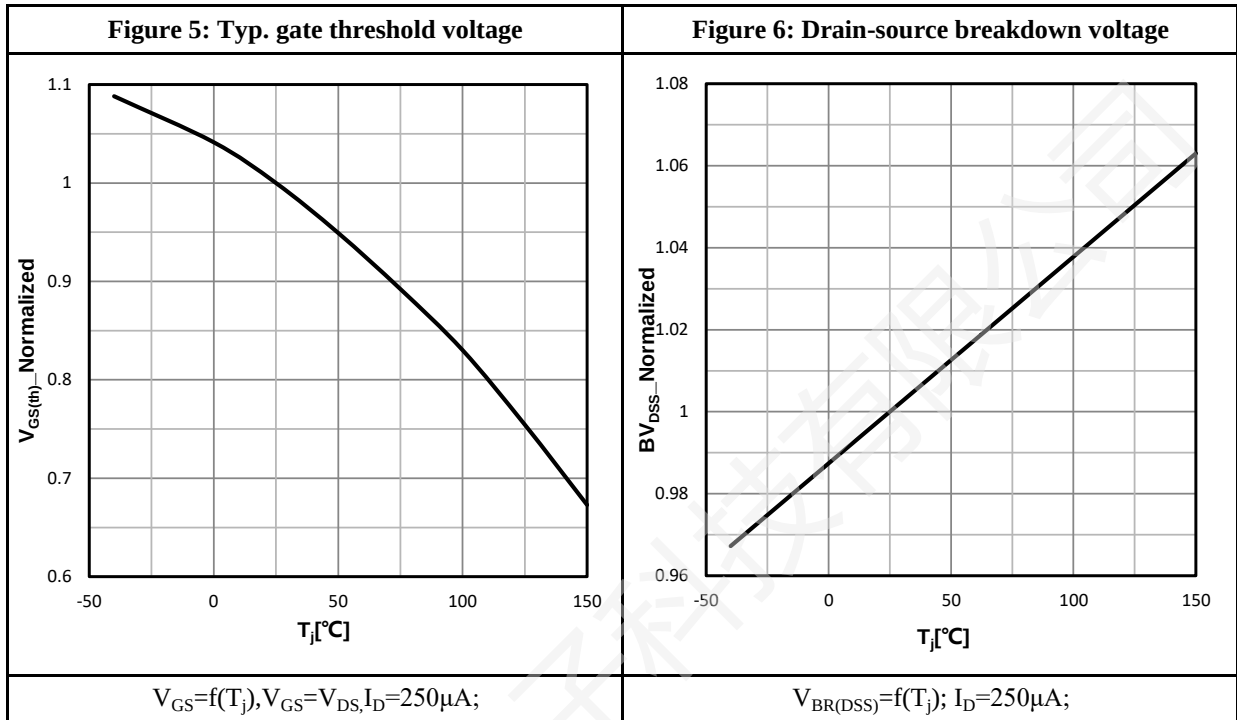
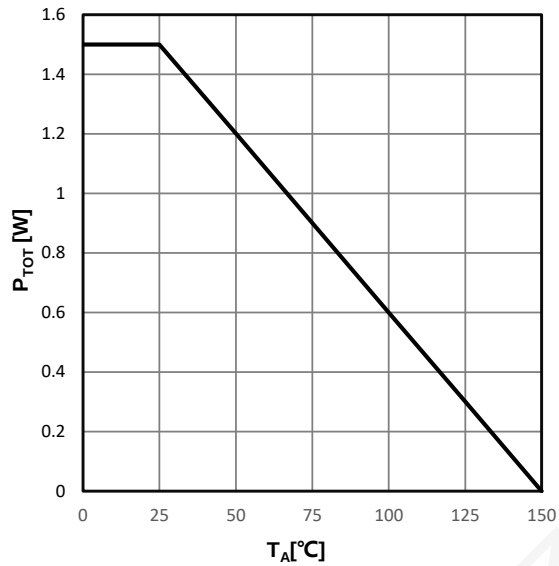
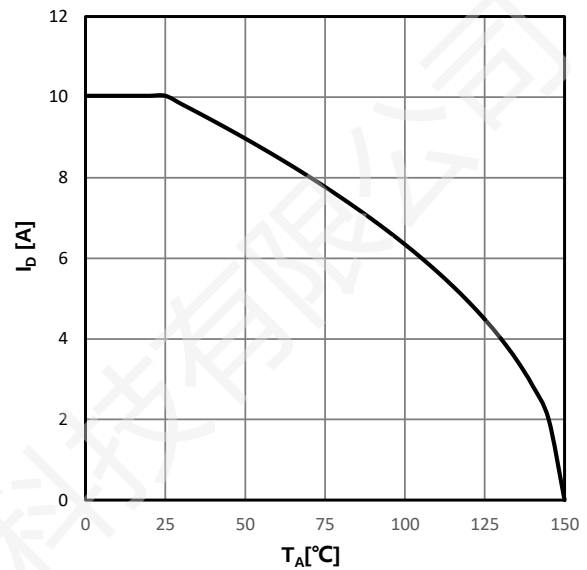
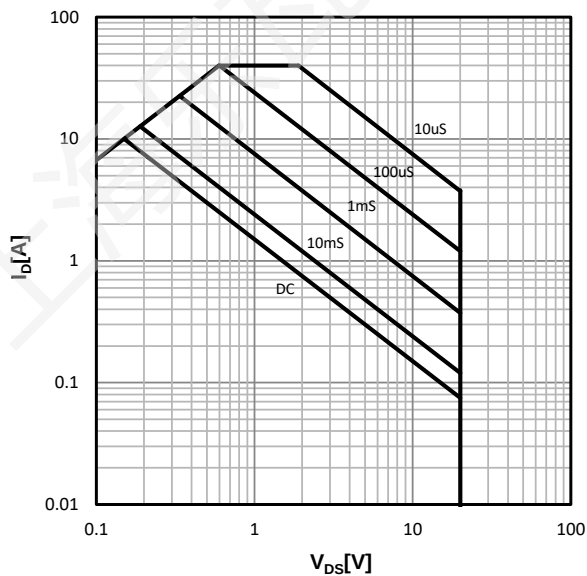


Figure 9: Power dissipation


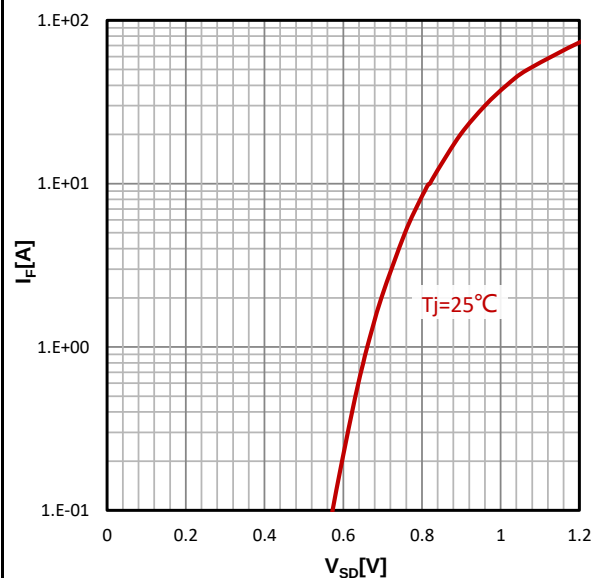
$$P_{tot}=f(T_A);$$

Figure 10: Drain current


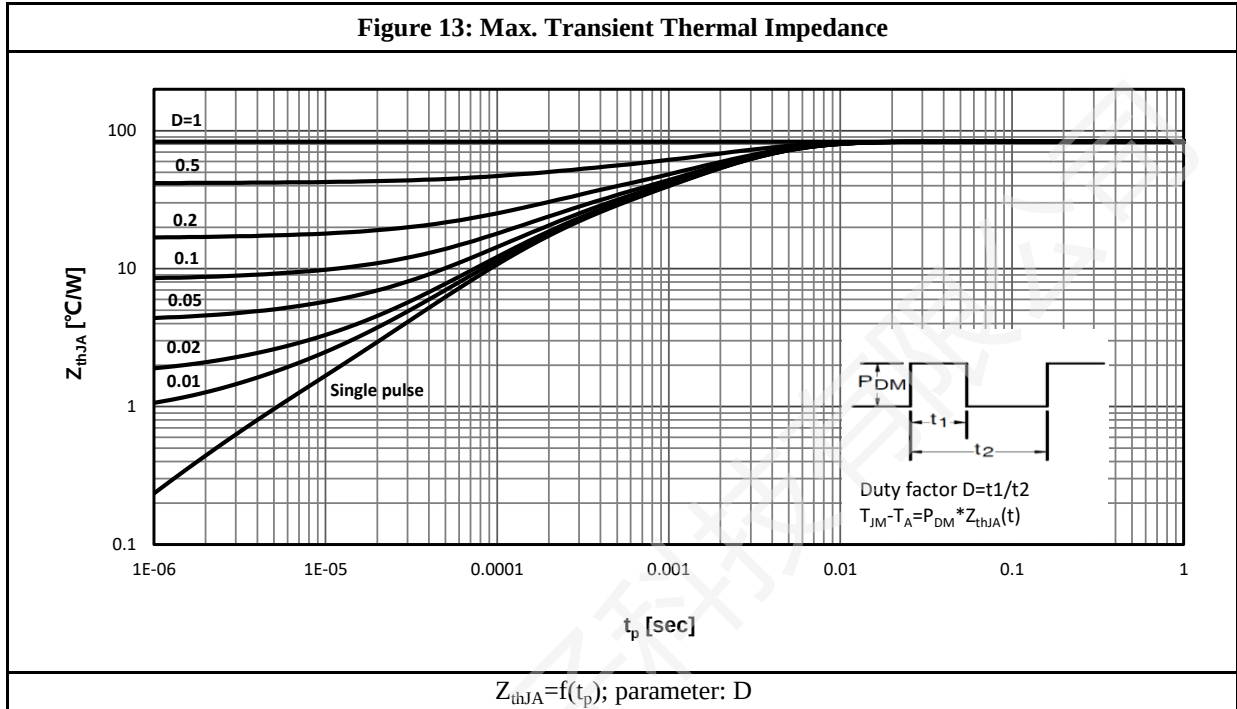
$$I_D=f(T_A);$$

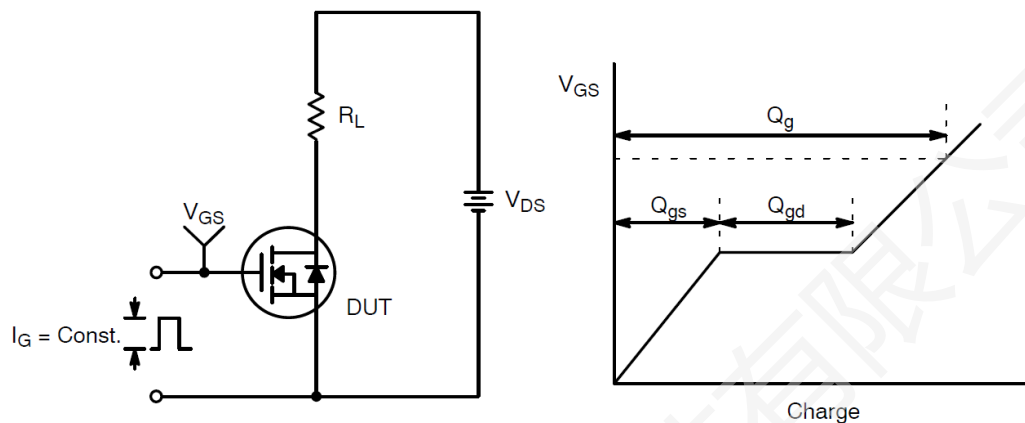
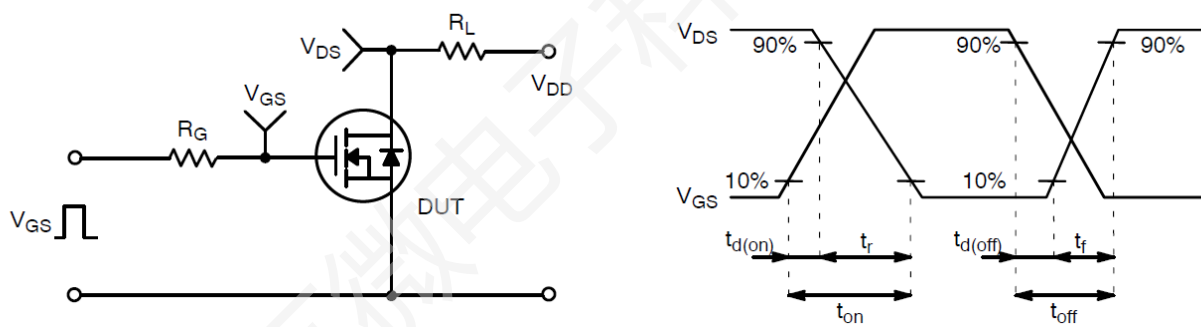
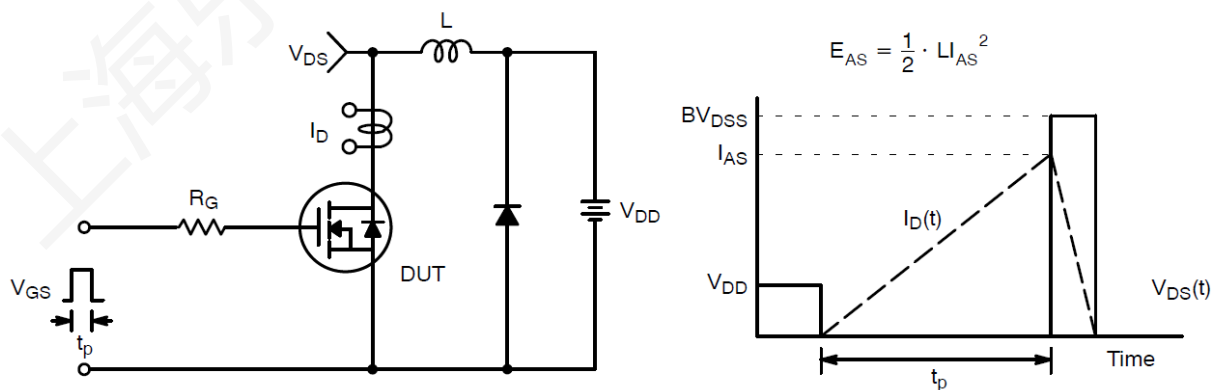
Figure 11: Safe operating area


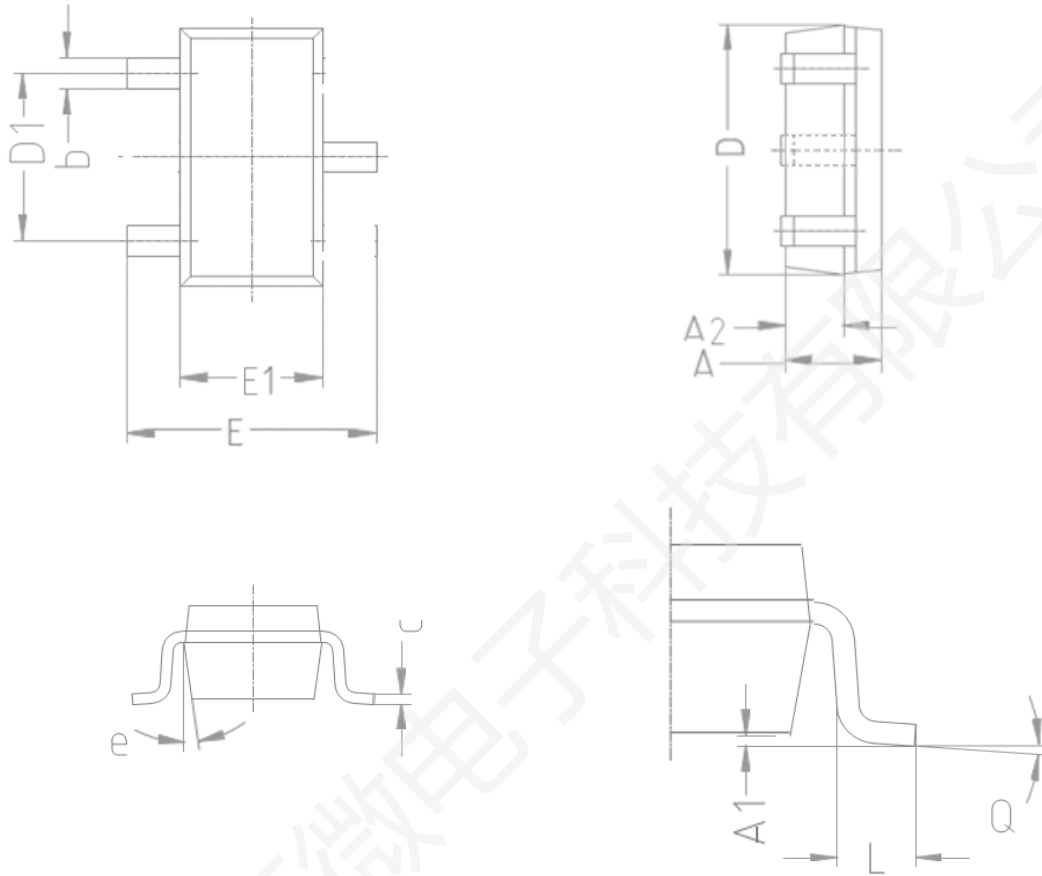
$$I_D=f(V_{DS}); T_A=25\text{ }^{\circ}\text{C}; D=0; \text{parameter: tp}$$

Figure 12: Typ. forward characteristics


$$I_F=f(V_{SD});$$

Figure 13: Max. Transient Thermal Impedance


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:


COMMON DIMENSION (MM)			
PKG	SOT23-3L		
Symbol	MIN	NOM	MAX
A	1.050	1.100	1.150
A1	0.010	0.060	0.150
A2	0.640	0.670	0.700
b	0.300	0.350	0.400
c	0.125	0.150	0.175
D	2.870	2.925	2.980
D1	1.800	1.900	2.000
E	2.650	2.825	3.000
E1	1.550	1.610	1.670
L	0.300	0.450	0.600
e	8°		
Q	0°	4°	8°

Revision History:

Revision	Date	Descriptions
Rev 1.1	Jan.2026	Formal Version

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