

## General Description:

The LWN4009A4 uses trench 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-252, 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

**100% DVDS Tested**

**100% Avalanche Tested**



## Package Marking and Ordering Information:

Marking	Part Number	Package	Packing	Qty.
N4009/LW A4/D.C.	LWN4009A4	TO-252	Reel	2500 Pcs

## Absolute Maximum Ratings:

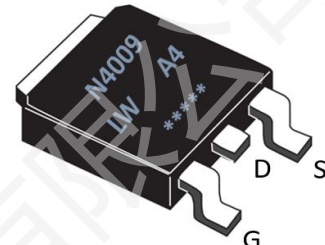
Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-to-Source Voltage	40	V
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	70
	Continuous Drain Current	$T_C=100^\circ\text{C}$	44
$I_{DM}^{a1}$	Pulsed Drain Current	280	A
$E_{AS}^{a2}$	Single pulse avalanche energy	120	mJ
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$P_D$	Power Dissipation	60	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:

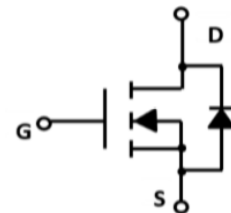
Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.08	$^\circ\text{C}/\text{W}$
$R_{\theta JA}^{a3}$	Thermal Resistance, Junction-to-Ambient	70	$^\circ\text{C}/\text{W}$

$V_{DSS}$	40	V
$I_D$	70	A
$P_D$	60	W
$R_{DS(ON) \text{ TYPE}}$	4.7	$\text{m}\Omega$

Marking and Pin Assignment



Inner Equivalent Principium Chart



**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	$V_{GS}=0V, I_D=250\mu A$	40	--	--	V
$I_{DSS}$	Drain to Source Leakage Current	$V_{DS}=40V, V_{GS}=0V$	--	--	1.0	$\mu A$
$I_{GSS(F)}$	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	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=20A$	--	4.7	6.1	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=4.5V, I_D=15A$	--	6.4	9.5	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	--	1851	--	pF
$C_{oss}$	Output Capacitance	$V_{DS}=20V$	--	187	--	
$C_{riss}$	Reverse Transfer Capacitance	$f=1.0MHz$	--	160	--	
$R_G$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	1.7	--	$\Omega$

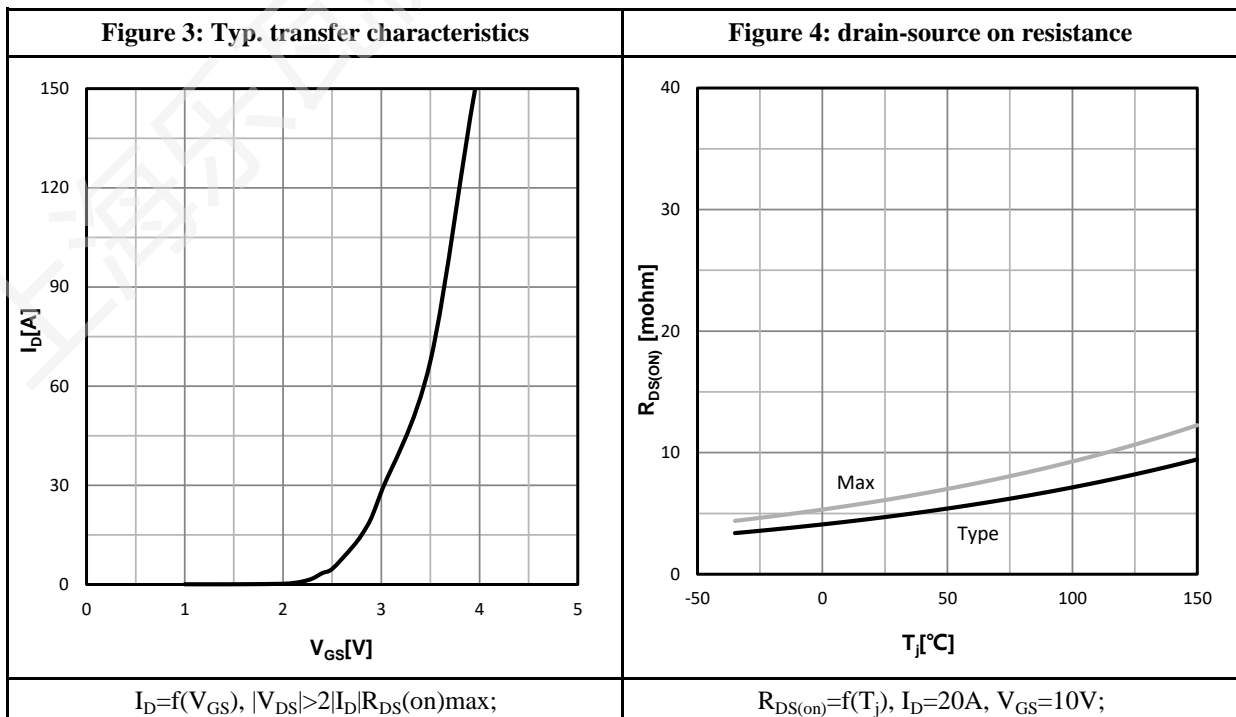
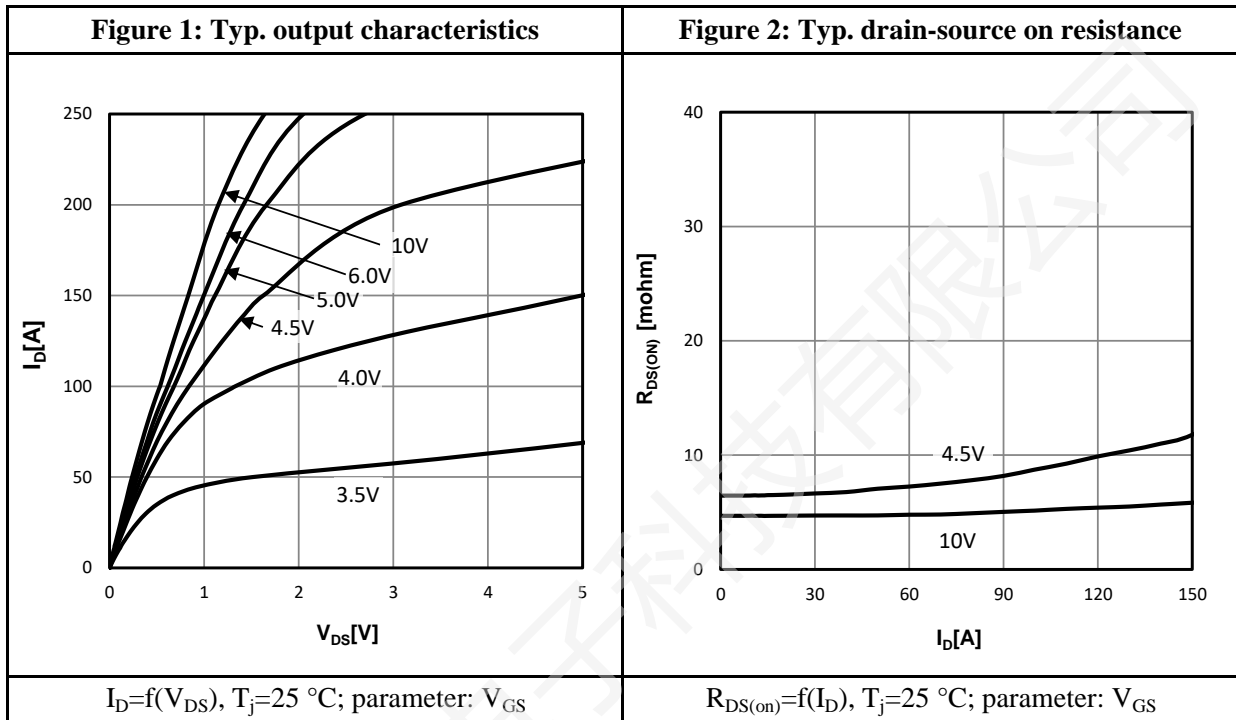
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=20A$	--	5.0	--	ns
$t_r$	Rise Time	$V_{DS}=20V$	--	15	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS}=10V$	--	20	--	
$t_f$	Fall Time	$R_G=3.0\Omega$	--	10	--	
$Q_g$	Total Gate Charge	$V_{GS}=10V$	--	42	--	nC
$Q_{gs}$	Gate to Source Charge	$V_{DS}=20V$	--	6.1	--	
$Q_{gd}$	Gate to Drain Charge	$I_D=20A$	--	8.9	--	

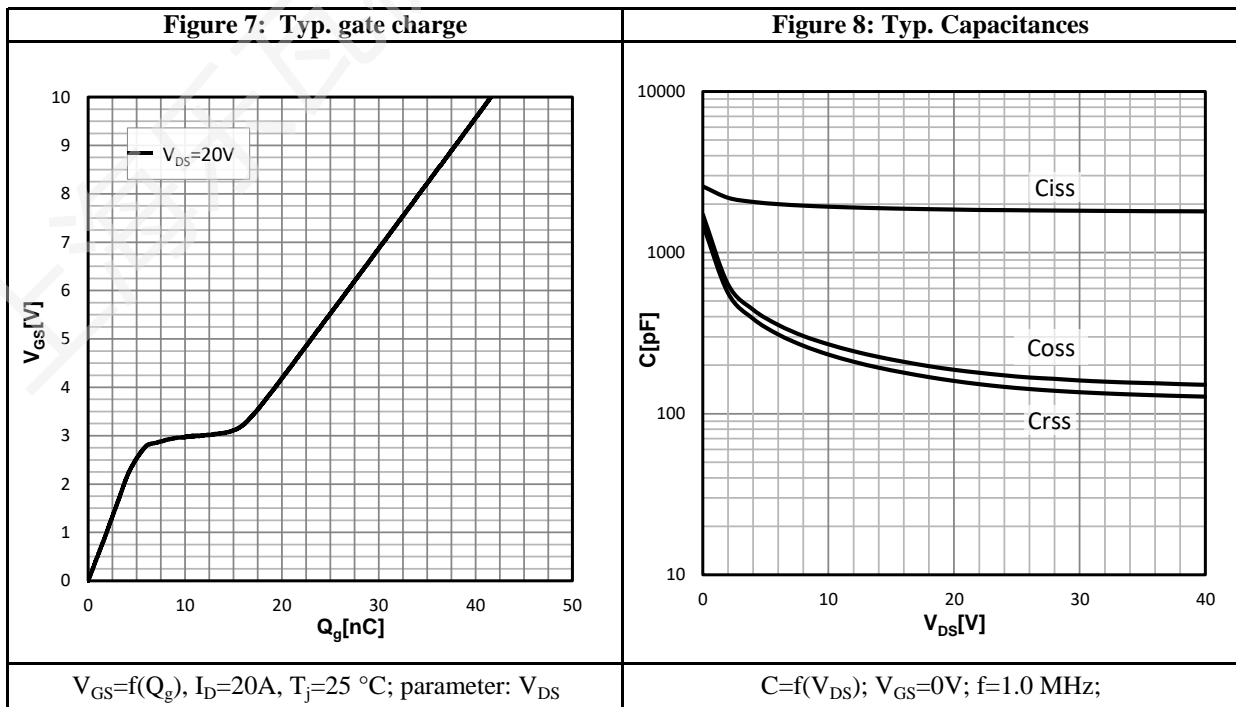
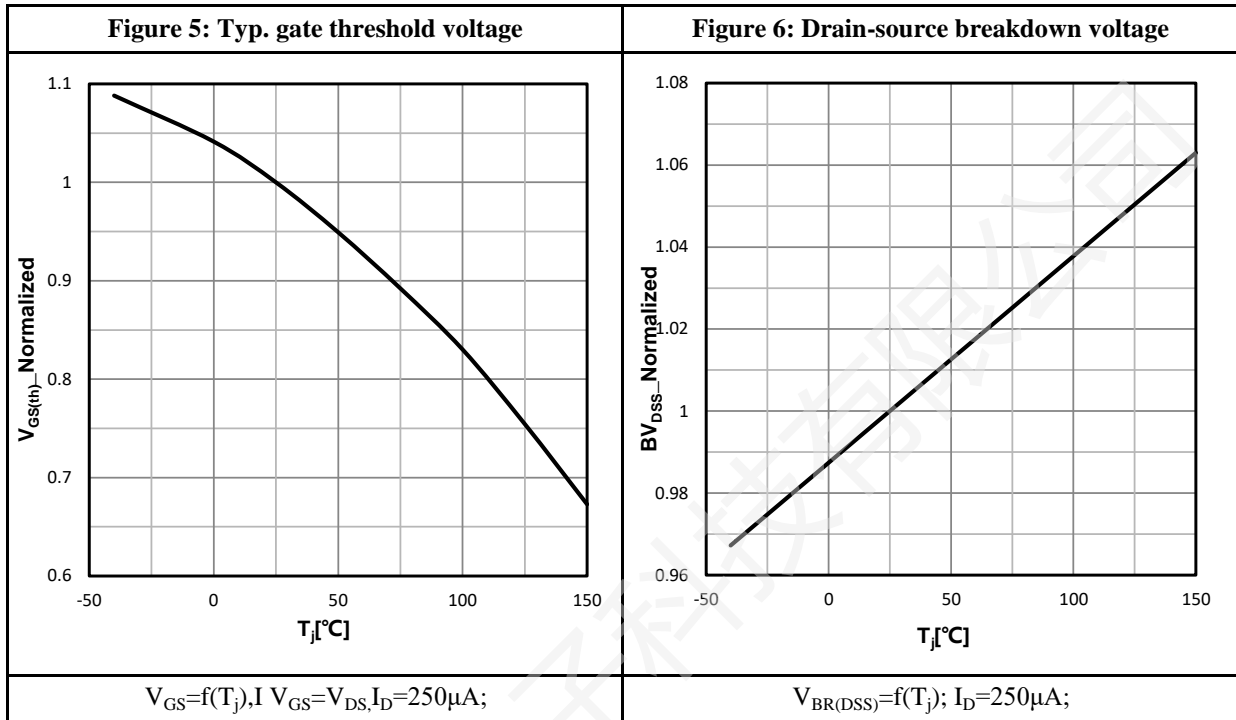
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$I_S$	Diode Forward Current	$T_C=25\text{ }^\circ\text{C}$	--	--	70	A
$V_{SD}$	Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	--	1.2	V

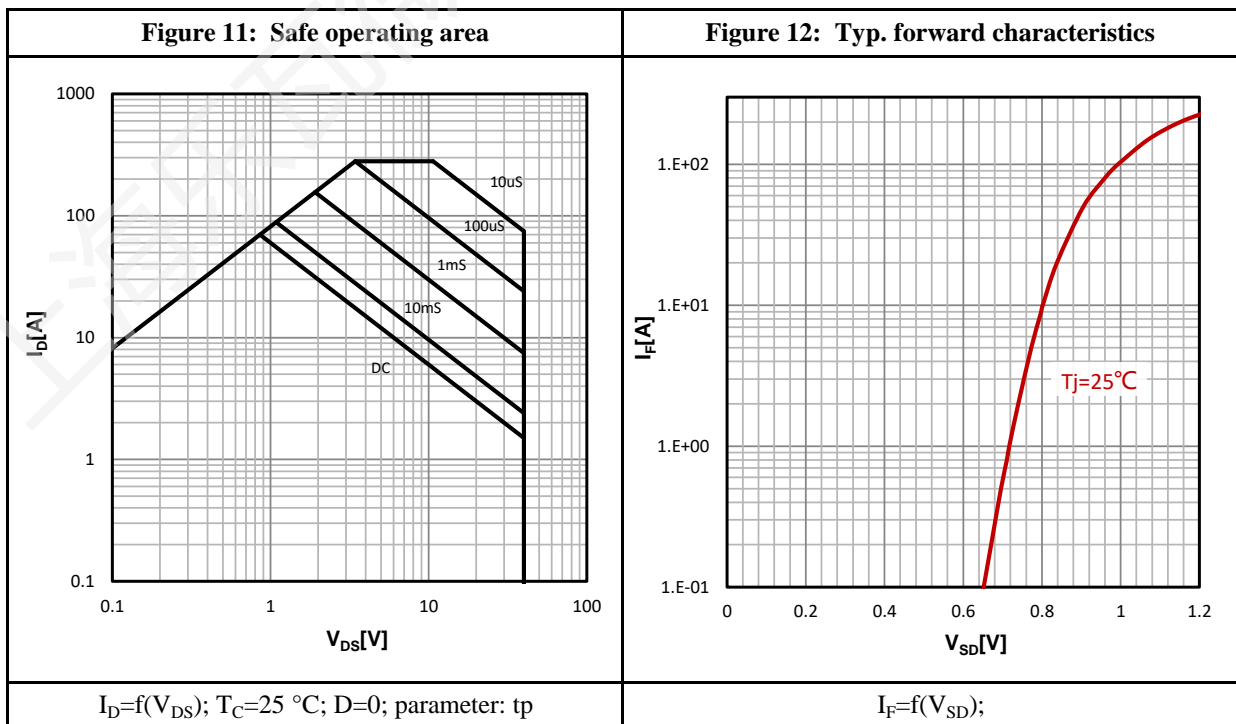
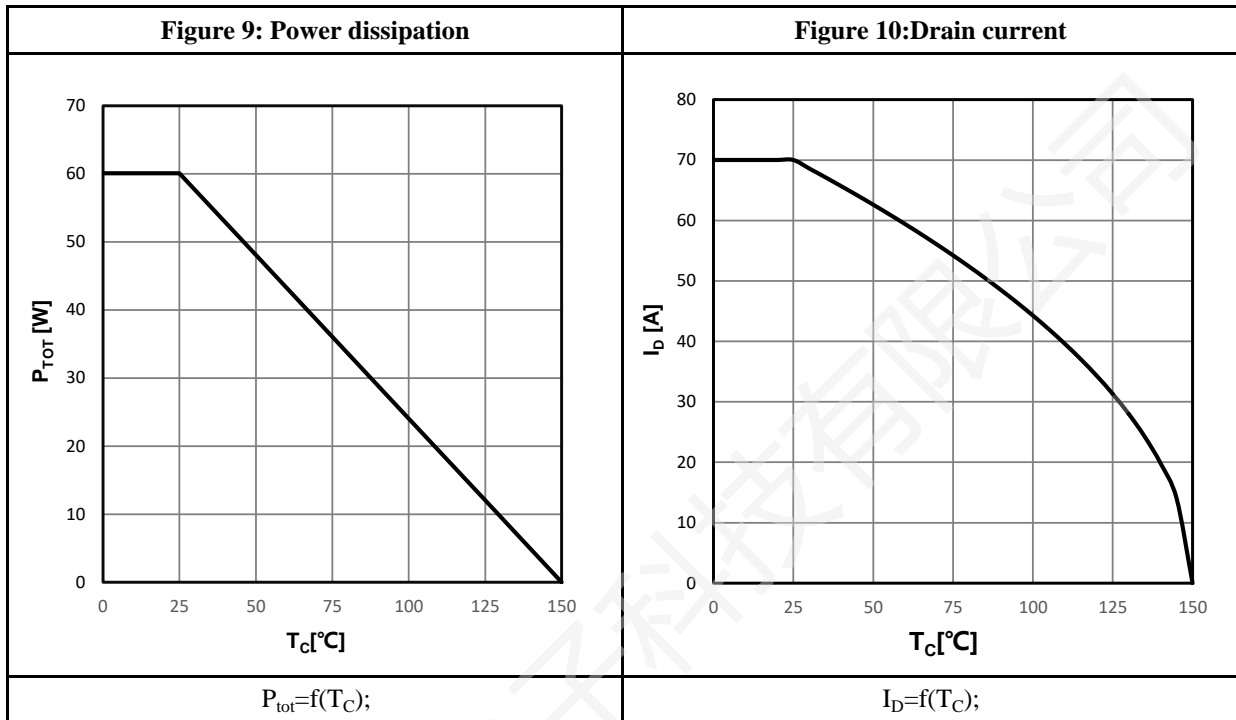
a1: Repetitive rating; pulse width limited by maximum junction temperature

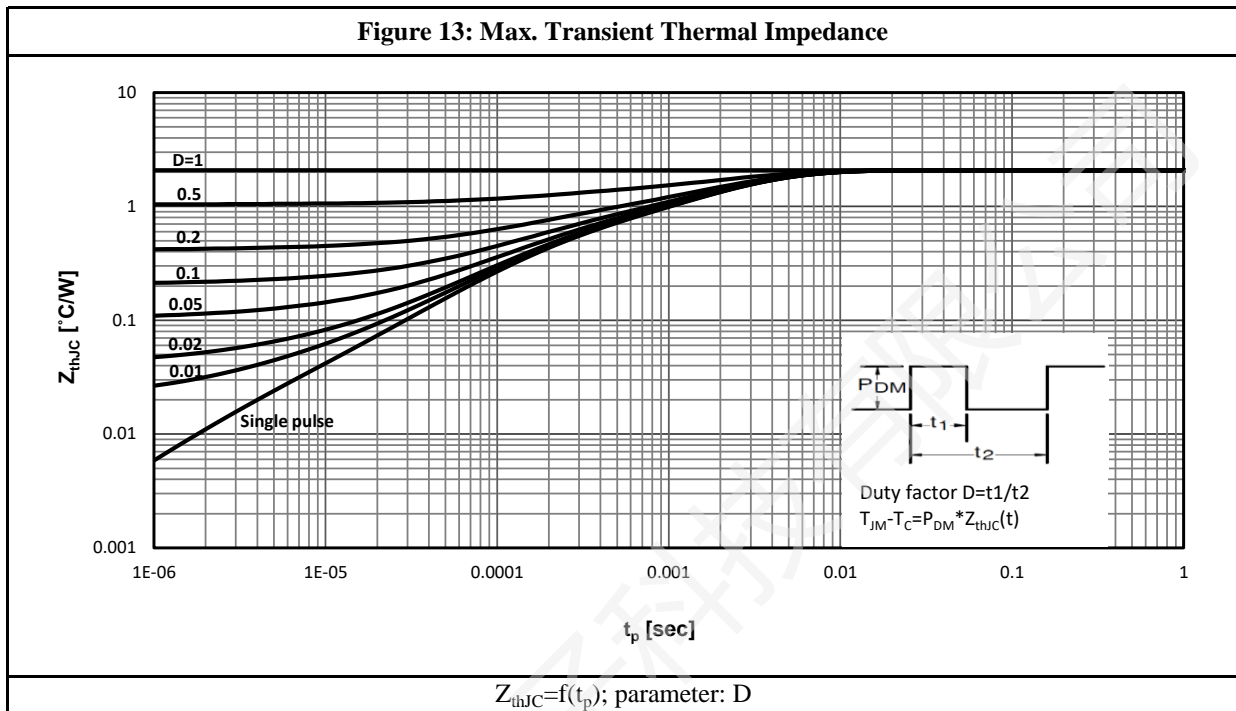
a2:  $V_{DD}=20V, L=0.1mH, R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$

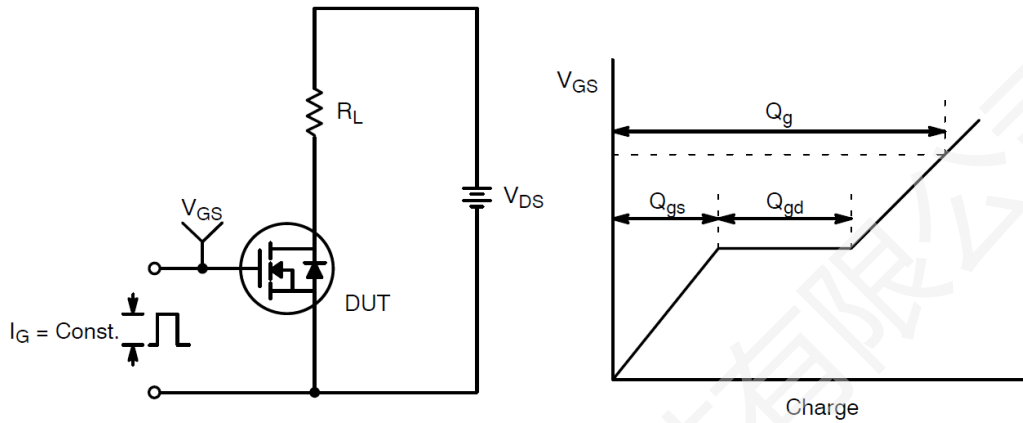
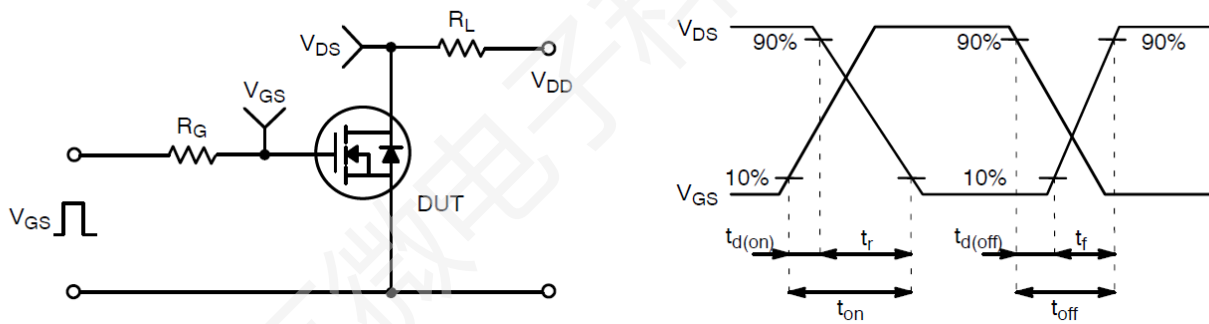
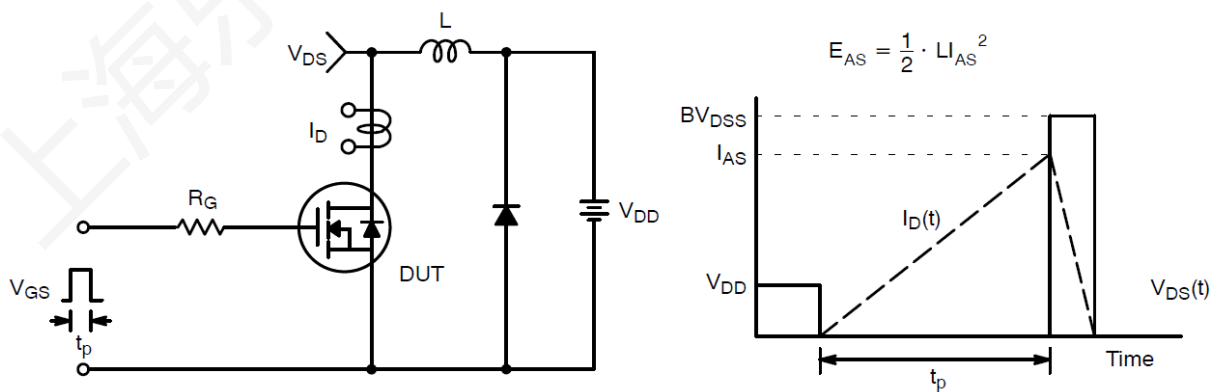
a3: Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection.

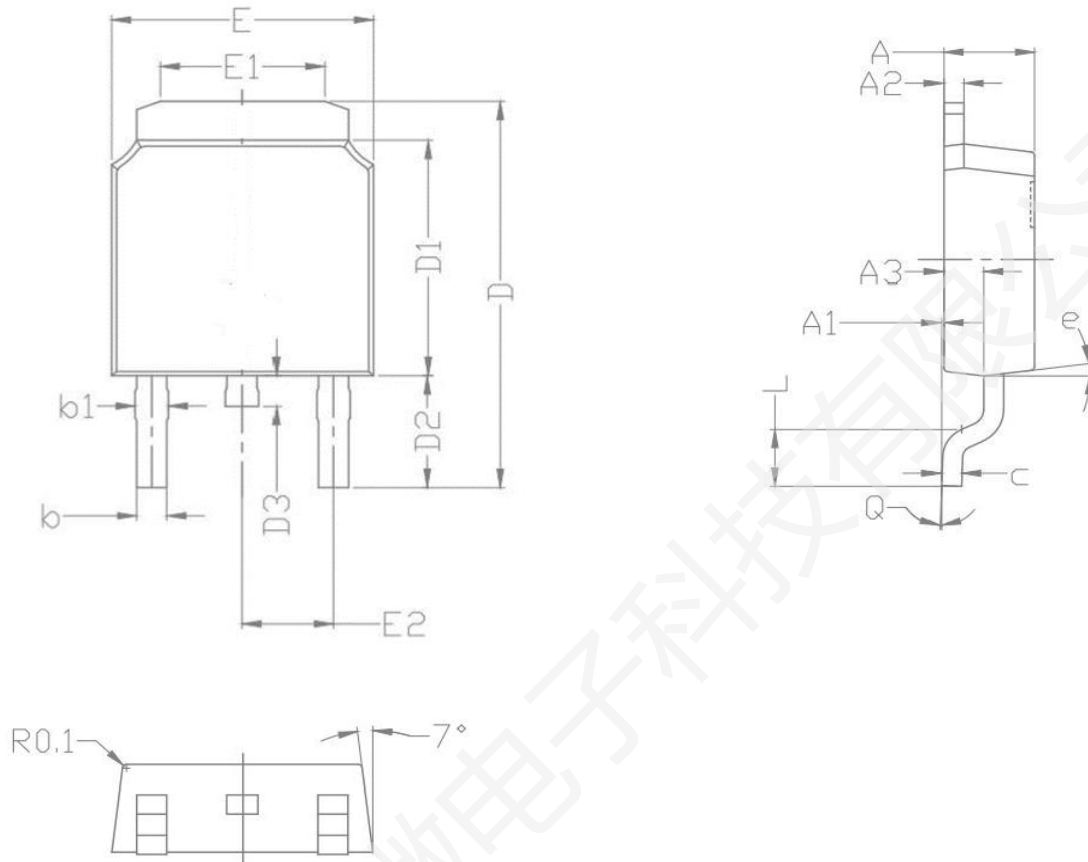
**Characteristics Curve:**








**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			
PKG	TO-252		
Symbol	Min	Nom	Max
A	2.200	2.300	2.400
A1	0.000	0.075	0.150
A2	0.460	0.525	0.590
A3	0.960	1.010	1.060
b	0.640	0.720	0.800
C	0.450	0.515	0.580
D	9.800	10.025	10.350
D1	6.000	6.100	6.200
D2	2.850	2.900	3.100
D3	0.490	0.800	1.000
E	6.400	6.550	6.700
E1	4.050	4.130	4.600
E2	2.250	2.286	2.300
L	1.400	1.550	1.700
e	7°	8°	9°
Q	0°	5°	10°

**Revision History:**

<b>Revison</b>	<b>Date</b>	<b>Descriptions</b>
Rev 1.0	July.2025	Initial Version

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