

General Description:

The LWD4004AD5 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 PDFN5*6-8L, 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.
D4004A/LW D5/D.C.	LWD4004AD5	PDFN5*6-8L	Reel	5000 Pcs

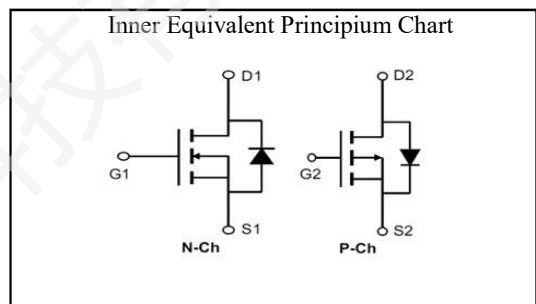
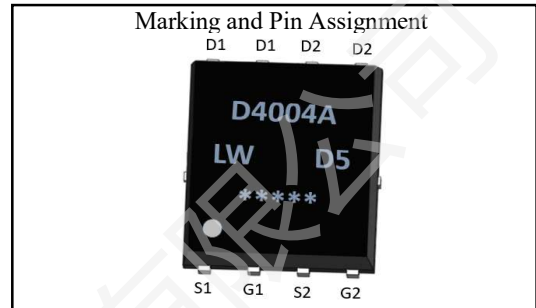
Absolute Maximum Ratings:

Symbol	Parameter		Value		Units
			N-Ch	P-Ch	
V _{DSS}	Drain-to-Source Voltage		40	-40	V
I _D	Continuous Drain Current	T _C =25°C	40	-35	A
	Continuous Drain Current	T _C =100°C	25	-22	A
I _{DM} ^{a1}	Pulsed Drain Current		160	-140	A
E _{AS} ^{a2}	Single pulse avalanche energy		54	92	mJ
V _{GS}	Gate-to-Source Voltage		±20	±20	V
P _D	Power Dissipation		32	36	W
T _J , T _{STG}	Operating Junction and Storage Temperature Range		150, -55 to 150		°C
T _L	Maximum Temperature for Soldering		260		°C

Thermal Characteristics:

Symbol	Parameter	Value		Units
		N-Ch	P-Ch	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.91	3.45	$^{\circ}C/W$
$R_{\theta JA}^{a3}$	Thermal Resistance, Junction-to-Ambient	68	62.5	$^{\circ}C/W$

Symbol	N-Ch	P-Ch	Units
V_{DSS}	40	-40	V
I_D	40	-35	A
$R_{DS(ON) \text{ TYPE}}$	10	13.5	m Ω



N-Channel 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	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	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.0	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=15A$	--	10	13	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=4.5V, I_D=10A$	--	12.5	18	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS} = 0V$	--	1201	--	pF
C_{oss}	Output Capacitance	$V_{DS} = 20V$	--	94	--	
C_{rss}	Reverse Transfer Capacitance	$f = 1.0MHz$	--	88	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1.0MHz$	--	1.7	--	Ω

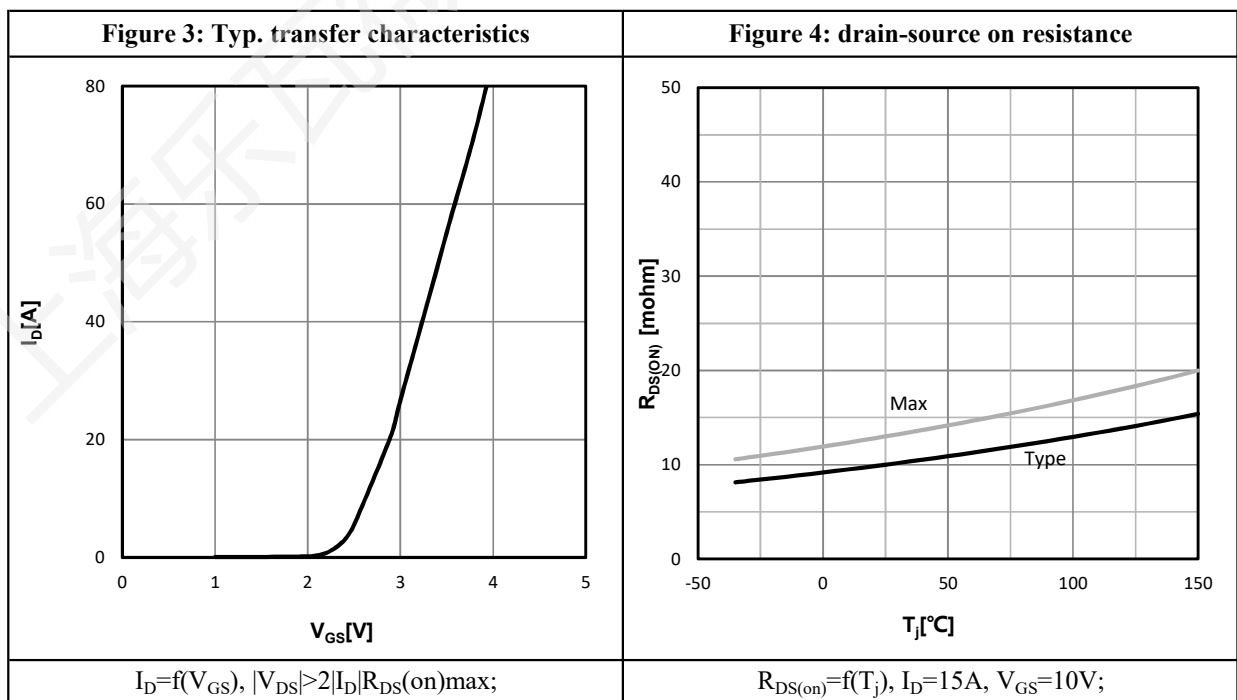
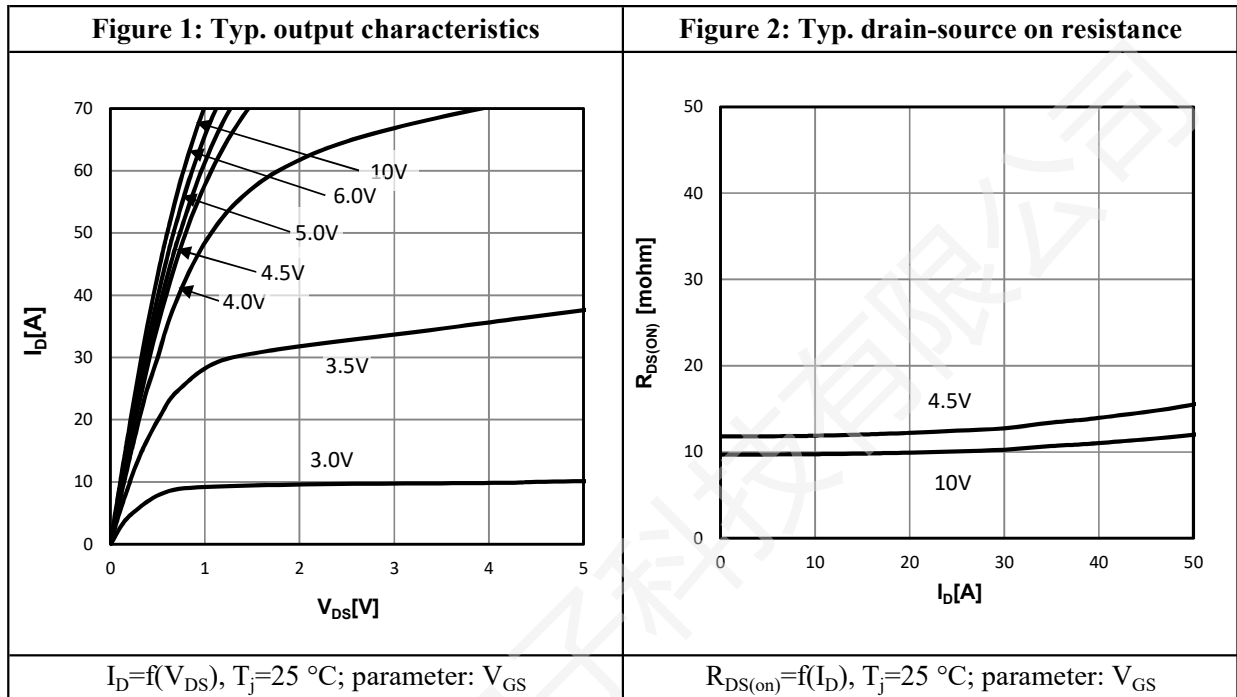
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = 15A$	--	5.0	--	ns
t_r	Rise Time	$V_{DS} = 20V$	--	12	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS} = 10V$	--	23	--	
t_f	Fall Time	$R_G = 3.0\Omega$	--	13	--	
Q_g	Total Gate Charge	$V_{GS} = 10V$	--	27.6	--	nC
Q_{gs}	Gate Source Charge	$V_{DS} = 20V$	--	3.5	--	
Q_{gd}	Gate Drain Charge	$I_D = 15A$	--	5.8	--	

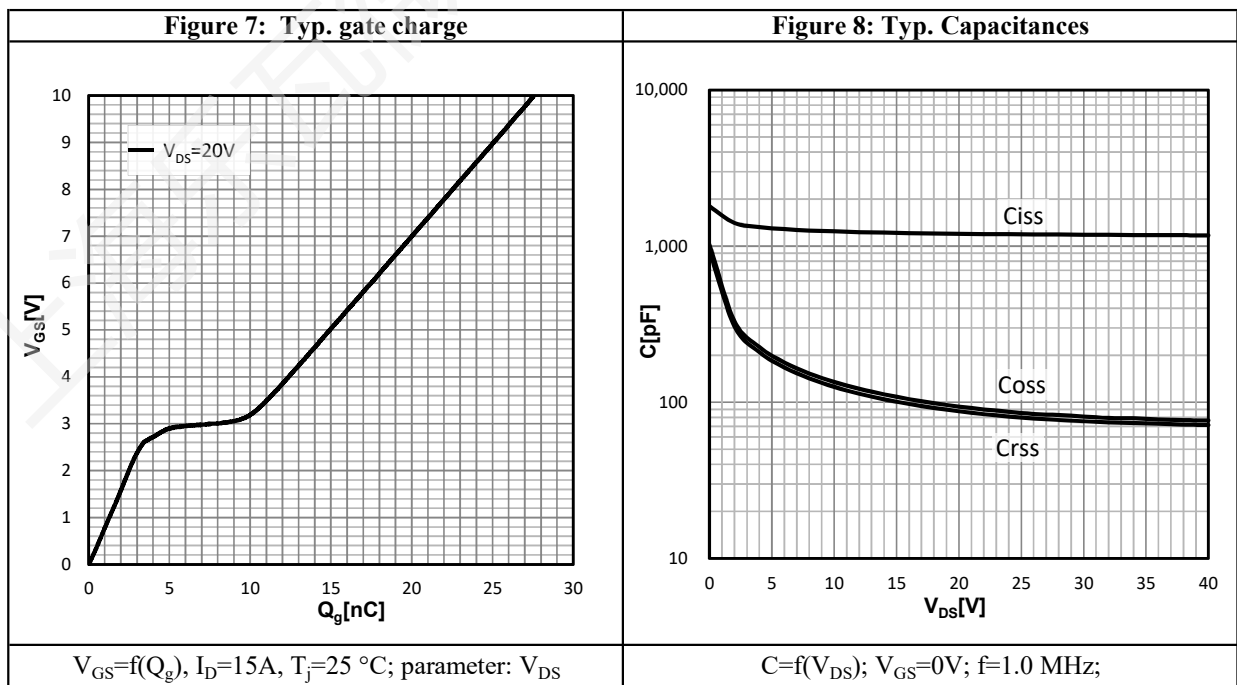
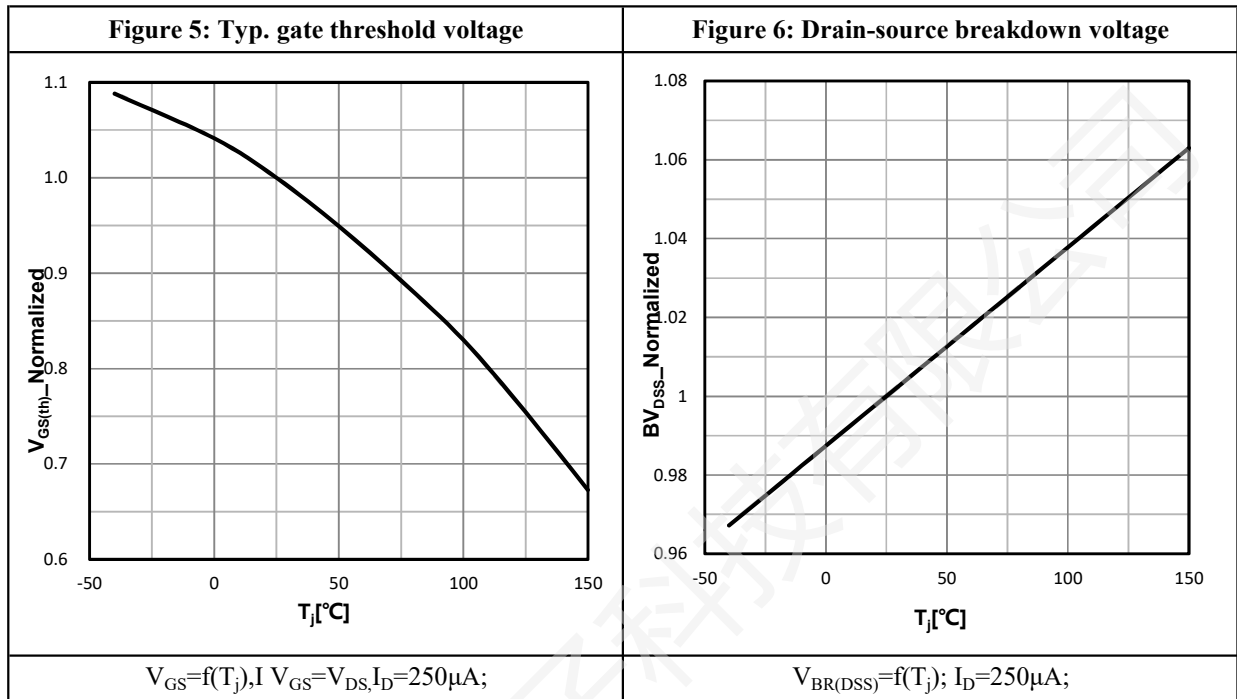
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_C = 25\text{ }^{\circ}\text{C}$	--	--	40	A
V_{SD}	Diode Forward Voltage	$I_S=15A, V_{GS}=0V$	--	--	1.2	V

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: Surface Mounted on FR4 Board, $t \leq 10sec$

N-Channel Characteristics Curve:




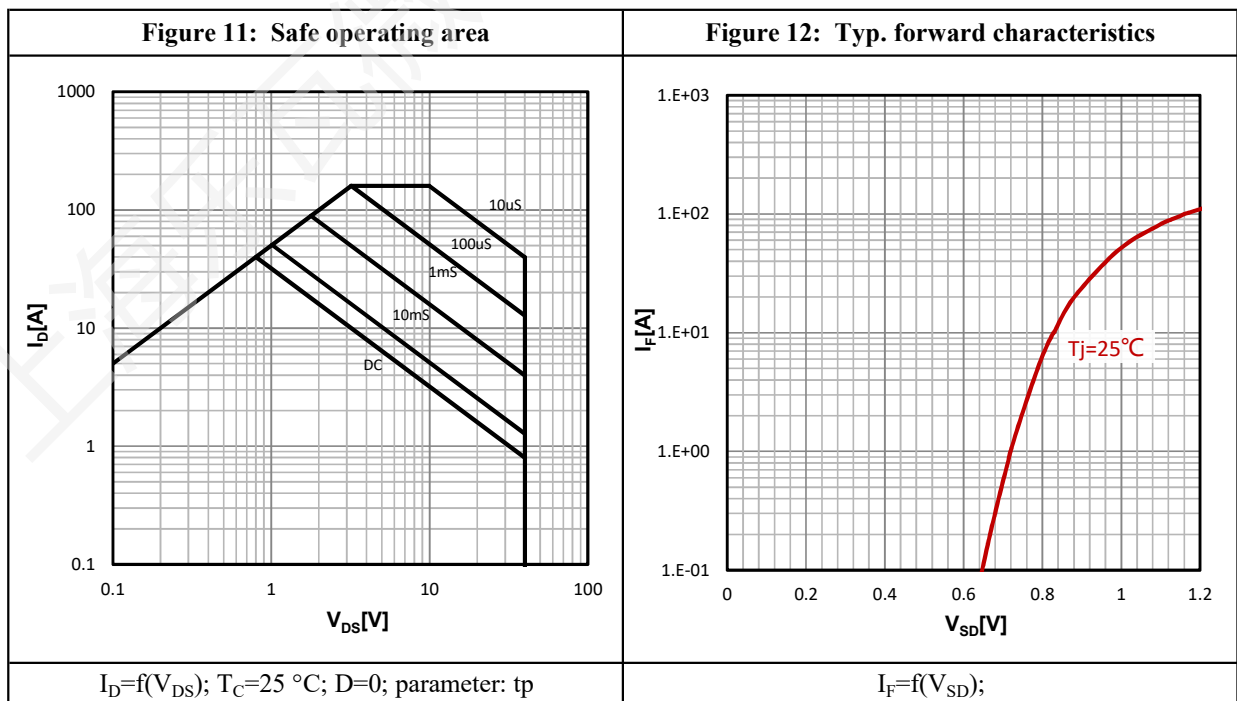
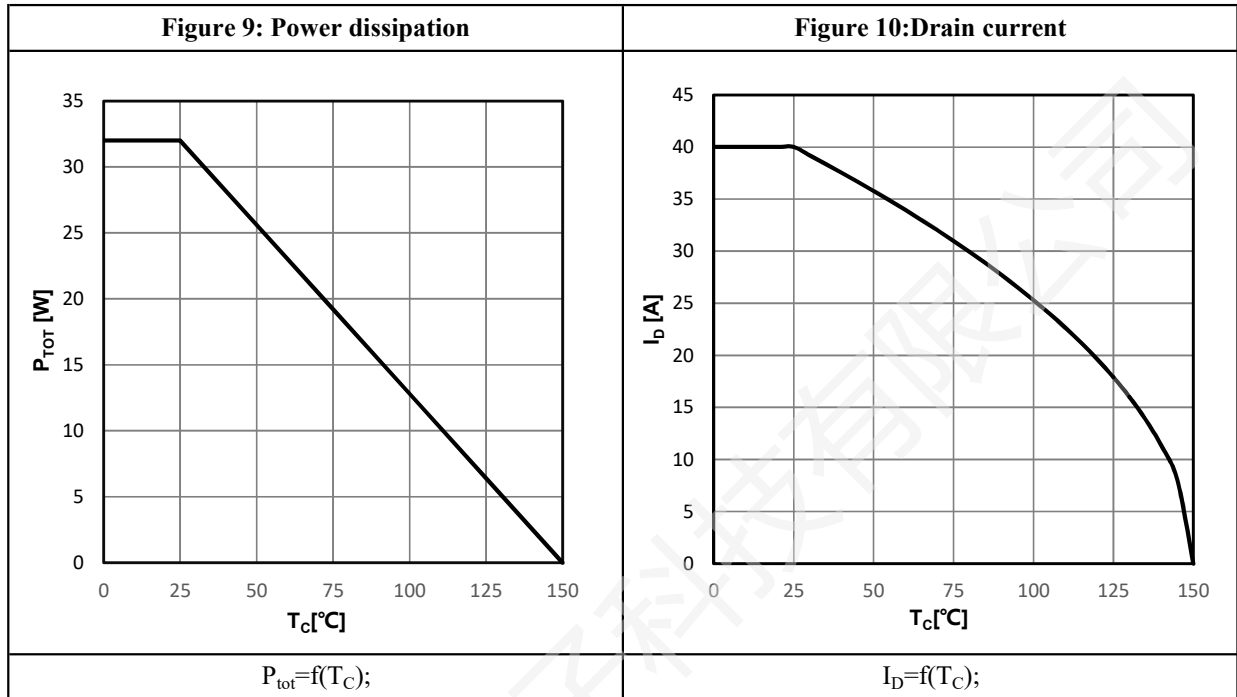
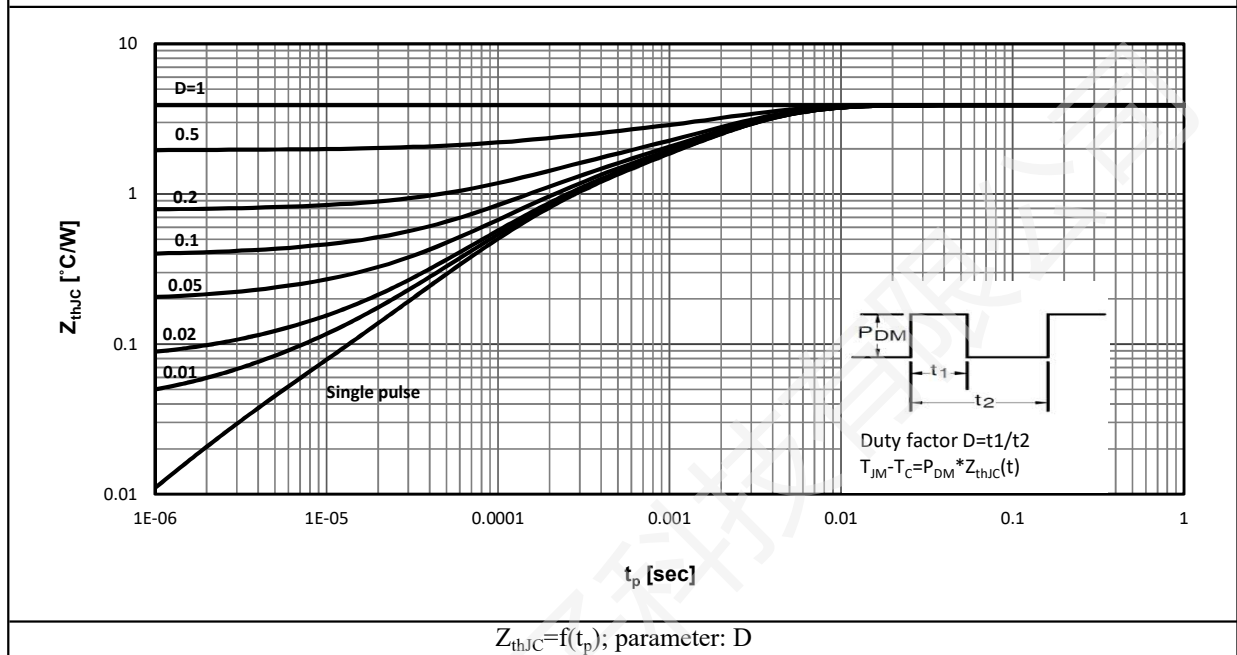
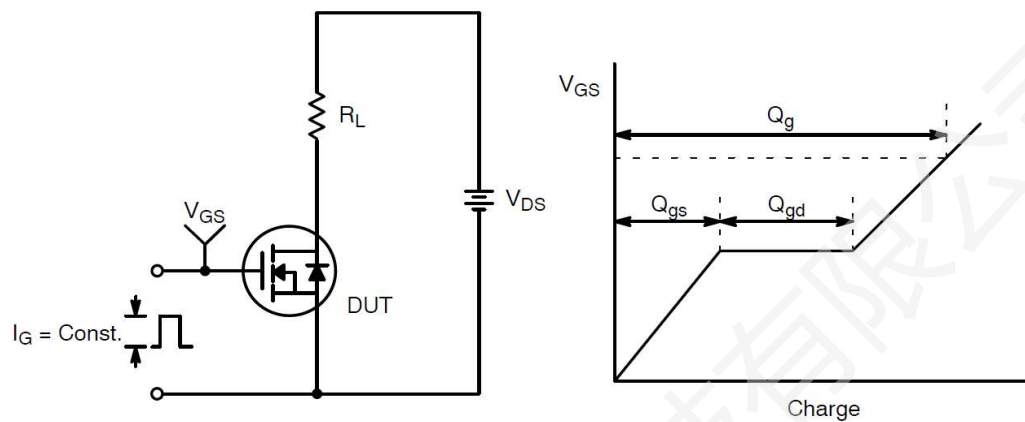
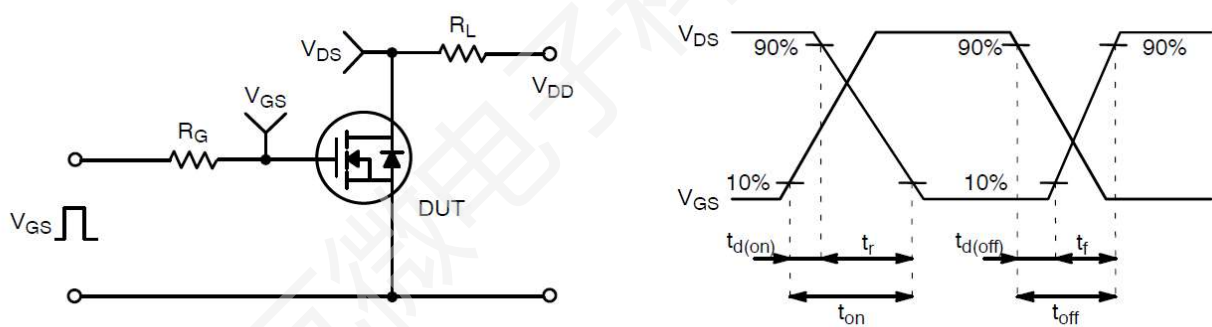
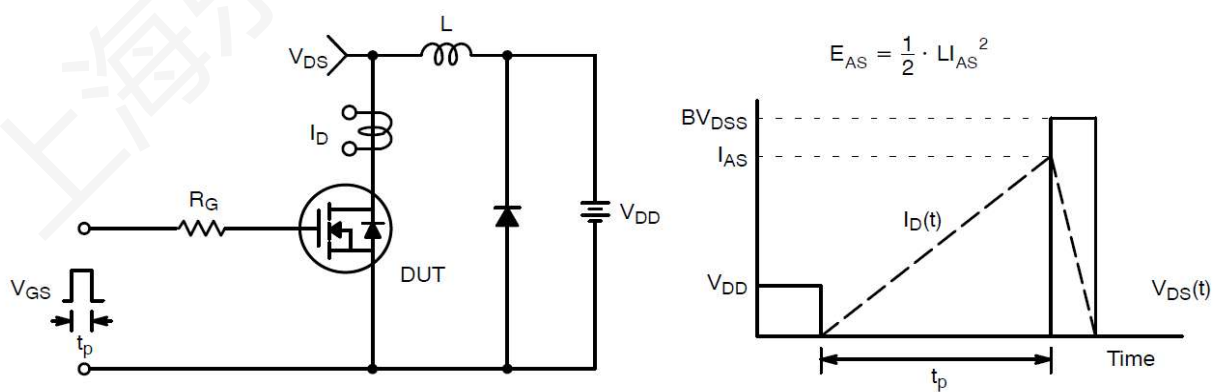


Figure 13: Max. Transient Thermal Impedance


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

P-Channel 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	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	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.7	-2.3	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=-10V, I_D=-15A$	--	13.5	17	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=-4.5V, I_D=-10A$	--	18	26	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS} = 0V$	--	1862	--	pF
C_{oss}	Output Capacitance	$V_{DS} = -20V$	--	207	--	
C_{rss}	Reverse Transfer Capacitance	$f = 1.0MHz$	--	188	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1.0MHz$	--	7.5	--	Ω

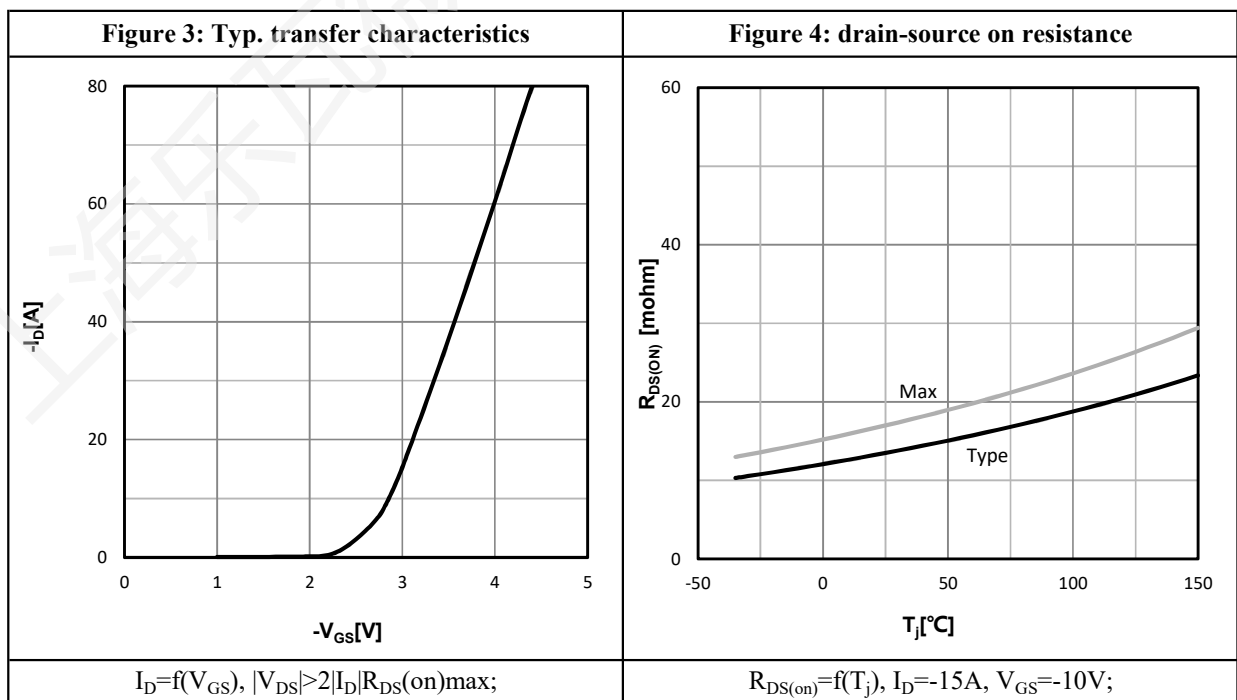
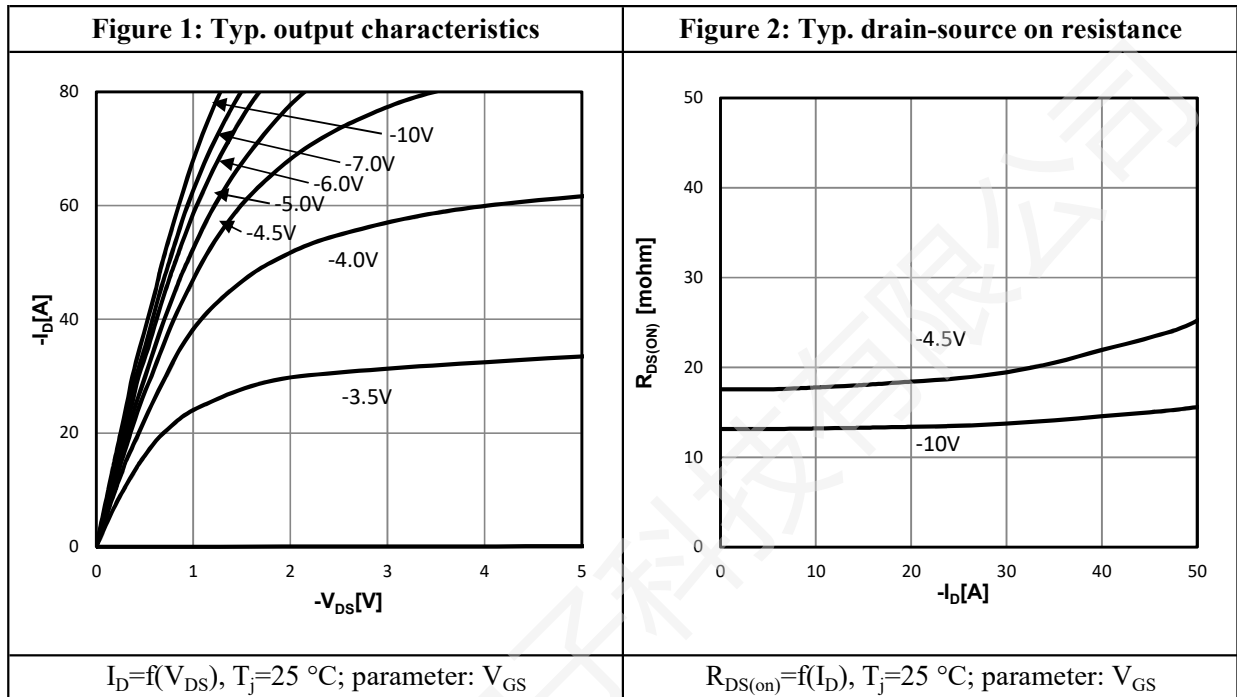
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = -15A$	--	11	--	ns
t_r	Rise Time	$V_{DS} = -20V$	--	10	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS} = -10V$	--	28	--	
t_f	Fall Time	$R_G = 3.0\Omega$	--	16	--	
Q_g	Total Gate Charge	$V_{GS} = -10V$	--	41.6	--	nC
Q_{gs}	Gate to Source Charge	$V_{DS} = -20V$	--	5.5	--	
Q_{gd}	Gate to Drain Charge	$I_D = -15A$	--	9.1	--	

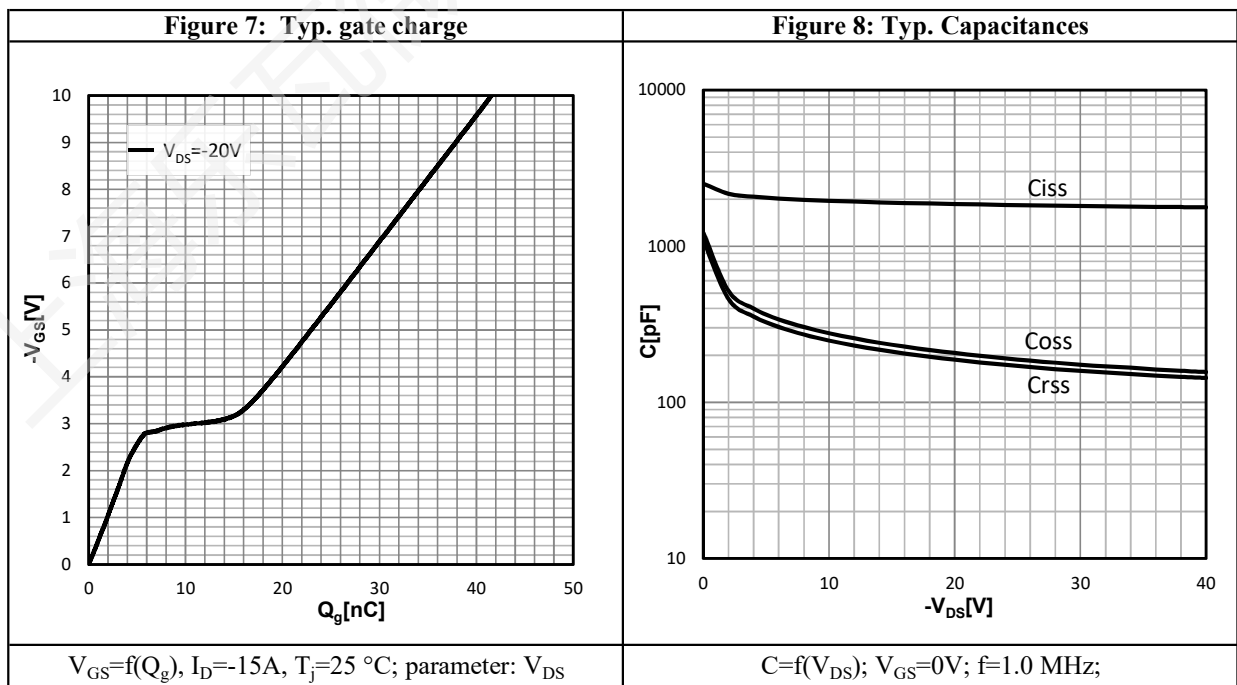
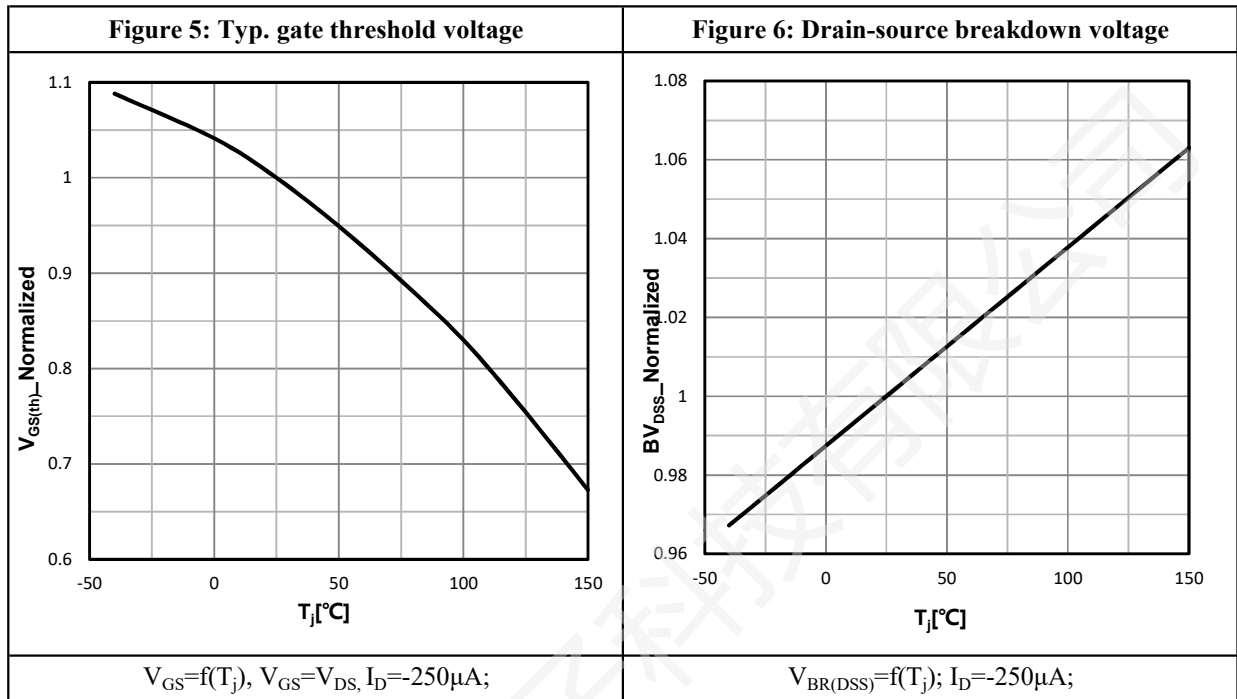
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_C = 25\text{ }^{\circ}\text{C}$	--	--	-35	A
V_{SD}	Diode Forward Voltage	$I_S = -15A, V_{GS} = 0V$	--	--	-1.2	V

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

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

a3: Surface Mounted on FR4 Board, $t \leq 10\text{sec}$

P-Channel Characteristics Curve:




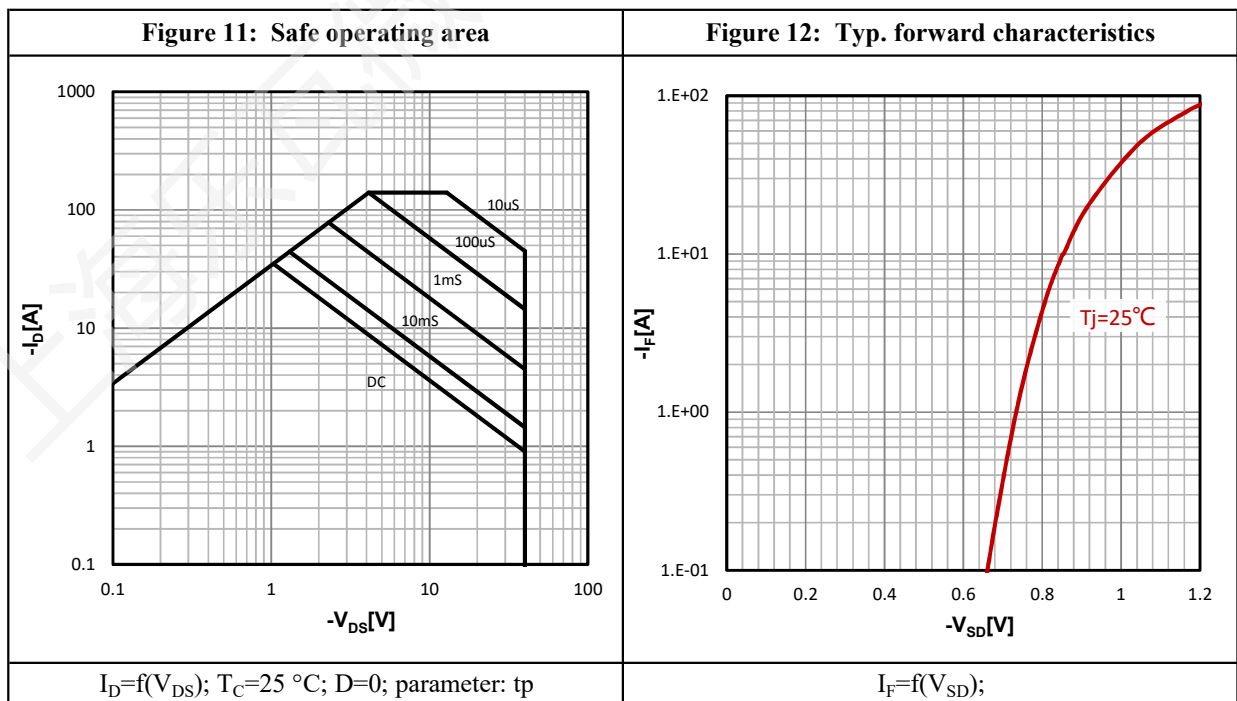
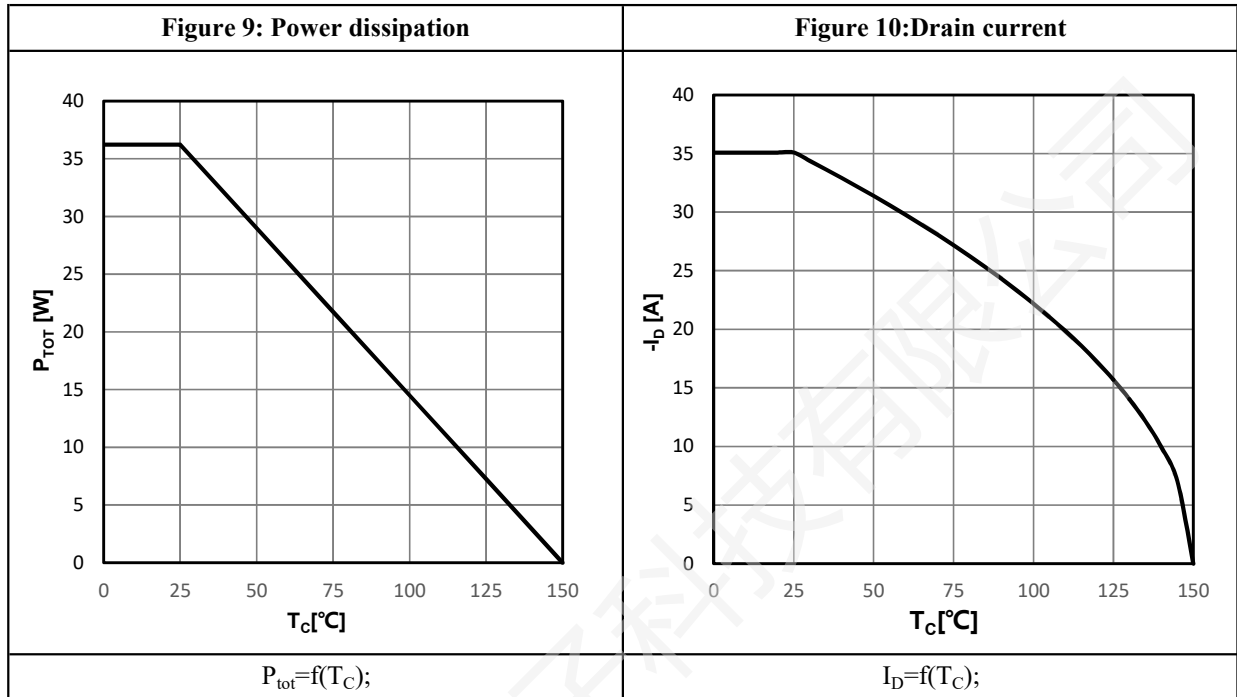
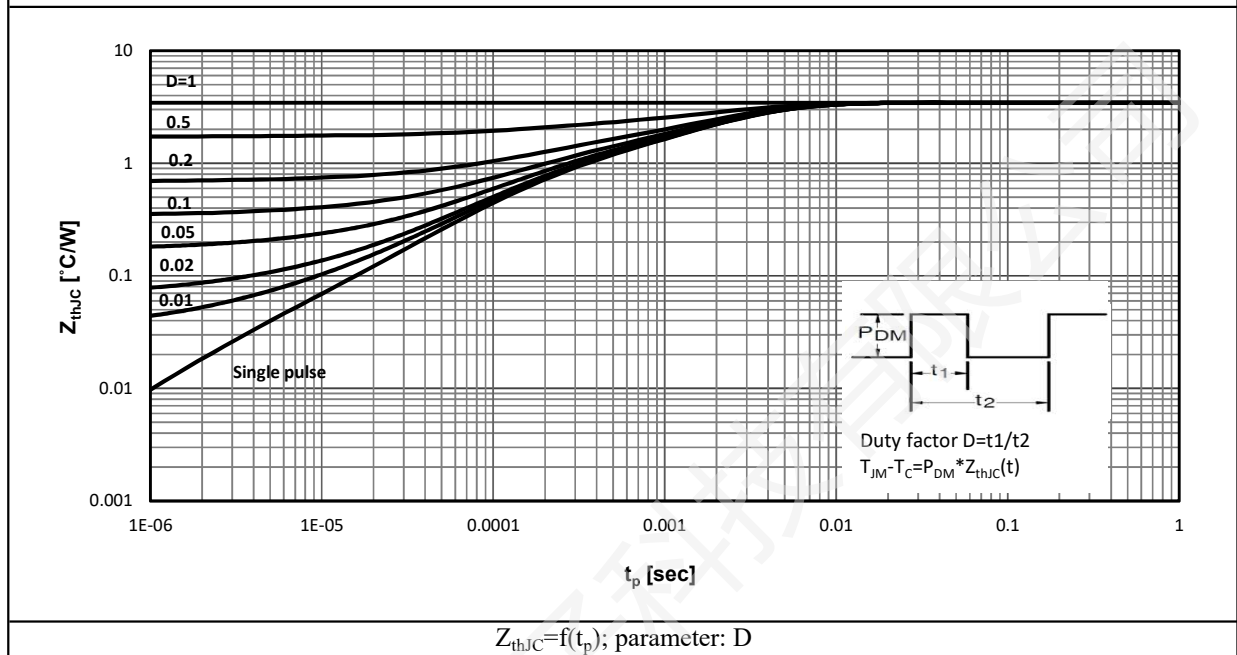


Figure 13: Max. Transient Thermal Impedance


P-Channel Test Circuit & Waveform:

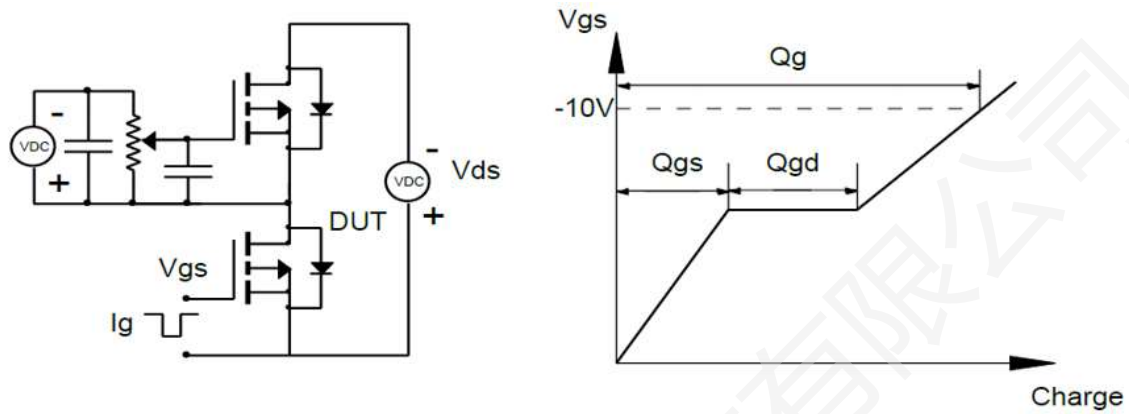


Figure 14: Gate Charge Test Circuit & Waveform

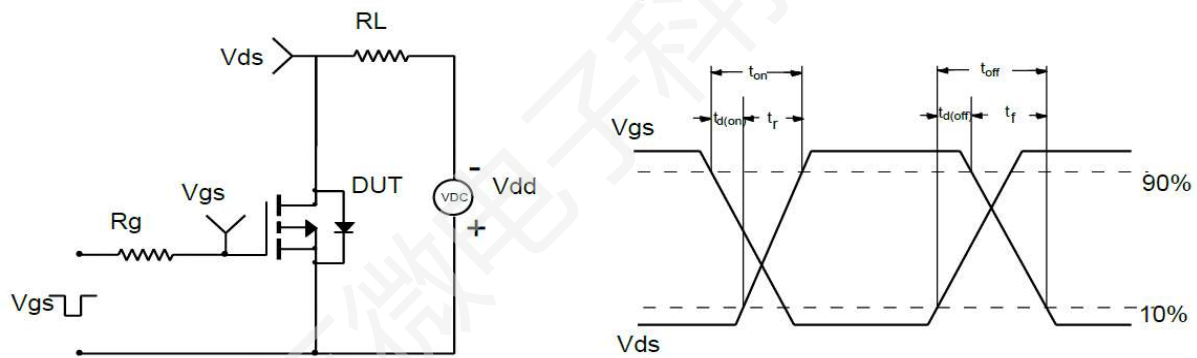


Figure 15: Resistive Switching Test Circuit & Waveforms

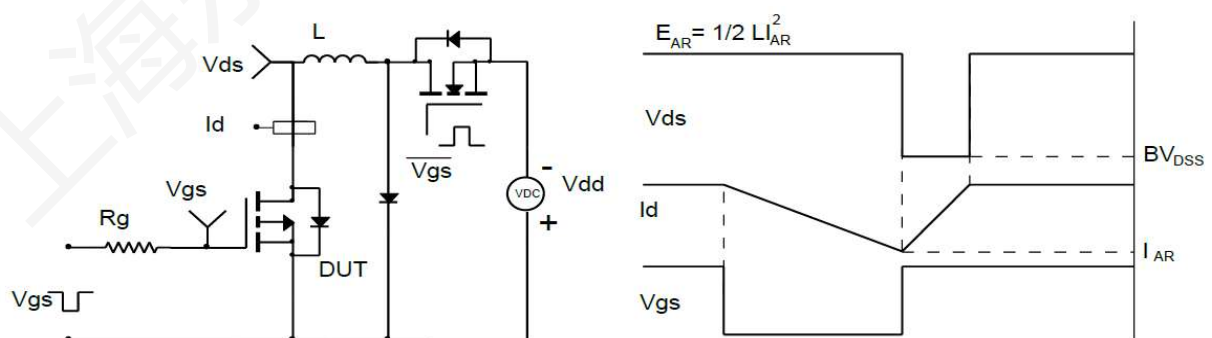
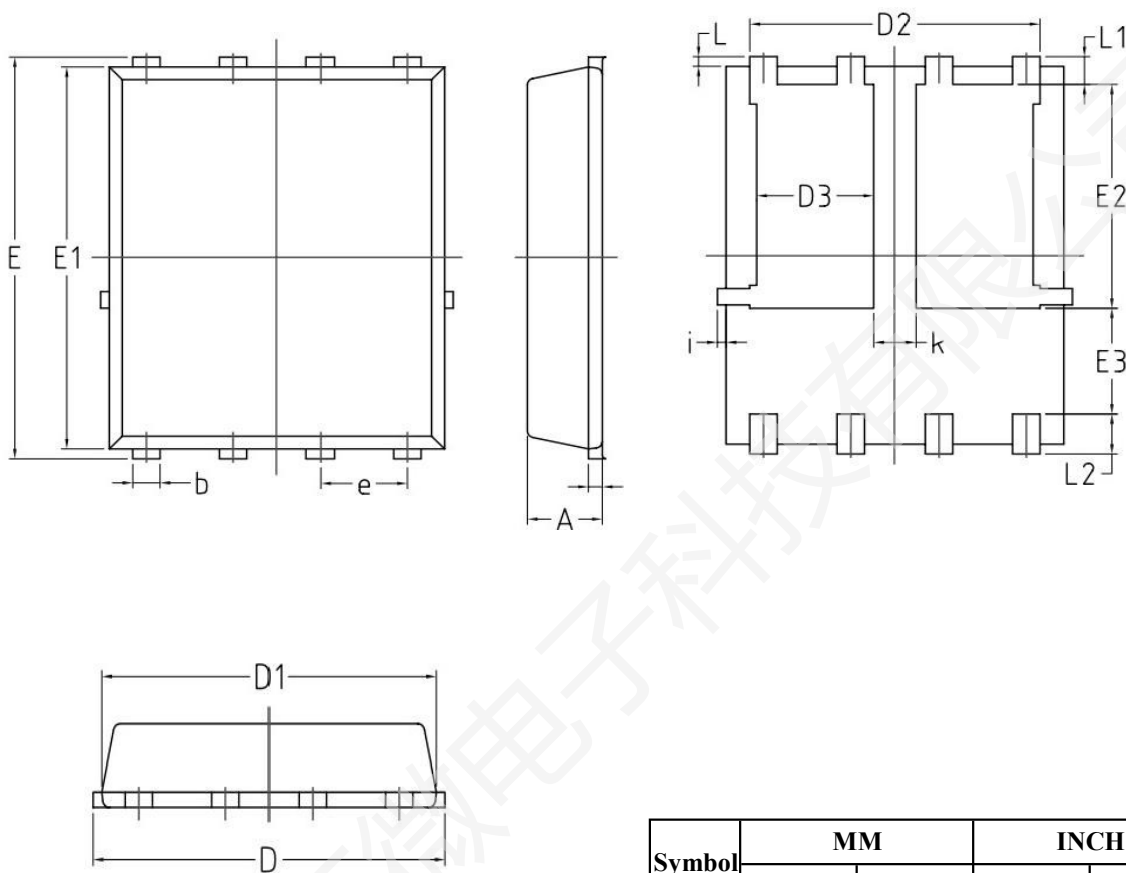


Figure 16: Unclamped Inductive Switching Test Circuit & Waveforms

Package Outline:


Symbol	MM		INCH	
	MIN	MAX	MIN	MAX
A	0.90	1.20	0.0354	0.0472
b	0.34	0.48	0.0134	0.0189
C	0.203 BSC		0.0080 BSC	
D	4.80	5.40	0.1890	0.2126
D1	4.80	5.00	0.1890	0.1969
D2	4.11	4.31	0.1620	0.1700
D3	1.60	1.80	0.0629	0.0708
E	5.90	6.15	0.2323	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	3.30	3.60	0.1300	0.1417
E3	1.40	/	0.0551	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.28	0.0019	0.0110
L1	0.38	0.58	0.0150	0.0228
L2	0.38	0.71	0.0150	0.0280
l	/	0.18	/	0.0070
k	0.50	0.70	0.0197	0.0276

Revision History:

Revision	Date	Descriptions
Rev 1.1	July.2025	Initial Version

Disclaimer:

The information in this document is believed to be accurate and reliable. However, no responsibility is assumed by LW-Micro for its use. All operating parameters must be designed, validated and tested to ensure they meet the requirements of your application. LW-Micro reserves the right to make any specification and/or circuitry changes without prior notification. Before starting a brand-new project, please contact LW-Micro Sales to get the most recent relevant information.

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