

General Description:

The LWD6003A4 Power MOSFET 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-252-4L, 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

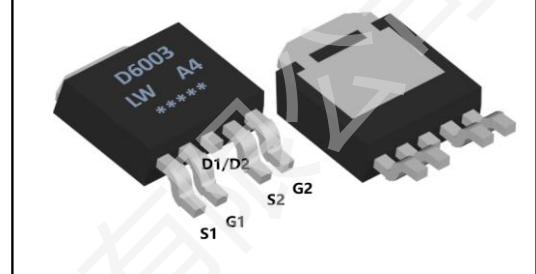
100% DVDS Tested

100% Avalanche Tested

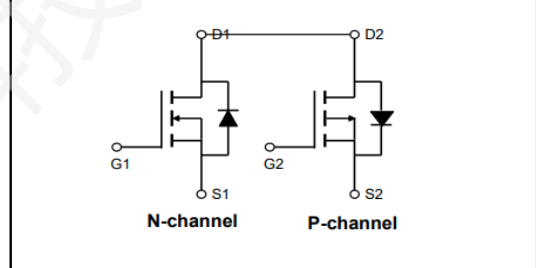


Symbol	N-Ch	P-Ch	Units
V_{DSS}	60	-60	V
I_D	40	-40	A
$R_{DS(ON) \text{ TYPE}}$	17	19	$m\Omega$

Marking and Pin Assignment



Inner Equivalent Principium Chart



Package Marking and Ordering Information:

Marking	Part Number	Package	Packing	Qty.
D6003/LW A4/D.C.	LWD6003A4	TO-252-4L	Reel	2500 Pcs

Absolute Maximum Ratings:

Symbol	Parameter		Value		Units
			N-Ch	P-Ch	
V_{DSS}	Drain-to-Source Voltage		60	-60	V
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	40	-40	A
	Continuous Drain Current	$T_C=100^\circ\text{C}$	25	-25	A
I_{DM}^{a1}	Pulsed Drain Current		160	-160	A
E_{AS}^{a2}	Single pulse avalanche energy		80	76	mJ
V_{GS}	Gate-to-Source Voltage		± 20	± 20	V
P_D	Power Dissipation		80	85	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
			N-Ch	P-Ch	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		1.56	1.47	$^\circ\text{C/W}$
$R_{\theta JA}^{a3}$	Thermal Resistance, Junction-to-Ambient		100	100	$^\circ\text{C/W}$

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	$V_{GS}=0V, I_D=250\mu A$	60	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=60V, V_{GS}=0V$	--	--	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	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.55	2.0	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=20A$	--	17	21	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=4.5V, I_D=15A$	--	19	26	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$	--	2285	--	pF
C_{oss}	Output Capacitance	$V_{DS}=30V$	--	100	--	
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	--	84	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	2.0	--	Ω

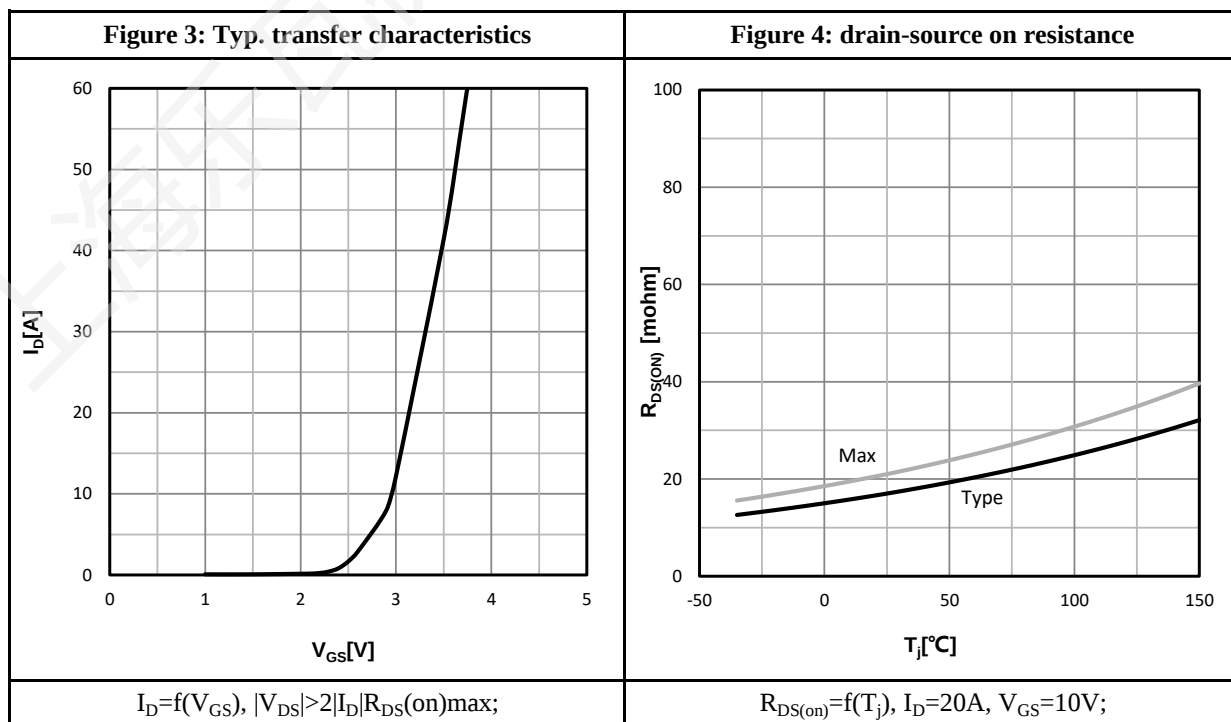
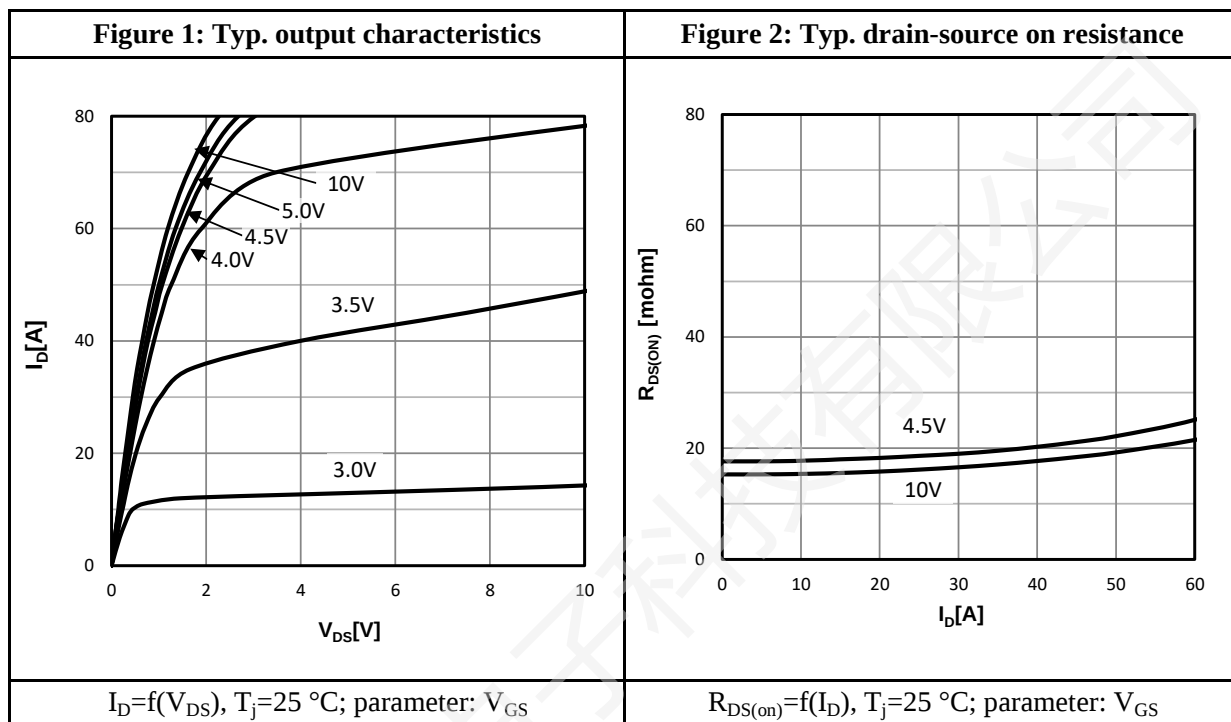
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=20A$	--	7.0	--	ns
t_r	Rise Time	$V_{DS}=30V$	--	5.5	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS}=10V$	--	30	--	
t_f	Fall Time	$R_G=3.0\Omega$	--	6.0	--	
Q_g	Total Gate Charge	$V_{GS}=10V$	--	50	--	nC
Q_{gs}	Gate to Source Charge	$V_{DS}=30V$	--	6.8	--	
Q_{gd}	Gate to Drain Charge	$I_D=20A$	--	11.3	--	

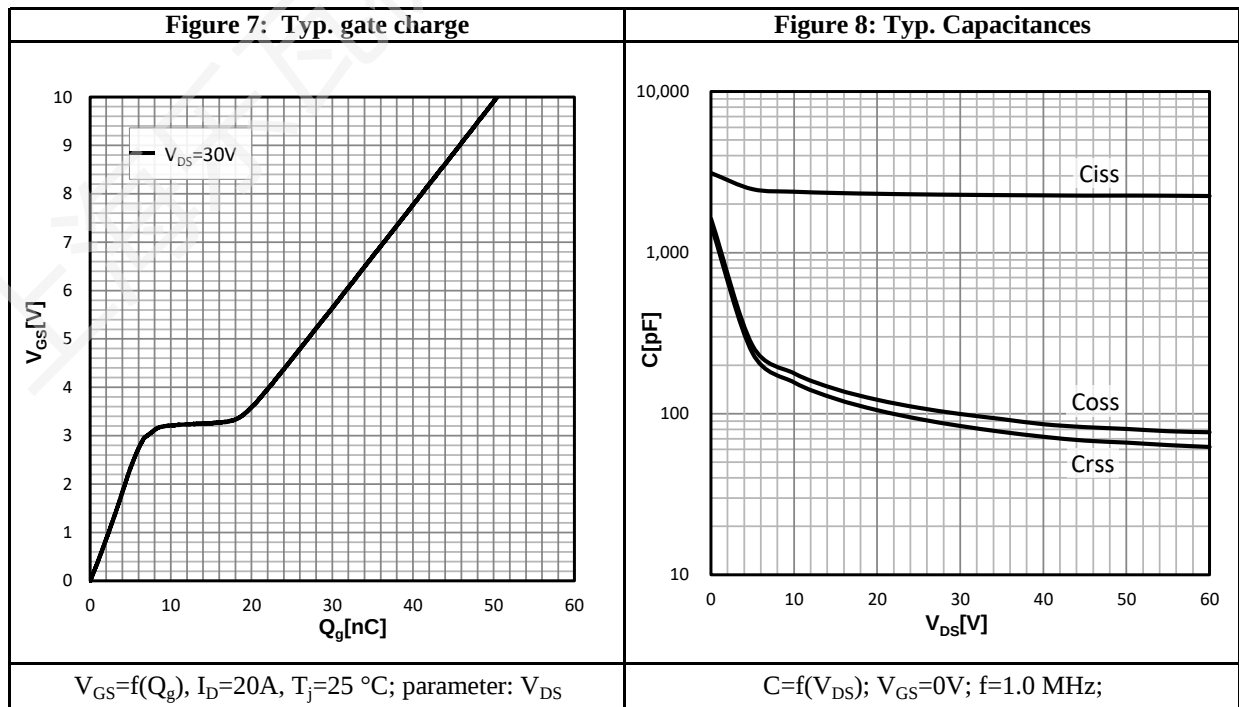
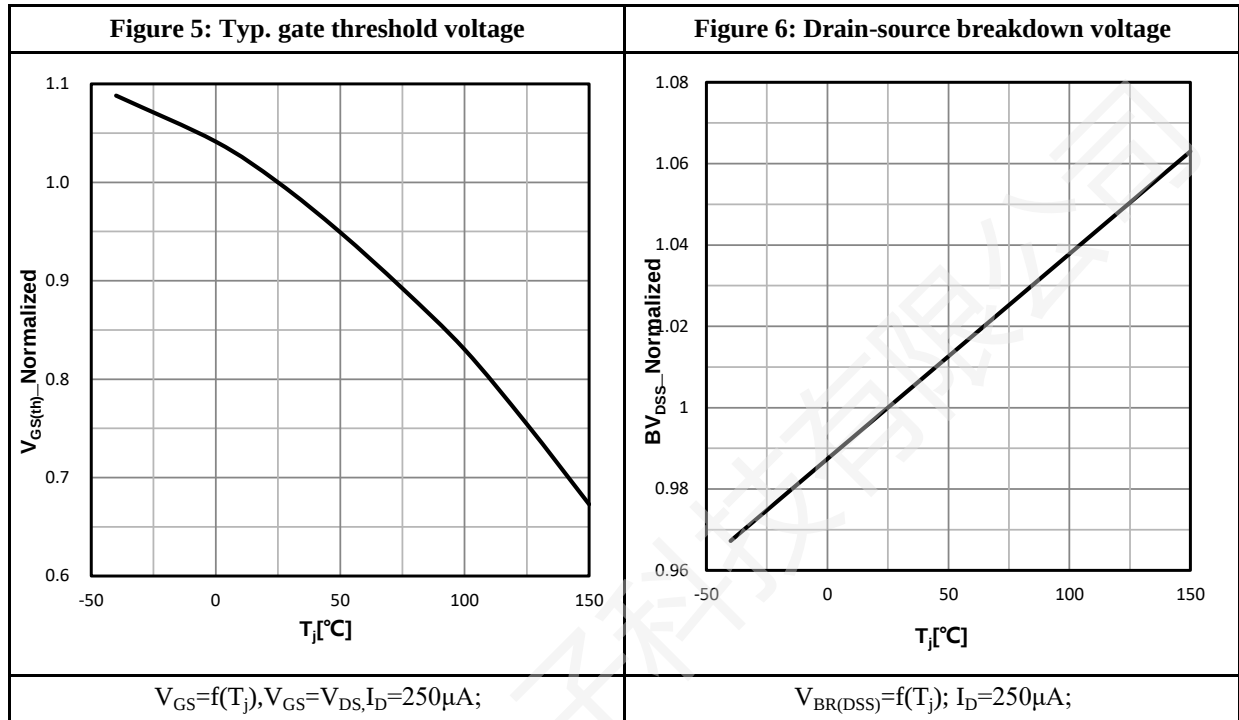
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_C=25\text{ }^{\circ}\text{C}$	--	--	40	A
V_{SD}	Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	--	1.2	V

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

a2: $V_{DD}=30V, L=0.1mH, R_G=25\Omega$, 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 cm² (one layer, 70 μm thick) copper area for drain connection.

N-Channel Characteristics Curve:




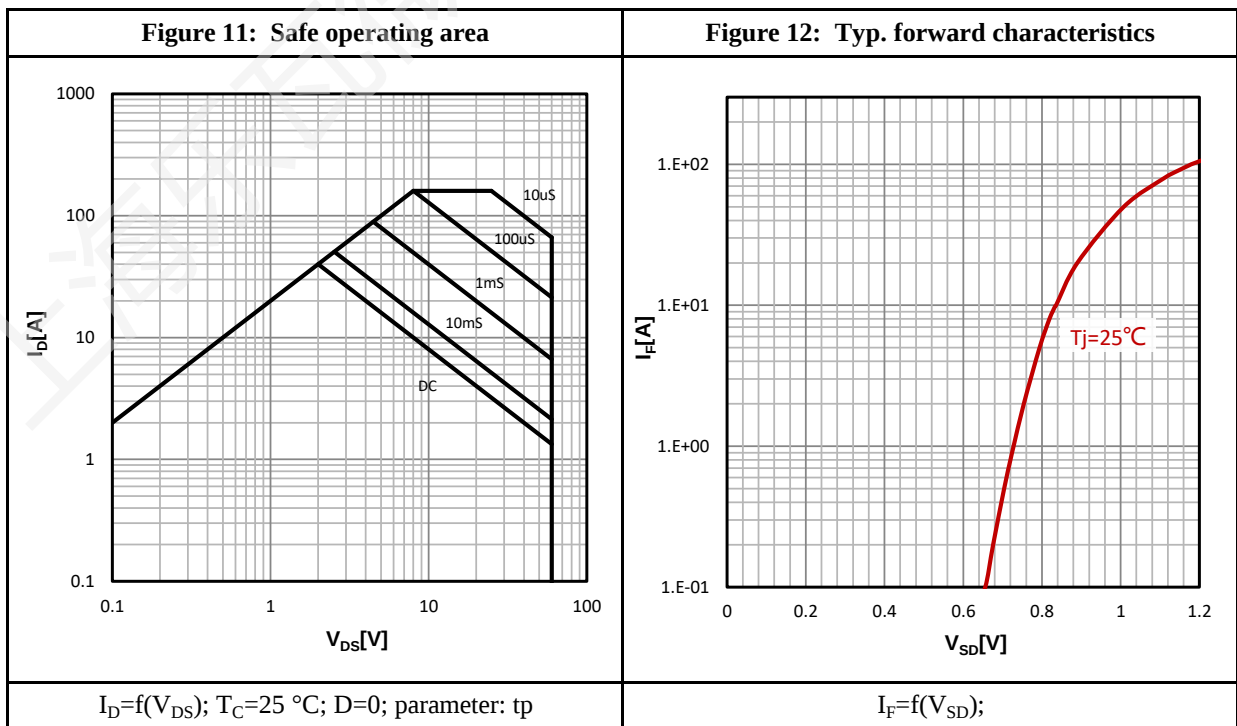
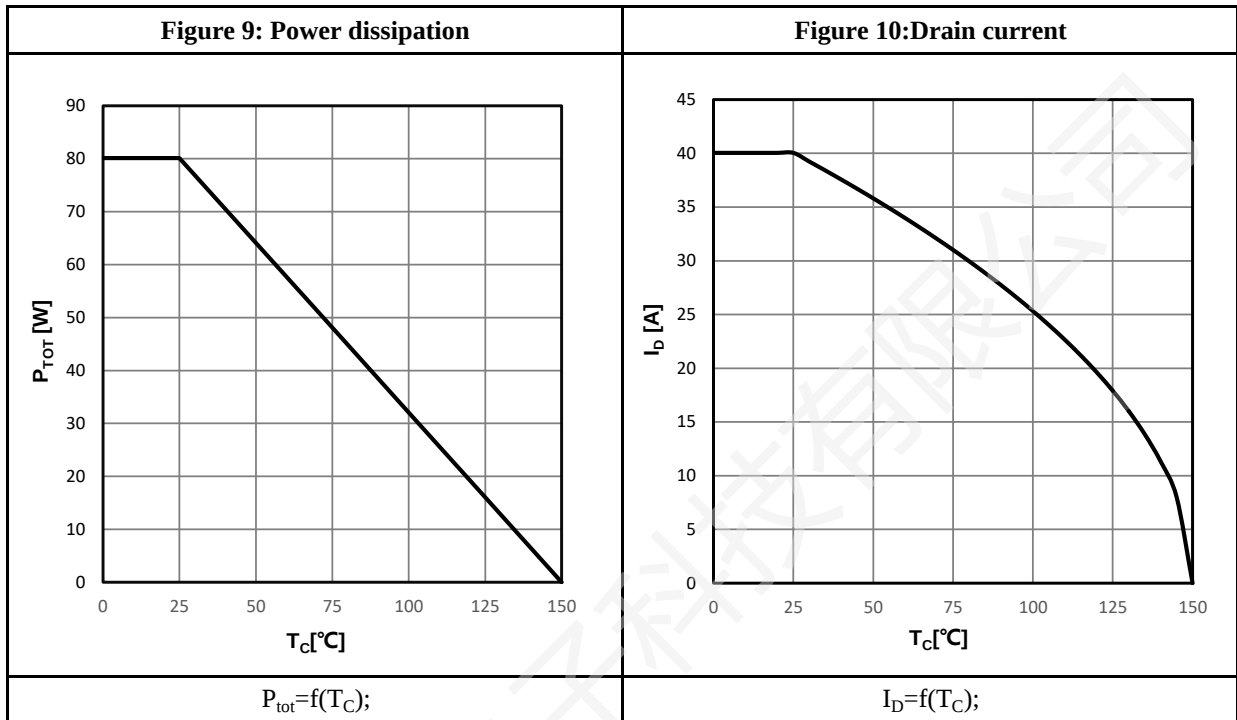
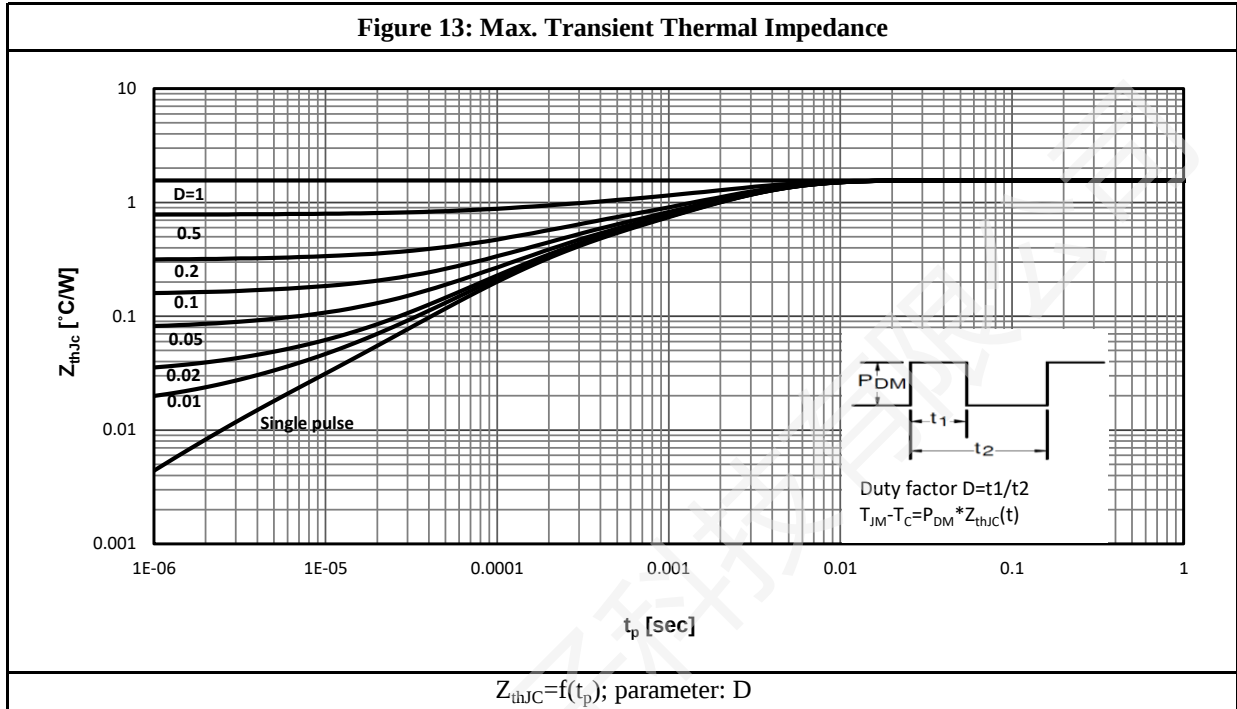
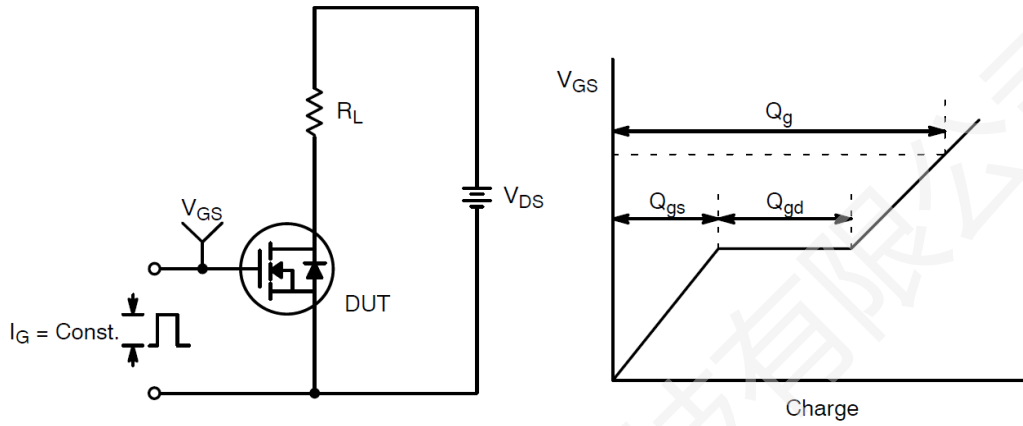
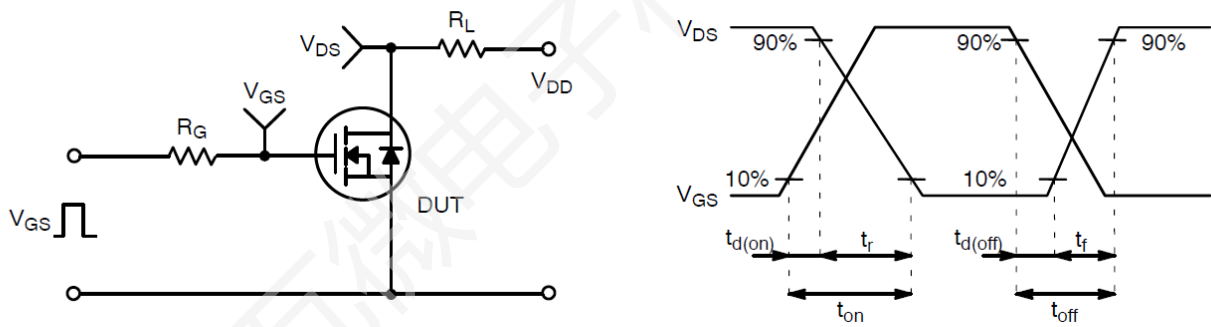
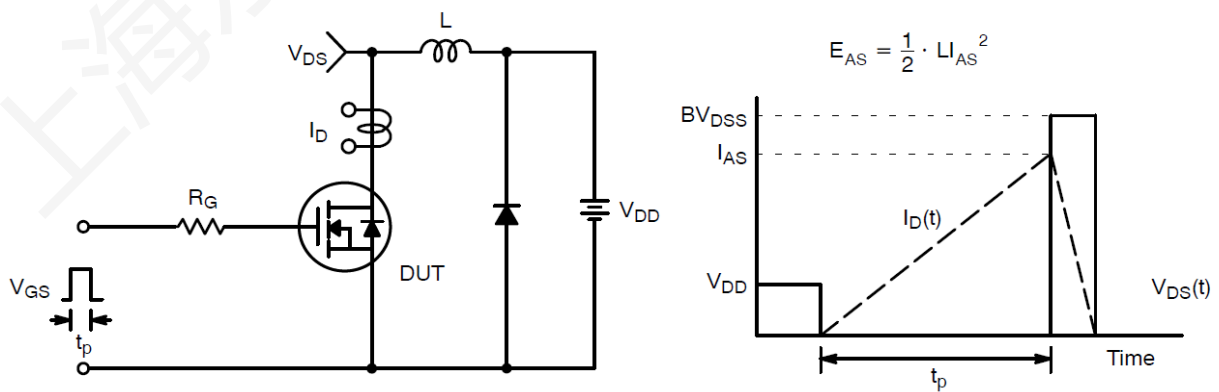


Figure 13: Max. Transient Thermal Impedance


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	$V_{GS}=0V, I_D=-250\mu A$	-60	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=-60V, V_{GS}=0V$	--	--	-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	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.3	-1.8	-2.3	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=-10V, I_D=-20A$	--	19	24	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=-4.5V, I_D=-15A$	--	25	32	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$	--	1508	--	pF
C_{oss}	Output Capacitance	$V_{DS}=-30V$	--	266	--	
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	--	21	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	7.7	--	Ω

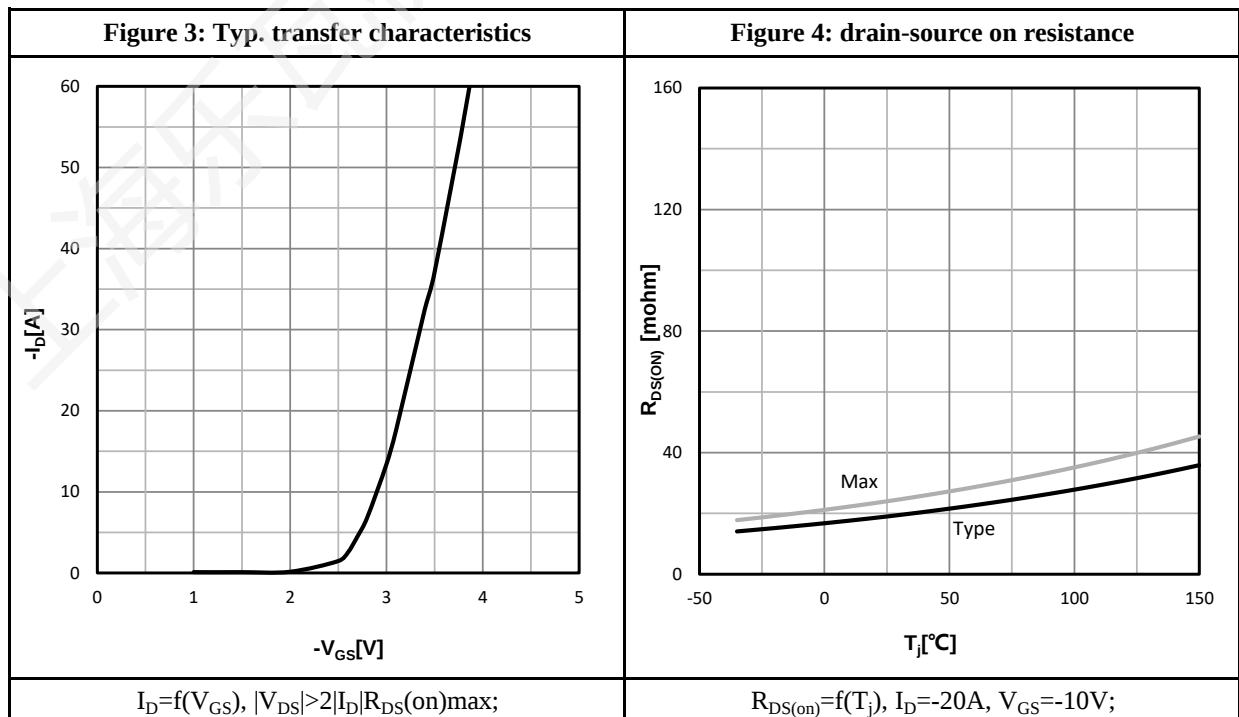
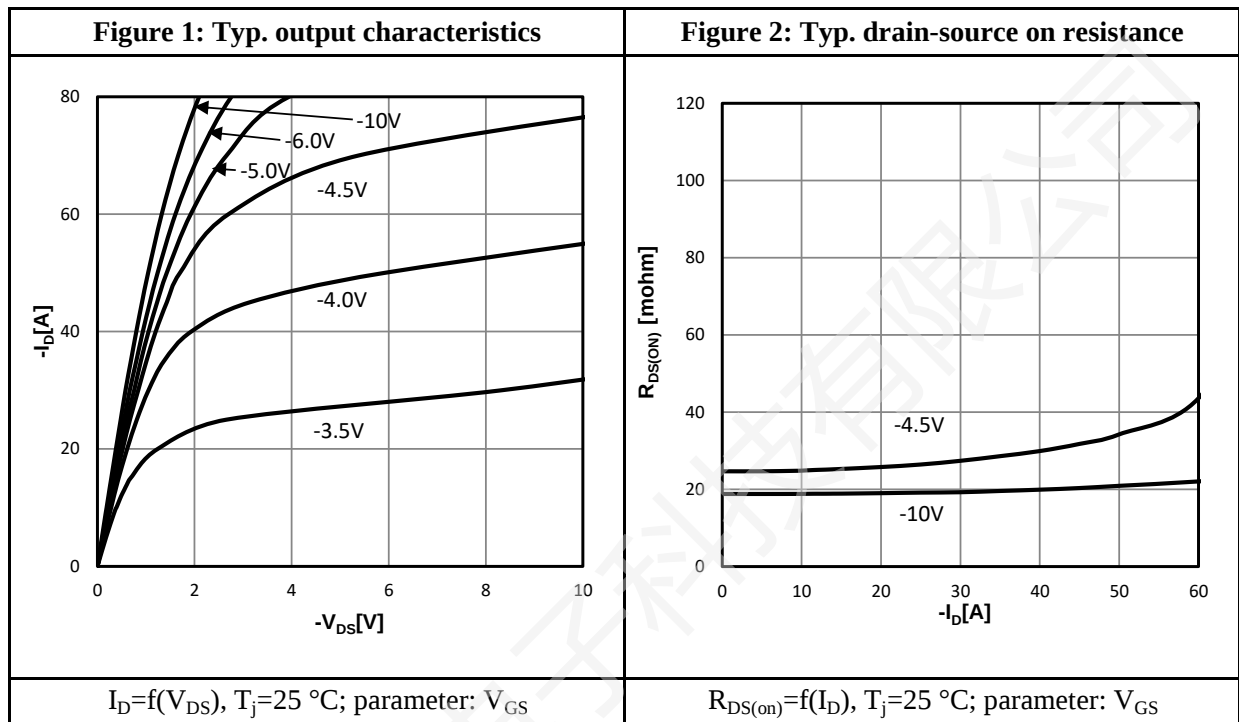
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=-20A$	--	10	--	ns
t_r	Rise Time	$V_{DS}=-30V$	--	15	--	
$t_{d(OFF)}$	Turn-Off Delay Time	$V_{GS}=-10V$	--	35	--	
t_f	Fall Time	$R_G=3.0\Omega$	--	12	--	
Q_g	Total Gate Charge	$V_{GS}=-10V$	--	26	--	nC
Q_{gs}	Gate to Source Charge	$V_{DS}=-30V$	--	5.3	--	
Q_{gd}	Gate to Drain Charge	$I_D=-20A$	--	4.3	--	

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	$I_S=-20A, V_{GS}=0V$	--	--	-1.2	V

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

a2: $V_{DD}=-30V, L=0.1mH, R_G=25\Omega$, 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 cm² (one layer, 70 μm thick) copper area for drain connection.

P-Channel Characteristics Curve:


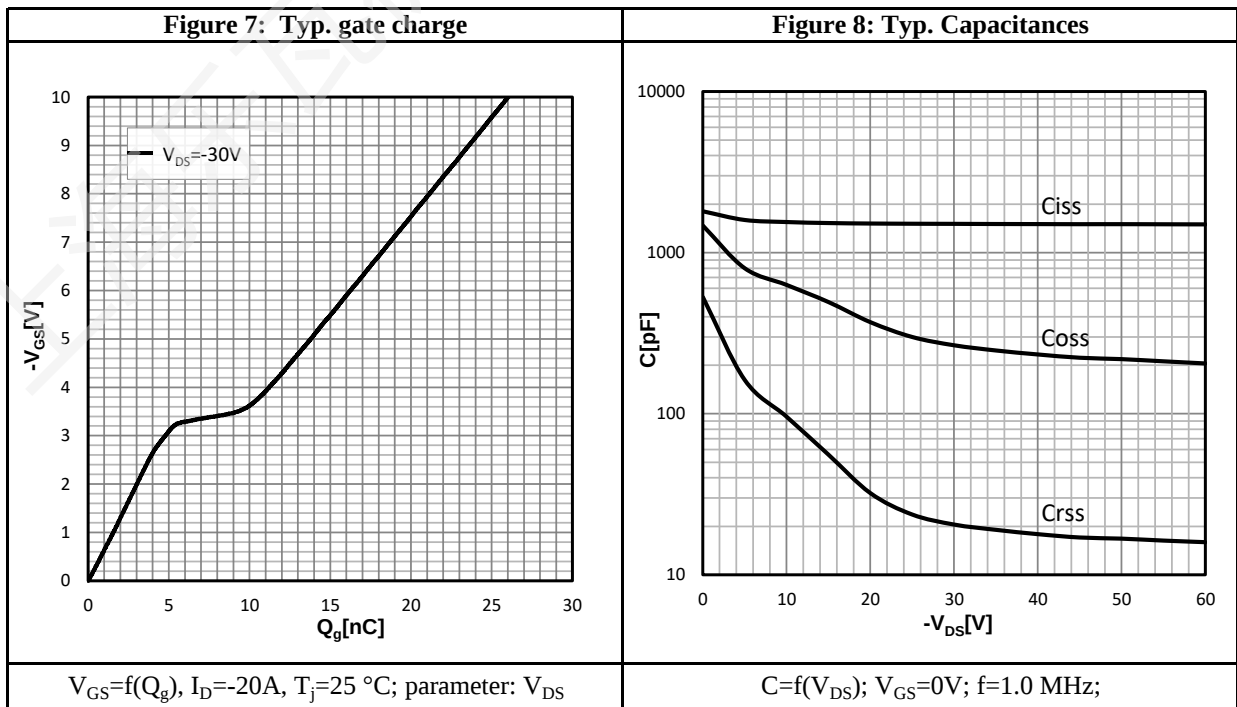
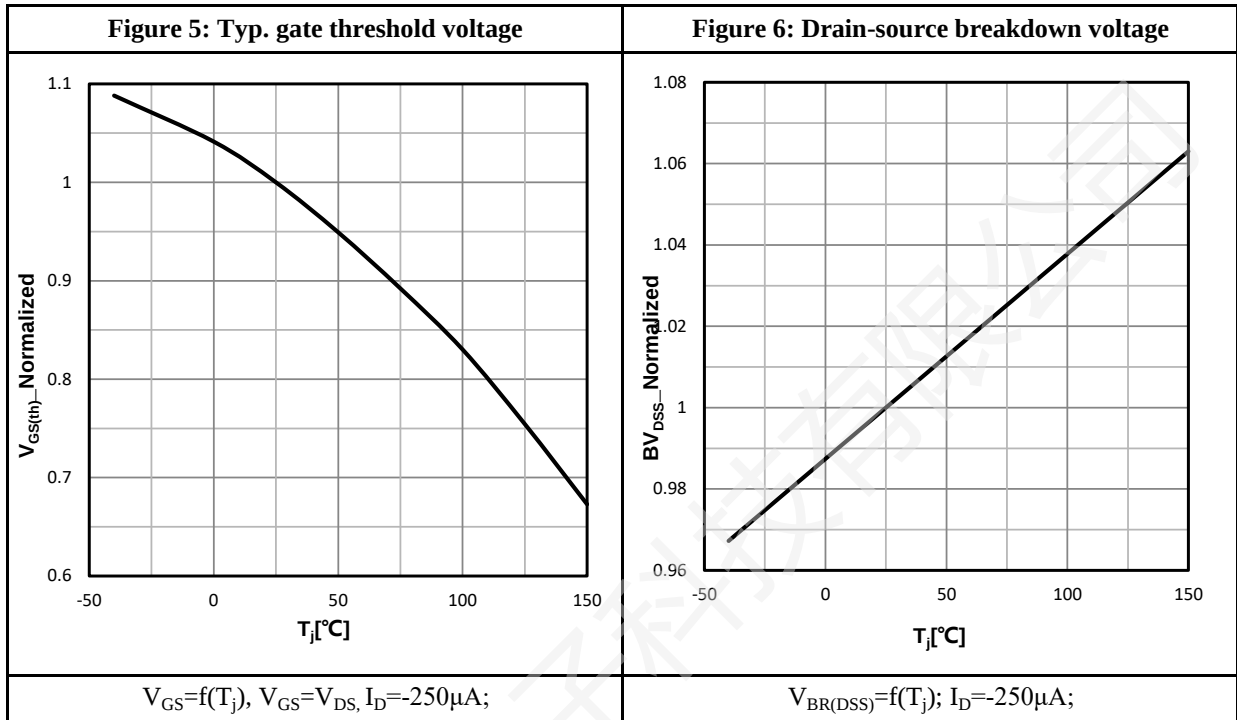
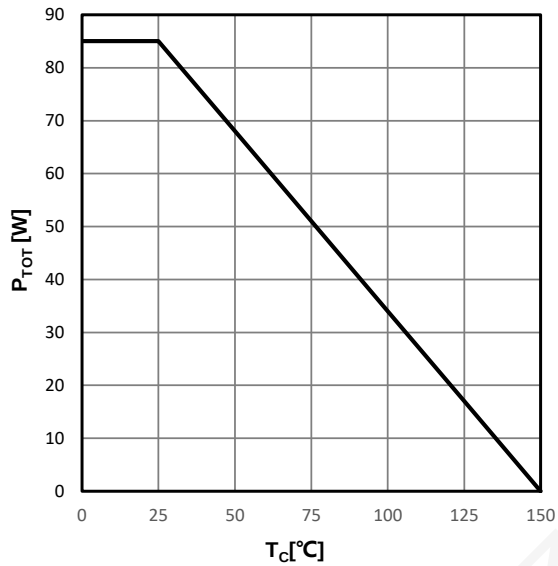
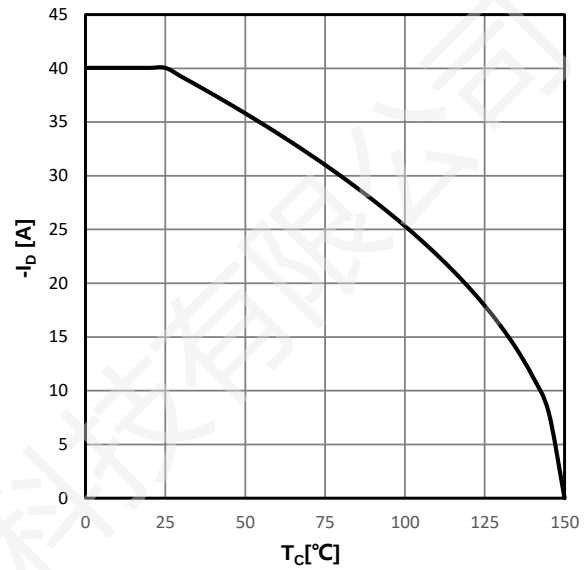
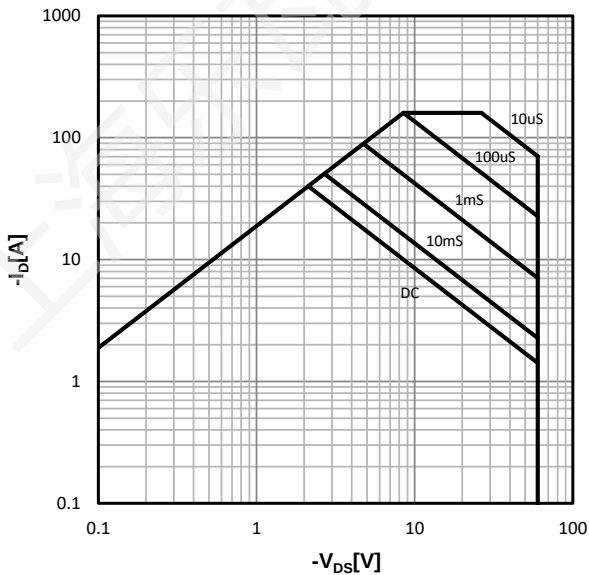


Figure 9: Power dissipation


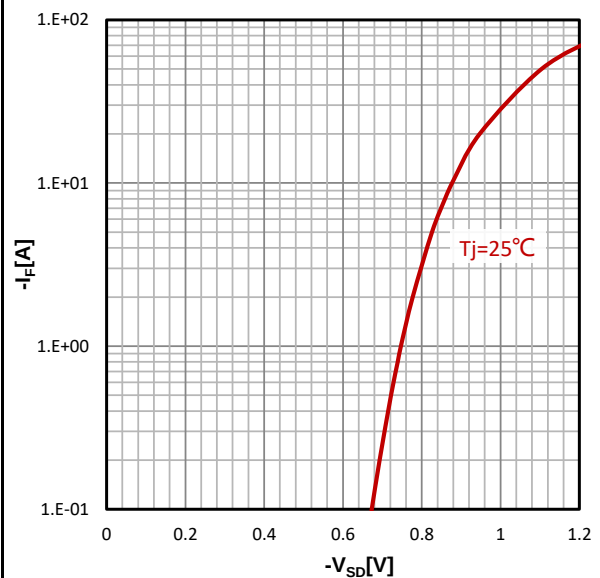
$$P_{tot}=f(T_C);$$

Figure 10: Drain current


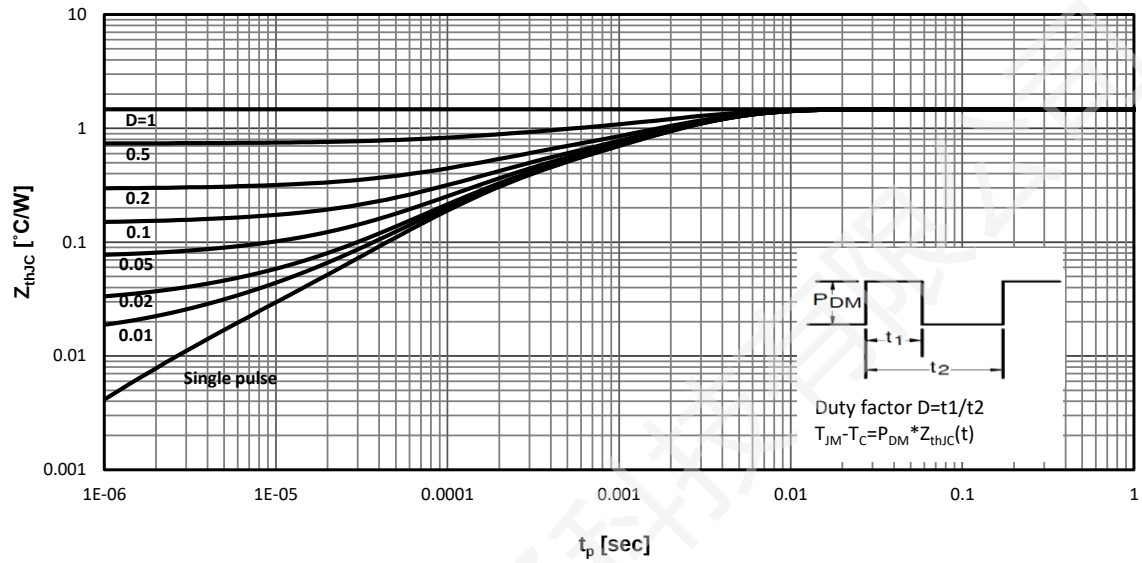
$$I_D=f(T_C);$$

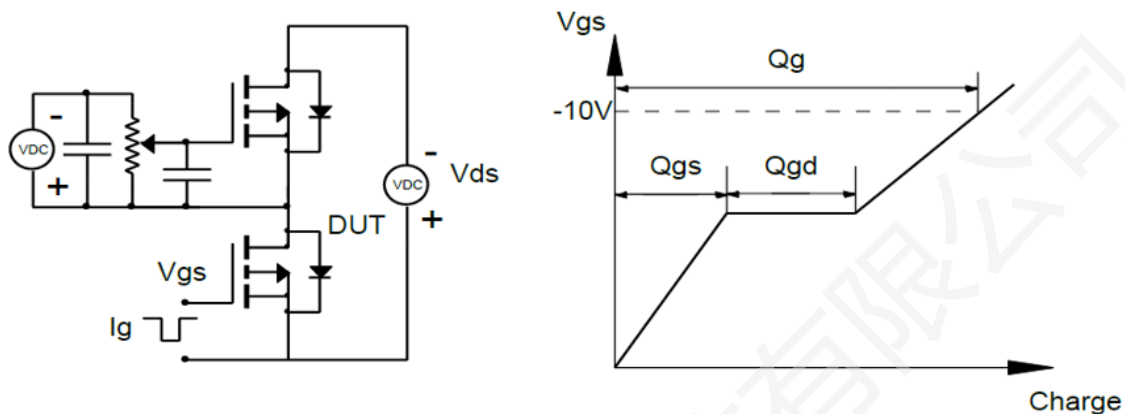
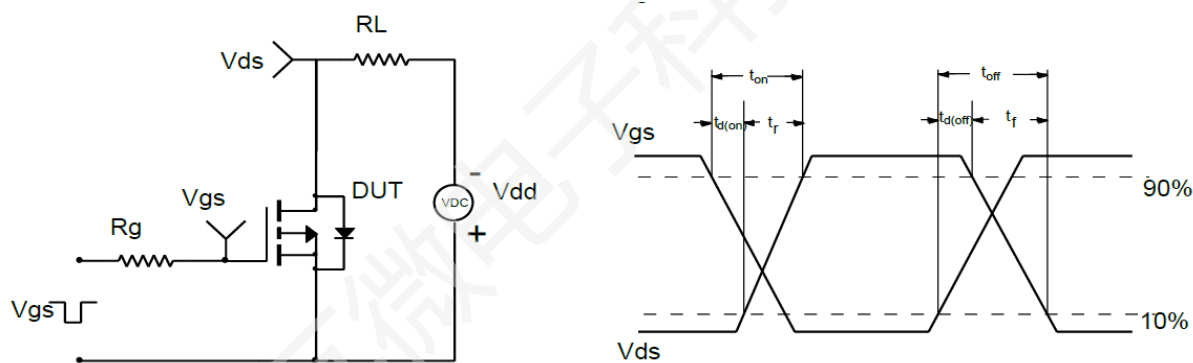
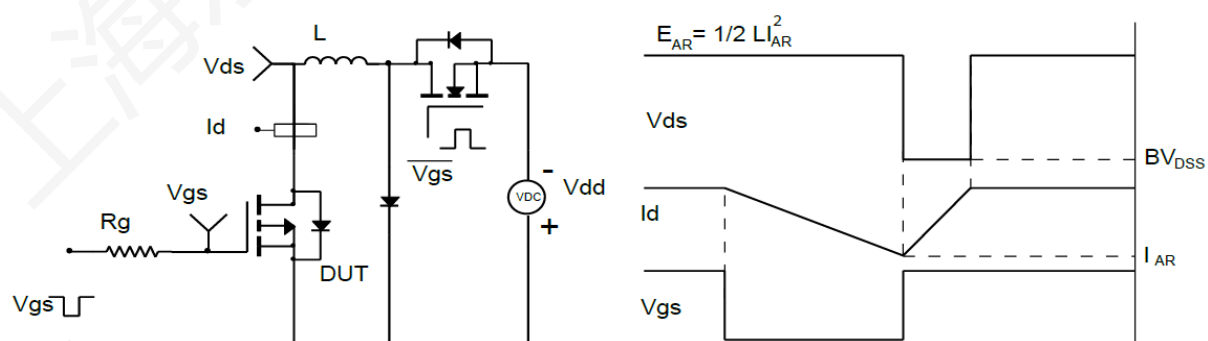
Figure 11: Safe operating area


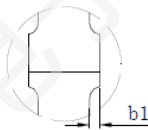
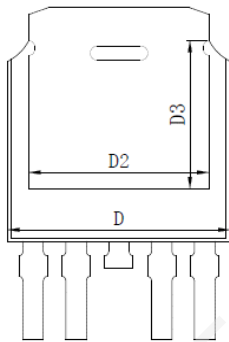
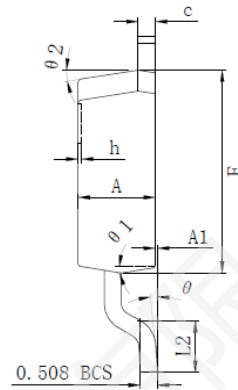
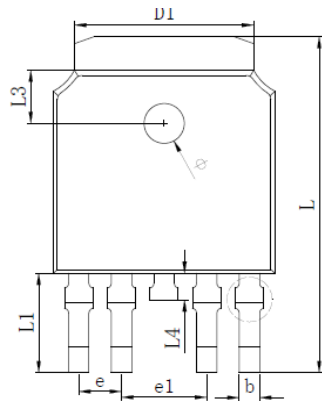
$$I_D=f(V_{DS}); T_C=25\text{ }^{\circ}\text{C}; D=0; \text{ parameter: tp}$$

Figure 12: Typ. forward characteristics


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

Figure 13: Max. Transient Thermal Impedance

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

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	MILLIMETER		
	MIN	TYP	MAX
A	2.200	2.300	2.400
A1	0.000		0.127
b	0.550	0.600	0.650
b1	0.000		0.120
c(电镀后)	0.460	0.520	0.580
D	6.500	6.600	6.700
D1	5.334REF		
D2	5.346REF		
D3	4.490REF		
E	6.000	6.100	6.200
e	1.270TYP		
e1	2.540TYP		
h	0.000	0.100	0.200
L	9.900	10.100	10.300
L1	2.988REF		
L2	1.400	1.550	1.700
L3	1.600REF		
L4	0.700	0.800	0.900
φ	1.100	1.200	1.300
θ	0°		8°
θ1	9° TYP		
θ2	9° TYP		

Revision History:

Revision	Date	Descriptions
Rev 1.0	July.2025	Initial Version

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