

### General Description:

The LWD4005A4 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-252-4L, 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**



### Package Marking and Ordering Information:

Marking	Part Number	Package	Packing	Qty.
D4005/LW A4/D.C.	LWD4005A4	TO-252-4L	Reel	2500 Pcs

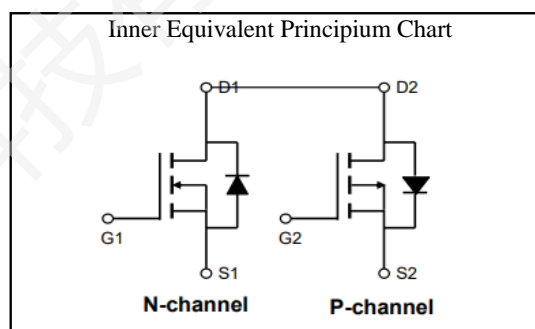
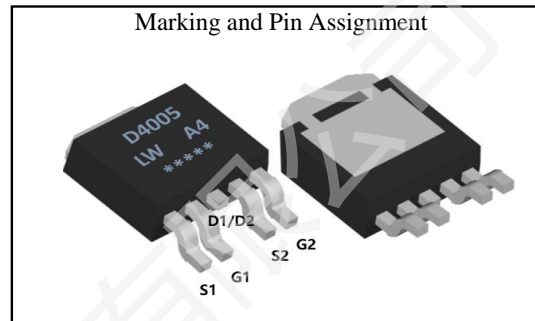
### Absolute Maximum Ratings:

Symbol	Parameter	Value		Units	
		N-Ch	P-Ch		
$V_{DSS}$	Drain-to-Source Voltage	40	-40	V	
$I_D$	Continuous Drain Current	$T_C=25^\circ\text{C}$	45	-35	A
	Continuous Drain Current	$T_C=100^\circ\text{C}$	28	-22	A
$I_{DM}^{a1}$	Pulsed Drain Current		180	-140	A
$E_{AS}^{a2}$	Single pulse avalanche energy		109	96	mJ
$V_{GS}$	Gate-to-Source Voltage		$\pm 20$	$\pm 20$	V
$P_D$	Power Dissipation		54	54	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	2.3	2.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}^{a3}$	Thermal Resistance, Junction-to-Ambient	89.3	89.3	$^\circ\text{C}/\text{W}$

Symbol	N-Ch	P-Ch	Units
$V_{DSS}$	40	-40	V
$I_D$	45	-35	A
$R_{DS(ON) \text{ TYPE}}$	6.5	13.5	$\text{m}\Omega$



**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	$\mu A$
$I_{GSS(F)}$	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	$V_{GS}=10V, I_D=20A$	--	6.5	8.0	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=4.5V, I_D=15A$	--	8.0	10	$m\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$C_{iss}$	Input Capacitance	$V_{GS}=0V$ $V_{DS}=20V$ $f=1.0MHz$	--	1906	--	pF
$C_{oss}$	Output Capacitance		--	182	--	
$C_{riss}$	Reverse Transfer Capacitance		--	160	--	
$R_G$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	4.0	--	$\Omega$

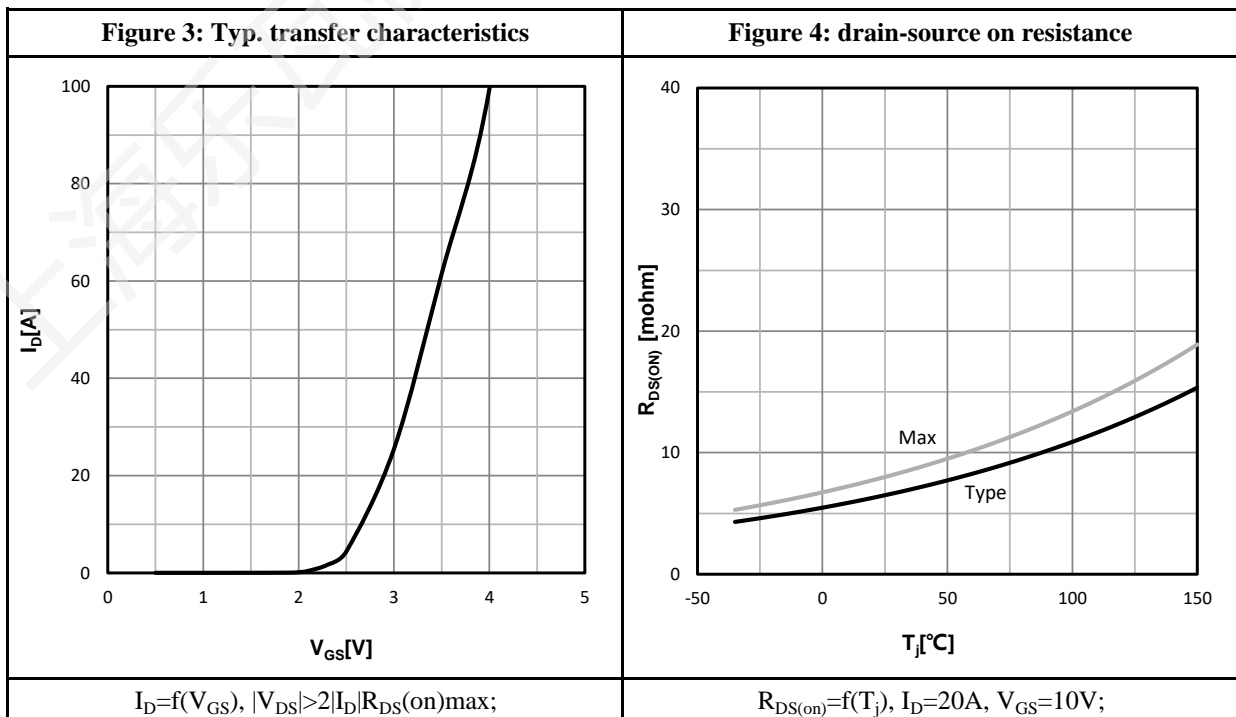
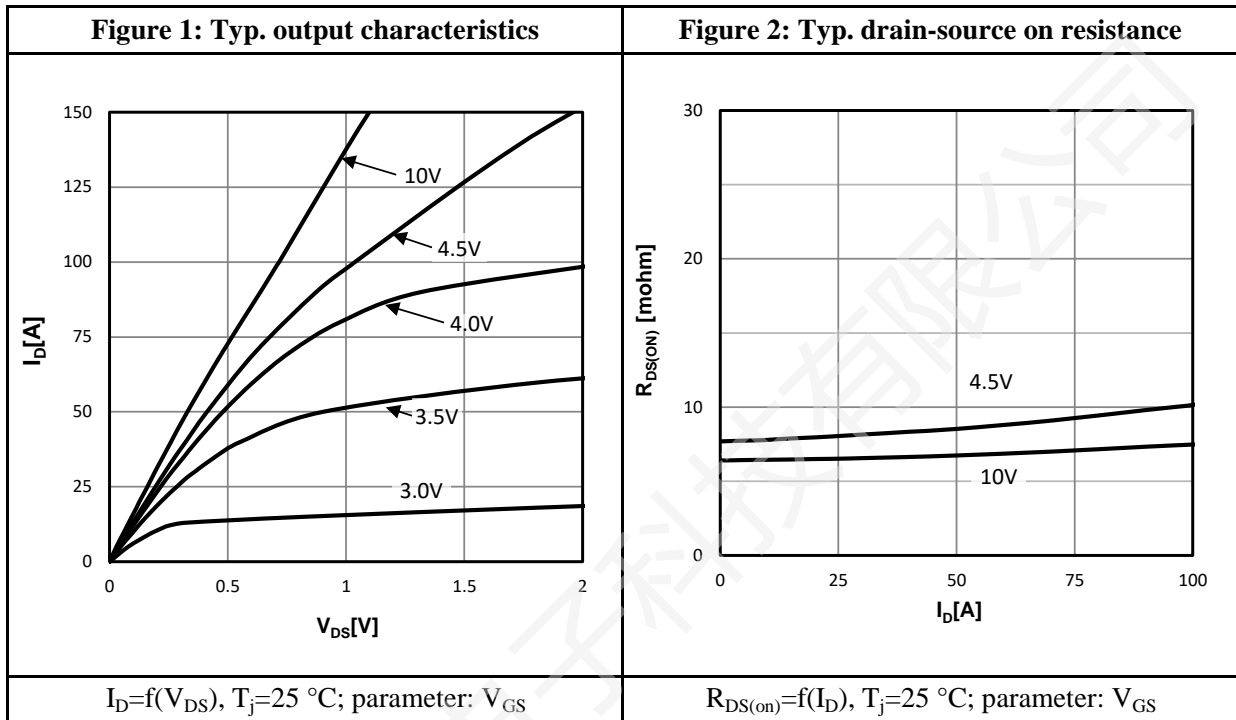
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=20A$ $V_{DS}=20V$ $V_{GS}=10V$ $R_G=3.0\Omega$	--	10	--	ns
$t_r$	Rise Time		--	37	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	39	--	
$t_f$	Fall Time		--	46	--	
$Q_g$	Total Gate Charge	$V_{GS}=10V$ $V_{DS}=20V$ $I_D=20A$	--	41	--	nC
$Q_{gs}$	Gate to Source Charge		--	6.0	--	
$Q_{gd}$	Gate to Drain Charge		--	9.1	--	

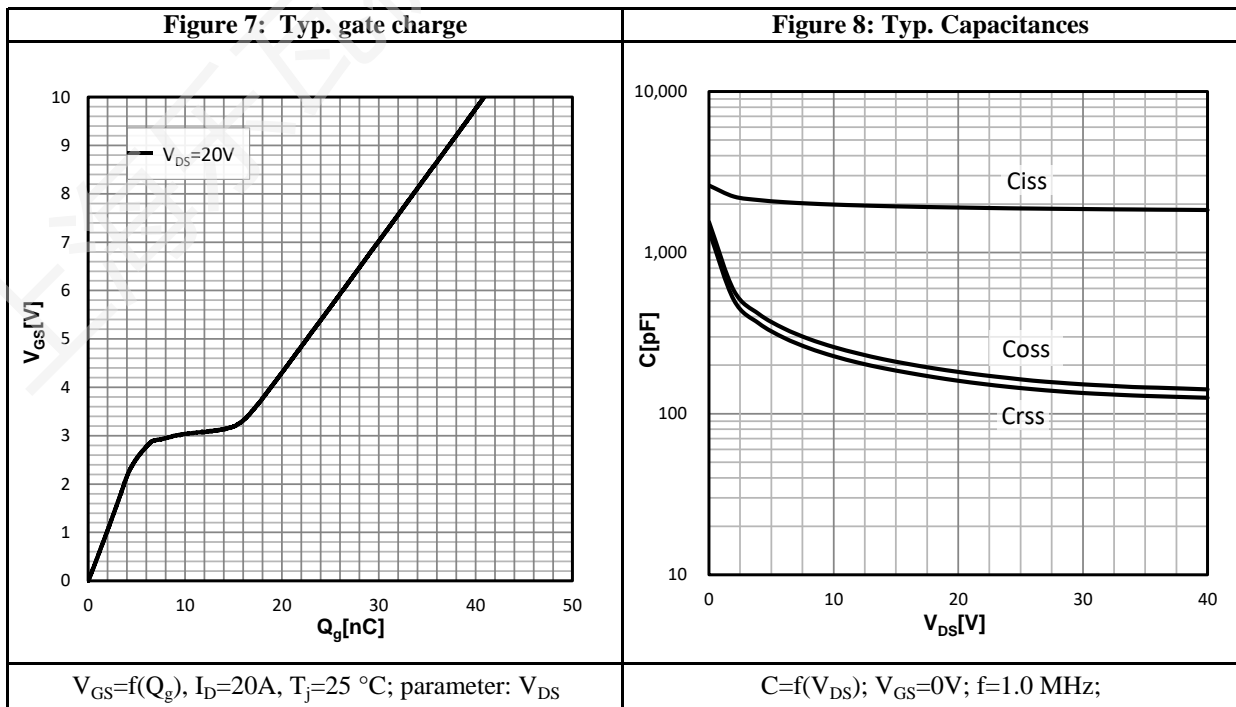
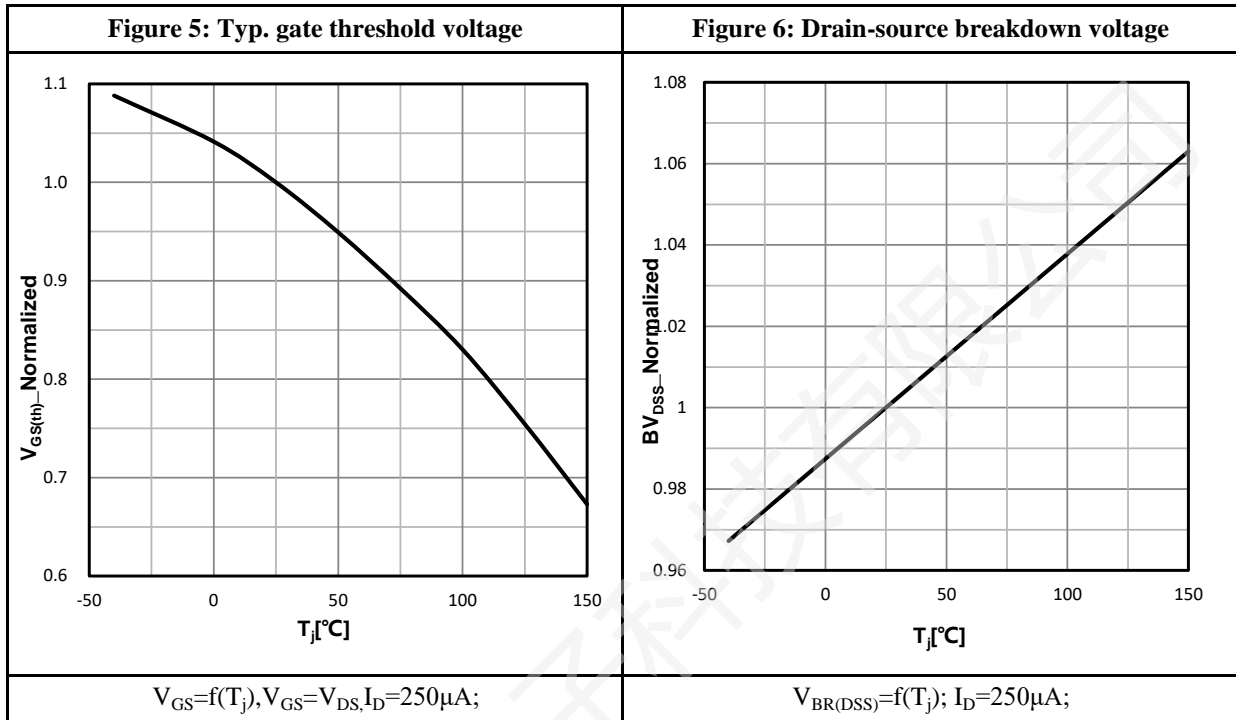
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$I_S$	Diode Forward Current	$T_C=25\text{ }^\circ\text{C}$	--	--	45	A
$V_{SD}$	Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	--	1.2	V

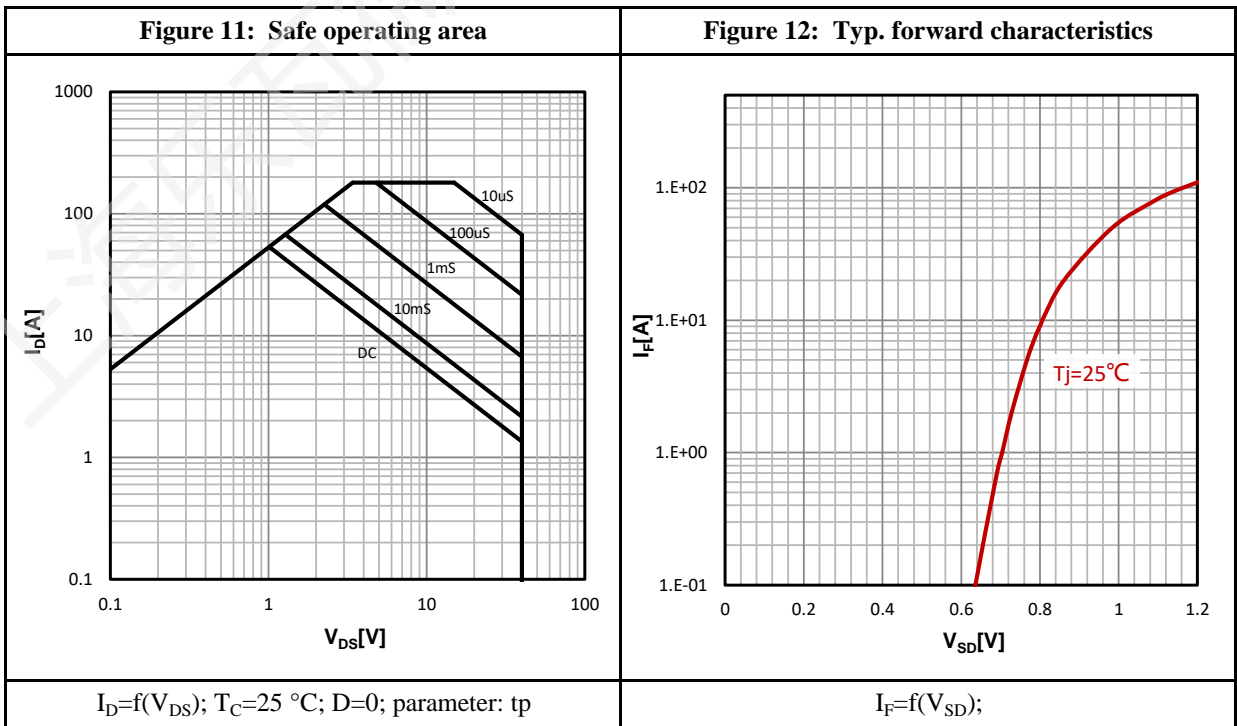
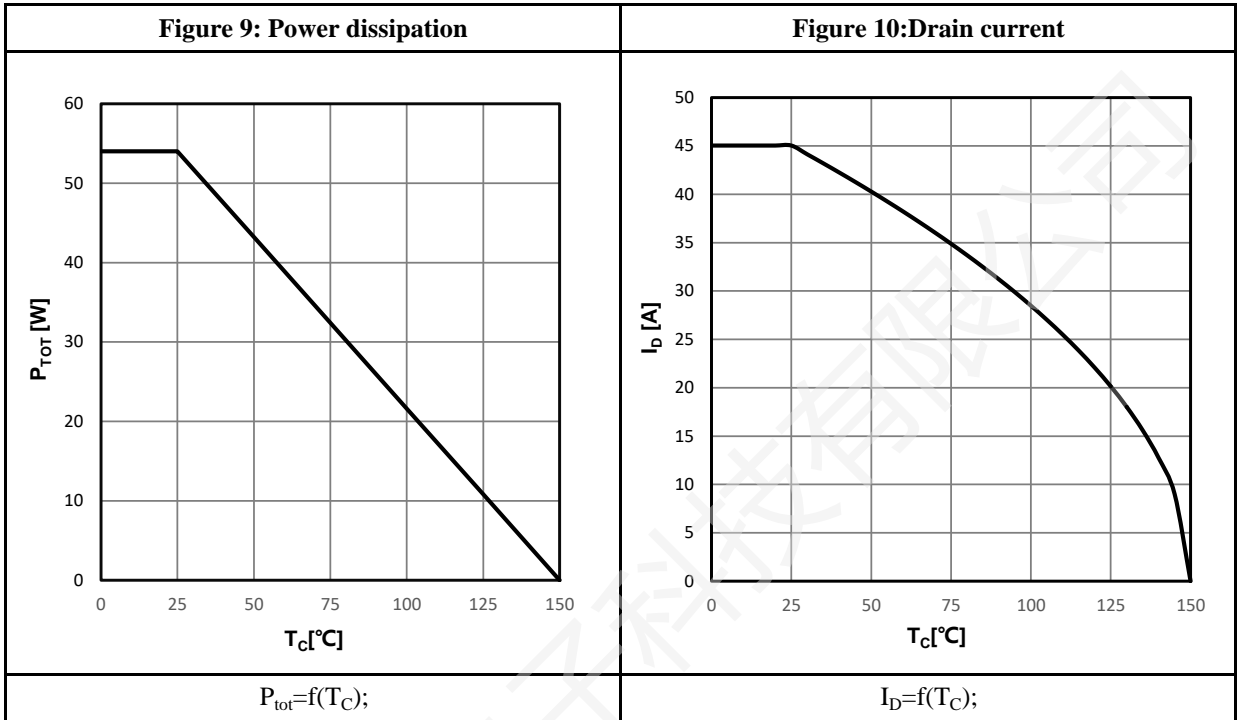
a1: Repetitive rating; pulse width limited by maximum junction temperature

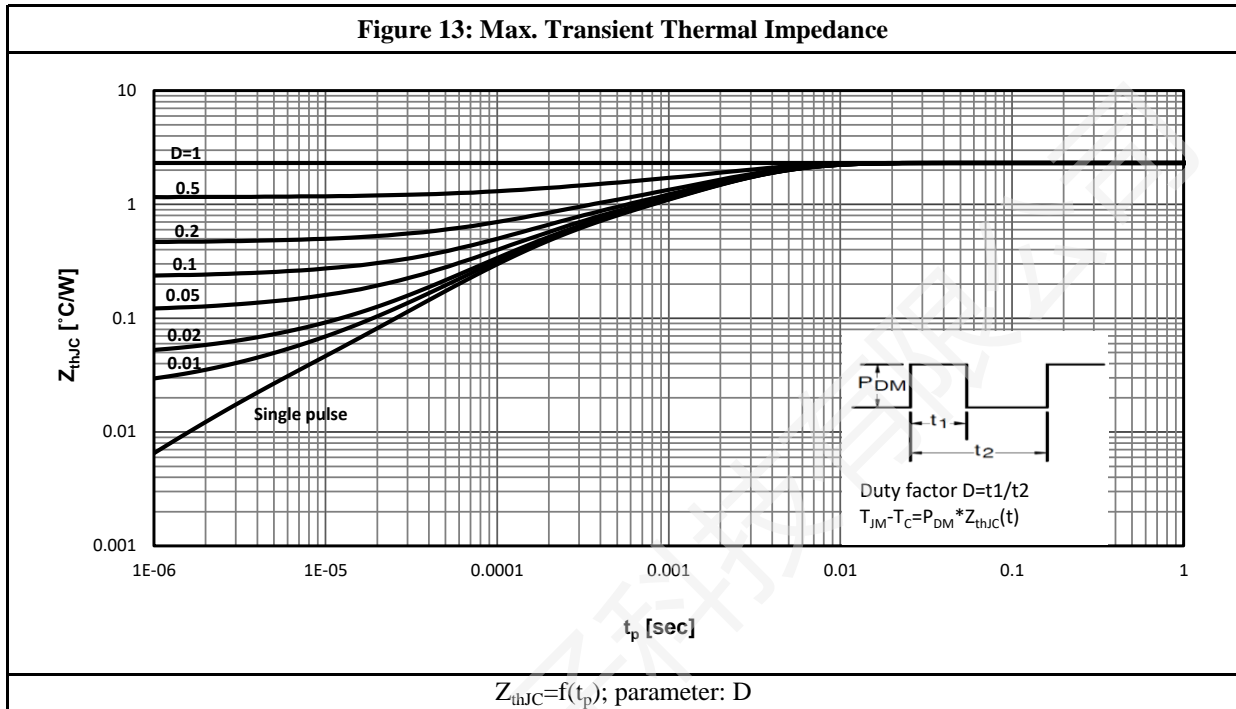
a2:  $V_{DD}=20V, L=0.1mH, R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$

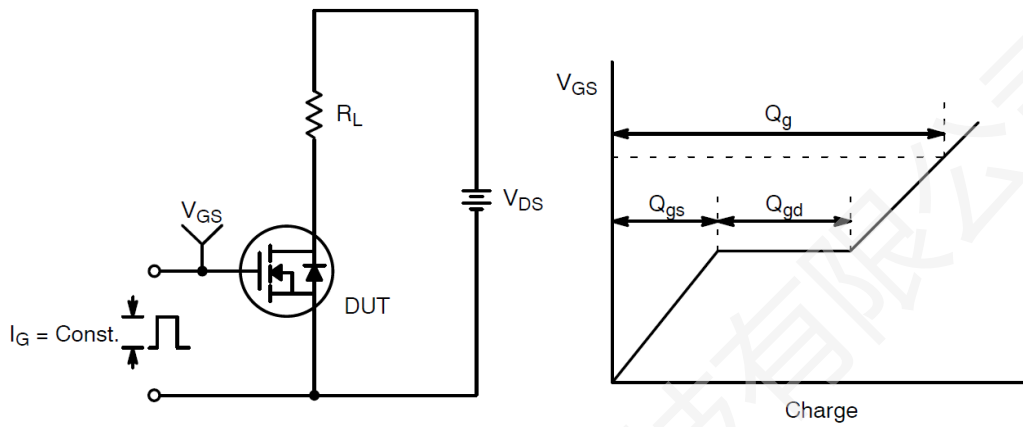
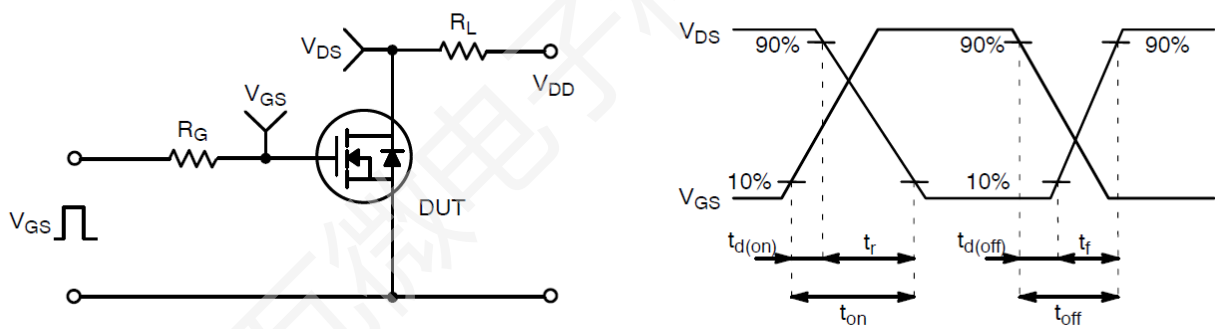
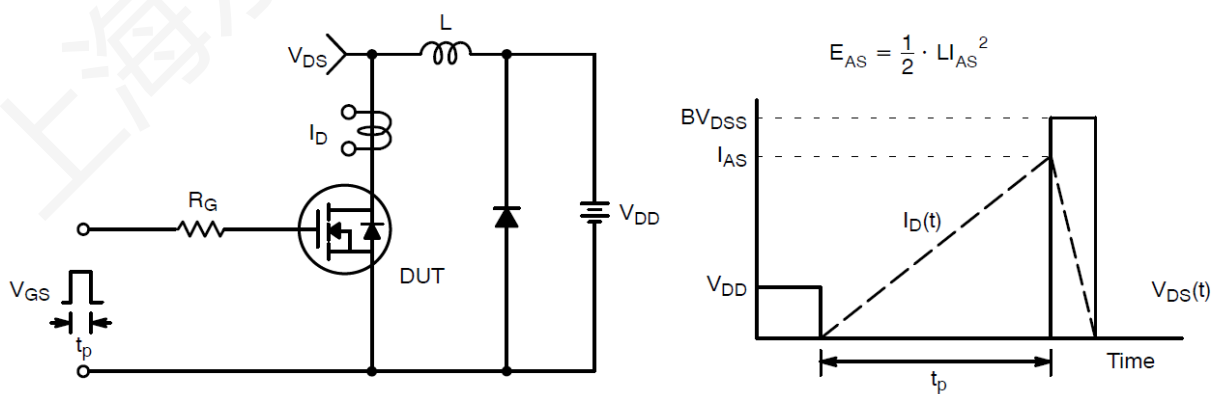
a3: Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection.

**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	$\mu A$
$I_{GSS(F)}$	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	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.7	-2.3	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=-10V, I_D=-12A$	--	13.5	17	m $\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=-4.5V, I_D=-8.0A$	--	18	25	m $\Omega$

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	--	1937	--	pF
$C_{oss}$	Output Capacitance	$V_{DS}=-20V$	--	209	--	
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0MHz$	--	191	--	
$R_G$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	--	7.0	--	$\Omega$

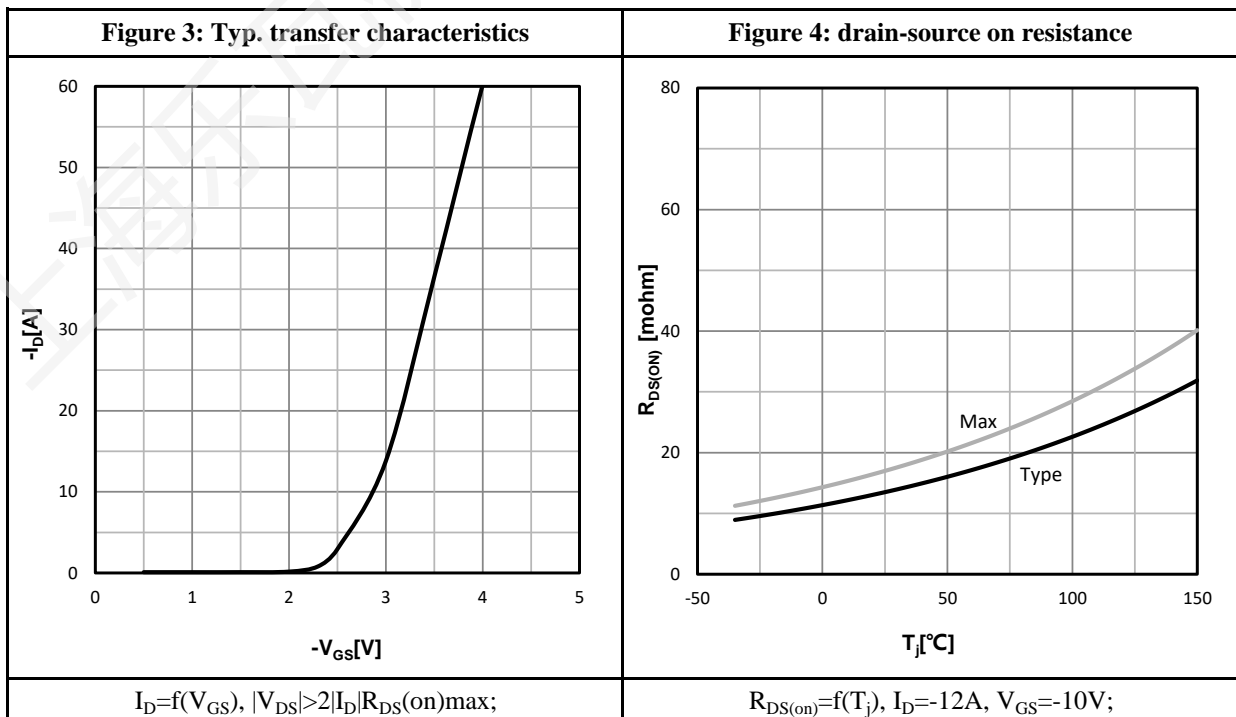
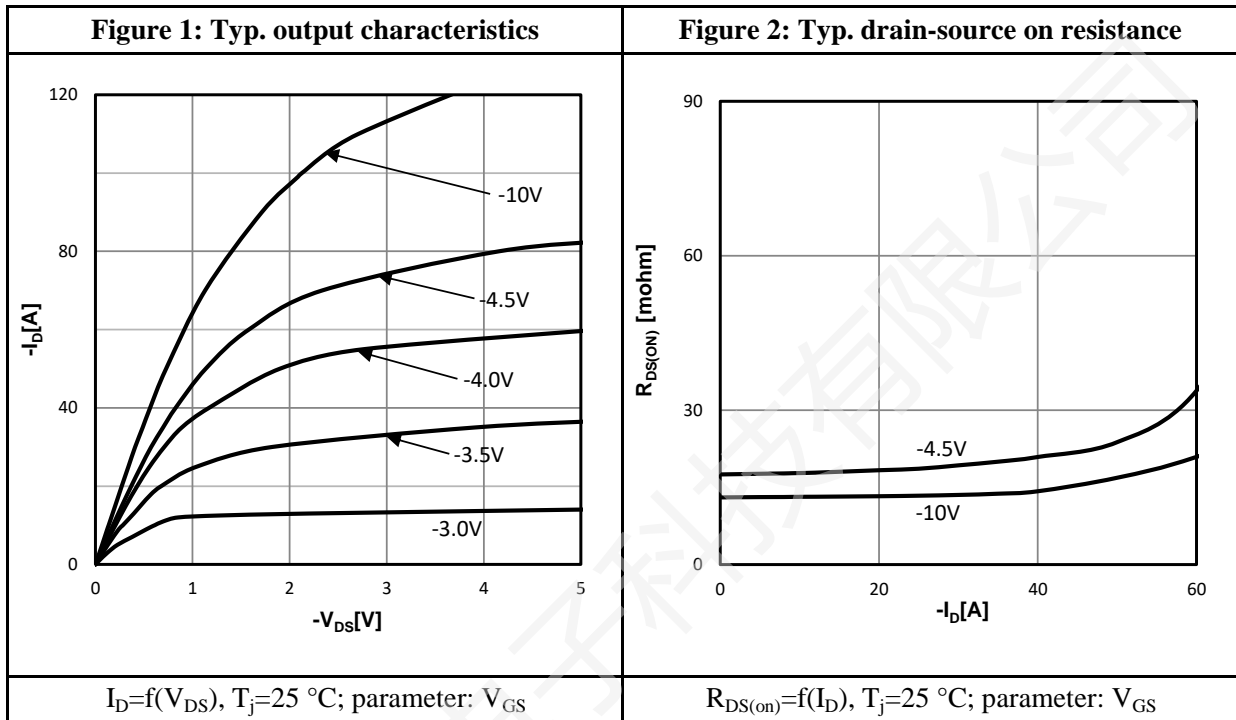
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=-12A$ $V_{DS}=-20V$ $V_{GS}=-10V$ $R_G=3.0\Omega$	--	11	--	ns
$t_r$	Rise Time		--	19	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	44	--	
$t_f$	Fall Time		--	26	--	
$Q_g$	Total Gate Charge	$V_{GS}=-10V$	--	42	--	nC
$Q_{gs}$	Gate to Source Charge	$V_{DS}=-20V$	--	5.3	--	
$Q_{gd}$	Gate to Drain Charge	$I_D=-12A$	--	9.2	--	

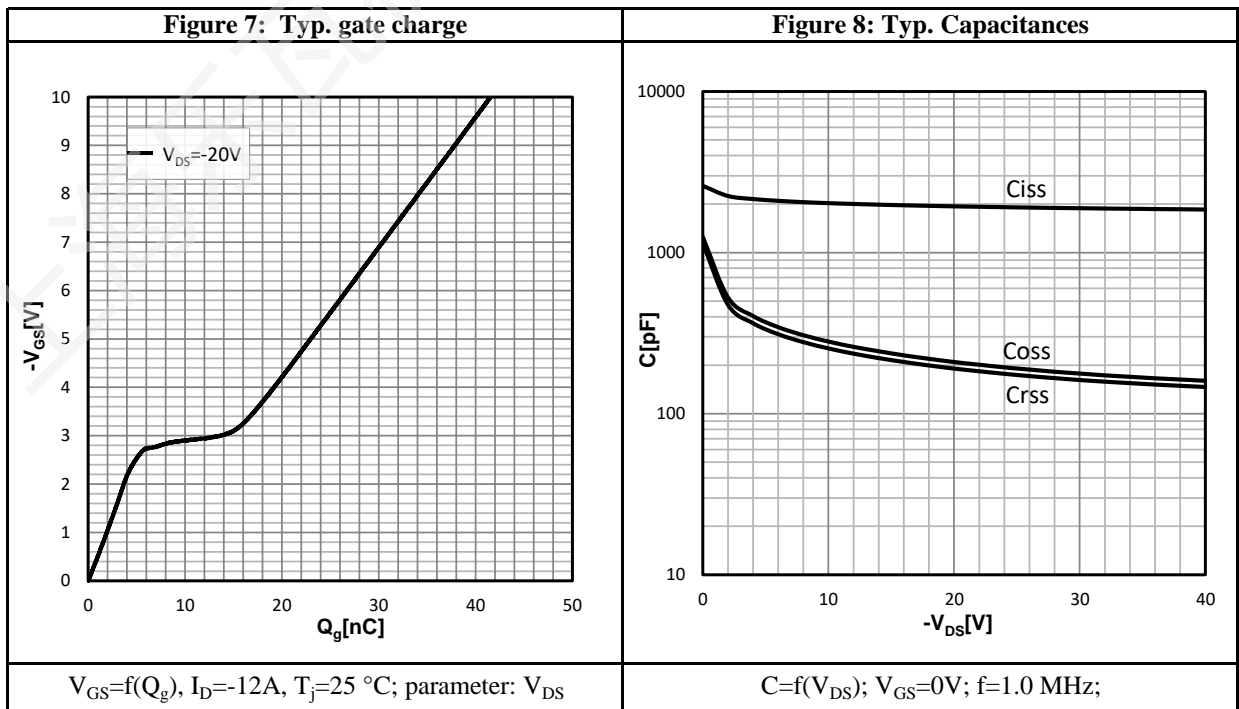
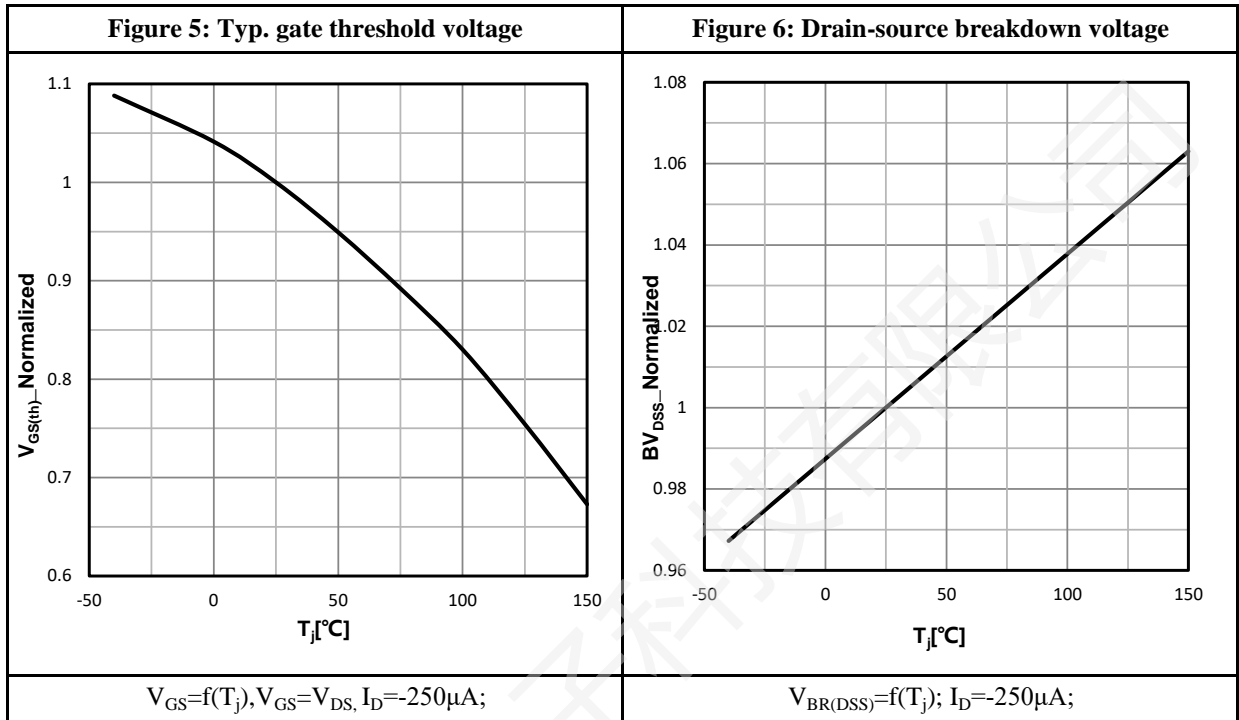
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$I_S$	Diode Forward Current	$T_C=25\text{ }^\circ\text{C}$	--	--	-35	A
$V_{SD}$	Diode Forward Voltage	$I_S=-12A, V_{GS}=0V$	--	--	-1.2	V

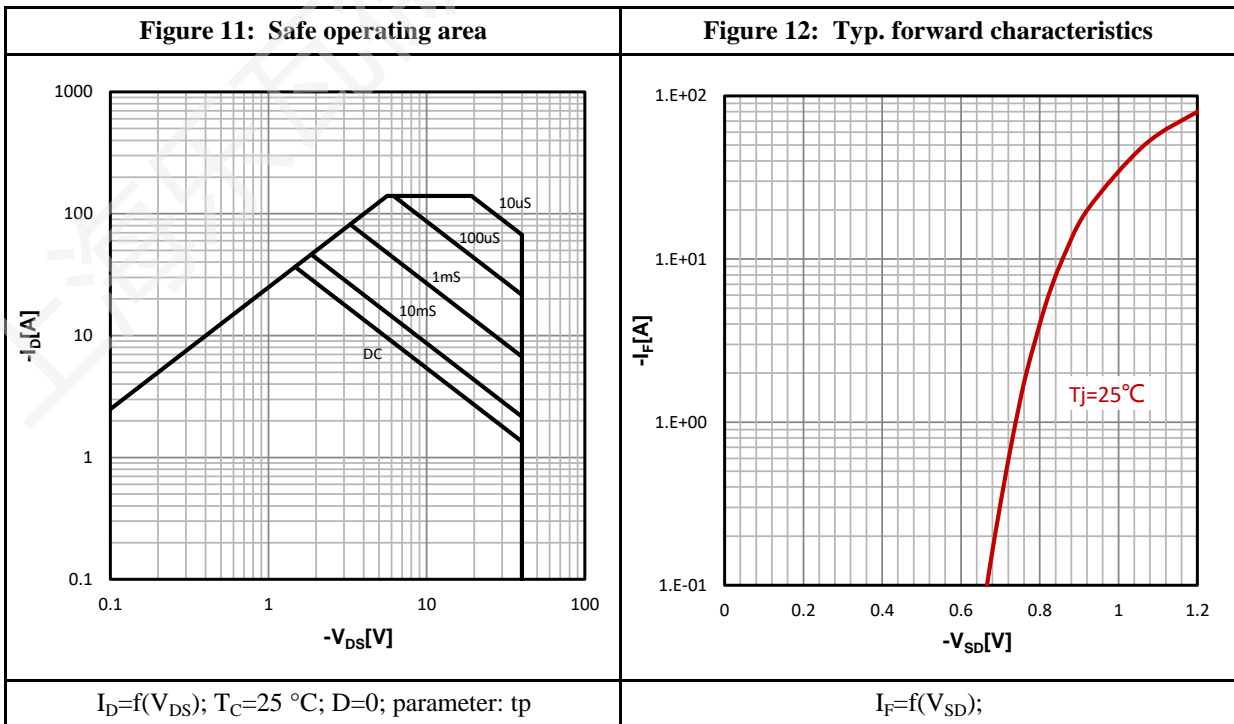
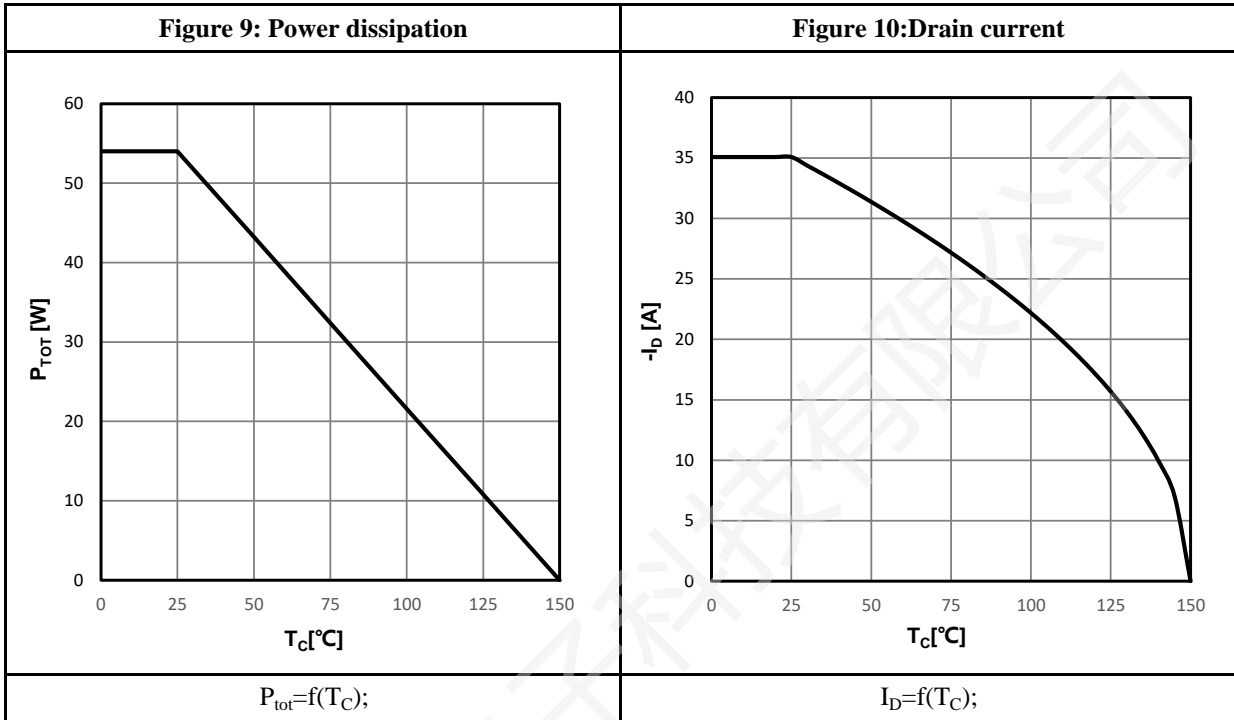
a1: Repetitive rating; pulse width limited by maximum junction temperature

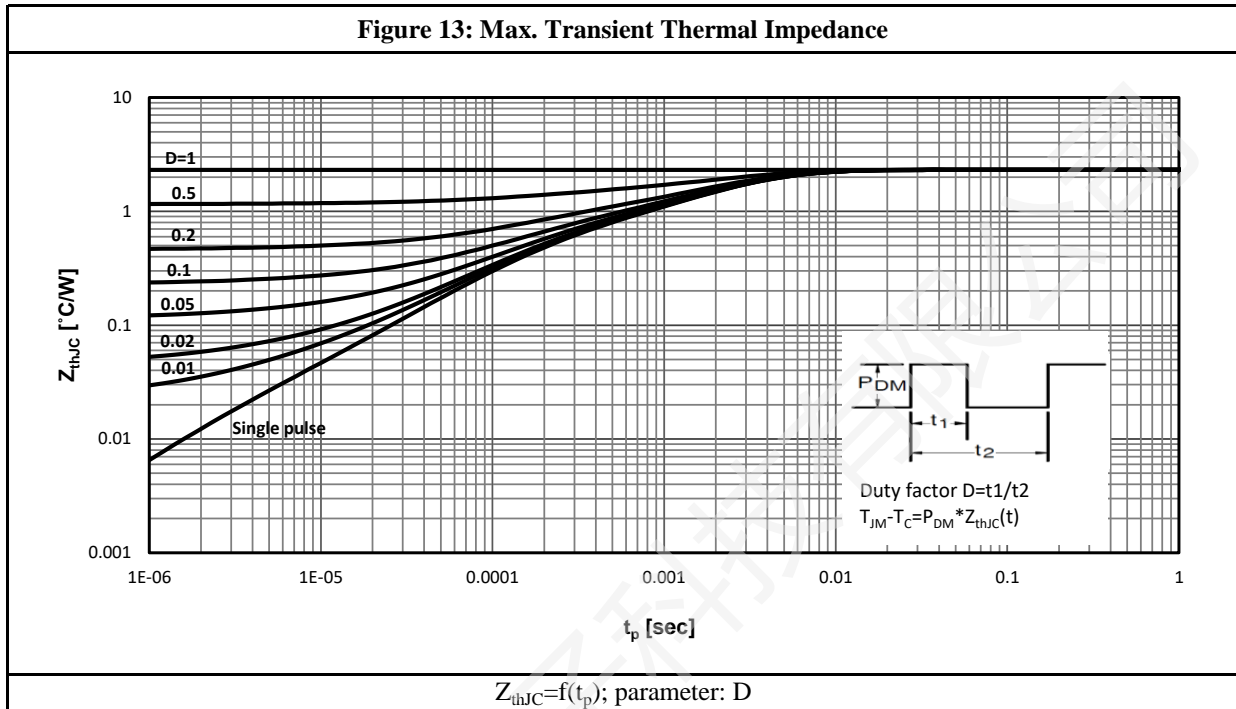
a2:  $V_{DD}=-20V, L=0.1mH, R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$

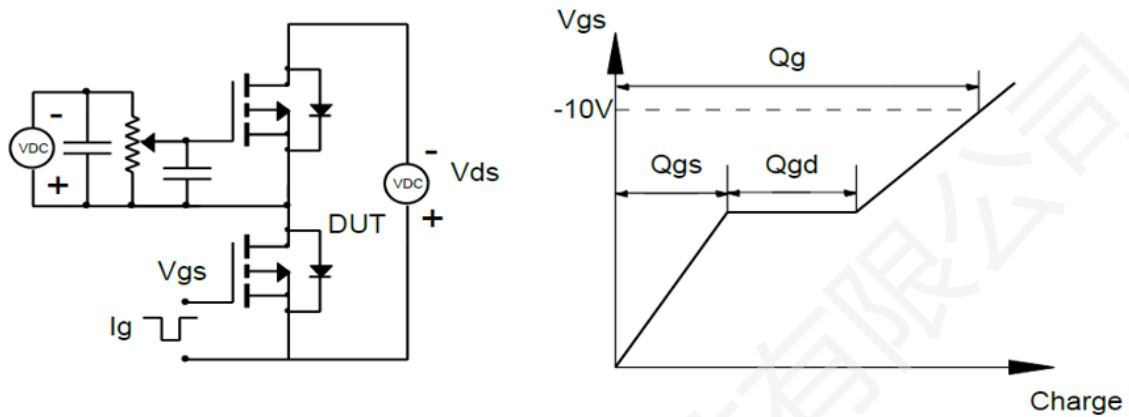
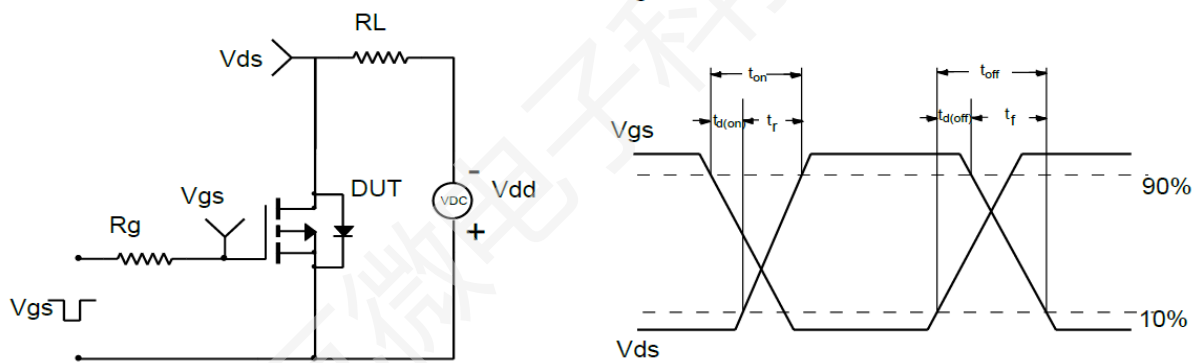
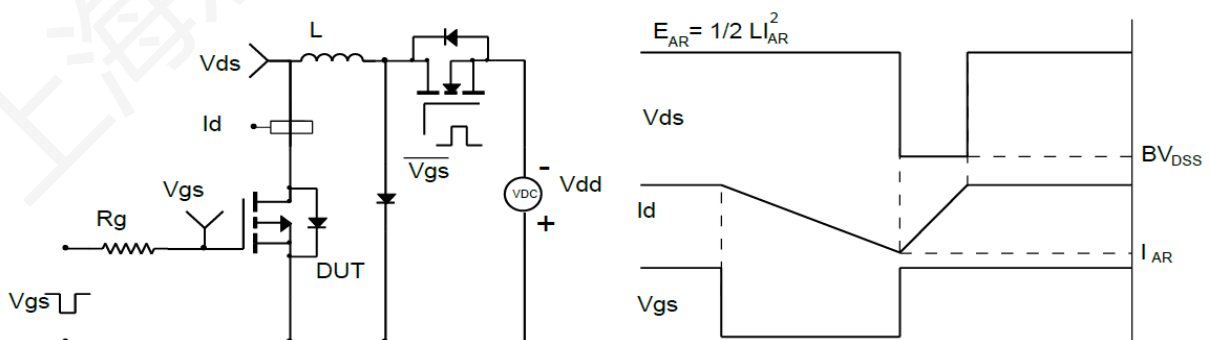
a3: Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection.

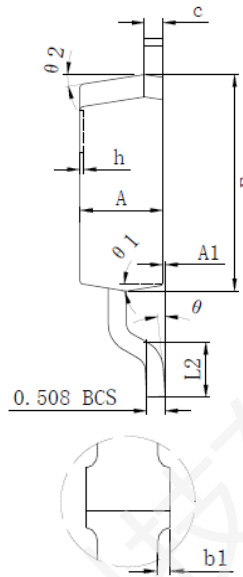
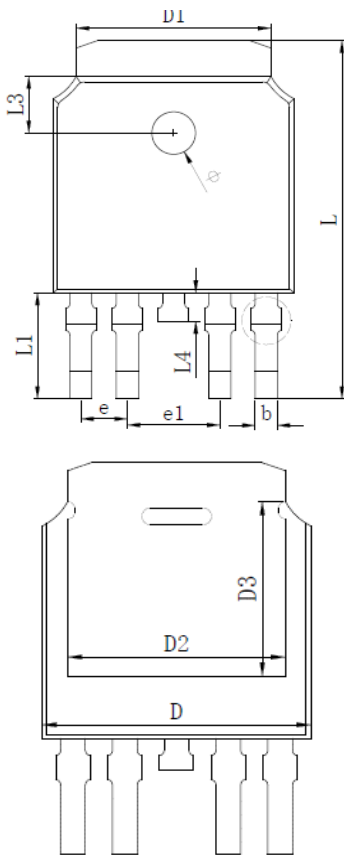
**P-Channel Characteristics Curve:**








**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:**

<b>Revison</b>	<b>Date</b>	<b>Descriptions</b>
Rev 1.1	Dec.2025	Formal Version

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