

P-Channel Enhancement Mode MOSFET

GENERAL DESCRIPTION

The PW2309 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

FEATURES

$V_{DS} = -60V$, $I_D = -3A$

$R_{DS(ON)} < 180m\Omega$ @ $V_{GS} = -10V$

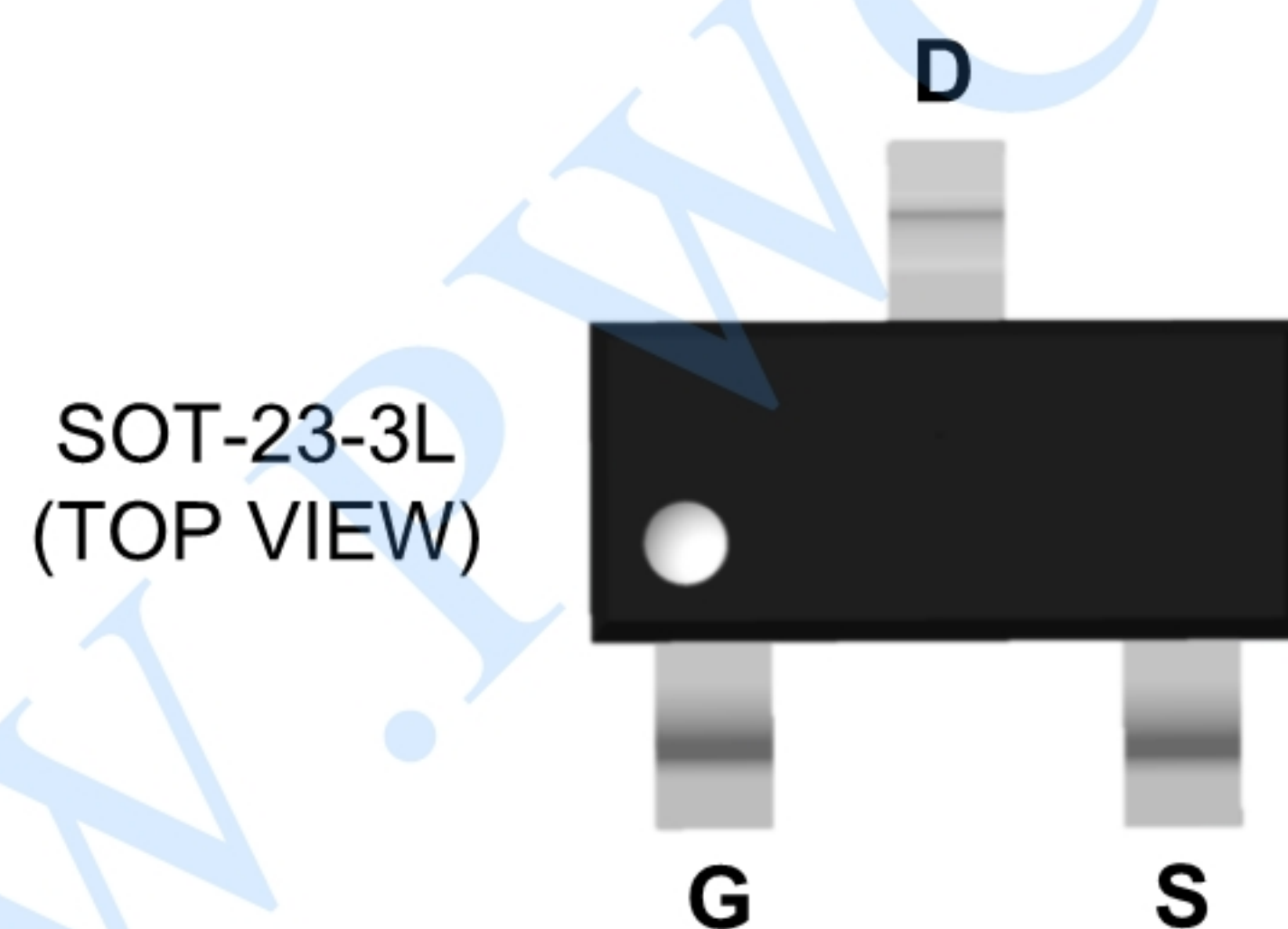
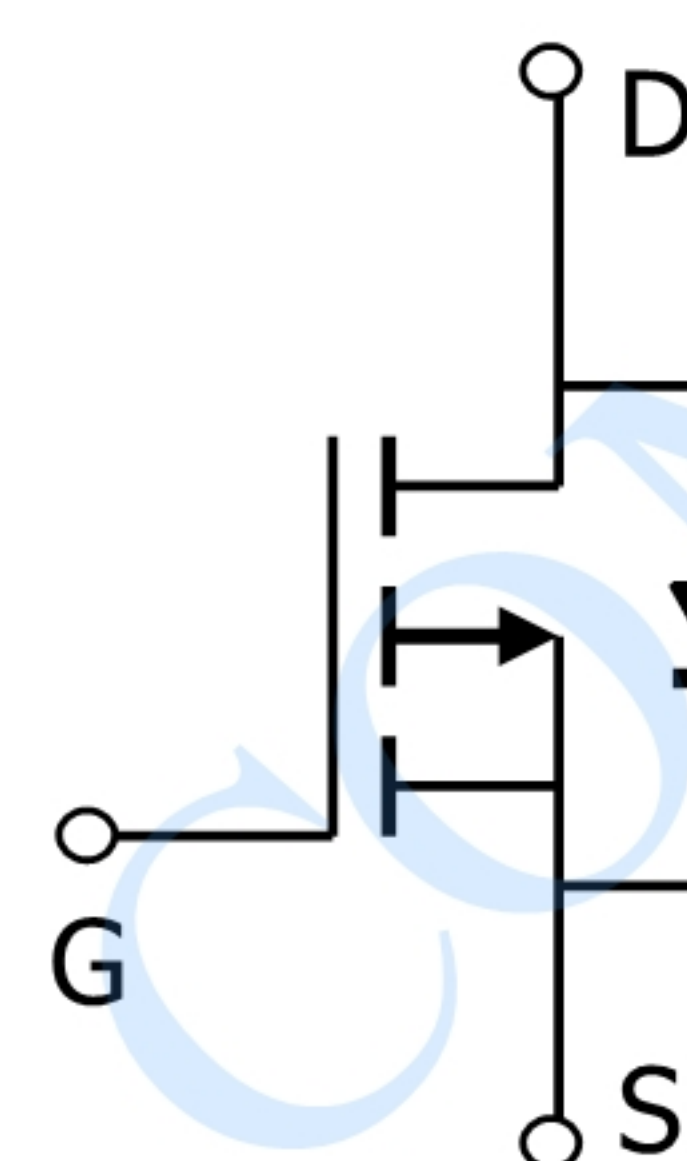
Available in a 3-Pin SOT23-3 Package

Application

Battery protection

Load switch

Uninterruptible power supply



Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current, V_{GS} @ -10V (NOTE1)	$I_D @ T_A = 25^\circ C$	-3.3	A
	$I_D @ T_A = 70^\circ C$	-1.4	A
Pulsed Drain Current (NOTE2)	I_{DM}	-7	A
Total Power Dissipation (NOTE3)	$P_D @ T_A = 25^\circ C$	1	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$
Thermal Resistance Junction-Ambient (NOTE1)	$R_{\theta JA}$	125	$^\circ C/W$
Thermal Resistance Junction-Case (NOTE1)	$R_{\theta JC}$	80	$^\circ C/W$

Note 1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

Note 2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

Note 3. The power dissipation is limited by 150 $^\circ C$ junction temperature



ELECTRICAL CHARACTERISTICS

(TA = 25°C, unless otherwise noted.)

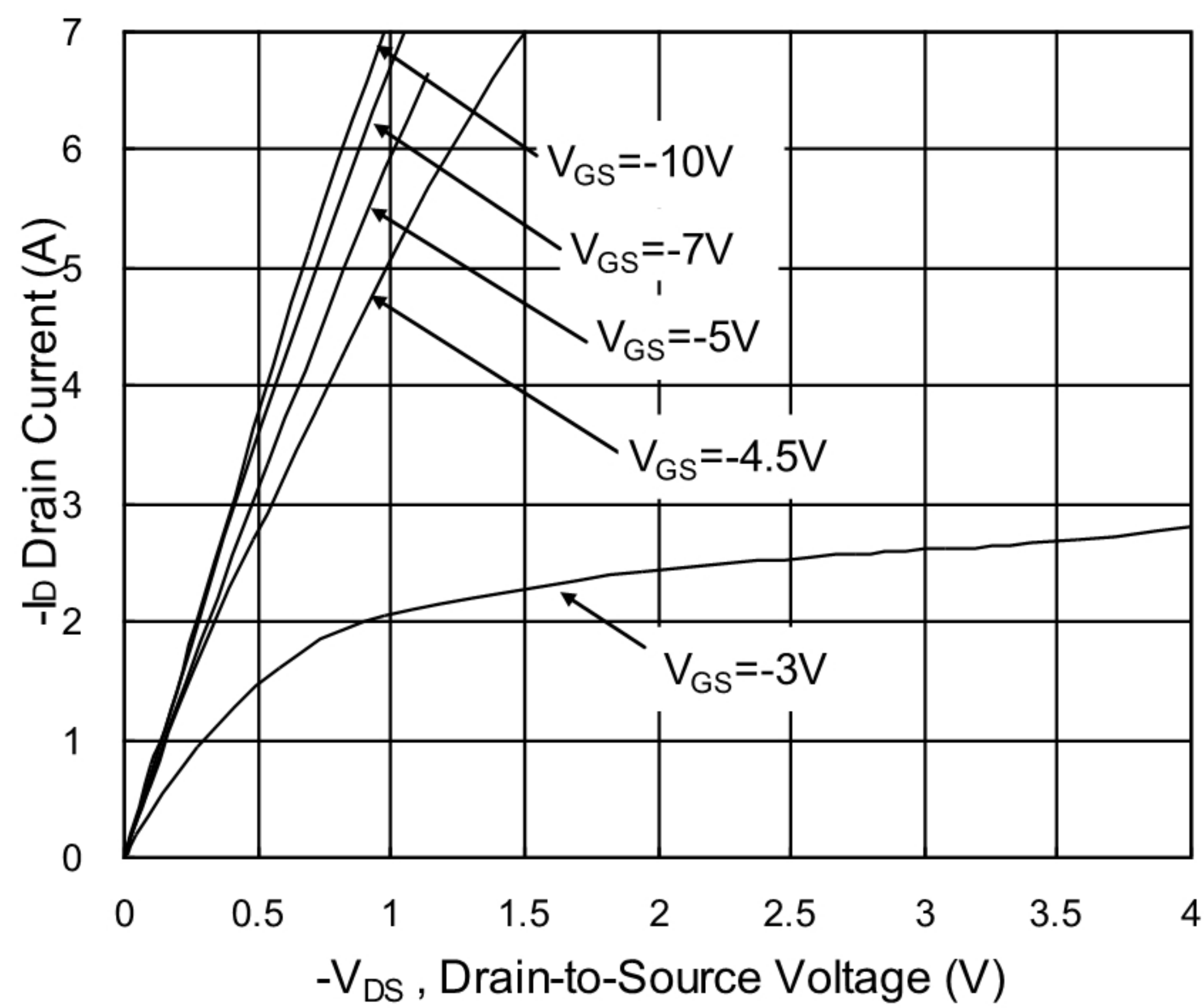
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =-250uA	-60			V
$\Delta BV_{DSS}/\Delta T_J$	BV _{DSS} Temperature Coefficient	Reference to 25°C , I _D =-1mA		-0.021		V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance (NOTE2)	V _{GS} =-10V , I _D =-1.5A		130	185	mΩ
		V _{GS} =-4.5V , I _D =-1A		158	200	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0		-2.5	V
$\Delta V_{GS(th)}$	V _{GS(th)} Temperature Coefficient			4.08		mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-48V , V _{GS} =0V , T _J =25°C			1	uA
		V _{DS} =-48V , V _{GS} =0V , T _J =55°C			5	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V			±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V , I _D =-1.5A		5.9		S
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-20V , V _{GS} =-4.5V , I _D =-1.5A		4.6		nC
Q _{gs}	Gate-Source Charge			1.4		nC
Q _{gd}	Gate-Drain Charge			1.62		nC
T _{d(on)}	Turn-On Delay Time	V _{DS} =-15V , V _{GS} =-10V , R _G =3.3Ω , I _D =-1A		17.4		ns
T _r	Rise Time			5.4		ns
T _{d(off)}	Turn-Off Delay Time			37.2		ns
T _f	Fall Time			2.4		ns
C _{iss}	Input Capacitance	V _{DS} =-15V , V _{GS} =0V , f=1MHz		531		pF
C _{oss}	Output Capacitance			59		pF
C _{rss}	Reverse Transfer Capacitance			38		pF
I _S	Continuous Source Current(NOTE1, 3)	V _G =V _D =0V , Force Current			-1.7	A
I _{SM}	Pulsed Source Current(NOTE2, 3)				-7	A
V _{SD}	Diode Forward Voltage (NOTE2)	V _{GS} =0V , I _S =-1A , T _J =25°C			-1.2	V

Note 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.

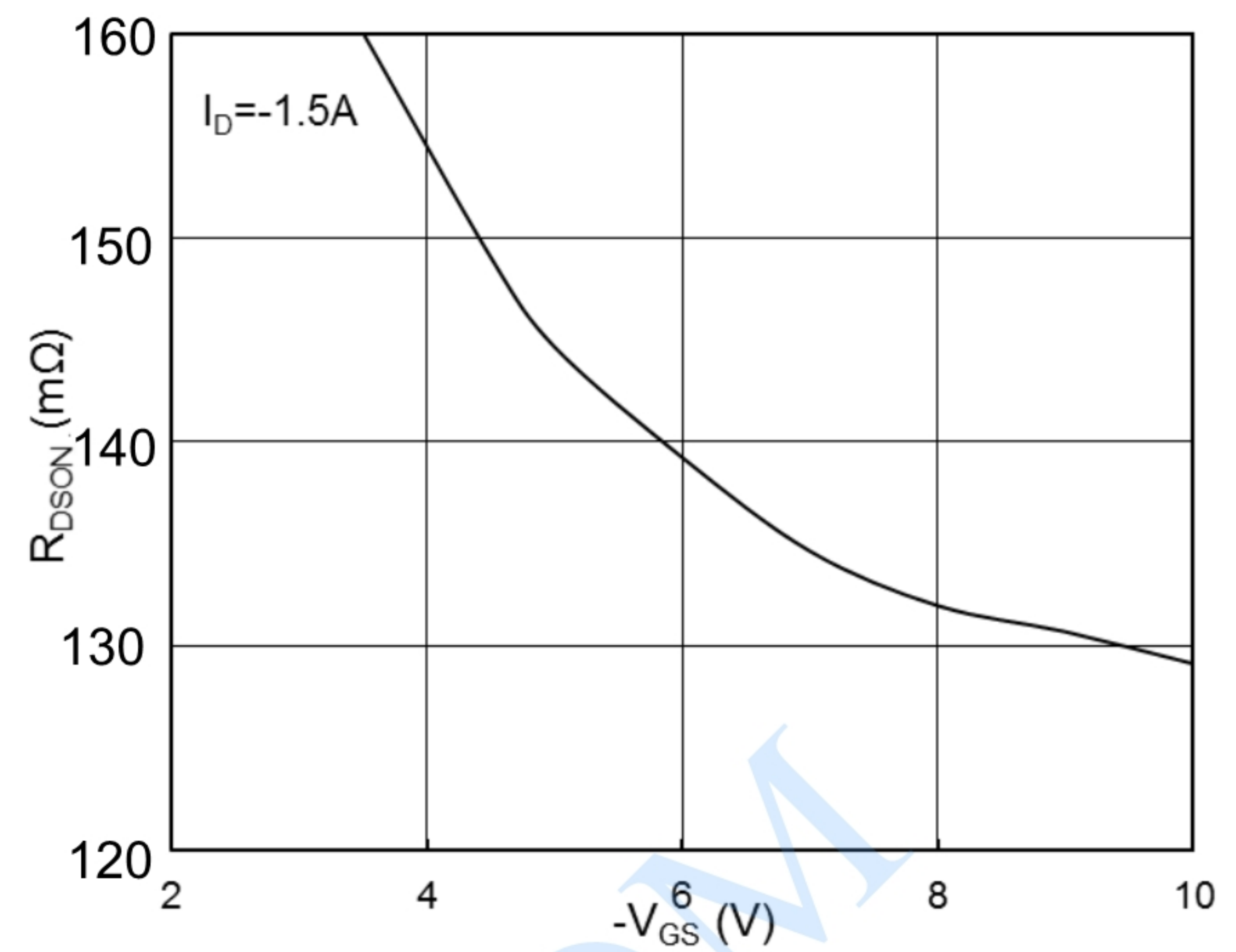
Note 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%

Note 3.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation

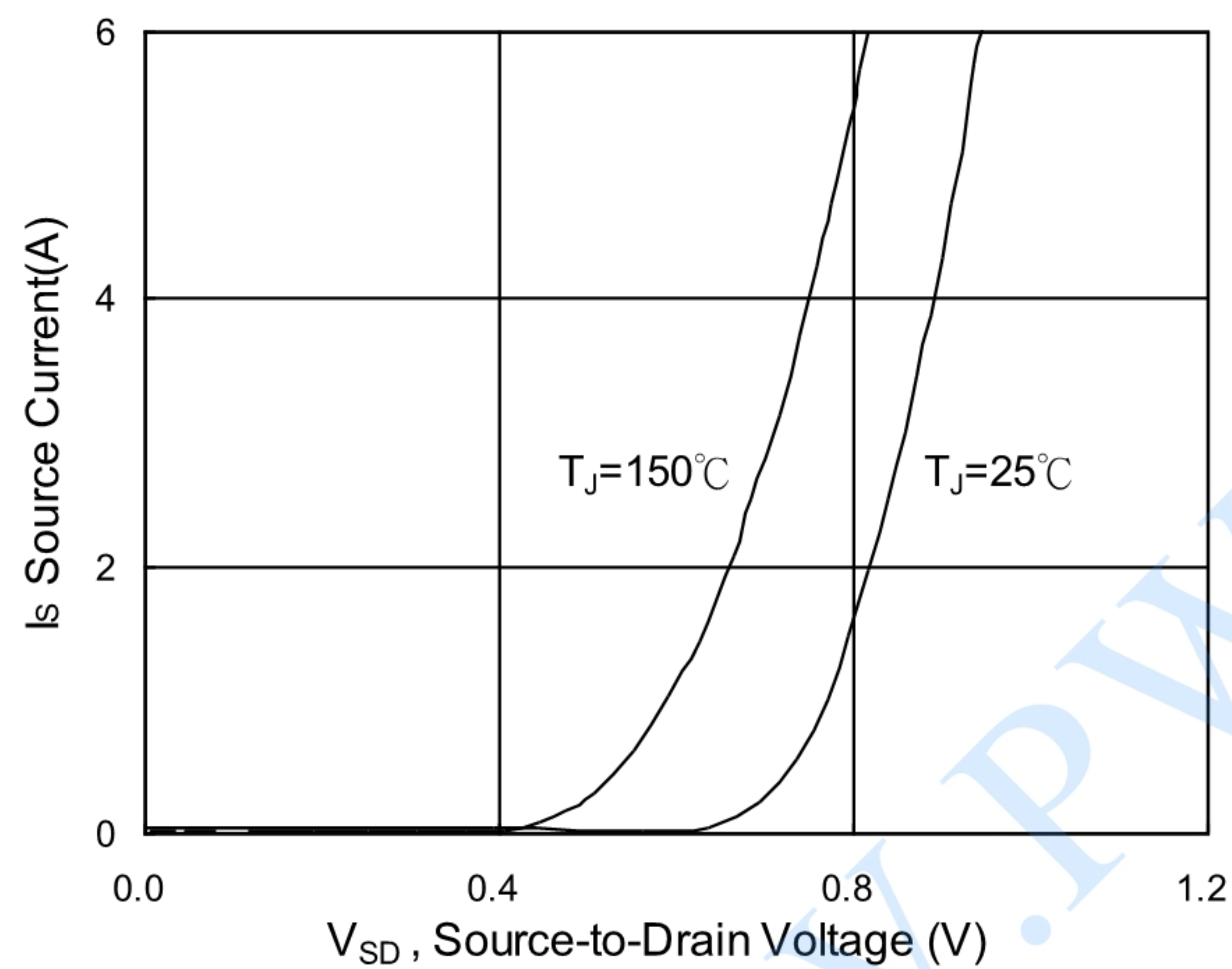
Thermal Characteristics



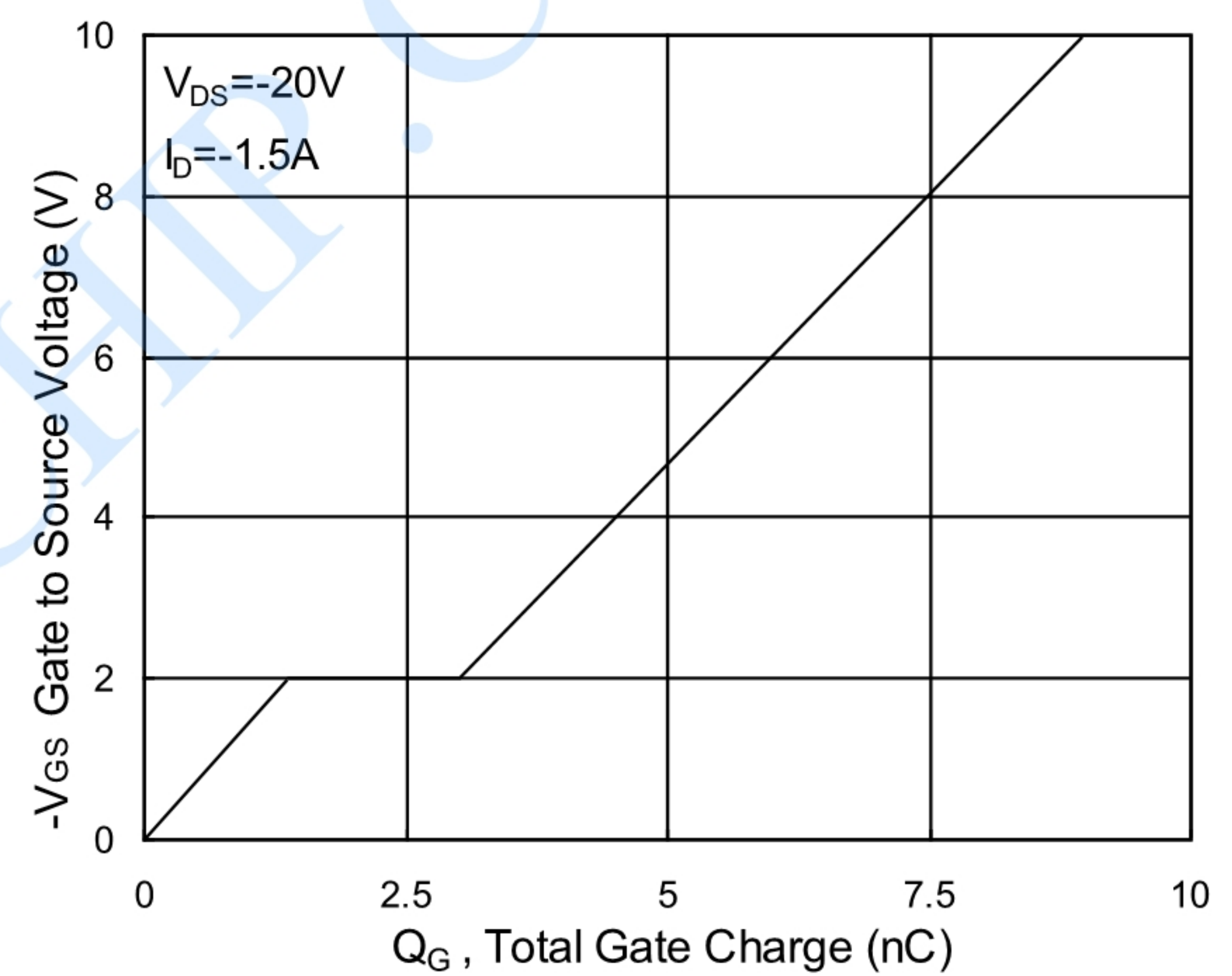
Typical Output Characteristics



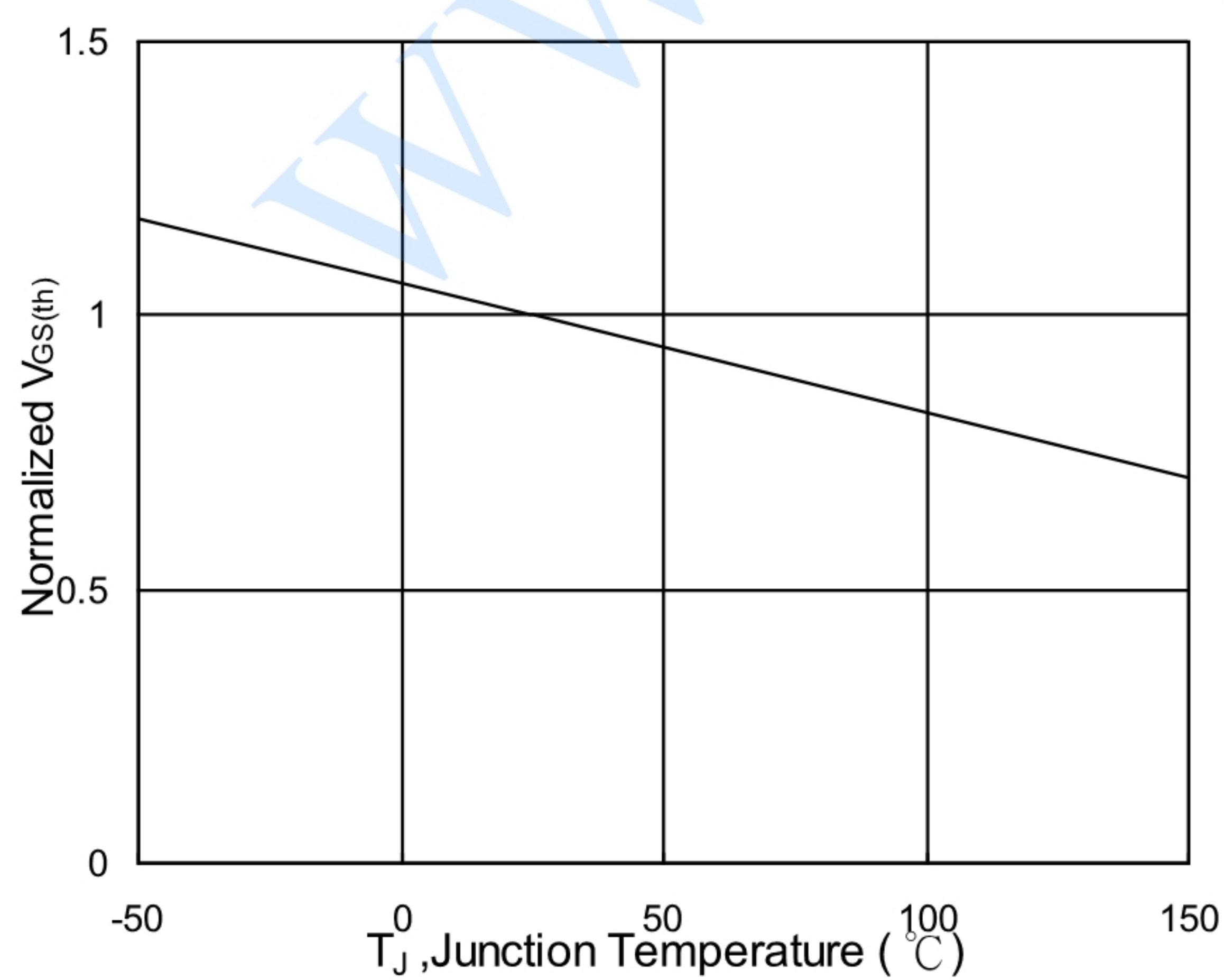
On-Resistance v.s Gate-Source



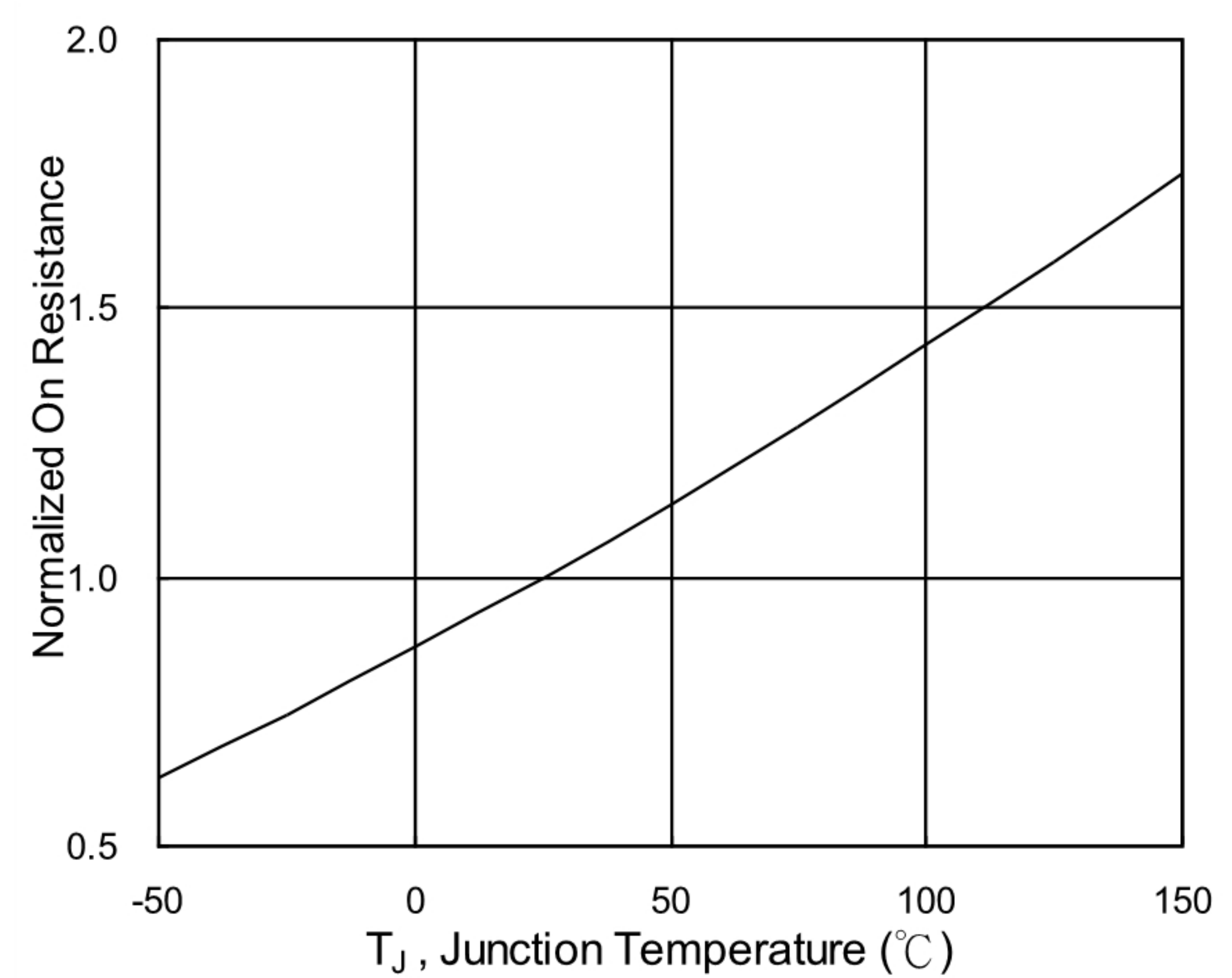
Forward Characteristics Of Reverse



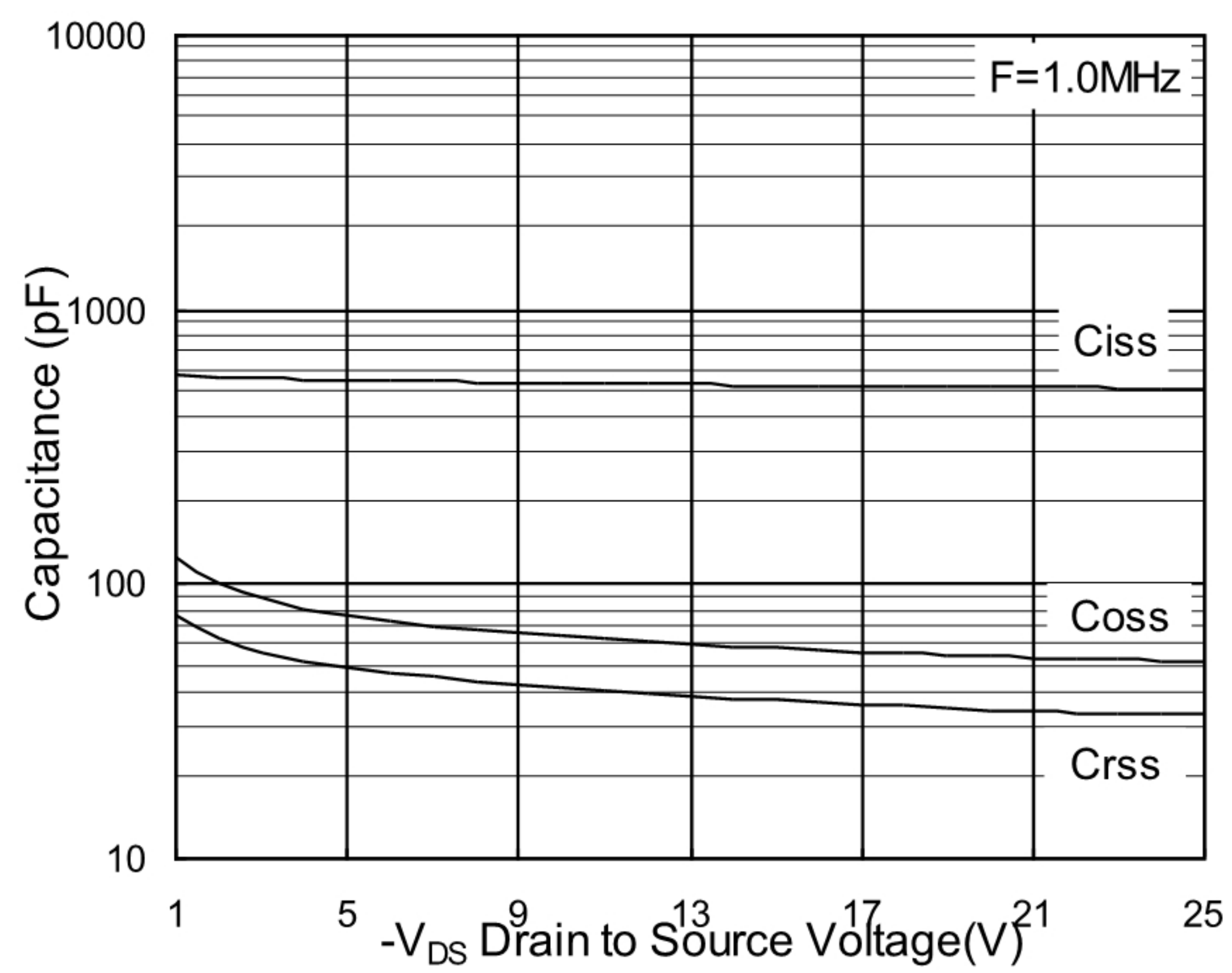
Gate-Charge Characteristics



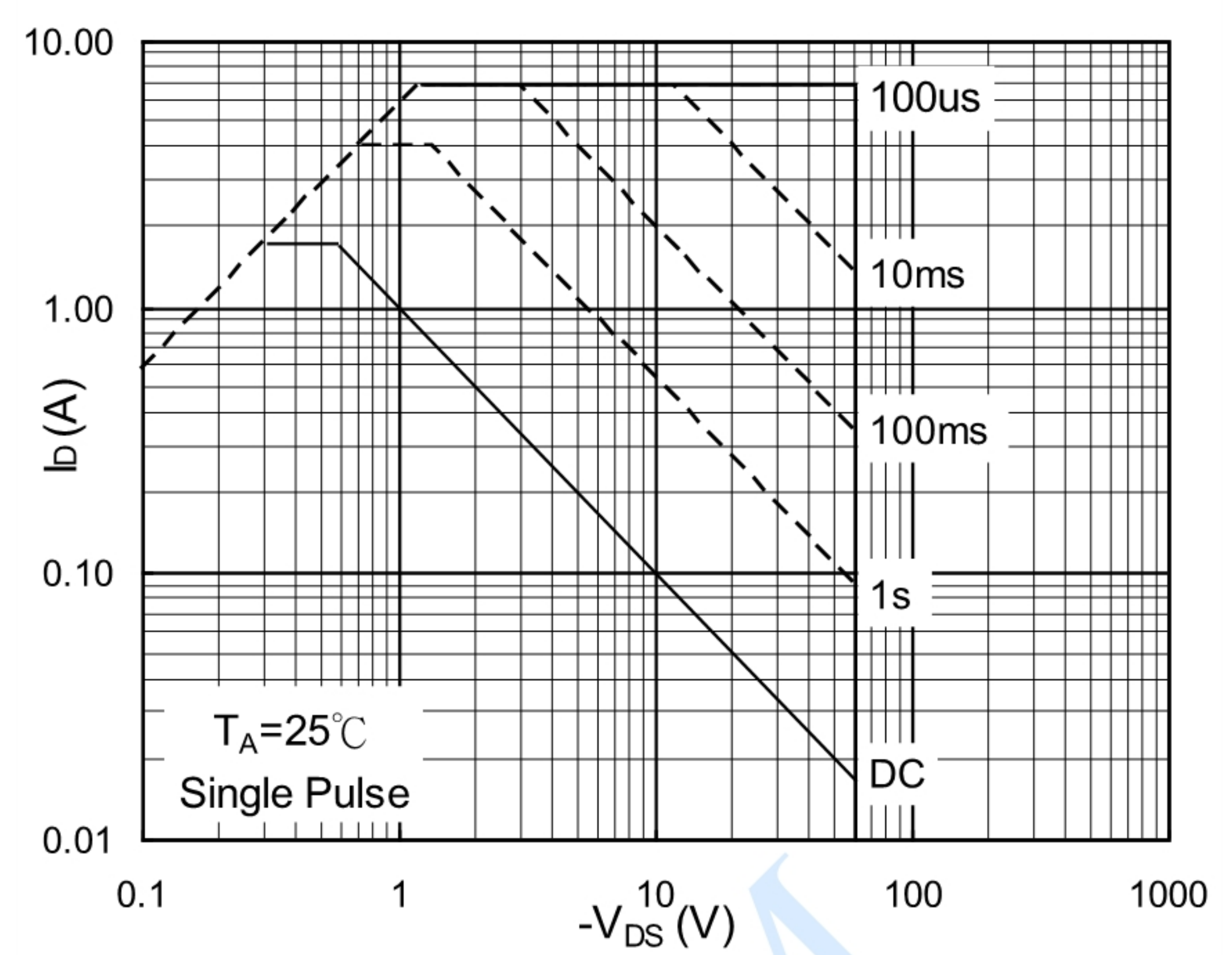
Normalized $V_{GS(th)}$ v.s T_J



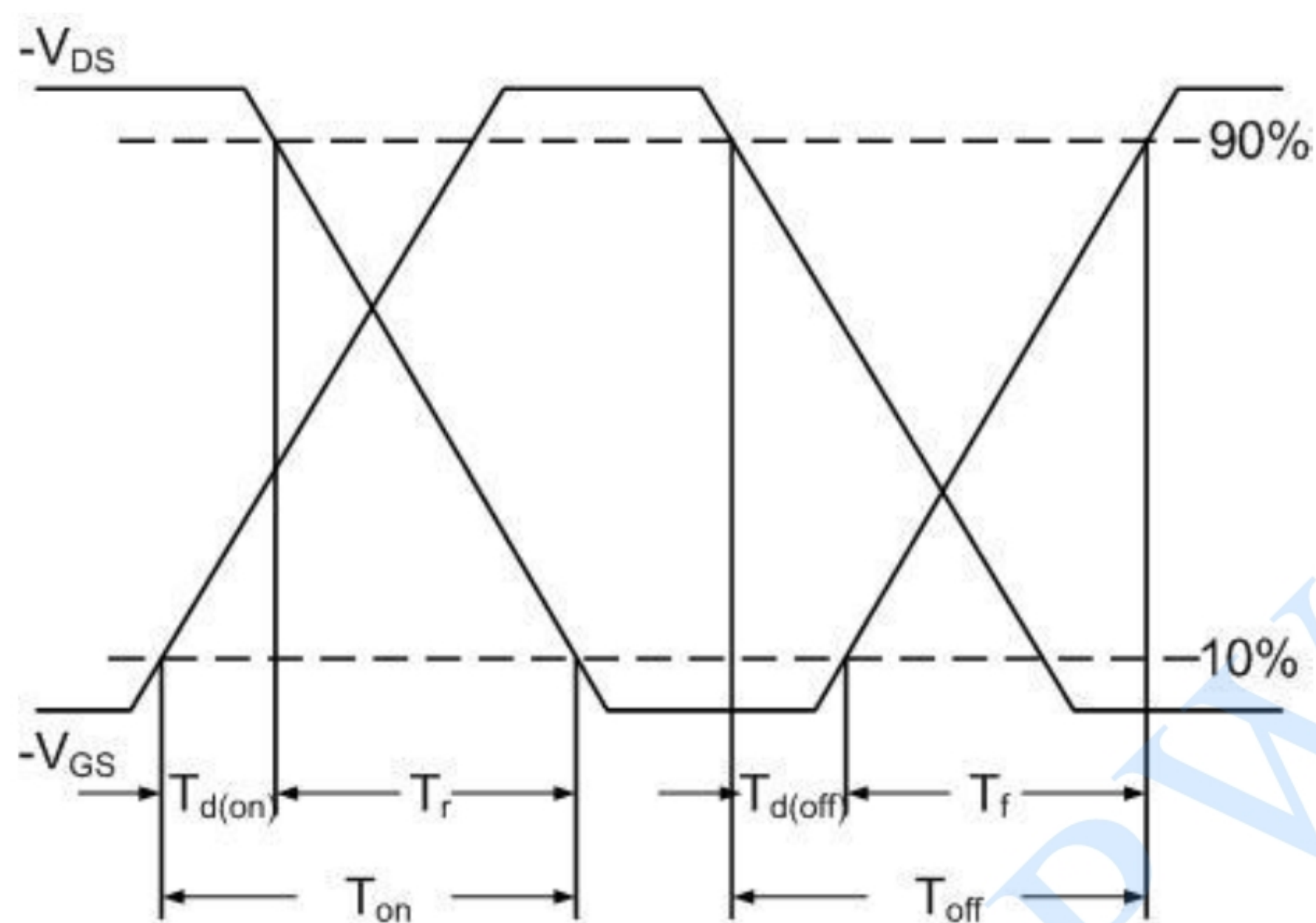
Normalized $R_{DS(on)}$ v.s T_J



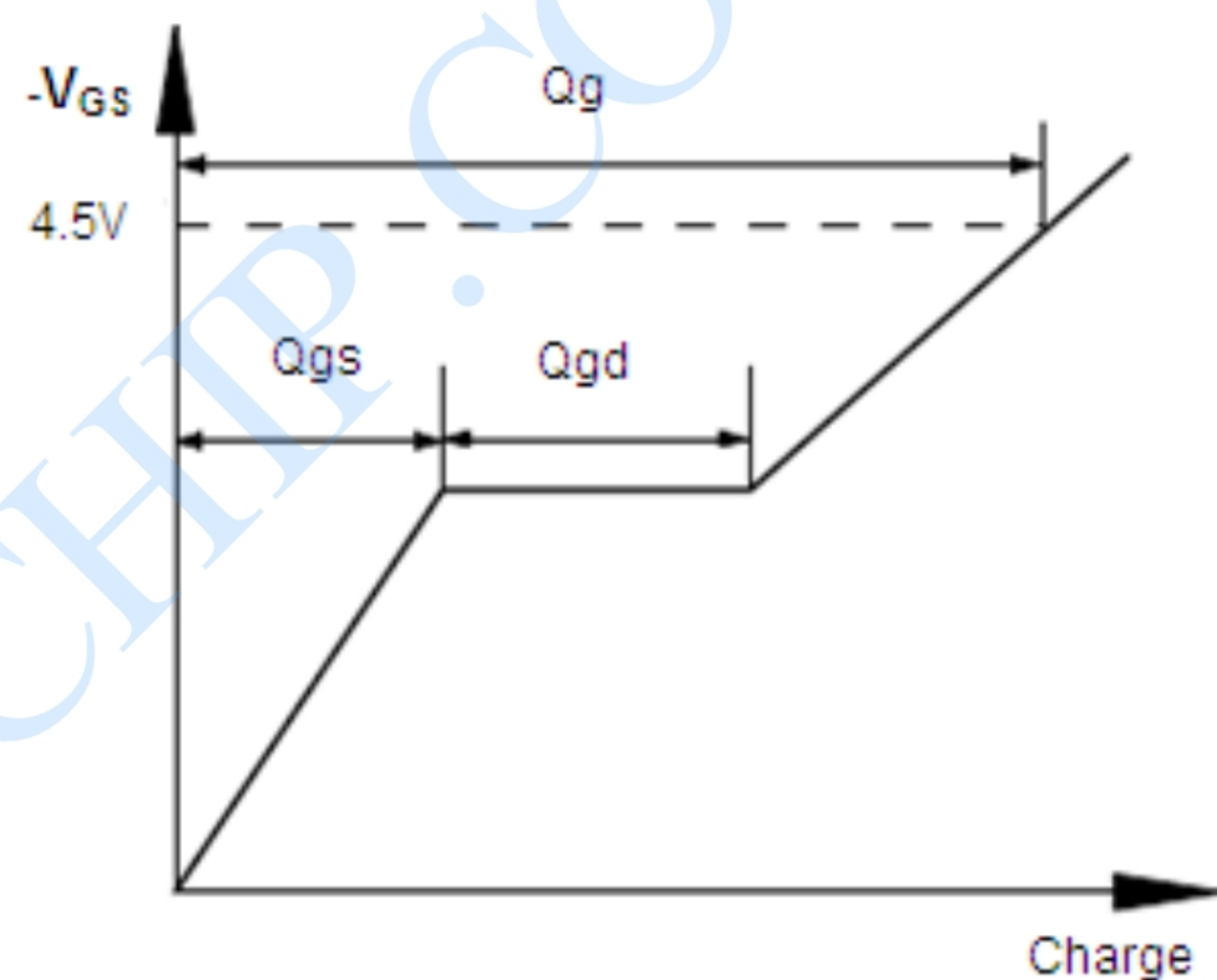
Capacitance



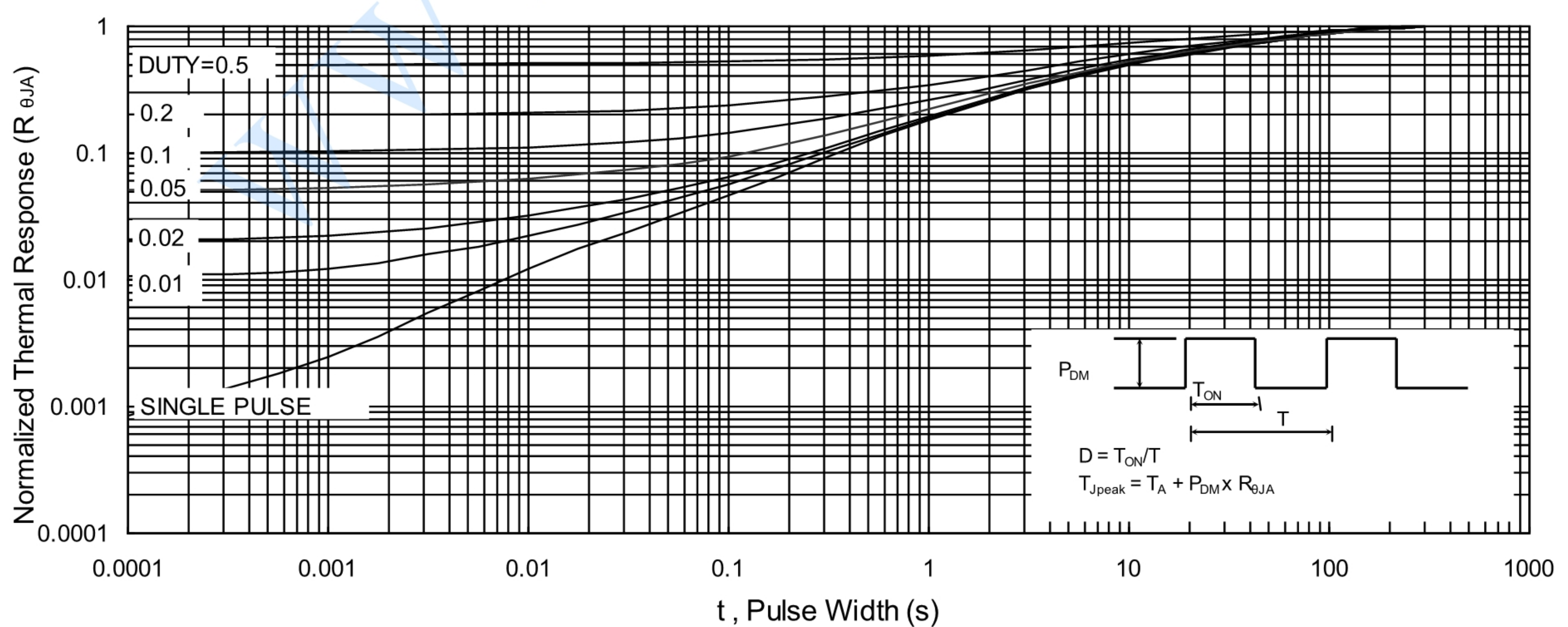
Safe Operating Area



Switching time waveform



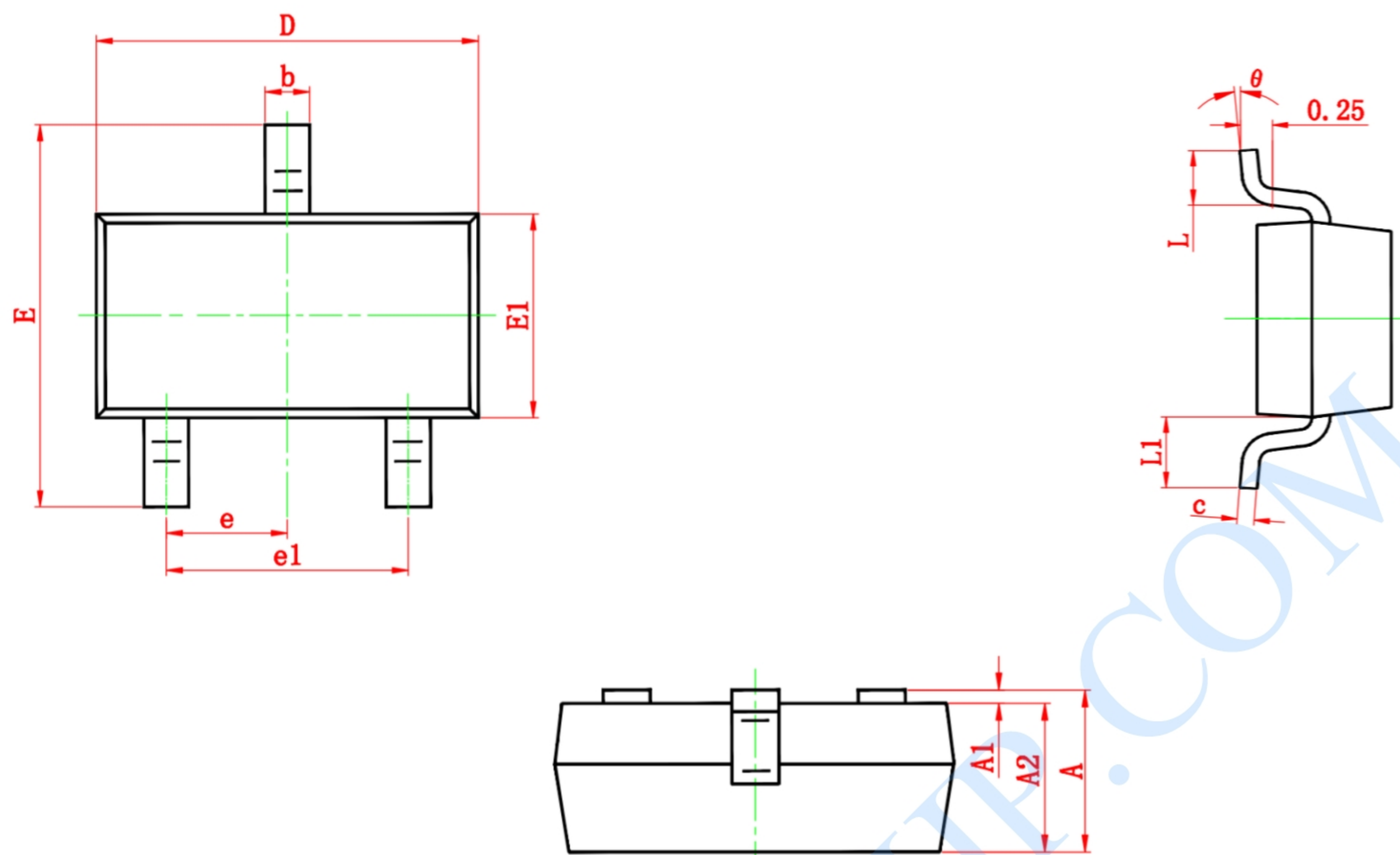
Gate Charge waveform



Normalized Maximum Transient Thermal Impedance

PACKAGE DESCRIPTION

SOT23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.



IMPORTANT NOTICE

Wuxi PWChip Semi Technology CO., LTD (PW) reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any products or services. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

PW assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using PW components.

PW products are not authorized for use in safety-critical applications (such as life support devices or systems) where a failure of the PW product would reasonably be expected to affect the safety or effectiveness of that devices or systems.

The information included herein is believed to be accurate and reliable. However, PW assumes no responsibility for its use; nor for any infringement of patents or other rights of third parties which may result from its use.